

REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE

South Central Electrical Infrastructure
University of Kentucky
Lexington, KY

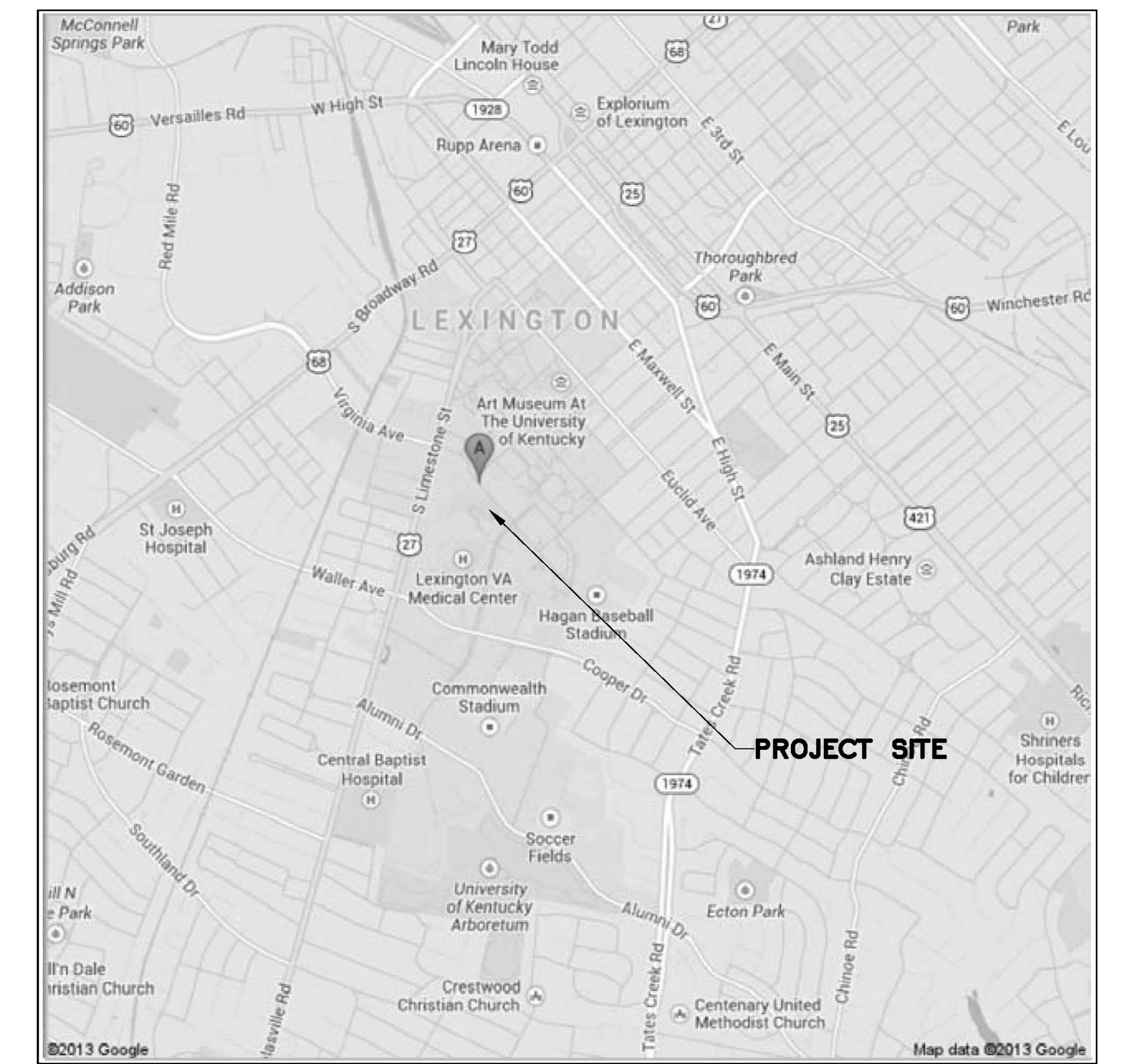
Project No. 2368.0
Contract Documents



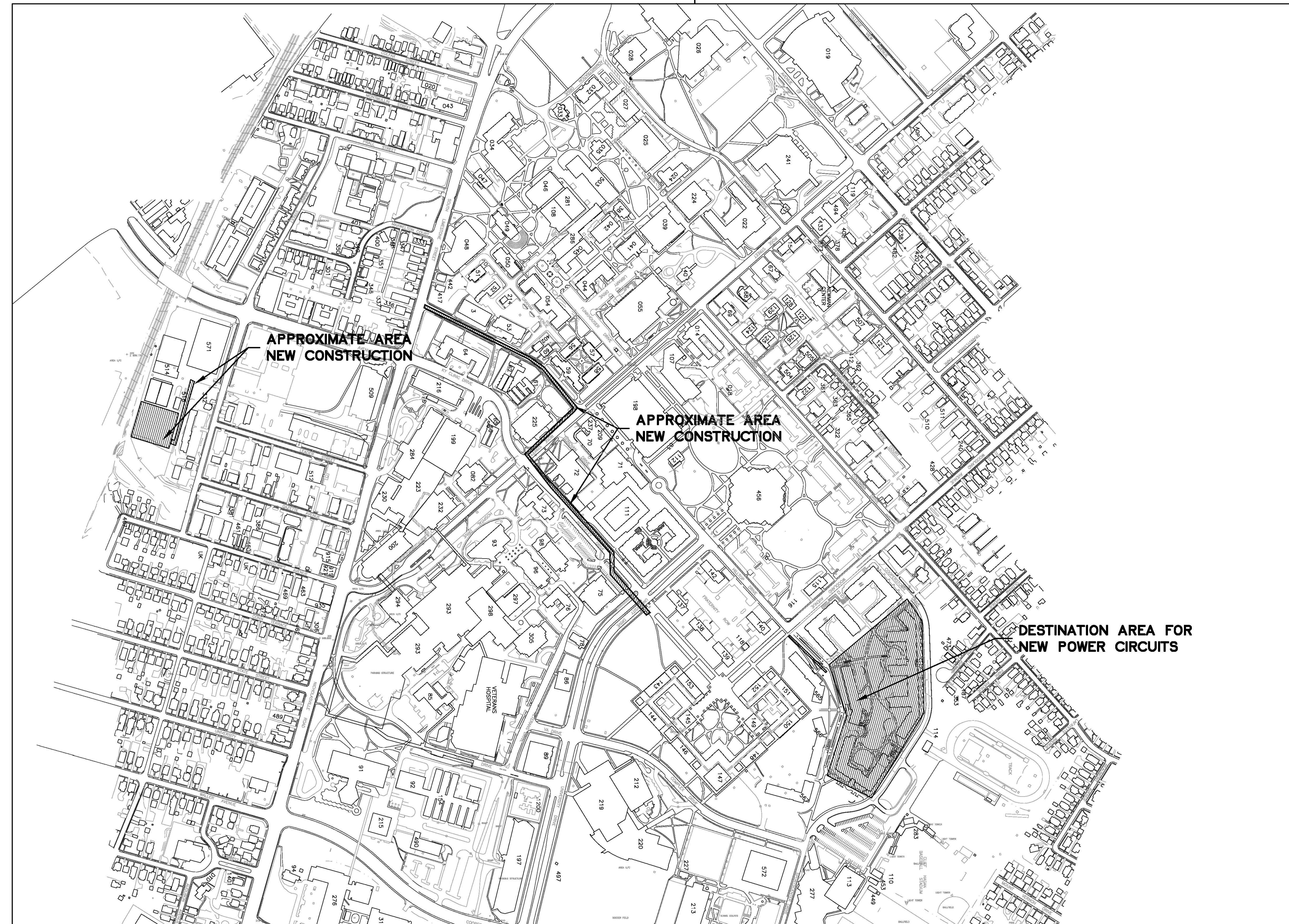
Staggs and Fisher Consulting Engineers, Inc.
3264 Lochness Drive, Lexington, KY 40517

DRAWING LIST

DRAWING NUMBER	DRAWING NAME
C0.0	COVER SHEET
U1.0	SITE UTILITIES KEY PLAN - OVERALL SITE
U2.0	SITE UTILITIES PLAN - AREA "A"
U2.1	SITE UTILITIES PLAN - AREA "B"
U2.2	SITE UTILITIES PLAN - AREA "C"
U2.3	SITE UTILITIES PLAN - AREA "D"
U3.0	SUBSTATION #3 - CONDUIT PLAN
U3.1	SUBSTATION #3 - GROUNDING PLAN
U3.2	SUBSTATION #3 - EQUIPMENT PLAN
U3.3	SUBSTATION #3 - BUSSING PLAN
U4.0	SITE UTILITIES DETAILS
U4.1	SITE UTILITIES DETAILS
U4.2	SUBSTATION DETAILS
U5.0	MANHOLE DETAILS
U5.1	MANHOLE DETAILS
U5.2	MANHOLE DETAILS



SITE LOCATION MAP



KEY PLAN

RECORD DRAWINGS DATE 12/16/2014

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STAGGS & FISHER CONSULTING ENGINEERS, INC.



SF Staggs and Fisher Consulting Engineers, Inc.
3264 Lochness Drive
Lexington, Kentucky 40517

COVER SHEET

REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS

University of Kentucky
Lexington, Kentucky

approved by

UK Project #: 2368.0

Site: 1/13/2014

S&F file no. 13524

Drawn by: WFW

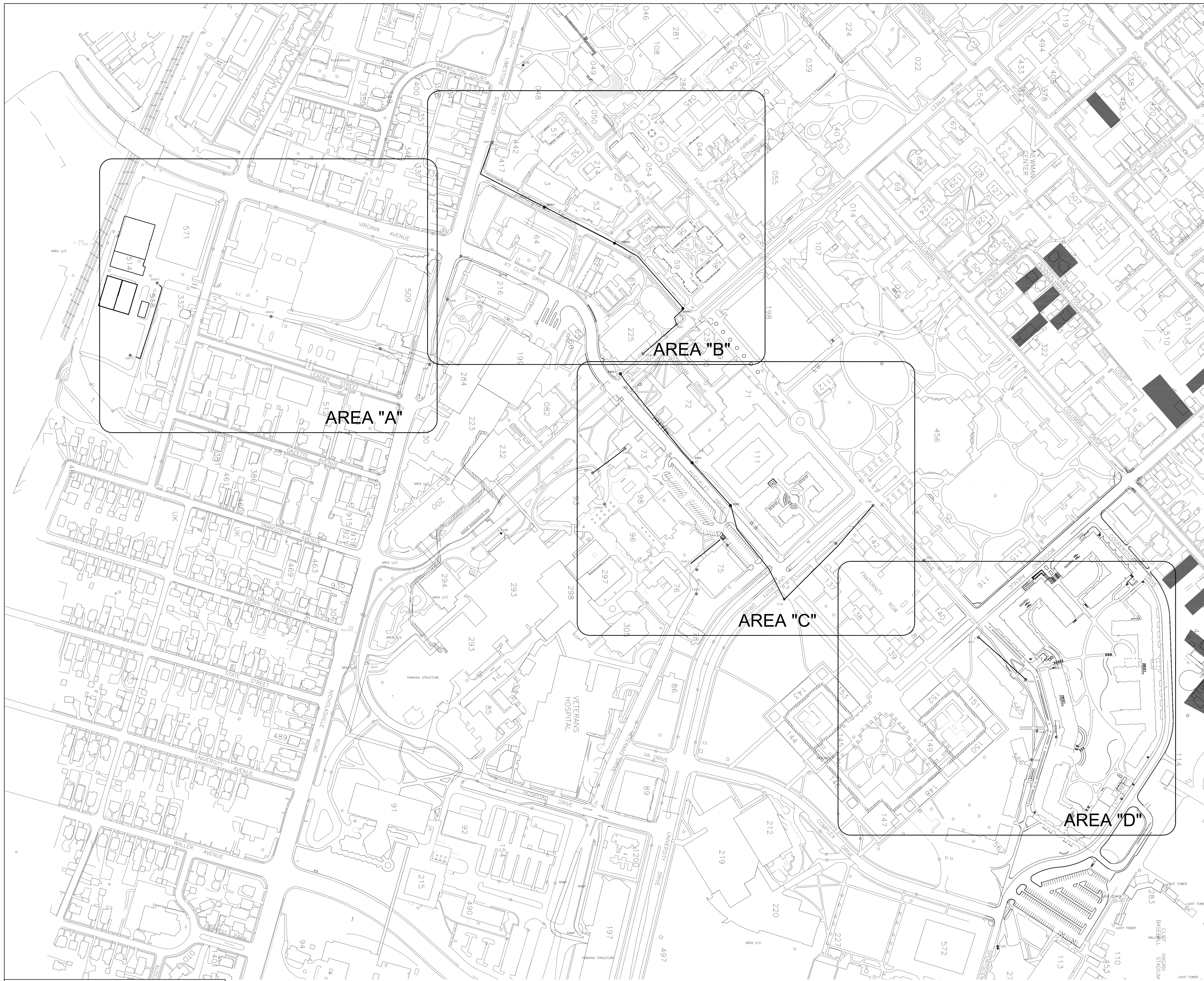
Checked by: GGC

Notes:

Drawing no.

C0.0

director - design and construction division 4/26



- GENERAL NOTES:**
- A. THE CONTRACT DOCUMENTS SHOW THE APPROXIMATE LOCATION OF THE EXISTING AND NEW SUBSURFACE UTILITY LINES. THESE LINES HAVE BEEN IDENTIFIED AND LOCATED AS ACCURATELY AS POSSIBLE USING AVAILABLE INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL ACTUAL LOCATIONS. IF ANY CHANGED, UNCHARTERED OR MISLOCATED UTILITY SERVICE IS INTERRUPTED FOR ANY REASON, THE CONTRACTOR WILL WORK CONTINUOUSLY TO RESTORE SERVICE TO THE SATISFACTION OF THE OWNER.
 - B. SHOULD UTILITIES REQUIRE RELOCATION OR REROUTING NOT SHOWN OR INDICATED TO BE RELOCATED OR REROUTED, CONTACT AND COOPERATE WITH THE OWNER TO MAKE THE REQUIRED ADJUSTMENTS AT AN EQUITABLE CHANGE IN THE CONTRACT PRICE.
 - C. EXISTING UTILITIES SHOWN MAY ACTUALLY BE IN DIFFERENT LOCATIONS AND ADDITIONAL UTILITIES NOT SHOWN MAY EXIST AND MAY BE IN USE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL UTILITIES DURING CONSTRUCTION.
 - D. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL EXISTING UNDERGROUND UTILITIES PRIOR TO EXCAVATING. THE OWNER WILL NOT LOCATE THESE UTILITIES FOR THE CONTRACTOR. IF AN OUTSIDE SERVICE OR COMPANY IS REQUIRED TO ACCURATELY LOCATE BURIED UTILITIES THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THIS WORK AND IS RESPONSIBLE FOR THE COSTS. THE CONTRACTOR SHOULD CONTACT APPROPRIATE UTILITY COMPANIES BEFORE DOING ANY EXCAVATING.
 - E. TOP ELEVATIONS OF NEW UNDERGROUND STRUCTURE ARE APPROXIMATE AND ARE FOR ESTIMATING PURPOSES ONLY. ACTUAL TOP ELEVATIONS MUST BE THE SAME AS FINISHED GRADE IN THE SAME AREA. SEE ARCHITECTURAL PLANS FOR FINISHED GRADES.
 - F. LOCATIONS OF UTILITIES ARE APPROXIMATE AND SUBJECT TO MINOR CHANGES IN THE FIELD. DO NOT SCALE THE DRAWINGS.
 - G. INSTALL UNDERGROUND FEEDERS WITH 2'-0" MINIMUM COVER.
 - H. EXCAVATION: MATERIALS TO BE EXCAVATED SHALL INCLUDE EARTH AND ANY OTHER MATERIAL, INCLUDING ROCK, ENCOUNTERED IN THE TRENCH EXCAVATION.
 - I. ALL UNDERGROUND CONDUITS FOR 15KV CABLING CONNECTIONS ARE TO BE ENCASED IN CONCRETE PER DETAILS.
 - J. ALL DIRECT BURIED LOW VOLTAGE CONDUITS SHALL BE SCHEDULE 80 PVC.
 - K. ALL CONDUIT RADI IN DUCTBANKS SHALL BE A MINIMUM OF 30".

NOTE:
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STAGGS & FISHER CONSULTING ENGINEERS, INC.

SCALE: NONE

<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		<p>SK Project #: 2399.0 Date: 1/13/2014</p>
		<p>SAF file no. 13524 Drawn by: BWF Checked by: GSC Notes:</p>
<p>SITE UTILITIES KEY PLAN OVERALL SITE</p>		
<p>REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS</p>		
<p>University of Kentucky Lexington, Kentucky</p>		<p>Drawing no. U1.0</p>
<p>approved by: </p>		
<p>director - design and construction division</p>		



- GOOD NOTES (AREA A):
1. NEW ELECTRIC DUCTBANK CONDUIT ENCASED IN CONCRETE PER DETAILS. CONNECT TO EXISTING DUCTBANK STUBBED OUT FROM MANHOLE.
 2. EXISTING ELECTRIC MANHOLE.
 3. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE NEW DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 4. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE EXISTING DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 5. SEE DETAILS FOR DUCTBANK TERMINATION INTO THE EXISTING MANHOLE.
 6. SEE SUBSTATION PLANS FOR ADDITIONAL WORK IN THIS AREA. THIS WORK IS PART OF ANOTHER BID PACKAGE AND IS INCLUDED HERE FOR REFERENCE ONLY.



E907-3
 36" DEEP
 3/4" CONDUIT
 10" DEEP
 2" SUMP PUMP LINE
 3' DEEP
 1.5" WATER
 3' DEEP
 E907-5

460 feet

E907-2

440 feet

E907-1

190 feet

E907

LEADER STREET

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 STAGGS & FISHER CONSULTING ENGINEERS, INC.

SCALE: 1" = 40'

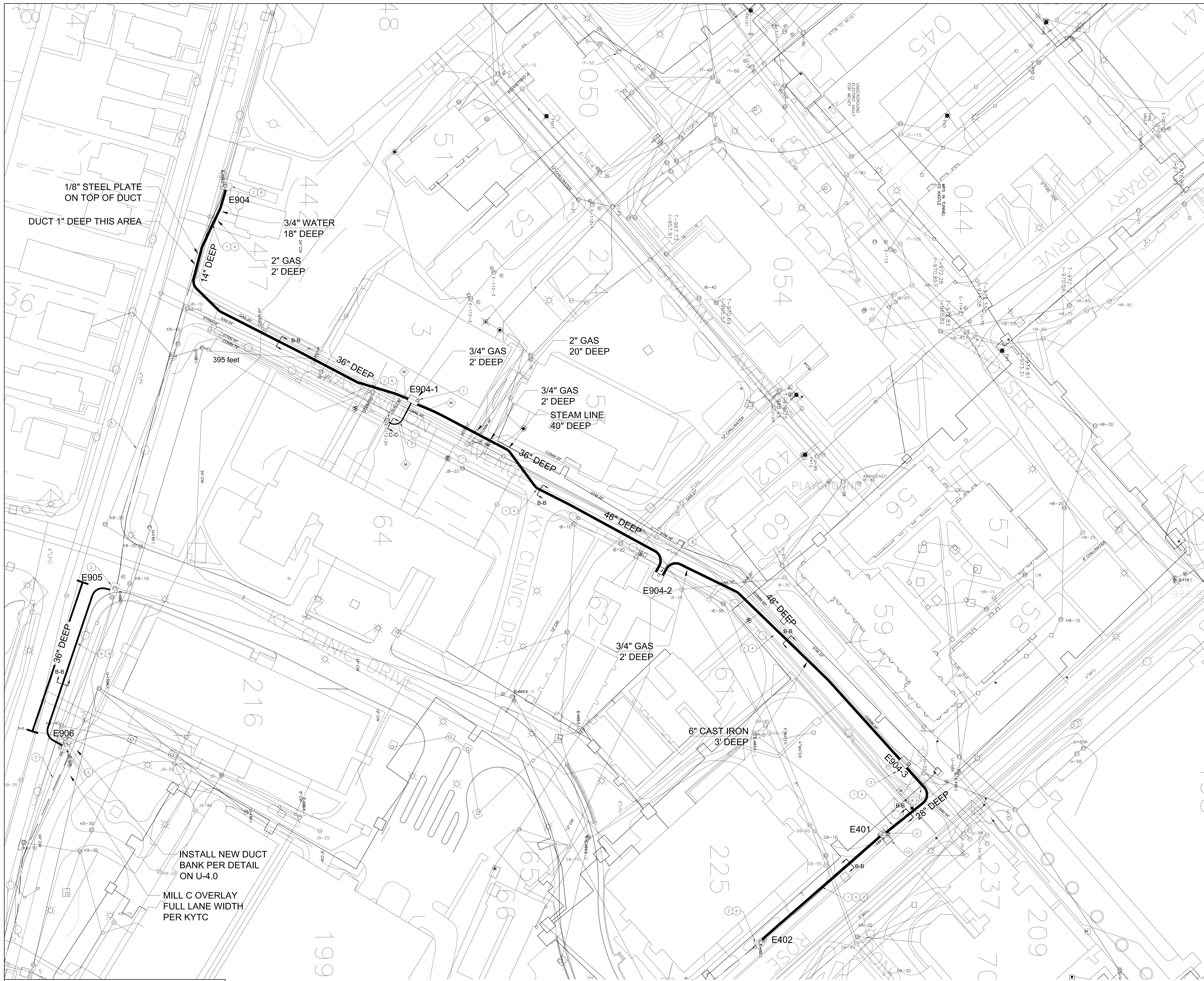
SF Staggs and Fisher Consulting Engineers, Inc.
 3264 Lochness Drive
 Lexington, Kentucky 40517

SITE UTILITIES PLAN AREA "A"		SK Project #: 2399.0
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		Site: 1/13/2014
University of Kentucky Lexington, Kentucky		S&F file no. 13524
approved by _____		Drawn by: BHP
director - design and construction division		Checked by: GSC
date _____		Notes:



U2.0

- CODED NOTES (AREA B):
1. NEW ELECTRIC DUCTBANK ENCASED IN CONCRETE PER DETAILS. CONNECT TO EXISTING DUCTBANK STUBBED OUT FROM MANHOLE.
 2. EXISTING ELECTRIC MANHOLE.
 3. NEW PRECAST ELECTRIC MANHOLE. SEE DETAILS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
 4. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE NEW DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 5. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE EXISTING DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 6. SEE DETAILS FOR DUCTBANK TERMINATION INTO THE EXISTING MANHOLE.
 7. INSTALL NEW DUCTBANK ALONGSIDE THE EXISTING ONE.
 8. PROVIDE AND INSTALL 1" FOAM BOARD BETWEEN THE DUCTBANK AND STEAM LINES WHERE THEY CROSS. EXTEND THE FOAM BOARD 3' IN EACH DIRECTION PAST THE EDGE OF THE CROSSING.
 9. NEW ELECTRIC DUCTBANK ENCASED IN CONCRETE PER DETAILS.
 10. CONSTRUCT AN EXPANSION TO THE EXISTING MANHOLE IN ACCORDANCE WITH THE STRUCTURAL DETAILS. PROVIDE MANHOLE WITH A GASKETED, WATER TIGHT LID.



INSTALL NEW DUCT BANK PER DETAIL ON U-4.0
MILL C OVERLAY FULL LANE WIDTH PER KYTC

RECORD DRAWINGS DATE 12/16/2014

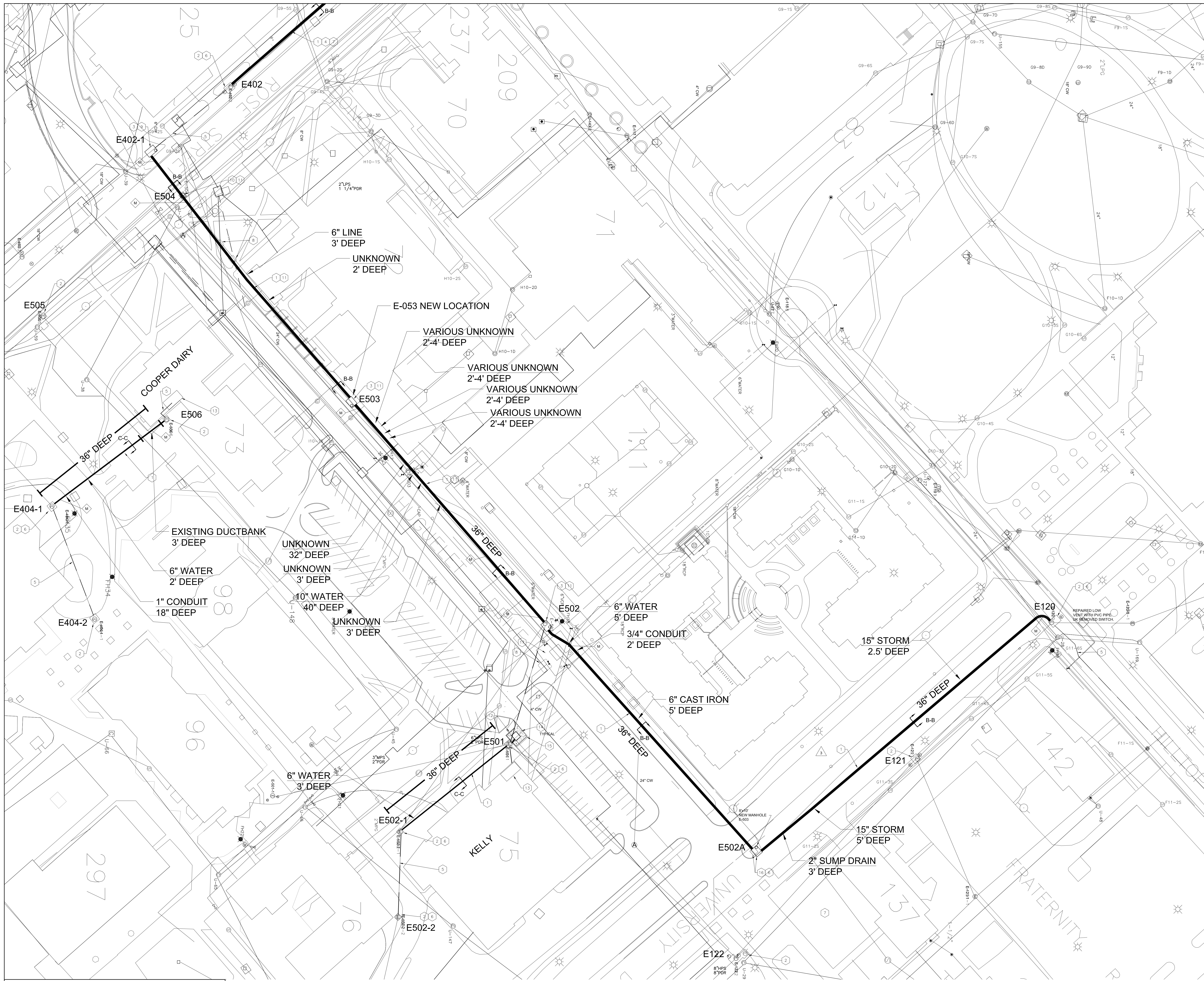
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STAGGS & FISHER CONSULTING ENGINEERS, INC.

SCALE: 1" = 40'

<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		<p>SK Project #: 2390.0</p>
		<p>Site: 1/13/2014</p>
<p>SITE UTILITIES PLAN AREA 'B'</p>		<p>SAF file no. 13524</p>
<p>REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS</p>		<p>Drawn by: BHF</p>
<p>University of Kentucky Lexington, Kentucky</p>		<p>Checked by: GSC</p>
<p>approved by: </p>		<p>Plotting no. U2.1</p>
<p>director - design and construction division</p>		<p>date</p>

NOTE:
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- GOOD NOTES (AREA C):**
1. NEW ELECTRIC DUCTBANK ENCASED IN CONCRETE PER DETAILS. CONNECT TO EXISTING DUCTBANK STUBBED OUT FROM MANHOLE.
 2. EXISTING ELECTRIC MANHOLE.
 3. NEW PRECAST ELECTRIC MANHOLE. SEE DETAILS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
 4. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE NEW DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 5. PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE EXISTING DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 6. SEE DETAILS FOR DUCTBANK TERMINATION INTO THE EXISTING MANHOLE.
 7. INSTALL NEW DUCTBANK ALONGSIDE THE EXISTING ONE.
 8. PROVIDE AND INSTALL 1" FOAM BOARD BETWEEN THE DUCTBANK AND STEAM LINES WHERE THEY CROSS. EXTEND THE FOAM BOARD 3' IN EACH DIRECTION PAST THE EDGE OF THE CROSSING.
 9. NEW CAST-IN-PLACE MANHOLE CONSTRUCTED AROUND THE EXISTING DUCTBANK. AFTER THE MANHOLE WALLS ARE COMPLETED, REMOVE THE CONCRETE FROM THE EXISTING DUCTBANK WITHIN THE CONFINES OF THE NEW MANHOLE. THERE ARE SEVERAL ACTIVE 15KV FEEDERS IN THIS DUCTBANK SO THE CONCRETE MUST BE CAREFULLY REMOVED. COORDINATE WITH THE OWNER FOR THIS REMOVAL, SO THAT APPROPRIATE SYSTEM WIDE PRECAUTIONS CAN BE IMPLEMENTED.
 10. REMOVE EXISTING MANHOLE STRUCTURE TO MAKE ROOM FOR NEW MANHOLE AND/OR DUCTBANK. THIS WORK CANNOT BEGIN UNTIL THE NEW 15KV FEEDER FOR THE COOPER DAIRY BUILDING HAS BEEN INSTALLED AND IN SERVICE.
 11. IT IS INTENDED THAT THE NEW DUCTBANK/MANHOLE SYSTEM BE INSTALLED IN THE SAME LOCATION AS THE ORIGINAL DUCTBANK/MANHOLE SYSTEM TO REDUCE CONFLICTS WITH OTHER UTILITIES IN THIS AREA. SEE THE 15KV SCHEMATIC DETAILS FOR ADDITIONAL INFORMATION ON CIRCUITS WHICH MUST BE REROUTED TO ALLOW THE EXISTING DUCTBANK SYSTEM TO BE REMOVED.
 12. NEW PAD MOUNT 15KV SWITCH PROVIDED BY THE OWNER AND INSTALLED BY THIS CONTRACTOR. MOUNT SWITCH ON A NEW CONCRETE PAD SIZED PER THE DETAIL. SEE THE 15KV SCHEMATIC DETAILS FOR ADDITIONAL INFORMATION. CONNECT NEW SWITCH TO EXISTING MANHOLE E501 WITH (9) 1" CONDUITS ENCASED IN CONCRETE PER DUCTBANK DETAILS.
 13. APPROXIMATE LOCATION OF THE BUILDING'S MAIN ELECTRIC ROOM.
 14. CONCRETE BOLLARD FOR PROTECTION OF SWITCH. SEE DETAIL FOR ADDITIONAL INFORMATION.
 15. AFTER CONCRETE PAD AND BOLLARDS FOR SWITCH ARE INSTALLED, POUR NEW CONCRETE AROUND SWITCH AS INDICATED. CONFORM TO PUBLISHED UK STANDARDS. MATCH EXISTING ELEVATION AND CHARACTERISTICS OF THE ADJACENT SIDEWALK CONCRETE.
 16. REMOVE EXISTING ABANDONED 416V MANHOLE AND INSTALL A NEW 4x10' MANHOLE IN THE SAME LOCATION BUT ORIENTED AS INDICATED.
 17. INSTALL 24 FOOT RADIUS ON DUCTBANK CONDUITS AT THIS LOCATION.

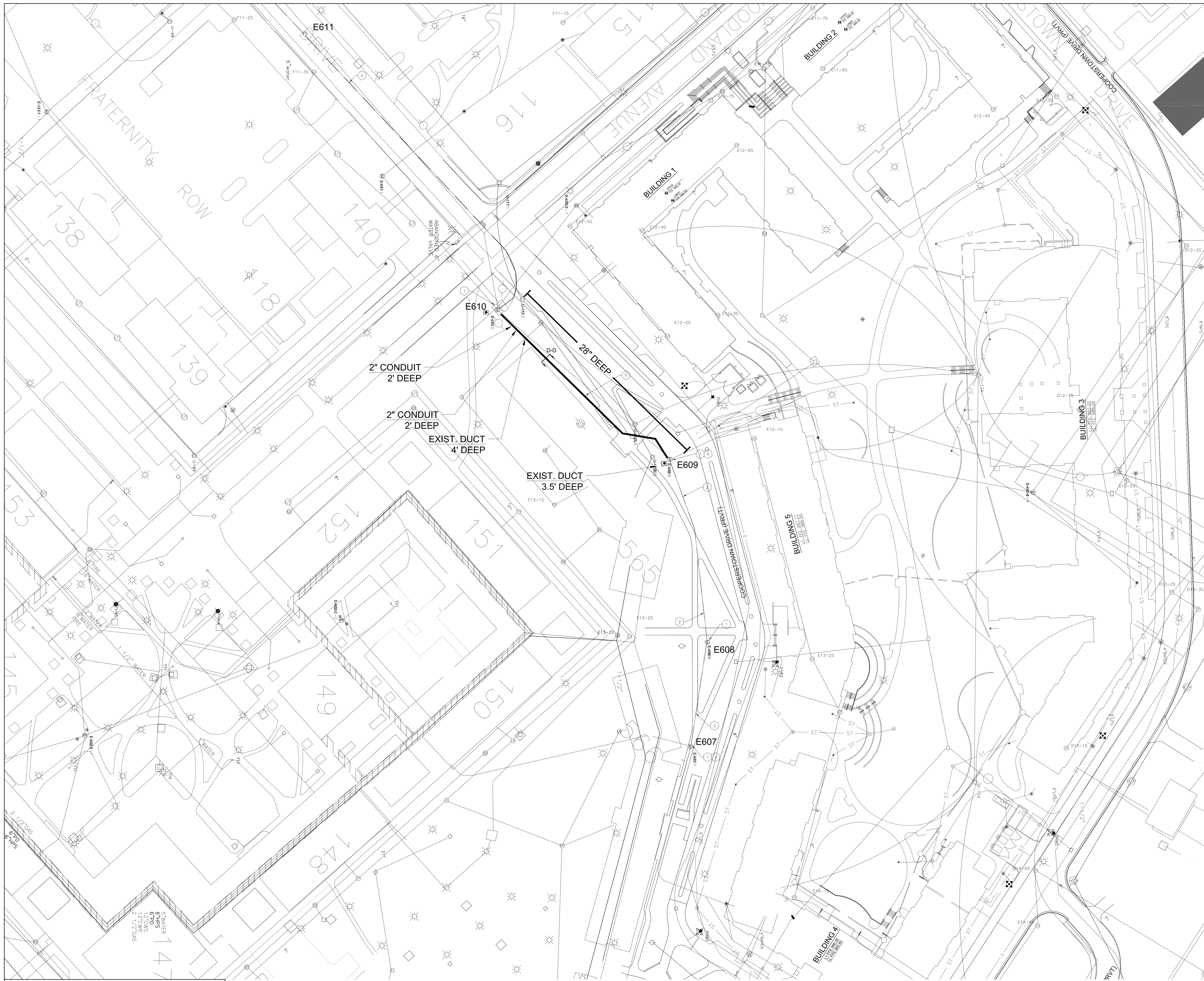
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 STAGGS & FISHER CONSULTING ENGINEERS, INC.

SCALE: 1" = 40'

Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517		UK Project #: 2399.0
		Site: 1/13/2014
SITE UTILITIES PLAN AREA 'C'		SAF file no. 13524 Drawn by: BWF Checked by: GGC Notes:
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		Drawing no. U2.2
University of Kentucky Lexington, Kentucky		approved by: _____ director - design and construction division





- CODED NOTES (AREA D):
- EXISTING ELECTRIC MANHOLE.
 - PROVIDE AND INSTALL A NEW 15KV CIRCUIT IN THE EXISTING DUCTBANK PER THE 15KV SCHEMATIC DETAILS.
 - DISCONNECT AND REMOVE EXISTING 4-WAY FROM MANHOLE AND INSTALL IN EXISTING MANHOLE E609. COORDINATE WITH OWNER FOR RECONNECTION AND REMOVAL. SEE 15KV SCHEMATIC FOR ADDITIONAL INFORMATION.
 - INSTALL NEW SWITCH (4-WAY WITH TIE) IN EXISTING MANHOLE E607. SEE 15KV SCHEMATIC FOR ADDITIONAL INFORMATION.
 - NEW ELECTRIC DUCTBANK CONDUIT ENCASED IN CONCRETE PER DETAILS.

RECORD DRAWINGS DATE 12/16/2014

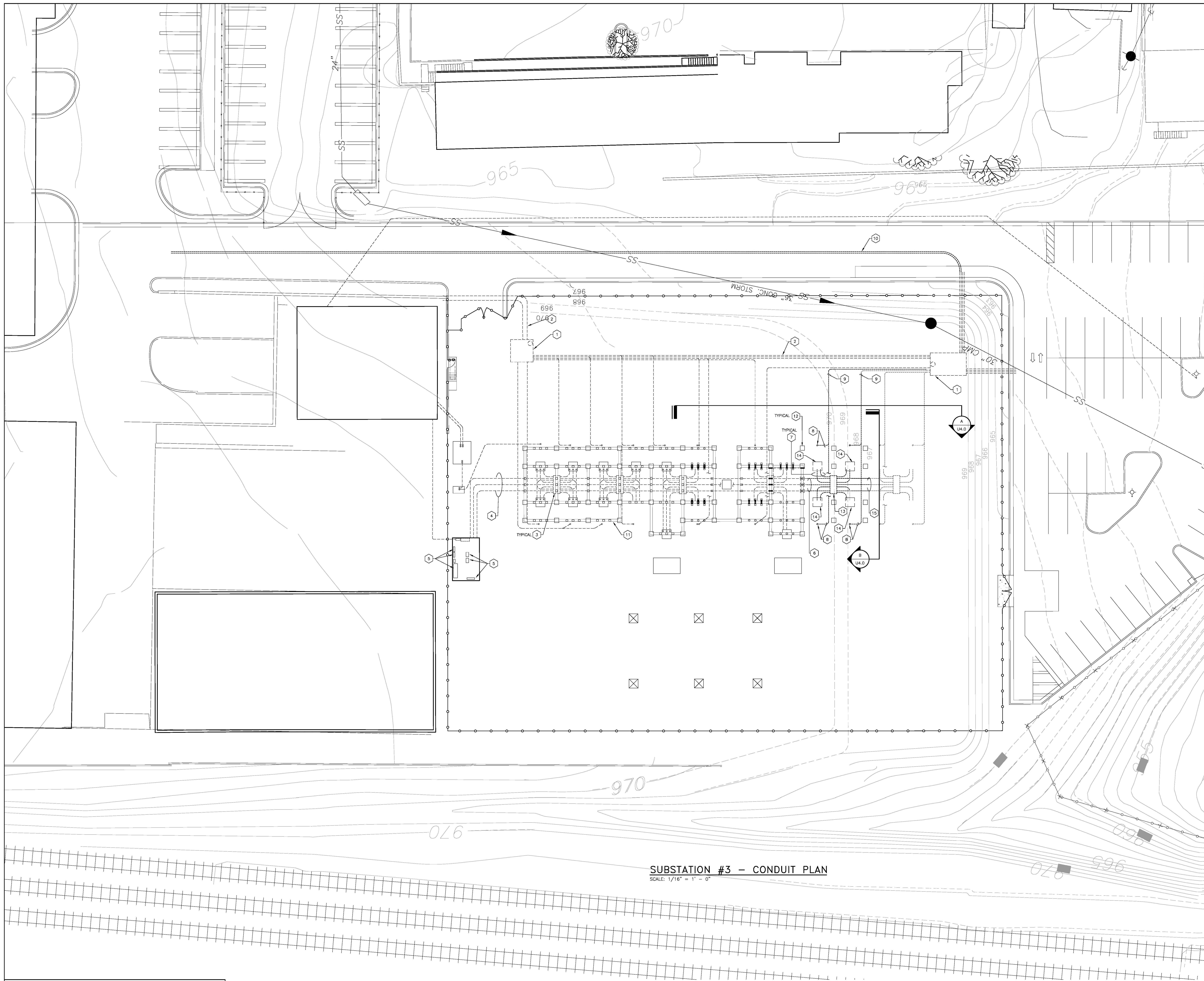
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STAGGS & FISHER CONSULTING ENGINEERS, INC.

SCALE: 1" = 40'

<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		<p>SK Project #: 2399.0</p>
		<p>Site: 1/13/2014</p>
<p>SITE UTILITIES PLAN AREA "D"</p>		<p>SAF file no. 13524</p>
<p>REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS</p>		<p>Drawn by: BWF</p>
<p>Lexington, Kentucky University of Kentucky</p>		<p>Checked by: GGC</p>
<p>approved by: </p>		<p>Drawing no. U2.3</p>
<p>director - design and construction division</p>		<p>date</p>

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- GENERAL NOTES:**
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 - C EXISTING UTILITIES SHOWN MAY ACTUALLY BE IN DIFFERENT LOCATIONS AND ADDITIONAL UTILITIES NOT SHOWN MAY EXIST AND MAY BE IN USE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL UTILITIES DURING CONSTRUCTION.
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 - E TOP ELEVATIONS OF NEW UNDERGROUND STRUCTURE ARE APPROXIMATE AND ARE FOR ESTIMATING PURPOSES ONLY. ACTUAL TOP ELEVATIONS MUST BE THE SAME AS FINISHED GRADE IN THE SAME AREA. SEE ARCHITECTURAL PLANS FOR FINISHED GRADES.
 - F LOCATIONS OF UTILITIES ARE APPROXIMATE AND SUBJECT TO MINOR CHANGES IN THE FIELD. DO NOT SCALE THE DRAWINGS.
 - G INSTALL UNDERGROUND FEEDERS WITH 2'-0" MINIMUM COVER.
 - H EXCAVATION: MATERIALS TO BE EXCAVATED SHALL INCLUDE EARTH AND ANY OTHER MATERIAL, INCLUDING ROCK, ENCOUNTERED IN THE TRENCH EXCAVATION.
 - I ALL UNDERGROUND CONDUITS FOR 15KV CABLING CONNECTIONS ARE TO BE ENCASED IN CONCRETE PER DETAILS.
 - J ALL DIRECT BURIED LOW VOLTAGE CONDUITS SHALL BE SCHEDULE 80 PVC.
 - K ALL CONDUIT RADI IN DUCTBANKS SHALL BE A MINIMUM OF 10 FEET.

- CODED NOTES (CONDUIT PLAN):**
1. EXISTING ELECTRIC MANHOLE E907-4.
 2. EXISTING DUCTBANK.
 3. EXISTING PULL BOX FOR BREAKER CONTROL AND MONITORING CABLING.
 4. EXISTING SUBSTATION BREAKER CONTROL CONDUITS TO CONTROL HOUSE.
 5. EXISTING SUBSTATION BREAKER CONTROL EQUIPMENT.
 6. PROVIDE AND INSTALL (4) 6" CONDUITS BETWEEN CONTROL SYSTEM PULLBOXES.
 7. PROVIDE AND INSTALL (1) 3" AND (1) 1/2" CONDUIT FROM EACH PULLBOX TO SUBSTATION BREAKER LOCATION. STUB CONDUITS UP 12" AFG.
 8. PROVIDE AND INSTALL (1) 6" CONDUIT TO RISER LOCATION. SEE DETAILS FOR ADDITIONAL INFORMATION.
 9. (2) 5" CONDUITS.
 10. ELECTRIC DUCTBANK CONSISTING OF (8) 5" CONDUITS AND (1) 2" CONDUIT ENCASED IN CONCRETE PER DETAIL. CONNECT TO ONE HALF OF THE EXISTING STUBOUTS FROM THE MANHOLE. THE EXISTING STUBOUTS ARE CONFIGURED IN A 4-BY-4 LAYOUT. UTILIZE THE TWO NORTHERN MOST VERTICAL ROWS OF CONDUITS. MAINTAIN COMPLETE ACCESS TO THE REMAINING STUBOUTS FOR FUTURE EXTENSION. SEE SITE UTILITIES PLAN - AREA "A" AND MANHOLE DETAILS FOR ADDITIONAL INFORMATION.
 11. EXISTING STEEL SUPERSTRUCTURE.
 12. PROVIDE AND INSTALL NEW CONCRETE BASE FOR SUPERSTRUCTURE COLUMNS. SEE DETAILS.
 13. NEW CONTROL CABLING PULL BOX. PULL BOX SHALL BE 36"x72"x21" DEEP QUARTZITE MODEL PG3672BA21 OR EQUAL.
 14. PROVIDE AND INSTALL NEW CONCRETE BASE FOR SUBSTATION BREAKER PER DETAILS.
 15. PROVIDE AND INSTALL (4) 6" CONDUITS STUBBED OUT AND CAPPED AS INDICATED FOR FUTURE EXTENSION OF SUBSTATION CONTROL WIRING.

SUBSTATION #3 - CONDUIT PLAN

SCALE: 1/16" = 1' - 0"

RECORD DRAWINGS DATE 12/16/2014

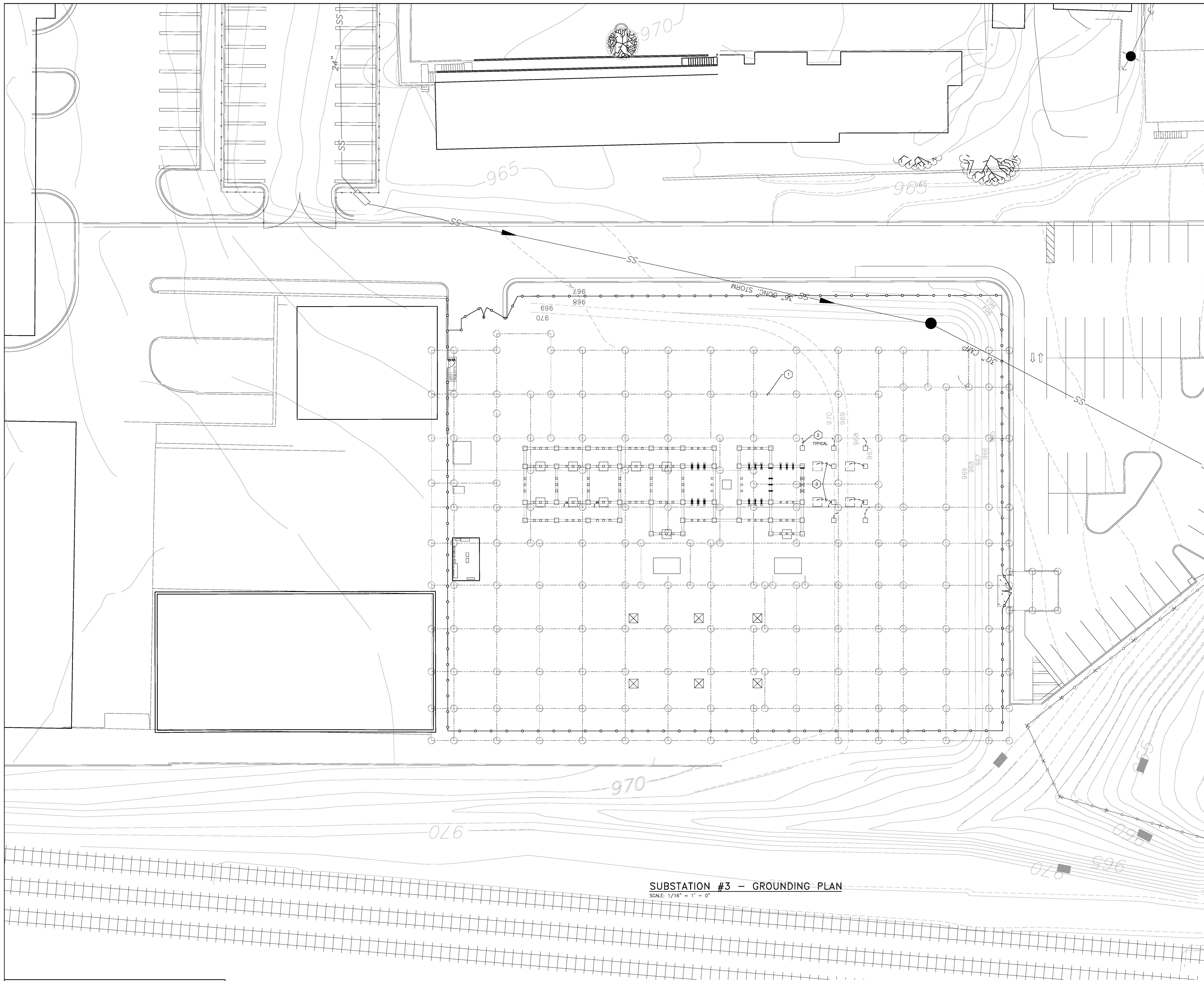
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<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		<p>UK Project #: 2389.0 Site: 1/13/2014</p>
		<p>SAF file no. 13324 Drawn by: WFW Checked by: GGC Notes:</p>
<p>SITE UTILITY PLAN - SUBSTATION #3 CONDUIT PLAN</p>		
<p>REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS</p>		
<p>University of Kentucky Lexington, Kentucky</p>		
<p>approved by: </p>		<p>drawing no. U3.0</p>
<p>director - design and construction division 40517</p>		





- CODED NOTES (GROUNDING PLAN):
- EXISTING GROUNDING GRID.
 - BOND NEW SUPERSTRUCTURE AT EACH CONCRETE BASE IN ACCORDANCE WITH THE DETAILS.
 - BOND THE NEW SUBSTATION BREAKER TO THE EXISTING GROUND GRID.

SUBSTATION #3 - GROUNDING PLAN
 SCALE: 1/16" = 1' - 0"

RECORD DRAWINGS DATE 12/16/2014

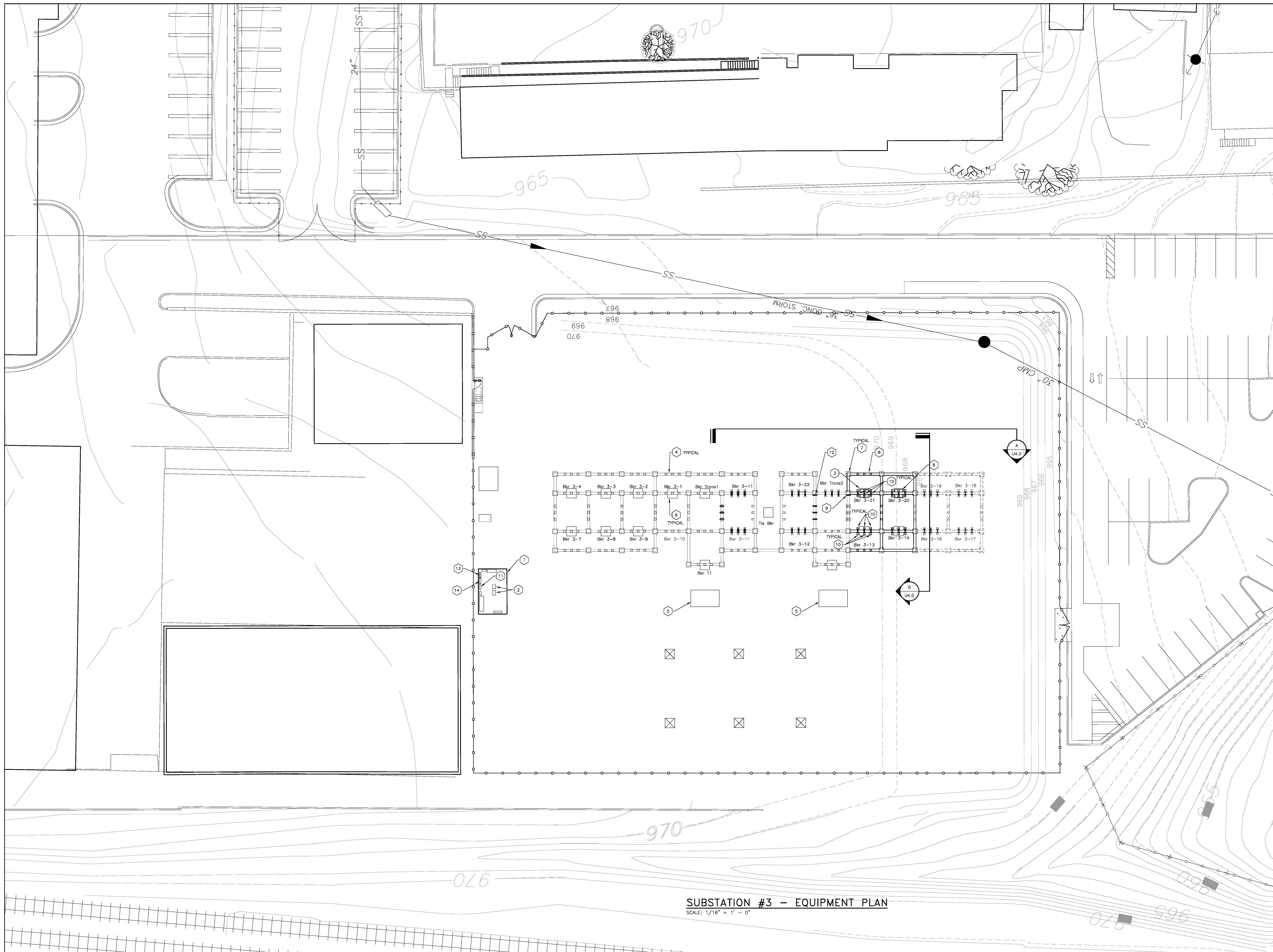
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STAGGS & FISHER CONSULTING ENGINEERS, INC.

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<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		UK Project #: 2369.0 Site: 1/3/2014 S&F file no. 13324 Drawn by: WFW Checked by: GGC Notes:
		drawing no. U3.1
SITE UTILITY PLAN - SUBSTATION #3 GROUNDING PLAN		University of Kentucky Lexington, Kentucky approved by: director - design and construction division





- CODED NOTES (EQUIPMENT PLAN):
- EXISTING SUBSTATION CONTROL HOUSE.
 - PANELBOARDS AND CONTROL STATIONS FOR SUBSTATION BREAKERS.
 - NEW 1200A BREAKER PROVIDED BY OWNER AND INSTALLED BY THIS CONTRACTOR.
 - EXISTING SUBSTATION SUPERSTRUCTURE.
 - EXISTING SUBSTATION TRANSFORMER.
 - EXISTING SUBSTATION BREAKER.
 - PROVIDE AND INSTALL CONCRETE BASES TO SUPPORT NEW SUPERSTRUCTURE. SEE DETAILS.
 - NEW SUBSTATION SUPERSTRUCTURE, MIRROR EXISTING AS SHOWN.
 - EXISTING BUS POTENTIAL TERMINATION CABINET.
 - NEW DISCONNECT SWITCHES FOR MAIN AND TRANSFER BUSES. SEE DETAILS.
 - EXISTING DC POWER PANELBOARD.
 - EXISTING BUS DIFFERENTIAL TERMINATION CABINET.
 - PROVIDE AND INSTALL A NEW AC PANELBOARD ADJACENT TO THE EXISTING ONE. PANELBOARD SHALL BE A 42 CIRCUIT, 208Y/120V, 3-PHASE, 4-WIRE, IN A NEMA 1 ENCLOSURE WITH A 225A MAIN CIRCUIT BREAKER. PROVIDE AND INSTALL A NEW FEEDER CONSISTING OF (4) #2/0'S AND (1) #4 GROUND IN 1" CONDUIT BETWEEN THE NEW AND EXISTING AC PANELS. CONNECT TO THE NEW DOUBLE LUGS OF THE EXISTING PANEL.
 - REMOVE THE INCOMING LUGS IN THE EXISTING AC PANELBOARD AND REPLACE WITH A SET OF DOUBLE LUGS TO FACILITATE FEEDING THE NEW ADJACENT AC PANELBOARD.

SUBSTATION #3 - EQUIPMENT PLAN
SCALE: 1/16" = 1' - 0"

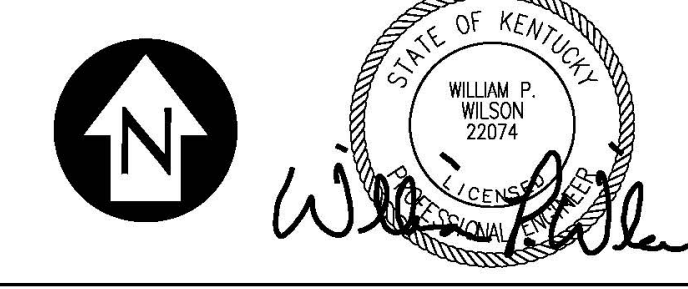
RECORD DRAWINGS DATE 12/16/2014

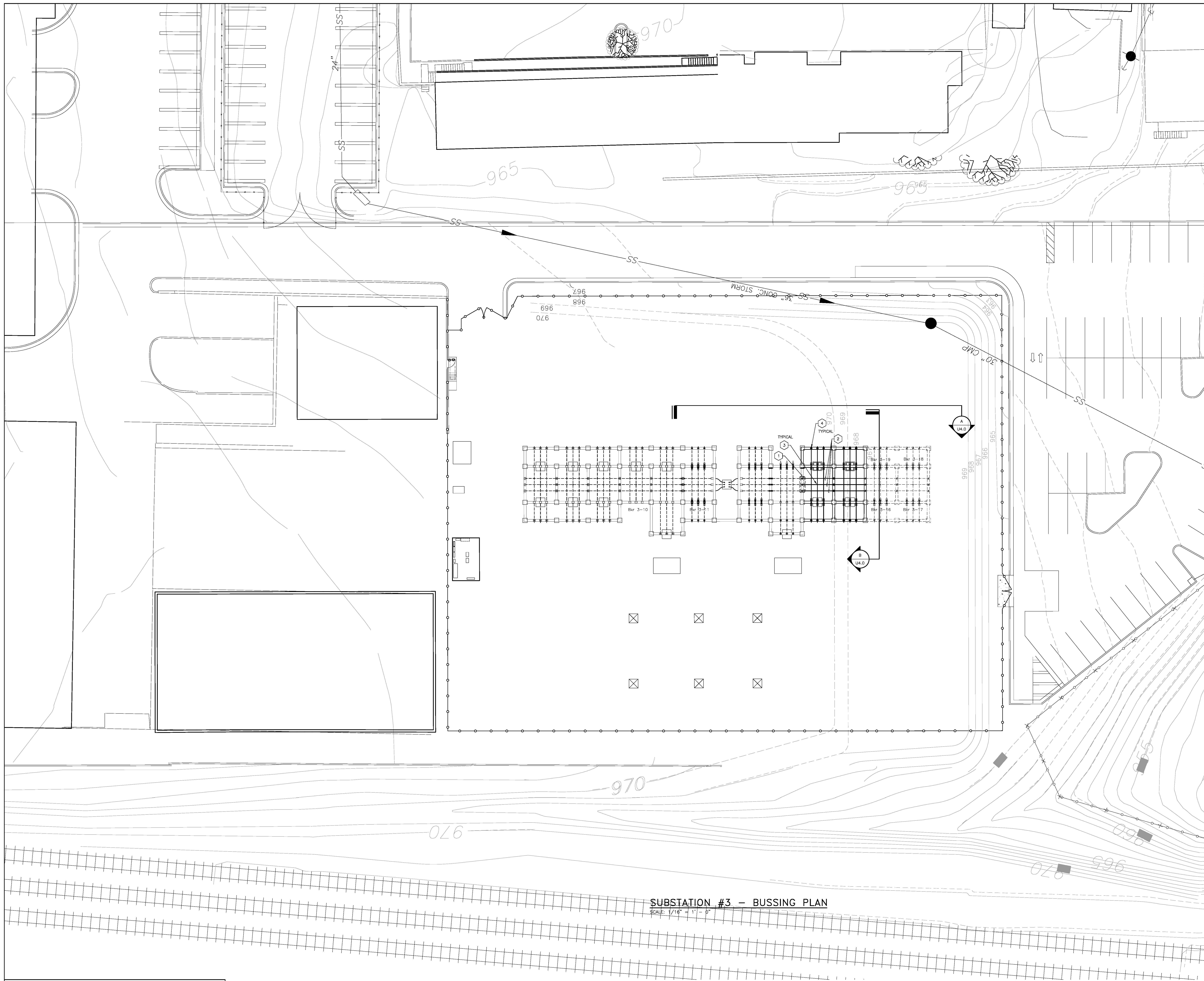
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<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		<p>UK Project #: 2369.0</p>
		<p>Site: 1/13/2014</p>
<p>SITE UTILITY PLAN - SUBSTATION #3 EQUIPMENT PLAN</p>		<p>SAF file no. 13324</p>
<p>REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS</p>		<p>Drawn by: WFW</p>
<p>University of Kentucky Lexington, Kentucky</p>		<p>Checked by: GGC</p>
<p>approved by: </p>		<p>Plotting no. U3.2</p>
<p>director - design and construction division</p>		<p>date</p>





- CODED NOTES (BUSSING PLAN):
- EXISTING MAIN AND TRANSFER BUSES STOP HERE. EXTEND BUSES AS REQUIRED TO THE NEW BREAKER BAY. SEE DETAILS.
 - COPPER PIPE BUS FOR NEW BUSES (MAIN AND TRANSFER). SEE DETAILS.
 - TEE CONNECTION FOR BREAKER BUS. SEE DETAILS.
 - POST INSULATOR.

SUBSTATION #3 - BUSSING PLAN
SCALE: 1/4" = 1' - 0"

RECORD DRAWINGS DATE 12/16/2014

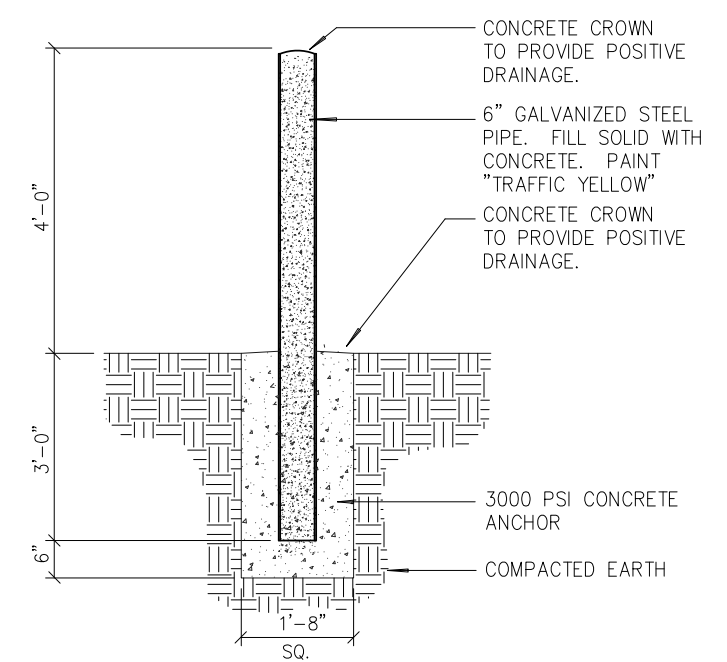
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STAGGS & FISHER CONSULTING ENGINEERS, INC.

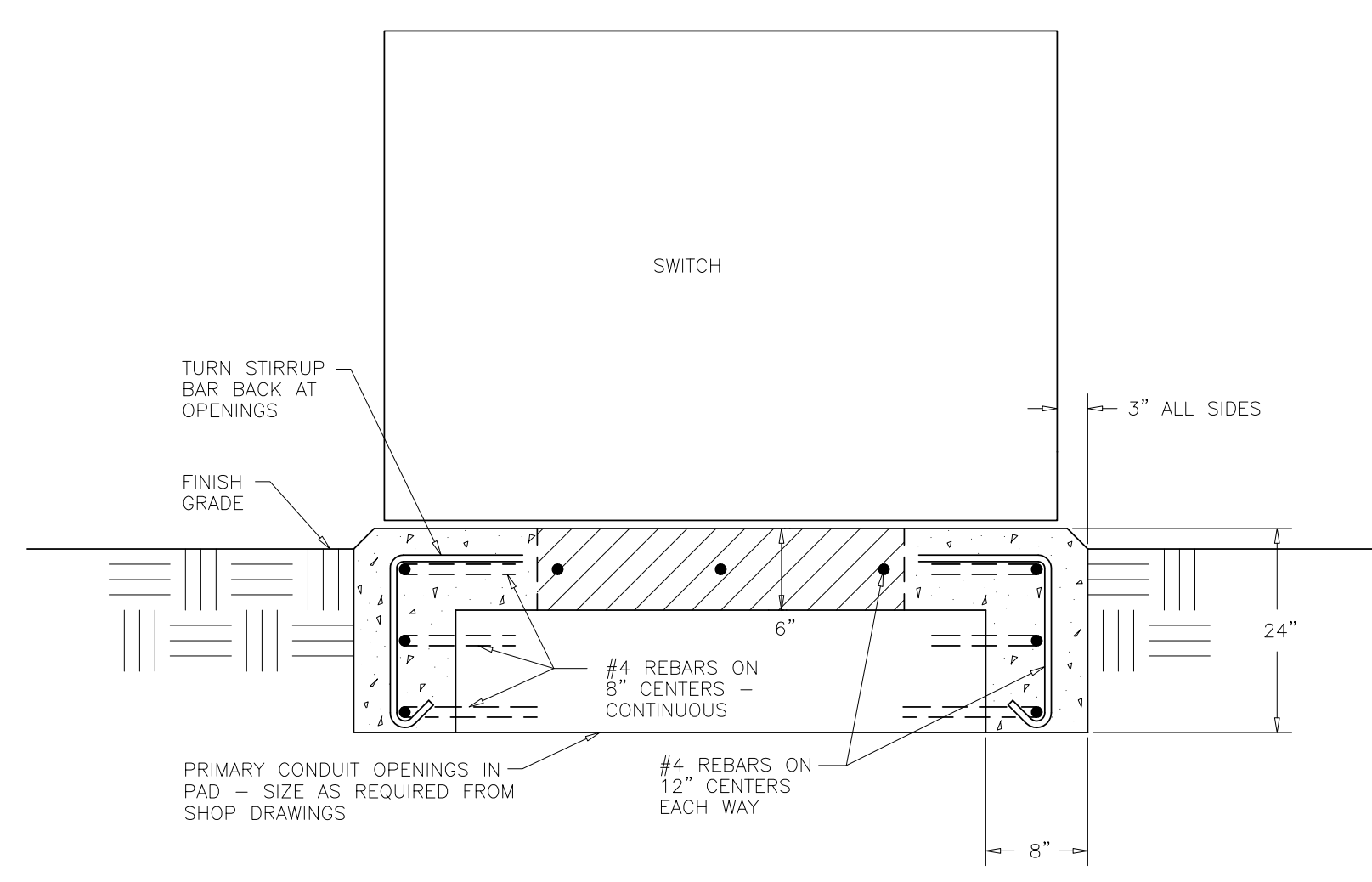
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<p>Staggs and Fisher Consulting Engineers, Inc. 3264 Lochness Drive Lexington, Kentucky 40517</p>		UK Project #: 2369.0 Date: 1/13/2014
		S&F File no.: 13324 Drawn by: WFW Checked by: GGC Notes:
SITE UTILITY PLAN - SUBSTATION #3 BUSSING PLAN		
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		
University of Kentucky Lexington, Kentucky		Drawing no.: U3.3
approved by:		
director - design and construction division 4054 of		

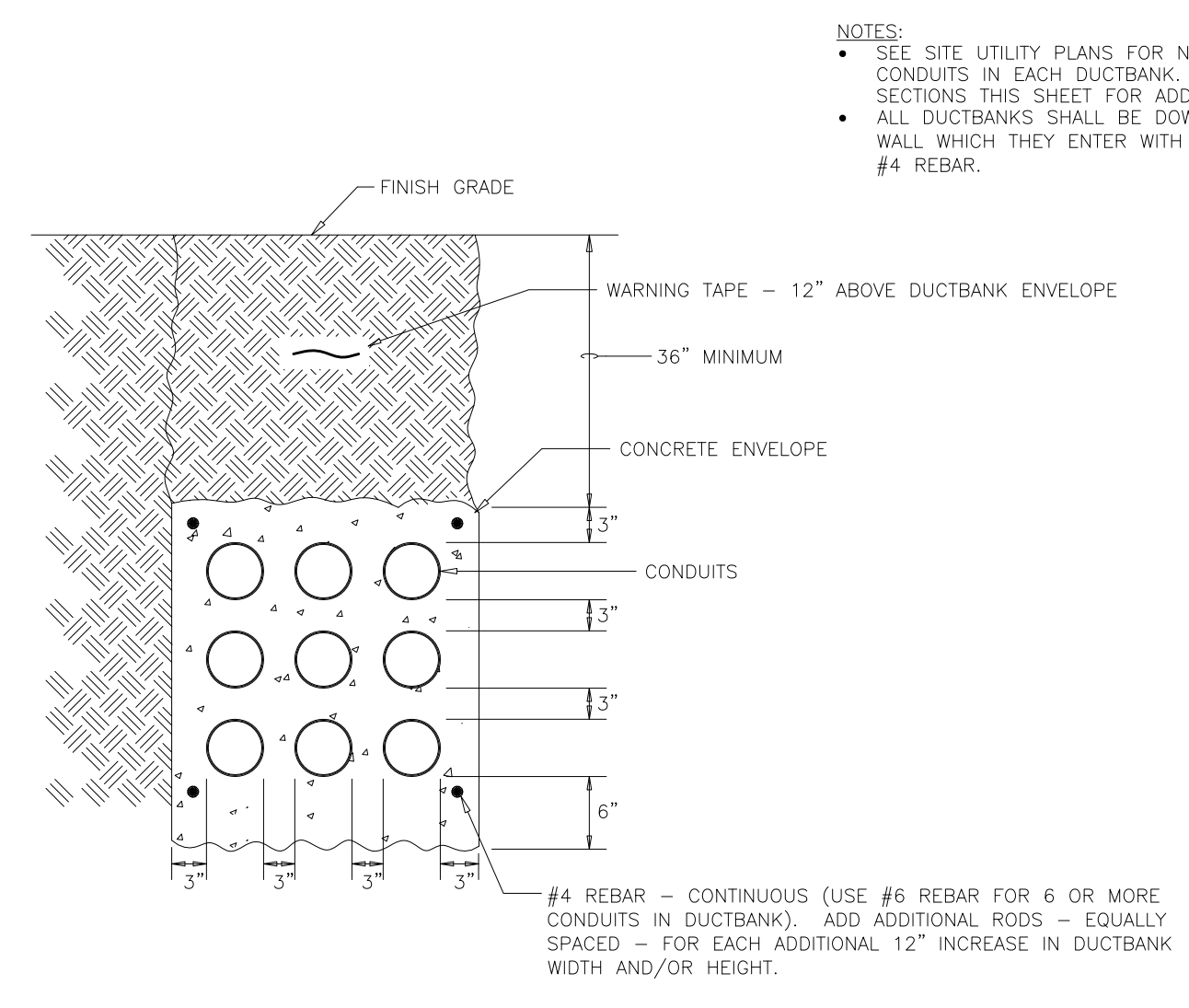




TYPICAL BOLLARD DETAIL
NO SCALE

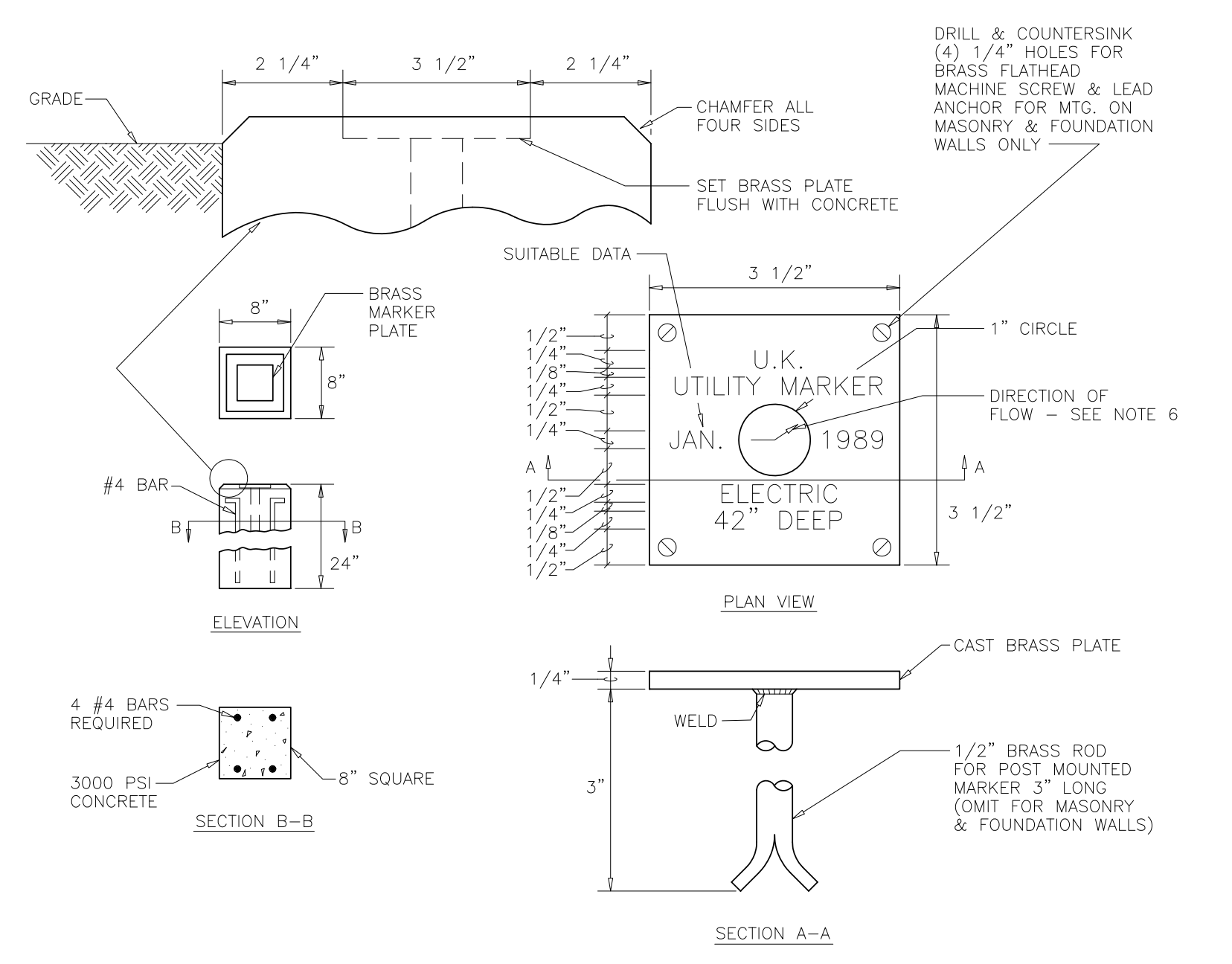


CONCRETE PAD DETAIL FOR PAD MOUNTED SWITCH
NO SCALE

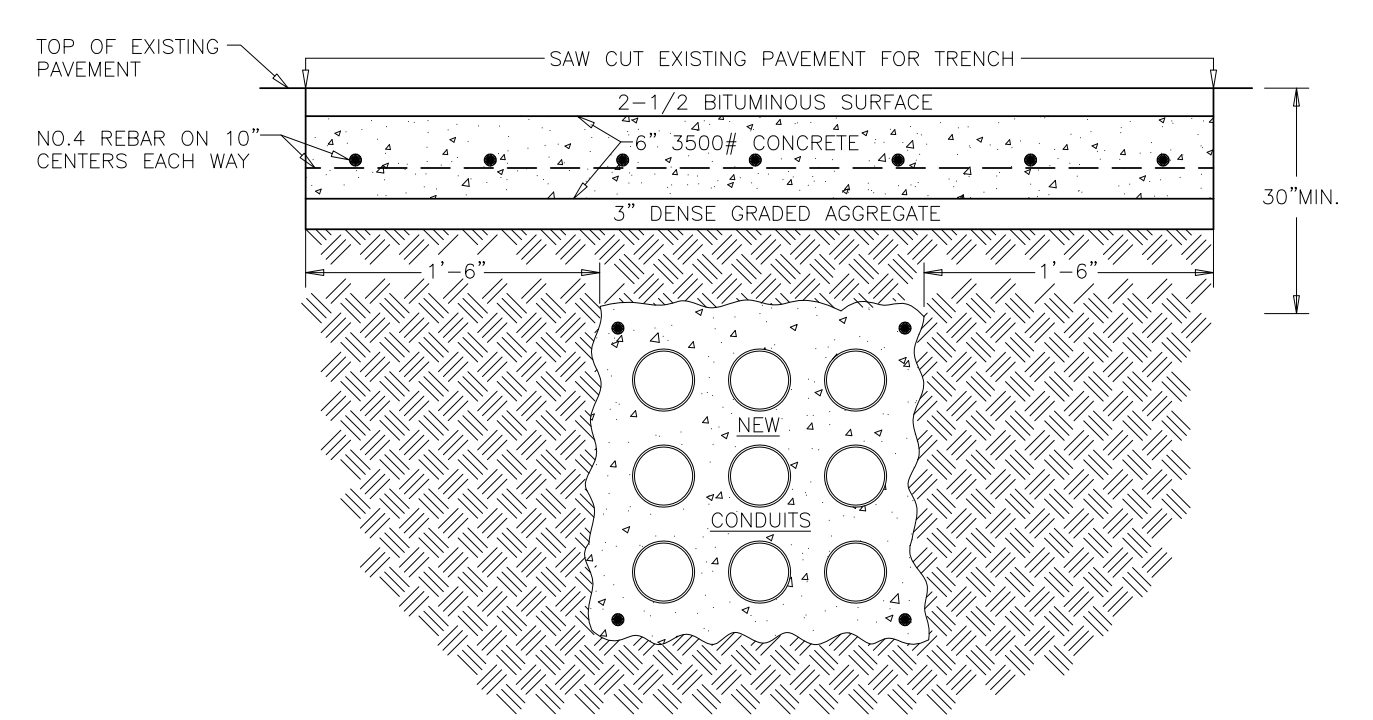


TYPICAL PRIMARY ELECTRICAL DUCTBANK INSTALLATION DETAIL
NO SCALE

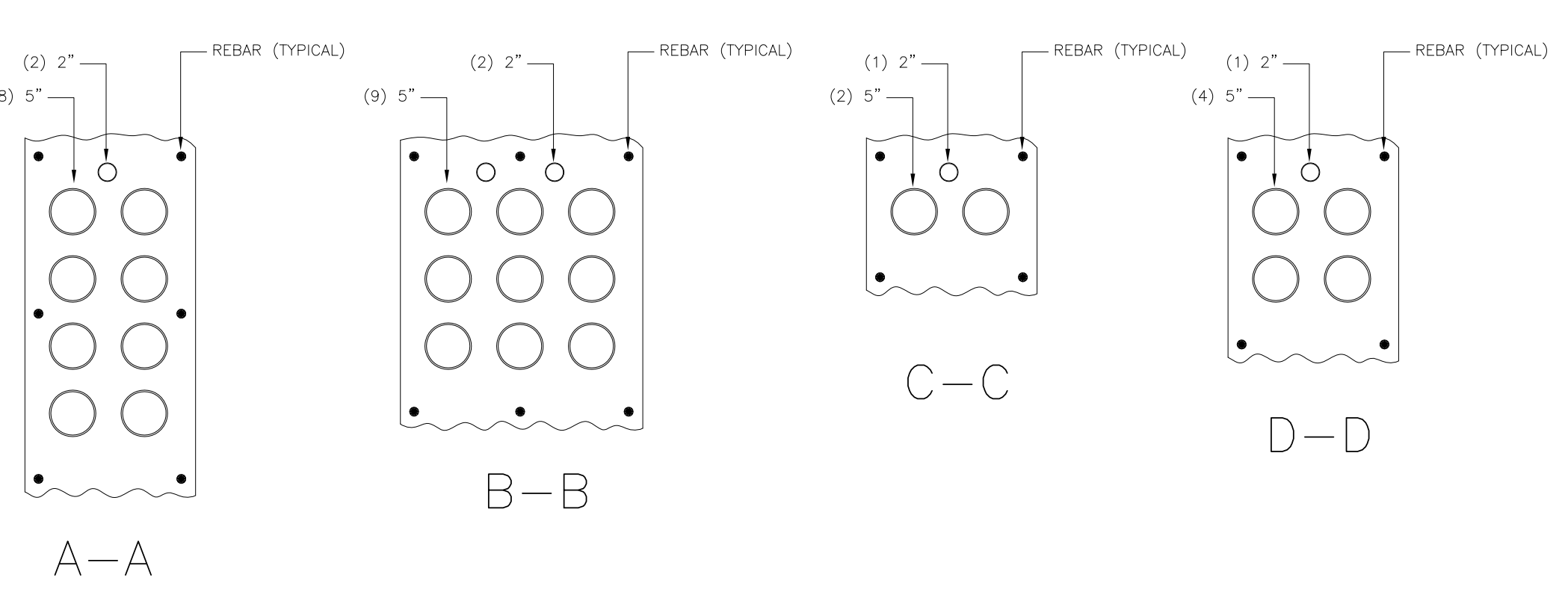
- NOTES:**
- 1 MARKERS SHALL BE LOCATED WHERE INDICATED ON DRAWINGS AND AT BUILDING/WALL/TUNNEL ENTRANCE/EXIT AND EVERY CHANGE IN DIRECTION.
 - 2 BRASS MARKERS SHALL BE CAST BY BRUCE FOX COMPANY, NEW ALBANY, INDIANA (WWW.BRUCEFOX.COM), OR EQUAL.
 - 3 ALL LETTERING SHALL BE OF THE RAISED TYPE. LETTERING SHOWN ON MARKER IS FOR EXAMPLE ONLY. LETTERING TO BE RAISED 1/8".
 - 4 AT THE CONTRACTOR'S OPTION, ONE MARKER MAY BE USED FOR COMPANION MARKS THAT ARE LOCATED CLOSE TOGETHER SUCH AS STEAM AND CONDENSATE PUMP DISCHARGE PIPING OR CHILLED WATER SUPPLY AND CHILLED WATER RETURN PIPING. PROVIDE ARROW FOR EACH MAIN.
 - 5 CONTRACTOR SHALL FURNISH A COMPLETE LIST FOR APPROVAL OF ALL MARKERS SHOWING NAMES, ARROWS, DEPTH AND DATE.
 - 6 WHEN UTILITY MARKERS ARE INSTALLED OVER LINES AT A POINT OF DIRECTION CHANGE, THE ARROW ON THE MARKERS SHALL BE "ANGLED" AS REQUIRED TO IMPLY THIS ROUTING.



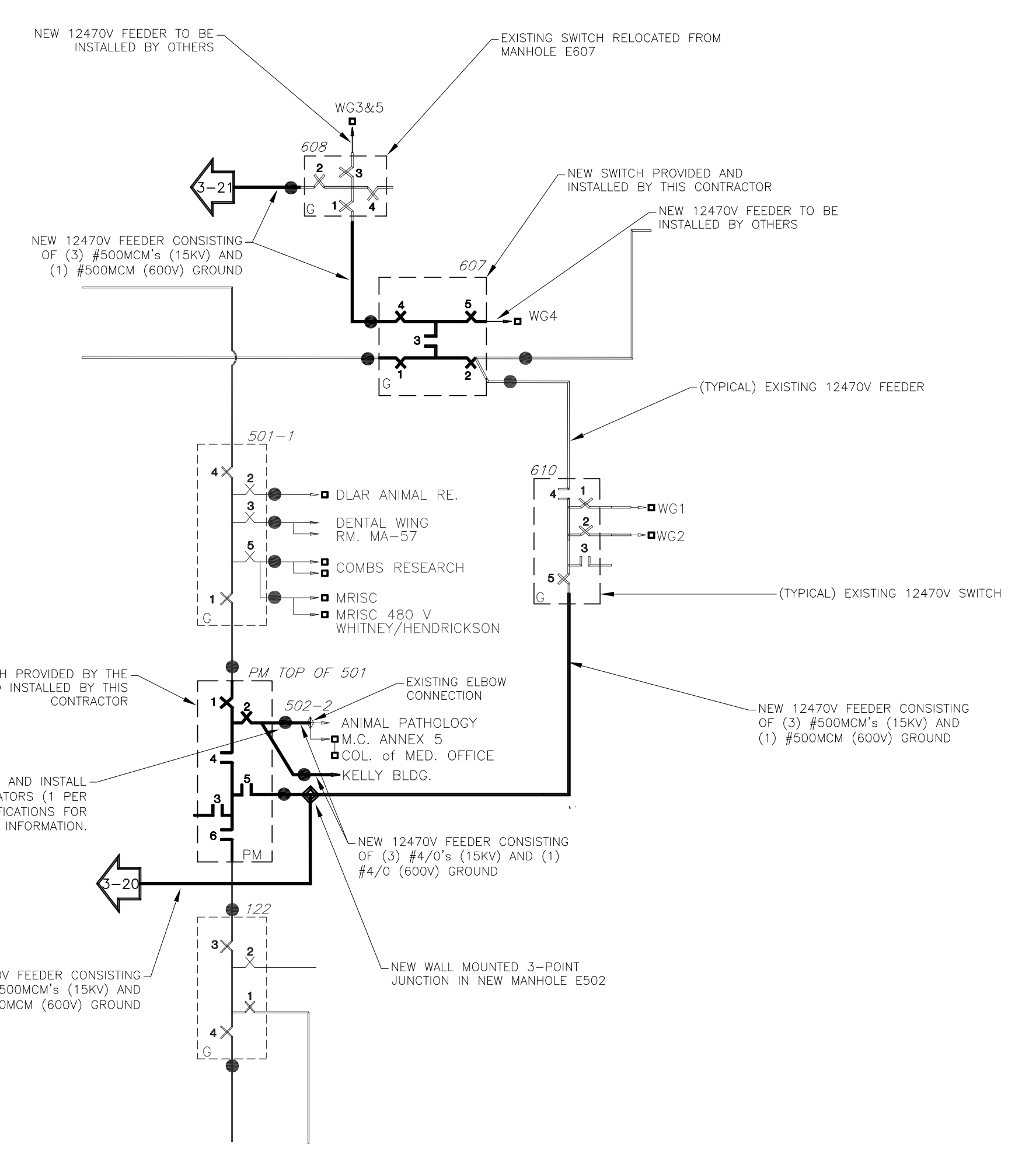
UTILITY SERVICE MARKER DETAIL
NO SCALE



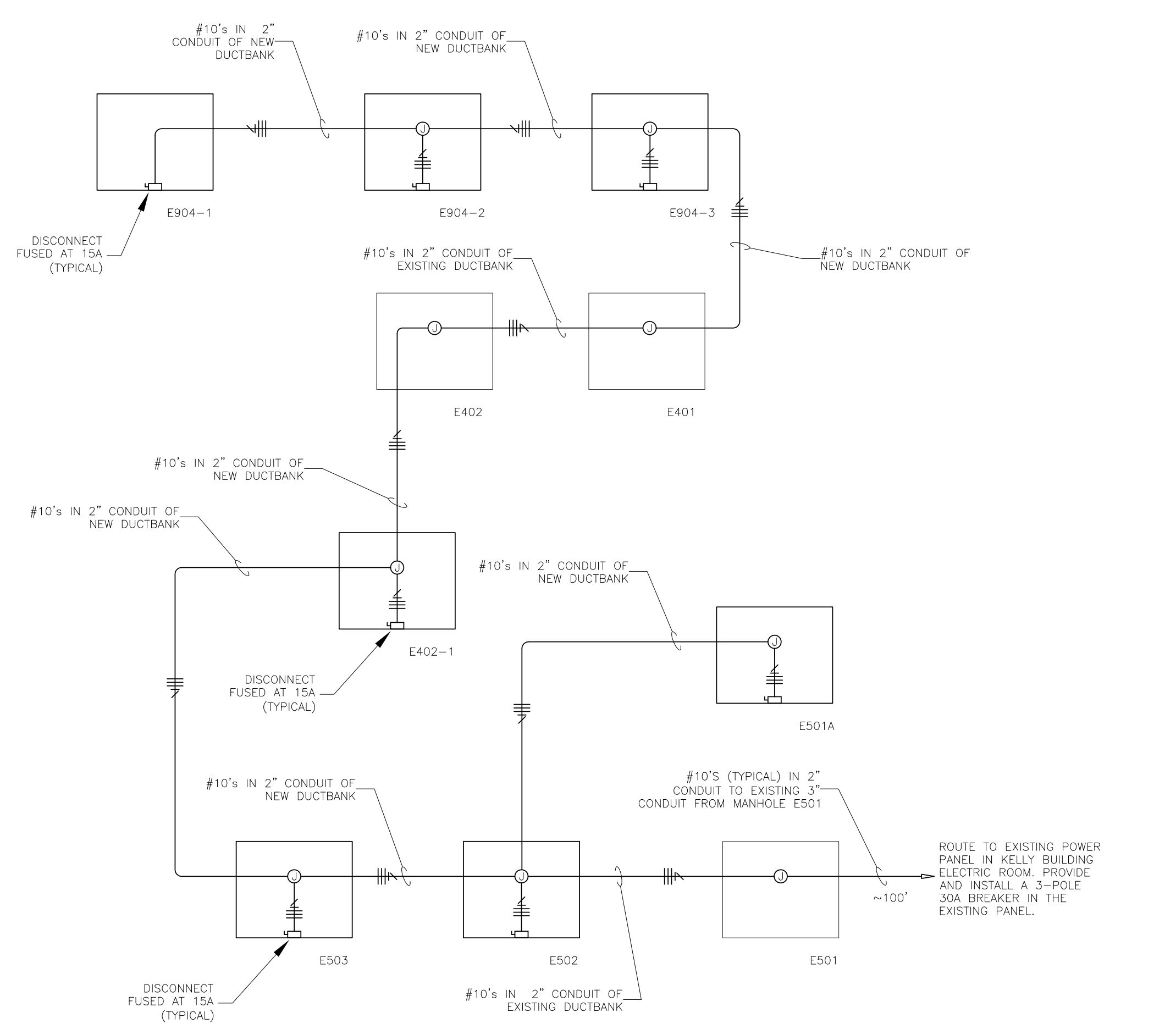
TYPICAL INSTALLATION DETAIL OF DUCTBANK UNDER ROADWAY
NO SCALE



DUCTBANK SECTIONS
NO SCALE



PARTIAL 12470V RISER
NO SCALE



MANHOLE POWER SCHEMATICS
NO SCALE

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RECORD DRAWINGS DATE 12/16/2014

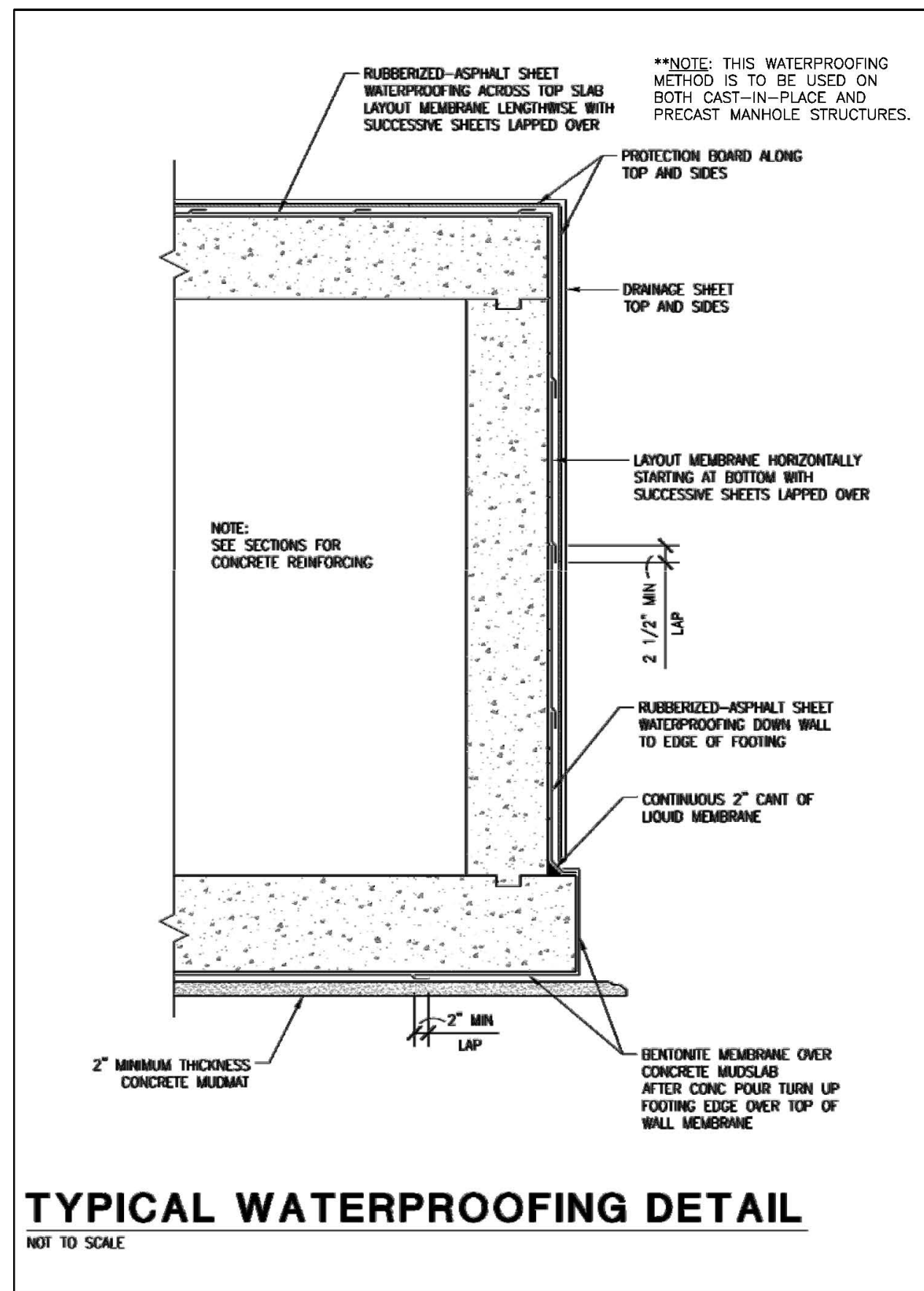
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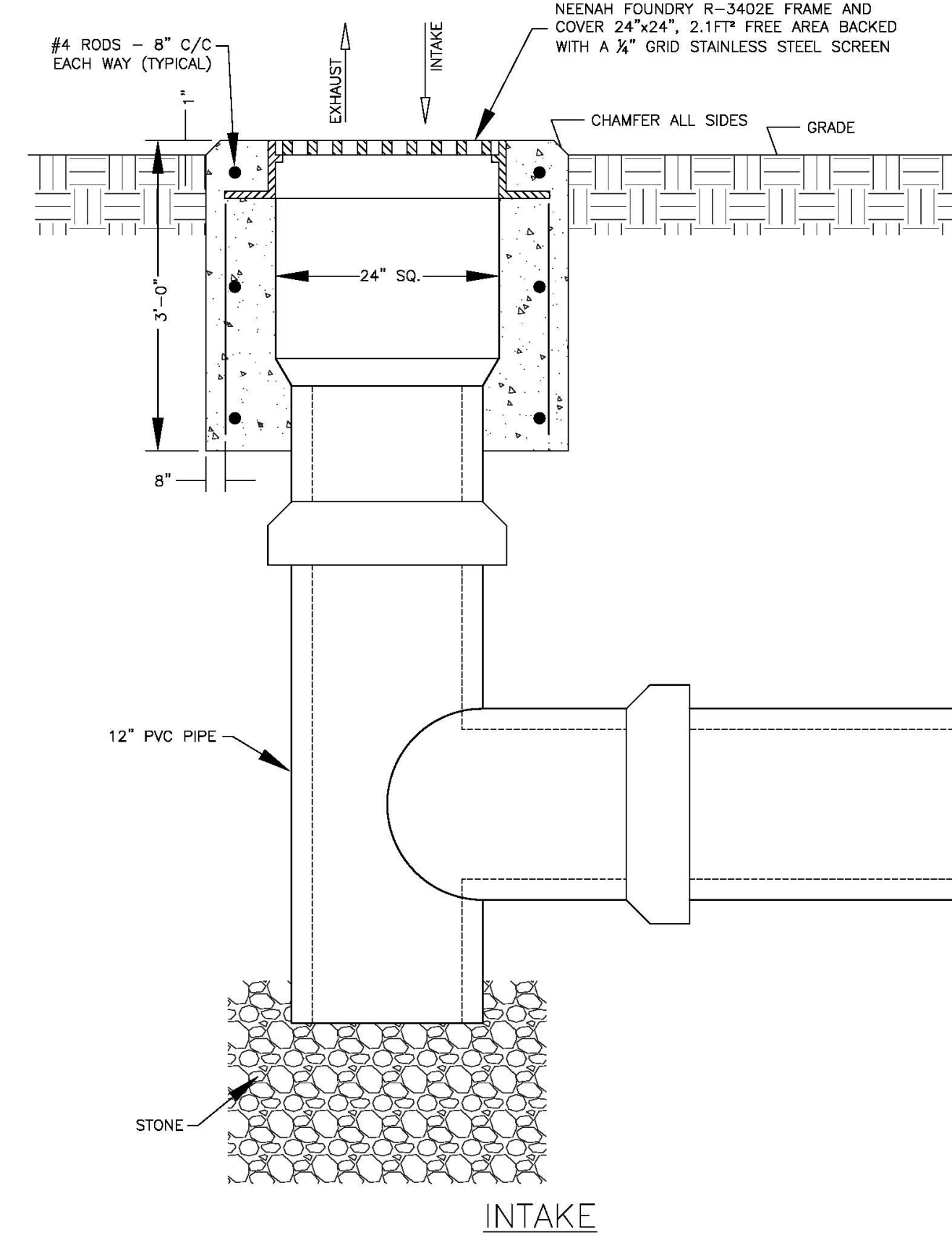
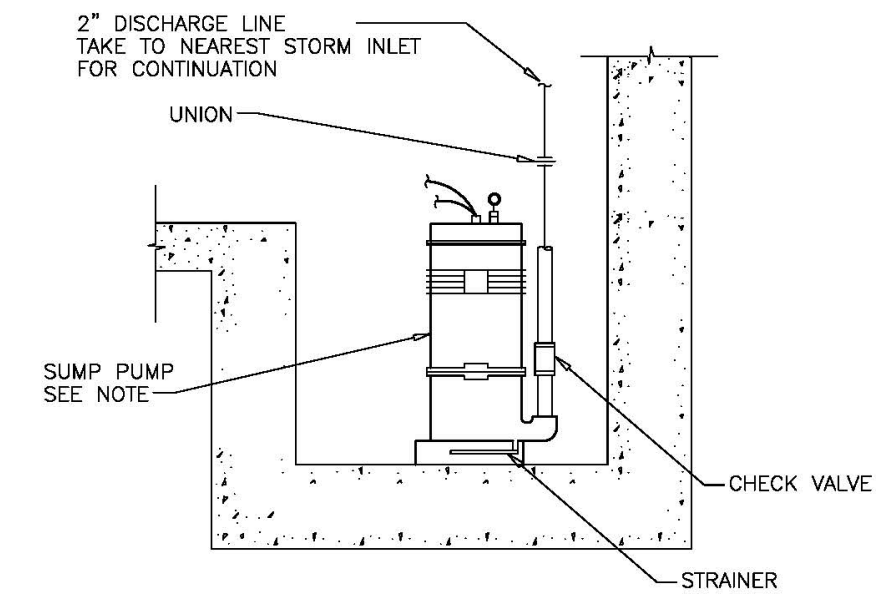


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3264 Lochness Drive
Lexington, Kentucky 40517

SITE UTILITIES DETAILS		JK Project #: 2390.0
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		Site: 1/13/2014
University of Kentucky Lexington, Kentucky		S&F file no. 13524
approved by _____		Drawn by: BWF
checked by: GGC		Reviewed by: _____
drawing no. U4.0		date _____
director - design and construction division		date _____

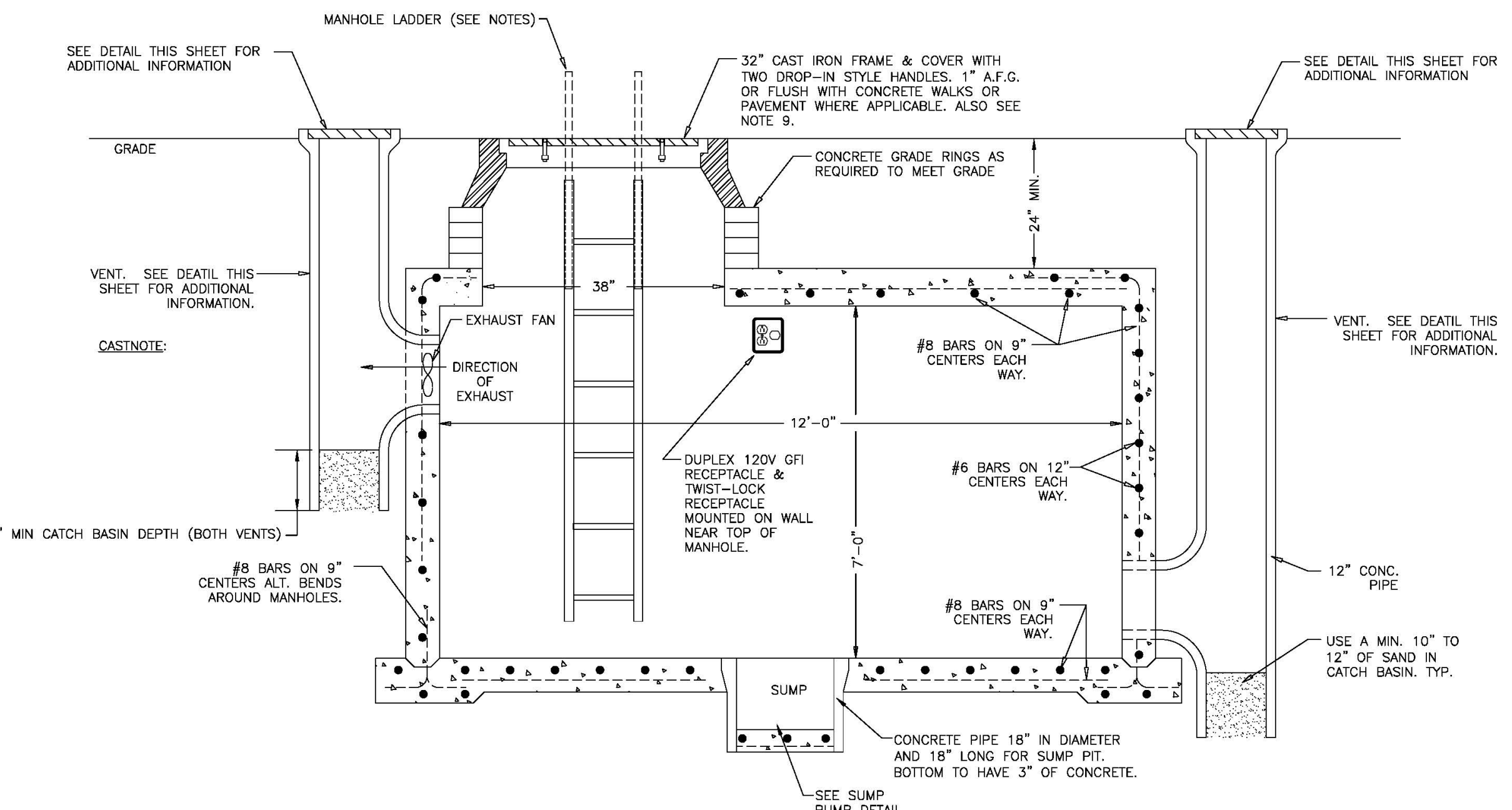
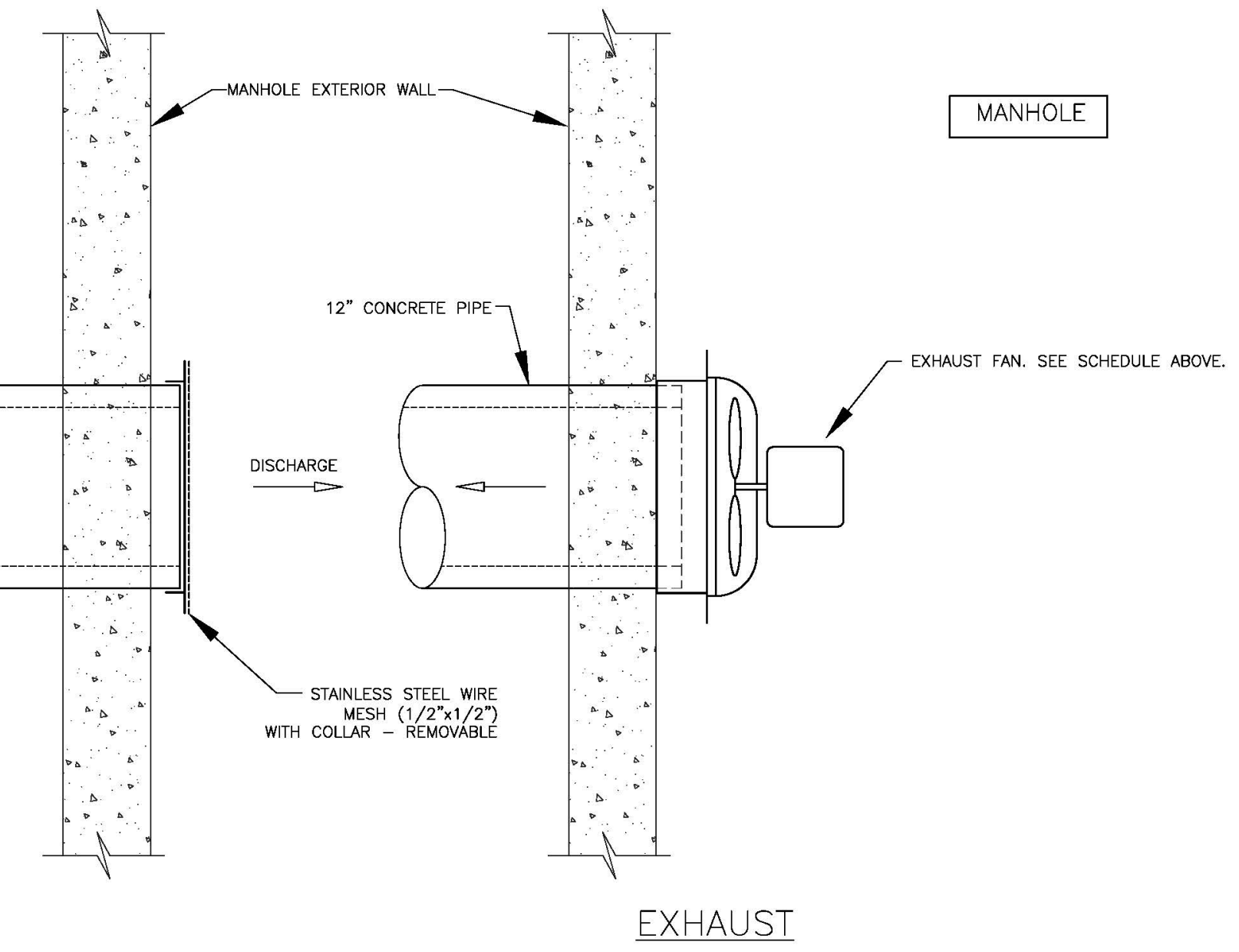


SUMP PUMP FOR VAULT AND MANHOLE
NOTE: SUMP-PUMP - ZOELLER PUMP MODEL NO. 2137,
1/2" SUBMERSIBLE SUMP PUMP RATED FOR HIGH TEMPERATURES - 200°F INTERMITTENT,
50 GPM @ 15 FT. HEAD, 0.5 HP, 208V/1Ø POWER. PROVIDE WITH FLOAT SWITCH. PUMP
SHALL BE SELF-VENTING.

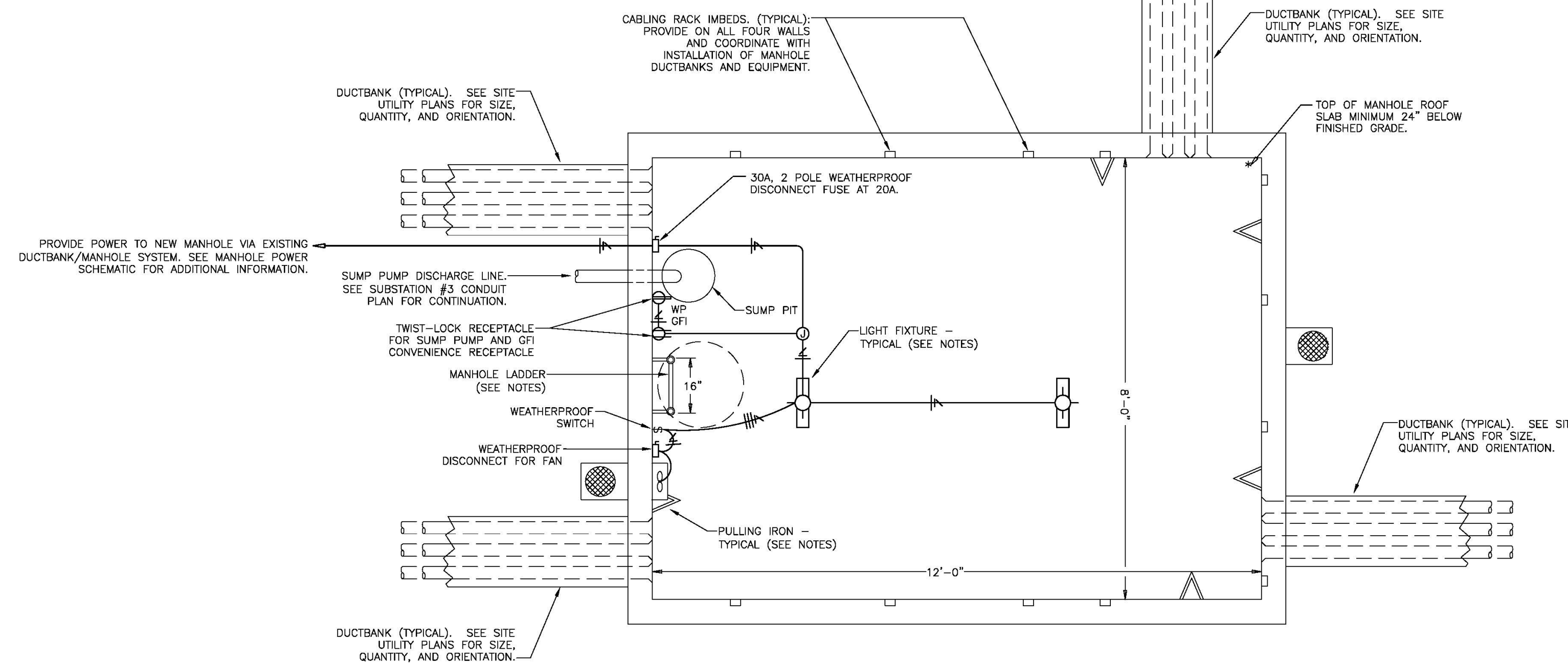


FANS													
SYMBOL	MANUFACTURER	MODEL	TYPE	SONES	CFM	S.P.		MOTOR		WHEEL		REMARKS	
						IN.	W.G.	HP	RPM	PH	VOLTS		TYPE
EF-1	GREENHECK	SE1-14-440-B6	*1	7.8	837	0.30	1160	0.2	1160	1	115	---	*2 *3

- REMARKS:
 *1 SIDE WALL DIRECT DRIVE EXHAUST FAN.
 *2 GALVANIZED STEEL CONSTRUCTION WITH ALUMINUM BLADE PROPELLER AND CORROSION RESISTANT FASTENERS.
 *3 PROVIDE OSHA APPROVED MOTOR SIDE GUARD.



- MANHOLE GENERAL NOTES:**
- MANHOLE E402-1 SHALL BE POURED-IN-PLACE WHILE THE OTHERS MAY BE PRECAST.
 - FOR CAST-IN-PLACE MANHOLES, BOTTOM IS ONE POUR, SIDES ARE ONE POUR, AND TOP IS ONE POUR.
 - PROVIDE A HIGH VENT AND A LOW VENT.
 - TOTAL SIZE OF MANHOLE SHALL BE 12'48"x7' UNLESS NOTED OTHERWISE.
 - PROVIDE PULLING EYES ONE PER WALL OPPOSITE ALL DUCT BANKS AND ONE RECESSED IN THE CENTER OF THE MANHOLE FLOOR.
 - PROVIDE VAPORPROOF FLUORESCENT LIGHT FIXTURES AS INDICATED. FIXTURES SHALL BE A LITHONIA DMM SERIES OR EQUAL WITH COLD WEATHER ELECTRONIC BALLAST AND TWO 32 WATT IS LAMPS.
 - WATERPROOF EXTERIOR SURFACES BELOW GRADE PORTION OF SIDES AND TOPS OF MANHOLES.
 - PROVIDE BELL ENDS ON ALL NEW CONDUITS.
 - H-20 TRUCK LOADING ON ALL MANHOLES.
 - COVER SHALL BE 32" DIAMETER MINIMUM. 32" DIA. CLEAR OPENING MUST BE MAINTAINED AS WELL AS H-20 LOADING.
 - EXHAUST FAN TO MEET OSHA REQUIREMENTS. SEE DETAIL THIS SHEET FOR ADDITIONAL INFORMATION. CONNECT FAN TO OPERATE WHEN LIGHT SWITCH IS TURNED ON.
 - MIN. REBAR INDICATED - PROVIDE TO MEET STRUCTURAL DESIGN.
 - ALL CONDUIT AND BOXES SHALL BE PVC.
 - DISCONNECTS SHALL BE NEMA 4 AND DEVICES SHALL BE NEMA 3R.
 - FOR ADDITIONAL SPECIFICATIONS, REFER TO UPRD GUIDELINE CORROSION.
 - MANHOLE LADDER AND LADDERS EXTENSIONS SHALL BE HALLIDAY PRODUCTS LD1 AND LE1, OR EQUAL.
 - MANHOLE REBAR SPACING AND CONCRETE THICKNESSES ARE ESTIMATED. MANHOLE IS TO BE CONSTRUCTED BASED ON THE DIMENSIONS AND FEATURES OUTLINED IN THESE DETAILS. THE SHOP DRAWINGS SHALL BE STAMPED BY A STRUCTURAL ENGINEER REGISTERED IN THE STATE OF KENTUCKY.
 - PROVIDE AND INSTALL CABLING RACKS ON ALL FOUR WALLS FROM TOP TO BOTTOM WITH BRACKETS AS REQUIRED FOR SUPPORT OF INSTALLED CABLING. CABLES ARE TO BE SUPPORTED FROM BRACKETS WITH PLASTIC OR FIBERGLASS DONUT STYLE INSULATORS TO COMPRESS ALL FOUR CABLES TOGETHER PER CIRCUIT.
 - ALL DUCTBANKS SHALL BE DOWELED INTO THE MANHOLE WALL WHICH THEY ENTER WITH AT LEAST FOUR 12" LONG #4 REBAR.



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 Lexington, Kentucky 40517

UTILITIES DETAILS		UK Project # 2380.0
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		Site 1/13/2014
University of Kentucky Lexington, Kentucky		S&F file no. 13324
approved by _____		drawn by WFW
director - design and construction division		checked by GOC
306		revision
306		drawing no. U4.1



GENERAL NOTES:

A. ALL DETAILS ARE SCHEMATIC ONLY AND DO NOT NECESSARILY INDICATE ALL REQUIRED EQUIPMENT AND HARDWARE TO EXPAND THE SUBSTATION SUPERSTRUCTURE AND BUSING. THIS CONTRACTOR SHALL PROVIDE AND INSTALL ALL ITEMS NECESSARY TO COMPLETE THE EXPANSION AND RESULT IN A FUNCTIONAL SYSTEM.

B. REQUIRED STRUCTURAL SUPPORT MEMBERS FOR STEEL SUPERSTRUCTURE ARE NOT SHOWN BUT REQUIRED IN ACCORDANCE WITH THE SUPERSTRUCTURE'S DESIGNER.

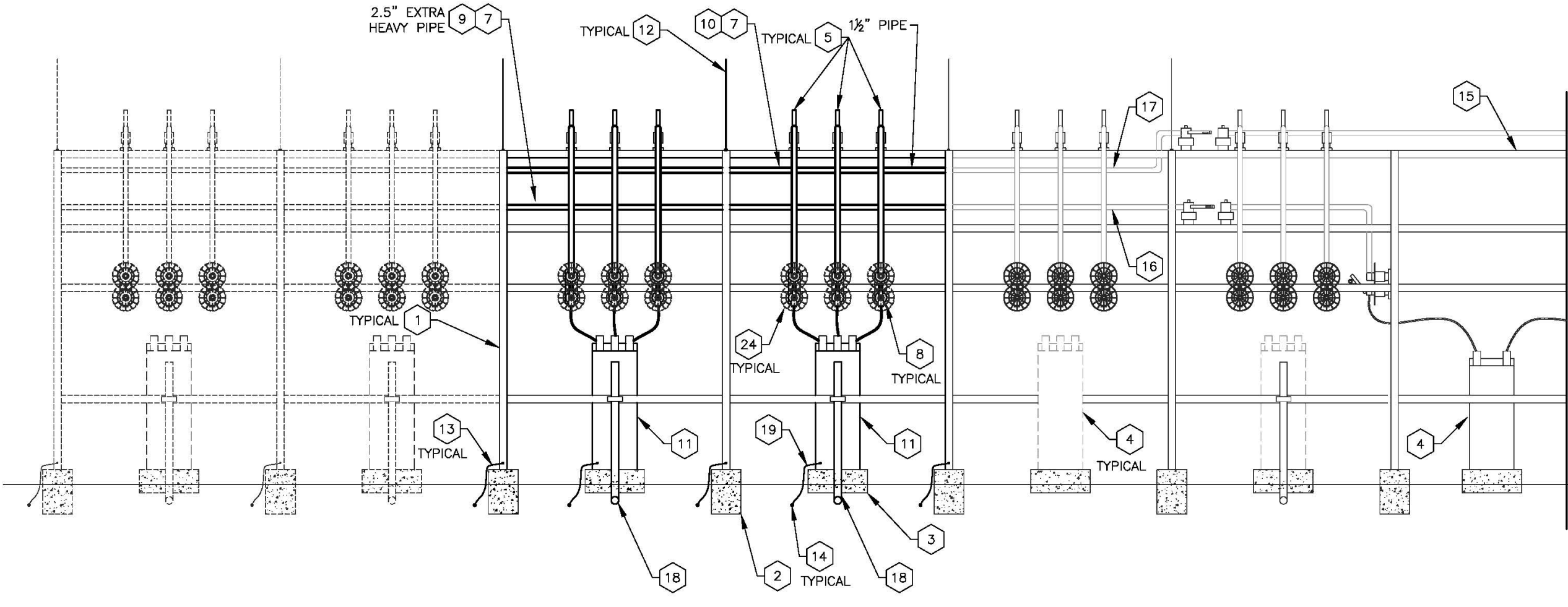
C. UNLESS OTHERWISE INDICATED, ALL ELEVATIONS OF NEW COPPER PIPE BUS ARE TO MATCH EXISTING BUS ELEVATIONS.

D. SUPERSTRUCTURE MEMBER SIZES, CONFIGURATION, BOLT PATTERNS, ETC. DIFFER BETWEEN SUBSTATIONS AND IN SOME CASES WITHIN THE SAME SUBSTATION. THIS CONTRACTOR SHALL FIELD VERIFY AND COORDINATE WITH THE SUPERSTRUCTURE DESIGNER ALL SUCH INFORMATION PRIOR TO FABRICATION OF THE NEW SUPERSTRUCTURE COMPONENTS TO ENSURE COMPONENT ASSEMBLY AND INTERFACING.

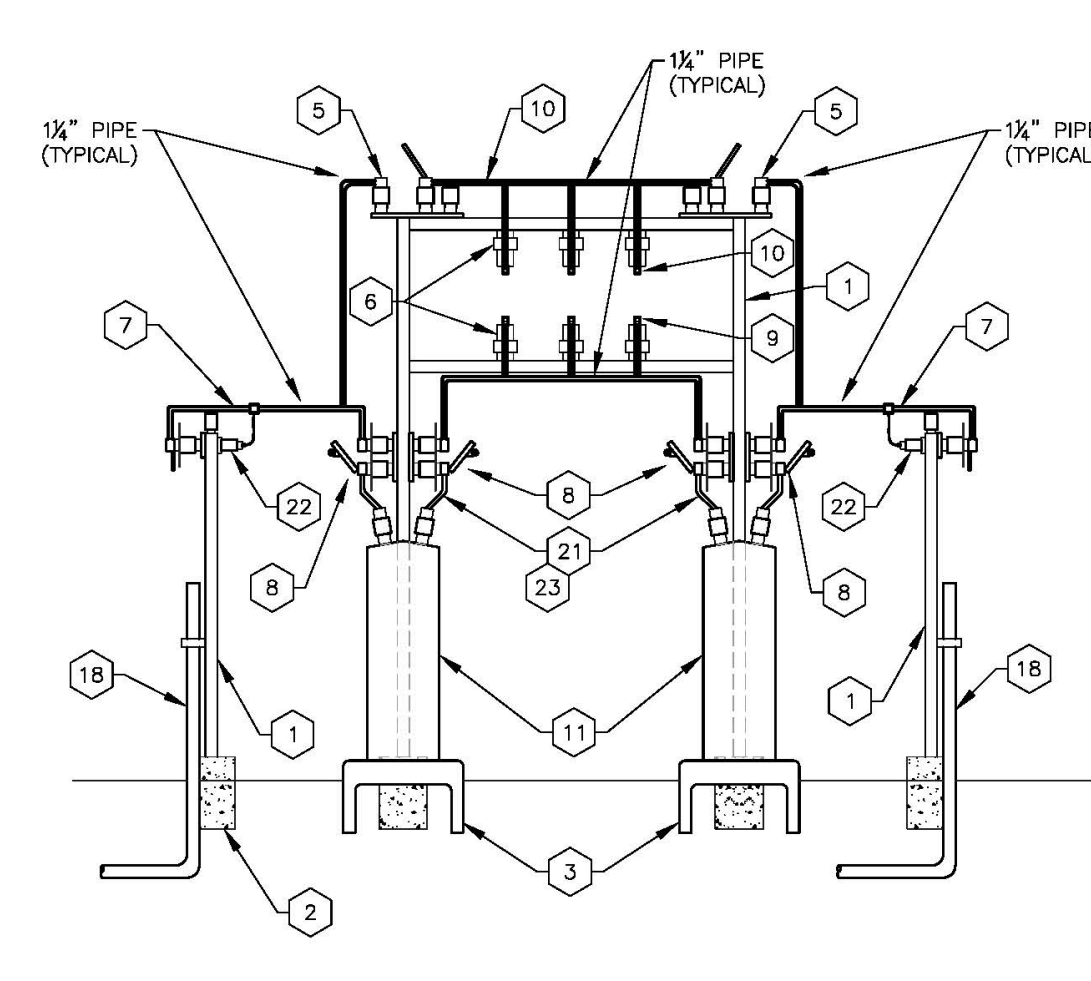
CODED NOTES (DETAILS):

- NEW STEEL SUPERSTRUCTURE.
- NEW CONCRETE BASE FOR STEEL COLUMN PER DETAIL.
- NEW CONCRETE BASE FOR FUTURE SUBSTATION BREAKER PER DETAIL.
- EXISTING SUBSTATION BREAKER.
- NEW 1200A 3φ GANG-OPERATED AIR BREAK SWITCH WITH REMOTE OPERATING HANDLE AT COLUMN BASE.
- NEW POST INSULATOR.
- NEW COPPER BUS PIPE.
- NEW GROUP OF (3) SINGLE POLE, 1200A DISCONNECT SWITCHES.
- MAIN BUS.
- TRANSFER BUS.
- NEW SUBSTATION BREAKER PROVIDED BY OWNER AND INSTALLED BY THIS CONTRACTOR.
- NEW LIGHTNING PROTECTION AIR TERMINAL. BOND TO STEEL COLUMN AS REQUIRED.

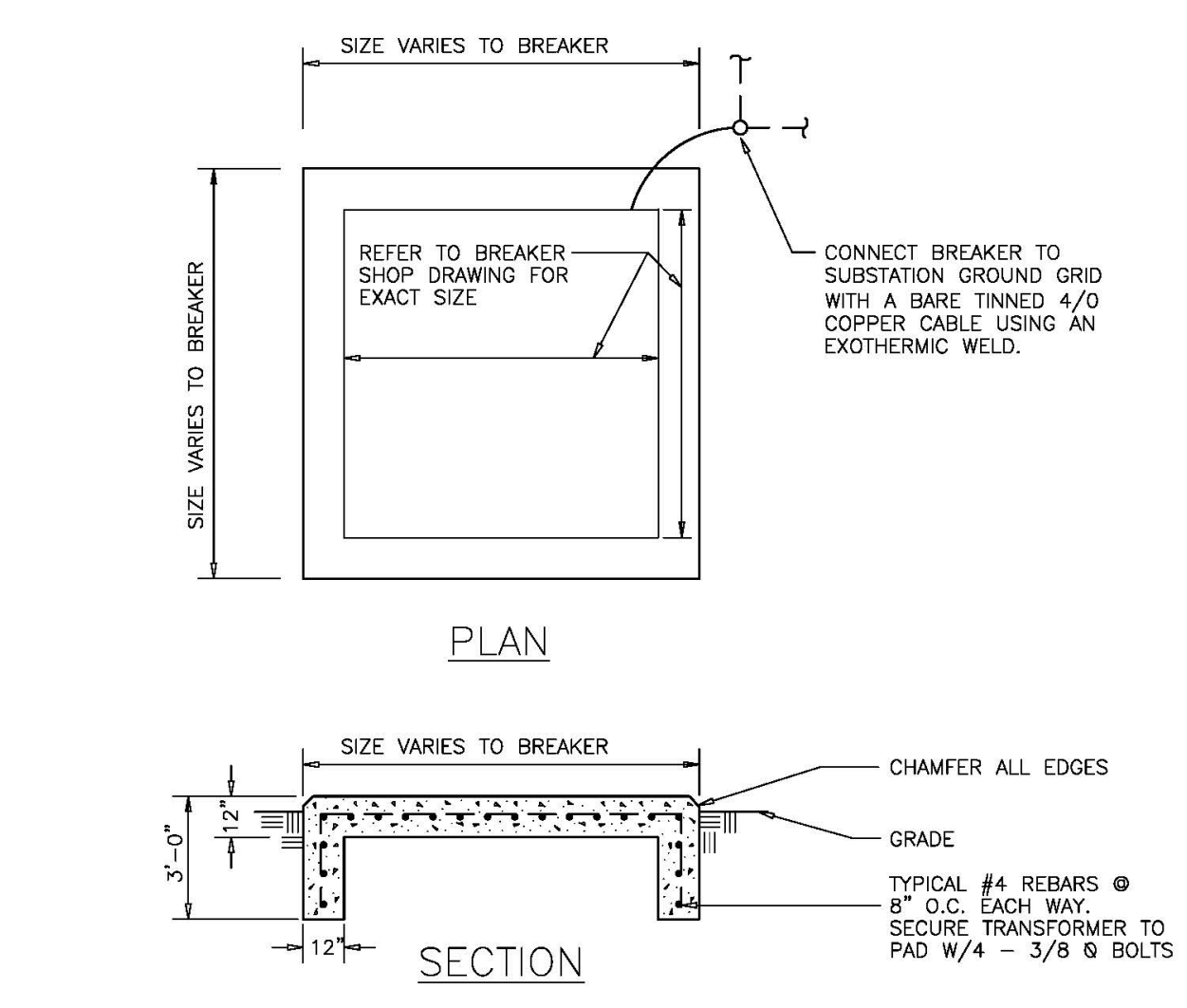
- BOND EACH STEEL COLUMN TO GROUNDING GRID. CONNECTIONS SHALL BE MADE USING EXOTHERMIC WELDS.
- NEW STEEL SUPERSTRUCTURE.
- GROUNDING GRID CABLE BELOW GRADE. CONNECTIONS SHALL BE MADE USING EXOTHERMIC WELDS.
- EXISTING STEEL SUPERSTRUCTURE.
- EXISTING MAIN BUS.
- EXISTING TRANSFER BUS.
- PROVIDE AND INSTALL (1) 5" GALVANIZED RIGID CONDUIT UP TO 10' AFG. SEE CONDUIT PLAN.
- GROUND SUBSTATION BREAKER TO GROUNDING GRID.
- PROVIDE AND INSTALL CABLING CONNECTION TO LOAD SIDE OF NEW BREAKER.
- PROVIDE AND INSTALL CABLING CONNECTION TO LINE SIDE OF BREAKER.
- POLYMER LIGHTNING ARRESTOR - ONE EACH PHASE.
- BARE 500MCM COPPER CABLE.
- VARMIT GUARD - SEE SPECIFICATIONS.



ELEVATION - SUBSTATION #3
SCALE: 1/8" = 1' - 0"



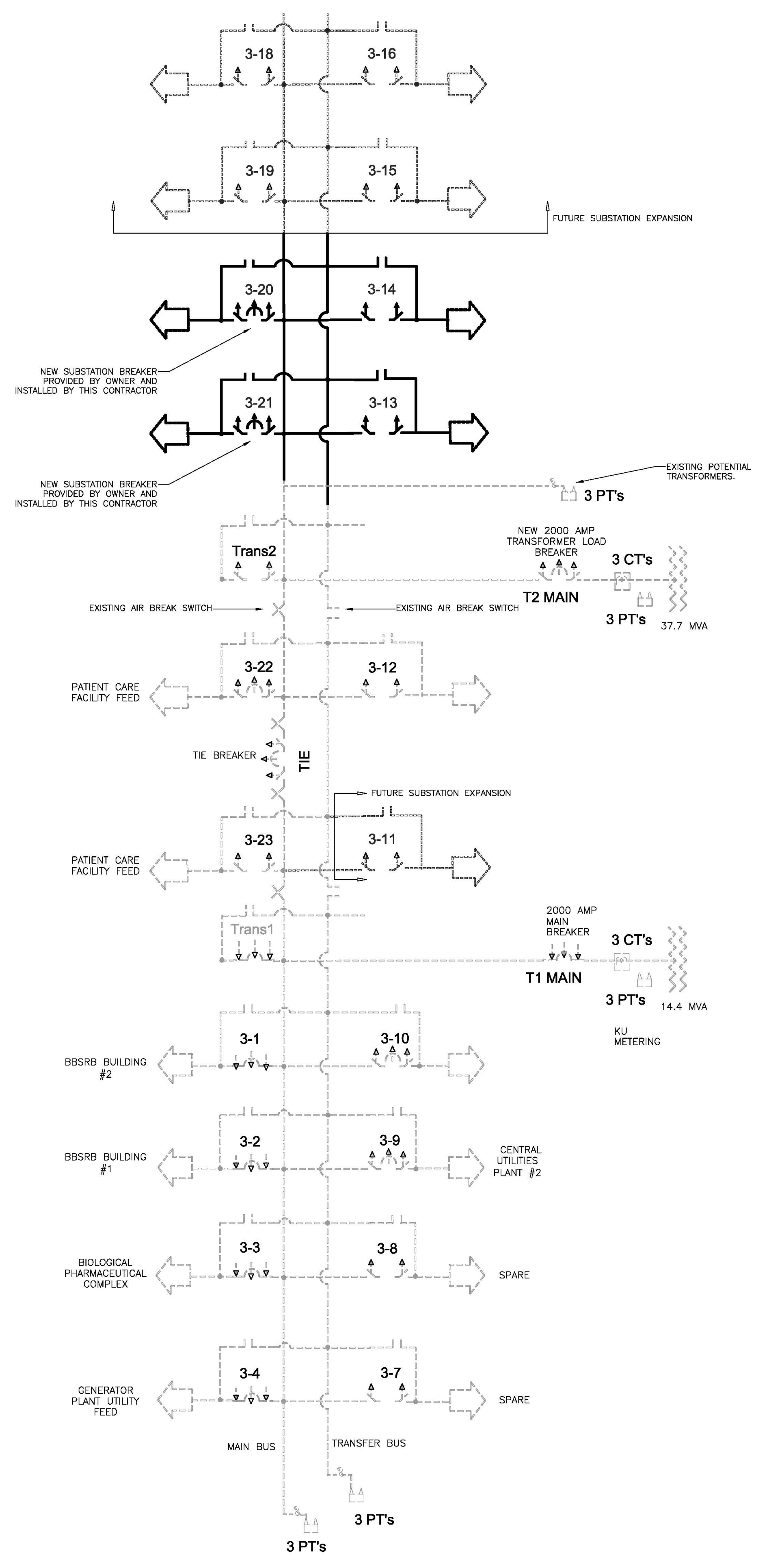
ELEVATION - SUBSTATION #3
SCALE: 1/8" = 1' - 0"



SUBSTATION BREAKER PAD DETAIL
NO SCALE

ONE-LINE DIAGRAM LEGEND

SYMBOL	DESCRIPTION
---	COPPER BUS (EXISTING)
—	COPPER BUS (NEW)
⎓	NEW SUBSTATION BREAKER WITH SINGLE POLE DISCONNECT SWITCHES (ONE PER PHASE)
⎓	NEW 3 GANG-OPERATED AIR BREAK SWITCH
⎓	NEW SINGLE-POLE DISCONNECT SWITCHES (ONE PER PHASE) WITH A POSITION FOR A FUTURE SUBSTATION BREAKER
⊥	COPPER BUS TEE CONNECTION

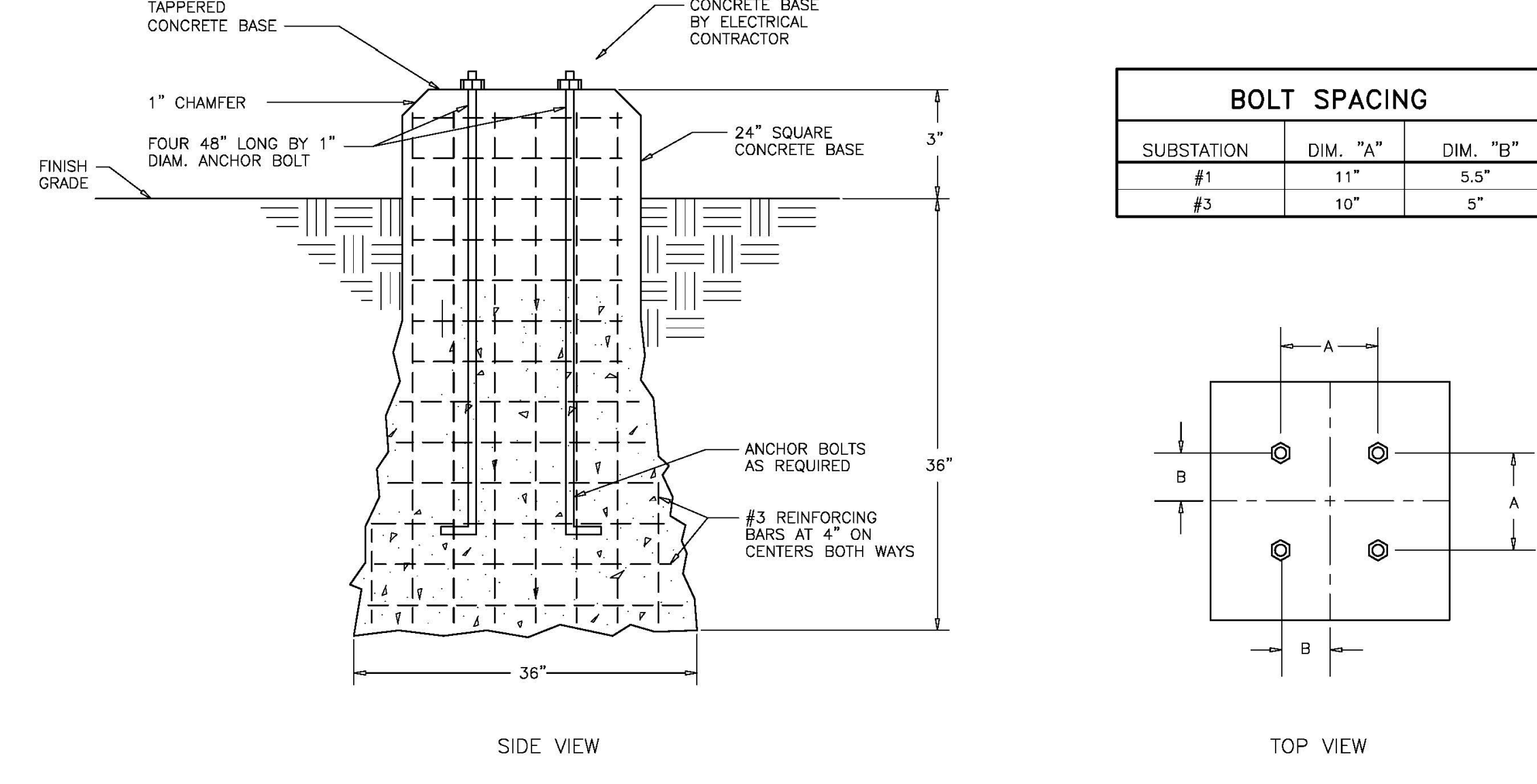


ONE-LINE SCHEMATIC - SUBSTATION #3
NO SCALE

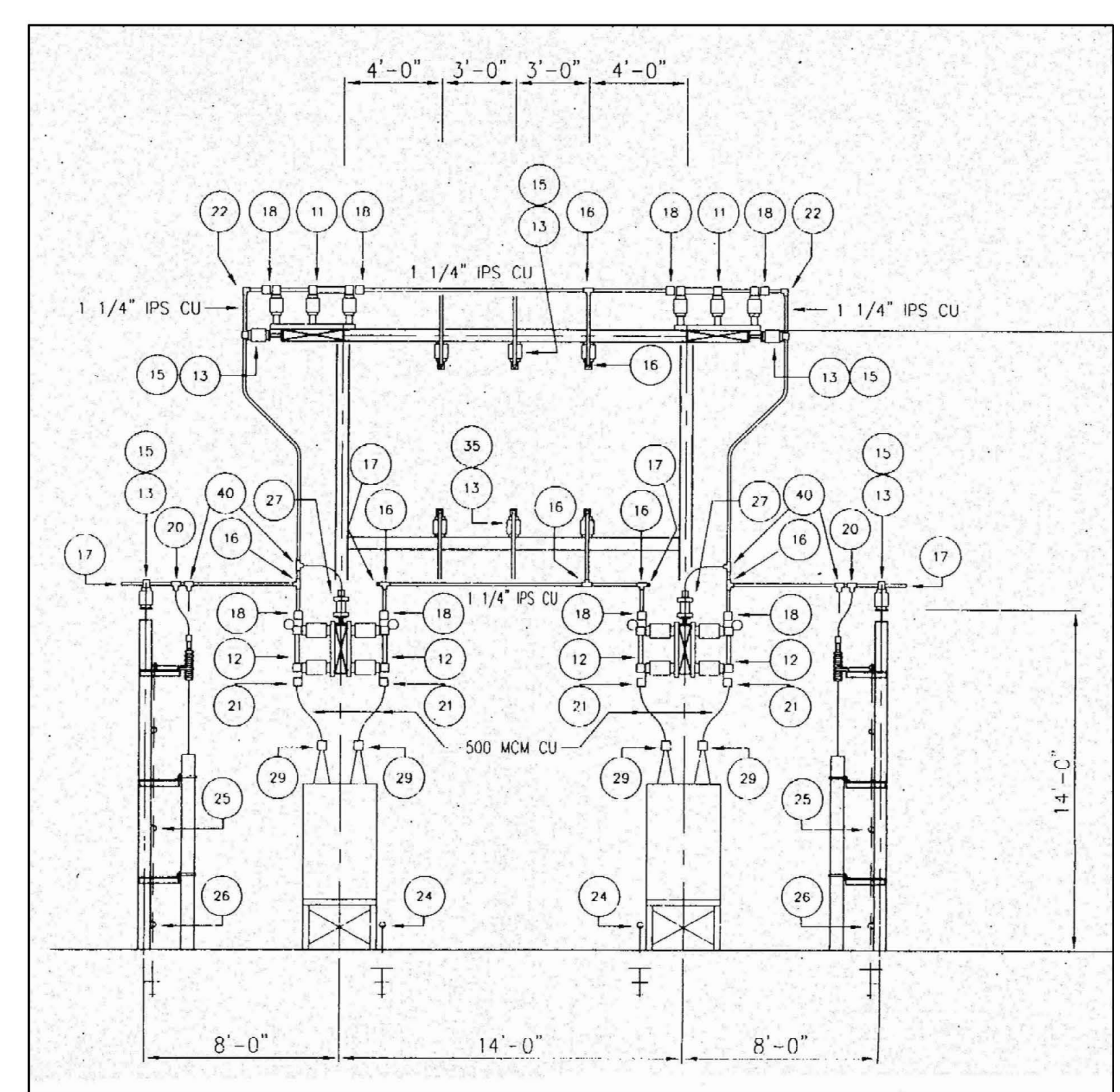
TYPICAL SUBSTATION PREFERRED PARTS LIST

Item #	Manufacturer	Catalog Number	Description
11	Southern States	TA-0C-151200	15KV, 1200 amp, 61kA mom, 110KV BIL, 3-phase gang operated air break switch
12	Southern States	PBO-151200	15KV, 1200 amp, 61kA mom, 110KV BIL, single phase hook stick operated disconnect switch
13	Newell or Locke		15KV station post insulators, TR205
14	Sefcor	CCT-4949	Bronze coupler for 1-1/4" cu bus, straight
15	Sefcor	SOTI-49-3	Bronze bus support for 1-1/4" bus
16	Sefcor	TTI-4949	Bronze tee connection for 1-1/4" top to 1-1/4" run
17	Sefcor	DF-49-BR	Bronze end cap for 1-1/4" bus
18	Sefcor	FNIT-49-4A	Bronze termination for 1-1/4" bus to a 4-hole pad
19	Sefcor	ETRCT-4848	Bronze splice connection for 1-1/4" bus
20	Sefcor	TRRCT-4920	Bronze tee connection for 1-1/4" run to 500 KCM cu cable tap
21	Sefcor	FNCT-34-4A	Bronze connection for 500 KCM cu to a 4-hole pad
22	Sefcor	LB90-4949	Bronze coupler, 90 deg bend for 1-1/4" bus
23			1-1/4" high conductivity copper bus, ASTM B-188
24	Sefcor	UKG-4052	Bronze equipment ground terminal
25	Sefcor	GF-12B	Bronze connection for 4/0 ground cable to galvanized steel
26	Sefcor	GT12-14-N-B	Bronze connection for two 4/0 ground cables to galvanized steel
27	OB	PVI 200009-3001	8.4 KV MCOV polymer lightning arrester
28			500 KCM copper
29	Sefcor	SAX-8666	Bronze stud connection for 1-1/4" - 12" thd to #2-1000 KCM copper
36	Sefcor	TTI-5349	Bronze tee connection for 1-1/2" run to 1-1/4" tap
35	Sefcor	SOTI-53-3	Bronze bus support for 1-1/2" bus
37	Sefcor	DF-53-BR	Bronze end caps for 1-1/2" bus
38	Sefcor	FNIT-53-4A	Bronze termination for 1-1/2" IPS copper bus to a 4-hole pad
Alt 38	Sefcor	CTI-5353	Bronze coupler for 1-1/2" copper bus straight
39	Sefcor	TRRCT-5314	Bronze tee connection for 1-1/2" run to #4 W copper cable tap
40	Sefcor	TRRCT-4914	Bronze tee connection for 1-1/4" run to #4 W copper cable tap
41	Cooper	Power Type L	12KV fused cutout for PT
	Southern States		All terminal mounting hardware

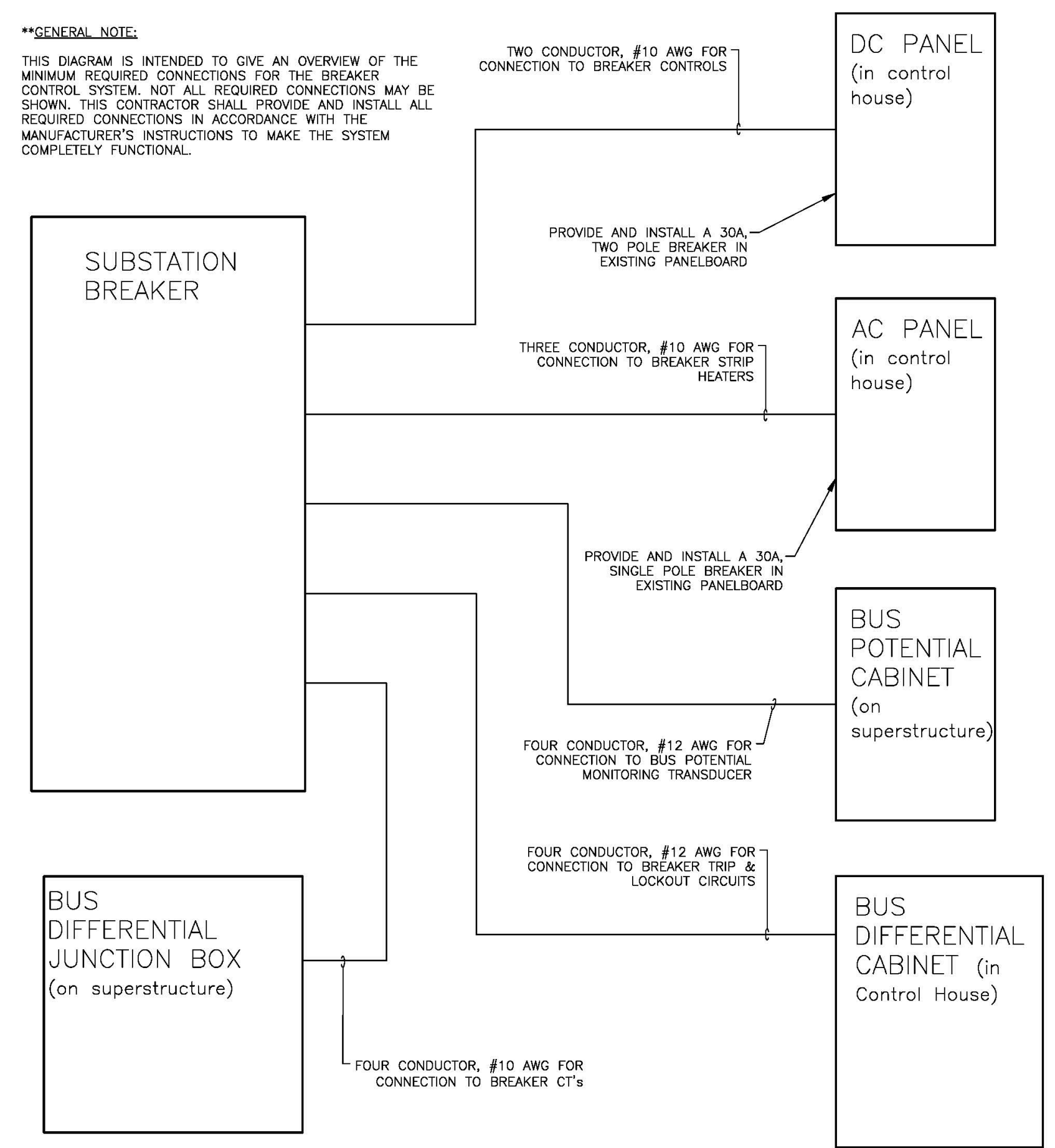
NOTE: The above part numbers and descriptions are meant for guidance on obtaining the parts from preferred suppliers. Actual sizes (i.e. copper bus diameters) are listed on the drawings. The above parts listing will require some adjustments in the numbers to match the specified equipment/hardware sizes.



DETAIL OF STEEL COLUMN BASE FOR SUBSTATION
NO SCALE



SUBSTATION EXAMPLE PART LISTING AND APPLICATION
NO SCALE



SUBSTATION BREAKER LOW VOLTAGE CABLING CONNECTIONS
NO SCALE

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REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS

University of Kentucky
Lexington, Kentucky

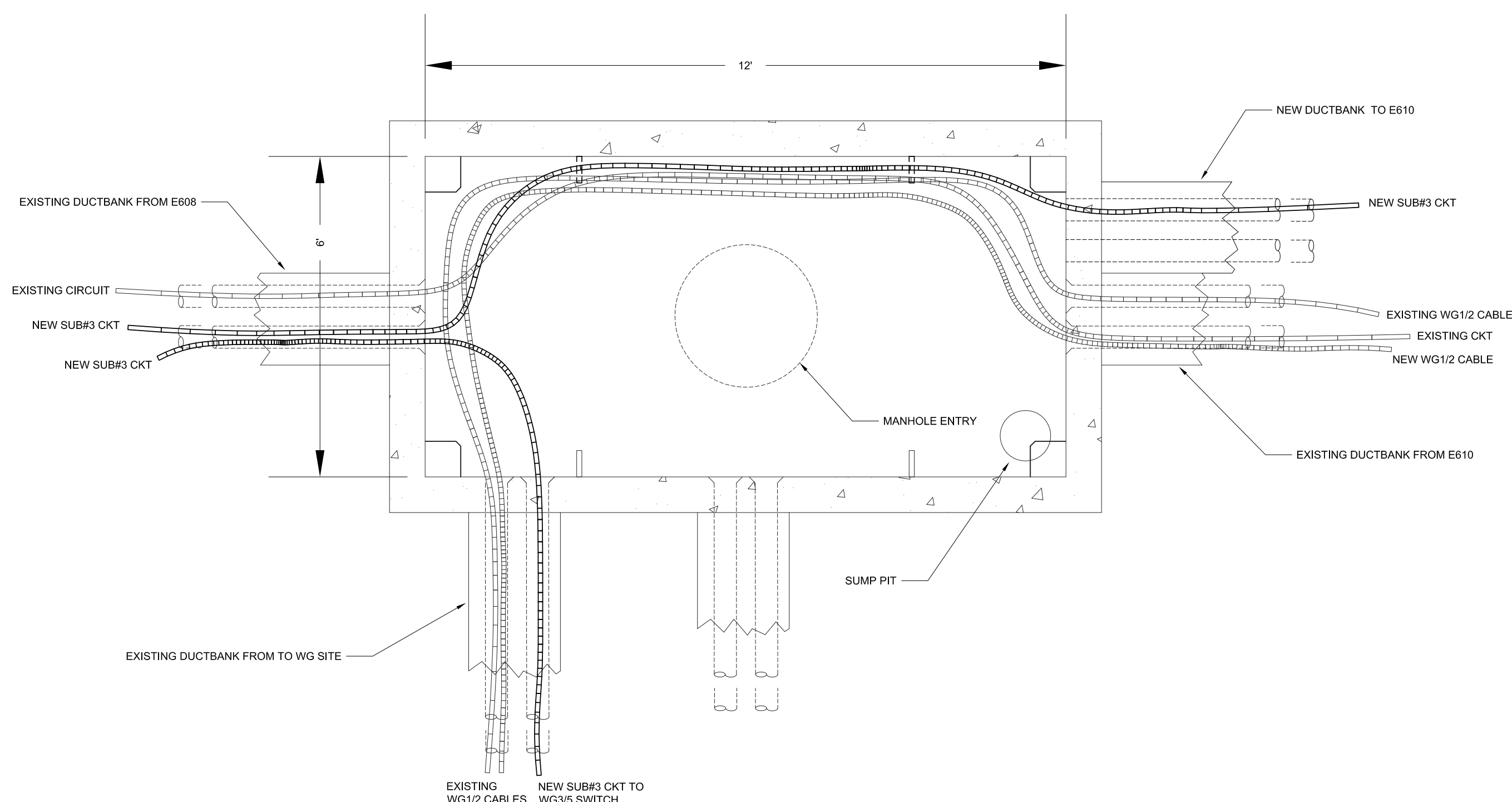
approved by: *William P. Wilson*

director - design and construction division 0304

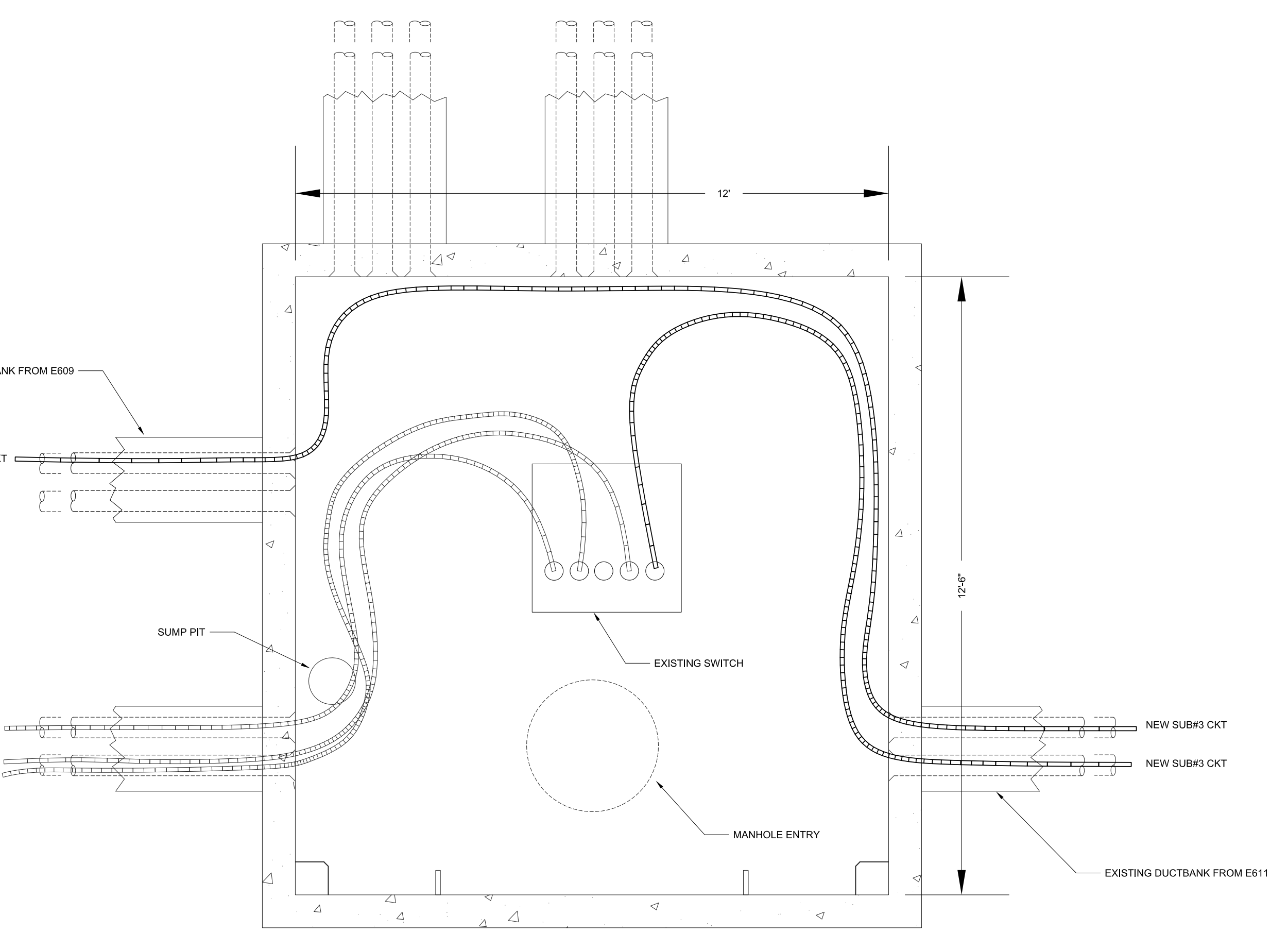
SK Project #: 2388.0
Site: 1/13/2014
S&F file no. 13324
Drawn by: WFW
Checked by: GGC
Notes:
Drawing No. **U4.2**

GENERAL MANHOLE NOTES:

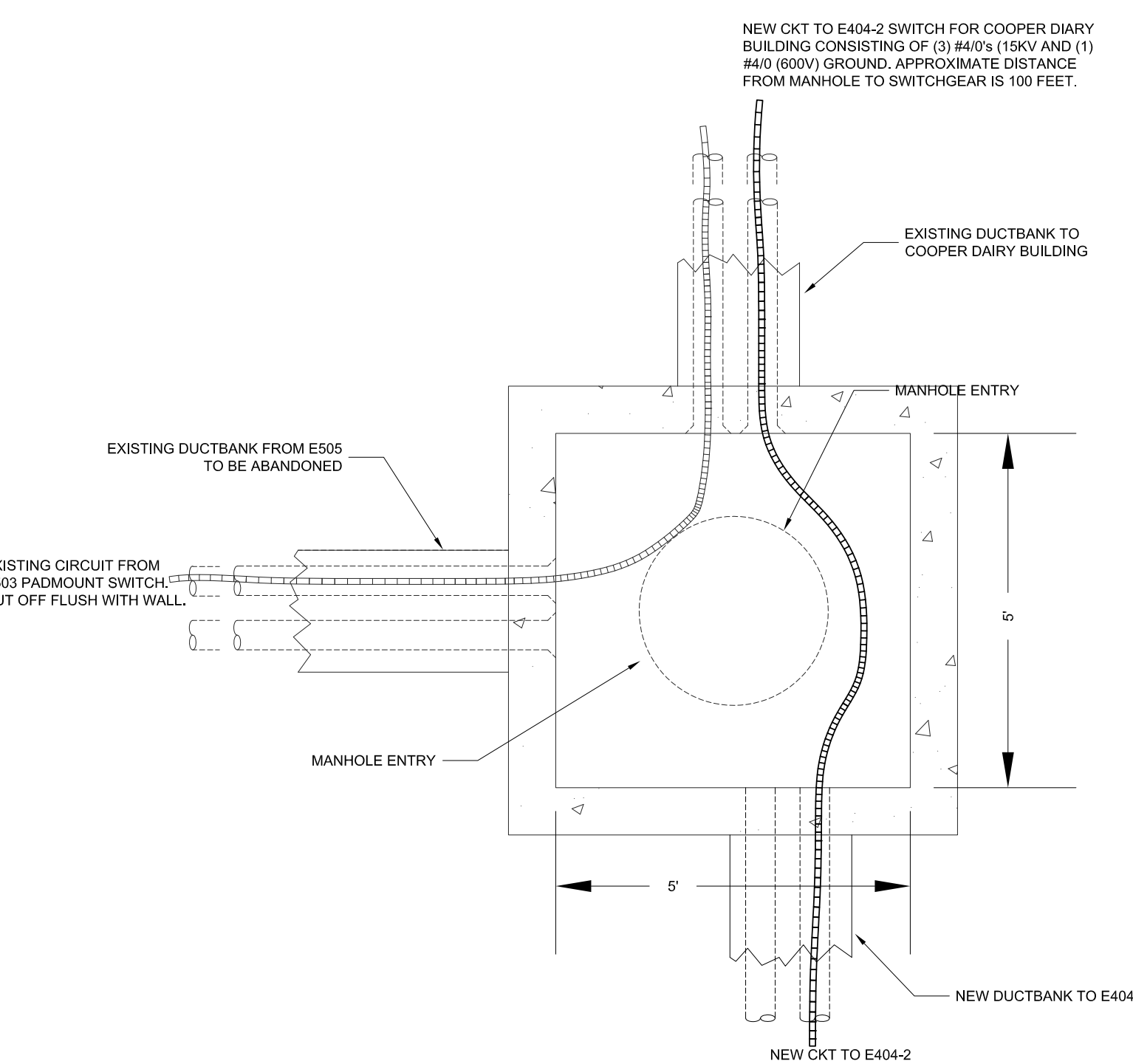
- ALL DETAILS ARE SCHEMATIC ONLY AND DO NOT NECESSARILY INDICATE ALL EQUIPMENT, ELEMENTS, OR POTENTIAL OBSTRUCTIONS WITHIN THE MANHOLE. ALL INSTALLATIONS MUST BE COORDINATED IN THE FIELD PRIOR TO INSTALLATION.
- REVIEW EACH MANHOLE CONFIGURATION WITH THE OWNER'S DESIGNATED REPRESENTATIVE WHEN PLANNING EACH INSTALLATION.
- EXISTING MANHOLES MAY CONTAIN WATER. THIS CONTRACTOR SHALL PUMP EACH MANHOLE PRIOR TO COMMENCEMENT OF ANY WORK AS REQUIRED. THIS CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING THE NECESSARY EQUIPMENT TO PERFORM THIS WORK.
- ALL NEW CABLING SHALL BE ROUTED IN EACH MANHOLE ALONG THE LONGEST PATH FROM ITS ENTRANCE CONDUIT TO ITS EXIT CONDUIT WHILE MAINTAINING THE PROPER BENDING RADIUS IN ACCORDANCE WITH THE CABLE MANUFACTURER'S INSTRUCTIONS.
- ALL NEW CABLING SHALL BE SUPPORTED AS REQUIRED. EXISTING CABLING RACKS MAY BE UTILIZED WHEN LOCATED IN THE PROPER PLACES. WHERE NO CABLING RACK EXISTS, THIS CONTRACTOR SHALL PROVIDE AND INSTALL THE NECESSARY VERTICAL STRUT, SUPPORT ARMS, PORCELAIN CABLE INSULATORS, ANCHORS, AND ANY OTHER REQUIRED HARDWARE.



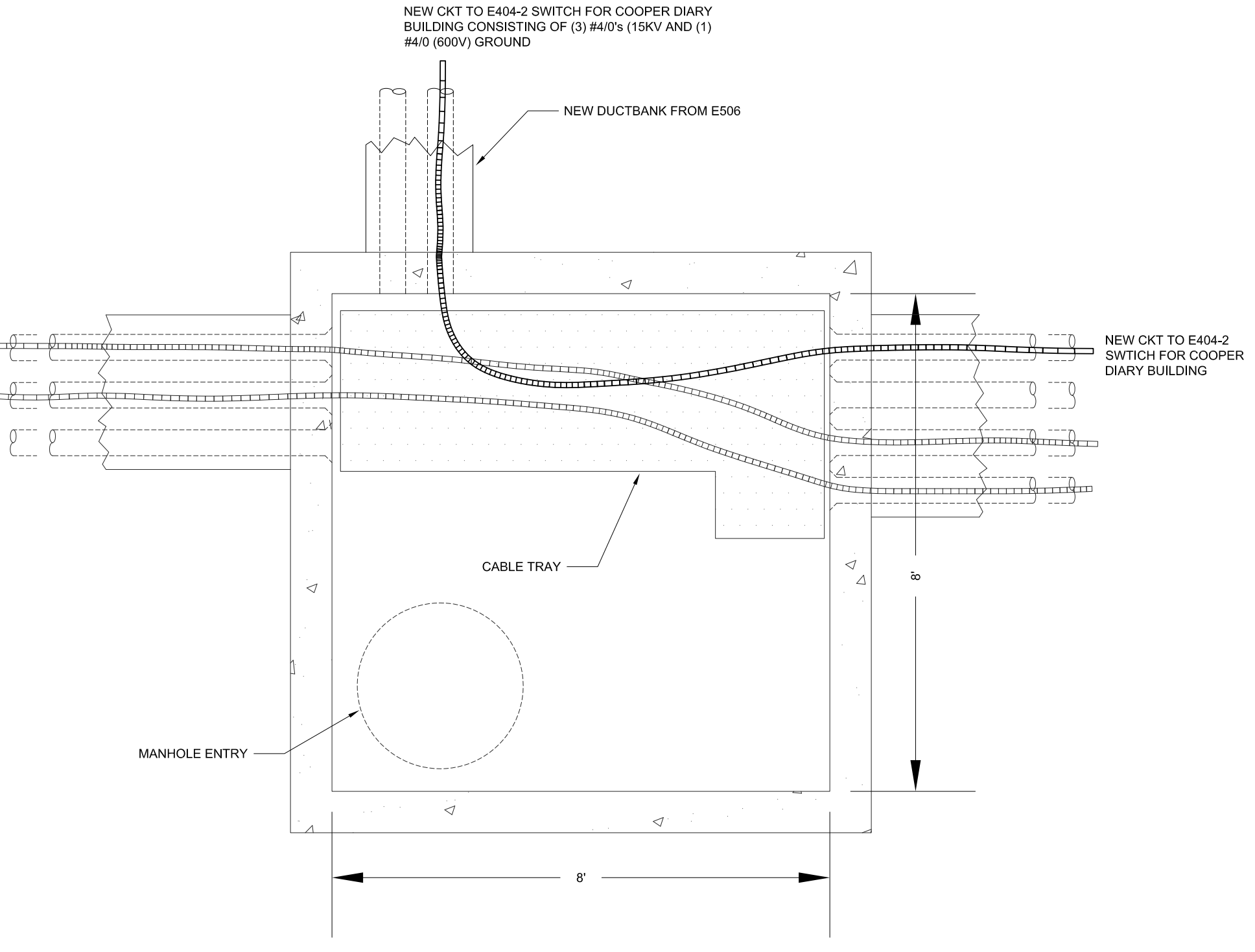
E609 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



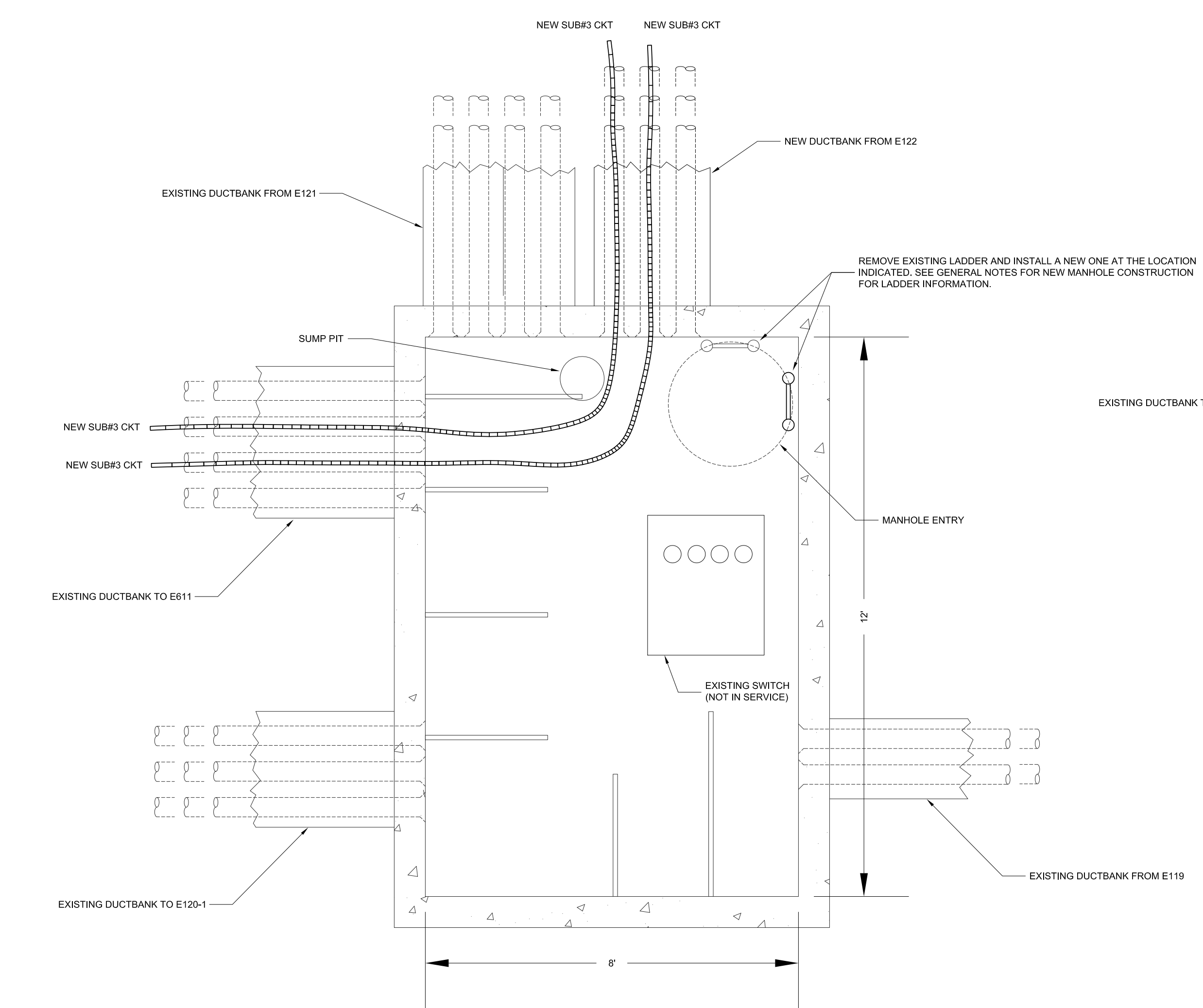
E610 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



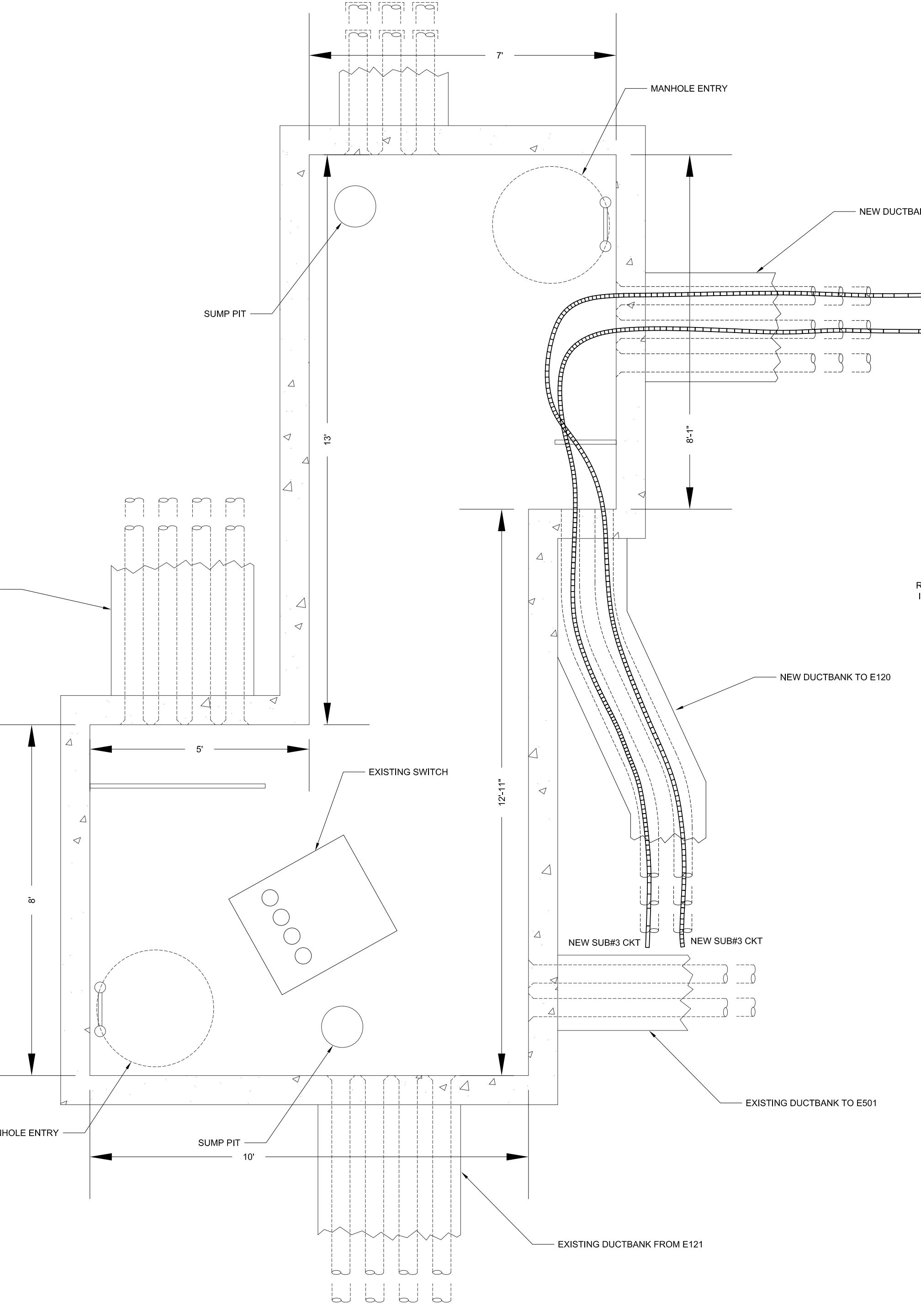
E506 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



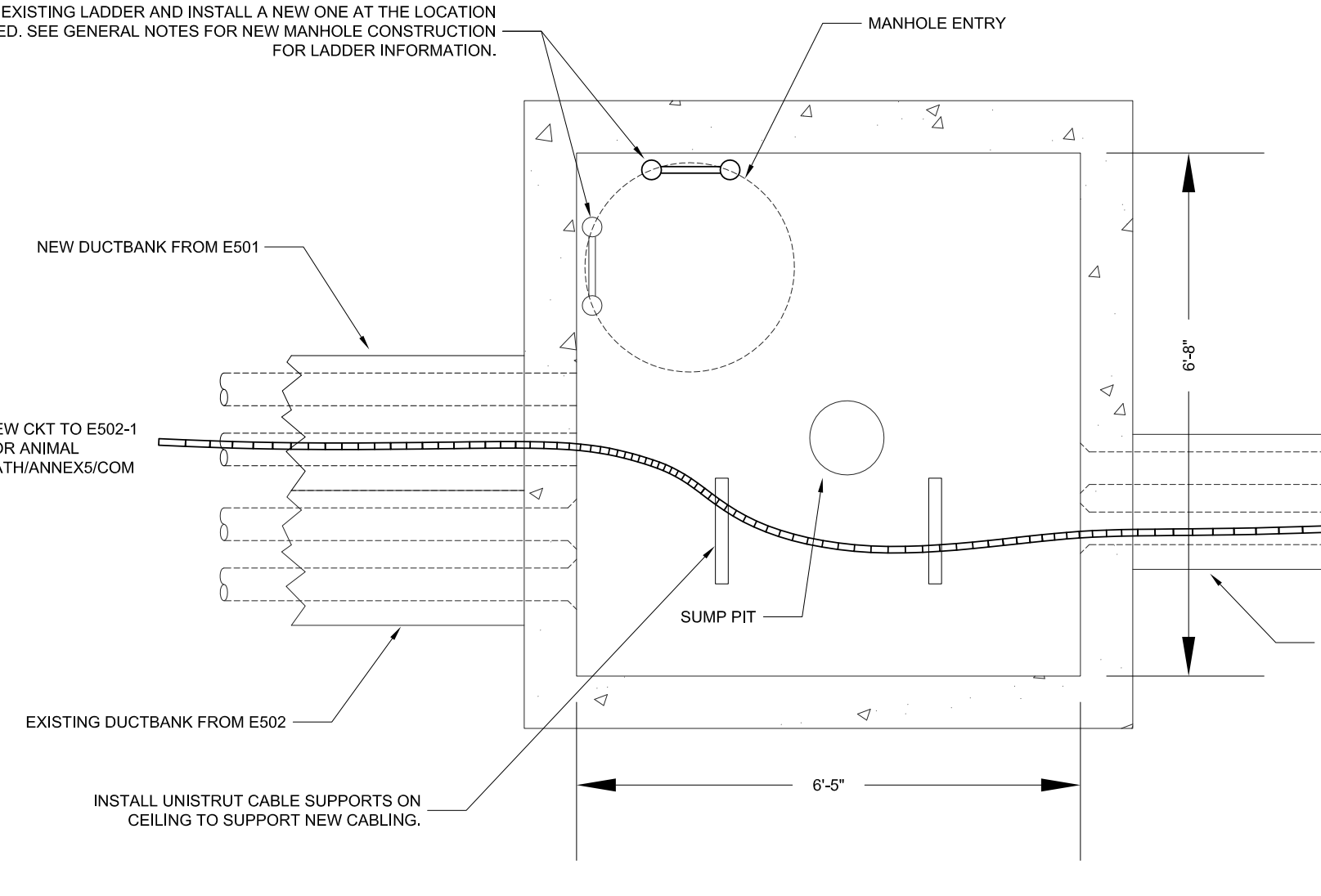
E404-1 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E120 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E122 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E502-1 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"

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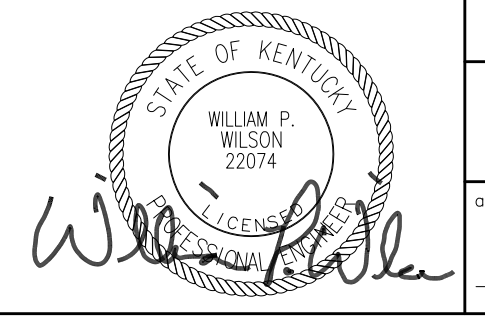
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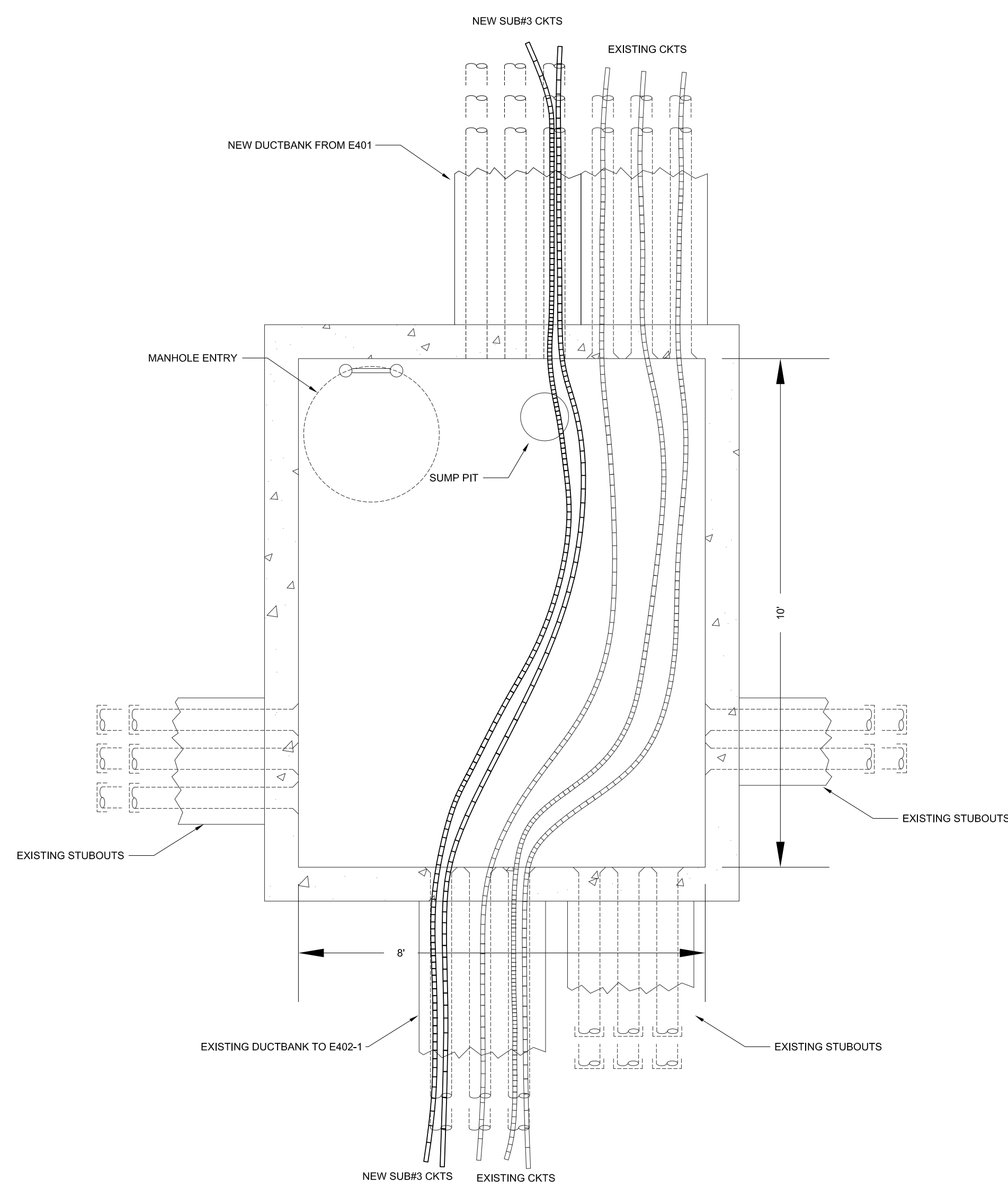
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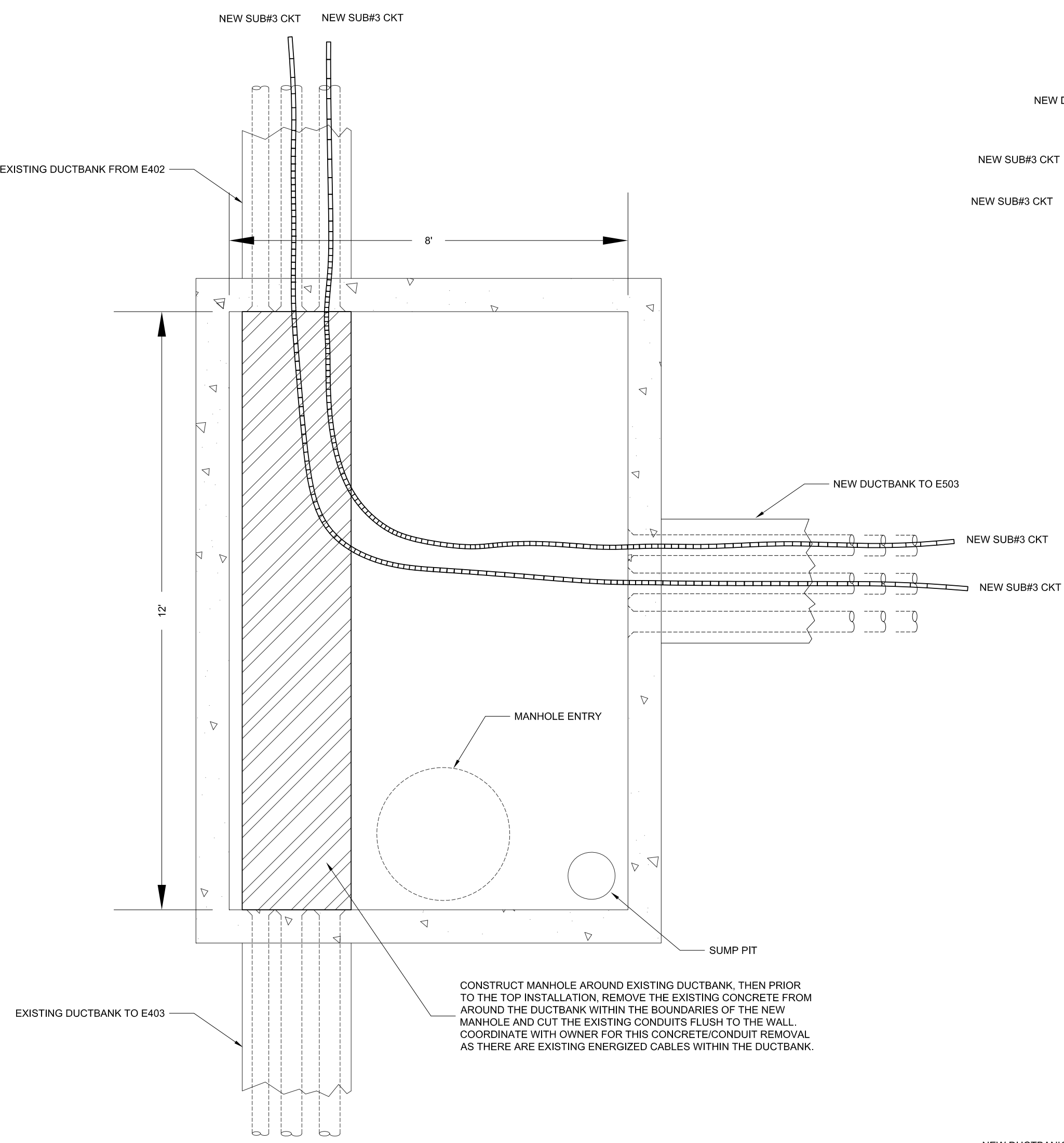
MANHOLE PLANS AND DETAILS		SK Project #: 2399.0
REPAIR/UPGRADE/IMPROVE ELECTRICAL INFRASTRUCTURE CENTRAL CAMPUS		Site: 1/13/2014
University of Kentucky Lexington, Kentucky		S&F file no. 13524
approved by _____		Drawn by: BWF
director - design and construction division		Checked by: GGC
date _____		Notes:
		Plotting no. _____



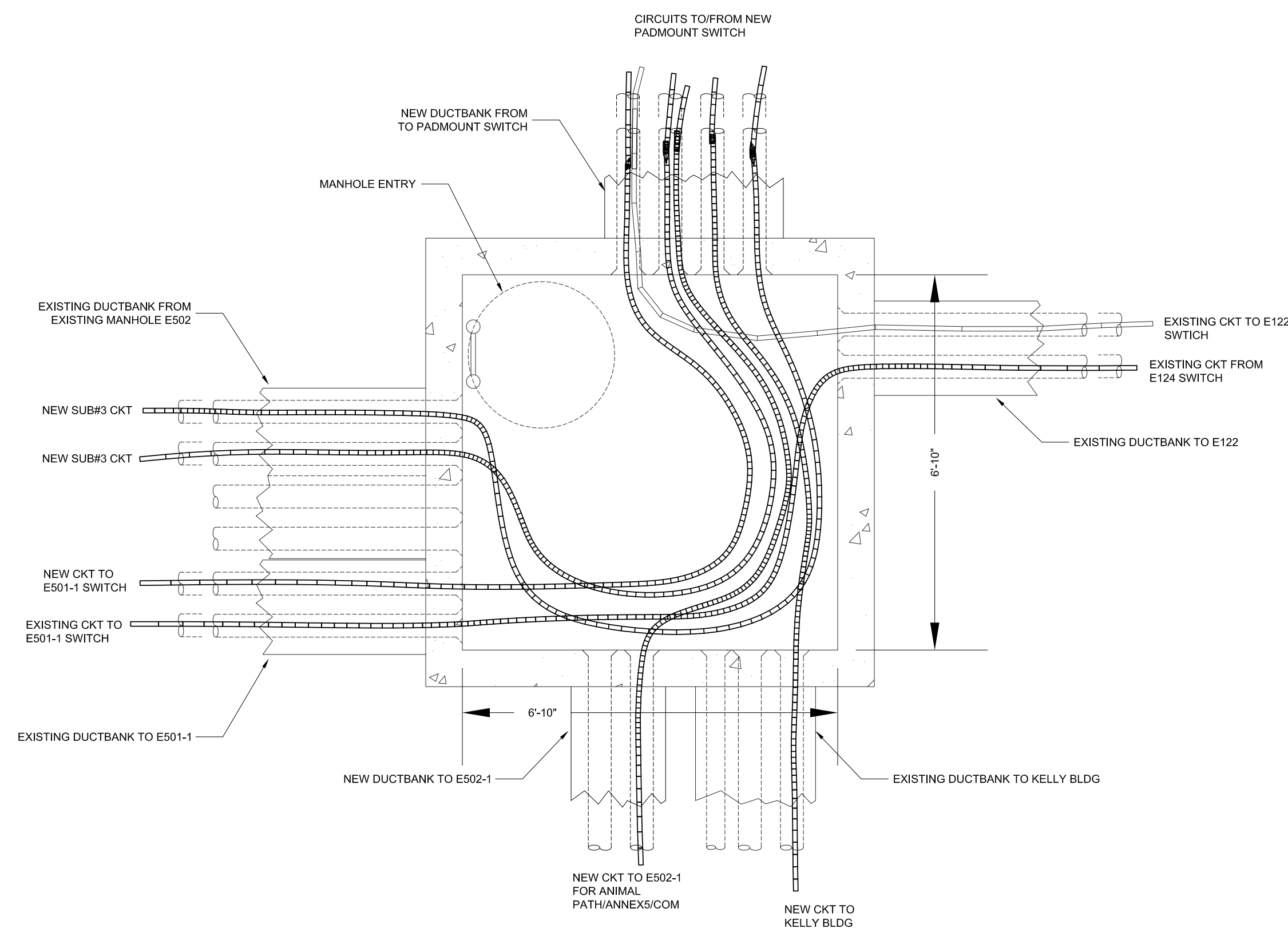
U5.0



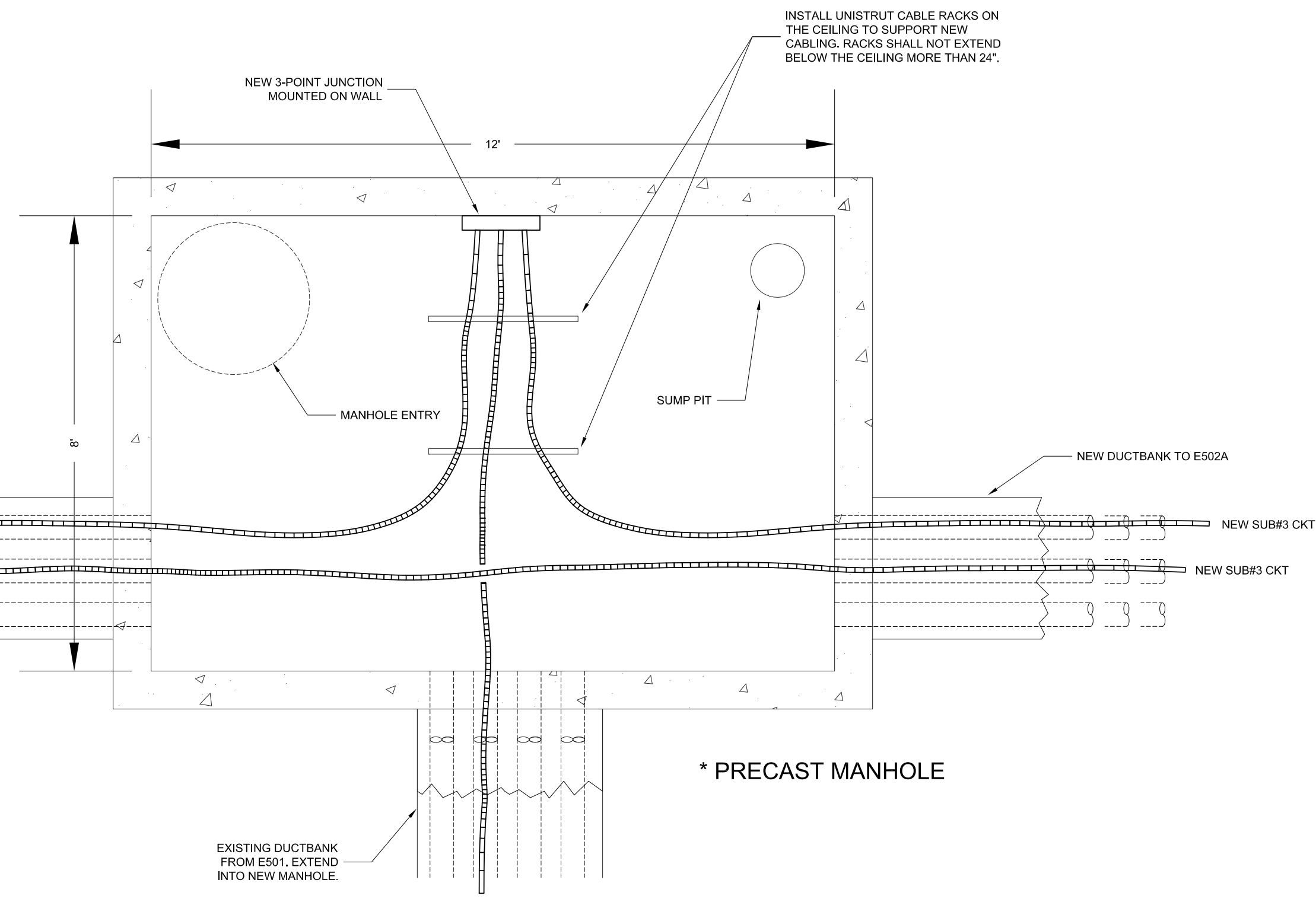
E402 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



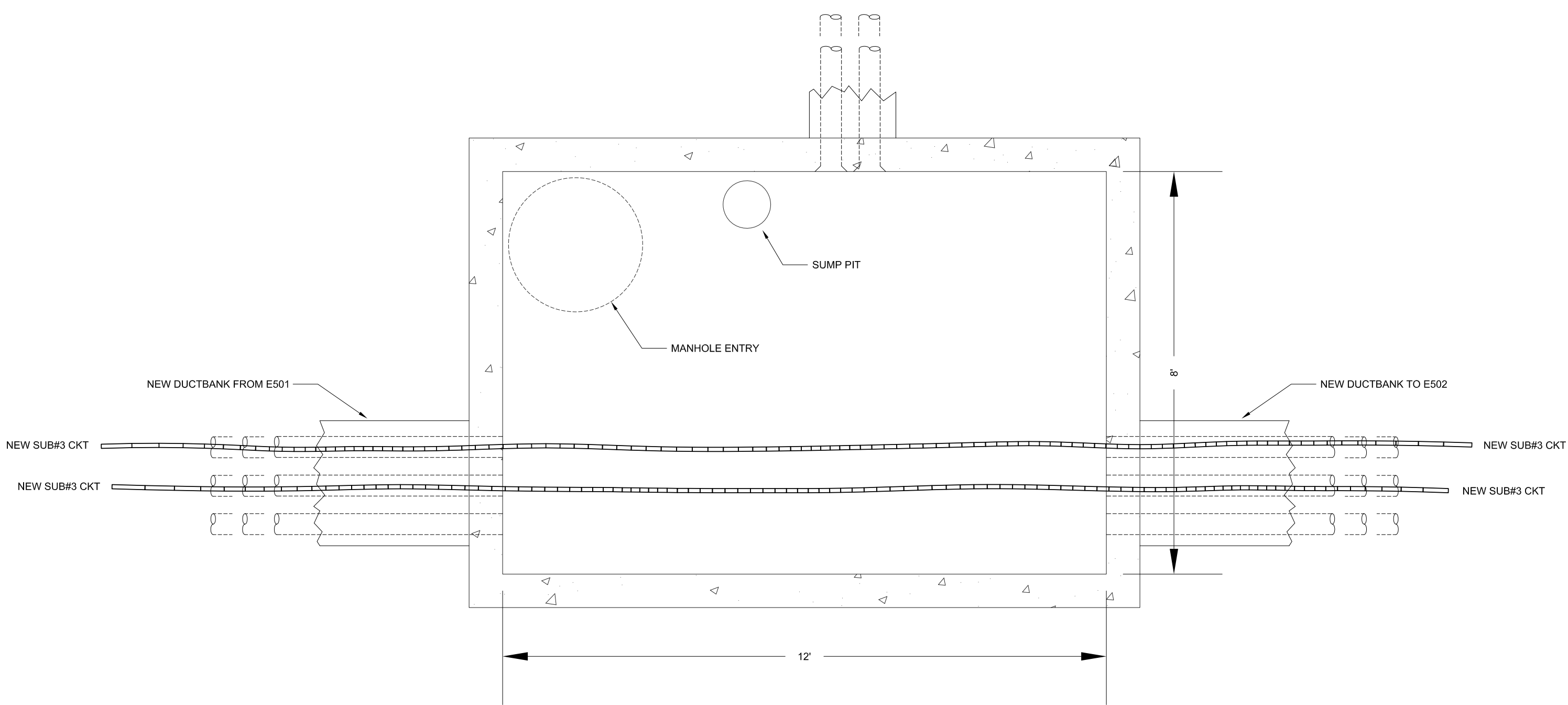
E402-1 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"



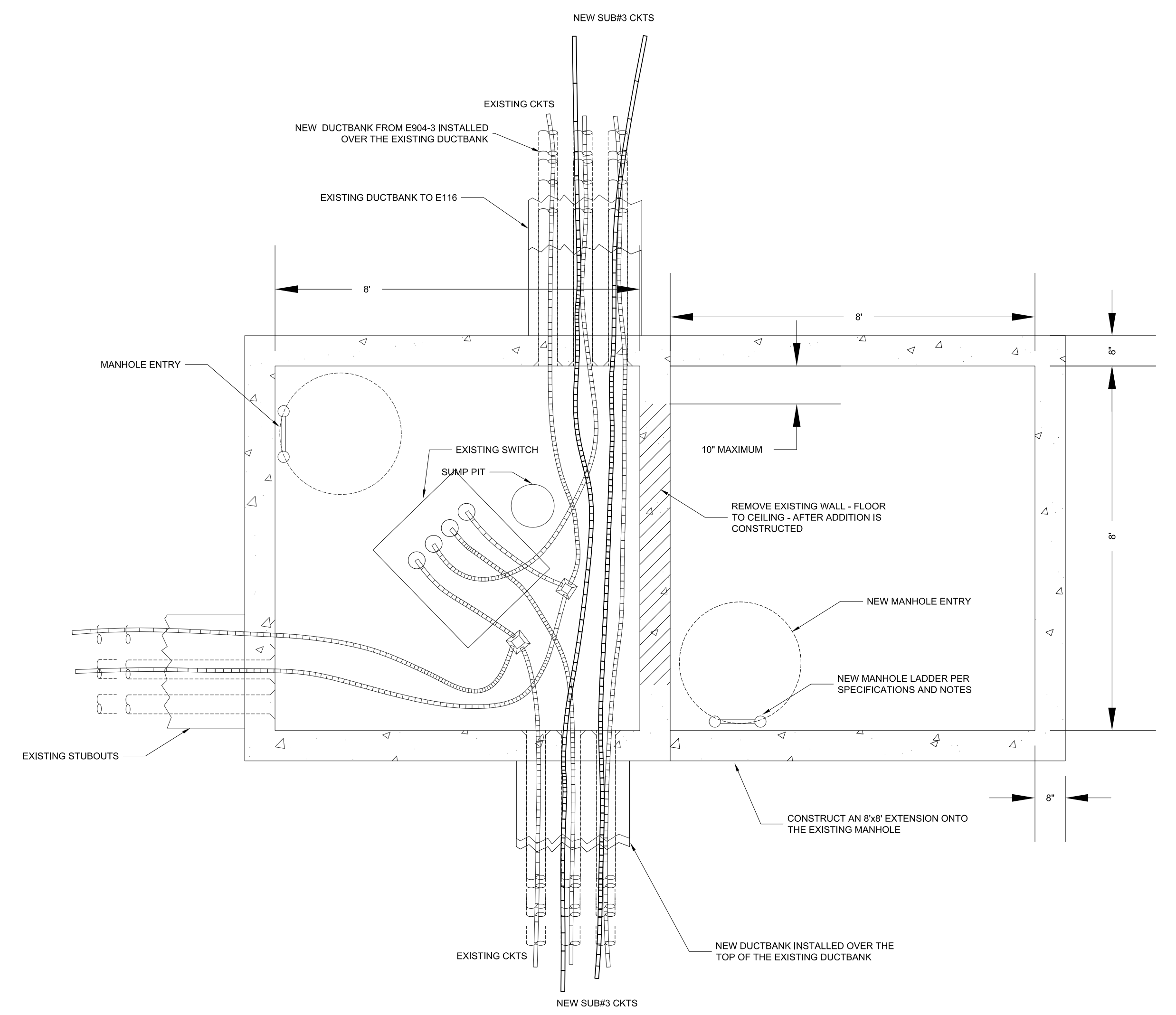
E501 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



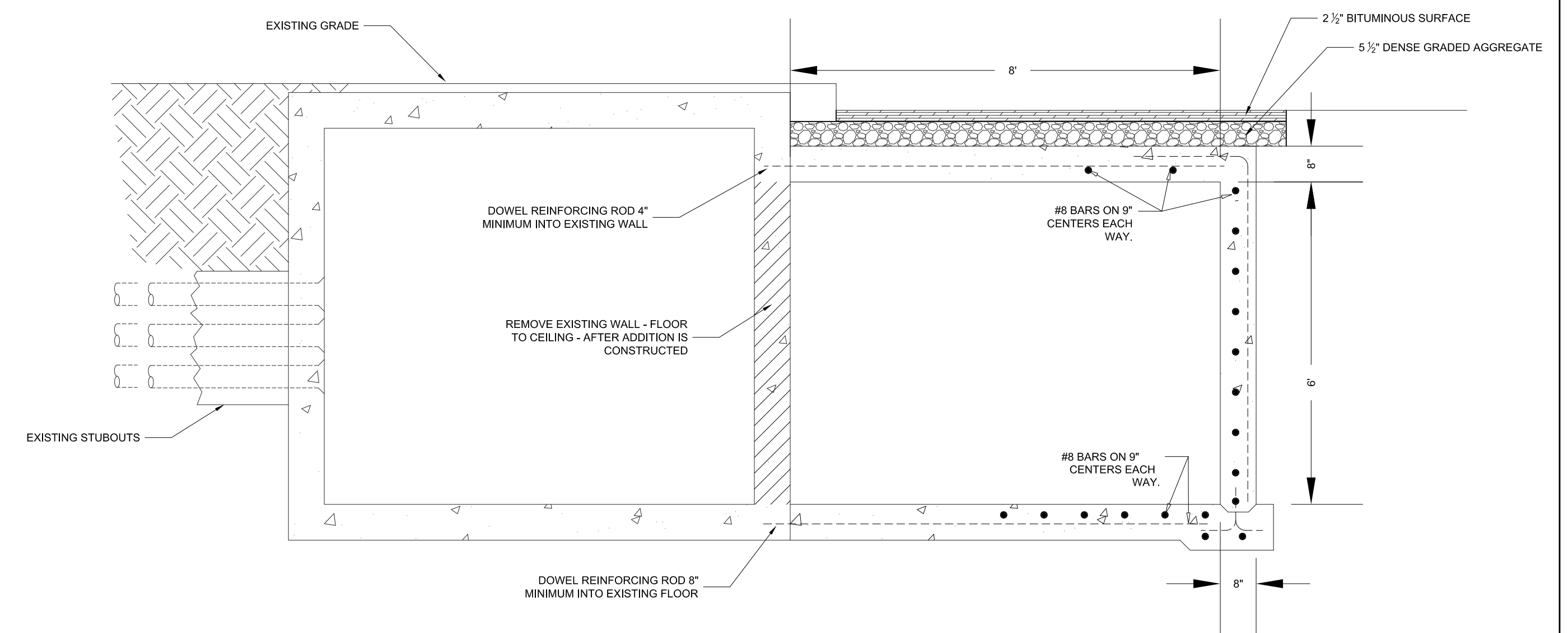
E502 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E503 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E401 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E401 - MANHOLE SECTION
SCALE: 3/8" = 1'-0"

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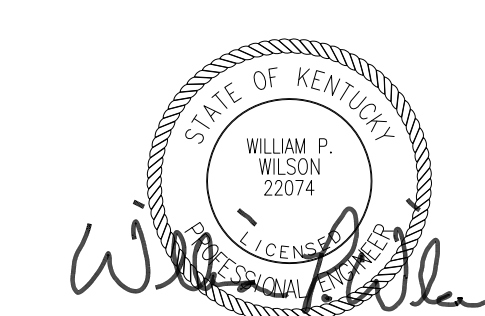
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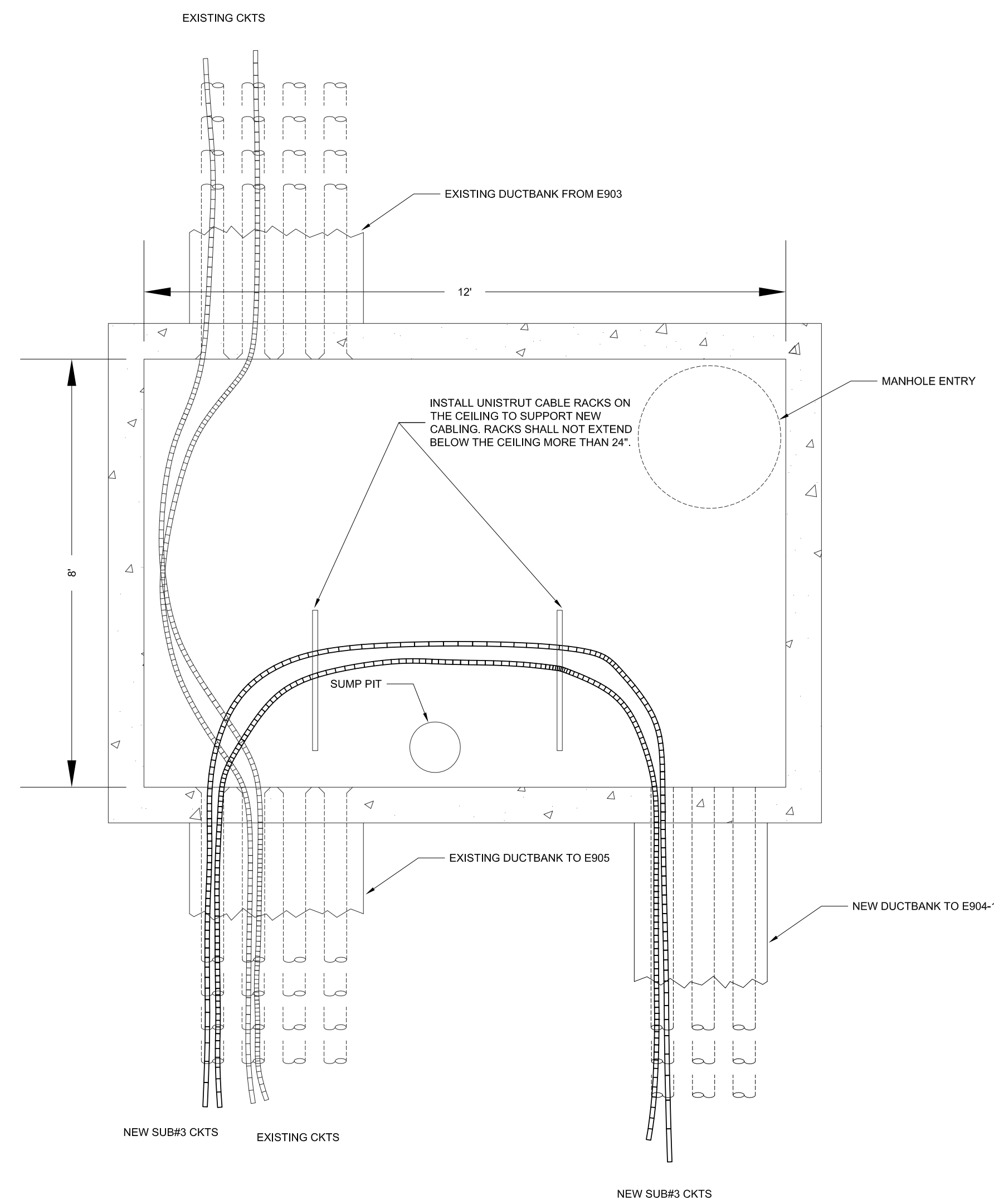
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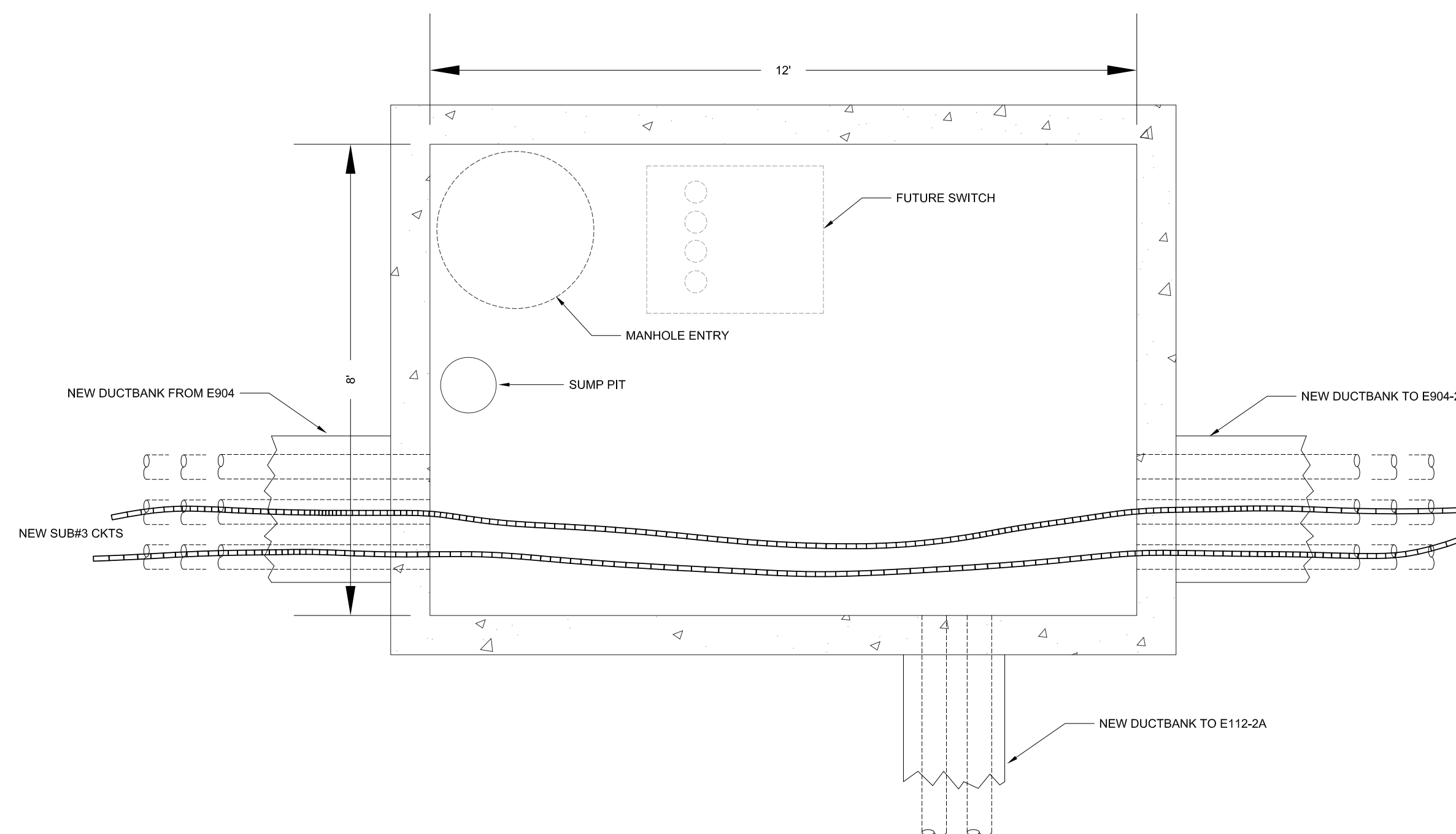
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University of Kentucky Lexington, Kentucky		S&F file no. 13524
approved by _____		Drawn by: BPH
director - design and construction division		Checked by: GSC
date _____		Notes:
_____		Drawing no. U5.1

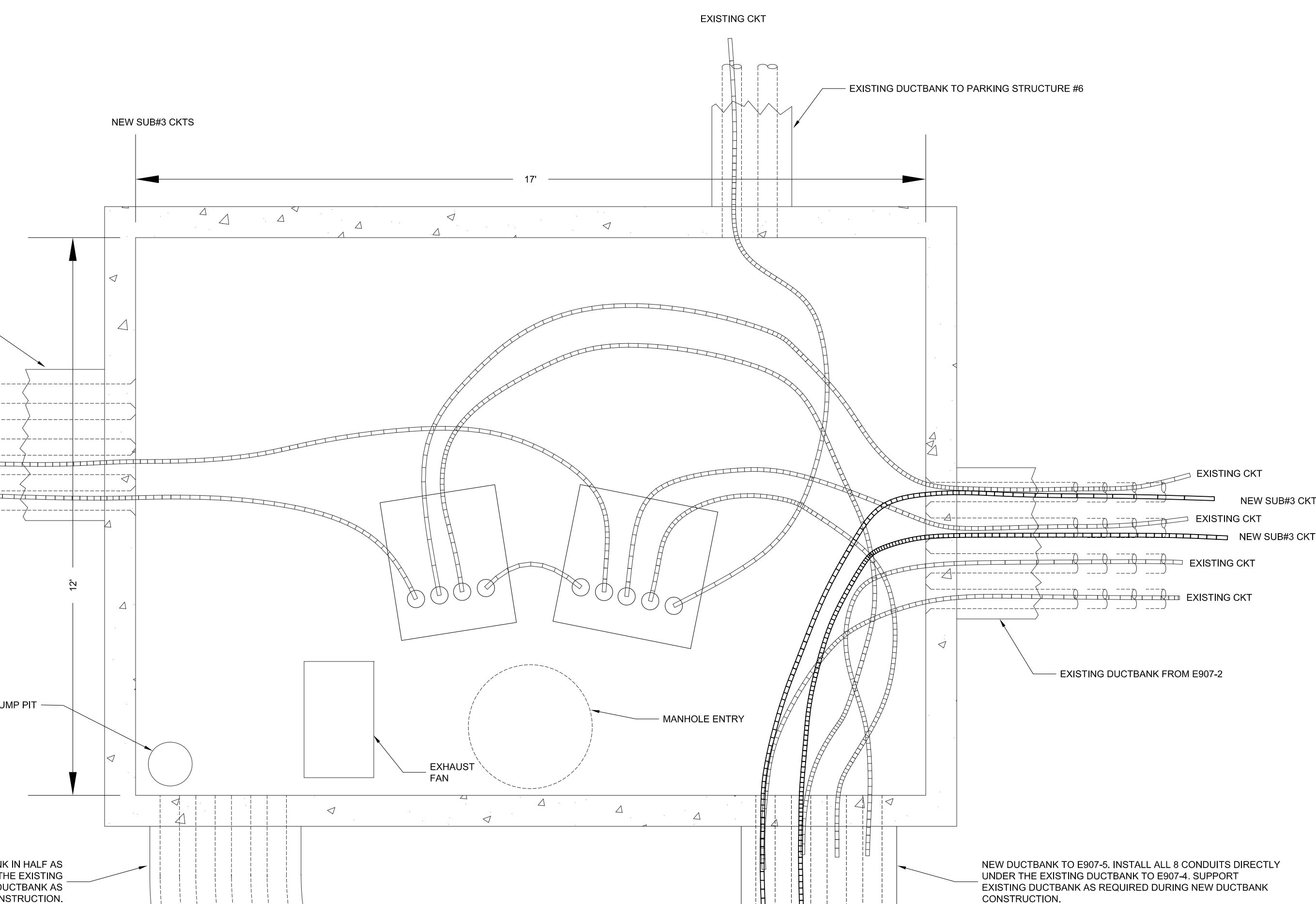




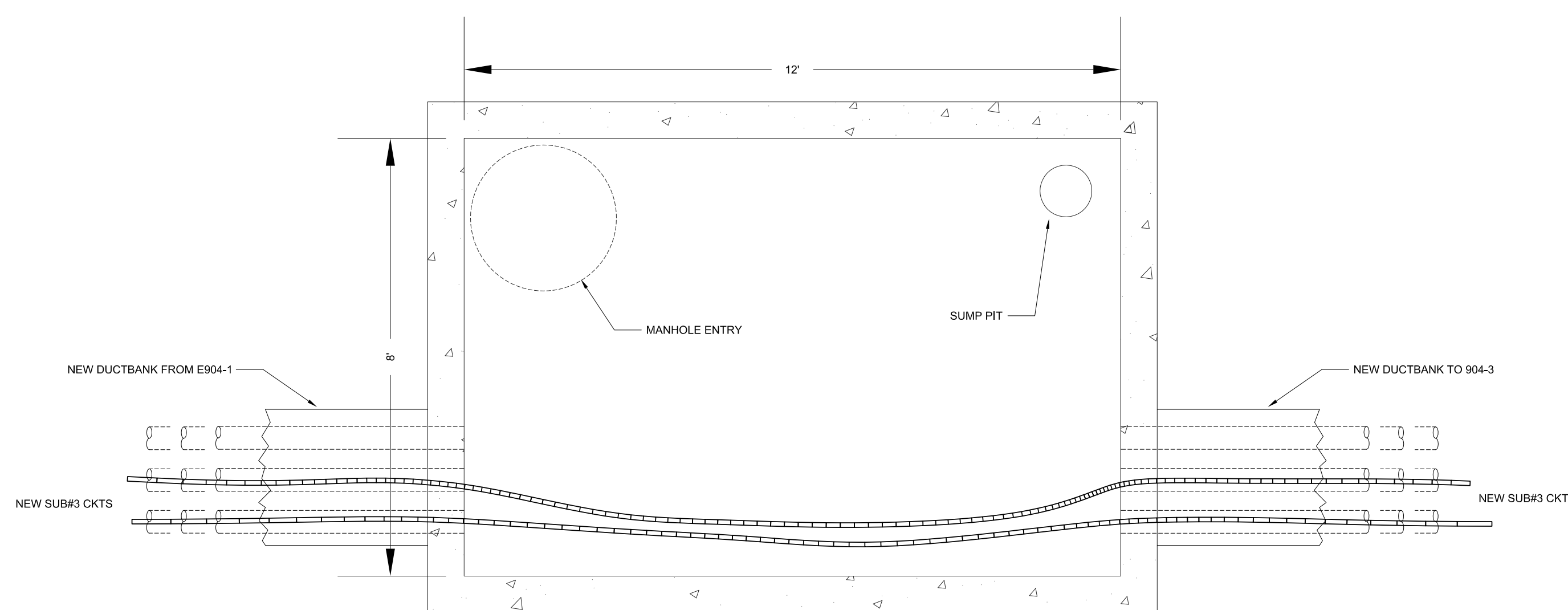
E904 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



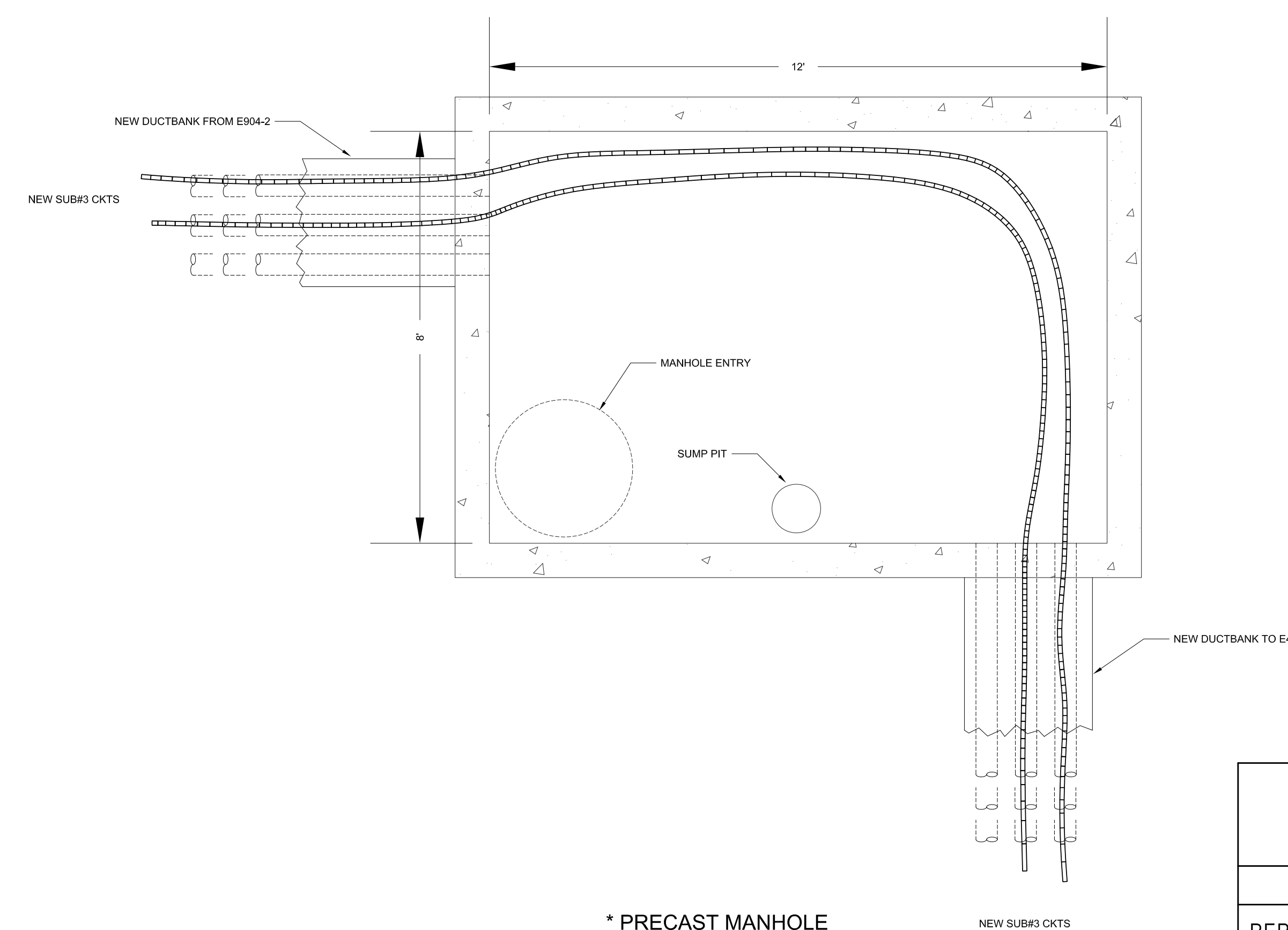
* PRECAST MANHOLE
E904-1 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"



E907-3 - MANHOLE PLAN
SCALE: 3/8" = 1'-0"



* PRECAST MANHOLE
E904-2 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"



* PRECAST MANHOLE
E904-3 - NEW MANHOLE PLAN
SCALE: 3/8" = 1'-0"

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University of Kentucky Lexington, Kentucky		SAF file no. 13524
approved by		Drawn by: BWF
director - design and construction division		Checked by: GGC
date		notes
		Plotting no.
		U5.2

WILLIAM P. WILSON
REGISTERED PROFESSIONAL ENGINEER
No. 22074
STATE OF KENTUCKY

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New Infrastructure Ductbank

Operations & Maintenance Manual



2412 Palumbo Dr.
Lexington, KY 40509
(859) 410-7810

New Infrastructure Ductbank

Operations & Maintenance Manual

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1. 26-6000 Vault Switch
2. 26-1300 Switch Gear
3. 26-0543 Lighting
4. 26-0513 Independent testing



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University of Kentucky New Infrastructure Project

26-6000 Vault Switch



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INSTALLATION, OPERATION AND
MAINTENANCE INSTRUCTIONS
**Two-Position SF₆ Switches and
Resettable Fault Interrupters
Subsurface and Padmount Styles**

211A234
Rev. A
June 2012

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This information is transmitted by G&W Canada Corporation. and accepted by you subject to the following understanding and agreement: By accepting these instructions and any included drawings you agree that all rights to the drawing and information contained herein, as well as the proprietary and novel features of the subject matter, are reserved by G&W Canada Corporation and that devices embodying such features or information derived from these disclosures will not be manufactured by you or disclosed to others without the expressed written consent of G&W CANADA Corporation. These drawings and information contained herein are and remain the property of G&W Canada Corporation and are not to be copied, reproduced or disclosed to others without the expressed written consent of G&W Canada Corporation.

1.1 General

This document is intended to provide the user with necessary information to properly receive, inspect, test, install, operate and maintain G&W CANADA SF₆ switches. If after reviewing the information contained herein, you should have any questions, please contact your G&W Canada or call our Customer Service number.

Read these Instructions	Read and understand the contents of this document and follow all locally approved procedures and safety practices before installing, operating or maintaining this equipment. Be sure to read and understand the Safety Information in Section 2.
Keep these Instructions	This document is a permanent part of your G&W CANADA switchgear. Keep it in a safe location where it can be readily available and referred to as necessary.
How to Contact G&W CANADA Corporation	<p>By Phone: 905-285-2200, Monday through Friday, 8:00 AM to 4:30 PM Eastern Time</p> <p>By Fax: 905-826-1509</p> <p>Mail: 2600 Argentia Road, Mississauga, Ontario, L5N 5V4, Canada</p> <p>Internet: To find your local G&W Canada Rep. visit our Web site: www.gwelec.com</p>

1.2 Qualified Persons

 **WARNING**

The equipment covered by this document is intended to be installed, operated and maintained by qualified persons who are trained in the installation, operation and maintenance of electric power distribution equipment along with the associated hazards. A qualified person has been trained and is competent:

- To de-energize, clear and tag circuits and equipment in accordance with established safety procedures.
- To distinguish between live parts from non-live parts of the equipment.
- In the proper use of insulated tools, wears protective equipment such as rubber gloves, hard hat, safety glasses, flash-clothes, etc. in accordance with established safety practices and is trained in the care of such equipment.
- As in certified in rendering first aid, especially in the technique of removing a person in contact with a live circuit and in applying cardiopulmonary respiration.

These instructions are intended only for qualified persons and are not intended as a substitute for adequate training and experience in safety procedures for this type of equipment.

1.3 Shipment Inspection

Examine the crated equipment carefully for any damage that may have occurred in transit. If damage is found, a claim must be filed at once with the transportation company. Uncrate and remove packing as soon as possible after receiving the equipment. Examine the equipment carefully for any hidden damage that may have occurred in transit and was previously undetected. If damage is found, a claim should be filed at once with the transportation company.



Temperature-Compensated Gauge



Non-Temperature Compensated Gauge

For Non-Temperature Compensated Gauge

Check the pressure to insure that the pressure corresponds to the values on the table located near the pressure gauge or in Table1, Section 6.2 of this instruction.

For Temperature Compensated Gauge

Check the pressure gauge and insure that the pressure indicator is in the GREEN acceptable zone.

If the pressure is below the recommended level or in the RED zone, contact your Canada Power Products Representative or contact Canada Power Products Customer Service before placing the equipment in service.

1.4 Storage

Switches that will not be installed immediately should be suitable stored in a clean, dry location. Possible replacement of crating material should be investigated. Make certain switches are protected from potential damage.

1.5 Switch Duty

Switch Module	Abbreviations	Load Break	Fault Interrupting
Linear Puffer	VG6, SG6, PG6	X	
Vacuum Interrupter	SRG6, PRG6	X	X

1.6 Switch Type Identification

Switch Type	Load Break 2- Position	Fault Interrupting
Vault / Subsurface	VG6, SG6	SRG6
Pad-Mount	PG6	PRG6

1.7 Standards

Some or all of these standards are applicable to this switch:

Type of Switch					
	Each switch is characterized by a "Type" (i.e. Pad Mount or a Subsurface [Vault] switch) and a "Duty" (i.e. Load Break, Fault Interrupting or both Load Break and Fault Interrupting.) To determine which standards apply to your particular switch select those indicated with a X.	P A D M O U N T	S U B S U R F A C E	L O A D B R E A K	F A U L T I N T.
Standards					
ANSI C57.12.28 1996. Switchgear and Transformers, Padmounted Equipment, Enclosure Integrity.		X			
ANSI/IEEE 386 - 1995. Separable Insulated Connectors for Power Distribution Systems Above 600 V.		X	X	X	X
ANSI/IEEE C37.60 - 2003. Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems.					X
ANSI/IEEE C37.71 - 1984. Three phase, Manually Operated Subsurface Load Interrupting Switches for Alternating Current Systems.			X		
ANSI C37.72 - 1987. Manually Operated, Deadfront, Padmounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating Current Systems.		X			
ANSI C37.85 - 1989. Interrupters used in Power Switchgear, X-radiation Limits for AC High-Voltage Power Vacuum.					X
IEEE C37.74-2003. IEEE Standard Requirements for Subsurface, Vault and Pad-Mounted Load-Interrupter Switchgear for Alternating Current Systems Up to 38kV		X	X	X	X

2.1 Safety Alert Messages

The following is important safety information. For safe installation and operation, be sure to read and understand all danger, warning and caution information. The various types of safety alert messages are described below:

**DANGER**

DANGER - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

CAUTION - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. May also be used to alert against unsafe practices.

2.2 Following Safety Instructions

Carefully read all safety messages in this manual and on your equipment. Keep safety signs in good condition. Replace missing or damaged safety signs.

Keep your equipment in proper working condition. Unauthorized modifications to the equipment may impair the function and/or safety and effect equipment life.

If you do not understand any part of these safety instructions and need assistance, contact your G&W CANADA Representative or G&W CANADA Customer Service.

2.3 Replacement Instruction and Labels

Replacement instructions and safety labels are available from G&W CANADA Corporation. To obtain them, please contact Customer Service.

2.4 List and Location of Safety Labels

The following are typical safety labels which must be followed. Refer to customer drawing in Section 10.1 for approximate location of the labels on the switch. The drawings represent typical configurations and may vary.

⚠ WARNING

Do not attempt to penetrate switch tank. Electrical Shock and/or Explosion may occur resulting in Severe Injury or Death

091A030

⚠ CAUTION

Do not look into viewing window while operating switch. Bright Flash may cause Temporary Eye Irritation.

091A039

⚠ DANGER

Hazardous Voltage. May Shock, Burn, or cause Death. Remote operation of switch is recommended. Switch is to be operated by Qualified Personnel in strict accordance with instruction manual.

091A031

⚠ DANGER

Do not operate if SF6 pressure is low (refer to chart on switch). Operating switch at incorrect pressure may cause an Explosion resulting in Severe Injury or Death. Refill switch to correct pressure following procedure in instruction manual before operating.

091A034

⚠ WARNING

Do not attempt to interrupt currents in excess of the ratings of this switch. Exceeding ratings of switch may cause an Explosion resulting in Severe Injury or Death. Refer to switch nameplate for maximum ratings.

091A033

⚠ WARNING

Do not operate switch if a short circuit is suspected. Exceeding ratings of switch may cause an Explosion resulting in Severe Injury or Death. Refer to switch nameplate for maximum ratings.

091A032

⚠ WARNING

SF6 Gas is heavier than air and may cause Suffocation. Do not exhaust SF6 into an Unventilated Area.


091A036

⚠ WARNING

Deepwell bushings are rated 200A continuous and 10,000A momentary current (IEEE 386). Exceeding ratings of bushing may cause an Explosion resulting in Severe Injury or Death

091A037

⚠ WARNING



Hazardous voltage inside. Can shock, burn or cause death.

Keep out. If open or unlocked, immediately call electric power and light company.

© NEMA STRANCO, INC. - MROUCH-1

⚠ CAUTION

Switch contains vacuum interrupters. Read instruction manual before energizing. Harmful X-rays may be produced.

091A035

⚠ WARNING

Deepwell bushings are rated 200A continuous and 10,000A momentary current (IEEE 386). Exceeding ratings of bushing may cause an Explosion resulting in Severe Injury or Death

091A037

2.5 X- Radiation Limits (if applicable)

G&W CANADA Vacuum Interrupters and Fault Interrupters are designed and tested in accordance with applicable sections of ANSI/IEEE C37.60-2003 and C37.85-1972, which include the following information. Reference the above standards for more detailed information.

The known United States manufacturers of vacuum interrupters initiated a test program during July of 1968 (as a Task Force of the NEMA Switchgear Section) to determine the present levels of X-radiation, if any, being emitted from high-voltage power vacuum interrupters, and to suggest permissible levels of radiation from such interrupters on the basis of their recognized application.

Each manufacturer conducted a series of tests on new vacuum interrupters taken from stock and recorded the X-radiation levels, if any, under the following conditions:

1. Dielectric withstand test voltage applied to new interrupters
2. Fault current interruption (where applicable)
3. Load current interruption
4. Dielectric withstand test voltages after fault current interruption
5. Dielectric withstand test voltages after load current interruption

As a result of evaluating the results of the aforementioned tests, the manufacturers concluded that neither the general public nor users will be subjected to harmful X-radiation due to normal application and operation of 15.5kV rated vacuum interrupter devices when applied within their assigned ratings and when the voltage applied across the open contacts of the interrupters is 15.5kV or less.

The manufacturers also concluded that at the permissible user dielectric withstand test voltage of 37.5kV radiation levels are negligible for vacuum interrupters rated 15.5kV. Normal electrical safety precautions will require the user to be at a safe distance from the interrupters, which will provide sufficient protection.

Precautions: If distances normally required for electrical safety are maintained, the exposure to test personnel will generally not exceed established dose limits. It is nevertheless recommended that adequate precautions such as shielding or distance be used to protect test personnel against possible higher X-radiation occurrences due, for example, to incorrect contact spacing or to the application of voltages in excess of those specified in column of Chart 1.

CHART 1

Test Voltage and X-Radiation Limits at One Meter Distance (Note 1)
Maximum X-Radiation Averaged Over an Area Not Greater than 100 cm² (mR/h)

Rated Max Voltage (kV RMS) (note 2) (Col 1)	Low-Frequency Insulation Level Withstand Test (kV RMS) (Col 2)	At Rated Max Voltage (Col 3)	At Low Frequency Insulation Withstand Test Voltage (Col 4)
15.5	37.5	0.5	15 (Note 3)

Notes:

- (1) Chart 1 will be expanded as additional ratings become available
- (2) This rating is the maximum line-to-line system voltage on which the vacuum interrupter is normally applied, whether the interrupter is rated on a single-phase or on a three-phase basis, using one interrupter per pole.
- (3) See Appendix A of ANSI C37.85-1972 for derivation of this value.

3.1 General

G&W CANADA Corporation manufactures a complete line of SF6 switches for load break, fault interrupting or a combination of load break and fault interrupting switching. Padmount, vault or subsurface configurations are available. Switches are connected to cable systems using industry standard bushings and connectors. Switches can be operated either manually using operating handle or remotely using a motor actuator. A variety of electronic controls are available for local or remote operation.

Refer to the outline drawing attached for identification and location of switch components for your particular switch style.

This switch has been shipped factory filled with the proper amount of SF₆.

If the switch has not maintained the proper pressure:

- For Non Temperature Compensated Gauge: Please refer to the table on the switch, located near the pressure gauge or Table 1, Section 6.2
- For Temperature Compensated Gauge: Pressure Indicator is in the RED zone

Do not install the switch. Follow the filling procedure in Section 6.3.

4.1 Handling



WARNING

Do not lift or handle switch by the bushings. Doing so may result in damage to the switch and possible injury or death to personnel.

The switch is equipped with lifting eyes or other lifting provisions. Use proper equipment to obtain a vertical lift without damaging the unit. See switch drawing in Section 10.1 for approximate weight and lifting provision details.

4.2 Mounting

For vault and pad mount applications, provisions should be made for ample cable training space. All switches have provisions for mounting. See switch drawing in Section 10.1 for mounting details. Check that the switch, in its installed position, is secured and that mountings are adequate to support the weight of the switch. For applications that may be subject to flooding, the mountings must be capable of withstanding buoyant tendencies.

4.3 Grounding (earthing)

Ground bosses are located on the switch tank. To ensure a good ground connection, the top surface of each boss must be sanded to expose bare metal before making a ground connection. The switch tank must be attached to a suitable ground as required by local practice. Ensure that all cable terminations for shielded cable have been properly grounded to the switch tank during installation.

4.4 Cable Connections

Each entrance must be properly terminated. Entrances must be terminated following instructions supplied by the termination manufacturer.



WARNING

Switch entrances are designed to accept cable accessories constructed in accordance with IEEE 386 or a termination means specifically approved by G&W CANADA Corp. The use of any other cable termination means can present an electrical hazard or cause failure resulting in serious injury or death.



DANGER

End caps constructed in accordance with IEEE 386 or a termination means specifically approved by G&W CANADA Corp. must be used to cover any terminal connections that are not terminated to a cable. The shipping caps will not provide proper electrical insulation for an energized terminal. Energizing a non-terminated connection can present an electrical hazard or cause failure resulting in serious injury or death.

4.5 Installation Testing

High potential testing on switches and cable systems may be conducted. Refer to Section 7, Testing.

4.6 Fault Indicators (if applicable)

Refer to separate instructions.

4.7 Interrupter Relays (if applicable)

Refer to separate instructions.

4.8 Voltage sensors (if applicable)

Refer to separate instructions.

4.9 Actuators (if applicable)

Refer to separate instructions.

4.10 Enclosure (if applicable)

If supplied, pad mount enclosures provide tamper resistant construction. Penta-head bolts require a special wrench to open and are located on each access door behind the door handle. Door handles conceal Penta-head bolt when pushed flush against the door and are supplied with a provision for padlocking. Wind stops are supplied for each door panel. Most enclosures are supplied with a flip-up top section that is locked in place behind the main access doors.

5.1 General

Switches are assigned ratings by the manufacturer and have been designed and tested using levels established by ANSI and/or IEC standards. Design and production tests are conducted to demonstrate that the equipment will perform within the ratings on the nameplate and customer drawing. See Section 9.1 and Customer Drawing in Section 10.1.

**WARNING**

Equipment in service will perform to established ratings only if properly installed, operated and maintained. Power switchgear is characterized by high voltage and high continuous and short circuit currents. It should be installed, operated and maintained by Qualified Personnel. Failure to properly install, operate or maintain the equipment may result in damage to the switch and possible injury or death.

For further information on operation and maintenance of equipment see ANSI C2 standards.

**WARNING**

Do not attempt to close into fault in excess of the switch ratings or to interrupt currents in excess of interrupting ratings. Either may result in damage to the switch and possible injury or death.

At least once per year and before each operation, check the SF₆ pressure by comparing the pressure gauge to the table on the switch or in Section 6.2 (for Non-Temperature Compensated gauge) or Pressure Indicator (for Temperature Compensated gauge) to ensure the indicator is in the GREEN acceptable zone. Re-pressurize, if required, in accordance with Section 6.3.

**WARNING**

Do not operate an energized switch if:

- **The Non-Temperature Compensated Gauge shows SF₆ gas pressure varies by more than 2 psig (14 kPa) from the Table 1, Section 6.2 or**
- **The Temperature Compensated Gauge shows SF₆ gas pressure is RED zone**

Check gauge pressure before operating the switch. Improper SF₆ gas pressure may cause the switch not to operate as designed, resulting in damage to the switch and possible injury or death.

5.2 Operation of the Puffer Source Switch Operators

Switch may be provided with different style operating handles. Review and follow the appropriate steps for your particular operating handle style.

**CAUTION**

Do not look into the viewing window while operating switch. The bright flash may cause temporary eye irritation.

5.2.1. Removable Operating Handle Installation (see figures 1 and 2)

The removable operating handles are usually supplied with Padmount switches and stored on a hook attached to the switch or inside the enclosure.

Install handle adapter to the handle casting and secure the handle by inserting the provided pin through holes on casting and adapter.

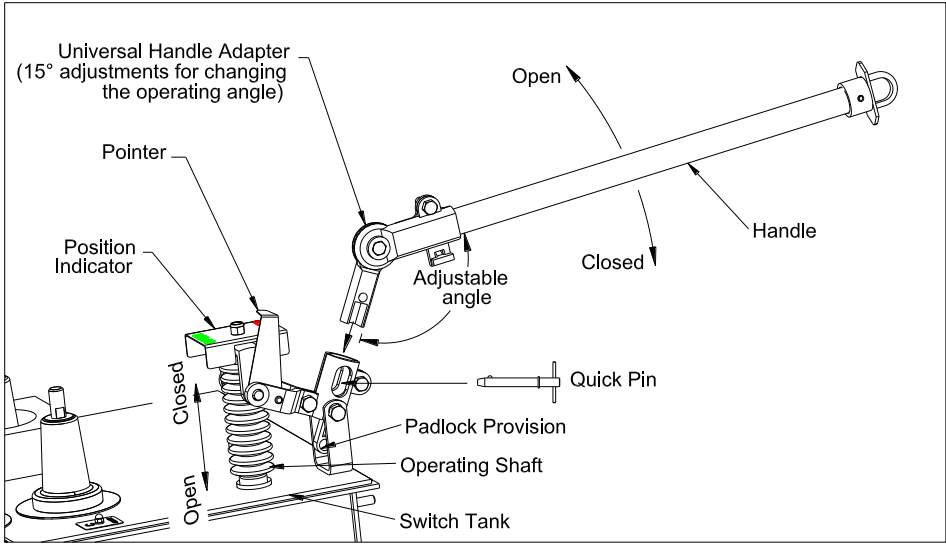


Figure 1: Removable Operating Handle for Subsurface SF6 Switches

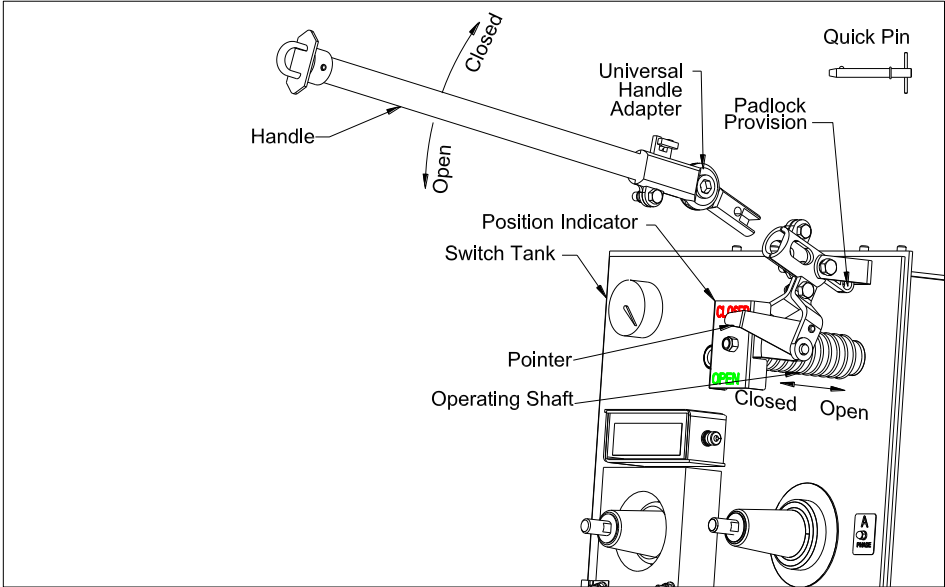


Figure 2: Removable Operating Handle for Padmount SF6 Switches

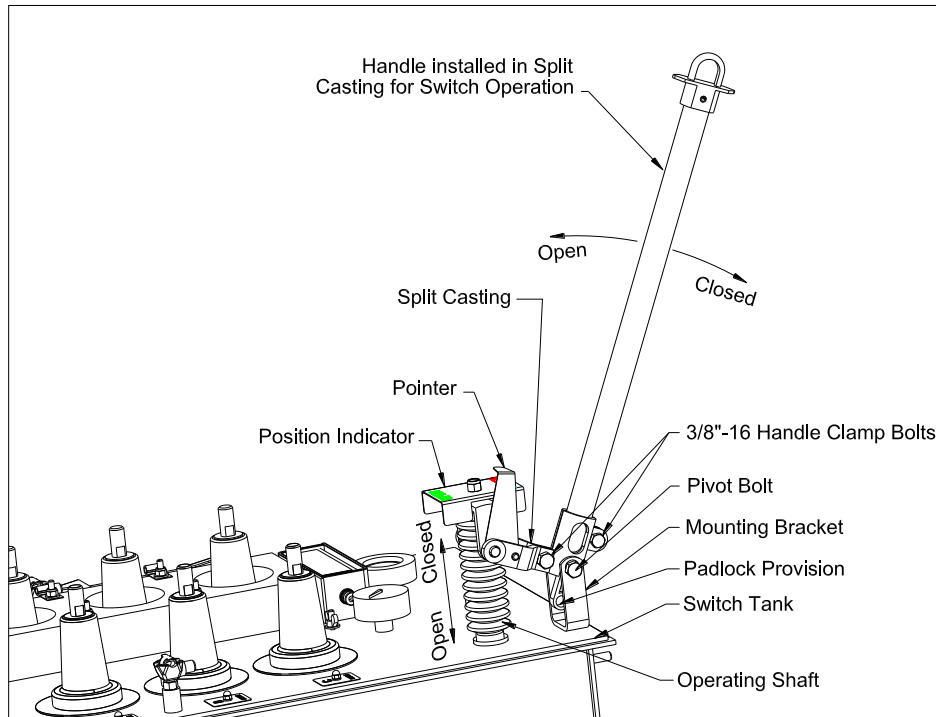


Figure 3: Operating Handle for Subsurface SF6 Switches

5.2.2. Permanent handle installation (see figure 3).

This style of operating handles are usually supplied for Vault and Subsurface SF6 Switches and stored on the shipping pallet.

The following instruction outlines the steps required to install the operating handles. Refer to figure 3 for orientation and identification of parts.

- 5.2.2.1.** Insert the operating handle into the split casting on the switch, mating the flat on the handle with the flat on the casting.
- 5.2.2.2.** Clamp the handle in place by evenly tightening the two 3/8\"-16 bolts and locknuts to approximately 10 foot-pounds.
- 5.2.2.3.** To reduce the amount of handle side play, adjust the total clearance between the split casting and the mounting bracket by tightening the pivot bolt and locknut until the sides of the mounting bracket contact the casting, and then back off the locknut 1/2 turn. Operate the switch and check that the split casting rotates freely between the mounting bracket without binding, interference or excessive side play.
- 5.2.2.4.** Repeat all steps for each operating handles

5.2.3. Switch Operation:

To operate the switch open or close, first check the present position of the switch. Use the permanently mounted handle or install the handle adapter into the operator casting on the switch and push or pull the operating handle toward the desired position (see figures 1, 2 & 3). The operating shaft will travel 3\" (toward the tank to Open the switch and away from the tank to Close the switch), when the operating handle rotates approximately 60 degrees, before the spring mechanism inside the switch tank is fully charged and unlatching will occur. The switch contacts will remain latched until released by action of the spring mechanism. At that point, the switch contacts move rapidly from one position to the next position independent of the operator's speed. Contacts will latch in the new position when the switching action is completed. The pointer indicates the switch contact position when the spring is unarmed. Avoid excessive force and speed when manually operating.

NOTE: The handle may over travel the 60 degrees specified above up to 15 degrees in either direction. This is normal for the operation and does not affect contact position. For safety, the mechanism provides positive position indication. The operating handle and indicator will return to its original position, signifying an incomplete operation if the switch contacts fails to move.

Verify the switch contacts position (Closed or Open) through the viewing windows when supplied and by the indicating pointer on the external operator.

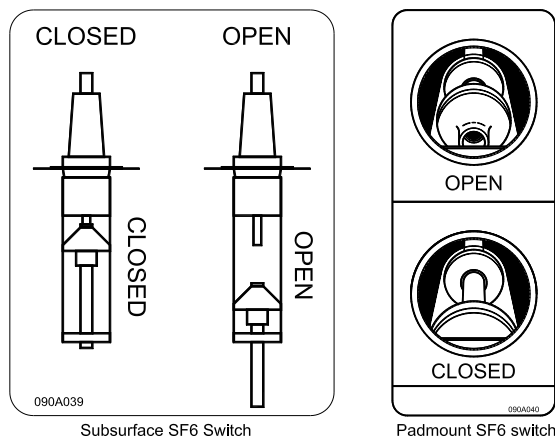


Fig. 4: Contacts position through viewing window for Puffer-Pak Load Break Switch

5.2.4. For remote/manual operation, either a hook stick or a rope may be used. A pulley arrangement may be needed for rope operation to provide training to the desired location and to maintain proper mechanical advantage. To operate the switch remotely, position the handle on the operator hex nut and attach the rope or hook stick to the eye at the end of the handle. By operating the switch slowly, the transfer, occurring when the handle reaches the limit of its travel, will be felt, indicating a complete operation. Motor operators are also available for electrical remote or SCADA control.

5.2.5. The indicator/handle assembly is equipped with provision for padlocking in all positions.

5.3 Operation of the Resettable Fault Interrupters (RFI)

Three-phase RFI switches are furnished with three vacuum interrupters which are internally ganged together. Single-phase RFI switches are furnished with one vacuum interrupter. G&W CANADA RFI switches may be provided with different type of insulated operating handles. Review and follow the appropriate steps for your particular operating handle style.

The Resettable Fault Interrupter (RFI) is a spring-operated device. The closing and opening speed of contacts are independent of the handle operation speed. The protection relay is inactive until it has been programmed and commissioned (see instruction 211A225 or 211A226 for RFI Control Relay). The Control Relay must be programmed and commissioned before putting the RFI into service. The RFI is normally shipped in “CLOSED” position.

NOTE: Although the external operating mechanism of the RFI looks the same as that on a G&W CANADA “Puffer-Pak” load break switch, the handle position cannot be relied upon to indicate the position of the switch contacts. The position of RFI handle (indicator) does not indicate the true switch contact position. To check on the position of the vacuum interrupter contacts, observe the position indicating flag through the viewing windows adjacent to the each interrupter operating handle.

The indicating plate of the operating handle for RFI has two positions that indicate “CLOSED or TRIPPED” or “OPEN”. If the pointer on the operating handle is in “OPEN” position, the vacuum interrupter contacts are “OPEN”. When the pointer on the operating handle is in “CLOSED or TRIPPED” position, the vacuum contacts may be in “CLOSED” or in “TRIPPED” (open) position if the RFI has been tripped, either by the operation of Control Relay or the Manual Trip button in the Relay Box.

5.3.1 For removable operating handle (see section 5.2.1)

5.3.2 For permanent operating handle (see section 5.2.2)

5.3.3 Verify the proper SF₆ pressure of the switch by viewing the pressure gauge on the tank and cross-referring the gas pressure/temperature Table 1, Section 6.2 of this instruction. The pressure/temperature chart is also located on the switch tank.

5.3.4 Verify interrupter contact position (OPEN or CLOSED) by looking through the viewing window adjacent to the operating handle coupling (see fig. 5).

5.3.5 TO OPEN the RFI using operating handle:

Move the handle to force the operating shaft move toward the switch tank (approximately 1” from its

original position) by a steady motion until mechanism opens. The operation can be heard and the position indicating flag viewable through the window will change from a “CLOSED” indication to an “OPEN” indication.

To OPEN the RFI using Control Relay:

Open the Control Relay Box and press the “Manual trip”. The Manual Trip button is only operative if there is sufficient current through the RFI to power the relay (8A minimum on average per phase) or if the control relay is connected to an external source of 12-24VDC. The operation can be heard and the position indicating flag viewable through the window will change from “CLOSED” to “OPEN”.

5.3.6 TO CLOSE the RFI, first determine the cause of the trip as described in 211A225 or 211A226, then investigate and correct any fault on the system. Then RESET and CLOSE the RFI by following these steps:

5.3.6.1 To RESET the RFI, move the operating handle with a steady motion to force the operating shaft move toward the switch tank (approximately 3” from its original position) until the mechanism stops and latched in OPEN position.

5.3.6.2 To CLOSE the RFI, move the operating handle with a steady motion to force the operating shaft move faraway from switch tank (approximately 3” from its original position) until the mechanism CLOSED and latched. The operation can be heard and the position indicating flag viewable through the window will change from “OPEN” to “CLOSED”.



WARNING

Do not perform any maintenance on equipment connected to the RFI switch unless the switch is completely isolated or pull and park the elbows to isolate its load-side cables.

5.4 Operation of the Control Relays

The electronic relay monitors the current and activates a trip solenoid, which opens the vacuum interrupters to interrupt overcurrents. The Relay is housed within a NEMA enclosure and are powered by current transformers externally mounted on the switch tank. The relays are factory set for current response curves if specified by customer.

Note: The control relay box may or may not be submersible. Non-submersible boxes must be mounted above any expected water level. The equipment mounted on a submersible switch is submersible to 10ft.

Reference switch outline drawing and separate instructions on RFI Relays for location and style of relays supplied. Review the instruction for more detailed information.

5.5 Locking in a position

Padlock provisions are provided.

5.6 Operation by actuator (if applicable)

See supplemental instructions provided

5.7 Automatic operation (if applicable)

See supplemental instructions provided

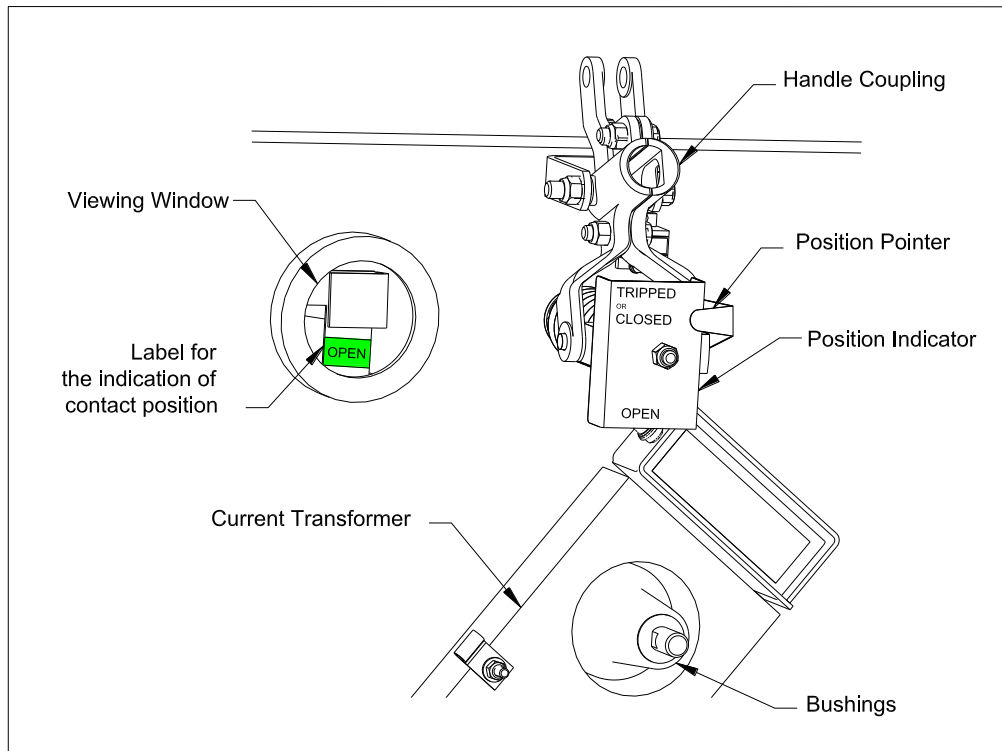


Fig. 5: Contact position through viewing window for RFI switch and position indication on the handle operator

5.8 Key Interlock (if applicable)

Some switches are equipped with key interlock for an added safety measure to prevent operation by authorized personnel or to assure safe coordination of energized equipment.

The Key Interlock allows the Puffer-Pak switches to be locked in “Closed” or “Open” position and allows the RFI to be locked in “Open” position only.

6.1 General

No internal maintenance is required. However, if the switch must be opened, personnel should be instructed to take certain precautions. During any internal maintenance, the switch must be de-energized. The SF₆ should be pumped from the switch through filters into a storage tank for reuse.

**CAUTION**

SF₆ removed from a switch should be pumped through a filter into a storage tank for reuse. SF₆ is heavier than air and will displace air (oxygen) in confined or low-lying areas. Make sure adequate ventilation is provided for enclosed or low-lying environments to prevent oxygen displacement and possible injury or death by asphyxiation.

SF₆ has been identified as a greenhouse gas and should not be released into the atmosphere. Emissions of SF₆ may contribute to global warming.

Occasional visual inspection of the switch is recommended and if possible, the switch(es) should be exercised periodically.

At least once per year and before each operation, check the SF₆ pressure by comparing the pressure gauge to the table on the switch located near the pressure gauge or in Section 6.2. Re-pressurize if required in accordance with Section 6.3. A fitting is provided on the tank for the addition of SF₆. If leak detection becomes necessary, detectors are readily available which are sensitive to SF₆.

6.2 Table 1, SF₆ Pressure/Temperature Chart

Ambient Temperature (1)	Filling Pressure	Ambient Temperature (1)	Filling Pressure
°C	kPa	°F	psig
-30	31	-20	4.7
-20	37	0	5.6
-10	43	20	6.5
0	49	40	7.5
10	55	60	8.4
20	61	80	9.3
30	66	100	10.2
40	72	120	11.2
50	78		

(1) For ambient temperatures less than -20°F (-30°C) or in excess of 120°F (50°C) consult factory.



WARNING

Do not operate an energized switch if the SF₆ gas pressure varies by more than 2 psig (14 kPa) from the table above. Check gauge pressure before operating the switch. Improper SF₆ gas pressure may cause the switch not to operate as designed, resulting in damage to the switch and possible injury or death to personnel.



CAUTION

Fresh SF₆ gas is nonflammable and non-toxic but is heavier than air. Oxygen may be displaced in low-lying or enclosed environments. Make sure adequate ventilation is provided to prevent oxygen displacement and possible asphyxiation.

6.3 SF₆ Filling Procedure

If it is suspected that the switch has lost some or all of its gas, follow this procedure to verify loss and properly refill the switch. Verify the switch pressure with a known gauge. This can be accomplished by connecting the known gauge to one end of a flexible hose suitable for pressure up to 15 psig or 103 kPa and connecting the other end to the switch fill valve.

Valves with the 1/4" SAE male flare connection have internal shut-offs which are activated by the hose connection fitting. Be sure to use the proper fittings for connecting to the fill valve.



CAUTION

Use of improper fittings can cause gas leakage leading to a complete loss of gas pressure. Complete loss of gas pressure can lead to a switch explosion resulting in serious injury and/or death.

- 6.3.1** If the switch has lost some gas but has maintained a positive pressure, it need not be de-energized or vacuumed before re-pressurizing with SF₆. Proceed to 6.3.5
- 6.3.2** If the switch has not maintained a positive pressure de-energize immediately and follow the entire filling procedure beginning with 6.3.3, below.
- 6.3.3** If the switch tank has not maintained a positive pressure of at least 2 psig (14 kPa) or has otherwise been opened to ambient air, the switch tank should be purged.



CAUTION

Do not purge the switch while energized. Complete loss of SF₆ gas can lead to a switch explosion resulting in serious injury and/or death.

The molecular sieve is located inside the switch tank in a plastic mesh. The switch tank may have to be cut open to replace the molecular sieve. Plastic gloves should be worn to prevent white power by-products from coming in contact with skin as it may cause irritation. One end of the plastic mesh may be unfastened to allow removal of the bags. It is important to minimize exposure of the molecular sieve to moist atmospheric conditions.

The molecular sieve is not listed in the U.S. EPA's Resource Conservation and Recover Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste. Dispose of the sieve and container in an environmentally acceptable manner, in full compliance with all applicable government regulations.

- 6.3.4** Remove the cap covering the valve, connect the vacuum pump, open the tank valve and evacuate the switch to between 29 and 30 inches of mercury at 60°F (98-101 kPa at 15.6°C). Disconnect vacuum pump.

Fill switch to 10 psig (79 kPa) with dry nitrogen having a dew point of less than -45°C (-49°F).

 **CAUTION**

Do not pressurize the switch beyond 103 kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

After completing the fill, vent and re-vacuum to between 29 and 30 inches of mercury at 60°F (98-101 kPa at 15.6°C). Disconnect vacuum pump. The switch is now purged.

- 6.3.5** Adjust the gas regulator to 20 psig (140 kPa) and allow a small volume of SF₆ to flow, purging air from the supply line prior to connecting the supply line to the switch.

 **CAUTION**

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

- 6.3.6** Remove the valve cap and make the connection to the switch. Re-pressurize the switch according to Table 1, Section 6.2.

 **CAUTION**

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

- 6.3.7** Once the switch is filled, stop the flow of SF₆, remove the filling line and replace the cap.

6.4 Handling of G&W CANADA SF₆ Switches

6.4.1 Overview

The following information is for reference as a general guideline when operating, performing maintenance or disposing of G&W CANADA Sulfur Hexafluoride (SF₆) gas insulated switchgear. This information is compiled in accordance with existing industry papers on the subject (*see reference section*). It is difficult to anticipate all possible situations that may occur. Any questions on how to handle a specific situation should be forwarded to the local G&W CANADA Corp. Representative. State and local regulations should always be considered.



CAUTION

SF₆ gas venting from a switch should be pumped through a filter into a storage tank for reuse. SF₆ heavier than air and will displace air in confined or low-lying areas. Make sure adequate ventilation is provided for low-lying or enclosed environments to prevent oxygen displacement and possible asphyxiation.

6.4.2 General Information

SF₆ gas has been used for many years in transmission cable systems and circuit breakers. The application versatility of the gas soon led to its use in distribution voltage (15.5-38kV) equipment. Although it is used as an insulating medium in both applications, there are some very important differences to consider. Primary considerations are the amount of SF₆ gas used in the equipment, typical operating pressures and the fault or load break energy associated with interruption.

6.4.2.1 Amount of Gas

High voltage circuit breakers use large amount of gas, up to 2000 lbs. (800 kg) in some applications. G&W CANADA SF₆ switches use between 8-20 lbs. of gas.

6.4.2.2 Operating Pressure

The pressure of SF₆ gas in any contained vessel will vary with temperature. Canada Power Products SF₆ switches require an operating pressure of approximately 8.5 psig at 60°F (55 kPa at 10 °C).

6.4.2.3 Fault or Load Break Energy

High voltage circuit breakers are designed to interrupt typically high energy fault current within the SF₆ environment. Canada Power Products SF₆ load break switches are designed for typically 600 Amp load break operation. In accordance with industry standards, the switches also have a momentary and fault close rating typically in the 20-40 kA asym. (32-64 kA peak) range. Arc interruption in SF₆ is therefore only a load break or low energy function, as opposed to a fault interrupting or high energy function. G&W CANADA switches designed for fault interrupting duty incorporate vacuum bottles or air insulated canister style fuses for these applications. All fault interruption is performed without the aid of SF₆ gas.

Sulfur hexafluoride gas, in its virgin state, is a non-toxic, nonflammable, odorless and colorless gas. It combines excellent electrical, chemical and thermal properties making it an ideal dielectric. Included in these properties are high dielectric strength, excellent arc quenching capability, excellent chemical stability and good thermal conductivity. Although the gas has many advantages, there are certain precautions which should be considered when dealing with this dielectric.

6.4.3 Safety Precautions & By-products

Sulfur hexafluoride has been described as a "physiologically inert gas". Laboratory rats have been exposed to a mixture of 80% SF₆ and 20% oxygen (the maximum concentration of gas possible without lowering the oxygen supply to an unsafe level) for periods of 16-24 hours. The rats showed no signs of intoxication or irritation either during exposure or afterward. SF₆ is heavier than air and will accumulate in low lying areas. Because the gas is odorless, colorless and non-poisonous, it cannot easily be detected without the use of proper equipment. The possibility of asphyxiation due to oxygen displacement needs to be considered. Proper gas detection instruments should be used.

At very high temperatures or in the presence of an electric arc, SF₆ can be slowly decomposed. Decomposition products include lower fluorides of sulfur, which are hydrolyzable, yielding SO₂ and HF. Arced SF₆ in the presence of moisture may form potentially toxic by-products which can exist in both the gaseous and solid states. G&W CANADA uses the driest, highest grade SF₆ gas commercially available. G&W CANADA SF₆ switches have short arcing times, small volumes of dry SF₆ and contain a molecular sieve to absorb possible moisture and arc by-products thus minimizing the amount of by-products released. However, all SF₆ by-products should be considered potentially dangerous.

6.4.4 Solid By-products

Tests have shown that arcing in SF₆ gas will produce solid by-products in the form of a fine dust or powder which consists of metal fluorides. These fluorides can be irritating and dangerous when in contact with skin or eyes. Contact with the powder should be avoided. Also, precautions should be taken to avoid inhaling the powder. The powder particles are small and light enough to be suspended in air for substantial periods of time. This dictates the use of respirators or other protection to prevent inhaling the suspended particles when internal maintenance of the switch is required.

6.4.5 Recommended Precautions

Vault or Enclosed Area Applications. In the unlikely event of a catastrophic switch failure which may cause the gas to be released to the environment, special precautions are necessary for vault or enclosed area applications. In this situation, toxic gases may accumulate and be present at dangerous levels. The gases that are produced will have a characteristic "rotten egg" odor. However, smell should not be used as a test for the presence of by-products. The vault should be completely ventilated of all contaminated gases. If a vault has been purged, use a halogen type detector to test the air in the vault to determine if all SF₆ gas has been vented and sufficient oxygen is present. If all SF₆ has been vented, then the other gaseous by-products should have been removed at the same time. In any case, it is recommended that personnel entering the enclosed area be provided with air masks or rescue breathing apparatus. Self-contained oxygen masks should be used for maximum safety.⁽¹⁾

Above Ground Outdoor Applications. In the unlikely event of a catastrophic switch failure in above ground, applications, typically the gases would be dispersed into the atmosphere. Allow adequate time, approximately thirty minutes, depending on conditions, for this to occur before investigating the equipment.

6.4.6 Opening an SF₆ Switch for Disposal

In order to dispose of a G&W CANADA SF₆ gas insulated switch, the switch must be opened. If the tank is still under pressure, the SF₆ must first be removed from the switch. This should be accomplished using suitable gas recovery equipment if at all possible. Alternately, the gas may be released to a well ventilated area where personnel will not be subject to possible arc by-products. One method might be to vent the gas through an absorber to neutralize any acid present. This can be accomplished using a hose on the fill valve of the tank. Air masks, breathing apparatus or, for maximum safety, self-contained oxygen masks should be provided for personnel if proper ventilation is not possible. Do not allow personnel to continually breathe gas that has an odor. Store the gas in suitable containers.



WARNING

Do not open any SF₆ filled equipment that has experienced arcing, corona or very high temperatures without taking adequate safety precautions to protect personnel from potentially hazardous solid and gaseous products.

Since G&W CANADA SF₆ tanks are welded, it is necessary to grind or otherwise remove the weld off of the lid. This can be accomplished by grinding the weld file flush and then chisel the remaining weld. This will minimize the possible spread of the solid by-products. Once the lid is removed, the exposed interior of the switch should be allowed to stand in a well ventilated area for at least thirty

minutes in order for any retained gaseous by-products to dissipate. The use of gas detection equipment and proper protective clothing is recommended.

6.4.7 Internal Cleanup

Although the amount of by-products should be minimal, personnel required to handle or remove the SF₆ solid by-products should wear skin protection equipment including disposable coveralls and gloves. Respiratory protection as previously described should also be worn. Any powder should be vacuumed ⁽²⁾ up or if possible wiped up with rags. The powder should be stored in an air tight metal container. The switch may have a light coating of white powder on the walls and components. These should be wiped down with a solution of sodium bicarbonate (baking soda). ⁽³⁾ The excess solution and rags should be disposed of with any powder previously collected. Parts with powder on them that cannot be reached should be disassembled and wiped down.

6.4.8 Disposal of Materials

The tank and components that have been cleaned in the prescribed manner may be disposed of safely. The collected powder, solution and cleanup materials should be placed together in double plastic bags inside a metal container and have water added to cover them. The pH of the solution should be checked. Solutions with a pH between 6 and 9 are generally suitable for normal disposal. If desired, soda carbonate (soda lime) ⁽⁴⁾ can be placed on top of the materials to neutralize the acidity.

Emission of SF₆, or disposal of contaminated absorbents may be subject to environmental regulations. Users should review their operations in terms of applicable federal, state and local laws and regulations.

6.4.9 SF₆ General Guideline References

1. Study of Arc By-products in Gas Insulated Equipment. EPRI Report EL1646, Project 1204-1.
2. SF₆ Gas Analysis Service. M J. Mastroianni & R. B. Jackson, Allied Chemical Corp. (Allied Signal)
3. Handling of SF₆ and Its Decomposition Products in Gas Insulated Switchgear (GIS). CIGRE Working Group 23.03, Electra No. 136 Part 1 dated June 1991 and Electra No. 137 Part 2 dated August 1991.

6.4.10 Footnotes

- (1) Can be supplied from safety equipment manufacturers, e.g., Scott Aviation, a division of Figgie International Inc., 2225 Erie St., Lancaster, New York, 14086, USA Telephone 716-683-5100.
- (2) Can be supplied from safety equipment manufacturers, e.g. Nilfisk of America, Inc., 300 Technology Drive, Malvern, Pennsylvania, 19355, USA or equivalent. Telephone 800 - *NIL - FISK*.
- (3) Rule of thumb is dissolving 4 oz. (114 grams) of baking soda in one gallon (3.785 liters) of water.
- (4) Rule of thumb is dissolving approximately 2.5 lbs. (1.1325 kilograms) of sodium carbonate (soda lime) to 55 gallons (211.538 liters) of water.

6.5 SF₆ Gas Specification

SF₆ is made from two materials, sulfur and fluorine, which are in abundant supply. SF₆ is readily available from any of several suppliers.

The use of commercial grade SF₆, per ASTM D2472, is recommended and may be obtained in cylinder sizes ranging from 6 to 115 pounds (2.714 to 52.036 kilograms).

Because high moisture content will affect the interrupting and dielectric properties of SF₆, cylinders should be sampled, testing dew point per ASTM D2029, before using. Simplified equipment for making this check is readily available. Cylinders whose dew point occurs above -45°C (-49°F) should be rejected.

6.6 Finish of Switch

The switch paint finish is comprised of a two part epoxy, gray coating (Munsell No. 5BG7/0.4). Clean using soap and water. Touch up paint is available.

6.7 Repair Parts List

Items such as operating handles, motor actuators, pressure gages, fill valves, shaft seals, bushings, gaskets, viewing windows, etc. are available from the factory if required. To inquire about spare or repair parts, contact G&W CANADA Representative or Customer Service with the switch serial number.

6.8 Returning Equipment to Service

- 6.8.1** Make sure that the load interrupting and fault interrupting switches grounding means are removed.
- 6.8.2** Make certain the load interrupting and fault interrupting switches are in the correct position. If the switch operators are to be padlocked, do so at this time.
- 6.8.3** For padmounted switches, padlock the enclosure before leaving the area even momentarily. This should be done even if the switch is accessible only to qualified persons.

7.1 Installation Testing

**WARNING**

Follow these precautions when performing electrical tests:

1. Completely de-energize the switch and disconnect it from all power sources.
2. Terminate all bushings with an insulated cap or other suitable cable termination capable of withstanding the test voltage.
3. Verify the SF₆ gas pressure is in accordance with Table X, Section 6.2.

Failure to observe these precautions can result in flash over, injury and equipment damage.

**WARNING**

The DC withstand capability of switches may be reduced due to damage, gas leakage, or electrical or mechanical wear. The DC test voltage must not exceed the withstand limits of the switch. Application of DC voltages greater than the withstand capability of the switch can result in flash over, injury and equipment damage.

**CAUTION**

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

**WARNING**

When it is necessary to test the cables connected to an energized switch, proper insulation between the power-frequency source and the DC test equipment must be maintained. Follow the recommendations of the manufacturer of the test or fault location equipment.

**DANGER**

Do not exceed the Maximum Dielectric Test Levels as shown in Section 7.1.2. Exceeding the test levels can cause flash over. This can lead to a fault in the switch or test equipment and cause serious personal injury or death.

7.1.1 General


After switches are completely installed in accordance with local practices, high voltage testing may be performed before the switch is energized. Test levels will generally be established by the cable or termination manufacturer but should not exceed the values listed in the tables below. Insure the test equipment is used in accordance with the manufacturer's instructions.


7.1.2 Maximum Dielectric Test Levels:

Switchgear Rating			Withstand Test Voltage	
50 Hz	60 Hz	Impulse (BIL)	Power Frequency	DC
12kV	N/A	75kV	28kV	35kV
N/A	15.5kV	95kV	34kV	42kV
24kV	27kV	125kV	40kV	62kV
36kV	38kV	150kV	50kV	82kV

7.2 Cable Testing

DC testing is primarily used to test the integrity of installed cable systems and terminations. DC testing should be performed in accordance with appropriate cable test standards, and must not exceed the rating of the switch.

 WARNING
DC testing cables installed on switches must only be performed when all ways of the switch and cables are isolated from all system voltages. Applying a DC test voltage to a switch with energized ways may lead to electrical failure of the switch resulting in personnel injury or death.

 WARNING
Testing of switches with internal potential transformers must not exceed the rating of the transformer. Applying a test voltage in excess of the transformer rating may damage the transformer leading to electrical failure of the switch which could result in personnel injury or death.

7.2.1 Maximum Cable Testing Levels:

Switchgear Rating			Cable Testing	Cable Thumping
50 Hz	60 Hz	Impulse (BIL)	Power Frequency	DC
12kV	15.5kV	95kV	30kV	15kV
24kV	27kV	125kV	40kV	20kV
36kV	38kV	150kV	40kV	20kV

7.3 Factory Production Tests

Routine (production) tests are conducted in accordance with applicable standards. The following are typical production tests performed.

Loadbreak Switches:

- Circuit Resistance Test
- Dielectric Test (60hz Withstand Test)
- Tightness Test (Leak Test)
- Design and Visual Checks (Operating Assurance Test)

Resettable Fault Interrupters:

- Circuit Resistance Test
- Dielectric Test (60hZ Withstand Test)
- Tightness Test (Leak Test)
- Design and Visual Checks (Operating Assurance Test)
- Calibration of Minimum Power Up Level and Time Current Tests
- Control and Secondary Wiring Tests

7.4 Resettable Fault Interrupter Testing

G&W CANADA Corp. can supply an optional tester to verify the proper operation of the Fault Interrupter electronics.

Contact your G&W CANADA representative for further information.

8.1 Leak Checking

SF6 switchgear is designed and built to be sealed for life. Should the pressure of the switch fall outside the range specified on the pressure/temperature chart, the switch should be checked for possible leaks. Hand held halogen leak detectors are generally suitable for detection of leaks which have caused a drop in pressure greater than allowed. These hand held detectors are commonly used for refrigeration equipment servicing and are readily available.

If a leak does occur, it is generally found to be at one of the points of penetration into the tank. These points of penetration typically consist of:

- Pressure Gauge
- Fill Valve
- Shaft Seals
- Bushings
- Viewing Windows
- Electrical Feedthroughs

Leak checking should be done in an area free of other substances that can be detected by the leak detector. The presence of solvents on the device being tested can give false leak detection readings.

Leak detection should follow the recommendations of the manufacture of the detection equipment being used. For hand held leak detectors of the “sniffer” type, generally the detection wand is moved slowly (1 cm/sec) over the area being tested. The presence of a leak is typically indicated by a change in audible tone or other visual indication.

**WARNING**

Repair of leaks on switches must only be attempted on de-energized equipment. Attempting repair on an energized switch can result in complete loss of pressure leading to failure of the switch which could cause severe personal injury or death.

Once the source of the leak has been detected, repair generally falls into one of three categories. If the leak is occurring from a threaded connection (pipe thread entrance) the fitting can be removed, sealant applied to the threads and the fitting reinstalled. If the leak is from a gasketed surface, the gasket may be replaced. When replacing a gasket it is important to clean the mating surfaces and apply a thin film of lubricant to the gasket for proper seating during assembly. Lubricant for gaskets should be a flourosilicone based oil for best results. If the leak is occurring from a component such as a pressure gauge or fill valve, then the component must be replaced.

Proper replacement components should be obtained from G&W CANADA Corp.

8.2 Controls

See separate control instructions.

9.1 Customer Drawing(s) including the followings:

- 1) Ratings
- 2) General layout with Dimensions

9.2 Supplemental Instructions, if applicable. May include:

- 1) Motor Actuators
- 2) Controls
- 3) Installation, operation and maintenance instructions of vacuum interrupter control
- 4) Facet Indicators
- 5) Voltage Sensors
- 6) Interrupter Relays
- 7) Low Pressure Warning Devices

9.3 Material Safety Data Information

See G&W CANADA Corp. website at www.canadapowerproducts.com for MSDS information.

G&W Canada, Terms and Conditions

SM-F-1, Rev 5

TERMS OF PAYMENT

Domestic accounts - Net 30.

International accounts - Standard terms are an irrevocable letter of credit, confirmed by a Prime U.S. bank, for the full amount of the contract, valid for at least 60 days beyond the latest quoted shipping date. Other terms may be granted upon receipt of satisfactory credit references and approval by our Finance Department. Letter of credit must be received prior to release of the order to manufacturing.

Late payment charge of 1¹/₂% per month on all past due invoices and unpaid balances. Shipments and deliveries hereunder shall at all times be subject to the judgment of Seller that the financial condition of Buyer at all times justifies continuance of shipments and deliveries hereunder. If Buyer shall fail to make any payments in accordance with the terms and provisions hereof, Seller, in addition to its rights and remedies, but not in limitation thereof, may at its option, defer shipments or deliveries hereunder, or under any other contract with the Buyer, except upon receipt of satisfactory security or of cash before shipment.

PRICE POLICY

It is G&W's policy to publish for sole use of our domestic representatives *Confidential* price lists of our Standard Products. Quoted prices are firm for 30 days (60 days international). Orders placed after 30 days (60 days international) are subject to price in effect at time of acceptance. Prices on acknowledged orders are firm for the agreed upon delivery time. Customer requests to extend originally agreed to delivery date will be subject to price escalation.

TAXES

Any taxes which the Seller may be required to pay or collect, under any existing or future law, upon or with respect to the sale, purchase, delivery, storage, processing, use or consumption of any of the material covered hereby, including taxes upon or measured by the receipts from the sale thereof, shall be for the account of the Buyer, who shall promptly pay the amount thereof to the Seller upon demand.

FREIGHT TERMS

Terms as stated in the attached quotation.

MINIMUM ORDER CHARGE

Domestic destination - \$250 Net

International destination - \$500 Net

EXPORT PACKING

Export order for all material or devices (except compound alone) - add 5% to net price of order. Export orders for compound alone -- add 50¢ per gallon.

TITLE AND INSURANCE

Seller assumes no responsibility for insuring shipments unless specifically requested by Buyer and then only at Buyer's expense and valuation. Regardless of freight payments, all risk of loss shall pass to Buyer upon delivery by Seller to carrier at F.O.B. point.

WARRANTY

EXCEPT AS OTHERWISE EXPRESSLY STATED HEREIN, SELLER MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO THE GOODS SOLD HEREUNDER. Seller warrants all goods sold hereunder to be free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment by Seller. Seller's obligation under this warranty is limited to repair or replacing, at its option, any goods, which upon inspection by Seller shall disclose to Seller's satisfaction to have been defective in material or workmanship. Buyer must return the goods to Seller's factory, shipping charges prepaid, with complete information as to alleged defects and the installation, operation and service of the goods.

LIMITS OF LIABILITY

Seller shall not be liable for, and Buyer shall indemnify the Seller from liability arising from injury or damage to property or persons caused in any manner by the operation, possession or use of the goods sold hereunder. The liability of Seller arising out of the supplying of any goods, or their use, whether on warranties or claim of negligence or otherwise, shall not in any case exceed the cost of correcting defects in the goods as herein provided. Seller shall not in any event be liable for any labor expended by Buyer on any defective goods or for any special direct, indirect or consequential damages arising out of or in connection with the use or performance of the goods. Seller assumes no responsibility with respect to the capacity of Seller's goods to function as components in other products. Buyer assumes full responsibility for specifications and design of any product in which Seller's goods may become components and shall indemnify Seller against any liability attributed to any inadequacy in such specifications or design. Seller shall not be liable for misoperation or misapplication of goods sold or supplied due to unusual or abnormal electrical system disturbances. **Important Notice:** User shall determine the suitability of the products for intended use, and assume all risk and liability in connection therewith.

DELAY

Shipping dates are approximate and are based upon prompt receipt of all necessary information. The Seller shall not be liable for delays in delivery or failure to manufacture or deliver due to acts of God, war, riot, embargoes, acts of civil or military authorities, priorities, allocations, fires, floods, epidemics, accidents, quarantine restrictions, mill conditions, strikes, differences with workmen, delays in transportation, shortage of cars, fuel, labor, manufacturing facilities, components or materials, acts of the Buyer, or any other cause beyond the reasonable control of the Seller. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

PATENTS

Seller will defend at its own expense any action brought against Buyer, to the extent that it is based on a claim that the goods furnished by Seller infringe a U.S. patent, and Seller will pay those costs and damages finally awarded against Buyer in any such action which are attributable to any such claim, but such defense and payments are conditioned on the following: (a) that Seller shall be notified promptly in writing by Buyer of any notice of such

claim; and (b) that Seller shall have sole control of the defense of any action on such claim and all negotiations for its settlement or compromise; and (c) should the goods become or in Seller's opinion be likely to become the subject of a claim of infringement of a U.S. patent, that Buyer shall permit Seller at its option and expense either to procure for Buyer the right to continue using the goods or to replace or modify the same so that it becomes noninfringing. The foregoing states the entire liability of Seller with respect to infringement of patents by the goods or any part thereof. Buyer shall hold Seller harmless against any expense, judgment or loss on account of any actual or alleged infringement of any patents, copyrights or trademarks which result from Seller's compliance with Buyer's designs, specifications or instructions.

PATTERNS AND TOOLS

Any patterns and tools heretofore or hereafter acquired specially to produce goods for Buyer shall become the property of the Seller. If Buyer does not order goods produced with such property for a period of two years, Seller may dispose of such property.

ORDER CANCELLATION

Non-Engineered Products

- A. Standard catalogued items not yet through complete order entry, no charge.
- B. Standard catalogued items through order entry but not yet in production - \$250.00 domestic; \$500 international.

Engineered Products

- A. Orders through order entry but not yet in engineering process - \$250.00 domestic; \$500 international.
- B. Orders in engineering process - 25% of order value plus any vendor charges levied against G&W for advanced ordered materials.
- C. Approval drawings furnished and materials advanced ordered - 35% of order value plus cost of materials ordered.
- D. Order released for production - up to 100% of order value.

STORAGE

Equipment on which manufacture or delivery is delayed, due to any cause within the Buyer's control, may be placed in storage by Seller, for Buyer's account and risk, and regular charges therefore and expenses in connection therewith shall be paid by Buyer, but if, in Seller's opinion, it is unable to obtain, or continue with such storage, Buyer will, on request, provide or arrange for suitable storage facilities and assume all costs and risks in connection therewith.

RETURN OF MATERIAL

No material shall be returned without first having secured approval and terms for return, along with necessary returned goods forms, from G&W Electric Co. Final acceptance of authorized returns will be made when the material is received at the factory.

COMPLIANCE WITH LAWS

Seller certifies that the goods sold hereunder were produced in compliance with all applicable requirements of sections 6, 7 and 12 of the Fair Labor Standards Act of 1938 amended and of regulations and orders of the United States Department of Labor issued under section 14 thereof.

GENERAL

A valid agreement binding upon Seller will only come into being as of the time a formal written acknowledgement of a purchase order is sent to Buyer by Seller. Such agreement is not assignable by Buyer without written approval of Seller. Such agreement will be governed by the laws of the State of Illinois. Waiver by Seller of a breach of any of the Terms and Conditions of this or any other agreement with Buyer shall not be construed as a waiver of any other breach.

ENTIRE AGREEMENT

These Terms and Conditions constitute the entire agreement between Seller and Buyer, and such agreement may not be modified or amended except by a writing executed after the date hereof by an authorized officer of Seller. Seller shall not be bound by any terms of Buyer's purchase order forms or other documents which attempt to impose conditions at variance with Seller's Terms and Conditions of Sale set forth herein unless the same shall be specifically agreed to in writing by an authorized officer of Seller. Seller's failure to object to the provisions contained in any of Buyer's forms shall not be deemed a waiver of the provisions of these Terms and Conditions which shall constitute the entire agreement between the parties.

INSTALLATION, SERVICING OR ERECTION

Installation, erection or servicing of the equipment or supervision thereof by Seller, if specified or requested by Buyer, is available. Contact Factory for terms and conditions.

University of Kentucky New Infrastructure Project

26-1300 Switch Gear





*1740 Fortune Court
Lexington, KY 40509
Tel. (859) 299-3787 / Fax (859) 299-7868
www.graybar.com*

UK Ductbank

Ready Electric

Square D Gear

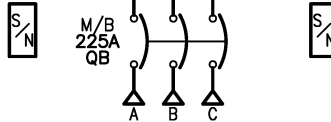
Phone: ()- Fax: ()-

Project Name: UK DUCTBANK Project Location: LEXINGTON Customer Name: READY ELECTRIC CO Q2C Number: 35693984 Quote Number: 1	Accessories Fuses NOT Included Overloads NOT Included Lamps NOT Included Lug Kits NOT Included
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Item Number	Quantity	Catalog Number / Details	Unit Price	Extended Price
001-00	1	NQ442L2C PNLBD INT NQ 225A MLO 42 CKT 3P CU Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 10kA Fully Rated Single Main: 225A/3P QB Circuit Breaker Incoming Conductors: 1 - #4 - 300 kcmil Bus: Copper: Silver/Tin Plated CU Ground Bar 42 Circuit Interior Type 1,Box: 50H x 20W x 5.75D Incoming: Bottom Trim: Surface with Door Box Cat No: MH50BE Front Cat No: NC50S Ref. Drawing: PBA707A Feeders: 42 - 20A/1P QOB Optional Features: Standard Panel (Box Ahead),Blank Endwalls,Copper Solid Neutral,Copper Ground Bar		
002-00	1	NQN2CU PNLBD NQ 225A 100% CU NEUTRAL KIT		
003-00	1	PK27GTACU PANELBOARD GROUND BAR KIT		
004-00	1	NQMB2Q PNLBD NQ MCB KIT FOR 225A MAX Q FRAME		
005-00	42	QOB120 MINIATURE CIRCUIT BREAKER 120/240V 20A		
006-00	1	QBL32225 MOLDED CASE CIRCUIT BREAKER 240V 225A		
007-00	1	MH50BE PANELBOARD ENCLOSURE/BOX TYPE 1 50H 20W		
008-00	1	NC50S PANELBOARD COVER/TRIM NF TYPE 1 S 50H		
009-00	7	H321DS SWITCH FUSIBLE HD 30A 3P STAINLESS		

REV	DESCRIPTION	BY	DATE	---	---	---	---
-	----	--	---/---/---	-	----	--	---/---/---

CKT NO	ACCESSORIES	TYPE	RATING AMP/P		RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1		QOB	20/1		20/1	QOB		2
3		QOB	20/1		20/1	QOB		4
5		QOB	20/1		20/1	QOB		6
7		QOB	20/1		20/1	QOB		8
9		QOB	20/1		20/1	QOB		10
11		QOB	20/1		20/1	QOB		12
13		QOB	20/1		20/1	QOB		14
15		QOB	20/1		20/1	QOB		16
17		QOB	20/1		20/1	QOB		18
19		QOB	20/1		20/1	QOB		20
21		QOB	20/1		20/1	QOB		22
23		QOB	20/1		20/1	QOB		24
25		QOB	20/1		20/1	QOB		26
27		QOB	20/1		20/1	QOB		28
29		QOB	20/1		20/1	QOB		30
31		QOB	20/1		20/1	QOB		32
33		QOB	20/1		20/1	QOB		34
35		QOB	20/1		20/1	QOB		36
37		QOB	20/1		20/1	QOB		38
39		QOB	20/1		20/1	QOB		40
41		QOB	20/1		20/1	QOB		42



PHYSICAL DATA

ENCLOSURE Type 1


Surface with Door
 FRONT CAT#: NC50S
 BOX CAT#: MH50BE
 DIMENSIONS:
 50''H x 20''W x 5.75''D
 WIRE BENDING SPACE:
 TOP - 5
 BOTTOM - 9.26
 SIDE - 6.13
 PBA: 707A

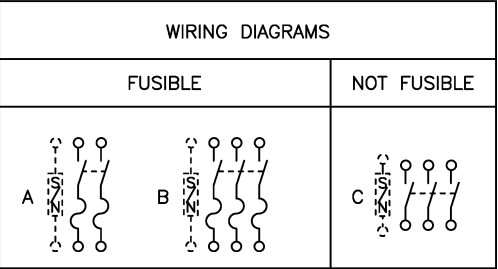
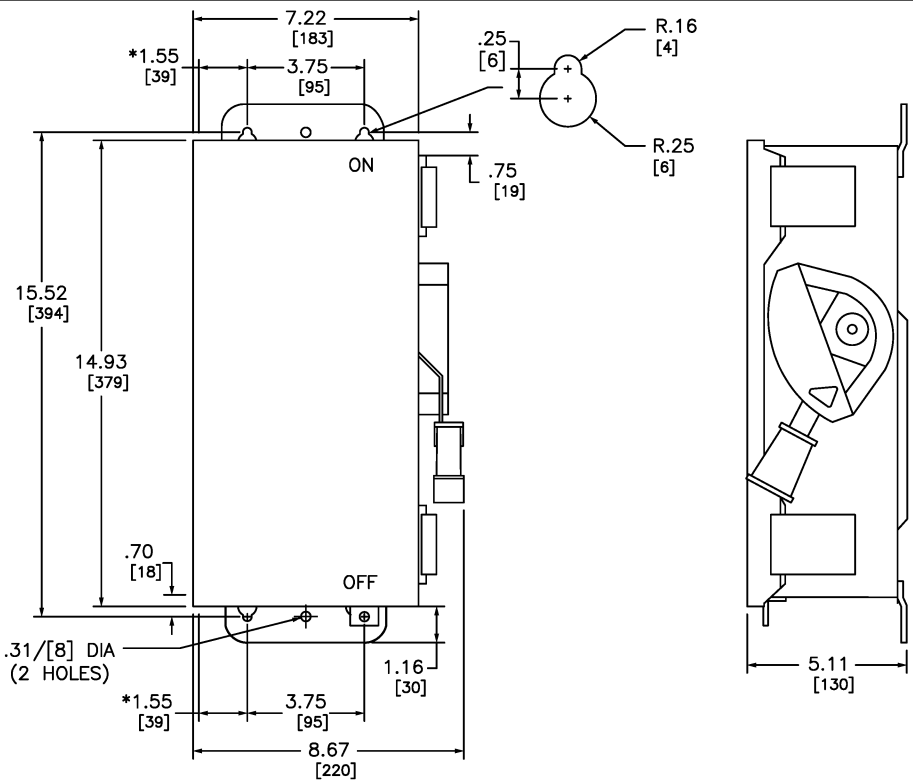
BUSSING: Copper
 Silver/Tin Plated

OPTIONAL FEATURES:
 Copper GROUND BAR
 BLANK ENDWALLS
 COPPER SOLID NEUTRAL

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
 System Ampacity: 225A
 10kA SYMS. SCCR
 MAIN: MAIN BREAKER QB 225A
 Bottom FEED
 10kA AIR
 INCOMING CONDUCTORS(S) PER NEC:
 #4 - 300 kcmil
 BRANCH MOUNTING TYPE: BOLT-ON
 -----BRANCH SUMMATION-----
 42 - 20A/1P QOB

JOB NAME:	UK DUCTBANK	EQUIPMENT DESIGNATION:	
JOB LOCATION:	LEXINGTON KY	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	October 15 2014	by Schneider Electric	
DRAWING STATUS:	QUOTE	DWG# 035693984-01	PG 1 OF 1 REV -



TERMINAL LUG DATA ‡

AMPERES	MAX WIRE	MIN WIRE	TYPE
30	#6 AWG	#12 AWG	AL
30	#6 AWG	#14 AWG	CU
60	#3 AWG	#12 AWG	AL
60	#3 AWG	#14 AWG	CU

DUAL DIMENSIONS: INCHES
MILLIMETERS

CATALOG NUMBER	VOLTAGE RATINGS	AMPERAGE RATINGS	WIRING DIAG	HORSEPOWER RATINGS																			
				240VAC				480VAC				600VAC				250 VDC		600 VDC					
				STD		MAX		STD		MAX		STD		MAX		STD	MAX	STD	MAX				
				1Ø	2Ø	3Ø	1Ø	2Ø	3Ø	1Ø	2Ø	3Ø	1Ø	2Ø	3Ø	1Ø	2Ø	3Ø	1Ø	2Ø			
H221DS	240VAC,250VDC	30	A	1 1/2*	-	3♦	3*	-	7 1/2♦	-	-	-	-	-	-	-	-	5*	-	-	-		
H221NDS	240VAC,250VDC	30	A	1 1/2*	-	3♦	3*	-	7 1/2♦	-	-	-	-	-	-	-	-	5*	-	-	-		
H321DS	240VAC,250VDC	30	B	1 1/2*	-	3♦	3*	-	7 1/2♦	-	-	-	-	-	-	-	-	5*	-	-	-		
H321NDS	240VAC,250VDC	30	B	1 1/2*	-	3♦	3*	-	7 1/2♦	-	-	-	-	-	-	-	-	5*	-	-	-		
H361DS	600VAC,600VDC	30	B	-	-	-	-	-	-	3*	-	5♦	7 1/2*	-	15♦	-	-	5*	-	10*	15*		
H361NDS	600VAC,600VDC	30	B	-	-	-	-	-	-	3*	-	5♦	7 1/2*	-	15♦	-	-	5*	-	10*	15*		
HU361DS	600VAC,600VDC	30	C	-	-	-	5*	-	10♦	-	-	-	-	-	7 1/2*	-	10*	-	30	-	5*	-	15*
H222DS	240VAC,250VDC	60	A	3*	-	7 1/2♦	10*	-	15♦	-	-	-	-	-	-	-	-	10*	-	-	-		
H222NDS	240VAC,250VDC	60	A	3*	-	7 1/2♦	10*	-	15♦	-	-	-	-	-	-	-	-	10*	-	-	-		
H322DS	240VAC,250VDC	60	B	3*	-	7 1/2♦	10*	-	15♦	-	-	-	-	-	-	-	-	10*	-	-	-		
H322NDS	240VAC,250VDC	60	B	3*	-	7 1/2♦	10*	-	15♦	-	-	-	-	-	-	-	-	10*	-	-	-		

NOTES:
 FINISH - TYPE 304 STAINLESS STEEL
 UL LISTED - E2875
 ALL NEUTRALS - INSULATED
 SHORT CIRCUIT CURRENT RATINGS:
 10,00- RMS SYMMETRICAL AMPERES
 WHEN USED IN CONJUNCTION WITH CLASS H OR K FUSES
 200,000 RMS SYMMETRICAL AMPERES WHEN USED IN CONJUNCTION WITH CLASS R, J, OR T FUSES
 * USE BOTH OUTER SWITCHING POLES.
 ♦ FOR CORNER GROUNDED DELTA, INSTALL NEUTRAL AND USE OUTER SWITCHING POLES FOR UNGROUNDED CONDUCTORS.
 ‡ LUGS SUITABLE FOR 60°C OR 75°C CONDUCTORS ONLY.

HEAVY DUTY SAFETY SWITCHES
 VISIBLE BLADES
 30 & 60 AMPERE - SERIES F6
 ENCLOSURE-NEMA TYPE 4, 4X AND 5 STAINLESS STEEL

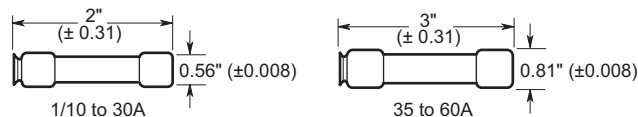
SQUARE D
Schneider Electric

DWG# 3178
NO.

FRN-R – 250Vac/125Vdc, 1/10-60A, Dual Element, Time-Delay Fuses



Dimensions - in



Description: Advanced protection, energy efficient Class RK5 dual element, current-limiting, time-delay fuses with optional open fuse indication on select ratings.

Time-delay – 10 seconds (minimum) at 500% of rated current (8 seconds for 1/10-30A sizes).

Catalog Symbol: FRN-R-(amp) (non-indicating)
FRN-R-(amp)ID (indicating)

Ratings:

- Volts – 250Vac, 125Vdc
- Amps – 1/10-60 Amps
- IR – 200kA Vac RMS Sym.
- 20kA Vdc

Agency Information:

CE, UL Listed, Std. 248-12, Class RK-5, Guide JDDZ, File E4273

CSA Certified, C22.2 No. 248.12, Class 1422-02, File 53787

Catalog Numbers (amps) – Non-indicating fuses

FRN-R-1/10	FRN-R-1 1/10	FRN-R-8*
FRN-R-1/8	FRN-R-2	FRN-R-9*
FRN-R-1 5/100	FRN-R-2 1/4	FRN-R-10*
FRN-R-3/10	FRN-R-2 1/2	FRN-R-12*
FRN-R-1/4	FRN-R-2 3/10	FRN-R-15*
FRN-R-3/10	FRN-R-3	FRN-R-17 1/2*
FRN-R-1/2	FRN-R-3 3/10	FRN-R-20*
FRN-R-5/10	FRN-R-3 1/2	FRN-R-25*
FRN-R-3/10	FRN-R-4	FRN-R-30*
FRN-R-3/10	FRN-R-4 1/2	FRN-R-35*
FRN-R-1	FRN-R-5	FRN-R-40*
FRN-R-1 1/8	FRN-R-5 1/10	FRN-R-45*
FRN-R-1 1/4	FRN-R-6	FRN-R-50*
FRN-R-1 1/10	FRN-R-6 1/4	FRN-R-60*
FRN-R-1 1/2	FRN-R-7	
FRN-R-1 3/10	FRN-R-7 1/2	

* Open fuse indication available by inserting the suffix "ID." E.g., FRN-R-15ID.

Carton Quantity and Weight

Amp Rating	Carton Qty.
1/10-15	10
17 1/2-30	10
35-60	10

Features:

- Provides motor overload, ground fault and short-circuit protection
- Helps protect motors against burnout from overloads
- Helps protect motors against burnout from single-phasing on three-phase systems
- Simplifies and improves blackout prevention (selective coordination)
- Dual-element fuses can be applied in circuits subject to temporary motor overloads and surge currents to provide both high performance short-circuit and overload protection
- The overload element provides protection against low level overcurrent of overloads and will hold an overload which is five times greater than the ampere rating of the fuse for a minimum of ten seconds.

Recommended Fuse Blocks

Fuse Amps	1-Pole	2-Pole	3-Pole
0-30	H25030-1	H25030-2	H25030-3
	R25030-1	R25030-2	R25030-3
35-60	H25060-1	H25060-2	H25060-3
	R25060-1	R25060-2	R25060-3

For additional information on the 250 volt fuse blocks, see Data Sheets # 1110 (R250), # 1112 (H250).

Fuse Reducers For Class R Fuses

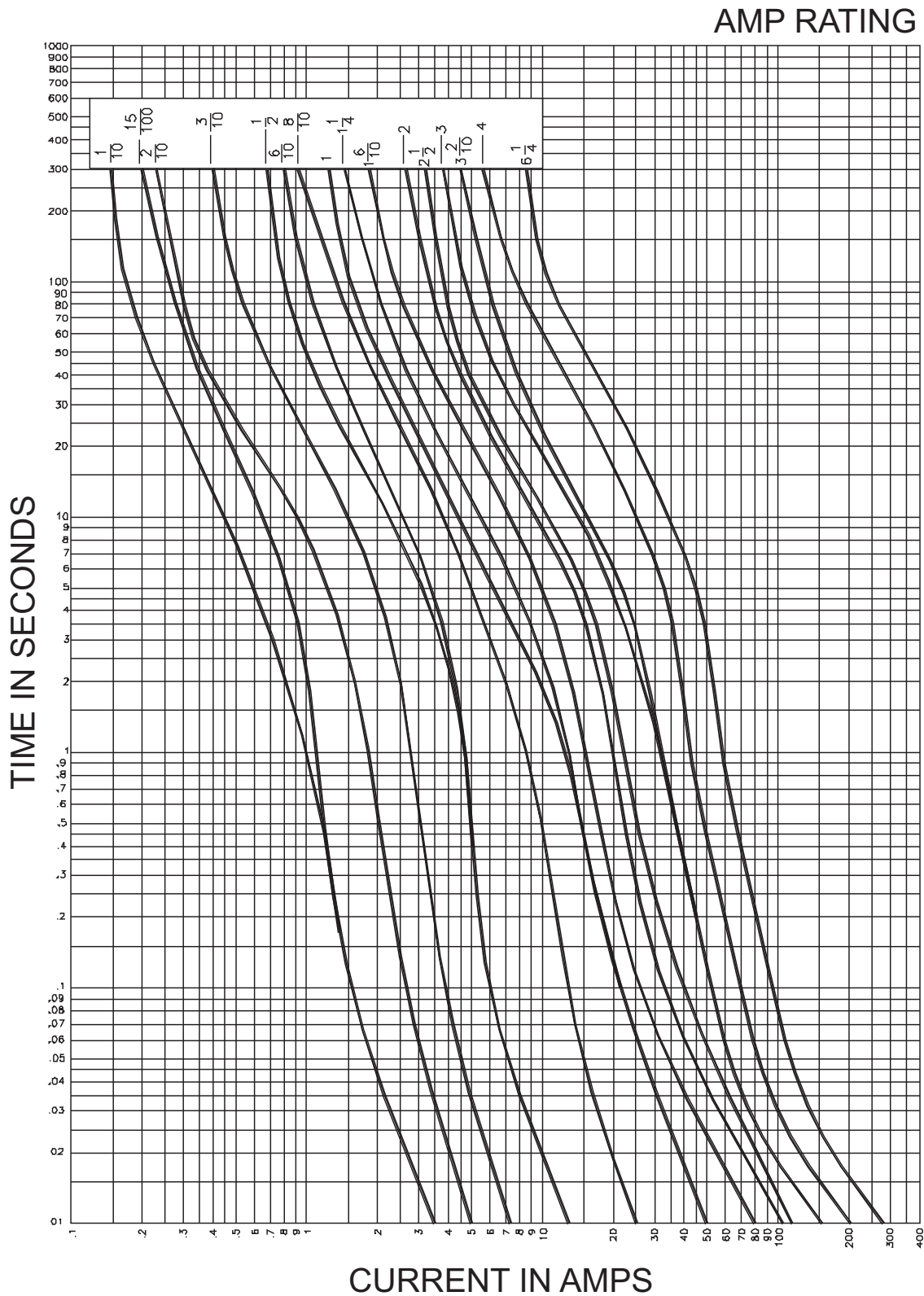
Equipment	Desired Fuse (Case) Size	Catalog Numbers (Pairs) 250V
60A	30A	NO.263-R
100A	30A	NO.213-R
	60A	NO.216-R
200A	60A	NO.226-R

For additional information on Class R fuse reducers, see Data Sheet # 1118.

FRN-R — 250Vac/125Vdc, 1/10-60A, Dual Element, Time-Delay Fuses

Time-Current Curves - Average Melt

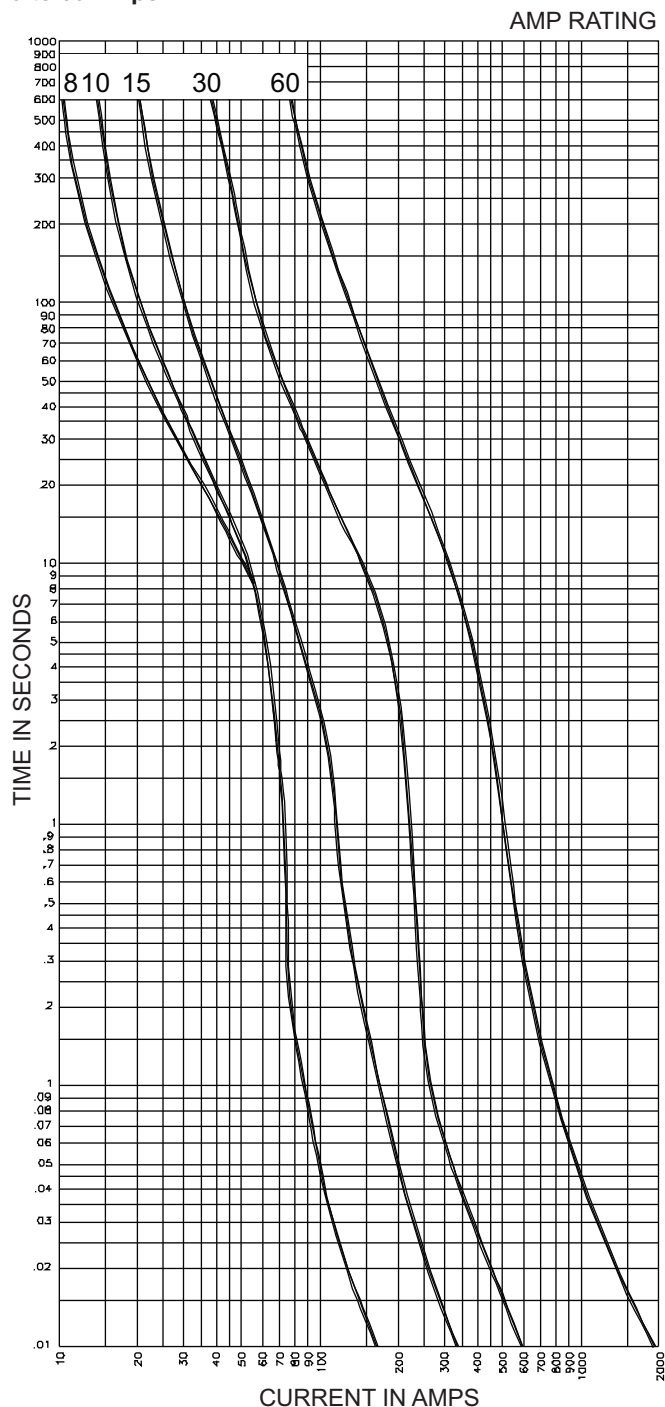
1/10 to 6 1/4 Amps



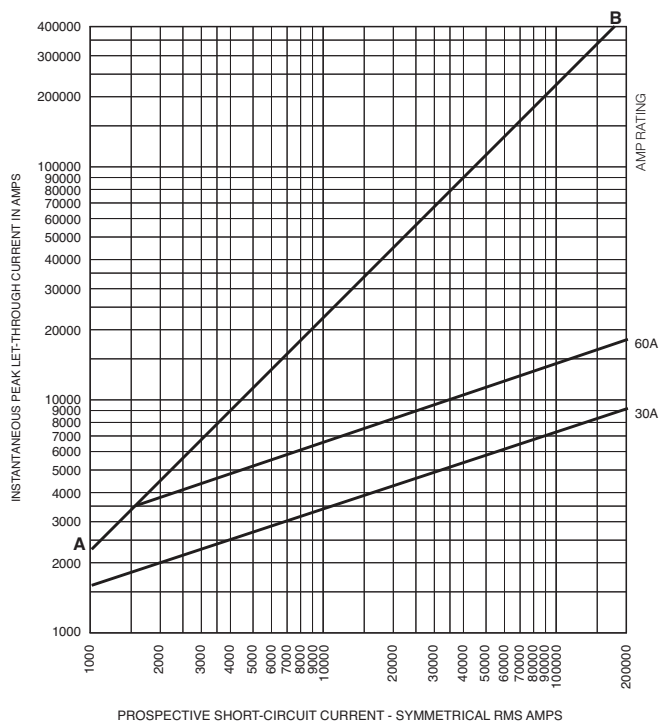
FRN-R – 250Vac/125Vdc, 1/10-60A, Dual Element, Time-Delay Fuses

Time-Current Curves - Average Melt

8 to 60 Amps



Current-Limitation Curves



Current-Limiting Effects

Prop. S.C.C.	Let-Through Current (Apparent RMS Symmetrical Vs. Fuse Rating)	
	30A	60A
5000	1000	2000
10,000	2000	3000
15,000	2000	3000
20,000	2000	4000
25,000	2000	4000
30,000	2000	4000
35,000	2000	4000
40,000	2000	5000
50,000	3000	5000
60,000	3000	5000
70,000	3000	6000
80,000	3000	6000
90,000	3000	6000
100,000	3000	6000
150,000	4000	7000
200,000	4000	8000

The only controlled copy of this Data Sheet is the electronic read-only version located on the Cooper Bussmann Network Drive. All other copies of this document are by definition uncontrolled. This bulletin is intended to clearly present comprehensive product data and provide technical information that will help the end user with design applications. Cooper Bussmann reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Cooper Bussmann also reserves the right to change or update, without notice, any technical information contained in this bulletin. Once a product has been selected, it should be tested by the user in all possible applications.

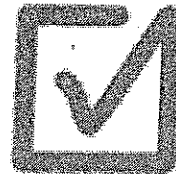


Retail and Consumer Warranty

Warranty to Customers Purchasing Through Authorized Square D Schneider Electric Distributors and Customers Purchasing Directly From Square D/Schneider Electric

Square D/Schneider Electric warrants equipment manufactured by it to be free from defects in materials and workmanship for eighteen (18) months from date of invoice from Square D/Schneider Electric or its authorized sales channel. If within the applicable warranty period purchaser discovers such item was not as warranted and promptly notifies Square D/Schneider Electric in writing, Square D/Schneider Electric shall repair or replace the items or refund the purchase price, at Square D/Schneider Electric's option.

These warranties shall not apply (a) to equipment not manufactured by Square D/Schneider Electric, (b) to equipment which shall have been repaired or altered by others than Square D/Schneider Electric, (c) to equipment which shall have been subjected to negligence, accident, or damage by circumstances beyond Square D/Schneider Electric's control, or to improper operation, maintenance or storage, or to other than normal use or service.



With respect to equipment sold but not manufactured by Square D/Schneider Electric, the warranty obligations of Square D/Schneider Electric shall in all respects conform and be limited to the warranty actually extended to Square D/Schneider Electric by its supplier. The foregoing warranties do not cover reimbursement for labor, transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

University of Kentucky New Infrastructure Project

26-0543 Lighting



Catalog Number	DMW 2 32 MVOLT BPNP L841HT8
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE — Intended for low to medium mounting heights where dust, dirt, humidity or moisture are present. Ideal for canopies, dock areas, wastewater treatment, refrigerated areas, food processing and other non-hazardous environments. Certain airborne contaminants can diminish integrity of acrylic. [Click here for Acrylic Environmental Compatibility table for suitable uses.](#)

CONSTRUCTION — Housing formed from impact resistant, UV stabilized, fiberglass reinforced polyester with cold-rolled steel enclosed wireway. Poured in place gasketing provides a seal between housing and diffuser. Captive, corrosion-resistant cam-action latches secure the diffuser; six on 4' units, and ten on 8' units. Stainless steel latches available.

Finish: Painted parts pretreated with a five-stage iron-phosphate process to ensure superior paint adhesion and corrosion resistance, then finished with a high-gloss, baked white enamel.

OPTICS — High-impact acrylic diffuser with a stippled interior surface to spread lamp image.

PLEASE NOTE: The standard 4' diffuser is 2-1/4" deep, and the standard 8' or 48T8HO diffuser is 3" deep. To order the 4' diffuser so that it matches the depth of the 8' diffuser, order the ARDP option. The 8' diffuser is not available in the 2-1/4" depth.

ELECTRICAL — Thermally protected, resetting, Class P, HPF, non-PCB, UL Listed and CSA Certified ballast is standard.

AWM, TFN, THHN wire throughout, rated for required temperatures.

INSTALLATION — For unit or row installations, surface (ceiling or wall) or suspended mounting. Wall mounting; horizontal orientation only for use in damp locations. Stainless steel surface spring-mounting brackets standard (2 included).

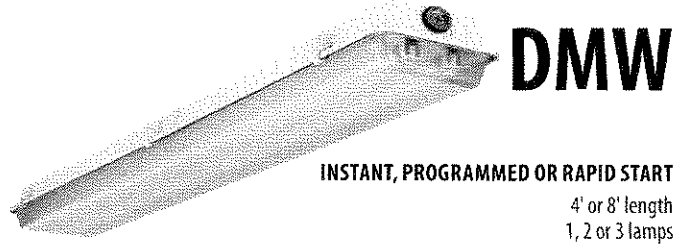
LISTINGS — 120V, 277V and MVOLT are UL Listed and CSA Certified (standard). 347V is CSA Certified (see Options). NOM Certified (see Options). Listed for 25°C ambient and wet locations for covered-ceiling applications. IP65 rated. Optional IP67 rating available (supplied with 8 latches on 4' units and 14 latches for 8' units; covered ceiling not required). Compliance to FDA/USDA requirements and/or NSF splash-zone certification.

WARRANTY — 1-year limited warranty. Complete warranty terms located at www.aquitybrands.com/CustomerResources/Terms_and_conditions.aspx

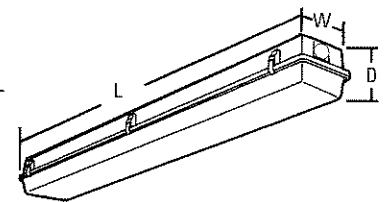
Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.

Enclosed and Gasketed Industrial



Specifications	
Length:	50 (127.0) 98 (248.9)
Width:	8-1/8 (20.6)
Fixture depth:	5-5/8 (14.3) (deep lens) 4-3/4 (12.1) (standard lens)



All dimensions are shown in inches (centimeters) unless otherwise noted.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: DMW 2 32 MVOLT GEB10IS

DMW	2	32		MVOLT	BPNP	L841HT8
Series	Number of lamps	Lamp type	Diffuser	Voltage	Ballast	Options
DMW	1	28T5 28W T5 (48") ³	(blank)	120	GEB10IS	ELDW Emergency battery pack (nominal 300 lumens) ^{7,8}
Wet location	2	32 32W T8 (48")	2-1/4" Deep high-impact acrylic (50% DR)	277		EL50W Emergency battery pack (nominal 500 lumens) ^{7,8}
For tandem double-length unit, add prefix Y. Example: TDMW ¹	3 ²	48T8HO 44W T8HO (48")	ARDP	347		EL60W Emergency battery pack (nominal 600 lumens) ^{7,8}
		54T5HO 54W T5HO (48") ⁴	3" Deep high-impact acrylic (50% DR) ⁵	MVOLT others available	GEB10RS	EL14DW Emergency battery pack (nominal 1400 lumens) ^{7,8}
		96T8 59W T8 slimline (96")				GLR Internal fast-blow fusing ⁹
		96T8HO 86W T8 380mA (96")			GEB10PS	GMF Internal slow-blow fusing ⁹
						RIF1 Radio interference filter, one per fixture
					GEB10PS90	STSL Stainless steel latches
						WLF Wet location fittings (one pair; installed, top, for use with 1/2" rigid conduit)
						IP67 IP67 rated; requires 8 latches for 4' fixtures and 14 latches for 8' fixtures
						CSA CSA certified (only required for 347V)
						NOM NOM certified
					BPNP= NEMA	CS89 6' white cord, 16/3, no plug, wet location
					PREMIUM T8	CS88 6' Brad Harrison 16/3 cord and straight blade plug set wet location ⁹
					. 88 NBF	MSI_ Wet location occupancy sensor pre-wired ^{9,10}
						DL Damp location ¹¹

Accessories: Order as separate catalog number.	
BCD	Bracket for hanger chain mounting. Two per package ¹²
HC36	Chain hangers (1 pair, 36" long); Requires BCD
WLF	Wet location fittings (1 pair, not installed, for use with 1/2" rigid conduit)
DMW/VRISMB	Surface mounting brackets (pair) ¹³

Notes

- Not available with 96T8 or 96T8HO.
- 32W T8 and 28 T5 lamps only.
- Must specify GEB10PS ballast.
- Must specify GEB10PS90 ballast.
- ARDP standard on 48T8HO and 8' fixtures.
- Available 347V T8 only.
- Must specify voltage; 120 or 277V only.
- Check battery pack spec sheet on www.powersentrxsafety.com for compatibility.
- Must specify voltage. Not available with MVOLT.
- For mounting up to 8' specify MS18; for mounting up to 20' specify MS120.
- DL option required for battery packs, sensors, and cord sets that are not wet location listed.
- For stainless steel, specify STS (ex: BCD STS).
- Brackets ship standard with fixture. For replacement purposes only.

DMW Instant, Programmed or Rapid Start

MOUNTING DATA

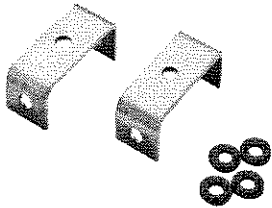
For unit or row installation, surface (ceiling or wall) or suspended mounting.

DMW — Drill holes through housing and channel at appropriate locations. Includes gasketed wet location fittings on ends for power feeding/mounting. Fitting is threaded for 1/2" rigid conduit (optional WLF for top mounting). Attach to surface using fasteners and sealing washers (by others) appropriate for ceiling materials.

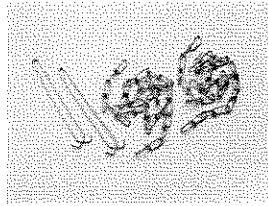
Unit Installation — Minimum of two hangers required.

Row installation — Minimum of two hangers required. Recommended 1/2" nipple with union (by others) for DMW.

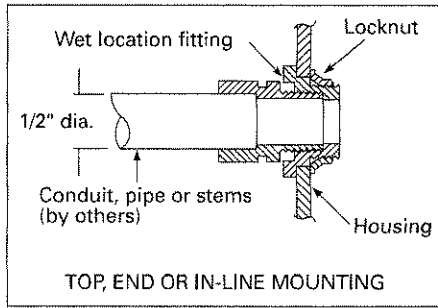
MOUNTING ACCESSORIES



BCD

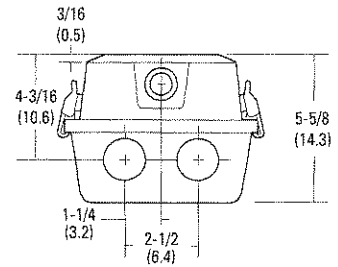
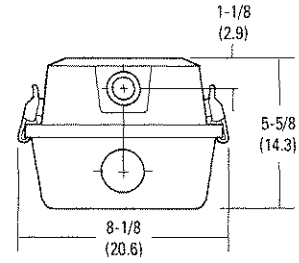


HC36



DIMENSIONS

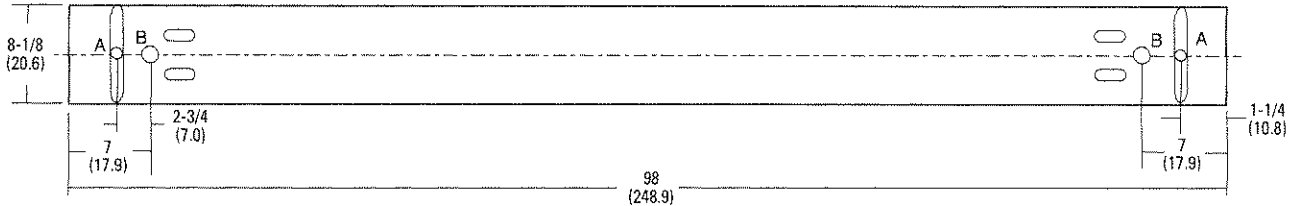
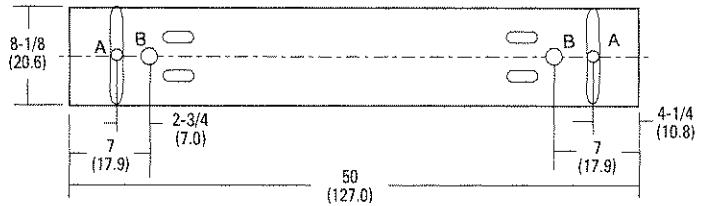
Inches (centimeters). Subject to change without notice.



A = 11/16 (17) Dia.

B = 1-1/8 (29) Dia.

Recommended mounting locations
(field drilling required)



PHOTOMETRICS

See www.lithonia.com.



**STATEMENT OF LIMITED WARRANTY
FOR ACUITY BRANDS LIGHTING, INC.
d/b/a LITHONIA LIGHTING®
NON-LED COMMERCIAL INDOOR PRODUCTS
FOR SHIPMENTS WITHIN THE UNITED STATES AND CANADA
10/01/12**



Subject to the exclusions set forth below, Acuity Brands Lighting, Inc. d/b/a Lithonia Lighting ("Acuity") warrants its non-LED commercial indoor lighting fixtures ("Product(s)") to be free from defect in material and workmanship for a period of one (1) year from the date of shipment from Acuity's facilities (the "General Warranty"), unless other warranties apply as outlined below. The painted finish of the Product(s) will be considered defective in material or workmanship only if there is substantial deterioration, in the form of blistering, cracking, or peeling. The painted finish is not warranted against fading or chalking, as fixture(s) may naturally fade or chalk over time due to normal aging.

For installed Rough Service Product(s), Acuity warrants that, for the lifetime of the Product(s), the polycarbonate lens and/or polycarbonate housing will withstand breakage resulting from occasional physical abuse and rough handling (the "Rough Service Warranty"), notwithstanding the vandalism exclusion set forth below.

Ballasts, lamps, emergency batteries and poles are excluded from the General Warranty. Holophane® and Accupro® brand ballasts, Acculamp® brand lamps, emergency batteries, and poles are warranted separately; and the terms of such warranties are located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx. Manufacturers of ballasts, lamps, emergency batteries and poles incorporated into the Product(s) are solely responsible for any costs or expenses related to any claims, repairs, or replacements associated with any such component(s). Assistance with warranty claims for any such component(s), and/or copies of each applicable manufacturer's warranty, may be obtained from an authorized Acuity post-sales or customer service representative.

This Statement of Limited Warranty ("Warranty") applies only when the Product(s) are installed in applications in which ambient temperatures are within the range of specified operating temperatures. Acuity will not be responsible under this Warranty for any failure of the Product(s) that results from external causes such as: acts of nature; physical damage; exposure to adverse or hazardous chemical or other substances; use of reactive cleaning agents and/or harsh chemicals to clean the Product(s); environmental conditions; vandalism; fire; power failure, improper power supply, power surges or dips, and/or excessive switching; induced vibration; animal or insect activity; fault or negligence of purchaser, any end user of the Product(s) and/or any third party not engaged by Acuity; improper or unauthorized use, installation, handling, storage, alteration, maintenance or service, including failure to abide by any product classifications or certifications, or failure to comply with any applicable standards, codes, recommendations, product specification sheets, or instructions of Acuity; use of the Product(s) with products, processes or materials supplied by any end user or third party; or any other occurrences beyond Acuity's reasonable control. Acuity also will not be responsible under this Warranty for any substantial deterioration in the Product finish that is caused by failure to clean, inspect or maintain the finish of the Product(s). If the Product(s) are used on existing foundations, anchorages or structures, the end user is solely responsible for the structural integrity of such existing foundations, anchorages or structures and all consequences arising from their use. Adequate records of operating history, maintenance, and/or testing must be kept by the end user and provided to Acuity upon request to substantiate that the Product(s) have failed to comply with the terms of this Warranty. Neither polycarbonate nor acrylic material used in the Products is warranted against yellowing, as yellowing may naturally occur over time due to normal aging. The Product(s) are not warranted against costs that may be incurred in connection with changes or modifications to the Product(s) required to accommodate site conditions and/or faulty building construction or design. In addition, the Product(s) are not warranted against cost resulting from installation of third party supplied components, failures of third party supplied components, or failures of Acuity supplied Product(s) caused by a third party supplied component. This Warranty only applies to the Product(s) when sold for commercial purposes and does not apply to any consumer product(s), all of which are governed by separate limited warranty terms. For the avoidance of doubt, Acuity emergency fixtures are not covered by this Warranty.

If the Product(s) fail to comply with the terms of this Warranty, Acuity, at its option, will repair or replace the Product(s) with the same or a functionally equivalent Product(s) or component part(s). This Warranty excludes labor and equipment required to remove and/or reinstall original or replacement parts. This Warranty extends only to the Product(s) as delivered to, and is for the sole and exclusive benefit of, the original end user of the Product(s) at the original location. This Warranty may not be transferred or assigned by the original end user. The repair or replacement of any Product(s) or component part within the Product(s) is the sole and exclusive remedy for failure of the Product(s) to comply with the terms of this Warranty and does not extend the Warranty period. Warranty claims regarding the Product(s) must be submitted in writing within (30) days of discovery of the defect or failure to an authorized Acuity post-sales or customer service representative. Product(s) or component part(s) may be required to be returned for inspection and verification of non-conformance by Acuity, but no Product(s) or component part(s) will be accepted for inspection, verification or return unless accompanied by a "return authorization number" which can be obtained only from an authorized Acuity post-sales or customer service representative. Acuity is not responsible for any costs and expenses incurred in connection with shipment of Product(s) to Acuity, but Acuity shall bear all cost and expense incurred in connection with shipment of replacement Product(s) to the customer.



**STATEMENT OF LIMITED WARRANTY
FOR ACUITY BRANDS LIGHTING, INC.
d/b/a LITHONIA LIGHTING®
NON-LED COMMERCIAL INDOOR PRODUCTS
FOR SHIPMENTS WITHIN THE UNITED STATES AND CANADA
10/01/12**



THE FOREGOING WARRANTY TERMS ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, AND ACUITY EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, RELATING DIRECTLY OR INDIRECTLY TO THE PRODUCT(S), WHETHER ORAL, WRITTEN, OR ARISING BY COURSE OF DEALING OR USAGE OF TRADE, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO AGENT, DISTRIBUTOR OR OTHER SUPPLIER OF ACUITY PRODUCTS HAS THE AUTHORITY TO MODIFY OR AMEND THIS WARRANTY WITHOUT EXPRESS WRITTEN AUTHORIZATION FROM ACUITY.

The total liability of Acuity on any and all claims of any kind, whether in contract, warranty, tort (including negligence), strict liability or otherwise, arising out of or in connection with, or resulting from, Acuity's performance or breach of this Warranty, or from Acuity's sale, delivery, resale, repair, or replacement of any Product(s) or the furnishing of any services, shall in no event exceed the purchase price allocable to the Product(s) that give rise to the claim, and any and all such liability shall terminate upon the expiration of the warranty period specified above.

IN NO EVENT SHALL ACUITY BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES, EVEN IF INFORMED OF THE POSSIBILITY OF SUCH DAMAGES, WHETHER AS THE RESULT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR ANY OTHER THEORY, INCLUDING WITHOUT LIMITATION LABOR OR EQUIPMENT REQUIRED TO REMOVE AND/OR REINSTALL ORIGINAL OR REPLACEMENT PARTS, LOSS OF TIME, PROFITS OR REVENUES, LACK OR LOSS OF PRODUCTIVITY, INTEREST CHARGES OR COST OF CAPITAL, COST OF SUBSTITUTE EQUIPMENT, SYSTEMS, SERVICES OR DOWNTIME COSTS, DAMAGE TO OR LOSS OF USE OF PROPERTY OR EQUIPMENT OR ANY INCONVENIENCE ARISING OUT OF ANY BREACH OF THE FOREGOING WARRANTY OR OBLIGATIONS UNDER SUCH WARRANTY.

Acuity reserves the right to modify or discontinue this Warranty without notice provided that any such modification or discontinuance will only be effective with respect to any Product(s) purchased after such modification or discontinuance.

University of Kentucky New Infrastructure Project

26-0513 Independent Test Results





BOSTON
508/668-9205
508/668-2142 FAX

CHICAGO
847/228-9595
847/228-9094 FAX

CINCINNATI
859/371-5355
859/371-5399 FAX

CLEVELAND
440/951-2706
440/951-6798 FAX

COLUMBUS
614/410-8484
614/410-8500 FAX

CONNECTICUT
203/949-2650
203/949-2646 FAX

DAYTON
937/278-0811
937/278-7791 FAX

DETROIT
734/524-0409
734/524-0410 FAX

INDIANAPOLIS
317/322-2055
317/322-2056 FAX

MILWAUKEE
262/784-3660
262/784-5124 FAX

NEW YORK
718/239-0359

PHILADELPHIA
215/208-1609
215/579-0830 FAX

PITTSBURGH
412/747-0550
412/747-0554 FAX



CHARTER MEMBER

September 29, 2014

Ready Electric
3300 Gilmore Industrial Blvd.
Louisville, Kentucky 40213

ATTENTION: Mr. Billy VanBuren (billyv@readyelec.com)

SUBJECT: Engineering Report
Cable Acceptance Testing
University of Kentucky
Project 3203250; Customer P.O. #85709

Dear Mr. VanBuren:

Enclosed is the Engineering Report detailing the project **High Voltage Maintenance** recently completed at the University of Kentucky. HVM is a full service independent testing company and appreciates the opportunity to provide your electrical maintenance, testing, and engineering services.

Our mission is to provide an independent technical service to enhance the safety, reliability, and efficiency of energy systems and provide a one-stop solution for quality energy services worldwide; from electrical commissioning and start up to large-scale operation and maintenance services. We will help you plan and execute projects efficiently and reduce project risk. We consolidate a vast array of engineering, consulting, monitoring, maintenance and professional services to dramatically improve the operational performance of industrial, commercial, and process customers.

Thank you for the opportunity to provide this service. If you have any questions, or we may be of further assistance, please call Brian Johnson at 859-421-6040.

Respectfully Submitted,

High Voltage Maintenance Division - Ohio Valley Area Service Center

RELIABILITY THROUGH ELECTRICAL TESTING, MAINTENANCE AND ENGINEERING SERVICES

ENGINEERING REPORT
Ready Electric
Cable Acceptance Testing
University of Kentucky

September 29, 2014

Project 3203250

SECTION 1 - PROJECT OVERVIEW

PROJECT SCOPE:

On September 12, 2014, *High Voltage Maintenance* performed acceptance testing on two (2) sets of 15kV cable at the University of Kentucky.

Detailed inspection and test data collected during the execution of this project is contained in Section 2 - Equipment Test Data of this engineering report.

PURPOSE:

Acceptance testing is performed to aid in the detection of manufacturing and installation defects and deficiencies that could result in premature equipment failure. Test results are evaluated and compared to historical information of similar equipment and manufacturer recommendations. Test results identified as outside the normal acceptable range are noted in the appraisal section of this report.

PROCEDURE:

All testing is performed in accordance with HVM's standard procedures including, but not limited to, selected specifications from the following: InterNational Electrical Testing Association (NETA), National Electrical Code (NEC), National Fire Protection Association 70B-Electrical Equipment Maintenance (NFPA 70B), Institute of Electrical and Electronic Engineers (IEEE), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA), manufacturer's instruction manuals and/or project specifications, unless otherwise noted.

APPRAISAL AND RECOMMENDATIONS:

Based on the results of the inspections and tests performed, the equipment included in this project is considered acceptable for service.

University of Kentucky New Infrastructure Project

CKT 3-21 Test Results





Table of Contents

Job # 3203250

High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

PAGE 1

CUSTOMER READY ELECTRIC
ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3203250
OWNER UNIVERSITY OF KENTUCKY; 196 HOSPITAL DR.; LEXINGTON KY
LOCATION/PLANT LEXINGTON, KY

SUBSTATION EQUIPMENT IDENTIFICATION	DATA TEST FORM EQUIPMENT LOCATION	TEST DATA PAGE #
MANHOLE CIRCUIT 3-21 - 120 FT RUN	13200 - CABLE HIGH POTENTIAL & INSUL RES LEXINGTON, KY	1
MANHOLE CIRCUIT 3-21 - 550 FT RUN	13200 - CABLE HIGH POTENTIAL & INSUL RES LEXINGTON, KY	2



CABLE HIGH POTENTIAL TEST AND INSULATION RESISTANCE

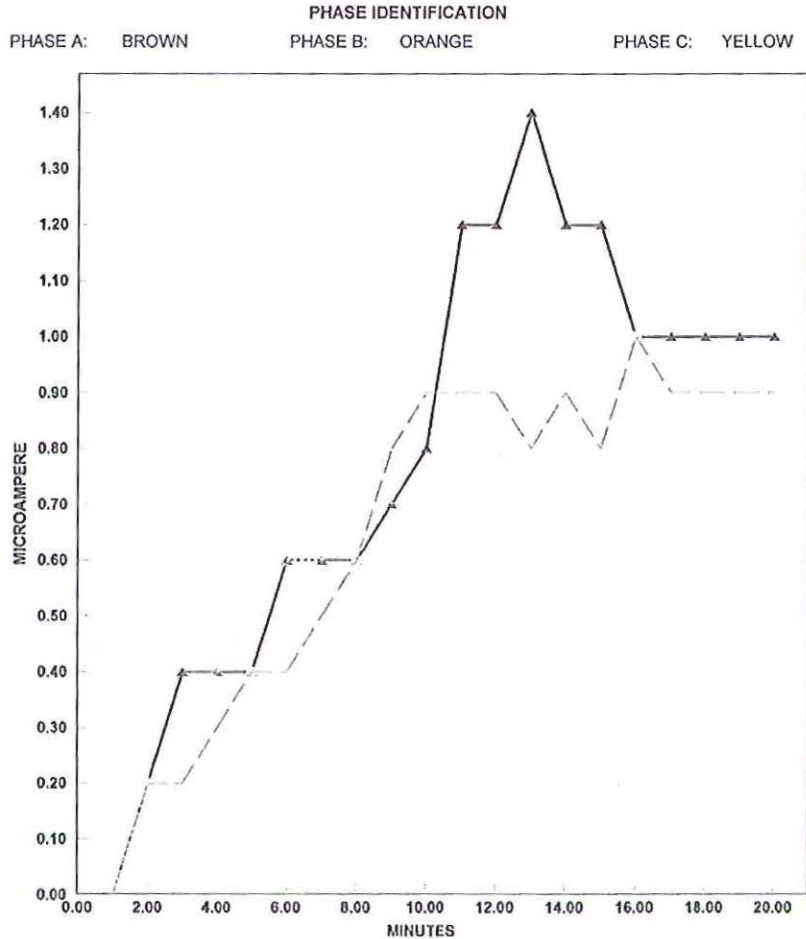
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 1
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3203250
 OWNER UNIVERSITY OF KENTUCKY; 196 HOSPITAL DR.; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NA
 DATE 9/12/2014 TEMPERATURE 24 °C HUMIDITY 44 % EQPT. LOCATION LEXINGTON, KY
 SUBSTATION MANHOLE EQUIPMENT I.D. CIRCUIT 3-21 - 120 FT RUN

CABLE SOURCE MANHOLE CABLE TERMINATION POINT MANHOLE
 OPERATING VOLTAGE 15 KV INSTALLED IN NON-METALLIC CONDUIT LENGTH 120 FT
 MANUFACTURER General Cable INSULATION TYPE EPR INSULATION THICKNESS 220 MILS
 SIZE 500 KCMIL KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE NEW

CONNECTED EQUIPMENT _____

TIME MINUTES	TEST KV	PHASE A µA	PHASE B µA	PHASE C µA
0.25				
0.50				
0.75				
1.00	5	0.00	0.00	0.00
1.25				
1.50				
1.75				
2.00	10	0.20	0.20	0.20
3.00	15	0.40	0.20	0.30
4.00	20	0.40	0.30	0.40
5.00	25	0.40	0.40	0.50
6.00	30	0.60	0.40	0.60
7.00	35	0.60	0.50	0.60
8.00	40	0.60	0.60	0.90
9.00	45	0.70	0.80	0.70
10.00	50	0.80	0.90	0.90
11.00	50	1.20	0.90	0.80
12.00	50	1.20	0.90	0.80
13.00	50	1.40	0.80	0.70
14.00	50	1.20	0.90	0.70
15.00	50	1.20	0.80	0.70
16.00	50	1.00	1.00	0.70
17.00	50	1.00	0.90	0.70
18.00	50	1.00	0.90	0.70
19.00	50	1.00	0.90	0.70
20.00	50	1.00	0.90	0.70
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5kV; SECS		9.8	9.9	9.7
SHIELD RESIST.- OHMS		0.5	0.5	0.5
INSULATION RESISTANCE		GIGA-OHMS @ 5 kV		
		121	97.6	197



COMMENTS :
 DEFICIENCIES &
 RECOMMENDATIONS:

EQPT. INVENTORY NO. OH126, K152

TESTED BY: Kennard, Scott



CABLE HIGH POTENTIAL TEST AND INSULATION RESISTANCE

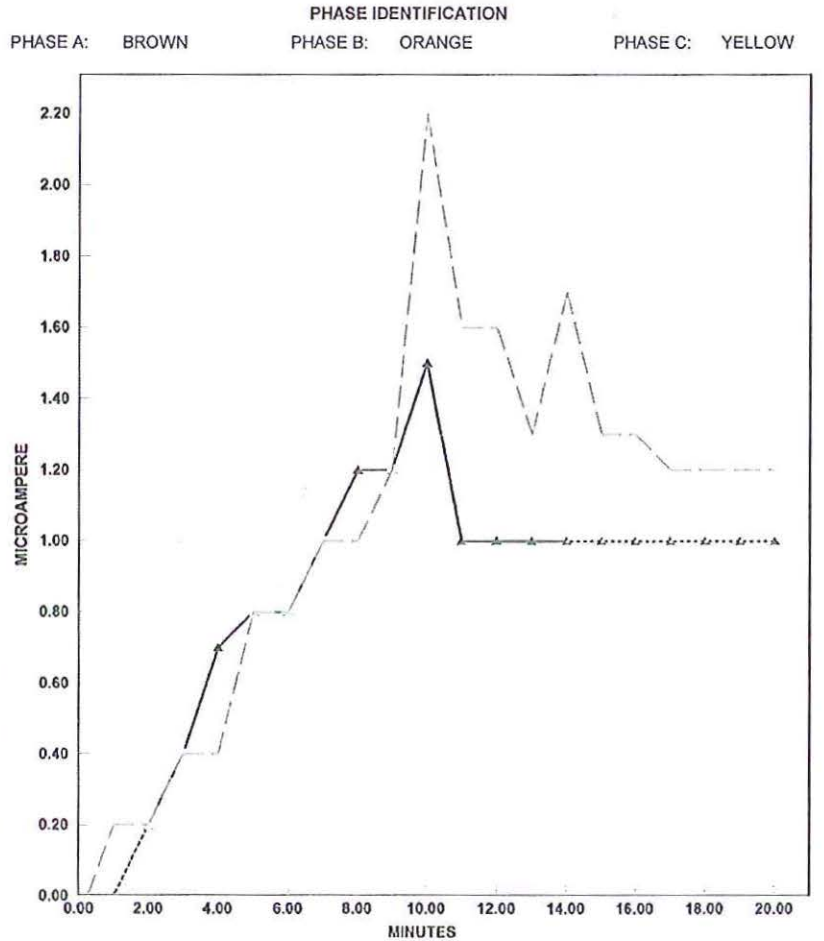
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 2
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3203250
 OWNER UNIVERSITY OF KENTUCKY; 196 HOSPITAL DR.; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NA
 DATE 9/12/2014 TEMPERATURE 24 °C HUMIDITY 44 % EQPT. LOCATION LEXINGTON, KY
 SUBSTATION MANHOLE EQUIPMENT I.D. CIRCUIT 3-21 - 550 FT RUN

CABLE SOURCE MANHOLE CABLE TERMINATION POINT MANHOLE
 OPERATING VOLTAGE 15 KV INSTALLED IN NON-METALLIC CONDUIT LENGTH 550 FT
 MANUFACTURER General Cable INSULATION TYPE EPR INSULATION THICKNESS 220 MILS
 SIZE 500 KCMIL KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE NEW

CONNECTED EQUIPMENT _____

TIME MINUTES	TEST KV	PHASE A μA	PHASE B μA	PHASE C μA
0.25				
0.50				
0.75				
1.00	5	0.00	0.20	0.00
1.25				
1.50				
1.75				
2.00	10	0.20	0.20	0.20
3.00	15	0.40	0.40	0.50
4.00	20	0.70	0.40	0.50
5.00	25	0.80	0.80	0.60
6.00	30	0.80	0.80	1.00
7.00	35	1.00	1.00	1.30
8.00	40	1.20	1.00	1.30
9.00	45	1.20	1.20	1.30
10.00	50	1.50	2.20	1.30
11.00	50	1.00	1.60	1.30
12.00	50	1.00	1.60	1.20
13.00	50	1.00	1.30	1.10
14.00	50	1.00	1.70	1.00
15.00	50	1.00	1.30	1.00
16.00	50	1.00	1.30	1.00
17.00	50	1.00	1.20	1.00
18.00	50	1.00	1.20	1.00
19.00	50	1.00	1.20	1.00
20.00	50	1.00	1.20	1.00
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5kV; SECS		24.2	30.8	24.7
SHIELD RESIST.- OHMS		0.5	0.5	0.5
INSULATION RESISTANCE		GIGA-OHMS @ 5 kV		
		120	76	150



COMMENTS : _____
 DEFICIENCIES & RECOMMENDATIONS: _____

EQPT. INVENTORY NO. OH126, K152 TESTED BY: Kennard, Scott

University of Kentucky New Infrastructure Project

Cooper Dairy Test Results





BOSTON
508/668-9205
508/668-2142 FAX

CHICAGO
847/228-9595
847/228-9094 FAX

CINCINNATI
859/371-5355
859/371-5399 FAX

CLEVELAND
440/951-2706
440/951-6798 FAX

COLUMBUS
614/410-8484
614/410-8500 FAX

CONNECTICUT
203/949-2650
203/949-2646 FAX

DAYTON
937/278-0811
937/278-7791 FAX

DETROIT
734/524-0409
734/524-0410 FAX

INDIANAPOLIS
317/322-2055
317/322-2056 FAX

MILWAUKEE
262/784-3660
262/784-5124 FAX

NEW YORK
718/239-0359

PHILADELPHIA
215/208-1609
215/579-0830 FAX

PITTSBURGH
412/747-0550
412/747-0554 FAX



CHARTER MEMBER

May 9, 2014

Ready Electric
3300 Gilmore Industrial Blvd.
Louisville, Kentucky 40213

ATTENTION: Mr. Billy VanBuren (billyv@readyelec.com)

SUBJECT: Engineering Report
Cable Acceptance Testing
University of Kentucky
Project 3196153; Customer P.O. #83690

Dear Mr. VanBuren:

Enclosed is the Engineering Report detailing the project **High Voltage Maintenance** recently completed at the University of Kentucky. HVM is a full service independent testing company and appreciates the opportunity to provide your electrical maintenance, testing, and engineering services.

Our mission is to provide an independent technical service to enhance the safety, reliability, and efficiency of energy systems and provide a one-stop solution for quality energy services worldwide; from electrical commissioning and start up to large-scale operation and maintenance services. We will help you plan and execute projects efficiently and reduce project risk. We consolidate a vast array of engineering, consulting, monitoring, maintenance and professional services to dramatically improve the operational performance of industrial, commercial, and process customers.

Thank you for the opportunity to provide this service. If you have any questions, or we may be of further assistance, please call Brian Johnson at 859-421-6040.

Respectfully Submitted,

High Voltage Maintenance Division - Ohio Valley Area Service Center

ENGINEERING REPORT
Ready Electric
Cable Acceptance Testing
University of Kentucky

May 9, 2014

Project 3196153

SECTION 1 - PROJECT OVERVIEW

PROJECT SCOPE:

On May 2, 2014, *High Voltage Maintenance* performed acceptance testing on one (1) set of 15kV cable at the University of Kentucky.

Detailed inspection and test data collected during the execution of this project is contained in Section 2 - Equipment Test Data of this engineering report.

PURPOSE:

Acceptance testing is performed to aid in the detection of manufacturing and installation defects and deficiencies that could result in premature equipment failure. Test results are evaluated and compared to historical information of similar equipment and manufacturer recommendations. Test results identified as outside the normal acceptable range are noted in the appraisal section of this report.

PROCEDURE:

All testing is performed in accordance with HVM's standard procedures including, but not limited to, selected specifications from the following: InterNational Electrical Testing Association (NETA), National Electrical Code (NEC), National Fire Protection Association 70B-Electrical Equipment Maintenance (NFPA 70B), Institute of Electrical and Electronic Engineers (IEEE), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA), manufacturer's instruction manuals and/or project specifications, unless otherwise noted.

APPRAISAL AND RECOMMENDATIONS:

Based on the results of the inspections and tests performed, the equipment included in this project is considered acceptable for service.



CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST

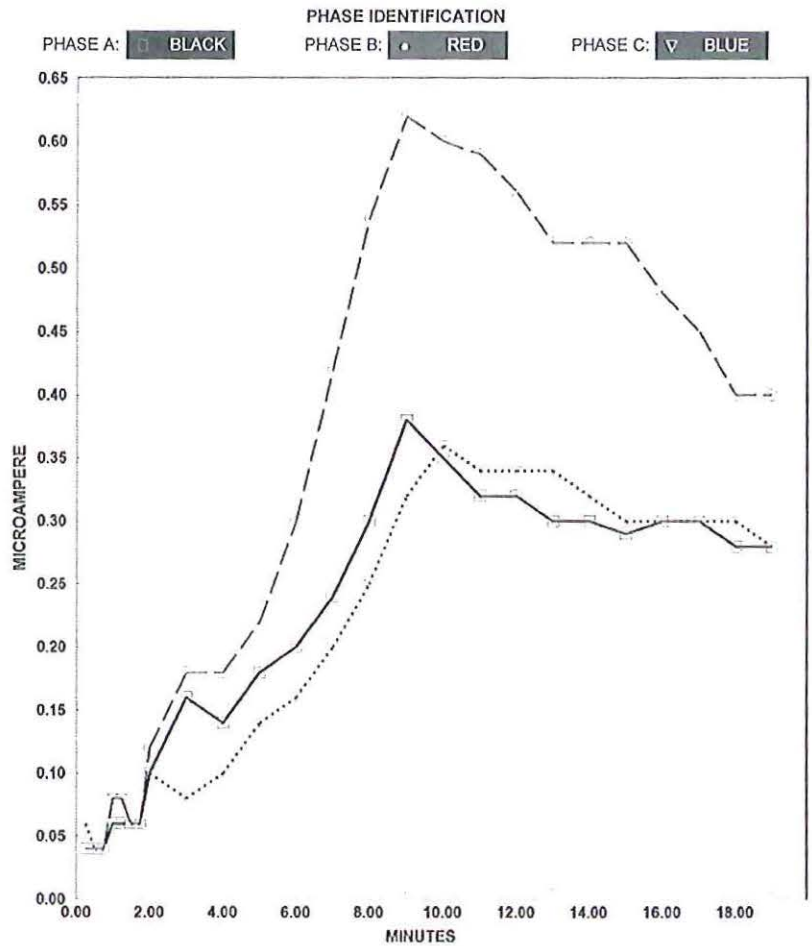
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 1
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3196153
 OWNER UNIVERSITY OF KENTUCKY; COOPER DAIRY BLDG - ROSE & HUGULET; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NEW
 DATE 5/2/2014 TEMPERATURE 24 °C HUMIDITY 62 % EQPT. LOCATION BASEMENT
 SUBSTATION COOPER DAIRY EQUIPMENT I.D. COOPER DAIRY PRIMARY

CABLE SOURCE 404-2 SWITCH CABLE TERMINATION POINT COOPER DAIRY PRIMARY SWITCH
 OPERATING VOLTAGE 12.470 KV INSTALLED IN DUCT BANK LENGTH 350 FT
 MANUFACTURER GENERAL CABLE INSULATION TYPE EPR INSULATION THICKNESS 220 MILS
 SIZE 4/0 KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE NEW
 SPLICES : HAND TAPED COLD-SHRINK KIT HEAT-SHRINK KIT OTHER _____
 TERMINATIONS : AIR TERMINATIONS LOAD-BREAK ELBOWS DEAD-BREAK ELBOWS OTHER _____

CONNECTED EQUIPMENT NOTHING CONNECTED

TIME MINUTES	TEST VOLTAGE (kV)	PHASE A (µA) Field I.D. BROWN	PHASE B (µA) Field I.D. ORANGE	PHASE C (µA) Field I.D. YELLOW
0.25	5	0.04	0.04	0.06
0.50	5	0.04	0.04	0.04
0.75	5	0.04	0.04	0.04
1.00	10	0.06	0.08	0.08
1.25	10	0.06	0.08	0.08
1.50	10	0.06	0.06	0.06
1.75	10	0.06	0.06	0.06
2.00	15	0.1	0.12	0.1
3.00	20	0.16	0.18	0.08
4.00	25	0.14	0.18	0.1
5.00	30	0.18	0.22	0.14
6.00	35	0.2	0.3	0.16
7.00	40	0.24	0.42	0.2
8.00	45	0.3	0.54	0.25
9.00	50	0.38	0.62	0.32
10.00	50	0.35	0.6	0.36
11.00	50	0.32	0.59	0.34
12.00	50	0.32	0.56	0.34
13.00	50	0.3	0.52	0.34
14.00	50	0.3	0.52	0.32
15.00	50	0.29	0.52	0.3
16.00	50	0.3	0.48	0.3
17.00	50	0.3	0.45	0.3
18.00	50	0.28	0.4	0.3
19.00	50	0.28	0.4	0.28
20.00				
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5.0 kV; SECS		0.23	0.22	0.23
SHIELD RESIST.- OHMS				
INSULATION RESISTANCE		2,000,000	2,000,000	200,000
		MEGOHMS @ 5.0 kVDC		



COMMENTS : _____
 DEFICIENCIES & RECOMMENDATIONS: _____

EQPT. INVENTORY NO. _____ TESTED BY: Fisher, Eric

University of Kentucky New Infrastructure Project

Kelly Building Test Results



2412 Palumbo Dr.
Lexington, KY 40509
(859) 410-7810



BOSTON
508/668-9205
508/668-2142 FAX

CHICAGO
847/228-9595
847/228-9094 FAX

CINCINNATI
859/371-5355
859/371-5399 FAX

CLEVELAND
440/951-2706
440/951-6798 FAX

COLUMBUS
614/410-8484
614/410-8500 FAX

CONNECTICUT
203/949-2650
203/949-2646 FAX

DAYTON
937/278-0811
937/278-7791 FAX

DETROIT
734/524-0409
734/524-0410 FAX

INDIANAPOLIS
317/322-2055
317/322-2056 FAX

MILWAUKEE
262/784-3660
262/784-5124 FAX

NEW YORK
718/239-0359

PHILADELPHIA
215/208-1609
215/579-0830 FAX

PITTSBURGH
412/747-0550
412/747-0554 FAX



CHARTER MEMBER

June 30, 2014

Ready Electric
3300 Gilmore Industrial Blvd.
Louisville, Kentucky 40213

ATTENTION: Mr. Billy VanBuren (billyv@readyelec.com)

SUBJECT: Engineering Report
Cable Acceptance Testing
University of Kentucky
Project 3198831; Customer P.O. #84324

Dear Mr. VanBuren:

Enclosed is the Engineering Report detailing the project **High Voltage Maintenance** recently completed at the University of Kentucky. HVM is a full service independent testing company and appreciates the opportunity to provide your electrical maintenance, testing, and engineering services.

Our mission is to provide an independent technical service to enhance the safety, reliability, and efficiency of energy systems and provide a one-stop solution for quality energy services worldwide; from electrical commissioning and start up to large-scale operation and maintenance services. We will help you plan and execute projects efficiently and reduce project risk. We consolidate a vast array of engineering, consulting, monitoring, maintenance and professional services to dramatically improve the operational performance of industrial, commercial, and process customers.

Thank you for the opportunity to provide this service. If you have any questions, or we may be of further assistance, please call Brian Johnson at 859-421-6040.

Respectfully Submitted,

High Voltage Maintenance Division - Ohio Valley Area Service Center

RELIABILITY THROUGH ELECTRICAL TESTING, MAINTENANCE AND ENGINEERING SERVICES

ENGINEERING REPORT
Ready Electric
Cable Acceptance Testing
University of Kentucky

June 30, 2014

Project 3198831

SECTION 1 - PROJECT OVERVIEW

PROJECT SCOPE:

On June 20, 2014, *High Voltage Maintenance* performed acceptance testing on one (1) set of 15kV cable at the University of Kentucky.

Detailed inspection and test data collected during the execution of this project is contained in Section 2 - Equipment Test Data of this engineering report.

PURPOSE:

Acceptance testing is performed to aid in the detection of manufacturing and installation defects and deficiencies that could result in premature equipment failure. Test results are evaluated and compared to historical information of similar equipment and manufacturer recommendations. Test results identified as outside the normal acceptable range are noted in the appraisal section of this report.

PROCEDURE:

All testing is performed in accordance with HVM's standard procedures including, but not limited to, selected specifications from the following: InterNational Electrical Testing Association (NETA), National Electrical Code (NEC), National Fire Protection Association 70B-Electrical Equipment Maintenance (NFPA 70B), Institute of Electrical and Electronic Engineers (IEEE), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA), manufacturer's instruction manuals and/or project specifications, unless otherwise noted.

APPRAISAL AND RECOMMENDATIONS:

Based on the results of the inspections and tests performed, the equipment included in this project is considered acceptable for service.



CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST

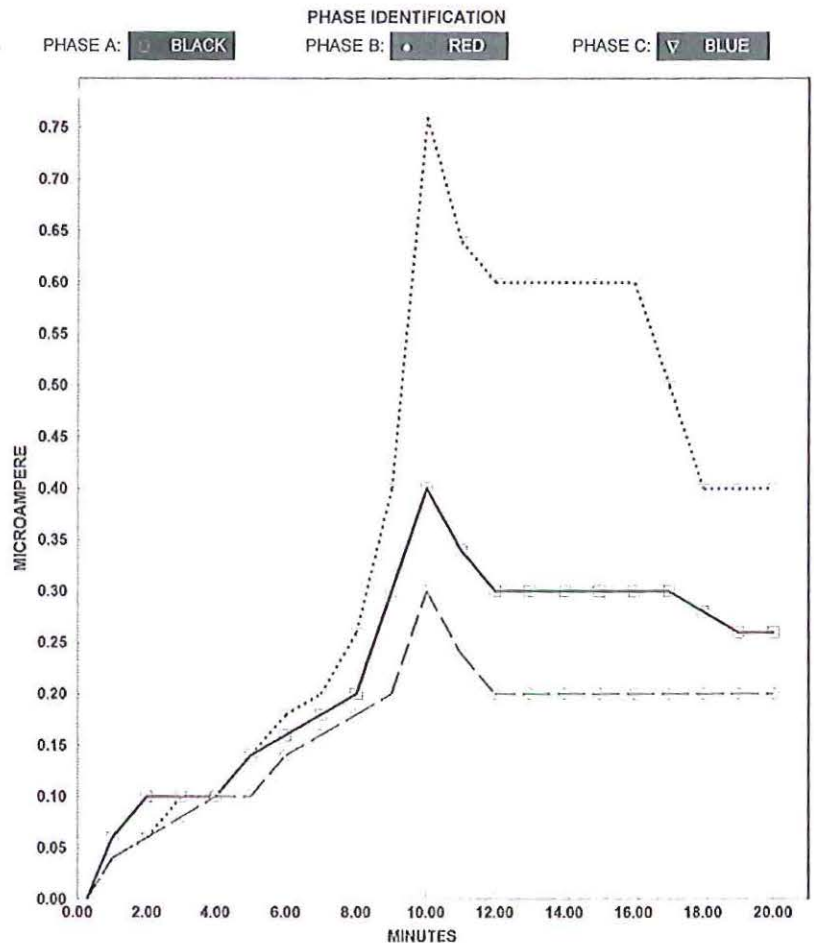
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 1
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3198831
 OWNER UNIVERSITY OF KENTUCKY; COOPER DAIRY BLDG - ROSE & HUGULET; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NEW
 DATE 6/20/2014 TEMPERATURE 39 °C HUMIDITY 49 % EQPT. LOCATION LEXINGTON, KY
 SUBSTATION KELLEY BUILDING EQUIPMENT I.D. KELLY BUILDING SWITCH

CABLE SOURCE KELLY BLDG SWITCH CABLE TERMINATION POINT MANHOLE 502-2
 OPERATING VOLTAGE 12.4 KV INSTALLED IN NON-METALLIC CONDUIT LENGTH 330 FT
 MANUFACTURER General Cable INSULATION TYPE XLP INSULATION THICKNESS 220 MILS
 SIZE 4/0 KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE NEW
 SPLICES : HAND TAPED COLD-SHRINK KIT HEAT-SHRINK KIT OTHER _____
 TERMINATIONS : AIR TERMINATIONS LOAD-BREAK ELBOWS DEAD-BREAK ELBOWS OTHER _____

CONNECTED EQUIPMENT NONE

TIME MINUTES	TEST VOLTAGE (kV)	PHASE A (µA) Field I.D. BROWN	PHASE B (µA) Field I.D. ORANGE	PHASE C (µA) Field I.D. YELLOW
0.25				
0.50				
0.75				
1.00	5	0.06	0.04	0.04
1.25				
1.50				
1.75				
2.00	10	0.1	0.06	0.06
3.00	15	0.1	0.08	0.1
4.00	20	0.1	0.1	0.1
5.00	25	0.14	0.1	0.14
6.00	30	0.16	0.14	0.18
7.00	35	0.18	0.16	0.2
8.00	40	0.2	0.18	0.26
9.00	45	0.3	0.2	0.4
10.00	50	0.4	0.3	0.76
11.00	50	0.34	0.24	0.64
12.00	50	0.3	0.2	0.6
13.00	50	0.3	0.2	0.6
14.00	50	0.3	0.2	0.6
15.00	50	0.3	0.2	0.6
16.00	50	0.3	0.2	0.6
17.00	50	0.3	0.2	0.5
18.00	50	0.28	0.2	0.4
19.00	50	0.26	0.2	0.4
20.00	50	0.26	0.2	0.4
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5.0 kV; SECS		3	3	4
SHIELD RESIST.- OHMS		0.6	0.7	0.6
INSULATION RESISTANCE		1,000,000	1,000,000	1,000,000
		MEGOHMS @ 5.0 KVDC		



COMMENTS :
DEFICIENCIES &
RECOMMENDATIONS:

CALIBRATED 06/30/2013

EQPT. INVENTORY NO. OH-152 OH-126

TESTED BY: SK DN

University of Kentucky New Infrastructure Project

Complete Test





BOSTON
508/668-9205
508/668-2142 FAX

CHICAGO
847/228-9595
847/228-9094 FAX

CINCINNATI
859/371-5355
859/371-5399 FAX

CLEVELAND
440/951-2706
440/951-6798 FAX

COLUMBUS
614/410-8484
614/410-8500 FAX

CONNECTICUT
203/949-2650
203/949-2646 FAX

DAYTON
937/278-0811
937/278-7791 FAX

DETROIT
734/524-0409
734/524-0410 FAX

INDIANAPOLIS
317/322-2055
317/322-2056 FAX

MILWAUKEE
262/784-3660
262/784-5124 FAX

NEW YORK
718/239-0359

PHILADELPHIA
215/208-1609
215/579-0830 FAX

PITTSBURGH
412/747-0550
412/747-0554 FAX



CHARTER MEMBER

January 5, 2015

Ready Electric
3300 Gilmore Industrial Blvd.
Louisville, Kentucky 40213

ATTENTION: Mr. Billy VanBuren (billyv@readyelec.com)

SUBJECT: Engineering Report
Cable Acceptance Testing
University of Kentucky
Project 3208347; Customer P.O. #87179

Dear Mr. VanBuren:

Enclosed is the Engineering Report detailing the project **High Voltage Maintenance** recently completed at the University of Kentucky. HVM is a full service independent testing company and appreciates the opportunity to provide your electrical maintenance, testing, and engineering services.

Our mission is to provide an independent technical service to enhance the safety, reliability, and efficiency of energy systems and provide a one-stop solution for quality energy services worldwide; from electrical commissioning and start up to large-scale operation and maintenance services. We will help you plan and execute projects efficiently and reduce project risk. We consolidate a vast array of engineering, consulting, monitoring, maintenance and professional services to dramatically improve the operational performance of industrial, commercial, and process customers.

Thank you for the opportunity to provide this service. If you have any questions, or we may be of further assistance, please call Brian Johnson at 859-421-6040.

Respectfully Submitted,

High Voltage Maintenance Division - Ohio Valley Area Service Center

RELIABILITY THROUGH ELECTRICAL TESTING, MAINTENANCE AND ENGINEERING SERVICES

ENGINEERING REPORT
Ready Electric
Cable Acceptance Testing
University of Kentucky

January 5, 2015

Project 3208347

SECTION 1 - PROJECT OVERVIEW

PROJECT SCOPE:

On December 12, 2014, *High Voltage Maintenance* performed acceptance testing on two (2) sets of 15kV cable at the University of Kentucky.

A listing of equipment included in this project including detailed inspection and test data is contained in the Equipment Test Reports following this engineering report.

PURPOSE:

Acceptance testing is performed to aid in the detection of manufacturing and installation defects and deficiencies that could result in premature equipment failure. Test results are evaluated and compared to historical information of similar equipment and manufacturer recommendations. Test results identified as outside the normal acceptable range are noted in the appraisal section of this report.

PROCEDURE:

All testing is performed in accordance with HVM's standard procedures including, but not limited to, selected specifications from the following: InterNational Electrical Testing Association (NETA), National Electrical Code (NEC), National Fire Protection Association 70B-Electrical Equipment Maintenance (NFPA 70B), Institute of Electrical and Electronic Engineers (IEEE), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA), manufacturer's instruction manuals and/or project specifications, unless otherwise noted.

APPRAISAL AND RECOMMENDATIONS:

Based on the results of the inspections and tests performed, the equipment included in this project is considered acceptable for service.



Table of Contents

Job # 3208347

High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

PAGE 1

CUSTOMER READY ELECTRIC
ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3208347
OWNER UNIVERSITY OF KENTUCKY; LIMESTONE & COOPER; LEXINGTON KY
LOCATION/PLANT LEXINGTON, KY

SUBSTATION EQUIPMENT IDENTIFICATION	DATA TEST FORM EQUIPMENT LOCATION	TEST DATA PAGE #
SUBSTATION #3 ADDITION 3-20	13300 - CABLE INSULATION RESISTANCE AND HIGH POTEI SUBSTATION 3	1
SUBSTATION #3 ADDITION 3-21	13300 - CABLE INSULATION RESISTANCE AND HIGH POTEI SUBSTATION 3	2



Comments Summary

Job # 3208347

High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

PAGE 1

CUSTOMER READY ELECTRIC
ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214
OWNER UNIVERSITY OF KENTUCKY; LIMESTONE & COOPER; LEXINGTON KY
LOCATION/PLANT LEXINGTON, KY

JOB # 3208347

Substation: SUBSTATION #3 ADDITION Page: 1
Equipment I.D.: 3-20 Date: 12/12/2014
Equipment: 13300 - CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST (2)

COMMENTS:

Test voltage taken to 50kV DC, requested by UK representative.

Substation: SUBSTATION #3 ADDITION Page: 2
Equipment I.D.: 3-21 Date: 12/12/2014
Equipment: 13300 - CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST

COMMENTS:

Test voltage taken to 50kV DC, requested by UK representative.



CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST

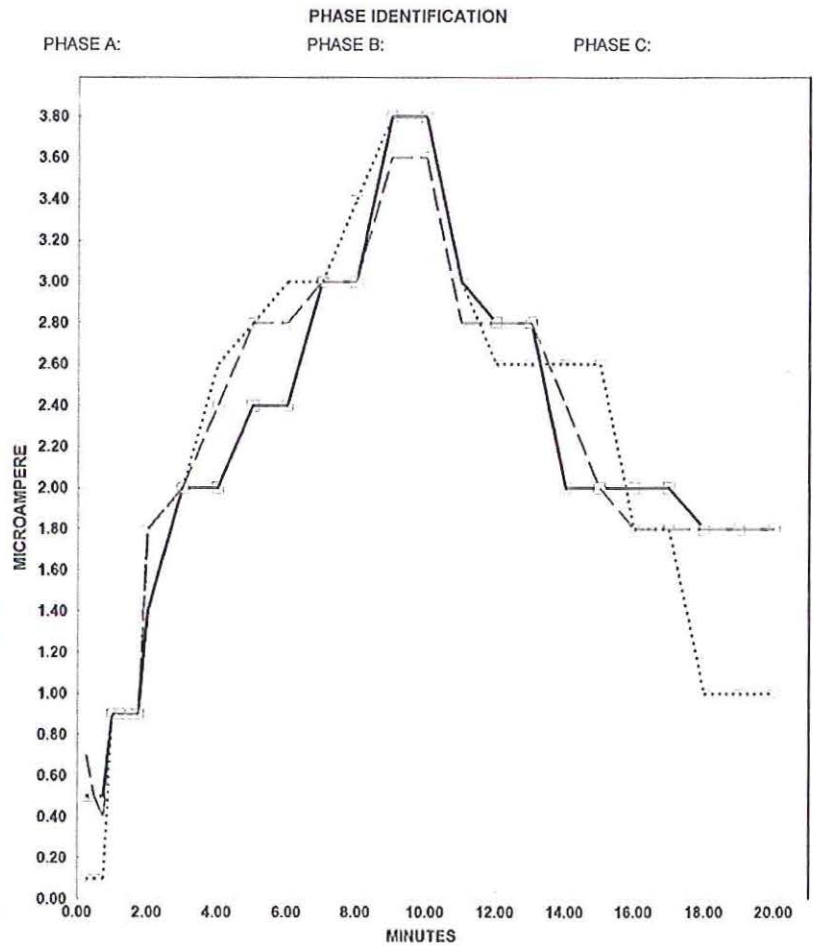
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 1
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3208347
 OWNER UNIVERSITY OF KENTUCKY; LIMESTONE & COOPER; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NA
 DATE 12/12/2014 TEMPERATURE 12 °C HUMIDITY 31 % EQPT. LOCATION SUBSTATION 3
 SUBSTATION SUBSTATION #3 ADDITION EQUIPMENT I.D. 3-20

CABLE SOURCE SUBSTATION 3 3-20 CABLE TERMINATION POINT MAN HOLE 16
 OPERATING VOLTAGE 12470 KV INSTALLED IN METALLIC CONDUIT LENGTH 6,000 FT
 MANUFACTURER General Cable INSULATION TYPE EPR INSULATION THICKNESS 220 MILS
 SIZE 500 KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE _____
 SPLICES : HAND TAPED COLD-SHRINK KIT HEAT-SHRINK KIT OTHER _____
 TERMINATIONS : AIR TERMINATIONS LOAD-BREAK ELBOWS DEAD-BREAK ELBOWS OTHER _____

CONNECTED EQUIPMENT visa breaks

TIME MINUTES	TEST VOLTAGE (KV)	PHASE A (µA) Field I.D. BROWN	PHASE B (µA) Field I.D. ORANGE	PHASE C (µA) Field I.D. YELLOW
0.25	5	0.5	0.7	0.1
0.50	5	0.5	0.5	0.1
0.75	5	0.5	0.4	0.1
1.00	10	0.9	0.9	0.9
1.25	10	0.9	0.9	0.9
1.50	10	0.9	0.9	0.9
1.75	10	0.9	0.9	0.9
2.00	15	1.4	1.8	1.8
3.00	20	2	2	2
4.00	25	2	2.4	2.6
5.00	30	2.4	2.8	2.8
6.00	35	2.4	2.8	3
7.00	40	3	3	3
8.00	45	3	3	3.4
9.00	50	3.8	3.6	3.8
10.00	50	3.8	3.6	3.8
11.00	50	3	2.8	3
12.00	50	2.8	2.8	2.6
13.00	50	2.8	2.8	2.6
14.00	50	2	2.4	2.6
15.00	50	2	2	2.6
16.00	50	2	1.8	1.8
17.00	50	2	1.8	1.8
18.00	50	1.8	1.8	1
19.00	50	1.8	1.8	1
20.00	50	1.8	1.8	1
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5.0 KV; SECS		330	365	358
SHIELD RESIST.- OHMS				
INSULATION RESISTANCE		500,000	500,000	500,000
		MEGOHMS @ 5.0 KVDC		



COMMENTS : Test voltage taken to 50kV DC, requested by UK representative.
 DEFICIENCIES & RECOMMENDATIONS: _____

EQPT. INVENTORY NO. OH150 TESTED BY: Newsome, Donnie



CABLE INSULATION RESISTANCE AND HIGH POTENTIAL TEST

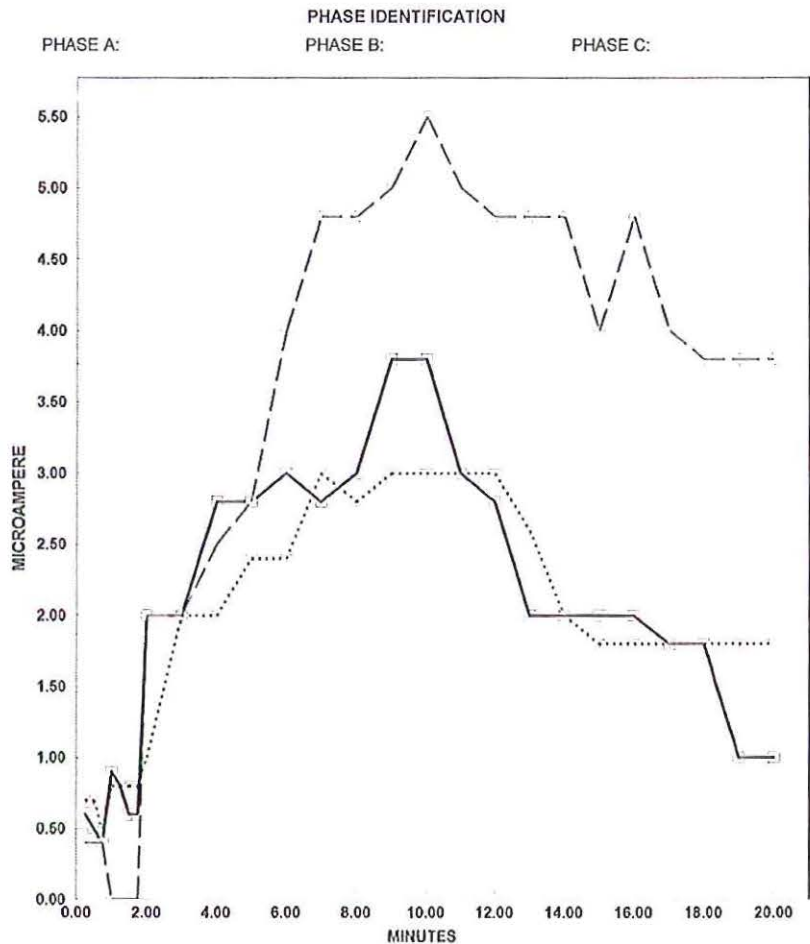
High Voltage Maintenance
Ohio Valley Area Service Center
5100 Energy Drive
Dayton, OH 45414
Phone 937-278-0811

CUSTOMER READY ELECTRIC PAGE 2
 ADDRESS 3300 GILMORE INDUSTRIAL BLVD; LOUISVILLE KY 40214 JOB # 3208347
 OWNER UNIVERSITY OF KENTUCKY; LIMESTONE & COOPER; LEXINGTON KY
 LOCATION/PLANT LEXINGTON, KY DATE LAST INSPECTION NA
 DATE 12/12/2014 TEMPERATURE 12 °C HUMIDITY 31 % EQPT. LOCATION SUBSTATION 3
 SUBSTATION SUBSTATION #3 ADDITION EQUIPMENT I.D. 3-21

CABLE SOURCE SUBSTATION 3 3-21 CABLE TERMINATION POINT MAN HOLE 16
 OPERATING VOLTAGE 12470 KV INSTALLED IN METALLIC CONDUIT LENGTH 6,000 FT
 MANUFACTURER General Cable INSULATION TYPE EPR INSULATION THICKNESS 220 MILS
 SIZE 500 KCMIL NO. OF CONDUCTORS 1CX3 CONDUCTOR MATERIAL COPPER
 RATED VOLTAGE 15 KV GROUNDED UNGROUNDED BELTED SHIELDED AGE _____
 SPLICES : HAND TAPED COLD-SHRINK KIT HEAT-SHRINK KIT OTHER _____
 TERMINATIONS : AIR TERMINATIONS LOAD-BREAK ELBOWS DEAD-BREAK ELBOWS OTHER _____

CONNECTED EQUIPMENT NONE

TIME MINUTES	TEST VOLTAGE (KV)	PHASE A (µA) Field I.D. BROWN	PHASE B (µA) Field I.D. ORANGE	PHASE C (µA) Field I.D. YELLOW
0.25	5	0.6	0.4	0.7
0.50	5	0.5	0.4	0.7
0.75	5	0.4	0.4	0.5
1.00	10	0.9	0	0.8
1.25	10	0.8	0	0.8
1.50	10	0.6	0	0.8
1.75	10	0.6	0	0.8
2.00	15	2	2	1
3.00	20	2	2	2
4.00	25	2.8	2.5	2
5.00	30	2.8	2.8	2.4
6.00	35	3	4	2.4
7.00	40	2.8	4.8	3
8.00	45	3	4.8	2.8
9.00	50	3.8	5	3
10.00	50	3.8	5.5	3
11.00	50	3	5	3
12.00	50	2.8	4.8	3
13.00	50	2	4.8	2.6
14.00	50	2	4.8	2
15.00	50	2	4	1.8
16.00	50	2	4.8	1.8
17.00	50	1.8	4	1.8
18.00	50	1.8	3.8	1.8
19.00	50	1	3.8	1.8
20.00	50	1	3.8	1.8
21.00				
22.00				
23.00				
24.00				
25.00				
DECAY TO 5.0 kV; SECS		347	360	300
SHIELD RESIST.- OHMS				
INSULATION RESISTANCE		500,000	500,000	500,000
		MEGOHMS @ 5.0 kVDC		



COMMENTS :
DEFICIENCIES &
RECOMMENDATIONS:

Test voltage taken to 50kV DC, requested by UK representative.

EQPT. INVENTORY NO. OH150

TESTED BY: Newsome, Donnie

Certificate of Calibration

Active: Yes

Client: 2076
 : High Voltage Maintenance
 :
 : 5100 Energy Drive
 : Dayton
 : OH : 45414

Instrument ID: OH-150
 Page: 1 of 1
 Work Order: 29058
 Calibration Date: 7/30/2014
 Date Cert. Issued: 7/31/2014
 Calibration Due Date: 7/31/2015

Work Sheet: E113A
 Type: HI-Pot Tester
 Serial Number: 1223
 Temperature: 71 DEG. F.
 Calibration Status Received: Pass
 Calibration Performed At: Client Facility
 Traceable Certificate No.: 00012271

Procedure: E113a
 Size/Model: High Voltage PTS-80
 Resolution: Analog
 Humidity: 60 % RH
 Calibration Status Returned: Pass
 Type of Calibration: Traceable
 Tolerance Description: +/-1 Division

Rev: 0

Measurement of Uncertainty:

Uncertainty of measurement is expressed at approximately a 95% confidence level utilizing a K-Factor of 2.

Comments:

Client Comments 1:

CTPM Gage No.	CTPM Traceable No.	CTPM Cal Due Date
: 0723	: RS100608	: 4/30/2015
: 0587	: RM100575	: 10/31/2015

Calibrated by Technician: David Simmons
 Certificate Issued by: Taml Sammons

All calibrations are traceable to the International system of units (SI) through National (NIST) or International Standards. Calibrations are performed in accordance with Documented CTPM Procedures. The results shown relate only to the item calibrated and are considered raw data and are not adjusted for uncertainty of measurement or other factors. CTPM offers no opinions or recommendations beyond the reporting of Pass or Fail tolerance conditions. CTPM offers no statements, opinions or recommendations of compliance relating to this equipment by the end user. This certificate may not be reproduced except in full without the written permission of CTPM.

Criteria Certified	Unit of Measure	Nominal	Instrument as Found	Tolerance
Voltage	kVDC	5	4.850	+/-1
Voltage	kVDC	10	9.824	+/-1
Voltage	kVDC	20	19.773	+/-1
Voltage	kVDC	30	29.735	+/-1

Form CTPM/CAL 7/11/2013

6000 Webster Street
 Dayton, OH 45414
 (866) 739-1077

