TECHNICAL SPECIFICATION

SUBSTATION PREFERRED EQUIPMENT

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00	Issued for Review	JWF	10-12-2018
01	Revised	JWF	11-09-2018
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08	Revised	ARG	09-23-2022
09	Revised	ARG	12-05-2022

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1. GENERAL

1.1. SCOPE

1.1.1. This document details preferred equipment requirements, specifications, and manufacturers that shall be used in AES Indiana (AES-IN) substations. It is the responsibility of the contractor(s) to verify these items meet or exceed the requirements for each specific application. Any discrepancies found within this document shall be reported to AES-IN Substation Engineering for clarification.

1.1.2. Any deviations from this list shall be approved by AES-IN Substation Engineering.

2. SUBSTATION HIGH VOLTAGE CIRCUIT BREAKERS

2.1. 345kV MEPPI Breaker Independent Pole Operation (IPO)

2.1.1. Mitsubishi Electric Breaker Type: 300-SFMT-63HK

2.1.2. Ratings: 362 kV, 4000 A, 63 kA with nearby capacitance

2.1.3. Close Coil Voltage: 90 to 140 VDC

2.1.4. Trip Coil Voltage: 70 to 140 VDC

2.1.5. Motor Control Voltage: 208 to 254 VAC

2.1.6. Current Transformers: 5 sets, 3000/5, C800, TRF = 2.0

2.1.7. AC Input Voltage: 1-PH, 240 VAC, 60 Hz

2.1.8. Similar to MEPPI SO# SG000110630002.

2.1.9. Approval Drawings & Certified Drawings required. Certified Drawings shall be provided in AutoCAD format.

2.2. 345kV MEPPI Gang-Operated Circuit Breaker

2.2.1. Mitsubishi Electric Breaker Type: 300-SFMT-63HF

2.2.2. Ratings: 362 kV, 3000 A, 63 kA with nearby capacitance

2.2.3. Close Coil Voltage: 90 to 140 VDC

2.2.4. Trip Coil Voltage: 70 to 140 VDC

2.2.5. Motor Control Voltage: 208 to 254 VAC

2.2.6. Current Transformers: 5 sets, 3000/5, C800, TRF = 2.0

2.2.7. AC Input Voltage: 1-PH, 240 VAC, 60 Hz

2.2.8. Similar to MEPPI SO# SG000092580001 with the following additions:

2.2.8.1. Provide a ground option of a ½" silicon bronze bolt that extends thru the control cabinet to connect to an external ground conductor provided by the customer during installation. This bolt shall connect to the ground bus within the control cabinet.

2.2.8.2. Provide a plastic cover for the terminal blocks for the incoming AC power connection.

2.2.9. Approval Drawings & Certified Drawings required. Certified Drawings shall be provided in AutoCAD format.

2.3. 145kV MEPPI Gang-Operated Circuit Breaker

2.3.1. Mitsubishi Electric Breaker Type: 120-SFMT-63HJ

2.3.2. Ratings: 145 kV, 3000 A, 63 kA with nearby capacitance

2.3.3. Close Coil Voltage: 90 to 140 VDC

2.3.4. Trip Coil Voltage: 70 to 140 VDC

2.3.5. Motor Control Voltage: 104 to 127 VAC

2.3.6. Current Transformers: 5 sets, 2000/5, C800, TRF = 2.0

2.3.7. AC Input Voltage: 1-PH, 240 VAC, 60 Hz or 1-PH, 120 VAC, 60 Hz

2.3.8. Similar to MEPPI SO# SG000112200001.

2.3.9. Approval Drawings & Certified Drawings required. Certified Drawings shall be provided in AutoCAD format.

2.4. 38kV Siemens Gang-Operated AC High Voltage Circuit Breaker

2.4.1. Siemens Breaker Type: SDV7-SE with Type VS-30041 Interrupter

2.4.2. Ratings: 38 kV, 1200 A, 31.5 kA

2.4.3. Close Coil Voltage: 90 to 140 VDC

2.4.4. Trip Coil Voltage: 70 to 140 VDC

2.4.5. Motor Control Voltage: 208 to 254 VAC

2.4.6. Current Transformers: 2 sets, 1200/5, C800, TRF = 2.0 (1 set per phase per side)

2.4.7. AC Input Voltage: 1-PH, 240 VAC, 60 Hz or 1-PH, 120 VAC, 60 Hz

2.4.8. Similar to Siemens Sales Order No. 3009112936.

2.4.9. Approval Drawings & Certified Drawings required. Certified Drawings shall be provided in AutoCAD format.

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3. BUS MATERIAL

3.1. 345/138kV Bus Material

3.1.1. 6063-T6, Schedule 40 Aluminum Tube

3.1.2. Utilize external Alcoa Bus Dampeners. Dampening cable is not acceptable.

3.1.3. Bus rating and bus size will be project specific. Typically, 4” bus will be the acceptable minimum.

3.1.4. Bus ‘A’ Frames will consist of 2-1/2” bus.

3.2. 345/138kV Bus Fittings

3.2.1. Bus – Welded

3.2.2. Wire – Compression

3.3. 138kV Bus to Breaker Connections

3.3.1. 3000 kcmil AAC “Trillium” 1 per phase

3.3.2. Or 1750 kcmil AAC “Jessamine” 2 per phase with 8” spacing

3.4. 138kV Bus to CCPD Connections

3.4.1. 397.5 kcmil AAC “Canna”

3.5. 138kV Bus to Arrester Connections

3.5.1. 954 kcmil ACSR “Rail”

3.5.2. Or application specific

3.6. 345kV Bus to CCPD Connections

3.6.1. 795 kcmil AAC “Arbutus”

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4. STATION POST INSULATORS

4.1. 345kV SYSTEM

4.1.1. Basic Impulse Level (BIL): 1300 kV

4.1.2. Leakage Distance: 231”

4.1.3. Impulse Flashover: 1410 kVp

4.1.4. Cantilever Strength: Application Specific

4.1.4.1. Standard Strength: TR-324

4.1.4.2. High Strength: TR-367

4.1.4.3. Extra High Strength: TR-369

4.1.5. Material: Porcelain

4.1.6. Color: Gray

4.1.7. Height: 106”

4.1.8. Bolt Circle: 5” or 7”, Application Specific

4.1.9. Type: Tapered or Uniform, Application Specific

4.1.10. Manufacturer: Lapp 315324-70 (TR-324), Lapp 315367-70 (TR-367), Lapp 315369-70 (TR-369), or equivalent.

4.2. 138kV SYSTEM

4.2.1. Basic Impulse Level (BIL): 650 kV

4.2.2. Leakage Distance: 116”

4.2.3. Impulse Flashover: 710 kVp

4.2.4. Cantilever Strength: Application Specific

4.2.4.1. Standard Strength: TR-288

4.2.4.2. High Strength: TR-289

4.2.5. Material: Porcelain

4.2.6. Color: Gray

4.2.7. Height: 54”

4.2.8. Bolt Circle: 5”

4.2.9. Manufacturer: Lapp 315288-70 (TR-288), Lapp 315289-70 (TR-289), or equivalent.

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4.3. 34.5kV SYSTEM

4.3.1. Basic Impulse Level (BIL): 200 kV

4.3.2. Leakage Distance: 37”

4.3.3. Impulse Flashover: 225 kVp

4.3.4. Cantilever Strength: Application Specific

4.3.4.1. Standard Strength: TR-210

4.3.4.2. High Strength: TR-231

4.3.5. Material: Porcelain

4.3.6. Color: Gray

4.3.7. Height: 18”

4.3.8. Bolt Circle: Application Specific

4.3.9. Manufacturer: Lapp 315210-70 (TR-210), Lapp 315231-70 (TR-231), or equivalent.

4.4. 13.8kV SYSTEM

4.4.1. Basic Impulse Level (BIL): 110 kV

4.4.2. Leakage Distance: 10.5”

4.4.3. Impulse Flashover: 105 kVp

4.4.4. Cantilever Strength: Application Specific

4.4.4.1. Standard Strength: TR-205

4.4.5. Material: Porcelain

4.4.6. Color: Gray

4.4.7. Height: 7.5”

4.4.8. Bolt Circle: 3”

4.4.9. Manufacturer: Lapp 315205-70 (TR-205) or equivalent.

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5. COUPLING CAPACITANCE VOLTAGE TRANSFORMER/POTENTIAL DEVICE (CCVT/CCPD) EQUIPMENT

5.1. 345kV SYSTEM CCVT/CCPD

5.1.1. Maximum Operating Voltage (P-P): 362 kV

5.1.2. Maximum Operating Voltage (P-G): 209 kV

5.1.3. Nominal System Voltage (P-P): 345 kV

5.1.4. Nominal System Voltage (P-G): 199 kV

5.1.5. Primary Rated Voltage: 207 kV

5.1.6. Basic Impulse Level (BIL): 1550 kV

5.1.7. Total Capacitance (nominal): 2150 pF

5.1.8. Minimum Creepage Distance: 341”

5.1.9. Ratio Secondary Voltage: 1800/3000:1, 1800/3000:1, 115 & 69 V

5.1.10. Thermal Rating: 1000 VA

5.1.11. Main Winding Filter: Ferroresonance Suppression

5.1.12. Potential Grounding Switch: Yes

5.1.13. Carrier Accessories: No, unless needed for carrier application.

5.1.14. High Voltage Terminal: 4-hole NEMA pad

5.1.15. Base/Tank Material: Aluminum or Stainless Steel

5.1.16. All CCPD’s shall be single-phase type with two (2) secondary windings.

5.1.17. Accuracy class and burden for the X and Y windings shall be 0.6 M, W, X, Y, Z.

5.1.18. Bushings shall be porcelain and gray in color.

5.1.19. Notes:

5.1.19.1. Three (3) Copies of instruction manuals shall be provided.

5.1.19.2. The following drawings are required for approval: Nameplate, Outline, Schematic & Wiring Diagrams

5.1.20. Manufacturers:

5.1.20.1. Preferred: Trench TEVF362

5.1.20.2. Alternate: GE Grid Solutions OTCF362.SI

5.2. 138kV SYSTEM CCVT/CCPD

5.2.1. Maximum Operating Voltage (P-P): 145 kV

5.2.2. Maximum Operating Voltage (P-G): 84 kV

5.2.3. Nominal System Voltage (P-P): 138 kV

5.2.4. Nominal System Voltage (P-G): 80 kV

5.2.5. Primary Rated Voltage: 80.5 kV

5.2.6. Basic Impulse Level (BIL): 650 kV

5.2.7. Total Capacitance (nominal): 5000 pF – 6250 pF

5.2.7.1. Note: To achieve 0.3 MWXYZ, GE CCVT's are rated at 8300 pF.

5.2.8. Minimum Creepage Distance: 140"

5.2.9. Ratio Secondary Voltage: 700/1200:1, 700/1200:1, 115 & 67.08 V

5.2.10. Thermal Rating: 1000 VA

5.2.11. Main Winding Filter: Ferroresonance Suppression

5.2.12. Potential Grounding Switch: Yes

5.2.13. Carrier Accessories: No, unless needed for carrier application.

5.2.14. High Voltage Terminal: 4-hole NEMA pad

5.2.15. Base/Tank Material: Aluminum or Stainless Steel

5.2.16. All CCPD's shall be single-phase type with two (2) secondary windings.

5.2.17. Accuracy class and burden for the X and Y windings shall be 0.3 M, W, X, Y, Z.

5.2.18. Bushings shall be porcelain and gray in color.

5.2.19. Notes:

5.2.19.1. Three (3) Copies of instruction manuals shall be provided.

5.2.19.2. The following drawings are required for approval: Nameplate, Outline, Schematic & Wiring Diagrams

5.2.20. Manufacturers:

5.2.20.1. Preferred: Trench TEMF145

5.2.20.2. Alternate: GE Grid Solutions OTCF145.SM

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5.3. 345kV or 138kV SYSTEM CCVT/CCPD ISOLATION SWITCH

5.3.1. Typical Use: Isolation switch for CCVT/CCPD V and E voltages.

5.3.2. Test Switch, 7 Pole, Front Connected

5.3.3. Switch Elements: P P P N P P P with barriers

5.3.4. Handle Colors: Black, Green, Red, NA, Orange, White/Black, Blue

5.3.5. Molded Base, Front Connected, Tin Plated

5.3.6. Manufacturers:

5.3.6.1. Preferred: Durham Company MP1760F-7774 (#1-1760F-30)

5.3.6.2. Alternate: ABB FT1 P/N CF991A46GG01

5.3.6.2.1. Note: The handle colors on the ABB test switch are Black, Green, Red, NA, Orange, White, Blue. A piece of black tape is to be affixed to the White handle to correspond to White/Black.

5.4. 345kV or 138kV SYSTEM CCVT/CCPD ISOLATION SWITCH ENCLSOURE

5.4.1. Aluminum, NEMA 4X, 20”H X 20”W X 6”D

5.4.2. Manufacturer: Cooper B-Line 20206-4XA W/ AW2020AP aluminum panel

6. SURGE ARRESTERS

6.1. 345kV SYSTEM

6.1.1. Maximum Operating Voltage (P-P): 362 kV

6.1.2. Maximum Operating Voltage (P-G): 209 kV

6.1.3. Nominal System Voltage (P-P): 345 kV

6.1.4. Nominal System Voltage (P-G): 199 kV

6.1.5. MCOV: 220 kV

6.1.6. Duty Cycle Rating: 276 kV

6.1.7. Class: ANSI / Station

6.1.8. Housing: Gray Porcelain

6.1.9. Bolt Circle: 10”

6.1.10. Manufacturer: Hubbell/Ohio Brass Cat# MVN276GA220AA or ABB equivalent.

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6.2. 138kV SYSTEM

6.2.1. Maximum Operating Voltage (P-P): 145 kV rms

6.2.2. Maximum Operating Voltage (P-G): 84 kV rms

6.2.3. Nominal System Voltage (P-P): 138 kV rms

6.2.4. Nominal System Voltage (P-G): 80 kV rms

6.2.5. MCOV: 98 kV

6.2.6. Duty Cycle Rating: 120 kV

6.2.7. Class: ANSI / Station

6.2.8. Housing: Gray Porcelain

6.2.9. Bolt Circle: 10”

6.2.10. Manufacturer: Hubbell/Ohio Brass Cat# MVN120GA098AA or ABB equivalent.

6.3. 34.5kV SYSTEM

6.3.1. Maximum Operating Voltage (P-P): 38 kV

6.3.2. Maximum Operating Voltage (P-G): 21.9 kV

6.3.3. Nominal System Voltage (P-P): 34.5 kV

6.3.4. Nominal System Voltage (P-G): 19.9 kV

6.3.5. MCOV: 24.4 kV

6.3.6. Duty Cycle Rating: 30 kV

6.3.7. Class: ANSI / Station

6.3.8. Housing: Gray Porcelain

6.3.9. Bolt Circle: 10”

6.3.10. Manufacturer: Hubbell/Ohio Brass Cat# MVN030GA024AA or ABB equivalent.

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6.4. 13.8kV SYSTEM

6.4.1. Maximum Operating Voltage (P-P): 14.5 kV

6.4.2. Maximum Operating Voltage (P-G): 8.37 kV

6.4.3. Nominal System Voltage (P-P): 13.8 kV

6.4.4. Nominal System Voltage (P-G): 7.97 kV

6.4.5. MCOV: 10.2 kV

6.4.6. Duty Cycle Rating: 12 kV

6.4.7. Class: ANSI / Station

6.4.8. Housing: Gray Porcelain

6.4.9. Bolt Circle: 3”

6.4.10. Manufacturer: Hubbell/Ohio Brass Cat# 2195103001 or GE 9L11ZGA012S.

6.4.10.1. Note: Designs should consider phase-to-ground clearances for the tallest preferred option, as there is a difference in height.

7. DISCONNECT SWITCHES

7.1. 345kV SYSTEM

7.1.1. Maximum Operating Voltage: 362 kV

7.1.2. Nominal System Voltage (P-P): 345 kV

7.1.3. Continuous Current: 2000 A or application specific.

7.1.4. Momentary Current Rating: 120 kA

7.1.5. Basic Impulse Level (BIL): 1300 kV

7.1.6. Phase Spacing (Center to Center): Application Specific

7.1.7. Notes:

7.1.7.1. All 345kV Switches shall be double side break or application specific.

7.1.7.2. Switch mounting will be application specific.

7.1.7.3. Operating mechanism location will be application specific.

7.1.7.4. All operating pipe, operating pipe couplers, and guides shall be included for switches.

7.1.7.5. Surfaces that make and break contact shall be silver to silver.

7.1.7.6. Switch Insulators shall be porcelain ANSI 70 Gray (TR-367).

7.1.8. Manufacturers: Pascor Atlantic or Southern States

7.2. 138kV SYSTEM

7.2.1. Maximum Operating Voltage: 145 kV

7.2.2. Nominal System Voltage (P-P): 138 kV

7.2.3. Continuous Current: 2000 A or Application Specific

7.2.4. Momentary Current Rating: 100 kA

7.2.5. Basic Impulse Level (BIL): 650 kV

7.2.6. Phase Spacing (Center to Center): 8’-0” or Application Specific

7.2.7. Low Bus Terminal Pad Height: Application Specific

7.2.8. Notes:

7.2.8.1. Type of switch will be application specific.

7.2.8.2. All switches shall be group, manual worm gear operated.

7.2.8.3. Switch Insulators shall be porcelain ANSI 70 Gray.

7.2.8.4. All operating pipe, operating pipe couplers, and guides shall be included for switches.

7.2.8.5. Arcing horns shall be installed on all switches.

7.2.8.6. Live parts shall be aluminum.

7.2.8.7. Surfaces that make and break contact shall be silver to silver.

7.2.8.8. Switch mounting will be application specific.

7.2.8.9. Operating mechanism location will be application specific.

7.2.9. Manufacturers: Pascor Atlantic or Southern States

7.3. 345kV/138kV SYSTEM MOTOR OPERATORS

7.3.1. Motor operators shall operate at 240 VAC. Cabinet heater capable of being operated at 240 VAC shall be provided. Motor control shall be 125 VDC. MOD must be fitted with a decoupling device and be operable using a hand crank mechanism should the motor operator fail.

7.3.2. Manufacturers: Pascor Atlantic or Southern States

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7.4. 34.5kV SYSTEM

7.4.1. Maximum Operating Voltage: 38 kV

7.4.2. Nominal System Voltage (P-P): 34.5 kV

7.4.3. Continuous Current: 2000 A or application specific

7.4.4. Momentary Current Rating: 100 kA

7.4.5. Basic Impulse Level (BIL): 200 kV

7.4.6. Phase Spacing (Center to Center): Application Specific

7.4.7. Low Bus Terminal Pad Height: Application Specific

7.4.8. Notes:

7.4.8.1. Type of switch will be application specific.

7.4.8.2. All switches shall be group, manual operated.

7.4.8.3. Switch Insulators shall be porcelain ANSI 70 Gray.

7.4.8.4. All operating pipe, operating pipe couplers, and guides shall be included for switches.

7.4.8.5. Arcing horns shall be installed on all switches.

7.4.8.6. Live parts shall be aluminum.

7.4.8.7. Surfaces that make and break contact shall be silver to silver.

7.4.8.8. Switch mounting will be application specific.

7.4.8.9. Operating mechanism location will be application specific.

7.4.9. Manufacturer: Pascor Atlantic or Southern States

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8. FIELD CABLES (CT, CONTROL, DC, & AC)

8.1. COLOR CODE

8.1.1. Method 1, Table E-1

8.1.1.1. Conductor 1: Black

8.1.1.2. Conductor 2: White

8.1.1.3. Conductor 3: Red

8.1.1.4. Conductor 4: Green

8.1.1.5. Conductor 5: Orange

8.1.1.6. Conductor 6: Blue

8.1.1.7. Conductor 7: White with Black Stripe

8.1.1.8. Conductor 8: Red with Black Stripe

8.1.1.9. Conductor 9: Green with Black Stripe

8.1.1.10. Conductor 10: Orange with Black Stripe

8.1.1.11. Conductor 11: Blue with Black Stripe

8.1.1.12. Conductor 12: Black with White Stripe

8.2. 2 Conductor #10 Gauge Cable

8.2.1. Typical Use: DC Power Cable

8.2.2. AES Indiana Stock Number: 10.527.407 (1804-010)

8.2.3. Manufacturer Information: Lake Cable TPT102-HD

8.2.4. CABLE, 2 COND. #10 7 STRAND CU. 20 MIL. WALL HIGH MOLECULAR WEIGHT, POLYEHTYLENE, 10 MIL WALL POLYVINYL CHLORIDE OVER EACH CONDUTOR, METHOD 1 TABLE E-1 COLOR CODING MYLAR TAPE 45 MIL BLACK POLYVINYL CHLORIDGE JACKET OVERALL 600V

8.2.5. Color Code: Method 1, Table E-1

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8.3. 4 Conductor #9 Gauge Cable

8.3.1. Typical Use: CT or Single Winding CCVT Cable

8.3.2. AES Indiana Stock Number: 10.500.734 (1804-013)

8.3.3. Manufacturer Information: Lake Cable TPT94(19)-HD

8.3.4. CABLE, 4 COND. #9 19/22 STRAND CU. 20 MIL WALL HIGH MOL WT POLYETHYLENE 10 MIL WALL POLYVINYL CHLORIDE OVER EACH CONDUCTOR, PIGMENT COLOR CODED, MYLAR TAPE, 60 MIL BLACK POLYVINYL CHLORIDE JACKET 600V CONTROL CABLE, METHOD 1 TABLE E-1 COLOR CODING

8.3.5. Color Code: Method 1, Table E-1

8.4. 9 Conductor #9 Gauge Cable

8.4.1. Typical Use: 2 Winding CCVT Cable

8.4.2. AES Indiana Stock Number: 10.527.409 (1804-033)

8.4.3. Manufacturer Information: Lake Cable TPT99(19)-HD

8.4.4. CABLE, 9 COND. #9 19/22 STRAND CU., POLYETHYLENE 10 MIL WALL PLYVINYL CHLORIDE OVER EACH CONDUCTOR, PIGMENT COLOR CODED, MYLAR TAPE, 60 MIL BLACK POLYVINYL CHLORIDE JACKET 600V, CONTROL CABLE, METHOD 1 TABLE E-1 COLOR CODING

8.4.5. Color Code: Method 1, Table E-1

8.5. 12 Conductor #12 Gauge Cable

8.5.1. Typical Use: Breaker or Motor Operated Disconnect Cable

8.5.2. AES Indiana Stock Number: 10.507.186 (1804-021)

8.5.3. Manufacturer Information: Lake Cable TPT1212-HD

8.5.4. CABLE, 12 COND. #12 7 STRAND CU. MIL WALL HIGH MOL. WT. POLYEHTYLENE 10 MIL WALL POLYVINYL CHLORIDE OVER EACH COND. PIGMENT COLOR CODED, MYLAR TAPE, 60 MIL BLACK POLYVINYL CHLORIDE JACKET 600V CONTROL CABLE, METHOD 1 TABLE E-1 COLOR CODING

8.5.5. Color Code: Method 1, Table E-1

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8.6. 1 Conductor #6 Gauge Cable

8.6.1. Typical Use: DC Power Cable

8.6.2. AES Indiana Stock Number: 10.507.191 (1803-500)

8.6.3. Manufacturer Information: Anixter 3B-0601-02

8.6.4. CABLE, POWER, 600V, 1/C COPPER #6, 7 STR COATED COPPER 45 MIL EPR INSULATION 30 MIL NEOPRENE JACKET OR BARE COPPER 60 MIL XLPE INSULATION PER LATEST AEIC AND IPCEA SPEC, SURFACE MARKED SIZE, VOLTAGE, TYPE, & MFG

8.7. 2 Conductor #6 Gauge Cable

8.7.1. Type Use: DC Power Cable

8.7.2. AES Indiana Stock Number: N/A

8.7.3. Manufacturer Information: Lake Cable TPT62-HD

8.7.4. 6 AWG 2 CONDUCTOR 7 STRAND BARE COPPER WITH HDPE AND PVC INSULATION, UNSHIELDED WITH AN OVERALL PVC JACKET 600V CABLE, APPROVED FOR USE IN CIRCUITS RATED 600V, 75-DEGREE C

8.7.5. Color Code: Method 1, Table E-1

8.8. 3 Conductor #6 Gauge Cable

8.8.1. Typical Use: AC Power Cable

8.8.2. AES Indiana Stock Number: N/A

8.8.3. Manufacturer Information: Lake Cable TPT63-HD

8.8.4. 6 AWG 3 CONDUCTOR 7 STRAND BARE COPPER WITH HDPE AND PVC INSULATION, UNSHIELDED WITH AN OVERALL PVC JACKET, 600V CABLE, APPROVED FOR USE IN CIRCUITS RATED 600V, 75-DEGREE C

8.8.5. Color Code: Method 1, Table E-1

8.9. Single Conductor Wire #14 to 1000 kcmil

8.9.1. Typical Use: AC or DC Power

8.9.2. Manufacturer Information: Okonite X-Olene Type XHHW-2

8.9.3. 600/1000V Power Control, Copper Conductor, 90°C Wet or Dry, Sunlight Resistant

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9. FIELD CABLE AND PANEL WIRING TERMINATING LUGS

9.1. TERMINATING LUGS

9.1.1. All terminations shall be made using a ratcheting crimp tool (3M Type TR-482, Tetra-Crimp 59824-1, or equivalent).

9.1.2. All 4/C #9 and 9/C #9 current transformer (CT) and potential transformer (PT) field cables shall be terminated on both ends using the following uninsulated lug.

9.1.2.1. Burndy YAV10H

9.1.2.1.1. Description: Copper Compression Lug, Heavy Duty, Ring Tongue with Shroud, 1 Hole with Inspection Hole, 12-10 AWG, #8-#10 Stud, Short Barrel, Tin Plated

9.1.3. All other #10 or #12 field cables and inter-panel wiring shall be terminated on both ends using the following insulated lug.

9.1.3.1. TE AMP 35109

9.1.3.1.1. Description: AMP, Terminal, Ring Tongue, 12-10 AWG, Yellow, Stud Size 10

9.1.4. All other cables and wiring requiring different size terminations larger than #10 should use the following termination lugs.

9.1.4.1. Burndy YAV2CL, YAV4CL, YAV6CL, or YAV8CL

9.1.4.1.1. Description: Copper Compression Lug, Ring Tongue with Inspection Hole, 1-Hole, Short Barrel, Tin Plated

10. FIBER OPTIC EQUIPMENT

10.1. FIBER OPTIC CABLES

10.1.1. 48-Fiber Count Single Mode ADSS

10.1.1.1. AES Indiana Stock Number: 10.585.241

10.1.1.1.1. Approved Manufacturers:

10.1.1.1.1.1. AFL DNA-32952

10.1.1.1.1.2. Prysmian F-ADES1255-12-ES-048-E3

10.1.2. 12-Fiber Count Multi-Mode, 62.5 µm (OM1)

10.1.2.1. Approved Manufacturers: Corning 012KU4-T4730D20

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10.2. DEAD END STRUCTURE SPLICE ENCLOSURE

10.2.1. FOSC450 D6 Fiber Optic Splice Closure, Gel Cable Sealing, Once Pre-Installed 72-Splice Tray, 6 Cable Attachments, 6 Ground Feed Through Lugs, With Test Valve

10.2.2. Manufacturer: CommScope FOSC450-D6-6-72-1-D6V with CommScope FOSC-ACC-WALL/POLE-MOUNT

10.3. CLOSET CONNECTOR AND SPLICE HOUSINGS (PATCH PANELS)

10.3.1. 19” Rack Mounted, 3 Rack Unit, Closet Connector and Splice Housing

10.3.1.1. Typical Use: Control House Fiber Optic Patch Panel

10.3.1.2. AES Indiana Stock Number: 10.527.686 (1703-713)

10.3.1.3. Manufacturer: Corning CCS-03U

10.3.2. Wall-Mountable Connector Housing

10.3.2.1. Typical Use: 34.5kV Switchgear Fiber Optic Patch Panels

10.3.2.2. Manufacturer: Corning WCH-04P or WCH-06P

10.3.3. Single-Panel Wall-Mountable Connector Housing

10.3.3.1. Typical Use: 15kV Switchgear Fiber Optic Patch Panel

10.3.3.2. Manufacturer: SPH-01P

10.4. CONNECTOR HOUSING SPLICES

10.4.1. Preferred Installation

10.4.1.1. CCH Pigtailed Splice Cassette, 12 Fiber, ST Compatible Connector, Single-Mode (OS2)

10.4.1.1.1. Manufacturer: Corning CCH-CS12-6T-P00RE

10.4.1.2. CCH Pigtailed Splice Cassette, 12 Fiber, ST Compatible Connector, 62.5 µm Multi-Mode (OM1)

10.4.1.2.1. Manufacturer: Corning CCH-CS12-5T-P00KE

10.4.2. Alternate Installation

10.4.2.1. Splice Tray

10.4.2.1.1. AES Indiana Stock Number: 10.525.662 (1703-715)

10.4.2.1.2. Manufacturer: Corning M67-081

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10.4.2.2. CCH Panel, Pigtailed ST Compatible Connectors, 12-Fiber, Single Mode (OS2)

10.4.2.2.1. AES Indiana Stock Number: 10.532.377 (1703-795)

10.4.2.2.2. Manufacturer: Corning CCH-CP12-6T-P03RH

10.4.2.3. CCH Panel, Pigtailed ST Compatible Connectors, 12-Fiber, Multi-Mode (OM1)

10.4.2.3.1. Manufacturer: Corning CCH-CP12-5T-P03KH

11. CABLE TRENCH

11.1. YARD CABLE TRENCH

11.1.1. Material: High-Density Polymer Concrete

11.1.2. Rating: 16,000 lb. wheel-load, 15 MPH Max

11.1.3. Interior Depth: 16” or Application Specific

11.1.4. Interior Width: 20” or Application Specific

11.1.5. Length: 118-1/8” or Application Specific

11.1.6. Bottom: Open (Standard)

11.1.7. Covers: Rated for 16,000 lb. wheel-load.

11.1.8. Preferred Manufacturer: Oldcastle Infrastructure Plastibeton 2016 with C20 covers.

12. ATTACHMENTS

Attachment	Description
A	Durham 1-1760F-30 Switch and ABB CF991A46GG01 Switch Cut Sheets
B	Lake Cable TPT102-HD Cut Sheet
C	Lake Cable TPT94(19)-HD Cut Sheet
D	Lake Cable TPT1212-HD Cut Sheet
E	Lake Cable TPT99(19)-HD Cut Sheet
F	Lake Cable TPT62-HD Cut Sheet
G	Anixter 3B-0601-02 Cut Sheet
H	Lake Cable TPT63-HD Cut Sheet
I	Lapp Station Post Insulators Cut Sheets
J	Trench TEVF362 Drawings
K	GE Grid Solutions OTCF326.SI
L	Trench TEMF145 Drawings
M	GE Grid Solutions OTCF145.SM Drawings
N	Hubbell – Ohio Brass Station Class Arresters Cut Sheets

N-ALT	GE Tranquell 9L11ZGA012S Cut Sheet
O	AFL DNA-32952 Cut Sheet
P	Prysmian F-ADES1255-12-ES-048-E3 Cut Sheet
Q	Corning 012KU4-T4730D20 Cut Sheet
R	CommScope FOSC450-D6-6-72-1-D6V Cut Sheet
S	Corning CCS-03U Cut Sheet
T	Corning WCH-04P/WCH-06P Cut Sheet
U	Corning SPH-01P Cut Sheet
V	Corning CCH-CS12-6T-P00RE Cut Sheet
W	Corning CCH-CS12-5T-P00KE Cut Sheet
X	Corning M67-081 Cut Sheet
Y	Corning CCH-CP12-6T-P03RH Cut Sheet
Z	Corning CCH-CP12-5T-P03KH Cut Sheet
AA	Oldcastle Plastibeton 2016 Cable Trench and C20 Covers
BB	Okonite XHHW-2 Wire

13. REVISION SUMMARY

Rev. No.	Date	By	Description
00	10-12-2018	JWF	▪ Issued for Review
01	11-09-2018	JWF	▪ Separated surge arresters based upon 34kV transformer presence at the station. ▪ Added color coding to cables. ▪ Added fiber optic equipment for single mode terminations.
02	06-12-2019	JWF	▪ Added 34.5kV Station Post Insulator section. ▪ Updated part number for 138kV surge arrester with 138/34.5kV transformer present. ▪ Added 34.5kV Disconnect Switch section. ▪ Added 34.5kV Surge Arrester section. ▪ Added 362kV, 145kV, and 38kV circuit breakers. ▪ 38kV circuit breaker change sets of CTs from 2 to 1. ▪ Modified formatting.
03	06-27-2019	JWF	▪ Added additional information (grounding bolt, plastic covers) to each high voltage circuit breaker description.
04	04-15-2020	JWF	▪ Updated 145kV MEPPI breaker description with updated serial number.
05	07-16-202	JWF	▪ Added field cable and panel wiring terminating lugs. ▪ Added field cable manufacturer information. ▪ Added 2/C #6 and 3/C #6 field cable information.

06	10-25-2021	JWF	▪ Removed 138kV arresters MVN108GA088AA from the specification.
07	09-23-2022	JWF	▪ Added 138kV CCPD alternate manufacturer.
08	09-23-2022	ARG	▪ Reformatted. ▪ Updated 362kV IPO, 145kV Gang-Operated, and 38kV Gang-Operated circuit breakers serial numbers with versions that included grounding bolt and plastic covers. Removed details about grounding bolts and plastic covers as those are captured in the serial number. ▪ Updated 345kV station post insulators to include TR-324, TR-367, TR-369 and allow for uniform or tapered construction. ▪ Added 13.8kV system station post insulators. ▪ Added 345kV system CCVT/CCPD listing. ▪ Revised 48F single-mode cable to new approved manufacturers and part numbers for 10.585.241. ▪ Added 12F multi-mode 62.5 µm fiber optic cable. ▪ Added wall-mountable connector housings. ▪ Added pigtailed splice cassettes as preferred over alternate pigtailed splice CCH panels with splice trays. ▪ Added cut sheets/attachments.
09	12-05-2022	ARG	▪ Added GE Tranquell 9L11ZGA012S as acceptable 13.8kV arrester. ▪ Added single conductor XHHW-2 wires. ▪ Added cable trench with Oldcastle Plastibeton as preferred material.
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