FIBER OPTIC COMMUNICATION 18

1. Introduction

Composite Optical Groundwire (OPGW) was developed to provide a large capacity telecommunications system utilizing overhead power transmission lines. Serving the additional purpose of an overhead ground wire, the OPGW is constructed of aluminum clad steel strands and aluminum alloy strands stranded with stainless steel tubes or surrounding a fiber unit (core) which contains optical fibers.

Table 1 - Fiber Optic Cable

Cable Type	Fiber Count	Outside Diameter (in)	Rated Breaking Strength, RBS (lbs)	Reel Length (ft)	Stock #
OPGW	48	0.508	19,837	10,500	27 59 086
				21,000	27 59 080
	72		19,555	10,500	27 59 087
				21,000	27 59 088
ADSS	48	0.528	4,943	-	18 16 285
	72	0.559	5,455		27 59 084
UG	72	0.400	-		18 66 671

Table 2 - Underground Microduct Options

Style	Outside/Inside Diameter (mm)	Stock #
3-way	18/14	12 01 338
4-way	18/14	12 01 341
7-way	18/14	12 01 339
Single	18/14	12 01 344
Single LSZH (Low Smoke Zero Halogen)	18/14	12 01 345

2. Precautions

A. Care must be taken to avoid damaging the OPGW during handling and stringing operations. Avoid sharp bends to the cable and take precautions to prevent crushing the OPGW during placement. The transmission quality of the optical fibers can potentially be degraded if the OPGW is subjected to excessive pulling tensions or excessively small bend diameters.

B. Following values shall be considered to help prevent damage to the OPGW

a. Maximum Stringing Tensions listed in DCS **07 00 07 06**

b. Minimum Bend Radius as follows:
During Installation (Dynamic): 20 x Diameter
After Installation (Static): 15 x Diameter

c. Pulling Speed:
60 meters per minute, or
195 feet per minute, or
3.6 km per hour, or
2.2 miles per hour.

d. Minimum distance from puller and tensioner to the stringing block:
3:1 Ratio

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2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

3. Installation

A. For guidance on splicing or network communication please contact the DCC at (866) 896-0662.

B. The contractor shall provide mechanical protection to the cable where it runs along the surface or edge of a structure or pulling devices.

C. At the locations where a splice is required, additional cable length must be provided to physically accommodate the splicing process.

a. The length of each cable end shall be not less than 115 feet from the base of the structure (ground level), or as otherwise noted on the Drawings, remembering that about 20 feet of cable shall be cut off to assure no damaged fiber is used.

b. If additional length is required, due to limited access for splicing vehicles, it shall be included, as required, and with the approval of the Ameren Construction Services or Ameren Engineering.

D. The fiber shall be neatly coiled and securely attached to the structure on bracketing of the splice enclosure, as specified on the Drawings referenced in the Appendices. The diameter of the coil shall be a minimum of three feet or as required based on the minimum allowed bending radii.

E. The Contractor shall handle all fiber optic cable in strict accordance with the cable manufacturer's specifications and procedures.

F. If any Owner-provided materials appear to be damaged or defective, the Contractor shall immediately report the details to the Construction Manager, who shall provide written directions regarding the corrective actions, storage, or disposal of these materials.

G. If the cable must be temporarily stored overnight while in the process of splicing, the cable ends shall be sealed to prevent water migration and the cable coils stored out of the reach of vandals. It is unacceptable to temporarily store cable at the base of the pole, unless the structure is in a safe and secured location.

H. All cables splice boxes, and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

I. Fiber shall be segregated by tray, conduit, innerduct, or other innerduct methods for protection.

J. Where ADSS fiber is placed underground, it shall have its own conduit and be designated as such or be segregated by using innerduct within the conduit or trench system.

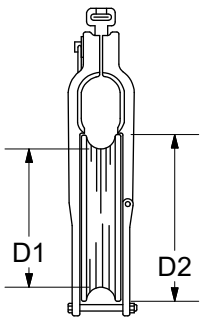
a. Innerduct will also be used in the main cable tray application within the control house.

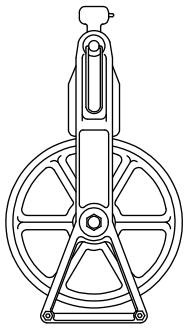
b. Within the confines of an enclosure, fiber jumpers should be segregated by a separate tray system, to ensure bend radii and cable weight concerns are mitigated.

K. Contractor shall mark conduits leaving Ameren Property with approved marking methods that should be prescribed in project documentation.

L. Kickstand or hold-offs will be required on any angled structures.

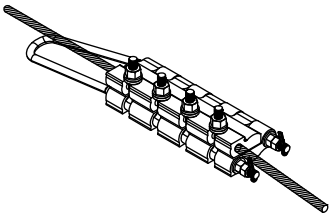
M. Use properly sized and line Stringing Blocks (do NOT use Array-type Stringing Blocks)



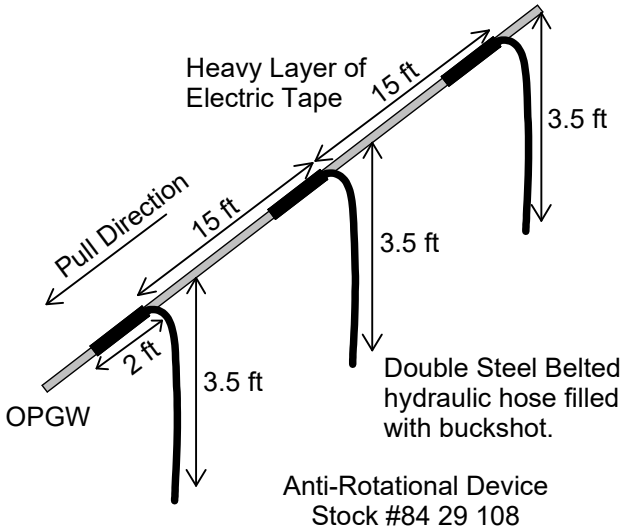


Stucture Angle (θ)	Bottom Groove Diameter (D1)	Typical Stringing Block (minimum) (D2)
First & last structures	21"	28"
Tangent Structures θ < 20	12"	16"
Tangent Structures 20 < θ < 45	18"	24"
Tangent Structures 45 < θ < 60	24"	32"
Tangent Structures 60 < θ < 90	31"	41"
Bull Wheel Diameter for 90°		

N. Use Anti-Rotational Device (Stock #84 29 108) and OPGW stringing tool (Stock #85 21 130):

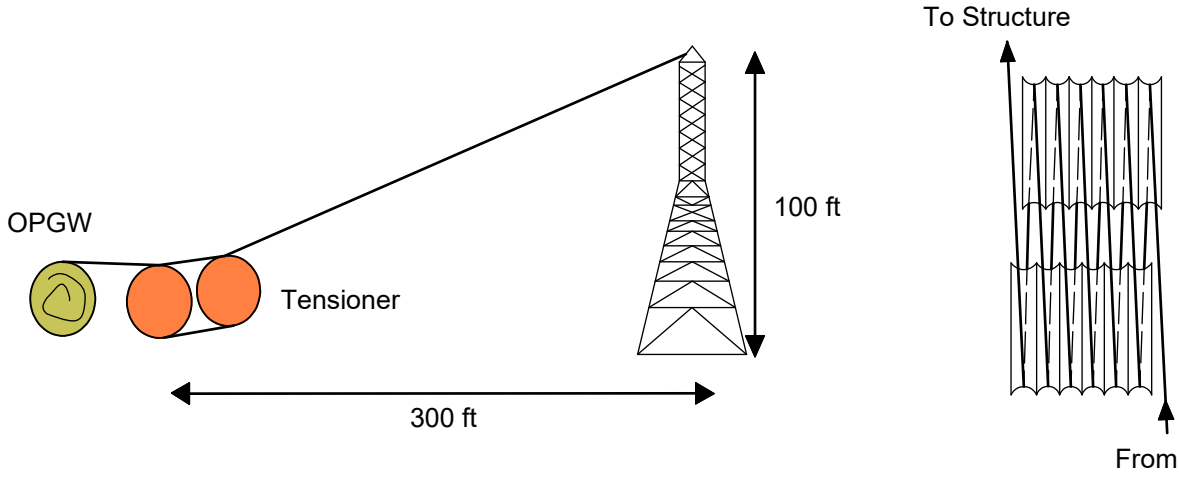


OPGW Stringing tool
Come-along (Pocket book grip)
Stock #85 21 130



Anti-Rotational Device
Stock #84 29 108

O. Tensioner shall be positioned 3x structure height from first structure and reeved Right-to-Left.



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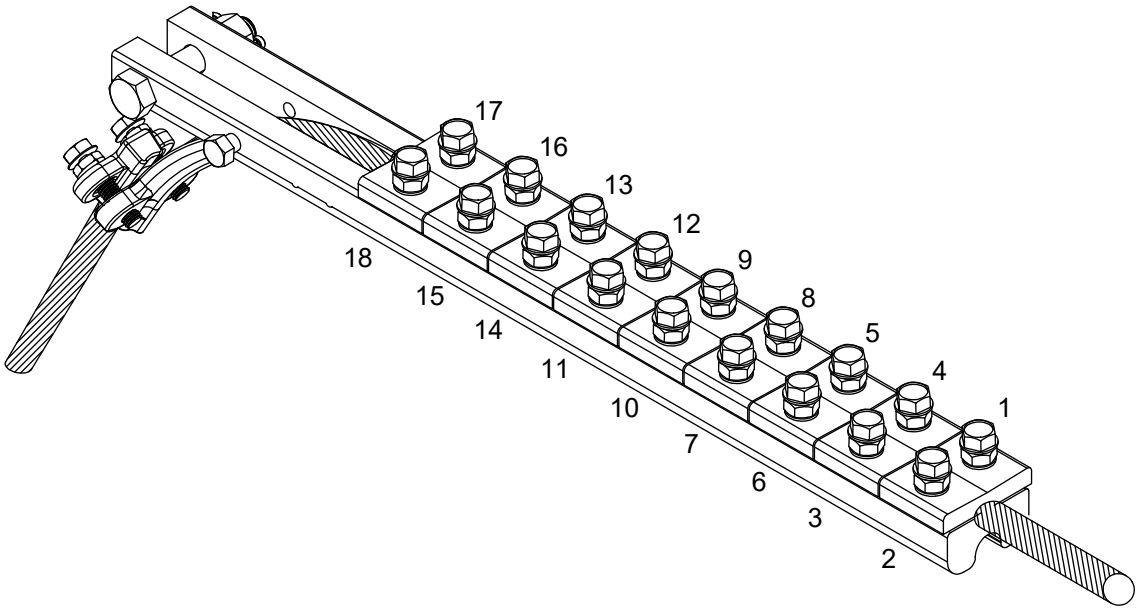
2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

P. Prior to pulling, tighten bolts and loosen inner tail of OPGW Reel.

Q. Pulling speed shall not exceed 200 ft/minute. Pulling tension shall not exceed 3,967 lbs (20% RBS). Do not exceed 48 hours in blocks prior to clipping in.

R. Deadend bolts shall be torqued to 40 ft-lbs and tightened in sequence at 5 ft-lbs increments.



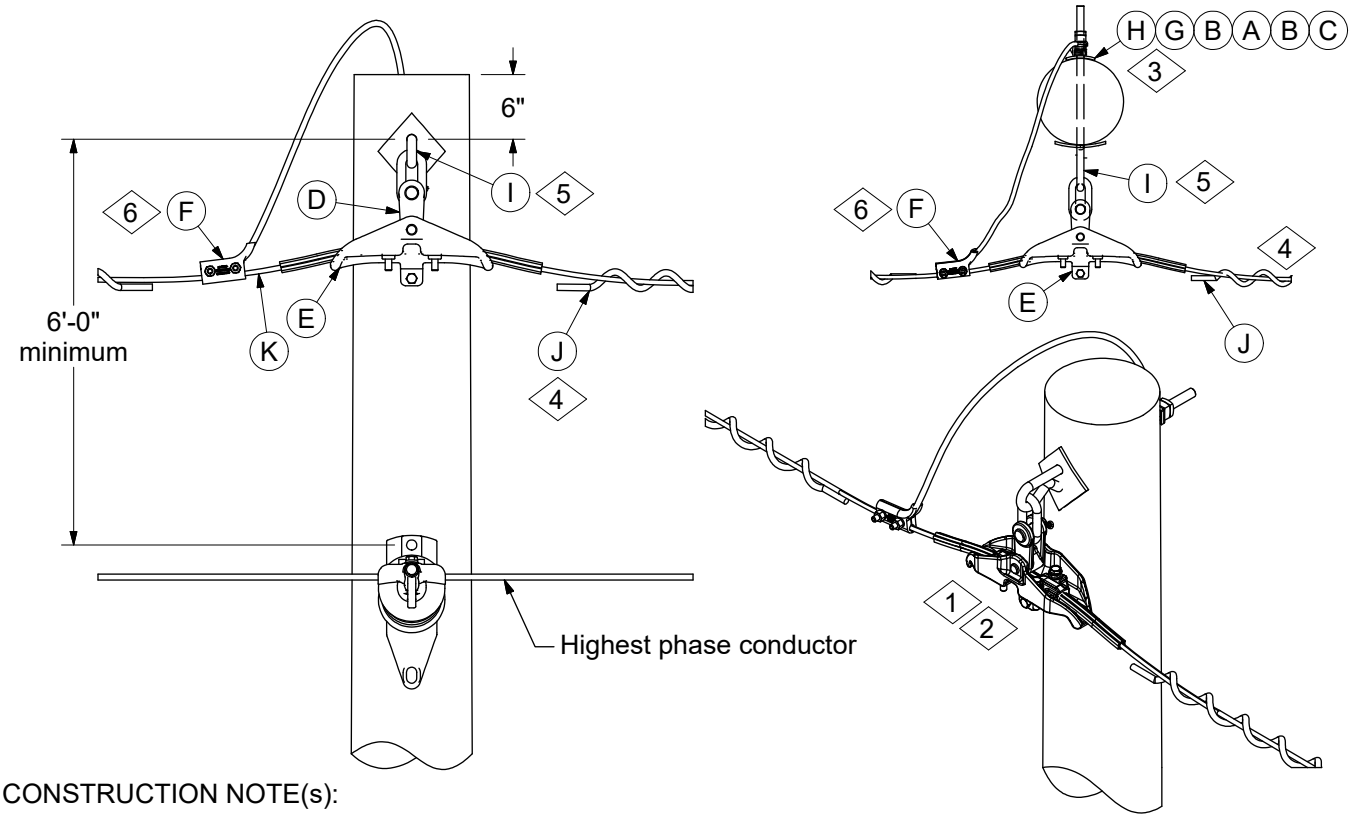
Bolted Deadend
(Stock #23 68 732)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

FIBER OPTIC COMMUNICATION

OPGW Tangent or Corner ≤ 30°

18 05 10 **
1 of 2



CONSTRUCTION NOTE(s):

1. Mark center of clamp location on OPGW cable with ink (not tape) when aligning armor rods and clamp body on OPGW.

2. Be sure to finger tighten bolts on clamp to ensure bolts are not compressed onto the OPGW, and alternate tightening. Tighten until break away bolt heads shear off.

3. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

	ITEM	STK / DCS #	DESCRIPTION 18 05 10 **	01
	A	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	B	23 15 001	Nut, Square, 3/4"	2
	C	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1
	D	23 58 127	Clevis Eye	1
	E	23 67 502	OPGW Supension Clamp w/ Armor Rods	1
	F	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	G	23 66 135	Lock Washer - 3/4" Double Coil	1
	H	23 66 031	Washer, Curved, Square, 3/4"	1
5,@	I	23 68 458	Static Support Bracket 3/4" x 14"	1
4,@	J	23 67 319	Spiral Vibration Damper	2
@	K	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
@	L	**12 00 10 ** @**	Grounding Unit	1

DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Note 5; provided locking hardware & OPGW stock #s
1	07/01/20	KR	

DESIGN NOTE(s):

4. Spiral Vibration Dampers are used on 350' and above spans only.

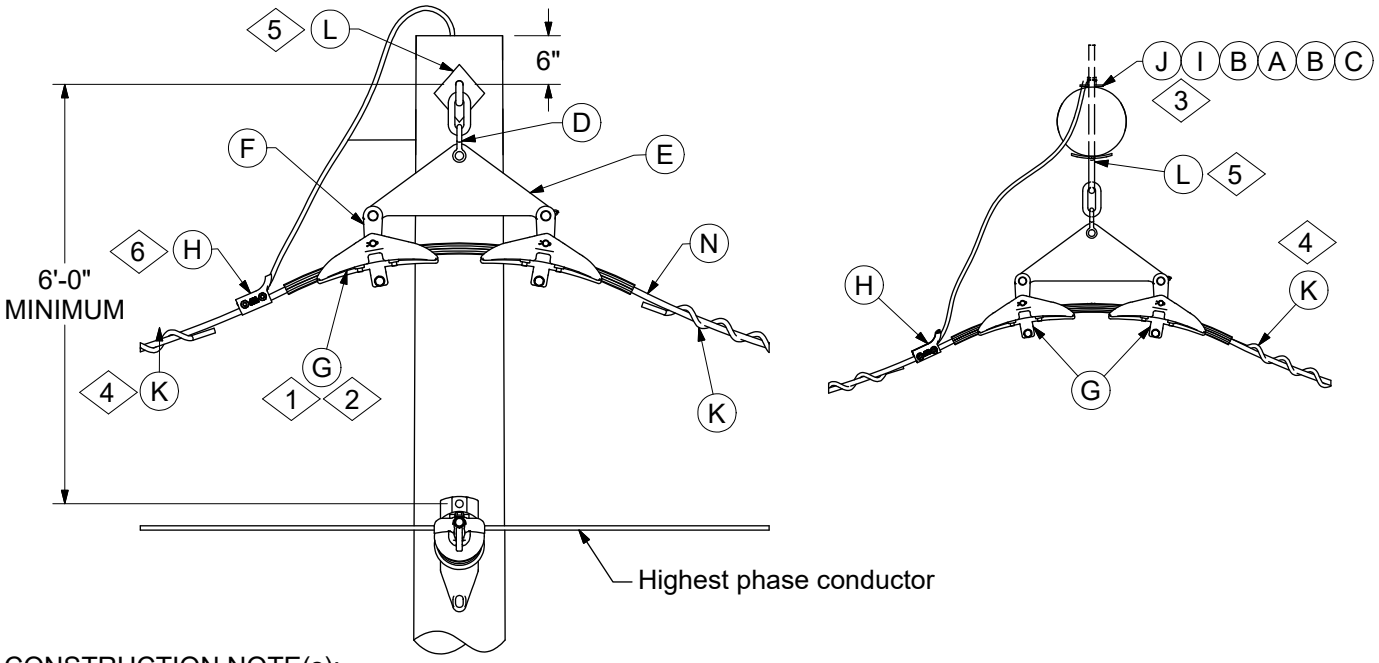
5. For larger wood or composite poles 16" static support (Stock #23 68 459), 18" static support (Stock #23 68 460), or 20" static support (Stock #23 68 614) will be required.

6. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

FIBER OPTIC COMMUNICATION

OPGW Tangent or Corner ≥ 30° ≤ 60°

18 05 11 **
1 of 1



CONSTRUCTION NOTE(s):

1. Mark Center of clamp location on OPGW with ink (not tape) when aligning armor rods and clamp body on OPGW.

2. Be sure to finger tighten bolts on clamp to ensure bolts are not compressed onto the OPGW, and alternate tightening. Tighten until break away bolt heads shear off.

3. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

	ITEM	STK / DCS #	DESCRIPTION 18 05 11 **	01
	A	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	B	23 15 001	Nut, Square, 3/4"	2
	C	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1
	D	23 68 368	Anchor shackle	1
	E	23 17 437	Yoke Plate	1
	F	23 58 127	Clevis Eye	2
	G	23 67 501	OPGW Suspension Clamp w/ Armor Rods	2
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	I	23 66 135	Lock Washer - 3/4" Double Coil	1
	J	23 66 031	Washer, Curved, Square, 3/4"	1
4,@	K	23 67 319	Spiral Vibration Damper	2
5,@	L	23 68 458	Static Support Bracket 3/4" x 14"	1
@	M	27 59 087	72-ct OPGW 10,500 ft Reel	#
		27 59 088	72-ct OPGW 21,000 ft Reel	#
@	N	**12 00 10 ** @**	Grounding Unit	1

DESIGN NOTE(s):

4. Spiral vibration dampers are used on 350’ and above spans only.

5. For larger wood poles or composite poles 16” static support (Stock #23 68 459), 18” static support (Stock #23 68 460), or 20”static support (Stock #23 68 614) will be required.

6. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

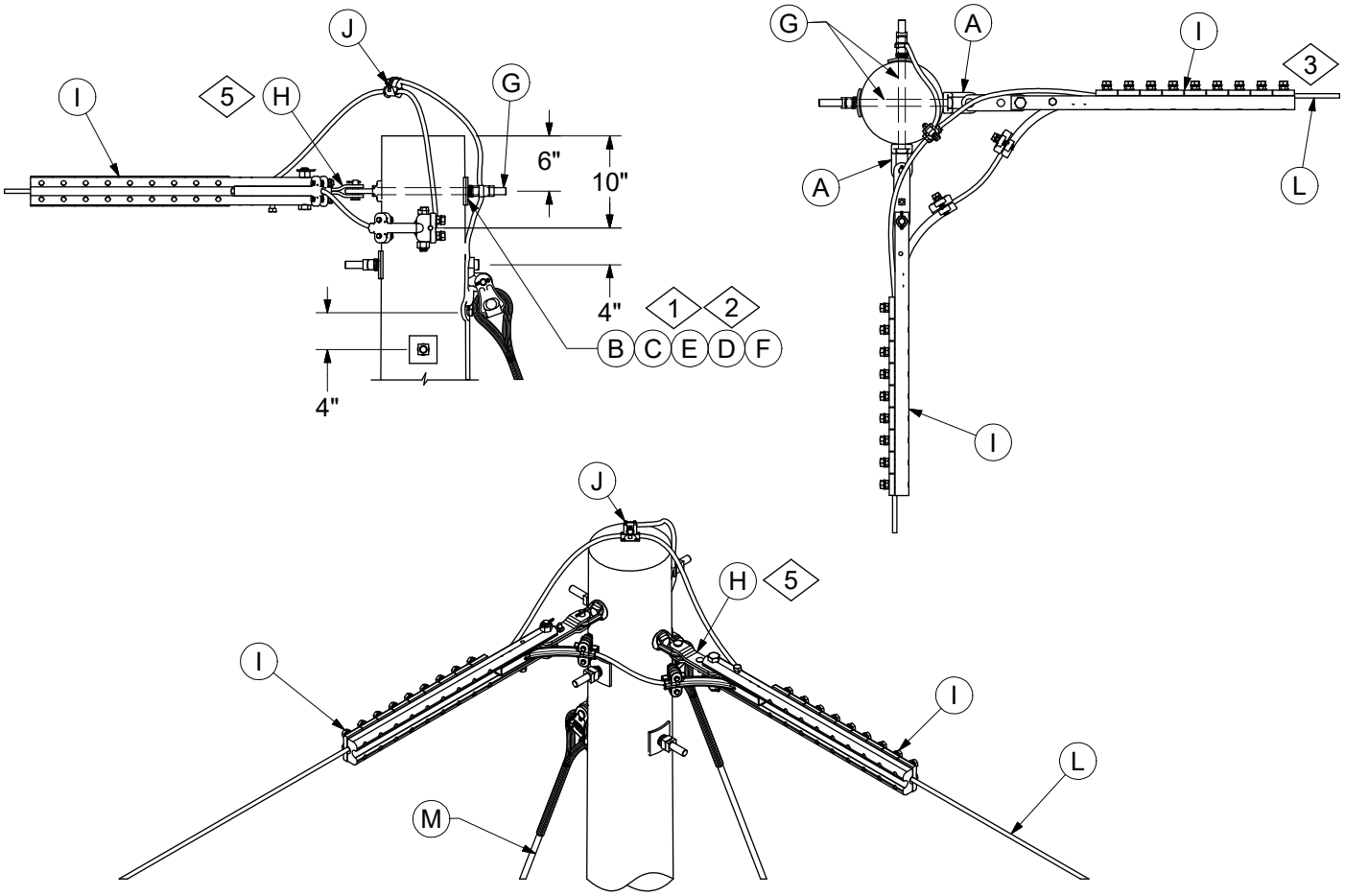
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Note 5; Rev'd BOM/drawing w/ locking hardware & OPGW stk #s
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

OPGW 90° Continuous Corner Without Splice

18 05 12 **
1 of 2



CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 18 05 12 **	01
	A	23 59 095	Eyelet, 3/4"	2
	B	23 66 031	Washer, Curved, Square, 3/4"	4
	C	23 66 135	Lock Washer - 3/4" Double Coil	4
	D	23 15 001	Nut, Square, 3/4"	1
	E	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	F	23 65 042	Lock Nut - 3/4" Square	4
	G	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	4
5	H	23 59 042	Link Extension - 6" Clevis Eye	2
	I	23 68 732	Bolted Deadend	2
	J	17 51 137	Clamp, Parallel Groove	1
	K	18 66 678	Bonding Wire, 60"	1
@	L	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
@	M	**11 00 4* ** @**	Guying Unit	2
@	N	**12 00 10 ** @**	Grounding Unit	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Notes; Rev'd BOM/drawings w/ locking hardware & OPGW stk #s
1	07/01/20	KR	

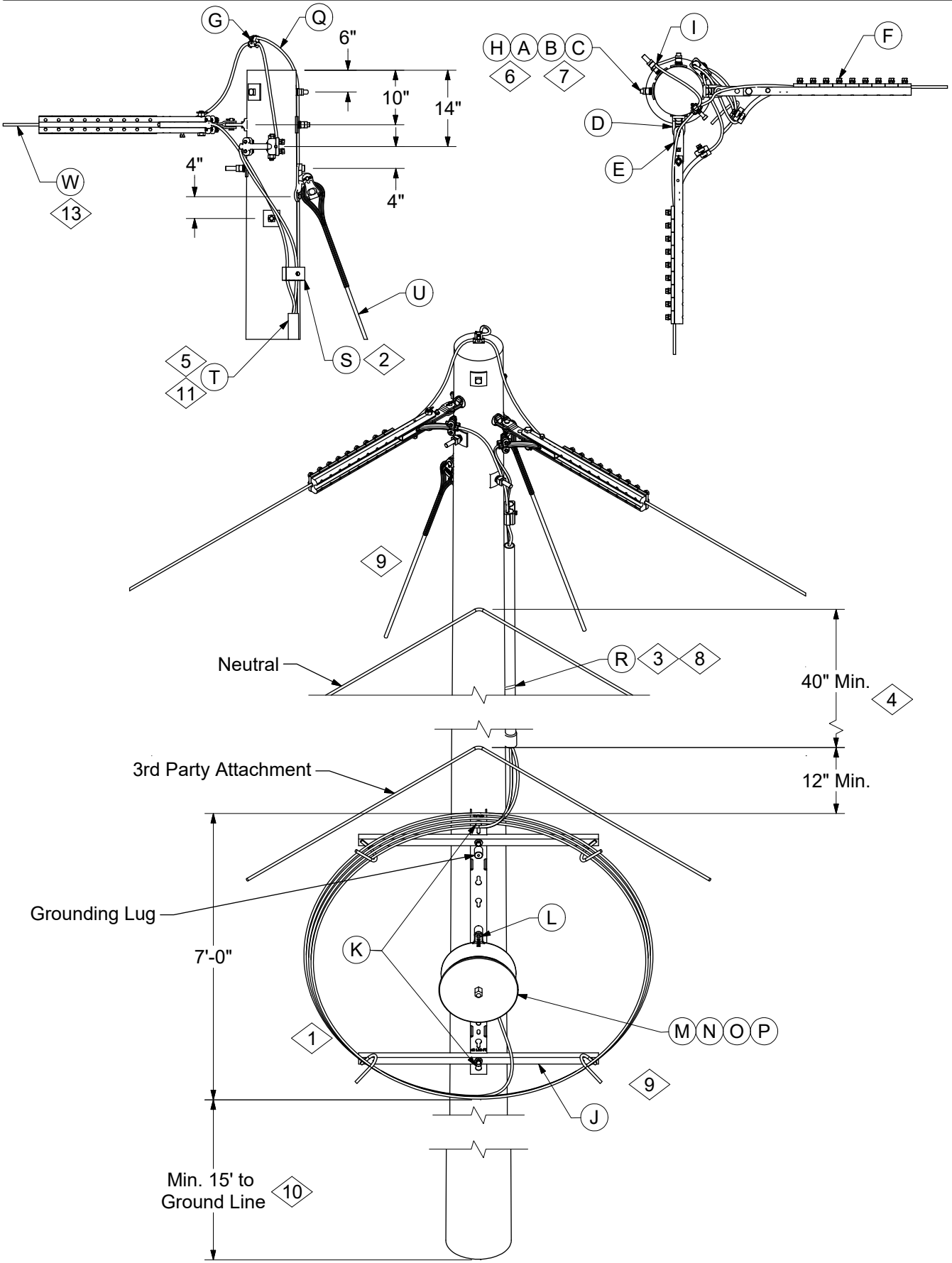
DESIGN NOTE(s):

3. Spiral vibration dampers (Stock #23 67 319) are used on 350’ and above spans only.

4. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

5. For loopovers, use 12" extension link (Stock #23 68 783).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Notes; Rev'd BOM/drawings w/ locking hardware & OPGW stk #s
1	07/01/20	KR	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added front/top views; Updated drawing/BOM/notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from the other third party attachments.
5. The conduit shall be installed through the entire energized zone on the pole.
6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
7. User longer machine bolts for larger wood or composite poles if requried.
8. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
9. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 13 **	01
	A	23 66 135	Washer, Lock, Double Coil 3/4"	3
	B	23 66 031	Washer, Square for 3/4" bolt	3
7	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
	D	23 59 095	Eyelet, for 3/4" bolt	2
	E	23 59 042	Extension Link 6"	2
	F	23 68 732	Bolted Deadend	2
	G	17 51 137	Clamp, Parallel Groove	4
	H	23 65 042	Lock Nut - 3/4" Square	3
	I	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	J	40 54 480	Coil Bracket	1
	K	23 60 011	Lag Screw - 5/8" x 5" galvanized	2
	L	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2
	M	40 54 478	Splice Enclosure	1
	N	17 60 734	Splice Protector Sleeve	10
	O	40 54 481	Connector Kit, OPGW	1
	P	40 54 479	Furcation Kit, OPGW	2
	Q	18 66 678	Bonding Wire, 60"	1
3,8,@	R	27 60 035	Strap, Iron Hanger	#
2,@	S	17 52 220	Downlead Clamp, OPGW	1
5,11,@	T	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1
9,@	U	**11 00 4* ** @**	Guying Unit	2
@	V	**12 00 10 ** @**	Grounding Unit	1
@	W	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added front/top views; Updated drawing/BOM/notes
1	07/01/20	KR	

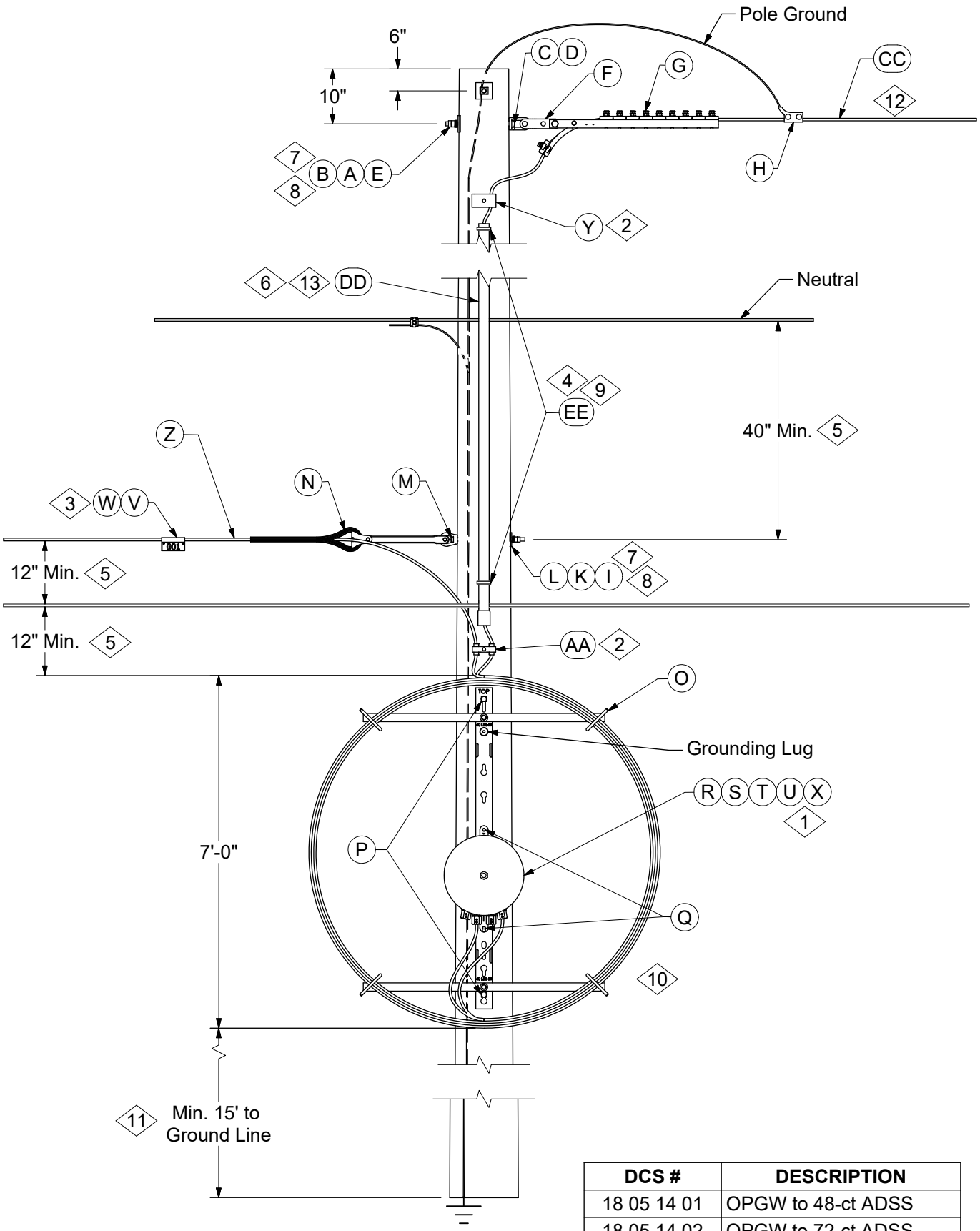
DESIGN NOTE(s):

10. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

11. For alternate construction, call for split conduit: 2" (Stock#12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220)

12. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

13. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.



DCS #	DESCRIPTION
18 05 14 01	OPGW to 48-ct ADSS
18 05 14 02	OPGW to 72-ct ADSS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, Notes, & Drawing
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of the pole.
4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
5. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
6. The conduit shall be installed through the entire energized zone on the pole.
7. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
8. Use longer machine bolts for larger wood or composite poles if required.
9. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
10. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 14 **	01	02
	A	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	B	23 66 031	Washer, Curved, Square, 3/4"	2	2
	C	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2
	D	23 59 095	Eyelet, 3/4"	1	1
	E	23 65 042	Lock Nut - 3/4" Square	2	2
	F	23 59 042	Link Extension - 6" Clevis Eye	1	1
	G	23 68 732	Bolted Deadend	1	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1	1
	I	23 65 043	Lock Nut - 5/8" Square	1	1
	J	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1
	K	23 66 134	Lock Washer - 5/8" Double Coil	1	1
	L	23 66 207	Washer, Curved, Square, 5/8"	2	2
	M	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	N	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadeand, 72-ct ADSS	-	1
	O	40 54 480	Coil Bracket	1	1
	P	23 60 011	Lag Screw - 5/8" x 5"	2	2
	Q	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2	2
	R	40 54 478	Splice Enclosure	1	1
	S	17 60 734	Splice Protector Sleeve	10	10
	T	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	U	40 54 479	Furcation Kit, OPGW	2	2
3	V	16 01 647	ID Tag, ADSS	1	1
	W	40 89 494	Nylon Zip Tie	2	2
	X	40 54 481	Connector Kit, OPGW	1	1
2,@	Y	17 52 220	Downlead Clamp, OPGW	#	#
@	Z	27 59 084	72-ct ADSS	#	#
2,@	AA	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	BB	**12 00 10 ** @**	Grounding Unit	1	1
@	CC	27 59 087	72-ct OPGW 10,500ft Reel	#	#
		27 59 088	72-ct OPGW 21,000ft Reel	#	#
13,@	DD	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#	#
4,9,@	EE	27 60 035	Strap, Iron Hanger	#	#
10,@	FF	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

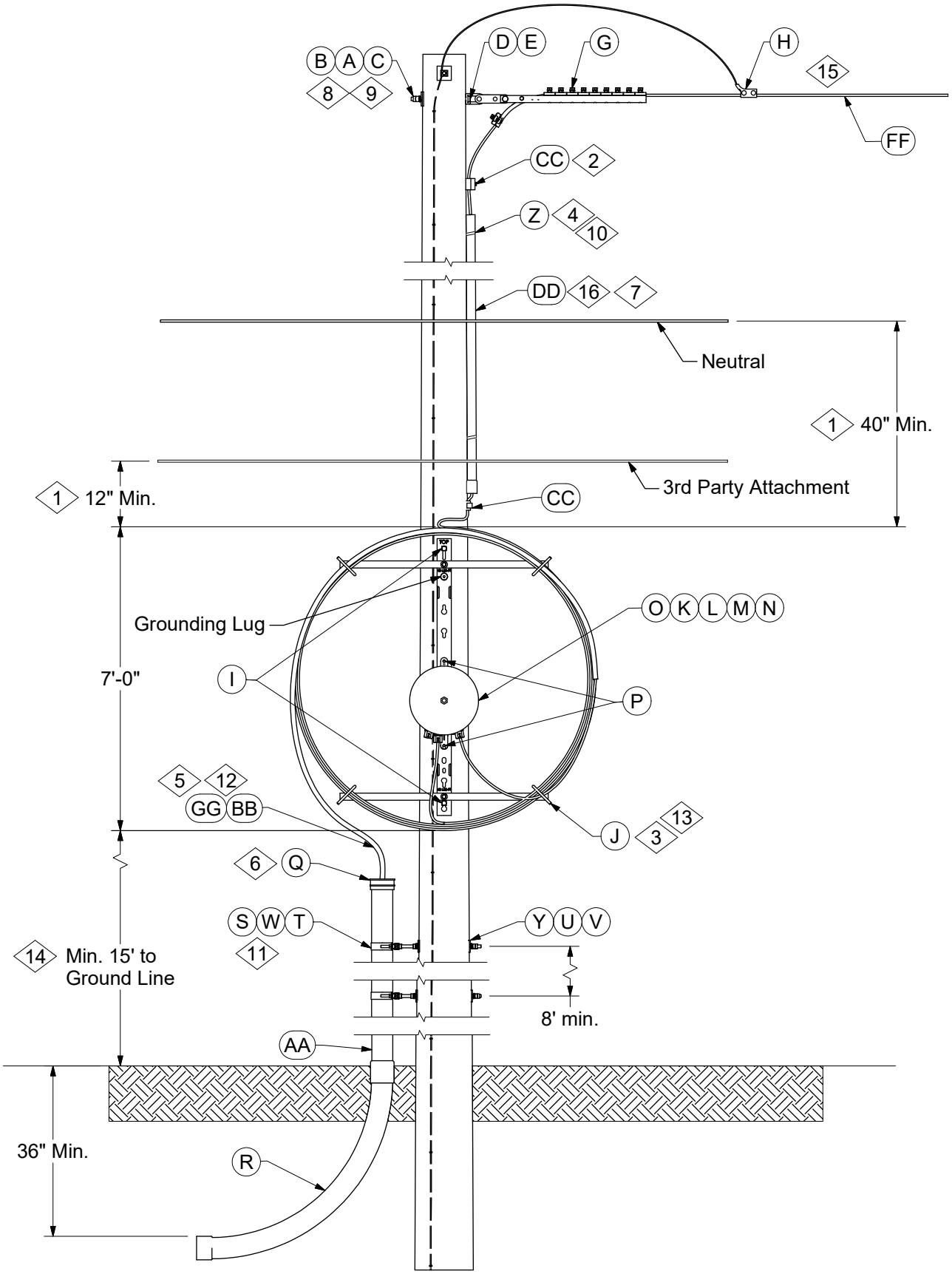
11. Bottom loop of coiled fiber optic cable shall be located minimum of 15' above ground.

12. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

13. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

14. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, Notes, & Drawing
1	07/01/20	KR	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

2. Install downlead clamps every 10'.

3. Coil 100' of extra fiber optic cable around coil bracket.

4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).

5. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).

6. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).

7. The conduit shall be installed through the entire energized zone on the pole.

8. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

9. Use longer machine bolts for larger wood or composite poles if required.

10. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).

11. To install standoff brackets on composite poles, pole band hardware (Stock #23 17 511) may be used instead of hardware requiring the pole to be drilled.

12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)

13. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 05 15 **	01
	A	23 66 135	Lock Washer - 3/4" Double Coil	2
	B	23 66 031	Washer, Curved, Square, 3/4"	2
	C	23 65 042	Lock Nut - 3/4" Square	2
	D	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2
	E	23 59 095	Eyelet, 3/4"	1
	F	23 59 042	Link Extension - 6" Clevis Eye	1
	G	23 68 732	Bolted Deadend	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	I	23 60 011	Lag Screw - 5/8" x 5"	2
	J	40 54 480	Coil Bracket	1
	K	40 54 479	Furcation Kit, OPGW	1
	L	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	M	40 54 481	Connector Kit, OPGW	1
	N	17 60 734	Splice Protector Sleeve	10
	O	40 54 478	Splice Enclosure	1
	P	23 52 031	Bolt, Mach., 1/2" x 3" w/ square nut	4
	Q	12 51 254	Conduit - Coupling 4" Bell End	1
	R	12 51 176	Conduit, PVC, Bend 4" x 90°, 36" Radius, Sch. 40	1
	S	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	2
	T	23 65 053	Nut - 5/8" Jam	2
	U	23 66 134	Lock Washer - 5/8" Double Coil	3
	V	23 65 043	Lock Nut - 5/8" Square	3
	W	23 06 087	Bracket - Standoff, 12"	2
	X	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	Y	23 66 207	Washer, Curved, Square, 5/8"	3
4,10,@	Z	27 60 035	Strap, Iron Hanger	#
@	AA	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	BB	18 66 671	72-ct UG Fiber Optic Cable	#
2,@	CC	17 52 220	Downlead Clamp, OPGW	#
16,@	DD	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1
@	EE	**12 00 10 ** @**	Grounding Unit	1
@	FF	27 59 087	72-ct OPGW 10,5000ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
12,@	GG	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
13,@	HH	**11 00 4* ** @**	Guying Unit	1

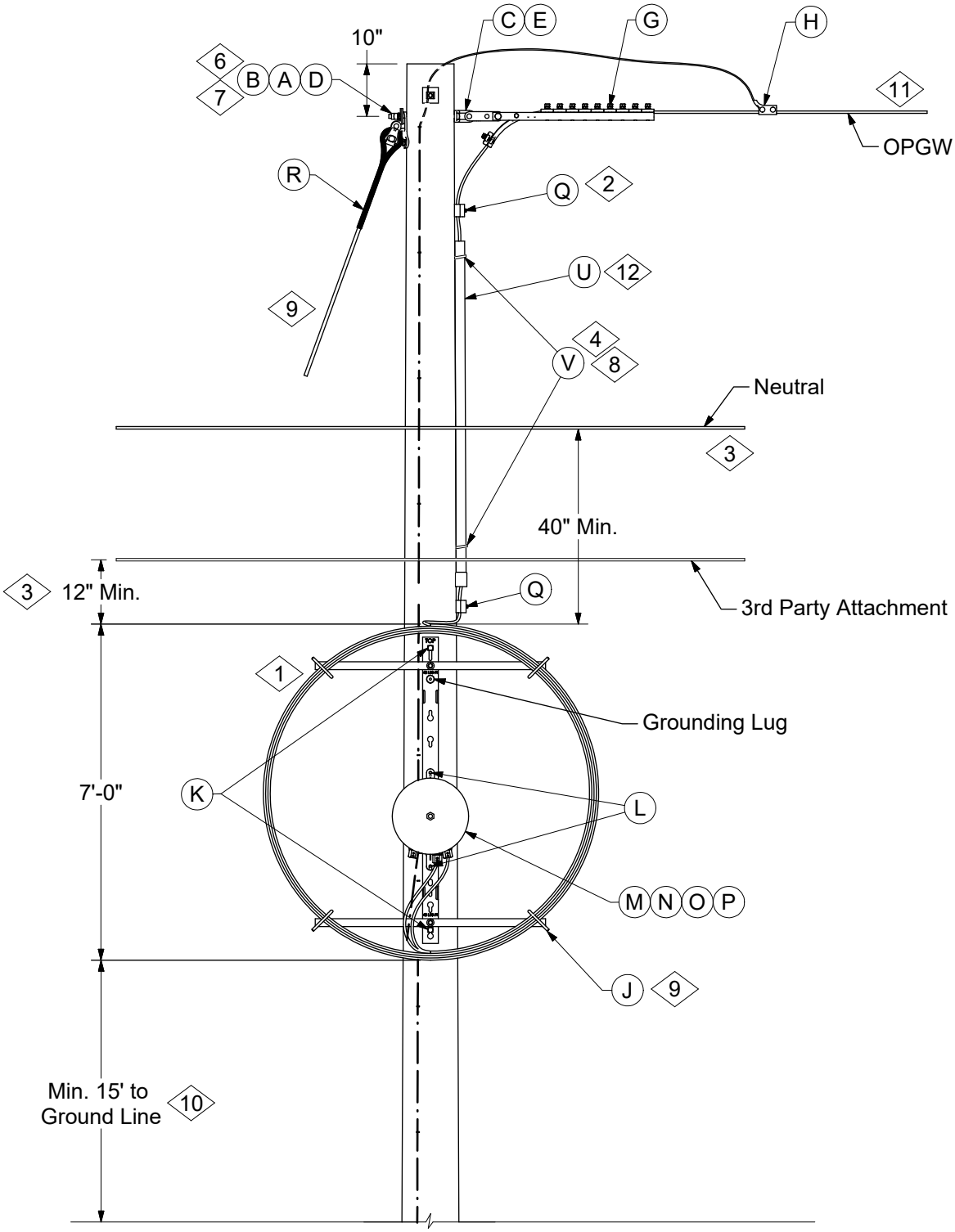
DESIGN NOTE(s):

14. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

15. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

16. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



DCS #	DESCRIPTION
18 05 16 01	OPGW Deadend w/ Splice
18 05 16 02	OPGW Deadend w/o Splice

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added 18 05 16 02, updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
5. The conduit shall be installed through the entire energized zone on the pole.
6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
7. Use longer machine bolts for larger wood or composite poles if required.
8. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
9. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 16 **	01	02
	A	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	B	23 66 031	Washer, Square for 3/4" bolt	2	2
	C	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2
	D	23 65 042	Lock Nut - 3/4" Square	2	2
	E	23 59 095	Eyelet, 3/4"	1	1
	F	23 59 042	Link Extension - 6" Clevis Eye	1	1
	G	23 68 732	Bolted Deadend	1	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1	1
	I	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1
	J	40 54 480	Coil Bracket	1	-
	K	23 60 011	Lag Screw - 5/8" x 5"	2	-
	L	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2	-
	M	40 54 478	Splice Enclosure	1	-
	N	17 60 734	Splice Protector Sleeve	10	-
	O	40 54 481	Connector Kit, OPGW	1	-
	P	40 54 479	Furcation Kit, OPGW	2	-
2,@	Q	17 52 220	Downlead Clamp, OPGW	#	-
9,@	R	**11 00 4* ** @**	Guying Unit	1	1
@	S	**12 00 10 ** @**	Grounding Unit	1	-
@	T	27 59 087	72-ct OPGW 10,500ft Reel	#	#
		27 59 088	72-ct OPGW 21,000ft Reel	#	#
5,12,@	U	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1	-
4,8,@	V	27 60 035	Strap, Iron Hanger	#	-

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added 18 05 16 02, updated BOM & Notes
1	07/01/20	KR	

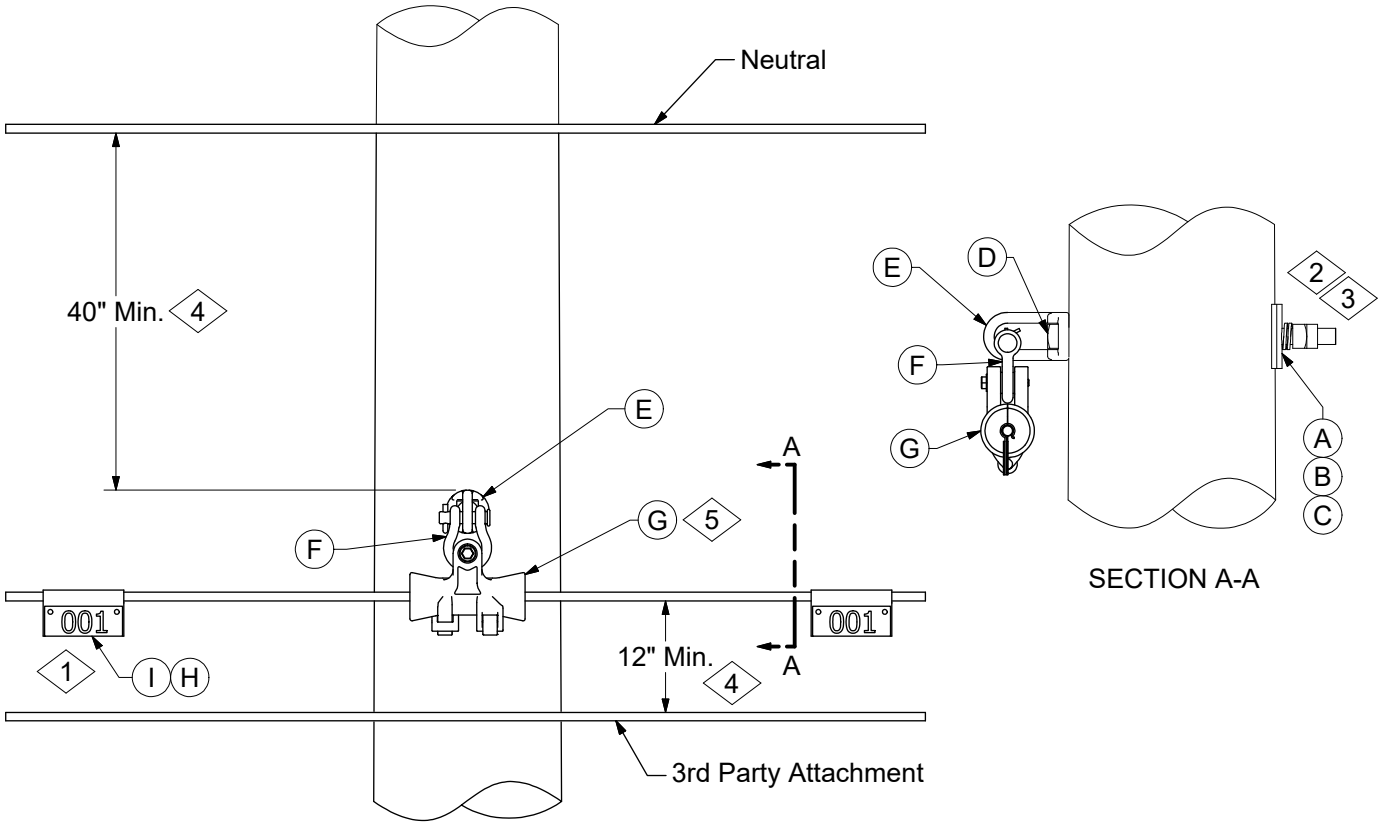
DESIGN NOTE(s):

10. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

11. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

12. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

13. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.



CONSTRUCTION NOTE(s):

1. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 01 **	01
	A	23 66 031	Washer, Curved, Square, 3/4"	1
	B	23 66 135	Lock Washer - 3/4" Double Coil	1
	C	23 65 042	Lock Nut - 3/4" Square	1
	D	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1
	E	23 59 095	Eyelet, 3/4"	1
	F	23 68 181	Shackle - Deadend	1
5	G	17 01 119	Clamp, Suspension, ADSS	1
	H	16 01 647	ID Tag, ADSS	2
	I	40 89 494	Nylon Zip Tie	4
@	J	27 59 084	72-ct ADSS	#

DESIGN NOTE(s):

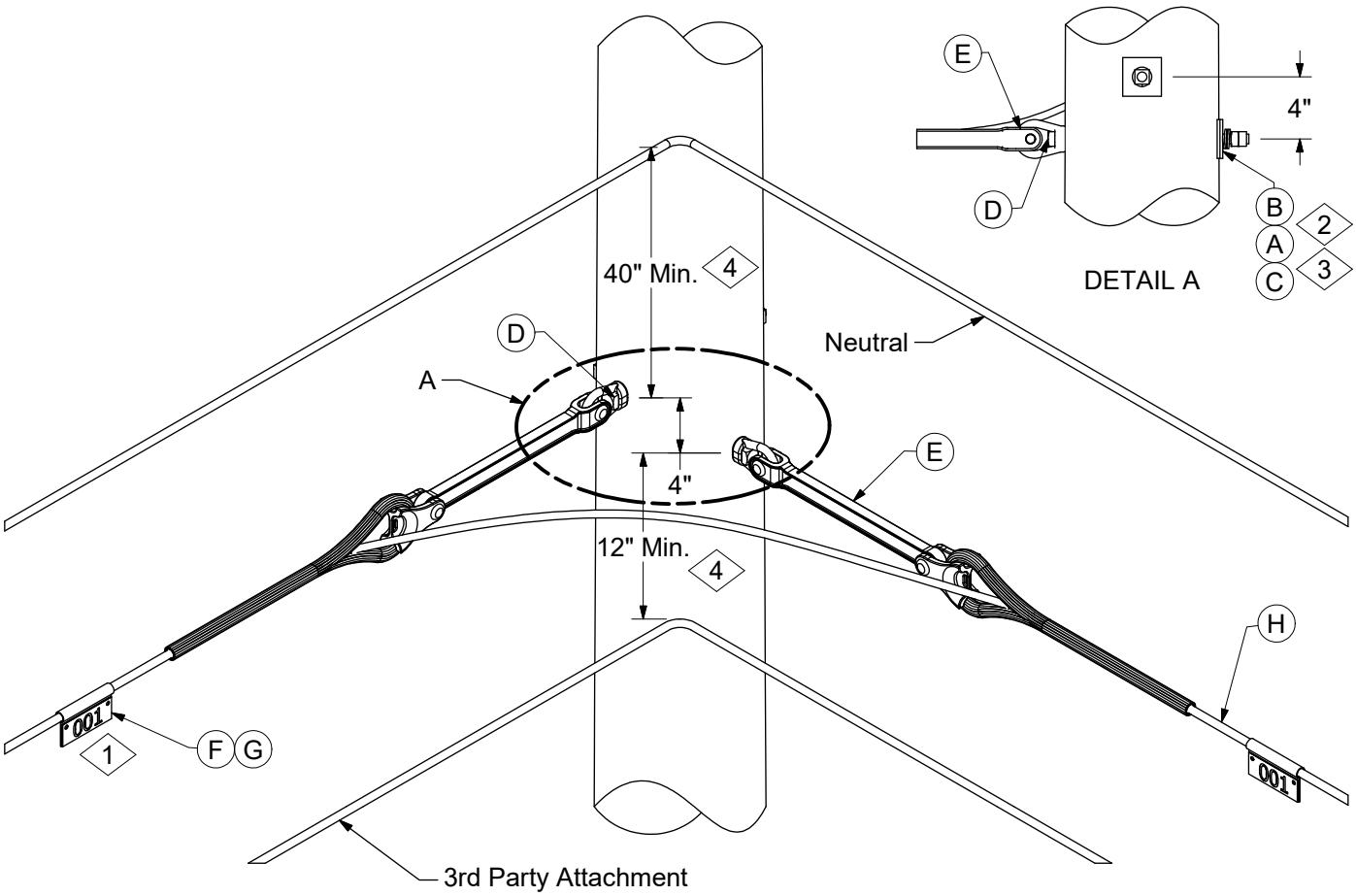
5. For spans > 600 feet use Stock #23 68 750 for 48-ct ADSS and Stock #23 68 779 for 72-ct ADSS.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Notes 2 & 3; revised BOM, drawing, & Note 4; Added side view detail
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

ADSS Deadend Corner Without Splice ≥ 30° ≤ 90°

18 10 02 **
1 of 1



CONSTRUCTION NOTE(s):

1. ADSS Tags should be attached with zip ties on overhead ADDS fiber optic cable within 10' of the pole.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 02 **	01	02
	A	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 68 747	Formed Wire Deadend, 48-ct ADSS	2	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	2
	F	16 01 647	ID Tag, ADSS	2	2
1	G	40 89 494	Nylon Zip Tie	4	4
@	H	27 59 084	72-ct ADSS	#	#
@	I	**11 00 4* ** @**	Guying Unit	1	1

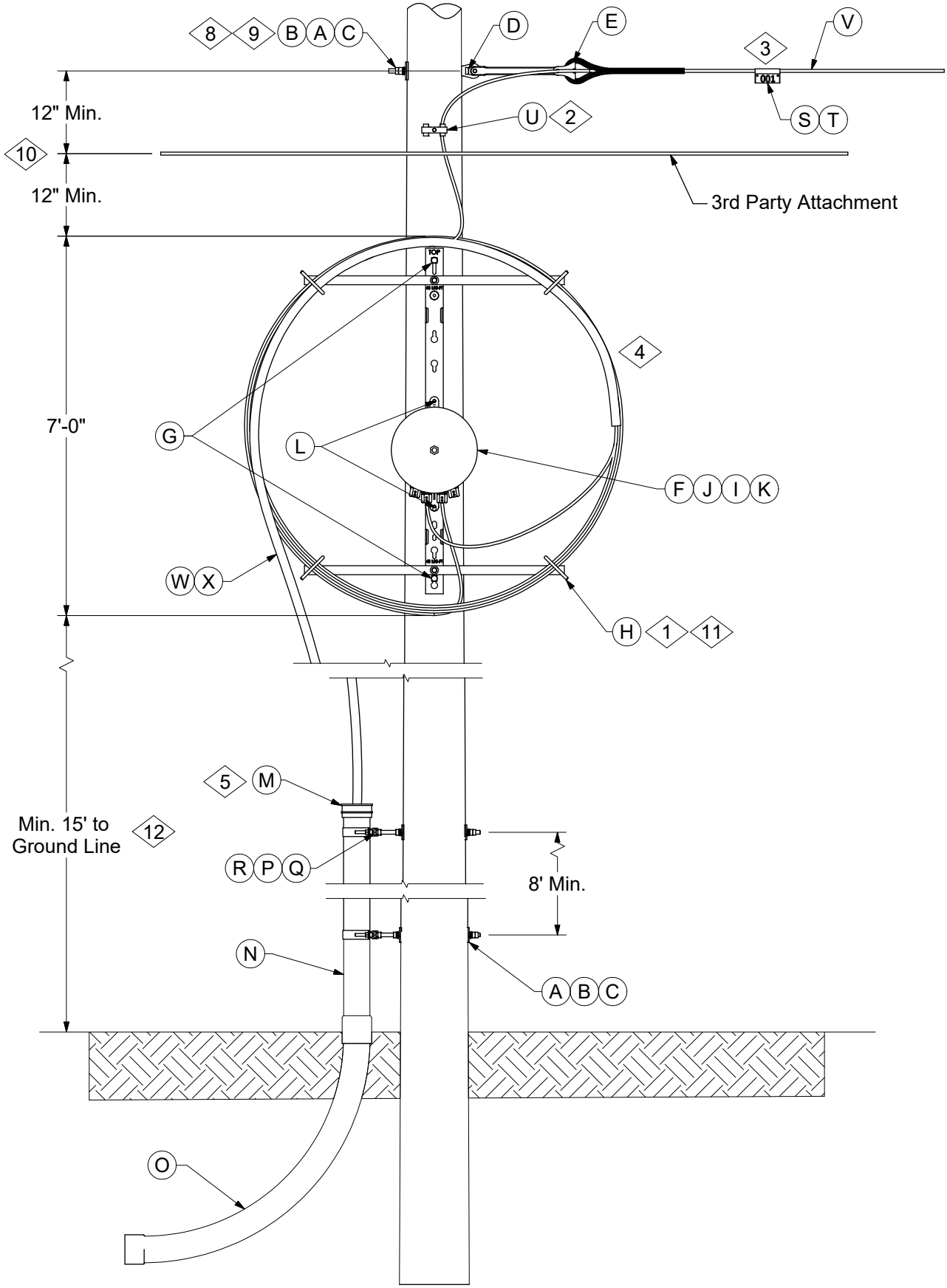
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added ISO & detail views, Notes 2, 3 & 4
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

ADSS Deadend Transition to Underground

18 10 03 **
1 of 3



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

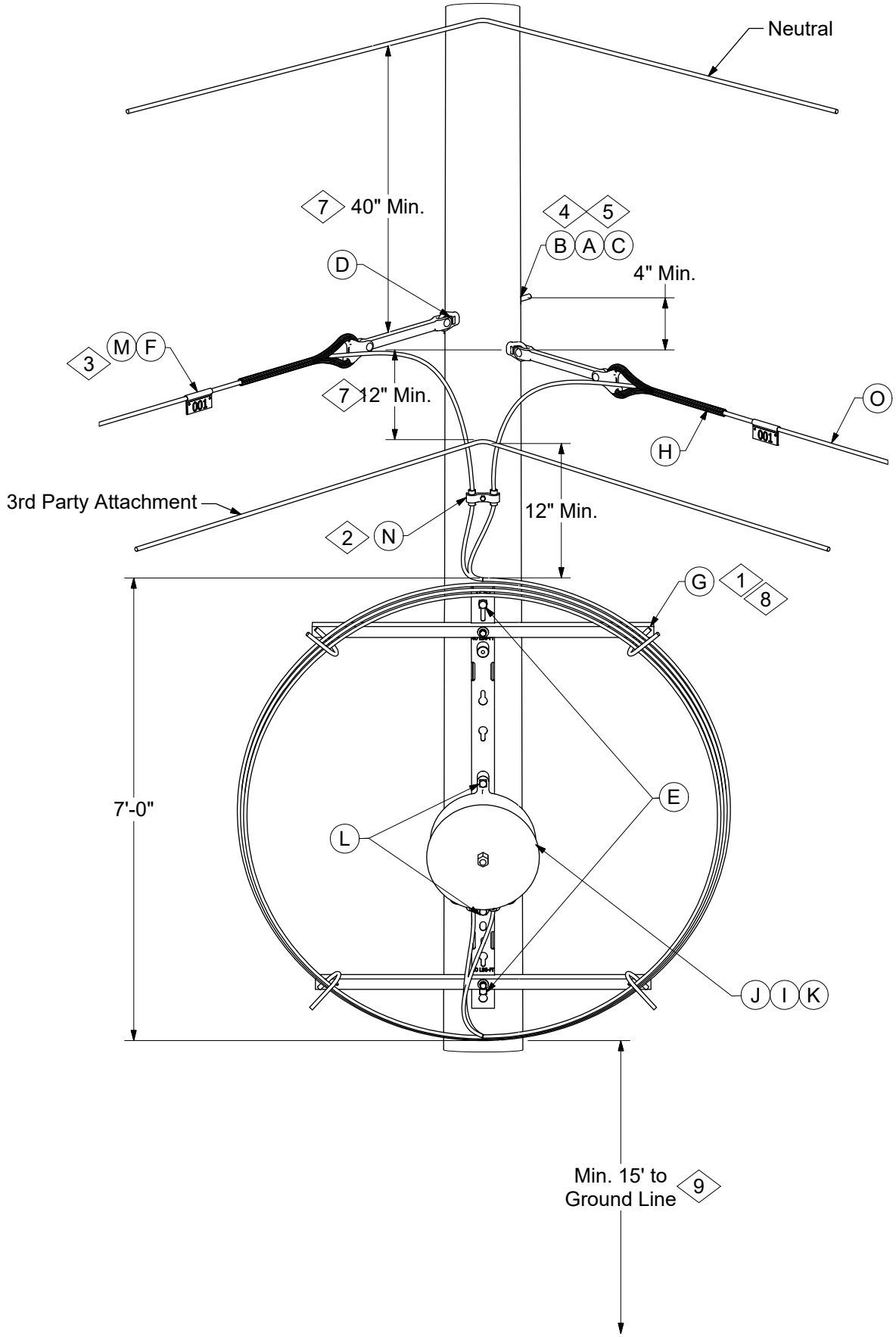
1. Coil 100' of extra fiber optic cable around splice rack.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.
4. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
5. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
6. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)
7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
8. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
9. Use longer machine bolts for larger wood or composite poles if required.
10. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
11. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 10 03 **	01	02
	A	23 66 207	Washer, Curved, Square, 5/8"	4	4
	B	23 66 134	Lock Washer - 5/8" Double Coil	4	4
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	E	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
	F	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	G	23 60 011	Lag Screw - 5/8" x 5"	2	2
	H	40 54 480	Coil Bracket	1	1
	I	17 60 734	Splice Protector Sleeve	10	10
	J	40 54 478	Splice Enclosure	1	1
	K	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	L	23 52 031	Bolt, 1/2" x 3" with Galv. Nut	2	2
5	M	12 51 254	Conduit - Coupling 4" Bell End	1	1
	N	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	1	1
	O	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
	P	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	2	2
	Q	23 65 053	Nut - 5/8" Jam	2	2
	R	23 06 087	Bracket - Standoff, 12"	2	2
3	S	16 01 647	ID Tag, ADSS	1	1
	T	40 89 494	Nylon Zip Tie	2	2
2,@	U	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	V	27 59 084	72-ct ADSS	#	#
@	W	18 66 671	72-ct UG Fiber Optic Cable	#	#
	X	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#	#
4,6,@		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#	#
11,@	Y	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

12. Bottom loop of fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

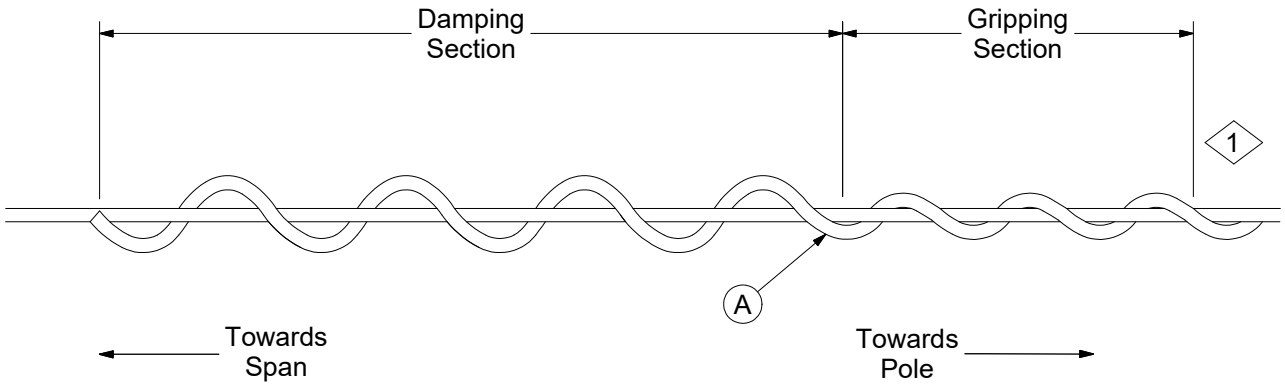
1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.
4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
5. Use longer machine bolts for larger wood or composite poles if required.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
8. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 10 04 **	01	02
	A	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 60 011	Lag Screw - 5/8" x 5"	2	2
	F	40 89 494	Nylon Zip Tie	4	4
	G	40 54 480	Coil Bracket	1	1
	H	23 68 747	Formed Wire Deadend, ADSS 48-ct Fiber	2	-
		23 68 778	Formed Wire Deadend, ADSS 72-ct Fiber	-	2
	I	17 60 734	Splice Protector Sleeve	10	10
	J	40 54 478	Splice Enclosure	1	1
	K	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	L	23 52 031	Bolt, Mach., 1/2" x 3" w/ square nut	2	2
3	M	16 01 647	ID Tag, ADSS	2	2
2,@	N	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	O	27 59 084	72-ct ADSS	#	#
8,@	P	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

9. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	07/01/20	KR	



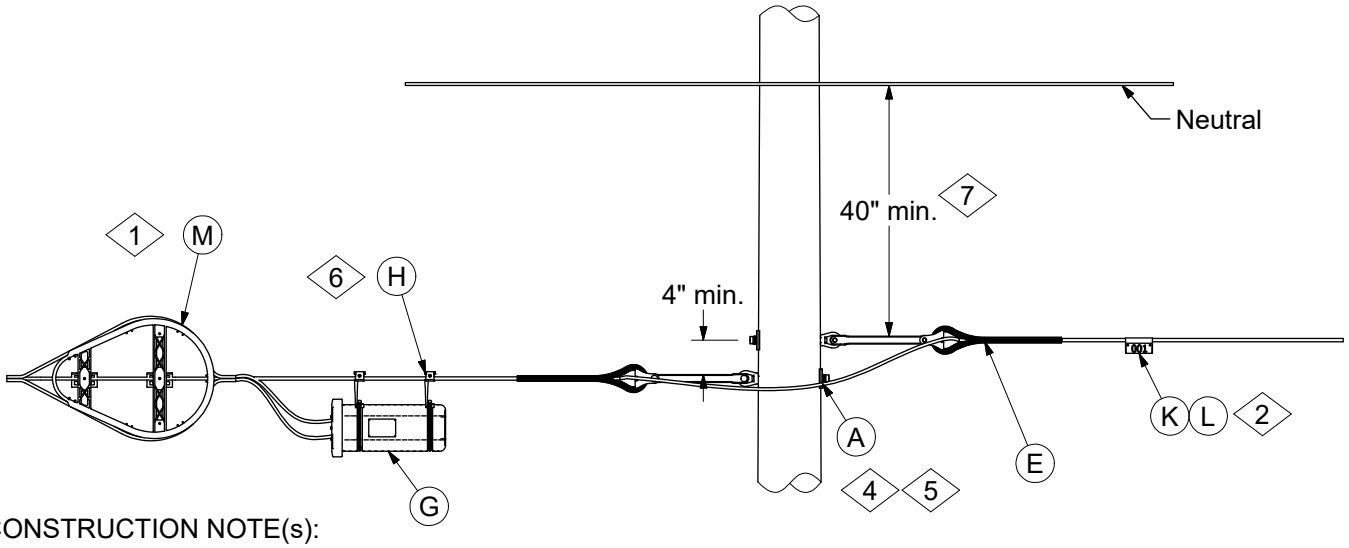
CONSTRUCTION NOTE(s):

1. Gripping section features smaller helix than damping section.

2. Dampers shall be used when cable spans exceed 350' and/or tension exceeds 15% of the rated cable breaking strength.

ITEM	STK / DCS #	DESCRIPTION 18 10 05 **	01
A	17 13 306	Vibration Damper - ADSS	1

REV	DATE	ENG	DESCRIPTION
1	01/01/23	KR	Revised Note 1, Converted to new format
0	04/01/19	KR	



CONSTRUCTION NOTE(s):

1. Coil 50' of extra fiber optic cable.

2. ADSS tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.

3. This standard can also be used on a tangent application.

4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

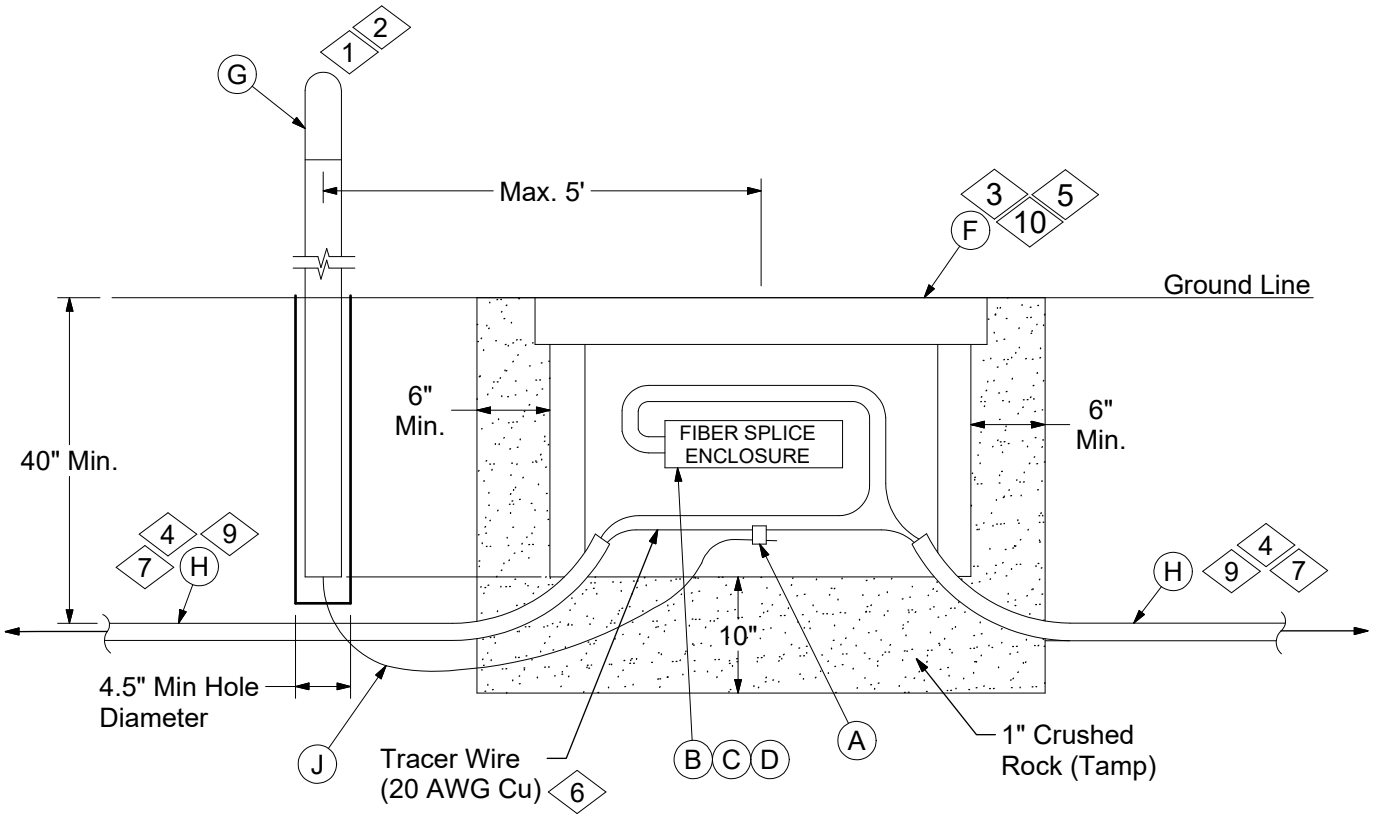
5. Use longer machine bolts for larger wood or composite poles if required.

6. Use Stock #23 56 117 for aerial mounting of Stock #40 54 502 splice enclosure.

7. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 06 **	01	02
	A	23 66 207	Washer, Curved, Square, 5/8"	2	2
	B	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 68 747	Formed Wire Deadend, ADSS 48-ct Fiber	2	-
		23 68 778	Formed Wire Deadend, ADSS 72-ct Fiber	-	2
	F	40 89 742	Splice Tray, 24 ct.	2	3
	G	40 54 494	Splice Enclosure	1	1
6	H	17 73 139	Aerial Mounting Bracket for Splice Enclosure	1	1
	I	17 60 734	Splice Protector Sleeve	10	10
	J	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
2	K	16 01 647	ID Tag, ADSS	1	1
	L	40 89 494	Nylon Zip Tie	2	2
@	M	17 02 178	Cable Holder (Snowshoe) ADSS	#	#
@	N	27 59 084	72-ct ADSS	#	#

REV	DATE	ENG	DESCRIPTION
0	01/01/23	KR	New



CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' from the center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-way HDPE Microducts.

5. Coil 50' of fiber optic cable per run (100' total). Splice-thru remaining unused microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. End caps (Stock #12 01 343) shall be installed on all unused microducts.

8. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 20 01 **	01
	A	40 89 744	Connector, tracer wire	1
	B	40 89 742	Splice Tray, 24 ct.	3
	C	40 54 494	Splice Box	1
	D	40 54 495	Splice Box Hand-Hole Stand	1
@	E	12 01 342	Straight-thru connectors for microducts	#
10,@	F	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
1,2,@	G	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
7,9,@	H	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	I	83 36 251	Pulling Tape	#
6,@	J	18 66 689	#12 Orange Tracer Wire	#
4,5,@	K	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

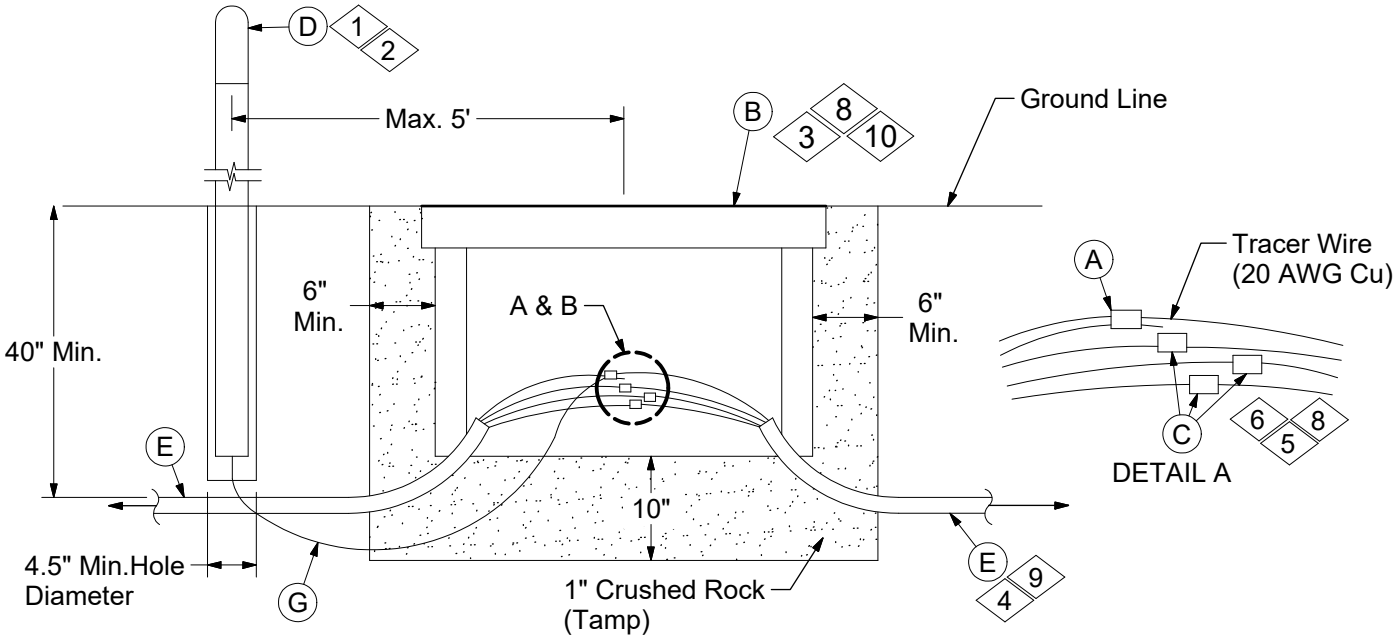
10 Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

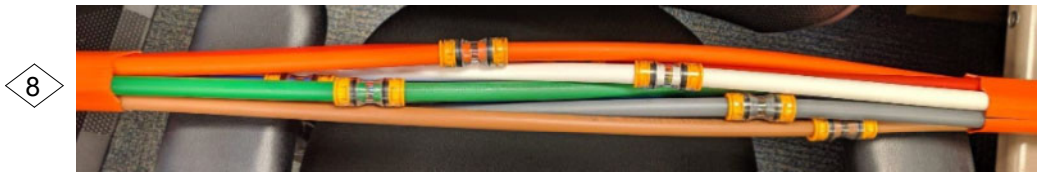
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber without Splice

18 20 02 **
1 of 2





DETAIL B

CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' North of center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

5. Splice-thru each of the microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

8. Where hand-holes are not feasible slide a section of schedule 80 pipe over the spliced microducts for bearing protection (Detail B). The pipe should extend at least 1' beyond the uncut end of the future path.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Drawing, BOM, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 20 02 **	01
	A	40 89 744	Connector, Tracer Wire	1
8,10,@	B	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
5,@	C	12 01 342	Straight-thru Connectors for Microducts	#
1,2,@	D	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
9,@	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	F	83 36 251	Pulling Tape	#
6,@	G	18 66 689	#12 Orange Tracer Wire	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

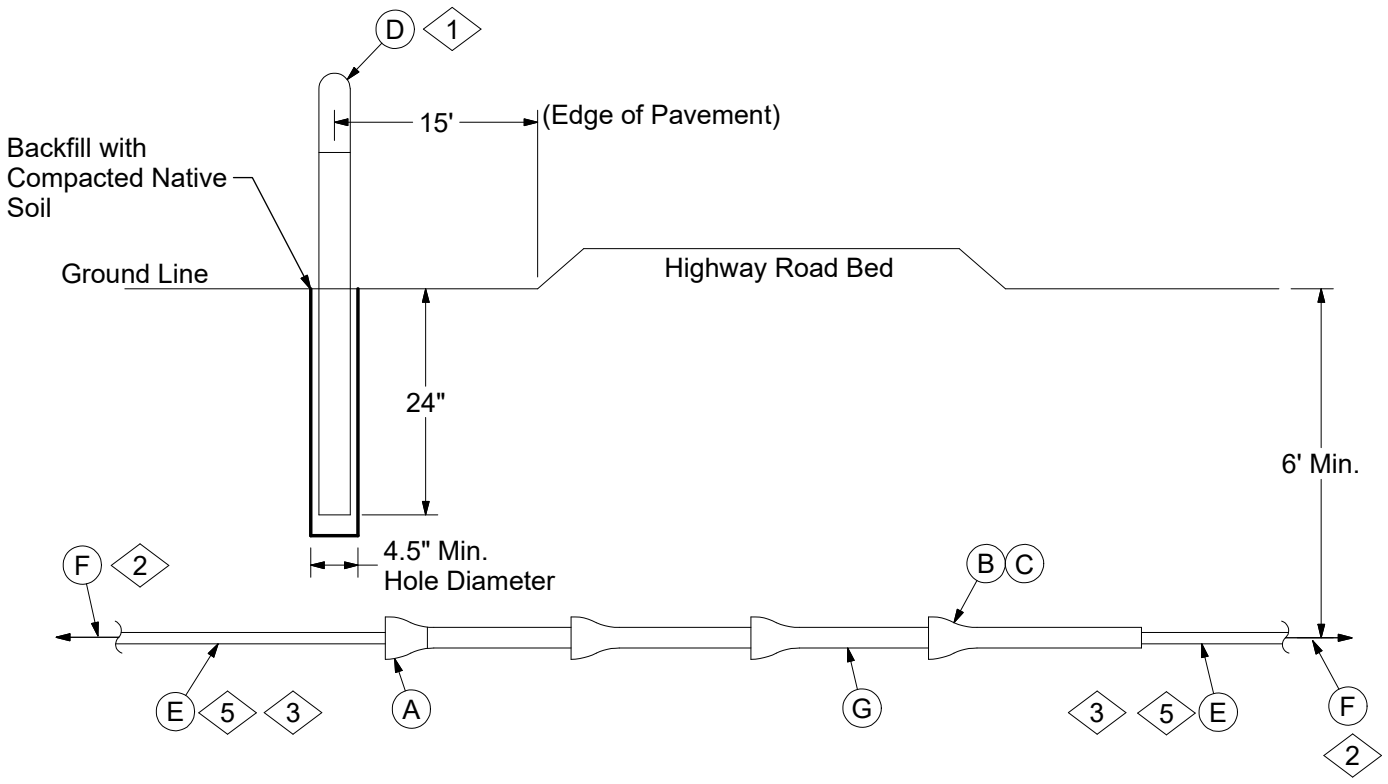
10. Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Drawing, BOM, & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber Bored Highway Crossing

18 20 03 **
1 of 1



CONSTRUCTION NOTE(s):

1. Install fiber marker without test paddle (Stock #16 16 292) 15' from edge of pavement directly over buried fiber.

2. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

3. End caps (Stock #12 01 343) shall be installed on all unused microducts.

4. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

5. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single Microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

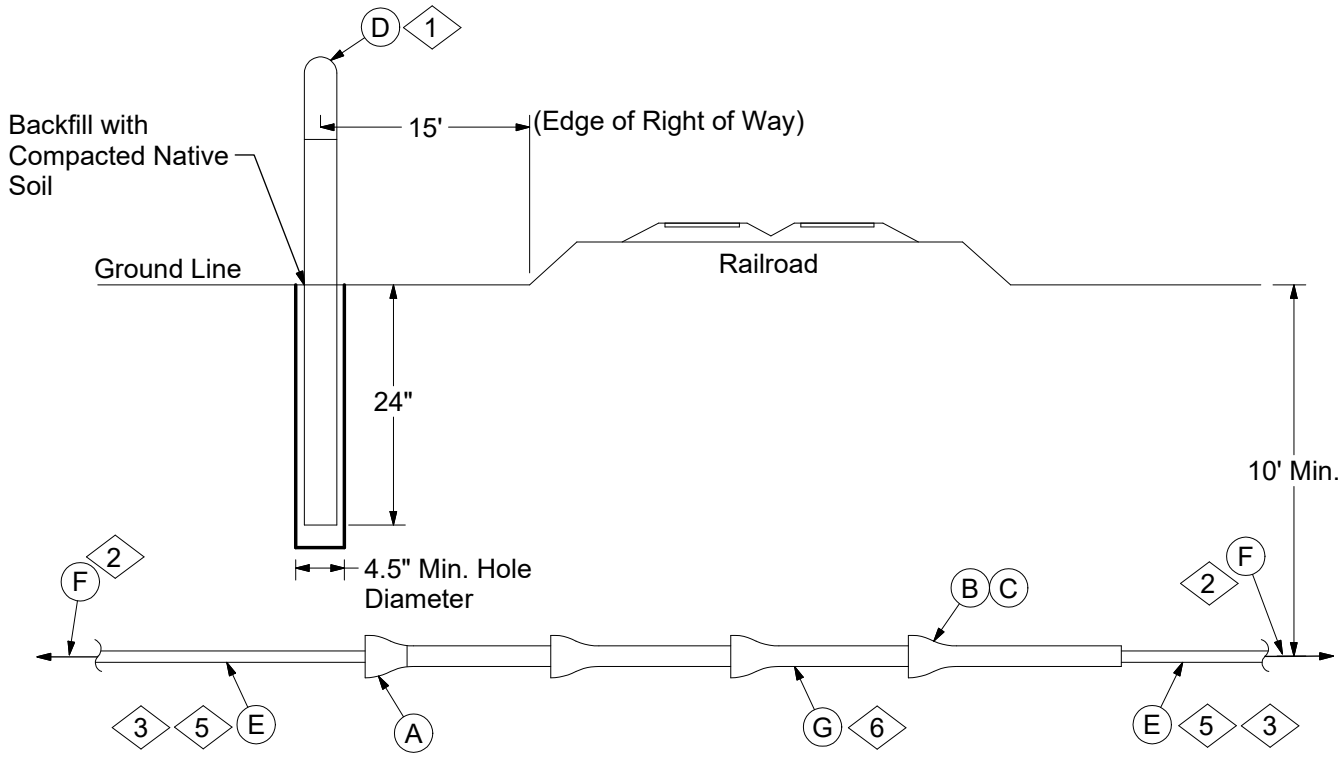
	ITEM	STK / DCS #	DESCRIPTION 18 20 03 **	01
	A	12 51 254	Bell End Fitting	1
	B	30 58 068	PVC Primer, Purple, 10 Ounce Container	1
	C	12 56 100	PVC Solvent Cement, Yellow	1
1,@	D	16 16 292	Orange Fiber Cable Marker without Test Paddle	#
	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Trace Wire	#
3,5,@		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Trace Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Trace Wire	#
2,@	F	83 36 251	Pulling Tape	#
@	G	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber Bored Railroad Crossing

18 20 04 **
1 of 1



CONSTRUCTION NOTE(s):

1. Install fiber marker without test paddle (Stock #16 16 292) 15' from edge of right-of-way directly over buried fiber.

2. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

3. End caps (Stock #12 01 343) shall be installed on all unused microducts.

4. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

5. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

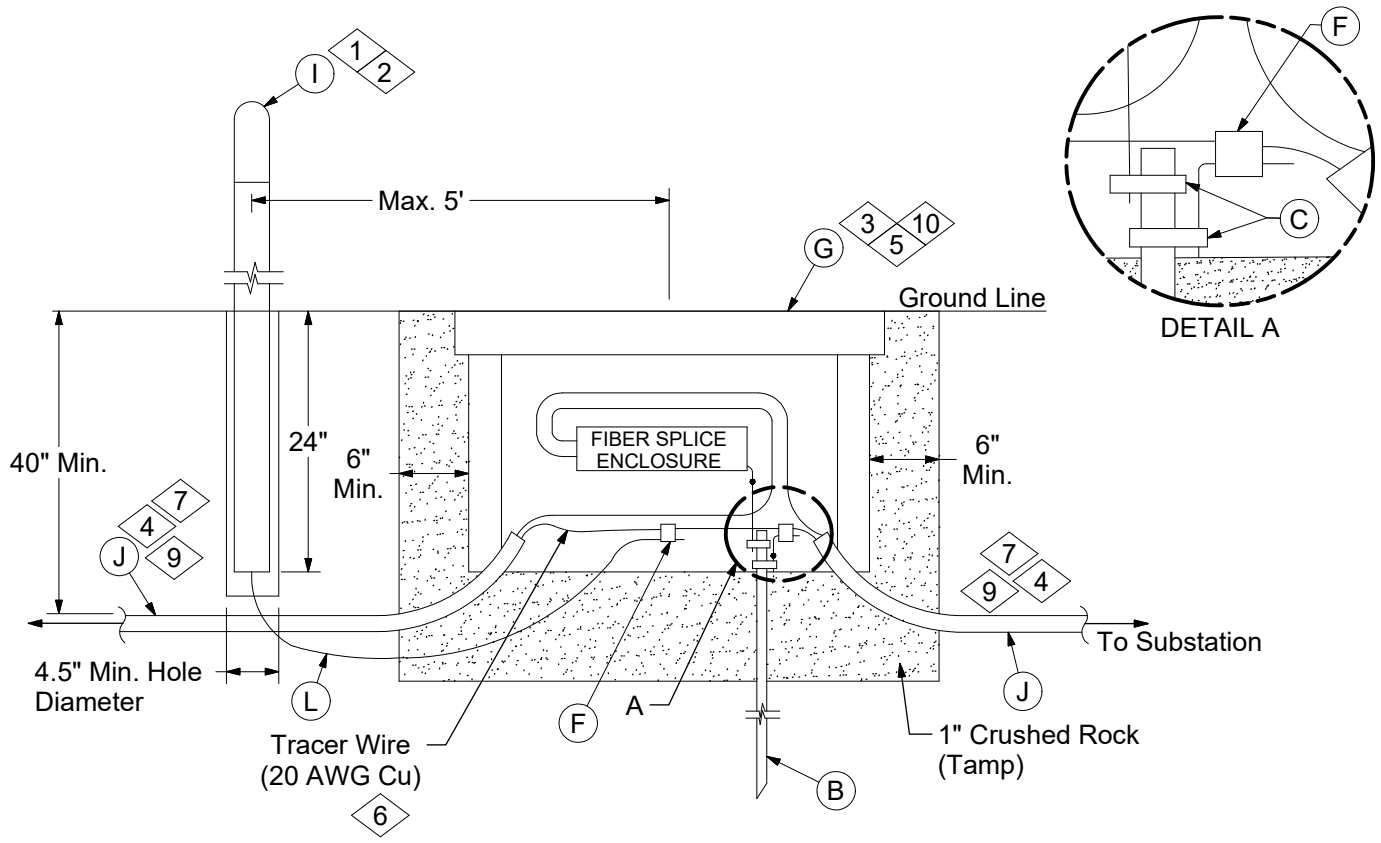
	ITEM	STK / DCS #	DESCRIPTION 18 20 04 **	01
	A	12 51 254	Bell End Fitting	1
	B	30 58 068	PVC Primer, Purple, 10 Ounce Container	1
	C	12 56 100	PVC Solvent Cement, Yellow	1
1,@	D	16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
3,5,@	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
2,@	F	83 36 251	Pulling Tape	#
6,@	G	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

6. When using steel conduit use Stock #40 83 343 in place of PVC.

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' from the center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-way HDPE Microducts.

5. Coil 50' of fiber optic cable per run (100' total). Splice-thru remaining unused microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. End caps (Stock #12 01 343) shall be installed on all unused microducts.

8. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

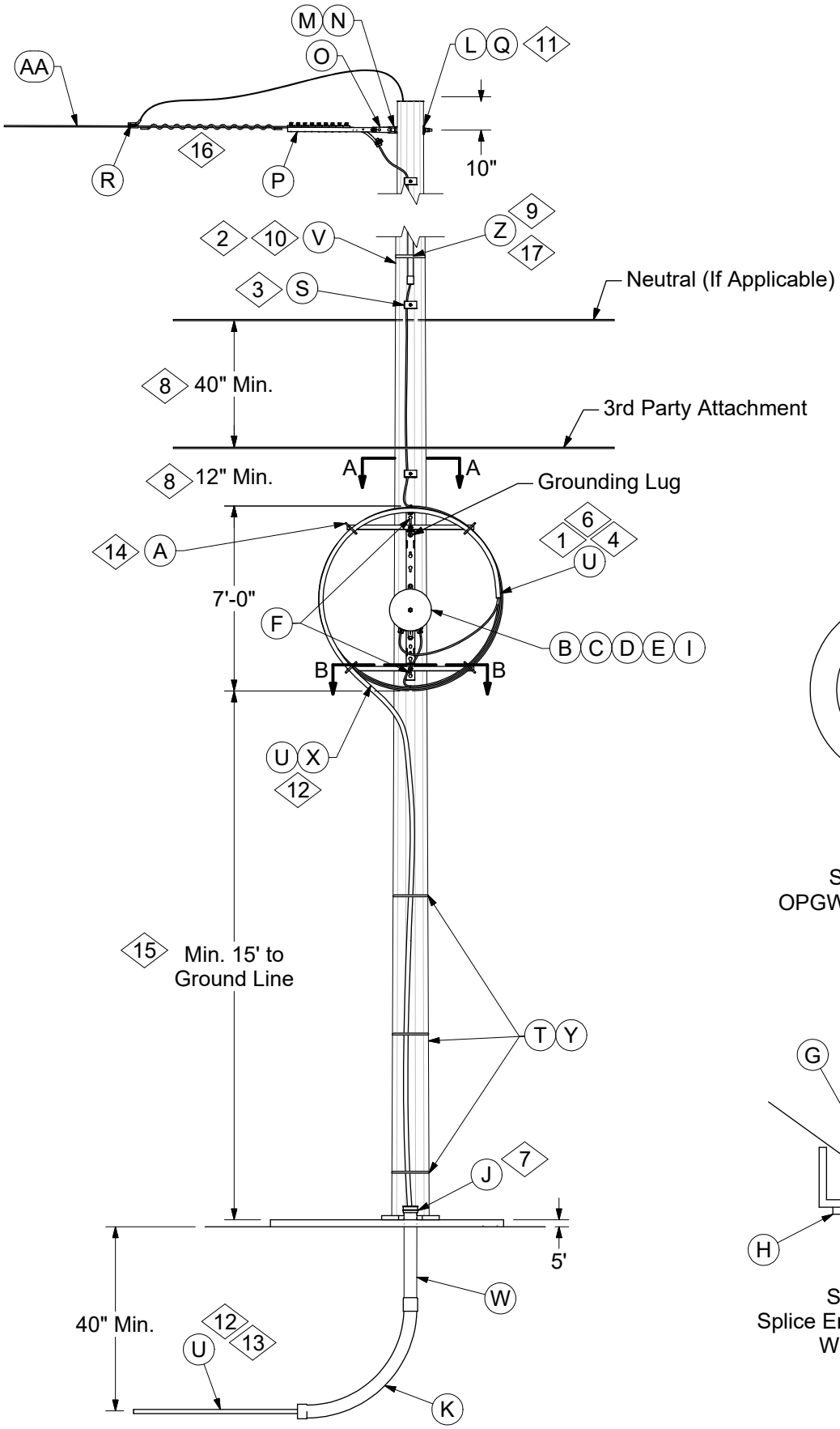
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

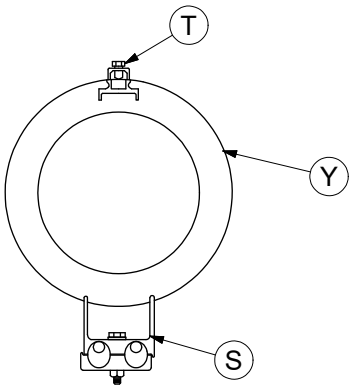
	ITEM	STK / DCS #	DESCRIPTION 18 20 05 **	01
	A	40 89 742	Splice Tray, 24ct.	3
	B	23 13 069	Ground Rod 5/8"x8' Copperweld	1
	C	17 52 032	Grounding Clamp	2
	D	40 54 494	Splice Box	1
	E	40 54 495	Splice Box Hand-Hole Stand	1
	F	40 89 744	Connector, Tracer Wire	1
10,@	G	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
5,@	H	12 01 342	Straight-Thru Connectors for Microducts	#
1,2,@	I	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
7,9,@	J	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	K	83 36 251	Pulling Tape	#
6,@	L	18 66 689	#12 Oranger Tracer Wire	#
@	M	18 52 025	#2 Solid Cu Ground Wire	#
@	N	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

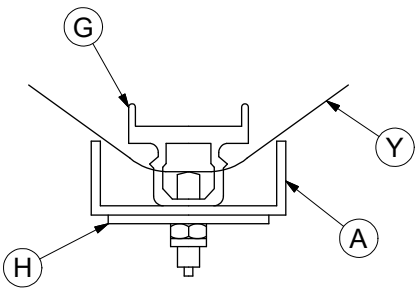
<10> Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	





SECTION A-A
OPGW Downlead Clamp
Assembly



SECTION B-B
Splice Enclosure Attachment
Without Bracket

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. To attach iron hanger to pole use #10 self tapping screws (Stock #21 76 679).
3. Install downlead clamps every 10'.
4. End caps (Stock #12 01 343) shall be installed on all unused microducts.
5. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
6. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
7. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
8. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
9. The conduit shall be installed through the entire energized zone on the pole.
10. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3” Conduit Strap (Stock #23 67 182), and 4” Conduit Strap (Stock #23 67 183).
11. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
13. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
14. If guying is utilized, the fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 30 01 **	01
	A	40 54 480	Coil Bracket	1
	B	17 60 734	Splice Protector Sleeve	10
	C	40 54 478	Splice Enclosure	1
	D	40 54 479	Furcation Kit, OPGW	1
	E	40 54 481	Connector Kit, OPGW	1
	F	23 52 024	Machine Bolt, Galv., 1/2" x 1-1/4", w/ Nut	2
	G	23 67 499	Banding Clamp, with 5/8" Stud and Nut	2
	H	23 66 027	Washer, Square, for 5/8" Bolt	2
	I	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	J	12 51 254	Conduit - Coupling 4" Bell End	1
	K	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1
	L	23 66 031	Washer, Curved, Square, 3/4"	1
	M	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1
	N	23 59 095	Eyelet, 3/4"	1
	O	23 59 042	Link Extension - 6" Clevis Eye	1
	P	23 68 732	Bolted Deadend	1
	Q	23 65 042	Lock Nut - 3/4" Square	1
	R	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
3,@	S	17 52 219	Downlead Clamp	#
@	T	23 67 500	Banding Clamp, w/ 5/8" Bolt	#
4,12,13,@	U	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
2,10,@	V	27 60 035	Strap, Iron Hanger	#
@	W	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	X	18 66 671	72-ct UG Fiber Optic Cable	#
@	Y	22 12 084	Banding, Stainless Steel	#
17,@	Z	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#
@	AA	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
@	BB	**12 00 10 10**	Grounding Unit	1

DESIGN NOTE(s):

15. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

16. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

17. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

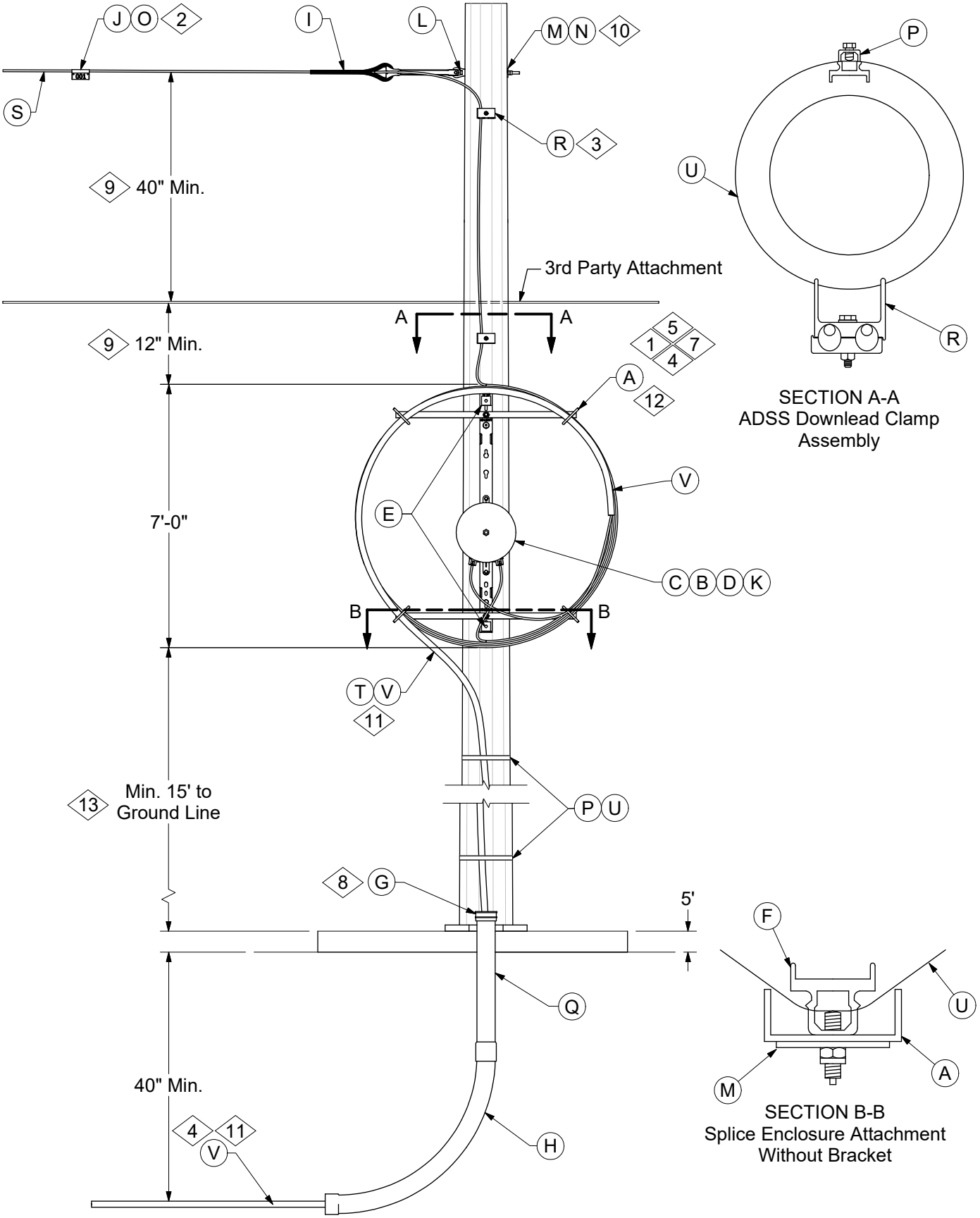
18. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Steel Pole ADSS to Underground Fiber

18 30 02 **
1 of 3



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100’ of extra fiber optic cable around coil bracket.
2. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10’ of pole.
3. Install downlead clamps every 10’.
4. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
5. End caps (Stock #12 01 343) shall be installed on all unused microducts.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
8. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
9. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
10. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
11. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
12. If guying is utilized, the fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

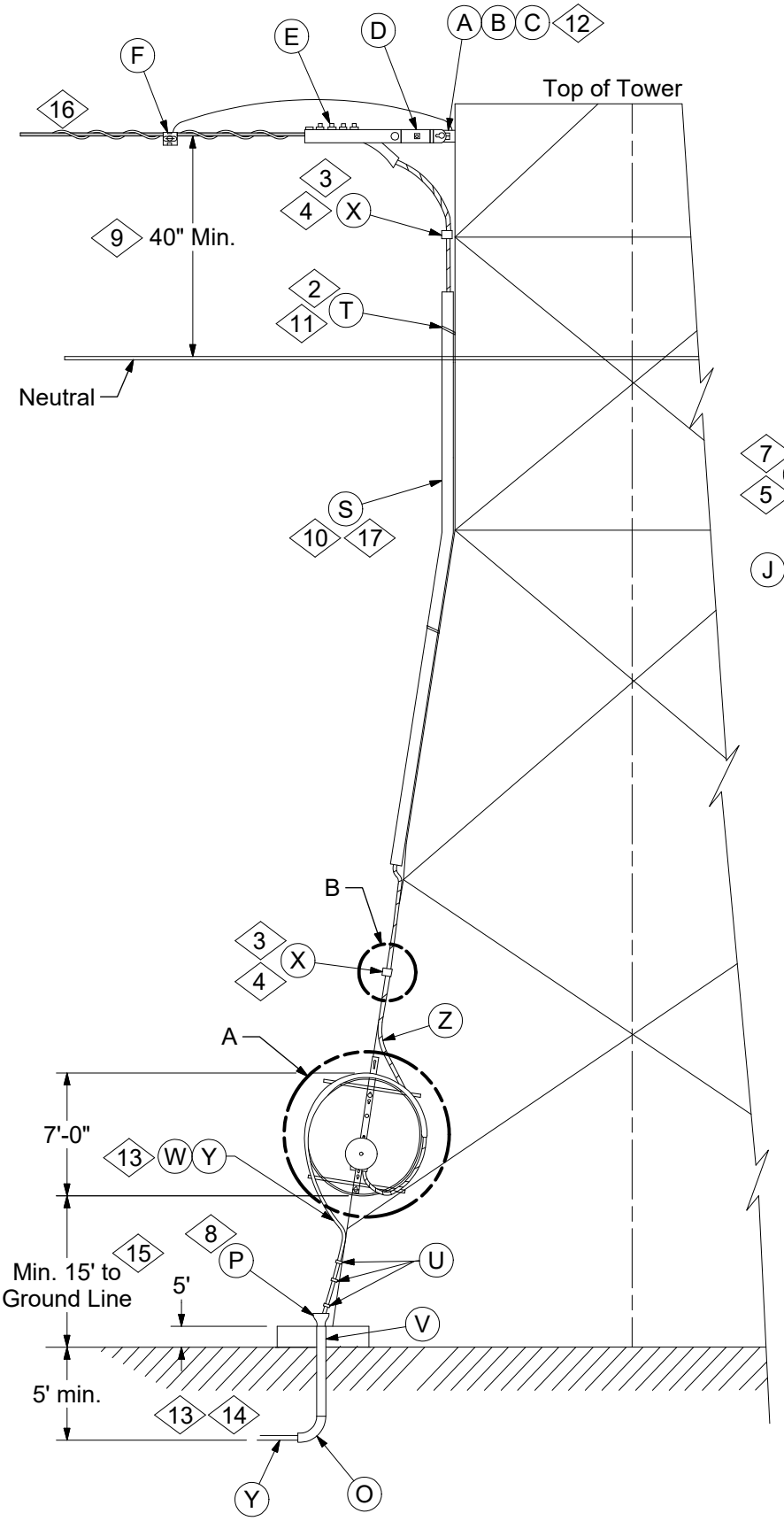
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

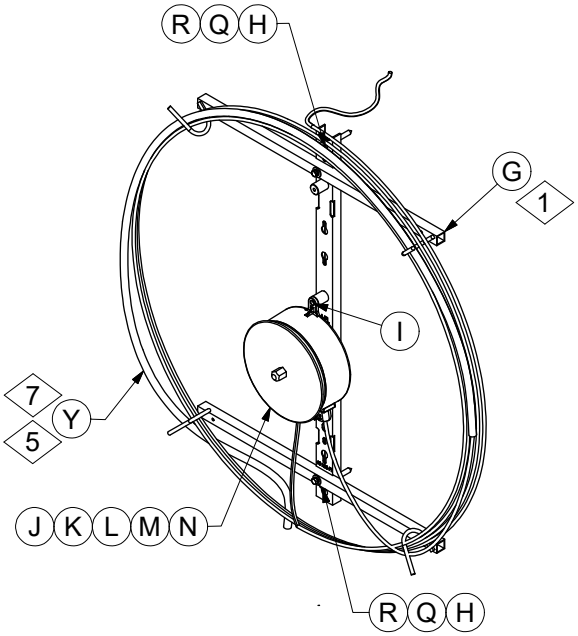
	ITEM	STK / DCS #	DESCRIPTION 18 30 02 **	01	02
	A	40 54 480	Coil Bracket	1	1
	B	17 60 734	Splice Protector Sleeve	10	10
	C	40 54 478	Splice Enclosure	1	1
	D	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	E	23 52 024	Machine Bolt, Galv. 1/2" x 1-1/4" w/ Nut	2	2
	F	23 67 499	Banding Clamp, with 5/8" Stud and Nut	2	2
	G	12 51 254	Conduit - Coupling 4" Bell End	1	1
	H	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
	I	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
2	J	16 01 647	ID Tag, ADSS	1	1
	K	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	L	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	M	23 66 027	Washer, Flat, Square 5/8"	2	2
	N	23 65 043	Lock Nut - 5/8" Square	1	1
	O	40 89 494	Nylon Zip Tie	2	2
@	P	23 67 500	Banding Clamp, with 5/8" Bolt	#	#
@	Q	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#	#
3,@	R	17 52 219	Downlead Clamp	#	#
@	S	27 59 084	72-ct ADSS	#	#
@	T	18 66 671	72-ct UG Fiber Optic Cable	#	#
@	U	22 12 084	Banding, Stainless Steel	#	#
	V	12 01 338	HDPE Microduct, 3-Way w/ 20 AWG Cu Tracer Wire	#	#
4,5,11,@		12 01 339	HDPE Microduct, 7-Way w/ 20 AWG Cu Tracer Wire	#	#
		12 01 341	HDPE Microduct, 4-Way w/ 20 AWG Cu Tracer Wire	#	#

DESIGN NOTE(s):

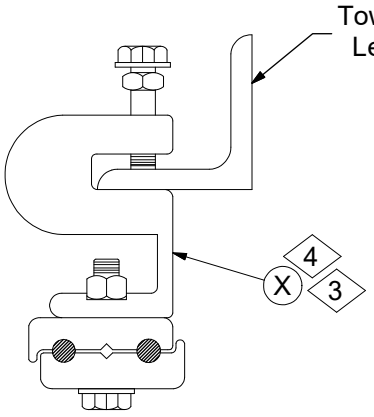
13 Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	





DETAIL A
Fiber Optic Splice Enclosure



DETAIL B
OPGW Downlead Clamp

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. To attach iron hanger to pole use #10 self tapping screws (Stock #21 76 679).
3. Install downlead clamps every 10'.
4. For lattice tower web thickness greater than 0.75" use stock code (Stock #17 52 228). For web thickness less than 0.75" use stock code (Stock #17 52 221).
5. End caps (Stock #12 01 343) shall be installed on all unused microducts.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with ends caps (Stock #12 01 343)
8. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
9. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
10. The conduit shall be installed through the entire energized zone on the pole.
11. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3” Conduit Strap (Stock #23 67 182), and 4” Conduit Strap (Stock #23 67 183).
12. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
13. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
14. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 40 01 **	01
	A	23 66 031	Washer, Square for 3/4" Bolt	1
	B	23 52 254	Mach. Bolt, Galv., 3/4" x 16"	1
	C	23 59 095	Eyelet, for 3/4" Bolt	1
	D	23 59 042	Extension Link, 6"	1
	E	23 68 732	Bolted Deadend	1
	F	17 52 217	Clamp for Bonding OPGW Static to Pole Ground	1
	G	40 54 480	Coil Bracket	1
	H	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	2
	I	23 52 031	Mach. Bolt, Galv., 1/2" x 3", w/ Nut	2
	J	40 54 478	Splice Enclosure	1
	K	17 60 734	Splice Protector Sleeve	10
	L	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	M	40 54 481	Connector Kit, OPGW	1
	N	40 54 479	Furcation Kit, OPGW	2
	O	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1
	P	12 51 254	Bell End Fitting	1
	Q	23 66 027	Washer, Flat, Square 5/8"	2
	R	23 65 043	Lock Nut - 5/8" Square	2
10,17,@	S	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#
2,11,@	T	27 60 035	Strap, Iron Hanger	#
@	U	40 89 494	Nylon Zip Tie	#
@	V	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	W	18 66 671	72-ct UG Fiber Optic Cable	#
3,4,@	X	17 52 221	Downlead Clamp	#
		17 52 228	Downlead Clamp	#
5,13,14,@	Y	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
@	Z	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#

DESIGN NOTE(s):

15. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

16. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

17. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

18. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

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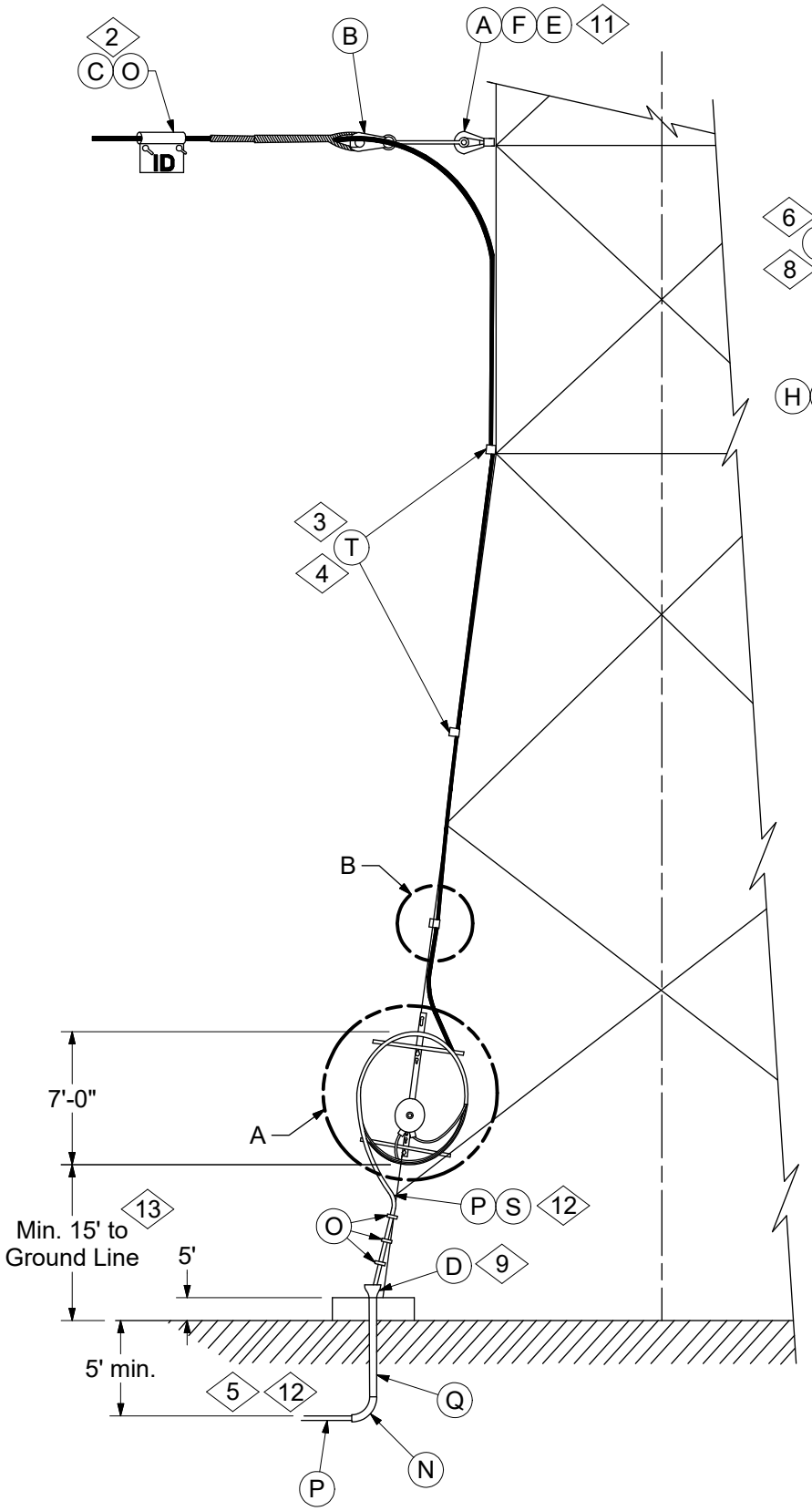
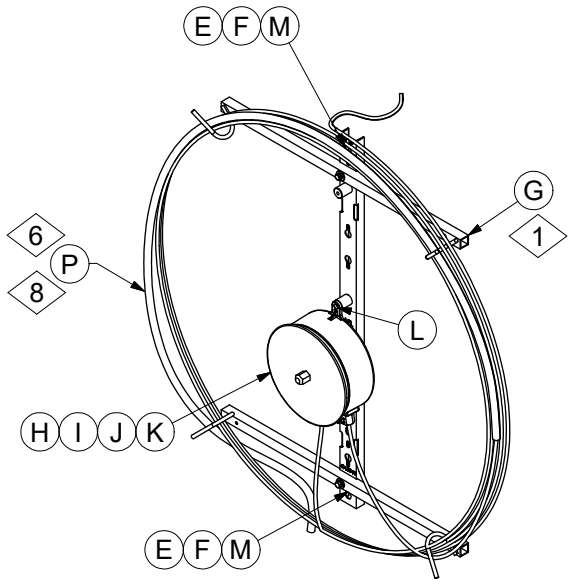
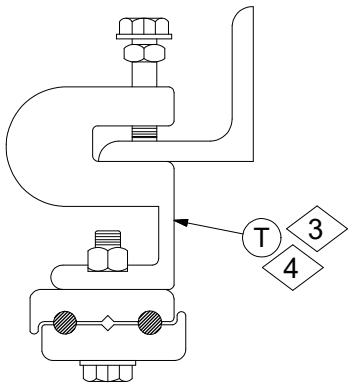




DETAIL A
Fiber Optic Splice Enclosure



DETAIL B
ADSS Downlead Clamp

DISTRIBUTION CONSTRUCTION STANDARDS

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CONSTRUCTION NOTE(s):

1. Coil 100’ of extra fiber optic cable around coil bracket.
2. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10’ of pole.
3. Install downlead clamps every 10’.
4. For lattice tower web thickness greater than 0.75" use stock code (Stock #17 52 228). For web thickness less than 0.75" use stock code (Stock #17 52 221).
5. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
6. End caps (Stock #12 01 343) shall be installed on all unused microducts.
7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
8. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with ends caps (Stock #12 01 343).
9. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
10. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
11. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)

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	ITEM	STK / DCS #	DESCRIPTION 18 40 02 **	01	02
	A	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	B	23 68 747	Formed Wire Deadend, 48-ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
	C	16 01 647	ID Tag, ADSS	1	1
	D	12 51 254	Bell End Fitting	1	1
	E	23 65 043	Lock Nut - 5/8" Square	3	3
	F	23 66 027	Washer, Flat, Square 5/8"	3	3
	G	40 54 480	Coil Bracket	1	1
	H	17 60 734	Splice Protector Sleeve	10	10
	I	40 54 478	Splice Enclosure	1	1
	J	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	K	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	L	23 52 024	Machine Bolt, Galv., 1/2" x 1-1/4", w/ Nut	2	2
	M	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	2	2
	N	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
@	O	40 89 494	Nylon Zip Tie	#	#
	P	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Trace Wire	#	#
5,8,12,@		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Trace Wire	#	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Trace Wire	#	#
@	Q	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#	#
@	R	27 59 084	72-ct ADSS	#	#
@	S	18 66 671	72-ct UG Fiber Optic Cable	#	#
	T	17 52 221	Downlead Clamp	#	#
3,4,@		17 52 228	Downlead Clamp	#	#

DESIGN NOTE(s):

13. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

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