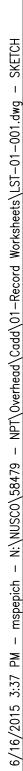
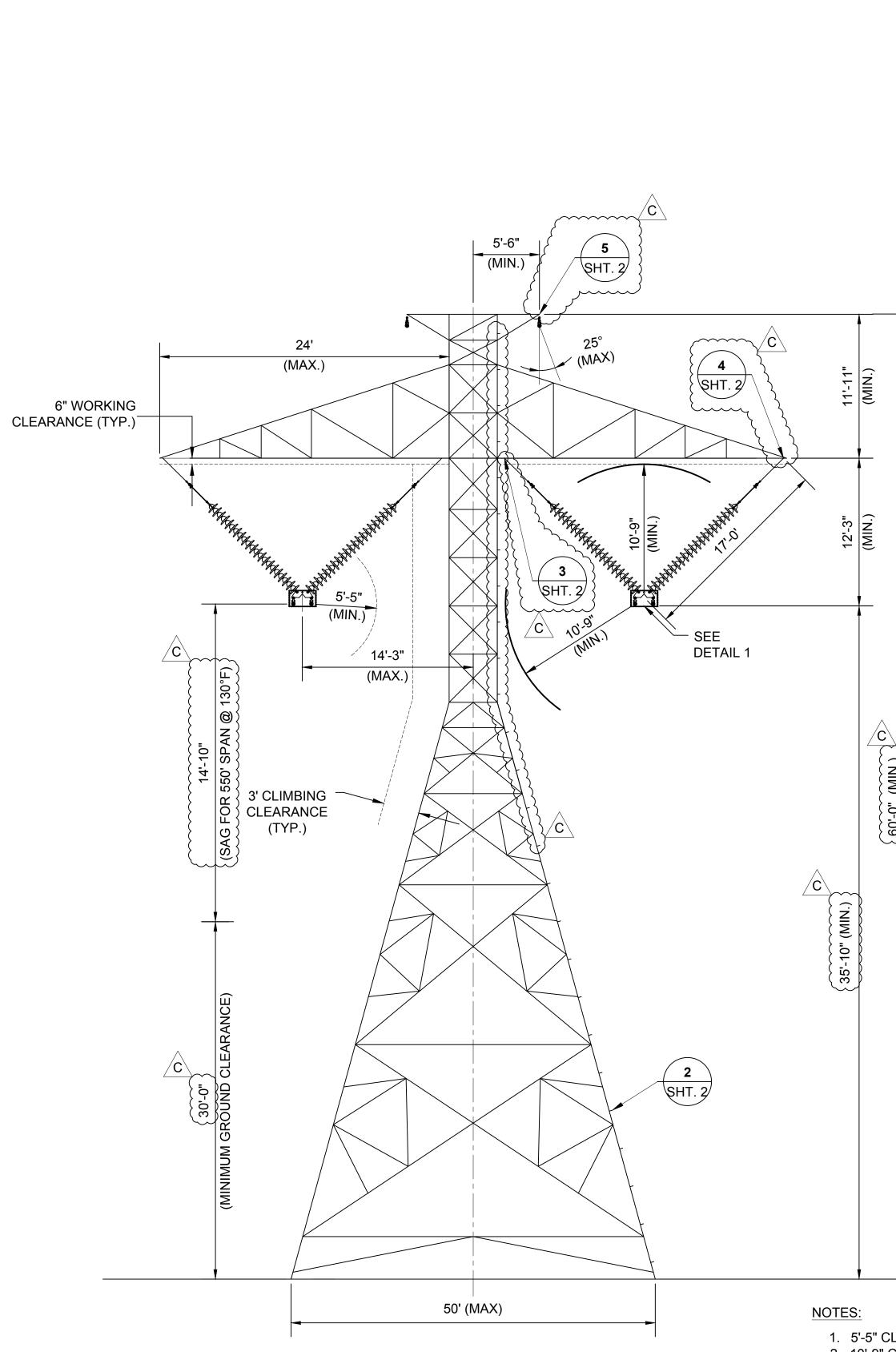
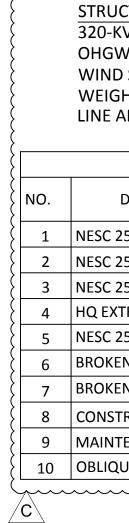


PRELIMINARY - NOT FOR CONSTRUCTION







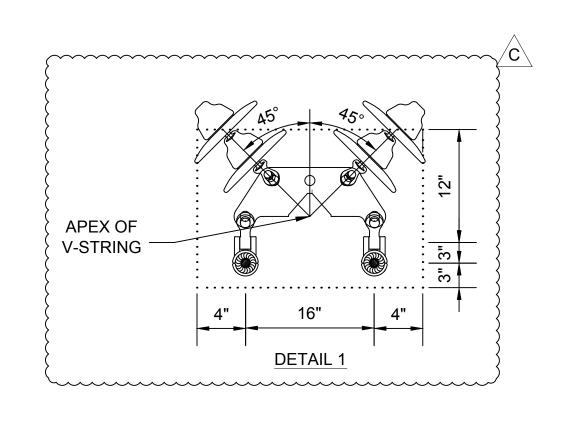


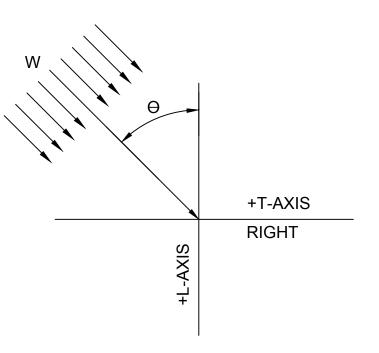
- AND LONGITUDINAL AXIS RESPECTIVELY. STRUCTURE.
- TOWER.

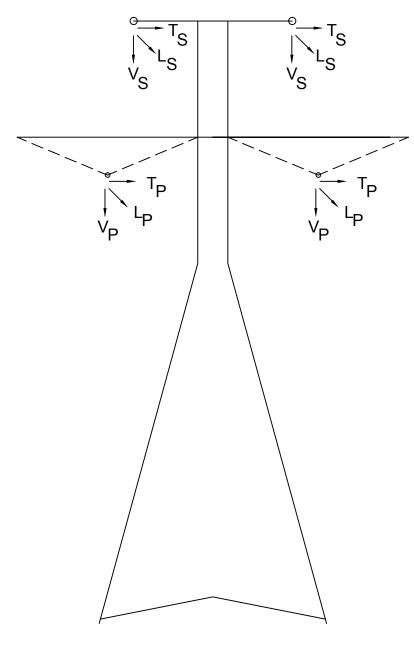
- B.
- CASE.

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	С		MISC. REVISIONS
	В		UPDATED STRUCTURE HEIG
	A		RELEASED FOR RFP
L	DWG F	REV	EPN/DESCRIPTION







LOADING TREE

1. 5'-5" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING CLEARANCE. 2. 10'-9" CLEARANCE MUST BE CONSIDERED FROM TOWER BODY AND ARMS.

|B|

80'-0" (MIN.) STRUCTURE HEIGHT RAN

PRELIMINARY - NOT FOR CONSTRUCTION

STRUCTURE NAME: 32-SCHLT-LTG-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 550 WEIGHT SPAN (FT): 850 LINE ANGLE: 0 - 2 DEGREES

	LOADING CASE DESIGN LOADS														
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К		
1	NESC 250B	0.00	0.50	39.53	1.45	1.03	0.00	13.54	5.30	0.00	10.00	90.00	1.50		
2	NESC 250C	60.00	0.00	100.00	0.43	0.75	0.00	5.61	5.98	0.00	29.00	90.00	1.00		
3	NESC 250D	15.00	1.00	39.53	2.03	0.74	0.00	12.70	3.28	0.00	4.00	90.00	1.00		
4	HQ EXTREME ICE	15.00	1.50	39.53	3.62	1.06	0.00	17.43	4.15	0.00	4.00	90.00	1.00		
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.96	0.48	0.00	9.02	2.65	0.00	4.00	90.00	1.00		
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.96	0.47	0.00	9.02	2.49	0.00	4.00	90.00	1.00		
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.96	0.37	5.50	9.02	1.51	24.00	4.00	90.00	1.00		
8	CONSTRUCTION	30.00	0.00	29.97	3.58	0.27	0.27	23.61	2.17	2.27	3.45	90.00	1.50		
9	MAINTENANCE	60.00	0.00	0.00	2.66	0.21	0.00	13.01	1.66	0.00	0.00	90.00	2.00		
10	OBLIQUE WIND	60.00	0.00	100.00	0.43	0.46	0.00	5.61	3.67	0.00	29.00	45.00	1.00		
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1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB. 14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

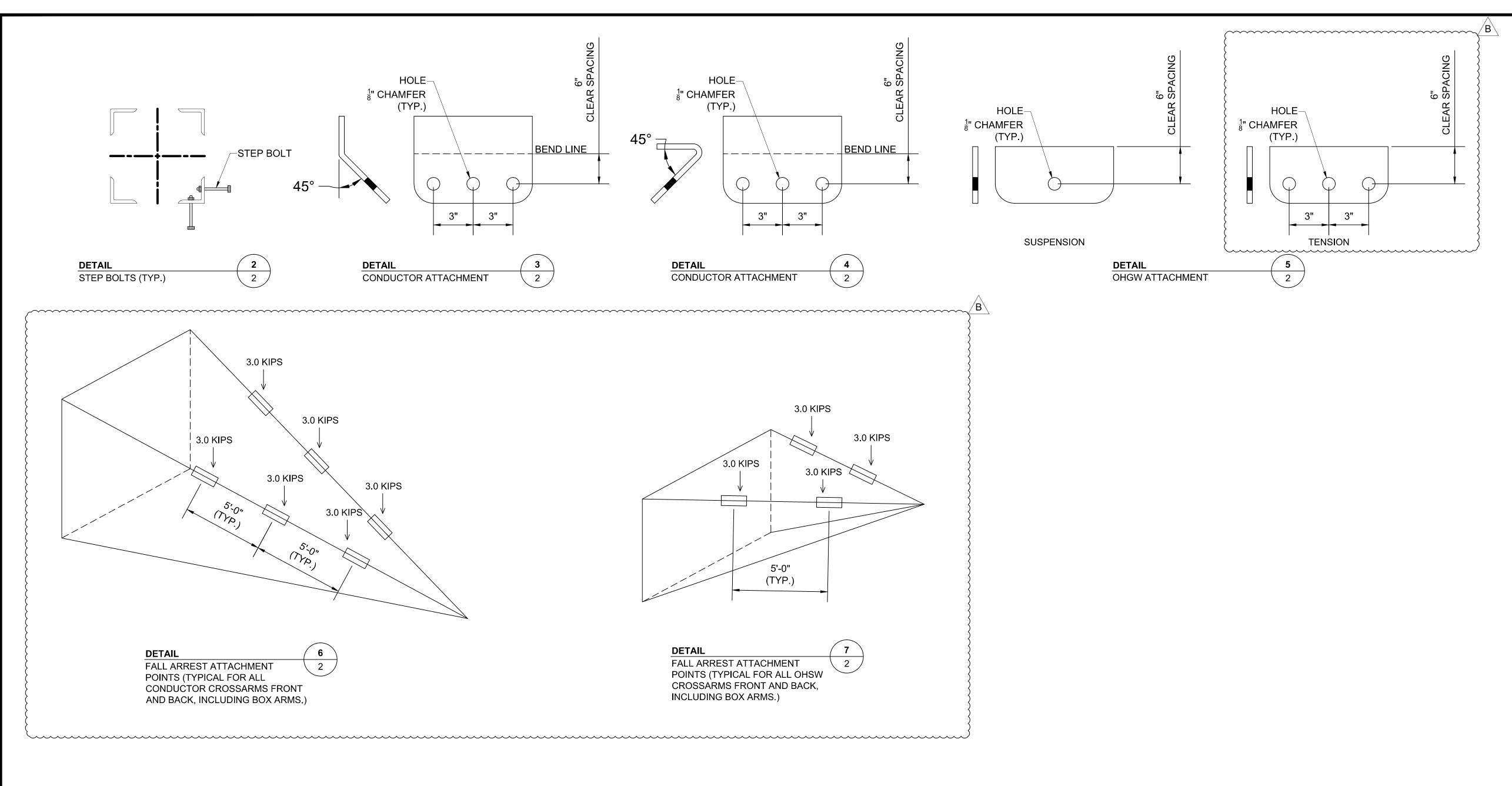
15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

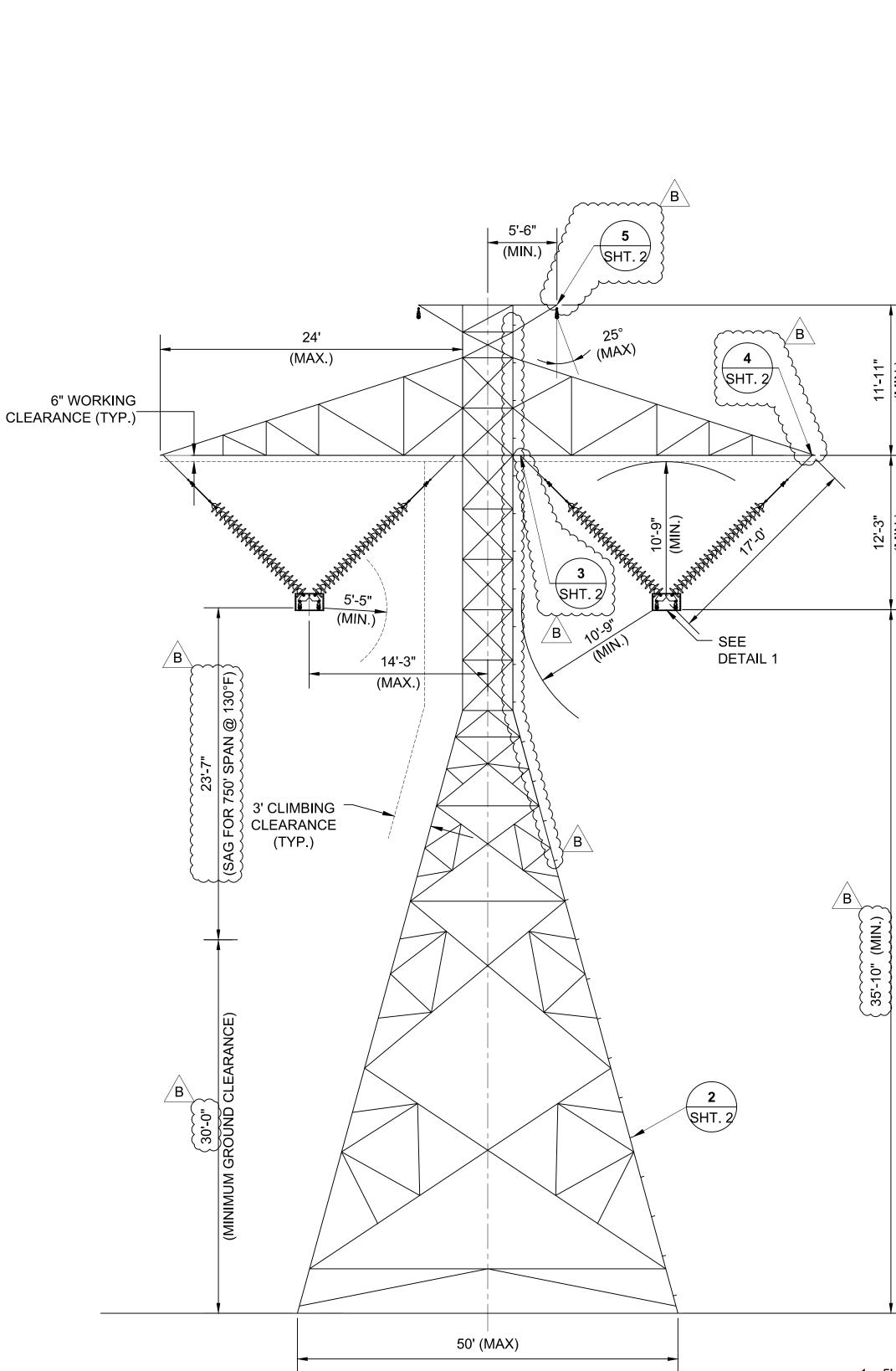
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

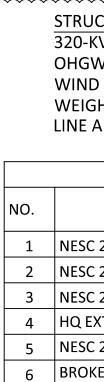
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N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-	01-001	L

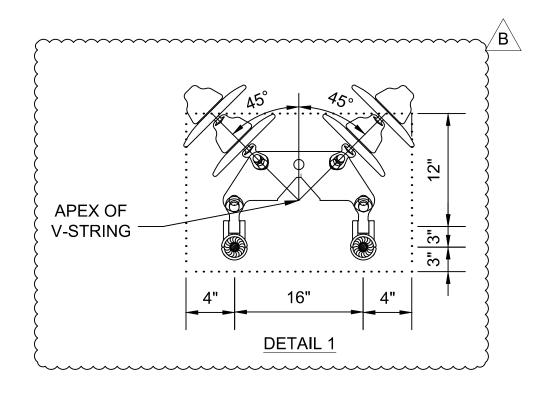


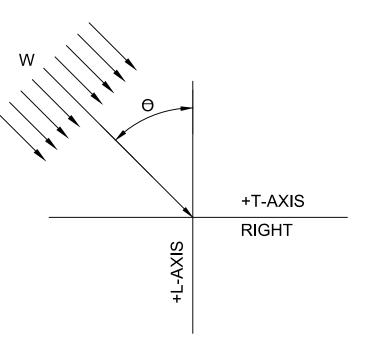
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	CONTRACT SERVICES									THE NORTHERN PASS		DRAWN KAK
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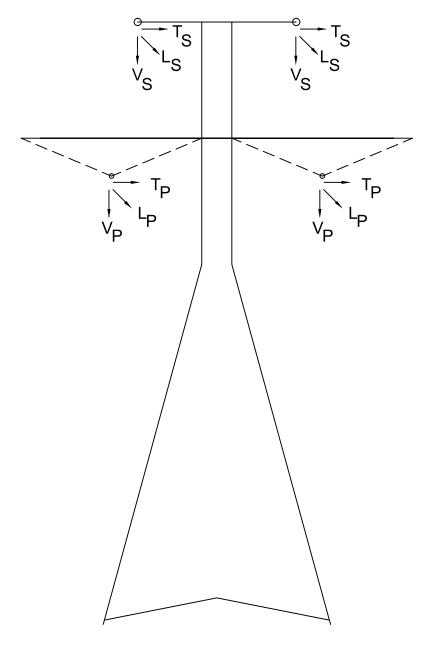












LOADING TREE

#### GENERAL NOTES:

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- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE. TOWER.

- - CASE.

∕B∖

	CONTRACT SERVICES		
		REV	DESCRIPTION
_			
	В		MISC. REVISIONS
	А		RELEASED FOR RFP
	DWG F	REV	EPN/DESCRIPTION

#### NOTES:

(60'-0" (MIN.)

STRUCTUF

1. 5'-5" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING CLEARANCE. 2. 10'-9" CLEARANCE MUST BE CONSIDERED FROM TOWER BODY AND ARMS.

PRELIMINARY - NOT FOR CONSTRUCTION

#### STRUCTURE NAME: 32-SCHLT-MTG-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 750 WEIGHT SPAN (FT): 1200 LINE ANGLE: 0 - 2 DEGREES

	LOADING CAS	ЗE			DESIGN LOADS								
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К
1	NESC 250B	0.00	0.50	39.53	2.01	1.28	0.00	18.06	6.29	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.59	0.97	0.00	7.55	7.67	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.84	0.91	0.00	17.22	3.81	0.00	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	5.09	1.30	0.00	23.90	4.81	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.34	0.58	0.00	12.04	3.04	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.34	0.57	0.00	12.04	2.88	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.34	0.47	5.50	12.04	2.01	30.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.82	0.30	0.27	26.51	2.40	2.27	3.45	90.00	1.50
9	MAINTENANCE	60.00	0.00	0.00	2.98	0.21	0.00	16.89	1.66	0.00	0.00	90.00	2.00
10	OBLIQUE WIND	60.00	0.00	100.00	0.59	0.56	0.00	7.55	4.51	0.00	29.00	45.00	1.00

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

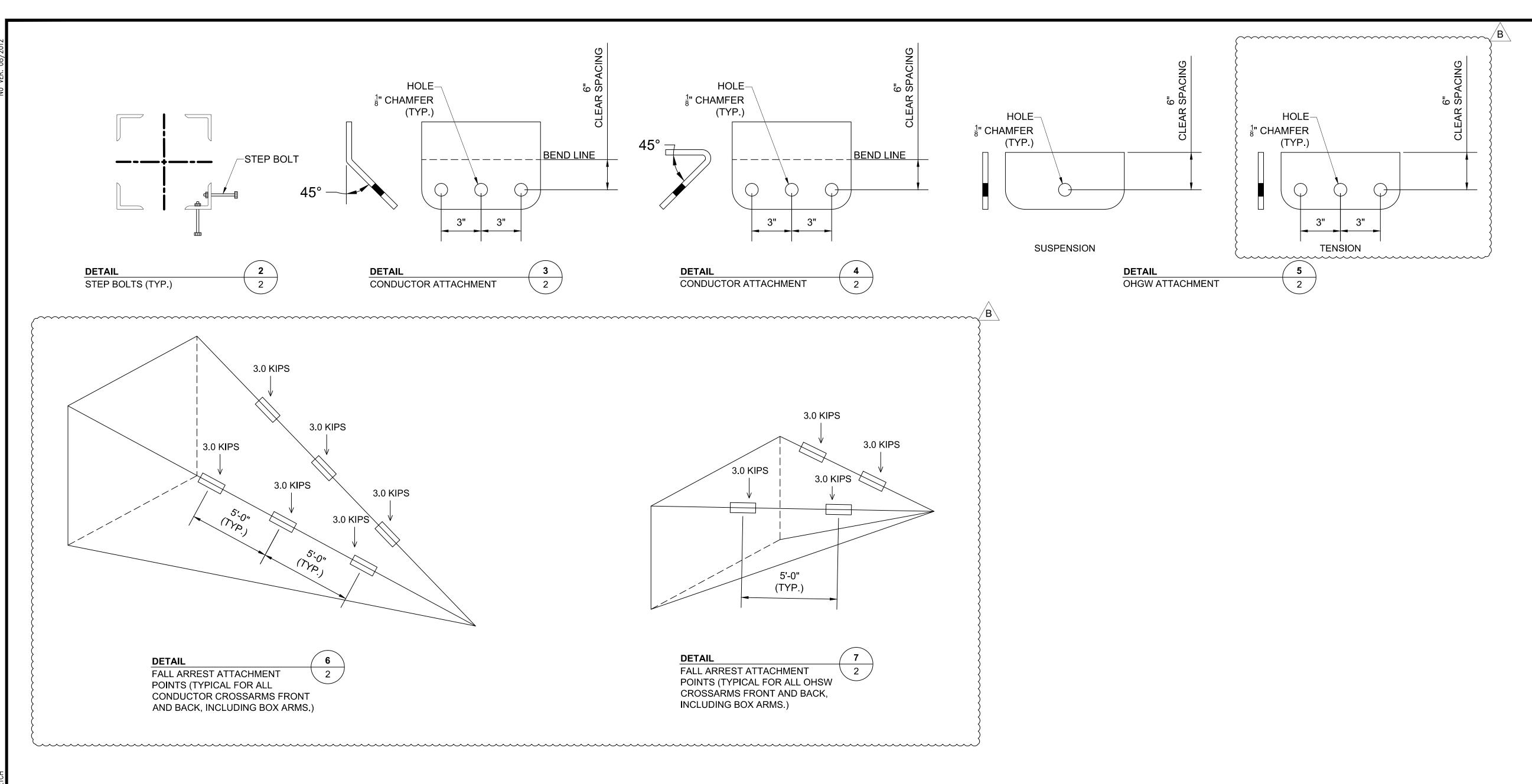
15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

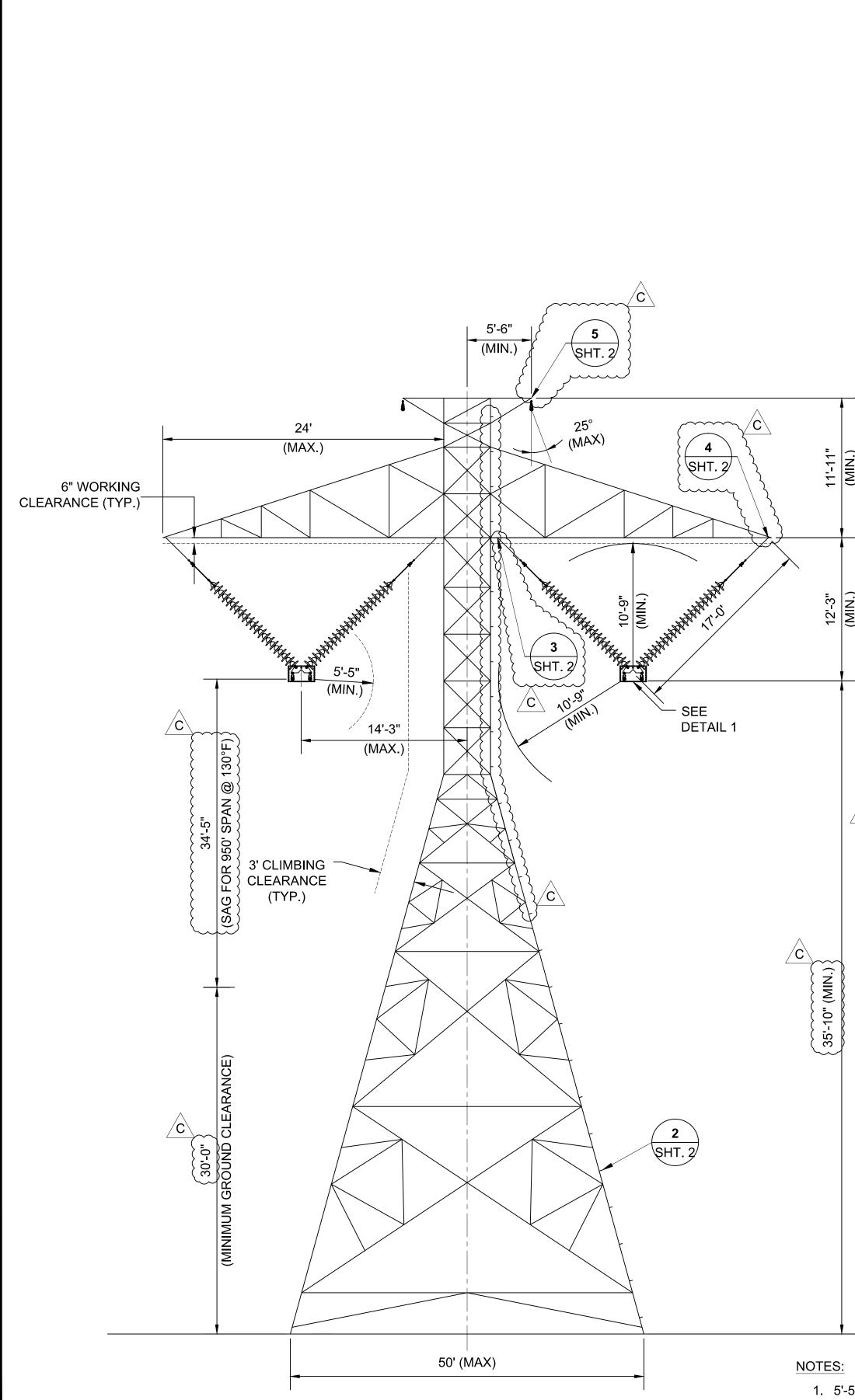
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

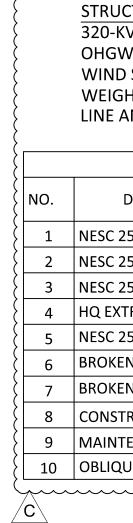
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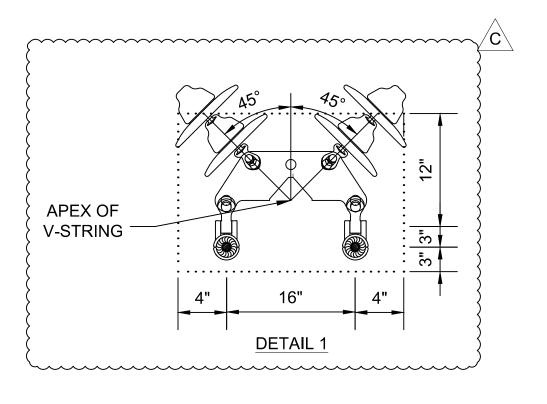


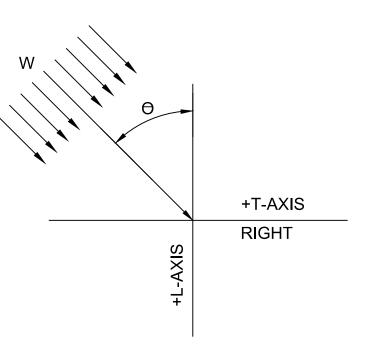
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B	2 2 3		HOLE DIAMETERS AND VANG COORDINATION WITH TOWER STEP BOLTS SHALL BE INSTA NCHES. STEP BOLTS SHALL B STRUCTURE SHALL BE DESIG DETAIL 5. FALL ARREST LOADS SHALL B	R VENI LLED BE PR GNED V	on A On A Ovidi With	AND H LTER ED FF SUSF	HARD NATE ROM ⁻ PENS	Ware Flai Towe Ion A	E MANUFAC NGES OF ON ER BASE TO AND TENSION	TURER. IE LEG. SPACING SHAL TOP OF TOWER. N ATTACHMENT PLATE:	L NOT EXC	}
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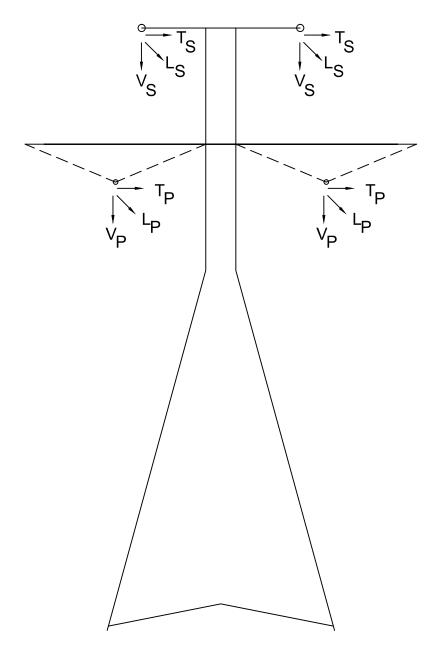












LOADING TREE

#### GENERAL NOTES:

- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE. TOWER.

- - CASE.

- LOADS UNDER THE MAINTENANCE LOAD CASE.

Image: Second structure       Image: Second structure         Image: Second structure       Image: Second structure <th>1</th> <th></th> <th></th> <th></th>	1			
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	-	DWG F	REV	EPN/DESCRIPTION

1. 5'-5" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING CLEARANCE. 2. 10'-9" CLEARANCE MUST BE CONSIDERED FROM TOWER BODY AND ARMS.

∕B∖

∕C∖

(60'-0" (MIN.)

STRUCTUR

PRELIMINARY - NOT FOR CONSTRUCTION

#### STRUCTURE NAME: 32-SCHLT-HTG-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 950 WEIGHT SPAN (FT): 1850 LINE ANGLE: 0 - 2 DEGREES

LOADING CAS	SE						DES	IGN LO	ADS			
DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К
250B	0.00	0.50	39.53	3.06	1.53	0.00	26.46	7.28	0.00	10.00	90.00	1.50
250C	60.00	0.00	100.00	0.88	1.19	0.00	11.15	9.36	0.00	29.00	90.00	1.00
50D	15.00	1.00	39.53	4.35	1.07	0.00	25.63	4.34	0.00	4.00	90.00	1.00
TREME ICE	15.00	1.50	39.53	7.81	1.53	0.00	35.93	5.48	0.00	4.00	90.00	1.00
250B w/o OLF	0.00	0.50	39.53	2.04	0.68	0.00	17.64	3.44	0.00	4.00	90.00	1.00
N WIRE (INTACT)	0.00	0.50	39.53	2.04	0.67	0.00	17.64	3.28	0.00	4.00	90.00	1.00
N WIRE (BROKEN)	0.00	0.50	39.53	2.04	0.57	5.50	17.64	2.58	40.00	4.00	90.00	1.00
RUCTION	30.00	0.00	29.97	4.25	0.33	0.27	31.91	2.63	2.27	3.45	90.00	1.50
ENANCE	60.00	0.00	0.00	3.56	0.21	0.00	24.09	1.66	0.00	0.00	90.00	2.00
UE WIND	60.00	0.00	100.00	0.88	0.67	0.00	11.15	5.35	0.00	29.00	45.00	1.00
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1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1

13. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE

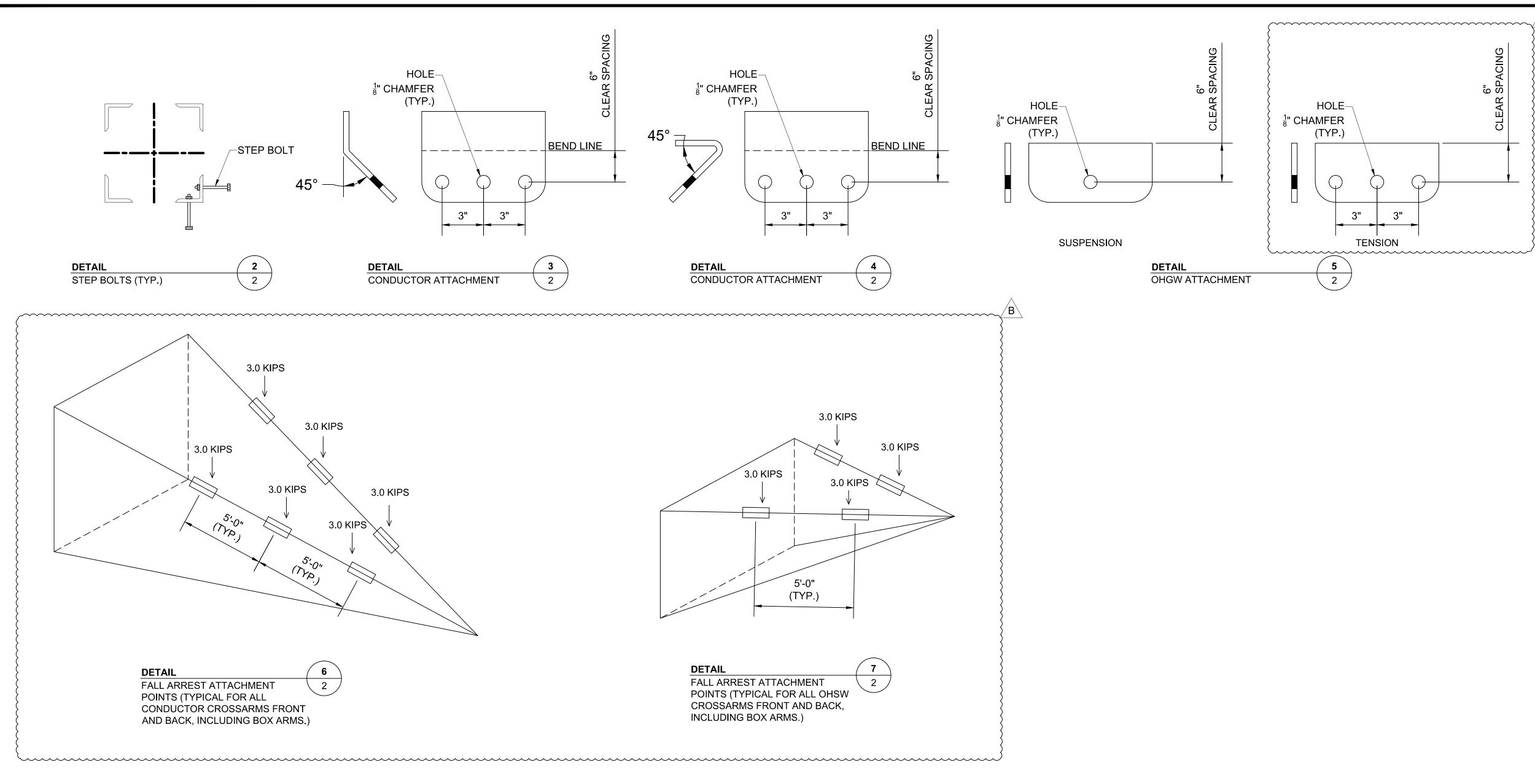
THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

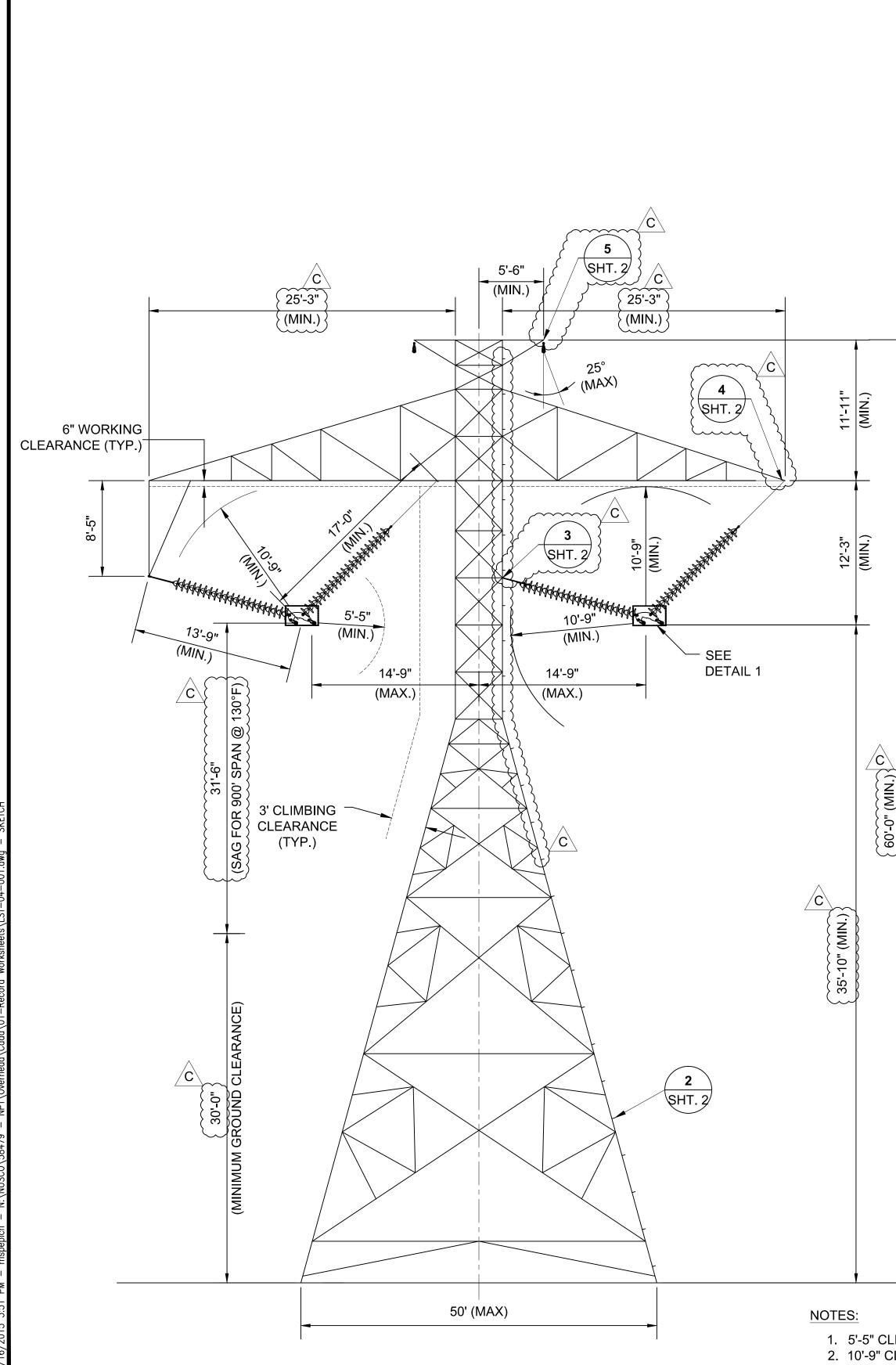
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

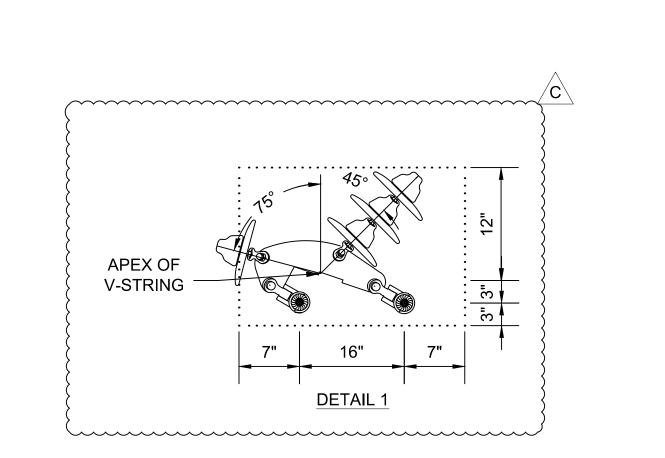
							λ		С
							THE NORTHERN PASS		drawn KAK
							V		engineer AKO
	ENG/PE#	DATE	DRN	CHKD	APPR				CHECKED
							DC HEAVY TANGENT		TAB
						3	2-SCHLT-HTG-002		APPROVED
						LOA	D & DESIGN DRAWI	NG	
S		5/21/15	KAK		•				date 5/1/15
GHT RANGE	•	5/8/15	KAK		•				5/1/15
P BID		5/1/15	KAK			SCALE	FILE: LST-03-001.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-0	03-001

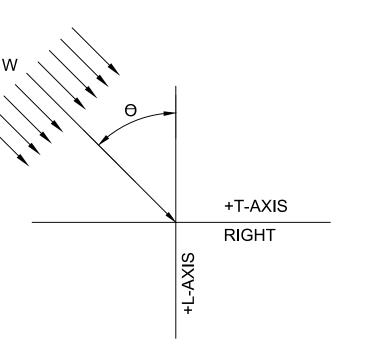


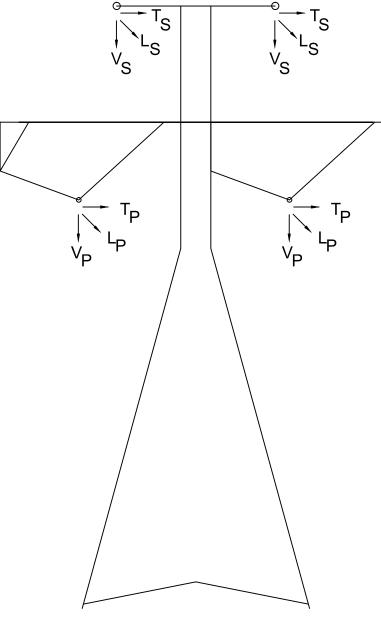
B		HO CC ST INC ST DE	DLE DIAMETERS AND VAN ORDINATION WITH TOWE EP BOLTS SHALL BE INST CHES. STEP BOLTS SHALL RUCTURE SHALL BE DES TAIL 5. LL ARREST LOADS SHALL	ER VENI FALLED L BE PR IGNED '	on A On A Ovidi With	ND H LTER ED FI SUSI	HARD NATE ROM 1 PENSI	WARE FLAN FOWE ON A	E MANUFAC NGES OF ON ER BASE TO ND TENSIO	TURER. NE LEG. SPACING SHAI TOP OF TOWER. N ATTACHMENT PLATE	LL NOT EXC	Ś
	CONTRACT SERVICES	REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR		THE NORTHERN PASS		DRAWN KAK ENGINEER AKO
									3	DC HEAVY TANGEN' 82-SCHLT-HTG-002 D & DESIGN DRAW	2	CHECKED TAB APPROVED
PRELIMINARY - NOT FOR CONSTRUCTION	B A DWG		MISC. REVISIONS RELEASED FOR RFP BID EPN/DESCRIPTION		5/21/15 5/1/15 DATE	KAK KAK DRN		· ·	scale NTS	FILE: LST-03-002.DWG	DRA	DATE 5/1/15 WING NO. 03-002

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	6" CLEAR SPACING	









LOADING TREE

	STRUCTURE NAME: 32-SCHLT-LAG-010													
	320-KV DC CONDUCTOR								•)# @ N	ESC HE	AVY)		•
	OHGW: 1 - 19 NO.10 AL		VELD P	'ER PHA	4SE (55	00#@	NESC I	HEAVY)					3
	WIND SPAN (FT): 900)
	WEIGHT SPAN (FT): 125													<
	LINE ANGLE: 2 - 10 DEG	REES												<
				r										, {
	LOADING CAS	<u>ب</u> E		'				DES	GIGN LOA	ADS				ιŞ
NO.	DESCRIPTION	TEMP	ICE	WIND	VS	TS	LS	VP	TP	LP	W	θ	к	13
	(°F) (IN) (MpN) (K) (K) (K) (K) (K) (DST)													
1														
2	NESC 250C	60.00	0.00	100.00	0.61	1.76	0.00	7.82	14.32	0.00	29.00	90.00	1.00	1)
3	NESC 250D	15.00	1.00	39.53	2.96	2.15	0.00	17.87	11.47	0.00	4.00	90.00	1.00	}
4	HQ EXTREME ICE	15.00	1.50	39.53	5.30	3.15	0.00	24.83	14.60	0.00	4.00	90.00	1.00	Ì
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.40	1.47	0.00	12.47	9.56	0.00	4.00	90.00	1.00	
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.40	1.41	0.00	12.47	8.76	0.00	4.00	90.00	1.00	\
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.40	0.93	5.50	12.47	3.88	24.00	4.00	90.00	1.00	\
8	CONSTRUCTION	30.00	0.00	29.97	3.85	1.05	0.27	26.93	8.74	2.27	3.45	90.00	1.50	
9	MAINTENANCE	60.00	0.00	0.00	3.02	1.03	0.00	17.45	8.27	0.00	0.00	90.00	2.00	
10	OBLIQUE WIND	60.00	0.00	100.00	0.61	1.28	0.00	7.82	10.53	0.00	29.00	45.00	1.00	1
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GENERAL NOTES:

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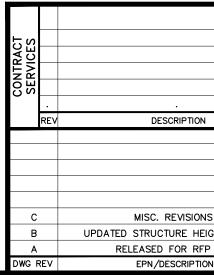
- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE.
- TOWER.

- CASE.

- ∕c∖

 - LOADS UNDER THE MAINTENANCE LOAD CASE.

C



1. 5'-5" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING CLEARANCE. 2. 10'-9" CLEARANCE MUST BE CONSIDERED FROM TOWER BODY AND ARMS.

/B∖

60'-0" (MIN.)

STRUCTUR

PRELIMINARY - NOT FOR CONSTRUCTION

STRUCTURE NAME: 32-SCHLT-LAG-010

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

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12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A (10) DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB. 14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE

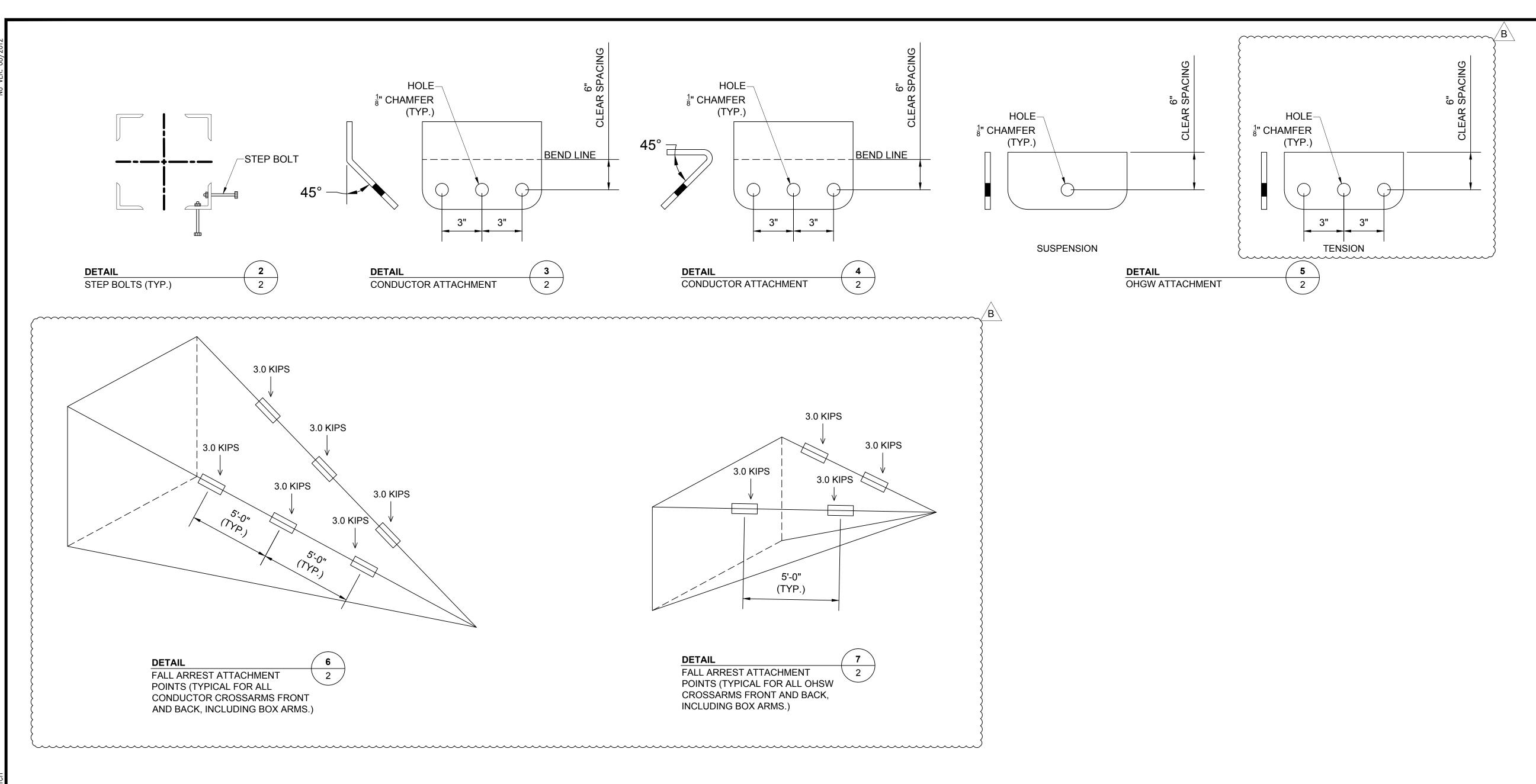
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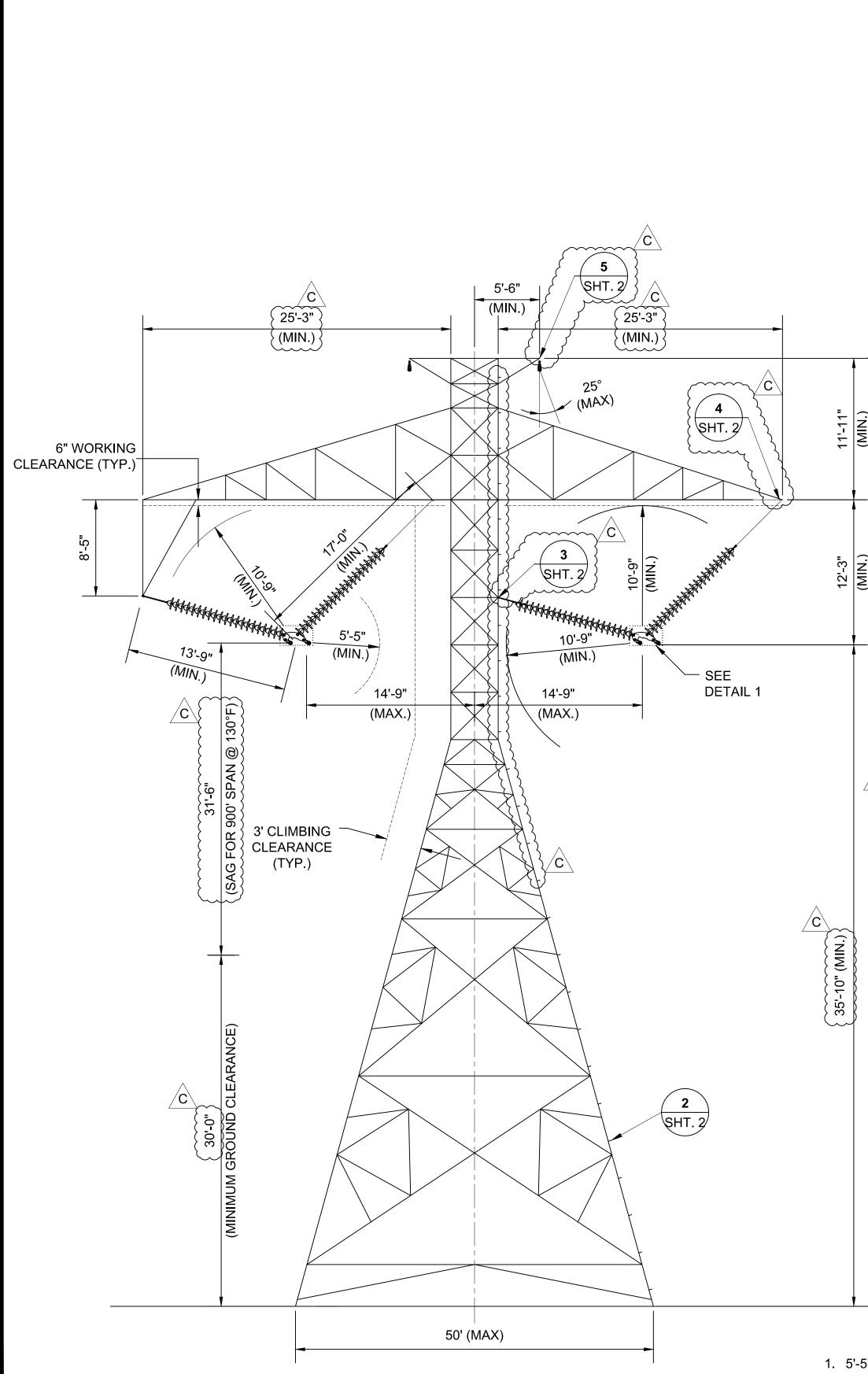
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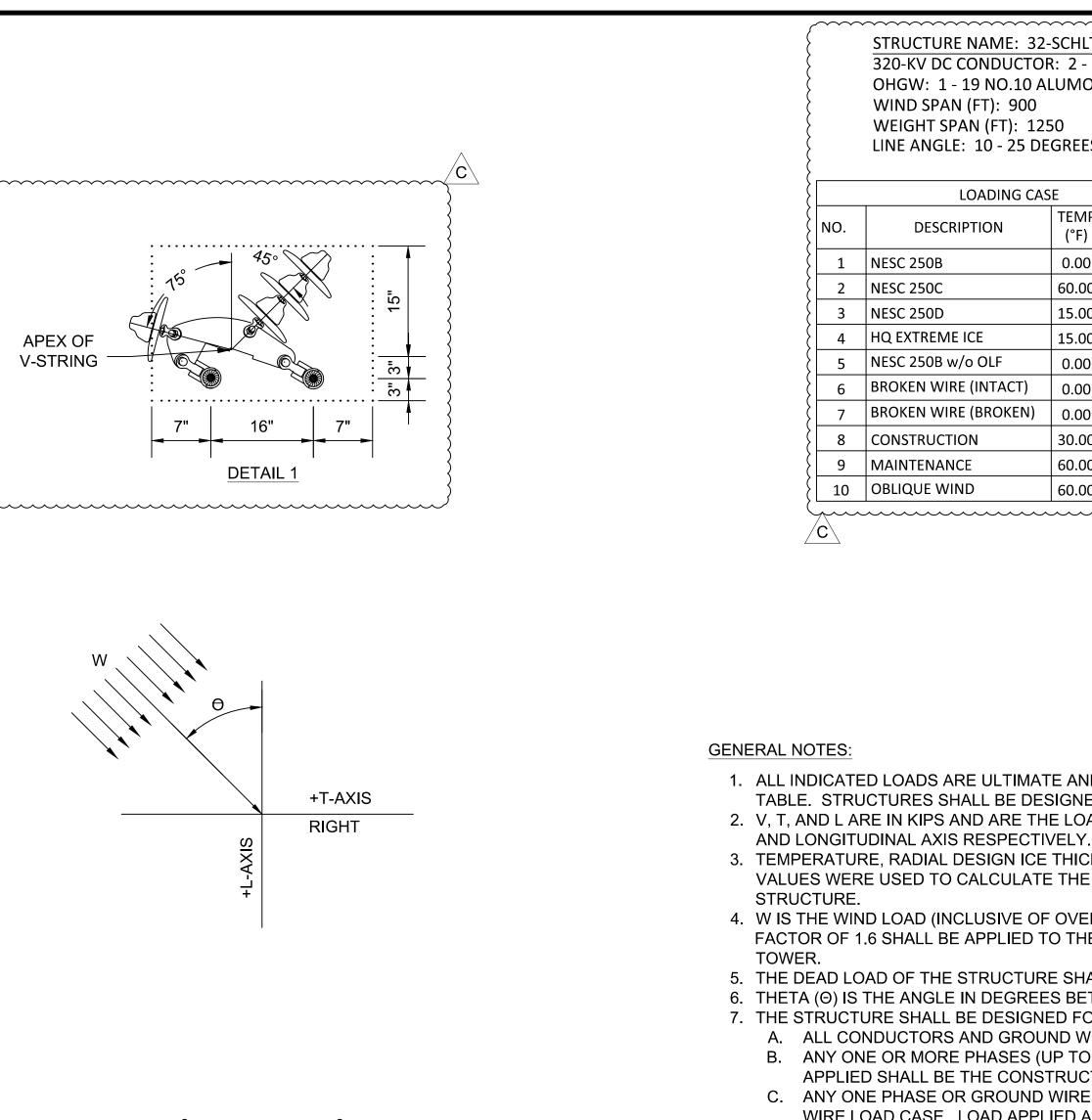
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW. 19. STRUCTURE SHALL BE DESIGNED TO WITHSTAND UNEVEN LEG EXTENSION DIFFERENTIAL ASSUMING VERTICAL TO HORIZONTAL GROUND SLOPE RATIO OF (1:2).

										С
						THE	NORTHERN PASS		draw KAI	
	•		•		•			ENGINE		
	ENG/PE#	DATE	DRN	CHKD	APPR			AK	0	
						320kV DC LIGHT	LE 2°-10°	CHECK TAE		
						32-SC	HLT-LAG-010		APPRO'	VED
						LOAD & I	DESIGN DRAWI	NG		
s	•	5/21/15	KAK							
GHT RANGE	•	5/8/15	KAK						5/1/	15
P BID		5/1/15	KAK				ST-04-001.DWG		ING NO.	1
N	CONT/PE#	DATE	DRN	CHKD	APPR	appr NTS image: LST-)1



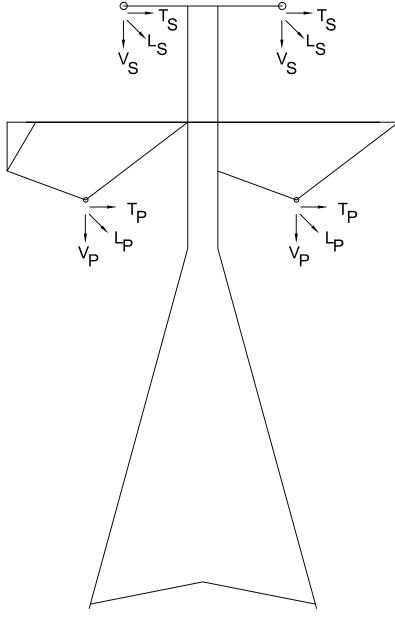
B	2. STI 2. STI 3. STI 5. DE	LE DIAMETERS AND VANG ORDINATION WITH TOWER EP BOLTS SHALL BE INSTA HES. STEP BOLTS SHALL RUCTURE SHALL BE DESIG TAIL 5. L ARREST LOADS SHALL	R VENDOR AL ALLED ON AL BE PROVIDE GNED WITH S	ND HAR FERNAT D FROM USPEN	DWAR FE FLA 1 TOW SION /	E MANUFACTURER NGES OF ONE LEG. SPACI ER BASE TO TOP OF TOWE ND TENSION ATTACHMEN	NG SHALL NOT EXCE	}
	CONTRACT SERVICES	DESCRIPTION	ENG/PE# DATE	DRN CHK	D APPR	THE NORTHER	IN PASS	B Drawn KAK Engineer AKO
						320kV DC LIGHT RUNN 32-SCHLT-I LOAD & DESIG	LAG-010	CHECKED TAB APPROVED
PRELIMINARY - NOT FOR CONSTRUCTION	B A DWG REV	MISC. REVISIONS RELEASED FOR RFP BID EPN/DESCRIPTION		KAK . KAK . DRN CHK	D APPR	SCALE FILE: LST-04-002. NTS IMAGE:		date 5/1/15 Ng no. 04-002





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C



16"

DETAIL ²

LOADING TREE

NOTES:

∕B∖

∕ C ∖

60'-0" (MIN.)

STRUC

1. 5'-5" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING CLEARANCE. 2. 10'-9" CLEARANCE MUST BE CONSIDERED FROM TOWER BODY AND ARMS.

APEX OF **V-STRING**

> PRELIMINARY - NOT FOR CONSTRUCTION

DESCRIPTION MISC. REVISION UPDATED STRUCTURE HEI RELEASED FOR RFF DWG REV EPN/DESCRIPTI

CASE.

STRUCTURE NAME: 32-SCHLT-HAG-025 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 900 WEIGHT SPAN (FT): 1250 LINE ANGLE: 10 - 25 DEGREES

	LOADING CAS	Ε						DES	GN LO	۹DS				
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К	
1	NESC 250B	0.00	0.50	39.53	2.09	5.30	0.00	18.70	36.32	0.00	10.00	90.00	1.50] {
2	NESC 250C	60.00	0.00	100.00	0.61	2.93	0.00	7.82	24.32	0.00	29.00	90.00	1.00] }
3	NESC 250D	15.00	1.00	39.53	2.96	4.22	0.00	17.87	24.95	0.00	4.00	90.00	1.00] }
4	HQ EXTREME ICE	15.00	1.50	39.53	5.30	6.27	0.00	24.83	31.83	0.00	4.00	90.00	1.00] }
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.40	2.98	0.00	12.47	21.09	0.00	4.00	90.00	1.00] {
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.40	2.83	0.00	12.47	19.10	0.00	4.00	90.00	1.00] {
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.40	1.64	5.48	12.47	10.44	39.85	4.00	90.00	1.00] {
8	CONSTRUCTION	30.00	0.00	29.97	3.85	2.40	0.27	26.93	20.18	2.27	3.45	90.00	1.50] }
9			0.00	0.00	3.02	2.56	0.00	17.45	20.54	0.00	0.00	90.00	2.00] }
10	OBLIQUE WIND	60.00	0.00	100.00	0.61	2.44	0.00	7.82	20.53	0.00	29.00	45.00	1.00] }
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A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

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8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH.

CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0. 9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A(15) DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB. 14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE

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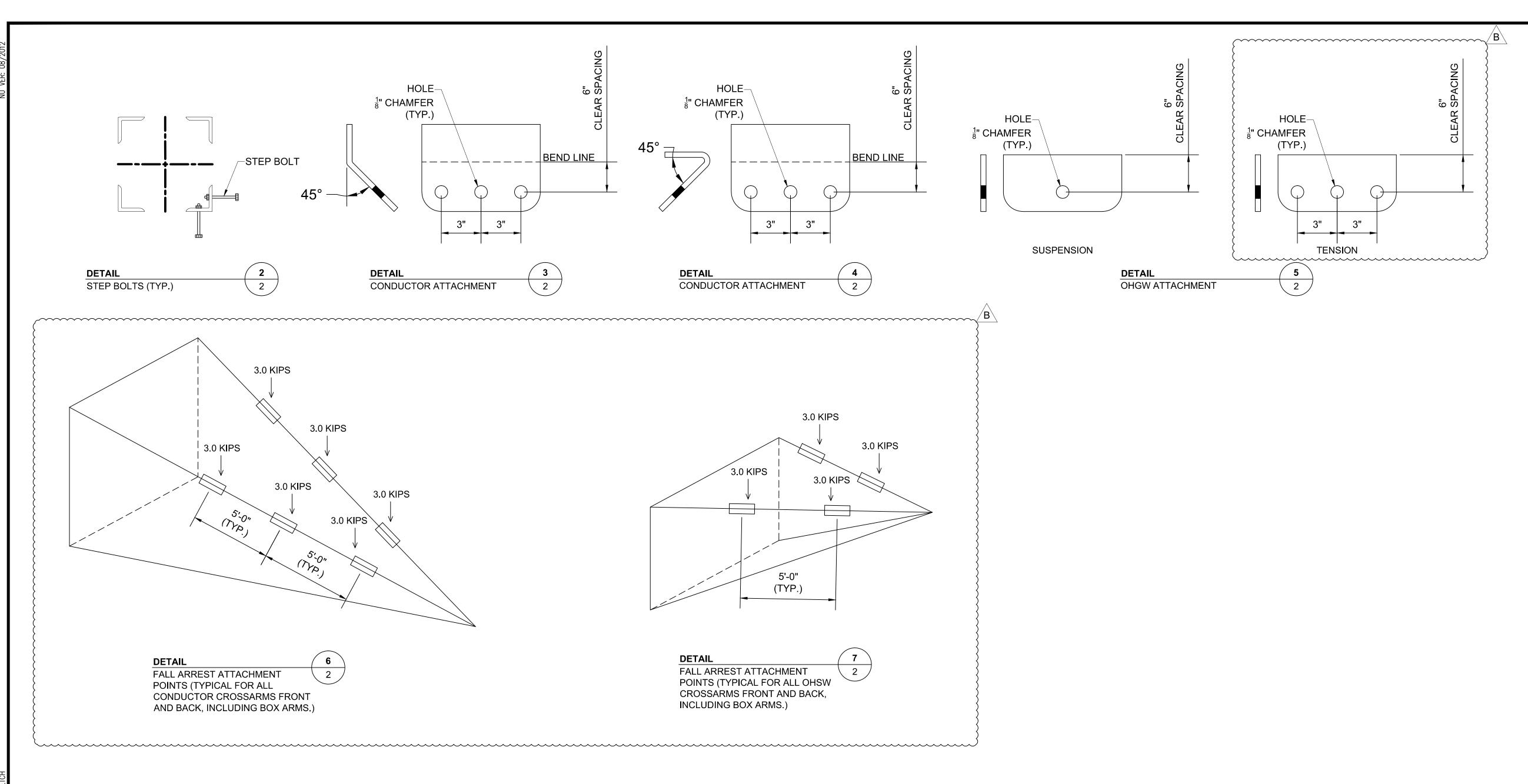
USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

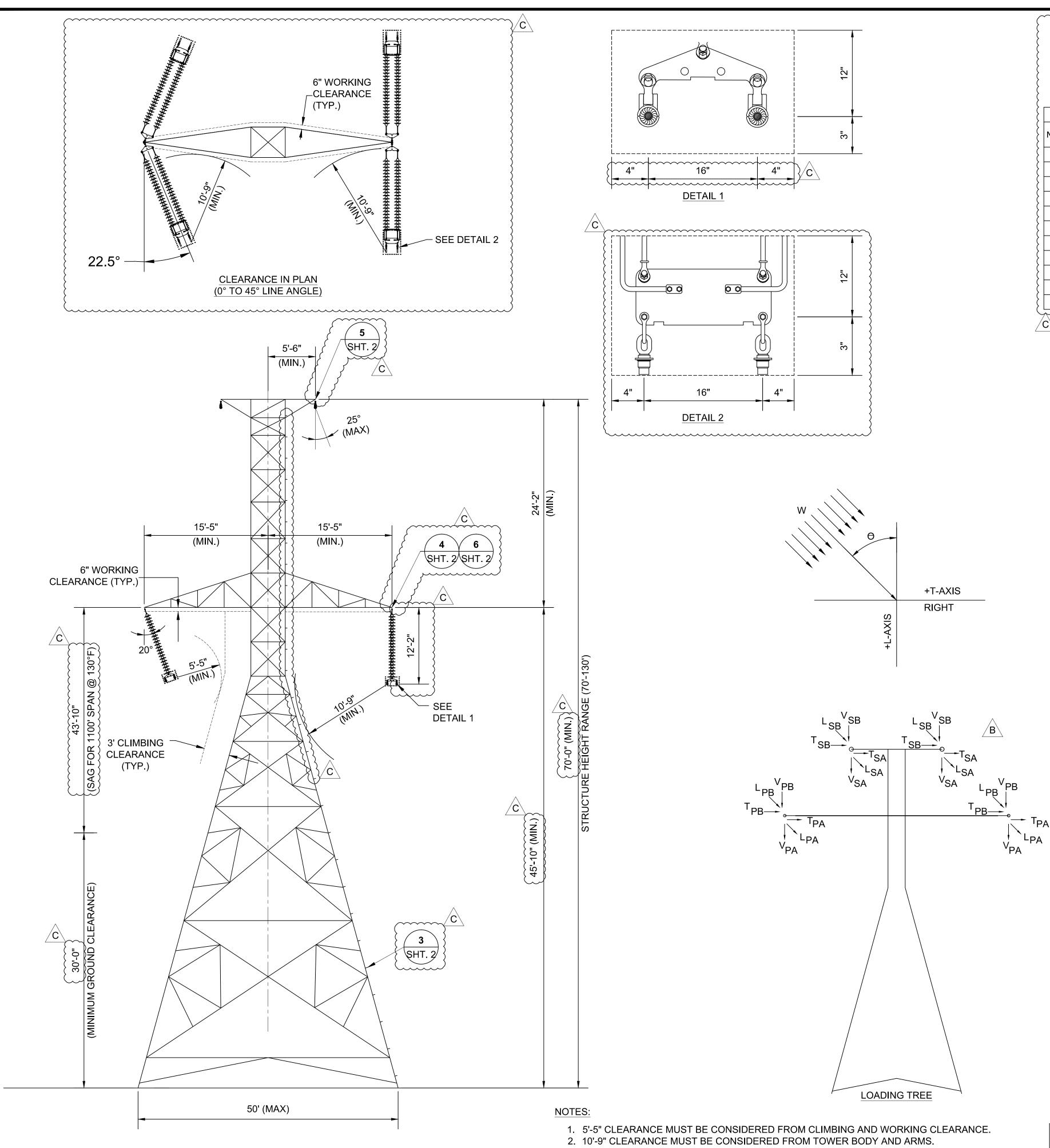
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

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							THE NORTHERN PASS		drawn KAK
	•		•		•			ENGINEER	
	ENG/PE#	E# DATE DRN CHKD APPR							AKO
							HEAVY RUNNING ANGL	E 10°-25°	checked TAB
							32-SCHLT-HAG-025		APPROVED
						LOAI	D & DESIGN DRAWI	NG	
S		5/21/15	KAK	•	•				DATE
GHT RANGE		5/8/15	KAK						5/1/15
P BID	•	5/1/15	KAK			SCALE	FILE: LST-05-001.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-0	05-001



B	C (2. S   IN   3. S   D	E OLE DIAMETERS AND VA OORDINATION WITH TOV TEP BOLTS SHALL BE INS NCHES. STEP BOLTS SHA TRUCTURE SHALL BE DE ETAIL 5. ALL ARREST LOADS SHA	VER VENDC STALLED ON LL BE PRO\ SIGNED WI	R AND N ALTEF /IDED F TH SUS	HARD RNATE ROM PENS	E FLA TOWE	E MANUFAC NGES OF OI ER BASE TO AND TENSIO	TURER. NE LEG. SPACING SHA TOP OF TOWER. N ATTACHMENT PLAT	ALL NOT EXC	
	CONTRACT SERVICES	DESCRIPTION	ENG/PE# D/	  	СНКД	APPR		THE NORTHERN PASS		DRAWN KAK ENGINER AKC
		DESCRIPTION					ہ ب	HEAVY RUNNNING AN 32-SCHLT-HAG-02 AD & DESIGN DRAV	25	checke TAB approv
· · · · · · · · · · · · · · · · · · ·				1/15 KAK						date 5/1/*

THE NORTHERN PASS DRAWN KAK **\7** ENGINEER AKO ENG/PE# DATE DRN CHKD APPR CHECKED 320kV DC HEAVY RUNNNING ANGLE 10°-25° TAB 32-SCHLT-HAG-025 APPROVED LOAD & DESIGN DRAWING DATE 5/1/15 5/21/15 KAK scale NTS DRAWING NO. LST-05-002 5/1/15 KAK FILE: LST-05-002.DWG IMAGE: CONT/PE# DATE DRN CHKD APPR



#### STRUCTURE NAME: 32-SCHLT-LDG-045 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN AHEAD (FT): 550 WIND SPAN BACK (FT): 550 WEIGHT SPAN AHEAD (FT): 825 WEIGHT SPAN BACK (FT): 825 LINE ANGLE: 0 - 45 DEGREES

	LOADING CAS					тса			тср						TOD		14/		
١0.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	1.41	4.37	9.62	1.41	4.37	-9.62	13.36	30.89	73.59	13.36	30.89	-73.59	10.00	90.00	1.5
2	NESC 250C	60.00	0.00	100.00	0.42	2.32	4.51	0.42	2.32	-4.51	5.52	19.43	38.67	5.52	19.43	-38.67	29.00	90.00	1.0
3	NESC 250D	15.00	1.00	39.53	1.97	3.53	8.01	1.97	3.53	-8.01	12.47	21.41	52.13	12.47	21.41	-52.13	4.00	90.00	1.0
4	HQ EXTREME ICE	15.00	1.50	39.53	3.51	5.25	12.04	3.51	5.25	-12.04	16.96	27.33	66.65	16.96	27.33	-66.65	4.00	90.00	1.0
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.94	2.51	5.83	0.94	2.51	-5.83	8.91	18.16	44.60	8.91	18.16	-44.60	4.00	90.00	1.0
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	2.38	-5.50	8.91	16.40	40.00	8.91	16.40	-40.00	4.00	90.00	1.0
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	0.28	0.00	8.91	16.40	40.00	8.91	1.09	0.00	4.00	90.00	1.0
8	CONSTRUCTION	30.00	0.00	29.97	4.12	1.52	0.27	1.98	2.08	-5.23	30.33	12.71	2.27	9.63	17.56	-44.25	3.45	90.00	1.5
9	MAINTENANCE	60.00	0.00	0.00	2.64	2.26	5.92	2.64	2.26	-5.92	12.84	18.16	47.44	12.84	18.16	-47.44	0.00	90.00	2.0
10	OBLIQUE WIND	60.00	0.00	100.00	0.42	2.03	4.51	0.42	2.03	-4.51	5.52	17.12	38.67	5.52	17.12	-38.67	29.00	45.00	1.0
11	UPLIFT	-20.00	0.00	0.00	0.42	1.70	4.43	0.42	1.70	-4.43	5.52	16.59	43.34	5.52	16.59	-43.34	0.00	90.00	1.0



- STRUCTURE.
- TOWER.

- CASE.

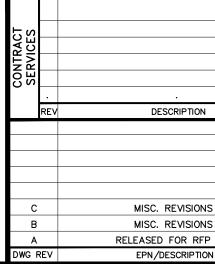
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- DETAIL 1
- VERTICAL SNUB.

- TO HORIZONTAL GROUND SLOPE RATIO OF (1:2).  $B^{\prime}$



PRELIMINARY - NOT FOR CONSTRUCTION 1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0.

2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE, AND LONGITUDINAL AXIS RESPECTIVELY.

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED,

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY.

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN

13. SNUB ANGLES SHALL BE LIMITED TO A 15 DEGREE DEFLECTION LINE ANGLE AND TO A 3 HORIZONTAL TO 1

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

15. TEMPORARY LIFT OR TENSION POINTS. CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED

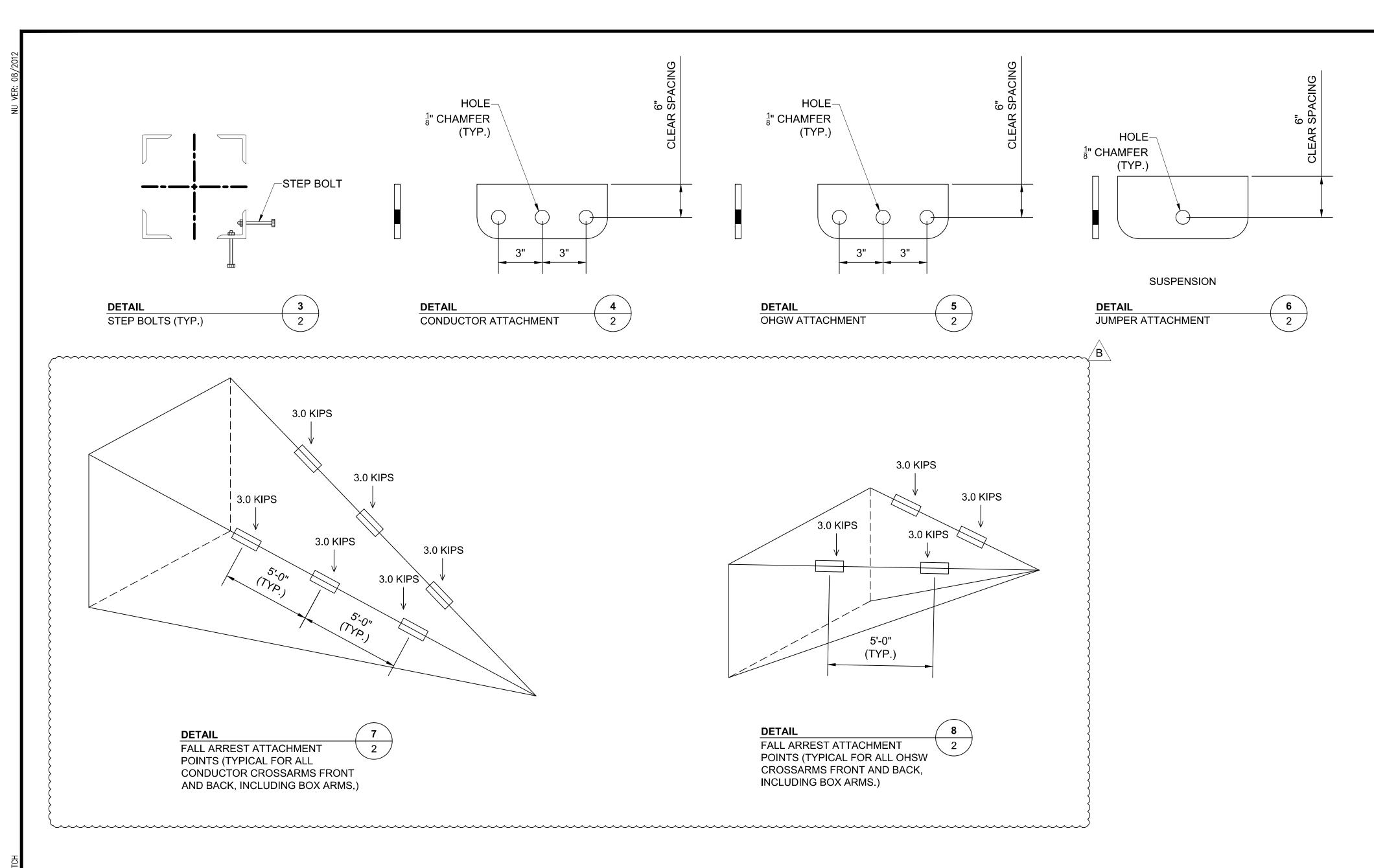
17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

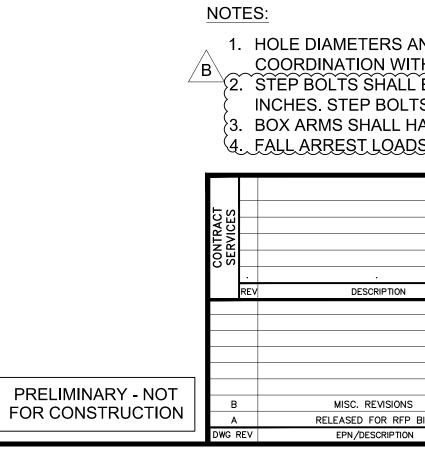
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

19. STRUCTURE SHALL BE DESIGNED TO WITHSTAND UNEVEN LEG EXTENSION DIFFERENTIAL ASSUMING VERTICAL

20. STRUCTURES SHALL ALSO BE DESIGNED WITH UPLIFT LOADING. UPLIFT SHALL BE CONSIDERED UNDER LOAD CASE 1, LOAD CASE 2, & LOAD CASE (11) FOR LOAD CASE 1 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB}WITH -1 KIPS. FOR LOAD CASE 2 REPLACE V_{SA} & V_{SB} WITH -0.1 KIPS AND V_{PA} & V_{PB} WITH -1.6 KIPS. FOR LOAD CASE 13 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB} WITH -2.3 KIPS.

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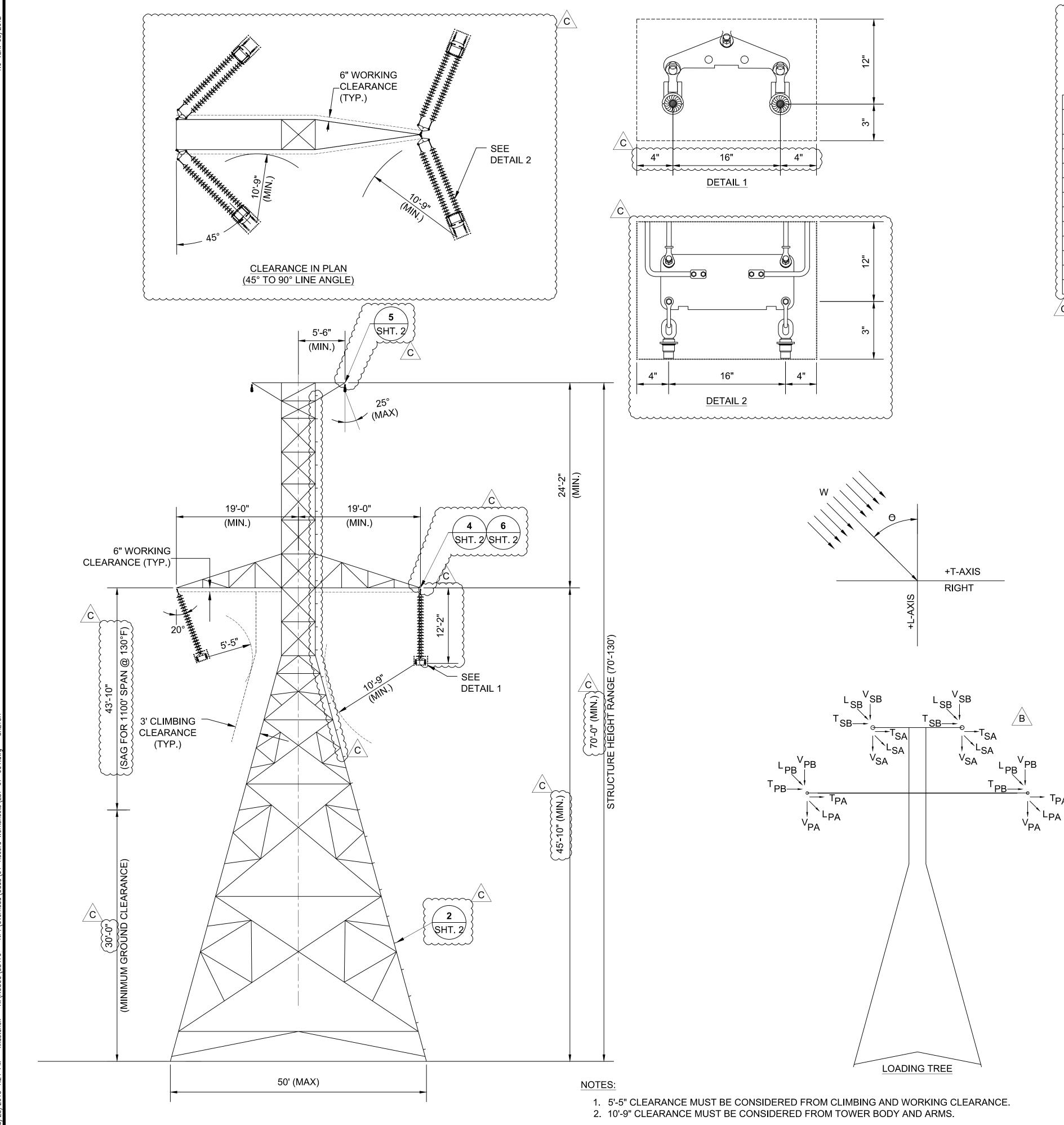




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ION	CONT/PE#	DATE	DRN	CHKD	APPR	CT/I	IMAGE:	гот-(	0-00	

1. HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH B COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER. 2. STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16

INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER. 3. BOX ARMS SHALL HAVE PLATE ATTACHMENT HOLE AT EACH CORNER AND AT MIDPOINT. 4. FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION. 



#### STRUCTURE NAME: 32-SCHLT-HDG-090 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN AHEAD (FT): 550 WIND SPAN BACK (FT): 550 WEIGHT SPAN AHEAD (FT): 825 WEIGHT SPAN BACK (FT): 825 LINE ANGLE: 45 - 90 DEGREES

	LOADING CAS	ЪЕ									DES	IGN LOA	ADS						
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	К
1	NESC 250B	0.00	0.50	39.53	1.41	7.50	8.89	1.41	7.50	-8.89	13.36	54.76	67.99	13.36	54.76	-67.99	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.42	3.79	4.17	0.42	3.79	-4.17	5.52	31.98	35.73	5.52	31.98	-35.73	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	1.97	6.12	7.40	1.97	6.12	-7.40	12.47	38.32	48.17	12.47	38.32	-48.17	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	3.51	9.16	11.13	3.51	9.16	-11.13	16.96	48.95	61.57	16.96	48.95	-61.57	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.94	4.40	5.39	0.94	4.40	-5.39	8.91	32.63	41.21	8.91	32.63	-41.21	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.94	4.17	5.08	0.94	4.17	-5.08	8.91	29.38	36.96	8.91	29.38	-36.96	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.94	4.17	5.08	0.94	0.28	0.00	8.91	29.38	36.96	8.91	1.09	0.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	4.12	1.38	0.25	1.98	3.78	-4.83	30.33	11.55	2.10	9.63	31.91	-40.88	3.45	90.00	1.50
9	MAINTENANCE	60.00	0.00	0.00	2.64	4.18	5.47	2.64	4.18	-5.47	12.84	33.55	43.83	12.84	33.55	-43.83	0.00	90.00	2.00
10	OBLIQUE WIND	60.00	0.00	100.00	0.42	3.49	4.17	0.42	3.49	-4.17	5.52	29.66	35.73	5.52	29.66	-35.73	29.00	45.00	1.0
11	UPLIFT	-20.00	0.00	0.00	0.42	3.13	4.09	0.42	3.13	-4.09	5.52	30.65	40.04	5.52	30.65	-40.04	0.00	90.00	1.0



- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE.
- TOWER.

- A. ALL CONDUCTORS AND GROUND WIRES INSTALLED,
- B
  - CASE.

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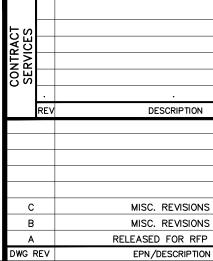
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TPA

- VERTICAL SNUB

- TO HORIZONTAL GROUND SLOPE RATIO OF (1:2).



PRELIMINARY - NOT FOR CONSTRUCTION 1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0.

2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY.

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1

13. SNUB ANGLES SHALL BE LIMITED TO A (15 DEGREE DEFLECTION) LINE ANGLE AND TO A 3 HORIZONTAL TO 1

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED

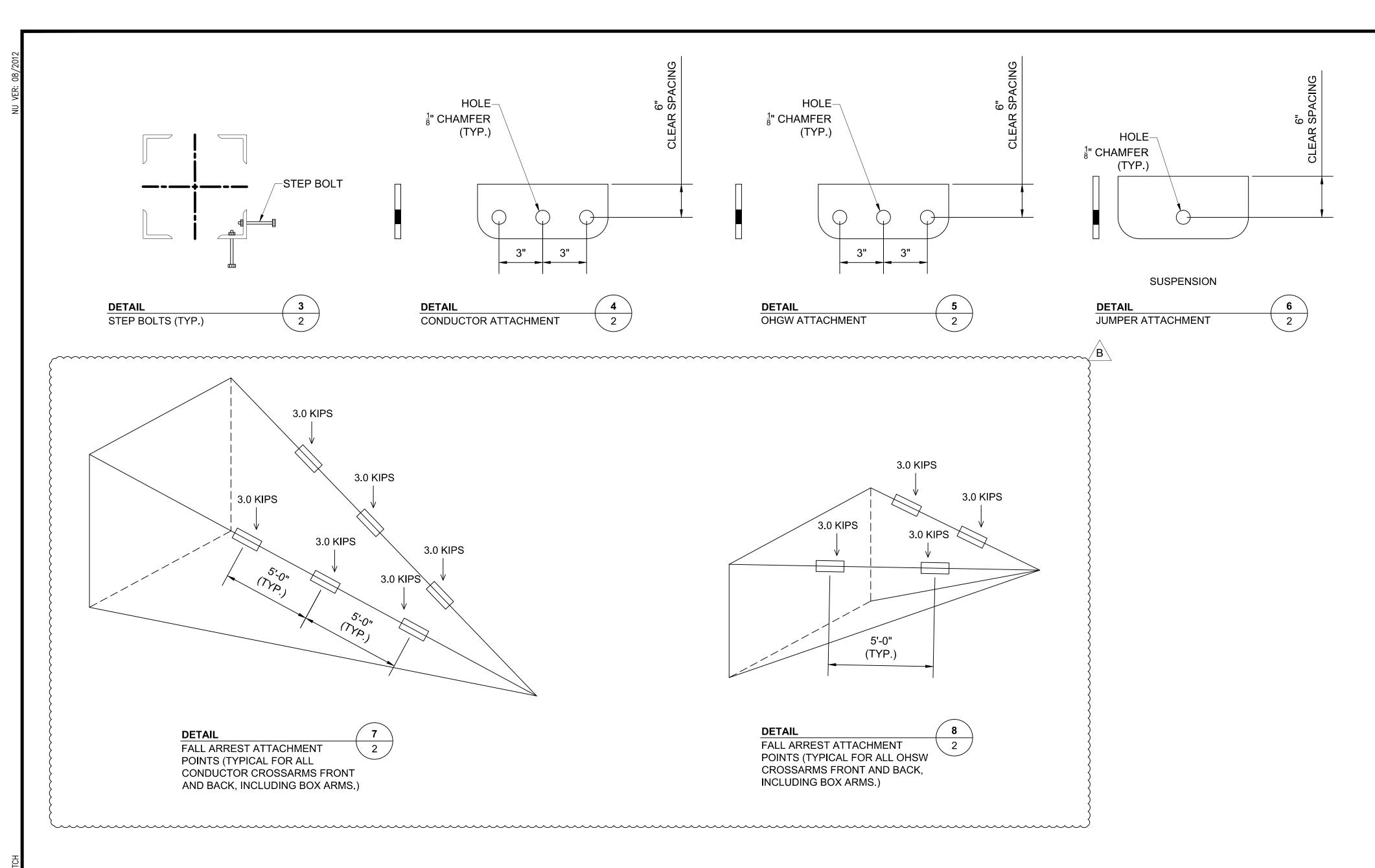
17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

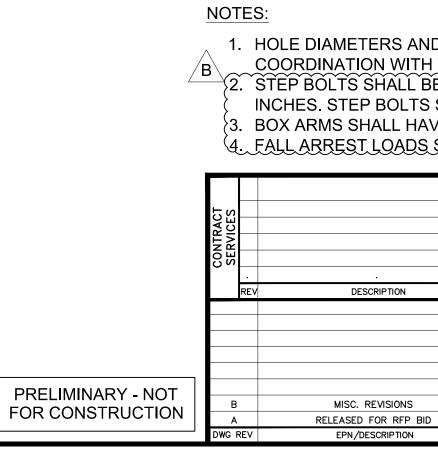
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

19. STRUCTURE SHALL BE DESIGNED TO WITHSTAND UNEVEN LEG EXTENSION DIFFERENTIAL ASSUMING VERTICAL

20. STRUCTURES SHALL ALSO BE DESIGNED WITH UPLIFT LOADING. UPLIFT SHALL BE CONSIDERED UNDER LOAD CASE 1, LOAD CASE 2, & LOAD CASE (11) FOR LOAD CASE 1 REPLACE V_{SA} & V_{SB} WITH -0.3 KIPS AND V_{PA} & V_{PB} WITH -1.9 KIPS. FOR LOAD CASE 2 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB} WITH -2.1 KIPS. FOR LOAD CASE 13 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB} WITH -3 KIPS.

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						THE NORTHERN PASS	dra K A	
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scale NTS FILE: LST-07-002.DWG

IMAGE:

5/1/15 KAK

CONT/PE# DATE DRN CHKD APPR

LST-07-002

 HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER.
 STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16 INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER.
 BOX ARMS SHALL HAVE PLATE ATTACHMENT HOLE AT EACH CORNER AND AT MIDPOINT.
 FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.

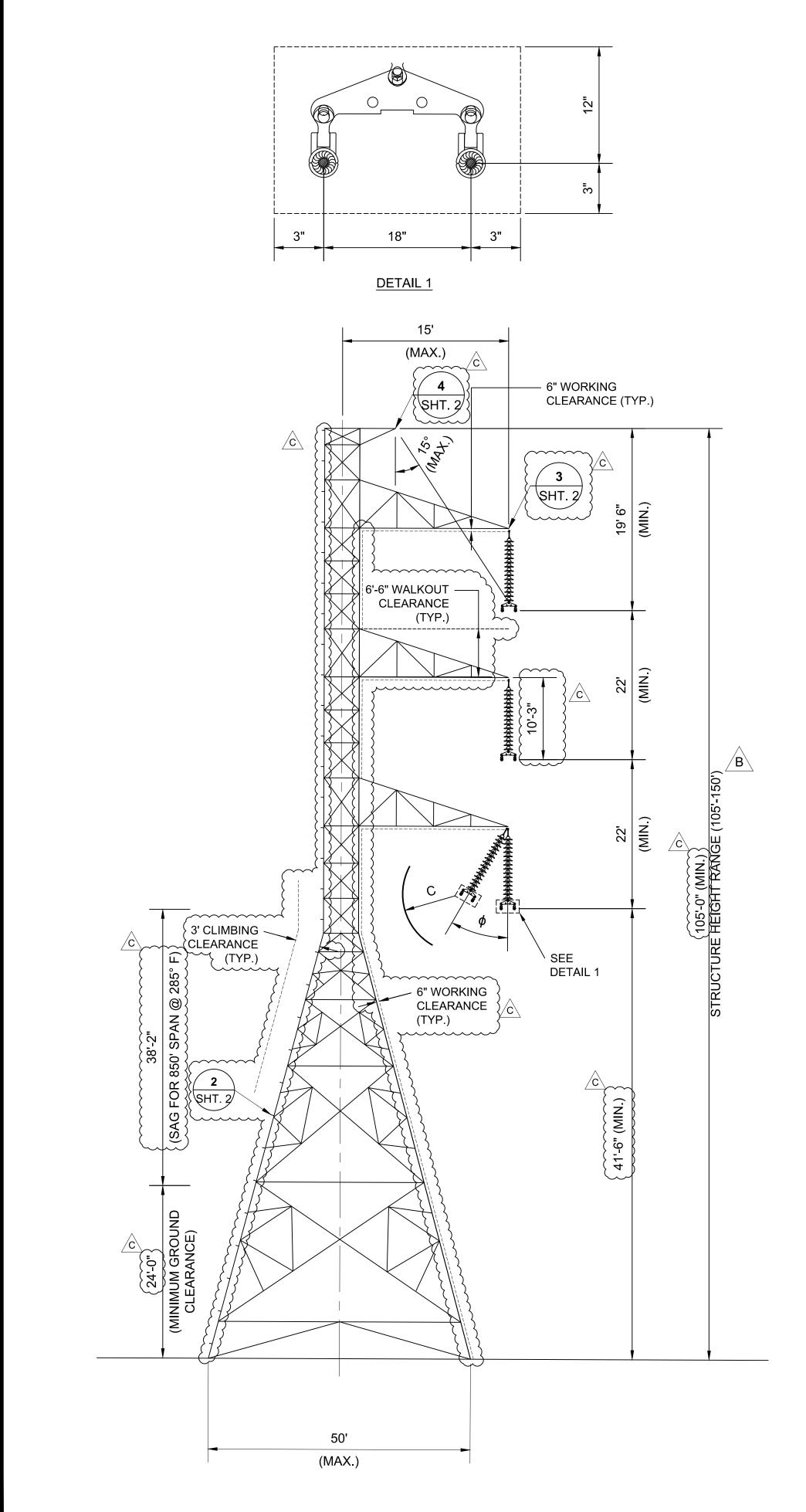
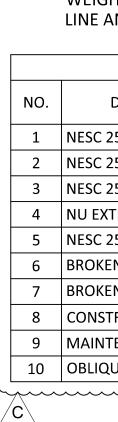


TABLE 1. INSULATOR SWING AND CLEAF	RANCE

CONDITION	φ	С	REMARKS
NU SWING C _W	0°	8'-6"	
NU SWING CL	25°	8'-1"	CLEARANCE MUST BE CONSIDERED
NU SWING C _S	43°	6'-2"	FROM TOWER BODY AND ARMS
NU SWING C _R	54°	2'-6"	
NU SWING C _W	0°	8'-6" ©	CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WALKOUT CLEARANCE





- AND LONGITUDINAL AXIS RESPECTIVELY. STRUCTURE.
- TOWER.

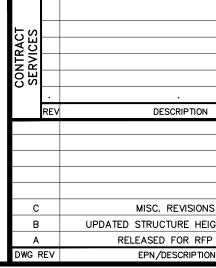
- CASE.

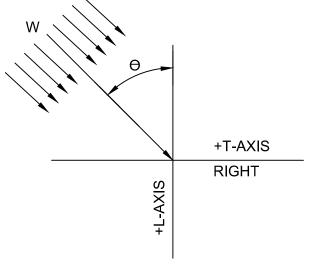
<u>∕C</u>∖

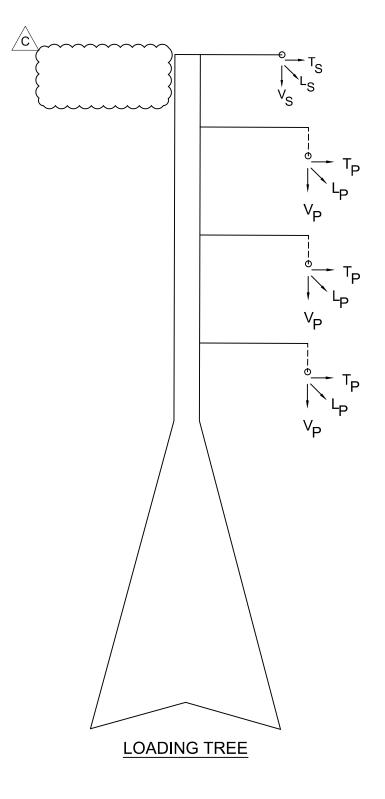
∕C∖

PRELIMINARY - NOT

FOR CONSTRUCTION







#### STRUCTURE NAME: 30-SCVLT-LTG-002 345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 850 WEIGHT SPAN (FT): 850 LINE ANGLE: 0 - 2 DEGREES

LOADING CAS	Ε				DESIGN LOADS								
DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К	
250B	0.00	0.50	39.53	1.45	1.40	0.00	8.94	4.99	0.00	10.00	90.00	1.50	
250C	60.00	0.00	100.00	0.43	1.08	0.00	3.49	6.26	0.00	29.00	90.00	1.00	
250D	15.00	1.00	39.53	2.03	0.99	0.00	9.14	3.09	0.00	4.00	90.00	1.00	
TREME ICE	15.00	1.25	39.53	2.76	1.20	0.00	11.12	3.56	0.00	4.00	90.00	1.00	
250B w/o OLF	0.00	0.50	39.53	0.96	0.63	0.00	5.96	2.29	0.00	4.00	90.00	1.00	
EN WIRE (INTACT)	0.00	0.50	39.53	0.96	0.62	0.00	5.96	2.21	0.00	4.00	90.00	1.00	
EN WIRE (BROKEN)	0.00	0.50	39.53	0.96	0.52	5.50	5.96	1.66	13.68	4.00	90.00	1.00	
TRUCTION	30.00	0.00	29.97	3.58	0.31	0.27	13.87	1.56	1.21	3.45	90.00	1.50	
TENANCE	60.00	0.00	0.00	2.66	0.21	0.00	8.79	0.93	0.00	0.00	90.00	2.00	
UE WIND	60.00	0.00	100.00	0.43	0.62	0.00	3.49	3.53	0.00	29.00	45.00	1.00	

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 15 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

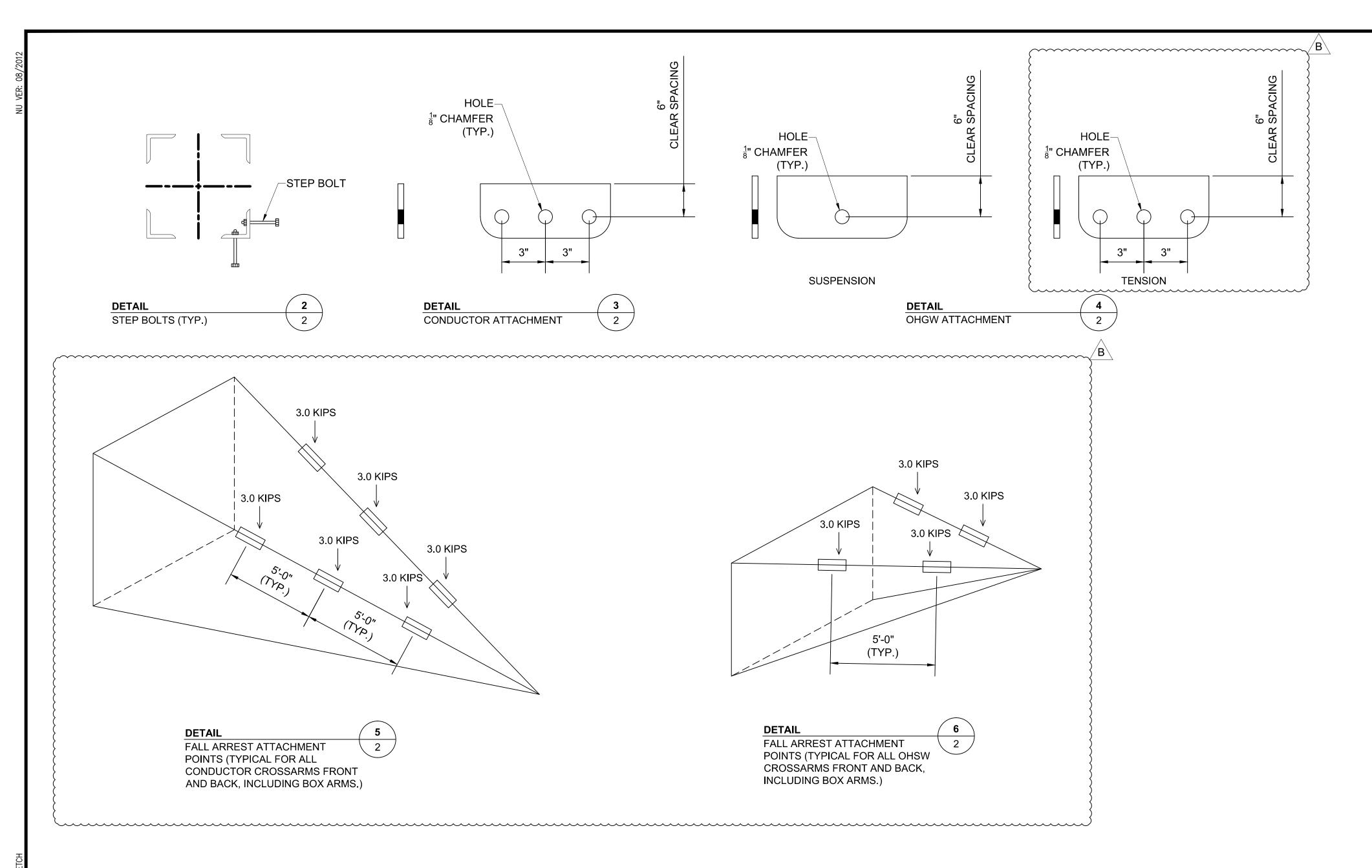
16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF 3,000 POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

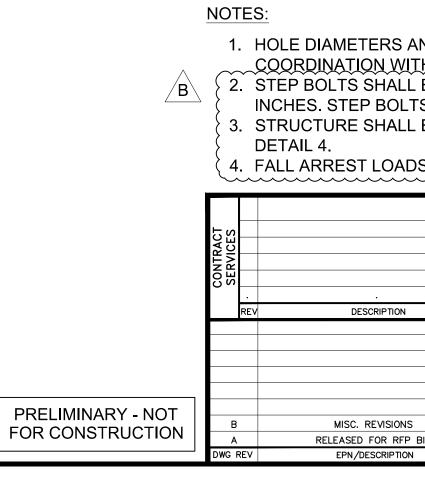
17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

18. PHI (φ) IS THE SWING ANGLE OF THE ASSEMBLY AND "C" IS THE REQUIRED ELECTRICAL CLEARANCE. THE STRUCTURE DESIGN SHALL PROVIDE CLEARANCE AS INDICATED IN TABLE 1.

19. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW. (FOR )  $\{$ WALKOUT CLEARANCES, ASSUME A WORKER HEIGHT OF 6'-6".

i       i       i       i       i       i       AKO         ENG/PE#       DATE       DRN       CHKD       APPR       AKO         I       I       I       I       I       I       I       CHECKEL         I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I									
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CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL CHECKEL	ENGINEER	<b>X</b> 7				•		•	
345kV AC LIGHT TANGENT 0°-2° TAB	AKO			APPR	CHKD	DRN	DATE	ENG/PE#	
30-SCVLT-LTG-002 APPROVE									
LOAD & DESIGN DRAWING									
S         5/21/15         MSP         .         .         5/1/1	date 5/1/15			•	•	MSP			S
GHT RANGE . 5/6/15 KAK				•	•	KAK	5/8/15		GHT RANGE
P BID . 5/1/15 KAK SCALE FILE: LST-08-001.DWG DRAWING NO.		FILE: LST-08-001.DWG				KAK	5/1/15		P BID
N CONT/PE# DATE DRN CHKD APPR NTS IMAGE: $LST-08-001$	LST-08-001	IMAGE:	NTS	APPR	CHKD	DRN	DATE	CONT/PE#	N





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							V		ENGI Ak	
	ENG/PE#	DATE	DRN	CHKD	APPR				CHEC	
				 			AC LIGHT TANGENT	0°-2°	TA	
							80—SCVLT—LTG—002 D & DESIGN DRAWI	NG	APPR	OVED
S		5/21/15	KAK						da 5/1	
P BID		5/1/15				SCALE	FILE: LST-08-002.DWG		ING NO.	
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-0	00-80	J2

4. FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.

COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER. 2. STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16 INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER. 3. STRUCTURE SHALL BE DESIGNED WITH SUSPENSION AND TENSION ATTACHMENT PLATES AS SHOWN IN

1. HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH



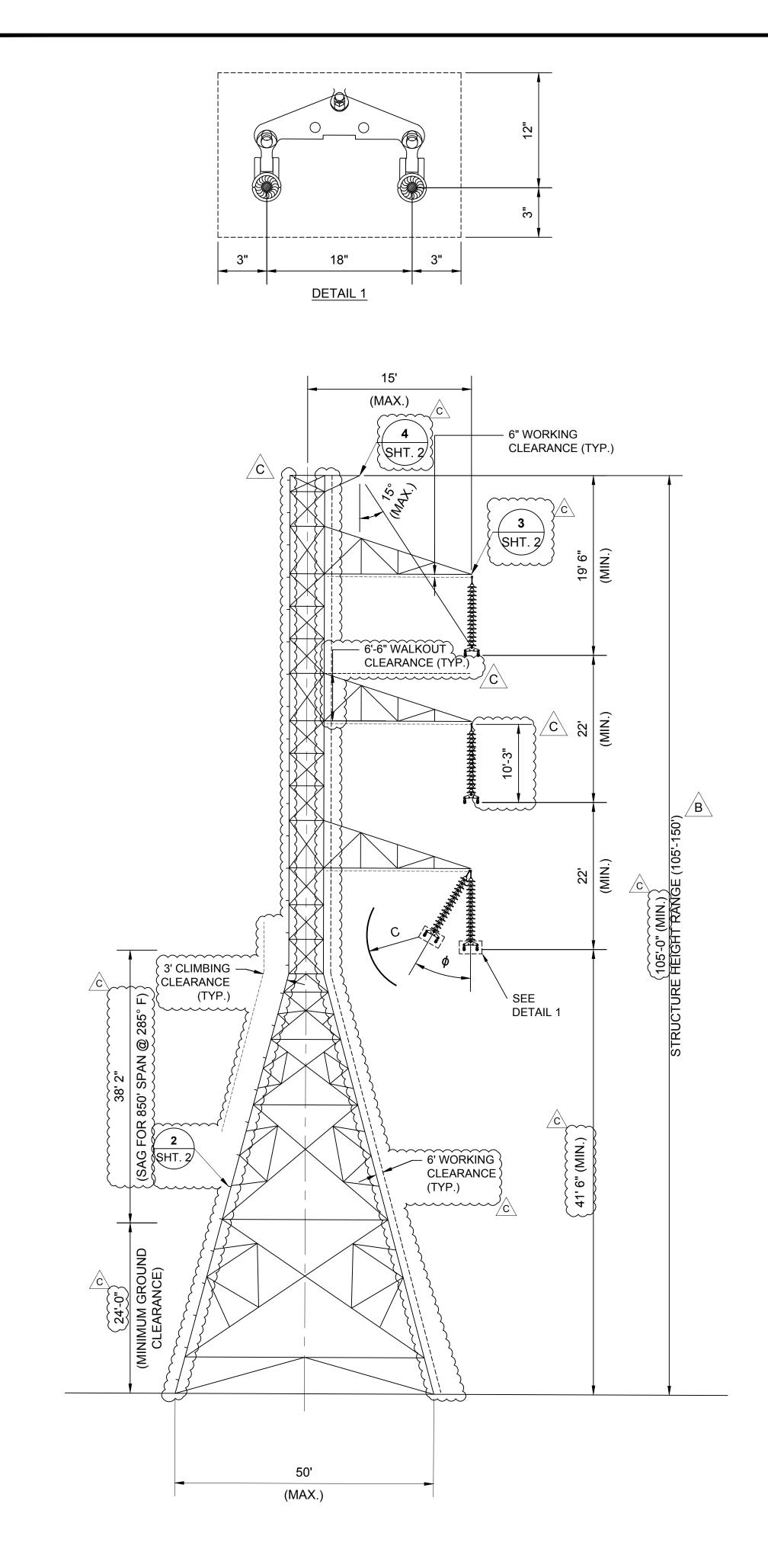


TABLE 1. INSULATOR SWING AND CLEARANCE

		[
CONDITION	ф	С	REMARKS		
NU SWING C _w	0°	8'-6"			
NU SWING C $_{\scriptscriptstyle L}$	25°	8'-1"	CLEARANCE MUST BE CONSIDERED		
NU SWING C $_{\rm s}$	43°	6'-2"	FROM TOWER BODY AND ARMS		
NU SWING C_{R}	54°	2'-6"			
NU SWING C _w	0°	8'-6"	CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WALKOUT CLEARANCE		

	STRUCTURE NAME: 30-SCVLT-HTG-002 345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 850 WEIGHT SPAN (FT): 1550 LINE ANGLE: 0 - 2 DEGREES												
LOADING CASE DESIGN LOADS													
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К
1	NESC 250B	0.00	0.50	39.53	2.58	1.40	0.00	15.32	4.99	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.75	1.08	0.00	6.00	6.26	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	3.65	0.99	0.00	16.00	3.09	0.00	4.00	90.00	1.00
4	NU EXTREME ICE	15.00	1.25	39.53	4.98	1.20	0.00	19.62	3.56	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.72	0.63	0.00	10.21	2.29	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.72	0.62	0.00	10.21	2.21	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.72	0.52	5.50	10.21	1.82	22.80	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	4.05	0.31	0.27	17.63	1.56	1.21	3.45	90.00	1.50
9	MAINTENANCE	60.00	0.00	0.00	3.29	0.21	0.00	13.80	0.93	0.00	0.00	90.00	2.00
10	OBLIQUE WIND	60.00	0.00	100.00	0.75	0.62	0.00	6.00	3.53	0.00	29.00	45.00	1.00

GENERAL NOTES:

/C\

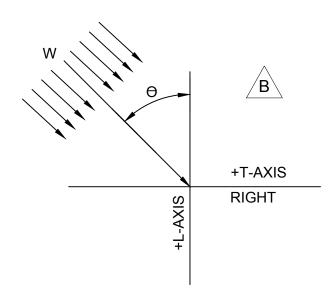
- AND LONGITUDINAL AXIS RESPECTIVELY. STRUCTURE.
- TOWER.

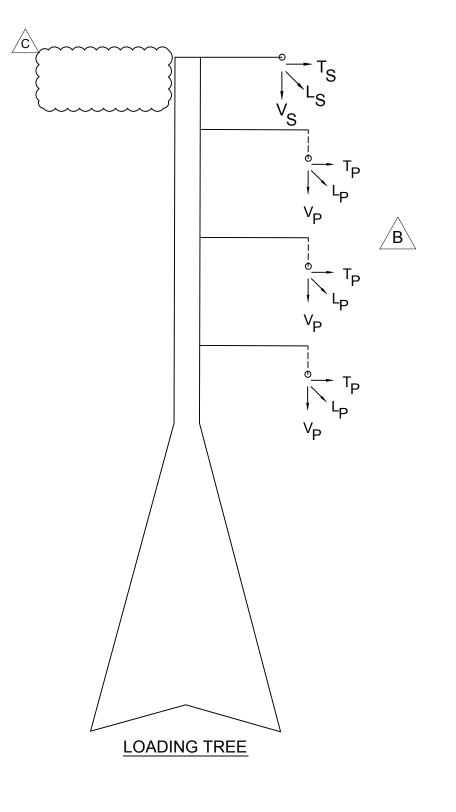
- CASE.

C

C

	CONTRACT SERVICES	REV	DESCRIPTION
PRELIMINARY - NOT	C		MISC. REVISIONS
FOR CONSTRUCTION	В		UPDATED STRUCTURE HEIGH
FUR CONSTRUCTION	А		RELEASED FOR RFP
	DWG R	EΥ	EPN/DESCRIPTION





1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE

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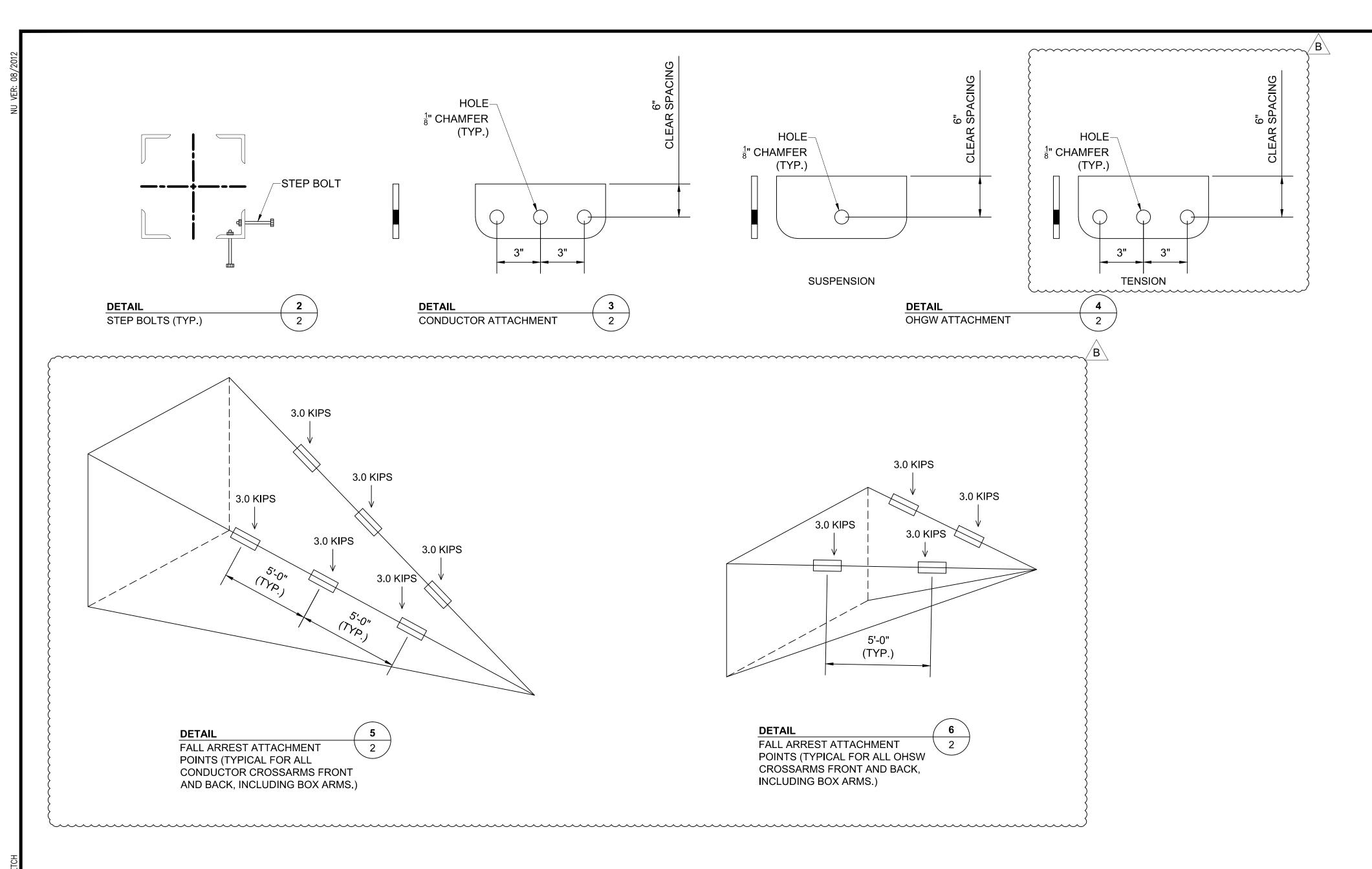
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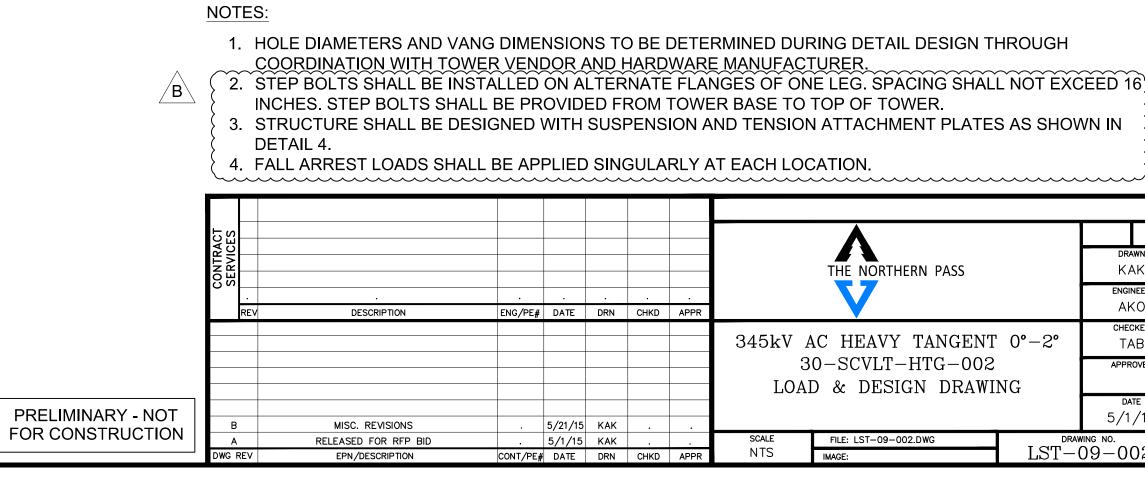
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							•		С
							THE NORTHERN PASS		drawn KAK
							V		engineer AKO
	ENG/PE#	DATE	DRN	CHKD	APPR				CHECKED
							AC HEAVY TANGEN		TAB
							0-SCVLT-HTG-002	2	APPROVED
						LOA	D & DESIGN DRAW	ING	
S		5/21/15	MSP						date 5/1/15
GHT RANGE	•	5/8/15	KAK		•				5/1/15
P BID		5/1/15	KAK			SCALE	FILE: LST-09-001.DWG		VING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-	09-001





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IS	•	5/21/15	KAK	•					3/1	/15
P BID		5/1/15	KAK	•		SCALE	FILE: LST-09-002.DWG		ING NO.	• •
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-()9–00	02

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COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER. INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER. 3. STRUCTURE SHALL BE DESIGNED WITH SUSPENSION AND TENSION ATTACHMENT PLATES AS SHOWN IN

1. HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH

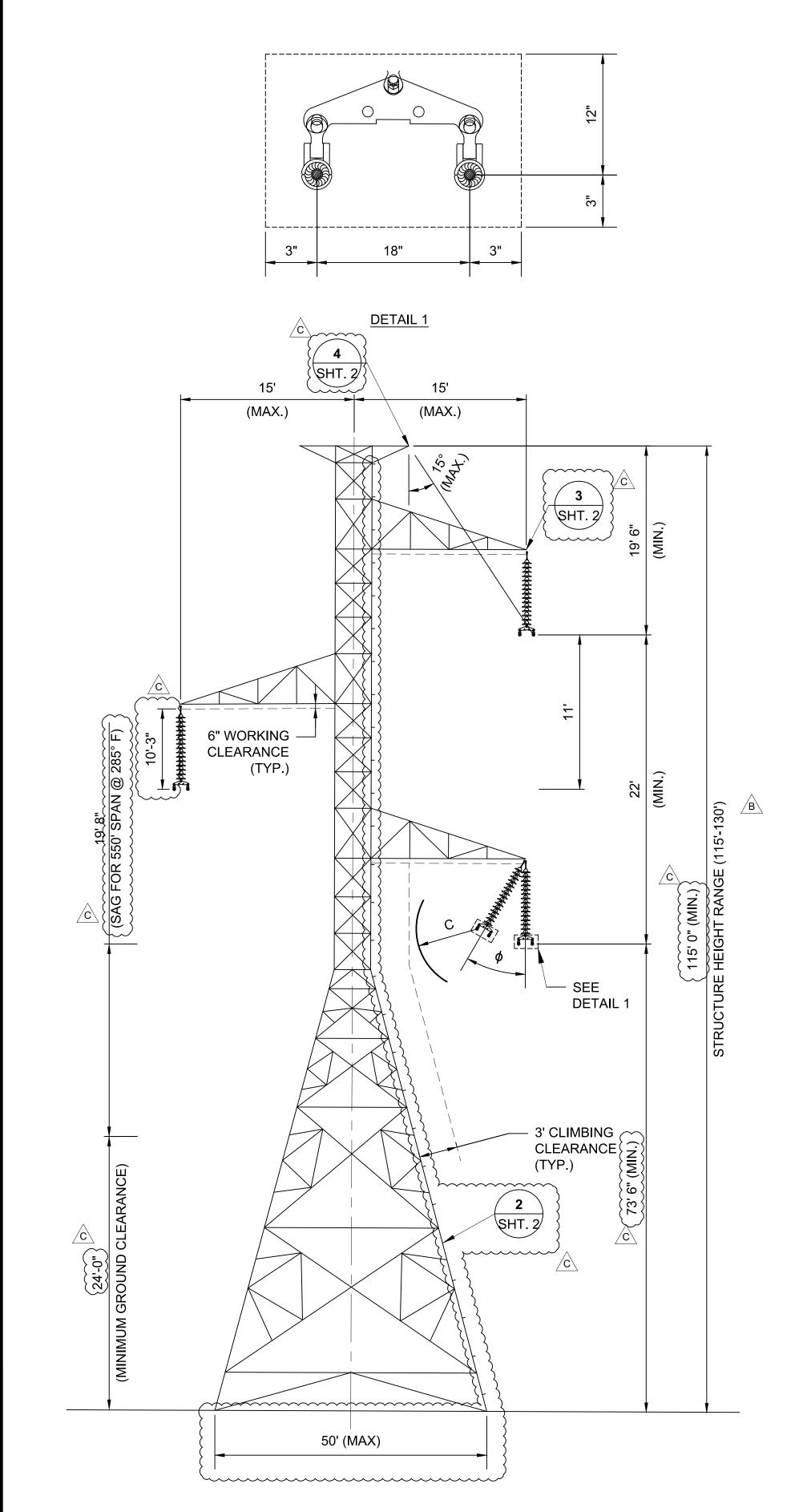


TABLE 1. INSULATOR SWING AND CLEARANCE

CONDITION	φ	С	REMARKS	
NU SWING C_w	0°	8'-6"		
NU SWING C $_{\scriptscriptstyle L}$	25°	8'-1"	CLEARANCE MUST BE CONSIDERED	
NU SWING C_s	43°	6'-2"	FROM TOWER BODY AND ARMS	
NU SWING C _R	54°	2'-6"		
NU SWING C_w	0°	(8'-6") 	CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WALKOUT CLEARANCE	

	STRUCTURE NAME: 30-3 345-KV AC CONDUCTOR OHGW: 1 - 19 NO.10 AL WIND SPAN (FT): 550 WEIGHT SPAN (FT): 850 LINE ANGLE: 0 - 2 DEGR	R: 2 - 15 LUMOW	590 KC	MIL 45/					•	1400#	@ NES	SC HEAN	VY)		
	LOADING CASE DESIGN LOADS														
NO.															
1	NESC 250B	0.00	0.50	39.53	1.45	1.03	0.00	8.94	3.73	0.00	10.00	90.00	1.50		
2	NESC 250C	60.00	0.00	100.00	0.43	0.75	0.00	3.49	4.34	0.00	29.00	90.00	1.00		
3	NESC 250D	15.00	1.00	39.53	2.03	0.74	0.00	9.14	2.39	0.00	4.00	90.00	1.00		
4	NU EXTREME ICE	15.00	1.25	39.53	2.76	0.90	0.00	11.12	2.76	0.00	4.00	90.00	1.00		
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.96	0.48	0.00	5.96	1.79	0.00	4.00	90.00	1.00		
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.96	0.47	0.00	5.96	1.71	0.00	4.00	90.00	1.00		
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.96	0.37	5.50	5.96	1.16	13.68	4.00	90.00	1.00		
8	CONSTRUCTION	30.00	0.00	29.97	3.58	0.27	0.27	13.87	1.30	1.21	3.45	90.00	1.50		
9	MAINTENANCE	60.00	0.00	0.00	2.66	0.21	0.00	8.79	0.93	0.00	0.00	90.00	2.00		
10	OBLIQUE WIND	60.00	0.00	100.00	0.43	0.46	0.00	3.49	2.57	0.00	29.00	45.00	1.00		

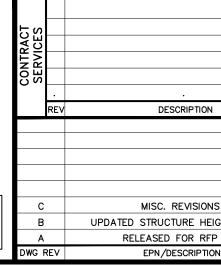


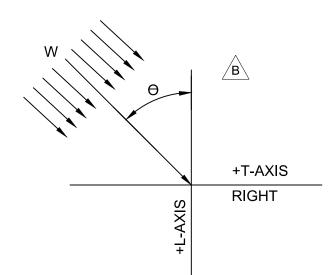
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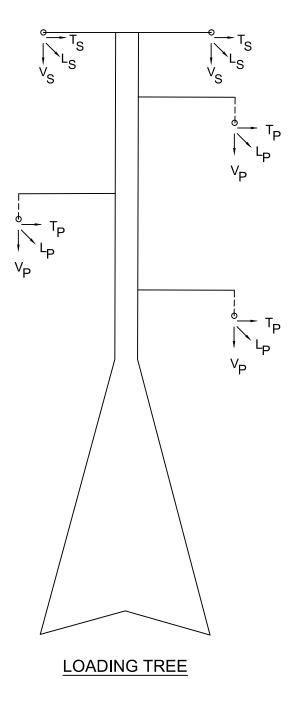
- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE.
- TOWER.
- - CASE.

PRELIMINARY - NOT

FOR CONSTRUCTION







1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

7. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 15 DEGREES.

12. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0 - 20°. CLEARANCES MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 1.

13. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

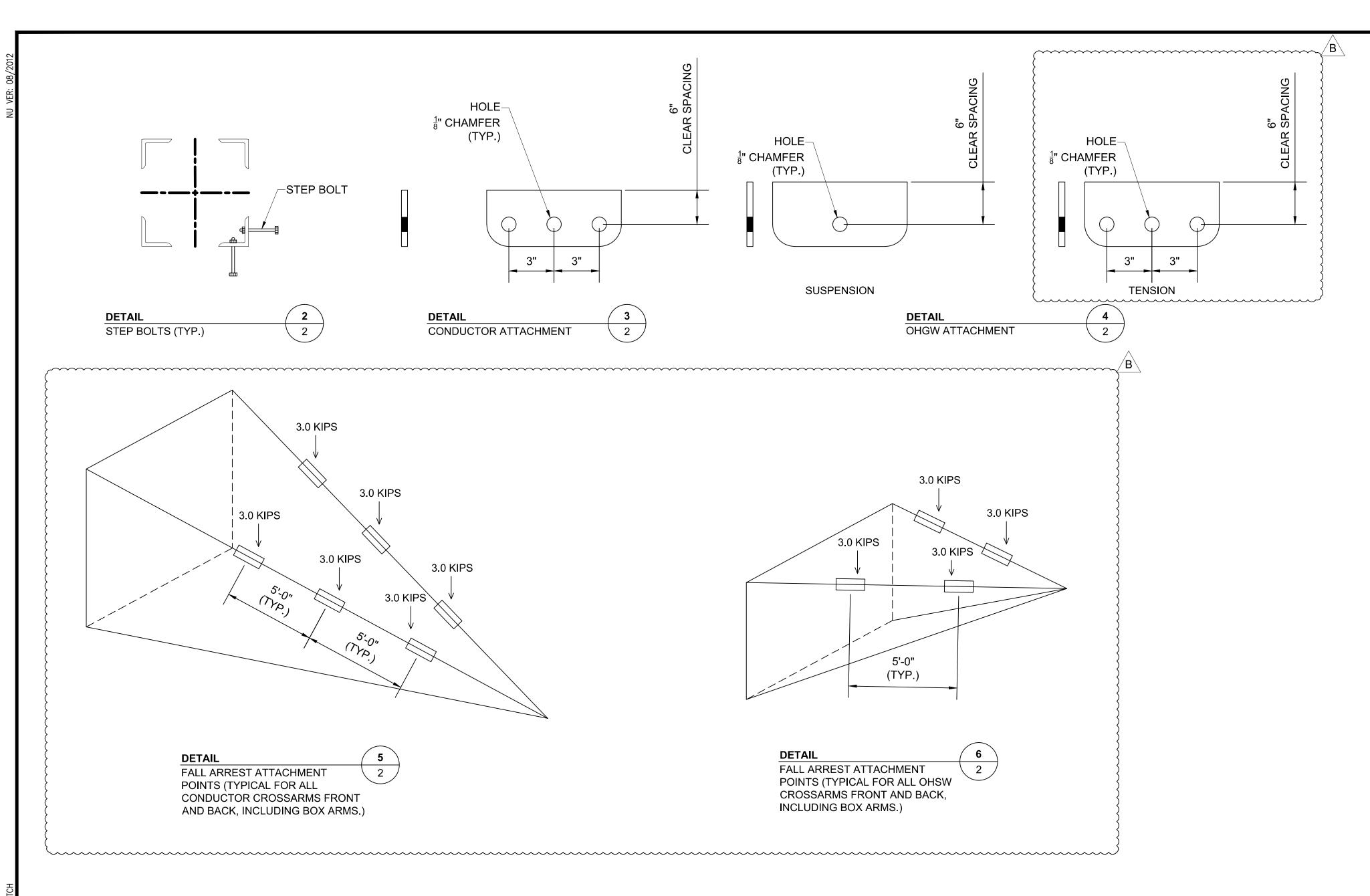
16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

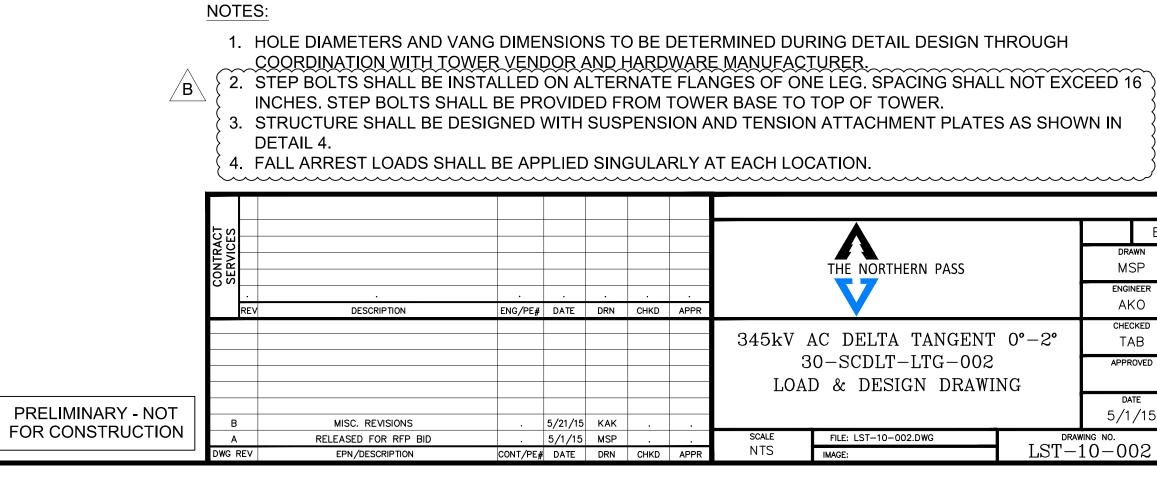
17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

18. PHI (φ) IS THE SWING ANGLE OF THE ASSEMBLY AND "C" IS THE REQUIRED ELECTRICAL CLEARANCE. THE STRUCTURE DESIGN SHALL PROVIDE CLEARANCE AS INDICATED IN TABLE 1.

19. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW, FOR } +WALKING CLEARANCES, ASSUME A WORKER HEIGHT OF 6'-6".

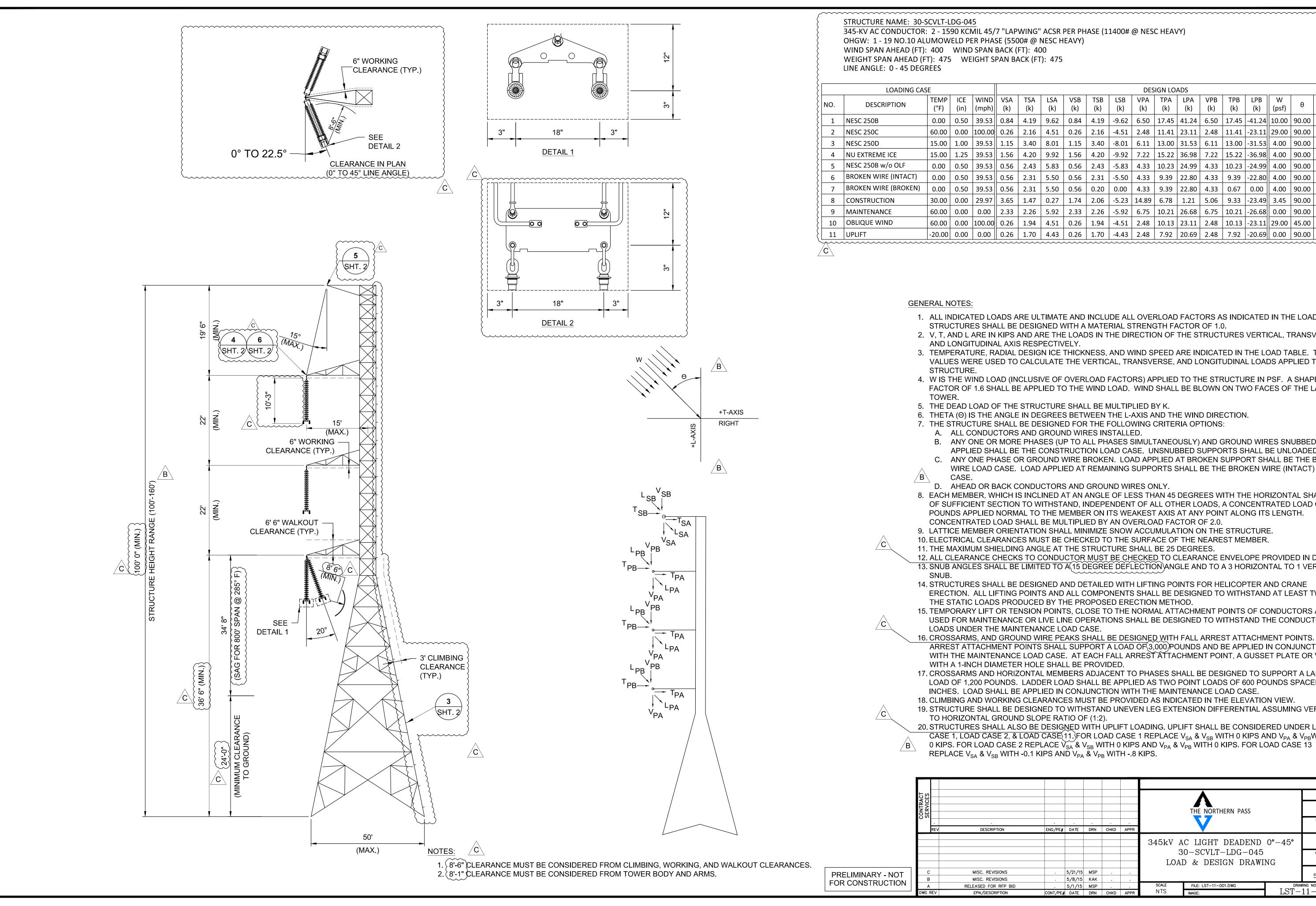
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S		5/21/15	MSP	•					DATE
GHT RANGE		5/8/15	KAK	•				_	5/1/15
P BID	•	5/1/15	MSP			SCALE	FILE: LST-10-001.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-	10-001





THE NORTHERN PASS DRAWN MSP **\7** ENGINEER AKO ENG/PE# DATE DRN CHKD APPR CHECKED 345kV AC DELTA TANGENT 0°-2° TAB 30-SCDLT-LTG-002 APPROVED LOAD & DESIGN DRAWING DATE 5/1/15 5/21/15 KAK scale NTS 5/1/15 MSP FILE: LST-10-002.DWG DRAWING NO. LST - 10 - 002IMAGE: CONT/PE# DATE DRN CHKD APPR

4. FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.



345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY)

						DES	GIGN LO	ADS						
VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	К
0.84	4.19	9.62	0.84	4.19	-9.62	6.50	17.45	41.24	6.50	17.45	-41.24	10.00	90.00	1.50
0.26	2.16	4.51	0.26	2.16	-4.51	2.48	11.41	23.11	2.48	11.41	-23.11	29.00	90.00	1.00
1.15	3.40	8.01	1.15	3.40	-8.01	6.11	13.00	31.53	6.11	13.00	-31.53	4.00	90.00	1.00
1.56	4.20	9.92	1.56	4.20	-9.92	7.22	15.22	36.98	7.22	15.22	-36.98	4.00	90.00	1.00
0.56	2.43	5.83	0.56	2.43	-5.83	4.33	10.23	24.99	4.33	10.23	-24.99	4.00	90.00	1.00
0.56	2.31	5.50	0.56	2.31	-5.50	4.33	9.39	22.80	4.33	9.39	-22.80	4.00	90.00	1.00
0.56	2.31	5.50	0.56	0.20	0.00	4.33	9.39	22.80	4.33	0.67	0.00	4.00	90.00	1.00
3.65	1.47	0.27	1.74	2.06	-5.23	14.89	6.78	1.21	5.06	9.33	-23.49	3.45	90.00	1.50
2.33	2.26	5.92	2.33	2.26	-5.92	6.75	10.21	26.68	6.75	10.21	-26.68	0.00	90.00	2.00
0.26	1.94	4.51	0.26	1.94	-4.51	2.48	10.13	23.11	2.48	10.13	-23.11	29.00	45.00	1.00
0.26	1.70	4.43	0.26	1.70	-4.43	2.48	7.92	20.69	2.48	7.92	-20.69	0.00	90.00	1.00
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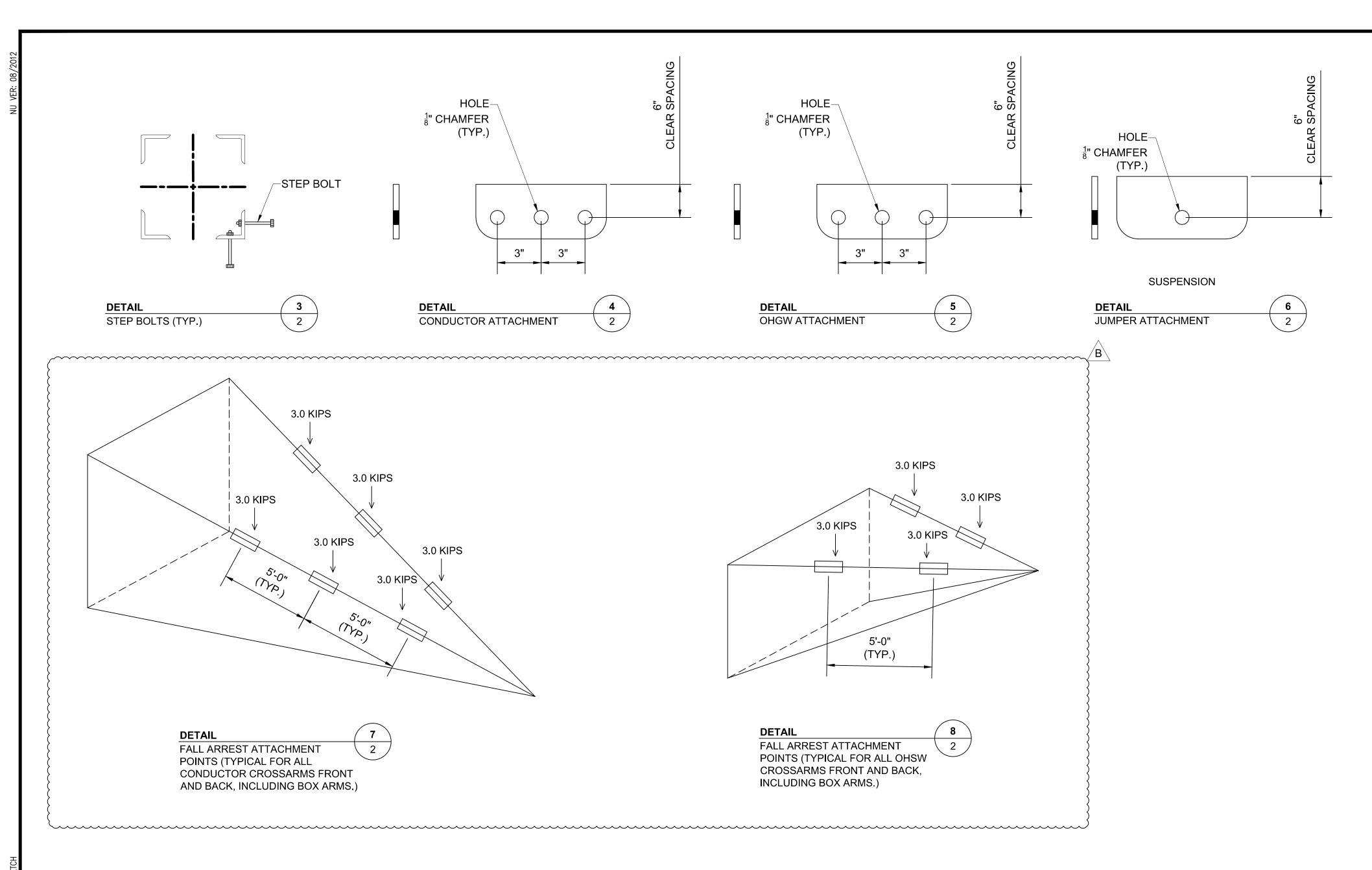
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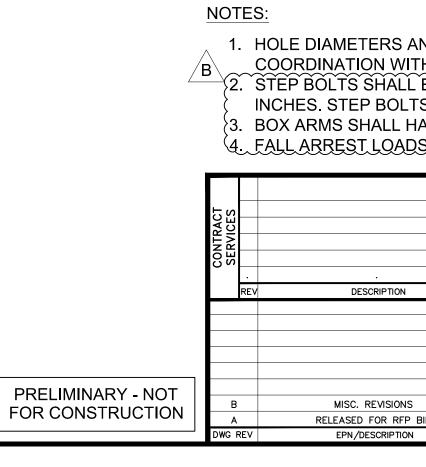
19. STRUCTURE SHALL BE DESIGNED TO WITHSTAND UNEVEN LEG EXTENSION DIFFERENTIAL ASSUMING VERTICAL TO HORIZONTAL GROUND SLOPE RATIO OF (1:2).

20. STRUCTURES SHALL ALSO BE DESIGNED WITH UPLIFT LOADING. UPLIFT SHALL BE CONSIDERED UNDER LOAD CASE 1, LOAD CASE 2, & LOAD CASE (11.) FOR LOAD CASE 1 REPLACE V_{SA} & V_{SB} WITH 0 KIPS AND V_{PA} & V_{PB}WITH 0 KIPS. FOR LOAD CASE 2 REPLACE VSA & VSB WITH 0 KIPS AND VPA & VPB WITH 0 KIPS. FOR LOAD CASE 13 REPLACE V_{SA} & V_{SB} WITH -0.1 KIPS AND V_{PA} & V_{PB} WITH -.8 KIPS.

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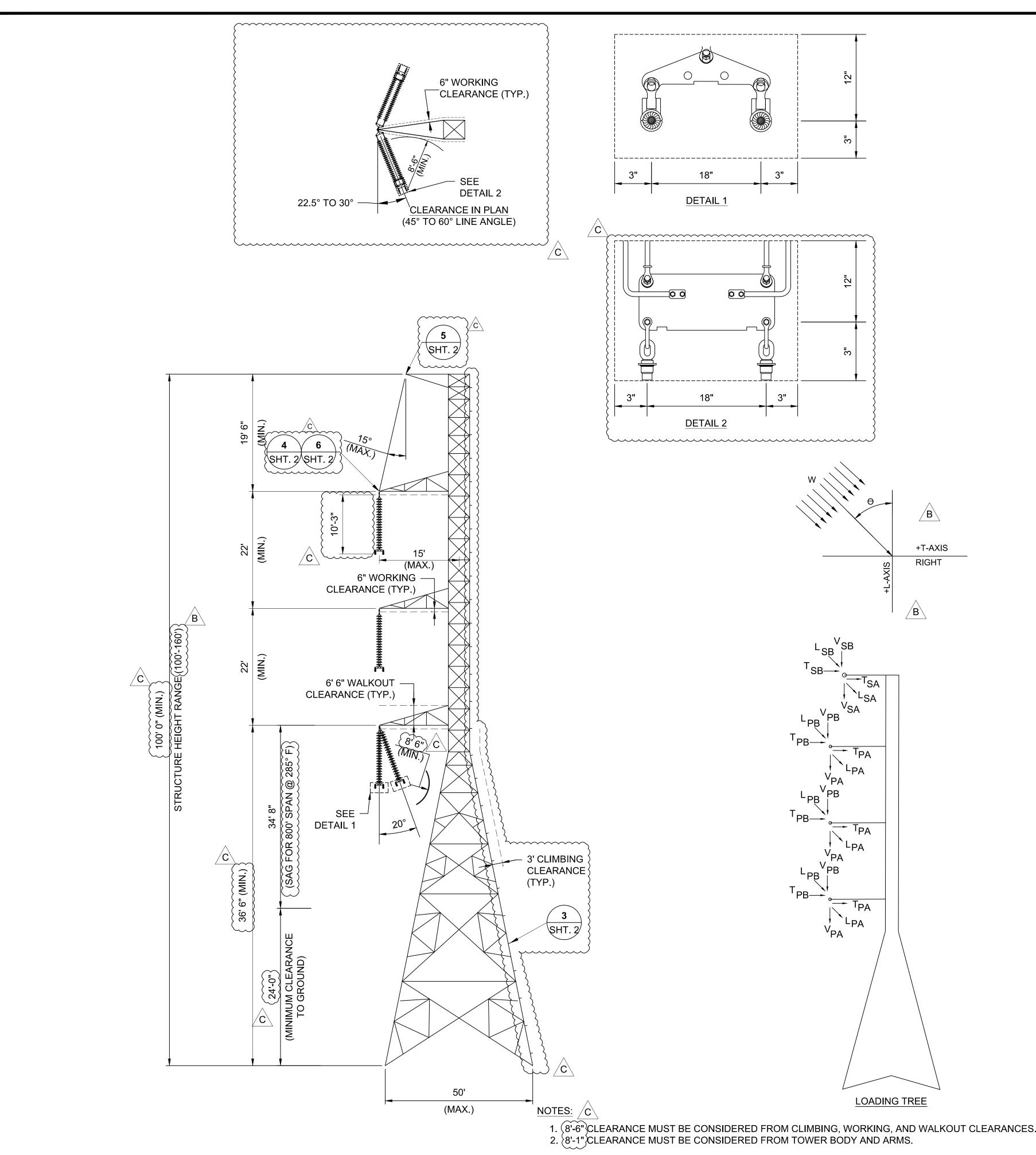


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	ION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-1	11 - 00	75

 HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER.
 STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16 INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER.
 BOX ARMS SHALL HAVE PLATE ATTACHMENT HOLE AT EACH CORNER AND AT MIDPOINT.
 FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.



STRUCTURE NAME: 30-SCVLT-MDG-060 OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN AHEAD (FT): 400 WIND SPAN BACK (FT): 400 WEIGHT SPAN AHEAD (FT): 475 WEIGHT SPAN BACK (FT): 475 LINE ANGLE: 45 - 60 DEGREES

	LOADING CAS	SE		/							DES	IGN LO	ADS						
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	0.84	5.32	8.89	0.84	5.32	-8.89	6.50	22.29	38.10	6.50	22.29	-38.10	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.26	2.69	4.17	0.26	2.69	-4.17	2.48	14.12	21.35	2.48	14.12	-21.35	29.00	90.00	1.00
3			39.53	1.15	4.34	7.40	1.15	4.34	-7.40	6.11	16.70	29.13	6.11	16.70	-29.13	4.00	90.00	1.00	
4	NU EXTREME ICE	15.00	1.25	39.53	1.56	5.36	9.17	1.56	5.36	-9.17	7.22	19.56	34.16	7.22	19.56	-34.16	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.56	3.12	5.39	0.56	3.12	-5.39	4.33	13.16	23.09	4.33	13.16	-23.09	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.56	2.95	5.08	0.56	2.95	-5.08	4.33	12.07	21.06	4.33	12.07	-21.06	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.56	2.95	5.08	0.56	0.20	0.00	4.33	12.07	21.06	4.33	0.67	0.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.65	1.45	0.25	1.74	2.67	-4.83	14.89	6.67	1.12	5.06	12.09	-21.70	3.45	90.00	1.50
9	MAINTENANCE	60.00	0.00	0.00	2.33	2.96	5.47	2.33	2.96	-5.47	6.75	13.34	24.65	6.75	13.34	-24.65	0.00	90.00	2.00
10	OBLIQUE WIND	60.00	0.00	100.00	0.26	2.47	4.17	0.26	2.47	-4.17	2.48	12.84	21.35	2.48	12.84	-21.35	29.00	45.00	1.00
11	UPLIFT	-20.00	0.00	0.00	0.26	2.22	4.09	0.26	2.22	-4.09	2.48	10.34	19.11	2.48	10.34	-19.11	0.00	90.00	1.00

GENERAL NOTES:

- AND LONGITUDINAL AXIS RESPECTIVELY.
- STRUCTURE.
- TOWER.

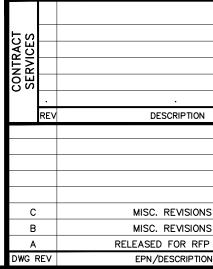
- CASE.

 $/C \setminus$

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- SNUB.



PRELIMINARY - NOT FOR CONSTRUCTION

345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY)

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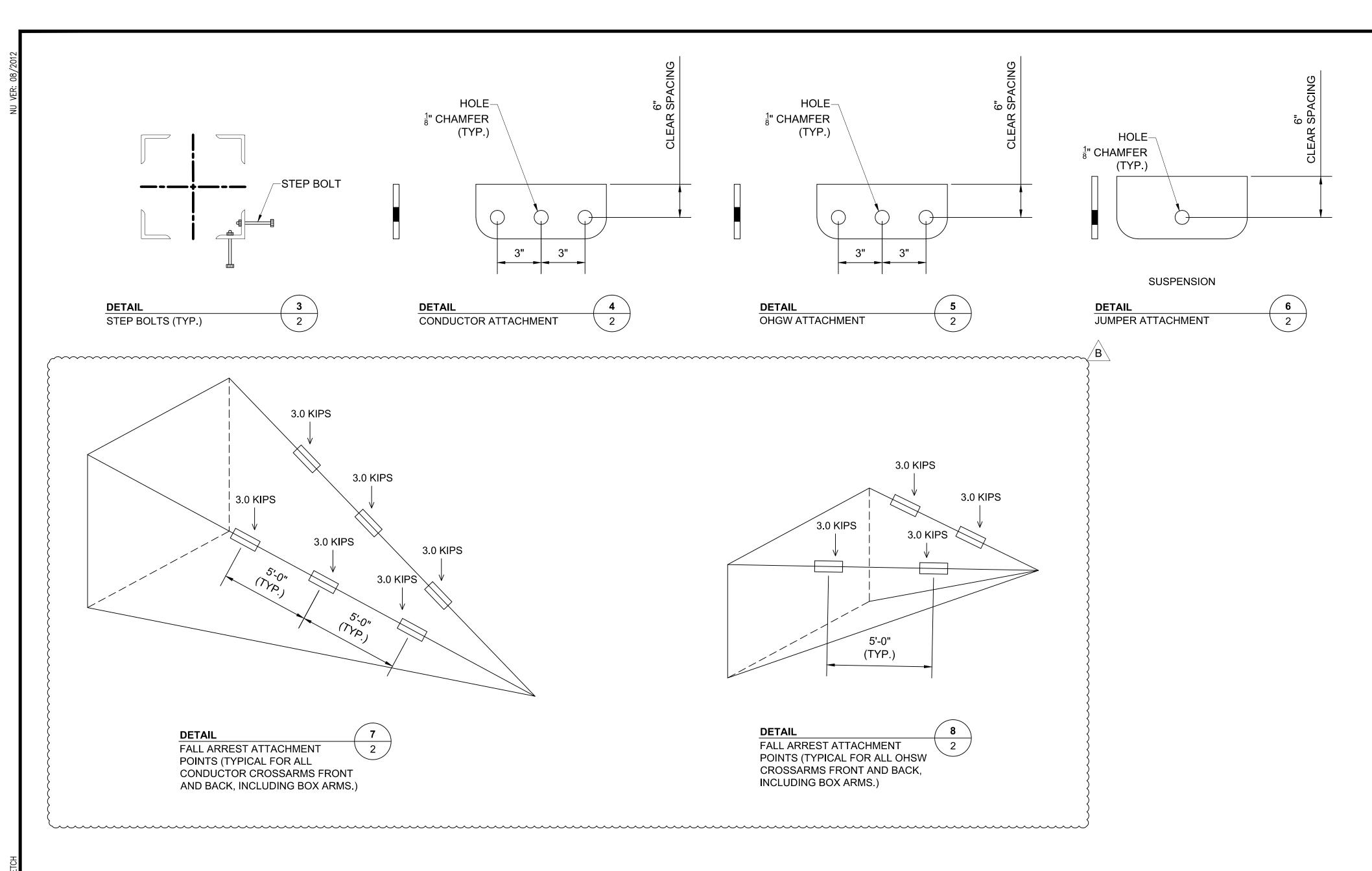
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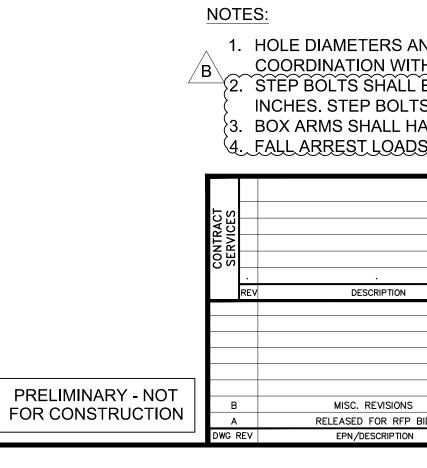
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							THE NORTHERN PASS		drawn MSP
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						LOAI	D & DESIGN DRAWI	NG	
S		5/21/15	MSP	•					date 5/1/15
S	•	5/8/15	KAK	•	•				5/1/15
P BID		5/1/15	MSP	•	•	SCALE	FILE: LST-12-001.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-	12-001

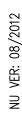


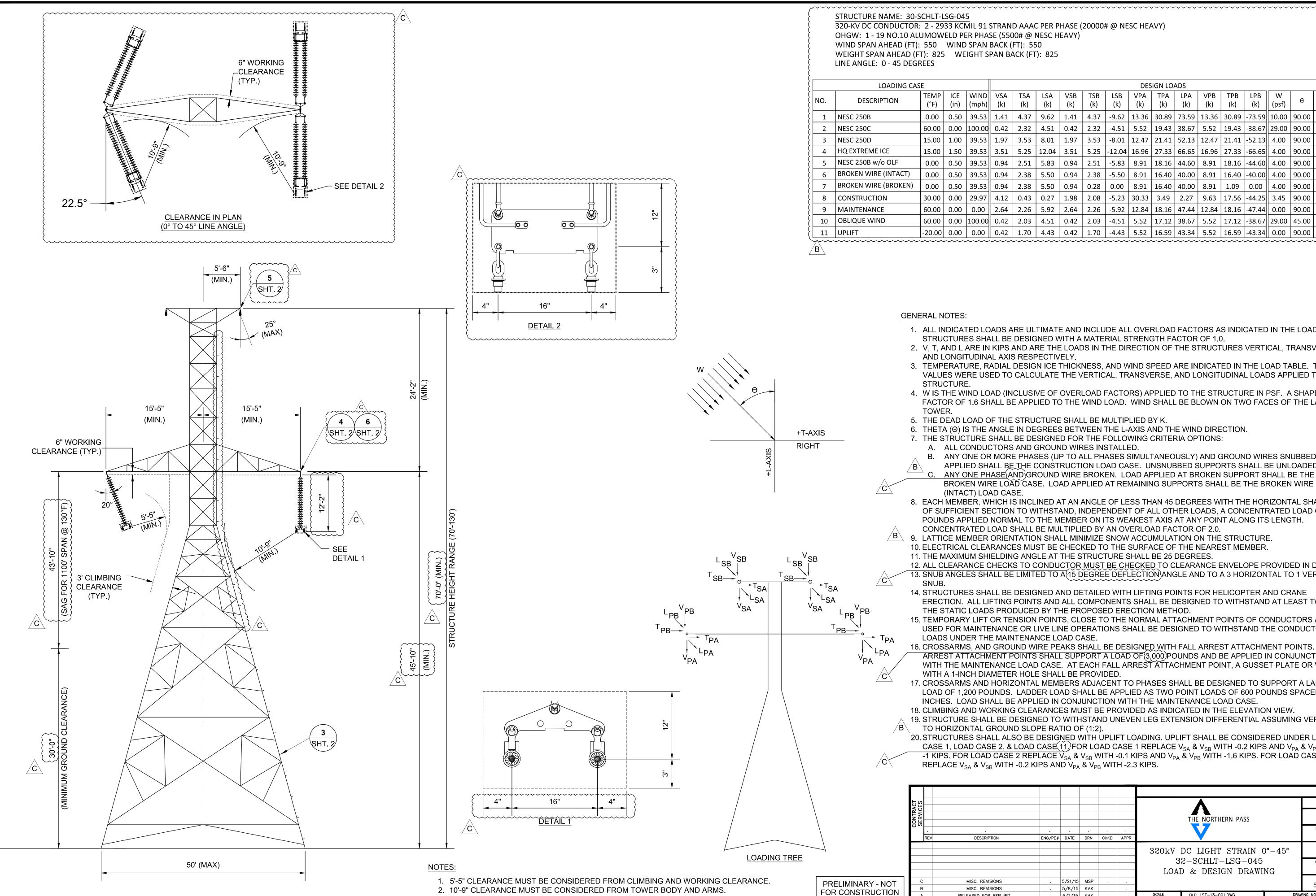


								I DEADEND 60° MDG-060 N DRAWING .dwg drawin		В			
									DRA	WN			
							AC MEDIUM DEADEND 60° TAB 0-SCVLT-MDG-060 APPROVED D & DESIGN DRAWING FILE: LST-12-002.DWG DRAWING NO.						
	•	•											
N	ENG/PE#	DATE	DRN	CHKD	APPR								
							THE NORTHERN PASS THE NORTHERN PASS MSP ENGINE AKC C MEDIUM DEADEND 60° -SCVLT-MDG-060 & DESIGN DRAWING FILE: LST-12-002.DWG DRAWING NO. LSTT 12 000	CKED					
						345kV A	45kV AC MEDIUM DEADEND 60° TAB						
						30	AKO 5kV AC MEDIUM DEADEND 60° 30-SCVLT-MDG-060 LOAD & DESIGN DRAWING DATE						
							45kV AC MEDIUM DEADEND 60° TAB 30-SCVLT-MDG-060 APPROVE						
						LOAI) & DESIGN DRAWI	NG					
NS		5/21/15	KAK		•				5/1	/15			
P BID		5/1/15	MSP	•	•	SCALE	FILE: LST-12-002.DWG						
ON	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-1	12 - 00	75			

B COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER. 2. STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16 INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER. 3. BOX ARMS SHALL HAVE PLATE ATTACHMENT HOLE AT EACH CORNER AND AT MIDPOINT. 4. FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.

1. HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH





OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN AHEAD (FT): 550 WIND SPAN BACK (FT): 550 WEIGHT SPAN AHEAD (FT): 825 WEIGHT SPAN BACK (FT): 825

	LOADING CAS	E									DES	IGN LO	ADS						
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)		TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	К
1	NESC 250B	0.00	0.50	39.53	1.41	4.37	9.62	1.41	4.37	-9.62	13.36	30.89	73.59	13.36	30.89	-73.59	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.42	2.32	4.51	0.42	2.32	-4.51	5.52	19.43	38.67	5.52	19.43	-38.67	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	1.97	3.53	8.01	1.97	3.53	-8.01	12.47	21.41	52.13	12.47	21.41	-52.13	4.00	90.00	1.0
4	HQ EXTREME ICE	15.00	1.50	39.53	3.51	5.25	12.04	3.51	5.25	-12.04	16.96	27.33	66.65	16.96	27.33	-66.65	4.00	90.00	1.0
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.94	2.51	5.83	0.94	2.51	-5.83	8.91	18.16	44.60	8.91	18.16	-44.60	4.00	90.00	1.0
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	2.38	-5.50	8.91	16.40	40.00	8.91	16.40	-40.00	4.00	90.00	1.0
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	0.28	0.00	8.91	16.40	40.00	8.91	1.09	0.00	4.00	90.00	1.0
8	CONSTRUCTION	30.00	0.00	29.97	4.12	0.43	0.27	1.98	2.08	-5.23	30.33	3.49	2.27	9.63	17.56	-44.25	3.45	90.00	1.5
9	MAINTENANCE	60.00	0.00	0.00	2.64	2.26	5.92	2.64	2.26	-5.92	12.84	18.16	47.44	12.84	18.16	-47.44	0.00	90.00	2.0
10	OBLIQUE WIND	60.00	0.00	100.00	0.42	2.03	4.51	0.42	2.03	-4.51	5.52	17.12	38.67	5.52	17.12	-38.67	29.00	45.00	1.0
11	UPLIFT	-20.00	0.00	0.00	0.42	1.70	4.43	0.42	1.70	-4.43	5.52	16.59	43.34	5.52	16.59	-43.34	0.00	90.00	1.0



- AND LONGITUDINAL AXIS RESPECTIVELY.

- (INTACT) LOAD CASE.

- DESCRIPTION MISC. REVISION MISC. REVISION Α RELEASED FOR RF DWG REV EPN/DESCRIPTI

320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY)

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0. 2. V, T, AND L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE,

3. TEMPERATURE, RADIAL DESIGN ICE THICKNESS, AND WIND SPEED ARE INDICATED IN THE LOAD TABLE. THESE

VALUES WERE USED TO CALCULATE THE VERTICAL, TRANSVERSE, AND LONGITUDINAL LOADS APPLIED TO THE

4. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.6 SHALL BE APPLIED TO THE WIND LOAD. WIND SHALL BE BLOWN ON TWO FACES OF THE LATTICE

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THETA (Θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE (AND) GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE

8. EACH MEMBER, WHICH IS INCLINED AT AN ANGLE OF LESS THAN 45 DEGREES WITH THE HORIZONTAL SHALL BE OF SUFFICIENT SECTION TO WITHSTAND, INDEPENDENT OF ALL OTHER LOADS, A CONCENTRATED LOAD OF 350 POUNDS APPLIED NORMAL TO THE MEMBER ON ITS WEAKEST AXIS AT ANY POINT ALONG ITS LENGTH. CONCENTRATED LOAD SHALL BE MULTIPLIED BY AN OVERLOAD FACTOR OF 2.0.

9. LATTICE MEMBER ORIENTATION SHALL MINIMIZE SNOW ACCUMULATION ON THE STRUCTURE.

10. ELECTRICAL CLEARANCES MUST BE CHECKED TO THE SURFACE OF THE NEAREST MEMBER.

11. THE MAXIMUM SHIELDING ANGLE AT THE STRUCTURE SHALL BE 25 DEGREES

12. ALL CLEARANCE CHECKS TO CONDUCTOR MUST BE CHECKED TO CLEARANCE ENVELOPE PROVIDED IN DETAIL 13. SNUB ANGLES SHALL BE LIMITED TO A 15 DEGREE DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL

14. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR HELICOPTER AND CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

15. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

16. CROSSARMS, AND GROUND WIRE PEAKS SHALL BE DESIGNED WITH FALL ARREST ATTACHMENT POINTS. FALL ARREST ATTACHMENT POINTS SHALL SUPPORT A LOAD OF (3,000) POUNDS AND BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE. AT EACH FALL ARREST ATTACHMENT POINT, A GUSSET PLATE OR VANG WITH A 1-INCH DIAMETER HOLE SHALL BE PROVIDED.

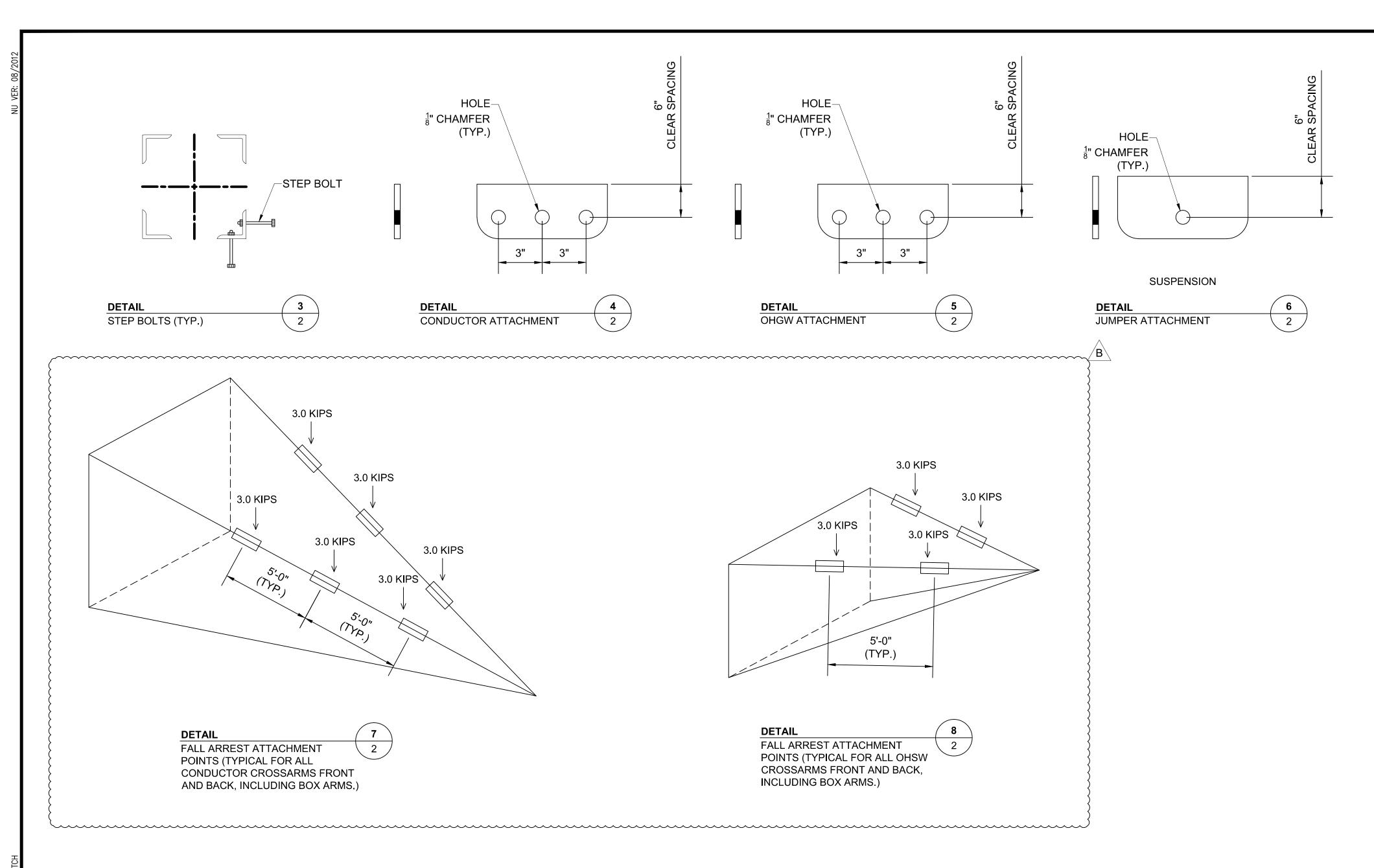
17. CROSSARMS AND HORIZONTAL MEMBERS ADJACENT TO PHASES SHALL BE DESIGNED TO SUPPORT A LADDER LOAD OF 1,200 POUNDS. LADDER LOAD SHALL BE APPLIED AS TWO POINT LOADS OF 600 POUNDS SPACED AT 15 INCHES. LOAD SHALL BE APPLIED IN CONJUNCTION WITH THE MAINTENANCE LOAD CASE.

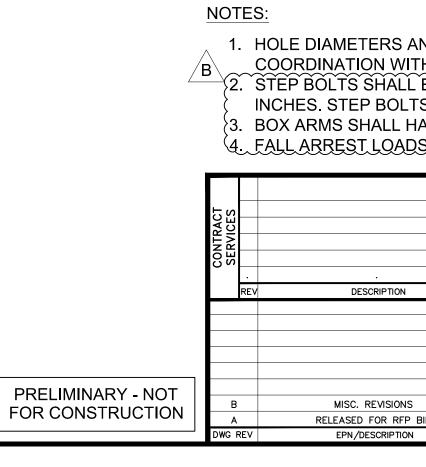
18. CLIMBING AND WORKING CLEARANCES MUST BE PROVIDED AS INDICATED IN THE ELEVATION VIEW.

19. STRUCTURE SHALL BE DESIGNED TO WITHSTAND UNEVEN LEG EXTENSION DIFFERENTIAL ASSUMING VERTICAL TO HORIZONTAL GROUND SLOPE RATIO OF (1:2).

20. STRUCTURES SHALL ALSO BE DESIGNED WITH UPLIFT LOADING. UPLIFT SHALL BE CONSIDERED UNDER LOAD CASE 1, LOAD CASE 2, & LOAD CASE 11) FOR LOAD CASE 1 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB} WITH -1 KIPS. FOR LOAD CASE 2 REPLACE V_{SA} & V_{SB} WITH -0.1 KIPS AND V_{PA} & V_{PB} WITH -1.6 KIPS. FOR LOAD CASE 13 REPLACE V_{SA} & V_{SB} WITH -0.2 KIPS AND V_{PA} & V_{PB} WITH -2.3 KIPS.

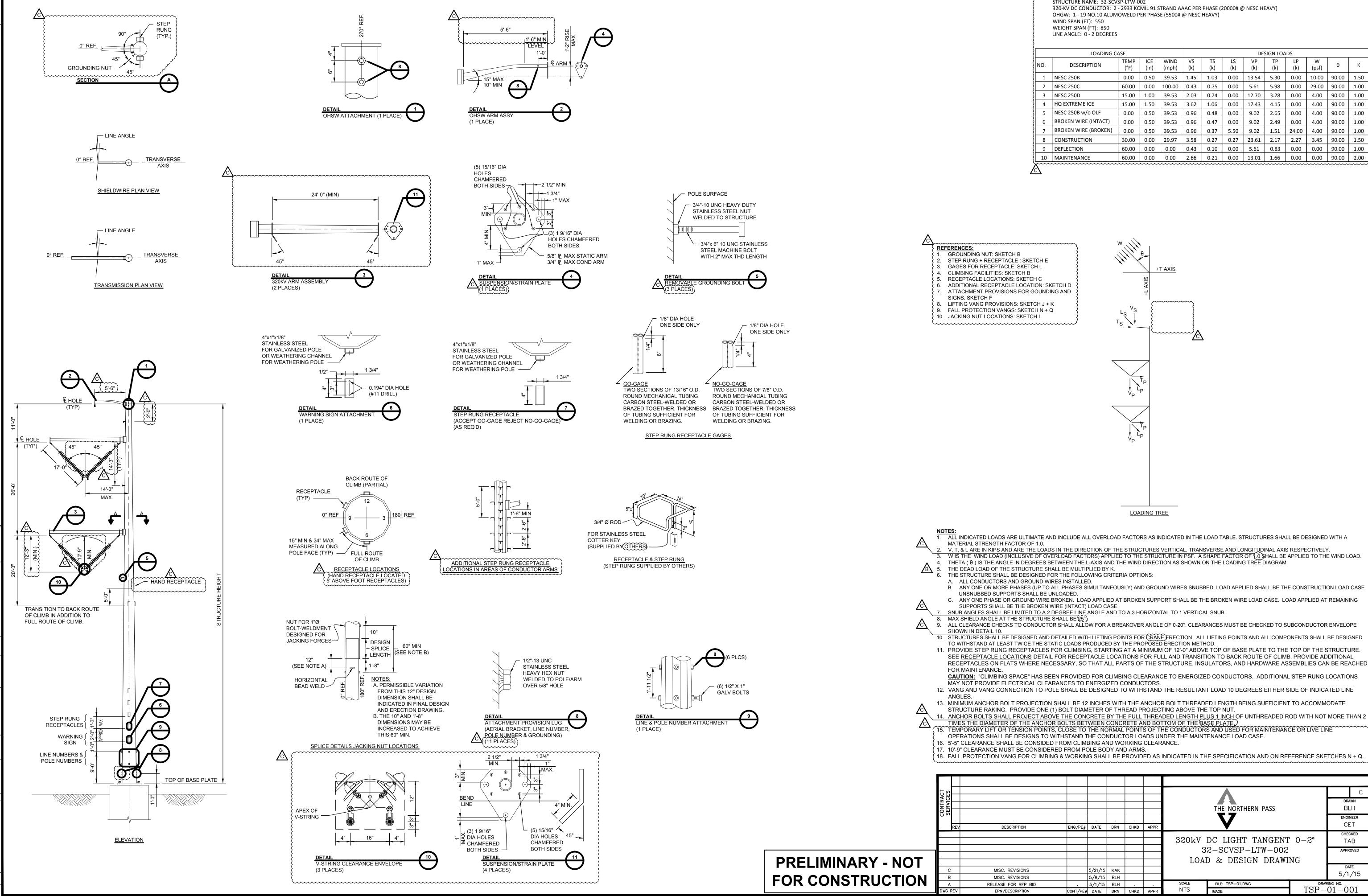
	С
THE NORTHERN PASS	drawn KAK
	engineer AKO
ENG/PE# DATE DRN CHKD APPR	
320kV DC LIGHT STRAIN 0°-45°	CHECKED TAB
32-SCHLT-LSG-045	APPROVED
LOAD & DESIGN DRAWING	
S . 5/21/15 MSP	date 5/1/15
S . 5/8/15 KAK	5/1/15
P BID . 5/1/15 KAK SCALE FILE: LST-13-001.DWG DRAWING	
)N CONT/PE# DATE DRN CHKD APPR NTS IMAGE: LST -13	3-001





							•	TRAIN 0°-45° SG-045 DRAWING		В
							THE NORTHERN PASS			
							DC LIGHT STRAIN 0°-45° 32-SCHLT-LSG-045			
	•	•		•	•					
N	ENG/PE#	DATE	DRN	CHKD	APPR				AK	(0
						320kV .	DC LIGHT STRAIN ()°-45°	TA	٨B
						3	2-SCHLT-LSG-045		APPR	OVED
								NG		
						LOAI	J & DESIGN DRAWI	NG		
٧S		5/21/15	KAK		•			5/1	/15	
P BID		5/1/15	KAK		•	SCALE	FILE: LST-13-002.DWG		ING NO.	
ON	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	LST-1	13-00	75

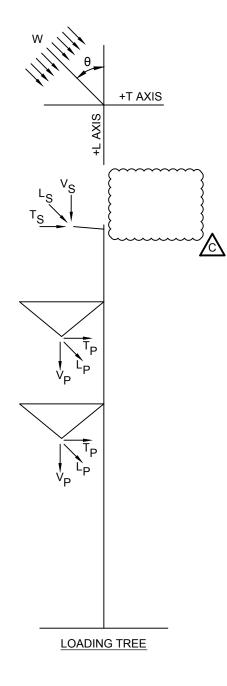
1. HOLE DIAMETERS AND VANG DIMENSIONS TO BE DETERMINED DURING DETAIL DESIGN THROUGH B COORDINATION WITH TOWER VENDOR AND HARDWARE MANUFACTURER. 2. STEP BOLTS SHALL BE INSTALLED ON ALTERNATE FLANGES OF ONE LEG. SPACING SHALL NOT EXCEED 16 INCHES. STEP BOLTS SHALL BE PROVIDED FROM TOWER BASE TO TOP OF TOWER. 3. BOX ARMS SHALL HAVE PLATE ATTACHMENT HOLE AT EACH CORNER AND AT MIDPOINT. 4. FALL ARREST LOADS SHALL BE APPLIED SINGULARLY AT EACH LOCATION.



STRUCTURE NAME: 32-SCVSP-LTW-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 550 WEIGHT SPAN (FT): 850 LINE ANGLE: 0 - 2 DEGREES

	LOADING CA	ASE						DE'	SIGN LOA	۸DS			,
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	1.45	1.03	0.00	13.54	5.30	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.43	0.75	0.00	5.61	5.98	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.03	0.74	0.00	12.70	3.28	0.00	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	3.62	1.06	0.00	17.43	4.15	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.96	0.48	0.00	9.02	2.65	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.96	0.47	0.00	9.02	2.49	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.96	0.37	5.50	9.02	1.51	24.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.58	0.27	0.27	23.61	2.17	2.27	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.43	0.10	0.00	5.61	0.83	0.00	0.00	90.00	1.00
10	MAINTENANCE	60.00	0.00	0.00	2.66	0.21	0.00	13.01	1.66	0.00	0.00	90.00	2.00

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1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

DRAWN

BLH

ENGINEER CET

CHECKED

TAB

APPROVED

DATE

5/1/15

DRAWING NO.

TSP-01-001

THE NORTHERN PASS

320kV DC LIGHT TANGENT 0-2°

32-SCVSP-LTW-002

LOAD & DESIGN DRAWING

57

FILE: TSP-01.DWG

IMAGE:

SCALE

NTS

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (.0) SHALL BE APPLIED TO THE WIND LOAD.

4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

ENG/PE# DATE DRN CHKD APPR

5/21/15 KAK

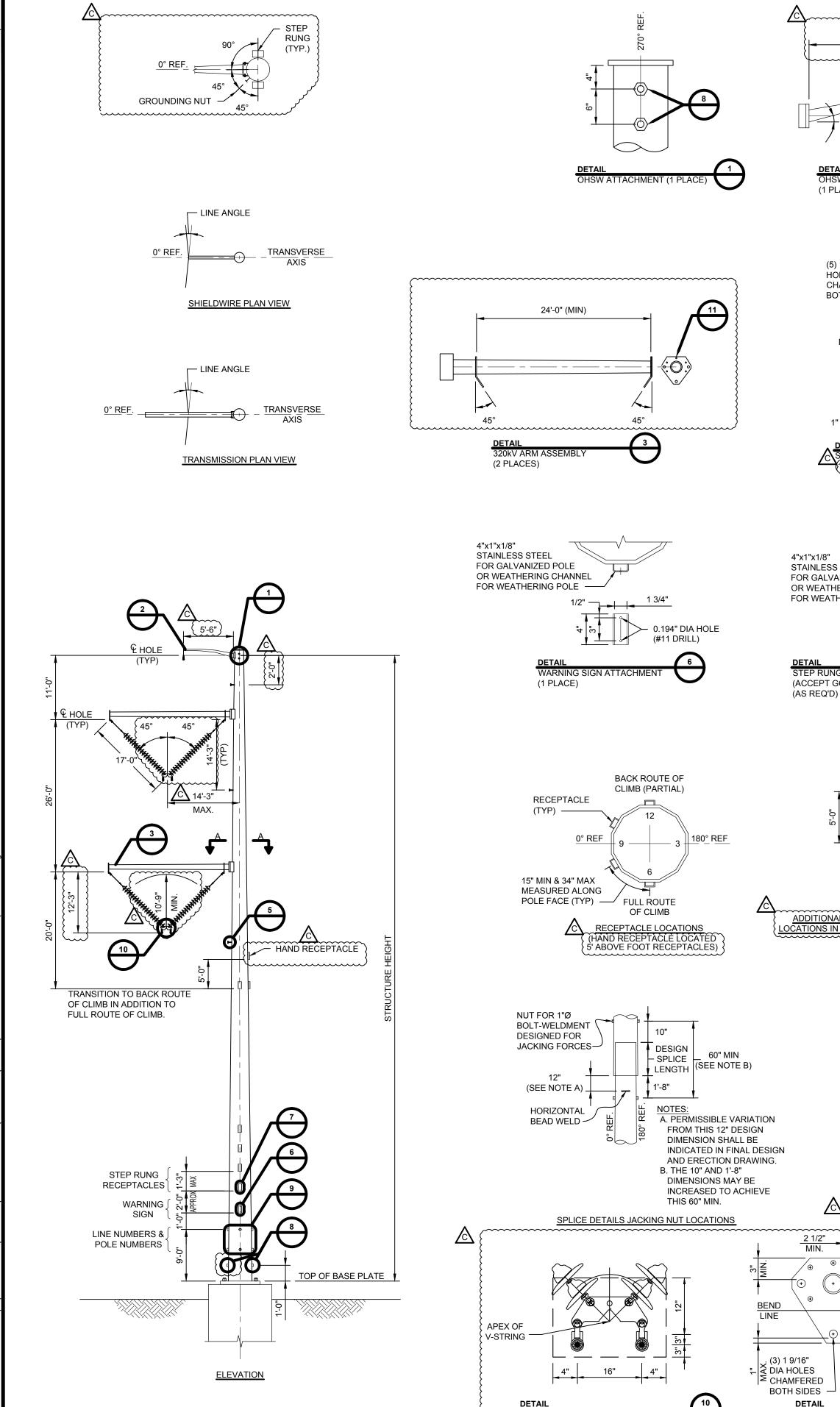
5/8/15 BLH

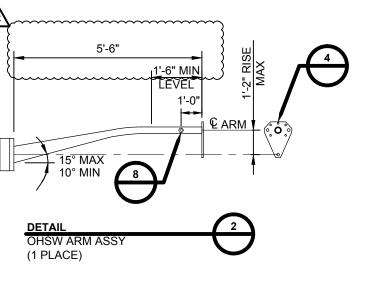
5/1/15 BLH

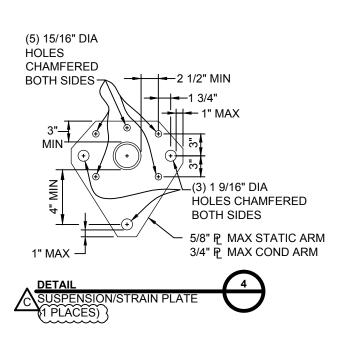
CONT/PE# DATE DRN CHKD APPR

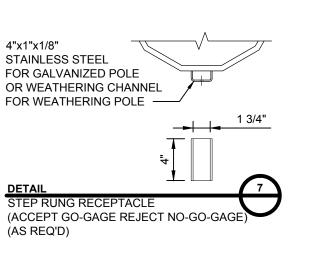
THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

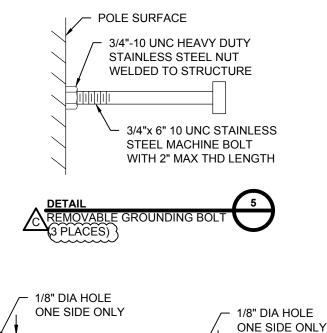
THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

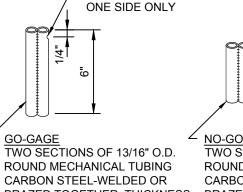


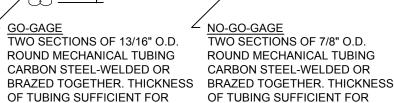






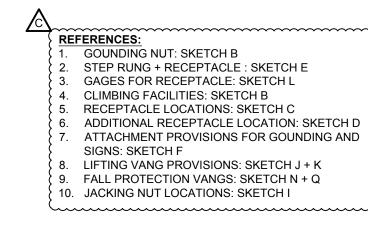


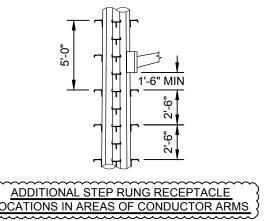


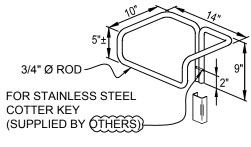


WELDING OR BRAZING.

STEP RUNG RECEPTACLE GAGES

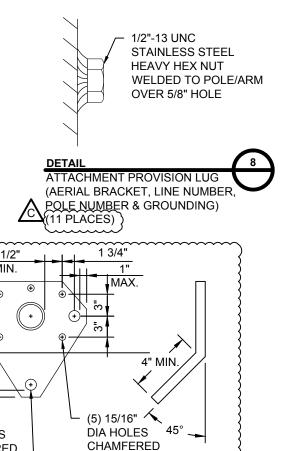






WELDING OR BRAZING.





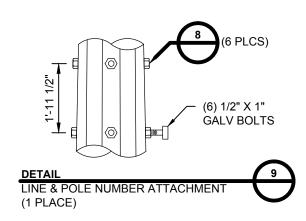
BOTH SIDES

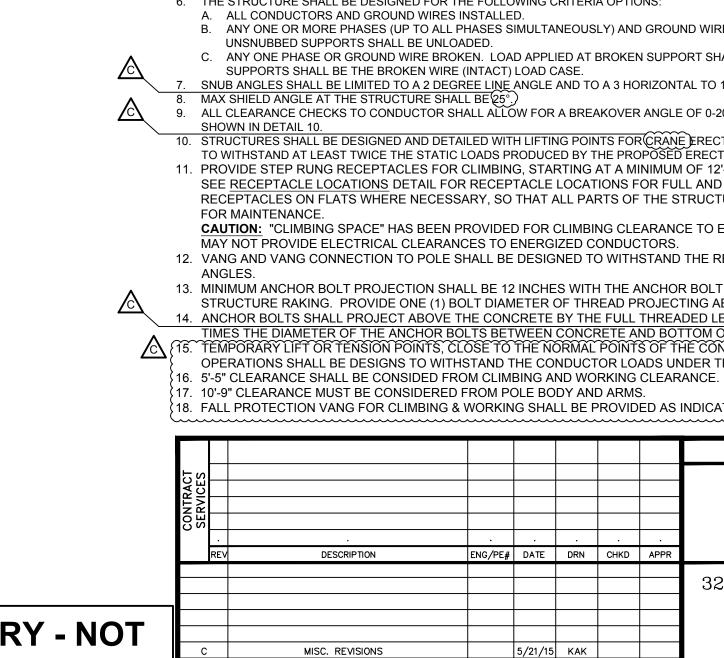
SUSPENSION/STRAIN PLATE

(4 PLACES)

RANCE ENVELOPI

(3 PLACES)





A

DWG REV

<u>/c\</u>

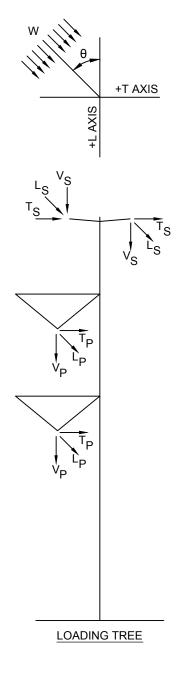
B 5.

PRELIMINARY - NOT FOR CONSTRUCTION

STRUCTURE NAME: 32-SCVSP-MTW-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 750 WEIGHT SPAN (FT): 1200 LINE ANGLE: 0 - 2 DEGREES

	LOADING C	ASE						DE	SIGN LOA	\DS			
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	К
1	NESC 250B	0.00	0.50	39.53	2.01	1.28	0.00	18.06	6.29	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.59	0.97	0.00	7.55	7.67	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.84	0.91	0.00	17.22	3.81	0.00	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	5.09	1.30	0.00	23.90	4.81	0.00	4.00	90.00	1.0
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.34	0.58	0.00	12.04	3.04	0.00	4.00	90.00	1.0
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.34	0.57	0.00	12.04	2.88	0.00	4.00	90.00	1.0
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.34	0.47	5.50	12.04	2.01	30.00	4.00	90.00	1.0
8	CONSTRUCTION	30.00	0.00	29.97	3.82	0.30	0.27	26.51	2.40	2.27	3.45	90.00	1.5
9	DEFLECTION	60.00	0.00	0.00	0.59	0.10	0.00	7.55	0.83	0.00	0.00	90.00	1.0
10	MAINTENANCE	60.00	0.00	0.00	2.98	0.21	0.00	16.89	1.66	0.00	0.00	90.00	2.0

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1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A MATERIAL STRENGTH FACTOR OF 1.0.

V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

7. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED

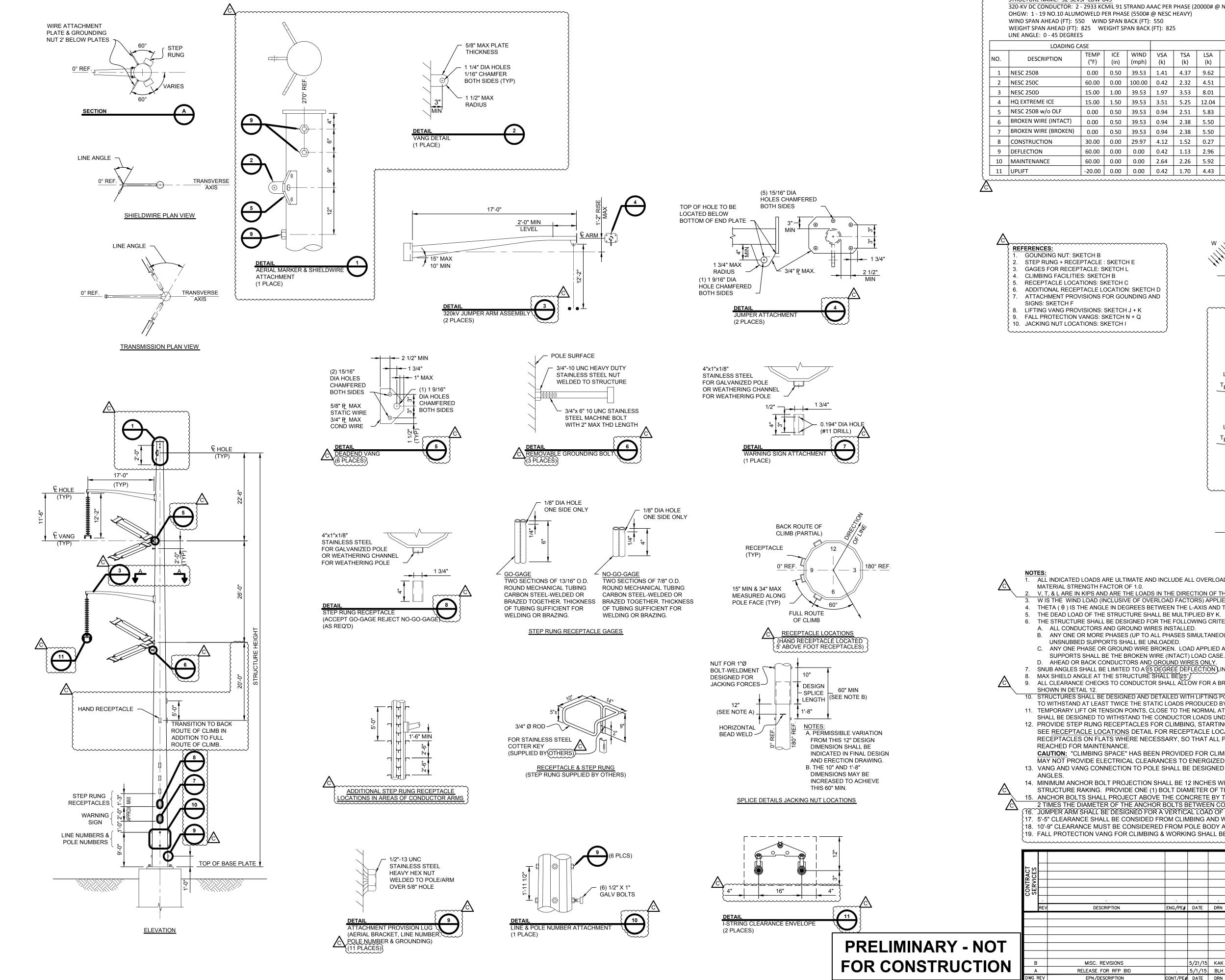
CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 12. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2

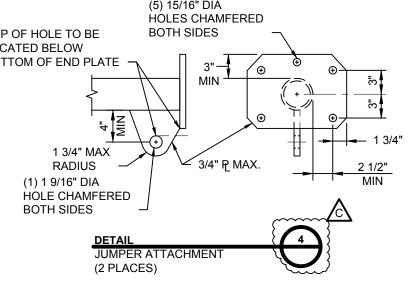
TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) OPERATIONS SHALL BE DESIGNS TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

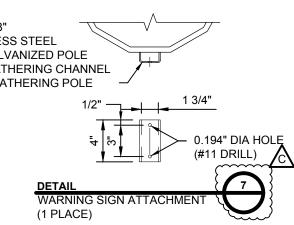
18. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + Q.

							С
							DRAWN
						T <u>HE</u> NORTHERN PASS	BLH
			•	•		Ι ζ	ENGINEER
DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR	V	CET
						320kV DC MEDIUM TANGENT 0-2°	CHECKED TAB
						32-SCVSP-MTW-002	APPROVED
						LOAD & DESIGN DRAWING	
MISC. REVISIONS		5/21/15	KAK				
MISC. REVISIONS		5/8/15	BLH				5/1/15
RELEASE FOR RFP BID		5/1/15	BLH				NG NO.
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS IMAGE: TSP-0	02-001



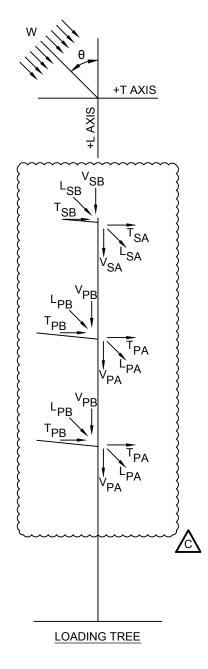
\sim	~~~~	STRUCTURE NAME: 32-SCV		M5	~~~~~	~~~~~	~~~~~	~~~~~					~~~~~	~~~~~	~~~~~	~~~~~	~~~~~	~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
		320-KV DC CONDUCTOR: 2			TRAND A	AAC PER	PHASE (2	.0000# @	NESC HE	AVY)										Ś
		OHGW: 1 - 19 NO.10 ALUM								,										}
		WIND SPAN AHEAD (FT): 55			• •		_													}
		WEIGHT SPAN AHEAD (FT): LINE ANGLE: 0 - 45 DEGREE		EIGHT SP	'AN BACK	(FT): 82)													Ś
		LOADING C	ASE									DE	SIGN LOA	DS						
	NO.	DESCRIPTION	TEMP	ICE	WIND	VSA	TSA	LSA	VSB	TSB	LSB	VPA	TPA	LPA	VPB	ТРВ	LPB	W	A	к
	NO.		(°F)	(in)	(mph)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(psf)	0	
	1	NESC 250B	0.00	0.50	39.53	1.41	4.37	9.62	1.41	4.37	-9.62	13.36	30.89	73.59	13.36	30.89	-73.59	10.00	90.00	1.50
	2	NESC 250C	60.00	0.00	100.00	0.42	2.32	4.51	0.42	2.32	-4.51	5.52	19.43	38.67	5.52	19.43	-38.67	29.00	90.00	1.00
	3	NESC 250D	15.00	1.00	39.53	1.97	3.53	8.01	1.97	3.53	-8.01	12.47	21.41	52.13	12.47	21.41	-52.13	4.00	90.00	1.00
	4	HQ EXTREME ICE	15.00	1.50	39.53	3.51	5.25	12.04	3.51	5.25	-12.04	16.96	27.33	66.65	16.96	27.33	-66.65	4.00	90.00	1.00
	5	NESC 250B w/o OLF	0.00	0.50	39.53	0.94	2.51	5.83	0.94	2.51	-5.83	8.91	18.16	44.60	8.91	18.16	-44.60	4.00	90.00	1.00
	6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	2.38	-5.50	8.91	16.40	40.00	8.91	16.40	-40.00	4.00	90.00	1.00
	7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.94	2.38	5.50	0.94	0.28	0.00	8.91	16.40	40.00	8.91	1.09	0.00	4.00	90.00	1.00
	8	CONSTRUCTION	30.00	0.00	29.97	4.12	1.52	0.27	1.98	2.08	-5.23	30.33	12.71	2.27	9.63	17.56	-44.25	3.45	90.00	1.50
	9	DEFLECTION	60.00	0.00	0.00	0.42	1.13	2.96	0.42	1.13	-2.96	5.52	9.08	23.72	5.52	9.08	-23.72	0.00	90.00	1.00
	10	MAINTENANCE	60.00	0.00	0.00	2.64	2.26	5.92	2.64	2.26	-5.92	12.84	18.16	47.44	12.84	18.16	-47.44	0.00	90.00	2.00
	11	UPLIFT	-20.00	0.00	0.00	0.42	1.70	4.43	0.42	1.70	-4.43	5.52	16.59	43.34	5.52	16.59	-43.34	0.00	90.00	1.00
<u>X</u>	~~~~		·····	~~~~~	·····									·····						~~~~
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	REI	ERENCES:
Ì	<u>1.</u>	GOUNDING NUT: SKETCH B
	2.	STEP RUNG + RECEPTACLE : SKETC
	3.	GAGES FOR RECEPTACLE: SKETCH
8	4.	CLIMBING FACILITIES: SKETCH B
Ì	5.	RECEPTACLE LOCATIONS: SKETCH
	6.	ADDITIONAL RECEPTACLE LOCATIO
	7.	ATTACHMENT PROVISIONS FOR GC
(> >	SIGNS: SKETCH F
Ì	8.	LIFTING VANG PROVISIONS: SKETC
	9.	FALL PROTECTION VANGS: SKETCH
0	10.	JACKING NUT LOCATIONS: SKETCH
(

CH E ΗL I C ON: SKETCH D OUNDING AND CH J + K HN+Q



ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1.0) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

6. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY.
7. SNUB ANGLES SHALL BE LIMITED TO A (15 DEGREE DEFLECTION) LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
8. MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE (25°)

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE.

SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

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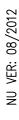
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

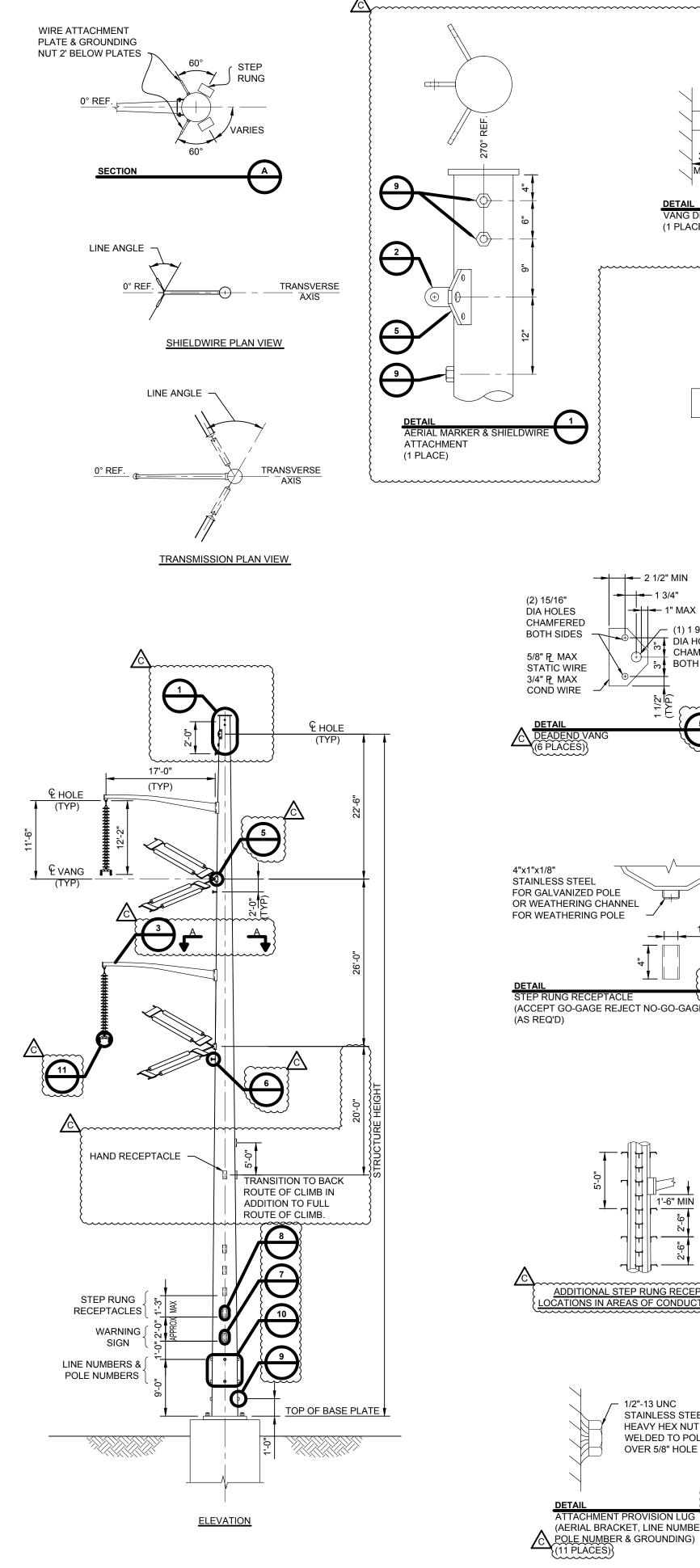
15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) JUMPER ARM SHALL BE DESIGNED FOR A VERTICAL LOAD OF 2,500 POUNDS.

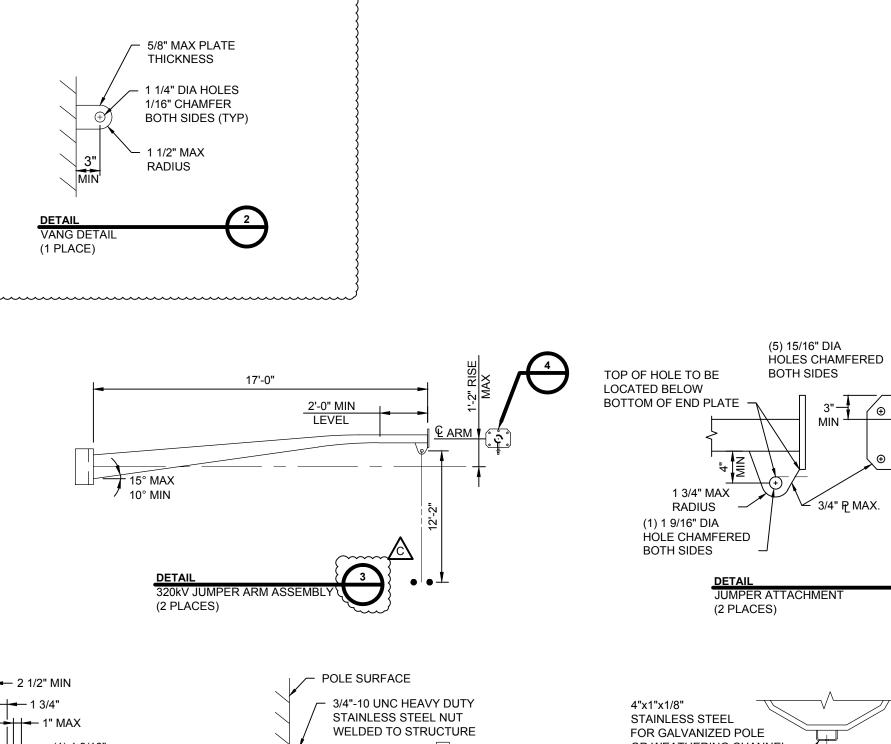
17. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE.

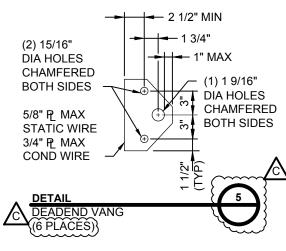
18. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS. 19. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + Q.

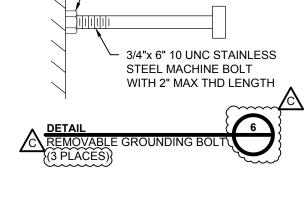
						C
						DRAWN
						THE NORTHERN PASS BLH
				•		ENGINEER
DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR	CET
						320kV DC LIGHT DEADEND 0-45° TAB
						32-SCVSP-LDW-045 APPROVED
						LOAD & DESIGN DRAWING
						DATE
MISC. REVISIONS		5/21/15	KAK			
LEASE FOR RFP BID		5/1/15	BLH	•		SCALE FILE: TSP-03.DWG DRAWING NO.
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS IMAGE: TSP-03-001
	, , ,					

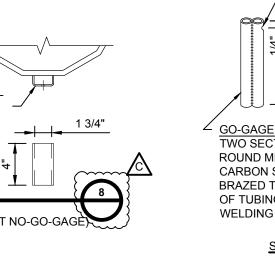


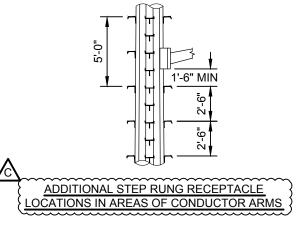


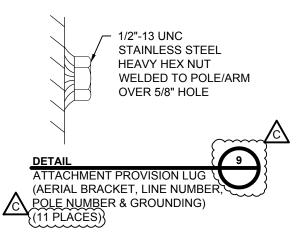




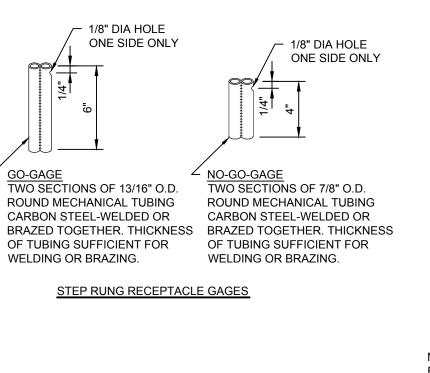


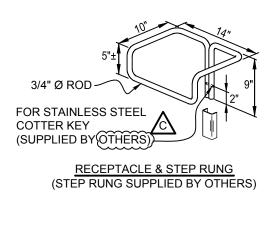


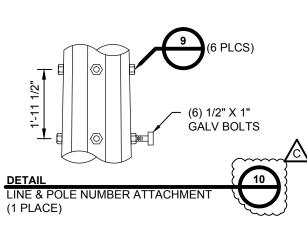


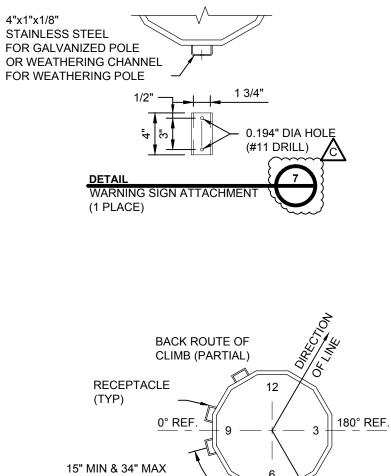


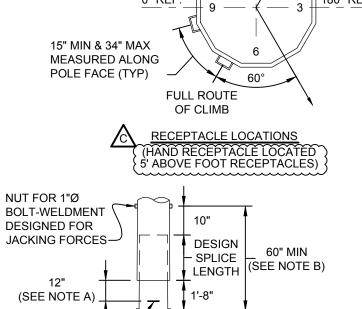
~~~~~	STRUCTURE NAME: 32-SCVSP-HDW-090																		
	320-KV DC CONDUCTOR: 2			STRAND A	AAC PER	PHASE (2	20000# a	NESC H	EAVY)										
	OHGW: 1 - 19 NO.10 ALUM					•	C		,										
	WIND SPAN AHEAD (FT): 55	50 WIN	D SPAN E	BACK (FT)	550														
	WEIGHT SPAN AHEAD (FT):		EIGHT SF	PAN BACK	(FT): 82	5													
	LINE ANGLE: 45 - 90 DEGRE	ES																	
	LOADING C	ASE									DE	SIGN LOA	DS						
NO.	DESCRIPTION	TEMP	ICE	WIND	VSA	TSA	LSA	VSB	TSB	LSB	VPA	TPA	LPA	VPB	ТРВ	LPB	W	θ	к
		(°F)	(in)	(mph)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(k)	(psf)	Ŭ	Ň
1	1 NESC 250B 0.00 0.50 39.53 1.41 7.50 8.89 1.41 7.50 -8.89 13.36 54.76 67.99 13.36 54.76 -67.99 10.00 90.00 1.50																		
2	NESC 250C	60.00	0.00	100.00	0.42	3.79	4.17	0.42	3.79	-4.17	5.52	31.98	35.73	5.52	31.98	-35.73	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	1.97	6.12	7.40	1.97	6.12	-7.40	12.47	38.32	48.17	12.47	38.32	-48.17	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	3.51	9.16	11.13	3.51	9.16	-11.13	16.96	48.95	61.57	16.96	48.95	-61.57	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.94	4.40	5.39	0.94	4.40	-5.39	8.91	32.63	41.21	8.91	32.63	-41.21	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.94	4.17	5.08	0.94	4.17	-5.08	8.91	29.38	36.96	8.91	29.38	-36.96	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.94	4.17	5.08	0.94	0.28	0.00	8.91	29.38	36.96	8.91	1.09	0.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	4.12	1.38	0.25	1.98	3.78	-4.83	30.33	11.55	2.10	9.63	31.91	-40.88	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.42	2.09	2.73	0.42	2.09	-2.73	5.52	16.77	21.92	5.52	16.77	-21.92	0.00	90.00	1.00
10	MAINTENANCE	60.00	0.00	0.00	2.64	4.18	5.47	2.64	4.18	-5.47	12.84	33.55	43.83	12.84	33.55	-43.83	0.00	90.00	2.00
11	UPLIFT	-20.00	0.00	0.00	0.42	3.13	4.09	0.42	3.13	-4.09	5.52	30.65	40.04	5.52	30.65	-40.04	0.00	90.00	1.00
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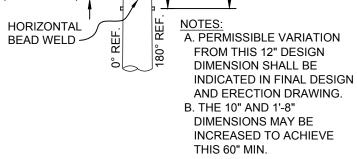




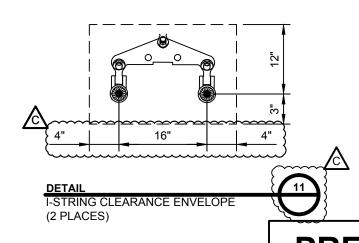


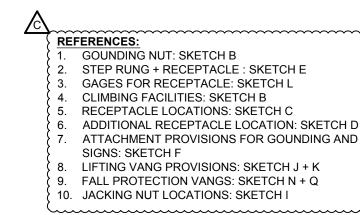


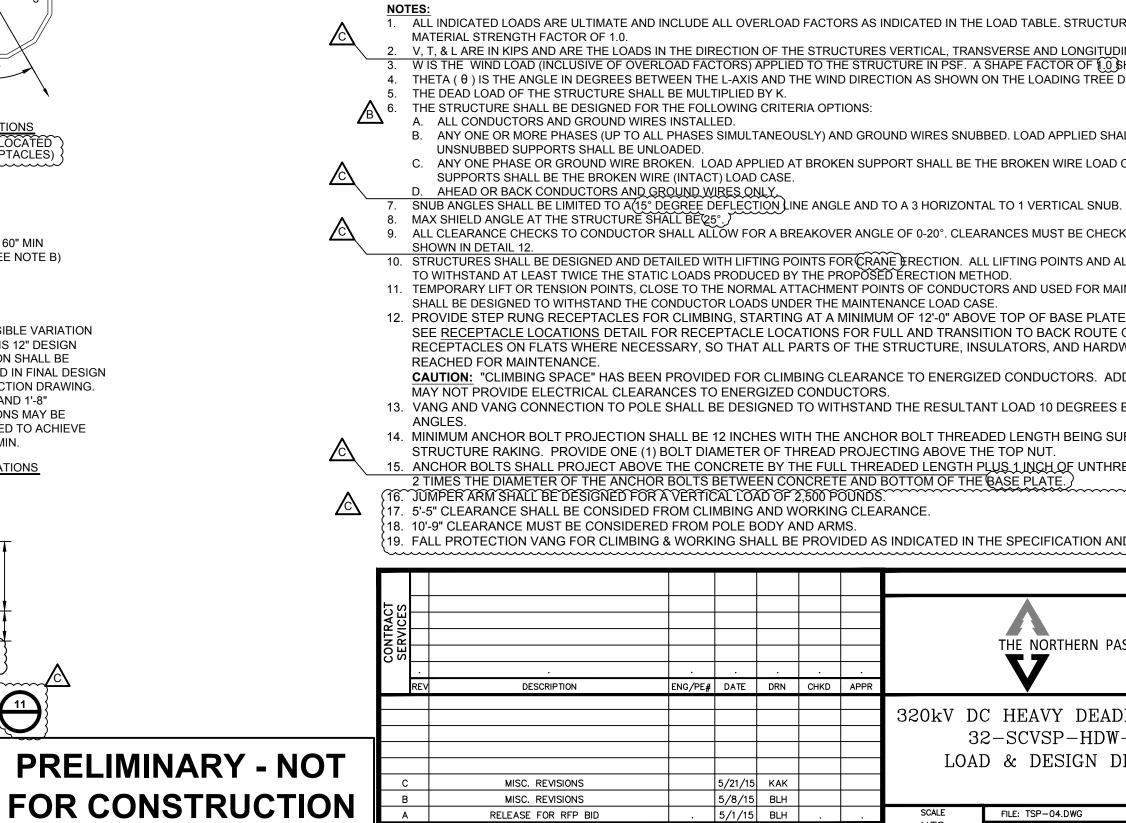




SPLICE DETAILS JACKING NUT LOCATIONS





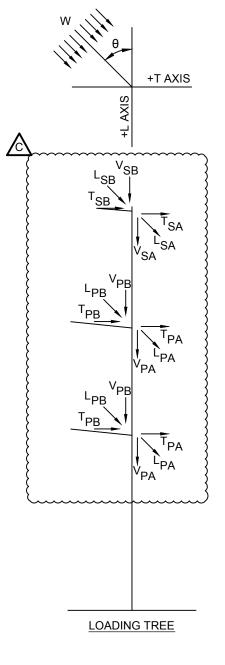


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DWG REV

RELEASE FOR RFP

EPN/DESCRIPTI



ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

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SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

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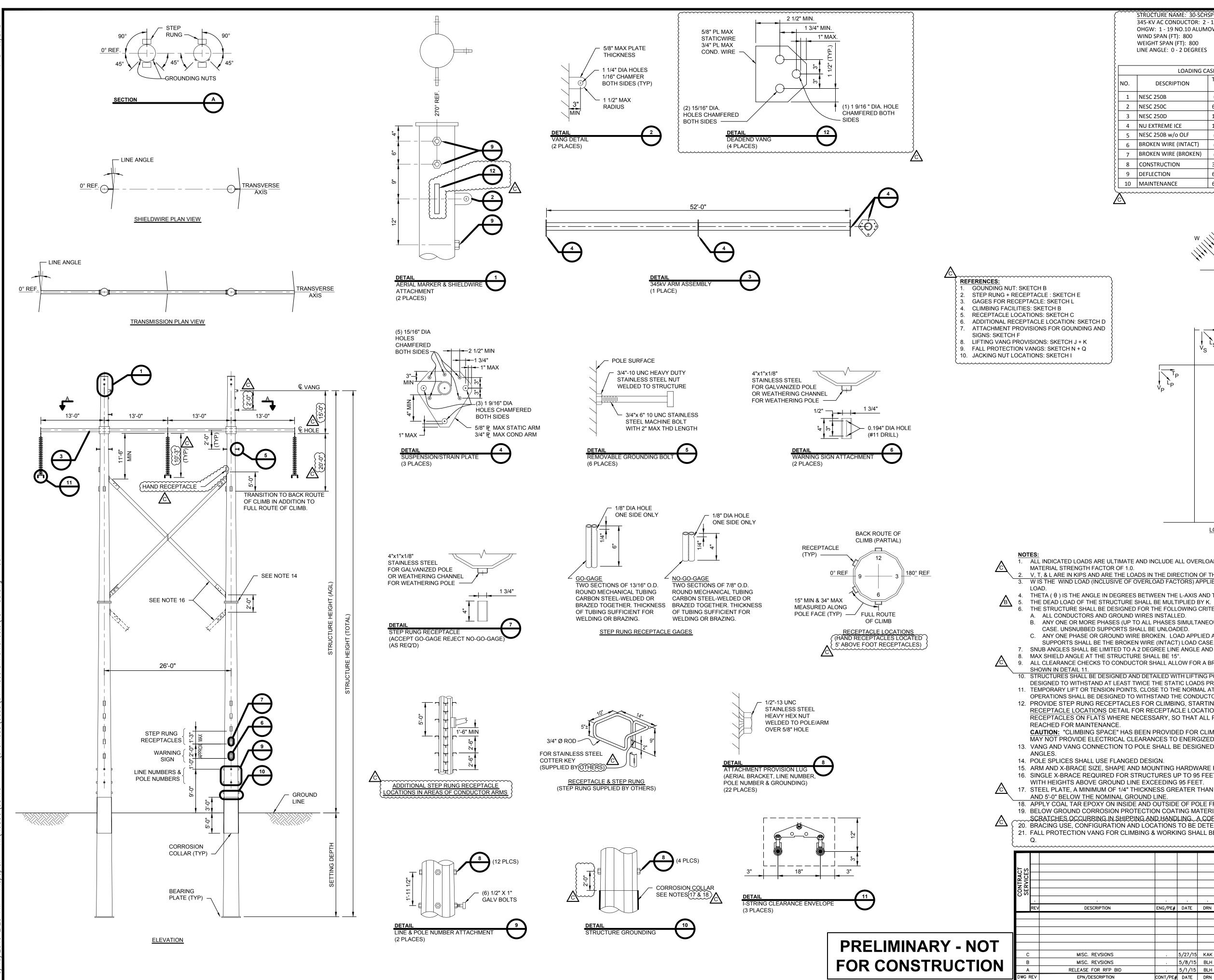
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						320kV D0	T/	٨B		
						32	APPR	OVED		
						LOAL	D & DESIGN DRAWI	NG		
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S		5/8/15	BLH							
BID		5/1/15	BLH			SCALE	ING NO.	0.1		
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S		5/8/15	BLH	•					5/1	/15
' BID		5/1/15	BLH			SCALE	FILE: TSP-05.DWG		ING NO.	0 .4
DN	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	05 - 0	01

SCRATCHES OCCURRING IN SHIPPING AND HANDLING, A COPY OF THE MSDS SHEET SHALL BE SUPPLIED WITH THE "TOUCH UP" MATERIALS. 20. BRACING USE, CONFIGURATION AND LOCATIONS TO BE DETERMINED BY MANUFACTURER. 21. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

19. BELOW GROUND CORROSION PROTECTION COATING MATERIAL SHALL BE SUPPLIED (ONE QUART PER TWO STRUCTURES) TO "TOUCH UP"

17. STEEL PLATE, A MINIMUM OF 1/4" THICKNESS GREATER THAN THAT REQUIRED FOR COLUMN STRENGTH SHALL BE IN PLACE IN THE AREA 3'-0" ABOVE

18. APPLY COAL TAR EPOXY ON INSIDE AND OUTSIDE OF POLE FROM BUTT OF POLE TO (12") ABOVE TOP OF CORROSION COLLAR.

WITH HEIGHTS ABOVE GROUND LINE EXCEEDING 95 FEET.

15. ARM AND X-BRACE SIZE, SHAPE AND MOUNTING HARDWARE REQUIRED SHALL BE DETERMINED AND FURNISHED BY POLE SUPPLIER. 16. SINGLE X-BRACE REQUIRED FOR STRUCTURES UP TO 95 FEET IN HEIGHT ABOVE GROUND LINE. TWO X-BRACES SHALL BE USED FOR STRUCTURES

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB

CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

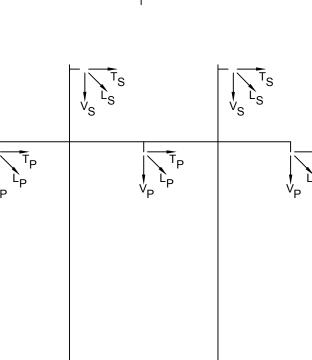
THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

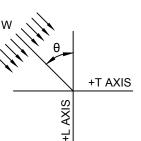
4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

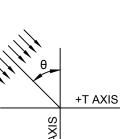
2. V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

LOADING TREE







STRUCTURE NAME: 30-SCHSP-LTW-002

LINE ANGLE: 0 - 2 DEGREES LOADING CASE DESIGN LOADS TEMP ICE WIND VS LS DESCRIPTION INO. (°F) | (in) | (mph) (k) (k) (k) (k) (k) 0.00 0.50 39.53 1.37 1.34 0.00 8.49 4.78 0.00 10.00 90.00 1.50 1 NESC 250B 60.00 0.00 100.00 0.41 1.03 0.00 3.31 5.94 0.00 29.00 90.00 1.00 2 NESC 250C 15.00 1.00 39.53 1.91 0.95 0.00 8.65 2.97 0.00 4.00 90.00 1.00 3 NESC 250D 15.00 1.25 39.53 2.60 1.15 0.00 10.51 3.43 0.00 4.00 90.00 1.00 4 NU EXTREME ICE 0.00 0.50 39.53 0.91 0.61 0.00 5.66 2.21 0.00 4.00 90.00 1.00 5 NESC 250B w/o OLF 0.00 0.50 39.53 0.91 0.59 0.00 5.66 2.13 0.00 4.00 90.00 1.00 6 BROKEN WIRE (INTACT) 7 BROKEN WIRE (BROKEN) 0.00 0.50 39.53 0.91 0.50 5.50 5.66 1.57 13.68 4.00 90.00 1.00 30.00 0.00 29.97 3.55 0.30 0.27 13.60 1.52 1.21 3.45 90.00 1.50 8 CONSTRUCTION

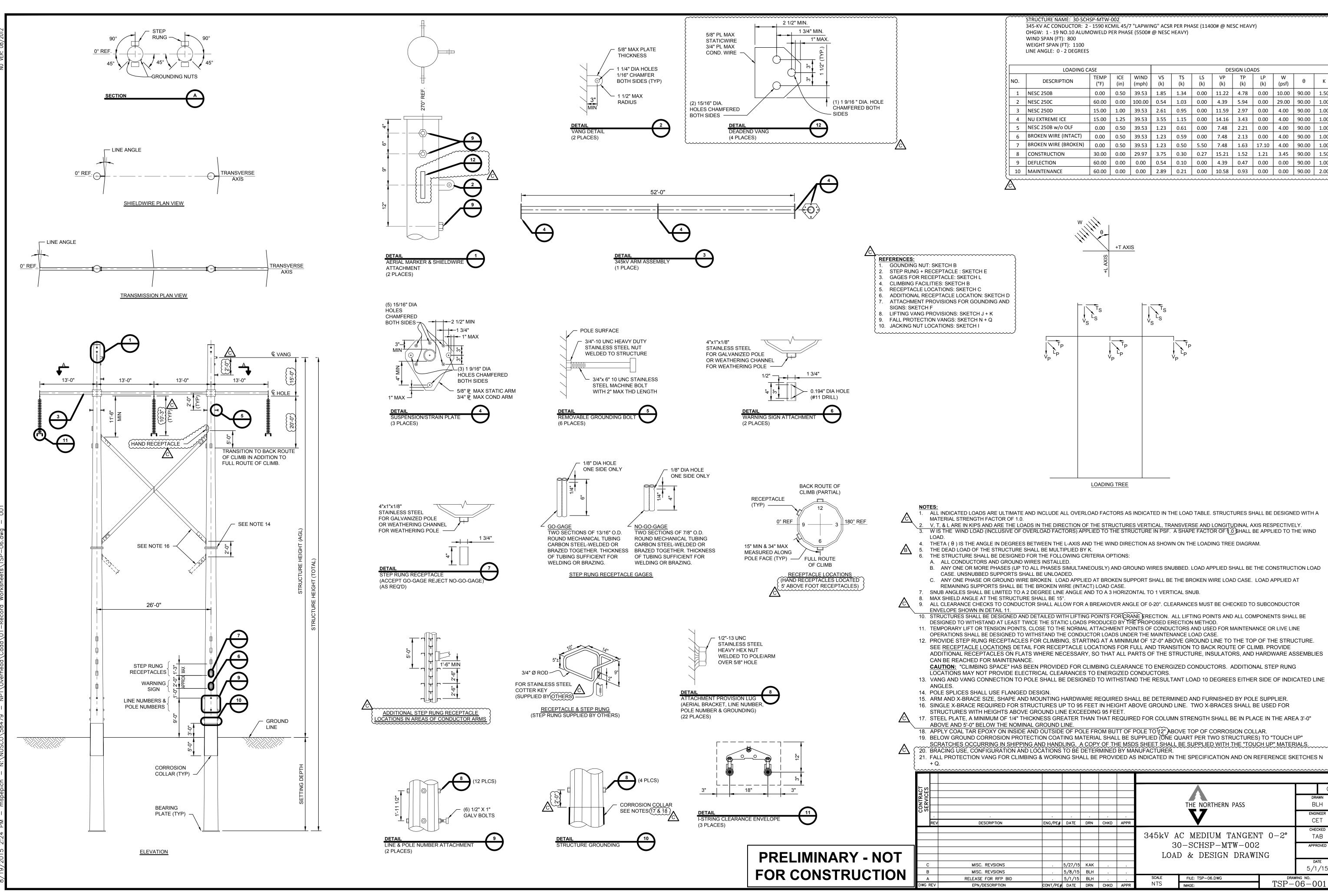
60.00 0.00 0.00 0.41 0.10 0.00 3.31 0.47 0.00 0.00 90.00 1.00

60.00 0.00 0.00 2.62 0.21 0.00 8.43 0.93 0.00 0.00 90.00 2.00

345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 800

WEIGHT SPAN (FT): 800

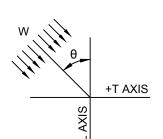
9 DEFLECTION 10 MAINTENANCE

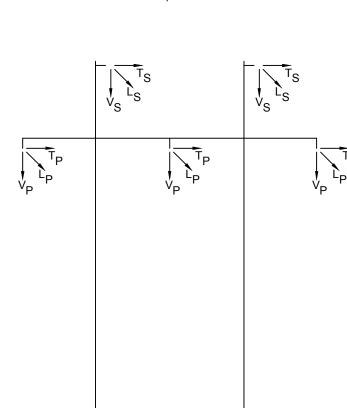


~~~~	STRUCTURE NAME: 30-SCHSP-MTW-002 345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 800 WEIGHT SPAN (FT): 1100 LINE ANGLE: 0 - 2 DEGREES														
	LOADING CASE DESIGN LOADS														
NO.	TEMP ICE WIND VS TS LS VP TP LP W														
1	NESC 250B	0.00	0.50	39.53	1.85	1.34	0.00	11.22	4.78	0.00	10.00	90.00	1.50		
2	NESC 250C	60.00	0.00	100.00	0.54	1.03	0.00	4.39	5.94	0.00	29.00	90.00	1.00		
3	NESC 250D	15.00	1.00	39.53	2.61	0.95	0.00	11.59	2.97	0.00	4.00	90.00	1.00		
4	NU EXTREME ICE	15.00	1.25	39.53	3.55	1.15	0.00	14.16	3.43	0.00	4.00	90.00	1.00		
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.23	0.61	0.00	7.48	2.21	0.00	4.00	90.00	1.00		
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.23	0.59	0.00	7.48	2.13	0.00	4.00	90.00	1.00		
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.23	0.50	5.50	7.48	1.63	17.10	4.00	90.00	1.00		
8	CONSTRUCTION	30.00	0.00	29.97	3.75	0.30	0.27	15.21	1.52	1.21	3.45	90.00	1.50		
9	DEFLECTION	60.00	0.00	0.00	0.54	0.10	0.00	4.39	0.47	0.00	0.00	90.00	1.00		

60.00 0.00 0.00 2.89 0.21 0.00 10.58 0.93 0.00 0.00 90.00 2.00

10 MAINTENANCE





LOADING TREE

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A 2. V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1.0) SHALL BE APPLIED TO THE WIND

THE NORTHERN PASS

345kV AC MEDIUM TANGENT 0-2°

30-SCHSP-MTW-002

LOAD & DESIGN DRAWING

FILE: TSP-06.DWG

IMAGE:

77

SCALE

NTS

BLH

ENGINEER

CET

TAB

APPROVED

5/1/15

DRAWING NO. TSP-06-001

4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

ENG/PE# DATE DRN CHKD APPR

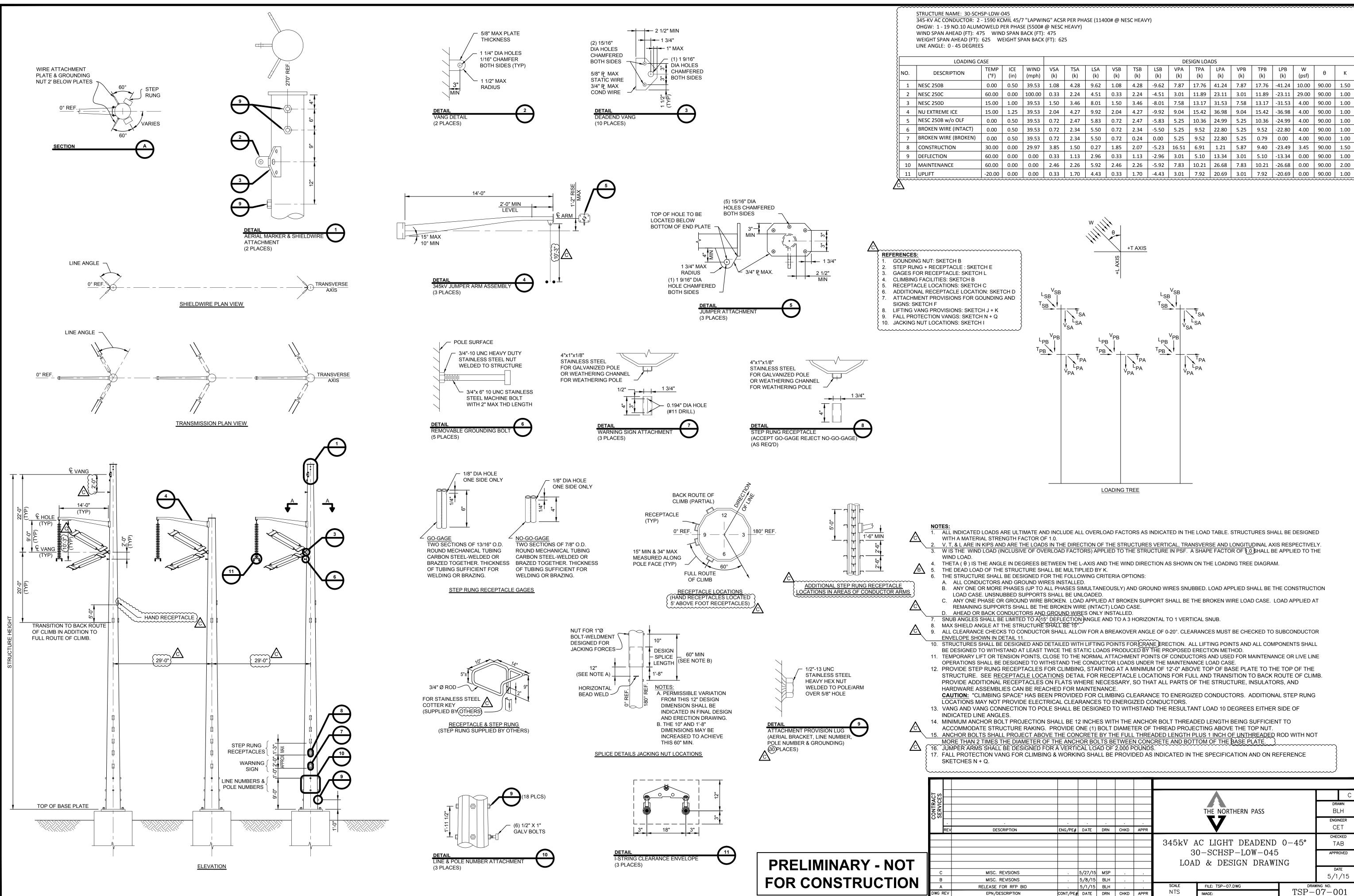
5/27/15 KAK

5/8/15 BLH

5/1/15 BLH

CONT/PE# DATE DRN CHKD APPR

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD



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	ENG/PE#	DATE	DRN	CHKD	APPR			CE	T	
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S		5/27/15	MSP					DA [:]		
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DN	CONT/PE#	DATE	DRN	CHKD	APPR	PPR NTS IMAGE: TSI				01

16. JUMPER ARMS SHALL BE DESIGNED FOR A VERTICAL LOAD OF 2,000 POUNDS. 17. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE

14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF

PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED FOR MAINTENANCE **CAUTION:** "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG

OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB.

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE RECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR

DESIGN LOADS

(k)

(k)

(k)

(k)

LSA VSB TSB LSB VPA TPA LPA VPB TPB LPB

(k)

VSA

(k)

WIND

(mph)

TSA

(k)

(k)

(k)

(k)

+T AXIS

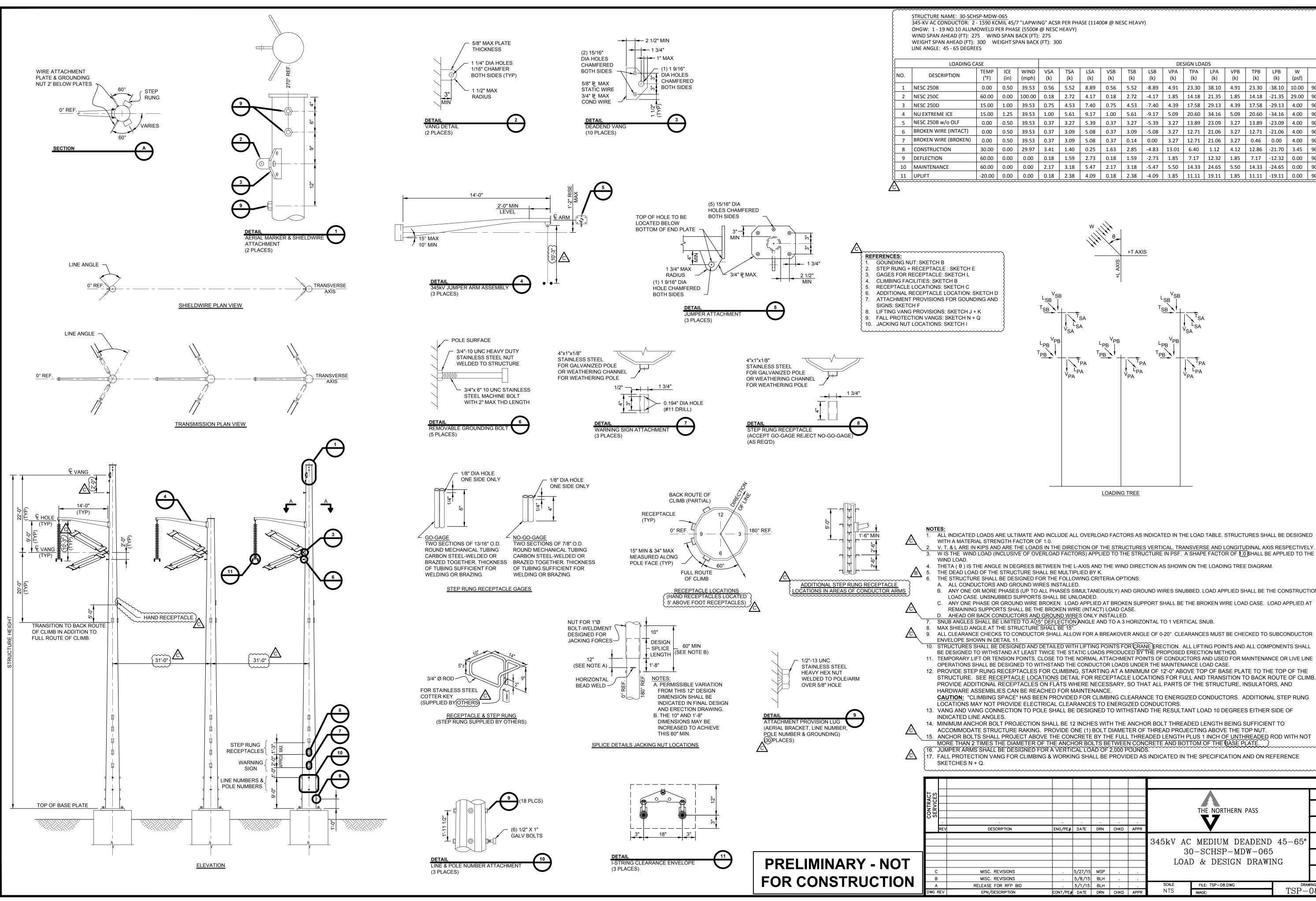
(k)

SNUB ANGLES SHALL BE LIMITED TO A (15° DEFLECTION) ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

LOADING TREE

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY INSTALLED.



ESIGNED FOR DR CLIMBING							HE SPECIFICATION AND ON RE	FERENCE	}
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							drawn BLH		
	ENG/PE#	DATE	DRN	CHKD	APPR				CET
						345kV AC	45–65°	CHECKED TAB	
						30	D-SCHSP-MDW-065	<b>)</b>	APPROVED
						LOAI	D & DESIGN DRAWI	NG	
S	<u> </u>	5/27/15	MSP						
S	· .	5/8/15	BLH						5/1/15
BID		5/1/15	BLH			SCALE	FILE: TSP-08.DWG		ING NO.
N	CONT/PE#	DATE	DRN	СНКД	APPR	NTS	IMAGE:	TSP-	08-001

13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF 14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED FOR MAINTENANCE.

STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB.

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9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY INSTALLED. 7. SNUB ANGLES SHALL BE LIMITED TO A (15° DEFLECTION) ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB. 8. MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE 15°.

REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS: B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION

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V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (.0) SHALL BE APPLIED TO THE

LOADING TREE

L_{PA}

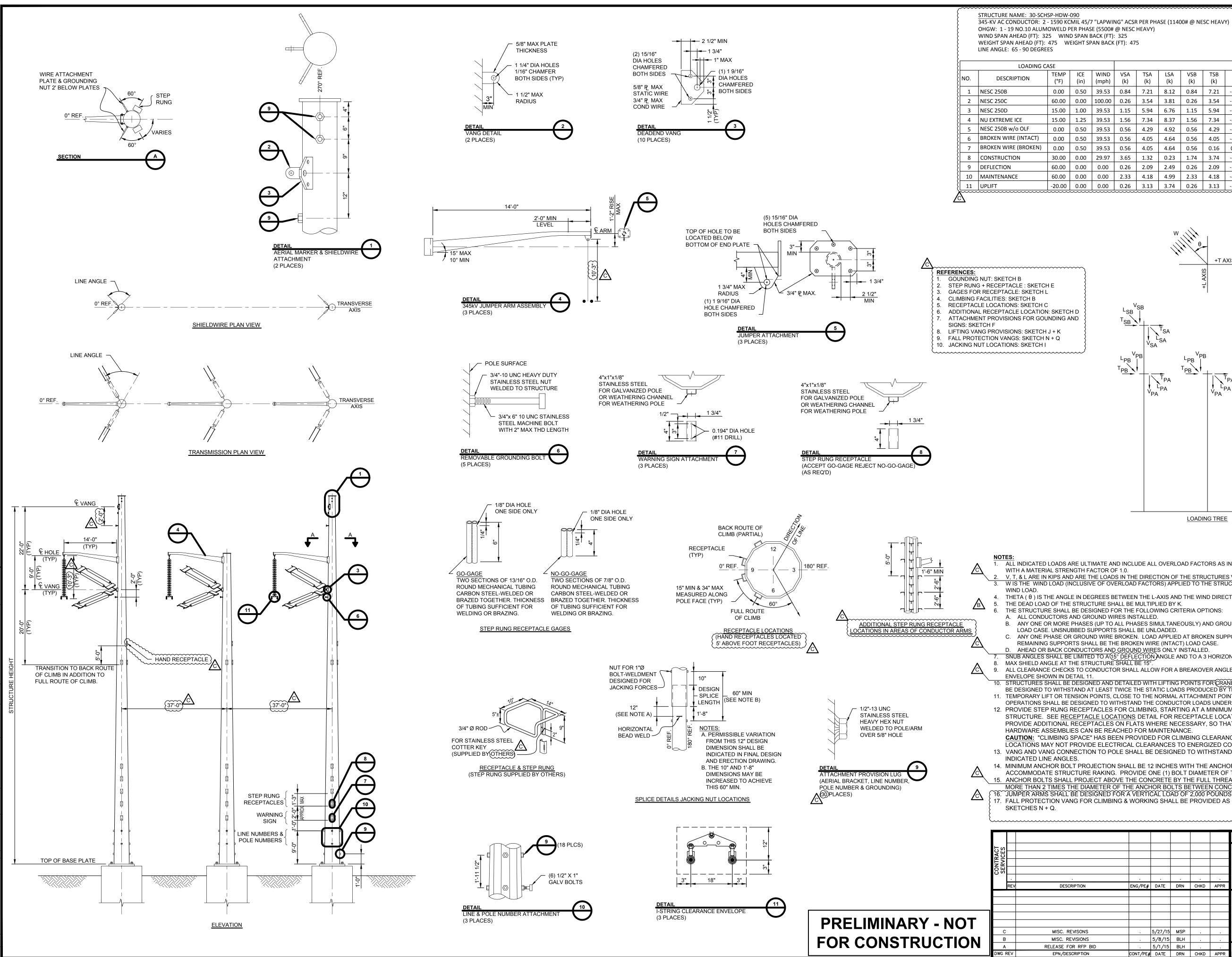
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+T AXIS

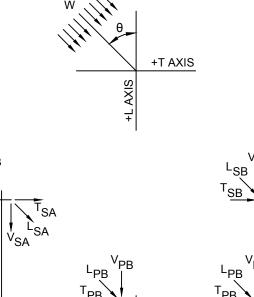
								DE	SIGN LOA	\DS						
E I)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	К
0	39.53	0.56	5.52	8.89	0.56	5.52	-8.89	4.91	23.30	38.10	4.91	23.30	-38.10	10.00	90.00	1.50
0	100.00	0.18	2.72	4.17	0.18	2.72	-4.17	1.85	14.18	21.35	1.85	14.18	-21.35	29.00	90.00	1.00
0	39.53	0.75	4.53	7.40	0.75	4.53	-7.40	4.39	17.58	29.13	4.39	17.58	-29.13	4.00	90.00	1.00
5	39.53	1.00	5.61	9.17	1.00	5.61	-9.17	5.09	20.60	34.16	5.09	20.60	-34.16	4.00	90.00	1.00
0	39.53	0.37	3.27	5.39	0.37	3.27	-5.39	3.27	13.89	23.09	3.27	13.89	-23.09	4.00	90.00	1.00
0	39.53	0.37	3.09	5.08	0.37	3.09	-5.08	3.27	12.71	21.06	3.27	12.71	-21.06	4.00	90.00	1.00
0	39.53	0.37	3.09	5.08	0.37	0.14	0.00	3.27	12.71	21.06	3.27	0.46	0.00	4.00	90.00	1.00
0	29.97	3.41	1.40	0.25	1.63	2.85	-4.83	13.01	6.40	1.12	4.12	12.86	-21.70	3.45	90.00	1.50
0	0.00	0.18	1.59	2.73	0.18	1.59	-2.73	1.85	7.17	12.32	1.85	7.17	-12.32	0.00	90.00	1.00
0	0.00	2.17	3.18	5.47	2.17	3.18	-5.47	5.50	14.33	24.65	5.50	14.33	-24.65	0.00	90.00	2.00
0	0.00	0.18	2.38	4.09	0.18	2.38	-4.09	1.85	11.11	19.11	1.85	11.11	-19.11	0.00	90.00	1.00
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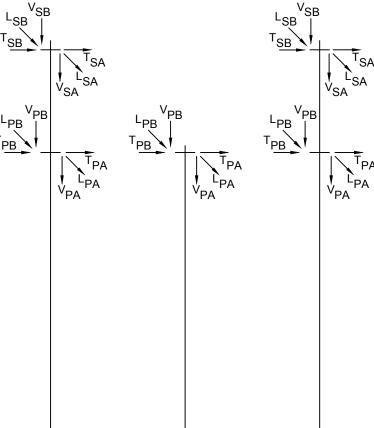
345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY)

TPB



															'
	DESIGN LOADS														
WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
39.53	0.84	7.21	8.12	0.84	7.21	-8.12	6.50	30.52	34.78	6.50	30.52	-34.78	10.00	90.00	1.50
100.00	0.26	3.54	3.81	0.26	3.54	-3.81	2.48	18.43	19.49	2.48	18.43	-19.49	29.00	90.00	1.00
39.53	1.15	5.94	6.76	1.15	5.94	-6.76	6.11	23.05	26.59	6.11	23.05	-26.59	4.00	90.00	1.00
39.53	1.56	7.34	8.37	1.56	7.34	-8.37	7.22	27.01	31.19	7.22	27.01	-31.19	4.00	90.00	1.00
39.53	0.56	4.29	4.92	0.56	4.29	-4.92	4.33	18.21	21.08	4.33	18.21	-21.08	4.00	90.00	1.00
39.53	0.56	4.05	4.64	0.56	4.05	-4.64	4.33	16.66	19.23	4.33	16.66	-19.23	4.00	90.00	1.00
39.53	0.56	4.05	4.64	0.56	0.16	0.00	4.33	16.66	19.23	4.33	0.54	0.00	4.00	90.00	1.00
29.97	3.65	1.32	0.23	1.74	3.74	-4.41	14.89	6.03	1.02	5.06	16.89	-19.81	3.45	90.00	1.50
0.00	0.26	2.09	2.49	0.26	2.09	-2.49	2.48	9.43	11.25	2.48	9.43	-11.25	0.00	90.00	1.00
0.00	2.33	4.18	4.99	2.33	4.18	-4.99	6.75	18.86	22.50	6.75	18.86	-22.50	0.00	90.00	2.00
0.00	0.26	3.13	3.74	0.26	3.13	-3.74	2.48	14.63	17.45	2.48	14.63	-17.45	0.00	90.00	1.00
	(mph) 39.53 100.00 39.53 39.53 39.53 39.53 39.53 29.97 0.00 0.00	(mph)(k)39.530.84100.000.2639.531.1539.531.5639.530.5639.530.5639.530.5629.973.650.000.260.002.330.000.26	(mph)(k)(k)39.530.847.21100.000.263.5439.531.155.9439.531.567.3439.530.564.2939.530.564.0539.530.564.0539.530.561.3229.973.651.320.000.262.090.002.334.180.000.263.13	(mph)(k)(k)(k)39.530.847.218.12100.000.263.543.8139.531.155.946.7639.531.567.348.3739.530.564.294.9239.530.564.054.6439.530.564.054.6439.530.561.320.230.000.262.092.490.002.334.184.990.000.263.133.74	(mph)(k)(k)(k)(k)39.530.847.218.120.84100.000.263.543.810.2639.531.155.946.761.1539.531.567.348.371.5639.530.564.294.920.5639.530.564.054.640.5639.530.564.054.640.5639.530.564.054.640.5639.530.564.054.640.5639.530.561.320.231.740.000.262.092.490.260.002.334.184.992.330.000.263.133.740.26	(mph)(k)(k)(k)(k)(k)39.530.847.218.120.847.21100.000.263.543.810.263.5439.531.155.946.761.155.9439.531.567.348.371.567.3439.530.564.294.920.564.2939.530.564.054.640.560.1629.973.651.320.231.743.740.000.262.092.490.262.090.002.334.184.992.334.180.000.263.133.740.263.13	(mph)(k)(k)(k)(k)(k)(k)39.530.847.218.120.847.21-8.12100.000.263.543.810.263.54-3.8139.531.155.946.761.155.94-6.7639.531.567.348.371.567.34-8.3739.530.564.294.920.564.29-4.9239.530.564.054.640.560.160.0029.973.651.320.231.743.74-4.410.000.262.092.490.262.09-2.490.002.334.184.992.334.18-4.990.000.263.133.740.263.13-3.74	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)39.530.847.218.120.847.21-8.126.50100.000.263.543.810.263.54-3.812.4839.531.155.946.761.155.94-6.766.1139.531.567.348.371.567.34-8.377.2239.530.564.294.920.564.29-4.924.3339.530.564.054.640.560.160.004.3339.530.564.054.640.560.160.004.3329.973.651.320.231.743.74-4.4114.890.000.262.092.490.262.09-2.492.480.000.263.133.740.263.13-3.742.48	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)39.530.847.218.120.847.21-8.126.5030.52100.000.263.543.810.263.54-3.812.4818.4339.531.155.946.761.155.94-6.766.1123.0539.531.567.348.371.567.34-8.377.2227.0139.530.564.294.920.564.29-4.924.3318.2139.530.564.054.640.560.160.004.3316.6639.530.564.054.640.560.160.004.3316.6639.530.564.054.640.560.160.004.3316.6639.530.564.054.640.560.160.004.3316.6639.530.564.054.640.560.160.004.3316.6639.530.564.054.640.560.160.004.3316.6639.530.564.052.092.492.489.430.000.262.092.490.262.09-2.492.489.430.000.263.133.740.263.13-3.742.4814.63	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)39.530.847.218.120.847.21-8.126.5030.5234.78100.000.263.543.810.263.54-3.812.4818.4319.4939.531.155.946.761.155.94-6.766.1123.0526.5939.531.567.348.371.567.34-8.377.2227.0131.1939.530.564.294.920.564.29-4.924.3318.2121.0839.530.564.054.640.560.160.004.3316.6619.2339.530.564.054.640.560.160.004.3316.6619.2339.530.564.054.640.560.160.004.3316.6619.2339.530.564.054.640.560.160.004.3316.6619.2339.530.564.051.743.74-4.4114.896.031.020.000.262.092.490.262.09-2.492.489.4311.250.000.263.133.740.263.13-3.742.4814.6317.45	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)VPB (k)39.530.847.218.120.847.21-8.126.5030.5234.786.50100.000.263.543.810.263.54-3.812.4818.4319.492.4839.531.155.946.761.155.94-6.766.1123.0526.596.1139.531.567.348.371.567.34-8.377.2227.0131.197.2239.530.564.294.920.564.29-4.924.3318.2121.084.3339.530.564.054.640.560.160.004.3316.6619.234.3339.530.564.054.640.560.160.004.3316.6619.234.3339.530.564.054.640.560.160.004.3316.6619.234.3339.530.564.052.092.492.489.4311.025.060.000.262.092.490.262.09-2.492.489.4311.252.480.000.263.133.740.263.13-3.742.4814.6317.452.48	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)VPB (k)TPB (k)39.530.847.218.120.847.21-8.126.5030.5234.786.5030.52100.000.263.543.810.263.54-3.812.4818.4319.492.4818.4339.531.155.946.761.155.94-6.766.1123.0526.596.1123.0539.531.567.348.371.567.34-8.377.2227.0131.197.2227.0139.530.564.294.920.564.29-4.924.3318.2121.084.3318.2139.530.564.054.640.560.160.004.3316.6619.234.3316.6639.530.564.054.640.560.160.004.3316.6619.234.3316.6639.530.564.054.640.560.160.004.3316.6619.234.3316.6639.530.564.054.640.560.160.004.3316.6619.234.3316.6639.530.564.054.640.560.160.004.3316.6619.234.3316.6639.530.564.051.743.74-4.4114	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)VPB (k)TPB (k)LPB (k)39.530.847.218.120.847.21-8.126.5030.5234.786.5030.52-34.78100.000.263.543.810.263.54-3.812.4818.4319.492.4818.43-19.4939.531.155.946.761.155.94-6.766.1123.0526.596.1123.05-26.5939.531.567.348.371.567.34-8.377.2227.0131.197.2227.01-31.1939.530.564.294.920.564.29-4.924.3318.2121.084.3318.21-21.0839.530.564.054.640.564.05-4.644.3316.6619.234.3316.66-19.2339.530.564.054.640.560.160.004.3316.6619.234.330.540.0029.973.651.320.231.743.74-4.4114.896.031.025.0616.89-19.230.000.262.092.490.262.09-2.492.489.4311.252.489.43-11.250.000.263.133.740.263.13-3.742.48 <td>WIND (mph)         VSA (k)         TSA (k)         LSA (k)         VSB (k)         TSB (k)         LSB (k)         VPA (k)         TPA (k)         LPA (k)         LPA (k)         VPB (k)         TPB (k)         LPB (k)         W(psf) (psf)           39.53         0.84         7.21         8.12         0.84         7.21         -8.12         6.50         30.52         34.78         6.50         30.52         -34.78         10.00           100.00         0.26         3.54         3.81         0.26         3.54         -3.81         2.48         18.43         19.49         2.48         18.43         -19.49         29.00           39.53         1.15         5.94         6.76         1.15         5.94         -6.76         6.11         23.05         26.59         6.11         23.05         -26.59         4.00           39.53         1.56         7.34         8.37         1.56         7.34         -8.37         7.22         27.01         31.19         7.22         27.01         -31.19         4.00           39.53         0.56         4.29         4.29         -4.92         4.33         18.66         19.23         4.33         16.66         -19.23         4.00</td> <td>WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)VPB (k)TPB (k)LPB (k)W (psf)θ39.530.847.218.120.847.21-8.126.5030.5234.786.5030.52-34.7810.0090.00100.000.263.543.810.263.54-3.812.4818.4319.492.4818.43-19.4929.0090.0039.531.155.946.761.155.94-6.766.1123.0526.596.1123.05-26.594.0090.0039.531.567.348.371.567.34-8.377.2227.0131.197.2227.01-31.194.0090.0039.530.564.294.920.564.29-4.924.3318.2121.084.3318.21-21.084.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.05</td>	WIND (mph)         VSA (k)         TSA (k)         LSA (k)         VSB (k)         TSB (k)         LSB (k)         VPA (k)         TPA (k)         LPA (k)         LPA (k)         VPB (k)         TPB (k)         LPB (k)         W(psf) (psf)           39.53         0.84         7.21         8.12         0.84         7.21         -8.12         6.50         30.52         34.78         6.50         30.52         -34.78         10.00           100.00         0.26         3.54         3.81         0.26         3.54         -3.81         2.48         18.43         19.49         2.48         18.43         -19.49         29.00           39.53         1.15         5.94         6.76         1.15         5.94         -6.76         6.11         23.05         26.59         6.11         23.05         -26.59         4.00           39.53         1.56         7.34         8.37         1.56         7.34         -8.37         7.22         27.01         31.19         7.22         27.01         -31.19         4.00           39.53         0.56         4.29         4.29         -4.92         4.33         18.66         19.23         4.33         16.66         -19.23         4.00	WIND (mph)VSA (k)TSA (k)LSA (k)VSB (k)TSB (k)LSB (k)VPA (k)TPA (k)LPA (k)VPB (k)TPB (k)LPB (k)W (psf)θ39.530.847.218.120.847.21-8.126.5030.5234.786.5030.52-34.7810.0090.00100.000.263.543.810.263.54-3.812.4818.4319.492.4818.43-19.4929.0090.0039.531.155.946.761.155.94-6.766.1123.0526.596.1123.05-26.594.0090.0039.531.567.348.371.567.34-8.377.2227.0131.197.2227.01-31.194.0090.0039.530.564.294.920.564.29-4.924.3318.2121.084.3318.21-21.084.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.054.640.560.160.004.3316.6619.234.3316.66-19.234.0090.0039.530.564.05





LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED

V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1.0) SHALL BE APPLIED TO THE

4. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION

LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT

REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY INSTALLED. SNUB ANGLES SHALL BE LIMITED TO A (15° DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR

0. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND

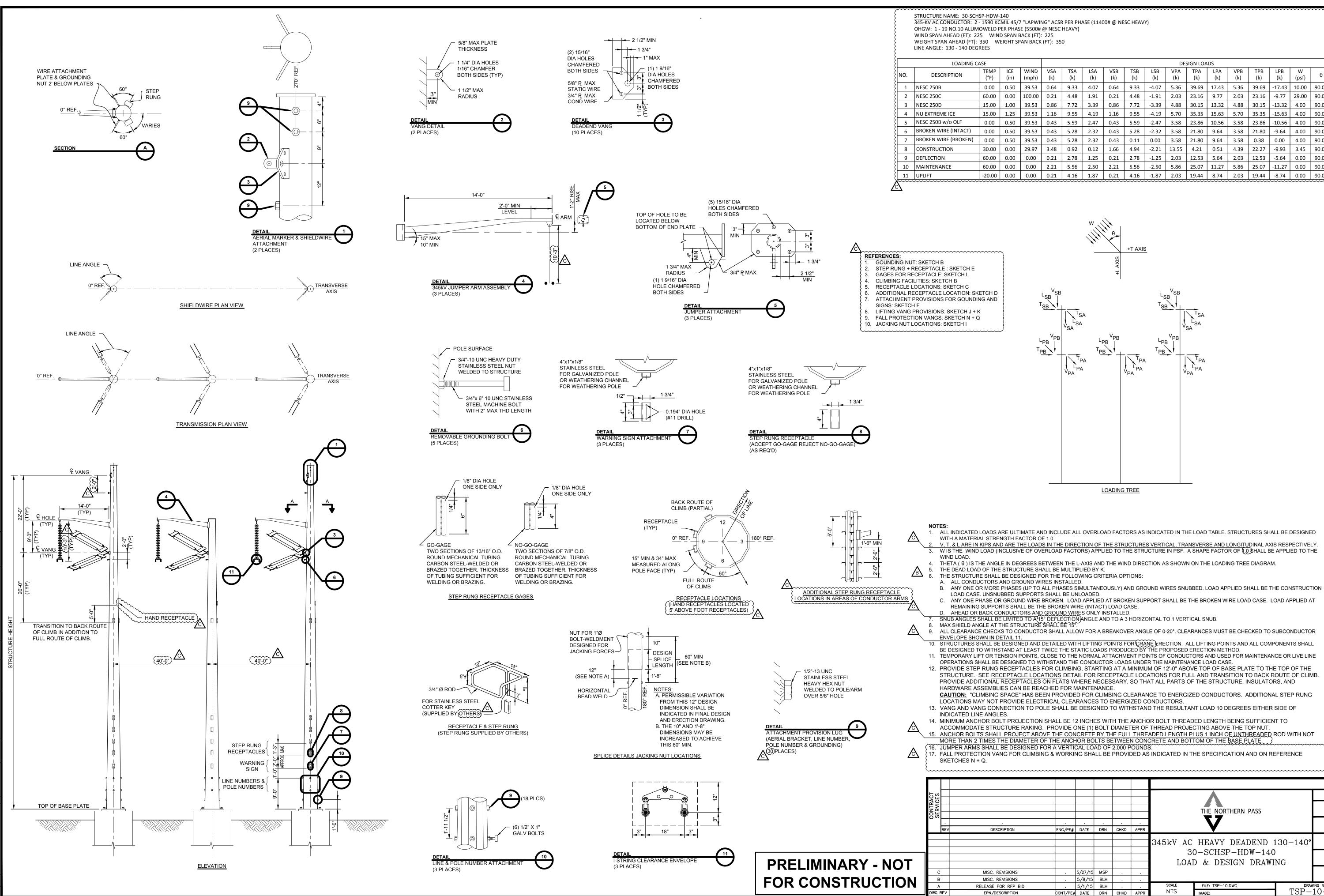
CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF

14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT

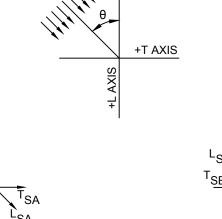
MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 17. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE

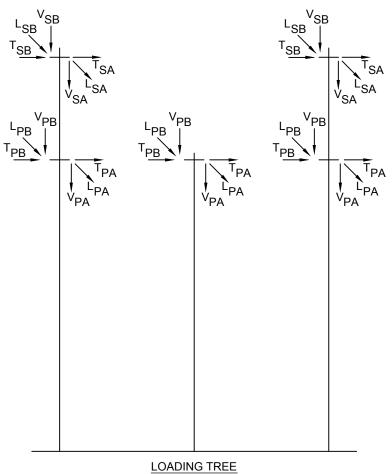
							С		
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	•		•	•	•		ENGINEER		
	ENG/PE#	DATE	DRN	CHKD	APPR			CET	
								CHECKED	
						345kV A0	TAB		
						30	D-SCHSP-HDW-090	APPROVED	
						LOAT	) & DESIGN DRAWI		
								i u	DATE
S		5/27/15	MSP						5/1/15
S		5/8/15	BLH						5/1/15
BID		5/1/15	BLH	•	•	SCALE	FILE: TSP-09.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	09-001		



7 "LAPWING"	ACSR PER	PHASE (	11400# @	Diverse Neavy)

								DE	SIGN LOA	DS						4
E 1)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.64	9.33	4.07	0.64	9.33	-4.07	5.36	39.69	17.43	5.36	39.69	-17.43	10.00	90.00	1.50
00	100.00	0.21	4.48	1.91	0.21	4.48	-1.91	2.03	23.16	9.77	2.03	23.16	-9.77	29.00	90.00	1.00
00	39.53	0.86	7.72	3.39	0.86	7.72	-3.39	4.88	30.15	13.32	4.88	30.15	-13.32	4.00	90.00	1.00
25	39.53	1.16	9.55	4.19	1.16	9.55	-4.19	5.70	35.35	15.63	5.70	35.35	-15.63	4.00	90.00	1.00
50	39.53	0.43	5.59	2.47	0.43	5.59	-2.47	3.58	23.86	10.56	3.58	23.86	-10.56	4.00	90.00	1.00
50	39.53	0.43	5.28	2.32	0.43	5.28	-2.32	3.58	21.80	9.64	3.58	21.80	-9.64	4.00	90.00	1.00
50	39.53	0.43	5.28	2.32	0.43	0.11	0.00	3.58	21.80	9.64	3.58	0.38	0.00	4.00	90.00	1.00
00	29.97	3.48	0.92	0.12	1.66	4.94	-2.21	13.55	4.21	0.51	4.39	22.27	-9.93	3.45	90.00	1.50
00	0.00	0.21	2.78	1.25	0.21	2.78	-1.25	2.03	12.53	5.64	2.03	12.53	-5.64	0.00	90.00	1.00
00	0.00	2.21	5.56	2.50	2.21	5.56	-2.50	5.86	25.07	11.27	5.86	25.07	-11.27	0.00	90.00	2.00
00	0.00	0.21	4.16	1.87	0.21	4.16	-1.87	2.03	19.44	8.74	2.03	19.44	-8.74	0.00	90.00	1.00
		<del>unu</del>	<del></del>				<del></del>	<del>unu</del>	<del>unn</del>	<del>unn</del>						





ENG/PE# DATE DRN CHKD APPR

5/27/15 MSP

5/8/15 BLH

5/1/15 BLH

CONT/PE# DATE DRN CHKD APPR

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED

DRAWN

BLH

ENGINEER

CET

TAB

APPROVED

5/1/15

DRAWING NO.

TSP-10-001

THE NORTHERN PASS

345kV AC HEAVY DEADEND 130–140

30-SCHSP-HDW-140

LOAD & DESIGN DRAWING

77

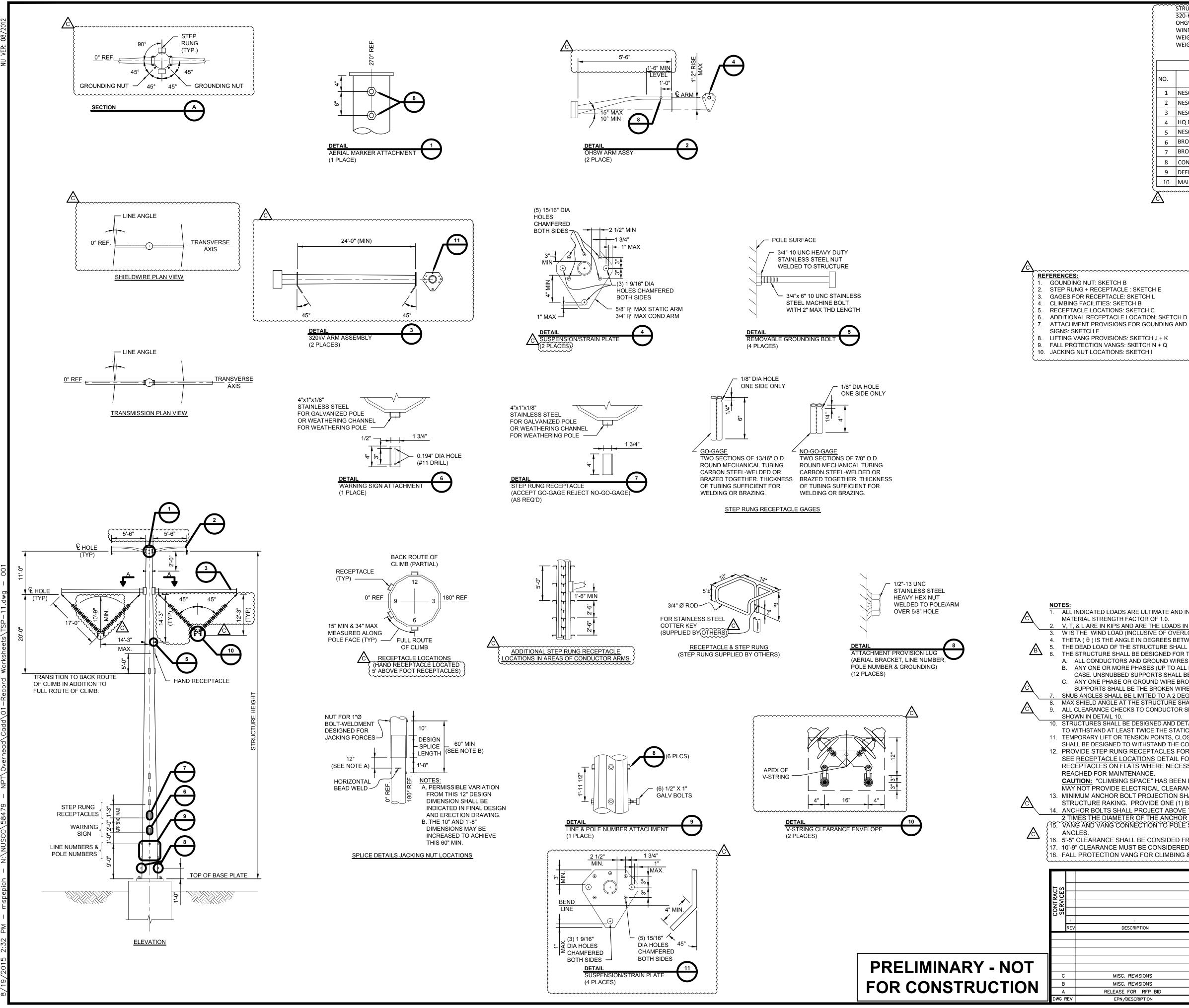
FILE: TSP-10.DWG

IMAGE

SCALE

NTS

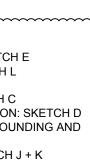
V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 🔅 SHALL BE APPLIED TO THE

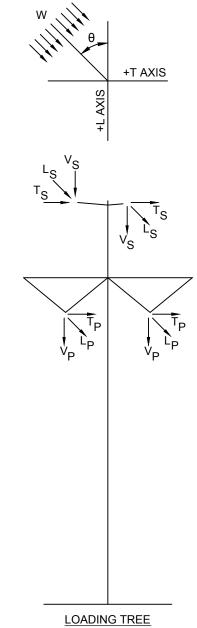


	STRUCTURE NAME: 32-SCHSP-LTW-002 320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 550 WEIGHT SPAN (FT): 850 WEIGHT SPAN (FT): 850												
	LOADING CA	ASE						DE	SIGN LOA	DS			;
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	1.45	1.03	0.00	13.54	5.30	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.43	0.75	0.00	5.61	5.98	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.03	0.74	0.00	12.70	3.28	0.00	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	3.62	1.06	0.00	17.43	4.15	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.96	0.48	0.00	9.02	2.65	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.96	0.47	0.00	9.02	2.49	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.96	0.37	5.50	9.02	1.51	24.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.58	0.27	0.27	23.61	2.17	2.27	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.43	0.10	0.00	5.61	0.83	0.00	0.00	90.00	1.00

60.00 0.00 0.00 2.66 0.21 0.00 13.01 1.66 0.00 0.00 90.00 2.00

10 MAINTENANCE





ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (.0.) SHALL BE APPLIED TO THE WIND LOAD. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

A. ALL CONDUCTORS AND GROUND WIRES INSTALLED. B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE 25°.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL

RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

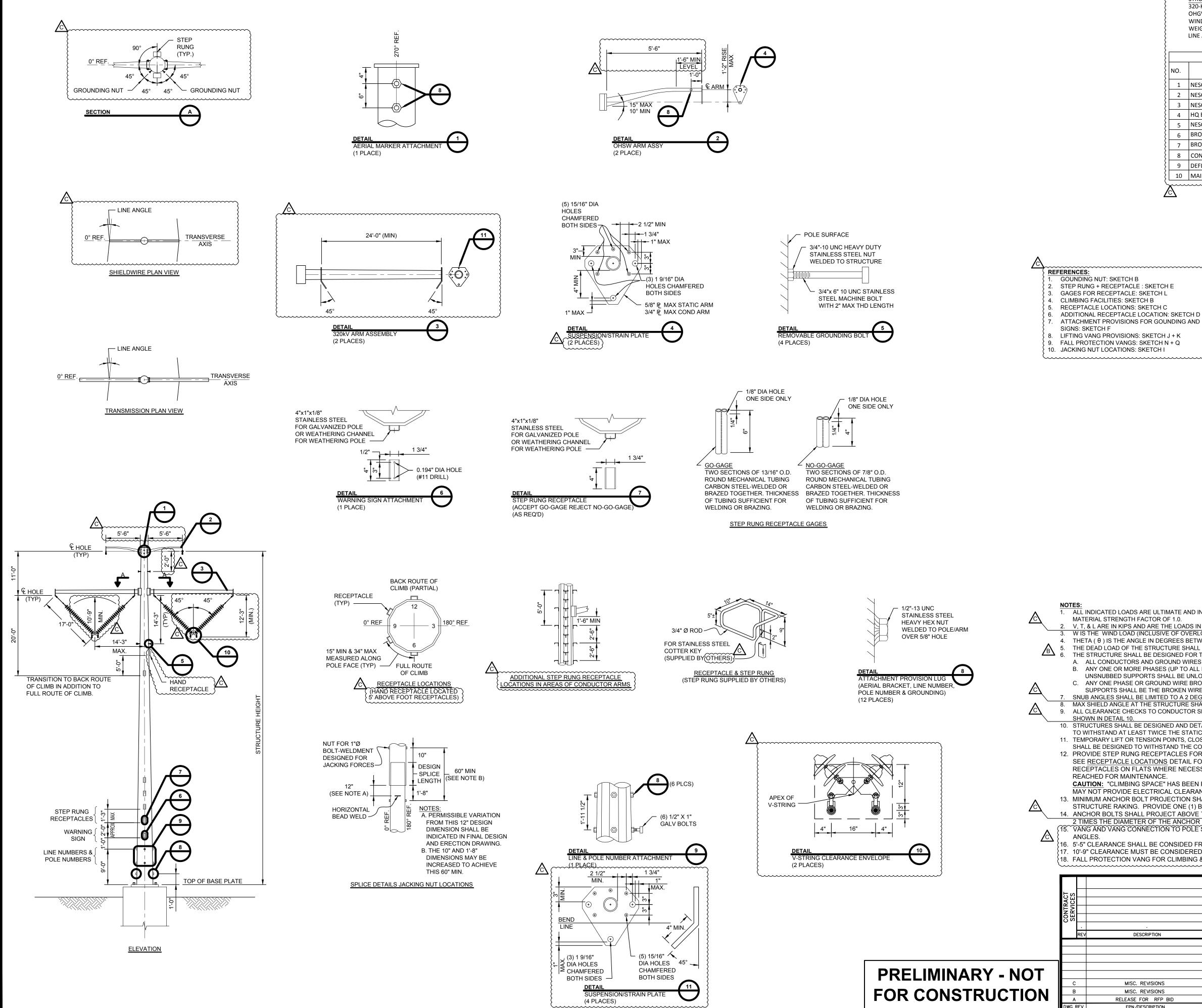
14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) (15. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE. 17. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

RELEASE FOR RF

EPN/DESCRIPTI

							•			С			
									DRA	WN			
							THE NORTHERN PASS		BL	н			
•					•				ENGINEER				
DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR			CE	T				
								CHEC	KED				
						320kV 1	320kV DC LIGHT TANGENT 0-2°						
						3	2-SCHSP-LTW-002		APPR	OVED			
						LOAI	D & DESIGN DRAWI	NG					
MISC. REVISIONS		5/21/15	KAK					DA ⁻					
MISC. REVISIONS		5/8/15	BLH						5/1	/15			
LEASE FOR RFP BID		5/1/15	BLH			SCALE		VING NO.	2.4				
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	APPR NTS IMAGE: TSP-11-0							



						<b>A</b>			С
						THE NORTHERN PASS		drawn BLH	
			•			V	Г	ENGIN	
DESCRIPTION	ENG/PE#	DATE	DRN	СНКД	APPR			CE	I
						320kV DC MEDIUM TANGENT (	0-2°	снеск ТА	
						32-SCHSP-MTW-002	Г	APPRO	VED
						LOAD & DESIGN DRAWING	r L		
MISC. REVISIONS		5/21/15	KAK				ſ	DAT	-
MISC. REVISIONS		5/8/15	BLH					5/1/	CI \
LEASE FOR RFP BID		5/1/15	BLH			SCALE FILE: TSP-12.DWG		NG NO.	24
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS IMAGE:	TSP-1	2-00	)1

18. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + Q.

17. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE.

14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) (15. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT

13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE

MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS

SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE.

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE(25°.)

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

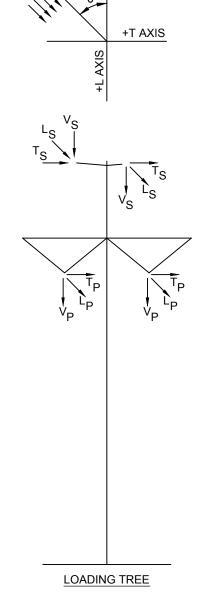
B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS: A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

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ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A



RELEASE FOR RF

STRUCTURE NAME: 32-SCHSP-MTW-002

LOADING CASE

WIND SPAN (FT): 750 WEIGHT SPAN (FT): 1200 LINE ANGLE: 0 - 2 DEGREES

DESCRIPTION

INO.

1 NESC 250B

2 NESC 250C

3 NESC 250D

4 HQ EXTREME ICE

8 CONSTRUCTION

9 DEFLECTION

10 MAINTENANCE

5 NESC 250B w/o OLF 6 BROKEN WIRE (INTACT)

320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY)

I WIND

VS

(k)

7 BROKEN WIRE (BROKEN) 0.00 0.50 39.53 1.34 0.47 5.50 12.04 2.01 30.00 4.00 90.00 1.00

LS

(k)

0.00 0.50 39.53 2.01 1.28 0.00 18.06 6.29 0.00 10.00 90.00 1.50

60.00 0.00 100.00 0.59 0.97 0.00 7.55 7.67 0.00 29.00 90.00 1.00

15.00 1.00 39.53 2.84 0.91 0.00 17.22 3.81 0.00 4.00 90.00 1.00

15.00 1.50 39.53 5.09 1.30 0.00 23.90 4.81 0.00 4.00 90.00 1.00 0.00 0.50 39.53 1.34 0.58 0.00 12.04 3.04 0.00 4.00 90.00 1.00

0.00 0.50 39.53 1.34 0.57 0.00 12.04 2.88 0.00 4.00 90.00 1.00

30.00 0.00 29.97 3.82 0.30 0.27 26.51 2.40 2.27 3.45 90.00 1.50 60.00 0.00 0.00 0.59 0.10 0.00 7.55 0.83 0.00 0.00 90.00 1.00

60.00 0.00 0.00 2.98 0.21 0.00 16.89 1.66 0.00 0.00 90.00 2.00

(k)

TS

(k)

DESIGN LOADS

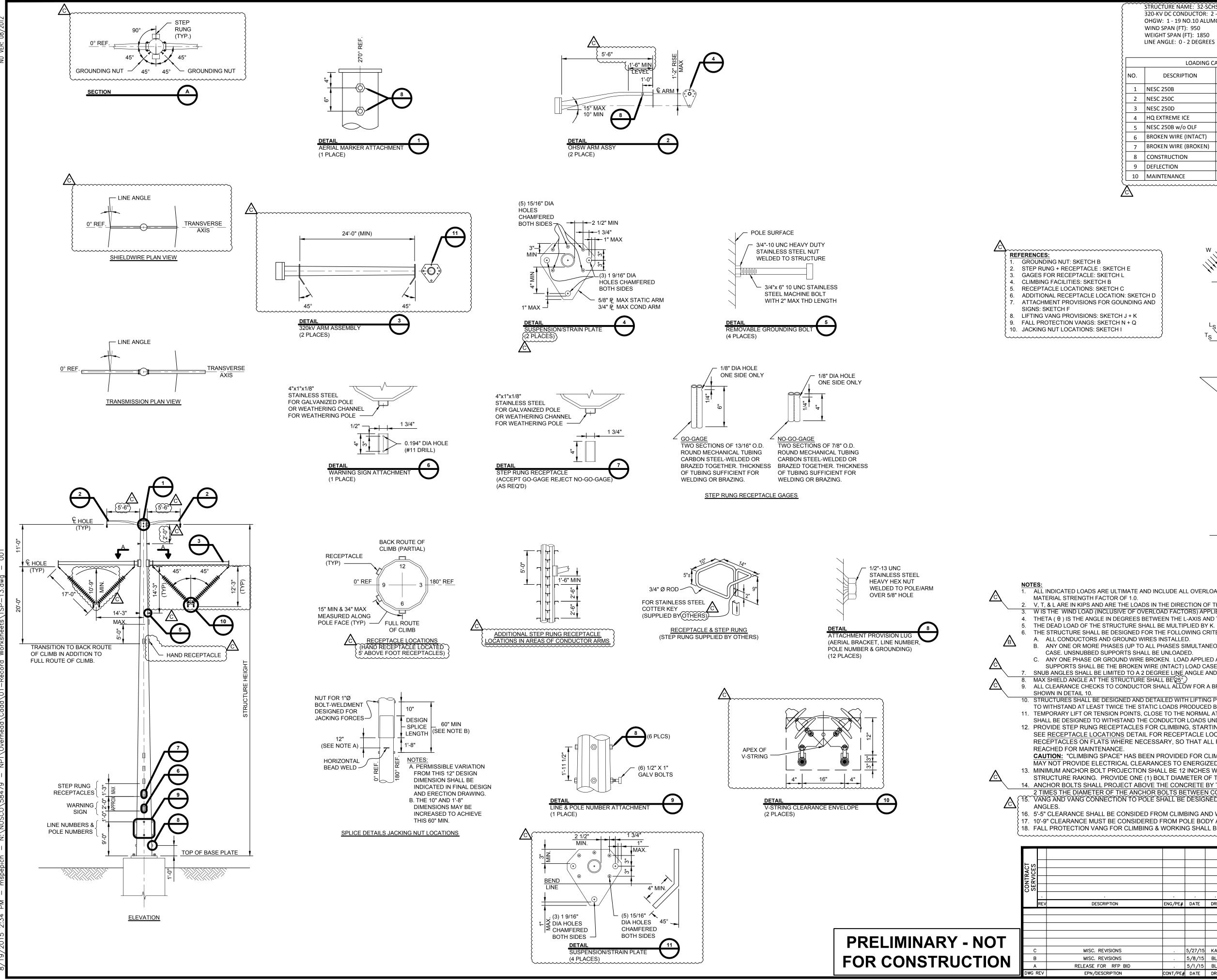
(k)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

TEMP

ICE

(°F) (in) (mph)



							<b>A</b>			С
									DRA	
							THE NORTHERN PASS		BL	.H
					•		V		ENGIN	
	ENG/PE#	DATE	DRN	CHKD	APPR		V		CE	. I
									CHEC	
							DC HEAVY TANGENT		TA	'B
						32	2-SCHSP-HTW-002		APPR	DVED
						LOAI	D & DESIGN DRAWI	NG		
S		5/27/15	KAK							
S		5/8/15	BLH		•				5/1,	/15
P BID		5/1/15	BLH			SCALE	FILE: TSP-13.DWG		VING NO.	24
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	13-00	J1

18. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + Q.

16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE. 17. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

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SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

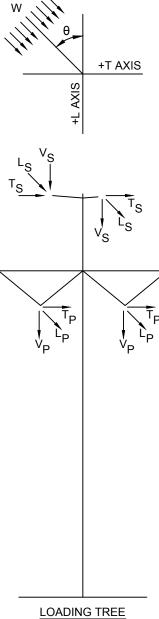
B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

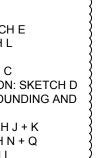
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2. V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD.

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A





6 BROKEN WIRE (INTACT) 0.00 0.50 39.53 2.04 0.67 0.00 17.64 3.28 0.00 4.00 90.00 1.00 7 BROKEN WIRE (BROKEN) 0.00 0.50 39.53 2.04 0.57 5.50 17.64 2.58 40.00 4.00 90.00 1.00 8 CONSTRUCTION 30.00 0.00 29.97 4.25 0.33 0.27 31.91 2.63 2.27 3.45 90.00 1.50 60.00 0.00 0.00 0.88 0.10 0.00 11.15 0.83 0.00 0.00 90.00 1.00 9 DEFLECTION 60.00 0.00 0.00 3.56 0.21 0.00 24.09 1.66 0.00 0.00 90.00 2.00 10 MAINTENANCE

LOADING CASE

DESCRIPTION

INO.

1 NESC 250B

2 NESC 250C

3 NESC 250D

4 HQ EXTREME ICE

5 NESC 250B w/o OLF

TEMP

ICE

(°F) | (in) | (mph)

STRUCTURE NAME: 32-SCHSP-HTW-002	~~~~
320-KV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY	<b>'</b> )
OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)	
WIND SPAN (FT): 950	
WEIGHT SPAN (FT): 1850	
LINE ANGLE: 0 - 2 DEGREES	

VS

(k)

DESIGN LOADS

(k)

LS

(k)

0.00 0.50 39.53 3.06 1.53 0.00 26.46 7.28 0.00 10.00 90.00 1.50

60.00 0.00 100.00 0.88 1.19 0.00 11.15 9.36 0.00 29.00 90.00 1.00

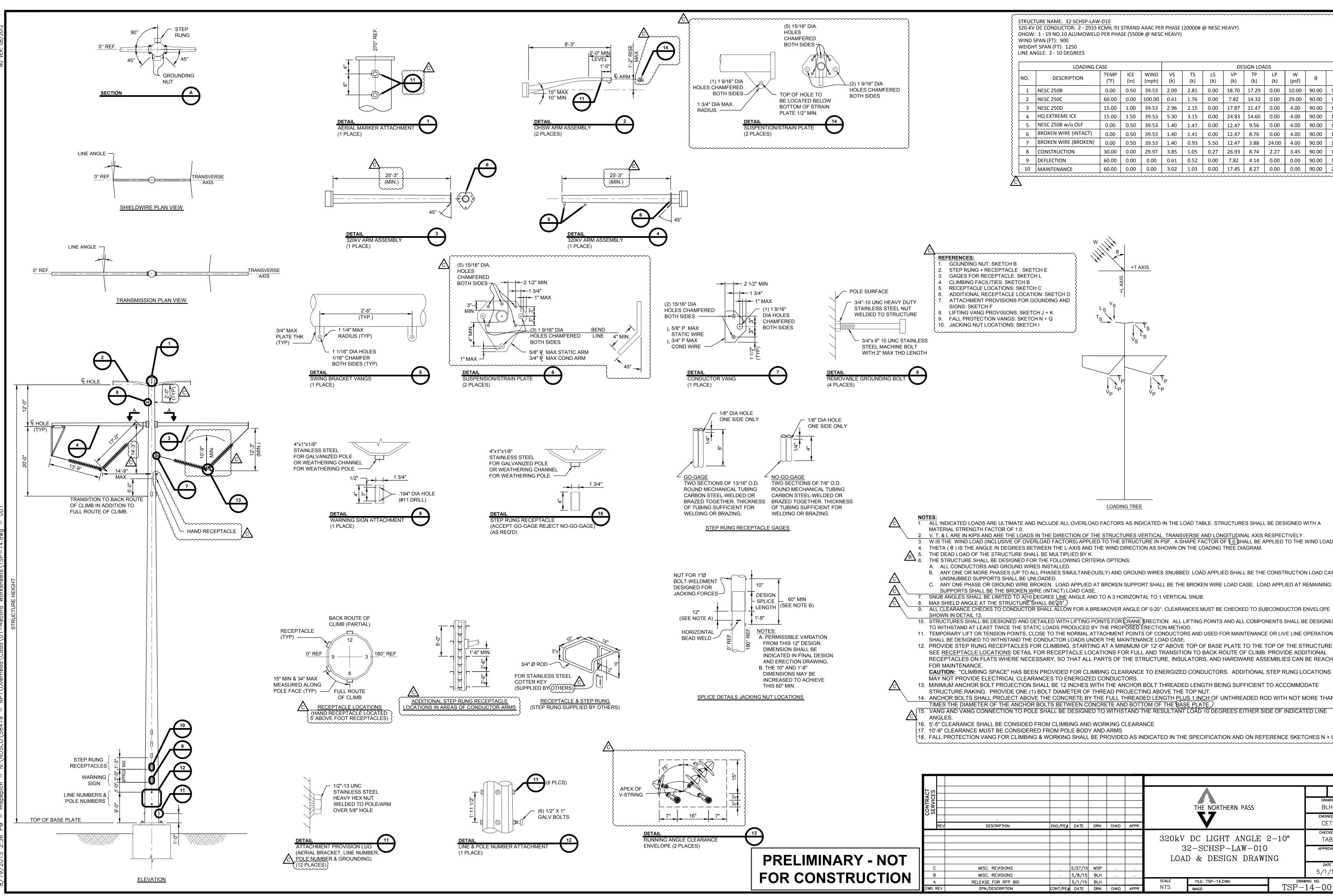
15.00 1.00 39.53 4.35 1.07 0.00 25.63 4.34 0.00 4.00 90.00 1.00

15.00 1.50 39.53 7.81 1.53 0.00 35.93 5.48 0.00 4.00 90.00 1.00

0.00 0.50 39.53 2.04 0.68 0.00 17.64 3.44 0.00 4.00 90.00 1.00

(k)

(k)



	20-KV DC CONDUCTOR:  2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) HGW:  1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) /IND SPAN (FT):  900														
WEIGH	/EIGHT SPAN (FT): 1250														
.INE A	NE ANGLE: 2 - 10 DEGREES														
	LOADING C	ASE						DE	SIGN LOA	NDS					
NO. DESCRIPTION TEMP (°F) (in) (mph) (k) (k) (k) (k) (k) (k) (k) (k) (k) (k															
1	NESC 250B	0.00	0.50	39.53	2.09	2.81	0.00	18.70	17.29	0.00	10.00	90.00	1.		
2	NESC 250C	60.00	0.00	100.00	0.61	1.76	0.00	7.82	14.32	0.00	29.00	90.00	1.		
3	NESC 250D	15.00	1.00	39.53	2.96	2.15	0.00	17.87	11.47	0.00	4.00	90.00	1.		
4	HQ EXTREME ICE	15.00	1.50	39.53	5.30	3.15	0.00	24.83	14.60	0.00	4.00	90.00	1.		
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.40	1.47	0.00	12.47	9.56	0.00	4.00	90.00	1.		
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.40	1.41	0.00	12.47	8.76	0.00	4.00	90.00	1.		
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.40	0.93	5.50	12.47	3.88	24.00	4.00	90.00	1.		
8	CONSTRUCTION	30.00	0.00	29.97	3.85	1.05	0.27	26.93	8.74	2.27	3.45	90.00	1.		
9	DEFLECTION	60.00	0.00	0.00	0.61	0.52	0.00	7.82	4.14	0.00	0.00	90.00	1.		
10	MAINTENANCE	60.00	0.00	0.00	3.02	1.03	0.00	17.45	8.27	0.00	0.00	90.00	2		

 $\Delta$ 

T_c

+T AXIS

LOADING TREE

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (10) SHALL BE APPLIED TO THE WIND LOAD. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

SNUB ANGLES SHALL BE LIMITED TO A 10 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

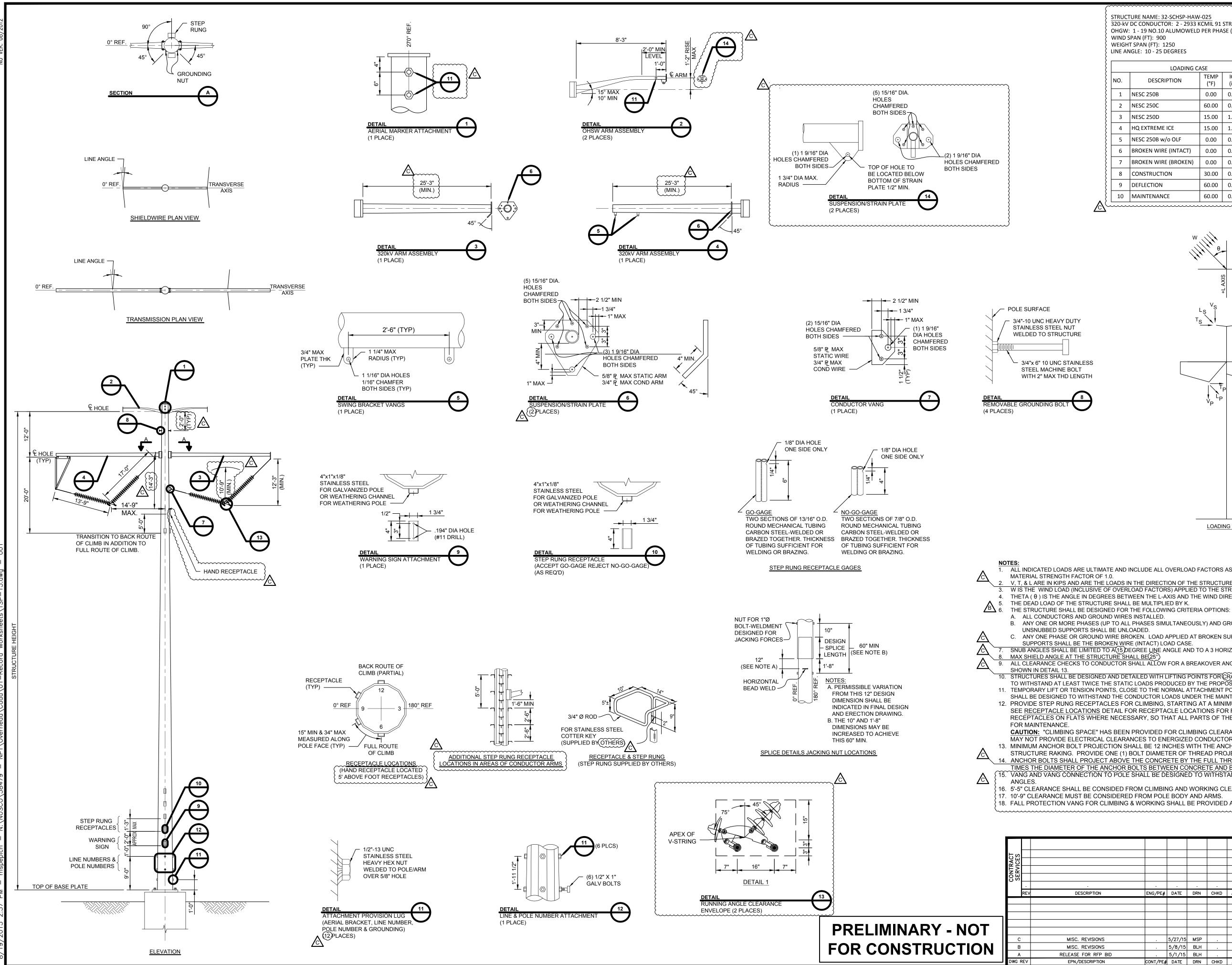
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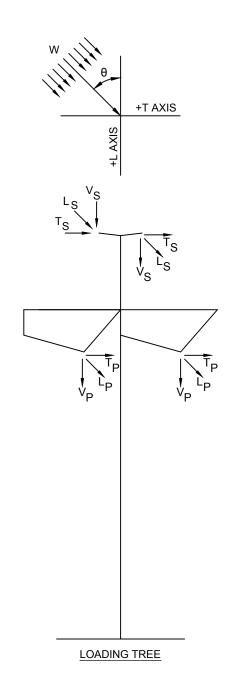
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(16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE

									С
									DRAWN
							THE NORTHERN PASS		BLH
	•						<b>Χ7</b>		ENGINEER
	ENG/PE#	DATE	DRN	CHKD	APPR		V		CET
								2 1 0 1	CHECKED
						320kv	DC LIGHT ANGLE 2	2-10°	TAB
						3	2-SCHSP-LAW-010		APPROVED
						LOAI	) & DESIGN DRAWI	NG	
5		5/27/15	MSP						
S		5/8/15	BLH						5/1/15
BID		5/1/15	BLH			SCALE	FILE: TSP-14.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	14-001



320-kV OHGW WIND S WEIGH	STRUCTURE NAME: 32-SCHSP-HAW-025 320-kV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 900 WEIGHT SPAN (FT): 1250 LINE ANGLE: 10 - 25 DEGREES												
	LOADING C	ASE						DE	SIGN LOA	\DS			
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	2.09	5.30	0.00	18.70	36.32	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.61	2.93	0.00	7.82	24.32	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.96	4.22	0.00	17.87	24.95	0.00	4.00	90.00	1.00
4	HQ EXTREME ICE	15.00	1.50	39.53	5.30	6.27	0.00	24.83	31.83	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.40	2.98	0.00	12.47	21.09	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.40	2.83	0.00	12.47	19.10	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.40	1.64	5.48	12.47	10.44	39.85	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.85	2.40	0.27	26.93	20.18	2.27	3.45	90.00	1.50
9	9 DEFLECTION 60.00 0.00 0.01 1.28 0.00 7.82 10.27 0.00 0.00 90.00 1.00												
10	10 MAINTENANCE 60.00 0.00 0.00 3.02 2.56 0.00 17.45 20.54 0.00 0.00 90.00 2.00												



(	RE	FERENCES:
ļ	\$ 1.	GOUNDING NUT: SKETCH B
1	2.	STEP RUNG + RECEPTACLE : SKETCH E GAGES FOR RECEPTACLE: SKETCH L CLIMBING FACILITIES: SKETCH B
	3.	GAGES FOR RECEPTACLE: SKETCH L
	4	CLIMBING FACILITIES: SKETCH B

CLIMBING FACILITIES: SKETCH B RECEPTACLE LOCATIONS: SKETCH C

ADDITIONAL RECEPTACLE LOCATION: SKETCH D

ATTACHMENT PROVISIONS FOR GOUNDING AND

- SIGNS: SKETCH F 8. LIFTING VANG PROVISIONS: SKETCH J + K
- 9. FALL PROTECTION VANGS: SKETCH N + Q
- 10. JACKING NUT LOCATIONS: SKETCH I

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V. T. & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (0) SHALL BE APPLIED TO THE WIND LOAD. THETA ( θ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SNUB ANGLES SHALL BE LIMITED TO A (15) DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE PRECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED

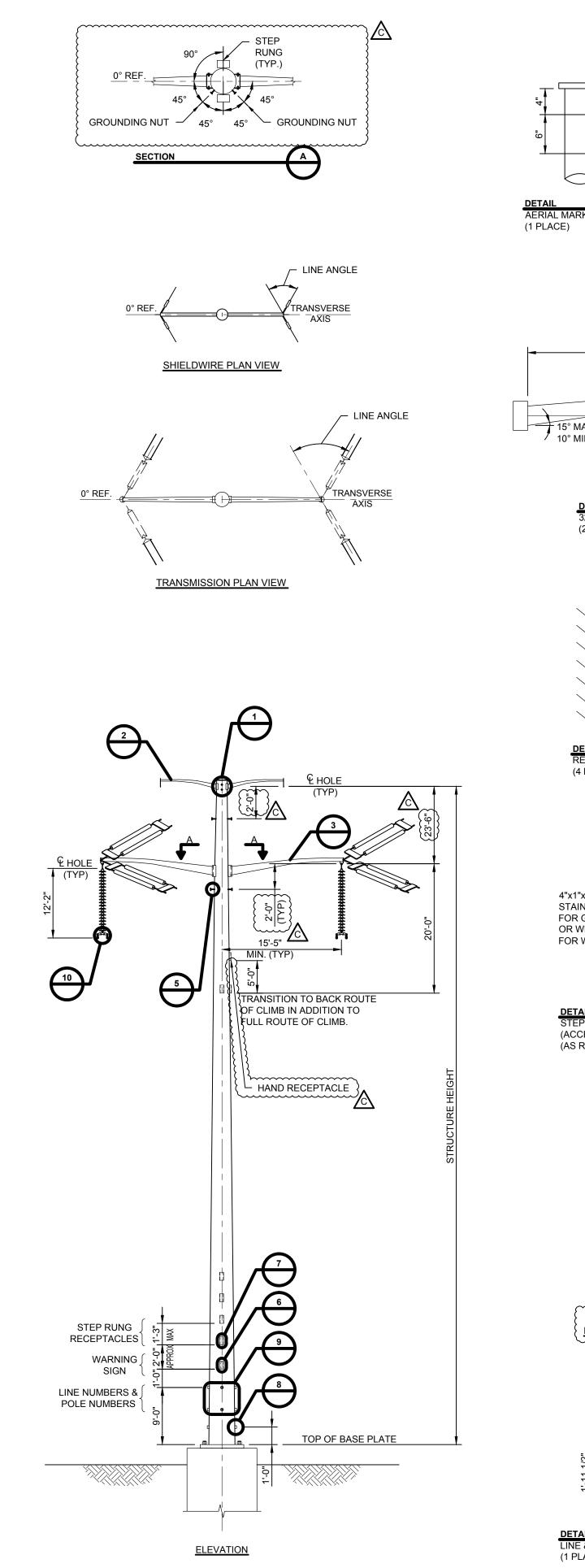
**CAUTION:** "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE

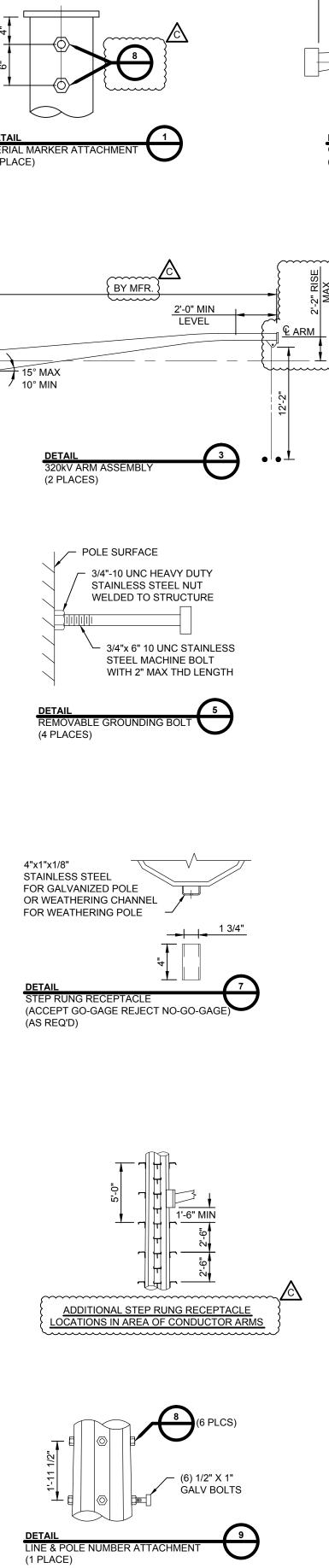
STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) {15. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

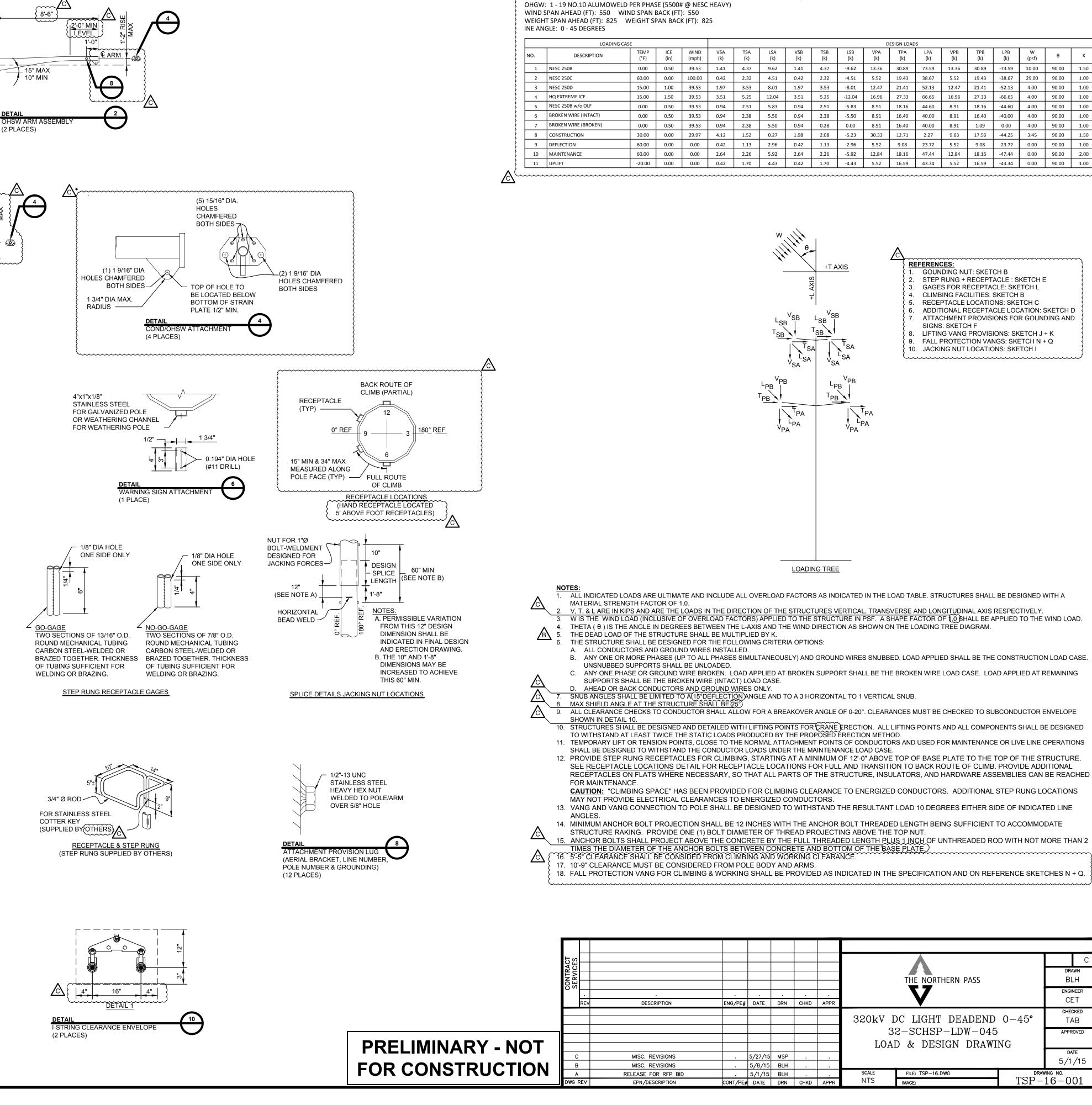
16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE.

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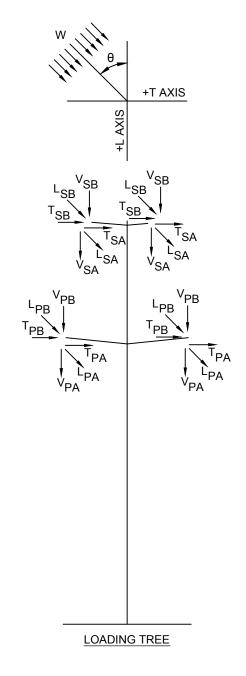


### 320-kV DC CONDUCTOR: 2 - 2933 KCMIL 91 STRAND AAAC PER PHASE (20000# @ NESC HEAVY)

STRUCTURE NAME: 32-SCHSP-LDW-045

								D	ESIGN LOAD	S						
ICE (in)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
0.50	39.53	1.41	4.37	9.62	1.41	4.37	-9.62	13.36	30.89	73.59	13.36	30.89	-73.59	10.00	90.00	1.50
0.00	100.00	0.42	2.32	4.51	0.42	2.32	-4.51	5.52	19.43	38.67	5.52	19.43	-38.67	29.00	90.00	1.00
L.00	39.53	1.97	3.53	8.01	1.97	3.53	-8.01	12.47	21.41	52.13	12.47	21.41	-52.13	4.00	90.00	1.00
L.50	39.53	3.51	5.25	12.04	3.51	5.25	-12.04	16.96	27.33	66.65	16.96	27.33	-66.65	4.00	90.00	1.00
0.50	39.53	0.94	2.51	5.83	0.94	2.51	-5.83	8.91	18.16	44.60	8.91	18.16	-44.60	4.00	90.00	1.00
0.50	39.53	0.94	2.38	5.50	0.94	2.38	-5.50	8.91	16.40	40.00	8.91	16.40	-40.00	4.00	90.00	1.00
0.50	39.53	0.94	2.38	5.50	0.94	0.28	0.00	8.91	16.40	40.00	8.91	1.09	0.00	4.00	90.00	1.00
0.00	29.97	4.12	1.52	0.27	1.98	2.08	-5.23	30.33	12.71	2.27	9.63	17.56	-44.25	3.45	90.00	1.50
0.00	0.00	0.42	1.13	2.96	0.42	1.13	-2.96	5.52	9.08	23.72	5.52	9.08	-23.72	0.00	90.00	1.00
0.00	0.00	2.64	2.26	5.92	2.64	2.26	-5.92	12.84	18.16	47.44	12.84	18.16	-47.44	0.00	90.00	2.00
0.00	0.00	0.42	1.70	4.43	0.42	1.70	-4.43	5.52	16.59	43.34	5.52	16.59	-43.34	0.00	90.00	1.00

**REFERENCES**:



1.	GOUNDING NUT: SKETCH B
2.	STEP RUNG + RECEPTACLE : SKETCH E
3.	GAGES FOR RECEPTACLE: SKETCH L
4.	CLIMBING FACILITIES: SKETCH B
5.	RECEPTACLE LOCATIONS: SKETCH C
6.	ADDITIONAL RECEPTACLE LOCATION: SKETCH D
7.	ATTACHMENT PROVISIONS FOR GOUNDING AND
	SIGNS: SKETCH F
8.	LIFTING VANG PROVISIONS: SKETCH J + K
9.	FALL PROTECTION VANGS: SKETCH N + Q
10.	JACKING NUT LOCATIONS: SKETCH I

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 2. V, 1, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1) SHALL BE APPLIED TO THE WIND LOAD. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SNUB ANGLES SHALL BE LIMITED TO A (15° DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.
 TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL

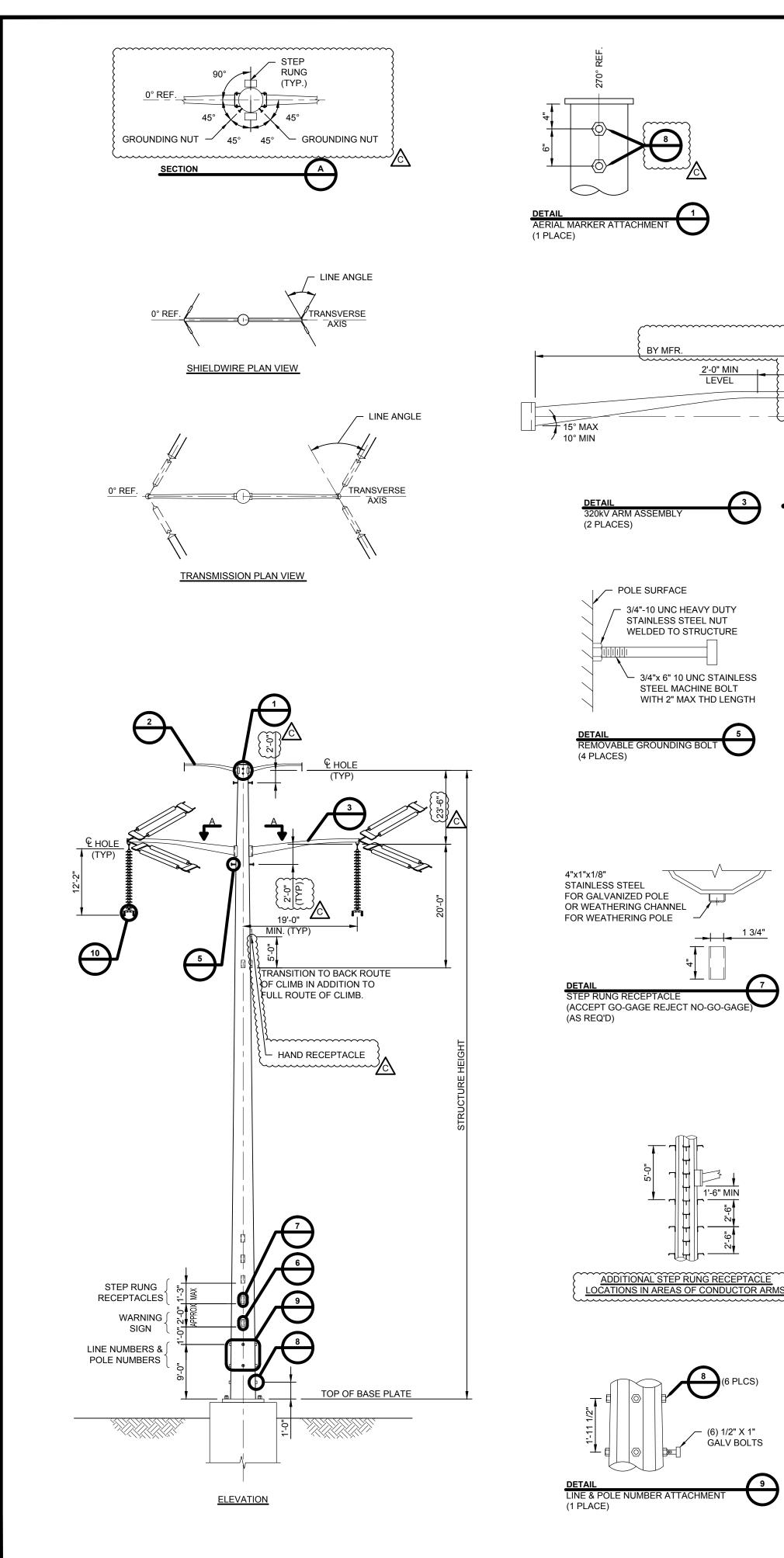
CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

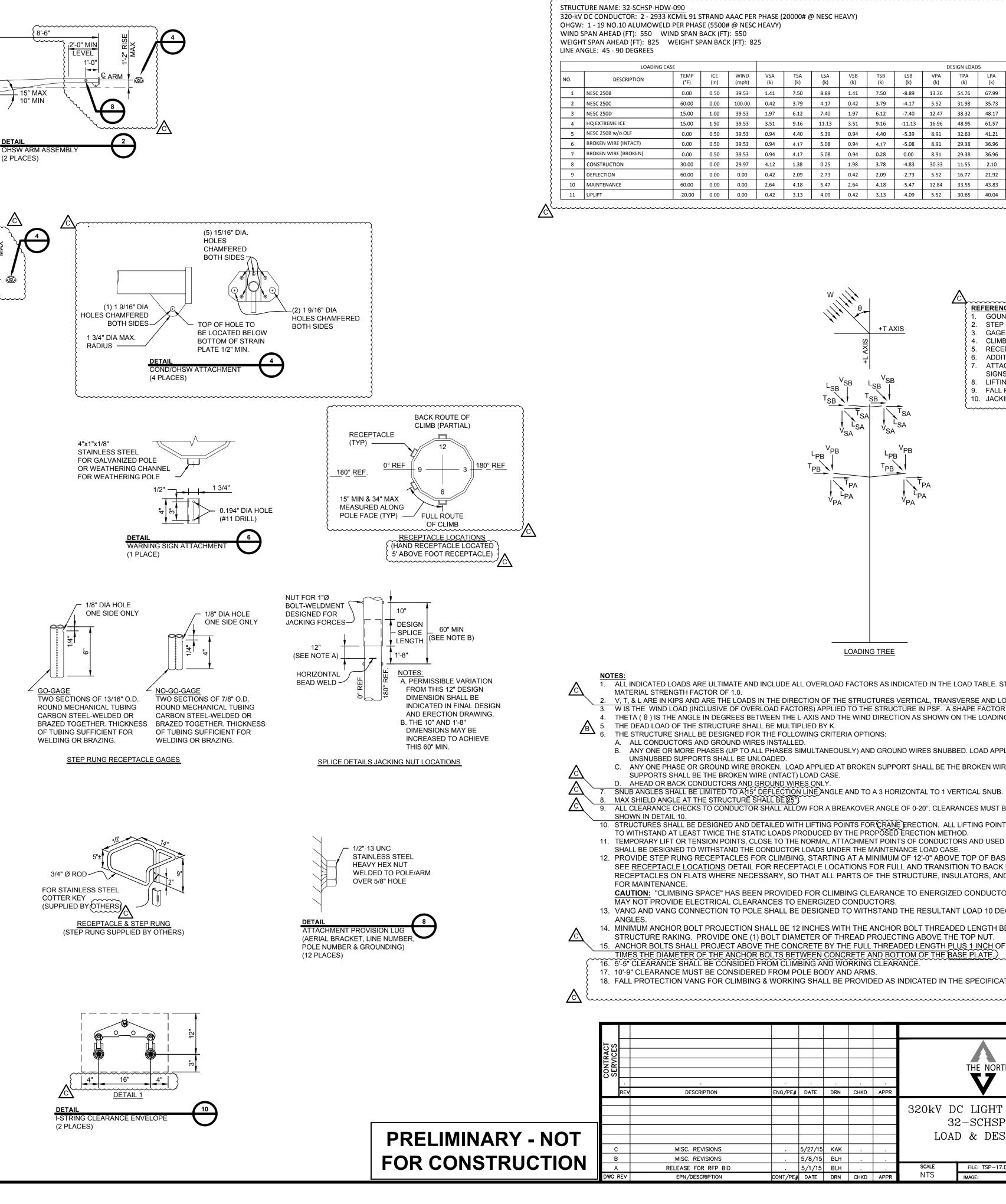
13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE 14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE

STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) 16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE. 17. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

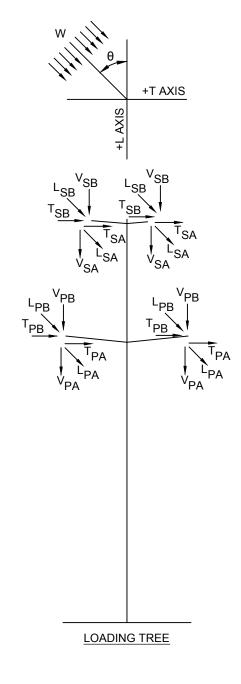
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								D	ESIGN LOAD	S						
ICE (in)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
0.50	39.53	1.41	7.50	8.89	1.41	7.50	-8.89	13.36	54.76	67.99	13.36	54.76	-67.99	10.00	90.00	1.50
0.00	100.00	0.42	3.79	4.17	0.42	3.79	-4.17	5.52	31.98	35.73	5.52	31.98	-35.73	29.00	90.00	1.00
1.00	39.53	1.97	6.12	7.40	1.97	6.12	-7.40	12.47	38.32	48.17	12.47	38.32	-48.17	4.00	90.00	1.00
1.50	39.53	3.51	9.16	11.13	3.51	9.16	-11.13	16.96	48.95	61.57	16.96	48.95	-61.57	4.00	90.00	1.00
0.50	39.53	0.94	4.40	5.39	0.94	4.40	-5.39	8.91	32.63	41.21	8.91	32.63	-41.21	4.00	90.00	1.00
0.50	39.53	0.94	4.17	5.08	0.94	4.17	-5.08	8.91	29.38	36.96	8.91	29.38	-36.96	4.00	90.00	1.00
0.50	39.53	0.94	4.17	5.08	0.94	0.28	0.00	8.91	29.38	36.96	8.91	1.09	0.00	4.00	90.00	1.00
0.00	29.97	4.12	1.38	0.25	1.98	3.78	-4.83	30.33	11.55	2.10	9.63	31.91	-40.88	3.45	90.00	1.50
0.00	0.00	0.42	2.09	2.73	0.42	2.09	-2.73	5.52	16.77	21.92	5.52	16.77	-21.92	0.00	90.00	1.00
0.00	0.00	2.64	4.18	5.47	2.64	4.18	-5.47	12.84	33.55	43.83	12.84	33.55	-43.83	0.00	90.00	2.00
0.00	0.00	0.42	3.13	4.09	0.42	3.13	-4.09	5.52	30.65	40.04	5.52	30.65	-40.04	0.00	90.00	1.00



**REFERENCES:** 

- GOUNDING NUT: SKETCH B
- STEP RUNG + RECEPTACLE : SKETCH E GAGES FOR RECEPTACLE: SKETCH L
- 4. CLIMBING FACILITIES: SKETCH B
- RECEPTACLE LOCATIONS: SKETCH C
- ADDITIONAL RECEPTACLE LOCATION: SKETCH D ATTACHMENT PROVISIONS FOR GOUNDING AND SIGNS: SKETCH F
- 8. LIFTING VANG PROVISIONS: SKETCH J + K
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THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

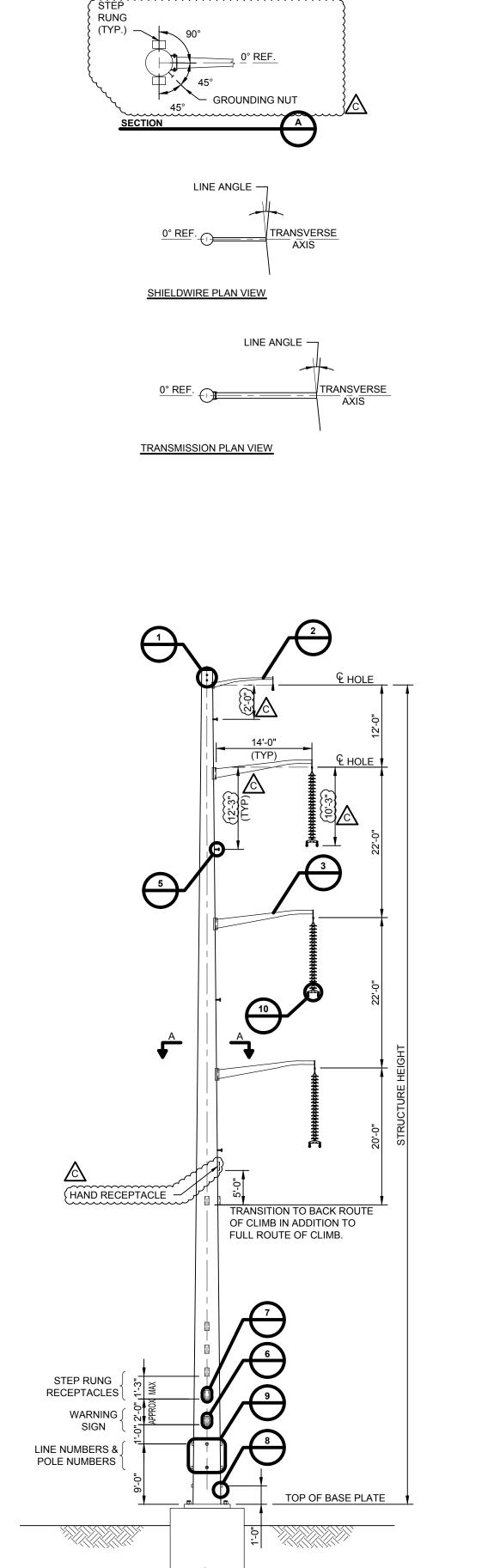
9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

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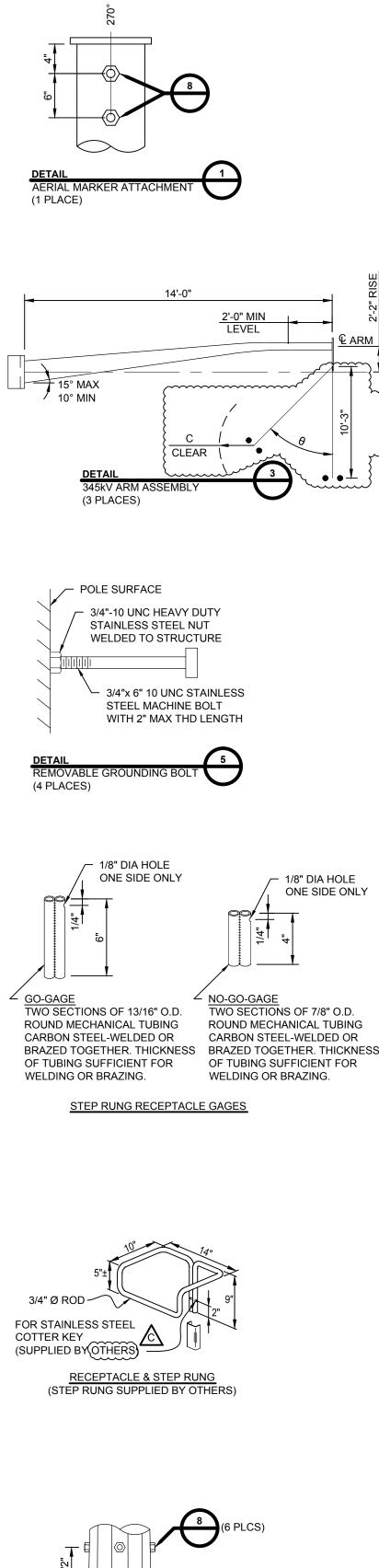
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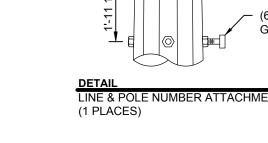
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) 16. 5'-5" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING CLEARANCE. 17. 10'-9" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

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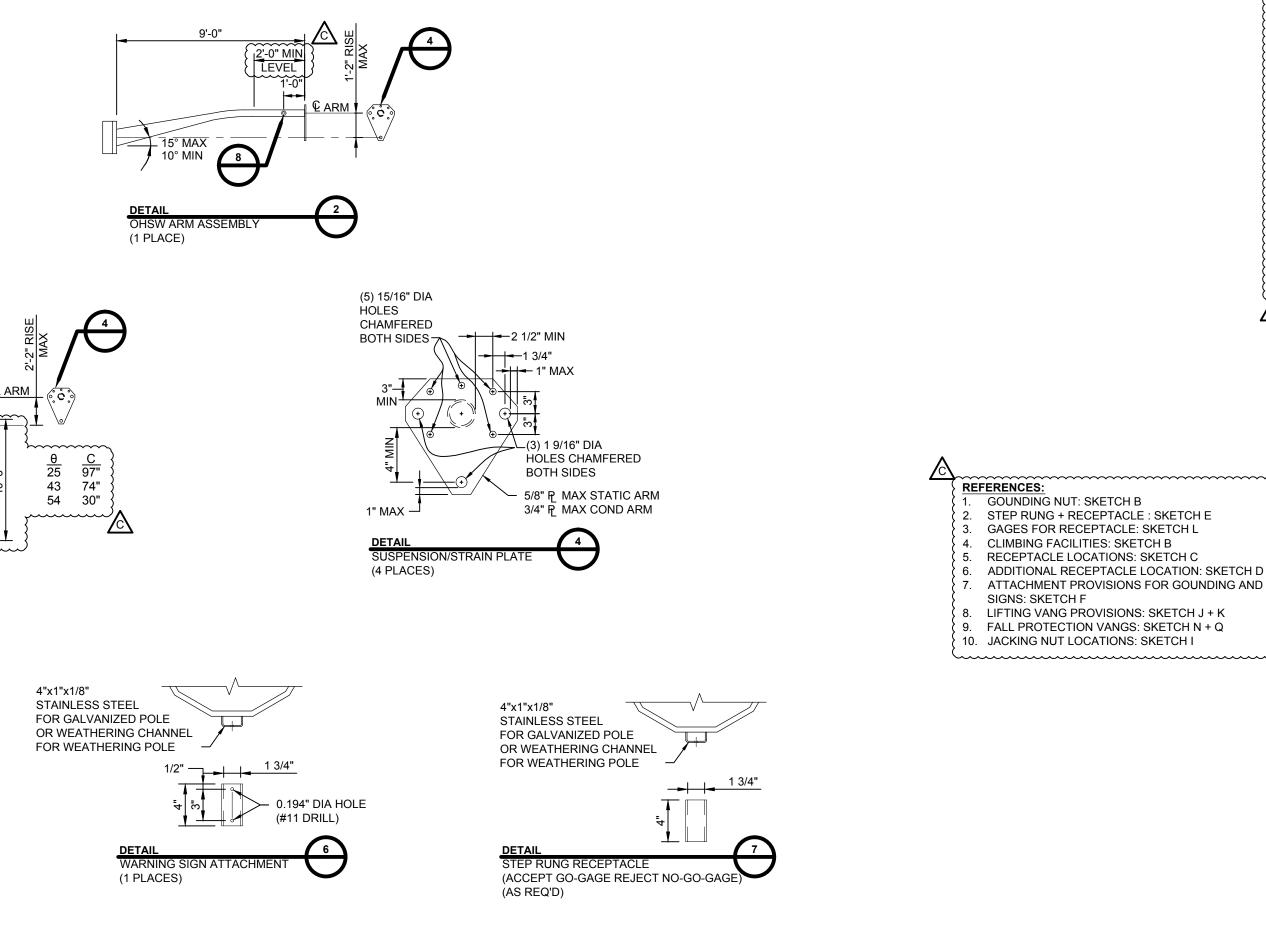


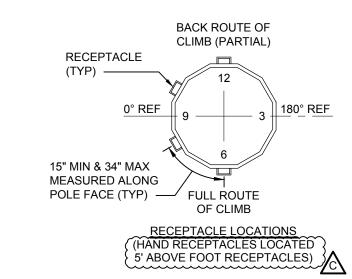
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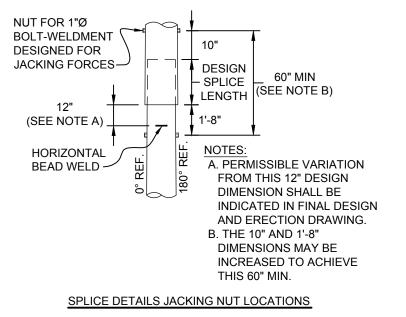


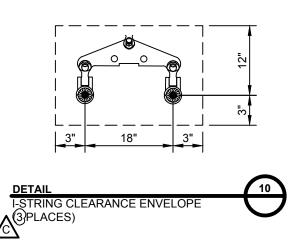


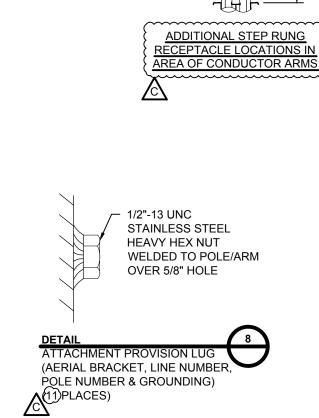
(6) 1/2" X 1" GALV BOLTS



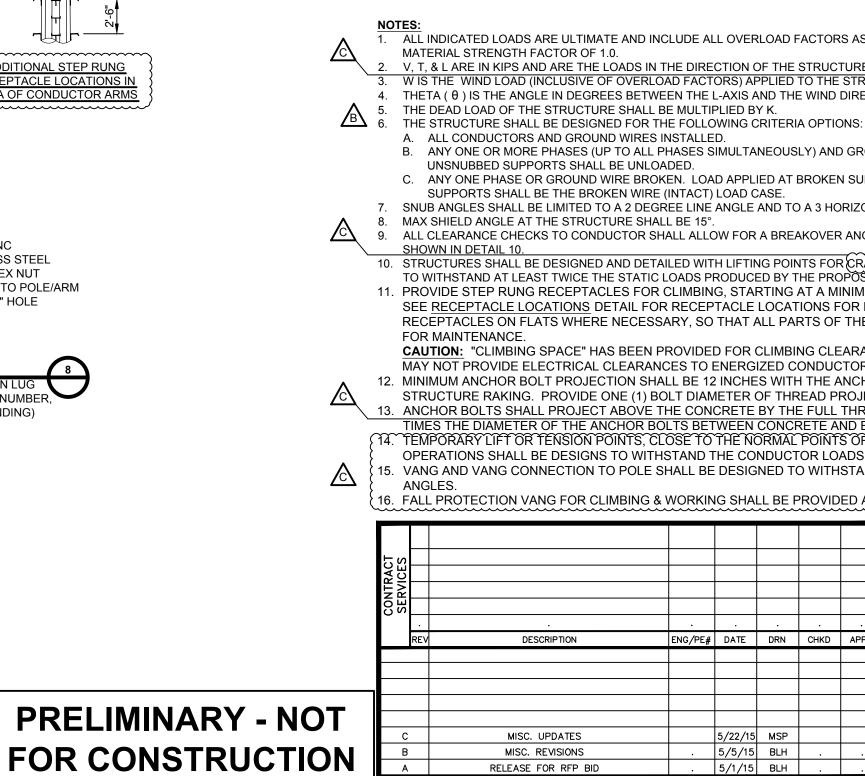








1'-6" MIN



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MISC. UPDATES		5/22/15	MSP						DA [*]	
MISC. REVISIONS		5/5/15							5/1	/15
RELEASE FOR RFP BID		5/1/15	BLH	•		SCALE	FILE: TSP-18.DWG		ING NO.	0.4
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	18 - 0	01

16. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + Q.

TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.) 14. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL POINTS OF THE CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNS TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 12. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 13. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2

SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

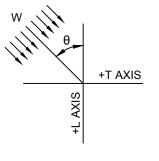
LOADING TREE

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A



STRUCTURE NAME: 30-SCVSP-LTW-002

LOADING CASE

WIND SPAN (FT): 850 WEIGHT SPAN (FT): 1550 LINE ANGLE: 0 - 2 DEGREES

DESCRIPTION

345-KV AC CONDUCTOR: 2 - 1590 KCMIL 45/7 "LAPWING" ACSR PER PHASE (11400# @ NESC HEAVY)

WIND

VS

(k)

7 BROKEN WIRE (BROKEN) 0.00 0.50 39.53 1.72 0.52 5.50 10.21 1.82 22.80 4.00 90.00 1.00

LS

(k)

0.00 0.50 39.53 2.58 1.40 0.00 15.32 4.99 0.00 10.00 90.00 1.50

60.00 0.00 100.00 0.75 1.08 0.00 6.00 6.26 0.00 29.00 90.00 1.00

15.00 1.00 39.53 3.65 0.99 0.00 16.00 3.09 0.00 4.00 90.00 1.00

15.00 1.25 39.53 4.98 1.20 0.00 19.62 3.56 0.00 4.00 90.00 1.00 0.00 0.50 39.53 1.72 0.63 0.00 10.21 2.29 0.00 4.00 90.00 1.00

0.00 0.50 39.53 1.72 0.62 0.00 10.21 2.21 0.00 4.00 90.00 1.00

30.00 0.00 29.97 4.05 0.31 0.27 17.63 1.56 1.21 3.45 90.00 1.50 60.00 0.00 0.00 0.75 0.10 0.00 6.00 0.47 0.00 0.00 90.00 1.00

60.00 0.00 0.00 3.29 0.21 0.00 13.80 0.93 0.00 0.00 90.00 2.00

(k)

(k)

DESIGN LOADS

(k)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

TEMP

ICE

(°F) (in) (mph)

INO.

1 NESC 250B

2 NESC 250C

3 NESC 250D

4 NU EXTREME ICE

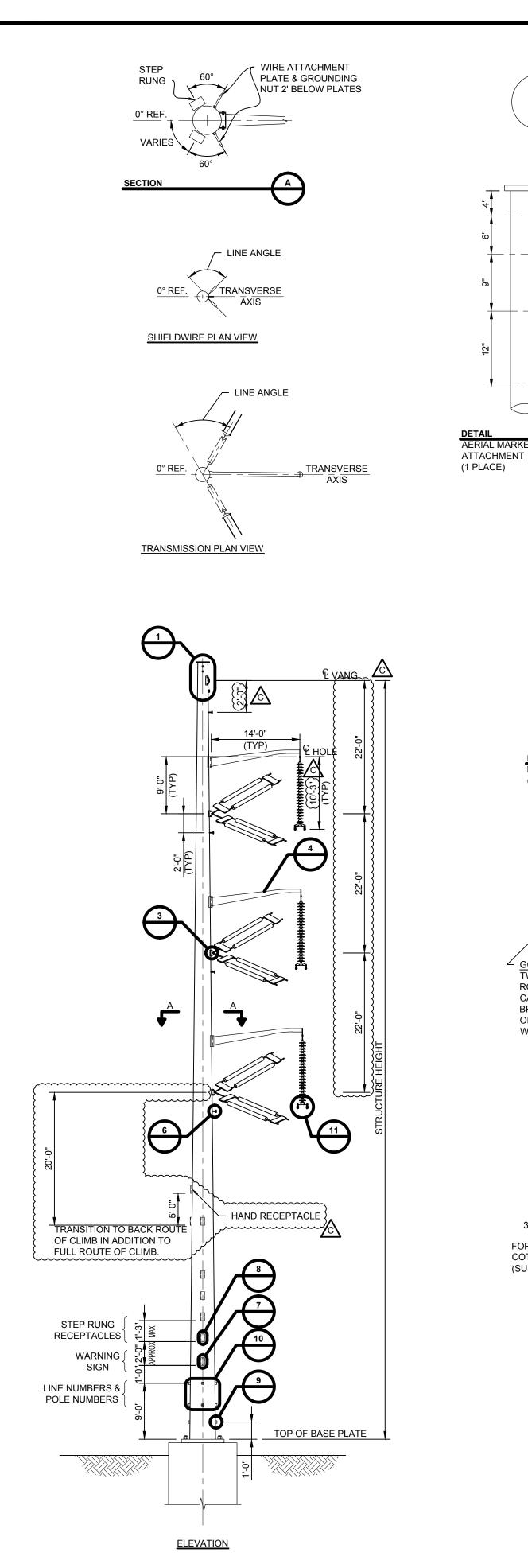
8 CONSTRUCTION

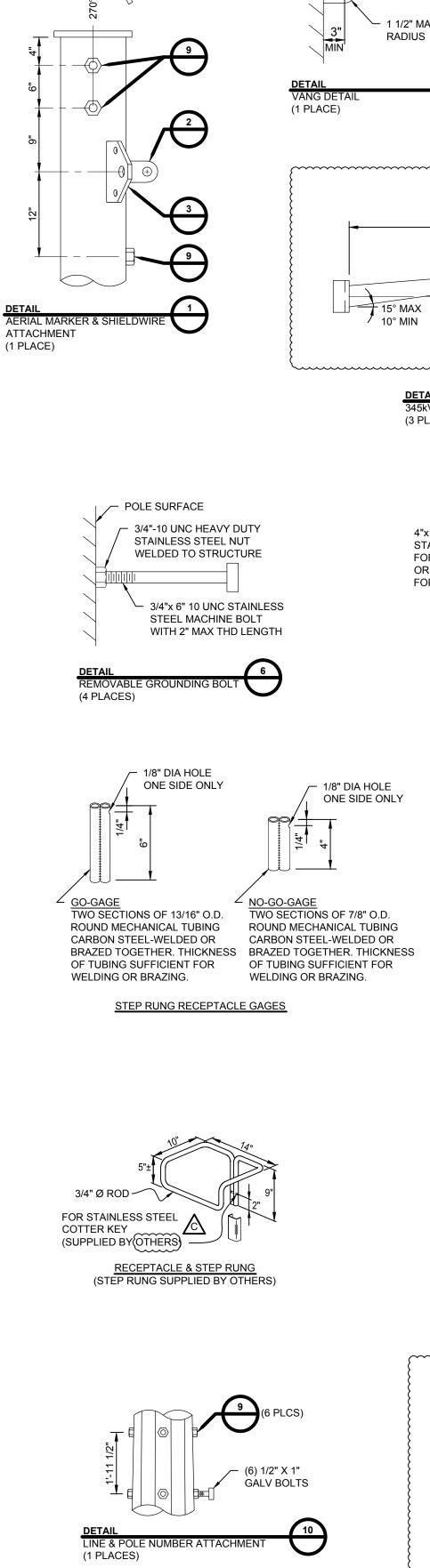
10 MAINTENANCE

9 DEFLECTION

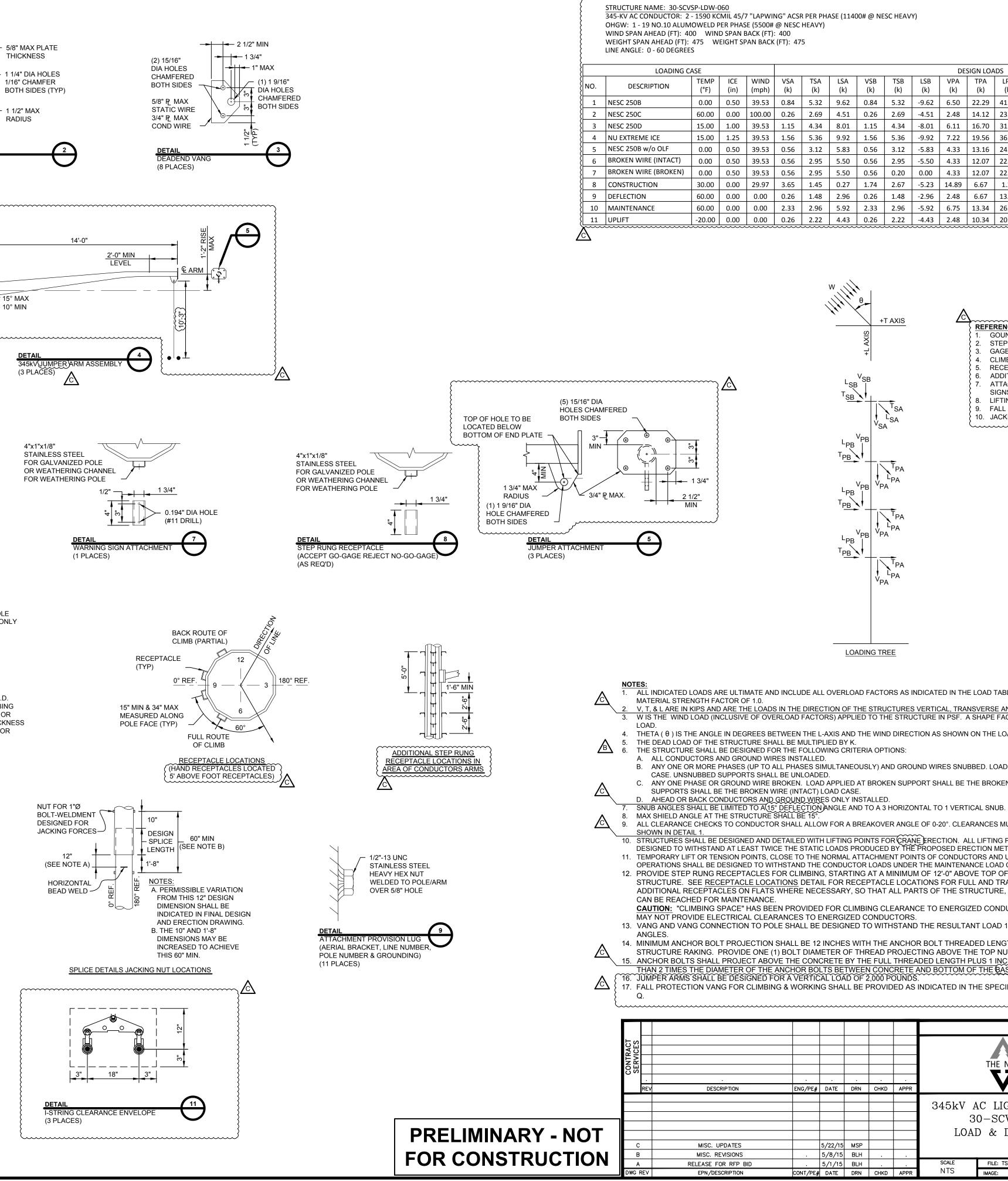
5 NESC 250B w/o OLF

6 BROKEN WIRE (INTACT)



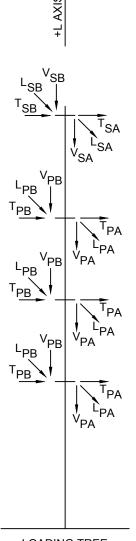


. . .



								DES	SIGN LOA	DS						}
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.84	5.32	9.62	0.84	5.32	-9.62	6.50	22.29	41.24	6.50	22.29	-41.24	10.00	90.00	1.50
00	100.00	0.26	2.69	4.51	0.26	2.69	-4.51	2.48	14.12	23.11	2.48	14.12	-23.11	29.00	90.00	1.00
00	39.53	1.15	4.34	8.01	1.15	4.34	-8.01	6.11	16.70	31.53	6.11	16.70	-31.53	4.00	90.00	1.00 }
25	39.53	1.56	5.36	9.92	1.56	5.36	-9.92	7.22	19.56	36.98	7.22	19.56	-36.98	4.00	90.00	1.00
50	39.53	0.56	3.12	5.83	0.56	3.12	-5.83	4.33	13.16	24.99	4.33	13.16	-24.99	4.00	90.00	1.00
50	39.53	0.56	2.95	5.50	0.56	2.95	-5.50	4.33	12.07	22.80	4.33	12.07	-22.80	4.00	90.00	1.00
50	39.53	0.56	2.95	5.50	0.56	0.20	0.00	4.33	12.07	22.80	4.33	0.67	0.00	4.00	90.00	1.00 }
00	29.97	3.65	1.45	0.27	1.74	2.67	-5.23	14.89	6.67	1.21	5.06	12.09	-23.49	3.45	90.00	1.50
00	0.00	0.26	1.48	2.96	0.26	1.48	-2.96	2.48	6.67	13.34	2.48	6.67	-13.34	0.00	90.00	1.00 }
00	0.00	2.33	2.96	5.92	2.33	2.96	-5.92	6.75	13.34	26.68	6.75	13.34	-26.68	0.00	90.00	2.00
00	0.00	0.26	2.22	4.43	0.26	2.22	-4.43	2.48	10.34	20.69	2.48	10.34	-20.69	0.00	90.00	1.00

+T AXIS



- **REFERENCES:** GOUNDING NUT: SKETCH B
- STEP RUNG + RECEPTACLE : SKETCH E
- GAGES FOR RECEPTACLE: SKETCH L
- CLIMBING FACILITIES: SKETCH B
- RECEPTACLE LOCATIONS: SKETCH C
- ADDITIONAL RECEPTACLE LOCATION: SKETCH D
- ATTACHMENT PROVISIONS FOR GOUNDING AND
- SIGNS: SKETCH F LIFTING VANG PROVISIONS: SKETCH J + K
- . FALL PROTECTION VANGS: SKETCH N + Q
- 10. JACKING NUT LOCATIONS: SKETCH I

LOADING TREE

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (10) SHALL BE APPLIED TO THE WIND 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE

OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE

STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES

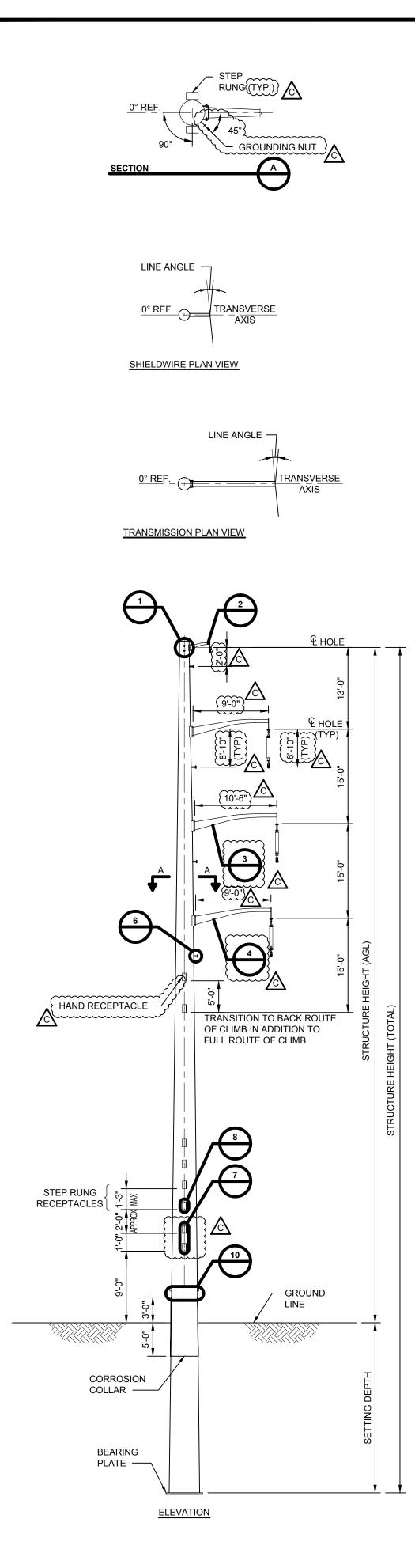
CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

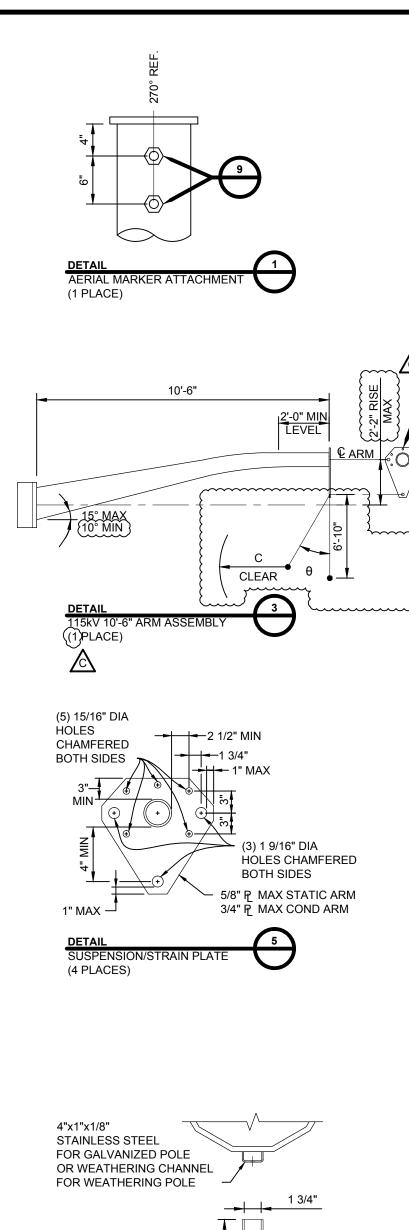
13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE 14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE

STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 16. JUMPER ARMS SHALL BE DESIGNED FOR A VERTICAL LOAD OF 2,000 POUNDS.

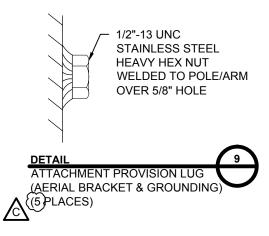
							•			С
									DRA	WN
							THE NORTHERN PASS		BL	.Н
							<b>₹7</b>		ENGIN	NEER
	ENG/PE#	DATE	DRN	CHKD	APPR		V		CE	T
								0.000	CHEC	
						345kV A	AC LIGHT DEADEND	0-60°	TA	B
						3	0-SCVSP-LDW-060		APPR	OVED
						LOAI	) & DESIGN DRAWI	NG		
2		5/22/15	MSP					110	DA	TE
s		5/8/15							5/1	/15
BID		5/1/15	BLH	•	•	SCALE	FILE: TSP-19.DWG		ING NO.	
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	19 - 00	01

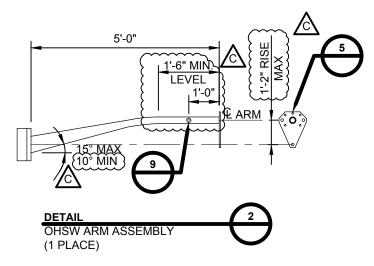


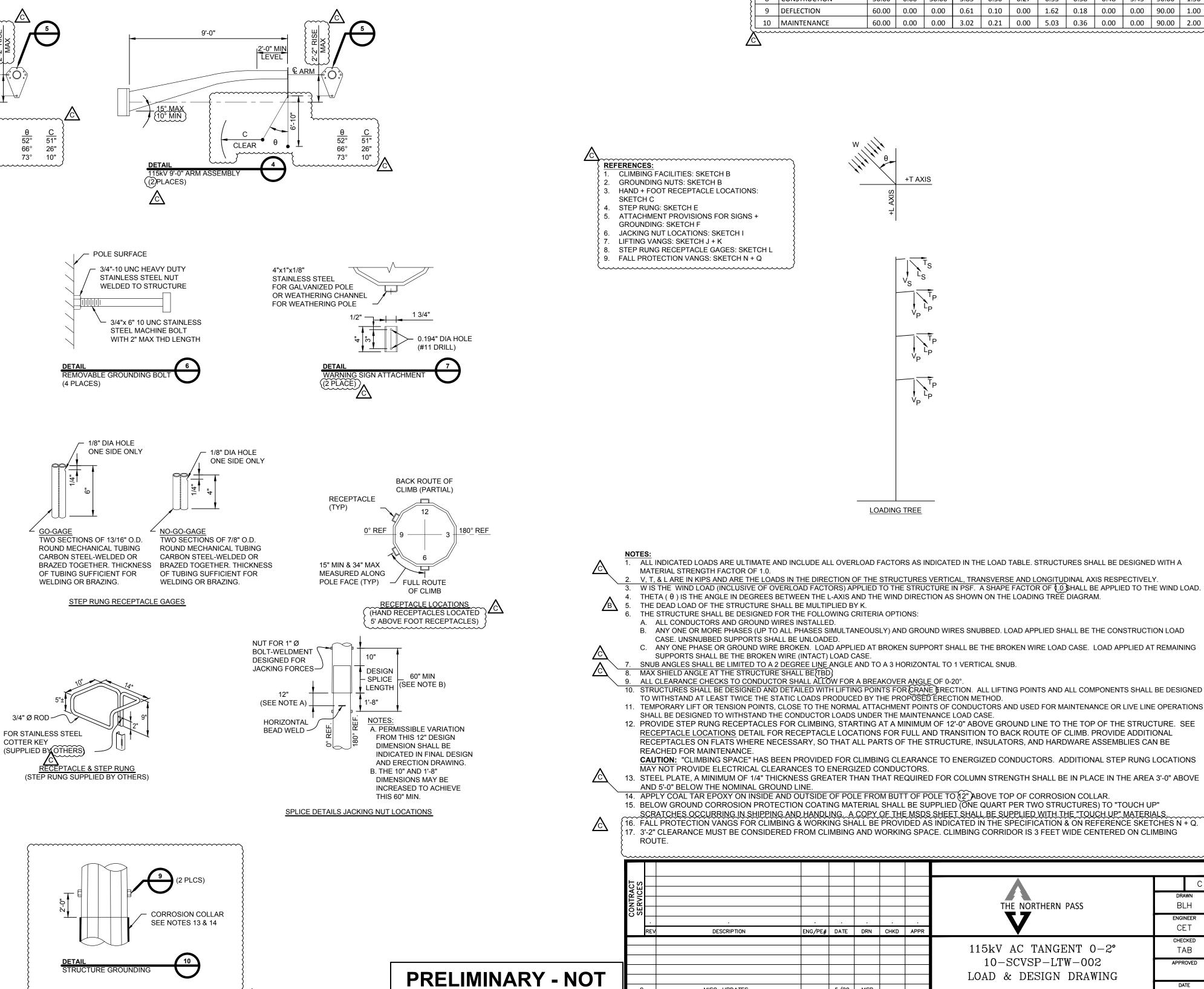




STEP RUNG RECEPTACLE (ACCEPT GO-GAGE REJECT NO-GO-GAG (AS REQ'D)







K 1.50	θ 90.00	W (psf)	LP	DESIGN LOADS								LOADING C	
	90.00		(k)	TP (k)	VP (k)	LS (k)	TS (k)	VS (k)	WIND (mph)	ICE (in)	TEMP (°F)	DESCRIPTION	NO.
1.0	50.00	10.00	0.00	1.96	4.52	0.00	1.34	2.09	39.50	0.50	0.00	NESC 250B	1
	90.00	29.00	0.00	2.20	1.62	0.00	1.03	0.61	100.00	0.00	60.00	NESC 250C	2
1.00	90.00	4.00	0.00	1.27	5.04	0.00	0.94	2.96	39.50	1.00	15.00	NESC 250D	3
1.0	90.00	4.00	0.00	1.47	6.35	0.00	1.14	4.03	39.50	1.30	15.00	NU EXTREME ICE	4
1.0	90.00	4.00	0.00	0.90	3.02	0.00	0.61	1.40	39.50	0.50	0.00	NESC 250B w/o OLF	5
1.0	90.00	4.00	0.00	0.80	3.02	0.00	0.59	1.40	39.50	0.50	0.00	BROKEN WIRE (INTACT)	6
1.0	90.00	4.00	6.75	0.68	3.02	5.50	0.50	1.40	39.50	0.50	0.00	BROKEN WIRE (BROKEN)	7
1.5	90.00	3.45	0.48	0.58	6.55	0.27	0.30	3.85	30.00	0.00	30.00	CONSTRUCTION	8
1.00	90.00	0.00	0.00	0.18	1.62	0.00	0.10	0.61	0.00	0.00	60.00	DEFLECTION	9
2.0	90.00	0.00	0.00	0.36	5.03	0.00	0.21	3.02	0.00	0.00	60.00	MAINTENANCE	10
	90.00 90.00	3.45 0.00	0.48	0.58 0.18	6.55 1.62	0.27	0.30 0.10	3.85 0.61	30.00 0.00	0.00	30.00 60.00	CONSTRUCTION DEFLECTION	8 9

115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

+T AXIS

STRUCTURE NAME: 10-SCVSP-LTW-002

WIND SPAN (FT): 800

DESCRIPTION

MISC. UPDATES

MISC. REVISIONS

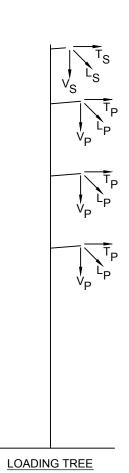
RELEASE FOR RFP BID

EPN/DESCRIPTION

в

A

DWG REV



1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

4. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE, UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE PRECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED

THE NORTHERN PASS

115kV AC TANGENT 0-2°

10-SCVSP-LTW-002

LOAD & DESIGN DRAWING

57

FILE: TSP-20.DWG

IMAGE

BLH

ENGINEER

CET

CHECKED

TAB

APPROVED

5/1/15

DRAWING NO. TSP-20-001

SCALE

NTS

TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB. 8. MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE TBD. 9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°.

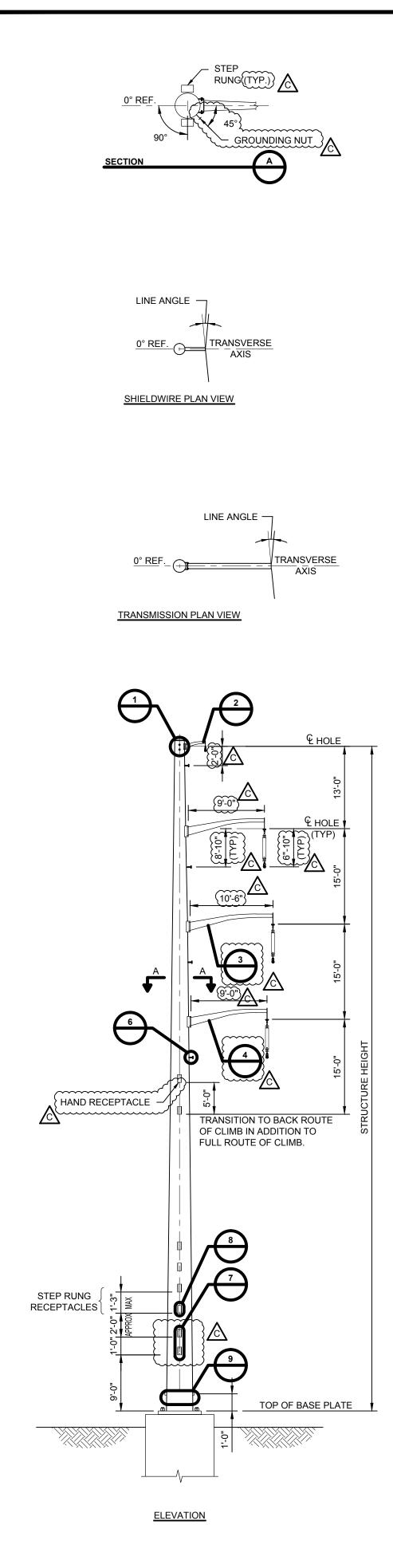
ENG/PE# DATE DRN CHKD APPR

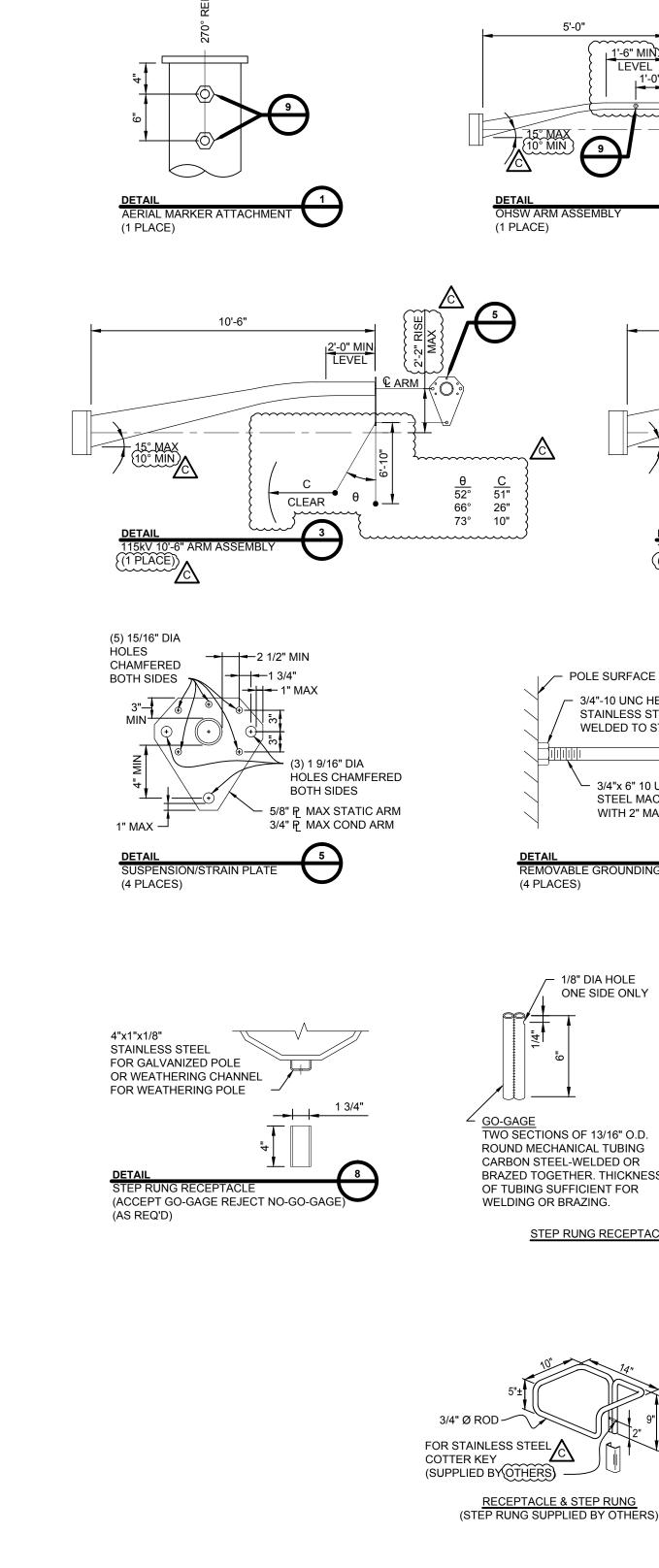
5/29 MSP

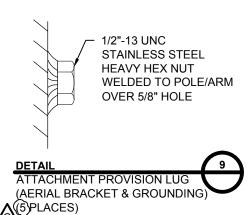
5/8/15 BLH

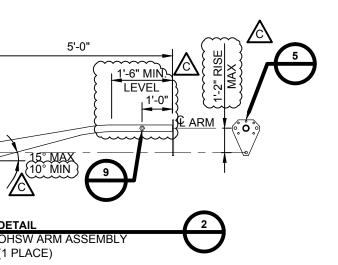
5/1/15 BLH

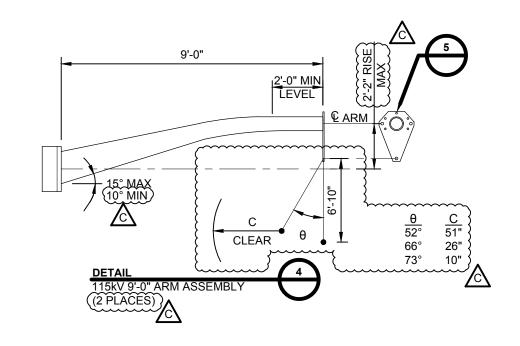
CONT/PE# DATE DRN CHKD APPR

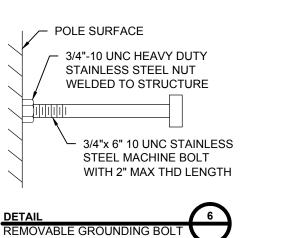


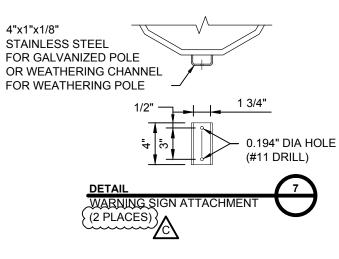


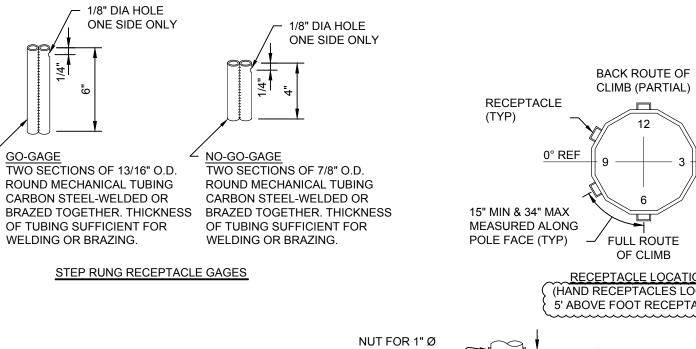


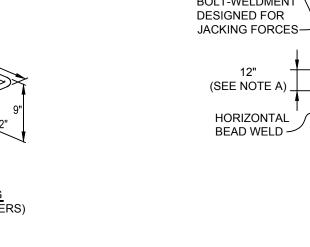


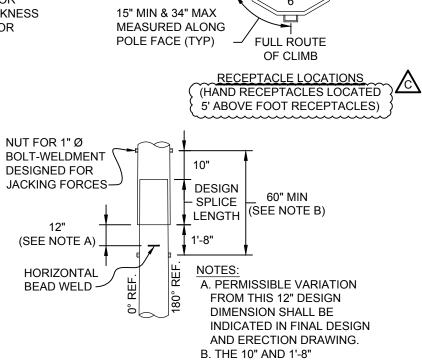












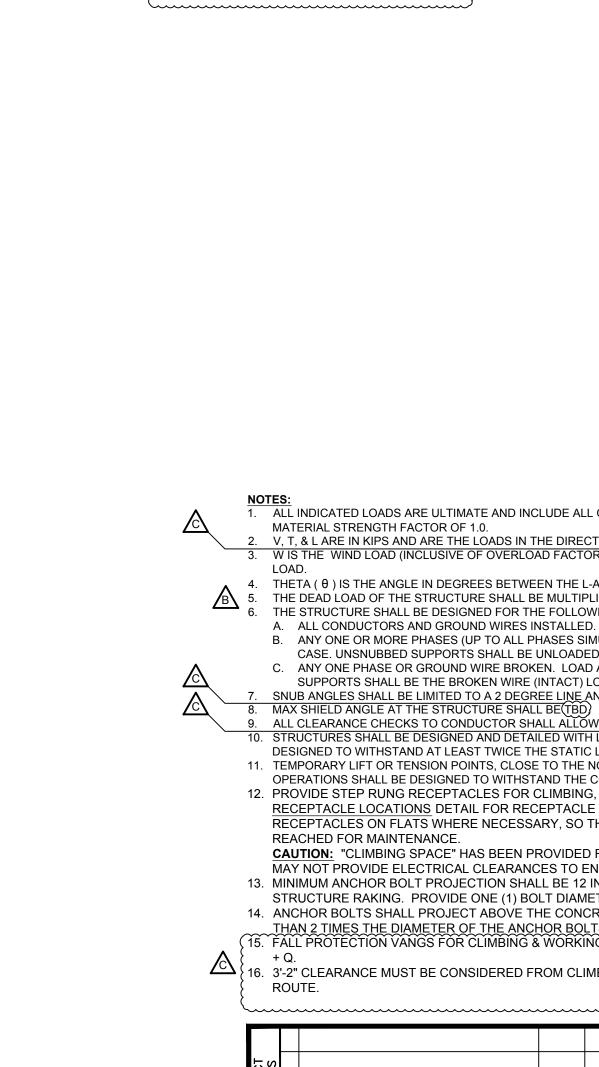
SPLICE DETAILS JACKING NUT LOCATIONS

DIMENSIONS MAY BE

THIS 60" MIN.

INCREASED TO ACHIEVE

180° REF



**REFERENCES:** 

GROUNDING NUT: SKETCH B

SIGNS: SKETCH F

STEP RUNG + RECEPTACLE : SKETCH E

GAGES FOR RECEPTACLE: SKETCH L

RECEPTACLE LOCATIONS: SKETCH C

LIFTING VANG PROVISIONS: SKETCH J + K

8. FALL PROTECTION VANGS: SKETCH N + Q 9. JACKING NUT LOCATIONS: SKETCH I

CLIMBING FACILITIES: SKETCH B

### **PRELIMINARY - NOT** FOR CONSTRUCTION в A DWG REV

CONSIDERED F	ROM CL		AND W	/ORKIN	G SPA(		ORRIDOR IS 3 FEET WIDE CENT	MBING
							THE NORTHERN PASS	C drawn BLH engineer
N	ENG/PE#	DATE	DRN	CHKD	APPR		V	CET
						10	«V AC TANGENT 0- 0-SCVSP-LTW-002 ) & DESIGN DRAWI	CHECKED TAB approved
ES NS		5/29 5/8/15	MSP BLH		· ·	Bom		date 5/1/15
ION	CONT/PE#	5/1/15	BLH	CHKD	APPR	scale NTS	FILE: TSP-20A.DWG IMAGE:	ng no. 20A-001

THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 15. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N

13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE

**CAUTION:** "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS

MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°.

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE (TBD)

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

DESCRIPTI

MISC. UPDATES

MISC. REVISION

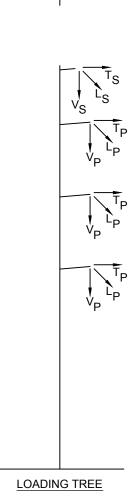
EPN/DESCRIPTI

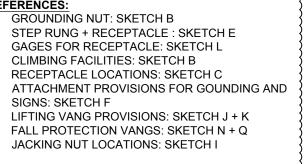
RELEASE FOR RFP

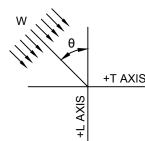
4. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM. 5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K. 6. THE STRUCTURE SHALL BE DECIDING FOR THE STRUCTURE SHALL BE MULTIPLIED BY K.

V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.0 SHALL BE APPLIED TO THE WIND

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A







WEIGHT SPAN (FT): 1250 

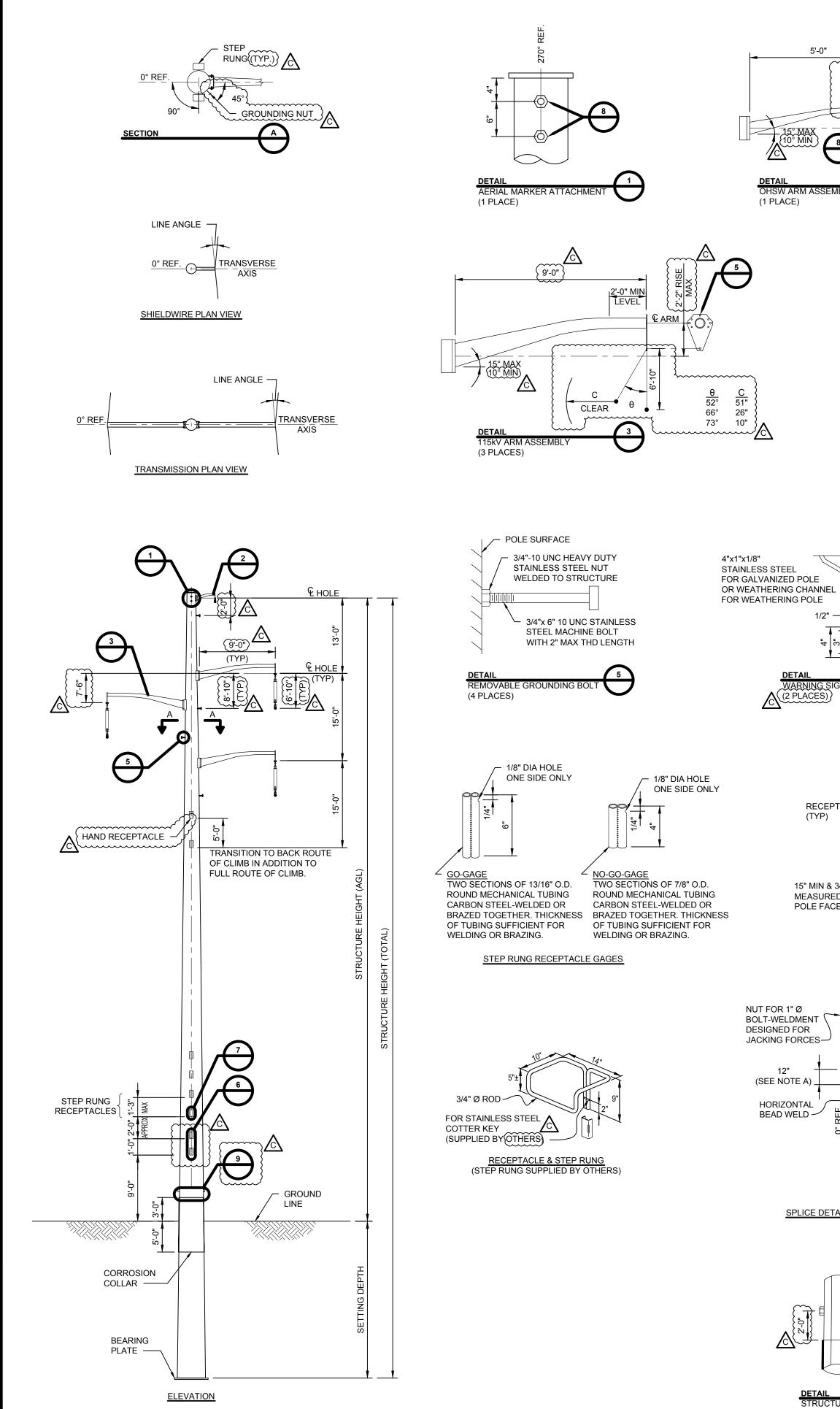
WIND SPAN (FT): 800

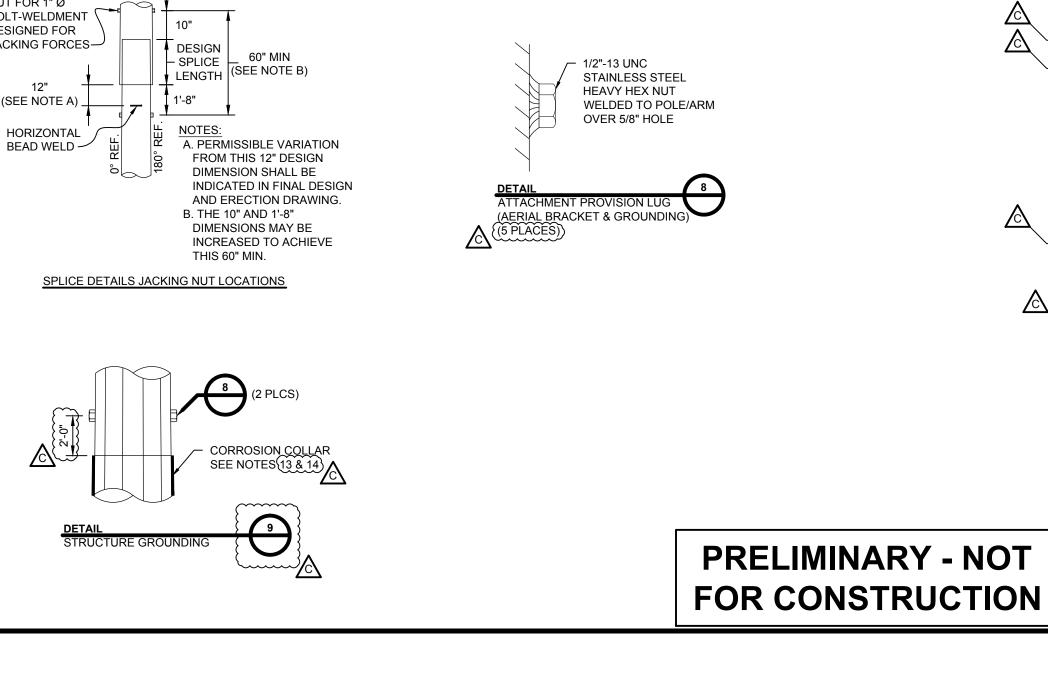
STRUCTURE NAME: 10-SCVSP-LTW-002

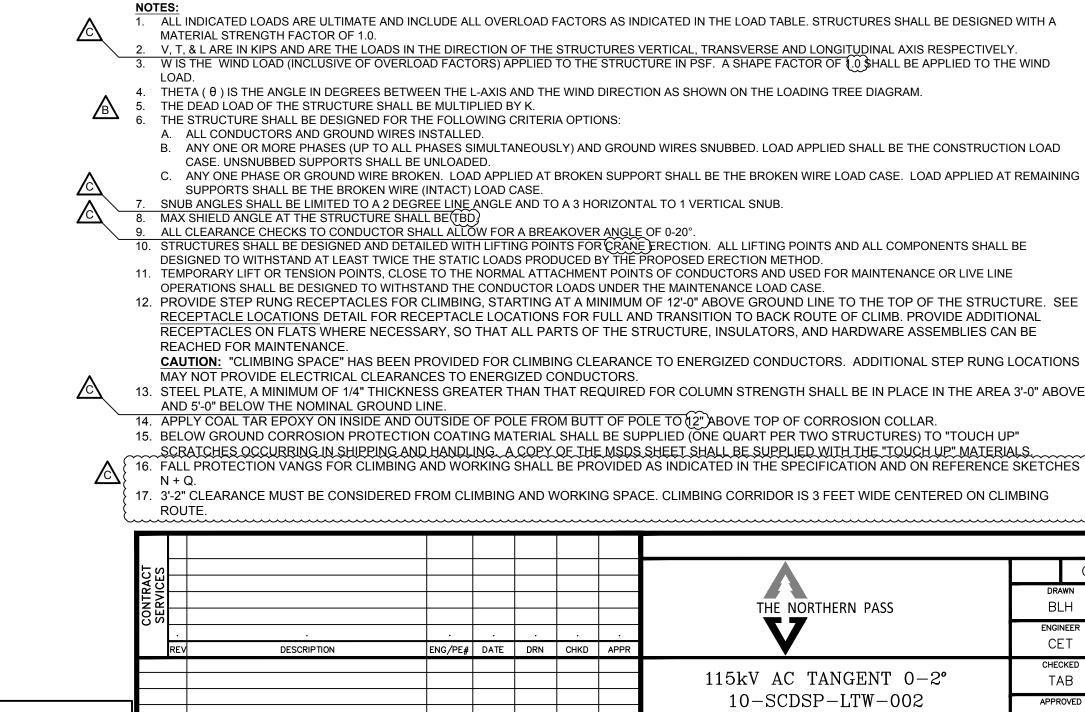
}	LINE ANGLE: 0 - 2 DEGREES													
	LOADING C	ASE						DE	SIGN LOA	DS				
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к	
1	NESC 250B	0.00	0.50	39.50	2.09	1.34	0.00	4.52	1.96	0.00	10.00	90.00	1.50	
2	NESC 250C	60.00	0.00	100.00	0.61	1.03	0.00	1.62	2.20	0.00	29.00	90.00	1.00	
3	NESC 250D	15.00	1.00	39.50	2.96	0.94	0.00	5.04	1.27	0.00	4.00	90.00	1.00	
4	NU EXTREME ICE	15.00	1.30	39.50	4.03	1.14	0.00	6.35	1.47	0.00	4.00	90.00	1.00	
5	NESC 250B w/o OLF	0.00	0.50	39.50	1.40	0.61	0.00	3.02	0.90	0.00	4.00	90.00	1.00	
6	BROKEN WIRE (INTACT)	0.00	0.50	39.50	1.40	0.59	0.00	3.02	0.80	0.00	4.00	90.00	1.00	
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.50	1.40	0.50	5.50	3.02	0.68	6.75	4.00	90.00	1.00	
8	CONSTRUCTION	30.00	0.00	30.00	3.85	0.30	0.27	6.55	0.58	0.48	3.45	90.00	1.50	
9	DEFLECTION	60.00	0.00	0.00	0.61	0.10	0.00	1.62	0.18	0.00	0.00	90.00	1.00	
10	MAINTENANCE	60.00	0.00	0.00	3.02	0.21	0.00	5.03	0.36	0.00	0.00	90.00	2.00	

115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

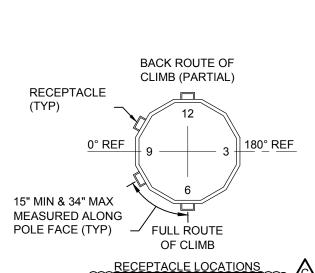






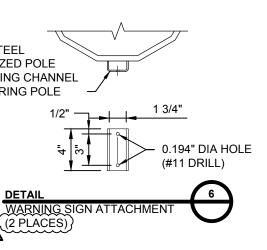
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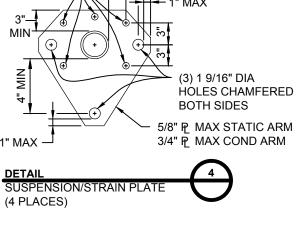
DWG REV

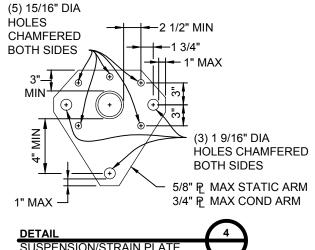


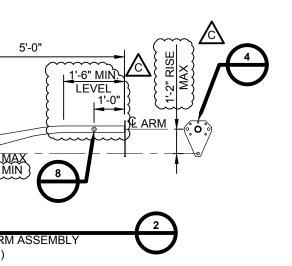
HAND RECEPTACLES LOCATED

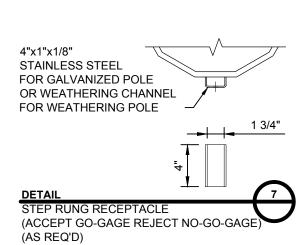
5' ABOVE FOOT RECEPTACLES)

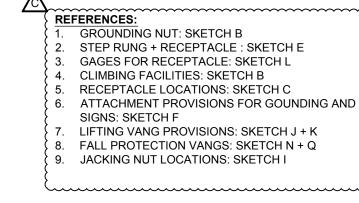












NCE MUST BE CONSIDERE		MBING	AND W	/ORKIN			ORRIDOR IS 3 FEET WIDE CENT		MBING				
							λ		С				
							THE NORTHERN PASS						
			•	•				ENGINEER					
DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR				CET				
							«V AC TANGENT 0-		checked TAB				
						1	0-SCDSP-LTW-002		APPROVED				
						LOAI	D & DESIGN DRAWI	NG					
MISC. UPDATES		5/29/15	MSP						date 5/1/15				
MISC. REVISIONS		5/8/15	BLH	•					5/1/15				
RELEASE FOR RFP BID		5/1/15	BLH			SCALE	FILE: TSP-21.DWG		ING NO.				
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	21-001				

SCRATCHES OCCURRING IN SHIPPING AND HANDLING. A COPY OF THE MSDS SHEET SHALL BE SUPPLIED WITH THE "TOUCH UP" MATERIALS. 16. FALL PROTECTION VANGS FOR CLIMBING AND WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES

14. APPLY COAL TAR EPOXY ON INSIDE AND OUTSIDE OF POLE FROM BUTT OF POLE TO (2") ABOVE TOP OF CORROSION COLLAR. 15. BELOW GROUND CORROSION PROTECTION COATING MATERIAL SHALL BE SUPPLIED (ONE QUART PER TWO STRUCTURES) TO "TOUCH UP"

MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. STEEL PLATE, A MINIMUM OF 1/4" THICKNESS GREATER THAN THAT REQUIRED FOR COLUMN STRENGTH SHALL BE IN PLACE IN THE AREA 3'-0" ABOVE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE

DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. 10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE

7. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

STRUCTURE NAME: 10-SCDSP-LTW-002

LOADING CASE

WIND SPAN (FT): 800 WEIGHT SPAN (FT): 1000

LINE ANGLE: 0 - 2 DEGREES

DESCRIPTION

INO.

1 NESC 250B

2 NESC 250C

3 NESC 250D

4 NU EXTREME ICE

8 CONSTRUCTION

10 MAINTENANCE

9 DEFLECTION

5 NESC 250B w/o OLF

6 BROKEN WIRE (INTACT)

115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)

+T AXIS

VS

(k)

7 BROKEN WIRE (BROKEN) 0.00 0.50 39.50 1.13 0.50 5.50 2.49 0.68 6.75 4.00 90.00 1.00

LS

(k)

0.00 0.50 39.50 1.69 1.34 0.00 3.74 1.96 0.00 10.00 90.00 1.50

60.00 0.00 100.00 0.50 1.03 0.00 1.34 2.20 0.00 29.00 90.00 1.00

15.00 1.00 39.50 2.38 0.94 0.00 4.11 1.27 0.00 4.00 90.00 1.00

15.00 1.30 39.50 3.23 1.14 0.00 5.16 1.47 0.00 4.00 90.00 1.00

0.00 0.50 39.50 1.13 0.61 0.00 2.49 0.90 0.00 4.00 90.00 1.00

0.00 0.50 39.50 1.13 0.59 0.00 2.49 0.80 0.00 4.00 90.00 1.00

30.00 0.00 30.00 3.68 0.30 0.27 6.14 0.58 0.48 3.45 90.00 1.50 60.00 0.00 0.00 0.50 0.10 0.00 1.34 0.18 0.00 0.00 90.00 1.00

60.00 0.00 0.00 2.80 0.21 0.00 4.49 0.36 0.00 0.00 90.00 2.00

(k)

(k)

DESIGN LOADS

(k)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

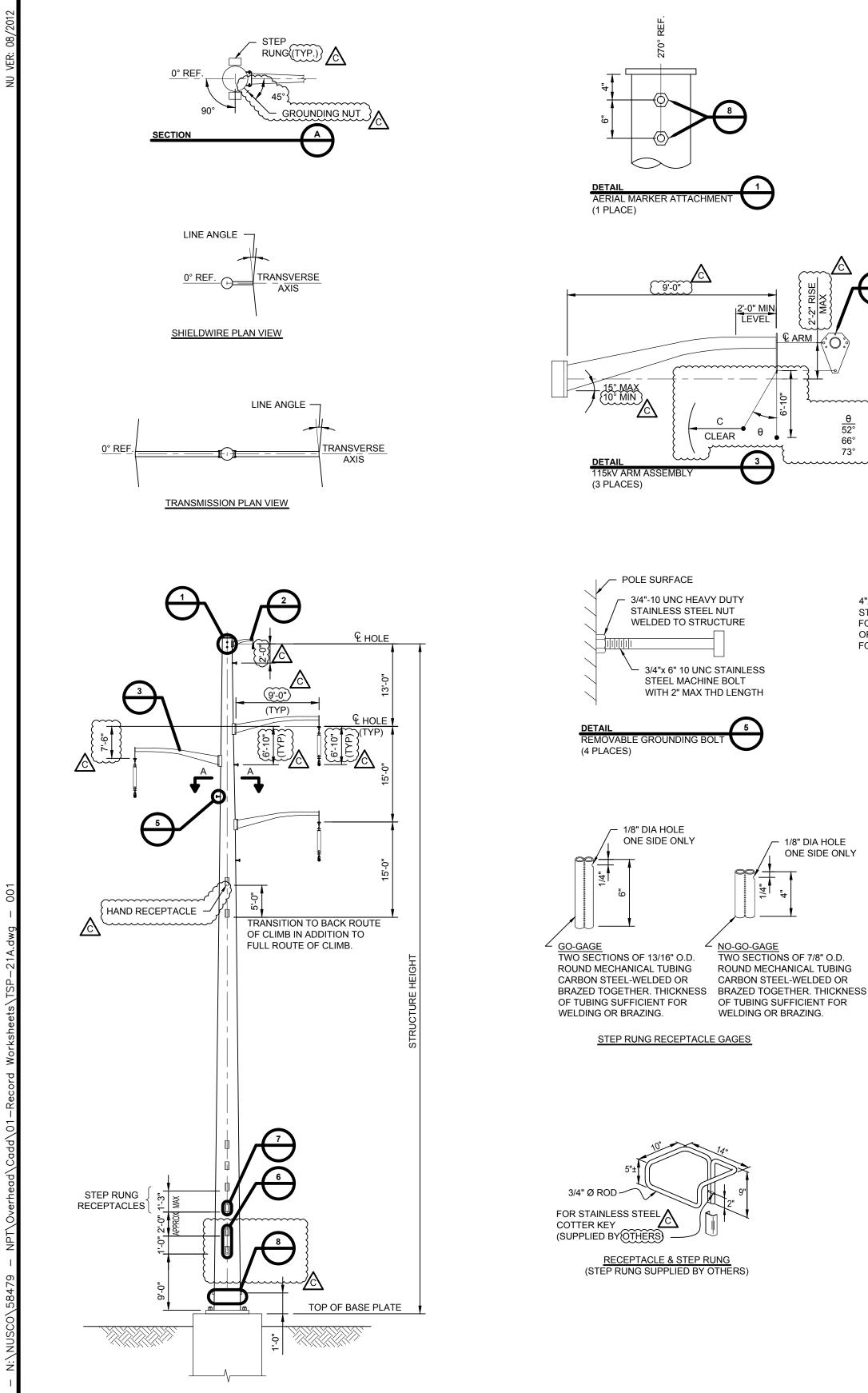
TEMP

ICE

(°F) (in) (mph)

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

LOADING TREE



ELEVATION

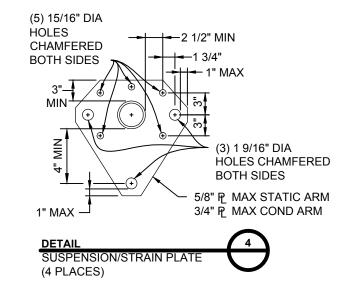
1/8" DIA HOLE

ONE SIDE ONLY

66° 26"

73° 10"

(1 PLACE)



4"x1"x1/8"

(AS REQ'D)

STAINLESS STEEL

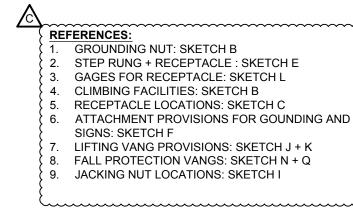
FOR GALVANIZED POLE

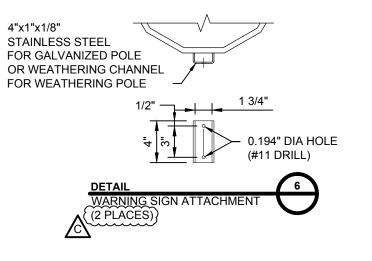
OR WEATHERING CHANNEL FOR WEATHERING POLE

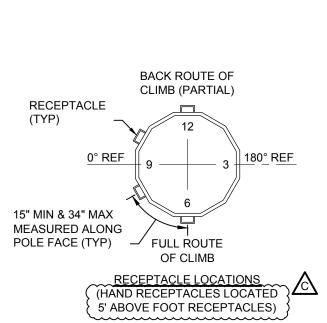
STEP RUNG RECEPTACLE

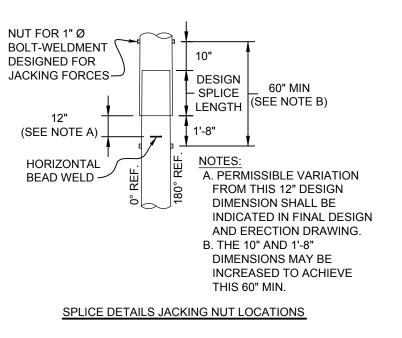
(ACCEPT GO-GAGE REJECT NO-GO-GAG

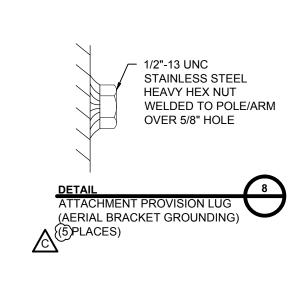
1 3/4"

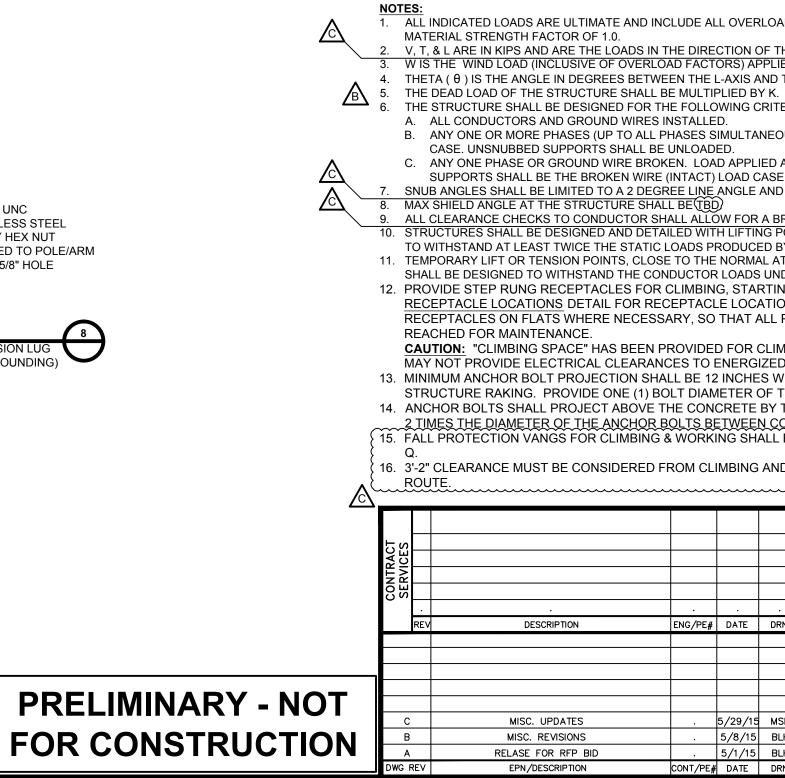




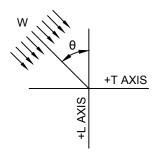








	STRUCTURE NAME: 10-SCDSP-LTW-002 115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 800 WEIGHT SPAN (FT): 1000 LINE ANGLE: 0 - 2 DEGREES												
	LOADING C	ASE						DE	SIGN LOA	\DS			
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.50	1.69	1.34	0.00	3.74	1.96	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.50	1.03	0.00	1.34	2.20	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.50	2.38	0.94	0.00	4.11	1.27	0.00	4.00	90.00	1.00
4	NU EXTREME ICE	15.00	1.30	39.50	3.23	1.14	0.00	5.16	1.47	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.50	1.13	0.61	0.00	2.49	0.90	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.50	1.13	0.59	0.00	2.49	0.80	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.50	1.13	0.50	5.50	2.49	0.68	6.75	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	30.00	3.68	0.30	0.27	6.14	0.58	0.48	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.50	0.10	0.00	1.34	0.18	0.00	0.00	90.00	1.00
10	MAINTENANCE	60.00	0.00	0.00	2.80	0.21	0.00	4.49	0.36	0.00	0.00	90.00	2.00



LOADING TREE

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 1.0 SHALL BE APPLIED TO THE WIND LOAD. 4. THETA ( $\theta$ ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

7. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. 10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

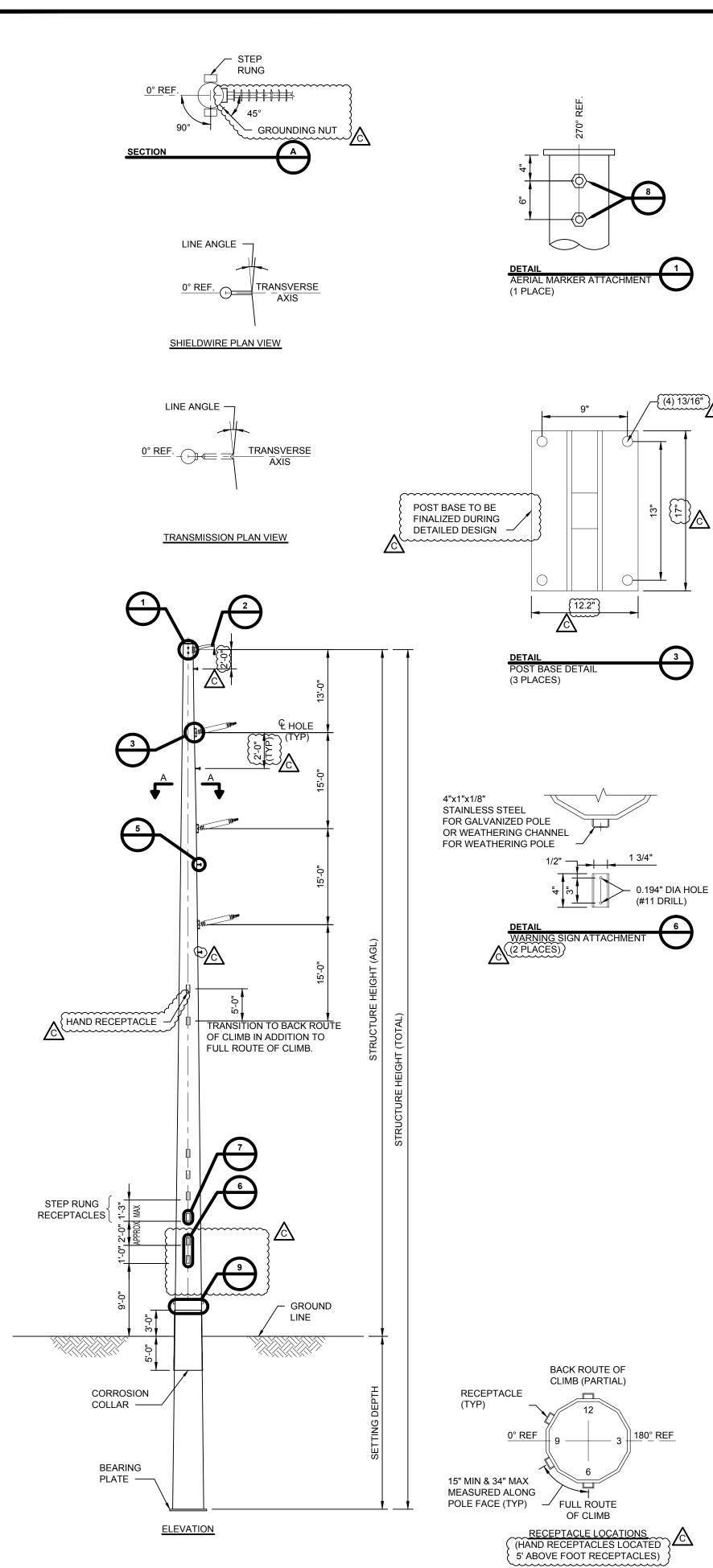
13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN

2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 15. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

16. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING

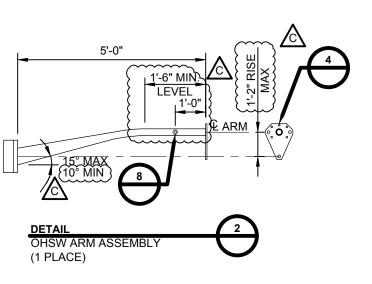
										с			
	_								DRAW	/N			
							THE NORTHERN PASS		BLł	4			
	<u> </u>						V						
	ENG/PE#	DATE	DRN	CHKD	APPR		V		CE	T			
									CHECK				
						115	«V AC TANGENT 0-	-2"	TAE	3			
						1	0-SCDSP-LTW-002		APPRO	VED			
						LOAI	D & DESIGN DRAW	NG					
 S	· .	5/29/15	MSP						DATE				
IS	· ·	5/8/15	BLH	·	•				5/1/	′15			
BID		5/1/15	BLH						VING NO.	~ 1			
N	CONT/PE#	DATE	DRN	СНКД	APPR	NTS	21A - 0	01					

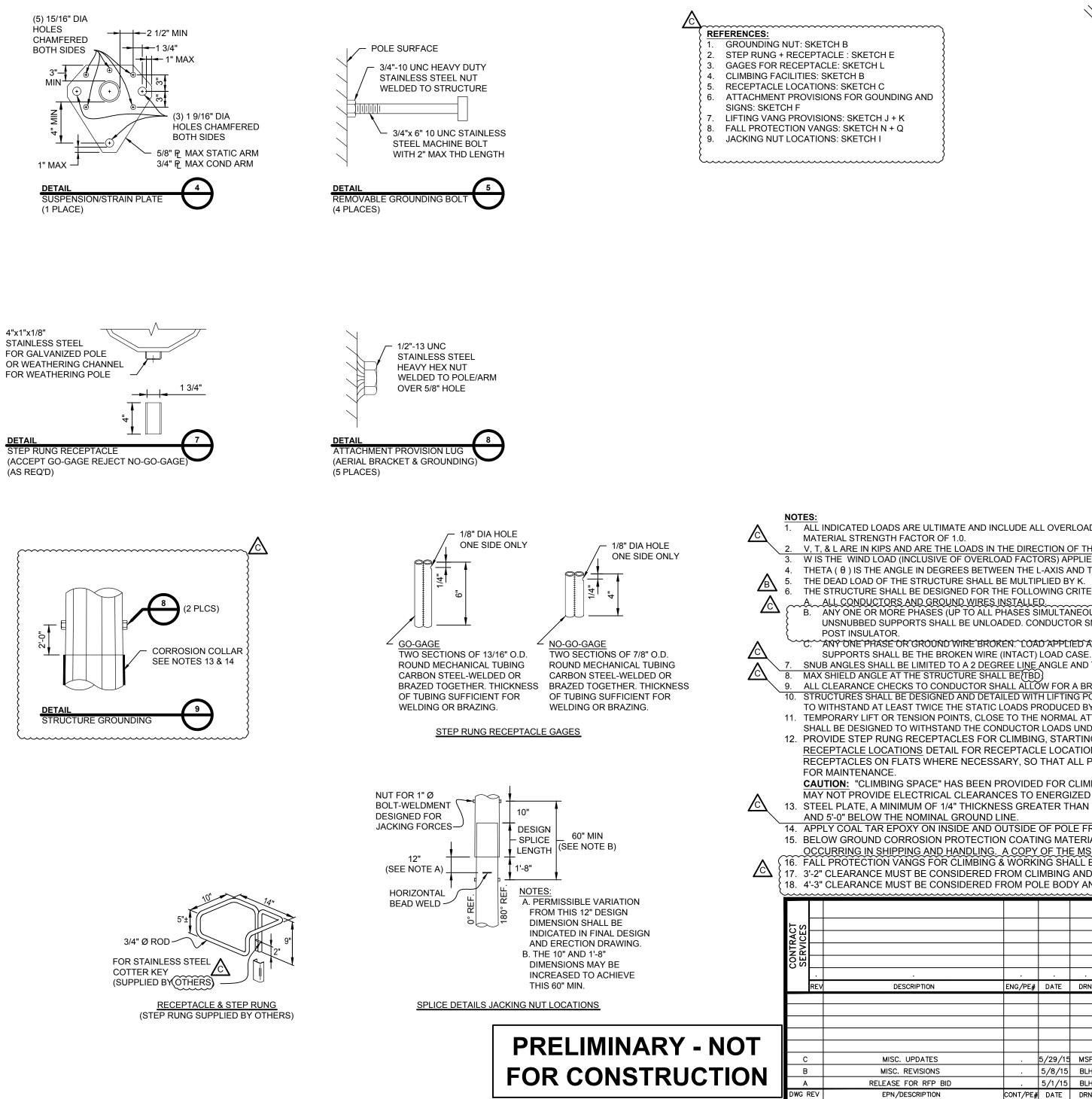




4"x1"x1/8"

(AS REQ'D)

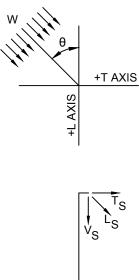


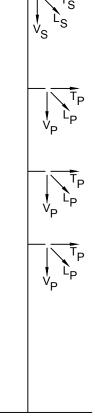


~~~~	STRUCTURE NAME: 10-SCVSP-LTW-002 115-KV AC CONDUCTOR: 1 - 1272 KCMIL 45/7 "BITTERN" ACSR PER PHASE (10000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 600 WEIGHT SPAN (FT): 950 LINE ANGLE: 0 - 2 DEGREES												
	LOADING C	ASE						DE	SIGN LOA	\DS			
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
1	NESC 250B	0.00	0.50	39.53	1.61	1.09	0.00	4.28	1.80	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.48	0.81	0.00	1.61	2.06	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.26	0.78	0.00	4.53	1.14	0.00	4.00	90.00	1.00
4	NU EXTREME ICE	15.00	1.25	39.53	3.07	0.94	0.00	5.59	1.31	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.07	0.51	0.00	2.85	0.85	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.07	0.49	0.00	2.85	0.68	0.00	4.00	90.00	1.00
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.07	0.40	5.50	2.85	0.57	6.00	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.44	0.25	0.24	6.71	0.58	0.51	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.48	0.10	0.00	1.61	0.19	0.00	0.00	90.00	1.00

60.00 0.00 0.00 2.75 0.21 0.00 5.02 0.38 0.00 0.00 90.00 2.00

10 MAINTENANCE





LOADING TREE

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE. UNSNUBBED SUPPORTS SHALL BE UNLOADED. CONDUCTOR SNUB LOADS SHALL BE APPLIED ON THE POLE SHAFT AT A POINT NEAR THE ATTACHMENT OF THE

°C.~~ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING^

SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. 10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE PRECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE

RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE REACHED

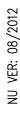
CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. STEEL PLATE, A MINIMUM OF 1/4" THICKNESS GREATER THAN THAT REQUIRED FOR COLUMN STRENGTH SHALL BE IN PLACE IN THE AREA 3'-0" ABOVE

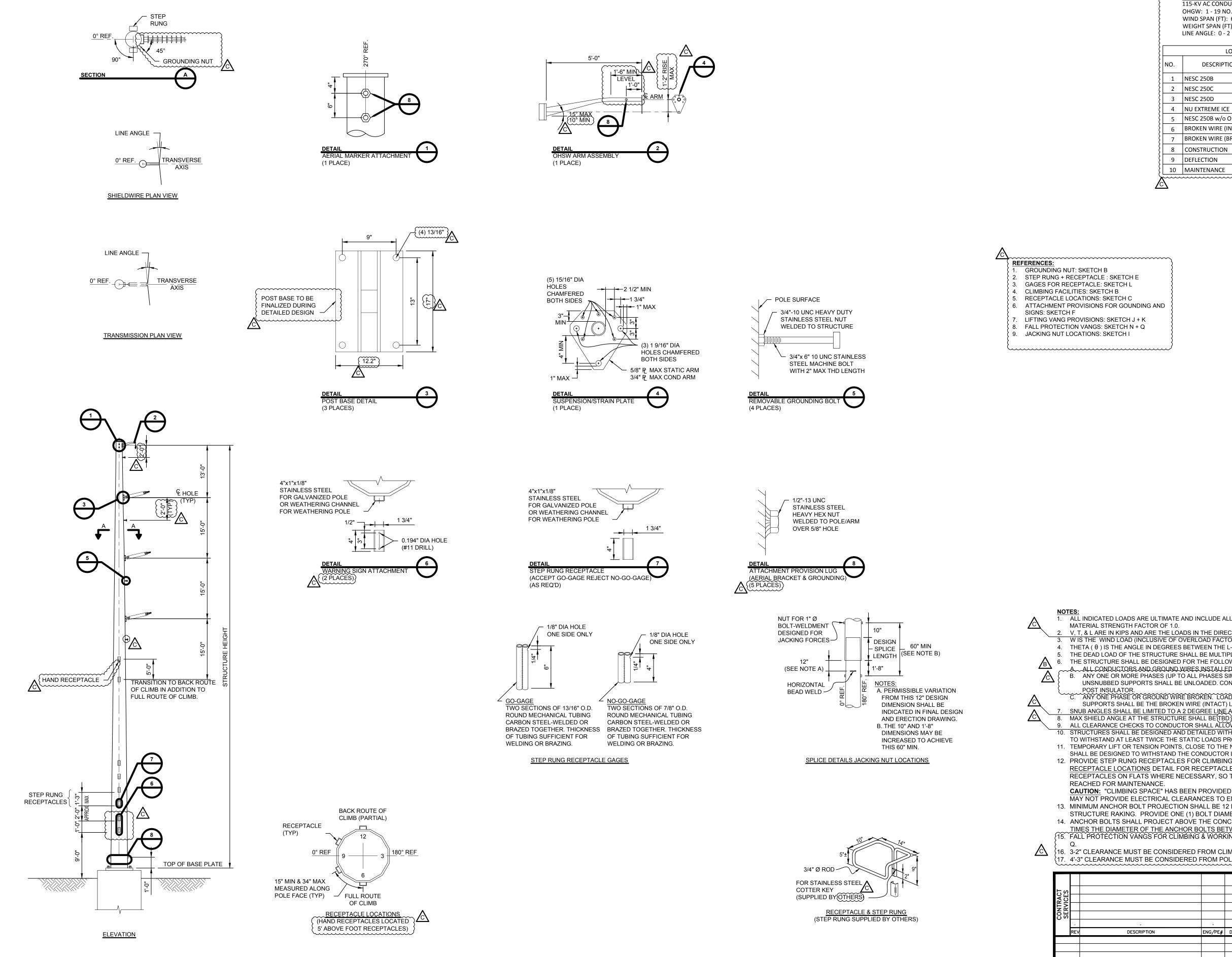
14. APPLY COAL TAR EPOXY ON INSIDE AND OUTSIDE OF POLE FROM BUTT OF POLE TO (2") ABOVE TOP OF CORROSION COLLAR.

15. BELOW GROUND CORROSION PROTECTION COATING MATERIAL SHALL BE SUPPLIED (ONE QUART PER TWO STRUCTURES) TO "TOUCH UP" SCRATCHES OCCURRING IN SHIPPING AND HANDLING. A COPY OF THE MSDS SHEET SHALL BE SUPPLIED WITH THE "TOUCH UP" MATERIALS. 16. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N + C 17. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE 18. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

	С
	RTHERN PASS BLH
ENG/PE# DATE DRN CHKD APPR	CET
II5kV AC	TANGENT 0-2° TAB
10-SCVS	SP-LTW-002 Approved
	ESIGN DRAWING
	DATE

						LOAI	D & DESIGN	DRAWI	NG		
										DATE	•
		5/29/15	MSP		•						
6		5/8/15	BLH							5/1/15	
BID		5/1/15	BLH			SCALE	FILE: TSP-22.DWG			ING NO.	
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:		TSP-	22-001	





PRELIMINARY - NOT

FOR CONSTRUCTION

							THE NORTHERN PASS		C drawn BLH
N	ENG/PE#	DATE	DRN	CHKD	APPR		V		engineer CET
							«V AC TANGENT 0-	-2°	CHECKED TAB
							0-SCVSP-LTW-002		APPROVED
						LOAI	D & DESIGN DRAWI	NG	
E		5/29/15							date 5/1/15
NS		5/8/15	BLH		•				
P BID	<u> </u>	5/1/15		•	•	SCALE	FILE: TSP-22A.DWG		
ION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	1257-2	22A-001

16. 3-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE

TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. {15. řÁLL PŘŎŤĚČŤIŎŇ VĂŇĠŠ FŎŘ ČĽIMBIŇĠ & ŴŎŘŘIŇĠ ŠHĂĽL BĚ PŘŎVIDĚĎ ĂŠ IŇDIČAŤĚĎ IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

14. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2

13. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. 10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE UNSNUBBED SUPPORTS SHALL BE UNLOADED. CONDUCTOR SNUB LOADS SHALL BE APPLIED ON THE POLE SHAFT AT A POINT NEAR THE ATTACHMENT OF THE ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

6. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS: A. ALL CONDUCTORS AND GROUND WIRES INSTALLED.

MISC. UPDATE

MISC. REVISION

EPN/DESCRIPTI

RELEASE FOR RFP

A

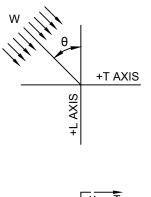
DWG REV

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (0) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

LOADING TREE



115-KV AC CONDUCTOR: 1 - 1272 KCMIL 45/7 "BITTERN" ACSR PER PHASE (10000# @ NESC HEAVY)

VS

(k)

7 BROKEN WIRE (BROKEN) 0.00 0.50 39.53 1.07 0.40 5.50 2.85 0.57 6.00 4.00 90.00 1.00

LS

(k)

0.00 0.50 39.53 1.61 1.09 0.00 4.28 1.80 0.00 10.00 90.00 1.50

60.00 0.00 100.00 0.48 0.81 0.00 1.61 2.06 0.00 29.00 90.00 1.00

15.00 1.00 39.53 2.26 0.78 0.00 4.53 1.14 0.00 4.00 90.00 1.00

15.00 1.25 39.53 3.07 0.94 0.00 5.59 1.31 0.00 4.00 90.00 1.00

0.00 0.50 39.53 1.07 0.51 0.00 2.85 0.85 0.00 4.00 90.00 1.00

0.00 0.50 39.53 1.07 0.49 0.00 2.85 0.68 0.00 4.00 90.00 1.00

30.00 0.00 29.97 3.44 0.25 0.24 6.71 0.58 0.51 3.45 90.00 1.50

60.00 0.00 0.00 0.48 0.10 0.00 1.61 0.19 0.00 0.00 90.00 1.00

60.00 0.00 0.00 2.75 0.21 0.00 5.02 0.38 0.00 0.00 90.00 2.00

(k)

TS

(k)

DESIGN LOADS

(k)

OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY)

TEMP

ICE

(°F) (in) (mph)

INO.

1 NESC 250B

2 NESC 250C

3 NESC 250D

4 NU EXTREME ICE

8 CONSTRUCTION

10 MAINTENANCE

9 DEFLECTION

5 NESC 250B w/o OLF

6 BROKEN WIRE (INTACT)

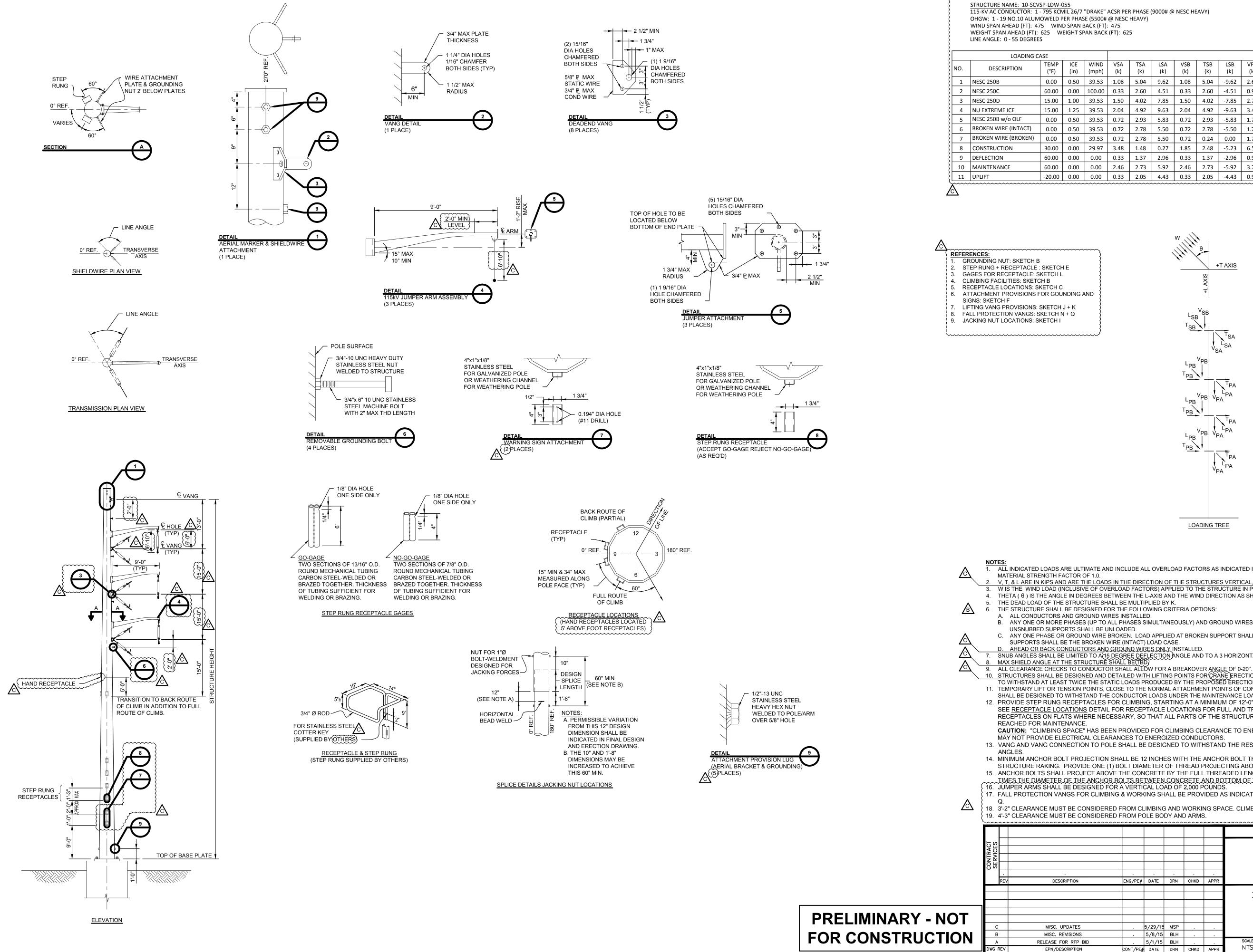
STRUCTURE NAME: 10-SCVSP-LTW-002

LOADING CASE

WIND SPAN (FT): 600

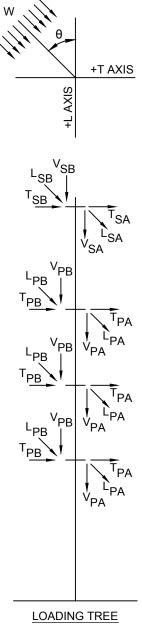
WEIGHT SPAN (FT): 950 LINE ANGLE: 0 - 2 DEGREES

DESCRIPTION



7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)	
ASE (5500# @ NESC HEAVY)	

			DESIGN LOADS													
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	1.08	5.04	9.62	1.08	5.04	-9.62	2.64	8.20	15.96	2.64	8.20	-15.96	10.00	90.00	1.50
00	100.00	0.33	2.60	4.51	0.33	2.60	-4.51	0.96	5.25	8.95	0.96	5.25	-8.95	29.00	90.00	1.00
00	39.53	1.50	4.02	7.85	1.50	4.02	-7.85	2.77	6.27	12.52	2.77	6.27	-12.52	4.00	90.00	1.00
25	39.53	2.04	4.92	9.63	2.04	4.92	-9.63	3.42	7.34	14.66	3.42	7.34	-14.66	4.00	90.00	1.00
50	39.53	0.72	2.93	5.83	0.72	2.93	-5.83	1.76	4.80	9.67	1.76	4.80	-9.67	4.00	90.00	1.00
50	39.53	0.72	2.78	5.50	0.72	2.78	-5.50	1.76	4.49	9.00	1.76	4.49	-9.00	4.00	90.00	1.00
50	39.53	0.72	2.78	5.50	0.72	0.24	0.00	1.76	4.49	9.00	1.76	0.33	0.00	4.00	90.00	1.00
00	29.97	3.48	1.48	0.27	1.85	2.48	-5.23	6.59	2.68	0.48	2.79	4.42	-9.24	3.45	90.00	1.50
00	0.00	0.33	1.37	2.96	0.33	1.37	-2.96	0.96	2.40	5.20	0.96	2.40	-5.20	0.00	90.00	1.00
00	0.00	2.46	2.73	5.92	2.46	2.73	-5.92	3.72	4.80	10.40	3.72	4.80	-10.40	0.00	90.00	2.00
00	0.00	0.33	2.05	4.43	0.33	2.05	-4.43	0.96	3.69	7.99	0.96	3.69	-7.99	0.00	90.00	1.00



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6. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SNUB ANGLES SHALL BE LIMITED TO A 15 DEGREE DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE(TBD)

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

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CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

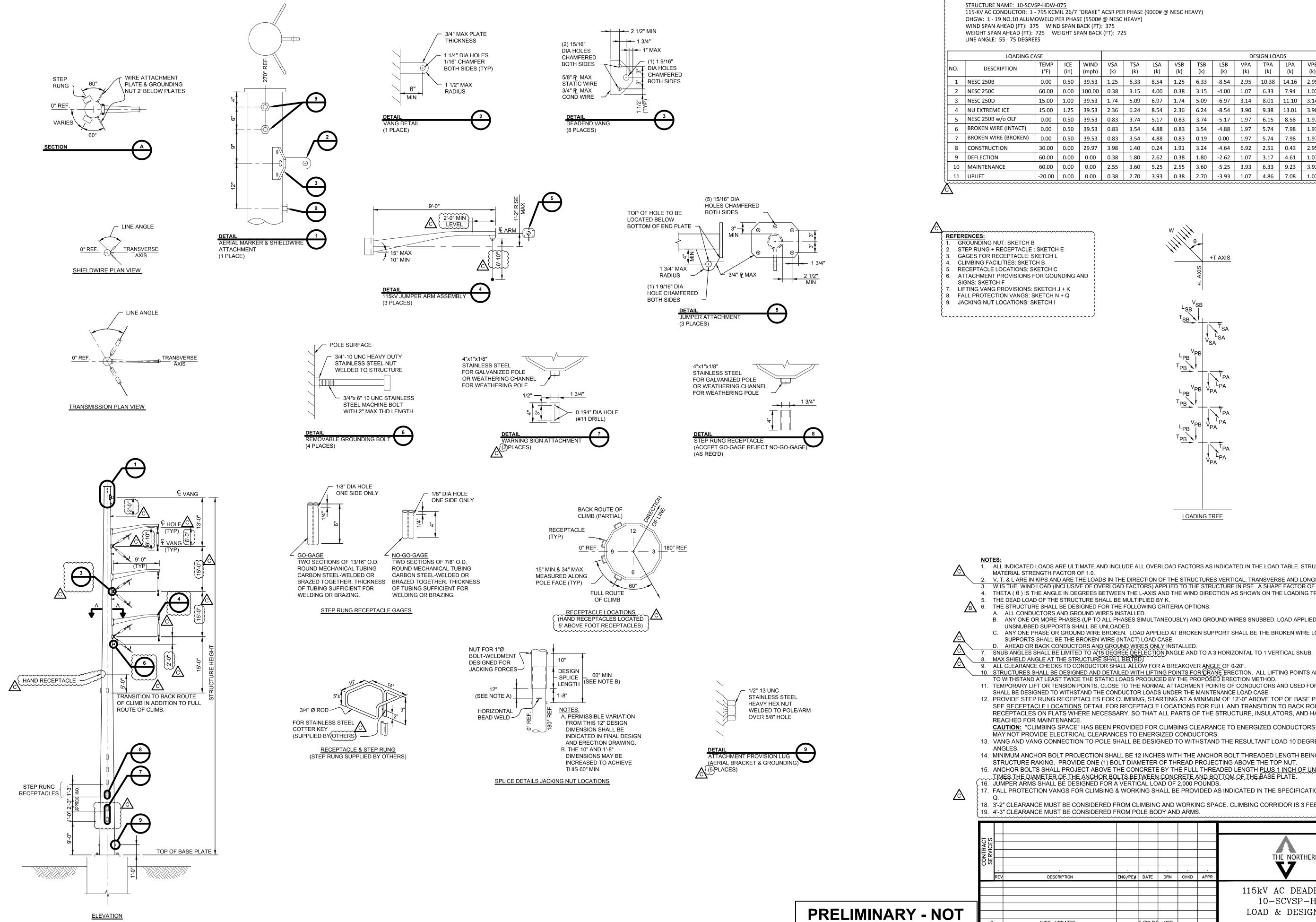
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

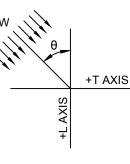
									С					
									DRAWN					
							THE NORTHERN PASS		BLH					
	1.			•			V							
	ENG/PE#	DATE	DRN	CHKD	APPR		V		CET					
									CHECKED					
						115k	V AC DEADEND 0-	55°	TAB					
						1	0-SCVSP-LDW-055		APPROVED					
						LOA	D & DESIGN DRAWI	NG						
5		5/29/15	MSP											
S		5/8/15	BLH						5/1/15					
BID		5/1/15	BLH			SCALE	FILE: TSP-23.DWG		ING NO.					
N	CONT/PE#	DATE	DRN	СНКД	APPR	NTS	IMAGE:	TSP-	23-001					

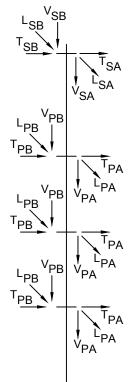


115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)

	• •			
SPAN	BACK	(FT):	725	

		L	DESIGN LOADS													
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	1.25	6.33	8.54	1.25	6.33	-8.54	2.95	10.38	14.16	2.95	10.38	-14.16	10.00	90.00	1.50
00	100.00	0.38	3.15	4.00	0.38	3.15	-4.00	1.07	6.33	7.94	1.07	6.33	-7.94	29.00	90.00	1.00
00	39.53	1.74	5.09	6.97	1.74	5.09	-6.97	3.14	8.01	11.10	3.14	8.01	-11.10	4.00	90.00	1.00
25	39.53	2.36	6.24	8.54	2.36	6.24	-8.54	3.90	9.38	13.01	3.90	9.38	-13.01	4.00	90.00	1.00
50	39.53	0.83	3.74	5.17	0.83	3.74	-5.17	1.97	6.15	8.58	1.97	6.15	-8.58	4.00	90.00	1.00
50	39.53	0.83	3.54	4.88	0.83	3.54	-4.88	1.97	5.74	7.98	1.97	5.74	-7.98	4.00	90.00	1.00
50	39.53	0.83	3.54	4.88	0.83	0.19	0.00	1.97	5.74	7.98	1.97	0.26	0.00	4.00	90.00	1.00
00	29.97	3.98	1.40	0.24	1.91	3.24	-4.64	6.92	2.51	0.43	2.95	5.74	-8.19	3.45	90.00	1.50
00	0.00	0.38	1.80	2.62	0.38	1.80	-2.62	1.07	3.17	4.61	1.07	3.17	-4.61	0.00	90.00	1.00
00	0.00	2.55	3.60	5.25	2.55	3.60	-5.25	3.93	6.33	9.23	3.93	6.33	-9.23	0.00	90.00	2.00
00	0.00	0.38	2.70	3.93	0.38	2.70	-3.93	1.07	4.86	7.08	1.07	4.86	-7.08	0.00	90.00	1.00





LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

2. V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

MISC. UPDATES

MISC. REVISION

EPN/DESCRIPTI

RELEASE FOR RFP

A

DWG REV

FOR CONSTRUCTION

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

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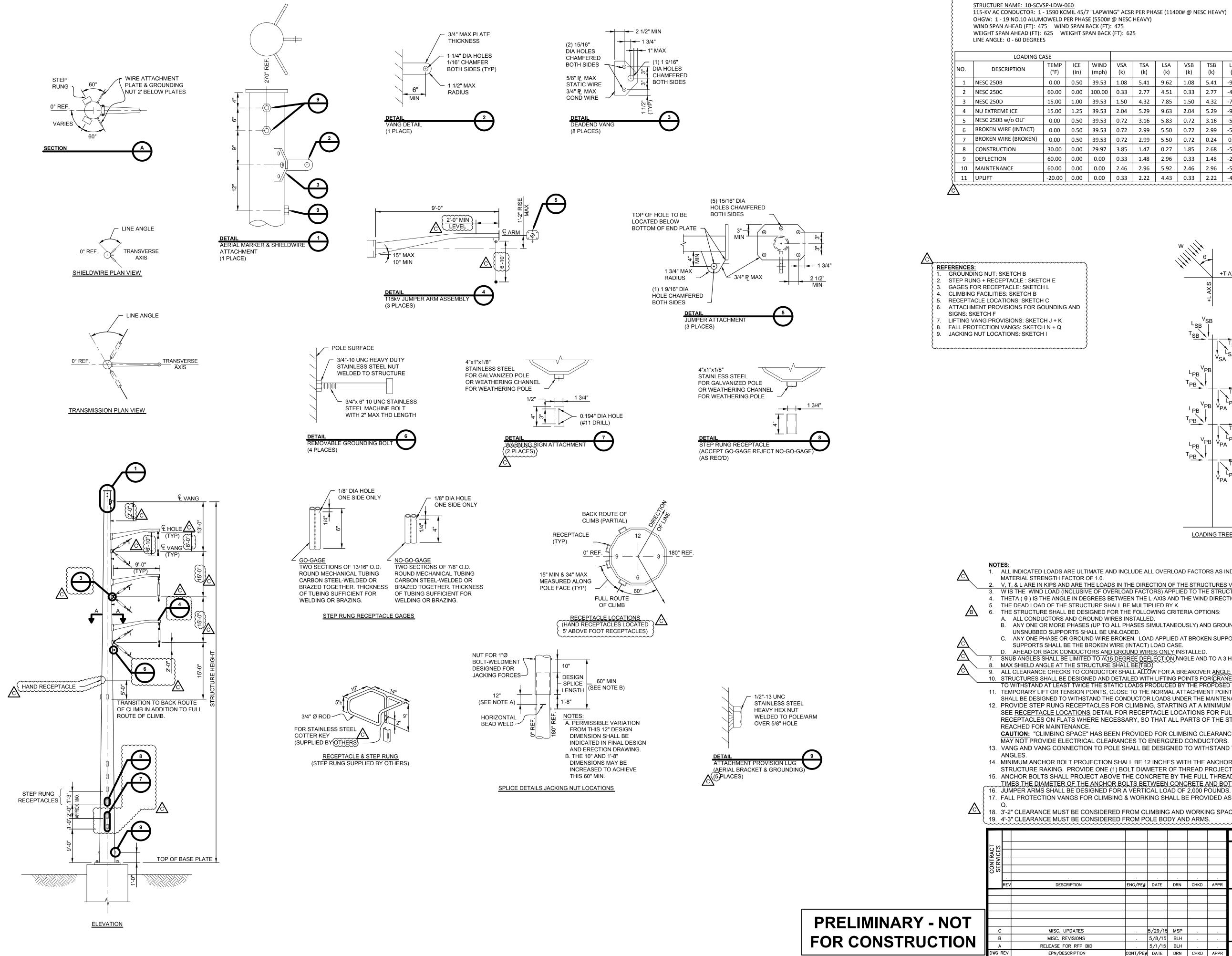
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15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

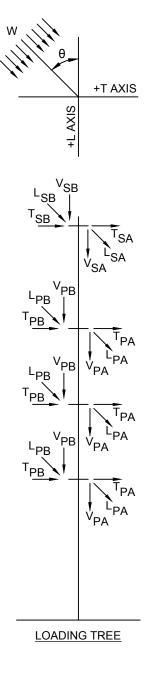
18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE 3 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

							•		С				
									drawn BLH				
							THE NORTHERN PASS						
	•						V						
	ENG/PE#	DATE	DRN	CHKD	APPR				CET				
						115k\	/ AC DEADEND 55-	-75°	CHECKED TAB				
						1()-SCVSP-HDW-075		APPROVED				
) & DESIGN DRAWI						
5		5/29/15	MSP	•					date 5/1/15				
S	•	5/8/15	BLH	•					5/1/15				
BID	•	5/1/15	BLH	•	•	SCALE	FILE: TSP-24.DWG						
DN .	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	24-001				



DACK	(1), 4/5	
SPAN B	ACK (FT):	625

								DES	SIGN LOA	DS						
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	1.08	5.41	9.62	1.08	5.41	-9.62	3.52	11.30	20.62	3.52	11.30	-20.62	10.00	90.00	1.50
00	100.00	0.33	2.77	4.51	0.33	2.77	-4.51	1.39	7.30	11.56	1.39	7.30	-11.56	29.00	90.00	1.00
00	39.53	1.50	4.32	7.85	1.50	4.32	-7.85	3.51	8.44	15.76	3.51	8.44	-15.76	4.00	90.00	1.00
25	39.53	2.04	5.29	9.63	2.04	5.29	-9.63	4.24	9.88	18.49	4.24	9.88	-18.49	4.00	90.00	1.00
50	39.53	0.72	3.16	5.83	0.72	3.16	-5.83	2.35	6.64	12.50	2.35	6.64	-12.50	4.00	90.00	1.00
50	39.53	0.72	2.99	5.50	0.72	2.99	-5.50	2.35	6.10	11.40	2.35	6.10	-11.40	4.00	90.00	1.00
50	39.53	0.72	2.99	5.50	0.72	0.24	0.00	2.35	6.10	11.40	2.35	0.40	0.00	4.00	90.00	1.00
00	29.97	3.85	1.47	0.27	1.85	2.68	-5.22	8.69	3.40	0.61	3.44	6.08	-11.74	3.45	90.00	1.50
00	0.00	0.33	1.48	2.96	0.33	1.48	-2.96	1.39	3.33	6.67	1.39	3.33	-6.67	0.00	90.00	1.00
00	0.00	2.46	2.96	5.92	2.46	2.96	-5.92	4.59	6.67	13.34	4.59	6.67	-13.34	0.00	90.00	2.00
00	0.00	0.33	2.22	4.43	0.33	2.22	-4.43	1.39	5.17	10.34	1.39	5.17	-10.34	0.00	90.00	1.00



ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

2. V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (0) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

D. AHEAD OR BACK CONDUCTORS AND GROUND WIRES ONLY INSTALLED.
 7. SNUB ANGLES SHALL BE LIMITED TO A (15 DEGREE DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 8. MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE(TBD)
 9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°.
 10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE <u>RECEPTACLE LOCATIONS</u> DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL

RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

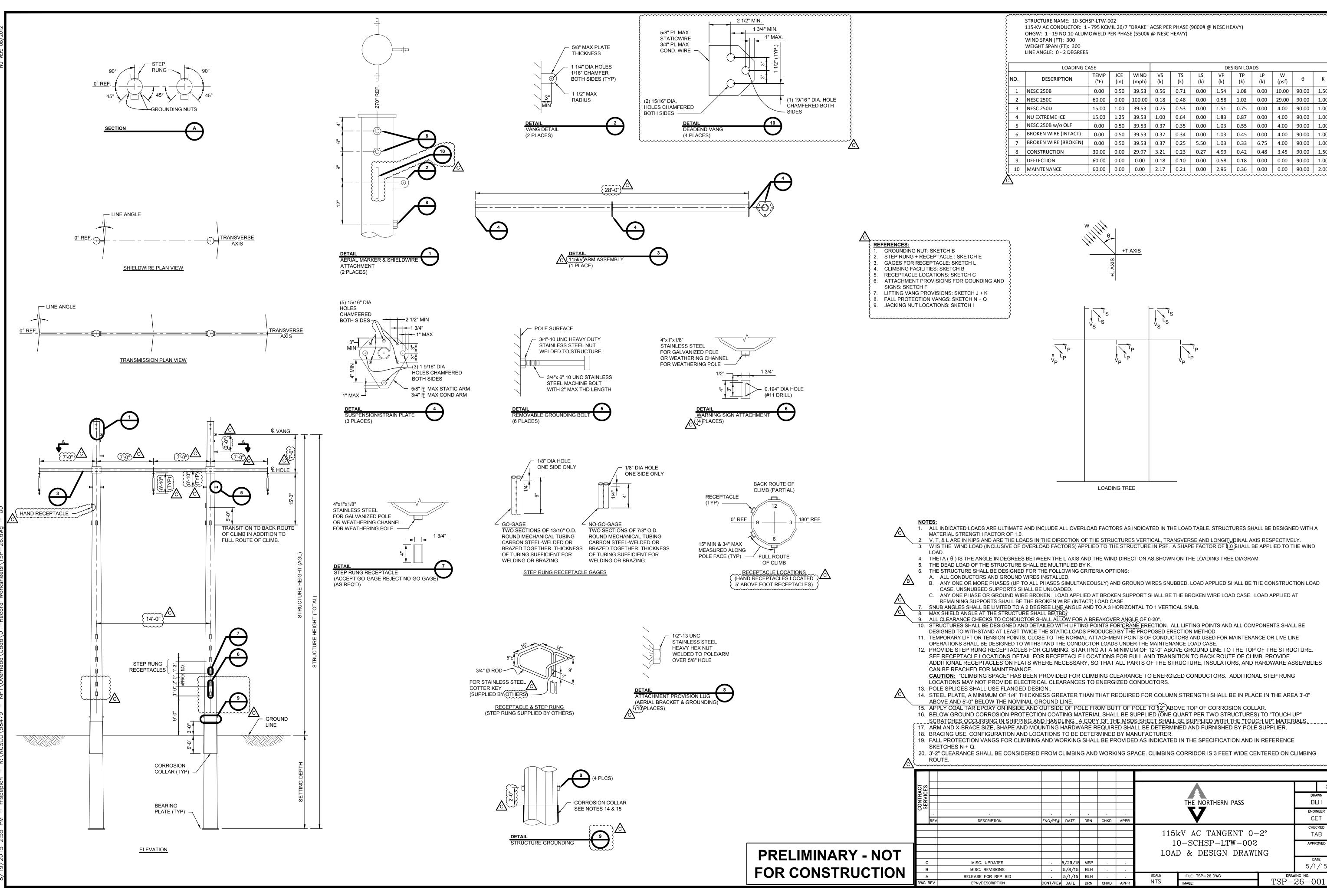
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE. 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

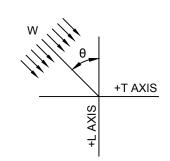
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							THE NORTHERN PASS		BL	H
					•		V			
	ENG/PE#	DATE	DRN	CHKD	APPR				CE	I
						1151-	V AC DEADEND O	COP	CHECI	
						119K	V AC DEADEND 0-	60°	TA	В
						10	O-SCVSP-LDW-060		APPRO	OVED
						LOAI) & DESIGN DRAWI	NG		
5		5/29/15	MSP		•				DAT	
S		5/8/15	BLH						5/1,	15
BID		5/1/15	BLH			SCALE	FILE: TSP-25.DWG		ING NO.	24
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	<u>25-0(</u>	J1

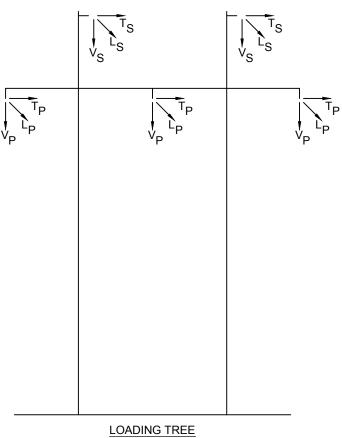


STRUCTURE NAME: 10-SCHSP-LTW-002 115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY) OHGW: 1 - 19 NO.10 ALUMOWELD PER PHASE (5500# @ NESC HEAVY) WIND SPAN (FT): 300 WEIGHT SPAN (FT): 300 LINE ANGLE: 0 - 2 DEGREES

	LOADING CA	ASE			h) (k) (k) (k) (k) (k) (k) (k) (psf) θ K 53 0.56 0.71 0.00 1.54 1.08 0.00 10.00 90.00 1.50 00 0.18 0.48 0.00 0.58 1.02 0.00 29.00 90.00 1.00 53 0.75 0.53 0.00 1.51 0.75 0.00 4.00 90.00 1.00 53 1.00 0.64 0.00 1.83 0.87 0.00 4.00 90.00 1.00 53 0.37 0.35 0.00 1.03 0.55 0.00 4.00 90.00 1.00									
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)								θ	к	
1	NESC 250B	0.00	0.50	39.53	0.56	0.71	0.00	1.54	1.08	0.00	10.00	90.00	1.50	
2	NESC 250C	60.00	0.00	100.00	0.18	0.48	0.00	0.58	1.02	0.00	29.00	90.00	1.00	
3	NESC 250D	15.00	1.00	39.53	0.75	0.53	0.00	1.51	0.75	0.00	4.00	90.00	1.00	
4	NU EXTREME ICE	15.00	1.25	39.53	1.00	0.64	0.00	1.83	0.87	0.00	4.00	90.00	1.00	
5	NESC 250B w/o OLF	0.00	0.50	39.53	0.37	0.35	0.00	1.03	0.55	0.00	4.00	90.00	1.00	
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	0.37	0.34	0.00	1.03	0.45	0.00	4.00	90.00	1.00	
7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	0.37	0.25	5.50	1.03	0.33	6.75	4.00	90.00	1.00	
8	CONSTRUCTION	30.00	0.00	29.97	3.21	0.23	0.27	4.99	0.42	0.48	3.45	90.00	1.50	
9	DEFLECTION	60.00	0.00	0.00	0.18	0.10	0.00	0.58	0.18	0.00	0.00	90.00	1.00	
10	MAINTENANCE	60.00	0.00	0.00	2.17	0.21	0.00	2.96	0.36	0.00	0.00	90.00	2.00	

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ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (0) SHALL BE APPLIED TO THE WIND

DRAWN

BLH

ENGINEER CET

CHECKED

TAB

APPROVED

5/1/15

DRAWING NO. TSP-26-001

THE NORTHERN PASS

115kV AC TANGENT 0-2°

10-SCHSP-LTW-002

LOAD & DESIGN DRAWING

57

FILE: TSP-26.DWG

IMAGE:

SCALE

NTS

4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

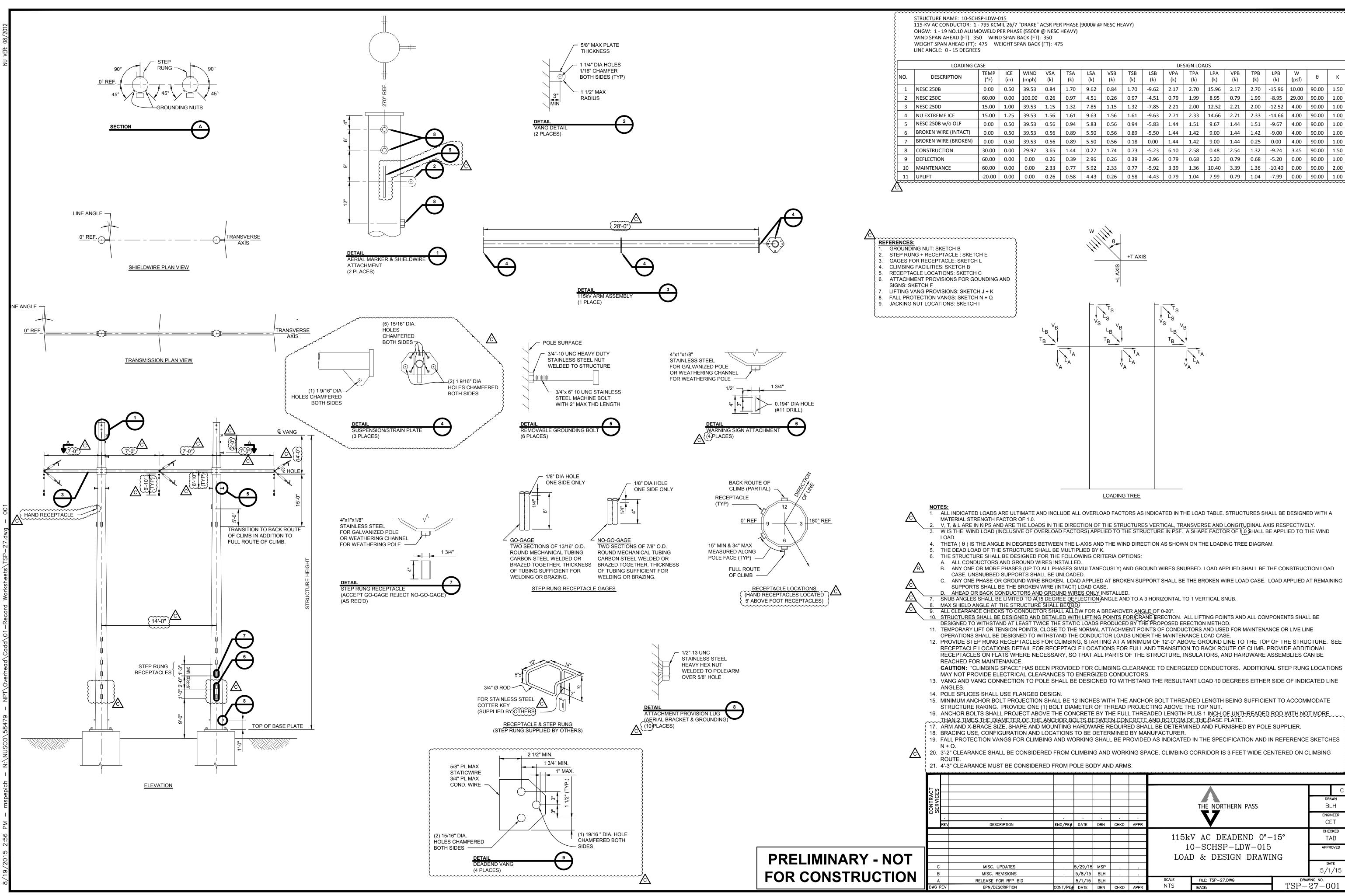
ENG/PE# DATE DRN CHKD APPR

5/29/15 MSP

5/8/15 BLH

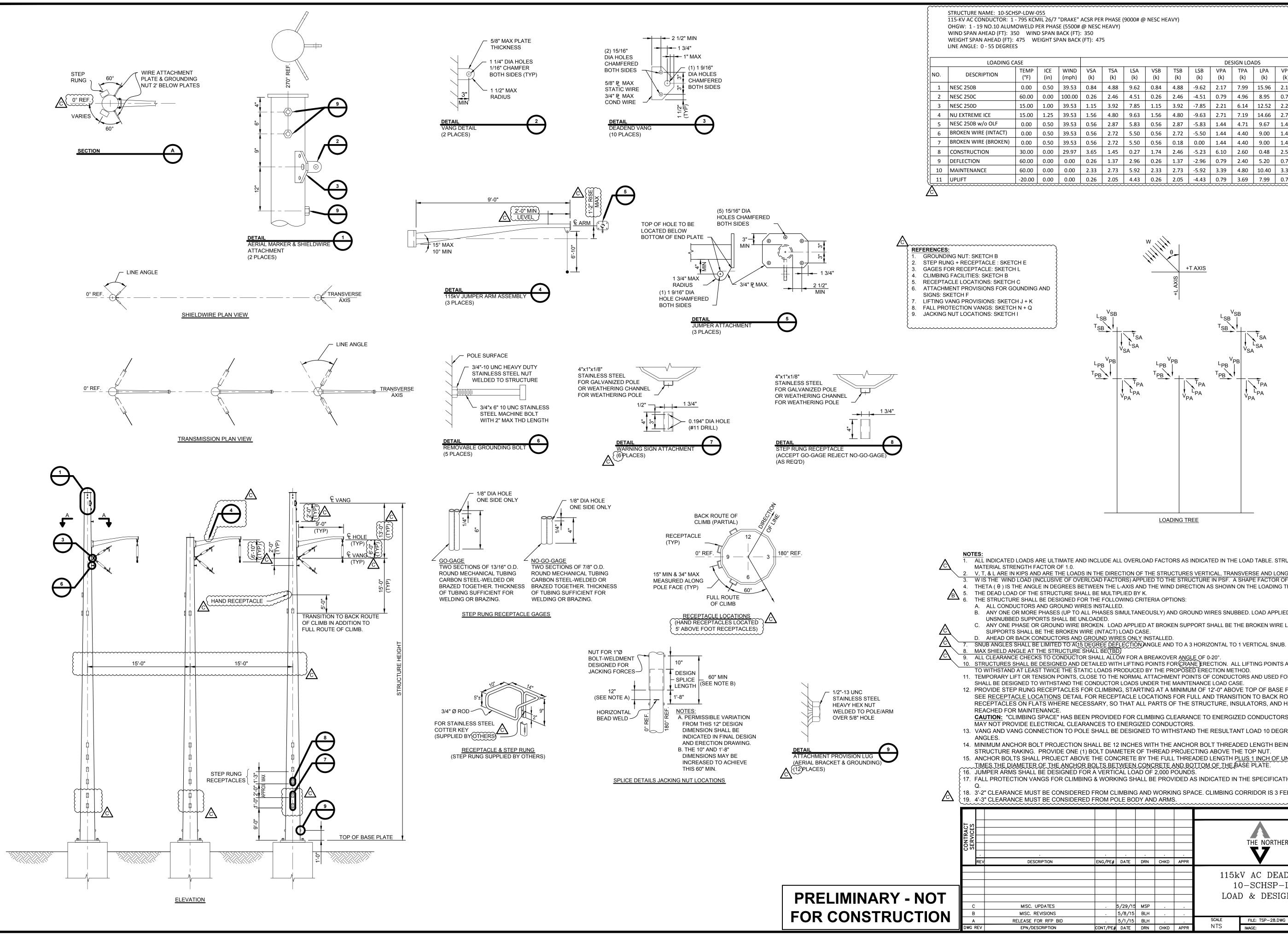
5/1/15 BLH

CONT/PE# DATE DRN CHKD APPR



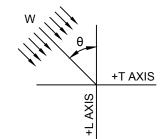
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									DRAWN
							THE NORTHERN PASS		BLH
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			•	•					ENGINEER
	ENG/PE#	DATE	DRN	CHKD	APPR				CET
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						115k	V AC DEADEND 0°-	·15°	TAB
						1	O-SCHSP-LDW-015		APPROVED
						LOAI	D & DESIGN DRAWI	NG	
5		5/29/15	MSP						
S		5/8/15							5/1/15
BID		5/1/15	BLH	•	•	SCALE	FILE: TSP-27.DWG		ING NO.
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	27-001

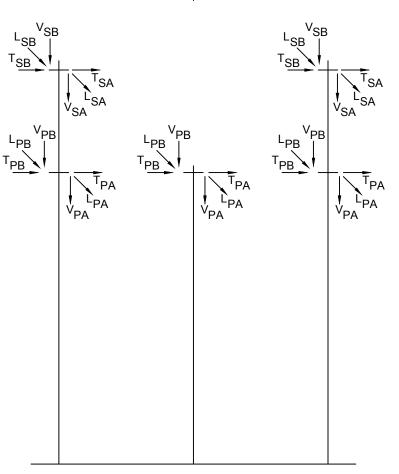
								DES	SIGN LOA	DS						l l
E)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
0	39.53	0.84	1.70	9.62	0.84	1.70	-9.62	2.17	2.70	15.96	2.17	2.70	-15.96	10.00	90.00	1.50
0	100.00	0.26	0.97	4.51	0.26	0.97	-4.51	0.79	1.99	8.95	0.79	1.99	-8.95	29.00	90.00	1.00
0	39.53	1.15	1.32	7.85	1.15	1.32	-7.85	2.21	2.00	12.52	2.21	2.00	-12.52	4.00	90.00	1.00
5	39.53	1.56	1.61	9.63	1.56	1.61	-9.63	2.71	2.33	14.66	2.71	2.33	-14.66	4.00	90.00	1.00
0	39.53	0.56	0.94	5.83	0.56	0.94	-5.83	1.44	1.51	9.67	1.44	1.51	-9.67	4.00	90.00	1.00
0	39.53	0.56	0.89	5.50	0.56	0.89	-5.50	1.44	1.42	9.00	1.44	1.42	-9.00	4.00	90.00	1.00
0	39.53	0.56	0.89	5.50	0.56	0.18	0.00	1.44	1.42	9.00	1.44	0.25	0.00	4.00	90.00	1.00
0	29.97	3.65	1.44	0.27	1.74	0.73	-5.23	6.10	2.58	0.48	2.54	1.32	-9.24	3.45	90.00	1.50
0	0.00	0.26	0.39	2.96	0.26	0.39	-2.96	0.79	0.68	5.20	0.79	0.68	-5.20	0.00	90.00	1.00
0	0.00	2.33	0.77	5.92	2.33	0.77	-5.92	3.39	1.36	10.40	3.39	1.36	-10.40	0.00	90.00	2.00



115-KV AC CONDUCTOR: 1 - 795 KCMIL 26/7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)

								DES	SIGN LOA	DS						l l
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.84	4.88	9.62	0.84	4.88	-9.62	2.17	7.99	15.96	2.17	7.99	-15.96	10.00	90.00	1.50
00	100.00	0.26	2.46	4.51	0.26	2.46	-4.51	0.79	4.96	8.95	0.79	4.96	-8.95	29.00	90.00	1.00
00	39.53	1.15	3.92	7.85	1.15	3.92	-7.85	2.21	6.14	12.52	2.21	6.14	-12.52	4.00	90.00	1.00
25	39.53	1.56	4.80	9.63	1.56	4.80	-9.63	2.71	7.19	14.66	2.71	7.19	-14.66	4.00	90.00	1.00
50	39.53	0.56	2.87	5.83	0.56	2.87	-5.83	1.44	4.71	9.67	1.44	4.71	-9.67	4.00	90.00	1.00
50	39.53	0.56	2.72	5.50	0.56	2.72	-5.50	1.44	4.40	9.00	1.44	4.40	-9.00	4.00	90.00	1.00
50	39.53	0.56	2.72	5.50	0.56	0.18	0.00	1.44	4.40	9.00	1.44	0.25	0.00	4.00	90.00	1.00
00	29.97	3.65	1.45	0.27	1.74	2.46	-5.23	6.10	2.60	0.48	2.54	4.38	-9.24	3.45	90.00	1.50
00	0.00	0.26	1.37	2.96	0.26	1.37	-2.96	0.79	2.40	5.20	0.79	2.40	-5.20	0.00	90.00	1.00
00	0.00	2.33	2.73	5.92	2.33	2.73	-5.92	3.39	4.80	10.40	3.39	4.80	-10.40	0.00	90.00	2.00
00	0.00	0.26	2.05	4.43	0.26	2.05	-4.43	0.79	3.69	7.99	0.79	3.69	-7.99	0.00	90.00	1.00





LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (1.0) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

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CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

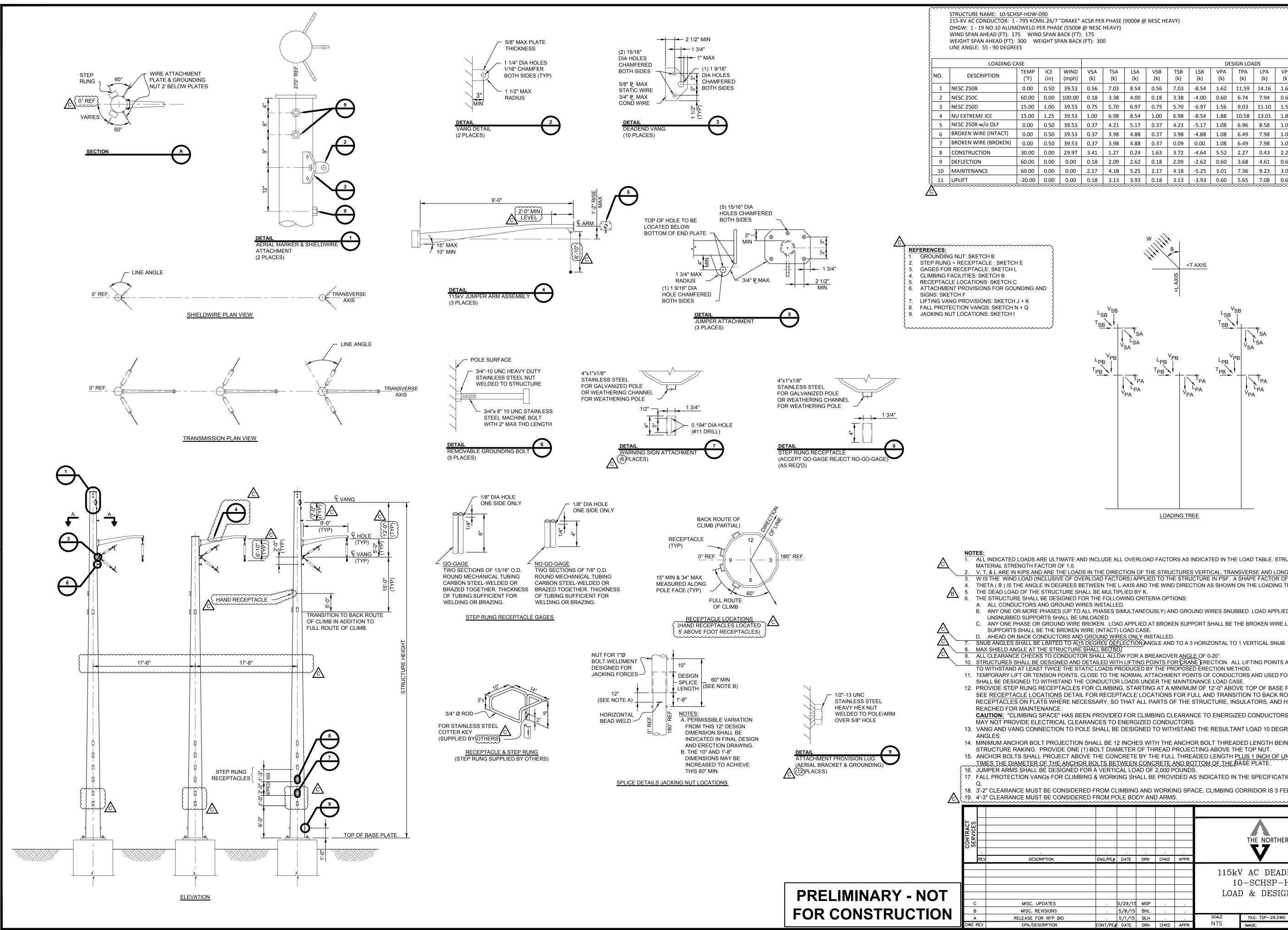
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

{ 17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

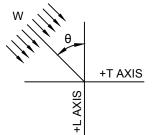
18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

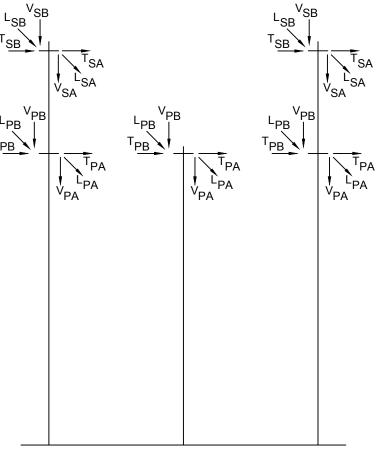
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							THE NORTHERN PASS		BL	.H		
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	ENG/PE#	DATE	DRN	CHKD	APPR				CE	. I		
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S		5/8/15	BLH	•					5/1,	/15		
BID		5/1/15	BLH	•	•	SCALE	FILE: TSP-28.DWG		ING NO.	01		
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	TSP-	28-0	U1		



7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)	
SE (5500# @ NESC HEAVY)	

								DES	SIGN LOA	DS						
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.56	7.03	8.54	0.56	7.03	-8.54	1.62	11.59	14.16	1.62	11.59	-14.16	10.00	90.00	1.50
00	100.00	0.18	3.38	4.00	0.18	3.38	-4.00	0.60	6.74	7.94	0.60	6.74	-7.94	29.00	90.00	1.00
00	39.53	0.75	5.70	6.97	0.75	5.70	-6.97	1.56	9.03	11.10	1.56	9.03	-11.10	4.00	90.00	1.00
25	39.53	1.00	6.98	8.54	1.00	6.98	-8.54	1.88	10.58	13.01	1.88	10.58	-13.01	4.00	90.00	1.00
50	39.53	0.37	4.21	5.17	0.37	4.21	-5.17	1.08	6.96	8.58	1.08	6.96	-8.58	4.00	90.00	1.00
50	39.53	0.37	3.98	4.88	0.37	3.98	-4.88	1.08	6.49	7.98	1.08	6.49	-7.98	4.00	90.00	1.00
50	39.53	0.37	3.98	4.88	0.37	0.09	0.00	1.08	6.49	7.98	1.08	0.12	0.00	4.00	90.00	1.00
00	29.97	3.41	1.27	0.24	1.63	3.72	-4.64	5.52	2.27	0.43	2.25	6.59	-8.19	3.45	90.00	1.50
00	0.00	0.18	2.09	2.62	0.18	2.09	-2.62	0.60	3.68	4.61	0.60	3.68	-4.61	0.00	90.00	1.00
00	0.00	2.17	4.18	5.25	2.17	4.18	-5.25	3.01	7.36	9.23	3.01	7.36	-9.23	0.00	90.00	2.00
00	0.00	0.18	3.13	3.93	0.18	3.13	-3.93	0.60	5.65	7.08	0.60	5.65	-7.08	0.00	90.00	1.00
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LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF 10 SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°.

STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD.

11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

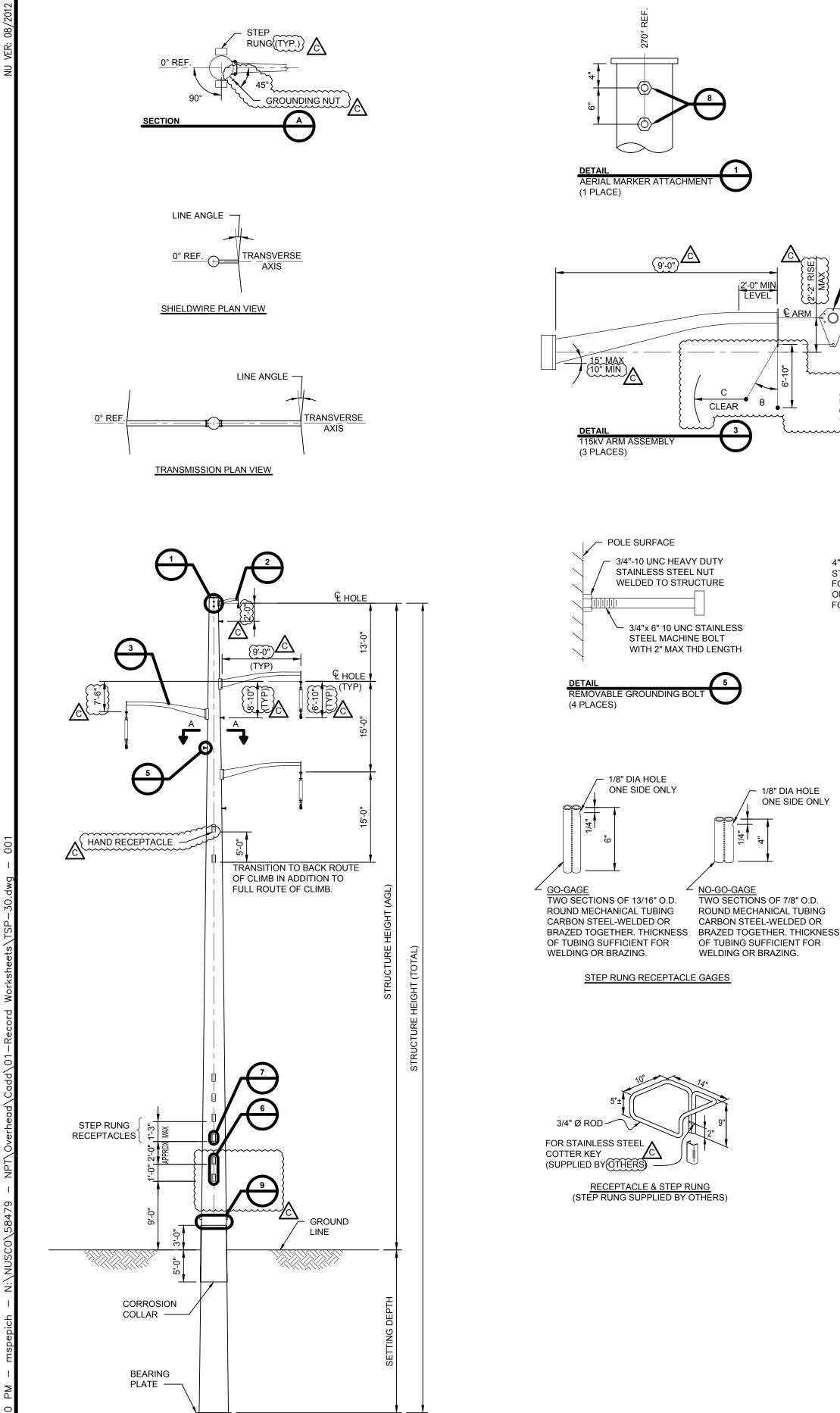
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE.

(17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE { 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

							•		С
							THE NORTHERN PASS		BLH
	•		•				V		ENGINEER
	ENG/PE#	DATE	DRN	CHKD	APPR				CET
						115kV	AC DEADEND 55-	-90°	CHECKED TAB
						10)-SCHSP-HDW-090		APPROVED
						LOAI) & DESIGN DRAWI	NG	
3		5/29/15	MSP	•	•				date 5/1/15
s		5/8/15	BHL						
BID		5/1/15	BLH			SCALE	FILE: TSP-29.DWG		
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	IMAGE:	ISP-	29-001



ELEVATION

(1 PLACE)

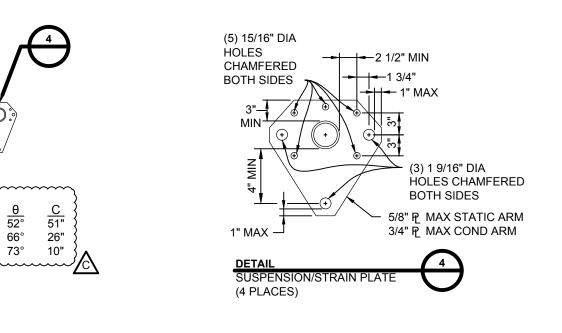
2'-0" MIN LEVEL

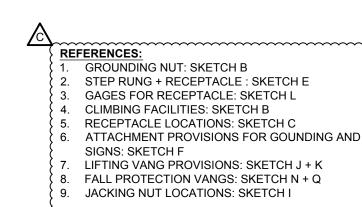
CLEAR

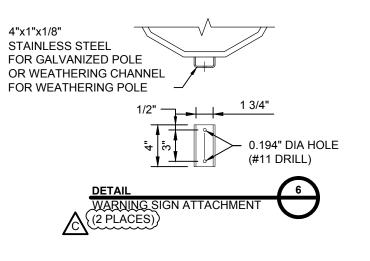
€ ARM

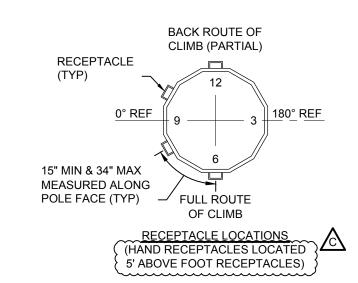
1/8" DIA HOLE

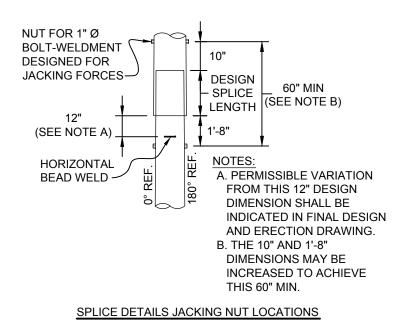
ONE SIDE ONLY

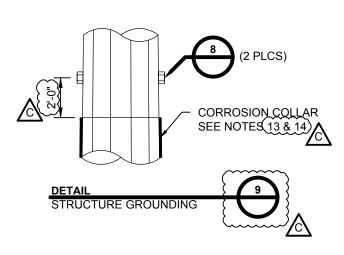


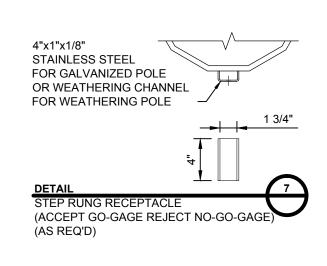


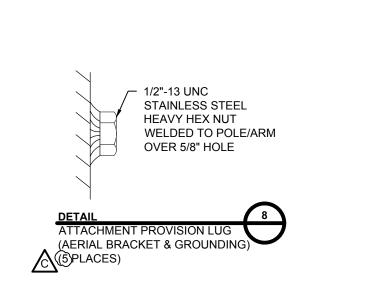


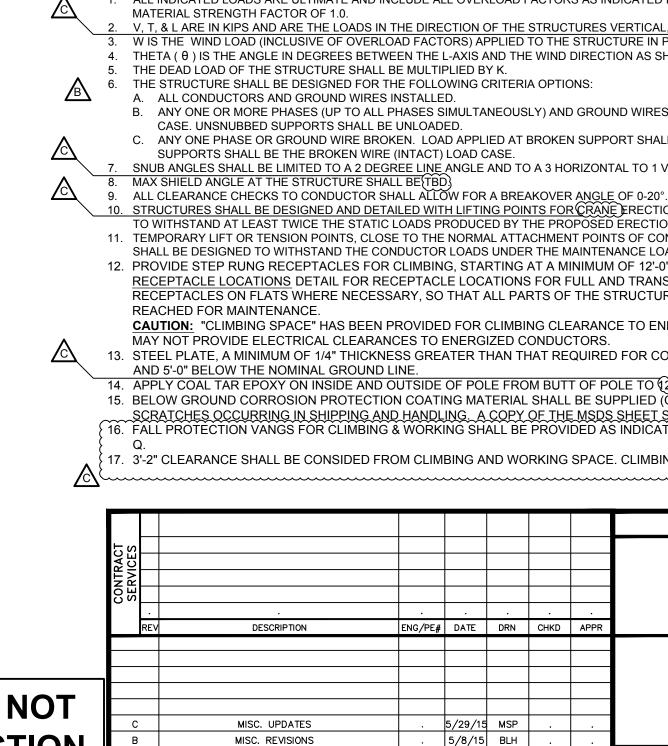












A

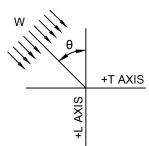
DWG REV

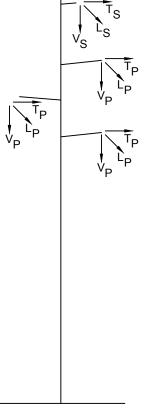
PRELIMINARY - NOT FOR CONSTRUCTION

	STRUCTURE NAME: 10-SCD 115-KV AC CONDUCTOR: 1 OHGW: 1 - 19 NO.10 ALUM WIND SPAN (FT): 800 WEIGHT SPAN (FT): 1000 LINE ANGLE: 0 - 2 DEGREES	- 1590 KC OWELD F	MIL 45/7				ASE (1140	 00# @ NE	SC HEAV	Y)	~~~~~	~~~~~	~~~~
}	LOADING C	ASE						DE	SIGN LOA	\DS			
NO.	DESCRIPTION	TEMP (°F)	ICE (in)	WIND (mph)	VS (k)	TS (k)	LS (k)	VP (k)	TP (k)	LP (k)	W (psf)	θ	к
{ 1	NESC 250B	0.00	0.50	39.53	1.69	1.34	0.00	5.15	2.39	0.00	10.00	90.00	1.50
2	NESC 250C	60.00	0.00	100.00	0.50	1.03	0.00	2.04	2.97	0.00	29.00	90.00	1.00
3	NESC 250D	15.00	1.00	39.53	2.38	0.94	0.00	5.30	1.48	0.00	4.00	90.00	1.00
4	NU EXTREME ICE	15.00	1.25	39.53	3.23	1.14	0.00	6.47	1.71	0.00	4.00	90.00	1.00
5	NESC 250B w/o OLF	0.00	0.50	39.53	1.13	0.61	0.00	3.44	1.10	0.00	4.00	90.00	1.00
6	BROKEN WIRE (INTACT)	0.00	0.50	39.53	1.13	0.59	0.00	3.44	0.97	0.00	4.00	90.00	1.00
{ 7	BROKEN WIRE (BROKEN)	0.00	0.50	39.53	1.13	0.50	5.50	3.44	0.82	8.55	4.00	90.00	1.00
8	CONSTRUCTION	30.00	0.00	29.97	3.68	0.30	0.27	7.98	0.76	0.61	3.45	90.00	1.50
9	DEFLECTION	60.00	0.00	0.00	0.50	0.10	0.00	2.04	0.23	0.00	0.00	90.00	1.00

60.00 0.00 0.00 2.80 0.31 0.00 5.88 0.47 0.00 0.00 90.00 2.00

10 MAINTENANCE





LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (.0) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

7. SNUB ANGLES SHALL BE LIMITED TO A 2 DEGREE LINE ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE ERECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS

SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE GROUND LINE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS.

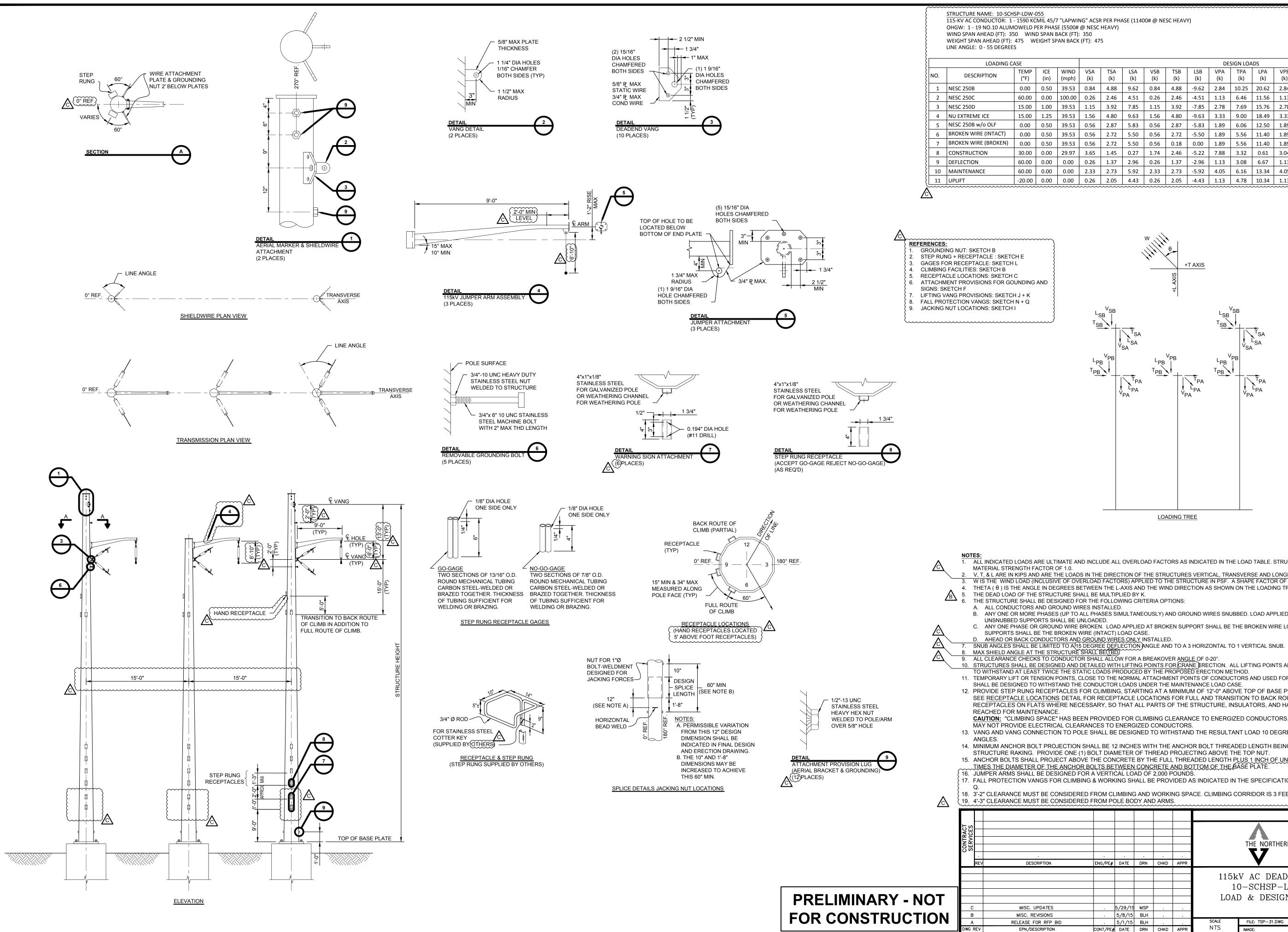
13. STEEL PLATE, A MINIMUM OF 1/4" THICKNESS GREATER THAN THAT REQUIRED FOR COLUMN STRENGTH SHALL BE IN PLACE IN THE AREA 3'-0" ABOVE

14. APPLY COAL TAR EPOXY ON INSIDE AND OUTSIDE OF POLE FROM BUTT OF POLE TO (2") ABOVE TOP OF CORROSION COLLAR. 15. BELOW GROUND CORROSION PROTECTION COATING MATERIAL SHALL BE SUPPLIED (ONE QUART PER TWO STRUCTURES) TO "TOUCH UP"

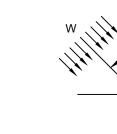
SCRATCHES OCCURRING IN SHIPPING AND HANDLING. A COPY OF THE MSDS SHEET SHALL BE SUPPLIED WITH THE "TOUCH UP" MATERIALS. 16. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

17. 3'-2" CLEARANCE SHALL BE CONSIDED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE. _____

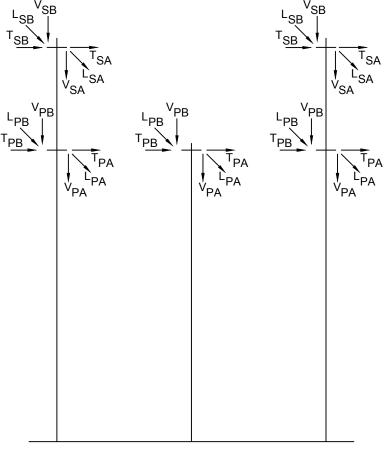
										С				
							THE NORTHERN PASS							
									BLH					
									ENGINE CE					
DESCRIPTION	ENG/PE#	DATE	DRN	СНКД	APPR		V							
								CHECKED						
						115	115kV AC TANGENT 0-2°							
						1	0-SCDSP-LTW-002		APPROVED					
						_								
						LOAI	D & DESIGN DRAWI	NG						
MISC. UPDATES		5/29/15	MSP						DATE					
MISC. REVISIONS		5/8/15	BLH						5/1/	15				
RELEASE FOR RFP BID		5/1/15	BLH						AWING NO.					
EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	30-001							



								DE	SIGN LOA	DS						
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.84	4.88	9.62	0.84	4.88	-9.62	2.84	10.25	20.62	2.84	10.25	-20.62	10.00	90.00	1.50
00	100.00	0.26	2.46	4.51	0.26	2.46	-4.51	1.13	6.46	11.56	1.13	6.46	-11.56	29.00	90.00	1.00
00	39.53	1.15	3.92	7.85	1.15	3.92	-7.85	2.78	7.69	15.76	2.78	7.69	-15.76	4.00	90.00	1.00
25	39.53	1.56	4.80	9.63	1.56	4.80	-9.63	3.33	9.00	18.49	3.33	9.00	-18.49	4.00	90.00	1.00
50	39.53	0.56	2.87	5.83	0.56	2.87	-5.83	1.89	6.06	12.50	1.89	6.06	-12.50	4.00	90.00	1.00
50	39.53	0.56	2.72	5.50	0.56	2.72	-5.50	1.89	5.56	11.40	1.89	5.56	-11.40	4.00	90.00	1.00
50	39.53	0.56	2.72	5.50	0.56	0.18	0.00	1.89	5.56	11.40	1.89	0.29	0.00	4.00	90.00	1.00
00	29.97	3.65	1.45	0.27	1.74	2.46	-5.22	7.88	3.32	0.61	3.04	5.57	-11.74	3.45	90.00	1.50
00	0.00	0.26	1.37	2.96	0.26	1.37	-2.96	1.13	3.08	6.67	1.13	3.08	-6.67	0.00	90.00	1.00
00	0.00	2.33	2.73	5.92	2.33	2.73	-5.92	4.05	6.16	13.34	4.05	6.16	-13.34	0.00	90.00	2.00
00	0.00	0.26	2.05	4.43	0.26	2.05	-4.43	1.13	4.78	10.34	1.13	4.78	-10.34	0.00	90.00	1.00
							·····	·····	·····	·····	····	·····	······		u u	



+T AXIS



LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

2. V, T, & LARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY. 3. W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (...) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

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C. ANY ONE PHASE OR GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT REMAINING

SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

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11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE. 12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE.

SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES CAN BE

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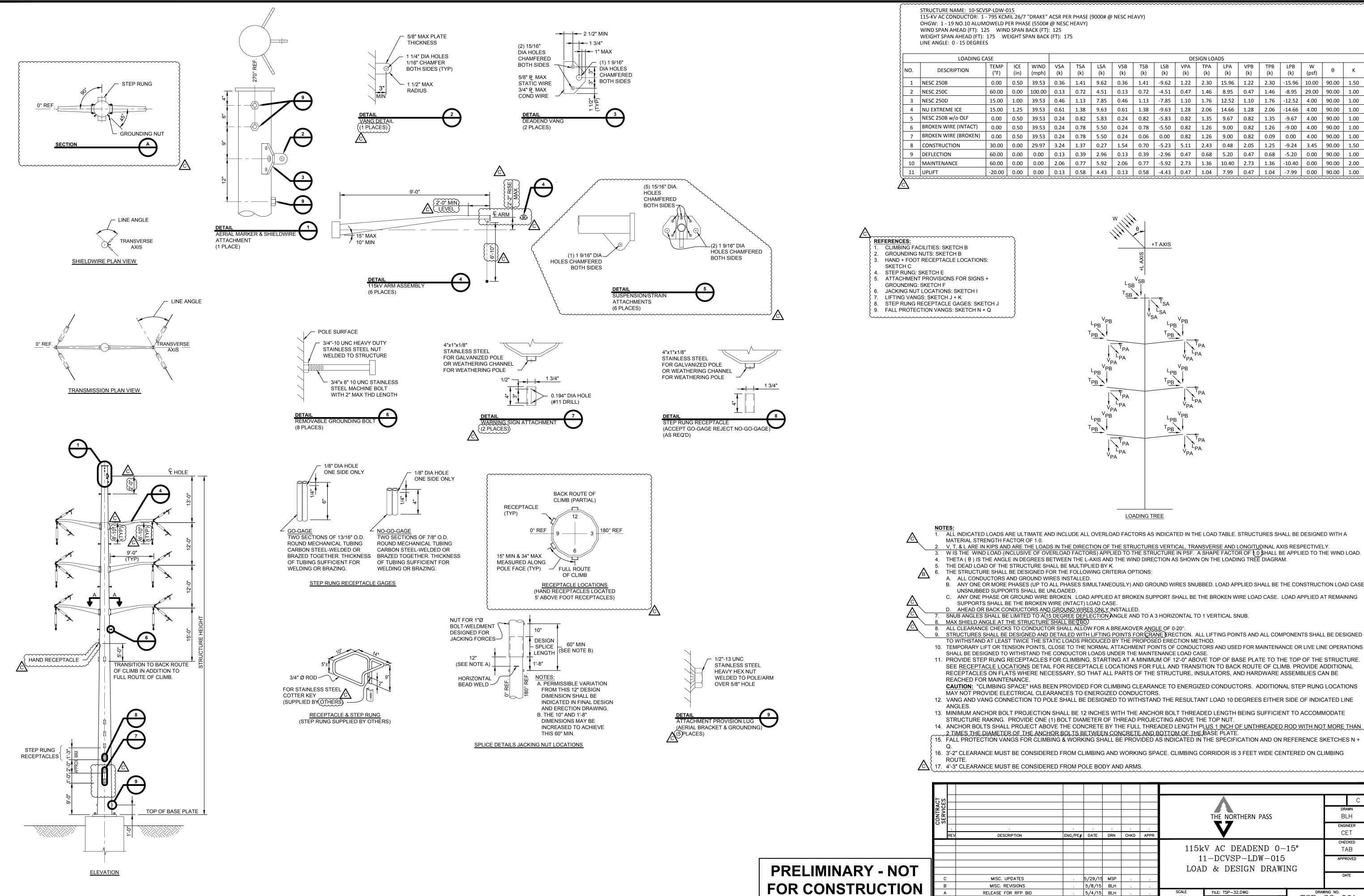
14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT.

15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 16. JUMPER ARMS SHALL BE DESIGNED FOR A VERTICAL LOAD OF 2,000 POUNDS.

{ 17. FALL PROTECTION VANGS FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

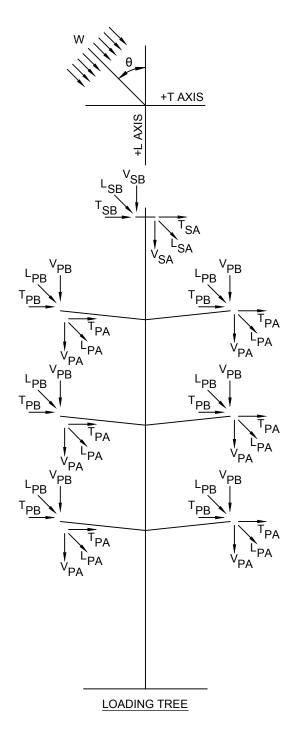
18. 3'-2" CLEARANCE MUST BE CONSIDERED FROM CLIMBING AND WORKING SPACE. CLIMBING CORRIDOR IS 3 FEET WIDE CENTERED ON CLIMBING ROUTE 19. 4'-3" CLEARANCE MUST BE CONSIDERED FROM POLE BODY AND ARMS.

							•			С				
							DRAWN							
							BLH							
							engineer CET							
	ENG/PE#	DATE	DRN	CHKD	APPR		V							
						1151-W AG DEADEND O 558		снес ТА						
							115kV AC DEADEND 0-55°							
						10	D-SCHSP-LDW-055		APPROVED					
						LOAI) & DESIGN DRAWI	NG						
5		5/29/15	MSP						DA'					
6		5/8/15	BLH						5/1	/15				
BID		5/1/15	BLH			SCALE	FILE: TSP-31.DWG		/ING NO.	01				
N	CONT/PE#	DATE	DRN	CHKD	APPR	ΝΓS	NTS IMAGE: TSF							



7 "DRAKE" ACSR PER PHASE (9000# @ NESC HEAVY)	
ASE (5500# @ NESC HEAVY)	

		DESIGN LOADS														
CE n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к
50	39.53	0.36	1.41	9.62	0.36	1.41	-9.62	1.22	2.30	15.96	1.22	2.30	-15.96	10.00	90.00	1.50
00	100.00	0.13	0.72	4.51	0.13	0.72	-4.51	0.47	1.46	8.95	0.47	1.46	-8.95	29.00	90.00	1.00
00	39.53	0.46	1.13	7.85	0.46	1.13	-7.85	1.10	1.76	12.52	1.10	1.76	-12.52	4.00	90.00	1.00
25	39.53	0.61	1.38	9.63	0.61	1.38	-9.63	1.28	2.06	14.66	1.28	2.06	-14.66	4.00	90.00	1.00
50	39.53	0.24	0.82	5.83	0.24	0.82	-5.83	0.82	1.35	9.67	0.82	1.35	-9.67	4.00	90.00	1.00
50	39.53	0.24	0.78	5.50	0.24	0.78	-5.50	0.82	1.26	9.00	0.82	1.26	-9.00	4.00	90.00	1.00
50	39.53	0.24	0.78	5.50	0.24	0.06	0.00	0.82	1.26	9.00	0.82	0.09	0.00	4.00	90.00	1.00
00	29.97	3.24	1.37	0.27	1.54	0.70	-5.23	5.11	2.43	0.48	2.05	1.25	-9.24	3.45	90.00	1.50
00	0.00	0.13	0.39	2.96	0.13	0.39	-2.96	0.47	0.68	5.20	0.47	0.68	-5.20	0.00	90.00	1.00
00	0.00	2.06	0.77	5.92	2.06	0.77	-5.92	2.73	1.36	10.40	2.73	1.36	-10.40	0.00	90.00	2.00
00	0.00	0.13	0.58	4.43	0.13	0.58	-4.43	0.47	1.04	7.99	0.47	1.04	-7.99	0.00	90.00	1.00



1. ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A

 V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (10) SHALL BE APPLIED TO THE WIND LOAD. 4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

THE NORTHERN PASS

115kV AC DEADEND 0-15°

11 - DCVSP - LDW - 015

LOAD & DESIGN DRAWING

57

FILE: TSP-32.DWG

IMAGE:

SCALE

NTS

DRAWN

BLH

ENGINEER

CET

CHECKED

TAB

APPROVED

DRAWING NO.

TSP-32-001

5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY K.

6. THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING CRITERIA OPTIONS:

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD CASE.

ENG/PE# DATE DRN CHKD APPR

5/29/15 MSP

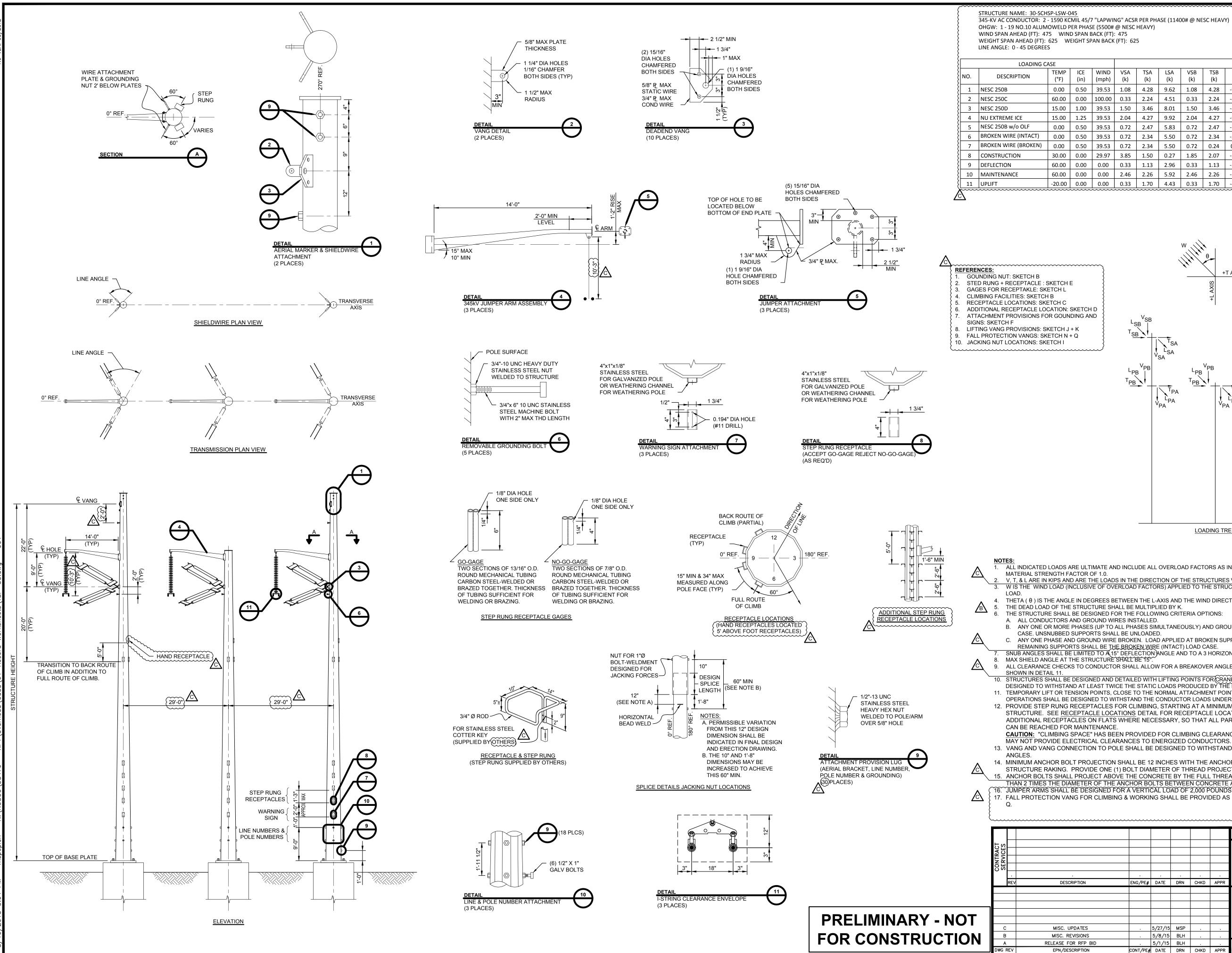
5/8/15 BLH

5/4/15 BLH

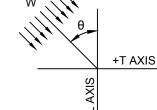
CONT/PE# DATE DRN CHKD APPR

DWG REV

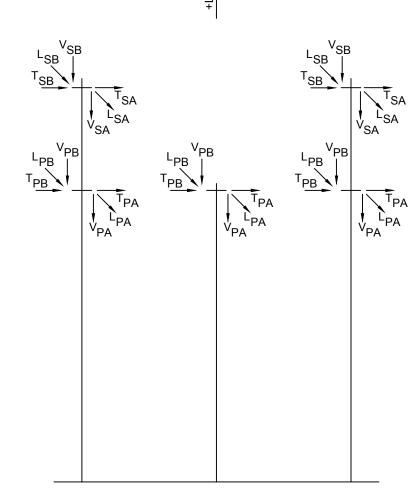
EPN/DESCRIPTION



								DES	SIGN LOA	DS						{
E n)	WIND (mph)	VSA (k)	TSA (k)	LSA (k)	VSB (k)	TSB (k)	LSB (k)	VPA (k)	TPA (k)	LPA (k)	VPB (k)	TPB (k)	LPB (k)	W (psf)	θ	к }
50	39.53	1.08	4.28	9.62	1.08	4.28	-9.62	7.87	17.76	41.24	7.87	17.76	-41.24	10.00	90.00	1.50
00	100.00	0.33	2.24	4.51	0.33	2.24	-4.51	3.01	11.89	23.11	3.01	11.89	-23.11	29.00	90.00	1.00
00	39.53	1.50	3.46	8.01	1.50	3.46	-8.01	7.58	13.17	31.53	7.58	13.17	-31.53	4.00	90.00	1.00
25	39.53	2.04	4.27	9.92	2.04	4.27	-9.92	9.04	15.42	36.98	9.04	15.42	-36.98	4.00	90.00	1.00
50	39.53	0.72	2.47	5.83	0.72	2.47	-5.83	5.25	10.36	24.99	5.25	10.36	-24.99	4.00	90.00	1.00
50	39.53	0.72	2.34	5.50	0.72	2.34	-5.50	5.25	9.52	22.80	5.25	9.52	-22.80	4.00	90.00	1.00
50	39.53	0.72	2.34	5.50	0.72	0.24	0.00	5.25	9.52	22.80	5.25	0.79	0.00	4.00	90.00	1.00
00	29.97	3.85	1.50	0.27	1.85	2.07	-5.23	16.51	6.91	1.21	5.87	9.40	-23.49	3.45	90.00	1.50
00	0.00	0.33	1.13	2.96	0.33	1.13	-2.96	3.01	5.10	13.34	3.01	5.10	-13.34	0.00	90.00	1.00
00	0.00	2.46	2.26	5.92	2.46	2.26	-5.92	7.83	10.21	26.68	7.83	10.21	-26.68	0.00	90.00	2.00
00	0.00	0.33	1.70	4.43	0.33	1.70	-4.43	3.01	7.92	20.69	3.01	7.92	-20.69	0.00	90.00	1.00







LOADING TREE

ALL INDICATED LOADS ARE ULTIMATE AND INCLUDE ALL OVERLOAD FACTORS AS INDICATED IN THE LOAD TABLE. STRUCTURES SHALL BE DESIGNED WITH A V, T, & L ARE IN KIPS AND ARE THE LOADS IN THE DIRECTION OF THE STRUCTURES VERTICAL, TRANSVERSE AND LONGITUDINAL AXIS RESPECTIVELY.
 W IS THE WIND LOAD (INCLUSIVE OF OVERLOAD FACTORS) APPLIED TO THE STRUCTURE IN PSF. A SHAPE FACTOR OF (10) SHALL BE APPLIED TO THE WIND

4. THETA (θ) IS THE ANGLE IN DEGREES BETWEEN THE L-AXIS AND THE WIND DIRECTION AS SHOWN ON THE LOADING TREE DIAGRAM.

B. ANY ONE OR MORE PHASES (UP TO ALL PHASES SIMULTANEOUSLY) AND GROUND WIRES SNUBBED. LOAD APPLIED SHALL BE THE CONSTRUCTION LOAD

C. ANY ONE PHASE AND GROUND WIRE BROKEN. LOAD APPLIED AT BROKEN SUPPORT SHALL BE THE BROKEN WIRE LOAD CASE. LOAD APPLIED AT

REMAINING SUPPORTS SHALL BE THE BROKEN WIRE (INTACT) LOAD CASE.

SNUB ANGLES SHALL BE LIMITED TO A 15° DEFLECTION ANGLE AND TO A 3 HORIZONTAL TO 1 VERTICAL SNUB.
 MAX SHIELD ANGLE AT THE STRUCTURE SHALL BE 15°.

9. ALL CLEARANCE CHECKS TO CONDUCTOR SHALL ALLOW FOR A BREAKOVER ANGLE OF 0-20°. CLEARANCES MUST BE CHECKED TO SUBCONDUCTOR ENVELOPE

10. STRUCTURES SHALL BE DESIGNED AND DETAILED WITH LIFTING POINTS FOR CRANE PRECTION. ALL LIFTING POINTS AND ALL COMPONENTS SHALL BE DESIGNED TO WITHSTAND AT LEAST TWICE THE STATIC LOADS PRODUCED BY THE PROPOSED ERECTION METHOD. 11. TEMPORARY LIFT OR TENSION POINTS, CLOSE TO THE NORMAL ATTACHMENT POINTS OF CONDUCTORS AND USED FOR MAINTENANCE OR LIVE LINE OPERATIONS SHALL BE DESIGNED TO WITHSTAND THE CONDUCTOR LOADS UNDER THE MAINTENANCE LOAD CASE.

12. PROVIDE STEP RUNG RECEPTACLES FOR CLIMBING, STARTING AT A MINIMUM OF 12'-0" ABOVE TOP OF BASE PLATE TO THE TOP OF THE STRUCTURE. SEE RECEPTACLE LOCATIONS DETAIL FOR RECEPTACLE LOCATIONS FOR FULL AND TRANSITION TO BACK ROUTE OF CLIMB. PROVIDE ADDITIONAL RECEPTACLES ON FLATS WHERE NECESSARY, SO THAT ALL PARTS OF THE STRUCTURE, INSULATORS, AND HARDWARE ASSEMBLIES

CAUTION: "CLIMBING SPACE" HAS BEEN PROVIDED FOR CLIMBING CLEARANCE TO ENERGIZED CONDUCTORS. ADDITIONAL STEP RUNG LOCATIONS MAY NOT PROVIDE ELECTRICAL CLEARANCES TO ENERGIZED CONDUCTORS. 13. VANG AND VANG CONNECTION TO POLE SHALL BE DESIGNED TO WITHSTAND THE RESULTANT LOAD 10 DEGREES EITHER SIDE OF INDICATED LINE

14. MINIMUM ANCHOR BOLT PROJECTION SHALL BE 12 INCHES WITH THE ANCHOR BOLT THREADED LENGTH BEING SUFFICIENT TO ACCOMMODATE STRUCTURE RAKING. PROVIDE ONE (1) BOLT DIAMETER OF THREAD PROJECTING ABOVE THE TOP NUT. 15. ANCHOR BOLTS SHALL PROJECT ABOVE THE CONCRETE BY THE FULL THREADED LENGTH PLUS 1 INCH OF UNTHREADED ROD WITH NOT MORE

THAN 2 TIMES THE DIAMETER OF THE ANCHOR BOLTS BETWEEN CONCRETE AND BOTTOM OF THE BASE PLATE. 16. JUMPER ARMS SHALL BE DESIGNED FOR A VERTICAL LOAD OF 2,000 POUNDS. $\{$ 17. FALL PROTECTION VANG FOR CLIMBING & WORKING SHALL BE PROVIDED AS INDICATED IN THE SPECIFICATION AND ON REFERENCE SKETCHES N +

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							THE NORTHERN PASS								
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	ENG/PE#	DATE	DRN	СНКД	APPR		V								
									CHECKE	D					
						345kV	345kV AC LIGHT STRAIN 0-45°								
						3	0-SCHSP-LSW-045		APPROVED						
						LOA	D & DESIGN DRAWI	NG							
S		5/27/15	MSP												
S		5/8/15	BLH						5/1/1	15					
P BID		5/1/15	BLH			SCALE	FILE: TSP-33.DWG		ING NO.						
N	CONT/PE#	DATE	DRN	CHKD	APPR	NTS	NTS IMAGE: TSP-								