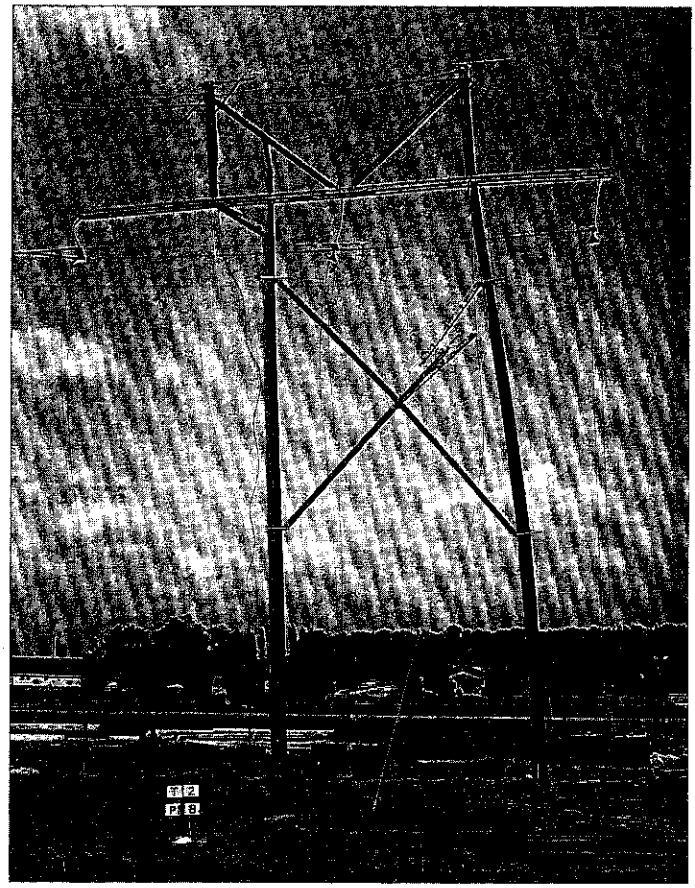
STRUCTURE TEST
JUNE 21, 1984



KANSAS CITY POWER & LIGHT COMPANY
KANSAS CITY, MISSOURI
HUGHES TYPE C4523-A TANGENT STRUCTURE
345 KV CONSTRUCTION

HUGHES
BROTHERS
Seward, Nebraska

HUGHES BROTHERS

P.O. BOX 159 • 210 NORTH 13TH STREET • SEWARD, NEBRASKA 68434 • PHONE (402) 643-2991 • TELEX 438076

PURPOSE:

The purpose of these tests was to confirm design calculations and the structural capability of the Hughes Type C4523-A H-frame tangent structure for various loading conditions.

PROCEDURE:

Two structures were framed and erected for these tests. The structure top, from the X-brace up, was framed on short pole stubs. A complete structure was framed on 85 ft. Class I Douglas Fir poles. The actual pole dimensions are listed in the body of the report.

The pole top structure was loaded in the vertical direction to the maximum design load times an overload capacity factor of 4.0. The loading was accomplished by means of hydraulic cylinders and known dead weights. The three phase positions were loaded equally and simultaneously.

The pole top structure was then loaded transversely by means of power winches. The loads were monitored by dynamometers and transverse deflection readings taken.

A premature failure of a 7/8 x 12" drop-forged turnbuckle in the west tension brace caused a short delay. The turnbuckle was replaced with an identical unit and the structure loaded to maximum design load requirements.

The full size structure was initially loaded vertically to NESC light loading conditions times an overload capacity factor of 4.0. The structure was then loaded incrementally in the transverse direction to failure. The transverse loads were applied by power winches and monitored with dynamometers.

DISCUSSION:

Investigation of the failed turnbuckle did not produce any positive reasons for the premature failure. The steel analysis appeared to be normal. The turnbuckle was manufactured by a very reputable and dependable company. Their quality control people are continuing the investigation.

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CONCLUSION:

The Hughes Type C4523-A structure performed favorably. All design criteria was met. Strengthening of the spacer fittings was deemed necessary by the Hughes Brothers, Inc. engineering staff and has been accomplished.

Respectfully submitted,

HUGHES BROTHERS, INC.

Stephen F. Smith
Vice-President, Engineering

SFS:jap

Drawn S. Whitten

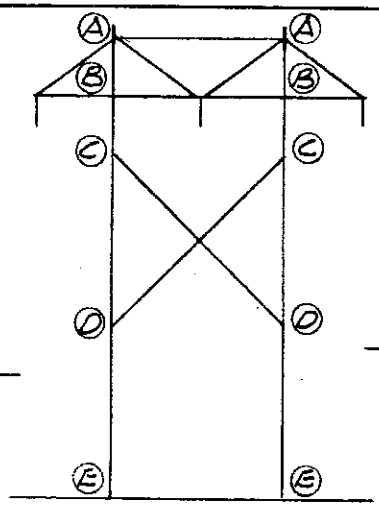
Approved

HUGHES BROTHERS

Date Printed

DRG. NO. A23345-2

TYPE C4523-A, 345 Kv TANGENT STR.
KANSAS CITY POWER & LIGHT CO.
FULL SIZE STRUCTURE TEST
NESC LIGHT



WEST

TEST NO. 2

DATE: 6-21-84

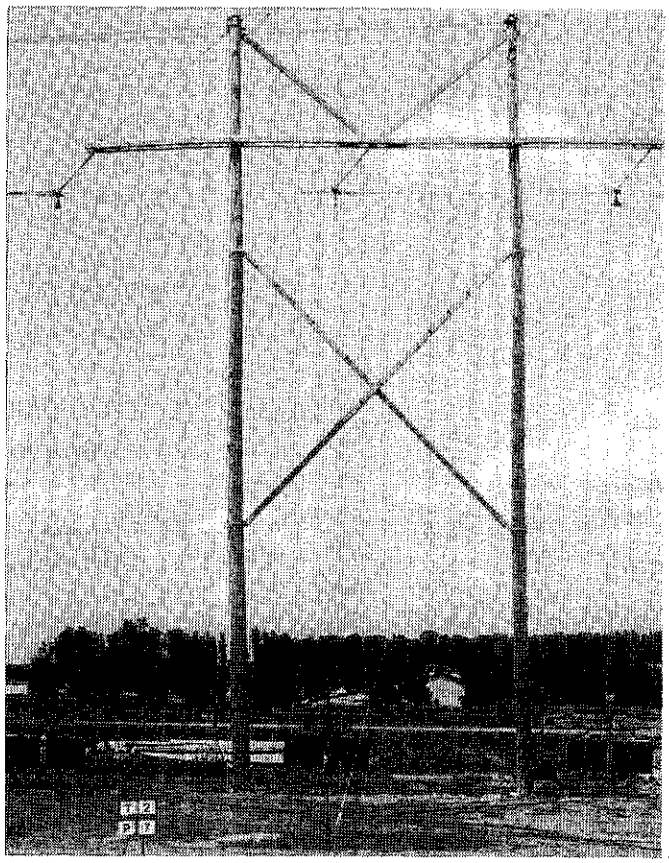
VERTICAL LOADS

East Phase	10,450 lbs.
Center Phase	10,450 lbs.
West Phase	10,450 lbs.
Per Shield Wire	1,200 lbs.

TRANSVERSE LOADS

LOADS (LBS.)			DEFLECTIONS (IN.)										
			WEST POLE					EAST POLE					PIC.
SHIELD WIRE (EA.)	COND (EA.)	TOTAL LOAD	A	B	C	D	THRUST	A	B	C	D	UP LIFT	NO.
0	0	0	0	0	0	0	0	0	0	0	0	0	T2P1
0	0	0	VERTICAL LOADS APPLIED										T2P2
300	1,850	6,150	3 3/4	3 1/8	2	1 5/8	1/4	2 5/8	3 1/8	2 3/8	1 3/8	0	T2P3
600	3,700	12,300	7 5/8	6 3/8	4 3/8	3 1/2	1/2	6 3/4	6 3/4	5	3 3/8	1/8	T2P4
900	5,550	18,450	14 3/4	12 3/8	9 1/8	6 3/4	3/4	12 3/4	12	8 7/8	5 7/8	1/8	T2P5
1,200	7,400	24,600	24 3/8	20 5/8	15 3/4	10 3/4	1 1/8	23	20 3/4	15 3/4	10	1/4	T2P6
1,350	8,325	27,675	34 5/8	29 5/8	22 1/2	15	1 1/4	31 1/2	28 1/8	22 1/4	14 1/2		T2P7
1,500	9,250	30,750			FAILURE								T2P8

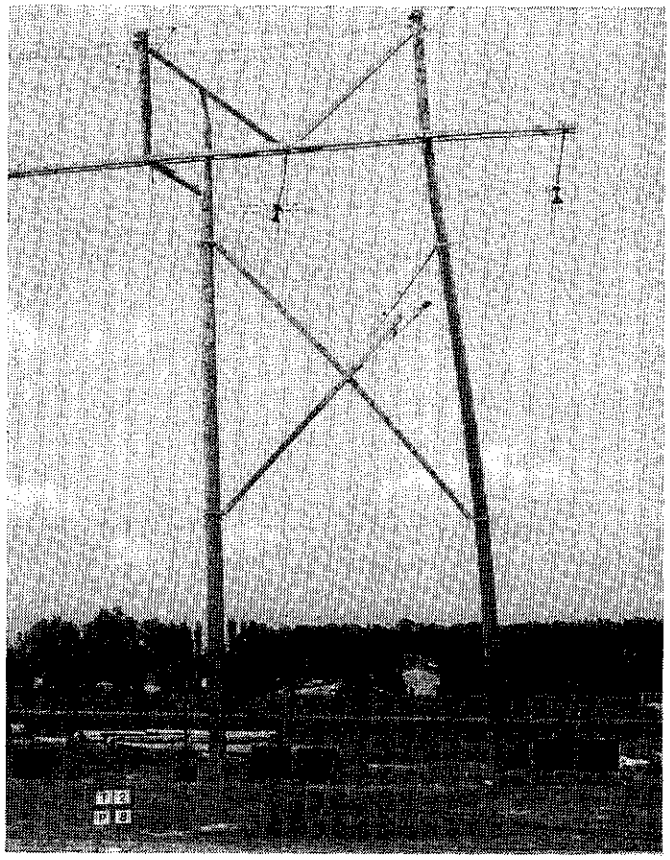
* Vertical loads applied during entire test represent NESC LIGHT loading x an overload capacity factor of 4.0.



Test No. 2
Photo No. 7

Vertical Loads
per shield wire = 1,200 lbs.
per phase = 10,450 lbs.

Transverse Loads
per shield wire = 1,350 lbs.
per phase = 8,325 lbs.
Total = 27,675 lbs.



Test No. 2
Photo No. 8
Failure

Vertical Loads
per shield wire = 1,200 lbs.
per phase = 10,450 lbs.

Transverse Loads
per shield wire =1,500 lbs.
per phase = 9,250 lbs.
Total = 30,750

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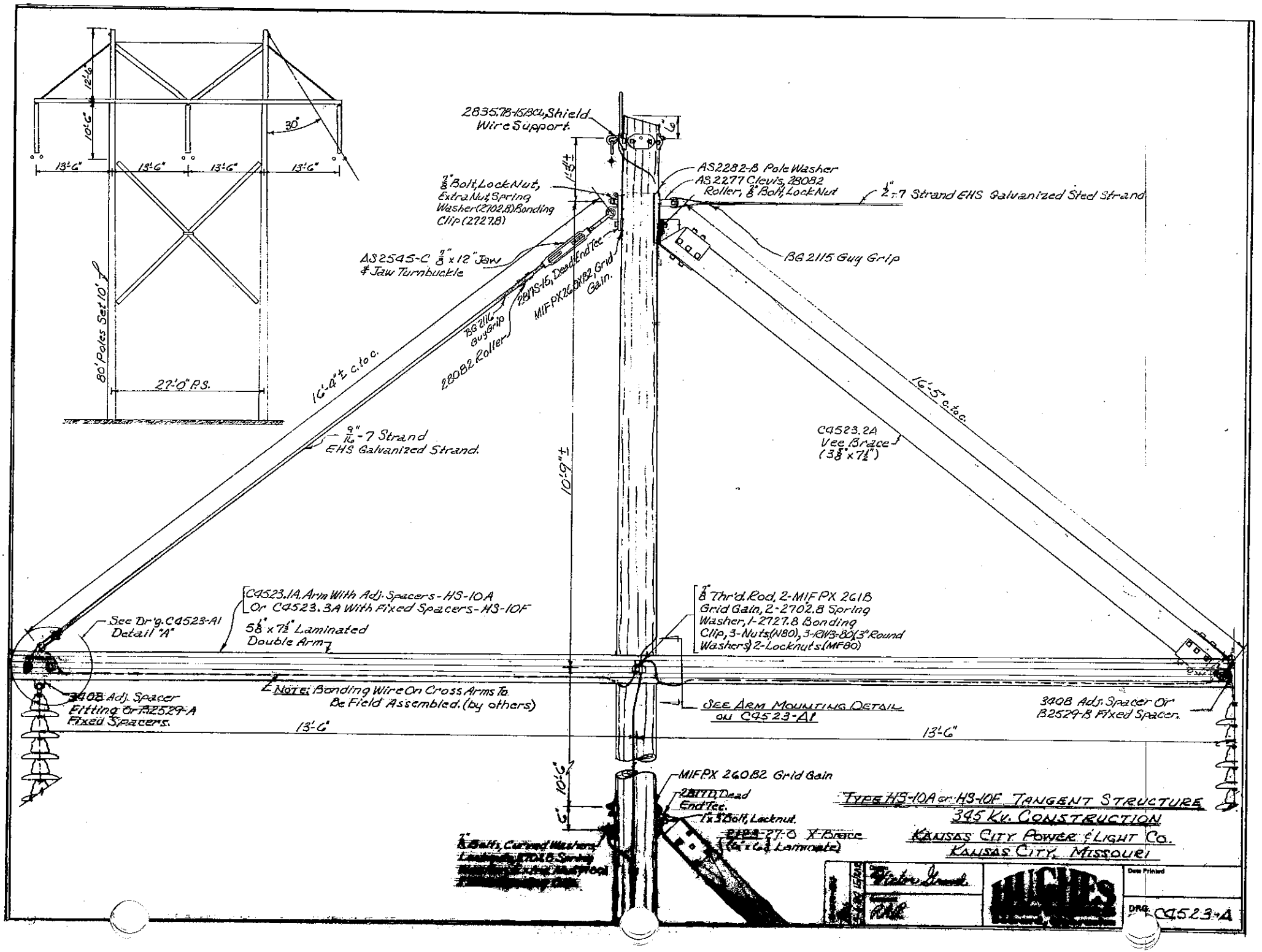
P.O. Box 159 210 North 13th Street Seward, Nebraska 68434


12'-6"
10'-6"
30°
13'-6"
13'-6"
13'-6"
13'-6"
80' Poles Set 10' ±
27'-0" P.S.
2835.78-1S3C4, Shield Wire Support.
7/8" Bolt, Lock Nut, Extra Nut, Spring Washer (2702.8) Bonding Clip (2727.8)
AS 2282-B Pole Washer
AS 2277 Clevis, 28082 Roller, 7/8" Bolt, Lock Nut
1/2" 7 Strand EHS Galvanized Steel Strand
BG 2115 Guy Grip
AS 2545-C 7/8" x 12" Jaw & Jaw Turnbuckle
BG 2116 Guy Grip
28082 Roller
2B1S-15, Dead End Tee
MIF PX 26 DX B2, Grid Gain.
16'-4" ± c. to c.
9/16" - 7 Strand EHS Galvanized Strand.
16'-5" c. to c.
C4523.2A Vee Brace (3 3/8" x 7 1/2")
10'-9" ±
C4523.1A Arm With Adj. Spacers - HS-10A Or C4523.3A With Fixed Spacers - HS-10F
5/8" x 7 1/2" Laminated Double Arm
See Dr'g. C4523-A1 Detail "A"
7/8" Thr'd. Rod, 2-MIF PX 26 IB Grid Gain, 2-2702.8 Spring Washer, 1-2727.8 Bonding Clip, 3-Nuts (N80), 3-RW3-80 (3" Round Washers) 2-Locknuts (MF80)
3408 Adj. Spacer Fitting Or B2529-A Fixed Spacers.
NOTE: Bonding Wire On Cross Arms To Be Field Assembled. (by others)
SEE ARM MOUNTING DETAIL ON C4523-A1
3408 Adj. Spacer Or B2529-B Fixed Spacer.
13'-6"
13'-6"
10'-6"
5'
MIF PX 26 DB2 Grid Gain
2B1TD Dead End Tee.
1" x 5" Bolt, Locknut.
B1P3-27-0 X-Brace (5 1/2" x 6" Laminate)
TYPE HS-10A or HS-10F TANGENT STRUCTURE
345 KV. CONSTRUCTION
KANSAS CITY POWER & LIGHT CO.
KANSAS CITY, MISSOURI
Date Printed
DRG. C4523-A