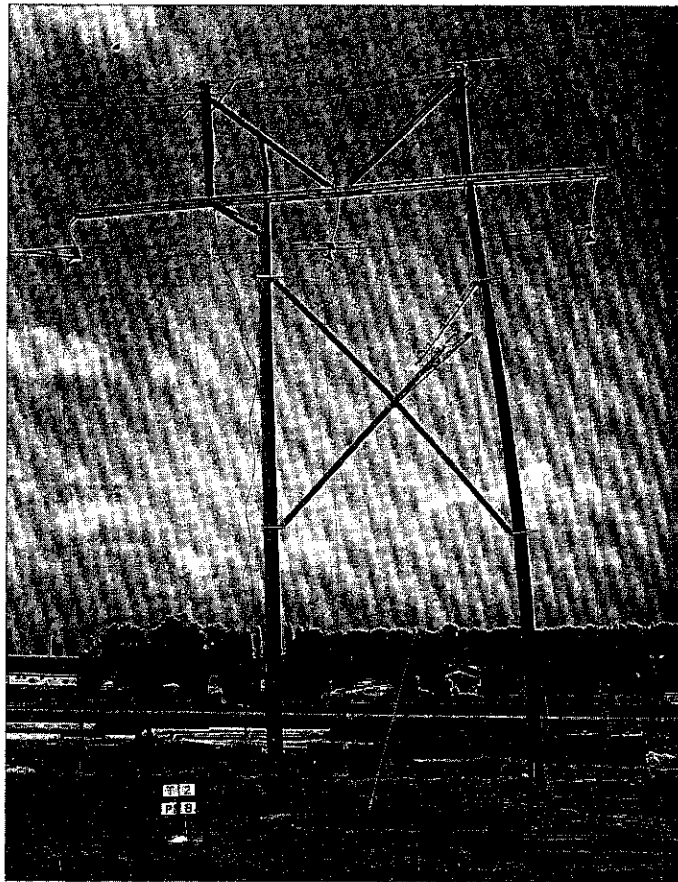


# STRUCTURE TEST

JUNE 21, 1984

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

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**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.

# HUGHES BROTHERS

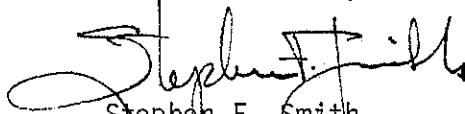
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CONCLUSION:

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.



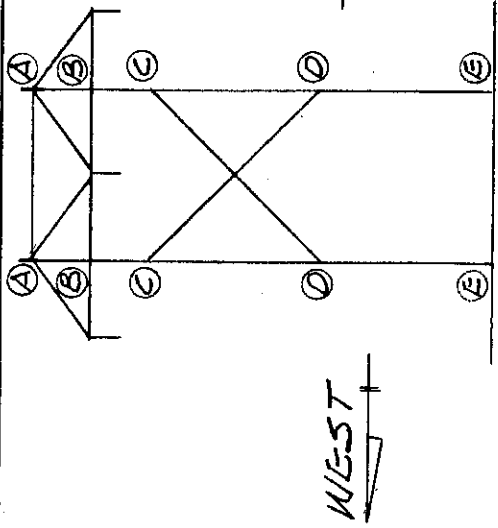
Stephen F. Smith  
Vice-President, Engineering

SFS:jap

TYPE C4523-A, 34.5KV TANGENT STR.  
 KANSAS CITY POWER & LIGHT CO.  
 FULL SIZE STRUCTURE TEST  
 NESC LIGHT

TEST No. 2

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

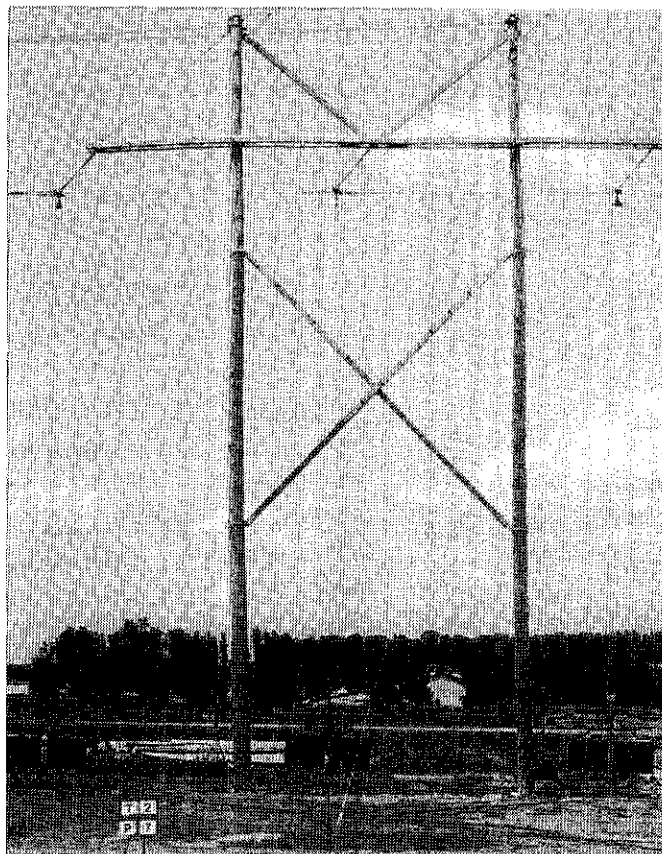
LOADS (LBS.)		DEFLECTIONS (IN.)										PIC. No.		
SHIELD WIRE (EA)	COND (EA)	TOTAL LOAD	WEST POLE			EAST POLE			THRUST		LIFT			
			A	B	C	A	B	C	D	D				
0	0	0	0	0	0	0	0	0	0	0	0	0	T2P1	
0	0	0	VERTICAL LOADS			APPLIED							T2P2	
300	1,850	6,150	3 3/4	3 1/8	2	1 5/8	1/4	2 5/8	3 1/8	2 3/8	1 3/8	0	T2P3	
600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

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

Drawn  
*J. Mifflin*  
 Approved



Date Printed  
 DRG. NO. A2345-C



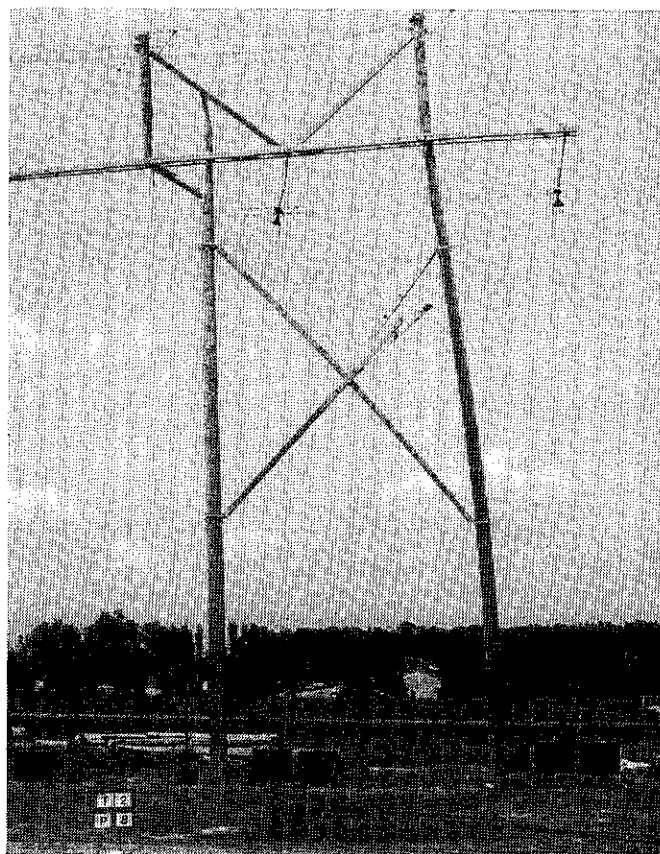
**Test No. 2**  
**Photo No. 7**

**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

**HUGHES**  
**BROTHERS**

