(3)

Estimate Request 12013 Estimate 19 - Kansas City, Kansas
Drexel - Replacing cables due to Collapse of 12th Street bridge.

~~Pictures in file~~ taken out

OUTLINE OF PLAN

On April 17, 1945 one of the channel piers of the 12th Street bridge over the Kaw River connecting the Argentine section with the main part of Kansas City, Kansas turned over, throwing the adjacent spans of the steel structure into the water.

For several days the Kaw River had been at flood stage due to excessive rains in the Kaw water shed. While some driftwood had collected against the pier it is believed that this was not the cause of the collapse of the pier.

The pier was built a considerable number of years ago and it is said that it does not rest on bed rock but on piles. It is possible that the water may have undermined the pier or may have penetrated between the stones of the pier and caused its collapse.

The Argentine section of the Drexel territory is served by two cables, a 909 pair 22 gauge and a 707 pair composite (202 pairs 19 gauge and 505 pairs 22 gauge) suspended from the bridge structure by catenary messenger strands attached to the steel beams under the roadway. There are three 200 foot spans and a 270 foot span of open steel work. A 205 foot section at the south end consists of iron pipes in the concrete and steel sections over the railroad tracks.

The pier that collapsed was the first north of the one at the south bank of the river and being in the channel was in water at all times even when the river was at its lowest level.

The collapse of the bridge broke the two cables at the points where the steel work fell into the river. The sudden strain pulled one of the cables in the pipes at the south end of the bridge against the edge of the pipe in the manhole damaging the sheath and necessitating the replacement of that cable in the pipe section.

In several manholes north of the river the cables were pulled off the manhole racks and iron pipe protection to the cables at the north pier was broken. The loss of the cables cut off service to about 2600 stations.

Temporary Service

A temporary switchboard was set up in a Fire Station and trunks to the Logan switchboard were obtained by stringing drop wire between terminals where Drexel and Westport (Logan) cables approached the boundary between the central office districts. Approximately 34 telephones at various points in the Argentine district were connected to the switchboard by temporary jumpers between cables at a manhole south of the bridge. This switchboard continued in service until permanent service to each telephone was completed by means of the replacing cables on the bridge.

Permanent Service

The loss of the two steel spans left a gap of 400 feet to cross. A line was carried over by a power launch belonging to the Government. Since the height of the steel structure did not permit the placing of catenary strands, it was necessary to place two 16000# strands clamped together for each cable.

Supply conditions were such that the cables available for restoring service were only a section of 606 pair 22 gauge and a piece of 505 pair composite cables. To secure enough cable pairs across the gap one 606 pair and two 505 pair cables were placed. The section of defective 707 pair composite cable in pipe in the bridge approach was replaced with 909 pair 22 gauge.

With two 16M strand supporting each cable, the measured sag was 10.5 feet at a temperature of approximately 50 degrees Fahrenheit.

The total load on the supporting strands under various loading conditions are as follows:

	Wt. per Ft.
(1) 0" ice - No wind	6.9#
(2) 0" ice - 8# wind	7.15#
(3) ½" ice - 4# wind	9.69#

The Catenary construction formula is as follows:

$$S = \frac{WL^2}{8T} \quad \text{or} \quad T = \frac{WL^2}{8S}$$

where S = Sag in feet

W = Weight in pounds per foot

L = Span length in feet

T = Tension in pounds

Under the condition of (1) above with a 10.5 feet sag the calculated tension is 13,200 pounds.

Condition #(3) above develops the greatest tension in the supporting strands. It is recognized that the sag will decrease as the temperature drops to the point where ice will form; however as the cable and strands load with ice, the sag increase due to the additional load will more than off set the decrease in sag which the lower temperature would tend to produce. Therefore it is evident that the sag under condition (3) will be as great or greater than under the conditions in (1) under which the sag of 10.5 feet was measured.

Therefore the combined tension in the two 16M strands under condition (3), assuming a minimum sag of 10.5 feet, would be 18,400 pounds.

The breaking strength of 16M strand is given as 18,000 pounds. A sag of 10.5 feet was secured on both strands and the tension in each strand was equalized. From the above calculations a factor of safety of approximately 2 should be realized under heavy loading conditions.

As mentioned previously the cables were subjected to a terrific strain when they parted. However only six pairs were found to be defective in splicing up the new cables. It seems advisable that the two cables be placed under continuous gas pressure in order that any sheath troubles may be caught before a failure results.

Plugs will be placed in each cable in the Drexel cable vault and at the south end of the bridge. Each cable is over 17,000 feet in length and as they are tied together by jumper cables on the bridge, the gas reservoir will be 35,000 feet of cable.

Permanent plans for repairing the bridge have not been determined. There is some demand by the people of the Argentine district that the bridge be built at two other locations. However the majority seem to be in favor of retaining the present location.

In the meantime consideration is being given to using two other bridges to carry part of the lines to Argentine. This would divide the load so only one cable would be required on the new bridge.