

OPEN WIRE  
TENSIONING

NOTES CONCERNING THIS APPENDIX

This appendix supplements Section G31.115.1 and describes a method of measuring sag to a greater degree of accuracy than covered in that section. The method outlined in this appendix should be used in stringing and checking the sags of wires transposed for "J" carrier operation.

The cross-reference "See Appendix" should be written in Section G31.115.1.

1. GENERAL

1.01 This appendix describes the method of measuring and checking sag in wires point transposed for "J" carrier operation.

1.02 The method of stringing wire that is point transposed for "J" carrier operation is outlined in Section G31.112-S.

1.03 In obtaining the proper sag by either the sighting or oscillation method as described in the following, proceed as follows:

(a) Measure or otherwise determine the length of the test span, from the center of one pole to the center of the next pole and use the nearest value in the sag tables (Section G31.116.1) for the span length involved.

(b) Read the air temperature on a thermometer that is located in the shade at a point near the line. Use the temperature column in the sag tables nearest to the thermometer reading.

1.04 All wires being replaced in the lead shall be given as nearly a uniform sag as practicable. It is especially important that the two wire's of a

pair shall have the same sag. When the stringing or repair work is completed and the wire is tied in, the sag of each wire of a pair in any span shall not deviate from the required sag given in Section G31.116.1 by more than one inch over or one inch under. When any greater variation occurs, the sag shall be readjusted to give as nearly the specified sag in both wires as practicable.

1.05 In the event of a failure in the lead, the wires shall be restored to service as soon as possible. This may entail splicing a broken wire or replacing a span or more of new wire. In any case, the sags of all spans that have been disturbed shall be carefully checked, in each direction from the point of failure, and brought into alignment with the other wires. Where temporary repairs are required, the sags shall be made as uniform as practicable and rechecked at the earliest opportunity to bring them within the requirements of Section G31.116.1. Where two men are available to do the checking, the sags should be corrected before leaving the job.

1.06 The method to be employed in checking sags is described in the following paragraphs.

1.07 Should an extensive replacement job of new wire be required, consult your supervisor.

## 2. METHOD OF CHECKING SAG - SIGHTING METHOD

2.01 The equipment consists of a gauge bar graduated in half inches, with a hook for hanging it on a crossarm, and a small telescope mounted on an adjustable member, which may be slid to any desired position on the bar. The standard sag gauge, as illustrated in Section G31.115.1, which has graduations corresponding to those on the telescope gauge bar, is also employed.

2.02 Two men are required, one to do the sighting from one pole of the span involved and one to handle the sag gauge on the other pole.

2.03 Where the wire to be checked is installed on the insulators, proceed as follows: Hang the telescope sag gauge over the wire, adjacent to the insulator, at one end of the span and the standard sag gauge in the same position at the other end of the span. Set the two gauges at the reading on the sliding members which corresponds to the amount of sag desired, to the nearest half inch. Align the telescope with the measurement on the opposite gauge and secure in place. If the sag is correct, the lowest point of the

wire should be seen at the center of the lens, or, in other words, in line with the top edge of the target on the adjacent gauge. If the wire is not in line, pull up until the required sag is obtained.

2.04 Where the wire is resting on the top of the crossarms, hang the gauges over the crossarms, as illustrated in Section G31.115.1. Align the telescope with the opposite gauge, as described above, and adjust the wire by pulling up or slacking back until the lowest point in the span is sighted in the center of the lens.

2.05 When the sag is so small that the lowest point on the wire is higher than the bottom of the crossarm, the sag cannot be read directly by the method described above as the crossarm would obscure the line of sight if the telescope could be raised to that level. In such cases, hang the two gauges on the wire or the crossarms, depending upon the position of the wire, and set the telescope on the gauge at the number that is twice that of the desired amount of sag. Sight through the telescope to the opposite sag gauge whose target should be placed directly under and in contact with the wire being checked. Adjust the wire until the lowest point appears in the center of the lens. This method introduces a small error as compared with equal readings and shall be used only when equal readings cannot be made.

2.06 The telescope sag gauge should be handled carefully. Care should be taken to keep the telescope lenses clean. Moisture collecting on the lenses or accumulations of dust will reduce visibility and make sighting difficult. When this occurs, clean the lenses with a soft, clean cloth.

#### 5. METHOD OF CHECKING SAG - OSCILLATION METHOD.

3.01 Sags may be checked by means of the oscillation method. This method consists of striking or plucking the wire to set up a traveling wave and then, with a stop watch, determine the number of seconds and fractions thereof, required for ten returns of the wave.

3.02 To check sags by means of the oscillation method, strike or pluck the wire from the side at a point about one foot from the crossarm. Do not oscillate the wire vertically as the wave cannot be seen as well when this is done. Looking along the wire the

wave can be seen travelling out to the far support and returning. Preferably, watch the wire at a point between midspan and the far support as the wave may be seen to better advantage than nearer the observer. Start the stop watch on the first or second return wave and count ten additional return waves. Stop the watch on the tenth (additional) return wave. The sag may then be read from the table (see Paragraph 3.04, below) for the number of seconds elapsed. Before attempting to check sags by the oscillation method, the employee assigned to this work should make a number of trial oscillation tests, measuring the sags also with a telescope gauge in order to familiarize himself with the work and make sure that his counting and timing of the oscillations is accurate.

3.03 If the sag is supposed to be eight inches or less, the wave may be started by striking the wire with the edge of the hand or fist. If more than eight inches, it will be found more satisfactory to pluck the wire; that is, pull it to one side and release quickly.

3.04 If the wire being checked is not attached to the insulator, but is lying on the crossarm, hold the wire firmly against the top of the arm while oscillating, otherwise the frequency of oscillation may be affected and result in incorrect readings.

OSCILLATION TABLE FOR CHECKING WIRE SAGS

<u>Sag</u> <u>Inches</u>	<u>Seconds for 10</u> <u>Oscillations</u>	<u>Sag</u> <u>Inches</u>	<u>Seconds for 10</u> <u>Oscillations</u>
4	5.7	12-1/2	10.2
4-1/2	6.1	13	10.4
5	6.4	13-1/2	10.6
5-1/2	6.7	14	10.8
6	7.1	14-1/2	11.0
6-1/2	7.3	15	11.2
7	7.6	15-1/2	11.3
7-1/2	7.9	16	11.5
8	8.1	16-1/2	11.7
8-1/2	8.4	17	11.9
9	8.6	17-1/2	12.0
9-1/2	8.9	18	12.2
10	9.1	18-1/2	12.4
10-1/2	9.3	19	12.6
11	9.5	19-1/2	12.7
11-1/2	9.7	20	12.9
12	10.0	20-1/2	13.0

#### 4. METHOD OF RETAINING PROPER SAG WHEN SPLICING REQUIRED

4.01 When it becomes necessary to splice in new wire for any reason, the following procedure shall be carried out in order to insure that the proper sag will be retained in the wires upon completion of the work.

4.02 With the wire grips and tackle in place, pull the wires to the specified sag and then proceed as follows:

- (a) Pull the wires hand-tight between the grips and cut the overlapping wires at a common point, at least one foot away from the crossarm.
- (b) Place an S copper sleeve over the end of one of the wires.
- (c) Cut an additional 1/4 inch off the end of the other wire and insert the wire in the sleeve.
- (d) Complete the splice with the sleeve rolling tool.