	VIBRATION DAMPER REQUIREMENTS FOR VARIOUS TYPES OF OVERHEAD CONDUCTORS	015073
Asset Type: Electric Transmission	Revision: Design, Estimating, and Planning	
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Rev. #05: This document replaces PG&E [REDACTED]	For a description of the changes, see Page 10.	

Purpose and Scope

This document illustrates the materials and installation data for protecting spans of conductor from fatigue damage due to aeolian vibrations.

1. The damper arrangements and spacings are intended for general use, on existing installations only.
2. Longer spans and conductor sizes not covered by this document should be referred to the transmission and distribution engineering personnel for assistance.
3. For new transmission lines, contact transmission line engineering personnel for damper arrangement and spacing requirements.
4. Every day tension (EDT) is the final conductor tension at the nominal temperature at 40° F, 0 lb wind for the design ruling span.
5. Dampers are to be installed on all spans longer than those shown in Table 1 on Page 2. The exception to this is low-tensioned lines where the EDT is less than 15% of the conductor ultimate (rated) strength and the line is **not** subjected to vibration producing winds. In general, dampers are not required in heavy loading areas or on lines where 715.5 kcmil aluminum is sagged according to [Document 015221](#), except for sections that may be exposed to winds as noted above. When dampers are installed on a section of low-tensioned lines due to wind exposure, install dampers in one additional adjacent span on each side of the exposed section. If a single span is exposed, a minimum of three spans should be dampened.
6. See Pages 9 and 10 for the application of dampers on #2 and #4 aluminum conductor steel reinforced (ACSR) conductors and 3 #6 and 7 #8 alumoweld overhead ground wires.
7. In general, dampers are not required on copper conductors. (See Page 10 for special application of dampers on copper conductors.)
8. In general, vibration dampers are not required for aluminum conductor steel supported (ACSS) type conductors. For special applications, refer to transmission line engineering personnel.

References

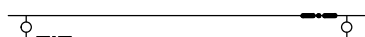
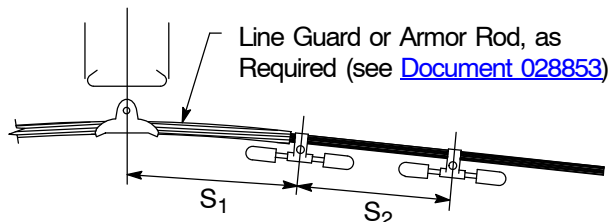
References	Location	Document
Sags and Tensions, Conductors on Wood Pole Lines	OH: Sags	015221
Armor Rods and Ties for Aluminum Conductors	OH: Conductors	028853
Methods of Mitigating Magnetic Heating Effects for Overhead Copper Lines	ELS	058127

Vibration Damper Requirements for Various Types of Overhead Conductors

Damper Arrangement for Each Conductor or Sub-conductor

Notes

1. Suspension construction is shown. However, Figure 4, Figure 5, and Figure 6 also apply to pin and post-type construction.
2. In Figure 4, dampers may be installed at either end of the span.



Method A

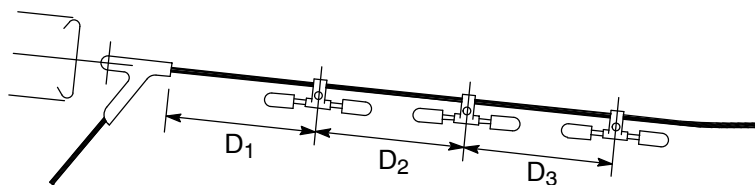


Method B

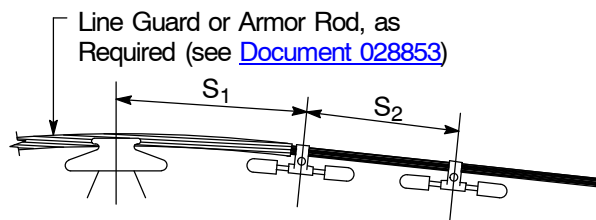
Plan View

(for bundle conductor either method A or B may be used)

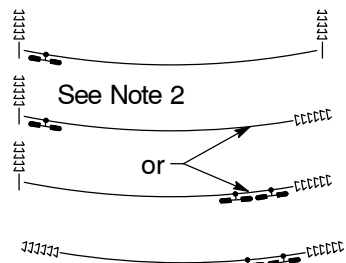
**Figure 1
Suspension Construction**



**Figure 2
Deadend Construction**



**Figure 3
Pin or Post Construction**



See Note 2

Figure 4



Figure 5

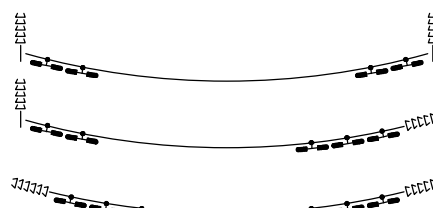


Figure 6

Table 1 Vibration Damper Requirements

Maximum Span Length Without Dampers (feet)	Conductor Size – AWG or kcmil	
	Aluminum	ACSR
200	3/0, 4/0, and 266.8	1/0, 3/0, and 4/0
200	336.4, 397.5	266.8, 336.4
300	715.5, 954	397.5
500	All Larger Sizes	All Larger Sizes

Vibration Damper Requirements for Various Types of Overhead Conductors

Alcoa 1700 Series Dampers for Aluminum Conductors

Table 2 1700 Series Dampers for Aluminum Conductors

Conductor Size <u>AWG or kcmil</u> Diameter	Damper						Design Ruling Span (feet)	Maximum Protectable Span (feet)				
	Catalog Number	Code	Spacing (inches) See Page 2					Figure 4 Page 2	Figure 5 Page 2	Figure 6 Page 2		
			S1	S2	D1	D2					D3	
<u>3/0 – 7 Str.</u> 0.464"	AFL-1703-4	188481	15	22	17	13	22	201 to 700	375	750	835	
								701 to 800	400	800	1,000	
								801 to 1,000	500	1,000	1,175	
	PLP VSD-10	187025						1,001 to 1,200	575	1,150	1,320	
								1,201 to 1,400	600	1,200	1,400	
<u>4/0 – 7 Str.</u> 0.522"	AFL-1703-4	188481	16	23	19	15	23	201 to 800	435	870	1,000	
								801 to 1,000	525	1,050	1,220	
								1,001 to 1,200	600	1,200	1,350	
	PLP VSD-20	187026						1,201 to 1,400	625	1,250	1,440	
								1,401 to 1,500	640	1,280	1,500	
<u>266.8 – 7 Str.</u> 0.586"	AFL-1704-5	188482	19	27	21	17	27	201 to 1,000	475	950	1,150	
								1,001 to 1,200	600	1,200	1,350	
								1,201 to 1,400	625	1,250	1,440	
	PLP VSD-20	187026						1,401 to 1,500	640	1,280	1,500	
<u>336.4 – 19 Str.</u> 0.666"	AFL-1704-5	188482	21	30	24	18	30	201 to 1,200	550	1,100	1,260	
								1,201 to 1,400	650	1,300	1,500	
								1,401 to 1,600	720	1,440	1,630	
	PLP VSD-20	187027						1,601 to 1,700	750	1,500	1,700	
<u>397.5 – 19 Str.</u> 0.724"	AFL-1704-6	188483	22	32	25	19	32	201 to 1,200	650	1,300	1,500	
								1,201 to 1,400	750	1,500	1,700	
								1,401 to 1,600	900	1,800	2,100	
	PLP VSD-25	187028						1,601 to 1,800	1,000	2,000	2,300	
								1,801 to 2,000	1,050	2,100	2,350	
<u>715.5 – 37 Str.</u> 0.974"	AFL-1706AA-9	188485	30	44	34	27	44	301 to 1,200	800	1,600	1,800	
									1,201 to 1,400	980	1,960	2,250
									1,401 to 1,600	1,050	2,100	2,400
	PLP VSD-35								1,601 to 1,800	1,120	2,240	2,575
									1,801 to 2,000	1,150	2,300	2,600
<u>954 – 37 Str.</u> 1.124"	AFL-1706AA-10	188486	36	53	40	33	53	301 to 1,200	900	1,800	2,100	
								1,201 to 1,400	1,100	2,200	2,450	
								1,401 to 1,600	1,200	2,400	2,600	
	PLP VSD-40	187030						1,601 to 1,800	1,250	2,500	2,800	
								1,801 to 2,000	1,300	2,600	2,900	

Vibration Damper Requirements for Various Types of Overhead Conductors

Alcoa 1700 Series Dampers for Aluminum Conductors (continued)**Table 2 1700 Series Dampers for Aluminum Conductors (Continued)**

Conductor Size AWG or kcmil Diameter	Damper						Design Ruling Span (feet)	Maximum Protectable Span (feet)			
	Catalog Number	Code	Spacing (inches) See Page 2					Figure 4 Page 2	Figure 5 Page 2	Figure 6 Page 2	
			S1	S2	D1	D2					D3
<u>1113 – 61 Str.</u> 1.216"	AFL- 1708AA-11	188487	38	57	43	35	57	401 to 1,200	1,050	2,100	2,400
	PLP VSD-40							1,201 to 1,400	1,120	2,240	2,600
								1,401 to 1,600	1,260	2,520	2,750
								1,601 to 1,800	1,370	2,740	3,000
								1,801 to 2,000	1,440	2,880	3,200
<u>1431 – 61 Str.</u> 1.379"	AFL- 1708AA-13	188645	44	-	44	36	-	401 to 1,200	1,400	2,800	-
	PLP VSD-40							1,201 to 1,400	1,500	3,000	-
								1,401 to 1,600	1,600	3,200	-
								1,601 to 1,800	1,700	3,400	-
								1,801 to 2,000	1,800	3,600	-
2,001 to 2,200	1,900	3,800	-								
<u>2300-61 Str.</u> 1.748" EDT Less Than 8300#	AFL- 1708AA-15	188467	53	-	53	43	-	401 to 1,200	1,500	3,000	-
								1,201 to 1,400	1,750	3,500	-
								1,401 to 1,600	1,900	3,800	-
EDT Over 8300#	PLP VSD-50		60	-	60	50	-	1,601 to 1,800	2,000	4,000	-
								1,801 to 2,000	2,100	4,200	-
								2,001 to 2,200	2,150	4,300	-
								2,201 to 2,400	2,200	4,400	-

Fargo – 4R Dampers for Aluminum Conductors**Note**

- Any surplus and all removed dampers should be retained for replacement or future use.

Table 3 4R Type Dampers For Aluminum Conductors

Conductor Size AWG or kcmil Diameter	Catalog Number	Code	Spacing (inches) See Page 2			Design Ruling Span (feet)	Maximum Protectable Span (feet)	
			S1	D1	D2		Figure 4 Page 2	Figure 5 Page 2
<u>3/0 – 7 Str.</u> 0.464"	Fargo 607051011	188648	32	35	21	201 to 700	425	850
						701 to 800	500	1,000
						801 to 1,000	600	1,200
						1,001 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
<u>4/0 – 7 Str.</u> 0.522"	Fargo 607051011	188648	31	35	21	201 to 800	500	1,000
						801 to 1,000	600	1,200
						1,001 to 1,200	700	1,400
						1201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800

Vibration Damper Requirements for Various Types of Overhead Conductors

Fargo – 4R Dampers for Aluminum Conductors (continued)

Table 3 4R Type Dampers For Aluminum Conductors (continued)

Conductor Size <u>AWG or kcmil</u> Diameter	Catalog Number	Code	Spacing (inches) See Page 2			Design Ruling Span (feet)	Maximum Protectable Span (feet)	
			S1	D1	D2		Figure 4 Page 2	Figure 5 Page 2
<u>266.8 – 7 Str.</u> 0.586"	Fargo 607051011	188648	31	35	21	201 to 1,000	600	1,200
						1,001 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800
<u>336.4 – 19 Str.</u> 0.666"	Fargo 607051011	188649	29	33	20	201 to 1,200	650	1,300
						1,201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800
						1,601 to 1,700	1000	2,000
<u>397.5 – 19 Str.</u> 0.724"	Fargo 607051011	188649	35	39	24	201 to 1,200	800	1,600
						1,201 to 1,400	850	1,700
						1,401 to 1,600	1,050	2,100
						1,601 to 1,800	1,150	2,300
						1,801 to 2,000	1,200	2,400
<u>715.5 – 37 Str.</u> 0.974"	Fargo 6071012	188650	40	45	27	301 to 1,200	900	1,800
						1,201 to 1,400	1,150	2,300
						1,401 to 1,600	1,250	2,500
						1,601 to 1,800	1,300	2,600
						1,801 to 2,000	1,400	2,800
<u>954 – 37 Str.</u> 1.124"	Fargo 6071012	188650	50	55	33	301 to 1,200	1,050	2,100
						1,201 to 1,400	1,250	2,500
						1,401 to 1,600	1,300	2,600
						1,601 to 1,800	1,400	2,800
						1,801 to 2,000	1,500	3,000
<u>1,113 – 61 Str.</u> 1.216"	Fargo 6071513	188651	66	71	43	401 to 1,200	1,200	2,400
						1,201 to 1,400	1,300	2,600
						1,401 to 1,600	1,400	2,800
						1,601 to 1,800	1,500	3,000
						1,801 to 2,000	1,600	3,200
<u>1,431 – 61 Str.</u> 1.379"	Fargo 6071513	188651	74	79	48	401 to 1,200	1,500	3,000
						1,201 to 1,400	1,600	3,200
						1,401 to 1,600	1,700	3,400
						1,601 to 1,800	1,800	3,600
						1,801 to 2,000	1,900	3,800
						2,001 to 2,200	2,000	4,000
<u>2,300-61 Str.</u> 1.748"	Fargo 6072014	188467	78	83	50	401 to 1,200	1,800	3,200
						1,201 to 1,400	1,750	3,500
						1,401 to 1,600	1,900	3,800
						1,601 to 1,800	2,000	4,000
						1,801 to 2,000	2,100	4,200
						2,001 to 2,200	2,150	4,300
2,201 to 2,400	2,200	4,400						

Vibration Damper Requirements for Various Types of Overhead Conductors

Alcoa 1700 Series Dampers for ACSR Conductors**Table 4 1700 Series Dampers for ACSR Conductors**

Conductor Size AWG or kcmil Diameter	Damper					Design Ruling Span (feet)	Maximum Protectable Span (feet)				
	Catalog Number	Code	Spacing (inches) See Page 2					Figure 4 Page 2	Figure 5 Page 2	Figure 6 Page 2	
			S1	S2	D1		D2				D3
<u>1/0 – 6/1</u> 0.398"	AFL-1703-3	188480	15	20	17	13	20	201 to 700	375	750	835
	PLP VSD-1012	187025						701 to 800	400	800	1,000
								801 to 1000	500	1,000	1,175
								1,001 to 1,200	575	1,150	1,320
								1,201 to 1,400	600	1,200	1,400
<u>3/0 – 6/1</u> 0.464"	AFL-1703-4	188481	19	22	18	13	22	201 to 800	435	870	1,000
	PLP VSD-2016	187026						801 to 1,000	525	1,050	1,220
								1,001 to 1,200	600	1,200	1,350
								1,201 to 1,400	625	1,250	1,440
								1,401 to 1,500	640	1,280	1,500
<u>4/0 – 6/1</u> 0.563"	AFL-1703-4	188481	20	25	20	15	25	201 to 1,000	475	950	1,150
	PLP VSD-2016	187026						1,001 to 1,200	600	1,200	1,350
								1,201 to 1,400	625	1,250	1,440
								1,401 to 1,500	640	1,280	1,500
<u>266.8 – 26/7</u> 0.642"	AFL-1704-5	188482	21	30	24	18	30	201 to 1,200	600	1,200	1,380
	PLP VSD-2020	187027						1,201 to 1,400	700	1,400	1,600
								1,401 to 1,600	800	1,600	1,840
								1,601 to 1,800	850	1,700	1,950
<u>336.4 – 30/7</u> 0.741"	AFL-1704-6	188483	25	35	28	21	35	201 to 1,200	800	1,600	1,800
	PLP VSD-2520	187028						1,201 to 1,400	975	1,950	2,250
								1,401 to 1,600	1,050	2,100	2,400
								1,601 to 1,800	1,120	2,240	2,575
<u>397.5 – 26/7</u> 0.783"	AFL-1705-7	188484	26	38	29	23	38	301 to 1,200	800	1,600	1,800
	PLP VSD-2525	187028						1,201 to 1,400	975	1,950	2,250
								1,401 to 1,600	1,050	2,100	2,400
								1,601 to 1,800	1,120	2,240	2,575
<u>795 – 54/7</u> <u>1.092"</u> EDT Less Than 4,000#	AFL- 1706AA-10	188486	34	39	30	24	29	401 to 1,200	1,100	2,200	2,500
	PLP VSD-4032	187030						1,201 to 1,400	1,200	2,400	2,750
								1,401 to 1,600	1,300	2,600	3,000
EDT Over 4,000#			36	54	40	32	54	1,601 to 1,800	1,400	2,800	3,225
								1,801 to 2,000	1,500	3,000	3,450

Vibration Damper Requirements for Various Types of Overhead Conductors

Alcoa 1700 Series Dampers for ACSR Conductors (continued)

Table 4 1700 Series Dampers for ACSR Conductors (continued)

Conductor Size <u>AWG or kcmil</u> Diameter	Catalog Number	Code	Spacing (inches) See Page 2					Design Ruling Span (feet)	Maximum Protectable Span (feet)		
			S1	S2	D1	D2	D3		Figure 4 Page 2	Figure 5 Page 2	Figure 6 Page 2
<u>954 – 54/7</u> 1.196” EDT Less Than 5000#	AFL- 1706AA-10	188486	36	53	37	32	53	401 to 1200	1,200	2,400	–
								1,201 to 1,400	1,300	2,600	–
								1,401 to 1,600	1,400	2,800	–
EDT Over 5000#	PLP VSD-4032	187034	38	60	42	36	60	1,601 to 1,800	1,500	3,000	3,400
								–	–	–	–
								1,801 to 2,000	1,600	3,200	3,700
<u>1852-51+ 12/7</u> 1.602” EDT Less Than 8300#	AFL- 1708AA-14	188464	50	–	50	40	–	401 to 1,200	1,500	3,000	–
								1,201 to 1,400	1,750	3,400	–
								1,401 to 1,600	1,900	3,800	–
EDT Over 8300#	Dulmison DB4-38		56	–	56	46	–	1,601 to 1,800	2,000	4,000	–
								1,801 to 2,000	2,100	4,200	–
								2,001 to 2,200	2,150	4,300	–
								2,201 to 2,400	2,200	4,400	–

Fargo – 4R Dampers for ACSR Conductors

Note

1. Any surplus and all removed dampers should be retained for replacement or future use.

Table 5 4R Type Dampers For ACSR Conductors

Conductor Size <u>AWG or kcmil</u> Diameter	Catalog Number	Code	Spacing (inches) See Page 2			Design Ruling Span (feet)	Maximum Protectable Span (feet)	
			S1	D1	D2		Figure 4 Page 2	Figure 5 Page 2
<u>1/0 – 6/1</u> 0.398”	Fargo 607051011	188648	35	39	23	201 to 700	425	850
						701 to 800	500	1,000
						801 to 1,000	600	1,200
						1,001 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
<u>3/0 – 7/1</u> 0.464”	Fargo 607051011	188648	31	35	21	201 to 800	500	1,000
						801 to 1,000	600	1,200
						1,001 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800
<u>4/0 – 6/1</u> 0.563”	Fargo 607051011	188648	31	35	21	201 to 1000	600	1,200
						1,001 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800

Vibration Damper Requirements for Various Types of Overhead Conductors

Fargo – 4R Dampers for ACSR Conductors (continued)**Table 5 4R Type Dampers For ACSR Conductors (continued)**

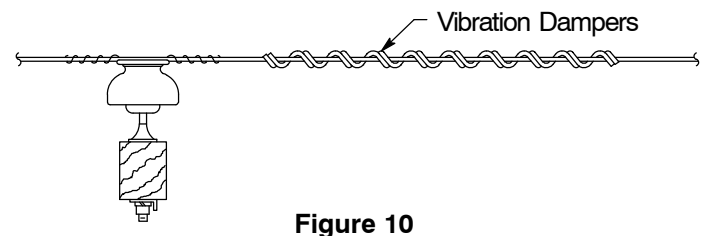
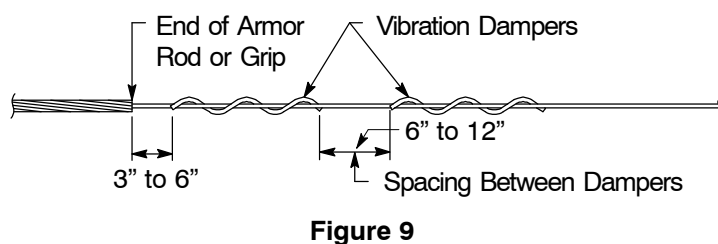
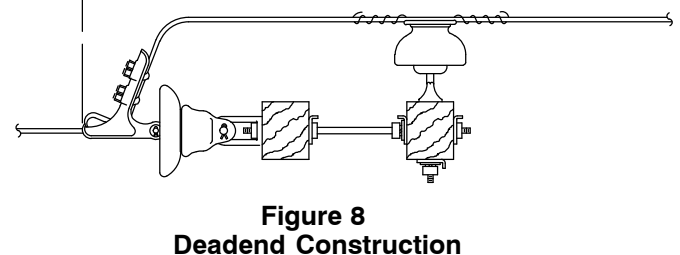
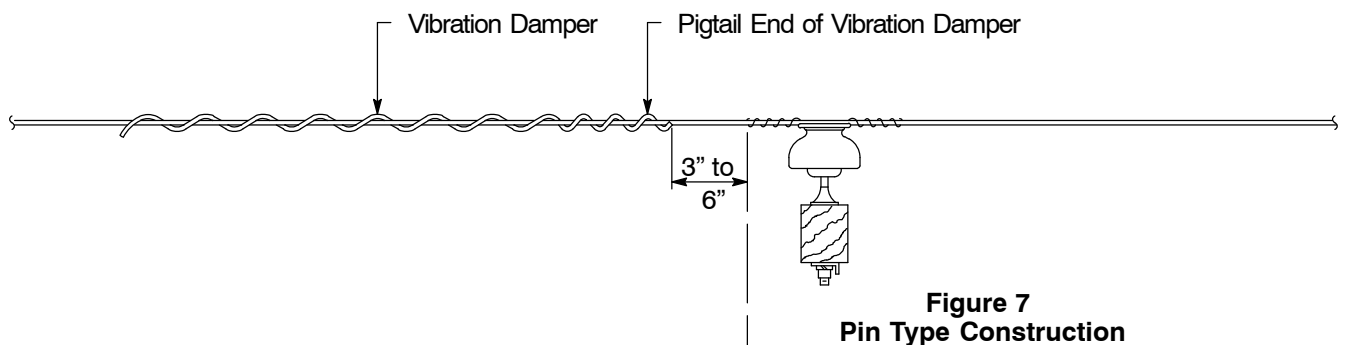
Conductor Size AWG or kcmil Diameter	Catalog Number	Code	Spacing (inches) See Page 2			Design Ruling Span (feet)	Maximum Protectable Span (feet)	
			S1	D1	D2		Figure 4 Page 2	Figure 5 Page 2
<u>266.8 – 26/7</u> 0.642"	Fargo 607051011	188649	29	33	20	201 to 1,200	700	1,400
						1,201 to 1,400	800	1,600
						1,401 to 1,600	900	1,800
						1,601 to 1,800	1,000	2,000
<u>336.4 – 30/7</u> 0.741"	Fargo 607051011	188649	33	37	22	201 to 1,200	900	1,800
						1,201 to 1,400	1,100	2,200
						1,401 to 1,600	1,200	2,400
						1,601 to 1,800	1,300	2,600
<u>397.5 – 26/7</u> 0.783"	Fargo 607051011	188649	35	39	23	301 to 1,200	900	1,800
						1,201 to 1,400	1,100	2,200
						1,401 to 1,600	1,200	2,400
						1,601 to 1,800	1,300	2,600
<u>795 – 54/7</u> 1.092"	Fargo 6071012	188650	54	59	35	401 to 1,200	1,250	2,500
						1,201 to 1,400	1,400	2,800
						1,401 to 1,600	1,550	3,100
						1,601 to 1,800	1,650	3,300
<u>954 – 54/7</u> <u>1.196"</u> EDT Less Than 5,000#	Fargo 6071513	188651	66	71	43	401 to 1,200	1,400	2,800
						1,201 to 1,400	1,500	3,000
						1,401 to 1,600	1,650	3,300
						1,601 to 1,800	1,750	3,500
EDT Over 5,000#			58	63	38	1,801 to 2,000	1,850	3,700
<u>1,852-51 + 12/7</u> 1.602"	Fargo 6072014	188464	70	75	45	401 to 1,200	1,600	3,200
						1,201 to 1,400	1,750	3,500
						1,401 to 1,600	1,900	3,800
						1,601 to 1,800	2,000	4,000
						1,801 to 2,000	2,100	4,200
						2,001 to 2,200	2,150	4,300
2,201 to 2,400	2,200	4,400						

Vibration Damper Requirements for Various Types of Overhead Conductors

Spiral-Type Vibration Dampers

Notes

1. At each end of the span, install one spiral damper per conductor on spans from 301 to 800 feet. Install two dampers per conductor on each end of spans 801 to 1,600 feet. Refer to transmission and distribution engineering personnel for assistance for spans shorter than 300 feet where conductor vibration is considered a problem. Install per Figure 7 and Figure 8.
2. No clamps or stoppers are required with spiral dampers since the pigtail portion of the damper is designed to grip the conductor.
3. Spiral-type vibration dampers are not placement sensitive. They may be placed on either side of a splice or a connector.
4. When the existing Stockbridge-type dampers, Alcoa catalog number 1701.4 fail, they are to be replaced with spiral-type dampers as shown in Table 6 on Page 10. Install one spiral damper per shield wire at each end of the span for spans up to 800 feet long, two spiral dampers at each end of the span for spans 801 to 1,600 feet, or three spiral dampers at each end of the span for spans 1,601 to 2,400 feet. Install per Figure 9.
5. When two dampers are required, they can be doubled up and installed as shown in Figure 10 rather than spread along the conductor as shown in Figure 9. A maximum of three dampers can be installed in a manner similar to that shown for two dampers in Figure 10.



Vibration Damper Requirements for Various Types of Overhead Conductors

Table 6 Spiral Vibration Dampers

Conductor and Shield Wire		Spiral Dampers		Code	Remarks (see notes)
		Manufacturer and Catalog Number			
Type	Size	PLP Co.	Dulmison		
ACSR	4	SVD-0103	SVD-0635	188388	1, 2, and 3 on Page 9
	2	5050103			
Alumoweld	3-#6	SVD-0104	SVD-0830	188670	2 and 4 on Page 9
	7-#8	5050104			

Alcoa 1700 Series Dampers for Special Application for Copper Conductors

Notes

- The spacing shown in Table 7 is for suspension, pin, or post-type construction. Install the damper adjacent to the end of armor rod or bypass connector (see [Document 058127](#)).
- Before installing damper, clean the conductor and apply a liberal coating of oxide-inhibitor compound. In corrosion areas after damper installation, coat the damper clamp and conductor area adjacent to the clamp with oxide-inhibitor compound.

Table 7 1700 Series Dampers for Copper Conductors

Conductor Size AWG or kcmil	Catalog Number ¹	Code	Spacing (inches) See Note 1 and Page 2				Maximum Protectable Span (feet)	
			S1	S2	D1	D2	Figure 4 on Page 2	Figure 5 On Page 2
#2 – 7 Str.	AFL-1701-2 CU	188686	10	12	12	12	400	800
1/0 – 7 Str.	AFL-1701-3 CU	188646	12	12	14	12	500	1,000
2/0 – 7 Str.			14	13	16	13	600	1,200
3/0 – 7 Str.	AFL-1702-4 CU	188647	15	15	18	15	700	1,400
4/0 – 7 Str.			16-1/2	17	19-1/2	17	800	1,600
250 – 19 Str.	AFL-1702-5 CU	188687	18	18-1/2	21-1/2	18-1/2	900	1,800

¹ The CU suffix adds the bronze clamp to the dampers shown on Table 7.

Revision Notes

Revision 05 has the following changes:

- Revised Table 7 on Page 10. Added two (2) columns “S1” and “S2”.
- Revised typos inside tables. “ALF” was changed to “AFL”
- Changed document owner from [REDACTED]) to [REDACTED]