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PREFORMED LINE PRODUCTS

DEAD-END: COATED

SIZE	JACKETING (SPECIFIC GRAVITY)	OUTSIDE DIAMETER (INCHES)	SUSTAINED LOAD TEST RESULTS (LBS.)	PERCENT OF BREAKING STRENGTH
2/0, 7W, 4/64s	Poly. (.928)	.539	1,800	104%
1/0, 7W, 4/64s	Poly. (.931)	.493	2,200	101%
1/0, 7W, 4/64s	Neoprene	.493	1,650	98%
2/0, 7W, 4/64s	Neoprene	.539	2,100	99%
366.4, 19W, 4/64s	Poly. (.933)	.791	4,500	79%
400, 19W, 6/64s	Neoprene	.913	5,000	80%
250, 19W, 5/64s	Neoprene	.732	3,200	79%
397.5, 19W, 6/64s	Poly. (.928)	.912	4,700	72%
3/0, 7W, 8/64s	Poly. (.927)	.706	1,900	70%
336.4, 19W, 5/64s	Neoprene	.824	3,600	67%
500, 37W, 6/64s	Poly. (.926)	1.001	5,600	65%
336.4, 19W, 4/64s	Poly. (.920)	.791	3,600	63%
1/0, 7W, 4/64s	Poly. (.918)	.493	1,100	62%
#4, 6/1, 8/64s	Poly. (.929)	.502	950	54%
4/0, 7W, 10/64s	Poly. (.920)	.830	3,000	49%
4/0, 7W, .078	Vinyl	.695	1,600	47%
336.4, 19W, .150" Compacted	Poly. (.943)	.910	2,600	46%
266.8, 19W, 10/64s	Poly. (.966)	.885	1,800	40%
4/0, 6/1, 4/64s	Neoprene	.688	2,900	36%
1/0, 7W, 10/64s	Poly. (.982)	.678	600	33%
1/0, 7W, 10/64s	Poly. (.949)	.692	500	28%

This table is based on actual results of long term sustained load tests and may be considered representative of the cables described.

Refer to reference charts in this section for additional information on Holding Strengths.

Specific gravity of various polyethylenes:
ASTM Designation D-1248-58T

Low Density (g/cu. cm.) 0.910-0.925
Medium Density (g/cu. cm.) 0.926-0.940
High Density (g/cu. cm.) 0.941-0.965

Weatherometer (UV) Test Report

Abstract
The purpose of this test is to demonstrate the Ultraviolet (UV) stability of the Gray High Density Polyethylene material when used in an outdoor application.
This is demonstrated by measuring the percent retention of tensile strength and elongation after 3000 hours of weathering.

Procedure
Three (3) tensile samples of each were measured at each 1000 hour weathering interval and compared to original unaged results.
Weatherometer aging was performed to ASTM G 155-00a specifications, Cycle 1 Test Method (continuous light, intermittent water spray), Optical filter type borosilicate or Daylight filter, Irradiance setting .35 W/m sq. @ 340 nm.

Results

Blend Number	*Tensile Original, psi*	*Elongation Original, %*	*Tensile After 3000 Hrs % Retention*	*Elongation After 3000 Hrs % Retention*
2269072	3508	827	89	77

Hendrix Requirement: Minimum Retention 50% through 3000 hours.

Conclusion
Results are Stable through 3000 hours of weathering.

Tensile Testing Procedure
Testing was conducted using a .075" thick tensile bars and a tensile width of .100".

Tested and Reported by: Gary Grenier
Aerial Process Engineer
Test Date: November 15, 2005

PLASTICS TECHNOLOGY LABORATORIES, INC.

Testing	:	Dielectric Strength
Test Method	:	ASTM D149-97a Method A
Project #	:	00-634 Purchase Order # : 92303
Customer	:	Hendrix
Attention	:	Gary Grenier
Analyst	:	P. Swint
Date	:	April 27, 2000

Rate of Rise	:	500 volts/sec
Sample Conditioning	:	40+ Hours at 23°C/50% RH
Electrode Size	:	1.0" diameter
Surrounding Medium	:	Oil
Test Specimen Type	:	3.5" x 8" Plaques
Test Conditions	:	23°C/50% RH

High Density Polyethylene Plaques	Test #	Failure Location On Electrode	Thickness (IN)	Breakdown Voltage (KV)	Dielectric Strength (V/MIL)
0.075" Black	1	Edge	0.082	65.0	793
	2	Edge	0.099	77.9	787
	3	Edge	0.082	71.4	871
	4	Edge	0.079	67.7	857
	5	Edge	0.085	71.6	842
	Average		0.085	70.7	830
	Std.Dev.		0.008	4.9	38
0.075" Gray	1	Edge	0.075	56.5	753
	2	Edge	0.082	60.9	743
	3	Edge	0.092	63.7	692
	4	Edge	0.103	66.5	647
	5	Edge	0.081	62.5	772
	Average		0.087	62.0	721
	Std.Dev.		0.011	3.7	51

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Preformed Line Products Company

RESEARCH AND ENGINEERING

April 7, 1976

TM-178-E

GUY-GRIP Dead-Ends

ABSTRACT

This technical memorandum presents a discussion of the features and capabilities relative to the performance and usage of GUY-GRIP dead-ends.

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Approved: Ralph B. Siter
Ralph B. Siter
Manager
Product Engineering

Date Approved: April 27, 1976

caj

Ing. SEBASTIÁN CABELLO
Perito Auxiliar

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Preformed Line Products Company

RESEARCH AND ENGINEERING

TM-178-E April 7, 1976

PART I - DESCRIPTION AND INTENDED USE

The GUY-GRIP dead-ends, Figure 1, are strand terminating devices having wide applications including use by electric power and telephone utilities, and CATV companies.

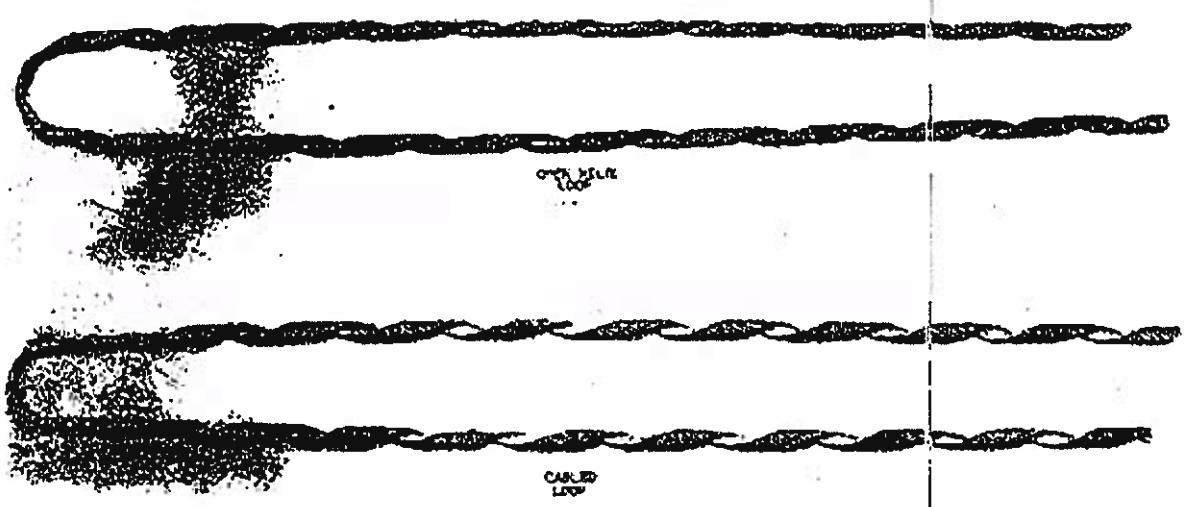

Figure 1 - Open Helix and Cabled Loop GUY-GRIP dead-ends

The GUY-GRIP dead-end is made of helically formed rods which, once applied, encircle the strand giving the product the same appearance as the strand. The loop portion, which attaches to strand hardware or guy strain insulators, can be "cabled" (the rods are twisted together in the loop) to better fit smaller hardware used in some market areas. For adequate gripping, the lay direction of the GUY-GRIP dead-end must be the same as the strand.

GUY-GRIP dead-ends are designed for use with most commercially available hardware. In no case should hardware which allows the strand to rotate about its own axis, such as a swivel, be used. However, articulated hardware such as a thimble clevis is recommended. For optimum performance of GUY-GRIP dead-ends, hardware conforming to the dimensions shown in Table III is recommended.

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Ingeniero Civil

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To insure material compatibility with the strand, GUY-GRIP dead-end designs are available in several materials including galvanized-, copper-, and aluminum-covered steel, and stainless steel. A complete line of GUY-GRIP dead-ends is available for strand sizes from 1/8" through 7/16". For larger strand sizes or for strand used in the guying of transmission structures, microwave towers and signal antennas, the Big-Grip dead-end or Vari-Grip dead-end is recommended.

GUY-GRIP dead-ends are wrapped around the strand by hand requiring no tools in their application.

PART II - MECHANICAL PERFORMANCE

TENSION TESTS

Discussion

The GUY-GRIP dead-end is designed to develop tension loads equal to or greater than the published rated breaking strength (RBS) of the strand. Due to the constant radial gripping force, which is inherent with the helical principle, premature strand slippage and breakage is avoided.

Satisfactory holding strength is accomplished by; designing the helix of the dead-end to approximately 80% of the diameter of the strand; properly selecting the rod diameter, number of rods, pitch length, and contact length; and coating the inside of the helix with an aluminum-oxide grit.

Extensive testing is required to properly design an efficient dead-end for strand usage.

Procedure

Tension tests conducted in the laboratory established the maximum holding capability of the GUY-GRIP dead-end. The dead-ends were applied to the strand with approximately three inches of strand extending beyond the crossover point. The test specimens were tensioned until failure occurred. These tests were conducted with the loops of the dead-ends applied to minimum diameter hardware as recommended in Table III. Figure 2 illustrates the test set-up.

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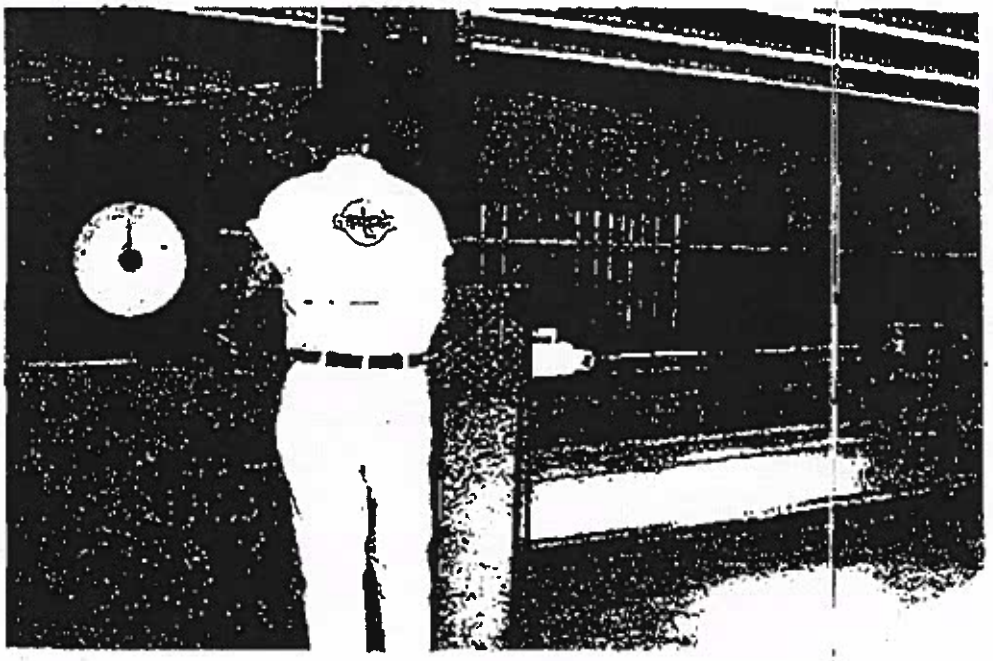

Figure 2 - Test Set-Up for Tension Tests

Results

The data from the galvanized steel and Alumoweld GUY-GRIP dead-end tension tests is listed in Table I. These results indicate that the GUY-GRIP dead-end will develop the published rated breaking strength of the strand for which they are designed. As indicated in these results, the strength of the strand may vary from a few percentage points over the manufacturers' rating to as high as eighteen percent over rated strength. To provide a reliable product, the GUY-GRIP dead-end has been designed to develop loads equal to the manufacturers' published rated breaking strength. Due to the safety factor designed into the GUY-GRIP dead-end, loads greater than RBS are often developed.

Ing. SERGIO APOLLO
Representante Legal

TABLE I

TENSION TEST DATA, GALVANIZED AND AW STRAND

Strand (RBS-lbs.)	Catalog No.	Length of Test Span (ft.)	Max. Load (lbs.)	Percent of RBS	Results
1/4" EHS 7w (6,650)	GDE-2104	15	7,550	113.5	Strand failed
	GDE-2104	15	7,450	112.0	Strand failed
	GDE-2104	15	7,550	113.5	Strand failed
5/16" EHS 7w (11,200)	GDE-2106	15	13,300	118.6	Strand failed
	GDE-2106	15	13,300	116.1	Dead-end slipped
	GDE-2106	15	13,250	118.3	Strand failed
3/8" EHS 7w (15,400)	GDE-2107	20	17,600	114.3	Dead-end slipped
	GDE-2107	20	17,500	113.6	Dead-end slipped
	GDE-2107	20	16,750	108.8	Dead-end slipped
7/16" EHS 7w (20,800)	GDE-2108	20	22,600	108.7	Strand failed
	GDE-2108	20	22,600	108.7	Strand failed
	GDE-2108	20	22,750	109.4	Strand failed
1/2" EHS 7w (26,900)	BG-2115*	25	31,200	116.0	Dead-end failed
	BG-2115*	25	30,700	114.0	Dead-end failed
	BG-2115*	25	31,200	116.0	Dead-end failed
7# 12 AW 7w (6,301)	AWDE-4110	15	7,400	117.4	Strand failed
	AWDE-4110	15	7,450	118.2	Strand failed
	AWDE-4110	15	7,300	115.9	Strand failed
7# 10 AW 7w (10,020)	AWDE-4116	15	11,600	115.8	Strand failed
	AWDE-4116	15	11,650	116.3	Strand failed
	AWDE-4116	15	11,600	115.8	Strand failed
16M AW 7w (16,000)	AWDE-4122	20	16,500	103.1	Strand failed
	AWDE-4122	20	16,450	102.8	Strand failed
	AWDE-4122	20	16,250	101.6	Strand failed
7# 7 AW 7w (19,060)	AWDE-4125	20	20,850	109.4	Strand failed
	AWDE-4125	20	21,200	111.2	Strand failed
	AWDE-4125	20	21,050	110.4	Strand failed
7# 5 AW 7w (27,030)	AWDE-4131	25	28,900	106.9	Strand failed
	AWDE-4131	25	29,100	107.7	Strand failed
	AWDE-4131	25	29,200	108.0	Strand failed

* Big-Grip dead-ends

Ing. SEBASTIÁN O. PALLO
Representante Legal

DYNAMIC FATIGUE TESTING

Discussion

Because of the many severe dynamic conditions to which strand and strand fittings are subjected to in the field, Preformed Line Products Company developed special test equipment to produce dynamic loading. This equipment is used for cyclic tension, repeated impact testing, and for vibration.

Procedure

Cyclic tension testing uses the same equipment as the tension tests, Figure 2. Testing is accomplished by programing the equipment to vary the tension load between two predetermined load values. This testing simulates loads caused by high, gusting winds.

Dynamic loading caused by galloping or cyclonic winds is simulated by the cyclic impact machine, Figure 3. This machine develops dynamic loading by raising and dropping a weighted boom supported by the test specimen. A load cell installed in series with the test specimen measures the dynamic load which is recorded on an oscillograph.

Ing. SEBASTIAN MARCELO

In vibration tests the strand and GUY-GRIP dead-end are subjected to standing-wave vibration which simulates wind-induced aeolian vibration, Figure 4.

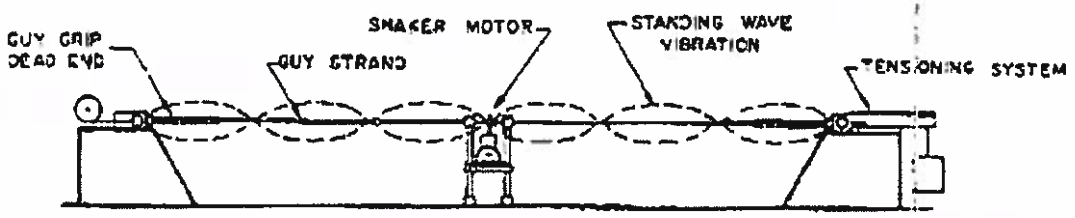

Figure 4 - Schematic of Vibration Test Equipment

Results

Observations made during these tests indicated the following:

1. The GUY-GRIP dead-end, even though acted upon by extreme dynamic loading, maintains without slippage a uniform grip on the strand.

2. Due to the unique uniform gripping of the helical wires of the GUY-GRIP dead-end, no damage to the protective coatings occurs at the dead-end/strand interface. This is attributed to the low stress concentration associated with GUY-GRIP dead-ends.

3. Since the loop of the GUY-GRIP dead-end seats extremely well in recommended pole line hardware excellent fatigue performance results.

Ing. SEBASTIÁN TARELLO
Representante Legal

FREE-FALL IMPACT TESTS

Discussion

In service a down or span guy may be subjected to high dynamic loads from falling storm debris or vehicular impact. Such loads are simulated in the laboratory with specially designed free-fall impact test equipment, Figure 5.

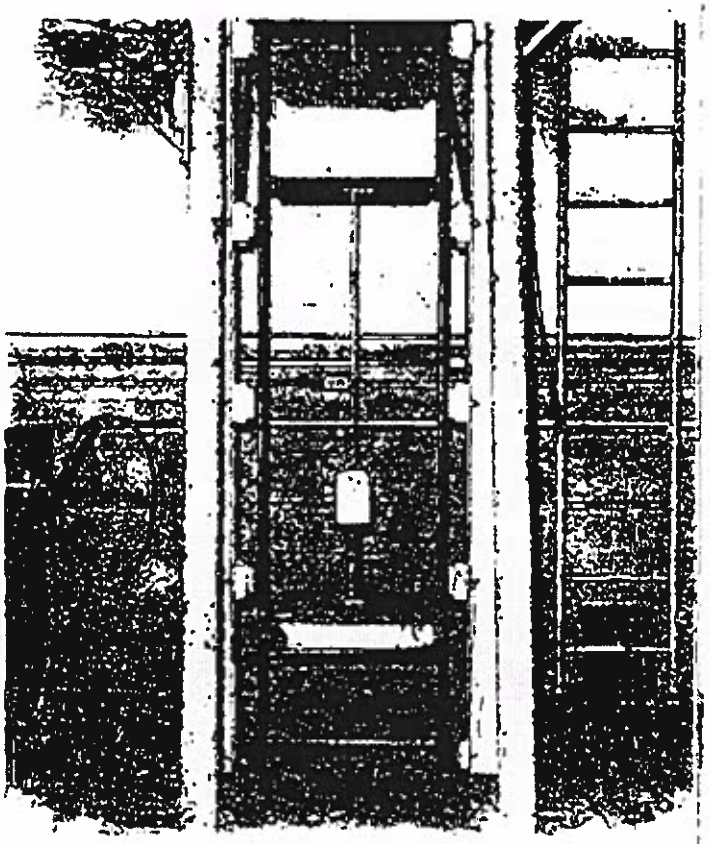

Figure 5. Free-Fall Impact Test Equipment

Procedure

Free-fall impact tests are conducted with a vertical impact machine which is capable of developing impact loads as high as 50,000 lbs. In these tests the dynamic load is attained by dropping a 900-lb. weighted platform 10 feet to a reaction platform secured to the test specimen.

Results

The free-fall impact test results are listed in Table II. Under these severe conditions, the test results prove that GUY-GRIP dead-ends develop loads equal to or greater than the published RBS of the strand.

ING. SEBASTIÁN CAMELLO

TABLE II

FREE-FALL IMPACT TESTING OF GALVANIZED STEEL AND AW STRAND

Strand RBS (lbs.)	Catalog No.	Max. Load (lbs.)	Percent of RBS	Results
1/4" EHS 7w (6,650)	GDE-2104	9,000	135	Strand failed
	GDE-2104	8,000	120	Strand failed
	GDE-2104	9,000	135	Strand failed
5/16" EHS 7w (11,200)	GDE-2106	15,700	140	Dead-end failed
	GDE-2106	14,200	127	No failure
	GDE-2106	15,500	138	Dead-end slipped
3/8" EHS 7w (15,400)	GDE-2107	19,250	125	Dead-end slipped
	GDE-2107	20,000	130	No failure
	GDE-2107	18,500	120	Dead-end slipped
7/16" EHS 7w (20,800)	GDE-2108	24,500	117	No failure
	GDE-2108	24,000	115	Strand failed
	GDE-2108	24,900	120	Strand failed
1/2" EHS 7w (26,900)	BG-2115*	31,700	118	No failure
	BG-2115*	31,600	117	Strand failed
	BG-2115*	32,200	120	Strand failed
7 #12 AW (6,301)	AWDE-4110	9,000	142	Strand failed
	AWDE-4110	9,000	142	Strand failed
	AWDE-4110	8,500	135	Strand failed
7 #10 AW (10,020)	AWDE-4116	13,000	130	Strand failed
	AWDE-4116	13,000	130	Strand failed
	AWDE-4116	14,000	140	Strand failed
16M AW (16,000)	AWDE-4122	19,750	123	Strand failed
	AWDE-4122	18,000	112	Strand failed
	AWDE-4122	20,000	125	Strand failed
7 #7 AW (19,060)	AWDE-4125	23,400	123	Dead-end failed
	AWDE-4125	24,000	126	Dead-end failed
	AWDE-4125	23,500	123	Dead-end failed
7 #5 AW (27,030)	AWDE-4131	35,000	129	Strand failed
	AWDE-4131	34,400	127	Strand failed

* Big-Grip dead-ends

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CONCLUSION

Extensive mechanical testing which include tension tests and a thorough evaluation of dynamic performance characteristics shows conclusively that GUY-GRIP dead-ends consistently develop tension loads equaling or exceeding the strand's strength rating.

PART III - QUESTIONS AND ANSWERS

The following is a list of answers to frequently asked questions about GUY-GRIP dead-ends.

Question: How long have GUY-GRIP dead-ends been used; how many are in service?

Answer: GUY-GRIP dead-ends have been used since 1951. Field usage now totals over 250 million.

Question: What design features are incorporated in the GUY-GRIP dead-end?

Answer: GUY-GRIP dead-ends utilize the proven helical concept that provides constant radial gripping force on the strand. PREFORMED'S exclusive "Cabled Loop" design provides a good fit for most pole line hardware including multiple groove anchor eyes, thereby resulting in maximum reliability.

cuatro -

Figure 6 - Dead-End Seats Properly

Question: From what material are GUY-GRIP dead-ends manufactured?

Answer: To insure material compatibility, thus minimizing the chances for galvanic corrosion, GUY-GRIP dead-ends are made from the same basic material as the strand to which they are applied. GUY-GRIP dead-ends are made for all types of galvanized steel, Alumoweld, aluminized, Copperweld and stainless steel strand.

Question: Can the GUY-GRIP dead-end be reused?

Answer: Yes. GUY-GRIP dead-ends may be safely applied a maximum of three times to the strand during initial installation. Care should be taken to inspect a GUY-GRIP dead-end for deformed rods and grit loss before reapplication. After initial installation, GUY-GRIP dead-ends should not be reused.

Question: Can GUY-GRIP dead-ends be used as tools, in place of a come-a-long or other tensioning devices?

Answer: No. GUY-GRIP dead-ends are not designed to be used as a tool. In the field the number of reapplications cannot be controlled. Excessive reapplications could result in excessive grit loss and rod deformation. These factors may result in decreased holding strength of the dead-end.

Ing. SERGIO CABELLO
Representante Legal

Question: Why do most sizes of GUY-GRIP dead-ends have two crossover marks?

Answer: GUY-GRIP dead-ends up to, and including, 3/8" for galvanized steel and 18M for Alumoweld strand have two crossover marks. Having two crossover marks enables the GUY-GRIP dead-end to properly fit guy strain insulators and large and small termination hardware. This feature is exclusive to the GUY-GRIP dead-end.

Question: Are specially designed GUY-GRIP dead-ends available for use on bridge strand, wire rope, aircraft cable and other cables?

Answer: Yes. Consult factory for specific details.

Question: What is the recommended procedure when electrical grounding of the guy strand is required?

Answer: While the GUY-GRIP dead-end offers a low resistance path, it is recommended that the tail of the strand be extended through the loop of the dead-end and be securely connected to appropriate grounding hardware. Anchor rods or guy bonding clamps may also be used.

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TABLE III

RECOMMENDED HARDWARE DIMENSIONS FOR GUY-GRIP DEAD-ENDS*

DEAD-END DIAMETER RANGE (in.)	NOMINAL STRAND SIZES		SEAT DIMENSIONS (FIGURE 1)		
	Galv. Steel	Alumoweld	Min. seat diameter with grip at first cross-over mark.	Max. seat diameter with grip at first cross-over mark.	Max. seat diameter with grip at second cross-over mark.
.123 - .143	1/8		3/4	1-3/4	
.144 - .173	5/32		3/4	1-3/4	2-1/2
.174 - .203	3/16		1-0	1-3/4	2-1/2
.204 - .230	7/32	3#10, 4M3	1-1/8	1-3/4	2-1/2
.231 - .259	1/4	7#12, 6M	1-1/8	1-3/4	2-1/2
.260 - .291	9/32	7#11, 8M	1-1/8	1-3/4	2-1/2
.292 - .336	5/16	7#10, 10M	1-1/4	1-3/4	2-1/2
.337 - .394	3/8	7#8, 14M, 16M	1-3/8	1-3/4	2-1/2
.395 - .474	7/16	7#7, 18M, 20M	1-3/8	2-3/8	2-1/2
.475 - .515	**	7#6	1-3/8	2-3/8	
.516 - .570	**	7#5, 25M	1-1/2	2-5/8	

** Use Big-Grip Dead-Ends

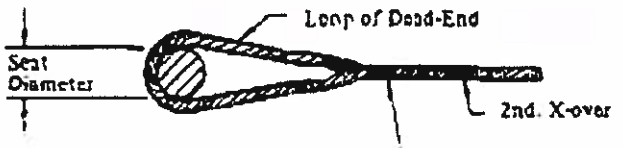
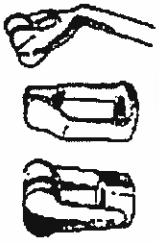


Figure 1

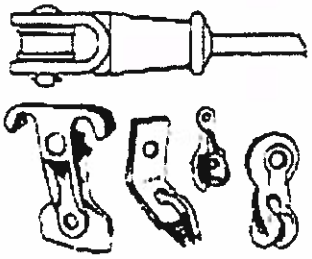
ACCEPTABLE FITTINGS

ANCHOR RODS

THIMBLE EYE-BOLTS, -EYENUTS & EYES



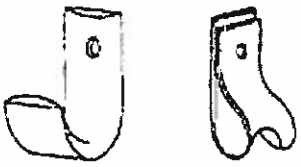
POLE FITTINGS



GUY-STRAIN INSULATORS

NEMA
54-1
54-2
54-3
54-4

GUY-HOOKS



CAUTION: Hardware of this type is not normally recommended because fatigue life of GUY-GRIP dead-ends could be substantially reduced.

EYELETS & EYENUTS

OVALEYE ANCHORS & BOLTS

CAUTION: Guy wire thimbles must be used with these and on all other small diameter hardware.

*Guying of transmission structures and metal towers require Big-Grip dead-ends.

Ing. SEBASTIÁN CASELLO

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Preformed Line Products Company

RESEARCH AND ENGINEERING

TECHNICAL MEMORANDUM

TM-116-E

Rated Holding Strength of PREFORMED Neoprene Coated Aluminum Dead-Ends on Weatherproof Conductors.

Effect of Cable's Jacket Material and Thickness:

The rated holding strength of PREFORMED Neoprene Coated Aluminum Dead-Ends for weatherproof conductors varies according to the type of material and the jacket thickness used in the construction of a particular conductor size. The primary variable affecting the holding characteristic of the PREFORMED Dead-End is the weatherproofing material. A secondary variable is the thickness of the weatherproofing, which can create a condition whereby several conductor sizes may have the same overall diameters.

Since PREFORMED Dead-End designs are predicated on overall diameters, variations in conductor weatherproofing thicknesses will dictate changes in dead-end designs to provide sufficient conductor coverage and holding pressure through the weatherproofing to the strength components of the conductor. Conversely, dead-ends for identical conductor sizes with equal O.D.'s will have a different rating depending on the type of material used in the weatherproofing construction. Therefore, it is difficult to predetermine any specific rated holding strength for the PREFORMED Dead-Ends to be used on weatherproof conductor. The following report is a compilation of the values obtained in the testing of PREFORMED Dead-Ends for specific designs of weatherproof conductors.

Necessity for Sustained-Load Test:

At the start of our development program static load test results were used (Figure 1) to rate the PREFORMED Dead-Ends. It was found that static tensile loads were not the only criteria for rating Neoprene Coated Aluminum Dead-Ends (NADE) because of the physical makeup of the

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various conductor weatherproofings. In addition to static loading performance it is necessary to test these dead-ends under sustained loading (Figure 2).

In most cases, when tested in static tension (ram speed approximately 2 inches per minute), the dead-ends are able to break the conductor. When similarly designed dead-ends and conductor combinations are subjected to a long term sustained-load test, generally lower holding strengths are recorded. This reduction in holding can be attributed to the creep and cold flow characteristics of the various weatherproofing materials. The problem is greatly amplified in the low tensile strength, free stripping neoprenes, but is also encountered in the higher density (.941 grams per cubic cm or above) polyethylenes, where lower holding strengths are recorded in both applications.

Procedure for Sustained-Load Tests:

The following is the procedure used for conducting sustained-load tests:

1. Dead-Ends applied to sample conductor (a 1-1/2 foot length of conductor extending through each dead-end loop).

2. To break the continuity of the weatherproofing a 1/2" strip is removed from the center of the sample.

3. Testing is started at a low load and after every 24-hour period the load is raised an additional 50 to 100 pounds, depending on the strength of the conductor.

4. During every 24-hour period the span is cycled from zero to the test load.

5. When the conductor starts slipping under its weatherproofing the dead-end is rated at the preceding test load.

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Classification of Polyethylene Jacket Density:

To obtain a trend of the NADE's holding strength with regard to weatherproof density, random samplings of density readings were taken on various polyethylene jacketed conductors.

Below is the specific gravity of various polyethylenes:

ASTM Designation D-1248 - 58T	
Low Density (g/cu. cm.)----------	0.910 - 0.925
Medium Density (g/cu. cm.)-------	0.926 - 0.940
High Density (g/cu. cm.)----------	0.941 - 0.965

Results:

The following is a list of the various tests conducted on weatherproof conductors in the PREFORMED Sustained-Load Test Rack:

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Test#	Standard ASA Conductors (A. A. Weatherproof)	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu
1	#6 (AA) 2/64" Polyethylene (Plum)	.246"	503 lbs.	18-NADE-C (4 rods-.094"Alum.)	at 450 lbs. conductor broke midspan	89.4%	.
2	#4 (AA) 2/64" Polyethylene (Apricot)	.294"	785 lbs.	19-NADE-E (5 rods-.094"Alum.)	at 750 lbs. conductor broke midspan	95.3%	
3	#4 (AA) 3/64" Neoprene (Hemlock)	.325"	743 lbs.	19-NADE-F (5 rods-.094"Alum.)	at 800 lbs. conductor broke midspan	108.0%	
4	#2 (AA) 3/64" Neoprene (Fir) (Coil #1)	.386"	1,140 lbs.	21-NADE-I (5 rods-.102"Alum.)	1,000 lbs.	87.8%	
5	#2 (AA) 3/64" Neoprene (Fir) (Coil #2, a soft spongy free stripping neoprene sent to us from a customer for testing)	.386"	1,140 lbs.	21-NADE-I (5 rods-.102"Alum.)	600 lbs.	52.7%	
6	#2 (AA) 3/64" Polyethylene (Peach)	.386"	1,204 lbs.	21-NADE-I (5 rods-.102"Alum.)	750 lbs.	62.3%	
7	1/0 (AA) 4/64" Polyethylene (Quince) (Coil #1)	.493"	1,771 lbs.	29-NADE-N (5 rods-.136"Alum.)	at 1,800 lbs. conductor broke midspan	101.0%	.9

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Test #	Standard ASA Conductors (A.A. Weatherproof)	O.D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu
8	1/0 (AA) 4/64" Polyethylene (Quince) (Coil #2)	.493"	1,771 lbs.	29-NADE-N (5 rods-.136"Alum.)	1,100 lbs.	62.0%	.9
9	1/0 (AA) 4/64" Neoprene (Sequoia) (Coil #1)	.493"	1,678 lbs.	29-NADE-N (5 rods-.136"Alum.)	at 1,650 lbs. conductor broke midspan	98.8%	
10	1/0 (AA) 4/64" Neoprene (Sequoia) (Coil #2)	.493"	1,678 lbs.	29-NADE-N (5 rods-.136"Alum.)	at 1,800 lbs. conductor broke midspan	107.4%	
11	2/0 (AA) 4/64" Neoprene (Cedar)	.539"	2,116 lbs.	33-NADE-P (5 rods-.146"Alum.)	2,100 lbs.	99.4%	
12	2/0 (AA) 4/64" Polyethylene (Almond)	.539"	2,116 lbs.	33-NADE-P (5 rods-.146"Alum.)	at 2,200 lbs. conductor broke midspan	104.0%	.9
13	3/0 (AA) 4/64" Polyethylene (Fig)	.589"	2,705 lbs.	33-NADE-S (5 rods-.167"Alum.)	2,200 lbs.	81.3%	
14	3/0 (AA) 4/64" Polyethylene (Fig) (Same coil as previous test)	.589"	2,705 lbs.	33-NADE-S (5 rods-.167"Alum.)	at 2,400 lbs. conductor broke midspan	88.7%	
15	3/0 (AA) 4/64" Neoprene (Holly)	.589"	2,562 lbs.	33-NADE-S (5 rods.-.167"Alum.)	at 2,700 lbs. conductor broke midspan	105.2%	
16	4/0 (AA) 4/64" Polyethylene (Olive) (Coil #1)	.647"	3,411 lbs.	34-NADE-U (5 rods-.167"Alum.)	2,600 lbs.	76.3%	

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Test #	Standard ASA Conductors (A. A. Weatherproof)	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Den (g/cu
17	4/0 (AA) 4/64" Polyethylene (Olive) (Coil #2)	.647"	3,411 lbs.	34-NADE-U (5 rods-.167" Alum.)	3,200 lbs.	93.8%	.9
18	4/0 (AA) 4/64" Neoprene (Pieris)	.647"	3,231 lbs.	34-NADE-U (5 rods.-.167" Alum.)	2,900 lbs.	89.8%	
19	250 Mcm (AA) 4/64" Polyethylene (Sassafras)	.699"	4,281 lbs.	41-NADE-W (6 rods-.167" Alum.)	2,400 lbs.	56.2%	
20	250 Mcm (AA) 5/64" Neoprene (Knobcone)	.730"	4,055 lbs.	43-NADE-X (6 rods-.167" Alum.)	3,200 lbs.	78.8%	
21	266.8 Mcm (AA) 4/64" Polyethylene (Mulberry)	.718"	4,568 lbs.	41-NADE-W (6 rods-.167" Alum.)	2,200 lbs.	46.8%	.9
22	336.4 Mcm (AA) 4/64" Polyethylene (Anona) (Coil #1)	.791"	5,648 lbs.	49-NADE-Z (6 rods-.167" Alum.)	3,600 lbs.	63.8%	.9
23	336.4 Mcm (AA) 4/64" Polyethylene (Anona) (Coil #2)	.791"	5,648 lbs.	49-NADE-Z (6 rods-.167" Alum.)	4,500 lbs.	79.6%	.9
24	336.4 Mcm (AA) 5/64" Neoprene (Box)	.822"	5,350 lbs.	49-NADE-Z (6 rods-.167" Alum.)	3,600 lbs.	67.2%	
25	336.4 Mcm (AA) 5/64" Neoprene (Box) (Same coil as above)	.822"	5,350 lbs.	49-NADE-Z (6 rods-.167" Alum.)	3,800 lbs.	71.2%	

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Test #	Standard ASA Conductors (A. A. Weatherproof)	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu
26	397.5 Mcm (AA) 5/64" Polyethylene (Molles)	.880"	6,540 lbs.	52-NADE-CC (6 rods-.182" Alum.)	2,900 lbs.	44.3%	.9
27	400 Mcm (AA) 6/64" Neoprene (Ponderosa)	.913"	6,235 lbs.	53-NADE-DD (6 rods-.182" Alum.)	5,000 lbs.	80.2%	
28	477 Mcm (AA) 5/64" Polyethylene (Huckleberry)	.951"	8,161 lbs.	53-NADE-EE (7 rods-.182" Alum.)	3,600 lbs.	44.1%	.9
29	500 Mcm (AA) 6/64" Polyethylene (Tupelo)	.970"	8,561 lbs.	53-NADE-EE (7 rods-.182" Alum.)	5,600 lbs.	65.4%	.9
30	556 Mcm (AA) 5/64" Polyethylene (Paw Paw)	1.014"	9,337 lbs.	54-NADE-FF (7 rods-.182" Alum.)	4,800 lbs.	51.4%	.9
31	5 Mcm (AA) 6/64" Polyethylene (Persimmon)	1.220"	13,620 lbs.	49-NADE-1.213 - 1.288 (7 rods-.204" Alum.)	5,000 lbs.	36.7%	

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Test #	Standard ASA Conductors (ACSR Weatherproof)	O.D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu.
32	#4 (ACSR) 6/1 - 2/64" Polyethylene (Butternut)	.313"	1,739 lbs.	20-NADE-G (5 rods-.094" Alum.)	800 lbs.	46.0%	
33	#4 (ACSR) 6/1 - 3/64" Neoprene (Buxus)	.344"	1,739 lbs.	20-NADE-H (5 rods-.094" Alum.)	750 lbs.	43.2%	
34	#4 (ACSR) 7/1 - 2/64" Polyethylene (Hickory)	.320"	2,176 lbs.	20-NADE-G (5 rods-.094" Alum.)	850 lbs.	39.0%	.9
35	#2 (ACSR) 6/1 - 3/64" Polyethylene (Pignut) (Coil #1)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,150 lbs.	43.4%	
36	#2 (ACSR) 6/1 - 3/64" Polyethylene (Pignut) (Coil #2)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	900 lbs.	34.0%	
37	#2 (ACSR) 6/1 - 3/64" Neoprene (Biota)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	900 lbs.	34.0%	
38	#2 (ACSR) 7/1 - 3/64" Polyethylene (Beech)	.418"	3,349 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,200 lbs.	35.8%	
39	#2 (ACSR) 7/1 - 3/64" Neoprene (Ilex) (Coil #1)	.418"	3,349 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,000 lbs.	29.9%	

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Test #	Standard ASA Conductors (ACSR Weatherproof)	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu.
32	#4 (ACSR) 6/1 - 2/64" Polyethylene (Butternut)	.313"	1,739 lbs.	20-NADE-G (5 rods-.094" Alum.)	800 lbs.	46.0%	
33	#4 (ACSR) 6/1 - 3/64" Neoprene (Buxus)	.344"	1,739 lbs.	20-NADE-H (5 rods-.094" Alum.)	750 lbs.	43.2%	
34	#4 (ACSR) 7/1 - 2/64" Polyethylene (Hickory)	.320"	2,176 lbs.	20-NADE-G (5 rods-.094" Alum.)	850 lbs.	39.0%	.9
35	#2 (ACSR) 6/1 - 3/64" Polyethylene (Pignut) (Coil #1)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,150 lbs.	43.4%	
36	#2 (ACSR) 6/1 - 3/64" Polyethylene (Pignut) (Coil #2)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	900 lbs.	34.0%	
37	#2 (ACSR) 6/1 - 3/64" Neoprene (Biota)	.409"	2,651 lbs.	24-NADE-J (5 rods-.102" Alum.)	900 lbs.	34.0%	
38	#2 (ACSR) 7/1 - 3/64" Polyethylene (Beech)	.418"	3,349 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,200 lbs.	35.8%	
39	#2 (ACSR) 7/1 - 3/64" Neoprene (Ilex) (Coil #1)	.418"	3,349 lbs.	24-NADE-J (5 rods-.102" Alum.)	1,000 lbs.	29.9%	

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Test #	Standard ASA Conductors (ACSR Weatherproof)	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu
40	#2 (ACSR) 7/1 - 3/64" Neoprene (Ilex) (Coil #2)	.418"	3,349 lbs.	24-NADE-J (5 rods-.102"Alum.)	900 lbs.	26.9%	
41	1/0 (ACSR) 6/1 - 4/64" Polyethylene (Almond)	.523"	4,066 lbs.	32-NADE-O (5 rods-.136"Alum.)	1,400 lbs.	34.5%	
42	1/0 (ACSR) 6/1 - 4/64" Neoprene (Jack Pine)	.523"	4,066 lbs.	32-NADE-O (5 rods-.136"Alum.)	2,500 lbs.	61.4%	
43	2/0 (ACSR) 6/1 - 4/64" Polyethylene (Pecan)	.572"	5,078 lbs.	34-NADE-R (5 rods-.146"Alum.)	2,600 lbs.	51.2%	
44	2/0 (ACSR) 6/1 - 4/64" Polyethylene (Pecan) (same coil as above)	.572"	5,078 lbs.	34-NADE-R (5 rods-.146"Alum.)	2,600 lbs.	51.2%	
45	2/0 (ACSR) 6/1 - 4/64" Neoprene (Arancaria)	.572"	5,078 lbs.	34-NADE-R (5 rods-.146"Alum.)	2,900 lbs.	57.0%	
46	3/0 (ACSR) 6/1 - 4/64" Polyethylene (Filbert)	.627"	6,341 lbs.	35-NADE-T (5 rods-.167"Alum.)	2,700 lbs.	42.5%	
47	4/0 (ACSR) 6/1 - 4/64" Neoprene (Retinospora)	.688"	7,999 lbs.	36-NADE-V (5 rods-.167"Alum.)	2,900 lbs.	36.3%	
48	4/0 (ACSR) 6/1 - 4/64" Polyethylene (Buckeye)	.688"	7,999 lbs.	36-NADE-V (5 rods-.167"Alum.)	2,900 lbs.	36.3%	

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Test #	Misc. Conductors	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Densi (g/cu.
49	#4 (Copper) 5/64" Rubber and 3/64" Neoprene ("A" Cable Company)	.475"	1,700 lbs.	29-NADE-.472-.502 (5 rods-.121"Alum.)	900 lbs.	53.0%	
50	#4 (AA) 15 Kv-.135" Polyethylene ("B" Cable Co.)	.501"	785 lbs.	29-NADE-.472-.502 (5 rods-.121"Alum.)	at 700 lbs. conductor broke midspan	89.2%	0.93
51	#4 (ACSR) 6/1-8/64" Polyethylene (Tree wire sent us from west coast)	.502"	1,739 lbs.	29-NADE-N (5 rods-.136"Alum.)	at 950 lbs. all the aluminum components of the conductor broke midspan	54.6%	0.92
52	1/0 (AA) 10-Kv-.110" Polyethylene ("B" Cable Co.)	.585"	1,800 lbs.	32-NADE-.572-.608 (5 rods-.146"Alum.)	at 2,050 lbs. conductor broke midspan	111.0%	0.92
53	4/0 (AA) .078" Vinyl ("A" Cable Co.)	.695"	3,411 lbs.	35-NADE-.691-.735 (5 rods-.182"Alum.)	1,600 lbs.	47.0%	
54	3/0 (AA) 8/64" Polyethylene (Tree wire sent us from west coast)	.704"	2,703 lbs.	41-NADE-W (6 rods-.167"Alum.)	1,900 lbs.	70.2%	0.92
55	2/0 (AA) 5/64" Rubber and 3/64" Neoprene ("A" Cable Co.)	.720"	2,116 lbs.	35-NADE-.691-.735 (5 rods-.182"Alum.)	1,400 lbs.	66.3%	

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Test #	Misc. Conductors	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu.
56	3/0 (AA) 15 Kv-.135" Polyethylene ("B" Cable Co.)	.732"	2,700 lbs.	35-NADE-.691-.735 (5 rods-.182" Alum.)	2,400 lbs.	88.8%	0.9
57	3/0 (AA) 10/64" Polyethylene (Received from customer)	.774"	2,705 lbs.	36-NADE-.736-.783 (6 rods-.167" Alum.)	1,900 lbs.	70.2%	
58	4/0 (AA) 10/64" Polyethylene ("A" Cable Co.)	.830"	6,075 lbs.	38-NADE-.784-.834 (6 rods-.167" Alum.)	3,000 lbs.	49.4%	0.9
59	397.5 MCM (AA) 6/64" Polyethylene ("C" Cable Co.)	.911"	6,540 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	4,700 lbs.	71.9%	0.9
60	336.4 MCM (AA) Compressto 10/64" Polyethylene ("B" Cable Co.)	.920"	5,648 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	3,000 lbs.	53.2%	0.9
61	477 MCM (AA) .085" Polyethylene ("B" Cable Co.)	.965"	6,161 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	3,100 lbs.	38.0%	0.9
62	397.5 MCM (AA) 10/64" Rubber and 4/64" Neoprene ("A" Cable Co.)	1.225"	6,196 lbs.	49-NADE-1.213-1.288 (7 rods-.204" Alum.)	2,400 lbs.	38.7%	

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Test #	Misc. Conductors	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu.
56	3/0 (AA) 15 Kv-.135" Polyethylene ("B" Cable Co.)	.732"	2,700 lbs.	35-NADE-.691-.735 (5 rods-.182" Alum.)	2,400 lbs.	88.8%	0.9
57	3/0 (AA) 10/64" Polyethylene (Received from customer)	.774"	2,705 lbs.	36-NADE-.736-.783 (6 rods-.167" Alum.)	1,900 lbs.	70.2%	
58	4/0 (AA) 10/64" Polyethylene ("A" Cable Co.)	.830"	6,075 lbs.	38-NADE-.784-.834 (6 rods-.167" Alum.)	3,000 lbs.	49.4%	0.9
59	397.5 MCM (AA) 6/64" Polyethylene ("C" Cable Co.)	.911"	6,540 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	4,700 lbs.	71.9%	0.9
60	336.4 MCM (AA) Compress-to 10/64" Polyethylene ("B" Cable Co.)	.920"	5,648 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	3,000 lbs.	53.2%	0.9
61	477 MCM (AA) .085" Polyethylene ("B" Cable Co.)	.965"	6,161 lbs.	42-NADE-.889-.945 (6 rods-.182" Alum.)	3,100 lbs.	38.0%	0.9
62	397.5 MCM (AA) 10/64" Rubber and 4/64" Neoprene ("A" Cable Co.)	1.225"	6,196 lbs.	49-NADE-1.213-1.288 (7 rods-.204" Alum.)	2,400 lbs.	38.7%	

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Test #	Misc. Conductors	O. D.	RBS of Conductor	Catalogue No. of Dead-End Used	Max. Sustained Load Held	% of RBS	Dens (g/cu.
63	#2 (AA) 10/64" High Density Polyethylene (received from customer)	.605"	1,204 lbs.	32-NADE-.572-.608 (5 rods-.146"Alum.)	450 lbs.	36.3%	0.9
64	1/0 (AA) 10/64" High Density Polyethylene ("B" Cable Co.)	.678"	1,771 lbs.	34-NADE-.649-.690 (5 rods-.167" Alum.)	600 lbs.	33.8%	0.9
65	1/0 (AA) 10/64" High Density Polyethylene (Same coil as previous test)	.678"	1,771 lbs.	34-NADE-.649-.690 (Same specs. as Alum. dead-end except for using .162"Alumoweld)	1,300 lbs.	73.3%	0.9
66	1/0 (AA) 10/64" High Density Polyethylene ("A" Cable Co.)	.692"	1,771 lbs.	35-NADE-.691-.735 (5 rods-.182" Alum.)	500 lbs.	28.2%	0.9
67	1/0 (AA) 10/64" High Density Polyethylene (Same coil as previous test)	.692"	1,771 lbs.	35-NADE-.691-.735 (Same specs. as Alum. dead-end except for using .182" Alumoweld)	900 lbs.	50.8%	0.9
68	266.8 MCM (AA) 10/64" High Density Polyethylene ("B" Cable Co.)	.885"	4,458 lbs.	42-NADE-.889-.945 (6 rods-.182"Alum.)	1,800 lbs.	39.4%	0.9
69	336.4 MCM (AA) Compress to .150" High Density Polyethylene ("B" Cable Co.)	-.910"	5,648 lbs.	42-NADE-.889-.945 (6 rods-.182"Alum.)	2,600 lbs.	46.2%	0.9

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Discussion of Results:

The majority of the tests run on the Standard ASA size Polyethylene-Jacketed Conductors had conventional (low density) polyethylene weather-proofing and the holding strength values in the preceding tests should be representative. The data tables indicate that the highest percentage holding strengths in the NADE product line occurs on medium density (0.926 - 0.940 polyethylene weatherproof conductors. Typical examples are tests numbered 7, 12, 17, etc. Tests #4 and #5 (#2 All-Aluminum) give a comparison that shows the reduction in holding strength when the NADE product line is used on a conductor weatherproofed with low tensile strength, free stripping neoprene.

As shown in tests #64 to #67 (1/0 All-Aluminum), greater holding strengths are accomplished on high density polyethylene conductors when Alumoweld is substituted for aluminum in the dead-end design. This substitution is not anticipated on conductor sizes above 4/0 since the aluminum dead ends for conductors above this size are capable of holding a minimum of 1,500 lbs. It has been indicated that field tensions on weatherproof conductors are generally well below this level, since weatherproof conductors are used primarily for urban distribution (short span lengths of 150 - 200 feet). Because of these short spans relatively low maximum tension requirements are employed in designing these lines. This is especially true in bundles aerial construction where the greatest portion of the span's weight is held by the steel messenger support strand.

Conclusion:

These tests indicate that the NADE's product line should develop sufficient holding strength for the most severe field service loading conditions encountered by the conductors used in these tests.

Prepared by	Approved by
Raymond Champa (Signed)	(Signed)
Project Engineer ~~112 Cliento doce~~ (Title)	Assistant Director Research and Engineering (Title)

Form RE

CERTIFIED TEST REPORT NUMBER 28608
INSULATED POWER CABLE RATED 5 TO 35 KV

PURCHASER	ANDE
PURCHASER'S ORDER #	OCI7686-LPI385/2009
PURCHASER'S SPECIFICATION #	Hendrix Special requirements per Gary Grenier Quality Plan
PURCHASER'S PART #	Matricula 403-5032
CABLE DESCRIPTION	Al 185mm2 19X PACT 25kV 75 3LYR 0.38 3.183.18 BTRHDPEBLK
CABLE QUANTITY	106016 Meters
NUMBER OF REELS	132
DOCUMENT ID	208205000587000
HENDRIX ORDER NUMBER	030333
REPORT DATE	December 1st, 2009

CERTIFICATION OF TESTS

Gordon D. Estabrook Jr. Mgr. QA & Prod. Eng.
Typewritten Name and Title

Table2						
Reel #	Tensile Cond Shield (MPa)	Ten Unaged Jacket (MPa)	Tensile Unaged Insulation (MPa)	Elon Unaged Jacket (psi)	Elongation Cond Shield (%)	Elongation Unaged Insulation (%)
Specs	Min=8.27	Min=19.3	Min=12.41	Min=400	Min=200	Min=500
LN7EXB01	13.5	21	16	675	608	720

Reel #	Bonding layers	Concentricity (%)	SS Wall Avg (mm)	Ins Wall Avg (mm)	Jacket Wall Avg (mm)	Jacket OD (mm)	Spark (KV)	DC Resistance Ohm/Km @ 20C
Specs		Min=85 Max=100					25	
LN7EXB01	Pass	92.50	.5486	3.3503	3.0175	29.8704	Pass	
LN7EXB02	Pass	92.80	.5791	3.3706	3.0861	29.8704	Pass	
LN7EXB03	Pass	96.10	.5639	3.3680	3.0582	29.8196	Pass	
LN7EXB04	Pass	95.70	.5588	3.3680	3.0429	29.8196	Pass	
LN7EXB05	Pass	97.10	.5690	3.3401	3.1191	29.8704	Pass	
LN7EXB06	Pass	95.00	.5740	3.2969	3.1242	29.8196	Pass	
LN7EXB07	Pass	98.60	.5258	3.3452	3.0175	29.8196	Pass	
LN7EXB08	Pass	96.70	.5232	3.2969	3.1394	29.8196	Pass	
LN7EXB09	Pass	98.40	.5283	3.3350	3.0988	29.8196	Pass	
LN7EXB10	Pass	98.20	.5613	3.3071	3.0404	29.8196	Pass	
LN7EXB100	Pass	96.30	.5817	3.1674	3.1344	29.6164	Pass	
LN7EXB101	Pass	96.60	.5207	3.1750	3.1521	29.6164	Pass	
LN7EXB102	Pass	98.50	.5766	3.1598	3.1623	29.6164	Pass	
LN7EXB103	Pass	97.60	.5512	3.1394	3.1547	29.6418	Pass	
LN7EXB104	Pass	97.20	.5385	3.1572	3.1572	29.6164	Pass	
LN7EXB105	Pass	97.00	.5690	3.1572	3.1369	29.6672	Pass	
LN7EXB106	Pass	97.50	.5359	3.0556	3.2233	29.5656	Pass	
LN7EXB108	Pass	97.30	.5131	3.2639	3.1521	29.5656	Pass	
LN7EXB109	Pass	97.00	.5359	3.0556	3.2233	29.5656	Pass	
LN7EXB11	Pass	98.20	.5486	3.2995	3.0556	29.8196	Pass	
LN7EXB110	Pass	99.00	.5182	3.2385	3.1928	29.5656	Pass	
LN7EXB111	Pass	96.80	.4928	3.2715	3.1445	29.5656	Pass	
LN7EXB112	Pass	96.10	.5029	3.1902	3.1928	29.5656	Pass	
LN7EXB113	Pass	98.60	.5486	3.1674	3.1928	29.5656	Pass	
LN7EXB114	Pass	96.80	.5563	3.1902	3.1699	29.6672	Pass	
LN7EXB115	Pass	96.10	.5410	3.1369	3.1826	29.6672	Pass	
LN7EXB116	Pass	97.00	.5309	3.1674	3.1598	29.6418	Pass	
LN7EXB117	Pass	97.20	.5690	3.1928	3.1598	29.6164	Pass	
LN7EXB118	Pass	95.00	.5537	3.1699	3.1547	29.6672	Pass	
LN7EXB119	Pass	98.80	.5486	3.1167	3.1877	29.6926	Pass	
LN7EXB12	Pass	98.00	.5258	3.2995	3.0277	29.8196	Pass	
LN7EXB120	Pass	96.40	.5690	3.1826	3.1471	29.6418	Pass	

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LN7EXB121	Pass	98.40	.5334	3.2055	3.1369	29.5910	Pass	
LN7EXB122	Pass	97.70	.5588	3.2156	3.1471	29.6672	Pass	
LN7EXB123	Pass	98.50	.5461	3.1191	3.1953	29.6164	Pass	
LN7EXB124	Pass	99.30	.5588	3.1445	3.1547	29.6418	Pass	
LN7EXB125	Pass	97.60	.5385	3.1826	3.1572	29.6418	Pass	
LN7EXB126	Pass	98.20	.5791	3.1826	3.1394	29.5910	Pass	
LN7EXB127	Pass	97.90	.5410	3.1521	3.1420	29.7180	Pass	
LN7EXB128	Pass	98.00	.5436	3.1420	3.1572	29.6672	Pass	
LN7EXB129	Pass	98.40	.5385	3.1979	3.1826	29.6418	Pass	
LN7EXB13	Pass	98.30	.5436	3.3147	3.0150	29.8196	Pass	
LN7EXB130	Pass	97.20	.4877	3.2182	3.1115	29.5656	Pass	
LN7EXB131	Pass	97.50	.5385	3.1877	3.0505	29.5656	Pass	
LN7EXB132	Pass	97.90	.5283	3.1699	3.1217	29.5656	Pass	
LN7EXB133	Pass	97.00	.4877	3.2182	3.1115	29.5656	Pass	
LN7EXB14	Pass	98.80	.5283	3.2334	3.0988	29.8196	Pass	
LN7EXB15	Pass	98.00	.5613	3.3071	3.0404	29.8196	Pass	
LN7EXB16	Pass	98.50	.5537	3.3045	3.0480	29.8196	Pass	
LN7EXB17	Pass	98.40	.5410	3.3096	3.0175	29.8196	Pass	
LN7EXB18	Pass	96.00	.5232	3.2969	3.1394	29.8196	Pass	
LN7EXB19	Pass	97.90	.5690	3.2436	3.0861	29.6926	Pass	
LN7EXB20	Pass	93.90	.5588	3.3630	3.0048	29.7688	Pass	
LN7EXB21	Pass	95.30	.5715	3.3122	3.0810	29.8196	Pass	
LN7EXB22	Pass	98.80	.5842	3.3172	3.0582	29.8196	Pass	
LN7EXB23	Pass	98.50	.5385	3.2842	3.0988	29.7942	Pass	
LN7EXB24	Pass	95.30	.5512	3.2918	3.1420	29.8450	Pass	
LN7EXB25	Pass	98.50	.5664	3.2893	3.0988	29.6672	Pass	
LN7EXB26	Pass	99.00	.5461	3.3071	3.0963	29.7180	Pass	
LN7EXB27	Pass	97.50	.5740	3.2969	3.1039	29.8196	Pass	1.57
LN7EXB28	Pass	98.10	.5664	3.3223	3.0963	29.8196	Pass	
LN7EXB29	Pass	95.20	.5613	3.2944	3.1115	29.8196	Pass	
LN7EXB30	Pass	98.00	.5944	3.2664	3.1191	29.8196	Pass	
LN7EXB31	Pass	98.40	.5766	3.2283	3.1547	29.7688	Pass	
LN7EXB32	Pass	96.70	.5817	3.2842	3.0912	29.7688	Pass	
LN7EXB33	Pass	94.60	.5588	3.2918	3.0531	29.6164	Pass	
LN7EXB34	Pass	97.20	.5359	3.2461	3.0277	29.6926	Pass	
LN7EXB35	Pass	95.90	.5613	3.2690	3.0582	29.6164	Pass	
LN7EXB36	Pass	95.20	.5740	3.2029	3.0937	29.6418	Pass	
LN7EXB37	Pass	97.10	.5359	3.1801	3.0658	29.5402	Pass	
LN7EXB38	Pass	96.90	.5436	3.2207	3.0861	29.5910	Pass	
LN7EXB39	Pass	97.90	.5486	3.3172	2.9667	29.6164	Pass	
LN7EXB40	Pass	96.50	.5512	3.2004	3.0861	29.5656	Pass	
LN7EXB41	Pass	97.90	.5867	3.2029	3.0582	29.5148	Pass	
LN7EXB42	Pass	95.20	.5588	3.2029	3.0378	29.6418	Pass	

LN7EXB43	Pass	96.80	.5715	3.2004	3.0709	29.6672	Pass	
LN7EXB44	Pass	95.20	.5334	3.2283	3.0632	29.6164	Pass	
LN7EXB45	Pass	97.50	.5588	3.1902	3.0963	29.6164	Pass	
LN7EXB46	Pass	97.10	.5639	3.1902	3.0632	29.6164	Pass	
LN7EXB47	Pass	96.00	.5563	3.2410	2.9972	29.5656	Pass	
LN7EXB48	Pass	98.50	.5563	3.2131	3.0734	29.6672	Pass	
LN7EXB49	Pass	98.10	.5461	3.3045	3.0531	29.5402	Pass	
LN7EXB50	Pass	98.30	.5410	3.2918	3.0353	29.5402	Pass	
LN7EXB51	Pass	98.10	.5766	3.1953	3.1394	29.5910	Pass	
LN7EXB52	Pass	96.60	.5639	3.0963	3.2055	29.5910	Pass	
LN7EXB53	Pass	98.10	.5563	3.2563	3.1547	29.6926	Pass	
LN7EXB54	Pass	98.00	.5537	3.2156	3.1547	29.5910	Pass	
LN7EXB55	Pass	95.20	.5258	3.2741	3.1318	29.6164	Pass	
LN7EXB56	Pass	98.70	.5639	3.1725	3.1953	29.6164	Pass	
LN7EXB57	Pass	98.00	.5918	3.1775	3.1318	29.6418	Pass	
LN7EXB58	Pass	97.50	.5690	3.1801	3.1699	29.6672	Pass	
LN7EXB59	Pass	98.50	.5664	3.2131	3.1445	29.5910	Pass	
LN7EXB60	Pass	97.00	.5715	3.2080	3.1217	29.5656	Pass	
LN7EXB61	Pass	96.00	.5182	3.2106	3.1369	29.6164	Pass	
LN7EXB62	Pass	96.80	.5436	3.1420	3.1598	29.6418	Pass	
LN7EXB63	Pass	99.20	.5283	3.1902	3.1420	29.6164	Pass	
LN7EXB64	Pass	98.70	.5410	3.1953	3.1572	29.5910	Pass	
LN7EXB65	Pass	98.20	.5461	3.2080	3.1699	29.6926	Pass	
LN7EXB66	Pass	98.20	.5766	3.1979	3.0912	29.6926	Pass	
LN7EXB67	Pass	97.30	.5639	3.1521	3.1750	29.6164	Pass	
LN7EXB68	Pass	97.00	.5613	3.1648	3.1648	29.6672	Pass	
LN7EXB69	Pass	99.40	.5385	3.1674	3.1547	29.6164	Pass	
LN7EXB70	Pass	97.00	.5613	3.1725	3.1471	29.6418	Pass	
LN7EXB71	Pass	96.40	.5690	3.1547	3.1801	29.7180	Pass	
LN7EXB72	Pass	97.00	.5436	3.1547	3.1801	29.6926	Pass	
LN7EXB73	Pass	98.20	.5766	3.1979	3.1547	29.6672	Pass	
LN7EXB74	Pass	98.00	.5588	3.1217	3.1674	29.5910	Pass	
LN7EXB75	Pass	96.40	.5690	3.1547	3.2410	29.6672	Pass	
LN7EXB76	Pass	99.00	.5359	3.2131	3.1572	29.5402	Pass	
LN7EXB77	Pass	99.20	.5588	3.1623	3.1877	29.6672	Pass	
LN7EXB78	Pass	98.90	.5486	3.1648	3.1674	29.6418	Pass	
LN7EXB79	Pass	98.40	.5410	3.1852	3.1445	29.6418	Pass	
LN7EXB80	Pass	98.20	.5893	3.1953	3.1369	29.5402	Pass	
LN7EXB81	Pass	97.80	.5690	3.1826	3.1394	29.6418	Pass	
LN7EXB82	Pass	97.60	4.4729	3.2334	3.1090	29.5910	Pass	
LN7EXB83	Pass	96.60	.5385	3.2563	3.1267	29.6164	Pass	
LN7EXB84	Pass	98.30	.5715	3.1750	3.2029	29.7180	Pass	
LN7EXB85	Pass	99.30	.5359	3.2360	3.1064	29.6926	Pass	

LN7EXB86	Pass	97.00	.5588	3.2182	3.1750	29.6926	Pass	
LN7EXB87	Pass	98.90	.5537	3.2309	3.1191	29.6418	Pass	
LN7EXB88	Pass	97.90	.5537	3.2334	3.1293	29.5910	Pass	
LN7EXB89	Pass	97.30	.5766	3.1877	3.1598	29.6164	Pass	
LN7EXB90	Pass	96.70	.5690	3.1598	3.1699	29.6164	Pass	
LN7EXB91	Pass	96.70	.5410	3.2004	3.1877	29.5910	Pass	
LN7EXB92	Pass	97.40	.5613	3.2334	3.1394	29.6672	Pass	
LN7EXB93	Pass	98.60	.5588	3.1902	3.1750	29.6672	Pass	
LN7EXB94	Pass	96.70	.5791	3.2131	3.1572	29.6164	Pass	
LN7EXB95	Pass	97.30	.5715	3.2131	3.1318	29.5910	Pass	
LN7EXB96	Pass	98.90	.5359	3.2283	3.1877	29.5656	Pass	
LN7EXB97	Pass	97.80	.5817	3.2360	3.2385	29.7434	Pass	
LN7EXB98	Pass	97.40	.5639	3.2080	3.1521	29.6926	Pass	
LN7EXB99	Pass	95.80	.5690	3.1725	3.2029	29.7180	Pass	

Inventory Report			
Reel #	Total Mtrs	Top	Drum
LN7EXB01	800	6778632	6777832
LN7EXB02	805	6779438	6778633
LN7EXB03	804	6780244	6779440
LN7EXB04	804	6781049	6780245
LN7EXB05	804	6781854	6781050
LN7EXB06	804	6782659	6781855
LN7EXB07	802	6784150	6783348
LN7EXB08	804	6784958	6784154
LN7EXB09	804	6785763	6784959
LN7EXB10	804	6786568	6785764
LN7EXB100	804	6888360	6887556
LN7EXB101	804	6859921	6859117
LN7EXB102	804	6860726	6859922
LN7EXB103	804	6861531	6860727
LN7EXB104	804	6862336	6861532
LN7EXB105	804	6863141	6862337
LN7EXB106	804	6863946	6863142
LN7EXB108	806	6887553	6886747
LN7EXB109	816	6886744	6885928
LN7EXB11	804	6787373	6786569
LN7EXB110	793	6866578	6865785
LN7EXB111	804	6867383	6866579
LN7EXB112	796	6868180	6867384
LN7EXB113	796	6868981	6868185
LN7EXB114	796	6868981	6868185
LN7EXB115	796	6870575	6869779

LN7EXB116	796	6871372	6870576
LN7EXB117	796	6872169	6871373
LN7EXB118	804	6872974	6872170
LN7EXB119	804	6873787	6872983
LN7EXB12	804	6788178	6787374
LN7EXB120	804	6874592	6873788
LN7EXB121	804	6875397	6874593
LN7EXB122	804	6876202	6875398
LN7EXB123	804	6877007	6876203
LN7EXB124	804	6877812	6877008
LN7EXB125	804	6878617	6877813
LN7EXB126	804	6879430	6878626
LN7EXB127	804	6880235	6879431
LN7EXB128	804	6881040	6880236
LN7EXB129	804	6881845	6881041
LN7EXB13	804	6788983	6788179
LN7EXB130	804	6882650	6881846
LN7EXB131	804	6883455	6882651
LN7EXB132	804	6884265	6883461
LN7EXB133	804	6885070	6884266
LN7EXB14	804	6789788	6788984
LN7EXB15	804	6790593	6789789
LN7EXB16	804	6791398	6790594
LN7EXB17	804	6792203	6791399
LN7EXB18	804	6793008	6792204
LN7EXB19	803	6793812	6793009
LN7EXB20	804	6794621	6793817
LN7EXB21	804	6795426	6794622
LN7EXB22	804	6796237	6795433
LN7EXB23	804	6797042	6796238
LN7EXB24	804	6797847	6797043
LN7EXB25	800	6798653	6797853
LN7EXB26	804	6799458	6798654
LN7EXB27	804	6800263	6799459
LN7EXB28	800	6801069	6800269
LN7EXB29	799	6801869	6801070
LN7EXB30	800	6802670	6801870
LN7EXB31	800	6803471	6802671
LN7EXB32	800	6804272	6803472
LN7EXB33	800	6805073	6804273
LN7EXB34	796	6805870	6805074
LN7EXB35	796	6806667	6805871
LN7EXB36	796	6807464	6806668

LN7EXB37	796	6808261	6807465
LN7EXB38	804	6809143	6808339
LN7EXB39	804	6809955	6809151
LN7EXB40	804	6810760	6809956
LN7EXB41	804	6811565	6810761
LN7EXB42	804	6812370	6811566
LN7EXB43	804	6813175	6812371
LN7EXB44	804	6813980	6813176
LN7EXB45	804	6814794	6813990
LN7EXB46	804	6815599	6814795
LN7EXB47	804	6816405	6815601
LN7EXB48	804	6817210	6816406
LN7EXB49	804	6818015	6817211
LN7EXB50	804	6818820	6818016
LN7EXB51	804	6819625	6818821
LN7EXB52	804	6820430	6819626
LN7EXB53	804	6821235	6820431
LN7EXB54	804	6822040	6821236
LN7EXB55	804	6822845	6822041
LN7EXB56	804	6823658	6822854
LN7EXB57	804	6824463	6823659
LN7EXB58	804	6825268	6824464
LN7EXB59	804	6826073	6825269
LN7EXB60	804	6826878	6826074
LN7EXB61	804	6827683	6826879
LN7EXB62	804	6828494	6827690
LN7EXB63	804	6829301	6828497
LN7EXB64	804	6830106	6829302
LN7EXB65	804	6830911	6830107
LN7EXB66	804	6831717	6830913
LN7EXB67	804	6832528	6831724
LN7EXB68	804	6833333	6832529
LN7EXB69	804	6834138	6833334
LN7EXB70	804	6834943	6834139
LN7EXB71	804	6835748	6834944
LN7EXB72	804	6836553	6835749
LN7EXB73	804	6837365	6836561
LN7EXB74	804	6837365	6836561
LN7EXB75	804	6838975	6838171
LN7EXB76	804	6839780	6838976
LN7EXB77	804	6840585	6839781
LN7EXB78	804	6841390	6840586
LN7EXB79	804	6842195	6841391

LN7EXB80	804	6843000	6842196
LN7EXB81	804	6823805	6823001
LN7EXB82	804	6844610	6843806
LN7EXB83	804	6845415	6844611
LN7EXB84	804	6846226	6845422
LN7EXB85	804	6847031	6846227
LN7EXB86	804	6847836	6847032
LN7EXB87	804	6848641	6847837
LN7EXB88	804	6849446	6848642
LN7EXB89	804	6850251	6849447
LN7EXB90	804	6851056	6850252
LN7EXB91	804	6851861	6851057
LN7EXB92	804	6852672	6851868
LN7EXB93	804	6853477	6852673
LN7EXB94	804	6854282	6853478
LN7EXB95	804	6855087	6854283
LN7EXB96	804	6855899	6855095
LN7EXB97	804	6856811	6856007
LN7EXB98	804	6857616	6856812
LN7EXB99	804	6858421	6857617