Contents

Terms and Warranties

All sales of Lapp products described in this catalog are subject to Lapp's Terms and Conditions of Sale as contained in Lapp's Sales Order or Order Acknowledgement Forms and the limited warranties and limitations of liability thereunder.

Lapp Line Post Insulators

DESIGN FEATURES

Large Conductor Grooves

Single Porcelain Body

Tie Top Line Posts have new wide top conductor grooves that meet ANSI Standards and provide for all popular conductors up to 1 1/2" in diameter. Top and neck are designed for either Wraplock ties or standard tie wire conductor attachment.

The single porcelain Line Post design eliminates tension loaded, nested porcelain shells, internal pins or inserts and avoids damaging pressure between porcelains.

Fog Type Leakage Corrugations

Multiple sheds provide extra leakage distance and uniform leakage path; shaped and spaced for natural cleaning; wind and rain flush off contamination, keep surface resistance high.

Short, Sturdy Sheds

Maximum protection for insulator body under mechanical impact and flashover. Short, sturdy sheds of Line Post design also contribute to the neat, trim appearance of modern overhead construction.

Hardware Externally Attached

Bases (and caps on Lapp Clamp Top Line Posts) are cemented on the porcelain, loading the porcelain with low intensity compression grip over a large area. There are no internal bursting forces from pins or inserts to damage porcelain.

"Straight Line" Flashover

Line terminals are separated by full length of insulator; flashover goes outside the unit. Loss of one or more sheds does not reduce flashover distance.

Interchangeable Stud Bolts

Easier stock inventory-separable long or short studs for wood and steel crossarms are easily installed in the field. A positive lockwasher, cooperating with serrated surfaces on the insulator base **and shoulder of stud, permits easy removal but locks** the stud against **loosening from line** vibration.

No Radio or TV Interference

The Lapp Line Post, by design. is free of radio and TV interference. No corona is formed at operating voltages on either Tie Top or Clamp Top Line Posts. No special glaze or treatment is required.

Interchangeable Clamp Top Clamps

Six standard clamp sizes (interchangeable on all Lapp Clamp Top Line Posts) provide for all conductor sizes .25" to 2.70". Design is radio-TV interference free with a minimum of parts to facilitate hot-line maintenance. Armor Grip Supports, interchangeable on all Lapp Clamp Top Line Posts, are available for conductor sizes .390" to 1.828".

Small Diameter

The Lapp Line Post gets its flashover and leakage values from height rather than spread. Small diameter Line Posts are easy to install, easy to work with hot line tools.

Line terminals are separated by the full length of the insulator. Loss of one or more sheds does not reduce flashover distance.

Choice of Glazes

Gray glaze is supplied on all standard strength Line Post insulators unless otherwise specified. Dark gray glaze is used on high strength Line Posts as a positive means for identifying these units in service.

Chocolate glaze is available on specification.

RG8 semi-conducting glaze for Line Post insulators installed in areas of heavy airborne contamination is optional.

The glaze, described on page 10, must be specified by catalog number for the RG insulator. RG Line Posts are recommended for sea coast areas with heavy salt fog and areas of heavy industrial contamination. Glaze is light gray, and insulators are underglaze stamped (RG) for ease in identification.

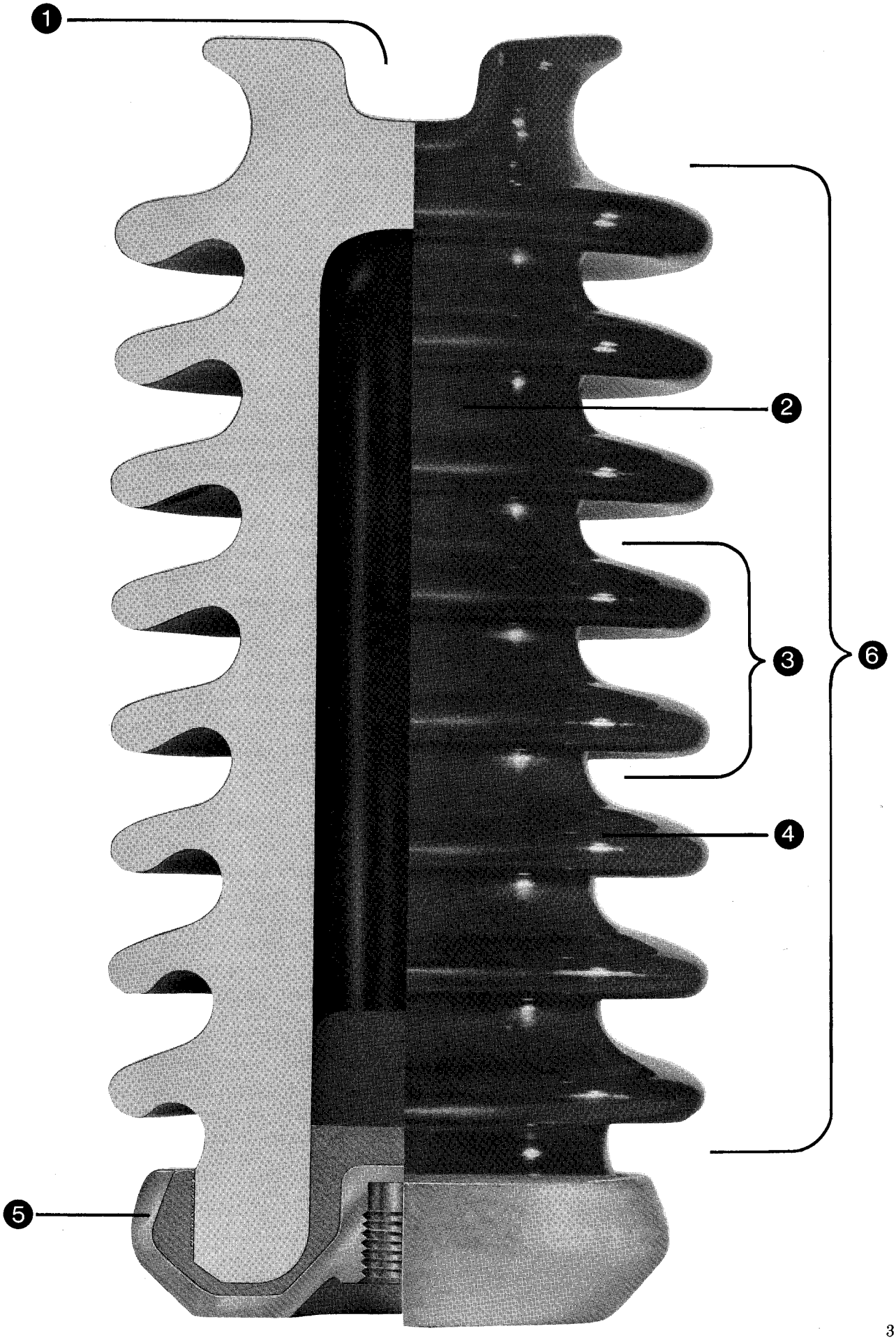
Armless Construction

Lapp Line Posts are available for horizontal mounting on wood, steel or concrete poles and steel structures. Curved base for wood pole mounting fits a wide range of pole diameters. Flat base for steel or concrete pole mounting can be mounted directly to pole or on pole gains. Stud mounted base is recommended for mounting on pole gains, brackets towers or structures.

Pre-Assembled 115/138 kv Line Posts

Horizontal Line Posts for 115/138 kv application are now available pre-assembled as a single, rigid unit for wood, concrete or steel pole mounting. Pre-assembled 161/230 kv Horizontal Line Posts are available on special order.

Pre-assembled Line Posts have top and bottom sections permanently joined with a metal flange or collar in place of the end caps used on the standard bolted assembly.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6

Lapp Distribution Post Insulators

For Stud Mounting on Crossarms or Brackets

Distribution Posts were originally designed by Lapp for use on long rural lines to provide greater reliability and maintenance free operation. They are now widely used in a variety of pole top configurations to improve the appearance as well as performance of all distribution overhead, rural and urban.

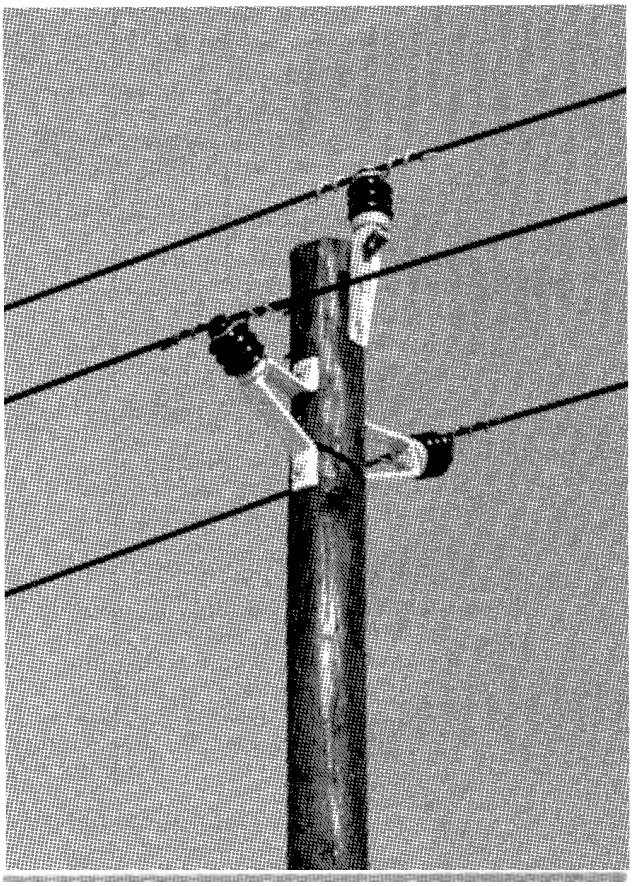
These versatile, trouble free insulators provide an important and completely acceptable structural member to temper public demands to "clean up" and beautify distribution structures.

Rural Distribution

Much of the rural distribution presently employing Lapp Distribution Posts is of the unshielded type utilizing pole top bracket and crossarm mounting of insulators.

Long-span rural construction requires relatively wide phase spacing on the supporting structure to provide adequate, mid-span conductor clearances under extreme conditions. Directly mounted horizontal distribution insulators, because they provided relatively small horizontal displacement, were seldom used for this type of installation. The advent of the side mounted offset bracket changed this by providing a means of eliminating the replacement prone wood crossarm from the rural scene. Now, Distribution Post insulators, both Tie Top and Clamp Top, utilizing a simple cup type base attached with a single stud may be mounted, in combination with the larger offset brackets, in the horizontal position to provide ample mid span conductor separation on long span construction.

This design, becoming increasingly popular, not only insures a low maintenance cost, trouble free pole top assembly; but in addition, provides substantial improvement in the appearance of both structure and line - a consideration of rapidly increasing importance in both rural and urban areas.



Stud mounted Distribution Posts on Lapp offset pole mounting brackets provide necessary conductor clearances on long spans. Offset pole mounting brackets are shown on page 6.

Distribution Post Characteristics

Lapp Distribution Posts are available for both vertical and horizontal mounting in either Tie Top or Clamp Top design in four voltage classifications: 15 kv, 20 kv, 27 kv, and 34.5 kv.

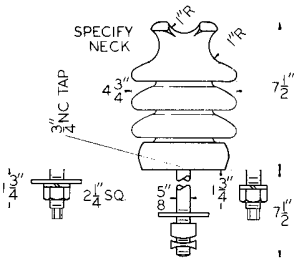
The units designed for upright or vertical mounting may be installed on a crossarm, a pole top bracket, or side mounting brackets, in a variety of configurations, with equal ease. The units designed for horizontal mounting can be furnished with a direct mounting base capable of installation on either curved or flat surface, or a simple cup type base for side bracket mounting.

All Lapp Distribution Posts are one piece porcelain units having all the characteristics of Line and Station Post insulators. They are inherently free from both radio and television interference without any additional treatment. Their trim, sturdy sheds enable them to withstand attacks from stones, bullets and power arcover far better than any pin type unit ever designed. They are especially useful for service on industrial feeders where maximum reliability is most valuable in providing optimum service continuity.

On the Tie Top unit the wide ANSI Standard wire groove is provided with a head and neck designed to enable the use of either Wraplock or standard wire ties.

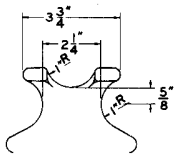
Gray glaze is standard for all porcelain, with chocolate glaze available. Specify chocolate glaze by deleting -70 from the catalog number.

Tie Top Attachment 15 kv-35 kv

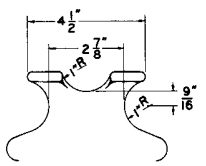


•4315-70
4315C-70
•4415-70

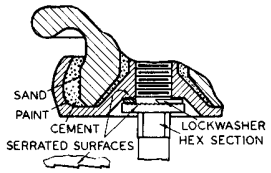
Head and Base Details



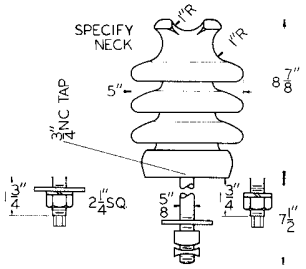
"C" Neck Tie Top Head Detail for Wraplock or conventional tie



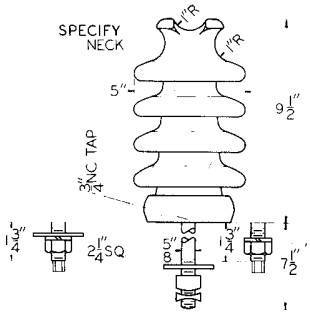
"F" Neck Tie Top Head Detail for Wraplock or conventional tie



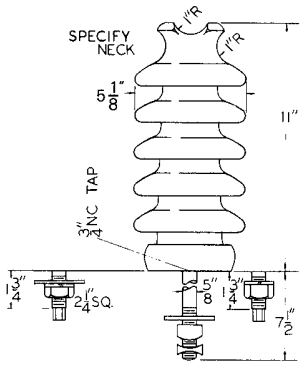
Mounting Base Detail



•4320-70
4320C-70
•4420-70



•4327-70
4327C-70
•4427-70



•4335-70
4335C-70
•4435-70

CATALOG NUMBER*				
Short Stud for Steel Crossarms	•4315-70	•4320-70	•4327-70	•4335-70
Short Stud for Bracket Mounting	4315C-70	4320C-70	4327C-70	4335C-70
Long Stud for Wood Crossarms	•4415-70	•4420-70	•4427-70	•4435-70
DIMENSIONS				
Leakage Distance, Inches	7.5	11	15.00	18
Dry Arcing Distance, Inches	5	5.75	7.6	9.25
MECHANICAL VALUES (ULTIMATE)**				
Cantilever Strength, Pounds	2000	2000	1500	1000
ELECTRICAL VALUES				
Usual Line Voltage, kv	15	20	27	35
Low Frequency Dry Flashover, kv	65	80	95	110
Low Frequency Wet Flashover, kv	40	55	65	80
Impulse Flashover—Positive, kv	100	110	140	165
Impulse Flashover—Negative, kv	130	140	190	205
RADIO INFLUENCE VOLTAGE DATA				
Test Voltage—Rms to Ground, kv	10	15	20	22
Maximum RIV—Microvolts at 1000 kc	50	50	50	100
PACKING AND SHIPPING DATA				
Net Weight Each, Pounds	7	7.25	10	11
Packed Weight Each, Pounds	7.5	8.5	10.5	12
Standard Package	16	9	6	6
Pallet Weight, Pounds	1644	1896	2328	2616
Pallet Quantity	216	216	216	216

*Catalog Number Designates "C" Neck. Add Suffix "P" to Catalog Number for "F" Neck, i.e. 4327-P.
**Maximum Recommended Working Load = 40% of Cantilever Rating

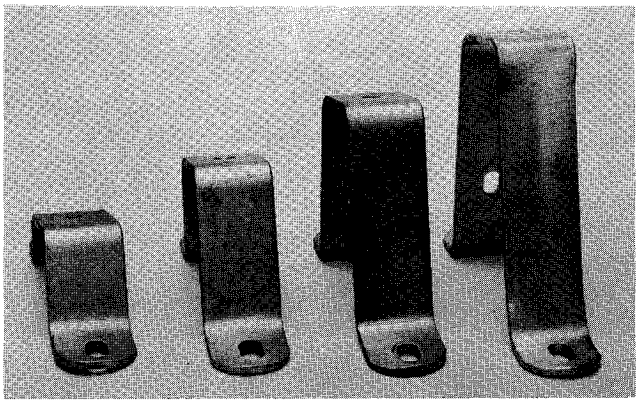
•REA Approved

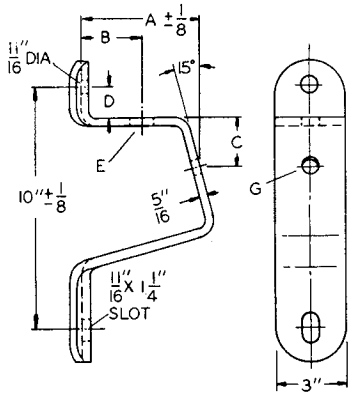
Lapp Offset Pole Mounting Brackets

Lapp pole gains or offset brackets are designed for use with all stud mounted Distribution Posts 15 kv through 27 kv to provide the physical separation of conductors necessary on long spans.

Insulators on offset brackets make an attractive installation on side mounted construction or with a pole top bracket in a compact triangular configuration.

Brackets are steel, hot dip galvanized, in four sizes 2'/z", 5", 7'/z" and 10" with offset spacing designed to fit all pole sizes. Ultimate strength is 16,500 inch-lbs., at the insulator mounting surface.

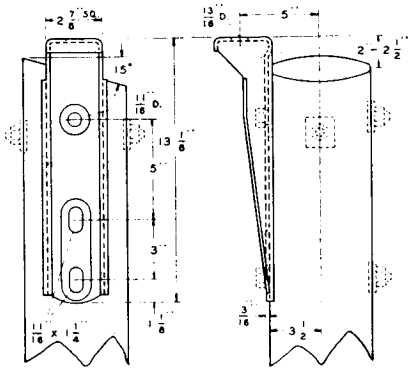




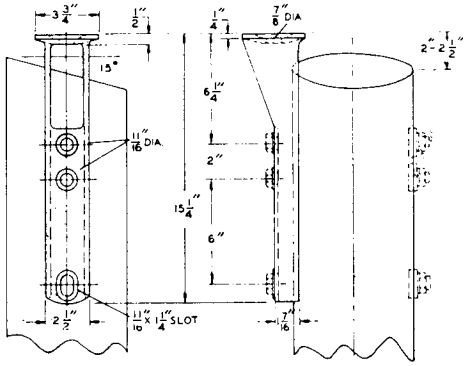
93359 Series Offset Brackets

Catalog Number	Dimensions, Inches				
	A	B	C	D	G
93359	2½	—	2⅛	1½	11/16
93360	5	2½	2	1½	11/16
93361	7½	2½	2	1½	11/16
93362	10	2½	2	1¼	11/16

Use Suffix A after Catalog Number for 13/16" G Dimension



49168



78912

Distribution Post Pole Top Brackets

Pole top mounting brackets for use with Lapp upright mounted Distribution Posts and Line Posts to 35 kv are available in a choice of pressed steel or malleable iron.

Bracket No. 49168 is a strong, light weight design of heavy gauge pressed steel, hot dip galvanized. Bracket mounts on the pole with standard throughbolts (not furnished) in a choice of bolt spacings. Top mounting hole is 11/16" diameter; bottom mounting holes are 11/16" wide, slotted to facilitate bolt hole alignment. Bracket develops 1500 lbs. strength with Posts through 27 kv. Packed weight each, 3.5 lbs.

Bracket No. 78912 is similar to the heavy duty malleable iron brackets. It is light weight, strong, designed for use with upright mounted Distribution Posts and Line Posts to 35 kv. Bracket is malleable iron, hot dip galvanized, rated at 1500 lbs. cantilever for Posts through 27 kv. Two top mounting holes 11/16" diameter and an 11/16" wide slotted bottom hole accommodate throughbolts (not furnished) for mounting bracket securely to the pole. Packed weight each, 6.5 lbs.

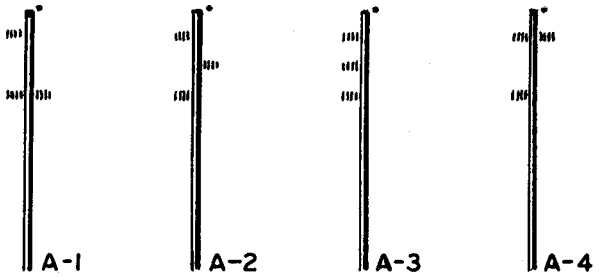
Construction With .

Lapp Distribution Posts

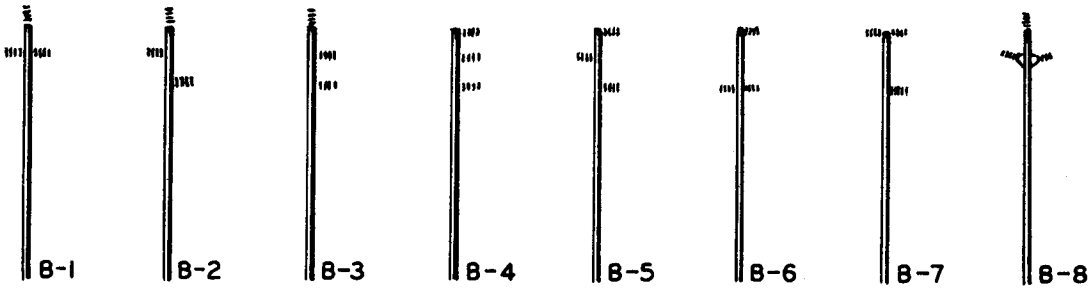
Lapp Distribution Post insulators for upright mounting on steel or wood crossarms are widely used, with or without a shield wire, on conventional pole top construction. Horizontally mounted Distribution Posts on the other hand, gaining wide acceptance in overhead distribution "Beautility" programs because of their neat, unobtrusive appearance and reliability, are used in a variety of pole top configurations mounted directly on the pole or mounted on offset brackets.

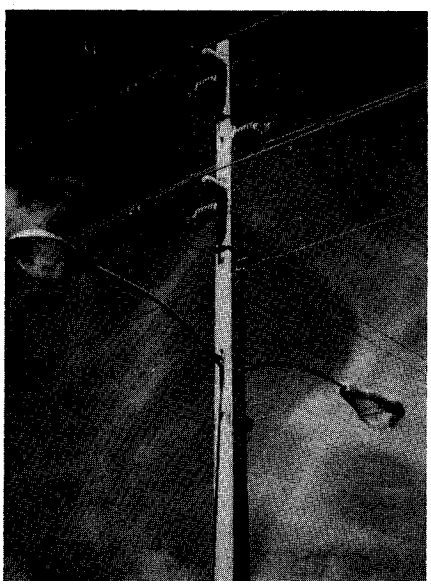
Some of the more popular shielded and unshielded distribution line designs utilizing Lapp Horizontal Mounting Distribution Posts are sketched below.

Shielded Distribution Configurations

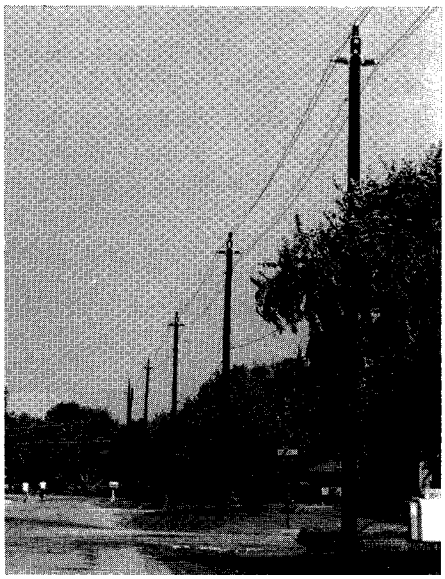


Unshielded Distribution Configurations

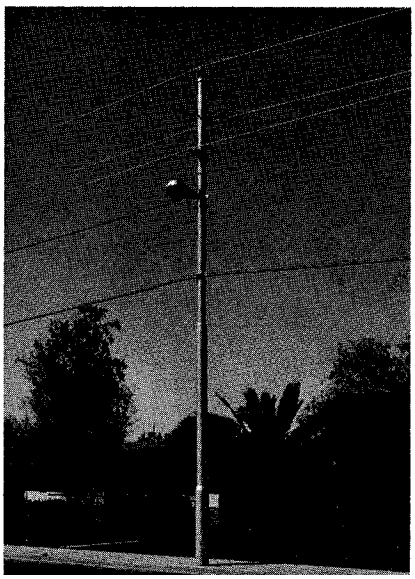




Clamp Top Distribution Posts make a clean looking pole top configuration on this unshielded junction pole construction.



This trim looking, unshielded triangular configuration on wood poles combines economy and reliability in distribution construction.



Unobtrusive distribution overhead in a residential area combines horizontal Distribution Posts and luminaire on same pole.

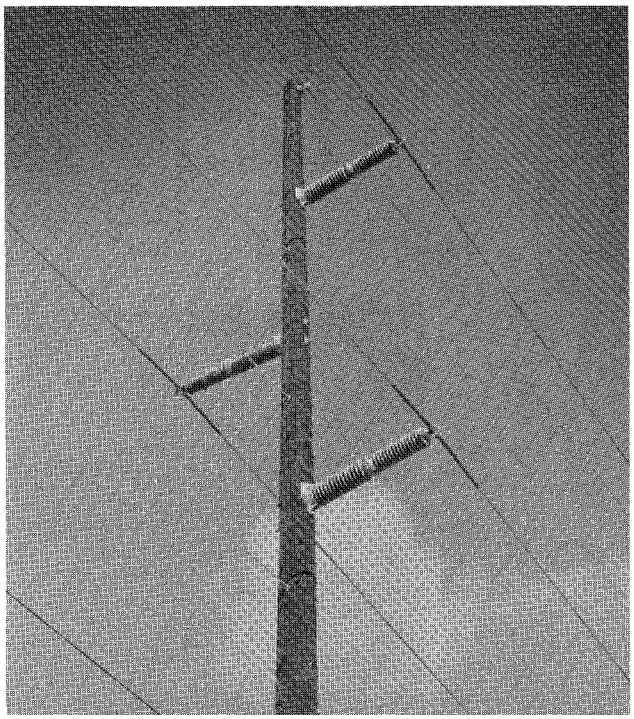
Lapp Line Post Insulators

The Line Post Design

Much of the success of the Line Post insulator can be attributed to the Lapp Fog Type design - a design developed by Lapp over 50 years ago that paved the way for Line Post and Station Post insulators and is now applied to practically all types of outdoor insulators. The Fog Type design develops a leakage distance on the principle of uniformity; uniformity of width and uniformity of condition of leakage path, i.e., dirtiness, wetness or dryness. If the leakage path is uniform, local hot spots will not develop to initiate a flashover.

The Lapp Fog Type design seeks to maintain this uniformity by maximum exposure - exposure to contamination, to wetting, to natural cleaning by wind and rain. It is typified by the familiar, many short sheds of the Line Post design, spaced to avoid pockets where contamination and moisture can accumulate.

With Line Post insulators, under heavy rain the contamination quickly flushes away and the leakage current falls rapidly. Under light rain or fog, when flashover is most probable, as the resistance falls the leakage current rises. The watts dissipated are evenly distributed over the entire insulator, drying it uniformly and holding down the leakage current to a safe value.



The trim, low voltage appearance of this 115kv shielded delta configuration on wood poles is one of the reasons why armless construction on Lapp Horizontal Line Posts has proved so popular for urban and suburban transmission construction.

Behavior Under Power Arcover

The Line Post gets its flashover and leakage distance from height and many short, sturdy sheds, rather than from spreading fragile shells as in a conventional unit. The petticoats themselves protect the body of the insulator from serious damage and even if one or more of these sheds is broken away, the flashover and leakage distances are lowered only slightly, if at all. Contrast this with the conventional insulator in which the loss of a shell will cost 35% or more of the electrical characteristics of the insulator.

Puncture

The hazard of puncture is eliminated in the Line Post design, because the puncture path down through the porcelain is practically the same length as the air flashover path. Under excess voltage the insulator will always flash over rather than puncture. There are no thin sections of porcelain subjected to high electrical stress.

Operation Under Contamination

The Fog Type corrugations on the Line Post insulator form a leakage surface that is open to the cleaning action of wind and rain. Thousands of Line Post units have been installed since 1931 under all types of contamination conditions, leaving no question as to the effectiveness of this design. Horizontally mounted Line Post insulators offer the very best opportunity of combating even the most severe contamination. The insulator is better exposed to the cleaning action of wind and rain, and even under the lightest mist or fog each shed drips free and clear of all others, thus being self-cleaning without the danger of flashover.

Mechanical Attack

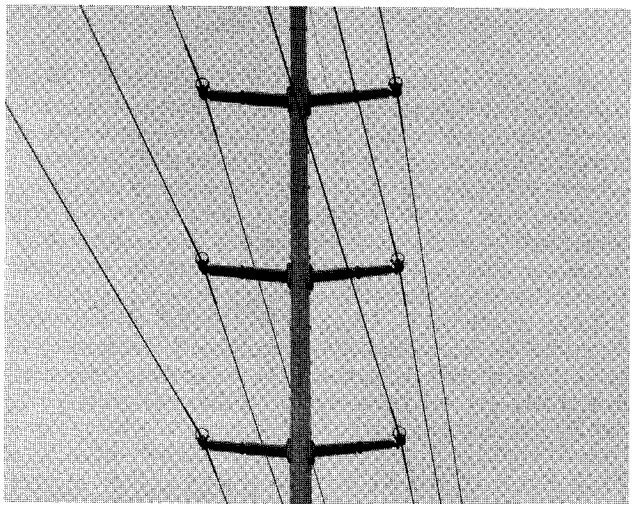
In the same way that the sturdy, short sheds of the Line Post protect it from damage under power arcover, they protect the insulator body and are effective in preventing outage from stones and bullets. The sheds are so designed that, under severe impact, they will break away without cracking the body. Hits from stones thrown from the ground at an insulator on the usual height of pole will do no damage. A direct hit with a rifle bullet may break off a shed but will not lower appreciably leakage and flashover distance. There is the best possible assurance that even under severe attack the insulator will remain in service.

Closed End Porcelain Design

Most Lapp Line Post porcelains are made with a central cavity and integral solid head design.

Lapp routinely tests every Line Post porcelain to determine both its electrical and mechanical soundness; gruelling tests assure the integrity of the porcelain. Every porcelain is placed solid head down, on a grounded table, and an electrode is dropped to the bottom of the center cavity and energized to a voltage that will puncture substandard porcelains and flash over sound porcelains. This stresses the porcelain to much greater values than the assembled insulator will ever undergo in service. If an imperfection is anywhere in the porcelain, the electrical stress concentrates in that area and punctures the porcelain.

Prior to electrical testing, the interior walls are coated with a liquid silicone that encapsulates any contaminants resulting from arcing during the test, and also prevents moisture from coating the interior walls which might cause radio noise in service. After electrical test, the hole is sealed with a permanent plug, hardware is cemented to the porcelain and the insulator is ready for final mechanical cantilever proof test and inspection.



Double circuit concrete pole 138kv transmission. Horizontally mounted RG Line Posts provide neat appearance and contamination control in residential neighborhoods.

The Line Post Line

Lapp Line Post insulators are available in three distinct styles or types, offering the transmission engineers a wide choice of insulators for overhead transmission design. The first and oldest series is the standard Line Post insulator for upright mounting on crossarm or structure. These units have an integral head on the porcelain for Tie Top conductor attachment, and a base cemented on the lower end for stud mounting to a flat surface.

The second series is the Clamp Top Line Post for upright mounting on crossarms. These insulators are similar to the Tie Top Line Posts, but have a metal cap cemented to the top of the porcelain to support a trunnion type clamp for attaching the conductor. A base cemented to the lower end of the porcelain takes a stud for mounting insulator to crossarm or structure.

The third series is the Horizontal Clamp Top Line Post insulator for armless transmission construction. These insulators consist of a Fog Type porcelain with a Horizontal Clamp Top cap cemented on the outboard end for clamp support of the conductor and a large base cemented on the lower end of the porcelain for mounting the insulator directly to the side of the pole, without crossarms or other supporting devices.

All three of these Line Post series are available in a choice of strength classes, in a wide range of voltage ratings.

Offset Downleads

Shielded Horizontal Line Post circuits on wood poles sometimes have the shield wire drops mounted directly to the pole. The insulator bases are grounded to the downlead, and the impulse flashover of the structure becomes that of the insulator itself. This practice is entirely satisfactory, but wide experience with Horizontal Line Post construction at all voltage levels, under a variety of lightning exposures, has proved the value of separating the shield wire drop from the pole. Fiberglass or wood standoff brackets are recommended to clear the shield wire drop from the top section of the pole to increase the impulse flashover level of the structure. This construction, offsetting the downlead, adds pole wood to both line to line and line to ground impulse paths, yet maintains the air gap paths at a safe level. A substantial increase in the impulse flashover level for such structures results.

Pre-Assembled Line Posts for 115/138 kv

The 115/138 kv Horizontal Line Post insulators are available as standard two piece assemblies bolted together or pre-assembled as a single, rigid unit for wood, concrete or steel pole mounting. Pre-assembed 161/230 kv Horizontal Line Posts are available on special order.

Pre-assembled Line Posts have top and bottom sections permanently joined with a metal flange or collar cemented to the porcelains in place of the standard end caps.

The pre-assembled insulators are lower in initial cost and save on field assembly.

Overload Protection

Lapp offers a choice of two methods of protecting Horizontal Line Posts mounted on rigid structures from damage caused by unbalanced longitudinal loads, broken conductor conditions or other unusual, suddenly applied longitudinal overloads.

The Lapp Load Limitere is a device developed for use with Horizontal Line Posts mounted on rigid structures to prevent cascading should a unit be accidentally overstressed and fail. It is designed to release and control the conductor on the outboard end of the insulator and is available on all Horizontal Line Post insulator ratings 115 kv, 230 kv and 345 kv, for mounting on steel, prestressed concrete or other rigid structures.

Load Limiters are available with shear bolts in a choice of strengths for tangent or angle construction.

Lapp hinged base designs for all Horizontal Line Posts 115 kv through 230 kv provide another method of overload protection for these insulators mounted on rigid structures. Mounted to the structure, the insulator pivots on the hinged base to reduce the load on the insulator caused by unblanaced longitudinal loads, broken conductor conditions or other unusual overloads.

When designing specifically for broken conductor conditions, a swivel clamp adapter can be added to the conductor end of the hinged base insulator. The swivel clamp adapter mounts on the standard Line Post trunnion cap to support the clamp and permit the conductor/clamp assembly to pivot on the insulator. The clamp rotates in relation to the insulator under overload to prevent conductor bending and crimping.

Lapp Resistance Graded Insulators - RG®
To Combat Insulator Contamination

Special insulator designs for years provided a generally satisfactory solution to problems of insulator surface contamination. Fog Type corrugations, for example, were pioneered by Lapp. Another method of combating insulator surface contamination flashover is with the use of semi-conducting glaze.

Achievement of Lapp Ceramic Research

The practical use of this idea in service has been delayed for many years because of the inability of the ceramic industry to produce a suitably stable and permanent glaze for the purpose. Continuous and concentrated research activity over a period of more than six years has resulted in the development at Lapp of a conducting glaze which meets the requirements of operating performance necessary for high voltage applications.

How Resistance Grading Works

Resistance grading, as perfected at Lapp, and applied to RG Line Post Insulators, consists of a glaze of controlled conductivity applied over the entire insulator surface. It prevents corona and flashover at working voltages in one, two or all of the following ways:

1) It provides linear voltage distribution across the insulator. Voltage distribution across a normal insulator is extremely non-uniform. In RG insulators, each section of the insulator surface does equal work, so local high voltage gradients are prevented.

2) Insulator surfaces are heated by leakage current applied to the porcelain surface ... usually in the order of three or four degrees centigrade above ambient. This means that in light fog or mist, condensation and surface wetting is avoided, and that more rapid drying will result when the surface does become wet. Heavier rain will wash and clean the insulator.

3) *Surface discharge due to dry band formation.* As a wet insulator begins to dry, there is always one area which dries first ... usually in a ring or band around the insulator. When the wet insulator is also heavily contaminated, a large voltage gradient appears across the dry area of higher resistance. When the gradient is of sufficient magnitude, an arc across the dry band results. Heating at the roots of the arc will speed the drying and lengthen the arc. An outage results when the arc grows to such a length as to short out the insulator. On RG Line Post insulators, the conductive glaze is in parallel with the dry section, so the total resistance of the combination is less than that of any area of dry contaminant alone. Instead of causing small arcs or scintillations, the higher leakage current results in drying the surface rapidly and usually almost simultaneously over the entire area so that flashover never initiates.

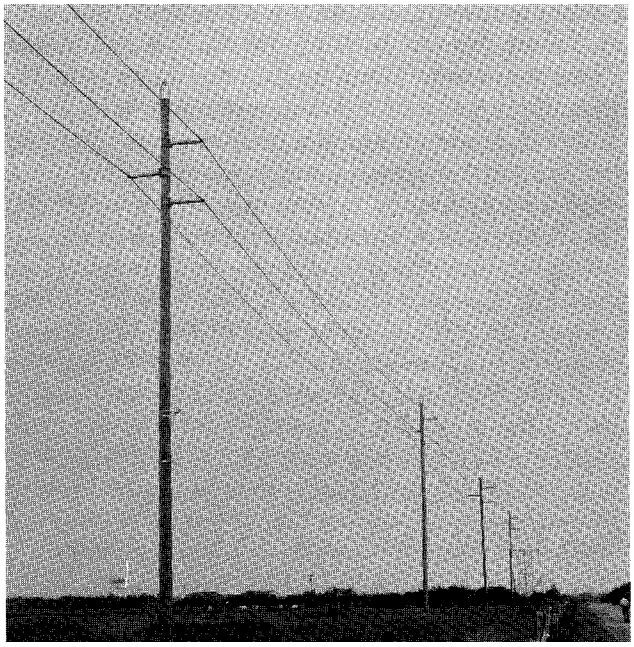
How RG Line Posts Can Save For You

In addition to whatever value you may put on improved transmission line reliability and decreased likelihood of outages, there are specific costs that can be avoided by installation of RG Line Post insulators in areas of severe contamination.

Contact the Lapp Sales Office in your area for additional information on RG savings and the proper application of RG Insulators on your system.

NO WASHING. In coastal areas, field trials indicate that insulator washing is usually not necessary. In dry periods, as contamination builds up, the conducting glaze is sufficient to overcome tendencies to generate corona or arc under any conditions of dew or light rain; during the wet season, accumulated pollution is flushed away naturally. Often this saving of washing costs is quite spectacular. In one test installation involving Horizontal Line Post insulators at 138 kv, the insulators with a regular glaze have required cleaning as frequently as twice a week during bad contamination conditions. RG Line Post insulators in the same area have served the year around without washing. A million dollars a year in washing costs for large utilities with serious contamination problems may be a reasonable estimate for savings resulting from the use of RG insulators.

NO SILICONE GREASING. Greasing of RG Line Posts or other RG insulators is not required; indeed use of grease would defeat the principal under which the conductive glaze derives its benefits. It is the uniform dissipation of leakage current over the conductive insulator surface that prevents initiation of surface discharges on RG insulators. Labor, Materials and downtime involved in greasing insulators to combat contamination are costly and the savings from installing RG insulators in heavily contaminated areas are considerable.



Lapp Resistance Graded (RG) Horizontal Line Posts on wood poles on this 115 kv line in the Gulf Coast area were used to combat severe salt fog contamination and reduce high cost of washing insulators.

Lapp Line Compaction With Horizontal Line Posts

A new dimension in transmission line design is possible with Lapp Line Compaction, using Horizontal Line Post insulators for new construction or for upgrading existing lines.

Trim, Neat Appearance

Lapp Line Compaction is the building of maximum transmission capability into a given right of way. Horizontal Line Posts capitalize on reduced phase to phase and phase to ground clearances by effectively controlling conductor position. This single pole, armless construction produces minimum visual impact with a trim, unobtrusive profile which assures an extra measure of public acceptance.

Operating Reliability

Lapp Line Compaction with Horizontal Line Posts is the modern, efficient method of transmission construction for all voltages to 230kv. This advanced design concept can cut construction costs, reduce right of way requirements, minimize maintenance and assure maximum operating reliability.

Economy Is The Key

Lapp Line Compaction with Horizontal Line Posts is a cost saving proposition from the very beginning on new construction projects. Use of this narrow conductor support system can result in a saving of 20% to 50% over other transmission designs on the outlay for right of way. Tall, single pole construction and long spans further enhance the cost advantages of this efficient design concept.

Lapp Line Compaction economies with Horizontal Line Posts are apparent in upgrading existing lines to higher voltages. Using existing rights of way, poles and often conductors, lines can be upgraded to higher voltages with Horizontal Line Posts at the lowest possible cost without sacrificing phase to phase clearances or phase to ground clearances.

Expenditures for crossarms, bracing hardware and structural members are greatly reduced or eliminated. Construction costs are further reduced by fast assembly insulators and framing of pole at ground level, for easy erection of structures ready for conductors. Easy stringing of conductors with standard equipment and general duty crews further reduces construction time and cost.

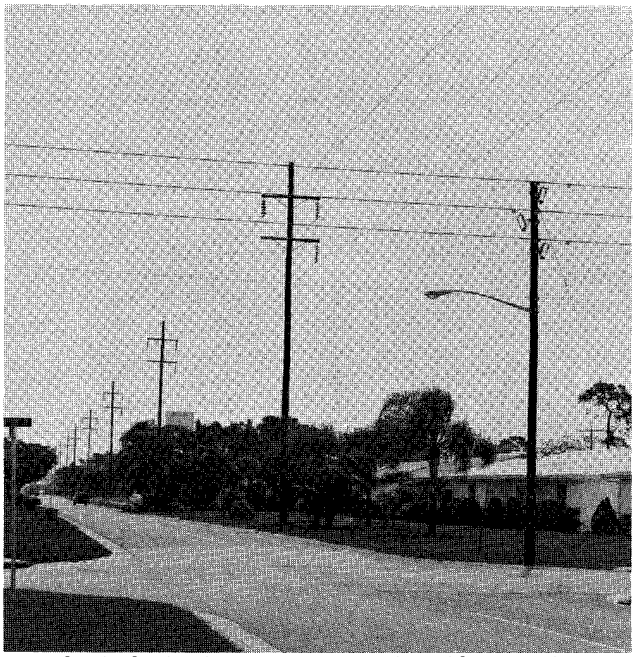
Reduced Cost Per Mile

Cost studies were conducted by an independent consulting firm to determine and compare in-place costs in dollars per mile of new construction for various transmission line designs at 115/138 kv, 230 kv and 345 kv voltage levels. Designs included Lapp Horizontal Line Post armless construction, Horizontal Vee assemblies, davit arm with suspensions and H-frame with suspension insulators.

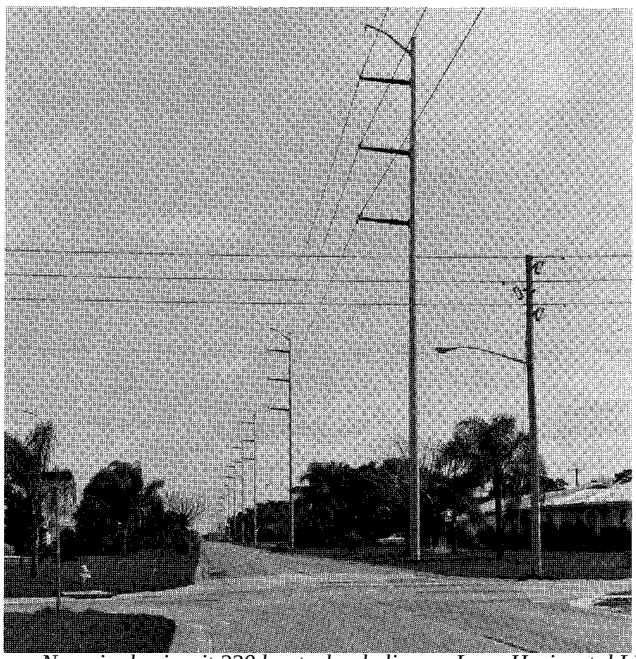
The results of the studies showed that single pole lines designed with Lapp Horizontal Line Posts are competitive with other designs and Horizontal Line Post construction results in the lowest installed cost in nearly all instances at 138 kv.

The Horizontal Line Post design is also competitive with all other types of construction at 230 kv and offers the lowest installed cost, with the exception of the Lapp Horizontal Vee design, which is the most attractive construction in dollars per mile at 230 kv.

The complete, tabulated results of this informative, independent survey are available on request from Lapp.



69 kv single circuit, tangent construction with suspensions on wood poles used only available right of way through residential area. Increased capacity was obtained by replacing and upgrading existing line to 230 kv. (See photo to the right).



New single circuit 230 kv steel pole line on Lapp Horizontal Line Posts utilizes same narrow right of way through residential area. Clearances were maintained by putting all three phases on the street side of the pole.

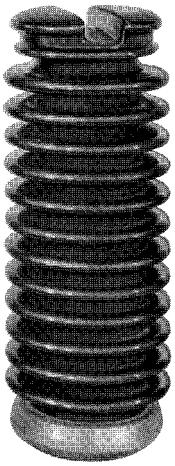
Lapp Standard Tie Top Line Posts

Upright Mounting EEI-NEMA Standard

The standard Line Post insulator developed and introduced by Lapp over 40 years ago is the only Line Post design proven by four decades of field service. These Line Posts are designed for upright or angle mounting on a crossarm and are supplied with a choice of stud assemblies for wood or steel crossarms. Catalog numbers listed are for insulators complete with stud assembly. To order insulators only, without studs, add suffix X to catalog number.

Conductor grooves are the wide Tie Top ANSI Standard type with head and neck designed for use with Wraplock or conventional tie wires. Conductor can be held in side grooves on units 25 kv through 45 kv to facilitate angles and for cornering. Side grooves on insulators 55 kv through 88 kv are for tie wires only. Large wide sided top groove will hold conductor readily for angles up to 15° (30° by using two insulators).

Gray glaze is standard on these insulators. Chocolate glaze can be supplied on order; specify chocolate glaze by deleting -70 from the catalog number. Long studs are supplied complete with large area flat washer, square nut and locknut for wood crossarms. Short studs for steel crossarms are supplied with standard hex nut and lockwasher.



Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG* Glaze	Required System Voltage For RG Application, kv
9325-70/9425-70	25	510089	15
•9335-70/9435-70	35	510090	25
•9345-70/9445-70	45	510091	35

*The RG version uses a metal tie top cap. This assures a positive contact for current flow.

CATALOG NUMBER						
Short Stud Units	**9325-70**	**•9335-70**	**•9345-70**	**•9355-70**	**9366-70**	**9982-70**
Long Stud Units	**9425-70**	**•9435-70**	**•9445-70**	•9455-70	**9466-70**	**9978-70**
ANSI CLASS						
Short Stud Units	57-1S	57-2S	57-3S	57-4S	57-5S	-
Long Stud Units	57-1L	57-2L	57-3L	57-4L	57-5L	-
DIMENSIONS						
Leakage Distance, Inches	14	22	29	40	45	53
Dry Arcing Distance, Inches	6.5	9.5	12.25	14.5	17.25	19.25
MECHANICAL VALUES (ULTIMATE)$						
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800
ELECTRICAL VALUES						
Usual Line Voltage, kv	25	35	45	55	66	88
Low Frequency Dry Flashover, kv	80	110	125	150	175	200
Low Frequency Wet Flashover, kv	60	85	100	125	150	170
Impulse Flashover-Positive, kv	130	180	210	255	290	330
Impulse Flashover-Negative, kv	155	205	260	340	380	425
RADIO INFLUENCE VOLTAGE DATA						
Test Voltage-Rms to Ground, kv	15	22	30	44	44	44
Maximum RIV-Microvolts at 1000 kc	100	100	200	200	200	200
PACKING AND SHIPPING DATA						
Net Weight, Each, Pounds	13	20.5	27.3	38	47	58.5
Packed Weight, Each, Pounds	14.5	22.5	29.8	40	52.5	65.5
Standard Package	6	3	3	3	3	2
Pallet Weight, Pounds	1782	2706	1404	2039	1585	1365
Pallet Quantity	126	126	42	48	30	20

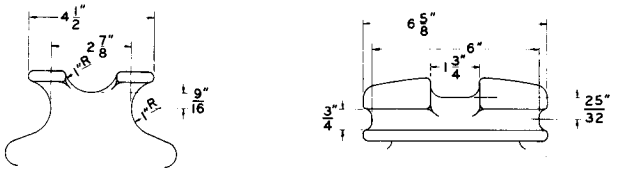
Maximum Recommended Working Load = 40% of Rating

-REA Approved

Tie Top Attachment 25 kv-88 kv

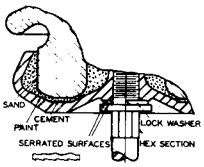
Head Detail

Tie Top Head Detail for Wraplock or conventional tie

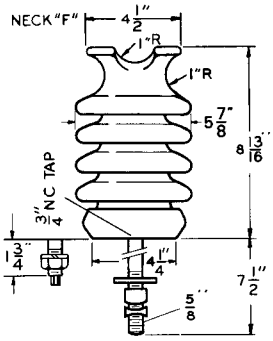


"F" Neck
25, 35, 45 kv

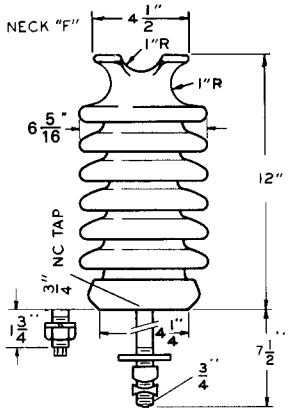
"N" Neck
55, 66, 88 kv



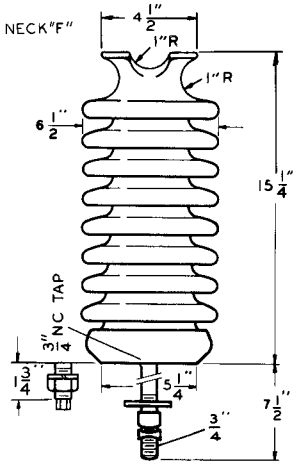
Mounting Base Detail



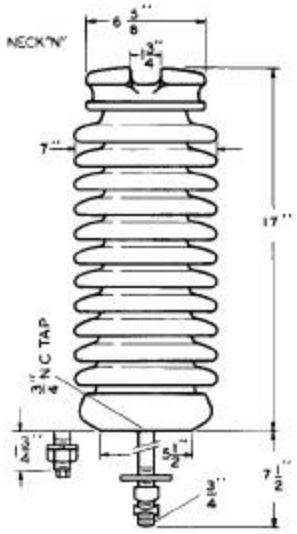
9325-70
9425-70



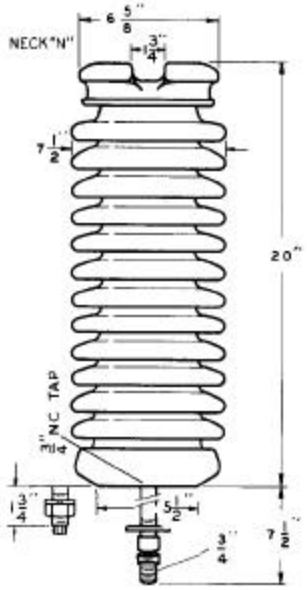
•9335-70
•9435-70



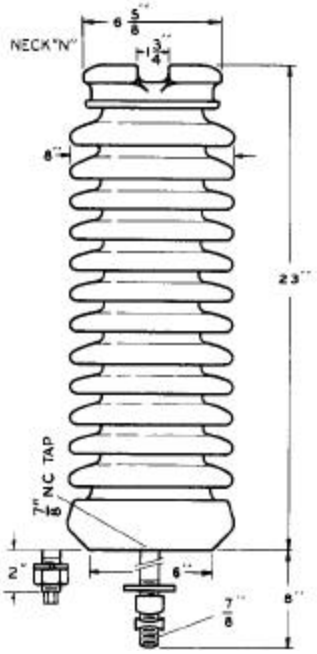
•9345-70
•9445-70



•9355-70
•9455-70



9366-70
9466-70



9982-70
9978-70

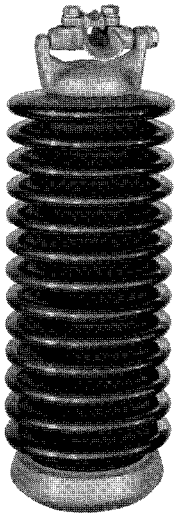
Lapp Clamp Top Line Posts

Upright Mounting Clamp Top

Insulators cataloged on these pages are Lapp Clamp Top Line Posts designed for upright mounting on crossarms or structures. They are rated at 2800 lb., cantilever strength in voltage ratings 25 kv through 115 kv. Clamps for use with these insulators are cataloged on page 36 for standard trunnion type and page 38 for Armor Grip Supports. Mounting studs for steel or wood crossarm mounting are cataloged on page 40. Order insulators, clamps and mounting studs by number to get the combination of insulator rating, clamp size and type of mounting required.

A metal cap, cemented to the outside of the Line Post head, supports the trunnion type clamp or Armor Grip Support. A single cap screw with captive lockwasher forms one end of the clamp bearing; simply backing off (not removing) cap screw allows for quick, easy installation or removal of clamp. No loose parts; ideal for hot line work.

Clamps for all conductor sizes .25" to 2.70" in ferrous or aluminum and Armor Grip Supports for conductors .390" to 1.828" are completely interchangeable on all of these insulators. Gray glaze is standard for these insulators, with chocolate glaze available. Specify chocolate glaze by deleting -70 from the catalog number.



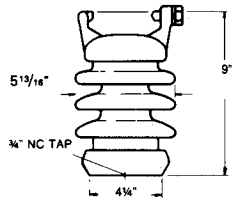
Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
4225-70	**25**	**510025**	**15**
4235-70	**35**	**510035**	**25**
4245-70	**45**	**510045**	**35**
4255-70	**55**	**510055**	**45**
4266-70	**66**	**510066**	**55**
4288-70	**88**	**510088**	**69**
308017-70	**115**	**510026**	69

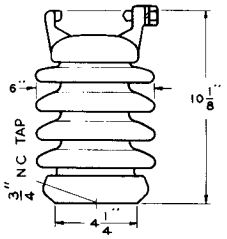
CATALOG NUMBER	**4220-70**	**4225-70**	**4235-70**	**4245-70**	**4255-70**	**4266-70**	**4288-70**	**308017-70**
DIMENSIONS								
Leakage Distance, Inches	10	14	22	29	40	45	53	71
Dry Arcing Distance, Inches	5	6.5	9.5	12.25	14.5	17.25	19.25	27
ANSI CLASS	-	57-11	57-12	57-13	57-14	57-15	-	-
MECHANICAL VALUES (ULTIMATE)*								
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000	5000	5000	5000	5000
ELECTRICAL VALUES								
Usual Line Voltage, kv	20	25	35	45	55	66	88	115
Low Frequency Dry Flashover, kv	70	80	110	125	150	175	200	270
Low Frequency Wet Flashover, kv	50	60	85	100	125	150	170	210
Impulse Flashover-Positive, kv	100	130	180	210	255	290	330	390
Impulse Flashover-Negative, kv	125	155	205	260	340	380	425	570
RADIO INFLUENCE VOLTAGE DATA								
Test Voltage-Rms to Ground, kv	15	15	22	30	44	44	44	88
Maximum RIV-Microvolts at 1000 kc	50	100	100	200	200	200	200	100
PACKING AND SHIPPING DATA								
Net Weight, Each, Pounds	14.3	17.5	28	34.3	42	49	63	102
Packed Weight, Each, Pounds	14.7	17.8	28.3	35	45	53	70	108
Standard Package	6	6	3	3	3	3	2	1
Pallet Weight, Pounds	1908	2307	3630	1530	2197	1647	1457	1671
Pallet Quantity	126	126	126	42	48	30	20	15

*Maximum Recommended Working Load = 40% of Rating

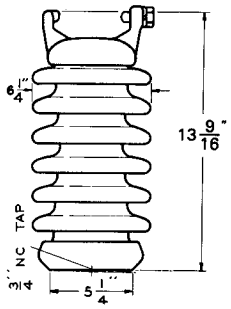
Clamp Top Attachment 20 kv – 115 kv



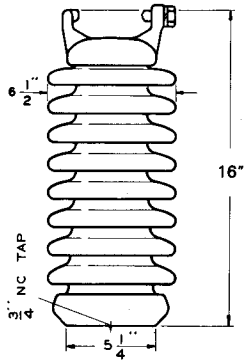
4220-70



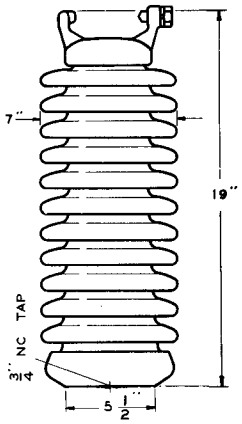
4225-70



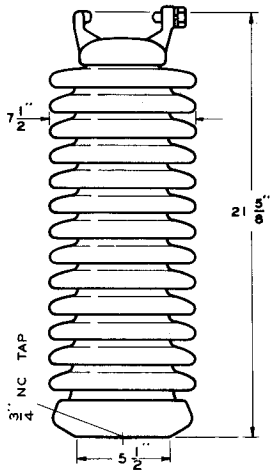
4235-70



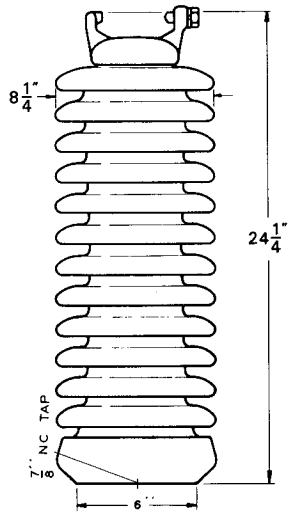
4245-70



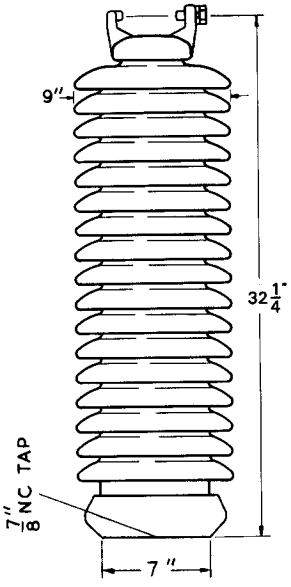
4255-70



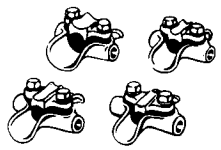
4266-70



4288-70

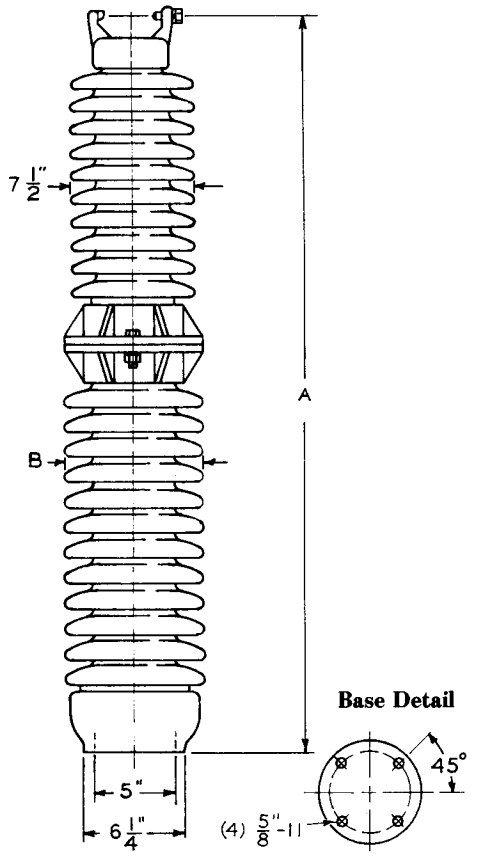


308017-70



Clamps for use with these insulators on page 36

Vertical Mounting Line Posts for 115/138 kv



Vertical Mounting Line Posts for 115/138 kv

Catalog Number	RG Catalog Number	Dimensions, Inches A	B	Flashover Ratings – kv Weight lbs. Leakage	60 Cycle Dry	Wet	Impulse Positive	Negative
*77169	510019	42¼	8½	82	325	215	525	660
*77170	510020	48¼	8½	100	380	255	610	780
*77171	510021	54½	9	115	435	295	695	900
*77172	510022	61	9¼	130	485	335	780	1000

* High strength porcelain, dark gray is standard.

Lapp Horizontal Mounting Line Posts

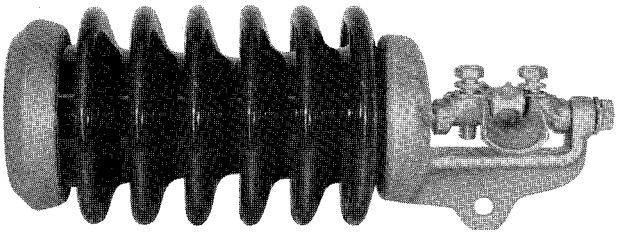
For Flat Surface Mounting

This series of Horizontal Line Post insulators, for ratings 25 kv through 115 kv, has a mounting base designed for attachment to pole gains or brackets for mounting on concrete or steel poles and steel structures. These insulators are recommended primarily for jumper loop control, downleads and similar applications. Horizontal Line Posts 25 kv through 115 kv with an integral gain base for wood pole mounting are listed on following pages 18 and 19.

While designed for special applications, this series of Horizontal Line Posts possesses all the advantages of strength, economy of construction, neat appearance and excellent electrical and mechanical characteristics of the other popular Lapp Clamp Top Line Posts.

A metal cap, cemented to the outside of the Line Post head, supports the trunnion type clamp or Armor Grip Support. A single cap screw with captive lockwasher forms one end of the clamp bearing; simply backing off (not removing) cap screw allows for quick, easy installation or removal of clamp. No loose parts; ideal for hot line work.

Standard Clamp Top clamps for conductor sizes .25" to 2.70" are cataloged on page 36, with Armor Grip Supports for conductors .390" to 1.828" listed on page 38. Mounting studs for use with this series of insulators are listed on Page 40. Gray glaze is standard for these insulators, with chocolate glaze available. Specify chocolate glaze by deleting -70 from the catalog number.



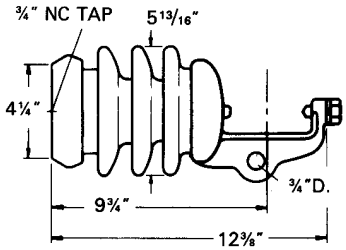
Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
4625-70	**25**	**510125**	**15**
4635-70	**35**	**510135**	**25**
4645-70	**45**	**510145**	**35**
4655-70	**55**	**510155**	**45**
4666-70	**66**	**510166**	**55**
4688-70	**88**	**510188**	**69**
75422E-70	**115**	**510028**	**69**

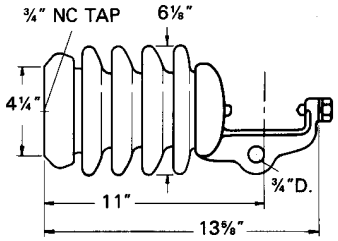
CATALOG NUMBER	**4620-70**	**4625-70**	**4635-70**	**4645-70**	**4655-70**	**4666-70**	**4688-70**	**75422E-70**
DIMENSIONS								
Leakage Distance, Inches	10	14	22	29	40	45	53	71
Dry Arcing Distance, Inches	5	6.5	9.5	12.25	14.5	17.25	19.25	27
MECHANICAL VALUES (ULTIMATE)*								
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000	5000	5000	5000	5000
ELECTRICAL VALUES								
Usual Line Voltage, kv	20	25	35	45	55	66	88	115
Low Frequency Dry Flashover, kv	70	80	110	125	150	175	200	270
Low Frequency Wet Flashover, kv	65	70	100	115	135	160	180	230
Impulse Flashover-Positive, kv	100	130	180	210	255	290	330	390
Impulse Flashover-Negative, kv	125	155	205	260	340	380	425	570
RADIO INFLUENCE VOLTAGE DATA								
Test Voltage-Rms to Ground, kv	15	15	22	30	44	44	44	88
Maximum RIV-Microvolts at 1000 kc	50	100	100	200	200	200	200	100
PACKING AND SHIPPING DATA								
Net Weight, Each, Pounds	14	19	28	35.3	38	58	67	94
Packed Weight, Each, Pounds	14.3	20	28.7	36.7	44	64	76	102
Standard Package	6	3	3	3	2	2	2	1
Pallet Weight, Pounds	1866	1860	1264	1600	935	1335	1555	1585
Pallet Quantity	126	90	42	42	20	20	20	15

*Maximum Recommended Working Load = 40% of Rating

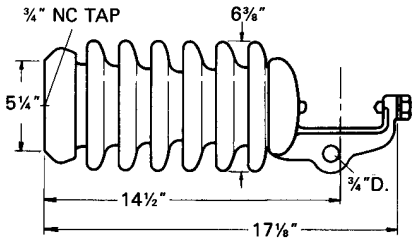
Clamp Top Attachment 20 kv - 115 kv



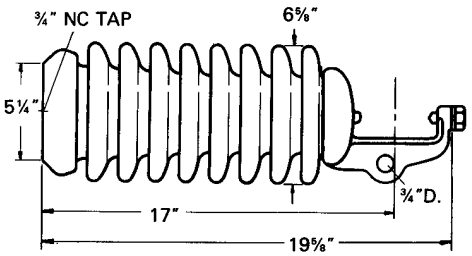
4620-70



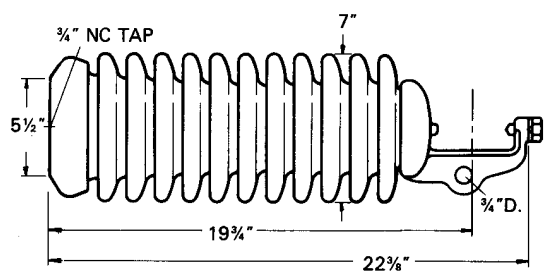
4625-70



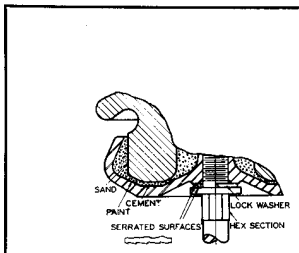
4635-70



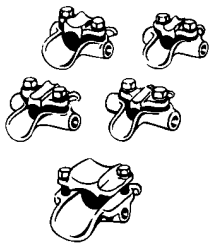
4645-70



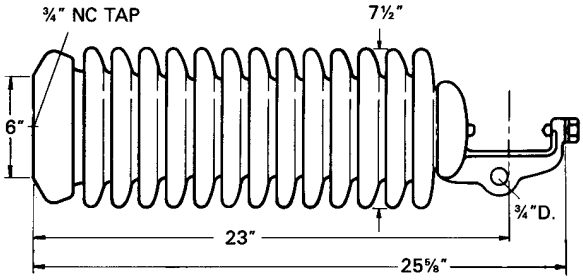
4655-70



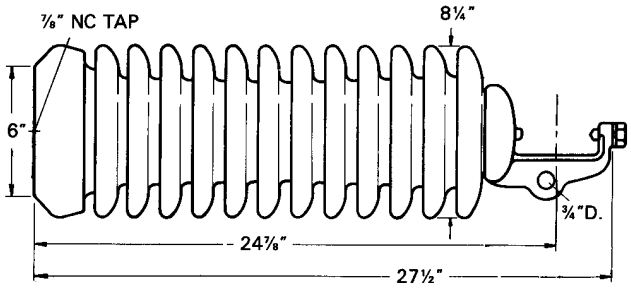
Mounting Base Detail



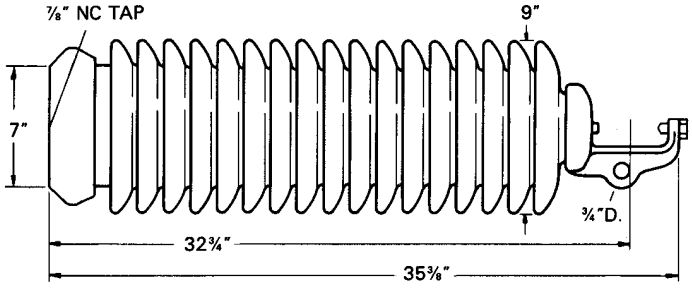
Clamps for use with these insulators on page 36



4666-70



4688-70



75422E-70

Lapp Horizontal Mounting Line Posts

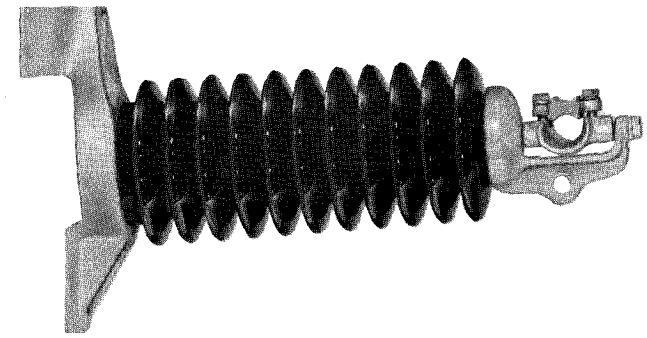
For Wood Pole Mounting

These Horizontal Mounting Line Posts designed for use on wood poles were introduced by Lapp over 15 years ago. They have since proved to be the most popular new transmission insulator design introduced in recent years, and have gained wide acceptance in the short time they have been available. Today, thousands of units have been made and are in service on utility systems throughout the country.

This series of Horizontal Line Posts 25 kv through 115 kv for wood pole mounting consists of a gain base cemented to the bottom of the Fog Type insulator, for mounting the insulator directly to the side of the pole. A metal cap cemented to the outside of the insulator head supports a trunnion type clamp or Armor Grip support for attaching the conductor. A single cap screw with captive lockwasher forms one end of the clamp bearing; simply backing off (not removing) cap screw allows for quick, easy installation or removal of clamp. No loose parts; ideal for hot line work.

Standard Clamp Top Clamps on page 36 and the Armor Grip Supports on page 38 are completely interchangeable for use on all of these Horizontal Line Post insulators. Order clamps and insulators separately. An eye on the Clamp Top cap is designed for attachment of a stringing block to facilitate conductor stringing and sagging operations.

Gray glaze is standard for these insulators, with chocolate glaze available. Specify chocolate glaze by deleting -70 from the catalog number.



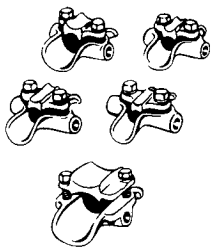
Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
4725-70	**25**	**510225**	**15**
4735-70	**35**	**510235**	**25**
4745-70	**45**	**510245**	**35**
4755-70	**55**	**510255**	**45**
4766-70	**66**	**510266**	**55**
4788-70	**88**	**510288**	**69**
58707-70	**115**	**510027**	69

CATALOG NUMBER	**4720-70**	**4725-70**	**4735-70**	**4745-70**	**4755-70**	**4766-70**	**4788-70**	**58707-70**
DIMENSIONS								
Leakage Distance, Inches	10	14	22	29	40	45	53	68
Dry Arcing Distance, Inches	5	6.5	9.5	12.25	14.5	17.25	19.25	27
MECHANICAL VALUES (ULTIMATE)*								
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000	5000	5000	5000	5000
ELECTRICAL VALUES								
Usual Line Voltage, kv	20	25	35	45	55	66	88	115
Low Frequency Dry Flashover, kv	70	80	110	125	150	175	200	270
Low Frequency Wet Flashover, kv	65	70	100	115	135	160	180	230
Impulse Flashover-Positive, kv	100	130	180	210	255	290	330	390
Impulse Flashover-Negative, kv	125	155	205	260	340	380	425	570
RADIO INFLUENCE VOLTAGE DATA								
Test Voltage-Rms to Ground, kv	15	15	22	30	44	44	44	88
Maximum RIV-Microvolts at 1000 kc	50	100	100	200	200	200	200	100
PACKING AND SHIPPING DATA								
Net Weight, Each, Pounds	18.5	20	29	35	45	59	77	105
Packed Weight, Each, Pounds	20	26	34	40	52	65	84	120
Standard Package	2	2	2	2	2	2	2	1
Pallet Weight, Pounds	1020	1460	1143	1319	1680	1095	1391	1135
Pallet Quantity	48	56	32	32	32	16	16	9

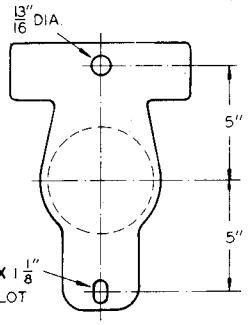
*Maximum Recommended Working Load = 40% of Rating

Clamp Top Attachment 20 kv - 115 kv

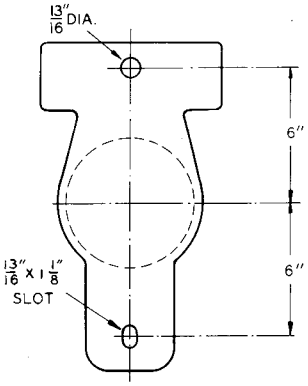


Clamps for use with these insulators on page 36

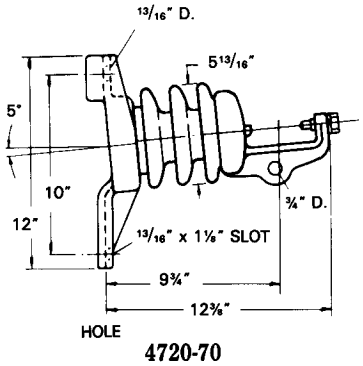
Mounting Base Detail



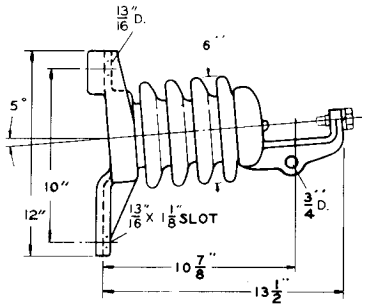
4720-70, 4725-70, 4735-70, 4745-70, 4755-70



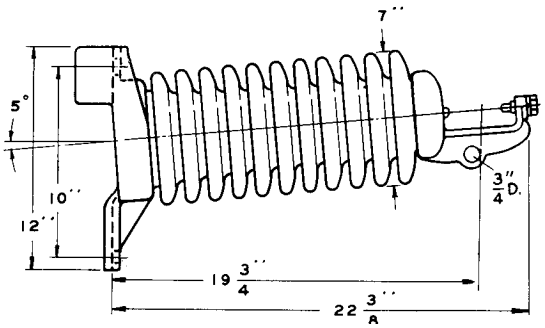
4766-70, 4788-70, 58707-70

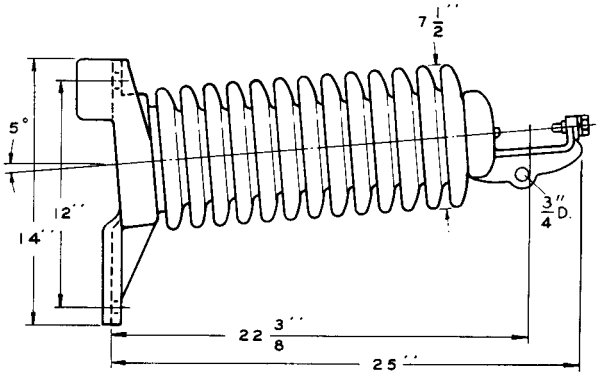


4720-70

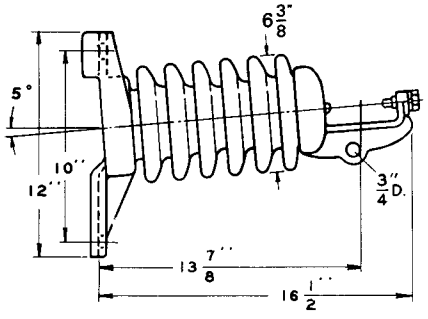


4725-70

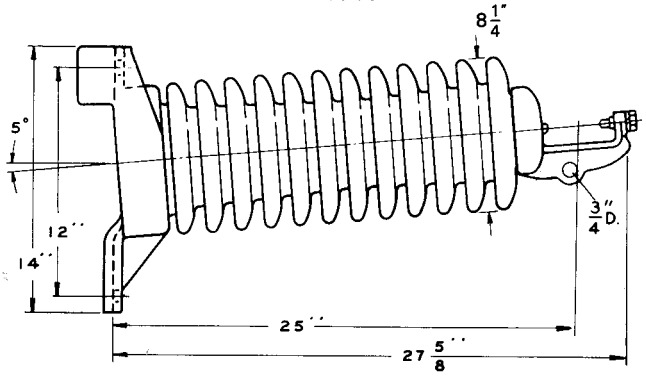




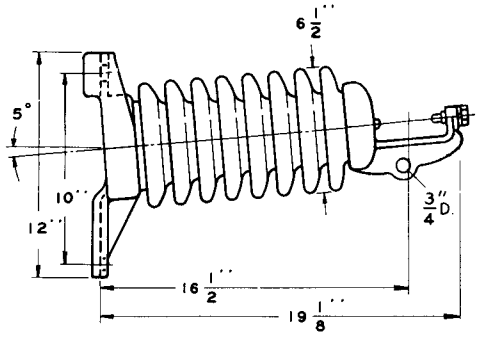
4766-70



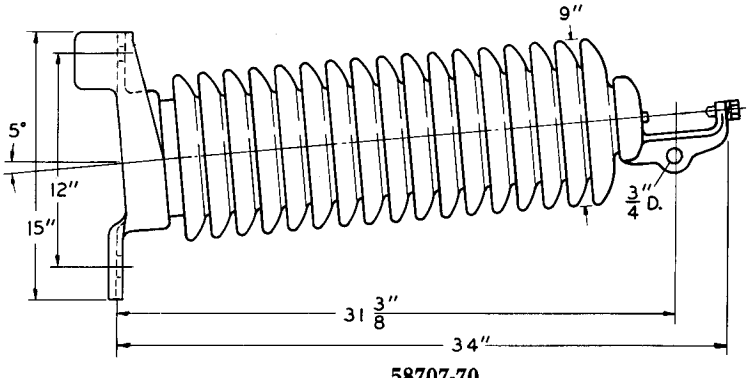
4735-70



4788-70



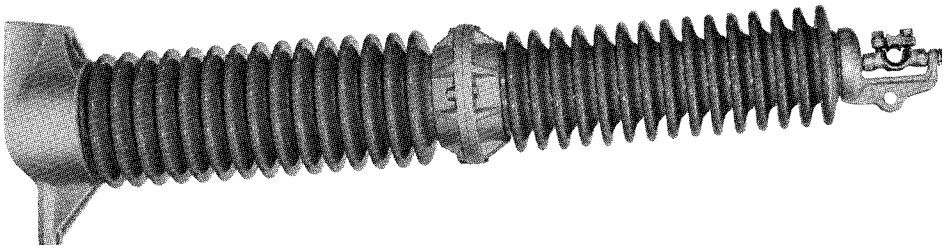
4745-70



58707-70

Lapp Horizontal Mounting Line Posts

For Wood Pole and Steel Pole Mounting 115 kv/138 kv



Lapp 115 kv Horizontal Line Post for Wood Pole Mounting

Trim, Low Voltage Appearance

One of the outstanding features of Horizontal Line Post lines at 115/138 kv is the trim, unobtrusive appearance of this type of construction. It has proved to be the best answer yet to the problem of running 114/138 kv overhead through built up urban or suburban areas, crowded industrial or commercial neighborhoods, and even down narrow, tree-fringed rights of way. Transmission construction with these Horizontal Line Posts has met with wide public acceptance because of this neat, compact low voltage look.

Operating Characteristics

In operating performance, these horizontal mounted Lapp Line Posts offer the same advantages as their smaller, lower voltage counterparts. Horizontal mounting assures uniform wetting of the Fog Type porcelain surface, self cleaning in wind and rain and improved wet flashover values. Units are completely radio and TV interference free at operating voltages.

Economy of Armless Construction

Armless construction at 115/138 kv is economical. Horizontal Line Posts eliminate the need for crossarms, braces and hardware, and are easily mounted on the pole with a minimum of labor and equipment. Savings in labor costs alone of up to 25% are possible.

Horizontal Line Post construction at 115/138 kv requires the narrowest right of way. It solves the problem of utilizing existing crowded rights of way for upgrading lines to higher voltages through congested, built up areas where easements are costly and difficult to obtain.

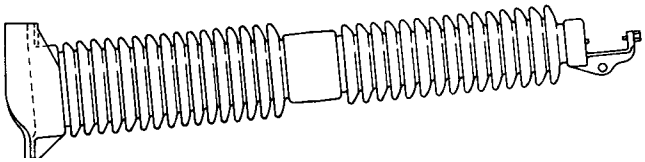
Dark gray glaze is standard for these insulators rated at 2800 lbs. cantilever. Standard Clamp Top clamps on page 36 or Armor Grip Supports listed on page 39 can be used with these insulators.

Pre-Assembled Line Posts

The 115/138 kv Horizontal Line Posts cataloged as standard two piece assemblies bolted together are now available preassembled as a single rigid unit for wood concrete or steel pole mounting.

Pre-assembled Line Posts have top and bottom sections permanently joined with a strong malleable iron collar cemented to the porcelains in place of the standard end caps and bolted assembly.

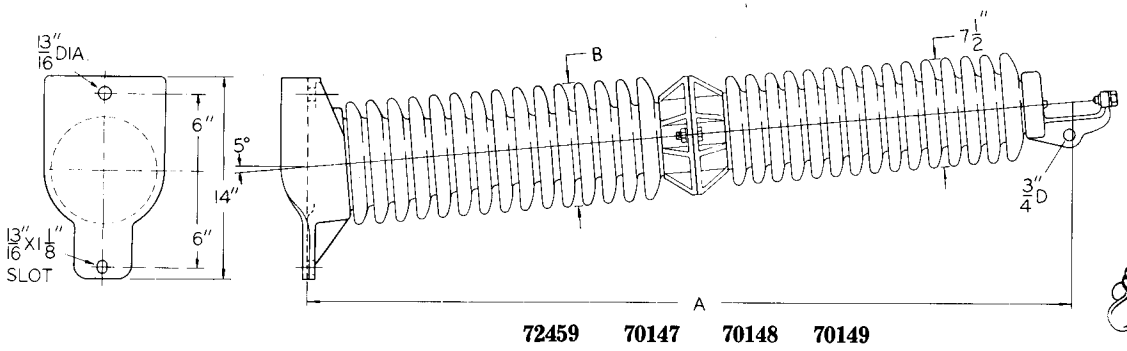
The pre-assembled insulators are lower in cost and save on field assembly. Order by adding suffix "PA" to regular or RG catalog number. Pre-assembled Line Posts have the same electrical and mechanical characteristics as the equivalent bolted assemblies.



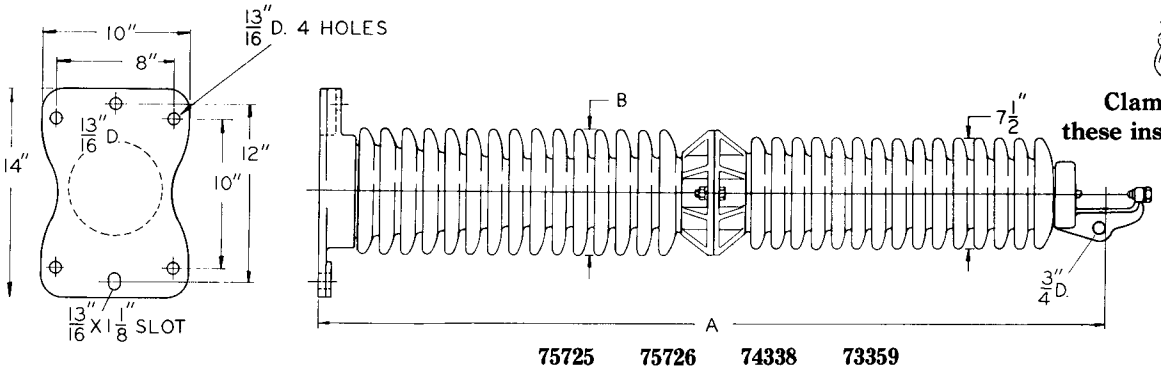
70148-PA

Equivalent Catalog Numbers

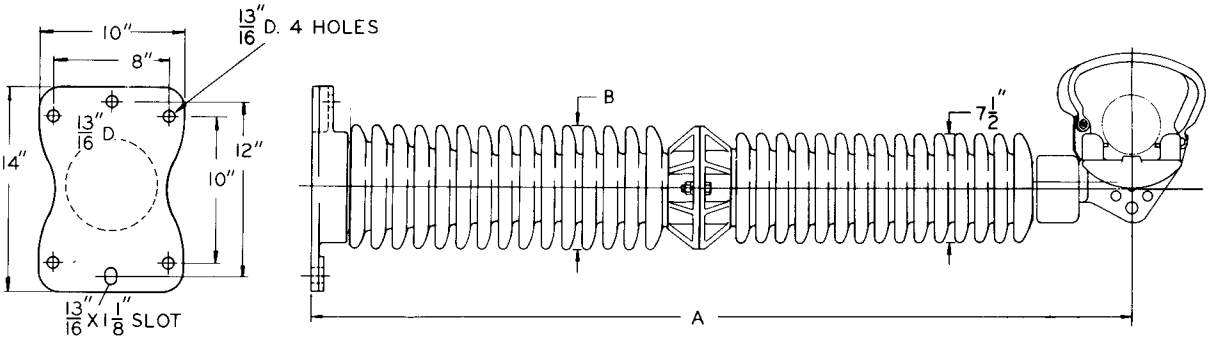
Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
72459	**115/138**	**-**	**-**
70147	**115/138**	**510507**	**115**
70148	**115/138**	**510508**	**138**
70149	**115/138**	**510509**	**138**
75725	**115/138**	**-**	**-**
75726	**115/138**	**510607**	**115**
74338	**115/138**	**510608**	**138**
73359	**115/138**	**510609**	**138**
301541	**115/138**	**-**	**-**
301542	**115/138**	**510617**	**115**
301543	**115/138**	**510618**	**138**
301544	**115/138**	**510619**	**138**



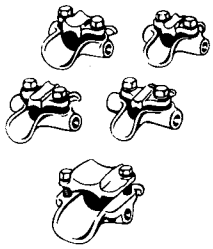
72459 70147 70148 70149



75725 75726 74338 73359



301541 301542 301543 301544



Clamps for use with these insulators on page 36

CATALOG NUMBER*								
Wood Pole Mounting	72459		**70147**		70148		**70149**	
Steel Pole Mounting, Jumpert	**75725**		**75726**		**74338**		73359	
Steel Pole Mounting, Load Limiter		301541		**301542**		301543		301544
DIMENSIONS								
"A" Dimension, Length, Inches	42.25	45	48.5	51.25	54	56.75	61	63.5
"B" Dimension, Inches	8.5	8.5	8.5	8.5	9	9	9.25	9.25
Leakage Distance, Inches	82	82	100	100	110	110	130	130
Dry Arcing Distance, Inches	36.25	36.25	42.25	42.25	48.25	48.25	54.25	54.25
MECHANICAL VALUES (ULTIMATE)"								
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000	5000	5000	5000	5000
ELECTRICAL VALUES								
Usual Line Voltage, kv	115/138	115/138	115/138	115/138	115/138	115/138	115/138	115/138
Low Frequency Dry Flashover, kv	325	325	380	380	435	435	485	485
Low Frequency Wet Flashover, kv	290	290	330	330	390	390	435	435
Impulse Flashover-Positive, kv	525	525	610	610	695	695	780	780
Impulse Flashover-Negative, kv	660	660	780	780	900	900	1000	1000
RADIO INFLUENCE VOLTAGE DATA								
Test Voltage-Rms to Ground, kv	88	88	88	88	88	88	88	88
Maximum RIV-Microvolts at 1000 kc	100	100	100	100	100	100	100	100
PACKING AND SHIPPING DATA								
Net Weight, Each, Pounds	154	164	160	170	170	180	185	195
Packed Weight, Each, Pounds	184	194	191	201	210	220	230	240
Standard Package	1	1	1/2	1/2	1/2	1/2	1/2	1/2

*Add Suffix "PA" to Catalog Number for Preassembled Units

1'These Units Can be Used With Load Limiters on page 39.

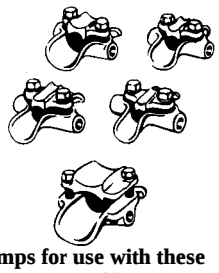
Lapp Horizontal Mounting Line Posts

For Steel Pole Mounting - Hinged Base 115 k

The hinged mounting base on these 115 kv/138 kv Horizontal Line Posts provides overload protection for the insulators when mounted on steel poles or other rigid structures.

The hinge design has two sections. One section, integral with the insulator base, pivots on the section mounted on the structure. The hinge base insulator is stable under normal loading and is self restoring to its original position after reacting to overload conditions.

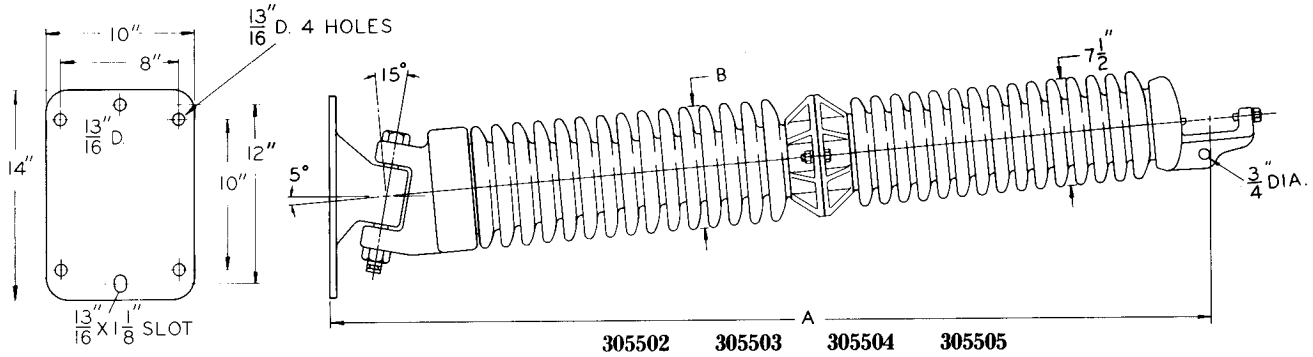
Insulators have same electrical and mechanical ratings as Load Limiter Line Posts cataloged on page 21, and offer an alternate method of overload protection. High strength porcelain, dark gray glazed, is standard. Insulators are radio-TV interference free at operating voltage.



Clamps for use with these insulators on page 36

Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305502	115/138	-	-
305503	115/138	510097	115
305504	115/138	510098	138
305505	115/138	510099	138



CATALOG NUMBER*				
Steel Pole Mounting, Hinged Baset	305502	305503	305504	305505
DIMENSIONS				
"A" Dimension, Length, Inches	48.13	54.38	60.88	66.5
"B" Dimension, Inches	8.5	8.5	9	9.25
Leakage Distance, Inches	82	100	110	130
Dry Arcing Distance, Inches	36.25	42.25	48.25	54.25
MECHANICAL VALUES (ULTIMATE)"				
Cantilever Strength, Pounds	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000
ELECTRICAL VALUES				
Usual Line Voltage, kv	115/138	115/138	115/138	115/138
Low Frequency Dry Flashover, kv	325	380	435	485
Low Frequency Wet Flashover, kv	290	330	390	435
Impulse Flashover - Positive, kv	525	610	695	780
Impulse Flashover - Negative, kv	660	780	900	1000
RADIO INFLUENCE VOLTAGE DATA				
Test Voltage - Rms to Ground, kv	88	88	88	88
Maximum RIV - Microvolts at 1000 kc	100	100	100	100
PACKING AND SHIPPING DATA				
Net Weight Each, Pounds	169	175	185	200
Packed Weight Each, Pounds	199	206	225	245
Standard Package	'/z	'/z	1~2	'~2

*Add Suffix "PA" to Catalog Number for Preassembled Units

"Maximum Recommended Working Load = 40% of Rating tPatent No. 3719770

Lapp Horizontal Mounting Line Posts

For Wood Pole Mounting 115 kv/138 kv

Bundled Conductor Applications

These 115 kv/138 kv Horizontal Line Post insulators for bundled conductor applications are the same basic insulators as the single conductor units for wood pole mounting described on page 21.

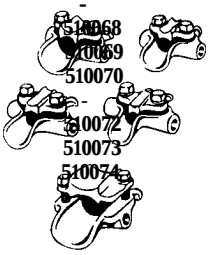
They have an integral end cap and double trunnion support for clamp Top conductor support. High strength porcelain with dark gray glaze is standard. Units are radio and TV interference free without addition of corona rings or shielding.

Equivalent Catalog Numbers

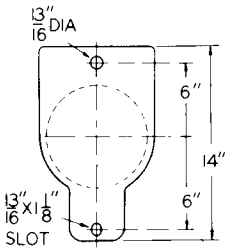
Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305065	115/138	-	-
98932	115/138	510521	115
90668	115/138	510522	138
93349	115/138	510523	138

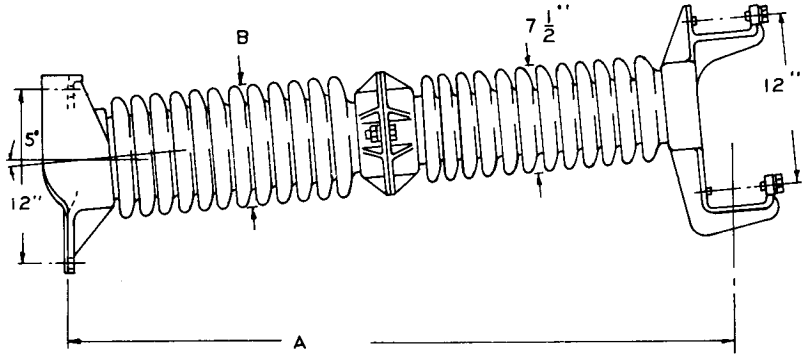
Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305169	115/138	-	-
305170	115/138	510068	115
79135	115/138	510069	138
79136	115/138	510070	138
303759	115/138	-	-
305195	115/138	510072	115
305071	115/138	510073	138
305072	1151138	510074	138



Clamps for use with these insulators on page 36





305065 98932 90668 93349

CATALOG NUMBER*	305065	98932	90668	93349
DIMENSIONS				
"A" Dimension, Inches	42.5	47.5	54.75	60.75
"B" Dimension, Inches	8.5	8.5	9	9.25
Leakage Distance, Inches	82	100	115	130
Dry Arcing Distance, Inches	36.25	42.25	48.25	48
MECHANICAL VALUES (ULTIMATE)"				
Cantilever Strength, Pounds	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000
ELECTRICAL VALUES				
Usual Line Voltage, kv	115/138	115/138	115/138	115/138
Low Frequency Dry Flashover, kv	325	380	435	485
Low Frequency Wet Flashover, kv	290	330	390	435
Impulse Flashover - Positive, kv	525	610	695	780
Impulse Flashover - Negative, kv	660	780	900	1000
RADIO INFLUENCE VOLTAGE DATA				
Test Voltage - Rms to Ground, kv	88	88	88	88
Maximum RIV - Microvolts at 1000 kc	100	100	100	100
PACKING AND SHIPPING DATA				
Net Weight Each, Pounds	169	170	180	195
Packed Weight Each, Pounds	194	201	220	240
Standard Package	1	Vz	~/z	1/z

*Add Suffix "PA" to Catalog Number for Preassembled Units

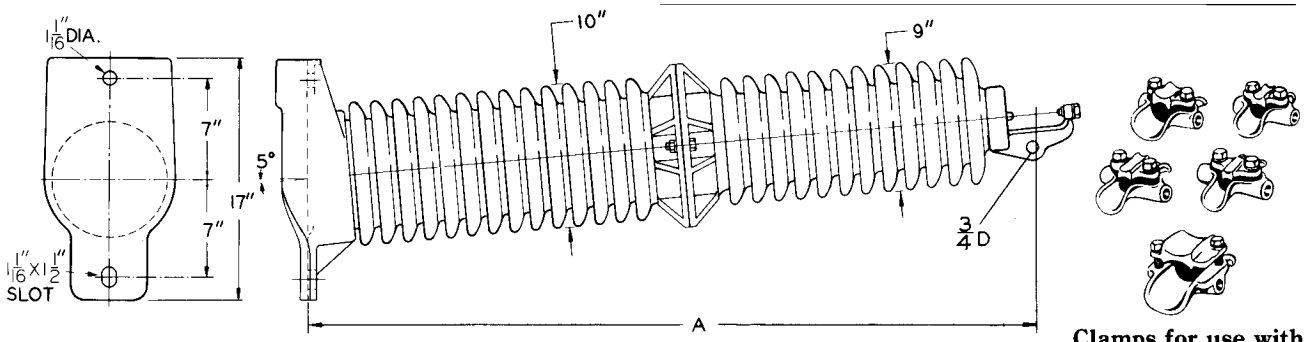
"Maximum Recommended Working Load = 40% of Rating

Lapp Horizontal Mounting Line Posts

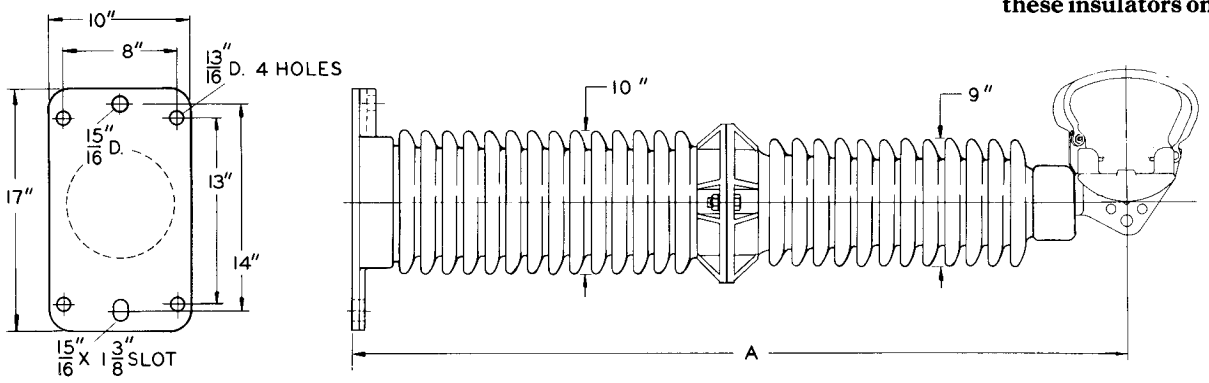
For Wood Pole and Steel Pole Mounting High Strength 115 kv/138 kv

High strength Horizontal Line Post insulators permit longer spans and larger, heavier conductors at 115 kv/138 kv with all of the economy and trim good looks of the single pole, armless overhead transmission design.

Insulators are radio-TV interference free and are available in a choice of leakage distances for wood pole or rigid structure mounting. Each assembly consists of two high strength porcelain insulator sections, dark gray glazed.



Clamps for use with these insulators on page 36



CATALOG NUMBER								
Wood Pole Mounting	305169			**305170**		79135		**79136**
Steel Pole Mounting, Load Limiter		**303759**			305195		**305071**	**305072**
DIMENSIONS								
"A" Dimension, Length, Inches	47		49.25	50	52.5	58	60.75	62
64.75								
Leakage Distance, Inches	82	82	100	100	115	110	130	130
Dry Arcing Distance, Inches	36.25		36.25	42.25	42.25	48.25	48.25	54.25
54.25								
MECHANICAL VALUES (ULTIMATE)*								
Cantilever Strength, Pounds	4000	4000	4000	4000	4000	4000	4000	3600
Tension Strength, Pounds	10000		10000	10000	10000	10000	10000	10000
10000								
ELECTRICAL VALUES								
Usual Line Voltage, kv	115/138		115/138	115/138	115/138	115/138	115/138	115/138
115/138								
Low Frequency Dry Flashover, kv	325	325	380	380	435	435	485	485
Low Frequency Wet Flashover, kv	290	290	330	330	390	390	435	435
Impulse Flashover - Positive, kv	525	525	610	610	695	695	780	780
Impulse Flashover - Negative, kv	660	660	780	780	900	900	1000	1000
RADIO INFLUENCE VOLTAGE DATA								
Test Voltage - Rms to Ground, kv	88	88	88	88	88	88	88	88
Maximum RIV - Microvolts at 1000 kc	100	100	100	100	100	100	100	
PACKING AND SHIPPING DATA								
Net Weight Each, Pounds	250	250	256	256	260	260	265	265
Packed Weight Each, Pounds	301	301	308	308	311	311	329	329
Standard Package	1/z	1/z	1/z	1/a	1/z	1/z	1/z	1/z

*Maximum Recommended Working Load = 40% of Rating

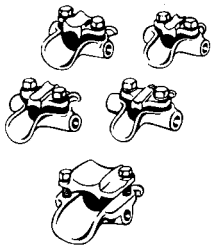
Lapp Horizontal Mounting Line Posts

For Steel Pole Mounting - High Strength 115 kv/138 kv

High strength Horizontal Line Posts for 115 kv/138 kv service on rigid structures have a hinged mounting base for overload protection. Like their high strength counterparts with standard mounting bases, these insulators can be used on longer spans with larger, heavier conductor for single pole armless construction.

Insulators mount on the pole with a self restoring hinge that permits the insulator to swing and absorb the shock of excessive loading for unbalanced longitudinal loads or broken conductor conditions.

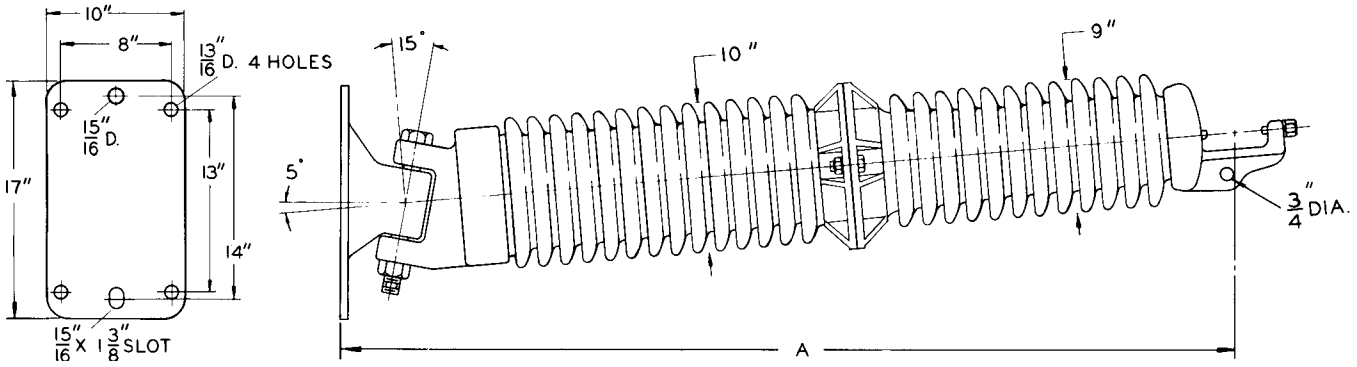
Insulators are radio-TV interference free at rated voltages. Each assembly consists of two high strength porcelain insulator sections, dark gray glazed.



Clamps for use with these insulators on page 36

Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305506	**115/138**	-	-
305507	**115/138**	**510101**	**115**
305508	**115/138**	**510102**	**138**
305509	**115/138**	**510103**	**138**



305506 305507 305508 305509

CATALOG NUMBER					
Steel Pole Mounting, Hinged Baset	**305506**		**305507**	**305508**	**305509**
DIMENSIONS					
"A" Dimension, Inches	55.5		58.75	66.75	69
Leakage Distance, Inches	82	100		110	130
Dry Arcing Distance, Inches	36.25		42.25	48.25	54.25
MECHANICAL VALUES (ULTIMATE)*					
Cantilever Strength, Pounds	4000		4000	4000	3600
Tension Strength, Pounds	10000		10000	10000	10000
ELECTRICAL VALUES					
Usual Line Voltage, kv	115/138		115/138	115/138	115/138
Low Frequency Dry Flashover, kv	325		380	435	485
Low Frequency Wet Flashover, kv	290		330	390	435
Impulse Flashover - Positive, kv	525		610	695	780
Impulse Flashover - Negative, kv	660		780	900	1000
RADIO INFLUENCE VOLTAGE DATA					
Test Voltage - Rms to Ground, kv	88	88	88	88	
Maximum RIV - Microvolts at 1000 kc	100		100	100	100
PACKING AND SHIPPING DATA					
Net Weight Each, Pounds	265		271	275	280
Packed Weight Each, Pounds	316		323	344	345
Standard Package	1/2	1/2	1/2	1/2	

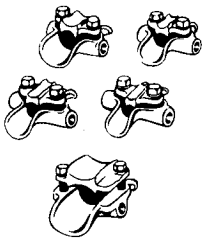
*Maximum Recommended Working Load = 40% of Rating

tPatent No. 3719770

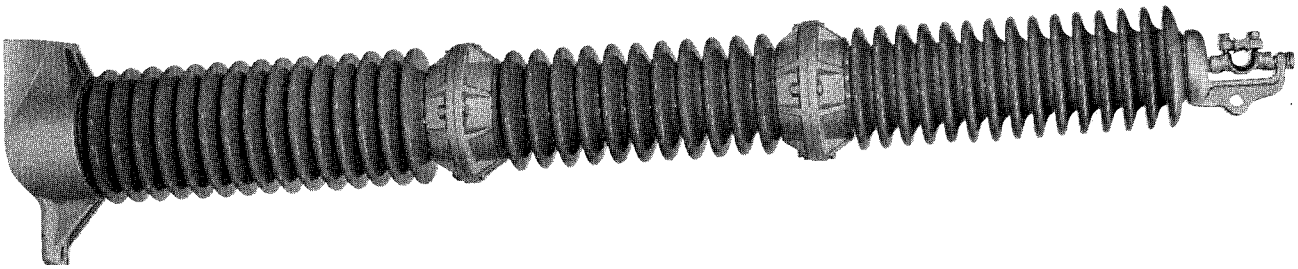
Lapp Horizontal Mounting Line Posts

For Wood Pole and Steel Pole Mounting 161 kv/230 kv

This tangent construction with Lapp 161 kv Horizontal Line Posts on treated wood poles is not only neat in appearance but it is economical to build, with worthwhile savings in labor, materials and right of way costs compared to conventional construction.



Clamps for use with these insulators on page 36

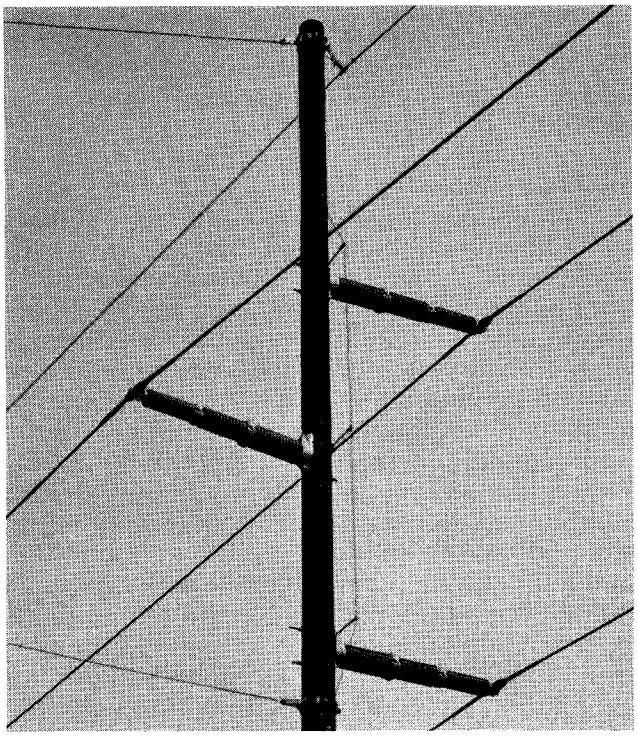


Lapp 161 kv Horizontal line Post for wood pole mounting.

Urban Construction

Problems encountered in running feeder lines through crowded, built up areas to handle increased industrial and commercial loads become greater at higher voltages. Construction costs soar, desirable right of way is costly and difficult to obtain, and public opinion opposes large, high voltage overhead structures in urban areas.

The neat, unobtrusive appearance of armless construction with Lapp Horizontal Line Posts has won public acceptance in urban and suburban areas where lines on conventional structures were ruled out. This, plus savings in labor and materials, right of way costs and maintenance free, reliable operation, make armless construction at 161/230 kv a valuable new tool for transmission design engineers.



Operating Characteristics

Lapp Horizontal Line Posts for 161 kv and 230 kv are in service on both wood pole and steel pole lines. These insulators are available in three sizes with 2800 lbs. cantilever rating and are similar in design to the smaller, lower voltage units described on page 20. They have the same high performance characteristics as the widely used 115/138 kv Horizontal Line Posts. Lapp Horizontal Line Posts for 161/230 kv consist of three Fog Type porcelain sections, with end caps cemented on the porcelain for bolting the sections together. An integral gain base cemented on the pole end of the insulator mounts the insulator securely to the pole. For wood pole mounting, the base has rounded bearing surface and mounts with through bolts, top and bottom. For steel pole mounting, the flat base has bolt holes on all four corners or centered holes top and bottom, for mounting to a welded bracket on the pole.

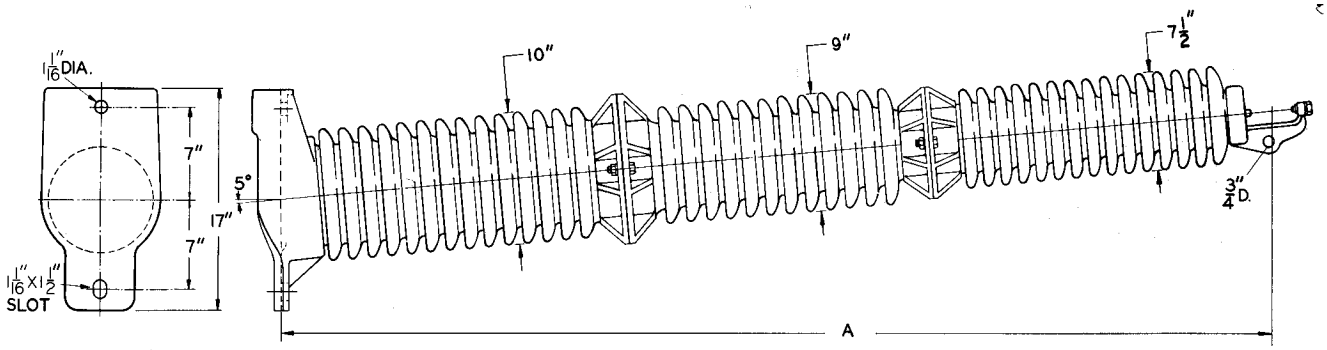
A trunnion cap cemented on the conductor end of the insulator supports standard trunnion clamps cataloged on page 36 or the Armor Grip Supports listed on page 38. Each top, center or bottom section is standard and interchangeable with other matching top, center or bottom sections to facilitate stock keeping.

Porcelain is Lapp high strength body, dark gray glazed for all insulators in this 161/230 kv series.

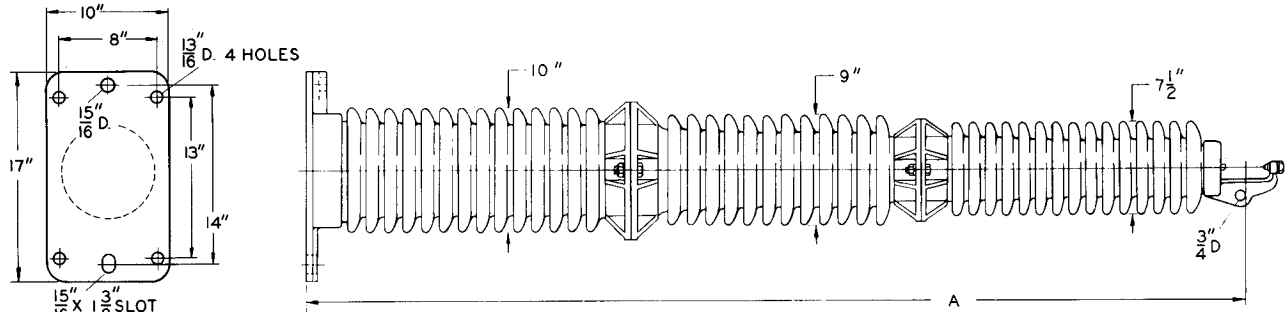
Pre-assembled 161/230 kv Horizontal Line Posts are available on special order.

Equivalent Catalog Numbers

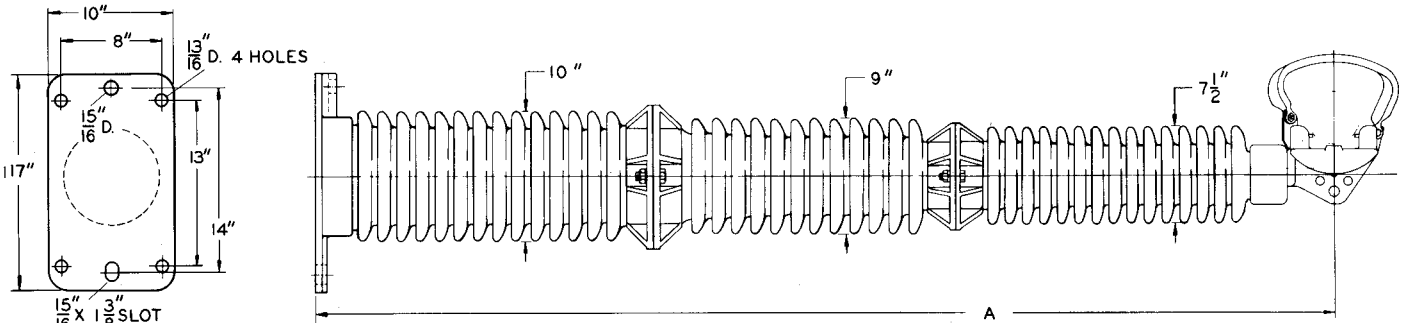
Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
76072-A	**161/230**	**510702**	**161**
76073-A	**161/230**	**510703**	**161**
76074-A	**161/230**	**510704**	**161**
76093	**161/230**	**510802**	**161**
76094	**161/230**	**510803**	**161**
76095	**161/230**	**510804**	**161**
301573	**161/230**	**510805**	**161**
301574	**161/230**	**510008**	**161**
301575	**161/230**	**510806**	**161**



76072-A 76073-A 76074-A



76093 76094 76095



301573 301574 301575

CATALOG NUMBER#						
Wood Pole Mounting	76072-A		76073-A		76074-A	
Steel Pole Mounting, Jumper Control*	76093		76094		76095	
Steel Pole Mounting, Load Limiter		301573		301574		301575
DIMENSIONS						
"A" Dimension, Length, Inches	73	75.75	79.75	82.5	84.75	87.5
Leakage Distance, Inches	138	138	154	154	167	167
Dry Arcing Distance, Inches	59	59	65	65	71	71
MECHANICAL VALUES (ULTIMATE)**						
Cantilever Strength, Pounds	2800	2800	2800	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000	5000	5000	5000
ELECTRICAL VALUES						
Usual Line Voltage, kv	161/230	161/230	161/230	161/230	161/230	161/230
Low Frequency Dry Flashover, kv	540	540	590	590	640	640
Low Frequency Wet Flashover, kv	485	485	530	530	575	575
Impulse Flashover - Positive, kv	860	860	945	945	1025	1025
Impulse Flashover - Negative, kv	1100	1100	1200	1200	1300	1300
RADIO INFLUENCE VOLTAGE DATA						
Test Voltage - Rms to Ground, kv	103	103	103	103	103	103
Maximum RIV - Microvolts at 1000 kc	100	100	100	100	100	100
PACKING AND SHIPPING DATA						
Net Weight Each, Pounds	315	325	337	347	359	369
Packed Weight Each, Pounds	361	371	394	404	421	431
Standard Package	1/3	1/3	1/3	1/3	1/3	1/3

*These Units Can be Used With Load Limiters on Page 35.

"Maximum Recommended Working Load = 40% of Rating.

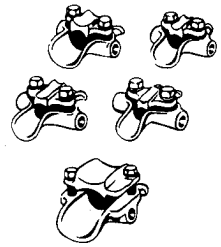
*Add Suffix RF to specify Radio Free Head for 230 kv application.

Lapp Horizontal Mounting Line Posts

For Steel Pole Mounting - Hinged Base 161 kv/230 kv

These Horizontal Line Posts with hinged bases are designed for 161 kv/230 kv single pole construction on steel or concrete poles. They have the same electrical and mechanical ratings as the flat mounting base insulators cataloged on page 27. The hinge consists of two sections. The section integral with the insulator base section pivots on the hinge plate mounted on the pole to provide overload protection from unbalanced longitudinal loads or broken conductor conditions.

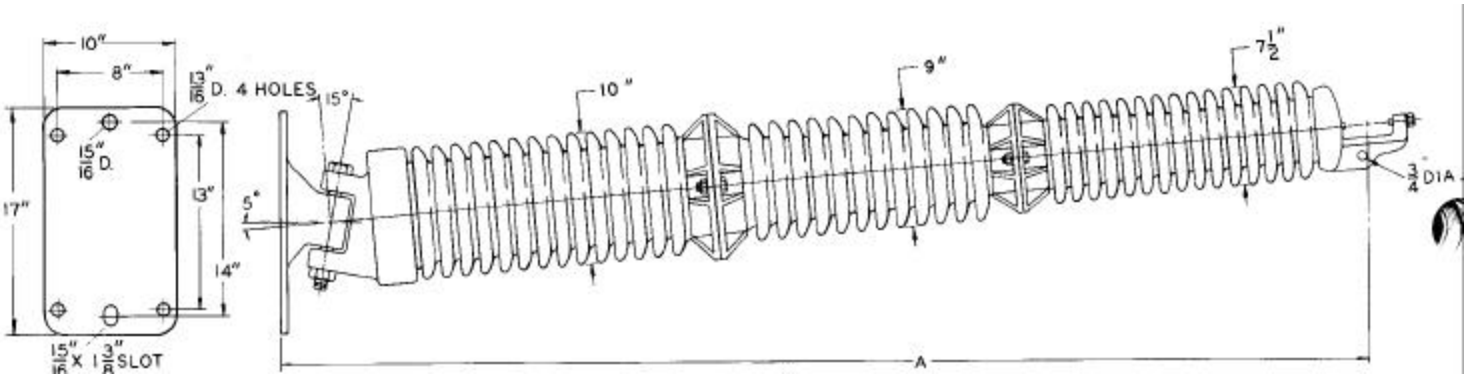
Insulators are radio-TV interference free at operating voltage without corona rings. Each insulator assembly consists of three high strength porcelain sections, dark gray glazed.



Clamps for use with these insulators on page 36

Equivalent Catalog Numbers

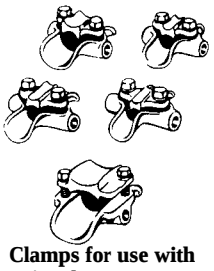
Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305510	**161/230**	**510104**	**161**
305511	**161/230**	**510105**	**161**
305512	**161/230**	**510106**	**161**



	305510	305511	305512
CATALOG NUMBER$			
Steel Pole Mounting, Hinged Baset	305510	305511	305512
DIMENSIONS			
"A" Dimension, Inches	82.5	86.25	91.06
Leakage Distance, Inches	138	154	167
Dry Arcing Distance, Inches	59	65	71
MECHANICAL VALUES (ULTIMATE)*			
Cantilever Strength, Pounds	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000
ELECTRICAL VALUES			
Usual Line Voltage, kv	161/230	161/230	161/230
Low Frequency Dry Flashover, kv	540	590	640
Low Frequency Wet Flashover, kv	485	530	575
Impulse Flashover - Positive, kv	860	945	1025
Impulse Flashover - Negative, kv	1100	1200	1300
RADIO INFLUENCE VOLTAGE DATA			
Test Voltage - Rms to Ground, kv	103	103	103
Maximum RIV - Microvolts at 1000 kc	100	100	100
PACKING AND SHIPPING DATA			
Net Weight Each, Pounds	330	352	374
Packed Weight Each, Pounds	376	410	437
Standard Package	1/3	1/3	1/3

*Maximum Recommended Working Load = 40% of Rating $Add Suffix RF to specify Radio Free Head for 230 kv application. tPatent No. 3719770

Lapp Horizontal Mounting Line Posts



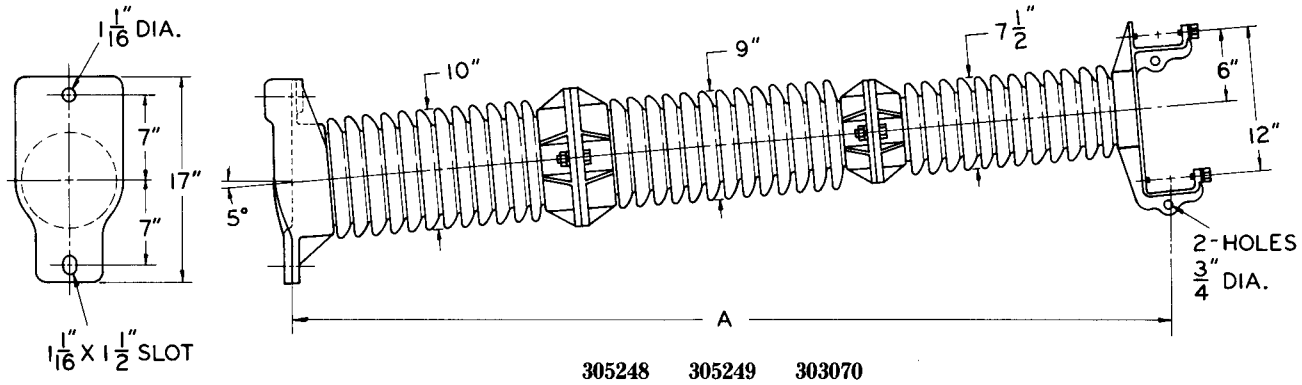
Clamps for use with these insulators on page 36

For Wood Pole Mounting 161 kv/230 kv Bundled Conductor Applications

Horizontal Line Post insulators for 161 kv/230 kv bundled conductor applications are the same basic insulators as the wood pole mounting units described on page 26. An integral cap and double trunnion clamp assembly supports the two conductors. Insulators are radio-TV interference free. High strength porcelain with dark gray glaze is standard.

Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305248	**161/230**	**510528**	**161**
305249	**161/230**	**510529**	**161**
303070	**161/230**	**510530**	**161**



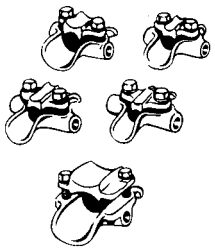
305248 305249 303070

CATALOG NUMBERS	**305248**	**305249**	**303070**
DIMENSIONS			
"A" Dimension, Length, Inches	73.25	80	85
Leakage Distance, Inches	138	154	167
Dry Arcing Distance, Inches	59	65	71
MECHANICAL VALUES (ULTIMATE)*			
Cantilever Strength, Pounds	2800	2800	2800
Tension Strength, Pounds	5000	5000	5000
ELECTRICAL VALUES			
Usual Line Voltage, kv	161/230	161/230	161/230
Low Frequency Dry Flashover, kv	540	590	640
Low Frequency Wet Flashover, kv	485	530	575
Impulse Flashover - Positive, kv	860	945	1025
Impulse Flashover - Negative, kv	1100	1200	1300
RADIO INFLUENCE VOLTAGE DATA			
Test Voltage - Rms to Ground, kv	103	103	103
Maximum RIV - Microvolts at 1000 kc	100	100	100
PACKING AND SHIPPING DATA			
Net Weight Each, Pounds	327	349	371
Packed Weight Each, Pounds	373	406	433
Standard Package	1/3	1/3	1/3

*Maximum Recommended Working Load = 40% of Rating

*Add Suffix RF to specify Radio Free Head for 230 kv application.

Lapp Horizontal Mounting Line Posts



Clamps for use with these insulators on page 36

For Steel Pole Mounting - High Strength 161 kv/230 kv

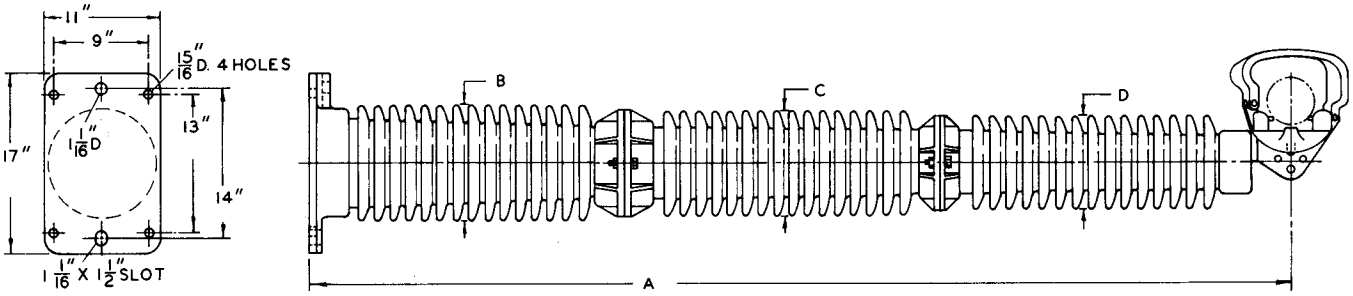
Three high strength Horizontal Line Post insulators are listed for rigid structure mounting in a choice of leakage distances and strength ratings.

These units have a special radio free head and are radio and TV interference free by design. They do not require corona rings or extra shielding.

Each assembly consists of three high strength porcelain insulator sections, dark gray glazed.

Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
303492	**161/230**	**510075**	**161**
305206	**161/230**	**510076**	**230**
301372	**161/230**	**510077**	**230**



CATALOG NUMBERS	**303492**	**305206**	**301372**
DIMENSIONS			
"A" Dimension, Length, Inches	87.5	93.5	101.5
"B" Dimension, Inches	11	12	12
"C" Dimension, Inches	10	10.5	10.5
"D" Dimension, Inches	9.625	10	10
Leakage Distance, Inches	167	212	230
Dry Arcing Distance, Inches	71	73	79
MECHANICAL VALUES (ULTIMATE)*			
Cantilever Strength, Pounds	3500	3500	3500
Tension Strength, Pounds	10000	10000	10000
ELECTRICAL VALUES			
Usual Line Voltage, kv	161/230	161/230	161/230
Low Frequency Dry Flashover, kv	640	690	735
Low Frequency Wet Flashover, kv	575	620	675
Impulse Flashover - Positive, kv	1025	1105	1185
Impulse Flashover - Negative, kv	1300	1370	1485
RADIO INFLUENCE VOLTAGE DATA			
Test Voltage - Rms to Ground, kv	146	146	146
Maximum RIV - Microvolts at 1000 kc	50	50	50
PACKING AND SHIPPING DATA			
Net Weight Each, Pounds	505	548	585
Packed Weight Each, Pounds	555	603	643
Standard Package	1/3	1/3	1/3

*Maximum Recommended Working Load = 40%a of Rating $Add

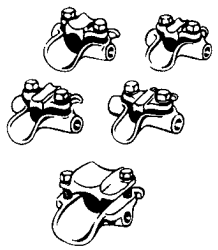
Suffix RF to specify Radio Free Head for 230 kv application.

Lapp Horizontal Mounting Line Posts

For Steel Pole Mounting - High Strength 161 kv/230 kv

High strength Horizontal Line Posts for mounting on steel or concrete poles permit longer spans and heavier conductors for armless construction at 161 kv/230 kv. The integral hinged mounting base provides overload protection for the insulator from unbalanced longitudinal loads or broken conductor conditions. Insulators have the same electrical and mechanical characteristics as the units cataloged on page 30.

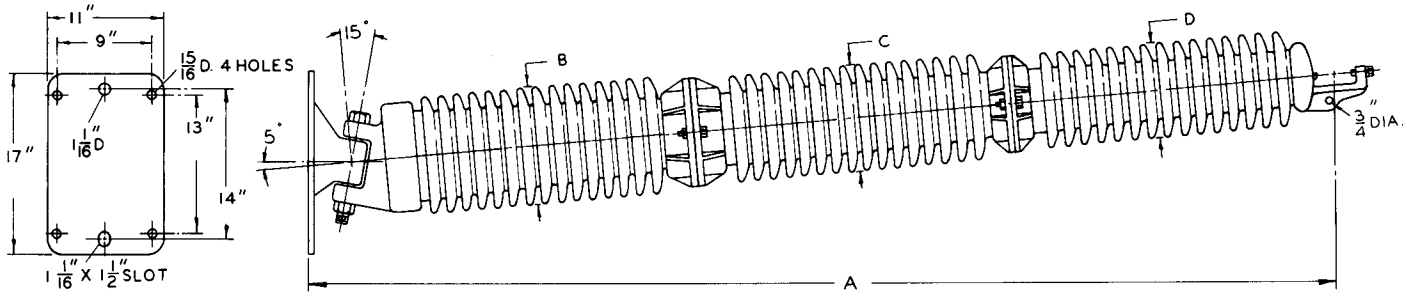
Insulators are radio-TV interference free at operating voltage without corona rings. Each insulator assembly consists of three high strength porcelain sections, dark gray glazed.



Clamps for use with these insulators on page 36

Equivalent Catalog Numbers

Regular Glaze	Usual Line Voltage, kV	RG Glaze	Required System Voltage For RG Application, kv
305513	**161/230**	**510107**	**161**
305514	**161/230**	**510108**	**230**
305515	**161/230**	**510109**	**230**



	305513		305514	**305515**
CATALOG NUMBERS				
Steel Pole Mounting, Hinged Baset				
DIMENSIONS				
"A"Dimension, Length, Inches	94.75	100.75		108.75
"B" Dimension, Inches	11	11	12	
"C" Dimension, Inches	10	10	10.5	
"D" Dimension, Inches	9.725	9	10	
Leakage Distance, Inches	167	212	230	
Dry Arcing Distance, Inches	71	73	79	
MECHANICAL VALUES (ULTIMATE)*				
Cantilever Strength, Pounds	3500	3500	3500	
Tension Strength, Pounds	10000		10000	10000
ELECTRICAL VALUES				
Usual Line Voltage, kv	161/230		161/230	161/230
Low Frequency Dry Flashover, kv	640	690	735	
Low Frequency Wet Flashover, kv	575	620	675	
Impulse Flashover - Positive, kv	1025	1105	1185	
Impulse Flashover - Negative, kv	1300	1370	1485	
RADIO INFLUENCE VOLTAGE DATA				
Test Voltage - Rms to Ground, kv	146	146	146	
Maximum RIV - Microvolts at 1000 kc	50	50	50	
PACKING AND SHIPPING DATA				
Net Weight Each, Pounds	520	563	600	
Packed Weight Each, Pounds	570	618	658	
Standard Package	1/3	1/3	1/3	

*Maximum Recommended Working Load = 40% of Rating *Add Suffix RF to specify Radio Free Head for 230 kv application. tPatent No. 3719770

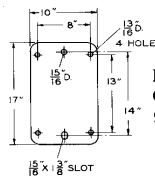
Lapp Horizontal Mounting Line Posts

For Jumper Loop Control 345 kv

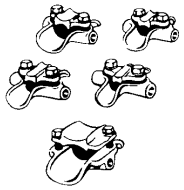
These Horizontal Line Post insulators are designed for jumper loop control only, at 345 kv. Insulators 98480 and 95082 are shown for wood pole, and 98337 and 95685 for steel pole mounting, for either single or double conductors.

Horizontal Line Posts for 345 kv jumper control are radio and TV interference free and are designed to retain the jumper loop in a positive position, affording adequate clearances in a neat looking, maintenance free construction. These insulators are particularly recommended for jumper loop control on modern 345 kv Horizontal Vee single pole transmission line designs.

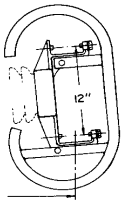
Assembly consists of four high strength insulator sections, dark gray glazed. Insulators take standard Clamp Top clamps for both single or bundled conductor designs.



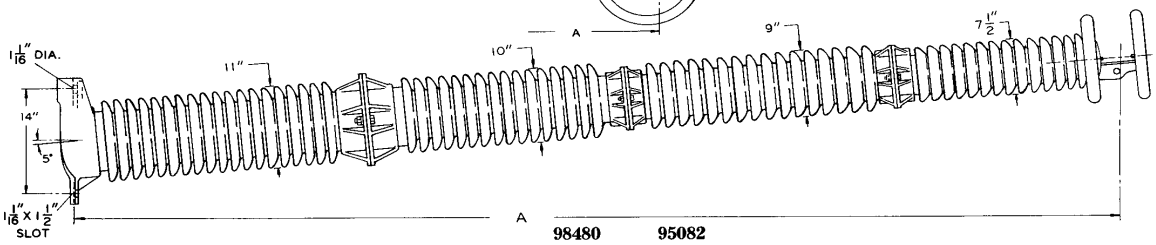
Base Detail for Catalog Numbers 98337 and 95685



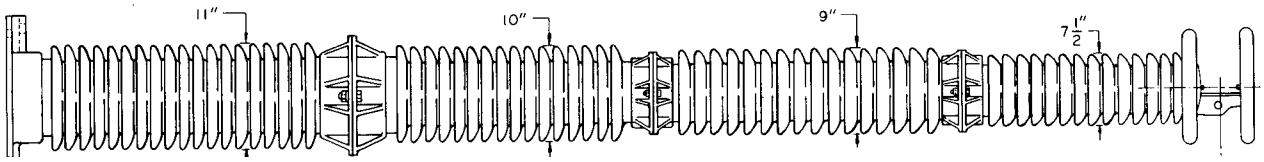
Clamps for use with these insulators on page 36



Bundled Conductor Head Detail for 95082 and 95685



98480 **95082**

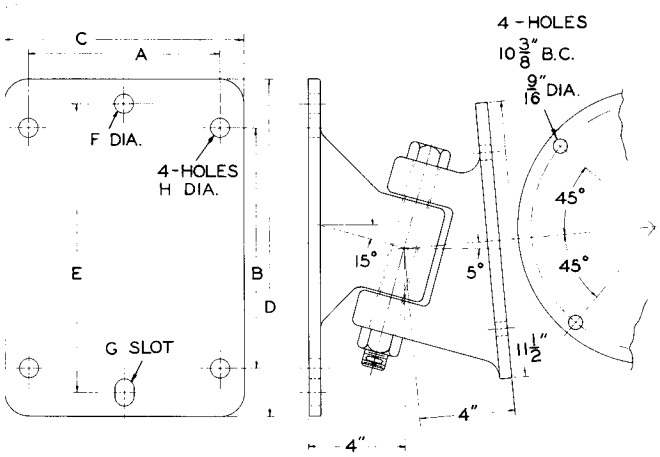


98337 **95685**

CATALOG NUMBER	98480	95082	98337	95685
DIMENSIONS				
"A" Dimension, Length, Inches	128	129	127-3/4	128-3/4
Leakage Distance, Inches	240	240	240	240
Dry Arcing Distance Inches	103	103	103	103
MECHANICAL VALUES (ULTIMATE)*				
Cantilever Strength, Pounds	1500	1500	1500	1500
_Tension Strength Pounds	5000	5000	5000	5000
ELECTRICAL VALUES				
Usual Line Voltage, kv	345	345	345	345
Low Frequency Dry Flashover, kv	965	965	945	945
Low Frequency Wet Flashover, kv	740	740	740	740
Impulse Flashover-Positive, kv	1610	1610	1610	1610
Impulse Flashover-Negative, kv	1850	1850	1850	1850
RADIO INFLUENCE VOLTAGE DATA				
Test Voltage-Rms to Ground, kv	230	230	230	230
Maximum RIV-Microvolts at 1000 ke	200	200	200	200
PACKING AND SHIPPING DATA				
Net Weight, Each, Pounds	556	561	556	561
Packed Weight, Each, Pounds	616	621	616	621
Standard Package	1/4	1/4	1/4	1/4

*Maximum Recommended Working Load = 40% of Rating.

Hardware for Horizontal Mounting Line Posts



Hinged Base Adaptert

The hinged mounting base provides an alternate method of overload protection for Horizontal Line Posts mounted on rigid structures and serves the same purpose as the Load Limner.

The hinged base adapter makes it possible to adapt a wide variety of Line Post insulators other than the standard hinged base units for rigid structure mounting. The hinge base adapter bolts to the base of the insulator. Mounted to the structure, the insulator pivots on the hinged base to reduce the load on the insulator caused by unbalanced longitudinal loads, broken conductor conditions or other unusual overloads.

The hinged base design is stable under normal loading and self restoring to original position after reacting to overload conditions. Bases are malleable iron, hot dip galvanized, in two sizes for 115/138 kv and 161/230 kv Line Post insulators.

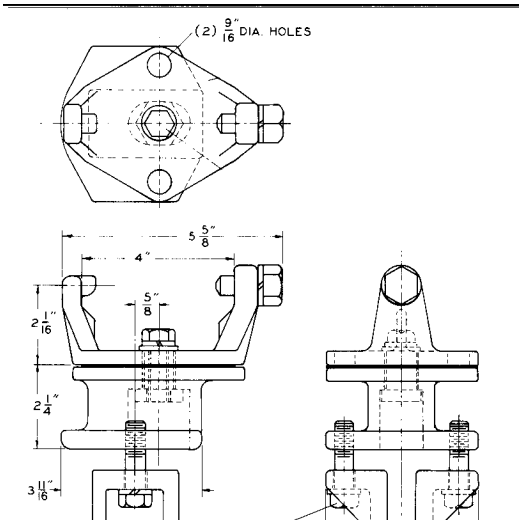
tPatent No. 3719770

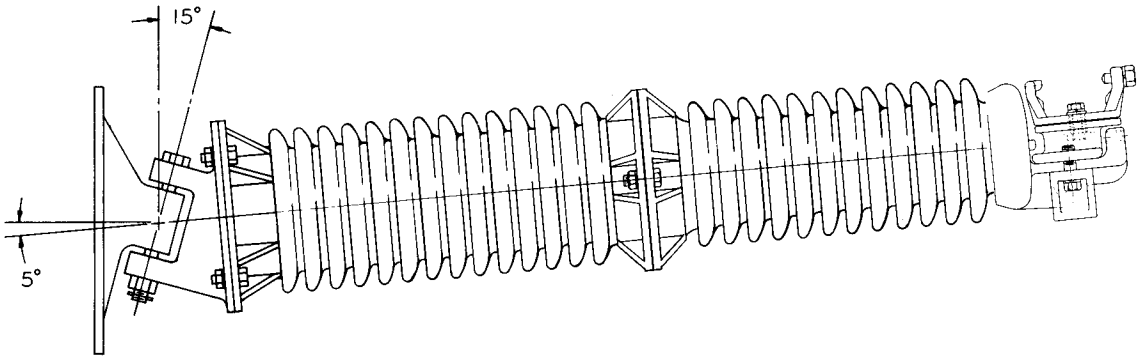
Catalog Number	Voltage Rating, KV	Dimensions, Inches							
		A	B	C	D	E	F	G	H
305066	115/138	8	10	10	14	12	13/16	13/16 x 1-1/8	13/16
305077	161/2R0	9	13	11	17	14	1-1 /lfi	1-1 /lfix l-1 /2	15/16

Swivel Clamp Adapter

The swivel clamp adapter mounts on the standard Line Post trunnion cap to support the clamp and permit the conductor/ clamp assembly to pivot on the insulator. The clamp rotates in relation to the insulator under overload to prevent conductor bending and crimping.

Swivel clamp adapters are recommended when designing for broken conductor conditions. Adapters are malleable iron, hot dip galvanized. They accept standard trunnion clamps and AGS clamps.





Drawing shows a Hinged Base Adapter and a Swivel Clamp Adapter added to a 138 kv Horizontal Line Post for rigid structure mounting.

Lapp Load Limiter® For Horizontal Line Posts

Overload Protection for Insulators on Rigid Structures

Armless construction with Lapp horizontally mounted Line Posts is now a standard practice with many utility companies for transmission and sub transmission construction at voltages through 230 kv. This trim, single pole construction provides an imaginative new approach to the old problems of line appearance, limited right of way, public acceptance, construction economies, maintenance, and operating performance.

Horizontal Line Post performance, however, is dependent upon the flexibility of the structure on which it is mounted, rather than the ultimate strength of the insulator alone. Field experience, as well as laboratory testing, has proved this conclusively.

On flexible supports (wood poles, for example), failure of the insulator is prevented under excessive loading because structural yielding redistributes the load in adjacent spans. Conversely, on rigid structures such as steel and prestressed concrete poles, the lack of structural flexibility tends to prevent conductor load redistribution, and excessive loading caused by a broken conductor, uneven ice loading, severe galloping, etc., can initiate insulator failures.

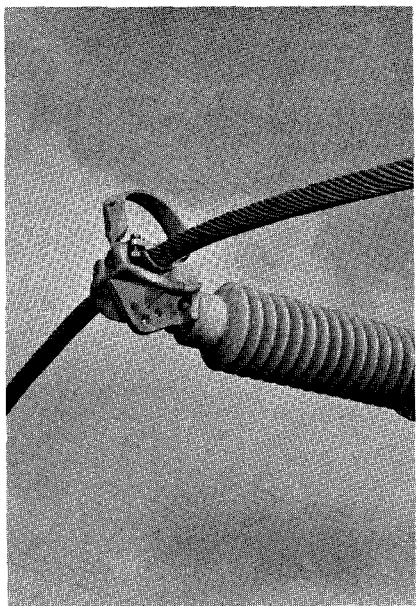
Although Horizontal Line Post failures are infrequent, regardless of the type of structure upon which they are mounted, when a failure does occur on a line employing rigid structures, it may trigger additional failures through the imposition of loads on the adjacent units well beyond their designed capability. When this occurs, cascading, or progressive failures, may result. There have been instances of cascading of insulators in service on rigid structure pole lines.

The Lapp Load Limiter is a device which has been developed for use with Horizontal Line Posts mounted on rigid structures to prevent cascading should a unit be accidentally overstressed and fail. It is designed to release and retain the conductor on the outboard end of the insulator and is available on all Horizontal Line Post ratings 115kv - 230 kv for mounting on steel, prestressed concrete, or other rigid structures where stresses beyond the capability of the insulator might be imposed by highly unbalanced longitudinal loads such as from a broken conductor.

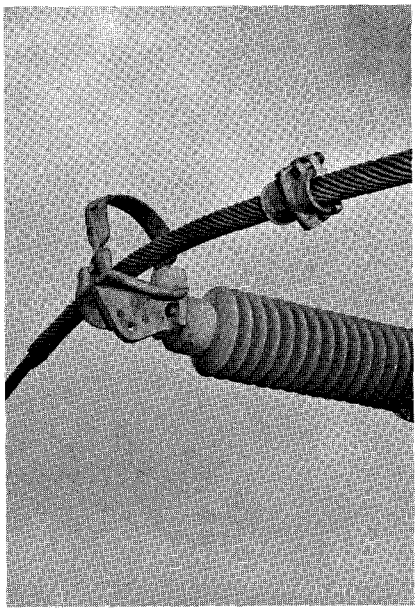
The transmission line Load Limiter consists of a belied aluminum body with a conductor clamp on trunnion shear bolts mounted on the end cap of the Horizontal Line Post. A hinged retainer loop effectively controls the conductor in the Load Limiter when the clamp is released. The conductor clamp (either Armor Grip Support or standard clamp) is held by two shear bolts, which are designed to release the clamp when stresses substantially below the ultimate cantilever strength of the Horizontal Post are imposed on the insulator by the conductor. Once released, the clamp is free to move longitudinally through the Load Limiter without imposing any substantial loading on the insulator, other than the vertical load. The retainer loop insures that the freed conductor will remain undamaged and stay within the confines of the Load Limiter until manually re-positioned and secured on new shear bolts.

The Lapp Load Limiter design has been fully tested under actual operating conditions, and has proved to be an effective, economical method for preventing progressive failure of insulators with Horizontal Line Post construction on rigid structures.

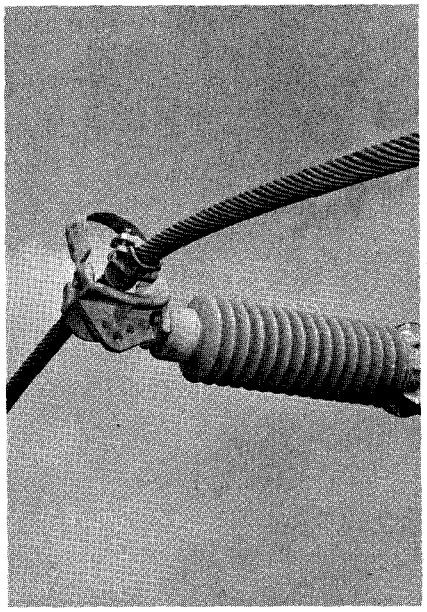
How the Load Limiter Works



Conductor and clamp are shown in normal position onLoadLimiter. Clamp ismounted on trunnion shear bolts designed to release at a pre-determined shear strength.



Longitudinal unbalance equal to the shear strength of the trunnion bolts has released the clamp. Clamp is pulled out of position and conductor rides on Load Limner body.



Clamp returns to near normal position after conductor movement subsides. New shear bolts are installed, and the conductor and clamp are ready to reseat on Load Limner.

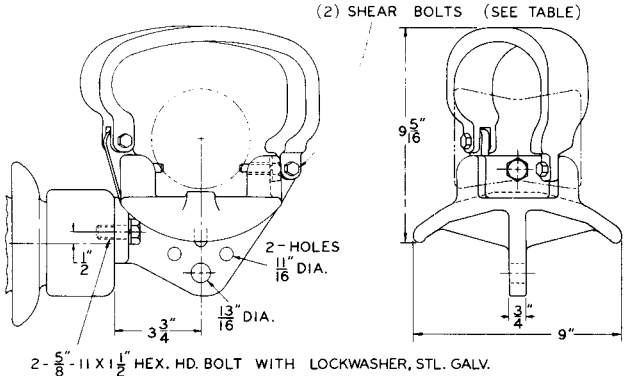
Lapp Load Limiter® For Horizontal Line Posts

Tangent Load Limiter Assemblies

Horizontal Line Posts for rigid structure mounting at 115 kv through 230 kv are cataloged as complete assemblies that include a tangent Load Limner (U.S. Pat. No. 3566011) which is compatible with the cantilever strength of the insulator.

The Load Limners and shear bolts can be ordered separately for stocking or replacement, but the shear strength of the Load Limner must correspond to the cantilever strength of the Line Post on which it is installed.

The Load Limner retainer ring and body are cast aluminum 356-T6. Each assembly consists of a hinged retainer ring on a belted body with trunnion shear bolts for supporting the conductor clamp. Order additional shear bolts by catalog number.



Load Limiter Catalog No.	Shear Strength Lba.	Insulator Cantilever Strength Lba.	Shear Bolt No.
301053-A	1200	2200	305879
301053-B	1500	2800	305880
301053-C	2250	4200	305881
301053-D	3000	5000	305882

Load Limiters For Adapting Clamp Top Line Posts For Rigid Structure Mounting

The Load Limiter consists of an aluminum belted body with trunnion mounted shear bolts, and a malleable iron clamping attachment to position the body of the Limiter in the line end insulator casting. A retainer loop effectively controls the conductor and clamp mounted in the Load Limiter. See illustration. The conductor clamp (either Armor Grip Support or standard clamp) is held by two shear bolts which are designed to release the clamp when stresses substantially below the ultimate cantilever strength of the Horizontal Post are imposed on it by the conductor. Once released, the clamp is free to move longitudinally through the Load Limner without the ability to impose any substantial loading on the insulator other than the weight of the conductor. The retainer loop insures that the freed conductor will remain within the confines of the Limiter until manually repositioned on new shear bolts.

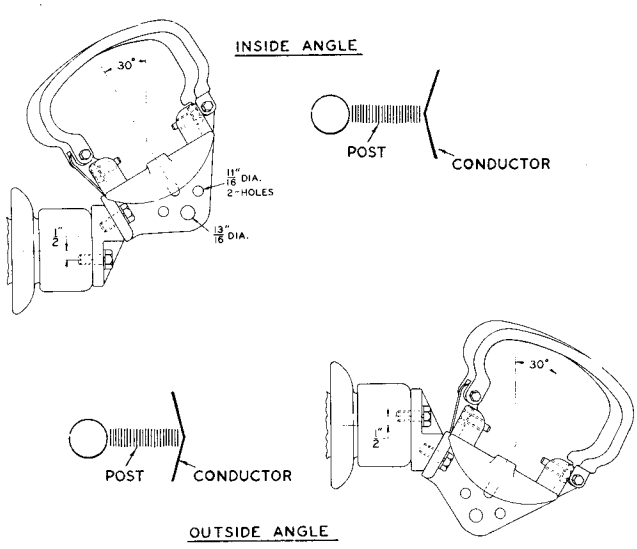
Angle Load Limiter Assemblies

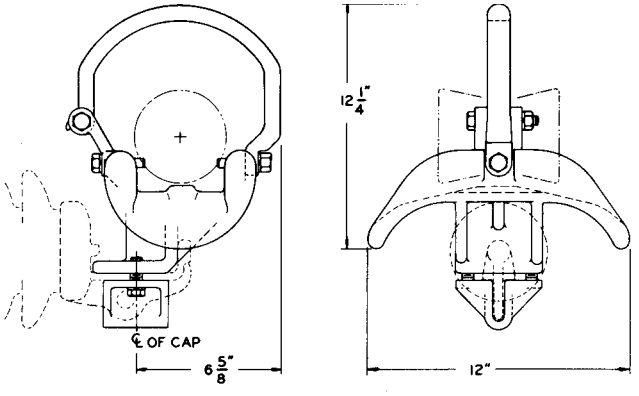
Angle construction with Load Limiters on Lapp Horizontal Line Posts is relatively simple. The standard tangent Load Limner assembly plus an inexpensive, wedge shaped angle adapter fitting is all that is required for either inside or outside angles.

The angle adapter (Catalog No. 301496) mounts on the insulator end cap and the Load Limner attaches to the adapter with two capscrews. The adapter is mounted down for positioning the Load Limiter for outside angles, and inverted for positioning the Load Limner for inside angles. The angle adapter body is 356-T6 cast aluminum, with two 5/8" tapped holes and 5/8"- 11 x 1-1/2" hex head capscrews for mounting the Load Limner.

Adapters are interchangeable and can be used on all sizes and ratings of Lapp Load Limner Horizontal Line Posts.

See accompanying drawings for installation procedure for angle construction.





Load Limner Catalog No.*	Shear Strength, Pounds	Line Poet Cantilever Strength, Lbs.	Shear Bolt Catalog No.
99048			1500
2800			305851
99048-A			2250
4200			305852
99048-B			3000
5000			305878

*Load Limiter has a malleable iron keeper.

Clamp Top Clamps

Clamps For Clamp Top Line Posts

Clamps for use with both upright and horizontally mounted Clamp Top Line Post insulators are available in a variety of sizes to accommodate conductor diameters ranging from .25" through 2.70".

One series of clamps with malleable iron bodies hot dip galvanized is used primarily with copper conductors and in areas of severe aeolian vibration.

A second series of clamps employing heat treated aluminum alloy bodies is used with ACSR, All Aluminum and All Aluminum Alloy conductors.

Conductor installation is simple and easy. Both capscrews are loosened and one is removed, the keeper is rotated out of position on the remaining capscrew, conductor is dropped into clamp seat, keeper is repositioned and the capscrews are replaced and tightened. The single loose part during installation makes these clamps ideal for new installations and hot line maintenance.

Clamps are mounted on a metal cap cemented to the top of the Line Post porcelain. A trunnion bearing on one side of the cap and a removable trunnion capscrew, acting as a bearing on the other side, support the clamp securely. Backing off this capscrew (removal is not required) disengages the clamp from the insulator.

Straight line clamps are designed to hold conductors without damage on tangents and line angles up to 15 degrees when the clamp is installed to bisect the line angle (7½ degrees on each side). The clamps will accommodate vertical angles up to a maximum of 40 degrees (20 degrees each side of clamp).

Recommended torque for tightening keeper capscrews on Clamp Top clamps is 25 foot pounds.

Angle Clamps for Clamp Top Line Posts

Angle clamps for turning larger angles than are possible with standard Clamp Top clamps are available for use with all Lapp Clamp Top Line Posts. Five clamp sizes are listed in either malleable iron, hot dip galvanized, or aluminum alloy for conductor sizes .25" to 2".

The clamps are interchangeable with standard Clamp Top clamps and are designed for use on upright or horizontally mounted Clamp Top Line Posts at angles to 30°. Angle clamps are designed to accommodate line angles up to 30 degrees when clamp is installed to bisect line angle (15 degrees each side). Vertical angles up to 40 degrees may also be accommodated (20 degrees each side of clamp).

When used on upright mounted Line Posts the strength of the crossarm, the method of mounting, the conductor tension and the cantilever strength of the Post – as well as the capability of the clamp – will determine the maximum angle of turn. For horizontally mounted Line Post applications the conductor tension and the tension rating of the Post will determine maximum angle of turn. For either cantilever or tension loads maximum loading should not exceed 40% of insulator ultimate strength rating.

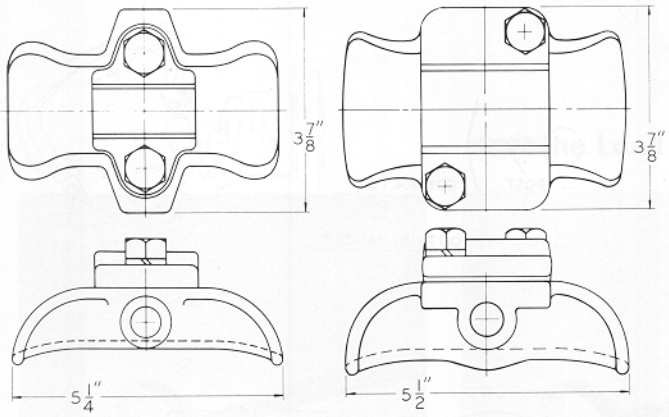
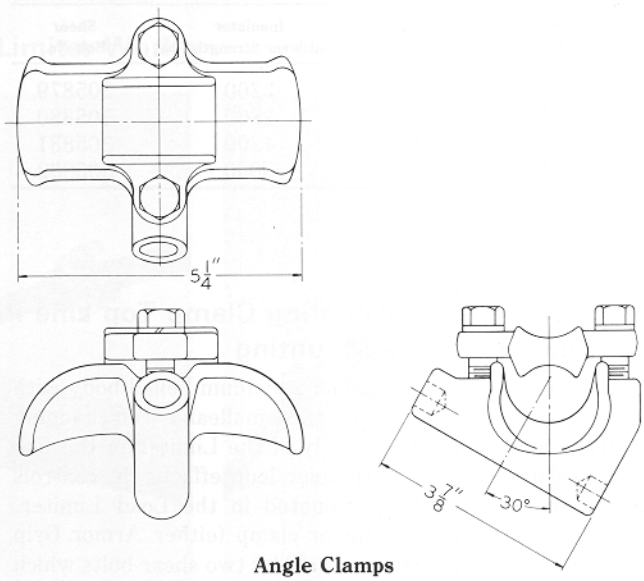


Fig. 1 Fig. 2

Clamps

CATALOG NUMBER			CONDUCTOR SIZE INCHES		PACKED WEIGHT LBS., EACH	
Ferrous	Aluminum	Fig. No.	Max.	Min.	Ferrous	Aluminum
47101	47111	1	.56	.25	2.0	1.0
47102	47112	1	.84	.35	2.25	1.2
47103	47113	1	1.06	.50	2.5	1.3
47104	47114	1	1.50	1.00	2.75	1.5
	47115	2	2.00	1.50	3.0	2.0
	98212*	2	2.70	2.00		4.3

*Clamp has 4 capscrews on keeper.



Angle Clamps

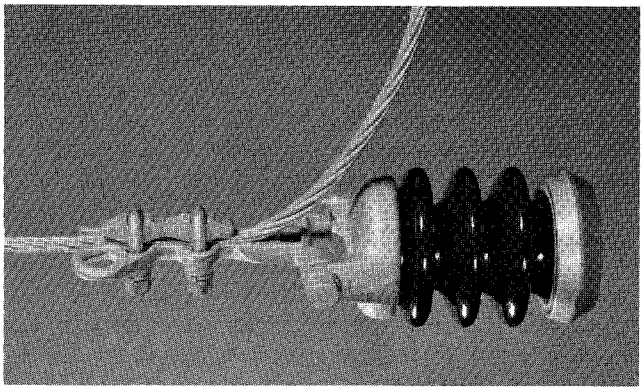
CATALOG NUMBER		CONDUCTOR SIZE INCHES		PACKED WEIGHT LBS., EACH	
Ferrous	Aluminum	Max.	Min.	Ferrous	Aluminum
	80481	.56	.25	2.75	1.25
80472	80482	.84	.35	3	1.5
80473	80483	1.06	.50	3.25	1.75
80474	80484	1.65	1.00	3.5	2
	80485	2.00	1.50	4	2.25

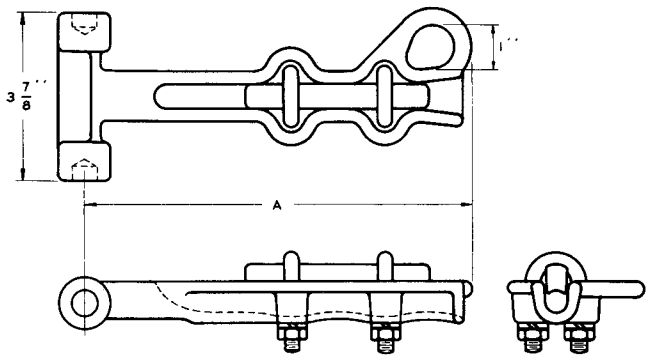
Slack Span Dead End Clamps

For Conductor Sizes .16" to 1.56"

Slack span construction provides a convenient and efficient way to take the full line load off substations and similar structures and simplifies construction of corners and angles where guying is a problem.

Utilizing standard Clamp Top Line Posts mounted horizontally and this series of special dead end clamps, it is possible to eliminate certain problems that have been inherent in slack span construction. The load on a slack span is very light; usually there is insufficient tension on a suspension type slack span dead end to hold the insulator string taut, and sloppy looking construction results. In addition, the very light tension permits the accumulation of insulating oxide and sulphide films between the metal parts of adjacent insulators. The arcing resulting is a prolific source of radio and television interference. The use of Lapp slack span clamps together with horizontally mounted Clamp Top Post insulators provides all of the benefits of slack span construction and eliminates the interference source.





Slack Span Clamp

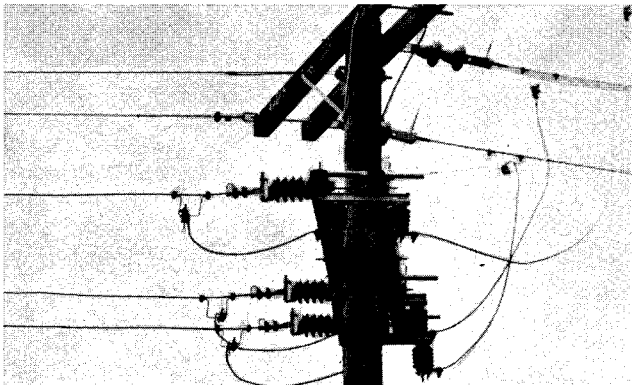
Clamp Position Controlled

By turning the insulator on its single center bolt attachment, the position of the clamp can be controlled so that the conductor leads directly into the clamp body at the point of attachment, the jumper being trained away to make an attractive, controlled assembly.

Mechanically, the Clamp Top Line Post insulators used with these clamps are rated at 5000 lbs. tension, more than ample for these light duty slack span applications. Insulators for slack span dead ends to 88 kv are shown on page 14, with insulators and clamps for higher voltage slack span applications available.

The horizontal mounting of Line Posts for slack span work provides excellent wet flashover characteristics since each petticoat drains free and clear of all the others under rain or fog conditions. If desired, insulators can be provided with a special trunnion cap screw for clamp mounting, which immobilizes the clamp completely. Normal clamp attachment allows for limited clamp movement.

Clamps for conductor sizes .16" to 1.56" are available in aluminum alloy. A stringing eye is provided on the clamp to facilitate installation.

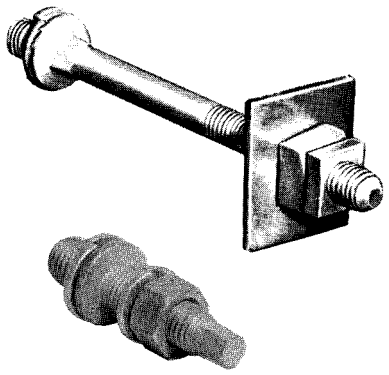


Installation of Lapp slack span deadend clamps on pole end of conductor leading into distribution substation.

CATALOG NUMBER Ammi num	CONDUCTOR SIZE, INCHES Max.	Min.	DIMENSION INCHES A	PACKED WEIGHT LBS., EACH Aluminum
*52939**	*.38*	*.16*	*53/a*	*1*
52840	*.62*	*.30*	*83/e*	*2*
52841	*.90*	*.45*	*83/a*	*2.5*
52842	*1.25*	*.62*	*95/a*	*3*
52843	*1.56*	*.80*	*13'/s*	*3.5*

*Single U-Bolt Clamps

Lapp Mounting Studs for Line Posts and Distribution Posts



Lapp Line Post studs are designed for use with all Line Posts and Distribution Posts with standard stud mounted bases for mounting the insulator to steel or wood crossarms and pole top or side mounted brackets. With a gain base for horizontal mounting, these studs are used to mount the insulator directly to the supporting structure.

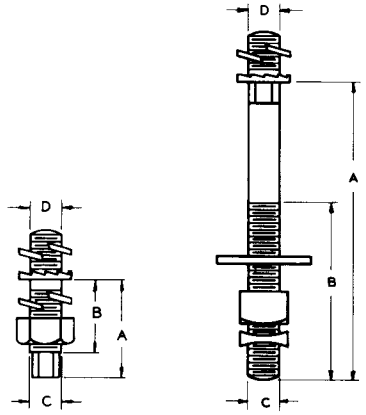
Line Posts studs are supplied as part of the catalog numbered assembly on Tie Top Line Posts and Distribution Posts equipped with base for single stud mounting. For Clamp Top insulators with base for single stud mounting, studs must be ordered by catalog number.

Commonly used studs with the stud size required for each insulator rating are listed in the table. Studs are supplied complete with lockwashers and hex nut for steel arm or bracket mounting. For assembly to the insulator base, a positive lockwasher cooperating with serrated surfaces on the base and stud permits easy removal but locks stud against loosening from line vibration. All stud parts are steel, hot dip galvanized.

Special length mounting studs are available in all shank "C" dimension diameters. Specify "A" dimension when ordering.

Catalog Number	For Attach. To	Dimensions, Inches A	B	C	D	Pkd. Wgt. Insulator Each, Pounds	Rating kv
301613	Steel	2416	11*6	sle	3/a	.62	15, 20, 25
•11612A	Wood	71/2	31/~z	s/s	3/s	1.00	15, 20, 25
*•74739	Steel	21h6	11'716	S/a	3/4	.62	15, 20, 25
301614	Steel	2*6	11*6	a/e	3/a	.75	35, 45, 55, 66
•10187A	Wood	7V2	4	a/4	a/4	1.43	35, 45, 55, 66
301616	Steel	37h6	3'/16	%s	%	1.00	88
10362A	Wood	8	4	3/8	%8	2.50	88

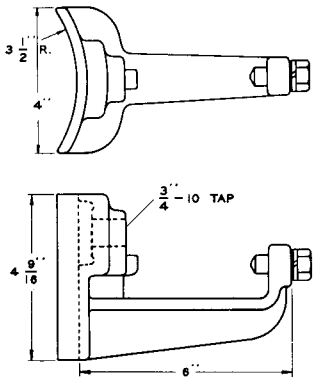
*Supplied with flat washer, lockerwasher and hex nut for bracket mounting. -REA Approved



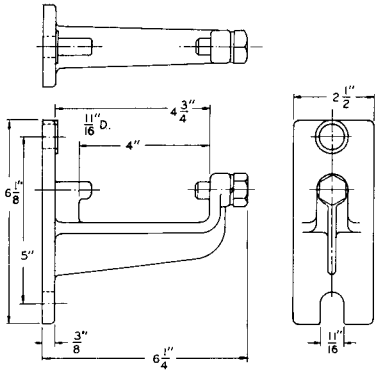
301613 For Steel Cross Arm

•11612-A For Wood Cross Arm

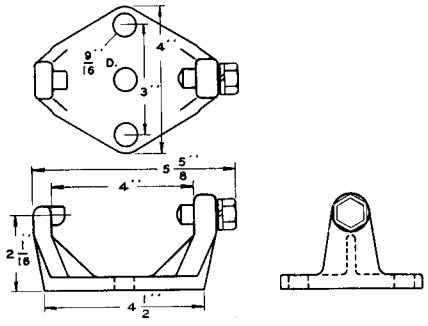
Ground Wire Brackets for Clamp Top Clamps



58533



91526



57111

These brackets were developed for use with the Clamp Top clamps listed on page 36 to provide a practical, inexpensive ground wire support on wood or steel structures. Bracket No. 58533 is designed with a curved mounting surface to fit the side of a wood pole, mounting in a horizontal position on the pole by means of a single Line Post type stud. Bracket No. 91526 is for horizontal mounting on the side of a steel structure and No. 57111 is for upright mounting on the top of a steel structure. Use regular steel bolts for attaching No. 91526 and No. 57111.

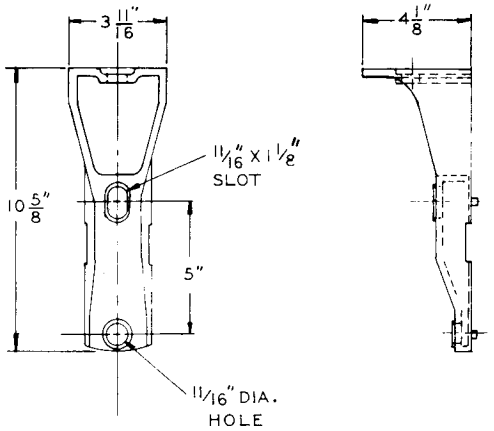
Any of the Clamp Top Clamps listed on page 36 can be used with these brackets. The clamps are easily and quickly assembled to the brackets on two trunnion bearings. A stationary trunnion bearing on the inside of the bracket and a removable trunnion cap screw on the outside of the bracket support the clamp. Brackets are malleable iron, hot dip galvanized. Packed weight is 450 lbs. per hundred.

Lapp Line Post Hardware

Light to Medium Duty Pole Top Brackets

Pole top mounting brackets for use with Lapp upright mounted Distribution Posts and Line Posts to 66 kv are listed below. Bracket mounts on the pole with standard throughbolts (not furnished) in a choice of bolt spacings. Brackets develop adequate strength for use with the maximum insulator strength ratings recommended for each size bracket. For larger insulators or heavy duty applications, use bracket No. 58153B listed on the bottom of the page.

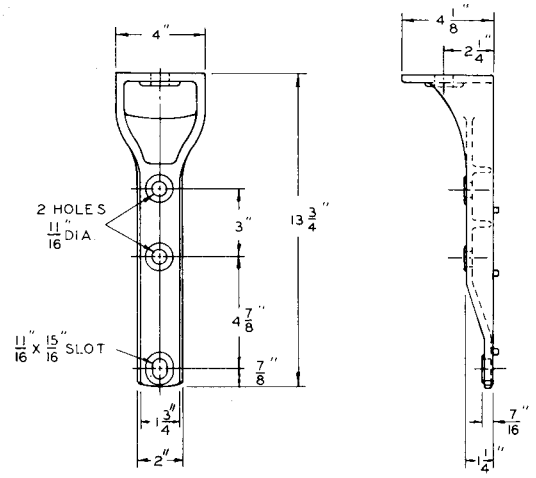
Material is malleable iron, hot dip galvanized and meets ASTM specifications A47 and A239. Grounding hole available; specify by adding suffix "G" to catalog number.



304042

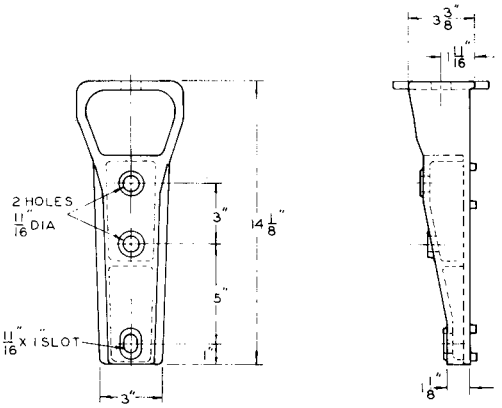
Maximum recommended voltage - 27 kv.
Maximum insulator working load - 10,000 in. lbs.

-REA Approved



304043A

Maximum recommended voltage - 35 kv.
Maximum insulator working load - 12,000 in. lbs.

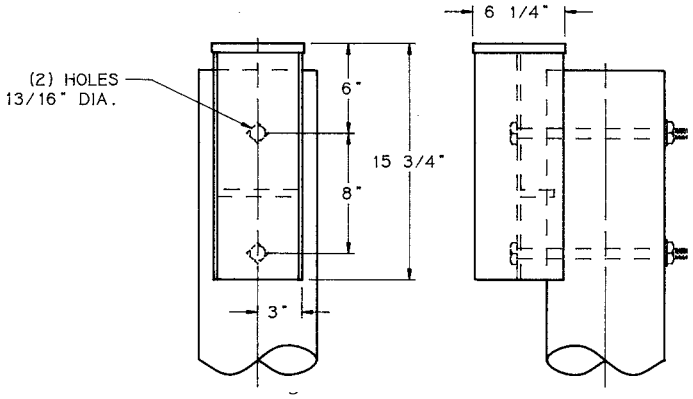


•304044

Maximum recommended voltage - 66 kv. Maximum insulator working load - 48,000 in. lbs.

Heavy Duty Pole Top Brackets

Bracket No. 58153B is a rugged, heavy duty design for use on Lapp high voltage Line Posts. It is used to support the upright mounted Line Post on the top phase of a combination 115 kv pole top and horizontal construction, a configuration useful in areas with a low incidence of lightning outages. Four 11/16" holes on a 5" bolt circle attach to the special base on the upright unit, with the other two phases on Horizontal Line Posts.



Lapp Line Post Hardware

Crossarm Saddles and Washers

Crossarm saddles are not generally required with Line Post construction. For heavy duty or for extra factors of safety, they are used at the bottom of the arms to prevent splitting. Saddles are pressed steel, hot dip galvanized.

The galvanized, malleable iron or aluminum roofing washers are for mounting Line Posts on roofed arms. For new construction, flat crossarms are preferred.

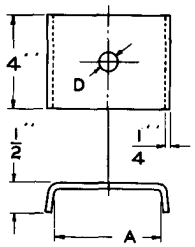


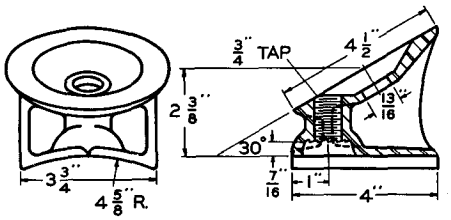
Fig. 1
Crossarm Saddle

Catalog Number	Figure No.	Dimensions, Inches A	B	D	Pkd. Wt. Each, Lbs.
•**10369**	1	3 ¾	-	13/16	1.50

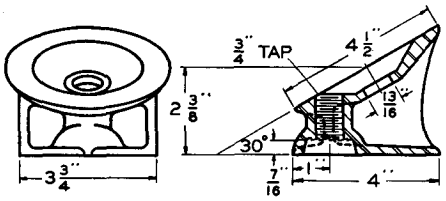
***REA Approved**

Angle Mounting Fittings

While not generally required, angle mounting adapters offer one Line Post where two would normally be used for turning a convenient method of reducing stress on the crossarm and corners or other angle construction. Fittings are malleable iron, on the insulator. These



12649



20175

fittings sometimes permit the use of hot dip galvanized. Packed weight 4.2 lbs. each.

For Roofed Crossarms

Angle mounting fitting No. 12649 is designed with a curved mounting surface for use on roofed crossarms. Fitting is attached to the crossarm with a No. 10187-A stud. Order studs separately.

For Flat Crossarms

Angle mounting fitting No. 20175 is designed for flat mounting on a wood or steel crossarm. For mounting on wood crossarms, use stud No. 10187-A; for steel crossarms, use stud No. 301614. Order studs separately.