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May 1, 2013

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-VIA HAND DELIVERY -

Ms. Ann Cole
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

130132-E1

Re: Approval of Florida Power & Light Company's 2013-2015 Storm Hardening Plan, filed in compliance with Rule 25-6.0342, F.A.C.

Dear Ms. Cole:

I am enclosing for filing in the above docket the original and seven (7) copies of Florida Power & Light Company's Petition for Approval of its 2013-2015 Storm Hardening Plan, together with a diskette containing the electronic version of same. The enclosed CD is HD density, the operating system is Windows 7, and the word processing software in which the document appears is Word 2010.

If there are any questions regarding this transmittal, please contact me at 561-304-5633.

Sincerely,

Scott A. Goorland

- COM _____
- AFD _____
- APA _____
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- ENG 6+CD
- GCL 1
- IDM _____
- TEL _____
- CLK _____

Enclosures

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: approval of Florida Power & Light Company's 2013-2015 Storm Hardening Plan pursuant to Rule 25-6.0342, F.A.C.) Docket No. 130132-E1
) Filed: May 1, 2013
)

**PETITION OF FLORIDA POWER & LIGHT COMPANY
FOR APPROVAL OF STORM HARDENING PLAN**

Florida Power & Light Company (“FPL”) hereby petitions the Commission for approval of its 2013-2015 Electric Infrastructure Storm Hardening Plan attached hereto as Exhibit 1 (the “FPL Plan”), which is submitted in compliance with Rule 25-6.0342, F.A.C. In support of this Petition, FPL states as follows:

1. FPL is a corporation with headquarters at 700 Universe Boulevard, Juno Beach, Florida 33408. FPL is an investor-owned utility operating under the jurisdiction of this Commission pursuant to the provisions of Chapter 366, Florida Statutes. FPL is a wholly-owned subsidiary of NextEra Energy, Inc., a registered holding company under the federal Public Utility Holding Company Act and related regulations. FPL provides generation, transmission, and distribution service to more than 4.5 million retail customers.

2. Any pleading, motion, notice, order or other document required to be served upon FPL or filed by any party to this proceeding should be served upon the following individuals:

Kenneth Hoffman
Vice President Regulatory Affairs
Ken.Hoffman@fpl.com
Florida Power & Light Company
215 S. Monroe Street, Ste 810
Tallahassee, FL 32301
850-521-3919
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3. This Petition is being filed consistent with Rule 28-106.201, Florida Administrative Code. The agency affected is the Florida Public Service Commission, located at 2540 Shumard Oak Blvd, Tallahassee, FL 32399. This case does not involve reversal or modification of an agency decision or an agency's proposed action. Therefore, subparagraph (c) and portions of subparagraphs (e), (f) and (g) of subsection (2) of such rule are not applicable to this Petition. In compliance with subparagraph (d), FPL states that it is not known which, if any, of the issues of material fact set forth in the body of this Petition, or the FPL Plan, may be disputed by others planning to participate in this proceeding.

4. Subsection (2) of Rule 25-6.0342 requires each Florida investor-owned electric utility such as FPL to file an updated detailed storm hardening plan every 3 years.

5. Subsections (3), (4) and (5) of Rule 25-6.0342 set forth the required elements of storm hardening plans. The FPL Plan contains all of the required elements. With respect to the deployment strategy contemplated by subsection (4), the FPL Plan contains a detailed description of FPL's deployment plans for 2013, which is the only year for which FPL's planning and budgeting process has progressed to the point that such details are available. The Plan also includes a discussion of FPL's current expectations for deployment in 2014 and 2015.

6. As contemplated by subsection (6) of Rule 25-6.0342, FPL has sought input from joint users and third-party attachers. On April 15, 2013, FPL sent a detailed information package on its storm hardening plans to representatives of all known attachers, including all individuals whose contact information had been provided to FPL pursuant to subsection (6) (See attacher distribution list). The cover letter for the information package invited comments by April 29, 2013. Additionally, in order to implement subsection (4)(e) of Rule 25-6.0342, the cover letter also solicited input from attachers on what the costs and benefits of FPL's storm hardening plans

will be for them. As of April 29, 2013, 11 attaching entities have contacted FPL regarding the FPL Plan. No attaching entity provided any cost or benefit information, expressed any concern with or suggested any changes to FPL's Plan.

7. In 2010, 2011 and 2012, there were 19 tropical cyclones that attained tropical storm or hurricane strength in the Atlantic. This annual level of storm activity is equal to the third highest annual number of named storms since 1851, when credible records began. While FPL's customers were fortunate that FPL's service territory was not heavily impacted by the named storms in the 2010-2012 seasons, one cannot reasonably rely upon continuing good fortune to shield customers from major storm impacts in the future. The high level of storm activity in recent years is a powerful reminder of the importance of moving FPL's storm hardening efforts toward completion. Moreover, the flooding in the Northeast associated with Hurricane Sandy in 2012 was unprecedented in recent decades, and experts are predicting that similar flooding is going to become more likely due to vulnerable coastal development and recent sea-level rise. This experience has focused additional attention on the importance of protecting FPL's coastal-area electric system against the consequences of large storm surges and flooding. The impact of Hurricane Sandy in the Northeast also underscores the increasing expectations and importance of a more storm-resilient electric system.

8. FPL's Plan will continue to increase the storm resilience of FPL's transmission and distribution system. At the same time, the Plan is carefully structured to achieve this increased storm resilience in a cost-effective manner. Implementation of the FPL Plan is expected to benefit FPL customers during and after future storm events by reducing the extent of power outages, especially for critical functions such as hospitals and governmental services as well as businesses such as grocery stores, gas stations and pharmacies that meet essential

community needs. Moreover, to the extent that FPL's hardened electric service facilities are better able to survive storm events undamaged, customers will also benefit due to a reduction in storm restoration costs.

9. In order to deliver storm resilience benefits cost-effectively, FPL's Plan provides for a continuation of FPL's previously approved three-prong approach to storm hardening FPL's distribution system, on an accelerated basis in order to complete key elements in the near future:

a. In the first prong, FPL intends to continue to apply the National Electrical Safety Code ("NESC") extreme wind loading ("EWL") design criteria to the electric facilities that serve critical infrastructure such as hospitals, 911 centers, special needs shelters, water treatment plants and fire stations (these critical services, and the electric facilities that serve them, are referred to as "CIFs") as well as specific poles that are important to overall restoration and relief efforts (these poles are referred to as "Targeted Critical Poles"). FPL believes that the expense of EWL design is warranted for these categories of electric facilities because the resulting storm resilience will be especially beneficial to FPL's customers. FPL notes that the application of EWL design criteria to electric facilities serving all acute care facilities, hospitals, 911 centers, emergency operation centers and special need shelters in FPL's service territory has been completed.

b. In the next prong, which is referred to as "Incremental Hardening," FPL increases the overall wind profile of certain main distribution lines (called "feeders") to a higher wind rating, up to and including EWL. Incremental hardening applies appropriate combinations of cost-effective engineering options (e.g., storm guying, relocation, adding intermediate poles, upgrading the pole) to eliminate weak links and take advantage of the existing storm resilience of

a circuit. The focus of Incremental Hardening is on feeders serving businesses that meet essential community needs, such as grocery stores, gas stations and pharmacies.

c. The third and final prong in FPL's storm hardening approach is the continued application of previously approved design guidelines for poles that are set or replaced in conjunction with new construction, major planned work, relocation projects and daily work. FPL's Plan continues to include standardized pole size/type specifications to be used in those circumstances. The specifications reflect the utilization of stronger poles and shorter span lengths for the facilities that are subject to the new design guidelines. This results in stronger designs that are consistent with EWL and are intended to facilitate the evolution of FPL's overall distribution system to EWL criteria over time.

10. In addition, in response to lessons learned from the storm surge and flooding damage experienced in the Northeast from Hurricane Sandy in 2012, and experts' predictions that similar flooding events are more likely to occur, FPL will implement a new distribution storm surge/flood initiative in 2014 and 2015. This initiative, which will better protect 15 above-grade vaults contained within its Miami downtown electric network distribution system that are more susceptible to these conditions, involves retrofitting these existing vaults with submersible equipment.

11. In 2013, FPL plans to spend approximately \$90-\$120 million deploying its hardening plans for the distribution system. This includes plans to harden 91 feeders, including 80 feeders which provide service to CIF customers and 11 feeders serving essential community needs. Additionally, FPL will harden critical poles at 3 highway crossings and 12 "01" switches. The Design Guidelines will be utilized system-wide for all new construction and daily work. In

total, FPL's 2013 infrastructure hardening deployment plan for its distribution system will impact approximately 445 miles of overhead electric circuits.

12. In 2014 and 2015, FPL expects to continue its strategy for hardening its distribution infrastructure, including targeting 80-140 circuits annually in 2014 and 2015. The associated projected annual costs for 2014 and 2015 are estimated to range from \$90-\$140 million. These estimates are based upon current work methods, products, and equipment and assume the necessary resources will be available to execute the plan. Also, in 2014 and 2015, FPL's projected annual costs plans to implement the new storm surge/flood initiative in its Miami downtown electric network are approximately \$1-\$3 million. Of course, FPL's 2014 and 2015 deployment plans may change based on FPL's experience with deployment in 2013 and other factors.

13. FPL's transmission system is already built to EWL standards and generally fared well in the 2004 and 2005 storm seasons. Nonetheless, based on experience with the performance of the system, including specific lessons learned from those extreme storm seasons, FPL is continuing two initiatives system-wide to further improve the storm resilience of its transmission and substation system: replacement of all wood transmission structures (expanded from the originally approved initiative to replace single pole un-guyed wood transmission structures); and replacement of ceramic post insulators on all concrete transmission poles with polymer post insulators to meet more current and stringent design standards.

14. Under FPL's proposed transmission hardening levels for 2013-2015, FPL forecasts advancing the completion of wood pole replacements to within 15-20 years, and completion of the insulator replacements by 2014. FPL will prioritize the work based on factors including proximity to high wind areas, system importance, customer density, and coordination

with the distribution CIF storm initiative. Other economic efficiencies, such as performing work on multiple transmission line sections within the same corridor, will also be considered. FPL expects to replace approximately 1,100-1,600 wood transmission structures each year in 2013-2015, and approximately 600-640 ceramic insulators on concrete transmission poles each year in 2013-2014.

15. Also, in response to lessons learned in 2012 from Hurricane Sandy in the Northeast, FPL plans to initiate several transmission storm surge/flood initiatives in 2013-2015 that will better protect certain transmission facilities and expedite restoration of service to customers. This includes water intrusion mitigation and the installation of real-time water level monitoring systems and communication equipment inside the 25 substations in FPL's system that are located below the FEMA 100-year flood elevations. The purchase of additional mobile fleet equipment will better enable the restoration of substation relay equipment and pump houses associated with underground transmission cables.

16. For the transmission system, FPL expects to continue implementing the wood transmission structure and ceramic post insulator replacement initiatives described above and the implement the storm surge/flood initiative at approximately \$52-\$80 million for each of the three years from 2013-2015.

17. As contemplated by subsection (5) of Rule 25-6.0342, the FPL Plan also continues to provide the FPL standards and procedures applicable to joint users and third-party attachers. These standards and procedures are intended to ensure that attachments do not interfere with or degrade the storm resilience achieved by FPL's storm hardening initiatives.

18. With the exception of the newly proposed storm surge/flood initiatives, all of FPL's initiatives have been previously approved by the Commission as part of FPL's 2007

hardening plan filing, in Order No. PSC-07-1023-FOF-EI, Docket No. 070301-EI, dated December 28, 2007, and as part of FPL's 2010 hardening plan filing, in Order No. PSC-11-0082-PAA-EI, Docket No. 100266-EI, dated January 31, 2011.

19. FPL expects a reduction in storm restoration costs as well as non-storm (day to day) restoration costs ("Restoration Cost Savings") as a result of its planned hardening activities, especially when one considers the interaction among all of FPL's Storm Secure initiatives, including the FPL Plan, pole inspections, and increased vegetation management activities. FPL has conducted an analysis to determine the average Restoration Cost Savings per mile of feeder for all planned hardening activities, and the estimated cost of those activities. The Restoration Cost Savings are expressed as a range at this time, because of the substantial uncertainties inherent in estimating them based on current information. While there are numerous areas of uncertainty, two are particularly important. First, neither FPL nor the utility industry generally has much experience with hardened distribution facilities. Therefore, there is little directly measured data on the improved resilience, and hence reduced Restoration Cost Savings, resulting from hardening such facilities. The second important uncertainty is how frequently FPL's service territory will be impacted by strong hurricanes. Based on a historical average, this will occur once every five years. However, as was experienced with the 2004-2005 hurricane seasons, strong hurricanes can sometimes occur more frequently. Moreover, while we have avoided direct strikes in recent years, the storm seasons have been exceptionally active overall. The estimate of cumulative Restoration Cost Savings over time will be directly affected by how frequently storms hit FPL's service territory. Taking these uncertainties into account, FPL has estimated that, over an analytical study period of 30 years, the net present value of Restoration Cost Savings per mile of hardened feeder would be approximately 45% to 70% of the cost to

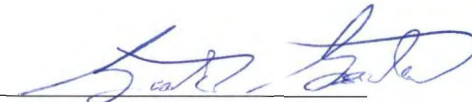
harden that mile of feeder for future major storm frequencies in the range of once every three to five years. Of course, if FPL were to face major storms more frequently than that, as it did in the 2004-2005 hurricane seasons, then the net present value of Restoration Cost Savings likely would exceed the hardening costs. In addition to Restoration Cost Savings, it is also important to note that customers will benefit substantially, in many direct and indirect ways, from the reduced number and duration of storm and non-storm outages resulting from the planned hardening activities.

20. In summary, the FPL Plan is a cost-effective approach to increasing storm resilience in ways that will most benefit FPL's customers. Its deployment is structured to focus initially on providing the most critical and essential benefits to the greatest number of customers, with broader based implementation thereafter. This is the most efficient approach to achieving useful storm resilience as promptly as possible at a reasonable cost. The FPL Plan complies with all of the requirements of Rule 25-6.0342 and should be approved by the Commission expeditiously as a prudent commitment of resources to meeting the Commission's storm hardening goals.

WHEREFORE, FPL respectfully requests the Commission to approve FPL's Storm Hardening Plan attached hereto as Exhibit 1.

Respectfully submitted,

Bryan S. Anderson
FL Authorized House Counsel No. 219511
(Admitted in IL, not admitted in FL)
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By: 

Scott A. Goorland
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EXHIBIT 1

Florida Power & Light Company

**Electric Infrastructure Storm
Hardening Plan
(Rule 25-6.0342, F.A.C.)**

May 1, 2013

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Florida Power & Light Company **Electric Infrastructure Storm Hardening Plan**

EXECUTIVE SUMMARY

Florida Power & Light Company's (FPL) efforts and cost-effective investments have provided its customers with reliability that is the best among Florida investor-owned electric utilities and with electric rates that are the lowest of all electric utilities in Florida. Today, the systems and devices that power our economy – the internet, personal computers, mobile devices, cloud computing, electronic payment systems - have become significantly more critical in conducting day-to-day business and personal interactions. For these reasons, reliable electric service is the lifeblood of our state's economy. Therefore, the ability to mitigate the impacts of future storms and restore power quicker after a severe weather event has become even more important, as evidenced most recently with the impacts associated with Hurricane Sandy in the Northeast.

Based on the company's own experience as well as the best-practices of other electricity providers, FPL has been strengthening its infrastructure since 2006. FPL has put particular emphasis on infrastructure that serves hundreds of critical facilities and other essential community needs, such as hospitals, police and fire stations and grocery stores.

Following the 2004 and 2005 extraordinary storms seasons, two key conclusions were drawn by FPL from its forensic data analysis. These conclusions continue to play the central role for FPL's 2013-2015 Storm Hardening Plan (the "Plan") and are as follows:

1. Hurricane Wilma forensic analysis confirmed that "wind only" was the predominant root cause of distribution pole breakage; and
2. FPL's transmission poles, which are already built to the National Electrical Safety Code (NESC) extreme wind loading criteria (EWL), performed well overall.

In short, during severe weather events, hardened infrastructure performs better in preventing some storm-related outages, speeding restoration times and delivering better overall everyday reliability.

FPL's 2013-2015 Plan continues and accelerates the strengthening of its electric system by building upon FPL's experience while also incorporating lessons-learned from other utilities' experiences during more recent weather events.

In 2010, 2011 and 2012, there were 19 tropical cyclones that attained tropical storm or hurricane strength in the Atlantic. This annual level of storm activity is equal to the third highest annual number of named storms since 1851,

when credible records began. While we were fortunate that FPL's service territory was not heavily impacted by the named storms in the 2010-2012 seasons, we cannot reasonably rely upon continuing good fortune to shield us from major storm impacts in the future. The high level of storm activity in recent years is a powerful reminder of the importance of moving our storm hardening efforts toward completion. Moreover, the flooding in the Northeast associated with Hurricane Sandy in 2012 was unprecedented. This experience has focused additional attention on the importance of protecting our coastal-area electric system against the consequences of large storm surges and flooding. The impact of Hurricane Sandy in the Northeast also underscores the increasing expectations and importance of a more storm-resilient electric system.

Although no electrical system can be made fully resistant to storm and hurricane impacts, FPL believes that its proposed hardening plan will mitigate the impact of future storms. FPL's 2013-2015 Plan includes a continuation of its previously approved three-prong approach for its distribution system, but on an accelerated basis which is intended to complete key Plan elements in the near future. The three prongs, each of which serves a different purpose under the plan, are EWL, Incremental Hardening, and Design Guidelines. This approach will allow FPL to complete certain key initiatives and to obtain hardening benefits across its entire service territory more promptly for customers. Specifically, FPL will continue to:

- Apply EWL to existing and new feeders (main distribution lines) as well as any associated laterals directly serving Critical Infrastructure Facilities (CIF) (i.e., critical customers such as hospitals and 911 centers, and certain poles critical to operations and efficient restoration). Feeders are the backbone and therefore a critical component of FPL's overhead distribution system. Feeder performance can have a substantial impact on the overall service reliability for FPL's customers.
- Apply Incremental Hardening to certain existing feeders so that, with targeted cost-effective modifications, the entire feeder's wind profile can be increased, up to and including EWL. Incremental Hardening focuses on "Community Projects", feeders serving essential community needs such as grocery stores, gas stations and pharmacies.
- Utilize system-wide FPL Design Guidelines containing criteria which will apply EWL to the design and construction of all new overhead facilities, major planned work, relocation projects, as well as daily work activities. These guidelines primarily are associated with changes in pole class, pole type and desired span lengths.

Additionally, in response to the recent flooding experienced in the Northeast associated with Hurricane Sandy, FPL is proposing to implement several targeted storm surge/flood initiatives for its distribution and transmission systems.

In 2013, for distribution, FPL plans to harden 91 feeder projects, including 80 feeder projects which provide service to CIF customers and 11 feeder projects serving essential community needs. FPL also will harden 15 critical poles, which includes highway crossings. Costs associated with this work are estimated to range from \$90-\$120 million.

FPL will also continue to implement EWL hardening criteria for new construction, major relocations and other work. In 2014 and 2015, FPL will continue with its three-prong approach for hardening its distribution infrastructure, including targeting 80-140 circuits annually. Additionally, in 2014 and 2015, FPL will implement a new distribution storm surge/flood initiative to better protect 15 above-grade vaults contained within the downtown Miami electric network system that are located in higher risk storm surge/flood areas.

The total projected annual costs for all 2014 and 2015 distribution hardening initiatives are estimated to range between \$91-\$143 million per year. The proposed 2013-2015 annual projects/funding levels reflect an increase over the 2010-2012 levels, but are consistent with the approved levels contained in FPL's original 2007-2009 hardening plan and represent important initiatives in improving the storm-resiliency of FPL's electric system. The 2013-2015 proposed projects/funding levels allow FPL to advance the completion date for all CIF and Community Projects to 2016. This completion date is more consistent with FPL's original, approved Plan for 2007-2009.

For transmission, which is already built to EWL standards and performed well during the 2004 and 2005 storm seasons, FPL will continue to improve its system with its previously approved plan under Storm Preparedness Initiative No. 4, replacing all wood transmission structures and all ceramic post insulators on square concrete poles to meet more current and stringent design standards. The proposed transmission hardening levels for 2013-2015 will allow FPL to advance the replacement rate for both wood transmission structures (all wood replacements will be completed within 15-20 years) and ceramic post insulators on square concrete poles (all of these insulator replacements will be completed by 2014). In 2013-2015, FPL also plans to initiate several transmission storm surge/flood initiatives that will incorporate both preventative and restoration improvement measures for certain substation and underground transmission facilities located in higher risk storm surge/flood areas. Total 2013-2015 annual transmission hardening costs are estimated to be \$52-\$80 million.

As provided in FPL's previously submitted and approved plans (Docket Nos. 070301-EI and 100266-EI), as well as in this filing, FPL's storm hardening plan is intended to result in less storm damage to the electrical infrastructure and therefore less restoration time and related costs. For example, in another Hurricane Wilma-type event, FPL estimates that hardened feeder pole failure

rates and associated restoration time, based on construction man-hours, will be reduced, and therefore provide restoration cost savings. More generally, all of FPL's approved initiatives, including its storm hardening plan, pole inspection programs and increased vegetation management activities, can be reasonably expected to reduce future storm restoration costs compared to what they would be without those initiatives. It is important to note, however, that despite the implementation of these initiatives, when severe weather events impact the state – outages will occur. However, these initiatives will mitigate such impact. The strategic and tactical initiatives and plans FPL is pursuing, including the hardening plans included in this filing, not only address the resiliency of FPL's system for future severe weather events, but also provide for an increased level of day-to-day reliability for its customers. The costs and benefits of FPL's response to the Commission's requirement in Docket No. 060198-EI for 10-point storm implementation plans were discussed in FPL's "Storm Preparedness Initiatives" document, which was filed, reviewed and approved in that docket and is incorporated herein by reference. Additionally, day-to-day reliability benefits are being realized with hardened feeders. Finally, improved systems and processes, including improved storm forensics, will allow for more and better data to be collected, evaluated and analyzed. Of course, FPL's system is very diverse and geographically large so it will take many years of sustained effort to achieve the full benefits of system-wide storm hardening.

While there are benefits from FPL's storm hardening and preparedness initiatives, it still remains nearly impossible at this time to estimate the full extent of the benefits with any precision. No two storms are exactly alike. However, a more storm-resilient infrastructure will fare better and provide for quicker and less expensive restoration than one which has not been hardened.

The actions described above continue to represent industry leading changes in construction standards, maintenance practices and restoration processes. The analyses and forensic observations performed after Hurricanes Katrina and Wilma still serve as the central foundation for FPL's hardening efforts, but there is presently limited or no historical data available for purposes of conducting overall cost/benefit analyses on many of these actions. As additional storm experience (e.g., Hurricane Sandy), more and better data, and new improved processes, products and materials become available, even better and more targeted hardening solutions will be implemented. In the meantime, FPL believes that continuing to implement its current hardening approach - targeting critical infrastructure for EWL, the application of Incremental Hardening for community projects, and the utilization of the Design Guidelines, as well as the newly proposed storm surge/flood initiatives resulting from Hurricane Sandy lessons learned – represent obvious and important initiatives that should be timely completed and which are in the best interest of FPL's customers and the State of Florida.

In conclusion, hardening the electric infrastructure remains a top priority for FPL. FPL's hardening efforts have already provided direct benefits to customers and the initiatives in this Plan will help FPL complete its hardening efforts consistent with the timelines first established in the aftermath of the 2004 and 2005 storm seasons and accelerate the benefits of a more storm-resilient system to customers and Florida's economy.

INTRODUCTION

In compliance with Rule 25-6.0342, F.A.C., the following provides details on FPL's electric distribution and transmission infrastructure storm hardening plans.

DISTRIBUTION

1.0 HISTORY / BACKGROUND

Two extraordinary hurricane seasons in 2004 and 2005 made it clear that significant changes are required in the way that Florida utilities design, construct and operate their electrical systems. This is particularly true for FPL's service territory, which during this time frame experienced the direct hit of five hurricanes and the indirect impact of two others. Standards that worked well and provided customers with reliable service in the past needed to be enhanced going forward. For example, Florida generally, and South Florida in particular, is much more heavily and densely populated than it was at the time of Hurricane Andrew; customers' expectations have changed over time; there has been evidence presented that suggests Florida may be in a more active part of a multi-decade hurricane cycle and can expect more frequent storm events. In fact, while FPL's service territory has not been affected by a major storm since 2005, 19 tropical cyclones formed in each of the years 2010-2012. This ties 2010, 2011 and 2012 with 1887 and 1995 as the third most active since 1851, when credible records began. This high level of storm activity and the damage and resulting impacts on customers associated with Hurricane Sandy are powerful reminders of the importance of moving our storm hardening efforts toward completion with deliberate speed.

Although no electrical system can be rendered fully resistant to hurricane impacts, FPL's storm hardening and preparedness initiatives, including its proposed hardening plan for 2013-2015, benefit its customers and communities. Continuing FPL's storm hardening approach for new construction, system upgrades and maintenance will provide significant improvements in FPL's system's resiliency to severe storms and its restoration time after these storms pass. Additionally, it will ensure that a critical mass of providers of basic services, essential to the health and safety

of communities served by FPL will have electric service as promptly as possible after a hurricane strike.

The central foundation for FPL's detailed distribution hardening plan is still the extensive analyses that FPL conducted either directly, or with the aid of external resources, e.g., KEMA, Incorporated. These analyses included detailed forensic observations of how the system performed after Hurricanes Katrina and Wilma. One key finding from the Hurricane Wilma forensic data was that "wind only" was the predominant root cause of distribution pole breakage as opposed to, for example, trees or other flying debris. This key data and the overall performance of FPL's transmission poles, which are already built to the NESC extreme wind criteria, forms the basis for FPL's proposal that certain parts of its distribution system be built to this highest criteria.

It is important to keep in mind that, in order to achieve changes to the resiliency of FPL's entire system, it will take many years of sustained effort. FPL's system cannot be changed overnight. It is very large, geographically diverse and all parts of the system are susceptible to hurricane impact.

Additionally, it is important to not focus on any one aspect. Electrical systems are exposed to a variety of different failure modes under the stress of hurricane conditions and typically each specific failure mode only accounts for a relatively small proportion of the total damage. For example, FPL and every other utility experience pole breakage during hurricane conditions. However, even if FPL had experienced zero pole failures during the 2004 and 2005 storms, there still would have been millions of customers without power due to fallen trees, etc.

Over time, substantial improvements to FPL's system will have cost implications for customers. To help control those costs and to get the most system improvement possible, as soon as possible, FPL has carefully developed its programs to focus early efforts on those parts of the system where the greatest impacts for a given level of investment can be achieved.

1.1 Hardening Accomplishments to Date

During the period 2006-2012, FPL hardened 269 feeder projects to EWL. These feeders serve 385 CIF customers and total over 974 miles. CIF customers served by these hardened feeders include acute care facilities, hospitals, 911 centers, special needs shelters, police and fire stations, water treatment plants, and county emergency operation centers located throughout FPL's service territory. FPL also hardened to EWL 115 highway crossings and 225 "01" switches. During this same period, FPL also utilized its Incremental Hardening approach to address 92 feeder projects (approximately 280 miles) serving essential community needs such as

grocery stores, gas stations and pharmacies. Finally, FPL also applied EWL to the design and construction of all new overhead facilities, major planned work, relocation projects as well as daily work activities.

The total costs for the 2006-2012 CIF and Community Project hardening efforts were \$319 million. The incremental costs associated with the hardening of newly installed overhead facilities, major planned work, relocation projects and daily work activities are not tracked.

2.0 NATIONAL ELECTRICAL SAFETY CODE (NESC) REQUIREMENTS

The NESC is an American National Standards Institute (ANSI – C2) standard that has evolved over the years. As stated in the NESC, “[t]he purpose of these rules is the practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment.” The standards cover a wide range of topics including grounding, overhead lines, clearances, strength and loading, underground, and rules for the operation of lines and equipment. The NESC is currently revised on a 5-year cycle, with the latest edition being 2012. This is the edition presently adopted by the Florida Administrative Code.

The NESC specifies grades of construction on the basis of the required strengths for safety. The relative order of grades of distribution construction is B, C, and N, with Grade B being the highest or strongest. The grade of construction required is determined by the voltage of the circuits involved and what they cross over. Grade C is typically the NESC minimum standard for most electrical distribution facilities. Grade B is only required when crossing railroad tracks, limited-access highways, and navigable waterways requiring waterway crossing permits.

Prior to 2007 and except for the period 1993-2004, FPL designed its distribution facilities based on the loading as specified in the NESC- Rule 250 B - Combined ice and wind loading for Grade B construction. While this has resulted in a very strong and reliable distribution system, the Rule 250 B criterion is not intended to design facilities for the sorts of extreme wind speed that can be experienced during hurricanes.

2.1 Extreme Wind Loading Criteria (EWL)

EWL is calculated using the wind speeds shown in Figure 250-2(d) of the NESC for Florida. The loading increases significantly with an increase in the wind speed since the wind loading formula uses the square of the wind speed.

Once the load is determined, it is multiplied by the appropriate Load Factor based on the Grade of Construction. This “factored” load is then used to

determine the required structure (pole) strength. The strength of various poles is dependent on the material from which they are made. The strength of wood poles is published in ANSI O5. The strength of poles made from other materials is provided by the manufacturer. Once the strength of a pole is known, it is multiplied by a Strength Factor based on the grade of construction and the material from which the pole is made. This "factored" strength then has to be equal to or greater than the "factored" load.

All facilities that are to be attached to the pole must also be accounted for when determining the desired strength of the structure. This includes the wind load on the pole itself, as well as the conductors, transformers, communication cables and other equipment on the pole. The design loading impact to meet EWL usually requires some combination of stronger poles and shorter span lengths (distance between poles) to reduce the wind loading imposed on the conductors and cables. The NESC requires the use of EWL for facilities that exceed 60 feet above ground or water level – normally transmission level structures.

2.2 FPL Compliance

Prior to 2007, FPL had generally utilized Grade B construction for all distribution lines, except as previously noted. There are also portions of FPL's service territory where Grade C construction was utilized based on a probabilistic study of hurricanes at that time. Since Grade B is stronger than Grade C construction, FPL's distribution facilities comply with and, in most cases, exceed the minimum requirements of the NESC. FPL's Distribution Engineering Reference Manual (DERM) and Distribution Construction Standards (DCS) are revised as required to ensure compliance with all applicable rules and regulations. For the purpose of implementing its hardening plan, applicable pages of FPL's DERM Addendum and DCS have been updated to include the requirements to meet the NESC EWL. The DERM Addendum and DCS were last updated in March 2013 and December 2010, respectively.

3.0 INFRASTRUCTURE HARDENING STRATEGY

FPL's distribution infrastructure consists of feeders (main distribution lines) and laterals (fused circuits that run off feeder lines), both of which carry primary voltage, as well as lines that carry secondary voltage (e.g., services). To harden its distribution infrastructure, FPL proposes to continue its previously approved three-prong approach: EWL; Incremental Hardening; and revised Design Guidelines. FPL will continue the practice of applying EWL to feeders and any associated laterals directly serving critical customers, as well as, certain critical poles. Feeders are the backbone and therefore a critical component of FPL's overall distribution overhead system. Feeder reliability can have a substantial impact on overall service reliability to FPL's

customers. The next prong, Incremental Hardening, will target existing feeders that with targeted modifications will increase the entire feeder's wind profile up to and including EWL. The third prong will continue to use the system-wide implementation of FPL's Design Guidelines, which apply EWL criteria to the design and construction of all new overhead facilities, major planned work, relocation projects and daily work activities. This three-prong approach allows FPL to continue to obtain hardening benefits more promptly and cost-effectively across its entire electric system. FPL will continue to evaluate its approach as new products and more cost-effective work methods are developed. The application of this three-prong approach is explained in Section 5.0.

Additionally, in response to lessons learned from the storm surge and flooding damage experienced in the Northeast from Hurricane Sandy in 2012, FPL will implement a new storm surge/flood initiative in 2014 and 2015. This initiative, which will better protect 15 above-grade vaults contained within its Miami downtown electric network distribution system that are more susceptible to these conditions, involves retrofitting these existing vaults with submersible equipment.

4.0 EXTREME WIND SPEED REGIONS FOR APPLICATION OF EWL

To apply the NESC extreme wind map for Florida, FPL proposes to continue with the application of EWL into three wind regions, corresponding to expected extreme winds of 105, 130 and 145 mph.

FPL reviewed its practices and procedures and determined that the most effective option for implementation of the extreme wind map would be by county. Each of the counties that FPL serves was evaluated by applying the highest wind rating for that county. FPL decided on the three extreme wind regions of 105, 130 and 145 mph for the following reasons:

- A smaller number of wind regions generate advantages through efficiency of work methods, training, engineering and administrative aspects such as standards development and deployment.
- 105, 130 and 145 mph is a well balanced approach to meet the EWL criteria in the counties within each region.

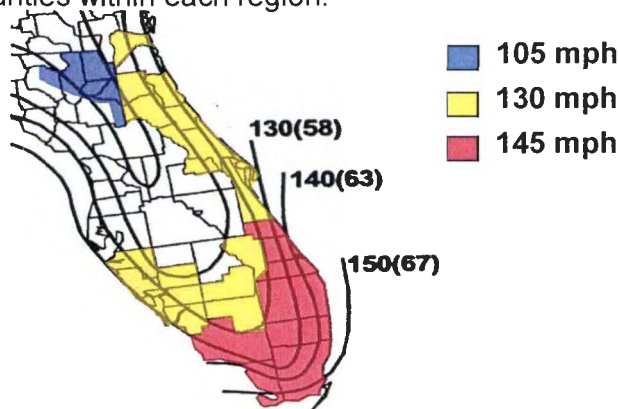


Figure 4-1 FPL Extreme Wind Regions (Meter/Sec)

Note: For the sparsely populated extreme southern tip of FPL's service territory, the design EWL wind speed will be 150 mph.

5.0 APPLICATION OF NEW DESIGN AND CONSTRUCTION STANDARDS

5.1 EWL

EWL will be applied to Top CIF feeders and any associated laterals directly serving critical customers. These facilities are critical and essential to the health, safety, welfare and security of the public. Examples of customers served by these facilities include hospitals, 911 Centers, Emergency Operations Centers (EOCs), water treatment plants (WTP), police and fire stations. To help identify these facilities, FPL has established a partnership with local EOCs, who assisted in providing input and selecting the most critical facilities. Based on this list, FPL's proposed plan is to harden these facilities to EWL where feasible, practical, and cost-effective.

EWL will also be applied to poles included in FPL's Targeted Critical Pole (TCP) Program. FPL's TCP Program focuses on poles that can impact restoration efforts. This program includes poles associated with overhead limited access highway crossings. If these poles fail, they can impede the flow of traffic and emergency vehicles. Priority will be given to potential evacuation routes or those highways used to provide relief efforts soon after the storm. TCPs also include the first distribution pole out of a substation, referred to in this report as "01" poles. If these poles fail, an entire feeder and associated laterals would lose service. All TCPs will be hardened to EWL where feasible, practical, and cost-effective.

5.2 Incremental Hardening

The objective of Incremental Hardening is to optimize the existing distribution infrastructure and cost-effectively increase the overall wind profile of a feeder to a higher wind rating, up to and including EWL. Incremental Hardening will apply appropriate combinations of cost-effective engineering options (e.g., storm guying, relocation, adding intermediate poles, upgrading the pole, etc.) to eliminate weaker links and take advantage of the existing storm resilience of a feeder. A minimum incremental wind rating is used for each of the established extreme wind regions as shown in Table 5-1. Incrementally hardening a feeder may not always achieve EWL, however, this approach will position FPL to do so in the future.

Extreme Wind Region	Incremental Hardening Minimum Wind Rating
145 MPH	125 MPH
130 MPH	115 MPH
105 MPH	105 MPH

Table 5-1 Incremental Hardening Minimum Wind Rating

Figures 5-1 and 5-2 illustrate an example of incremental hardening. In this example the wind rating of the two highlighted poles falls below the minimum wind rating for the region, which is 125 MPH in this example. All poles whose wind rating is below the minimum incremental rating will be upgraded.

Before Incremental Hardening

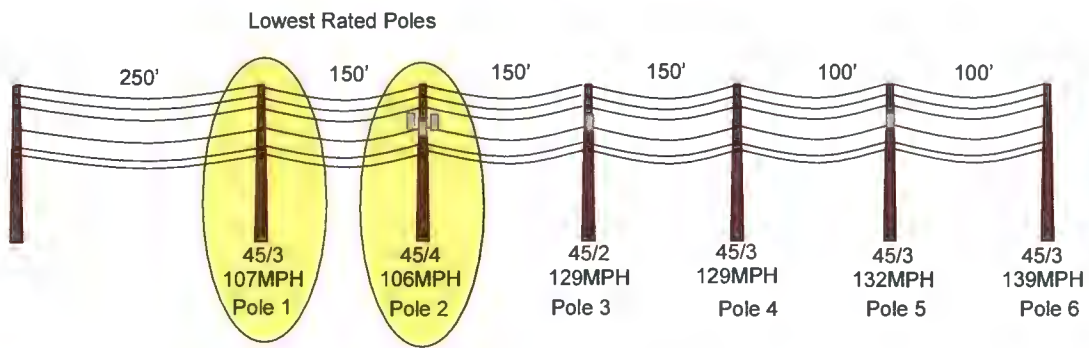


Figure 5-1: Feeder Wind Profile Before Incremental Hardening

After Incremental Hardening

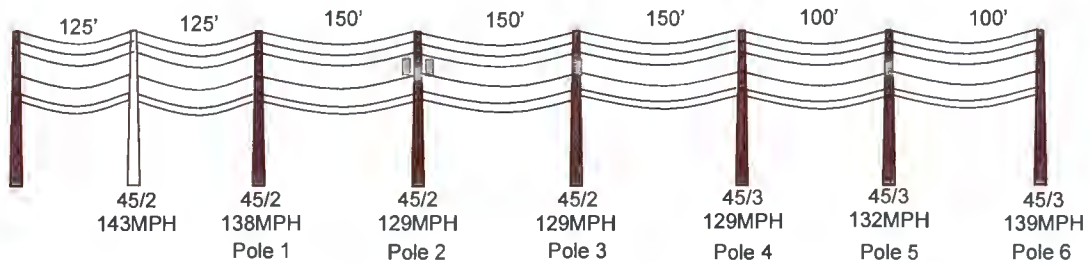


Figure 5-2: Feeder Wind Profile After Incremental Hardening

By targeting poles 1 and 2 for upgrading and installing an intermediate pole before pole 1, the feeder's overall wind profile has been raised to a higher wind rating in a cost-effective manner.

Incremental Hardening will target "community projects." Community projects are associated with feeders that serve community needs such as grocery stores, gas stations and pharmacies. These types of services have also been identified as an essential need within the communities FPL serves. Typically these types of businesses are located near major thoroughfares and are easily accessible to the community.

5.3 Design Guidelines for New Construction

FPL is utilizing its revised Design Guidelines and processes to apply EWL for new construction, major planned work, relocation projects and daily work activities. Depending on the scope of the work that is performed in a particular project, this could result in the EWL hardening of an entire circuit (in the case of large-scale projects) or in EWL hardening of one or more poles (in the case of small projects) so that the affected circuit will be in a position to be fully EWL hardened in the future. These guidelines are primarily associated with changes in pole class, pole type and desired span lengths to be utilized. Standardizing these processes ensures that this type of construction work aligns with FPL's hardening strategy.

FPL's pole sizing guidelines now provide for a minimum installation of Class 2 wood poles for all new feeder and three-phase lateral work in cases where previous designs might have called for a Class 3 wood pole. For two-phase and single-phase lateral work, a Class 3 wood pole is now required, where previous designs might have called for a Class 5 wood pole. For service and secondary work, a minimum of a Class 4 wood pole is to be used, where previously Class 5 or 6 wood poles could have been used. For critical poles, FPL is installing concrete poles at accessible locations. These guidelines position FPL for completely hardening existing circuits to EWL in the future.

Below, Table 5-2 illustrates a sample comparison of the Guidelines prior to 2007 vs. the Hardening Guidelines and the average percentage increase in wind rating. MPH calculations are dependent on various factors, including span length, equipment and attachments, framing, etc. Variations in any of these factors may yield different results.

Pole Type	Guidelines Prior to 2007	Hardening Guidelines	Average % Increase in Wind Rating
Critical Pole	Class 3 (wood)	Class III-H (concrete)	*47%
Feeder Pole	Class 3 (wood)	Class 2 (wood)	11%
Lateral Pole	Class 5 (wood)	Class 3 (wood)	22%
Service Pole	Class 5 (wood)	Class 4 (wood)	11%

*FPL working with manufacturer was able to increase the strength of new concrete poles.
Table 5-2 Design Guidelines Pole Recommendations

FPL's Distribution Design Guidelines are included in the Appendix, which is attached to this filing.

5.4 Hardening Existing Facilities

To determine how a circuit or critical pole will be hardened, a field survey of the circuit facilities must be performed. By capturing detailed information at each pole location such as pole type, class, span distance, attachments, wire size and framing, a comprehensive wind-loading analysis can be performed to determine the current wind rating of each pole, and ultimately the circuit itself. This data is then used to identify the specific pole locations on the circuit that do not meet the desired wind rating. Once locations have been identified, recommendations to increase the allowable wind rating of the pole can be made.

FPL proposes to continue to utilize its "design toolkit" that focuses on evaluating and using cost-effective hardening options for each location. Examples of options in the toolkit include the following:

- Storm Guying – Install one guy in each direction perpendicular to the line of lead. This is a very cost-effective option; however, proper field conditions need to be present to allow for installation.
- Equipment Relocation – Equipment on a pole may be moved to a near-by stronger pole or one with a higher allowable wind rating.
- Intermediate Pole – Install a single pole when long span lengths are present. By reducing the span length, the wind rating of both adjacent poles is increased.
- Upgrading Pole Class – Replace the existing pole for a higher class pole to increase the pole's wind rating.
- Undergrounding Facilities – Utilize if there are significant barriers to build overhead or if it is a more cost-effective option for a specific application.

These options are not mutually exclusive, and when used in combination with sound engineering practices, can provide a cost-effective method to harden a circuit.

Design recommendations on any given project will take into account hardening (making facilities more resilient to storm force winds), mitigation (if circuit fails, how can damage be minimized), as well as restoration (improving the efficiency of restoration in the event of failure). Since multiple factors can contribute to losing power after a storm, utilizing this multi-faceted approach will help in reducing the amount of work required to restore power to a damaged circuit.

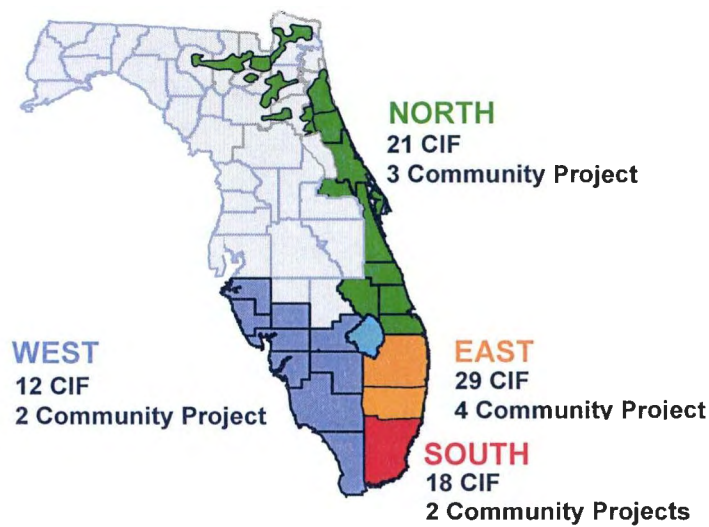
6.0 DEPLOYMENT PLANS

6.1 2013 Deployment Plan

In 2013, FPL proposes to utilize EWL to harden 80 CIF feeders serving 156 CIF customer accounts. The TCP Program will also focus on hardening to EWL three overhead Highway Crossings on I-95, I-75 and the Sawgrass Expressway as well as 12 additional critical poles, each being the first distribution feeder pole outside of a substation. These 15 TCP projects have been targeted because of their criticality in expediting restoration efforts. Additionally, FPL plans to complete incremental hardening on 11 Community Project feeders.

Lists of the CIF Customers and Community Projects' feeders planned for 2013 are included in the Appendix to this filing. The following map indicates, by region across the FPL service territory, where these projects are located.

Figure 6-1 – 2013 Feeder Hardening Map



Deployment plans and estimates utilizing the application of design guidelines were developed based upon historical feeder hardening projects. The proposed 2013 deployment plan corresponds to approximately 445 overhead circuit miles and includes approximately 16,000 poles. It is estimated that over 40% of the 16,000 poles included in the 445 overhead circuit miles already ready meet the designated wind-loading (EWL or Incremental) and will not require any additional hardening.

6.2 2014 and 2015 Deployment Plans

In 2014 and 2015, FPL will continue to address CIF hardening, critical poles, and community projects, and will continue to utilize the Design Guidelines. FPL estimates that during these two years it will annually harden approximately 80-140 CIF and Community Project feeders. Consistent with the stipulation reached in late 2007 regarding the "Process to Engage Third Party Attachers", FPL will continue to provide a preliminary list of projects in September of each year that it proposes to undertake in the following calendar year, pending internal budget approval. Then, when the budget is approved, FPL will provide the final list.

Additionally, in 2014 and 2015, FPL will implement a new storm surge/flood initiative to better protect 15 above-grade vaults contained within its downtown Miami distribution electric network system that are located in areas that are more susceptible to these conditions.

7.0 DESIGN AND CONSTRUCTION STANDARDS

7.1 Distribution Engineering Reference Manual (DERM)

FPL publishes its DERM to convey the standards of distribution design. The DERM provides FPL's designers with a reference for designing distribution facilities. This reference manual contains background information, engineering considerations, examples of necessary calculations and tables developed from the calculations. The tables are a guide for general applications whereas the examples provide the designers with the method to design facilities not included in the Tables. FPL published and issued an "Addendum" to its DERM as a supplemental publication to enable the designers to design distribution facilities based on the 2012 NESC EWL criteria. A copy of the current DERM Addendum is included in the Appendix attached to this filing.

7.2 Distribution Construction Standards (DCS)

FPL's DCS provides the designers and the construction crews with information needed to build the distribution facilities. Designers use the manual to convey instructions to the field. The field crews use the manual to

construct the facilities. The DCS contains drawings and instructions on clearances, framing (how facilities will be arranged on the pole), grounding, guying, equipment, and the assembly of the various parts.

7.3 Design Guidelines

FPL's Design Guidelines and a Quick Reference Guide provide the field designers with simple reference documents when the details provided in the DERM and DCS are not needed to develop the design plan. The intention of this document is to standardize designs for hardening as it relates to new construction, major planned work, relocations as well as daily work activities. These guidelines are primarily associated with changes in pole class, pole type and desired span lengths for overhead construction. In addition, FPL has adopted additional hardening guidelines for poles that are deemed critical for general operations or during restoration events. A copy of the current Design Guidelines and the Quick Reference Guide are included in the Appendix.

8.0 ATTACHMENTS BY OTHER ENTITIES

8.1 Attachment Standards and Procedures

There are attachments by other entities to FPL poles throughout its service area. These attachments are made by Incumbent Local Exchange Carriers (ILEC), Cable TV Companies (CATV), Telecommunication Carriers (Non-ILEC) and Governmental Entities. Additionally, FPL attaches to certain ILEC poles. The standards and procedures for these attachments, created to ensure conformance to FPL's standards and hardening plans as required by the FPSC, are attached and included in the Appendix.

8.2 Input from Attaching Entities

On April 15, 2013, FPL mailed an informational package regarding its 2013-2015 hardening plans as well as the current draft of its "Attachment Standards and Procedures" to all attaching entities. In total, 104 packages were sent to these entities which included cable TV, telecommunication, and telephone companies as well as city and county agencies. FPL requested attaching entities to provide their input to FPL by April 29, 2013, including their costs and benefits associated with FPL's proposed hardening plans. As of April 29, 2013, FPL was contacted by 11 attaching entities. There were no suggested changes or issues with FPL's proposed 2013-2015 plans received from any attaching entity. Comments/input received included seeking clarification or some additional information.

9.0 RESEARCH AND DEVELOPMENT

Design and construction to NESC EWL involves more than just engineering reference manuals and construction standards. FPL has made efforts to seek out and evaluate new products, work methods, and construction techniques that may enable FPL to more cost-effectively build to this increased standard. Concurrently, FPL also continues to evaluate its existing construction practices to ensure they are adequate to meet EWL. Examples of these efforts include:

- FPL's evaluations of different pole technologies, e.g., steel, iron, several formulations of concrete, wood and composite materials. The evaluations confirmed that FPL has good economical source vendors for wood and concrete poles, and so far, the other pole technologies have very limited applications and higher cost.
- An FPL evaluation that resulted in the use of heavy-duty field equipment that allows for the installation of heavier concrete poles without the use of costly cranes when field conditions are acceptable. At the same time, FPL and their concrete pole manufacturers jointly developed a stronger and lighter weight concrete pole.
- Utilizing lessons learned from previous storms, FPL made changes to streetlight brackets, implemented use of cross-arm braces for steel cross-arms on wood distribution poles, strengthened the method of attaching riser shields to poles, implemented improved guidelines for the use of slack span construction and verified the strength of current methods used for attaching wire to insulators.
- As part of FPL's efforts to strengthen existing installations, specification and application guidelines were written to use the recently developed pole reinforcement method called the ET Truss. This enables a pole to be strengthened cost-effectively, avoiding a pole replacement.
- For underground facilities, FPL piloted the use of the stainless steel Vista switchgear, below-grade and padmount versions, designed to withstand flooding and intermittent shallow immersion. The pad mounted switch has a lower profile than the conventional switchgear, is preferred over the below-grade version due to operational and access factors, and is suitable for floodplains not expected to experience direct storm surge. The Vista switchgear became an FPL standard option provided to customers considering underground projects.
- Collaborative research efforts continue with all Florida investor-owned utilities, Co-ops, Municipalities and the Public Utilities Research Center (PURC). This research, which began in 2007, has resulted in greater knowledge about wind conditions and the effects of vegetation management during storm and non-storm, as well as the development of hurricane and damage modeling that can assist in further understanding the costs and benefits of undergrounding.

10.0 UNDERGROUND DISTRIBUTION FACILITIES

10.1 Underground Systems

FPL's current underground construction systems include the following design applications:

- Pad-mounted, above grade transformers and switch gear for typical URD subdivisions and small commercial areas.
- Concrete encased duct and manhole systems with above grade vaults in designated areas of high load density, where it is feasible, practical and cost-effective. For example, this application has been used in portions of Miami, Miami Beach, Fort Lauderdale, West Palm Beach and Sarasota.
- Secondary network systems and vaults with redundant throw-over, as in downtown Miami.

The current FPL system has approximately 67,000 total miles of distribution infrastructure. Underground power lines make up nearly 37% (25,000 miles) of this total with about 7% (1,700 miles) being in concrete encased duct bank. In the past five years, over 60% of all new distribution construction throughout the FPL service territory has been installed underground. In the tri-county area of Miami-Dade, Broward and Palm Beach Counties, where local ordinances for Underground Residential Distribution (URD) construction exist, approximately 90% of new construction is installed underground.

10.2 Equipment Technologies

The standard FPL URD equipment for all new underground residential distribution (pad-mounted transformers, switch cabinets, etc.) is dead-front made from stainless steel, or in combination with mild steel. Stainless steel equipment has the advantage of extended service life due to its resistance to weathering and corrosion, but has a considerably higher initial cost. Dead-front equipment (i.e., without energized parts exposed on the operating side of the equipment) is more reliable.

Through an FPL 2010 pilot program on Jupiter Island, FPL found it suitable to utilize the Vista Underground Distribution Switchgear for floodplains not expected to experience direct storm surge. FPL now provides Vista Underground Switchgear as a standard option for customers considering underground projects. These transformers, which can be fully submerged without water infiltrating the tank, make transformers more flood and surge resilient.

As previously mentioned, FPL will be implementing a new storm surge/flood initiative in 2014 and 2015, that involves retrofitting 15 above-grade vaults in the downtown Miami network, that are located just at or within the FEMA 100 year flood elevation levels, with submersible equipment. Specifically, FPL will be replacing the existing primary disconnect switches and network protectors within these vaults with new sealed, stainless steel equipment.

10.3 Installation Practices

FPL complies with existing local ordinances when constructing underground systems. The Florida Building Code leaves the responsibility of determining adequate floodplains to each municipality which usually base their local ordinances on Federal Emergency Management Agency 100-year flood criteria.

10.4 Hardening and Storm Preparedness

Approximately 20% of FPL's underground distribution infrastructure is within the Category 1 - Category 3 floodplain as defined by the Florida Department of Community Affairs. Historically, FPL has not been as severely impacted by flooding and storm surge from hurricanes as it has been by wind. However, storm surge damage, when it does occur, can result in significant outages and long restoration times, as most recently experienced in the Northeast with Hurricane Sandy. Therefore, in 2014 and 2015, FPL will implement a storm surge initiative that will utilize the installation of submersible equipment to strengthen 15 above-grade vaults in its downtown Miami distribution network system. Additionally, FPL has guidelines in place for the prompt post-storm inspection and mitigation of damage to equipment exposed to flooding or storm surge. These guidelines include the necessary steps to purge any sand and water that has invaded the equipment and to restore it to service.

While recognizing that underground equipment is less impacted by predominantly wind events, FPL also offers a Governmental Adjustment Factor (GAF) tariff to promote conversion of electric facilities from overhead to underground. Through the GAF, FPL invests 25% of the total cost for qualified local government-sponsored conversion projects.

11.0 PROJECTED COSTS AND BENEFITS

11.1 Costs

FPL

In 2013, FPL plans to harden 91 feeders, including 80 feeder projects which provide service to CIF customers and 11 feeder projects serving special community needs. Additionally, FPL will harden three highway crossings and

12 "01" switches. Costs associated with this work are estimated to range from \$90-\$120 million. FPL will also continue to implement hardening criteria for new construction, major relocations and other work. The incremental costs of hardening associated with these activities are not specifically tracked.

In 2014 and 2015, FPL expects to continue its strategy for hardening its infrastructure, including targeting 80-140 circuits annually in 2014 and 2015. The associated projected annual costs for 2014 and 2015 are estimated to range from \$90-\$140 million. These estimates are based upon current work methods, products, and equipment and assume the necessary resources will be available to execute the plan.

While the proposed 2013-2015 annual projects/funding levels reflect an increase over the 2010-2012 levels, they are consistent with the approved levels contained in FPL's original 2007-2009 hardening plan.

Also, in 2014 and 2015, FPL plans to implement a new storm surge/flood initiative to strengthen 15 vaults in its Miami downtown electric network, that are located just at or within the FEMA 100 year flood elevation levels, with submersible equipment. Projected annual costs for this initiative are approximately \$1-\$3 million.

Attaching Entities

As of April 29, 2013, no cost information has been received from attachers.

11.2 Benefits

FPL

The proposed CIF and Community projects/funding levels for 2013-2015 will allow FPL to advance the completion of all CIF and Community Projects to 2016. This completion date is more consistent with FPL's original, approved Plan for 2007-2009. Completing these projects sooner extends the benefits of hardened critical infrastructure to a larger portion of FPL's total service territory sooner.

FPL's 2014 and 2015 initiative to retrofit 15 vaults in its Miami downtown electric network with submersible equipment should also mitigate storm surge/flood damage to these facilities that are more susceptible to these conditions.

FPL expects a reduction in storm restoration costs as well as non-storm (day to day) restoration costs ("Restoration Cost Savings") as a result of its planned hardening activities.

FPL has conducted an analysis to determine the relationship between the expected Restoration Cost Savings from the planned CIF and Community

projects hardening activities, and the estimated cost of those activities. This analysis looks at the average Restoration Cost Savings per mile of feeder for all planned hardening activities, rather than at each activity separately, because FPL does not feel that it has sufficient information at this time to distinguish between the benefits attributable to one type of hardening activity versus another.

Moreover, these Restoration Cost Savings have to be expressed as a range at this time, because of the substantial uncertainties inherent in estimating them based on current information. While there are numerous areas of uncertainty, two are particularly important.

First, neither FPL nor the utility industry generally has much experience with hardened distribution facilities. Therefore, there is little directly measured data on the improved resilience, and hence reduced Restoration Cost Savings, resulting from hardening such facilities. FPL has relied primarily upon four sources of data for estimating the improved resilience of hardened CIF and Community project distribution facilities. The data sources are as follows:

- Experience from the 2004-2005 hurricane seasons, which provided substantial insight into the specific causes of pole failures (and hence both the nature and magnitude of potential improvements in storm resilience that could result from addressing those causes).
- The work performed by KEMA for FPL following the 2005 storm season which addressed the potential storm-resilience improvements that could be expected from hardening activities.
- A comparison in performance during the strong winds of hurricane Wilma between FPL's transmission poles (which were designed to EWL standards and generally fared very well) and its distribution poles (which generally were not designed to EWL standards and experienced a significant number of "wind only" failures).
- An independent analysis prepared by Davies Consulting, Inc., in February 2006 that addressed the impact of hurricanes with varying strengths on pole replacements for FPL and ten other utilities. This report showed that there is a strong correlation between the percentage of poles requiring replacement and the strength of storms and that FPL's pole replacement rates were lower than those of other utilities for storms of comparable strengths. It is important to note that most of the other utilities in this analysis build their distribution systems to meet Grade C construction, while FPL's standard was Grade B construction, which seems to confirm that the strength of the system, i.e., Grade C vs. Grade B vs. EWL, does have an impact.

Second, no one is in a position to know for sure how frequently FPL's service territory will be impacted by strong hurricanes. Based on a long-term historical average, this will occur once every five years. However, as was

experienced in the 2004-2005 hurricane seasons, strong hurricanes can periodically occur more frequently. Moreover, while we have avoided direct strikes in recent years, the storm seasons have been exceptionally active overall. The estimate of cumulative Restoration Cost Savings over time will be directly affected by how frequently storms hit FPL's service territory.

Taking these uncertainties into account, FPL has estimated that, over an analytical study period of 30 years, the net present value of Restoration Cost Savings per mile of hardened feeder would be approximately 45% to 70% of the cost to harden that mile of feeder for future major storm frequencies in the range of once every three to five years. Of course, it is possible that FPL will face major storms more frequently than that, as it did in the 2004-2005 hurricane seasons. If that were the case, then the net present value of Restoration Cost Savings likely would exceed the hardening costs.

It is also important to note that, in addition to Restoration Cost Savings, customers will benefit substantially, in many direct and indirect ways, from the reduced number and duration of storm and non-storm outages resulting from the planned hardening activities. As a result of the discussions with the Commission about storm hardening following the 2005 storm season, FPL understands that the Commission considers these customer benefits to be important. However, FPL expects that they vary substantially from customer to customer and FPL is not in a position to assign a monetary value to them. Therefore, FPL has not attempted to reflect the customer benefits in its quantitative benefit/cost analysis.

FPL would also like to point out that, while the Commission's storm hardening rule calls for utilities to provide estimates of benefits and costs in connection to their storm hardening plans, the criterion by which the plans are to be judged for approval is whether they are "cost-effective" (see Rule 25-6.0342(2), F.A.C.). A commonly-accepted definition of "cost-effective" is an activity that "produces optimum results for the expenditure." (Random House Unabridged Dictionary - 2006). This is a different measure than the benefit-cost ratio, and is typically used where, as FPL suggests is the case here, a particular outcome is desired without necessarily being able to quantify precisely the benefits of that outcome. In those circumstances, what becomes important from an economic perspective is to ensure that the desired outcome is achieved as efficiently as possible. FPL's storm hardening plan is highly cost-effective, at many levels. It focuses its hardening activities initially on critical infrastructure facilities and community projects, where the most customers will receive the most benefits as quickly as possible. For the facilities that will be hardened to EWL standards, each pole location is evaluated to determine how it can be strengthened to meet those standards at the least cost and with the least disruption. And for community projects, the approach is even more targeted, specifically focusing

on "weak link" poles, where hardening a few poles can significantly increase the strength of an entire pole line.

Attaching Entities

As of April 29, 2013, no benefits information has been received from attachers.

TRANSMISSION

1.0 HISTORY / BACKGROUND

While FPL's transmission facilities were also affected by the 2004 and 2005 storms, the damage experienced was significantly less than the damage sustained by distribution facilities. A primary reason for this is due to the fact that transmission structures are already constructed to meet EWL. However, FPL's hardening plan identifies several initiatives specifically addressing the transmission infrastructure.

2.0 NESC REQUIREMENTS AND COMPLIANCE

FPL transmission line structural designs are mandated by Florida Statute Section 366.04, which requires that all high voltage transmission structures satisfy the requirements specified by the NESC. ANSI C2 addresses EWL criteria (Rule 250C) and covers all wind sensitive factors and wind related effects that need to be considered in the design calculations. FPL transmission structures are designed to meet EWL under NESC Rule 250 C and are constructed to meet Grade B Construction under NESC Sections 25 and 26.

3.0 DETERMINATION OF EXTREME WIND SPEEDS FOR APPLICATION OF EWL

For transmission structures, FPL interpolates the NESC wind load contours (NESC Figure 250-2d) into 5 mph intervals. Based on the global position system (GPS) coordinates, transmission structures are designed for the upper wind speed of each interpolated 5 mph wind contour interval.

4.0 DESIGN AND CONSTRUCTION STANDARDS

FPL's transmission and substation system is already designed for EWL using the following design standards:

NESC

- As required by Florida Statute Section 366.04

American Society of Civil Engineers (ASCE)

- Minimum Design Loads for Buildings & Other Structures “ASCE/SEI 7-05”
- Design of Steel Transmission Pole Structures “ASCE/SEI 48-05”
- No. 74: Guidelines for Electrical Transmission Line Structural Loading
- No. 91: Design of Guyed Electrical Transmission Structures
- ASCE/PCI, Guide for the Design of Pre-stressed Concrete Poles

Institute of Electrical and Electronics Engineers

- IEEE Standard 751 – 1990, IEEE Trial-Use Design Guide for Wood Transmission Structures

FPL’s transmission construction standards are incorporated into the following two books as summarized below:

Transmission Structure Standards (TSS)

The TSS includes drawings showing the framing and configuration of both current and historical transmission structures. Each structure standard drawing includes dimensions, material lists, and any applicable transmission installation specification (TIS) standards.

Transmission Installation Specification (TIS)

The TIS includes installation and testing procedures for various transmission components. The book contains the following sections:

1. Anchors & Foundations
2. Bonding & Grounding
3. Conductor & Conductor Fittings
4. Poles & Structures
5. Right-of-Way Items
6. Insulator & Arrester
7. Fiber Optics

Construction or installation specifications that are unique to a particular location and not incorporated in either standard referenced above are incorporated in the construction package for the individual project.

5.0 DEPLOYMENT STRATEGY

Since FPL’s transmission and substation system is already designed for EWL, FPL does not believe there is a general need for further hardening of the system. However, based on FPL’s experience with the performance of its system, including specific lessons learned from the 2004-2005 storm seasons, FPL has implemented the following two transmission storm preparedness initiatives that are also included in Initiative No. 4, which have been previously approved by the Commission as part of FPL’s “Storm Preparedness Initiatives” in Order No. PSC-06-0781-PAA-EI, Docket No.

060198-EI and in Order No. PSC-11-0082-PAA-EI in Docket No. 100266-EI, and also reported on in FPL's annual March 1 compliance filings.

1. Replacement of Wood Transmission Structures

In 2008 FPL implemented a comprehensive plan for replacing wood transmission structures with concrete per FPL's current design standards. Although designed for EWL, these structures accounted for 68% of all the transmission structures requiring replacement during the 2004-2005 storm seasons.

2. Ceramic Post Transmission Line Insulators

In 2006, FPL implemented a comprehensive plan for replacing existing ceramic post insulators on concrete poles with polymer post insulators, FPL's current design standard. Although designed for EWL, ceramic post insulators on concrete poles accounted for 68% of all the insulators replaced as a result of the 2004-2005 storm seasons.

FPL's proposed replacement levels for 2013-2015 will advance the completion of these two storm secure initiatives. For the wood transmission structure replacement initiative, approximately 1100-1600 structures will now be targeted for replacement each year. This increased level of replacement will allow FPL to advance the replacement rate for wood transmission structures, such that all replacements will be completed within the next 15-20 years. For the replacement of ceramic post insulators on square concrete poles, approximately 600-640 structures will be targeted for re-insulation each year. This increased level of replacement will accelerate the projected completion of this initiative from 2021 to 2014. This is consistent with FPL's intent to provide the benefits of hardening throughout FPL's service territory and electric system promptly. FPL will prioritize these two existing transmission storm hardening initiatives based on factors including proximity to high wind areas, system importance, customer count, and coordination with the distribution CIF storm initiative. Other economic efficiencies, such as performing work on multiple transmission line sections within the same corridor, will also be considered.

Also, in response to lessons learned in 2012 from Hurricane Sandy in the Northeast, FPL plans to initiate several transmission storm surge/flood initiatives in 2013-2015 that will better protect certain transmission facilities and expedite restoration of service to customers. This includes water intrusion mitigation and the installation of real-time water level monitoring systems and communication equipment inside the 25 substations in FPL's system that are located below the FEMA 100-year flood elevations. Also, the purchase of additional mobile fleet equipment will better enable the restoration of substation relay equipment and pump houses associated with underground transmission cables.

6.0 COSTS AND BENEFITS

The 2013-2015 total estimated annual cost of FPL's transmission hardening initiatives – replacing wood structures (\$45-\$70 million), replacing ceramic insulators on square concrete poles (\$3-\$4 million) and the storm surge/flood initiatives (\$4-\$6 million) is \$52-\$80 million.

During Hurricane Wilma, wood transmission structures and ceramic insulators on square concrete poles were the two major factors for transmission line outages and the leading cause of substations being out of service. Increasing the number of wood structures and ceramic post insulators on square concrete poles to be replaced annually accelerates the completion dates for these initiatives. This eliminates these "weak links" from the system and extends the benefits associated with the new hardened facilities to a larger portion of FPL's total service territory sooner.

Damage and outages caused by storm surge/flooding associated with Hurricane Sandy in the Northeast was significant. FPL's 2013-2015 storm surge/flood initiatives will help to protect and mitigate damage to certain transmission equipment and facilities that are more susceptible to these conditions and also expedite restoration efforts.

Count	Region	County	Substation	Fdr	Driver	Project Address
1	Dade	Miami-Dade	LITTLE RIVER	800632	Community Project	NW 2 AVE / NW 62 ST
2	Dade	Miami-Dade	PRINCETON	801634	WTP	14490 SW 268TH ST # WT3045
3	Dade	Miami-Dade	BISCAYNE	801836	WTP	12098 NW 11TH AVE # WATER
4	Dade	Miami-Dade	DEAUVILLE	801940	Fire	1275 NE 79TH ST #FIRE
5	Dade	Miami-Dade	SOUTH MIAMI	802438	Fire	5860 SW 70TH ST
6	Dade	Miami-Dade	FLORIDA CITY	803132	WTP	19500 SW 376TH ST # WT3009
7	Dade	Miami-Dade	FLORIDA CITY	803138	WTP	22 SE 16TH ST #WT3010
8	Dade	Miami-Dade	HOMESTEAD	803236	WTP	29001 SW 142ND AVE # WS3047
9	Dade	Miami-Dade	MIAMI SHORES	803433	Community Project	BISCAYNE BLVD / NE 2 AVE
10	Dade	Miami-Dade	HAULOVER	804733	Fire	10500 COLLINS AVE # FIRE STATION 21
11	Dade	Miami-Dade	GOLDEN GLADES	806035	Police	1020 NW 163RD DR
12	Dade	Miami-Dade	ROSELAWN	807035	Fire	800 W 49TH ST # FIRE STA-3
13	Dade	Miami-Dade	VILLAGE GREEN	807433	WTP	4801 SW 117TH AVE # SO 4683
14	Dade	Miami-Dade	MIAMI LAKES	807962	Fire	8200 COMMERCE WAY # FIRESTATI
15	Dade	Miami-Dade	FLAGAMI	808061	Police	1527 NW 79TH AVE
16	Dade	Miami-Dade	SNAKE CREEK	808435	Fire	4775 NW 199TH ST
17	Dade	Miami-Dade	SAGA	809434	Police	24775 SW 87 AVE #MARINE PT
18	Dade	Miami-Dade	NEWTON	810362	Fire	4200 SW 142ND AVE
19	Dade	Miami-Dade	ANHINGA	811362	WTP	19510 SW 354TH ST #WATER PLANT
20	Dade	Miami-Dade	LUMMUS	811636	Fire	6500 FISHER ISLAND DR # FIRE STATION 42
21	East	Broward	SISTRUNK	700136	Fire	528 NW 2ND ST # FIRESTATION 2
22	East	Broward	FAIRMONT	700736	Community Project	SR 7 / BROWARD BLVD
23	East	Broward	SAMPLE ROAD	701033	Fire	3740 NE 22ND AVE # FIRE HSE
24	East	Broward	PORT (Project)	701433	Seaports	VARIOUS PORT EVERGLADES ACCOUNTS
25	East	Broward	DANIA	701534	Police	100 W DANIA BEACH BLVD #POLICE DEPT
26	East	Broward	PLANTATION	701638	WTP	500 NW 65TH AVE #EAST WTR PLT
27	East	Broward	PEMBROKE (Project)	702438	WTP	3441 HOLLYWOOD BLVD #WTR PLANT
28	East	Broward	MCARTHUR	702735	Fire	1900 NW 56TH AVE # FIRE
29	East	Broward	HAWKINS	702936	Police	701 SW 71ST AVE # CITYHALL
30	East	Broward	RAVENSWOOD	703132	Community Project	STIRLING RD
31	East	Broward	WOODLANDS	703236	Police	6279 W OAKLAND PARK BLVD # SAFETY BLD
32	East	Broward	PALM AIRE	703633	EOC	6000 NW 21ST AVE #FIRE STATION 53 & EOC
33	East	Broward	FASHION	704463	Community Project	N FEDERAL HWY
34	East	Broward	SPRINGTREE	704664	Fire	7801 NW 50TH ST
35	East	Broward	JACARANDA	705164	Police	451 NW 70TH TER # POL
36	East	Broward	PHOENIX	705464	Police	7515 NW 88TH AVE #BROWARD SHERIFF
37	East	Broward	PHOENIX	705468	EOC	2801 CORAL SPRINGS DR # POLICE/FIRE
38	East	Broward	CHAPEL	706964	EOC	6057 SW 198TH TER # FIRE STATION 101
39	East	Broward	HUNTINGTON	708163	911 Facility	14801 SW 27TH ST #FIRE STATION
40	East	Broward	BRONCO	709731	WTP	7351 SW 30TH ST #WTP
41	East	Palm Beach	BOCA RATON	400733	Police	100 NW 2 AVE #POLICE STA
42	East	Palm Beach	BELLE GLADE	400932	WTP	39700 HOOKER HWY # LRWTP
43	East	Palm Beach	JUPITER	401835	Community Project	CENTER ST
44	East	Palm Beach	JUPITER	401838	WTP	17403 CENTRAL BLVD # WTRPLT
45	East	Palm Beach	SOUTH BAY	403633	WTP	950 US HIGHWAY 27 N # N WATER PLANT
46	East	Palm Beach	BOCA TEECA	404233	Police	3614 S OCEAN BLVD #WTP/PD/EOC/FD
47	East	Palm Beach	HILLSBORO	404739	Police	928 E HILLSBORO BLVD # FIRE
48	East	Palm Beach	GERMANTOWN	404839	WTP	200 SW 6TH ST # WTR TRMT PLT
49	East	Palm Beach	DELTRAIL	405864	WTP	13026 JOG RD # WTP3SROC
50	East	Palm Beach	JOG	407234	WTP	1500 JOG RD #WTP 8
51	East	Palm Beach	QUANTUM	407931	EOC	2080 HIGH RIDGE RD #STATION 5
52	East	Palm Beach	CATCHMENT	409762	FPL	4325 HAVERHILL RD N #WEC1
53	East	Palm Beach	EVERNIA	411861	WTP	1009 BANYAN BLVD # WATER PLANT
54	North	Baker	MACCLENNY	300963	WTP	307 W OHIO AVE #NEW
55	North	Brevard	COCOA BEACH	200735	Community Project	A1A
56	North	Brevard	MIMS	202231	WTP	2260 HIGH CT # HIGH CT WTP
57	North	Brevard	SARNO	205631	WTP	6055 LAKE WASHINGTON RD #WTP
58	North	Brevard	WYOMING	207361	WTP	250 OSMOSIS DR SE # WATER PLNT B
59	North	Brevard	VIERA	209762	Acute Care	8745 N WICKHAM RD # CEP VIERA HOSPITAL
60	North	Indian River	WABASSO	400663	WTP	7751 58TH AVE # NORTH COUNTY WTP HOBART
61	North	Indian River	OSLO	402932	WTP	1550 9TH ST SW # SCRO
62	North	Martin	OLYMPIA	401762	WTP	9650 SE WATER ST #WTR PLNT
63	North	Putnam	CRESCENT CITY	100632	WTP	105 CYPRESS AVE #WATER PLNT
64	North	Putnam	HUDSON	101634	WTP	320 N MOODY RD #PLANT
65	North	Putnam	COMO	105132	WTP	108 CITRUS CIR # WATER PLANT
66	North	St Johns	MATANZAS	102532	Community Project	A1A
67	North	St Johns	KACIE	104731	WTP	2160 WATER PLANT RD #WTP
68	North	St Johns	GERONA	105236	WTP	860 W 16TH ST # WATERPLANT
69	North	St Lucie	TURNPIKE	406162	EOC	2195 SE AIROSO BLVD #COMUNTYCNTR
70	North	St Lucie	PLAZA	410161	WTP	1001 SE PRINEVILLE ST # LIME WTP
71	North	St Lucie	PEACOCK	411661	WTP	7599 LTC PKWY # JEA WTP - BUS 2
72	North	Volusia	SOUTH DAYTONA	100936	Police	1672 S RIDGEWOOD AVE # POLICE CITY HALL
73	North	Volusia	GENERAL ELECTRIC	101537	FPL	1025 WILLIAMSON BLVD
74	North	Volusia	EDGEWATER	101935	WTP	3315 STATE ROAD 442 # THOMAS WATER PL
75	North	Volusia	BULOW	102032	Community Project	JOHN ANDERSON DR
76	North	Volusia	WILLOW	103831	WTP	4400 WELLFIELD DR # GARNSEYWTP
77	North	Volusia	TOMOKA	106063	WTP	35 BREAKAWAY TRL # WTR PLNT
78	West	Charlotte	CLEVELAND	504431	WTP	38100 WASHINGTON LOOP RD
79	West	Charlotte	DEEPCREEK	506364	WTP	8998 SW COUNTY ROAD 769 # NEW WTR PLNT
80	West	De Soto	CARLSTROM	505961	Community Project	SW HIGHWAY 17
81	West	Henry	LABELLE	502461	911 Facility	9045 SE RAINTREE BLVD
82	West	Lee	ORTIZ	503864	WTP	2751 JACKSONVILLE ST #WATER PLNT
83	West	Lee	ORTIZ	503865	EOC	2665 ORTIZ AVE # EOC
84	West	Lee	WINKLER	505464	EOC	4000 VERONICA "S" SHOEMAKER BLVD # FS 6
85	West	Lee	CORKSCREW	507466	Police	10501 FGCU BLVD S #CAMPUS SUPPORT/POLICE
86	West	Manatee	WALKER	506036	Community Project	14TH ST (US HWY 41)
87	West	Manatee	WOODS	506963	WTP	5490 53RD AVE E # WARD LK PMP
88	West	Manatee	RYE	508262	WTP	17915 WATERLINE RD # SV13160
89	West	Sarasota	VENICE	500334	WTP	200 WARFIELD AVE # RO
90	West	Sarasota	COCOPLUM	503262	WTP	5655 NORTH PORT BLVD # NPWTP
91	West	Sarasota	AUBURN	505764	WTP	1255 MABRY CARLTON PKWY # PLNT

2013 '01 Switches

Region	County	Substation	Feeder
DADE	Miami-Dade	MIAMI BEACH	800232
DADE	Miami-Dade	CUTLER	802031
DADE	Miami-Dade	CUTLER	802032
EAST	Broward	OAKLAND PARK	700433
EAST	Palm Beach	BELLE GLADE	400931
EAST	Palm Beach	HILLSBORO	404731
NORTH	Putnam	PALATKA	100431
NORTH	Putnam	PALATKA	100432
NORTH	Putnam	CRESCENT CITY	100631
WEST	Collier	NAPLES	501231
WEST	Manatee	CORTEZ	500631
WEST	Sarasota	ENGLEWOOD	500761

2013 Highway Crossings

Region	County	Substation	Feeder	Highway
Dade	Miami-Dade	FULFORD	801431	I-95
East	Broward	CULLUM	707134	Sawgrass
North	Columbia	NASH	LAT 306133	I-75

2013 Hardening Projects

**Distribution Engineering Reference Manual
(DERM)**

Section 4 – Overhead Line Design

ADDENDUM FOR EXTREME WIND LOADING



Distribution Engineering Reference Manual

FPL

Section 4 – Overhead Line Design

(REV. March 1, 2013)

Distribution Engineering Reference Manual (DERM)

Section 4 – Overhead Line Design

**ADDENDUM FOR EXTREME
WIND LOADING**



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ADDENDUM FOR EXTREME WIND LOADING

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Storm Secure**Distribution Overhead Line Design for Extreme Wind Loading****ADDENDUM TO**
DISTRIBUTION ENGINEERING REFERENCE MANUAL (DERM)**Introduction**

In 2006, FPL introduced the concept of "STORM SECURE". One part of this concept is to harden the electrical system by adopting new standards based on extreme wind velocity criteria. The Florida Public Service Commission and the Florida Administrative Code have adopted the 2007 NESC for the applicable standard of construction.

FPL designs its distribution facilities based on the loading as specified in the 2007 National Electrical Safety Code (NESC) using Grade B Construction. The NESC specifies three weather conditions to consider for calculating loads:

- Rule 250 B. Combined ice and wind loading (FPL standard construction prior to 2007)
- Rule 250 C. Extreme wind loading (FPL current standard construction)
- Rule 250 D. Extreme ice with concurrent wind loading (this is a new loading condition in the 2007 NESC that will not impact FPL).

Prior to the hardening effort, FPL has been designing overhead distribution using the loads calculated under Rule 250 B. This addendum provides the designers the information needed to design projects using Rule 250 C, grade B (extreme wind loading) to calculate the loads, when it is determined that the particular pole line is to be designed to meet extreme wind loading (EWL) requirements. The NESC extreme wind map identifies 7 Basic Wind Speeds throughout Florida. In order to minimize the design effort to accommodate these 7 wind speeds, FPL has created 3 wind regions with designated wind speeds of 105 mph, 130 mph, and 145 mph. The Map shown in Figure 4.2.2-1 identifies the counties within our service territory that fall into the 3 wind regions. Whenever extreme wind designs are deployed, they will be designed to the identified wind speed for the location of the work to be done.



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4.2.2 Poles Structures and Guying

A. Poles, General Information

1. Pole Brands

The pole brand includes the pole length & class, the type of treatment, the manufacturer, the date the pole was manufactured and FPL.

Wood Poles – This brand is located at 15' from the bottom of the pole.

Square (cast) Concrete poles – the brand up until 2007 was located 15' from the bottom. New specifications now require the brand to be at 20' from the bottom of the pole.

Distribution Spun Concrete poles – The brand information is on a metal tag that is located 20' from the bottom of the pole.

2. Design Specifications

The NESC specifies 3 Grades of construction: Grade B, Grade C, and Grade N with Grade B being the strongest of the three. These grades of construction are the basis for the required strengths for safety. FPL uses Grade B Construction for all distribution facilities. This means that the calculated loads must be multiplied by "Load Factors" and the calculated or specified strength of structures must be multiplied by "Strength Factors". The Strength multiplied by the Strength Factor (SF) must be equal to, or greater than the Load multiplied by the Load Factor (LF).

Equation 4.2.2-1

$$\text{Strength} \times \text{Strength Factor} \geq \text{Load} \times \text{Load Factor}$$

Table 4.2.2 – 1 below lists the Load Factors and Strength Factors for Grade B Construction from NESC Table 253-1 and Table 261-1A.

Table 4.2.2 - 1 Extreme Wind
Strength Factors & Load Factors

Strength of	Strength Factor
Wood Poles	0.75
Concrete Poles	1.00
Composite Poles	1.00
Support Hardware	1.00
Guy Wire	0.90
Guy Anchor and Foundation	1.00
	Load Factor
Extreme Wind Loads	1.00

FPL uses the NESC Extreme Wind Loading for its design criteria. As such, identify the wind speed for the job location and determine the load based on the following formula.

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Equation 4.2.2-2

$$\text{Load in pounds} = 0.00256 \times (V_{mph})^2 \times k_z \times G_{RF} \times I \times C_f \times A(\text{ft}^2)$$

Where,

0.00256 - Velocity-Pressure Numerical Coefficient

V -Velocity of wind in miles per hour (3 second gust)

 k_z -Velocity Pressure Exposure Coefficient G_{RF} -Gust Response Factor

I -Importance Factor, 1.0 for utility structures and their supported facilities.

 C_f - Force Coefficient (Shape Factor)
For Wood & Spun Concrete Poles = 1.0
For Square Concrete Poles = 1.6A - Projected Wind Area, ft^2 .

The NESC provides formulas for calculating k_z and G_{RF} . However, Tables are also provided and Table 4.2.2-2 below shows the values needed for most distribution structures.

Table 4.2.2-2 Velocity pressure Exposure coefficient (k_z)
and Gust Response Factors (G_{RF})

Height (h)	Structure		Equipment		Wire		
	k_z^1	G_{RF}^4	k_z^2	G_{RF}^5	k_z^3	G_{RF}^4 ($L \leq 250$ ft)	G_{RF}^4 ($250 < L \leq 500$ ft)
≤ 33	0.9	1.02	1.0	1.02	1.0	0.93	0.86
>33 to 50	1	0.97	1.1	0.97	1.1	0.88	0.82
>50 to 80	1.1	0.93	1.2	0.93	1.2	0.86	0.80

1. h for the pole k_z is to be the height of the pole above ground
2. h for the equipment k_z is the height of the center of the area of the equipment above ground
3. h for the wire k_z is the height of the wire above ground
4. h for the G_{RF} is the height above ground for the structure and the wire
5. h for the G_{RF} for the equipment is based on the height of the structure above ground
6. L = design wind span (average of span on both sides of structure)

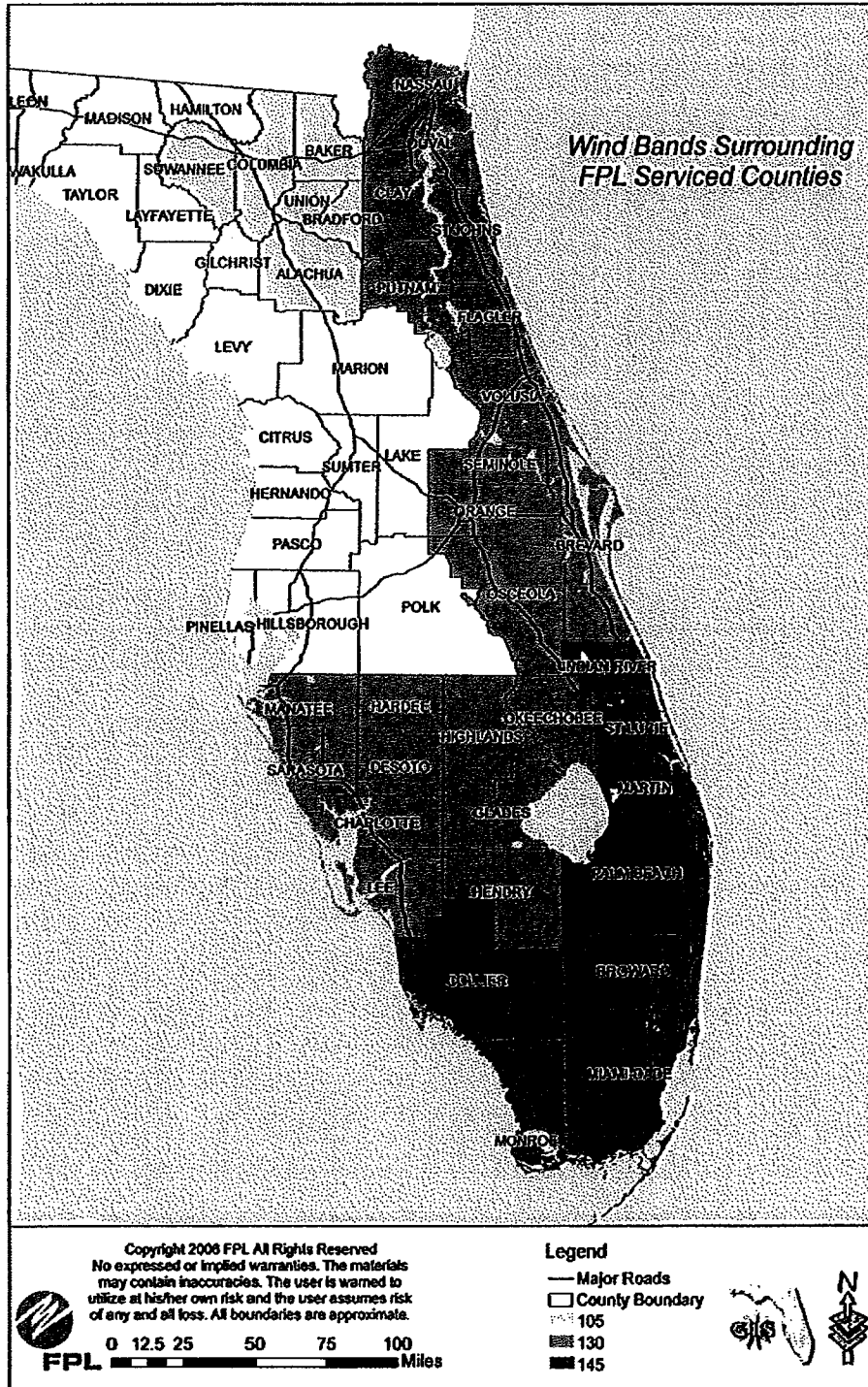
The wind speeds to be used are shown in Figure 4.2.2 – 1



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ADDENDUM FOR EXTREME WIND LOADING

Figure 4.2.2 –1 Wind Regions by County





3. *Wood Pole Strength*

The strength of wood poles is specified in the American National Standard – ANSI O5.1-2002. In addition to strength of wood poles, this standard specifies dimensions, shape, sweep spiral grain, knots, and many other characteristics of wood poles.

A change from previous calculations shown in the DERM for allowable pole strength is that the circumference to be used is now considered to be the ground line circumference rather than the “fixity” point circumference. Another change is the strength factor to be used. For extreme wind the strength factor for wood poles is 0.75 (see Table 4.2.2-1)

Example 4.2.2-1:

Determine the pole strength for wind loading on a 45’/2 wood pole that is set 7 feet.

$$\text{Equation 4.2.2-3} \quad M_r = 0.000264fC^3$$

Where

M_r	=	Moment (ultimate or long term bowing) measured in foot-pounds
f	=	Fiber Stress (8000 or 1000 psi for Southern Yellow Pine)
C	=	Circumference at ground Line

From Table G (DERM 4.2.2) circumference at Ground line = 40.1 inches

$$M_r = 0.000264 \times (8,000) \times (40.1)^3 = 136,184 \text{ ft.-lbs.}$$

This is the strength for the 45’/2 wood pole. However for design, apply the NESC Strength Factor of 0.75.

The strength of the 45’/2 wood pole = $136,184 \times 0.75 = 102,138 \text{ ft.-lbs.}$

4. *Concrete Pole Strength*

The strength of concrete poles is based on the application of a designated load at a specified location on the pole. This load is measured in KIPS = 1,000 pounds per KIP. A 5 KIP pole is rated based on applying 5,000 pounds of load at two feet below the top of the pole. Most distribution poles are rated by applying the load at two feet down from the top. However, for the type “O”, “S”, and “SU” poles, this load is applied at one

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ADDENDUM FOR EXTREME WIND LOADING

foot down from the top. Like wood poles, concrete poles have a continuous rating (loads that are always on the pole) and a temporary rating (wind loads that come and go). Spun concrete poles (unlike other FPL distribution concrete poles) are designated by their KIP rating rather than a type (i.e., O, S, SU, III, III-G, III-H). Table 4.2.2-3 List the ratings (in KIPS) for the various concrete poles.

Pole Type	Temporary Rating	Continuous Rating
O	0.85	0.26
S & SU	0.90	0.30
III	1.30	0.56
III-A	1.30	0.60
III-G	2.40	0.90
III-H 6 KIP	4.20	1.20
III-H 8 KIP	6.00	2.40
12 KIP Square	8.40	4.20
Spun Concrete		
4.0 KIP	NO LONGER USED	
4.7 KIP	4.70	1.73
5.0 KIP	NO LONGER USED	
6.0 KIP	4.50	1.70
8.0 KIP	6.15	3.1

To calculate the strength of the pole uses the following:

For O, S, SU,

$$M_r = \text{Rating (Table 4.2.2-3)} \times (\text{Pole Length} - \text{setting depth} - 1 \text{ foot})$$

Example: 35' Type SU for extreme wind loading

$$M_r = 0.9 \text{ KIPS} \times (35 - 7.5 - 1) = 23,850 \text{ ft-lbs}$$

For III, III-A, III-G, III-H

$$M_r = \text{Rating (Table 4.2.2-3)} \times (\text{Pole Length} - \text{setting depth} - 2 \text{ feet})$$

Example: 50' Type III-H (6 KIP) for extreme wind loading

$$M_r = 4.2 \text{ KIPS} \times (50 - 11.5 - 2) = 153,300 \text{ ft-lbs}$$

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ADDENDUM FOR EXTREME WIND LOADING

For Spun Concrete

$$M_r = \text{Rating (Table 4.2.2-3)} \times (\text{Pole Length} - \text{setting depth} - 2 \text{ feet})$$

Example: 50' 4.7 KIP for extreme wind loading

$$M_r = 4.7 \text{ KIPS} \times (50 - 11 - 2) = 173,900 \text{ ft-lbs}$$

For pre-stressed concrete poles, the NESC extreme wind strength factor = 1.0. The values calculated above will be the correct strength for concrete poles.

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ADDENDUM FOR EXTREME WIND LOADING

B. Wind Loading**1. Wind Loading on poles.**

To calculate the wind load on the pole (see DERM 4.2.2 C3.a):

- a. Calculate the area of the pole exposed to the wind

$$\text{Equation 4.2.2-4} \quad A = H_1 \left(\frac{a+b}{2} \right) \left(\frac{1}{12} \right)$$

A = projected area above ground line in square feet.
 H_1 = the pole's height above the ground line in feet.

For wood and spun concrete poles,

a = diameter at top of pole in inches.

b = diameter of pole at ground line in inches.

For square concrete poles, dimensions a and b are the widths of one face at top and ground line respectively.

- b. Calculate the center of the area.

$$\text{Equation 4.2.2-5} \quad H_{CA} = \frac{H_1(b+2a)}{3(b+a)}$$

H_{CA} is used to calculate the ground line moment due to the wind force.

- c. Calculate the wind force acting on the area (see Equation 4.2.2-2 with explanation of terms)

$$\text{Load in pounds} = 0.00256 \cdot (V_{\text{mph}})^2 \cdot k_z \cdot G_{RF} \cdot I \cdot C_f \cdot A(\text{ft}^2)$$

Example Calculation for Wood Pole

Pole Length/Class = 45'/2

Setting depth = 7' (from DCS D-3.0)

Wind Region = 145 mph

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ADDENDUM FOR EXTREME WIND LOADING

$$\text{Projected Area } A = H_1(\text{ft.}) \times \frac{1 \text{ ft}}{12 \text{ in}} \times \left[\frac{a + b(\text{inches})}{2} \right]$$

From Table G, Page 71, the circumference at the top of a 45' / 2 pole is 25",

$$a = \frac{25''}{\pi} = 7.96''$$

The circumference at 38 ft. below the pole top 40.1", $b = \frac{40.1''}{\pi} = 12.76''$

$$A = \frac{38}{12} \times \left[\frac{7.96 + 12.76}{2} \right] = 32.81 \text{ sq. ft.}$$

$$\text{Height of center of area, } H_{CA} = \frac{H_1(b+2a)}{3(b+a)} = \frac{38(12.76+15.92)}{3(12.76+7.96)}$$

$$H_{CA} = \text{Moment Arm} = 17.53 \text{ ft.}$$

Wind Load on Pole =

$$0.00256 \times (145)^2 \times 1.0 \times 0.97 \times 1.0 \times 1.0 \times 32.81 = 1713 \text{ lbs}$$

Where:

$$k_z \text{ is based on } h = 38'; \quad k_z = 1.0$$

$$G_{RF} \text{ is based on } h = 38'; \quad G_{RF} = 0.97$$

$$C_f = 1.0 \text{ for wood and spun concrete poles}$$

$$C_f = 1.6 \text{ for square concrete poles}$$

This load must then be multiplied by the Load Factor, which for extreme wind equals 1.0 and the moment arm to obtain the Ground Line Moment (M_P) of the wind acting on the pole only.

Equation 4.2.2-6

$$M_P = \text{Wind Load} \times \text{Load Factor} \times \text{Moment Arm.}$$

$$M_P = 1713 \text{ lbs} \times 1 \times 17.53 \text{ ft.} = 30,030 \text{ ft. lbs.}$$

The strength of this pole, previously calculated is 102,138 ft.-lbs. The pole itself has used up 29% (30,030/102,138) of its capacity for 145 mph extreme wind. Subtracting the wind load from the strength leaves 72,108 ft.-lbs (102,138 - 30,030) for conductors and other attachments.

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Engineering**ADDENDUM FOR EXTREME WIND LOADING**Example Calculation for Square Concrete Pole

Pole Length/Class = 50'/III-H
 Setting depth = 11.5' (from DCS D-3.0)
 Wind Region = 145 mph

$$\text{Projected Area, } A = H_1(\text{ft.}) \times \frac{1 \text{ ft}}{12 \text{ in}} \times \left[\frac{a + b(\text{inches})}{2} \right]$$

From Table H, the width of the pole at the top $a = 9.00''$
 The width at ground line, $b = 15.24''$

$$A = \frac{38.5}{12} \times \left[\frac{15.24 + 9.00}{2} \right] = 38.89 \text{ sq. ft.}$$

$$\text{Height of center of area, } H_{CA} = \frac{H_1(b+2a)}{3(b+a)} = \frac{38.5(15.24+18.00)}{3(15.24+9.00)}$$

$$H_{CA} = \text{Moment Arm} = 17.6 \text{ ft.}$$

Wind Load on Pole =

$$0.00256 \times (145)^2 \times 1.0 \times 0.97 \times 1.0 \times 1.6 \times 38.89 = \mathbf{3248 \text{ lbs}}$$

Where:

k_z is based on $h = 38.5'$; $k_z = 1.0$

G_{RF} is based on $h = 38.5'$; $G_{RF} = 0.97$

$C_f = 1.0$ for wood and spun concrete poles

$C_f = 1.6$ for square concrete poles

This load must then be multiplied by the Load Factor, which for extreme wind equals 1.0 and the moment arm to obtain the Ground Line Moment (M_P) of the wind acting on the pole only.

$$M_P = \text{Wind Load} \times \text{Load Factor} \times \text{Moment Arm.}$$

$$M_P = 3248 \text{ lbs} \times 1 \times 17.6 \text{ ft.} = 57,163 \text{ ft. lbs.}$$

The strength of this pole, previously calculated is 153,300 ft.-lbs. The pole itself has used up 37% (57,163/153,300) of its capacity for 145 mph extreme wind. Subtracting the wind load from the strength leaves 96,137 ft.-lbs (153,300 – 57,163) for conductors and other attachments.

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Pole Length/Class = 50'/4.7 KIP
 Setting depth = 11' (from DCS D-3.0)
 Wind Region = 145 mph

$$\text{Projected Area, } A = H_1 (\text{ft.}) \times \frac{1 \text{ ft}}{12 \text{ inc.}} \times \left[\frac{a + b (\text{inches})}{2} \right]$$

From Table H, the diameter of the pole at the top $a = 9.55''$
 The diameter at ground line, $b = 16.57''$

$$\text{So } A = \frac{39}{12} \times \left[\frac{9.55 + 16.57}{2} \right] = 42.45 \text{ sq. ft.}$$

$$\text{Height of center of area, } H_{CA} = \frac{H_1 (b + 2a)}{3(b + a)} = \frac{39(16.57 + 19.1)}{3(16.57 + 9.55)}$$

$$H_{CA} = \text{Moment Arm} = 17.75 \text{ ft.}$$

Wind Load on Pole =

$$0.00256 \times (145)^2 \times 1.0 \times 0.97 \times 1.0 \times 1.0 \times 42.45 = 2,216 \text{ lbs}$$

Where:

k_z is based on $h = 39'$; $k_z = 1.0$

G_{RF} is based on $h = 39'$; $G_{RF} = 0.97$

$C_f = 1.0$ for wood and spun concrete poles

$C_f = 1.6$ for square concrete poles

This load must then be multiplied by the Load Factor, which for extreme wind equals 1.0 and the moment arm to obtain the Ground Line Moment (M_p) of the wind acting on the pole only.

$M_p = \text{Wind Load} \times \text{Load Factor} \times \text{Moment Arm.}$

$$M_p = 2,216 \text{ lbs} \times 1 \times 17.75 \text{ ft.} = 39,341 \text{ ft. lbs.}$$

The strength of this pole, previously calculated is 173,900 ft.-lbs. The pole itself has used up 23% ($39,341/173,900$) of its capacity for 145 mph extreme wind. Subtract the wind load from the strength leaves 134,559 ft.-lbs ($173,900 - 39,341$) for conductors and other attachments.

Table 4.2.2-4 Lists the allowable groundline moments for various pole sizes.



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Table 4.2.2-4 Allowable Ground Line Moments

Wood Poles (in earth)				
Pole Size	Setting Depth	Allowable Moment for Attachments at Designated Wind Speeds		
		105 mph	130 mph	145 mph
35/5	6	32178	28738	26324
35/4	6	42429	38656	36007
40/5	6.5	36936	31956	28460
40/4	6.5	48263	42812	38986
40/3	6.5	61567	55646	51489
40/2	6.5	76998	70607	66119
45/3	7	66363	58624	53190
45/2	7	86391	78000	72108
50/2	7	93535	82611	74941
55/2	7.5	99693	86174	76682
60/1	8	131634	113020	99951



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Table 4.2.2-4 Allowable Ground Line Moments (cont.)

Square Concrete Poles (In earth)				
Pole Size	Setting Depth	Allowable Moment for Attachments at Designated Wind Speeds		
		105 mph	130 mph	145 mph
35/Type O	7	15426	11417	8602
35/SU	7.5	15323	10778	7588
35/III-G	9	48907	44275	41022
40/II-A	10	23777	17050	12327
40/II-G	9	56781	49950	45154
40/II-H (6 KIP)	11.5	96450	88537	82981
40/II-H (8 KIP)	11.5	144214	136334	130802
40/12 KIP	13	191480	181610	174681
45/II-A	10	24142	14146	7127
45/II-G	9	62676	52592	45511
45/II-H (6 KIP)	11.5	110053	98198	89874
45/II-H (8 KIP)	11.5	166860	155062	146779
45/12 KIP	13.5	222175	208520	198933
50/II-A	10	24111	10635	1173
50/II-G	9.5	67701	54539	45297
50/II-H (6 KIP)	11.5	123164	107106	95831
50/II-H (8 KIP)	11.5	189028	173056	161842
50/12 KIP	13.5	252789	233067	219219
55/II-G	9.5	72176	55004	42947
55/II-H (6 KIP)	12	133764	113283	98902
55/II-H (8 KIP)	12	207792	187431	173135
55/12 KIP	14	280155	254873	237121
60/II-H (6 KIP)	12	144138	117993	99637
60/II-H (8 KIP)	12	227254	201278	183040
60/12 KIP	14	308835	276454	253719
65/II-H (6 KIP)	12	149613	115197	91032
65/II-H (8 KIP)	12	241862	207685	183688

Spun Concrete Poles (in earth)				
Pole Size	Setting Depth	Allowable Moment for Attachments at Designated Wind Speeds		
		105 mph	130 mph	145 mph
50/4.7 KIP	11	153270	142277	134559
55/4.7 KIP	12	167116	153482	143910
60/5.0 KIP	12.5	190953	171477	157803
65/5.0 KIP	13	202928	177845	160233
70/5.0 KIP	13.5	214369	183392	161642
50/6.0 KIP	11	199372	190380	182659
55/6.0 KIP	12	219049	204678	194604
55/8.0 KIP	12	301049	286688	276605
75/8.0 KIP	13.5	405684	368209	341911



ADDENDUM FOR EXTREME WIND LOADING

2. Wind Loading on conductors.

The wind loading on conductors is calculated in a similar method to the wind loading on the pole. The load in pounds per conductor uses Equation 4.2.2-2 with the appropriate factors for the attachment heights as shown in Table 4.2.2-2.

To calculate the wind load on the conductor:

- a. Determine the wind region (105 mph, 130 mph, or 145 mph)
- b. Calculate the attachment height to determine the k_z and G_{RF} (Table 4.2.2-2)
- c. The Importance Factor (I) and the Force Coefficient (C_f) are both equal to 1 for conductors.
- d. Calculate the area per foot of conductor
- e. Calculate the wind load per foot of conductor
- f. Calculate the total wind load on the conductor for the length of conductor exposed to the wind (Average of the Spans on either side of the pole).

Example:

Determine the wind load on a 170 foot length $[(180'\text{span} + 160'\text{span})/2]$ of 568.3 ACAR conductor that is attached at 30 feet above the ground in the 145 mph wind region.

From Table 4.2.2-2:

$$K_z = 1.0$$

$$G_{RF} = 0.93$$

Calculate the area per foot of conductor

Diameter = 0.879 inches (ref DCS F-7.0.0)

For a 1 foot length of conductor:

Projected Area.

$$A = 1(\text{ft.}) \times \left[\frac{\text{Conductor Diameter}(\text{inches})}{12(\text{inches} / \text{ft})} \right]$$

$$A = 1(\text{ft.}) \times \left[\frac{0.879(\text{inches})}{12(\text{inches} / \text{ft})} \right]$$

$A = 0.073$ Square Ft. for each foot of span length

The wind load in pounds per foot of span length (from Equation 4.2.2-2) is

$$\text{Load in pounds} = 0.00256 \times (V_{\text{mph}})^2 \times k_z \times G_{RF} \times I \times C_f \times A(\text{ft}^2)$$

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$$\begin{aligned}\text{Load in pounds} &= 0.00256 \times (145)^2 \times 1 \times .93 \times 1 \times 1 \times .073 \\ \text{Load} &= 3.667 \text{ pounds per foot}\end{aligned}$$

$$\begin{aligned}\text{Total Load} &= \text{Length of conductor} \times \text{Load per foot of conductor} \\ &= 170 \times 3.667 \\ \text{Total Load} &= 623.3 \text{ pounds}\end{aligned}$$

This is the load that the wind exerts on the conductor attached at 30 above ground. This load will have to be applied to the pole to determine if the pole has the strength to support the load.

The wind load per foot of conductor for the three wind regions can be found in Table 4.2.2-5, Table 4.2.2- 6 and Table 4.2.2-7.

3. Wind Loading on equipment.

The wind loading on equipment is calculated in a similar method to the wind loading on the pole and the conductors. The load in pounds uses Equation 4.2.2-2 with the appropriate factors for the attachment heights as shown in Table 4.2.2-2 and the area of the equipment.

To calculate the wind load on the equipment:

- a. Determine the wind region (105 mph, 130 mph, or 145 mph)
- b. Calculate the attachment height to determine the k_z (Table 4.2.2-2) (For equipment, use the top mounting hole of the equipment bracket.)
- c. Use the height of the pole above ground to determine G_{RF} (Table 4.2.2-2)
- d. The Importance Factor (I) is equal to 1.
- e. The Force Coefficient (C_f) is equal to 1.0 for cylindrical equipment and 1.6 for rectangular equipment.
- f. Calculate the area of the equipment
- g. Calculate the wind load on the equipment

Example:

Determine the wind load on a 50 kVA transformer mounted at 28 feet on a pole that is 38 feet above the ground in the 145 mph wind region.

From Table 4.2.2-2:

$$\begin{aligned}K_z &= 1.0 \text{ (Equipment } \leq 33' \text{ above ground)} \\ G_{RF} &= 0.97 \text{ (Equipment based on Pole height } > 33' \text{ to } 50' \text{ above ground)} \\ C_f &= 1.0 \\ A &= 4.44 \text{ square feet}\end{aligned}$$



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The wind load in pounds from Equation 4.2.2-2 is

$$\text{Load in pounds} = 0.00256 \times (V_{\text{mph}})^2 \times k_z \times G_{RF} \times I \times C_f \times A(\text{ft}^2)$$

$$\begin{aligned} \text{Load in pounds} &= 0.00256 \times (145)^2 \times 1 \times .97 \times 1 \times 1 \times 4.44 \\ \text{Load} &= 231.8 \text{ pounds} \end{aligned}$$

This is the load that the wind exerts on the transformer attached at 28 feet above ground. This load will have to be applied to the pole to determine if the pole has the strength to support the load.

The wind load on equipment for the three wind regions can be found in Table 4.2.2-5 (105 mph), Table 4.2.2- 6 (130 mph) and Table 4.2.2-7 (145 mph).



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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-5 Wind Force on Conductors & Equipment

**Wind Speed = 105 mph
CONDUCTORS**

Conductor	Diameter	Force in pounds per foot Conductor Height Above Ground		
		≤33'	>33' to 50'	>50' to 80'
568.3 MCM ACAR	0.879	1.923	2.001	2.134
3/0 AAAC	0.502	1.098	1.143	1.218
1/0 AAAC	0.398	0.871	0.906	0.966
#4 AAAC	0.250	0.547	0.569	0.607
3/0 TPX	1.238	2.708	2.819	3.005
1/0 TPX	1.026	2.244	2.336	2.490
6 DPX	0.496	1.085	1.129	1.204
CATV				
Feeder w/1/4"Msgnr	0.750	1.641	1.708	1.820
Trunk w/1/4"Msgnr	1.000	2.187	2.277	2.427
Telephone				
100 pr (24 GA BKMS) Self-Support	0.960	2.100	2.186	2.330
600 pr (24 GA BKMA w/3/8" Msgnr	2.295	5.020	5.225	5.571

**Wind Speed = 105 mph
EQUIPMENT**

Transformers	Sq. Ft.	Pole Height in same range as Equipment Force in pounds at top mounting Bolt Height Above Ground			Pole height >33' to 50' Equipment Ht ≤33'
		≤33'	>33' to 50'	>50' to 80'	
25	3.75	108.0	112.9	118.1	102.7
50	4.44	127.8	133.7	139.9	121.6
75	4.81	138.5	144.9	151.5	131.7
100	6.55	188.6	197.3	206.3	179.3
167	10.83	311.8	326.1	341.1	296.5
Capacitors					
Switched (1)	19.91	573.2	599.6	627.1	545.1
Fixed (1)	16.89	486.2	508.6	532.0	462.4
Reclosers					
1 phase	4.00	115.2	120.5	126.0	109.5
3 phase (1)	16.89	486.2	508.6	532.0	462.4
Automation Switches					
Joslyn	8.89	255.9	267.7	280.0	243.4
Cooper	10.56	304.0	318.0	332.6	289.1
S&C	15.60	449.1	469.8	491.4	427.1
Riser - PVC U-Guard		Force in pounds per foot of riser Height Above Ground			
2" U-Guard	0.19	5.4	5.6	5.9	5.1
5" U-Guard	0.46	12.8	13.8	14.4	13.2

(1) The 1.6 C_r factor for rectangular shape is included in the Area shown for Capacitors and 3 Phase Recloser



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Table 4.2.2-6 Wind Force on Conductors & Equipment

**Wind Speed = 130 mph
CONDUCTORS**

Conductor	Diameter	Force in pounds per foot Conductor Height Above Ground		
		≤33'	>33' to 50'	>50' to 80'
568.3 MCM ACAR	0.879	2.947	3.068	3.270
3/0 AAAC	0.502	1.683	1.752	1.868
1/0 AAAC	0.398	1.334	1.389	1.481
#4 AAAC	0.250	0.838	0.872	0.930
3/0 TPX	1.238	4.151	4.321	4.606
1/0 TPX	1.026	3.440	3.581	3.817
6 DPX	0.496	1.663	1.731	1.845
CATV				
Feeder w/1/4"Msgnr	0.750	2.515	2.617	2.791
Trunk w/1/4"Msgnr	1.000	3.353	3.490	3.721
Telephone				
100 pr (24 GA BKMS) Self-Support	0.960	3.219	3.350	3.572
600 pr (24 GA BKMA w/3/8" Msgnr	2.295	7.695	8.009	8.539

**Wind Speed = 130 mph
EQUIPMENT**

Transformers	Sq. Ft.	Pole Height in same range as Equipment Force in pounds at top mounting Bolt Height Above Ground			Pole height >33' to 50' Equipment Ht ≤33'
		≤33'	>33' to 50'	>50' to 80'	
25	3.75	165.5	173.1	181.1	157.4
50	4.44	195.9	205.0	214.4	186.3
75	4.81	212.3	222.0	232.2	201.9
100	6.55	289.0	302.4	316.3	274.9
167	10.83	477.9	499.9	522.9	454.5
Capacitors					
Switched (1)	19.91	878.6	919.1	961.3	835.5
Fixed (1)	16.89	745.3	779.7	815.5	708.8
Reclosers					
1 phase	4.00	176.5	184.7	193.1	167.9
3 phase (1)	16.89	745.3	779.7	815.5	708.8
Automation Switches					
Joslyn	8.89	392.3	410.4	429.2	373.1
Cooper	10.56	466.0	487.5	509.9	443.2
S&C	15.60	688.4	720.1	753.2	654.7
Riser - PVC U-Guard					
		Force in pounds per foot of riser Height Above Ground			
2" U-Guard	0.19	8.3	8.7	9.1	7.9
5" U-Guard	0.46	20.2	21.2	22.1	19.2

(1) The 1.6 C_r factor for rectangular shape is included in the Area shown for Capacitors and 3 Phase Recloser



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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-7 Wind Force on Conductors & Equipment

Wind Speed = 145 mph
CONDUCTORS

Conductor	Diameter	Force in pounds per foot Conductor Height Above Ground		
		≤33'	>33' to 50'	>50' to 80'
568.3 MCM ACAR	0.879	3.687	3.816	4.069
3/0 AAAC	0.502	2.094	2.180	2.324
1/0 AAAC	0.398	1.660	1.728	1.842
#4 AAAC	0.250	1.043	1.085	1.157
3/0 TPX	1.238	5.164	5.375	5.731
1/0 TPX	1.026	4.280	4.455	4.749
6 DPX	0.496	2.069	2.154	2.296
CATV				
Feeder w/1/4"Msgnr	0.750	3.129	3.256	3.472
Trunk w/1/4"Msgnr	1.000	4.171	4.342	4.629
Telephone				
100 pr (24 GA BKMS) Self-Support	0.960	4.005	4.168	4.444
600 pr (24 GA BKMA w/3/8" Msgnr)	2.295	9.573	9.964	10.623

Wind Speed = 145 mph
EQUIPMENT

Transformers	Sq. Ft.	Pole Height in same range as Equipment Force in pounds at top mounting Bolt Height Above Ground			Pole height >33' to 50' Equipment Ht
		≤33'	>33' to 50'	>50' to 80'	
25	3.750	205.9	215.4	225.3	≤33'
50	4.440	243.8	255.0	266.7	195.8
75	4.810	264.1	276.2	288.9	231.8
100	6.550	359.6	376.2	393.4	251.1
167	10.830	594.6	622.0	650.5	342.0
Capacitors					
Switched (1)	19.910	1093.1	1143.4	1195.9	565.4
Fixed (1)	16.890	927.3	970.0	1014.5	1039.5
Reclosers					
1 phase	4.000	219.6	229.7	240.3	881.8
3 phase (1)	16.890	927.3	970.0	1014.5	208.8
Automation Switches					
Joslyn	8.890	488.1	510.6	534.0	464.1
Cooper	10.560	579.7	606.5	634.3	551.3
S&C	15.600	856.4	895.9	937.1	814.5
Riser - PVC U-Guard					
		Force in pounds per foot of riser Height Above Ground			
2" U-Guard	0.188	10.3	10.8	11.3	9.8
5" U-Guard	0.458	25.2	26.3	27.5	23.9

(1) The 1.6 C_r factor for rectangular shape is included in the Area shown for Capacitors and 3 Phase Recloser



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ADDENDUM FOR EXTREME WIND LOADING

The methodology to determine if a pole has the strength for a specific design or to determine the maximum span distance a specific size pole can support for framing, is the same as shown in the DERM 4.2.2 pages 12-15. The examples shown below show the calculations based on using the new tables for extreme wind loading. Note that the ground line is now the point used for the calculations rather than the "fixity" point.

Example:

Conductor: 3-568.3 MCM ACAR and #3/0 AAAC - Neutral

Framing: DCS page E-5.0.0 (Modified Vertical) and I-41.0.1 (for single phase transformer)

Transformer: 50 kVA

CATV: Trunk

Telephone: 1-600 pair, 24 gauge, BKMA

Average Span Length = 150 feet

Attachment heights must be calculated using the framing identified and the pole setting depths as shown in the Revised DCS page D-3.0.0



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ADDENDUM FOR EXTREME WIND LOADING

Case I: Determine if a 45'2 wood pole is strong enough for this design.

Calculate the moments on the pole.

CONDUCTORS		Number of	Wind Load	Avg.	Height		
	Conductors	x	Per Ft.	Span	Above	=	MOMENT (ft.-lb.)
			Table 4.2.2-7	Length	Ground		
Primary							
568	1	x	3.816	x 150	x 39	=	22324
568	1	x	3.816	x 150	x 36.6	=	20950
568	1	x	3.816	x 150	x 33.9	=	19404
Neut. Sec., St Lt							
3/0	1	x	2.094	x 150	x 28.8	=	9046
CATV - PROPOSED							
Trunk	1	x	4.171	x 150	x 25.4	=	15892
TELEPHONE							
600 pr 24 Ga BKMA	1	x	9.573	x 150	x 24.4	=	35037
TOTAL MOMENT DUE TO CONDUCTORS						=	122653
EQUIPMENT			Wind Load		Height		
			Force in lbs		Above	=	MOMENT (ft.-lb.)
					Ground		
TRANSFORMERS							
1 Phase	LE FOR INSTRUCTIONS)		231.8	x	29.9	=	6931
	50 KVA						
TOTAL MOMENT DUE TO EQUIPMENT						=	6931 ft.-lb.
TOTAL ALL MOMENTS						=	129,583 ft.-lb.

45'2 Wood Pole

From Table 4.2.2-4, the allowable moment for attachments to a 45'2 wood pole in a 145 mph wind region is 72,108 ft-lbs. A 45'2 wood pole cannot be used.



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ADDENDUM FOR EXTREME WIND LOADING

Case II: Determine if a 50'III-H square concrete pole is strong enough for this design

DCS D-3.0.0 shows a revised setting depth for square concrete poles. The new setting depth is generally 5 feet deeper than previous. A 50'III-H square concrete pole is set 11.5 feet deep.

Re-calculate the moments based on attachment heights.

<u>CONDUCTORS</u>	Number of Conductors	x	Wind Load Per Ft. Table 4.2.2-7	x	Avg. Span Length	x	Height Above Ground	=	MOMENT (ft.-lb.)
<u>Primary</u>									
568	1	x	3.816	x	150	x	39.5	=	22610
568	1	x	3.816	x	150	x	37.1	=	21236
568	1	x	3.816	x	150	x	34.4	=	19691
<u>Neut. Sec., St Lt</u>									
3/0	1	x	2.094	x	150	x	29.3	=	9203
<u>CATV - PROPOSED</u>									
Trunk	1	x	4.171	x	150	x	25.4	=	15892
<u>TELEPHONE</u>									
600 pr 24 Ga BKMA	1	x	9.573	x	150	x	24.4	=	35037
TOTAL MOMENT DUE TO CONDUCTORS								=	123668
<u>EQUIPMENT</u>									
			Wind Load Force in lbs				Height Above Ground	=	MOMENT (ft.-lb.)
<u>TRANSFORMERS</u>	LE FOR INSTRUCTIONS)								
1 Phase	50 KVA		231.8		x		29.9	=	6931
TOTAL MOMENT DUE TO EQUIPMENT								=	6931 ft.-lb.
TOTAL ALL MOMENTS								=	130,599 ft.-lb.

50 III-H Square Concrete Pole

From Table 4.2.2-4, the allowable moment for attachments to a 50'III-H 6 KIP square concrete pole in a 145 mph wind region is 95,831 ft-lbs and cannot be used. The allowable moment for attachments to a 50'III-H 8 KIP square concrete pole in a 145 mph wind region is 161,842 ft-lbs and can be used.



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ADDENDUM FOR EXTREME WIND LOADING

Case III: Determine if a 50'/4.7 KIP spun concrete pole is strong enough for this design.

DCS D-3.0.0 shows the setting depths for spun concrete poles. A 50'/4.7 KIP spun concrete pole is set 11 feet deep.

Re-calculate the moments based on attachment heights.

<u>CONDUCTORS</u>	Number of Conductors	x	Wind Load Per Ft. Table 4.2.2-7	x	Avg. Span Length	x	Height Above Ground	=	MOMENT (ft.-lb.)
<u>Primary</u>									
568	1	x	3.816	x	150	x	40	=	22896
568	1	x	3.816	x	150	x	37.6	=	21522
568	1	x	3.816	x	150	x	34.9	=	19977
<u>Neut. Sec., St Lt</u>									
3/0	1	x	2.094	x	150	x	29.8	=	9360
<u>CATV - PROPOSED</u>									
Trunk	1	x	4.171	x	150	x	25.4	=	15892
<u>TELEPHONE</u>									
600 pr 24 Ga BKMA	1	x	9.573	x	150	x	24.4	=	35037
TOTAL MOMENT DUE TO CONDUCTORS								=	124684
<u>EQUIPMENT</u>			Wind Load Force in lbs				Height Above Ground	=	MOMENT (ft.-lb.)
<u>TRANSFORMERS</u>	LE FOR INSTRUCTIONS)								
1 Phase	50 KVA		231.8		x		29.9	=	6931
TOTAL MOMENT DUE TO EQUIPMENT								=	6931 ft.-lb.
50' - 4.7 KIP Spun Concrete Pole									
TOTAL ALL MOMENTS								=	131,615 ft.-lb.

From Table 4.2.2-4, the allowable moment for attachments to a 50'/4.7 KIP spun concrete pole in a 145 mph wind region is 134,559 ft.-lbs. A 50'/4.7 KIP spun concrete pole can be used.

Using similar calculations from DERM 4.2.2 page 13, the maximum span distance for each of the poles above can be determined.

- Determine the moment due to 1 foot of conductor moments
- Subtract the moment due to the transformer from the total allowable moment
- Divide the remaining allowable moment by the total 1 foot conductor moments.



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ADDENDUM FOR EXTREME WIND LOADING

<u>CONDUCTORS</u>	Number of Conductors	x	Wind Load Per Ft. Table 4.2.2-7	x	Avg. Span Length	x	Height Above Ground	=	MOMENT (ft.-lb.)
<u>Primary</u>									
568	1	x	3.816	x	1	x	39	=	149
568	1	x	3.816	x	1	x	36.6	=	140
568	1	x	3.816	x	1	x	33.9	=	129
<u>Neut., Sec., St Lt</u>									
3/0	1	x	2.094	x	1	x	28.8	=	60
<u>CATV - PROPOSED</u>									
Trunk	1	x	4.171	x	1	x	25.4	=	106
<u>TELEPHONE</u>									
600 pr 24 Ga BKMA	1	x	9.573	x	1	x	24.4	=	234
TOTAL MOMENT DUE TO CONDUCTORS								=	818
<u>EQUIPMENT</u>			Wind Load Force in lbs				Height Above Ground	=	MOMENT (ft.-lb.)
<u>TRANSFORMERS</u>	LE FOR INSTRUCTIONS)								
1 Phase	50 KVA		231.8		x		29.9	=	6931
TOTAL MOMENT DUE TO EQUIPMENT								=	6931 ft.-lb.
45/2 Wood Pole									
TOTAL ALL MOMENTS								=	7,749 ft.-lb.

Maximum Allowable Moment on 45/2 pole = 72108
 Transformer Moment = 6931
 Available for Conductors = 65177
 Conductor Moments per foot of span = 818

Maximum Span Distance = 80 FT



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ADDENDUM FOR EXTREME WIND LOADING

<u>CONDUCTORS</u>	Number of Conductors	x	Wind Load Per Ft. Table 4.2.2-7	x	Avg. Span Length	x	Height Above Ground	=	MOMENT (ft.-lb.)
<u>Primary</u>									
568	1	x	3.816	x	1	x	39.5	=	151
568	1	x	3.816	x	1	x	37.1	=	142
568	1	x	3.816	x	1	x	34.4	=	131
<u>Neut. Sec., St Lt</u>									
3/0	1	x	2.094	x	1	x	29.3	=	61
<u>CATV - PROPOSED</u>									
Trunk	1	x	4.171	x	1	x	25.4	=	106
<u>TELEPHONE</u>									
600 pr 24 Ga BKMA	1	x	9.573	x	1	x	24.4	=	234
TOTAL MOMENT DUE TO CONDUCTORS								=	824
<u>EQUIPMENT</u>			Wind Load Force in lbs				Height Above Ground	=	MOMENT (ft.-lb.)
<u>TRANSFORMERS</u>	LE FOR INSTRUCTIONS)								
1 Phase	50 KVA		231.8		x		29.9	=	6931
TOTAL MOMENT DUE TO EQUIPMENT								=	6931 ft.-lb.
50 III-H Square Concrete Pole									
TOTAL ALL MOMENTS								=	7,755 ft.-lb.

Maximum Allowable Moment on 50/IIIH 6 KIP \downarrow 95831
 Transformer Moment = 6931
 Available for Conductors = 88900
 Conductor Moments per foot of span = 824
Maximum Span Distance = 108 FT

Maximum Allowable Moment on 50/IIIH 8 KIP \downarrow 161842
 Transformer Moment = 6931
 Available for Conductors = 154911
 Conductor Moments per foot of span = 824
Maximum Span Distance = 188 FT



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ADDENDUM FOR EXTREME WIND LOADING

<u>CONDUCTORS</u>		Number of	Wind Load	Avg.	Height		
Conductors	x	Table 4.2.2-7	Per Ft.	Span	Above	=	MOMENT (ft.-lb.)
				Length	Ground		
Primary							
568	1	x	3.816	x	1	x	40 = 153
568	1	x	3.816	x	1	x	37.6 = 143
568	1	x	3.816	x	1	x	34.9 = 133
Neut., Sec., St Lt							
3/0	1	x	2.094	x	1	x	29.8 = 62
CATV - PROPOSED							
Trunk	1	x	4.171	x	1	x	25.4 = 106
TELEPHONE							
600 pr 24 Ga BKMA	1	x	9.573	x	1	x	24.4 = 234
TOTAL MOMENT DUE TO CONDUCTORS						=	831
<u>EQUIPMENT</u>			Wind Load		Height		
			Force in lbs		Above	=	MOMENT (ft.-lb.)
					Ground		
<u>TRANSFORMERS</u>		LE FOR INSTRUCTIONS)					
1 Phase	50 KVA		231.8	x	29.9	=	6931
TOTAL MOMENT DUE TO EQUIPMENT						=	6931 ft.-lb.
50' - 4.7 KIP Spun Concrete Pole							
TOTAL ALL MOMENTS						=	7,762 ft.-lb.

Maximum Allowable Moment on 50/4.7 KIP pole	134559
Transformer Moment =	6931
Available for Conductors =	127628
Conductor Moments per foot of span =	831
Maximum Span Distance =	154 FT

Maximum span distances for Modified Vertical Framing with various pole sizes and types, conductor sizes, CATV and Telephone Cables are listed in Table 4.2.2-8 (105 mph), Table 4.2.2-9 (130 mph), and Table 4.2.2-10 (145 mph). These Tables are for reference only. New computer programs are available that provide a more detailed analysis and can be used in lieu of the tables. The span distances shown were calculated using 95% of the span distance calculated using the KEMA" Pole Design Calculation Toolkit" program. This will allow for slight variation in field conditions and rounding of values. Using the calculations described in this document may be slightly different than the table values. In some cases, the limiting factor is not the wind loading, but the required clearance above the ground and above other conductors or cables. For all joint use clearance calculations, the top joint user is considered to be attached at 23 feet above ground. When clearance is the limiting factor, the maximum span length for a specific pole is shown in bold italics. In some cases, the joint use clearance criteria cannot be met using the pole height indicated.

One other criterion incorporated in the tables is a maximum design span of 350 feet. Longer spans may be achieved, but need to be addressed on an individual basis.



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ADDENDUM FOR EXTREME WIND LOADING
Table 4.2.2-8

Transverse Pole Loading due to Extreme Wind - 105 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors		Wood Pole Height and Class					
		40/3	45/3	45/2	50/2	55/2	60/1
3-568 ACAR & 3/0 AAAC-N	FPL Only	296	281	350	342	324	350
	FPL With						
	1-100 pair	<i>100</i>	211	<i>250</i>	275	259	307
	1-600 pair	<i>100</i>	165	216	200	191	223
	1-CATV	<i>100</i>	209	<i>250</i>	273	257	304
	1-100 pair & 1 CATV	<i>100</i>	176	230	213	202	255
1-600 pair & 1 CATV	<i>100</i>	144	188	174	166	194	
3-568 ACAR & 3/0 AAAC-N & 3/0 TPX	FPL Only	206	195	273	256	224	283
	FPL With	(2)					
	1-100 pair	(2)	<i>150</i>	<i>150</i>	202	191	224
	1-600 pair	(2)	137	<i>150</i>	166	158	184
	1-CATV	(2)	<i>150</i>	<i>150</i>	200	190	222
	1-100 pair & 1 CATV	(2)	144	<i>150</i>	175	166	194
1-600 pair & 1 CATV	(2)	123	<i>150</i>	148	142	164	
3-3/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>100</i>	<i>250</i>	<i>250</i>	350	350	350
	1-600 pair	<i>100</i>	223	<i>250</i>	290	276	322
	1-CATV	<i>100</i>	<i>250</i>	<i>250</i>	350	350	350
	1-100 pair & 1 CATV	<i>100</i>	<i>250</i>	<i>250</i>	350	300	350
1-600 pair & 1 CATV	<i>100</i>	186	<i>250</i>	283	215	268	
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	250	299	350	350	344	350
	FPL With	(2)					
	1-100 pair	(2)	<i>150</i>	<i>150</i>	<i>250</i>	276	323
	1-600 pair	(2)	<i>150</i>	<i>150</i>	212	201	234
	1-CATV	(2)	<i>150</i>	<i>150</i>	<i>250</i>	275	320
	1-100 pair & 1 CATV	(2)	<i>150</i>	<i>150</i>	225	214	268
1-600 pair & 1 CATV	(2)	143	<i>150</i>	172	164	190	

(1) Span Lengths Shown in *Italic* are Limited by Clearance Criteria

(2) Required clearance cannot be met with Pole length



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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-8

Transverse Pole Loading due to Extreme Wind - 105 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors		Wood Pole Height and Class					
		40/3	45/3	45/2	50/2	55/2	60/1
3-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>100</i>	<i>250</i>	<i>250</i>	350	350	350
	1-600 pair	<i>100</i>	<i>250</i>	<i>250</i>	325	311	350
	1-CATV	<i>100</i>	<i>250</i>	<i>250</i>	350	350	350
	1-100 pair & 1 CATV	<i>100</i>	<i>250</i>	<i>250</i>	350	340	350
	1-600 pair & 1 CATV	<i>100</i>	205	<i>250</i>	265	237	295
3-1/0 & 1/0 N & 3/0 TPX	FPL Only	250	348	350	350	350	350
	FPL With	(2)					
	1-100 pair	(2)	<i>150</i>	<i>150</i>	<i>250</i>	311	350
	1-600 pair	(2)	<i>150</i>	<i>150</i>	232	220	275
	1-CATV	(2)	<i>150</i>	<i>150</i>	<i>250</i>	308	350
	1-100 pair & 1 CATV	(2)	<i>150</i>	<i>150</i>	<i>250</i>	236	295
	1-600 pair & 1 CATV	(2)	<i>150</i>	<i>150</i>	199	189	219
2-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>150</i>	350	350	350	350	350
	1-600 pair	<i>150</i>	290	350	350	333	350
	1-CATV	<i>150</i>	350	350	350	350	350
	1-100 pair & 1 CATV	<i>150</i>	322	350	350	350	350
	1-600 pair & 1 CATV	<i>150</i>	214	301	284	266	308
2-1/0 & 1/0 N & 3/0 TPX	FPL Only	300	350	350	350	350	350
	FPL With	(2)					
	1-100 pair	(2)	<i>200</i>	<i>200</i>	<i>300</i>	333	350
	1-600 pair	(2)	198	<i>200</i>	262	229	285
	1-CATV	(2)	<i>200</i>	<i>200</i>	<i>300</i>	331	350
	1-100 pair & 1 CATV	(2)	<i>200</i>	<i>200</i>	281	265	308
	1-600 pair & 1 CATV	(2)	167	<i>200</i>	204	193	224
1-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>250</i>	350	350	350	350	350
	1-600 pair	<i>250</i>	306	350	350	350	350
	1-CATV	<i>250</i>	350	350	350	350	350
	1-100 pair & 1 CATV	<i>250</i>	345	350	350	350	350
	1-600 pair & 1 CATV	235	218	307	291	274	317
1-1/0 & 1/0 N & 3/0 TPX	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>150</i>	<i>250</i>	<i>250</i>	<i>300</i>	350	350
	1-600 pair	<i>150</i>	202	<i>250</i>	268	234	294
	1-CATV	<i>150</i>	<i>250</i>	<i>250</i>	<i>300</i>	350	350
	1-100 pair & 1 CATV	<i>150</i>	220	<i>250</i>	290	273	317
	1-600 pair & 1 CATV	<i>150</i>	168	219	207	194	226

(1) Span Lengths Shown in *Italic* are Limited by Clearance Criteria

(2) Required clearance cannot be met with Pole length



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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-8

Transverse Pole Loading due to Extreme Wind - 105 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SQUARE CONCRETE POLE HEIGHT AND CLASS				
		45IIIH	45IIIH	50IIIH	55IIIH	60IIIH
3-568 & 3/0 N	FPL Only	274	350	350	350	350
	FPL With					
	1-100 pair	208	<i>100</i>	<i>250</i>	350	350
	1-600 pair	165	<i>100</i>	<i>250</i>	305	289
	1-CATV	206	<i>100</i>	<i>250</i>	350	350
	1-100 pair & 1 CATV	176	<i>100</i>	<i>250</i>	325	307
	1-600 pair & 1 CATV	144	<i>100</i>	<i>250</i>	266	235
	FPL Only	192	<i>250</i>	<i>300</i>	350	339
3-568 & 3/0 N & 3/0 TPX	FPL With	(2)	(2)			
	1-100 pair	(2)	(2)	<i>150</i>	<i>250</i>	289
	1-600 pair	(2)	(2)	<i>150</i>	237	223
	1-CATV	(2)	(2)	<i>150</i>	<i>250</i>	287
	1-100 pair & 1 CATV	(2)	(2)	<i>150</i>	<i>250</i>	235
	1-600 pair & 1 CATV	(2)	(2)	<i>150</i>	211	200
	FPL Only	350	350	350	350	350
3-3/0 & 1/0 N	FPL With					
	1-100 pair	<i>200</i>	<i>100</i>	<i>300</i>	<i>350</i>	<i>350</i>
	1-600 pair	<i>200</i>	<i>100</i>	<i>300</i>	<i>350</i>	<i>350</i>
	1-CATV	<i>200</i>	<i>100</i>	<i>300</i>	<i>350</i>	<i>350</i>
	1-100 pair & 1 CATV	<i>200</i>	<i>100</i>	<i>300</i>	<i>350</i>	<i>350</i>
	1-600 pair & 1 CATV	187	<i>100</i>	<i>300</i>	<i>350</i>	325
	FPL Only	297	<i>250</i>	350	350	350
3-3/0 & 1/0 N & 3/0 TPX	FPL With		(2)			
	1-100 pair	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-600 pair	<i>100</i>	(2)	<i>150</i>	<i>250</i>	305
	1-CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-100 pair & 1 CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	325
	1-600 pair & 1 CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	266
	FPL Only	350	350	350	350	350
3-1/0 & 1/0 N	FPL With					
	1-100 pair	<i>200</i>	<i>100</i>	<i>300</i>	350	350
	1-600 pair	<i>200</i>	<i>100</i>	<i>300</i>	350	350
	1-CATV	<i>200</i>	<i>100</i>	<i>300</i>	350	350
	1-100 pair & 1 CATV	<i>200</i>	<i>100</i>	<i>300</i>	350	350
	1-600 pair & 1 CATV	<i>200</i>	<i>100</i>	<i>300</i>	350	350
	FPL Only	350	<i>250</i>	350	350	350
3-1/0 & 1/0 N & 3/0 TPX	FPL With		(2)			
	1-100 pair	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-600 pair	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-100 pair & 1 CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	350
	1-600 pair & 1 CATV	<i>100</i>	(2)	<i>150</i>	<i>250</i>	297

(1) Span Lengths Shown in *Italic* are Limited by Clearance Criteria
(2) Required clearance cannot be met with Pole length



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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-8

Transverse Pole Loading due to Extreme Wind - 105 MPH
Maximum Span Length in Feet
 Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SPUN CONCRETE POLE HEIGHT AND CLASS			
		50' 4.7kip	55' 4.7kip	60' 5kip	65' 5kip
3-568 & 3/0 N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>250</i>	350	350	350
	1-600 pair	<i>250</i>	350	350	350
	1-CATV	<i>250</i>	350	350	350
	1-100 pair & 1 CATV	<i>250</i>	350	350	350
1-600 pair & 1 CATV	<i>250</i>	333	339	321	
3-568 & 3/0 N & 3/0 TPX	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>150</i>	<i>250</i>	<i>300</i>	350
	1-600 pair	<i>150</i>	<i>250</i>	<i>300</i>	305
	1-CATV	<i>150</i>	<i>250</i>	<i>300</i>	350
	1-100 pair & 1 CATV	<i>150</i>	<i>250</i>	<i>300</i>	321
1-600 pair & 1 CATV	<i>150</i>	<i>250</i>	288	272	
3-3/0 & 1/0 N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>300</i>	350	350	350
	1-600 pair	<i>300</i>	350	350	350
	1-CATV	<i>300</i>	350	350	350
	1-100 pair & 1 CATV	<i>300</i>	350	350	350
1-600 pair & 1 CATV	<i>300</i>	429	438	411	
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>150</i>	<i>250</i>	<i>350</i>	350
	1-600 pair	<i>150</i>	<i>250</i>	<i>350</i>	350
	1-CATV	<i>150</i>	<i>250</i>	<i>350</i>	350
	1-100 pair & 1 CATV	<i>150</i>	<i>250</i>	<i>350</i>	350
1-600 pair & 1 CATV	<i>150</i>	<i>250</i>	<i>350</i>	334	
3-350 CU & 2/0 CU N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>250</i>	350	350	350
	1-600 pair	<i>250</i>	350	350	350
	1-CATV	<i>250</i>	350	350	350
	1-100 pair & 1 CATV	<i>250</i>	350	350	350
1-600 pair & 1 CATV	<i>250</i>	350	350	350	
3-350 CU & 2/0 CU N & 3/0 TPX	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>200</i>	<i>250</i>	<i>350</i>	350
	1-600 pair	<i>200</i>	<i>250</i>	<i>350</i>	343
	1-CATV	<i>200</i>	<i>250</i>	<i>350</i>	350
	1-100 pair & 1 CATV	<i>200</i>	<i>250</i>	<i>350</i>	350
1-600 pair & 1 CATV	<i>200</i>	<i>250</i>	323	302	

(1) Span Lengths Shown in *Italic* are Limited by Clearance Criteria
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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-9

Transverse Pole Loading due to Extreme Wind - 130 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	WOOD POLE HEIGHT AND CLASS					
		40/3	45/3	45/2	50/2	55/2	60/1
3-568 & 3/0 N	FPL Only	162	151	201	183	170	200
	FPL With						
	1-100 pair	<i>100</i>	122	162	147	137	160
	1-600 pair	<i>100</i>	95	127	115	107	125
	1-CATV	<i>100</i>	121	161	146	136	159
	1-100 pair & 1 CATV	<i>100</i>	102	135	123	114	133
	1-600 pair & 1 CATV	91	83	111	100	94	108
3-568 & 3/0 N & 3/0 TPX	FPL Only	122	112	149	137	126	148
	FPL With	(2)					
	1-100 pair	(2)	95	127	116	107	125
	1-600 pair	(2)	79	105	96	89	104
	1-CATV	(2)	95	126	116	107	124
	1-100 pair & 1 CATV	(2)	83	110	101	93	108
	1-600 pair & 1 CATV	(2)	70	94	86	80	92
3-3/0 & 1/0 N	FPL Only	295	274	364	333	308	350
	FPL With						
	1-100 pair	<i>100</i>	181	<i>250</i>	219	203	237
	1-600 pair	<i>100</i>	128	171	155	145	167
	1-CATV	<i>100</i>	179	<i>250</i>	216	201	234
	1-100 pair & 1 CATV	<i>100</i>	140	186	168	158	182
	1-600 pair & 1 CATV	<i>100</i>	107	143	128	121	139
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	175	161	214	198	181	211
	FPL With	(2)					
	1-100 pair	(2)	128	171	157	145	168
	1-600 pair	(2)	101	134	122	113	131
	1-CATV	(2)	127	169	156	143	166
	1-100 pair & 1 CATV	(2)	106	143	130	121	139
	1-600 pair & 1 CATV	(2)	87	117	105	99	113
3-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>100</i>	214	<i>250</i>	278	258	301
	1-600 pair	<i>100</i>	144	193	174	163	188
	1-CATV	<i>100</i>	211	<i>250</i>	275	256	297
	1-100 pair & 1 CATV	<i>100</i>	159	212	191	180	207
	1-600 pair & 1 CATV	<i>100</i>	118	158	142	133	153

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-9

Transverse Pole Loading due to Extreme Wind - 130 MPH
Maximum Span Length In Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	WOOD POLE HEIGHT AND CLASS					
		40/3	45/3	45/2	50/2	55/2	60/1
3-1/0 & 1/0 N & 3/0 TPX	FPL Only	203	186	267	230	211	264
	FPL With	(2)					
	1-100 pair		144	<i>150</i>	177	163	189
	1-600 pair		110	146	134	124	143
	1-CATV		143	<i>150</i>	175	162	187
	1-100 pair & 1 CATV		118	<i>150</i>	143	133	153
	1-600 pair & 1 CATV		94	126	114	106	123
2-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>200</i>	265	<i>350</i>	325	298	348
	1-600 pair	170	155	206	192	175	202
	1-CATV	<i>200</i>	261	347	318	294	340
	1-100 pair & 1 CATV	189	172	230	213	195	225
	1-600 pair & 1 CATV	136	123	163	153	139	161
2-1/0 & 1/0 N & 3/0 TPX	FPL Only	226	208	298	276	236	296
	FPL With	(2)					
	1-100 pair		155	<i>200</i>	191	175	203
	1-600 pair		114	151	142	129	149
	1-CATV		153	204	189	173	201
	1-100 pair & 1 CATV		123	163	151	139	161
	1-600 pair & 1 CATV		96	128	118	109	125
1-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	<i>250</i>	308	<i>350</i>	<i>350</i>	349	<i>350</i>
	1-600 pair	179	163	218	202	186	216
	1-CATV	<i>250</i>	348	<i>350</i>	<i>350</i>	<i>350</i>	<i>350</i>
	1-100 pair & 1 CATV	222	203	292	271	232	288
	1-600 pair & 1 CATV	147	134	179	166	153	177
1-1/0 & 1/0 N & 3/0 TPX	FPL Only	274	257	341	309	285	333
	FPL With						
	1-100 pair	<i>150</i>	166	221	202	187	217
	1-600 pair	126	117	156	143	132	153
	1-CATV	<i>150</i>	178	<i>250</i>	217	200	233
	1-100 pair & 1 CATV	146	135	181	166	152	177
	1-600 pair & 1 CATV	110	102	135	125	115	133

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-9

Transverse Pole Loading due to Extreme Wind - 130 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SQUARE CONCRETE POLE HEIGHT AND CLASS				
		45IIIG	45IIH	50IIH	55IIH	60IIH
3-568 & 3/0 N	FPL Only	143	308	290	268	227
	FPL With					
	1-100 pair	115	<i>100</i>	216	200	182
	1-600 pair	90	<i>100</i>	170	156	143
	1-CATV	114	<i>100</i>	215	198	181
	1-100 pair & 1 CATV	96	<i>100</i>	181	166	153
	1-600 pair & 1 CATV	79	<i>100</i>	148	136	125
3-568 & 3/0 N & 3/0 TPX	FPL Only	105	213	200	186	169
	FPL With	(2)	(2)			
	1-100 pair			<i>150</i>	158	143
	1-600 pair			141	130	119
	1-CATV			<i>150</i>	157	143
	1-100 pair & 1 CATV			147	137	124
	1-600 pair & 1 CATV			125	116	106
3-3/0 & 1/0 N	FPL Only	259	350	350	350	350
	FPL With					
	1-100 pair	171	<i>100</i>	<i>300</i>	318	291
	1-600 pair	123	<i>100</i>	228	210	194
	1-CATV	169	<i>100</i>	<i>300</i>	314	287
	1-100 pair & 1 CATV	133	<i>100</i>	267	228	210
	1-600 pair & 1 CATV	103	<i>100</i>	190	174	162
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	152	<i>150</i>	308	286	259
	FPL With	(2)	(2)			
	1-100 pair			<i>150</i>	213	194
	1-600 pair			<i>150</i>	165	151
	1-CATV			<i>150</i>	211	192
	1-100 pair & 1 CATV			<i>150</i>	176	161
	1-600 pair & 1 CATV			<i>150</i>	143	131
3-1/0 & 1/0 N	FPL Only	332	350	350	350	350
	FPL With					
	1-100 pair	<i>200</i>	<i>100</i>	<i>300</i>	350	345
	1-600 pair	138	<i>100</i>	277	236	218
	1-CATV	200	<i>100</i>	<i>300</i>	350	340
	1-100 pair & 1 CATV	151	<i>100</i>	<i>300</i>	280	257
	1-600 pair & 1 CATV	113	<i>100</i>	210	192	178
3-1/0 & 1/0 N & 3/0 TPX	FPL Only	177	<i>250</i>	350	334	302
	FPL With	(2)	(2)			
	1-100 pair			<i>150</i>	<i>250</i>	218
	1-600 pair			<i>150</i>	181	166
	1-CATV			<i>150</i>	237	218
	1-100 pair & 1 CATV			<i>150</i>	194	178
	1-600 pair & 1 CATV			<i>150</i>	155	143

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-9

Transverse Pole Loading due to Extreme Wind - 130 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SPUN CONCRETE POLE HEIGHT AND CLASS			
		50' 4.7kip	55' 4.7kip	60' 5kip	65' 5kip
3-568 & 3/0 N	FPL Only	350	350	350	337
	FPL With				
	1-100 pair	<i>250</i>	294	289	270
	1-600 pair	223	214	213	197
	1-CATV	<i>250</i>	292	287	268
	1-100 pair & 1 CATV	<i>250</i>	227	225	209
	1-600 pair & 1 CATV	195	185	185	170
3-568 & 3/0 N & 3/0 TPX	FPL Only	284	274	269	232
	FPL With				
	1-100 pair	<i>150</i>	216	213	197
	1-600 pair	<i>150</i>	178	176	162
	1-CATV	<i>150</i>	215	211	196
	1-100 pair & 1 CATV	<i>150</i>	187	184	170
	1-600 pair & 1 CATV	<i>150</i>	159	158	144
3-3/0 & 1/0 N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>300</i>	350	350	350
	1-600 pair	<i>300</i>	310	307	282
	1-CATV	<i>300</i>	350	350	350
	1-100 pair & 1 CATV	<i>300</i>	336	333	307
	1-600 pair & 1 CATV	270	257	256	219
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>150</i>	<i>250</i>	307	283
	1-600 pair	<i>150</i>	226	224	205
	1-CATV	<i>150</i>	<i>250</i>	305	280
	1-100 pair & 1 CATV	<i>150</i>	<i>250</i>	256	219
	1-600 pair & 1 CATV	<i>150</i>	196	195	178
3-350 CU & 2/0 CU N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>250</i>	350	350	328
	1-600 pair	<i>250</i>	267	266	228
	1-CATV	<i>250</i>	350	350	325
	1-100 pair & 1 CATV	<i>250</i>	287	284	263
	1-600 pair & 1 CATV	221	211	211	194
3-350 CU & 2/0 CU N & 3/0 TPX	FPL Only	339	328	321	298
	FPL With				
	1-100 pair	<i>200</i>	<i>250</i>	266	228
	1-600 pair	<i>200</i>	201	200	183
	1-CATV	<i>200</i>	<i>250</i>	262	226
	1-100 pair & 1 CATV	<i>200</i>	213	210	194
	1-600 pair & 1 CATV	184	177	176	161

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-10

Transverse Pole Loading due to Extreme Wind - 145 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors		Wood Pole Height and Class					
		40/3	45/3	45/2	50/2	55/2	60/1
3-568 ACAR & 3/0 AAAC-N	FPL Only	121	110	150	134	122	143
	FPL With						
	1-100 pair	98	88	121	107	98	114
	1-600 pair	78	69	94	84	77	88
	1-CATV	97	87	120	106	97	113
	1-100 pair & 1 CATV	83	74	101	89	82	94
1-600 pair & 1 CATV	68	61	83	73	67	77	
3-568 ACAR & 3/0 AAAC-N & 3/0 TPX	FPL Only	90	82	111	100	90	105
	FPL With	(2)					
	1-100 pair	(2)	69	94	85	77	89
	1-600 pair	(2)	57	78	69	64	73
	1-CATV	(2)	69	94	85	76	88
	1-100 pair & 1 CATV	(2)	61	82	73	67	77
1-600 pair & 1 CATV	(2)	51	70	62	57	66	
3-3/0 & 1/0 N	FPL Only	203	186	272	226	205	257
	FPL With						
	1-100 pair	146	131	179	160	145	168
	1-600 pair	105	93	127	113	104	119
	1-CATV	144	130	177	158	143	166
	1-100 pair & 1 CATV	114	102	138	123	113	129
1-600 pair & 1 CATV	88	78	106	94	86	99	
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	130	117	159	143	130	150
	FPL With	(2)					
	1-100 pair	(2)	93	127	114	104	120
	1-600 pair	(2)	73	100	88	81	93
	1-CATV	(2)	93	126	113	103	119
	1-100 pair & 1 CATV	(2)	78	105	95	86	99
1-600 pair & 1 CATV	(2)	64	86	77	70	81	

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-10

Transverse Pole Loading due to Extreme Wind - 145 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors		Wood Pole Height and Class					
		40/3	45/3	45/2	50/2	55/2	60/1
3-1/0 & 1/0 N	FPL Only	282	256	348	311	282	330
	FPL With						
	1-100 pair	<i>100</i>	156	212	188	173	200
	1-600 pair	<i>100</i>	105	143	126	117	134
	1-CATV	<i>100</i>	154	209	186	170	197
	1-100 pair & 1 CATV	<i>100</i>	116	157	140	128	146
	1-600 pair & 1 CATV	98	86	117	104	95	108
3-1/0 & 1/0 N & 3/0 TPX	FPL Only	151	136	184	167	151	174
	FPL With	(2)					
	1-100 pair	(2)	105	143	128	117	134
	1-600 pair	(2)	80	108	97	89	102
	1-CATV	(2)	105	142	127	116	133
	1-100 pair & 1 CATV	(2)	86	117	105	95	108
	1-600 pair & 1 CATV	(2)	68	93	84	76	86
2-1/0 & 1/0 N	FPL Only	350	334	350	350	350	350
	FPL With						
	1-100 pair	200	180	262	220	199	230
	1-600 pair	126	113	153	140	125	143
	1-CATV	196	177	258	217	195	226
	1-100 pair & 1 CATV	141	125	170	155	140	161
	1-600 pair & 1 CATV	101	89	122	111	100	114
2-1/0 & 1/0 N & 3/0 TPX	FPL Only	168	152	206	187	169	196
	FPL With	(2)					
	1-100 pair	(2)	113	153	140	125	144
	1-600 pair	(2)	83	112	103	92	105
	1-CATV	(2)	111	151	138	124	143
	1-100 pair & 1 CATV	(2)	89	122	110	100	114
	1-600 pair & 1 CATV	(2)	70	95	86	78	89
1-1/0 & 1/0 N	FPL Only	350	350	350	350	350	350
	FPL With						
	1-100 pair	231	208	305	276	232	288
	1-600 pair	133	119	162	147	133	154
	1-CATV	226	203	297	270	227	282
	1-100 pair & 1 CATV	150	135	182	167	151	174
	1-600 pair & 1 CATV	103	91	124	114	103	118
1-1/0 & 1/0 N & 3/0 TPX	FPL Only	188	174	237	210	191	221
	FPL With						
	1-100 pair	133	122	164	147	134	154
	1-600 pair	94	86	116	105	94	108
	1-CATV	131	120	162	146	132	152
	1-100 pair & 1 CATV	103	92	125	114	103	118
	1-600 pair & 1 CATV	78	70	96	87	78	90

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-10

Transverse Pole Loading due to Extreme Wind - 145 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SQUARE CONCRETE POLE HEIGHT AND CLASS				
		45III G	45IIII H	50IIII H	55IIII H	60IIII H
3-568 & 3/0 N	FPL Only	99	209	193	174	154
	FPL With					
	1-100 pair	80	<i>100</i>	155	139	124
	1-600 pair	63	<i>100</i>	122	109	97
	1-CATV	79	<i>100</i>	154	138	123
	1-100 pair & 1 CATV	67	<i>100</i>	129	116	104
	1-600 pair & 1 CATV	55	<i>100</i>	105	95	85
3-568 & 3/0 N & 3/0 TPX	FPL Only	73	157	143	130	114
	FPL With					
	1-100 pair	(2)	(2)	122	110	97
	1-600 pair			101	90	81
	1-CATV			121	109	97
	1-100 pair & 1 CATV			105	95	85
	1-600 pair & 1 CATV			90	81	72
3-3/0 & 1/0 N	FPL Only	167	350	349	314	278
	FPL With					
	1-100 pair	119	<i>100</i>	230	206	184
	1-600 pair	85	<i>100</i>	163	146	131
	1-CATV	118	<i>100</i>	227	204	181
	1-100 pair & 1 CATV	92	<i>100</i>	178	159	143
	1-600 pair & 1 CATV	71	<i>100</i>	136	122	109
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	105	225	204	186	164
	FPL With					
	1-100 pair	(2)	(2)	<i>150</i>	148	131
	1-600 pair			127	115	103
	1-CATV			<i>150</i>	147	130
	1-100 pair & 1 CATV			136	123	109
	1-600 pair & 1 CATV			111	100	89
3-1/0 & 1/0 N	FPL Only	214	350	350	350	350
	FPL With					
	1-100 pair	142	<i>100</i>	294	264	219
	1-600 pair	96	<i>100</i>	184	164	147
	1-CATV	140	<i>100</i>	290	260	215
	1-100 pair & 1 CATV	105	<i>100</i>	202	181	162
	1-600 pair & 1 CATV	79	<i>100</i>	150	134	121
3-1/0 & 1/0 N & 3/0 TPX	FPL Only	123	<i>250</i>	257	218	191
	FPL With					
	1-100 pair	96	(2)	<i>150</i>	167	147
	1-600 pair	73		140	126	112
	1-CATV	95		150	165	146
	1-100 pair & 1 CATV	78		150	135	121
	1-600 pair & 1 CATV	63		121	108	96

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ADDENDUM FOR EXTREME WIND LOADING

Table 4.2.2-10

Transverse Pole Loading due to Extreme Wind - 145 MPH
Maximum Span Length in Feet
Modified Vertical Construction (DCS E-5.0.0)

Conductors	Attachments	SPUN CONCRETE POLE HEIGHT AND CLASS			
		50' 4.7kip	55' 4.7kip	60' 5kip	65' 5kip
3-568 & 3/0 N	FPL Only	291	276	267	227
	FPL With				
	1-100 pair	217	205	200	181
	1-600 pair	170	161	157	143
	1-CATV	215	203	198	181
	1-100 pair & 1 CATV	181	171	166	151
	1-600 pair & 1 CATV	148	140	137	124
3-568 & 3/0 N & 3/0 TPX	FPL Only	200	192	184	168
	FPL With				
	1-100 pair	<i>150</i>	162	157	143
	1-600 pair	141	134	130	118
	1-CATV	<i>150</i>	162	156	142
	1-100 pair & 1 CATV	147	141	137	124
	1-600 pair & 1 CATV	125	120	116	105
3-3/0 & 1/0 N	FPL Only	350	350	350	350
	FPL With				
	1-100 pair	<i>300</i>	328	317	288
	1-600 pair	229	217	212	191
	1-CATV	<i>300</i>	324	314	285
	1-100 pair & 1 CATV	267	235	230	207
	1-600 pair & 1 CATV	191	180	177	158
3-3/0 & 1/0 N & 3/0 TPX	FPL Only	309	296	283	257
	FPL With				
	1-100 pair	<i>150</i>	219	212	191
	1-600 pair	<i>150</i>	170	165	148
	1-CATV	<i>150</i>	218	210	189
	1-100 pair & 1 CATV	<i>150</i>	181	176	158
	1-600 pair & 1 CATV	<i>150</i>	147	143	128
3-350 CU & 2/0 CU N	FPL Only	350	350	341	313
	FPL With				
	1-100 pair	<i>250</i>	269	259	220
	1-600 pair	198	187	182	165
	1-CATV	<i>250</i>	266	257	219
	1-100 pair & 1 CATV	212	200	196	177
	1-600 pair & 1 CATV	168	159	156	140
3-350 CU & 2/0 CU N & 3/0 TPX	FPL Only	257	230	220	200
	FPL With				
	1-100 pair	198	189	182	165
	1-600 pair	159	151	147	132
	1-CATV	196	187	181	164
	1-100 pair & 1 CATV	168	161	156	140
	1-600 pair & 1 CATV	141	133	130	116

(1) Span Lengths Shown in *Italic* are Limited by Clearance Criteria

(2) Required clearance cannot be met with Pole length

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ADDENDUM FOR EXTREME WIND LOADING

C. Storm Guying

One method to overcome the overload on a pole due to transverse wind load is to add storm guys. Storm guys are installed in pairs(back to back) – one on each side of the pole perpendicular to the pole line. These guys should typically be installed 6 inches to 2 feet below the primary attachments.

Calculating the size of the guy wire is very much like calculating a deadend guy.

1. Calculate the transverse wind load on the pole, conductors and all attachments and equipment.
2. The load is then used to size the guy wire based on the load, the attachment height and lead length.
3. A final check should be made to verify that the strength of the pole above the guy attachment is adequate.

Using the example of Case I above for the 45'2 pole, calculate the size of the storm guys and anchors required for extreme wind loading.

1. Transverse wind loads:

Pole	=	Wind load on pole
Primary	=	Wind Load per ft x span length x number of conductors
Neutral	=	Wind Load per ft x span length
CATV	=	Wind Load per ft x span length
Telephone	=	Wind Load per ft x span length
Transformer	=	Wind Load

Load on Pole	=				1713 pounds			
Primary	=	3.816	x	170	x	3	=	1946 pounds
Neutral	=	2.094	x	170	x	1	=	356 pounds
CATV	=	4.171	x	170	x	1	=	709 pounds
Telephone	=	9.573	x	170	x	1	=	1627 pounds
Transformer	=	231.8	x	1			=	232 pounds
								Total Load = 6583 pounds

2. Determine the guy wire size and anchor size required for this installation.

To calculate the tension in the guy wire use the equation below

$$\text{Equation 4.2.2-7} \quad T_{DG} = \frac{T_{TWL}}{L} \times \sqrt{H_G^2 + L^2}$$

Where:



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ADDENDUM FOR EXTREME WIND LOADING

- T_{DG} = Tension in down guy
- T_{TWL} = Transverse Wind Load
- L = The down guy Lead length
- H_G = The attachment Height of the down guy

Use the total transverse wind load for the load to be guyed with the guy attached 6 inches below C phase primary (34.1') and a lead length of 20 feet.

$$T_{DG} = \frac{6583}{20} \sqrt{(34.1)^2 + (20)^2}$$

$$T_{DG} = 13,013 \text{ Pounds}$$

For extreme wind loading, the required strength of the guy wire is equal to the rated breaking strength of the guy wire x 0.9.

Table 4.2.2-11 Storm Guy Strength

Guy Size	Rated Breaking Strength (RBS)	Allowable Guy Tension .9 X RBS
5/16	11200	10080
7/16	20800	18720
9/16	33700	30330

For this example, a 7/16" guy will be installed in each direction perpendicular to the pole line. Use the tension in the down guy to select the appropriate anchor from DCS D-4.0.2. In this case, a 10" screw anchor will do the job.

3. One final check is to be sure that the pole length above the storm guy attachment has sufficient strength to support the load above it. Basically, this is just like calculating the strength of the total pole but now the "ground line" is at the storm guy attachment height and all of the facilities above this point will create a moment here.

With the top of the pole at 38' and the down guy at 34.1 feet, the length of pole exposed to the wind is now 38-34.1 = 3.9 ft.

Use equation 4.2.2-3 to determine the strength of this section of pole.



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ADDENDUM FOR EXTREME WIND LOADING

From Table G (DERM 4.2.2) circumference at 3.9 feet down from the top of the pole = 26.5 inches

$$M_r = 0.000264 \times (8,000) \times (26.5)^3 \times 0.75 = 29,478 \text{ ft.-lbs.}$$

Use equation 4.2.2-4 to find the area of this section of pole

$$A = 3.9 \left(\frac{25 + 26.5}{2} \right) \left(\frac{1}{12} \right) = 2.66 \text{ sqft}$$

Use equation 4.2.2-5 to find the center of the area of this section of pole

$$\text{Height of center of area, } H_{CA} = \frac{3.9(8.44 + 2(7.96))}{3(8.44 + 7.96)} = 1.93 \text{ ft}$$

Use equation 4.2.2-2 to find the wind load on this section of pole

$$\text{Load in pounds} = 0.00256 \times (145)^2 \times 1.0 \times 0.97 \times 1 \times 1 \times 2.66 = 139 \text{ pounds}$$

Use equation 4.2.2-6 to determine the moment due to the wind load on this section of the pole at the guy attachment point

$$\text{Moment} = 1.93 \times 139 = 269 \text{ ft lbs}$$

Determine the moment created by the wind load on the conductors

Primary	=	3.816	x	170	x	1	x	4.9	=	3179	Ft-Lbs
	=	3.816	x	170	x	1	x	2.5	=	1622	Ft-Lbs
	=	3.816	x	170	x	1	x	0.5	=	324	Ft-Lbs
										5125	Ft-Lbs

$$\text{Total Moment} = 269 + 5125 = 5393 \text{ Ft-Lbs}$$

This load is well under the strength calculated above and the design using storm guys will meet requirements.



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ADDENDUM FOR EXTREME WIND LOADING

4.2.3 Pole Framing

A. Slack Span Construction

Slack span construction is employed where it is impractical to follow conventional guying practices. The proper application is a pull-off from either a tangent pole or a properly guyed deadend pole to another properly guyed deadend pole. The intent is not to slack span to a stand alone (self-support) pole unless that pole has been properly sized for this application. Improper use of slack span construction can cause a pole to bow or lean which then can cause more slack in the conductors. More slack in the conductors can result in improper clearances and increased potential for conductors to make contact with each other.

DERM 4.4.5 page 1 shows the initial sag to be used when installing slack spans. The amount of sag shown, limits the per conductor tension to 50 pounds.

Slack Span design criteria:

1. Vertical construction is preferred for two and three phase installations (DCS E-5.7.1).
Maintain 36" separation between phases at the poles.
2. Limit the span lengths to

Table 4.2.2-12 Slack Span Length & Sag

SLACK SPAN		
CONDUCTOR	MAXIMUM LENGTH	INITIAL SAG
568.3 ACAR	50'	3'-7"
3/0 AAAC	75'	2'-9"
1/0 AAAC	95'	2'-10"

3. Use class 2 poles minimum.
4. If crossarm construction is used, use the 9 foot heavy duty wood crossarms or the 8'6" steel crossarm for added horizontal spacing (DCS E-29.0.0 and E-29.1.0).

PREPARED BY:
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There are many poles in the distribution system identified as Targeted Poles. These poles are deemed critical by virtue of the equipment mounted on them or their importance to maintaining the system. As stated in The Distribution Design Guide "The following list comprises what will be considered targeted poles. When installing and/or replacing an accessible targeted pole, use a III-H concrete pole or a spun concrete pole for spans greater than 300 feet. If the pole is inaccessible, use a Class 2 pole, or consider relocating the equipment to an accessible concrete pole."

Targeted Critical Pole List

"01" Feeder Switch Poles (first pole outside the substation)

Automated Feeder Switches

Interstate/Highway Crossings

Capacitor Banks

Multiple Primary Risers

3 Phase Reclosers (or three single phase Reclosers)

Aerial Auto Transformers

Multiple Circuits

3 phase Transformer Banks (3-100 kVA and larger)

Regulators

Primary Meter

The targeted pole also should meet the design criteria for wind loading as previously shown.

C. Distribution Design Guidelines

The Storm Secure Organization has developed a set of guidelines for Distribution Designers to use when designing or maintaining distribution facilities. The designer can go online to see the most current version.

Distribution Design Guidelines

**FPL****Service Planning Quick Reference Guide**

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Distribution Design Guidelines

Distribution Design Guidelines

The following **guidelines** will be used to standardize the design of FPL's overhead distribution facilities when **practical, feasible, and cost effective**.

General

1. FPL has made a change to adopt Extreme Windloading (EWL) as the design criteria for: (1) new pole line construction, (2) pole line extensions, (3) pole line relocations, (4) feeder pole replacements on multi-circuit pole lines, and (5) feeder pole replacements on Top-CIF feeders. Reference the Pole Sizing section (pg 7) for the guidelines to determine the necessary pole class and type for all work. Refer to the Distribution Engineering Reference Manual Addendum for calculating pole sizes for specific framing under extreme wind loading conditions.
2. For maintenance, existing non-top-CIF pole lines may be evaluated using NESC combined ice and wind loading with Grade B construction. This represents the loading prior to the adoption of extreme wind loading. If the pole must be replaced, refer to the Pole Sizing section for the minimum class pole to be installed. Refer to the Distribution Engineering Reference Manual (DERM) Section 4 for calculating pole sizes for specific framing under the NESC combined ice and wind loading conditions.
3. Every attempt should be made to place new or replacement poles in private easements or as close to the front edge of property (right of way line) as practical.
4. Overhead pole lines should be placed in front lot lines or accessible locations where feasible.
5. When replacing poles, the new pole should be set as close as possible to the existing pole to avoid the creation of a new pole location.
6. Poles are not to be placed in medians.
7. Concrete poles are not to be placed in inaccessible locations or locations that could potentially become inaccessible.
8. Please reference the minimum setting depth charts located in DCS D-3.0.0 which shows the increased setting depths for concrete poles.
9. Every effort should be made not to install poles in sidewalks. If a pole must be placed in a sidewalk, a minimum unobstructed sidewalk width of 32" must be maintained to comply with the American Disabilities Act (ADA) requirements.
10. If concrete poles are required by the governing agency as a requirement of the permit, and if the work is being done solely for FPL purposes (feeder tie, etc.), then the concrete

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Distribution Design Guidelines

poles are installed with no differential charges. If the concrete poles are required as a condition of the permit, and the work is being done at the request of a customer (and fall outside the Pole Sizing Guidelines) to provide service to the customer or relocation by request of the customer, then the customer is charged a differential cost for the concrete poles.

11. When installing new OH secondary spans, multiplexed cable should be used instead of open wire secondary. When reconductoring or relocating existing pole lines containing open wire secondary, replace the open wire with multiplexed cable whenever possible. The system neutral should not be removed when replacing open wire secondary with multiplexed cable if primary wire is present. It is necessary to maintain a separate system neutral for operational continuity of the system.
12. When designing overhead facilities where secondary and service crossings exist across major roadways, the engineer should take into consideration placing these secondary street crossings underground. Operations Director Approval is required.
13. Whenever extending a feeder, reconductoring a feeder section, or attaching a device to a feeder, always reference the nearest existing disconnect switch number on the construction drawing and show the dimension to the switch. This will aid the Control Centers in updating their switching system and will aid AMG in updating AMS, as well as provide the Production Lead and Distribution Tech information needed for switching and RC Off requests.
14. When an overhead feeder crosses any obstacle to access (i.e. – water bodies such as rivers, canals, swamps; limited access RW such as interstate highways, turnpikes, and expressways; etc.) disconnect switches should be placed on both sides of the obstacle in order to isolate the crossing in the event of a wiredown situation. See the example in the Crossing Multi-lane Limited Access Highways section (pg 5).
15. Projects that affect or extend feeder conductors should always be coordinated with Distribution Planning to ensure optimization of the distribution grid. Taking into account future feeder plans such as, feeder boundary changes, sectionalizing devices, integration of automation and remotely controlled protection.

As always, good engineering judgment, safety, reliability, and cost effectiveness should be considered. In addition to these guidelines, all distribution facilities shall be engineered to meet the minimum requirements set forth in all applicable standards and codes including but not limited to the National Electrical Safety Code (NESC), Utility Accommodation Guide, and FPL Distribution Construction Standards. Please contact a Distribution Construction Services (DCS) analyst with any questions.

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Distribution Design Guidelines

New Construction

1. When installing a new feeder, lateral, or service pole, reference the Pole Sizing section for the guidelines to determine the necessary pole class and type to meet Extreme Wind Loading (EWL) for the wind zone region (105, 130, or 145 MPH).
2. Modified Vertical is the preferred framing for accessible locations. Post-top (single phase) or Cross Arm (multi phase) is the preferred framing for inaccessible locations.
3. During the design of new pole lines in developed areas, field visits should be conducted to ensure the design would cause minimum impact to the existing property owners.
4. Overhead pole lines should not be built on both sides of a roadway unless agreed to by the customer nor should multi-circuit pole lines be created. When designing main feeder routes all viable options must be reviewed (including alternative routes) and consideration should be given to constructing the line underground. If undergrounding is chosen and it is not the least cost option, approval is required from the Engineering & Technical Services Director and the Operations Director. In addition, prior to proceeding with any pole lines on both sides of a street or any multi-circuit feeder design recommendations, Operations Director approval is required.
5. When there is an existing pole line in the rear easement, every effort should be made not to build a second pole line along the right of way.
6. When installing a pole line within a transmission line, accessible distribution poles should be concrete. Distribution concrete poles should not be installed in inaccessible locations.
7. If concrete distribution poles are installed in a concrete transmission line there is no additional charge to the customer (the concrete poles are FPL's choice and not requested by the customer). Coordination between the transmission and distribution design is critical and consideration should be given to a design with all transmission poles versus distribution intermediate poles. This approach will reduce the overall number of poles.
8. When transmission is overbuilding (concrete structures), along an existing distribution corridor, if the distribution wood poles are in good condition, do not replace. If wood poles need to be changed out or relocated, replace with concrete poles to match the transmission pole type. Coordination between the transmission and distribution design is critical and consideration should be given to a design with all transmission poles versus distribution intermediate poles. This approach will reduce the overall number of poles.



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Distribution Design Guidelines

Existing / Maintenance

1. When installing and/or replacing a feeder, lateral, or service pole on an existing pole line, reference the Pole Sizing section for the guidelines to determine the necessary pole class and type.
2. When installing or replacing a feeder pole on a feeder that serves a Top-CIF customer, ensure the new pole will meet extreme wind loading (versus just a minimum class 2 or IIIH pole) so that it will not have to be replaced when the feeder is hardened as a hardening project. Please reference the Storm Secure Hardening SharePoint Site: Distribution > Central Maintenance > Central Contractor Services > Hardening > Reports > Feeder Prioritization_XXXXXX Snapshot for the list of Top-CIF feeders within the Prioritization File.
3. When extending pole lines, the existing pole type should be used as a guide for the new pole type. If concrete poles are requested by the customer or are required as a condition of the permit and fall outside the Pole Sizing Guidelines, the customer will pay a differential charge for the concrete poles.
4. When replacing pole(s) and anchor(s) with larger self-supporting concrete poles, caution should be used, as the property owners in the vicinity of the pole will not necessarily perceive this concrete pole as a better choice.
5. When replacing poles on a multi-circuit feeder the replacement pole should be designed for Extreme Wind Loading. Contact the CMC Hardening Group for assistance in using the KEMA Toolkit/Pole Foreman/Design Manager to calculate the windloading.

Relocations

1. When relocating a pole line, reference the Pole Sizing section for the guidelines to determine the necessary pole class and type to meet Extreme Wind Loading (EWL) for the wind zone region (105, 130, or 145 MPH).
2. When relocating either a concrete or wood pole line for a highway improvement project, the existing pole line 'type' should be used as a guide for the pole type replacements. There is no additional charge for concrete poles if the existing poles being relocated are concrete (like for like relocation). If the customer requests an "upgrade" to concrete poles, a differential is charged.
3. Reimbursable relocations will equal the cost to relocate the line built to Extreme Wind Loading (plus removal of old), including indirect cost.
4. Agency relocation projects should be coordinated with Distribution Planning to ensure optimization of the distribution grid and to take into account future feeder plans and potential feeder boundary changes.

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Distribution Design Guidelines

Crossing Multi-lane Limited Access Highways

The following guidelines are to be used when an overhead feeder crosses any obstacle to access (i.e. –limited access R/W such as interstate highways, turnpikes, and expressways, etc.). Similar consideration can be given to water bodies such as rivers, canals, swamps.

1. Underground installation is the preferred design for all new crossings (1, 2, 3 phase) of multi-lane limited access highways & hardening of existing crossings; reference Fig 1. Limited Access Highway Crossing Schematic (Preferred). If underground construction is not feasible, reference Fig 2. Limited Access Highway Crossing Schematic (Alternate).
2. Underground crossing for 1 & 2 phases should be designed for potential three phase feeder size cable. Ensure riser poles meet or exceed extreme wind design for the designated region. For further information please contact the CMC Hardening Group.
3. For accessible overhead crossings, use concrete poles (III-H or greater square concrete pole) for the crossing poles and minimum Class 2 wood poles for the intermediate poles. For inaccessible overhead crossings, minimum Class 2 wood poles should be used for the crossing and intermediate poles. All poles installed should meet or exceed EWL for the designated region.
4. Every attempt should be made to install storm guys & back guys for the highway crossing poles. Storm guys are not required on the adjacent poles.
5. Frame the highway crossing pole double deadend (See LOC 2 & 3 Fig 2 below).
6. Install disconnect switches on adjacent poles on both sides of the crossing (or as required by field conditions) to isolate the feeder section for restoration. Switches are to be installed in **accessible** locations that can be reached with readily available aerial equipment. Switches should be installed at ~42 Above Grade (AG), with a maximum pole size of 50' wood or 55' concrete. If there is no load between the nearest existing switch and the crossing, an additional switch is not required.
7. Check for uplift on all poles. Refer to DERM Section 4.2.3 Page 4 of 16 & DCS E-4.0.2 and E-4.0.3. Back guys should be installed at the adjacent pole if required for uplift.
8. Ensure to maintain proper clearance above or under all highways as dictated by the owner of the R/W & DCS B-3.0.1.
9. Any conductors crossing the highway that have splices should be replaced with a continuous conductor (NESC 261H2a). See Fig 2 below for additional notes on the use of splices on adjacent spans. One additional set of deadend insulators at the highway crossing pole may be used if this eliminates the need for splices when installing a new pole.



10. Engineers must conduct a pre-design meeting with the Production Lead to ensure the feasibility of the proposed design.
11. As always, use good engineering judgment to produce a quality, cost-effective design.

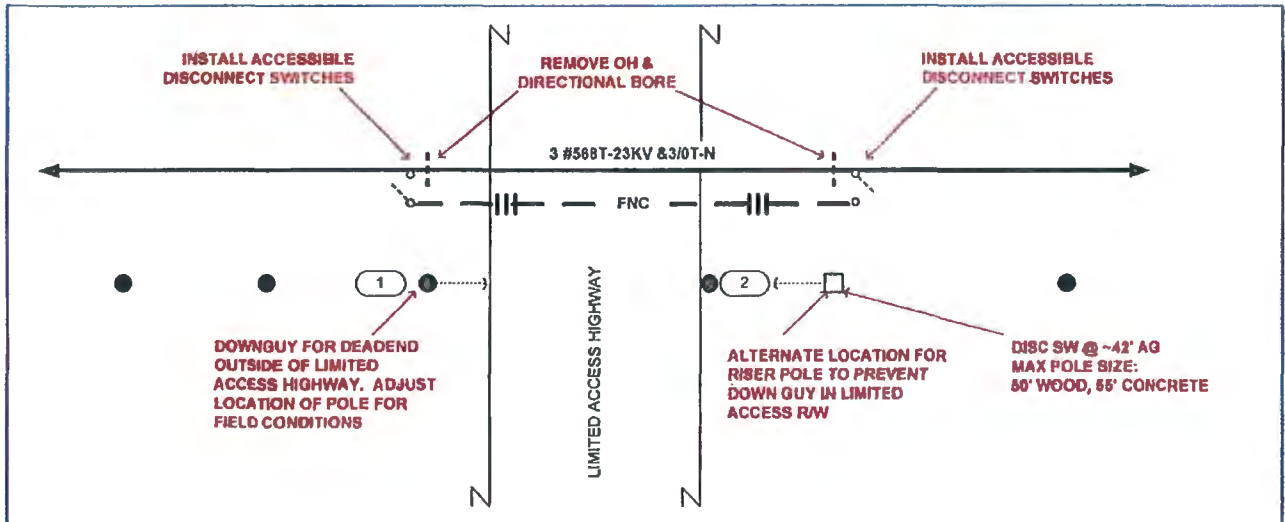


Fig 1. Limited Access Highway Crossing Schematic (Preferred)

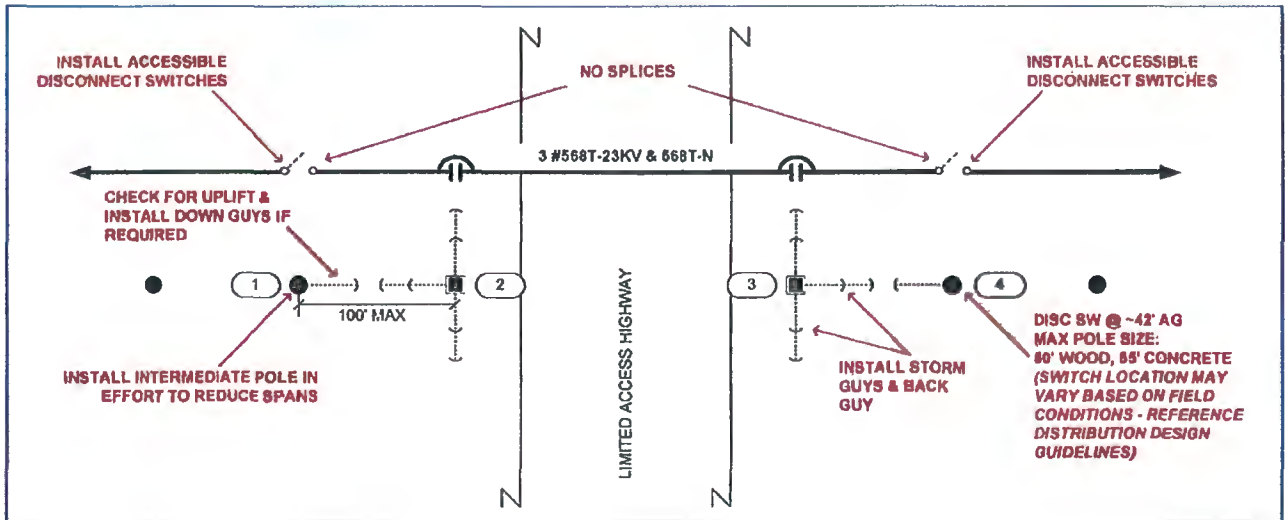


Fig 2. Limited Access Highway Crossing Schematic (Alternate)

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Pole Sizing

1. FPL has made a change to adopt Extreme Windloading (EWL) as the design criteria for: (1) new pole line construction, (2) pole line extensions, (3) pole line relocations, (4) feeder pole replacements on multi-circuit pole lines, and (4) feeder pole replacements on Top-CIF feeders. Reference the Pole Sizing Guidelines (at the end of this section) to determine the necessary pole class and type.
2. When installing or replacing a feeder pole on a feeder that serves a Top-CIF customer, ensure the new pole will meet the extreme wind design (versus just a minimum class 2 or IIIH pole) so that it will not have to be replaced when the feeder is hardened as a hardening project. Please reference the Storm Secure SharePoint Site: Distribution > Central Maintenance > Central Contractor Services > Hardening > Reports > Feeder Prioritization_XXXXXX Snapshot for the list of Top-CIF feeders within the Prioritization File.
3. For maintenance, existing non-top-CIF pole lines may be evaluated using NESC combined ice and wind loading with Grade B construction. This represents the loading prior to the adoption of extreme wind loading. If the pole must be replaced, refer to the Pole Sizing Guidelines for the minimum class pole to be installed.
4. When performing work on an existing pole, and the pole requires change out (e.g., clearance height, location, condition, or the ability to support the planned activity), use the Pole Selection Guidelines. If the planned work can be done without changing out the pole, use the existing pole(s).
5. Foreign pole owners are required to discuss design requirements with FPL prior to construction. FPL will assist with identifying the targeted poles.
6. Efforts should be made to ensure that span distances do not exceed 250 ft. for wood poles and 350 ft. for concrete poles even if longer spans would meet the Extreme Wind Loading requirements.
7. Concrete poles are preferred in the cases where replacement costs would be extremely high (i.e. duct system riser pole, corner poles with multiple circuits, critical poles, etc). No differential is charged for poles in this case.



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Distribution Design Guidelines

Critical Pole Definitions & Sizing:

The following list comprises what will be considered critical poles. When installing and/or when doing work that otherwise requires the replacement of an accessible critical pole, use concrete. If the pole is inaccessible, use a minimum Class 2 wood pole, or consider relocating the equipment to an accessible concrete pole.

Critical Pole Identifier			
For new or when replaced use minimum III-H Square Concrete Pole⁵ (minimum Class 2 if inaccessible)			
Critical Poles	DCS Reference	Critical Poles	DCS Reference
1 st switch out of substation or duct system riser pole	UH-15.0.0 Fig 2 UH-15.3.1	Automated Feeder Switches (AFS) ²	C-9.2.0
Interstate Crossings ^{1,3}	E-10.0.0 Fig 2	Aerial Auto Transformers ²	I-9.0.0
Poles with multiple primary risers	UH-15.2.0	3 phase transformer banks 3 – 100 kVA and larger ²	I-52.0.2
Multi-circuit poles ⁴	Frame as existing	Capacitor Banks ²	J-2.0.2 & J-2.0.3
Three-phase reclosers ² (or Three single-phase reclosers)	C-8.0.0	Regulators	I-10.1.1
Primary Meter	K-28.0.0	Interruption	C-9.5.0

All references are to the Distribution Construction Standards (DCS).

If the critical pole is for new construction, line extensions, relocations, or is on a Top-CIF feeder use the DERM Addendum for Extreme Wind Loading tables 4.2.2-8, 4.2.2-9, or 4.2.2-10 determine if a stronger pole than the minimum class 2 or IIIH pole is needed. For situations that are not in these tables, run the KEMA Toolkit/Pole Foreman/Design Manager to calculate the windloading for the specified pole and attachments combination.

- 1) Every attempt should be made to install storm guys where feasible and practical.
- 2) Frame in-line per standard to equally distribute weight.
- 3) Refer to the Crossing Multi-lane Limited Access Highways section for details.
- 4) Contact CMC Hardening Group before designing new multi-circuit line.
- 5) To eliminate field drilling, inventory Special Drill Pole & create Pole Boring Detail for all III-H Poles on Hardening Jobs.



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Distribution Design Guidelines

Pole Sizing Guidelines:

The following tables should be used as guidelines to help determine pole class and type, when installing and/or replacing a feeder, lateral or service pole.

**Feeder or Three
Phase Lateral:**

Pole Line Description	New Construction, Line Extension, & Pole Line Relocation	Existing Infrastructure ¹	Installing or Replacing a Critical Pole ²
Wood	Use minimum Class 2 Wood Pole to meet EWL	Use Class 2 Wood Poles	Use III-H (Accessible) or Class 2 Wood (Inaccessible)
Concrete	Use minimum III-H Concrete Pole to meet EWL	Use III-H Concrete Poles	Use III-H Concrete Poles

When designing for EWL refer to the DERM Section 4 - Addendum for Extreme Wind Loading tables 4.2.2-8, 4.2.2-9, or 4.2.2-10 to determine if a stronger pole than the minimum class 2 or IIIH pole is needed. For situations that are not in these tables, run the KEMA Toolkit/Pole Foreman/Design Manager to calculate the windloading for the specified pole and attachments combination.

**Single or Two
Phase Lateral:**

Pole Line Description	New Construction, Line Extension, & Pole Line Relocation	Existing Infrastructure ¹	Installing or Replacing a Critical Pole ²
Wood	Use minimum Class 3 Wood Pole to meet EWL	Use Class 3 Wood Poles	Use III-H (Accessible) or Class 2 Wood (Inaccessible)
Concrete	Use minimum III-G ³ or III-H poles	Use III-G ³ or III-H poles to match existing line	Use III-H Concrete Poles

Notes:

¹⁾ To be used when replacing a pole or installing an intermediate pole within an existing pole line. If it is a Top-CIF feeder pole or a multi-circuit pole then it also needs to meet EWL.

²⁾ Reference Critical Pole List on pg.8.

³⁾ Use of III-G poles should be limited to existing concrete lateral pole lines whose wire size is less than or equal to 1/0A.



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Distribution Design Guidelines

Basic Span Lengths for selected poles for Extreme Wind Loading:

Facility	Phase(s)	Wire size	Pole size	Recommended Maximum Span Length ⁴ (FPL with 2 attachments – FPL ONLY)		
				105 MPH	130 MPH	145 MPH
Feeder		3#568 ACAR	Class 2	180' - 230'	125' - 200'	90' - 140'
		3#3/0 AAAC	Class 2	180' - 250'	170' - 250'	120' - 220'
Lateral	3 PH	3#1/0 AAAC	Class 2	180' - 250'	180' - 250'	155' - 250'
	2 PH	2#1/0 AAAC	Class 3	180' - 250'	180' - 250'	125' - 250'
	1 PH	1#1/0 AAAC	Class 3	180' - 250'	180' - 250'	150' - 250'

⁴The lower number equates to the maximum span for FPL primary and two 1" foreign attachments. The higher number equates to the recommended maximum span for FPL primary only. Reference the DERM Addendum for EWL tables 4.2.2-8, 4.2.2-9, 4.2.2-10 when adding additional attachment(s) or equipment. As always, good engineering judgment, safety, reliability, and cost effectiveness should be considered.

Service / Secondary / St. Light / Outdoor Light Poles:

When installing or replacing a service or street light poles, a minimum of Class 4 wood pole should be used. Specific calculations may require a higher class pole for large quadruplex wire.

For any questions on pole sizing to meet EWL or running the KEMA Toolkit/Pole Foreman/Design Manager to calculate windloading, please contact the CMC Hardening Group



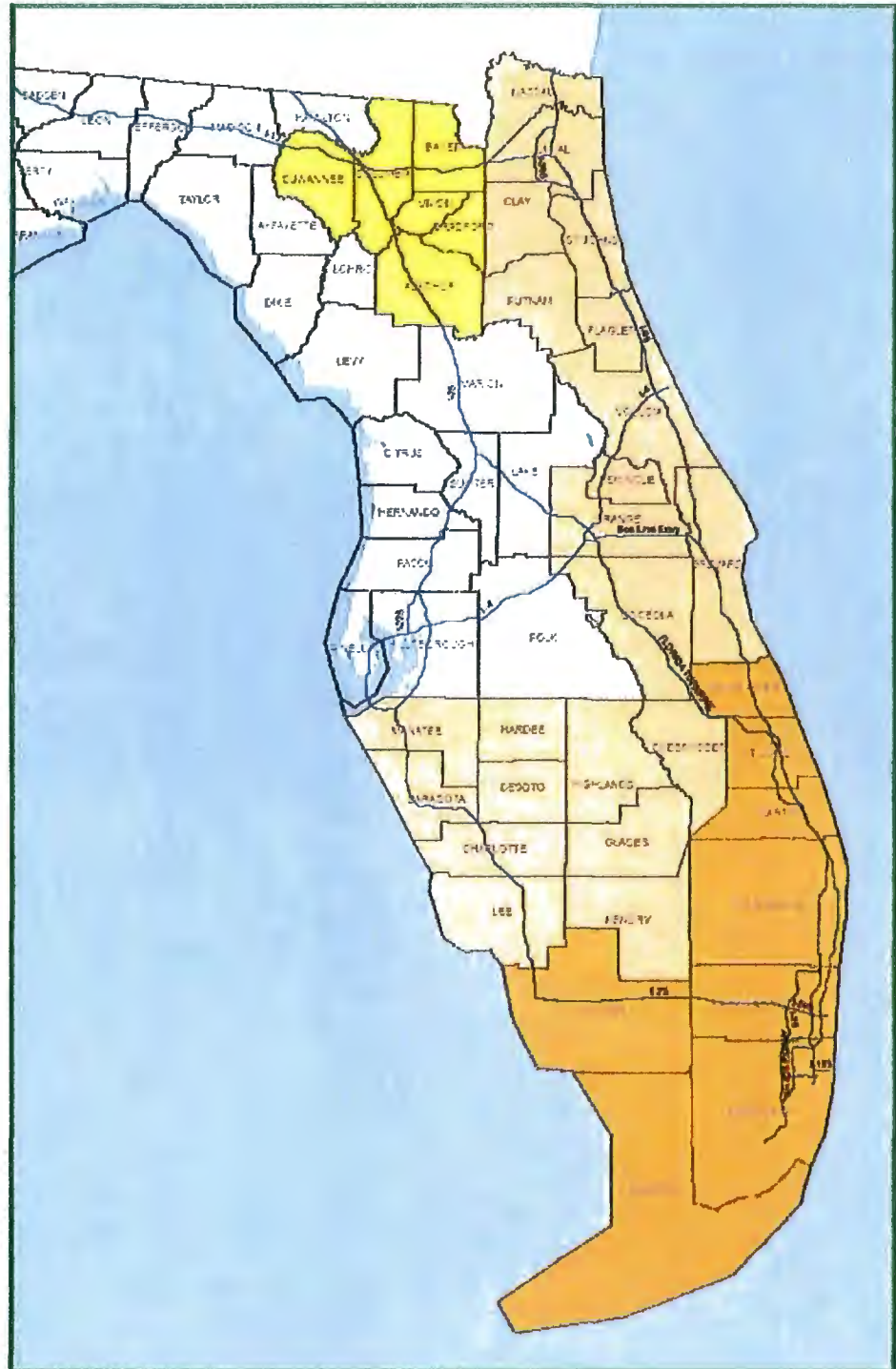
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Distribution Design Guidelines

Extreme Wind Loading (EWL) 3 Zone Map



Wind Zone	County
130	Alachua
105	Baker
105	Bradford
130	Brevard
145	Broward
130	Charlotte
130	Clay
145	Collier
105	Columbia
145	Miami-Dade
130	De Soto
130	Duval
130	Flagler
130	Glades
130	Hardee
130	Hendry
130	Highlands
145	Indian River
130	Lee
130	Manatee
145	Martin
145	Monroe
130	Nassau
130	Okeechobee
130	Osceola
130	Orange
145	Palm Beach
130	Putnam
130	Sarasota
130	Seminole
130	St Johns
145	St Lucie
105	Suwannee
105	Union
130	Volusia





SUBJECT

Distribution Design Guidelines

Notification of FPL Facilities

Form 360, Notification of FPL Facilities, is to be used for all construction projects. Please include a copy of this form in negotiations with builders and developers. This form can be found on the DCS Website under "Letters and Agreements", or in WMS on the "Reports" menu item for the work request.

Hardening Design Guidelines
Quick Reference Guide



Hardening Design Guidelines Quick Reference Guide



Feeder or Three Phase Lateral:

Pole Line Description	New Construction, Line Extension, & Pole Line Relocation ¹	Existing Infrastructure ²	Installing or Replacing a Critical Pole ²
Wood	Use minimum Class 2 Wood Pole to meet EWL	Use Class 2 Wood Poles	Use III-H (Accessible) or Class 2 Wood (Inaccessible)
Concrete	Use minimum III-H Concrete Pole to meet EWL	Use III-H Concrete Poles	Use III-H Concrete Poles

Single or Two Phase Lateral:

Pole Line Description	New Construction, Line Extension, & Pole Line Relocation ¹	Existing Infrastructure ²	Installing or Replacing a Critical Pole ²
Wood	Use minimum Class 3 Wood Pole to meet EWL	Use Class 3 Wood Poles	Use III-H (Accessible) or Class 2 Wood (Inaccessible)
Concrete	Use minimum III-G ³ or III-H poles	Use III-G ³ or III-H poles to match existing line	Use III-H Concrete Poles

Facility	Phase(s)	Wire size	Pole size	Recommended Maximum Span Length ³ (FPL with 2 attachments – FPL ONLY)		
				105 MPH	130 MPH	145 MPH
Feeder		3#568 ACAR	Class 2	180' - 230'	125' - 200'	90' - 140'
		3#3/0 AAAC	Class 2	180' - 250'	170' - 250'	120' - 220'
Lateral	3 PH	3#1/0 AAAC	Class 2	180' - 250'	180' - 250'	155' - 250'
	2 PH	2#1/0 AAAC	Class 3	180' - 250'	180' - 250'	125' - 250'
	1 PH	1#1/0 AAAC	Class 3	180' - 250'	180' - 250'	150' - 250'

¹To also be used when extending or relocating a pole line. For span length details, use the Recommended Span Lengths above.

²To be used when replacing a pole or installing an intermediate pole within an existing pole line. *If it is a Top-CIF feeder pole or a multi-circuit pole then it also needs to meet EWL.*

³The lower number equates to the maximum span for FPL primary and two 1" foreign attachments. The higher number equates to the recommended maximum span for FPL primary only. Reference the DERM addendum for EWL 4.2.2-8, 4.2.2-9, 4.2.2-10 tables when adding additional attachment(s) or equipment. Remember to always contact Delivery Assurance Hardening when working on a Top CIF feeder. As always, good engineering judgment, safety, reliability, and cost effectiveness should be considered.

Critical Pole Identifier			
For new or when replaced use minimum III-H Square Concrete Pole (minimum Class 2 if inaccessible)			
Critical Poles	DCS Reference	Critical Poles	DCS Reference
1 st switch out of substation or duct system riser pole	UH-15.0.0 Fig 2 UH-15.3.1	Automated Feeder Switches (AFS)	C-9.2.0
Interstate Crossings	E-10.0.0 Fig 2	Aerial Auto Transformers	I-9.0.0
Poles with multiple primary risers	UH-15.2.0	3 phase transformer banks 3 – 100 kVA and larger	I-52.0.2
Multi-circuit poles	Frame as existing	Capacitor Banks	J-2.0.2 & J-2.0.3
Three-phase reclosers (or Three single-phase reclosers)	C-8.0.0	Regulators	I-10.1.1
Primary Meter	K-28.0.0	Interruption	C-9.5.0

All references are to the Distribution Construction Standards (DCS).



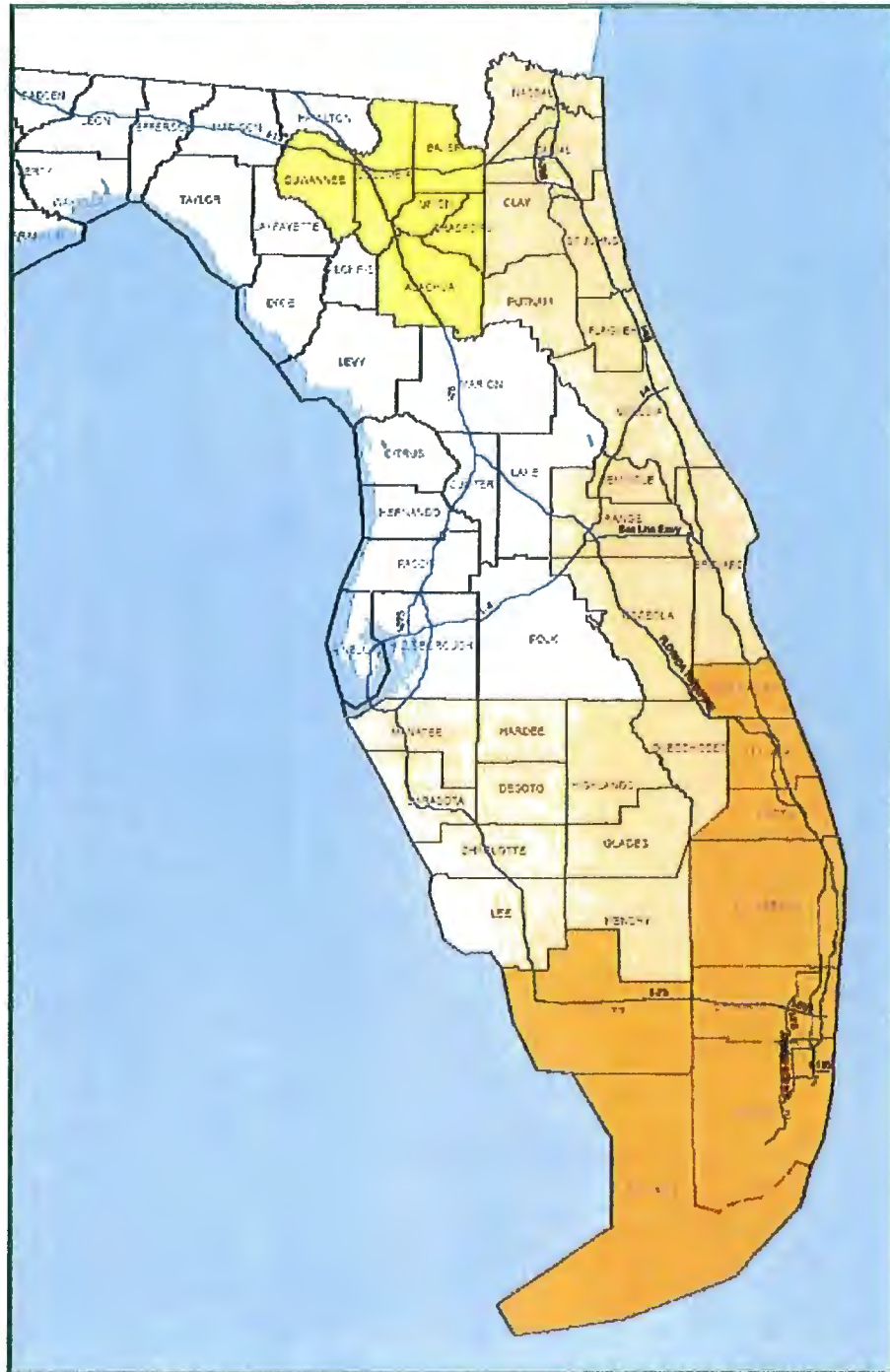
Hardening Design Guidelines Quick Reference Guide



Extreme Wind Loading (EWL) 3 Zone Map



Wind Zone	County
130	Alachua
105	Baker
105	Bradford
130	Brevard
145	Broward
130	Charlotte
130	Clay
145	Collier
105	Columbia
145	Miami-Dade
130	De Soto
130	Duval
130	Flagler
130	Glades
130	Hardee
130	Hendry
130	Highlands
145	Indian River
130	Lee
130	Manatee
145	Martin
145	Monroe
130	Nassau
130	Okeechobee
130	Osceola
130	Orange
145	Palm Beach
130	Pulnam
130	Sarasota
130	Seminole
130	St Johns
145	St Lucie
105	Suwannee
105	Union
130	Volusia



Reference the Service Planning Quick Reference Guide-Distribution Design Guidelines for a complete summary of Hardening Guidelines

Attachment Guidelines & Procedures

ADDENDUM

**TO FPL'S PERMIT APPLICATION PROCESS MANUALS,
ATTACHMENT AGREEMENTS AND JOINT USE AGREEMENTS**

FPL ATTACHMENT STANDARDS AND PROCEDURES

March 11, 2013

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I. SAFETY

SAFETY

It is the responsibility of the attacher to ensure that all persons involved with the application for attachment to FPL poles, and all persons involved with the field engineering, design, installation, construction and ongoing maintenance of these attachments, comply with all applicable federal, state and local safety laws and regulations including the Occupational Safety and Health Act, the National Electrical Safety Code (NESC), any requirements of FPL and any additional safety requirements requested by FPL.

It is also the responsibility of the attacher to warn its employees and contractors that electrical facilities are high voltage facilities and to inform these persons as to safety and precautionary measures which he or she must use when working on or near FPL poles and other facilities.

Proper guying of cables must be accomplished by the attacher.

To ensure that poles are always accessible for workers, particularly in locations inaccessible to bucket trucks, cable risers installed on FPL poles must not interfere with climbing space on the pole.

With the exception of pole-top antennas, second and third party attachments will be limited to the NESC designated communication space below the electrical supply space on all distribution poles with FPL attached. At no time may the communication/CATV worker encroach upon the electric supply space on the pole. Governmental Entities requesting attachments to FPL street light facilities may have certain attachments (i.e. banners, holiday decorations, etc) to those facilities provided that the attachments are installed in accordance with the terms and conditions of their agreements for the use of such facilities.

For any device emitting radio frequency (RF) radiation, to ensure the health and safety of utility workers, attacher shall install electric service disconnects as part of attacher's equipment to enable utility crews and personnel to disconnect power when working on the poles used for attacher's devices. FPL crews will be instructed to disconnect power to attacher's devices prior to working on the pole and to reconnect power to the devices when the work is complete. Furthermore, the attacher MUST label the device with language that advises the utility worker of the emission of RF radiation and advises the utility worker to disable the device.

FPL's poles routinely have attachments that emit RF radiation. Attachers are required to acknowledge that RF radiation on these poles exists, and that the owner of the device is responsible for the operation of those devices. Attachers are required to familiarize themselves, instruct and warn their employees, agents, contractors and subcontractors who are working around these devices, prior to performing any work or installation on or around any FPL pole.

Attachment of RF emitting devices is limited to one measured and FPL approved output device per pole. Attachers may not attach antennas or other RF emitting devices to a pole if it already has an antenna or RF emitting device installed by FPL or a third-party.

FPL inspects its poles on a routine basis. Poles requiring replacement are tagged by FPL for future replacement. Attachers are required to acknowledge that these tags and FPL's pole tagging convention exist, and that the form of the tags utilized by FPL may change from time to time. Attachers are to familiarize themselves, their employees, agents, contractors and subcontractors with FPL's pole tagging convention and any modifications to that convention, including the form of tag utilized, prior to performing any work or installation on or around any FPL pole.

II. STANDARDS

II. A. ATTACHMENT CRITERIA

No attachment or increase in bundle size of an existing attachment may be made to an FPL pole without prior approval by FPL's permit application vendor or an FPL engineer. (See the Procedures section.) Wireline and telecommunication antenna attachments may only be made to FPL distribution poles. Wireline attachments may be made to transmission poles ONLY if FPL distribution facilities are also attached to the pole and ONLY after receiving written approval from FPL's Transmission Department. Street Light Facilities - Governmental Entities requesting attachments to FPL street light facilities may make certain attachments (i.e. banners, holiday decorations, etc) to those facilities provided that the attachments are installed in accordance with the terms and conditions of their agreements for the use of such facilities. Electric service, if required, will be provided to an off-pole location. Power supplies are not allowed on the pole.

Attachment Criteria – Communication Space

NON JOINT USE POLE
(no telephone)

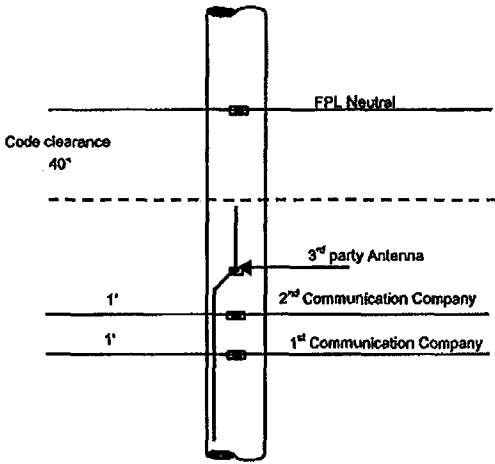


Fig 1

JOINT USE POLE
(power & telephone)

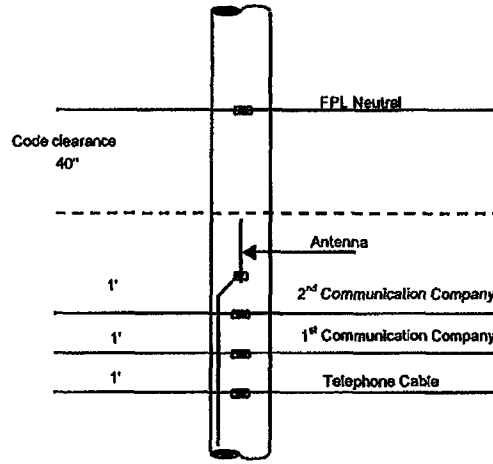


Fig 2

1. The 1st cable attachment will be located at a height providing minimum clearance over roads, obstacles, etc.
2. All additional cable or antenna attachments will be located 1' above the highest existing communication cable, with antenna highest.
3. The antenna attachment will be a minimum of 1' above highest cable. Only one antenna attachment permitted per pole.

1. The 1st cable attachment will be located 1' above Telephone's highest cable Attachment
2. The 2nd cable attachment will be located 1' above the existing
3. The antenna attachment will be a minimum of 1' above highest communication cable. Only one antenna attachment permitted per pole.

- NOTE:** No cable or antenna attachment placed in the communication space will compromise the 40" NESC code clearance space.
- NOTE:** By signing this document, applicant acknowledges that FPL tags poles for replacement and that the form of the tags utilized by FPL may change from time to time and that Applicant, its employees, contractors, subcontractors and agents are familiar with FPL's pole tagging convention and any modifications to that convention, including the form of tag utilized, prior to performing any work or installation on or around any FPL pole.
- NOTE:** Applicant also acknowledges that FPL's poles routinely have attachments that emit RF radiation. Attachers are required to familiarize themselves, instruct and warn their employees, agents, contractors and subcontractors who are working around these devices, prior to performing any work or installation on or around any FPL pole.

Space Allocation

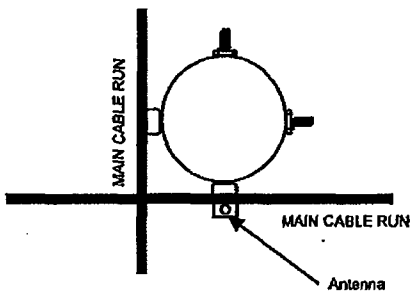


Fig 3

POLE ATTACHMENT LOCATION

1. Attachment is limited to the communication space.
2. All main cable attachments shall be located either on the same side of the pole as FPL's neutral or on one common adjacent side.
3. No main line cable attachments shall be located on the side of the pole opposite FPL's neutral.
4. All electrical connections must be made off the pole.
5. No more than two risers will be allowed per pole. Keep in mind, FPL's electric service to attacher may be one of these risers.

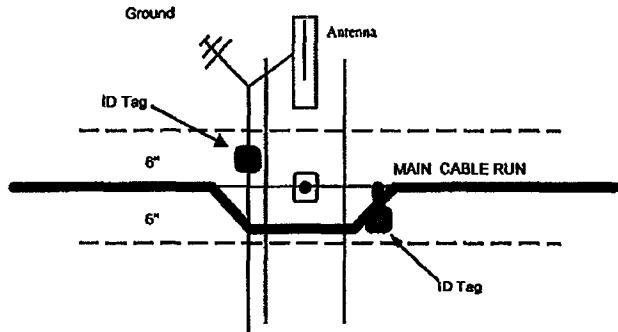
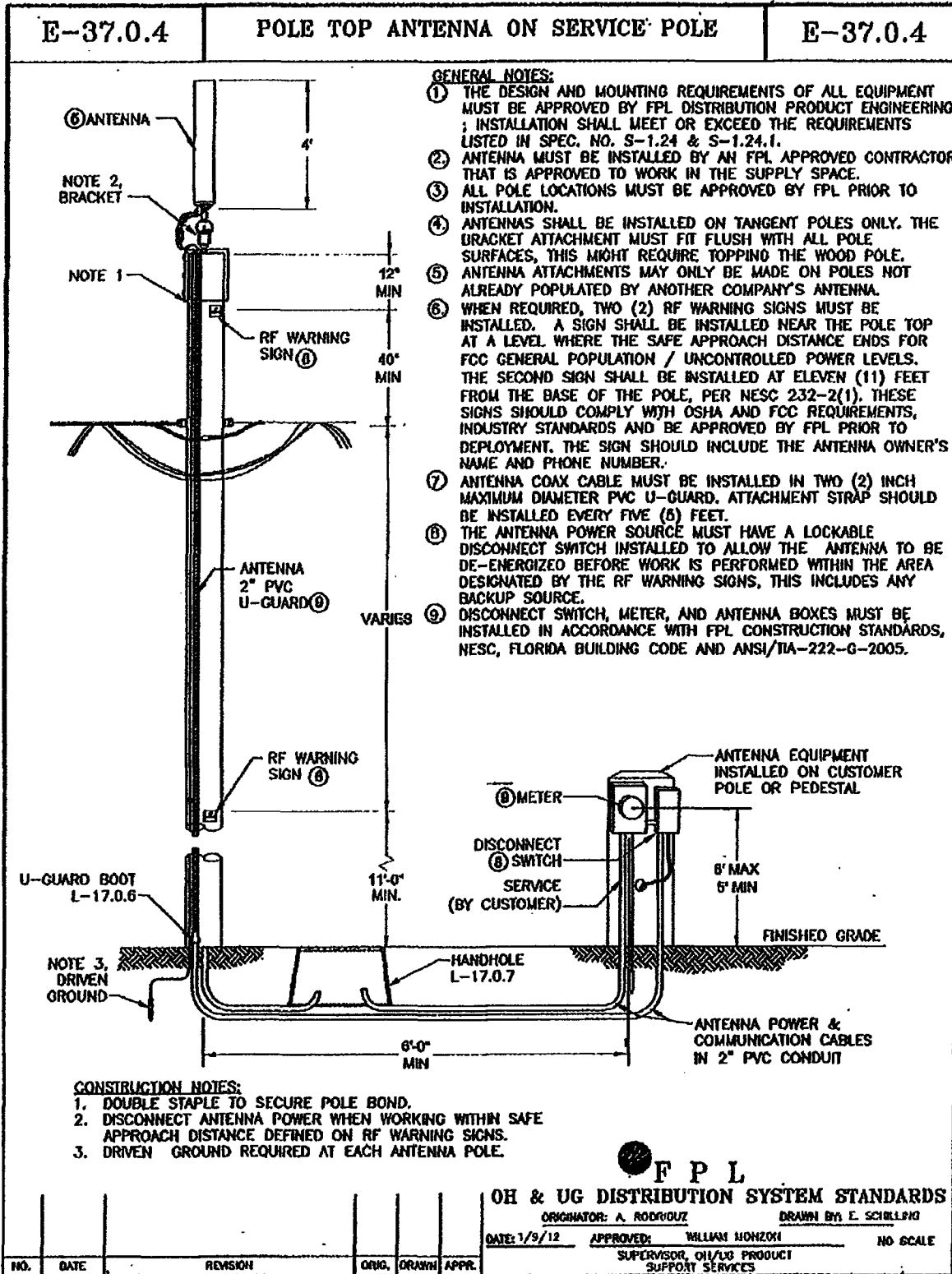


Fig 4

IDENTIFICATION TAG

1. Each separate attachment shall be identified in accordance with guidelines developed by the FUCC or FPL.
2. Each company shall register their unique ID tag with the FUCC's Joint Use Subcommittee or FPL.
3. Antenna ID tags shall be installed at every pole attachment.
4. Cable ID tags shall be installed at the first and last pole attachment as well as every fifth pole attachment and at every street intersection.

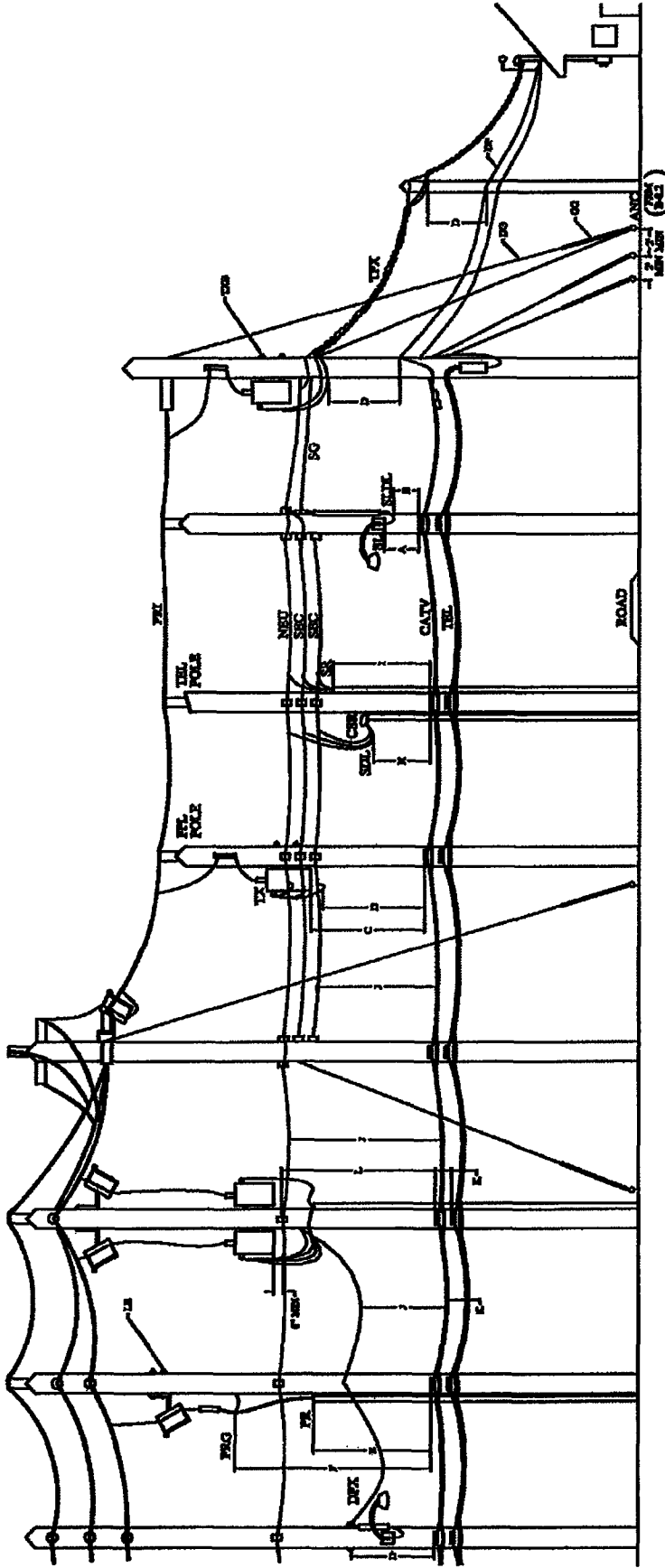
Typical Attachment Criteria for Pole Top Mounted Antennas



II.B. ATTACHMENT CLEARANCES

It is the responsibility of the attacher to ensure that attachments are designed and constructed in accordance with the National Electrical Safety Code and these guidelines, and to secure any necessary permit, consent or certification from state, county or municipal authorities or from the owners of the property to construct and maintain attachments to FPL poles. Wireless antenna clearance requirements are the same as the clearance requirements for CATV and telecommunications facilities.

CLEARANCES OF COMMUNICATION CABLES TO FPL & OTHER FOREIGN UTILITIES



DIMENSION (LETTER)	SEPARATION FROM FOREIGN UTILITIES TO...	FPL MINIMUM REQUIREMENT	** NESC MINIMUM REQUIREMENT	NESC APPLICABLE REFERENCE SECTION
A	STRENGTH BRACKET	4 INCHES	4 INCHES	23 C, TABLE 23A-2
B	STRENGTH DEEP LOOP	12 INCHES	12 INCHES	23 D
C	TRANSFORMER BOTTOM	30 INCHES	30 INCHES	23 B, TABLE 23A-1
D	SEC DEEP 1/2 SECONDARY	40 INCHES	40 INCHES	23S, TABLE 23S-5
E	PRIMARY WIRE SHIELD	3 INCHES	NONE	239 O1, EXCEPTION 1
F	PRIMARY WIRE GROUND	40 INCHES	40 INCHES	239 G1
G	SYNDROP AND DEEP LOOP	12 INCHES	12 INCHES	235 C1, EXCEPTION 3
H	CUSTOMER OWNED	40 INCHES	40 INCHES	TABLE 235-5
I	SERVICE DEEP LOOP	40 INCHES	40 INCHES	TABLE 235-5, EXCEPTION 3
J	SERVICE EDGE	30 INCHES	30 INCHES	239 G7
K	MID SPAN	30 INCHES	30 INCHES	239-1
L	FOREIGN UTILITIES	12 INCHES	12 INCHES AT POLE, 4 INCHES ALONG SPAN	235 H
	NEUTRAL	40 INCHES ***	30 INCHES	TABLE 235-5, EXCEPTION 6

* FOLLOW THE MINIMUM. ** NESC REQUIREMENT PROVIDED FOR REFERENCE ONLY. *** WIRE TO SEC IS PLANNED BY SEC. ** NESC REQUIREMENT IS INCREASED TO 30 INCHES ALONG SPAN.

II.C. WINDLOADING CRITERIA AND CALCULATIONS

Before any additional load is added to an FPL owned pole, it is incumbent upon the attacher to verify that their addition meets FPL's Design Guidelines and Electric Infrastructure Storm Hardening Plan which are included as part of this filing. Additionally if the load on a pole is increased, evidence that it meets those requirements, through engineering analysis, must be included with the Permit to attach or Notice of Intent to Overlash.

III. PROCEDURES

III.A. PROCEDURES FOR JOINT USERS

FPL and Incumbent Local Exchange Carriers (ILEC) explore the benefits of joint use and share the cost of pole ownership.

New Construction

1. New facilities are designed and built in accordance with the detail plans filed with the FPSC and the existing joint use agreement.
2. The joint use agreement for each company dictates which company sets the new pole(s) and how costs are distributed.
3. If FPL is building the new pole line, CIAC will be collected for the increased size and strength required to accommodate the attachments of third parties requesting to attach.

There are times when the ILEC determines they would like to attach to a pole they were not previously attached to or they wish to modify their facilities, which would in turn increase the loading on a pole

Existing Poles

1. If the ILEC is increasing load on the pole, it is imperative for the ILEC engineer to learn if the pole has been hardened or if the pole now has stronger windloading requirements due to detail plans filed with the FPSC. This is true if the pole is owned by FPL or the ILEC. Discussion with the FPL engineer will help determine the design criteria of the pole.
2. If the new attachment would compromise the loading standard, the ILEC engineer may request make-ready from the FPL engineer to accommodate their attachments. A contribution will be charged in accordance with the joint use agreement or supplemental (addendum) agreements that followed it.

III. B. PROCEDURE FOR THIRD PARTIES (CATV AND TELECOMMUNICATIONS CARRIERS (non-ILECs))

1) APPLY for permit or submit Notification of Intent to Overlash.

- Create appropriate application package(s) and retain copies for your company:
- Non-make ready – no FPL construction is needed
- Make ready - requires design, cost approval, invoice, payment, and construction of FPL work order prior to FPL permit approval (includes cases where make ready is necessitated by overlash)
- Notification of Intent to Overlash - When overlash to existing attachments where resulting bundle is heavier than the existing attachment or has an increased diameter over that of the existing attachment and there is no need for make ready
- Remember that permits are not granted for attachments to poles that are exclusively part of an FPL street lighting system.
- The attachment permit is for cables, wires and supporting hardware only, not for power supplies, amplifiers, antennas or similar equipment.
- Review permit application package for accuracy and completeness to avoid rejection.
- Submit complete permit package (Permit number must include submittal year).

2) RECEIVE approved Exhibit “A”

3) CONSTRUCT/QC attachments.

- You must have an approved Exhibit “A”
- **A copy of the approved Exhibit “A”, highlighted CATV and FPL maps must be available for inspection on the job site during construction of the attachments.**
- You must complete construction within 60 days of approval or permit will automatically expire, and you will need to re-apply.
- Build facilities as designed in approved permit package.
- **Conform to FPL requirements (clearances, tagging, bonding, down guys, anchors, guy guards, proper brackets for attachments per reverse side of the**

Exhibit "A", no stand off or extension arms, etc.) and NESC standards.

- Upon completion of construction, perform quality control review of facilities for compliance and make adjustments if necessary.

4) NOTIFY of construction completion. (Exhibit "B")

- **Send notice monthly (provided there have been attachments/removals during that month). Remember to include all routine attachments to drop or lift poles.**
- Notice (Exhibit "B") must be sent to permit process contractor (Alpine).
- Notice (Exhibit "B") must be sent within 30 days after construction of the attachments is complete.

Additional Steps for Antenna Attachers

Prior to applying for a permit to attach as described above, the attacher must:

- 1) **OBTAIN Equipment Evaluation Approval from FPL**
 - Required once for every new piece of equipment to be installed on or above FPL property
 - A copy of the approved Equipment Evaluation Form must be included with each complete permit application package submitted to the permit application vendor.
- 2) **OBTAIN Pole Top Evaluation Approval from FPL, if required**
 - A Pole Top Evaluation Package is only required if the antenna will be installed above primary conductor or in-line with a primary conductor pole line.
 - Where required, a unique Pole Top Evaluation is required for each installation, regardless of the pole owner, if FPL has facilities on the pole.
 - A copy of the approved Pole Top Evaluation Package, if required, must be included with each complete permit application package submitted to the permit application vendor of the pole owner.
 - If FPL make-ready is required on a foreign utility pole, a make-ready permit is required from FPL and an attachment permit is required from the foreign utility pole owner.

III.C. PROCEDURES FOR GOVERNMENTAL ATTACHMENTS

Attachment Permits are required for:

- New attachments to FPL poles
- Overlashings of existing attachments to FPL poles where the resulting bundle is heavier than the existing attachment or has an increased diameter over that of the existing attachment
- Major rebuilds or upgrades
- Attachments to non-FPL poles that require FPL make-ready

The attachment permit is for Licensee cables, wires and supporting hardware only, not for power supplies, amplifiers or similar equipment.

Wireline attachments are not allowed to poles exclusively a part of an FPL street lighting system.

Permits requiring FPL make-ready will not be approved until FPL design, payment by the Applicant and construction is completed by FPL.

PERMIT APPLICATION PROCESS

1. Field Survey - Identify ownership and pole size and existing attachments, conductor sizes, and span lengths.
2. Complete the Pole & Midspan Measurement Form
3. Ensure that all minimum clearances will be maintained.
4. Calculate windloading.
5. Complete the "Attachment and Application and Permit Exhibit A".
6. Assemble permit package (which may or may not include request for make ready).
7. Review completed package for accuracy
8. Submit package to FPL for approval
9. Once approved make attachments
10. When complete return Exhibit B to FPL

SECTION IV.

**PERMIT APPLICATION PROCESS
FOR FPL TRANSMISSION POLES
(AND TRANSMISSION GUY STUBS)**

REVISED 2/18/2013

[NOTE: PERMIT APPROVAL IS BY FPL – TRANSMISSION PROJECTS
DEPARTMENT ONLY AND REQUIRES ADDITIONAL TIME TO GAIN
APPROVAL]

Application Requirements

Applications will be considered only for transmission poles already having distribution underbuilt facilities.

All applications for attachment to transmission poles require complete structural calculations. Applicant shall demonstrate that the poles can withstand the additional proposed mechanical and environmental loads. Calculations shall be provided with input and GT-STRUDL output forms, with non-linear analysis results and structural summary, signed and sealed by a Professional Engineer – Structural, licensed in the State of Florida.

Application Costs

The cost associated with reviewing the application calculations will be the responsibility of the applicant. Review of calculations for approval is performed by FPL Transmission at a cost of \$175 per manhour (regardless of final approval or disapproval of the request). A deposit of \$5,000 dollars, payable to FPL, is required for quantities of up to 25 poles.

Application Process

Submit completed application to FPL Representative (same as for distribution attachments). Your representative will review the application for completeness. Completed applications will be forwarded to FPL's Transmission Projects Group for review.

1.0 DESIGN CRITERIA

When more than one code applies, the more stringent criteria shall govern.

1.1 CLEARANCES

Any overhead cable installation shall comply with FPL 2012 NESC Basic Clearances for Overhead Transmission Lines (or later published standard), the National Electric Safety Code (NESC)-2012 (or latest version adopted by the Florida Public Service Commission) or other governmental agency codes.

1.2 DESIGN LOADS

1.2.1 POLE DESIGN

Design loads shall meet the specifications defined in the National Electric Safety Code (NESC)-2012, the American Society of Civil Engineer (ASCE) ASCE/ANSI 7-05 "Minimum Design Loads for Buildings and Other Structures" and ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading" (2009). For towers with cellular antennas, design shall meet, in addition to the others listed, the specifications defined in ANSI/TIA/EIA 222, "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures".

STEEL TRANSMISSION STRUCTURES

Designs shall meet the specifications defined in the ASCE Standard 48-11, "Design of Steel Transmission Pole Structures",

and ASCE Standard 10-97, "Design of Latticed Steel Transmission Structures".

CONCRETE TRANSMISSION POLES

Designs shall meet the specification defined in the ASCE Manual 123 "Prestressed Concrete Transmission Pole Structures: Recommended Practice for Design and Installation" (2012).

WOOD TRANSMISSION POLES

Designs shall meet the specification defined in the IEEE Standard 751 "Trial-Use Design Guide for Wood Transmission Structures" and ANSI O5.1, "Specifications and Dimensions for Wood Poles" (2008).

1.2.2 WEATHER RELATED LOADS

Transmission poles are required to resist the weather-related loads (Extreme Wind and Ice/Wind). The applied wind load cases that need to be considered for transmission structures from ALL angles are defined as follows:

Under District Loads (NESC Section 250 B)

FPL service territory is classified as the "Light Loading District".

Under Extreme Wind Loads (NESC Section 250 C)

ASCE 7-05 "Minimum Design Loads for buildings and Other Structures" and ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading" (2009) are the basis of this control criteria. The Importance Factor is 1.15 for this load case.

Under Combined Ice/Wind loads (NESC Section 250 D)

ASCE 7-05 "Minimum Design Loads for buildings and Other Structures" and ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading" (2009) are the basis of this control criteria. The Importance Factor is 1.15 for this load case.

Under Serviceability Requirements (FPL Policy for Concrete Poles)

45-mph, 3-second gust wind load is considered as the minimum wind load applied for the zero-tension condition, which is only applied to prestressed concrete poles. The calculation of the wind pressure also follows the requirements of ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures" and ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading" (2009). The Importance Factor is 1.0 for this load case.

1.2.3 OSHA REQUIREMENTS

This project shall be designed to meet all Occupations Safety and Health Administration (OSHA) rules and regulations.

2.0 PERMIT PACKAGE

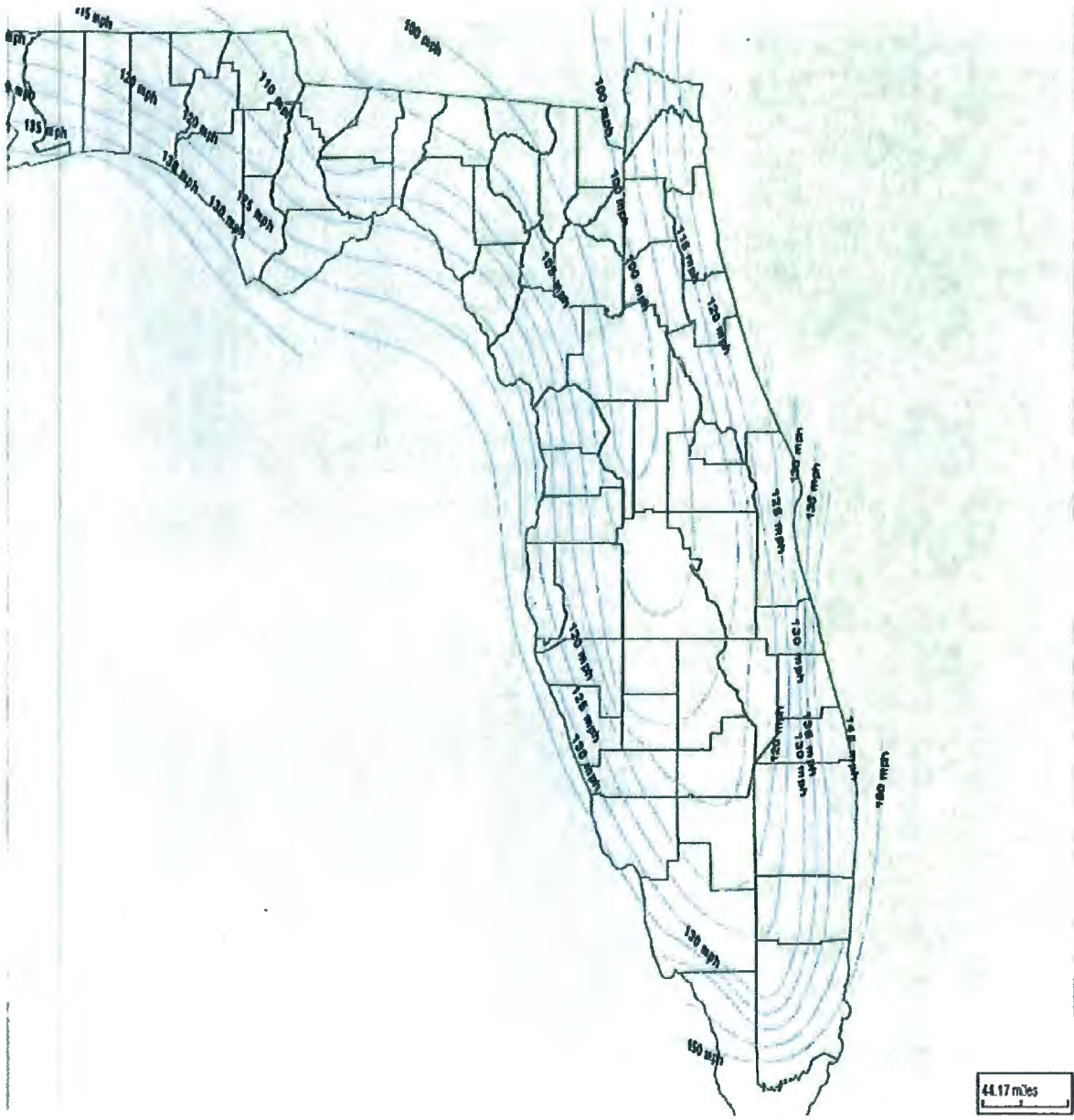
A permit application shall consist of two (2) complete packages in the following order:

- 1) Payment for Permit (payable to FPL)
- 2) Original, signed Exhibit "A" (front and back)
- 3) Calculations (signed and sealed)
- 4) Field Notes
- 5) Pictures of all affected poles, with corresponding pole identification numbers (photographs or jpeg files)
- 6) Licensee maps (plan/profile) showing route, spans, pole heights, and the Licensee facilities proposed for installation
- 7) Copy of the FPL Primary Map, with the affected area highlighted

3.0 APPROVAL / DISAPPROVAL

Upon review of the permit application, a response stating approval or disapproval will be communicated by the FPL – Transmission Projects Department.

FLORIDA WIND ZONES-2002



2013 Attachers List

3/5/2013

AT&T Florida

Neil Jennings
State Manager – Joint Use / Right of Way
AT&T - Florida, Inc.
3400 Martin Luther King Drive
Pensacola, FL 32503

Verizon

Attn: Steve R. Lindsay, Staff Consultant – Centralized Joint Use
1909 US Hwy 301 N
MC FLG2 937
Building D
Tampa, FL 33619

CenturyLink - Florida

Henry Bowlin
Manager Network Support - Joint Use
952 First Street, Altamonte Springs, Florida 32701
Mailstop: FLALTH 0101-115

Windstream Communications

Gary Cary
Windstream Florida, Inc
206 White Ave,
Live Oak, FL 326064
Attn: Engineering

Northeast Florida Telephone Company

Tracy Mathews
130 North 4th Street
P.O. BOX 485
Macclenny, FL 32063-0485

Indiantown Telephone Systems

Attn: Mike Brown
15925 S.W. Warfield Blvd.
Indiantown, FL 33456

DeltaCom, Inc.

John McGuffey, Field Engineer II
1809 Hillyer Robinson Ind Pkwy
Anniston, AL 36207

ATC Outdoor DAS, LLC

Attn: Director of DAS Solutions and Acquisitions
400 Regency Forest Drive
Suite 300
Cary, NC 27518

Dedicated Fiber Systems, Inc.

Attn: Charles T. Nichols
4651 Salisbury Rd
Suite 4004
Jacksonville, FL 32256

ePath Communications, Inc.

Attn: Joseph A. Tortoretti, CEO
5110 Eisenhower Blvd.
Suite 310

3/5/2013

Tampa, FL 33634

ExteNet Systems, Inc.

Attn: Mr. Terry Ray, Vice President and CFO
1901 S. Meyers Rd
Suite 190
Oakbrook Terrace, IL 60181

Fiberlight

Attn: Chad Pifer
3655 Brookside Parkway
Suite 550
Alpharetta, GA 30022

FPL Fibernet LLC

Attn: Sheldon S Jordan
9250 West Flagler Street
Miami, FL 33174

Hotwire Communications, LLC

Kristin Johnson, President
300 E. Lancaster Avenue, Suite 208
Wynnewood, PA 19083

Level 3 Communications (SE Florida)

Attn: Jeff Sloan
1025 Eldorado Blvd
Broomfield, CO 80021

MCI

Attn: Virgil Springer
6929 N. Lakewood Ave.
Tulsa, OK 74117

NewPath Networks, LLC

Attn: Michael J. Kavanaugh, CEO
1300 North Northlake Way
Seattle, WA 98103

Nextel South, Corp.

Attn: Tim Thompson, Regional Vice President
Field Engineering and Operations
6575 The Corners Parkway
Norcross, GA 30092

Crown Castle NG East Attn: Contracts Administrator

2216 O'Toole Avenue
San Jose, CA 95131

NUVOX Communications

Attn: John Hunt
2301 Lucien Way Suite 200
Maitland, FL 32751

PT Wireless

Attn: Joe Faber
444 High Street Suite 400
Palo Alto, CA 94301

3/5/2013

Qwest Communications Corporation

Attn: Gary Hunt
700 West Mineral Avenue
UT H27.19
Littleton, Colorado 80120

SETEL

Attn: Ken Kirkland
1165 South 6 Street
Macclenny, FL 32063

Sunesys, LLC

Attn: Paul T. Bradshaw
202 Titus Av
Warrington, PA 18976

S.F.M. & T., INC

Attn: Tom Terwilliger
15398 SW 153 St
Miami, FL 33187

T-Mobile South, LLC

Attn: Harlan Kickhoefer
8100 SW 10th Street
Building 3, Suite 1000
Plantation, FL 33324

TAPCO

Attn: Thomas J. Farrell
23170 Harborview Road
Charlotte Harbor, FL 33980

TCG South Florida

Attn: V.P. of Operations
1001 West Cypress Creek Rd.
Suite #209
Fort Lauderdale, FL 33309

Tier 3 Communications

Attn: Loren Rosenthal
2235 First Street
Suite 217
Fort Myers, Florida 33901

Tina Davis

Sr. V.P. & Deputy General Counsel
Time Warner Telecom
10475 Park Meadows Dr.
Littleton, CO 80124

U.S. Metropolitan Telecom, LLC

Attn: Carlie Ancor
24017 Production Circle
Bonita Springs, FL 34135

XO Communications

Attn: Leslie Strickland - Corporate Accounting
11111 Sunset Hills Road
Reston, VA 20190

3/5/2013

Windstream KDL, Inc.
8825 Bond Street
Overland Park, KS 66214
Attn: Tamela Bruns

3/5/2013

City of Cocoa Beach

Jeff Thiel, I.T. Director
2 South Orlando Avenue
Cocoa Beach, FL 32931

City of Hollywood

Attn: John Barletta
2600 Hollywood Blv
Hollywood, FL 33020

City of Stuart

Public Works Director
121 SW Flagler Avenue
Stuart, FL 34994

City of Miami Beach

Trish Walker, Chief Financial Officer
1700 Convention Center Drive
Miami Beach, FL 33139

City of North Miami Beach

1750 NE 19th AV
North Miami Beach, FL 33162
Attn: Assistant Director Jeff An

City of Miami Gardens

1020 NW 163rd Drive
Miami, Gardens, FL 33169
Attn: Captain Alfred Lewers

Palm Beach County

Attn: Chuck Spalding
Palm Beach County Government Center
301 North Olive Avenue 8th Floor
West Palm Beach, FL 33401

Town of Juno Beach

Town Manager
340 Ocean Drive
Juno Beach, FL 33408

Village of Wellington

Tom Amberguy
14000 Greenbriar Blvd
Wellington, FL 33414

WLRN

Attn: Chief Engineer
172 NE 15 Street
Miami, FL 33132

City of Bradenton Beach

Attn: Nora Idso
107 Gulf Drive North
Bradenton Beach Fl 34217

City of Palm Bay

C/O Deputy City Manager Sue Hahn, P.E., ICMA-CM
120 Malabar Rd
Palm Bay, Fl. 32907

3/5/2013

3/5/2013

City of South Daytona

Attn: Les Gillis
1672 S. Ridgewood Ave
South Daytona, FL 32119

City of Ormond Beach

Attn: Ned Huhta
22 South Beach Street
Ormond Beach Fl. 32174

City of St Augustine Beach

Marc Chatten, Public Works Director
2200 SR A1A South
St Augustine Beach, FL 32080

Collier County

Collier County Government Complex
Attn: Traffic Operations Supervisor
3301 E. Tamiami Trail
Naples, FL 34112

Myakka River State Park

13207 S.R. 72
Sarasota, Florida 34241

Sarasota County

Transportation Department – Engineering Division
Sarasota County Operations Center
1001 Sarasota Center Blvd.
Sarasota, FL 34240

City of Arcadia

Steve Underwood, Supv. WWTP
PO Box 351
Arcadia, FL 34265

City of Sarasota

Douglas Jeffcoat, Director of Public Works
1761 12th St.
Sarasota, FL 34236

City of Punta Gorda

Rick Keeney, Director of Public Works
3130 Cooper St.
Punta Gorda, FL 33950

City of Palm Beach Gardens

Patricia Snider, City Clerk
10500 North Military Trail
Palm Beach Gardens, FL 33410

Town Of Juno Beach

Attn: Joseph LoBello
340 Ocean Drive
Juno Beach, FL 33408



3/5/2013

Seminole County

Attn: Traffic Engineering
140 Bush Loop
Sanford, FL 32773

City of Hollywood

Attn: Town Clerk
2600 Hollywood Boulevard
Hollywood, Florida 33020-4807

Vero Beach

1053 20th Place
Vero Beach FL 32960

Volusia County

Department of Engineering
123 W. Indiana Ave
DeLand FL, 32720

Broward County

Traffic Engineering Division
2300 West Commercial Boulevard
Fort Lauderdale, Florida 33309

West Palm Beach

ENGINEERING SERVICES
401 Clematis Street
West Palm Beach, FL 33401

City of Boca Raton

Attn: Town Clerk
201 W. Palmetto Park Rd.
Boca Raton, FL 33432

Brevard County

Attn: Traffic Engineering
2725 Judge Fran Jamieson Way
Suite A-204
Viera, FL 32940

City of Cape Canaveral

105 Polk Avenue
Cape Canaveral, Florida 32920

Charlotte County

18500 Murdock Circle
Port Charlotte, FL 33948

Indian River County

Attn: Traffic Engineering
1028 20th Place
Vero Beach FL 32960

Manatee County

Manatee County Board of Commissioners
P. O. Box 1000, Bradenton, FL 34206-1000
1112 Manatee Avenue West, Bradenton, FL 34205

Martin County

County Administrative Center

3/5/2013

2401 SE Monterey Road
Stuart, FL 34996-3322

City of Melbourne

City Hall
900 E. Strawbridge Ave.
Melbourne, FL 32901

City of Bradenton

Attn: Jim Mclellan – Engineering Section Manager
1411 9th Street West
Bradenton, FL 34205

City of Palmetto

Allen Tusing - Public Works Director
600 17th St W
Palmetto, FL 34221

Town of Longboat Key

James Linkogle – Public Works
501 General Harris St
Longboat, FL 34228

City of Holmes Beach

Joe Duennes – Public Works Director
5801 Marina Dr.
Holmes Bch, FL 34217

Palm Beach County

Palm Beach County Governmental Center
301 N. Olive Avenue
West Palm Beach, FL 33401

City Of Port St. Lucie

City Clerk's Office
121 SW Port St. Lucie Blvd.
1st Floor, Building "A", Room 187
Port St. Lucie, FL 34984-5099

City of Rockledge

City Hall
1600 Huntington Lane
Rockledge, Florida
32955-2660

St. Lucie County

Board of County Commissioners
2300 Virginia Avenue
Fort Pierce, Florida 34982

State of Florida, Department of Transportation

Ruth Yanks
FDOT Utility Section
3400 W Commercial Blvd
Fort Lauderdale, FL 33309

Town of Lake Park

Attn: Mike Wells or Terry Leary
535 Park Avenue
Lake Park, FL 33403

3/5/2013

3/5/2013

Hendry County

Hendry County Commission
25 E. Hickpoochee Ave
LaBelle, Florida 33935

City of Deltona

Municipal Complex
2345 Providence Boulevard
Deltona, Florida 32725

City of Fort Myers

City Clerks Office
2200 Second Street
Fort Myers, Florida 33902

City of Lauderdale Lakes

Roy Denson, Assistant Director of Public Works
4300 N.W. 36th Street
Lauderdale Lakes, Florida 33319

City of Coral Springs

City Attorney
9551 W. Sample Road
Coral Springs, Florida 33065

City of Boynton Beach

City Clerk's Office
100 E. Boynton Beach Blvd
Boynton Beach, Florida 33435-3838

City of Delray Beach

Assistant City Manager
100 NW 1st Av
Delray Beach, Florida 33444

City of Cape Canaveral

City Clerk
105 Polk Ave.
Cape Canaveral, FL 32920

City Of Palm Bay

City Clerk
120 Malabar Rd SE
Palm Bay, FL 32907

City Of West Melbourne

City Attorney
2285 Minton Road.
West Melbourne, Florida 32904-4928

Town of Indialantic by the Sea

City Clerk
216 5th Avenue
Indialantic FL 32903

City Of Fort Lauderdale

City Clerk
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

3/5/2013

Columbia County

Public Works
607 NW Quinten St
Lake City, FL 32055

City Of Miami

City Clerk
3500 Pan American Drive
Miami, Florida 33133

City Of Labelle

City Clerk
PO Box 580
LaBelle, FL 33975

City Of Riviera Beach

City Clerk
600 West Blue Heron Blvd.
Riviera Beach, Florida 33404

City Of Pompano Beach

City Clerk
100 West Atlantic Boulevard
Pompano Beach, Florida 33060

Comcast

Christopher McDonald
Director State Government Affairs-Florida
300 West Pensacola St.
Tallahassee, Florida 32301

Advanced Cable Communications

Jeff Glaser
12409 NW 35 St.
Coral Springs, Florida 33065

Atlantic Broadband

Dave Floberg
1681 Kennedy Causeway
North Bay Village, Florida 33141

Altitude Communications LLC

Michael Jury
3045 Rockridge Pass
Matthews, NC 28104

Florida Cable

Gary English
23505 SR 40
Astor, Florida 32102

Bright House Networks

Dennis Black
700 Carillon Parkway, Suite 6
St. Petersburg, Florida 33716

Marco Cable

Bill Gaston
914-B Park Avenue

3/5/2013

Marco Island, FL 34145