

# Make Ready Project Review and Design Presentation

January 11, 2021



# Agenda

- Discuss what WEC needs to process a proposal.
- Review codes and standards that must be met to approve a proposal.
- Go over a proposal with commonly found issues.
- Discuss the best way to submit proposals.
- Discuss how we can help.
- Address any remaining questions.

## Goals for Today

- Gain a common understanding of what is to be submitted and what is needed to get approval.
- Give attachers an understanding of our interpretation of the codes and standards WEC follows.
- Give attachers the knowledge needed to submit a complete proposal.

## Ultimate Goal

To help attachers meet  
their goal of completing  
projects in WEC territory

# WEC Provided Information – Initial Email

- General information in [email](#) body
  - Instructions for Pole Profile Sheets
  - Site map requirements
  - Pictures
  - Sag calculations
  - Make ready changes we do/don't allow
  - Pole loading
- [Pole attachment requirements PDF](#)
- [Pole Profile Sheet PDF](#)

# Pole Attachment Requirements

- We require potential attachers to submit certain pieces of key information within their Proposals in SPANS in order to reduce the time spent reviewing and editing submittals
  - Application – Permit for Pole Attachments
  - Route / site maps
  - Pole Profile sheets / clearance analysis
  - Photos
  - Pole loading analysis
- This information will not only help us to identify the desired route, but decrease the overall time required to perform proposal and engineering review and generate an accurate cost estimate for the attacher

# Make Ready Data Overview: Information That Must Be Provided By Attacher

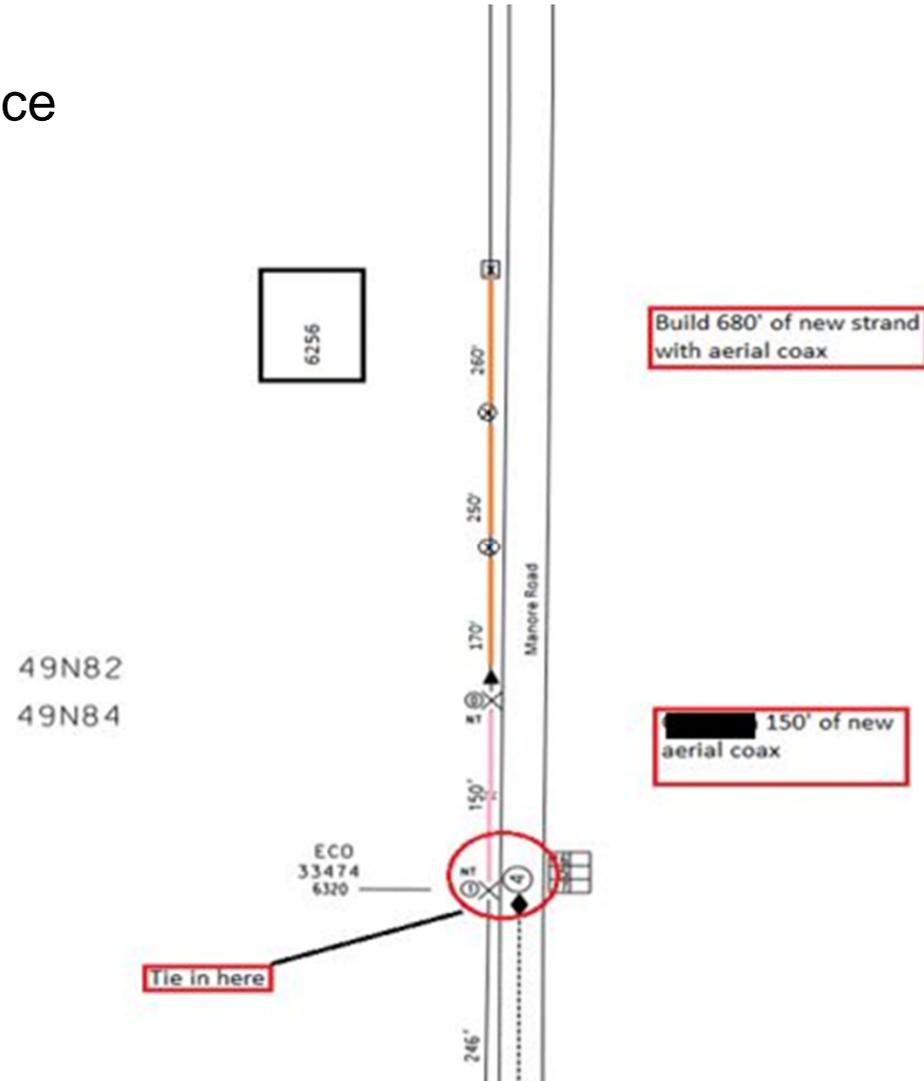
- Permit application
  - Site map (overview of installation routes)
  - Three photographs of each pole
  - Pole profile sheets / clearance analysis)
    - Sagline
    - Sag-10
    - O-Calc
- Pole loading analysis
  - O-Calc summary report (high level results)
  - O-Calc pole reports (detailed pole information)
  - O-Calc PPLX files (pole models to import)
- Make ready recommendation sheet

# Proposal Requirements: Site Maps

- Accurate pole location data;
  - Digitized, not hand drawn
  - Poles correspond with existing field conditions
  - Include right of way and property lines for new builds
- North Arrow
- Annotated roads
  - A cross street is required to better locate route for review
  - Include road names, specifying State and U.S Routes if applicable
  - Critical crossings shown on map; waterbodies, railroads
- Annotated pole tags that match the field and profile sheets
  - Poles labeled to accurately reflect WE tag numbers and/or joint use tags when no WE tag is present
- Span lengths
  - Accurate span lengths between poles (to scale)
- Attachment type indicated
  - Aerial cable, overhead guys, down guys, risers for underground feeds
  - Guying and riser details also required on profile sheets as applicable

# Examples of Insufficient Site Maps

- Missing cross street for reference
- Missing pole ID information
- No North Arrow



# Examples of Insufficient Site Maps

- Missing cross street names for reference
- Missing pole ID information and accurate location
- At a glance, there is no way of telling how many poles attachers wish to attach to
- Missing span lengths
- Avoid using Google maps



# Examples of Insufficient Site Maps

- Missing cross street name for reference
- Hand drawn
- Is this to scale?

Commercial & Residential Survey Form

165144  
 P= OVER 34'  
 F= 23'9"  
 BUC= 23'  
 SPC= 27'3"  
 F= 21'10"  
 F= 21'

MID  
 P= 26'0"  
 F= 23'4"  
 BUC= 20'8"  
 F= 19'3"  
 SPC= 17'9"

MID  
 P= 25'1"  
 BUC= 21'8"  
 SPC= 20'8"

MID  
 P= 24'10"  
 BUC= 21'9"  
 SPC= 20'7"

MID  
 P= 24'9"  
 F= 21'10"  
 SPC= 21'2"

MID  
 P= 24'4"  
 F= 22'9"  
 SPC= 21'6"

Repetition Rd

200' 93' 75' 39' 21' 213' 219'

TIE POINT

N.T. ③  
 P= OVER 34'  
 F= 24'6"  
 BUC= 23'7"  
 SPC= 23'  
 F= 22'2"  
 F= 21'3"

1062CPD  
 P= 24'9"  
 BUC= 21'10"  
 SPC= 20'10"

486  
 797  
 P= 23'7"  
 BUC= 19'10"  
 SPC= 19'3"

A9083  
 P= 24'8"  
 F= 21'8"  
 SPC= 21'4"

1062CPD  
 P= 24'6"  
 F= 22'8"  
 SPC= 21'8"

165514  
 P= 30'4"  
 F= 25'  
 SPC= 23'5"  
 F= 22'8"

MID  
 P= 24'4"  
 F= 21'8"  
 SP= 19'14"

Date Rec'd _____	Total footage from Plant _____	New Construction <input type="checkbox"/> YES <input type="checkbox"/> NO	Aerial Const.Ft _____
Ticket# _____	Drop A / UG _____	Open Trench <input type="checkbox"/> YES <input type="checkbox"/> NO	UG Plowing _____
Customer _____	Drop Footage _____	Sidewalk Bore Ft. _____	Hand Trench _____
City _____	Building attach. footage _____	Driveway Bore Ft. _____	Concrete Cut _____
Surveyor _____	Pole # _____	Conduit size & Ft. _____	Right of Way <input type="checkbox"/> YES <input type="checkbox"/> NO
#Potential Cust. _____	Tap Value _____	Freeway Crossing <input type="checkbox"/> YES <input type="checkbox"/> NO	Existing Conduit <input type="checkbox"/> YES <input type="checkbox"/> NO
CUSTOMER SIGNATURE _____	Interior Drop length _____	Railroad Crossing <input type="checkbox"/> YES <input type="checkbox"/> NO	Existing Conduit <input type="checkbox"/> YES <input type="checkbox"/> NO
	Drop Ceiling <input type="checkbox"/> YES <input type="checkbox"/> NO	Existing Fiber <input type="checkbox"/> YES <input type="checkbox"/> NO	
		PRINTED NAME _____	



# Proposal Requirements: Photos

- As part of the proposal requirements, a minimum of three 5 megapixel photos will be required for each pole in the proposal
- The three photos will show the pole from different angles to see from ground to pole top
  - Capturing the entire pole will also provide a look at the midspans in each direction
  - Ensures pole details are visible to compare with profile sheets
    - Risers, guying, equipment, etc.

# Photos

- The first photo faces the direction of the route
- This photo should capture the entirety of the pole, everything from the base to the primary
- The photo should also capture the environment the span is crossing to confirm ground clearance standards



# Photos

- The second photo is generally facing the pole head on
- This photo should capture a clear view of all the attachments on the pole typically taken 30-60 feet from the pole



# Photos

- The third photo will be facing away from the route
- This photo should also capture the entirety of the pole, as well as the environment beneath the span much like the first photo



# Proposal Requirements: Pole Profile Sheets

- Pole Profile Sheets provide the necessary detail for sag calculations and pole loading
- Complete and accurate Pole Profile Sheets are critical in determining whether an attachment can be approved

Utilizing the current Pole Profile Sheet the goal is to:

- To capture all relevant data on an existing asset, so that engineering can adhere to all NESC and WE standards
- Collect all data necessary for engineering review

# Proposal Requirements: Pole Profile Sheets

- Completed as much as possible
  - Lowest wire height
  - Drip loops
  - Streetlights
    - bonded vs unbonded
  
- Existing midspan height for
  - Lowest WE conductor
  - Top and bottom comm lines
  - Sag-line results

POLE PROFILE SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

Pole # \_\_\_\_\_

Pole Class/Height \_\_\_\_\_

Condition: Good \_\_\_\_\_ Needs Inspection \_\_\_\_\_

WE Lowest Conductor Span  
Secondary or Neutral  
If Sec: Open or Cabled \_\_\_\_\_

Arm Type & Size \_\_\_\_\_

Transformer: Bottom \_\_\_\_\_  
Size \_\_\_\_\_ Quadrant \_\_\_\_\_  
Drip Loop \_\_\_\_\_

Street Light:  
Height of Bracket \_\_\_\_\_  
Grounded YES or NO \_\_\_\_\_  
Quadrant: \_\_\_\_\_  
Drip Loop \_\_\_\_\_

Telephone TV FA  
Other \_\_\_\_\_

Strand Size \_\_\_\_\_  
Bonded YES or NO \_\_\_\_\_  
# of Cables in Bundle \_\_\_\_\_  
Arm Type & Size \_\_\_\_\_

Telephone TV FA  
Other \_\_\_\_\_

Strand Size \_\_\_\_\_  
Bonded YES or NO \_\_\_\_\_  
# of Cables in Bundle \_\_\_\_\_  
Arm Type & Size \_\_\_\_\_

Attach Ht. \_\_\_\_\_

Attach Ht. \_\_\_\_\_

Attach Ht. \_\_\_\_\_

Street Address \_\_\_\_\_

City/Town/Village \_\_\_\_\_

Date: \_\_\_\_\_ Project # \_\_\_\_\_

PRIMARY: \_\_\_\_\_

Mid Span Ht. \_\_\_\_\_ Max Sag \_\_\_\_\_

Vertical Ground: YES or NO \_\_\_\_\_

Indicate fiber figure 8 where present

Where required, include drops (att. Ht. below, angles and length on aerial view with guying on back)

Mid Span Ht.	Max Sag	
Cable #1	Cable #2	Cable #3
Type: _____	Type: _____	Type: _____
Size: _____	Size: _____	Size: _____
Cable #5	Cable #6	Cable #7
Type: _____	Type: _____	Type: _____
Size: _____	Size: _____	Size: _____
Cable #4	Cable #8	
Type: _____	Type: _____	
Size: _____	Size: _____	

Mid Span Ht.	Max Sag	
Cable #1	Cable #2	Cable #3
Type: _____	Type: _____	Type: _____
Size: _____	Size: _____	Size: _____
Cable #5	Cable #6	Cable #7
Type: _____	Type: _____	Type: _____
Size: _____	Size: _____	Size: _____
Cable #4	Cable #8	
Type: _____	Type: _____	
Size: _____	Size: _____	

# Proposal Requirements: Pole Profile Sheets

- Communications Equipment
  - Power supply, amplifier, etc.
- Terrain/crossings under span
- Riser details
- Guying details
- Make ready recommendations
  - Pole loading report attached?
  - Pole pass/fail

Communications Equipment (circle all that apply and show location on riser diagram below)

Telephone: Terminal Box Splice Case  
 CATV: Power Supply Amplifier Splice Case  
 Fiber: Splice Case  
 Misc. (please write in) \_\_\_\_\_

Span Crosses Over: (Circle all that apply) Yard - Field - Body of Water - Wetland - Sidewalk - Railroad \_\_\_\_\_  
 Res. Driveway - Com Driveway - Road ROW - Road (name of Road) \_\_\_\_\_

Riser Information  
 Show Existing and Proposed Risers  
 E, T, TV, FA, O, or U  
 (O=other, U=unknown)

Height of Riser Heads



_____
_____
_____
_____

Existing Guying

#1 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#2 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#3 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____
#4 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#5 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#6 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____
#7 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#8 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____	#9 Anchor Type-Ht-Owner _____ Diameter of Existing Guys _____ Diameter of Anchor _____

Span to Left

Span to Right

○

**MAKE-READY RECOMMENDATIONS** Pole Loading Reports Attached: Yes No Pass Fail

Attachment Height \_\_\_\_\_ Existing Attachment \_\_\_\_\_ New Attachment \_\_\_\_\_



# Proposal Requirements: Summary

In summary, the basic information required for attachment includes:

- A site map of the desired route
- Pole profile sheets for each desired pole
- A minimum of three 5 mega pixel photos of each pole, depicting the entire pole from 3 different angles
- Pole loading analysis for each pole

Following these new requirements will lead to fewer resubmittals and quicker turnaround of estimates and make ready solutions

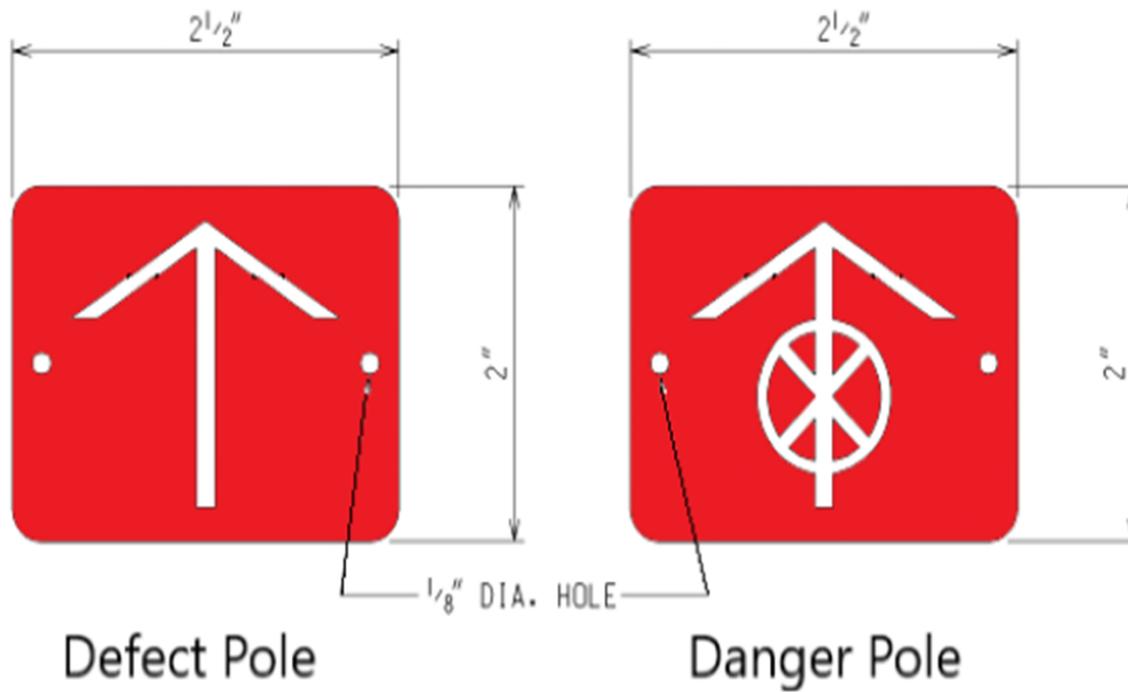
# Make Ready Data Review - Poles

- The following poles are not allowed to be attached to for make ready:
  - Poles that We Energies is not attached (need to contact the pole owner)
  - Transmission poles (work with ATC)
  - Ornamental light poles

# Make Ready Data Review - Poles

- Verify length and class
  - We Energies typically uses class 2, 4 and 5 poles
  - New construction may be class 3
- Verify ownership of pole
- Discuss with We Energies if you find:
  - C-truss reinforced poles
  - Stubbed poles
  - Defect/danger tagged pole (red square tags)

# Defect, Danger Pole Tags



# Make Ready Data Review

- We Energies Wire and Cables
  - Verify correct type, span length, attachment height, angle and tension
- Communication Attachments
  - Verify correct type, span length, attachment height, angle and tension
- Guying
  - Guying lead length, angle, guy wire material, attachment height
    - HS 5/16", 3/8", and 7/16" guy wire has been historically used
    - EHS 3/8" guy wire primarily used now
  - Anchor type (we instruct make ready firms to assume an 8" single helix)

# Make Ready Data Review

- Equipment
  - Transformers, capacitor banks, voltage regulators, reclosers
  - CATV power supplies
- Report unauthorized customer attachments such as:
  - Private wiring or lights
  - Basketball hoops
  - Permanent signs

# Clearance Analysis

- State of Wisconsin has adopted the 2017 NESC
- Ensure that the existing pole attachments and new pole attachment will meet the National Electric Safety Code (NESC)
- Due to new attachment, no “grandfathering” to previous NESC revisions
- Spot check measurements are expected, especially for situations where the NESC clearances will be minimally met

# Clearance Analysis

- Clearances need to be calculated for worst case scenario per the NESC, not just “as measured”
- For ground clearance, worst case sags could be under two conditions:
  - High operating temperature – 200 degrees F / 90 degrees F ambient
  - Ice loading – 32 degrees F with ½” of radial ice
- For mid-span clearance between lowest power facility and highest communication facility (both options need to be calculated and choose the worst case):
  - Lowest power at 200 degrees and highest comm. at 90 degrees **OR**
  - Lowest power at 32 degrees with ½” radial ice and comm. at 32 degrees with **NO ice**

# Clearance Analysis

- 15.5ft is the typical minimum required clearance
- We Energies generally doesn't allow the reduced 9.5' clearances for inaccessible/subject to pedestrian traffic only
- Locations that require additional clearance:
  - Railroad crossings
  - Limited access highway crossings
  - State highway and some county road crossings
  - Navigable waterways
- A 5' taller replacement pole may only result in 3.5' of additional height
  - 10% + 2ft burial depth standard
  - 40ft pole (34ft AGL) → 45ft pole (38.5ft AGL)
  - Old standard (8' neutral spacing) to new standard (9' neutral spacing)

# Clearance Analysis – NESC Requirements

Table I

Vertical clearance of wires, conductors, and cables above ground roadway, rail, or water surfaces. (Voltages are phase to ground for effectively grounded circuits and phase to phase for ungrounded wye and delta circuits.)

	[11][15] Insulated communication conductors and cable; messengers; surge protection wires; grounded guys; neutral conductors	Non-insulated communication conductors; supply cables (triplex and quadruplex) of 0 to 750V [27][34]	Supply cables over 750V [28] open supply conductors 0 to 750V [14][27][34]	Open supply conductors, over 750V to 22kV [14][27]
Nature of surface underneath wires, conductors, or cables	(Ft.)	(Ft.)	(Ft.)	(Ft.)
Where wires, conductors, or cables cross over or overhang				
1. Track rails of railroads (except electrified railroads using overhead trolley conductors. [2][16][22][30])	23.5	24.0	24.5	26.5
2. Roads, streets, and other areas subject to truck traffic. [23][27][31]	15.5	16.0	16.5	18.5
3. Driveways, parking lots, and alleys. [23][32]	15.5 [7][13]	16.0 [7][13]	16.5 [7]	18.5
4. Other land traversed by vehicles, such as cultivated, grazing, forest, orchard, etc. [26]	15.5	16.0	16.5	18.5
<del>5. Spaces and ways subject to pedestrians or restricted traffic only. [9]</del>	<del>9.5</del>	<del>12.0 [8]</del>	<del>12.5 [8]</del>	<del>14.5</del>

Where the Wisconsin DOT has maintenance jurisdiction (permitting authority), minimum clearance over the roadway (under worse case conditions) shall be 17 feet. WISDOT Utility Accommodation Policy Book, section 96.22 paragraph (B).

# Clearance Analysis

- We Energies discourages designing to bare minimum or within a few inches of minimum due to numerous variables:
  - Pole length variability (-3" to +6" allowable per spec.)
  - Terrain changes
  - Installation embedment depth of pole
  - Installation tension of wires and cables
  - Installation attachment height
  - Sag table variability as spans deviate from ruling span
  - Measurements are not formally surveyed

# Clearance Analysis

- Other clearances to consider include:
  - Buildings
  - Traffic signals
  - Lighting (both on the pole and to stand-alone poles)
  - Billboards and business signs
  - Swimming pools
  - Flag poles
  - Transmission line crossings
  - Crossings not on the same structure
  - Clearances of power and communication service drops

# Communication Clearance Issue to Traffic Pole



NESC 234B requires 3ft horizontal clearance and 2ft vertical clearance

# Communication Clearance Issue to Traffic Sign

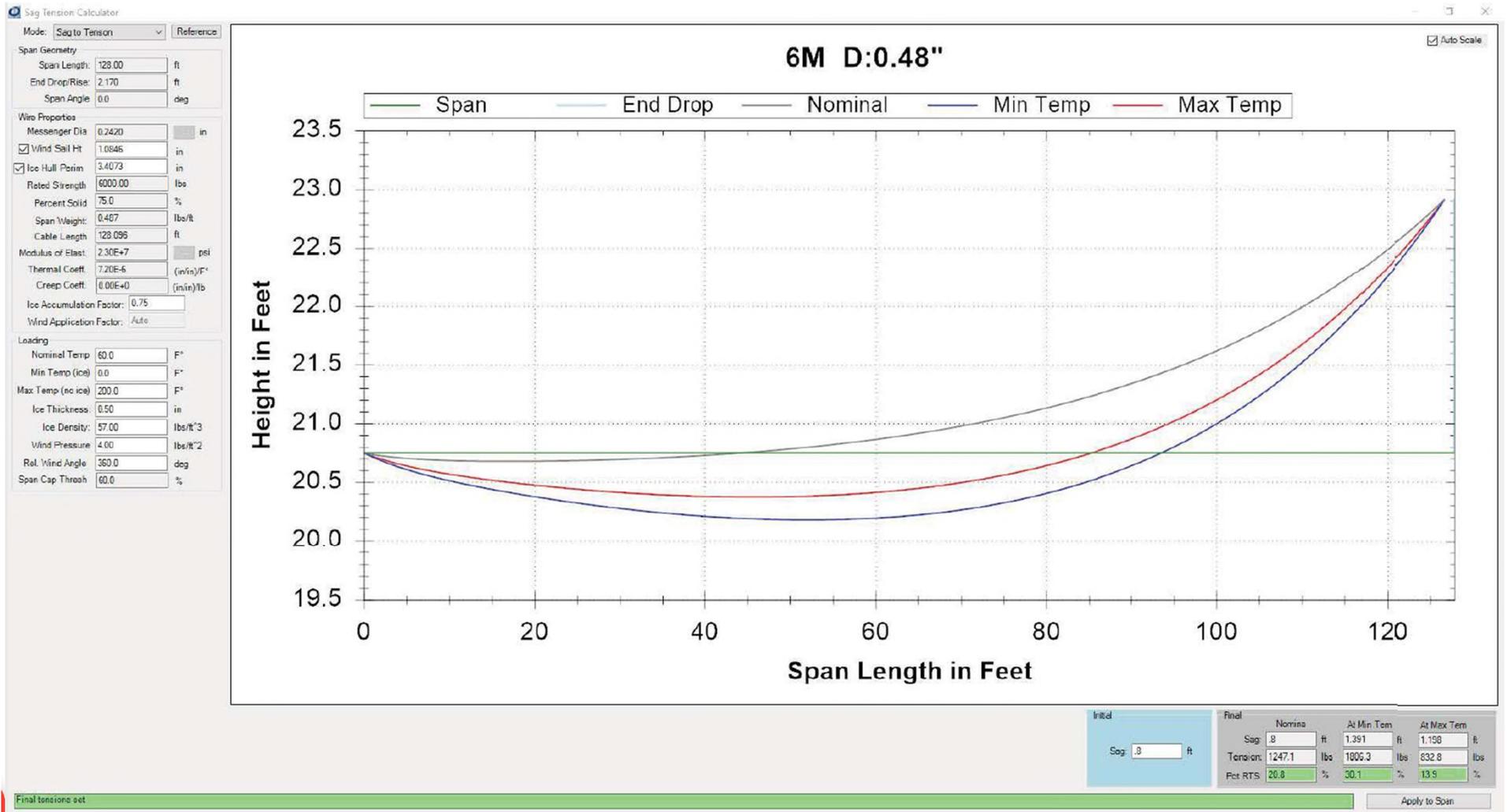


NESC 234B requires 3ft horizontal clearance and 2ft vertical clearance

# Communication Service Drops on Neutral



# Example of Clearance Analysis – O-Calc



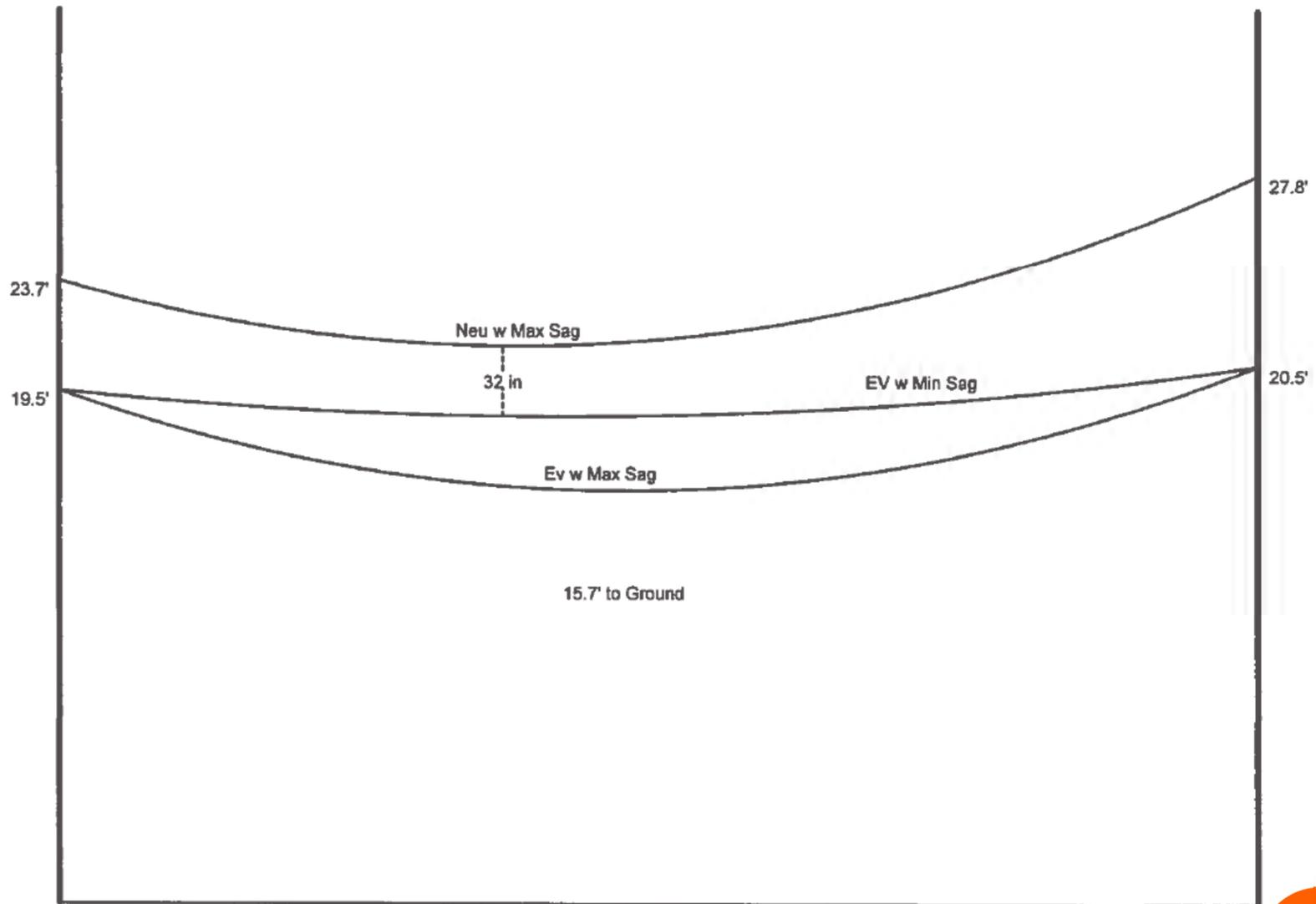
# Example of Clearance Analysis – O-Calc



# Example of Clearance Analysis – Sagline

19-11582

E64-17951



Pole 1

Pole 2



# Clearance Analysis – Code Violation Mitigation

- The make ready engineering firm provides suggestions to mitigate code violations.
- We Energies usually cannot raise power attachments and meet our construction standards
  - For existing poles, we won't force our new standards to be met, which generally require larger spacing (9ft vs. 8ft)
  - We will not decrease clearances less than what our legacy standards call for

# Clearance Analysis – Code Violation Mitigation

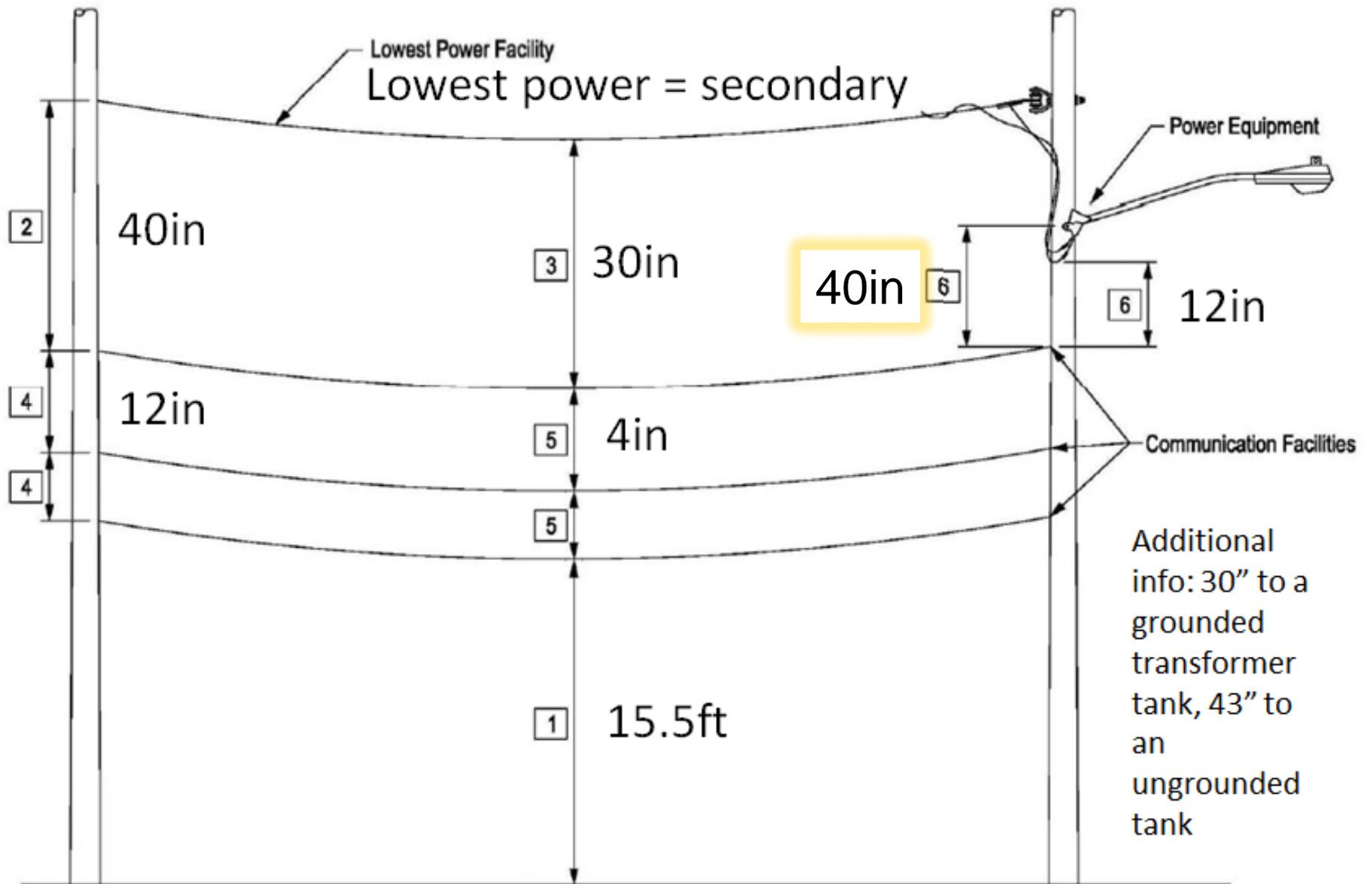
- Some make ready suggestions cannot be implemented
- Common request – “*pull sag out of span*”
  - Lines can be re-sagged to proper tension per sag tables
    - This can only be done “deadend to deadend”
    - A single span of wire cannot be resagged unless there is a deadend on each end of the span
  - Service drops have limited tension maximums so attachment point on the customer’s end isn’t damaged
- Common request – “*raise/lower existing communication attachment height to meet mid-span clearance to power secondary/neutral or make space for new attacher*”
  - Will raising existing communication attachment height create midspan clearance violations to power conductors/equipment?
  - Will lowering existing communication attachment height create new ground clearance violations, especially service drops?

# Clearance Analysis – Power Service Drops

- Code allows for reduced clearances for services if attachment height on the building doesn't allow for higher clearances

[7] Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following (feet) (cables are triplex and quadruplex):

a.	Insulated supply service drops limited to 300V to ground.	12.5
b.	Insulated drip loops of supply service drops limited to 300V to ground.	10.5
c.	Supply service drop cables limited to 150V to ground.	12.0
d.	Drip loops only of service drop cables limited to 150V to ground.	10.0
e.	Insulated communication service drops	11.5



# Pole Strength Analysis

- All poles are required to meet NESC pole strength requirements
  - Heavy Loading Zone – ½” radial ice, 4 lbs. wind, 0 degrees F
    - Verify Strength and Load factors are accurate for the Grade of construction
- Make ready pole strength analysis performed using O-Calc Pro
- NESC Grade C construction OK in most cases
- NESC Grade B construction required for:
  - Limited access highway crossings
  - Navigable waterway crossings
  - Railroad crossings

# Pole Strength Analysis

- Compare data in the pole strength analysis with the pole profile sheets to verify everything matches:
  - Wire types, tensions, angles and attachment heights
  - Pole height and class
  - Guying – anchor lead, type, angle and attachment height
  - Crossarms, braces, insulators – check they seem reasonable as they don't impact pole loading appreciably
- If a pole is being replaced or attachments modified for clearance violation mitigations, the pole strength model needs to be modified and reviewed

# Pole Strength Analysis – Soils

- Soil Classification
  - Default to soil class 5
  - May increase soil class if field conditions warrant

Soil Class	Description
0	Sound hard rock, unweathered
1	Very dense and/or cemented sands; coarse gravel and cobbles
2	Dense fine sands; very hard silts and clays (may be preloaded)
3	Dense clayey sands and gravel; hard silts and clays
4	Medium dense sandy gravel; very stiff to hard silts and clays
5	Medium dense coarse sands and sandy gravels; stiff to very stiff silts and clays
6	Loose to medium dense fine to coarse sands; firm to stiff clays and silts
7	Loose fine sands; Alluvium; loess; soft-firm clays; varied clays; fill
8	Peat, organic silts; inundated silts, fly ash; very loose sands; very soft to soft clay

# Pole Strength Analysis - Tensions

- Conductor Tensions
  - Typically, use maximum guying tensions listed in sag tables
  - Service drops – model at 400 lbs. of tension
    - Some secondary (pole to pole) can be modeled at 400 lbs. if it is obviously just a tangent attachment, continuing to the service
    - Communication service drops – model at 50 lbs.
  - Slack Spans – model at 500 lbs. of tension per wire
    - Some firms were modeling full tension spans as slack spans in order to have the pole strength analysis pass

# Pole Strength Analysis - Guying

- Guy Wire
  - HS 5/16", 3/8", and 7/16" guy wire has been historically used
  - EHS 3/8" guy wire primarily used now
- Anchor
  - Assume 8" single helix anchor
  - No record of anchors other than looking back at historical work requests
- Only We Energies should be attached to We Energies anchors
- If communication companies attached to existing We Energies anchors, they must be insulated
  - Call out un-insulated guy wires attached to We Energies anchors

# Make Ready Design - Guying

- Anchors available:
  - 8" single helix
  - 10" single helix
  - 8" twin helix
  - Options for anchors in rocky or swampy areas
- Guy wire – 3/8" Extra-high strength (EHS)
- Sidewalk guy available in extenuating circumstances
- All We Energies guy wires and guys attached to We Energies anchors need to be insulated (see Standard G80)
- Outer-most guy wire needs plastic guy guard
- For replacement anchors, only We Energies to attach
  - Communication facilities required to install their own guys and anchors

# Pole Strength Analysis – Head Guys

- Head Guys AKA Span Guys
- To properly model, pole that creates tension on the head guy needs to be modeled
- From the output of the head guy model, insert the applied tension to the guy-stub pole head-guy tension

# Pole Strength Analysis – We Energies-caused issues

- We Energies is entitled to 100% of pole capacity (height and strength) for company-owned poles
- If a pole exceeds 100% loading, save a copy of pole and remove all other attachers:
  - If pole loading exceeds 100%, We Energies will pay for mitigation
  - If pole loading is less than 100%, attacher will pay for mitigation

# Pole Replacement– General Guidelines

- Replacement single-phase pole should be a minimum 40' class 5 pole
- Replacement 3-phase pole should be a minimum 45' class 3 pole
- Pole replacements should be in 5' intervals to prevent insulator up-lift on adjacent poles
  - Spans less than ~100' may not even be able to accommodate a 5' pole height difference
- All new poles need a pole ground installed
- Burial of overhead facilities may be a viable option
  - Burial of service wires isn't widely available due to customer equipment would need to be upgraded

# Pole Replacements– Integrating Into Existing Construction

- We Energies' preference is to build pole replacements to our current construction standards
- However, this may not be reasonable for integrating into existing construction
  - Handled on a case by case basis
  - Building to a legacy standard in existing construction may be allowed if it prevents significant rebuild or additional pole replacements
  - Pole still must meet current NESC requirements
  - Do not reduce We Energies spacing to less than that of the legacy standard

# Post-Construction Inspection

- After make ready work is complete and the new cables have been installed, a post-construction inspection will be performed
- Intended to confirm that installation and construction was performed as designed and meets NESC
- Identify any poles that require a communication attachment to transfer to the new pole (double wood)

# Post-Construction Inspection

- Field checks include the following items:
  - Attachments were made at the correct height
  - Wires and cables were installed at the correct tension and are sagged in appropriately
  - Verify clearances are met (ground and mid-span)
  - Correct pole height and class was installed
  - Verify guying is correctly installed, including insulation and guy guards
  - Confirm ancillary items such as pole tags, high voltage signs, guy guards, yard clean-up, etc.

# Post-Construction Inspection

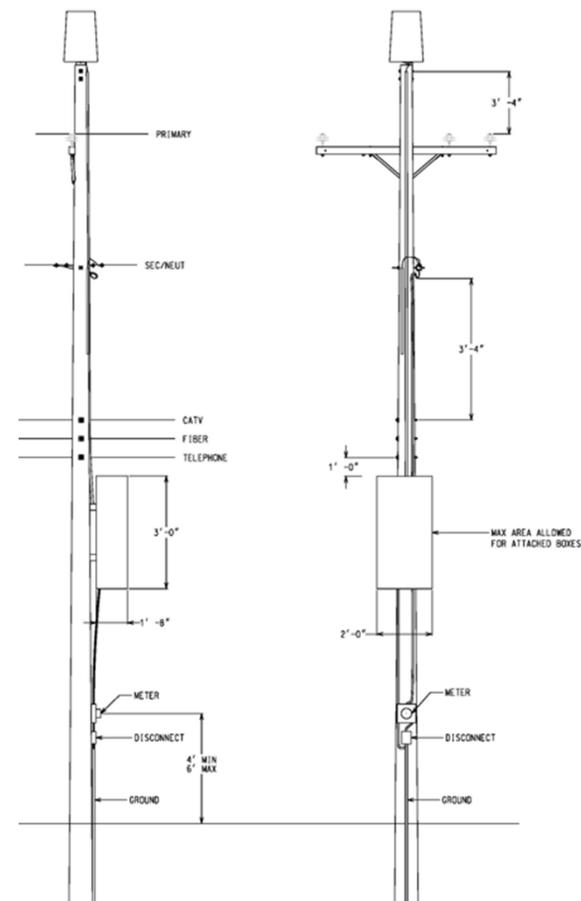
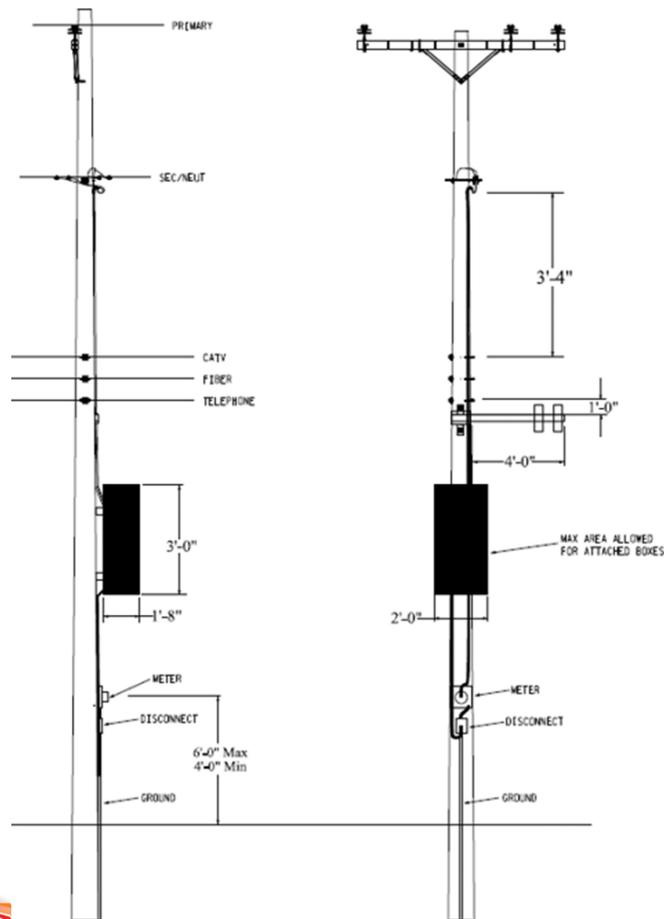
- If a deficiency is found:
  - Determine who caused the deficiency
  - Determine how to mitigate the deficiency
  - Provide detailed follow-up information to make ready company if they are responsible

# Miscellaneous Information

- Wisconsin is in the NESC Heavy Loading area
- Pole embedment depth standard is 10% + 2'
- Some poles may require discussion with existing communication companies:
  - CATV power supplies
  - Very large risers
  - Splice box placement in relation to new pole position
- Neutral with duplex/triplex secondary strung underneath or vertical open wire secondary are common
  - Neutral is usually in the top position
  - The two 120V wires are usually middle/bottom
  - Replacing with a shared neutral 3c1/0 ACSR secondary may be a viable mitigation option

# Miscellaneous Information – Pole Top Antennas

- We Energies has standards for antenna attachments
- Requirements vary based on type/size of antenna



# Wrap-up

