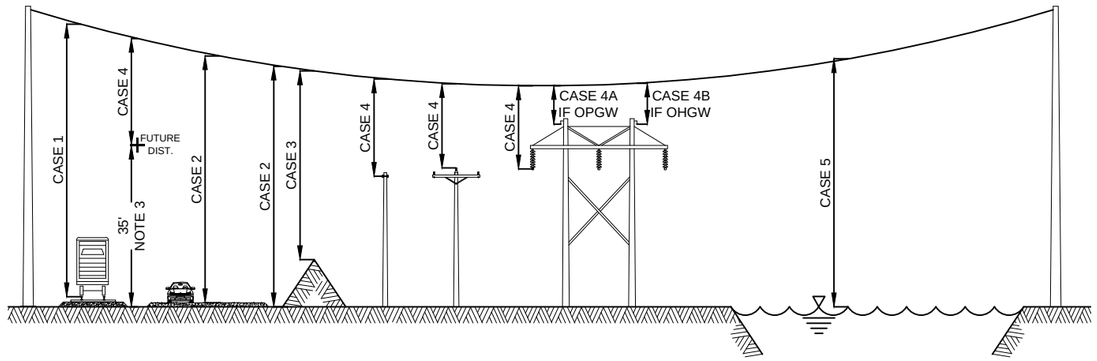

	VOLTAGE	34.5/46/69kV DESIGN	34.5kV	46kV	69kV	115kV		230kV		345kV	
CASE	FEATURE	IUSA	NESC CODE	NESC CODE	NESC CODE	IUSA	NESC CODE	IUSA	NESC CODE	IUSA	NESC CODE
1	TRACKS OF RAILROAD (NOTE G)	32'	26.5'	26.7'	27.2'	33'	28.1'	37'	30.4'	40'	32.7'
2	GROUND (VEHICLE/HORSE ACCESSIBLE)	24'	18.5'	18.7'	19.2'	25'	20.1'	29'	22.4'	32'	24.7'
2A	GROUND NEAR NAVIGABLE WATER (NOTE B)	29'	23.5'	23.7'	24.2'	30'	25.1'	34'	27.4'	37'	29.7'
3	PEDESTRIAN-ACCESS ONLY	20'	14.5'	14.7'	15.2'	21'	16.4'	25'	18.4'	28'	20.7'
4	LINE CROSSINGS (NOTE E)										
4A	COMMUNICATIONS CABLES INC. MESSENGERS	10'	5'	5.2'	5.7'	11'	6.6'	15'	8.9'	19'	11.2'
4B	INSULATED OR OPEN 34.5KV AND BELOW	7'	2'	2.2'	2.7'	8'	3.6'	12'	5.9'	16'	8.2'
	46kV	7'	2.2'	2.4'	2.9'	8'	3.8'	13'	6.1'	17'	8.4'
	69kV	8'	2.7'	2.9'	3.3'	9'	4.3'	14'	6.6'	18'	8.9'
	115kV	10'	3.6'	3.8'	4.3'	10'	5.2'	15'	7.5'	20'	9.8'
	230kV	14'	5.9'	6.1'	6.6'	15'	7.5'	18'	9.8'	22'	12.2'
	345kV	18'	8.2'	8.4'	8.9'	20'	9.8'	22'	12.2'	23'	14.5'
5	WATER CROSSINGS (NOTE B)										
	NOT SUITABLE FOR SAILBOATS	24'	17'	17.2'	17.7'	25'	18.6'	29'	20.9'	32'	23.2'
	LESS THAN 20 ACRES	26'	20.5'	20.7'	21.2'	27'	22.1'	31'	24.4'	34'	26.7'
	20 TO 200 ACRES (NOTE F)	34'	28.5'	28.7'	29.2'	35'	30.1'	39'	32.4'	42'	34.7'
	200 TO 2,000 ACRES	40'	34.5'	34.7'	35.2'	41'	36.1'	45'	38.4'	48'	40.7'
	GREATER THAN 2,000 ACRES	46'	40.5'	40.7'	41.2'	47'	42.1'	51'	44.4'	54'	46.7'

NOTE A: NEW IBERDROLA USA TRANSMISSION LINES AND STRUCTURES SHALL BE DESIGNED AND CONSTRUCTED TO THE IUSA CLEARANCE CRITERIA. EXISTING LINES SHALL BE CHECKED TO NESC CODE CLEARANCES FROM THE TIME OF CONSTRUCTION.

NOTE B: FOR LAND AREAS NEAR NAVIGABLE WATERWAYS AN ADDITIONAL 5' CLEARANCE BUFFER SHALL BE EMPLOYED FOR AREAS USED FOR THE RIGGING OF SAILBOATS.

NOTE C: AT ALL ROAD CROSSINGS (INCLUDING HIGHWAY AND INTERSTATE CROSSINGS), THE DESIGNER SHALL DESIGN THE LINE AS IF A DISTRIBUTION LINE WITH A HEIGHT OF 35' ABOVE GROUND EXISTS FOR THE POTENTIAL OF FUTURE CONSTRUCTION OF NEW DISTRIBUTION OR FUTURE EXPANSION OF EXISTING DISTRIBUTION. THE EXCEPTION TO THIS IS IF TALLER DISTRIBUTION CURRENTLY EXISTS IN THE LOCATION IN QUESTION.

NOTE D: ALL NEW IBERDROLA USA TRANSMISSION LINES SHALL HAVE ALL CLEARANCES CHECKED AT MAXIMUM OPERATING TEMPERATURE AND AT THE NESC HEAVY ICE LOADING (0.5" OF RADIAL ICE) TO ENSURE THAT MAXIMUM SAG IS BEING CHECKED FOR CLEARANCES.

NOTE E: WHEN CHECKING CLEARANCES BETWEEN CROSSING CONDUCTORS THE CLEARANCE SHALL BE CHECKED WITH THE UPPER CONDUCTOR AT MAXIMUM RATED OPERATING TEMPERATURE AND THE LOWER CONDUCTOR OPERATING AT 30°F. WHEN CONSTRUCTING NEW LINES THE LINE WITH THE HIGHER VOLTAGE SHALL CROSS OVER THE LINE WITH THE LOWER VOLTAGE IF AT ALL POSSIBLE.

NOTE F: WHEN DESIGNING AND CONSTRUCTING TRANSMISSION LINES OR STRUCTURES IN MAINE THE 200 TO 2000 ACRE WATER CROSSING CLEARANCE CRITERIA SHALL BE USED FOR THE 20 TO 200 WATER ACRE CROSSING CLEARANCE CRITERIA PER THE MAINE PUBLIC UTILITIES COMMISSION (MPUC).

NOTE G: CERTAIN RAILROAD COMPANIES MAY REQUIRE CLEARANCE ABOVE THE MINIMUM NUMBER IN THE TABLE. ANY TIME THAT A TRANSMISSION LINE CROSSES A RAILROAD OR IS BUILT WITHIN A RAILROAD CORRIDOR THE RAILROAD COMPANY SHALL BE CONTACTED TO OBTAIN ANY ADDITIONAL REQUIREMENTS.

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IBERDROLA USA

TRANSMISSION CONSTRUCTION STANDARDS MANUAL

TRANSMISSION STANDARDS - ELECTRICAL DATA
DESIGN CRITERIA - VERTICAL CLEARANCES

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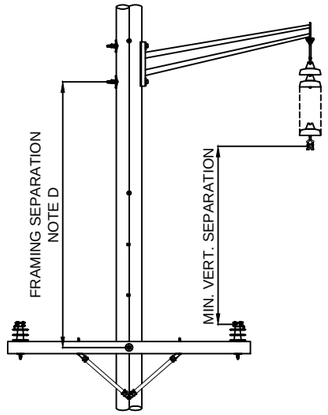
B. Franklin	04/03/14	Becken/Hart	3/05/2015	Barry R. Hart	3/12/2015

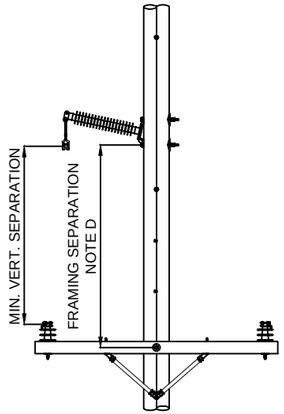
TM2.23.TB-02-001

Sheet 1



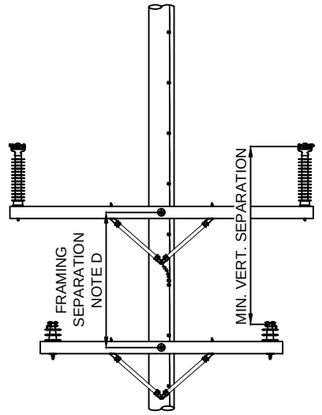
TRANSMISSION DAVIT ARM CONSTRUCTION
WITH SUSPENSION INSULATORS
WITH UNDERBUILT DISTRIBUTION

FRAMING SEPARATION				
		TRANSMISSION VOLTAGE (PHASE-TO-PHASE)		
DIST.VOLTAGE (PHASE-TO-PHASE)	SPAN LENGTH (NOTE D)	35/46kV	69kV	115kV
15kV NOTE O	≤ 150'	13'-6"	14'-6"	16'-6"
	≤ 250'	16'-6"	17'-6"	20'-6"
	≤ 300'	18'-0"	19'-0"	23'-6"
35kV NOTE P	≤ 150'	14'-0"	15'-0"	17'-0"
	≤ 250'	17'-0"	18'-0"	21'-0"
	≤ 300'	18'-6"	19'-6"	23'-6"



TRANSMISSION CONSTRUCTION
WITH HORIZONTAL POST INSULATORS
WITH UNDERBUILT DISTRIBUTION

FRAMING SEPARATION				
		TRANSMISSION VOLTAGE (PHASE-TO-PHASE)		
DIST.VOLTAGE (PHASE-TO-PHASE)	SPAN LENGTH (NOTE D)	35/46kV	69kV	115kV
15kV NOTE O	≤ 150'	10'-0"	10'-0"	11'-6"
	≤ 250'	13'-0"	13'-0"	15'-6"
	≤ 300'	14'-6"	14'-6"	18'-0"
35kV NOTE P	≤ 150'	10'-6"	10'-6"	12'-0"
	≤ 250'	13'-6"	13'-6"	16'-0"
	≤ 300'	15'-0"	15'-0"	18'-6"



TRANSMISSION CROSSARM CONSTRUCTION
WITH VERTICAL POST INSULATORS
WITH UNDERBUILT DISTRIBUTION

FRAMING SEPARATION				
		TRANSMISSION VOLTAGE (PHASE-TO-PHASE)		
DIST.VOLTAGE (PHASE-TO-PHASE)	SPAN LENGTH (NOTE D)	35/46kV	69kV	115kV
15kV NOTE O	≤ 150'	9'-6"	7'-6"	N/A
	≤ 250'	12'-6"	10'-6"	N/A
	≤ 300'	14'-0"	12'-0"	N/A
35kV NOTE P	≤ 150'	10'-0"	8'-0"	N/A
	≤ 250'	13'-0"	11'-0"	N/A
	≤ 300'	14'-6"	12'-6"	N/A

MIN. VERT. SEPARATION FROM BOTTOM TRANSMISSION COND. TO TOP DIST. COND.					
		TRANSMISSION VOLTAGE (PHASE-TO-PHASE)			
DIST.VOLTAGE (PHASE-TO-PHASE)	SPAN LENGTH (NOTE E)	35kV	46kV	69kV	115kV
15kV NOTE O	≤ 150'	9'-6"	9'-6"	10'-0"	11'-6"
	≤ 250'	12'-6"	12'-6"	13'-0"	15'-6"
	≤ 300'	14'-0"	14'-0"	14'-6"	18'-0"
35kV NOTE P	≤ 150'	10'-0"	10'-0"	10'-6"	12'-0"
	≤ 250'	13'-0"	13'-0"	13'-6"	16'-0"
	≤ 300'	14'-6"	14'-6"	15'-0"	18'-6"

NOTE A: AT ANY POINT IN THE SPAN THE CLEARANCE BETWEEN THE TRANSMISSION CONDUCTORS AND UNDERBUILT DISTRIBUTION CONDUCTORS SHALL MEET OR EXCEED THE NESC RULE 235 REQUIREMENTS.

NOTE B: WHEN CHECKING CLEARANCES BETWEEN THE TRANSMISSION AND DISTRIBUTION CONDUCTORS THE TRANSMISSION CONDUCTORS SHALL BE AT THEIR MAXIMUM OPERATING TEMPERATURE PER TF-04-001 AND THE DISTRIBUTION CONDUCTORS SHALL BE AT 30°F WITH NO WIND AND NO ICE.

NOTE C: THESE CLEARANCES SHALL BE MAINTAINED FOR ALL DISTRIBUTION UTILITIES MOUNTED ON TRANSMISSION STRUCTURES.

NOTE D: FRAMING SEPARATION IS DEFINED AS THE DISTANCE THAT THE DISTRIBUTION CROSSARM MOUNTING BOLT SHALL BE FROM THE BOTTOM TRANSMISSION APPURTENANCE MOUNTING BOLT AS SHOWN IN EACH OF THE DETAILS.

NOTE E: UNDERBUILT DISTRIBUTION ON SPANS MORE THAN 300' ARE NOT RECOMMENDED. CONTACT SYSTEM ENGINEERING - TRANSMISSION SECTION AND SYSTEM ENGINEERING - DISTRIBUTION SECTION IF DISTRIBUTION IS TO BE UNDERBUILT WITH SPANS OVER 300'.

NOTE F: IT IS ACCEPTABLE FOR THE DISTRIBUTION NEUTRAL TO BE GROUNDED VIA THE DOWNGROUND WIRE FROM THE TRANSMISSION CIRCUIT. IF THE DISTRIBUTION NEUTRAL IS TO BE GROUNDED WHILE NOT USING THE DOWNGROUND FROM THE TRANSMISSION CIRCUIT THEN THE DISTRIBUTION DOWNGROUND AND GROUND ROD SHALL BE INSTALLED ON THE OPPOSITE SIDE OF THE POLE FROM THE TRANSMISSION DOWNGROUND.

NOTE G: DISTRIBUTION EQUIPMENT SUCH AS TRANSFORMERS AND RECLOSERS SHALL NOT BE MOUNTED TO TRANSMISSION STRUCTURES IF AT ALL POSSIBLE.

NOTE H: STRUCTURES SHALL BE GUYED ON THE BISECT AT THE DISTRIBUTION LEVEL IF THERE IS MORE THAN A 3° LINE ANGLE ON THE STRUCTURE.

NOTE I: ALL STRUCTURES WITH DISTRIBUTION DEADENDS SHALL BE GUYED IN-LINE TO THE DISTRIBUTION CONDUCTORS AT THE DISTRIBUTION LEVEL.

NOTE J: ALL GUYS, INCLUDING THOSE AT AND BELOW THE DISTRIBUTION LEVEL, SHALL BE THE SAME TYPE AND SIZE AS THE TRANSMISSION GUY WIRES ABOVE.

NOTE K: ALL GUYS SUPPORTING OR LOCATED ABOVE THE ENERGIZED DISTRIBUTION CONDUCTORS SHALL HAVE FIBERGLASS STRAIN INSULATORS INSTALLED PER SECTION TR. THE QUANTITY OF FIBERGLASS STRAIN INSULATORS SHALL BE INSTALLED SUCH THAT IF THE GUY WIRE WERE TO FAIL THEN THE METALLIC PORTION OF THE GUY WIRE WOULD NOT COME CLOSE ENOUGH TO THE TRANSMISSION OR DISTRIBUTION CONDUCTORS SUCH THAT IT COULD BECOME ENERGIZED. REFER TO TR SECTION FOR DETAILS FOR ADDING FIBERGLASS STRAIN INSULATORS TO GUY.

NOTE L: WHEN DESIGNING STRUCTURES FOR UNDERBUILT DISTRIBUTION THE HIGHER OF THE STANDARD DISTRIBUTION GROUND CLEARANCE OR THE 35kV/46kV/69kV STANDARD TRANSMISSION GROUND CLEARANCE PER TRANSMISSION STANDARD TB-02-001 SHALL BE MAINTAINED FOR THE DISTRIBUTION CONDUCTOR.

NOTE M: WHEN DESIGNING STRUCTURES FOR UNDERBUILT DISTRIBUTION THE DISTRIBUTION CONDUCTORS (INCLUDING THE NEUTRAL) SHALL BE DESIGNED TO THE SAME CONSTRUCTION GRADE, LOADING CONDITIONS AND LOADING COMBINATIONS AS THE TRANSMISSION CONDUCTORS. THIS SHALL INCLUDE THE SAME OVERLOAD FACTORS AND STRENGTH REDUCTION FACTORS.

NOTE O: THE STANDARD SPACINGS ABOVE FOR NOMINAL DISTRIBUTION PHASE-TO-PHASE VOLTAGE OF 15kV SHALL BE MAINTAINED FOR ANY ACTUAL DISTRIBUTION PHASE-TO-PHASE VOLTAGE LESS THAN OR EQUAL TO 15kV.

NOTE P: THE STANDARD SPACINGS ABOVE FOR NOMINAL DISTRIBUTION PHASE-TO-PHASE VOLTAGE OF 35kV SHALL BE MAINTAINED FOR ANY ACTUAL DISTRIBUTION PHASE-TO-PHASE VOLTAGE GREATER THAN 15kV AND LESS THAN OR EQUAL TO 35kV.

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Contact Engineering Standards - Transmission Section for the creation of new standards and CUs.

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IBERDROLA USA

TRANSMISSION CONSTRUCTION STANDARDS MANUAL

TRANSMISSION STANDARDS - ELECTRICAL DATA
CLEARANCES
UNDERBUILT DISTRIBUTION

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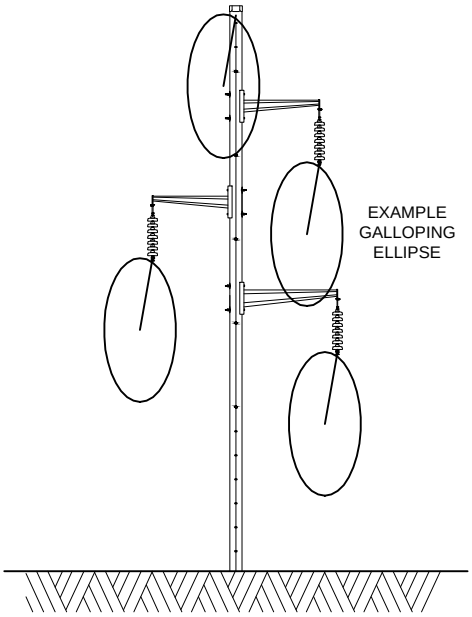
Sheet 1



NOTE: STRUCTURE SHOWN FOR REPRESENTATION.
GALLOPING IS MOST PRONOUNCED MID-SPAN

CONDUCTOR GALLOPING IS A WIND-INDUCED CONDUCTOR MOTION PHENOMENON. ICE COLLECTION ON THE CONDUCTORS COUPLED WITH WIND OFTEN CAUSES THE CONDUCTORS TO MOVE IN A LOW FREQUENCY, HIGH AMPLITUDE, OSCILLATORY MANNER. HISTORICALLY, THERE HAS BEEN EVIDENCE THAT GALLOPING HAS BEEN THE CAUSE OF OUTAGES WITHIN THE IBERDROLA USA TRANSMISSION SYSTEM.

WHEN DESIGNING A NEW LINE THE DESIGNER SHALL PERFORM A SINGLE LOOP GALLOPING ANALYSIS FOR ALL SPANS LESS THAN 500 FEET. THE DESIGNER SHALL ALSO PERFORM A DOUBLE LOOP GALLOPING ANALYSIS ON ALL SPANS LONGER THAN 500 FEET.

GALLOPING ANALYSIS SHALL BE PERFORMED CONSIDERING THE FOLLOWING WEATHER CONDITIONS:
TEMPERATURE: 0°F
WIND: 2PSF (28MPH)
RADIAL ICE: 0.5 INCHES

FOR NEW CONSTRUCTION, NO GALLOPING ELLIPSES SHALL OVERLAP.

IF GALLOPING ELLIPSES OVERLAP THE DESIGNER SHALL DESIGN A SYSTEM FOR GALLOPING MITIGATION AND SUBMIT FOR APPROVAL TO IBERDROLA SYSTEM ENGINEERING - TRANSMISSION SECTION.

ACCEPTABLE MEANS FOR GALLOPING MITIGATION DEVICES INCLUDE BUT ARE NOT LIMITED TO DETUNED CONDUCTOR PENDULUMS, AIR FLOW SPOILERS, AND CONDUCTOR WRAPS THAT PREVENT EXCESS ICE ACCUMULATION ON THE CONDUCTOR.

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TRANSMISSION CONSTRUCTION STANDARDS MANUAL

TRANSMISSION STANDARDS - ELECTRICAL DATA
DESIGN CRITERIA - CONDUCTOR GALLOPING

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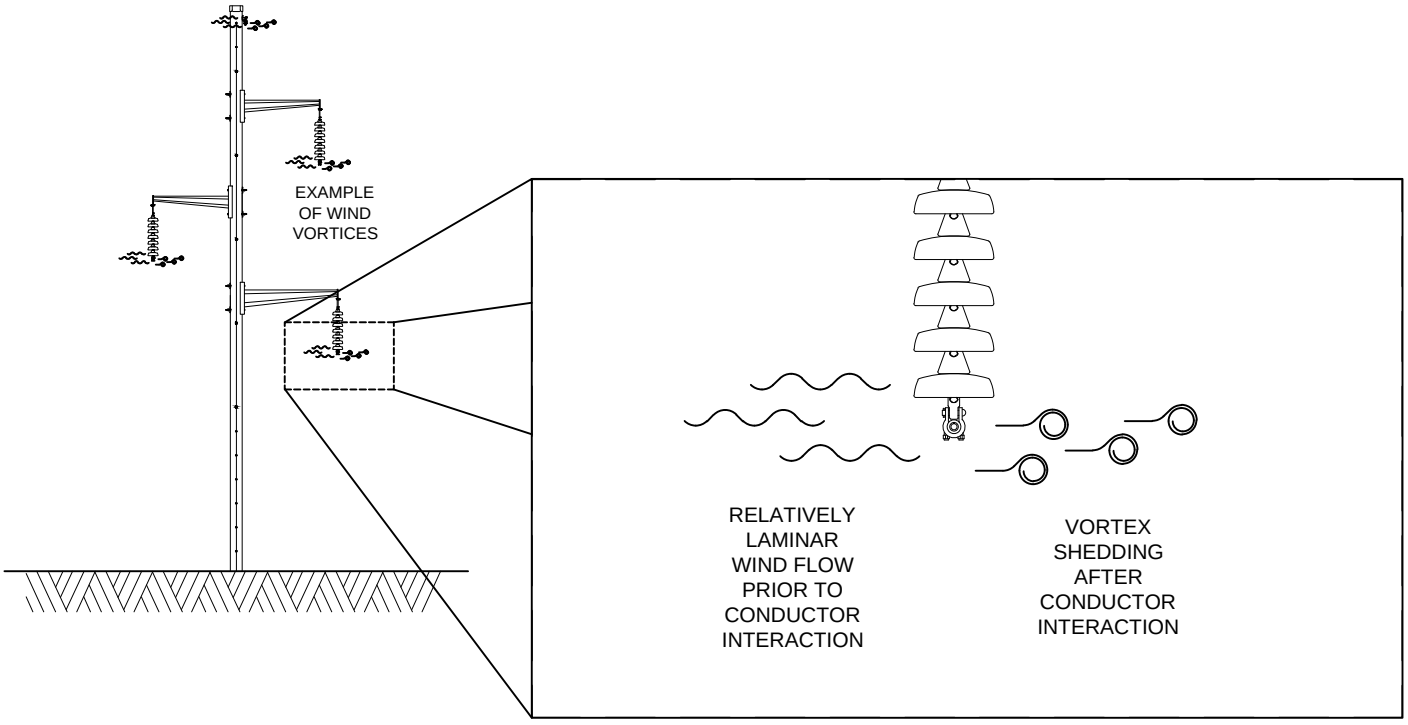
B. Franklin	08/26/14	Becken/Hart	1/08/2015	Barry R. Hart	1/08/2015		



AEOLIAN VIBRATION IS A WIND-INDUCED CONDUCTOR MOTION PHENOMENON. WIND CAUSES THE CONDUCTORS TO MOVE IN A HIGH FREQUENCY, LOW AMPLITUDE, SINUSOIDAL MANNER. HISTORICALLY, THERE HAS BEEN EVIDENCE THAT AEOLIAN VIBRATION HAS BEEN THE CAUSE OF CONDUCTOR AND HARDWARE FAILURES IN TRANSMISSION SYSTEMS.

WHEN DESIGNING A NEW LINE THAT MEETS ANY OF THE FOLLOWING CRITERIA THE DESIGNER SHALL DESIGN A SYSTEM FOR VIBRATION MITIGATION AND SUBMIT FOR APPROVAL TO IBERDROLA SYSTEM ENGINEERING - TRANSMISSION SECTION.

- NESC HEAVY TENSION OF 10,000 LBS. OR MORE
- CONDUCTOR SPANS OF 1,000' OR MORE
- OPGW SPANS OF 400' OR MORE
- SPANS WITH A HORIZ. TENSION/WEIGHT PER FOOT RATIO OF 3,200' OR MORE
  - HORIZ. TENSION CALCULATED AT 0°F, NO WIND, NO ICE, INITIAL

ACCEPTABLE MEANS FOR VIBRATION MITIGATION DEVICES INCLUDE STOCKBRIDGE VIBRATION DAMPERS (CONDUCTORS AND STATIC WIRES ONLY, SPIRAL VIBRATION DAMPERS (OPGW ONLY), AND SPACER DAMPERS (3+ CONDUCTOR BUNDLES). REFER TO TJ SECTION FOR VIBRATION DAMPER DETAILS.

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Contact Engineering Standards - Transmission Section for the creation of new standards and CUs.

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IBERDROLA USA

TRANSMISSION CONSTRUCTION STANDARDS MANUAL

TRANSMISSION STANDARDS - ELECTRICAL DATA
DESIGN CRITERIA - AEOLIAN VIBRATION

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B. Franklin	09/26/14	Becken/Hart	1/08/2015	Barry R. Hart	1/08/2015		

A study of the expected electric and magnetic fields (EMF) effects using the Winter Normal Ratings as required by the NYPSC should be performed on proposed transmission lines. The results of the study should show that the maximum levels at the edge of the project ROW are below the levels recommended in the Commission's Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities.

A review of environmental impacts should include but not be limited to:

- minimizing land use impacts
- be consistent with the goals of the 2009 New York State Open Space Conservation Plan
- be consistent with local land use plans or policies, including future planned land use plans.
- minimize visual impact to resources within 5 miles of the project including historic resources, national parks, recreation areas, seashores, forests, state forest preserves and state or federally designated trails.

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IBERDROLA USA TRANSMISSION CONSTRUCTION STANDARDS MANUAL

TRANSMISSION ELECTRICAL DATA
ELECTROMAGNETIC FIELD
STUDY OF IMPACTS

Revision	
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/ /2014	

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L.A. Best	11/14/2013	Shepard/Becken/Hart	/ /2014	Barry R. Hart	/ /2014		