

2019 PLS-CADD Advanced Training and User Group

PLS-CADD & FAA

by

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Federal Airways & Airspace®

Introductions

Justin Pittman

- Production Manager, Airspace OMS
- Airspace specialist

Clyde Pittman

- Director of Engineering at Federal Airways & Airspace (FA&A)
- Technical Expert of Airspace and TERPS algorithms
- Prior to joining FA&A in 1998, Clyde was Supervisor of Electronic Engineering of the FAA's Great Lakes Region with 27 years of experience.

Introductions

Federal Airways & Airspace

- Established in 1984
- Developers of Airspace® and TERPS® software used for determining FAA height compliance of tall structures
- Number of US projects completed and approved by the FAA number into the 10,000's. Number of structures evaluated by Airspace OMS are in the millions.
- Technical expert witness
- State Governments
- Technical experts to ODOT Aviation Department for tall structure applications
- Airspace OMS is used by every industry that requires compliance with FAA rules and regulations

Discussion Topics

- **Title 14 CFR Part 77**
 - FAA Notice Criteria
 - FAA Obstruction Standards
- **AC 70/7400-1L Change 2**
 - Chapter 8. Dual Lighting with Red/Medium-Intensity Flashing White Light System
 - Chapter 10. Marking & Lighting of Catenary and Catenary Support Structures
- **Case Study #1**
 - Designing Transmission Lines near airports
- **Case Study #2**
 - Leveraging PLS-CADD for seeking FAA marking & lighting relief

Title 14 CFR Part 77

§ 77.1 Purpose:

- (a) The requirements to provide notice to the FAA of certain proposed construction, or the alteration of existing structures;
- (b) The standards used to determine obstructions to air navigation, and navigational and communication facilities;
- (c) The process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities or equipment; and
- (d) The process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations.

Problem

- How to accurately determine FAA notice and obstruction requirements without being subjected to excessive regulatory burdens, construction delays and obstacle lighting while enhancing efficiency through automation and PLS-CADD?

Part 77.9 Notice Criteria

KNOW YOUR LIMITS

What criteria is established that triggers notice to the FAA?

Part 77.9 Notice Criteria

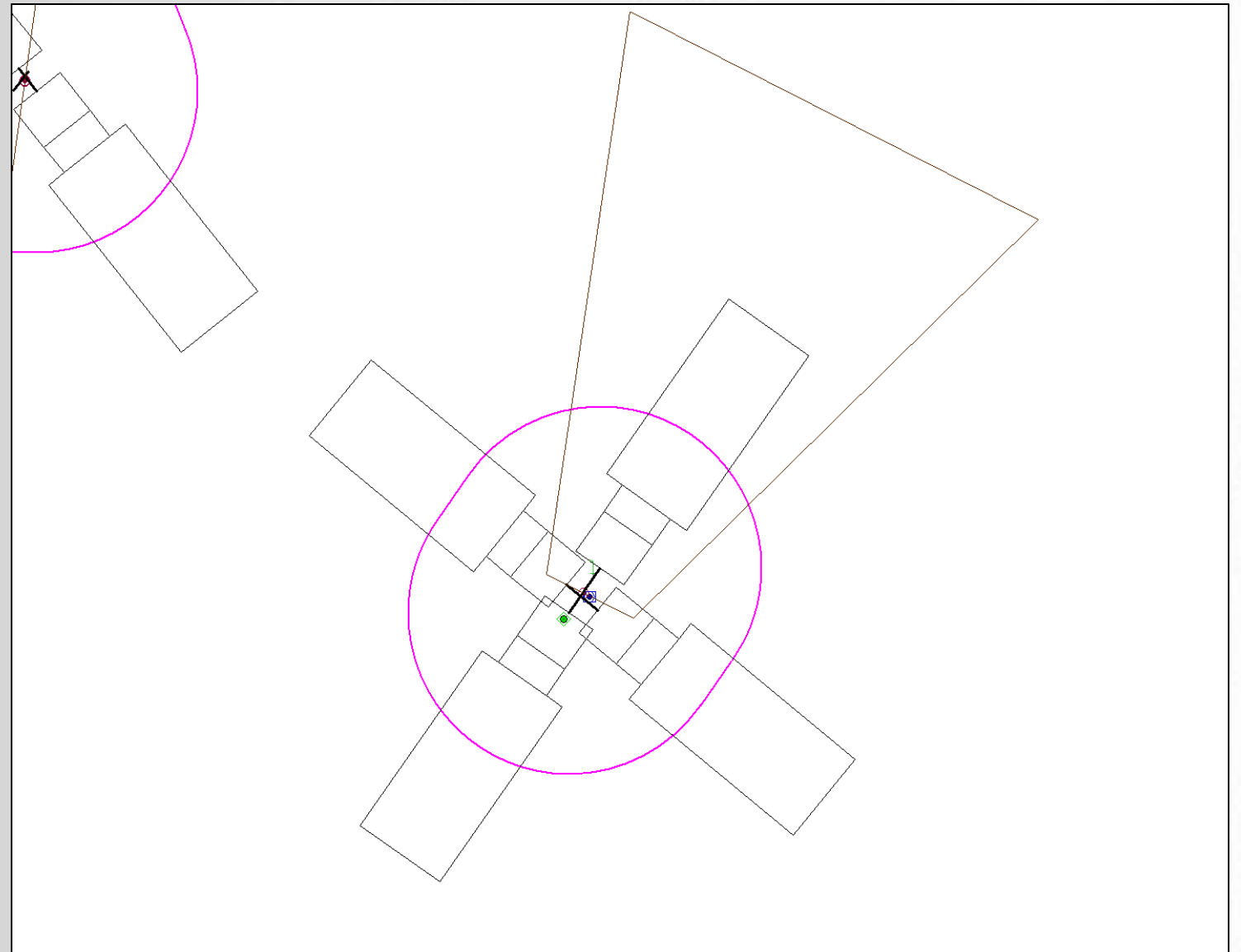
Notice Criteria

- 77.9(a) – 200 ft AGL
- 77.9(b) – Slope
- 77.9(e) – Traverse Way
- 77.9(d) – On Airport
- IFR Direct & Offset Notice

EMI

EMI not part of Title 14 CFR Part 77. However, it is the structure owner's responsibility that they will not interfere or block a light or signal of a navigational aid per FAA Act of 1958.

Airspace accurately computes all Part 77 criteria and identifies potential EMI impact.



Part 77.9 Notice Criteria

KNOW YOUR LIMITS

What criteria is established that normally triggers obstacle marking and/or lighting?

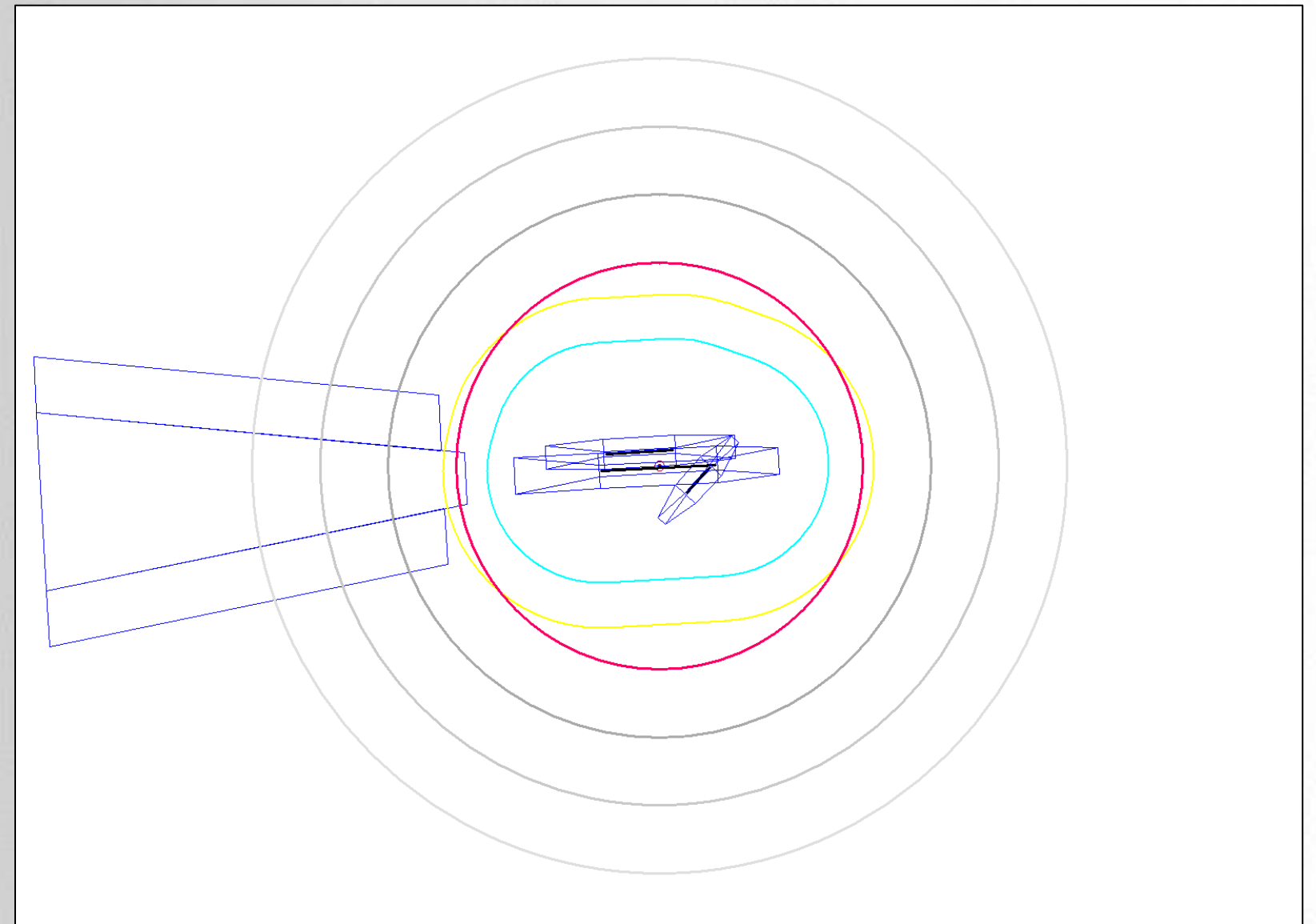
Part 77 Obstruction Standards

Obstruction Standards

Civil

- 77.17(a)(1) – 499 ft AGL
- 77.17(a)(2) – VFR Transitional
- 77.19(a) – Horizontal Surface
- 77.19(b) – Conical Surface
- 77.19(c) – Primary Area
- 77.19(d) – AOS Approach
- 77.19(e) – AOS Transitional

Airspace accurately computes all Part 77 criteria and identifies potential EMI

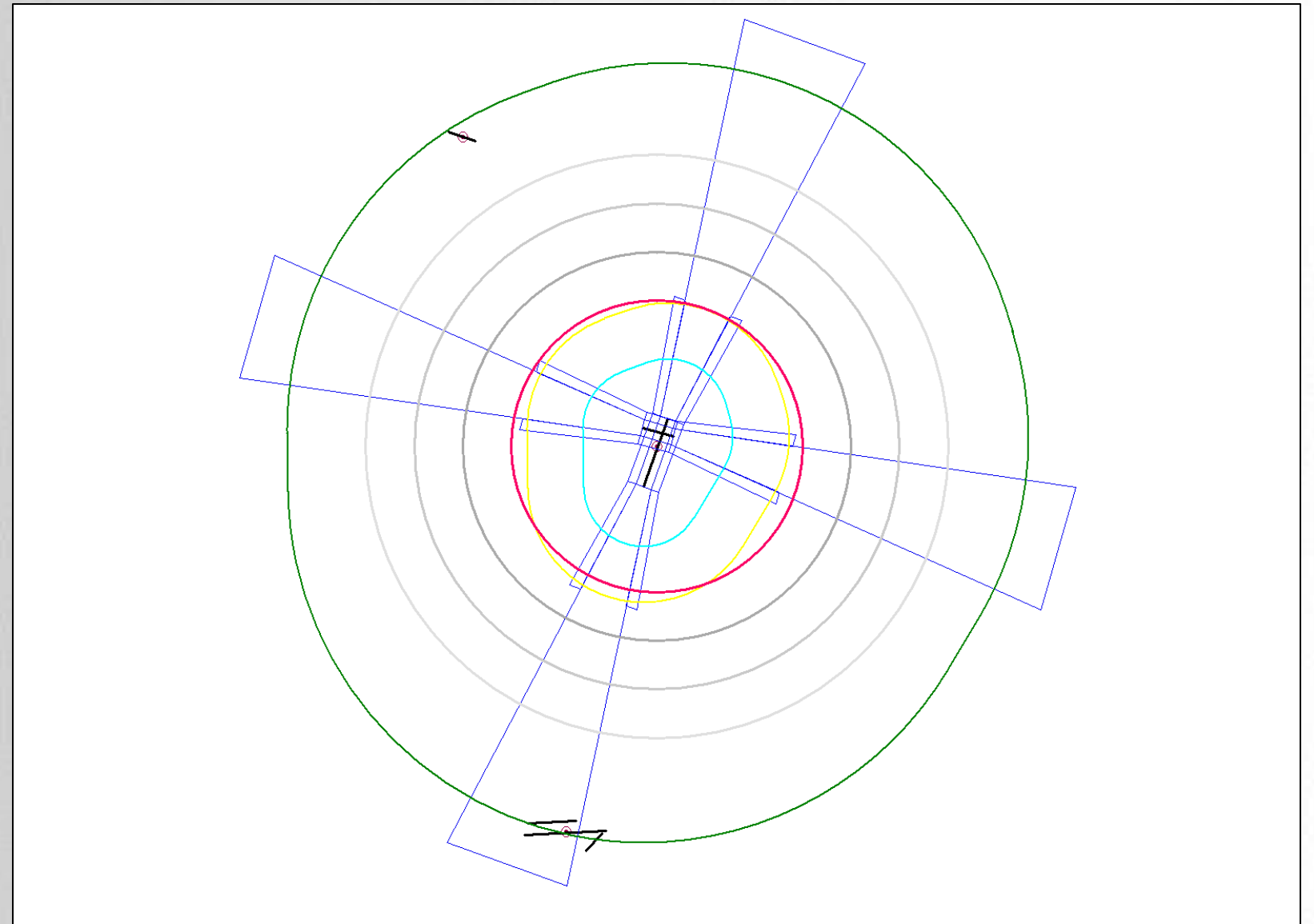


Part 77 Obstruction Standards

Obstruction Standards

Military

- 77.21(a)(1) – Inner Horizontal Surface
- 77.21(a)(2) – Conical Surface
- 77.21(a)(3) – Outer Horizontal Surface
- 77.21(b)(1) – Primary Surface
- 77.21(b)(2) – Clear Zone Surface
- 77.21(b)(3) – Approach Surface
- 77.21(b)(4) – Transitional Surface
- Airspace accurately computes all Part 77 criteria and identifies potential EMI impact.

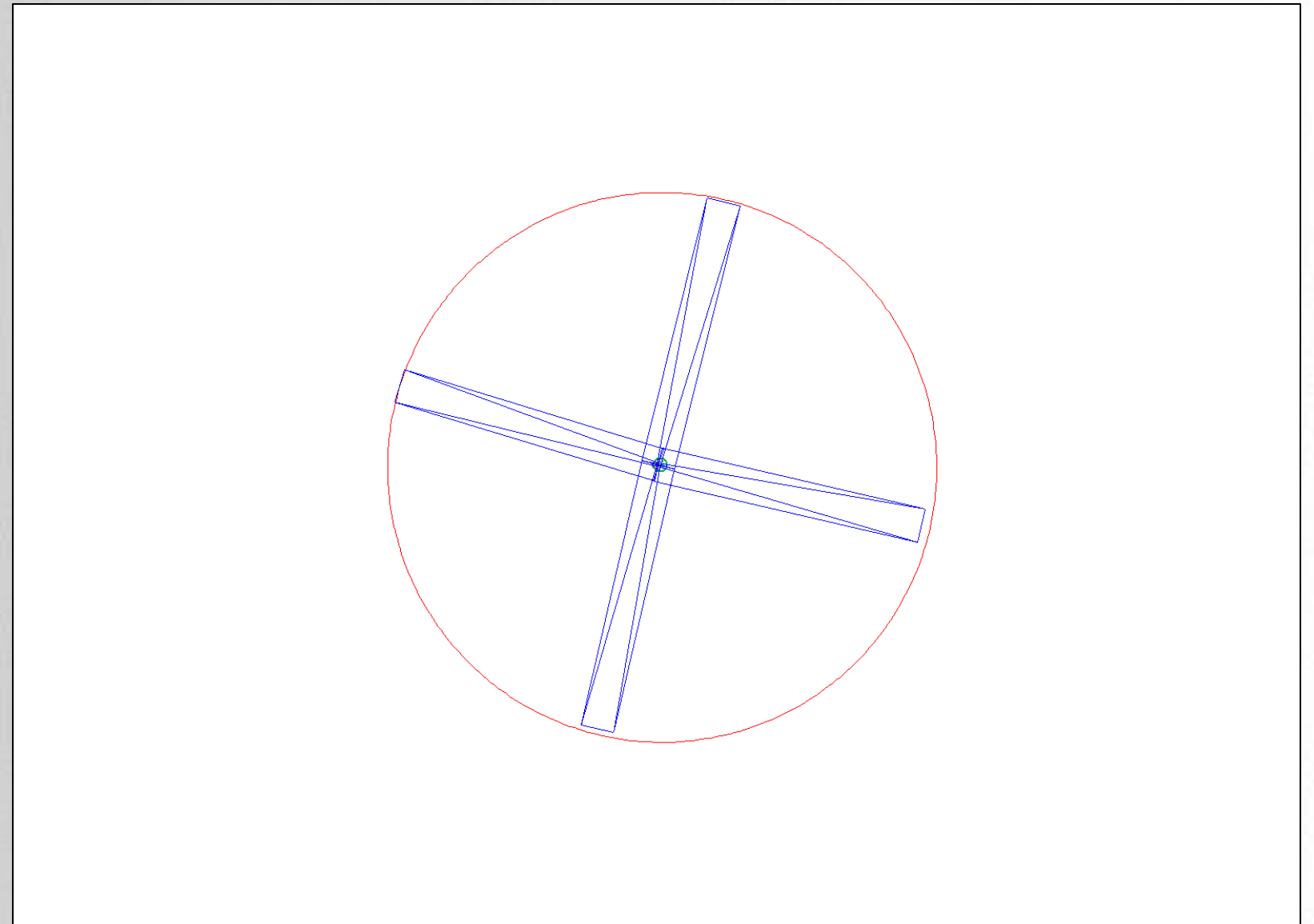


Part 77 Obstruction Standards

Obstruction Standards

Heliports

- 77.23(a) – Primary Surface
- 77.23(b) – Approach Surface
- 77.23(c) – Transitional Surface
- Airspace accurately computes all Part 77 criteria and identifies potential EMI impact.



AC 70/7400-1L Change 2

Effective: August 17, 2018

Purpose

- This Advisory Circular (AC) sets forth standards for marking and lighting obstructions that have been deemed to be a hazard to air navigation.

Relevant Chapters for Transmission Lines and Design

- Chapter 5. Red Obstruction Light System
- Chapter 8. Dual Lighting with Red/Medium-Intensity Flashing White Light System
- Chapter 10. Marking & Lighting of Catenary and Catenary Support Structures

AC 70/7400-1L Change 2

Chapter 5

Red obstruction lights are used to increase conspicuity during nighttime. Daytime and twilight marking is required. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

- **Structures 150 Feet (46 m) AGL or Less.** Two or more steady-burning red (L810) lights **should** be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.
- **Structures Exceeding 150 Feet (46 m) AGL.** At least one red flashing (L-864) light **should** be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

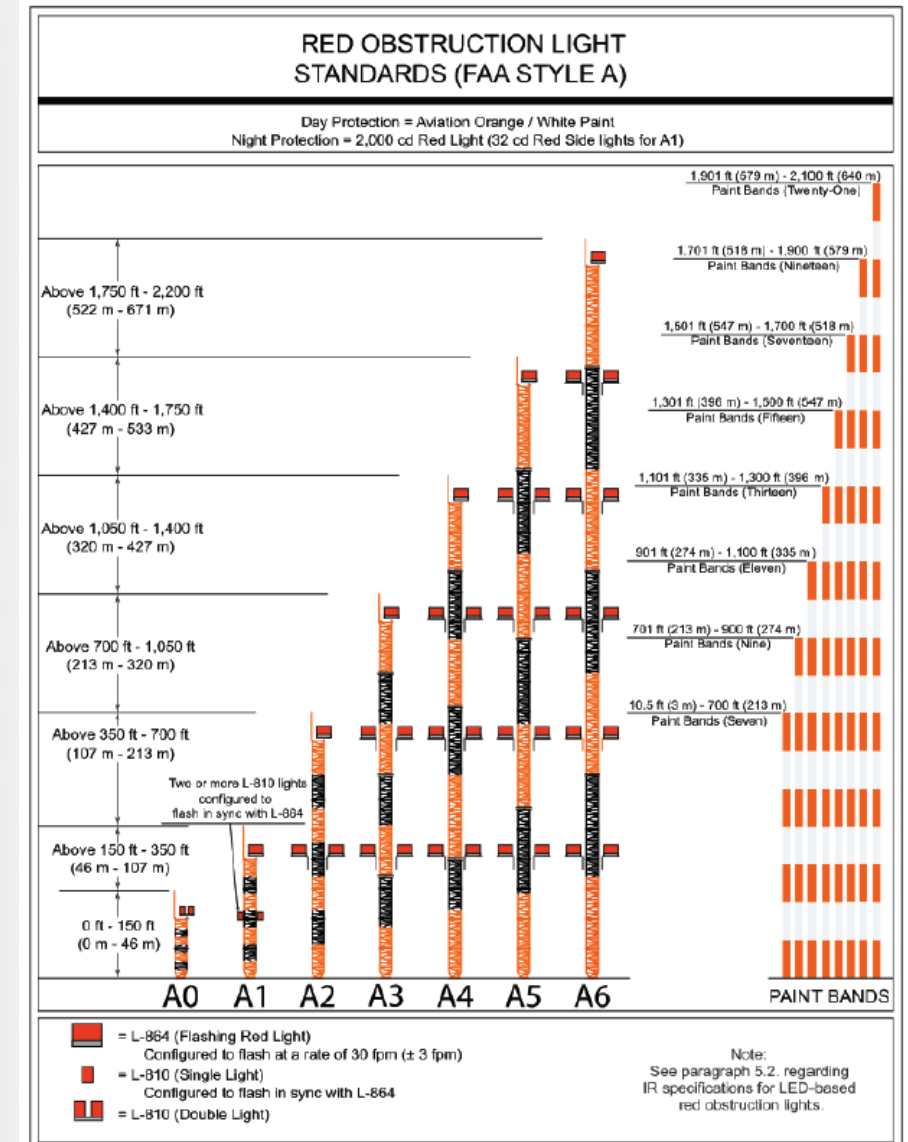


Figure A-7. Red Obstruction Light Standards

AC 70/7400-1L Change 2

Chapter 8

This dual lighting system includes red lights (L-864) for nighttime and medium-intensity, flashing white lights (L-865) for daytime and twilight use. This lighting system may be used in lieu of operating a medium-intensity flashing white lighting system at night. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

- **Structures Exceeding 200 Feet (60 m) AGL.** At least one red flashing (L-864) light **should** be installed in a manner to ensure an unobstructed view of one or more lights by a pilot. Additionally multiple (L-810) light should be installed and configured to flash in sync with (L-864) light.

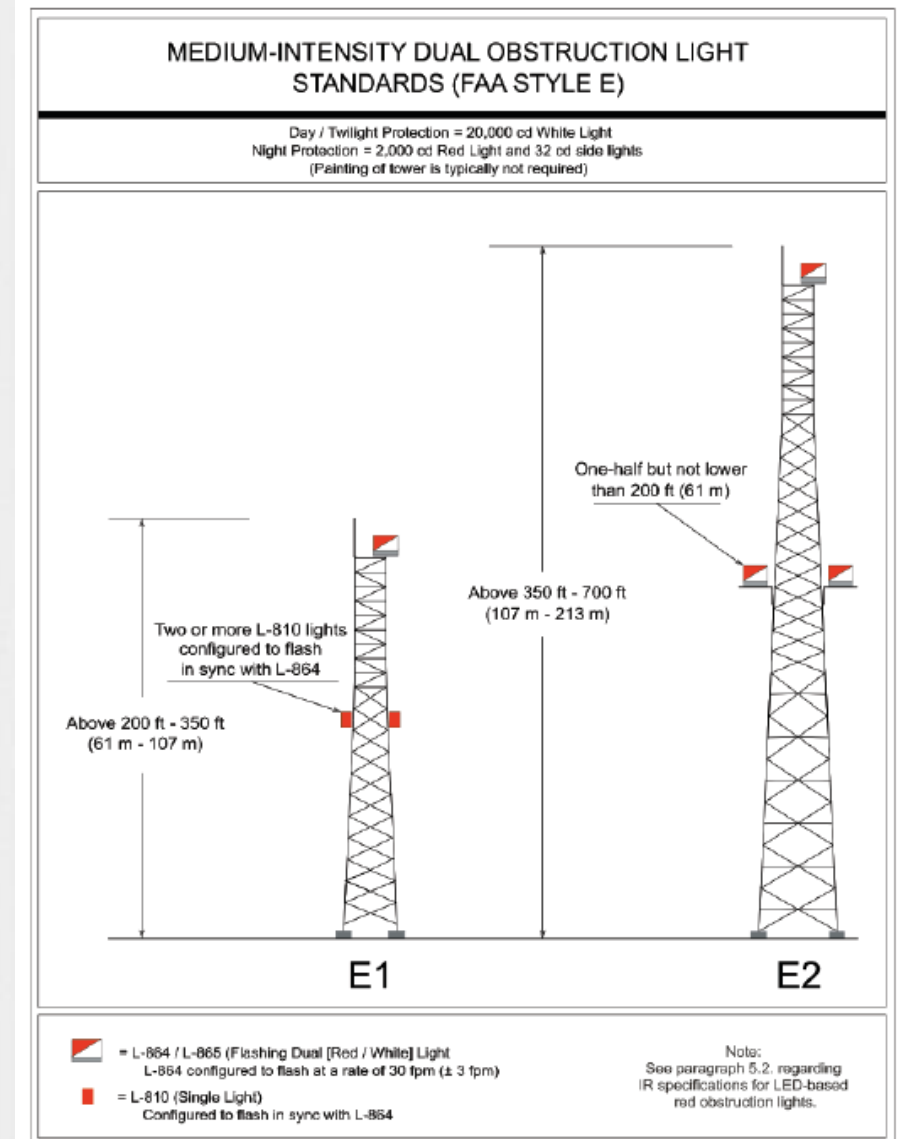


Figure A-11. Medium-Intensity Dual Obstruction Lighting Standards

AC 70/7400-1L Change 2

Chapter 10

Purpose: Wires may be either energized or non-energized and are used for transmission, distribution, or for other purposes, as defined. The recommended marking and lighting of **both the structures and wires** provides day and night conspicuity and assists pilots in identifying and avoiding catenary wires and associated support structures.

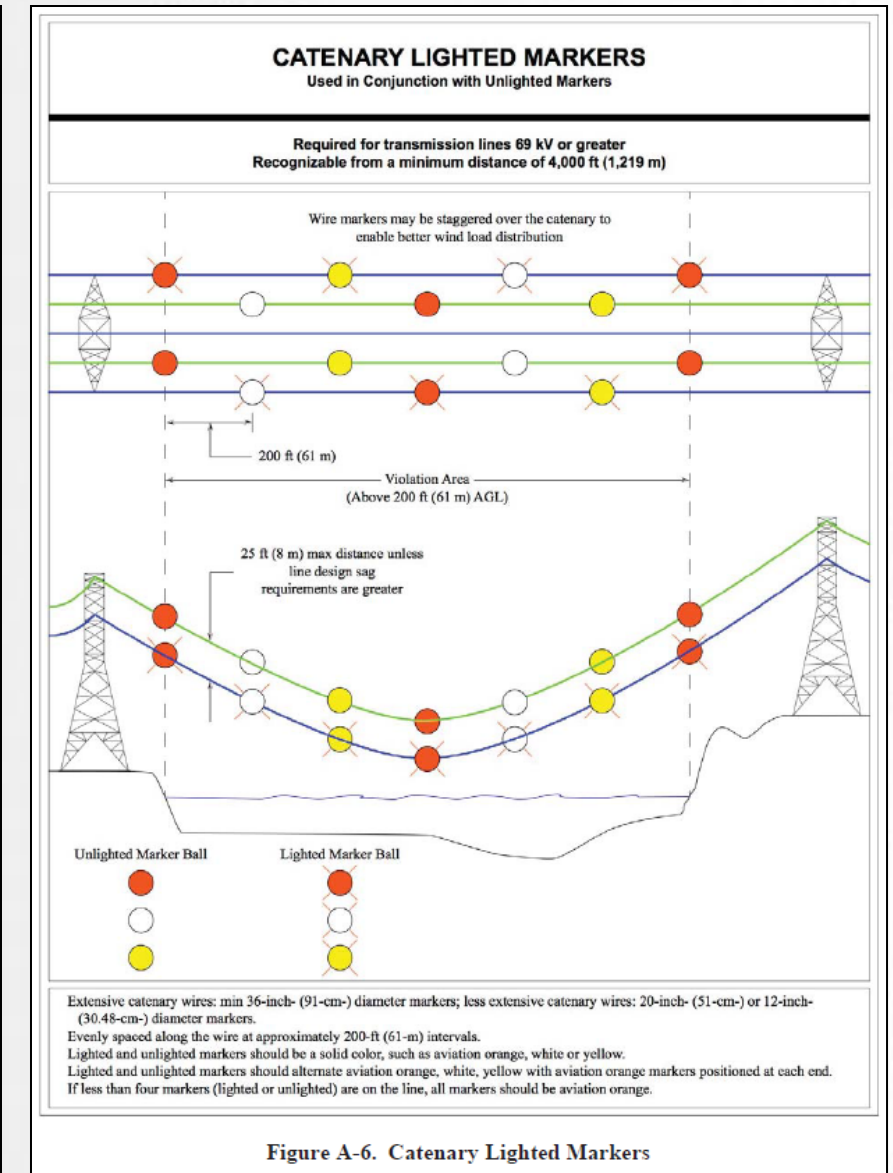
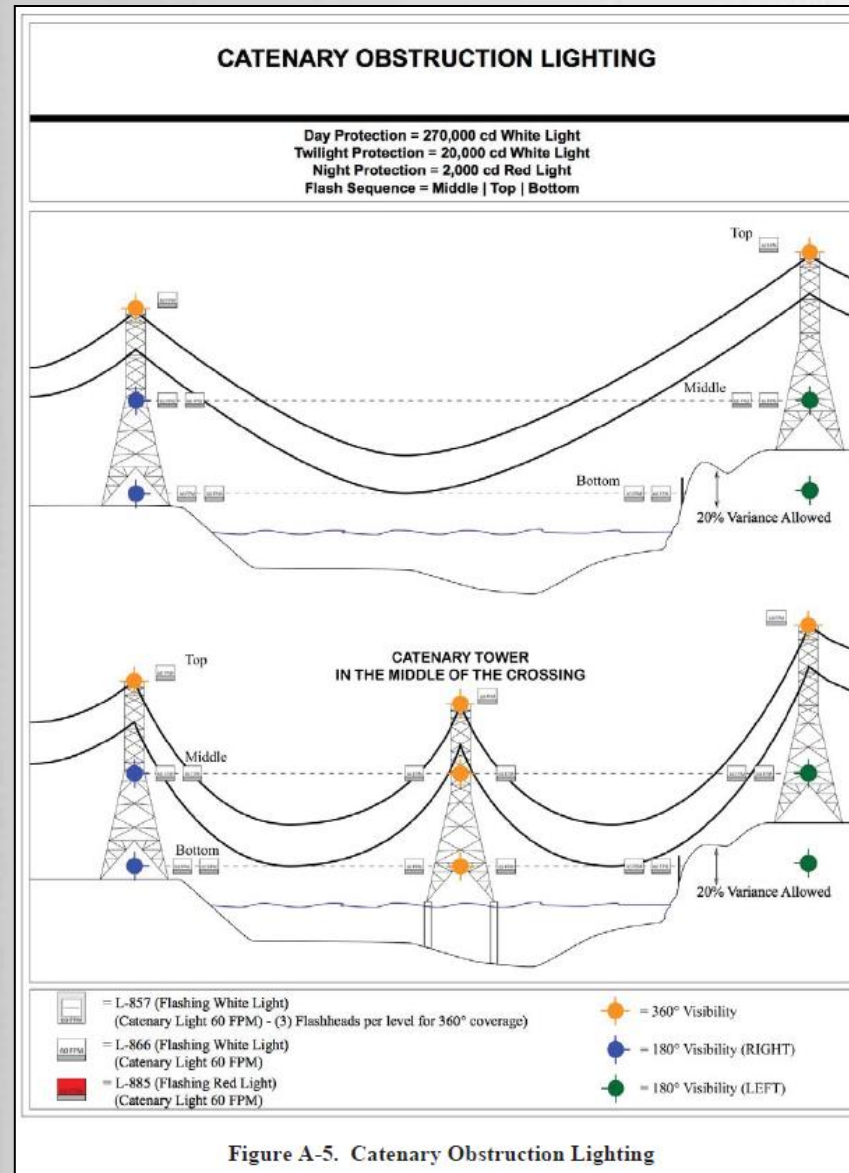
Catenary Notes:

- Lighted markers should be used on transmission line catenary wires near airports, heliports, across rivers, canyons, lakes, areas of known risk to aviation, etc.
- High-voltage (69 kV or greater) transmission lines should be fitted with lighted markers.

AC 70/7400-1L Change 2

Catenary Notes Cont.:

- The maximum sag distance between the line energizing the lighted markers and the highest catenary wire above the lighted markers should be no more than 25 feet (7.6 m), otherwise unlit marker balls will need to be installed on the shield wire.
- When submitting top the FAA for obstruction analysis and approval the height of the catenary on the coldest day should be used.

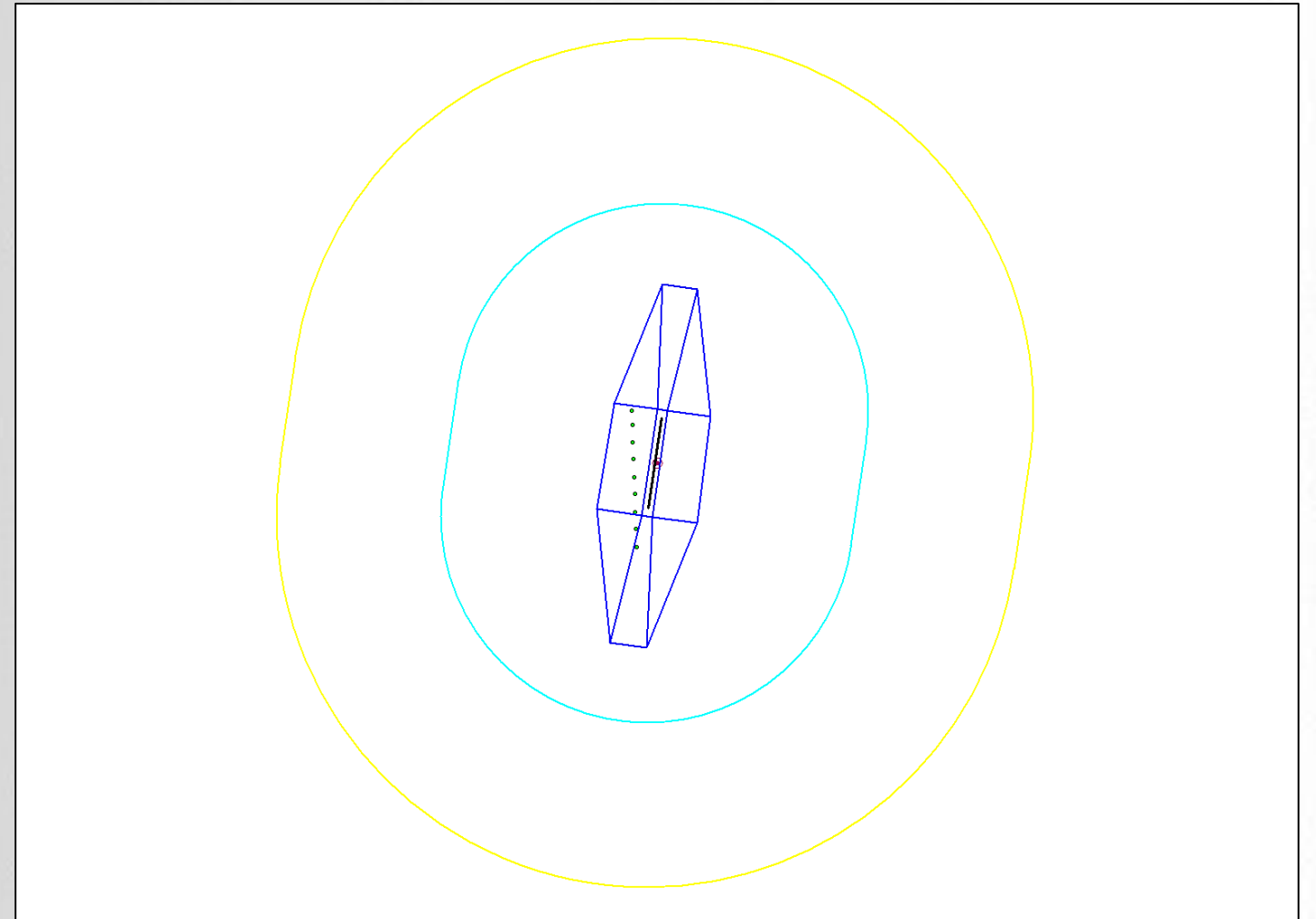


Case Study 1 (Bowman Field)

Scope:

Evaluate proposed transmission line to determine FAA notice height limit and maximum height to avoid obstruction marking and lighting structures.

150 ft AGL was used as the maximum height a structure could be for the initial test.



Case Study 1 (Bowman Field)

Approach:

1. Leverage PLS-CADD “Structure Longitude, Latitude, and Height” report to facilitate ease in transferring proposed structure data to Airspace
2. Load PLS-CADD report into Airspace for analysis
3. Review results for FAA notice and obstruction height limits
4. Redesign structure(s) if necessary to remain below obstruction height limit
5. Export proposed structure data into Excel for FAA multipoint submission

Case Study 1 (Bowman Field)

Approach:

- Leverage PLS-CADD “Structure Longitude, Latitude, and Height” report to facilitate ease in transferring proposed structure data to Airspace.
- Load PLS-CADD report into Airspace for analysis.

Row Number	Structure number	Structure name	Latitude	Longitude	Elevation	Structure height
1	111	2011-ANE-1349.tow	44.41349444	-70.148225	300	150
2	110	2011-ANE-1350.tow	44.41253333	-70.14817778	319	150
3	109	2011-ANE-1351.tow	44.41135833	-70.14811667	325	150
4	108	2011-ANE-1352.tow	44.41028889	-70.14806389	325	150
5	107	2011-ANE-1353.tow	44.40908333	-70.148	318	150
6	106	2011-ANE-1354.tow	44.40796111	-70.14794722	318	150
7	105	2011-ANE-1355.tow	44.40675556	-70.14788611	312	150
8	104	2011-ANE-1356.tow	44.40563056	-70.14783056	310	150
9	103	2011-ANE-1357.tow	44.4044	-70.14776944	307	150

Case Study 1 (Bowman Field)

Approach Continued:

- Review results for FAA notice and obstruction height limits
- Redesign structure(s) in PLS-CADD if necessary to remain below obstruction height limit, if desired or possible.

The screenshot displays the 'Help' window in the PLS-CADD software. It is divided into several sections:

- Structure Longitude, Latitude and Height Report:** Lists metadata including Creator Application (PLS-CADD), Version (19.6.548), File Date (6/5/2019), File Time (8:06:02 AM), Structure Count (9), and Coordinate System (nad83).
- Airspace Project Details:** Lists Project Name (B10_demo), Study Of (New Construction), Duration (Permanent), Nearest State (ME), Analysis Date (6/9/2019 11:28:41 AM), and Data Date (5/1/2019).
- Filter Results:** Includes dropdown menus for 'Notice' (set to 'All') and 'Obstruction' (set to 'All').
- Table:** A table with 11 columns: Airspace Reports, Structure Number, Latitude, Longitude, Site Elevation, Structure height, Exceeds Notice, Notice Limit, Exceeds Obstruction, and Obstruction Limit. It contains 10 rows of data for structures B10_demo-1.
- Buttons:** 'Close' and 'Export' buttons are located at the bottom right.

☒ Airspace Reports	Structure Number	Latitude	Longitude	Site Elevation	Structure height	Exceeds Notice	Notice Limit	Exceeds Obstruction	Obstruction Limit
	B10_demo-1	44.41349444	-70.148225	300	60	True	324	False	411
	B10_demo-1	44.41253333	70.14817778	319	44	True	338	False	402
	B10_demo-1	44.41135833	70.14811667	325	63	True	342	False	389
	B10_demo-1	44.41028889	70.14806389	325	63	True	347	True	378
	B10_demo-1	44.40908333	-70.148	318	64	True	333	True	365
	B10_demo-1	44.40796111	70.14794722	318	44	True	326	True	353
	B10_demo-1	44.40675556	70.14788611	312	49	True	316	True	340
	B10_demo-1	44.40563056	70.14783056	310	49	True	316	True	342
	B10_demo-1	44.4044	70.14776944	307	49	True	316	True	355

Case Study 1 (Bowman Field)

Approach Continued:

- Airspace creates a properly formatted Excel file of exported structure data to streamline FAA application submission process.
- Excel structure data can be uploaded to FAA's OEAAA web portal via multipoint submission.
- Manual entry of structure data is avoided.
- Possible typos is eliminated.

Sponsor (person, company, etc. proposing this action)
* Sponsor: Federal Airways & Airspace

Construction / Alteration Information

* Notice Of: Construction
* Duration: Permanent
if Temporary: Months: Days:
Work Schedule - Start: 08/01/2019 (mm/dd/yyyy)
Work Schedule - End: 08/31/2020 (mm/dd/yyyy)
State Filing: Not filed with State
* Will your structure transmit frequencies? No

Structure Details

* Structure Type: Transmission Line
* Nearest City: East Livermore
* Nearest State: Maine
* Description of Location: Structures near B10 Airport
* Description of Proposal: Establish new Electrical Transmission Line in Existing Utility easement

Proposed Frequency Bands

* Note: All required information must be entered before importing your spreadsheet data.
Structure names should be unique for a given project and structure names should not be updated.

Download Spreadsheet template for loading project - [OECaseDataSpreadsheet v2.0](#) (Right click and then click on 'Save Link As' to locally save it)

Select file to import Case(s) information: No file chosen

* Note: The data imported from you spreadsheet will be displayed in this section.

Location(s) Data

Structure Name	Latitude	Longitude	SE	Structure Height (AGL)	Requested M&L	Current M&L	Prior ASN	Current AGL	ADLS	SE Comments	Message
111	44-24-48.58	70-8-53.61	300	60	None	null	null	null	null	null	Valid
110	44-24-45.12	70-8-53.44	319	44	None	null	null	null	null	null	Valid
109	44-24-40.89	70-8-53.22	325	63	None	null	null	null	null	null	Valid
108	44-24-37.04	70-8-53.03	325	63	Spherical markers and red lights	null	null	null	null	null	Valid
107	44-24-32.7	70-8-52.8	318	64	Spherical markers and red lights	null	null	null	null	null	Valid
106	44-24-28.66	70-8-52.61	318	44	Spherical markers and red lights	null	null	null	null	null	Valid
105	44-24-24.32	70-8-52.39	312	49	Spherical markers and red lights	null	null	null	null	null	Valid
104	44-24-20.27	70-8-52.19	310	49	Spherical markers and red lights	null	null	null	null	null	Valid
103	44-24-15.84	70-8-51.97	307	49	Spherical markers and red lights	null	null	null	null	null	Valid

Case Study 2 (Catenary > 200 ft AGL)

Example:

- Catenary has been identified to exceed 200 ft AGL.

Parameters

N 41° 03' 27.94"

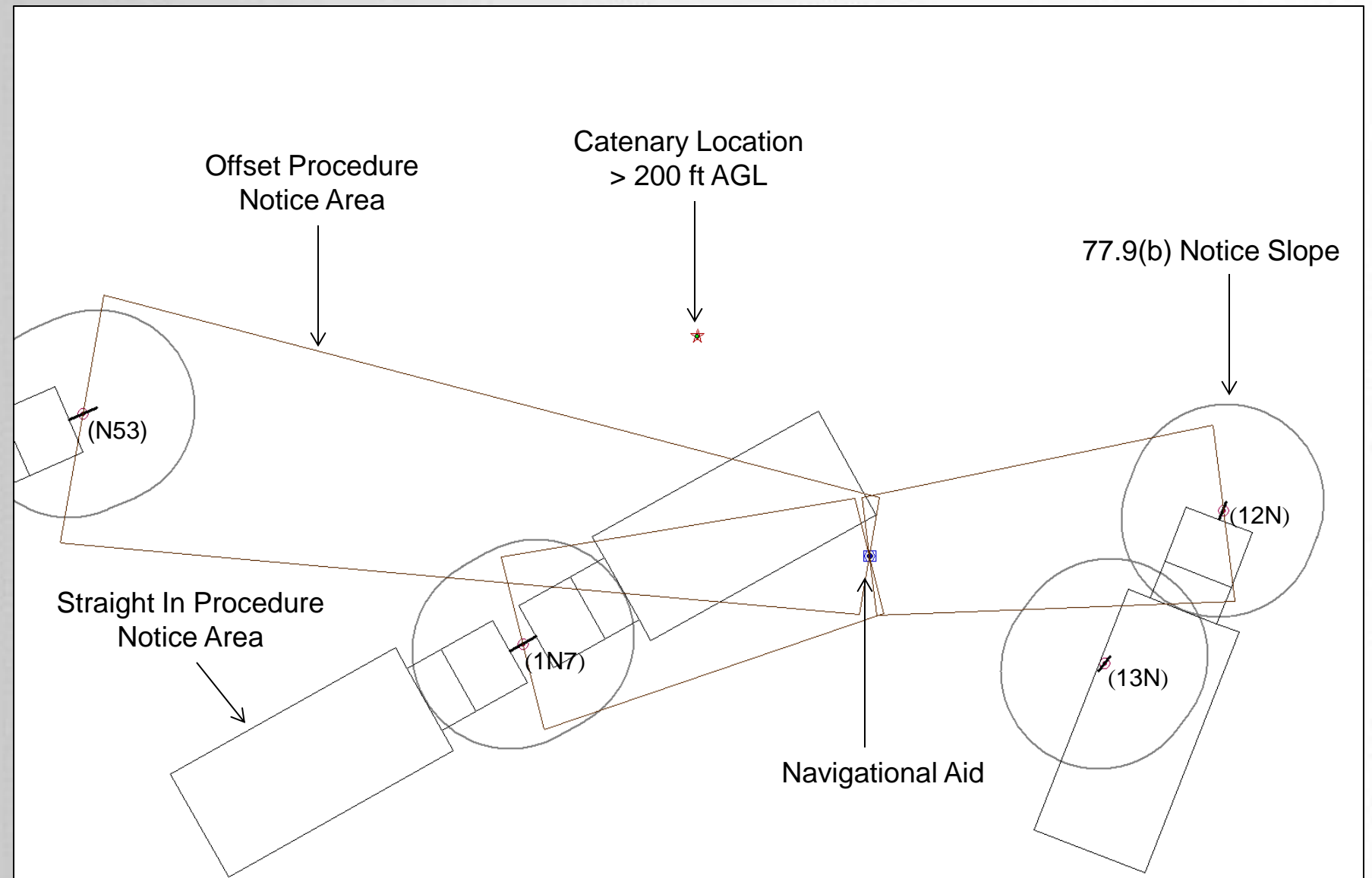
W 74° 55' 58.54"

827 ft Ground Elevation

231 ft Above Ground Level

FAA Requirements

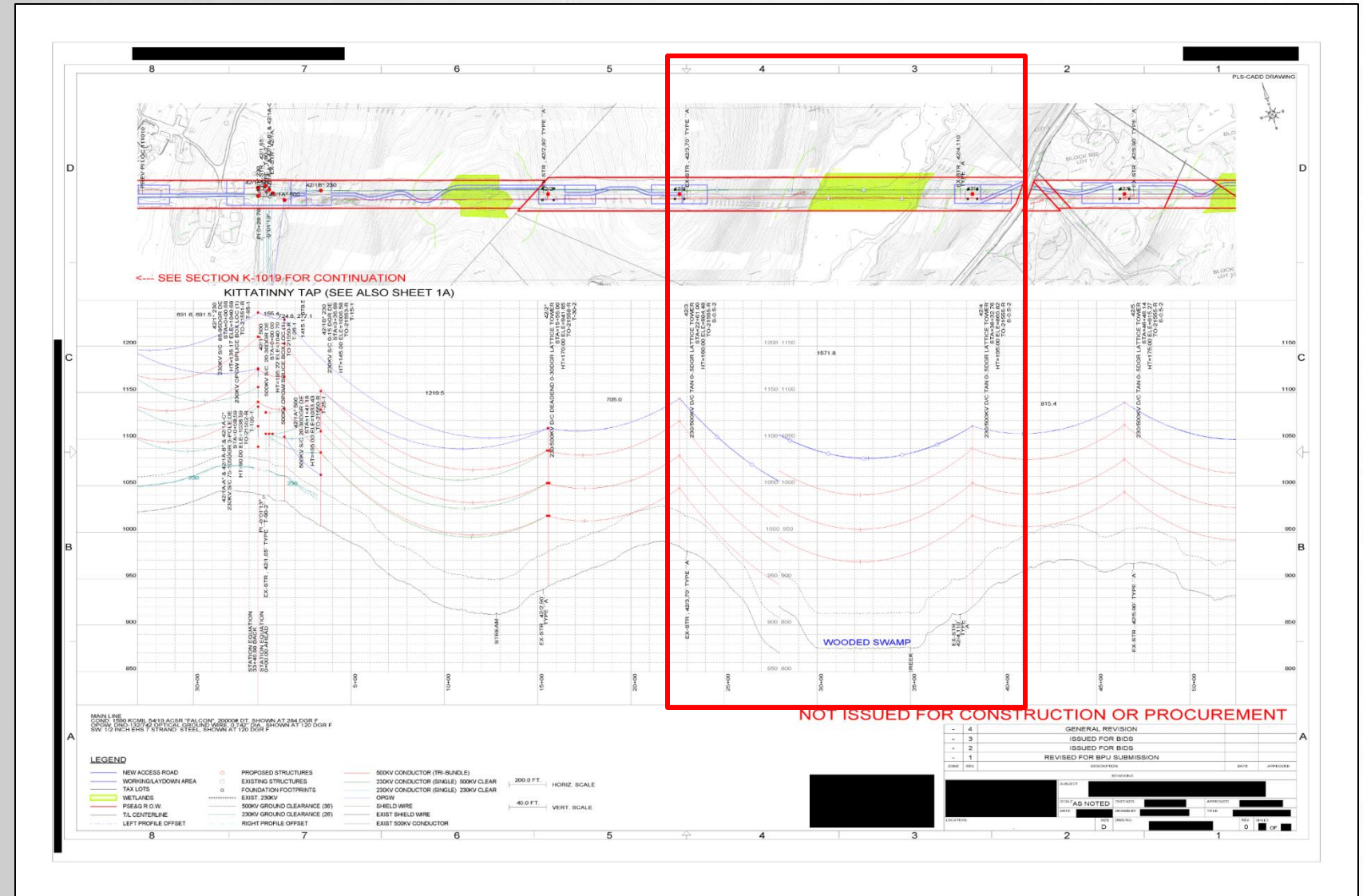
- Exceeds 77.9(a) and filing notice of construction is required.
- FAA standard recommendation is to require marking or lighting of catenary exceeding 200 ft.



Case Study 2 (Catenary > +200 ft AGL)

Approach

- Leverage PLS-CADD drawings to avoid marking and/or lighting requirements.
- Develop graphics to accurately depict actual environment.
- Utilize LiDAR data to enhance vegetation in area under catenaries exceeding 200 ft AGL and marking should not apply.
- Demonstrate it is impractical for aircraft to operate in specific topographic features i.e. narrow ravines.



Case Study 2 (Catenary > +200 ft AGL)

Initial FAA Outcome

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Span from 42/3 to 42/4
Location:	Hardwick, NJ
Latitude:	41-03-27.94N NAD 83
Longitude:	74-55-58.54W
Heights:	231 feet above ground level (AGL) 1058 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2. Obstruction Marking and Lighting, spherical markers - Chapters 3(Marked)&12.

Marking & Lighting Study Outcome

** MARKING & LIGHTING RECOMMENDATION **

The Federal Aviation Administration has completed an evaluation of your request concerning:

Structure:	Lighting Study Span 42/3 to 42/4
Location:	Harwick, NJ
Latitude:	41-03-27.94N NAD 83
Longitude:	74-55-58.54W
Heights:	827 feet site elevation (SE) 231 feet above ground level (AGL) 1058 feet above mean sea level (AMSL)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory Circular 70/7460-1 K Change 2.

Action will be taken to ensure aeronautical charts and records are updated to reflect the marking/lighting changes which exist at this time.

Conclusion

- Know your limits
 - FAA Notice Criteria
 - FAA Obstruction Standards
- Improve FAA compliance efficiency
 - PLS-CADD reports and images
 - Airspace Analysis
 - Airspace Export to Excel
- Design Transmission Line structures to minimize FAA notice as well as marking/lighting requirements.

Power Line Systems

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