**EXHIBIT C**

**Engineering Specifications for an Overhead Bipolar HVDC Transmission Line**

**Segment** **of**

GENERAL INFORMATION

1. Name of Petitioner:

2. Name or Circuit Number of Line:

3. Length of Segment:       miles

4. Segment is located in the following sections, townships, and ranges:

5. Segment in ( select phrase ) in      .

6. Segment will be maintained in accordance with the Iowa Electrical Safety Code and the           Edition of the National Electrical Safety Code.

7. Maximum *Capable of Operating* Voltage:       kVDC Nominal Operating Voltage:       kVDC

NESC RULE 232D VERTICAL OVERHEAD CLEARANCE REQUIREMENTS

8. Maximum DC Operating Voltage to Ground in Kilovolts: (V) =

9. Maximum Switching Surge Factor: (PU) =

10. Electrical Component of Clearance: (D) =

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nature of Surface Underneath Lines** | **Table 232-3 Reference Height** | **+** | **Electrical Component of Clearance (D)** | **=** | **Clearance\*** | |
| 11. | *Open Ground* | 14 ft. | + | ft. | = | ft. | |
| 12. | *Roads* | 14 ft. | + | ft. | = | ft. | |
| 13. | *Railroads* | 25 ft.\*\* | + | ft. | = | ft. | |
| 14. | *Water* | 12.5 ft. | + | ft. | = | ft. | |
| 15. | *Water Areas Suitable for Sailboating*  *(<20 acres)* | 16 ft. | + | ft. | = | ft. | |
| 16. | *Water Areas Suitable for Sailboating*  *(20 to 200 acres)* | 24 ft. | + | ft. | = | ft. | |
| 17. | *Water Areas Suitable for Sailboating*  *(200 to 2000 acres)* | 30 ft. | + | ft. | = | ft. | |
| 18. | *Water Areas Suitable for Sailboating*  *(>2000 acres)* | 36 ft. | + | ft. | = | ft. | |
|  | \* The Iowa Electrical Safety Code and the applicable edition of the NESC should both be referenced to determine the conditions at which the above clearances apply. | | | | | |
|  | \*\* 199 IAC 42.6(2)”a” requires the height of a rail car to be 23 feet, 3 feet higher than the NESC, when calculating clearances. | | | | | |

CONDUCTORS AND INSULATORS

19. Number of Conductors per Bundle:

20. Conductor Code Word:       Size:       MCM Stranding:       Material:      ­­­­­­­­­\_\_\_\_\_\_\_

21. Typical Tangent Structure Insulators:

22. Typical Strain Structure Insulators:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Insulator Bell Electrical Characteristics in Accordance with IEC 61325** | | | | |
|  |  | DC Withstand Voltage | | Dry Lightning Impulse Withstand Voltage | DC SF6 Puncture Withstand Voltage |
|  | Catalog Number | Dry 1 Minute | Wet 1 Minute |
| 23. |  | kV | kV | kV | kV |
| 24. |  | kV | kV | kV | kV |

25. Number of Metallic Return Conductors (MRC):

26. MRC(s) Maximum Operating Voltage:       MRC(s) Typical Operating Voltage:

27. MRC(s) Code Word:       Size:       MCM Stranding:       Material:

28. Shield Wire(s):

TYPICAL TANGENT STRUCTURES

29. Construction Grade:       Typical Span:       ft. Maximum Span:       ft.

30. Typical Tangent Structures are:

31. Typical Height After Installation:       ft.

TYPICAL STRUCTURE DRAWING

32. A dimensioned drawing of a typical tangent structure       been attached.

ADDITIONAL DRAWINGS REQUIRED FOR NEW CONSTRUCTION

33. Angle structures       be used in this segment of line. A dimensioned drawing of a typical angle structure       been attached.

34. Dead-end structures       be used in this segment of line. A dimensioned drawing of a typical dead-end structure       been attached.

35. There (select phrase) along this segment of line. Drawings showing the clearance envelope for each grain bin in relation to the proposed line (select phrase) .