U.S. Department of Agriculture
Natural Resources Conservation Service

MT-ENG-201
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ANODE DESIGN SHEET FOR BURIED STEEL PIPELINES

Name _____ Date _____

Location _____ By _____

Legal Description _____ Soil Name _____

Pipe Coating _____ C _____

1	2	3	4	5	6	7
Station	Resistivity (Re) ohm-cm	Average Re ohm-cm	Pipe Length Ft.	Pipe Unit Area of Surface $Ft.^2/Ft.$	A = Pipe Surface Area, Sq. Ft. Col. 4 x Col. 5	$\frac{A}{\text{Ave. Re}}$ $\frac{\text{(Col. 6)}}{\text{(Col. 3)}}$

TOTAL $\left[\frac{A}{\text{Ave. Re}}\right]$ = _____

I_T = Current Output required for protection

I_T = C x Total $\left[\frac{A}{\text{Ave. Re}}\right]$ = _____ x _____ = _____ mA

C = Pipe Coating Coefficient
Re = Soil Resistivity in ohm-cm
A = Surface Area of Pipe in ft^2
C = A Constant for a Given Pipe Coating

For design purposes, C shall be considered to be not less than 32 for Class A coatings and not less than 60 for Class B coatings.

ANODE DESIGN SHEET FOR BURIED STEEL PIPELINES
(Continued)

The kind of galvanized anode to be used depends on the resistivity of the soils in the anode bed location. If the resistivity of the anode bed is:

a. Less than 2,000 ohm-cm, zinc anodes shall be used;
b. Between 2,000 and 3,000 ohm-cm, either zinc or magnesium anodes shall be used; and
c. Between 3,000 and 10,000 ohm-cm, magnesium anodes shall be used.

Anodes shall not be required if soil resistivity is greater than 10,000 ohm-cm.

The number of anodes needed to protect the pipeline may be estimated by dividing the total cathode current requirement of the pipeline by the current output per anode.

Thus: I_T/I_M

$N = I_T/I_M$ and $I_M = k/R =$ _____ / _____ = _____ mA

$N =$ _____ / _____ = _____

Where:

N = number of anodes needed
I_T = total current requirements in mA
I_M = maximum anode current output in mA
k = constant for a given anode, from table in Standards and Specifications
R = soil resistivity of the anode bed in ohm-cm.

The expected life of an anode, based on the use of 17 lb/ampere year for magnesium and 26 lb/ampere year for zinc and a utilization factor of 0.80 shall be computed as follows:

Magnesium $Y = 47W/I_o$
Zinc $Y = 31W/I_o$

Where:
Y = expected life in years
W = weight of anode in lbs.
I_o = design anode current in mA = I_M unless resistors are used in anode circuit to reduce output.

Y = _____ x _____ / _____ = _____ years

Recommendations: _____