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# PREVENTION OF CORROSION OF METAL PIPES PLACED UNDERGROUND

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## ABSTRACT OF THE DISCLOSURE

The present invention deals with the use of an admixture of naturally occurring soils removed during ditching or trenching operations and 2 to 10 percent of lime by weight as a back fill and filling of the ditch or trench after metal pipe such as used in a pipe line is placed in the trench or ditch and the admixture tamped or compacted. The use of naturally occurring native clays, generally containing some clay materials of the bentonitic type may be employed to the extent of 5 to 20 percent by weight of the admixture of lime and the original soil if there is insufficient clay in the original soil to yield the desired lime-soil reaction to cause the formation of a hard, dense, impermeable condition of the admixture of lime and soil and one in which a high electrical resistance of said admixture also results.

The present invention deals with the protection of metal pipes placed underground against corrosive action. In all manner of transportation of various fluids such as water, crude oil, refined petroleum products, natural gas, liquified petroleum gases, slurries and suspensions of solids in liquid or gases in pipelines, a most important consideration is the protection of the metal pipe against the corrosive action of the soil in which the pipe or conduit is placed. Since the condition of soil varies a great deal over the many areas in which metal pipe or conduit is buried the problem of corrosion protection is quite complex. Furthermore the pipe may be subject to the effects of electric currents which enhance the difficulties involved in providing full protection against corrosive action.

The general practice followed in providing corrosion protection when installing or placing metal pipe in the ground is the use of special coatings and wrappings to insulate or separate the pipe from the surrounding soil environment and/or the use of cathodic protection of the metal pipe. Both coating and wrapping and cathodic protection are used in many installations of pipe lines or conduit when severe environmental soil conditions exist. Also, cathodic protection is employed in cases where the metal pipe may not be coated and/or wrapped. To repeat, protection of the metal pipe or conduit is sought through the application of coatings and/or wrappings to insulate the metal from the corrosive environment or by use of an applied electric current in the manner provided through cathodic protection methods to minimize or attempt to eliminate completely the corrosion of the metal pipe or conduit which otherwise would take place, or a combination of both.

The method described herewith is designed to eliminate the use of coatings and/or wrappings of all sorts and cathodic protection of metal pipe or conduit or to further increase the effectiveness of such protective measures, should they be employed in the generally accepted practices related to protecting such buried metal pipe and conduits against corrosive action.

Simply, the method consists of mixing lime with the soil removed during digging of the ditch or trench in which the metal pipe or conduit is to be placed and backfilling the ditch or trench with the admixture. The admixture of



lime and soil is placed at the bottom of the ditch, the uncoated pipe laid in the ditch, and the ditch filled with the admixture. The depth of soil and lime admixture placed in the bottom of the ditch may vary depending on the size of the pipe being laid, though normally with pipe up to 16" diameter, 4" to 6" of the lime-soil admixture is sufficient. With larger sized pipe the size of the ditch should be such so as to provide from 6" to 8" of the lime-soil admixture to encompass the pipe. That is, the pipe should have a rather uniform thickness of the soil-lime admixture completely around it. Obviously there may be more than the minimum thicknesses cited above in the upper part of the ditch, depending on the total depth of the trench or ditch. After backfilling the ditch or trench with the admixture of lime and soil with an amount sufficient to cover the pipe or conduit with 4" to 8" of said admixture, the remainder of the trench may be filled with original soil removed from the trench or ditch.

Tamping, use of mechanical vibrators, or such similar means of causing compression of the admixture may be employed to increase compaction and hasten the consolidation. Slight additions of water may be necessary when the moisture conditions encountered are considered insufficient. Moisture content for optimum reaction of the lime-soil admixture varies but ranges from 10 to 30 percent have been found to yield good results.

Of particular importance in the application of the method for the protection of pipes or conduits against corrosion is the use of a sufficient amount of either hydrated or unhydrated lime. The quantity of lime required to achieve the desired results varies with the soil and moisture conditions, but it has been 2 percent to 10 percent of lime by weight of soil in most soils. By a positive reaction is meant a resulting increase in resistivity, a consolidation of the soil-lime mixture, a decrease in permeability, an increase in alkalinity (much above that needed for neutralization), and an increased resistance to wetting once drying or partial drying of the soil-lime admixture has taken place. It has been found that, at times, with soils which are quite sandy or contain large amounts of sand the addition of clay with the lime is necessary to provide a soil-lime admixture which will have the required properties and which will yield satisfactory results for corrosion protection. Thus, the use of a naturally occurring clay, preferably one containing sodium ion as the base exchange cation, can be combined with the soil and lime to give the desired results. The quantity of clay to be added varies, depending on how sandy the soil may be, and amounts ranging from 5 percent to 20 percent by weight of lime-soil admixture of a native clay can be employed.

The lime-soil reaction, which results in a consolidation and hardening of the admixture of lime and soil, may be accelerated through tamping or pressing the admixture around the pipe during backfilling. Though this is the preferred method for placing the lime-soil admixture around the pipe or conduit, it has been found that consolidation takes place without tamping, the natural weight of the back fill being sufficient to yield a well consolidated hard, impermeable, high electrical and water resistant alkaline material around the pipe or conduit.

I claim:

1. A method of protecting steel pipe or conduit from corrosion when said pipe or conduit is placed underground which employs an admixture of hydrated lime and soil taken from the ditch in which the pipe or conduit is to be buried said admixture containing from 2 to 10 percent of hydrated lime by weight of soil removed from the ditch and further containing from 10 to 25 percent of water by weight of soil removed from the ditch, dispos-

ing of said admixture in and around the pipe or conduit by backfilling the ditch with said admixture and compacting the said admixture during the backfilling of the ditch, and completing the compacting when the pipe or conduit has been completely covered thereby obtaining a well consolidated, hard, impermeable, water resistant mass around the pipe or conduit which is alkaline and which exhibits a high electrical resistivity.

2. A method of protecting steel pipe or conduit from corrosion when said pipe or conduit is placed underground which employs an admixture of hydrated lime, a naturally occurring or native clay, and soil taken from the ditch in which the pipe or conduit is to be buried, said admixture containing from 2 to 10 percent of hydrated lime by weight of soil removed from the ditch, from 5 to 20 percent of naturally occurring or native clay by weight of soil removed from the ditch, and from 10 to 25 percent of water by weight of soil removed from the ditch, disposing of said admixture in and around the



pipe or conduit by backfilling the ditch with such admixture and compacting the said admixture during the back-filling of the ditch, and completing the compacting when the pipe or conduit has been completely covered thereby obtaining a well consolidated, hard, impermeable, water resistant mass around the pipe or conduit which is alkaline and which exhibits a high electrical resistivity.

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