

APPENDIX "Z-4"Disintegration of Iron and Steel in Alkaline SoilsSummary of Final Report

1. The corrosion of iron and steel is an electro-chemical process. Complete disintegration occurs in wrought iron and steel due to the absence of a supporting matrix of non-corrodible material. Graphitic softening in cast iron is produced when an area is corroding but a connected matrix of non-corrodible cementite and cementite-phosphide eutectic preserves the form of the pipe and holds the graphite flakes and some of the corroded iron in the form of hydrates or oxides.
2. The tendency to corrode is directly proportional to the free carbon (graphite) content of an iron or steel. Combined carbon forms a non-corrosive material. Galvanic couples set up between the graphite and ferrite account for the major portion of the corrosion.
3. Stray current electrolysis produces a similar effect to auto-corrosion.
4. Auto-corrosion was found to be directly proportional to the hydrogen ion concentration of the surrounding solution when such a solution is buffered.
5. Oxygen promotes corrosion due to the higher pH developed in the presence of ferric hydroxide as compared with ferrous hydroxide. A protective coating of ferric hydroxide may reduce the rate of corrosion but the tendency to corrode will persist.