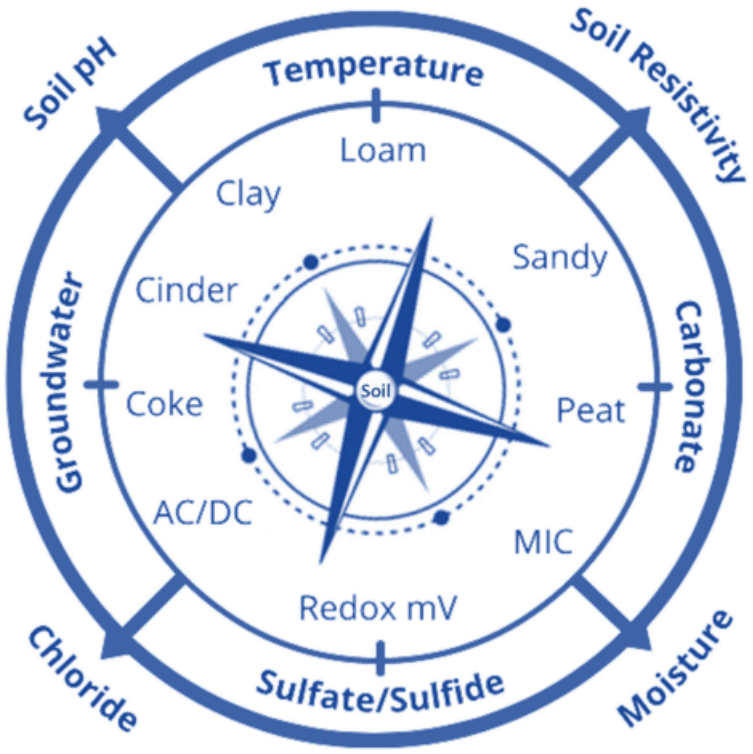


Corrosion Modeling Software and Corrosion Prediction Software Series

**Soil-Compass®: Soil Corrosion Prediction and Modeling for Metals & Alloys**

*The Ultimate Software Solutions to Costly Soil Corrosion*

Version 9.20

★ **Performance** ★ **Functionality** ★ **Usability**

Anytime Anywhere Any Device Any OS

No USB dongles No installation No Browser Plug-ins

Contact Us for Licensing Details



**Overview of Soil-Compass**

Soil corrosion refers to corrosion of metals and alloys in underground structures exposed to soil environment. The severity of soil corrosion is determined by many factors, including temperature, soil moisture content, oxygen availability, soil resistivity (soil condition and characteristics), soil type (water drainage capability) and homogeneity (variation in soil type), microbial activities, stray current drainage, age, and cathodic polarization if CP is installed. Soil-Compass is the only device and OS independent software tool on the market for the prediction and modeling of soil corrosion for metals and alloys. Designers, architects, engineers, consultants, operation personnel, maintenance and inspection engineers can quickly determine the corrosion depth, the corrosion rates, and the remaining life of the structure or components, anytime, anywhere, on any device running any OS without the need to install or download anything. Soil-Compass also predicts the soil corrosivity class, the likelihood of microbiologically-influenced corrosion (MIC), DC stray current corrosion and AC corrosion in compliance with ISO 18086. Soil-Compass software models the effects of the following critical factors on soil corrosion:

- Soil type
- Soil temperature
- Soil resistivity
- Soil pH
- Soil moisture content
- Soil chloride content
- Soil carbonate content
- Soil sulfate content
- Soil sulfide content
- Soil redox potential

The outputs of Soil-Compass include the following:

- ANSI/AWWA C105 point rating with regard to soil corrosivity,

- the soil corrosivity category as per BS EN 12501 standard,
- the corrosion depth,
- the corrosion rate,
- the remaining life or the time-to-perforation,
- the mode of failure,
- likelihood of microbiologically-influenced corrosion (MIC) in the soil environments
- the risk of DC stray current corrosion and AC corrosion.

Figures below show the screen shots of Soil-Compass.

| | | | | | |
|---|---|---|---|---|---|
| Structure Location/ID | XYZ at 123 ABC Street | | | | |
| Material | Open Hearth Iron | | Age of Structure | years | 8.000 |
| Nominal Thickness | mm | 3.000 | CP Cathodic Polarization | - mV | 0.000 |
| Soil Type | Peat | | Presence of Groundwater | | Seasonal |
| Soil Temperature | °C | 10.00 | Soil pH | | 7.00 |
| Soil Resistivity | Ohm.cm | 2,500 | Cinder and Coke | | None |
| Soil Moisture Content | % | 40.00 | Sulphate Content | mg/kg | 1,500 |
| Soil Chloride Content | mg/kg | 100 | Sulphide/$H_2S$ | mg/kg | 20 |
| Soil Carbonate Content | % | 0.00 | Soil Redox Potential | mV | 0 |
| **ANSI/AWWA C105 Point Rating** | 12 | | **Soil Corrosivity (BS EN 12501)** | | **Very Corrosive** |

**Corrosion Prediction**

| | | |
|---|---|---|
| Maximum Corrosion Depth | mm | 1.668 |
| Corrosion Rate | mm/y | 0.104 |
| Remaining Life (Time to Perforation) | years | 17.800 |
| MIC Likelihood | **MIC is likely to occur.** | |
| MIC at localized sites may occur at >1.0 mm/y. | | |

**Stray Current and AC Corrosion Prediction**

| | | |
|---|---|---|
| Stray Current Discharge | $A/m^2$ | 0.000 |
| Stray Current Corrosion Rate | mm/y | 0.000 |
| Soil Corrosivity for AC Corrosion | as per ISO 18086 | High |
| AC Voltage to Remote Earth | V | 0.000 |
| DC Current Density | $A/m^2$ | 0.000 |
| AC Corrosion is not a concern. No action is required. | | |

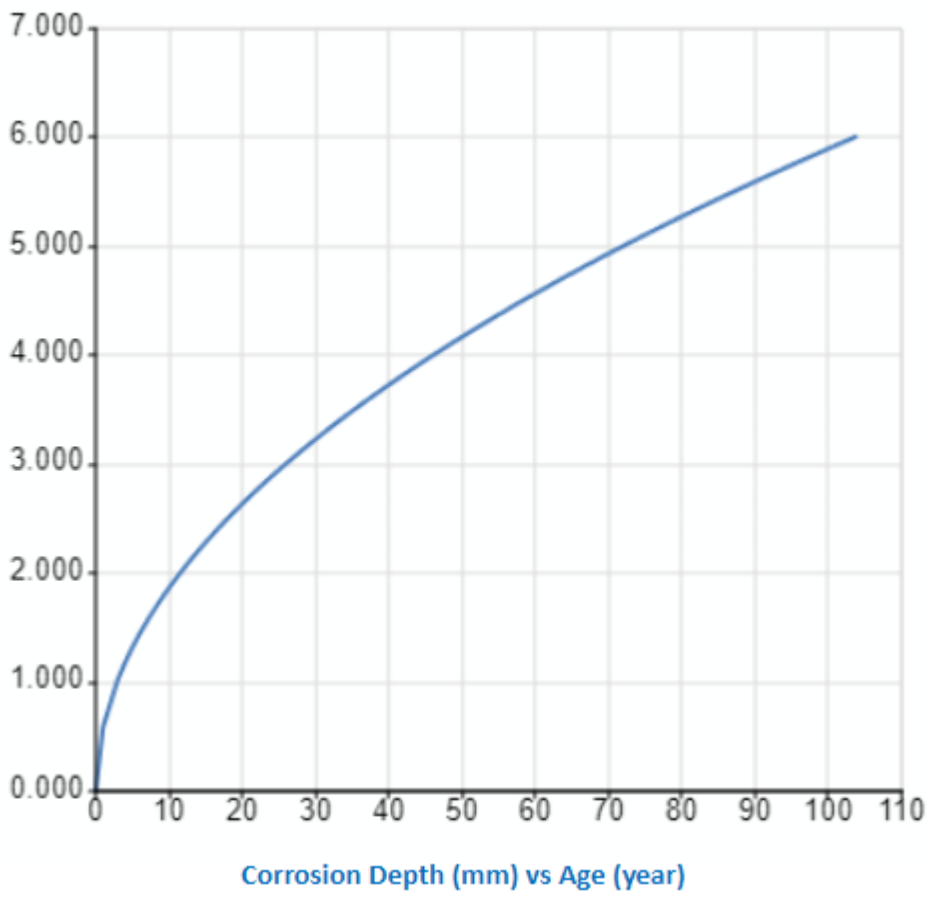


Figure 1 Soil-Compass Predicts the rate of soil corrosion (including MIC) and the remaining life of structures.

Under the specified exposure conditions shown in Figure 1 above, Soil-Compass predicts, the corrosion rate, the accumulated depth of corrosion at the specified age, and the remaining life of the structure. The predictive engine used in Soil-Compass for the modeling and prediction of soil corrosion of metals and alloys complies with applicable international standard ISO 18086 and relevant industry best practices.

Using Soil-Compass is as easy as 1-2-3.

(1) Select the Material & enter the Age and Thickness of the structure.

(2) Enter the soil property data.

(3) Review the prediction results.

The following figures show the screen shots of Soil-Compass.


Figure 2 Soil-Compass predicts corrosion of cast irons, steels, stainless steels and alloys exposed to the soil environments.

Soil-Compass predicts the effect of cathodic polarization on the corrosion rate and the remaining life of the structure if cathodic protection system is installed. Figures 3 and 4 below show the same structure before and after cathodic protection system is installed.

| | | | | | |
|---|---|---|---|---|---|
| Structure Location/ID | XYZ at 123 ABC Street | | | | |
| Material | Ductile Iron | | Age of Structure | years | 8.000 |
| Nominal Thickness | mm | 3.000 | CP Cathodic Polarization | - mV | 0.000 |
| Soil Type | Clay | | Presence of Groundwater | | Seasonal |
| Soil Temperature | °C | 20.00 | Soil pH | | 7.00 |
| Soil Resistivity | Ohm.cm | 2,500 | Cinder and Coke | | Exist |
| Soil Moisture Content | % | 40.00 | Sulphate Content | mg/kg | 500 |
| Soil Chloride Content | mg/kg | 200 | Sulphide/$H_2S$ | mg/kg | 0 |
| Soil Carbonate Content | % | 0.00 | Soil Redox Potential | mV | 0 |
| **ANSI/AWWA C105 Point Rating** | 10 | | **Soil Corrosivity (BS EN 12501)** | Moderately Corrosive | |

**Corrosion Prediction**

| | | |
|---|---|---|
| Maximum Corrosion Depth | mm | 2.702 |
| Corrosion Rate | mm/y | 0.338 |
| Remaining Life (Time to Perforation) | years | 2.200 |
| MIC Likelihood | MIC is not expected. | |

Mode of Failure: Leak due to perforation and/or cracking.

**Stray Current and AC Corrosion Prediction**

| | | |
|---|---|---|
| Stray Current Discharge | $A/m^2$ | 0.000 |
| Stray Current Corrosion Rate | mm/y | 0.000 |
| Soil Corrosivity for AC Corrosion | as per ISO 18086 | High |
| AC Voltage to Remote Earth | V | 0.000 |
| DC Current Density | $A/m^2$ | 0.000 |

AC Corrosion is not a concern. No action is required.

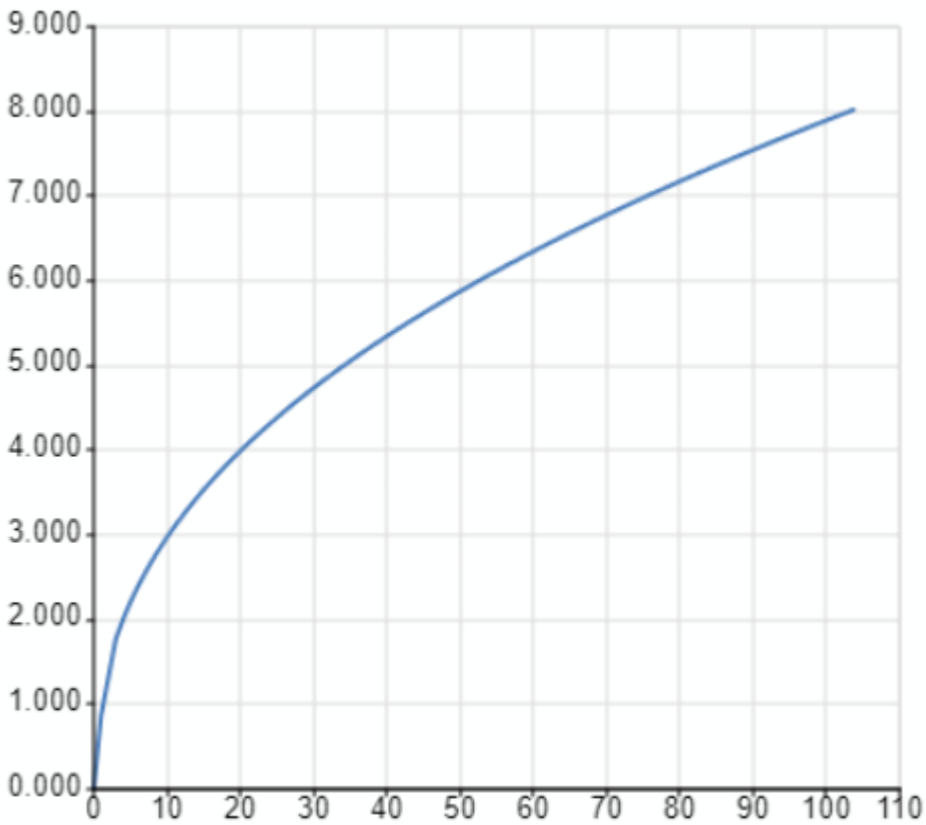


Figure 3 Soil-Compass predicts the corrosion rate and remaining life for a structure without cathodic protection system.

| | | | | | |
|---|---|---|---|---|---|
| Structure Location/ID | XYZ at 123 ABC Street | | | | |
| Material | Ductile Iron | | Age of Structure | years | 8.000 |
| Nominal Thickness | mm | 3.000 | CP Cathodic Polarization | - mV | 20.000 |
| Soil Type | Clay | | Presence of Groundwater | | Seasonal |
| Soil Temperature | °C | 20.00 | Soil pH | | 7.00 |
| Soil Resistivity | Ohm.cm | 2,500 | Cinder and Coke | | Exist |
| Soil Moisture Content | % | 40.00 | Sulphate Content | mg/kg | 500 |
| Soil Chloride Content | mg/kg | 200 | Sulphide/$H_2S$ | mg/kg | 0 |
| Soil Carbonate Content | % | 0.00 | Soil Redox Potential | mV | 0 |
| **ANSI/AWWA C105 Point Rating** | | 10 | **Soil Corrosivity (BS EN 12501)** | | Moderately Corrosive |

| **Corrosion Prediction** | | |
|---|---|---|
| Maximum Corrosion Depth | mm | 1.224 |
| Corrosion Rate | mm/y | 0.153 |
| Remaining Life (Time to Perforation) | years | 58.200 |
| MIC Likelihood | MIC is not expected. | |
| Mode of Failure: Leak due to perforation and/or cracking. | | |

| **Stray Current and AC Corrosion Prediction** | | |
|---|---|---|
| Stray Current Discharge | $A/m^2$ | 0.000 |
| Stray Current Corrosion Rate | mm/y | 0.000 |
| Soil Corrosivity for AC Corrosion | as per ISO 18086 | High |
| AC Voltage to Remote Earth | V | 0.000 |
| DC Current Density | $A/m^2$ | 0.000 |
| AC Corrosion is not a concern. No action is required. | | |

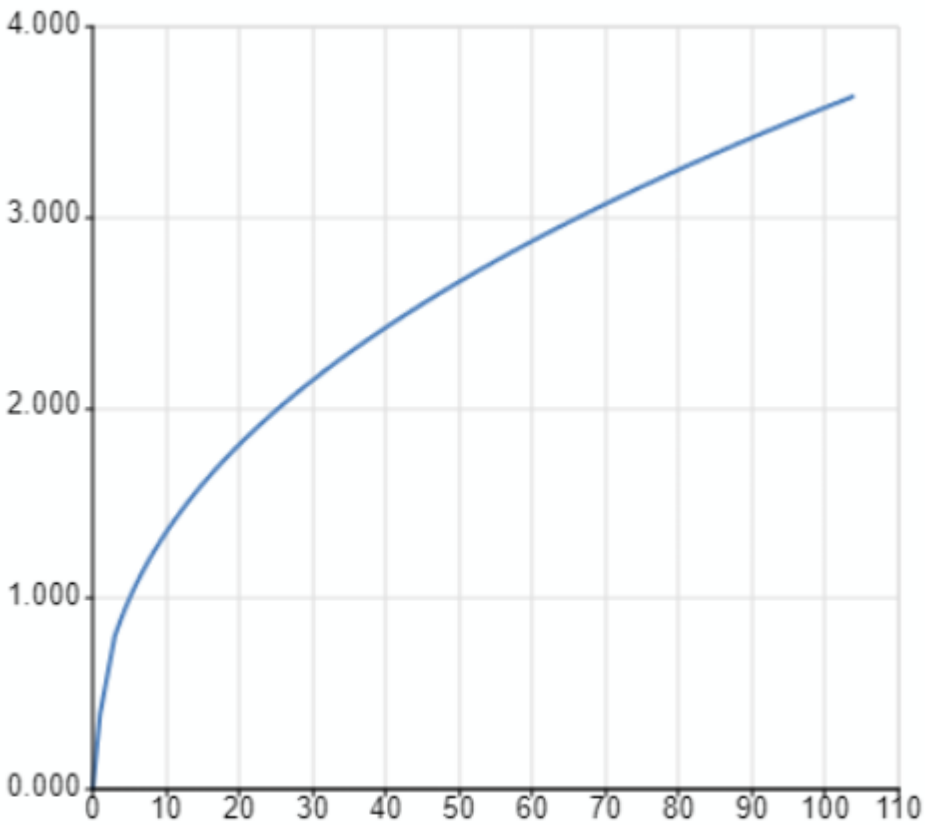


Figure 4 Soil-Compass predicts the corrosion rate and remaining life for a structure with cathodic protection system installed (CP cathodic polarization = 20 mV).

| | | | | | |
|---|---|---|---|---|---|
| Structure Location/ID | XYZ at 123 ABC Street | | | | |
| Material | Open Hearth Iron | | Age of Structure | years | 8.000 |
| Nominal Thickness | mm | 3.000 | CP Cathodic Polarization | - mV | 0.000 |
| Soil Type | Clay | | Presence of Groundwater | | Seasonal |
| Soil Temperature | °C | 10.00 | Soil pH | | 7.00 |
| Soil Resistivity | Ohm.cm | 15,000 | Cinder and Coke | | None |
| Soil Moisture Content | % | 20.00 | Sulphate Content | mg/kg | 50 |
| Soil Chloride Content | mg/kg | 20 | Sulphide/$H_2S$ | mg/kg | 0 |
| Soil Carbonate Content | % | 0.00 | Soil Redox Potential | mV | 0 |
| **ANSI/AWWA C105 Point Rating** | | 8 | **Soil Corrosivity (BS EN 12501)** | | Moderately Corrosive |

**Corrosion Prediction**

| | | |
|---|---|---|
| Maximum Corrosion Depth | mm | 0.999 |
| Corrosion Rate | mm/y | 0.062 |
| Remaining Life (Time to Perforation) | years | 63.950 |
| MIC Likelihood | MIC is not expected. | |

Mode of Failure: Leak due to perforation and/or cracking.

**Stray Current and AC Corrosion Prediction**

| | | |
|---|---|---|
| Stray Current Discharge | $A/m^2$ | 0.000 |
| Stray Current Corrosion Rate | mm/y | 0.000 |
| Soil Corrosivity for AC Corrosion | as per ISO 18086 | Medium |
| AC Voltage to Remote Earth | V | 0.000 |
| DC Current Density | $A/m^2$ | 0.000 |

AC Corrosion is not a concern. No action is required.

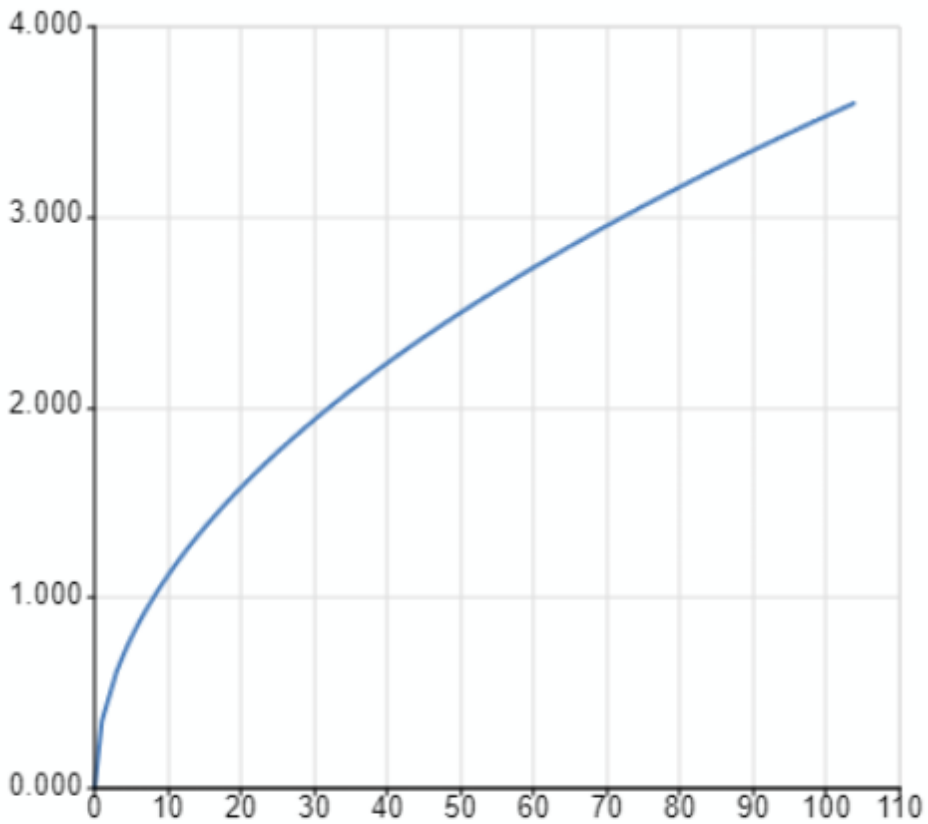


Figure 5 Soil-Compass predicts soil corrosion, soil corrosivity, stray current and AC corrosion.

Soil-Compass models and predicts soil corrosion of metals and alloys including commonly used aluminum alloys, copper, zinc, cast irons, steel and galvanized steel, stainless steels and duplex steels. Following is the list of metals and alloys included in Soil-Compass software:

Al 1100

Al 2017

Al 2024

Al 5052

Al 6053

Cast Iron

Ductile Iron

Open Hearth Iron

Wrought Iron

Steel

Galvanized Steel

Copper

Lead

Zinc

Type 410

Type 430

Type 444

Type 446

Type 304

Type 304L

Type 304LN

Type 316

Type 316L

Type 316LN

Type 317

Type 317L

Type 317LMN

Type 321

Type 347

904L

SMO254

AL-6X

AL-6XN

Inconel 625

Incoloy 825

Duplex 2205

Duplex 2304

Duplex 2507

Duplex 2707HD

The powerful applications of Soil-Compass are truly unlimited in engineering design, corrosion prediction and corrosion modeling, materials selection, and remaining life estimation of structures and components buried in the soil environments.

Click here to contact us for licensing details and experience the power of Soil-Compass.

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*Soil-Compass, giving you the right directions in Soil Corrosion Prediction and Modeling*