James Instruments Gecor 6

A unique patented field system for measuring the rate of corrosion and other parameters of reinforcement bars.

Features and Benefits

- The U.S. Strategic Highway Research Program (SHRP) describes the system as "giving the corrosion rate most closely matching the true values."
- The system gives important complementary measurements for the interpretation of corrosion rate results.
- The "A" sensor measures the corrosion rate and half cell potential.
- The "B" sensor measures concrete resistivity, ambient temperature and relative humidity.
- Corrosion rate measurement time is 2-5 minutes and up to 100 readings can be stored in the memory for later downloading to a PC.
- Weighing only 9 lbs., the system is easy to use, portable, and menu driven.

Rebar Corrosion and its Effects

Corrosion of reinforcement concrete affects the safety and durability of concrete structures in the following ways:

- **A** The steel cross section is reduced, weakening the structure.
- **B** The concrete is cracked due to the volume increase in rust.
- **C** The steel to concrete bond is reduced when cracking and spalling are initiated.

Corrosion is worsened where there is low concrete cover over the steel, high relative humidity and increased moisture present.

Corrosion Rate

A true measure of the corrosion rate is possible using the polarization resistance technique. It has been well established in the laboratory by Stern and Geary that corrosion current is linearly related to polarization resistance.

Over a period of four years GECOR 6 was developed by several research organizations. The polarization resistance is measured with a central reference electrode, surrounded by an external counter electrode. A unique guard ring and external electrode system confines the area of the rebar tested. This makes the GECOR 6 the only field method for determining polarization resistance that is verifiable with proven laboratory techniques.

GECOR 6 gives the corrosion rate (I_{corr}) which is a quantitative measurement of the amount of steel turning into oxide at the time of measurement. The current can be converted into metal section loss by Faraday's Equation.

Corrosion rate values measured by GECOR 6 give precise information on the risk of corrosion and the following broad criteria have been established:

I_{corr}	$<0.2 \mu A/cm^2$	Passive condition
I_{corr}	0.2 to $0.5 \mu A/cm^2$	Low corrosion
I_{corr}	0.5 to $1.0 \mu A/cm^2$	Moderate corrosion
I_{corr}	$>1 \mu A/cm^2$	High corrosion rate

Corrosion rate measurements with GECOR 6 should be taken at strategic locations. Other data such as chloride concentration, carbonation depths or half cell potentials and resistivity that can also be measured with GECOR 6, should be considered.

Corrosion rates vary during the life of the structure, depending on the variations in concrete moisture content, chloride concentration and temperature. Measurements at different intervals should be carried out in order to get average I_{corr} values.

Complementary Measurements

Corrosion potentials can be taken, and interpreted to give a probability of corrosion. However, these half cell potential values do not give precise information on the risk of corrosion. A direct relationship between corrosion rate and corrosion potential has not been established.

Concrete resistivity of the area around the sensor is defined from the formula:

$$\text{RESISTIVITY} = 2 \times R \times D$$

Where R is the resistance of a pulse between the sensor electrode and the rebar network.

D is electrode diameter and the sensor.

Concrete resistivity measured by GECOR 6 is useful in the interpretation of corrosion rate because it is related to the moisture content.

>100 to 200kΩ cm	Very low corrosion rate even with high chloride concentration or carbonation.
50-100kΩ cm	Low corrosion rate
10-50kΩ cm	Moderate to high corrosion rate where steel is active
<10kΩ cm	Resistivity is not the controlling parameter of the corrosion rate

Since the rate of oxidation is directly related to the amount of heat energy available, *temperature* has a direct effect on corrosion rate. Relative humidity decreases with increasing temperature and resistivity increases with increasing temperature.

Relative humidity influences the amount of moisture in the pores of the concrete to sustain the corrosion reaction as well as water run off, dew formation, etc.

James Insturments Gecor 6

Technical Specifications

Specifications

1. Meter

Dimensions	12 x 8 x 6.5 inches (30 x 20 x 16cm)
Weight	9 Lbs. (4kg)
Batteries	4 “D” type alkaline (24 hours operation)
Power Consumption	1 Watt
LCD Screen	2 line 16 character display
Memory	up to 100 corrosion rate readings
Accessories	100ft (30m) cable for sensor to meter connection Verification box RS-232 interface cable Software for downloading to PC

Constant for Stern and Geary Equation: 26mV

2. Sensor “A”

Dimensions	7” diameter x .8” (18 x 2cm)
Weight	2 Lbs. (0.9kg)
Components	1 copper/copper sulphate central reference electrode 2 copper/copper sulphate confinement sensor electrodes 3 copper sulphate solution reservoirs 2 concentric stainless steel counter electrodes 1 sponge pad

The meter with “A” sensor will measure and store:
- Corrosion rate (Stern & Geary law).
- Corrosion potential
- Concrete Polarization Resistance
- Date, time and location of reading

3. Sensor “B”

Dimensions	10.2” diameter x 1.4” (26 x 3.5cm)
Weight	0.6 Lbs. (0.3kg)
Components	1 copper/copper sulphate reference electrodes 1 copper sulphate solution reservoir 1 stainless steel counter electrode 1 solid state temperature probe –10°C to 80°C 1 Capacitance relative humidity probe 3 to 95%

The meter with “B” sensor will measure and store:
- Concrete resistivity
- Relative humidity
- Temperature (°C)

Sales Numbers

GECOR 6

C-CS-5000	(complete system)
C-CS-5100	Meter (electronic)
C-CS-5200	Sensor A
C-CS-5300	Sensor B
C-082-10799-050	Jar of copper sulfate
C-080-107999-400	Varification box

US Patent No. 5,259,944 and other patents pending

PROMAT (HK) Limited 寶時（香港）有限公司
: 2661 2392 : 5196 8860 : info@promat.hk : http://www.promat.hk
PROMAT
Your Solution To Testing Instrument