



CARBON LOW RESISTANCE GROUND MODULE

Ministry of Commerce, Industry and Energy

- Obtained certification of new technology of electric power with "Triangle method for lightning protection system"
- Korea Patents
- Tested by Korea Electrotechnology Research Institute (Test Report Issued)

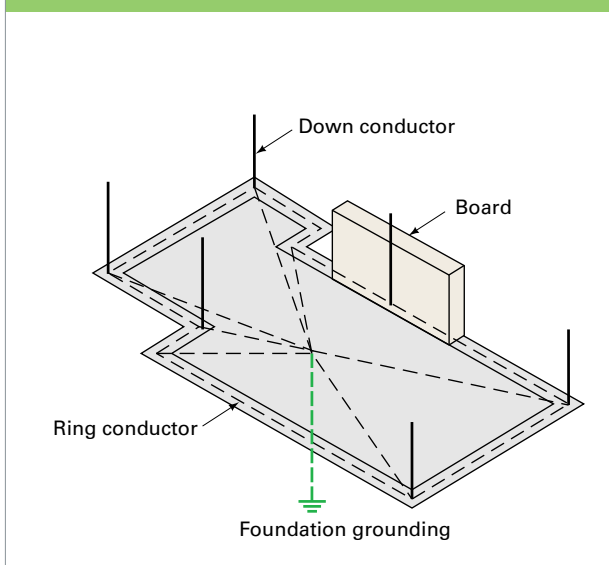


GLOBAL EQUIPOTENTIAL GROUNDING SYSTEM

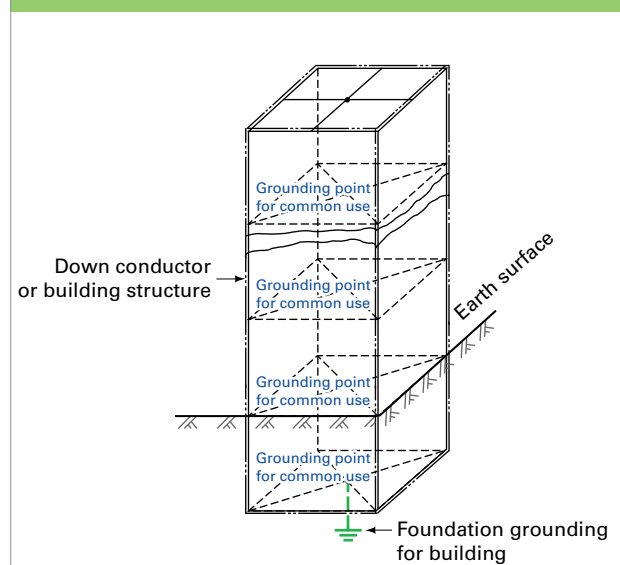


- Global equipotential grounding system combines the natural grounding matter (earth) with an artificial grounding matter (grounding electrode) for the equipotential grounding.
A strong lightning strike becomes neutralized and relatively stable only when it hits the earth.
- Global equipotential grounding system consists of the internal equipotential network and the grounding device used in common for AC grounding, DC grounding, protected area, lightning protection grounding and antistatic grounding.
The number of grounding should be the minimum number of connected to facilities.

AN EXAMPLE OF GROUNDING PLAN ON A BASE OF BUILDING FOR EQUALIZATION OF ELECTRIC POTENTIAL



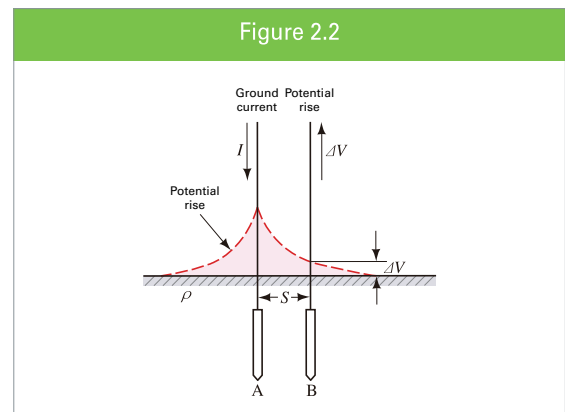
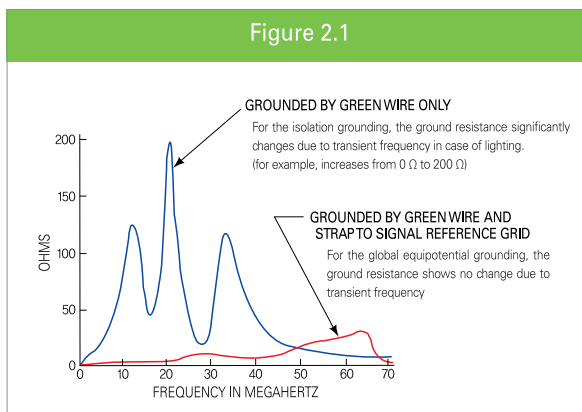
AN EXAMPLE OF SETTING THE COMMON GROUNDING POINT ON FLOORS OF BUILDING



GROUNDING TECHNOLOGY TRENDS IN THE WORLD

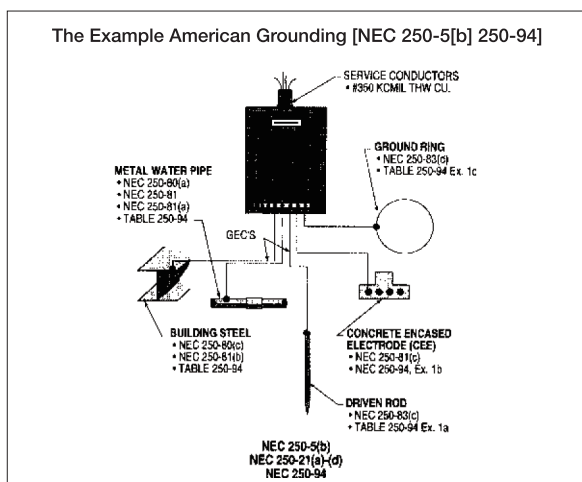
All the standards and grounding standards of the world move towards the complete equipotential integrated grounding, and the reasons are as in the following.

- 1 Isolation grounding has the high ground resistance and has bad influence on devices because it has a bad transient impedance (frequency) characteristic in case of lightning strikes. (Refer to Figure 2.1)
- 2 Isolation grounding causes all surge and noises and thereby, worsens damages on devices due to direct lightning strike and induced lightning strike. (Refer to Figure 2.2)



- 3 The resistivity classification system of Type 1, Type 2, Type 3 and Special Type 3 lacks the scientific basis. (This system developed by Japan in 1990s is groundless.)
Japan also has recognized this fact and started to change JIS standard and all other standards to the global equipotential grounding since 1999.
- 4 Features of the equipotential integrated grounding
 - Lowers the electric potential based on good transient impedance characteristic in the event of lightning
 - Eliminates surge and noises with its low electric potential in the event of induced lightning strike and direct lightning strike
 - Does not cause any problem regarding grounding, when the equipotential grounding is applied to communication system and power system

Example 1: KTX from Seoul to Busan installed the equipotential integrated grounding in all aspects including communication and powers.
Example 2: USA NFPA 780 Standards and NEC Standards



NFPA 780
Standard for the Installation of Lightning Protection Systems 2000 Edition

3.14 Common Grounding.

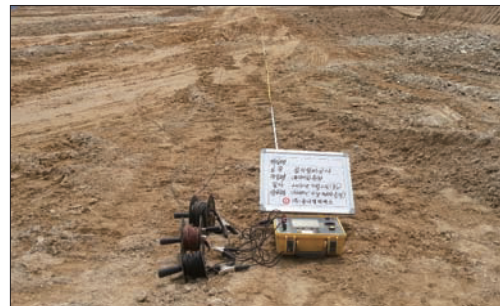
3.14.1 General. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds, as well as underground metallic piping systems. Underground metallic piping systems shall include water service, well casings located within 25 ft (7.6 m) of the structure, gas piping, underground conduits, underground liquefied petroleum gas piping systems, and so on. Interconnection to a gas line shall be made on the customer's side of the meter. Main-size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

3.14.2 Common Ground Bondings. Where electric, Community Antenna Television (CATV), data, telephone, or other systems are bonded to a metallic water pipe, only one connection from the lightning protection system to the water pipe system shall be required, provided that the water pipe is electrically continuous between all systems. If the water pipe is not electrically continuous due to the use of plastic pipe sections or other reasons, the nonconductive sections shall be bridged with main-size conductors, or the connection shall be made at a point where electrical continuity is ensured.

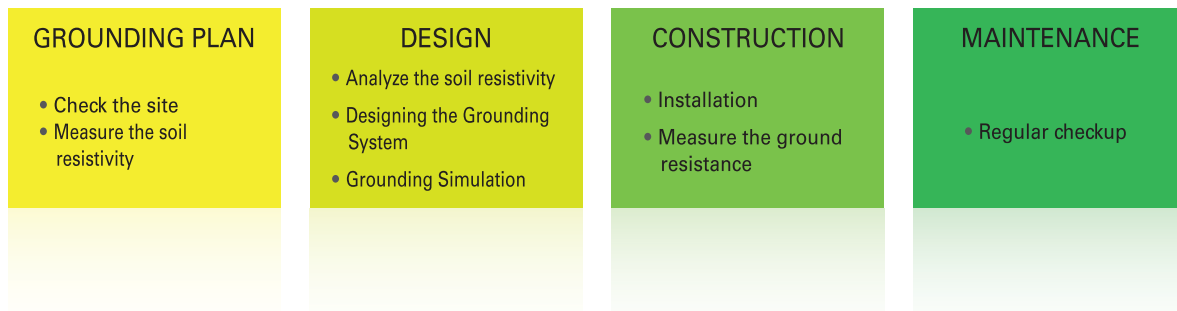
PROCEDURE OF THE GROUNDING CONSULTING

CONSULTING AND INSTALLATION CUSTOMIZED FOR THE SITE

- Measure and analyze the soil resistivity using a special program
- The grounding design with a computer program
- Measure the ground resistance
- Install and maintain the carbon ground module
- Analyze and maintain the existing grounding

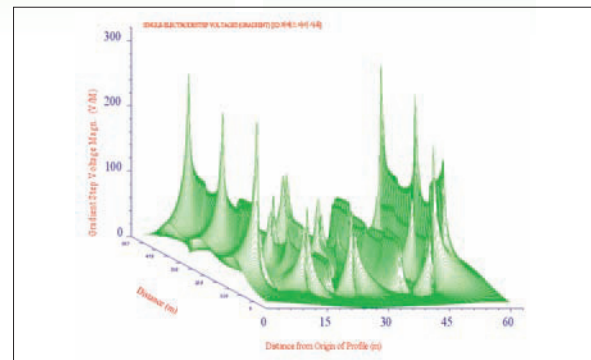


THE FLOW OF THE GROUNDING CONSULTING



MEASURE THE SOIL RESISTIVITY

- Wenner Four-Electrode Method
- Measuring Equipment : TERCA 2, CA6470, CA6471, SATURN GEO X



ANALYZE THE SOIL RESISTIVITY

- Use RESAP module of CDEGS program
- Determine the ρ -a curve suitable for the soil
- Calculate the soil resistivity according to thickness of the land layer and the earth's strata

DESIGN THE GROUNDING SYSTEM AND CALCULATE/MEASURE THE GROUND RESISTANCE

- Use the grounding simulation program, CDEGS
- Apply IEEE Std.80-2000
- Calculate the grounding potential including the safe voltage



CARBON LOW RESISTANCE GROUND MODULE

● Overview

The Carbon Ground Module developed by OMNI LPS is a new kind of ground module made of non-metal mineral and electrolysis with high electrical conductivity and stability.

The material used in this product has started a new era in which the grounding system can be installed on the rocky and mountain area. In general, steel angle, iron pipe, copper rod and copper plate are low in stability, and the ground resistance increases the rocky and mountain areas. Our "Carbon Ground Module" with low resistance can be used semi-permanently and it especially works well in the rocky and mountain areas. It also solves the difficult problem of ground resistance as it can be used to make a special artificial grounding on the sand or rock formation nearby the ground point.

This Carbon Ground Module, which is a non-pollutive, nontoxic and non-corrosive product, can be used easily and semi-permanently.

This "Carbon Ground Module" is made of the special Carbon that can offer the low resistance. Also, it significantly magnifies the earth discharge effect of lightning current with the cross-section expansion and abnormal current discharge effect compared to a metal with same size. In this way, it reduces the contact resistance between the grounding body and the soil. This product maximizes the electrolytic effect of the grounding body based on its strong water absorbing power and ability of maintaining the humidity.

Recently, the "Carbon Ground Module" was installed on a surface of concrete for PSD (Platform Screen Door) in subway station and met the ground resistance required (less than 5Ω). Plus, it proved its performance when it was installed on the rocky area of Jeju Island.

● Purpose

The "Carbon Ground Module" is the best grounding conductor to be installed in the mountain area, highlands and rocky area.

It is also used as the grounding body for the lightning ground, distributing board ground, KEPCO line ground and wireless communication protection ground.

● Features

- It has very strong water absorbing power, humidity maintaining capability and low ground resistance.
- It can be used semi-permanently as the non-pollutive, nontoxic and non-corrosive product.
- The resistance is not increased even by repeated strong lightning current, and the product does not harden, break, or crumble.
- It has better performance than typical ground resistance reducing agents.
- The property of this product does not change even in a temperature 40 °C below zero.
- It can obtain the low resistance with the earth-surface construction in the rocky area of mountain tops.

Carbon Low Resistance Ground Module

● Features of Carbon Ground Module (OMNI G-series)

Model	Size(mm)	Weight(kg)	Specific resistance under a temperature lower than the room temperature	Form
OMNI G-2S	Ø 260×1000	50	≤ 4.0	Cylinder Type
OMNI G-2J				
OMNI G-2N				
OMNI G-1N	Ø 160×800	20	≤ 4.5	Board Type
OMNI G-3N	360(L)×280(W)×70(T)	10	≤ 7	

● Application

- The soil resistivity of highlands/mountain tops is very high because the soil in the mountain area is mainly the bed rock or weathered rock.
- Even if many ground rods or grounding devices are installed, it is still difficult to get the low ground resistance.

The “Carbon Ground Module” plays as the solution for this kind of problem. An example of installation and verification is as in the following.

JEJU ISLAND							
Place of Installation	Location	Type of Soil	Soil Resistivity [Ω.m]	Comparison of Ground Resistance		Grounding Method	Evaluation
				Existing ground resistance[Ω]	After installing the carbon ground module Ground resistance [Ω]		
Jeju 4.3 Pyeonghwa (Peace) Park	Altitude of Jeju Island 300m	Scoria (Song-i) (Volcanic rock)	1500	35	less than 10	Global equipotential grounding	Excellent
Jeju Livestock Sanitation Research Center	Altitude of Jeju Island 300m	Scoria (Song-i) (Volcanic rock)	2500	-	less than 5	Global equipotential grounding	Excellent
Geum-neung Agricultural Complex	Geum-neung Agricultural Complex	Scoria (Song-i) (Volcanic rock)	1500	-	less than 5	Global equipotential grounding	Excellent

The grounding resistance is quite high in Jeju Island because most of land is composed of basalt. Even if the grounding rod is installed, it is difficult for the grounding rod to work due to small contact of land.

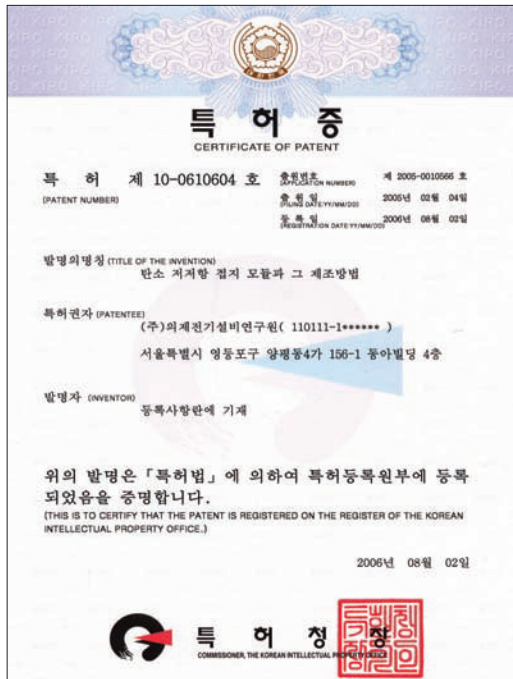
(The worst condition for the grounding resistance)However, the Carbon Ground Module was installed in Jeju Island with such terrible condition and it proved its performance. Now, the Carbon Ground Module is constantly expanding its application scope. Besides, the Carbon Ground Module was installed in many organizations including Korea Meteorological Administration, military facilities, Seoul Metro, Korea Gas Corporation, LH corporation and, SH corporation.

● Specification and drawings

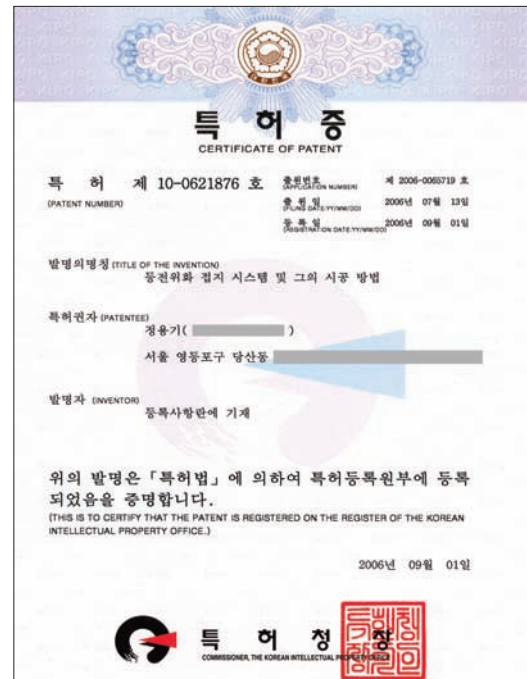
Visit www.omnilps.com and download the specification and drawings

PATENT AND TEST REPORT

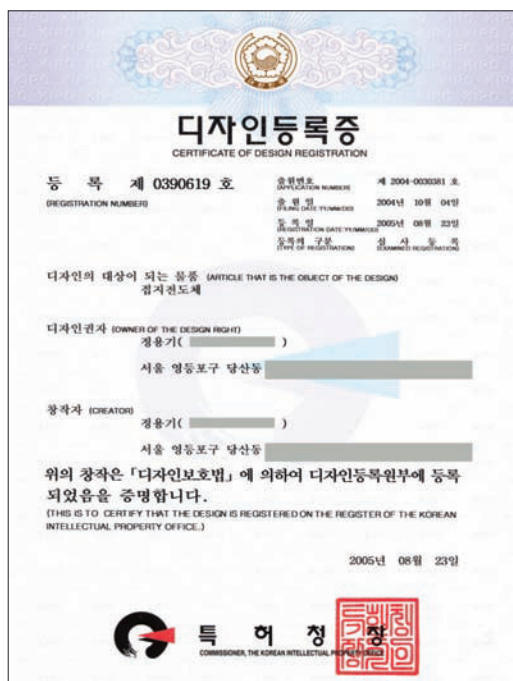
- Patent (Carbon Ground Module)



- Patent (Equipotential Grounding Method)



- Design Patent (Carbon Ground Module)



- Korea Electrotechnology Research Institute
Performance Test Report



PRODUCT CATALOGUE

CARBON GROUND MODULE

OMNI G SERIES



OMNI G-2S, OMNI G-2J

- Standard** - Length : Ø 260 mm×1000 mm
- Weight : Above 50 kg
- Certification** - Korea Patent



OMNI G-2N

- Standard** - Length : Ø 260 mm×1000 mm
- Weight : Above 50 kg
- Certification** - Korea Patent + Certification
of New Technology of Electric Power



OMNI G-1N


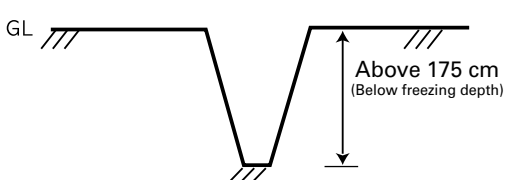
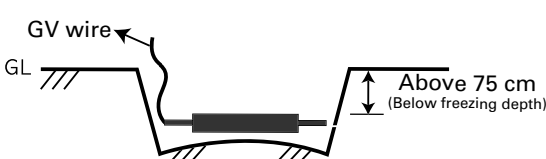
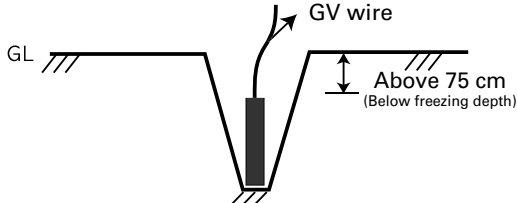
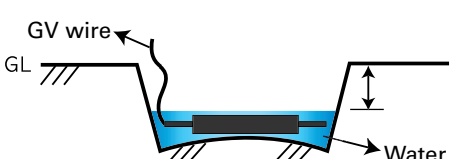
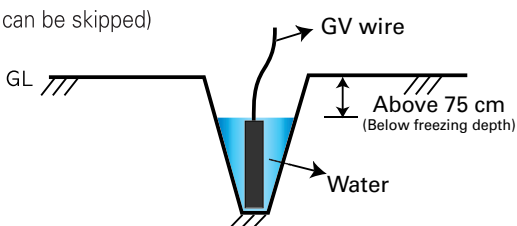
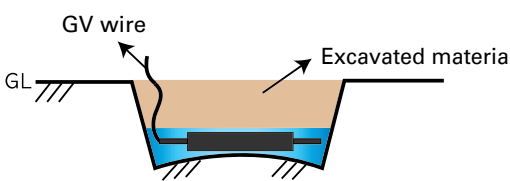
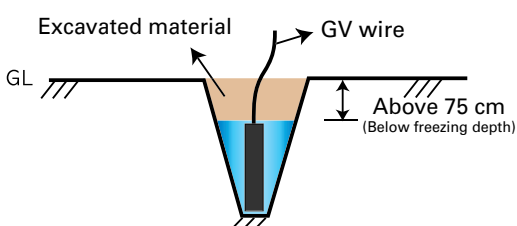
- Standard** - Length : Ø 160 mm×800 mm
- Weight : Above 20 kg
- Certification** - Korea Patent



OMNI G-3N

- Standard** - Length : 360(L)×280(W)×70(D)(mm)
- Weight : 10 kg
- Certification** - Korea Patent

INSTALLATION METHOD

	INSTALLATION METHOD (1)	INSTALLATION METHOD (2)
1	<p>Excavation: Excavate as shown in the figure below. (However, when the product is installed on the bottom of underground layer, excavate only to the length of the product because the temperature must be below the freezing point.)</p> 	
2	<p>Placing the carbon ground module: Place the carbon ground module connected to GV wire as shown in the picture below.</p> 	
3	<p>Pour water until the Carbon Ground Module sinks in order to minimize the gap between Carbon Ground Module and the soil surrounding it. Put the water to sink the carbon ground module. (If the underground water exists in the excavated area, this process can be skipped)</p> 	
4	<p>Filling: Refill the excavated area with soil.</p> 	
5	Fix the outgoing cable.	

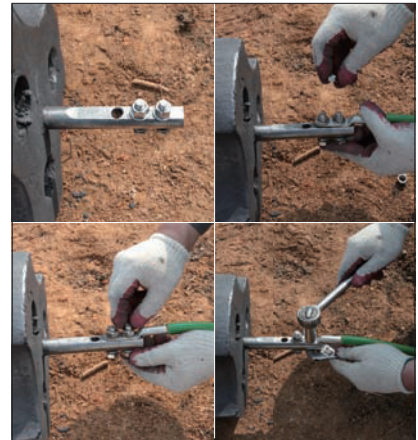
Carbon Low Resistance Ground Module



1. Carbon Ground Module
2. F-GV Wire, Anti-corrosion Tape, Insulating Tape, Bolt, Nut, Washer(flat, spring), Copper Tubing Connector



Excavation (Carbon Ground Module)



Connect the Carbon Ground Module + Copper tubing connector



Put the rubber tape on the connecting part



Put the insulating tape on the connecting part



Place the Carbon Ground Module



Put water



Refill



Fix the outgoing cable