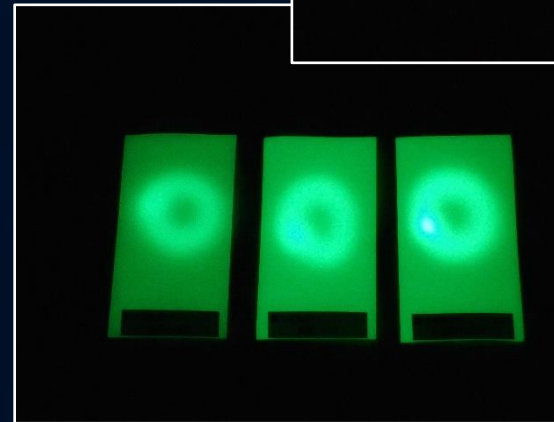
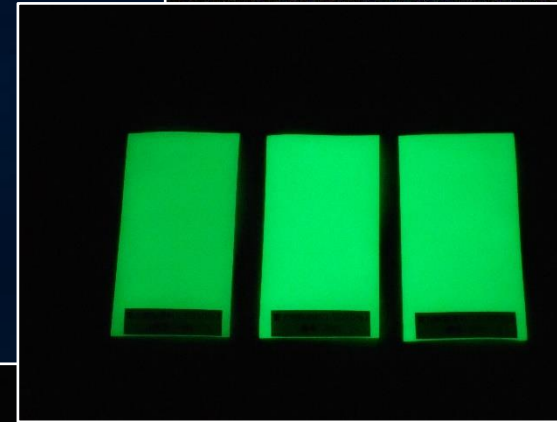
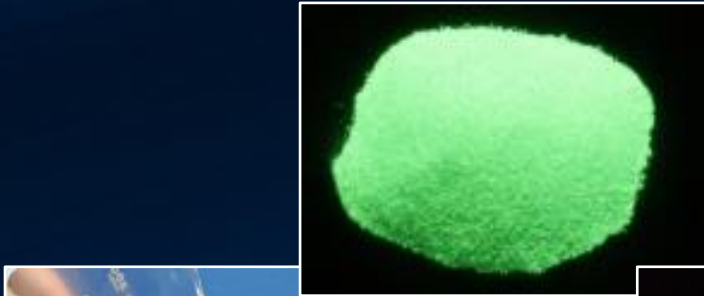
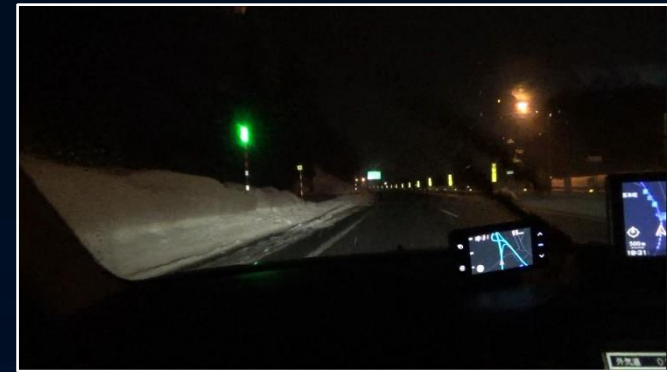


# *Luminescent Resin Paint Development*



# Various Visual Guidance Countermeasures

Nowdays, various kinds of visual guidance countermeasures are implemented to show lane branches, road ends or road shapes, along the side or at the centre of the road, in order to guide drivers during day and night. It is not only used to recognize road shapes at night, but also as an anticipation against visibility disturbance during snowstorm. In addition, in snowy areas some of them serve as markers of snow removal work.





# Visual Guidance by Luminescent Technology

Luminescence is a phenomenon that ultraviolet rays, that contained in light, are absorbed and stored as energy, and then the accumulated energy is released in the dark for a while to emit light, and then the stored light is gradually released and attenuated, absorbs light and repeats the accumulation of light. Currently, utilization in various places such as evacuation directions and induction routes is increasing due to the advantage that electric energy is stored and natural light is emitted so that power supply is unnecessary.



**Natural lighting, compliant with no-power environment, maintenance-free, anti-theft, workability**

# Countermeasures For Visual Guidance In Overseas

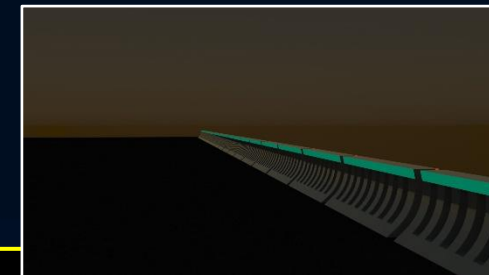
The pictures below shows the visual guidance countermeasures in overseas. There are many protective fences made of concrete, many countermeasures with coloring and reflecting body attached to the road attached structure as seen in the pictures. However, it is not enough to be the visual guidance at night, to ensure visibility, to support safety driving or used to be a countermeasure to protect pedestrians at present.



Technical proposal using luminescent in to concrete structures such as protective walls



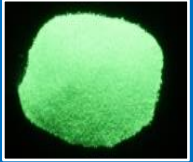
『 Luminescent resin paint 』





# Luminescent Resin Painting

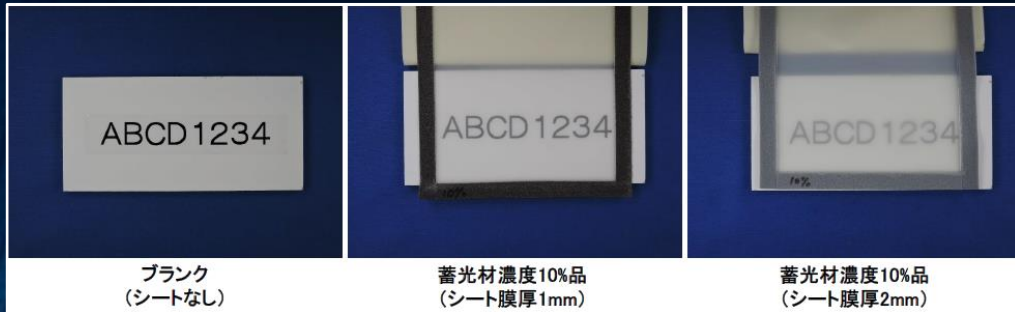
「 Luminescent materials 」



「 High weather-resistant clear urethane resin 」



『 Luminescent resin paint 』



Transparent status of coating film 1 mm/2 mm,  
concentration of luminescent material 10%



Luminescence status by coating film sheet, at each luminescent material  
concentration and thickness

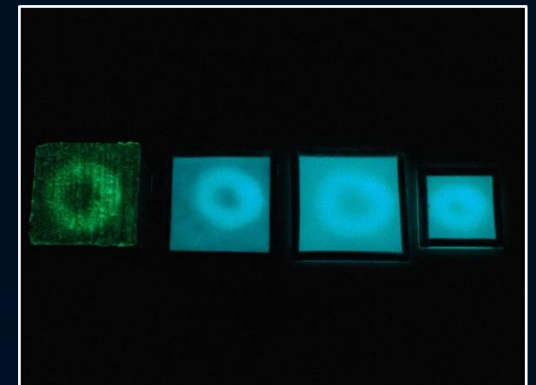
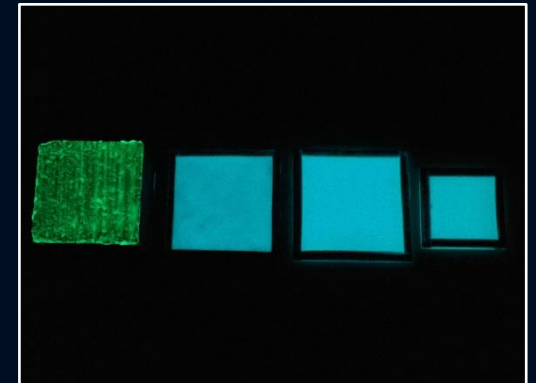
(From the left, concentration 10% 1 mm thick, 10% 2 mm thick, 20% 1  
mm thick, 20 mm 2 mm thick)



Light emission condition of 50%  
luminescent material concentration/2  
mm coating film

(From the photo in left side)

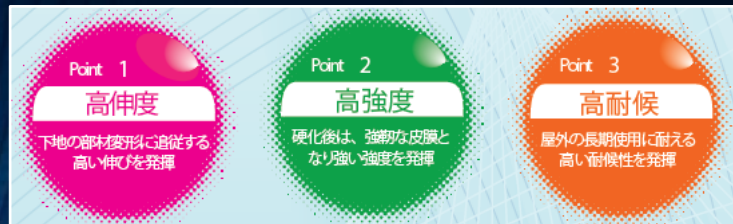
- ・Concrete
- ・ Hot galvanized steel sheet
- ・ PC resin
- ・ Glass



Marking by irradiation of  
black light pen

# What Is Transparent High Weather Resistance Urethane Resin

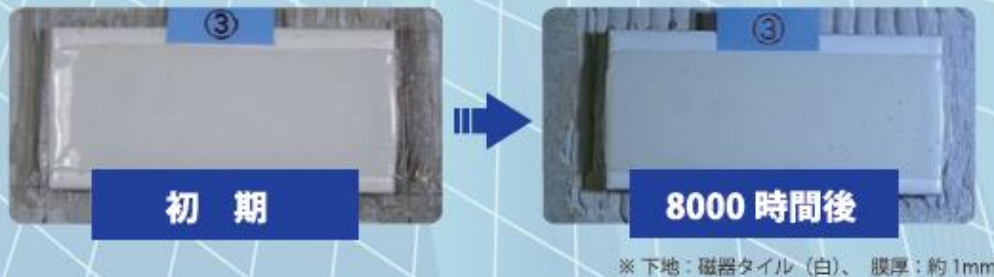
This resin is a moisture-curing polyurethane, high weather resistant coating material.



- Prevent concrete from crack/neutralization/sulphate deterioration
- Prevent deterioration by freezing and thawing in cold district
- Low glossiness attenuation/dye change, transparent, high weather resistance (about 40 years equivalent)
- Surface protection/reinforcement
- Strong film properties (compatibility of strength and elongation)
- Liquid/paste applicable and roller coating are possible

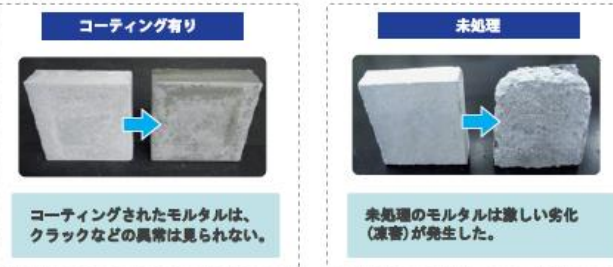
## 促進耐候性（サンシャインウェザーメーター）

8000 時間（当社推定換算：約 40 年相当）まで測定したが、クラックや変色などの変化が見られない。



## ● モルタルの凍害防止試験

モルタルをベースに、樹脂コーティング有りと無し（未処理）の試験体を「-20℃ 気中 2hr → 20℃ 水中 1hr × 200 サイクル」で処理を行った。



## ● 硫酸Na水溶液による劣化防止試験

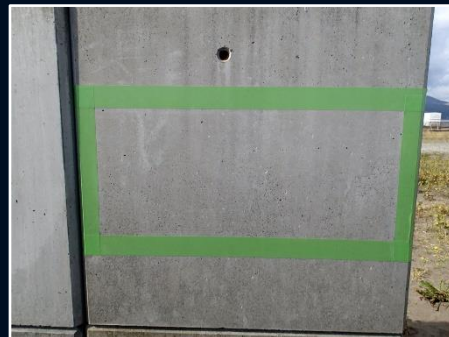
モルタルをベースに、樹脂コーティング有りと無し（未処理）の試験体を硫酸Na水溶液を用い『5℃ × 24h → 40℃ × 24h × 7 サイクル』で処理を行った。





# Concrete Coating Process

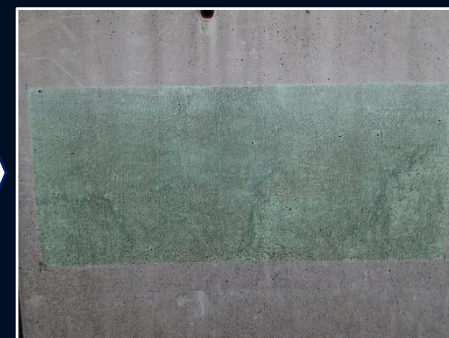
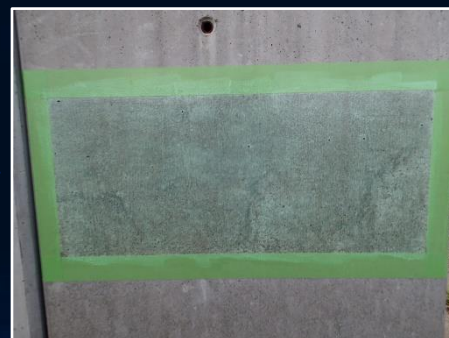
Surface  
Treatment



Primer  
Application

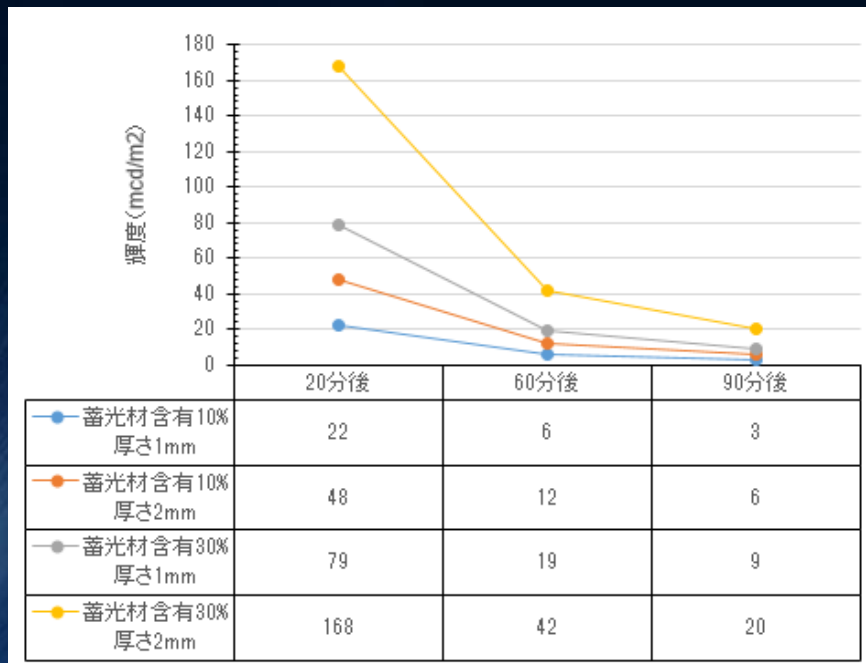


Applying Luminescent  
Resin Paint



# Afterglow Test On Sheet

The results of afterglow test with the luminescent resin paint sheet are shown below. Due to receive sunlight, although it does not match with test method of JIS Z 9107 and the light source, evaluation was performed by refer to JIS Z 9107 and JIS Z 9095 as reference evaluation of afterglow. The result reached the "Glow lower limit value such as a phosphorescent safety sign, guidance line, etc." irrespective of the content of luminescent material.



## Sheet afterglow time estimation result

(Y axis: brightness balance, X axis: afterglow estimated time)



### 1. Materials and method

- Sheet making method: pour into mold, peel off in sheet after curing
- Sheet size: 11 cm × 16 cm × 1 mm / 2 mm
- Sample: Coating film thickness of luminescent material content 10% / 30% 1 mm / 2 mm

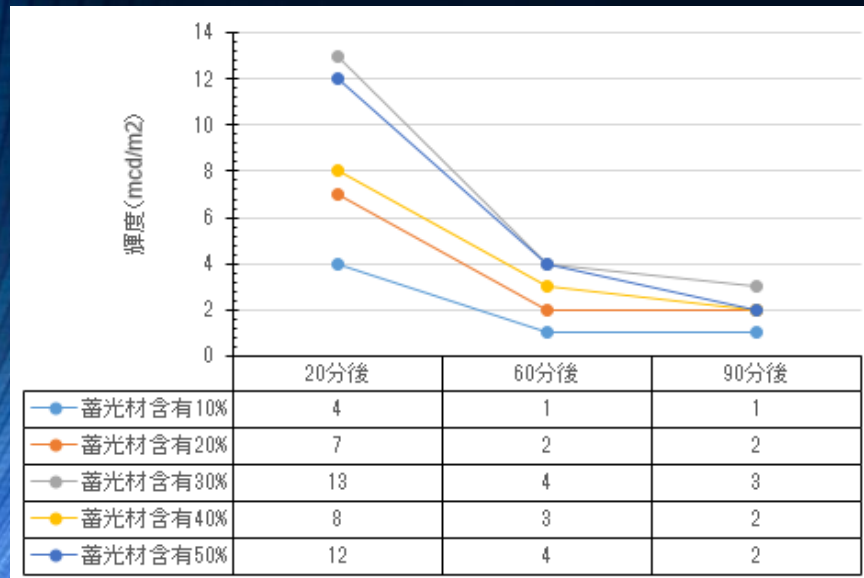
### 2. Test conditions

- Light source: Always receive sunlight
- Measurement frequency: measured for each sheet (N = 3)
- ※ Results are N = 3 average value
- Estimation method: speculative measurement by luminescent meter BM-100



# Afterglow Test On Concrete Coating

The results of afterglow test by luminescent resin paint that coating at concrete are shown below. Due to receive sunlight, although it does not match with test method of JIS Z 9107 and the light source, evaluation was performed by referring JIS Z 9107 and JIS Z 9095 as reference evaluation of afterglow. As a result, with respect to the content of the phosphorescent material of 20% or more, "Glow lower limit value such as a photo phosphorescent safety sign, guidance line" has been reached.



Concrete coating afterglow time estimation result  
(Y axis: brightness balance, X axis: afterglow estimated time)



- ・ Application method: Roller coating on concrete block surface
- ・ Coated surface: Width 150 mm × length 800 mm × Coating film thickness about 0.3 to 0.5 mm
- ・ Sample: Apply with a luminescent material content of 10% to 50%

## 2. Test conditions

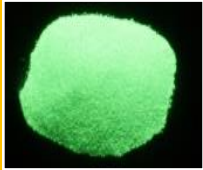
- ・ Light source: Always receive sunlight
- ・ Measurement frequency: Representative portion for each application surface (N = 1)
- ・ Estimation method: speculative measurement by luminescent meter BM-100



# LED-Compatible Luminescent Resin Paint

LED compatible luminescent resin paint contains LED compatible luminescent materials, improved about 3 times in luminance and about 2 times in afterglow time compared with conventional luminescent materials. It is greatly effective when it is applied indoors and outdoors together with the luminescent resin paint depending on the application.

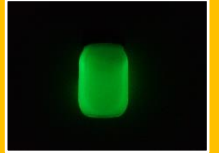
「LED compatible luminescent material」



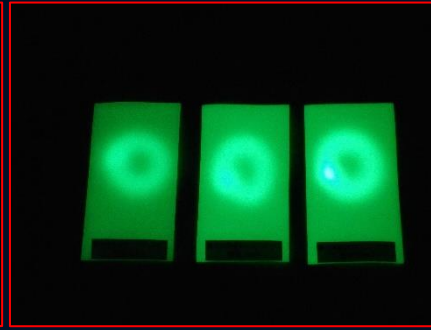
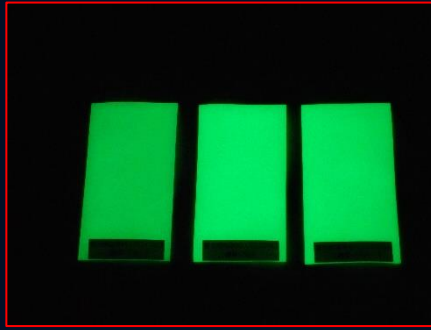
「High weather resistant clear urethane resin」



『LED compatible Luminescent resin paint』



- Applicable objects: Concrete, glass, resin or steel materials are possible.
  - Useful life time is 40 years (from the result of resin material physical property evaluation).
  - Excellent in water resistance, heat resistance, cold resistance and flexibility. (From each test result)
  - Weather resistance A result has been obtained of 15 years or more. (From accelerated exposure test results)
- \* Similar results are obtained for luminescent resin coatings.



Coating sheet sample thickness 2 mm  
Content of luminescent material compatible to LED: 10%, 20%, 30%

Marking by black light pen irradiation

Coating sheet sample thickness 2 mm  
Ordinary luminescent material content: 30%

※Conditions:  
The irradiation time using the LED light bulb is set to about the same 10 seconds for the LED compatible luminescent material and ordinary luminescent material.



# LED-Compatible Luminescent Resin Paint - Afterglow Test by Coated Film

Following table shows results of the afterglow test using coating sheet sample of LED compatible luminescent resin paint, with six types shown below. As a result of using the LED bulb as the light source and observing the decline of the luminance at the irradiation time 1 minute and 20 minutes by photograph and visual observation, as a result of visual observation, the luminance of the evacuation guidance lamp specified for 2 hours or more by irradiation for 20 minutes was confirmed.

実施前



種別(配置)

LED10% 膜厚1mm	LED20% 膜厚1mm	LED30% 膜厚1mm
LED10% 膜厚2mm	LED20% 膜厚2mm	LED30% 膜厚2mm

照射時間	照射後2分	照射後10分	照射後20分	照射後30分	照射後60分	照射後120分	照射後180分
1分							
20分							

# LED-Compatible Luminescent Resin Paint

## 【Usage: Indoors People Guidance】



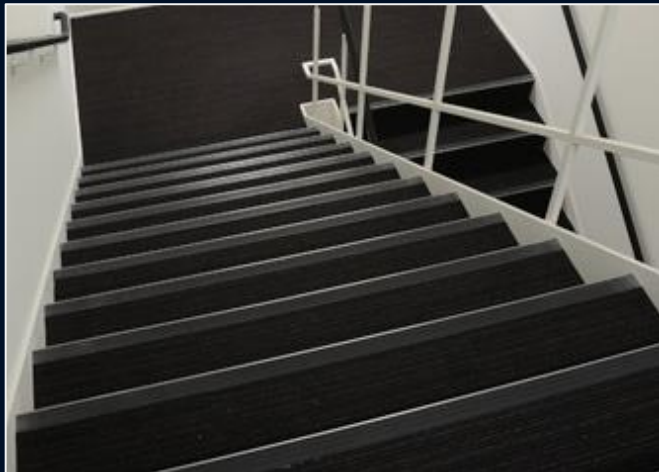
JR platform, emergency shelter



Guide lamp by application to LED fluorescent tube



Wallpaper application by black light pen  
Used as message board



By applying to stairs  
Prevent trampling and position marking during darkness



Position indication by applying to a handrail



Position indication by application to door knob



Position indication by application to keyhole



# LED-Compatible Luminescent Resin Paint

## 【Usage: Vehicle/Ship Outdoor Guidance】



Gaze guidance by applying to guardrail



Utilization of luminance (after glow) by application to delineator resin cover



Parking lot line



White line on road



Gaze guidance by applying to protective wall



Application to ship mooring block



Position indication by application to road curb etc



# LED-Compatible Luminescent Resin Paint

## 【Usage: Warning Alerts, etc】



Mobile cover



Kanban/sign board



Outer wall logo (company name)



Lid-free road and agricultural groove



Electric pole



Fall prevention fence (road, river, port)





# LED-Compatible Luminescent Resin Paint 【Other Effects Except of Light Emission by Coating】



Prevent concrete deterioration



Prevent rubber crack



UV cut by glass coating



Prevent resin degradation by UV



Prevent steel corrosion

# Maintenance Management by LED-Compatible Luminescent Resin Paint And Application To Inspection/Testing Field

The Ministry of Land, Infrastructure, Transportation and Tourism has been promoting “Boosts to the disappearance of utility poles” since 1986, and the “Act of boosts to the disappearance of utility poles” came into effective in December, 2008, and construction is currently being carried out by each local government . In the construction of “Boosts to the disappearance of utility poles”, the burial of underground such as various cable pipes will increase, so maintenance and inspection work may increase. Inspection and inspection work done in underground water supply and sewerage systems, pressure vessel interior, tunnel seam joints, etc. is also indispensable in the future infrastructure development due to aging and is expected to increase. LED-compatible luminescent resin paint response to LED or black light are significant and because of its high brightness, we can expect great effect on maintenance and inspection by applying at place as shown in the pictures below.



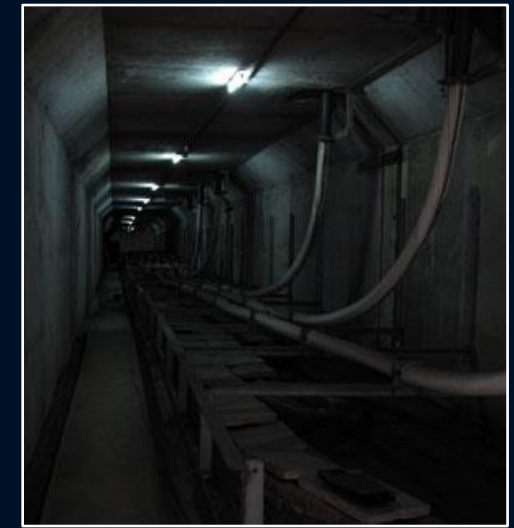
"Promote boosts to the disappearance of utility poles"  
Object: CCVP pipe  
(Power cable protection tube) (Orange)  
Object: ECVP pipe  
(General PVC pipe) (grey)



Maintenance and inspection of water supply and sewer pipes in buildings  
Object: PVC pipe, steel pipe



Alternative test method to penetrant test  
Object: steel pipe



Pipe visual inspection in dark place