



CAELAR LB

**CAELAR<sup>®</sup> LB**

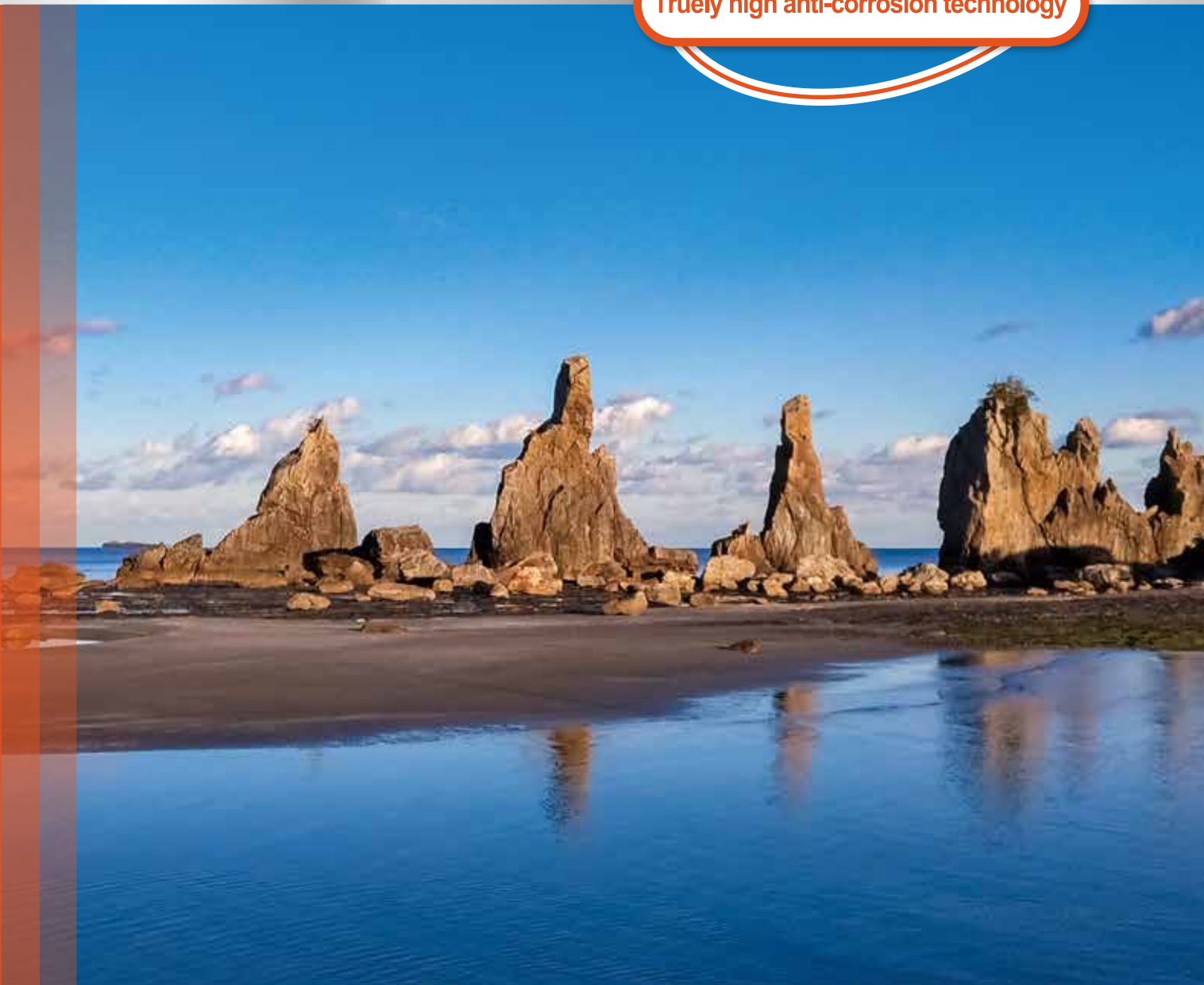
New  
Development

**Superior Anti-corrosion**  
Corrosion resistance of  
Iron exceed SUS

D-alloy

Completely  
Chrome-free

Truely high anti-corrosion technology



Nihon Ruspert Co., Ltd.

# Corrosion resistance of Iron exceed SUS

## Development concept

- The target is even using carbon-steel that the performance of anti-corrosion is equivalent to austenite SUS
- The excellent anti-corrosion treatment have being developed even that the self-drilling screw being drilled or the coating damage during tightening bolts
- It also can be suitable for austenite SUS that make the SUS with better corrosion resistance

# Features

## ✓ Superior Anti-corrosion

A tough alloy coating combined with zinc-nickel alloy plating and add having further lubricating ability of top coating which 3 complex layers can improve excellent corrosion resistance

## ✓ Completely chrome-free

With the consideration to the earth environment, without using the hazardous chromium compound to ensure the health safety

## ✓ Reduction of hydrogen embrittlement

The release of hydrogen is easy due to microcracked structure of Zn-Ni alloy plating, which can reduce hydrogen embrittlement occurrence

## ✓ Weather Resistance

The products can be maintained even being used at the severe seacoast and industrial area for long term.

## ✓ Heat Resistance

It is totally secure even being used under high temperature environment thanks to the zinc nickel plating and inorganic coating combination that has a superior heat resistance.

## ✓ Gas resistance

There is no early rust issue under the environment of high concentration of sulfur dioxide and other corrosive gas.

## ✓ Electrolytic Corrosion Resistance

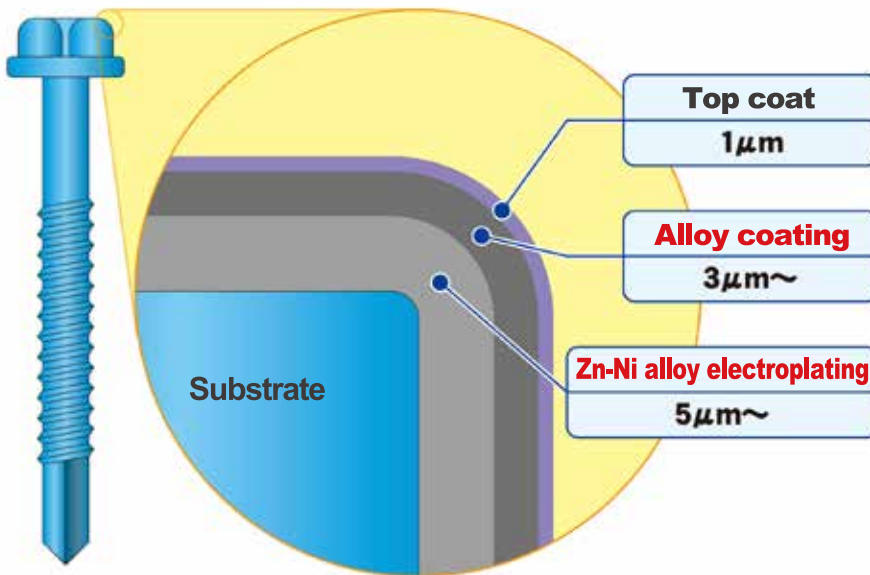
Reduce the dissimilar metal contact corrosion apparently by mean of SUS product with coating tighten in aluminum board and plated steel board

## ✓ Galling prevention

Reduce the galling issue when tightening stainless steel fasteners

# Coating film structure and Corrosion prevention structure

Improve the anti-corrosion significantly through combining three different function anti-corrosion film



Top coat have lubricating ability even though coating damage which can protect 1st and 2nd layer

Enhance anti-corrosion performance by improving adhesion with top coat and passivating alloy coating

Corrosion prevention of substrate is attributed to protective effect of Zn-Ni alloy by self-sacrifice

## Test Result

SST 2000 H

**No red rust occurred**

- The pictures in left and in right to show the condition of drilling damage before SST, and drilling screw condition after testing
- White material occurred due to the effect of anti-corrosion by self-sacrifice, but no red rust was found



# Standard film and Expected corrosion resistance

Utilizing the characteristics Zn-Ni alloy, high corrosion resistance can be achieved with thin film

Standard film				Expected corrosion resistance (Red rust occurred)	
Zn-Ni alloy plating	Alloy coating	Top coating	Total	After drilling(SWCH18A)	
				Salt Spary Test	Over 1000 Hours
				Combined Cycle Test	Over 100 Cycles
5 $\mu$ m~	3 $\mu$ m~	1 $\mu$ m	9 $\mu$ m~	Before drilling	
				Salt Spary Test	Over 3000 Hours
				Combined Cycle Test	Over 300 Cycles

Evaluation after drilling mean that assessment of corrosion protection properties by drilling into and out of the cold rolled steel(thickness:6mm)

## Comparison various surface treatment

	carbon steel SWCH18A CAELAR LB	Martensitic stainless steel SUS410 passivating treatment	Austenitic stainless steel SUS304/XM-7 passivating treatment
Corrosion resistance	◎	×	◎
scratch resistance	◎	△	◎
electrolytic corrosion resistance	◎	×	×
acid resistance	◎	×	○
corrosive gas resistance	◎	△	○
salt damage resistance	◎	×	○
weather resistance	◎	×	◎
galling resistance	◎	×	×

◎ Very suitable ○ suitable △ part of suitable × unsuitable



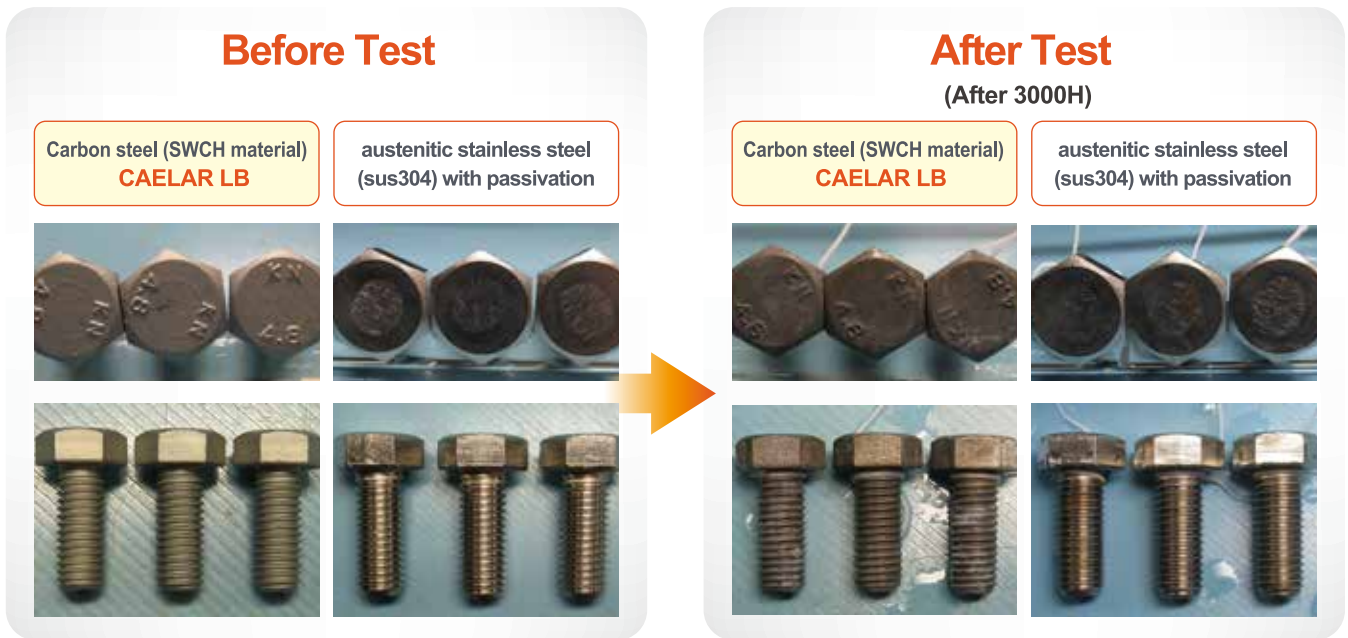
# Corrosion resistance test

## 1. Salt spray test

JIS Z 2371 / 3000H finish

No red rust occurred

Test sample: Bolt M8 x 20  
Film thickness: 11µm

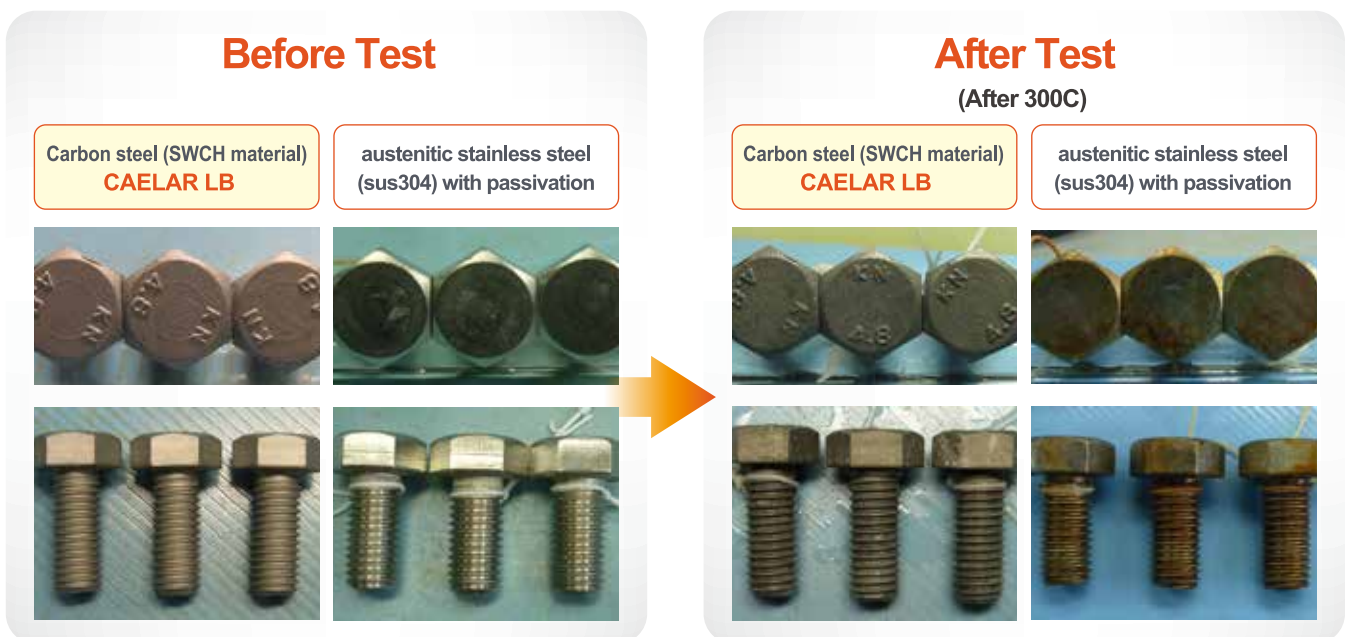


## 2. Combined cycle test

JASO M609-91 / 300 cycle finish

No red rust occurred

Test sample: Bolt M8 x 20  
Film thickness: 11µm





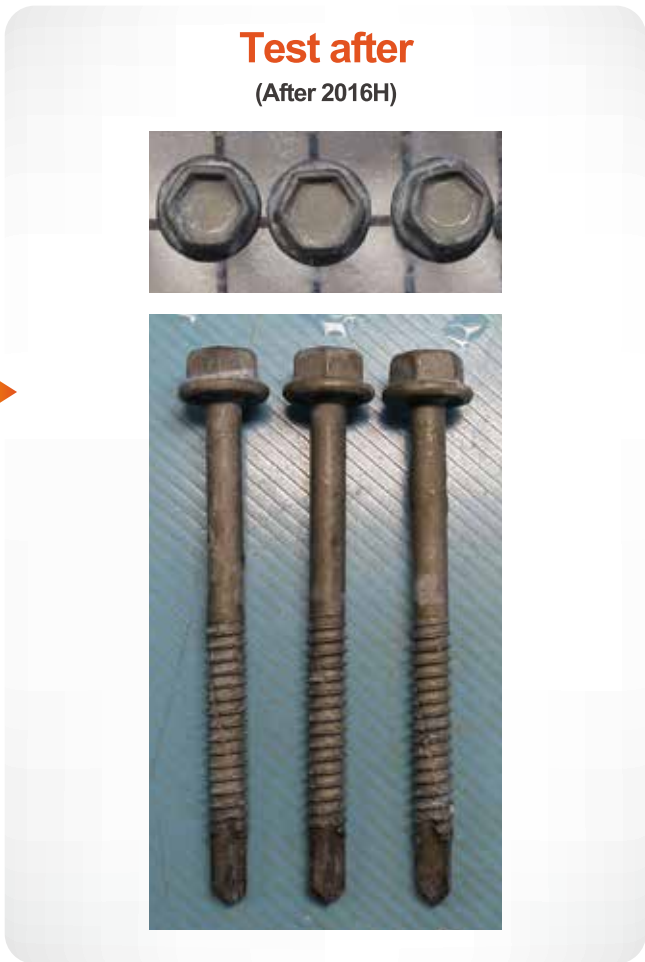
Film performance test after Drilling screw in and out of the steel plate cold commercial by one time which have 6mm thickness

### 3. drilling test (salt spray test)

spcc 6mm drilling in and out of the iron plate

JIS Z 2371 / 2016H finish **No red rust occurred**

Test sample: hex self-drilling screw M6×70  
Material: SUS410 + CAELAR LB  
Film thickness: 14.6 μm



# Electrolytic corrosion resistance test

## 1. Salt spray test

JIS Z 2371 / 3000H finish






















Connecting plate: aluminum

plate material: A6063S-T5 (JIS H-4100) equivalent

AL plate treatment(anodizing 9 μm+clear coating 7 μm )

①•② material: SUS304, SUS316L tighten into Al plate

③ Tighten fastener with Caelar LB treatment Film thickness: 11 μm

		① SUS316L with passivation	② SUS304 with passivation	③ SUS304 + Caelar LB
test before	bolt Head			
	bolt body			
Afer 3000H	bolt Head			
	bolt body			
After remove	Front			
	Back			
	Fastening			

Test Results

red rust occured after SST1848 in contact position

red rust occured after SST168 in contact position






















Surface no change



## 2. Combined cycle test

JASO M609-91 / 300 cycle finish **No red rust occurred**

Connecting plate:aluminum  
 plate material:A6063S-T5(JIS H-4100 equivalent)  
 AL plate treatment(anodizing 9 μm+clear coating 7 μm)  
 ①・② material:SUS304,SUS316L tighten into Al plate  
 ③ Tighten fastener with Calear treatment Film thickness:11 μm

		① SUS316L with passivation	② SUS304 with passivation	③ SUS304 + Calear LB
test before	bolt Head			
	bolt body			
Afer 300C	bolt Head			
	bolt body			
After remove	Front			
	Back			
	Fastening			

Test Results

red rust occurred after CCT103C in contact position

red rust occurred after CCT262C in contact position

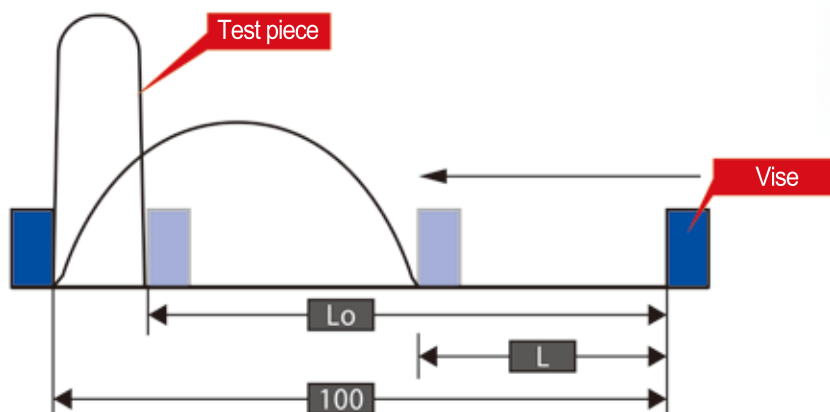
Surface no change

Electrolytic coriison cause white rust in fastener that it can't remove from AL plate due to adhesnion

# CAELAR LB treatment can reduce the hydrogen embrittlement occurred

## 1. Delta Gauge Method

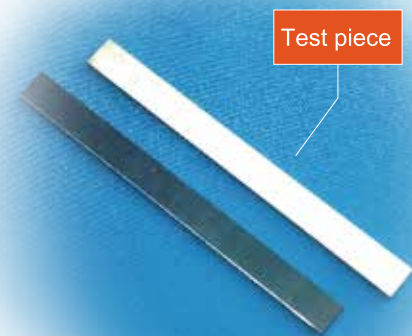
Delta Gauge Method is invented to bend the steel plate with low speed until snapping which is sensitive to the hydrogen embrittlement and test the falling rate of its tenderness so as to get its hydrogen embrittlement happening rate.



※ The hydrogen embrittlement rate is relatively compared with the one without any surface treatment. It is not the common data about the happening rate of hydrogen embrittlement by itself. And the hydrogen occlusion quantity can not be measured directly.

### Test Result(according to Delta Gauge Method)

Description	Sample A	Sample B	Sample C
Distance until Broken (mm)	85.0	83.2	42.3
	85.0	85.0	36.3
	85.0	84.1	40.2
	85.0	81.2	36.2
	85.0	85.0	35.3
Average distance until broken (mm)	85.0	83.7	38.1



left:substrate right:test piece with plating

### The principle of Evaluation Measurement

Hydrogen Embrittlement Rate (%) =  $(L_0 - L) 100 / L_0$   
 $L_0$ : Bending until snapping distance using the piece (substrate) without hydrogen embrittlement issue(mm)  
 $L$ : Bending until snapping distance using the test piece treated by pickling process with hydrogen embrittlement issue



Test piece

Sample A : Substrate (without treatment)  
 Sample B : CAELAR LB  
 Sample C : Traditional Zinc Electroplating (No baking treatment)

**CAELAR LB treatment can reduce the hydrogen embrittlement occurred**

# Treatment Processing

## The method of Dip-spin

Zn-Ni alloy plating

Alloy coating

1

baking 250°C

Alloy coating

2

Baking 250°C

top coating

Baking 180°C

Inspection

Shippment

※ Alloy coating

Alloy coating → Baking 2 times coating repeated is standard which can change under requirement

## The method of spray

Zn-Ni alloy plating

Alloy coating

1

baking 250°C

top coating

Baking 180°C

Inspection

Shippment

※ Alloy coating

1 time coating is standard which can change under requirement



New  
Development

Superior Anti-corrosion  
Corrosion resistance of  
Iron exceed SUS

CAELAR LB

**CAELAR<sup>®</sup> LB**



**Nihon Ruspert Co., Ltd.**

■ Head Office

18-3 Shinminatomachi, Kishiwada City, Osaka, 596-0012 Japan

TEL: 072-432-8711

FAX: 072-432-2860

E-mail: [sales@ruspert.co.jp](mailto:sales@ruspert.co.jp)

URL: [www.ruspert.co.jp](http://www.ruspert.co.jp)



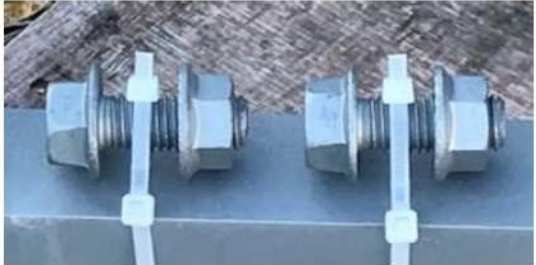




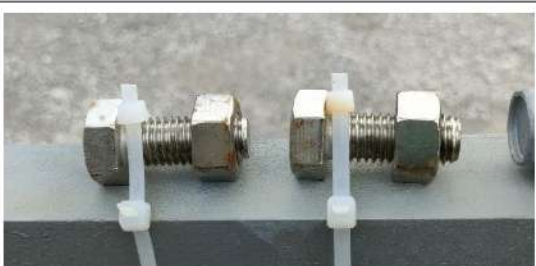
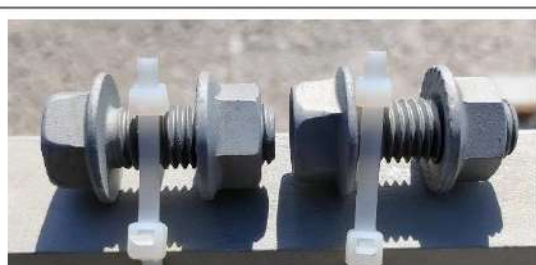
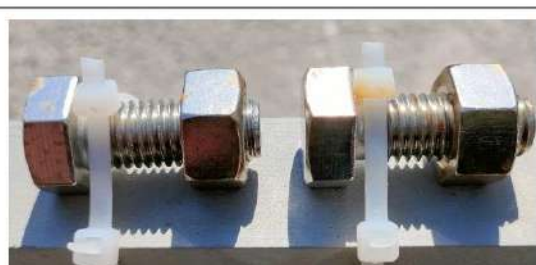


## Steel with CAELAR LB Finish VS SUS 304 Exposure Testing



Nihon Ruspart Co., Ltd.

At Shiono Misaki, Kushimoto Town, Wakayama Pref

Steel with CAELAR LB	SUS 304
<b>At start of test</b>	
	
<b>Six months elapsed</b>	
	
<b>1 year elapsed</b>	
	
<b>1 year and 3 months (as of the end of March, the latest)</b>	
	

Rusting of SUS304 is confirmed after 1 year.

Kaera LB maintains its aesthetic appearance after 1 year and 3 months