# Buildex®

CONNECTIONS THAT LAST

Self-Drilling Fasteners

**ITW Construction Products (Shanghai) Co., Ltd**
Address: A13, No. 3802, Shengang Road, Songjiang District, Shanghai
Tel: 021-6775 5768 Fax: 021-63220175
Email: sales@itwcpchina.com
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依工建筑官方微信

Buildex 100 YEARS 1917 - 2017

# Buildex®标的®
# 不锈钢系列

300 Series (18-8) Stainless Steel Self-Drilling Fasteners
To provide the maximum, long-term corrosion resistance

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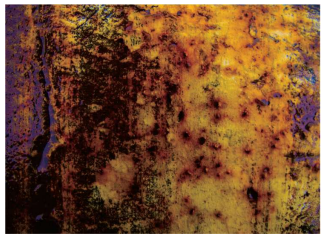
## Corrosion matters

Corrosion matters. It can make structures unsafe and unstable. It can also lead to components and whole installations needing to be replaced. All of which can be costly in money, time and with a risk of injury.

### What is corrosion?



Corrosion is the physicochemical interaction between a metal and its environment, which results in changes in the metal's properties, and which may lead to significant functional impairment of the metal, the environment, or the technical system of which they form a part (see ISO 8044:2010).

With the metals commonly used in engineering, such as carbon steel, stainless steel, zinc, copper and aluminum, the typical corrosion process can be regarded as the thermodynamically favored reverse reaction of the metal-winning (extraction) process.

### Factors

Corrosion takes different forms in different environments. So, for your build, you need to consider the factors which can increase the risk of corrosion:

- Humidity: Humidity needs to be present for any atmospheric reaction.
- Temperature: The higher the temperature, the higher the rate of corrosion will be.
- Salt: This can be air containing salt near a coast, or from de-icing salt in the winter.
- Industrial pollution: High levels of sulphur dioxide speed up corrosive reactions.
- Galvanic (contact) corrosion: Caused by two dissimilar materials coming into contact.

Australian fastener performance standard (AS3566 2002) pointed out the necessity of testing in real environment, determining the corrosion rate of fasteners through real testing in harsh environment. The test of ITW Buildex company has shown that even if a few similar screws could pass the laboratory salt mist test, they fail in the real natural environment test for the following reasons.

- The laboratory tests on the four corrosion indexes of screws, acid rain, salt mist, humidity, and ultraviolet light are carried out respectively in a "single" environment under manual control, but these conditions do not occur alone on the building as in the laboratory in the real natural environment.
- The laboratory test method ignores the current corrosion effect caused by the contact of similar metals, such as purlins, steel plates, supports, washers, and screws. In fact, the current corrosion effect is one of the common causes of roof corrosion.
- The laboratory test is generally at a constant temperature of about 35 ℃, but the temperature changes in the "real natural environment". In summer, the actual roof temperature can be up to more than 60 ℃ under the direct exposure to the sun, which greatly speeds up the corrosion rate.



## Buildex® Real world test

Buildex® pioneered the use of real world outdoor exposure testing for coatings development in 1994 and has continually developed and improved the performance of its coatings, providing superior corrosion protection. Constant extensive real world testing sets us apart from competitors.

Led by CSIRO (the Scientific and industrial research organization of the Commonwealth of Australia), three experimental bases (located in marine climate environment, marine / acid rain climate environment and industrial area) were established in Australia to help Buildex® accurately obtain the relevant data of real environment test under the worst conditions.

## What is stainless steel?

Large amounts of tests have shown that the corrosion resistance of steel in various corrosive media increases with the increase of chromium content in steel. When the chromium content reaches a certain value, the corrosion resistance of steel changes suddenly and the chromium content causing the sudden change of corrosion resistance is different due to the different corrosive environments and other elements in steel. The minimum chromium content of industrial stainless steel is 11% ~ 12%. In GB / T20878-2007 (The Grades and Chemical Composition of Stainless Steel and Heat Resistant Steel), stainless steel is defined as steel which has stainless and corrosion resistance as its main characteristics, chromium content at least 10.5%, and carbon content no more than 1.2%.

## Classification

There are dozens of kinds of stainless steel. Roughly classified by their main alloy elements as follows:

1) Chromium type stainless steel

2) Chromium nickel stainless steel

Classified by metallographic structure, roughly divided into Martensite, ferrite, and austenite (two new types: dual phase steel and precipitation hardening steel).

Chromium type stainless steel is martensitic stainless steel and ferritic stainless steel. The metallographic structure of chromium nickel stainless steel is a typical austenite, thus being called austenitic stainless steel.



| Classification by major elements | | | | Classification by metallographic structure |
|---|---|---|---|---|
| Key elements | Common name | Grade of steel | Abbreviation | |
| Chromium | 13 chromium | SST 410 series | 13Cr | Martensite (after quenching) |
| | 18 chromium | SST 430 series | 18Cr | Ferrite |
| Chromium nickel | 18 Cr-8 Ni | SST 304 series | 18Cr8Ni | Austenite |
| | | SST 316 series | 18Cr8Ni2.5Mo | |

**Cr, Ni and Mo are short for chromium, nickel, and molybdenum respectively.

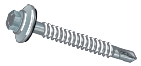
## Characteristics

| Characteristics | Austenite (18-8) SST 304, SST 316 series | Ferrite (18 Cr) SST 430 Series | Martensite (13 Cr) SST 410 series |
|---|---|---|---|
| Magnetic | No | Yes | Yes |
| Quenching hardening | No | No | Yes, easy to crack after cooling with high carbon |
| Process hardening | High. With high nickel%, the work hardening is low. | Some hardening occurs during cold working | similar with low carbon steel |
| Corrosion resistance, weather resistance | Excellent performance | Worse than austenite | Worse than ferrite |
| Impact properties and ductility | Excellent. Plasticity is also good | Worse than austenite | Same as ferrite |
| Weldability | Excellent. Rapid cooling after welding is required from 800 ℃ to 500 ℃ | Worse than austenite. Grain growth and embrittlement in heat affected zone | Bad. Preheat before welding, heattreat-ment after welding to avoid weld cracks |
| Low temperature performance | Enough toughness even at - 200 ℃ | Worse than austenite | Same as ferrite |
| Anisotropy | Almost nonexistent | Yes, when bending at 90 ° angle to the rolling direction | Yes |
| Thermal expansion property | 1.5 times of low carbon steel | Almost the same as low carbon steel | Same as ferrite |
| Thermal conductivity | 1 / 3 of low carbon steel | 1 / 2 of low carbon steel | Same as ferrite |

Ferritic Stainless Steels - The lack of other alloying elements means ferritic stainless steel are known as plain Chromium steels. Chromium content between 12~18%. Have moderate corrosion resistance; not susceptible to stress corrosion; Magnetic; Cannot be hardened by heat treatment; Always used in the annealed condition; Poor weldability. Not suitable for roofing system.

Martensitic stainless steel - lowest chromium content (less than 11.5 ~ 13.5%), Moderate corrosion resistance; Heat treatable; Magnetic; Inability to be cold formed; Poor weldability not suitable for roofing system with long service life requirements.

Austenitic stainless steel - chromium content of 18 ~ 20%, Adding nickel to stainless steel in sufficient amounts, changes the microstructure to "austenite" . Excellent corrosion resistance; Non-magnetic when annealed; Rapidly work harden with cold work; Not hardenable by heat treatment; Ductile and readily formable; Excellent weldability; Hygienic with excellent cleanability; Good performance at high temperatures; Excellent performance at low temperatures The most used product series are 304 and 316 series stainless steel.



## Physical properties of stainless steel

(A) Conductivity. Lower than other steels. The resistivity tends increase with chromium or nickel content increase. The resistivity of chromium nickel stainless steel (SST304) is higher than that of chromium stainless steel (SST430 AND SST410), but about 3 ~ 4 times, 40 times and 15 times much higher than that of low carbon steel, copper, and aluminum respectively.

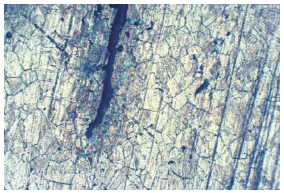
(B) Thermal properties. Almost same as low carbon steel, but the thermal conductivity is usually smaller than low carbon steel, is about 1/2 of low carbon steel; chromium nickel type is about 1/3 of low carbon steel and 1/4 of copper.

(C) Magnetic performance. Chromium type stainless steel has strong magnetism and is attracted by magnets, but chromium nickel type stainless steel usually has no magnetism and can't be attracted by magnets. Among the chromium nickel stainless steel series, some types like SST304 series are magnetic because the metallographic structure may change during cold bending and cold drawing.



## Forms of corrosion of stainless steel

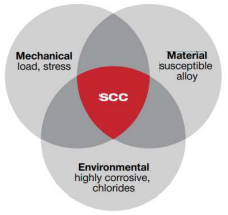
The corrosion types of common stainless steel screws are as follows.



**1) General corrosion (or continuous corrosion)**

This corrosion is generally evenly distributed on the inner and outer surfaces , the effective section of the part under stress is continuously reduced and damaged. This form of corrosion destroys large amounts of metal materials, but its risk is small from the technical perspective, which can be reduced by taking appropriate protective measures.

**2) Stress corrosion cracking (SCC)**




Stress corrosion cracking (SCC) is a combined mechanical and electrochemical corrosion process that results in cracking of certain materials. It can lead to unexpected sudden brittle failure of normally ductile metals subjected to stress levels well below their yield strength. Internal stresses in a material can be sufficient to initiate an attack of stress corrosion cracking. Stress corrosion cracking is not simply an overlapping of corrosion stresses, but can be understood as an autocatalytic, self-accelerat leading to high metal dissolution rates (anodic reaction). Initially, formed and develops into a crack due to applied or residual stress in the material. The crack formation opens up a new active (non-passive) metal surface, which again will corrode very easily. This leads to further crack propagation and again to the exposure of new highly active metal surfaces in the crack. Metal dissolution in the crack will advance rapidly until mechanical failure occurs

**3) Intercrystalline (intergranular) corrosion**

Intercrystalline corrosion is a special form of localized corrosion, where the corrosive attack takes place in a quite narrow path preferentially along the grain boundaries in the metal structure. The most common effect of this form of corrosion is a rapid mechanical disintegration (loss of ductility) of the material. Usually it can be prevented by using the right material and production process.

**4) Crevice corrosion**

Crevice corrosion refers to corrosion occurring in cracks or crevices formed between two surfaces (made from the same metal, different metals or even a metal and a non-metal). This type of corrosion is initiated by the restricted entrance of oxygen from the air by diffusion into the crevice area leading to different concentrations of dissolved oxygen in the common electrolyte (the so-called aeration cell). Again, the two partial reactions will take place on different parts of the surface. Oxygen reduction takes place in the outer areas with higher oxygen concentrations easily accessible by the surrounding air, whereas the anodic metal dissolution occurs in the crevice area resulting in localized attack (e.g. pitting). It may also occur under washers or gaskets, when the entry of water underneath is not prevented

**5) Pitting corrosion**

Pitting corrosion is a localized form of corrosion that leads to the creation of small holes or "pits" in the metal. This form of corrosion is mainly found on passive metals. Passive metals and alloys, such as aluminium, titanium and stainless steel owe their corrosion resistance to a thin oxide layer on the surface with a thickness of only a few nanometers. The corrosion initiating process starts with a local break-down of the passive layer. Local corrosive attack can be initiated on stainless steels, for example, by chloride ions.

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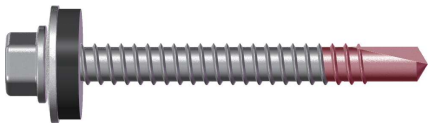
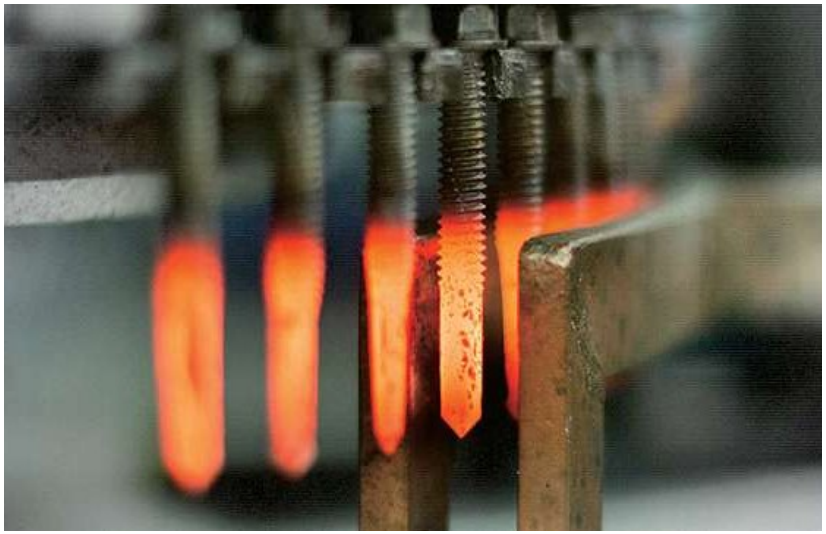
Buildex® Bi-metal stainless steeel screws combine the high level corrosion resistance of 300 series stainless steel and the drilling performance of carbon steel self-drilling screws.

Buildex® Bi-metal screw has a hardened, self-drilling carbon steel drill point fused to the stainless steel shank.Buildex® Bi-metal stainless steel screws are the perfect choice for coastal & industrial applications or if your job is exposed to chemicals.

SST 304L

SST 316L





Buildex® has a more complex production process of bimetallic fasteners compared with carbon steel nails. The overall process can be simplified into five steps.

- Cold forged stainless steel screw head and alloy steel section
- Fusing
- Drilling bit and threat forming
- Harden aolly metal drilling bit
- Surface treatment

Buildex factory runs the most advanced bimetallic welding process and has skilled and experienced staff. The production process is highly automated to ensure the product stability of Buildex®.Through continuous improvement of robotics technologies and internal design of production equipment, we have long been committed to improving the competitiveness of products.



## Buildex® 不锈钢自攻自钻螺钉真实环境测试结果

Buildex has many years experience with real world testing. Many of our products have been developed and improved as a direct result from what has been learned during the testing.

After a period of one year, the severe conditions at these sites give an accurate indication of a products likely performance when used in real world situation. Competitor products are also periodically tested.

Since March 1999 Buildex in conjunction with some of Australia's leading Sheeting & Cladding material manufactures have set up a specific program to test Stainless Steel and Class 4 screws in various materials.

The severe conditions encountered at both King Island and Newcastle sites have given Buildex the ideal testing grounds for Stainless Steel screws installed in various materials.

Australian High Corrosion Areas


Stainless corrugated sheeting attached to galvanised beams on an open test rig at Newcastle. Screws used Stainless Teks® and Taptites in grade 304 and 316. Test period 16 months. All Buildex screws show no structural failures

Ampelite Webglass® sheeting attached to galvanised beams on a sheltered test rig at our Newcastle site. Taptite screw in Stainless grade 304, 316 and Martensitic self-drilling screws, all parts where assembled with stainless plates and EPDM washers. Test period was 18 months. Results from this test and actual job site use of Martensitic screws have made us aware of hardness problems when using these products in crest fixing applications. The instances of failure experienced were all related to fatigue situations where the crest fix fastener was subject to repeated bending as the roof sheet expanded and contracted.

Aluminium sheeting and purlins on a sheltered test rig at our King Island site. Purpose of this test was to measure the relative corrosion performance of Stainless and other coated screws when used in Aluminium. Test period 44 months. Results obtained confirm the use of Buildex Stainless 304-316 series as the best solution for this sheeting system.

Galvanic (contact) corrosion refers to corrosion damage where two dissimilar metals have an electrically conducting connection and are in contact with a common corrosive electrolyte. In the electrochemical model of corrosion, one of the two partial reactions (anodic metal dissolution and cathodic oxygen reduction) takes place almost exclusively on one metal.

Galvanic corrosion can be avoided by the right choice of material cominations. As a general rule of thumb, a fastener should always be made of the same or a more noble metal than the part to be fastened, since it typically has the smaller surface area, and failure of the fastener is usually critical.

## Impact on lifetime of the fastener by galvanic (contact) corrosion

| Fastened part (large area) | Fastener (small area) | | | | | |
|---|---|---|---|---|---|---|
| | Al-Zn alloy | Galvanized | Zinc Alloy | Stainless Steel | Aluminium Alloy | Copper (Alloys) |
| Al-Zn alloy | □ | □ | □ | ■ | □ | ■ |
| Galvanized | □ | □ | □ | ■ | □ | ■ |
| Zinc Alloy | □ | □ | □ | ■ | □ | ■ |
| Stainless Steel | ■ | ■ | ■ | □ | ■ | ■ |
| Aluminium Alloy | □ | □ | □ | ■ | □ | ■ |
| Copper (Alloys) | ■ | ■ | ■ | ■ | ■ | □ |

□ No impact on life time ■ Impact on life time

## Impact on rainwater flow from upper metal roof panel to lower

| Lower Fastened part (large area) | Upper Metal Roof Panel、Accessary、Fastener | | | | | |
|---|---|---|---|---|---|---|
| | Al-Zn Alloy | Galvanized | Zinc Alloy | Stainless Steel | Aluminium Alloy | Copper (Alloys) |
| Al-Zn Alloy | □ | □ | □ | □ | □ | ■ |
| Galvanized | ■ | □ | □ | ■ | ■ | ■ |
| Zinc Alloy | ■ | □ | □ | ■ | ■ | ■ |
| Stainless Steel | □ | □ | □ | □ | □ | □ |
| Aluminium Alloy | □ | □ | □ | □ | □ | ■ |
| Copper (Alloys) | □ | □ | □ | □ | □ | □ |

□ No impact on life time ■ Impact on life time



## Buildex® Stainless Steel Screw

The only true assurance for protection against our corrosive coastline, fall out and emissions from industrial stacks, chlorine and other chemically polluted environments.

Buildex® Stainless Steel screws conform to the new Australian standards for fasteners AS3566.2. where it states screws should be inherently corrosion resistant.

Used in conjunction with sheeting & cladding manufacturer's guidelines Buildex® offers you a variety of Stainless Steel screws suitable for use in metal, timber and aluminium host materials.

The Australian Standard for fastener performance (AS3566 2002) has recognised the need for real world testing as a way of determining the rate of corrosion in areas.

| Stainless grade | Product | Stainless Group | | Selection Guide | | | |
|---|---|---|---|---|---|---|---|
| 304L 316L | Teks*self-drilling | Austenitic | | Used in higher corrosion resistance is required. Suitable for use with Stainless/ Aluminium / Fibreglass sheeting and cladding. | | | |
| Content% | C | Si | M n | P | S | Cr | Ni |
| 304L | ≤0.03 | ≤1.00 | ≤2.00 | ≤0.045 | ≤0.030 | 17.50-19.50 | 8.00-12.00 |
| 316L | ≤0.03 | ≤1.00 | ≤2.00 | ≤0.045 | ≤0.030 | 16.00-18.00 | 10.00-14.00 |

## Buildex® SST Screw Technical Date

| Test Material | TPI (Threads per Inch) | Pullout | Single Shear | Axial Tensile | Breaking Torque |
|---|---|---|---|---|---|
| 2.50mm purlin<br>5.00mm purlin | 12-14 | 7.00 KN<br>12.60 KN | 8.5 KN | 12.3 KN | 11.5 Nm |

*All values are averages obtained under laboratory conditions and appropriate safety factors should be applied for design purposes. These figures are applicable to Buildex® head marked product only.

| Diameter | Drilling (mm) | Effective Thread (mm) | Washer | Specification | Approval |
|---|---|---|---|---|---|
| 6.8mm/15g | 2.4 | ≤6.0 | 16mm ABW | SST1 12-14x22 HEX/BW | |
| 5.5mm/12g | 6.0<br>6.0<br>6.0<br>6.0<br>6.0<br>12.5 | ≤10<br>≤14<br>≤20<br>≤34<br>25-57<br>≤13 | 16mm ABW | SST 12-14x28 HEX/BW<br>SST 12-14x32 HEX/BW<br>SST 12-14x38 HEX/BW<br>SST 12-14x52 HEX/BW<br>SST 12-14x75 HEX/BW<br>SST5 12-24x38 HEX/BW | |
| 6.3mm/14g | 6.0<br>6.0 | ≤14<br>≤20 | 16mm ABW | SST 14-14x32 HEX/BW<br>SST 14-14x38 HEX/BW | FM<br>FM |

*Above seecifications with 304L material are standing stock, if you need more help, please contact ITW CP China or local distributor.

## Stainless Steel Characteristics

Do not put your roof at risk by using unqualified screws.Screw account for less than 2% of the building composition cost, but bear 80% of the safety responsibility of the building, and it is not easy to maintain and replace. Improper selection of screws will impact building life, but also bring additional maintenance costs.The screws design and service life shall be the same with the building.

Buildex® roof and cladding fasteners and the Climaseal® coating process has been proven to stand the test of time in Australia's harsh marine environment, providing superior corrosion protection. Buildex® pioneered the use of real world outdoor exposure testing for coatings development in 1994 and has continually developed and improved the performance of its coatings, providing superior corrosion protection.

Other screw with rusted

Buildex® self drilling screw

## Project

**Public Building**
- Anyang Sports Center
- Macau Mage Transit Hub
- Beijing Daxing Airport
- Universal Studios Beijing
- Chengdu Tianfu Airport
- Dongan Lake Sports Center
- G60 Kechuang Cloud Corridor
- Lhasa Gonggar Airport
- Qingyuan Olympic Center
- Shenzhen Exhibition Center
- Shanghai Disney Land

Beijing Daxing Airport

Chengdu Tianfu Airport



## Project

**Industrial Building**
- Anhui kaize New Material Co., Ltd
- Anheng Power Technology Witpark
- Mapletree Logistics (Kaifeng)
- Guangdong Taishan Thermal Power Plant
- Guohuapan Power EPC Project
- Hainan Changjiang Husbandry Project
- Heluxue (China) Co., Ltd. Taicang Factory
- Jiulong Paper (Quanzhou) Co., Ltd
- Cleman Technology (Tianjin) Co., Ltd
- Liaoning New Hope Fangshen Project
- Marton Heavy Industries (Taicang) Co., Ltd
- Midea Group Co., Ltd. (Thailand)
- Nike Sports (China) Co., Ltd. (Ganzhou)
- SAIC Volkswagen Automotive Co., Ltd
- Shenyang Dadong BMW factory
- Schlumberger Shanghai Product Center
- Shandong Yingke Medical Technology Co., Ltd
- Shanghai Waigaoqiao Shipyard
- Yingkou Yunken Husbandry Co., Ltd
- Yunnan Shenhuo Aluminum Co., Ltd
- Great Wall Motor Co., Ltd. (Rizhao)
- Great Wall Motor Co., Ltd. (Xushui)
- Guangdong Hailong CSCEC Project
- Zhongqiao Sports Co., Ltd. (Jinjiang)

Guohuapan Power EPC Project

Shenyang Dadong BMW Factory

Yunnan Shenhuo Aluminum Co., Ltd

Anheng Power Technology Witpark

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Established in 1917, Buildex® is one of the wrold leading manufacturer and suppliers of self-drilling screw and fasteners. All Buildex® fasteners are engineered to perform more efficiently than conventional fasteners with trade reliablility, speed of installation and superior protection against corrosion.

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