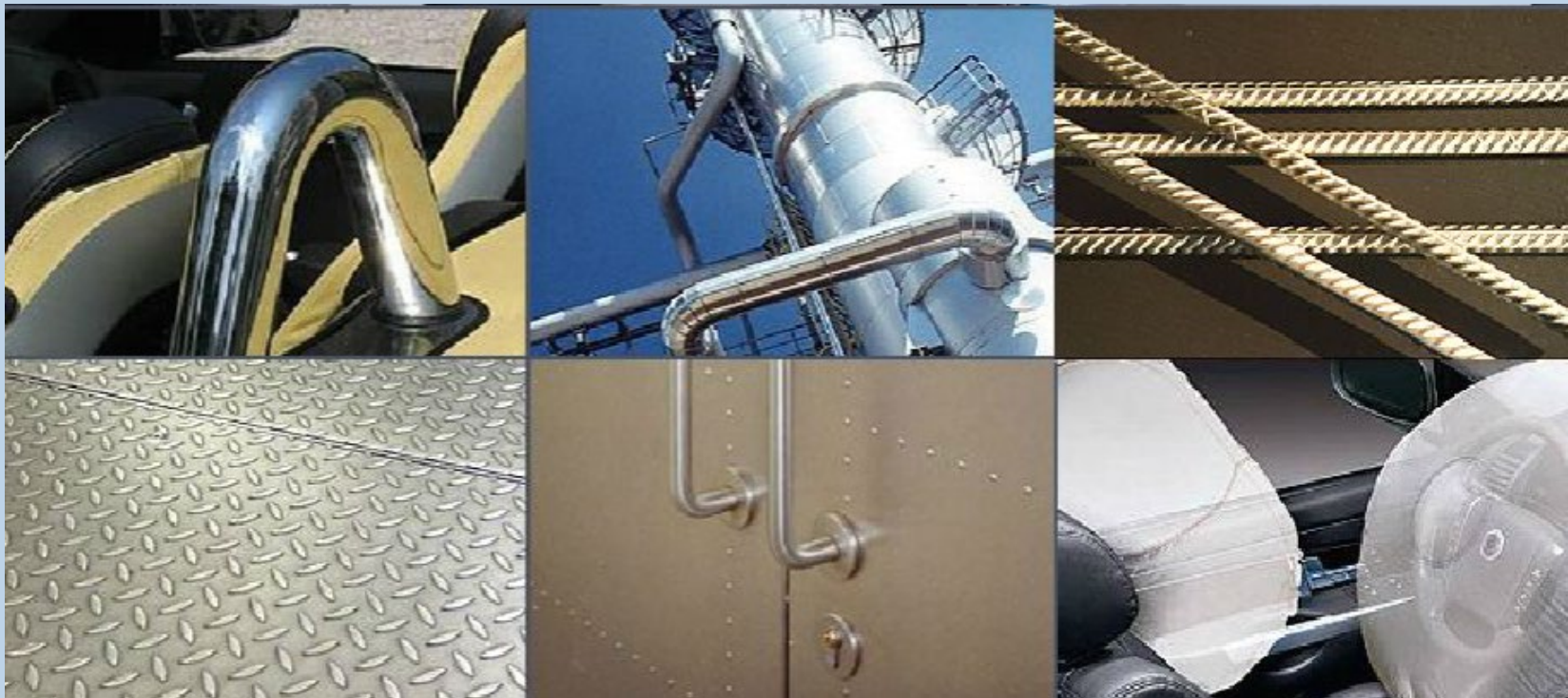


Stainless Steel and Safety



Stainless steel contributes to safety through its:

- Inherent corrosion resistance**
- High mechanical properties**
- Formability and energy absorption potential**

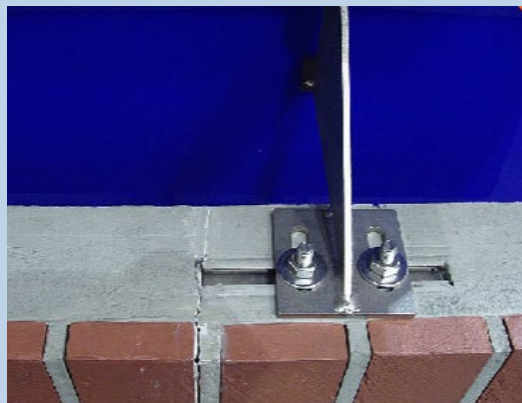
The following images show just some of the safety applications for stainless steel...

Stainless Steel and Safety

Wall anchors and brick supports

Structural parts (such as brick-support systems and wall anchors) are usually inaccessible for regular inspection and cleaning. Corrosion-resistant materials are required to ensure their structural integrity, even after decades of service life. Stainless steel is an ideal material for this purpose. Certain national building codes even make stainless steel compulsory, recommending or even imposing particular grades.

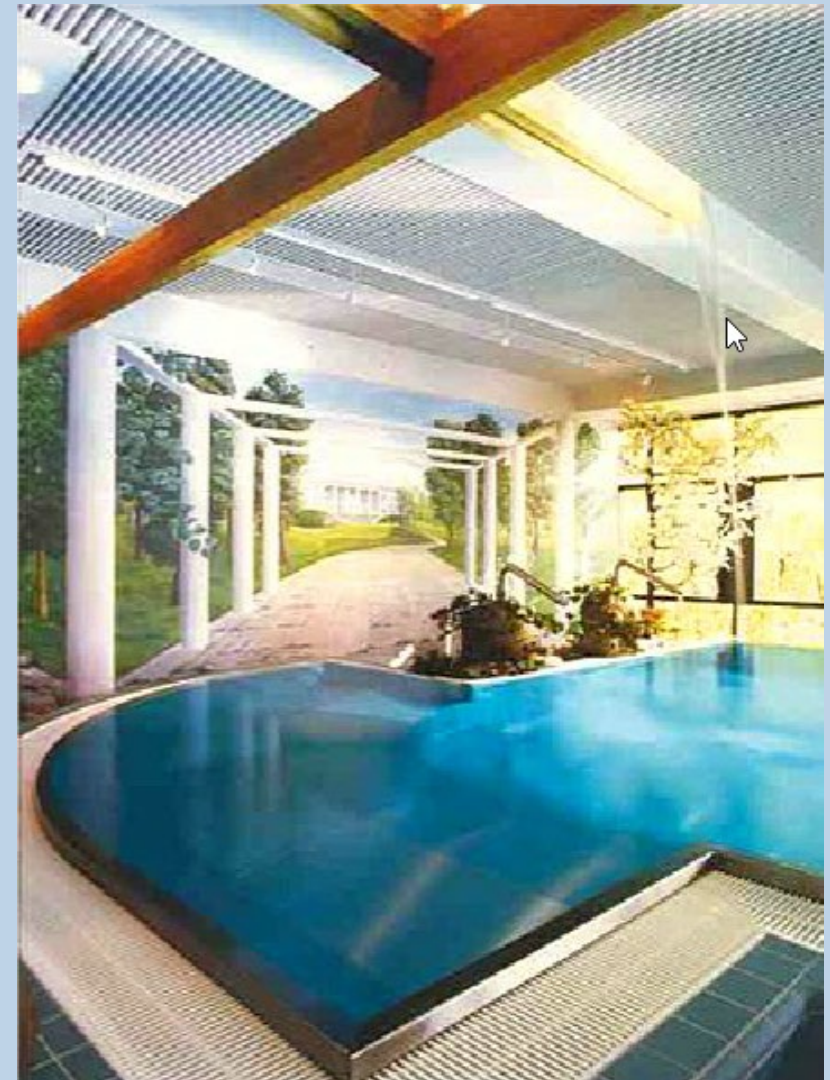
For inaccessible structural parts, or those exposed to moderate levels of chlorides and sulphur dioxide, molybdenum-containing austenitic grades are typically specified. Duplex and highly-alloyed austenitic grades are the material of choice in particularly aggressive environments and where accumulation of corrosive elements is possible (for example, in bridge structures by the sea).



Suspensions in indoor swimming pools

Indoor swimming pools are among the most aggressive environments for metallic materials. Surprisingly, it is not stainless steel linings, jumping boards and attractions, where grade selection is important. Here grades from the AISI 316 (EN 1.4401) family are usually a good choice.

The areas at risk are often away from the pool (for example, fasteners in suspended ceilings). Through repeated condensation of pool water and drying, the chloride concentrations on the steel can be many times higher than in the pool water itself. However, there are even stainless steel grades that are perfectly safe over salt water pools. Duplex grades containing more than 3% molybdenum are especially suitable.



Stainless Steel and Safety

Infrastructure

Arches in coastal environments are exposed to salt corrosion in combination with high wind loads. Stainless steel columns and fasteners ensure long-term safety and functionality.



Stainless Steel and Safety

Structural safety of concrete

The corrosion of reinforcement bar is a classic cause of structural problems in concrete. The selective use of corrosion resistant stainless steel extends the lifespan of a concrete construction considerably.

The first large scale use of stainless steel reinforcing was during the renovation of St. Paul's Cathedral in London during the 1920s. Time has proved this choice was a good decision.



Fasteners

Stainless steel fasteners keep road signs securely in place. Wind loads, corrosive stress and accidental damage require a material of outstanding resistance - stainless steel.

Picture courtesy of Euro Inox



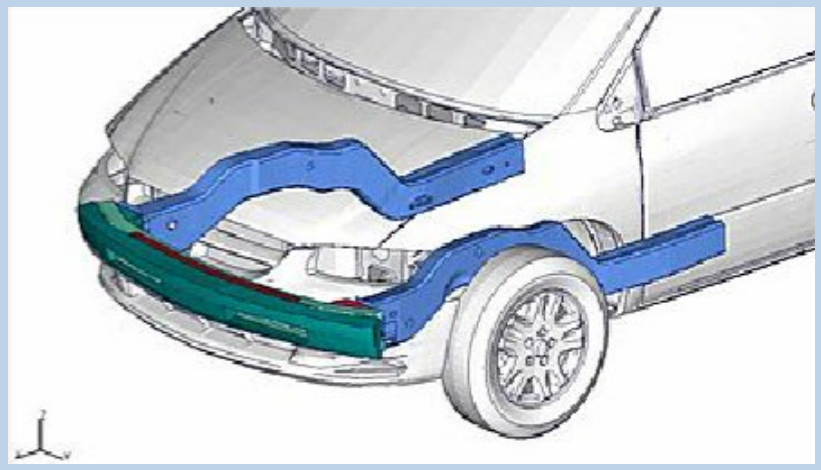


Stainless Steel and Safety

Structural parts of passenger cars

Materials in the crumple zone of a car must absorb as much energy as possible to protect the driver and passengers. Hardly any other engineering material has the same energy-absorption potential as austenitic stainless steel. It work-hardens during deformation, ensuring a progressive increase in its energy absorption capability.

Even in work-hardened condition, stainless steel remains formable. This allows complex parts to be made in one piece, further increasing its strength and durability.





Stainless Steel and Safety

Roll-over beams

In modern convertibles, drivers and passengers can enjoy a similar level of safety as in a saloon car, even if the vehicle turns over. The A-pillar and ultra-high-strength roll-over beams, often made of stainless steel, ensure ample survival space.

Stainless steel adds safety to the pleasure of driving an open car.

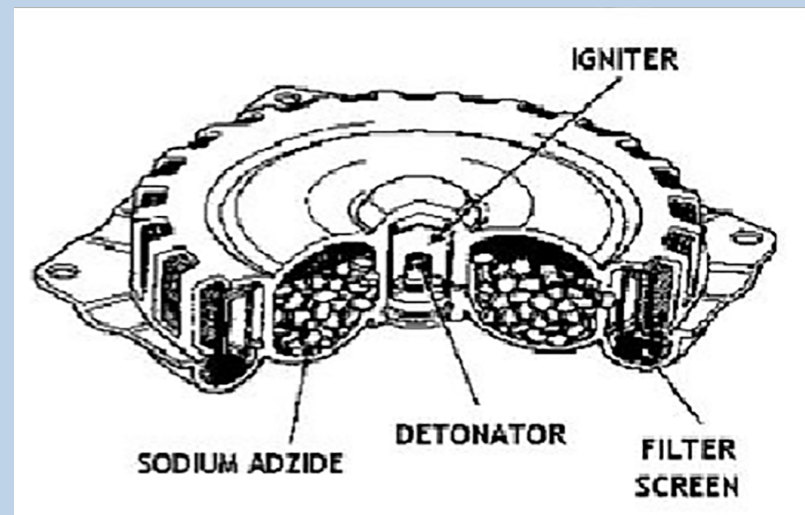


Stainless Steel and Safety

Airbags

In case of a collision, airbags are inflated within as little as 15 thousandths of a second. The gas that fills the airbag is produced by igniting pellets of sodium azide (a rocket fuel). The pellets are enclosed in a small container. As it must withstand temperatures of up to 200°C (around 400°F) and considerable mechanical stress, the container is usually made of stainless steel.

Since the introduction of airbags, stainless steel has helped save tens of thousands of people from severe or fatal injury.





Stainless Steel and Safety

Structures for rail carriages

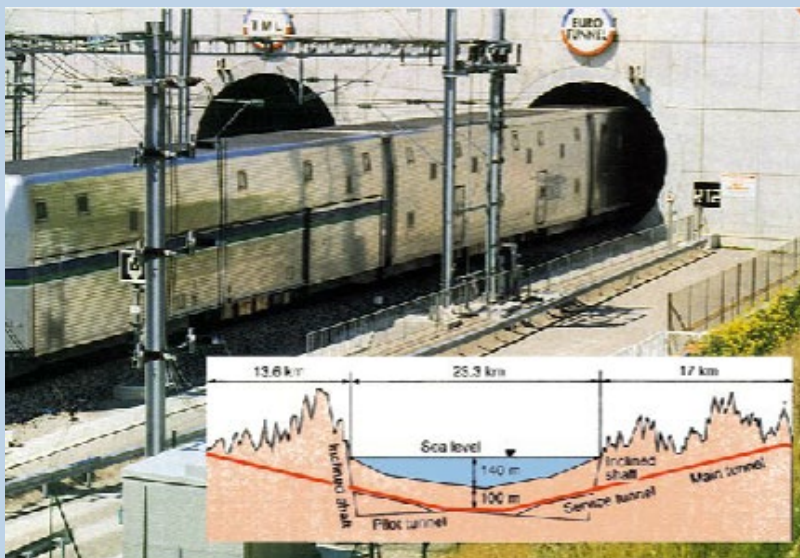
Modern rail carriages are designed to protect passengers in the unlikely case of an accident. Ultra high-strength stainless steel structures provide outstanding energy-absorption capacity. Stainless steel carriages are also lighter than conventional counterparts, saving energy.



Stainless Steel and Safety

Rail carriages for tunnel service

In the Channel Tunnel, which runs under the North Sea between the United Kingdom and France, stainless steel railcars are used. They were chosen for their durability and their fire safety.



Stainless Steel and Safety

Safe transport of hazardous goods

Road tankers for hazardous goods are often made of stainless steel. Stainless steel not only withstands corrosive liquids, it also provides additional safety. Austenitic stainless steels are very formable. In the event of an accident, the tank can stand considerable buckling without breaking.





Stainless Steel and Safety

Fire protection on oil rigs

Duplex stainless steel with a mixed austenitic-ferritic crystalline structure is used for structural components and process equipment on oil rigs. It unites high mechanical properties with resistance to seawater.

In blast walls and emergency escape tunnels, stainless steel can absorb shock energy and is highly fire resistant. Fire escape tunnels have been made in grade AISI 316L (EN 1.4432) and resist a 30 minute jet fire successfully.



Stainless Steel and Safety

Firefighting equipment

Firefighting equipment must remain operational in places where mechanical damage is a risk. Stainless steel, as a high-strength material, protects the equipment well.



Stainless Steel and Safety

Sprinkler systems on board

On cruise ships, fire safety is paramount. Sprinkler ducts are permanently exposed to the salt-laden marine atmosphere. Stainless steel is used to ensure that the sprinkler system works well after many years of service.



Stainless Steel and Safety

Exposed metallic structures

Stainless steel resists fire longer than carbon steel and other metallic materials. If you can give people enough time to escape, external fire protection can often be made redundant. Architects wanting the aesthetics of metals, can leave stainless steel structural parts exposed and make them an architectural feature.



Stainless Steel and Safety

Lifesaving equipment

Stainless steel, due to its corrosion resistance, ensures that life saving equipment remains operational in an aggressive coastal atmosphere. Molybdenum-bearing grade AISI 316 (EN 1.4401) with a smooth surface is the preferred choice. Even if exposed to sea spray, the washing effect of rain prevents an accumulation of salt.



Stainless Steel and Safety

Underground cabling

Electricity breakdowns, especially in the event of a fire, can have disastrous effects in underground railway stations. Stainless steel is used for cable protection and electrical cabinets. It has a low thermal conductivity (in the case of standard grade AISI 304 (EN 1.4301) - $15\text{W}/(\text{m}\cdot\text{K})$). This is only one quarter of the conductivity of carbon steel. Stainless steel consistently outperforms most other metallic and, especially, synthetic materials.

Stainless steel protects safety-critical cables from the effects of a fire much longer than conventional materials can.



Stainless Steel and Safety

Electrical equipment in tunnels

Under the corrosive conditions of tunnels (such as in the Channel Tunnel) splitter boxes and fasteners are made in stainless steel for enhanced safety and durability.



Stainless Steel and Safety

Electrical safety in public areas

In public spaces, stainless steel protects safety-critical electrical equipment from hooliganism and accidental damage. Austenitic stainless steel work-hardens. The faster and the more violently an intruder tries to force the door open, the more stainless steel will resist.

Graffiti can also be removed from the bright and shiny stainless steel with much less effort than from materials with a rougher surface.



Stainless Steel and Safety

Anti-slip floors in the workplace

Stainless steel chequer plate has outstanding anti-slip properties. It is extensively used in chemical plants and the food processing industry.



Stainless Steel and Safety

Anti-slip floors in public spaces

In railway and underground stations, stainless steel anti-slip floors make platforms, staircases and access routes safe to use, even in wet or wintry conditions.



Guidance for the blind

Stainless steel in-floor guidance systems can provide orientation and make life safer for people with impaired vision.



Stainless Steel and Safety

Traffic dividers

Stainless steel bollards efficiently separate the street space and protect pedestrians. In other places they prevent burglars breaking shopfronts by driving their car into the window.



Stainless Steel and Safety

Glare prevention in tunnels

Road tunnels, combining humidity, exhaust gases and sometimes de-icing salts, can be among the most corrosive built-environments. Stainless steel is the answer for cladding and fastening. However, to prevent glare from the lights of other vehicles, the stainless steel is coated. High-quality coatings, such as PVDF, have a minimum design life of 30 years.



Stainless Steel and Safety

Safety for parked cars

Stainless woven-metal is ideal for public car parks. While preventing uncontrolled access, it also forms a visually attractive envelope and allows natural ventilation.



Stainless Steel and Safety

Intrusion protection in the home

In the home, stainless steel woven-metal can also be used for shutters. They ensure both intrusion protection and sun shading while still allowing light to enter.



Stainless Steel and Safety

Burglary protection in shops

Stainless steel defies attempts to break into shops. Its work-hardening properties are the reason why. The more violently it is attacked, the stronger it gets. This makes stainless steel ideal for intrusion protection.



Stainless Steel and Safety

Document safety

To document the cultural heritage of countries for future centuries, key documents are microfilmed and stored in mines. Stored deep underground, the material can even survive a nuclear explosion. Stainless steel grade 304 was an obvious choice for the containers. The containers must endure for at least 500 years.



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