

IMOA
INTERNATIONAL MOLYBDENUM ASSOCIATION
THE VOICE OF THE MOLYBDENUM INDUSTRY

# MOLY REVIEW

01 / 2026


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# Reflections of migration

**In Rotterdam's former docklands, a century-old warehouse has been transformed into a remarkable art museum. At its heart, a double-helix staircase clad in highly reflective stainless steel creates a dramatic contrast with the building's robust industrial structure.**



© Nicole Kinsman

Migration is as old as humanity itself and has many causes: economic hardship, political, religious or ethnic persecution, war, environmental change, and the pursuit of education, freedom, or a better life. It is never only a move from one place to another but a deeply emotional process shaped by hope and anticipation, as well as fear, loss, and farewell. To migrate is to leave behind familiar spaces, languages, and relationships. These journeys leave traces not only in individual lives but also in cities, particularly in harbors and stations.

Rotterdam, with its deep-water port and strategic access to the North Sea and the Rhine, developed into one of the world's most important trading hubs and gateways to Europe. Its port expanded rapidly during the 19th century with industrialization and the growth of international trade. Alongside its commercial rise, Rotterdam became a major point of departure and arrival for people from across Europe and beyond.

What better place for the world's first art museum dedicated to migration than Rotterdam? "Fenix" is housed in a historic harbor warehouse completed in 1923 for the Holland America Line, originally known as the San Francisco Warehouse. Severely damaged during the Second World War and by a fire in 1948, it was rebuilt in the 1950s as two separate structures, named Fenixloods I and Fenixloods II. Decades later, Fenixloods II would become home to the museum.

## Transforming the warehouse

The historic structure of the building was restored by Rotterdam-based Bureau Polderman. Successive alterations were removed, revealing the original concrete frame and its calm rhythm of robust columns and distinctive window openings. Window frames and sliding doors echo the original green finish.

Within the restored structure, the 16,000-square-meter museum extends over two floors. Around 150 artworks and objects explore migration from different perspectives. The ground floor combines dining and cultural spaces with a large central atrium. The upper floor accommodates most of the exhibitions in two spacious halls, illuminated by large north-facing windows and south-facing skylights that provide abundant, glare-free daylight.

In the center of the museum, Chinese firm MAD Architects inserted a striking contemporary intervention into the century-old warehouse: the "Tornado". Part staircase, part sculpture, and part viewing platform, the double-helix structure rises from the atrium, spirals through the roof, and culminates in a panoramic deck overlooking the city and the River Maas.




**Stretching 360 meters along the quay, the San Francisco Warehouse was once a key hub between Rotterdam and destinations across the world.**

## Movement in steel

The two intertwined staircases offer different routes up and down. They repeatedly cross and separate to create a dynamic sequence of movement, encounter, and choice. Structurally, the Tornado is conceived as a spatial truss of round steel tubes clad in stainless steel. Its complex geometry enables dramatic cantilevers of up to 17 meters. A white steel framework within the warehouse supports the Tornado, keeping it entirely independent of the historic building.

**Raw concrete contrasts with mirror-polished stainless steel and white-coated steel, creating a striking interplay of different surfaces.**






Internal stiffeners made of 6–15 mm thick stainless steel reinforce the Tornado's cladding.




An opening in the mirror-polished stainless steel panel allows the Tornado's spatial truss to connect to the supporting steel framework.

The Tornado's cladding consists of 297 individually shaped panels, fabricated from approximately 400 tonnes of Type 316L stainless steel. The material was selected for its corrosion resistance in Rotterdam's marine-influenced atmosphere, as well as its formability, weldability, and suitability for high-quality surface finishes. The panels are formed into complex three-dimensional shapes from 6 mm thick sheets, with 8 mm sheets used for the underside of the viewing platform canopy and 3 mm sheets for the integrated lighting channels. The cold-rolled, skin-passed 2B finish provided the ideal starting point for fabricator CIG Architecture in Groningen, who polished the material to achieve a mirror-like surface. Selected exterior concave surfaces were given a non-directional brushed finish to prevent excessive concentration of solar heat.

With its fluid, seemingly continuous movement, the Tornado echoes the flows of people, goods, and stories that have shaped Rotterdam's harbor. Its intertwined routes transform the act of moving into an architectural experience, while the highly reflective stainless steel dissolves the boundary between structure and surroundings. More than a means of vertical circulation, the Tornado gives architectural form to themes of movement, uncertainty, encounter, and hope that run throughout Fenix. (MH)

The two staircases and a lift lead to the viewing platform 24 meters above ground. Planks of modified wood, known as Kebony, evoke the deck of a ship.



# Molybdenum keeps heat flowing

**Heating and cooling systems depend on water to transfer heat through buildings, factories, and power plants. However, without proper treatment, the circulating water can gradually corrode pipes and equipment, reducing efficiency and shortening service life. Molybdate-based corrosion inhibitors help prevent this deterioration.**



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Closed-loop heating and cooling systems, which circulate the same water continuously through a sealed network of pipes, pumps, boilers, chillers, and heat exchangers, are designed to operate for decades with minimal maintenance. These systems are used wherever heat must be delivered, removed, or recovered efficiently, including heating and cooling buildings, as well as industrial processes in manufacturing plants and power stations. A common treatment to keep these systems running optimally involves molybdenum-based, water-soluble chemicals known as molybdates.

## Why corrosion matters

Water may appear harmless, but it naturally contains substances that promote corrosion. Dissolved oxygen is one of the main drivers of corrosion, while chlorides and microorganisms can accelerate metal attack. Water chemistry, temperature, and flow conditions all influence the rate at which corrosion develops, making proper water treatment essential. Even in closed loops where water never leaves the system, dissolved oxygen, salts, and other contaminants can trigger corrosion unless properly treated.

Corrosion is more than the gradual loss of metal. As steel and other alloys corrode, the resulting corrosion products accumulate inside pipes and heat exchangers. These deposits narrow the flow of water and form an insulating layer that reduces heat transfer. Pumps must work harder to maintain circulation, which increases energy consumption and decreases the heat exchangers' efficiency.

As corrosion continues, localized attack can eventually lead to leaks or complete system failure. For example, a 2018 investigation into the failure of a European bottle manufacturing plant found that corrosion caused extensive leakage in its cooling system, which led to repeated shutdowns and costly repairs. The researchers concluded that a relatively inexpensive corrosion-inhibitor treatment, such as one with molybdates, could likely have prevented the failure.

Because corrosion develops gradually, these problems often go unnoticed until performance has already declined or repairs become necessary. Preventing corrosion is therefore not only about avoiding leaks, but also about maintaining efficient heat transfer, reducing operating costs, and extending the service life of valuable equipment.

› **Corrosion products and sediment buildup inside a pipe.**



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## Building a barrier with molybdates

One of the most widely used methods of protecting closed-loop heating and cooling systems is treatment with molybdate corrosion inhibitors. These water-soluble compounds, produced from molybdenum, help form protective films on iron, aluminum, and copper-based metals. For iron-based alloys such as steel, dissolved iron ions and oxygen react with molybdate at the metal surface to reinforce the naturally occurring oxide layer, creating a stable molybdenum-enriched passive film. The resulting transparent passive film limits further metal dissolution and protects the underlying metal from continued corrosion. Molybdates do not eliminate corrosion entirely but suppress it enough to allow closed-loop systems to operate efficiently throughout their intended service lives. Unlike many corrosion inhibitors, molybdates remain stable at elevated temperatures and do not readily break down in chlorinated systems, making them particularly well suited to industrial cooling systems where localized hot spots and chlorination are common.

Molybdates became widely adopted during the 1970s as chromate-based inhibitors were phased out because of their carcinogenicity and the associated environmental and occupational health concerns. In comparison, molybdates provide effective corrosion protection while posing a comparatively low toxicity risk, making them a preferred choice for many closed-loop systems. Today, the largest application of molybdates is in industrial cooling water treatment for power plants and other industrial facilities, although they are equally effective in commercial buildings and domestic heating systems. Their use is now so widespread that simple molybdenum test strips are routinely used by maintenance personnel to verify that inhibitor concentrations remain within the recommended range.

# Compounding benefits

In practice, molybdate inhibitors are rarely used on their own. Although they can be used as a stand-alone treatment, the relatively high concentrations required for effective corrosion protection – typically around 200 to 300 milligrams per liter – make this approach less economical. Commercial water treatment products are therefore often supplied as pre-formulated blends that combine molybdates with other complementary additives. Nitrites work synergistically with molybdates to improve corrosion resistance, while azoles such as benzotriazole or tolyltriazole protect copper alloys. Phosphonates help control mineral scale, and other additives stabilize pH or suppress microbiological growth. By addressing several corrosion and water-quality challenges simultaneously, these formulations provide broader protection.

The benefits of molybdate treatment extend well beyond preventing corrosion; energy savings can also be significant. According to a study by the UK's Carbon Trust, cleaning and properly treating a dirty heating system can reduce natural gas consumption by up to 15%. This equates to avoiding around 90 kilograms of carbon dioxide emissions per home each year.

Across the millions of heating and cooling systems that rely on molybdate inhibitors, these energy savings translate into significant reductions in resource consumption and greenhouse gas emissions. It is another example of how small amounts of molybdenum contribute to sustainability by conserving energy and extending the life of essential infrastructure.




**Sodium molybdate is a water-soluble molybdenum compound widely used in corrosion-inhibitor formulations.**

**The narrow flow passages of plate heat exchangers can accumulate corrosion products, restricting water flow and reducing heat-transfer efficiency. Molybdate inhibitors help limit this buildup by suppressing corrosion.**



# Duplex bridge in a box

A dated concrete footbridge crossing a railway in the UK presented a familiar accessibility problem: passengers unable to use the stairs faced a lengthy detour to cross the tracks. Replacing it with an accessible bridge with elevators would normally involve months of onsite construction. A radically different approach reduced the most disruptive part of the work to just 36 hours.




© Climax Molybdenum

Britain's railway is in desperate need of modernization. Saddled with a heavily utilized existing network that often dates to the Victorian era, it relies on a construction model that has seen little change in 50 years. Its operator, Network Rail, has ambitious targets for public accessibility and sustainability, which it must pursue at a time when funds are limited. All told, a complex picture to resolve. Even modest improvements, such as upgrades to station footbridges, are costly and frequently beset by overruns. It is within this context that a new approach to railway footbridge construction emerged.

## From project to product

The typical solution for rail station bridges is a painted carbon steel truss, a design more or less unchanged since the 1970s. While this approach is structurally efficient and requires minimal initial outlay, it creates a future liability of closing the bridge for costly repainting. The costs of repainting are driven by the logistics of working in a live rail environment, which necessitates suspended scaffolding, encapsulation to prevent environmental contamination, and even scheduled rail line closures to ensure worker safety. With major maintenance interventions typically required every 25 years, this operational expenditure can vastly exceed initial costs.

Conventional construction methods also demand a prolonged and often disruptive site presence. This period can have significant effects on passengers, affecting scheduled train services and restricting access to boarding platforms. Total site time for a complete footbridge project often takes eight months or more. The installation of a standard elevator shaft alone can require up to 26 weeks of onsite work. And when all is said and done, the average project timeline for a typical bridge is four years.

**Bead blasting gives the stainless steel cladding a clean, uniform matte finish that reduces glare and is easy to maintain.**







**Elevators at either end of the AVA footbridge provide accessible passage across the railway.**

The AVA bridge concept provides a major rethink, shifting from a project-based philosophy to a product-based one. The concept originates from the Network Rail Footbridge Design Ideas Competition, organized by the Royal Institute of British Architects (RIBA) in 2018. Architectural firm Hawkins\Brown proposed a modular "kit of parts" method of construction that could be configured for a range of sites. It would be mostly assembled offsite using lighter materials than traditional approaches, dramatically reducing onsite construction time.

While falling short of winning the top prize, the idea provoked interest and was developed further through funding from the Transport Infrastructure Efficiency Strategy (TIES) Living Lab. The outcome was a new consortium bringing together the client, designers, contractor, and fabricator. Network Rail, Expedition Engineering, and Hawkins\Brown led the design, working with contractor Walker Construction and fabricator McNealy Brown. ARX designed the lift system.

AVA's product-based approach relies on material and structural choices that reduce onsite processes, particularly painting and concrete work. Molybdenum-containing duplex stainless steel is a key aspect of the design. The lean duplex alloy S32101, which contains about 0.2% molybdenum, was used for both the full-size prototype and the first operational bridge. It provides greater yield strength (450 MPa) than the carbon steel typically used in bridge construction (355 MPa). The higher design strength allows for a lighter structure and reduced demands on the foundations. The material requires no coatings during its







**Prototype components illustrate the AVA bridge's construction method: stainless steel plates are folded into structural sections (left), which are assembled using preloaded bolts rather than welding (right).**

120-year design life, removing a significant component of maintenance costs. For more demanding environments, such as coastal locations, the design could instead use the more corrosion-resistant duplex grade 2205, containing around 3% molybdenum.

## Design details

The bridge uses a novel modular structure consisting of 1.2-meter sections, which are folded from 6-millimeter stainless steel plate. The bridge span can be configured with different numbers of modules to suit the requirements of a particular station. The modules are joined using a lapped-plate detail to create bridge spans of up to 20 meters. The module dimensions were chosen to suit standard fabrication equipment. Using 6-millimeter plate and a maximum sheet size of 1.5 by 3 meters keeps fabrication within the capacity of widely available laser cutting and brake press equipment. The resulting modules are light enough to be assembled in the factory using relatively small lifting equipment before being transported to site.

**AVA staircases being assembled in the fabrication workshop, reducing the work required onsite.**




To facilitate both assembly and disassembly, the design avoids onsite welding and uses only bolted connections. These connections rely heavily on A4 bolts, which are made from Type 316L stainless steel with a minimum molybdenum content of 2.5%. These bolts have similar mechanical properties to conventional 10.9 structural carbon steel bolts. Almost 13,000 of them, altogether weighing 1.7 tonnes, were provided by Bumax for the first operational bridge. The bolts were designed as preloaded assemblies to ensure no slip occurs in service and prevent loosening due to vibration. They were pre-lubricated and tightened following a carefully specified four-stage process to prevent galling, a form of wear in which the mating surfaces of stainless steel fasteners can stick together during tightening. The connection design followed guidance in the then-draft Eurocode prEN 1993-1-4, as no standard for preloaded stainless steel bolts had yet been issued. The recommendations were based on results from the SIROCO research project on slip-resistent connections, co-funded by the European Union and industry partners, including IMOA.

## Significantly less disruption

The high degree of preassembly involved in the AVA concept means onsite construction can be reduced from a typical 35–45 weeks to around 15 weeks. The project timeline also decreases by almost 60%, from

the typical four years down to 20 months. Elements such as the main bridge span and stair assemblies can be transported to site and craned into place within 36 hours, requiring only a single possession, a scheduled period when the railway is closed to train traffic so work can be carried out safely.

The use of shallow lift pits minimizes excavation, reducing site preparation time and the risk of encountering buried utilities or unexpected ground conditions. A specialist “configurator” computer program, which helps tailor the design to specific site needs, cuts the time required for planning and approvals.

The modular bridge product philosophy also includes the integration of mechanical, electrical, and plumbing systems. The AVA lift modules are pre-commissioned and tested in a factory, an approach that reduces lift installation time from up to 26 weeks down to just two. Service runs for power and data are concealed behind hinged panels that can be accessed from deck level, allowing for convenient, safe future maintenance. The bridge deck is made of a non-slip aluminum surface with a service life of 60 years or more, another pragmatic choice that is easily replaceable and eliminates concrete work.

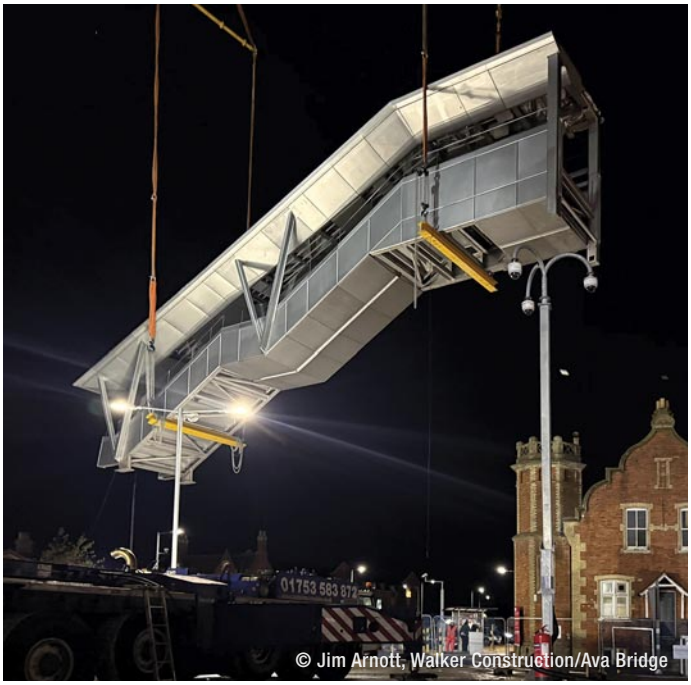
## Stowmarket to the world

The first operational AVA bridge was installed at Stowmarket, Suffolk, in late 2025. Network Rail approved the AVA design for widespread adoption. Its Footbridges & Subways Design Manual compares AVA with other standard station designs across criteria including passenger experience, safety, maintenance, buildability, cost, and sustainability. AVA achieves the highest overall score in this comparison. Its sustainability credentials include an extended design life and high potential for reuse through the modular design approach: if no longer needed, modules could be reused in bridges elsewhere.

The cost comparison is equally striking. Despite the higher material cost of duplex stainless steel compared with carbon steel, AVA has the lowest estimated initial capital cost of the four covered station footbridge designs in the comparison. Its minimal maintenance requirements deliver additional savings over its 120-year design life. The team now is seeking to refine the product to bring down costs further. The AVA Consortium maintains that a structured order portfolio is key to achieving further cost reductions to the scheme by unlocking economies of scale and spreading upfront manufacturing and design costs across multiple projects.

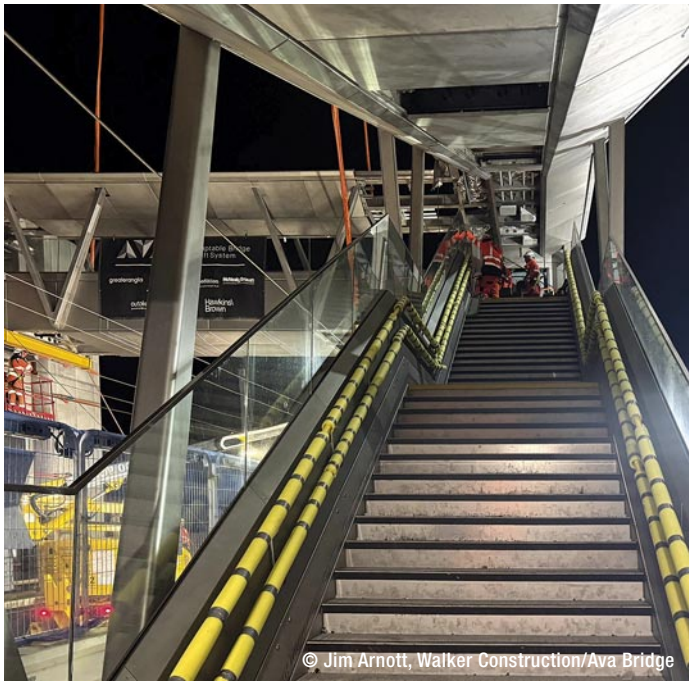
The AVA bridge at Stowmarket illustrates how manufacturing principles, such as standardization, offsite preassembly, and using advanced materials, offer a compelling approach for railway footbridge construction. While the concept is still early in development, it highlights the potential of treating bridges as adaptable products rather than bespoke construction projects. With it comes a vision for a more efficient modernization of railway stations, both in Britain and abroad. (MC)

**The prefabricated staircase being craned into position at Stowmarket station.**



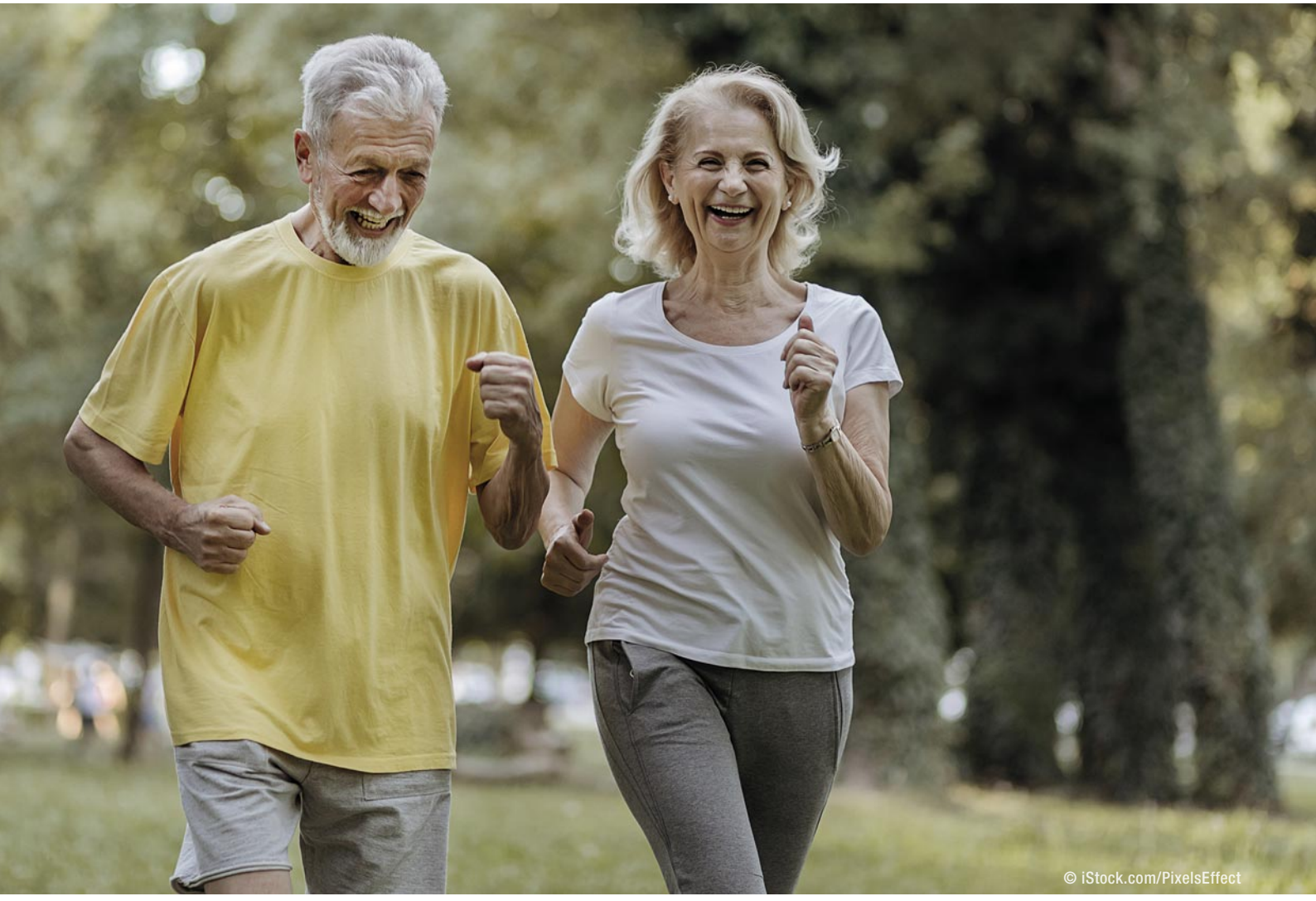
© Jim Arnott, Walker Construction/Ava Bridge

**The installed staircase, with its stainless steel structure, glass balustrades, and integrated handrails.**


© Jim Arnott, Walker Construction/Ava Bridge

# The stent (r)evolution

**When a blocked artery causes a heart attack, a tiny metal tube called a stent can restore blood flow. As these life-saving stents have become ever finer and more sophisticated, their materials have evolved too. Molybdenum has played a role throughout this evolution, from early stainless steel designs to some of today's most advanced stents.**



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Heart disease is the world's leading cause of death, accounting for one in three lives lost each year. The heart pumps around 7,500 liters of blood through the body each day and depends on its coronary arteries for its own blood supply. These arteries can become narrowed by the buildup of fatty deposits, known as plaque. If the plaque ruptures, a blood clot can form and partially or completely block the artery, cutting off the flow of blood to the heart muscle. If blood flow is not restored quickly, the resulting damage to the muscle can lead to a heart attack.

## Placing a stent

When a significant narrowing or blockage of an artery is suspected, a procedure called coronary angiography can reveal its location and severity. A catheter, usually inserted at the wrist or groin, delivers an iodine-based contrast agent that is visible under X-ray, allowing doctors to pinpoint the obstruction. If the artery needs to be reopened, a thin guidewire is passed through the narrowed area and a balloon catheter carrying the collapsed stent is advanced along the guidewire. When the balloon is inflated, it pushes the plaque against the artery wall and expands the stent, restoring the vessel to a sufficient diameter for blood to flow. The balloon is then deflated and removed, while the stent remains in place to support the artery.

## The evolution of stenting

A major breakthrough in treating narrowed coronary arteries came in Zürich in 1977, when cardiologist Andreas Grüntzig performed the first successful coronary balloon angioplasty procedure on a 38-year-old patient. Instead of opening the chest, Grüntzig guided a catheter carrying a small balloon through the patient's blood vessels to the narrowed artery. When inflated, the balloon pressed the plaque against the artery wall and restored blood flow. This procedure revolutionized treatment, but its benefits were not always lasting; after balloon angioplasty alone, the artery could recoil or gradually narrow again, a process known as restenosis.

The next breakthrough came in 1986, when French cardiologist Jacques Puel and Swiss cardiologist Ulrich Sigwart implanted the first coronary stents. Unlike balloon angioplasty alone, the stent remained in the artery after the balloon was withdrawn, holding it open and reducing the frequency of restenosis by around half. Early stents were made primarily from Type 316L stainless steel.

Yet stenting presents another challenge. Implanting the stent injures the inner lining of the artery, and the resulting healing response can cause excessive tissue growth within the stent, again narrowing the passage. Drug-eluting stents were developed to reduce this risk. Their surface carries a drug that inhibits excessive cell proliferation and is gradually released into the surrounding tissue. Today, drug-eluting stents have largely replaced bare-metal stents in coronary interventions.

**Sequence of stent placement**



Closed stent positioned in the narrowed artery.



Stent expanded with a balloon catheter.



Expanded stent remains in place, allowing blood to flow freely.

Coronary stents are typically 2.25 – 4 mm in diameter and 8 – 38 mm long, while strut thickness has decreased from around 120 – 140 µm in earlier stents to as little as 60 µm today.

Illustration © iStock.com/PhonlamaiPhoto

## Why thinner struts matter

A stent must balance competing requirements: it needs to be strong enough to hold the artery open yet be flexible and thin enough to travel through narrow and often tortuous blood vessels. To achieve this balance, many stents are manufactured by precision laser cutting an intricate pattern into a little metal tube, leaving a flexible mesh of slender struts, some finer than a human hair.

The thinner these individual struts can be made, the more flexible the stent becomes, which makes it easier to insert. Thinner struts also cause less disturbance to blood flow and less injury to the vessel wall, reducing the risk of restenosis and clot reformation. But reducing strut thickness places greater demands on the material; it must provide the required strength with less metal, while the increasingly fine structure must still be clearly visible under X-ray during placement. These competing requirements have driven the development of ever more sophisticated stent alloys and designs.

# Ever more effective alloys

Type 316L stainless steel was the material of choice for the first generations of coronary stents and is still used today. Its combination of strength, ductility, biocompatibility, and corrosion resistance makes it well suited to the demanding environment inside the human body. Its approximately 2.5% molybdenum content provides improved resistance to localized corrosion. The relatively modest strength of Type 316L, however, limited how far strut thickness could be reduced, encouraging the adoption of stronger alloys that could provide the required mechanical performance with less metal.

Two cobalt-based alloys have played important roles in coronary stents: L605, a cobalt-chromium-tungsten alloy containing essentially no molybdenum, and MP35N, a cobalt-nickel-chromium alloy containing around 10% molybdenum. Their higher strength enabled thinner struts than Type 316L while maintaining sufficient radial strength.

L605 remains widely used in current drug-eluting stents. MP35N was used in several generations of coronary stents and continues today in combination with other metals. For example, one modern stent uses a wire with an outer layer of molybdenum-containing MP35N surrounding a dense platinum-iridium core, combining the strength of the cobalt alloy with improved X-ray visibility.

Another approach is platinum-chromium (Pt-Cr), which combines high strength with good X-ray visibility. Platinum makes the stent easier to see under X-ray, while around 2.6% molybdenum enhances corrosion resistance and strength. Pt-Cr is used in major contemporary drug-eluting stent platforms.

**A physician views the catheter as it moves through the vessels on a screen.**




© Mehmet Çetin / Alamy



© Medtronic

**Illustration of a modern coronary stent mounted on a balloon catheter before deployment.**

# A stent designed to disappear?

Stents support reopened arteries while they heal, but after recovery, the metal structure may no longer be necessary and can contribute to late complications. This has prompted research into bioresorbable materials that provide temporary support before gradually degrading in the body. One candidate is Mo-14Re, an alloy containing 86% molybdenum and 14% rhenium. Early research has shown a promising combination of mechanical properties and controlled degradation, making it a potential material for future bioresorbable stents.

From established stainless steels to high-strength cobalt alloys and newer platinum-containing designs, advances in materials have enabled ever finer stents. Molybdenum contributes to several of today's stent materials and may play an even greater role in future designs.

In less than half a century, coronary intervention has progressed from Grüntzig's pioneering balloon procedure to today's highly sophisticated drug-eluting stents. His breakthrough showed that a blocked coronary artery could be treated through a tiny incision rather than major surgery, while successive generations of stents have made treatment more durable, reducing restenosis and the need for repeat procedures. However, even the most sophisticated stent treats the consequences rather than the causes of heart disease. With up to 80% of heart disease considered preventable, a healthy diet, regular exercise, avoiding smoking, and other preventive measures remain as important as advances in treatment. After all, no matter how effective stents become, the best option is always a healthy artery. (TP)

# IMOA news

## Remembering Dr Philip Mitchell

With profound sadness we share the passing of Dr Philip Mitchell, a truly special person to IMOA and our longest-serving technical expert. A Leverhulme Emeritus Professor at the University of Reading, Philip brought an unparalleled breadth and depth of expertise in molybdenum chemistry. Having worked with the Association for nearly four decades, almost from its inception in 1989, Philip's contributions to IMOA were invaluable, always delivered in his uniquely good humored and engaging manner. His scientific insight was instrumental to advancing IMOA's work. Philip's loss will be keenly felt across the Association.



## Structural stainless steel webinars available online

IMOA partnered with Southeast University in Nanjing to present a webinar series on structural stainless steel for structural engineers. Two webinars are available on IMOA's YouTube channel, with Chinese-subtitled versions on IMOA's Chinese website.

- Part 1: *Introduction to the use of stainless steel in construction* & Part 2: *Design of structural stainless steel – principles and Eurocode rules:* Nancy Baddoo and Dr Francisco Meza of the Steel Construction Institute cover applications, properties and alloy selection, followed by structural design to Eurocode rules.
- *Resilient design of structural stainless steel:* Nancy Baddoo, Dr Francisco Meza and Dr Baofeng Zheng of Southeast University explore fire and seismic design, including US and Chinese approaches, and sustainability.

## Updated Molybdenum Profile for Supply Chain Due Diligence and Responsible Sourcing published

TDi Sustainability has published an updated *Molybdenum Profile for Supply Chain Due Diligence and Responsible Sourcing*, building on the first edition developed in 2021. The update is timely, reflecting molybdenum's important role in renewable energy technologies, including solar and wind systems. It also highlights the growing importance of responsible sourcing and resilient supply chains as deployment of sustainable energy infrastructure and high-performance technologies accelerates.

The Molybdenum Profile gives a detailed overview of the molybdenum supply chain with a focus on environmental, social, and governance (ESG) considerations. It examines the ESG implications for industry stakeholders and outlines the current responsible sourcing standards, certifications, and initiatives relevant to molybdenum.

Developed by TDi Sustainability in collaboration with the International Molybdenum Association (IMOA), this resource is designed to support materials specifiers, steelmakers, and standards-setters, such as ResponsibleSteel and The Copper Mark, in making informed decisions about responsible sourcing.



## New members ratified at IMOA's 38th Annual General Meeting

Our most well-attended AGM ever took place 9–10 September, 2026 in Salt Lake City, US. During the proceedings, IMOA ratified and welcomed the following three members:

- **Luonan County Jiulong Mining Co., Ltd,** a primary molybdenum mining company based in Shaanxi Province, China.
- **AMG Critical Minerals N.V.,** a global recycler specializing in the recycling and processing of spent HDS catalysts.
- **Trafigura Pte. Ltd,** a global commodities trading company.

We now have 81 members from mining, processing, recycling, end users, assaying, and logistics providers across the globe.

## Molybdenum and steel symposium in Xi'an, China

Organized by IMOA member Jinduicheng Molybdenum Group and the Chinese Society for Metals, with support from IMOA, the 4th International Symposium on Molybdenum (Tungsten and Vanadium) and Steel took place in Xi'an, China, on 19–21 May, 2026. More than 500 Chinese and international experts, academics, and industry representatives, including senior executives from major steel producers, gathered to discuss innovation and developments in molybdenum, tungsten, and vanadium and their applications in steel.




IMOA Technical Director Dr Nicole Kinsman presented *Strength and durability – the expanding landscape of duplex stainless steel*. IMOA consultant Dr Gaetano Ronchi also contributed to the program, delivering a presentation on *The unique role of molybdenum in steel*.

## Welcome to new IMOA Health, Safety, and Environment Executive

Dr Ruth Danzeisen joined IMOA's HSE team in April 2026, bringing over 20 years of toxicology experience. She is working closely with current HSE Executive Sandra Carey, who will retire at the end of the year. Ruth has previously served as Corporate Toxicology Director at Albemarle Corporation, Principal Toxicologist at the Cobalt Institute, and Assistant Director of the HSE Development Program at the International Copper Association. "It is very exciting to be given the opportunity to join the IMOA team," Ruth commented. "I am returning to my toxicological roots, the transition metals. My experience in the metals association work, combined with my practice in industry, is a solid foundation to take on and continue the great work Sandra and her team have done."



**Publisher:**
International Molybdenum Association
454-458 Chiswick High Road
London W4 5TT, United Kingdom
www.imoa.info
info@imoa.info
+44 20 8747 6120

**Editor in Chief:**
Nicole Kinsman

**Managing Editor:**
Karlee Williston

**Contributing Writers:**
Martina Helzel (MH), Max Cooper (MC), Thierry Pierard (TP).

**Layout and Design:**
circa drei, Martina Helzel

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Atrium of the Fenix museum in Rotterdam
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