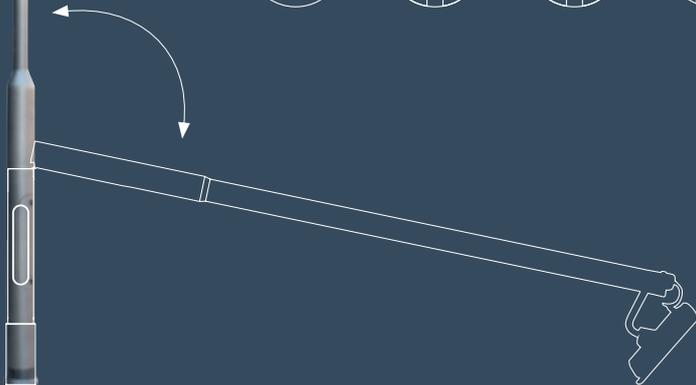
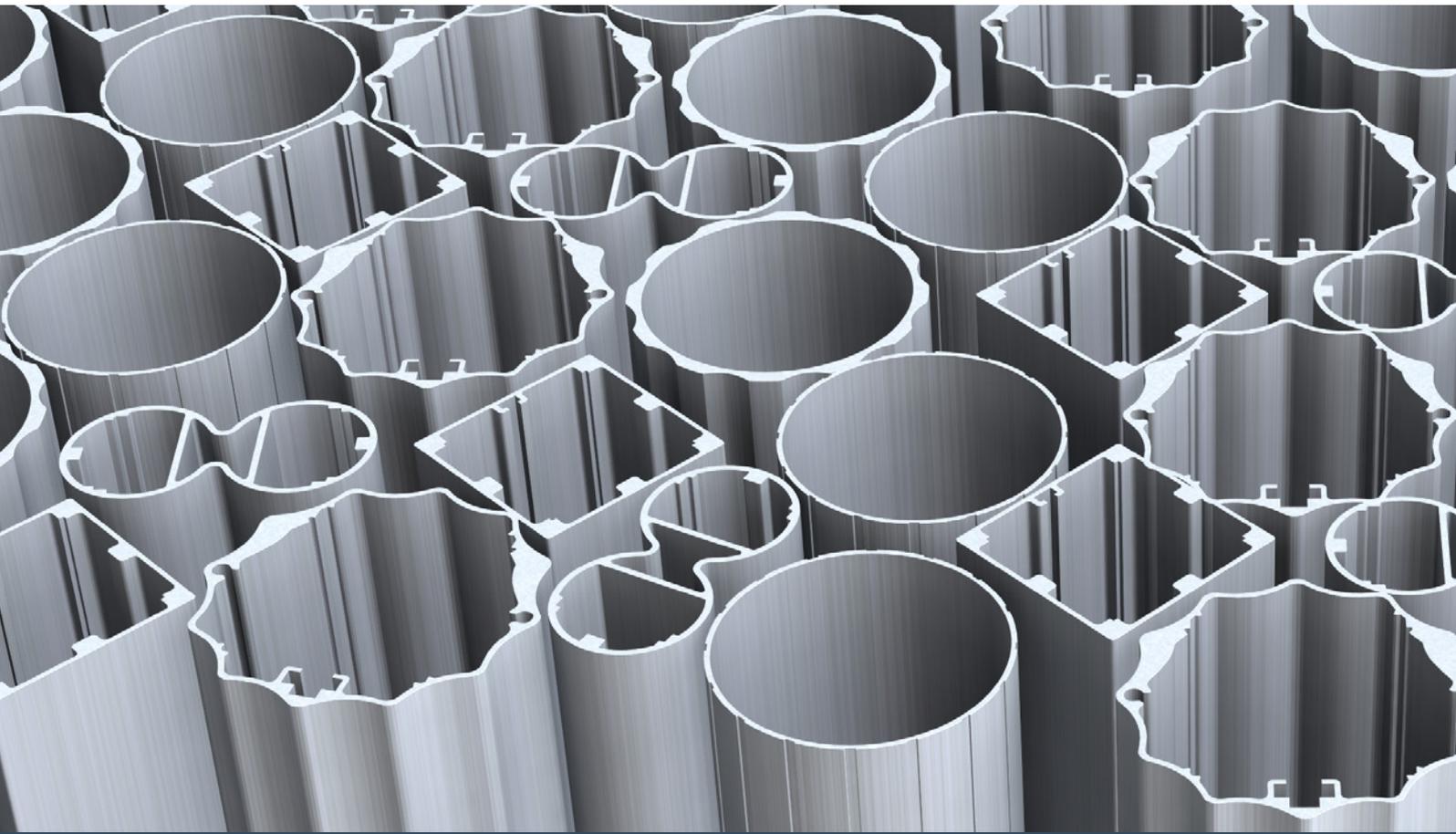




Innovative
aluminium solutions
by Pole Products



hydro.com/poleproducts



Content

Page 2	Introduction
Page 4	Reliable partner
Page 6	Aluminium, the unique properties
Page 8	Aluminium, the circular metal
Page 10	The technical characteristics of our products
Page 12	Passive Safety saves lives
Page 14	In-house product development
Page 16	Street light poles
Page 18	Custom made light poles
Page 20	Solar poles
Page 22	Smart poles create Smart Cities
Page 24	Raise & Lower poles
Page 26	Traffic Regulation Installations
Page 28	Traffic Signal Poles
Page 30	Traffic Sign Posts
Page 32	Surface treatment
Page 34	Solutions for different situations
Page 36	Worldwide projects

Introduction

Everyone knows them; light poles, traffic regulation installations, traffic sign posts... We see them around us as part of the streetscape and the design of public space. They are indispensable in our daily lives. Pole Products offers aluminium solutions for public infrastructure projects. But what makes our solutions so special?



Infinite aluminium, infinite opportunities

Since the 1960s, Pole Products has been active in developing sustainable solutions for public spaces, such as light poles, flagpoles and solutions for traffic regulation systems. This history of experience, makes Pole Products a reliable partner in the markets in which we operate.

We are committed to strengthening the viability of our customers and communities, shaping a sustainable future through innovative aluminium solutions. Keeping in mind your specific needs, we would like to contribute toward making your cities more beautiful and the development of your urban heritage.

Technical expertise, passion for aluminium, eye for design, attention to the environment and safety, are the foundation of our products. That makes our solutions so special!

This brochure is an introduction to our organization and capabilities. It also gives more insight into the material aluminium and it will explain why the material of the future fits perfectly well within a policy of sustainable procurement.

Finally you experience how we, together with you, convert ideas into sustainable, beautiful and smart aluminium solutions.

If, after reading this brochure, you have questions, our team of enthusiastic professionals is there for you.



Reliable partner

“Achieving a close working relationship with customers to provide them with aluminium solutions that have added value.” That is what it is all about at Hydro.



ISO 9001



ISO 14001



CE certified - EN 40



CE certified - EN 12899



CE certified - EN 1090-3

Safe and responsible operations is our top priority

An instinct to commercialize

A healthy society needs healthy businesses. We create partnerships to better meet our customers' needs, always looking for the commercial solution helping our customers and the world move forward.

Building businesses that matter

Since Hydro began, we have built businesses that helped sustain and nurture the world around us, making a difference by creating fundamental value – whether financial, environmental or societal.

Norsk Hydro

Hydro is a fully integrated aluminium company with 35,000 employees in 40 countries on all continents, combining local expertise, worldwide reach and unmatched capabilities in R&D.

In addition to production of primary aluminium, rolled and extruded products and recycling, Hydro also extracts bauxite, refines alumina and generates energy to be the only 360° company of the global aluminium industry.

Pole Products

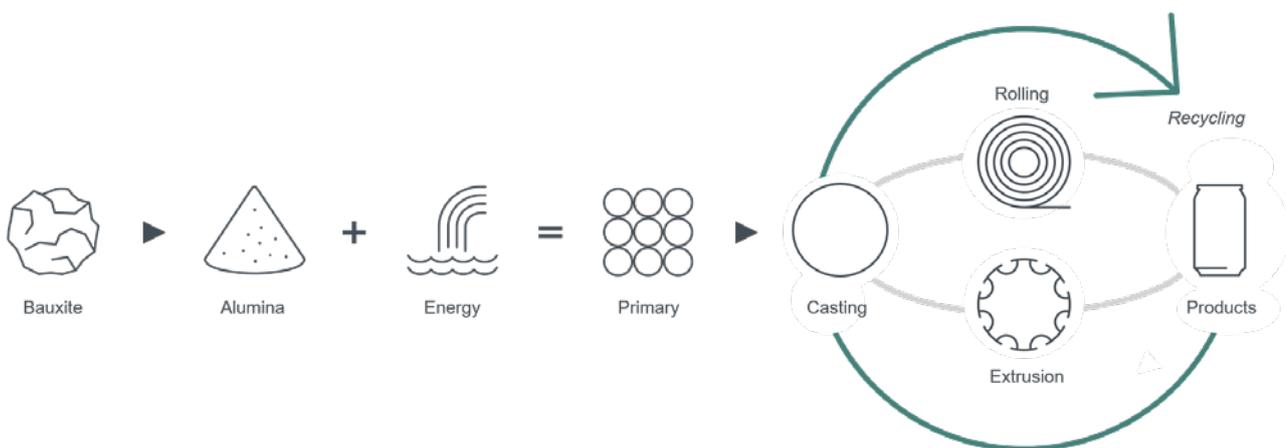
Pole Products, part of Norsk Hydro, is the leading aluminium light pole manufacturer with a production location in the Netherlands and local representation in over 20 countries. Our products are CE certified in accordance with the EN 40 as well as the EN 12899 standard and EN 1090-3. Pole Products runs a Quality and Environmental Management system in accordance with the requirements of ISO 9001 and ISO 14001.

Safe and responsible operations

We provide all employees with a safe and healthy workplace, with the aim of avoiding injuries and incidents. We continuously try to reduce the environmental impact of our activities, and to optimize the use of raw materials. We use our innovation and technical resources to find economical solutions that fit within our sustainability policy.

Customer first

We see the world through our customers' eyes, anticipate their needs and move fast locally and globally to deliver excellence. With our own supplier Hydro Extrusion BV, which is also located in Drunen, Pole Products has flexibility and can optimally guarantee quality. These are all elements which contribute to customer satisfaction.



Aluminium, the unique properties

Did you know that after iron, aluminium is by far the most widely used metal in the world? The number of applications in which aluminium is selected is increasing continuously.



The natural oxide layer of aluminium is dense and provides excellent corrosion protection

Aluminium possesses a unique combination of attractive properties. Many of these are extremely important in our efforts to create a more sustainable society. The aluminium properties that play an important role for our poles are:

- Low weight
- High strength
- Superior malleability
- Easy machining
- Excellent corrosion resistance
- Highly sustainable

Low weight

The mass of aluminium is much lower than traditional materials, resulting in fewer kilos of material needed to manufacture an aluminium pole. The weight saving offers many advantages such as faster installation, less fuel consumption during transportation as well as ergonomic advantages.

Superior malleability

The excellent malleability of aluminium in both hot and cold state is utilized at bending and by other deforming treatments. Therefore, aluminium offers countless possibilities for decorative applications in public spaces.



Easy machining

Aluminium is easy to handle in most machining methods: milling, drilling, cutting, bending, punching, welding, etc. An additional advantage is that the energy consumption during the machining process is relatively low.

Excellent corrosion resistance

When aluminium reacts with the oxygen in the air, a very thin layer of oxide is formed that is just a few hundredths of a micron thick (1 micron or $1\mu\text{m}$ is equal to one thousandth of a millimeter). This layer is dense and provides excellent corrosion protection. If damaged mechanically, the aluminium oxide layer repairs itself immediately.

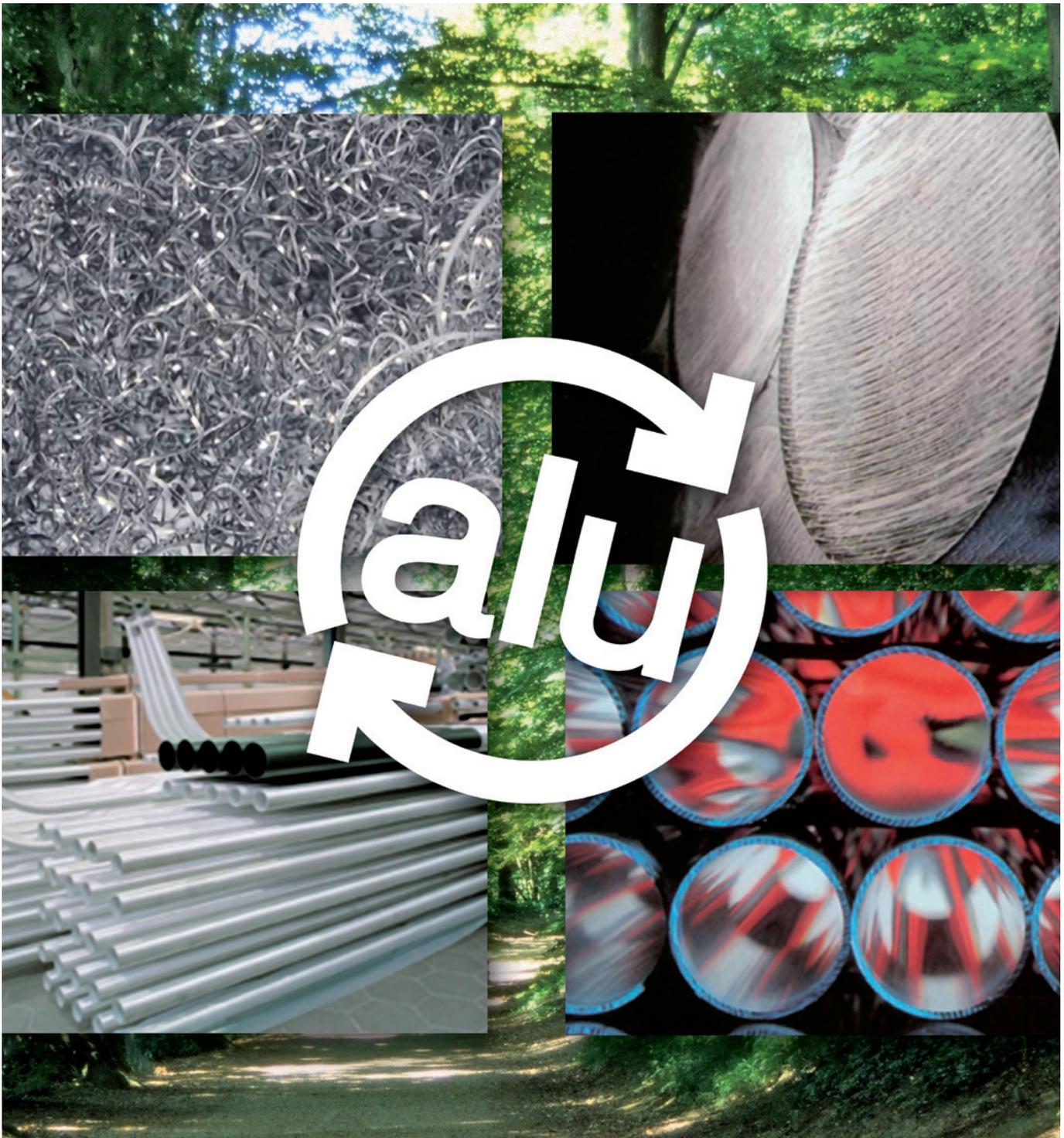
Soil is not a homogeneous material. Mineral composition, moisture content, the pH value, the presence of organic materials and electrical conductivity can all vary widely from site to site. These differences make it difficult to predict a metal's durability in soil. As a solution to this problem, Pole Products makes use of corrosion protection tape around the root section of the pole.

The range of attractive properties offers numerous possibilities to create solutions that are innovative, efficient and sustainable.



Aluminium, the circular metal

There are multiple examples within Hydro that show that aluminium is the ideal material to use when it comes to sustainable development.



Instead of 'less waste', the goal is 'no waste'

Did you know that because of the use of aluminium in cars, the weight of the car can be reduced? If we include the production and distribution (wheel-to-wheel) of fuel, a weight reduction of 100 kg in a car means a saving of 10 g of CO₂ per kilometer, in other words 2000 kg during the life of the car.

Another example is the development around solar energy. Aluminium is often used in solar frameworks, but what makes aluminium so environmentally friendly?

The most important features are given below:

- About 8% of the earth's crust consists of aluminium in the form of different minerals.
- Aluminium is 100% recyclable, time after time.
- Recycling aluminium only takes 5% of the energy needed for its initial production.
- There is no downgrade during the recycling process.

* Check out the website of the European Aluminium Association for more information: www.european-aluminium.eu

Sustainability is part of our CSR policy

Pole Products does a lot of research to improve the energy efficiency of its production processes, to increase the percentage of recycled materials and to minimize waste. This has led to highly sustainable products such as Carbon Neutral poles and *Cradle to Cradle Certified*TM silver light poles. Through the Take Back system Pole Products has reached a golden level in the key area 'material reutilization' within the *Cradle to Cradle Certified*TM program. Pole Products collects complete light poles (including fittings, cabling, etc.) at the end of their lifespan and returns them into the technical cycle.

In-house recycling capacity

Hydro has 9 extrusion cast houses across Europe for



recycling of which one is located in Drunen. These cast houses have a yearly capacity of 200,000 metric tons (enough for more than 7 million poles).

Circular Economy

The ideas of a future circular economy are spreading in the discussions around sustainable development and solutions. The circular economy is a generic term for an industrial economy that is, by design or intention, restorative and in which material endlessly flows in a closed cycle. Aluminium is well positioned to match these principles.

Cradle to Cradle[®]

The circular economy is based on the Cradle to Cradle[®] design concept 'waste=food'. In a C2C model, product materials circulate in an endless cycle with no net effect on the environment. To date, more than 2,000 products worldwide have received C2C certification.

Since 2011, we offer *Cradle to Cradle Certified*TM light poles as first supplier in the world.*

* *Cradle to Cradle Certified*TM is a certification mark of MBDC.



We are the first supplier in the world to offer
*Cradle to Cradle Certified*TM light poles

The technical characteristics of our products

Pole Products has over 50 years of experience in the machining of aluminium and has a strong ability to integrate advanced technological innovations into a pole. Hence, we are able to offer the most effective and safest solutions.



We are able to offer the most effective and safest solutions.

Our poles, all manufactured from a seamless tube of aluminium, have several technical characteristics that form the basis of effectiveness and safety. We will explain the most important ones.

According to international standards

Aluminium poles are designed and calculated according to international standards in which several factors are taken into account, such as material, reference wind speed, wind pressures, terrain category and safety factors. When all these factors are calculated, it can be determined if the pole meets the standard.

Europe applies the EN 40 standard for light poles and the EN 12899 for supports for use with fixed vertical road traffic signs.

Door section

A pole is fitted with a door (service door) with dimensions according to the EN 40 standard. The door section of our pole is easy to operate. The door is equipped with a double sliding lock. If required, the pole can be equipped with a second door depending on the strength calculation.

Patented reinforcement profile

The poles from Pole Products are equipped with the VT5+ reinforcement profile that is welded and expanded inside the pole. This patented profile gives extra strength to the section around the door area. This solution is stronger than type 5,

as stated in the European EN 40-3-3 standard. Independent scientific research shows that in addition to the tension, the effect of torsion is also reduced.

Base plates

Poles installed on hard surfaces such as concrete foundations, bridges and viaducts are provided with a base plate. Depending on the situation, different types of base plates, all made of aluminium, are available:

- Functional two-piece base plates for situations that require a practical solution;
- Beautifully designed one-piece base plates for environments where aesthetics are the decisive factor;
- Practical hinged base plates for places that are difficult to reach and where a hinged pole is not wanted.



Two-piece base

One-piece base



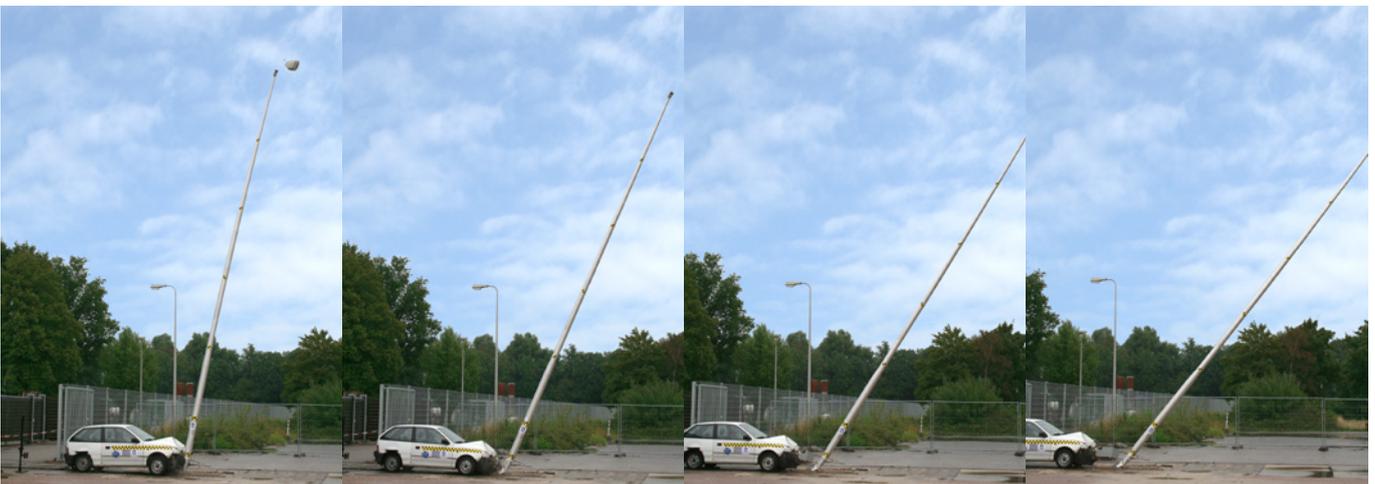
Reinforcement profile



Door section

Passive Safety saves lives

Have you ever thought of the impact of a collision when a car hits a light pole? Accidents do happen and can happen to all of us. Even at low speeds, a collision can be fatal. The crash friendly aluminum poles from Hydro reduce the risk of personal injury after a collision and, therefore, increase your safety on the road.



Frontal impact – LE crash test

Crash tests

Since the 1970s, Pole Products has been conducting crash tests to investigate the safest constructions for your roads. This long history of building up knowledge on this topic has resulted in a range of safe, secure and sustainable aluminium solutions for all of your lighting needs. We give you the opportunity to design and create safe roads with Fully Certified (and endorsed by a Notified Body) passive safe poles in all shapes and sizes.

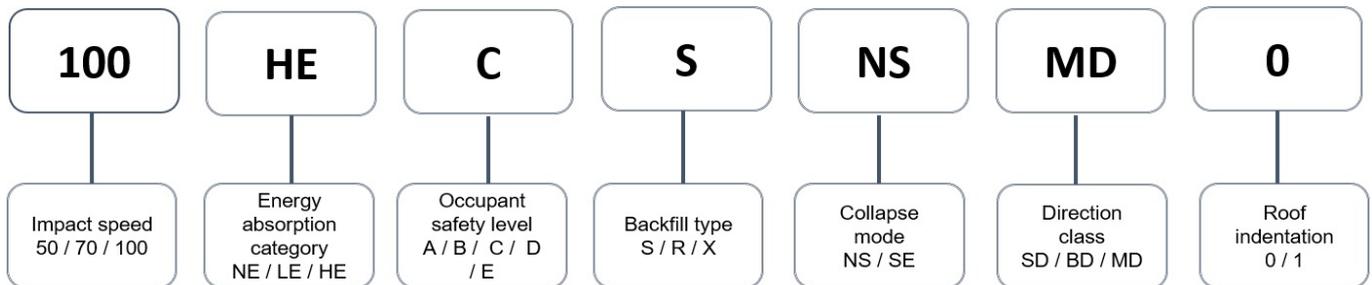
The use of crash friendly, also referred to as passive safe light poles, traffic signals and sign posts are becoming increasingly important on both highways and rural roads. The European EN 12767 standard specifies performance requirements for passive safe support structures for permanent road equipment. It both defines and limits the levels of occupant injury severity when impacting these structures.

Three categories of passive safe structures

There are three categories of passive safe support structures:

- High-energy (HE) absorbing: slows the vehicle considerably on impact. The risk of secondary collisions with trees, pedestrians and other road users is reduced, however, the severity of the impact for vehicle occupants can be high.
- Low-energy (LE) absorbing: generally designed to bend in front of and under the impacting vehicle before shearing or detaching toward the end of the impact.
- Non-energy (NE) absorbing: allows the vehicle to continue after the impact with a limited reduction in speed. They may, therefore, represent a lower primary injury risk than energy absorbing support structures, but a higher secondary injury risk if other hazards exist behind the support structure.

Passive safe classifications



EN 12767 regulations for road safety

The passive safe classifications in the European Standard EN 12767 include codes for impact speed, energy absorption category, occupant safety level, backfill type, collapse mode, direction class and risk of roof indentation.

For more information about passive safe poles, please contact us.



Street light poles, the standard in our streetscape

A light pole can have beautiful lines, an exciting shape or an interesting structure. But first and foremost, a light pole is part of a series. Along roads, they form a repeating pattern. This not only makes them crucial for nighttime safety but also esthetically pleasing for the daytime appearance of roads.



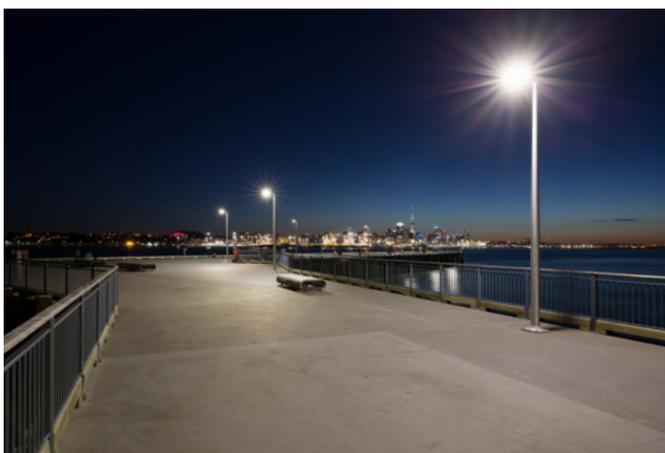
Our broad range of street light poles consists of conical and cylindrical (stepped) light poles. They are manufactured from seamless aluminium tubes and are supplied as standard in natural brushed aluminium. If required, we deliver the light poles anodized or electrostatically powder coated.



Auckland Airport – New Zealand



Drunen – The Netherlands



Devonport North Wharf – New Zealand



Leeuwarden – The Netherlands

Custom made light poles, shaped by your ideas

A unique urban plan requires unique lighting. The features and functions of your urban landscape demand custom made solutions; solutions in the form of light poles turned into unique, specially designed objects that become one with the surroundings or provide accents in the urban environment.



Together we make innovative aluminium solutions



El Jadida – Morocco

Aluminium has specific properties that make the material ideal for use in public spaces. In decorative projects, aluminium provides numerous opportunities. Where light poles become limited edition works of art, designers choose for light poles from Hydro.

Together we make innovative aluminium solutions. Your imagination is the fuel for our creativity...



Alkmaar – The Netherlands



Albertillery – United Kingdom



Houlgate – France

Solar poles create their own energy

The use of solar power systems has increased considerably in recent years including in public lighting. Innovative solar panel technology integrated in an aluminium light pole offers economic and sustainable benefits.



Innovative solar panel technology integrated in an aluminium light pole offers economic and sustainable benefits.

By choosing sustainable lighting you can save a lot of energy. Poles equipped with solar panels are increasingly becoming part of the street scene. Even where no cabling or infrastructure for lighting is available, light poles with solar panels offer a solution.

Hydro can supply a wide range of poles suitable for various solar applications. Our engineers enjoy meeting designers, developers and suppliers of solar technology. Together we can combine our technical expertise in the field of aluminium poles and your knowledge of advanced solar panel technology to find and create the ideal solution for a solar pole. Please contact us for more information.



Smart poles create smart cities

Two thirds of the world's population will be living in urban areas by 2050. This puts enormous pressure on city councils and planners to make their cities smarter and greener by optimizing infrastructure and energy. Intelligent light poles can increase urban efficiency while dramatically reducing energy costs.

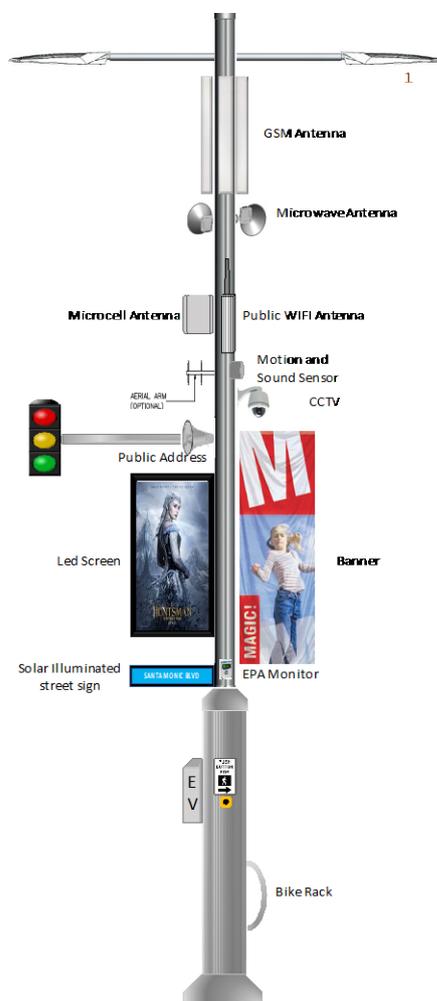


There is really no limit to the potential features and functions that can be integrated into the intelligent light poles

Intelligent or multifunctional light poles, can help solve many urban problems due to their ability to incorporate software controls, electronics and sensors that can receive and transmit data. They can improve parking and traffic management through real-time data, leading to a reduction in congestion and emissions. Intelligent poles can also monitor air quality, detect and notify officials about street flooding or be turned into charging stations for electric vehicles.

Our new generation intelligent multifunctional poles are stronger, last longer and are safer than ever before.

The smart poles have been designed from conception with modular multifunctional components. There is really no limit to the potential features and functions that can be integrated into the intelligent light poles. They can easily retrofit a myriad of new and evolving technologies and devices as they become available over time.



The smart pole is a single street infrastructure pole that has the flexibility to house:

- a street light
- a pedestrian light
- a traffic light
- a street sign
- a parking meter
- Public wifi
- Traffic analytics
- Emergency management
- Public announcement system
- Telecommunications cellular network
- USB charging station
- CCTV smart surveillance public safety & security
- Public address system and emergency assembly point
- Solar powered items such as illuminated street signs and wayfinding signage
- Solar panel for sully to electrical grid
- Bike rack
- Environmental & noise pollution monitoring equipment
- Motion sensor
- Vehicle charging stations
- Income generator - Digital advertising display panel, banner or lightbox for events and corporate sponsorship
- Irrigated flower baskets for city gentrification
- Atomised water spray for public cool zones

Raise & Lower poles, allowing easy and safe operations

Cameras and traffic lights require regular maintenance. The Raise & Lower poles from Hydro, called HiLo, can be operated manually due to the low weight of aluminium, allowing the carrying out of maintenance in a safe and secure manner.



The Raise & Lower poles from Hydro are especially designed to carry out maintenance on cameras and other devices in a safe and secure manner

Raise & Lower poles are mainly used for camera applications, but also its use as a Traffic Signal Pole is increasing. Because a cherry picker is no longer needed, you avoid the dangers of working at height and save significantly on the cost of maintenance and traffic management. The HiLo poles are crash friendly in accordance with the European EN 12767 standard.



Hinge mechanism (wedge)

Raise & Lower poles with wedge

The Raise & Lower poles with wedge have an ingenious hinge mechanism that is located just above the door section. The seamless fitted hinge mechanism is invisibly integrated into the pole. After the door is opened, you can unlock the mechanism from inside the pole.

Raise & Lower tool

The optional Raise & Lower tool provides easy operation of poles with a higher top weight such as heavier cameras or traffic lights. The operation of the pole from ground level can still be performed manually, to facilitate safe and cost effective maintenance.

Raise & Lower poles with winch

The Raise & Lower pole with winch is provided with an integrated hinge system. The hinge mechanism is located halfway up the pole, which allows the top of the pole to be lowered to working height. The winch is located behind the door.



Raise & Lower pole with wedge



Raise & Lower pole with winch



Traffic Regulation Installations, offering safety in public spaces

The traffic on our roads and in public spaces keeps on growing. To increase safety for all road users, it is important to manage traffic in the right direction. Traffic Regulation Installations (TRI's) play an important role within this context.



Aluminium is perfectly suitable for Traffic Regulation Installations

Besides light poles, Pole Products offers a variety of aluminium poles and structures for traffic signs, warning signs and static signs. The range of TRI products can be divided into two families: Traffic Sign Posts and Traffic Signal Poles.

By using Hydro aluminium Traffic Regulation Installations, you will be impressed with the ease of installation coupled with the improvements to safety and health and, in particular, manual handling and the reduced requirement for working at height.



Multi legged Sign Post

Saving on maintenance costs

During its lifespan, a Hydro TRI does not have to be disassembled for maintenance like other material structures. Due to the natural oxide layer of aluminium, surface treatment is not necessary.

Different foundation possibilities

Installation in soil (Soil S), concrete (Rigid R) or a special foundation (Type X) in accordance with the EN 12767 standard is possible.

Combining elements

Traffic Regulation Installations can also combine different elements on the same pole such as traffic signals, street lighting and any illuminated signs to eliminate the number of poles in the streetscape.

Safety first

Safety in public spaces is a prerequisite for products for facilitating traffic. Pole Products test its products extensively both by its own engineers and by an independent accredited test institute. As a result, you are assured of reliable products that are certified according to the applicable European EN 12899 standard and tested in accordance with the EN 12767 standard. All certificates are endorsed by a Notified Body.

Crash friendly

Hydro offers Passive Safe Traffic Regulation Installations, fully crash tested (NE2) and endorsed by a Notified Body.

Easy and safe installation

Due to the light weight of aluminium, TRI's are easy and safe to install. The light weight of the horizontal beam of cantilevers and gantries allows easy preassembly of traffic lights on site.



Support for pedestrian crossing sign



ADVIOS (Temporary TRI)

Traffic Signal Poles, giving you the green light

Traffic Signal Poles come in all shapes and sizes. From the largest bespoke gantries to cantilevers and push button poles. Pole Products has developed a range of Traffic Signal Poles that is suitable for all types of traffic situations, helping to keep all road users safe.



Traffic Signal Poles and push button poles

The range of Traffic Signal Poles consists of:

- Traffic Signal Poles
- Cranked Traffic Signal Poles
- Raise & Lower Traffic Signal Poles
- Push button poles
- Cantilevers
- Gantries
- Universal poles that allow attachments and extensions

Safe installations & maintenance

Raise & Lower versions of the Traffic Signal Poles overcome the problems and risks of working at height. A hinge enables the pole to be cranked down by an operator who can work on repairs from ground level and away from the flow of traffic.

Crash friendly:

Passively Safe, fully crash tested (NE2) and endorsed by a Notified Body.



Gantry



Detail signal head



Traffic Signal Pole (Punch 6m 165/145)



Raise & Lower Traffic Signal Pole including hinge tool



Cantilever



Cranked Traffic Signal Pole (Punch 4m cr 114/145)

Traffic Sign Posts, leading the way

Wouldn't it be nice if the entire streetscape was of a uniform design? Where light poles and traffic sign posts, both aluminium structures, are a good match? Hydro offers the ultimate solution for your ideal image, so that beauty and signage go hand-in-hand.



We can offer a full range of supports for static and variable traffic signs, all under the family name Traffic Sign Posts. They are made from seamless aluminium tubes and entirely passive safe.

The range of Traffic Sign Posts solutions can be divided into Single legged Sign Posts and multi legged Sign Posts.



Support for Variable Message Sign



Support for pedestrian crossing sign



Support for smiley board



PRIS (parking system) incl. lighting



Single legged Sign Post



Single legged Sign Post



Double legged Sign Post



Custom made Sign Post

Surface treatment

The corrosion resistance of aluminium is excellent. This is why there is no need to surface treat aluminium poles. However, if a street image needs a certain color or design, there are of course possibilities to treat the surface with a coating or anodizing it.



Powder coated finish (RAL)

Powder coating, anodizing, Decoline...

Powder coating

An electrostatically powder coated finish is available in a range of colors. RAL colors as well as DB colors or maybe even your own PMS color that suits your local environment.

Anodizing

Anodizing is one of the most common methods of surface treatment for aluminium, which gives the pole a nice matt appearance. The advantages of anodizing are that it increases corrosion durability, creates a dirt-repellent surface, offers a decorative finish with constant color and glow, and provides a touch friendly and functional surface.

Decoline

Are you searching for a light pole with the look of wood, and yet prefer aluminium? Decoline is the answer. Thanks to a unique and innovative process, Pole Products is able to produce poles in a range of decorative designs never before thought possible. It is also possible to create your own surface texture. The special Qualicoat coating guarantees color fastness and offers optimal protection against the influence of weather and UV radiation.



Natural anodized Brushed finished



Decoline finish



Barneveld - The Netherlands (Decoline wood finished)

Solutions for different situations

Loose sand, vandalism, work at ground level, installation in the ground ... All situations where a pole requires extra attention. The accessories of Pole Products offer a solution in such situations that will protect and stabilize your pole.





Alulock

Optimal protection against vandalism

The door of a pole is often a target of vandalism. With the development of the Alulock ①, the unique patented door lock from Pole Products, vandalism will not stand a chance. The Alulock is provided with an oval-shaped stainless steel bolt with an oval eccentric bolt so that you can only open the door lock with a special key.

A stable placement in loose soil

To counter possible sinking into the ground or unwanted turning from a pole in loose soil, the universal twist-on ground plate ④ and/or twist-on ground wings ③, are the ideal solution. They are made from environmentally friendly PP (polypropylene) and easy to assemble.

An additional protection against mechanical damage

In situations where a pole needs additional protection from being damaged at ground level (e.g. during mechanical sweeping, mowing or paving activities, or the installation of the pole), the ground level protector offers the solution. The ground level protector ② optimally protects the pole just below and above ground level, precisely where it is needed. The fully recyclable ground level protector is made of PP (polypropylene) and available in the colors black and gray. The material is UV stabilized for optimal protection against the sun.

Placement in the ground

In situations where a pole is installed in the ground, the pole is provided with a root section. The length of the root section depends on the height of the pole and soil conditions as specified in the EN 40-6 standard. The root section has a cable entry to allow the passage of electric cables.

Anti-corrosion tape is applied to the root section of the pole up to a height of 250 mm above ground level. The tape provides protection against corrosion throughout the life of the pole and is, at the end of the pole's lifespan, 100% recyclable.



Worldwide projects



Malécon, Havana – Cuba



Hersbruck – Germany



Shuaiba Refinery – Kuwait



Malaga – Spain



Bacia Norte do Patane – Macau



St. Margarets college, Christchurch – New Zealand



Schiphol Airport – The Netherlands



London – United Kingdom



Brussels – Belgium



Nouasseur – Morocco



Sydney – Australia



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Hydro is a global supplier of aluminium with activities throughout the value chain, from bauxite extraction to the production of rolled and extruded aluminium products and building systems. Based in Norway, the company employs 35,000 people in more than 40 countries. Rooted in a century of experience in renewable energy production, technology development and progressive partnerships, Hydro is committed to strengthening the viability of the customers and communities we serve.