GALVANISATION PLANT

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GALVANISING PLANT DĘBICA WELDON Sp. z o.o.

Dear Readers,

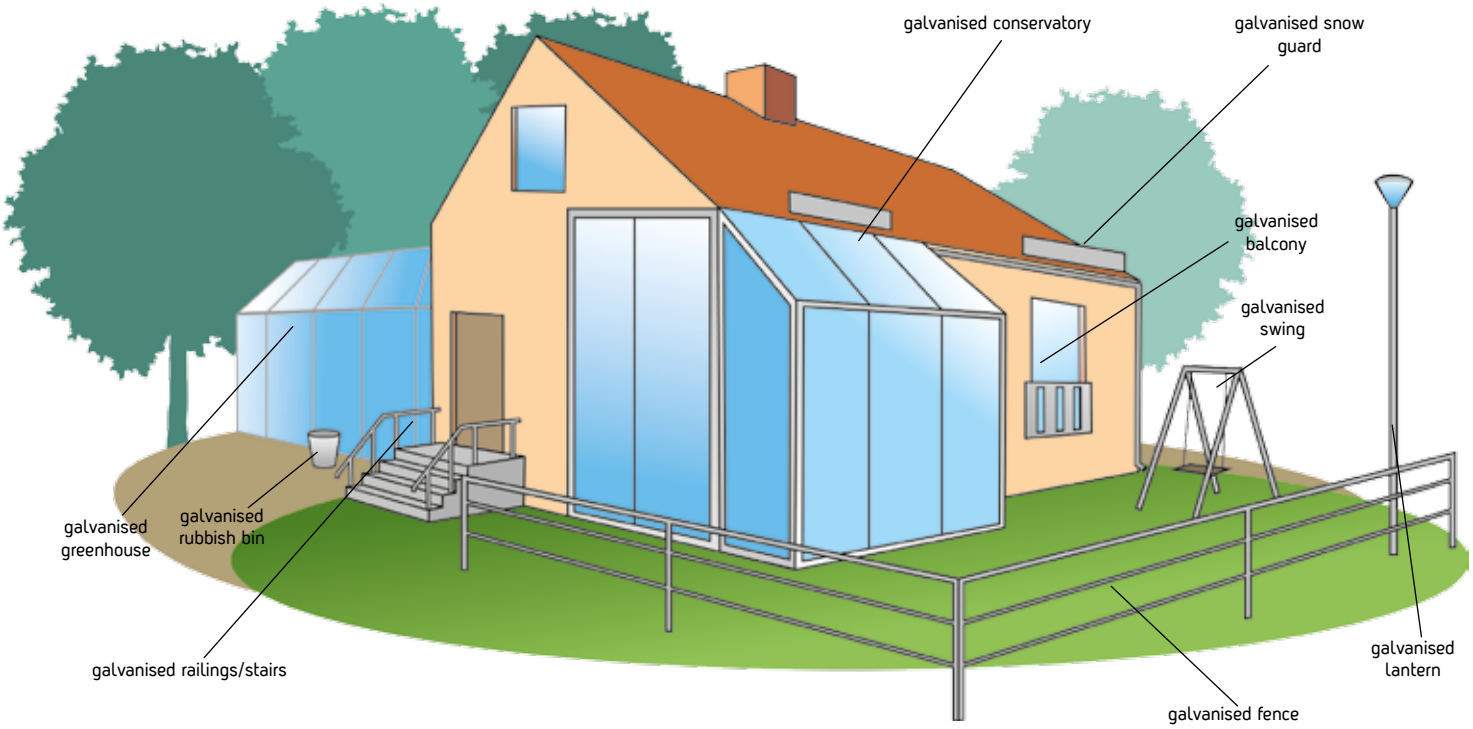
In line with our long-term strategy, Weldon sp. z o.o. consistently fulfils successive stages of the development vision adopted. One of the important steps, favourable to the creation and maintenance of our competitive advantage over consecutive years, was the August 2013 purchase of a galvanising plant in Dębica. Our own corrosion preventing plant is an essential part of the entire Company, which in a long run will allow us to optimise the production processes, expand our range and strengthen our market position.

The range of products we galvanise is highly diversified – from steel construction structures, through to traffic barriers, containers, construction accessories, steel gratings, fencing details, gates, to lampposts and railway poles as well as other elements of municipal and road infrastructure. Galvanised coatings feature excellent resilience to corrosion and abrasion. The use of precise high-quality materials along with the technological process, developed over years of experience, ascertain superb parameters. We ensure high quality zinc coating compliant with the PN-EN ISO 1461 standard.

Feel free to cooperate with us

Weldon sp. z o.o CEO
Marek Różański

HOT-DIP GALVANISING



Dip galvanising, commonly known as hot-dip galvanising, is one of the best anti-corrosion methods for steel structures. Discovered in 18th century and introduced into industrial practice nearly 170 years ago, this method has gained a high level of substantive and technological progress.

The essence of the process is appropriate physical and chemical preparation of steel surface (grease removal, etching, flux treatment, drying) and elements immersion in molten zinc alloy in the temperature of 450°C - 460°C. The outcome of the steel and zinc diffusion process are alloyed layers which contain various ratios of both components, where the external layer of the coating features the composition of zinc bath used in the process. After water cooling the coating boasts high mechanical resistance and aesthetic appearance.

Proper zinc plating, with the consideration of the environmental exposure rating, in which it is used, lasts between 10 to 100 years. Hot-dip galvanising is a solution meeting the durability, aesthetical and ecological requirements in the era of modern anti-corrosion prevention.

Why hot-dip galvanising?

Anti-corrosion prevention resulting from hot-dip galvanising guarantees years of protection with no need to repair. Zinc plating tightly and precisely covering the external and internal surfaces of an element, its edges, cavities and corners – provides double: electrochemical and barrier protection for steel. An alloyed zinc layer inseparably connected with the surface of steel prevents its oxidation, meanwhile the diverse hardness of individual layers protects against mechanical damage. The galvanisation process, although it is fast, offers steel elements surface protection for many years. Currently, galvanisation is the most effective anti-corrosion protection technology, which meets high durability, aesthetical and ecological standards.

Coating thickness

The layers produced in the hot-dip galvanisation process are of an average thickness of 70 to 150 micrometers. This thickness is sufficient to protect steel from corrosion for dozens of years. An average durability of zinc plating is 30-50 years.
Zinc plating thickness is measured in micrometers or in g/m2 as plating mass.

Minimum coating thickness ranges recommended, depending on the thickness of the material of the elements which are galvanised, are specified by a PN-EN ISO 1461 standard:

Steel thickness (t) in mm	Min. average coating thickness (µm)
t>6	85
3 < t < 6	70
1,5 < t < 3	55
t < 1,5	45

Plating thickness depends on the following factors:

a) steel thickness,
b) chemical composition of steel, particularly the content of the elements: silicon, phosphorus and carbon,
c) zinc bath temperature and time of immersion in zinc bath,
d) chemical composition of zinc bath,
e) element surface roughness.

TECHNOLOGICAL REQUIREMENTS

Achieving optimum steel structures galvanisation results highly depends on the manner of their design and manufacture. Elements designated for galvanisation should be in a shape enabling the bath to reach each galvanised surface and then easy dripping.

the design stage the following should be considered:

a) zinc bath dimensions,
b) all thermal consequences,
c) individual features of an element designated for galvanisation,
d) expected methods of galvanised structure assembly,
e) the condition of steel elements surface prior to galvanisation

Structure design guidelines are set out in the PN-EN ISO 14713 standard.

Structures designated for hot-dip galvanisation should meet the following conditions:

1. Welds should be made with semiautomatic method with shielded gas welding. Welding with covered electrode method is not recommended due to bad quality of zinc coating on the welds.
2. Structure surface should be free from: overlaps, scales, post welding chips, sharp edges, oil, emulsion impurities and soiling with other materials used in lining out, marking, welding, drilling, etc. In the instance of electrode welding the welding rod coating should be removed to minimise surface faults. Steel surface faults such as overlaps, lining out scratches, grind-downs, pores, welding chips or faulty welds become visible after galvanisation.
3. Structure elements should have process holes appropriate for ventilation and free zinc flow in and out of the element and to suspend it (metal sheet holders with holes may be welded on).
4. Closed box sections and overlapping surfaces over 400 cm2 are not recommended. In the instance of overlap welded surfaces, the weld should be tight all around (welded around) and the cladding must adhere tightly to the structure. Box sections and overlapping surfaces may cause structure damage – weld cracking.
5. Each structure element should be made of a single steel type.
6. Structures should be free from small splits or cavities. Welds should be tight and closed around the element because otherwise flux and acid remains may drip out after galvanisation lowering the quality of covering (the so called 'sweating').
7. Dimensional allowance in openings for screws should be 1 – 2 mm.
8. Loss of shape may occur as thermal influence of zinc bath releases internal pressure, which is particularly visible in welded elements, therefore the welding technology should be developed in a way allowing pressure optimisation during welding.

If in doubt or in individual cases consult the technical documentation with our technology specialist.

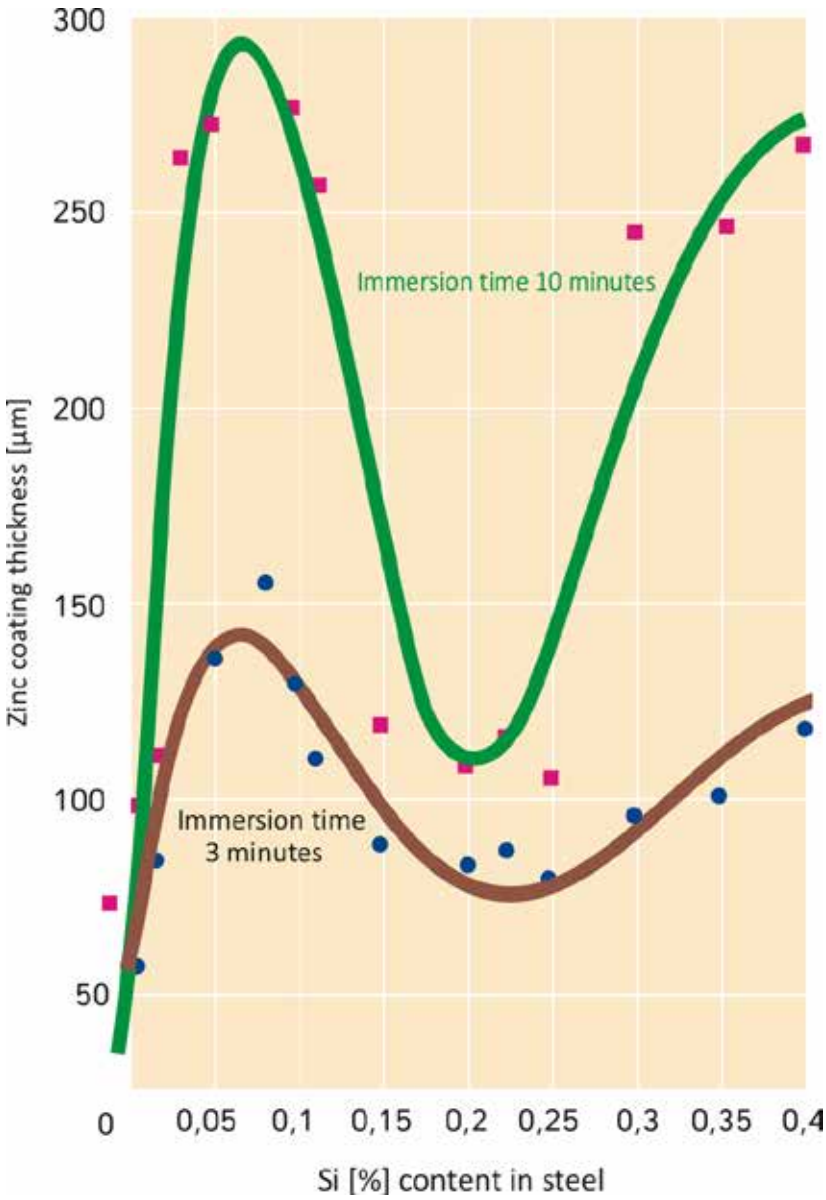
Table 1. Technological holes diameters with regards to the profile and the size of a section shape.

Internal closed profile dimensions [] lower than:			Minimum diameter of holes [] at the opposite ends of profiles with the openings number:		
○	□	▭	1	2	4
15	15	20x10	8		
20	20	30x15	10		
30	30	40x20	12	10	
40	40	50x30	14	12	
50	50	60x40	16	12	10
60	60	80x40	20	12	10
80	80	100x60	25	16	12
100	100	120x80	30	25	14
120	120	160x80	40	30	18
160	160	200x120	60	40	25
200	200	260x140	80	50	30
250	250	350x150	120	80	50
300	300	400x200	150	100	60
400	400	500x300	200	150	100
500	500	600x400	300	200	150

Influence of silicon on the quality of zinc plating

All steel types presented in DIN 17100 and PN-88-H-84020 and PN-86/H-84018 may be hot-dip galvanised. The quality of the achieved zinc plating (shine, smoothness, thickness, adhesion, etc.) varies and depends on the chemical composition, particularly the content of carbon (C), phosphorus (P) and silicon (Si). Carbon and silicon content in steel should not exceed 0.5% in total. It is possible that in steel containing silicon, the iron-zinc reaction is particularly strong and the participation of ferro-zinc alloy in the zinc coating may be higher than usually. In extreme cases the zinc coating may be of ferro-zinc alloy composition only. Such phenomenon (the so called Sandelin effect) is observed particularly with silicon composition from 0.03% to 0.14% as well as above 0.25% (graph). In such instances the zinc coating is mostly matt-grey, rough, uneven, very brittle and consequently – susceptible to deformation and mechanical damage.

This phenomenon causes reduced adhesion of thick coatings to the surface of steel. Due to that effect hot-dip galvanising of steel containing silicon in the ranges indicated above is not recommended. However, steel types with silicon content below 0.03% or in the range of 0.14% to 0.25% (with an aggregate silicon and phosphorus content no more than 0.045%) are recommended. The hot-dip galvanisation process temperature ranges between 450°C to 460°C. Comprehensive study shows that technological properties of steel do not suffer quality loss during hot-dip galvanisation.

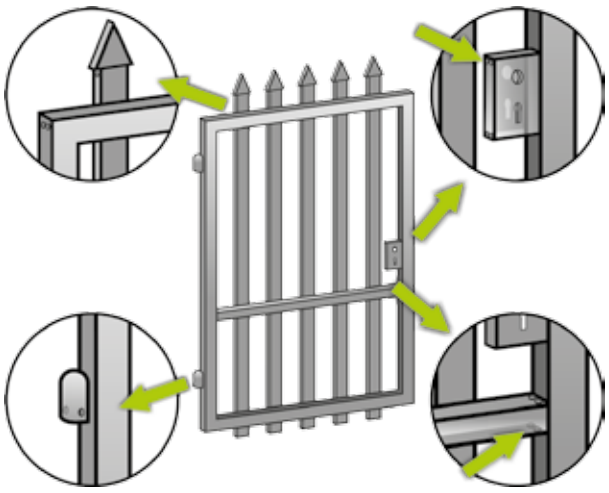


Types of steel	Silicon content [%]	Hot-galvanised zinc coating (appearance)	
Low-silicon	<0,03		silver, shiny
Sandelin	0,03>0,14		grey, matt, rough, brittle
Sebisty	0,14>0,25		silver and shiny to matt and grey
High-silicon	>0,25		matt, grey, brittle

Table 2. Zinc coating appearance on various types of steel

EXAMPLES OF STRUCTURE PREPRATION

Fencing

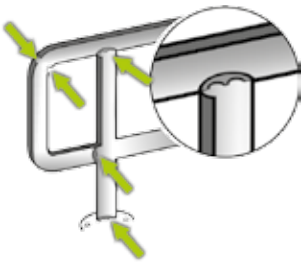


EXTERNAL HOLES

INTERNAL HOLES

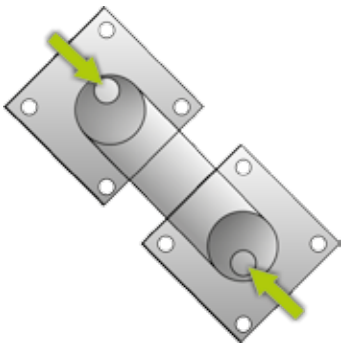
Barriers

All technological holes should be visible to ensure control prior to galvanisation process.



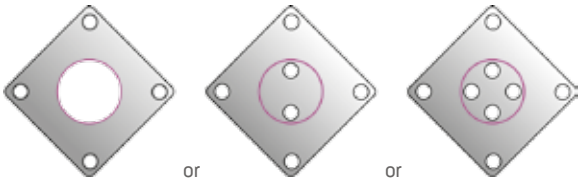
Alternative solution

Tube openings



Openings should be made at both tube ends, with respect to each other at a 180° angle turned around the tube axis

Other examples of technological holes

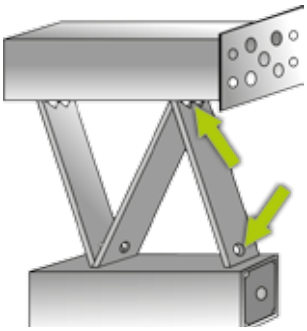


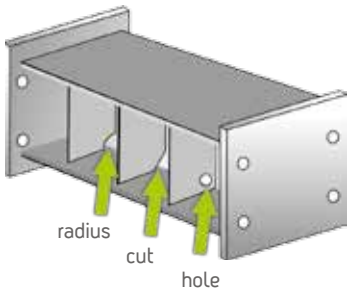
or or

Quantity and the surface of the holes depend on the tube diameter and may not be lower than the data in Table 1.

Bevelled angles, ribs

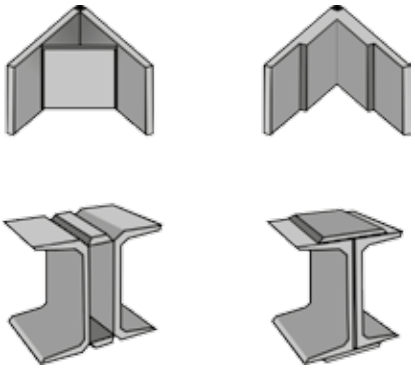
Preferred solution for manufacturing technological holes in ribs is an arched cut. The arch radius depends on the profile size:





Profile height:	Radius:
100-120	R=15mm
120-200	R=20mm
200-300	R=25mm
>300	R=30mm

Covers and reinforcements



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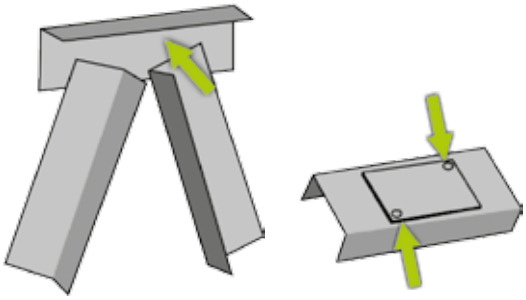
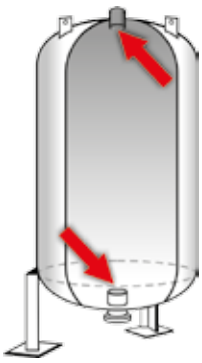


The designs for hardenings and angle plates should include their ending before the shelf of the main element to allow zinc drip-off on each end. Covers to be welded with a continuous weld. Covers of a surface area over 400cm² should have ventilation holes. If possible, apply a solution eliminating covers.

EXAMPLES OF STRUCTURE PREPRATION

Containers

Flanges and connector pipes should end exactly at the external surface of a container



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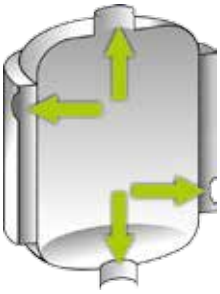
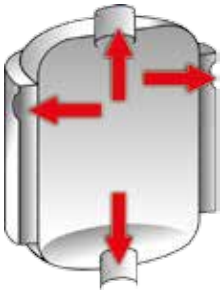
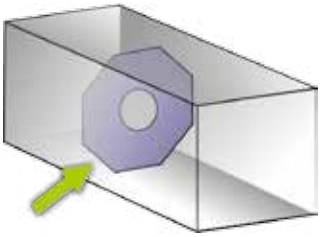


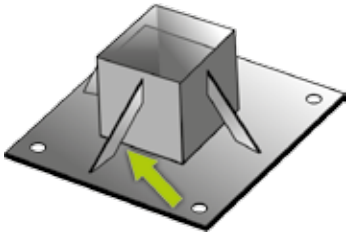
Internal areas should have appropriate zinc flow

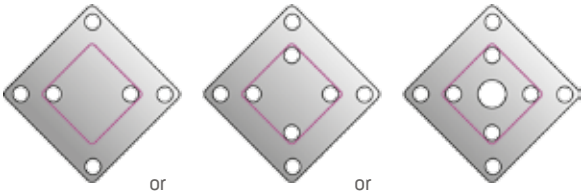


Beams reinforcement, alloys

The use of hardenings requires their opening (opening and bevels)



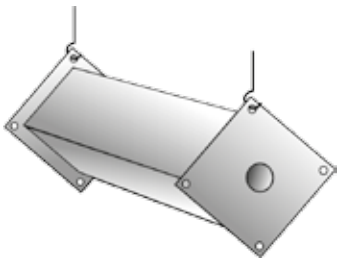




or or

Openings in alloys are made in the corners, with a large diameter an additional opening is made in the centre.
The quantity and the surface of the holes depend on the profile diameter and should comply with Table 1.

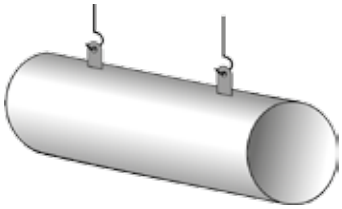
Element suspension methods



Suspension with the use of assembly holes.

Such solution is possible if it does not cause deformation of the structure during transport and galvanisation process.

Suspension with the use of additional holders.



If the element lacks assembly holes or suspension with their use may cause structure deformation during transport or galvanisation process, additional holders in the form of holes or handles must be made.
Additional holders must be made at a distance of ¼ of the length of the element on both ends.

CONTACT

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Corporate video:
https://www.youtube.com/watch?v=gd-Jt1VuObE

Opening hours:

Galvanisation Plant Dębica Weldon sp. z o.o. operates on a three-shifts-basis from Monday to Friday and also on Saturdays upon individual arrangements.

Operating design:

Zinc bath dimensions:
7000 x 1500 x 2800 mm (length x width x depth)

Maximum operating dimensions of galvanised elements:
6800 x 1400 x 2400 mm

Maximum weight of an element unit – up to 3 tonnes.

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