

**International Scientific Conference CIBv – Civil Engineering and  
Building Services  
BRAȘOV 2023**

**“Hot dip galvanizing for anticorrosive protection.  
A step inside the steel”**

**Romanian National Galvanizers Association (ANAZ)**

# Hot dip galvanizing for anticorrosive protection

## A step inside the steel

But, only three months later, in December 1967 you find that the bridge you worked for, the famous “Silver Bridge” has collapsed, taking the lives of 46 people



Time flies and you are now in August 2018 when another famous bridge, the Polcevera Viaduct is collapsing and 43 people lose their lives



**Frankly speaking, these two bridges together, took almost one life for each year of their operating period. 90 years of operating period, 89 lives. And we do not have the right to overlook this fact!**

**There were mistakes, failures in computing the data, some maintenance issues..., indeed. But there was a key factor there, which maximized the existence of these disasters. An enemy, working, in silence whether it can be seen, whether it is completely hidden.**

**It's name is**

# **CORROSION**

# Hot dip galvanizing for anticorrosive protection.

## A step inside the steel

## Process presentation



Degreasing



Rinsing



Pickling



Rinsing



Fluxing



Drying



Immersion in molten zinc

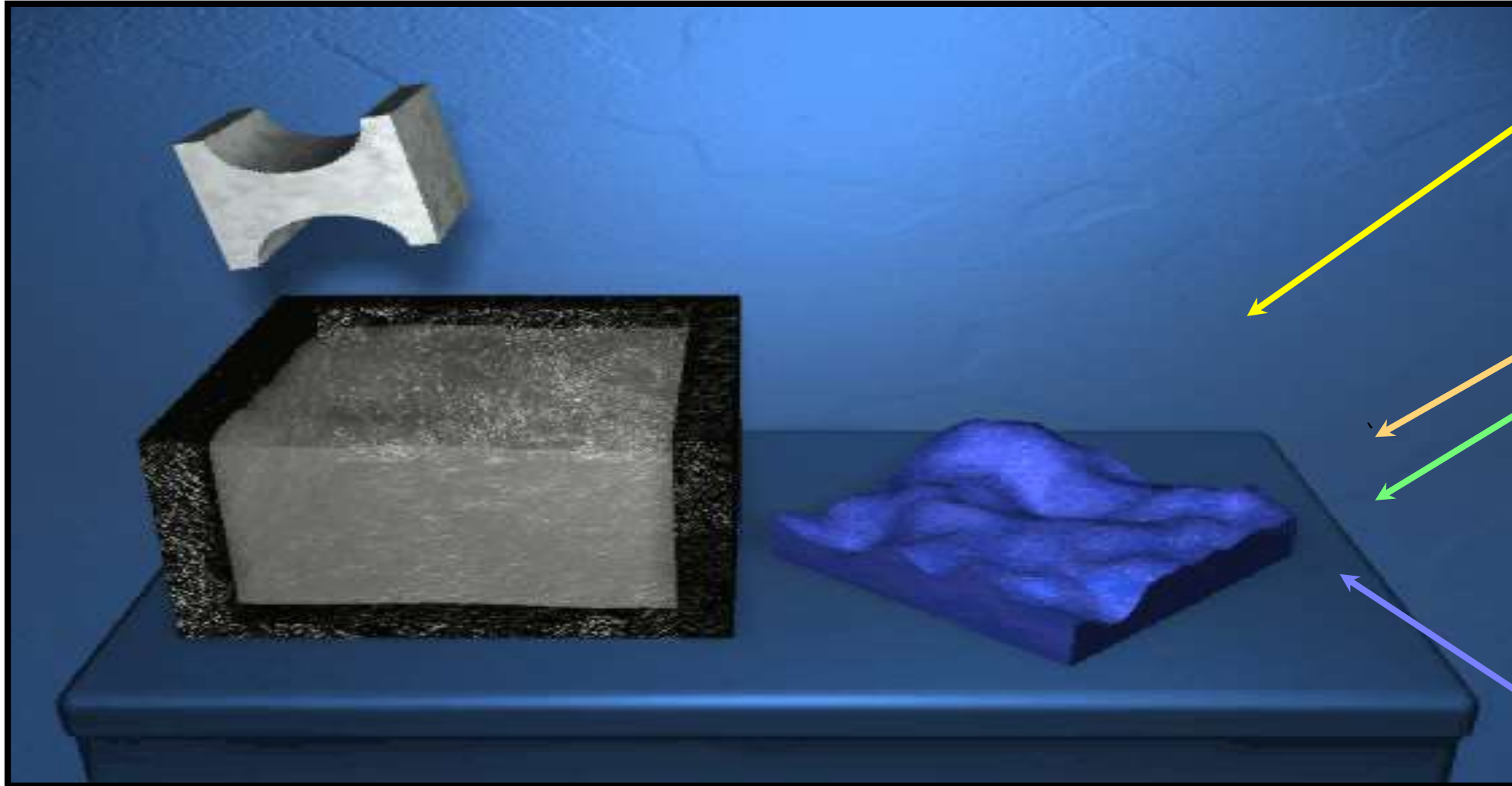


Cooling

### Cooling:

- Option in the air or in dedicated bath
- Potential further treatment for passivation

# Hot dip galvanizing for anticorrosive protection. A step inside the steel



Superior layer:  
Pure zinc ( $\eta$ )

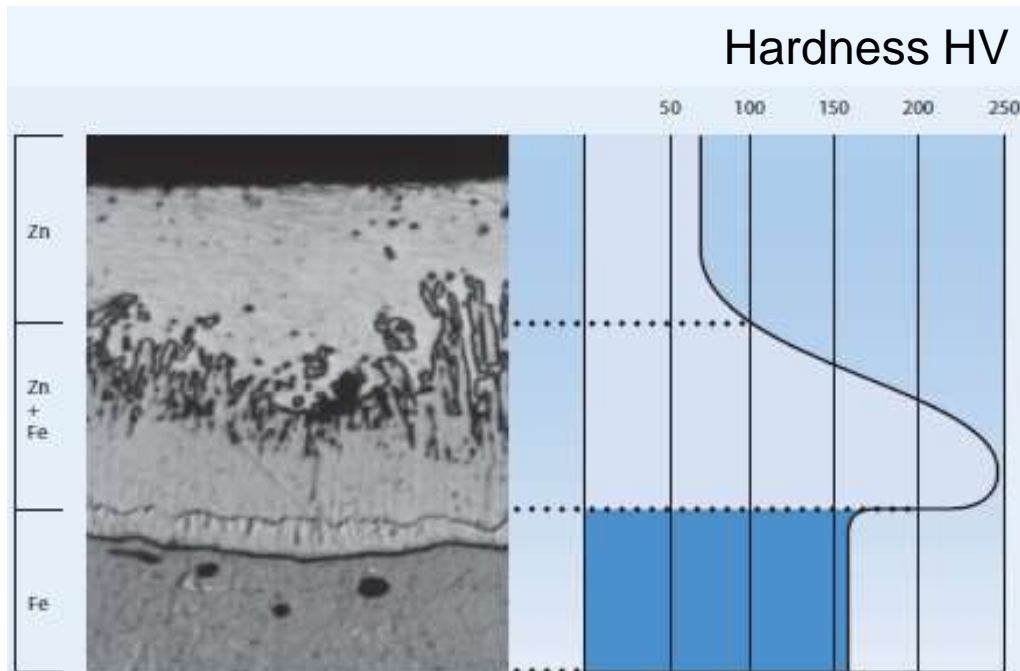
Zn – Fe Alloy  
layers:  
6% Fe ( $\zeta$ )  
10% Fe ( $\delta$ )

Base material:  
Steel

# Hot dip galvanizing for anticorrosive protection. A step inside the steel

## But what about hardness?

- See the cross section of a hot dip galvanized part with the attached graph (fig. 1)
- See the zoom of this surface, observe the alloy concentration evolution and the hardness expressed in HV and HR (fig.2)



**Conclusion:  
the delta ( $\delta$ ) layer  
has considerably  
higher hardness  
than the base  
material itself**

Fig. 1

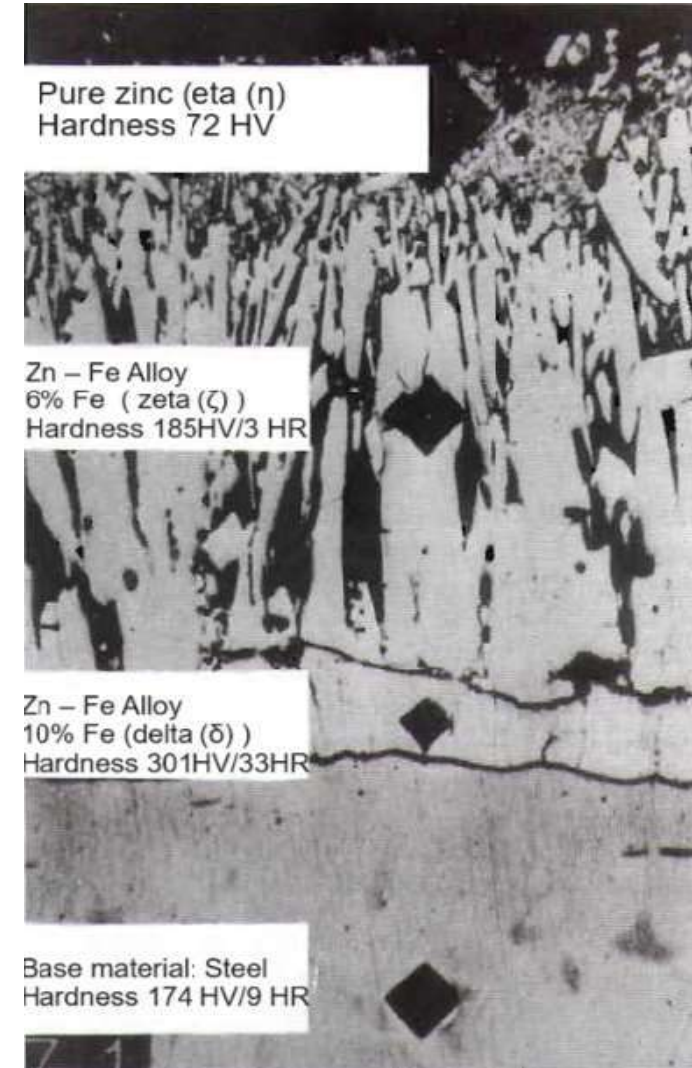


Fig. 2



EN ISO 1461

# Hot dip galvanizing for anticorrosive protection. A step inside the steel



Asociația Națională a Zincatorilor



Asociația Europeană a Zincatorilor



international zinc association

Asociația Internațională a Zincului

**SR EN ISO 1461:2022 – Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods**



**SR EN ISO 10684:2009 – Fasteners – Hot dip galvanized coatings**

# Hot dip galvanizing for anticorrosive protection.

## A step inside the steel Stoneham Arch Bridge, Quebec, Canada 2012

A bridge with no maintenance for more than  
100 years!



**SR EN ISO 10348:2019 – Steel for the reinforcement of  
concrete – Galvanized reinforcing steel – Part 2: Galvanized  
reinforcing steel products**



# Hot dip galvanizing for anticorrosive protection.

## A step inside the steel

Callender-Hamilton bridge	Name	Nandu Iron Bridge
Crossing the River Lyden	Purpose	Crossing the Nandu River
Lyndlinch, Dorset county, England	Location	north of Hainan Province, China
Steel truss bridge	Structure	Steel truss bridge
<b>1942</b>	<b>Construction year</b>	<b>1942</b>
Canadian	Constructor	Japan
(was supposed to be a part of the landscape for a short period of time)		(to serve for 20 years)
40 t	Maximul loading capacity	20 t
<b>Hot Dip Galvanizing</b>	<b>Anticorrosive protection method</b>	<b>Paint</b>
<b>Simple strengthening in order to be adapted at the new standards for 40 t loading</b>	<b>Maintenance</b>	<b>No info available</b>
<b>Opened for traffic</b>	<b>Status</b>	<b>Closed for traffic since 1984, partially collapsed in 2000 as result of a flood, preserved by the community as a monument. A new bridge, the Qiongzhou Bridge was built in 1984 about 5 km north.</b>



141.5 microns still offer for the C3 environment about 70 years of anticorrosive protection







# Hot dip galvanizing for anticorrosive protection. A step inside the steel



Asociația Națională a Zincatorilor



Asociația Națională a Zincatorilor



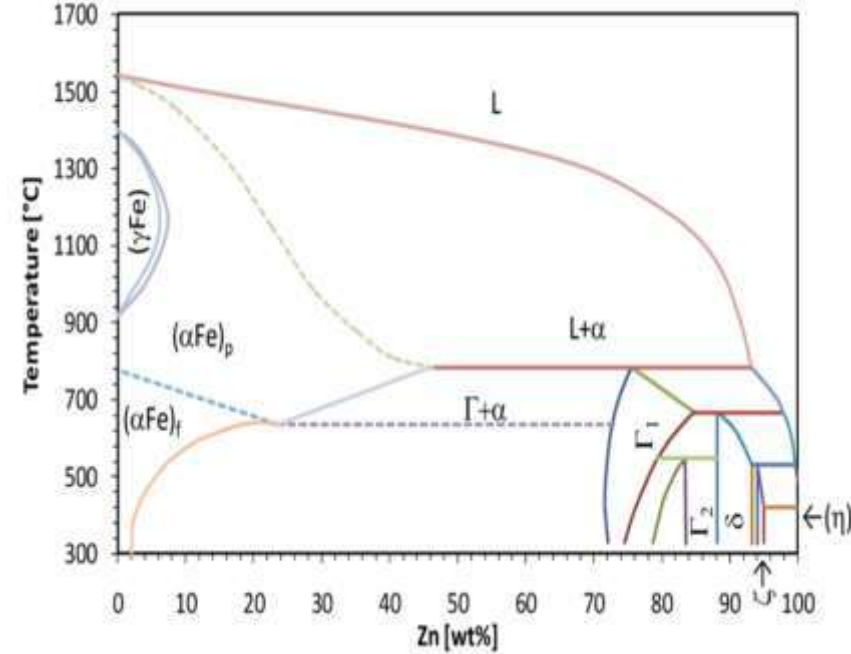
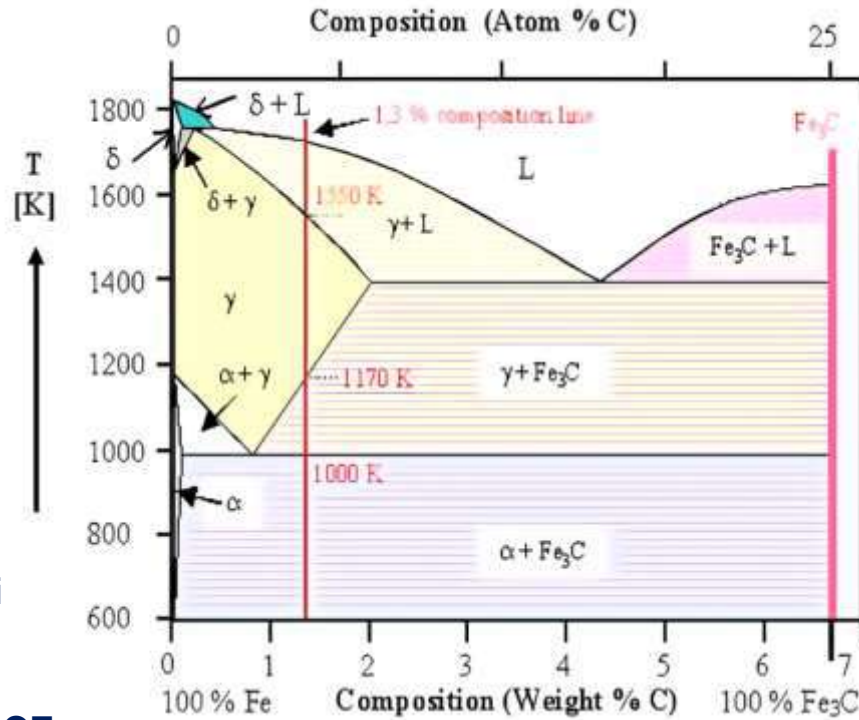
International zinc association

Asociația Internațională a Zincului

As the **IRON-CARBON DIAGRAM** is considered the



Leonardo Da Vinci  
“**MONA LISA**”  
of the  
**MATERIAL SCIENCE**



The **IRON-ZINC DIAGRAM** become



Constantin Brâncuși  
“**The kiss**” of the  
**ANTICORROSIVE PROTECTION SCIENCE**

**A bright spot for learning!**

**Let's add in the regular curricula of our students the IRON-ZINC DIAGRAM linked to the IRON-CARBON DIAGRAM**

**Because at 450°C the Zinc hugs the Steel and so they live for long, long time together!**

**“Hot dip galvanizing for anticorrosive protection.  
A step inside the steel”**

**Thank you for the opportunity to be here today!**

**ing. Virgiliu Vițan**