# GI OR GL? DEBUNKING POPULAR BELIEFS AMID TROPICAL WEATHER


# FIRST TIME HOME BUYER




Photo by **RODNAE Productions** from **Pexels**

# CREATING RELIABILITY FOR YOUR PROJECT

Source: BlueScope

# ONLY TO FIND THE ROOF RUSTED AND LEAKING WITHIN 10 YEARS

Source: BlueScope

# ONLY TO FIND THE ROOF RUSTED AND LEAKING WITHIN 10 YEARS

Source: Google Earth

# IMAGINE THE TROUBLES IT MAY CAUSE TO THE OWNER

https://www.rpsmetalroofing.com/how-to-prevent-your-metal-roof-from-rusting/


# MAINTENANCE COST

https://staydryroofing.com/top-differences-between-a-reroof-vs-roof-replacement/


# UNSEEN COST




Photo by **Anna Tarazevich** from **Pexels**

# ECONOMICAL IMPACT

https://www.deseret.com/faith/2021/5/12/22429166/the-unseen-economic-social-impact-of-american-faith-brian-grim-religious-freedom-business-foundation


# CONSEQUENCE OF MATERIAL CHOICES

# CONDITION OF TROPICAL WEATHER

-

# HUMID AIR & FREQUENT RAIN





Photo by **Brett Sayles** from **Pexels**

# CONDITION OF TROPICAL WEATHER

-

# HOT SUNNY DAYS




Photo by **MarcTutorials** from **Pexels**

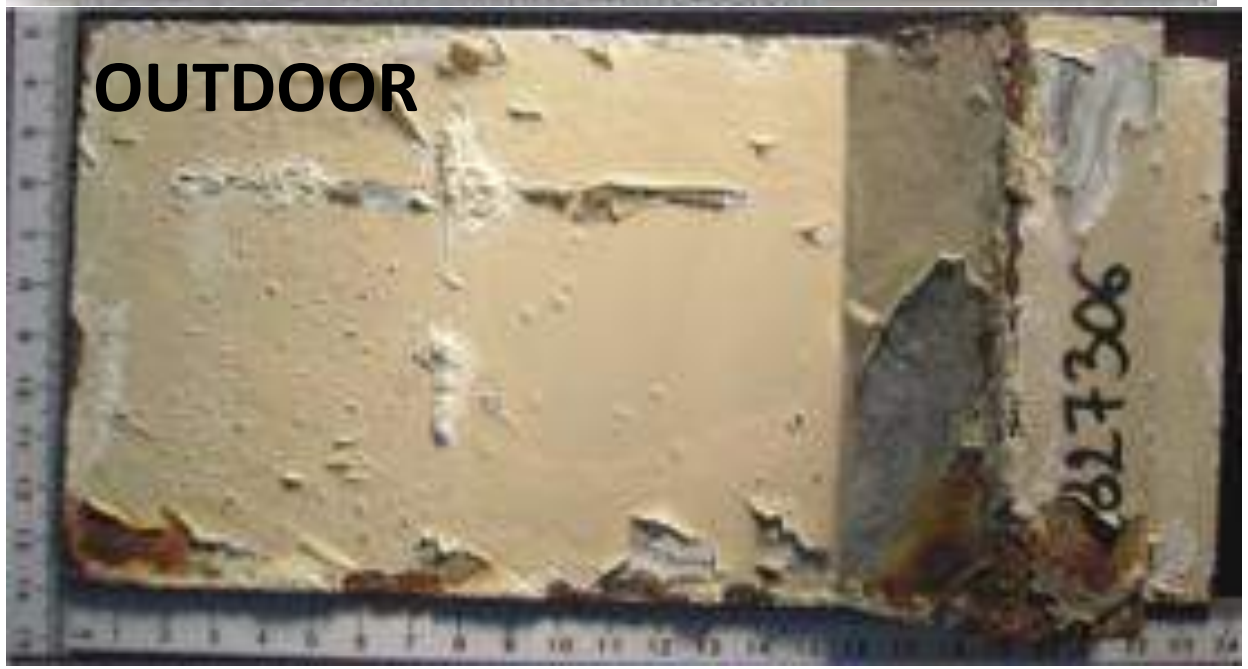
# POPULAR BELIEFS THAT GALVANISED COATING WILL NOT RUST




Source: BlueScope

# DO NOT TAKE IT FOR GRANTED

Source: BlueScope

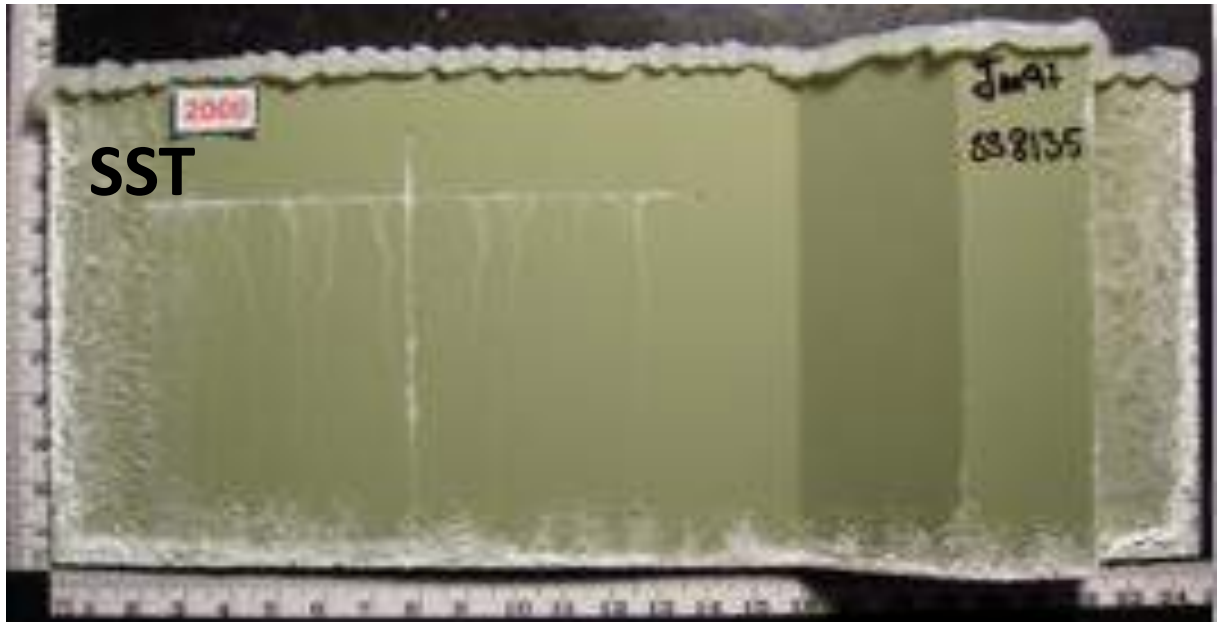




# COMMON PROBLEMS FACED

-

# DISCREPANCY OF PERFORMANCE TEST

Source: BlueScope

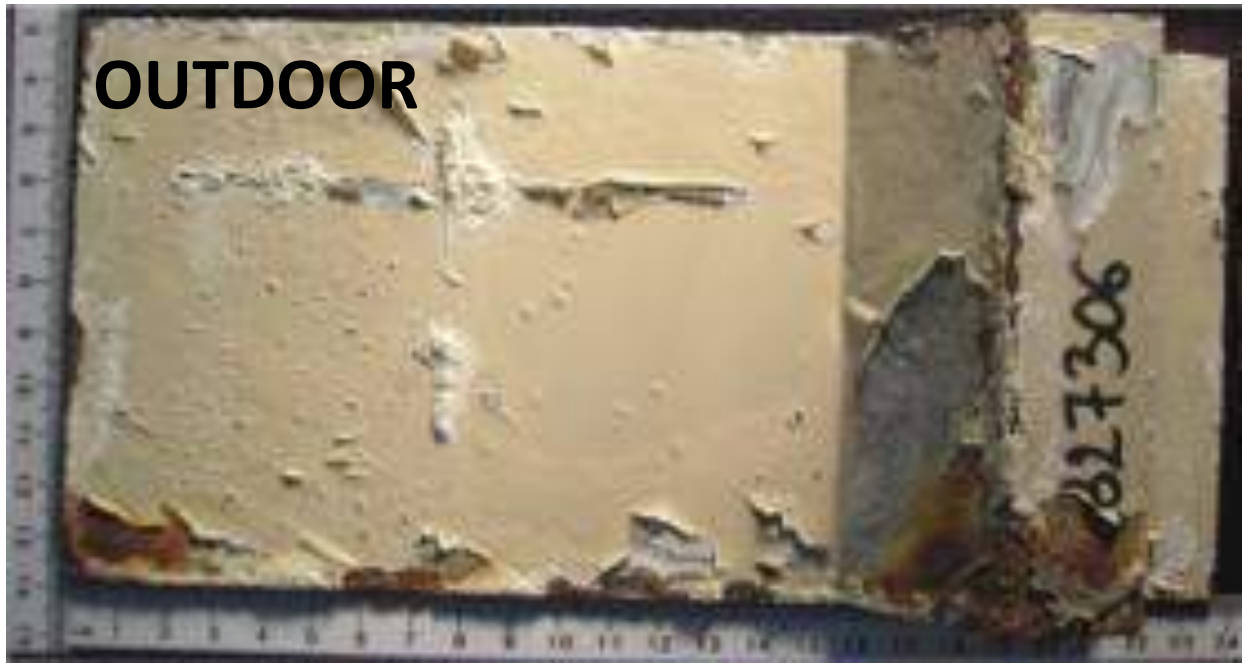



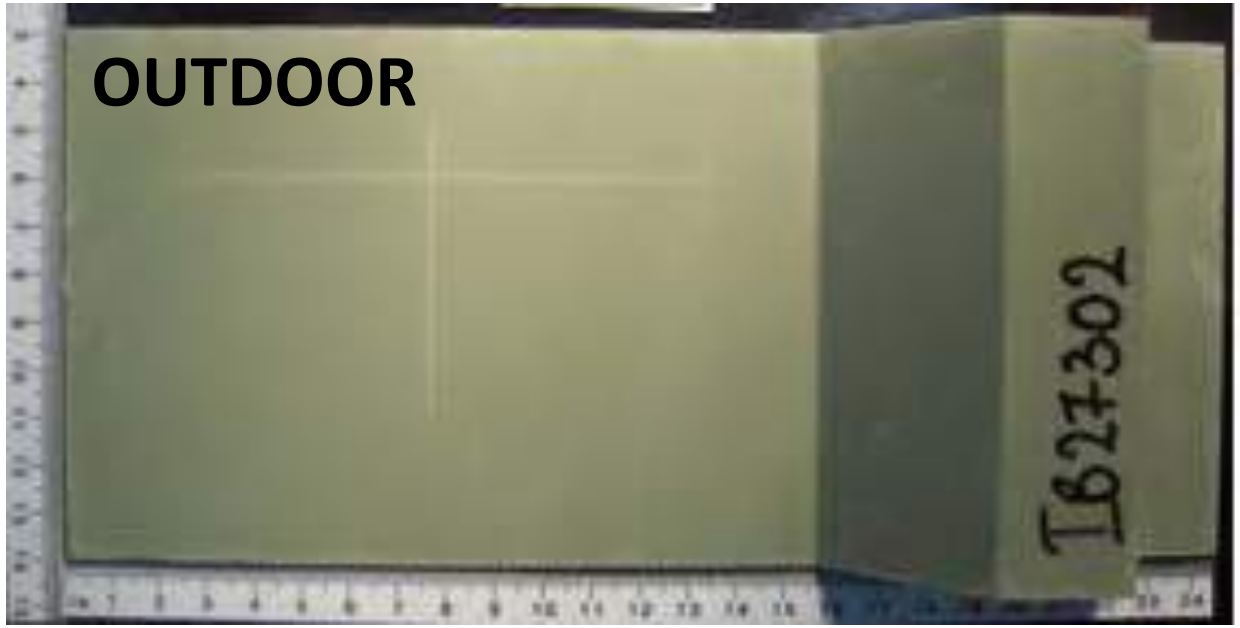

# COMMON PROBLEMS FACED

-

# DISCREPANCY OF PERFORMANCE TEST

Source: BlueScope




# OUTDOOR EXPOSURE TEST NOT COMMONLY ASKED

Source: BlueScope

# PARAMOUNT TO IDENTIFY MATERIAL SUITABILITY

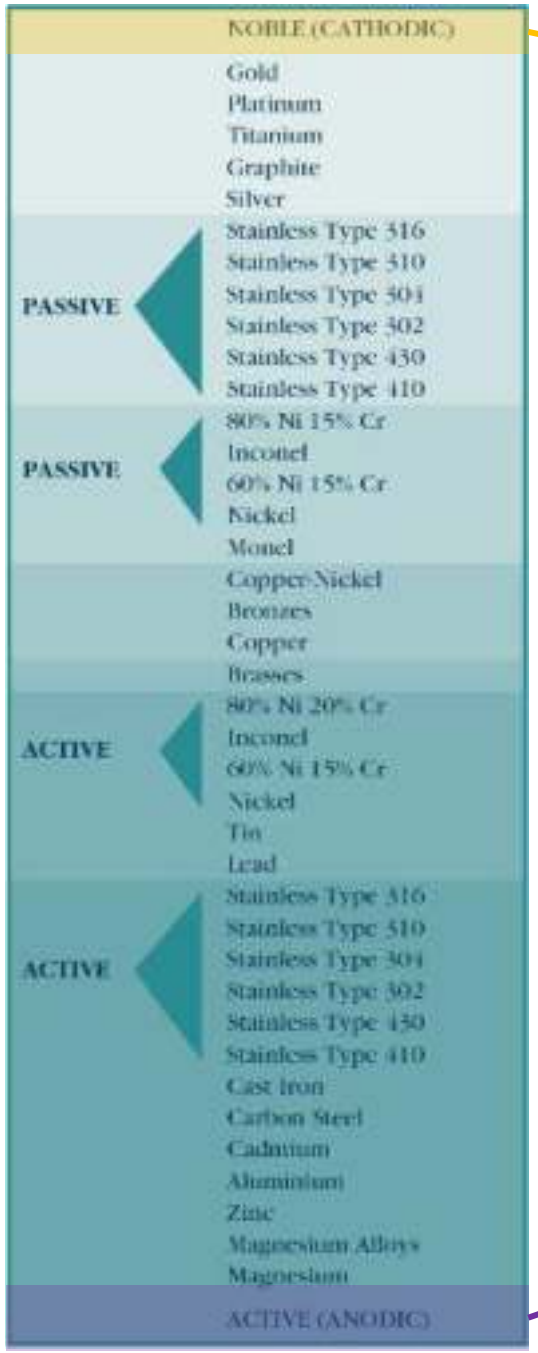
Source: BlueScope

???

STEEL

???

# WHAT ARE THE DIFFERENT TYPES OF GALVANIC COATING FOR STEEL?

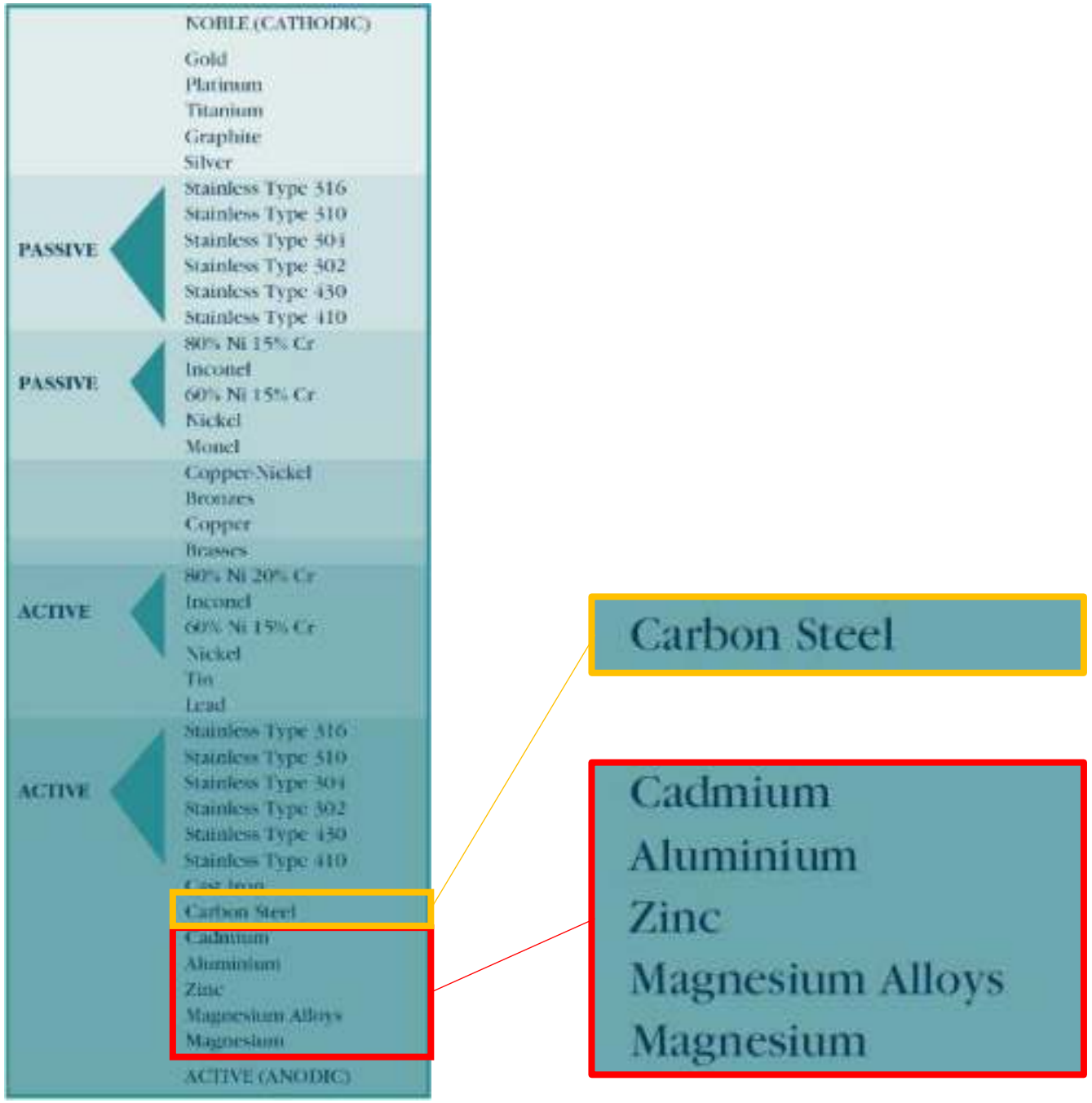



NOBLE (CATHODIC)

ACTIVE (ANODIC)

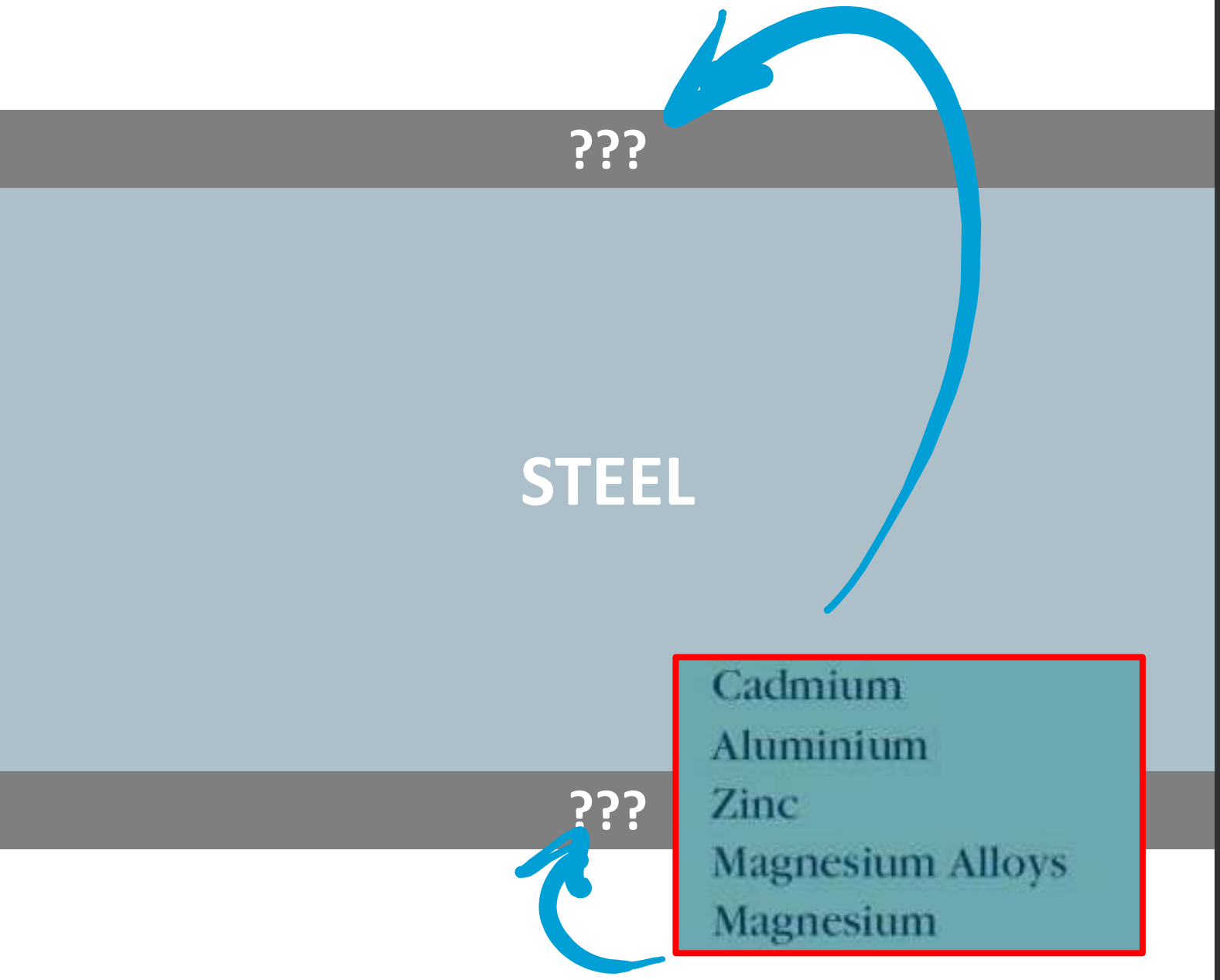
# GALVANIC SERIES

Source: BlueScope



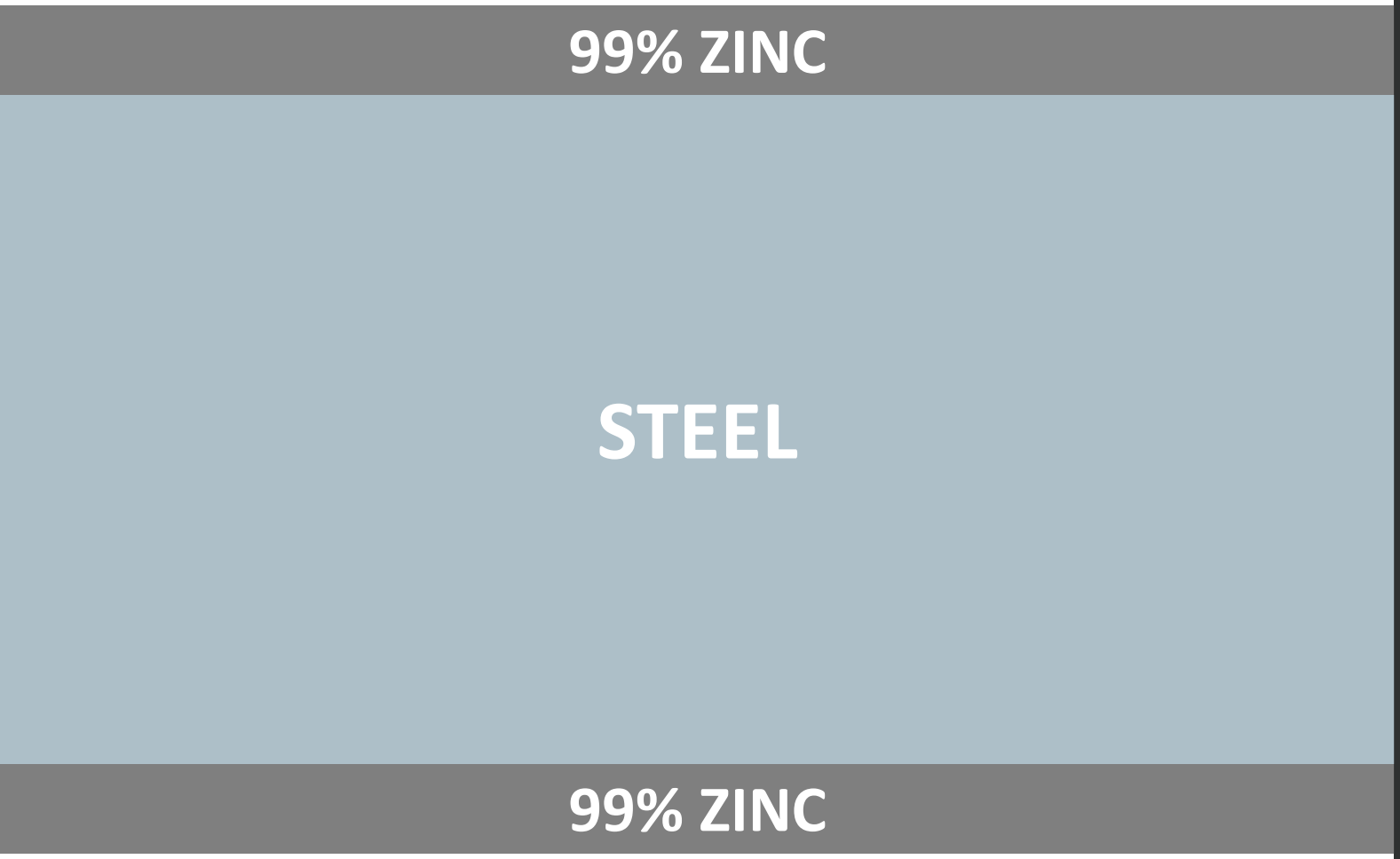

# A FEW RELATIVELY ANODIC (ACTIVE) METALS TO STEEL

Source: BlueScope




# USAGE OF DIFFERENT METALS IN DIFFERENT CONCENTRATION

Source: BlueScope




# SOME COMMON GALVANIC COATING

55% ALUMINIUM, 43.5% ZINC

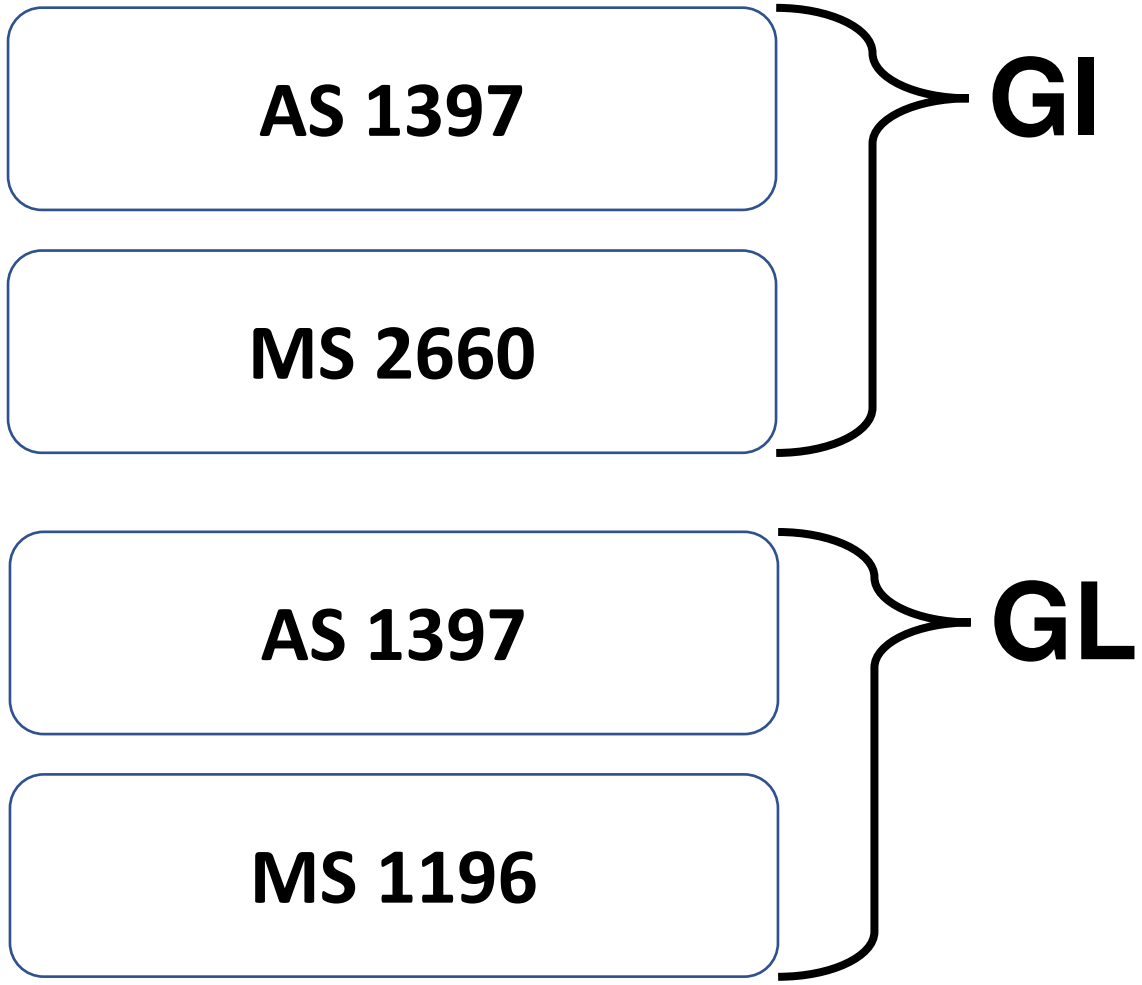
STEEL

55% ALUMINIUM, 43.5% ZINC

# SOME COMMON GALVANIC COATING

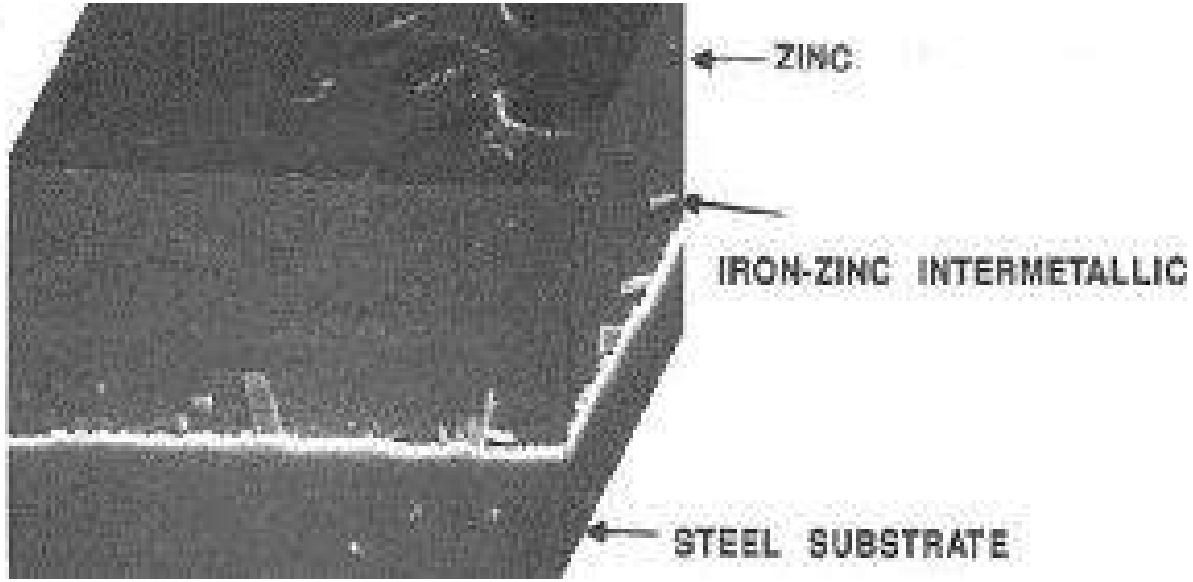

# 1

# WHAT ARE “GI” & “GL”

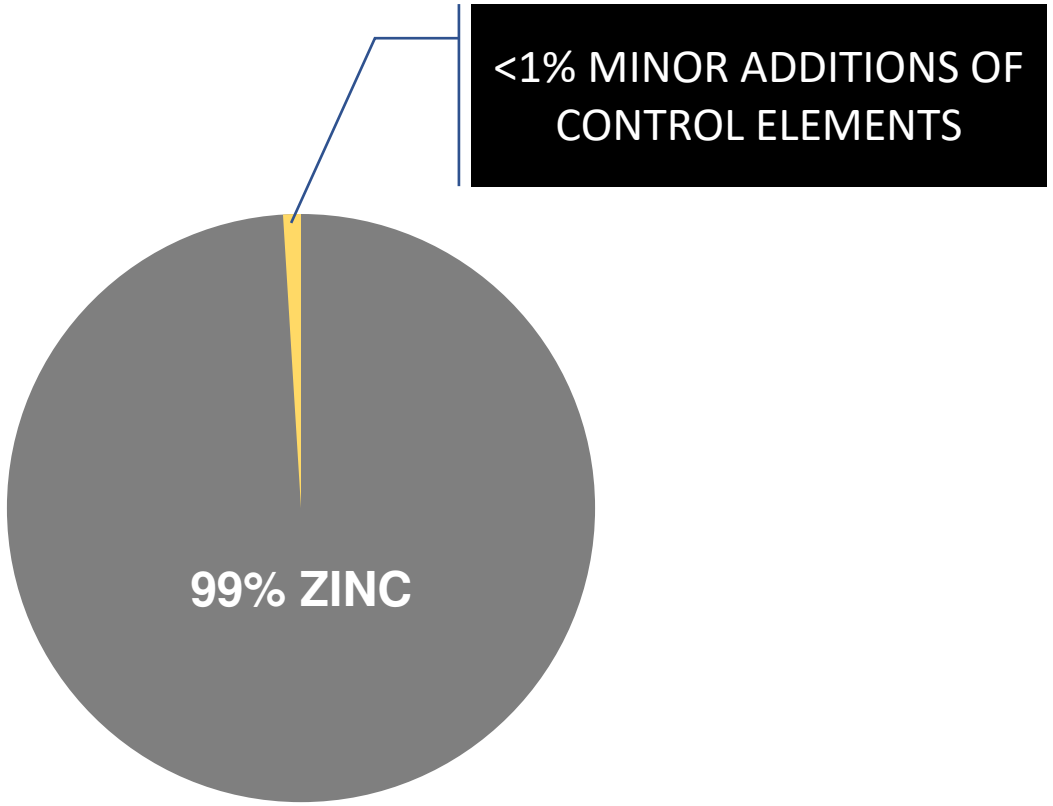



# DIFFERENT STANDARDS FOR GI & GL

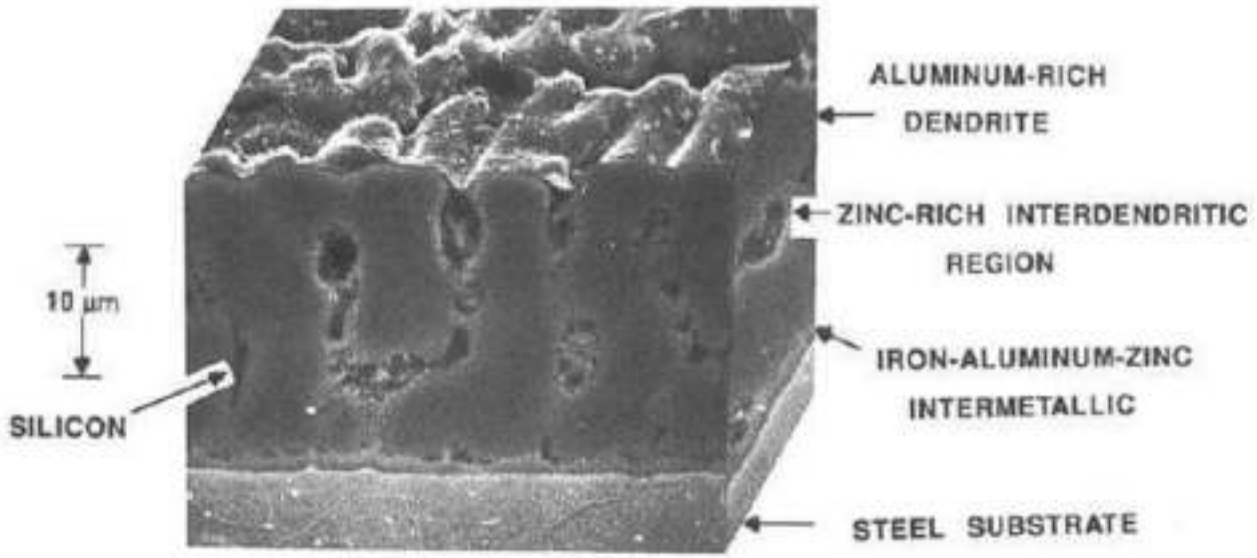

# STANDARD DOCUMENTS




# GI - GALVANISED IRON

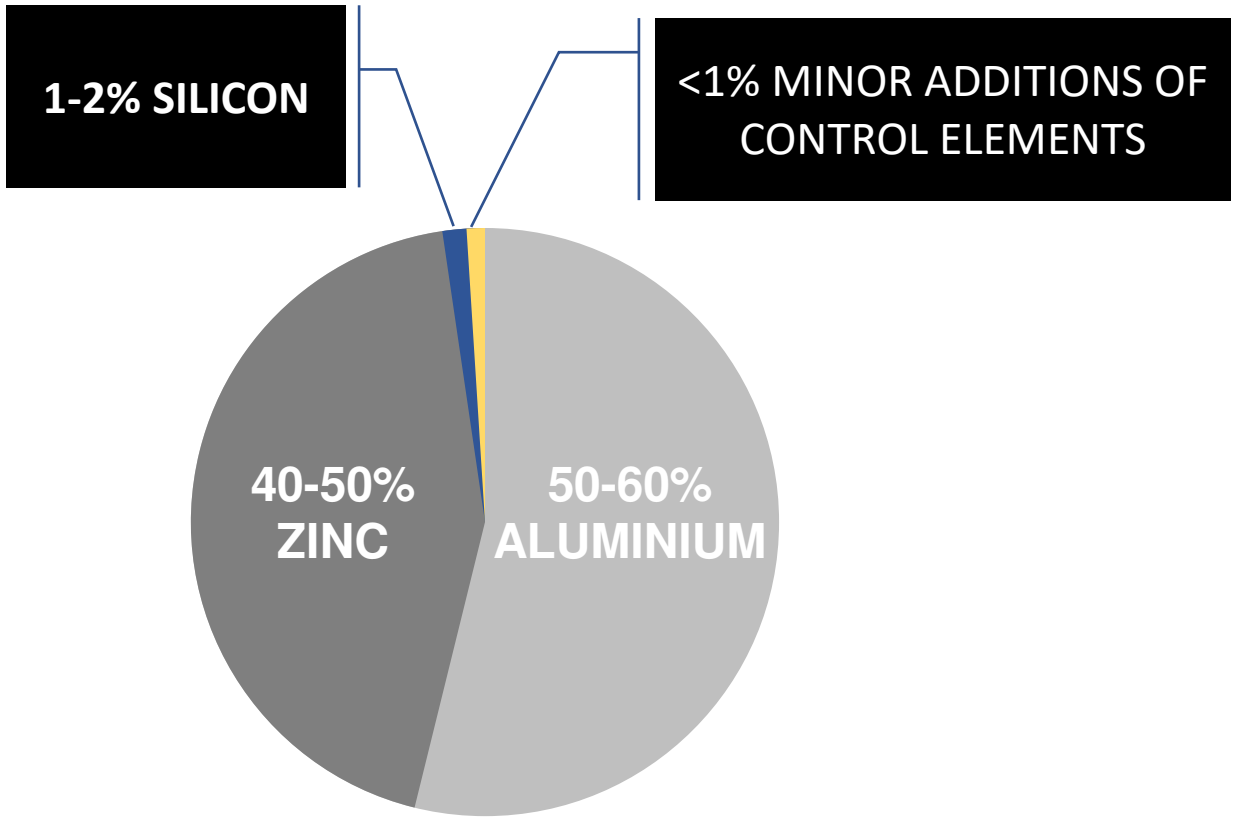



# FORMULA BASED ON STANDARDS

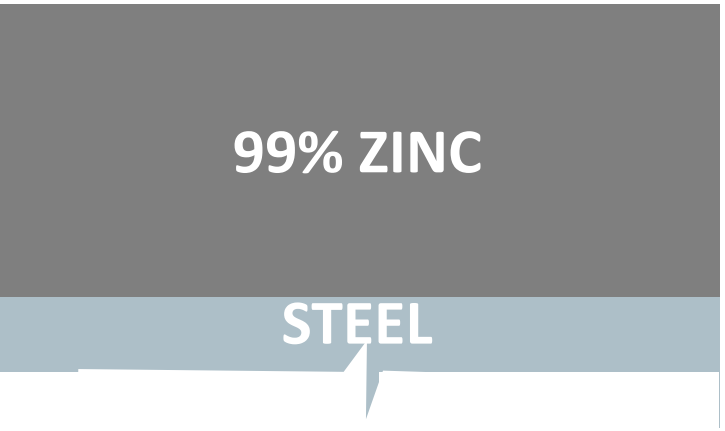


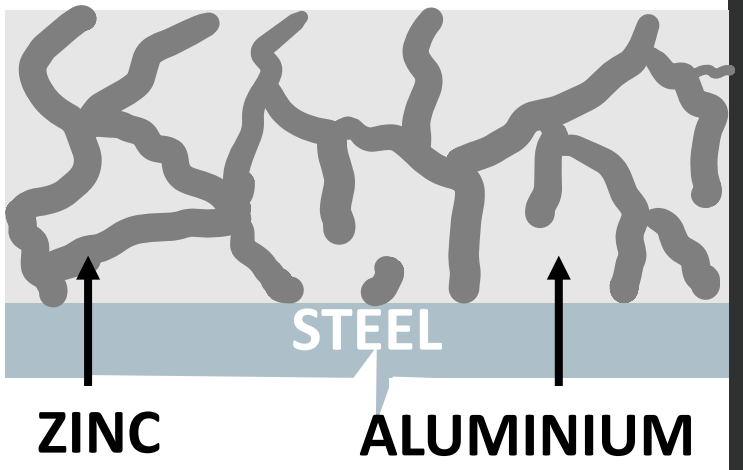

# GL
# -
# GALVALUME®

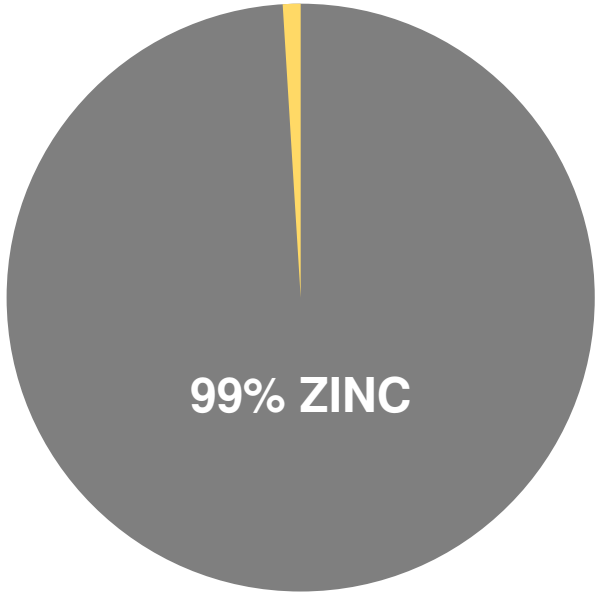
https://www.galvalume.com/



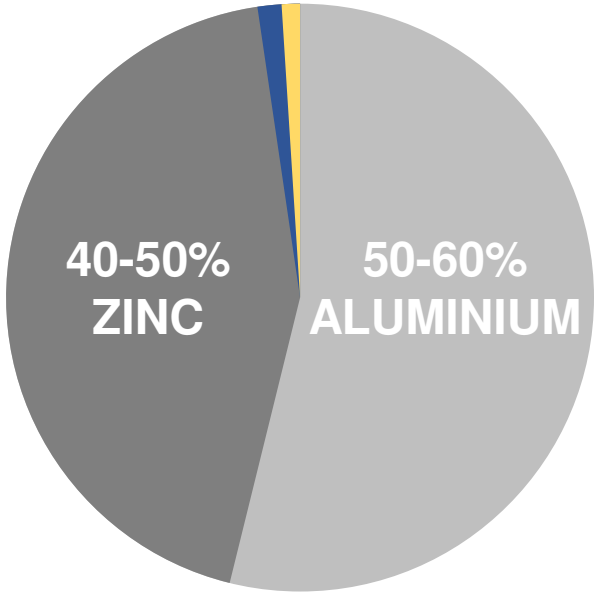

# FORMULA BASED ON STANDARDS



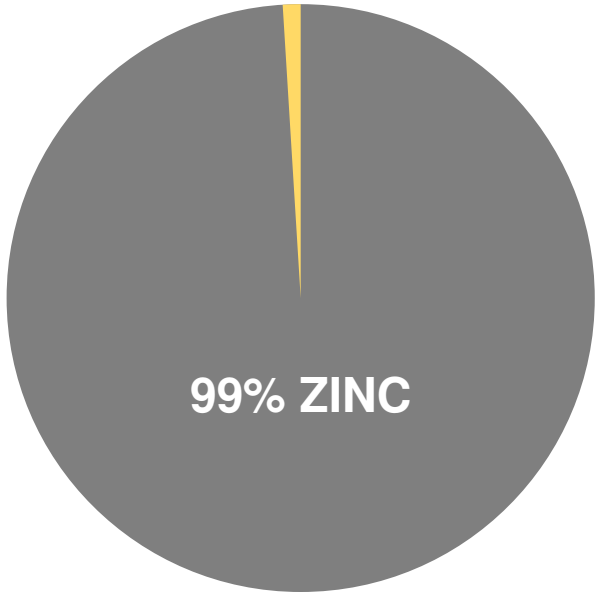




GI



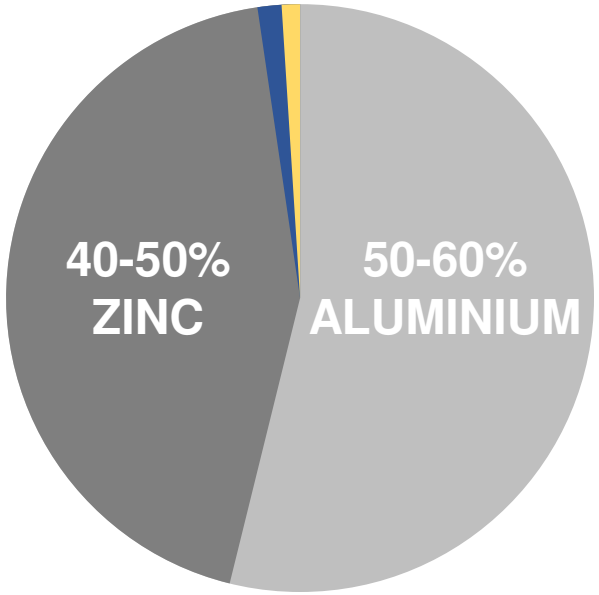

GL

# HOW TO COMPARE ACROSS DIFFERENT COATING TYPE?




**GI**

**Z150**



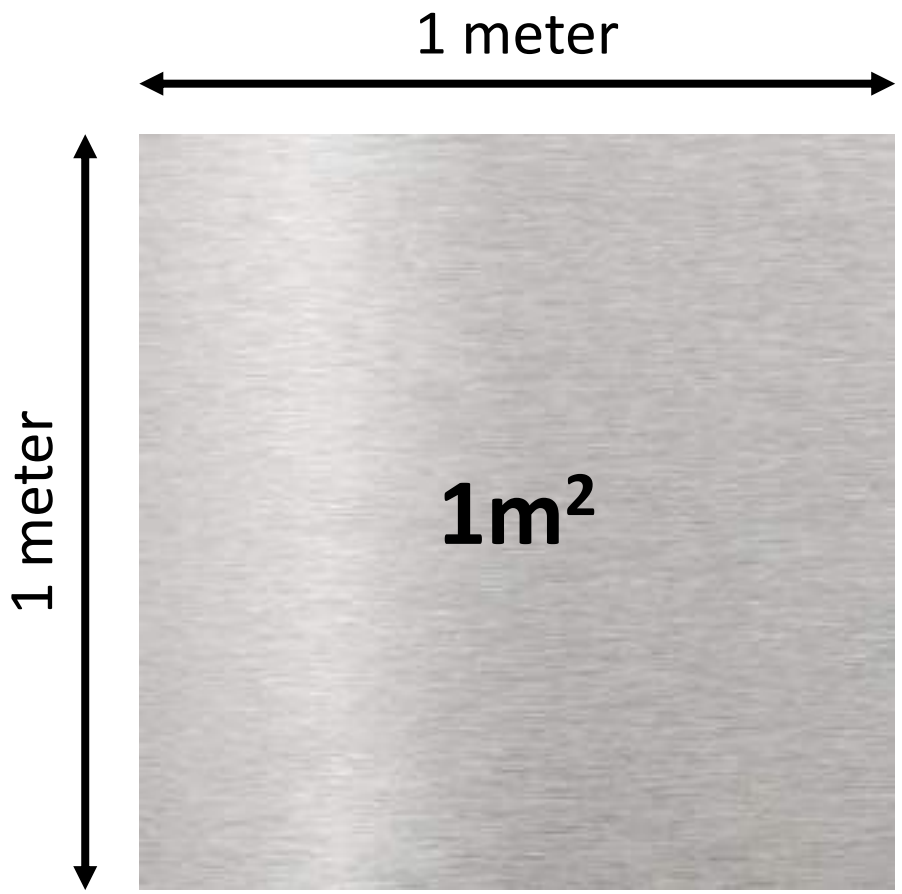

**GL**

**AZ150**

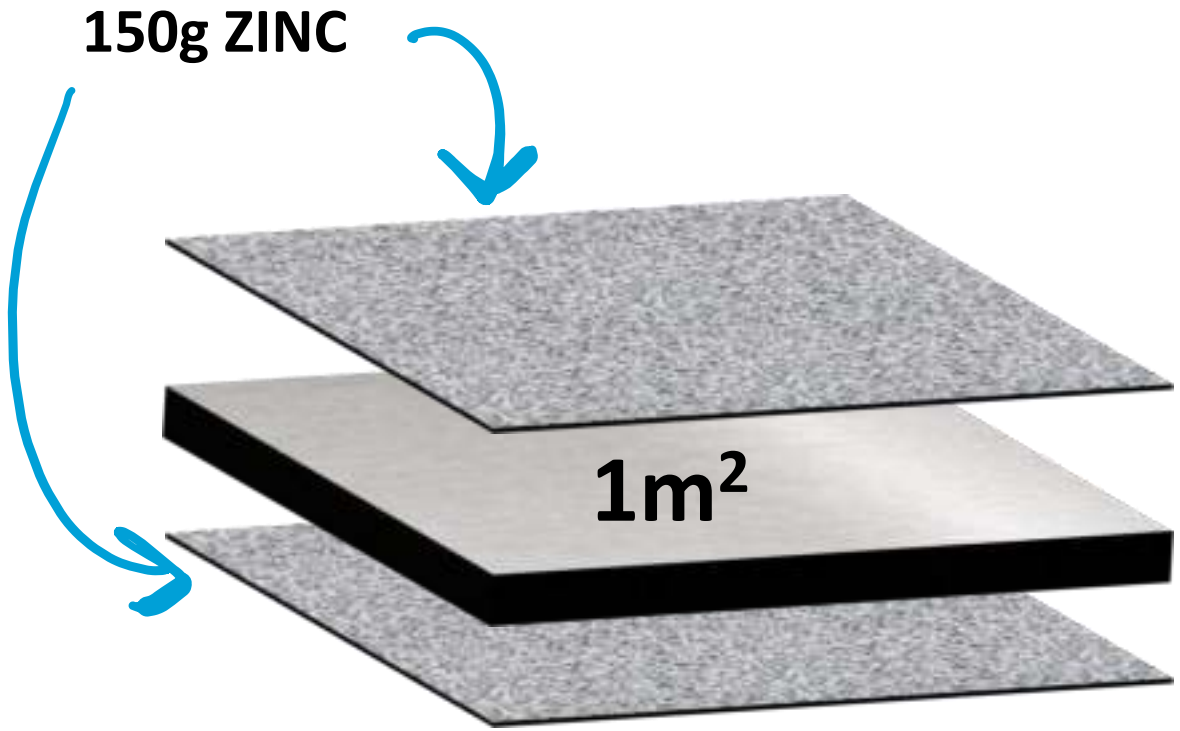
# SHOULD WE COMPARE Z150 & AZ150?


# HAVE YOU SEEN PACKAGED PAPER?

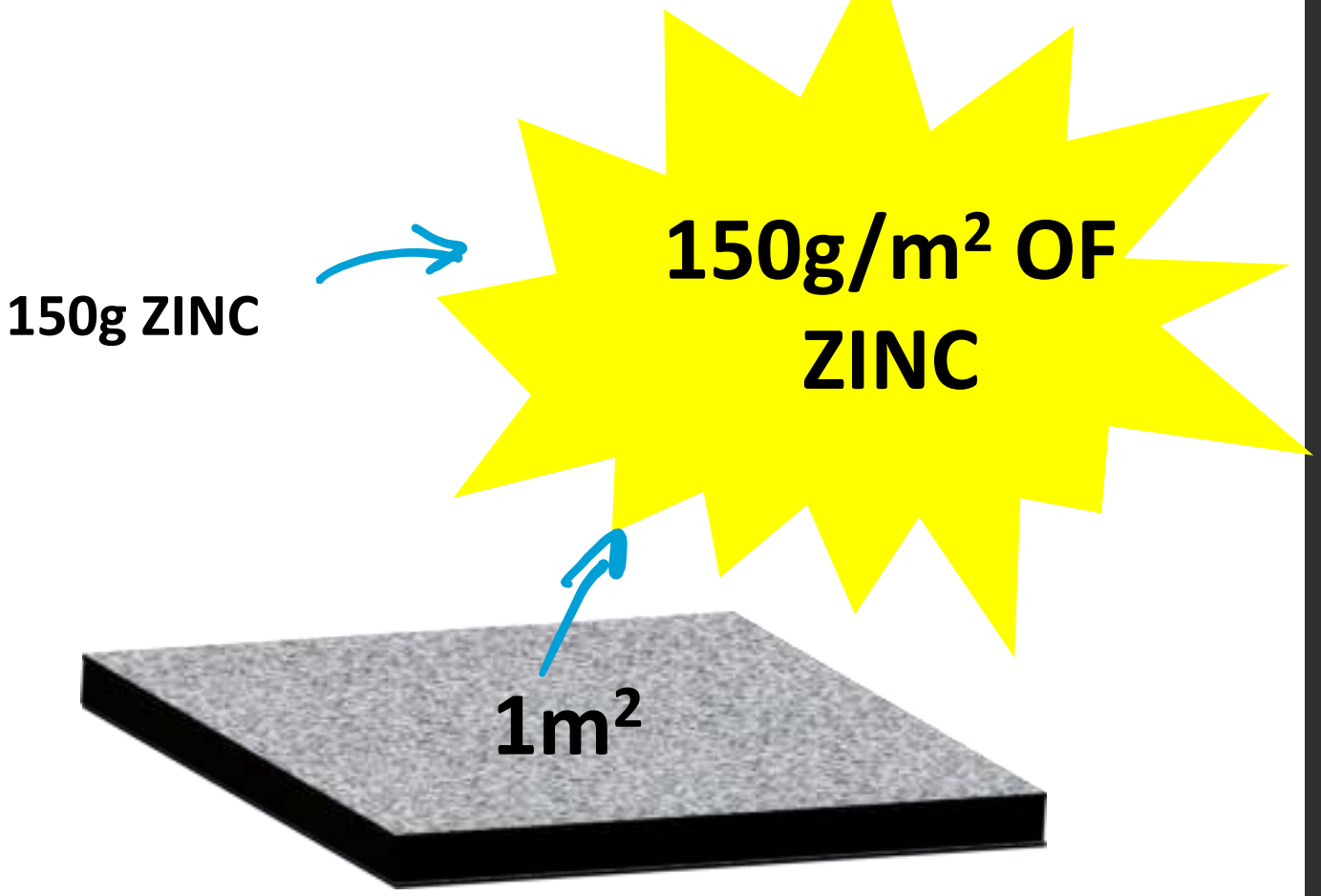

# THICKNESS REPRESENTED IN "gsm" OR "g/m²"



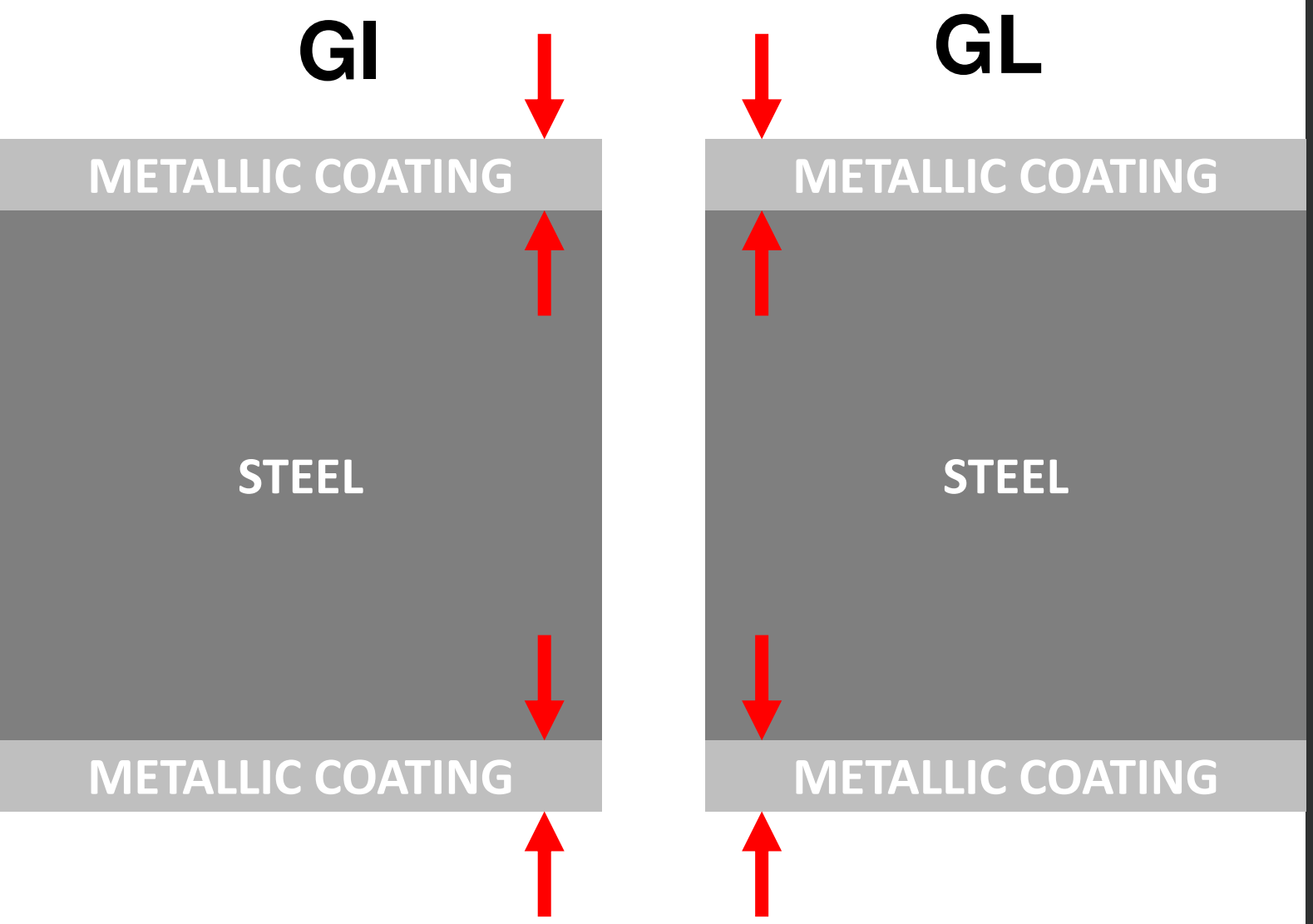

# HOW TO GET Z150?



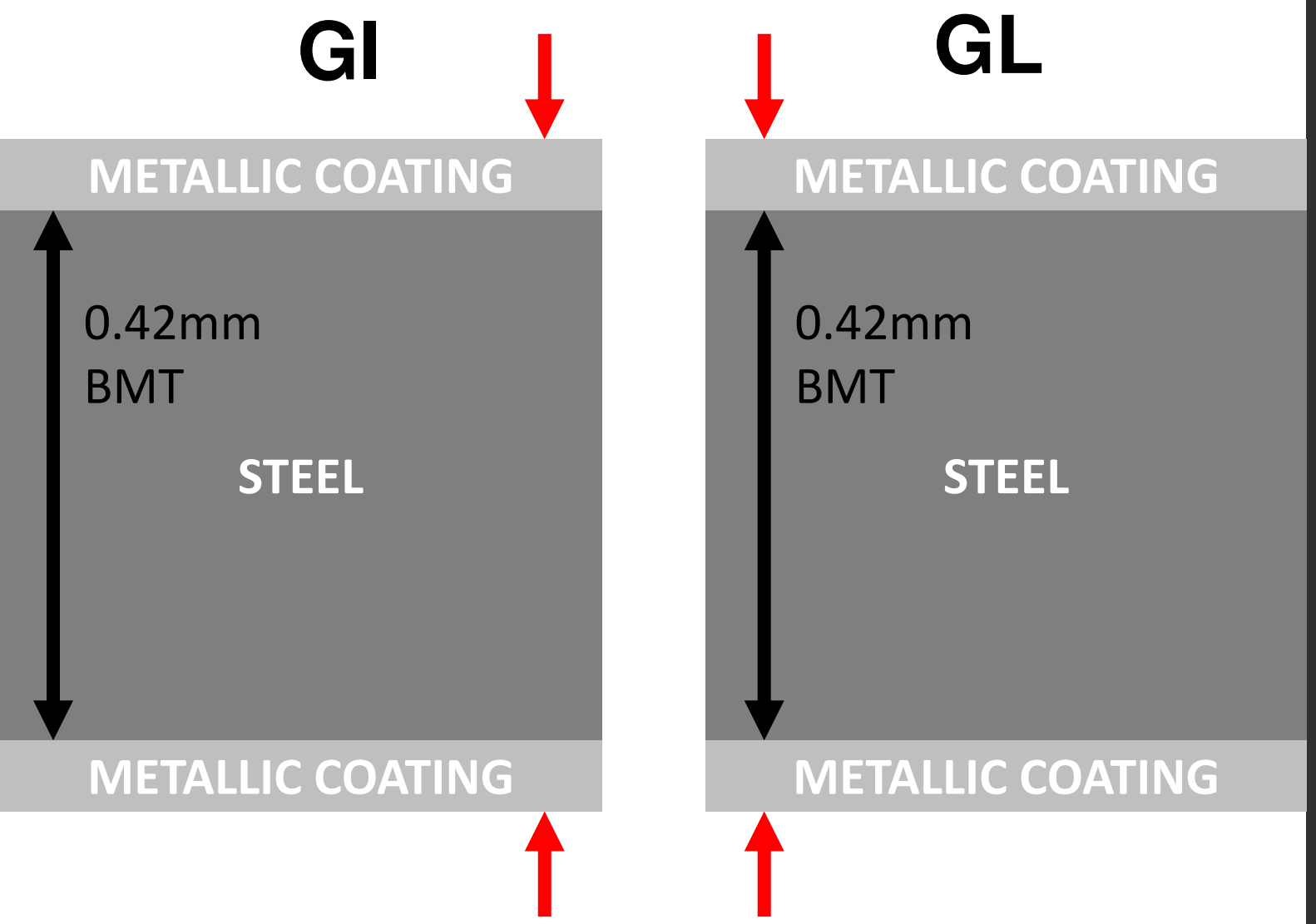

# HOW TO GET Z150?



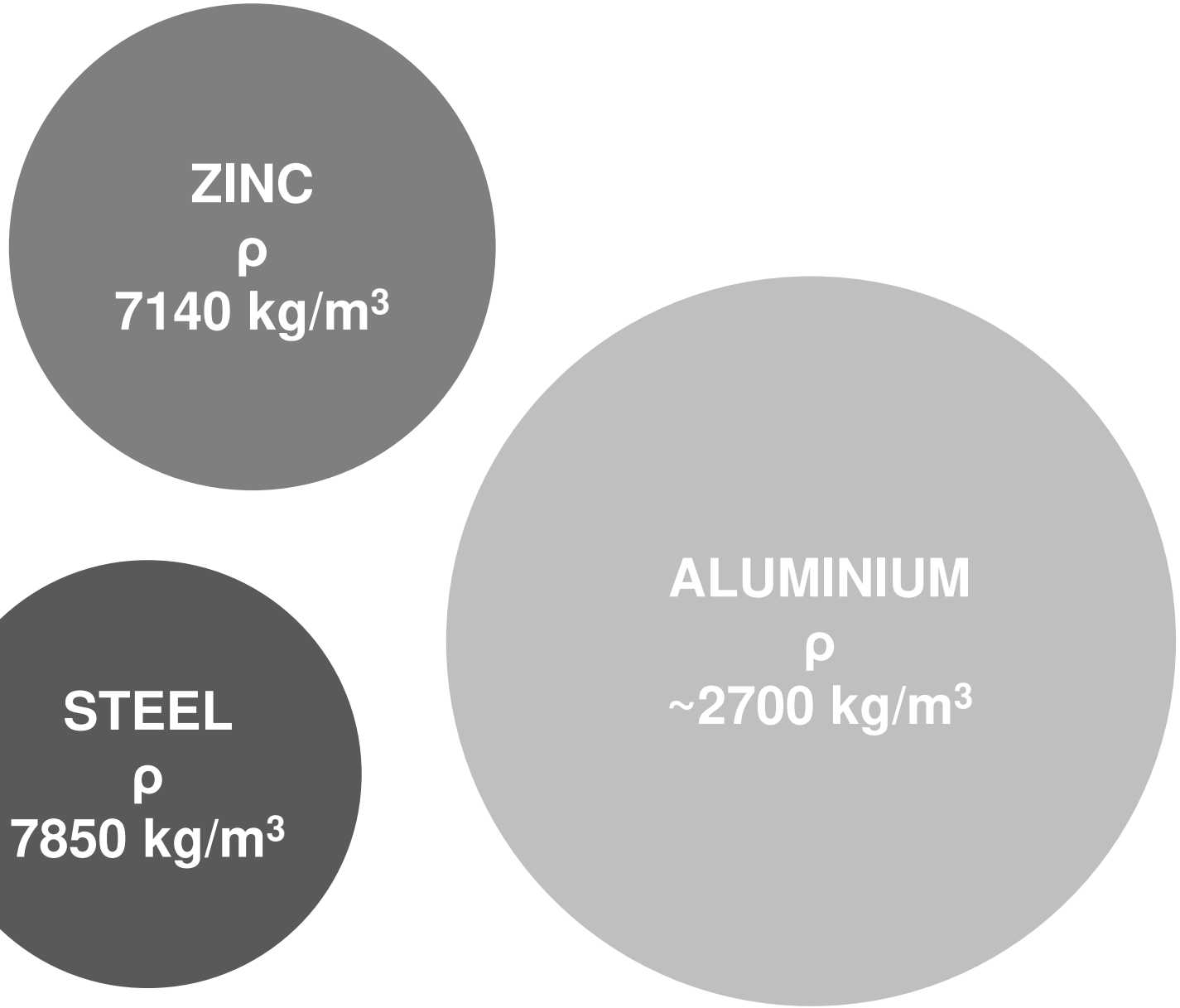

# HOW TO GET Z150?




# COMPARE BY THE COATING THICKNESS?



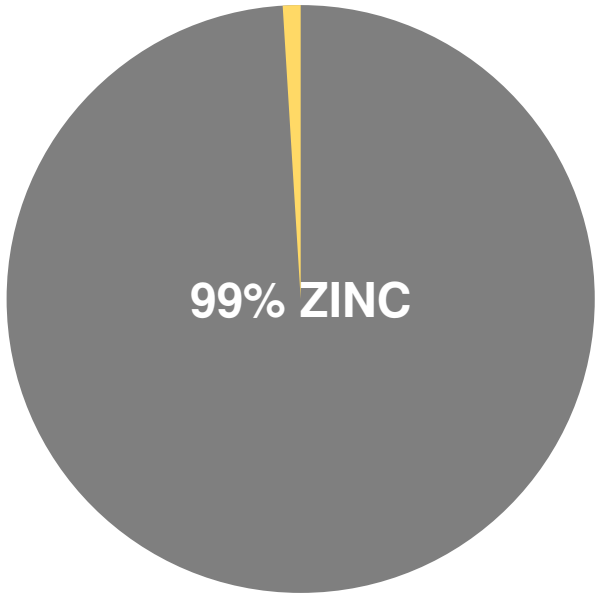

# PHYSICAL MEASUREMENT




# DENSITY
# ρ

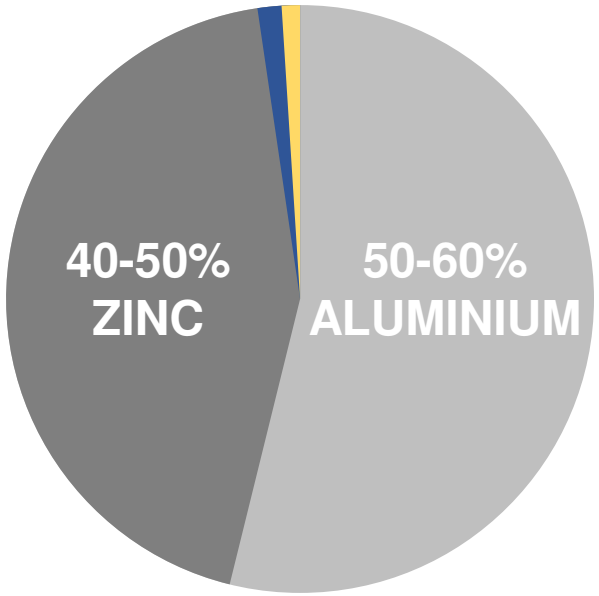



Source: https://www.engineeringtoolbox.com/metal-alloys-densities-d_50.html




**GI**

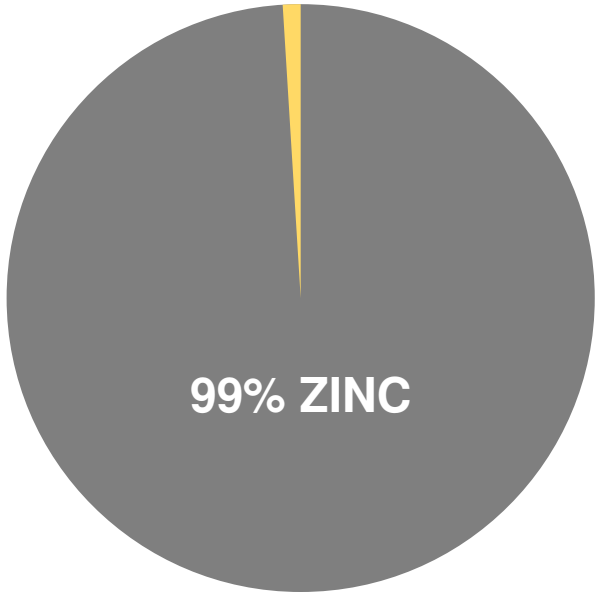
**Type Z** coating density,
$\rho$ = **7140 kg/m$^3$**




**GL**

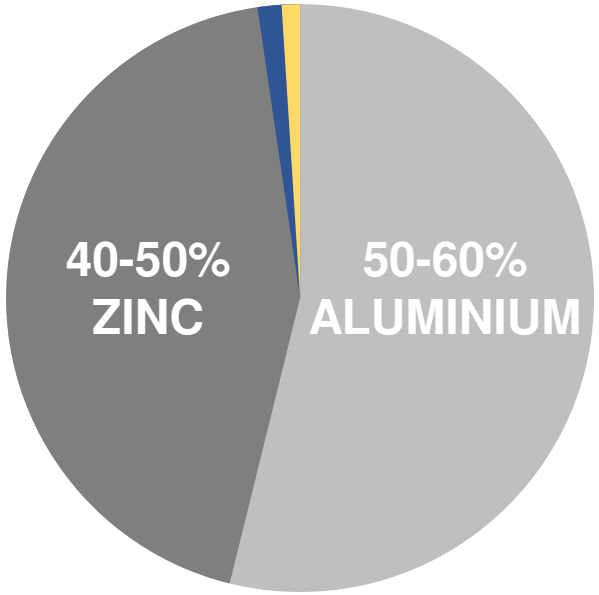
**Type AZ** coating density,
$\rho$ = **3680 kg/m$^3$**

# DIFFERENT COATING DENSITY




**GI**

**Z150**




**GL**

**AZ150**

# COMPARE Z150 & AZ150

# FORMULA USED TO CALCULATE COATING THICKNESS

Physical thickness of the coating can be calculated as:

$$\boldsymbol{Thickness = \frac{Coating\ Mass}{\rho}}$$

*For **Z150***

$$Thickness = \frac{150}{7140}$$

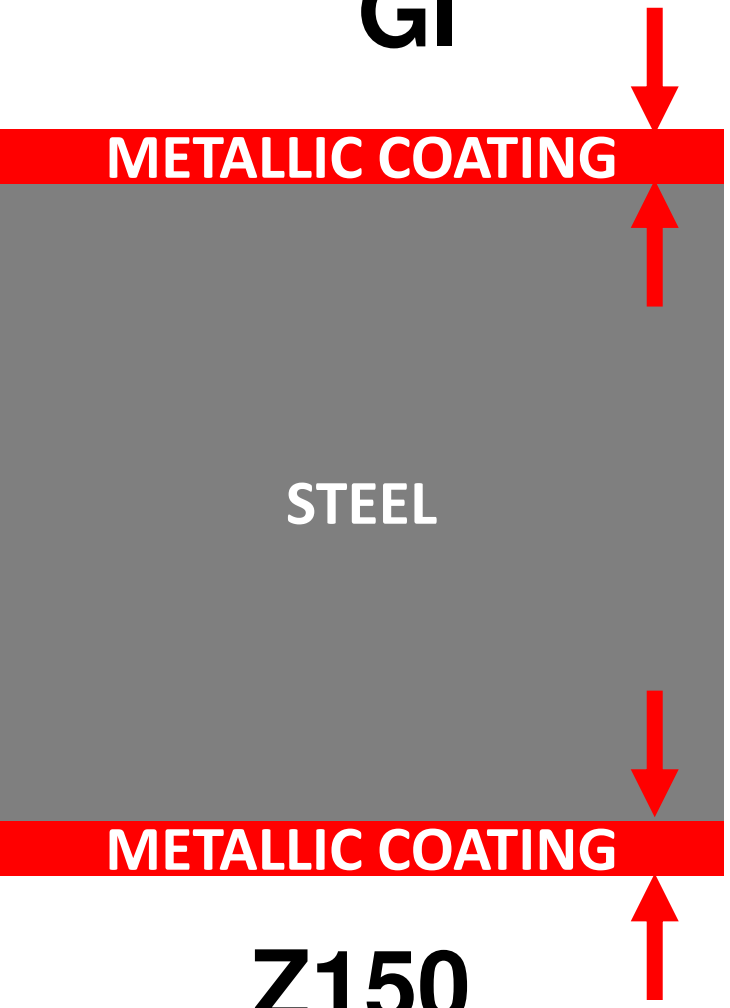
***= 0.021mm***

*For **AZ150***

$$Thickness = \frac{150}{3680}$$

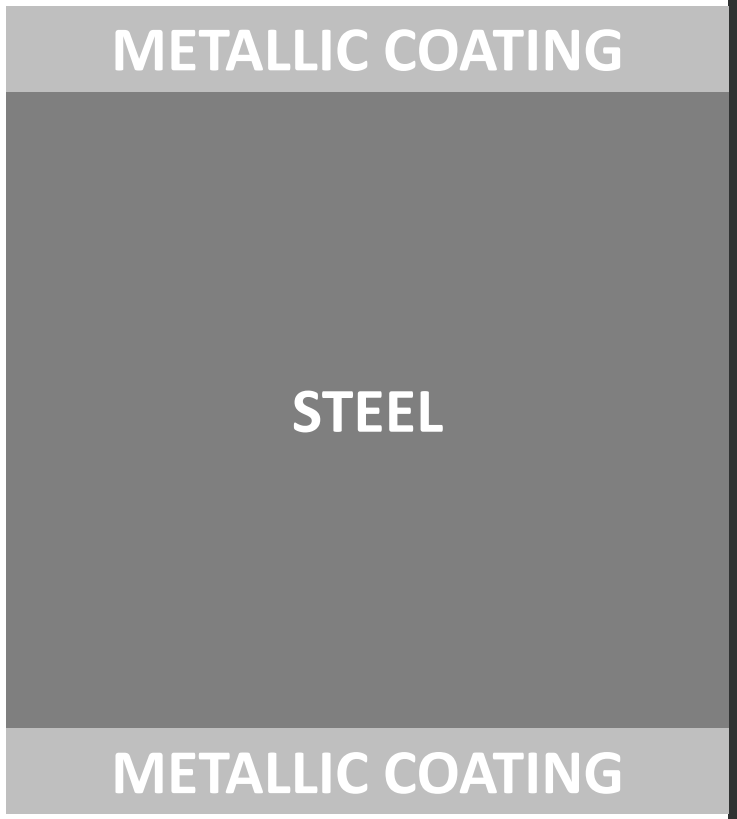
***= 0.041mm***

## GI



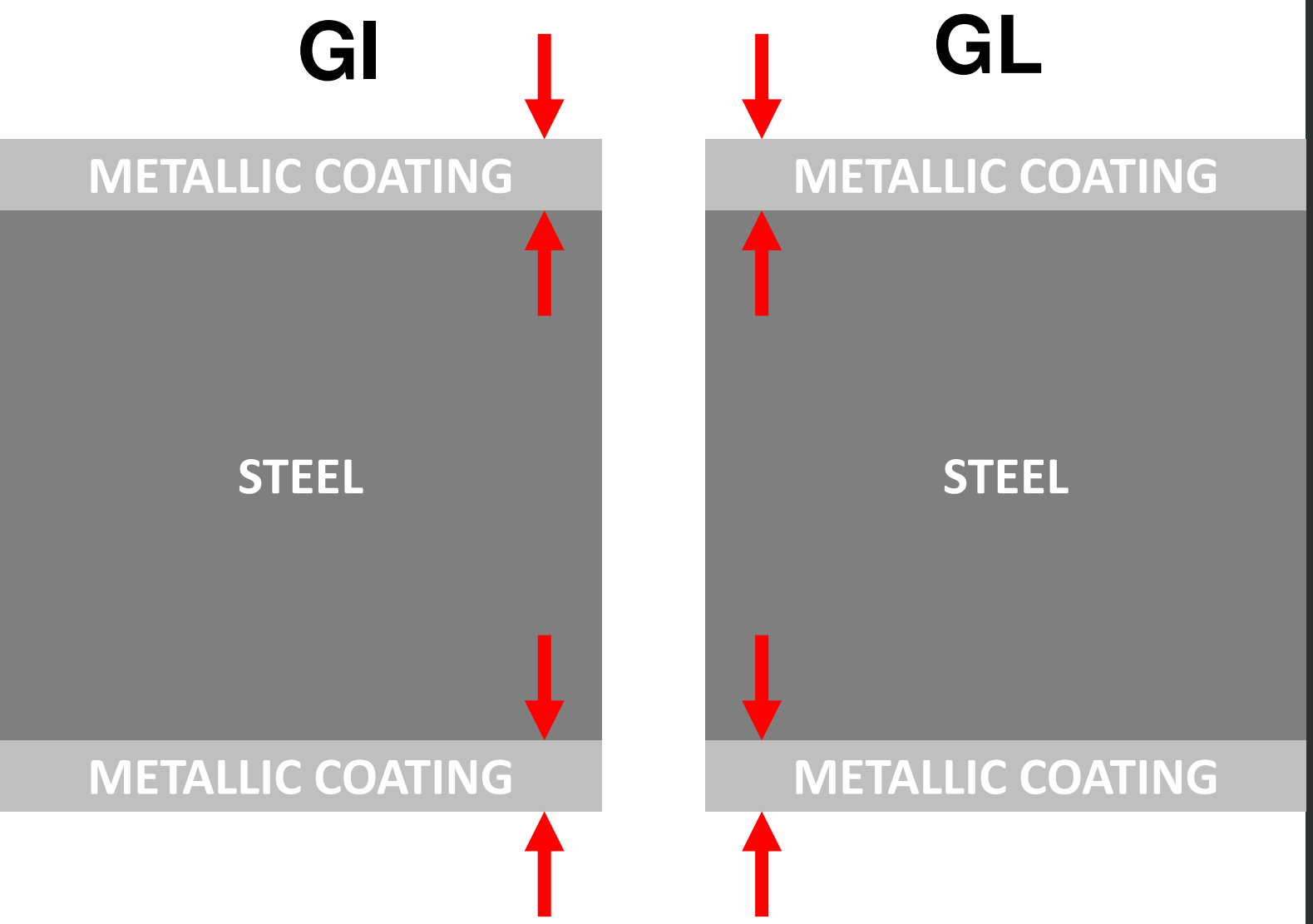

**Z150**
**~0.021mm**

## GL




**AZ150**
**~0.041mm**

# Z150 IS THINNER THAN AZ150 BY HALF




# NEAREST COATING THICKNESS

Physical thickness of the coating can be calculated as:

$$\boldsymbol{Thickness = \frac{Coating\ Mass}{\rho}}$$

*For **Z275***

$$Thickness = \frac{275}{7140}$$

***= 0.038mm***

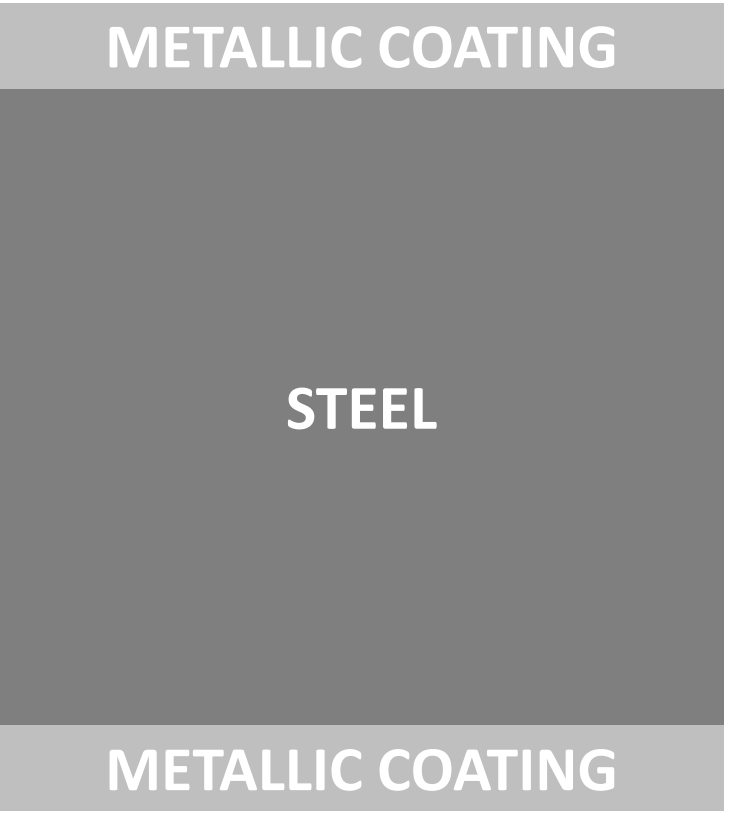
*For **AZ150***

$$Thickness = \frac{150}{3680}$$

***= 0.041mm***

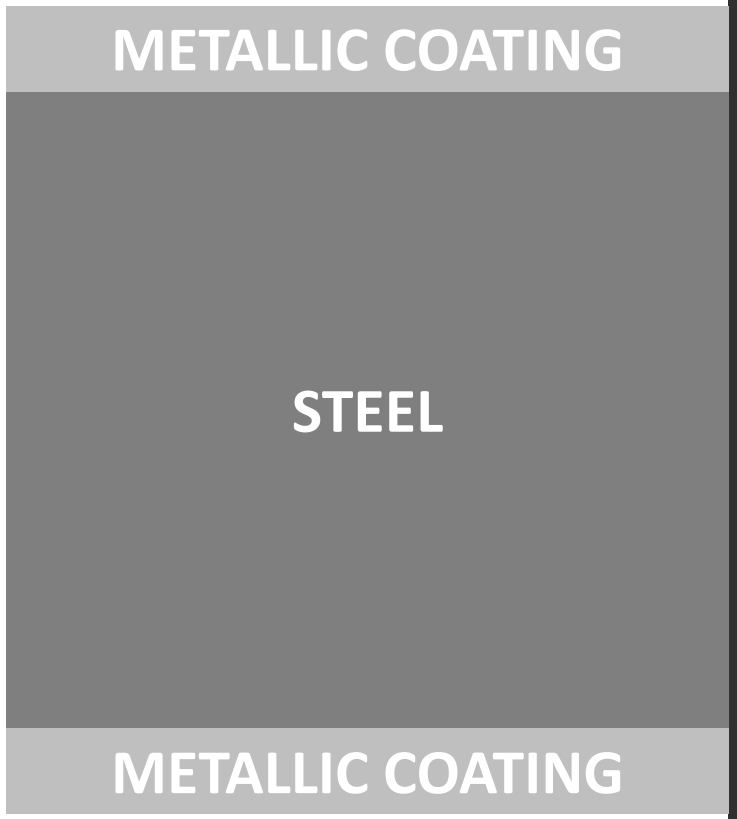
**FIND CLOSEST THICKNESS USING THE SAME FORMULA**

# GI




**Z275**
**~0.038mm**

# GL




**AZ150**
**~0.041mm**

## Z275 & AZ150 SIMILAR THICKNESS

# ② PERFORMANCE OF GI & GL

Source: BlueScope

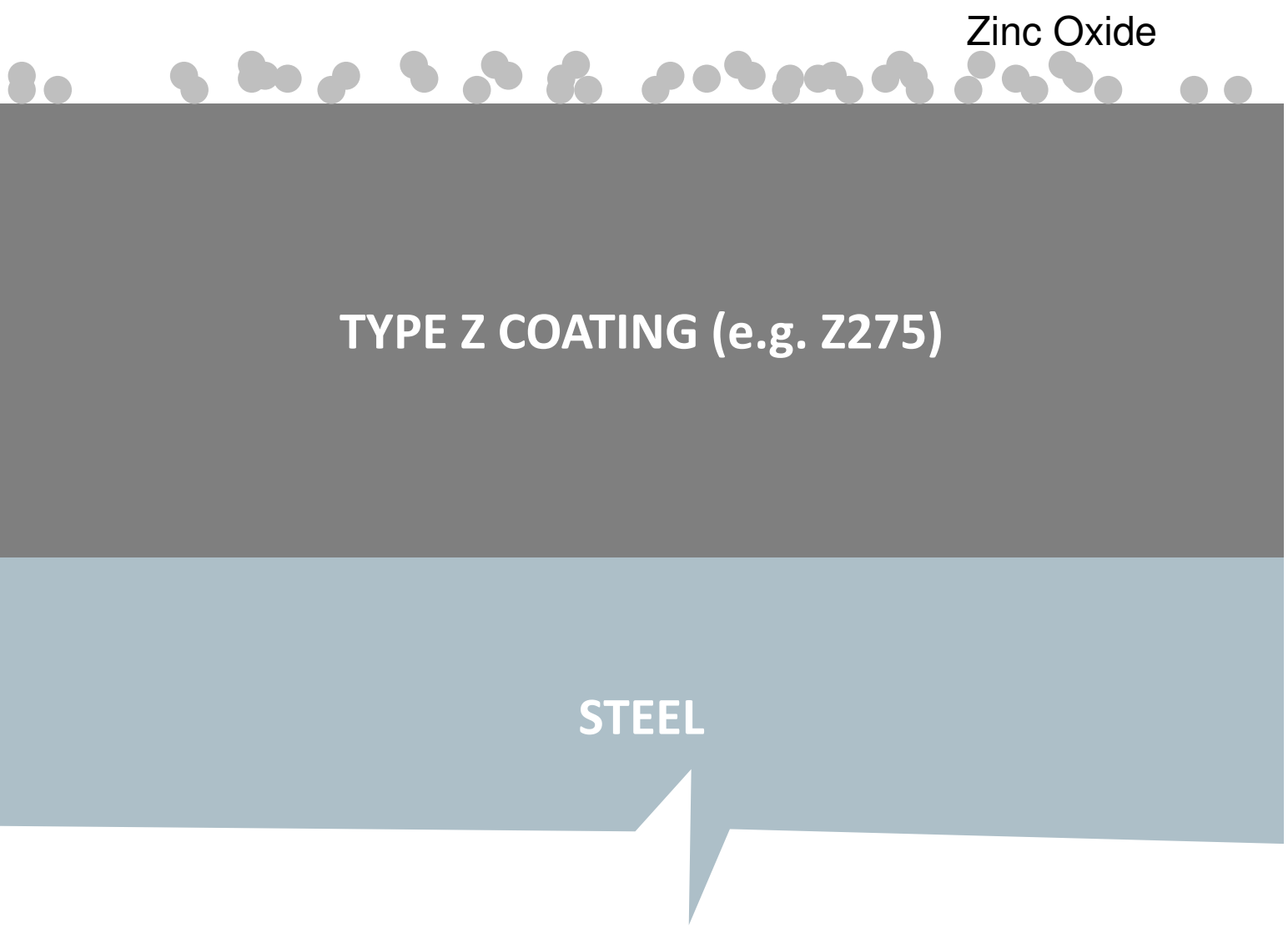
| | GI | | GL | |
|---|---|---|---|---|
| List of Tests | AS 1397 | MS 2660 | AS 1397 | MS 1196 |
| Quality Test | | | | |

# STANDARDS ONLY INCLUDE QUALITY TESTS

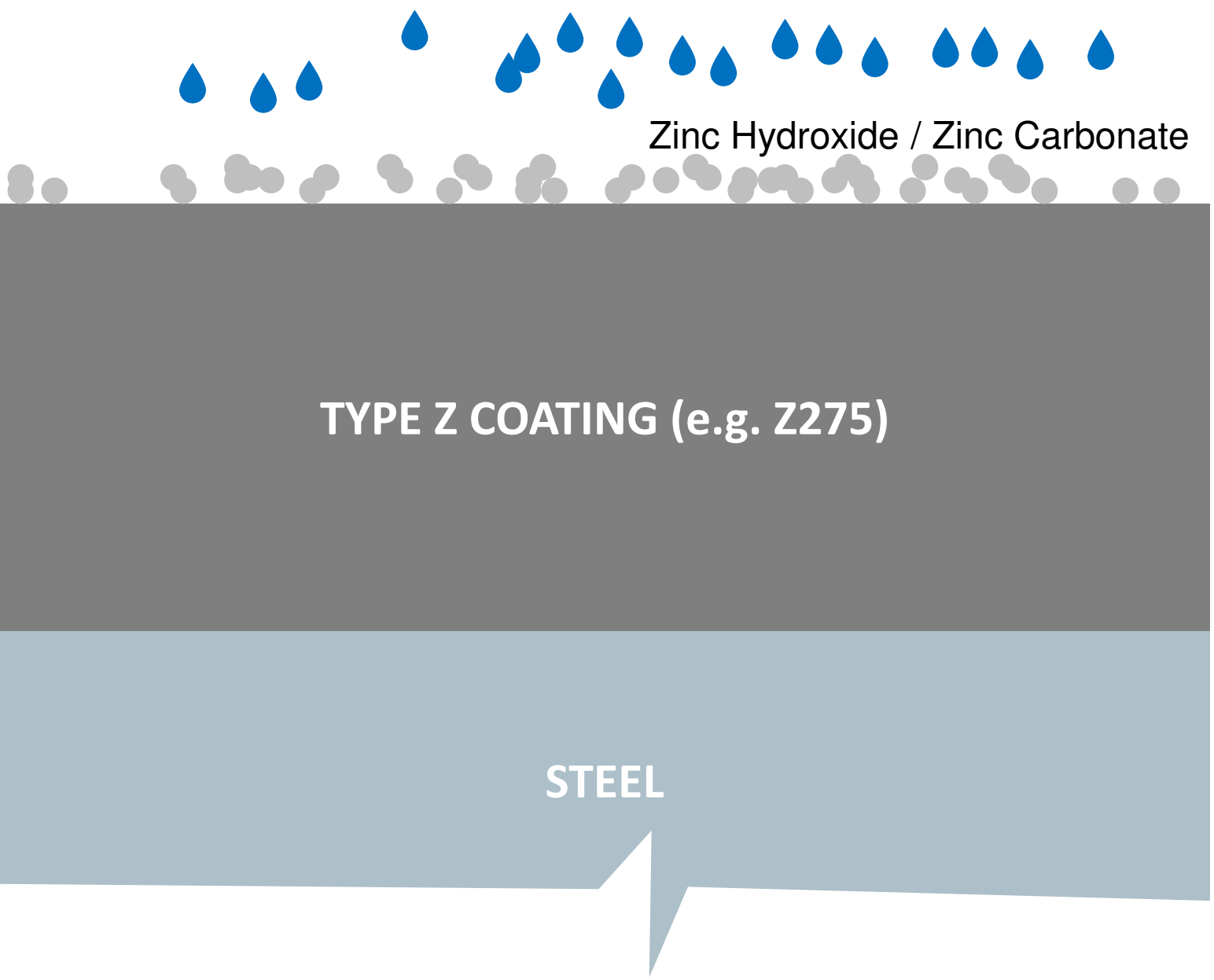
# CORROSION MECHANISM OF GI

TYPE Z COATING (e.g. Z275)

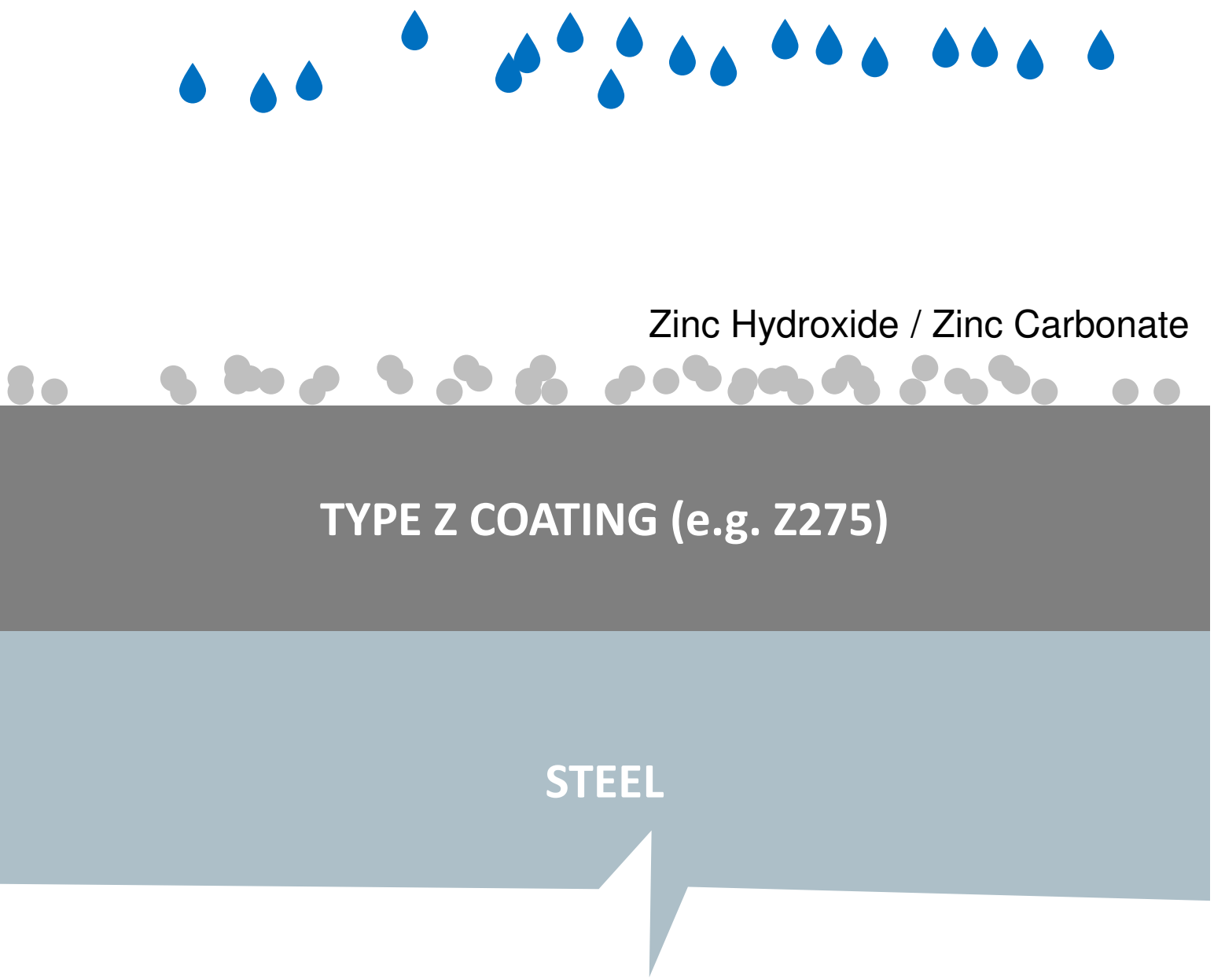
STEEL



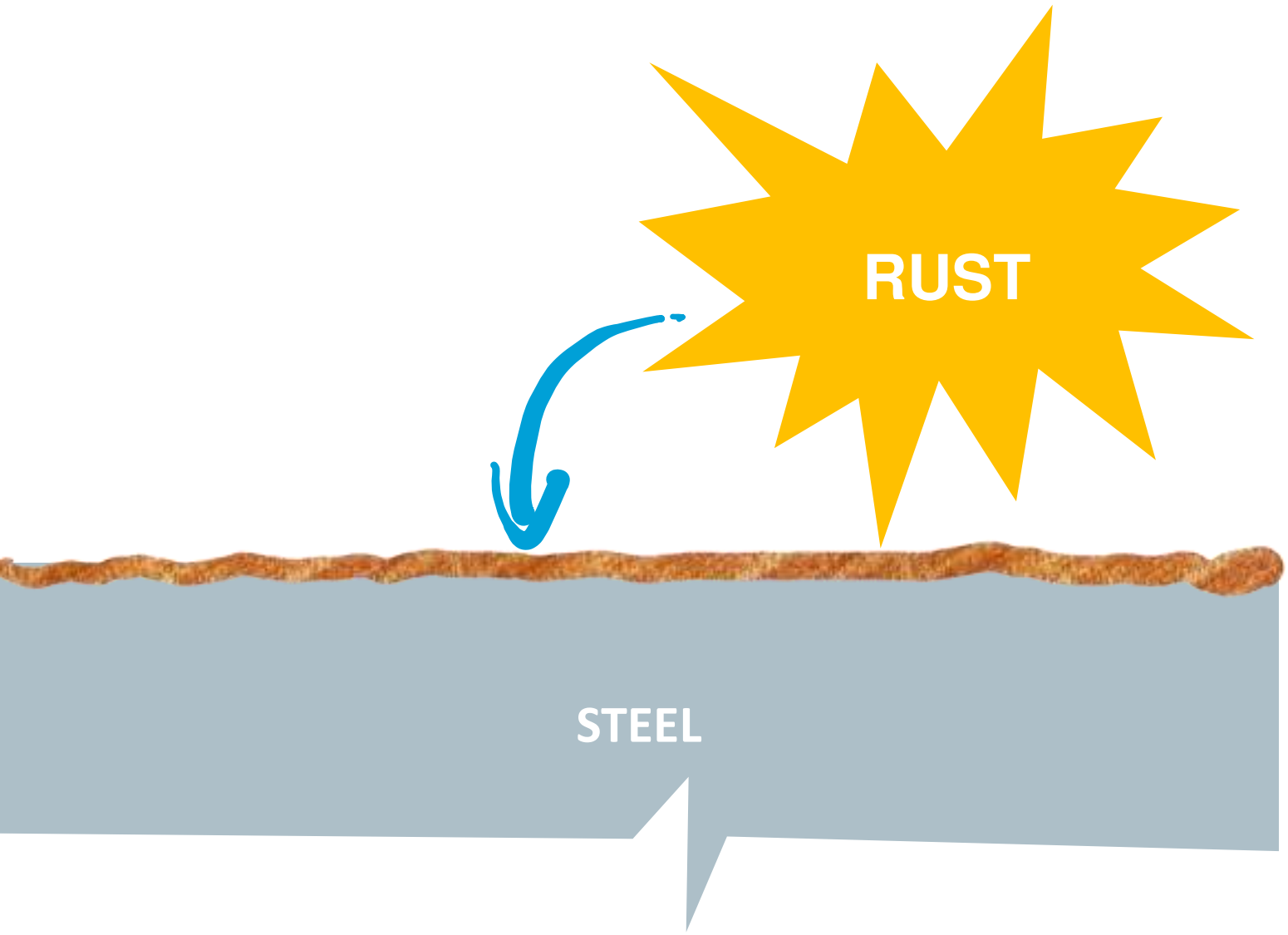

# ZINC COATING FORMS ZINC OXIDE




# CONVERTS INTO ZINC HYDROXIDE & ZINC CARBONATE

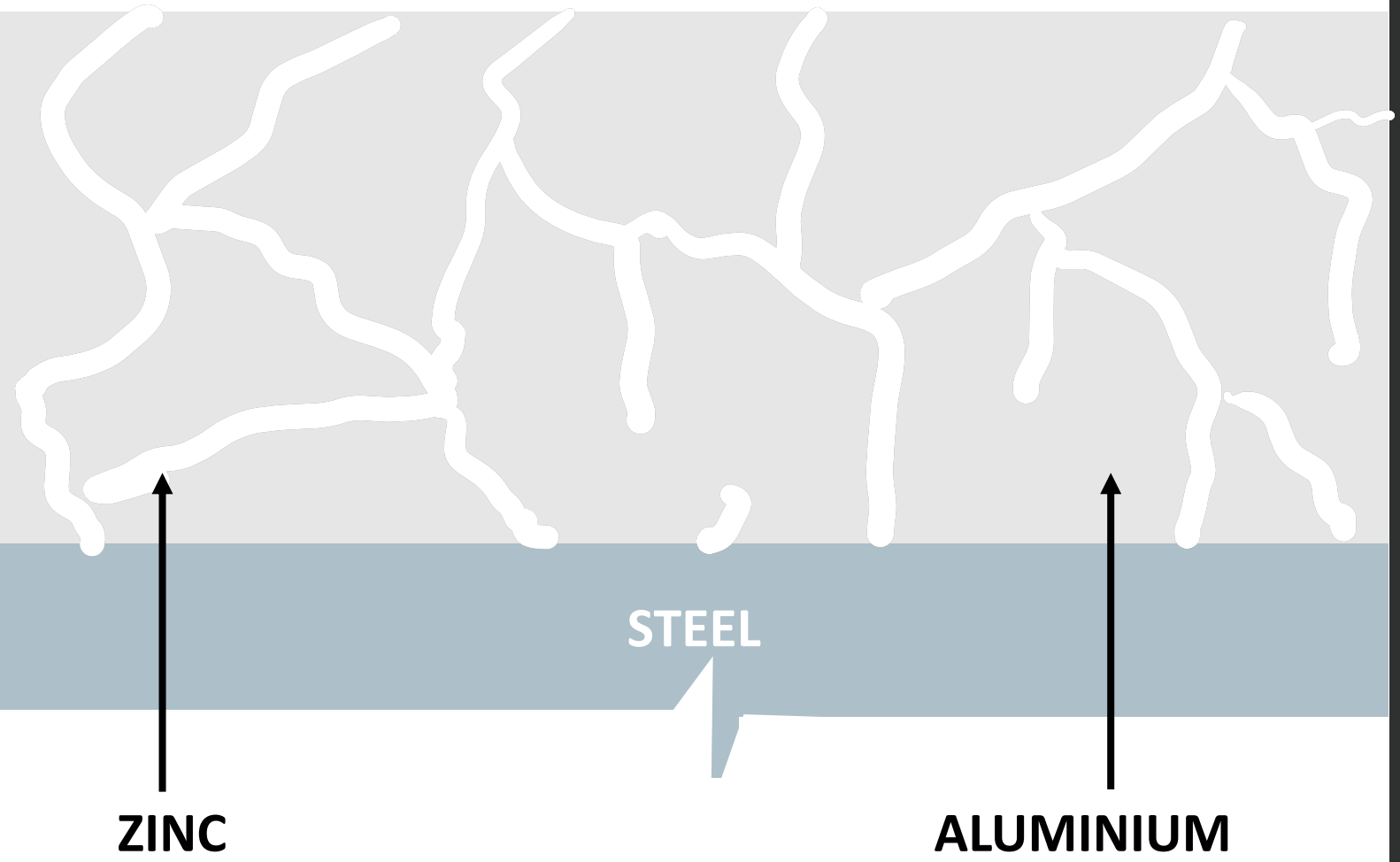


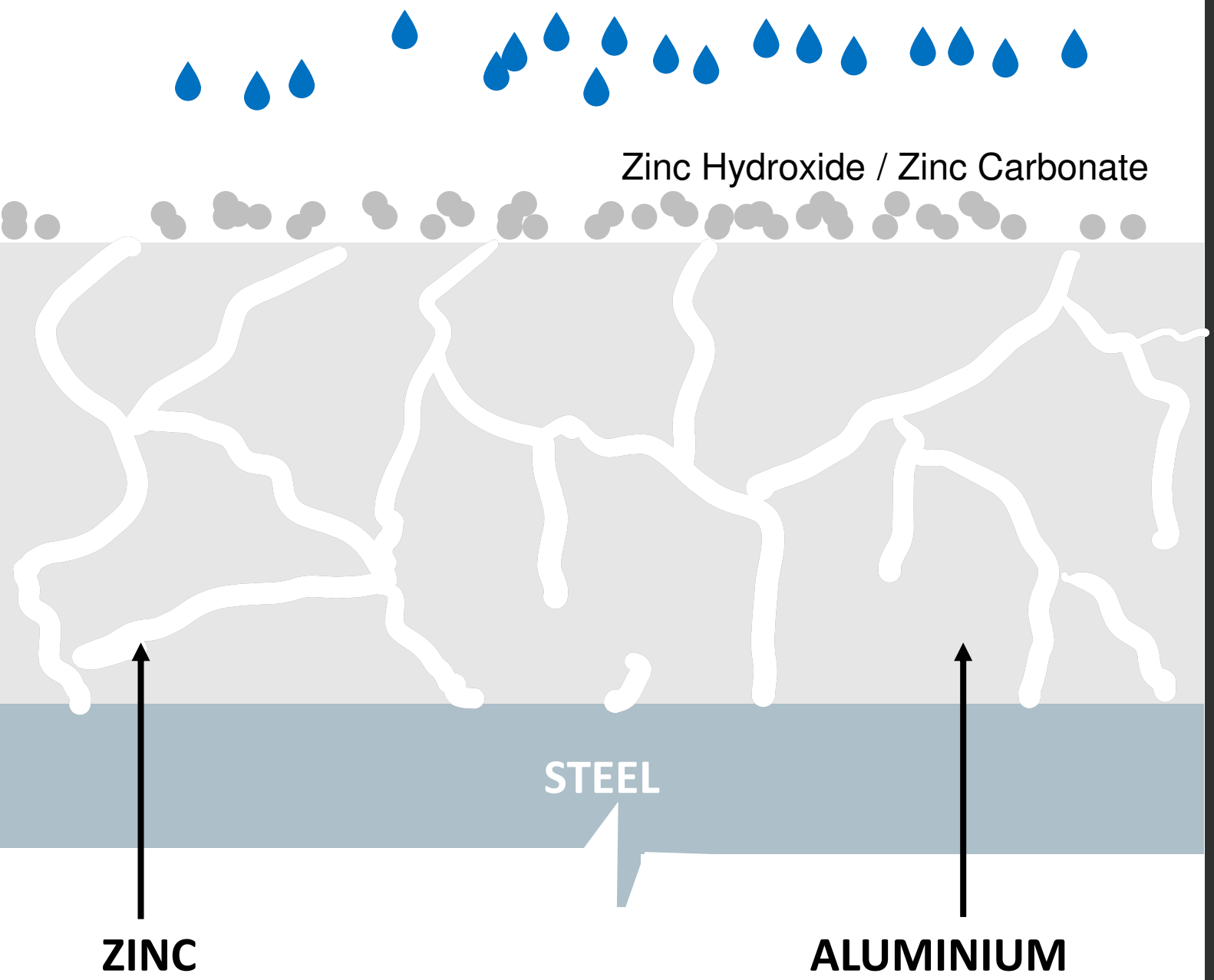

# COATING WEARS OFF BY CYCLICAL ATMOSPHERIC EXPOSURE



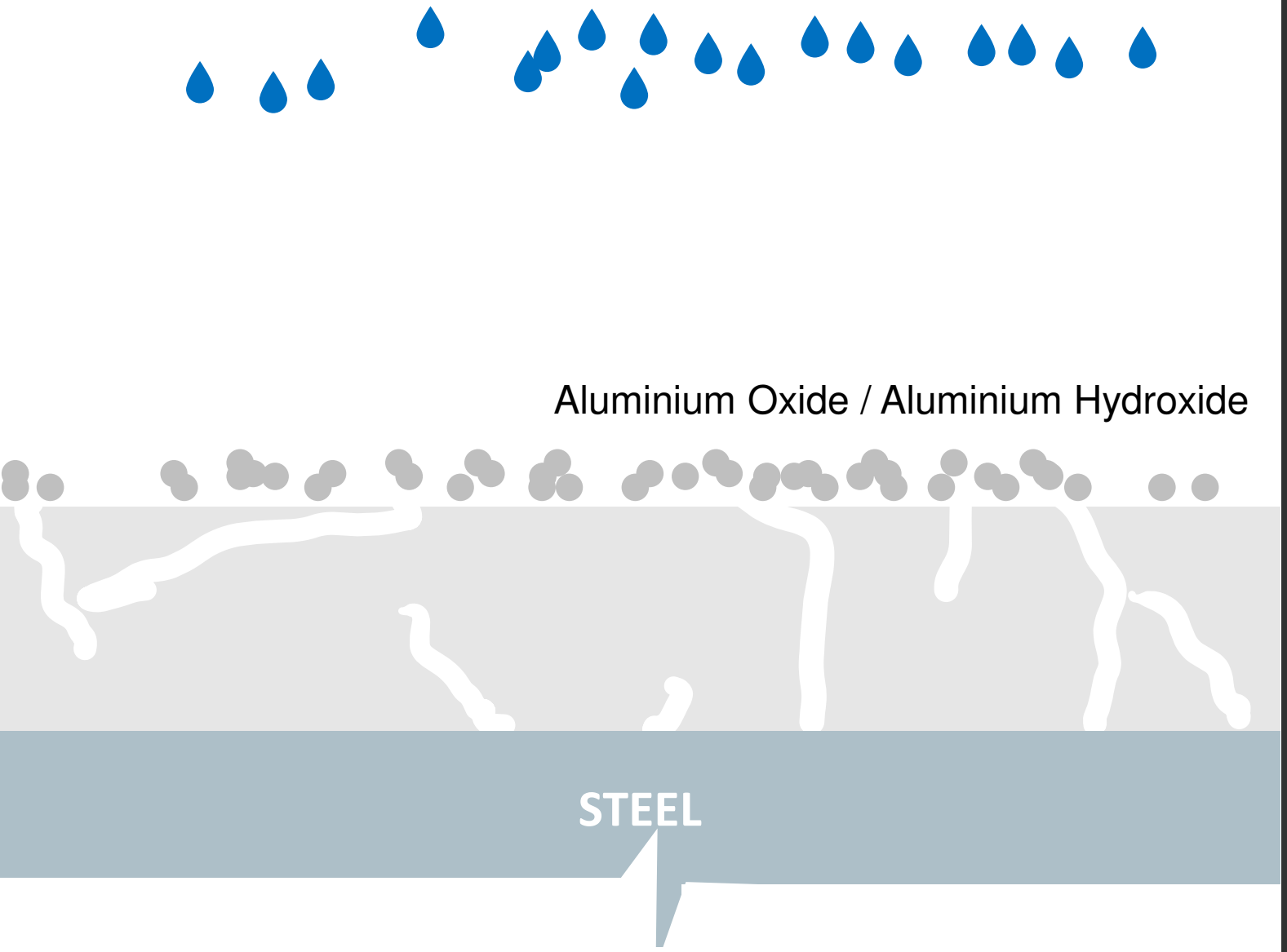

# START RUSTING ONCE ZINC COATING IS DEPLETED

# CORROSION MECHANISM OF GL

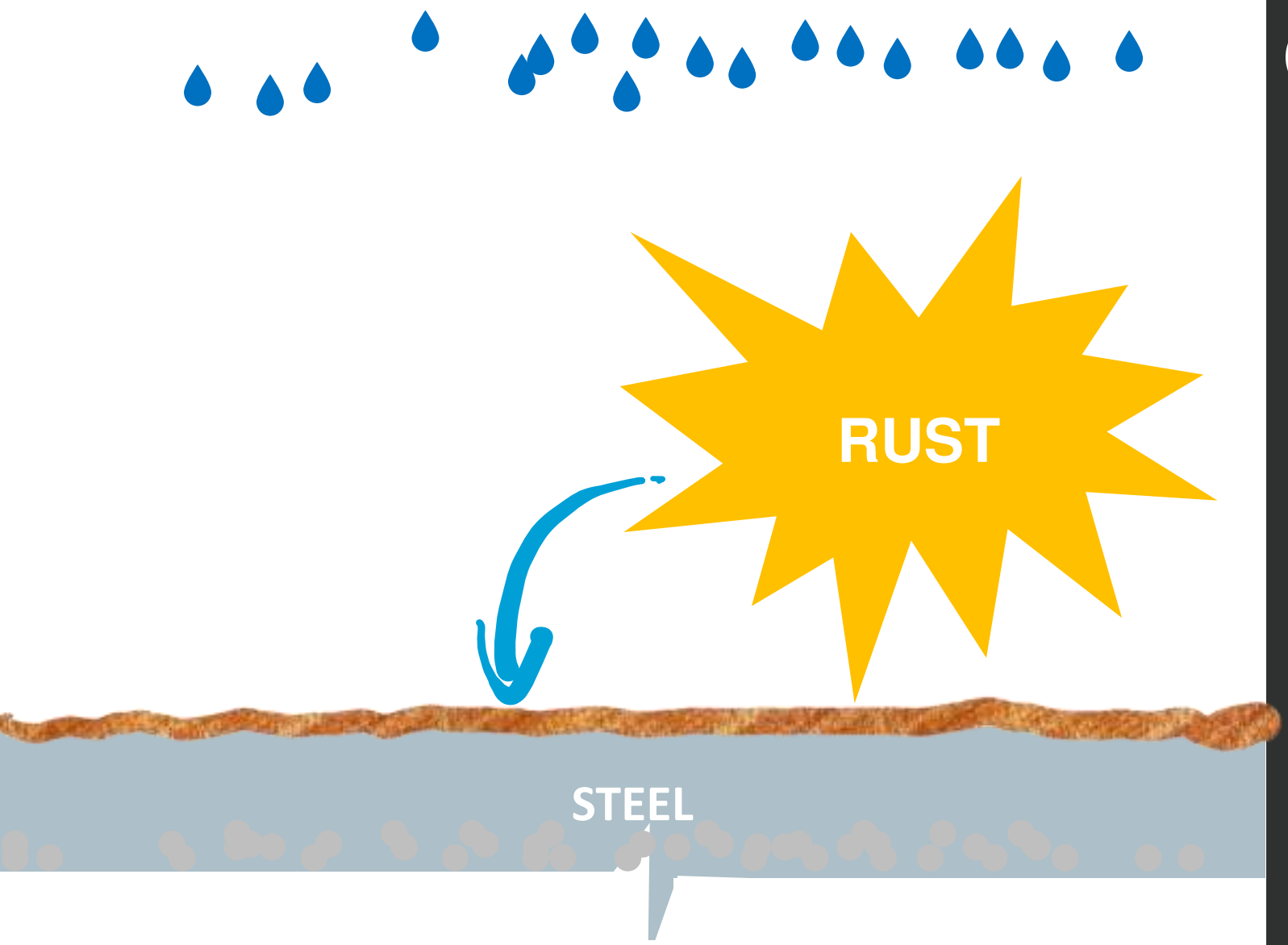





# ZINC CONTENT FORMS ZINC HYDROXIDE & ZINC CARBONATE

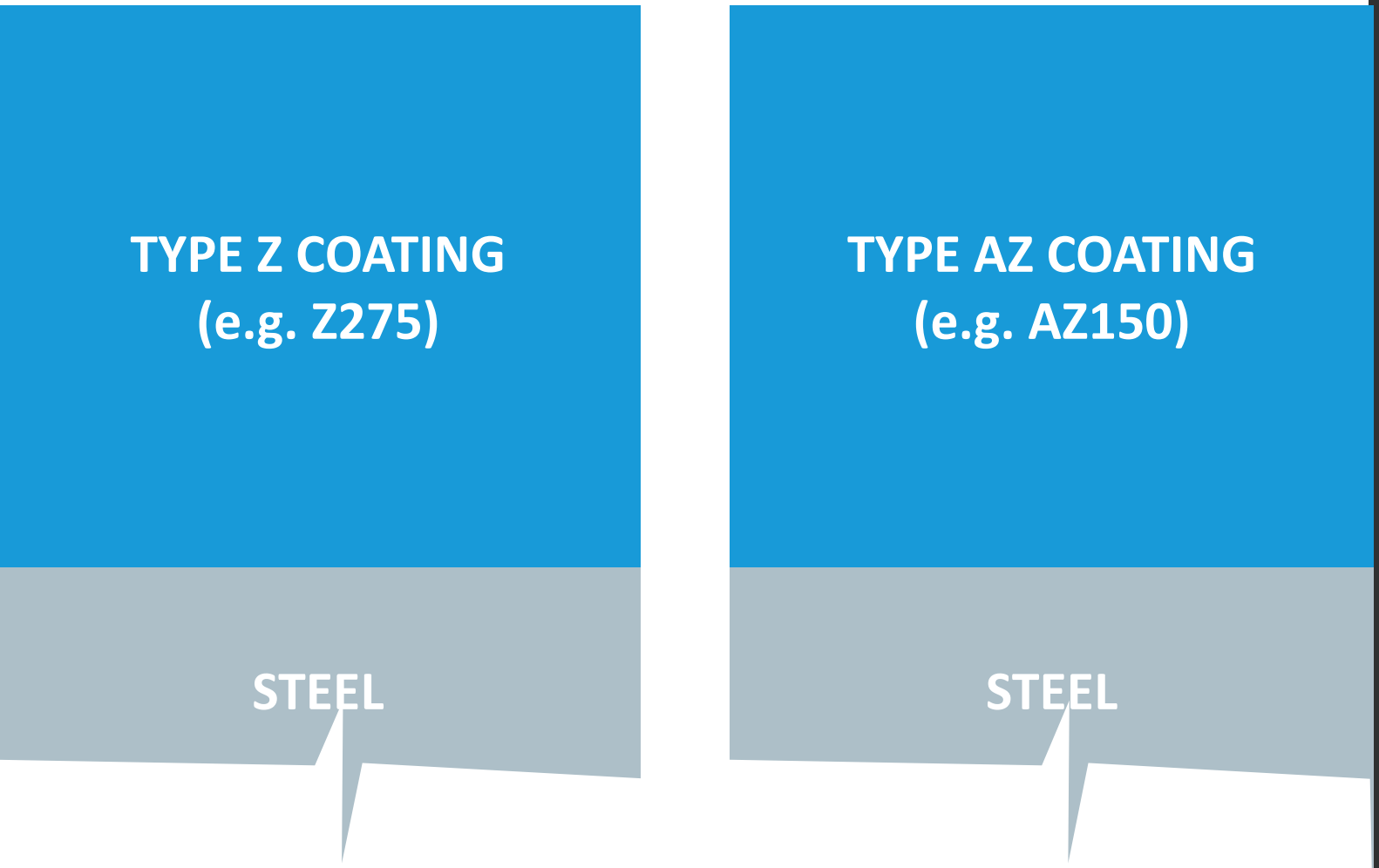



# ALUMINIUM WILL START DEPLETING ONCE ZINC IS GONE

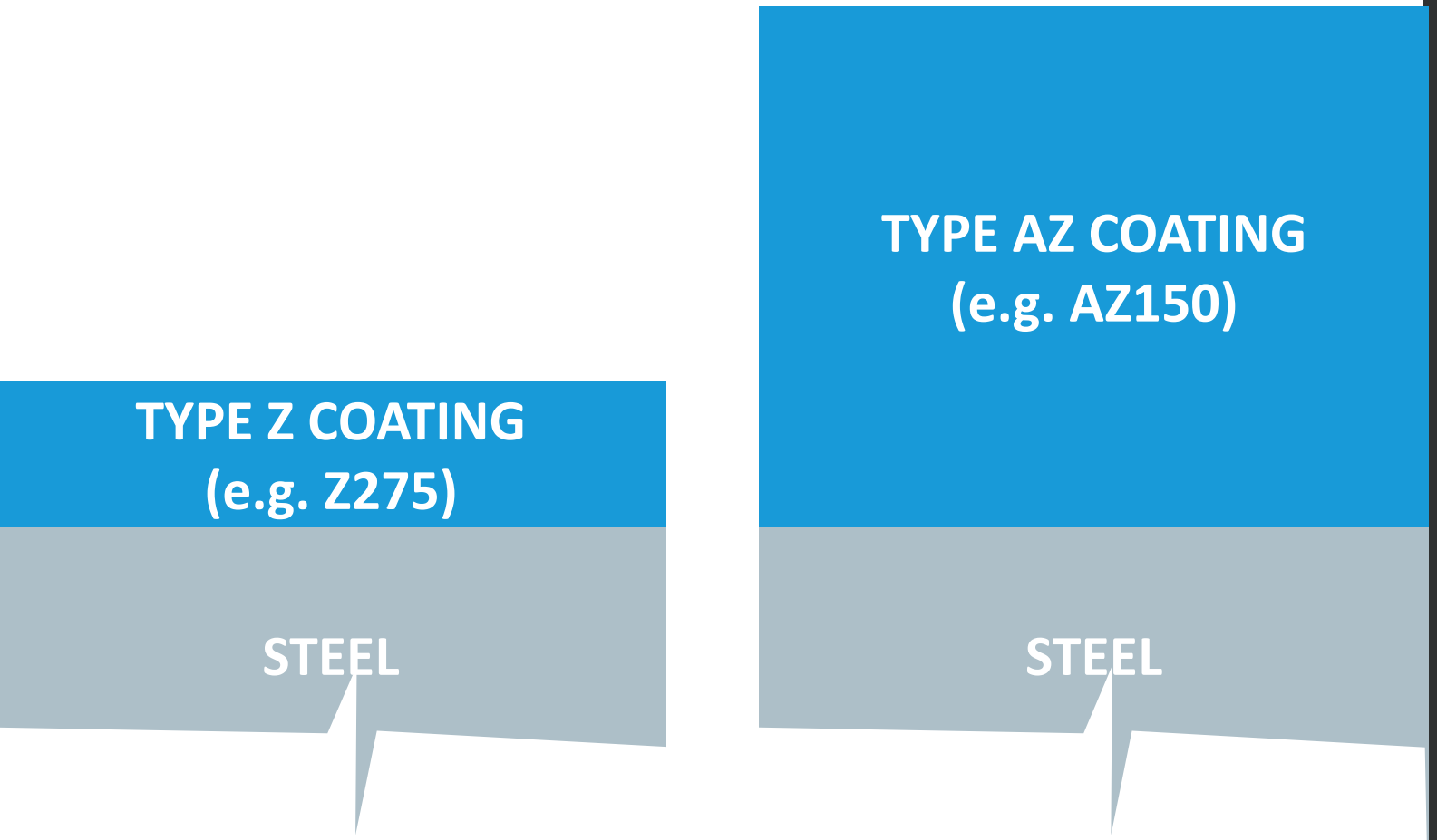



# ALUMINIUM WILL START DEPLETING ONCE ZINC IS GONE

# COMPARE CORROSION RATE



# GI (TYPE Z) WEARS OFF FASTER



# HOW TO TEST THESE PERFORMANCE ?

Photo by **Nathan Cowley** from **Pexels**

# OUTDOOR EXPOSURE TEST

Source: BlueScope

# TROPICAL WEATHER

Photo by **Asad Photo Maldives** from **Pexels**

# HIGHER HUMIDITY

Photo by Lum3n from Pexels

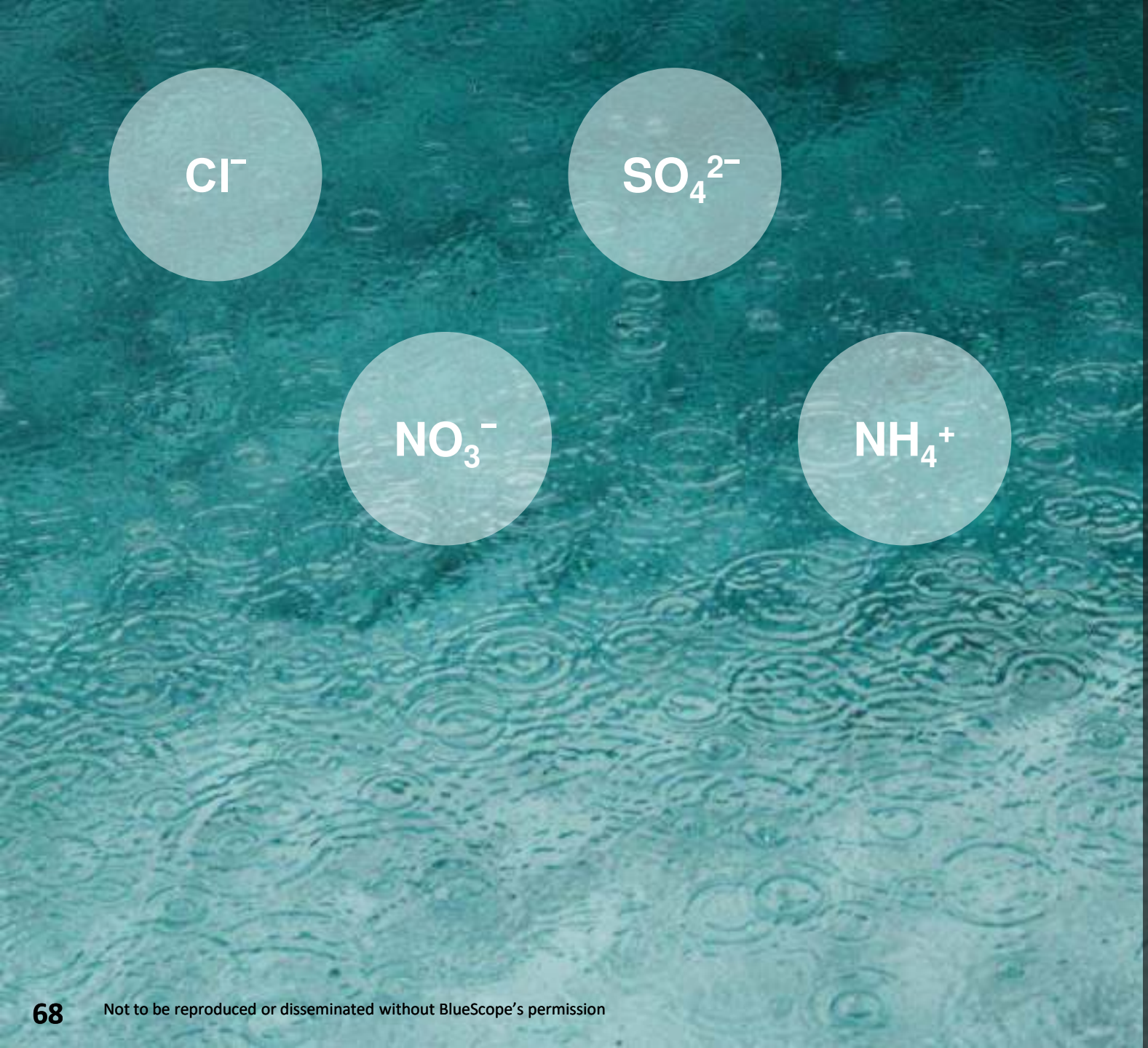

# HOTTER WEATHER




https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/hot-weather-lowers-exam-grades/articleshow/64411581.cms

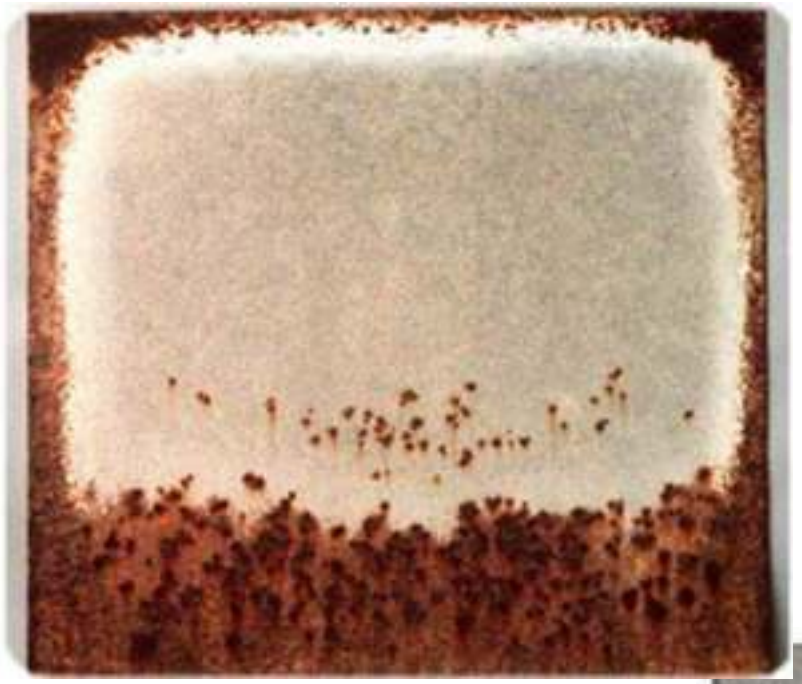
# COASTAL AREA

Photo by **Pok Rie** from **Pexels**




# RAIN COMPOSITION

Photo by Matheus Natan from Pexels

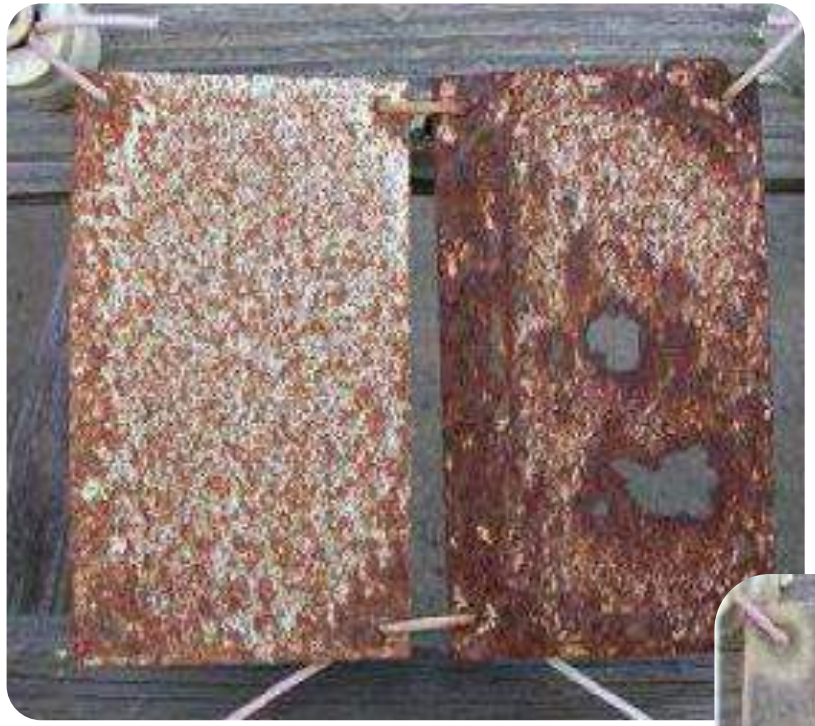


Z275

AZ150

# OUTDOOR EXPOSURE FOR 6 YEARS

Source: BlueScope



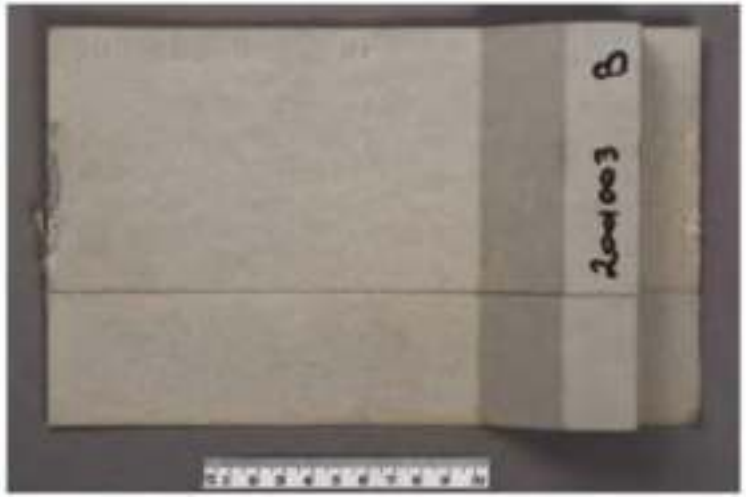
Z275

AZ150

# OUTDOOR EXPOSURE FOR 12 YEARS

Source: BlueScope

Z275



AZ150

Z180

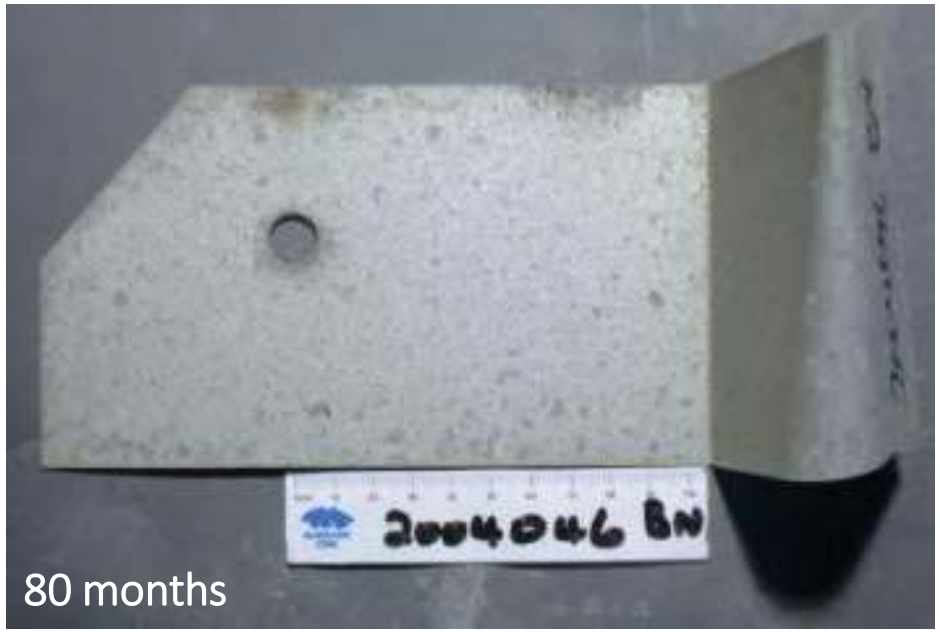
# OUTDOOR EXPOSURE FOR 5 YEARS

Source: BlueScope

# OUTDOOR EXPOSURE FOR <7 YEARS IN SEVERE MARINE


**Z600**

**AZ150**

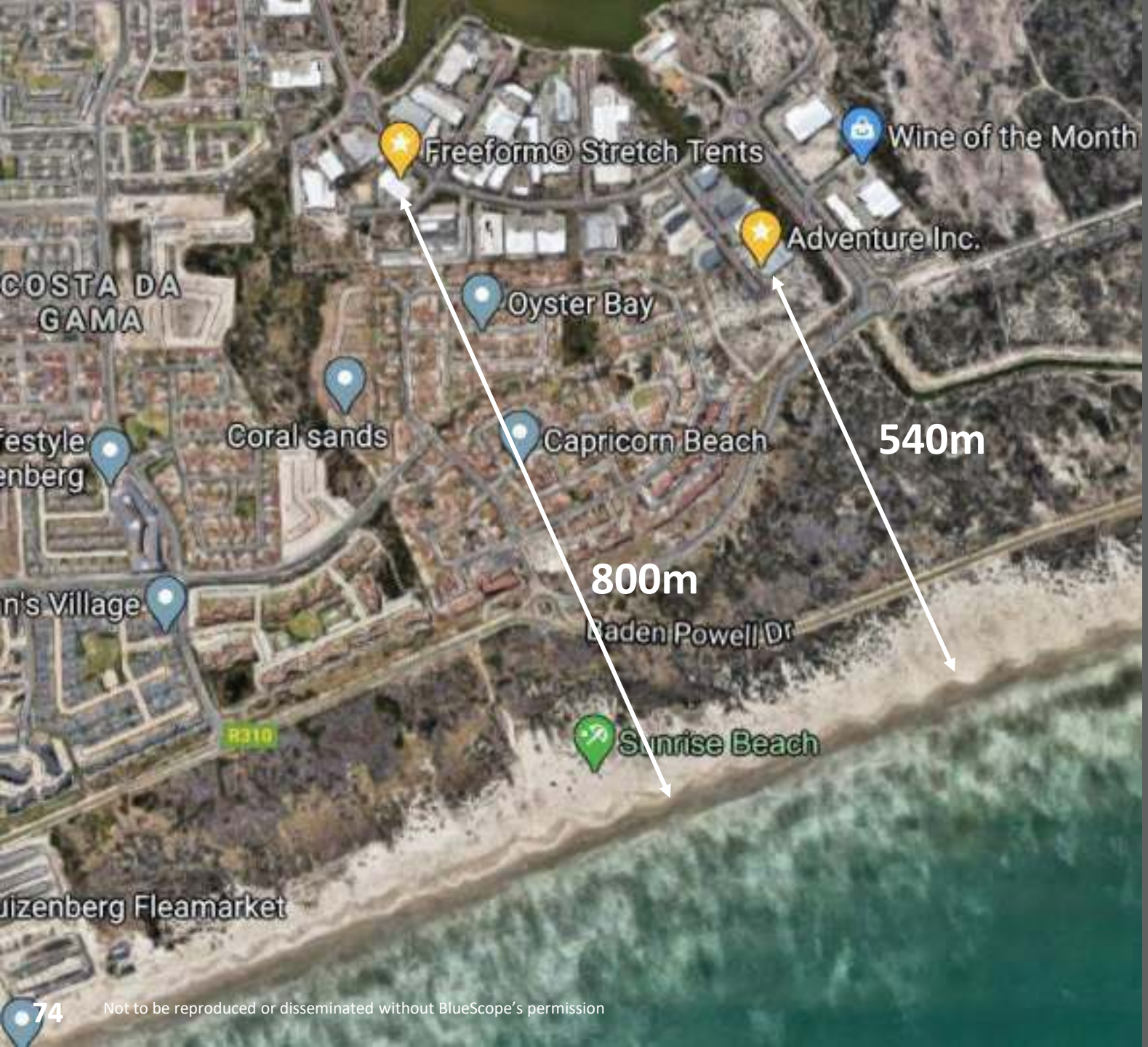



Source: BlueScope



# PPGI & PPGL OUTDOOR PERFORMANCE

Source: BlueScope




# PPGI & PPGL OUTDOOR PERFORMANCE

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_


# MARINE ENVIRONMENT

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# PPGL OUTDOOR PERFORMANCE AFTER >8.5YEARS

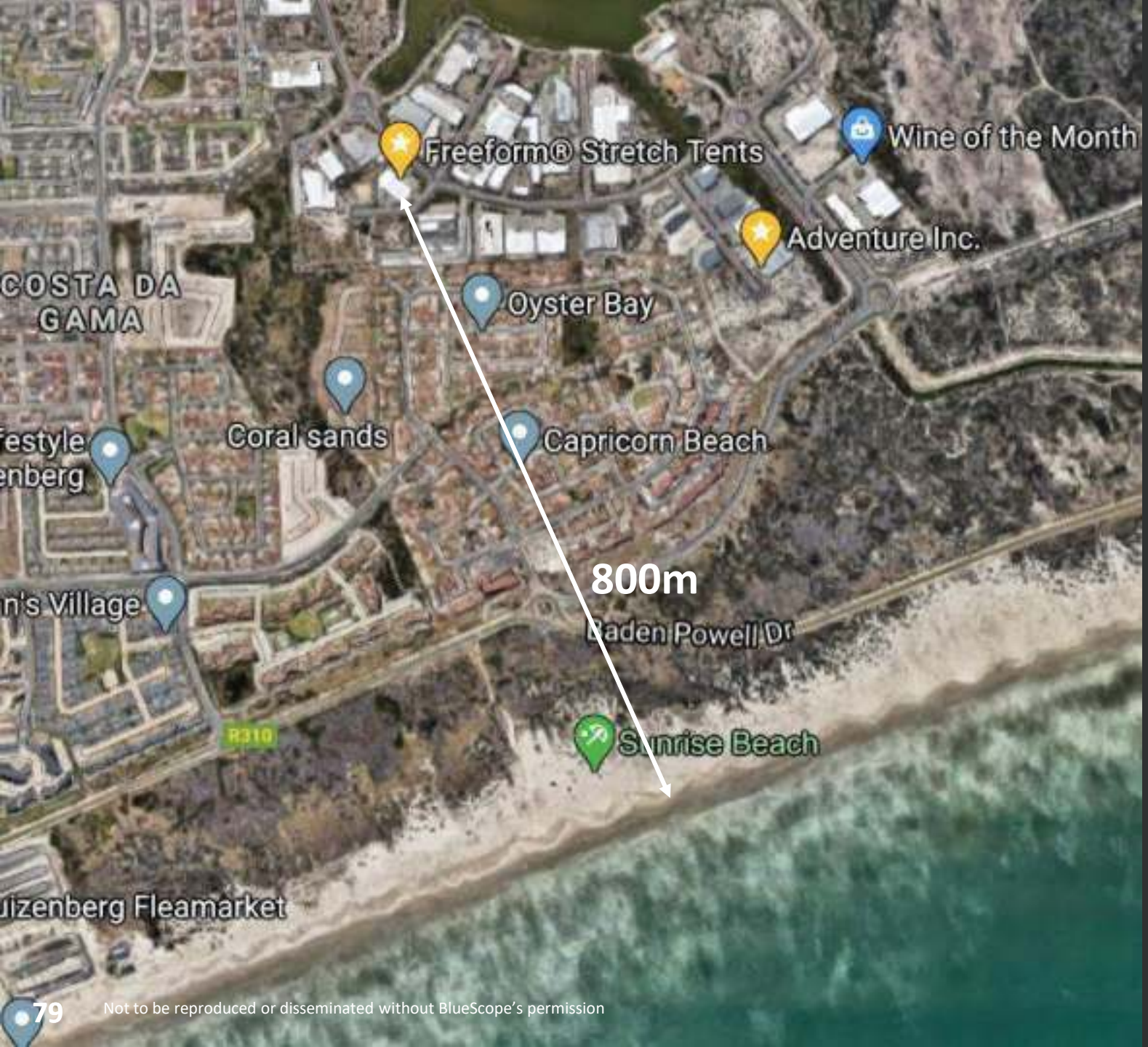
Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# PPGL
# NO SIGN OF CORROSION

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_


# GI CLIP RUSTED

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_




# PPGI OUTDOOR PERFORMANCE

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# PPGI IN SERVICE FOR 5YEARS

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# MOST CUT EDGES RUSTED

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# MOST CUT EDGES RUSTED

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_

# GI CLIP RUSTED

Source: BlueScope (CS-ULT-05 Cape Town (Adventure Inc.)_


# 3

# LIMITATION OF GI & GL

https://www.vecteezy.com/vector-art/2120305-business-boundary-limitation-or-framing-that-prevent-progress-work-concept

Z275

AZ150

| Environment | Years to first rust | | | |
|---|---|---|---|---|
| | Zn | Zn-4Al | Zn-7Al | Zn-55Al |
| **Severe marine** | | | | |
| 25 m from ocean, Kure Beach, NC | 4 | 9 | 9 | 15 |
| **Moderate marine** | | | | |
| 250 m from ocean, Kure Beach, NC | 16 | 15 | 14 | >25 |
| **Rural** | | | | |
| Saylorsburg, PA | 14 | 14 | 14 | >25 |
| **Industrial** | | | | |
| Bethlehem, PA | 10 | 10 | 9 | >25 |

# GI WEARS OFF FASTER OUTDOOR

Source: ASM Handbook, Volume 5: Surface Engineering

Z275

AZ150

| Environment | Years to first rust | | | |
|---|---|---|---|---|
| | Zn | Zn-4Al | Zn-7Al | Zn-55Al |
| **Severe marine** | | | | |
| 25 m from ocean, Kure Beach, NC | 4 | 9 | 9 | 15 |
| **Moderate marine** | | | | |
| 250 m from ocean, Kure Beach, NC | 16 | 15 | 14 | >25 |
| **Rural** | | | | |
| Saylorsburg, PA | 14 | 14 | 14 | >25 |
| **Industrial** | | | | |
| Bethlehem, PA | 10 | 10 | 9 | >25 |

# GI WEARS OFF FASTER OUTDOOR

Source: ASM Handbook, Volume 5: Surface Engineering

Z275

AZ150

| Environment | Years to first rust | | | |
|---|---|---|---|---|
| | Zn | Zn-4Al | Zn-7Al | Zn-55Al |
| **Severe marine** | | | | |
| 25 m from ocean, Kure Beach, NC | 4 | 9 | 9 | 15 |
| **Moderate marine** | | | | |
| 250 m from ocean, Kure Beach, NC | 16 | 15 | 14 | >25 |
| **Rural** | | | | |
| Saylorsburg, PA | 14 | 14 | 14 | >25 |
| **Industrial** | | | | |
| Bethlehem, PA | 10 | 10 | 9 | >25 |

# GI WEARS OFF FASTER OUTDOOR

Source: ASM Handbook, Volume 5: Surface Engineering

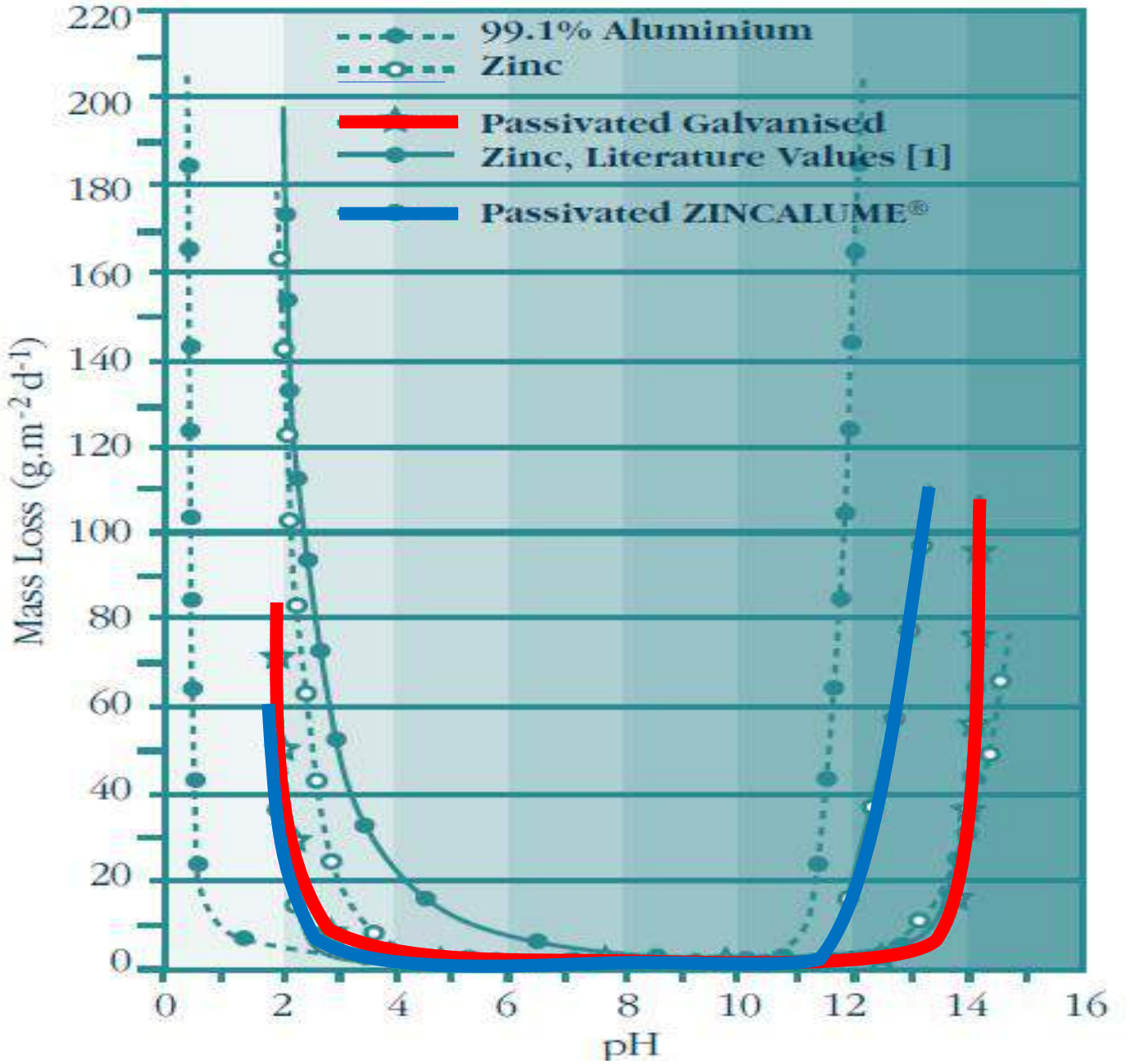
Z275

AZ150

| Environment | Years to first rust | | | |
|---|---|---|---|---|
| | Zn | Zn-4Al | Zn-7Al | Zn-55Al |
| **Severe marine** | | | | |
| 25 m from ocean, Kure Beach, NC | 4 | 9 | 9 | 15 |
| **Moderate marine** | | | | |
| 250 m from ocean, Kure Beach, NC | 16 | 15 | 14 | >25 |
| **Rural** | | | | |
| Saylorsburg, PA | 14 | 14 | 14 | >25 |
| **Industrial** | | | | |
| Bethlehem, PA | 10 | 10 | 9 | >25 |

# GI WEARS OFF FASTER OUTDOOR

Source: ASM Handbook, Volume 5: Surface Engineering




# GL REACT FASTER IN MORE ALKALINE ENVIRONMENT

Source: BlueScope

# GL NOT SUITABLE AS PERMANENT FORMWORK

https://www.facebook.com/login/?next=https%3A%2F%2Fwww.facebook.com%2FProfilageOceanIndienLtee%2Fposts%2F1336075153225184

# SUMMARY

1. DEFINING GI & GL
2. PERFORMANCE DIFFERENCE IN TROPICAL
3. LIMITATION OF GI & GL

Source: BlueScope


IDEAS TO SHARE?
EMAIL TO events@bluescope.com
Photo by Luca Nardone from Pexels

BlueScope | steel CONNECT

Survey Form

Colorbond VERMOE Zincalume TrueCore

events@bluescope.com

NS BlueScope Malaysia