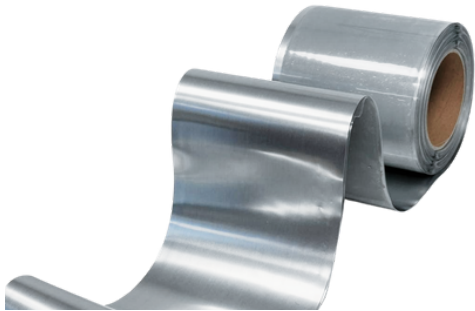


INSTALLATION GUIDELINES

Zinc Layer Anode (ZLA®)

Zinc sacrificial anodes for corrosion control of steel in concrete.



Short description

ZLA is a galvanic zinc anode used to protect reinforcing steel in concrete against corrosion. The system operates without any external power source: the zinc layer has a more negative potential than steel and automatically becomes the sacrificial anode. This forces the reinforcement to act as the cathode, stopping corrosion of the rebar.

Chlorides, variations in concrete cover, and poor concrete quality can create local anodic areas on the reinforcement. These zones generate rust, volume expansion, cracking, and spalling of the concrete. ZLA replaces these anodic sites and shifts the corrosion process to the zinc layer, preventing further damage.

ZLA is electrically connected to the reinforcement and works through ionic conduction in the adhesive and concrete. In visually sensitive or very wet environments, the ZLA can be covered with a cementitious layer and a protective topcoat.

Monitoring can be performed according to EN 12696; use only equipment suitable for galvanic systems.

Procedure

The installation procedure includes the following steps:

1. Check accessibility of the construction and take precautions if necessary
2. Prepare the concrete surface
3. Localize the reinforcement
4. Make mechanically reinforcement connections
5. Check electric continuity of the reinforcement
6. If required, perform additional potential mapping of the reinforcement to indicate the degree and extend of expected corrosion
7. Apply ZLA onto the concrete surface
8. Make electric connections of the reinforcement with the zinc sheets
9. Check electric connections with a resistance meter
10. Check polarisation of the reinforcement by use of reference electrodes

It is recommended to keep up a log-book in which all steps are described and checked. Situations which differ from the installation procedures must be indicated accurately in the log-book and checked and signed by the supervisor prior to proceed.

In case certain situations is not clear how to handle the ZLA properly, we recommend to contact your distributor prior to proceed with the installation. Each step of the installation procedure is described in detail below.



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Installation procedures

The ZLA is a thin zinc-layer with an ionic conductive and adhesive electrolyte. It is supplied with a polypropylene top-liner to protect the adhesive against clogging. The ZLA is provided in rolls (appr. 1mm thickness, 25cm wide and 20m long) with a nominal zinc sheet thickness of 250micron. Before application the top-liner is removed manually and the ZLA is adhered onto a cleaned concrete surface. After application the concrete surface is covered with a metal-like foil.



Localize the reinforcement (if necessary)

The best and easy way in localizing the reinforcement is by use of a rebar locator, which accurately locates reinforcing bars and welded wire meshes. Some rebar locators also measure the concrete cover and determines the diameter of the bars. *A list of suppliers can be forwarded by your distributor upon request.*

Surface preparation

Prior to applying the ZLA the concrete surface should be prepared in the following manner:

1. Old concrete surfaces must be structurally sound. Any unsound areas must be repaired prior to proceeding with the installation. Remove existing paint, scale and loose concrete by steam clean, chiseling, rough sanding, sandblasting, shot blasting or dust free grinding. In some cases where plant conditions allow, a stripper may be used to remove excessive build-up of paints or sealers.

2. Paint must be removed the paint by scraping, wire brush, steam clean or power-washing the surface.

3. Dirt, grease, oil, chalk and under-eave deposits must be removed by washing with a detergent solution (TSP) or commercial cleaner recommended for cleaning concrete surfaces using a sponge or brush. Protected areas, such as under eaves and overhangs, need special attention to remove invisible deposits that can promote a premature disbonding problem.

After washing, thoroughly rinse with clean water and allow to dry. Power-washing is also a fast, effective method of removing dirt, chalk, etc. If a power-washer is used, follow the manufacturer's recommendations and warnings.

4. Grind or chip all projections from the concrete greater than 5mm. Remove any loose concrete, and clean and fill holes, cracks and other surface defects with an approved method by use of a mineral cement-based mortar. We recommend to use the international standard EN/ISO12696 when choosing repair mortars. The patch should be smoothed.

5. Make sure that after any surface treatment all dust and dirt is removed thoroughly to avoid futural disbondment of the ZLA.

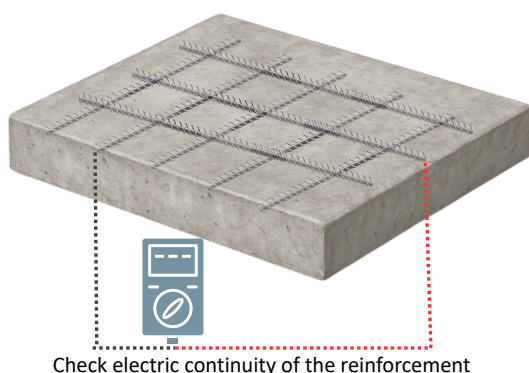
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Check electric continuity of the reinforcement

Each electric connection of the anode with the rebar is checked in a similar way as further described below.

After making the right connection check the electric resistance of the connection using a digital multimeter. Switch the multimeter to the resistance position (Ω) and measure the resistance. The criterion for this is less than 1 Ω (DC-) resistance.

Instead of making the contact directly on the connection strip, it could be checked by making contact with the current distributor bar of the anode and the reinforcement.



Follow the design

Follow the project-specific design provided. The example design sketch shows the required spacing between the ZLA layers. This spacing ensures that, in the event of a waterproofing failure, only one individual ZLA sheet is affected rather than a larger continuous area.

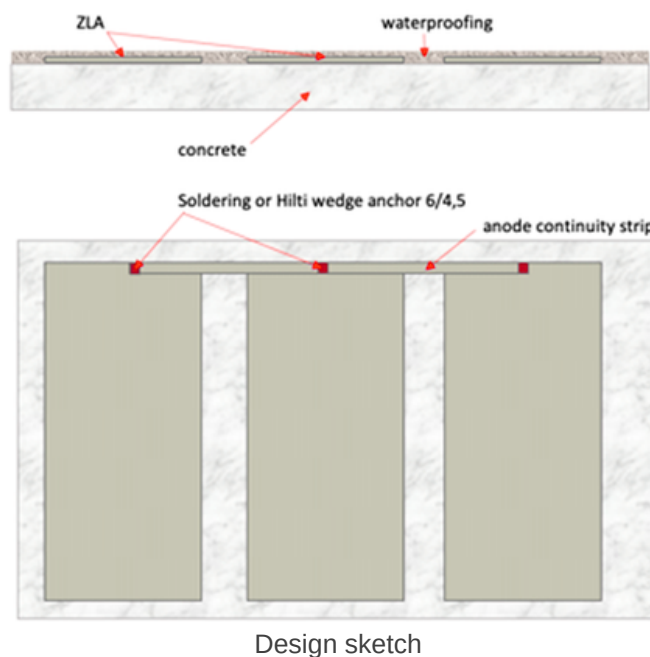
This is why that small details in a design are important to follow.

Additional potential mapping (if required)

If a selective approach is desired due to economic reasons potential mapping of all concrete elements involved should be considered.

During mapping the values are logged as computer-tables and later on, with special software, processed as corrosion-graphics. This type of software analyses potential-values and gradients, and calculates for each measuring location the possible chance of active corrosion. After the interpretation the results are presented as colour-cards. By using this measuring method hundreds of square meters of concrete surface per hour can be mapped and processed.

For further information about this technique and making the right interpretations, please contact us or your local distributor.



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Apply ZLA onto the concrete surface

After cutting the ZLA into the appropriate length the top-liner can be removed carefully and the ZLA can be applied onto the concrete surface by hand-pushing. After the ZLA is applied on the surface apply extra pressure to the whole surface area of ZLA so it will firmly adhere to the concrete.

Zinc sheet connections for electric continuity

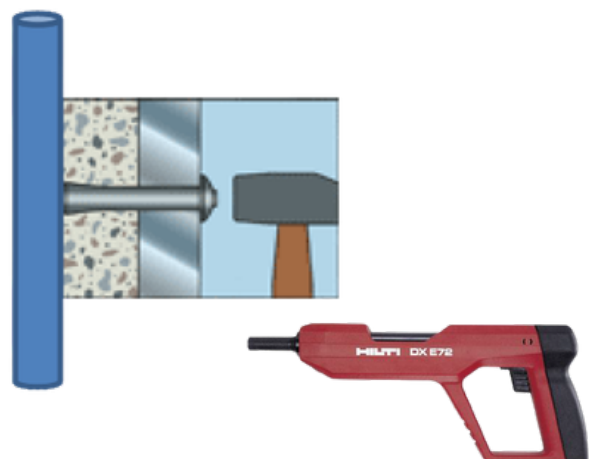
When the ZLA is applied upon the concrete surface prior to apply a surface protection all the zinc sheets should be interconnected with each other for the electric current to flow to the sheets which are connected to the rebar. The resistance should be checked with a LCR meter and should be less than 1 Ohm.

The interconnections from one sheet to another can be performed in different ways. Normal zinc soldering can be used. Any other mechanical contacts like rivetting or similar will give satisfactory results. We recommend at least 2 interconnections per meter sheet length. Please contact your distributor for support and equipment details.



Make electric connections of the reinforcement with the zinc sheet

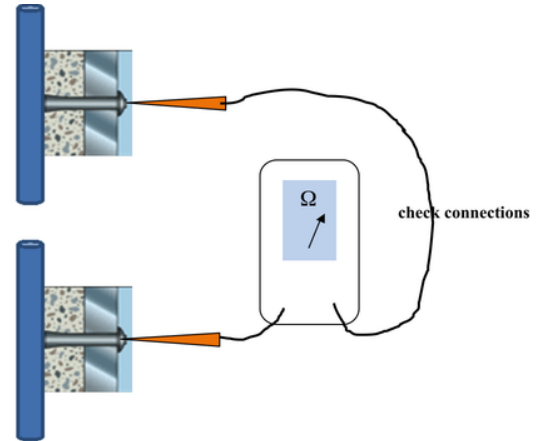
Electric contacts of the zinc sheets by applying washers and nuts when using welded studs or the powder actuated fastening tools..



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Check electric connections with a resistance meter

Each electric connection with the ZLA is checked in a similar way as described above. Instead of making the contact with alligator clips directly on the connections, it is checked by making contact directly with the zinc-layer of the ZLA.

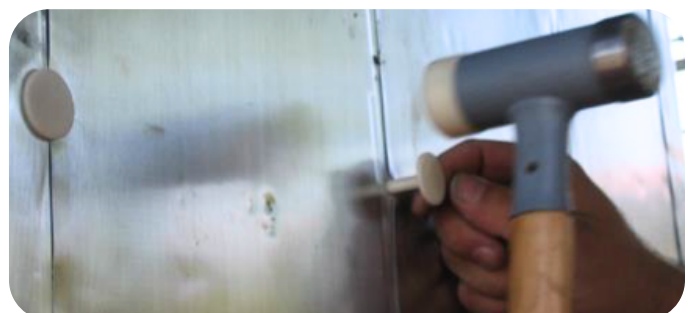


Protection and waterproofing systems

A product's service life is its expected life time, or the acceptable period of use in service. Service life does not only depend on the estimated service life which can be calculated by the anode's consumption rates but also involves external or environmental factors. These environmental factors may have serious impact on the service life of ZLA if not taken into account.

In the next part some recommended products are presented which -if properly applied- will extend ZLA's service life. It is important however to strictly follow the manufacturers application procedures:

- Surface preparation and cleaning
- Sealing exposed ends, joints and external sheets
- Protection and waterproofing coatings / systems



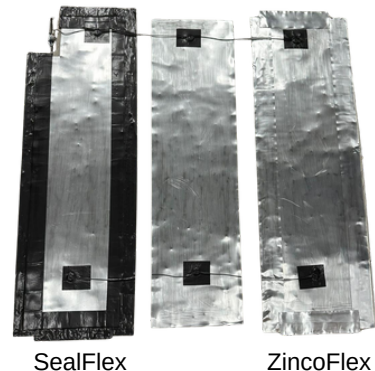
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Sealing external sheets

After applying the anode, and in case of exposure to humidity, condensation or running water, the exposed ends and overlap or joints can be sealed with Zincoflex or SealFlex.

These are highly flexible self-adhesive butyl tapes with a high tack 1mm thick butyl rubber adhesive highly resistant to gas and water vapors. Adheres to all metals and porous materials like concrete.

Further information can be found in the CorrPRE ZincoFlex & SealFlex Technical Data Sheet. In case no waterproofing system will be applied it is recommended to seal all the exposed ends to avoid humidity ingress.



Protection and waterproofing coatings

Basically there are different ways to protect ZLA from humidity or other environmental issues. The level of protection can be divided in to the following levels:

1. In case of interior application with no exposure to humidity, condensation or whatsoever:

No protection is necessary.

Prevent cracking at joints and overlaps

To avoid cracking of the protective layers in the joints, sheet overlapping and exposed sheet-end cracking, we recommend to embed locally:

1. A fiberglass texture in the first layer, to act as a reinforcement (see the Fibreglass Mesh Data Sheet).
2. Or a fibreglass tape with coarse (8 x 8) mesh of appr. 10cm width in the first layer of fresh coating/waterproofing, to act as a reinforcement along the joints.

After the mesh has been laid, finish off the surface with a flat trowel and apply a second layer of coating/waterproofing when the first one has set.

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Movement, temperature and special geometry considerations

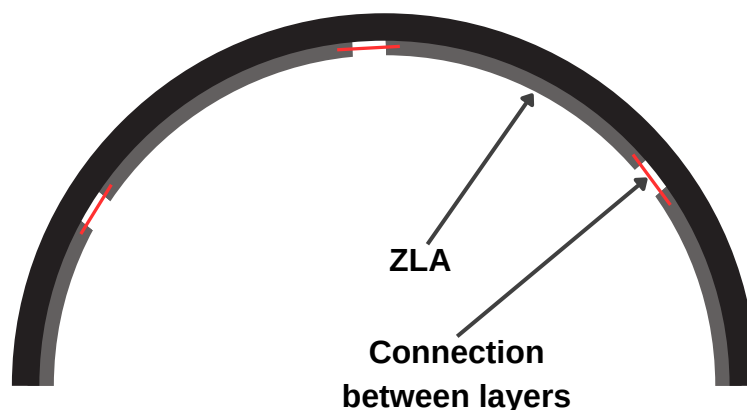
For long, continuous ZLA® installations, thermal movement of the concrete substrate should be taken into account. Outdoor concrete elements, such as bridge parapets, edge beams and elevated exposed zones, may expand and contract due to daily and seasonal temperature changes.

As ZLA® is a zinc-based laminate, its thermal movement differs from that of concrete. When very long uninterrupted lengths are installed, internal shear stress may develop between the ZLA® and the substrate. This can affect adhesion and, in some cases, may lead to local lifting or delamination.

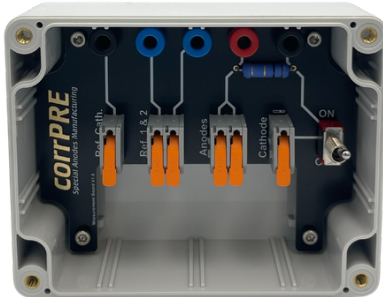
For this reason, it is recommended to limit individual ZLA® strip lengths to approximately 3 to 5 metres, especially on exposed structures or areas subject to significant temperature variation. Longer areas should be divided into shorter sections.

Additional care is also required when installing ZLA® on curved or rounded surfaces, such as ramps, tunnels, parking structures or long sweeping radii. Applying one continuous strip around a curve may introduce tension between the inner and outer radii, which can increase the risk of buckling or lifting over time.

On curved surfaces, the ZLA® should preferably be divided into two or more shorter segments, depending on the radius and total length. Each segment should be properly aligned and bonded to the substrate. Electrical continuity between segments can be achieved using suitable conductive joints.



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Monitoring

According to the international standard EN/ISO12696 a monitoring system shall be incorporated in order to determine the performance of the cathodic protection system.

Reference electrodes (RE) which are suitable for concrete are applied for monitoring purposes. Reference electrodes can be supplied together with the ZLA upon request.

According to EN/ISO12696 : "the functional check shall be undertaken monthly in the first year of operation and, subject to satisfactory performance, thereafter at 3 month intervals. Typically the performance assessment shall be undertaken at 3 month intervals in the first year of operation and, subject to satisfactory performance and review at 6 month to 12 month intervals thereafter".

Directions for adhesive strengths

Directions for adhesive strength of ZLA on concrete and coating/waterproofing or similar on zinc and concrete can be found in the table below:

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Peel Adhesion to Concrete and Zinc: ASTM D-3330, 90° angle peel, 300 mm/min separation speed:

	ADHESION TO CONCRETE ADHESION TO ZINC N/100MM	ADHESION TO CONCRETE ADHESION TO ZINC N/100MM
AFTER 72 HOURS AT 21°C	12	12

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For further application details, see Technical Data Sheet Waterproofing Suppliers or similar.

All technical data stated in this Technical Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control. The information, and, in particular, the recommendations relating to the application and end-use of CorrPRE's products, are given in good faith based on CorrPRE's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with CorrPRE's recommendations.

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Approved by: R. Giorgini