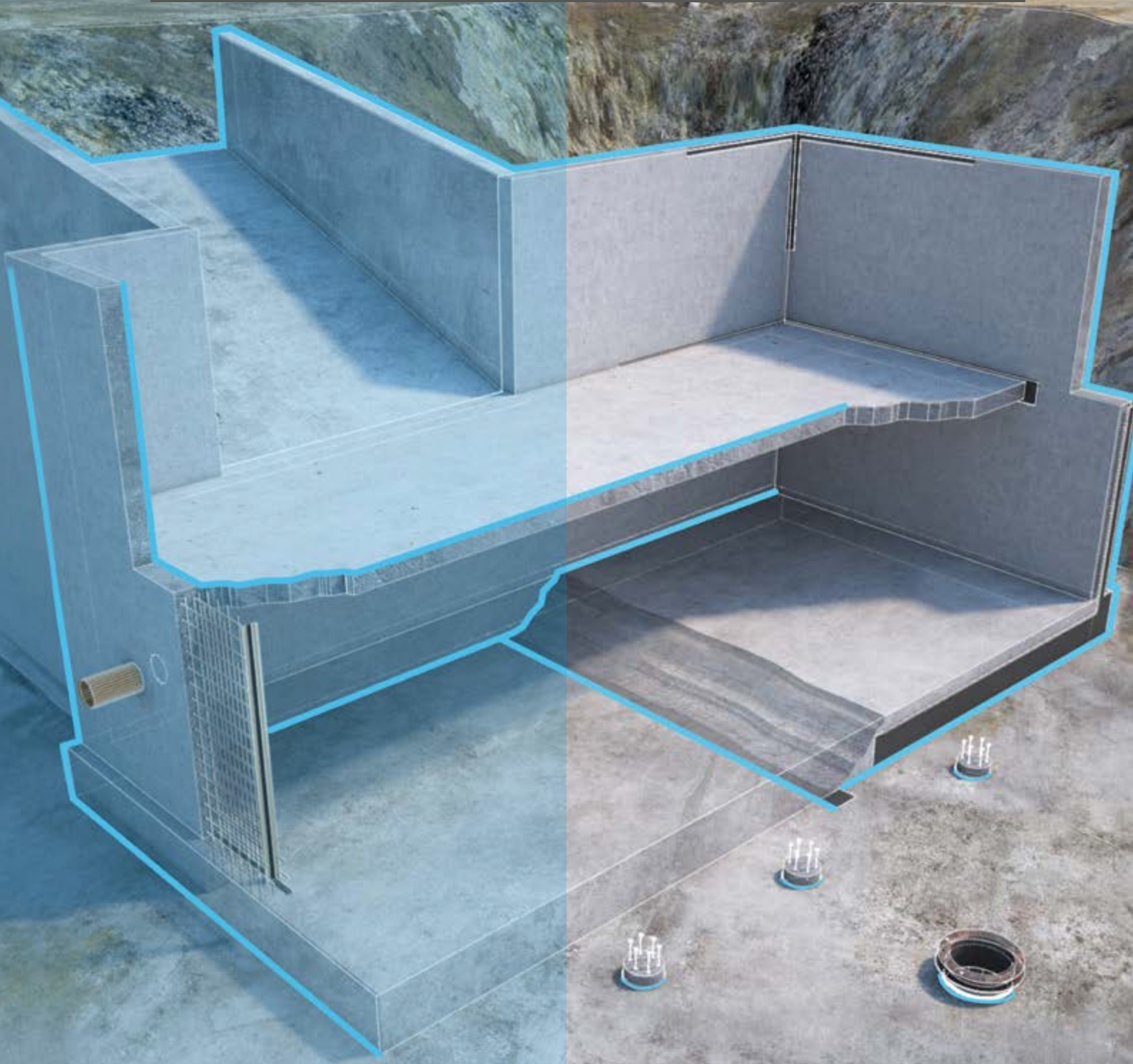


WATERPROOF STRUCTURES

Systems for concrete sealing



VOLTECO
WATERPROOF TECHNOLOGY

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General design considerations of underground sub-structures

DESIGN AND DURABILITY OF CONCRETE STRUCTURES

To ensure the durability of concrete structures, it is essential to make wise decisions right from the design stage. Often, **premature degradation of RC structures** is the result of a wrong choice of the prescribed type of concrete, the environmental conditions to which the structure is subject and the incorrect or absent installation of suitable waterproof seals on joints and cracks.

REGULATIONS

The EN 206-1 and UNI 11104 regulations establish the standards for the design and construction of sub-structures. They indicate the environmental exposure classes, the limits of external aggression, the requirements for the protection of the reinforcements and the water-cement ratio, all with a clear targets: **to guarantee a minimum service life for the structure.**

THE CHOICE OF CONCRETE

Before starting construction, it is necessary to carefully consider the location and type of structure, ensuring the selection of the most appropriate concrete and taking into account the minimum measures to **prevent deterioration of the structures**:

- Respect for the **correct** covering thickness of the reinforcements.
- Choice of **concrete type** based on the environment and intended use.
- Using an **aggregate diameter** that suits the geometry and reinforcement.
- Selection of **concrete consistency**.
- Use of **specialised materials/products** to improve the strength of concrete.

DESIGN AND CONSTRUCTION RESPONSIBILITY

To obtain concrete with specific performance, the standards establish **condizioni minimum operating conditions that designers must follow**. The choice of material must be made by a qualified professional, considering the parameters defined by the regulations in force and the type of structure to be built. **The designer has direct responsibility for the design** of all structures, while the company must source concrete that complies with the specifications received and install it correctly.

CLASS OF RESISTENCE

The resistance of concrete depends on the resistance class and represents its capability to resist compressive stress and is expressed in MPa or N/mm². This class is fundamental to evaluate the **material's ability to withstand loads in a structure**. The choice of resistance class is influenced by the casting method, compaction and curing of the concrete. These processes, if not performed correctly, can significantly affect the strength of the material compared to the specimen values.

NOMINAL LIFE OF THE WORK

Nominal life is the expected period for the performance and safety of the structure and is influenced by factors such as the surrounding environment, usage and quality of the concrete. Correct waterproofing can significantly extend it, protecting the structure from the harmful action of water, one of the main agents of degradation for concrete buildings.

WATER/CEMENT RATIO

The water/cement ratio is a key parameter that determines the **compaction of concrete**. The technical standards establish maximum values of this ratio to satisfy the different exposure classes and the specific resistances required. The composition of the concrete, and in particular the water/cement ratio, must never be altered by adding water: many characteristics of the concrete would be lost!

CONSISTENCY CLASS

The consistency of the concrete is important for the workability of the material. This must be chosen based on the characteristics of the structure and compaction methods. It is evident that the more compact and homogeneous the material, the greater its ability to **resist the action of aggressive agents and its mechanical resistance**. In defining the composition of the mixture, a single parameter governs both performances: the water/cement ratio.

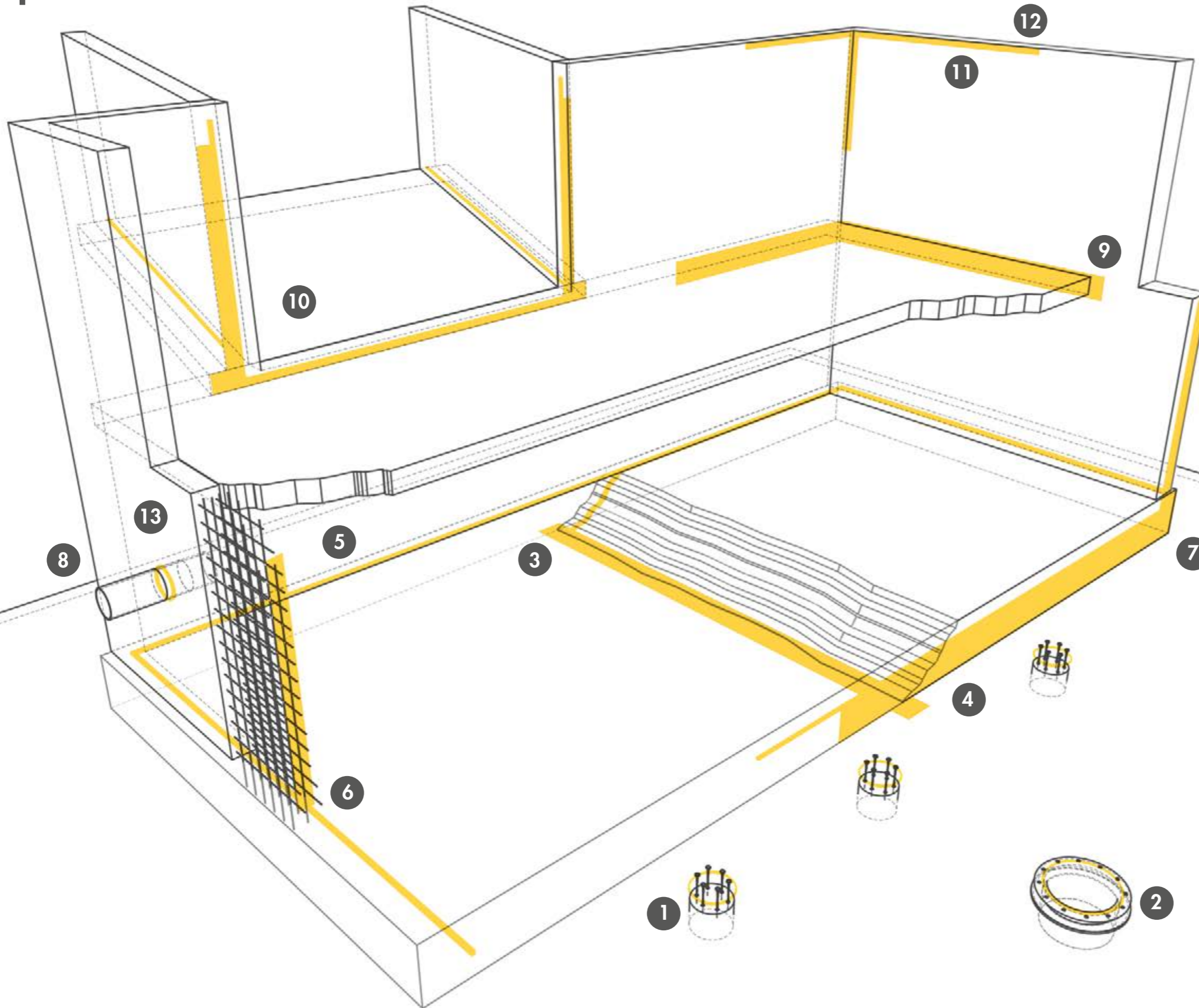
JOINT SEALING

Another extremely important measure is the **careful sealing of all structural joints** that are formed during the construction of concrete structures. This includes casting joints, expansion joints and also any cracking that may occur due to the curing of the castings or movements of the structure. Correct management of these technical details is essential to ensure the long-term durability and safety of the sub structures.

CONCLUSIONS

In summary, the careful selection of concrete, compliance with regulations, attention to environmental conditions and careful sealing of discontinuities represent fundamental steps to guarantee the longevity and long-lasting use of buildings over the years. Collaboration between designers, contractors and waterproofing specialists is essential to achieving success in this area.

SOLUTIONS for sealing discontinuities in concrete

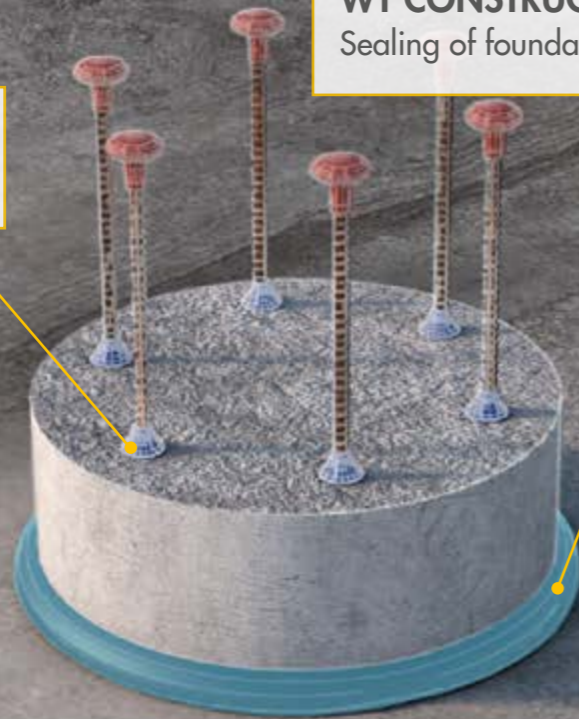


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1. FOUNDATION PILE

AKTI-VO 201
Sealing of the passing rebars

WT CONSTRUCTION
Sealing of foundation pile/slab



Foundation piles are an important element to ensure stability in buildings, they are made to transfer the load of the building uniformly to the underlying ground.

2. WELL POINT

WT CONSTRUCTION
Sealing of foundation pile/slab



Well points are useful for lowering the groundwater level. Positioned in the structure itself, they therefore facilitate the construction of the foundations of underground structures.

3. HORIZONTAL CASTING JOINT

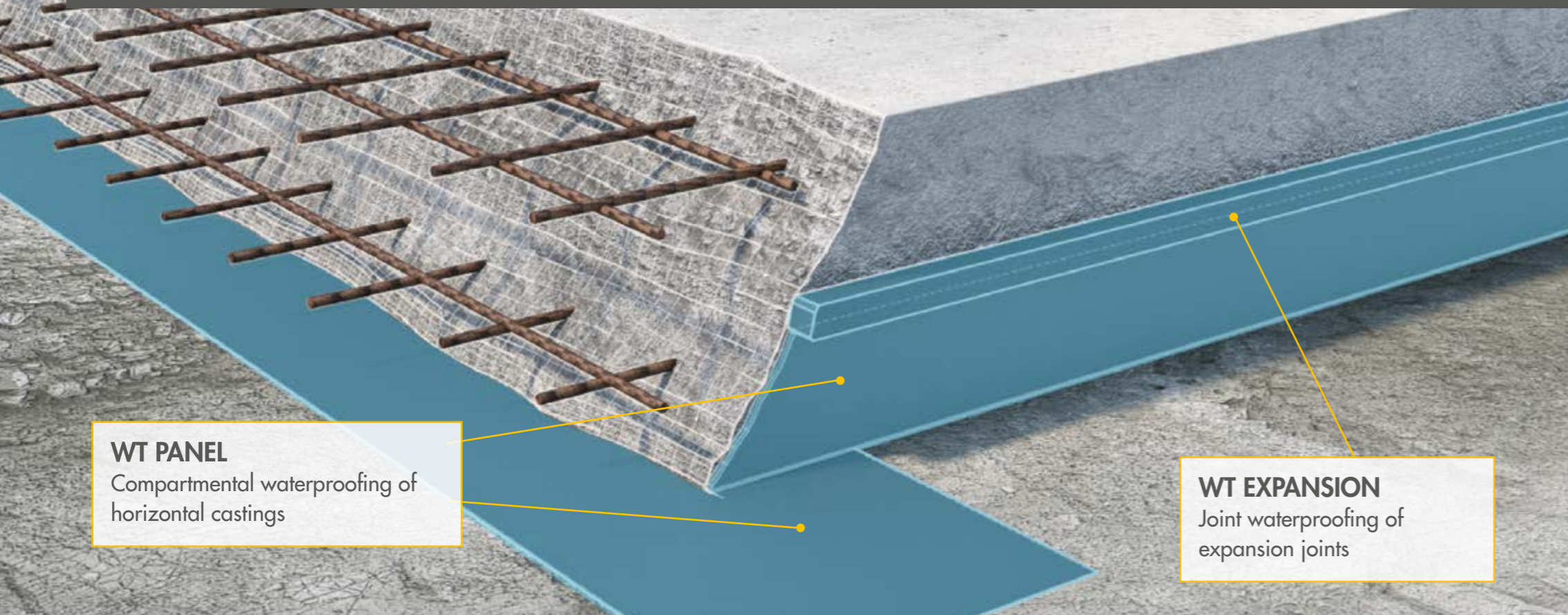


WT CONSTRUCTION
Complete connection of joints

WT PANEL
Compartmental waterproofing of horizontal castings

Castings carried out consecutively for construction site needs can give rise to **casting restarts along the slope.**

4. CONTINUITY OF PROFILES IN EXPANSION JOINTS



WT PANEL
Compartmental waterproofing of horizontal castings

WT EXPANSION
Joint waterproofing of expansion joints

The connection between the joints and their sealing they guarantee a continuous barrier against water, (preserving the stability of the building and reducing maintenance costs) and the long-term integrity of the building.

5. CONSTRUCTION JOINT



WT CONSTRUCTION
Sealing between the slab and the wall

Construction joints, inevitable in the construction of a structure, become critical points that can compromise the waterproof seal, especially in variable contexts and geometries, discontinuous terrain and non-homogeneous, heavy or seismic loads. Stable anchoring to the support even in rainy conditions.

6. COMPARTMENTAL SEALING OF WALLS



WT BREAK
Crack inducer

In reinforced concrete structures, the formation of **spontaneous cracks** due to hydraulic shrinkage and/or differentiated structural loads **must be guided** with special elements (the so called "crack inducer") for the subdivision of the vertical works.

7. EXPANSION JOINT

WT EXPANSION + WT PANEL
Expansion joint waterproofing



An **expansion joint** in a concrete structure plays a fundamental role in managing the movements of the structure itself. The continuity of the profiles allows for complete waterproofing of the interface between the castings. In fact, their main function is to monitor the movements that can arise over time, allowing the structure to adapt flexibly.

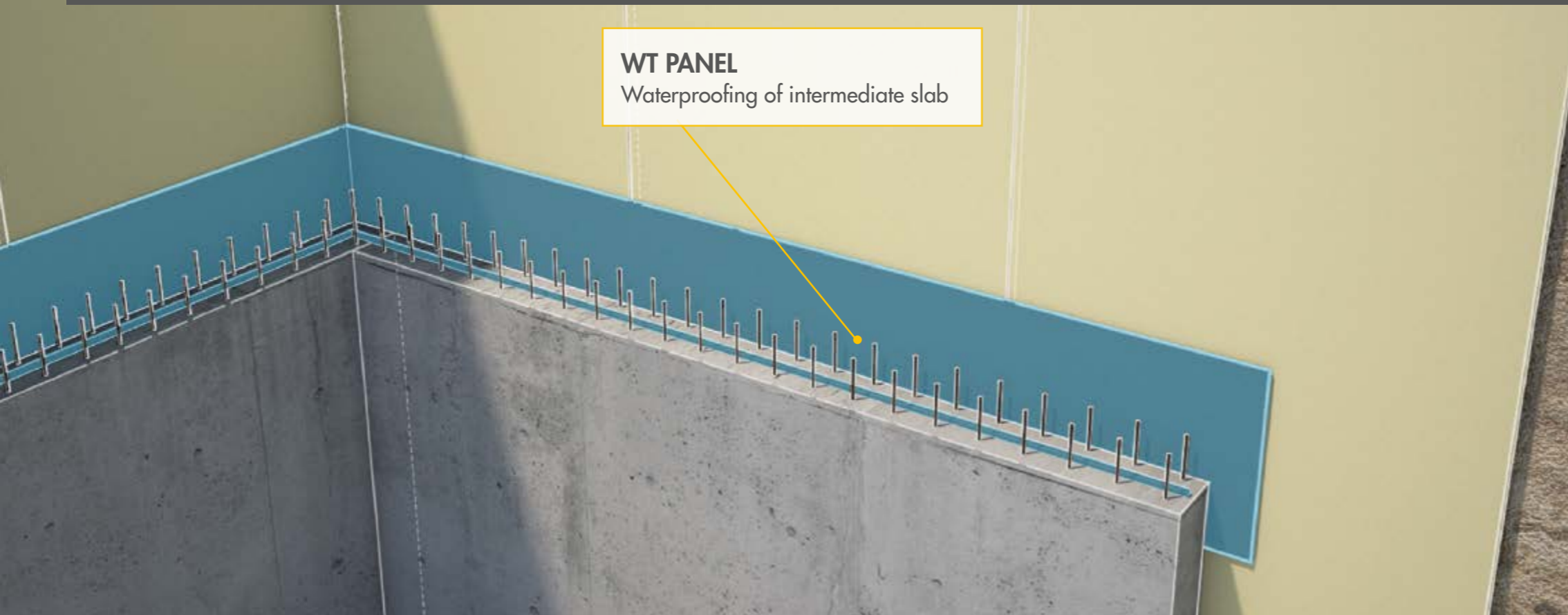
8. TUBAZIONE PASSANTE

WT STRIP
Penetration sealing



In the context of **underground structures**, it is necessary to create holes in the structure in order to allow the passage of various pipes. With consequent sealing problems that favor the infiltration of rainwater or groundwater.

9. INTERMEDIATE SLAB



The infiltration of water into the head of the intermediate floor of an underground structure can cause damage that is difficult to repair and can put the use of the premises at risk.

10. RAMP CONNECTION



A concrete access ramp for underground rooms is an inclined structure that provides passage to underground spaces such as car parks and cellars. Its design must ensure safety standard stability and durability and adapt to the important movements to which it is subjected.

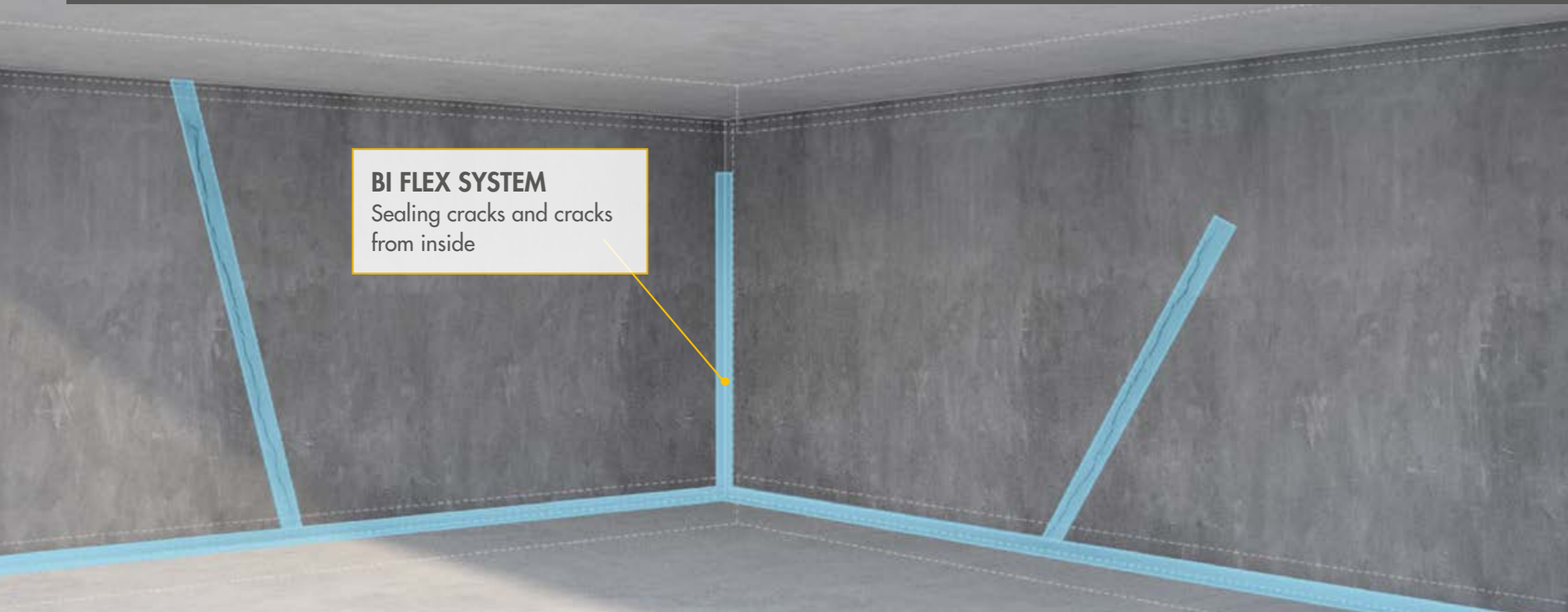
11. DISCONTINUITY OF PRECAST WALLS



BI FLEX SYSTEM
External sealing

The external waterproofing of **casting and construction joints** allows for better visual control of their continuity and execution. Particularly suitable for the use of precast elements.

12. POST-CAST DISCONTINUITY



BI FLEX SYSTEM
Sealing cracks and cracks
from inside

The repair of spontaneous cracks, construction joints, expansion joints **that are not adequately sealed**, allows post-execution defects to be promptly repaired.

13. SPRAYED CONCRETE TECHNIQUE



WT PANEL
Waterproof protection for construction joints

WT CONSTRUCTION
Sealing between the slab and the wall

The sprayed concrete technique, or "**shotcrete**", is known for its versatility and practicality. The use of hydroreactive rubber panels during the application phases offers significant advantages. These panels allow for the maximization of the methodology, providing **precise guidance for the pour** and ensuring programmed compartmental waterproofing.

Furthermore, they contribute to the protection of "fresh on fresh" construction joints, preventing potential structural weak points and **guaranteeing a waterproof seal**, thus reducing the risk of water infiltration.

WT CONSTRUCTION

Hydro-expansive EPDM waterstop reinforced with steel mesh

- > Perfect sealing and high resistance to hydraulic load
- > Excellent dimensional stability even in the case of volumetric increase due to premature contact with water. The profile maintains the volumetric mass



WT EXPANSION

Hydro-expansive EPDM gasket

- > Perfect hydraulic seal
- > High resistance to hydraulic load



WT PANEL

Hydro-expansive EPDM panel

- > High hydro-expansive capacity and stability
- > Easy adaptation to the dimensions of the structures to be waterproofed at the technical joint



WT STRIP

Hydro-expansive EPDM tape

- > High hydro-expansive capacity and stability
- > Flexibility and easy adaptation to the shape and dimensions of the structures to be sealed

WT BREAK

Self-sealing box profile

- > Perfect hydraulic seal
- > Maximum control of reinforced concrete shrinkage phenomena
- > Compartment the walls



VOL-TEC

Expansive profile for broad movement technical joints

- > Manually adjustable pressure of the rubber structure, possibility of adjusting the tightening torque even after installation
- > Easy verification and inspection of the profile's efficiency status



SISTEMA BI FLEX

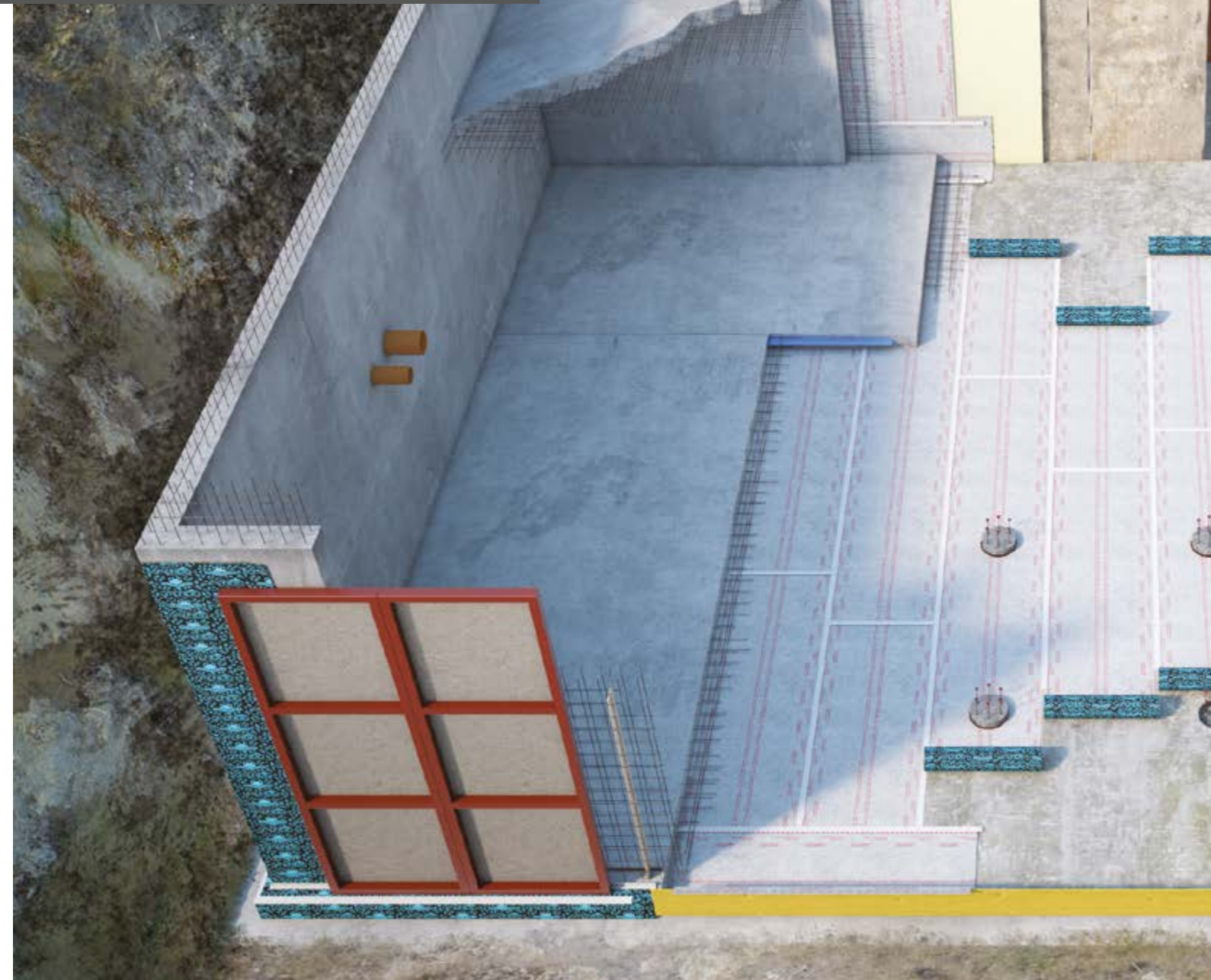
Elastic tape based on TPE polymers and epoxy adhesive for gluing

- > Total waterproofing with positive/negative hydrostatic thrust
- > Visible and repairable hydraulic seal check



Total waterproofing FOCUS AMPHIBIA

- » waterproofing
- » humidity barrier
- » radon gas barrier



The advantages of 3000 Grip

- Absolute watertightness with no lateral water migration
- Immediate mechanical protection, self healing and self sealing
- High resistance to hydraulic load
- High flexibility and ability to bridge cracks

In case of adoption of **VOLTECO** technologies in the development of the waterproofing design, several principles are followed which have been studied to avoid or limit the onset of potential problems:

- **Self-sealing overlap technology:** double sealing with adhesive mastic and combination of compaction and gelling
 - **Self-healing technology:** ability of the active layer to seal potential damage
 - **Certified limitation of lateral water migration:** combination of compaction and gel formation to stop water diffusion between the membrane and the substructure
 - **Mechanical bonding to concrete fresh:** intimate adhesion between fresh concrete and membrane to cooperate to limit the diffusion of water
 - **Application of a protective concrete screed:** (optional to limit damage during the application of the reinforcements and to protect in case of rain, dust, mud or traffic loads)
- > All these developments have been studied and tested at high levels of hydrostatic water pressure (up to 7 bar).



DEGREE OF RISK AND TYPE OF STRUCTURE

The new standard BS 8102:2022 (Protection of underground structures against water), with specific reference to the Type B section - Integral and structural protection, covers the specifications of the materials used.

In detail, the aim of the recent review is to improve the watertightness specifications of the concrete product.

Measures to achieve this include:

- **Limitation of the risk** of infiltration from penetrations through a specific mix design
- Define all mix design factors, including **castings size and sequence**
- Define the **limits of cracks** and related additional protection measures depending on the degree of performance required (in terms of impermeability)
- Use of **water resistant additives**
- **Waterstops** designed as a continuous and mandatory system.

LINES OF DEFENSE

The waterproofing design must always provide continuity between different technologies and, depending on the degree of risk, **one or more defensive lines** from the water capable of limiting problems resulting from errors or problems related to concrete such as, for example:

- Presence and distribution of **aggregates** in the mix
- Concrete **vibration** mode
- Method of **adding additives** to the mix
- Presence of **cracks and shrinkages** due to the curing process
- Presence of **construction joints**
- Presence of **movement joints**
- **Surrounding external conditions** (meteorological and environmental)

> These conditions make the presence of a second or, in critical conditions, one more appropriate than ever third line of defense.

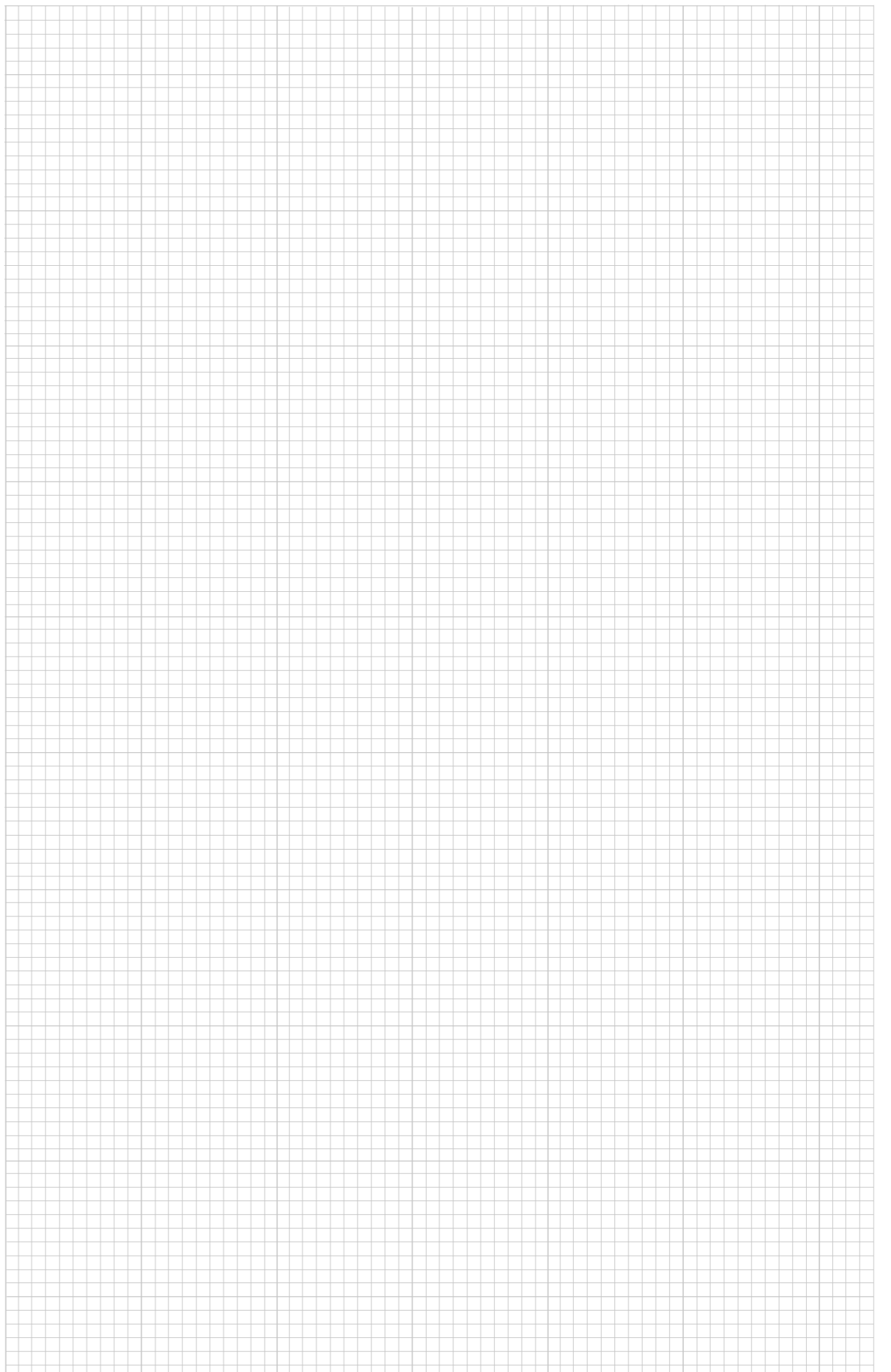
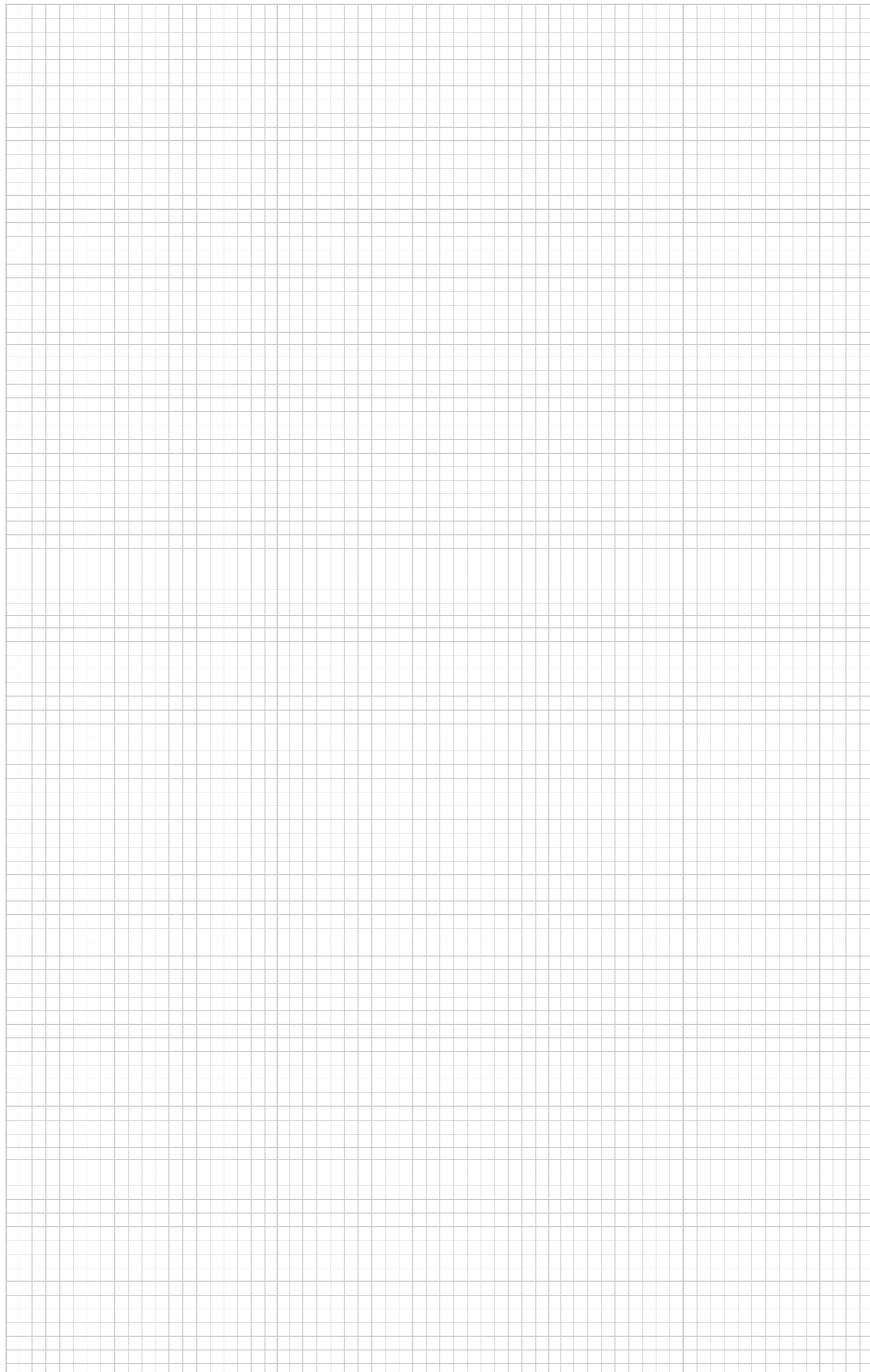
RIPARABILITÀ

In this sense, the standard also indicates **repairability systems**. The repairability of basement waterproofing depends on factors such as the method chosen, the quality of the initial installation and the extent of the damage. In general, interior waterproofing methods tend to be more accessible for repairs, as they are within the confines of the basement space. Exterior waterproofing repairs can be more challenging and expensive because they can involve excavation and create handling issues in the area. In the event of water infiltration into the underground structure, it is essential to identify the cause and degree of damage (humidity, infiltration, cracks, etc.) and address the problem promptly. The specific method for repair depends on the extent of the problem and the underlying cause. There are several **common methods to limit and repair water leaks** that may occur in some areas and must be implemented by approved and experienced applicators. The most frequent are:

- » **Repair and seal**
fessure e giunti
- » **Repair leaks**
dai corpi passanti
- » **Seal**
construction and casting joints
- » **Repair cracks**
structural
- » **Apply drainage systems**
temporary (like pumps)
- » **Restoration of concrete structures**
with specific waterproofing coating

> All the suggested methods can be modulated and implemented on a case-by-case basis depending on the context and situation, on structures designed to resist water under pressure and in compliance with the technical data sheets of the identified technologies

> Obviously all the suggested methods must be represented and approved by the Designer and/or the Site Manager.



Volteco

the ideal partner for waterproofing

Established in 1976, after forty-five years of activity, **Volteco** is today a provider of waterproofing solutions for the construction industry. **Volteco** works with passion and commitment on both national and international fields, for companies, through a network of distributors and applicators, cooperating with designers. Choosing Volteco means preventing, or solving, the problems caused by water.

Volteco solutions are in fact designed to meet specific needs based on different field of applications:

- Waterproofing of basements;
- Waterproofing of pools and tanks;
- Waterproofing of terraces and flat roofs;
- Treatment of damp walls;
- Facade restoration.

Thanks to a complete service consisting in technical expertise, professional approach and a trained and constantly updated installation network, **Volteco** offers personalized advice at every stage of the construction process.

Volteco is a specialist in his field, the Specialist of Waterproofing!



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