

# VOLTEX® CR

## SELF-SEALING HYDROPHILIC BENTONITE WATERPROOFING MEMBRANE

Ideal version for high salinity or polluted waters

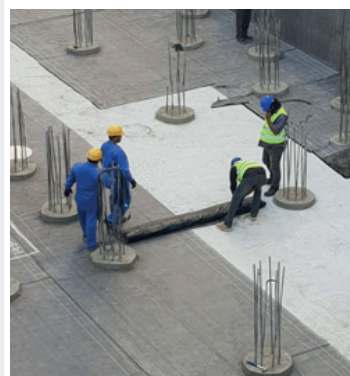
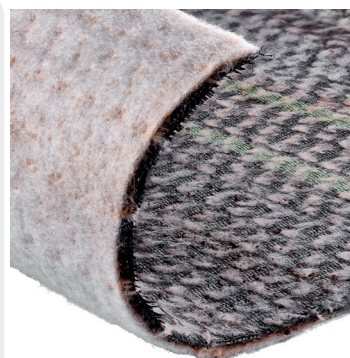


**VOLTEX® CR (chemical resistant)** is a highly effective waterproofing composite of high strength geotextiles and 5 kg/m<sup>2</sup> of sodium bentonite. The high swelling, low permeable sodium bentonite is encapsulated between a non-woven and woven geotextile. **VOLTEX® CR** contains contaminant-resistant sodium bentonite, which is ideal for groundwater contamination. A proprietary needlepunch process interlocks the geotextiles together forming an extremely strong composite that maintains the equal coverage of bentonite and protects it from extreme weather conditions and construction related damage. Once backfilled, **VOLTEX® CR** hydrates and forms a monolithic waterproofing membrane. **VOLTEX® CR** contains zero VOCs, can be installed in almost any weather condition to green concrete, and most importantly, has proven effective on both new and remedial waterproofing projects.

### BENEFITS

**VOLTEX® CR** is a natural sodium bentonite-based membrane for waterproofing foundations and structures below-ground that is particularly suitable in the presence of contaminants. The product features are:

- ✓ **SELF-REPAIRING CAPACITY:** **VOLTEX®** is self-sealing when hydrated, and ensures maximum sealing at overlaps, penetrations and in the event of accidental damage to the membrane.
- ✓ **COMPACTNESS AND UNIFORMITY OF THE BENTONITE LAYER:** the patented needle-punching technology interlocks the geotextiles together and encapsulates the bentonite between the two outer layers.
- ✓ **MECHANICAL ADHESION TO THE CAST:** the fibres coming out of the geotextile are incorporated into the confinement casting, providing a strong mechanical bond of the whole membrane to the cast concrete.
- ✓ **EASY TO APPLY:** **VOLTEX®** is quick and easy to install on concrete, stabilised concrete or dividing walls even at low temperatures or high humidity. **VOLTEX®** can be confined with concrete or soil.
- ✓ **SECURING JOINTS:** waterproofing is also secure at joints and points of discontinuity thanks to the possibility of shaping the membrane and using complementary products, such as waterstop, bentonite mastic.
- ✓ **RESISTANT TO HIGH HYDROSTATIC PRESSURE:** **VOLTEX®** provides effective waterproofing protection for structural concrete surfaces under continuous or intermittent hydrostatic pressure - tested up to 70 m (6.89 bar) - ASTM D 5385 mod.
- ✓ **CHEMICAL STABILITY:** **VOLTEX CR®** is able to withstand high concentrations of the following contaminants: nitrates, phosphates, chlorides, sulphates, lime and organic solvents. The sealing capacity is guaranteed even in the case of contaminants, electrolytes and organic compounds present in the water.



### APPLICATIONS

**VOLTEX® CR** is a bentonite-based waterproofing membrane ideal for:

- ✓ surfaces of foundations and generally horizontal underground structures;
- ✓ structural slabs, concrete beds, earth-covered structures;
- ✓ structural concrete surfaces under continuous or intermittent hydrostatic pressure;
- ✓ cellars, garages, basements, technical rooms, underground basements in general (new)
- ✓ Tunnels, subways and similar infrastructure;
- ✓ applications in the presence of slightly contaminated water (\*).

(\*) The suitability of the product can be verified by submitting a water sample for a compatibility test before installation.

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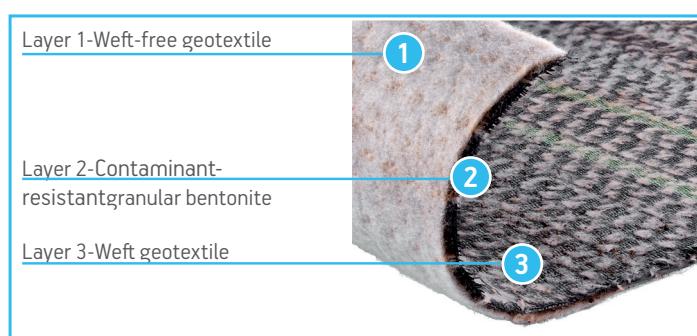
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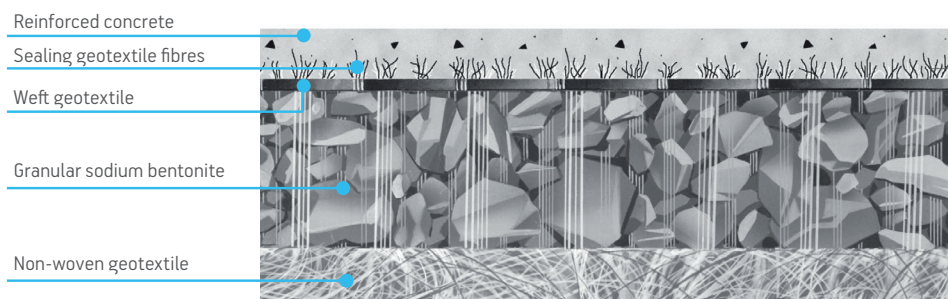
## HOW IT WORKS

VOLTEX® works by forming a low permeability membrane upon contact with water. When wetted, unconfined bentonite can swell up to 15 times its dry volume. When confined under pressure the swell is controlled, forming a dense, impervious waterproofing membrane. The swelling action of VOLTEX® can self-seal small concrete cracks caused by ground settlement, concrete shrinkage, or seismic action; problems over which there is normally no control. VOLTEX® forms a strong mechanical bond to concrete when the geotextile fibres are encapsulated into the surface of cast-in-place concrete.

### Composition of the membrane



### Cutaway view of the membrane



## PACKAGING AND STORAGE

**VOLTEX® CR** is available in the following formats:

- Roll 1.1 x 5 m = 5,5m<sup>2</sup>

Weight of one roll = 33 kg approx.

Pallet (palletised container) = 35 rolls = 192.5m<sup>2</sup>

- Roll 2.5 x 20 m = 50,5m<sup>2</sup>

Weight of one roll = 300 kg

- Roll 5 x 40 m = 200 m<sup>2</sup>

Weight of one roll = 1200 kg

The products should be stored in a dry place protected from sun and humidity. Once opened, rolls should be used and protected within 24 hours. In its original packaging, the product retains its properties for 12 months.

## INSTALLATION

### SURFACE PREPARATION AND MEMBRANE LAYING

#### HORIZONTAL APPLICATION

The laying surface should be as compact as possible and free of sharp material to avoid cutting the membrane. Concrete surfaces: concrete should be free of voids and projections. Any surface irregularities must be removed before installation. A minimum 150 mm thick reinforced slab is recommended if installed over a concrete blinding.

Apply BENTOSEAL over filled tie-bolt holes and to honeycombed concrete and surface voids. Tie-bolt holes extending through the wall should be completely filled with non-shrink cementitious grout and a piece of WATERSTOP-RX® centred in the wall.

Unroll **VOLTEX®** and install it with the geotextile (dark grey side) facing the concrete surface to be waterproofed. Use WATERSTOP-RX® expanding bentonite joints in combination with mastic at the connection points between the horizontal surface and the vertical wall, in casting joints and in the case of pipes and pilings, such as pillars. In the vertical and horizontal connections, extend VOLTEX® onto footing a minimum 150 mm, where required, to tie into vertical wall waterproofing.

#### TREATMENT OF OVERLAPS

Overlap all adjoining edges a minimum 100 mm and stagger sheet ends a minimum 300 mm. Staple or nail edges together as required to prevent any displacement before and during concrete placement.

### PENETRATIONS AND CRITICAL POINTS

Cut VOLTEX® to closely fit around penetrations and pile caps. Install VOLCLAY GRANULES® under cut VOLTEX® edge and then apply a minimum 19 mm thick fillet of BENTOSEAL® to top of cut VOLTEX® edge and at penetrations. Extend BENTOSEAL® onto VOLTEX® and coat a minimum of 50 mm.

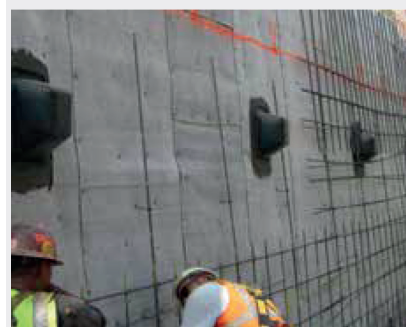
### PROTECTION AND CONFINEMENT

Schedule waterproofing material installation to permit prompt placement of concrete or compacted backfill. **VOLTEX®** membranes must be confined and protected within 24 hours with a layer of at least 10 cm in order to compress the membrane evenly. On horizontal surfaces, pour in the direction of the overlaps. Keep **VOLTEX®** and all accessory products dry prior to back fill or concrete placement.

**For full instructions please refer to the VOLTEX Installation Manual®.**



Under slab application




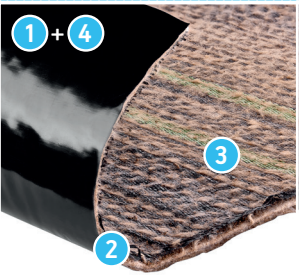
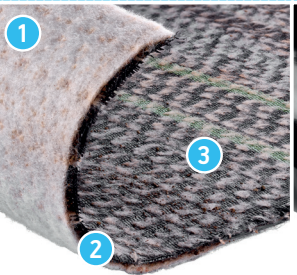
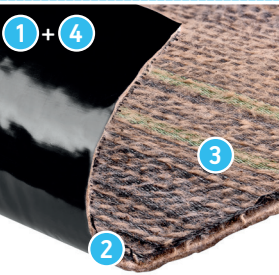
Vertical installation

## TECHNICAL CHARACTERISTICS

PROPERTIES	TEST METHOD	TEST RESULTS
<b>BENTONITE</b>		
Bentonite free swell	ASTM D 5890	>24ml/2g
Bentonite fluid loss	ASTM D 5891	max. 18ml
Bentonite mass / unit area	EN 14196	5 kg/m <sup>2</sup>
<b>COMPOSITE MEMBRANE</b>		
Resistance to hydrostatic pressure	ASTM D 5385 (mod)	70m
Peel resistance from concrete	ASTM D 903 (mod)	min. 2.6kN/m
Hydraulic conductivity	ASTM D 5084	1.0 x 10 <sup>-9</sup> cm/s
Tensile strength (MD/CD)	EN ISO 10319	10.0 kN/m / 10.0 kN/m
Thickness at 2 kPa	EN ISO 9863-1	7.0 mm (standard)
Puncture resistance	EN ISO 12236	1.8 kN
Low temperature flexibility	ASTM D 1970	Unaffected at -32°C



## AVAILABLE VERSIONS

VERSIONS	VOLTEX®	VOLTEX® DS	VOLTEX® CR	VOLTEX® DSCR
VOLTEX bentonite systems				
Composition of the membrane	Layer 1-Weft-free geotextile Layer 2-Granular bentonite Layer 3-Weft geotextile	Layer 1-Weft-free geotextile Layer 2-Granular bentonite Layer 3-Weft geotextile Layer 4- PE coating	Layer 1-Weft-free geotextile Layer 2-Contaminant-resistant granular bentonite Layer 3-Weft geotextile	Layer 1-Weft-free geotextile Layer 2-Contaminant-resistant granular bentonite Layer 3-Weft geotextile Layer 4- PE coating
Bentonite core features	Granular sodium bentonite content: 5 kg/m <sup>2</sup>			
Integrated polyethylene (PE) coating	-	+	-	+
Chemical resistance (CR)	-	-	+	+
Main use	Foundations and underground structures: <ul style="list-style-type: none"> <li>▶ Slabs</li> <li>▶ Concrete beds</li> </ul>	Foundations and underground structures: <ul style="list-style-type: none"> <li>▶ Slabs</li> <li>▶ Dividing walls</li> <li>▶ Retention walls/stabilised earth retention walls/piling</li> <li>▶ Vertical installation</li> </ul>	Foundations and underground structures: <ul style="list-style-type: none"> <li>▶ Slabs</li> <li>▶ Slightly contaminated water</li> </ul>	Foundations and underground structures: <ul style="list-style-type: none"> <li>▶ Slabs, Dividing walls</li> <li>▶ Retention walls/stabilised earth retention walls/piling</li> <li>▶ Slightly contaminated water</li> <li>▶ Vertical installation</li> </ul>
Formats	1.1 x 5 m / 2.5 x 20 m / 5 x 40 m			

## INSTALLATION MANUAL

### SURFACE PREPARATION AND MEMBRANE LAYING

Installation guidelines herein are for cast-in-place concrete applications. For shotcrete, precast concrete, and other applications not covered herein, contact DRACO's technical department for applicable installation guidelines.

Install VOLTEX® in strict accordance with the manufacturer's installation guidelines using accessory products as required. Use VOLTEX CR® as required for contaminated conditions.

#### HORIZONTAL APPLICATION

Install VOLTEX® with the dark grey (woven) geotextile toward the concrete to be waterproofed. Install WATERSTOP-RX® on vertical and horizontal construction joints. Schedule waterproofing material installation to permit prompt placement of concrete or compacted backfill.

#### SUBSTRATE PREPARATION

*Under slab:* the substrate should be smooth and compacted to a minimum of 85% as per amended Proctor test.

*Concrete walls:* concrete should be free of voids and projections. Any surface irregularities must be removed before installation.

Apply BENTOSEAL® over filled tie-bolt holes and to honeycombed concrete and surface voids. Tie-bolt holes extending through the wall should be completely filled with non-shrink cementitious grout and a piece of WATERSTOP-RX® centred in the wall.

### UNDER CONCRETE SLABS

VOLTEX® is recommended for use under structural reinforced concrete slabs 100 mm thick or greater on a compacted earth/gravel substrate. A minimum 150 mm thick reinforced slab is recommended if installed over a concrete blinding. Where hydrostatic conditions exist, install VOLTEX® under footings and ground beams.

Place VOLTEX® over the properly prepared substrate with the dark grey (woven) geotextile side up. Overlap all adjoining edges a minimum 100 mm and stagger sheet ends a minimum 300 mm. Staple or nail edges together to prevent any displacement before and during concrete placement.

Cut VOLTEX® to closely fit around penetrations and pile caps. Install VOLCLAY GRANULES® under cut VOLTEX® edge and then apply a minimum 19 mm thick fillet of BENTOSEAL® to top and at penetrations, pile caps, ground beams and other detailing. Extend BENTOSEAL® onto VOLTEX® and coat a minimum of 50 mm. For hydrostatic conditions, VOLTEX® should be installed under ground beams and footings. In the vertical and horizontal connections, extend VOLTEX® onto footing a minimum 150 mm to tie into vertical wall waterproofing.

Where property line retaining walls, such as secant/contiguous piling, steel sheet piling, soldier pile and lagging with IPE bars and wooden beams, are used as the outside concrete form, install a VOLTEX® transition course at the base of the wall per "Shoring Wall Transition" instructions within the "Property Line Construction" section herein. Continue the under-slab VOLTEX® installation up to the retaining wall overlapping the transition course a minimum 300 mm.

## BACKFILLED CAST-IN-PLACE CONCRETE WALLS

Before installing the first course of VOLTEX®, install BENTOSEAL® fillet (min 38 x 38 mm) at the wall / footing transition corner. Trowel apply BENTOSEAL® to form a continuous line.

## PRE-APPLIED INSTALLATION

Apply VOLTEX® to timber formwork, either horizontally or vertically, by nailing or stapling, following general application guidelines for lapping all adjacent edges 100 mm, and staggering adjacent roll ends no less than 300 mm (avoiding four-way laps), and additionally ensuring that overlaps face downwards, as applicable. The nonwoven (white) geotextile should be installed against the formwork, and the woven (grey) geotextile should face the concrete to be waterproofed.

Extend VOLTEX® the full depth of the formwork, so that it overlaps 100 mm over the adjacent edges; apply the membrane into the slab edge and wall kicker, and allow no less than 150 mm at the top of the formwork, to provide waterproofing continuity.

Position and tie forms as required, penetrating VOLTEX® as necessary. Normal concrete practice is sufficient in terms of striking times for formwork, but due care should be taken to ensure that VOLTEX® remains bonded to green concrete. Where a slab toe exists, and underslab VOLTEX® has terminated at the top edge of the slab, an additional layer of membrane will be required to link the two layers and ensure the waterproofing continuity. Install BENTOSEAL® fillet (min 38 x 38 mm) at the internal vertical wall/slab corner, and place additional VOLTEX® over the slab 'toe' lapping 100 mm over the layer previously installed on the edge of slab, and continue over the toe terminating under the unbonded wall VOLTEX® flap at the back of the kicker.

## POST-APPLIED INSTALLATION

Beginning at the corner of the vertical wall and footing, install VOLTEX® horizontally onto the bottom strip of the vertical wall; extend the bottom edge of the membrane on the footing by at least 150 mm. Fasten VOLTEX® into position with maximum 600 mm on centre washers. Install adjacent VOLTEX® rolls; overlap the preceding membrane a minimum 100 mm. At inside wall corners install 1.5 m membrane on one wall and the remainder around the corner on the other wall. To make the operation easier, cut the lower edge of VOLTEX® at the corner. Then apply VOLTEX® to the uncovered area of the footing at the corner. Coat the membrane portion and corner overlap with BENTOSEAL® mastic. Complete the installation horizontally along the perimeter before proceeding vertically.

At inside wall corners apply a continuous 19 mm fillet of BENTOSEAL® directly in the corner prior to installing VOLTEX®. Stagger all vertical overlap joints a minimum of 300 mm. For hydrostatic conditions, the vertical wall VOLTEX® should cover the entire footing and overlap the under-slab waterproofing a minimum 150 mm.

## PIPES AND PENETRATIONS

Cut VOLTEX® to closely fit around penetrations. After installing VOLTEX®, apply a layer of BENTOSEAL® with a minimum thickness of 19 mm around the perimeter to completely fill any voids between the penetration and the edge of VOLTEX®. Apply BENTOSEAL® to both the penetration and the edges of VOLTEX® for at least 38 mm. In areas where multiple penetrations are close together, it may be impractical to cut VOLTEX® to fit around each penetration. Therefore, apply a BENTOSEAL® filler with a minimum thickness of 19 mm

around the base of each penetration and cover the entire surface. Apply BENTOSEAL® 38 mm onto the penetrations.

Terminate VOLTEX® membrane 300 mm below finished ground elevation with washer-head fasteners maximum 300 mm on centre. Install CETBIT 300 self-adhering waterproofing membrane to primed concrete substrate with bottom edge overlapping top edge of VOLTEX® membrane minimum 100 mm. Overlap all roll ends a minimum 100 mm to form a continuous flashing. Height of flashing shall be as per project details and specifications. Install a rigid termination bar along top edge of CETBIT 300; fastened maximum 300 mm on centre. Complete ground termination detail with tooled bead of CETSEAL along the top edge, at all penetrations and all exposed overlaps. Backfill should be placed and compacted to minimum 85% as per amended Proctor test promptly after waterproofing installation. Backfill should consist of compactable soil or grit (19 mm or less) free of debris, sharp objects, and stone larger than 19 mm.

## CAST-IN-PLACE RETENTION WALLS

Use VOLTEX® to waterproof various types of cast-in-place retention walls, including: secant/contiguous piling, steel sheet piling, soldier pile and lagging with IPE bars and wooden beams and stabilized earth shoring walls.

The following guidelines outline the installation of VOLTEX® on secant/contiguous piles.

Preparation of secant/contiguous piles: the substrate must be free of voids and projections. Any voids, cavities or cracks greater than 20 mm must be covered with a layer of cementitious grout or BENTOSEAL®. Projections greater than 20 mm must be removed or levelled out. Generally, slightly undulating surfaces are acceptable, sudden changes in level, i.e. ridges and hollows, are not. On contiguous piling, ensure that soil columns between piles are cut back to no less than one third of the pile diameter, to create a fixing cleavage, and reduce the likelihood of soil dislodging behind VOLTEX®. Where required, cast concrete or apply shotcrete to contiguous piles to provide a sound substrate, particularly where large voids occur between piles due to unstable soil loss.

Shoring Wall Transition: at base of shoring wall, install VOLTEX® sheet horizontally oriented (dark grey woven geotextile facing installer) with the bottom edge extending out onto the horizontal substrate a minimum 300 mm and the top edge of the sheet extending a minimum 300 mm above the finished slab elevation. Secure VOLTEX® sheet to shoring wall with washer-head fasteners maximum 600 mm on centre. Overlap edges of VOLTEX® sheets a minimum 100 mm. If the slab thickness is greater than 600 mm, install a second full sheet or cut strip of VOLTEX® on the shoring wall to meet the 300 mm requirement above the top slab elevation. Overlap top edge of previous sheet and edges of adjacent sheets a minimum 100 mm.

Secant/contiguous/steel sheet piles installation: follow the 'Shoring Wall Transition' instructions for installation of VOLTEX® transition course at the base of the secant/contiguous/steel sheet piles, with the 300 mm base flap cut and placed as necessary, to allow the material to lay flat and provide continuity with the under slab installation.

Use washer-head fasteners to secure VOLTEX®, as per general application guidelines for lapping all adjacent edges 100 mm, and staggering adjacent roll ends no less than 300 mm (avoiding four-way laps); as applicable, ensuring that VOLTEX® closely contours the application surface. For secant and contiguous piling, locate fasteners close to cleavages. For steel sheet piling, locate fasteners close to sheet pile interlocks and along internal/external sheet pile corners.



**Penetrations:** install a cut collar of VOLTEX® tightly around the penetration; extending a minimum 300 mm radius. Apply BENTOSEAL® over VOLTEX® collar around penetration; extending BENTOSEAL® a minimum 75 mm radius at 6 mm thickness. Then install main course of VOLTEX® membrane tightly around the penetration. Finally, detail around penetration with 19 mm thick and 300 mm radius fillet of BENTOSEAL®. With sleeved pipes, fill the gap between the pipe and the sleeve with non-shrink cementitious grout and install WATERSTOP-RX® to both sides of sleeve.

**Ground Termination:** terminate VOLTEX® membrane 300 mm below finished ground elevation with washer-head fasteners maximum 300 mm on centre. Install CETBIT 300 flashing to primed concrete substrate with bottom edge overlapping top edge of VOLTEX® membrane minimum 100 mm. Overlap all roll ends a minimum 100 mm to form a continuous flashing. Height of flashing shall be as per project details and specifications. Install a rigid termination bar along top edge of CETBIT 300; fastened maximum 300 mm on centre. Complete ground termination detail with tooled bead of CETSEAL along the top edge, at all penetrations and all exposed overlaps.

Secure all excavated VOLTEX® overlaps with washer-head fasteners maximum 600 mm on centre. Backfill should be placed and compacted to minimum 85% as per amended Proctor test promptly after waterproofing installation. Backfill should consist of compactable soil or sharp grit (19 mm or less) free of debris, sharp objects, and stone larger than 19 mm.

**LIMITATIONS:** VOLTEX® should only be installed after substrate preparation has been properly completed and is suitable to receive the waterproofing system. Concrete work should be cast-in-place with conventional forms that produce a smooth surface.

VOLTEX® is designed for below-ground waterproofing applications where the product is properly confined. VOLTEX® should not be installed in standing water or over ice. If ground water contains strong acids, alkalies, or is of a conductivity of 2,500 µmhos/cm or greater, water samples should be submitted to DRACO SpA for compatibility testing. ULTRASEAL XP may be required if contaminated ground water or saltwater conditions exist.

VOLTEX® is designed for use under reinforced concrete slabs 100 mm thick or greater or on a compacted earth/gravel substrate. VOLTEX® requires a minimum 150 mm thick reinforced concrete slab if installed over a concrete blinding. VOLTEX® is not designed for split-slab floors. VOLTEX® is not intended to seal expansion joints; contact DRACO for expansion joints applications. Do not use VOLTEX® on masonry block foundation walls. Contact DRACO for special installation guidelines that apply to shotcrete and precast concrete construction. Contact DRACO for information on suitable products and for guidelines on applications not included in this document.

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