Freecem® Capsule

Cementitious anchoring Capsules for Rebars and Dowels

The Construction Alchemists

Description

Freecem® Capsule is an anchoring capsule, a cementitious non-shrink grout designed for the anchoring of rebars or dowels in concrete, masonry or rock. This dry pre-mixed cement grout is encapsulated in a water permeable wrapping and once the grout capsule is saturated in water it becomes a fast setting thixotropic grout and is easily inserted in the anchoring hole. Freecem® Capsules contain a blend of special cementitious binders, graded fillers and chemical additives.

Features & Benefits

- Simple and economical
- Easy to install
- Easy handling and storage
- Reduces installation time and cost
- No product mixing on site
- No special tools and equipment required
- High early strengths
- Thixotropic mix
- Stable water/cement ratio
- No toxic emanation or fumes
- Environmentally friendly
- Does not contain chlorides

Primary Application

It can be used for civil engineering, architectural, mining or geological projects with plain, threaded or deformed rebars or dowels. The typical applications are but not limited to:

Fixing of fully grouted steel rock bolts and dowels for strata control in tunneling and mining to minimize fall of roof and as support system.

• Structural repairs
• Dams and tunnels
• Concrete formwork anchors
• Mining anchors
• Mining - grout plugs for exploratory holes

Technical properties

Effect of temperature : The hardened grout is nonflammable And will provide satisfactory anchorage up to 200°C

Toxicity : Product is non-toxic.

Setting time

Initial	30min
Final	600min

Min. Compressive Strength at 28 days: 48.2 MPa **(ASTM C-109)**

Creep Test (ASTM E-1512) : Exceeds Requirements

Soaking time : 2-3 min

Working time 20° C : 15 min

Expansion (ASTM C-1090) : 0.04%

- Consult an engineer for structural design and capacity.
- Engineer must evaluate substrate and anchoring conditions.
- Underwater: Strength may be reduced by 30% depending application.
- Cold weather applications may have slower initial setting time.

Quantity Estimation

Number of capsules required for the project can be estimated using the following expression:

$$N=3.142\ L \times \{ (D/2)^2 - (R/2)^2 \} \div V$$

Where,
N= Minimum number of capsules required
R= Rebar/ bolt diameter (mm)
D= Diameter of the hole (mm)
V= 1,47,262 mm^3
L= hole depth in mm (calculate total depth)

Recommended installation procedure:

1. DRILL ANCHORING HOLES: Drill holes as per recommended minimum dimensions in Table 1. Use rotary percussion hammer with carbide bits. Do not use diamond core bits. For faster and easier installation, increase hole diameter up to 6 mm greater than the bar diameter for bars up to 25mm
2. CLEAN ANCHORING HOLES: The hole must be clean before inserting the grout capsule. Clean with water pressure or air pressure to eliminate all dust and contaminants. Clean holes from bottom out. Residual water must be removed. Anchoring holes must be clean prior to inserting Freecem® Capsule.
3. SOAK THE GROUT CAPSULES IN WATER: Soak the grout capsules in clean water for 1 to 2 minutes or until bubbles cease coming out of the capsules. Water temperature should be between 2° C and 25° C . In cold weather conditions, water and capsules can be warmed up to 25°C (to accelerate the setting time of the capsule.
4. INSERT THE GROUT CAPSULE IN THE ANCHORING HOLE: Working time of the grout capsule is about 15 minutes at 27°C. Twist off end with staple and insert open end in hole. Do not remove the wrapping of the grout capsule. A capsule can be cut to required length when an anchoring hole does not require a full capsule. The remaining part can be used for another anchoring hole.

CAUTION:
Volume of grout required to fill hole may vary due to diameter and length of hole, cavities, fissures and nature of substrate. User must ensure that grout completely fills hole and encapsulates bar at surface after insertion of bar.

5. INSERT BAR IN THE ANCHORING HOLE: Insert bar without rotating it through the capsule that is already in the hole. Use a hammer or percussion hammer/drill if required. Do not touch or move bar before final setting time. **Do not rotate rebar**

Anchoring Guide with Freecem® Capsules*

* values based on experimental data, however actual values may differ at site and recommended confirmation by site trias / Lab tests

Table - 1

Nominal Bar /Bolt Size (mm)	Recommended Hole Size (mm)	Capsule Dia (mm)	Embedment Length (mm)	Ultimate Pullout Load (KN)	Max. Tensile Load (KN)	Min. embedment length to develop yield strength of steel (mm)
25	28	25	220	200	190	200
			315	250		
32	38	25	350	360	209	220
			425	380		

Notes: The hole and rebar diameter may vary. Use the smallest hole diameter that allows easy insert of capsule and rebar
Grade of steel - Fe 415 (minimum)
Tests made at 28 days and 27° C
Hydraulic jack capacity: 400 KN
Concrete compressive strength of substrate > 35 MPa

Estimating

Packaging

Freecem® Capsules are supplied in double lined polythene sacks and corrugated cardboard boxes each containing 50 nos.

Standard Sizes available are :

25mm dia x 500mm length
25mm dia x 300mm length
Other lengths and/or diameter as per individual customer's requirements can be made depending on quantities.

Storage

Freecem® Capsules has a shelf life of 6 months if kept in dry store in original, unopened containers. If stored at high temperature and/or high humidity conditions the shelf life may be reduced.

Precautions

Health & Safety instructions

The capsule grout is based on hydraulic cements which are alkaline. Splashes on skin should be washed off . Splashes in eyes should be washed out immediately and medical advice should be taken.

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