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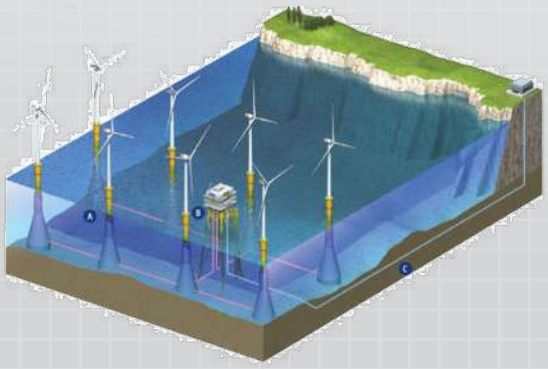


CASE STUDY

REBAR COUPLERS & HEADED BARS ON

FECAMP

WIND FARM PROJECT

GRAVITY BASE STRUCTURES

Dextra

www.dextragroup.com

Project description

Stakeholders

Owner:
EDF Renewable / Enbridge / WPD / CPP Investments

Contractor:
Bouygues TP / SAIPEM / Boskalis

Rebar Fabricatror: SNAAM(SNBA)
Steel Fixer: Welbond

Description

Construction of 71 Gravity Based Structures (GBS: Gravity Based Structures) at Le Havre Port 2000, France.

To be towed and installed of the coast of Fecamp.

Each GBS will support a 180 meter-high windmill.

Timeline

2020

Le Havre:
- WindMill Factory Construction
- GBS Site Installation

Fécamp:
- Maintenance base construction

2021

Le Havre:
- WindMill Factory Construction
- GBS Erection

Fécamp:
- Maintenance base construction

2022 - 2023

Cherbourg:
- Preassembly of the windmills

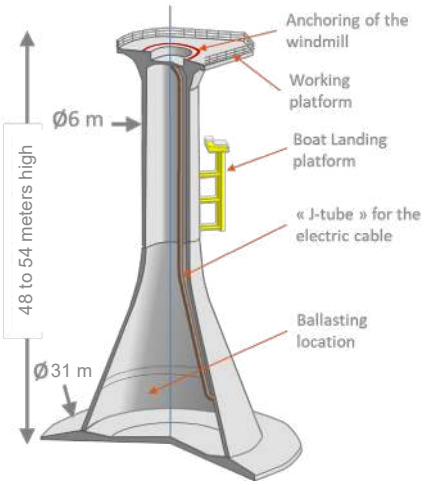
Offshore:
- GBS installation

≥ 2023

Start-up & Commissioning

20 years Operation & Maintenance

Some key figures



500MW
TOTAL POWER

71 GBS

2,000 m³ of concrete/GBS

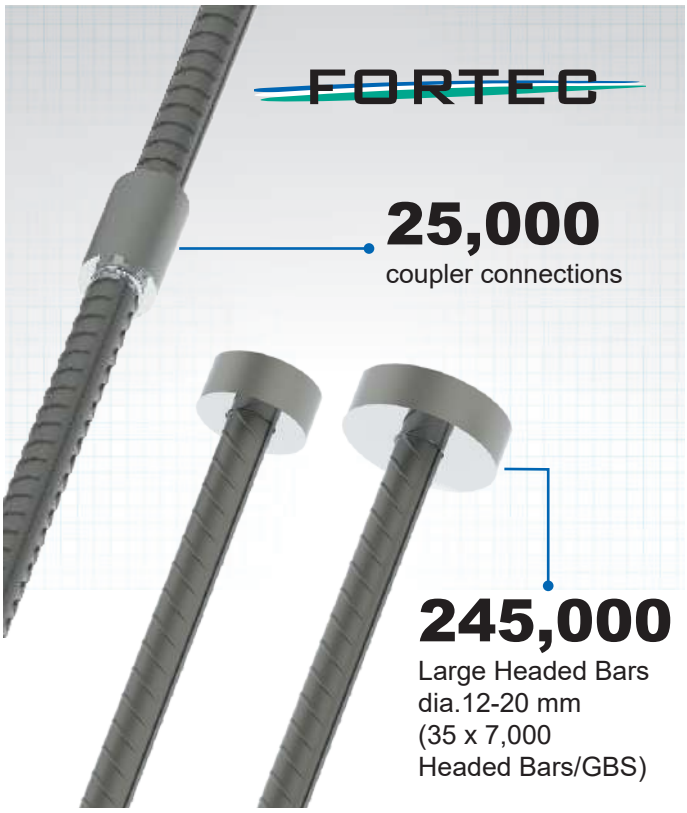
425 Tns of rebars / GBS

GBS time schedule over **12 months**

Cut & bend workshop capacity **100t of rebar/day**

- **14,900 tons** of reinforcement steel for 35 GBS
- Reinforcement diameters: **12-32 mm**
- Steel/concrete ratio: **215kg/m³ average** up to **400 kg/m³**

About
Dextra Couplers & Headed bars



Main benefits

Coupler applications (see also pages 6-7):

1. Temporary openings for ease of moving material and people during the different steps of construction.
2. Aids constructability with climbing formwork for fast cycle GBS building.
3. Improve rebar congestion, avoiding overlapping splices.

Headed bars

1. Reduced rebar congestion and the steel/concrete ratio.
2. Improved buildability and quality
3. Suitable for sequenced concrete pours.
4. Suitable for seismic design.
5. Fast to install: reduced labour and crane time.
6. Head can be removed for ease of rebar positional adjustment.
7. Improved concrete compaction and surface quality(reduction of honeycombing).

About Dextra coupler solutions

Dextra couplers are based on a **Parallel Thread technology**. The same couplers are used for **standard connection** (when the continuation bar can be rotated) and **position connection** (when neither bar can be rotated).

For Fécamp, SNBA (SNAAM Group) was equipped with sets of threading equipment at their premises.

Gravity Based Structures
Construction Sequence

PRECAST AREA

Quai de Bougainville, Port 2000

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GBS are built at Port 2000, Le Havre, France, to be towed once completed, off the coast at Fécamp.

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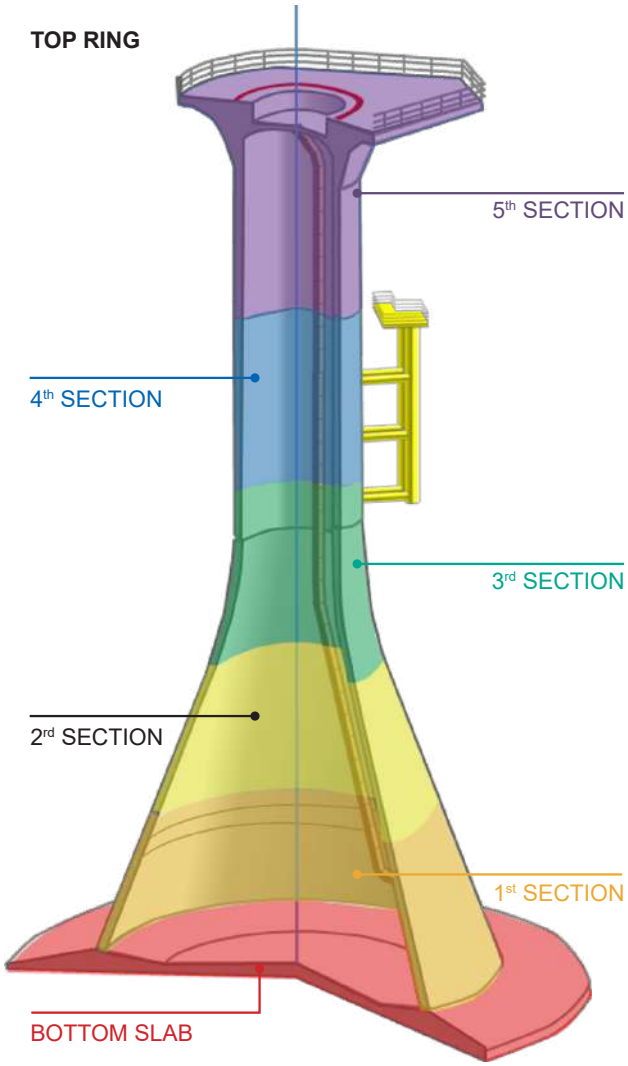
CONCRETING SEQUENCE

Each GBS is poured in five concreting sections with tailor made and dedicated formwork.



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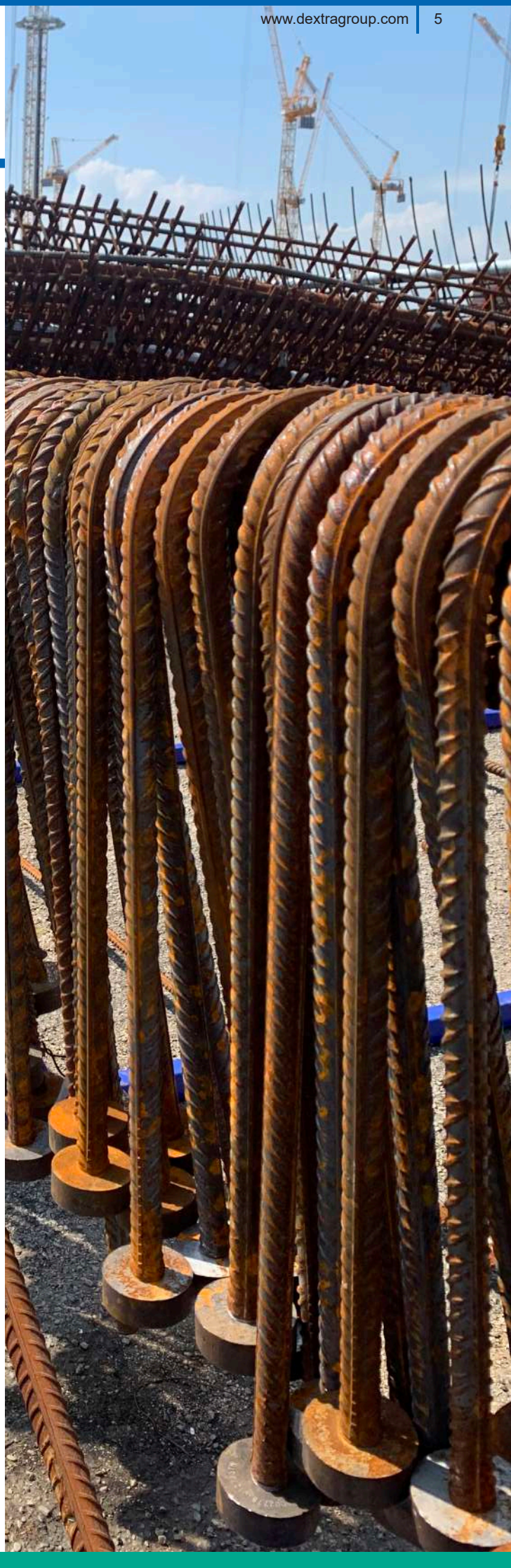
STEP 1 BOTTOM SLAB

STEP 2 1st CONCRETING SECTION

STEP 3-6 2nd - 5th CONCRETING SECTIONS

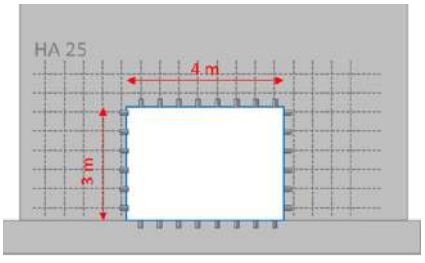


Gravity Base Structure
Couplers applications

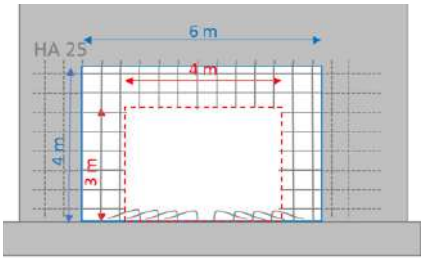
1 TEMPORARY OPENINGS IN GBS

To facilitate the circulation of site personnel and material inside the GBS during the construction, temporary openings have been made using Dextra couplers at different heights: Minimizing opening dimensions and safety by avoiding overlapping lengths of protruding rebars.

Use of couplers for “clean” wall openings avoiding protuding rebars



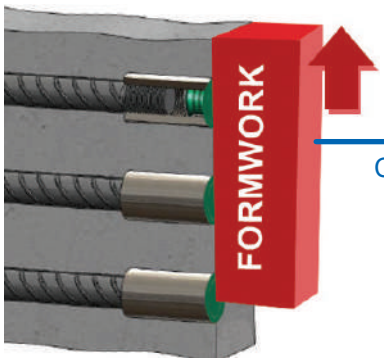
With Couplers



Without Couplers

2 WALL/SLAB CONNECTIONS

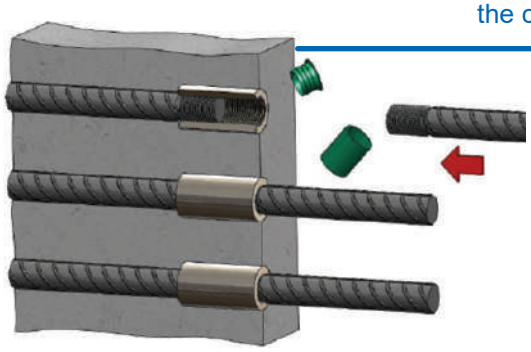
Several layers of Dextra couplers are installed as walls starter bars.



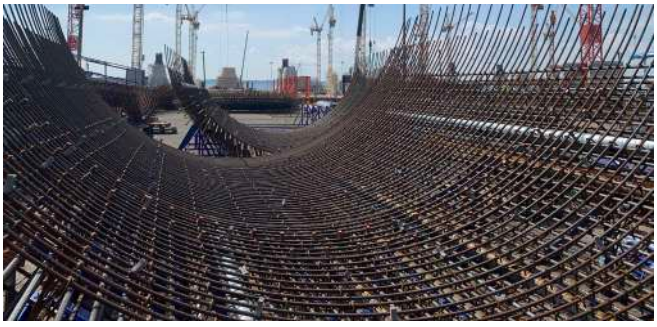
Couplers are cast in concrete

Once the concrete pouring/curing is completed, starter bars are screwed in the couplers to start the junction walls reinforcement.

Continuation bars are screwed in the couplers



Walls starter bars connected



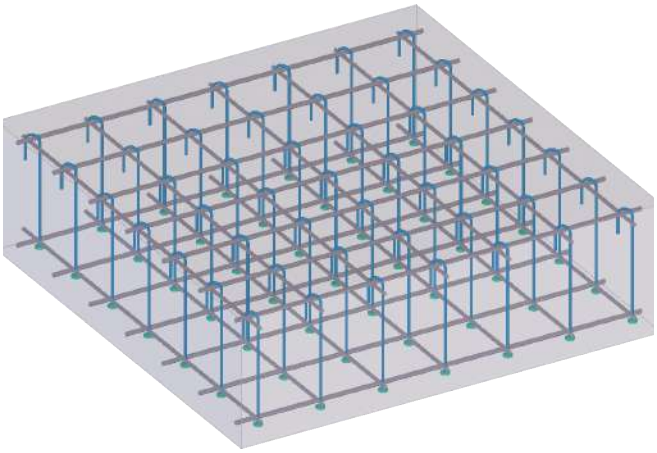
Headed bars / End Anchors applications

Headed Bars are mechanical bar anchorages where an end-anchor plate is fixed at the end of a threaded rebar. They are great alternative to traditional hooked bars which are difficult to install, especially when bent on both ends , and as an alternative to a bonded length of straight or bent length of rebar, acting as an anchorage.

Dextra Headed Bars were used as an efficient solution for the vertical reinforcement of the foundation.

Dextra Headed bars are available with head size equivalent to a bearing area 4 or 9 times the cross section area of the rebar they connect to, which makes them suitable and compliant with most codes of practice around the world. They reduce rebar congestion and improve constructability, saving time and hence money on site.

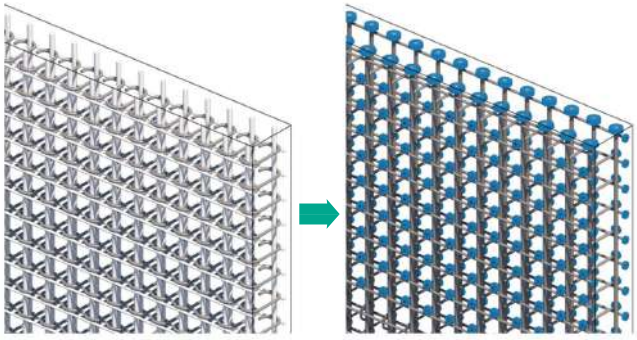
1 RAFT & SLABS



Using headed bars can reduce rebar congestion, improve buildability and increase on-site productivity.

2 SHEAR WALLS / CROSS TIES

Dextra headed bars can be used as shear wall cross ties as an alternative to rebar with hooked anchorage.



Headed bars installed during wall panels prefabrication.

Commercial presence in more than 55 countries.

HEADQUARTERS THAILAND
Dextra Manufacturing Co., Ltd.
Tel: (66) 2 021 3800
Fax: (66) 2 328 0374
E-mail: thailand@dextragroup.com

EUROPE
Dextra Europe SARL.
Tel: (33) 1 45 53 70 82
Fax: (33) 1 47 04 28 97
E-mail: europe@dextragroup.com

NORTH AMERICA
Dextra America Inc.
Tel: (1) 206 742 6020
E-mail: america@dextragroup.com

CHINA
Dextra Building Products
(Guangdong) Co., Ltd.
Tel: (86) 20 2261 9901
Fax: (86) 20 2261 9902
E-mail: china@dextragroup.com

MIDDLE EAST
Dextra Middle-East FZE
Tel: (971) 4886 5620
Fax: (971) 4886 5621
E-mail: middleeast@dextragroup.com

LATIN AMERICA
Dextra Latam
Tel: (507) 6454 8100 / 831 1442
E-mail: latam@dextragroup.com

HONG KONG
Dextra Pacific Ltd.
Tel: (852) 2845 7766 / 2511 8236
Fax: (852) 2586 1656 / 2519 0852
E-mail: dplbuilding@dextragroup.com

INDIA
Dextra India Pvt. Ltd.
Tel: (91) 22 2838 6294 / 22 2839 2694
Fax: (91) 22 2839 2674
E-mail: india@dextragroup.com

SOUTH AMERICA
Dextra do Brasil
Tel: (55) 11 5505 2475 / 11 5505 2477
E-mail: brasil@dextragroup.com

Dextra
www.dextragroup.com