

Hollow Core Slabs in residential market

A short view on the Danish approach to the market

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CRH Concrete A/S

Key Figures

Market Share > 30%,
Sales + € 180m,
Volume approx. 600.000 ts./Y,
11 Factories,
Employees c 1.200

Active in

Wall/Façade panels (products & systems)
Flooring – hollow core and lightweight floors
Reinforced & pre-stressed elements
Special structures (multi-storey garages, stadium)
Housing concept (from villas to apartments)
Stairs and Balconies
Civil components

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Agenda

- Historic background
- Branch organisation
 - Cooperation
 - Quality assurance
 - Technical common knowledge
- Market
- Future challenges



Demand for housing in the cities due to stand still during II world war and the following years combined with increasing migration from country to city.

Public subsidies for the construction of housing, started in the 1950's.

Efficient and faster construction methods were in demand.

Precast elements and the first floor slabs were a new and fast growing competitor to traditional construction.



Precast construction continued growing through the 60's and 70's



Green field construction

GRH

History





No earthquake zone





Founded 1958

Essentially an organisation of competitors,

- but joined in the competition with other materials.

Visionares that saw cooperation in common solutions/ standard geometri, as a benefit by

- making design with elements easier
- ensuring competition on similar products
- facilitating cooperation on projects
- increased possibility to convey precast solutions to consultants, architechts and educational institutions.

Modularity in construction

Key influence factors

- Educational material
- Adapting to already existing modules (Brick)
- Solutions adapted to modularity



Economic incentive

- Price
- Time



Hollow Core Slabs

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Hollow Core Slabs natural advantages

Weight reduction

Prestressed to increase crack capacity

Larger spans/ reduced thickness

HCS 220, 14 stories (6 m span) 210 kg/m² 30 kN/m² building 176 kN/m foundation

~ 20 %









Setting a "standard" quality for precast elements Trust!

Tolerancer for betonelementers hovedmål

Revideret udgave 1975

Tolerances for basic measures



æ

Tekniske Bestemmelser, TB for Betonelementkontrollen, BEK



Maintaining quality

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Certificeringsoversigt	Esbjerg	Varde	Hobro	Ringsted	Viby	Tilst	Brørup	Linå	Søndersø	Borup	Tingsted
DS/EN 13224	-	-	JA	-	-	-	-	-	-	-	-
DS/EN 13225	JA	JA							JA	JA	JA
DS/EN 13747	-	JA			•					JA	-
DS/EN 14843	JA	JA							-	-	JA
DS/EN 14991	JA	JA							-	-	-
DS/EN 14992	JA	JA							JA	JA	JA
DS/EN 1168	-	-					V			-	-
DS/EN 1520	-	-							JA	JA	-
DS/EN 15050	-	-	JA	-	-	-	-	-	-	-	-

Alle elementer i henhold til en harmoniseret produktstandard leveres således nu CE-mærkede.

Ud over EC-certifikaterne er CRH Concrete certificeret på følgende områder:

- Betonproduktion iht. DS/EN 206-1 og DS 2426.
- · Betonelementproduktion iht. DS/EN 13369.
- Retning af armering fra coils iht. DS/EN 10080.
- Stålkonstruktioner (EXC1, EXC2) iht. EN 1090-1.



BEF representation in the Danish Standard organisation



DANSK STANDARD

8 members on the national mirror commitee EN 1992-1-1

2 members on the national mirror commitee EN 1990-1-1

- Influence on national choices and comments on EN codes
- Working for better conditions thus increasing competition capability

Members mainly members in the Technical Commitee of BEF, but also comprises two Consulting Engineers

Credibility





Cooperation with Health & Safety athorities

Cooperation with the contractors

Defining responsibilities of producer and contractor

Practical common safety information

Supplemented with a producer specific user guide



Leverandørbrugsanvisning 2013



Altaner · Badekabiner · Bjælker · Dæk · Facader · Fundamenter Skaktelementer · Søjler · Tagplader · Trapper · Tribuneelementer · Vægge



Branchevejledning om MONTAGE AF BETON-ELEMENTER OG LET-BETONELEMENTER

4.th edition

Activities to promote precast

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Design guides





Suppl. calculation



Sensorisk bedømmelse af afgasning

fra betonelementer December 2001 Udarbejdet af Lis Winther Funch

238 1 5200/50

TEKNOLOGISI

Indoor climate evaluation



Clarifying interface with construction partnes



April 2006 | Branchevejledning

El-indstøbninger i elementer af beton og letklinkerbeton





Specific activities on Hollow Core Slabs	Hollow Core in residential market IPHA, May 2016
Fire & HCS	Dansk standard DS/EN 1168 + A3 6. udgave
Nov. 2004 Danish Fire Institute made test	2011-11-23
Dec. 2004 BEF answer documenting errors in the test set up	Præfabrikerede betonprodukter -
Apr. 2005 Test performed by BEF proving the fire resistance of HCS	Huldækelementer Precast concrete products – Hollow core slabs
June 2005 Guide for fire design of HCS	OR REPROD
	Sustained by the HolCo fire project
	CODAUGH Darity Danisk StanDard Danisk StanDard Danisk StanDard Standards Kolingevej & Dirite 2006 Diatolstanland Darity 5200 Diatolstanland Darity 5200 Diatolstanland Darity 5200 Diatolstanland
	Fax -46 39 96 61 02 durok atanders@46.0k www.ds.dk © Dansk Standard - Eftentryk uden tilladelse forbudt

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Specific activities on Hollow Core Slabs

Sound insulation

- SBI 237 Sound insulation in new buildings
- States floor slabs must weigh more than 440 kg/m²

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HCS 180 and 220 are disqualified!

Accoustic report from Consultant. 350 kg/m² and approbiate floor





Håndglittet beton og hamsterhjul

Beton og træ i smuk harmoni

Skræddersyet skumbeton skåner

Development in usage of precast



Aided by :

- Higher buildings
- Capacity to deliver



Competing products

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Insitu cast slabs

Double T's or other elements

Wood or steel

Abeo SL floor



Superlight structure:

Weighs slightly more than the equivalent HCS Less internal height

Costs more

Promoted their product on alleged flaws in Hollow Core Slabs and larger spans than the equivalent Hollow Core Slab

Future challenges

Technical issues

- Fire explosive spalling
- Fire calculations transfer from EN 1168 to EN 1992-1-1

BIM

- Information exchange
- Automatic volume measurement on 3D models
- Building information

Aggregates

- Natural aggregates
- Reused materials
- Finding the right balance

- Sustainability
 - Measuring method
 - Including full lifetime?
 - Transport
 - etc