DTU Civil Engineering
Department of Civil Engineering

DANISH TECHNOLOGICAL INSTITUTE

CONCRETE EXPERTCENTRE

Egenskabsudvikling og hærdeteknologi

Project content

- strength development of the concrete at different curing temperatures
- activation energy is estimated from the Arrhenius equation
- microstructure of selected concretes using optical and scanning electron microscopy - information on how it develops over time at different temperature
- chloride migration coefficient (NT Build 492) as a function of maturity at different curing temperature
- chloride bulk diffusion (NT Build 443) of selected concrete

Experimental program

	10°C	20°C	30°C	45°C	60°C	Slump 120-180 mm ΔAir content < 0,5% between batches EN 480-11/batch NTB388/ batch
Ren Rapid	MPa: 1,2,7,28, 56 days NTB492: 28,56,90 ,180 days NTB443: 28, 180 days	MPa: 1,2,7,28, 56,180 Days NTB492: 28,56,90 ,180 days NTB443: 28, 180 days	MPa: 1,2,7,28, 56 Days NTB492: 28,56,90 ,180 days NTB443: 28, 180 days	MPa: 1,2,7,28, 56 days NTB492: 28,56,90 ,180 days NTB443: 28, 180 days	MPa: 1,2,7,28, 56 Days NTB492: 28,56,90 ,180 days NTB443: 28, 180 days	
Ren Lavalkali						
Rapid + 25% FA						
Lav alkali + 25% FA						
CEM III/B						
Lavalkali + 4% SF						
Lavalkali + 4% SF + 12% FA						

Each concrete type:

78 Ø150 cylinders
30 Ø100 cylinders
} 500 liter

Lidt billeder

Expected results – strength development and activation energy

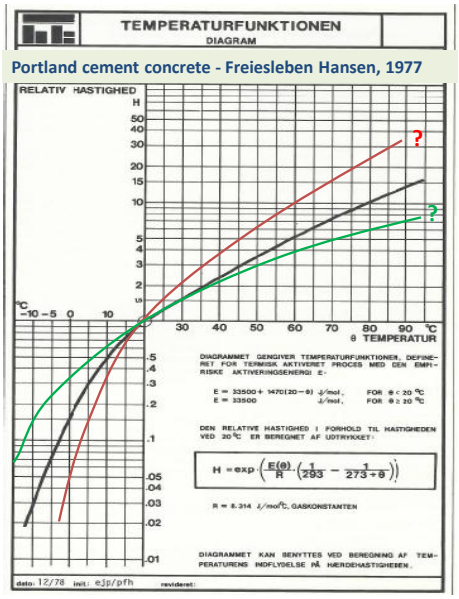
Heat development to strength development

Maturity concept

Behavior of more modern powder combinations, e.g. combinations containing fly ash and slag.

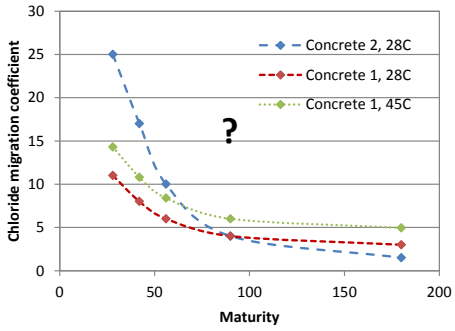
Input to:

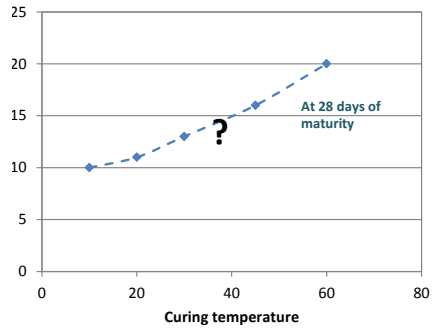
- Optimization of curing
- Striping of formwork
- Evaporation protection
- Selection of binder combination
- Early age crack control



Portland cement concrete - Freiesleben Hansen, 1977

Expected results – chloride migration coefficient and bulk diffusion

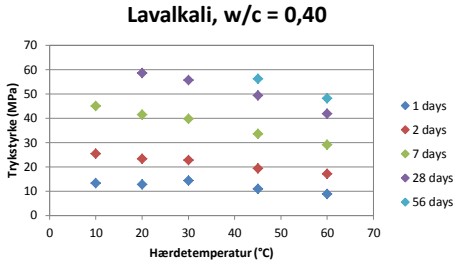


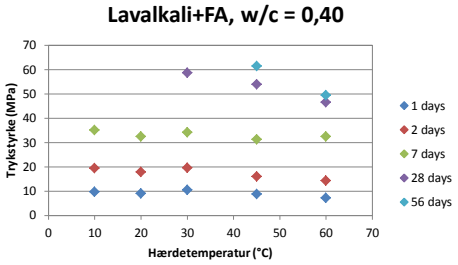


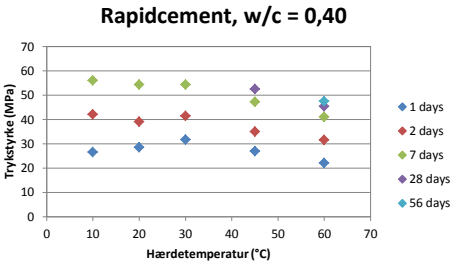
Input to:

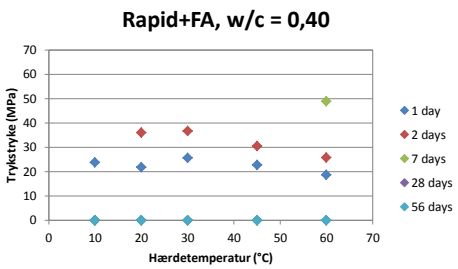
- selection of binder combination
- optimization of curing
- choice of maturity at first exposure
- Comparison of NT Build 492 and 443

Project content









Project content

Concrete ID	Temp	Maturity	CMC
A	10	28	
A	20	28	
A	30	28	18,2 x E-12
A	45	28	16,7 x E-12
A	60	28	24,9 x E-12
A	10	56	
A	20	56	
A	30	56	
A	45	56	11,3 x E-12
A	60	56	17,8 x E-12
A	10	90	
A	20	90	
A	30	90	
A	45	90	
A	60	90	18 x E-12
A	10	180	
A	20	180	
A	30	180	
A	45	180	
A	60	180	

Concrete	Temp	Maturity	CMC
B	10	28	
B	20	28	
B	30	28	10,3 x E-12
B	45	28	3,4 x E-12
B	60	28	2,2 x E-12
B	10	56	
B	20	56	
B	30	56	
B	45	56	#DIV/0!
B	60	56	1,2 x E-12
B	10	90	
B	20	90	
B	30	90	
B	45	90	
B	60	90	
B	10	180	
B	20	180	
B	30	180	
B	45	180	
B	60	180	

Concrete	Temp	Maturity	CMC
C	10	28	
C	20	28	
C	30	28	#DIV/0!
C	45	28	13,4 x E-12
C	60	28	20,2 x E-12
C	10	56	
C	20	56	
C	30	56	
C	45	56	
C	60	56	19,7 x E-12
C	10	90	
C	20	90	
C	30	90	
C	45	90	
C	60	90	
C	10	180	
C	20	180	
C	30	180	
C	45	180	
C	60	180	