

## MANAGEMENT REPORT

**CONTRACT N° : G1RD-CT-2002-00782**

**PROJECT N° : -**

**ACRONYM : ECOServe – Cluster 2 – R(earch)**

**TITLE : EUROPEAN CONSTRUCTION IN SERVICE OF SOCIETY (ECOServe)  
CLUSTER 2:Production and Application of Blended Cements**

**Research Activities**

**PROJECT CO-ORDINATOR: Verein Deutscher Zementwerke e. V. (VDZ) (D)  
(German Cement Works Association)**

**PARTNERS :**

<b>CTG SpA</b>	<b>(I)</b>
<b>Norcem A.S.</b>	<b>(NO)</b>
<b>Titan Cement Company</b>	<b>(EL)</b>

**REPORTING PERIOD : FROM 01.10.2004 TO 31.03.2005**

**PROJECT START DATE : 01.10.2003 DURATION : 24 Month**

**Date of issue of this report : 20.05.2004**



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2002)**



ECO-Serve-C2-R-0012

**EUROPEAN CONSTRUCTION IN SERVICE OF SOCIETY  
ECO-SERVE NETWORK**

**CLUSTER 2  
Production and Application of Blended Cements**

**Research Activities**

**Contract No. G1RD-CT-2002-00782**

4. Periodic Report

Period under review: 01.10.2004 - 31.03.2005

20.05.2004

Edited by Dr.-Ing. Christoph Müller  
Verein Deutscher Zementwerke, Düsseldorf - Germany

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## 1 Technical overview

### 1.1 Summary of the specific objectives

On November 15th 2002, the European Thematic Network “EUROPEAN CONSTRUCTION IN SERVICE OF SOCIETY” (ECOServe) was established. One of the technical clusters of the ECOServe Network, **cluster 2**, deals with the **production and application of blended cements**.

The cluster consists of network (N) and research activities (R) in 6 inter-related tasks (figures 1 and 2).

Participants in the research activities of cluster 2 are:

Partner No. *	Name	Short name
1	Verein Deutscher Zementwerke	VDZ
2	CTG SpA	CTG
3	Norcem A.S.	Norcem
5	Titan Cement Company	Titan

\*: ref. to Annex 1 „Description of work“ to Contract No. G1RD-CT-2002-00782

### Structure of the network

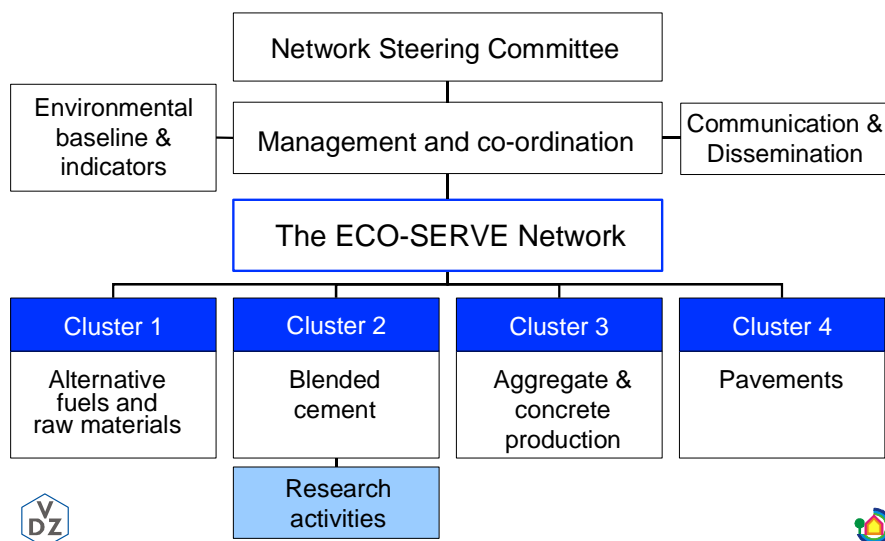


Figure 1: Structure of the ECO-Serve-network

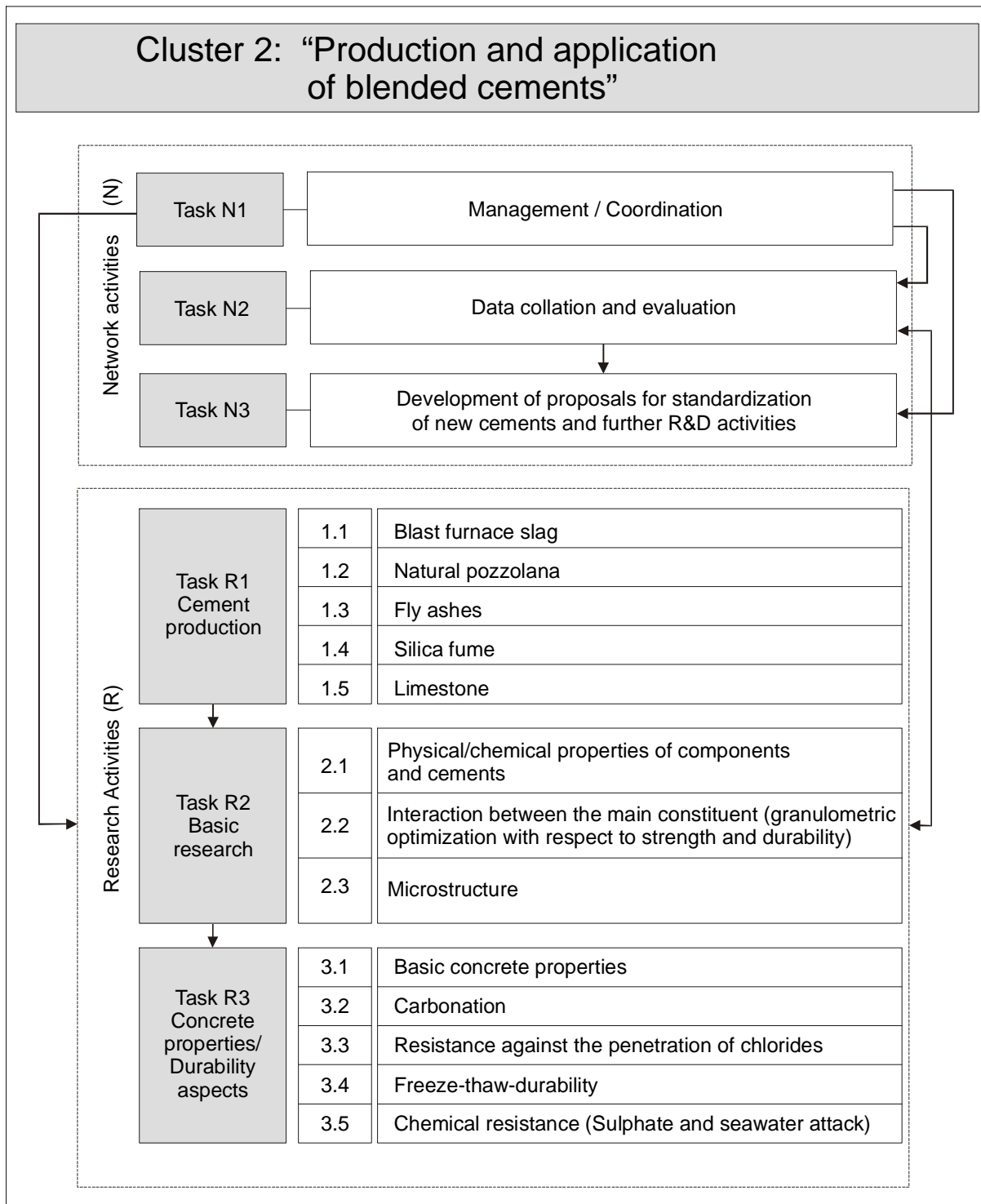


Figure 2: Structure of cluster 2

This report summarises the reasearch activities of cluster 2 for the reporting period 01.10.2004 - 31.03.2005. During that period, the specific objectives were:

- Production of laboratory cements;
- determination of cement, mortar and concrete properties.

## 1.2 Overview of the technical progress

Partners continued with the production of laboratory cements. Further investigations on cement, mortar and concrete properties have been carried out. A detailed survey of the activities of the partners and the results during the period under review is given in chapter 3.

## 1.3 Comparison of planned activities and actual work

The following ammendments / modifications of the workplan have to be taken into account:

<b><u>Partner 1:</u></b> <b><u>(VDZ)</u></b>	Investigations on fly ashes have been reduced due to the quality of calcareus fly ashes in Germany (Sub-task 1.3). A lot more modifications have been made with cements containing limestone (Sub-task 2.2). VDZ makes investigations on chloride penetration for NORCEM (Sub-task 3.3).
<b><u>Partner 2:</u></b> <b><u>(CTG)</u></b>	No relevant deviation from the planned work schedule has to be pointed out. The assessment of shrinkage is still in progress as well as the resistance to freeze/thaw cycles, seawater attack and chloride ingress. The performances of all the cements that have been prepared, including the CEM 45 LL, have been assessed also in concrete.
<b><u>Partner 3:</u></b> <b><u>(NORCEM)</u></b>	The production of trial mixes was originally planned for May/June 2004. Due to capacity problems and internal restructuring of work tasks, as well as other strategic issues, led to a re-scheduling of the laboratory programme. The concrete mixes were produced in november/december 2004. VDZ makes investigations on chloride penetration for NORCEM (Sub-task 3.3). The work at Norcem R&D is presently proceeding according to the work plan.
<b><u>Partner 5:</u></b>	Physical testing including particle size distribution, Blaine, water demand and strength are concluded. Concrete tests are on schedule.

In general, the ammendments / modifications will not lead to any change of the overall

budget or limitations of the perceptions and the expected outcome of the project.

According to the workplan (Annex 1 „Description of work“ to Contract No. G1RD-CT-2002-00782) the deliverables and milestones specified in tables 1 and 2 have to be delivered and maintained during the period under review.




**Table 1:** Overview of deliverables in research activities of cluster 2

Deliverable No.	Delivery month	Output from Task/ sub task No.	Nature of Deliverable and brief description		Status
1	2	3	4	5	6
D3-D6	<b>04/2004-09/2004</b>	R1.1-R1.5	Data/Re /Mat	Process data from the production of blended cements and blended cements (data and materials of 4 partners)	according to schedule
D7-D11	<b>09/2005</b>	R3.1-R3.5	Data/Re	Basic concrete properties (data of 4 partners) Carbonation (data of 4 partners) Penetration of chlorides (data of 2 partners) Freeze-thaw-durability (data of 3 partners) Chemical resistance (data of 4 partners)	not included in the period under review ↪ first results were included in 1 <sup>st</sup> yearly report ECO-Serve-C2-R-0010)
D12	<b>09/2004</b>	...	Data/Re	Evaluation of D3-D6	according to schedule

**Table 2:** Overview of Milestones in research activities of cluster 2

Milestone No.	Month	Brief description of milestone / objectives	Status
1	2	3	4
M3	18	Fixing of final work plan (cement compositions, concrete mixtures, etc.)	according to schedule ↪ ECO-Serve-C2-R-0008
M4	<b>09/2004</b>	Evaluation of D3-D6	according to schedule

Legend to tables 1 and 2:

-  Milestone/deliverable completely achieved
-  Milestone/deliverable partly achieved or achieved with changes
-  Milestone/deliverable not achieved

#### **1.4 Planned activities for the next period**

Partners will continue with their investigations according to the workplan fixed within the meeting dated 18.10.2003 with slight revisions acc. to the progress report (1<sup>st</sup> yearly report ECO-Serve-C2-R-0010) and the third meeting dated 01.02.2005 (Annex A).

At present, partners see no necessity for further revisions of the workplan.

#### **2 Management and co-ordination aspects**

In the period under review one cluster meeting took place on 01.02.2005 at the Research Institute of the Cement Industry, Düsseldorf, Germany. The minutes of the meeting are given in annex A.

### 3 Activities of the partners (Detailed reports)

#### 3.1 Partner 1: VDZ

##### 3.1.1 Cements

Investigations on fly ashes have been reduced due to the quality of calcareous fly ashes in Germany (Sub-task 1.3). A lot more modifications have been made with cements containing limestone (Sub-task 2.2). The following new cements (table 3) are under investigation.

**Table 3:** Overview of new cements under investigation

Cement	Composition						
	PC2	PC3	LL4	LL5	LL6	LL7	S1
	mass %						
1	2						
CEM 14	65	-	35	-	-	-	-
CEM 15	65	-	-	35	-	-	-
CEM 16	65	-	-	-	35	-	-
CEM 17	65	-	-	-	-	35	-
CEM 18	50	-	-	20	-	-	30
CEM 19	-	50	-	20	-	-	50
PC2, PC3: Portland cement							
LL4 – LL7: Limestone meal							
S1: Ground granulated blastfurnace slag							

Results for these cements will follow.

##### 3.1.2 Concrete

Investigations have been planned according to the workplan. Table 4 gives an overview about the concrete mixes and the test methods.

Table 4: Overview of concrete mixes under investigation

Cement	c	w/c	AEA	f <sub>cm</sub>	d <sub>c</sub>	D <sub>Cl, M</sub>	CT	BT	CF/CIF	CDF	ST
	kg/m <sup>3</sup>			28 d							
1	2	3	4	5	6	7	8	9	10	11	12
CEM 1-2	300	0,60	-	x	x	-	-	-	-	-	-
	320	0,50	-	x	-	-	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	x
CEM 12-1	280	0,60	-	x	x	-	-	-	-	-	-
	300	0,60	-	x	x	-	x	-	-	-	-
	320	0,50	-	x	-	x	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	x
CEM 13-1	300	0,60	-	x	x	-	x	-	-	-	-
	320	0,50	-	x	-	x	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	x
CEM 14	300	0,60	-	x	-	-	x	-	-	-	-
	320	0,50	x	x	-	-	-	-	-	x	-
CEM 15	300	0,60	-	x	x	-	x	-	-	-	-
	320	0,50	-	x	-	x	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	-
CEM 16	300	0,60	-	x	-	-	x	-	-	-	-
	320	0,50	x	x	-	-	-	-	-	x	-
CEM 17	300	0,60	-	x	-	-	x	-	-	-	-
	320	0,50	x	x	-	-	-	-	-	x	-
CEM 18	300	0,60	-	x	x	-	x	-	-	-	-
	320	0,50	-	x	-	x	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	x
CEM 19	300	0,60	-	x	x	-	x	-	-	-	-
	320	0,50	-	x	-	x	-	x	x	-	-
	320	0,50	x	x	-	-	-	-	-	x	x
AEA:	Air entraining agent				d <sub>c</sub> :	Depth of carbonation					
f <sub>cm</sub> :	Concrete compressive strength				D <sub>Cl, M</sub> :	Rapid chloride migration method					
CT:	Cube test acc. to prENV 12390-9										
BT:	Beam test acc. to CEN Report "Testing the Freeze-thaw Resistance of Concrete – Internal Structural Damage" (Feb. 2003)										
CF/CIF:	CF test acc. to prENV 12390-9 / CIF test acc. to CEN Report "Testing the Freeze-thaw Resistance of Concrete – Internal Structural Damage" (Feb. 2003)										
CDF:	CDF test acc. to prENV 12390-9										
ST:	Slab test acc. to prENV 12390-9										

### 3.2 Partner 2: CTG

#### 3.2.1 General

The work in the period under review has been focused on tasks R1, R2 and R3.

The activities on task R1 and R2 were strongly correlated since it has been necessary to refine the formulations of cements that still were not classifiable according to strength classes of EN 197-1.

Physico-mechanical properties and durability behaviour of concretes based on the developed cements have been inspected in the frame of task R3.

#### 3.2.2 Cements

The cements that have been further developed are the limestone cement CEM 45LL (55% clinker + 45% limestone) and the recycled pozzolanic cement CEM 30G-15B (55% clinker + 30% glass + 15% brick).

In both cases the strength development was not enough in order to reach the threshold limit for their classification according to EN 197-1.

In Table 5 the compressive strength value of the cements in their first phase of development are compared with the values obtained after the further development.

**Table 5:** Phases of development of cements CEM 45LL and CEM 30G-15B

Cement type	Phase of development	Compressive strength [MPa]			
		1 d	2 d	7 d	28 d
1	2	3	4	5	6
CEM 45LL	1 <sup>st</sup>	5.3	10.6	20.2	27.1
	2 <sup>nd</sup>	5.8	11.2	20.5	28.3
CEM 30G-15B	1 <sup>st</sup>	6.1	10.3	18.5	31.7
	2 <sup>nd</sup>	6.5	10.3	19.5	38.1

As can be noticed from the analysis of Table 5, the CEM 30G-15B, after the 2nd development phase, can be classified as cement of class 32.5 N. This result has been reached by increasing the fineness of glass and without changing the fineness of brick.

Relating to cement CEM 45 LL it has not been possible to fit the standard requirements, with particular reference to compressive strength at 28 days.

The performances of all the cements that have been prepared, including the CEM 45 LL, have been assessed also in concrete.

### 3.2.3 Concrete

The plan for the concrete characterisation foresees two different mix-proportionings as summarised in table 6; nevertheless the first assessment, for sake of simplicity, has been carried out by preparing one mix having the proportions indicated in table 6.

**Table 6:** Programmed and tested concrete mixes

MIX	Programmed Mix 1	Programmed Mix 2	Tested mix
1	2	3	4
CEM content [kg/m <sup>3</sup> ]	280	320	300
w/c	0.6	0.5	0.55

The compressive strength values for the concrete mixes at ages of 3, 7, 28 and 90 days are reported in table 7.

**Table 7:** Strength development for concrete mixes

Parameter	Unit	MIX 1	MIX 2	MIX 3	MIX 4	MIX 5
1	2	3	4	5	6	7
Strength development						
3d	MPa	20.0	10.0	15.5	11.0	24.0
7d		32.0	14.5	25.5	16.5	32.5
28d		50.2	23.0	34.5	29.5	47.5
90d		51.0	26.0	41.0	44.0	52.0

In figure 3 it is shown the good correlation that has been found for the compressive strength of standard mortars and of concretes.

No relevant deviation from the planned work schedule has to be pointed out.

The assessment of shrinkage is still in progress as well as the resistance to freeze/thaw cycles, seawater attack and chloride ingress.

The testing of mix 1 and mix 2 of table 6, according to the foreseen experimental plan, has been scheduled.

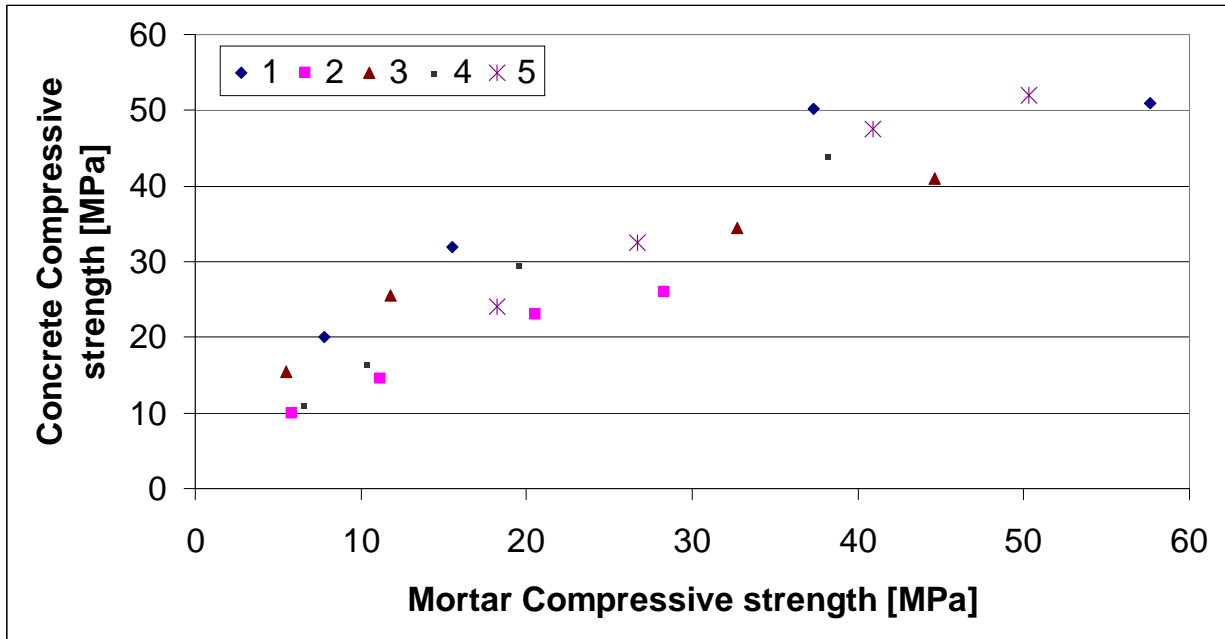


Figure 3: Correlation between compressive strength of mortars and concretes

### **3.3 Partner 3: NORCEM**

#### **3.3.1 Cements**

Norcem's work with blended cements in cluster 2 include cements in and beyond the limits of EN 197-1.

Some of the cements according to EN 197-1 would, however, be new in the Norwegian market, containing a new constituent (limestone), or greater quantity of substitutes (more fly ash), or mixes of additional constituents (fly ash and limestone).

These new cement types have so far not been approved in the Norwegian application documents and therefore would need further documentation of durability for certain applications. A series of laboratory made blended cements is subject to various performance testing in concrete.

#### **3.3.2 Concrete**

Chloride penetration as well as freeze-thaw resistance testing is on its way. The programme is a "screening test" for mapping of performance, made with certain boundary conditions, and care must be taken in generalizing the conclusions.

All together, the series comprise 16 different mixes with cements containing different clinker substitutes:

- 8 of the mixes are with cement and strength grade designed for housing, w/c of these are 0,60 and 0,50. These are tested for frost scaling in pure water only, at the age of 1 month and 3 months.
- 8 of the mixes are with cement and strength grade designed for other construction works, w/c of these are 0,50 and 0,40. These are tested for a) freeze-thaw scaling in 3 % NaCl, at the age of 1 month and 3 months, and b) chloride penetration at two different ages, fixed by VDZ to align with testing of that of other project partners.

The properties being investigated comprise:

##### Basic properties

- Slump initially. Material afterwards used for cube strength, if necessary.
- Density and initial total air content.
- Compressive strength: 2, 7, 28 & 90 days strength according to NS-EN 12390 (2 x 4 cubes).

Carbonation

One prism of 10 x 10 x 50 cm<sup>3</sup> per mix. Demoulded after one day and stored at 65 % RH. Testing by twistoff after 1, 3, 6 and 12 months + 2 & 4 years.

Chloride penetration of mix 9 – 16:

3 cylinders (10 x 20 cm) per mix, are cut in 5 cm slices at the age of 7-10 days. Prior to and after cutting: stored in water until 28 days of age, then packed in plastic for transportation and stored in water until testing again after transportation.

Frost (mix nos. 1-8) & Freeze-Thaw testing (9-16):

For each mix, 4 cubes 15 cm are made and de-moulded after 24 hours, then subjected to water storage until the age of 7 days. Stored at prescribed conditions until the age of 10-12, days, then packed in plastic until further preparation:

All samples are cut at the age of 21 days. All samples are pre-conditioned in the controlled climate (20 °C, 65 % RH, 45 ± 15 g/m<sup>2</sup>h) until pre-saturation prior to testing. Testing start for cubes 1a, 2a, 3a, 4a at 31 days, 1-4b at 3 months age. This means that the samples to be tested at 3 months will have their test surface exposed to laboratory climate (& carbonatization) for appr. two months prior to testing, as they more or less would under field conditions.

Mix nos. 1-8 are to be tested in pure water only, mix nos. 9-16 in 3 % NaCl only.

Norcem Eco-Serve Concrete Mix Overview is given in table 8 with dates for casting, as effective or scheduled per March 10th 2005.

Table 8: Norcem Eco-Serve Concrete Mix Overview

Nr	Date	Cement (Info for VDZ only)	CEM	FA	LL	w/c 0,60	w/c 0,50	w/c 0,40
Concrete without air entrainment								
1	2	3	4	5	6	7	8	9
1	28.02.05	Ref. Std. FA)	AI2	20	0	X		
2	28.02.05	CEM II A-V	PP1	20	0	X		
3	03.03.05	"	PP1	20	0		X	
4	01.03.05	CEM II B-"M"	PP2	20	10	X		
5	01.03.05	"	PP3	30	20	X		
6	03.03.05	"	PP3	30	20		X	
7	02.03.05	CEM II A-LL	PP4	0	20	X		
8	02.03.05	CEM I (Ref. 80% Ind, 20%Anl)	PP7	0	0	X		
Concrete with air entrainment (5-6 % total air content)								
9	07.03.05	CEM I 42,5	BP2	0	0		X	
10	09.03.05	"	BP2	0	0			X
11	08.03.05	CEM II A-V	PP1	20	0		X	
12	08.03.05	CEM II B-V	PP5	35	0		X	
13	10.03.05	"	PP5	35	0			X
14	09.03.05	CEM II "B"-V	PP6	50	0		X	
15	10.03.05	"	PP6	50	0			X
16	14.03.05	CEM I(Ref. 80% Ind, 20%Anl)	PP7	0	0			X

### 3.4 Partner 5: TITAN

#### 3.4.1 Cements

Production of blended cements strength class 42.5 MPa:

- FA (35%) (Calcareous);
- FA (45%), (Calcareous);
- Production of reference cement with no addition.

Production of blended cements strength class 32.5 MPa:

- Limestone (35%);
- Pozzolana (35%);
- FA / pozzolana / limestone (6 / 17 / 8 %);
- FA / pozzolana / limestone (15 / 12 / 15 %);
- Production of reference cement with no addition.

Physical testing including particle size distribution, Blaine, water demand and strength are concluded. Concrete tests with the above mentioned cements are on schedule.

Sulphate resistance test for cements with 35 and 45 % fly ash are proceeding. The shrinkage measurement involves  $4 \times 4 \times 16 \text{ cm}^3$  prisms which are immersed in saturated  $\text{Ca(OH)}_2$  solution for 12 days and after that immersed in 4.4 %  $\text{Na}_2\text{SO}_4$  solution. Evaluation is based on visual assessment and length comparison between sulphate storage and reference storage. Specimens are at the moment one month old while evaluation will continue up to 90 days.

Penetration of chlorides experiment is on schedule (rapid chloride migration method).

Carbonation experiments are on schedule. Test specimens of  $100 \times 100 \times 400 \text{ mm}^3$  are made while carbonation chamber settings are adjusted to 800 ppm concentration of  $\text{CO}_2$  (typical concentration for Greek urban area).

#### 3.4.2 Concrete

Two concrete categories (with cement contents equal to 280 and  $320 \text{ kg/m}^3$ ) were evaluated according to rheological, mechanical and durability properties. The results of the various tests are presented below. Portland cement was used as reference cement while cement mixtures of Portland cement with calcareous fly ash were used as described in previous reports.

Basic concrete properties were measured for both categories according to following European standards: slump: EN 12350-Part 2, Air content: EN 12350-Part 7 and Compressive Strength: EN 12390-Part 3. Results are summarized in tables 9 and 10.

Table 9: Category 1 (280 kg/m<sup>3</sup> cement,  $W_{\text{eff}}/C= 0,60$ )

Concrete property	Ref cement	Cem 2760	Cem 2761	Cem 2762	Cem 2763	Cem 2764	Cem 2765	Cem 2766	Cem 2767
Compressive Strength									
1	2	3	4	5	6	7	8	9	10
f,2days (MPa)	21,0	16,2	13,2	13,2	11,0	14	13,0	13,5	11,9
f,7 days (MPa)	40,6	33,9	28,7	26,5	26,2	27	27,2	29,4	27,4
f,28 days (MPa)	55,7	50,2	42,0	40,0	42,4	42,9	40,3	47,2	44,9
f,90 days (MPa)	-	-	-	-	-	-	-	-	-
Admixture (% w/w cem)	0,8	1,0	2,3	2,3	2,0	2,4	2,4	2,3	2,3
Air Content (%)	2,0	1,9	2,3	2,2	2,1	2,1	2,0	2,0	2,3
Slump (cm)	12	12	12	12	12	10	10	11	10
FA content	0%	35%	35%	35%	45%	45%	45%	35%	45%
FA fineness	-	6,5	16,0	19,8	6,5	16,0	19,8	2,0	2,0

The results of compressive strength at the age of 90 days (f, 90 days) are still expected and therefore not included in table 9.

Table 10: Category 2 (320 kg/m<sup>3</sup> cement,  $W_{eff}/C= 0,50$ )

Concrete property	Ref	Cem	Cem	Cem	Cem	Cem	Cem	Cem	Cem
Compressive Strength	cement	2760	2761	2762	2763	2764	2765	2766	2767
1	2	3	4	5	6	7	8	9	10
f,2days (MPa)	28,9	28,3	27,6	27,9	25,8	24,9	24,0	28,8	25,6
f,7 days (MPa)	48,1	41,8	40,7	38,6	39,6	36,8	33,7	43,0	42,2
f,28 days (MPa)	59,8	57,1	53,4	54,9	57,1	53,6	49,4	60,1	57,2
f,90 days (MPa)	64,5	65,0	62,2	60,3	65,4	61,6	55,7	65,7	65,6
Air Content (%)	2,0	1,6	1,7	1,7	1,8	2,2	2,2	1,6	1,8
Slump (cm)	3	0	0	0	0	0	0	2	0
FA content	0%	35%	35%	35%	45%	45%	45%	35%	45%
FA fineness	-	6,5	16,0	19,8	6,5	16,0	19,8	2,0	2,0

ECO-Serve-C2-R-0011

**EUROPEAN CONSTRUCTION IN SERVICE OF SOCIETY  
ECO-SERVE NETWORK**

**CLUSTER 2  
Production and Application of Blended Cements**

Minutes of the 3. Meeting

01.02.2005 in Düsseldorf

Date: 01 February 2005 at 10 a.m.

Place: Research Institute of the Cement Industry, Düsseldorf, Germany

Present were:

1	Adrian Francu	(AF)	Lafarge Romcim
2	Bram Doms	(BD)	BBRI
3	Manolis Chaniotakis	(MH)	Titan Cement Company S.A.
4	Christoph Müller	(CM)	Verein Deutscher Zementwerke e.V.
5	Eberhard Siebel	(ES)	Verein Deutscher Zementwerke e.V.
6	Terje Ronning	(TR)	NORCEM
7	Roberto Cucitore	(RC)	CTG SpA

Minutes taken by CM.

## Agenda

TOP	Content	Report by
Network – All cluster members (10:00 – 15:00)		
N1	Opening of the meeting and introduction of new members	
N2	Minutes of the 2. meeting	
N3	ECOServe management: Website – Project center – Power point presentation	B. Doms
N4	Cluster 2 – network: Status quo	C. Müller
N5	Cluster 2 - network: Demand and reality – statements to work plan and achievements	all members
N6	Any other business	

Research – Only principal contractors (15:00 – 17:00)		
R1	Status quo of investigations, Adjustment nominal/actual work	CTG, Norcem, Titan, VDZ

### N1 Opening of the meeting

ES welcomed all participants to the 3. meeting of cluster 2 of the ECO-Serve Network, especially FA and BD, both joining the cluster for the first time. AF is Technical Commercial Manager of Lafarge Romcim SA and a new member of the cluster. BD is member of the management group of the network. ES then asked for comments to the proposed agenda.

The proposed agenda was adopted.

## N2 Minutes of the 2. meeting

The minutes of the second meeting were adopted without comments or changes.

## N3 ECOServe management: Website – Project center – Power point presentation

A presentation about the ECOServe website and the project center was given by BD. Information about the website and the project center are available on the project center:

**ECO-Serve Website Manual.pdf**  
**GettingStartedWithViadesk\_v2.pdf**

## N4/N5 Cluster 2 – network: Status quo / Demand and reality – statements to work plan and achievements

A presentation about the Status quo of the work of cluster 2 was given by CM and is summarized in figure A1.

## Overview of deliverables

Task / Deliverable		Availability	
Mapping of activities and stakeholders - <i>Questionnaire</i>	D0	1 <sup>st</sup> periodic report	Project office
		Online	ECOServe website
Mapping of activities and stakeholders – <i>Results</i>	D1	2 <sup>nd</sup> periodic report	Project office
		Online	ECOServe website
Reference list on blended cements	D1	4 <sup>th</sup> periodic report	Project office
		Online	ECOServe website
Production of blended cements in Europe	M1,2	2 <sup>nd</sup> periodic report	Project office
		Power point presentation	ECOServe website
Application of blended cements: Application rules	M1,2	4 <sup>th</sup> periodic report	Project office / ECOServe website
Further documents (examples)		3 <sup>rd</sup> periodic report	Project office
		Comments of cluster 2 with regard to environmental indicators	Project office
		Minutes of the meetings	Project office
Power point presentation about blended cements / work of cluster 2		-	Project office
		Online	ECOServe website



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**Figure A1:** Cluster 2 – Network: Overview of deliverables

The following discussion about the progress of work and the next work steps is summarized in figure A2.

## Action plan for the next period

Item / Action	Responsible / Schedule
Continuation compilation and evaluation of NAR	All members (according to responsibility assignment)
<u>Co-operation with cluster 3</u>	
<ul style="list-style-type: none"> <li>↳ All members of cluster 2 comment on "State of the art" of cluster 3</li> <li>↳ VDZ prepares statement and send it to cluster 3</li> <li>↳ Proposal: Joint meeting cluster 3 in 2005</li> </ul>	All members send comments to VDZ until 30.04.2005  Next meeting cluster 2: 13./14.09.2005 or 20./21.09.2005 2nd day: Joint meeting with cluster 3
Collect data on the clinker content in practise: Comparison of the use of concrete additions and blended cements	↳ VDZ prepares a questionnaire
Examples: Bridge / house	
Every member makes a proposals for a good article on the benefits of blended cements for the website.	↳ 5-10 articles on the benefits of blended cements on the website
Updating and improvement of the power point presentation	All members
Argumentation paper for the use of blended cements	↳ first proposal to be prepared by VDZ
Proposal for further RTD activities	



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**Figure A2:** Cluster 2 – Network: Action plan for the next period

### N6 Any other business

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**R1 Status quo of investigations, Adjustment nominal/actual work**

The following ammendments / modifications of the workplan have to be taken into account:

<b><u>All partners:</u></b>	Sub-task 1.4 "Silica-Fume" was canceled and sub-task 1.5 "Limestone" was expanded
<b><u>Partner 1: (VDZ)</u></b>	Investigations on fly ashes have been reduced due to the quality of calcareus fly ashes in Germany (Sub-task 1.3). A lot more modifications have been made with cements containing slag and limestone (Sub-task 2.2). VDZ will make investigations on chloride penetration for NORCEM (Sub-task 3.3).
<b><u>Partner 2: (CTG)</u></b>	The selection and analysis of the starting materials has consumed more time than expected. The planned activities are now acc. to schedule.
<b><u>Partner 3: (NORCEM)</u></b>	The production of trial mixes was originally planned for May/June 2004. Due to capacity problems and internal restructuring of work tasks, as well as other strategic issues, led to a re-scheduling of the laboratory programme. The concrete mixes were produced in november/december 2004. VDZ makes investigations on chloride penetration for NORCEM (Sub-task 3.3).
<b><u>Partner 5:</u></b>	No remarks.

In general, the ammendments / modifications will not lead to any change of the overall budget or limitations of the perceptions and the expected outcome of the project.

The meeting closed at 16:30 p.m.

signed  
Dr.-Ing. E. Siebel

signed  
i. V. Dr.-Ing. C. Müller