Nano-Crete Technical Summary

Compressive Strength Test:

Compressive strength test was done at ages (3, 7, 14, 28 days)

No.	Dimensions cm			Loading Area	Volume	Weight	Unit Weight	Crushing Load	Compressive Strength	Date	
	Length	Width	Height	cm^2	cm^2	Kg	gm/cm^3	Ton	kg/cm^2	Casting	Crushing
1	15.1	15.0	14.8	227	3352	6.97	2.08	63.50	280	26/3	29/3
2	15.0	15.0	15.1	225	3398	7.07	2.08	71.00	316	"	"
3	15.0	15.2	14.9	228	3397	7.17	2.11	71.00	311	"	"
4	15.0	15.1	15.0	227	3398	7.07	2.08	82.50	364	"	2/4
5	14.9	14.9	15.0	222	3330	6.99	2.10	75.00	338	"	"
6	15.2	15.4	15.4	234	3605	7.46	2.07	87.00	372	"	"
7	15.4	15.4	15.3	237	3629	7.69	2.12	93.00	392	"	9/4
8	15.0	15.3	15.0	230	3443	7.34	2.13	88.00	383	"	"
9	15.2	15.1	14.9	230	3420	7.26	2.12	84.00	366	"	"
10	15.0	15.1	14.9	227	3375	7.31	2.17	104.50	461	"	23/4
11	15.1	15.2	15.4	230	3535	7.68	2.17	101.00	440	"	"
12	15.0	15.1	15.1	227	3420	7.21	2.11	102.50	453	"	"

Notes: The results are only valid for the above tested specimens delivered by the client.

- Mix Proportions: for each 100% ENCON powder take 15% solution.
- Solution Proportions: 300 Water: 1 ENCON Nano-Crete Concentrate
- Mixing Time: 7 min. according to client requirements
- Cubes from (1-3) cured by air
- Cubes from (4-12) cured by air for 3 days then they cured by wet cloth until test day

Flexural Strength Test:

Flexural Strength Test was done at ages (7, 28 days) according to American Specification Standard ASTM C384-86.

Flexural Strength Test Results for ENCON Nano-Crete Tile Specimens at age 7 days

Property		Test Piece No.		
		1	2	3
Specimen Dimensions	Length	50	50	50
(cm)	Width	10	10	10
	Thickness	10	10	10
Loading Span	(cm)	40	40	40
Failure Load at mid third Span (kg)		412.50	295.00	380.00
Flexural Strength (kg/cm^2)		33.00	23.60	30.60

General Notes:

- Average flexural strength (after 7 days) 29.000 kg/cm^2
- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 Water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements
- The curing was by air for 3 days then with wet cloth until test's date

Flexural Strength Test Results for ENCON Nano-Crete Tile Specimens at age 28 days

Property		Test Piece No.		
		1	2	3
Specimen Dimensions	Length	50	50	50
(cm)	Width	10	10	10
	Thickness	10	10	10
Loading Span	(cm)	40	40	40
Failure Load at mid third Span (kg)		633.50	541.00	724.50
Flexural Strength (kg/cm^2)		50.68	43.28	57.96

General Notes:

- Average flexural strength (after 28 day) 50.64 kg/cm^2
- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 Water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements
- The curing was by air for 3 days then with wet cloth until test's date

Abrasion Resistance of Traditional Tiles:

Abrasion resistance of traditional tiles was done at age 28 days

Property		Test Piece			
		1	2	3	4
Specimen Dimensions	Length	5	5	5.1	5
(cm)	Width	5	5	5	5
	Thickness	2.5	2.3	2.6	2.4
Weight Before Abrasion	(gm)	123.1	114.5	129.1	120.1
Weight After Abrasion	(gm)	114.4	106.5	121.6	112.4
Density of Surface Layer	(gm/cm^3)	2.13			
Surface Layer Thickness Loss		1.63	1.50	1.38	1.45
(abrasion)	(mm)				

General Notes:

- Rotation distance (m): 500
- Abrasion Material: Quartz
- Compression on specimen (g/cm^2): 500
- Average thickness loss – 1.49 (mm)
- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 Water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements
- The curing was by air for 3 days then with wet cloth until test's date

Determination of Plastic Shrinkage:

Plastic shrinkage test was done according to American Specification Standard ASTM C827

Specimen	Plastic Shrinkage Value
Control Specimen	1000×10^{-6}
ENCON Specimen	600×10^{-6}

General Notes:

- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements

Pullout Test Results between ENCON Concrete and Steel Bars

The test was done according to ASTM C900-99

Specimen No.	Steel Bar Dim. (mm)	Bond Length (cm)	Bonding surface area (cm^2)	Pullout loud (ton)	Bond Strength (kg/cm^2)
1	16	30	301.6	12.9	42.77
2	16	30	301.6	14.1	46.75
3	16	30	301.6	11.85	39.29

General Notes:

- Specimen Shape and Dimension:
  Specimens were cylinder casted by ENCON Nano-Crete with 15 cm dim. and 30 cm height with a steel bar of 16 mm dim in the center, the steel bar was 30 cm length (with 15 cm embedded in the cylinder).
- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements
- The curing was by air for 3 days then with wet cloth until test's date

Absorption Test

After initial curing, samples were wrapped in wet burlap sheets and kept moist during the final curing period

- Mix Proportions: for each 100% ENCON powder take 15% solution
- Solution Proportions: 300 Water: 1 ENCON Nano-Crete Concentrate
- Mixing time: 7 min. according to client requirements

TEST RESULTS:

- Moisture Content: 8.1% Average of three samples (by weight)
- Absorption Test: 1.5% Average of three samples (by weight) above M/C
- Compressive Strength Tests
  - At 10-Days 27.5 MPa Average of three tests
  - At 21-Days 32.6 MPa Average of two tests
  - At 28-Days 37.6 MPa Average of two tests

Test Results of Scaling Resistance of ENCON Nano-Crete Surface Exposed to De-icing and Swimming Pool Chemicals

TEST RESULTS:

- Tap Water
  - After 10 cycles 0.033 kg/m^2
  - After 20 cycles 0.043 kg/m^2
- Swimming Pool Chemicals at typical user concentrations
  - After 10 cycles 0.049 kg/m^2
  - After 20 cycles 0.096 kg/m^2
- Sodium Chloride (Salt) 10% Solution
  - After 10 cycles 0.073 kg/m^2
  - After 20 cycles 0.100 kg/m^2

Salt Scale, modified MTO LS-412, 50 freeze-thaw cycles.

Sample A			
ENCON Mortar	Solution	Mass Loss (g)	kg/m2
w/ ENCON Concentrate	Distilled Water	16.1	0.245
	3% NaCl	34.4	0.523
	Pool Cl	16.7	0.254
Sample B			
ENCON Mortar	Distilled Water	Mass Loss (g)	kg/m2
	DW	17.1	0.260
	3% NaCl	133.4	2.027
	Pool Cl	16.9	0.257

Test Results of Cubes Containing Ckd, Sand, Cement and ENCON Nano-Crete Liquid
(ASTM C 114)

Sample composition:
40% CKD, 52% Sand, 8% Cement and 27.5% ENCON diluted solution (200 Water: 1 ENCON Nano-Crete concentrate)

The following were the test results:
Chlorides were reduced from 17% to 0.2% after 28 days
Confirmation that cubes did not dissolve in water: did not dissolve
Zero residues appearing on the surface of the cubes

Compressive strength after 3 days 30 kg per ccm
Compressive strength after 7 days 40 kg per ccm
Compressive strength after 14 days was 60 kg per ccm

Components (Weight %)		
Loss On Ignition		16.41
Insoluble Residue		10.18
Silicon Dioxide	SiO_2	15.98
Aluminum Oxide	Al_2O_3	4.06
Ferric Oxide	Fe_2O_3	3.25
Calcium Oxide	CaO	32.65
Magnesium Oxide	MgO	1.31
Sulfur Trioxide	SO_3	0.21
Sodium Oxide	Na_2O	1.89
Potassium Oxide	K_2O	0.60
Chloride	Cl^-	9.35

Result chemical analysis "by pass filter dust"