Geopolymer Camp 2016

This project is made to build these kinds of houses

Inside GP 2014 camp, I presented the project NEGUEV.

brief recall of the highlights:

The Negev. A desert area between the borders between Egypt, Jordan and Israel. Mountains rising to over a thousand meters and valleys carved by river flooding ...

it falls into the area about 1,290 cubic meters of rainwater per hectare. The absence of withholding maintains a desert flora and the erosion continues silt eradication work likely to develop land cover, and therefore the occupation of sites. The mountainous configuration shows that it is possible to construct used by micro-dams, whose surface corresponds to withholding of 1 hectare, with buildings with a maximum height does not exceed 5 meters. The land contains close sources of sodium, sodium carbonates, chlorides etc. (Dead Sea).

After two stays of study and meet Rodney Hirsch, participating in the GP of 2015, we began the implementation of the study phase for the realization of massive stones capable of achieving the chosen rainwater in zoned.

The objective of Phase 2:

- Look for local sources of supply of materials needed to manufacture massive limestone rocks on the basis of the formula of the pyramids.

- Study the procedures for metering and manufacturing of samples

- Build one or more buildings with this method: in this case, we will build two residential prototypes igloo-shaped (geodesic dome), which will test area on the car lift stones that will be molded on site (method of pyramid builders, their insulating capacity and tightness rainwater.

Procedures and formulations:

The research was based on the basic formula of the pyramids. :
- The presence of limestone containing kaolinite
- The supply of ash "high temperature" from the burning of wood in Cairo bakeries, and recovery of industrial ashes in taxes
- The supply of soda (sodium carbonate decahydrated formula Na2CO3.10H2O) extracts from "Chott" (salty lakes dried up).
- The presence of water from the Nile near the construction site.

And that's all !!!

Still we had to master the formulations and procedures.
I think that the basic form was set on the volume of water in each tank. This is indeed the most delicate point of the mixture.

The mixture of sodium carbonate in water causes the formation of liquid caustic soda, and which is added in the ash (calcium carbonate) to form the " GEOPOLYMERIC glue ", wherein the limestone is mixed containing kaolinite.

The amount of ash was calculated from the mass of water in each basin. In fact it was calcium carbonate (also known as quicklime), probably mixed with impurities from burning wood in the form of minerals salts.

It is on this basis that we have tried to reconstruct the various possible formulas.
The basic ingredients used were:
- Sodium hydroxide (caustic soda) powder
- Calcium oxide (quicklime) in various forms: ash, industrial CAO,
- kaolinite extracted from local limestone quarries (limestone 80% pure kaolinite 20%) or from import (MPO: Limestone 20%, 80% kaolinite, Italia)
- Water.
- Local clay for some tests
- Local limestone extracted from nearby quarries (chalk, almost pure limestone).

Each procedure was noted, with each weighing.
The time of each mixture were also noted, based on the Egyptian procedures found by Professor Davidovits.

Work completed :

The place: Site of Makman Dunes, 30 minutes south of Beer Sheva
Elevation: 500 meters
Number of tests: more than 40
Number of manufacturing formulas used: 9

LEXICAL WORDS

Argile = clay
Calcaire = limestone
Chaux cendrée = Carbonate de calcium = calcium carbonate = $CaCO_3$
Carbonate de soude = sodium carbonate = Na_2CO_3
Eau = water = H_2O
Cendre = ash
Cendre de haute température de combustion = furnace ash
Craie = chalk
Hydroxide de sodium = soude caustique = NaOH = caustic soda
Chaux vive = CaO = quicklime

TEST OF SAMPLES GP MAKMAN DUNES MARS 2016

date	15/03/2016	lieu	revivim	agent	BR
n° éssai	ingrédients	nom	fournisseur	%	qté gr.
7 argile +cendres locales	kaolinite	kao sfb	yehu clays	4.65%	50
	cendre locale	makman	rodney	4.65%	50
	carbonate	caco3	yehu clays	2.33%	25
	eau	H2O	local	23.26%	250
	argile	revivim	local	65.12%	700
	masses			100.00%	1075

n° éssai	ingrédients	nom	fournisseur	%	qté gr.
9 limestone + clay	kaolinite	MPO	yehu	3.92%	50
	carbonate	CACO3	yehu	3.92%	50
	cendre locale	filtrée	makman	1.96%	25
	eau	H2O		19.61%	250
	limestone	filtrée	revivim	54.90%	700
	clay	filtrée	revivim	15.69%	200
	masses			100.00%	1275

n° éssai	ingredients	nom	fournisseur	%	qté gr.
12 formule mixte egypte calcaire et argile: reprise du 6 et ajouts	kaolinite	kao SFB	yehu clays	3.05%	30
	carbonate sodium	NAC03	bersheva	0.71%	7
	chaux cendrée	CACO3	local	1.53%	15
	eau	H2O	local	13.24%	130
	limestone brut	calcaire	local	40.73%	400
	clay	argile	local	40.73%	400
	masses			100.00%	982

n° éssai	ingredients	nom	fournisseur	%	qté gr.
13 calcaire pur	calcaire	filtré	makman	42.33%	800
	kaolinite	MPO	yehu clays	2.65%	50
	carbonate	NAO3	bersheva	1.06%	20
	carbonate	CAO3	yehu clays	2.12%	40
	eau	H2O		9.52%	180
	limestone	brut	makman	42.33%	800
	masses			100.00%	1890

n° éssai	ingredients	nom	fournisseur	%	qté gr.
16 cendres pips olives	limestone	calcaire	local	65.75%	1000
	clay	argile	local	13.15%	200
	kaolinite MPO	KMPO	yehu	3.62%	55
	cendres	CaO	pips	2.96%	45
	eau	H2O		11.83%	180
	carbonate sodium	Na2CO3	brshv	1.38%	21
	carbonate calcium	CaCO3	yehu	1.31%	20
	MASSE TOTALE			100.00%	1521

n° éssai	ingredients	nom	fournisseur	%	qté gr.
17 cendres olives et kaolinite 20/80	limestone	calcaire	local	56.94%	800
	clay	argile	local	14.23%	200
	kaolinite MPO	KMPO	yehu	3.91%	55
	cendres	Ca0	pips	3.20%	45
	eau	H2O		12.81%	180
	carbonate sodium	Na2 CO3	brshv	1.78%	25
	kaolinite yehu	80/20	yehu	7.12%	100
	MASSE TOTALE			100.00%	1405

n° éssai	ingredients	nom	fournisseur	%	qté gr.
18 CaO, limestone, clay	kaolinite MPO	mpo	yehu	4.48%	60
	chaux vive	Ca0	neguev ind	3.73%	50
	eau	H2O		14.93%	200
	carbonate sodium	Na2CO3		2.24%	30
	clay	argile	local	14.93%	200
	limestone	calcaire	local	59.70%	800
	MASSE TOTALE			100.00%	1340

n° éssai	ingredients	nom	fournisseur	%	qté gr.
19 CaO, limestone, clay	kaolinite MPO	MPO	yehu	4.17%	60
	chaux vive	CaO	neguev ind	3.47%	50
	eau			13.89%	200
	carbonate sodium	Na2CO3		2.08%	30
	clay	argile	local	20.83%	300
	limestone	calcaire	local	55.56%	800
	MASSE TOTALE			100.00%	1440

n° éssai	ingredients	nom	fournisseur	%	qté gr.
21 CaO, KMPO, clay, limestone	CaO	chaux vive		4.35%	100
	Na2CO3	carbonate soude		2.17%	50
	H2O	eau		17.39%	400
	KMPO	kaolinite 80%		6.52%	150
	clay		revivim	13.91%	320
	limestone		revivim	55.65%	1280
	MASSE TOTALE			100.00%	2300

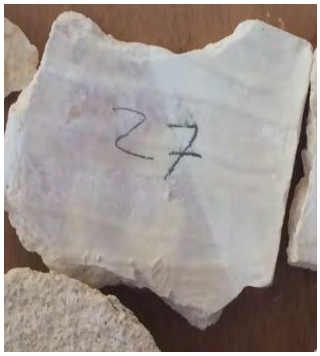
n° éssai	ingredients	nom	fournisseur	référence	qté gr.
22 mix CaO et pips ashe	CaO			2.08%	50
	pips ashe			2.08%	50
	Na2CO3			2.08%	50
	H2O			16.67%	400
	KMPO			6.25%	150
	clay		revivim	12.50%	300
	limestone		revivim	58.33%	1400
	MASSE			100.00%	2400

n° éssai	ingredients	nom	fournisseur	%	qté gr.
24 KMPO et NaOH	KMPO	kaolinite 80%		9.09%	200
	NaOH	hydroxyde sodium		9.09%	200
	H2O	eau		9.09%	200
	limestone	mix + silicium		72.73%	1600
	MASSE				2200

n° éssai	ingredients	nom	fournisseur	%	qté gr.
25 dose mini NaOH	KMPO			5.00%	100
	NaOH			5.00%	100
	H2O			10.00%	200
	limestone			80.00%	1600
	MASSE			100.00%	2000

n° éssai	ingredients	nom	fournisseur	%	qté gr.
26 carrelage	NaOH			12.50%	100
	KMPO			12.50%	100
	H2O			12.50%	100
	CaCO3			62.50%	500
	masse				800

n° éssai	ingredients	nom	fournisseur	%	qté gr.
27 carrelage	NaOH			10.00%	100
	KMPO			10.00%	100
	H2O			20.00%	200
	CaCO3			60.00%	600
	MASSE				1000



n° éssai	ingredients	nom	fournisseur	%	qté gr.
28 carrelage	NaOH			12.50%	100
	KMPO			12.50%	100
	H2O			25.00%	200
	CaCO3			50.00%	400
	MASSE				800

Colors of interpretation:

Yellow, orange, red: inability to hardening, disintegration in water.
Green: curability, uncertainty of resistance to water, lack of waterproofing.
Blue: proper curing, resistance to water, drainage waterproof, heat insulation

conclusions

-1- Rocks, minerals and chemicals are available in the area.

-2- The test formulas, derived from the formulas pyramids, are effective, and the samples are solid and waterproof.

-3- Certain formulas have allowed us to discover that the manufactured materials are also insulating materials: tests on gas burner: below 480 °, 65 ° above.

***** Joseph Amenophis son of Hapou : read the book : « The Pyramids: An Enigma Solved », from Joseph Davidovits. Institut Géopolymères, isbn : 9780557021192.

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Note: all results shown here are incomplete. The informed reader will know why, and to find out more, simply for him to contact us. Is'nt it ?