THE INFLUENCE OF THE QUALITY OF WATER ON THE MECHANICAL PROPRITIES BRICKS OF EARTH. (IN THE CASE OF WATER FROM THE EL HEDEB)

Hachem CHAIB[a].*, Abdelouahed KRIKER[a], Saci DAHMANI[a]

[a.] Laboratory of exploitation and valorization of natural resources in arid zones, Ouargla 30000, Algeria

chaib.hachem.dz@gmail.com

Abstract

The present work, aims to study the influence of the quality of the water in the mix of some drilling in the south-eastern region of Algeria on the mechanical properties of bricks of earth. These bricks are made on the basis of the materials of local constructions of this region (clay, dune sand).
In this study, we proposed the water in the El hadeb, this example is of origin underground, the water albienne.

Key words: water, the water Albienne, mechanical properties, brick.

1. INTRODUCTION

The Laboratory of exploitation and exploitation of natural resources in arid zone (E.V.R.N.Z.A) of the University of Ouargla (Algeria) follows a program of research and study of thermal insulation of few construction materials usually used in the Saharan regions as "The Red Brick", in view of a contribution to the improvement of the Properties thermo-mechanical systems of construction materials in the Saharan areas.

We have proposed a comparative study of a few drilling in our region on the properties thermo-mechanical.

2. Materials and Methods

2.1. The SAND DUNES

For our study we used the sand dunes of Sidi-Khouiled (Ouargla). We have carried out the following tests:

- The mass density absolute
- The apparent volumic mass
- Equivalent of sand
- Chemical analysis

These analyzes are conducted at the Laboratory of Civil Engineering from the University of Kasdi Merbah Ouargla, for all the tests we have used three samples in each characteristic. The results obtained are the following:

Table 1. Physical characteristics of sand dunes

Tests	**Result**
The mass density absolute	ρ_s =2560 kg/m ^{3}
The apparent volumic mass	ρ_s =1512.5 kg/m ^{3}
Equivalent of sand	**ESp=99,.+23%**

Chemical analysis

The following table shows the percentages of chemical components of sand dunes. This analysis is conducted in the Laboratory of Public Works of the South (L.T.P.S) unit of Ouargla.

Table 2. Chemical compositions of sand

The components	**Percentages (%)**
Fe 2O3 - Al2 O3	0.25
Ca SO4, 2H2O	2.78
SO4	0.51
Ca CO3	1.30
Insoluble	93.23
Na Cl	Trace
Loss at the fire	**1.16**

We note that the percentage of (Ca SO4), (SO4) is less than the limit recommended. Of this fact the sand used is non-aggressive.

2.2. The clay

For this research we have used the clay to Touggourt at Ouargla. We have carried out the following tests on the clay:

- Dry density
- Blue of methylene
- Limit of Atterberg

- Chemical analysis

These tests are carried out at the Laboratory of Public Works of the South (L.T.P.S) unit of Ouargla. The results are in Table 3.

Table 3. Physical characteristics of sand dunes

Characteristics	**Result**
The dry density (NF P 94/064)	P =2.03 g/cm ^{3}
Methylene blue (NF EN 933-9)	VBS = 8
Limit of Atterberg (NF P 94-051)	**W $_{L}$ = 69.58%**
	W $_{P}$ = 24.71%
	I $_{P}$ = 44.87%

Chemical analysis

The main results of the chemical analysis carried out are grouped in the following table:

Table 5. Chemical compositions of the clay

Chemical Characteristics	**The components**	**Percentages (%)**
Insoluble (NF P 15 - 461)	Insoluble	63.18
Sulphate (BS 1377)	SO $_{3}$	0.45
	Ca SO $_{4}$ / 2H $_{2}$ O	2.46
The carbonates (NF P 15 - 461)	CaCO $_{3}$	18.0
Chlorides (method of MOHR)	Cl $^{-}$	0.42
	NaCl	0.68

The table shows that the elements of this clay are insoluble in percentage of approximately 64%, the levels of sulphates and chlorides are very low.

2.3. The water of GACHAGE

The mixing water serves on the one hand to the hydrations of cement and on the other hand allows the fluidization of the dough, that the water Between in contact with the clay anhydrous, it reacts to form hydrates of clay.

2.3.1. TYPE OF waters used

a. Distilled water

Distilled water is water that has undergone a distillation, therefore is theoretically free of some minerals and agencies that could be found in the water "natural." Possibility to filter

the water in distilled using several methods, such as reverse osmosis, carbon filter, and UV oxidation or electrodialysis, distilled water is used in several fields of science, engineering laboratory and industrial, because it does not contain impurities and salts, which cause deposits in the tools and equipment, leading to damage, and is used in more in the pipelines.

b. Tap water

The tap water used is the water of the laboratory of civil engineering of the University of Kassedi Merbah, Ouargla. This water is extracted from a groundwater Mio-Pliocene called.

Table 6. Chemical composition of the tap water

Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Cl^{-}	$No.^{3-}$	SO_4^{-2}	HCO^{3-}	PH
264.53	106.92	25	515.2	795.2	13.5	818.57	97	7.77

The concentrations are data in mg/l.

The conductivity 4.560 ms/cm

The résidée sec to 105 0C 2844 mg/l

TH = ([Ca+2] meq/L + [Mg+2] meq/l) . 50 = 1106,5 mg/lCaCo3

This water is very hard and may salt has a pH acceptable.

c. Water in the El Hedeb

This sample of water is taken from the quote of El HADEB (common ROUISSATE, Ouargla). The water is of origin underground, the water Albienne. The waters of this pad Albienne are characterized by:

_ its great depth (in the order of 1000 to 1400m);

_ its cartésianisme (water springs to the surface, with a pressure of the order of 24 bars);

_ its heat (hot water, t= 57° C to the mouth of the wells);

_ its salt content acceptable following the Algerian standards (2g/L).

Table 7. Chemical composition of the water in the El Hedeb

Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Cl^{-}	$No.^{3-}$	SO_4^{-2}	HCO^{3-}	PH
168.34	65.61	32	299	461.5	38	502.5	135	38

The concentrations are data in mg/l.

The conductivity 2.770 ms/cm.

The résidée sec to 105 0C 1696 mg/l.

TH = ([Ca+2] meq/L + [Mg+2] meq/l) . 50 = 694 mg/lCaCo3

This water is less harsh and a salinity better than tap water, its pH is good.

3. Results and Discussion

We have proposed for our work the three compositions (Clay+sand):

- Composition C1 :70% clay +30%sand (distilled water)
- Composition C2: 70% clay +30%sand (tap water)
- Composition C3 70% clay +30%sand (the water of sebkha)

The tests were performed on bricks of dimensions (200×100×50 mm), the results are grouped in the Table 8.

Table 8. The results of the compositions

Measuring cylinder (brick)	**C1**	**C2**	**C3**
The mass M (kg)	**1.45**	**1.43**	**1.40**
Thermal conductivity **Λ** (W/m°C)	**0.64**	**0.63**	**0.56**
Thermal Resistance R th (M°C/W)	**0.070**	**0.071**	**0.076**
Resistance to traction	**1.34**	**1.19**	**1.07**
Resistance to compression	**4.81**	**3.2**	**2.6**

After the results obtained we note that:

- A remarkable reduction of the thermal conductivity in the bricks C3 and it is due to the high salinity of the mixing water in the mixture.
- The thermal resistance will automatically increase in the bricks C3, this is logical in view of the fact that theoretically r th varies in the opposite direction that λ .
- The resistance to bending the highest is that of the composition (C1) is it is due to the use of the distilled water that gives a good cohesion of the matrix of the mixture.

4. CONCLUSION

According to this experimental study, we can draw the following conclusions:

- A remarkable reduction of the thermal conductivity in the bricks C3 and it is due to the high salinity of the mixing water in the mixture.
- The thermal resistance will automatically increase in the bricks C3, this is logical in view of the fact that theoretically r th varies in the opposite direction that λ .
- The resistance to bending the highest is that of the composition (C1) is it is due to the use of the distilled water that gives a good cohesion of the matrix of the mixture.

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