Study of the Present State of Tombs "BURIALS" of Tell Basta " New Discoveries" with Application on one of the Selected Tombs.

ATEF ABD EL-LATIF•

Introduction:

Bubastis "Tell Basta", the very ancient city, is already well known "it was called pr-B3as.t.t, and transcribed by the Greek as Bubastis.

The ancient Egyptian records let understand that First Bubastis Was a part of the 13th nome of Lower Egypt(1) "Heliopolitan" . After the division of the Nome Bubastis became the capital and its northern part known as the 18th . nome of Lower Egyptian . It seems to Reach its highest Fame during the 22 and 23 Dynasties When Bubastis appeared to be the Capital of the Egyptian kingdom .The City Was One of the centers of building activities in the Delta During the Pharaonic Period Till the Roman Time . the Modern City is Called ZAGAZIG , But the Old Site is still known as Tell Basta , Which Lies to the South East of the Modern City.

Since the Time of Herodotus Many travelers historian and archaeologists "E.Naville1887," Labib Habshi 1939 , Shafiq Farid ,1960 Ahmed Elsawi 1976 , Monir Basta and M.I.Bakr "University of ZAGAZIG" .

Tell Basta is One K.M. Away From ZAGAZIG Train Station "FIG 1-2" . the Remaining Area of Tell Basta is Only 120 Acres but Sadly this Area is Being Minimized Everyday due to Various factors Such as Increasing Population in the Last Few Year . A Hospital , 5 Cemeteries , a Farm a Slaughter House and a sewage Station (40 Acres) were built on the Archaeological Site of Tell

• Cairo University, Faculty of Archaeology.

(1)BAKR , M.I., TELL BASTA , VOI.I., tombs and burial customs at Bubastis , university of ZAGAZIG , 1992 , pp.13-16.

Basta . the Road (Alex – Port said) Played a Major Role in Dividing the Archaeological Site . the Western Part of the Ancient Area Which Ends at the Cairo Mansourah Railway Track Via Belbeis was used for Planting Crops . in addition to that the North East and South Eastern Parts were Planted . there are also the Plunderers who Enjoyed Digging out the Finds , Small Brick Factories Made the Brick from the Soil of the Area . Last but not Least the new villages "KAFR EL NAKHAL"[1].[2] ….etc .

Due to the Important of this archaeological Site , Various Excavations were Organized it Resulted in the discovery of Temples , Palaces Cemeteries and Chapels :-

- the Temple of PEPI&TETI……etc
- the New , middle and Cats Necropolises in addition to Several Statues , Scarcophogi and Other Moveable objects . During 1983 – 1984 excavation Seasons of ZAGAZIG University Several Great Mud Brick Mastabas Were Discovered Dating Back to the 6th Dynasty but they had been Buried Under Tombs dating Back to the Intermediate Period . in these Mastabas Which are Called the Eastern Cemetery several Small Decorated lime Stone and Vaulted Mud brick tombs were found . the Tombs of "ANKH IN BASET" and the rest of lime stone tombs have not been documented and Puplished Yet .

Many Deterioration factors play a major role in the degradation of tell Basta monuments in general and the tombs of the eastern cemetery specifically we can calssify these different factors as follow :-

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(1) ابراهيم محمد كامل ، اقليم شرق الدلتا فى عصوره التاريخية القديمة الجزء الثانى القاهرة ١٩٨٥، ٩ ، ١٠ .

(2)(1)BAKR , M.I.,Op.Cit.pp13,14

- Moisture , e.g. ground water , sewage water and rain water "table no.1 show the annual rate of rainfall on ZAGAZIG city" .

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Months	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Annual Mean
Monthly Mean	6.1	6.7	5.6	3.8	2	2.6	Trace	0	0	Trace	6.8	4.3	22.9

- Air temperature variation "table no.2 show the annual max . and min. temperature recorded in ZAGAZIG"

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Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
Maxi.	19.8	20.9	23.8	27.8	31.4	33.2	34.5	34.3	32.6	30.3	25.9	21.9	28
Mini.	6.6	7.1	9.1	12	15.6	18.6	20.2	20.3	18.6	16.5	13.1	8.6	13.9

- Salts .

- Biological deterioration factors "wild bees nests and plants , which grow inside and around the tombs .
- Faulty restoration .
- Modern addition to the cemetery , by building mud brick rooms over the ancient burials a photos from 1 to 10 show the present state of the burials "tombs"

2- Materials and Methods :

to evaluate the present state of the tombs in the eastern cemetery of tell Basta some analytical methods were adapted:

x-ray diffraction analysis :- the method was used to identify and analyse the mineralogical composition of stone and salts samples .

S.E.M EDAX "x-ray dispersive energy" Analysis :- this method "non – destructive" which is often used when samples are scarce in the field of archaeological conservation was adapted to analyse some very small samples "stone and plaster from the tombs" .

3- Results and Discussion :

3/1 Results

3/1/1 X.R.D analysis :

fig.3-6 show the X.R.D patterns of the studied samples and table no.3 show the results obtained while studying the mineralogical composition of the chosen samples

table no.3 show the result of X.R.D analysis*

SAMPLES	MINERALOGICAL COMPOSITION	CHEMICAL F.	PERCENTAGE %
A Salt	Halite (Hal.) 5-0628 Calcite (cal.) 5-0586 Quartz (Q.) 5-0490	Nacl $CaCO_3$ Sio_2	70.9 29.1 1.3
B Salt with new mortar	Halite Calcite Gypsum(GY.)6-0040 Quartz	Nacl CaCO3 $CaSO_4.2H_2O$ SiO_2	59.6 27 11.2 2.1
C Deteriorated Stone	Calcite Halite Gypsum Quartz	$CaCO_3$ Nacl $CaCO_4.2H_2O$ SiO_2	80.7 11.1 4.1 3.9
D Salt with Painting Layer	Halite Gypsum Calcite	Nacl $CaSO_4.2H_2O$ $CaCO_3$	59.2 27.9 12.8

3/1/2 S.E.M EDAX analysis :- the following result were obtained while using S.E.M EDAX method

3/1/2/1 Sample E.

Kind of sample:

Deteriorated lime stone "ANKH IN BASET tomb"

Analysis by S.E.M EDAX:

* sample A,B,C from the tomb of ANKH IN BASET and D from ESET NEFER tomb

S.E.M EDAX analysis "fig.7" show that the mainly constitutes of the sample are CaO , Na_2O , CL_2O and SiO_2 Oxides which indicate the presence of calcite $CaCO_3$, Halite Nacl and Quartz SiO_2 in the same consecutive order

3/1/2/2 Sample F.

Kind of Sample:

Visually good lime stone "ANKH IN BASET tomb"

Analysis by S.E.M EDAX:

S.E.M EDAX analysis "fig.8" show that the mainly constitute of the sample are Ca element in addition to traces from CL and Na elements which indicate the presence of calcite $CaCO_3$ which is the main component together with some traces from Halite NaCL.

3/1/2/3 Sample G.

Kind of Sample:

New mortar for completion "ANKH IN BASET tomb"

Analysis by S.E.M "EDAX":

S.E.M EDAX analysis "fig.9" show that the mainly constitutes of the sample are CaO , SO_3 and SiO_2 which indicate the presence of Gypsum $CaSO_4.2H_2O$, calcite $CaCO_3$ and Quartz in the same constitutive order.

3/1/2/4 Sample H.

Kind of sample:

Plaster "ANKH SHAEF tomb"

Analysis by S.E.M EDAX :

S.E.M EDAX analysis "fig.10" show hat the mainly constitutes of the sample are CaO and SO3 oxides indicating to Gypsum Caso4.2H2O essentially components of the plaster layer of the tomb.

3/2 Discussion :

from the results obtained in this study it was evident that monuments of tell Basta , in general , and the tombs of eastern cemetery specifically suffer from the following deterioration factors :-

Moisture from different sources, underground water , sewage water and rain water play a major role with other deteriorating

factors on the degradation process of the tombs for example the highest rate of rainfall was recorded during winter and the annual rate of rainfall is 22.9 mm/year

Air temperature variation , the daily & seasonal change of temperature are considered one of the main deteriorating factors on stone and mural painting. the difference between the highest and lowest recorded temperatures during the month of may reached 15.8 c in the studied site . the average annual rate of difference recorded was 14.1 c which is considered relatively high in the case of stone painting layers and plaster , due to the different expansion and contraction thermal coefficient of their mineralogical composition , these change cause what is called fragmentation , if the difference is more than the elastic limit , cohesive strength and heat absorption capacity together with the daily change of temperature and its distribution within the material .(1)

Salts , salts is one of the main causes of deterioration in porous material " stone wall painting brick and mortar" which cause severe damage to the painting layer the pigments and the support in particular , especially by over time and continuous supply . the composition of the Salts are usually related to their source .(٢) crycilc salt crystallization results in physical breakdown of the material . objects affected by such processes are often difficult to conserve .(3)

(1) GALAN , E ., the influence of temperature changes on stone decay in : proceedings of 1st course C.U.M., university school of monument conservation , weathering and air pollution , venezia ,1991. PP119.

(2) ROSSI – MANARESI , R., and tucci , A., pore structure and disruptive or cementing effects of salt crystallization in various types of stone , stud. In cons.Vol.36.1991. pp.53-58

(3) DOEHNE , E., in site dynamic of sodium sulflat hydration and dehydration in stone pores: observation at high magnification using the environment S.E.M. in the conservation of monuments in the Mediterranean basin , proceedings of the 3rd international symposium venezia 1994.pp 143-150.

Halite is considered the most common soluble salt . the degradation by salt within the pores, either by crystallization or hydration pressure crystal growth generates stresses [4] which are sufficient to cause disintegration. the material become weak and friable and the surface crumbles away. once the surface is lost or distorted The historical and artistic importance largely lost as well .
Biological deterioration factors , wiled bees nests and plants , which grow inside and around the tombs one of the main biological deterioration factor in this site . the wild bees netes make distortion of the surface of wall painting "ESET NEFER tomb" which includes 2.23% soluble salts , 0.45% bicarbonate , 0.20% chlorides , 0.34% sulfate and 0.1% calcium oxide . on the other hand the air dried samples contains 47.59% course sand 18.88% fine sand 31.3% silt and mud in addition to soluble salts 2.23%[1].[2].

The deterioration by plants on monuments indicate poor maintenance and continuous supply by a permanent source of moisture and high local moisture content in the building "tomb" and considered as a result rather than the cause of deterioration [3] .

The growing of plants causes severe problems on the tombs whereas the roots of higher plants weaken the stone of the tombs by their infiltration into the structure "mechanical action" . the roots also have strong negative change , that combined with the positive

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[4] PRICE ,C.A., an expert chemical model for determining the environmental conditions needed to prevent salt damage in porous materials , in : proc. Of origin mechanisms of monuments in marine and continental environments , BARI "ITALY" 1995 . p143.

[1] SOLIMAN , M.S., sedimentology of bees sandy nests on Egyptian monuments , a topic in environment geoegyptology of Egypt , vol. 3,1995, pp1-11.

[2] محمد محمود حسنى واخرون الآفات الزراعية الحشرية و الحيوانية دار المعارف القاهرة ١٩٧٦ ص٨٦٣.

(3) STAMBOLOV , T., the deterioration and conservation of porous building material in monuments ICCROM , 1976 p27.

hydrogen Ions of rhizosfere causes chemical reactions [4] which significantly weather the mineral surface . plants on the other hand exudates several substances "organic acids" particularly through the roots which cause damages "chemical action".

Careless and Faulty Restoration The tombs of the eastern cemetery suffer from severe damage as a result of faulty restoration , completion in particular , whereas different mortars in kinds , color and texture were used for completion which led to distortion of wall painting of the tombs "ANKH IN BASET" . furthermore there are new addition by buildings a mud brick rooms over the tombs 2003 which isolate the tombs visually .

From the data by X.R.D and S.E.M EDAX it can be concluded that , Halite Nacl is the main component of studied salts samples plus a small amount of Gypsum in sample no.c . the presence of Halite which is soluble salt and very hygroscopic is so serious in deterioration of the tombs on the long-term taking into account the possibility of repeating the hydration and recrytallization cycle. Which may cause more damage to the lime stone and painting layers of wall painting . It was obvious that calcite $CaCO_3$ is the main component of lime stone plus a small amount of Halite as a deterioration product in addition to trace from Quartz SiO_2 . Results showed also that it was used lime mortar which rich in amount of Gypsum $CaCO_4.2H_2O$, which was used also for plaster on the tomb of "ANKH SHAEF".

([4]) TERESA , M.L.S. , et.al., excavated monuments as environment for plants conimbriga Portugal , case study in : the conservation of monuments in the Mediterranean basin , proceedings of the 3rd . international symposium venezia 1994 pp.323-328.

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ROSSI – MANARESI , R., and tucci , A., pore structure and disruptive or cementing effects of salt crystallization in various types of stone , stud. In cons. Vol.36 .1991.

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STAMBOLOV , T., the deterioration and conservation of porous building material in monuments ICCROM , 1976

TERESA , M.L.S. , et.al., excavated monuments as environment for plants conimbriga Portugal , case study in : the conservation of monuments in the Mediterranean basin , proceedings of the 3rd . international symposium venezia 1994

ابراهيم محمد كامل ، اقليم شرق الدلتا فى عصوره التاريخية القديمة الجزء الثانى القاهرة ١٩٨٥.

محمد محمود حسنى واخرون الآفات الزراعية الحشرية و الحيوانية دار المعارف القاهرة ١٩٧٦ .

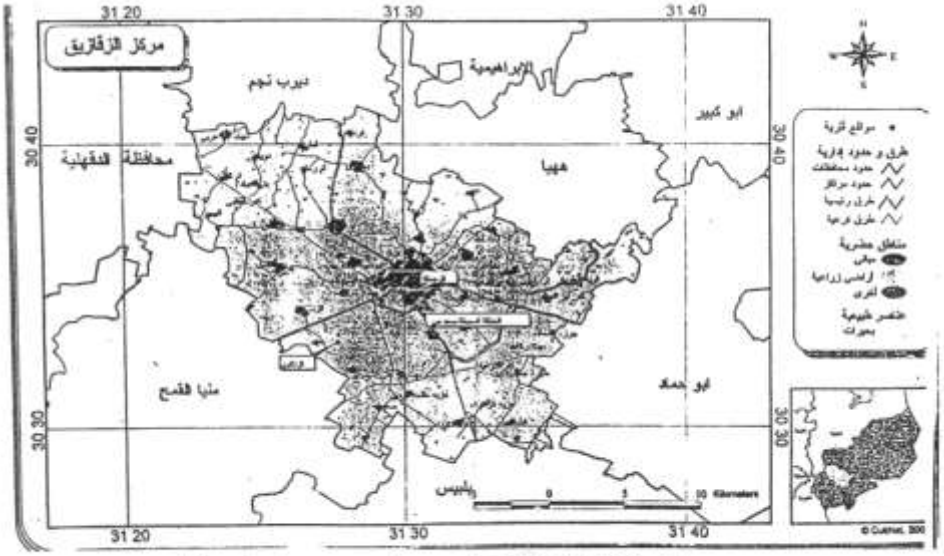


Fig.1 shows plan of ZAGAZIG city .

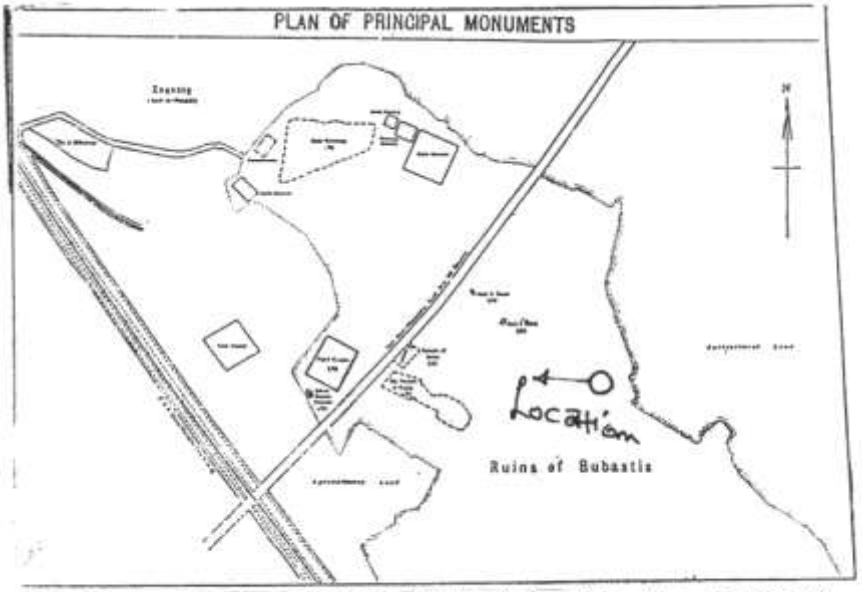


Fig.2 shows plan of Tell Basta (after Naville ,E 1891.)

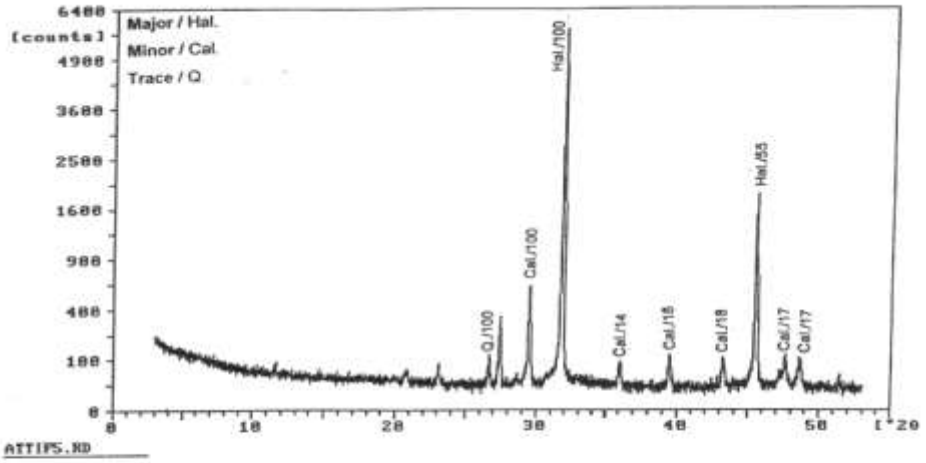


Fig.3 shows X.R.D pattern of sample A

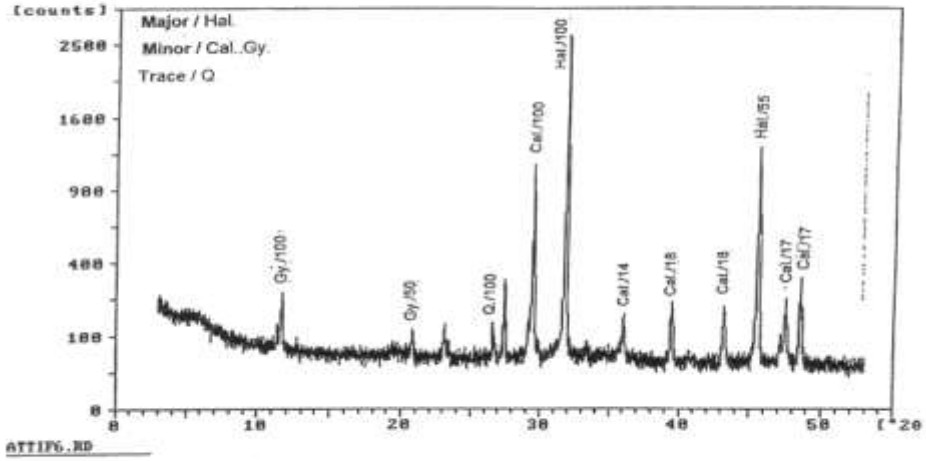
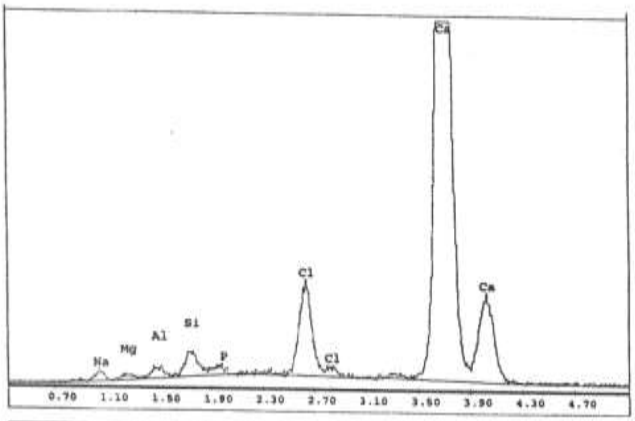


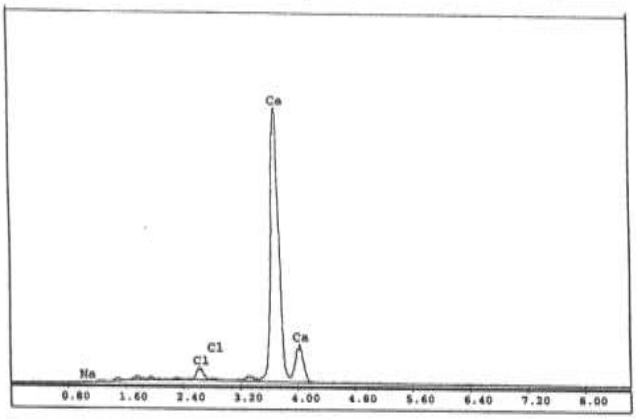
Fig.4 shows X.R.D pattern of sample B



EDAX ZAF Quantification (Standardless)
Oxides
SEC Table : Default

Element	Wt %	At %	K-Ratio	Z	A	F
Na2O	5.55	5.27	0.0100	0.9783	0.2480	1.0019
MgO	1.94	2.83	0.0040	1.0034	0.3401	1.0035
Al2O3	2.60	1.50	0.0063	0.9744	0.4661	1.0064
SiO2	4.54	4.44	0.0128	1.0033	0.5924	1.0108
P2O5	0.98	0.41	0.0029	0.9705	0.6942	1.0193
Cl2O	7.72	5.22	0.0547	0.9514	0.8710	1.0476
CaO	76.66	80.34	0.5116	0.9784	0.9543	1.0000
Total	100.00	100.00				

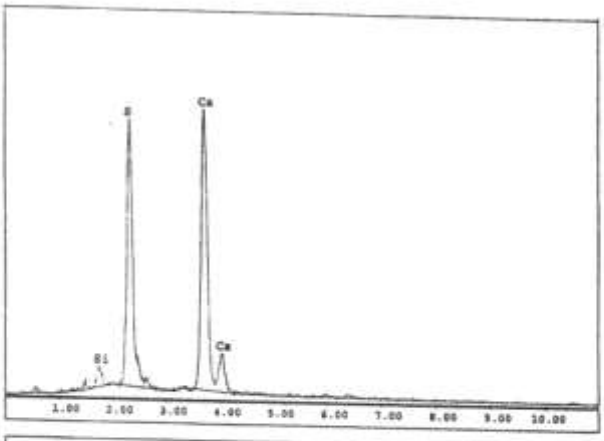
Fig.7 S.E.M EDAX pattern of sample E



EDAX ZAF Quantification (Standardless)
Element Normalized
SEC Table : Default
Coating Correction Used : Element : C , Factor : 14.00

Element	Wt %	At %	K-Ratio	Z	A	F
NaK	0.80	1.38	0.0023	1.0018	0.2869	1.0016
ClK	3.12	3.49	0.0306	0.9761	0.9274	1.0831
CaK	96.08	95.12	0.9503	1.0008	0.9883	1.0000
Total	100.00	100.00				

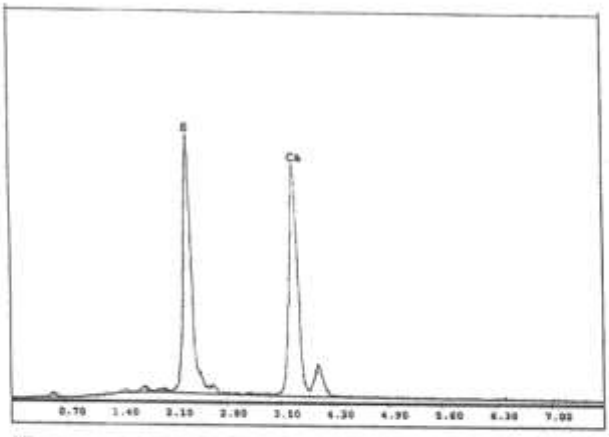
Fig.8 S.E.M EDAX pattern of sample F



EDAX ZAF Quantification (Standardless)
Oxides
SEC Table : Default

Element	Wt %	At %	K-Ratio	Z	A	F
SiO2	3.77	4.22	0.0119	0.9885	0.6721	1.0156
SO3	54.88	46.14	0.1682	0.9815	0.8604	1.0138
CaO	41.35	49.64	0.2576	0.9619	0.9062	1.0000
Total	100.00	100.00				

Fig.9 S.E.M EDAX pattern of sample G



EDAX ZAF Quantification (Standardless)
Oxides
SEC Table : Default

Element	Wt %	At %	K-Ratio	Z	A	F
SO3	61.00	52.28	0.3130	0.9810	0.8773	1.0130
CaO	39.00	47.72	0.2408	0.9613	0.8989	1.0000
Total	100.00	100.00				

Fig.10 S.E.M EDAX pattern of sample H

Photo 1 shows general view of the site in 2002

Photo 2 shows general view of the site in 2003

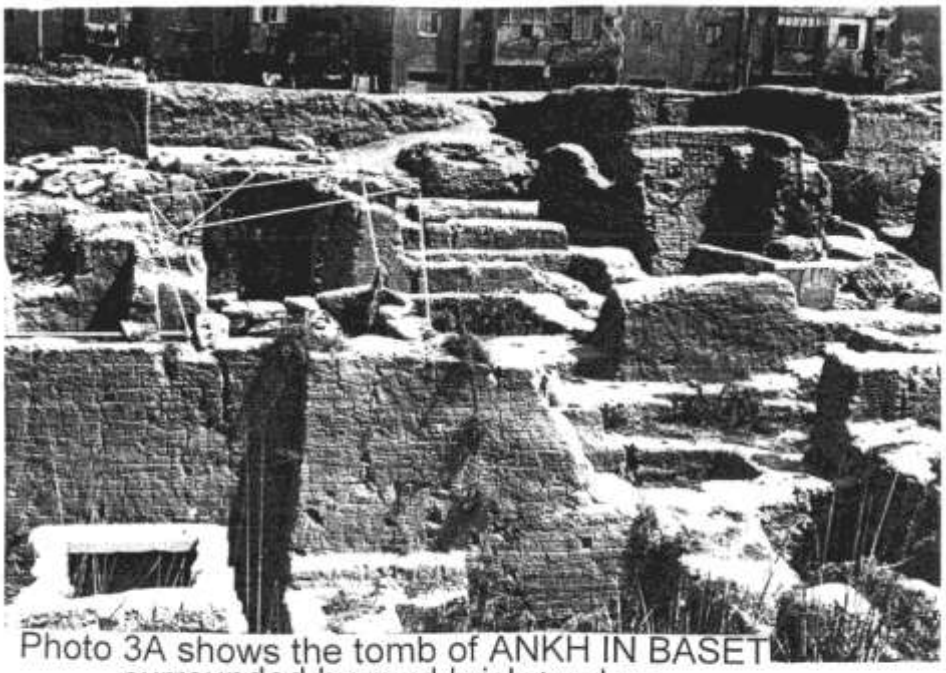


Photo 3A shows the tomb of ANKH IN BASET surrounded by mud brick tombs .

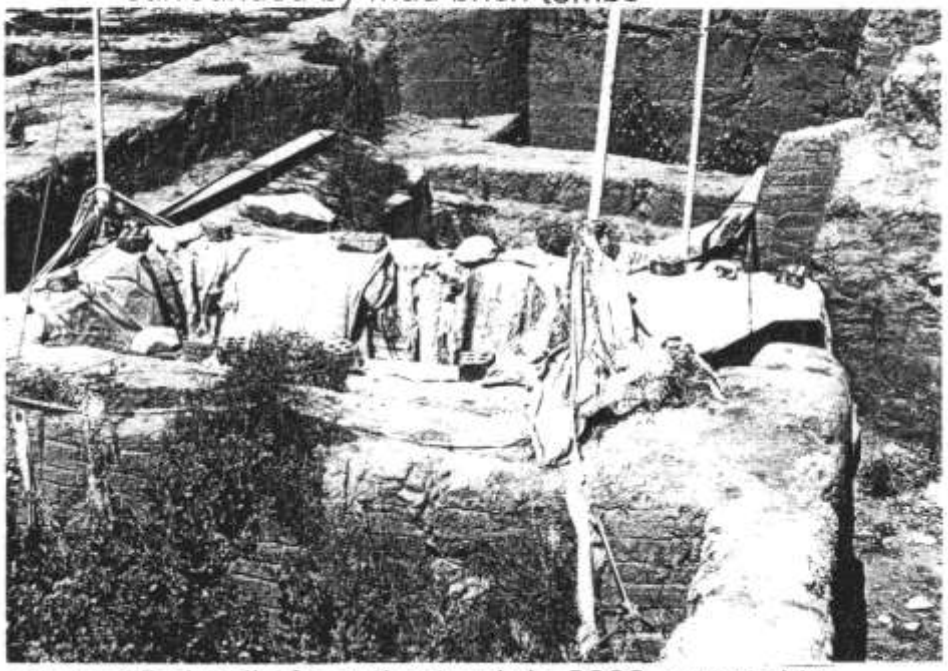


Photo 3B details from the tomb in 2002 covered by different textiles and surrounded by plants.

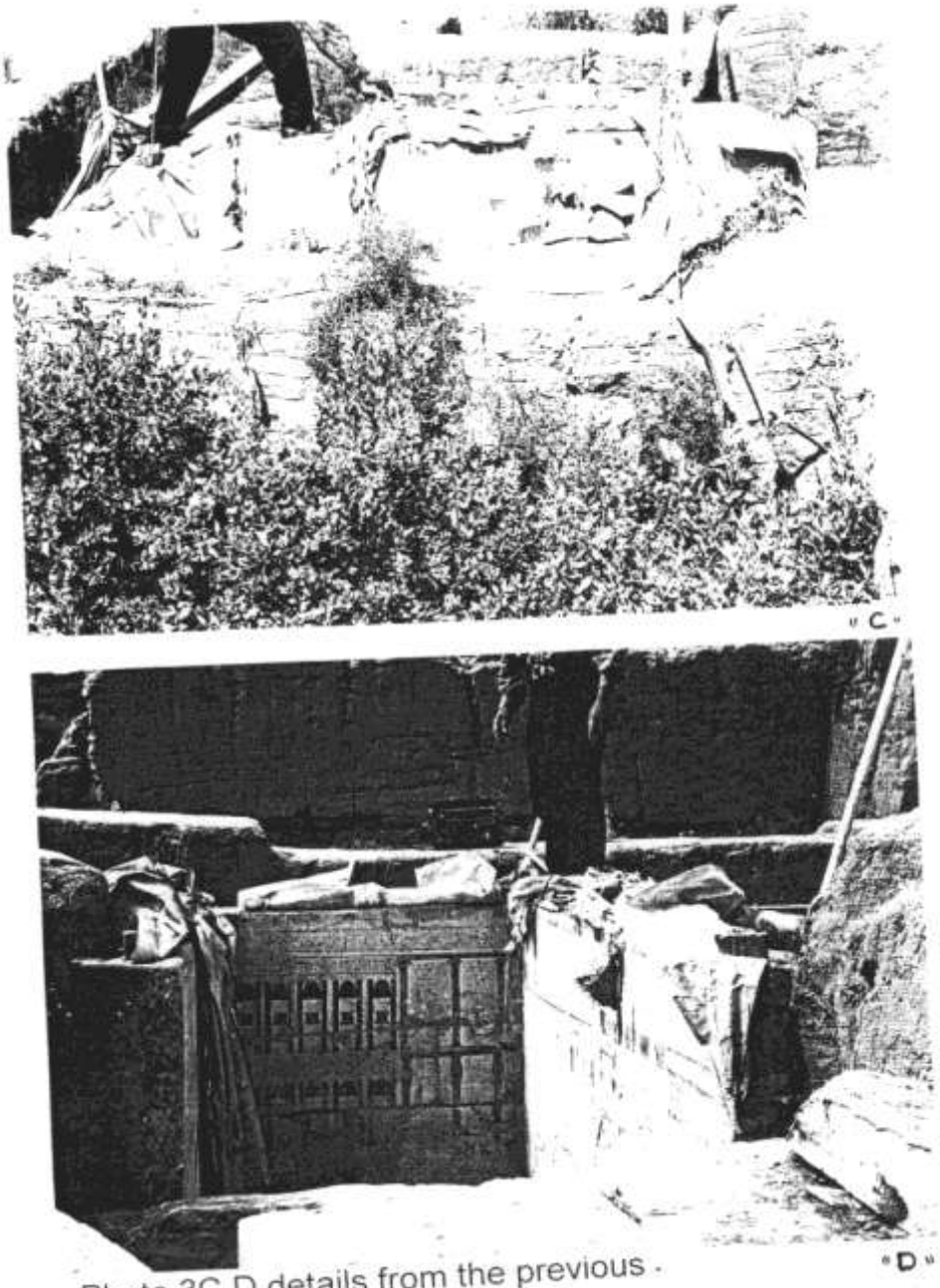


Photo 3C,D details from the previous .

Photo 3E shows the present state of the tomb (2003)

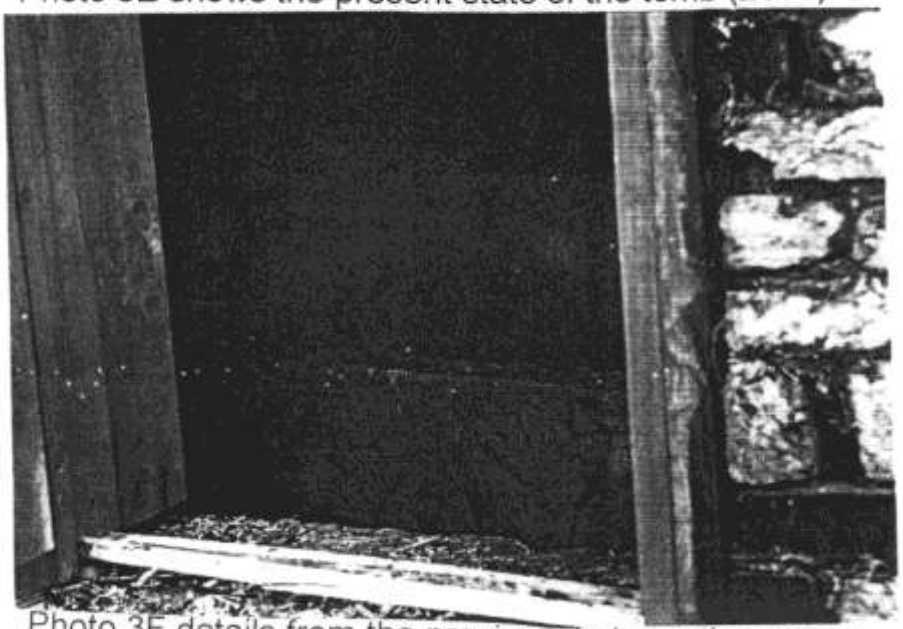


Photo 3F details from the previous 1 shows the severe damage of wall painting.

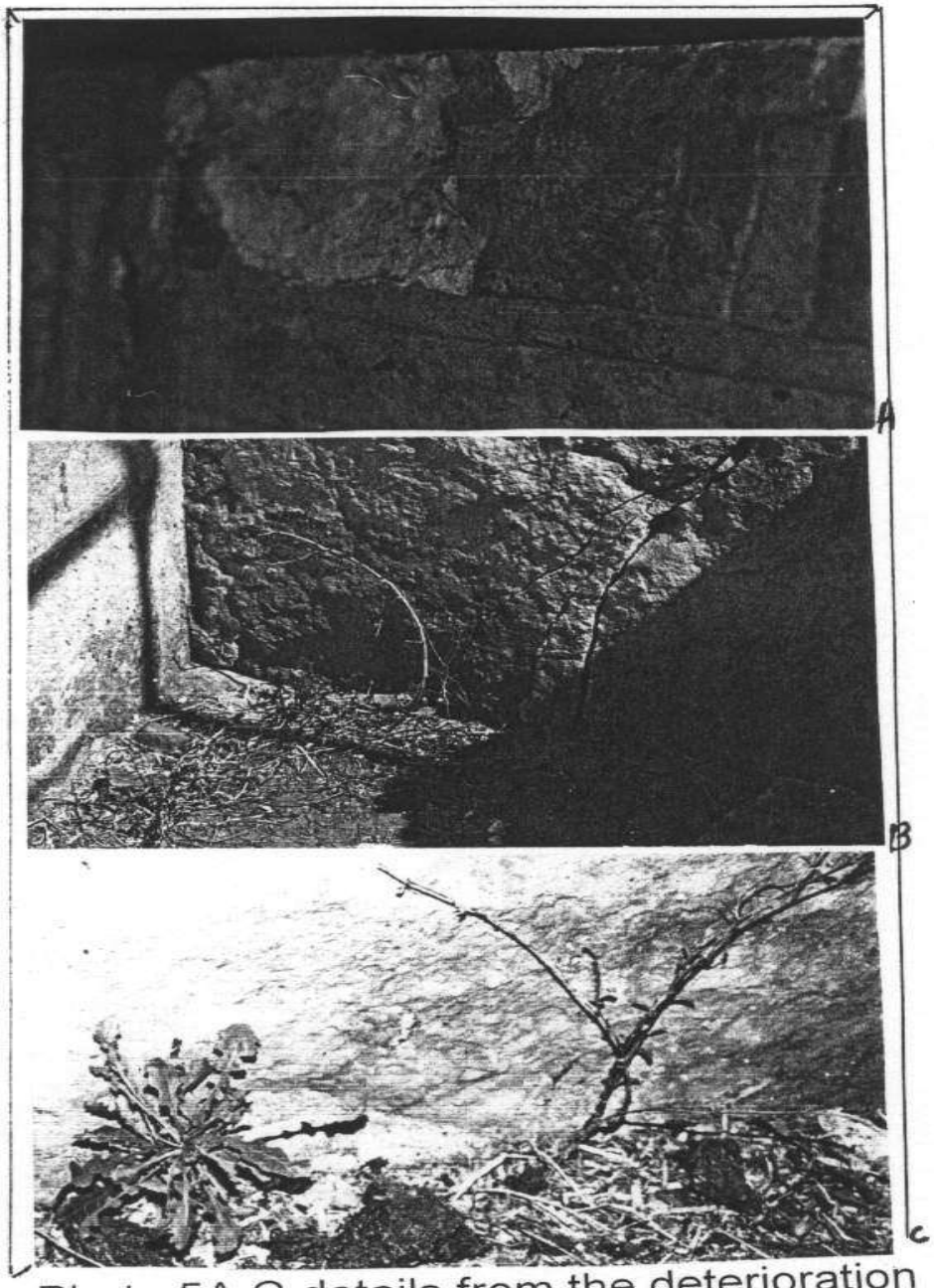


Photo 5A:C details from the deterioration aspects in the tomb .

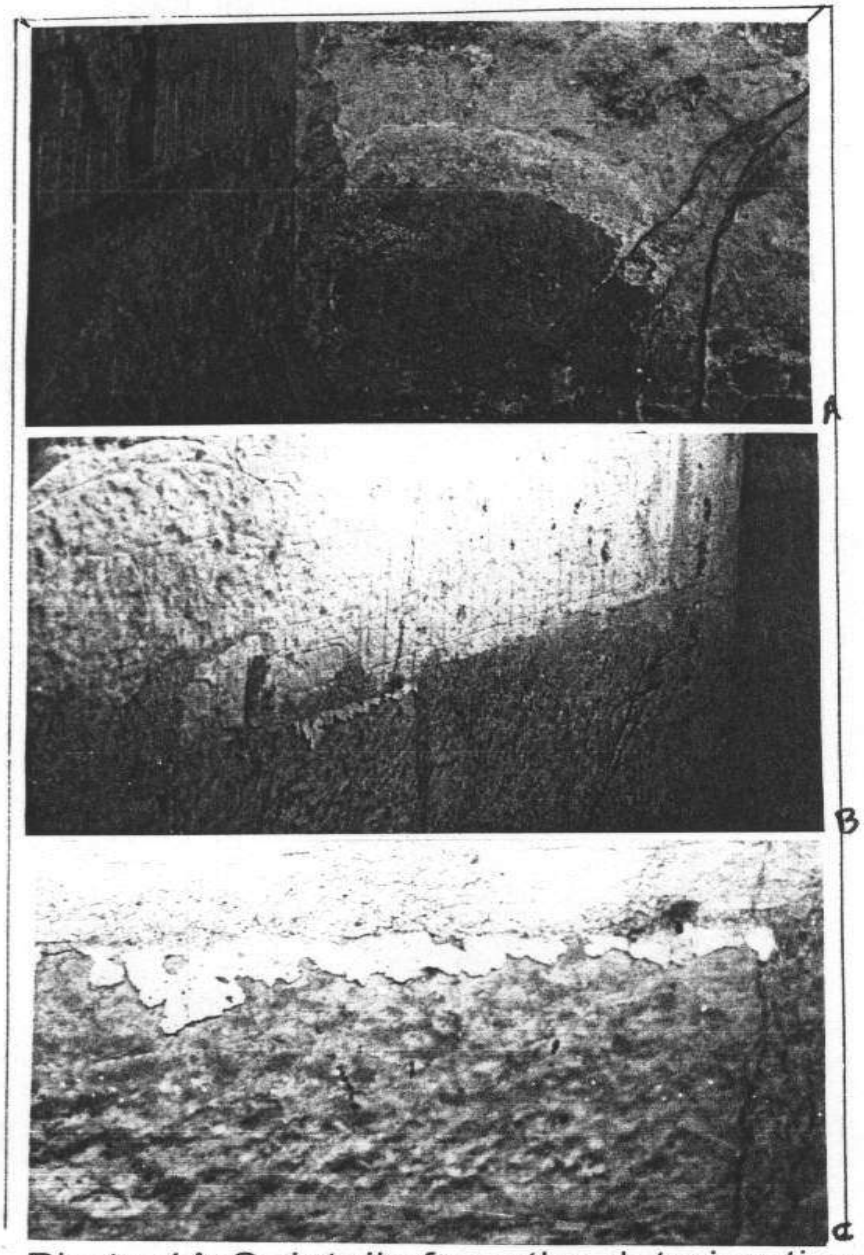


Photo 4A:C details from the deterioration aspects in the tomb .

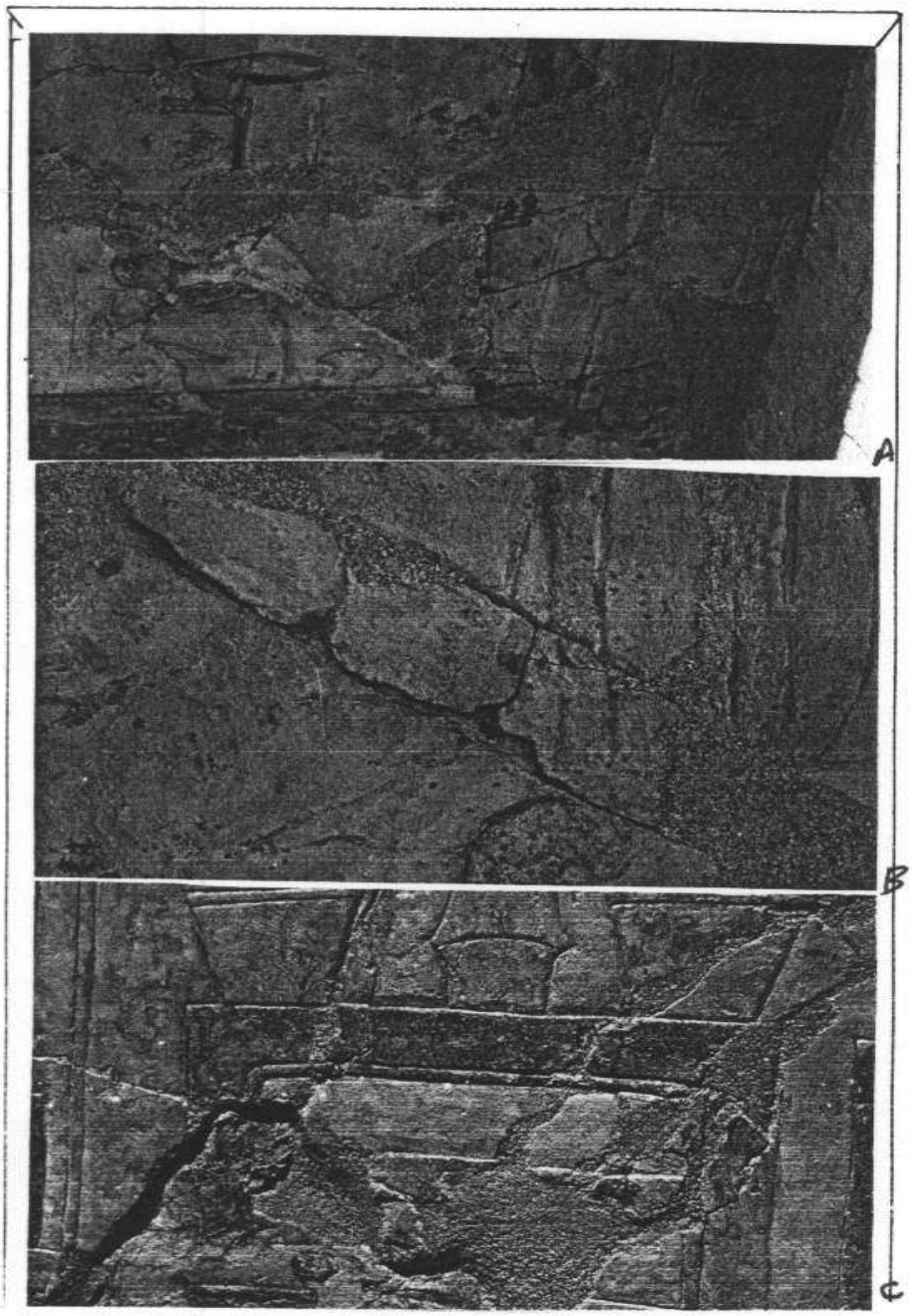


Photo 6A:C details from the deterioration aspects in the tomb.

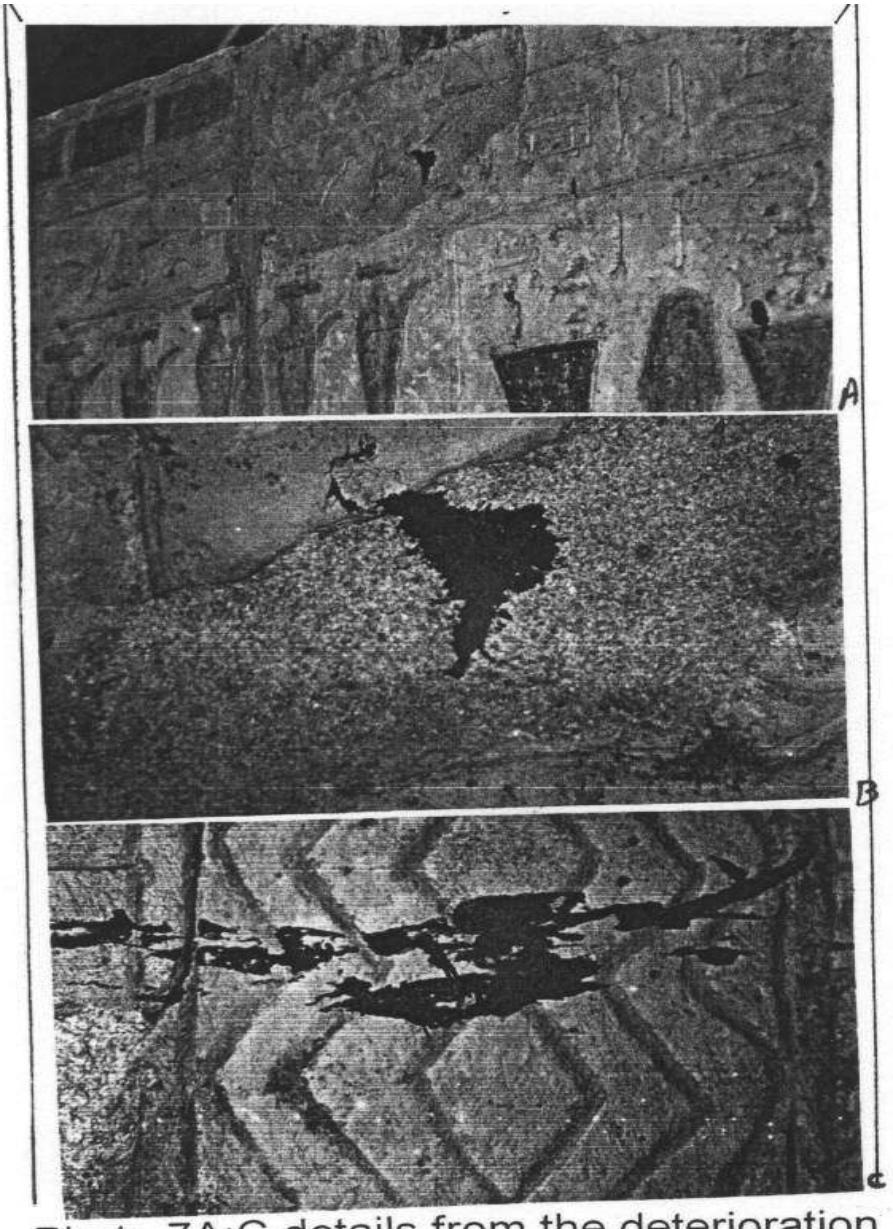


Photo 7A:C details from the deterioration aspects in the tomb ·

Photo 8A,B shows the aspects of the deterioration in the tomb of ESET NEFER.

Photo 9 shows the present state of the tomb of ANKH SHAEF .

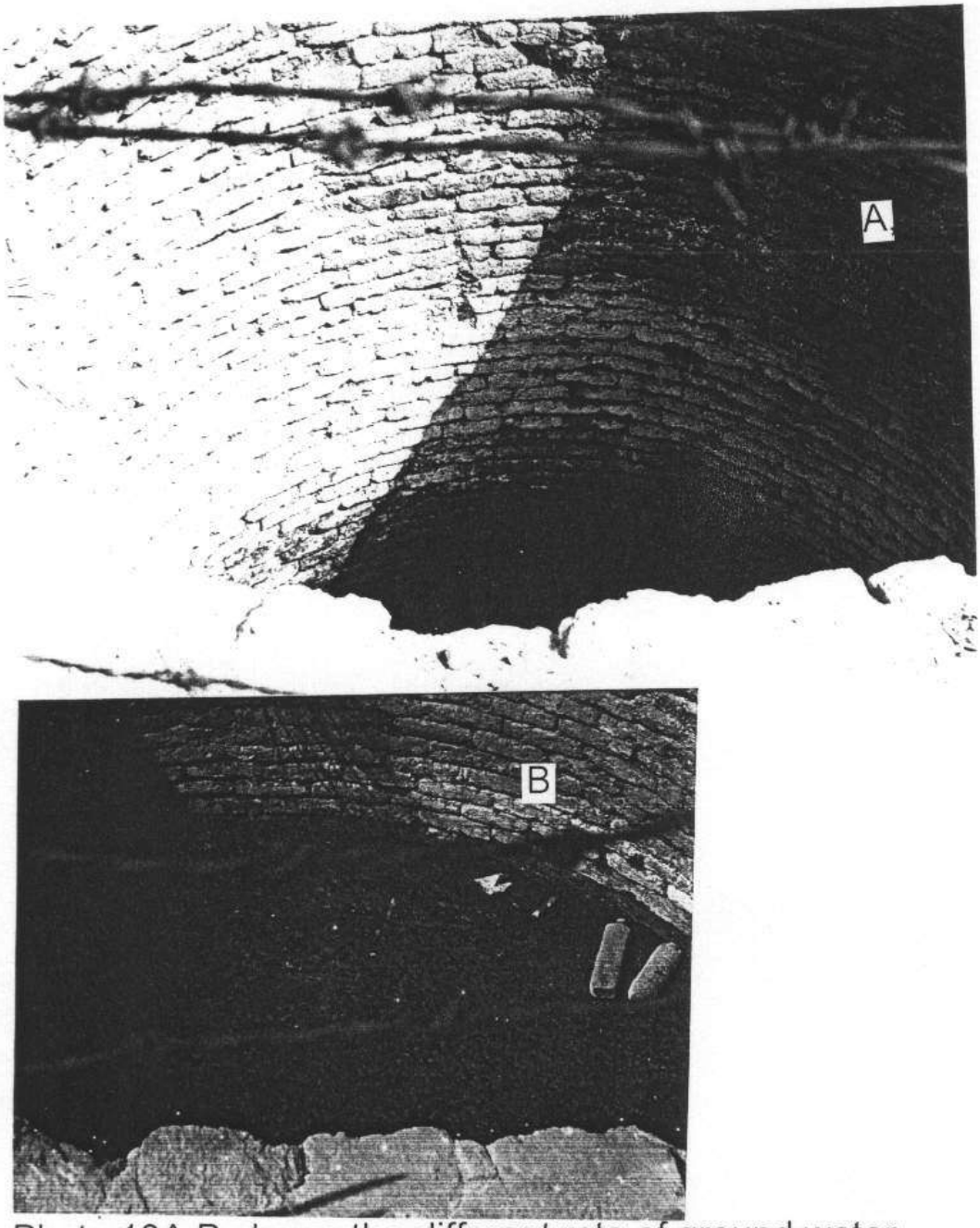


Photo 10A,B shows the different rate of ground water in romanic well On the site .