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PHOTOGRAPHIC
INTERPRETATION
REPORT

NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

SURFACE-TO-AIR MISSILE GUIDANCE AREAS, EGYPT

EGYPT

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MARCH 1972

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INTRODUCTION

1. This report is a study of the nine types of guidance areas associated with SA-2, SA-3, and SA-6 surface-to-air missile (SAM) sites in Egypt. Included are those sites targeted by NPIC as of 1 January 1972 (through site number 606). Each of the nine types will be discussed, including a brief description, history, methods of hardening and construction, and deployment. The report also includes a photograph of each type of guidance area, drawings, and mensural and reference data.

DESCRIPTION

Revetted Guidance Area (Figure 1)

2. The revetted guidance areas in Egypt are typical of those also found in the USSR and other parts of the world. The area usually consists of one or two drive-through revetments and three to four drive-in revetments to accommodate the associated vans, and a circular revetment for the guidance radar. From 1963, when an SA-2 site was observed for the first time in Egypt, to August 1969 only revetted and modified revetted (referred to as odd in this report) guidance areas existed in Egypt.

3. The method of construction is similar to that of all revetments throughout Egypt. A bulldozer clears and levels the base of the revetment area. Then one of two methods of forming the revetment walls is used. One method is to simply doze the earth up into a mound to form the revetment walls. This type of revetment is most common in the older revetted sites. The second method is to build either a wood or concrete retaining wall and then embank it with earth. The drive-through revetments house one to three vans in a line. The drive-in revetments are normally perpendicular to the drive-through revetment. Each drive-in revetment usually holds only one van. These revetments are normally high enough so the vans do not extend above them. The circular guidance radar revetment is constructed in the same manner but it not as high, since the radar troughs must be exposed to function properly.

4. The 156 revetted guidance areas are dispersed throughout Egypt. Approximately 85 percent of the revetted guidance areas are at SA-2 sites (Table 1).

Prefab-I Guidance Area (Figures 2 and 3)

5. The Prefab-I guidance area consists of one linear, single-lane, drive-through structure covered with an earth and cement roof, three to four drive-in revetments, and a circular radar revetment. The Prefab-I was, for the most part, built between July and November 1970 with the peak of construction taking place during September 1970.

6. This type of guidance area is called Prefab-I because it is made from precast concrete slab sections, each in the form of a U ( ). One U section is used for the top and one for the bottom forming a boxlike section approximately 3 meters (10 feet) high inside. These U sections are connected in rows until they have a single drive-through linear structure Some of the structures are constructed at ground level while others are constructed in a trench. The structure is then covered with one to two feet of earth. A probable clay/soil cement roof is then constructed on top of the earth-covered structure. Three to four drive-in revetments are then constructed perpendicular to the linear structure. These revetments are built similar to those in the revetted guidance area. The circular guidance radar revetment is always on the opposite side of the drive-through linear structure from the drive-in revetments.

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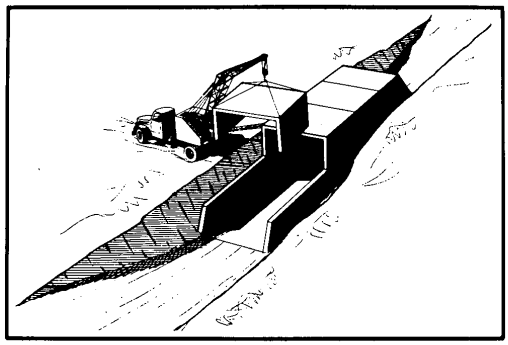
PREFAB I GUIDANCE AREA



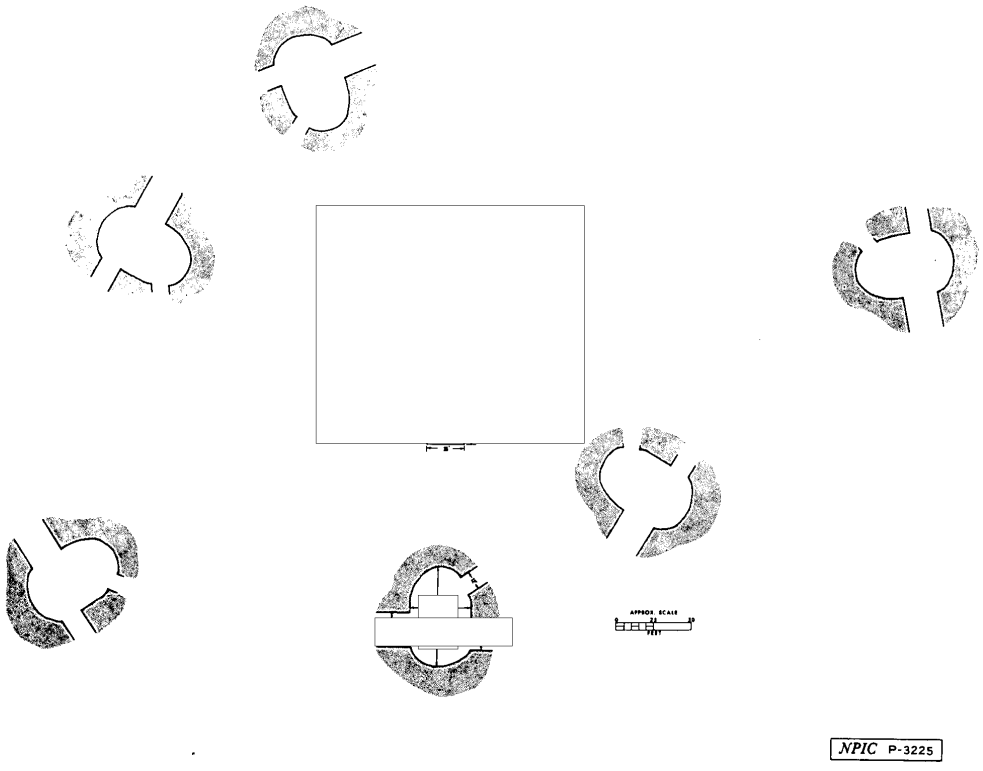


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FIGURE 3. ARTIST'S CONCEPT OF A PREFAB-I GUIDANCE AREA

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7. The Prefab-I is structurally the weakest of all the hardened guidance areas but is the fastest to construct. The bunkered structure mainly protects the radar control vans. The generator vans are normally positioned in the open drive-in revetments, while the guidance radar is always in the circular revetment. There are a total of 101 Prefab-I central guidance areas in Egypt (Table 1). The A1 Ismailiyah and Suez areas have a total of 94, Bani Suwagf has three, and the remaining four are at A1 Mansurah. Only four of these are SA-3 configured sites and they are all in the A1 Ismailiyah area.

Single-I Guidance Area (Figures 4 and 5)

8. A Single-I guidance area consists of one linear single-lane drive-through structure which is earth mounded, three to four drive-in revetments, and a circular guidance radar revetment. The first Single-I was constructed in March 1970 with the majority being built during June, July, and August 1970. Most of the recently built sites have this type of guidance area.

9. Initial construction begins with the digging of a linear excavation. Then a probable wooden frame is prepared, in which a reinforced concrete structure 25X1
25X1
feet) wide is poured. When hard, the structure is then earth mounded 25X1
3.0 meters (10 feet) high. Three to four drive-in revetments similar to those in the revetted guidance areas are then constructed perpendicular to the linear structure. The circular revetment for the guidance radar is normally built on top of the linear structure. The Single-I appears very similar to the Prefab-I when complete except for the roof on top of the Prefab-I. The Single-I will also be longer than a Prefab-I. 25X1

10. A total of 140 Single-I guidance areas are in Egypt (Table 1). They are fairly evenly distributed throughout the country. The Cairo and A1 Ismailiyah areas each have approximately twice the number found in any other given area. Only two SA-3 configured sites have Single-I guidance areas.

Double-I Guidance Area (Figures 6 and 7)

11. The Double-I guidance area consists of two linear single-lane drive-through structures side by side and an X-shaped revetment for the guidance radar. The first construction of the Double-I was noted in March 1970; however the majority were constructed during July 1970.

12. Construction begins with the digging of two linear excavations side by side. Frameworks are prepared and a reinforced concrete structure 25X1
25X1
is constructed in each excavation. When hard the two structures are completely covered over . The guidance radar position is 25X1
then built on top of the mound and road served.

13. Van distribution can only be estimated. Probably the generator and power distribution vans are positioned in one structure and the control vans in the other. The guidance radar and antenna trailer are always in the X-shaped revetment.

14. There are 51 Double-I central guidance areas in Egypt; of these, 45 are in the Cairo area, four in Alexandria, and two at Aswan. Only six are SA-2 configured sites.

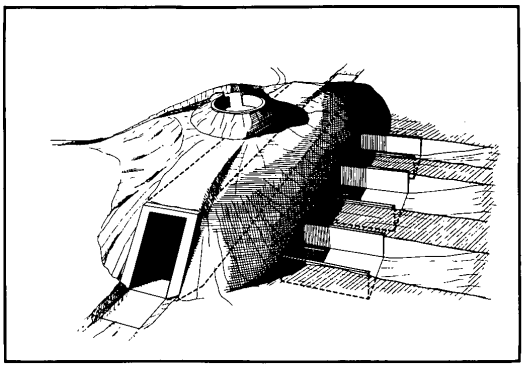
T-Shaped Guidance Area (Figures 8 and 9)

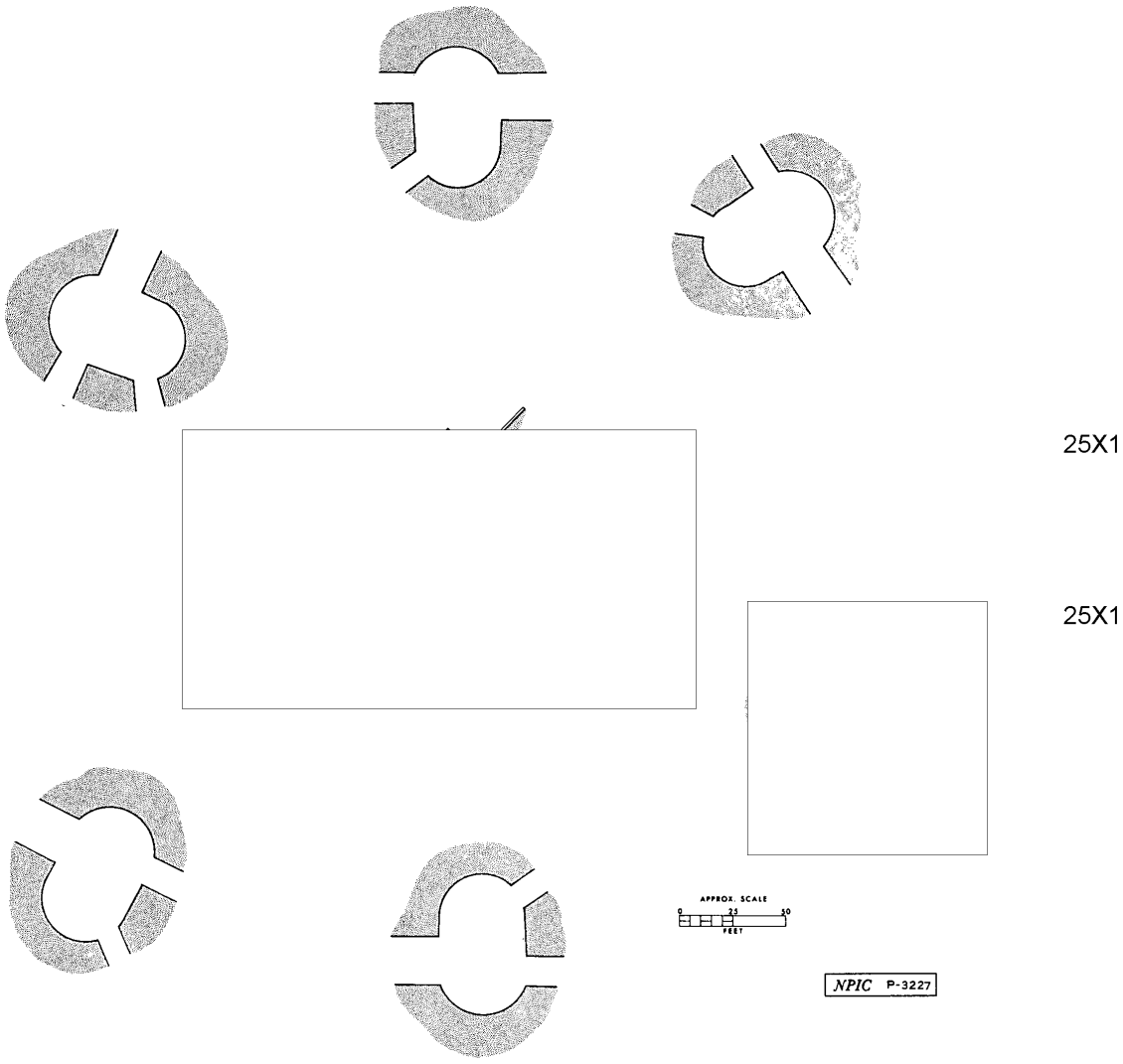
15. The T-shaped guidance area is constructed like the Double-I with the addition of a perpendicular room on one of the linear structures making the shape similar to the letter T with the horizontal section doubled. A circular revetment is built on top for the guidance radar. The first T-shaped guidance area was seen in December 1969.

25X1

25X1

SINGLE I GUIDANCE AREA





25X1

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FIGURE 5. ARTIST'S CONCEPT OF A SINGLE-I GUIDANCE AREA

25X1

16. Construction begins with digging of a large T-shaped excavation. One T-shaped framework and one linear framework are constructed in the excavation. The two reinforced concrete structures are poured and allowed to hardened. The two structures are then completely earth mounded so only the five entrances can be seen. The double horizontal sections [redacted] with a perpendicular room [redacted]. The guidance radar position is then built on top of the mound and is road served.

17. There are only 27 T-shaped guidance areas in Egypt (Table 1). Ten are in the Cairo area and the remainder are evenly distributed throughout the country, with the exception of Al Ismailiyah and Suez areas where there are none. During January 1970 several T-shapes were started in these two areas but all were bombed and damaged. Construction was never completed, and in many cases Prefab-I's were later constructed in or near the same location. The T-shape has basically been used with the SA-2 configured sites. The one exception was originally an SA-2 but was later converted to an SA-3 configured site. This guidance area contains about three times the space needed to house all the associated vans normally seen with the SA-2 system, thus, accurate van distribution cannot be determined. The radar is the only piece of exposed guidance equipment observed at this type of site.

Seven-Entrance Guidance Area (Figure 10)

18. The Seven-Entrance guidance area is a rectangular mound of earth with five entrances on one side, one entrance on the opposite side and one entrance on the end. A circular radar revetment is on top of the mound. Two of these guidance areas were built in September 1969 and one each was built in December 1969, March 1970, and April 1970, making a total of five in Egypt.

19. None of these guidance areas was observed during the construction phase; therefore, it is estimated that there are seven separate structures similar in size and shape to the revetted sites earth covered forming one large mound. A circular revetment for the guidance radar is then constructed on top of the earth mound.

20. The Seven-Entrance guidance area was the first attempt at hardening the guidance area in Egypt. Only five were constructed, two near Al Ismailiyah, two near Suez, and one near Bir Safajah.

21. The guidance-associated van distribution is unknown, but it is estimated that each bunker would house one van. This arrangement would leave one bunkered structure for an unknown use. As always, the guidance radar is located atop the mound protected somewhat by low revetting of its position.

Odd Guidance Area (Figure 11)

22. The Odd guidance areas are all variations of the revetted guidance area. In most cases a roof has been constructed over the revetments for weather protection only. In other cases there is a platform for the guidance radar to give it some height. The Odd type has been in Egypt since early 1969.

23. Most of the Odd types were initially revetted guidance areas with the modification being added at a later date. Only a small number had the modification incorporated as part of the initial construction phase. In all cases the construction of the Odd guidance area is the same as the previously described revetted guidance area. The 18 Odd guidance areas, three of which are SA-3 configured, are scattered throughout the country. Deployment of the guidance radar and its associated vans are the same as in the revetted guidance area.

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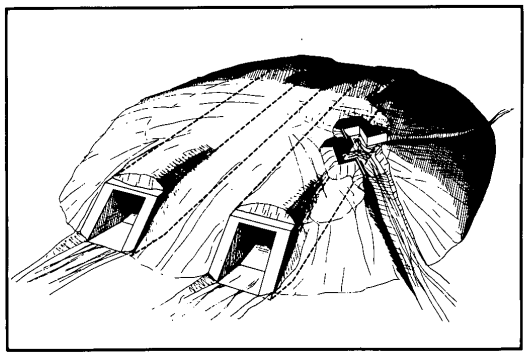
DOUBLE I GUIDANCE AREA



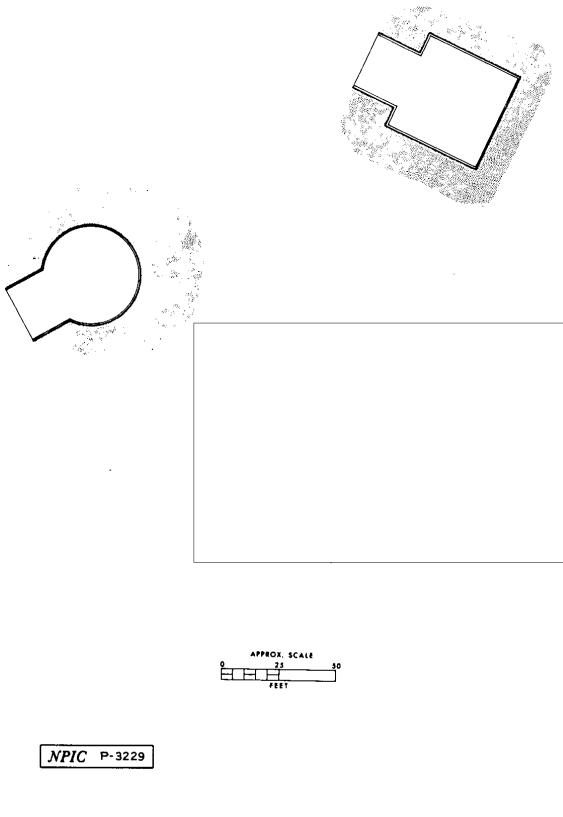


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FIGURE 7. ARTIST'S CONCEPT OF A DOUBLE-I GUIDANCE AREA

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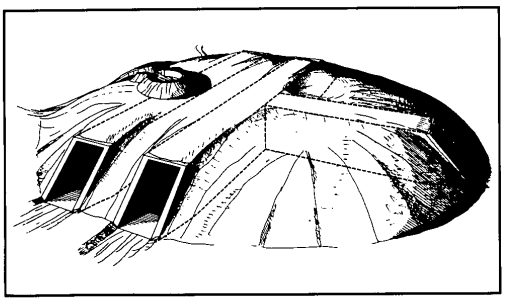
"T" SHAPED GUIDANCE AREA



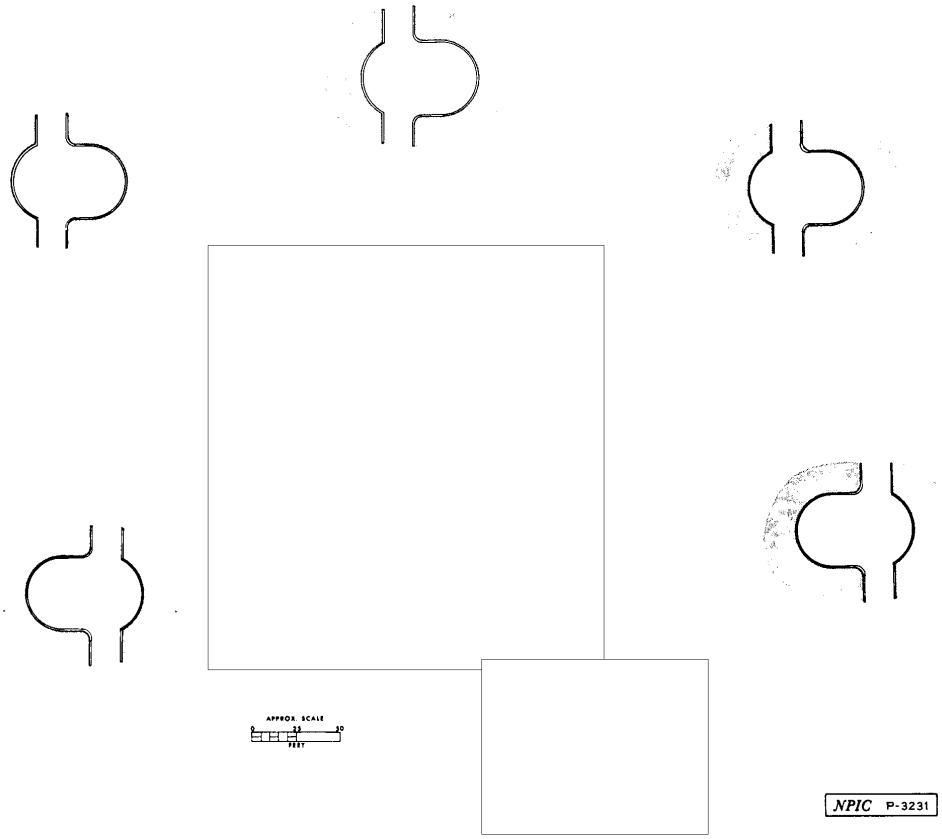


FIGURE 9. ARTIST'S CONCEPT OF A T-SHAPED GUIDANCE AREA

Field-Deployed Guidance Area (Figure 12)

24. A Field-Deployed guidance area is one that has no revetments, structures or any type of protection. The field-deployed SAM site has appeared throughout the country at different times, and normally is deployed for short periods of time. Since no construction is necessary the field-deployed site may be set up and may become operational very rapidly. The guidance radar and vans are set up in the same or similar manner as they are in the revetted type. The only difference is the absence of protection from blast and explosions. There have been several occasions in Egypt when the SAM equipment for a site was field deployed nearby while the hardened site was constructed. In Egypt at present, there are three field-deployed sites having four launch positions and one site having six launch positions.

SA-6 Revetted Guidance Area (Figure 13)

25. The SA-6 system has been deployed in two ways in Egypt. One way is to deploy around an existing SA-2 or SA-3 site. When deployed in this way, the tracking and guidance radar is positioned in the radar revetment normally used to house the FAN SONG or LOW BLOW radar. The radar support equipment occupies the side revetments, and there are no alterations to the original guidance area (Figure 14). The other way is to deploy in sites constructed specifically for the SA-6. This type of site has a revetted guidance area and consists of three drive-in revetments and four personnel shelters. The revetments may be arranged in a line or a V-pattern. The revetment located in the middle of a line, or at the pinnacle in the case of the V, will house the tracking and guidance radar. The other two revetments accommodate the radar support equipment. This type of guidance area was first observed in April 1971.

26. None of the SA-6 guidance areas were observed on high-resolution photography during the construction phases; but it is estimated that the base area for the revetment is cleared and leveled by bulldozer, and then a concrete liner [redacted] 25X1
[redacted] 25X1 is constructed and embanked with earth.

27. Each of the four personnel shelters consists of a linear concrete structure [redacted]; with a rectangular concrete lined walk-in entrance 25X1 revetment at each end. There are two small air vents that protrude from the linear structure. After construction is complete the structure is earth covered leaving the mound and entrances visible. These entrances measure [redacted] 25X1
25X1

28. Ten SA-6 associated sites have been identified in Egypt (Table 1); all are located in the vicinity of the Aswan high dam. Seven of these sites have the revetted SA-6 type guidance areas, two are deployed at SA-2 sites having Single-I guidance areas, and one is deployed at an SA-3 site having a Double-I guidance area.

25X1

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Table 1. The Nine Types of Guidance Areas in Egypt

	REVETTED	PREFAB-I	SINGLE-I	DOUBLE-I	T-SHAPED	SEVEN-ENTRANCE	ODD	FIELD-DEPLOYED	SA-6 GUIDANCE AREA	TOTALS
SA-2										
AL FAYYUM	3		8							11
AL GHURDAQAH	1		7							8
AL ISMAILIYAH	41	77	21			2	3			144
AL MANSURAH	1	4	6		4					15
AL UQSUR	4		5							9
ALEXANDRIA	4		4	2	5		2			17
ASWAN	4		5	1	5		4	2		21
ASYUT	2		7							9
BANI SUWAYF	4	3	7		1					15
BIR SAFAJAH	3				1	1				5
CAIRO	37		31	3	10		1			82
MATRUH	3		3							6
NAJ HAMMADI	3		7							10
PORT SAID	5									5
SUEZ	12	13	9			2	2			38
TANTA	4		14				3			21
ZAFARANAH	1		4							5
TOTAL SA-2	132	97	138	6	26	5	15	2		421
SA-3										
AL ISMAILIYAH		4								4
ALEXANDRIA	1		1	2			1			5
ASWAN	8			1				3		12
ASYUT			1							1
BANI SUAYF	1				1					2
CAIRO	14			42			2			58
TOTAL SA-3	24	4	2	45	1		3	3		82
SA-6										
ASWAN			2*	1*					7	10
TOTAL	156	101	140	51	27	5	18	5	7	510

*Included in the Aswan SA-2 and SA-3 counts.

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