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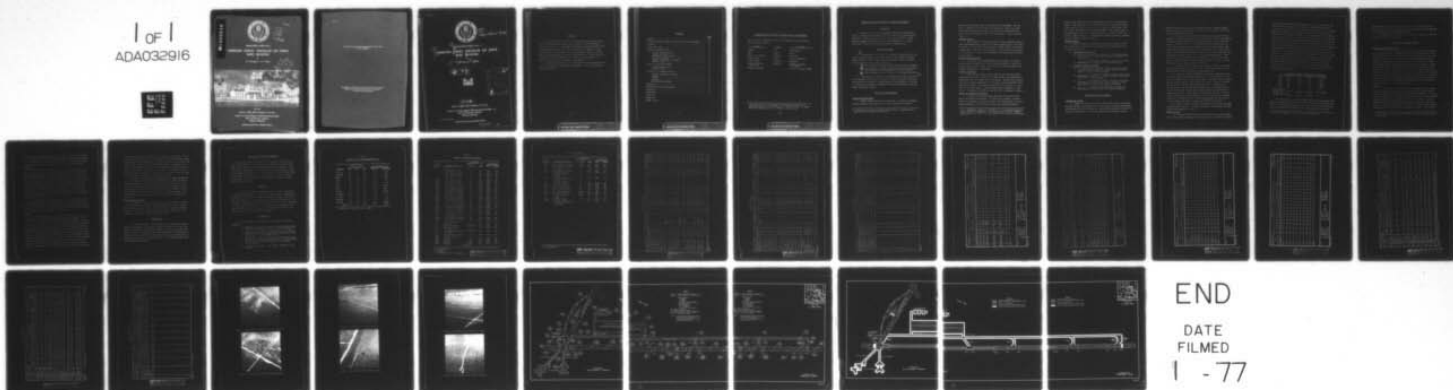
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CONDITION SURVEY, KINCHELOE AIR FORCE BASE, MICHIGAN.(U)
MAY 73 H T THORNTON, P J VEDROS

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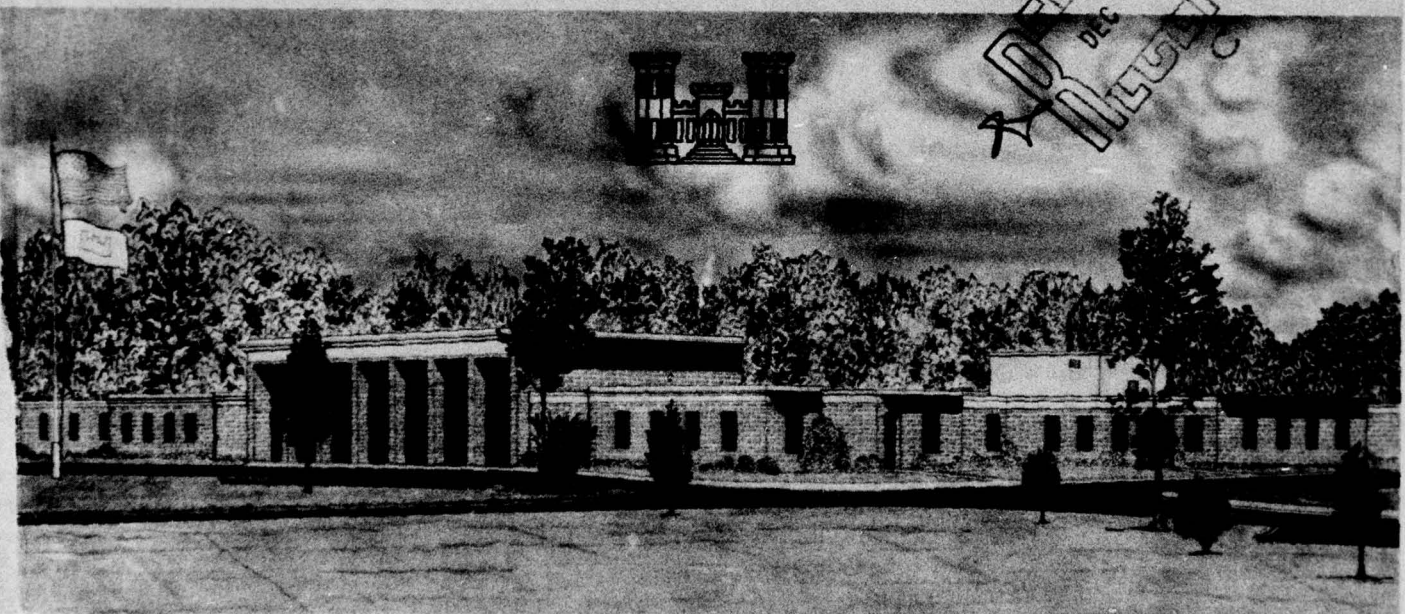
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CONDITION SURVEY, KINCHELOE AIR FORCE BASE, MICHIGAN

by

H. T. Thornton, Jr., P. J. Vedros

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Soils and Pavements Laboratory
Vicksburg, Mississippi

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Foreword

The study reported herein was conducted under the general supervision of the Engineering Design Criteria Branch, Soils and Pavements Laboratory, of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. Personnel involved in the condition survey were Messrs. H. T. Thornton, Jr., R. N. Gordon, Sr., and S. J. Alford. This report was prepared by Messrs. Thornton and P. J. Vedros under the general supervision of Messrs. J. P. Sale, R. G. Ahlvin, and R. L. Hutchinson of the Soils and Pavements Laboratory.

COL Ernest D. Peixotto, CE, was Director of the WES during the conduct of the study and preparation of the report. Mr. F. R. Brown was Technical Director.

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Conversion Factors, British to Metric Units of Measurement

British units of measurement used in this report can be converted to metric units as follows:

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
inches	2.54	centimeters
feet	0.3048	meters
miles (U. S. statute)	1.609344	kilometers
square inches	6.4516	square centimeters
pounds (mass)	0.45359237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter
Fahrenheit degrees	*	Celsius or Kelvin degrees

* To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9)(F - 32)$. To obtain Kelvin (K) readings, use: $K = (5/9)(F - 32) + 273.15$.

CONDITION SURVEY, KINCHELOE AIR FORCE BASE, MICHIGAN

Authority

1. Authority for conducting condition surveys at selected airfields is contained in amendment to FY 1972 RDTE Funding Authorization (MFS-MC-5, 16 February 1972), subject: "Air Force Airfield Pavement Research Program," from the Office, Chief of Engineers, U. S. Army, Directorate of Military Construction, dated 18 February 1972.

Purpose and Scope

2. The purpose of this report is to present the results of a condition survey performed at Kincheloe Air Force Base (KAFB), Michigan, during 27-29 April 1972. The following three major areas of interest were considered in this condition survey:

- ① The structural condition of the primary airfield pavements.
- ② The condition of pavement repairs and the types of maintenance materials that have been used at this airfield.
- ③ Any detrimental effects of frost to the pavement facilities.

3. This report is limited to a presentation of visual observations of the pavement conditions, discussion of these observations, and pertinent remarks with regard to the performance of the pavements. No physical tests of the pavements, foundations, or patching materials were performed during this survey.

Pertinent Background Data

Location and topography

4. KAFB, formerly Kinross Air Force Base, is located in Chippewa County, Michigan, approximately 2-1/2 miles* southeast of Kinross,

* A table of factors for converting British units of measurement to metric units is presented on page vii.

Michigan, and 18 miles south of Sault Ste. Marie, Michigan. The airfield is situated on a relatively flat sandy plain, which lies some 80 ft above the surrounding area. The elevation of the airfield is about 790 ft above mean sea level. A vicinity map is shown in plates 1 and 2.

Geology and soils

5. The airfield is underlain by thinly bedded limestone strata of Ordovician-Richmond age, which have a slight regional dip to the south. The bedrock is covered by a thin veneer of clayey, glacial till and uncemented sand. The soil at the airfield is a loose uniform sand, which is classified as an SP material according to the Unified Soil Classification System.*

Drainage and water table

6. The sandy soil is predominantly free draining. The water table occurs at a depth of 10 to 20 ft below the surface. Due to the pervious nature of the natural soil, the use of field tile drains and pavement edge drains is unnecessary.

Climatic conditions

7. KAFB weather station records indicate that the mean annual temperature of the area is about 41 F, with monthly mean temperatures ranging from 14 F in January to 65 F in August. Records also show that an absolute maximum temperature of 94 F and an absolute minimum of -33 F have been recorded. The average annual rainfall is about 35 in. Winters are long and rigorous, and the average annual snowfall is about 110 in. A tabulation of climatic data for 1971 is presented in table 1.

General description of airfield

8. In April 1972, the airfield facilities consisted of both heavy- and light-load pavements. The heavy-load pavements included a NW-SE (15-33) runway, a parallel taxiway, two warm-up aprons, four connecting taxiways, a SAC operational apron and connecting taxiways,

* U. S. Department of Defense, "Unified Soil Classification System for Roads, Airfields, Embankments, and Foundations," Military Standard MIL-STD-619B, June 1968, U. S. Government Printing Office, Washington, D. C.

hangar access aprons and connecting taxiways, and SAC alert aprons and taxiway. The runway was 300 ft wide and 12,000 ft long; the SAC operational apron was 700 ft wide and 2,185 ft long; and the taxiways were 75 ft wide. The light-load pavements included an ADC parking apron, an ADC operational apron, and connecting taxiways. A layout of the airfield is shown in plate 1. A pavement plan indicating the type pavement on each facility is shown in plate 2.

Previous reports

9. Previous reports concerning the airfield facilities at KAFB are listed below. Pertinent data were extracted from them for use in this condition survey.

10. Condition survey reports:

- a. Ohio River Division Laboratories, CE, "Condition Survey Report, Kinross Air Force Base, Michigan," November 1958, Cincinnati, Ohio.
- b. _____, "Condition Survey Report, Kincheloe Air Force Base, Michigan," September 1966, Cincinnati, Ohio.

11. Pavement evaluation reports:

- a. U. S. Army Engineer District, Detroit, CE, "Final Report, Airfield Pavement Evaluation, Kinross Airport, Kinross, Michigan," 1944, Detroit, Michigan.
- b. _____, "Evaluation of Flexible Pavement, Extension of Northwest-Southeast Runway, Kinross Air Force Base, Michigan," 1954, Detroit, Michigan.
- c. _____, "Evaluation of Flexible Pavement, Alert Taxiway Extension and Rear Access Apron, Kinross Air Force Base, Michigan," August 1958, Detroit, Michigan.
- d. _____, "Airfield Evaluation Report, Kincheloe Air Force Base, Michigan," March 1960, Detroit, Michigan.

History of Airfield Pavements

Construction history

12. During the period July-October 1942, three runways, peripheral and stub taxiways, turnarounds, and an operational apron were constructed. The pavement of these facilities was 6-in. portland cement concrete (PCC), which was thickened to 9 in. at the longitudinal construction joints,

transverse expansion joints, and longitudinal edges. These pavements were designed to support a gross aircraft load of 30,000 lb with a tire inflation pressure of 44 psi.

13. During the period May-October 1952, the following were constructed: a 1,680-ft extension to the southeast end of the NW-SE runway, a taxiway extension paralleling and then connecting to this runway extension, an alert apron, and a 60-ft-wide by 695-ft-long taxiway connecting the alert apron to the northwest end of the NW-SE runway. Two triangular areas were also added to the operational apron at the junctures of the apron and connecting taxiways. All of these pavements were of flexible pavement construction. During May-September 1956, a rear access apron was constructed, and an extension was added to the alert taxiway. These pavements were designed to support a 25,000-lb, single-wheel load having a tire pressure of 200 psi.

14. In 1957, the NW-SE runway was extended 1,800 ft at the southeast end with uniform 9- and 10-in. PCC. The parallel taxiway was extended 2,596 ft at the northwest end with 10-in. PCC.

15. During the period 1957-1959 the runway was strengthened, and additional extensions, taxiways, aprons, etc., were constructed. Pavements constructed at this time were designed to support a 265,000-lb gear load on twin-twin wheels spaced 37-62-37 in. with a 267-sq-in. contact area per wheel. The SAC hangar access aprons were designed for a 160,000-lb gear load with the same configuration as indicated above for the 265,000-lb load. The ADC alert access taxiway was constructed to support a 25,000-lb, single-wheel load with a tire pressure of 200 psi. The SAC hangar access apron extensions (5 and 6) and the south warm-up apron were constructed in 1961 to the same heavy-load design criteria as the pavements designed to support the 265,000-lb gear load.

16. Details of the construction history of the airfield pavements are presented in table 2. Pavement thicknesses, descriptions, and other details are presented in table 3.

Traffic history

17. A detailed traffic record was available for the period 1966-1971. Some traffic information for the period prior to 1966 is available

in the reports referenced in paragraphs 10 and 11. The earliest aircraft traffic data date back to July 1953, when F-94 aircraft were stationed at the airfield. The F-94 aircraft operated at the base until April 1954, averaging on the order of 500-600 cycles* of traffic per month. The F-89 aircraft replaced the F-94 and averaged about 600-700 cycles per month. Traffic records for August 1956-August 1957 indicate that about 825 cycles per month by military aircraft and 160 cycles per month by civilian aircraft were applied at the airfield. About 95 percent of the military aircraft traffic was from F-89 and F-102 operations. The predominant civilian aircraft using the field was the DC-3. The date that B-52's began operating at KAFB was not available, but it is assumed to be about 1960. In 1965, aircraft traffic consisted of about 80 cycles per month by B-52 and KC-135 aircraft, 60 cycles per month by T-33 aircraft, and about 250 cycles per month by F-106 aircraft. The average gross operating load of the B-52 during this time was 410,000 lb and of the KC-135 was 225,000 lb. The detailed traffic record for the period 1966-1971 is tabulated below. Portions of this record have been estimated.

Year	Cycles of Operation per Type of Aircraft			
	Heavy Bomber	Tanker	Heavy Cargo	All Others
1966	895	842	49	5,869
1967	860	640	48	4,066
1968	756	536	68	1,552
1969	654	554	25	1,577
1970	780	565	20	1,750
1971	947	602	11	2,080
Average takeoff weight, lb	400,000	250,000	195,000	6,000-70,000
Average landing weight, lb	250,000	145,000	80,000	--

18. The records indicate that there have been approximately 70-80 cycles per month of B-52 traffic and 50-70 cycles of KC-135 traffic applied on the pavements during alert exercises. During these exercises, the B-52's approach the northwest end of the runway, taxi down the

* A cycle of operation is one landing and one takeoff.

runway, turn off at taxiway 9, and return to their parking positions. The KC-135's taxi down the length of the runway and the parallel taxiway, and then return to their parking positions.

19. Approximately 60 percent of the takeoffs at KAFB are from the northwest (15) end of the runway.

Conditions of Pavement Surfaces

Pavement inspection procedure

20. The following procedure was used in conducting the inspection of the rigid pavements. Representative features were selected for detailed inspection. The features were then inspected slab* by slab, and the defects were recorded. The locations of the individual pavement features, the inspection starting points, and the directions in which the pavements were inspected (shown by arrows) are indicated in plate 1. The results of the rigid pavement survey for those features that were inspected in detail are presented in table 4. This table shows a quantitative breakdown of the various types of defects and a condition rating for each pavement feature inspected in detail. The procedures used for determining the condition rating of a pavement are given in Appendix III of Department of the Army Technical Manual TM-827-3, "Rigid Airfield Pavement Evaluation," dated September 1965.

Runway

21. As is noted in tables 3 and 4, the pavements of the runway consist of various thicknesses of PCC and reinforced portland cement concrete (RPCC), as well as PCC overlays and RPCC overlays. All of the runway pavements were in excellent structural condition. The only pavements that contained major defects (11 slabs with transverse cracks) were the 14-in. RPCC overlay pavements located between sta 10+00 and 50+00. As is indicated in table 4, there were a number of minor defects (mostly spalls and pop-outs) in the pavement surfaces. Spall repairs

* A slab is the smallest unit, containing no joints, of a given pavement feature.

made with PCC and grout were more numerous from sta 10+00 to 50+00 than in other areas of the runway. Some of the repaired spalls were performing satisfactorily, and some were showing signs of slight deterioration (see photos 1 and 2). The pop-outs had also been patched with PCC.

Taxiways

22. The parallel taxiway was in excellent condition except for one area about 500 ft southeast of taxiway 9, where 16 slabs contained major structural defects. In the 1966 survey, there were 12 slabs in this area that contained major structural defects. The increase in defects has been mostly in the form of diagonal cracks. The remainder of the primary taxiway system was in excellent condition, with only four slabs in SAC operational apron access taxiway 2 and two slabs in SAC alert taxiway 2 having a major structural defect. A small number of minor defects, such as spalls and pop-outs, were recorded. The thicknesses of the pavements of the primary taxiways were 21 in. and of the SAC alert taxiways were 20 in.

23. The SAC hangar apron access taxiway was not surveyed in detail but was generally in a spalled condition, with some slabs containing structural defects. The condition of this taxiway was rated as fair to good. The ADC alert facility, the ADC hangar access apron, and taxiway B have been closed to traffic for some time.

Aprons

24. Approximately one-half of the SAC operational apron was not accessible for a detailed study due to parked alert aircraft. As is noted in table 4, 1080 of the total 2142 slabs were surveyed. The pavement is 17 in. thick in the apron area. No major defects were recorded in the area surveyed. About 3 percent of the slabs surveyed contained minor defects such as spalls or pop-outs. Some longitudinal and transverse joint spalls had been patched with epoxy concrete, and the patches appeared to be performing satisfactorily. A cursory examination of the portion of the apron that was not surveyed in detail indicated that some of the slabs showed signs of structural cracks and some scaling and spalling. The distress was observed in the slabs beneath the parked aircraft. The north and south warm-up aprons and the SAC alert parking

stubs were in excellent condition, with a total of only 5 slabs containing a major structural defect. Minor defects in the north warm-up apron were very few, except for pop-outs in about 15 percent of the slabs. The large number of pop-outs in the north warm-up apron (as compared with those in other areas) may be due to its extensive use during alert exercises. The aircraft tend to utilize this area in taxiing to and from the parking areas and normally have to pause in the area before crossing over the runway and returning to the SAC alert stubs.

25. The ADC parking apron and operational apron were constructed in 1942 of 9-6-9-in. PCC. These aprons contained a moderate number of structural defects, pop-outs, and spalls. The PCC that has been used to patch the spalls and pop-outs has performed satisfactorily. Epoxy material has been tried on some of the spalls, but the patches have become unbonded and have had to be replaced. These aprons receive only light traffic and are considered to be in fair to poor condition (see photos 3-5).

Miscellaneous pavements

26. Taxiways 9 and 11 were surveyed in detail and were in excellent condition. The asphaltic concrete shoulders and blast pavements were in good condition, with only a minor amount of shrinkage cracking occurring. Some of the larger cracks, such as the longitudinal crack (photo 6) on the north overrun, need to be sealed.

Maintenance

27. A large reduction in maintenance costs at KAFB was realized with the curtailment of use of the taxiways and aprons in the ADC area. Most of the airfield maintenance now consists of repairing pop-outs and spalls with PCC on an in-house basis when time permits or when necessitated by hazardous conditions. Epoxy patches have not performed well in this area, so they are no longer being used. PCC patches are used, and they perform satisfactorily.

Condition of Joint Seal Materials

28. At the time of this survey, the joint seal material was in fair to good condition. During August and September 1972, joint seal material was applied on the runway and primary taxiway system. Joint seal material conforming to Federal Specification SS-S-1614 was applied to the taxiway and runway ends and to the north and south warm-up aprons. The remainder of the runway, the parallel taxiway, and the connecting taxiways were sealed with a joint seal material conforming to Federal Specification SS-S-1401.

Evaluation

29. The latest pavement evaluation report for KAFB was prepared in 1960 (see paragraph 11d). Since some changes in gear configurations and methods of evaluation have been made since that time, a new evaluation table (table 5) has been prepared. The physical properties of the materials as determined in previous evaluations were used for determining the load-carrying capabilities of the pavements. An evaluation for the frost-melting period was not made, since the subgrade at KAFB is considered to be a nonfrost-susceptible material.

Conclusions

30. The following remarks summarize the findings of the 1972 inspection:

- a. The primary pavements subjected to heavy loading are performing satisfactorily and are in excellent condition.
- b. There has been very little progression in the number and degree of defects in the portion of the parallel taxiway near taxiway 9 since the 1966 survey.
- c. Minor defects, such as pop-outs and spalls, have not developed into a major maintenance problem at this airfield. The PCC used for patching appears to be performing satisfactorily.
- d. There are no drainage or frost damage problems at this airfield.

Table 1
Climatic Data,* January-December 1971

<u>Month</u>	<u>Average Daily Temperature, F</u>			<u>Precipitation, in.</u>	
	<u>Max</u>	<u>Min</u>	<u>Mean</u>	<u>Rainfall</u>	<u>Snowfall</u>
January	21	6	14	2.7	27.7
February	24	7	16	1.5	18.4
March	32	15	24	2.1	16.1
April	47	30	39	2.8	3.3
May	60	39	50	2.7	0.3
June	71	49	60	3.0	Trace
July	75	53	64	3.2	None
August	75	54	65	3.8	Trace
September	64	46	55	4.0	0.3
October	55	38	47	2.1	1.9
November	40	27	34	3.6	16.3
December	<u>27</u>	<u>13</u>	<u>20</u>	<u>4.2</u>	<u>25.5</u>
Annual	49	31	41	35.7	109.8

* Furnished by weather station at KAFB.

Table 2
Airfield Construction History

Feature No.	Pavement Facility	Pavement		Construction	
		Thickness in.	Type	Year	Agency
	NW-SE runway				
	Sta 0+00 to 55+00	6	PCC	1942	CE†
	Sta 55+00 to 71+80	3	AC	1952	CE
	Sta 71+80 to 80+00	9	PCC	1957	CE
	Sta 80+00 to 89+80	10	PCC	1957	CE
R1A	Sta 0+00 to 5+00*	24	PCC	1958	CE
R2B	Sta 0+00 to 5+00*	22	PCC	1958	CE
R3B	Sta 5+00 to 10+00*	22	PCC	1958	CE
R13D	Sta 5+00 to 10+00*	14	RPCC	1958	CE
R4C	Sta 10+00 to 50+00**	14	RPCC	1958	CE
R14D	Sta 10+00 to 50+00**	14	PCC	1958	CE
R5C	Sta 50+00 to 55+00*	20	PCC	1958	CE
R12C	Sta 70+40 to 72+00*	20	PCC	1958	CE
R15D	Sta 50+00 to 55+00*	14	RPCC	1958	CE
R6C	Sta 55+00 to 70+40**	12	RPCC	1958	CE
R16D	Sta 55+00 to 70+40**	12	PCC	1958	CE
R17D	Sta 70+40 to 72+00*	14	PCC	1958	CE
R7C	Sta 72+00 to 80+00**	12	PCC	1958	CE
R18D	Sta 72+00 to 80+00**	12	PCC	1958	CE
R8C	Sta 80+00 to 89+80**	12	PCC	1958	CE
R19D	Sta 80+00 to 89+80**	12	PCC	1958	CE
R9C	Sta 89+80 to 110+00	17	PCC	1959	CE
R20D	Sta 89+80 to 115+00 and 120+00	15	PCC	1959	CE
R10B	Sta 110+00 to 115+00	20	PCC	1959	CE
R11A	Sta 115+00 to 120+00	21	PCC	1959	CE
T1A	South connecting taxiway	21	PCC	1959	CE
T2A	Parallel taxiway	20-21-20	PCC	1959	CE
T3A	North connecting taxiway*	21	PCC	1959	CE
T4A	SAC operational apron taxiway	17-21-17	PCC	1959	CE
T5A	SAC operational apron access taxiways	21	PCC	1959	CE
T10A					
T6C	Taxiway 11	17	PCC	1959	CE
T15C	Taxiway 9	17	PCC	1959	CE
T7B	Taxiway A	9-6-9	PCC	1942	CE
T12B	Taxiway B	9-6-9	PCC	1942	CE

(Continued)

- * Reconstruction.
- ** Overlay.
- † CE denotes Corps of Engineers.

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Table 2 (Concluded)

Feature No.	Pavement Facility	Pavement		Construction	
		Thickness in.	Type	Year	Agency
T11B	ADC connecting taxiway	9-6-9	PCC	1942	CE
T8B	ADC alert apron access taxiway	10	PCC	1959	CE
A1B	SAC operational apron	17	PCC	1959	CE
A2B	SAC hangar access aprons (1-4) and taxiway	14	PCC	1959	CE
A2B	SAC hangar access aprons (5 and 6) and taxiway extension	14	PCC	1961	CE
A3B	SAC alert aprons	20	PCC	1959	CE
T9B	SAC alert taxiways	20	PCC	1959	CE
A4B	North warm-up apron*	20	PCC	1959	CE
A5B	South warm-up apron	20	PCC	1961	CE
A7B	ADC operational apron	9-6-9	PCC	1942	CE
A6B	ADC parking apron	9-6-9	PCC	1942	CE
A8B	ADC hangar access apron	9-6-9	PCC	1942	CE
A9B	ADC alert apron	3	AC	1952	CE
T13B	ADC alert taxiway extension and rear access apron	3	AC	1956	CE

* Reconstruction.

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TABLE 3
SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY Election, AEP, N.H.	FACILITY NUMBER AND IDENTIFICATION			OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA OR CONSIDERED
	FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK. IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
B1A	W-SE runway, 1st 500 Ft; sta 0+00 to 5+00, 200-ft width, east side	500	200	24	Portland cement concrete	800	24	Portland cement concrete	800				Sand (SF)	300	Excellent
B2B	W-SE runway, 1st 500 Ft; sta 0+00 to 5+00, 100-ft width, west side	500	100	22	Portland cement concrete	800	22	Portland cement concrete	800				Sand (SF)	300	Excellent
B3B	W-SE runway, 2nd 500 Ft; sta 5+00 to 10+00	500	110	22	Portland cement concrete	800	22	Portland cement concrete	800				Sand (SF)	300	Excellent
B13D	W-SE runway, 2nd 500 Ft; sta 5+00 to 10+00, outside edges	500	95	14	Portland cement concrete reinforced	800	14	Portland cement concrete reinforced	800				Sand (SF)	300	Excellent
B1C	W-SE runway interior sta 10+00 to 50+00	4,000	110	14	Portland cement concrete reinforced (0.17%) $\frac{h}{E} = 14.9$	800	6	Portland cement concrete reinforced $\frac{h}{E} = 14.9$	800	5	Stabilized gravel (SW)	250	Sand (SF)		Excellent
B13D	W-SE runway interior sta 10+00 to 50+00, outside edges	4,000	95	14	Portland cement concrete	800	6	Portland cement concrete	800				Sand (SF)	300	Excellent
B5C	W-SE runway interior sta 50+00 to 59+00	500	212	20	Portland cement concrete	800	20	Portland cement concrete	800				Sand (SF)	300	Excellent
B13D	W-SE runway interior sta 50+00 to 59+00, west side	500	90	14	Portland cement concrete reinforced	800	14	Portland cement concrete reinforced	800				Sand (SF)	300	Excellent
B6C	W-SE runway interior sta 59+00 to 70+00	1,340	120	12	Portland cement concrete reinforced (0.28%) $\frac{h}{E} = 13.5$	800	3	Portland cement concrete reinforced	800	6	Stabilized gravel (SW)	CBR-50	Sand (SF)	CBR-23	Excellent
B15D	W-SE runway interior sta 59+00 to 70+00, outside edges	1,340	90	12	Portland cement concrete	800	3	Portland cement concrete	800	6	Stabilized gravel (SW)	CBR-50	Sand (SF)	CBR-23	Excellent
B12D	W-SE runway interior sta 70+00 to 72+00	160	110	20	Portland cement concrete	800	20	Portland cement concrete	800				Sand (SF)	300	Excellent
B17D	W-SE runway interior sta 70+00 to 72+00, outside edges	160	95	14	Portland cement concrete	800	14	Portland cement concrete	800				Sand (SF)	300	Excellent
B7C	W-SE runway interior sta 72+00 to 80+00	800	120	12	Portland cement concrete	800	9	Portland cement concrete $\frac{h}{E} = 17.3$	800				Sand (SF)	200	Excellent
B15D	W-SE runway interior sta 72+00 to 80+00, outside edges	800	90	12	Portland cement concrete	800	9	Portland cement concrete	800				Sand (SF)	200	Excellent
B5C	W-SE runway interior sta 80+00 to 89+00	980	120	12	Portland cement concrete	800	10	Portland cement concrete $\frac{h}{E} = 18$	800				Sand (SF)	200	Excellent

* Equivalent thickness.

COPY AVAILABLE TO DDC DOES NOT
PERMIT FULLY LEGIBLE PRODUCTION

Table 3 (Continued)
SUMMARY OF PHYSICAL PROPERTY DATA

KINCHELOE AFB, Mich. FACILITY NUMBER AND IDENTIFICATION	FACILITY		OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
	LENGTH FT	WIDTH FT	THICK IN.	DESCRIPTION	FLEX. STR PSI	THICK IN.	DESCRIPTION	FLEX. STR PSI	THICK IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
R193 NW-SE runway interior sta 80+00 to 89+00, outside edges	980	90	12	Portland cement concrete	800	10	Portland cement concrete	750				Sand (SF)	200	Excellent
R192 NW-SE runway interior sta 89+00 to 110+00	2,080	100				17	Portland cement concrete	750				Sand (SF)	300	Excellent
R108 NW-SE runway, 2nd 500 ft; sta 110+00 to 115+00	500	100				20	Portland cement concrete	750				Sand (SF)	300	Excellent
R114 NW-SE runway, 1st 500 ft; sta 115+00 to 120+00	500	200				21	Portland cement concrete	750				Sand (SF)	300	Excellent
R208 NW-SE runway, sta 89+00 to 120+00, west side, and sta 89+00 to 115+00, east side	3,000	100				15	Portland cement concrete	750				Sand (SF)	300	Excellent
T1A South connecting taxiway	934	75				21	Portland cement concrete	750				Sand (SF)	300	Excellent
T2A Parallel taxiway	10,500	75				20-21-22	Portland cement concrete	750				Sand (SF)	300	Excellent
T3A North connecting taxiway	1,082	75				21	Portland cement concrete	810				Sand (SF)	300	Excellent
T4 SAC operational apron taxiway	1,910	75				17-21-27	Portland cement concrete	770				Sand (SF)	300	Excellent
T5A SAC operational apron taxiways (2)	250	75				21	Portland cement concrete	770				Sand (SF)	300	Excellent
T0B SAC alert taxiways 1 & 2 and alert aprons	Varies	Varies				20	Portland cement concrete	790				Sand (SF)	300	Excellent
A1B SAC operational apron	2,185	700				17	Portland cement concrete	770				Sand (SF)	300	Excellent
A1B North warm-up apron	600	250				20	Portland cement concrete	800				Sand (SF)	300	Excellent
A2B South warm-up apron	600	250				20	Portland cement concrete	760				Sand (SF)	300	Excellent
A2B SAC hangar access aprons (1-4) & taxiway SAC hangar access apron extension (5 & 6)	Varies	Varies				14	Portland cement concrete	760				Sand (SF)	300	Fair
T7B Taxiway A	1,700	50				9-5-9	Portland cement concrete	850				Sand (SF)		Fair to poor
T12B Taxiway B	1,700	50				21	Portland cement concrete	770				Sand (SF)	300	Excellent
T11B ADC connecting taxiway extension (5 & 6)	350	75				10	Portland cement concrete	770				Sand (SF)	300	Fair
T15C Taxiway 9	600	75												
T0C Taxiway 11	600	75												
T6B ADC alert taxiway	600	75												

(2 of 3 sheets)

NSG FORM 1000
MAY 1956

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Table 3. (Continued)
SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY				OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	GENERAL CONDITION OF AREA CONSIDERED	
															DESCRIPTION
Blindhole APB, Mich.															
A7B ADC operation apron	900+	300	9-6-9				Portland cement concrete	250	5	Stabilized aggregate (5%)	250	Good (BT)	250	Fair	
A6B ADC parking apron	1,575+	300													
A5B ADC hangar access apron	2,735+	300													
A9B ADC alert apron and taxiway	Varies	Varies													
B21X 36-SE runway blast area sta 310+00 to 312+50	180	300					Asphaltic concrete		7	Stabilized aggregate (5%)	100	Good (BT)	100	Fair	
B21Y 36-SE runway blast area sta 312+50 to 312+50	150	300					Bituminous surface		8		CBR= 50	Good (BT)	CBR= 85	Good	
B22X 36-SE runway overrun sta 312+50 to 313+00	850	300					Bituminous surface		8		CBR= 50	Good (BT)	CBR= 25	Good	
B22Y 36-SE runway overrun sta 312+50 to 313+00	850	300					Double bituminous surface treatment		10		CBR= 50	Good (BT)	CBR= 25	Good	

Table 4 (Continued)

DATE: April 1972		SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY											AERFIELD Litchfield, Ill., Mich.													
NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	BASE THICK IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS											% OF SLABS WITH MAJOR DEFECTS	% OF MAJOR DEFECTS	CONDITION								
					I	-	\	Δ	*	K	w	S	J	↓	J				⊕	M	P	O	C	D		
B7C	NW-SE runway, sta 815B 72+00 to 80+00	20 by 21 1/4 15 by 21 1/4	640	12 1/2																		92	100	Excellent		
B6C	NW-SE runway, sta 80+00 to 89+50	20 by 21 1/4 15 by 21 1/4	800	12 1/8																			93	100	Excellent	
B9C	NW-SE runway, sta 820D 89+50 to 110+00	25 by 25	960	15 & 17																			87	100	Excellent	
F10C	NW-SE runway 820D 33 end End 500 ft	25 by 25	240	15 & 20																			17	100	Excellent	
R11A	NW-SE runway 820D 33 end Jet 500 ft	25 by 25	240	15 & 21																			7	100	Excellent	
T1A	South connecting taxiway	25 by 25	126	21																			1	100	Excellent	
T2A	Parallel taxiway	25 by 25	1275	20- 21- 20																				13	100	Excellent
T3A	North connecting taxiway	25 by 25	226	21																				5	100	Excellent

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	w	SHRINKAGE CRACK	M	MAP CRACKING
-	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
*	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

WES FORM NO. 2004
JUN 1972

(2 of 4 sheets)

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Table 4 (continued)

DATE: April 1972		SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY														AIRFIELD: MILWAUKEE AFB, WIS.					
NO.	FEATURE	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE THICK. IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS														% OF SLABS NO. MAJOR DEFECTS	% OF SLABS NO. DEFECTS	CONDITION
					I	-	/	Δ	*	K	w	S	J	↓	J	⊕	M	P			
T9B	SAC alert taxiway 1	25 by 25	300	20														9	95	100	Excellent
T9B	SAC alert taxiway 2	25 by 25	255	20	2									1	1	6		7	93	99	Excellent
T5A	SAC operational apron access taxiway 2	25 by 25	50	21	2	1	1								2	2			84	92	Excellent
T10A	SAC operational apron access taxiway 1	25 by 25	49	21												7			86	100	Excellent
T4A	SAC operational apron taxiway	25 by 25	360	17-21										2	1	1		4	98	100	Excellent
A1B	SAC operational apron	25 by 25	1090*	17										1	7	7		13	97	100	Excellent
A3B	SAC alert stubs 1-9	25 by 25	623	20	2	1								1	1	3		9	97	99	Excellent
A4B	North warm-up apron	25 by 25	274	20	1									2	3	1	4	36	84	99	Excellent
A5B	South warm-up apron	25 by 25	249	20												3		7	95	99	Excellent
T15C	Taxiway 9	25 by 25	134	17	2											2		10	91	99	Excellent

REMARKS: * 1080 slabs surveyed out of total of 2142 slabs.

LEGEND: I LONGITUDINAL CRACK
 - TRANSVERSE CRACK
 / DIAGONAL CRACK
 Δ CORNER BREAK
 * SHATTERED SLAB
 K KEYED JOINT FAILURE
 S SHRINKAGE CRACK
 W SCALING
 J SPALL ON TRANSVERSE JOINT
 ↓ SPALL ON LONGITUDINAL JOINT
 ⊕ CORNER SPALL
 ⊕ SETTLEMENT
 M MAP CRACKING
 P PUMPING JOINT
 O POP-OUT
 C UNCONTROLLED CONTRACTION CRACK
 D "D" CRACKING

COPY AVAILABLE TO DDC DOES NOT PERMIT FULLY LEGIBLE PRODUCTION

Table 5

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Kincheloe AFB		DATE OF EVALUATION		LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										REMARKS
MONTH: April		YR: 1972		TRICYCLE ARRANGEMENT										BICYCLE
NO.	FEATURE	DESIGNATION	PAVEMENT OPERATIONAL USE	TRICYCLE ARRANGEMENT										BICYCLE
				1	2	3	4	5	6	7	8	9	10	
				SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-PSI CONTACT AREA	SINGLE 241.50-IN. CONTACT AREA	TW 24 IN. C-C 226-PSI IN. CONTACT AREA EACH TIRE	SINGLE TANDUM 48 IN. SPACING 400-PSI CONTACT AREA	TW 37 IN. C-C 387-PSI IN. CONTACT AREA EACH TIRE	TW 44 IN. C-C 483-PSI IN. CONTACT AREA EACH TIRE	TW 44 IN. C-C 33 IN. M-N 208-PSI IN. CONTACT AREA EACH TIRE	C-54 GEAR CONFIGURATION	TW 1 TW 1 TW 1	
R1A	NW-SE runway 1st 500 ft sta 0+00 to 5+00 200-ft width east side		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R2B	NW-SE runway 1st 500 ft sta 0+00 to 5+00 100-ft width west		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R3B	NW-SE runway 2nd 500 ft sta 5+00 to 10+00		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R4C	Runway interior sta 10+00 to 50+00		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R5C	Runway interior sta 50+00 to 55+00, sta 70+40 to 72+00		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R6C	Runway interior sta 55+00 to 70+40		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R7C	Runway interior sta 72+00 to 80+00		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R8C	Runway interior sta 80+00 to 89+80		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
R9C	Runway interior sta 89+80 to 1110+00		Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	

Note: + sign denotes allowable gross loading greater than maximum gross weight of any existing aircraft having indicated gear configuration.
 (a) denotes allowable gross loading less than minimum gross weight of any existing aircraft having indicated gear configuration.

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Table 5 (Continued)
SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Kincheloe AFB		DATE OF EVALUATION		LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS												REMARKS
MONTH: April		YR: 1972		TRICYCLE ARRANGEMENT												
NO.	FEATURE DESIGNATION	PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	1	2	3	4	5	6	7	8	9	10			
R10B	NW-SE runway 2nd 500 ft. sta 110+00 to 115+00	Capacity	155,000+	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+			
R11A	NW-SE runway 1st 500 ft. sta 115+00 to 120+00	Capacity	155,000+	155,000+	85,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T1A	South connecting taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T2A	Parallel taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T3A	North connecting taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T4A	SAC operation apron taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T5A T10A	SAC access taxiways 1 & 2	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T15C T6C	Taxiway 9 Taxiway 11	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
T7B T11B	Taxiway A ADC connecting taxiway	Capacity	45,000	30,000	75,000	70,000	115,000	85,000	125,000	155,000	155,000	410,000	(a)			
A1B	SAC operational apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+				
A2B	SAC hanger access aprons & taxiways (1-4)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	260,000	230,000+	380,000+	800,000+	360,000			
A3B T9B	SAC alert aprons & taxiways	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	230,000+	380,000+	800,000+	600,000+			
A4B	North warm-up apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	230,000+	380,000+	800,000+	600,000+			

WES FORM NO. 959
JUNE 1972

EDITION OF AUG 1960 IS OBSOLETE.

(2 of 3 sheets)

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Table 5 (Concluded)
SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Kincheloe AFB		LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										REMARKS	
DATE OF EVALUATION MONTH: April YR: 1972		TRICYCLE ARRANGEMENT											
NO.	FEATURE DESIGNATION	PAVEMENT OPERATIONAL USE	1	2	3	4	5	6	7	8	9		BICYCLE
A7B	South warm-up apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	590,000	
A6B A7B	ADC operational apron ADC parking apron	Capacity	45,000	30,000	75,000	70,000	115,000	85,000	125,000	155,000	440,000	(%)	
	Note: Evaluation not required for frbst criteria as subgrade is considered to be non frost-susceptible.												

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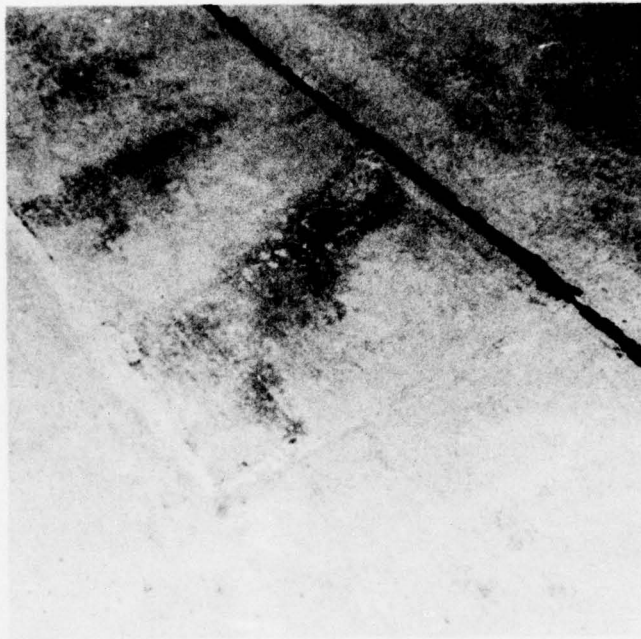


Photo 1. Spall repaired with PCC (in good condition)

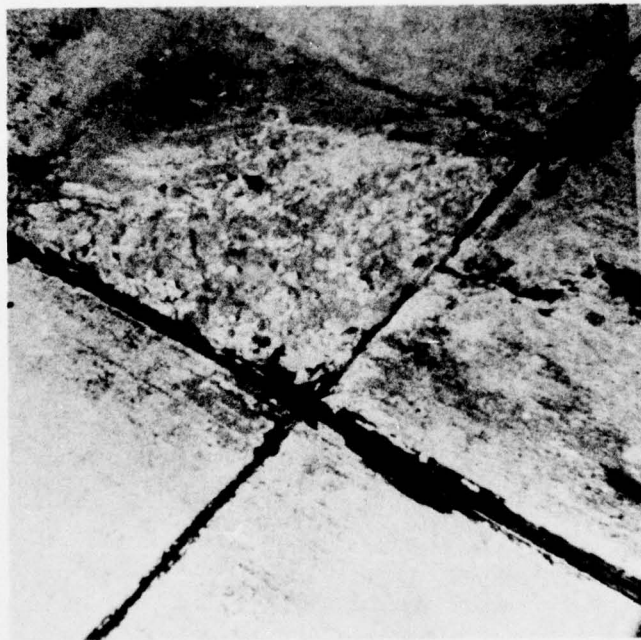


Photo 2. Spall repaired with PCC (deteriorating)

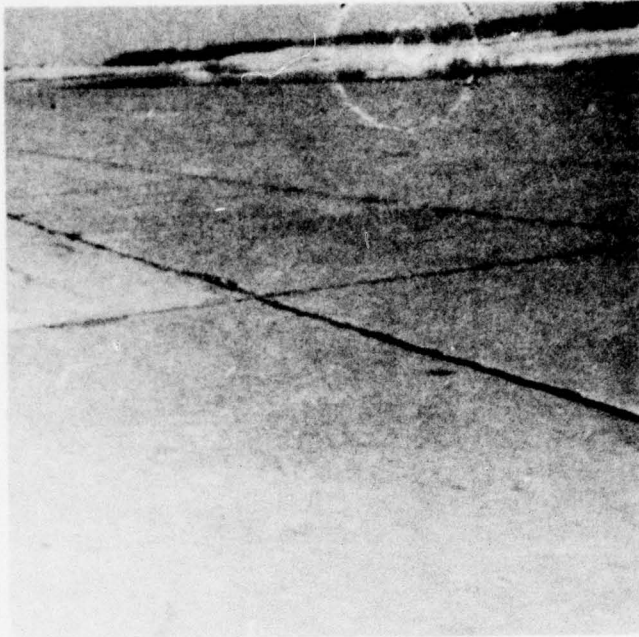


Photo 3. Condition of ADC parking apron

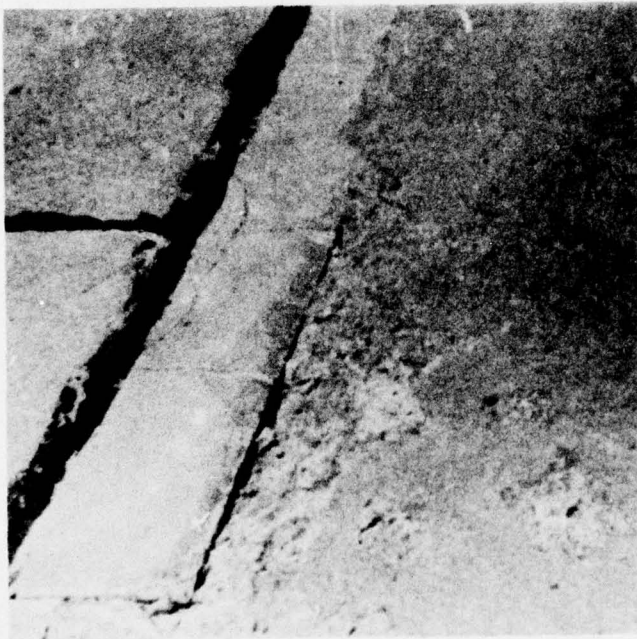


Photo 4. Spall repair on ADC parking apron



Photo 5. Condition of ADC operational apron

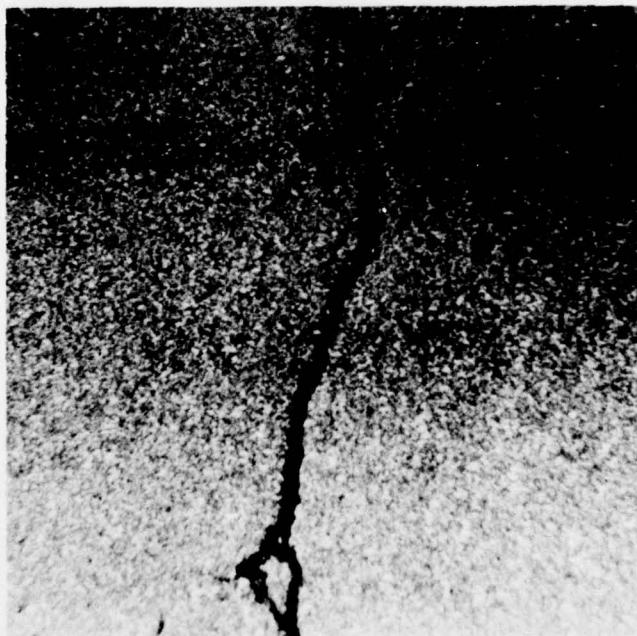
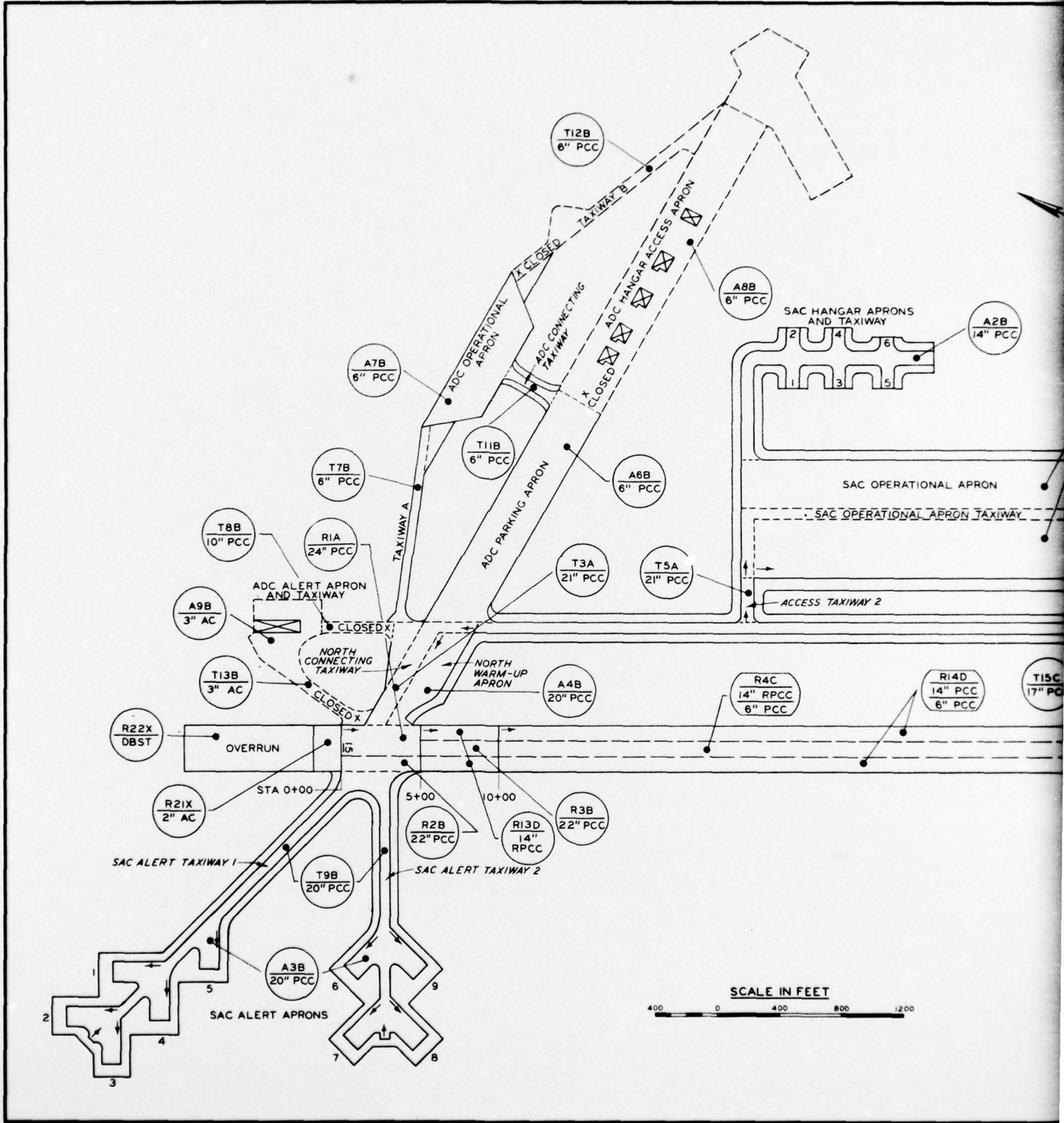


Photo 6. Longitudinal crack in north overrun



LEGEND

← FEATURE DESIGNATION (SEE NOTE 1)

 ← SURFACE PAVEMENT THICKNESS AND TYPE

TYPE OF FEATURE

R - RUNWAY
 T - TAXIWAY
 A - APRON

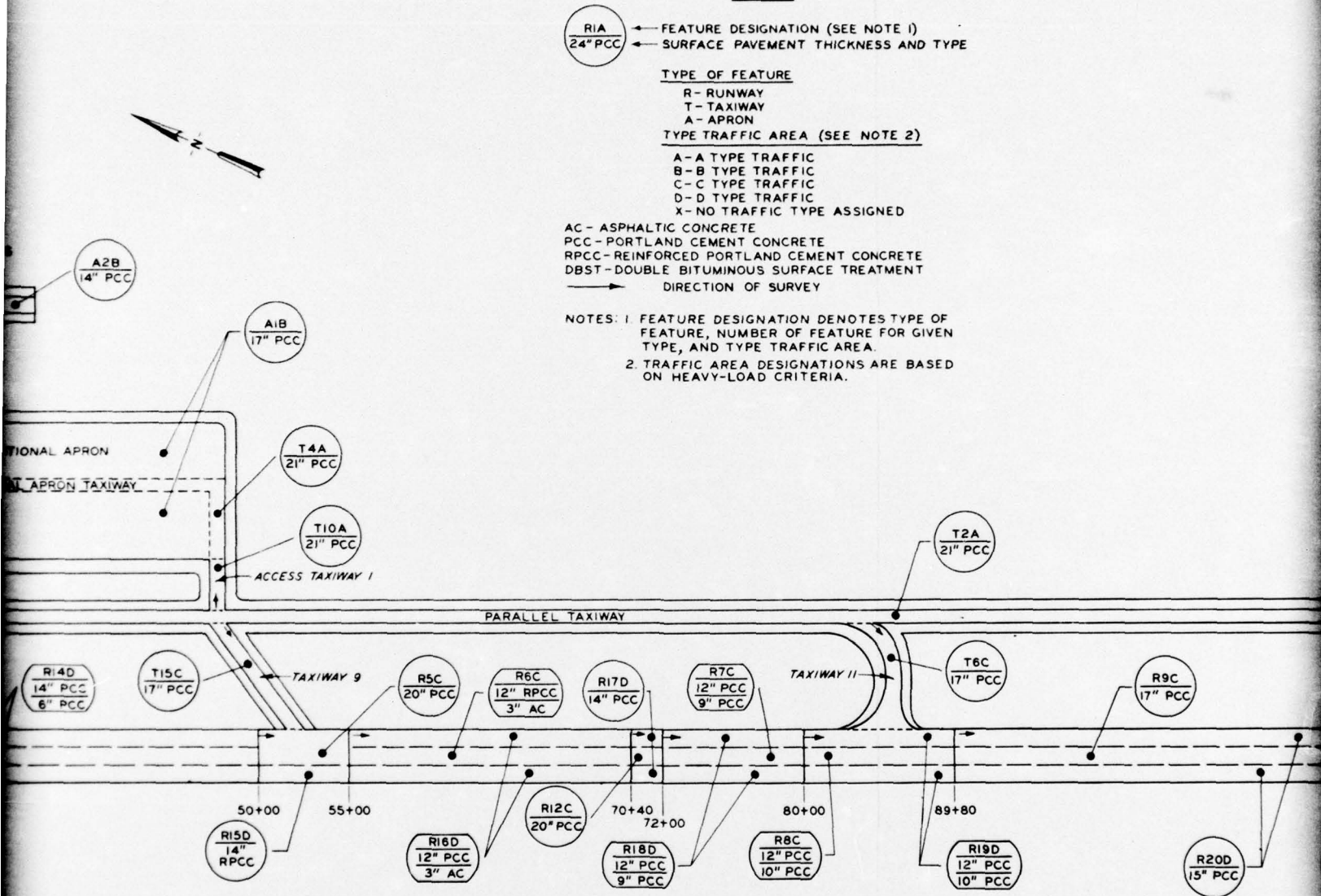
TYPE TRAFFIC AREA (SEE NOTE 2)

A - A TYPE TRAFFIC
 B - B TYPE TRAFFIC
 C - C TYPE TRAFFIC
 D - D TYPE TRAFFIC
 X - NO TRAFFIC TYPE ASSIGNED

AC - ASPHALTIC CONCRETE
 PCC - PORTLAND CEMENT CONCRETE
 RPCC - REINFORCED PORTLAND CEMENT CONCRETE
 DBST - DOUBLE BITUMINOUS SURFACE TREATMENT
 → DIRECTION OF SURVEY

NOTES: 1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER OF FEATURE FOR GIVEN TYPE, AND TYPE TRAFFIC AREA.

2. TRAFFIC AREA DESIGNATIONS ARE BASED ON HEAVY-LOAD CRITERIA.



LEGEND

RIA ← FEATURE DESIGNATION (SEE NOTE 1)
24" PCC ← SURFACE PAVEMENT THICKNESS AND TYPE

TYPE OF FEATURE

R - RUNWAY
 T - TAXIWAY
 A - APRON

TYPE TRAFFIC AREA (SEE NOTE 2)

A - A TYPE TRAFFIC
 B - B TYPE TRAFFIC
 C - C TYPE TRAFFIC
 D - D TYPE TRAFFIC
 X - NO TRAFFIC TYPE ASSIGNED

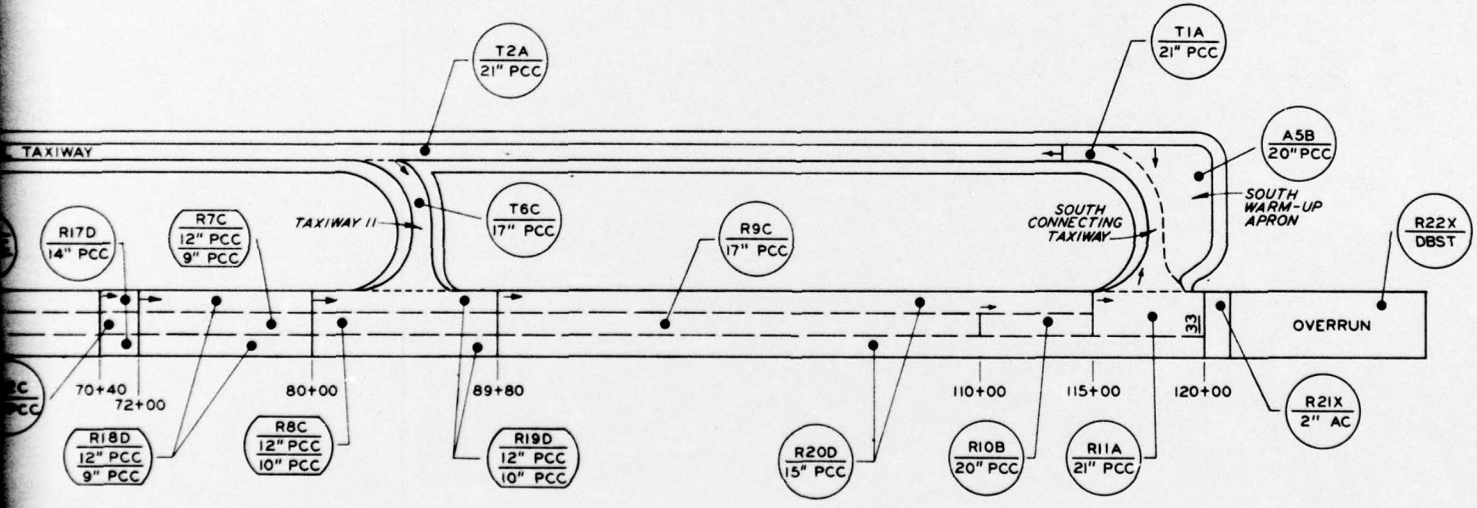
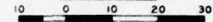
AC - ASPHALTIC CONCRETE
 PCC - PORTLAND CEMENT CONCRETE
 RPCC - REINFORCED PORTLAND CEMENT CONCRETE
 DBST - DOUBLE BITUMINOUS SURFACE TREATMENT
 → DIRECTION OF SURVEY

NOTES: 1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER OF FEATURE FOR GIVEN TYPE, AND TYPE TRAFFIC AREA.
 2. TRAFFIC AREA DESIGNATIONS ARE BASED ON HEAVY-LOAD CRITERIA.

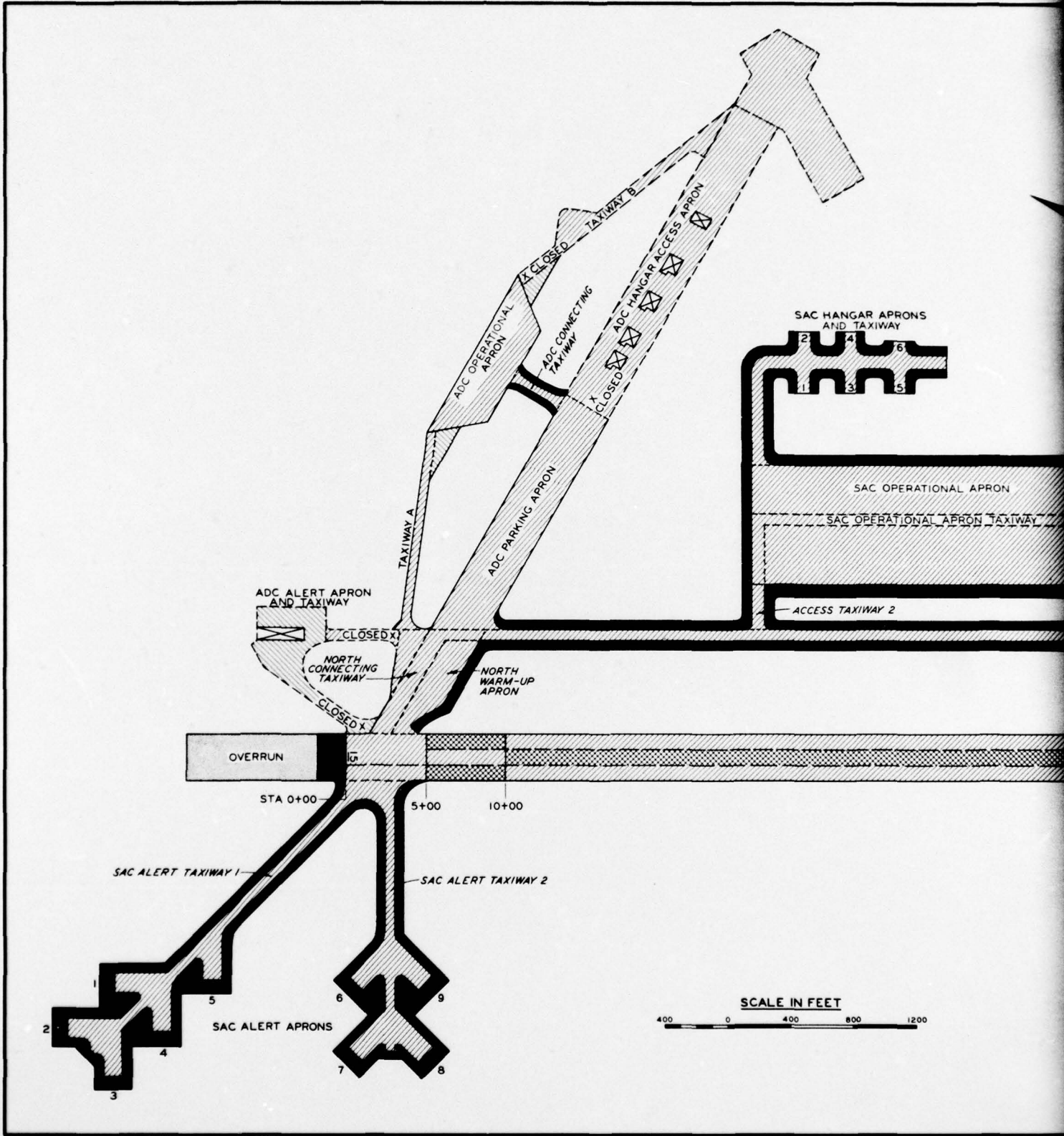


VICINITY MAP

SCALE IN MILES








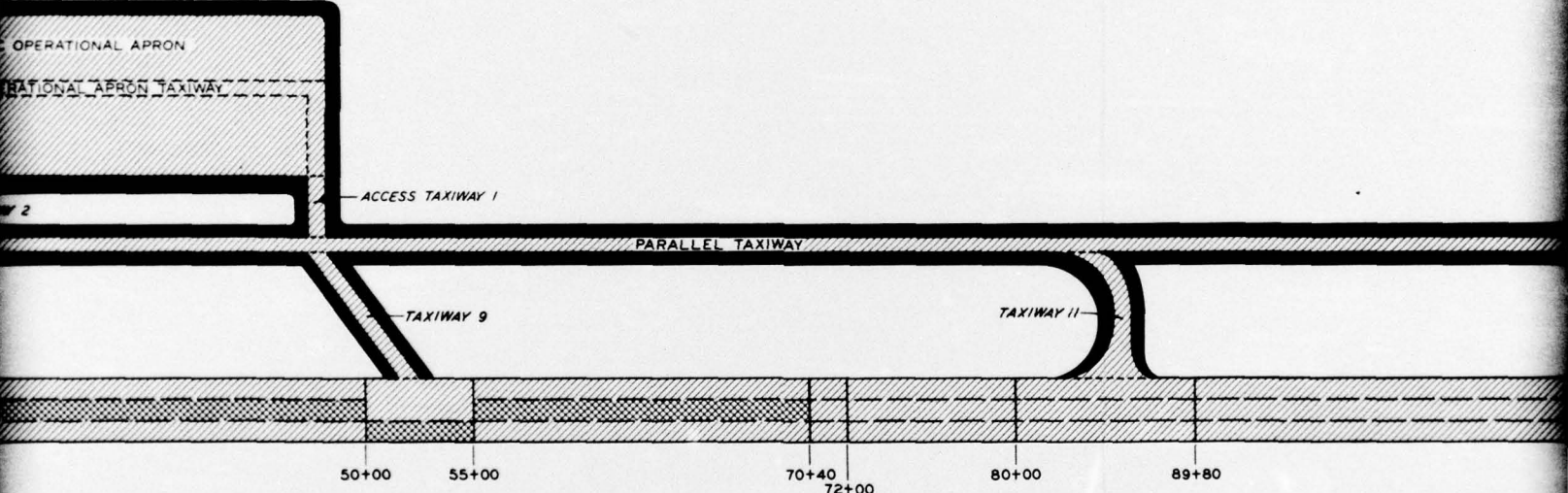
**KINCHELOE AFB
AIRFIELD LAYOUT**





LEGEND






-  PORTLAND CEMENT CONCRETE (PCC)
-  REINFORCED PORTLAND CEMENT CONCRETE (RPCC)
-  ASPHALTIC CONCRETE (AC)
-  DOUBLE BITUMINOUS SURFACE TREATMENT (DBST)
-  BLAST AND SHOULDER PAVEMENT (NON-TRAFFIC)



1200

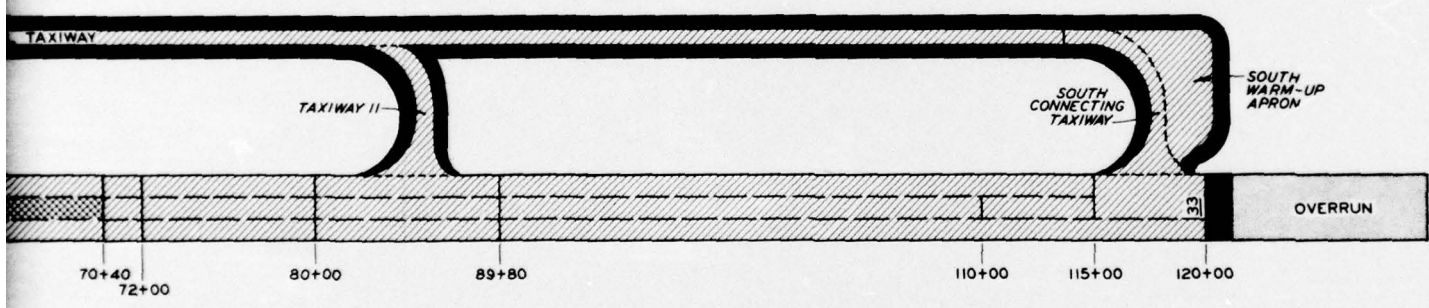
2

LEGEND

-  PORTLAND CEMENT CONCRETE (PCC)
-  REINFORCED PORTLAND CEMENT CONCRETE (RPCC)
-  ASPHALTIC CONCRETE (AC)
-  DOUBLE BITUMINOUS SURFACE TREATMENT (DBST)
-  BLAST AND SHOULDER PAVEMENT (NON-TRAFFIC)



VICINITY MAP
SCALE IN MILES
10 0 10 20 30



**KINCHELOE AFB
PAVEMENT PLAN**