AD-A032 886 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 1/5
CONDITION SURVEY, WURTSMITH AIR FORCE BASE, MICHIGAN.(U)
APR 73 P J VEDROS, H T THORNTON

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MISCELLANEOUS PAPER S-73-13

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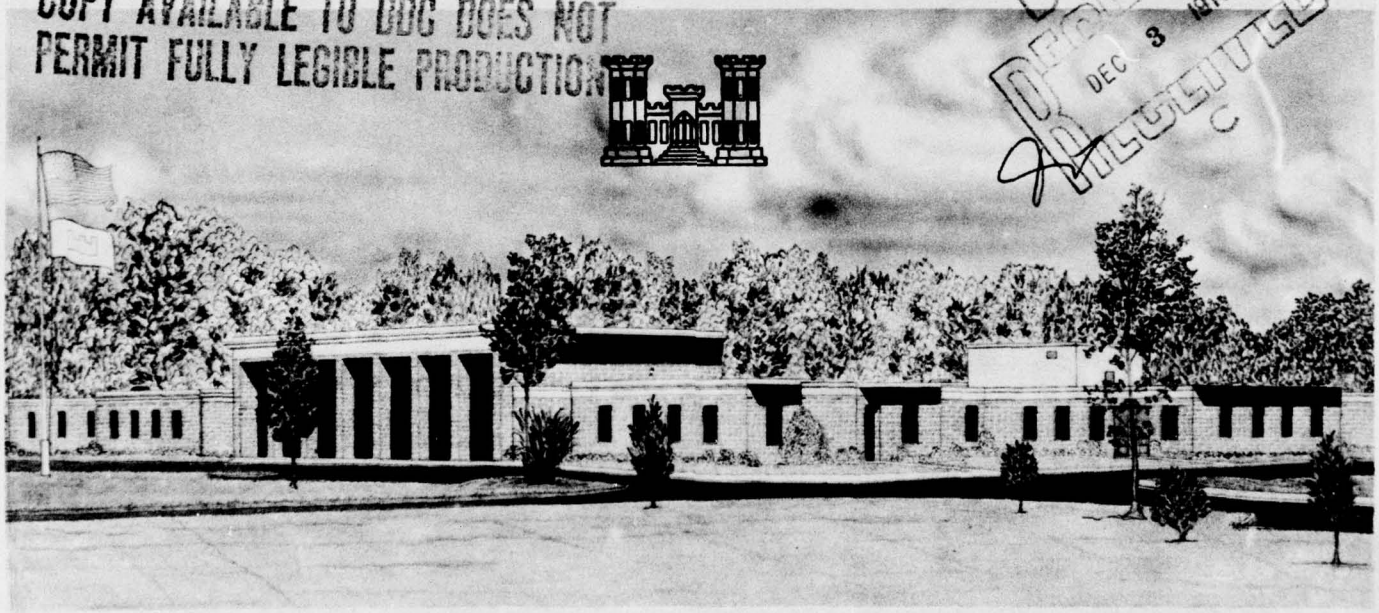
by

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



April 1973

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Conducted by U. S. Army Engineer Waterways Experiment Station
Soils and Pavements Laboratory
Vicksburg, Mississippi

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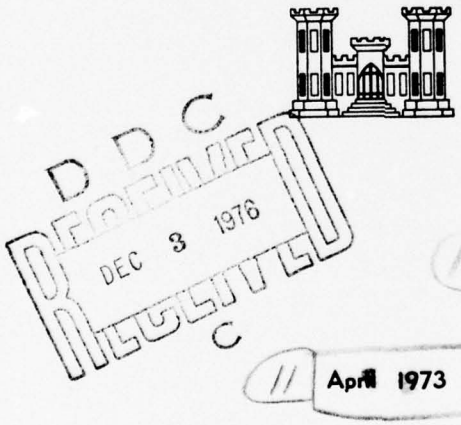

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ARMY-MRC VICKSBURG, MISS.

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., Concrete Laboratory, and S. J. Alford and R. N. Gordon, Soils and Pavements Laboratory. This report was prepared by Mr. Thornton and Mr. 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. Appendix A was obtained from the Air Force.

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.

Contents

Conversion Factors, British to Metric Units of Measurement

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

Multiply	By	To Obtain
inches	2.54	centimeters
feet	0.3048	meters
miles (U. S. statute)	1.609344	kilometers
square inches	6.4516	square centimeters
square feet	0.092903	square meters
square yards	0.8361274	square meters
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, WURTSMITH 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 Wurtsmith Air Force Base (WAFB), Michigan, during 1-5 May 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. Appendix A to this report presents the annual pavement maintenance plan for WAFB.

Pertinent Background Data

Location

4. WAFB is located in Oscoda County, Michigan, about 1-1/2 miles*

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

west of the shoreline of Lake Huron and 2-1/2 miles northwest of Oscoda, Michigan. A vicinity map is shown in plate 1.

Topography and soils

5. The airfield is located in a nearly level sand plain. The average elevation within the airfield site is approximately 620 ft above mean sea level. The predominant soil type, "grayling" sand, is a loose, uniformly graded sand ranging from yellowish brown to grayish yellow in color. The soil extends to considerable depths throughout the airfield site. The subgrade and foundation subsoils are composed generally of nonplastic, nonfrost-susceptible uniformly graded fine sand, which is classified as an SP or SP/SM material according to the Unified Soil Classification System.*

Drainage and water table

6. The surface soil and subsoil are granular and free draining to a known depth of about 20 ft. The groundwater table varies from 15 to 20 ft below the ground surface. Prior to 1955, no subdrains or collection systems for airfield surface runoff had been constructed due to the highly pervious characteristics of the subsoil. Subsequent construction has provided ponding areas and catch basins to expedite runoff from apron areas for relief from standing water during freeze-thaw periods.

Climatic conditions

7. The average annual rainfall in the area is approximately 28 in., with an average annual snowfall of 56.8 in. The mean annual temperature is approximately 45 F. The winters are long and rigorous, while the summers are comparatively short and mild. Climatic data for the period August 1969 to July 1970 are presented in table 1. Rainfall is generally well distributed throughout the year. The rainfall occurs generally as moderate and prolonged rain or as frequent showers, but rarely as a heavy downpour. The snowfall is heaviest from November to

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* 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.

March, but light snowfalls and flurries may occur as late as May and as early as October. Snow remains on the ground throughout the winter. Prevailing winds are from the northwest varying from strong to light. The mean freezing index for the 10-year period 1943-1953 was 950 degree-days. The design freezing index (based on the coldest year in 10) for this same period was approximately 1190 degree-days.

General description of airfield

8. In May 1972, the airfield consisted of a NE-SW (06-24) runway, a parallel taxiway with four connecting taxiways, a SAC operational apron with a connecting taxiway to seven hangar aprons and taxiways, four ADC aprons of various sizes with connecting taxiways to the runway and to other hangar aprons, a warm-up apron at the NE end, and a SAC alert apron with parking stubs and a connecting taxiway. The runway was 300 ft wide and 11,800 ft long. The SAC operational apron was approximately 2200 ft long and 775 ft wide. Taxiways A-D, F, I, and J were 75 ft wide; taxiway E was 100 ft wide; taxiways G and K (the old E-W and NE-SW runways, respectively) were 150 ft wide; and taxiway H was 50 ft wide. The ADC operational apron was approximately 1500 by 575 ft. Other aprons were of various sizes. A layout of the airfield is shown in plate 1.

Previous reports

9. Previous reports concerning WAFB are listed below. Pertinent data were extracted from them for use in this condition survey.

a. Condition survey reports. The following three condition survey reports were prepared by the U. S. Army Engineer Division, Ohio River, CE:

(1) "Condition Survey Report, Wurtsmith Air Force Base, Michigan," January 1959, Cincinnati, Ohio.

(2) "Condition Survey Report, Wurtsmith Air Force Base, Michigan," September 1966, Cincinnati, Ohio.

(3) "Investigation of Pavement Spalling at Wurtsmith Air Force Base, Michigan," December 1966, Cincinnati, Ohio.

b. Pavement evaluation reports. The following four pavement evaluation reports were prepared by the U. S. Army Engineer District, Detroit, CE:

(1) "Final Report, Airfield Pavement Evaluation, Oscoda Army Airfield, Oscoda, Michigan," 1944.

(2) "Evaluation of Rigid Pavement, Extension of Northeast-Southwest Runway, Wurtsmith AFB, Michigan," 1954.

(3) "Evaluation of Rigid Pavement, Apron and Alert Taxiway Extensions, Wurtsmith AFB, Michigan," January 1957.

(4) "Airfield Evaluation Report, Wurtsmith AFB, Michigan," March 1960.

History of Airfield Pavements

Construction history

10. The airfield was first developed in 1936 as Camp Skeel, a landing auxiliary to Selfridge Field. The landing surface at that time was treated gravel. In February 1942, two diagonal runways were constructed and surfaced with soil cement. Later in 1942, three runways, connecting taxiways, and an apron were constructed of portland cement concrete (PCC). The field was known during World War II as Oscoda Army Airfield. A new 3000-ft runway extension, a parallel taxiway, and an alert apron and taxiway were constructed in 1951. Additional pavements, consisting generally of various access taxiways, apron areas, and extensions to existing aprons, were constructed during 1955-1957. During 1958-1959, the airfield was rebuilt to accommodate heavy aircraft. Construction completed at this time consisted of a runway, a parallel taxiway, warm-up aprons at each runway end, a hangar apron, alert facilities, and a parking apron of about 188,000 sq yd. Details of the design and construction history of the airfield pavements are presented in table 2. Pavement thicknesses, descriptions, and other details are presented in table 3.

Traffic history

11. A detailed traffic record was not available for this study; however, some traffic information was available from previous condition surveys and pavement evaluations. In addition, a traffic count for the year 1971 was obtained during this survey. The B-52 aircraft started

operations at WAFB in July 1960. Prior to this time, the predominant aircraft operating from the airfield were fighters (F-89 series), with occasional operations by aircraft of the C-54 and C-124 classes. The 1966 condition survey indicated that operations at that time consisted of about 250 cycles per month, of which approximately 75 cycles were B-52 aircraft operations, 90 cycles were KC-135 operations, and the remainder were F-101 and transient aircraft operations. (A cycle of aircraft traffic is a combination of one landing and one takeoff.) In addition to the aircraft traffic described above, about three alert taxiing exercises involving 11 to 16 aircraft each were conducted each month. In 1971, there were approximately 11,460 cycles of traffic, of which 1056 cycles were B-52 operations (about 88 per month), 924 cycles were KC-135 operations (about 77 per month), and the remaining cycles were various transient aircraft operations. On normal missions, the average gross weight at takeoff of the B-52 aircraft is approximately 400,000 lb. During alert conditions, the weights are up to about 490,000 lb. It is estimated that approximately 75 percent of the takeoffs are from the northeast (24) end of the runway.

Conditions of Pavement Surfaces

Pavement inspection

12. The following procedure was used in conducting the pavement 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. (A slab is the smallest unit, containing no joints, of a pavement feature.) The locations of the individual pavement features, the inspection starting points, and the directions in which the pavements were inspected are shown 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 condition ratings are based primarily on the total percentage of slabs containing no major defects. Although minor defects (spalls, shrinkage cracks,

pop-outs, etc.) are usually discounted in determining the condition ratings, some consideration must be given to them with respect to their effect on the normal operations of aircraft. Consideration must also be given to the minor defects when they may possibly develop into major defects under continuing traffic. The procedures used for determining the condition rating of a pavement are given in Appendix III of Department of the Army Technical Manual TM 5-827-3, "Rigid Airfield Pavement Evaluation," dated September 1965.

Runway

13. A detailed inspection (slab by slab) of the runway pavement indicated that it was in excellent structural condition. Eight slabs located in the 15-in.-thick pavement in the outside lane of the interior of the runway (feature R5D) contained the only major defects. However, as is shown in table 4, there were a considerable number of spalls and pop-outs, and some "D" cracking had occurred in the pavement surface. Every slab in the first 1000 ft of the southwest (06) end and almost every slab in the runway interior contained pop-outs (photos 1 and 2). An investigation of the spalling condition on the runway at WAFB was performed in 1966, and the results were published in the report referenced in paragraph 9a. There has been a progression in the number of spalls on the longitudinal joints since the 1966 investigation. The spalls and pop-outs have been repaired with patches of a latex material or an epoxy concrete. Since the patching on the runway has to be accomplished between aircraft operations, a fast setting epoxy patch is used. In some cases a poor patching job has resulted because of the rush. The repair of spalls and pop-outs is a costly, major maintenance problem at this airfield.

14. Structurally, the pavements are performing satisfactorily under traffic of the B-52 aircraft now using the pavements. Five B-52 pilots and twenty-two KC-135 pilots were asked to rate the riding quality of the runway. Sixty-three percent rated it as smooth, while thirty-seven percent rated it as fair.

Primary taxiways

15. The primary taxiway system consists of taxiways A, B, and E;

the SAC operational apron taxiway; and apron access taxiways 1 and 2. All of these primary taxiways consist of 21-in.-thick PCC, and all were in excellent structural condition, with only three major defects observed in the entire system. Pop-outs and spalls were the predominant minor defects in the system. Thirty-six slabs of taxiway A contained what was identified as "D" cracking, a condition which can become severe enough to develop into spalls. Spalls of 1 to 4 ft in length are occurring along longitudinal joints at the rate of 5 to 7 per year in the southwestern two-thirds of taxiway A.

Aprons and miscellaneous pavements

16. The 17-in.-thick pavement of the SAC operational apron was in excellent structural condition at the time of inspection. Approximately 20 percent of the apron area contained pop-outs and spalls.

17. The 20-in.-thick pavement of the northeast warm-up apron was in excellent structural condition. Approximately 15 percent of this apron contained pop-outs and spalls.

18. The SAC alert facility, which consists of nine parking stubs and taxiway F (20-in.-thick pavement), was in excellent structural condition. However, 100 percent of the slabs in the parking stubs and 87 percent of the slabs in the taxiway contained pop-outs. There were numerous pop-out patches in the taxiway; and, in the 600 ft closest to the runway, some deterioration of the patches was observed.

19. Connecting taxiways C and D were in excellent condition, with only a minor number of pop-outs and joint spalls. The 10-in.-thick pavement of taxiway J (feature T6B) was not surveyed in detail, but it was noted that structural distress had occurred in the taxiway up to taxiway K due to parking of heavy aircraft during alert exercises.

20. The remaining facilities were not selected for detailed inspection; however, a cursory inspection was made of the pavements. It was noted that taxiway K (the original NE-SW runway) was in excellent to poor condition. In 1970, a section of this taxiway (adjacent to taxiway J), which had an original pavement of 6 in. of PCC over 6 in. of soil cement, was replaced with 14 in. of PCC so that taxiway K could be used as a turnaround apron for unloading cargo. In 1971, a section of

taxiway K (adjacent to taxiway G), which is used as a power check pad, was replaced with 9 in. of PCC, and a 10- by 10- by 3-ft reinforced concrete tiedown anchor was constructed. The new pavements were in excellent condition, and the original pavements, though not in use, were in poor condition (photos 3 and 4, respectively). The ADC operational apron was considered to be in good condition, even though a number of the slabs had major defects. In 1969, about 4500 sq yd of this apron area (originally 7 in. of PCC) was replaced with 9 in. of PCC (photo 5). Taxiway G (the old E-W runway), which received an asphaltic-concrete overlay on its center in 1967, was in fair condition. In the 1972 inspection, these pavements (taxiways G, J, and K) showed signs of cracking from overloads by fighters and transient aircraft.

Maintenance

21. Maintenance of the older pavements has consisted mostly of replacing failed concrete slabs and sealing joints and cracks. Repair of pop-outs and joint spalling seems to be the major maintenance problem in the newer pavements (those constructed since 1958). Records show that during 1962-1963, when the first major program to repair pop-outs was initiated, approximately $475,000 was spent on overall maintenance of airfield pavements. About $260,000 of this amount was spent on pop-out repairs. Maintenance expenditures after this time are as follows:

Date	Expenditure	Description of Repair
October 1965	$30,873	Place slurry seal on shoulders and overruns
September 1967	$16,880	Perform general pop-out and pavement repairs. Seal joints for 600 ft at each end of runway, on SAC operational apron, and on ADC operational apron
October 1967	$58,000	Seal joints and repair pop-outs on runway, primary taxiways, and SAC operational apron and alert facility

(Continued)

Date	Expenditure	Description of Repairs
August 1968	$33,780	Repair 60,000 pop-outs without coring (40,000 with latex, 20,000 with epoxy)
	$32,350	Repair 33,000 pop-outs (18,000 with latex, 15,000 with epoxy)
October 1969	$97,380	Replace 210 10- by 20-ft by 9-in. concrete slabs in ADC operational apron
	$73,000	Replace some old concrete with 9-in. PCC; repair a 480-sq-ft spalled area and 1300 pop-outs; and seal 6000 ft of joints on taxiway G
October 1970	$158,220	Replace old concrete with 9-in. PCC on taxiway G
Summer 1971	--	Place double bituminous seal on overruns
Since 1967	$140,000	Repair pop-outs by shops on in-house basis at a cost of approximately $0.60 per hole
FY 1973		Plan to repair 20,000 new and recap 30,000 old pop-outs

Condition of Joint Seal Materials

22. The last major joint seal repair was accomplished in 1967. At this time, all the joints in the runway, the primary taxiways, the SAC alert facility, the SAC operational apron, and the ADC operational apron were resealed. At the time of the 1972 survey, the joint seal material in these areas was in generally good condition. Joint seal material in other areas was in fair to poor condition.

Evaluation

23. The latest pavement evaluation report for WAFB was prepared in 1960 (see paragraph 9b). Since some changes in gear configurations and methods of evaluation have been made since that time, a new evaluation table has been prepared (table 5). The physical properties of the materials as determined in previous evaluations were used for

determining the load-carrying capabilities of the pavements. An evaluation of the effects of frost action was not required for most of the pavements because of the nonfrost-susceptible nature of the sandy subgrade; however, an evaluation of the frost capacities of taxiway H and the AIC operational apron was made because of the presence of frost-susceptible base courses under these pavement facilities.

Conclusions

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

a. The heavy-load pavements are in excellent condition, with the predominant defects being joint spalls and pop-outs.

b. Some "D" cracking was observed in the outer lanes of the runway and in taxiway A. Spalls will probably develop in these areas in the future.

c. The longitudinal joint failures in the southwestern two-thirds of taxiway A could become a serious maintenance problem in the future.

d. Joint seal materials in primary traffic areas are in generally good condition.

e. Pop-outs are a major maintenance problem in primary traffic areas, and they require continuous repair.

f. Spall repairs made with epoxy concrete and PCC are performing satisfactorily.

g. Pop-out repairs made with epoxy concrete and latex are also performing satisfactorily.

h. Most of the original pavement constructed in 1942 is in poor condition.

Table 1

Climatic Data,* August 1969-July 1970

Month	Average Daily Temperature, F			Precipitation, in.	
	Max	Min	Mean	Rainfall	Snowfall
January	27	12	20	1.5	14.0
February	30	13	22	1.7	14.0
March	37	21	29	1.9	10.3
April	51	33	42	2.8	2.7
May	63	42	52	3.0	0.1
June	73	52	63	2.7	Trace
July	78	57	67	3.0	Trace
August	77	56	67	2.7	None
September	68	49	59	2.8	Trace
October	58	40	49	2.2	0.1
November	44	30	37	2.5	4.8
December	31	18	25	1.6	10.8
Annual	53	35	45	28.4	56.8

* Furnished by WAFB.

Table 2

Airfield Construction History

Feature No.	Pavement Facility	Pavement Thickness in.	Pavement Type	Construction Year(s)	Construction Agency	Design Criteria
T14B	Taxiway K (original NE-SW runway)	6	PCC	1942	CE*	Gross load - 74,000 lb Wheel load - 37,000 lb Tire pressure - 67-1/2 psi
T8B	Taxiway G (original E-W runway)	10-7-10	PCC	1942	CE	--
A6B	ADC operational apron	10-7-10	PCC	1942	CE	--
A12B	ADC alert apron and taxiway	10	PCC	1951	CE	Engineering Manual (EM) for Military Construction Wheel load - 25,000 lb Tire pressure - 200 psi
A10B	ADC hangar apron and taxiway	10	PCC	1951	CE	
A11B, A13B	ADC alert taxiway and apron additions	10	PCC	1955	CE	
A9B	ADC parking aprons	10	PCC	1955	CE	
A7B	Hangar access apron	14	PCC	1955	CE	Gear load - 80,000 lb Dual wheels - 37 in. c-to-c Tire pressure - 150 psi
A8B	Hangar apron and taxiway	14	PCC	1955	CE	Gear load - 80,000 lb Dual wheels - 37 in. c-to-c Tire pressure - 150 psi
A14B	Rear apron	3	AC	1956	CE	--
T6B	Taxiways J and I	10	PCC	1959	CE	Wheel load - 25,000 lb 100-sq-in. contact area
T7B	Taxiway G (west 700 ft)	10	PCC	1959	CE	Wheel load - 25,000 lb 100-sq-in. contact area
A3B	Hangar aprons and taxiways	14	PCC	1958-59	CE	Gear load - 160,000 lb
A1B	SAC operational apron	17	PCC	1958-59	CE	EM 1110-45-303 Gear load - 265,000 lb 37- by 62- by 37-in. spacing 267-sq-in. contact area
T5A	SAC operational apron taxiway	21 and 17	PCC	1958-59	CE	
T4A, T12A	SAC operational apron access taxiways	21	PCC	1958-59	CE	
T1A, T3A	Taxiways B and E	21	PCC	1958-59	CE	
T2A	Taxiway A	21 and 20	PCC	1958-59	CE	
T10C, T11C	Taxiways C and D	17	PCC	1958-59	CE	
R1A, R7A	Runway ends (200-ft-wide section, 500 ft each end)	21	PCC	1958-59	CE	
R3B, R6B	Runway (100-ft-wide center section, 2d 500 ft each end)	20	PCC	1958-59	CE	
R4C	Runway interior (100-ft-wide center section)	17	PCC	1958-59	CE	
R5D	Runway interior (100-ft each side)	15	PCC	1958-59	CE	
A5B	NE warm-up apron	20	PCC	1958-59	CE	
T13B, A2B	SAC alert aprons and taxiway F	20	PCC	1958-59	CE	
T8B	Taxiway G (original E-W runway) 2800 ft by 75 ft	2.5	AC overlay	1967	CE	
T14B	Taxiway K (original NE-SW runway) Approximately 500 ft of end replaced	14	PCC	1970	Contract	--
T14B	Taxiway K (power check pad). Approximately 700- by 50-ft area replaced	9	PCC	1971	Contract	--

* CE denotes Corps of Engineers.

Table 3

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY				OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
Wurtsmith AFB, Mich.															
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	
R1A R7A	NE-SW runway; 1st 500 ft each end	500 500	200 200				21	Portland cement concrete	890				Sand (SP)	250	Excellent
R2B	NE-SW runway; 1st 500 ft 24 end, north 100-ft edge	500	100				20	Portland cement concrete (including 20-ft transition 21 to 20 in.)					Sand (SP)	250	Excellent
R3B R6B	NE-SW runway; 2nd 500 ft each end	500 each	100 each				20	Portland cement concrete (20-ft transition lane on each side)	890				Sand (SP)	250	Excellent
R4C	NE-SW runway interior	9,800	100 (200 at taxiways C and B)				17	Portland cement concrete	890				Sand (SP)	250	Excellent
R5D	NE-SW runway interior outside lanes	11,400 10,400	100				15	Portland cement concrete					Sand (SP)	250	Excellent
T1A	Taxiway B	1,133+	75				21	Portland cement concrete	830				Sand (SP)	250	Excellent
T2A	Taxiway A	10,460+	75				20-21-20	Portland cement concrete	860				Sand (SP)	250	Excellent
T3A	Taxiway E	850	100				21	Portland cement concrete	840				Sand (SP)	250	Excellent
T4A T12A	SAC operational apron access taxiways (2)	250 each	75 each				21	Portland cement concrete	810				Sand (SP)	250	Excellent
T5A	SAC operational apron taxiway	2,885	75				17-21-17	Portland cement concrete	810				Sand (SP)	250	Excellent
T6B	Taxiway J Taxiway I	2,800± 600±	75 75				10	Portland cement concrete	780				Sand (SP)	250	Very good
T7B	Taxiway G	675	75				10	Portland cement concrete	860				Sand (SP)	250	Excellent
T8B	Taxiway C	2,800±	150	2.5	Asphaltic concrete (h_c = 9.5)		10-7-10	Portland cement concrete	800	2 to 6	Gravel	250	Sand (SP)		Fair
T9B	Taxiway H	450	50				9	Portland cement concrete	800	4 to 8	Mixed sand and clay	250 x_r=25	Sand (SP)		Excellent
T10C T11C	Connecting taxiways C and D	840 each	75 each				17	Portland cement concrete	810				Sand (SP)	250	Excellent
A1B	SAC operational apron	2,185	775				17	Portland cement concrete	810				Sand (SP)	250	Excellent
A2B T13B	SAC alert stubs (9) and taxiway F	Varies	Varies				20	Portland cement concrete	850				Sand (SP)	250	Excellent
A3B	SAC hangar aprons (6) and taxiway	Varies	Varies				14	Portland cement concrete	810				Sand (SP)	250	Excellent
T14B	Taxiway K (NE-SW parking apron)	1,680±	150				14-6-10	Portland cement concrete	+,800,-	6	Soil cement	250	Sand (SP)		Poor to Excellent

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MAR 1958

(1 of 2 sheets)

Table 3 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY Wurtsmith AFB, Mich.				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	
A9B	NE warm-up apron	Varies	Varies				20	Portland cement concrete	840				Sand (SP)	250	Excellent
A6B	ADC operational apron	1,900±	575±				10-7-10	Portland cement concrete	800	4 to 8	Mixed sand and clay	250 K_c=275	Sand (SP)		Good
A7B	Hangar access apron and taxiway	Varies	Varies				14	Portland cement concrete	850				Sand (SP)	250	Excellent
A8B	Maintenance hangar apron and taxiway	Varies	Varies				14	Portland cement concrete	850				Sand (SP)	250	Excellent
A9B	ADC parking apron	Varies	Varies				10	Portland cement concrete	800				Sand (SP)	250	Excellent
A10B	ADC hangar apron and taxiway	Varies	Varies				10	Portland cement concrete	840				Sand (SP)	250	Excellent
A11B	ADC alert apron and taxiway addition	Varies	Varies				10	Portland cement concrete	800				Sand (SP)	250	Excellent
A12B	ADC alert apron and taxiway	Varies	Varies				10	Portland cement concrete	840				Sand (SP)	250	Excellent
A12B	ADC alert apron extension	Varies	Varies				10	Portland cement concrete	800				Sand (SP)	250	Excellent
A13B	Rear access apron	620	177				3	Asphaltic concrete		6	Stabilized aggregate	CBR 50	Sand (SP)	CBR 26	Excellent

Table 4

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Wurtsmith AFB, Mich.

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK. IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																	% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	*	K	~	S	J	↓	J	⊕	M	P	O	C	D			
R1A R2B	NE-SW runway 24 end 1st 500 ft	25 by 25	240	20 and 21							4		7	11	18				27		8	82	100	Excel-lent
R3B R5D	NE-SW runway 24 end 2nd 500 ft	25 by 25	240	15 and 20							5		13	26	43				84		9	28	100	Excel-lent
R4C R5D	NE-SW runway interior	25 by 25	4704	15 and 17	7	1					4		50	188	260				4563		12	3	99	Excel-lent
R5D R6B	NE-SW runway 6 end 2nd 500 ft	25 by 25	240	15 and 20									2	3	14				240			0	100	Excel-lent
R7A R5D	NE-SW runway 6 end 1st 500 ft	25 by 25	240	15 and 21									5	3	7				240			0	100	Excel-lent
T1A	Taxiway B	25 by 25	184	21				1			2		4	6	16				12			80	99	Excel-lent
T2A	Taxiway A	25 by 25	1398	20-21-20							1		35	27	57				190		36	88	100	Excel-lent
T3A	Taxiway E	25 by 25	146	21								2	4	3	10				123			12	100	Excel-lent
T4A	SAC operational apron access taxiway 1	25 by 25	52	21	1						1		3	1	2				44			8	99	Excel-lent
T12A	SAC operational apron access taxiway 2	25 by 25	50	21															33			34	100	Excel-lent

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	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

(1 of 2 sheets)

Table 4 (Continued)

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Portsmith AFB, Mich.

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS: I	—	\	Δ	✳	K	~	S	J	↲	J	⊕	M	P	O	C	D	% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
T5A	SAC operational apron taxiway	25 by 25	366	17-21-17				2			2		5	3	9				143		3	58	99	Excellent
T13B	Taxiway P	25 by 25	414	20									3	5	8				361			13	100	Excellent
A1B	SAC operational apron	25 by 25	2241	17									4	5	5				138			82	100	Excellent
A2B	Alert stubs 1-9	25 by 25	675	20										5	2				675			0	100	Excellent
A5B	NE warm-up apron	25 by 25	270	20	2						2		1	3	11				22			86	99	Excellent
T10C	Taxiway C	25 by 25	118	17									3	4	5				9			89	100	Excellent
T11C	Taxiway D	25 by 25	120	17									1	5	15				10		2	80	100	Excellent

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	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 2 sheets)

Table 5

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Wurtsmith AFB, Mich. DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN., C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN., C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 44-IN., C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33-IN. × 48-IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	REMARKS
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
R1A R7A	NE-SW runway 1st 500 feet each end	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	
R2B	NE-SW runway 1st 500 feet 24 end north 100 feet edge	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	
R3B R6B	NE-SW runway 2nd 500 feet each end	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	
R4C R5D	NE-SW runway interior	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	
T1A	Taxiway F	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	580,000	
T2A	Taxiway A	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	
T3A	Taxiway E	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	600,000	
T4A T12A	SAC operational apron access taxiways (2)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	580,000	
T5A	Sac operational apron taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	580,000	
T6B	Taxiways I and J	Capacity	90,000	70,000	130,000	135,000	200,000+	155,000	210,000	320,000	800,000+	(a)	
T7B	Taxiway G	Capacity	95,000	75,000	145,000	145,000	200,000+	170,000	230,000	350,000	800,000+	240,000	
T8B	Taxiway G	Capacity	85,000	65,000	130,000	130,000	200,000+	150,000	205,000	285,000	800,000+	(a)	
T9B	Taxiway H*	Capacity	75,000	60,000	120,000	115,000	185,000	135,000	190,000	285,000	730,000	(a)	
		Frost capacity	55,000	45,000	75,000	75,000	115,000	85,000	(a)	155,000	430,000	(a)	
T10C T11C	Taxiways C and D	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	610,000+	

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.
* Evaluation of frost capacity required due to presence of frost-susceptible base course beneath feature.

Table 5 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Wurtsmith AFB, Mich. DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 44-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33 IN. × 46 IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	REMARKS
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
A1B	SAC operational apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	460,000	
A2B T13B	SAC alert stubs (9) and taxiway F	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	600,000	
A3B	SAC hangar aprons (6) and taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	265,000	330,000+	380,000+	800,000+	370,000	
T14B	Taxiway K	Capacity	30,000	23,000	55,000	50,000	80,000	60,000	(a)	125,000	320,000	(a)	Reduced by 25%
A5B	NE warm-up apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	330,000+	380,000+	800,000+	530,000	
A6B	ADC operational apron *	Capacity	55,000	40,000	75,000	85,000	135,000	95,000	125,000	205,000	530,000	(a)	
		Frost capacity	35,000	30,000	55,000	55,000	80,000	60,000	(a)	115,000	330,000	(a)	
A7B	Hangar access apron and taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	270,000	330,000+	380,000+	800,000+	370,000	
A8B	Maintenance hangar apron and taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	270,000	330,000+	380,000+	800,000+	370,000	
A9B	ADC parking apron	Capacity	90,000	70,000	140,000	135,000	200,000+	155,000	215,000	330,000	800,000+	(a)	
A10B	ADC hangar apron and taxiway	Capacity	95,000	75,000	155,000+	145,000	200,000+	165,000	225,000	340,000	800,000+	235,000	
A11B	ADC alert apron and taxiway addition	Capacity	90,000	70,000	140,000	135,000	200,000+	155,000	215,000	330,000	800,000+	(a)	
A12B	ADC alert apron and taxiway	Capacity	95,000	75,000	155,000+	145,000	200,000+	165,000	225,000	340,000	800,000+	235,000	
A13B	ADC alert apron extension	Capacity	90,000	70,000	140,000	135,000	200,000+	155,000	215,000	330,000	800,000+	(a)	
A14B	Rear access apron	Capacity	80,000	60,000	75,000	110,000	150,000	140,000	190,000	190,000	530,000	(a)	

* Evaluation of frost capacity required due to presence of frost-susceptible base course beneath feature.

Photo 1. Pop-outs in interior of runway

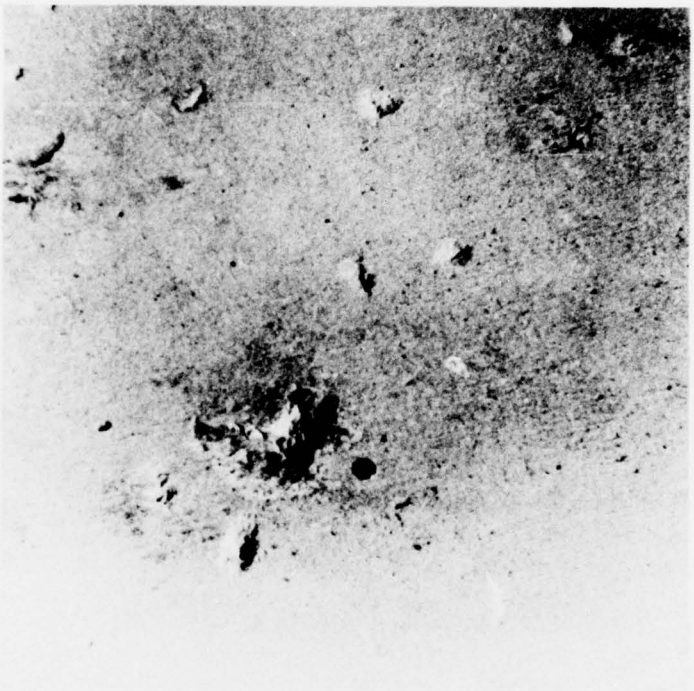


Photo 2. Pop-outs in traffic area D (outside edges of runway)

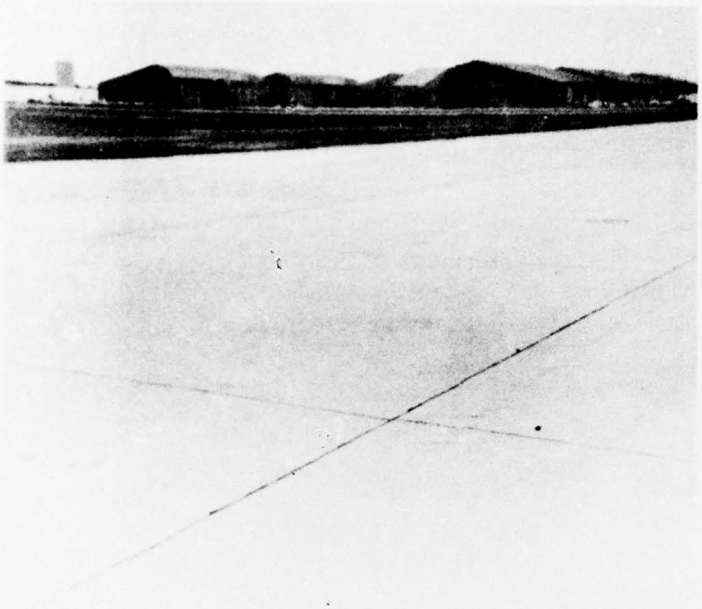


Photo 3. New 14-in. PCC surface on taxiway K

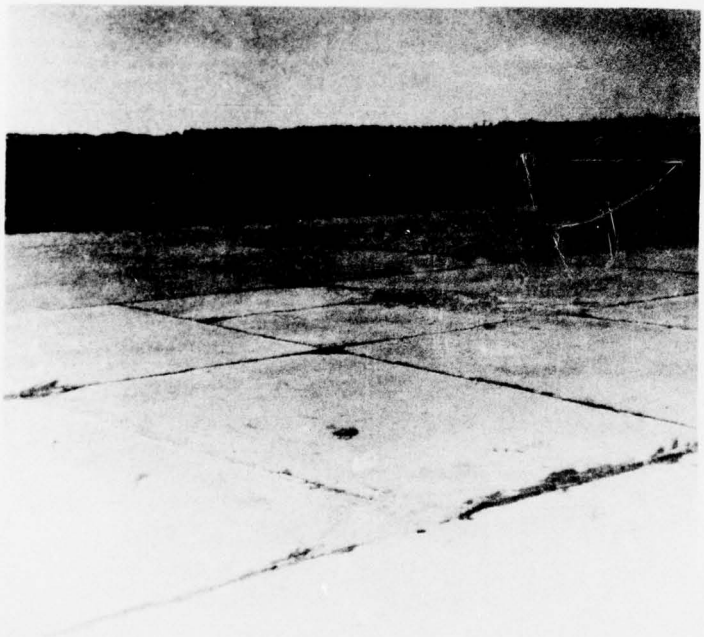
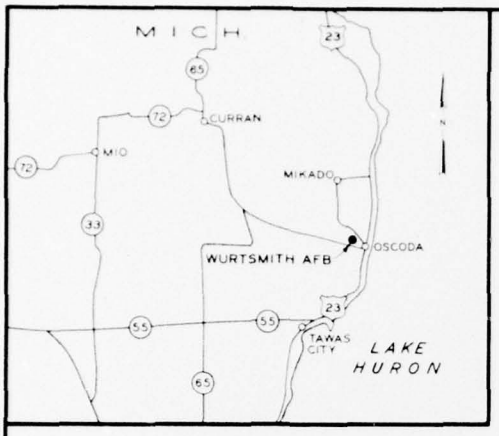


Photo 4. Original pavement on taxiway K; condition rated poor

Photo 5. ADC operational apron



VICINITY MAP

SCALE IN MILES

10 0 10 20

LEGEND

- PORTLAND CEMENT CONCRETE (PCC)
- ASPHALTIC CONCRETE (AC)
- ASPHALTIC CONCRETE OVER PORTLAND CEMENT (AC/PCC)
- DOUBLE BITUMINOUS SURFACE TREATMENT (DBST)
- BLAST PAVEMENT (AC-NON TRAFFIC)

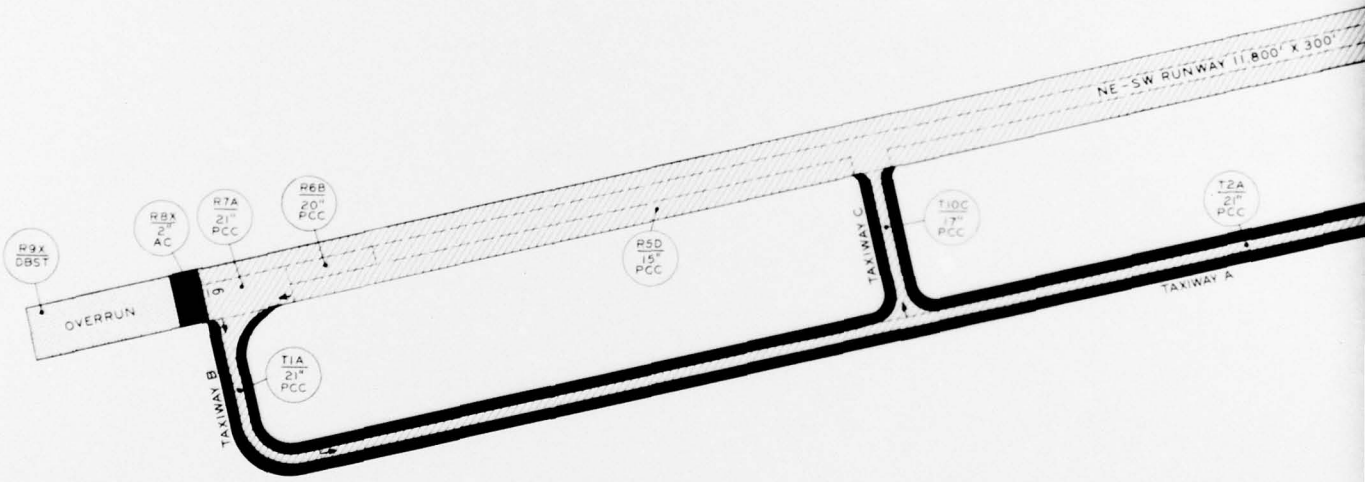
R1A / 21"PCC ← FEATURE DESIGNATION (SEE NOTE 1) / ← SURFACE THICKNESS AND TYPE

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

← - DIRECTION OF SURVEY

NO



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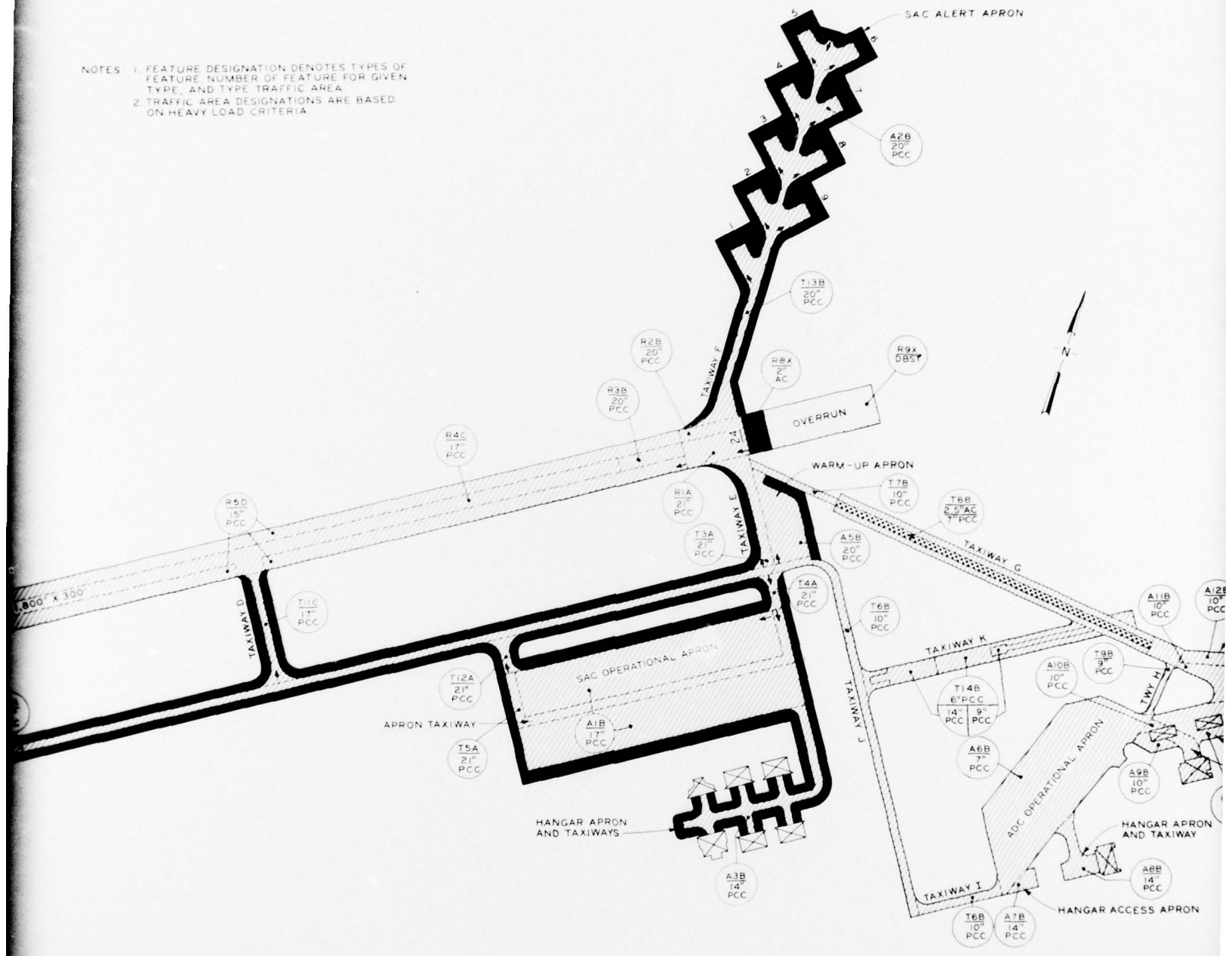
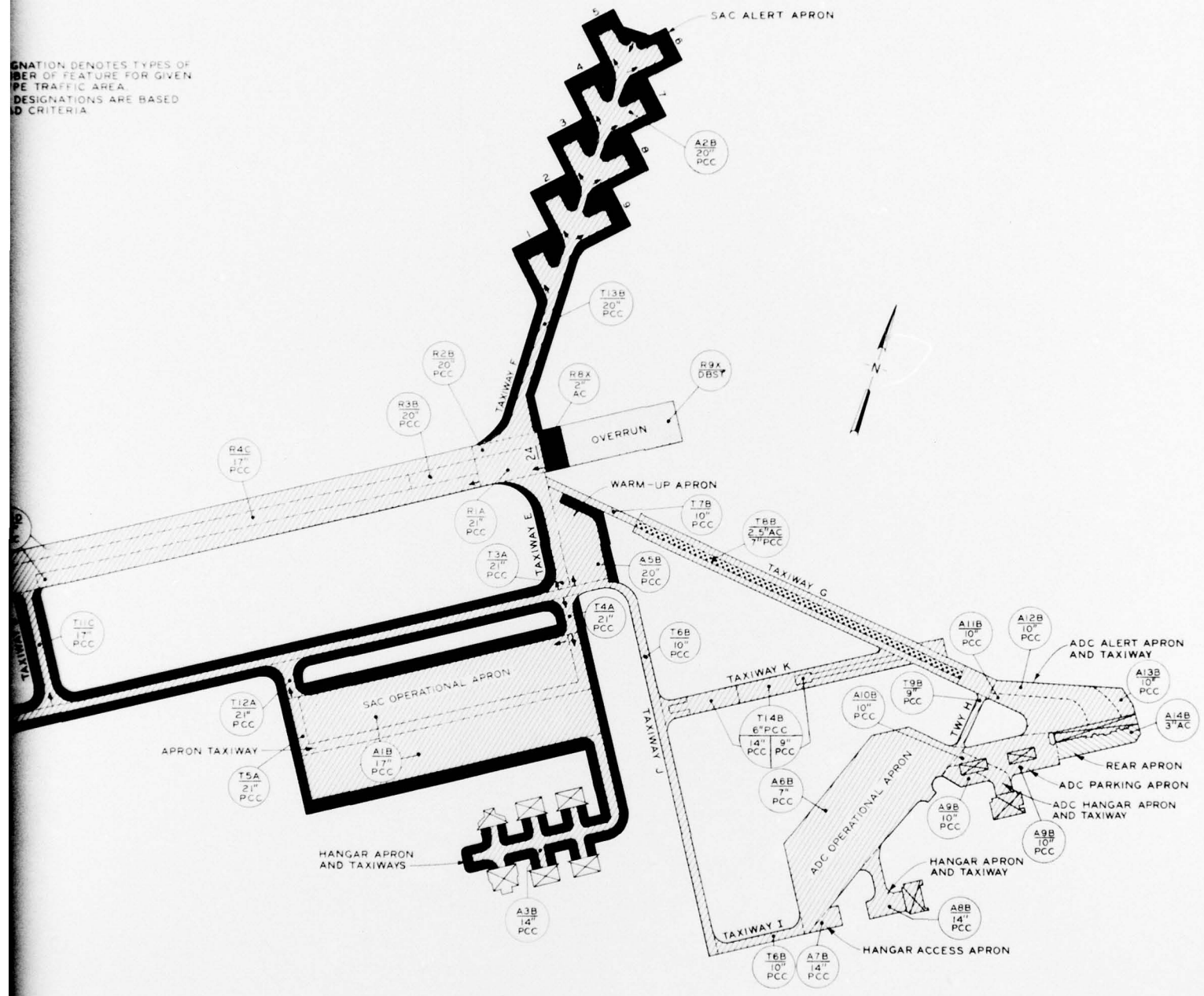


WURTSMITH AFB

AIRFIELD LAYOUT AND PAVE

2

GNATION DENOTES TYPES OF
BER OF FEATURE FOR GIVEN
PE TRAFFIC AREA
DESIGNATIONS ARE BASED
D CRITERIA



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800 1200

WURTSMITH AFB

AIRFIELD LAYOUT AND PAVEMENT PLAN

PLATE 1

3

APPENDIX A: WAFB ANNUAL PAVEMENT MAINTENANCE PLAN

Description	Pavement Type	Year(s) Constructed	Maintenance Completed	Present and Proposed Maintenance
Primary runway (11,800 by 300 ft) 393,333 sq yd of 19-, 17-, 20-, and 21-in.-thick pavement	Rigid heavy	1958-59	FY 70-71: 40,000 pop-outs and 30,000 spalls repaired in house	FY 71: repair 20,000 pop-outs and recap 30,000 old pop-outs Project WUR 90-8: replace 4 slabs; design completed, but no funds available
Two overruns (150 by 300 ft) 10,000 sq yd of 2-in.-thick blast pavement	Flexible light	1959	FY 66: slurry seal applied FY 70: random cracks sealed in house	Project WUR 53-0: apply patches and double bituminous seal (under contract)
Two overruns (850 by 300 ft) 56,667 sq yd of double bituminous surface treatment	Double bituminous seal over gravel base	1959	FY 66: slurry seal applied FY 70: random cracks sealed in house	Project WUR 53-0: apply patches and double bituminous seal (under contract)
SAC alert taxiway, 34,304 sq yd of 20-in.-thick pavement	Rigid heavy	1958-59	FY 70-71: spalls repaired in house	Yearly in-house maintenance program
ADC alert taxiway: 8,183 sq yd of 10-in.-thick pavement; 21,666 sq yd of 10-7-10-in. pavement	Rigid light; flexible overlay	1942 (extended during 1954)	FY 68: bituminous overlay applied to pavement constructed in 1942 FY 70-71: random cracks sealed in house	Yearly in-house maintenance program
SAC operational apron access taxiways 14,120 sq yd of 20-21-20-in. pavement	Rigid heavy	1958-59	FY 70-71: spalls repaired and random cracks sealed in house	Yearly in-house maintenance program
ADC operational apron access taxiway 26,128 sq yd of 10-in. pavement	Rigid light	1958-59	FY 70: spalls repaired and random cracks sealed in house	Yearly in-house maintenance program with limitations according to available man-hours
ADC operational apron access taxiway 14,630 sq yd of 10-7-10-in. pavement	Rigid light	1942	FY 70: damaged slabs replaced under contract	Yearly in-house maintenance program with limitations according to available man-hours
Primary runway connecting taxiways 124,575 sq yd of 17-in. and 20-21-20-in. pavement	Rigid heavy	1958-59	FY 70: spalls repaired and bad joints sealed in house	FY 71: repair pop-outs and spalls in house
ADC access taxiway, 2,361 sq yd of 10-7-10-in. pavement	Rigid light	1942	FY 67: joints sealed FY 70: spalls repaired in house	Yearly in-house maintenance program
SAC hangar apron and taxiways 16,429 sq yd of 14-in.-thick pavement	Rigid light	1959	FY 67: joints sealed and damaged slabs replaced FY 68-70: spalls repaired in house	FY 71: Project WUR 101-8: replace 15 damaged slabs (completed in Oct 71)
ADC hangar access apron 35,509 sq yd of 10- and 14-in.-thick pavement	Rigid light	1942 1951 1967	FY 70: spalls repaired and joints sealed in house	Yearly in-house maintenance program with limitations according to available man-hours
SAC operational apron, 118,153 sq yd of 17-in.-thick pavement	Rigid heavy	1959	FY 70: joints sealed on spalled areas in house	FY 72: repair pop-outs and spalls in house
ADC operational access apron 10,189 sq yd of 10-in.-thick pavement	Rigid light	1942 1955-56	FY 70-71: spalls repaired in house	Yearly in-house maintenance program
ADC operational apron, 88,676 sq yd of 10-in. and 10-7-10-in. pavement	Rigid light	1942 (small areas) 1955-56	FY 67: joints sealed FY 70: damaged slabs replaced (under contract) and spalls repaired in house	FY 72: repair spalls in house
ADC connecting taxiway 27,744 sq yd of 14- and 6-in.-thick pavement	Rigid light	1942	Yearly in-house maintenance program	FY 72: Project WUR 130-6 (completed Oct 71). Project WUR 135-8: repair power check pad (under contract)
SAC alert apron, 36,250 sq yd of 20-in.-thick pavement	Rigid heavy	1959	FY 67: joints sealed under contract. Yearly in-house maintenance program	FY 72: repair pop-outs and spalls in house
Taxiway and apron stabilized shoulders	Flexible light	1959	FY 70-71: random cracks sealed in house	Yearly in-house maintenance program. Project WUR 86-6 being reviewed
Warm-up apron, 17,916 sq yd of 20-in.-thick pavement	Rigid heavy	1959	FY 67: joints sealed under contract FY 68: pop-outs repaired. Yearly in-house maintenance program	Yearly in-house maintenance program
ADC power check pad, 300 sq yd of 6-in.-thick pavement	Rigid light	1942	FY 63: pop-outs repaired and joints sealed under contract. Yearly in-house maintenance program	Yearly in-house maintenance program
Airfield drainage facilities	--	1942-60	FY 63: additional facilities constructed under contract	Yearly in-house maintenance program