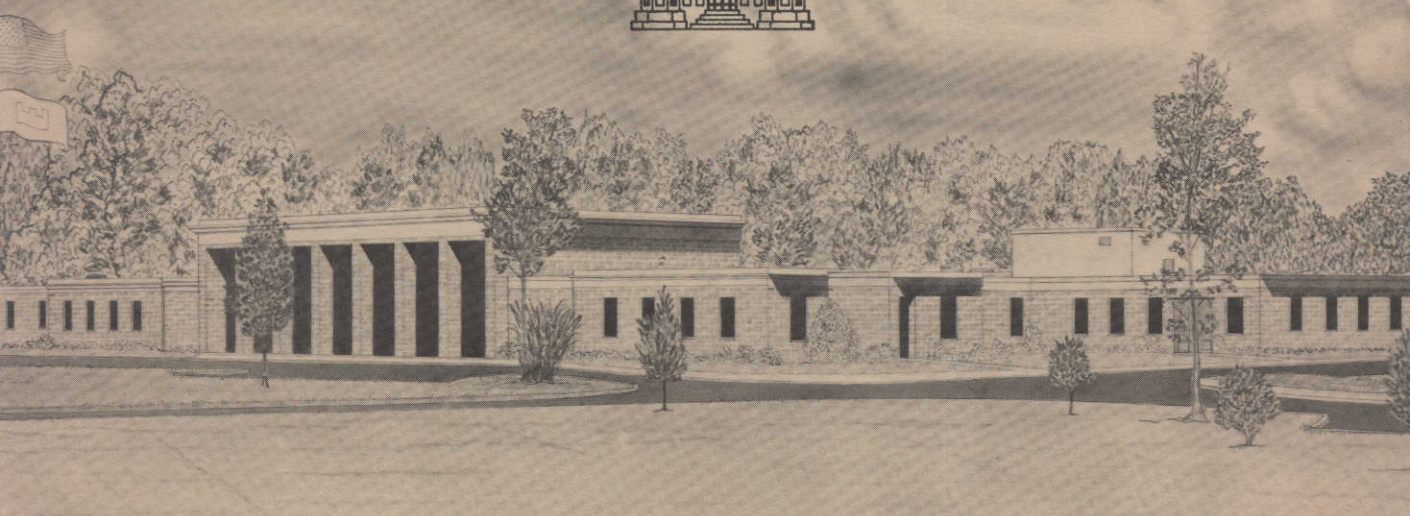
MISCELLANEOUS PAPER S-73-12

CONDITION SURVEY, ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

by

P. J. Vedros



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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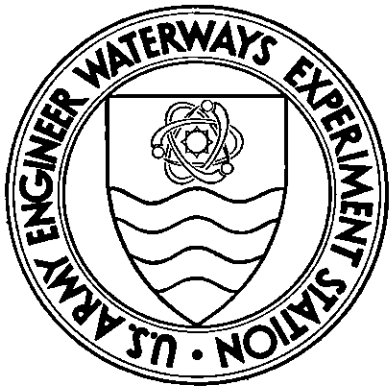

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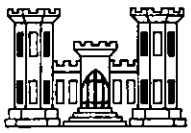

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ARMY-MRC VICKSBURG, MISS.

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 from the U. S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, New Hampshire; the U. S. Army Construction Engineering Research Laboratory (CERL), Champaign, Illinois; and the WES participated in this study. Personnel involved in the condition survey were Messrs. P. J. Vedros, R. D. Jackson, H. T. Thornton, Jr., S. J. Alford, and K. A. O'Connor of the WES; T. C. Johnson of CRREL; and G. Schanz of CERL. The main text of this report was prepared by Mr. Vedros under the general supervision of Messrs. J. P. Sale, R. G. Ahlvin, and R. L. Hutchinson of the Soils and Pavements Laboratory. The section of the report concerning frost action was prepared by Messrs. Johnson and G. D. Gilman of CRREL. 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

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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:

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 yards	0.8361274	square meters
pounds (mass)	0.45359237	kilograms
kips (mass)	453.59237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter
miles per hour	1.609344	kilometers per hour

CONDITION SURVEY, ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

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 Ellsworth Air Force Base (EAFB), South Dakota, during 6-9 April 1972. The following three major areas of interest were considered in this condition survey:

a. The structural condition of the primary airfield pavements.

b. The condition of pavement repairs and the types of maintenance materials that have been used at this airfield.

c. 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 pavements, foundations, or patching materials were performed during this survey. The annual pavement maintenance plan for EAFB is presented in Appendix A.

Pertinent Background Data

General description of airfield

4. EAFB, formerly Rapid City Air Force Base, is located in

Pennington and Meade Counties, South Dakota, approximately 6 miles* northeast of Rapid City.

5. In April 1972, the airfield facilities consisted of a NW-SE (12-30) runway, a parallel taxiway, a large operational apron, two warm-up aprons, a connecting taxiway to the runway and aprons, nine hangar access taxiways and aprons, two washracks, a missile loading facility, and an alert facility. The runway was 300 ft wide and 13,497 ft long; the operational apron was 850 ft wide and approximately 4,160 ft long; and the taxiways were 100 ft wide, except for a 75-ft-wide taxiway through the old ADC alert apron. 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

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

a. Condition survey reports.

(1) Ohio River Division Laboratories, CE, "Preliminary Report on Rigid Pavement Condition Survey of Rapid City Air Force Base, South Dakota," August 1947, Cincinnati, Ohio.

(2) _____, "Report of Rigid Pavement Condition Survey, Rapid City Air Force Base, South Dakota," July 1950, Cincinnati, Ohio.

(3) U. S. Army Engineer Division, Missouri River, CE, "Rigid Pavement Condition Survey of Ellsworth Air Force Base, South Dakota," April 1956, Omaha, Nebraska.

(4) _____, "Rigid Pavement Condition Survey, Ellsworth Air Force Base, South Dakota," June 1959, Omaha, Nebraska.

(5) U. S. Army Engineer District, Omaha, CE, "Report of Investigation of Flexible Airfield Pavement," October 1959, Omaha, Nebraska.

(6) Ohio River Division Laboratories, CE, "Condition Survey Report, Ellsworth Air Force Base, South Dakota," February 1965, Cincinnati, Ohio.

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

b. Pavement evaluation reports.

(1) U. S. Army Engineer Division, Missouri River, CE, "Pavement Evaluation Report, Rapid City Air Force Base, Rapid City, South Dakota (Evaluation No. I)," December 1944, Omaha, Nebraska.

(2) U. S. Army Engineer District, Omaha, CE, "Pavement Evaluation Report No. II, Ellsworth Air Force Base, Rapid City, South Dakota," October 1955, Omaha, Nebraska.

(3) _____, "Pavement Evaluation Report No. III, Ellsworth Air Force Base, South Dakota," November 1956, Omaha, Nebraska.

(4) _____, "Pavement Evaluation Report No. IV, Ellsworth Air Force Base," July 1957, Omaha, Nebraska.

(5) _____, "Pavement Evaluation Report No. V, Ellsworth Air Force Base," December 1957, Omaha, Nebraska.

(6) _____, "Airfield Evaluation Report, Ellsworth Air Force Base, South Dakota," November 1959, Omaha, Nebraska.

(7) _____, "Airfield Evaluation Report, Ellsworth Air Force Base, South Dakota," December 1960, Omaha, Nebraska.

(8) _____, "Airfield Evaluation Report, Ellsworth Air Force Base," January 1962, Omaha, Nebraska.

(9) Civil Engineering Center, Wright-Patterson Air Force Base, "Airfield Pavement Evaluation Report, Ellsworth Air Force Base, South Dakota," June 1971, Dayton, Ohio.

History of Airfield Pavements

Design and construction history

7. Details of the design and construction history of the airfield pavements (extracted from the reports referenced in paragraph 6) are presented in table 1. Pavement thicknesses, descriptions, and other details are presented in table 2.

Traffic history

8. A detailed traffic record was not available for this study; however, some traffic information was available from previous condition surveys and pavement evaluations. B-52 aircraft started

operating at EAFB in March 1957. Prior to that time, the heaviest aircraft using the field was the B-36. It was estimated that, in the last three years of operations by B-36 aircraft, approximately 7,000 coverages of channelized traffic were applied on the primary taxiway. Traffic at that time averaged about 1,000 cycles* per month, of which 40 percent was from fighters; 20 percent, C-124; 20 percent, B-36; and 20 percent, miscellaneous aircraft. During the period April 1957-March 1958, there were 404 cycles of B-47 traffic, 317 cycles of B-52 traffic, 23 cycles of KC-97 traffic, 178 cycles of C-124 traffic, and 6,239 cycles of miscellaneous aircraft traffic. From April-August 1958, a total of 454 cycles of B-52 traffic were applied. Traffic records for the period April-May 1959 indicate that 230 cycles of B-52, 3 cycles of KC-97, 11 cycles of KC-135, 23 cycles of C-124, and 800 cycles of miscellaneous aircraft traffic were applied. The average number of cycles per month during March-May 1964 was 585 for transports, cargoes, and tankers; 360 for fighters; and 89 for B-52's. Traffic records for heavy aircraft during the period 1 January 1971-31 December 1971 indicate that the total number of cycles was as follows: 1, C-5A; 96, C-141; 1,961, KC-135; 612, EC-135; and 828, B-52. The operating load of the B-52 for a basic mission was 410,000 lb; operating loads for the KC-135 and the EC-135 were 235,000 and 260,000 lb, respectively.

9. Based on the above information, it is estimated that there have been approximately 10,000-12,000 cycles of B-52 traffic applied to the airfield pavements at EAFB. The SE runway end is used for approximately 75 percent of the takeoffs and landings. The primary taxiway leading to this end of the runway and the runway end have, therefore, received approximately 5,000 coverages of channelized traffic from B-52 aircraft. Some portions of the apron taxiway receive 100 percent of these operations. Taxiway 26 (the primary taxiway to the NW end of the runway), which has developed distress at the joints, has received about 1,500 coverages from B-52 aircraft. The takeoff weight of these aircraft has averaged 400,000 lb. It was reported that, at present, about

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

8 to 10 practice alert aircraft per month taxi down the length of the runway, travel along the primary taxiway, and return to the parking stubs. The aircraft weigh about 488,000 lb during these exercises. These movements have not been included in the total number of cycles listed above. Assuming that these practice alerts have been occurring since B-52's have been at the field, there have been approximately 700 additional coverages of this heavy load applied on the full length of the runway and primary taxiway system.

Conditions of Pavement Surfaces

Pavement inspection procedure

10. 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 3. 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 5-827-3, "Rigid Airfield Pavement Evaluation," dated September 1965. The pavement defect identified as a keyed joint failure in table 3 was not included in the reference manual, because this type defect has only recently been observed. It results from traffic by extremely heavy aircraft and is considered to be a major defect.

Runway

11. In general, the condition of the pavement surface on the

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

runway was considered to be excellent. The 1000-ft runway ends were in excellent condition with only two major structural defects recorded (table 3). The 75-ft inlay section of the interior portion of the runway from sta 40+06 to 65+06 (features R12C, R14C, and R15C), which consisted of 18-in. reinforced portland cement concrete (PCC), had nine slabs that contained transverse cracks. The crack openings were very small and appeared to be held tightly together by the reinforcement (photo 1). The condition of this inlay section was rated as good.

12. An asphaltic concrete (AC) overlay was placed on the runway from sta 135+30 to 160+03 in 1966 and from sta 65+06 to 135+30 in 1969; and, at the time of this survey, the overlay pavement was in excellent condition. There was evidence of some reflection cracking at the joints, with some free water in the cracks, probably from frost melting. The overlay was feathered at sta 165+03, and the edges of the overlay were raveling at this point (photo 2).

13. The 17-in. PCC in the center 50 ft of the runway from sta 135+30 to 155+03 was replaced with 19-in. PCC in 1963 due to failures that had been experienced in the 17-in. pavement. The surface of the 19-in. PCC was reported to have become rough and an AC overlay was placed in 1966 to correct this condition. It was not possible to determine the performance of the 19-in. PCC because of the AC overlay.

14. Structurally, the pavements seem to be performing satisfactorily under the loads imposed by the B-52's now using the pavements. Sixteen B-52 pilots and thirty-six KC-135 pilots were asked to rate the riding quality of the runway, and only five B-52 pilots rated it as rough. The roughness was indicated to be on the northwest end of the runway, especially during landings.

Primary taxiway system

15. The primary taxiway system consists of taxiways 26, 21, and 17. The northwest end of taxiway 26 (feature T1A), which was constructed in 1956, was designed for channelized traffic of 100,000-lb wheel loads. The outer lanes are 19 in. thick, and the center lane is 22 in. thick, with a transition between the center and outer lanes. A condition survey performed in 1959 reported that, at that time, approximately

40 slabs contained longitudinal spalls that were the result of keyed joint failures. During the 1972 survey, it was estimated that approximately 163 slabs in the center lane contained longitudinal spalls that were considered to have resulted from keyed joint failures. These failed areas have been sawed out and replaced by hot-mix AC patches. The patches vary in length from several feet to the full length of a slab, and frequently the joints on both sides of the slab require patching. There were 23 slabs in this taxiway that had been replaced because they had reached a shattered condition. This feature was rated as being in fair condition, based on the defects that were recorded in the 1972 survey.

16. The next portion of taxiway 26 (feature T2A) is of flexible pavement construction. This area had developed distress from B-52 operations, so the center 50 ft of the taxiway was overlaid with 4 to 6 in. of AC in 1971. At the time of this survey, this feature was in excellent condition, with no evidence of grooving or cracking from the heavy aircraft operations.

17. The portion of taxiway 26 adjacent to the operational apron (feature T4A), which was constructed in 1953 of 21-in.-thick PCC, is 100 ft wide. Failures occurred in the two middle lanes, and, in 1963, the Air Force replaced the center 50 ft of this taxiway with PCC pavement of the same thickness. This new pavement was placed in three lanes with slabs that were 16 ft 8 in. wide and 12 ft 6 in. long. The as-built drawings show that the longitudinal joints contained dowels instead of keyed joints. The 1972 survey indicated that about 14 slabs in the center 50-ft section contained longitudinal spalls that had been patched as well as about 6 other major structural defects (see photos 3 and 4). The center section of the taxiway was in good condition, and the outer edges were in excellent condition.

18. Taxiway 21 is the taxiing area through the operational apron. Originally, the portion of the taxiway identified as feature T5A was constructed as part of the apron, and an area was marked off for taxiing purposes. It was reported that failures in the form of rutting developed in the tar concrete surface under B-52 operations, so, in 1967,

the 4-in. bituminous pavement (1-1/2-in. tar concrete and 2-1/2-in. AC) was removed and replaced with 4-in. AC. All aircraft operations from the apron area funnel onto this taxiway for alert movements or for take-offs. The surface of the taxiway pavement in 1972 showed evidence of slight rutting and longitudinal cracking from B-52 operations; however, the pavement is presently considered to be in very good condition.

19. A portion of taxiway 21 (feature T6A) crosses the area which was part of the old N-S runway. It was reported that, in two instances in the past, aircraft wheels have broken through the apron surface in areas just adjacent to the underlying old N-S runway. This portion of taxiway 21 consists of 23-in.-thick PCC and was in excellent condition.

20. The portion of taxiway 17 leading off the south edge of the operational apron through the old ADC alert apron (features T7A and T8A) consists of 23-in.-thick PCC and was rated very good during this survey. The remaining portion of taxiway 17 to the southeast end of the runway (feature T9A) consists of 21-in. reinforced PCC. There were some structural defects in this feature, such as transverse cracks, but they were held tightly together by the reinforcement. There were a number of slabs in this feature that contained corner spalls, and about half of these spalls had been patched with AC. The condition of this feature was rated as good.

Operational apron

21. The large operational apron, which is constructed of bituminous pavement (feature A2B), was in fair condition. The tar concrete surface contained some random cracking that was not associated with overloading. The tar concrete surface has received a number of slurry seal coats (coal tar pitch emulsion and sand) over the years. The most recent coat was applied in about 1967. This treatment had tended to keep surface cracks sealed. It was reported that, during hot summer days, the tar surface softens and cracking of the seal material occurs.

SAC alert facility

22. The SAC alert facility consists of a taxiway (feature T11B) and nine parking stubs (feature A5B). The taxiway was in very good condition, and the parking stubs, except stubs 6 and 9, were in

excellent condition. There were two corner breaks observed in stub 6 and four structural cracks (longitudinal, corner, and transverse) in stub 9. These two facilities were in very good condition. The alert facility is constructed mostly on a deep fill, but there was evidence of only one or two slabs near stub 2 where some slight settlement had occurred.

NW and SE warm-up aprons

23. The NW warm-up apron (feature A1B) and SE warm-up apron (feature A4B) are constructed of 19-in.-thick PCC pavement. A number of longitudinal spalls, which had been patched and are attributed to keyed joint failures, were observed on the NW warm-up apron. The SE warm-up apron did not have joint defects but did have a few structural breaks. Both apron areas were in very good condition.

Secondary facilities

24. The taxiways in the maintenance hangar areas (taxiways 7-11) were in fair to very good condition. Taxiways 8 and 9 have 50-ft-wide center sections of 23-in. PCC, and taxiways 10 and 11 are constructed of 21-in. PCC. Taxiway 10 received an AC overlay in 1966. These four taxiways (8-11) contained only a few structural defects in the taxiing areas, and the pavements were all in very good condition. Taxiway 7 was surfaced with an AC overlay over 19-in. PCC; a considerable amount of reflection cracking was evident in the overlay. However, the reflection cracks have all been sealed.

25. The 13-in. PCC in the nose dock apron areas was badly spalled, cracked, scaled, and in generally poor condition. Taxiways 22 and 27, which are ladder taxiways off the runway, are paved with AC. Both were in fair condition. There was evidence of some overload cracks, but most of the cracking in the surface was random cracking resulting from aging and climatic conditions. The pavements appeared to be performing satisfactorily.

Maintenance

26. Maintenance at EAFB had consisted of crack sealing, replacing

shattered slabs, slurry sealing, joint resealing, patching joint spalls, and repairing localized failed areas on the aprons. A copy of the annual pavement maintenance plan was obtained from the Air Force and is included in this report as Appendix A. This maintenance plan indicates the type and amount of maintenance that had been performed at EAFB through November 1969. The costs of maintenance for airfield pavements were reported to be as follows:

FY 1968 - $122,815
FY 1969 - $146,849
FY 1970 - Not available
FY 1971 - $90,091
FY 1972 - $232,111 (to date)

27. Maintenance of the longitudinal spalls on the north end of taxiway 26 has consisted of sawing to a minimum depth of 2 in. in the sound concrete beyond the spalled area and chipping out the unsound concrete to the depth of the keyway. The exposed surface is then brushed with a tack coat, and hot-mix AC is used in the patch. When existing patches have settled 1/2 in. or more below the adjacent slab, additional hot-mix AC has been applied. These patches have been performing fairly well for the past 10 years. It was reported that, in the area of taxiway 26 that contained dowels, patching the spalls required the removal of only about 4 in. of unsound concrete (i.e., the depth of the patch was less than the depth of the dowel).

28. Maintenance of the operational apron has consisted of repairing two areas where towed aircraft were reported to have broken through the pavement surface adjacent to the old N-S runway. A slurry seal of tar emulsion and sand was placed on the apron area during about 1967, and this repair has helped to seal the cracks in the surface.

29. At the present time, there is a maintenance problem in the sod area just adjacent to the paved area where the B-52's perform engine run-up checks. The sod, along with parts of the adjacent edge of the paved surface, is being eroded away.

30. Pop-outs are not a major problem at this base, because

crushed limestone has been used as the coarse aggregate for the PCC. Some of the pop-outs have been patched with epoxy resin materials, which have performed satisfactorily.

31. The joint seal material generally was in fair condition. However, there are some areas where the joint seal material is in poor condition, and the joints need to be resealed.

Comparisons of Pavement Performances

32. The latest evaluation of the pavements was reported in June 1971 (see paragraph 6b). The thicknesses of the pavements, the physical property data, and the evaluation loads presented in the referenced report were used for a comparison of the past pavement performances with the performances indicated by the results of the condition survey reported herein.

Runway

33. Based on the evaluation loads (table 4) and present design criteria for normal operations, none of the pavements of the runway have been overloaded from B-52 operations. In consideration of the practice alert operations at 488,000-lb gross loads and under the assumption (based on the traffic data) that approximately 700 coverages of this load have been applied to the full length of the runway, the first 1,000 ft of the northwest (12) end of the runway is approaching the design criteria requirements for loads and coverages. On the basis of the 5,000 coverages applied, the southeast (30) end is in about the minimum-to-full operational category for aircraft with approximately 400,000-lb gross loads. As is noted in table 4, the evaluation gross load for this end of the runway for the minimum-to-full category is 600,000 lb.

Primary taxiways

34. Taxiway 26 in the primary taxiway system has experienced distress in the rigid and flexible pavement sections as a result of B-52 operations. These pavements were designed to support a 100,000-lb gear load on twin wheels, which at the time of construction were the loading

and gear configuration of B-47 aircraft. The flexible pavement section (feature T?A) was overlaid after distress had developed; and, with the additional overlay thickness and the present intensity of traffic, this area is not presently being overloaded by B-52 operations. The north end of taxiway 26 (feature T1A) was constructed in 1956 of 22-in.-thick PCC; shortly after B-52 operations started in about 1959, distress occurred in the longitudinal joint in the middle lane in the form of a longitudinal spall. The keyed joints on each side of the middle lane were failing. At the present time, about 96 percent of the slabs in the middle lane contain asphalt patches as a result of the keyed joint failures. This is the only type of defect noted in these slabs; thus the 22-in.-thick pavement is carrying the load of the B-52 aircraft without the benefit of a load-transfer device. The other portion of taxiway 26 (feature T4A), which was reconstructed by the Air Force in 1963, consists of 21-in.-thick, 50-ft-wide PCC with doweled joints. This pavement is experiencing longitudinal spalls in the 50-ft-wide reconstructed area. At the time of this survey, 68 percent of the slabs in the center 50-ft-wide section of this taxiway contained asphalt patches required because of the joint spalls.

35. Taxiway 21 through the operational apron was reconstructed of 4-in. AC in 1967, because the existing pavement (1-1/2-in. tar concrete and 2-1/2-in. AC) was rutting under B-52 operations. The replacement of the pavement surface did not change the load-carrying capability, and the AC surface is showing signs of longitudinal cracking and grooving from overloads of B-52 traffic.

36. Features T7A and T8A of taxiway 17 consist of 23-in.-thick PCC. According to the evaluation, this area is not being overloaded by present B-52 operations. The 21-in. reinforced section of taxiway 17 (feature T9A) contained some defects, but the reinforcement is keeping the cracks tightly closed. This pavement is not being overloaded by B-52 operations.

Aprons

37. All of the apron pavements (except the heavy-bomber alert apron hardstands) are overloaded by operations of the B-52 at gross

loads of approximately 400,000 lb. The large operational apron appears to be performing satisfactorily under present B-52 operations. There was little evidence of overloading in the areas where the planes are parked. Distress from overloads was, however, noted in the taxiing lanes and near the fueling pits.

Frost Action

Objectives of inspection

38. The objectives of the inspection were to determine:

a. Any adverse effects of frost heave to the pavements during the winter months.

b. Any traffic-induced failures that might be related to thaw weakening of the subgrades or base courses.

Frost heave of pavements

39. The airfield pavements (traffic and nontraffic areas of flexible and rigid pavements) were inspected to identify any localized or generalized surface irregularities that might indicate differential frost heaving. The inspection, which was conducted on 6 and 7 April, was believed to have coincided with or followed shortly after the period of thawing of frozen base courses and subgrades. Therefore, the effects of any detrimental nonuniform heave should have been apparent.

40. Personnel in the Base Civil Engineering Office were queried regarding the development of undesirable surface unevenness during the winter, and pilots were asked to rate the degree of roughness of the runway. Fifty-two pilots of B-52 and KC-135 aircraft were canvassed; only five rated the runway as rough, and only six considered the runway to be less smooth during the winter months. The engineers stated that the 1969 runway overlay was constructed partly to correct a rough surface. Evidently, the overlay accomplished this purpose; furthermore, frost action since that time has not caused surface irregularities to recur. The consensus of the condition survey team was that the runway did not exhibit roughness detectable in a passenger car at speeds of up to 60 mph.

41. The taxiways and aprons were not found to have suffered settlements or other vertical displacements, except for the extremely overloaded 13-in. PCC hangar access pavements and slight surface rutting in certain AC taxiways. No evidence of differential frost heave was observed, even on pavements of 20- to 25-in. combined thicknesses (pavement and base course). In fact, differential frost heave was not evident even in the old ADC alert apron, which has a 2-1/2-in. AC overlay on a 7-in. PCC pavement, for a combined thickness of 9-1/2 in. above a frost-susceptible subbase.

Thaw weakening of subgrades or base courses

42. The extent of thaw weakening of the subgrade and base courses could not be readily determined by inspection of the pavements. Pavements usually are repaired or otherwise corrected (as with overlays) when failures occur and usually are not easily examined during a condition survey. However, even if the failed pavements can be examined, it is often impossible to determine by visual observations whether a failure is the result of thaw weakening or of deficiencies in the thickness of the subgrade, base, or pavement. In general, the depletion of the fatigue resistance of a pavement system in a frost area is progressive under repeated load applications and is inevitably related to thaw weakening, whether the evidence of fatigue or failure becomes visible during the frost-melting period or at some other time of year. Accordingly, the degree of thaw weakening and its effects, if any, on the condition of the pavements at EAFB could not be appraised merely by an inspection of the pavements. Some limited perception of the severity of frost effects at the base can be gained, however, by comparing the performance of certain pavements with what might have been expected in the light of current frost design criteria.

Pavement performances versus frost condition criteria

43. Many of the pavements are severely deficient in slab thickness and/or in combined thickness when compared with current frost criteria or even with normal (nonfrost) design criteria. However, most

of the pavements were in good to excellent condition, and the pavements that showed distress or had been overlaid (indicating prior distress) were not necessarily those with severe thickness deficiencies. The following paragraphs contain brief comments regarding several of the pavements.

44. At the northwest end of taxiway 26 (feature T1A), nearly continuous longitudinal keyed joint failures have occurred along both edges of the center slab, thereby eliminating effective load transfer to adjoining slabs. The design is severely deficient for either frost or normal (nonfrost) design. Yet slabs in which the keyed joints have failed have not cracked further; thus it seems very doubtful that the subgrade modulus at this location has decreased during thawing seasons to the level of the magnitude assumed by current frost design criteria for the thawing season. The pavements of feature T1A, the adjoining taxiway through the northwest warm-up apron, and the northwest end of the runway (feature R3A) are of identical design and apparently experience identical traffic, yet the latter two pavements show little or no distress. A comparison of feature T1A with feature T4A (a part of the same taxiway) shows that feature T4A has a combined thickness of 62 in. and therefore must surely have a high subgrade modulus even in the spring. Yet the pavement of feature T4A shows distress only slightly less severe than feature T1A. Thus, it is believed that the pattern of distress in these pavements is not dependent on frost action, which indeed can have an insignificant effect upon them.

45. The center 50 ft of the runway interior (traffic area C) consists of 19-in. PCC over 34 in. of gravel from sta 135+30 to 155+03 (feature R7C). This structure was not considered to be deficient in design thickness for this type of facility; however, it had been overlaid with 2 in. of AC, yielding a combined thickness of 55 in. Presumably, the overlay was applied because the original pavement had manifested severe distress. The AC overlay pavement from sta 65+06 to 130+04 (feature R11C), with a combined thickness ranging from 27-1/2 to 30-1/2 in., appeared to be performing as well as the 55-in. pavement of feature R7C. The overlay was placed in 1969 and was in excellent condition at the time of this inspection. This performance is surprising, because the

combined thickness of 27-1/2 to 30-1/2 in. should be severely deficient according to current criteria (even for the normal condition) for subgrade CBR values of 5 to 8, as are reported for EAFB in the 1971 pavement evaluation report. Possibly, the relatively good performance of the 27-1/2- to 30-1/2-in. section results from the composition of the individual layers, most of which are asphalt- or cement-stabilized materials. At any rate, the condition of the pavements in the interior of the runway suggests that they have not been significantly affected by frost action.

46. The edges of the runway have relatively thin sections (combined thickness of 20 in. from sta 40+06 to 130+04), yet roughness from frost heave was not reported nor was it observed during the inspection. Similarly, there was no evidence of differential frost heave along the edges of the taxiways, where taxiway pavements with thicknesses of 25 to 62 in. adjoin shoulder pavements with thicknesses of 17 to 20 in. Again, frost action apparently has not significantly affected the pavements.

47. The comments in paragraphs 43-46 presuppose that a significant amount of B-52 traffic has been applied at this airfield, and some of the comments would be invalid were this not so. However, the data presented in this report show that significant B-52 traffic has occurred over the years (even though the cumulative number of coverages is somewhat less than the total assumed in the design criteria) and that the coverages were applied at significantly lower loads than the 265-kip assembly load currently used for design.

Design freezing index

48. A design freezing index of 1439 degree-days has been cited in previous condition surveys and pavement evaluation reports (paragraph 6). This value is the average of the three coldest winters in the 1921 to 1954 period (1935-36, 1948-49, and 1949-50). The design freezing index reflecting the average of the three coldest years in the past 30 years (1941-1971) is 1360 degree-days. The latter determination also includes the 1948-49 and 1949-50 winters, with the winter of 1968-69 replacing 1935-36. Both design indices are based on records of the Rapid City Weather Station and consider average daily temperatures for the

transition months at both ends of the freezing seasons.

49. Seasonal indices since 1956-57 are tabulated below, together with the mean freezing index for the 1931-60 period. These values from Rapid City Weather Station records are based entirely on average monthly temperatures and are generally somewhat lower than indices that consider average daily temperatures for the transition months. On a seasonal basis, this numerical difference may vary from an essentially negligible amount to more than 150 degree-days. The values do, however, indicate the relative severity of the freezing seasons and show that several substantially colder-than-normal winters have occurred during the period of B-52 aircraft operations.

Freezing Season	Freezing Index degree-days	Freezing Season	Freezing Index degree-days
1957-58	323	1965-66	907
1958-59	794	1966-67	417
1959-60	839	1967-68	694
1960-61	363	1968-69	1230
1961-62	997	1969-70	731
1962-63	730	1970-71	1026
1963-64	578	1971-72	957
1964-65	1125	30-year Mean (1931-1960)	678

Groundwater table

50. The most logical explanation for the scant evidence of differential frost heave and of significant pavement distress during spring thaws is the existence of a very deep groundwater table. Evidence on this point is conflicting, however. Engineers attached to the Base Civil Engineering Office at EAFB expressed the opinion that at times the groundwater table is located no more than 2 to 3 ft below the ground surface. There were several references to a lake that was formerly located in the area now occupied by the runway, and it has been reported that free water was found in the base course when various pavements were excavated to install stronger inlay sections. Logs of a number of

borings taken at various locations on the base were examined. The groundwater table in most cases was not mentioned; but, in some cases, it was shown to be at depths of 20 to 30 ft. Groundwater investigations at EAFB reported by the U. S. Army Engineer District, Omaha, in April 1951, found that groundwater generally was not present within less than about 20 ft below the surface. These investigations appear to be quite conclusive. The reports that water has been found near the surface apparently refer to localized perched water, possibly from infiltration through pavement joints and cracks, and evidently such sources do not supply an ample amount of water to support extensive frost action. Possibly, this condition might be more generalized except that the landform at and surrounding the base, with well defined water courses and other topographic relief, is favorable for runoff of surface water.

Evaluation

51. The latest evaluation report for this airfield was prepared in 1971 (see paragraph 6b). The load-carrying capabilities for the various features have been taken from the 1971 report and presented in this report in table 4. This material has been repeated to provide the reader with as much of the latest pavement information as possible under one cover.

Conclusions

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

a. The pavements on the northwest end of the runway are designed for 100,000-lb gear loads and are not being overloaded by present operations, since the majority of heavily loaded aircraft use the southeast end of the runway for takeoff.

b. The keyed joint failures occurring on taxiway 26 have only recently been identified in heavy-load test sections and are failures that occur fairly rapidly. Methods of repairing or strengthening those pavements that contain

keyed joints are being investigated by the U. S. Army Engineer Waterways Experiment Station.

c. The satisfactory performance of the 22-in. slabs after failure of the keyed joints indicates that further studies are required to determine if the present thickness requirements are too conservative.

d. The hot-mix AC patches in the areas of longitudinal spalls on the taxiway have performed satisfactorily as a temporary form of maintenance. However, the patches settle and roughen under taxiing aircraft, and more material must be added to the patch as a filler.

e. The recent overlay work on the runway appears to have eliminated the objectionable roughness experienced by operational personnel. However, there is still some minor roughness on the northwest end of the runway during landings.

f. The AC overlay (4 to 6 in.) placed on taxiway 26 (feature T2A) in 1971 increased the load-carrying capability of this facility by approximately 25 percent. This overlay was placed after the most recent evaluation report was prepared.

g. While several substantially colder-than-normal winters have been experienced in recent years at the base and the subgrade soils are classified as highly frost susceptible, it is not evident that the pavements have been adversely affected by frost heave.

h. Features with a combined thickness of pavement and nonfrost-susceptible base that is substantially less than what is required under current design criteria have performed well. It appears that subgrades have not been severely weakened by freezing and thawing. It is believed, however, that the absence of a high groundwater table has restricted frost action.

Photo 1. Transverse crack in reinforced PCC slab of NW-SE runway

Photo 2. Raveling of feathered edge of AC at sta 165+03 of NW-SE runway

Photo 3. Patched joint spalls on taxiway 26 near parking apron. Note that patches are on each side of joint

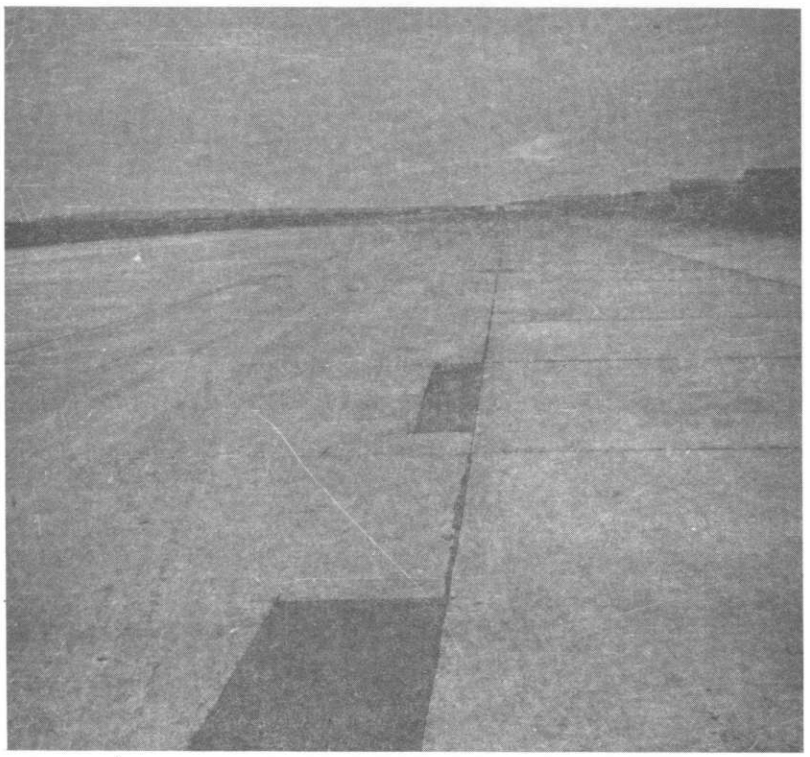

Photo 4. Patched joint spalls near north end of taxiway 26 (feature T4A)

Table 1

Airfield Construction History

Pavement Facility	Pavement Thickness in.	Pavement Type	Date(s) of Construction	Design Loading	Remarks
N-S runway*	3-1/2 to 1-1/2	AC	1942	80,000-lb gross plane load	Abandoned
E-W runway*	3-1/2 to 1-1/2	AC	1942	80,000-lb gross plane load	Abandoned
NW-SE runway	3-1/2 to 1-1/2	AC	1942	80,000-lb gross plane load	
Taxiways A, B, C,** D,** and F*	7	PCC	1942-43	74,000-lb gross plane load	Taxiways A, C, D, E, and F abandoned
Taxiway E**	7	PCC	1942	74,000-lb gross plane load	Abandoned
Taxiway G**	4	AC	1942	74,000-lb gross plane load	Abandoned
Old N-S operational apron*	7	PCC	1942	80,000-lb gross plane load	North portion abandoned
N-S runway, overlay*	7	PCC	1943		
E-W runway, overlay*	7	PCC	1943		
NW-SE runway, overlay	7	PCC	1943		
NW-SE runway					
Sta 30+06 to 47+10	3	BP†	1950	80,000-lb gross plane load	
Sta 130+53 to 135+30	3	AC	1950	80,000-lb gross plane load	
Sta 130+53 to 135+30, overlay	3	AC	1950		
Taxiway K	4	BP	1950	120,000-lb gross plane load	Redesignated taxiway 17
Taxiway H	4	AC	1950	120,000-lb gross plane load	Redesignated taxiway 22
Operational apron	4	BP	1950	120,000-lb gross plane load	
Heavy maintenance apron	4	BP	1950	120,000-lb gross plane load	
Heavy-bomber hangar aprons	4	BP	1950	220,000-lb gross plane load	
Connecting taxiway	4	BP	1950	220,000-lb gross plane load	
Taxiway G	4	BP	1950	220,000-lb gross plane load	
Taxiways J-1 and J-2	4	BP	1950	120,000-lb gross plane load	Incorporated in operational apron
NW-SE runway, overlay	5	AC	1951	100,000-lb twin gear load	
N-S runway, south end; overlay	5	AC	1951		
ADC alert taxiway and apron	3	AC	1951-52	25,000-lb single-wheel load	
ADC operational apron extension	3	AC	1951-52	25,000-lb single-wheel load	
Old N-S operational apron, south end; overlay	2-1/2	AC	1953	25,000-lb single-wheel load	
Taxiways A and B, overlay	2-1/2	AC	1953		Redesignated taxiways 25 and 19
Maintenance docks taxiways L-1, L-2, L-3, and L-4	4	AC	1953	100,000-lb twin gear load	Redesignated taxiways 13, 14, 15, and 16
Multipurpose dock aprons M-2 and M-3	13	PCC	1953	25,000-lb single-wheel load	
Taxiways M-1, M-2, and M-3	21	PCC	1953	100,000-lb twin gear load	Redesignated taxiways 26, 11, and 10
Calibration platform (overlay)*	13	PCC	1954		Abandoned
Connecting taxiway (overlay)*	5	AC	1954		Abandoned
Aircraft washrack	17 and 12	PCC	1954	80,000- and 25,000-lb gear load	
Maintenance aprons M-4 and M-5	17	PCC	1955	80,000-lb gear load	
Taxiways M-1, M-4, and M-5	4	AC	1955	100,000-lb gear load	Redesignated taxiways 26, 9, and 8
NW-SE runway extension	22-19 and 17	PCC	1956	100,000-lb twin gear load	
Primary taxiway	19 and 22	PCC	1956	100,000-lb twin gear load	Taxiway 26
N and S warm-up aprons	19	PCC	1956	100,000-lb twin gear load	
Maintenance aprons M-6 and M-5 (extension)	19	PCC	1956	80,000-lb gear load	
Taxiways M-6 and M-5 (extension)	19	PCC	1956	100,000-lb twin gear load	Taxiways 7 and 8
Maintenance dock aprons L-1A, L-2A, and L-3A	19	PCC	1956	80,000-lb gear load	
Taxiways L-1A, L-2A, and L-3A	19	PCC	1956	100,000-lb twin gear load	Redesignated aprons
South apron (ready shelters)	19	PCC	1956	100,000-lb twin gear load	
Heavy-bomber hangar apron extension	19	PCC	1958	160,000-lb twin-twin gear load	
Heavy-bomber alert apron	22	PCC	1958	265,000-lb twin-twin gear load	
Heavy-bomber alert taxiway	22	PCC	1958	265,000-lb twin-twin gear load	
NW-SE runway reconstruction, sta 30+06 to 40+06	22 and 23	PCC	1958	265,000-lb twin-twin gear load	
Through taxiway on operational apron and parking apron	22 and 23	PCC	1958	265,000-lb twin-twin gear load	Taxiway 21
Taxiway M-4 and M-5	23	PCC	1959		Air Force replaced 50 ft of flexible pavement with two 25-in. lanes of rigid pavement, taxiways 9 and 8
NW-SE runway, sta 40+06 to 65+06	18	PCC††	1960	265,000-lb twin-twin gear load	Center 75 ft
NW-SE runway (overlay), sta 65+06 to 130+04	2 to 5	AC	1960		Center 75 ft
NW-SE runway, sta 130+04 to 135+30	17	PCC††	1960	265,000-lb twin-twin gear load	Center 75 ft
Taxiway K	21	PCC††	1961	265,000-lb twin-twin gear load	Replaced center 50 ft, taxiway 17
Taxiway M-2 apron access	21	PCC	1963		Air Force replaced two lanes, 50 ft wide, taxiway 11
NW-SE runway extension inlay, sta 0+00 to 20+00	19	PCC	1963		Air Force replaced two 50-ft-wide center lanes, edges thickened to 24 in.
Taxiway M-1 adjoining taxiways M-2 and M-3	21	PCC	1963		Air Force replaced three 50-ft-wide lanes, taxiway 26
Missile loading/unloading facility and taxiway 23	3	AC	1965		
Pad	17	PCC	1965		
Hangar access apron off taxiway 14	4	AC	1966		
Taxiway 10 (overlay)	2	AC	1966		
NW-SE runway (overlay) sta 135+30 to 160+03	2	AC	1966		
NW-SE runway (overlay) sta 65+06 to 135+30	1-1/2	AC	1969		
Taxiway 26 (old taxiway M-1) center 50 ft	4 to 6	AC	1971		

* Portion of abandoned or partly abandoned pavement that is shown in plate 1.

** Abandoned pavement that is not shown in plate 1.

† Bituminous pavement.

†† Reinforced.

Table 2

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	
R1X Overruns	850	300					Double bituminous surface treatment		6	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)		Excellent
									35	Gravel subbase (GW)	50	Frost Gp F-3		
R2X Blast areas at NW-SE runway ends	150	300				2	Asphaltic concrete		6	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Excellent
									33	Gravel subbase (GW) Frost Gp F-1	50	Frost Gp F-3		
R3A NW-SE runway, NW end; Sta 160+03 to 165+03	500	300				22	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Excellent
											K_f = 25	Frost Gp F-3		
R4B NW-SE runway, NW end; 100-ft center, sta 155+03 to 160+03	500	100	2	Asphaltic concrete		19	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Excellent
											K_f = 25	Frost Gp F-3		
R14C NW-SE runway, SE end; 75-ft center, sta 43+00 to 47+40	440	75				18	Reinforced portland cement concrete	750	12 to 17	Gravel subbase (GW)	K = 125	Clay (CH or CL)		Good
											K_f = 70	Frost Gp F-3		
R13D NW-SE runway, SE end; outside edges, sta 43+00 to 47+40	440	112.5	0 to 5	Asphaltic concrete		3	Asphaltic concrete	750	12	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Good
									15	Gravel subbase (GW)	50	Frost Gp F-3		
R12C NW-SE runway; 75-ft center, Sta 47+40 to 65+06	1766	75				18	Reinforced portland cement concrete	750	9	Gravel base course	K = 110	Clay (CH or CL)		Good
											K_f = 55	Frost Gp F-3		
R11C NW-SE runway; 75-ft center, Sta 65+06 to 130+04	6498	75	9 to 12	Asphaltic concrete		7	Portland cement concrete	750	3-1/2	Asphaltic concrete	K = 200	Clay (CH or CL)		Excellent
									8	Gravel base course	K_f = 75	Frost Gp F-3		
R10D NW-SE runway; outside edges, Sta 47+40 to 130+04	8264	112.5	5	Asphaltic concrete		7	Portland cement concrete	750	2	Asphaltic concrete	K = 100	Clay (CH or CL)		Good
									6	Gravel base course	K_f = 100	Frost Gp F-3		
R9C NW-SE runway; 75-ft center, Sta 130+04 to 135+30	526	75	2	Asphaltic concrete		17	Reinforced portland cement concrete	750	18	Gravel base	K = 160	Clay (CH or CL)		Excellent
											K_f = 100	Frost Gp F-3		
R8D NW-SE runway; outside edges, Sta 130+04 to 135+30	526	112.5				6-8	Asphaltic concrete		12	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Good
									15	Gravel subbase (GW)	50	Frost Gp F-3		
R5D NW-SE runway, NW end; outside edges, sta 155+03 to 160+03	500	100				19	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Excellent
											K_f = 25	Frost Gp F-3		

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MAR 1958

Table 2 (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	
R6D NW-SE runway; outside edges, sta 135+30 to 155+03	1973	125	2	Asphaltic concrete		17	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60 K_f = 25	Clay (CH or CL) Frost Gp F-3		Excellent
R7C NW-SE runway; 50-ft center, sta 135+30 to 155+03	1973	50	2	Asphaltic concrete		19	Portland cement concrete	650	24 10	Crushed limestone (GW) Gravel filter course (GW)	K = 60 K_f = 25	Clay (CH or CL) Frost Gp F-3		Excellent
R15C NW-SE runway, SE end; 75-ft center, sta 40+06 to 43+00	294	75				18	Reinforced portland cement concrete	750	12	Gravel base course (GW)	K = 125 K_f = 70	Clay (CH or CL) Frost Gp F-3		Good
R16D NW-SE runway, SE end; outside edges, sta 40+06 to 43+00	294	112.5				3	Asphaltic concrete		12 15	Crushed limestone (GW) Gravel subbase (GW)	CBR = 80 50	Clay (CH or CL) Frost Gp F-3	CBR = 5	Good
R17B NW-SE runway, SE end; 100-ft center, sta 35+06 to 40+06	500	100				22	Portland cement concrete	665	25	Gravel base (GW)	K = 160 K_f = 140	Clay (CH or CL) Frost Gp F-3		Excellent
R18D NW-SE runway, SE end; outside edges, sta 35+06 to 40+06	500	100				15	Portland cement concrete	665	32	Gravel base (GW)	K = 160 K_f = 140	Clay (CH or CL) Frost Gp F-3		Excellent
R19A NW-SE runway, SE end; sta 30+06 to 35+06	500	300				23	Portland cement concrete	665	24	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL) Frost Gp F-3		Excellent
T1A Taxiway 26	3330	50 to 75				19-22-19	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60 K_f = 25	Clay (CH or CL) Frost Gp F-3		Fair
T2A Center 50 ft of taxiways 26 and 27	2450	50	4 to 6	Asphaltic concrete		4	Asphaltic concrete		6 42	Crushed limestone (GW) Sand (SM) Frost Gp F-2	CBR = 80 55	Clay (CH or CL) Frost Gp F-3	8	Excellent
T12B Taxiway 7	783	75	2	Asphaltic concrete		19	Portland cement concrete	680	4	Gravel filter course (GW)	K = 60 K_f = 25	Clay (CH or CL) Frost Gp F-3		Fair
T13B 50-ft keel in taxiway 8	1300	50				22-23-22	Portland cement concrete	700	20	Gravel base course (GW)	K = 120 K_f = 120	Clay (CH or CL) Frost Gp F-3		Very good

WES FORM MAR 1958 1000

Table 2 (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	
T27B Outside 25 ft of taxiway 8	1300	25				4	Asphaltic concrete		6	Crushed limestone	CBR = 80	Clay (CH or CL)		Good
									42	Sand subbase (S-M), F-2	45	Frost Gp F-3		
T14B 50-ft keel in taxiway 9	1650	50				22-23-22	Portland cement concrete	700	20	Gravel base course (GW)	K = 120	Clay (CH or CL)		Very good
											K_f = 120	Frost Gp F-3		
T28B Outside 25 ft of taxiway 9	1650	25				4	Asphaltic concrete		6	Crushed limestone (GW-GM), F-1	CBR = 80	Clay (CH or CL)	CBR = 8	Good
									33	Gravel subbase (GP), F-1	45	Frost Gp F-3		
T15B Ladder taxiways off taxiway 10	300	75				21	Portland cement concrete	670	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Good
											K_f = 25	Frost Gp F-3		
T16B Taxiway 10	2000	75	2	Asphaltic concrete		21	Portland cement concrete	670	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Fair
											K_f = 25	Frost Gp F-3		
T18B 50-ft keel section in taxiway 11	1975	50				21	Portland cement concrete	700	4	Gravel filter course (GW)	K = 120	Clay (CH or CL)		Very good
											K_f = 120	Frost Gp F-3		
T19B Outside 25 ft of taxiway 11	1975	25				4	Asphaltic concrete		6	Crushed limestone (GW), F-1	CBR = 80	Clay (CH or CL)	CBR = 8	Very good
									33	Gravel subbase (GP), F-1	45	Frost Gp F-3		
T17B Taxiway to washrack	250	75				17	Portland cement concrete	620	12	Gravel base course	K = 100	Clay (CH or CL)		Fair
											K_f = 50	Frost Gp F-3		
T26B Ladder taxiways off taxiway 11	Varies	Varies				21	Portland cement concrete	620	4	Gravel base course	K = 100	Clay (CH or CL)		Good
											K_f = 50	Frost Gp F-3		
T4A Taxiway 26	1325	75				21	Portland cement concrete	650	12	Crushed limestone (GW)	K = 120	Clay (CH or CL)		Good
									29	Gravel (GW)	K_f = 120	Frost Gp F-3		
T5A Taxiway 21	4200	50				4	Asphaltic concrete		12	Crushed limestone (GW-GM), F-1	CBR = 80	Clay (CH or CL)	CBR = 6	Very good
									27	Gravel subbase (GP), F-1	35	Frost Gp F-3		

Table 2 (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	
T3B	Taxiways 26 and 27, outside edges	2450	25, 37.5				4	Asphaltic concrete		6	Crushed limestone (GM)	CBR = 80	Clay (CH or CL)	CBR = 8	Fair
										33	Sand subbase (SM) Frost Gp F-2	55	Frost Gp F-3		
T6A	Taxiway 21 (through old N-S runway)	448	100				22-23-22	Portland cement concrete	665	25 24 25	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL)		Excellent
T7A	Taxiway 17 (through old ADC alert apron)	789	75				23	Portland cement concrete	665	24	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL)		Very good
T8A	Taxiway 17 (through old ADC alert apron)	507	75				22-23-22	Portland cement concrete	665	25 24 25	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL)		Very good
T9A	Center 50 ft of taxiway 17	1810	50				21	Reinforced portland cement concrete	750	24	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL)		Good
T10B	Outside edges of taxiway 17	1810	Varies				4	Asphaltic concrete		12	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Good
										28	Gravel subbase (GW), F-1	45			
T11B	Center 25 ft of SAC alert apron and taxiway	2897	25				22	Portland cement concrete	665	24	Gravel base (GW)	K = 140 K_f = 140	Clay (CH or CL)		Very good
T22C	Taxiway 22	850	100				4	Asphaltic concrete		12	Crushed limestone (GW-GM), F-1	CBR = 80	Clay (CH or CL)	CBR = 8	Good
										28	Gravel subbase (GP), F-1	45	Frost Gp F-3		
T23B	Center 150 ft of taxiway 25	1100	150	5	Asphaltic concrete		7	Portland cement concrete	650	3-1/2	Asphaltic concrete	K = 200	Clay (CH or CL)		Good
										8	Gravel (GW)	K_f = 75	Frost Gp F-3		
T24B	Outside edges of taxiway 25	1100	75	4	Asphaltic concrete		7	Portland cement concrete	650	1-1/2	Asphaltic concrete	K = 200	Clay (CH or CL)		Fair
										6	Gravel (GW)	K_f = 75	Frost Gp F-3		
T20B	Center 25 ft of taxiways 13, 14, 15, and 16	678.5	25				4	Asphaltic concrete		12	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Good
										29	Gravel subbase (GW)	45	Frost Gp F-3		

WES FORM MAR 1958 1000

Table 2 (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	
T25B Taxiway 23	775	75				3	Asphaltic concrete		6	Crushed limestone	CBR = 80	Clay (CH or CL)	CBR = 5	Excellent
									28	Gravel subbase				
									4	Gravel filter course	45			
T21B Taxiway 5	571	75				3	Asphaltic concrete		6	Crushed limestone	CBR = 80	Clay (CH or CL)	CBR = 5	Closed
									15	Gravel subbase	50	Frost Gp F-3		
A6B Apron with taxiway 7	522	287.5	2	Asphaltic concrete		19	Portland cement concrete	680	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Fair
											K_f = 25	Frost Gp F-3		
A7B Apron with taxiway 8	1000	287.5				17	Portland cement concrete	700	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Good
											K_f = 25	Frost Gp F-3		
A8B North end of apron with taxiway 8	236	300				19	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Good
											K_f = 25	Frost Gp F-3		
A9B Apron with taxiway 9	1360	262				17	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Good
											K_f = 25	Frost Gp F-3		
A10B Apron with taxiway 10	Varies	Varies				13	Portland cement concrete	650	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Poor
											K_f = 25	Frost Gp F-3		
A12B Washracks	Varies	Varies				12	Portland cement concrete	620	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Poor
											K_f = 25	Frost Gp F-3		
A11B Apron with taxiway 11	Varies	Varies				13	Portland cement concrete	620	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Poor
											K_f = 25	Frost Gp F-3		
A2B Operational apron	Varies	850				4	Tar concrete		12	Crushed limestone (GW-GM), F-1	CBR = 80	Clay (SC or CL)	CBR = 6	Fair
									27	Gravel subbase (GP), F-1	35	Frost Gp F-3		
A18B Old ADC alert apron	Varies	600	2-1/2	Asphaltic concrete		8	Portland cement concrete	650				Clay (CH or CL)	K = 50	Fair
												Frost Gp F-3	K_f = 25	

WES FORM 1000
MAR 1958

Table 2 (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	
A19B Hangar access aprons 13, 14, and 15	308.5	140				19	Portland cement concrete	680	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Very good
											K_f = 25	Frost Gp F-3		
A13B Apron access taxiways 13, 14, 15, and 16, outside	687.5	Varies				4	Asphaltic concrete		12	Crushed limestone (GW)	CBR = 80	Clay (CH or CL)	CBR = 5	Fair
									29	Gravel subbase (GW), F-1	45	Frost Gp F-3		
A3B Old N-S runway used as part of parking apron (center 150 ft)	1000±	150	4	Asphaltic concrete		7	Portland cement concrete	750	3-1/2	Asphaltic concrete	K = 200	Clay (CH or CL)		Good
									8	Gravel base (GW)	K_f = 75	Frost Gp F-3		
A20B Old N-S runway used as part of parking apron (outside 75 ft)	1200±	75	4	Asphaltic concrete		7	Portland cement concrete	750	1-1/2	Asphaltic concrete	K = 150	Clay (CH or CL)		Good
									6	Gravel base (GW)	K_f = 50	Frost Gp F-3		
A14B South apron	783	384				19	Portland cement concrete	680	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Good
											K_f = 25	Frost Gp F-3		
A15B ADC alert apron	310	190				3	Asphaltic concrete		6	Crushed limestone	CBR = 80	Clay (CH or CL)	CBR = 5	Fair
									15	Gravel subbase (F-1)	45	Frost Gp F-3		
A5B SAC alert apron	2897	Varies				22	Portland cement concrete	665	24	Gravel base (GW)	K = 120	Clay (CH or CL)		Excellent
											K_f = 120	Frost Gp F-3		
A17B Loading pad, center portion						17	Portland cement concrete	670	13	Gravel base (GW)	K = 100	Clay (CH or CL)		Excellent
									4	Filter course	K_f = 100	Frost Gp F-3		
A16B Loading pad, exterior portion	Varies	25				2	Asphaltic concrete		6	Crushed limestone	CBR = 80	Clay (CH or CL)	CBR = 5	Excellent
									10	Subbase (F-1)				
									4	Sand filter course	50	Frost Gp F-3		
A4B SE warm-up apron	Varies	Varies				19	Portland cement concrete	630	4	Gravel filter course (GW)	K = 140	Clay (CH or CL)		Very good
											K_f = 140	Frost Gp F-3		
A1B NW warm-up apron	700	225				19	Portland cement concrete	630	4	Gravel filter course (GW)	K = 60	Clay (CH or CL)		Very good
											K_f = 25	Frost Gp F-3		

WES FORM 1000
MAR 1958

(6 of 6 sheets)

DATE: April 1972

SUMMARY OF DATA – RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Ellsworth AFB, S. Dak.

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
					|	—	\	Δ	✱	~~	S	J	⊥	J꜀	C	M	K	O			
R19A	NW-SE runway, SE end; sta 30+06 to 35+06	25x25	240	23		1				3			5	2				12	90.0	99.0	Excellent
R17B R18B	NW-SE runway, SE end; sta 35+06 to 40+06	25x25	240	22 15		1				5			4	1		2		4	93.0	99.0	Excellent
R17C R18C R19C	NW-SE runway; 75-ft center, sta 40+06 to 65+06	80x25 89x25	27 60	18 Reinf.		4 5						1 0		1 1				7 24	61.0	90.0	Good
R3A	NW-SE runway, NW end; sta 160+03 to 165+03	25x25	240	22								1	1	2				16	87.0	100.0	Excellent
R4B R5B	NW-SE runway, NW end; sta 155+03 to 160+03	25x25	240	19			3							2		7		12	90.0	99.0	Excellent
T1A	Taxiway 26 *1	20x25	768	22		6	9			10		2	3		5	2	143	2	74.5	76.8	Fair
T2A	Taxiway 26 *2	12.5x16.66 25x25	306 102	21	0 2		1 1	5 0		0 2	8 0	21 0	29 27	78 0				8 4	68.5	95.5	Good
T6A	Taxiway 21 (through old N-S runway) *3	20x20	105	23								5		2				2	91.2	100.0	Excellent
T7A T8A	Taxiway 17 (through old ADC alert apron) *4	25x25	168	23	2							15	4	3				7	82.7	68.8	Very good
T9A	Taxiway 17	16.66x75±	81	21 Reinf.		8		1		6		7	1	5		7		7	58.0	89.0	Good

REMARKS: Notes:
*1 - This feature has approximately 23 slabs that have been replaced and 196 slabs that contain asphalt patches. Keyways have been used for longitudinal joints.
*2 - This feature contains 138 slabs that have asphalt patches. Difficult to differentiate between longitudinal or corner spalls. Dowels have been used for longitudinal joints.
*3 - Five corner spalls have been patched with asphalt.
*4 - Area along taxiway 17 has one slab width of concrete on either side of the 75-ft-wide taxiway. On east side, 100% of slabs contain major defects; and, on west side, 86% of slabs contain major defects.

LEGEND:

|	LONGITUDINAL CRACK	~~	SHRINKAGE CRACK	C	UNCONTROLLED CONTRACTION CRACK
—	TRANSVERSE CRACK	S	SCALING	M	MAP CRACKING
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	K	KEYWAY JOINT FAILURE
Δ	CORNER BREAK	⊥	SPALL ON LONGITUDINAL JOINT	O	POP-OUT
✱	SHATTERED SLAB	J꜀	CORNER SPALL		

Table 3 (Continued)

DATE: April 1972

SUMMARY OF DATA – RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Ellsworth AFB, S. Dak.

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
					|	—	\	Δ	✳	~	S	J	⊥	J	C	M	K	O			
T11B	SAC alert *5 taxiway	20x25 25x25	300 176	22		2								7	1		10	18	94.3	97.5	Very good
A8B	SAC alert stubs (9)	25x25	109	22	1	2	1	5			15	10	25	10					81.6	88.5	Excellent
A1B	NW warm-up *6 apron	25x25	231	19		2											22		96.6	99.6	Very good
A4B	SE warm-up apron	25x25	180	19	1	1	1	2											97.2	97.2	Very good
T15B	Taxiway 11	16.8x25	300	21	3	4	5	7				25	14	11				11	78.7	93.7	Very good

REMARKS: *5 - This feature has 14 joint spalls that have been patched (possibly 10 of these could be keyway joint failures).
*6 - Majority of slabs have light map cracking.

LEGEND:

|	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	C	UNCONTROLLED CONTRACTION CRACK
—	TRANSVERSE CRACK	S	SCALING	M	MAP CRACKING
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	K	KEYWAY JOINT FAILURE
Δ	CORNER BREAK	⊥	SPALL ON LONGITUDINAL JOINT	O	POP–OUT
✳	SHATTERED SLAB	J	CORNER SPALL		

Table 4

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Ellsworth AFB, S. Dak. DATE OF EVALUATION MONTH: April 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 50-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	
R3A	NW-SE runway, NW end; sta 160+03 to 165+03	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	360,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	245,000	230,000+	350,000	800,000+	340,000	
R4B	NW-SE runway, NW end, 100-ft center, sta 155+03 to 160+03	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	290,000	230,000+	380,000+	800,000+	370,000	
		Frost capacity	150,000	85,000+	150,000	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	330,000	
R7C	NW-SE runway; 50-ft center, sta 135+30 to 155+03	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	480,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	440,000	
R9C	NW-SE runway; 75-ft center, sta 130+04 to 135+30	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	450,000	
R11C	NW-SE runway; 75-ft center, sta 65+06 to 130+04	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	250,000	230,000+	380,000+	800,000+	350,000	
		Frost capacity	115,000	85,000+	155,000+	165,000	200,000+	185,000	230,000+	320,000	800,000+	250,000	
R12C	NW-SE runway; 75-ft center, sta 47+40 to 65+06	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	500,000	
R14C	NW-SE runway, SE end; 75-ft center, sta 43+00 to 47+40	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
R15C	NW-SE runway, SE end; 75-ft center, sta 40+06 to 43+00	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	

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.

Table 4 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Ellsworth AFB, S. Dak. DATE OF EVALUATION MONTH: April 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	
R17B	NW-SE runway, SE end; 100-ft center, sta 35+06 to 40+06	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	490,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	
R19A	NW-SE runway, SE end; sta 30+06 to 35+06	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	
T1A	Taxiway 26	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	195,000	230,000+	300,000	800,000+	275,000	Reduced 25% due to pavement condition
		Frost capacity	145,000	85,000+	145,000	190,000	200,000+	170,000	210,000	245,000	720,000	235,000	
T2A	Center 50 ft of taxiways 26 and 27	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	550,000	
		Frost capacity	30,000	30,000	(a)	(a)	65,000	(a)	(a)	(a)	(a)	(a)	
T12B	Taxiway 7	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	300,000	230,000+	380,000+	800,000+	380,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	300,000	230,000+	380,000+	800,000+	370,000	
T13B	50-ft keel in taxiway 8	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
T14B	50-ft keel in taxiway 9	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
T15B	Ladder taxiways off taxiway 10	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	300,000	230,000+	380,000+	800,000+	380,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	350,000	
T16B	Taxiway 10	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	430,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	340,000	
T18B	50-ft keel in taxiway 11	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	
T17B	Taxiway to washrack	Capacity	130,000	85,000+	155,000+	210,000	200,000+	235,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	130,000	85,000+	155,000+	175,000	200,000+	195,000	230,000+	300,000	800,000+	245,000	
T26B	Ladder taxiways off taxiway 11	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	300,000	230,000+	380,000+	800,000+	380,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	350,000	

Table 4 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Ellsworth AFB, S. Dak. DATE OF EVALUATION MONTH: April 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	
T4A	Taxiway 26	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	270,000	230,000+	380,000+	800,000+	390,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	270,000	230,000+	380,000+	800,000+	390,000	
T5A	Taxiway 21	Capacity	155,000+	60,000	110,000	140,000	180,000	200,000	230,000+	280,000	770,000	280,000	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
T6A	Taxiway 21 (through old N-S runway)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
T7A	Taxiway 17 (through old ADC alert apron)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
T8A	Taxiway 17 (through old ADC alert apron)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	390,000	
T9A	Center 50 ft of taxiway 17	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	550,000	
T11B	Center 25 ft of SAC alert apron and taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	470,000	
T22C	Taxiway 22	Capacity	155,000+	85,000+	155,000+	180,000	200,000+	300,000	230,000+	380,000+	800,000+	480,000	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
T23B	Center 150 ft of taxiway 25	Capacity	75,000	60,000	110,000	110,000	175,000	130,000	175,000	245,000	700,000	(a)	
		Frost capacity	55,000	45,000	80,000	80,000	125,000	95,000	120,000	170,000	500,000	(a)	
T20B	Center 25 ft of taxiways 13, 14, 15, and 16	Capacity	155,000+	60,000	110,000	140,000	200,000+	220,000	230,000+	320,000	800,000+	250,000	
		Frost capacity	50,000	50,000	55,000	70,000	110,000	70,000	(a)	110,000	(a)	(a)	
T25B	Taxiway 23	Capacity	120,000	45,000	95,000	105,000	160,000	165,000	200,000	235,000	670,000	(a)	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
T21B	Taxiway 5	Capacity	65,000	45,000	70,000	80,000	100,000	85,000	(a)	(a)	330,000	(a)	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	

Table 4 (Continued)

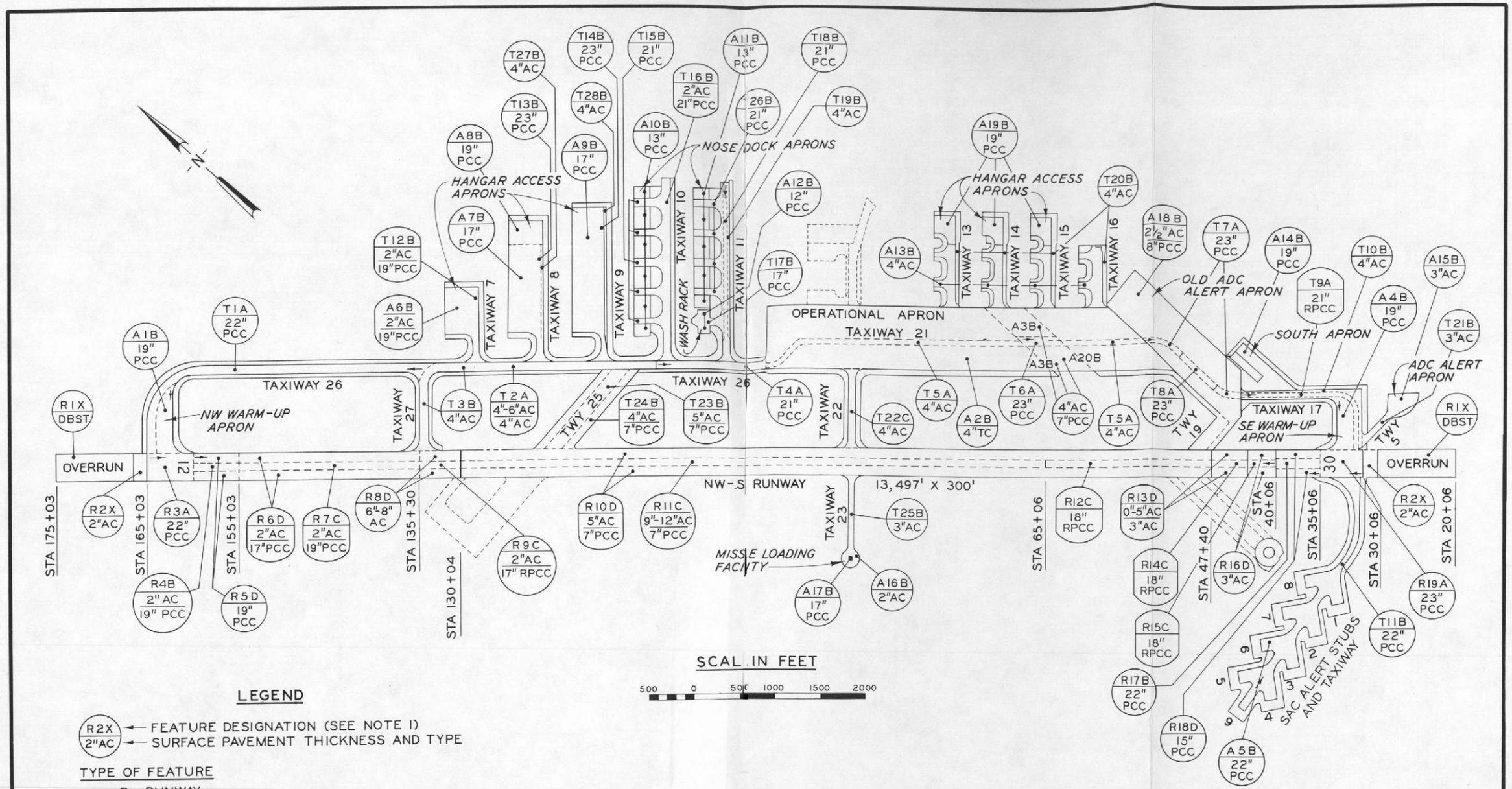
SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Ellsworth AFB, S. Dak. DATE OF EVALUATION MONTH: April 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	
A6B	Apron with taxiway 7	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	300,000	230,000+	380,000+	800,000+	380,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	250,000	230,000+	360,000	800,000+	310,000	
A7B	Apron with taxiway 8	Capacity	155,000+	85,000+	150,000	200,000	200,000+	220,000	230,000+	350,000	800,000+	285,000	
		Frost capacity	135,000	85,000+	140,000	180,000	200,000+	195,000	230,000+	300,000	800,000+	240,000	
A8B	North end of apron with taxiway 8	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	245,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	150,000	85,000+	155,000+	200,000	200,000+	215,000	230,000+	320,000	800,000+	270,000	
A9B	Apron with taxiway 9	Capacity	135,000	85,000+	155,000+	185,000	200,000+	205,000	230,000+	320,000	800,000+	260,000	
		Frost capacity	125,000	85,000+	150,000	165,000	200,000+	180,000	215,000	265,000	800,000+	(a)	
A10B	Apron with taxiway 10	Capacity	85,000	70,000	115,000	120,000	180,000	135,000	170,000	225,000	670,000	(a)	
		Frost capacity	80,000	65,000	100,000	110,000	160,000	120,000	145,000	190,000	550,000	(a)	
A12B	Washracks	Capacity	75,000	60,000	100,000	105,000	155,000	115,000	145,000	200,000	590,000	(a)	
		Frost capacity	70,000	55,000	85,000	95,000	135,000	100,000	125,000	165,000	480,000	(a)	
A11B	Apron with taxiway 11	Capacity	85,000	70,000	110,000	120,000	175,000	130,000	165,000	220,000	650,000	(a)	
		Frost capacity	75,000	65,000	95,000	105,000	150,000	115,000	140,000	180,000	520,000	(a)	
A2B	Operational apron	Capacity	155,000+	60,000	110,000	140,000	200,000+	220,000	230,000+	300,000	800,000+	290,000	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
A18B	Old ADC alert apron	Capacity	45,000	35,000	60,000	65,000	95,000	70,000	(a)	132,000	380,000	(a)	
		Frost capacity	40,000	30,000	50,000	55,000	85,000	60,000	(a)	110,000	320,000	(a)	
A19B	Hangar access aprons 13, 14, and 15	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	255,000	230,000+	380,000+	800,000+	320,000	
		Frost capacity	155,000+	85,000+	155,000+	210,000	200,000+	225,000	230,000+	330,000	800,000+	280,000	
A3B	Old N-S runway used as part of parking apron (center 150 ft)	Capacity	85,000	70,000	125,000	130,000	200,000+	145,000	200,000	280,000	800,000+	(a)	
		Frost capacity	65,000	50,000	90,000	95,000	145,000	105,000	140,000	200,000	580,000	(a)	

Table 4 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Ellsworth AFB, S. Dak. DATE OF EVALUATION MONTH: April 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	
A20B	Old N-S runway used as part of parking apron (outside 75 ft)	Capacity	75,000	60,000	105,000	110,000	170,000	125,000	170,000	240,000	680,000	(a)	
		Frost capacity	60,000	45,000	80,000	80,000	125,000	95,000	120,000	165,000	490,000	(a)	
A14B	South apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	255,000	230,000+	380,000+	800,000+	320,000	
		Frost capacity	155,000+	85,000+	155,000+	210,000	200,000+	225,000	230,000+	330,000	800,000+	280,000	
A15B	ADC alert apron	Capacity	65,000	45,000	70,000	80,000	100,000	85,000	(a)	115,000	330,000	(a)	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
A5B	SAC alert apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	450,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	450,000	
A16B	Loading pad, exterior portion	Capacity	50,000	30,000	55,000	70,000	90,000	75,000	(a)	(a)	(a)	(a)	
		Frost capacity	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	
A17B	Loading pad, center portion	Capacity	155,000+	85,000+	155,000+	210,000	200,000+	235,000	230,000+	380,000+	800,000+	300,000	
		Frost capacity	155,000+	85,000+	155,000+	210,000	200,000+	235,000	230,000+	380,000+	800,000+	300,000	
A4B	SE warm-up apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	360,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	280,000	230,000+	380,000+	800,000+	360,000	
A1B	NW warm-up apron	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	230,000	230,000+	360,000	800,000+	295,000	
		Frost capacity	145,000	85,000+	155,000+	190,000	200,000+	205,000	230,000+	300,000	800,000+	255,000	



LEGEND

R2X / 2"AC ← FEATURE DESIGNATION (SEE NOTE 1)
2"AC ← 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
- X – NO TRAFFIC TYPE ASSIGNED

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

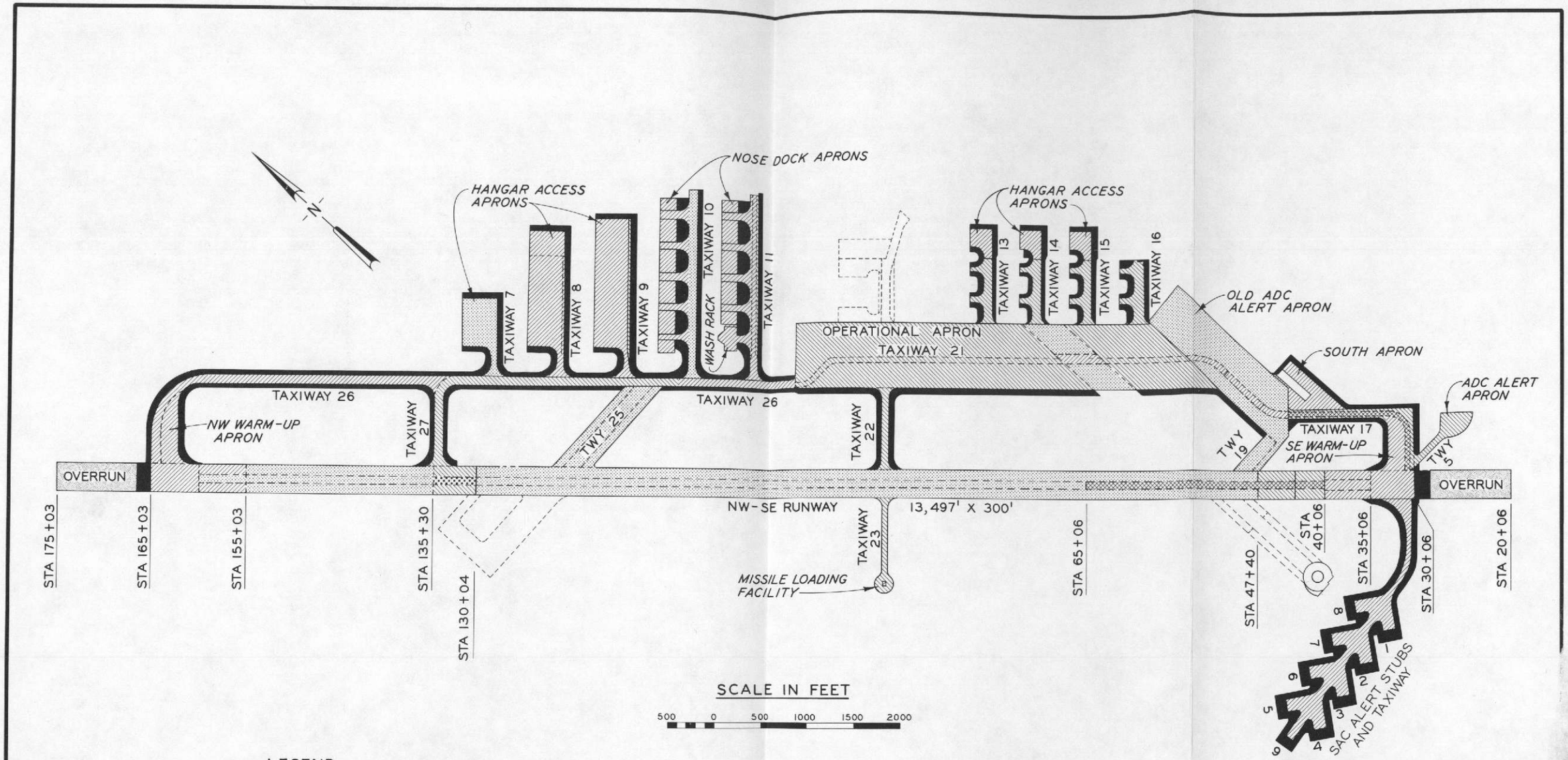
NOTES: 1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER OF FEATURE FOR GIVEN TYPE, AND TYPE TRAFFIC AREA.

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

ELLSWORTH AIR FORCE BASE
SOUTH DAKOTA

AIRFIELD LAYOUT

PLATE 1



SCALE IN FEET

500 0 500 1000 1500 2000

LEGEND

- BITUMINOUS CONCRETE (AC OR TAR)
- PORTLAND CEMENT CONCRETE (PCC)
- ASPHALTIC CONCRETE (AC) OVER PORTLAND CEMENT CONCRETE (PCC)
- REINFORCED PORTLAND CEMENT CONCRETE (RPCC)
- ASPHALTIC CONCRETE (AC) OVER REINFORCED PORTLAND CEMENT CONCRETE (RPCC)
- DOUBLE BITUMINOUS SURFACE TREATMENT (DBST)
- BLAST PAVEMENT (AC-NONTRAFFIC AREA)

ELLSWORTH AIR FORCE BASE
SOUTH DAKOTA

PAVEMENT PLAN

P

Facility Description	Pavement Type	Year Const.	Existing Condition	Maintenance and Repair History	Present or Proposed Maintenance and Repair
T/W, Apron Access 12,374 SY Total: 7800 SY of 50-ft-wide Keel (22 - to 23-in. PCC & 24- to 25-in. subbase) 2740 SY (17-in. PCC & 4-in. filter 25-ft edge - 4-in. AC 6-in. base and 42-in. subbase)	PCC Heavy	1962	Satisfactory	Slurry Sealed Shoulder Stab 1966	Spall Repair Required
T/W, Apron Access 14, 118 SY Total: (50-ft Keel Section of 22- to 23-in. PCC on 24- to 25-in. subbase. (25-ft Section of 17-in. PCC 4-in. filter) 25-ft section of 4-in. AC, 6-in. base & 42-in. subbase	PCC Heavy	1962	Satisfactory	Slurry Sealed Shoulder Stab 1966	
T/W Apron Access, 22, 165 SY Total: (2-in. AC on 21-in. PCC on 4-in. filter). The area between the access to stub parking and the stub parking is light-duty concrete.	PCC	1953	Satisfactory	Cracks in overlay	
Apron Access 10, Access Apron to Stub Parking	PCC	1953	Satisfactory	Apron overlayed panels 1966, Slurry sealed Shoulder Stab 66 and Pads	
T/W Apron Access 22, 135 SY Total: (10,569 SY of 50-ft Keel in 1902. 5 LF 23-in. PCC on 24-in. Base. Remainder is 21-in. PCC on 4-in. Base). The area between the Access to stub parking is light-duty concrete.	PCC	1963	Satisfactory	Pads restriped 1965 Slurry sealed Shoulder Stab 1966	
Runway N End, S End and Keel 160,000 SY (Keel-19 in. concrete, 24-in. Base and 10 in. Filter) (Shoulders-17-in. concrete and 4-in. filter)	Rigid Heavy	Ext 42	Satisfactory	Laid Keel Section 1962, Overlayed 33,000 sq yds Asphaltic Concrete July 1966, re-striped Sep 1966 and in 1968, Repaired 1,500 S.F. of spalls	ELS 18-0 to reseal 3,500 ft of cracks in South end
Edges and Center Section 290, 456 SY 7-in. AC, on 7-in. PCC & 8-in. Base	Flex Heavy		Satisfactory	Slurry Sealed 252,000 SY July 1966, Sealed 56,000 LF Joints in July 1966, Restriped 1966 and 1968	ELS 72-0 Overlay Center 6,500 ft Route Old Crack and fill with slurry seal. Oct 1969
Runway Overruns 66,666 SY Total: (10,000 SY of 2-in. AC on 6-in. base and 33-in. subbase). (56,666 SY of 6-in. base and 36-in. subbase).	Flex Light	1956	Satisfactory	Chips Sealed 50,000 SY 1962, Flush Sealed 16,700 SY 1962. Restriped Chevrons 1964	
Alert T/W 17,2 Total: (22-in. PCC on 24-in. base)	Rigid Heavy	1958	Satisfactory	Sealed Joints with 200A 1962, Slurry Sealed Shoulder 1966	
Alert T/W 3,230 SY Total: (3-in. AC on 6-in. Base and 15-in. subbase). Not used for Aircraft).	Flex Light	1951	Satisfactory	No recent maintenance or repair	ELS 184-2 to seal cracks
T/W Apron Access 7,396 SY Total: (2-in. AC Overlay on 19-in. PCC on 4-in. filter)	PCC	1956	Satisfactory	Slurry Sealed Shoulder Pads with AC Overlay 1966	ELS 184-2 to seal cracks
T/W, Apron Access, 14,632 SY Total: (4 in. AC on 18 in. reinf. PCC with 12-in. 17-in. subbase). Abandoned as TW used as road and parking.	Flex	1952	Satisfactory		
T/W, Apron Access 9,941 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex	1953	Fair	Slurry Sealed 1966	
T/W, Apron Access 8,941 base and 29-in. subbase	Flex	1953	Fair	Slurry Sealed 1966	
T/W, Apron Access 8,491 SY Total: 4-in. AC on 12-in. base and 29-in. subbase	Flex	1953	Fair	Slurry Sealed 1966 30 Sq Ft spalls repaired in-house FY 67	
T/W, Apron Access 6,725 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex	1953	Satisfactory	Slurry Seal 1966	
T/W, Access 22, 497 SY Total: (12,497 SY of Flex 4-in. AC on 12-in. Base and 28-in. subbase). 10,000 SY of 21-in. reinf. PCC on 25-in. base).	Flex Rigid Heavy	1950	Satisfactory	Joints Sealed 1962 Slurry Sealed Shoulder Stab 1966	
T/W, Runway Access 12,024 SY (22-in. PCC on 24-in. Base).	PCC Heavy	1958	Satisfactory	Slurry Sealed Shoulder Stab 1966, Sealed Joints 1962	
T/W, Runway Access 9,700 SY Total: (22-in. PCC on 4-in. Filter). Not Used by heavy aircraft.	Flex	1954	Satisfactory	Slurry Sealed in 1966	

(Continued)

Facility Description	Pavement Type	Year Const.	Existing Condition	Maintenance and Repair History	Present or Proposed Maintenance and Repair
T/W, Runway Access 42,333 Flex SY Total: 7-in. PCC, 3-1/2 AC on 8-in. base-center). Occasionally used for C-47 Runups.	Flex	1942	Abandoned for Heavy Aircraft	Slurry Sealed in 1965	Pavement to be removed (In-House)
T/W, Runway Access 19,270 SY	Rigid Heavy	1958	Satisfactory	Restriped 1965	
Runway Access 139,254 SY (4-in. AC on 12-in. base and 28-in. subbase).	Flex Heavy	1958	Unsatisfactory	Restriped FY 65 Replaced 50-in. and 70-in. wide strip on center for entire length in FY 68	
Runway Access 9,683 SY (4-in. on 12-in. base and 28-in. subbase).	Flex	1950	Satisfactory	Slurry Sealed in 1966	
Runway Access 8,150 SY Total:	AC Heavy	1965	Satisfactory	Rebuilt to Accomodate Unloading Missiles 1965	
Runway Access 14,985 SY Total: (3-in. AC on 6-in. base and 15-in. subbase). Used by SAC Aero Club.	Flex Light	1952	Satisfactory	No recent maintenance or repair	ELS 108-0 to repair
Runway Access 38,127 SY Total: (4-in. AC, 7-in. PCC, 1-1/2-in. AC).	Flex Overlay Pavement	1942	Satisfactory	Slurry Sealed in June 1965. Slurry Seal 1966. Large failure at T/W 25 and 26 repaired 1967.	
Runway Access 82,916 SY Total: (56,000 SY of 19-in. and 22-in. PCC on 12-in. base and 29-in. subbase)	Rigid	1953	Satisfactory	Repaired Longitudinal Fractures and replace 9 fractured Slabs in 1965 Minor patching in-house 1967. Repaired spalls in-house FY 68.	ELS 108-0 to repair spalls slabs are moving at one spot and will require repair
Runway Access (26,916 SY of 4-in. AC on 6-in. base and 42-in. subbase)	Flex	1956	Fair	Slurry Seal Shoulder Stab 1966.	
Runway Access 11,525 SY Total: (4-in. AC on 6-in. base and 42-in. subbase).	Flex	1953	Fair	Slurry Sealed 1966	
T/W 1,270 SY Total: (17-in. PCC on 4-in. filter).	Heavy	1962	Satisfactory	Wash Rack 50-ft Heavy Duty Keel Section Laid 1962	Joints to be sealed by Contracts
Runway Access 12,388 SY Total: Used only in Emergencies.	3-1/2-in. AC 7-in. PCC	Orig 1942	Satisfactory	No recent major maintenance or repair	To be removed completely (In-house)
TW Support 7,770 SY (7-in. PCC on 8-in. base)	Rigid Light	1943	Unsatisfactory	No recent major repair	To be removed completely (In-house)
T/W Support 5,889 SY Total: (5-in. AC on 7-in.).	Rigid Light	1943	Unsatisfactory	No recent major maintenance or repair	To be removed completely (In-house)
Hangar Access and Stub Parking 16, 117 SY Total: (19-in. PCC on 4-in. Filter).	Rigid	1956	Satisfactory	Placed 2-in. AC Overlay 1966	ELS 184-2 to seal cracks
Hangar Access and Stub Parking 41,670 SY Total: (19-in. PCC and 17-in. PCC on 4-in. Filter)	Rigid	1955	Satisfactory	No recent Maintenance or repair	
Hangar Access and Stub Parking 37,013 SY Total: (17-in. PCC on 4-in. Filter).	Rigid	1955	Satisfactory	No Recent Maintenance Replaced Repair	
Hangar Access and stub Parking 38,302 SY Total: (13-in. PCC on 4-in. filter), (21-in. PCC on 4-in. filter).	Rigid	1953	Satisfactory	Placed 2-in. AC Overlay Replaced Broken Slabs 1966. Replaced 50 x 50 AC Pad 1968	
Hangar Access and Stub Parking 30, 734 SY Total: (13-in. PCC on 4-in. Filter) (21-in. PCC on 4-in. Filter).	Rigid	1953	Unsatisfactory	Replaced Broken Slabs 1966	ELS 18-0 to seal joints
Apron, Hangar Access 9,109 SY Total: (4-in. AC on 12-in. base and 28-in. subbase).	Flex Heavy	1950	Satisfactory		
Apron Hangar Access 12,082 SY (19-in. PCC on 4-in. filter) Used for M. Men Vehicle Parking	Rigid	1962	Satisfactory	No recent major repair	
Apron Hangar Access 9,109 SY (4-in. AC on 12-in. base and 27-in. subbase). Used for M. Men Vehicle Parking	Flex	1950	Satisfactory	Slurry Sealed 1966	
Hangar Access Apron 1,688 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex-Med	1966	Satisfactory	Slurry Sealed 1966	
Apron, Hangar Access 1,688 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex-Med	1966	Satisfactory	Slurry Sealed 1966	

(Continued)

Facility Description	Pavement Type	Year Const.	Existing Condition	Maintenance and Repair History	Present or Proposed Maintenance and Repair
Apron, Hangar Access 2,023 SY Total: (19-in. PCC on 4-in. filter)	Rigid-Med	1956	Satisfactory	No recent major repairs	
Hangar Access Apron 1,688 SY Total (4-in. AC on 12-in. base and 29-in. subbase).	Flex-Med	1956	Satisfactory	Slurry Sealed	
Apron, Hangar Access 1,688 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex-Med	1955	Satisfactory	Slurry Sealed 1966	
Apron, Hangar Access 2,023 SY Total: (19-in. PCC on 4-in. Filter)	Rigid-Med	1956	Satisfactory	No recent major repair	
Hangar Access Apron 2,023 SY Total: (19-in. PCC on 4-in. Filter)	Rigid-Med	1956	Satisfactory	No recent Maintenance	
Hangar Access Apron 1,688 SY Total: (4-in. AC on 12-in. base and 29-in. subbase).	Flex	1955	Satisfactory	Slurry Sealed in 1966	
Loading Apron 14,091 SY Total:	Rigid	1965	Satisfactory	No Recent Maintenance or Repair	
Loading Apron 34,081 SY Total: (7-in. PCC, 3-1/2-in. or 1-1/2-in. AC on 6-in. - 8-in. base) To be Abandoned	Rigid-Lt	1943	Unsatisfactory	No Recent Maintenance Repair	To be Completely removed (In-house)
Operational Apron 81,258 SY Total: (4-in. AC on 12-in. base and 27-in. base)	Flex Heavy	1950	Satisfactory	Constructed 14 Hardstands 1965, Slurry Sealed shoulder Stab 1966. Slurry Sealed.	Asphalt at Parking Spots need repairing.
Operational Apron 79,444 SY Total: (2-1/2-in. AC on 7-in. PCC)	Rigid-Over laid with AC Heavy	1942	Unsatisfactory	Slurry Sealed 1967. Repaired Keel transition 1968	
Base Flight 21,676 SY Total: (4-in. AC on 12-in. Base and 27-in. subbase)	Flex Heavy	1950	Satisfactory	No Recent Maintenance or Repair	
Trans Ent 22,891 SY Total: (4-in. AC on 12-in. base and 27-in. subbase)	Flex Heavy	1950	Satisfactory	No Recent Maintenance or Repair	
Shoulder Stab 365,914 SY Total: (2-in. AC on 6-in. base and 9-in. - 15-in. subbase)	Flex-Lt	1942 1960	Satisfactory		
Hardstand Calib 6,683 SY Total: (20-in. PCC or 3-1/2-in. AC on 8-in. Base) Used in Emergencies Only.	Rigid Overlaid	1954	Satisfactory		To be Completely removed (In-house)
Hangar Access Apron 1,688 SY Total: (4-in. AC on 12-in. Base and 29-in. Subbase)	Rigid-Med	1955	Satisfactory	Slurry Sealed 1966	
Hangar Aprons 1,688 SY Total: (4-in. AC on 12-in. Base and 29-in. subbase)	Flex-Med	1955	Satisfactory	Slurry Sealed 1966	
Hangar Aprons (Access) 1,688 SY Total: (3-in. AC on 6-in. base and 15-in. subbase)	Flex-Med	1955	Satisfactory	Slurry Sealed 1966	
Apron Hangar Access 3,250 SY Total: (3-in. AC on 6-in. base and 15-in. subbase)	Flex-Med	1952	Satisfactory	Slurry Sealed 1967	
Apron Hangar Access 19,489 Total: (19-in. PCC on 4-in. Filter)	Rigid	1957	Satisfactory	Slurry Sealed 1967	
Apron Hangar Access 7,369 SY Total: (3-in. AC on 6-in. base and 15-in. subbase)	Flex-Med	1951	Satisfactory	No Recent Major Repair	ELS 184-2 to seal cracks
Apron Hangar Access 16,605 SY Total: (7-in. PCC and 4-in. AC) Hangar and Apron used by SAC Aero Club.	Flex	1950	Unsatisfactory	No Recent Major Repair	ELS 108-0 to repair
Power Check Pad 14,613 SY (19-in. PCC on 4-in. filter)	Rigid-Med	1956	Satisfactory	Sealed Joints 1961 Slurry Sealed Shoulder Stab 1966	ELS 108-0 to repair spalls
Power Check Pad 11,500 SY (19-in. PCC on 4-in. filter)	Rigid-Med	1956	Satisfactory	Sealed Joints 1961 Slurry sealed shoulder Stab 1966	ELS 108-0 to repair spalls
Corrosion Control 4,579 SY Total: (12-in. PCC on 4-in. filter)	Rigid-Med	1954	Satisfactory		