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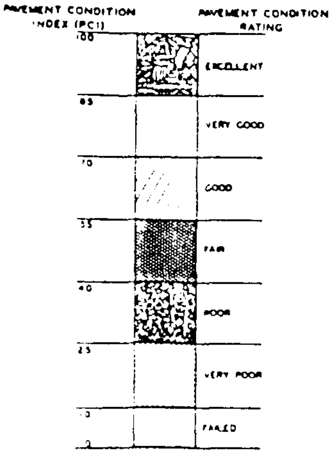
CONDITION SURVEY AND PAVER IMPLEMENTATION EDWARDS AIR FORCE BASE, CALIFORNIA



by

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Final Report

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A pavement condition survey was performed at Edwards Air Force Base, California, in August 1989 for the purpose of determining the pavement condition index of the airfield features and for performing the initial implementation of the PAVER pavement management system. The pavement identification and condition survey data were input into a Micro PAVER data base.

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PREFACE

The condition survey described in this report was requested by Military Interdepartmental Purchases Request (MIPR) No. F04611-89-X-0091 dated 17 February 1989 from AFFTC/PKOS, Edwards Air Force Base, CA, to the US Army Engineer Waterways Experiment Station (WES), Vicksburg, MS.

The condition survey at Edwards Air Force Base was performed by a WES condition survey team from 24 July to 5 August 1989. The team consisted of Messrs. R. A. Bentsen, W. P. Grogan, J. A. Harrison, D. D. Mathews, and R. T. Graham, Pavement Systems Division (PSD), Geotechnical Laboratory (GL). This report was prepared by Mr. Bentsen under the supervision of Messrs. J. W. Hall, Jr., Chief, Systems Analysis Branch, PSD, and H. H. Ulery, Jr., Chief, PDS. The work was under the general supervision of Dr. W. F. Marcuson III, Chief, GL, WES. Ms. Odell F. Allen, Visual Production Center, Information Technology Laboratory, edited the report.

Commander and Director of WES during the preparation of this report was COL Larry B. Fulton, EN. Technical Director was Dr. Robert W. Whalin.

CONTENTS

CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
inches	2.54	centimetres
pounds (force) per square inch	6.894757	kilopascals
square feet	0.09290304	square metres

CONDITION SURVEY AND PAVER IMPLEMENTATION
EDWARDS AIR FORCE BASE, CALIFORNIA

PART I: INTRODUCTION

Background

1. This report describes the condition survey and initial implementation of a pavement management system utilizing the PAVER system of the airfield pavements at Edwards Air Force Base (AFB), CA. The implementation was performed to provide base engineers with the initial data base required for making pavement management decisions concerning costs and maintenance requirements. The condition survey was performed by the US Army Engineer Waterways Experiment Station from 24 July to 5 August 1989.

Objective and Scope

2. The overall objective of this project was to determine the pavement condition of the airfield pavements at Edwards AFB and to input the information into a Micro PAVER data base to provide the base engineers with a permanent data base to use for future pavement management decisions. This objective was accomplished by:

a. Performing a condition survey of the pavements in accordance with AFR 93-5.*

b. Inputting the pavement network and condition survey information into Micro PAVER to calculate a pavement condition index (PCI) of each of the pavement features.

c. Producing detail drawings of the pavement features to ensure that future condition surveys will be performed at the same locations as the one performed for this report.

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* Headquarters, Department of the Air Force. 1981 (May). "Airfield Pavement Evaluation Program," Air Force Regulation AFR 93-5, Washington, DC.

PART II: PAVEMENT CONDITION SURVEY

Introduction

3. A pavement condition survey is performed to determine the present surface condition of the various pavement features on an airfield. The procedure used in performing the condition survey was developed by the US Army Corps of Engineers and has been accepted as a regulation by the US Air Force.* The knowledge of the condition survey procedures discussed in AFR 93-5 is required for the use and understanding of this report.

Pavement Definition and Identification

4. The pavement network is divided into three specific units in order to manage the pavement network effectively. The three units of division are the feature, the section, and the sample unit. The method for dividing the pavement network is detailed in AFR 93-5 and is briefly discussed herein.

5. Airfield pavement features, or branches in some terminology, are defined by various parameters such as the pavement type, construction history, and pavement usage. The feature designations at Edwards AFB were most recently established in "Airfield Pavement Evaluation, Edwards Air Force Base, California."** These feature designations, shown in Figure 1, are made under strict guidelines, and any changes to them must be highly justified. Locating the features on the airfield itself is necessary before the performance of the condition survey can proceed.

6. Four features shown in Figure 1 have been designated or constructed since the performance of the 1989 pavement evaluation. Runway 04 overrun (01C) and features A33B and A34B have been included in this condition survey. The construction of the anechoic chamber taxiway (T15A) has been recently completed and has also been included in this survey. The physical property data for these new features as well as for the previously designated features are given in Table 1.

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* Headquarters, Department of the Air Force. 1981. "Airfield Pavement Evaluation Program," Air Force Regulation AFR 93-5, Washington, DC.

** US Air Force Engineering and Services Center. 1989 (June). "Airfield Pavement Evaluation, Edwards AFB, California," Tyndall AFB, FL.

7. After each pavement feature has been defined, further division of the feature may be required for reasons such as traffic flow. The further division of features is done into sections. For instance, a runway feature may be 300 ft* wide, but the majority of the traffic occurs in the middle of the feature. Therefore, a section is defined in the center of the feature with additional sections defined on either side of the middle section. Also, an apron may contain taxi lanes which the aircraft follow to their parking locations, a section which would differ from the areas used for the actual parking of the aircraft. Therefore, these elements of the feature are divided into sections. If a feature requires no division, for definition purposes, it is still considered to contain one section.

8. After the pavement section definition has been completed, the section is divided into sample units, which are conveniently sized areas of pavement on which the inspection is performed. A standard sample unit on asphaltic concrete (AC) pavement is a 5,000-sq ft area, and a standard sample unit on portland cement concrete (PCC) pavement consists of 20 slabs. A pavement section is divided into sample units for condition survey purposes only. Recognizing that not all sample units can be 5,000 sq ft or 20 slabs, deviations of 25 percent on either side of these values are allowed for survey purposes.

9. When a section has been divided into sample units, it has been properly prepared for the survey. An inspection of all of the sample units within a section could require a considerable amount of time. Therefore, the random sampling method was developed to provide an adequate calculation of the PCI while inspecting only a portion of the sample units in a section. The method, further defined in AFR 93-5, allowed for a reduction in the number of sample units surveyed without a significant loss of accuracy in the calculation of the PCI. It should be noted, however, that the inspection of all the sample units may be necessary for estimation of maintenance and repair work.

10. An essential concept in pavement management is determining the deterioration of the pavement surface over time. The PCI is used in the PAVER system to determine this deterioration. Determining the PCI of a pavement section at different time intervals requires that the same sample units of the

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* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page 3.

section be surveyed to get a precise idea of the deterioration rate. Drawings of each of the pavement features and any section divisions have been included in this report to illustrate the sample units within each feature to permit future condition surveys to be conducted at these same locations. Figures 2 to 29 illustrate the sample unit layouts for each of the features and sections at Edwards AFB. The circled numbers indicate the sample units that were surveyed. Where no numbers are circled, the number shown indicate the sample units that were surveyed.

Pavement Inspection

11. The performance of a condition survey consists of inspecting the pavement surface for various types of distresses, determining the severity of each distress found, and measuring the amount of distress within the sample unit. Distress quantities on AC pavement are measured in either linear feet or square feet within the sample unit, and those on PCC pavement are measured by counting the number of slabs affected within the sample unit.

12. The product of the condition survey is the PCI of the sample unit. The PCI is a value from 0 to 100 (worst to best, respectively) of the surface condition of the pavement. The PCI is obtained by determining a deduct value for the amount of each distress type and the severity found in the inspection, determining a corrected deduct value for the combined effect of various distresses on the pavement condition, and subtracting the corrected deduct value from 100. A pavement with no distress has a PCI of 100. Varying amounts of distress decrease the PCI value to a possible low of 0. Pavement condition ratings (excellent to failed) are assigned to different levels of PCI values. These ratings and their respective PCI value definitions are shown in Figure 30. The PCI of the pavement section is calculated by averaging the PCI's of the sample units surveyed.

13. The majority of the pavement features at Edwards AFB are rated from very good to excellent condition with some features rated from poor to fair. Figure 31 illustrates the condition ratings of the features at Edwards AFB. Photos 1 through 12 show various distresses that were observed on the airfield pavements.

PART III: MICRO PAVER DATA BASE IMPLEMENTATION

14. The use of the PAVER system requires knowledge of both computers and the PAVER system itself. Micro PAVER is a microcomputer-based version of the PAVER pavement management system. When discussing the pavement management system itself, the terms PAVER and Micro PAVER are interchangeable. Discussions concerning the Micro PAVER data base and the operations involved with the Micro PAVER programs are specific to Micro PAVER. This report does not describe the operation of a computer; however, it does outline the necessary Micro PAVER procedures in moderate detail. The "Micro PAVER User's Guide"* goes into specific details of all the procedures for setting up and using a Micro PAVER data base and should be used as a reference when performing operations in the Micro PAVER system.

15. The Micro PAVER system consists of three different system functions. Performing each function requires the use of specific programs, files, and procedures. The three functions are data entry, report generation, and data analysis.

Data Entry

16. The pavement network data are entered into the Micro PAVER data base in a logical order that defines the features and sections first. The additional information is then entered that allows the user to perform data base related operations such as PCI calculation and report generation. The data are entered into the Micro PAVER data base through a series of menu-driven Micro PAVER programs.

17. The two ways to collect the condition survey data in the field are by recording the data manually on condition survey data sheets and later placing the data into the Micro PAVER data base, or by inputting the data directly into the FIELD program on a portable computer. The FIELD program places the data into the necessary Micro PAVER format as the data are entered into the computer and saves the data in a file that can be directly uploaded to the

* "Micro PAVER User's Guide," 1988 (Sep). Version 2.0, US Army Construction Engineering Research Laboratory.

Micro PAVER data base. The data for the Edwards AFB condition survey were collected on data sheets and later input into Micro PAVER.

Report Generation and Data Analysis

18. Micro PAVER generates reports that provide a summary or specific information based on the data stored in the mainframe data base. It also calculates information such as budget needs from data and analysis programs provided with the Micro PAVER system. These reports can be used to generate broad information of the entire data base or to list details from a selected portion of the pavement system. Brief descriptions of the Micro PAVER reports are given in Table 2. The data report and analysis programs provide an engineer with the information required to make pavement management decisions.

19. The results of two Micro PAVER reports have been included in this report. The Inspection Report produces a detailed summary of the distresses found in each sample unit surveyed as well as an extrapolation for the entire feature and section. The majority of the Edwards AFB pavements are showing little distress due to loading. Most of the distresses observed were environmentally induced. Pad 8 (feature A23B) and the LOX storage pad (feature A26B) were the pavements exhibiting the largest amount of load related distress.

20. The Inspection Schedule Report gives the section surveying requirements for the next five years, depending on the minimum PCI and rate of deterioration deemed allowable for each section use and rank. The results of the Inspection Schedule Report are presented in Table 4. The minimum PCI and deterioration rates input to the Inspection Schedule Report were a minimum PCI of 70 for all features and allowable time limits between inspections of 1 year for rates of deterioration above 6 points per year, 3 years for rates of deterioration between 2 and 6 points per year, and 5 years for rates of deterioration below 2 points per year.

Table 1

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE				SUBBASE			SUBGRADE		
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR %	K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR %	K PSI/IN
R1A	Runway 4-22 Sta 0+00 to 10+00	1,000	300	Excellent				19	PCC	750								Silty Sand (SM)		250
R2C	Runway 4-22 Sta 10+00 to 72+50	6,250	300	Very Good				17	PCC	750								Silty Sand (SM)		250
R3A	Runway 4-22 Sta 72+50 to 77+50	500	300	Very Good				19	PCC	720								Silty Sand (SM)		250
R4C	Runway 4-22 Sta 77+50 to 140+00	6,250	300	Very Good				17	PCC	800								Silty Sand (SM)		250
R5A	Runway 4-22 Sta 140+00 to 150+00	1,000	300	Very Good				19	PCC	725								Silty Sand (SM)		250
O1C	Runway 04 Overrun	760	Varies	Very Good				2	AC									Silty Sand (SM)		
T1A	Taxiway A	6,515	100	Excellent				18	PCC	740								Silty Sand (SM)		250
T2A	Taxiway F	5,940	150	Excellent				18	PCC	650								Silty Sand (SM)		250
T3A	Taxiway C	7,000	100	Excellent				19	PCC	700								Silty Sand (SM)		300

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(Continued)

Table 1 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE				SUBBASE			SUBGRADE		
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR %	K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR %	K PSI/IN
T4A	Taxiways/Pads 21-24	150	Varies	Good				12	PCC	600								Silty Sand (SM)		250
T5A	Taxiway to Lakebed	1,800	300	Excellent				18	PCC	690								Silty Sand (SM)		250
T6A	Taxiway G	2,375	75	Very Good				17	PCC	700								Silty Sand (SM)		250
T7A	Taxiway B	4,400	75	Excellent				18	PCC	725								Silty Sand (SM)		250
T8A	Taxiway to Ramp 3	520	75	Good				14	PCC	640								Silty Sand (SM)		250
T9A	Taxiway F	6,450	100	Excellent				19	PCC	700								Silty Sand (SM)		300
T10A	Taxiway D	2,300	100	Very Good				18	PCC	600								Silty Sand (SM)		300
T11A	Taxiway E	3,488	100	Excellent				16	PCC	600								Silty Sand (SM)		300
T12C	F-104 Nose Dock and Heat Loads Lab Taxiway (NASA)	665	50	Very Good				15	PCC	700								Silty Sand (SM)		250

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Table 1 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE				SUBBASE			SUBGRADE		
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR %	K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR %	K PSI/IN
F13A	NASA Lakebed Ramp	400	75	Very Good				17	PCC	650								Silty Sand (SM)		250
F14A	NASA Shuttle Tow Way	5,100	60	Fair				15	PCC	700								Silty Sand (SM)		250
F15A	Anechoic Chamber Taxiway	3,115	60	Excellent				12	PCC									Silty Sand (SM)		
A1B	Runway 04 Warm-Up Apron	Varies	300	Excellent				19	PCC	700								Silty Sand (SM)		250
A2B	Ramp 2	Varies	Varies	Very Good				14	PCC	700								Silty Sand (SM)		250
A3B	Ramp 3	Varies	Varies	Very Good				14	PCC	700								Silty Sand (SM)		250
A4B	Ramp 1	5,940	300	Excellent				19	PCC	700								Silty Sand (SM)		250
A5B	Ramp 1	5,940	150	Excellent				18	PCC	700								Silty Sand (SM)		250
A6B	Pads 21-24	94	92.5	Good				9.5	PCC	600								Silty Sand (SM)		250

(Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE			SUBBASE			SUBGRADE	
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR % / K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR % / K PSI/IN
A7B	Runway 22 Warm-Up Apron	Varies	300	Very Good				19	PCC	750							Silty Sand (SM)	300
A8B	Ramps 4 and 5	Varies	Varies	Good/ Very Good				14	PCC	750							Silty Sand (SM)	250
A9B	Ramp 5	Varies	Varies	Very Good				14	PCC	740							Silty Sand (SM)	250
A10B	Ramp 6	Varies	445	Very Good				15	PCC	775							Silty Sand (SM)	250
A11B	Ramp 7	Varies	Varies	Excel-lent				14	PCC	670							Silty Sand (SM)	250
A12B	Ramps 8 and 9	Varies	Varies	Excel-lent				14	PCC	675							Silty Sand (SM)	250
A13B	Ramps 9 and 10	Varies	Varies	Excel-lent				18	PCC	650							Silty Sand (SM)	250
A14B	Ramps 11 and 12	Varies	Varies	Very Good				12	PCC	570							Silty Sand (SM)	300
A15B	NASA North Parking Apron	Varies	120	Very Good				16	PCC	780							Silty Sand (SM)	250

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Table 1 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE				SUBBASE			SUBGRADE		
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR %	K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR %	K PSI/IN
A16B	NASA B-52 Parking Area	Varies	50	Very Poor				5.5	PCC									Silty Sand (SM)		250
A17B	NASA Parking Apron	Varies	700	Good				15	PCC	750								Silty Sand (SM)		250
A18B	NASA 4801 Hangar Apron	210	125	Very Good				16	PCC	700								Silty Sand (SM)		250
A19B	NASA YF-12 Hangar Apron	420	60	Good				15	PCC	720								Silty Sand (SM)		250
A20B	NASA YF-12 Hangar Apron	240	100	Fair				12	PCC	630								Silty Sand (SM)		250
A21B	Pad 4	450	150	Good				17	PCC	700								Silty Sand (SM)		250
A22B	Pads 5 and 6	1,100	Varies	Very Good				18	PCC	600								Silty Sand (SM)		250
A23B	Pads 7 and 8	Varies	Varies	Good				15	PCC	750								Silty Sand (SM)		250
A24B	Hush House Hangar Access Apron	500	75	Excellent				10	PCC	800								Silty Sand (SM)		250

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(Continued)

Table 1 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE				SUBBASE			SUBGRADE		
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR %	K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR %	K PSI/IN
A25B	LOX Area Apron	Varies	Varies	Very Good				18	PCC	700								Silty Sand (SM)		250
A26B	LOX Storage Pad	Varies	150	Poor				9.5	PCC	420								Silty Sand (SM)		250
A27B	Pad 16	600	125	Very Good				14	PCC	700								Silty Sand (SM)		250
A28B	Pad 18	475	Varies	Very Good				18	PCC	650								Silty Sand (SM)		300
A29B	Pad 19	600	150	Good				12	PCC	640								Silty Sand (SM)		300
A30B	NASA Run-Up Apron	600	187.5	Good				16	PCC	630								Silty Sand (SM)		250
A31B	NASA Parking Apron Fillet	Varies	Varies	Good				15	PCC	750								Silty Sand (SM)		250
A32B	F-104 Nose Dock and Heat Loads Lab Hangar (NASA)	Varies	100	Excellent				16	PCC	650								Silty Sand (SM)		250
A33B	NASA 4802 Hangar Apron	Varies	50	Very Good				16	PCC									Silty Sand (SM)		250

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(Continued)

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Table 1 (Concluded)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE			SUBBASE			SUBGRADE	
FEATURE	IDENTIFICATION	LENGTH (FT)	WIDTH (FT)	GENERAL CONDITION PCI	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	FLEX STR (PSI)	THICKNESS (IN)	DESCRIPTION	CBR % / K PSI/IN	THICKNESS (IN)	DESCRIPTION	CBR %	DESCRIPTION	CBR % / K PSI/IN
A34B	NASA Shuttle Hangar Apron	285	60	Good				15	PCC								Silty Sand (SM)	250
WASH	Washrack	330	Varies	Very Good				9	PCC								Silty Sand (SM)	

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Table 2

Micro PAVER Reports

List	-	Lists the branch name, number, and number of sections in each branch.
Inventory	-	Provides inventory information of the pavement sections.
PCI	-	Provides branch and section information, last construction and inspection dates, age, and PCI for each branch/section combination.
Inspection	-	Provides both the summary and sample unit PCI and distress information for the pavement sections.
PCI Frequency	-	Provides an overall condition frequency, based on PCI, for the year requested.
Budget Planning	-	Provides a 5-year budget by estimating the costs to maintain the pavements above a given condition level.
Budget Condition Forecasts	-	A combination of the PCI frequency and budget planning reports; this predicts the budget and pavement condition depending on the repairs performed.
Inspection Schedule	-	Provides a schedule of sections to be inspected during a 5-year period.
Condition History	-	Provides a PCI versus time curve of a specific section, including a 5-year projection.
Family Curve	-	Models and predicts pavement condition of sections of a specific type, use, and range (a family).
Section Prediction	-	Uses family curve to predict the condition of selected sections.
M & R	-	Determines repair and overlay cost depending on the user's maintenance and repair policy.
Network Maintenance	-	Determines the repair costs over the entire network depending on the user's maintenance and repair policy.
Economic Analysis	-	Provides the user with annual cost information to help determine the most economical M & R alternative.
Pavement Performance Prediction	-	Nondata base PCI prediction models for AC or PCC pavements.

Table 3

Extrapolated Distress Summary, Edwards AFB

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
R01A	1	Jt* Seal Damage	M	160	100.00
		Small Patch	L	51	32.14
		Large Patch	M	1	0.71
		Shrinkage Crack	N/A	2	1.43
		Joint Spall	L	9	5.71
	2	Jt Seal Damage	M	106	100.00
		Small Patch	L	74	46.43
		Shrinkage Crack	N/A	5	3.57
		Joint Spall	L	3	2.14
		Corner Spall	L	1	0.71
	3	Linear Cracking	L	1	0.71
		Jt Seal Damage	M	160	100.00
		Small Patch	L	84	52.86
		Small Patch	M	3	2.14
		Shrinkage Crack	N/A	3	10.00
		Joint Spall	L	5	3.57
		Corner Spall	L	3	2.14
R02C	1	Linear Cracking	L	2	0.24
		Jt Seal Damage	H	1,000	100.00
		Small Patch	L	540	54.05
		Small Patch	M	9	0.95
		Large Patch	L	38	3.81
		Shrinkage Crack	N/A	476	47.62
		Joint Spall	L	40	4.05
		Joint Spall	M	4	0.48
		Corner Spall	L	4	0.48
	2	Linear Cracking	L	4	0.48
		Jt Seal Damage	H	1,000	100.00
		Small Patch	L	397	39.76
		Faulting	L	42	4.29
		Shrinkage Crack	N/A	350	35.00
		Joint Spall	L	26	2.62
		Corner Spall	L	11	1.19
		Corner Spall	H	2	0.24

(Continued)

* Jt = joint.

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
R02C (Cont.)	3	Jt Seal Damage	H	1,000	100.00
		Small Patch	L	311	31.19
		Small Patch	M	7	0.71
		Faulting	L	7	0.71
		Shrinkage Crack	N/A	216	21.67
		Joint Spall	L	28	2.86
		Joint Spall	M	4	0.48
		Corner Spall	L	11	1.19
		Corner Spall	M	4	0.48
R03A	1	Jt Seal Damage	H	80	100.00
		Small Patch	L	70	87.50
		Joint Spall	L	2	2.50
	2	Jt Seal Damage	H	80	100.00
		Small Patch	L	42	52.50
		Joint Spall	L	1	1.25
	3	Jt Seal Damage	H	80	100.00
		Small Patch	L	10	12.5
		Joint Spall	L	4	5.0
		Corner Spall	L	1	1.25
R04C	1	Linear Crack	L	2	0.24
		Jt Seal Crack	H	1,000	100.00
		Small Patch	L	133	13.33
		Small Patch	M	52	5.24
		Shrinkage Crack	N/A	295	29.52
		Joint Spall	L	52	5.24
		Joint Spall	M	4	0.48
		Joint Spall	H	2	0.24
		Corner Spall	L	19	1.90
		Corner Spall	H	2	0.24
	2	Linear Crack	L	2	0.24
		Jt Seal Damage	H	1,000	100.00
		Small Patch	L	295	29.52
		Small Patch	M	4	0.48
		Large Patch	L	2	0.24
		Shrinkage Crack	N/A	276	27.62
		Joint Spall	L	21	2.14
		Joint Spall	M	4	0.48

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
R04C (Cont.)	3	Corner Spall	L	11	1.19
		Corner Spall	M	9	0.95
	3	Jt Seal Damage	H	1,000	100.00
		Small Patch	L	9	0.95
		Small Patch	M	2	0.24
		Shrinkage Crack	N/A	228	22.86
		Joint Spall	L	26	2.62
		Corner Spall	L	28	2.86
		Corner Spall	M	16	1.67
R05A	1	Small Patch	L	56	35.00
		Small Patch	M	4	2.86
		Small Patch	H	3	2.14
		Shrinkage Crack	N/A	155	97.14
		Joint Spall	L	17	10.71
		Joint Spall	M	5	3.57
		Corner Spall	L	3	2.14
	2	Jt Seal Damage	M	160	100.00
		Small Patch	L	72	45.00
		Small Patch	M	5	3.57
		Small Patch	H	1	0.71
		Shrinkage Crack	N/A	144	90.00
		Joint Spall	L	3	2.14
	3	Linear Crack	L	1	0.71
		Jt Seal Damage	M	160	100.00
		Shrinkage Crack	N/A	32	20.00
		Joint Spall	L	5	3.57
		Corner Spall	L	2	1.43
001C	1	Block Cracking	L	620**	0.45
		Depression	H	148**	0.11
		L & T† Cracking	L	4,442††	3.25
		L & T Cracking	M	2,745††	2.01

(Continued)

** Quantity in square feet.
† L & T - Longitudinal and transverse.
†† Quantity in linear feet.

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
T01A	1	Linear Crack	L	2	0.21
		Jt Seal Damage	M	1,400	100.00
		Small Patch	L	404	14.58
		Shrinkage Crack	N/A	26	1.88
T02A	1	Linear Cracking	L	9	0.66
		Small Patch	L	97	6.80
		Large Patch	L	9	0.66
		Faulting	L	3	0.22
		Shrinkage Crack	N/A	12	0.88
		Joint Spall	L	103	7.24
		Joint Spall	M	3	0.22
		Corner Spall	L	28	1.97
T03A	1	Corner Break	L	2	22.00
		Linear Cracking	L	2	22.00
		Jt Seal Damage	L	1,154	100.00
		Small Patch	L	131	11.43
		Large Patch	L	10	0.90
		Shrinkage Crack	N/A	12	1.12
T04A	1	Linear Cracking	L	17	51.52
		Small Patch	L	2	6.06
		Large Patch	L	1	3.03
		Shattered Slab	L	12	36.36
T05A	1	Jt Seal Damage	M	864	100.00
		Small Patch	L	382	44.25
		Shrinkage Crack	N/A	15	1.75
		Joint Spall	L	2	0.25
		Corner Spall	L	4	0.50
T06A	1	Jt Seal Damage	H	488	100.00
		Small Patch	L	12	2.49
		Shrinkage Crack	N/A	3	0.71
		Joint Spall	L	86	17.79
		Corner Spall	L	8	1.78
T07A	1	Jt Seal Damage	M	578	100.00
		Large Patch	L	5	0.89
		Shrinkage Crack	N/A	18	3.27
		Joint Spall	L	3	0.60

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
T08A	1	Linear Crack	L	24	36.51
		Jt Seal Damage	M	66	100.00
		Small Patch	L	49	74.60
		Large Patch	L	6	9.52
		Shrinkage Crack	N/A	13	20.63
T09A	1	Linear Cracking	L	2	0.22
		Jt Seal Damage	M	1,311	100.00
		Small Patch	L	357	27.29
		Large Patch	L	2	0.22
		Shrinkage Crack	N/A	8	0.66
T10A	1	Linear Cracking	L	1	0.34
		Jt Seal Damage	M	485	100.00
		Small Patch	L	21	4.38
		Small Patch	M	1	0.34
		Large Patch	L	1	0.34
		Shrinkage Crack	N/A	129	26.60
		Joint Spall	L	19	4.04
		Joint Spall	M	3	0.67
		Joint Spall	H	1	0.34
		Corner Spall	L	11	2.36
		Corner Spall	M	1	0.34
T11A	1	Linear Cracking	L	9	1.39
		Jt Seal Damage	M	700	100.00
		Small Patch	L	221	31.67
		Large Patch	L	3	0.56
		Shrinkage Crack	N/A	5	0.83
T15A	1	Linear Cracking	L	12	2.49
		Jt Seal Damage	L	511	100.00
		Small Patch	L	55	10.90
		Large Patch	L	1	0.31
		Shrinkage Crack	N/A	3	0.62
A01B	1	Small Patch	L	61	16.73
		Shrinkage Crack	N/A	158	43.19
		Joint Spall	L	7	1.95
A02B	1	Linear Cracking	L	57	10.65
		Jt Seal Damage	L	540	100.00
		Small Patch	L	59	10.97

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A02B (Cont.)	1	Large Patch	L	29	5.48
		Shrinkage Crack	N/A	71	13.23
		Joint Spall	L	10	1.94
		Joint Spall	M	1	0.32
		Corner Spall	L	3	0.65
A03B	1	Linear Cracking	L	36	6.23
		Jt Seal Damage	M	580	100.00
		Small Patch	L	154	26.56
		Large Patch	L	28	4.92
		Large Patch	M	1	0.33
		Shattered Slab	L	1	0.33
		Shrinkage Crack	N/A	77	13.44
		Corner Spall	L	1	0.33
A04B	1	Linear Cracking	L	40	1.38
		Linear Cracking	M	5	0.17
		Small Patch	L	135	4.66
		Large Patch	L	185	6.38
		Shrinkage Crack	N/A	30	1.03
		Joint Spall	L	50	1.72
		Joint Spall	M	10	0.34
		Corner Spall	L	55	1.90
A05B	1	Linear Cracking	L	6	0.44
		Small Patch	L	56	3.98
		Large Patch	L	43	3.10
		Shrinkage Crack	N/A	3	0.22
		Joint Spall	L	21	1.55
		Corner Spall	L	15	1.11
A06B	1	Corner Break	L	6	7.50
		Corner Break	M	3	3.75
		Linear Cracking	L	30	37.50
		Linear Cracking	M	2	2.50
		Small Patch	L	4	5.00
		Small Patch	M	1	1.25
		Large Patch	L	1	1.25
		Shattered Slab	L	3	3.75
		Shattered Slab	M	2	2.50
		Shrinkage Crack	N/A	1	1.25
		Joint Spall	L	1	1.25
		Joint Spall	M	1	1.25

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A07B	1	Linear Cracking	L	3	0.60
		Small Patch	L	72	11.61
		Large Patch	L	53	8.63
		Shrinkage Crack	N/A	382	61.31
		Joint Spall	L	14	2.38
		Corner Spall	L	11	1.79
A08B	1	Jt Seal Damage	M	199	100.00
		Small Patch	L	1	0.58
		Scaling	L	19	9.94
		Shrinkage Crack	N/A	180	90.64
		Joint Spall	L	4	2.34
		Corner Spall	L	1	0.58
	2	Linear Cracking	L	7	4.29
		Jt Seal Damage	M	180	100.00
		Large Patch	L	119	66.43
		Scaling	L	59	32.86
		Shrinkage Crack	N/A	136	75.71
		Joint Spall	L	6	3.57
A09B	1	Linear Cracking	L	2	0.85
		Jt Seal Damage	M	349	100.00
		Small Patch	L	14	4.24
		Large Patch	L	2	0.85
		Scaling	L	4	1.27
		Shrinkage Crack	N/A	254	72.88
		Joint Spall	L	11	3.39
		Corner Spall	L	13	3.81
A10B	1	Jt Seal Damage	H	1,067	100.00
		Small Patch	L	39	3.74
		Shrinkage Crack	N/A	537	50.37
		Joint Spall	L	31	2.99
		Joint Spall	M	5	0.50
		Corner Spall	L	42	3.99
		Corner Spall	M	7	0.75
A11B	1	Linear Cracking	L	3	0.66
		Jt Seal Damage	M	558	100.00
		Small Patch	L	11	1.99
		Large Patch	L	12	2.32
		Large Patch	M	1	0.33

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A11B (Cont.)	1	Shrinkage Crack	N/A	11	1.99
		Joint Spall	L	12	2.32
		Corner Spall	L	1	0.33
A12B	1	Corner Break	L	1	0.42
		Linear Cracking	M	1	0.42
		Jt Seal Damage	M	339	100.00
		Small Patch	L	8	2.51
		Large Patch	L	18	5.44
		Shrinkage Crack	N/A	11	3.35
		Joint Spall	L	1	0.42
		Corner Spall	L	1	0.42
	2	Corner Break	L	1	0.77
		Linear Cracking	L	4	3.08
		Jt Seal Damage	M	161	100.00
		Small Patch	L	7	4.62
		Large Patch	L	18	11.54
		Joint Spall	L	1	0.77
A13B	1	Jt Seal Damage	M	301	100.00
		Small Patch	L	14	4.95
		Large Patch	L	5	1.80
		Shrinkage Crack	N/A	1	0.45
	2	Jt Seal Damage	M	291	100.00
		Small Patch	L	8	2.88
		Small Patch	M	1	0.48
		Large Patch	L	4	1.44
		Joint Spall	L	1	0.48
A14B	1	Corner Break	L	2	0.22
		Linear Cracking	L	172	15.18
		Jt Seal Damage	M	1,136	100.00
		Small Patch	L	46	4.12
		Large Patch	L	12	1.08
		Shrinkage Crack	N/A	81	7.16
		Joint Spall	L	2	0.22
		Corner Spall	L	2	0.22
A21B	1	Linear Cracking	L	5	5.26
		Linear Cracking	M	1	1.05
		Jt Seal Cracking	M	113	100.00

(Continued)

Table . (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A21A (Cont.)	1	Small Patch	L	10	9.47
		Large Patch	L	32	28.42
		Large Patch	M	4	4.21
		Scaling	L	2	2.11
		Shrinkage Crack	N/A	68	61.05
A22B	1	Linear Cracking	L	3	0.90
		Jt Seal Damage	M	334	100.00
		Small Patch	L	13	4.05
		Large Patch	L	3	0.90
		Shrinkage Crack	N/A	117	35.14
		Joint Spall	M	3	0.90
		Corner Spall	L	3	0.90
		Corner Spall	M	1	0.45
A23B	1	Corner Break	L	1	0.46
		Linear Cracking	L	40	12.04
		Linear Cracking	M	17	5.09
		Linear Cracking	H	1	0.46
		Jt Seal Damage	H	339	100.00
		Small Patch	L	4	1.39
		Large Patch	L	6	1.85
		Shattered Slab	L	1	0.46
		Shattered Slab	H	1	0.46
		Shrinkage Crack	N/A	199	58.80
		Joint Spall	L	21	6.48
		Joint Spall	M	18	5.56
		Joint Spall	H	4	1.39
		Corner Spall	L	15	4.63
		Corner Spall	M	7	2.31
		Corner Spall	H	1	0.46
A24B	1	Corner Break	L	2	1.69
		Linear Cracking	L	3	2.54
		Small Patch	L	4	3.39
		Shrinkage Crack	N/A	1	0.85
		Corner Spall	L	2	1.69
		Corner Spall	M	1	0.85
A25B	1	Corner Break	L	3	0.80
		Linear Cracking	L	8	2.08
		Linear Cracking	M	2	0.51
		Jt Seal Damage	M	392	100.00

(Continued)

Table 3 (Continued)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A25B (Cont.)	1	Small Patch	L	17	4.42
		Small Patch	M	1	0.40
		Large Patch	L	17	4.42
		Scaling	M	1	0.40
		Shrinkage Crack	N/A	211	54.01
		Joint Spall	L	15	4.01
		Joint Spall	M	1	0.40
		Corner Spall	L	9	2.41
		Corner Spall	M	3	0.80
A26B	1	Linear Cracking	L	28	26.83
		Linear Cracking	M	10	9.76
		Linear Cracking	H	5	4.88
		Jt Seal Damage	H	107	100.00
		Small Patch	L	2	2.44
		Large Patch	L	2	2.44
		Shattered Slab	L	15	14.63
		Shattered Slab	M	13	12.20
		Shrinkage Crack	N/A	54	51.22
		Joint Spall	L	2	2.44
A27B	1	Corner Break	L	1	0.65
		Linear Cracking	L	29	16.99
		Jt Seal Damage	M	176	100.00
		Small Patch	L	55	31.37
		Small Patch	M	1	0.65
		Large Patch	L	8	4.58
		Shrinkage Crack	N/A	127	72.55
		Joint Spall	L	1	0.65
		Joint Spall	M	1	0.65
		Corner Spall	L	1	0.65
A28B	1	Corner Break	L	1	0.75
		Linear Cracking	L	5	2.99
		Jt Seal Damage	L	173	100.00
		Small Patch	L	6	3.73
		Large Patch	L	5	2.99
		Scaling	L	3	2.24
		Shrinkage Crack	N/A	81	47.01
		Joint Spall	L	3	2.24
		Joint Spall	M	1	0.75
		Corner Spall	L	3	2.24

(Continued)

Table 3 (Concluded)

Feature	Section	Distress	Severity	Extrapolated Quantity Number of Slabs	Percent of Total Area
A29B	1	Linear Cracking	L	27	13.07
		Jt Seal Damage	H	214	100.00
		Small Patch	L	22	10.46
		Large Patch	L	41	19.61
		Scaling	M	1	0.65
		Shattered Slab	L	5	2.61
		Shrinkage Crack	N/A	97	45.75
		Joint Spall	L	2	1.31
		Corner Spall	H	1	0.65
WASH	1	Linear Cracking	L	4	2.21
		Jt Seal Damage	M	204	100.00
		Small Patch	L	15	7.35
		Small Patch	M	1	0.74
		Large Patch	L	7	3.68
		Scaling	L	3	1.47
		Shrinkage Crack	N/A	138	67.65
		Joint Spall	L	7	3.68
		Joint Spall	M	1	0.74
		Corner Spall	L	1	0.74

(Sheet 11 of 11)

Table 4

A 5-Year Inspection Schedule, Edwards AFB

Year to Inspect	Feature	Sections
1990	T04A	1
	T08A	1
	A06B	1
	A08B	2
	A21B	1
	A23B	1
	A26B	1
	A29B	1
1991	T06A	1
	T15A	1
	A27B	1
1995	R01A	1, 2, 3
	R02C	1, 2, 3
	R03A	1, 2, 3
	R04A	1, 2, 3
	R05A	1, 2, 3
	T01A	1
	T02A	1
	T03A	1
	T05A	1
	T07A	1
	T09A	1
	T10A	1
	T11A	1
	A01B	1
	A02B	1
	A03B	1
	A04B	1
	A05B	1
	A07B	1
	A08B	1
	A09B	1
	A10B	1
	A11B	1
	A12B	1, 2
	A13B	1, 2
	A14B	1
	A22B	1
	A24B	1
	A25B	1
	A28B	

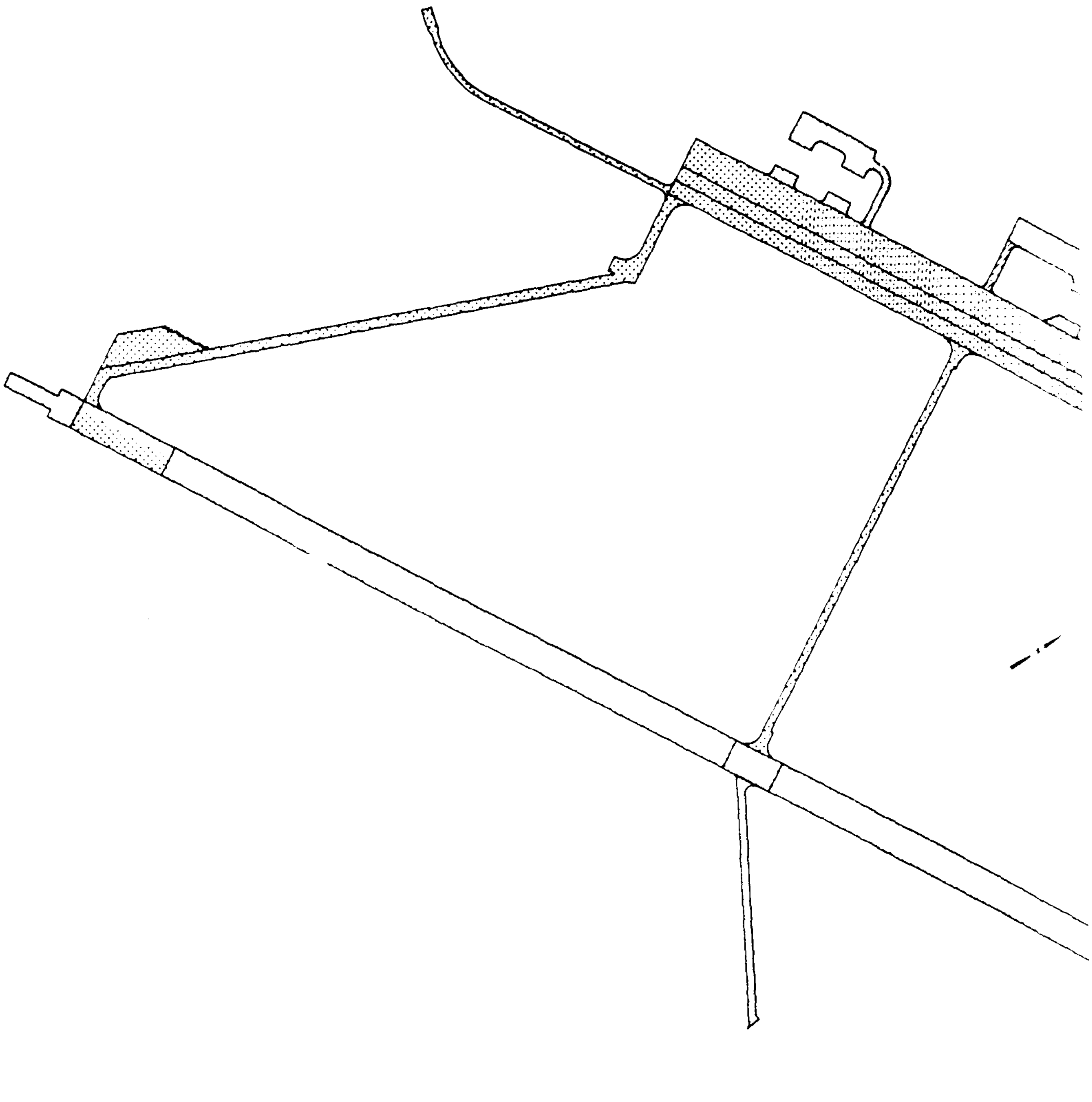
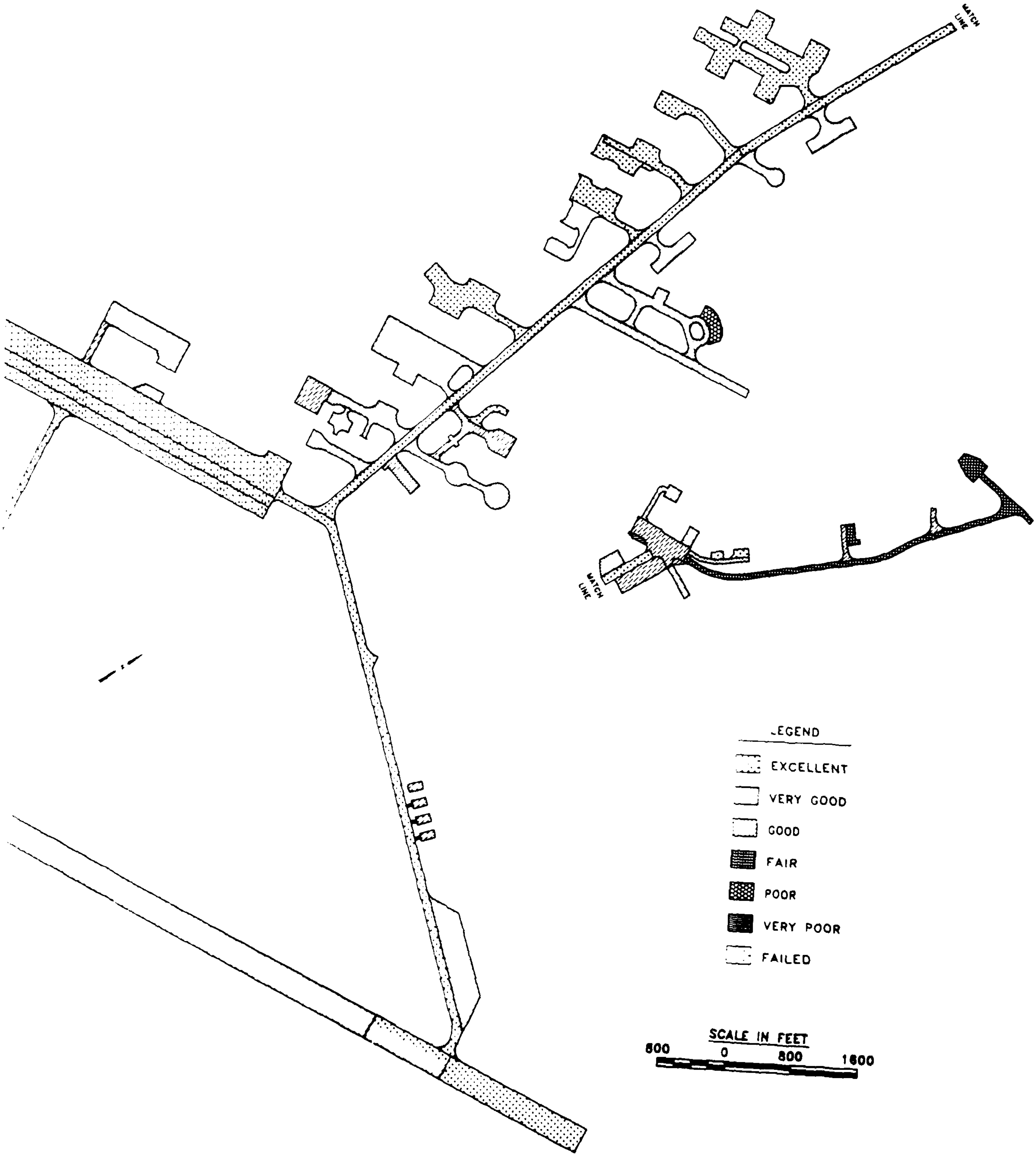


Figure 1. Airfield pavement feature ident



·nt feature identifications at Edwards AFB

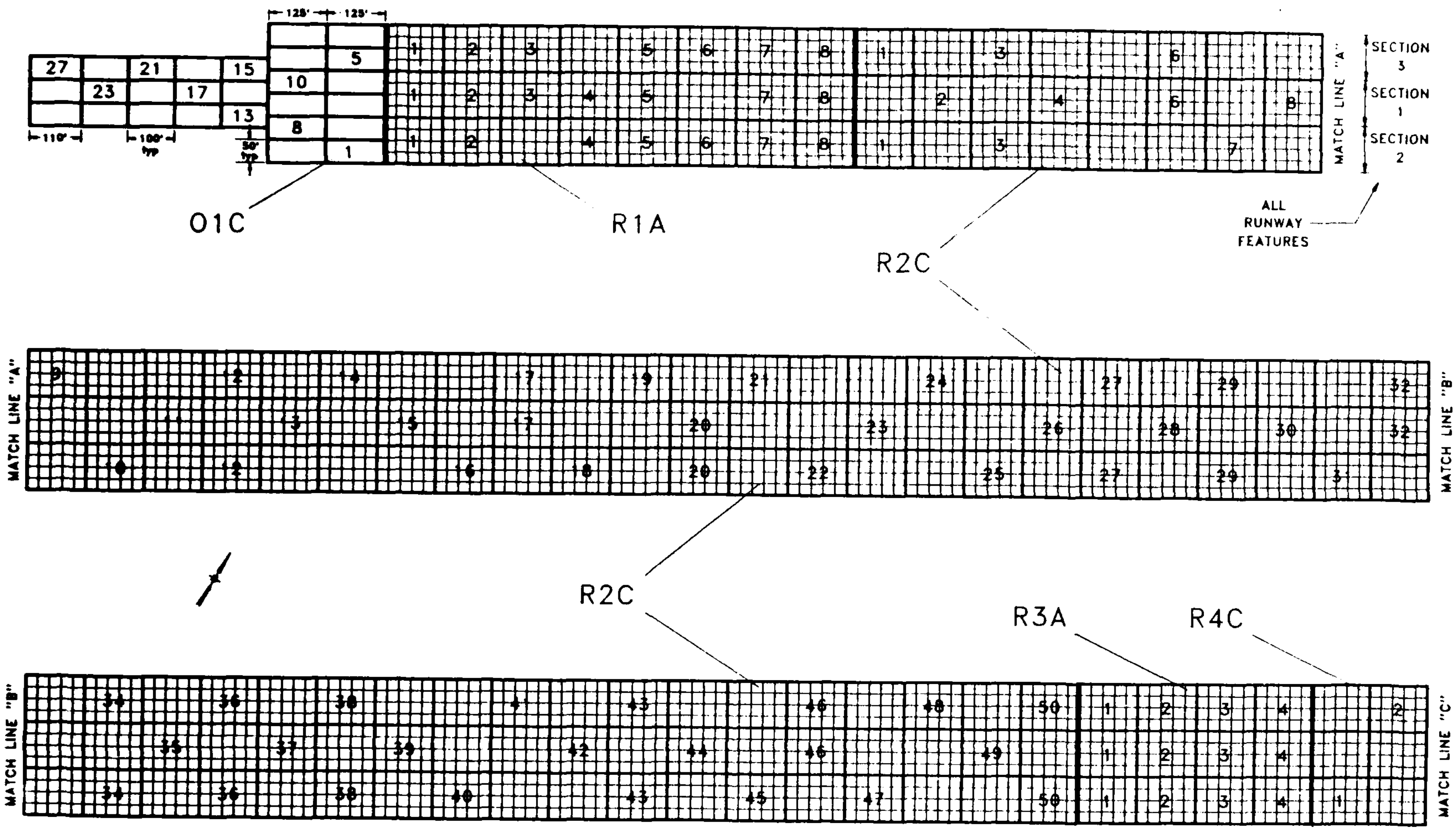


Figure 2. Sample unit layout, Runway 4-22 (features R1A, R2C, R3A, and R4C) and Runway 04 overrun (O1C)

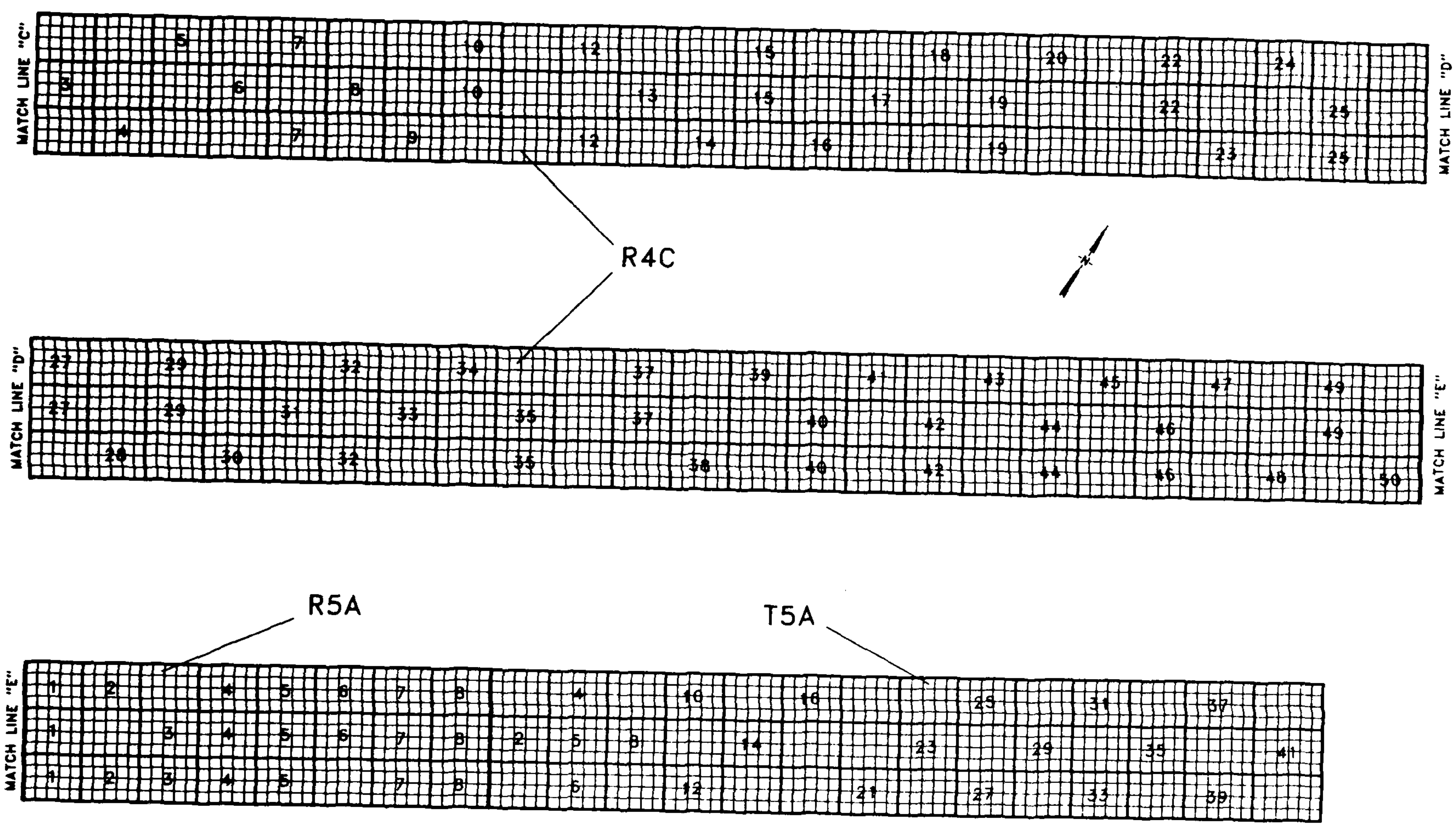


Figure 3. Sample unit layout, Runway 4-22 (features R4C and R5A) and the taxiway to the lakebed (feature T5A)

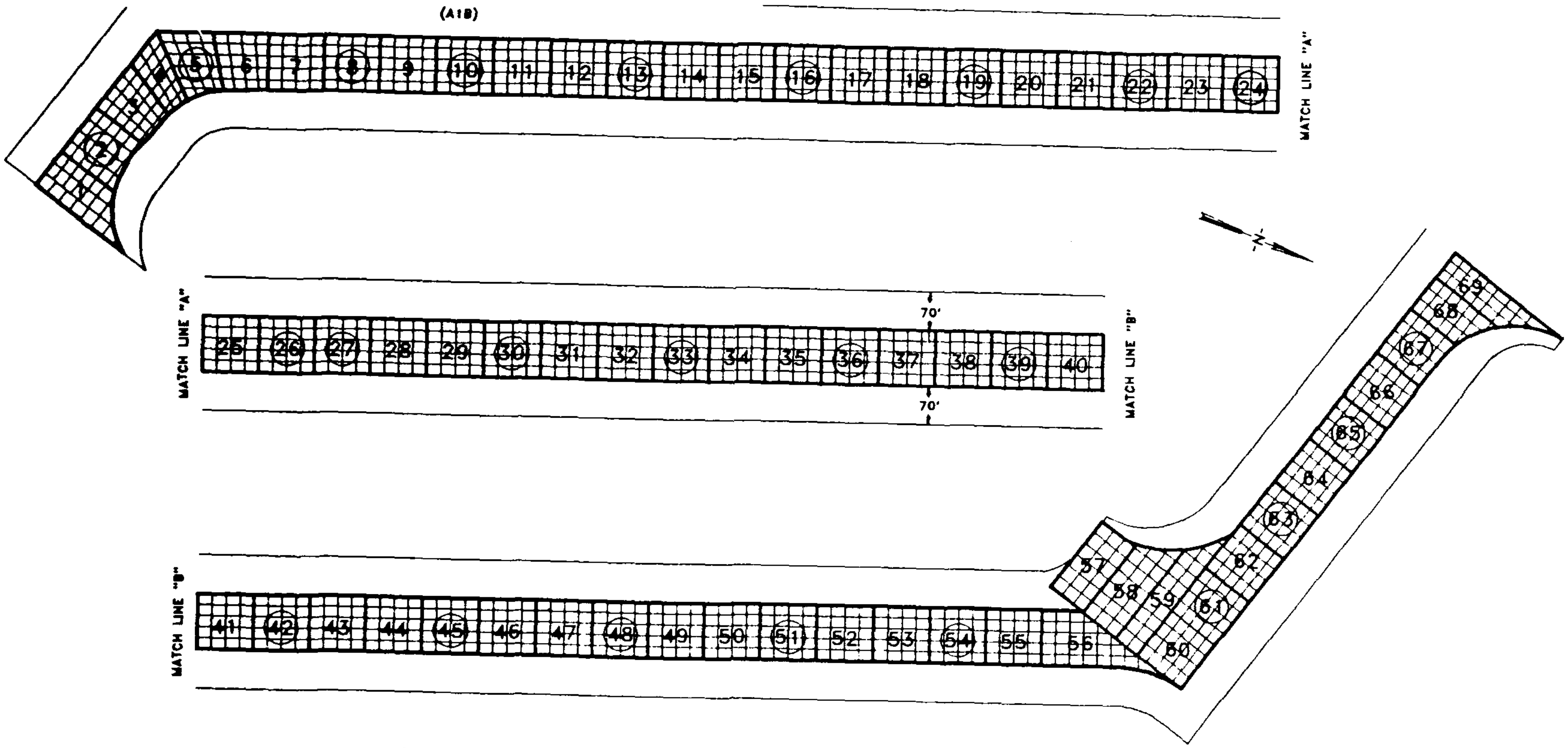


Figure 4. Sample unit layout, Taxiway A (feature T14A)

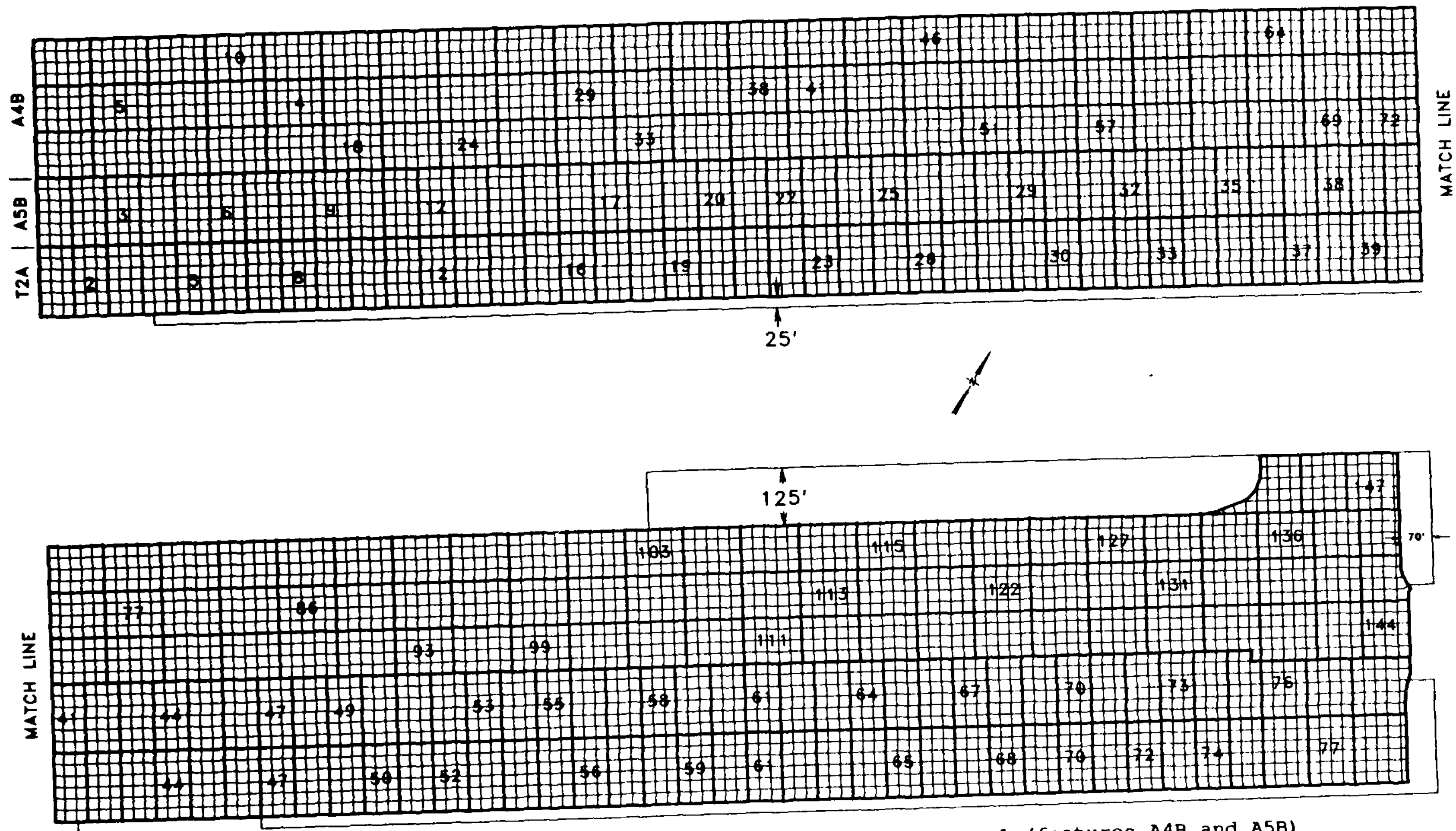


Figure 5. Sample unit layout, Taxiway F (feature T2A) and Ramp 1 (features A4B and A5B)

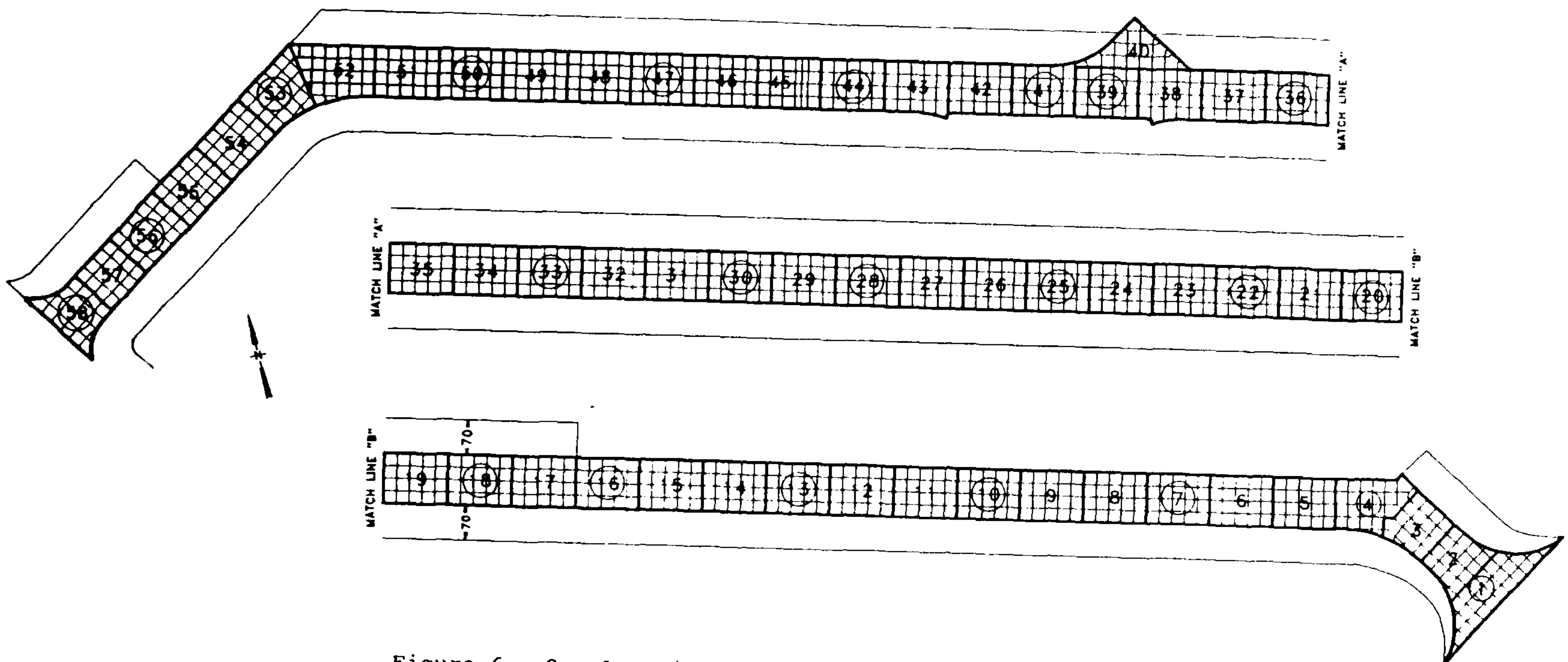


Figure 6. Sample unit layout, Taxiway C (feature T3A)

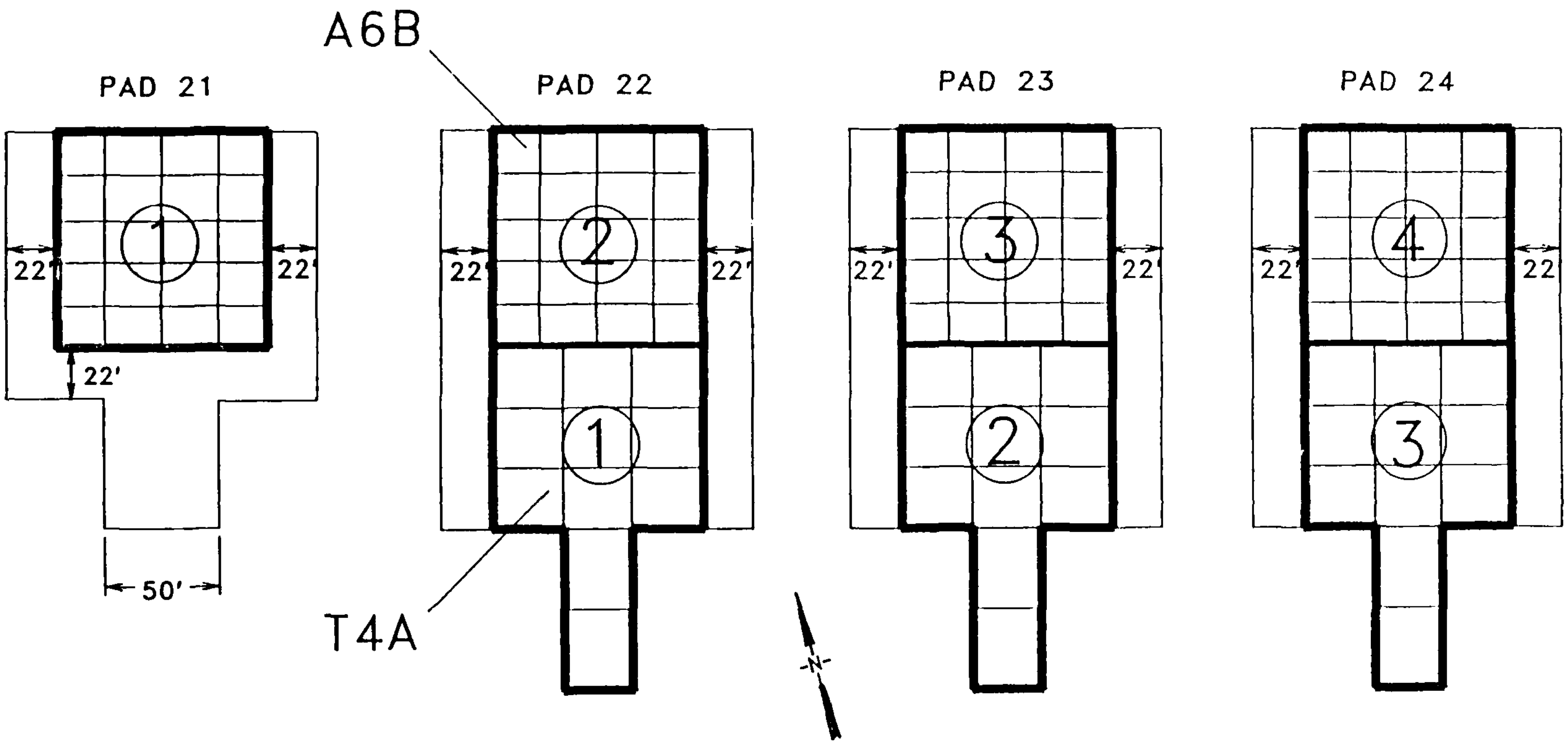


Figure 7. Sample unit layout, Pads 21-24 (feature A6B) and their taxiways (feature T4A)

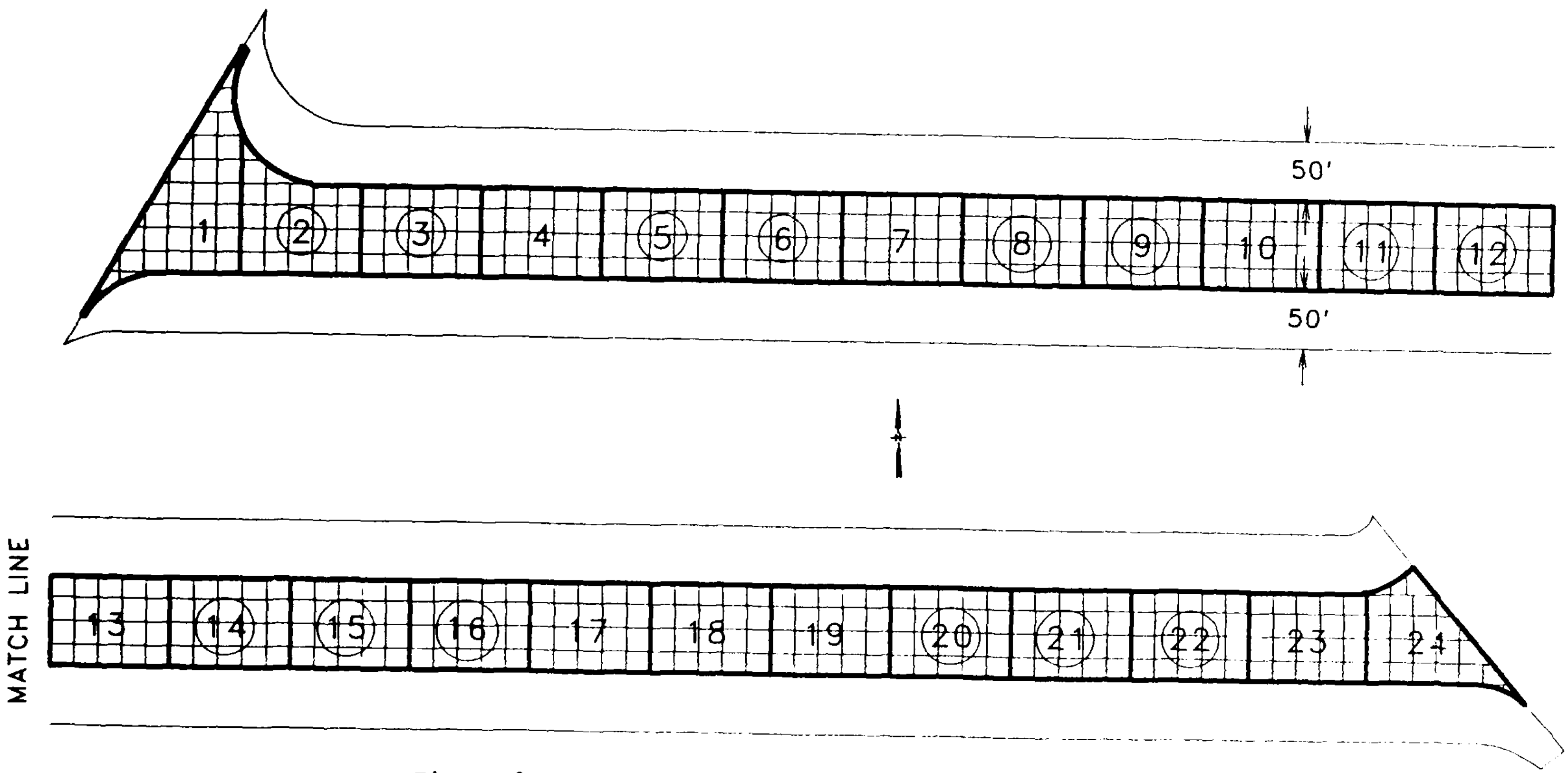


Figure 8. Sample unit layout, Taxiway G (fe.cure T6A)

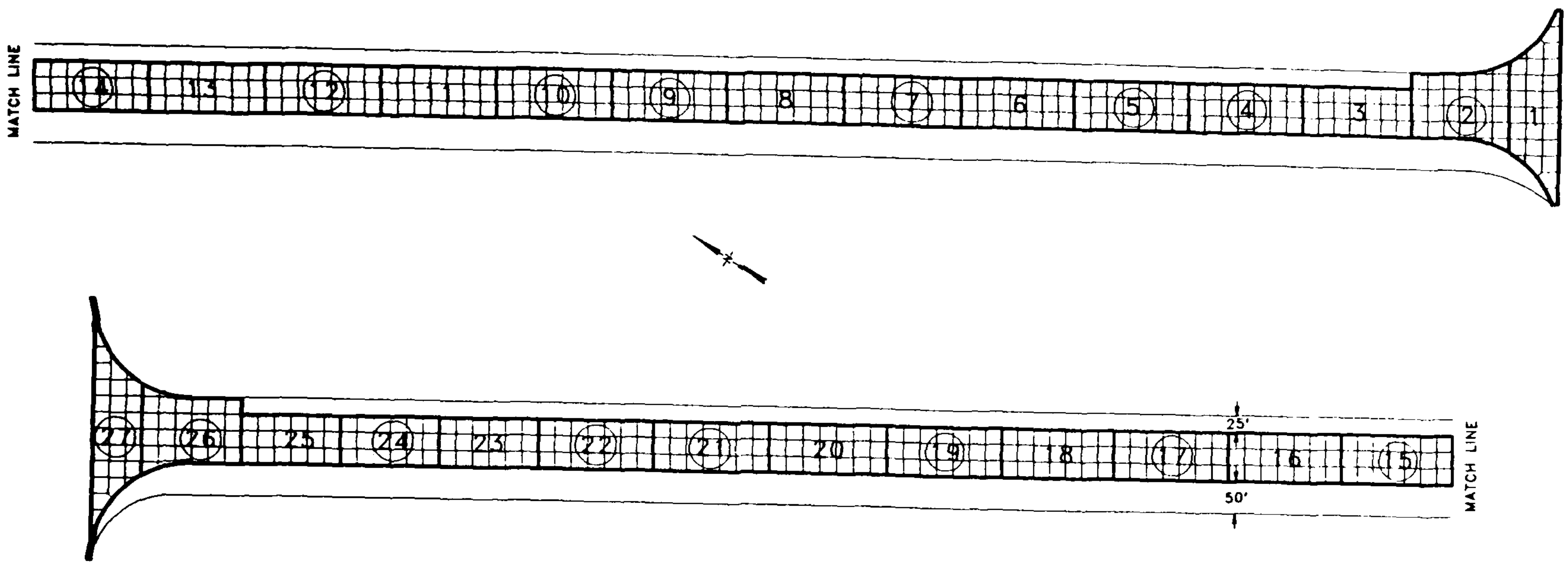


Figure 9. Sample unit layout, Taxiway B (feature T7A)

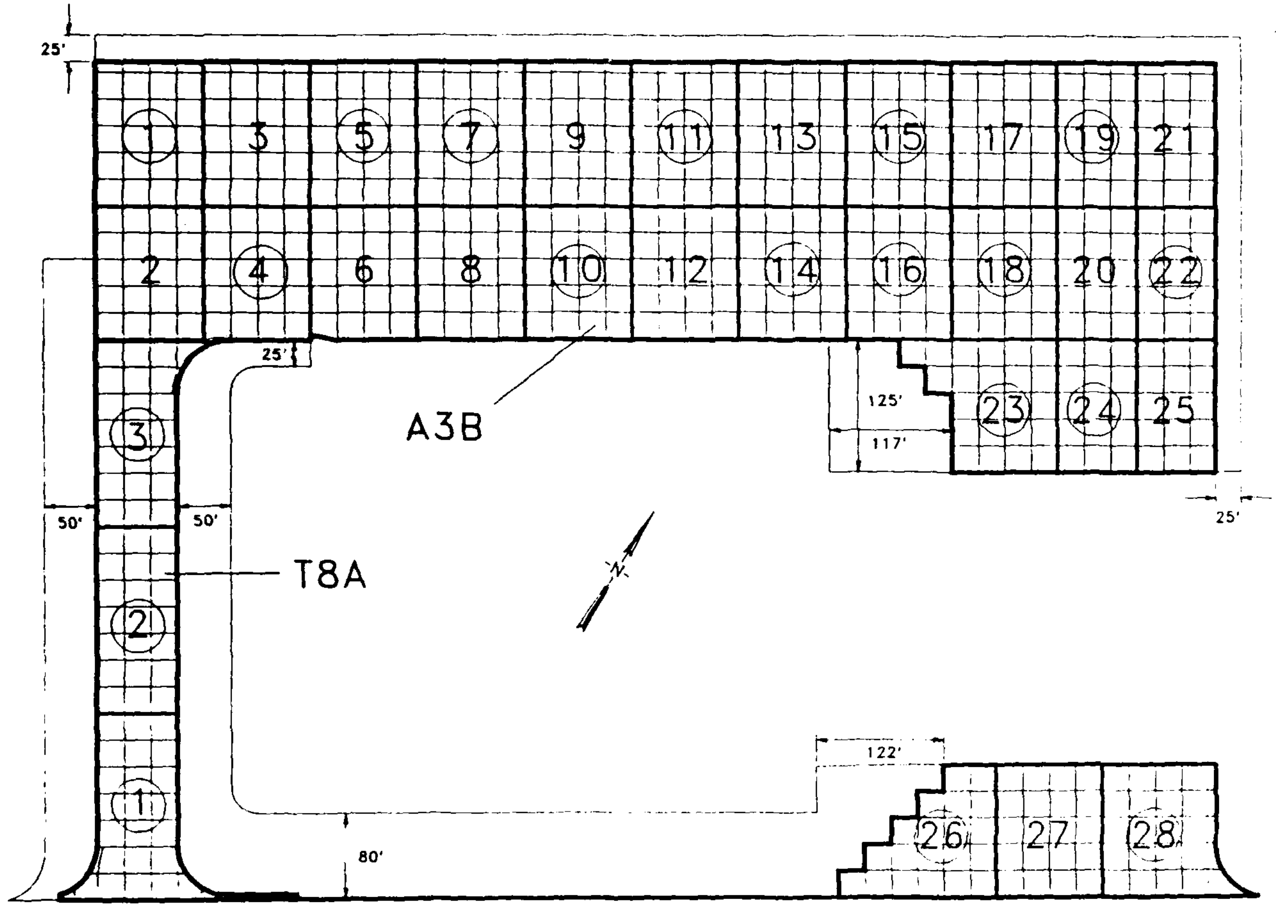


Figure 10. Sample unit layout, Ramp 3 (feature A3B) and its taxiway (feature T8A)

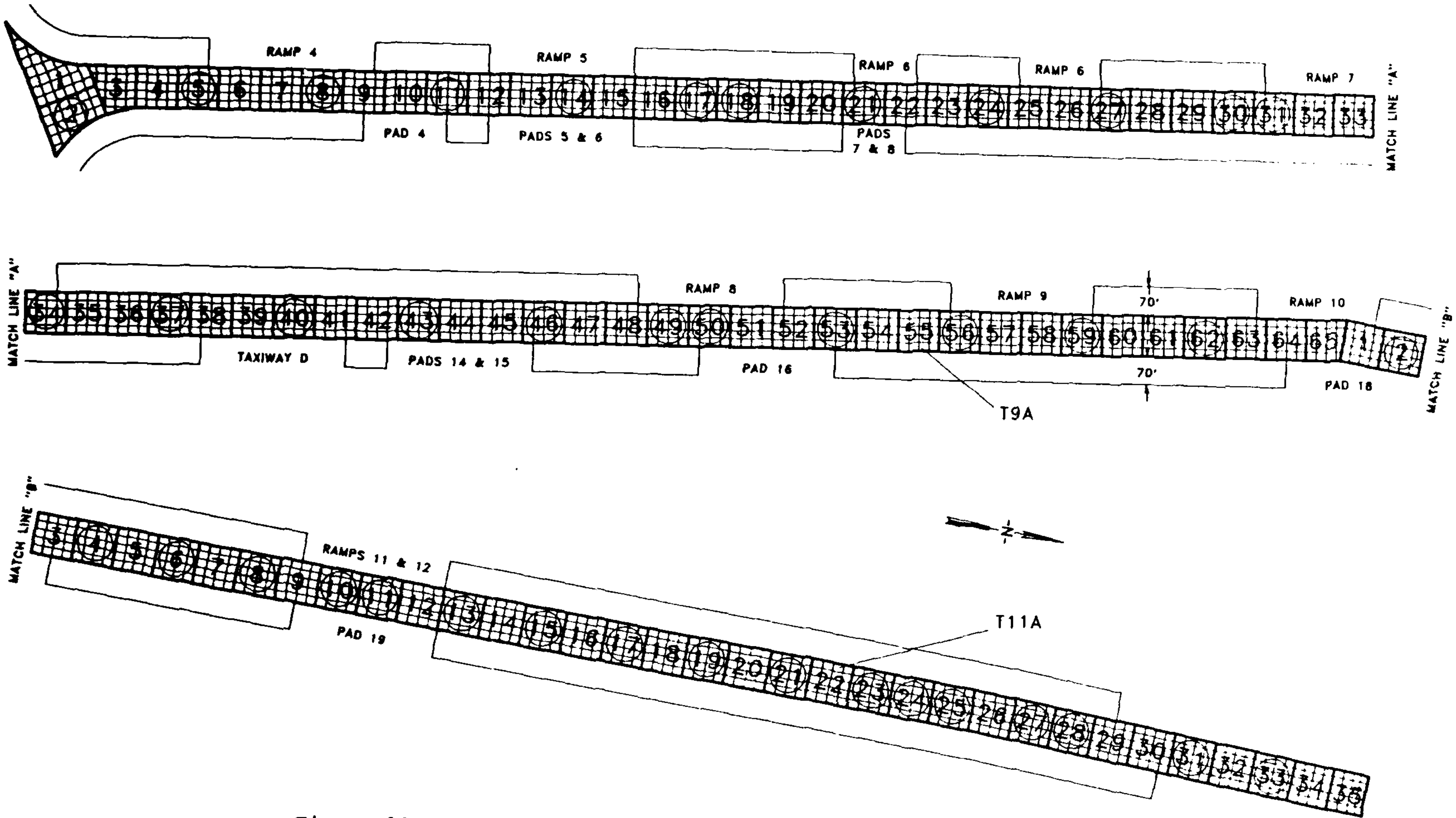


Figure 11. Sample unit layout, Taxiway E (features T9A and T11A)

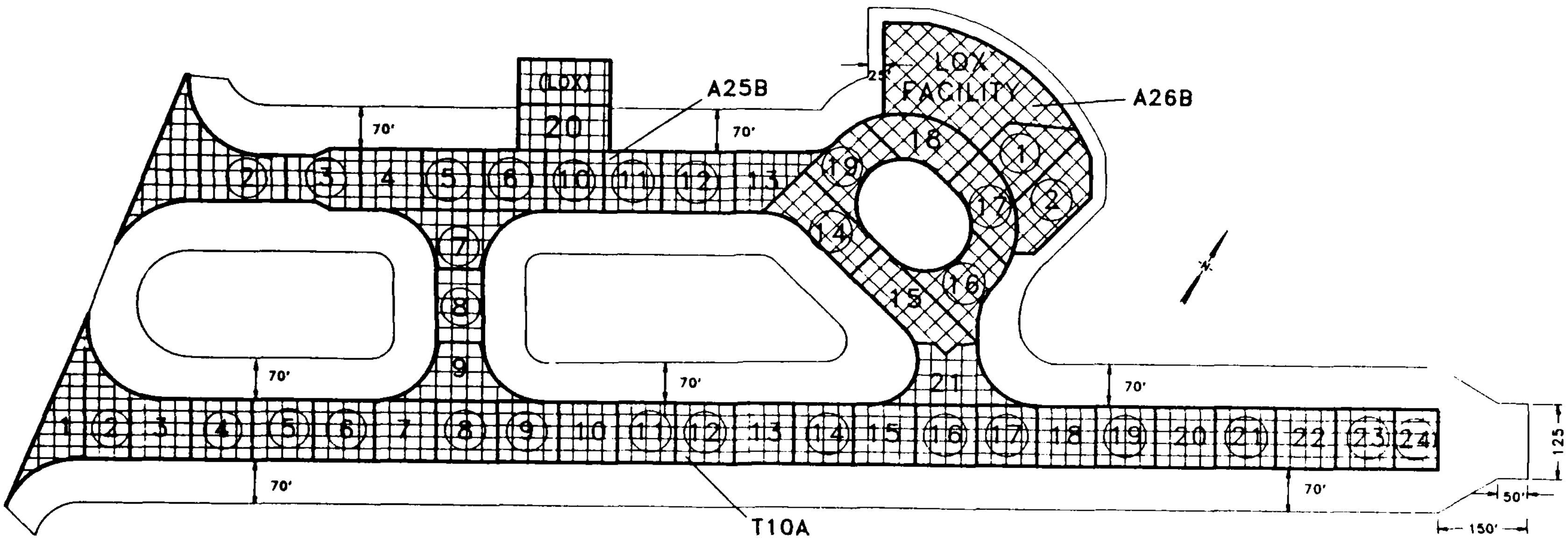


Figure 12. Sample unit layout, Taxiway D (feature T10A) and the LOX area apron (feature A25B) and storage pad (feature A26B)

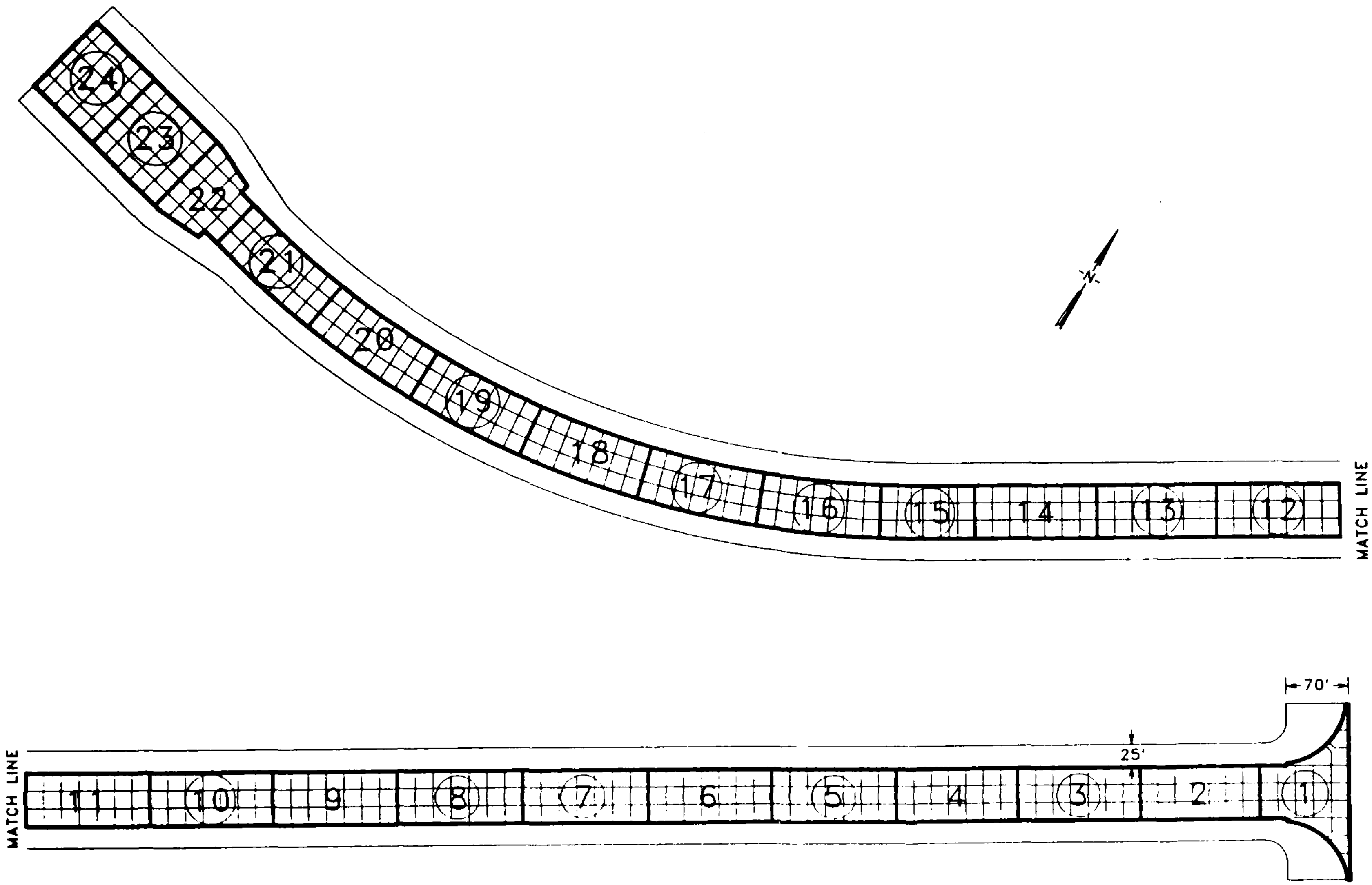


Figure 13. Sample unit layout, anechoic chamber taxiway (feature T15A)

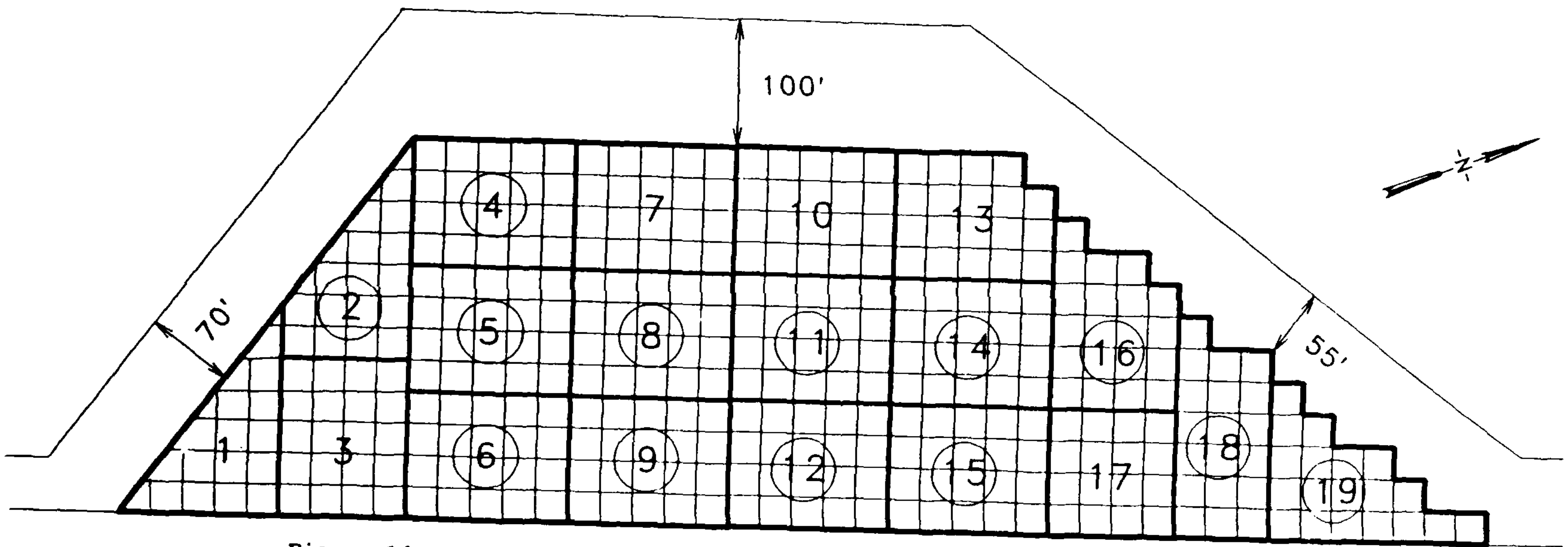


Figure 14. Sample unit layout, Runway 04 warm-up apron (feature A1B)

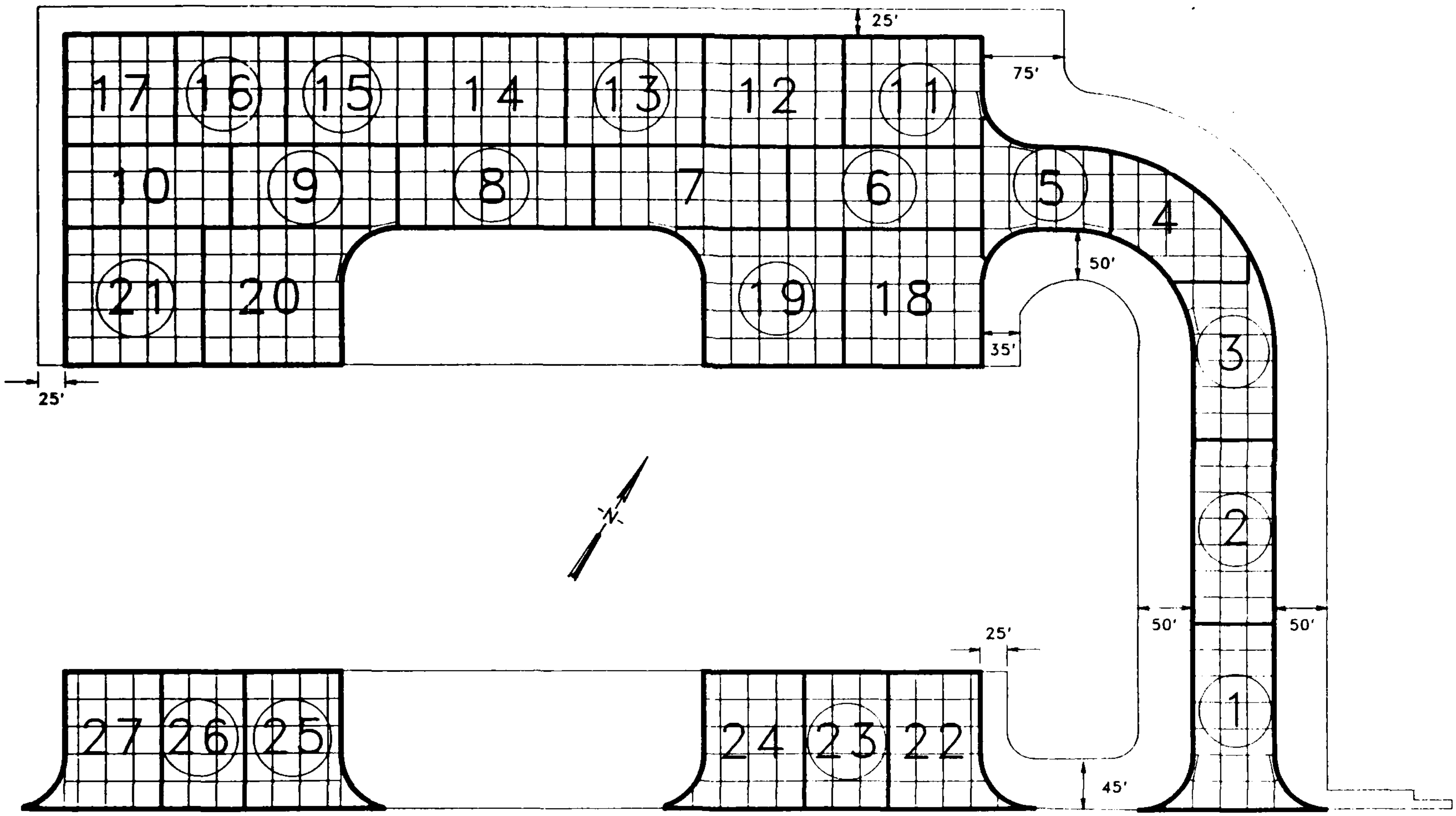


Figure 15. Sample unit layout, Ramp 2 (feature A2B)

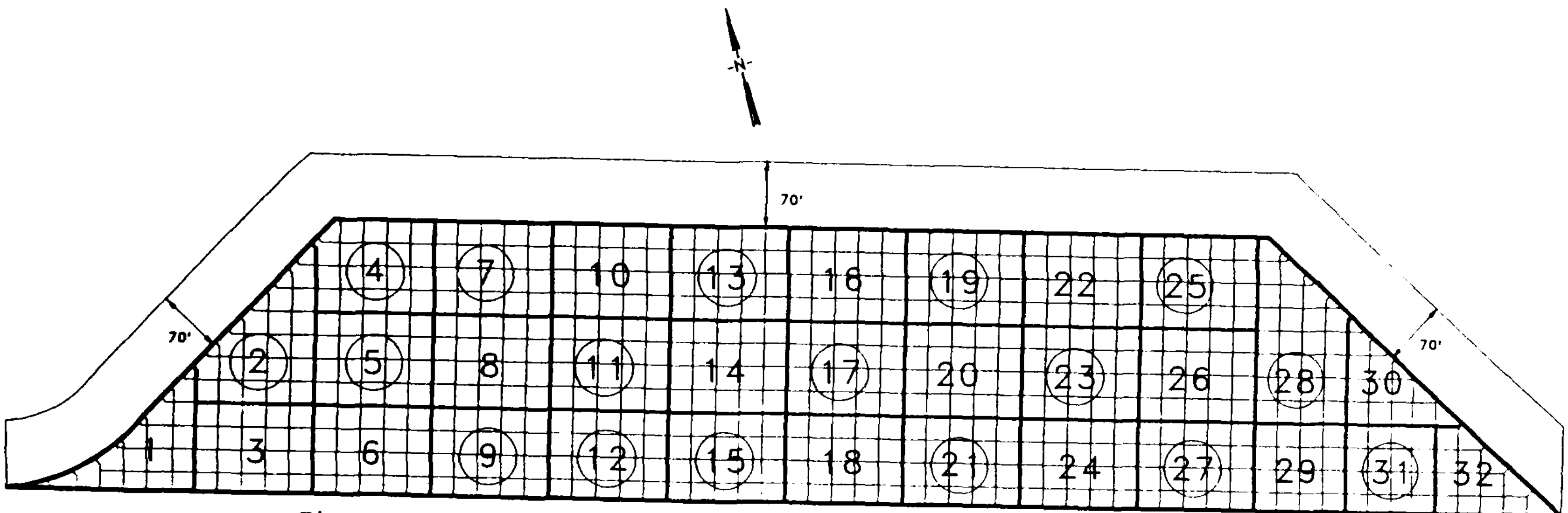


Figure 16. Sample unit layout, Runway 22 warm-up apron (feature A7B)

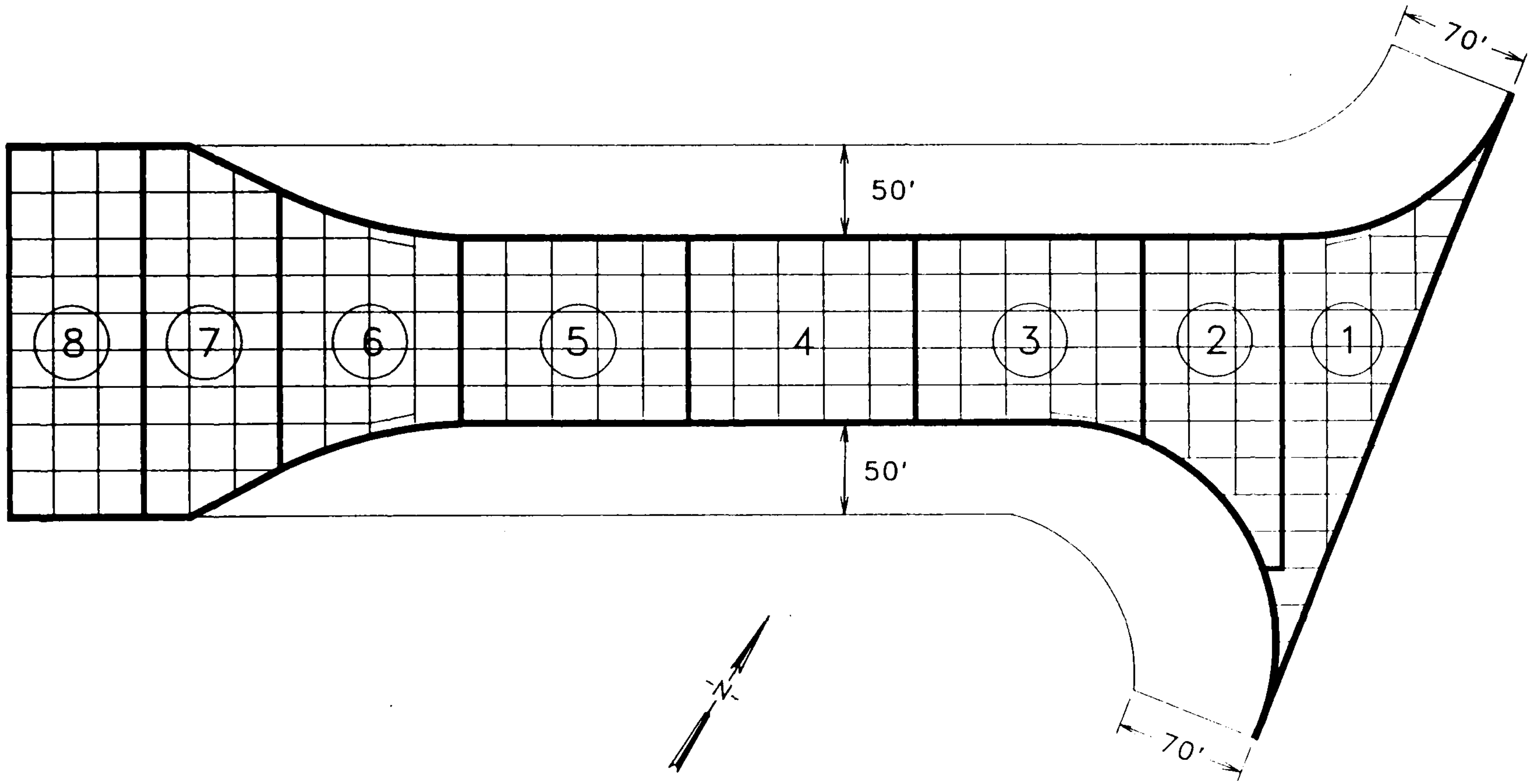


Figure 17. Sample unit layout, Ramp 4 (feature A8B, section 1)

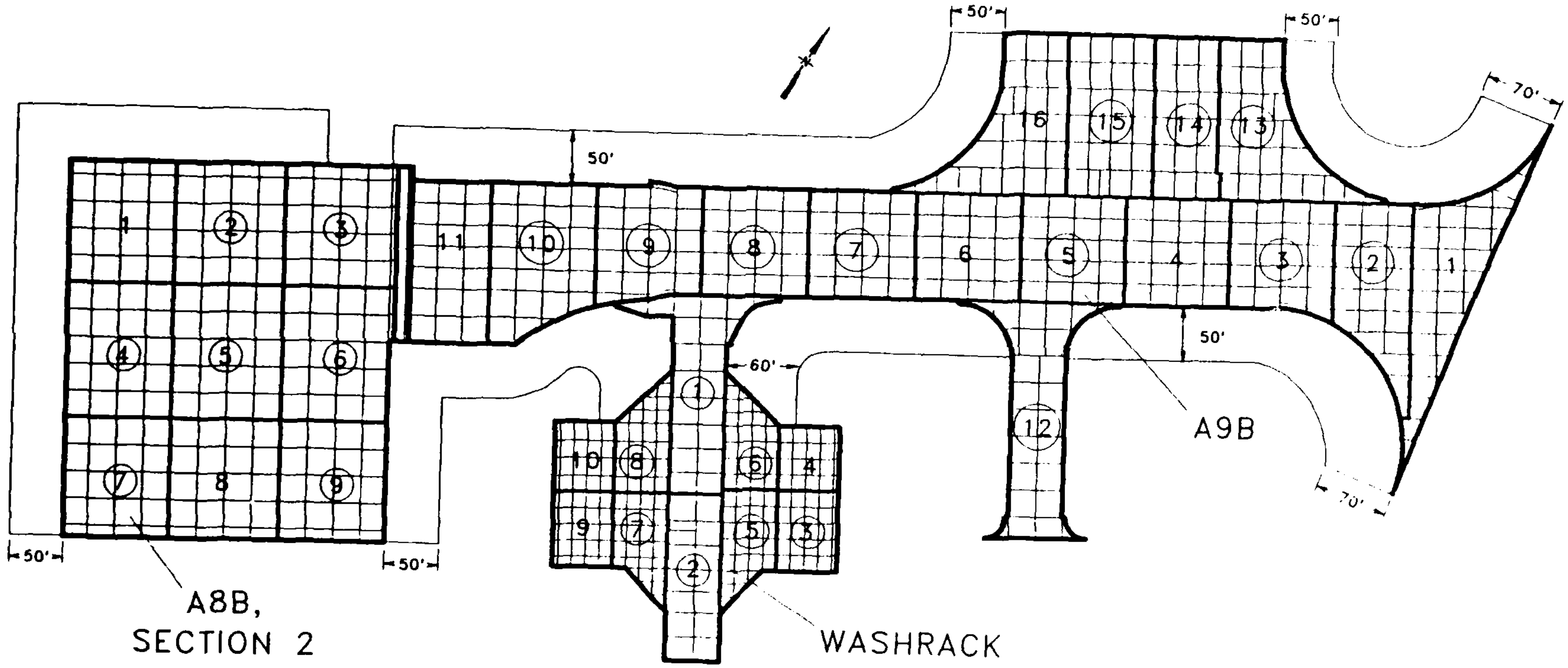


Figure 18. Sample unit layout, Ramp 5 (feature A8B, section 2 and feature A9B) and the washrack (feature WASH)

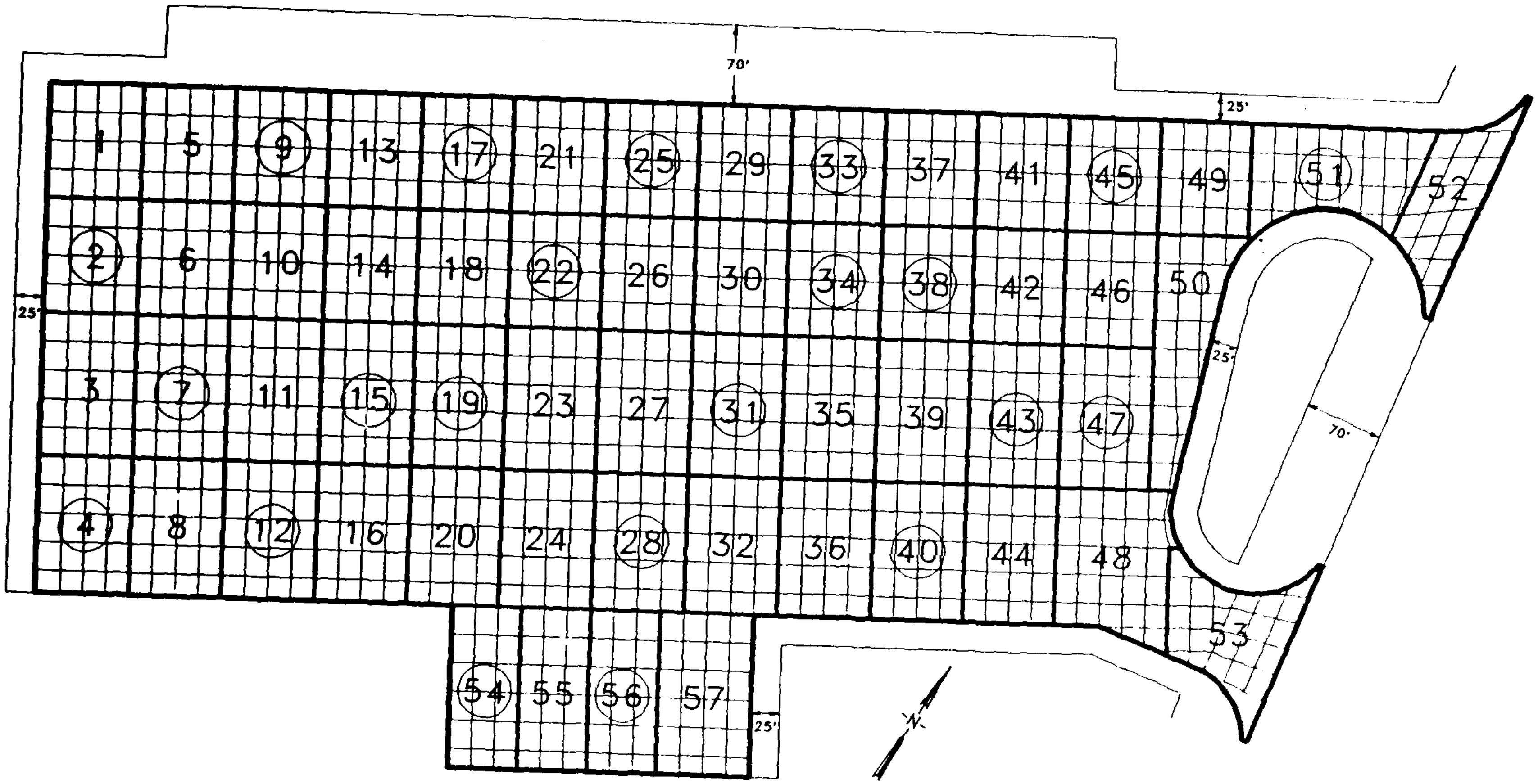


Figure 19. Sample unit layout, Ramp 6 (feature A10B)

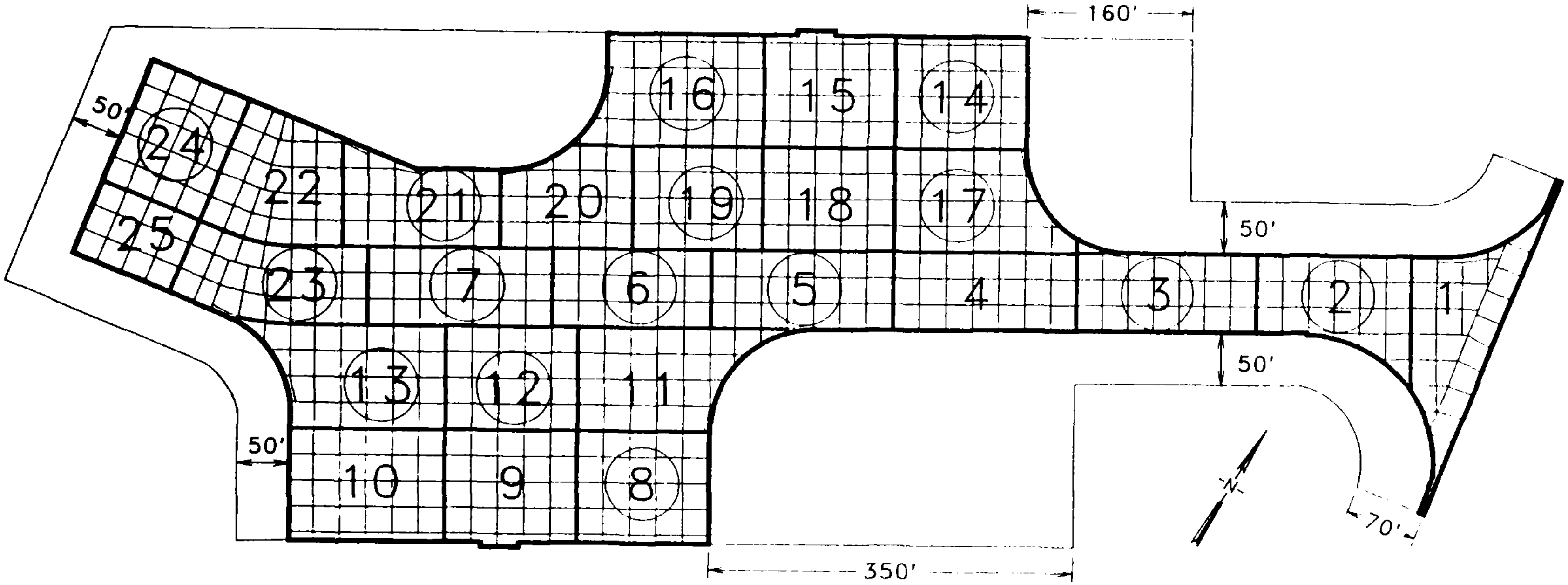


Figure 20. Sample unit layout, Ramp 7 (feature A11B)

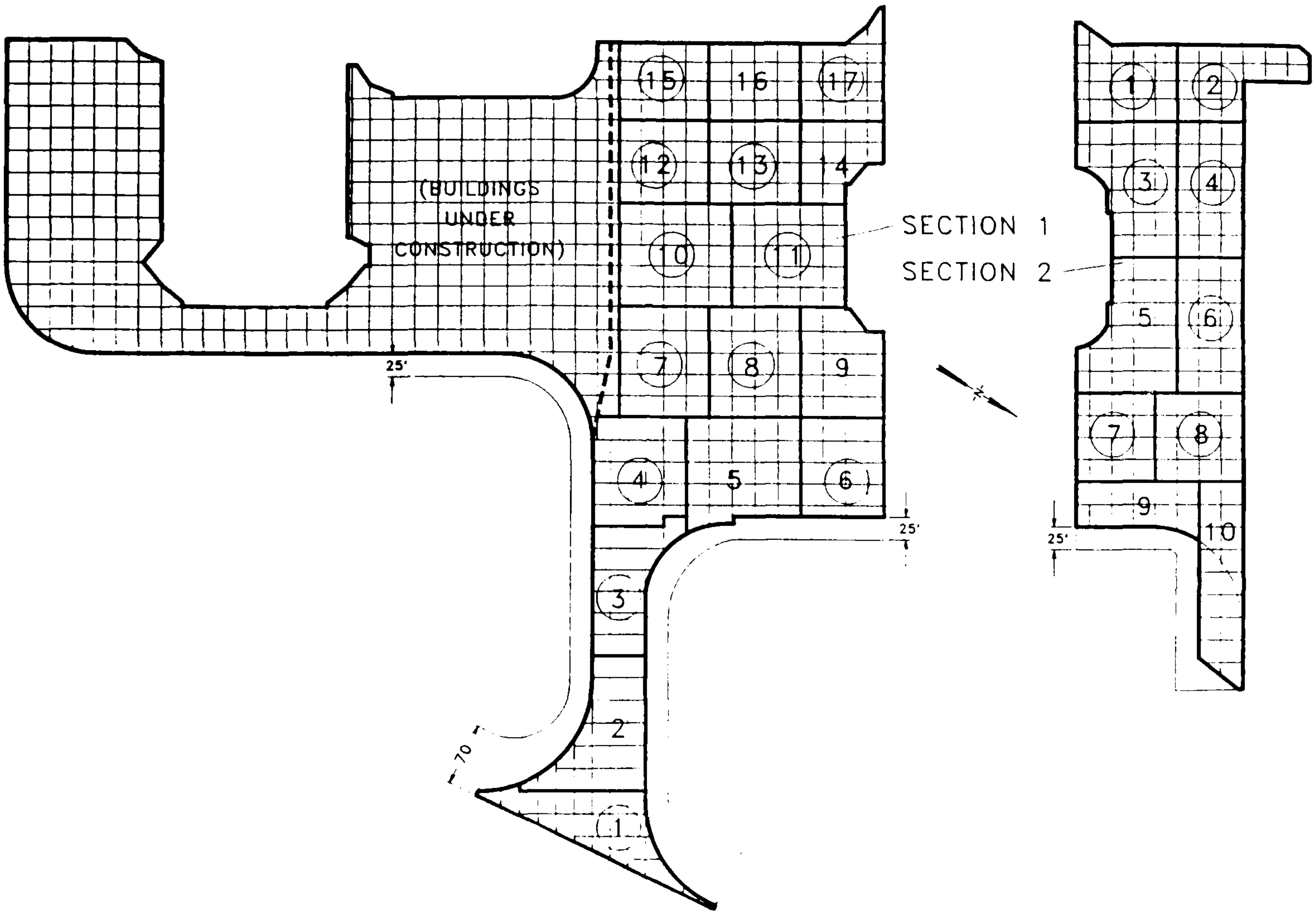


Figure 21. Sample unit layout, Ramps 8 (feature A12B, section 1) and 9 (feature A12B, section 2)

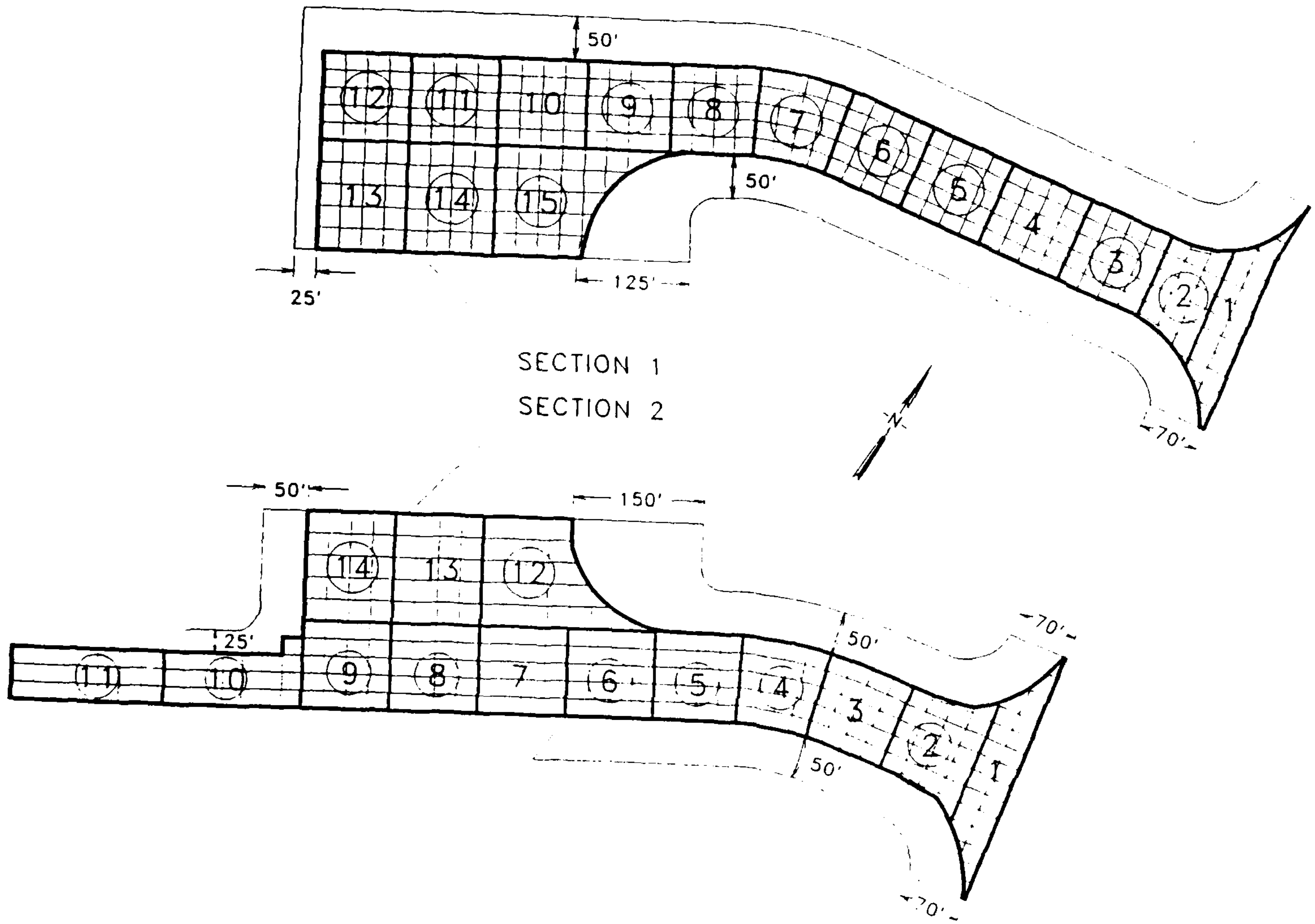


Figure 22. Sample unit layout, Ramps 9 (feature A13B, section 1) and 10 (feature A13B, section 2)

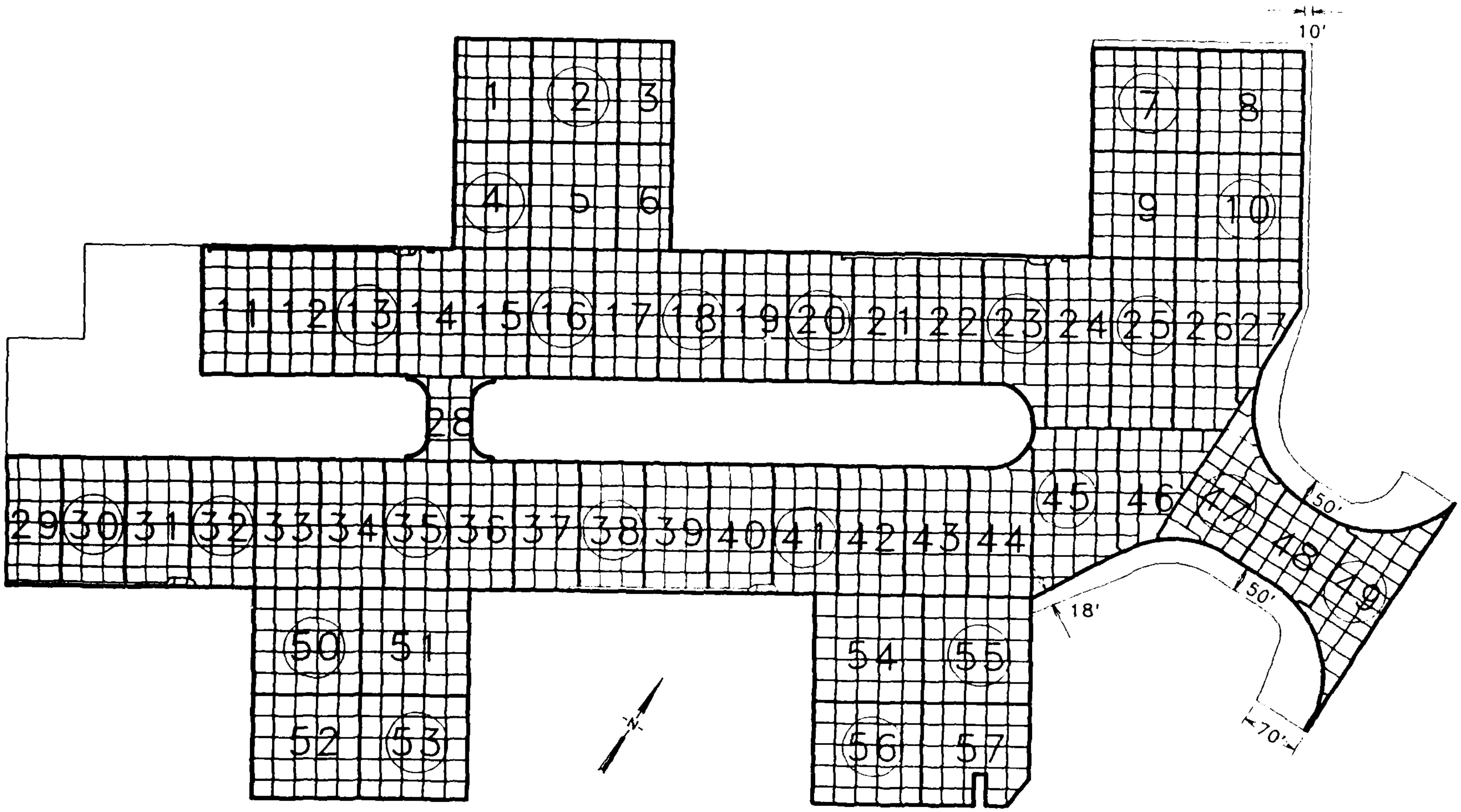


Figure 23. Sample unit layout, Ramps 11 and 12 (feature A14B)

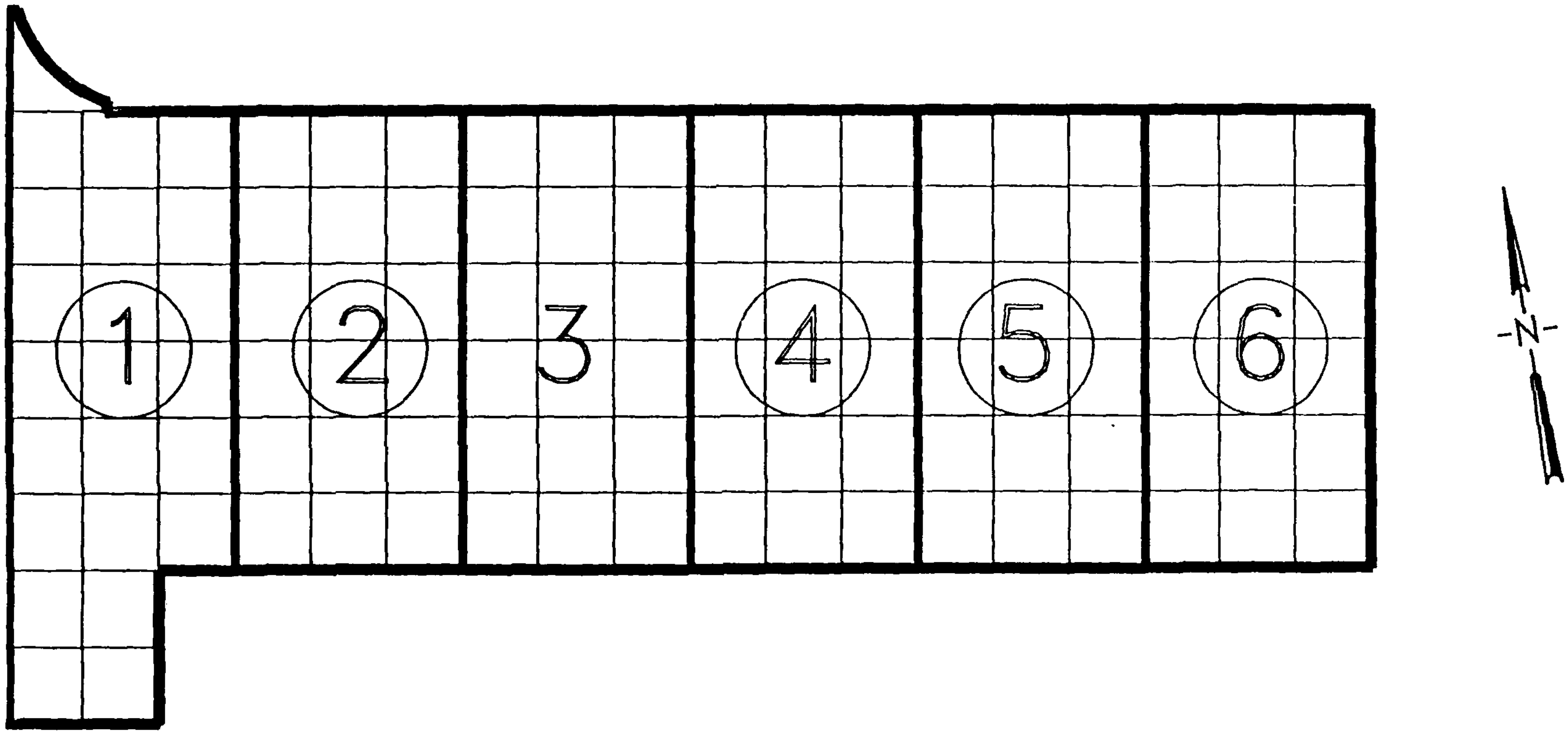


Figure 24. Sample unit, layout, Pad 4 (feature A21B)

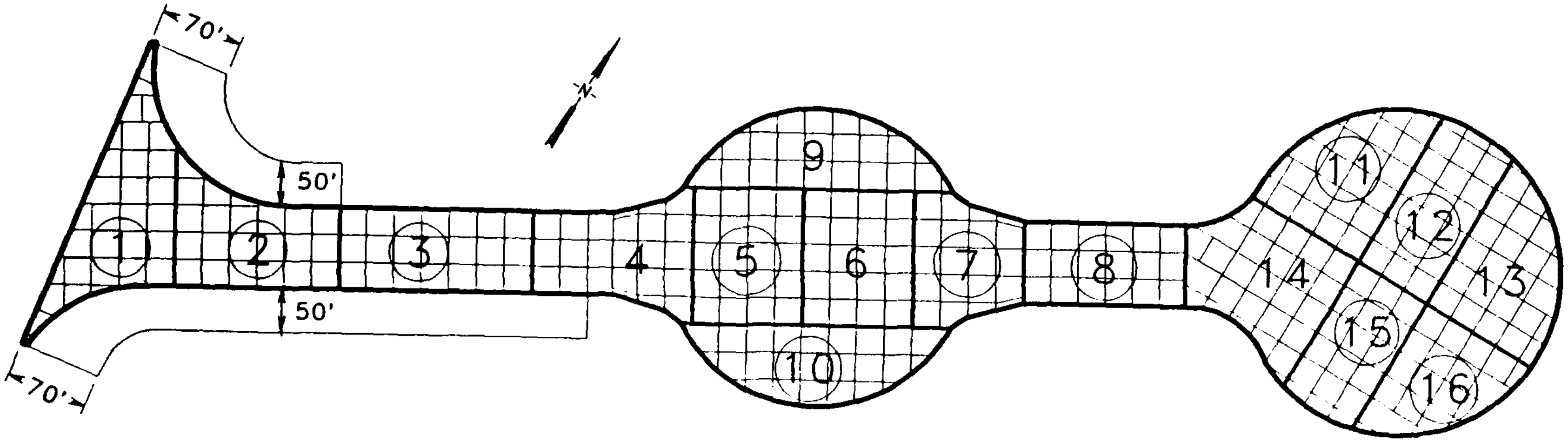


Figure 25. Sample unit layout, Pads 5 and 6 (feature A22B)

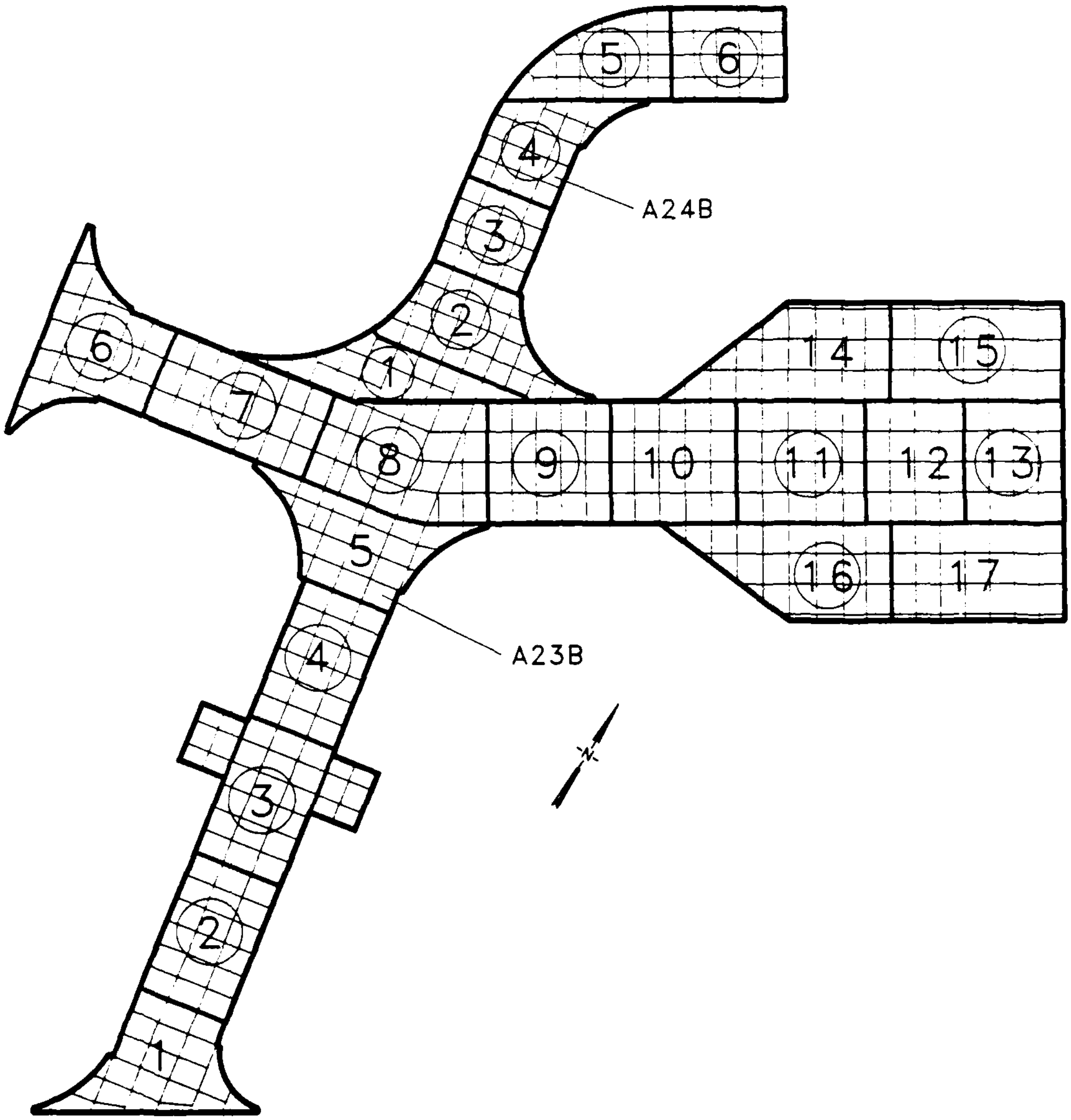


Figure 26. Sample unit layout, Pads 7 and 8 (feature A23B) and the hush house hangar access apron (feature A24B)

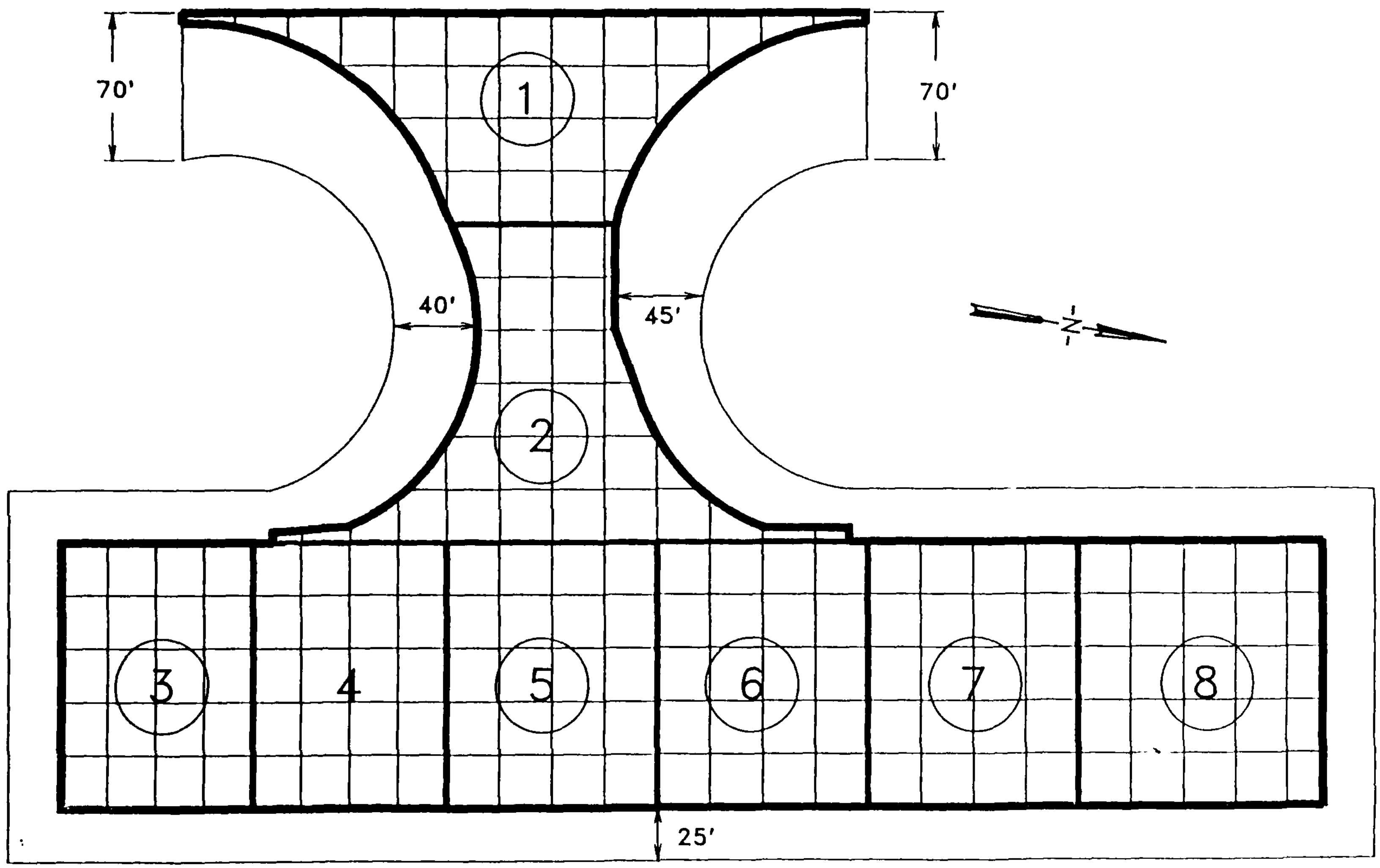


Figure 27. Sample unit layout, Pad 16 blast pad (feature A27B)

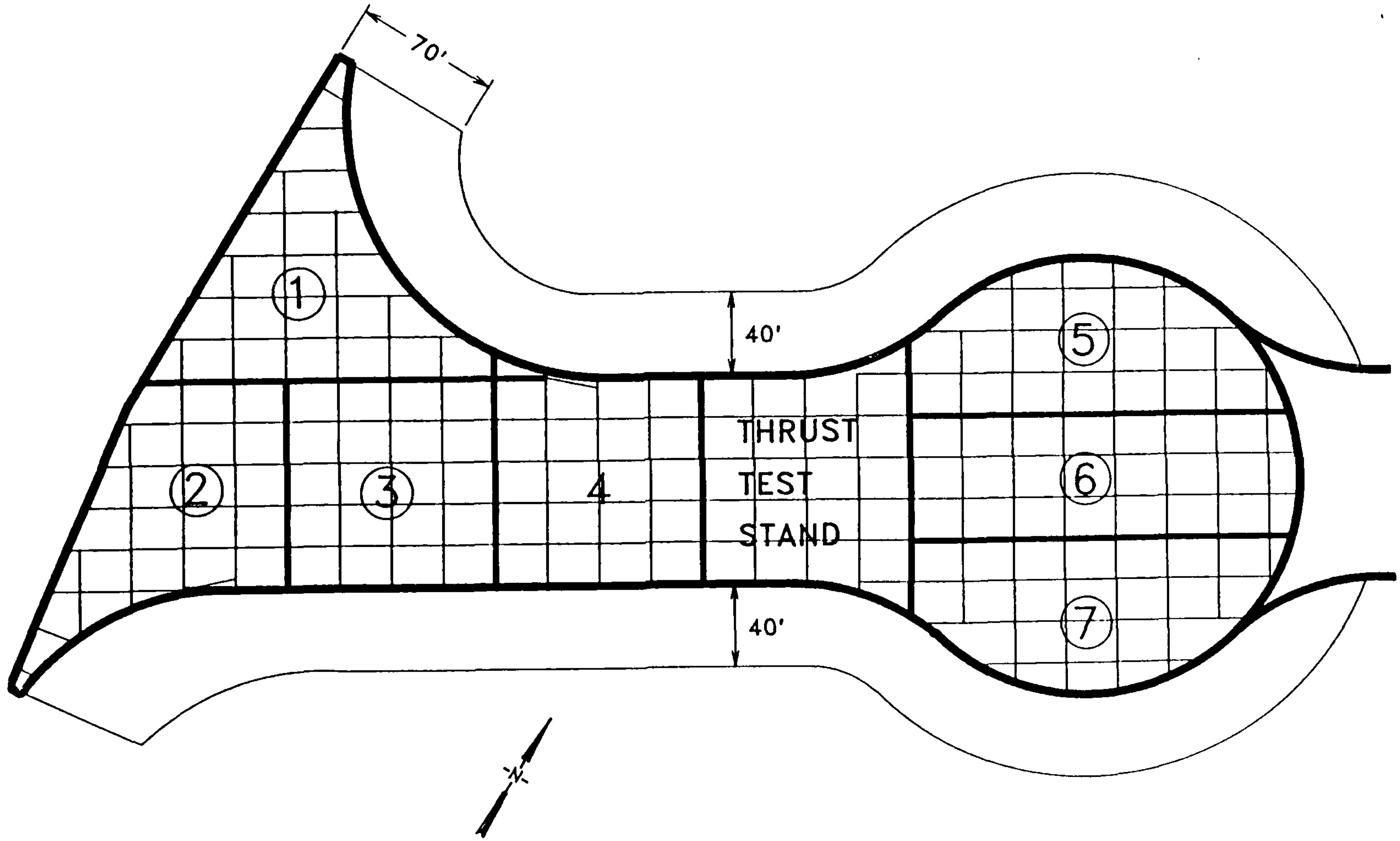


Figure 28. Sample unit layout, Pad 18 thrust stand (feature A28B)

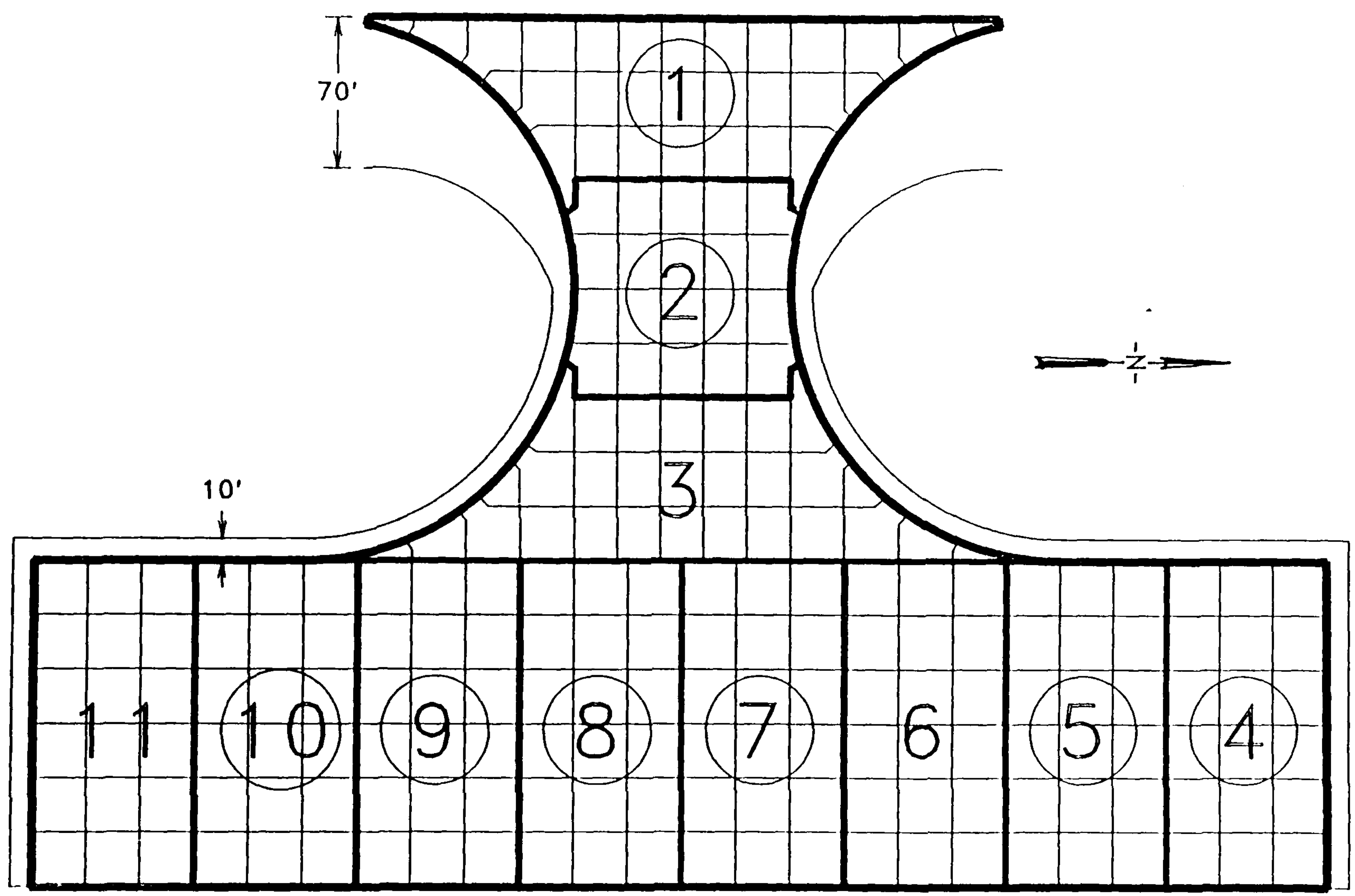


Figure 29. Sample unit layout, Pad 19 (feature A29B)

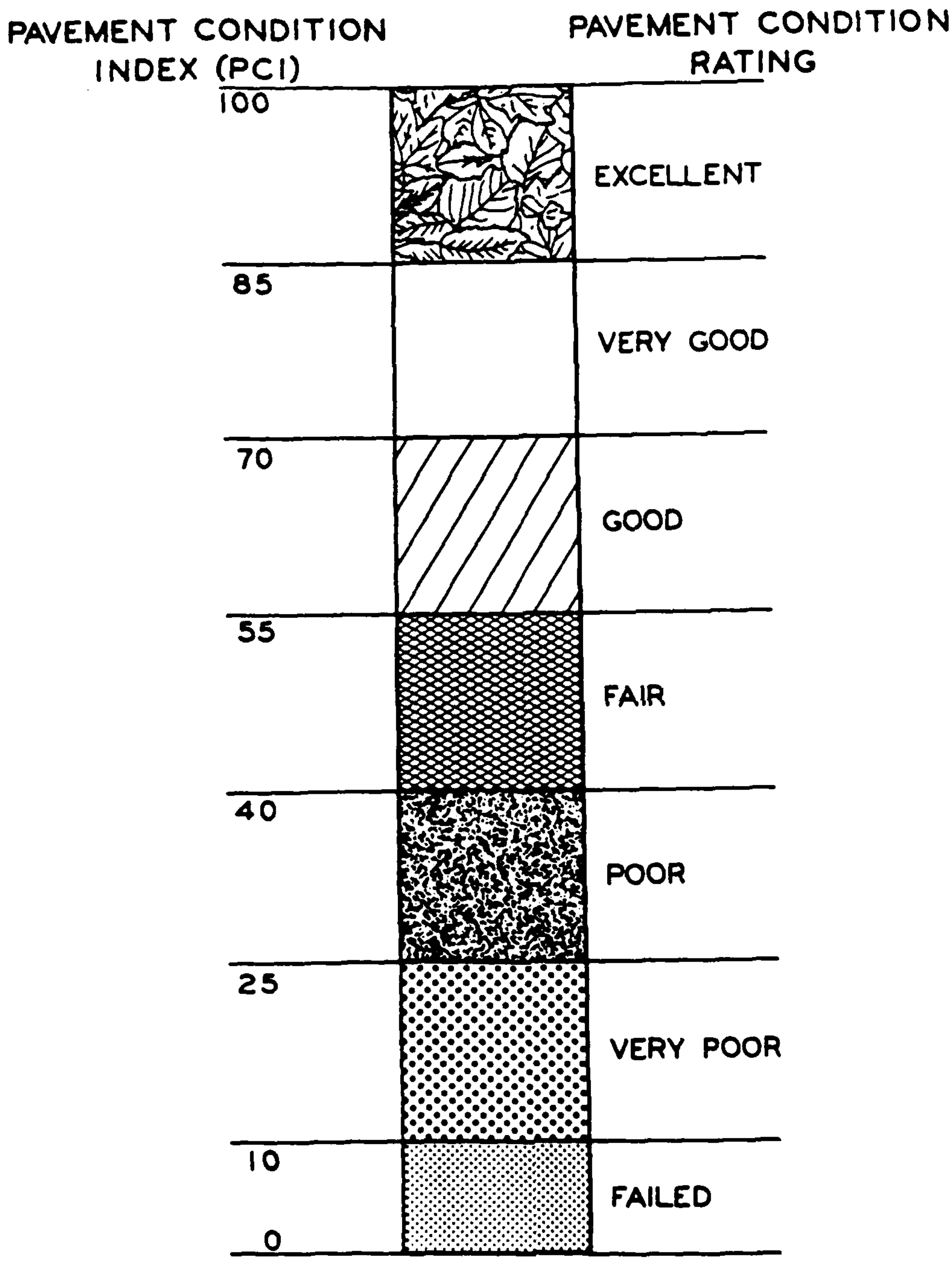


Figure 30. Scale for pavement condition ratings

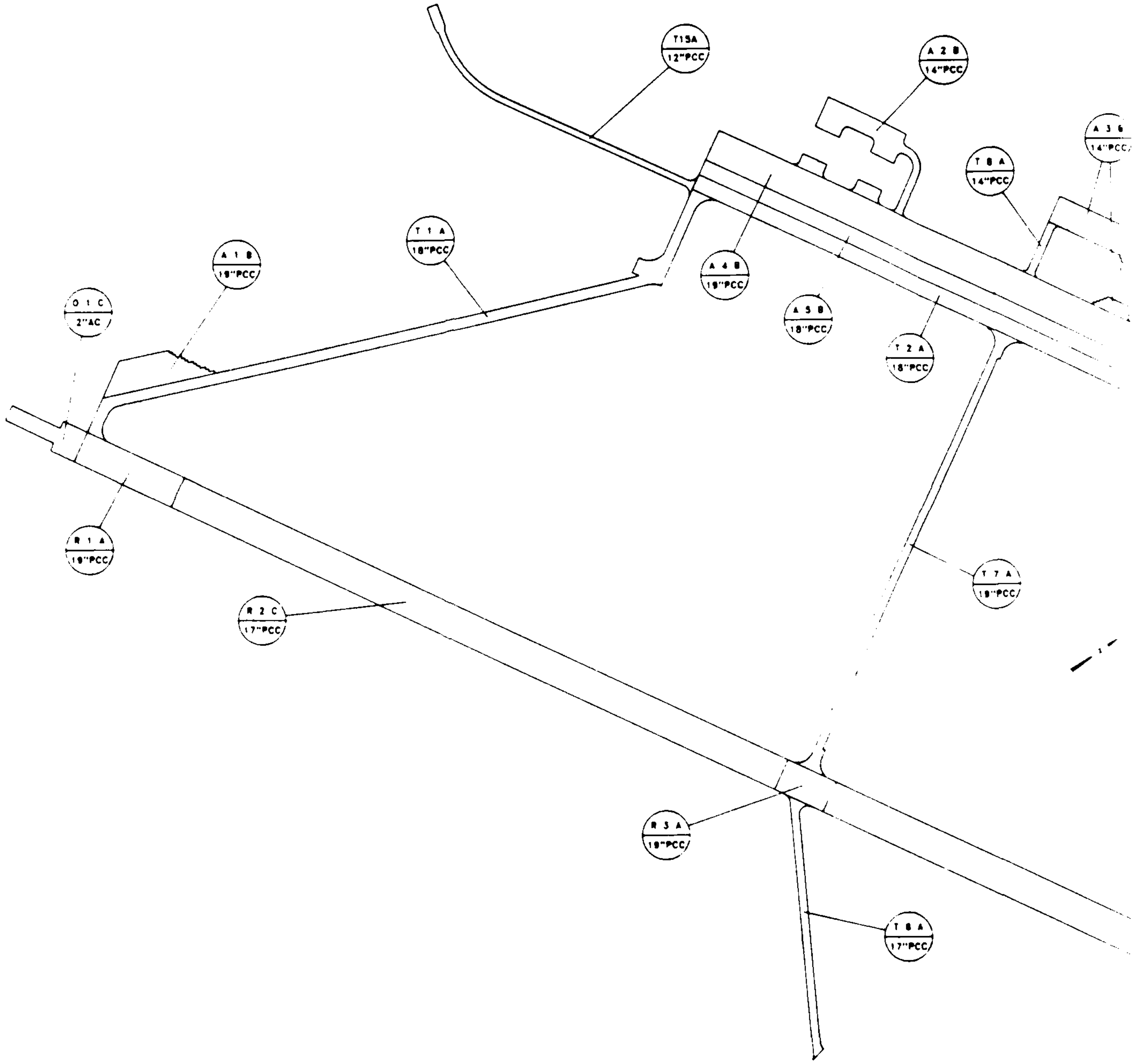
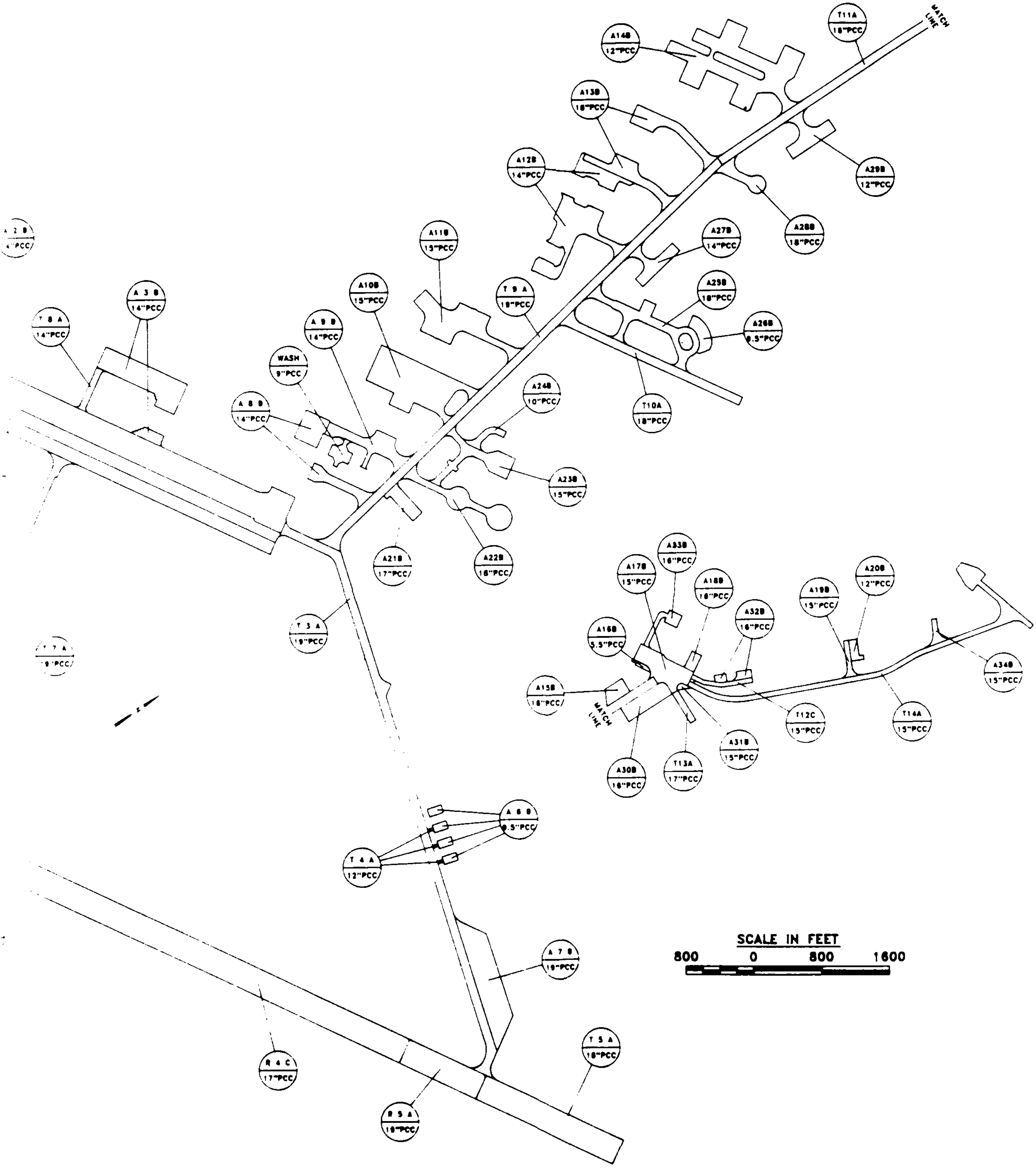


Figure 31. Pavement condition rat



ent condition ratings at Edwards AFB

Photo 1. Typical medium-severity corner spall, Runway 4-22

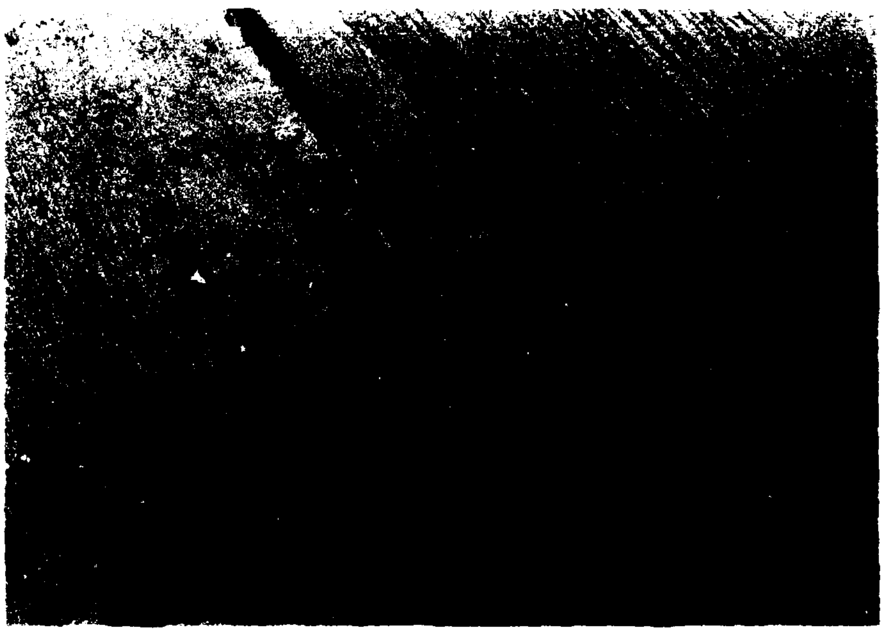


Photo 2. Typical medium-severity joint spall and low-severity patching, Runway 4-22

Photo 3. Typical low-severity patch, Runway 4-22

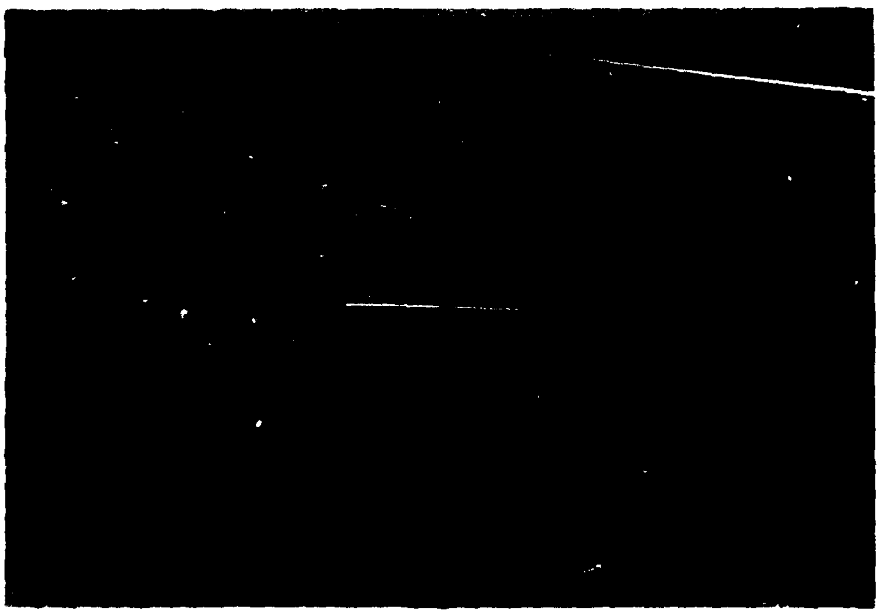


Photo 4. Low-severity faulting, Runway 4-22 (R2C)

Photo 5. High-severity patchi ̮ and joint seal damage, Runway 4-22 (R1A)

Photo 6. Typical joint and corner spall patches evident throughout the airfield

Photo 7. Widened joint due to slab migration, Taxiway F (T2A)

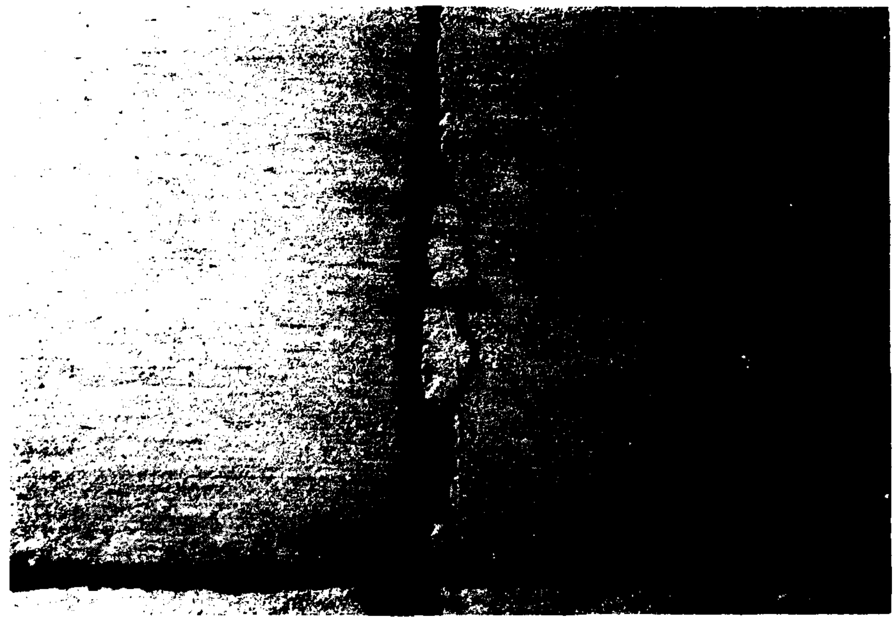


Photo 8. Low-severity joint spall, Taxiway D (T10A)

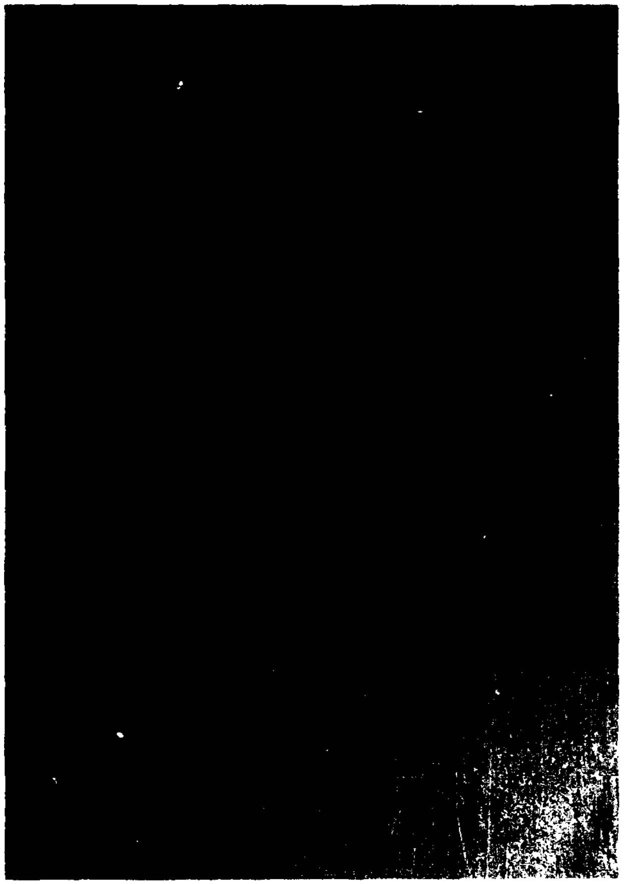


Photo 9. Low-severity linear crack, anechoic chamber taxiway (T15A)

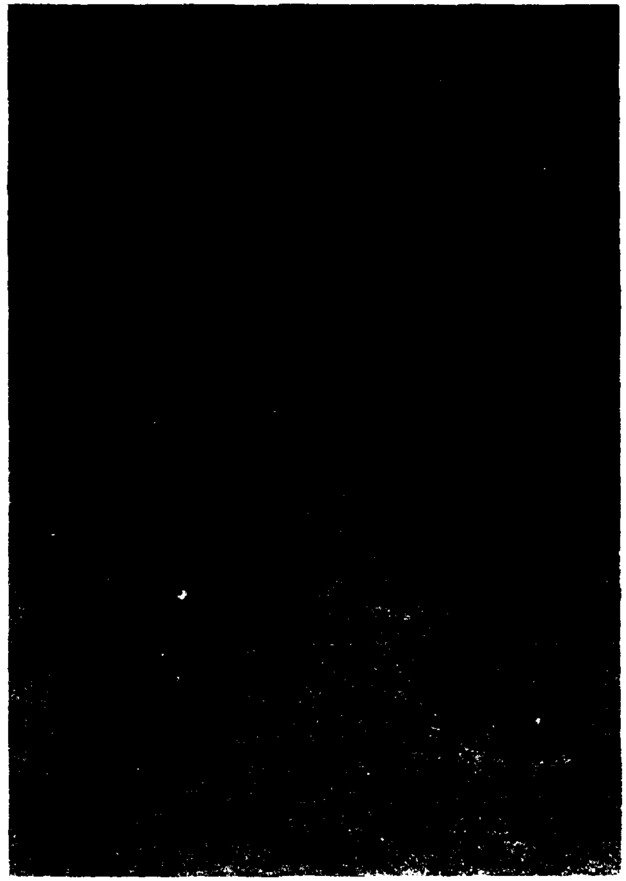


Photo 10. Typical shrinkage crack, Runway 04 warm-up apron (A1B)

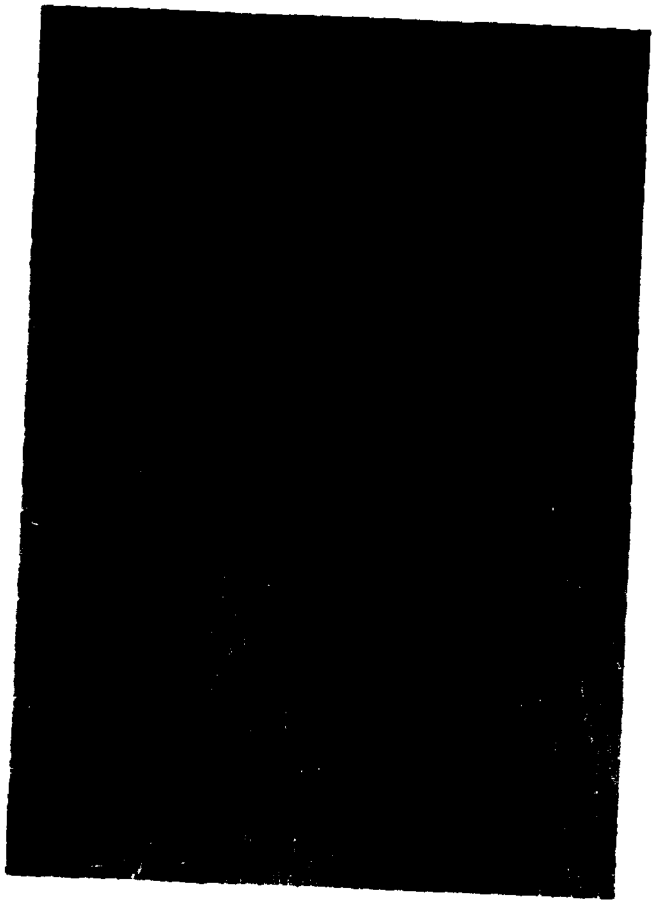


Photo 11. Medium-severity linear crack
Pad 7 (A23B)

Photo 12. Medium-severity corner break, Pad 7 (A23B)