RUNWAY FRICTION MEASUREMENTS
AND
AIRFIELD PAVEMENT CONDITION SURVEY

MARINE CORPS AIR STATION (HELICOPTER)

JACKSONVILLE, N.C.

DEPARTMENT OF THE NAVY

ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
Norfolk, Virginia

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511

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15 MAY 1979

From: Commander, Atlantic Division, Naval Facilities Engineering Command
To: Commanding Officer, Marine Corps Air Station (Helicopter), New River, Jacksonville, North Carolina 28545

Subj: Airfield Pavement Condition Survey and Runway Friction Measurements, Marine Corps Air Station (Helicopter), New River, Jacksonville, North Carolina

Ref: (a) NAVFACINST 11132.14B

Encl: (1) Subject Report

1. Enclosure (1) contains the results of field tests and visual statistical evaluation of the pavement at the airfield and is submitted in accordance with reference (a).

J. M. DAVIS
BY DIRECTION

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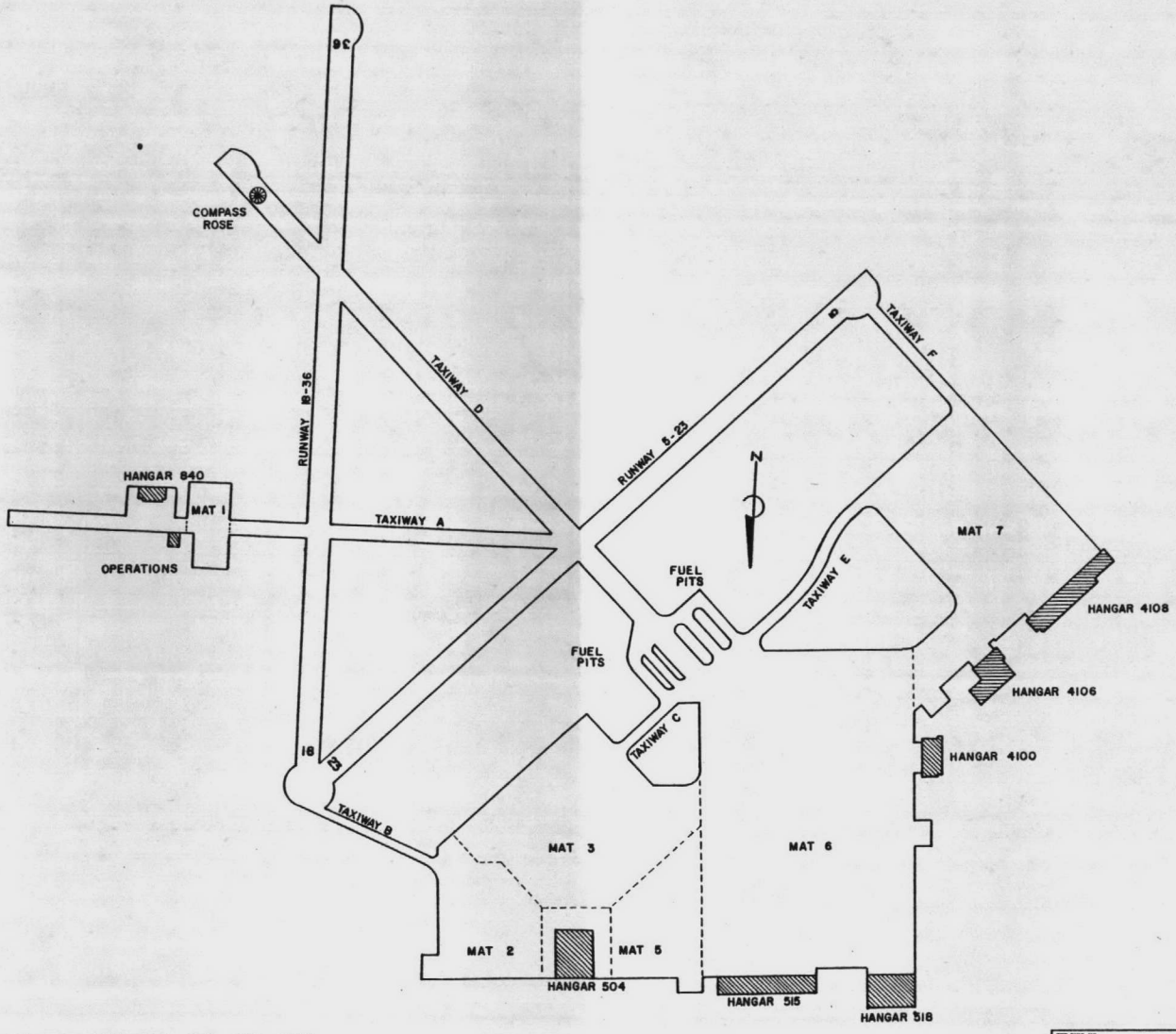
CMC
CIVENGRLAB
NAVFACENGCOM
MARCORB CAMLEJ (PWO)
MCAS NEW RIVER (AIROPS)

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED



300' 0 300' 600' 900' 1200' 1500'

GRAPHIC SCALE

EFD DWG. NO.	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND	
WORK REQ. NO.	ATLANTIC DIVISION	
DES.	NAVAL STATION NORFOLK, VA.	
DRWN.		
TR.	MCAS (H) NEW RIVER	
CHK.	JACKSONVILLE, N.C.	
SR. MBR.		
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TABLE OF CONTENTS

PART I

FRICTION MEASUREMENTS

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DESCRIPTION:

Part I - Friction Measurements

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INTRODUCTION

This report contains a summary of the significant data resulting from skid resistance testing conducted by the Atlantic Division, Naval Facilities Engineering Command. The field tests were conducted to evaluate the runway skid resistance and hydro-planing characteristics. All testing was in accordance with the Navy's standard procedure using a Mu-Meter. The Greek letter Mu has traditionally represented the coefficient of friction and will be so used in this report.

PURPOSE

Aircraft accident data has cited frequent occurrences of poor braking, hydroplaning and loss of control on wet runways at many Air Stations. This testing system incorporating a "Mu-Meter", which is a commercially developed trailer-mounted friction measuring instrument, has been designed to alert Air Operations personnel of potential runway hazards to help prevent these accidents. The results of this testing are also to be used to evaluate the runway pavement texture and surface drainage characteristics which may influence the type and degree of future maintenance projects to correct existing problems.

The data of immediate interest to Air Operations personnel involves the actual or measured Mu and its relation to probable sliding of aircraft. Since the Mu is inversely proportional to the quantity of water on the pavement, a curve has been developed to simulate the

the rate of Mu recovery with time from cessation of a heavy rainfall. This recovery rate is primarily influenced by the drainage characteristics of the pavement and is reflected by the slope measurements. The Mu recovery curve has been developed for each section of runway tested and, in this report, is located with the test data summary for the specific runway desired.

TEST LOCATIONS

The tests were conducted on 1,000-foot segments of the runway in the landing gear wheel tracking path. The areas considered most critical for skidding and suspected to have the poorest friction were selected for testing. The rubber build-up at touchdown locations are most suspect for poor friction resistance and are, therefore, automatically selected for testing. Runway interior areas with poor transverse drainage or cross wind conditions that hold water are other factors considered in location selection. The Air Operations office was consulted for information concerning any known or suspected poor areas of traction. They had no knowledge or reports of unsatisfactory areas. The actual test locations and type of surfacing tested is shown in the test data summary of this report.

EQUIPMENT

The basic item of equipment used to measure the coefficient of friction is the Mu-Meter. This trailered instrument continuously records the friction between the tires, which are toed outward approximately

seven and a half degrees, and the surface over which it is towed. This angle of the tires creates a spreading force between the wheels, varying with the amount of friction between the tires and pavement. This force is measured by a pressure cell and is converted to Mu for recording. The Mu-Meter was designed and manufactured by M. L. Aviation of Maidenhead, Birks, England, who is the sole source manufacturer of this equipment. In addition to the continuous graphical recording of Mu with the distance travelled, a remote read-out device was used to check the graphical Mu trace. The remote read-out continuously integrates the Mu for every twenty feet travelled while testing. The record is made by a continuous trace on the graphically scaled paper scroll in the Mu-Meter trailer. To coordinate the portion of the trace representing the test section, an event marker is built into the recorder and is controlled from the towing vehicle. The beginning, ending or pavement change can be noted by a blip or mark on the scroll by the test personnel during the run.

MCAS, New River provided the runway foamer truck for controlled application of water to each test section. This truck contained a tachometer for accurate speed control per running gear and a water pump on the rear for uniform discharge of water through its eight foot spray bar.

A specially built slope measuring bar was used to determine the longitudinal and transverse slope along the runway. The bar is made of aluminum and is two inches by three inches and ten feet long. Machinists' levels have been attached and carefully calibrated to define slopes from 0 to 2 percent with accuracy to the nearest 0.1 percent.

TEST PROCEDURES

On the runway, the centerline longitudinal grade and transverse crown grade on each side of the centerline were measured and recorded every 500 feet. Positive transverse slope recordings indicate that the water drains away from the centerline and negative slope recordings indicate that water drains toward the centerline. Positive longitudinal slope recordings indicate water drains in the direction of numerically increasing longitudinal stations.

Research testing by the Air Force has established that theoretical hydroplaning will occur with the Mu-Meter towed at 40 MPH on pavement coated with 0.2 inch of water. In order to duplicate but not exceed this condition, the application of the water must be carefully calibrated. This was done by applying the exact quantity of water needed over a 1,000-foot test section in calibration runs. It was found during these calibration tests that 0.2 inches of water could effectively be applied in one pass permitting a greater amount of water to still be on the test section for the first Mu-Meter run, rather than in two passes of 0.1 inches each, where the residual water would be much less than the 0.2 inches desired.

The Mu-Meter runs begin as soon as possible after the water has been applied. In order to properly plot the rate of recovery of the average Mu with time, the zero water time for recording purposes occurs when the water truck is exactly half way through the test section. A stop-watch is begun at zero water time and the time from zero, at the beginning and ending of each Mu-Meter run for the test series, is recorded.

The test runs are repeated until the average Mu from one run to the next shows little or no change, or until the average Mu approximates that obtained with dry pavement. For this report, a dry run was made for each test section prior to applying the water.

Each test run required two people in the vehicle to conduct the test. The driver must maintain proper alignment and speed as well as operate the event marker. The second person controls and records data from both the stop watch and the remote read-out. This recorded data is checked with the continuous trace for verification after the series is completed.

Prior to any testing with the Mu-Meter, it is calibrated with a known roughness calibration board. Each day this calibration is again checked and proper adjustments made when necessary.

TEST RESULTS

The results of all field testing are contained in the data summary section of this report. The data includes: a layout of test sections which details the location of each section on the runway; a gradient measurements sheet showing longitudinal and transverse grades at every 500 feet of runway; the Mu-Meter measurements of pavement friction for each test section on the runway, which contains field results for each test run; a plot of the Mu recovery with the time from water application for each test section and prints of the actual distance trace for each run. When reviewing these results, the continuous distance trace proceeds

from the bottom continuing to the top for each run. The direction of each run is shown by the "Heading Degrees" column of the Mu-Meter, Measure of Pavement Friction sheet. The heavy horizontal lines on the distance trace sheets are the beginning and ending of each run. These lines have been located to correlate the beginning and ending event marker blips with the Mu trace. The chart correlator, which is furnished with the Meter to correct for the different marker arm lengths of the continuous trace recorder, has been used to locate these lines. Each inch of trace approximates 450 linear feet of travel in the test sections. The dual blip is used to mark select items within the test section such as concrete/asphalt transition.

The relationship of the measured friction values obtained with the Mu-Meter to the aircraft performance characteristics has been empirically correlated by the Air Force. The following table is provided as a guide.

"Mu-Values"	Anticipated Braking Response	Hydroplaning Potential
0 - 0.25	Unacceptable	Very High probability for hydroplaning.
0.25 - 0.41	Marginal	Potential for hydroplaning exists for some aircraft under certain conditions.
0.42 - 0.50	Fair	Transitional.
GREATER than 0.50	Good	No hydroplaning problems expected.

The following compilation of test results is provided for handy reference to be used in conjunction with the preceding table:

COEFFICIENT OF FRICTION (Mu)

RUNWAY	TEST SECTION	STATIONS	LOCATION	TYPE PAVE-MENT	COEFFICIENT OF FRICTION (Mu)		
					HEADING	INUNDATED	FIFTEEN MINUTES AFTER INUNDATION
5-23	A	33+00-43+00	Left Centerline	A.C.	23	.74	.84*
						*10	min. after
	B	33+00-43+00	Right Centerline	A.C.	5	.70	.84
	C	5+00-15+00	Left Centerline	A.C.	5	.76	.88#
						#11	min. after
	D	5+00-15+00	Right Centerline	A.C.	5	.74	.84
18-36	E	10+00-20+00	Right Centerline	A.C.	18	.63	.74
	F	10+00-20+00	Left Centerline	A.C.	36	.64	.74
	G	35+00-45+00	Left Centerline	A.C.	18	.60	.74
	H	35+00-45+00	Right Centerline	A.C.	36	.71	.74

REMARKS: The above compilation of test results is provided for handy reference to be used in conjunction with the table on the preceding page.

CONCLUSION

The Marine Corps Air Station (Helicopter) New River, Jacksonville, North Carolina has two 5,000 by 150 foot flexible pavement runways. Four skid resistance tests, each 1,000 feet in length, were performed per runway.

Surface drainage of runway 5-23 is excellent. Surface drainage of runway 18-36 is good with some wheel tracking ruts developing which ponds a little water.

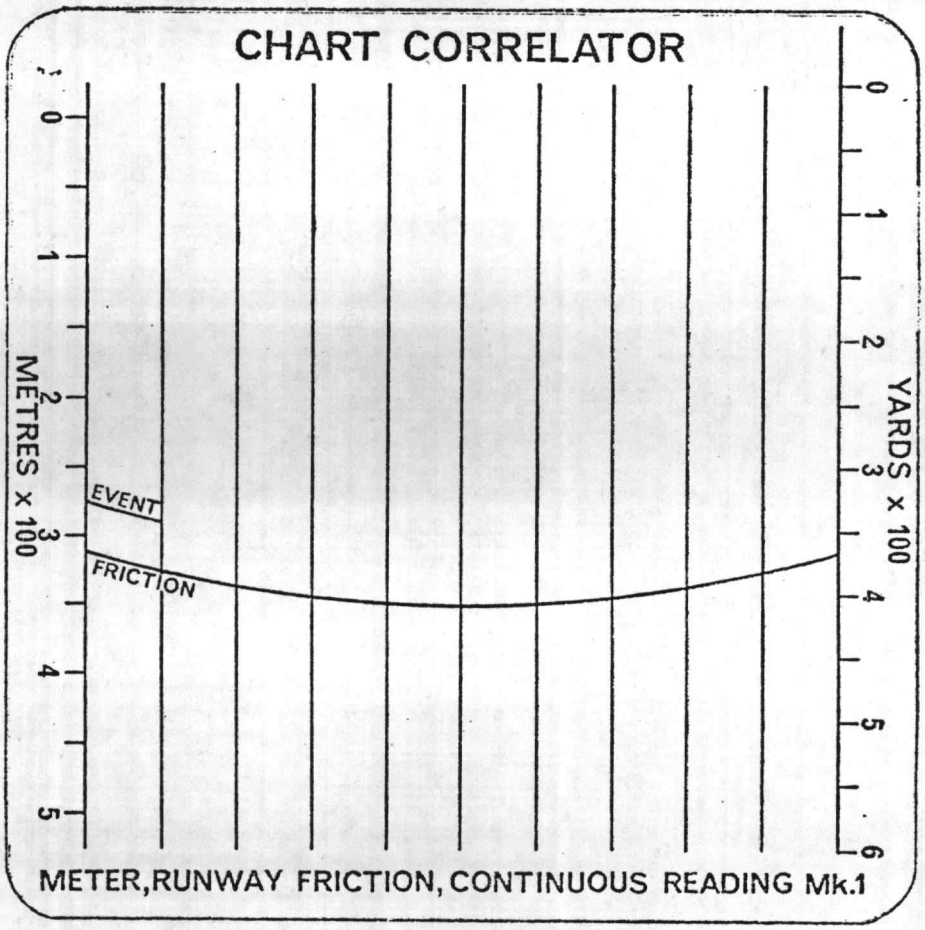
Runway 18-36 is in the poorest condition of the two runways. In February 1976 the runway had just been slurry sealed a few months before the condition survey and there were no defects showing. At the present time there are many cracks throughout the surface of the runway (some on the verge of becoming pattern cracking). At approximately 1,500 feet from the approach end of 18 and west of the center line, there is a slight depression that previously caused ponding when it rained. At the present time, final surface drainage in this area is through the cracks in the runway and the ponding is of very short duration. MU's for this runway are very good, 60+ when inundated.

Runway 5-23 is in fair condition with only a moderate number of cracks throughout the surface of the runway. Between stations 0+00 and 2+00 adjacent to taxiway "F", the cracks are more severe. Even when inundated the MU's for this runway are excellent, 70+. The average MU's are somewhat higher now than they were in 1976. In 1976 the runway had just been overlaid with asphaltic concrete. At that time all of the oils in the surface of the pavement had not been removed and consequently

the surface of the runway was more slippery, particularly when wet.

No dry pavement MU's were needed for these runways because they were rated as "good" or better even when inundated. Although dry MU's would normally be run, it would have required additional days in the field which was unnecessary.

Recommendations of future pavement mainteanace is contained in Part II - Condition Survey.



NOTE: See page F-6 for use of chart correlator.

CHARTS & GRAPHS

RUNWAY 5-23

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DESCRIPTION:

R/W 5-23

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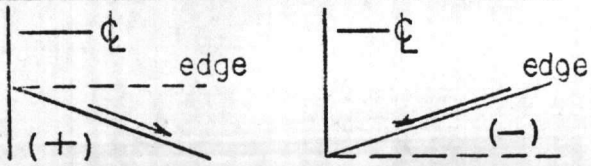
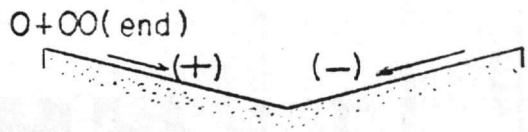
GRADIENT MEASUREMENTS FOR SKID RESISTANCE TESTING

STATION: MCAS (H) New River, N.C. RUNWAY: 5-23

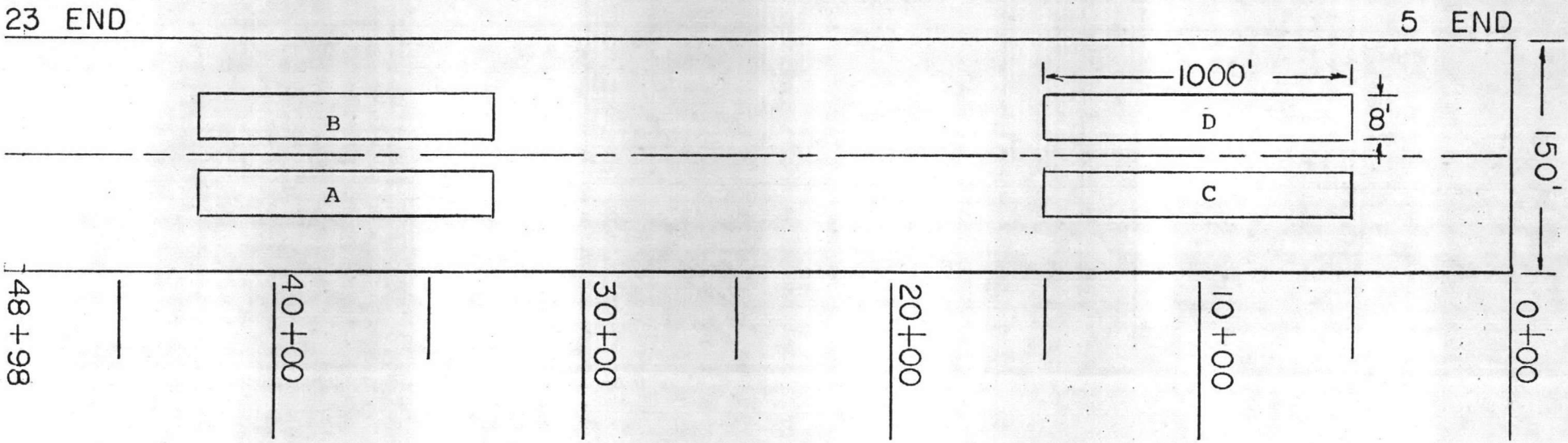
TRANSVERSE SIGN CONVENTION



LONGITUDINAL SIGN CONVENTION



STATION	TRANSVERSE 20' LEFT	TRANSVERSE 10' LEFT	LONGITUDINAL CENTERLINE	TRANSVERSE 10' RIGHT	TRANSVERSE 20' RIGHT
0+00	+0.65	+0.65	+0.25	+0.25	+0.35
5+00	+1.70	+1.25	-0.25	+0.55	+1.75
10+00	+0.50	+0.65	0.00	+0.55	+0.65
15+00	+1.00	+0.65	+0.10	+1.50	+1.75
20+00	+1.70	+0.75	+0.25	+1.00	+0.65
25+00	+0.75	+0.75	+0.25	+0.25	+0.60
30+00	+0.65	+0.80	-0.05	+0.70	+0.70
35+00	+0.25	+1.00	+0.40	+0.65	+1.10
40+00	+0.50	+1.00	+0.25	+0.60	+0.50
45+00	+0.80	+1.75	+0.25	+0.85	+1.65
48+98	-0.25	+0.10	0.00	+0.65	+0.25

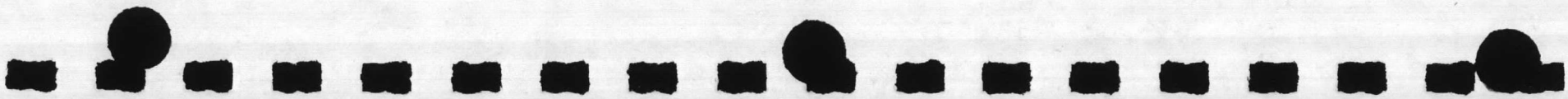


LAYOUT OF TEST SECTIONS

STATION: MCAS (H) NEW RIVER, N.C. RUNWAY 5—23

= AC

= PCC



Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS (H) NEW RIVER,N.C. RUNWAY: 5-23 TEST SECTION: A

DATE: 3 April 1979 TYPE OF PAVEMENT: A.C. STA: 33+00-43+00 left center line

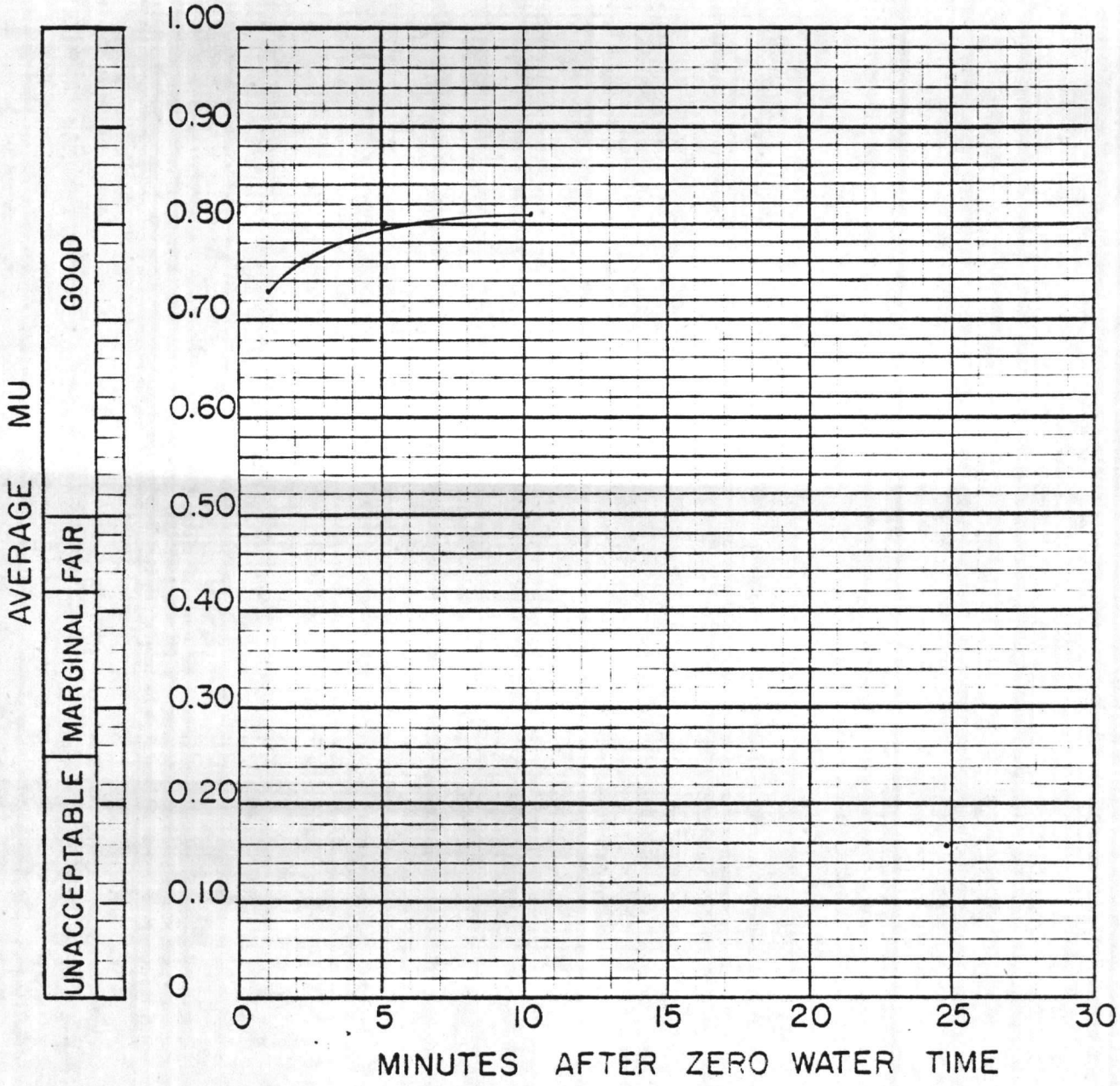
LOCAL ZERO WATER TIME: 0930 WEATHER CONDITIONS: showers

RELATIVE HUMIDITY: 100% WIND: -outhwest 12MPH TEMPERATURE: 71 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN. CHART	MAX. CHART	AVG. CHART	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.				WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	23	1	02	1	19	.55	.81	.73	51	38	.74
2	5	2	20	2	37	.69	.79	.76	51	39	.76
3	23	5	01	5	18	.74	.83	.80	50	41	.82
4	5	10	20	10	37	.77	.83	.81	50	42	.84
5											
6											
7											
8											

REMARKS: Excellent drainage on test section.

RUNWAY 5-23 SECTION A STATION 33+00-43+00
left center

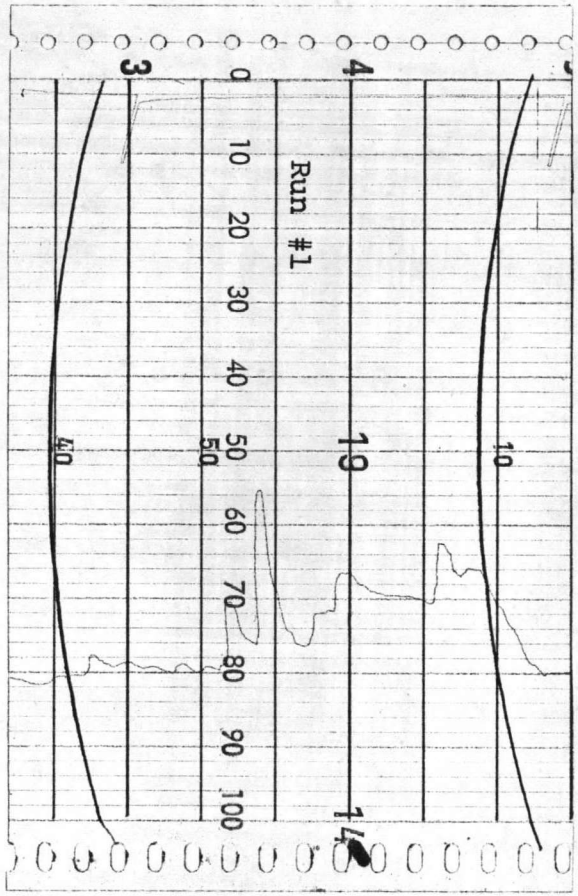


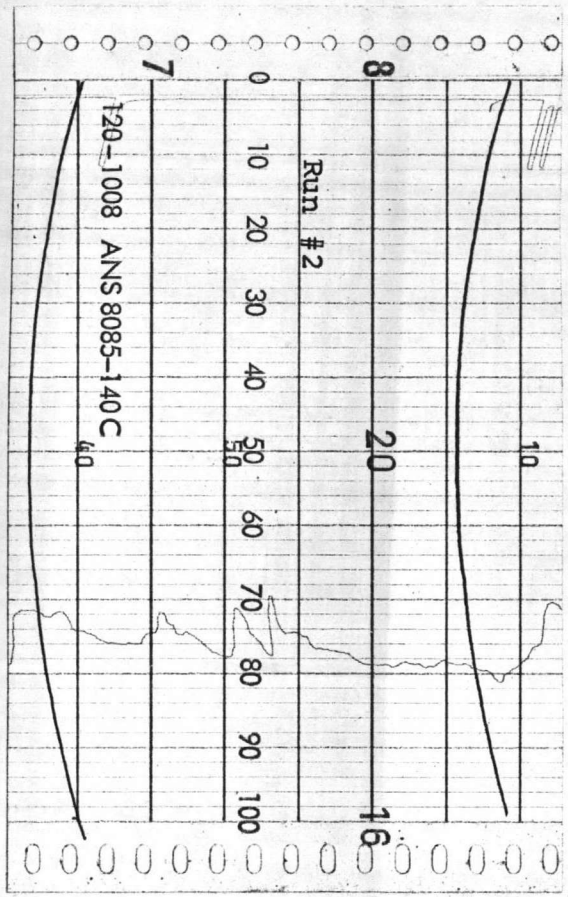
GOOD — HYDROPLANING NOT EXPECTED.

FAIR — TRANSITIONAL.

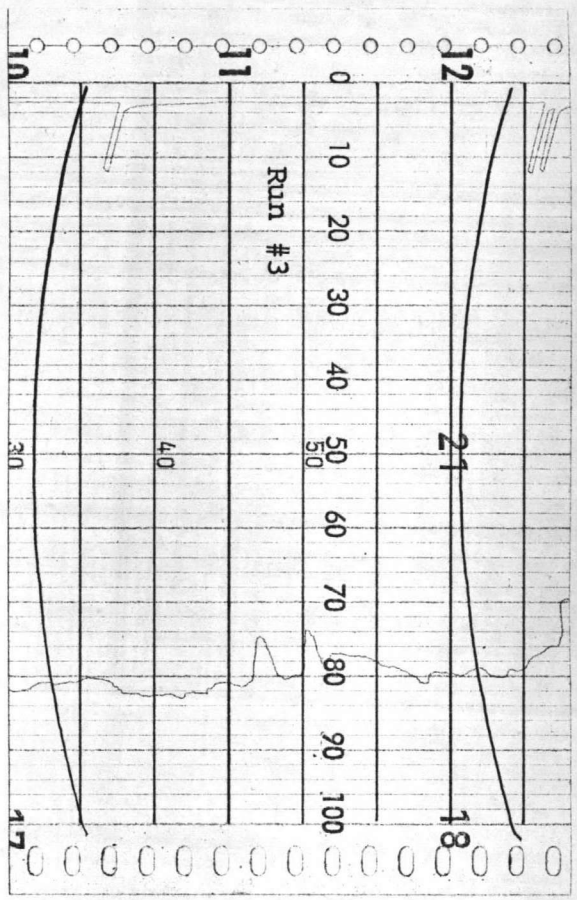
MARGINAL — POTENTIAL HYDROPLANING.

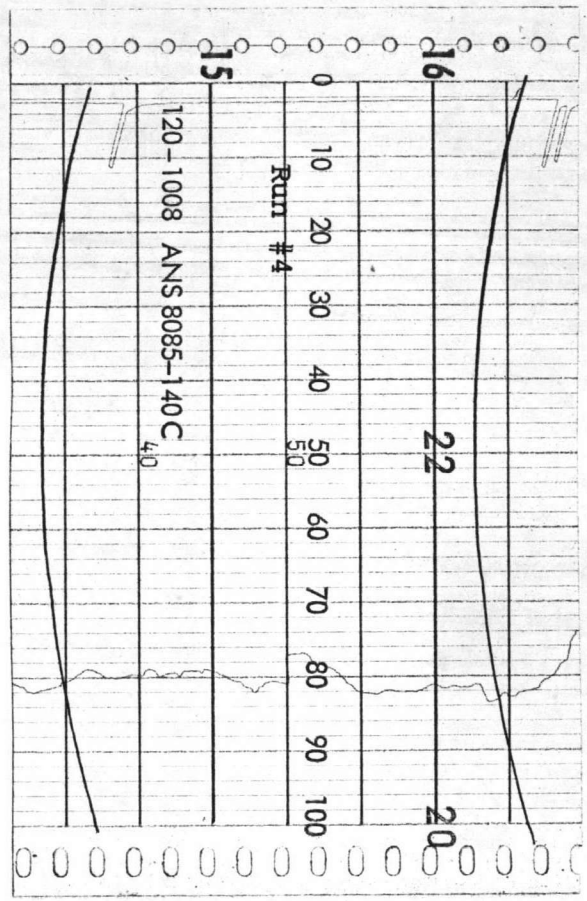
UNACCEPTABLE — HIGH PROBABILITY OF HYDROPLANING.





MCAS (H) New River, N.C.
Runway 5-23
Test Section "A"





MCAS (H) New River, N.C.
Runway 5-23
Test Section "A"

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS(H) NEW RIVER, N.C. RUNWAY: 5-23 TEST SECTION: B

DATE: 3 April 1979 TYPE OF PAVEMENT: A.C. STA: 33+00-43+00 right ~~center line~~

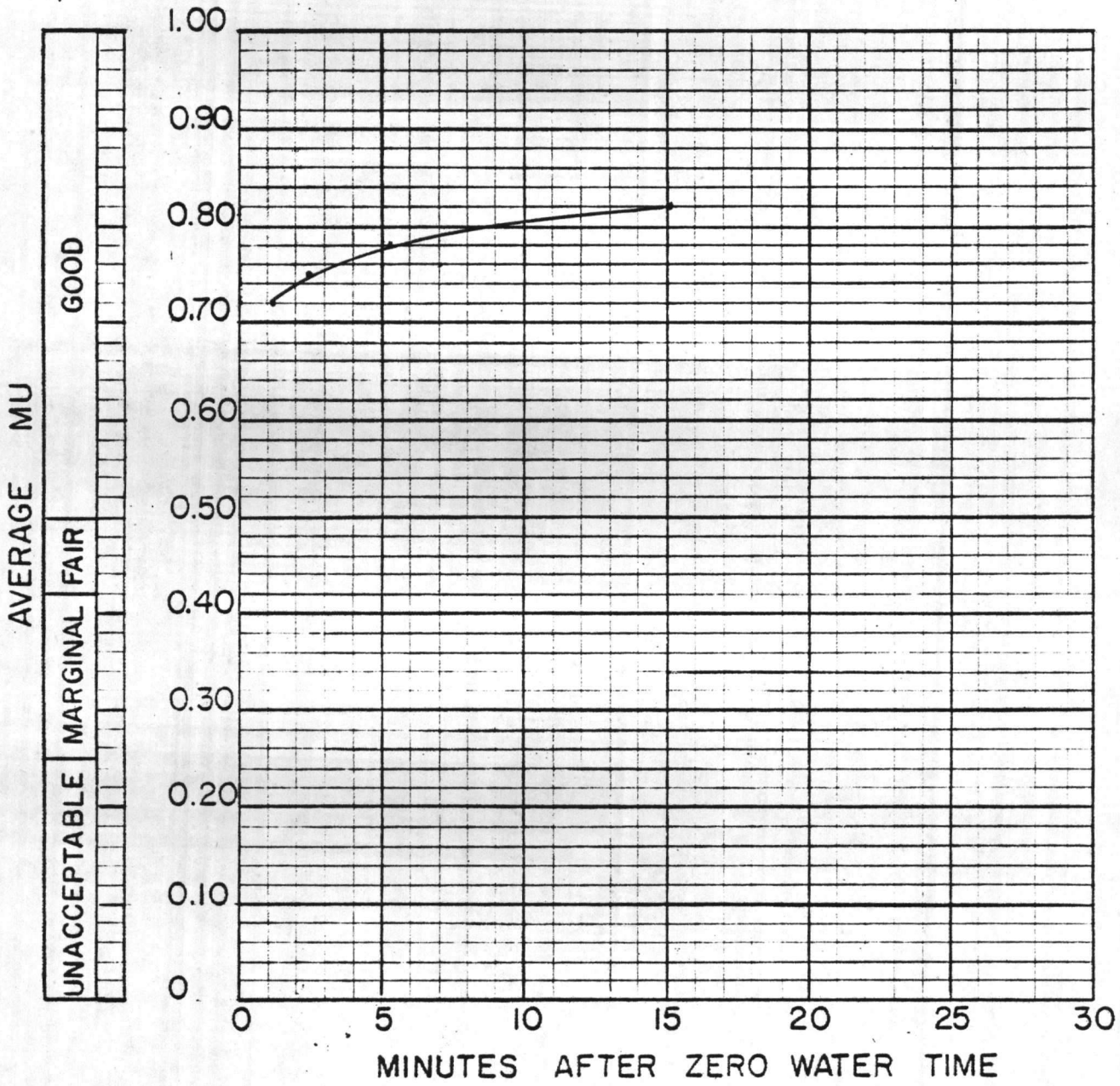
LOCAL ZERO WATER TIME: 1015 WEATHER CONDITIONS: heavy overcast

RELATIVE HUMIDITY: 95% WIND: southwest 12 MPH TEMPERATURE: 71 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN. CHART	MAX. CHART	AVG. CHART	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.				WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	5	1	10	1	27	.41	.75	.72	51	36	.70
2	23	2	30	2	47	.57	.81	.75	51	39	.76
3	5	5	10	5	27	.52	.85	.78	51	40	.78
4	23	15	01	15	18	.78	.87	.82	51	43	.84
5											
6											
7											
8											

REMARKS: Excellent drainage on test section.
Slight ponding station 36+00 to 38+00.

RUNWAY 5-23 SECTION B STATION 33+00-43+00
right center

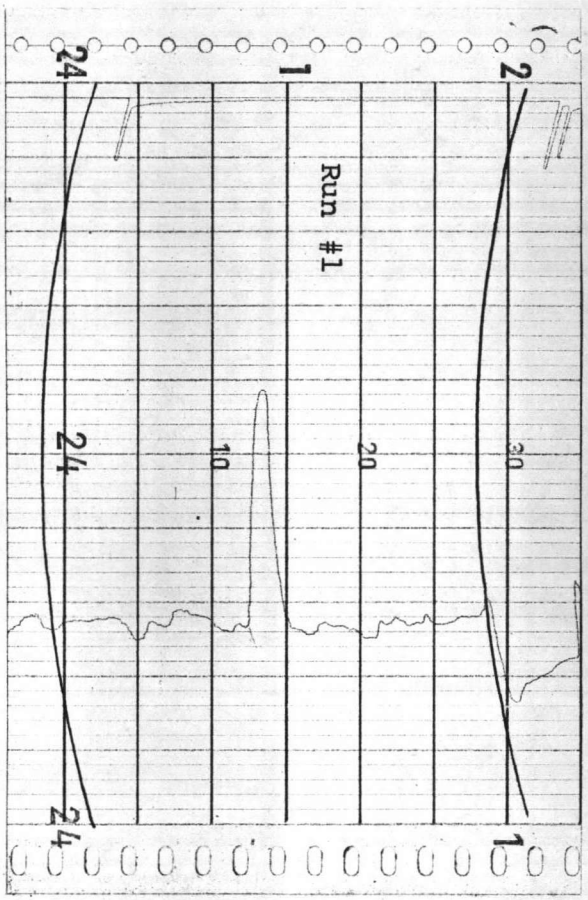


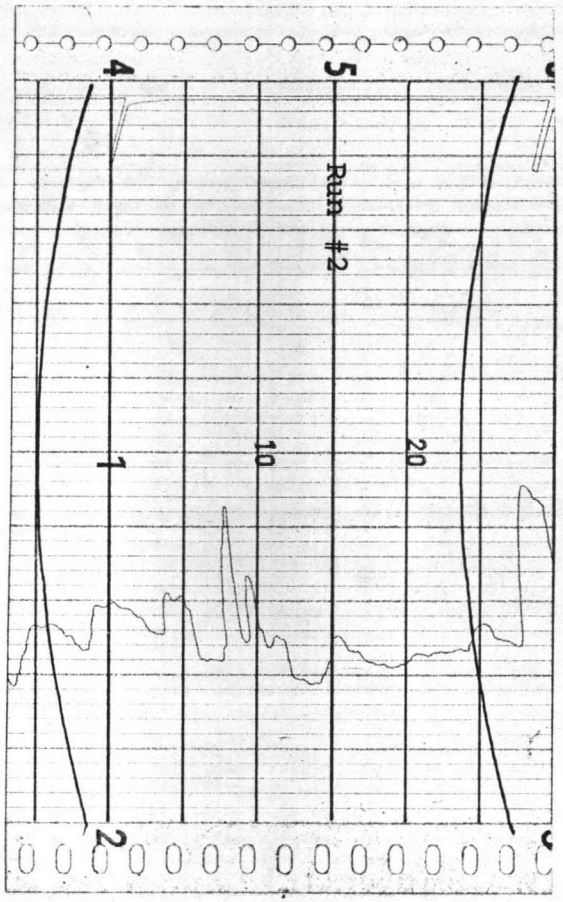
GOOD — HYDROPLANING NOT EXPECTED.

FAIR — TRANSITIONAL.

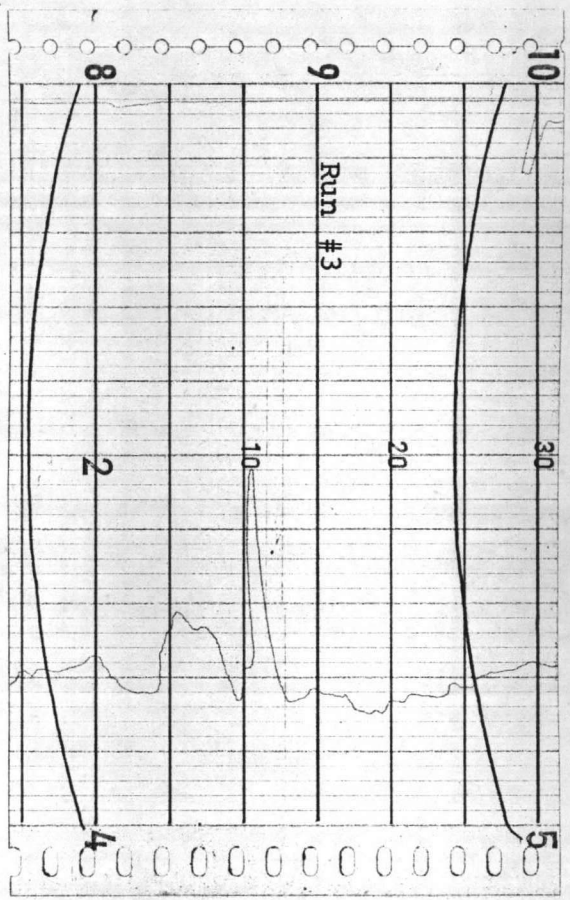
MARGINAL — POTENTIAL HYDROPLANING.

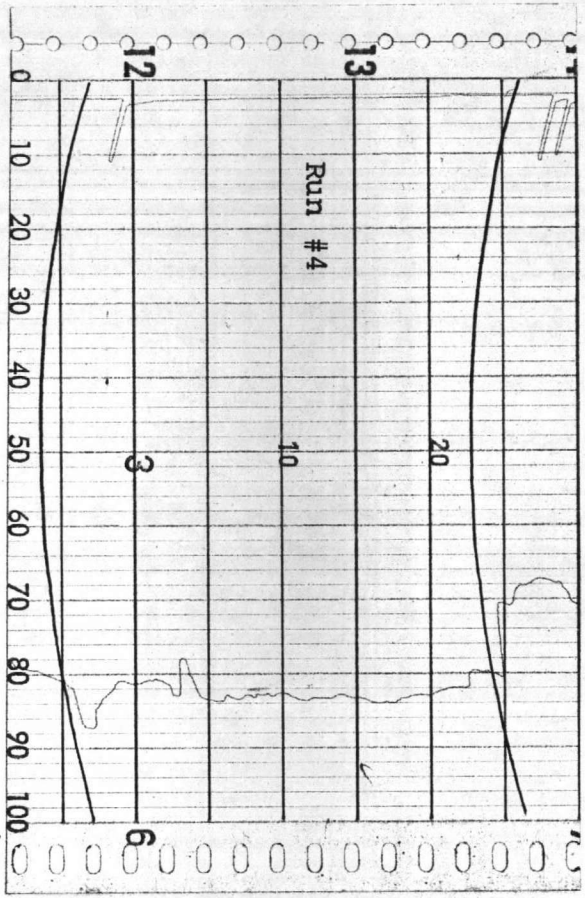
UNACCEPTABLE — HIGH PROBABILITY OF HYDROPLANING.





MCAS (H) New River, N.C.
Runway 5-23
Test Section "B"





MCAS (H) New River, N.C.
Runway 5-23
Test Section "B"

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS (H) NEW RIVER,N.C. RUNWAY: 5-23 TEST SECTION: C

DATE: 2 April 1979 TYPE OF PAVEMENT: A.C. STA: 5+00-15+00 left center line

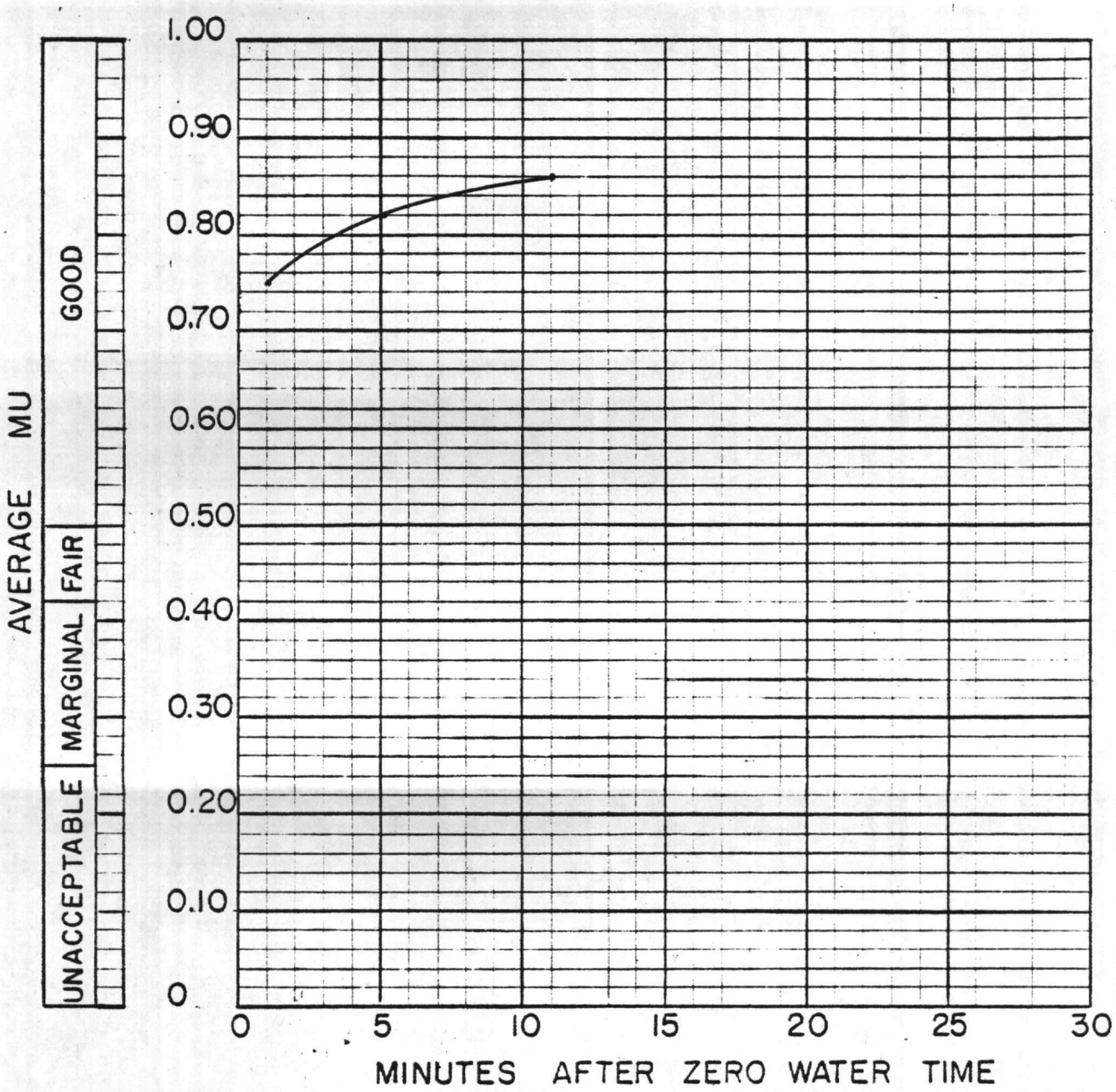
LOCAL ZERO WATER TIME: 1120 WEATHER CONDITIONS: heavy overcast

RELATIVE HUMIDITY: 95% WIND: s-uthwest 10 MPH TEMPERATURE: 71 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN.	MAX.	AVG.	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.	CHART	CHART	CHART	WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	5	1	01	1	18	.71	.79	.75	51	39	.76
2	23	5	00	5	17	.81	.84	.82	51	41	.82
3	5	11	01	11	18	.84	.86	.86	51	45	.88
4											
5											
6											
7											
8											

REMARKS: Excellent drainage on test section.

RUNWAY 5-23 SECTION C STATION 5+00-15+00 left center

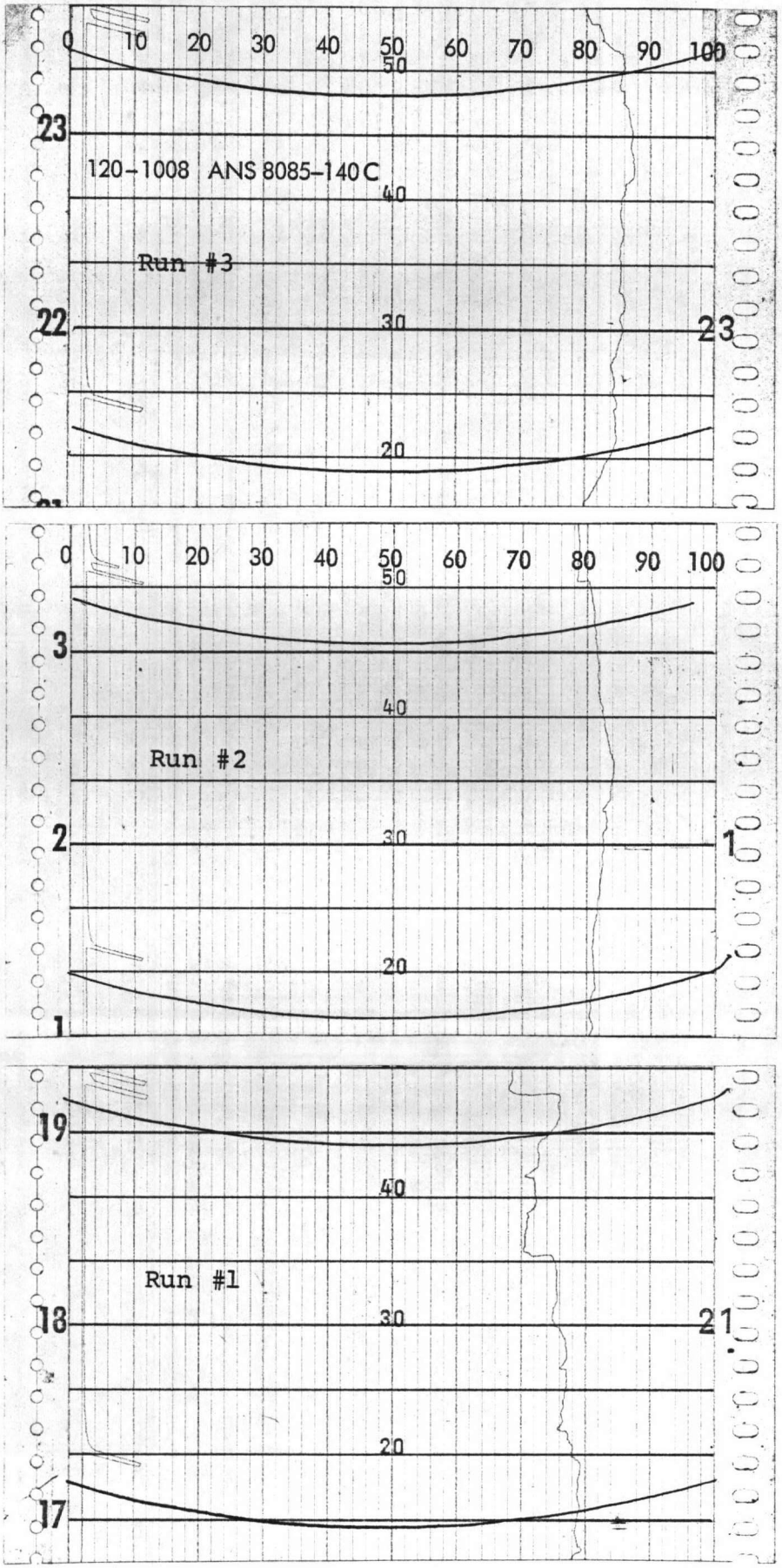


GOOD —— HYDROPLANING NOT EXPECTED.

FAIR —— TRANSITIONAL.

MARGINAL —— POTENTIAL HYDROPLANING.

UNACCEPTABLE —— HIGH PROBABILITY OF HYDROPLANING.



MCAS (H) New River, N.C.
Runway 5-23
Test Section "C"

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS(H) NEW RIVER,N.C. RUNWAY: 5-23 TEST SECTION: D

DATE: 3 April 1979 TYPE OF PAVEMENT: A.C. STA: 5+00-15+00 right center line

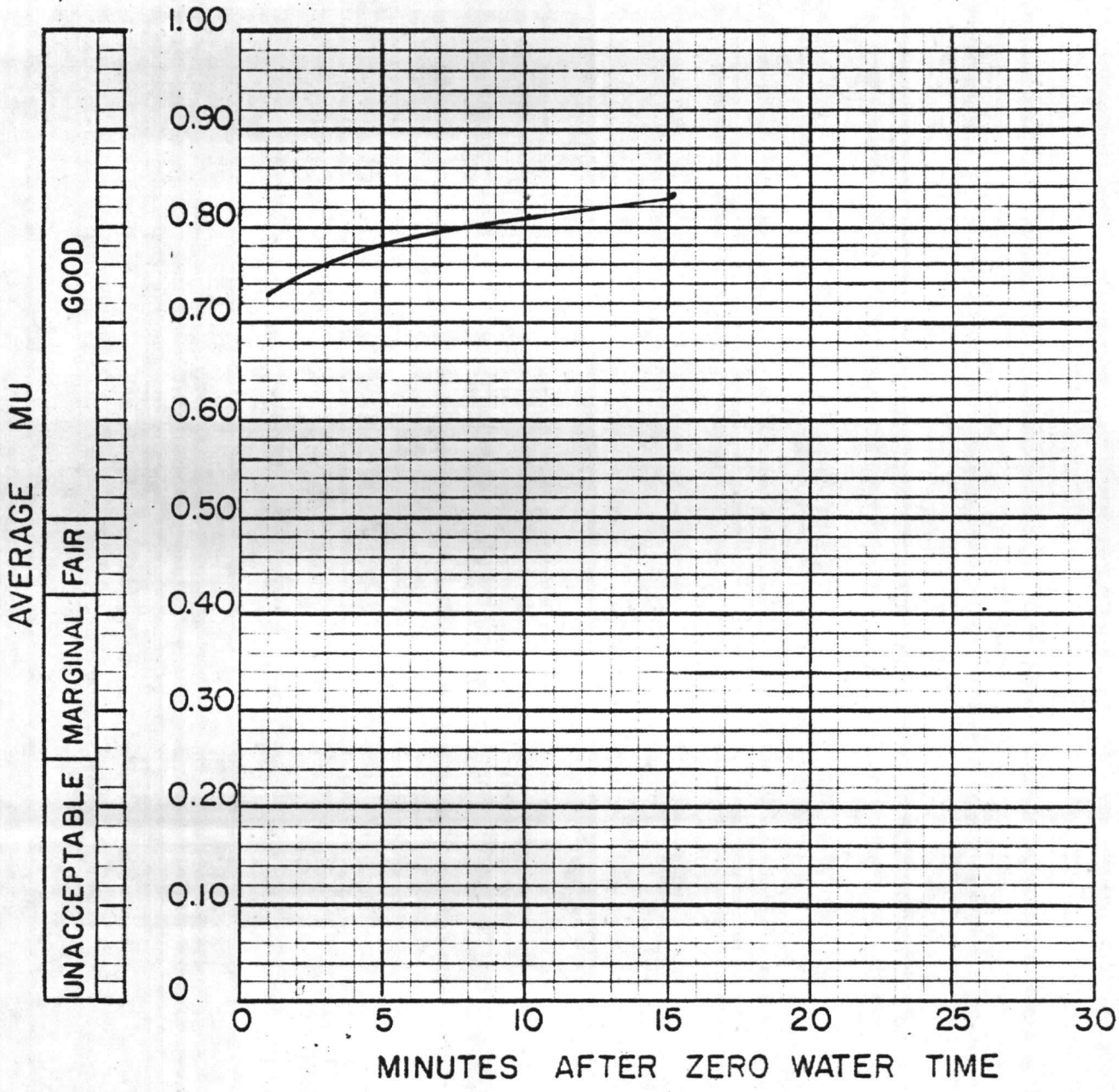
LOCAL ZERO WATER TIME: 1045 WEATHER CONDITIONS: heavy overcast

RELATIVE HUMIDITY: 90% WIND: southwest 10 MPH TEMPERATURE: 71 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN.	MAX.	AVG.	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.	CHART	CHART	CHART	WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	5	1	02	1	19	.62	.81	.73	51	38	.74
2	23	3	01	3	18	.68	.81	.76	51	39	.76
3	5	10	01	10	18	.78	.83	.81	51	42	.82
4	23	15	03	15	20	.79	.85	.83	51	43	.84
5											
6											
7											
8											

REMARKS: Excellent drainage on test section.

RUNWAY 5-23 SECTION D STATION 5+00-15+00
right center

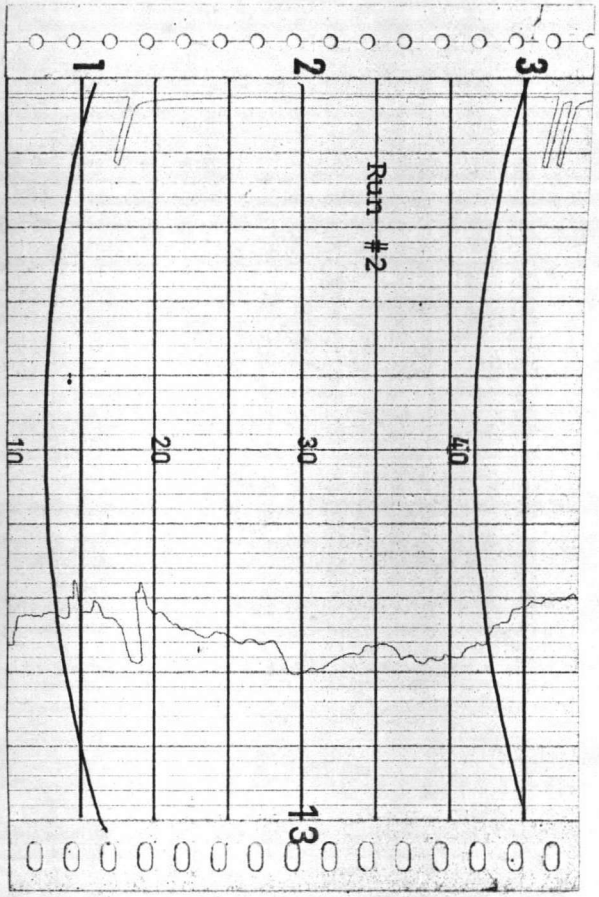


GOOD —— HYDROPLANING NOT EXPECTED.

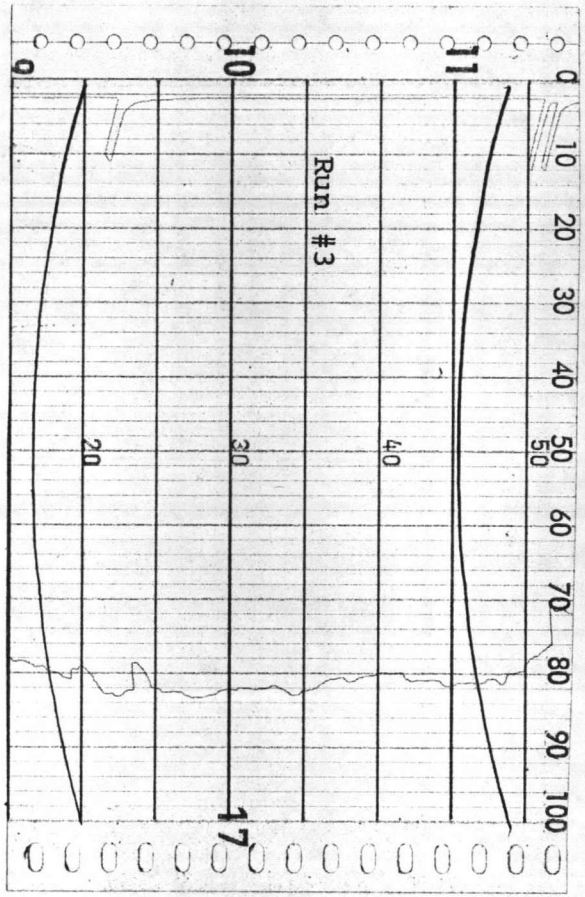
FAIR —— TRANSITIONAL.

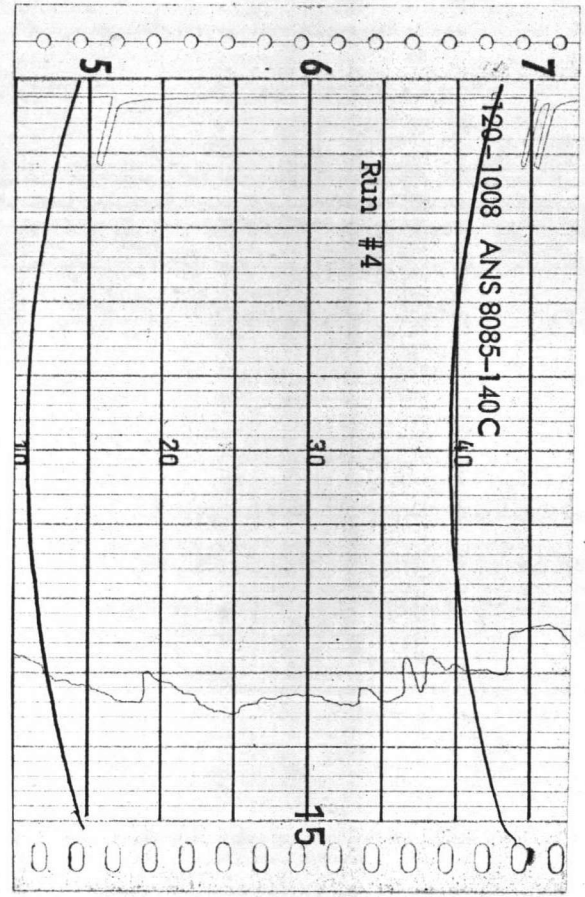
MARGINAL —— POTENTIAL HYDROPLANING.

UNACCEPTABLE —— HIGH PROBABILITY OF HYDROPLANING.



MCAS (H) New River, N.C.
Runway 5-23
Test Section "D"





MCAS(H) New River, N.C.
Runway 5-23
Test Section "D"

CHARTS & GRAPHS

RUNWAY 18-36

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DESCRIPTION:

R/W 18-36

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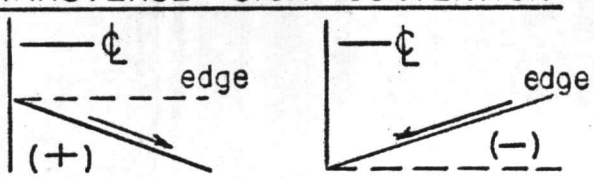
R/W 18-36

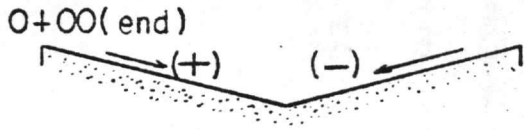
GRADIENT MEASUREMENTS FOR SKID RESISTANCE TESTING

STATION: MCAS (H) New River, N.C. RUNWAY: 18-36

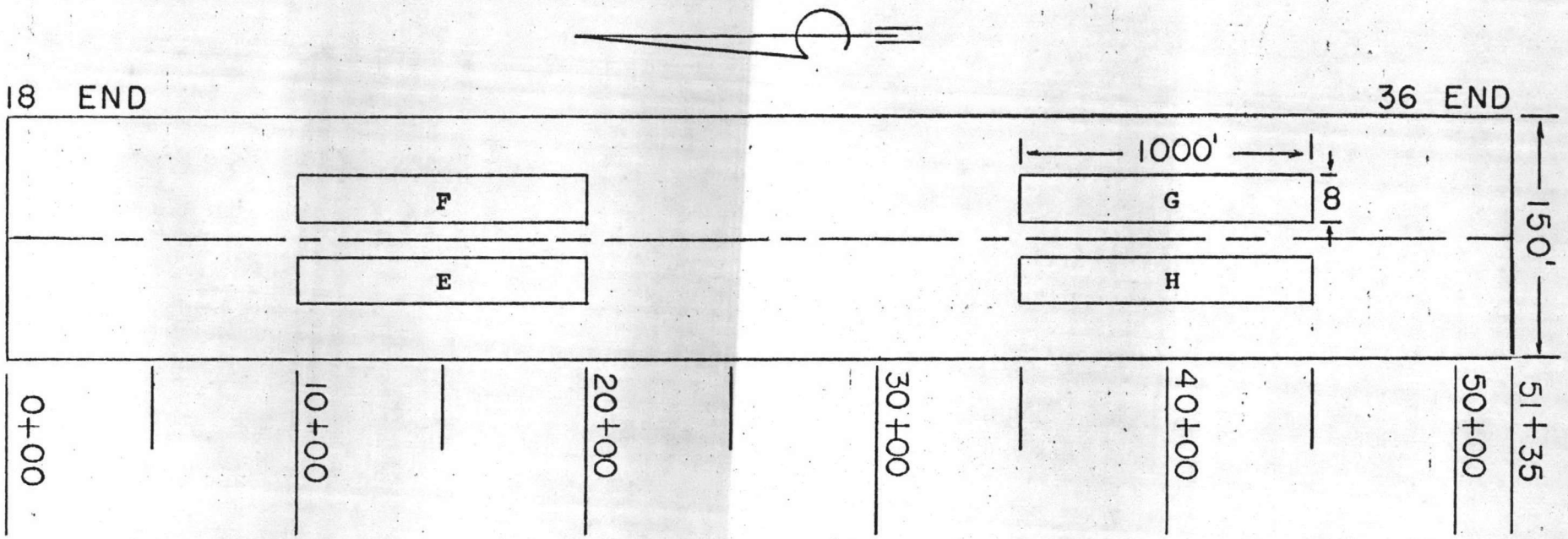
TRANSVERSE SIGN CONVENTION



LONGITUDINAL SIGN CONVENTION



STATION	TRANSVERSE 20' LEFT	TRANSVERSE 10' LEFT	LONGITUDINAL CENTERLINE	TRANSVERSE 10' RIGHT	TRANSVERSE 20' RIGHT
0+00	+0.50	+0.05	-0.15	+0.05	+0.20
5+00	+1.75	+1.75	-0.20	+1.60	+1.55
10+00	+0.75	+0.75	-0.35	+1.00	+0.50
15+00	+0.45	+1.50	-0.40	+1.75	+0.45
20+00	+0.55	+0.05	-0.30	+0.05	+0.35
25+00	+0.25	+0.05	-0.25	+0.60	+0.30
30+00	+0.25	+0.90	-0.25	+0.05	+0.35
35+00	+0.40	+0.75	-0.25	+0.50	+0.25
40+00	+0.80	+0.75	+0.05	+0.75	+0.75
45+00	+0.65	+0.25	+0.25	+0.55	+0.40
50+00	+0.25	+0.35	-0.25	+0.35	+0.35
51+35	+0.75	+0.25	+0.50	+0.25	+0.45



LAYOUT OF TEST SECTIONS

STATION: MCAS(H) NEW RIVER, N.C. RUNWAY 18 — 36

= AC

= PCC

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS(H) New River, N.C. RUNWAY: 18-36 TEST SECTION: E

DATE: 4 April 1979 TYPE OF PAVEMENT: A.C. STA: 10+00 to 20+00 Right of Centerline.

LOCAL ZERO WATER TIME: 0930 WEATHER CONDITIONS: Showers

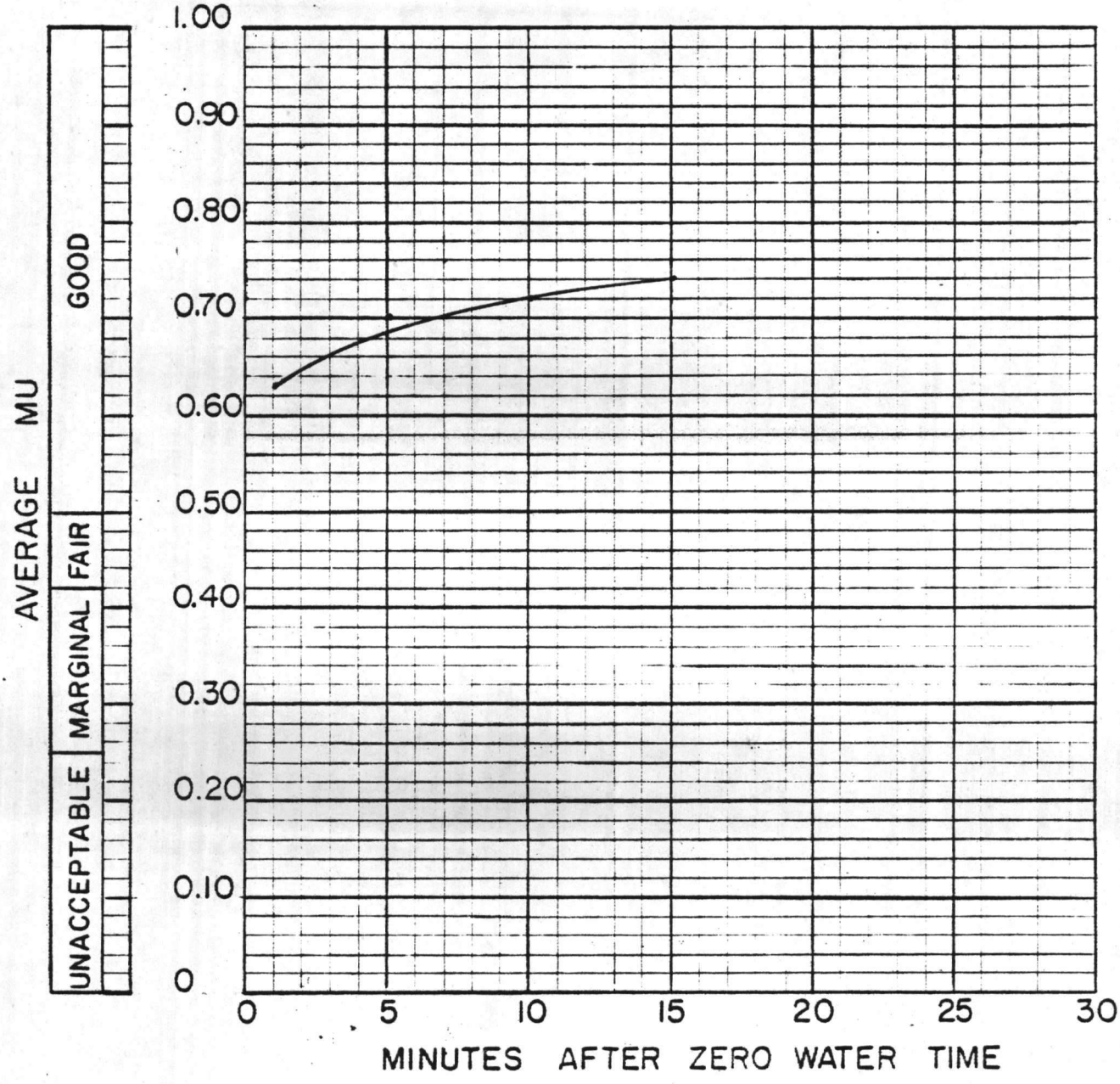
RELATIVE HUMIDITY: 100% WIND: Southwest @ 8 MPH TEMPERATURE: ¢ 68 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu. FOR TOTAL TEST SECTION					
		IN		OUT		MIN.	MAX.	AVG.	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.	CHART	CHART	CHART	WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	18	1	02	1	19	.33	.75	.63	.50	.32	.64
2	36	5	00	5	17	.47	.76	.70	.50	.35	.70
3	18	10	01	10	18	.41	.79	.72	.50	.36	.72
4	36	15	02	15	19	.65	.77	.74	.51	.38	.74
5											
6											
7											
8											

REMARKS:

Good drainage on test section with some isolated ponding.

RUNWAY 18-36 SECTION E STATION 10+00 to 20+00
Right of centerlir

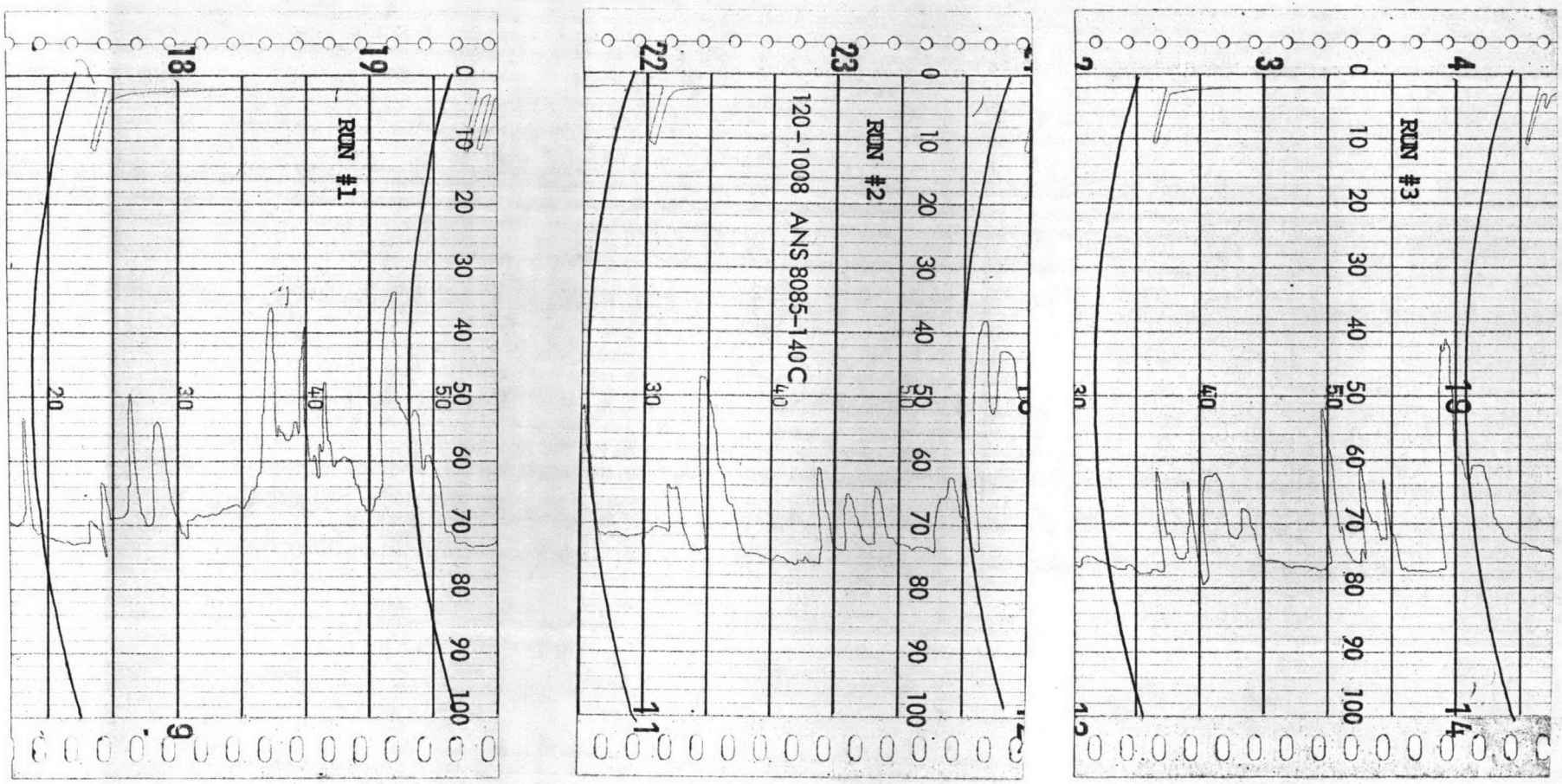


GOOD —— HYDROPLANING NOT EXPECTED.

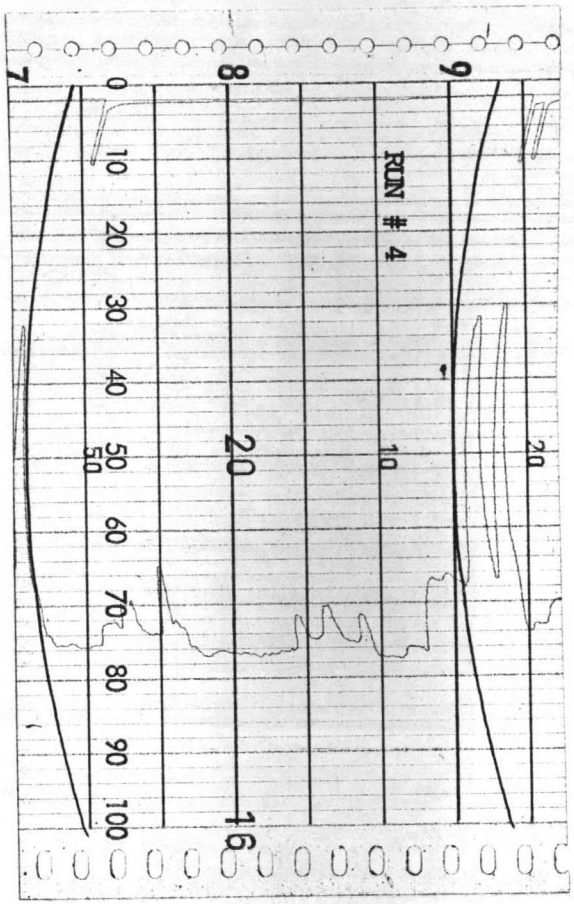
FAIR —— TRANSITIONAL.

MARGINAL —— POTENTIAL HYDROPLANING.

UNACCEPTABLE —— HIGH PROBABILITY OF HYDROPLANING.



MCAS(H) New River, N.C.
Runway 18-36
Test Section E



MCAS (H) New River, N.C.
Runway 18-36
Test Section E

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS (H) New River, N.C. RUNWAY: 18-36 TEST SECTION: F

DATE: 4 April 1979 TYPE OF PAVEMENT: A.C. STA: 10+00 to 20+00 Left of Centerline

LOCAL ZERO WATER TIME: 1000 WEATHER CONDITIONS: Heavey Overcast

RELATIVE HUMIDITY: 100% WIND: Southwest @ 8 MPH TEMPERATURE: 68 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu. FOR TOTAL TEST SECTION					
		IN		OUT		MIN.	MAX.	AVG.	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.	CHART	CHART	CHART	WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	36	1	01	1	18	.42	.73	.64	.51	.33	.64
2	18	5	01	5	18	.46	.77	.69	.51	.36	.70
3	36	10	03	10	20	.37	.78	.72	.50	.36	.72
4	18	15	05	15	22	.65	.76	.73	.50	.37	.74
5	36	20	20	20	37	.39	.77	.74	.51	.38	.74
6											
7											
8											

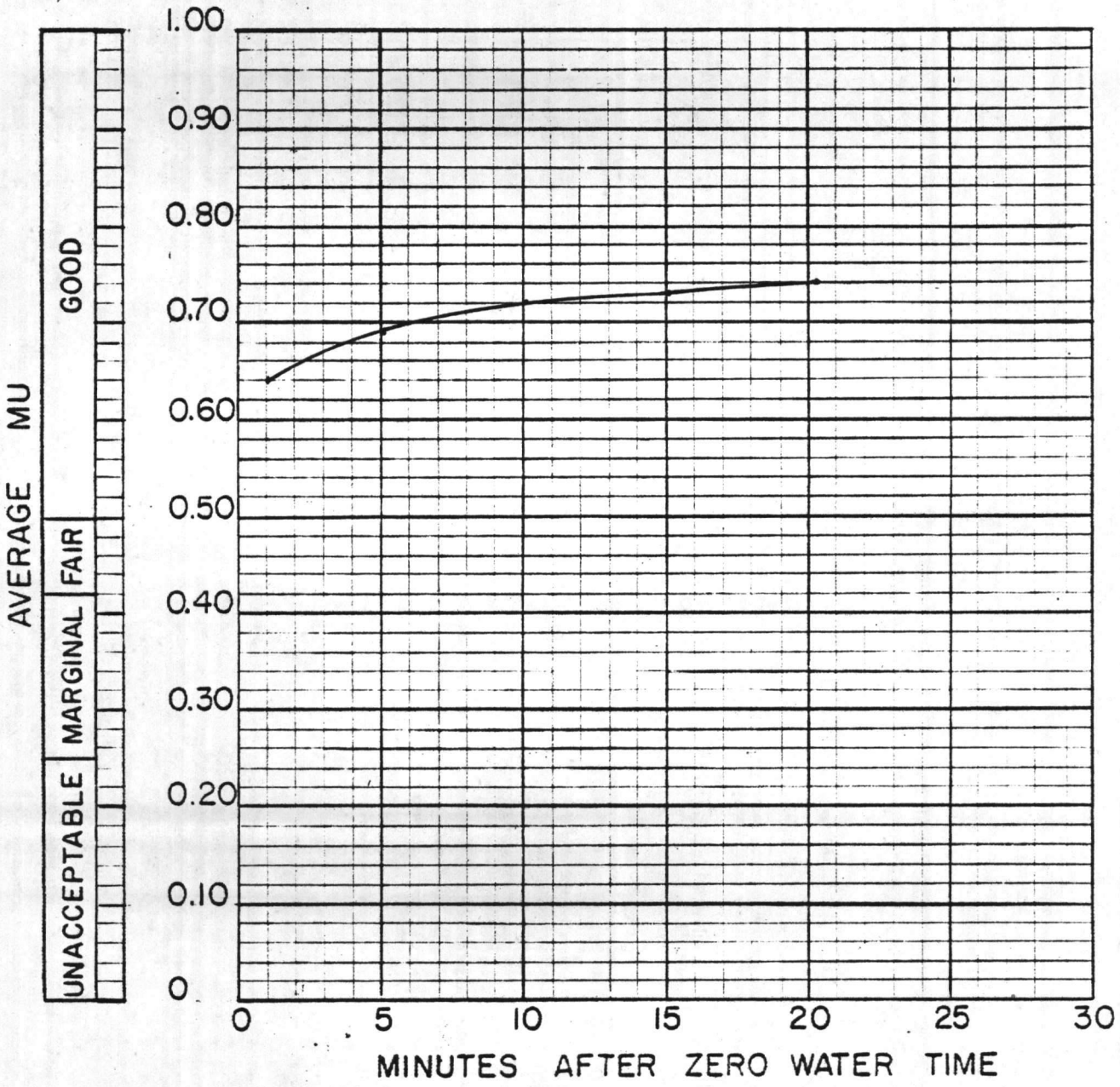
REMARKS:

Good drainage on test section with some iso;ated ponding.

F-34

RUNWAY 18-36 SECTION F STATION 10+00 to 20+00

Left of centerlin

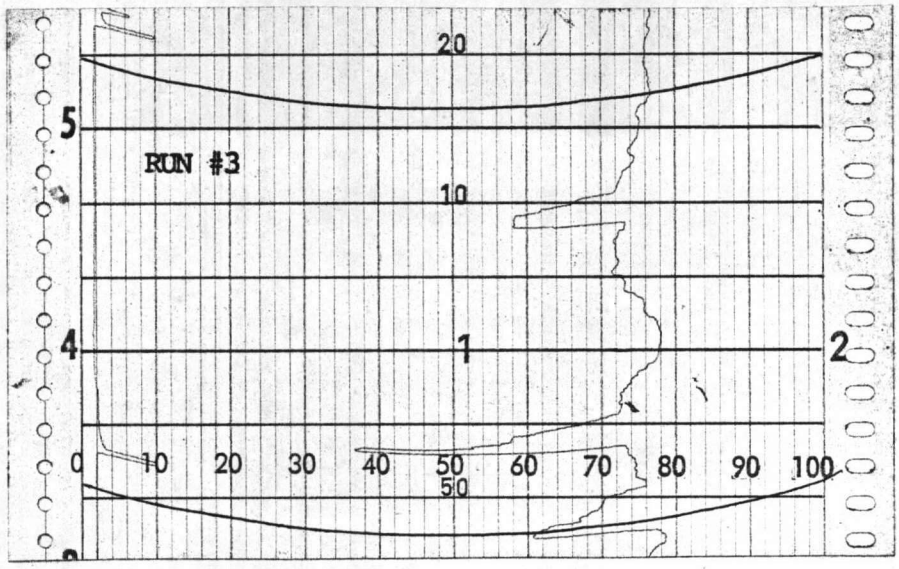


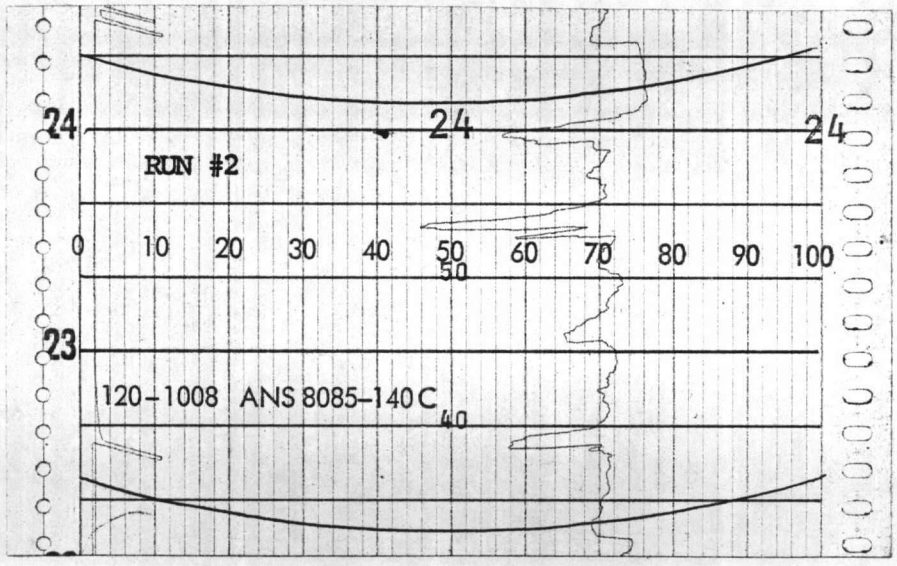
GOOD — HYDROPLANING NOT EXPECTED.

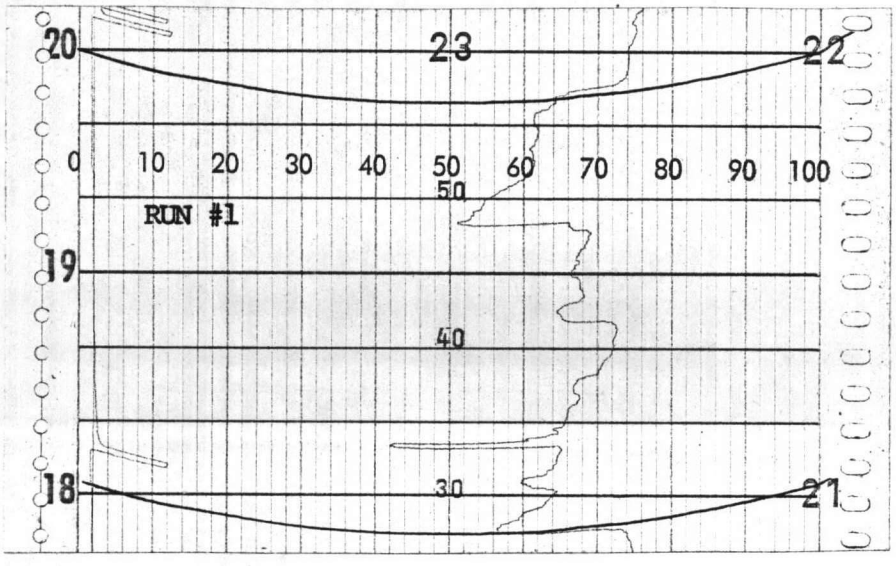
FAIR — TRANSITIONAL.

MARGINAL — POTENTIAL HYDROPLANING.

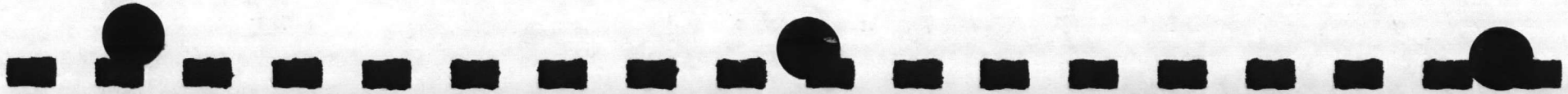
UNACCEPTABLE — HIGH PROBABILITY OF HYDROPLANING.

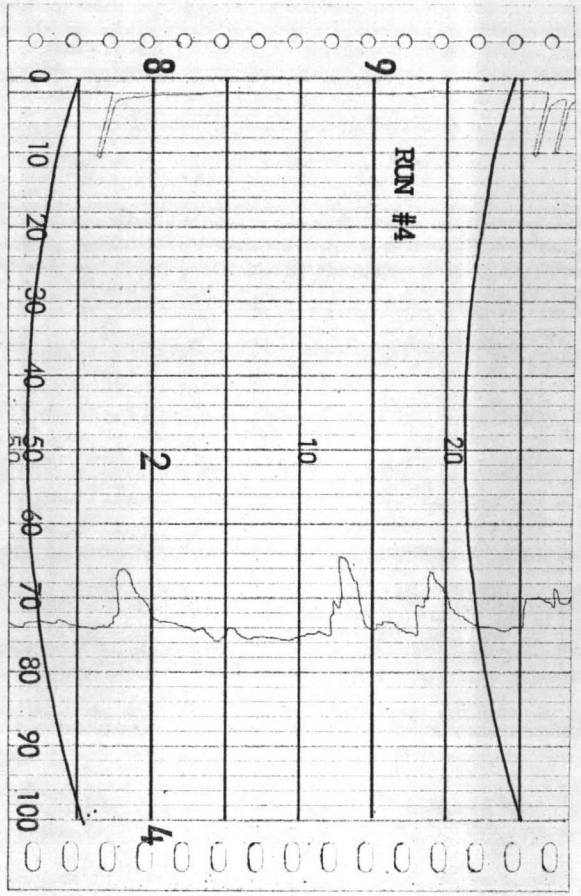


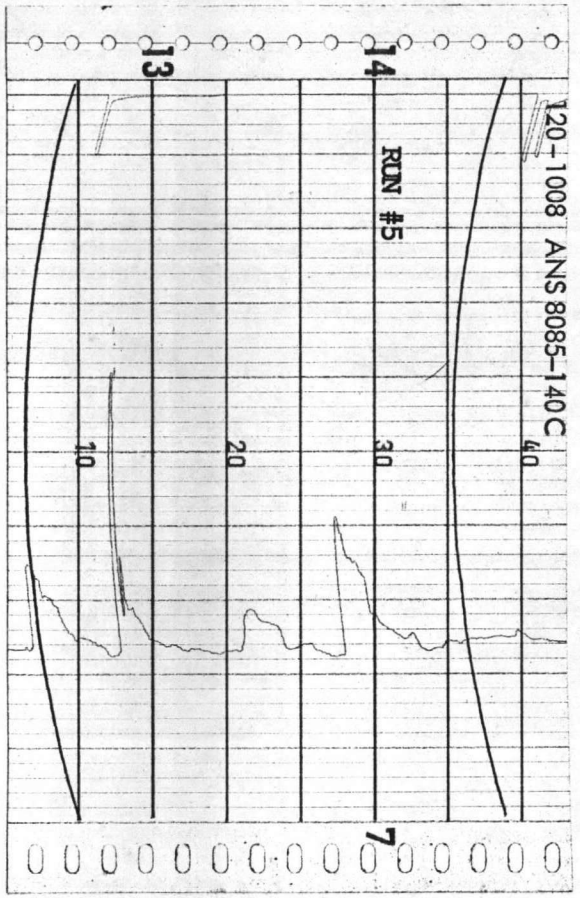




MCAS (H) New River, N.C.
Runway 18-36
Test Section F







MCAS (H) New River, N.C.
Runway 18-36
Test Section F

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS (H) New River, N.C. RUNWAY: 18-36 TEST SECTION: 6

DATE: 4 April 1979 TYPE OF PAVEMENT: A.C. STA: 35+00 to 45+00 Left of Centerline

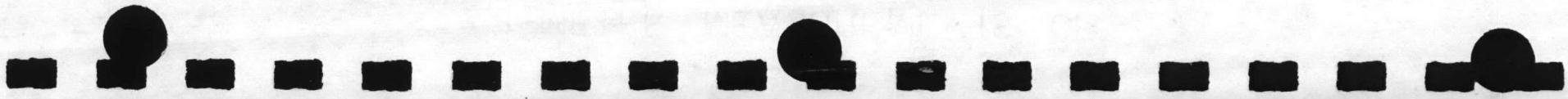
LOCAL ZERO WATER TIME: 1030 WEATHER CONDITIONS: Heavy Overcast

RELATIVE HUMIDITY: 100% WIND: Southwest @ 5 MPH TEMPERATURE: 70 °F.

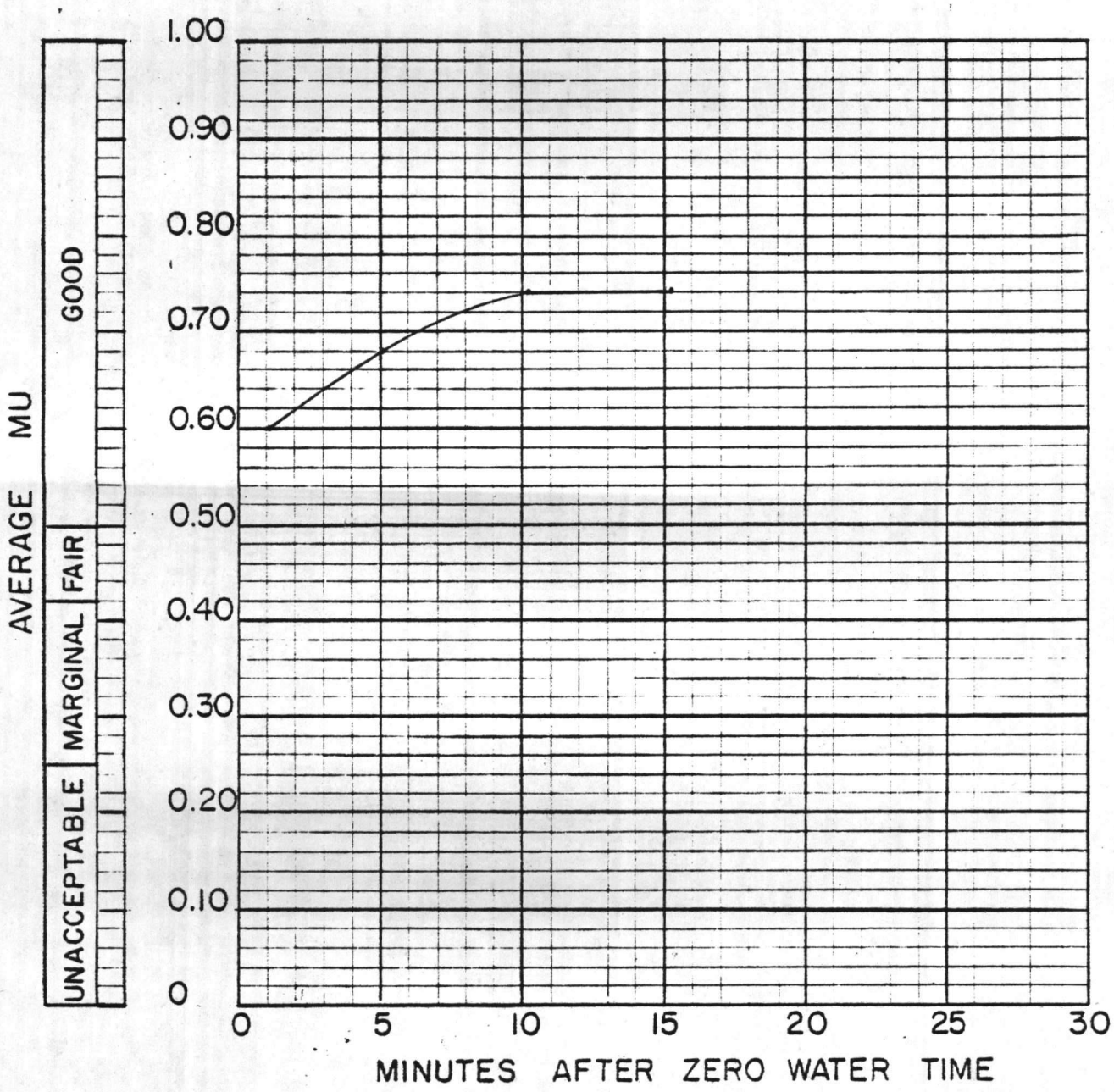
RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN.	MAX.	AVG.	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.	CHART	CHART	CHART	WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	18	1	01	1	18	,48	.69	.60	.51	.30	.58
2	36	5	02	5	19	.43	.77	.68	.51	.37	.72
3	18	10	10	10	27	.47	.77	.74	.51	.38	.74
4	36	15	10	15	27	.41	.79	.74	.51	.38	.74
5											
6											
7											
8											

REMARKS:

Good drainage on test section with slight ponding between station 35+00 to 38+00.



RUNWAY 18-36 SECTION G STATION 35+00 to 45+00
Left of Centerlin

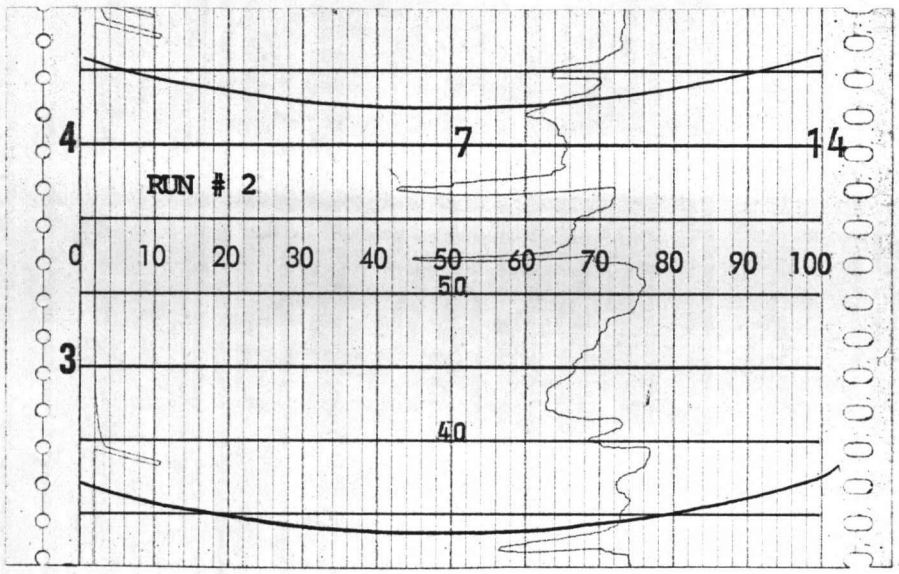


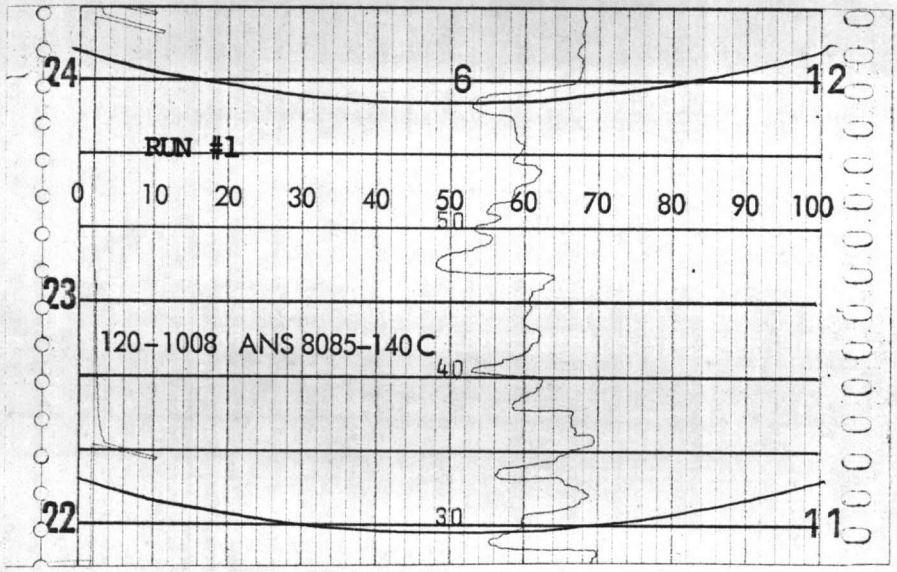
GOOD —— HYDROPLANING NOT EXPECTED.

FAIR —— TRANSITIONAL.

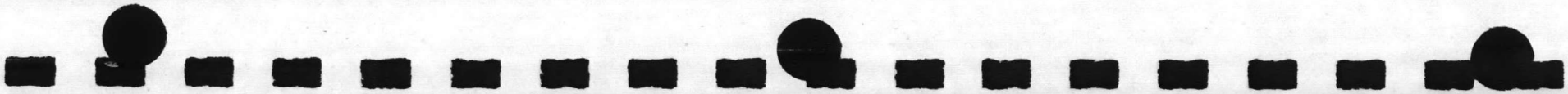
MARGINAL —— POTENTIAL HYDROPLANING.

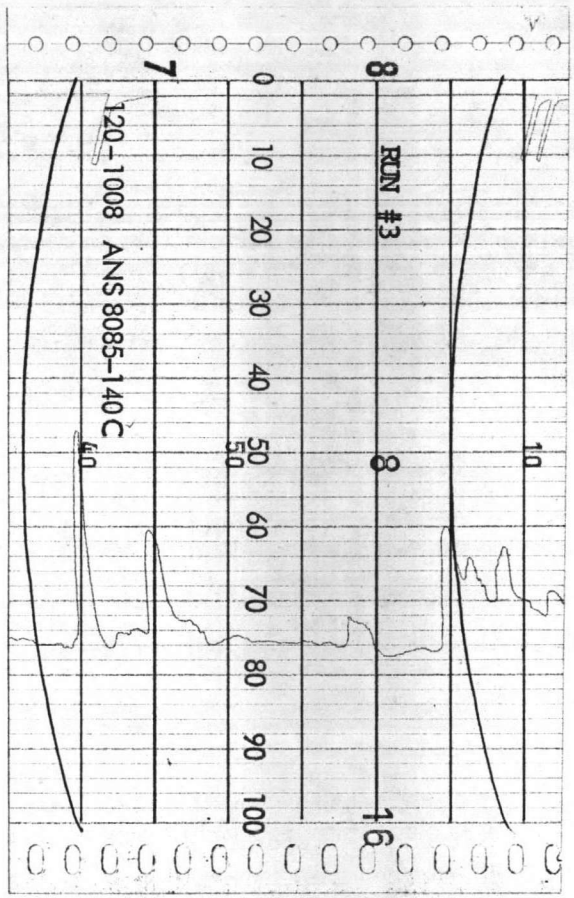
UNACCEPTABLE —— HIGH PROBABILITY OF HYDROPLANING.

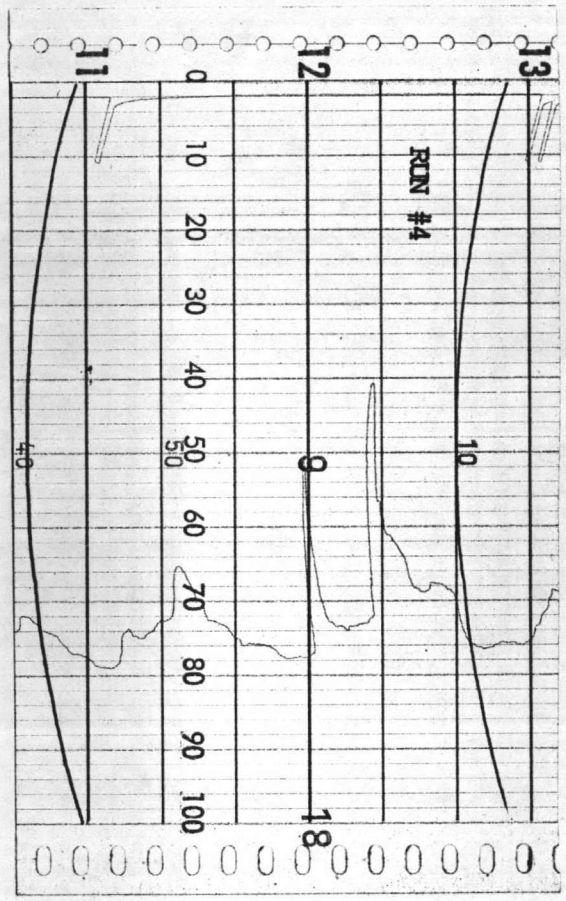




MCAS (H) New River, N.C.
Runway 18-36
Test Section G







MCAS (H) New River, N.C.
Runway 18-36
Test Section G

Mu-METER MEASUREMENTS OF PAVEMENT FRICTION

STATION: MCAS(H) NEW RIVER,N.C. RUNWAY: 18-36 TEST SECTION: H

DATE: 4 April 1979 TYPE OF PAVEMENT: A.C. STA: 35+00-45+00 right center line

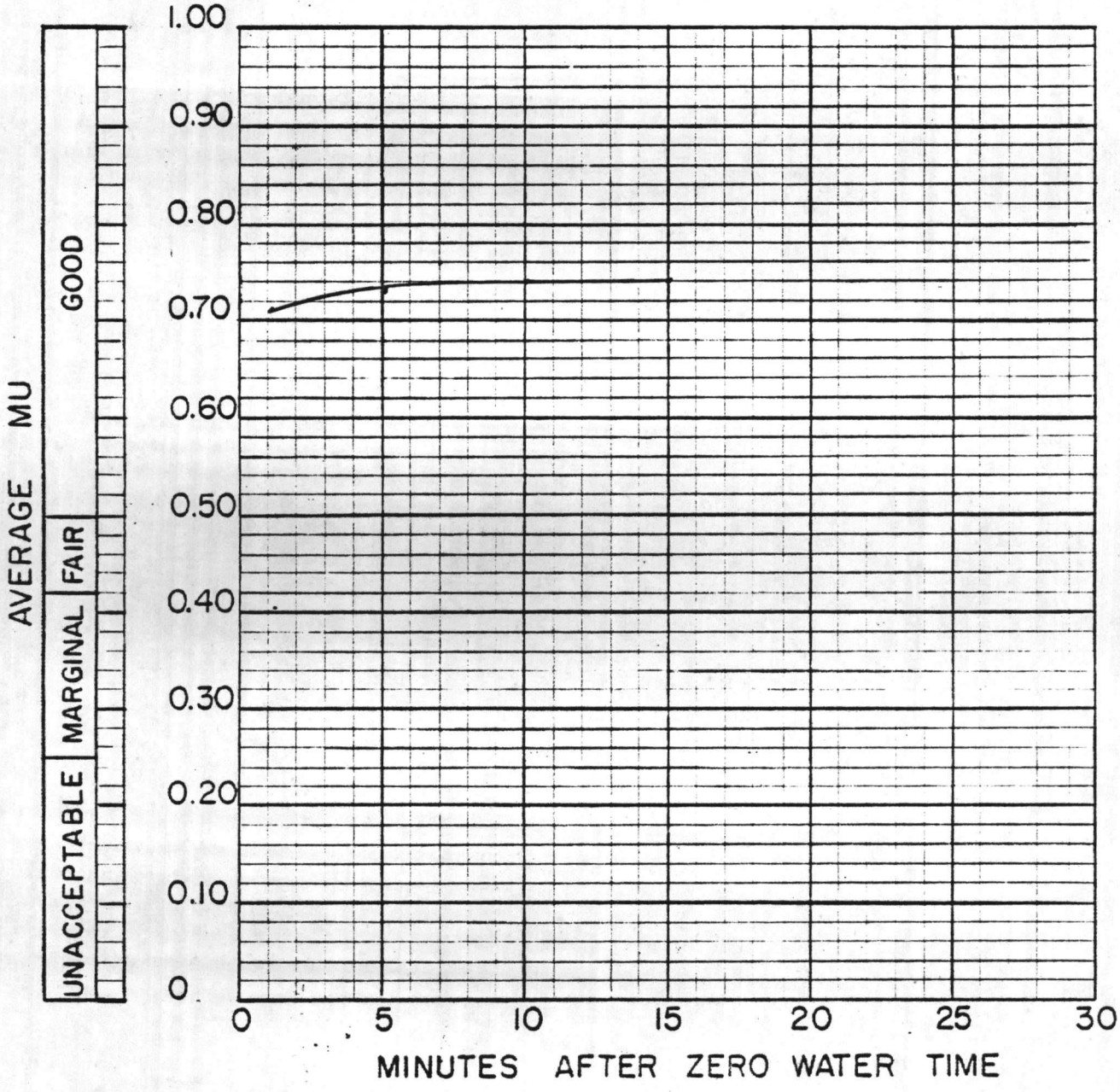
LOCAL ZERO WATER TIME: 1105 WEATHER CONDITIONS: heavy overcast

RELATIVE HUMIDITY: 100% WIND: southwest 12 MPH TEMPERATURE: 70 °F.

RUN NO.	HEADING DEGREES	TIME FROM ZERO WATER TIME				Mu FOR TOTAL TEST SECTION					
		IN		OUT		MIN. CHART	MAX. CHART	AVG. CHART	REMOTE RECORDER		
		MIN.	SEC.	MIN.	SEC.				WINDOW-B.	WINDOW-C	AVG. Mu = C/B
DRY											
1	36	1	02	1	19	.59	.75	.71	51	36	.70
2	18	5	00	5	17	.62	.76	.73	51	37	.72
3	36	10	01	10	18	.70	.77	.74	51	38	.74
4	18	15	00	15	17	.70	.75	.74	51	38	.74
5											
6											
7											
8											

REMARKS: Good drainage on test section.
Isolated ponding station 40+00 to 45+00.

RUNWAY 18-36 SECTION H STATION 35+00-45+00
right center

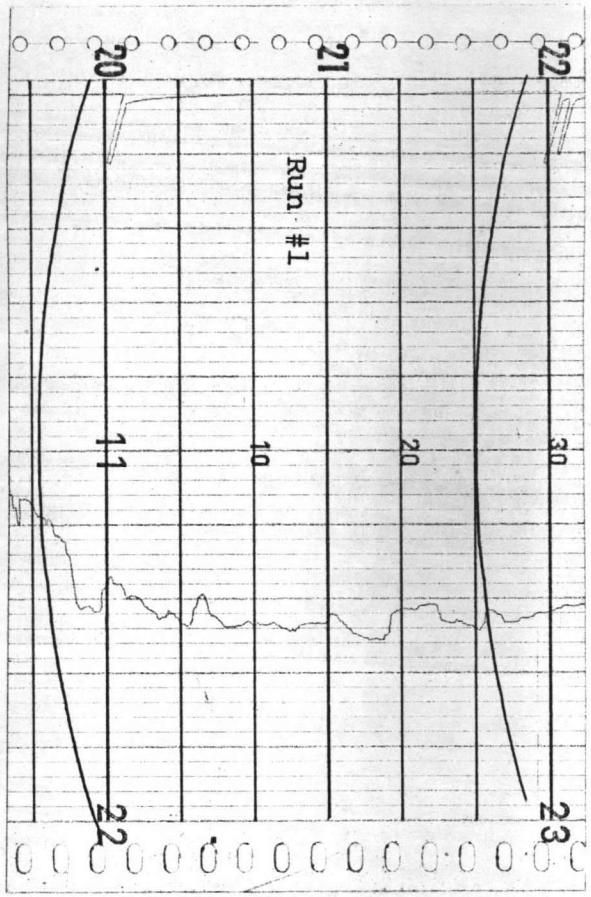


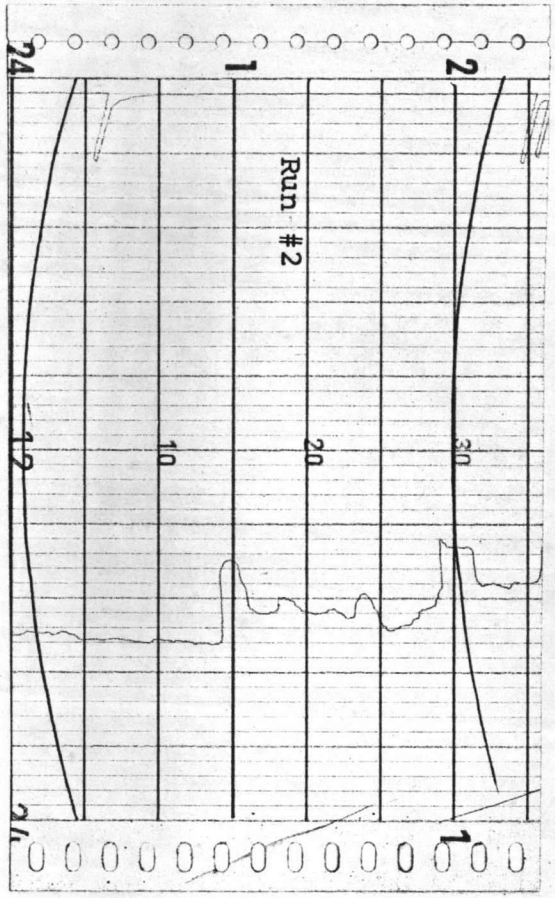
GOOD — HYDROPLANING NOT EXPECTED.

FAIR — TRANSITIONAL.

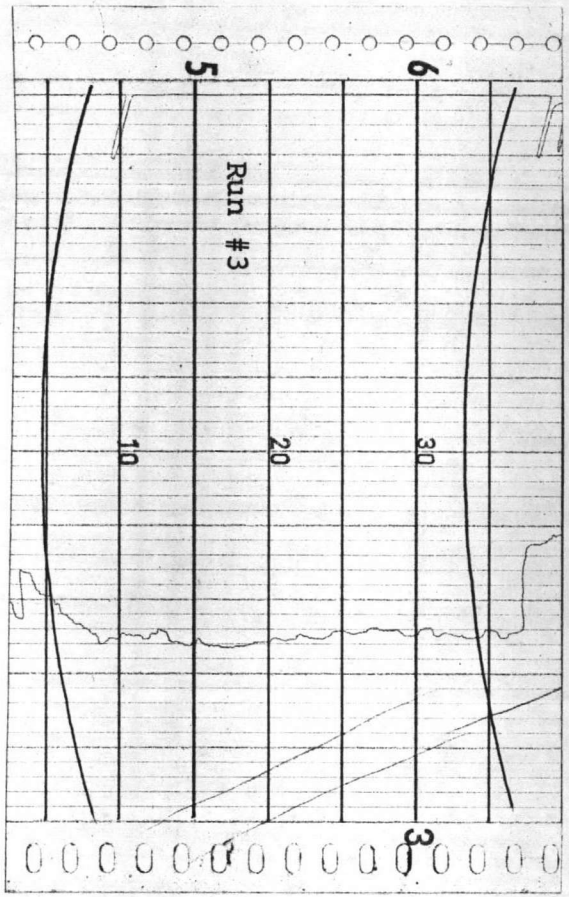
MARGINAL — POTENTIAL HYDROPLANING.

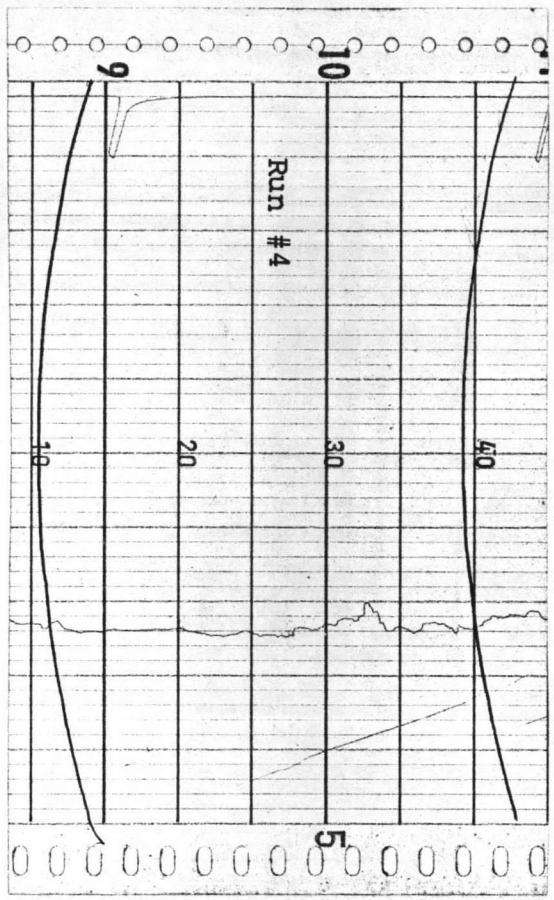
UNACCEPTABLE — HIGH PROBABILITY OF HYDROPLANING.



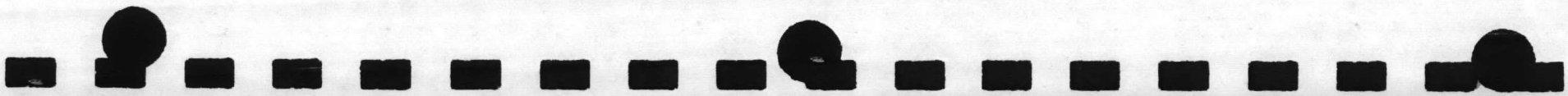


MCAS (H) New River, N.C.
Runway 18-36
Test Section "H"





MCAS (H) New River, N.C.
Runway 18-36
Test Section "H"



PART II

AIRFIELD PAVEMENT CONDITION SURVEY

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DESCRIPTION:

Part II - Condition Survey

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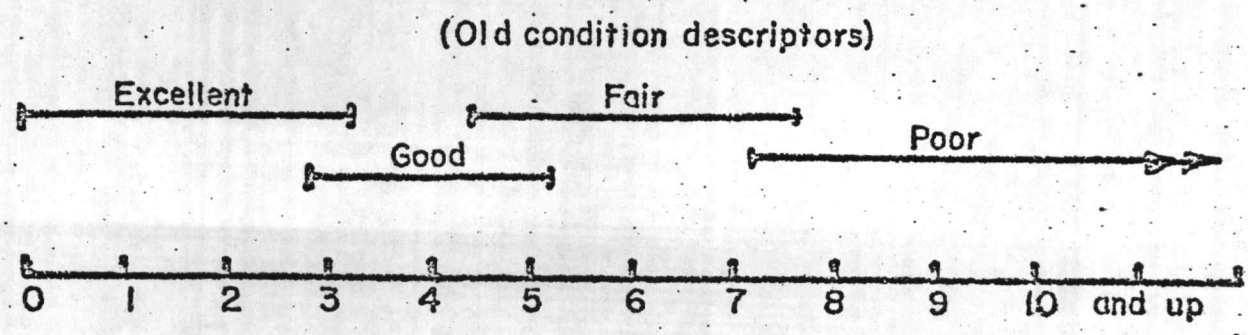
INTRODUCTION

In October 1969, The Naval Facilities Engineering Command authorized a series of periodic pavement condition surveys to be conducted at Naval and Marine Corps Air Stations. The purpose of this condition survey task is to determine the suitability of the airfield pavement surfaces for aircraft operational requirements and to establish a uniform basis for maintenance and repair efforts. During the month of March 1979, a pavement condition survey (runways only) was conducted at Marine Corps Air Station (H) Jacksonville, North Carolina. The survey consisted of a sophisticated, statistically-based procedure of pavement defect identification and defect measurement which permitted the establishment of condition numbers (weighed defect densities) which are direct indicators of the surface condition of the asphaltic concrete (AC) and/or portland cement concrete (PCC) airfield pavement facilities. Though different survey techniques were used for the two pavement types, the resulting defect densities often were similar numerically. However, this was coincidental. The defect densities for the two types of pavement are incompatible and must be considered separately. Additional survey efforts included photographic coverage of defect types, preparation of the construction history of the station, compilation of data on current aircraft traffic and aircraft types using the station and delineation of requirements for future pavement evaluation efforts at the station. Runway skid resistance tests were performed during the condition survey conducted in March 1979 and a comprehensive runway skid resistance synopsis is submitted in Part One of this report.



The numerical defect densities presented in this report were developed to aid in determining the suitability of the airfield pavement surfaces for aircraft operational requirements and to establish an unbiased, uniform basis for initiating maintenance and repair efforts. As such, defect densities are simply visually-determined indicators of the condition of the pavement and do not represent true "condition ratings" in that they do not include factors relating to pavement strengths, traffic usage, etc. It is possible that additional measurements or modifications may be considered necessary or desirable in future condition survey programs.

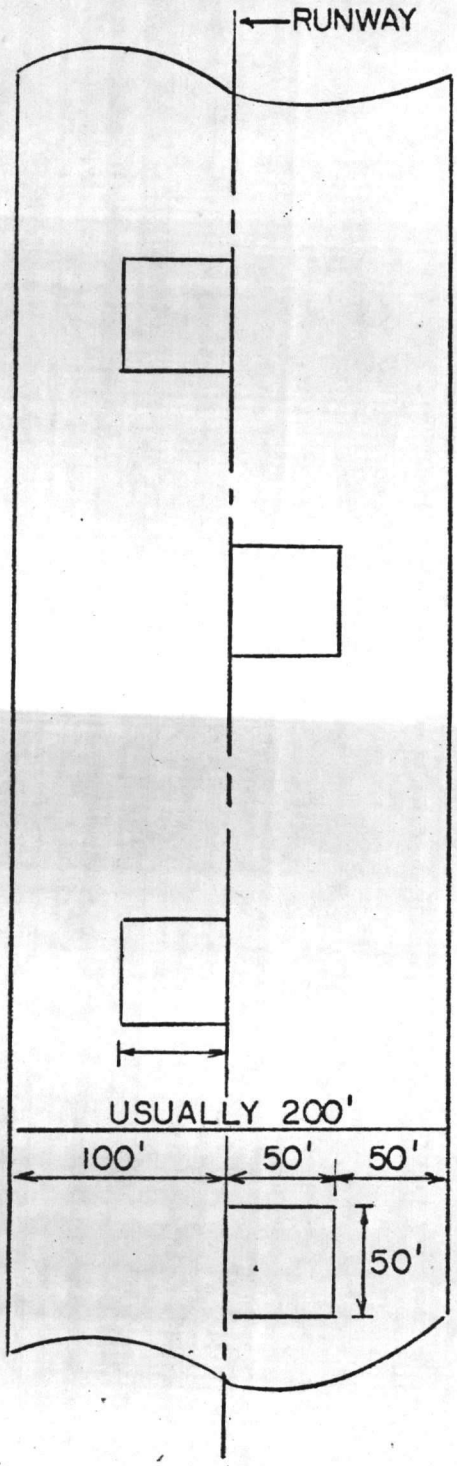
RESULTS OF CONDITION SURVEY

Marine Corps Air Station (H) Jacksonville, North Carolina has two 5,000 foot flexible runways. Runway 5-23 received a hot mix asphaltic concrete overlay in the latter part of 1975. Runway 18-36 received a slurry seal during the same period of time.

In February 1976 a condition survey was performed on runways 5-23 and 18-36 and the condition of both runways was excellent.

At present time the condition of runway 18-36 has significantly deteriorated since 1976 and runway 5-23 is in the initial stage of deterioration but is in much better condition than runway 18-36.

It is recommended that initial steps be taken to include an overlay for runway 18-36 in the MILCON Program for the station. This runway will be in dire need of an overlay in 3 to 5 years. The slurry seal did a good job of "buying time" to allow normal scheduling of expensive maintenance. Runway 5-23 should not require any major maintenance for approximately another five years provided it is not grossly overloaded during this period.



SAMPLE AREA

NOTE: SAMPLE AREA SPACING DETERMINED BY STATISTICAL THEORY.

TYPICAL RUNWAY

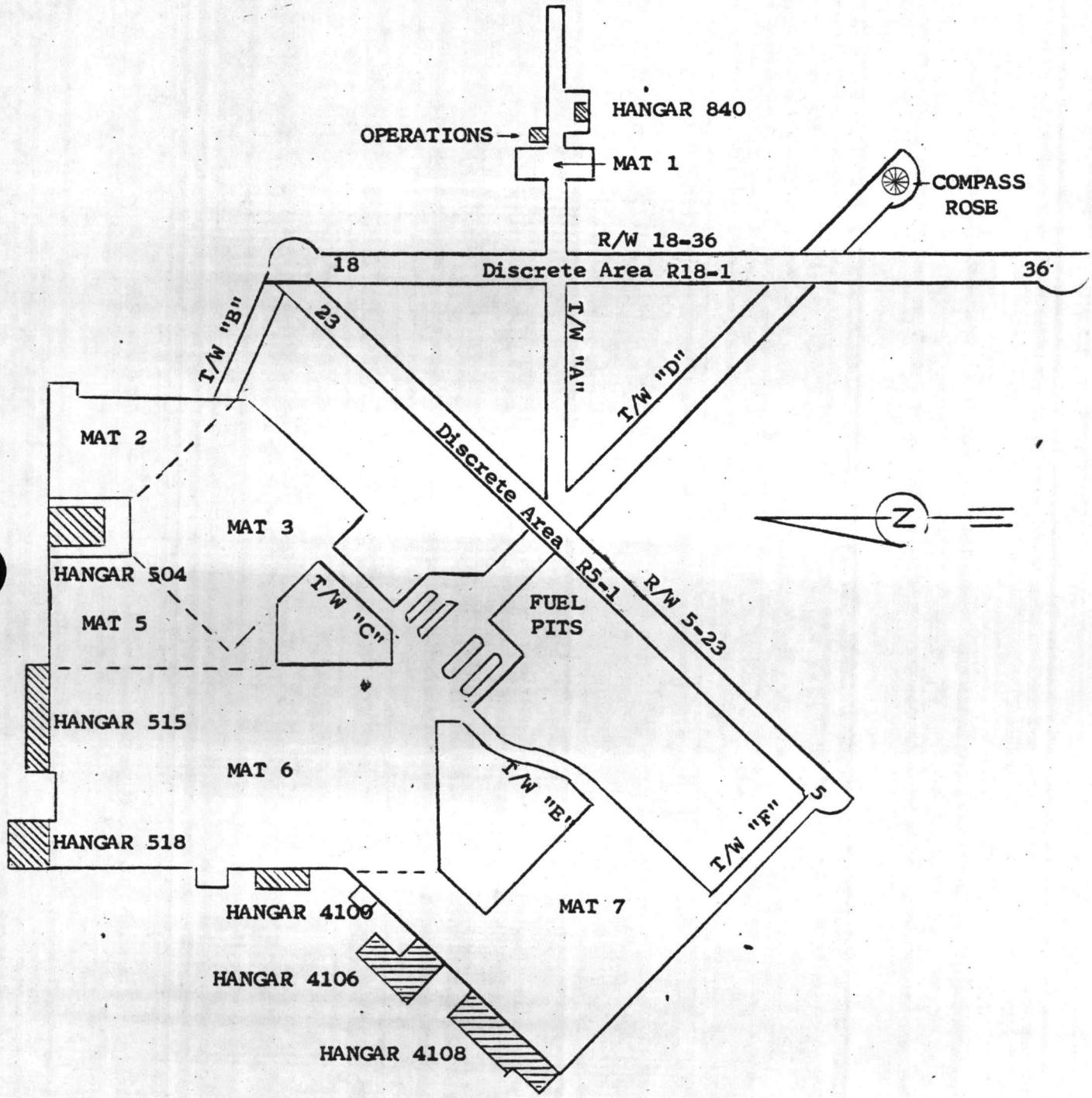
ASPHALTIC CONCRETE SAMPLE AREAS

DEFECT SEVERITY WEIGHTS

MCAS (H) NEW RIVER, N.C.

ASPHALTIC CONCRETE	
DEFECT	WEIGHT
Depression	9.0
Rutting	9.0
Broken-uo Area	9.0
Faulting	8.5
Raveling	7.0
Erosion-Jet Blast	7.5
Longitudinal, Transverse, or Longitudinal Construction Joint Crack	3.0
Pattern Cracking	3.0
Patching	3.5
Reflection Crack	1.5
Oil Spillage	1.5

PORTLAND CEMENT CONCRETE	
DEFECT	WEIGHT
Depression	9.0
Shattered Slab	9.0
Faulting	8.5
Spalling	7.5
Scaling	7.0
"D-Line" Cracking	6.5
Pumping	4.0
Joint Seal Problem	3.0
Corner Break	3.0
Intersecting Crack	3.0
Longitudinal or Transverse Crack	1.5



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MCAS (H) NEW RIVER
JACKSONVILLE, N.C.
DISCRETE AREA LOCATIONS

ASPHALTIC CONCRETE DISCRETE AREA DEFECT SUMMARY

Airfield MCAS(H) New River, N.C. Facility Runway 5-23

Discrete Area R5-1 Area of Discrete Area (a) 489,800 ft^2

No. of Sample Areas (b) 16 Ratio: (a/2500b) 12.25

Defect Type	Length or Area of Sampled Defects	Total Length or Area of All Defects: (c) x Ratio	Defect Density (per 10 sq. ft.) 10 d/a	Defect Severity Weight	Weighted Defect Density: (e) x (f)
	(c)	(d)	(e)	(f)	(g)
T.C., L.C. or LCJ	944 Ft.	11564.00	0.24	3.0	0.72
Reflection Crack	700 Ft.	8575.00	0.18	1.5	0.27
Faulting					
Patching					
Settlement or Depression					
Pattern Cracking					
Rutting					
Raveling					
Erosion—Jet Blast					
Oil Spillage					
Broken-up Area					
				Total	0.99 A

Remarks on Pavement Condition

Pavement from station 0+00 to 2+00 has severe cracking.

Majority of cracks one-sixteenth inch wide.

5ND LANTDIV 4-11132/5 (1-72)

ASPHALTIC CONCRETE DISCRETE AREA DEFECT SUMMARY

Airfield MCAS(H) New River, N.C. Facility Runway 18-36

Discrete Area R18-1 Area of Discrete Area (a) 513,500 ft^2

No. of Sample Areas (b) 16 Ratio: (a/2500b) 12.84

Defect Type	Length or Area of Sampled Defects	Total Length or Area of All Defects: (c) x Ratio	Defect Density (per 10 sq. ft.) 10 d/a	Defect Severity Weight	Weighted Defect Density: (e) x (f)
	(c)	(d)	(e)	(f)	(g)
T.C., L.C. or LCJ	4502 Ft.	57805.68	1.13	3.0	3.39
Reflection Crack	300 Ft.	3852.00	0.08	1.5	0.12
Faulting					
Patching					
Settlement or Depression					
Pattern Cracking	1672 Sq. Ft.	21468.48	0.42	3.0	1.26
Rutting					
Raveling					
Erosion--Jet Blast					
Oil Spillage					
Broken-up Area					
				Total	4.77 A

Remarks on Pavement Condition

Majority of cracks could become pattern cracking in neas future.

Majority of cracks one-eigth inch wide.

5ND LANTDIV 4-11132/5 (1-72)

ASPHALTIC CONCRETE FACILITY DEFECT SUMMARY

Airfield MCAS(H) New River, N.C.

Date Surveyed March 1979

Facility (or portion)	Weighted Defect Density Total	Ratio: Discrete Area / Total Facility Area*	Average Weighted Defect Density (a) x (b)
	(a)	(b)	(c)**
RUNWAY 18-36			
R18-1	4.77	1.000	4.77 A
RUNWAY 5-23			
R5-1	0.99	1.000	0.99 A

* If facility entirely constructed of AC, indicates total facility area. If facility only partly constructed of AC, indicates total area of AC portion of facility.

** Letter suffix "A" on average weighted defect densities indicates asphaltic concrete pavements.

5ND LANTDIV 4-11132/4 (1-72)


MCAS (H) NEW RIVER
SEVERE CRACKS
STATION 0+70
RUNWAY 5-23
1


MCAS (H) NEW RIVER
PATTERN
CRACKING
RUNWAY 18-36
2


MCAS(H) NEW RIVER
TYPICAL CRACKS
40400
3

APPENDIX A

CONSTRUCTION HISTORY

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DESCRIPTION:

Appendix A - Construction

History

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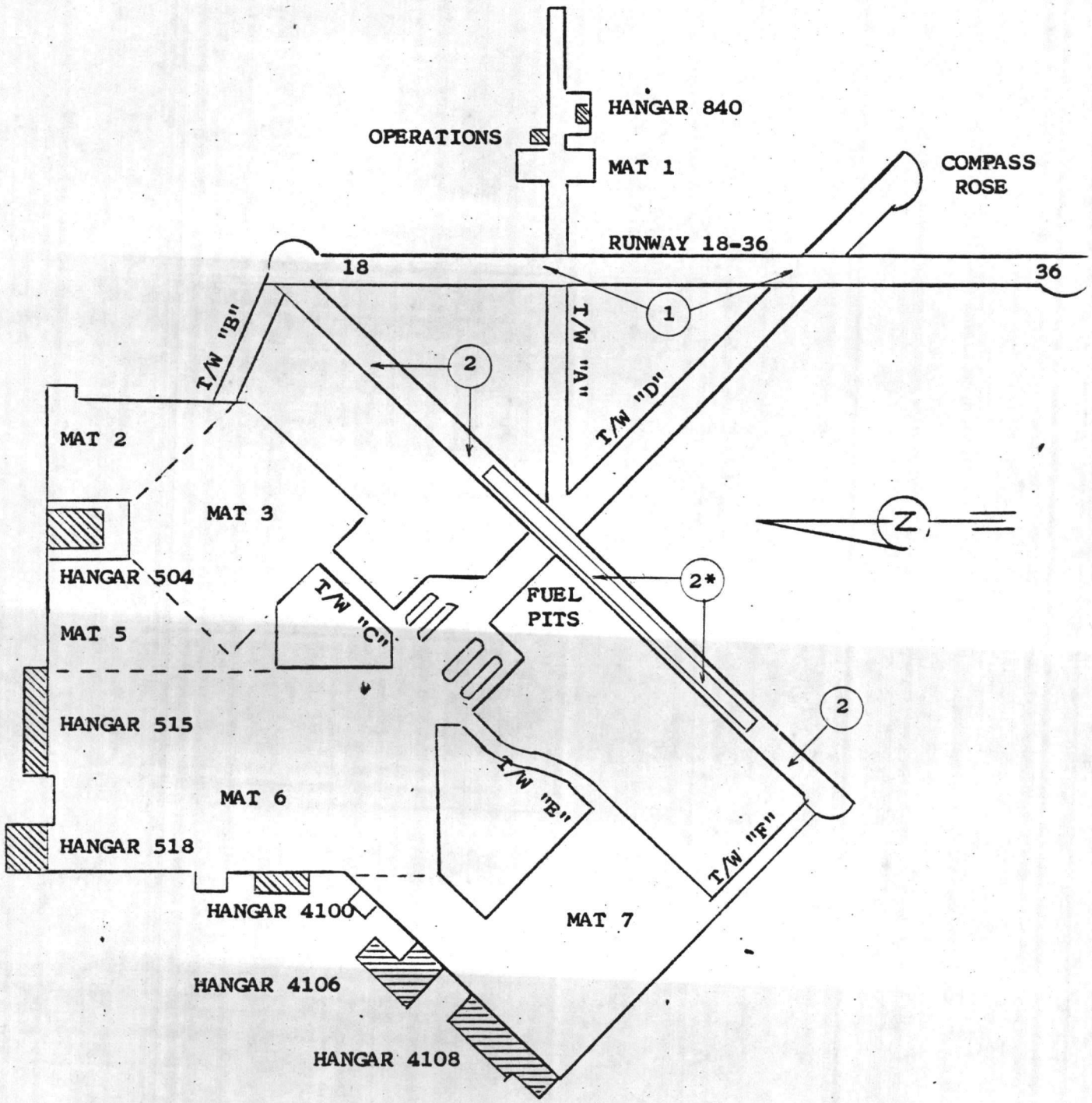

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MCAS (H) NEW RIVER, N.C
JACKSONVILLE, N.C.
CONSTRUCTION HISTORY

Appendix A

CONSTRUCTION HISTORY FOR MCAS (H) NEW RIVER, N.C.

Item No.	Section From Surface to Subgrade	Date Constructed	Date Strengthened or Sealed
1	RUNWAY 18-36		
	Slurry Sealed		1975
	1½" Asphaltic Concrete		1961-1962
	Variable thickness of Sand Asphalt		
	leveling course.		1961-1962
	3" Sand Tar	1944	
	6" Shell Rock	1944	
	Sand Basegrade		
2	RUNWAY 5-23		
*	1½" Asphaltic Concrete overlay		1975
	1½" Asphaltic Concrete		1961-1962
	Variable thickness of Sand Asphalt		
	leveling course.		1961-1962
	3" Sand Tar	1944	
	6" Shell Rock	1944	
	Sand Subgrade		
*	NOTE: Approximately between sta. 10+00 thru Sta. 30+00		
	center 100 feet of pavement was removed to a depth of		
	12 to 14 inches. The basecourse was replaced with a		
	blackbase asphaltic pavement, then the entire runway		

was overlaid with 1½ inches of asphaltic concrete.

APPENDIX B

MISCELLANEOUS DATA

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DESCRIPTION:

Appendix B - Miscellaneous Data

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PRECIPITATION DATA

APRIL 1978 - MARCH 1979

MCAS (H) NEW RIVER N.C.

APRIL 1978	6.53"
MAY 1978	4.16"
JUNE 1978	2.70"
JULY 1978	5.33"
AUGUST 1978	4.28"
SEPTEMBER 1978	2.31"
OCTOBER 1978	1.10"
NOVEMBER 1978	3.78"
DECEMBER 1978	4.10"
JANUARY 1979	6.82"
FEBRUARY 1979	4.50"
MARCH 1979	3.16"
TOTAL	48.77"

TYPES OF AIRCRAFT USING AIR STATION

MCAS (H) NEW RIVER

JACKSONVILLE, N.C.

BASED AT STATION:	CH-53A
	CH-46D
	OV-10
	UH-1E
	T-28
	S-2
USING STATION ON A TRANSIENT BASIS:	C-130
	C-131
	P-3
	C-141