

**Tech  
Library**

~~SECRET~~ B

AD \_\_\_\_\_

RDTE PROJECT NO./FSN \_\_\_\_\_

TECOM PROJECT NO. 1-VG-123-000-001  
(PHASE I)

TEST AGENCY PROJECT NO. \_\_\_\_\_

TEST SPONSOR US Army Tank-Automotive Command

TEST SPONSOR PROJECT NO. \_\_\_\_\_

TRADOC AC NO. \_\_\_\_\_



US ARMY REPORT 193

PRODUCT IMPROVEMENT TEST OF NONMETALLIC FUEL TANKS

FOR

TRUCKS, M151 AND M715 SERIES

(PHASE I)

FIRST LETTER REPORT

BY

JUAN A. SUAREZ

**DUGWAY PROVING GROUND  
TECHNICAL LIBRARY**

PG R0193

JUNE 1974

DISTRIBUTION LIMITED TO US GOVERNMENT AGENCIES ONLY; TEST AND EVALUATION;  
JUNE 1974. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO US ARMY  
TANK-AUTOMOTIVE COMMAND, WARREN, MICHIGAN 48090.

**U. S. ARMY YUMA PROVING GROUND  
YUMA, ARIZONA**

700171

141001

Destroy this report when no longer needed. Do not return it to the originator.

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

The use of trade names in this report does not constitute an official endorsement or approval of the use of such commercial hardware or software. This report may not be cited for purpose of advertisement.

## **DISCLAIMER NOTICE**

**This document may contain  
pages which do not  
reproduce legibly.**

**Inconsistent page numbers  
are due to omittance of blank  
pages.**

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER USAYPG Report 193	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series (Phase I)		5. TYPE OF REPORT & PERIOD COVERED First Letter Report, 17 April 1973 through 10 May 1974
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)  JUAN A. SUAREZ		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Yuma Proving Ground ATTN: STEYP-MTM Yuma, Arizona 85364		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Tank-Automotive Command ATTN: AMSTA-RHT Warren, Michigan 48090		12. REPORT DATE June 1974
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) US Army Test and Evaluation Command ATTN: AMSTE-BB US Army Aberdeen Proving Ground, Maryland 21005		15. SECURITY CLASS. (of this report)  UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE NA
16. DISTRIBUTION STATEMENT (of this Report) Distribution limited to US Government Agencies only; Test and Evaluation; June 1974. Other requests for this document must be referred to US Army Tank-Automotive Command, Warren, Michigan 48090		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series was conducted by US Army Yuma Proving Ground during the period 17 April 1973 through 10 May 1974. The purpose of the test was to determine the suitability of the nylon fuel tanks for M151 and M715 series trucks under desert environmental conditions. The test items were installed in M151 and M715 series trucks. These trucks were operated under routine, administrative operation on gravel, paved and cross-country terrain at US Army Yuma Proving Ground. It was concluded that under desert environmental conditions,		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

the nylon fuel tanks are suitable for use in the M715 and M151 series trucks.

It was recommended that:

(1) To preclude further fuel tank support bands slippage, one of the following actions must be implemented: (a) Change the nylon fuel tank design to provide molded depressions, or (b) join the support bands by installing two metal banding straps between them.

(2) Incorporate the operational procedure of grounding the fuel pump and the fuel sending unit in pertinent technical manuals.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

DEPARTMENT OF THE ARMY Mr. J.A. Suarez/mjt/899-2929  
US Army Yuma Proving Ground  
Yuma, Arizona 85364

STEYP-MTM

SUBJECT: First Letter Report on Product Improvement Test of Nonmetallic  
Fuel Tanks for Trucks, M151 and M715 Series, TECOM Project No.  
1-VG-123-000-001 (Phase I)

Commander  
US Army Tank-Automotive Command  
ATTN: AMSTA-RHT  
Warren, Michigan 48090

Dates of Test: 17 April 1973 through 10 May 1974

1. REFERENCES

- a. Letter, Headquarters, US Army Test and Evaluation Command, AMSTE-BB, dated 13 April 1972, subject: Customer Test Directive: Product Improvement Test of Non-Metallic Fuel Tanks for Trucks, M151 and M715.
- b. Customer Test Directive, AMSTA-RPT, dated 28 March 1972, plus inclosure letter, dated 14 March 1972, subject: Test Program of Non-Metallic Fuel Tanks.
- c. Letter, US Army Tank-Automotive Command, AMSTA-RPT, dated 15 November 1972, subject: Product Improvement Test of Non-Metallic Fuel Tanks.
- d. Letter, Headquarters, US Army Test and Evaluation Command, AMSTE-BB, dated 15 December 1972, subject: Product Improvement Test of Non-Metallic Fuel Tanks for Trucks, M151 and M715.
- e. Customer Test Directive, AMSTA-RPT, dated 4 December 1972, plus inclosure letter, dated 16 November 1972, subject: Revised Test Program for Non-Metallic Fuel Tanks.
- f. Letter, US Army Test and Evaluation Command, AMSTE-BB, dated 23 February 1973, subject: Rescheduling of Non-Metallic Fuel Tank Tests.

STEYP-MTM

SUBJECT: First Letter Report on Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series, TECOM Project No. 1-VG-123-000-001 (Phase I)

g. Letter, US Army Tank-Automotive Command, AMSTA-RHT, dated 6 November 1973, subject: Product Improvement Test of Non-Metallic Fuel Tanks.

## 2. BACKGROUND

Nonmetallic fuel tanks have certain advantages over metallic tanks in so far as they are not prone to corrosion, are light weight and are somewhat less expensive than metal fuel tanks. US Army Tank-Automotive Command has been in the process of securing from private industry, under contract, a quantity of nylon, high density polyethylene, and cross-linked polyethylene fuel tanks. Since this material is relatively new, the Army has established a program to field test them in all environments (hot, cold, dry, humid) for at least 1 year to determine their suitability to military application. A test program, Reference b, was initiated and its general plan was to test a quantity of nonmetallic fuel tanks at the arctic, desert, and tropic test sites. Due to unresponsive bidding from manufacturers, and, later, to delay in obtaining the necessary tooling required in manufacturing the test items, the original test program was revised and rescheduled by References c through g. In its revision, Reference e also includes testing the items at the temperate test site. Because the test items could not arrive at the different test sites at the same time, TACOM decided to divide the program into two phases. Phase I of the test (nylon fuel tanks) was to start between March and April 1973 at the arctic, desert and temperate test sites; Phase II of the test (high density polyethylene and cross-linked polyethylene fuel tanks) was to start between January and April 1974 at all four of the previously mentioned test sites.

This report is based on the results obtained during Phase I of the test (routine, administrative operation of the M151 and M715 series with the installed nylon fuel tanks on gravel, paved and cross-country terrain) at US Army Yuma Proving Ground.

## 3. OBJECTIVE

To determine the suitability of the nylon fuel tanks for the M151 and M715 series trucks under desert environmental conditions.

## 4. PROCEDURES AND RESULTS

Sixteen nylon fuel tanks (one each for eight M715 and one each for eight M151 series trucks) were received for test. Each test item was inspected;

STEYP-MTM

SUBJECT: First Letter Report on Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series, TECOM Project No. 1-VG-123-000-001 (Phase I)

no damage or irregularities were found. The conventional terne plate tank was removed from each of the facility trucks and stored for future reinstallation. The test items were installed in the above facility trucks in accordance with the installation and safety procedures outlined in TM 9-2320-218-20 (Organizational Maintenance Manual for M151 series trucks) and TM 9-2320-244-20 (Organizational Maintenance Manual for M715 series trucks). Since the M151A1 truck contains a self-grounded submerged fuel pump in the terne plate fuel tank, the fuel pump in the nylon fuel tank as well as the fuel sending unit had to be grounded. The mileage of each truck was then recorded. The 16 trucks were operated for 1 year under routine, administrative operation on gravel, paved and cross-country terrain. During the 1-year period, as circumstances permitted, the fuel tanks were checked for fuel leakage, cracking, bulging, etc. When a problem developed, it was investigated and then temporarily corrected by USAYPG to expedite testing. After the one-year test period was completed, the mileage of each truck was recorded again to establish total test miles on each nylon fuel tank. The nylon fuel tanks were inspected before and after removal from the trucks. No damage or irregularities were found in the test items except for some thermal expansion of the fuel tanks which was expected of this material. No color changes, cracking or crazing were found during this inspection.

Date of installation and removal of each test item, identification of each truck, total test miles accumulated on each test item, and pertinent remarks can be found in Inclosure 1. Photographs illustrating the nylon fuel tank as installed on the truck can be found in Inclosure 2. Meteorological data at USAYPG from April 1973 through April 1974 are included for information purposes in Inclosure 3.

The following incidents occurred with the M715's nylon fuel tanks during the 1 year of test:

a. After 116 days of operation and 2087 accumulated test miles on the nylon fuel tank which was installed in truck USA Reg No. 03B00469, the support bands were found to have slipped off (due to road vibrations) allowing the fuel tank to fall to the ground. The fuel lines and the gage wire were ripped loose. The fuel tank itself sustained minor scratches but did not rupture. The fuel tank was then reinstalled. At this time, two metal banding straps were installed joining the two support bands to keep them from separating.



STEYP-MTM

SUBJECT: First Letter Report on Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series, TECOM Project No. 1-VG-123-000-001 (Phase I)

b. Another incident similar to the one mentioned in the above paragraph occurred with truck USA Reg No. 03J43568 after 119 days of operation and 1652 accumulated test miles. Two metal banding straps were then installed joining the two support bands.

c. A last incident similar to the ones in the above paragraphs occurred with truck USA Reg No. 03E92768 after 125 days of operation and 761 accumulated test miles. However, the incident was noticed before the fuel tank could fall off, preventing possible damage to the fuel tank or any of its components. Metal banding straps were installed as explained above.

During the inspection of all the above incidents, it was found that the nuts on the end of the support bands could not be tightened further. However, there was an incident with M715 truck USA Reg No. 03M41668 where one of the nuts on the end of a support band loosened and fell off, allowing the support band to loosen and the tank to nearly fall off. The support bands were put back in place and the nut was tightened.

After the support band slippage incident occurred in three separate trucks, two metal banding straps were installed on each of the nylon fuel tanks on the rest of the M715 series trucks.

Illustrations of this modification can be found in Figures 3 and 4, Inclosure 2.

## 5. CONCLUSIONS

The nylon fuel tanks are suitable for use in the M715 and M151 series trucks under desert environmental conditions.

## 6. RECOMMENDATIONS

a. To preclude further fuel tank support bands slippage, one of the following actions must be implemented:

(1) Change the nylon fuel tank design to provide molded depressions, or

(2) Join the support bands by installing two metal banding straps between them (See Fig 3 and 4 of Incl 2).

STEYP-MTM

SUBJECT: First Letter Report on Product Improvement Test of Nonmetallic Fuel Tanks for Trucks, M151 and M715 Series, TECOM Project No. 1-VG-123-000-001 (Phase I)

b. Incorporate the operational procedure of grounding the fuel pump and the fuel sending unit in pertinent technical manuals.

FOR THE COMMANDER:



RAMON J. HEICK

Acting Director of Materiel Test

4 Incl

1. Test Data
2. Photographs
3. Meteorological Data
4. Distribution List

TEST DATA  
NYLON FUEL TANKS

Dates		Truck USA Reg No.	Type of Truck	Total Test Miles	Remarks
Installation	Removal				
17 Apr 73	2 May 74	2J8621	M151A1, $\frac{1}{4}$ -Ton	2,792	The submerged fuel pump and fuel sending unit must be grounded. Incorporation of this operational procedure in the pertinent technical manuals is required.
18 Apr 73	29 Apr 74	2F0458	M151A1, $\frac{1}{4}$ -Ton	4,644	
20 Apr 73	10 May 74	2R0799	M151A1, $\frac{1}{4}$ -Ton	8,273	
20 Apr 73	29 Apr 74	2P8730	M151A1, $\frac{1}{4}$ -Ton	2,113	
23 Apr 73	30 Apr 74	2N1756	M151A1, $\frac{1}{4}$ -Ton	4,085	
23 Apr 73	6 May 74	2K6397	M151A1, $\frac{1}{4}$ -Ton	5,098	
23 Apr 73	3 May 74	2J8403	M151A1, $\frac{1}{4}$ -Ton	4,361	
24 Apr 73	30 Apr 74	2J8565	M151A1, $\frac{1}{4}$ -Ton	4,763	
17 Apr 73	2 May 74	03M41668	M715, $1\frac{1}{4}$ -Ton	6,941	(1) After 127 days of operation and 1101 accumulated test miles, the nut on the end of a support band loosened and fell off. The support band loosened and the tank nearly fell off. (2) Two metal banding straps were added on 23 Aug 73 after 1169 accumulated test miles.
18 Apr 73	6 May 74	03E92768	M715, $1\frac{1}{4}$ -Ton	3,730	(1) After 125 days of operation and 761 accumulated test miles, the support bands began to slip off. The fuel tank did not fall off. (2) Two metal banding straps were added on 21 August 1973 after 761 accumulated test miles.
18 Apr 73	29 Apr 74	03U40168	M725, $1\frac{1}{4}$ -Ton	6,691	(1) Two metal banding straps were added (no record of date and mileage). (2) Vehicle remained parked since 29 Jan 74 waiting for power train repair parts.
20 Apr 73	7 May 74	03F50668	M715, $1\frac{1}{4}$ -Ton	7,355	Two metal banding straps were added on 27 Aug 73 after 3343 accumulated test miles.
23 Apr 73	6 May 74	3D67368	M715, $1\frac{1}{4}$ -Ton	980	Two metal banding straps were added on 23 Aug 73 after 432 accumulated test miles.
24 Apr 73	29 Apr 74	03J43568	M715, $1\frac{1}{4}$ -Ton	3,347	(1) After 119 days of operation and 1652 accumulated test miles, the support bands slipped off. The fuel tank fell off. (2) Two metal banding straps were added on 23 Aug 73 after 1652 accumulated test miles.
25 Apr 73	30 Apr 74	03J02268	M715, $1\frac{1}{4}$ -Ton	2,561	Two metal banding straps were added on 22 Aug 73 after 991 accumulated test miles.
26 Apr 73	7 May 74	03B00469	M715, $1\frac{1}{4}$ -Ton	6,221	(1) After 116 days of operation and 2087 accumulated test miles, the support bands slipped off. The fuel tank fell off. (2) Two metal banding straps were added on 17 Aug 73 after 2087 accumulated test miles.

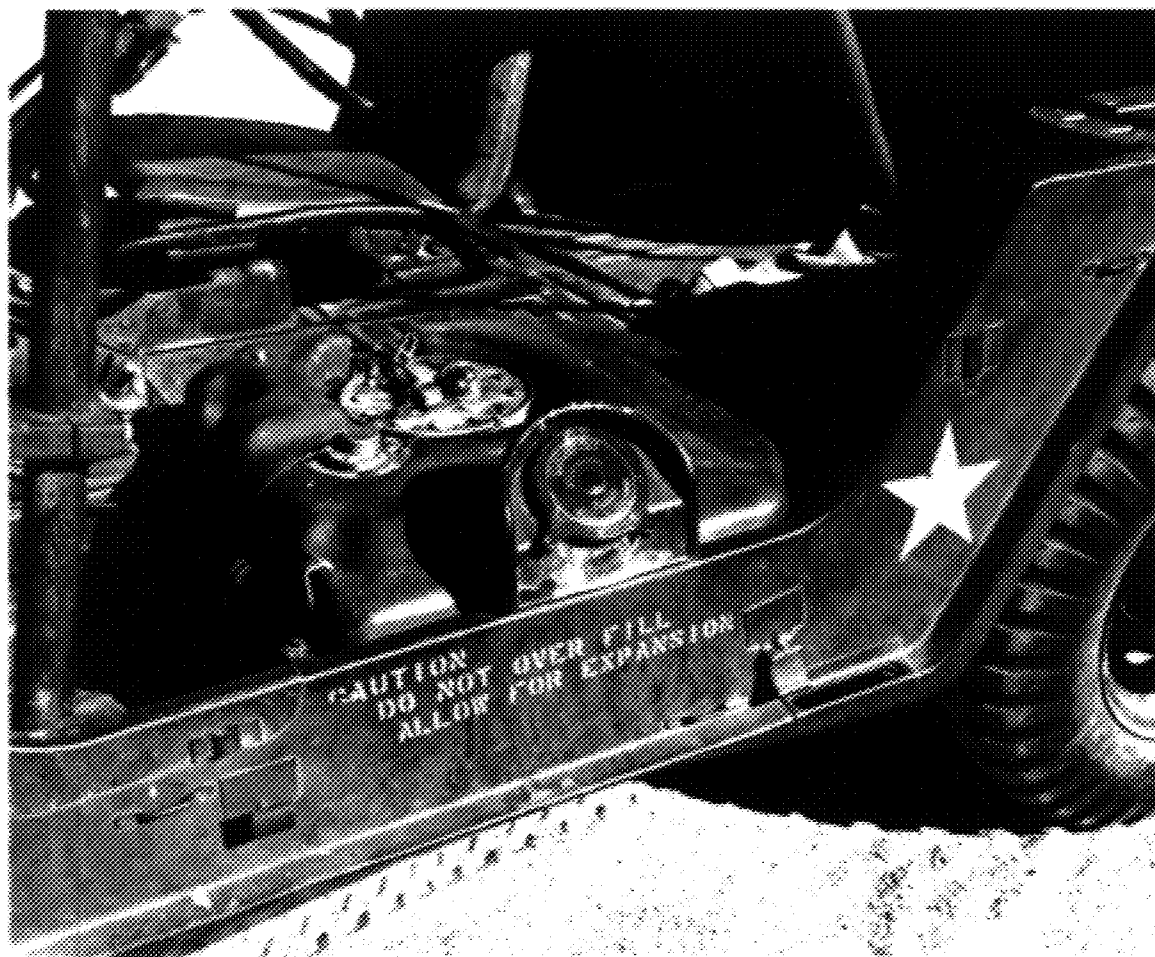


FIGURE 1. Nylon fuel tank as installed in an M151A1 1/4-ton truck (left 3/4 front view)



FIGURE 2. Nylon fuel tank as installed in an M151A1 1/4-ton truck (right 3/4 front view)

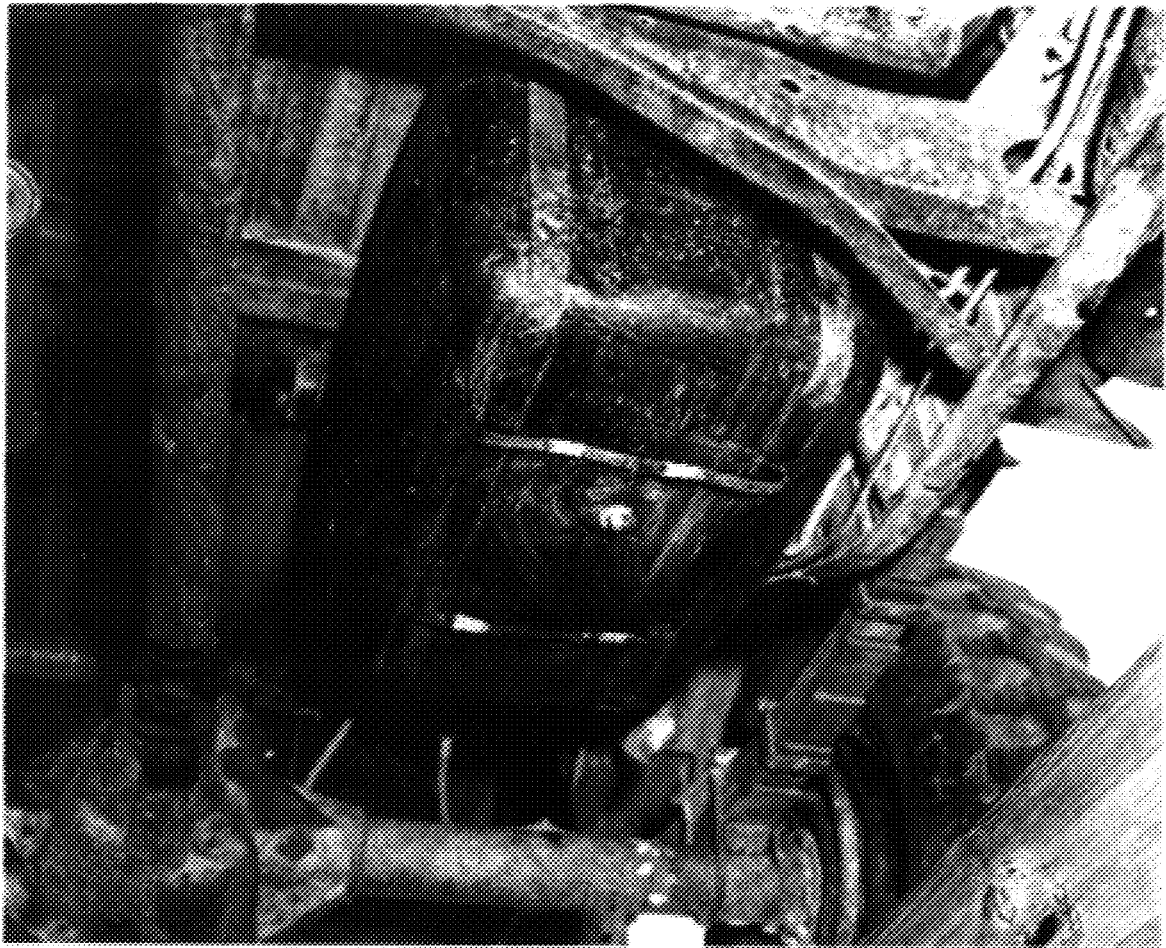
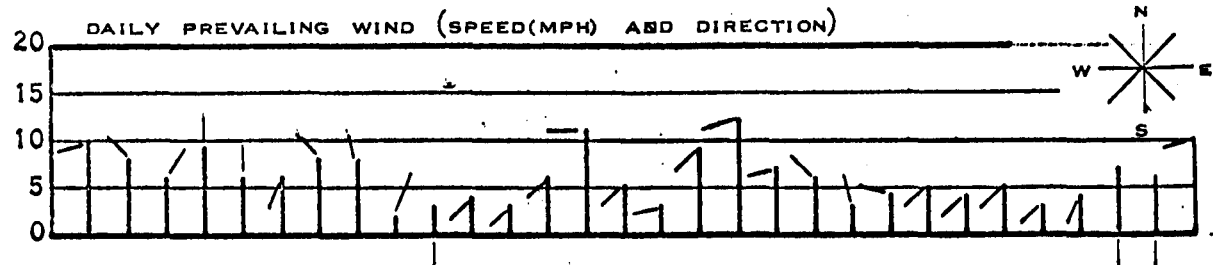
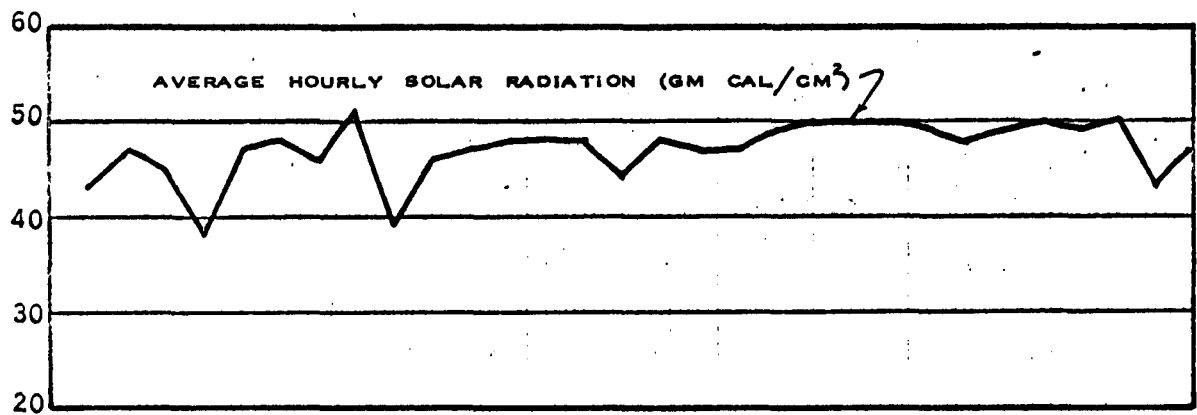
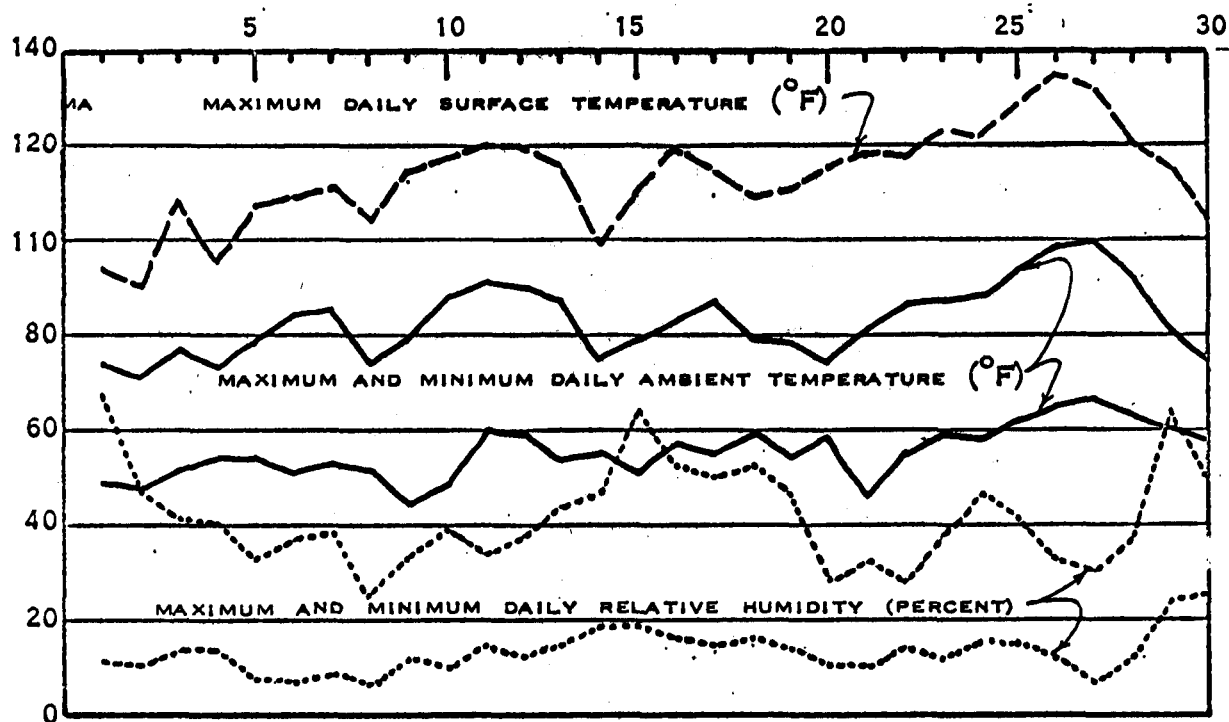


FIGURE 3. Nylon fuel tank as installed in an M715 1-1/4 ton truck (bottom front view). Note the crossed metal bands that had to be installed to keep the conventional support bands from separating.



FIGURE 4. Nylon fuel tank as installed in an M715 1-1/4 ton truck (bottom rear view). Note the crossed metal bands that had to be installed to keep the conventional support bands from separating.

# METEOROLOGICAL SUMMARY FOR APRIL 1973



AVERAGE DAILY SKY CONDITION C - CLEAR P - PARTLY CLOUDY & CLOUDY

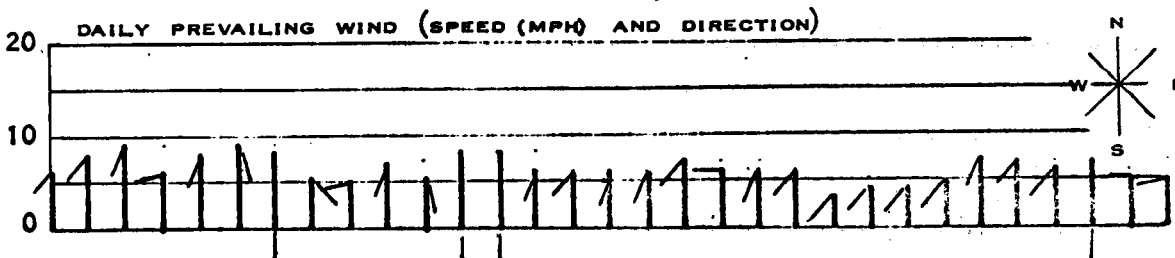
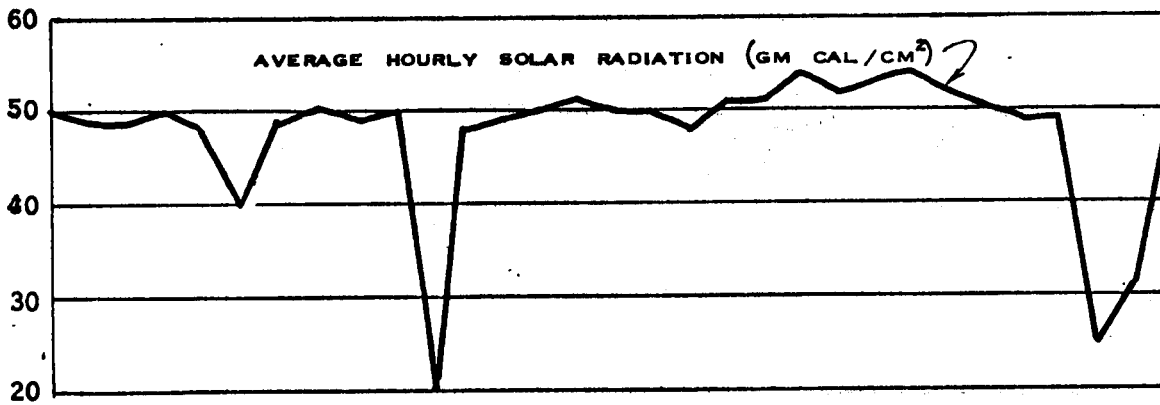
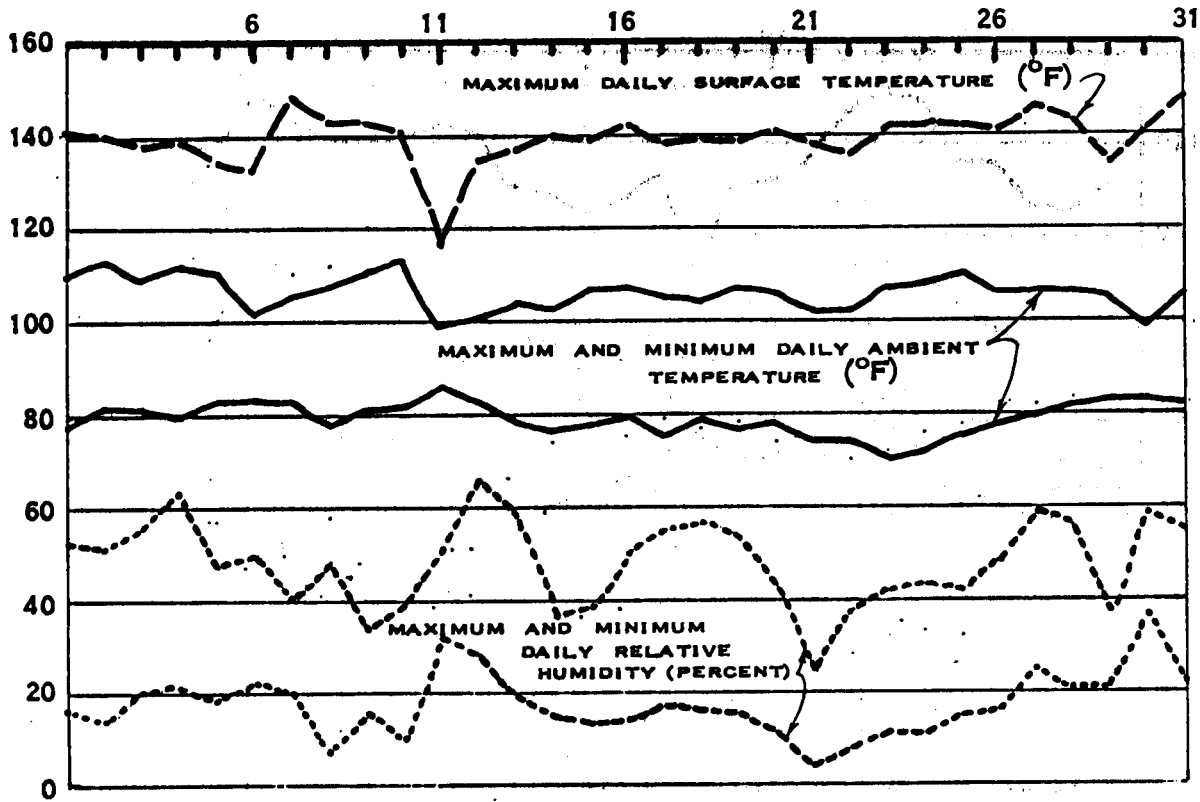
C C C C C C C C P P C C C C P C C C P C C C C C C C C P







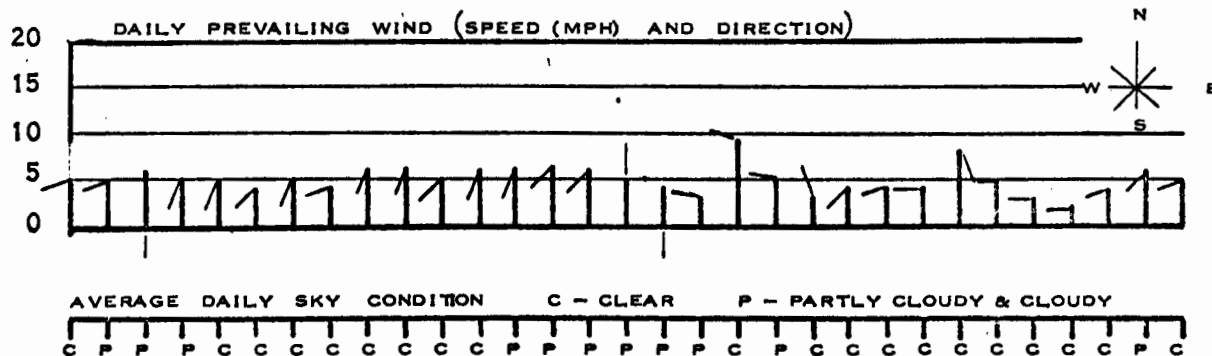
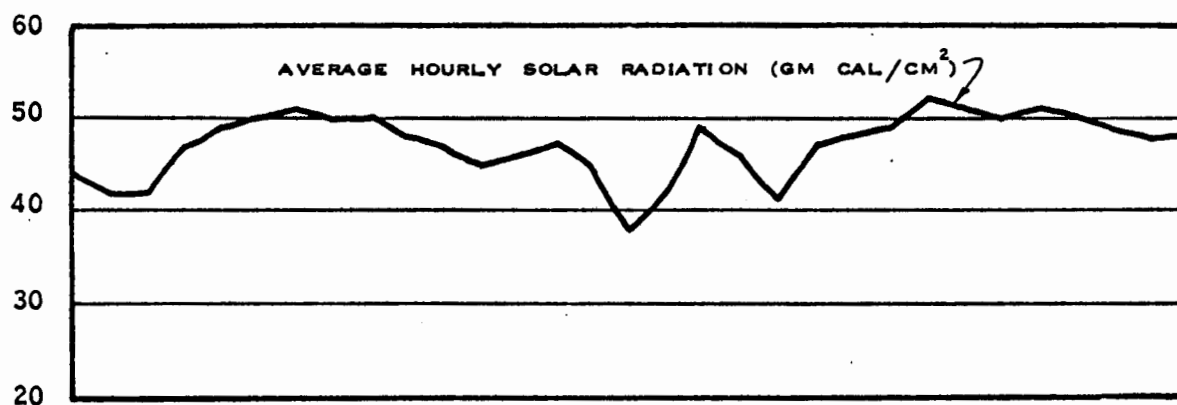
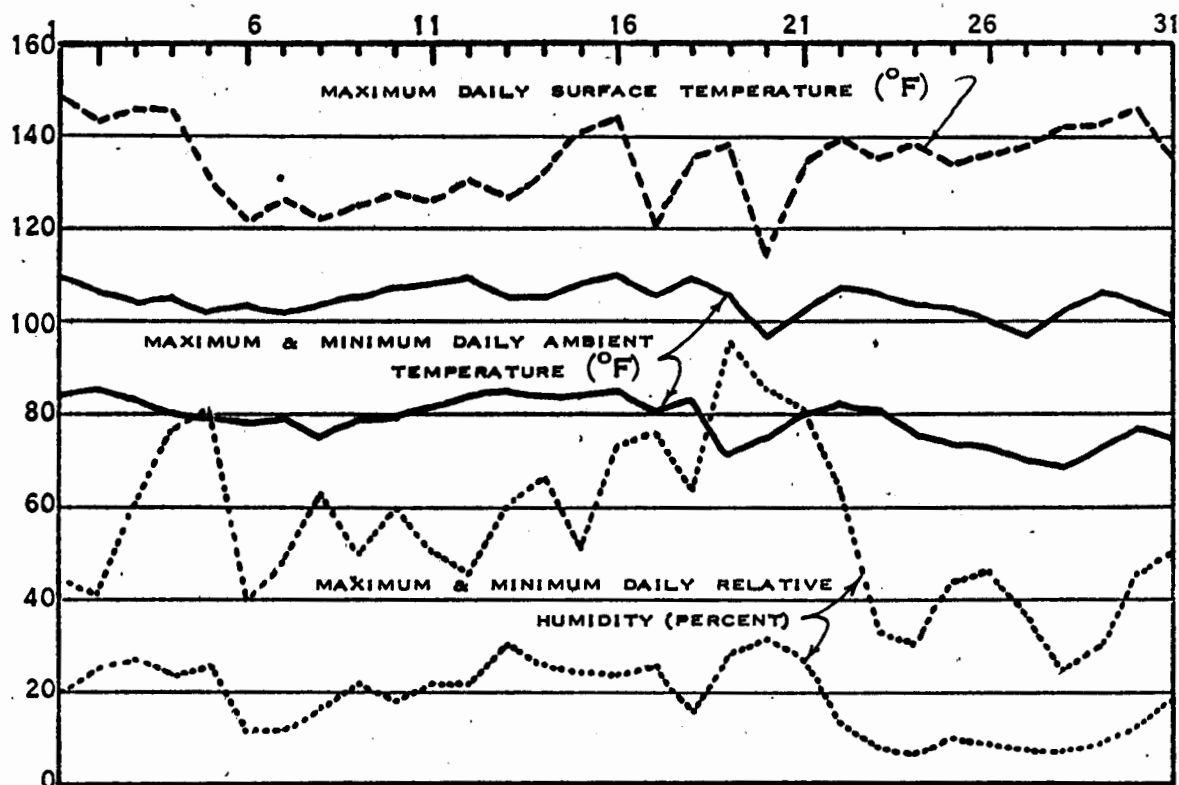
# METEOROLOGICAL SUMMARY FOR JULY 1973



AVERAGE DAILY SKY CONDITION C - CLEAR, P - PARTLY CLOUDY & CLOUDY

C C C C C P C C C C C P C C C C C C C C C C C C C C C P C

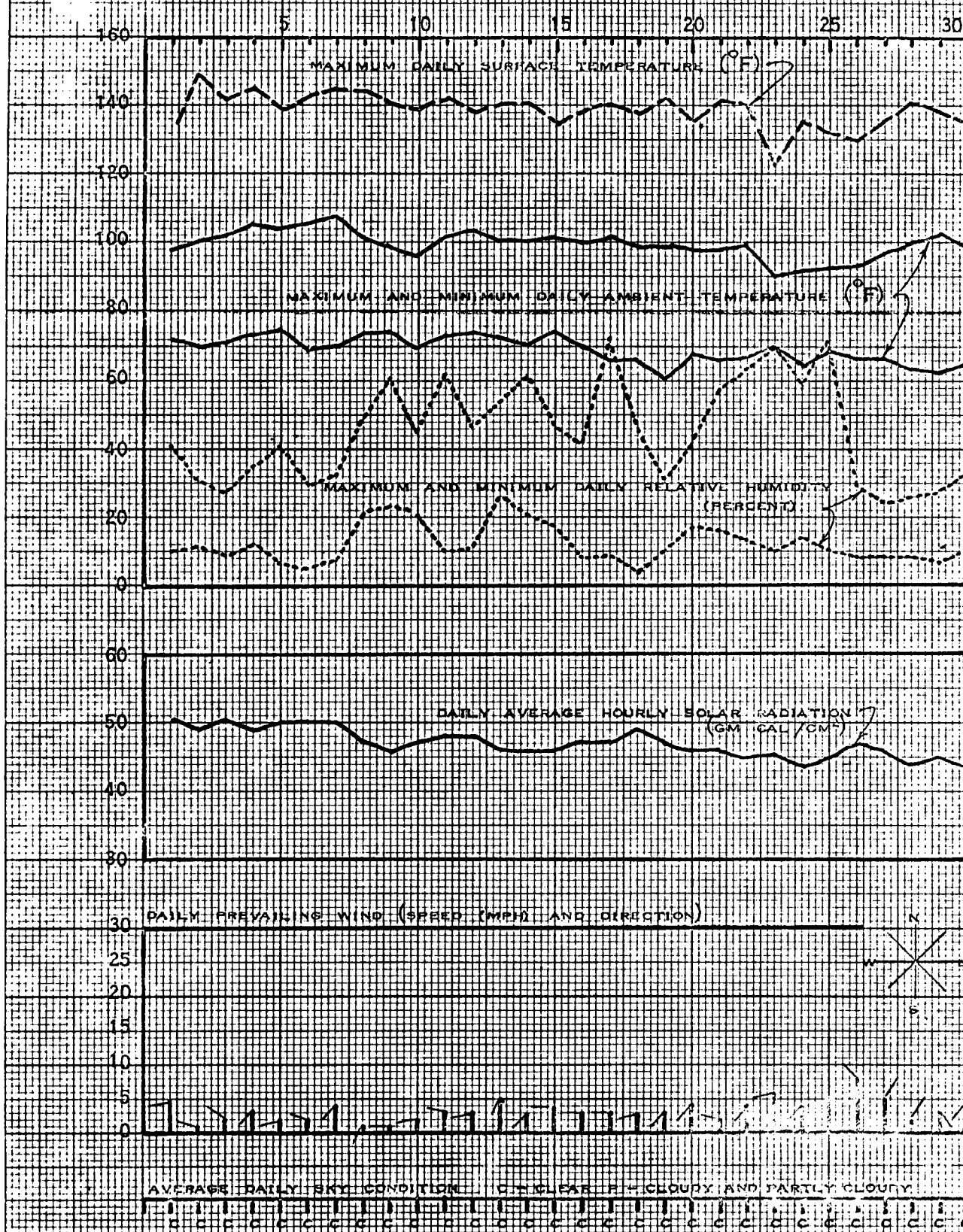
## METEROLOGICAL SUMMARY FOR AUGUST 1973

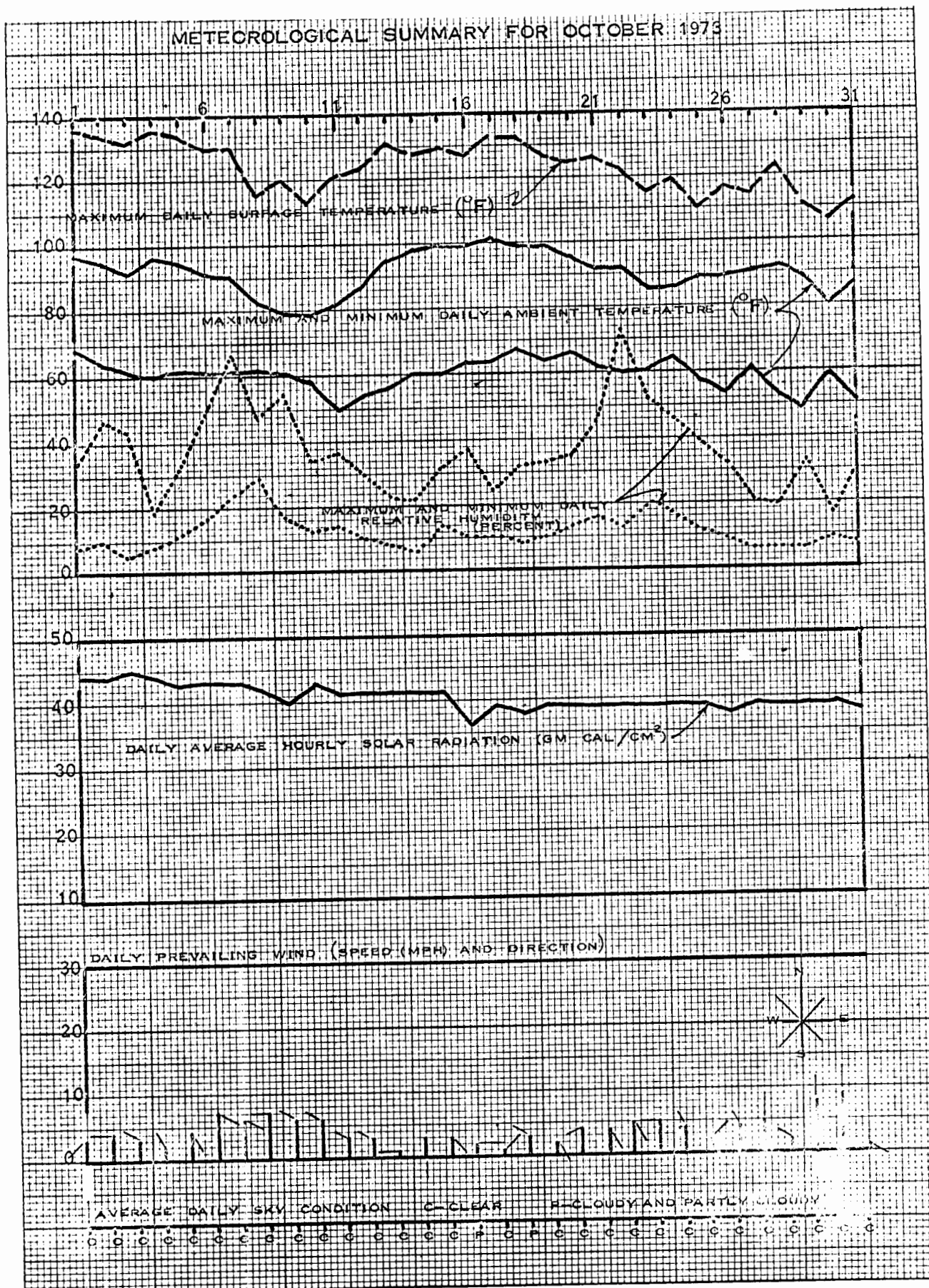


Incl 3

Page 5 of 14

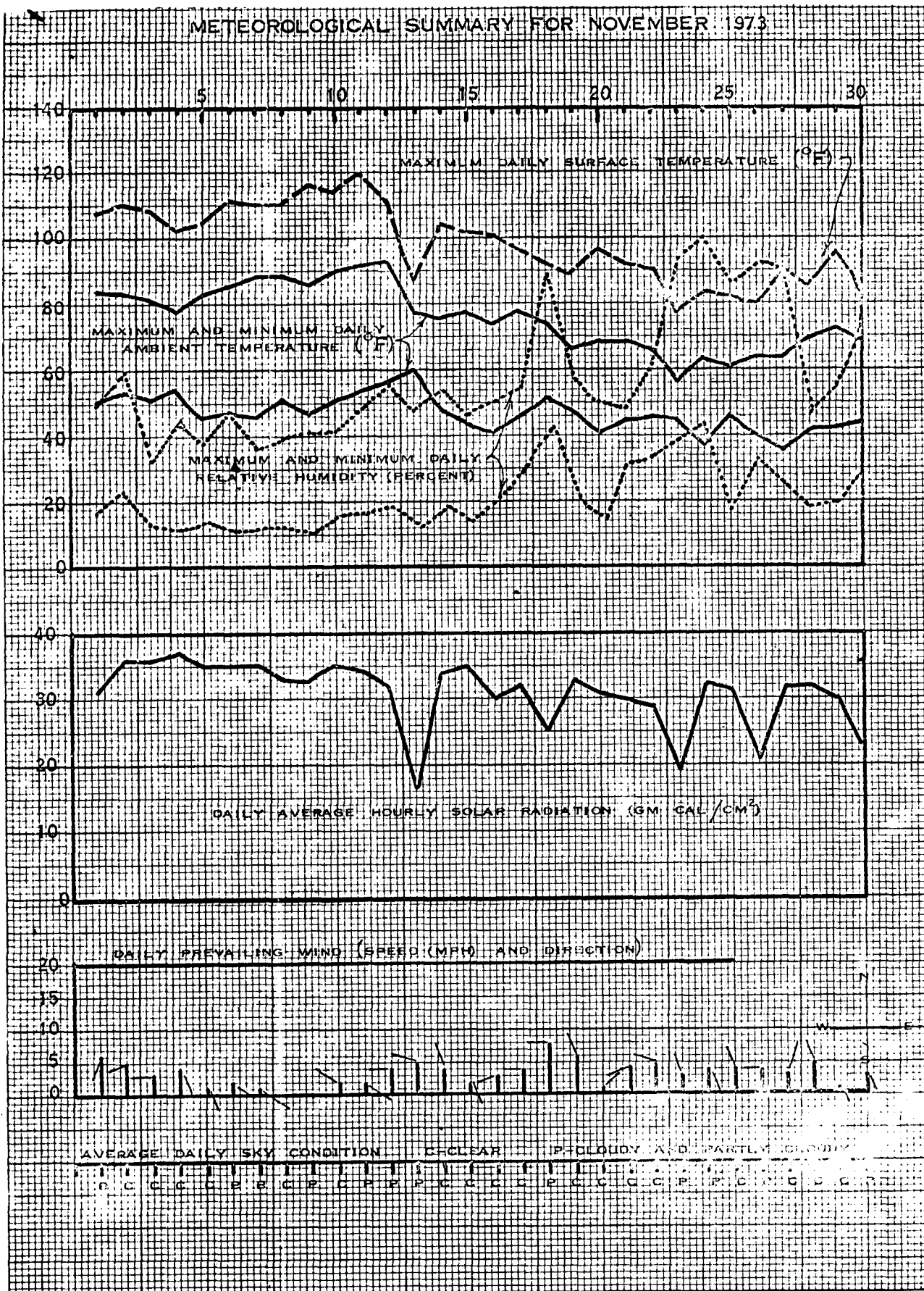
# METEOROLOGICAL SUMMARY FOR SEPTEMBER 1973



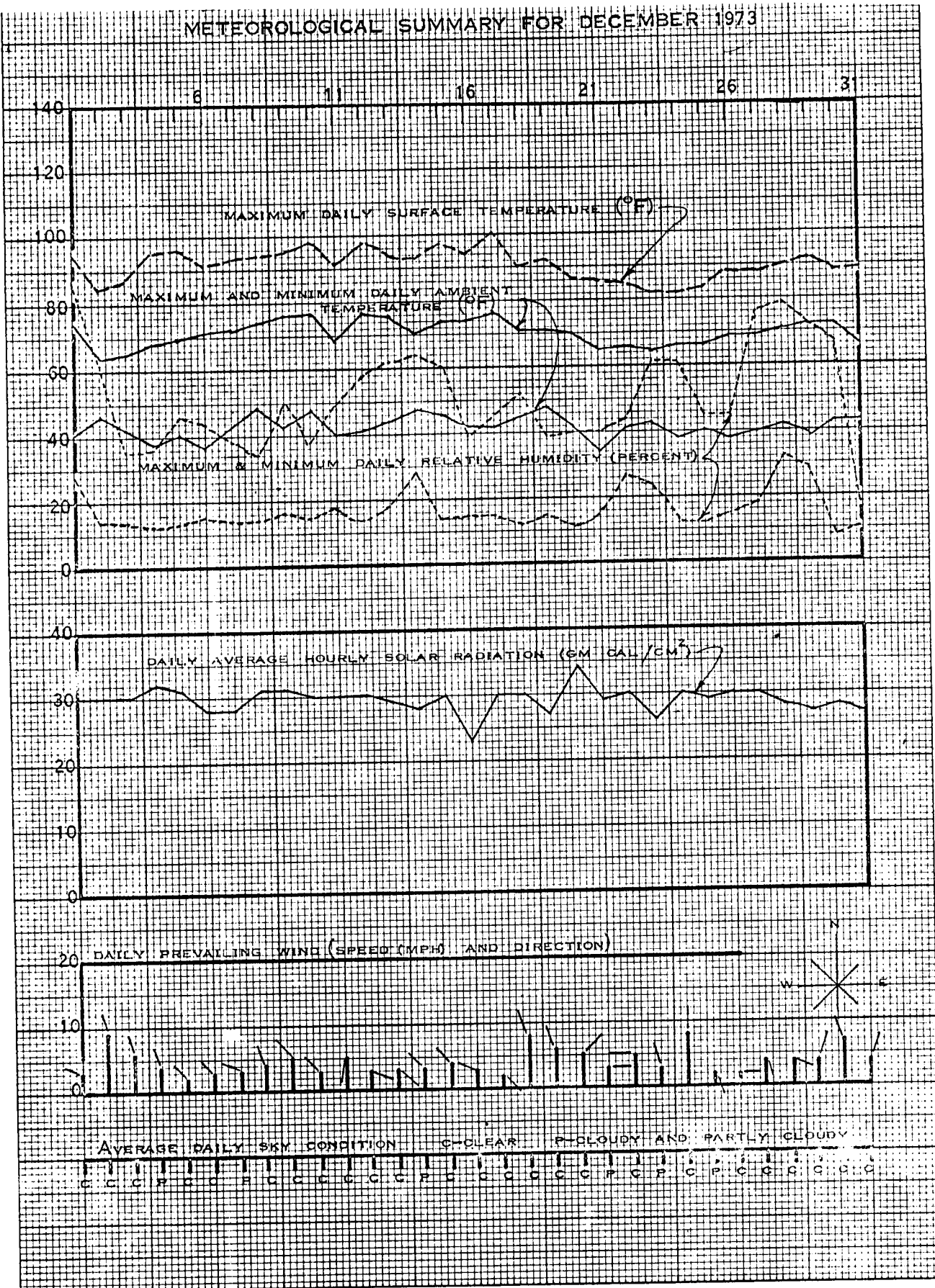




## METEOROLOGICAL SUMMARY FOR NOVEMBER 1973

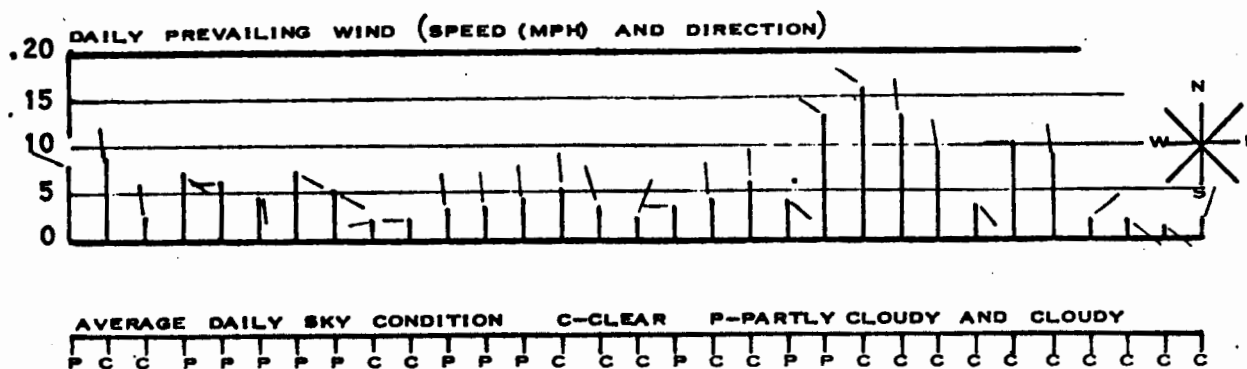
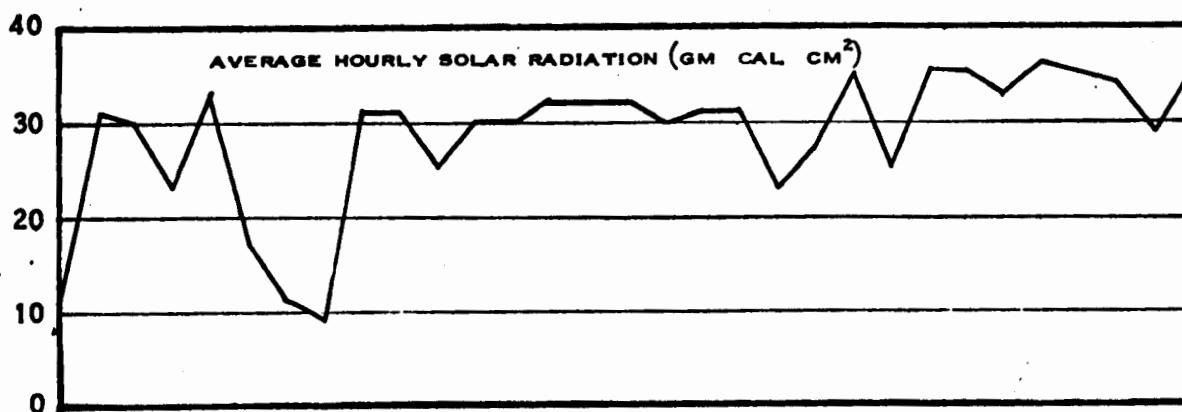
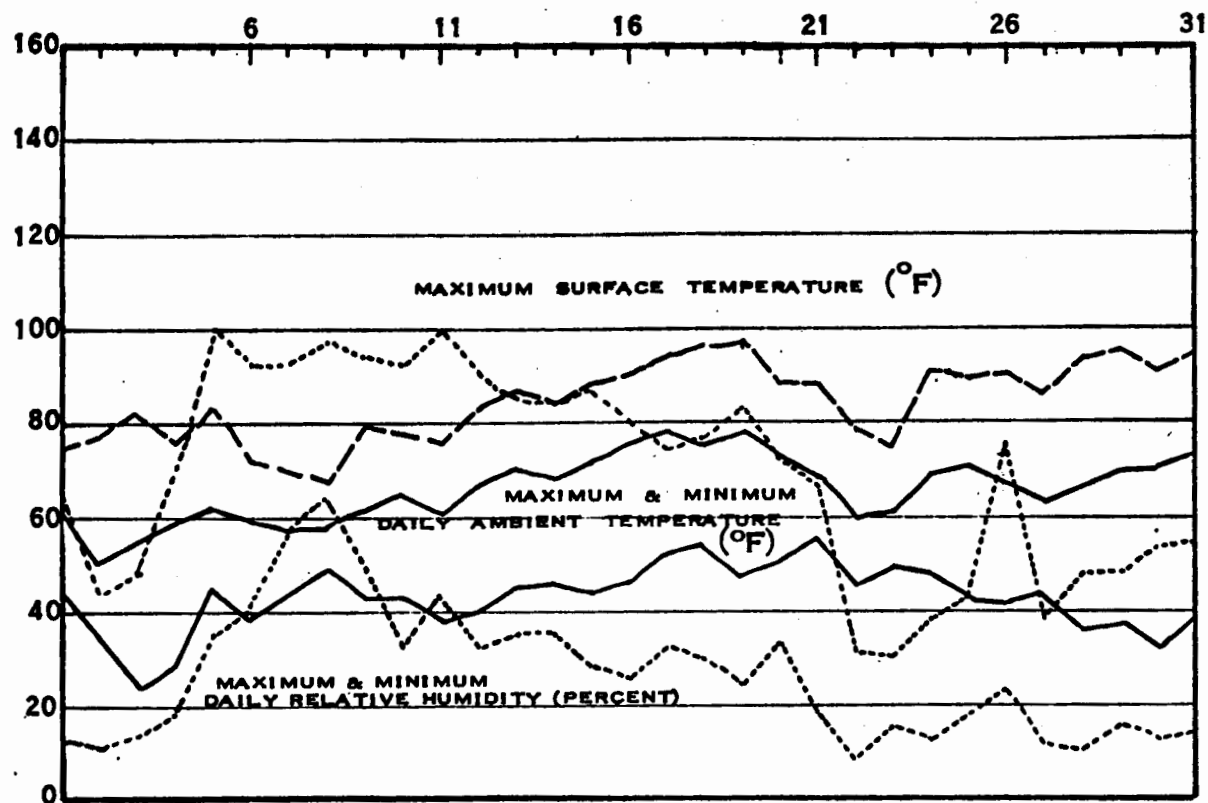


## METEOROLOGICAL SUMMARY FOR DECEMBER 1973

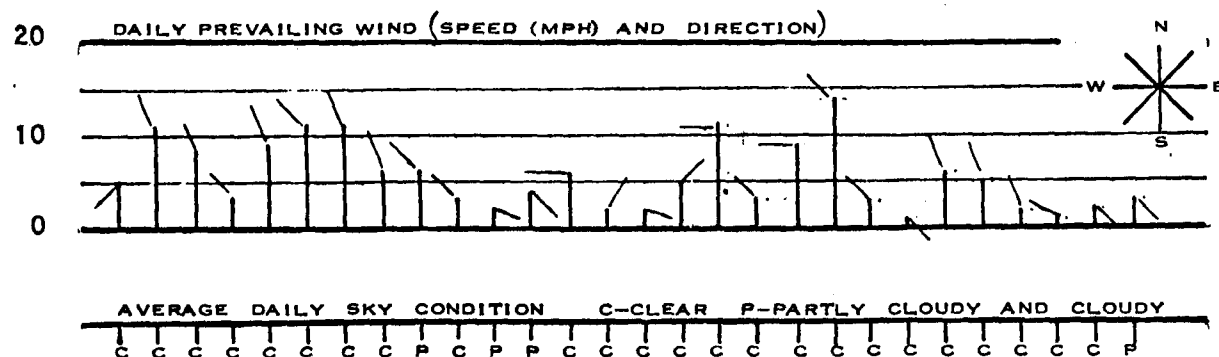
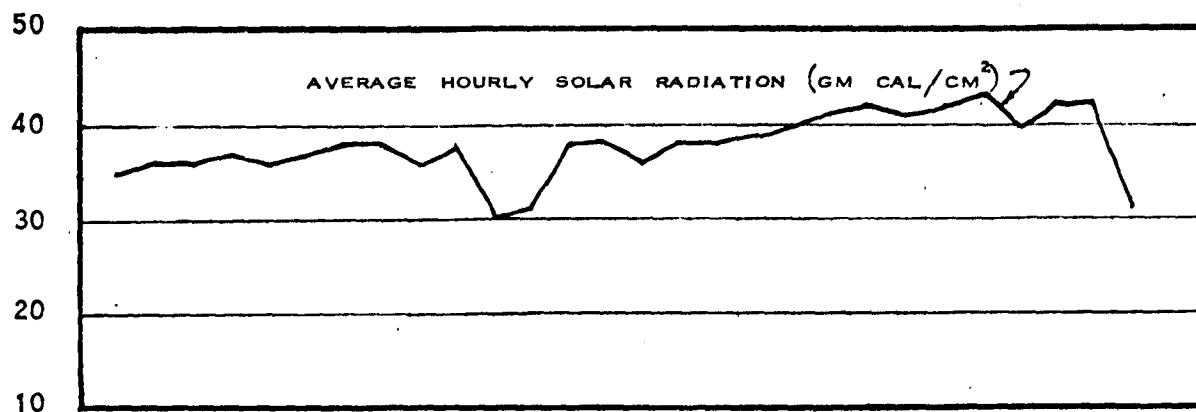
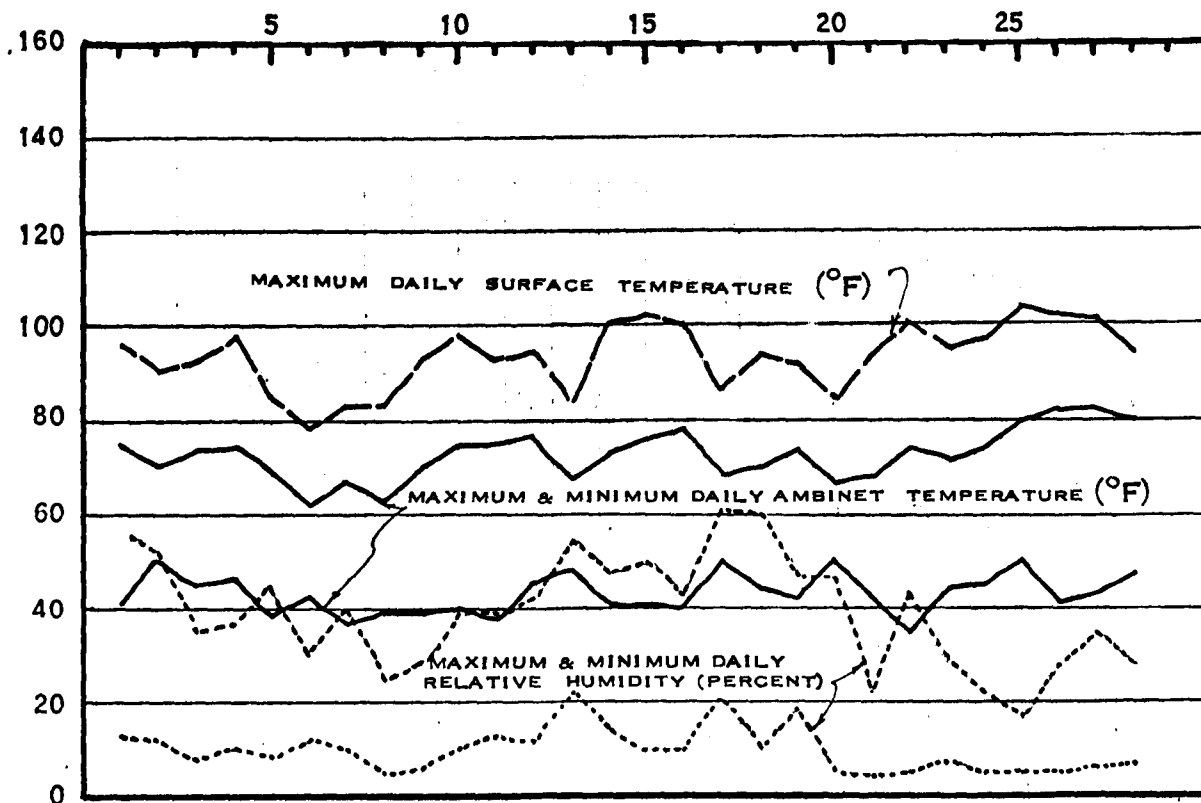




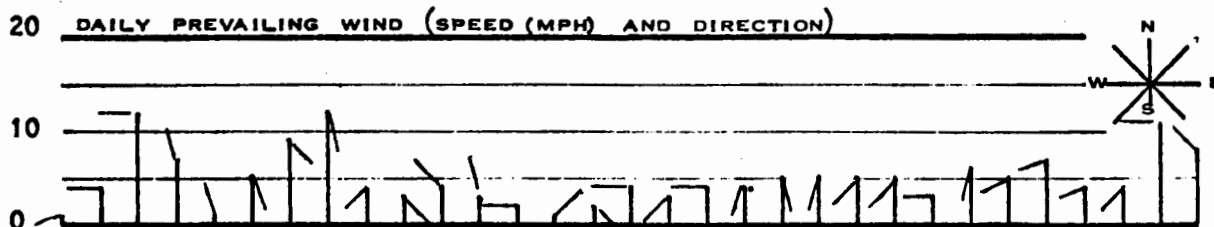
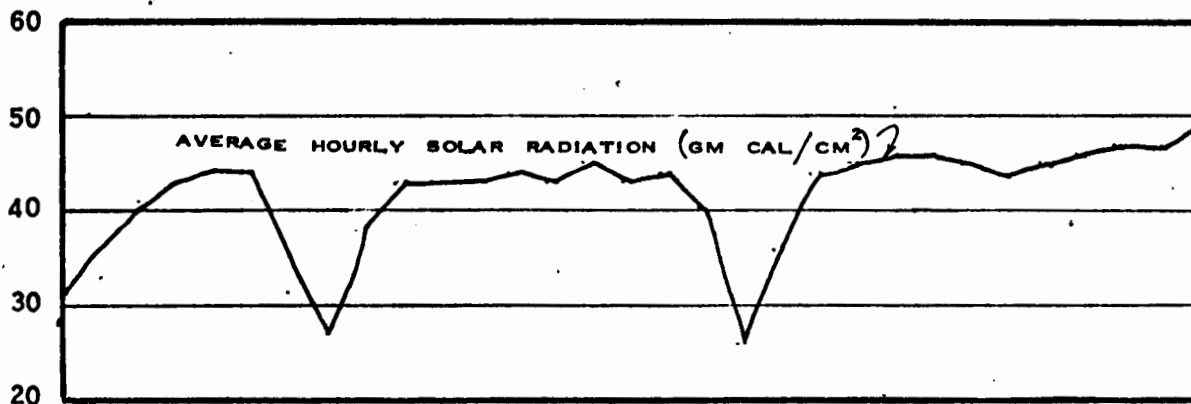
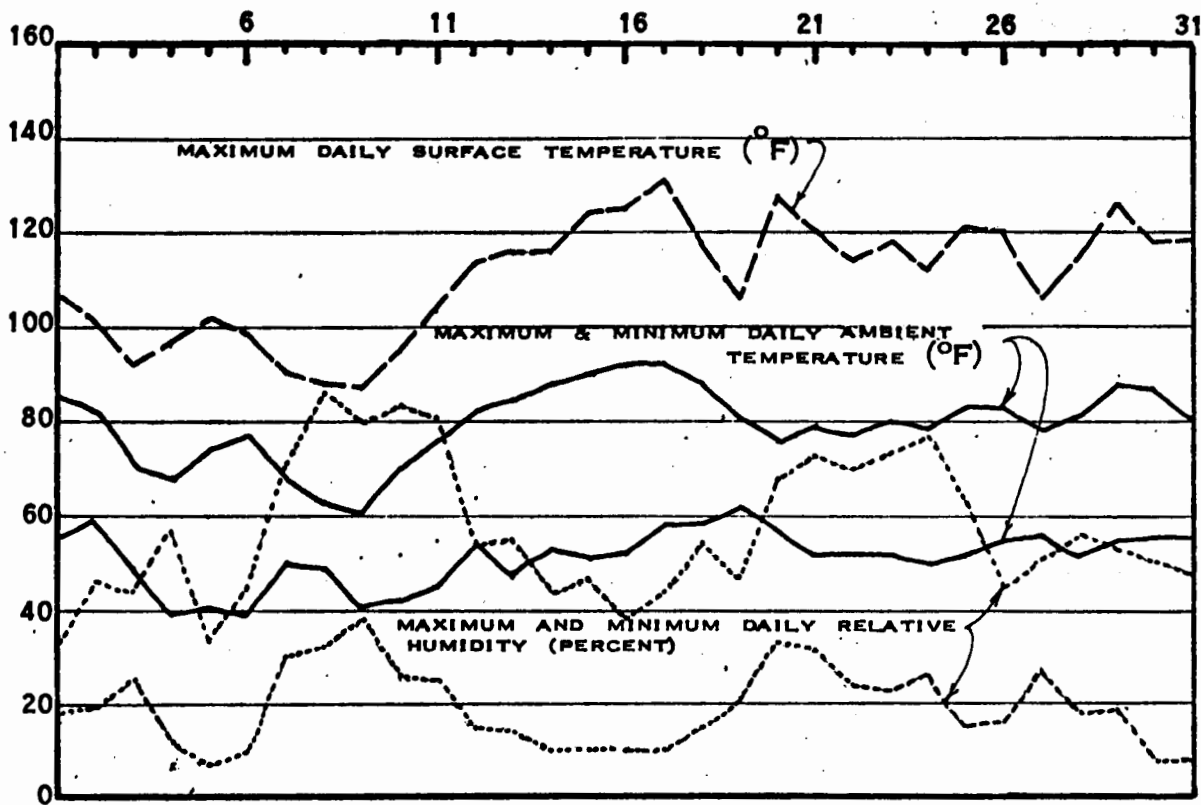
## METEOROLOGICAL SUMMARY FOR JANUARY 1974



# METEOROLOGICAL SUMMARY FOR FEBRUARY 1974

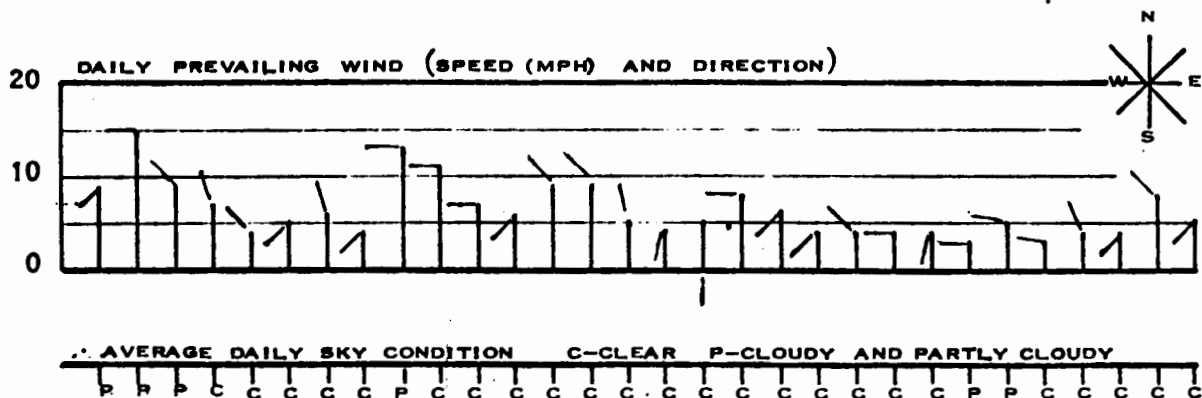
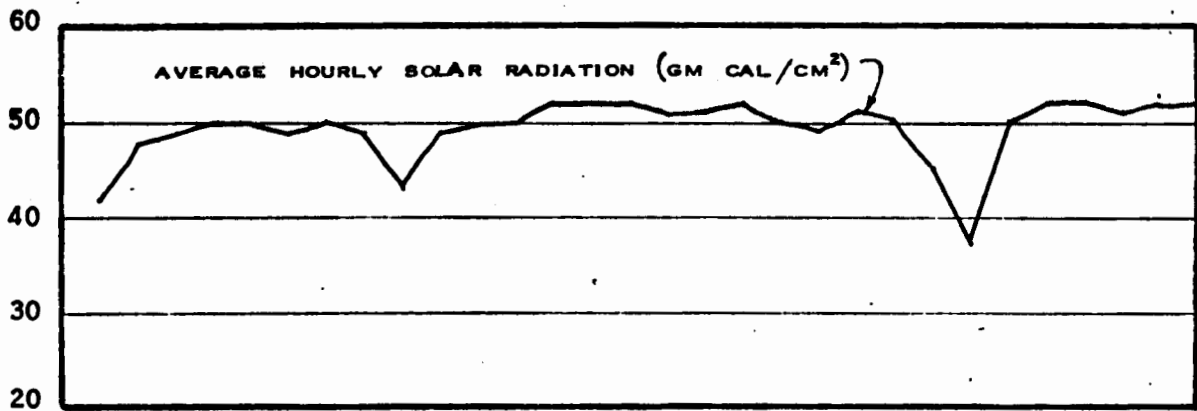
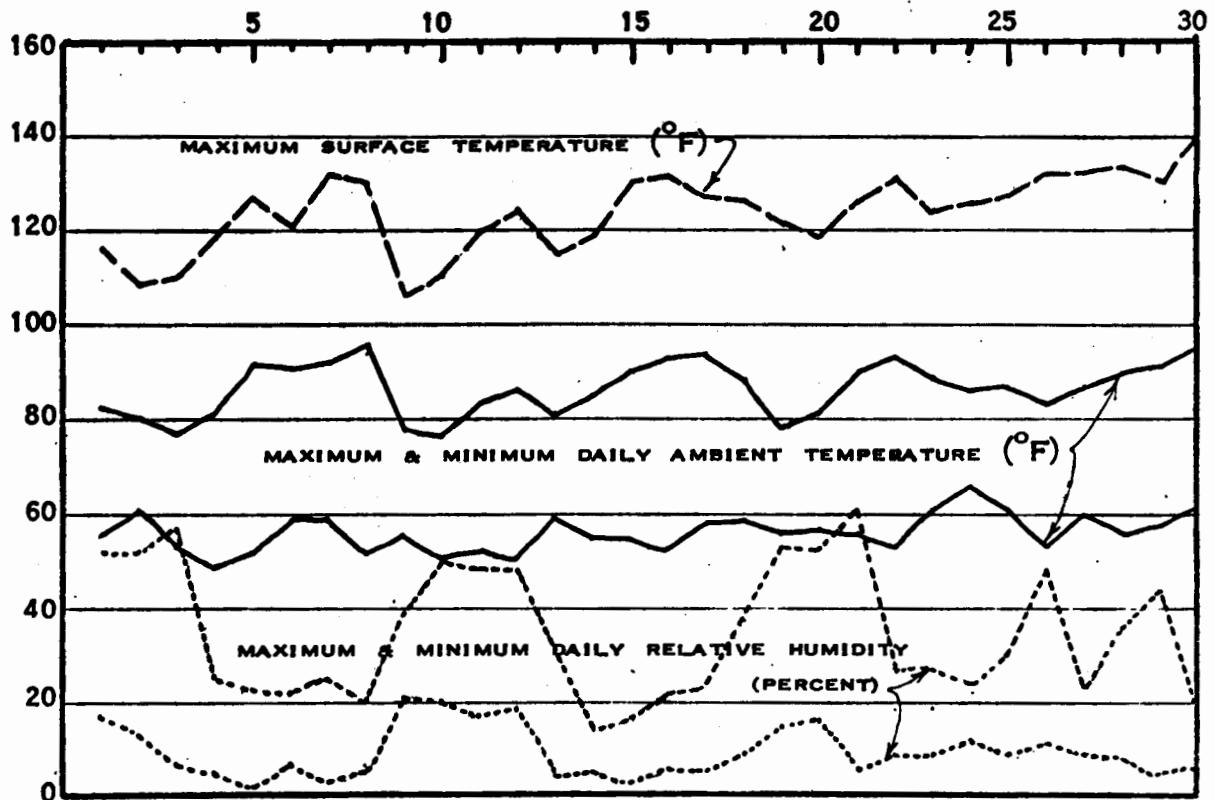


# METEOROLOGICAL SUMMARY FOR MARCH 1974

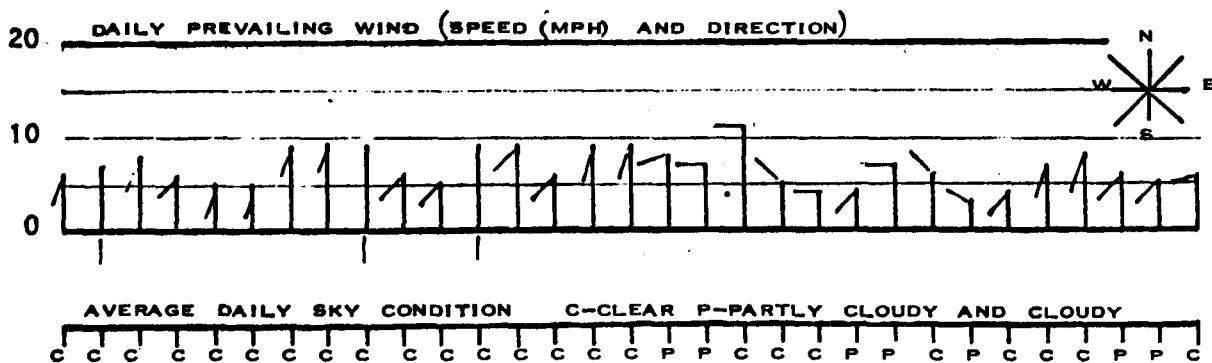
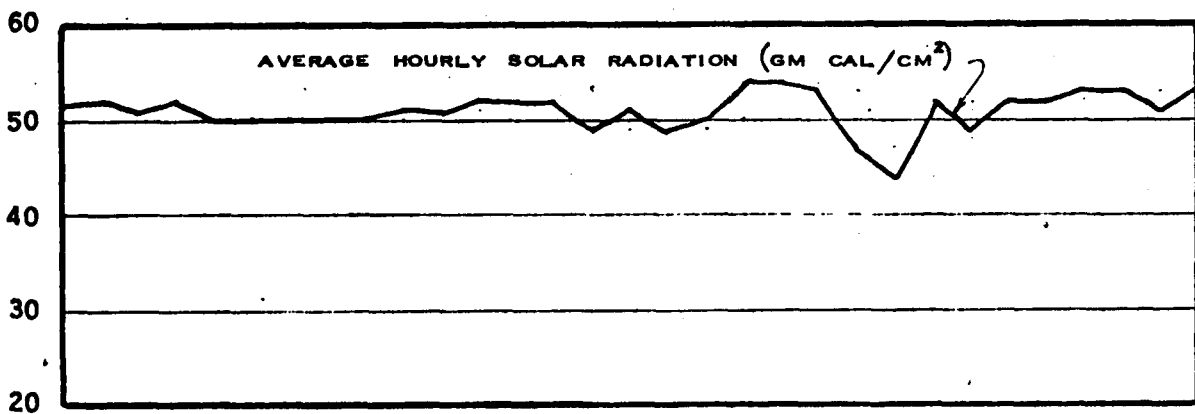
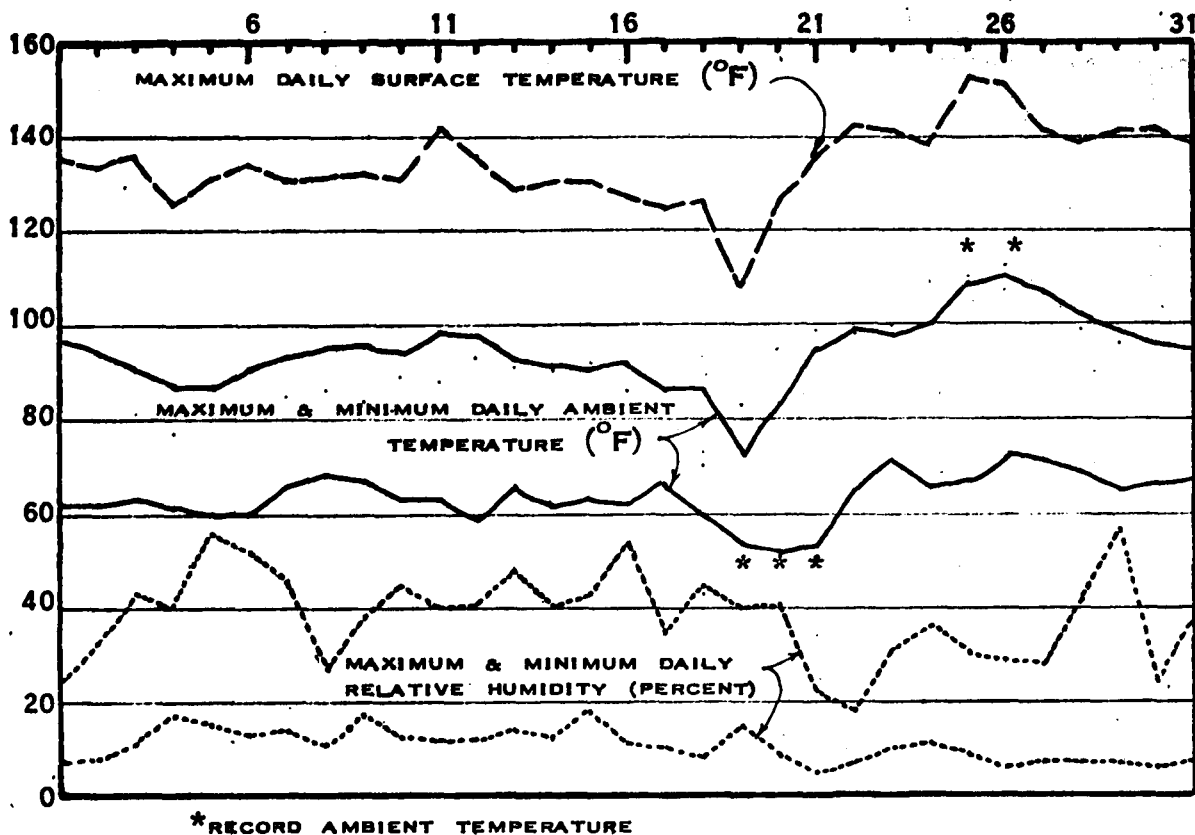


AVERAGE DAILY SKY CONDITION C-CLEAR P-PARTLY CLOUDY AND CLOUDY

# METEOROLOGICAL SUMMARY FOR APRIL 1974



# METEOROLOGICAL SUMMARY FOR MAY 1974



DISTRIBUTION LIST

<u>ADDRESSEE</u>	<u>NO. OF COPIES</u>
Commander US Army Test and Evaluation Command ATTN: AMSTE-BB US Army Aberdeen Proving Ground, MD 21005	2
Commander US Army Tank and Automotive Command ATTN: AMSTA-RHT AMSTA-QST Warren, Michigan 48090	20 2
Commander US Army Arctic Test Center ATTN: STEAC-PL-TSA APO Seattle 98733	1
Commander US Army Aberdeen Proving Ground ATTN: STEAP-MT-S US Army Aberdeen Proving Ground, Maryland 21005	1
Commander US Army Tropic Test Center ATTN: STETC-00-P STETC-TD-P P. O. Drawer 942 Fort Clayton, Canal Zone	1 1
Commander US Army Yuma Proving Ground ATTN: STEYP-ADT STEYP-MTM Yuma, Arizona 85364	1 6
Commander Defense Documentation Center for Scientific and Technical Information ATTN: Document Service Center Cameron Station Alexandria, Virginia 22314	2

Incl 4