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SYNOPTIC METEOROLOGY
MANUAL OF STANDARD PRACTICES

By

D. E. Jenne

March 22, 1954

Control Unit
Biophysics Section

HANFORD OPERATION
RICELAND, WASHINGTON

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EMERGENCY PROCEDURES

1.01. GENERAL

Emergencies which may affect all or part of the Hanford plant fall into two main classes. They are:

1. Emergencies arising from internal causes (process failure or enemy sabotage).
2. Emergencies arising from enemy action (attack by aircraft or guided missiles).

Procedures to observe at 622 Building in the event of either of the above are given in 1.02 and 1.03. A fire, an unusual incident, or an emergency necessitating abandonment of the 622 Building, are hereby classified as "Special Emergencies" and are treated in 1.04.

Fig. I

Route Map for Evacuation of
622 Building if the Direction
of Exit is West.

- (1) Arrows show route to be followed from 622 Bldg.
- (2) Total distance from 622 Bldg. to junction where caravan is joined = 2.7 miles.

EMERGENCY PROCEDURES

1.03. EMERGENCIES ARISING FROM ENEMY ACTION

Notification is received via Crash Alarm. Immediately thereafter the power house whistle in 200-W will sound warnings as follows:

Five-minute steady whistle blast is the signal to evacuate. In this case take whatever means of transportation is available and proceed at once to Staging Area No. 3 shown on the accompanying Route Map (filed only in copies 4-6). Do not wait to join a caravan.

Three-minute series of short blasts is the signal indicating an immediate attack. In this case personnel are not to leave the station, but are to seek the best, immediately available shelter at the 622 Building.

Note: In the event of a practice evacuation, personnel at 622 Building will not participate.

EMERGENCY PROCEDURES

1.04. SPECIAL EMERGENCIES

1.041. A Fire

- (1). Call the 200-W Fire Department (phone 7701). Give the Fire Department the specific location of the fire. Do not merely say "Fire" and hang up.
- (2). Use a fire extinguisher on any small fire which is readily accessible with an extinguisher.
- (3). Use the fire hose on a fire not accessible with an extinguisher or on any large fire whatsoever, whether inside or outside the building.

Whenever it is necessary to use the fire hose equipment,

- (a). Remove cover from hose box.
- (b). Remove hose and lay it straight before turning on water.
- (c). Open gate valve at west end of box.
- (d). Open valve on hose nozzle, and apply water to fire.

In the winter time, in addition to the above steps, it will also be necessary to close the riser drain valve and open the riser cut-off valve. These steps are taken after completion of (a) and (b) above.

1.042. Unusual Incidents or Circumstances

Most important of these types of emergencies are those concerning security. Anything which concerns protection or security must be treated as an emergency even though no immediate danger seems apparent. The procedure is as follows:

- (1). Collect the fullest information possible - even to the neglect of routine duties.
- (2). Phone Security Patrol in Richland (4-3251 or 4-3252) and state the details.
- (3). Write a report and submit it to immediate supervisor.

EMERGENCY PROCEDURES

1.04. SPECIAL EMERGENCIES (Continued)

1.043. Emergencies Necessitating Abandonment of the Building

The Meteorology Building should be manned at all times. It is recognized, however, that circumstances other than the foregoing could arise which would compel a lone station attendant to leave. Reasons could be personal injury or illness, or an emergency at home. In any such circumstance, personnel should observe the procedure given below.

1. Never leave the station on account of sickness or injury, except to report to 200-W First Aid. First Aid may always be summoned to the station by calling 7703 and will always furnish transportation to Richland if such is deemed necessary.
2. A lone station attendant must never leave for home in the station vehicle except for some extreme emergency at home. Even then, the attendant must be able to park the vehicle in an authorized place at the Consolidated Transportation Center and reach his final destination from there, either by transportation of his own or by contacting the bus dispatcher who will furnish transportation to any residence in Richland.
3. Whenever the Meteorology Station is abandoned (except in the case of an area evacuation) immediate supervision must be notified, regardless of the time of day or night. Then, before leaving, the building must be locked and the keys left at the 200-W Badge House.

EMERGENCY PROCEDURES

1.05 AIR-RAID PROCEDURE

1.051. Notification

Notification of an air-raid will be received at 600 Building via the crash alarm system. In addition there will be a signal, as follows, from the 200 West Power House whistle:

THREE SHORT BLASTS AND PAUSE, repeated for two minutes.

1.052. Shutdown Procedure

STOP WORK and immediately initiate steps 1-5 of the blackout procedure (1.04). Then get in the station vehicle and proceed to the T Shelter located in Building 221-T.

EMERGENCY PROCEDURES

1.06 FIRE FIGHTING PROCEDURE

Should it become necessary to fight a fire, either in 622 Building itself or in the immediate vicinity of the building, the procedure is as follows:

- (1). Call the 200-W Fire Department (phone 7701). Give the Fire Department the specific location of the fire. Do not merely say "Fire" and hang up.
- (2). Use a fire extinguisher on any small fire which is readily accessible with an extinguisher.
- (3). Use the fire hose on a fire not accessible with an extinguisher or on any large fire whatsoever, whether inside or outside the building.

Whenever it is necessary to use the fire hose equipment,

- (a). Remove cover from hose box.
- (b). Remove hose and lay it straight before turning on water.
- (c). Open gate valve at west end of box.
- (d). Open valve on hose nozzle, and apply water to fire.

In the winter time, in addition to the above steps, it will also be necessary to close the riser drain valve and open the riser cut-off valve. These steps are taken after completion of (a) and (b) above.

EMERGENCY PROCEDURES1.07 EMERGENCIES NECESSITATING ABANDONMENT OF THE 622 BUILDING

The 622 Building is to be manned at all times. It should never be abandoned unless there is a general evacuation of the 200 West area (see 1.02 and 1.05). It is recognized, however, that the station is frequently attended by only one man, and that circumstances may arise when a lone station attendant must leave. Reasons could be personal illness or injury, or an emergency at home. In any such circumstances, personnel concerned will be governed by the following three rules:

- (1) Never leave the station on account of sickness or injury, except to report to 200 West First Aid. (First Aid may always be summoned to the station by calling 7703).
- (2). Never leave for Richland in the station vehicle except for some extreme emergency at home. Even in this case, it is essential that the car be driven directly to the Dispatcher's Office at the 1131 Bus Terminal. Immediate transportation to domicile or to any other desired location will then be furnished by the dispatcher who will afterward park the station vehicle in the Richland outer area parking lot (OAPL) in the 1100 Area located off Thayer Drive. Any person driving the station vehicle to Richland may, of course, park the car at the OAPL himself if he needs no further transportation, or if he has his own transportation from there to his final destination.
- (3). Whenever the meteorology station is abandoned for any reason whatsoever (except in the case of an evacuation of the entire 200 West area) the supervisor must be notified regardless of the time of day or night, the building locked, and the keys left at the 200 West Badgehouse. The building keys are always kept on the back side of the door to the cabinet on the extreme right of the utility room.

EMERGENCY PROCEDURES

1.08 REPORTING OF STRANGE OR UNUSUAL INCIDENTS OR CIRCUMSTANCES.

Most important of these types of emergencies are those concerning security. Anything which concerns protection or security must be treated as an emergency even though no immediate danger seems apparent. The procedure is as follows:

- (1). Collect the fullest information possible--even to the neglect of routine duties.
- (2). Phone Security Patrol in Richland (4-3251 or 4-3252) and state the details.
- (3). Write a report and submit it to immediate supervisor.

SECTION 2. SAFETY AND HOUSEKEEPING PRACTICES

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SAFETY AND HOUSEKEEPING PRACTICES

2.01 SAFETY PRACTICES

Safety is part of the job at Hanford Works. Hence, all 622 Building employees are expected to cooperate wholeheartedly with the plant safety program. The following is an effective accident prevention code with which everyone should become familiar.

1. Learn your safety instructions and follow them. Observe the safety rules posted on the tower and in the pibal shed. Observe all warning signs and tags. Take an active part in safety meetings.
2. Take two seconds of "safety thought" to prevent injuries. The most frequently experienced injuries occurring to office workers are paper cuts, puncture wounds from pencils and pens, staple wounds, and wounds resulting from falls or from running into open doors and drawers. Application of a few seconds of safety thought before beginning any job will prevent most of these injuries.
3. Do not indulge in "horseplay". Leave this sort of thing to the horses. Boisterous conduct, scuffling, and practical jokes often result in injury to someone. Such conduct is prohibited.
4. Use personal protective equipment furnished for your job. Gloves and safety glasses, for example, are required for several operations in the pibal shed. Protective equipment is for your protection. Use it.
5. Eliminate or report unsafe conditions and fire hazards promptly. Develop safety consciousness. Become familiar with the job hazard breakdowns on the following pages.
6. If you do get hurt, no matter how slightly, REPORT IT and GO TO FIRST AID AT ONCE. A neglected cut, bruise, burn, blister, or scratch may become seriously infected. Minor injuries sometimes grow into major injuries because of tardiness in reporting to First Aid.

SAFETY AND HOUSEKEEPING PRACTICES.02 HOUSEKEEPING PRACTICES

All of the routine clean-up work at 622 Building is done by Janitor Service. This work includes:

1. Daily

- (a) Sweeping of floors.
- (b) Emptying of trash.
- (c) Cleaning of toilet and wash basin.

2. Biweekly cleaning and defrosting of refrigerator on Tuesday.

3. Monthly

- (a) Polishing of floors
- (b) Cleaning of the upstairs room, the elevator room, and the pibal shed.

Janitor Service does not and cannot do everything which is necessary to maintain the station in its required neat and clean condition. Therefore, the housekeeping practices listed below must be observed by 622 Building personnel.

1. Leave the quarters neat and orderly at the conclusion of each work period.
2. In wet weather, wipe shoes on the mats which are provided at each door entrance.
3. Never leave a "mess" for Janitor Service to clean up. When, for example, a person spills milk or breaks a jar the resulting mess must be cleaned up promptly and thoroughly. Do not leave this for someone else.
4. Keep all doors and unscreened windows closed. This is necessary to keep the building free of flies and insects.
5. Do not let personal belongings accumulate in the building. Newspapers, non-professional magazines, and empty milk bottles, for example, must either be taken home promptly or they will summarily be discarded.

SECTION 3. POLICIES AND PROCEDURES

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POLICIES AND PROCEDURES3.01 MAINTENANCE OF STANDARD TIME

All references to time of day at 622 Building are with respect to a 24-hour clock which is set on pacific standard (120th meridian) time. This is an invariable policy which must be followed at all times. If the plant generally should operate with clocks at variance with pacific standard time, our schedule of working hours will conform with those of the rest of the plant. Our clocks, however, will remain on pacific standard time and all records of every description will be kept on this time. All references to time of day in this manual are pacific standard, unless otherwise specified.

POLICIES AND PROCEDURES

3.02 WORK SCHEDULES

Each employee at 622 Building is assigned to either (a) straight day work, or (b) shift work.

Employees assigned to "straight days" will work Monday through Friday (40-hour week), or Monday through Saturday (48-hour week.)

Employees assigned to "shift work" will follow the shift schedule which is kept prominently posted at all times. If the shift schedule specifies "one additional day scheduled off during week", this day will always be Thursday unless:

1. Other arrangements are made in advance.
2. More than one employee is on the same shift. In this case, no more than one of them may be scheduled off on Thursday.

If Thursday is a plant-observed holiday, an employee may not, for this reason alone, be scheduled off on some other day.

Employees who are assigned to shift work are subject to change to straight days at any time, and vice versa. Such changes may be temporary, semi-permanent, or permanent--as the supervisor sees fit.

POLICIES AND PROCEDURES

3.03. HOLIDAYS.

On all plant-observed holidays, only "stand-by" personnel (three men working 8 hours each) are normally maintained at 622 building. Selection of those to work on a plant-observed holiday will be announced by the supervisor at least two weeks in advance.

POLICIES AND PROCEDURES

3.04 VACATIONS

All vacations at 622 Building are taken in accordance with the HW Office and Policy Guide number 13.1. In addition to these Company rules, the following apply:

1. A vacation schedule is prepared near the beginning of each year. The order of choice in selecting vacation dates will be in the order of decreasing seniority; i.e., the person with the most seniority selects his vacation period first, etc.
2. Ordinarily, no more than one employee may be on vacation at the same time.
3. If an employee wishes to change his vacation after the schedule is prepared, he may do so. However, he no longer retains his seniority rights and the new vacation period which he selects must be one on which no other vacation is scheduled.
4. The supervisor reserves the right to cancel a scheduled vacation whenever this becomes necessary. If this is done, however, the employee concerned retains his seniority rights in selecting a new vacation period.

POLICIES AND PROCEDURES

3.05 ABSENCES

Except in the case of personal illness or some other justifiable reason, all absences must be arranged in advance in order to be excused. Even in the excepted cases, an employee who cannot report for work when scheduled is expected to notify his supervisor at the earliest possible time. If an employee reports for work, but for some reason cannot complete his scheduled number of hours on the job, he must be governed by 1.07.

POLICIES AND PROCEDURES3.06 THE STATION LOG BOOK3.061 Entries in the Station Log Book

The station log book should contain a complete record of all pertinent non-routine occurrences of every description. The following are examples:

- (1) Records of all non-routine visitors. If there is one visitor, his name and affiliation should be given. If there are two or more visitors it is usually sufficient to give the identity of the leader and write anything which seems pertinent regarding the remaining people.
- (2) Records of all troubles encountered. Maybe the car can't be started. Maybe the teletype won't work. Maybe sickness is encountered or a piece of equipment is damaged. Details of all such events should always be written up in detail in the station log book.
- (3) Records of unusual natural phenomena - whether meteorological or not. Earthquakes, tornadoes, January thunderstorms, or June snowstorms are examples of rare events which should be written up in full detail in the station log.
- (4) Details of all telephone conversations in which pertinent meteorological or other information is discussed. In this category are calls concerning special forecasts or for information from the records of the station. Write-ups concerning such calls should give the time of the conversation, the identity of the other party, and should be explicit about the subject matter discussed.

All entries in the station log should be neatly written and clearly worded. Each item for a single shift should begin a new paragraph and should be identified by number. In the margin at the left, opposite the entries for any particular shift, should appear both the number of the shift in roman numerals (I, II, or III) and the initials of all those working the shift.

3.062 Dating the Station Log Book

The date stamp should be used exclusively for dating the book. Dates should appear both at the top of each page and below the last entry made by the #III shift.

REVISED TIME CARD EFFECTIVE APRIL 12, 1954

NUMBERS 1 THROUGH 7 SHOW ORDER IN WHICH
THE TIME CARD IS TO BE COMPLETED

① Supervisor shows number of employee's shift schedule and identifies him as a day or shift worker.

③ Supervisor checks one block (yes or no) for each day scheduled to work.

RESERVED for use by Payroll only.

⑤ Supervisor enters complete reason for absences for which pay is recommended. (See also OPG 18.1 - See VIII-I.)

② Supervisor enters the time the employee starts and quits work. (See Note 1.)

Starting Time - Line 9
Quitting Time - Line 6
Call-ins - Lines 12-10 or 5-1

⑥ Employee Signs Here.
(See Note 3.)

④ Supervisor summarizes each day's time worked or absent in these blocks. (See Note 2.)

RESERVED for use by Payroll only.

RESERVED for authorized approval for absence payment.

⑦ Supervisor Signs Here.

TIME CARD							
III-1		12-12345		J M DOE		NAME	
☒ SHIFT WORKER		LOCATION		PAY NUMBER		☐ DAY WORKER	
11- WORKED	8	8	8		8	8	8
14- ABSENT				0	8-5		
ISOLATION PAY CHECK (YES OR NO)							
YES	☒	☒	☒	☒	☒	☒	☒
NO							
HRS. WORKED	HRS. PREM.		HRS. SICK		HRS. ABSENT		HRS. SHIFT
ISOLATION	HRS. W.O.P.		HRS. O.T.		HRS. PREM. FOR HOLIDAY WORKED		HRS. PREM. FOR HOLIDAY NOT WORKED
<small>(1) INDICATE HOURS WORKED ON SCHEDULED DAYS OF REST BY PLACING A "1" OR "2" ABOVE THE APPROPRIATE DAY OF REST WORKED. (2) INCLUDE ONLY HOURS UP TO END OF PAYROLL WEEK. (3) INCLUDE ONLY HOURS AFTER END OF PAYROLL WEEK PRIOR TO QUITTING TIME. (4) SHOW HOURS ABSENT FOLLOWED BY ABSENCE SYMBOL. SEE REVERSE SIDE.</small>							
REASONS FOR ABSENCE:							
Throat infection							
AUTHORIZED APPROVAL FOR PAYMENT							
	MON.	TUE.	WED.	THU.	FRI.	SAT.	SUN.
12							
11							
10							
9	3:48	3:48	3:48		7:48		7:48
8							
7							
6	12:18	12:18	12:18		4:18		4:18
5							
4							
3							
2							
1							
J. M. Doe				A. B. Black			

- Note 1 - In locations where time clocks are used, the starting and quitting time will be shown by clock punch.
- Note 2 - Time will be summarized for each day separately. No total for the week will be shown.
- Note 3 - Where time is recorded by clock punch, the employee need not sign.

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POLICIES AND PROCEDURES

3.07 TIME CARDS, "DISTRIBUTION OF MONTHLY SALARY" CARDS, MONTHLY ATTENDANCE REPORTS

3.071 Time Cards

3.071-1 General. Blank weekly time cards are normally received along with salary checks (see 3.08). Completed cards (see 3.071-2) are deposited on Sunday of each week in a receptacle marked "Time Cards" at the Richland Bus Terminal. Responsibility for delivery of the time cards to this receptacle lies with the #2 (day) shift meteorologist (or his appointed representative) on Sunday.

3.071-2 Long-hand Entries on Time Cards

- (a) Front Side. The front side is filled out in accordance with the procedure illustrated in the sample at the left. In cases where the employee completes his work week later than the supervisor, then the supervisor will fill out the card on the days for which he can vouch and turn it over to the meteorologist with whom the employee is scheduled to complete his work week. This meteorologist will be responsible for seeing that the card is properly completed and signed.
- (b) Reverse Side. The reverse side of the time card is filled out by the employee in accordance with the procedure illustrated under the caption "PREDETERMINED COST CODE USAGE" (see opposite 3.07 P 2).
- (c) Shift Schedules. Shift schedules (see blank at the upper left hand corner of the time card) which are authorized for use at 622 Building are as follows:

I-2. Straight day. Employees on this shift schedule work from 0748 to 1618, Monday through Friday.

III-1. Standard rotating shifts for 24-hour coverage. Employees on this shift schedule are assigned to work on either "A", "B", "C", or "D" shift.

VI-34. #2 and #3 shift coverage. Employees on this shift schedule are assigned to work on either "X" or "Y" shift.

VI-46. #2 and #3 shift coverage. Employees on this shift schedule are assigned to work on either "U" or "V" shift.

It is the responsibility of the supervisor to keep posted prominently, at all times, a schedule which shows both "work" days and the "off" days for each shift for each day of the current year.

POLICIES AND PROCEDURES3.07 TIME CARDS, "DISTRIBUTION OF MONTHLY SALARY" CARDS, MONTHLY ATTENDANCE REPORTS3.072 "Distribution of Monthly Salary" Cards (P-3601-E)

These cards are filled out and signed by each exempt employee in accordance with a letter dated May 18, 1954, and signed by J. H. Roberts (filed in this manual opposite the blank side of the cost code exhibit at the right). Completed cards are due on the supervisor's desk either on the 15th of the month, or on the last scheduled day of work prior thereto.

3.073 Monthly Attendance Reports (A-273-D)

These reports are filled out and signed by each exempt employee in accordance with instructions tabulated on the back side of the form. Completed reports are due on the supervisor's desk on the last scheduled work day of each calendar month.

PREDETERMINED COST CODE USAGE

REVERSE
SIDE OF
CARD

Servicing Unit Code: 88413
Customer Unit Code: 9230
Account Classification: 12900

DATE	TIME	IN	OUT	CODE OR WORK ORDER	HRS. TO TENTHS
8	8	4	1	9230	36.0
TOTAL HOURS WORKED THIS WEEK MUST EQUAL TOTAL HRS. WORKED ON TIME CARD					36.0

DISTRIBUTION OF WEEKLY SALARY

TIME CARD

I-1
EMPLOYEE: 86
LOCATION: 04650
SHIFT: 88413
DATE: 10-5-52

DATE	TIME	IN	OUT	CODE OR WORK ORDER	HRS. TO TENTHS
8	8	4	1	9230	36.0
TOTAL HOURS WORKED THIS WEEK MUST EQUAL TOTAL HRS. WORKED ON TIME CARD					36.0

DISTRIBUTION OF WEEKLY SALARY

COST CODE NOT PREDETERMINED

REVERSE
SIDE OF
CARD

Servicing Unit Code: 9230
Work Order, Equipment No. Etc.: 1B-5100
"Foreman" or "Type-of-Service" Code: 31

DATE	TIME	IN	OUT	CODE OR WORK ORDER	HRS. TO TENTHS
3				9230 1B-5100	31
1				1B-5140	1
2				68B-2619	2
5				68C-2365	5
1	5	1		G-62425	2.5
5	5	5		129	2.5
4				1B-5102	4
3.5				1B-5154	3.5
2				1B-6815	2
4.8				68A-4717	4.8
23.5				B-64170	5.5
2				68C-2375	2
TOTAL HOURS WORKED THIS WEEK MUST EQUAL TOTAL HRS. WORKED ON TIME CARD					36.0

DISTRIBUTION OF WEEKLY SALARY

"Total Hours Worked This Week" on face of time card and total of labor distribution must agree.

Recap of Hours Worked on Each Code

Total Hours Worked (Leave blank if "trailer" card is used.)

"TRAILER" CARD

Copied From Face of Time Card

NAME: J.H. Roe
DATE: 10-5-52
EMPLOYEE: 86
LOCATION: 9230
PATROLL NUMBER: 4650-923

DATE	TIME	IN	OUT	CODE OR WORK ORDER	HOURS TO TENTHS
1				G-67033	1
5				1B-6844	5
5				1B-6843	5
5				1B-5024	5
5				68A-4717	5
7				1B-5155	7
1				1B-5103	1
1.5				1B-5157	1.5
5				68C-2499	5
TOTAL HOURS WORKED THIS WEEK MUST EQUAL TOTAL HRS. WORKED ON TIME CARD					36.0

DISTRIBUTION OF WEEKLY SALARY

SUPERVISOR: Richard Roe

Recap of Hours Worked on Each Code

NOTE: This labor distribution should not include coding of isolation pay, shift differential, overtime premium, absence payments and holiday pay.

May 18, 1954

H. A. Kornberg
W. A. McAdams
M. L. Mickelson
D. W. Pearce
J. M. Smith

EXEMPT TIME DISTRIBUTION CODING PROCEDURE

Coding exempt time distribution cards (these are the IBM size cards not the monthly attendance report) presents somewhat a problem in that due to cost closing and cut offs we cannot wait until the end of the actual calendar month to obtain this information. Therefore, will you please code these cards based on a fiscal month which will run from the 16th through the 15th of each month. Cards should be forwarded direct to Costs - Staff Departments, Room 341, 703 Building, 700 Area by no later than the 16th of each month. In the event that the 16th falls on Friday or a weekend, the following Monday will be good enough for delivery purposes.

How to Code the Cards

- A. Only three codes should be used for time actually spent on the job. These are:

10100 General Supervision
200-- (With the appropriate work identification (decimal) code if applicable). Applied Labor
19900 Unassigned Time (Optional with General Supervision)

- B. For time which you receive pay but do not actually work, use the following codes:

19400 Vacation and Holiday
19600 Absences

(Note: it is not necessary to code overtime premium or area differential)

One problem which may confuse you will be the method by which we are required to handle holiday time. If the card is being turned in for a month which has a holiday that falls either before or after the 15th of that calendar month then we should show one day as holiday time. I will admit this may not make much sense to you but it helps our bookkeeping. In the case of overtime you should still only distribute to a total of 100%. That is, if you work an extra day don't distribute 105% of your time. You should probably absorb this extra day in the largest code as shown on the example below. When coding a day's time for practical purposes we use 5% as the equivalent of one day's time. This is not exactly right but since the number of working days in every month vary this 5% figure is the easiest to use. If you want to code less than a full day, this is certainly permissible.

May 18, 1954

Please use only the right hand section of the card for coding purposes. You should fill in the servicing code block with your servicing unit code, leave the customer code blank if its the same as the servicing unit, and fill in the account class code and complete the percentage distribution. If the customer is different than the unit to which you are assigned then use their code which they should supply. Please be sure that the top of the card contains all the information requested. If by some chance you do not have a card please call this office and we will prepare a "dummy" card for your time distribution.

Now lets take a theoretical example: Mr. A. C. Case of the Biology Control Unit worked during the month of November (actually October 16th through November 15) on the following jobs:

- A. One day on the Effect of Process Effluents on Aquatic Organisms (decimal 94).
- B. One day on special work for the Technical Section (their code 5210-211).
- C. Ten days on Effect of Process Effluents on Plant and Animal Life (decimal 95).
- D. One day on Control of Algae in 107 Basin (decimal 75).
- E. Five days on vacation.
- F. One day to Spokane to attend a conference.
- G. Sick a day.

His time distribution card would then read:

A.	8320	<u> </u>	20094	5%	
B.	8320	<u>5210</u>	21100	5%	
C.	8320	<u> </u>	20095	45%	
D.	8320	<u> </u>	20075	5%	
E.	8320	<u> </u>	19400	25%	(Vacation)
F.	8320	<u> </u>	19900	5%	(Conference)
G.	8320	<u> </u>	19600	5%	(Sick)
H.	8320	<u> </u>	19400	5%	(Thanksgiving, since it falls in the calendar month of November)

You will note that even though Mr. Case worked ten days on decimal 95 we only charged 45%. What we have done here is let the largest charge absorb the difference to arrive at an even 100%.

Please remember that these instructions apply only to exempt time distribution coding and it is not necessary on non-exempt cards to code holiday, sick time, vacations, overtime premium and area differential. If you have any further questions please call my office (phone 7-4371 or 8-2351). Your use of these codes will be appreciated since they do help to simplify our work.

J. H. Roberts
General Cost Unit

POLICIES AND PROCEDURES3.08 SALARY CHECKS3.081 Weekly

Weekly salary checks are normally delivered at the 200-west badge house on Thursday of each week. Responsibility for picking up those checks for 622 Building employees lies with the #3 (swing) shift forecaster on Thursday. Whenever a holiday interferes with normal time for delivery of weekly salary checks, special arrangements will be made.

3.082 Monthly

Salary checks for exempt personnel are distributed by the supervisor on the last full banking day of each month.

SECTION 4. INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

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FIGURE 4.01. CORRECTLY-LABELED ENDS OF WIND AND TEMPERATURE CHART BOXES

SEE OTHER END FOR CHART NO.
USE THIS BOX FOR FILING

RECORD FROM 10-10-51

TO 10-20-51

FROM # 5 Vel.

METER NO. # 5 Vel.

MULTIPLY READING BY 200' Level

CHART LENGTH, 103 FEET
THE ESTERLINE-ANGUS CO., INC.
INDIANAPOLIS 6, IND., USA

(a)
For wind velocity chart
(E & A chart # 4313-C)

SEE OTHER END FOR CHART NO.
USE THIS BOX FOR FILING

RECORD FROM 1-5-52

TO 1-19-52

FROM # 3 Den.

METER NO. # 3 Den.

MULTIPLY READING BY 200' Level

CHART LENGTH, 103 FEET
THE ESTERLINE-ANGUS CO., INC.
INDIANAPOLIS 6, IND., U.S.A.

(b)
For wind direction chart
(E & A chart # 1255-C)

Instructions: Mark the ends of the chart boxes to correspond with the record tapes to be filed in them as follows:

- (1) Record dates corresponding to the period of chart record
- (2) Record the type of information which the chart contains

2½" x 1½" gummed label

SOIL TEMPERATURES

½", 15", 36" below g'nd sfc.

From: 1-14-53
To: 2-20-53

LEEDS & NORTHRUP

(c)
For soil temperature chart
(L & N chart # 35)

2½" x 1½" gummed label

AIR TEMPERATURES

3-ft. to 400-ft. levels

From: 3-3-52
To: 4-1-52

LEEDS & NORTHRUP

(d)
For air temperature chart
(L & N chart # 31)

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01. THE WIND AND TEMPERATURE SYSTEMS.4.011. The Gurley Wind System.4.011-1. Description.

The system consists of nine anemometers and four wind vanes, together with their transmitters and recorders. These are identified on the 622 Building instrument room panel as follows:

<u>Velocity</u>		<u>Direction</u>	
<u>Identification</u>	<u>Height Above</u>	<u>Identification</u>	<u>Height Above</u>
<u>Number</u>	<u>Ground Surface</u>	<u>Number</u>	<u>Ground Surface</u>
	<u>(Feet)</u>		<u>(Feet)</u>
1	400	1	400
2	350	2	300
3	300	3	200
4	250	4	50
5	200		
6	150		
7	100		
8	50		
9	7		

A complete description of the system is given in the Gurley Instruction Booklet which is filed in the "Manual of Instructions on Meteorological Instruments". References to this booklet are as follows:

<u>Subject Material</u>	<u>Pages</u>
DC anemometer instrument	3-8
AC direction instruments	9-13

4.011-2. Chart Change Procedure.

There are 13 recorder charts altogether--9 velocity and 4 direction. When run at normal speed any one chart will record for about 15 days before a change is necessary. Standard policy, however, is to change all charts at the same time. In the procedure which follows, steps (A) and (B) are the responsibility of meteorology personnel; the remainder are the responsibility of the 200 West instrument personnel.

- A. Properly label the boxes containing the new charts. See figure 4.01, (A) and (B).
- B. Get all needed information from the old tapes before they are removed.
- C. Fill all ink wells. There are 17 of these altogether; one for each of the nine velocity recorders and two for each of the four direction recorders.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01. THE WIND AND TEMPERATURE SYSTEMS.4.011. The Gurley Wind System.4.011-2. Chart Change Procedure (Continued):

- D. Loosen the drive gear retaining nut on the upper left-hand side of the tape mechanism.
- E. Roll out the old tape and cut off the unused portion to within 18 inches of the end of the recording trace.
- F. Remove the re-wind spool and the used record tape thereon.
- G. Remove the re-wind spool from the record tape. This is done by turning the spool clockwise away from the end of the tape, pulling gently to the right at the same time.
- H. Label the removed tape (direction or velocity number and level), take new tape from appropriate box, and replace with the tape just removed.
- I. Remove old cardboard spool holder in back and replace with the new tape. The new tape is oriented so that the hour figures are on the left.
- J. Insert end of tape in opening marked "Insert End of Chart Here" and continue around the recorder plate and top roller until the recording pen rests on the correct time. Be careful not to confuse A.M. and P.M. hours.
- K. Tighten the drive gear retaining nut. This is the same nut which was loosened in step (D).
- L. Replace front spool in holder and start the loose tape winding on it.
- M. Wind the tension spring to the proper tension. This is done by taking the black-handled crank at the right of each chart (at the right of the left-hand chart where there are two charts in one chart box) and inserting it in the slot plainly visible at the right between the two spools.

4.011-3. Adjustment of Chart Speed.

Normally, the charts are run at a speed of 3 inches per hour. They can, however, be run at 60 times this speed, or at a rate of 3 inches per minute. The adjustment is made by pushing the lever at the left-hand side of the chart mechanism to the "down" position. Where two recorders are in one box, the lever on the left recorder will run both charts at the same speed.

4.011-4. The Zero Adjustment.

This adjustment is located at the bottom of each velocity box and below each of the chart mechanisms. It is utilized during calm periods by sliding the adjustment dial to the right or left until the pen records zero on the chart. The chart should always be tapped slightly in order to eliminate the frictional drag between pen and chart.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01. THE WIND AND TEMPERATURE SYSTEMS.4.011. The Gurley Wind System (Continued)4.011-5. Alignment of the Wind Vanes and Calibration of the Direction Recorders:

In this job, assistance of meteorology personnel is necessary in establishing a control line. With reference to figure II, the procedure is as follows:

- A. A transit or theodolite is set on point C and the line CB established.
- B. The tower boom is rotated by the instrument men until the axis of the wind vane is centered on the line of sight CB.
- C. With the vane pointing in the direction BC it is secured in this position by means of a hollow aluminum pole with a slotted end. When not in use, this pole is kept in the 622 building instrument room. It is lain horizontally against the south wall about six feet above the floor level.
- D. With the wind vane secured in the direction BC, the necessary adjustments are made by the instrument men until both indicator and recorded register 315 degrees of azimuth.

4.012. The Leeds and Northrup Temperature System.4.012-1. Description:

The system consists of 11 thermohm installations, together with transmitting equipment and two recorders. Full descriptive material appears in the Instrument Instruction Manual under the heading "Temperature Installation". Essential information is given in the table which follows.

2000-2001

Date			Time			Location		
10-10-01	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30
10-11-01	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30
10-12-01	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30
10-13-01	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30

TOWER DATA

LAT. 46° 33' 46" N

LONG. 119° 34' 52" W

ALT. BASE 727.1 FEET

ALT. TOP 1137.1 FEET

ALT. OFFICE FLOOR 727.7 FEET

5000

1000

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01. THE WIND AND TEMPERATURE SYSTEMS.4.012. The Leeds and Northrup Temperature System.4.012-1. Description (Continued):Essential Information - Temperature Installation

<u>Subject</u>	<u>Lower Recorder</u>	<u>Upper Recorder</u>																																										
Sensing elements	3 nickel thermohms. To afford protection against corrosion the bottom two are both painted with Glyptol and wrapped with one layer of black plastic tape.	8 copper thermohms. Each is housed in a radiation shield and is aspirated by a single 200 cfm exhauster located at the base of the tower.																																										
Type of chart used	L & N number 35	L & N number 31																																										
Chart speed	1½ inches per hour	2 inches per hour																																										
Chart range	From 0 to 200 degrees F.	60 degrees. By switching ranges, however, (see 4.012-3) the chart is good for temperatures anywhere between -40 and +120 degrees Fahrenheit.																																										
Increment of one chart scale division																																												
Time scale	20 minutes	15 minutes																																										
Temperature scale	2 degrees F.	1 degree F.																																										
Rate of printing	1 point per minute	1 point each 30 seconds																																										
Printed point identification system	<table> <tr> <th><u>Point Number</u></th><th><u>Color</u></th><th><u>Level*</u></th></tr> <tr> <td>1</td><td>Red</td><td>2</td></tr> <tr> <td>2</td><td>Black</td><td>36</td></tr> <tr> <td>3</td><td>Red</td><td>½</td></tr> <tr> <td>4</td><td>Green</td><td>15</td></tr> </table>	<u>Point Number</u>	<u>Color</u>	<u>Level*</u>	1	Red	2	2	Black	36	3	Red	½	4	Green	15	<table> <tr> <th><u>Point Number</u></th><th><u>Color</u></th><th><u>Level**</u></th></tr> <tr> <td>1</td><td>Red</td><td>3</td></tr> <tr> <td>-</td><td>Blue</td><td>50</td></tr> <tr> <td>-</td><td>Black</td><td>100</td></tr> <tr> <td>-</td><td>Violet</td><td>150</td></tr> <tr> <td>-</td><td>Green</td><td>200</td></tr> <tr> <td>-</td><td>Black</td><td>250</td></tr> <tr> <td>-</td><td>Yellow</td><td>300</td></tr> <tr> <td>8</td><td>Black</td><td>400</td></tr> </table>	<u>Point Number</u>	<u>Color</u>	<u>Level**</u>	1	Red	3	-	Blue	50	-	Black	100	-	Violet	150	-	Green	200	-	Black	250	-	Yellow	300	8	Black	400
<u>Point Number</u>	<u>Color</u>	<u>Level*</u>																																										
1	Red	2																																										
2	Black	36																																										
3	Red	½																																										
4	Green	15																																										
<u>Point Number</u>	<u>Color</u>	<u>Level**</u>																																										
1	Red	3																																										
-	Blue	50																																										
-	Black	100																																										
-	Violet	150																																										
-	Green	200																																										
-	Black	250																																										
-	Yellow	300																																										
8	Black	400																																										

* Depth below ground surface (inches)

** Height above ground surface (feet)

FIGURE 4.01. CORRECTLY-LABELED ENDS OF WIND AND TEMPERATURE CHART BOXES

SEE OTHER END FOR CHART NO.
USE THIS BOX FOR FILING

RECORD FROM 10-10-51

TO 10-20-51

FROM

METER NO. # 5 Vel.

MULTIPLY READING BY 200' Level

CHART LENGTH, 103 FEET
THE ESTERLINE-ANGUS CO., INC.
INDIANAPOLIS 6, IND., USA

(a)

For wind velocity chart
(E & A chart # 4313-C)

SEE OTHER END FOR CHART NO.
USE THIS BOX FOR FILING

RECORD FROM 1-5-52

TO 1-19-52

FROM

METER NO. # 3 Den.

MULTIPLY READING BY 200' Level

CHART LENGTH, 103 FEET
THE ESTERLINE-ANGUS CO., INC.
INDIANAPOLIS 6, IND., U.S.A.

(b)

For wind direction chart
(E & A chart # 1255-C)

Instructions: Mark the ends of the chart boxes to correspond with the record tapes to be filed in them as follows:

- (1) Record dates corresponding to the period of chart record
- (2) Record the type of information which the chart contains

2½" x 1½" gummed label

SOIL TEMPERATURES

½", 15", 36" below g'nd sfc.

From: 1-14-53
To: 2-20-53

LEEDS & NORTHRUP

(c)

For soil temperature chart
(L & N chart # 35)

AIR TEMPERATURES

3-ft. to 400-ft. levels

From: 3-3-52
To: 4-1-52

LEEDS & NORTHRUP

(d)

For air temperature chart
(L & N chart # 31)

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01 THE WIND AND TEMPERATURE SYSTEMS.4.012. The Leeds and Northrup Temperature System (Continued)4.012-2. Chart Change Procedure.

Both the lower and upper charts will run for approximately one month before a change is necessary. The procedure is outlined fully on pages 5-9 of the booklet "Directions for Speedomax Type "G" Recorders". This is one of two Leeds and Northrup booklets filed in the 622 building instrument instruction manual.

Prior to the actual chart changes which are the responsibility of the 200 West instrument personnel, it is the responsibility of meteorology personnel to do the following:

- (1) Get all needed information from the old charts.
- (2) Prepare the boxes in which the old charts will be filed (see figure 4.01, C and D). See also 4.013 (3).

4.012-3. Switching of ranges (Upper Chart Only).

The total range of the instrument is from -40 to +120 degrees fahrenheit (160 degrees). The chart, however, has a span of only 60 degrees. A manual switching device is therefore incorporated to provide three 60-degree range spans as follows:

<u>Range Designation</u>	<u>From</u>	<u>To</u>	<u>Span</u>
Low	40	20	60
Middle	10	70	60
High	60	120	60

It will be noted from the above that there is 10 degrees of overlap between ranges. A red warning light located at the top center part of the recorder door signals when the temperature is within an overlapping span. The range switch is located at the upper left-hand corner of the chart assembly. A red arrow automatically points to the range on which the instrument is set.

4.013. Responsibilities of Meteorology.

Responsibilities of meteorology personnel in connection with the wind and temperature systems are as follows:

- (1) Note all troubles which develop and report these to the 200 West Instrument People. If at all possible, report troubles at times of the semi-weekly inspections. At nights and on week-ends, instrument service is available to meteorology only in case of an emergency.

all necessary data on charts as the spools unwind. All tapes should be dated with a date stamp. This should be done as soon as possible. For the wind tapes, dating is usually sufficient

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.01 THE WIND AND TEMPERATURE SYSTEMS.4.013. Responsibilities of Meteorology (Continued)

(2) Continued:

marking. For the temperature tapes, however, it is also necessary to identify the time marks corresponding to each hour of the day. In addition, for the upper chart, it is necessary to identify the 10-degree temperature lines at least once on each shift. Figure 4.013 is an illustration of a correctly marked section of the upper temperature chart.

- (3) Label chart boxes in which ~~the~~ the record tapes are filed (see figure 4.01). This labeling is done on the boxes containing the new charts, and in advance of the time that the instrument people change the charts.

1) Identify the time lines corresponding to each hour.

2) Identify the temperature lines corresponding to each 10 degrees.

3) Stamp on date once each day.

4) Identify the series from which temperatures are read hourly on the half-hour.

FIGURE 4.013. CORRECT LABELING OF TEMPERATURE CHART (L & N NO. 31)

MAR 7 - 1952

0000

2300

30

50

0200

0100

CORRECT LABELING OF RECORD CHARTS

FIGURE 4.011

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.02. THE BAROGRAPH.

4.021. Description.

This instrument is adequately described in the Friez Barograph Instruction Booklet, pages 1-4. This booklet is on file in the Instrument Instruction Manual.

4.022. Chart Changes.

Chart changes are performed each four days. They should be made on the #2 (day) shift, but otherwise the time of day is optional. Whenever a change is due a new chart is prepared by Meteorology as shown by the example in figure 4.011. The actual chart change is the responsibility of Instrument Maintenance and will be performed by Meteorology personnel only if no instrument man is readily available for the work. The procedure follows:

1. Move the pen away from the chart by means of the shifting lever located in front.
2. Release the instrument cover latch at the right and tip the cover to the left.
3. Remove chart drum from spindle by drawing straight upwards. If the drum binds on the spindle, DO NOT exert excessive pressure. A bent spindle may result. Merely allow the chart-drum to settle slowly to its position of rest and then carefully draw upward as before.
4. Wind the clock by means of the winding key in the open end of the cylinder. Wind the mechanism fully, but not too tightly.
5. Remove the old chart by pulling the chart retaining clamp out of its slot in the drum.
6. Wrap the new chart about the drum, using the instructions for tapered end charts-nonslotted clock cylinders (figure 4.012).
7. Insert chart clamp in slot and press down firmly.
8. Place drum on spindle and guide it gently down until the gears mesh.
9. Ink recording pen when necessary.
10. Rotate the drum COUNTERCLOCKWISE until the position of the recording pen corresponds to the correct time.

CAUTION: WHEN MOVING THE BAROGRAPH FROM ONE LOCATION TO ANOTHER ALWAYS USE ONE HAND TO SUPPORT IT AT THE BOTTOM.

FIGURE 4.012

INSTRUCTIONS FOR THE INSTALLATION OF CHARTS

The chart end opposite to the end with the number must be folded under. Place the numbered end of the chart in position as shown.

Wrap the chart around the cylinder until the folded end, held by the left hand, can be lapped over the nonfolded end, held by the right hand.

Make certain that the lower edge of the chart rests squarely against the flange at the bottom of the cylinder. Insert the chart clip within the folded end as shown; also, the chart clip may be installed on the outside of the folded end, as shown by the right hand illustration on the back page of these instructions.

TAPERED END CHARTS; Nonslotted Clock Cylinders

Charts with square (non-tapered) ends can be installed only on the nonslotted type of clock cylinders. Do not fold or crease either end. Place the chart upon the cylinder as shown.

Wrap the chart around the cylinder until the end held by the left hand can be lapped over the end held by the right hand.

Make certain that the lower edge of the chart rests squarely against the flange at the bottom of the cylinder, and, while holding the chart snugly in place, install the chart clip.

SQUARE END CHARTS

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.03. THE MERCURIAL BAROMETER.

This station is equipped with both a W.M. Welch Co. and a Henry J. Green Co. mercurial barometer. Either of these two instruments may be used.

4.031. Description and Use:

Descriptive material and operating instructions for the Welch instrument are contained in a booklet filed in the Instrument Instruction Manual. The same instructions are applicable to the Green instrument (see also the Green Company Leaflet in the Instrument Instruction Manual). It should be noted, however, that the Green instrument vernier scale is graduated in inches and millibars, while the Welch instrument vernier scale is graduated in inches and millimeters. One thing is very important, regardless of which instrument is being used. That is:

DON'T EVER MOVE THE BAROMETER FROM ONE LOCATION TO ANOTHER WITHOUT FIRST SCREWING UP CISTERN SCREW, TAKING BAROMETER OFF HOOK, AND SLOWLY TURNING BOTTOM UP.

4.032. Maintenance and Repair:

After about two years of continuous use, the ivory point and the mercury in the cistern should be cleaned and the instrument recalibrated. No group at Hanford Works is equipped to calibrate a mercurial barometer. For this reason, it will generally be found necessary to send the instrument to the factory for any needed maintenance or repair work.

HW-622

CORRECT LABELING OF RECORD CHARTS

FIGURE 4.011

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.04. THE THERMOGRAPH.

4.041. Description.

This instrument is adequately described in the Friez Thermograph Instruction Booklet, pages 1-2.

4.042. Chart Changes.

Chart changes are performed daily at any time between the hours of 0800 and 1200. The new chart is prepared by Meteorology as shown by the example in figure 4.011. The actual chart change is the responsibility of Instrument Maintenance and will be performed by Meteorology personnel only if no instrument man is readily available for the work. The procedure follows:

1. Move the pen away from the chart by means of the shifting lever located in the front.
2. Release the instrument cover latch at the left and tip the cover to the right.
3. Remove chart drum from spindle by drawing straight upwards. If the drum binds on the spindle, DO NOT exert excessive pressure. A bent spindle may result. Merely allow the chart drum to settle slowly to its position of rest and then draw carefully upward as before.
4. Wind the clock by means of the winding key in the open end of the cylinder. Wind the mechanism fully, but not too tightly. THIS IS AN 8-DAY CLOCK--WIND ON MONDAY ONLY.
5. Remove the old chart by pulling the chart retaining clamp out of its slot in the drum.
6. Wrap the new chart around the drum, using the instructions for square end charts (figure 4.012).
7. Insert chart clamp in slot and press down firmly.
8. Place drum on spindle and guide it gently down until the gears mesh.
9. Ink recording pen when necessary.
10. Bring the recording pen to correct time by a COUNTERCLOCKWISE turning of the drum.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 COVER4.34. THE THERMOGRAPH: (CONTINUED)4.343. Adjustments:(1) Setting the Pen to Correct Temperature.

This is done by turning the adjusting thumb nut located above the Bourdon tube -- refer to figure 4, page 10, of the Friez Thermograph Instruction Book.

(2) Regulating the Clock.

Access to the regulator is afforded by a peek-hole with a movable cover in the top of the cylinder plate. The words "FAST" and "SLOW" indicate directions for turning.

4.344. Maintenance and Repair.

The maintenance schedule shall consist of periodic dusting of the Bourdon tube, cleaning of the pen, and lubrication. This work shall be in accordance with instructions given on pages 6-8 of the Bendix-Friez Thermograph Instruction Book.

FIGURE 4.012

INSTRUCTIONS FOR THE INSTALLATION OF CHARTS

The chart end opposite to the end with the number must be folded under. Place the numbered end of the chart in position as shown.

Wrap the chart around the cylinder until the folded end, held by the left hand, can be lapped over the nonfolded end, held by the right hand.

Make certain that the lower edge of the chart rests squarely against the flange at the bottom of the cylinder. Insert the chart clip within the folded end, as shown; also, the chart clip may be installed on the outside of the folded end, as shown by the right hand illustration on the back page of these instructions.

TAPERED END CHARTS; Nonslotted Clock Cylinders

Charts with square (non-tapered) ends can be installed only on the nonslotted type of clock cylinders. Do not fold or crease either end. Place the chart upon the cylinder as shown.

Wrap the chart around the cylinder until the end held by the left hand can be lapped over the end held by the right hand.

Make certain that the lower edge of the chart rests squarely against the flange at the bottom of the cylinder, and, while holding the chart snugly in place, install the chart clip.

SQUARE END CHARTS

FIGURE 4.05

Above: The sling psychrometer.
Below: Methods of whirling the psychrometer.

① *Incorrect method.*

② *Correct method.*

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.05. THE SLING PSYCHROMETER.4.051. Description.

This instrument, illustrated in figure 4.05, consists of two thermometers mounted on an aluminum back. The thermometers are exactly alike except that the bulb of one is covered by a white muslin.

4.052. How to Whirl the Psychrometer.

Incorrect whirling may cause an undue amount of breakage of the thermometers. The psychrometer should be whirled in front of the body as in figure 4.05, (2), NOT alongside the body as in figure 4.05, (1).

The whirling should be done in a shady spot where there are no obstructions within radius of the whirling sling. The observer should stand with his face into the wind, and whirl the psychrometer as far in front of his body as possible. If the shade of the 622 Building is on the lee side of the building, try to find more suitable shade, or try to orientate the body in such a manner as to provide shade, while at the same time exposing the psychrometer to the wind.

4.053. When to Read the Psychrometer.

After whirling for about 10 seconds, quickly read both thermometers, the wet-bulb first. Repeat until two successive readings of the wet-bulb are the same, indicating that it has reached its lowest temperature. If the temperature of the wet-bulb should rise between two successive readings, the muslin will have dried and must be moistened again, and the whirling repeated. Before commencing for a second time, permit the wet-bulb to assume as low a temperature as possible.

4.054. Moistening the Wet-Bulb.

Water is used as a moistening agent and this must be kept clean. Water from rain or snow is preferable and it should be kept in a stoppered bottle. The wet-bulb is ordinarily moistened just prior to whirling. If, however, it is expected that the final wet-bulb temperature will be 32 degrees or lower, the wetting should be done at least 15 minutes prior to whirling. This will reduce the temperature of the wet-bulb without prolonged whirling.

When the temperature is high, say 100 or greater, and the humidity low, say 15% or less, the moistening should be done with pre-cooled water. This averts the possibility of premature drying of the muslin.

4.055. Renewal of Muslin.

Whenever a muslin becomes soiled, it should be replaced with a new one. Frequency of changes will vary according to the weather. However, it will practically always be necessary to make a change following a dust storm. The procedure for installation of the new muslin is as follows:

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.05. THE SLING PSYCHROMETER.4.055. Renewal of Muslin (Continued)

- (1) Place the thermometer on a flat surface, the bulb extending over the edge (figure 6.06 (1)).
- (2) Wash the muslin with clear water to free it of all sizing and starch.
- (3) Place the wetted muslin around the wet-bulb. Let about $\frac{1}{4}$ -inch of the muslin extend above the neck of the wet-bulb. Then tie a string around the neck of the bulb (figure 4.06, 2).
- (4) With another piece of string, make a single loop about $\frac{1}{4}$ to $\frac{1}{8}$ inch above the lower end of the bulb (figure 4.06-3). Then slowly tighten so that the loop slips below the end of the bulb (figure 4.06-4).

Figure 4.06. Renewal of muslin on wet-bulb thermometer.

- (5) Trim off excess string. Also cut the muslin about $\frac{1}{4}$ inch below bulb.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.06. MAXIMUM AND MINIMUM THERMOMETERS.

The U. S. Weather Bureau employs two units, each mounted on a Townsend support as shown by the upper portion of figure 4.07. ~~Note that the minimum thermometer is kept level, while the maximum thermometer is kept with the bulb end slightly lower than the opposite end. Both thermometers are inclined about 5° to the horizontal -- the bulb end being down in the case of the minimum thermometer and up in case of the maximum thermometer.~~

Figure 4.07

SET NO. 484 FOR REGISTERING EXTREMES
OF DAILY TEMPERATURE

Maximum and Minimum Thermometers provide an easy method for determining extremes of temperature over any desired period. They are in service at all meteorological and climatological stations to collect basic climatic data. In many specialized phases of agriculture a record of maximum and minimum temperatures is essential for scientific farming.

4.061. The Maximum Thermometer.

The maximum thermometer registers the highest temperature during an interval by providing a constriction in the capillary. As the temperature rises, the mercury is forced past the constriction, but the column will break at the constriction as soon as the temperature begins to fall, leaving the thread of mercury in the tube indicating its highest reading. The maximum temperature is read by tilting the thermometer so that the bulb end is inclined slightly downward, and reading the top of the mercury column. The thermometer can be set in either of two ways as follows:

- (1) By removing it from its support and, holding it firmly in the hand by the end remote from the bulb, subjecting it to a downward sweeping motion.
- (2) By whirling it without removing it from its support.

If the latter method of setting the thermometer is chosen, two precautionary measures are necessary. These are:

- (1) Start the whirling motion with the mercury thread resting against the constriction. If the thread is allowed to strike violently against the

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.06. MAXIMUM AND MINIMUM THERMOMETERS.4.061. The Maximum Thermometer (Continued)

constriction, the tube may crack at this point. Even though the crack may not extend to the surface of the tube, the thermometer will become a "retreater", and register maximum temperatures which are too low.

(2) Make sure that the thermometer is securely clamped to the support.

It will always appear as though the mercury column is broken at the constriction. Hence, in setting the thermometer, the appearance of the constriction is no indication as to whether or not the mercury columns are joined. It is obvious, however, that ~~the~~ the top of the mercury column cannot be forced down any lower than the temperature of the surrounding air.

4.062. The Minimum Thermometer.

The minimum thermometer is a spirit thermometer with a small dark index in the bore. The index is kept inside the spirit column by the surface tension of the meniscus. As the temperature falls, the index is pulled toward the bulb -- remaining stationary as the temperature rises. The minimum temperature is read from the right hand side of the index.

Setting the minimum thermometer merely involves raising the bulb and allowing the index to run slowly down the tube as far as the meniscus.

4.063. The Six-Type Thermometer.

A complete description of this instrument, and instructions for its use, are given in figure 4.08.

FIGURE 4.08

INSTRUCTIONS

For use of Taylor Six's Maximum (High) and Minimum (Low) Self-Registering Thermometer

Features of Construction

Glass bulb (2) is filled with a liquid which expands and contracts on an increase or decrease of temperature. Connecting "U"-tube (5) contains the mercury column and part of the expanding liquid, while expansion chamber (1) takes care of the increase and decrease of liquid volume due to the expansion and contraction of the liquid in bulb (2) and "U"-tube (5).

In the left-hand bore of "U"-tube (5) is the minimum "index" (6) while in the right-hand bore is the maximum "index" (4).

To read temperature registered by either index, refer to bottom edge of index.

To read temperature as indicated by either mercury column, refer to top or meniscus of column.

How It Operates

Observe left scale for low temperature reading and right scale for high temperature reading.

As the temperature surrounding bulb (2) increases, the liquid therein expands, forcing the mercury column down on the left side of "U"-tube (5) and up on the right side of "U"-tube (5), carrying with it the maximum "index" (4). As the temperature surrounding the bulb decreases, liquid therein contracts, causing the mercury column in the left side of the "U"-tube (5) to rise, carrying with it minimum "index" (6). Maximum "index" (4) remains at the highest graduation indicated during a temperature increase—while the minimum "index" (6) remains at the lowest graduation indicated during a temperature decrease.

Resetting of Indices: To reset, place the ends of the permanent magnet (3) furnished with the instrument on the surface of the "U"-tube (5) directly over the "index" to be reset, as shown, and slowly draw downward until the "index" rests on the mercury column.

Caution: Subjecting the instrument to severe vibration may cause mercury column separation, the "indices" to slip down into the mercury column, or both, resulting in erroneous readings.

To Reunite Mercury: Should the mercury column become separated, grasp the instrument firmly at the upper end, giving a number of forceful downward swings, until columns are again united.

To Release Indices: If either "index" settles into its respective mercury column, follow the above instructions. After the first few swings use the magnet to draw the "indices" out of the mercury column. If "index" (4) has been forced into expansion chamber (1) manipulate it by tapping gently, using the magnet to return it to the bore of the tube.

FIGURE 4.09. THE STANDARD PRECIPITATION GAGE.

Sectional view of gage
with principal parts labeled.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.07. THE STANDARD PRECIPITATION MEASURING GAGE.4.071. Description.

Figure 4.09 shows the instrument and a cutaway with the component parts labeled. The diameter of the collector is eight inches. The cross-sectional area of the measuring tube is one-tenth that of the collector, thus magnifying measurements ten times.

4.072. Operation During Periods of Liquid Precipitation.

1. Allow water to collect in the gage and measure its depth each hour on the hour.
2. Following the measurements which are taken at 0000, 0800, and 1600, empty the contents of the measuring tube into a bottle for Regional Survey (see 4.077).

4.073. Operation During Periods of Freezing or Frozen Precipitation.

During periods of freezing or frozen precipitation, remove the collector and measuring tube from the standard gage and bring them into the office. In addition, take one of two 8-inch square snow collector pans from the office and place it out-of-doors. Precipitation will now be collecting both in the snow collector pan and in the overflow can of the standard gage. For measurements of the water equivalent of this type of precipitation, follow the procedure outlined in 4.076.

4.074. Operation When Liquid Precipitation Changes to Freezing or Frozen Precipitation.

Effect the procedure outlined in 4.073 immediately as soon as the change of precipitation type is complete, as when rain, or a combination of rain and snow, changes completely to snow. Thereafter follow the procedure outlined in 4.076.

4.075. Operation When Freezing or Frozen Precipitation Changes to Liquid Precipitation.

Immediately bring the snow collector pan into the office and obtain the water equivalent of the precipitation which has collected in it. Use the procedure outlined in 4.076. Do not restore the collector and measuring tube to the standard gage until the next scheduled gage-emptying time (0000, 0800, or 1600).

4.076. Obtaining the Water Equivalent of Precipitation When a Measurable Portion of it is of the Freezing or Frozen Type.

The exact water equivalent is obtained only at gage-emptying times (0000, 0800, or 1600). To get it, choose one of the three plans given below, whichever is appropriate.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.07. THE STANDARD PRECIPITATION MEASURING GAGE.4.076. Obtaining the Water Equivalent of Precipitation When a Measurable Portion of it is of the Freezing or Frozen Type (Continued):

Plan 1 - For use when freezing or frozen precipitation is occurring at gage-emptying time.

1. Bring the snow collector pan into the office and replace it with another.
2. Melt the precipitation in the snow collector pan. Cover to prevent evaporation.
3. After melting is complete, pour the contents of the pan into a one-liter graduate. Obtain the precipitation water equivalent by noting the volume in cc. and applying figure 4.09-1.
4. Do nothing about the standard gage. Continue to allow the precipitation to collect in the overflow can.

Plan 2 - For use when liquid precipitation is occurring at gage-emptying time.

1. Take from the office a snow collector pan and both the collector and measuring tube of the standard gage.
2. Empty the contents of the overflow can into the snow collector pan and replace the collector and measuring tube of the standard gage.
3. Melt the precipitation in the snow collector pan. Cover to prevent evaporation.
4. After melting is complete, pour the contents of the snow collector pan into a one-liter graduate. Obtain the precipitation water equivalent by noting the volume in cc. and applying figure 4.09-1. If this precipitation is for a period longer than the preceding eight hours it will be necessary to effect the procedure outlined in 4.076-1.

Plan 3 - For use when no precipitation is occurring at gage-emptying time.

1. Bring both the snow collector pan and the overflow can into the office and allow the contents of both to melt. Cover collectors to prevent evaporation.
2. After melting is complete, pour the contents of the snow collector pan into the one-liter graduate and the contents of the overflow can into the measuring tube.
3. Use the measuring stick to obtain directly the precipitation water equivalent in the measuring tube. Obtain the precipitation water equivalent in the graduate by noting the volume in cc. and applying figure 4.09-1.
4. Return the standard gage to service either with or without the collector and measuring tube--whichever way seems appropriate at the time.

4.076-1. When the standard gage contains precipitation other than that occurring within the preceding 8-hour period and either plan 2 or 3 is applicable, proceed as follows:

- A. Use as the correct water equivalent of all precipitation since the last time the standard gage was emptied, the depth (H) shown by the

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

measuring stick when inserted in the measuring tube.

- B. Compare H with h, the latter being the sum of all amounts for the same period obtained from the snow collector pans.
- C. Prorate the difference (H - h) equally between each of the 8-hour periods since the standard gage was previously emptied.
- D. When steps (A), (B), and (C) have been taken, throw away the water from the standard gage. Bottle for Regional Survey all water appearing in the liter graduate.

4.076-2. Criteria for determining the correct procedure in 4.073-4.076 when different types of precipitation are observed simultaneously.

- A. A storm of any type precipitation (snow, for example) is considered as remaining of that type through any transition period of a combination of types (snow mixed with rain, for example) until the storm changes entirely to the new type (rain, for example).
- B. A storm which begins as a combination of two or more types of precipitation is considered to be of whatever single type to which it eventually changes. A snow collector pan should be placed out-of-doors as soon as such a storm begins. This is to take care of the eventuality of the storm changing into the freezing or frozen types.
- C. A storm which begins as a combination of two or more types of precipitation and never changes into a single type is considered to be:

- (1) Liquid, if that is one of the types occurring.
- (2) Freezing, if liquid is not one of the types occurring.

4.077. Collecting Precipitation Samples for Regional Survey.

Collecting of samples for Regional Survey involves little more than bottling the water equivalent of precipitation rather than throwing it away. Samples are collected at the regular times for gage-emptying (0000, 0800, and 1600). Bottles are furnished by Regional Survey.

Ordinarily, each gage-emptying is in a separate bottle. Such procedure, however, is not always practical. If, for example, rain fell from 0700 to 1200, it would be impractical to separate that which occurred prior to 0800 from that which occurred afterward. In such a case, the water in the gage at 1600 should be poured in with the sample collected at 0800.

All samples collected for Regional Survey should be properly identified with a label (Form R-2829). Examples of correctly marked labels are posted in the instrument room.

FIGURE 4.12. EXAMPLE OF CORRECTLY LABELED SNOW-RAIN RECORDER CHARTS

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.08. THE RECORDING PRECIPITATION MEASURING GAGE.

4.081. Description.

This is a weighing-type gage. Figure 4.11 shows all principal parts except the specially designed collector of approximately 18 inches diameter. This collector reduces the capacity of the gage from 6 inches for which it was originally designed, to 1.2 inches. The reduced capacity magnifies the measurements such that one inch of precipitation is equal to five inches of chart. The time scale corresponds to one revolution of the chart drum in 24 hours. For other descriptive material, refer to the "Manual of Instructions on Meteorological Instruments" under the heading "Stevens Recording Precipitation Gage".

4.082. Purpose.

The sole purpose of the instrument is to collect data on precipitation intensity. The standard gage is the source of all figures relating to monthly, daily, and hourly amounts.

4.083. Chart Changing.

4.083-1. Labeling of Charts.

Figure 4.12 shows the information which is written on a chart both before its installation on the chart drum and after its removal therefrom.

4.083-2. Responsibility for Changes.

The actual chart changing is the responsibility of the 200 West instrument people. Labeling and procuring the charts is the responsibility of meteorology personnel.

4.083-3. Precautions.

The change procedure (4.083-5) involves lifting which, for safety reasons, should be done only when two men are available.

4.083-4. Frequency of Changes.

Steps (A), (E), (I), (K), and (L) of 4.083-5 are accomplished weekly. These steps do not involve the actual removal of one chart and the installation of another. The remaining steps which do include the changing of charts are accomplished by the instrument people only when they are so directed by meteorology personnel and are given a new chart correctly labeled as per figure 4.12.

4.083-5. The Change Procedure.

- A. Remove padlock and eye-pin. The key to the padlock is kept inserted at all times.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.08. THE RECORDING PRECIPITATION MEASURING GAGE.4.083. Chart Changing.4.083-5. The Change Procedure (Continued):

- B. Tip back the hinged collector.
- C. Remove the bucket and empty it.
- D. Replace bucket and collector.
- E. Raise the housing about 10 inches until it catches. This requires two men.
- F. Pull out the pen release arm.
- G. Remove the old chart.
- H. Substitute the new chart, matching the holes in the chart margin with the pins on the edge of the drum. Lap the chart ends with the terminal edge uppermost, and match the graduation lines. Secure the chart with a spring band at each margin.
- I. Set the pen for time by turning the drum in a counter-clockwise direction. Ink pen whenever necessary.
- J. Set the pen to zero on the chart by means of the adjusting screw (part 21 in figure 4.11).
- K. Wind the clock. Be sure to wind both springs equally.
- L. Lower the housing and replace the eye-pin and padlock. Leave key in lock.

4.084. Maintenance and Repair.

The maintenance schedule shall consist of the following:

- 1. Providing a drop of oil to the crown gear teeth and to the pen arm pivots each six months.
- 2. Lubricating the clock once each year. Only high-grade watch oil should be used.
- 3. Checking the instrument for level and for accuracy. This should be done every six months.

4.085. Calibration.

Whenever calibration is necessary, it should always be done with the apparatus in level position. The table below supplies the necessary data.

<u>Volume of</u> <u>Water (cc)</u>	<u>Equivalent</u> <u>Weight (Pounds)</u>	<u>Desired Reading</u> <u>of Chart (Inches)</u>
810	1.79	0.20
1620	3.57	0.40
2430	5.36	0.60
3240	7.14	0.80
4050	8.93	1.00

1. Recorder base
2. Leveling screw leg
3. Leveling vial
4. Oil damper pot
5. Cam weight
6. Cam
7. Cam pulley
8. Bucket platform support rod (3)
9. Bucket platform support rod (3)
10. Bucket platform support rod (3)
11. Housing guide rod

**Figure 4.11. CUTAWAY OF
LEUPOLD AND STEVENS
RECORDING PRECIPITATION
MEASURING GAGE WITH
PRINCIPAL PARTS LABELED.**

12. Main weighing lever
13. Small weighing lever (2)
14. Weighing lever supporting cable
15. Supporting cable collar
16. Weighing lever support rod (3)
17. Support bracket
18. Chart drum
19. Pen
20. Pen arm
21. Pen adjusting screw
22. Pen release arm

4.09. PILOT BALLOON EQUIPMENT.

4.091. Description and Use.

The pilot balloon equipment consists of a shed (622-C Building) and various other items described herein which are necessary in obtaining information on the direction and speed of the winds aloft. The shed itself is divided into the inflation and observation portions. Above the latter are four hinged roof sections, the operation of which is described in 4.093.

4.092. The Theodolite.

4.092-1. Description.

Figures 4.13 and 4.14 are illustrations of the theodolite with principal parts labeled. The main element is a telescope with a magnifying power of about 25 diameters. It is so arranged that the objective lens may be rotated 360 degrees around a vertical axis, and approximately 290 degrees around a horizontal axis. Readings of the elevation and azimuth angles are made from vertical and horizontal scales. The telescope is operated by means of vertical and horizontal tangent screws which also serve as verniers. The theodolite is equipped with lights for illuminating the scales and cross hairs for night observations.

4.092-2. Leveling.

The instrument is set with the feet of the tripod oriented in such a manner that the top of the mounting head looks to be nearly level. Further leveling is accomplished with the leveling screws as follows. The head of the theodolite is turned so that each spirit level is parallel to an imaginary line connecting two diagonally opposite leveling screws (figure 4.15 - top). Each diagonally opposite pair of leveling screws is then turned in opposing directions as illustrated in figure 4.15 until the spirit level parallel to each pair of screws is level. The leveling screws should be kept snug, but never tight. When the leveling procedure is finished, the head is turned through 360 degrees, during which operation the levels are checked in several positions to see that the instrument is level in every direction. If not, an instrumental error is indicated, and the levels need adjusting (see 4.092-4A).

4.092-3. Orientation.

After the theodolite is leveled, it is oriented by engaging the horizontal tangent screw on the azimuth of one of the reference points of figure 4.15-bottom. The head of the theodolite is turned, with the base plate unclamped, so that the reference point is centered in the field of view. Then the base plate is clamped and the fine adjustment necessary for centering the reference point exactly is done with the slow-motion screw.

4.092-4. Setting Up Over a Point.

Should it become necessary to set up the theodolite over a specific point as exemplified in figure 4.16, the procedure is as follows: The instrument

Figure 4.13. THE THEODOLITE WITH PRINCIPAL PARTS LABELED. This is a view looking into the objective lens.

111 8 5 3 6

Figure 4.14. THE THEODOLITE WITH PRINCIPAL PARTS LABELED. This is a view looking into the eye-piece.

Position and process for leveling theodolite. Lines AB and CD are parallel; lines WX and YZ are parallel; if leveling screws are turned in direction of r and r' , the bubble in level (AB) moves to the right; if turned in directions l and l' , the bubble moves to the left.

FIGURE 4.15 - Top: Leveling the theodolite. Bottom: Layout sketch of reference points available for orientation of a theodolite set up on the observation platform of the 622 pilot balloon shed.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.09 PILOT BALLOON EQUIPMENT4.092 The Theodolite4.092-4 Setting Up Over a Point (Continued):

is set with the tripod feet pushed firmly into the ground in such a manner that the mounting base looks to be nearly level and the plumb bob point is within a lateral distance of, say 1/4 inch, of the point. Then, using the procedure described in 4.092-2, the leveling screws are turned until each pair of spirit levels is approximately level. With the leveling screws still loose, the head is then shifted until the plumb bob is exactly over the point. Further adjustment of the leveling screws should not alter the position of the plumb bob. The instrument is now ready for orientation.

4.092-5. Determination of Azimuth:

If no reference points are available for orienting the theodolite, or if it is desired to check the azimuth of one or more reference points, then orientation is best determined by (a) observing the sun at 1200 true solar time, or by (b) observing polaris at elongation or culmination.

A. Observing the Sun at 1200 True Solar Time.

When the sun is observed at this time it will be directly over the observer's meridian; that is, directly south of the observer. The only problem, then, is to get true solar noon into terms of local (Pacific) standard time. This is done very simply by application of the formula:

$$LST = TST + M - (\text{Equation of Time}) \text{ -----(1)}$$

where LST and TST are respectively, local standard time and true solar time. Since solar noon is specified, TST is, in terms of the 24-hour clock, equal to 1200.

M has the value 4D minutes where D is equal to the longitude of the observation point minus the longitude of the standard meridian in degrees.

The equation of time is given by figure 4.17.

At the 622 Building the longitude is 119.581 degrees. The standard meridian is the 120th for all points in the Pacific time zone. Equation (1) therefore reduces to:

$$\begin{aligned} LST &= 1200 + 4 (119.581 - 120.000) - (\text{Equation of Time}) \\ &= 1200 - 2 \text{ minutes} - (\text{Equation of Time}) \\ &= 1158 - (\text{Equation of Time}) \text{ -----(2)} \end{aligned}$$

FIGURE 4.16. Centering theodolite using plumb bob.

FIGURE 4.17. Equation of time

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.09 PILOT BALLOON EQUIPMENT4.092 The Theodolite4.092-5. Determination of Azimuth.A. Observing the Sun at 1200 True Solar Time (Continued):

On March 16, for example, the equation of time has a value of about minus nine minutes. Therefore, true solar noon on this date would come at 1158 - (-9 minutes) = 1158 + 9 minutes = 1207, Pacific standard time. After this has been determined the theodolite is leveled, the base plate clamp is loosened, and the azimuth angle is set at 180 degrees. This azimuth setting is retained throughout the orientation procedure, any necessary movement of the telescope being accomplished by moving the base plate itself. With the sun centered in the cross hairs of the telescope one minute before the determined time of solar passage over the meridian, the base plate clamp is tightened and the image of the sun is kept in the cross hairs by the use of the slow motion screw and the vertical tangent screw until the exact time when the sun is over the meridian. At that time the theodolite is properly oriented with the 0-degree azimuth reading indicating true north.

Note: Whenever the theodolite is directed at the sun, the objective lens is covered by smoked glass or over-exposed film.

B. Observing Polaris at Elongation or at Culmination.

The star polaris, when observed at either upper or lower culmination, is exactly on a line of sight drawn between the observer and true north. It is customary, however, to observe polaris at either eastern or western elongation. If the orientation is made at one of these times a minimum error is introduced because the rate of change of variation with respect to time is then at a minimum. The position of polaris and the times at which it may be observed at either elongation or at culmination are given by figure 4.18.

4.092-6. Adjustments.

- A. The levels. When the instrument is leveled as described in 4.092-2, it should stay level when the horizontal tangent screw is disengaged and the head turned 180 degrees. If the bubbles do not stay centered when this is done, the spirit levels on the telescope frame are not parallel to the base plate and adjustment is necessary. The procedure is described completely by figure 4.19.
- B. The vertical scale. Although the whole vertical circle is graduated in degrees, only one quadrant, from 0 to 90 degrees, is used in measuring the elevation angle of the pilot balloon. When the telescope is level, the vertical scale reading should be exactly zero. To check the vertical scale for true zero, the theodolite is first leveled and the vertical scale is set on zero. In this position, the instrument is rotated on its vertical axis and some convenient reference point is sighted at the intersection of the cross hairs. A clearly marked point on a wall may be used for a reference point (see lower portion of figure 4.20). The telescope is then turned over until the

NOTES 1) The azimuth of Polaris at the latitude of 622 building is: 0.0 degrees at upper or lower culmination.
1.4 degrees at eastern elongation.
358.6 degrees at western elongation.

2) Local mean time is equal to local standard time minus 4D minutes, where D is as defined in 4.092-5a.
At 622 building, the difference between local mean time and local standard time amounts only to about two minutes and is therefore of no significance.

FIGURE 4.18 - Local mean time vs. culminations and elongations of Polaris. Inset shows position of Polaris.

Figure 4.20.
Top left - proper method of carrying theodolite.
Top right - using side of building for adjusting horizontal axis.
Bottom - use of marks on building for adjusting vertical scale.

THE PHOTOGRAPHS ON the opposite page show the proper method of carrying the theodolite, a method of adjusting the horizontal axis, and a method of adjusting the vertical scale. Note that only one arm is used in carrying the theodolite, and that the eyepiece is pointed downward (top left). Although a plumb line is best adapted to adjusting the horizontal axis, the side of a building can be assumed to be vertical, and can be used as an "emergency" plumb line where the use of a plumb line is impossible or impracticable (top right). In the bottom photograph, the upper cross indicates the original sighting of the cross hairs in adjusting the vertical scale; the lower cross indicates the sighting after the telescope has been turned through 180° on both the vertical and horizontal scales, and shows that the vertical scale needs adjustment.

THE SCHEMATIC DIAGRAMS at the right, all drawn as viewed from the same side of the theodolite, show how the bubble in the spirit level may be in the center, although the base plate is not horizontal. This occurs when the level is not parallel to the base plate. The diagrams show what occurs when the level is adjusted. Starting with the bubble centered in the level ①, the theodolite is turned through 180° ②. Since the level is not parallel to the base plate, the bubble is off center when the base plate is turned ③. When half the error is taken up with the capstan screw, at A, the level is brought parallel to the base plate, although the base plate is still not level ④. When the other half of the error is taken up with the leveling screws ⑤, the bubble is in the center. When the theodolite is turned through 180° after the adjustment is made, the bubble is still in the center, because the level is now parallel to the base plate ⑤.

Figure 4.19. ADJUSTMENT OF LEVELS.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.09. PILOT BALLOON EQUIPMENT.

4.092. The Theodolite.

4.092-6 Adjustments (Continued)

B. The vertical scale (continued):

vertical scale reads 180 degrees and the instrument is swung around horizontally so that the objective lens again faces the selected reference point. If the reference point now falls on the intersection of the cross hairs, the telescope is level and needs no adjustment. If, however, the reference point is too high or too low, the vertical tangent screw is turned until the point is again on the intersection of the cross hairs. The amount that the theodolite is turned is noted. The tangent screw is then turned back one-half this distance and the index plate on the vertical scale is loosened and moved until the index marker is exactly on 180 degrees. This process is repeated until the reference point appears at the intersection of the cross hairs in both the 0 and 180 degree positions of the telescope.

C. The vernier. When a full degree graduation of the vertical or horizontal scale coincides with the scale reference marker, the corresponding vernier knob should read zero. If this is not so, adjustment is necessary. The screw holding the vernier knob to the tangent-screw shaft is loosened and the vernier knob is turned so that zero coincides with the vernier marker.

D. The horizontal axis. The horizontal axis of the telescope should always be in a true horizontal plane. To check this, a plumb bob is suspended on a string sighted at the intersection of the cross hairs. If the horizontal axis is in proper position, the string may be sighted down its entire length without changing the setting on the horizontal scale. (The side of a building or the tower may be used in an emergency--see top right of figure 4.20). If this cannot be done, one of the bearing supports on the telescope frame is too high or too low. The horizontal axis may be raised or lowered by turning a capstan screw located at the bottom of the axis bearing just behind the battery box. Before the capstan screw can be turned, a lock nut below the capstan screw must be loosened. To align the horizontal axis with a true horizontal plane, the following procedure is used: After the theodolite is leveled, a reference point high on a wall is selected and marked. This point is then sighted at the intersection of the cross hairs, with the use of the horizontal tangent screw. The telescope is lowered and sighted on the lower portion of the wall where another reference point in the same vertical line is selected and marked. The telescope is then turned over, the horizontal tangent screw disengaged, and the telescope turned through 180 degrees. The upper reference point is again sighted at the intersection of the cross hairs. The telescope is then lowered to the level of the lower reference point. If the lower reference point appears at the intersection of the cross hairs, the horizontal axis is in proper position and no adjustment is necessary. If not, one-half the discrepancy is eliminated by turning the capstan screw at the end of the horizontal axis. This procedure is repeated until both reference points are directly in line when viewed through the telescope in both the upright and inverted positions.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER09. PILOT BALLOON EQUIPMENT.4.092. The Theodolite.4.092-7 Use and Care.

The instrument is normally kept mounted on the observation platform of the pilot balloon shed. Whenever it is used, the following rules should be observed:

- A. At the conclusion of each balloon run, slip the brass protective cap over the telescope lens and slip the protective cover over the theodolite head. If the batteries are used, it is also necessary to disengage the battery case immediately after a run; otherwise the batteries will be dead within a few hours.
- B. Prior to the beginning of each balloon run, slip the sunshield over the telescope lens.
- C. When it is necessary to carry the instrument, take the following precautions:
 - (1) See that the mounting head is screwed tightly to the tripod and that the leveling screws are snug.
 - (2) See that the base plate clamp is tightened. The horizontal tangent screw is disengaged to prevent any stress on the milling of the base plate. The telescope is placed vertically and the vertical tangent screw tightened.
 - (3) Carry the instrument as demonstrated in the upper left portion of Figure 4 20. The tripod is carried alongside the body, with the legs extending to the rear. Only when the instrument is to be carried long distances is the tripod placed on the shoulder with the legs in front and the head to the rear.

4.092-8. Maintenance and Repairs.

No theodolite should be used continuously for more than six months without being cleaned and adjusted. This work plus any necessary minor repairs may be arranged through the 200-West instrument people.

4.092-9. Inventory of Theodolites.

In order that there will always be at least one theodolite available for use while another is out of service; four are kept at the 622 Building. The inventory is given below:

<u>Name</u>	<u>S.P. Number</u>
David White	USA-NEW 7666
David White	USA-NEW 7667
David White	USA-NEW 7670
David White	USA-NEW 7671

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER.09. PILOT BALLOON EQUIPMENT.4.092. The Theodolite.4.092-10. Installing Theodolite in Carrying Case.

When installed in the carrying case, the theodolite is mounted on a sliding aluminum base on which places are fitted for the sun shade, extra bulbs, and for the steel pins used in making adjustments (4.092-6). The carrying case is also provided with holders for a screwdriver and plumb bob, and space for extra batteries. Before the theodolite is placed in the case, the sun shade is removed and the objective lens is covered with a protective brass cap. The horizontal and vertical tangent screws are disengaged. The instrument is then installed in the case, with the battery box on the left-hand side, the eyepiece to the right, and the objective lens at the left rear (Figure 4.21). The telescope is tilted to the greatest possible angle, with the gunsights on the lower side.

Figure 4.21. Theodolite carrying case with theodolite installed.

INSTRUMENTS AND EQUIPMENT LOCATED AT
THE 622 TOWER

4.09 PILOT BALLOON EQUIPMENT.

4.093 The "Pibal" Shed

4.093-1 Description

The pilot balloon (pibal) shed is a small shed located about 50 feet ENE of the E entrance to the main building. In it are housed helium tanks, balloons, an interval timer, inflation equipment, and a theodolite. The latter sits on an observation platform which is about 3 feet above the concrete floor on which the helium tanks rest. Above the observation platform and theodolite are four hinged roof sections which are lowered as needed to permit tracking of a balloon.

4.093-2 Procedure for Inflating Balloons

4.093-21 During Daylight

- (a) Remove all excess air from the balloon by folding or squeezing carefully in the hand.
- (b) Make sure that the regulator valve is closed. Then open cylinder valve slowly.
- (c) Hold the balloon upright by the tip and slowly open the regulator valve by turning it clockwise until a pressure not in excess of five pounds is recorded on the low pressure gage. Pressure in excess of ten pounds might cause the hose to slip off the nozzle. Not less than 2 minutes should be taken to inflate the balloon.
- (d) Allow balloon to inflate just sufficiently to raise the nozzle. If the balloon should become overinflated, permit the excess gas to escape slowly.
- (e) Twist the balloon several times until several folds are creased in the neck. Then remove it from the nozzle and seal it by tying the neck securely with doubled string.
- (f) Close cylinder valve. Open regulator valve until pressure falls to zero -- then close it again and leave it closed until another balloon is inflated.

4.093-22 During Darkness

Proceed exactly as in 4.093-21 except, as a first step, screw the 53-gram night attachment to the bottom of the inflation nozzle to compensate for the weight of the pibal lighting unit. Remove this attachment as soon as the inflation has been completed.

INSTRUMENTS AND EQUIPMENT LOCATED AT
THE 622 TOWER

4.09 PILOT BALLOON EQUIPMENT.

4.093 The "Pibal" Shed

4.093-3 Procedure for Operation of the Hinged Roof Sections

- (a) Lower the north section first. Remove hook from eye on lever and lower the section SLOWLY until it comes to rest on its support outside the shed.
- (b) Lower the east section next. Do this by first raising the south section just sufficiently to free the east section, then lowering the east section as outlined in (a).
- (c) Frequently it will not be necessary to lower either the south or west sections. However, should it be necessary to lower one of them, then lower both.
- (d) Secure all lowered sections in the "down" position. This is done by means of the pins provided.
- (e) After completion of balloon run, raise the sections in the following order: west, east, south, and north. Then secure the sections in the raised position by means of the hooks and eyes provided.

4.093-4 Procedure for Changing Helium Tanks

- (a) Remove regulator valve from tank by using wrench provided and turning nut counterclockwise.
- (b) Move empty cylinder to a position behind the chain retainer, replace head cap, and tear off the bottom portion of the green tag.
- (c) Remove cap from head of full cylinder and move cylinder to position behind the chain retainer.
- (d) Replace regulator valve.

CAUTION: Wear gloves throughout the operations (a) to (d) above.

4.094 The Plotting Board

4.094-1 Description

The plotting board is a rotary protractor type and is hinged to the wall near the east entrance to the building. It is always kept in the raised position against the wall except when in use.

INSTRUMENTS AND EQUIPMENT LOCATED AT
THE 622 TOWER

4.09 PILOT BALLOON EQUIPMENT

4.094 The Plotting Board (Con't)

4.094-2 Operation

The plotting board will be operated in accordance with instructions contained under captions 1420 and 1430, pages 13-15, of the following publication:

"Manual of Winds - Aloft Observations"
(WBAN) Circular 0

In applying the above instructions, bear in mind that at this station the form on which data are tabulated bears the number R-145 rather than WBAN-20.

CORRECT LABELING OF RECORD CHARTS

FIGURE 4.011

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.10. THE HYGROGRAPH.

This station is equipped with both a Serdex Hygrothermograph and a Frese Hygrograph. Either of these may be used from time to time.

4.101. Chart Changes.

Regardless of instrument used, chart changes are made by ^{inst.} ~~meteorology~~ personnel daily at 0800. Figure 4.23 shows how a clean chart should be labeled before being installed on the drum. For the Serdex instrument, follow the chart change procedure given in the Company's book of operating instructions--refer to the manual of instructions on meteorological instruments.

For the Frese instrument, follow the chart change instructions given below:

1. Loosen the catch at the left end of the instrument and raise the cover.
2. Lift the pen from the chart by pulling out on the lever just below the instrument base.
3. Remove the chart drum by lifting it up and over the drive mechanism. In doing this DO NOT GRASP THE TOP OF THE DRUM. The top is detachable and may come off--thus allowing the drum to fall.
4. Remove the chart retaining clamp and detach the top of the drum.
5. Wind the clock which is located inside the chart drum, and replace the top.
6. Install new chart on drum, being careful to see that the bottom of the chart rests securely on the flange of the drum. Set to desired time by turning drum counter-clockwise.
7. Reverse the procedures outlined in steps (1) to (4). Check the time setting very carefully--both before and after the housing is lowered.

4.102. Operation and Maintenance.

For the Serdex instrument, follow the Company's book of operating instructions--refer to the manual of instructions on meteorological instruments. For the Frese instrument the Company recommends only that the hygrometer hairs be soaked thoroughly from time to time with a small camel hair brush. With the hairs soaked, the pen should indicate 90%. The Company further suggests that cleaning the hairs with distilled water will remove small particles of grit and oil, and help maintain the accuracy of the instrument.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.11. THE RADIO RECEIVER SET.

4.111. Description.

Refer to booklet filed under the caption "Hallicrafter Radio". See the "Manual of Instructions on Meteorological Instruments".

4.112. Use.

The radio is used for receiving on the weather and standard broadcast bands, and for receiving time checks from the National Bureau of Standards. It is turned on and off by means of a combination switch and volume control marked "A.F. Gain".

4.113. Operation of The Standard Broadcast Band.

1. Set the toggle switch at the left rear corner of the radio in the "down" position.
2. Turn "R.F. Gain" switch clockwise as far as it will go.
3. Turn "Selectivity" switch to "Broad I.F.".
4. Turn "B.F.O." switch to the "Off" position.
5. Turn "Band Switch" to position #1.
6. Set "Send-Rec" switch on "Rec".
7. Select desired station by means of the "Main Tuning" dial. Those stations most frequently used for receiving broadcasts direct from U. S. Weather Bureau personnel, are as follows:

<u>Name of Station</u>	<u>Location of Station</u>	<u>Frequency</u> <u>(Kcs)</u>
KIMA	Yakima	1400
KUJ	Walla Walla	1470

4.114. Operation of The Weather Band.

1. Set the toggle switch at the left rear corner of the radio on the "up" position.
2. Set other switches on the positions specified in 4.113, (2) to (6), inclusive.
3. Set "Main Tuning" on 630 kcs.
4. Select the desired station by means of the "Kilocycles" control located at the top of the radio.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

Those stations most frequently used for receiving CCA weather reports, are as follows:

<u>Name of Station</u>	<u>Call Letter</u>	<u>Frequency (Kcs)</u>
Ellensburg	ELN	385
The Dalles	TDL	230
Pendleton	PDT	340

4.115. Receiving Time Checks from the National Bureau of Standards.

1. Set the toggle switch at the left rear corner of the radio in the "down" position.
2. Set "Band Switch" on position #3.
3. Set other switches on the positions specified in 4.113, (2) to (6), inclusive.
4. Set main tuning control at 15 mc on band #3. For other frequencies, refer to the Station WWV schedule in 4.115-1 below. The WWV schedule also describes the manner in which the time signals are given.

4.115-1. Radio Station WWV Schedule.

Standard frequency transmissions are made continuously, day and night, as a public service by the National Bureau of Standards over its standard-frequency stations, WWV, on the following frequencies:

<u>Mc.</u>	<u>Power (kw)</u>	<u>Audio Frequency (Cycles)</u>
2.5	0.7	1 and 440
5.0	8.0	1 and 440
10.0	9.0	1,440 and 4,000
15.0	9.0	1,440 and 4,000
20.0	8.5	1,440 and 4,000
25.0	0.1	1,440 and 4,000
30.0	0.1	1 and 440
35.0	0.1	1

A 0.005-second pulse may be heard as a faint tick every second, except the 59th second of each minute.. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted at precisely one minute before each hour and each five minutes thereafter (59th minute; 4 minutes past hour, 9 minutes past hour, etc.), resuming after an interval of precisely one minute. This one minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric-disturbance warnings applicable to the North Atlantic path are given at 19 and 49 minutes past each hour. If a disturbance is in progress or is antici-

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.11. THE RADIO RECEIVER SET.

4.115. Receiving Time Checks from the National Bureau of Standards.

4.115-1. Radio Station WWV Schedule (Continued)

pated within 12 hours, the time announcement is followed by 6 W's; if conditions are unstable, the time announcement is followed by 6 U's; if conditions are quiet or normal, the time announcement is followed by 8 N's. The announcements of the stations service and call are given by voice at the hour and half-hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second.

4.116. Radio Maintenance.

There is no rigid maintenance schedule on the radio. Any trouble encountered with this equipment should be reported to Radio Maintenance (phone 7-1151).

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.12. THE ASPIRATOR PUMP.

4.121. Location and Function.

An aspirator pump of approximately 200 c.f.m. capacity is located about six feet from the tower and on the 622 Building side. It is the function of this pump to keep at least 10 c.f.m. of air flowing past each of the air thermohms. Without aspiration, thermohm temperature recordings would not be accurate. Hence, continuous operation of the pump is essential.

4.122. Control.

The aspirator pump is controlled by a switch marked "aspiration" located alongside the main electrical switch box in the instrument room.

4.123. Maintenance.

Maintenance of the pump is the responsibility of ~~the~~ Electrical ~~Department~~
~~and West~~

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.13. THE PYRHELIOMETER INSTALLATION4.131. Description

The installation consists of a pyrliometer, together with transmitting equipment and a recorder. The pyrliometer, described in the instrument instruction manual, is located southeast of the building. The actuating element is about 4 feet above the ground surface and is situated so that no shadows are cast upon it except from the tower guy wires and occasionally from a pole a considerable distance to the west. The recorder is a Leeds and Northrup speedomax of the same type described in the instrument instruction manual under the caption "Temperature Installation". The chart required is L & N # 4. It runs at a speed of one inch per hour and one chart will run for 60 days before a change is necessary.

4.132. Chart Change Procedure

Chart changes are the responsibility of Instrument personnel. The procedure is outlined fully on pages 5-9 of the booklet "Directions for Speedomax Type 'G' Records". This is one of two Leeds and Northrup booklets filed in the 622 Building instrument instruction manual.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.13. THE PYRHELIOMETER INSTALLATION (CONTINUED)4.133. Responsibilities of Meteorology

- (1) Note all troubles which develop and report these to the instrument personnel in 200 West.
- (2) See that the lamp bulb in which the receiving element is sealed is kept free of dust, dirt, and snow. Wipe it with a cloth or kleenex tissue as often as is necessary. Accumulations of liquid moisture on the bulb do not impair the accuracy of the data.
- (3) Mark all necessary data on the recorder chart as it unwinds. This work includes (a) dating the chart with a date stamp shortly after 0000 each day, (b) identifying the time divisions for each hour, and (c) identifying the radiation divisions for each 0.2 gram calorie per square centimeter per minute (see figure 5.05 opposite 5.15 P 1).
- (4) After each chart change by the instrument people, properly identify the chart box in which the old record tape is filed. This work consists of typing essential data (see sample below) on a gummed label and pasting it to one end of the chart box.

<p><u>SOLAR RADIATION</u></p> <p>From: 1-27-53 To: 3-27-53</p> <p>HW - 622 Building</p>

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER

4.14 THE CLINOMETER AND CEILING PROJECTOR

4.141. Location

The ceiling light is located about 9 feet south of the east-west pole line running to 622 Building and is 1000 feet west of the transformer pole at 622 Building. The clinometer is kept in a box in a handy location in the map room of the 622 Building.

4.142. Description

Both the clinometer and ceiling projector are described in the 622 Building Instrument Instruction Manual under the caption "Ceiling Projector."

4.143. Use of the Clinometer and Ceiling Projector to Determine Ceiling Heights.

- (1) Remove the canvas cover from the ceiling light.
- (2) Turn on the ceiling light by pressing switch #4 of the instrument room panel box.
- (3) Follow steps (2) to (7) on page 7 of Circular N. Obtain the ceiling height by applying the tables for a 1000 ft. base line.

4.144. Use of Clinometer to Determine the Amount of Sky Cover.

This is a special and sometimes a quite valuable, use of the clinometer. Under certain conditions, it eliminates all guess-work in determining a figure for sky cover. For use of the clinometer in this respect, refer to Circular N, Pages 2-3, Paragraph 1120, 1120.1, and 1121.

4.145. Care and Maintenance

The ceiling light should be protected from the weather when not in use. Since it normally will be used only at night, the canvas cover should be replaced at the time the #1 shift leaves for home. Any trouble encountered or any maintenance required should be reported to Electrical Maintenance in 200 West Area.

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.15. THE TOWER ELEVATOR4.151. Operation

Before anyone operates the elevator it is necessary that he know and follow both (1) the tower safety rules posted at the top of the stairway to the first tower landing, and (2) the job hazard breakdown--JH 1, Section 2, of this Manual. Instructions for actually operating the elevator are posted in the elevator itself.

4.152. Maintenance

Maintenance work on the elevator is the responsibility of Electrical Maintenance, in 202-S Building (phone 7439)

INSTRUMENTS AND EQUIPMENT LOCATED AT THE 622 TOWER4.16 The Dewpoint System4.16.1 Description

The installation consists of 6 Dewcels and power units located at various heights, and a Speedomax Recorder located in the instrument room of the 622 Building. The points printed on the chart are identified by levels as follows:

IDENTIFICATION

<u>Number</u>	<u>Color</u>	<u>Level*</u>
1	red	3'
-	blue	50'
-	black	100'
-	yellow	reference (20°)
-	green	200'
-	black	reference (20°)
-	violet	300'
8	black	400'

* Feet above ground surface.

Descriptive material and maintenance instructions on the dewcel installation are filed in the "Manual of Instructions on Meteorological Instruments" under the heading "Foxboro Dewcel." Material on the Speedomax Recorder, including procedure for chart changes, is filed in the same manual under the heading "Temperature Installation."

4.16.2 Responsibilities of Meteorology

Responsibilities of meteorology in connection with the dewpoint system are the same as for the temperature and wind system. These are listed at the bottom of 4.01-P 4. Chart Boxes are labeled as shown below:

<p style="text-align: center;"><u>DEWPOINTS</u></p> <p>From: 1-27-53 To: 3-27-53</p> <p>HW - 622 Building</p>

SECTION 4B. OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS

4B-0.	INTRODUCTION - - - - -	4B P1
4B-1.	INVENTORY OF INSTRUMENTS AND RESPONSIBILITY FOR THEIR MAINTENANCE - - - -	4B P2
4B-2.	CHART CHANGE SCHEDULES - - - - -	4B P3
4B-3.	DISPOSITION OF RECORDS - - - - -	4B P4
4B-4.	COOPERATIVE OBSERVERS	
4B-41.	Definition of - - - - -	4B P5
4B-42.	List of - - - - -	4B P5
4B-43.	Instructions for - - - - -	4B P5
4B-5.	INSTRUMENT MAINTENANCE - - - - -	4B P5

OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS4B-O. INTRODUCTION

All meteorological instruments which are charged to code 8223, and which are not located in the immediate vicinity of the 622 Tower, are herein referred to as "Off-Site" meteorological instruments. In the following pages are presented details concerning the operation and maintenance of such instruments and the disposition of the records therefrom.

SECTION 4B. OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS

4B-1. INVENTORY OF INSTRUMENTS AND RESPONSIBILITY FOR THEIR MAINTENANCE

LOCATION	NAME AND DESCRIPTION	USA-HEW OR OTHER IDENTIFICATION NUMBER	MAINTAINED BY INSTRUMENT MAINTENANCE IN AREA
Station 1 about 13 miles NW of 100-B Area	Friez Thermograph-model #505 (Weekly Recording Period)	358813	200 West (Phone 7708)
100-B Area Patrol Headquarters Bldg.	Friez Wind Instrument (Triple Register Type)	45570	100-B (Phone 4419)
100-D Area Patrol Headquarters Bldg.	Friez Wind Instrument (Triple Register Type)	61563	100-D (Phone 5519)
100-F Area Patrol Headquarters Bldg.	Friez Wind Instrument (Triple Register Type)	424253	100-F (Phone 5617)
100-F Area near 108-F Bldg.	Friez Thermograph-model #505 (Daily Recording Period)	Serial #3152	
	Standard Precipitation Measuring Gage	-	
100-H Area Patrol Headquarters Bldg.	Friez Wind Instrument (Aero-vane Type)	424175 Direction 424176 Speed	100-H (Phone 5419)
Station 14 on north slope of Rattlesnake Mountain about 10 miles south of 622 Bldg.	Friez Thermograph-model #505 (Weekly Recording Period)	419460	200 West (Phone 7708)
In Richland on Thayer Drive about 1/2 block north of Carmichael Junior High School	Friez Wind Instrument (Friez Aerovane Type)	434245 Transmitter 434246 Recorder	700 (Phone 8-7171)
	Friez Thermograph-model #505 (Weekly Recording Period)	422759	
	Standard Precipitation Measuring Gage	USWB 14853	
	Tipping Bucket-Type Rain Gage	355383	
	Maximum-Minimum Thermometer Equipment	-	
	Sling Psychrometer Equipment	-	
In Richland at 1182 Bldg. above High School Athletic Field	Friez Barograph	355378	
	Mercurial Barometer (Precision Thermometer & Instruction Co.)	358811	

OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS4B-2. CHART CHANGE SCHEDULES

LOCATION	CHART	CHART CHANGES	
		Time	By
Station 1	Thermograph	Every Tuesday (1) before 1200	Instrument Maintenance 200-West Area
Station 14	Thermograph	Every Wednesday (2) before 1200	Instrument Maintenance 200-West Area
100-F	Thermograph	Daily (3) at 0900	Instrument Maintenance 100-F Area
100-B-D-F Areas	Wind	Daily (3) at 1200	Patrol
100-H	Wind	Bi-Weekly or Friday (4)	Instrument Maintenance 100-H Area
Richland	Wind Speed Wind Direction	Bi-Weekly on Friday (4)	Instrument Maintenance 700 Area
	Barograph	Every Monday (5) and Friday (6) before 1200	
	Thermograph	Every Monday (7) before 1200	

- (1) If Tuesday is a holiday, the chart change is moved ahead to Monday.
- (2) If Wednesday is a holiday, the chart change is delayed until Thursday.
- (3) Inclusive of Saturdays, Sundays, and holidays.
- (4) If Friday is a holiday, the chart change is moved ahead to Thursday.
- (5) If Monday is a holiday, the chart change is delayed until Tuesday.
- (6) If Friday is a holiday, the chart change is moved ahead to Thursday.
- (7) If Monday is a holiday, the chart change is made by a member of Synoptic Meteorology.

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OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS

4B-3. Disposition of Records

RECORD	SENT TO 622 BUILDING BY	DISPOSITION OF RECORDS UPON RECEIPT AT 622 BLDG.
Thermograph Charts for Stations 1 and 14	Instrument Maintenance in 200-W Area	(1) Charts are inspected and dated. (2) Temperatures at 30 minutes past each odd hour are tabulated as per instructions given in 5.16 - P 4. (3) Charts are filed.
Thermograph Charts and precipitation data for 100-F Area	Instrument Maintenance in 100-F Area	(1) Thermograph chart is processed the same as for stations 1 and 14. (2) Precipitation (Mea- sured at chart-change time and recorded on the replaced chart) is tabulated on form 1638.
Wind, Thermograph, and Barograph, Charts for Richland	Instrument Maintenance in 700 Area (Phone 8-7171)	(1) Thermograph chart is processed the same as for stations 1 and 14. (2) Chart boxes are pro- perly marked. The average wind speed and prevailing direction for each hour are tabulated on IBM cards as per instructions given in 5.16 - P 5. (3) The barograph charts are filed. No data are abstracted therefrom.
Wind charts and hourly one-minute observations of wind direction and speed: Areas 100-B-D-F.	Patrol in designated Area	Charts and records are filed. No data are abstracted therefrom.
Wind charts for 100-H Area	Instrument Maintenance in 100-H Area	Chart boxes are properly marked. The average wind speed and prevailing direction for each hour are tabulated on IBM cards as per instructions given in 5.16 - P 5.

OFF-SITE METEOROLOGICAL INSTRUMENTS AND RECORDS

4B-4. COOPERATIVE OBSERVERS

4B-41. Definition of Cooperative Observer

The term "Cooperative Observer" is herein applied to personnel who are not directly associated with Meteorology, but who nevertheless perform some necessary function pertaining to the meteorology program, using instruments charged to Meteorology.

4B-42. Listing of Cooperative Observers

There are three groups on the plant who satisfy the definition of "Cooperative Observer" as given below. They are:

- (1) Patrol in all 100 Areas.
- (2) Utility Office (1182 Building) in Richland. (The records which this office sends to HAP0 Meteorology are routed via the AEC who, in turn, copies certain information onto WB Form 1009 for submission to the United States Weather Bureau. The USWB publishes this information in Monthly and Annual Climatological Summaries of Washington and lists the AEC as Cooperative Observer).
- (3) Instrument Maintenance, 100-F Area.

4B-43. Instructions for Cooperative Observers

All Cooperative Observers are supplied with a set of instructions for taking the observations for which they are responsible. These instructions are filed in the Appendix of this Manual (Copy 5 only).

4B-5. INSTRUMENT MAINTENANCE

Instrument maintenance includes, in addition to chart changes, maintenance of the instruments in accordance with the Manufacturing Manual of Instructions, and making specified minor repairs. A record of instructions supplied to various instrument maintenance groups is filed in the Appendix of this Manual (Copy 5 only).

SECTION 5 OBSERVATIONAL PROCEDURES AND FORM ENTRIES

AND CARD
PUNCHING

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SECTION 5 OBSERVATIONAL PROCEDURES FORM ENTRIES

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SECTION 5
OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING

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OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.01. FUNDAMENTALS

5.011. Continuity of Records.

The continuity of all meteorological records will be maintained wherever possible. If necessary, continuity will be maintained even at the expense of absolute accuracy.

5.012. Interpolation, Extrapolation, or Estimation for Missing or Incorrect Data.

Consider the data in the table below.

TABLE 5.01.
ONE-HOUR AVERAGE WIND SPEEDS
AS INDICATED BY THE E-A RECORDER CHARTS

	<u>Height Above Ground Surface (Feet)</u>								
	7	50	100	150	200	250	300	350	400
Speed	15	19	21	23	0 (24)	25	26	27	18 (28)

The zero at 200 feet indicates, of course, that the instrument is inoperative. However, according to 5.011, a blank space will not be inserted because of this. The figure in parenthesis, which is at least a good approximation, should be inserted.

The 18 at 400 feet shows that, although the instrument is recording, something is obviously wrong with it. The figure in parenthesis, although it may not be absolutely correct, is at least approximate. It should therefore be entered in the records rather than the obviously erroneous 18.

The above are examples of what must be done to correct instrumental errors and to maintain continuity although instruments are partially or totally inoperative. Listed below are errors which will show on the record tapes, even though the instruments are functioning perfectly. These errors must be corrected as much as possible.

1. Wind from the S. The 622 Building seriously restricts the flow of air past the 7-foot anemometer with a wind in this direction at any appreciable speed. A critical inspection of the wind speed trace clearly shows this. The observer must estimate a speed which is more in line with the speeds indicated at other levels rather than record a figure which is obviously too low.
2. Wind from the SE. A wind in this direction must blow past the tower framework before actuating the anemometers. This affects the traces of wind speed at all levels to an extent which is plainly visible. The observer must record speeds which are somewhat above those indicated in such cases.
3. Soil Thermohm in Shadow of Tower. The tower casts a brief shadow on the soil thermohm on all sunny days. This will affect one of the hourly

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

observations of temperature 1/2 inch below the soil surface. The hour affected will be one of the following, depending upon the season.

0730	0930
0830	1030

The temperature discontinuity produced by the tower shadow shows very conspicuously on the recorder chart. Soil temperatures during this time must be recorded on the basis of a smoothed curve without the discontinuity. It should be remembered, however, that any discontinuities produced by meteorological causes, such as the sun passing behind a cumulus cloud, are not smoothed out.

5.013. Reading a Scale.

If the scale of an instrument, a thermometer for example, is not in the same plane as the mercury thread, errors of parallax will occur. To avoid these errors it is mandatory that the line of sight be at right angles to the scale (figure 5.03-1).

5.014. Interpolating.

With the line of sight adjusted as in figure 5.03-1, it will happen more often than not, that the reading appears between two of the graduations. Though it is sometimes sufficient to report the reading to the nearest graduation, it is often necessary, as in the case of dry and wet-bulb thermometers, to report the reading more closely. It is then necessary to interpolate by eye. To do this, imagine the space between the graduations within which the reading falls divided into two parts and these halves again divided into quarters (figure 5.03-2). The fractional reading will then be 0.1 or 0.2, 0.3 or 0.4, 0.6 or 0.7, 0.8 or 0.9, depending within which quarter the reading falls. Of the two values for each quarter, the better can then easily be selected by the observer. Five-tenths is reported if the reading falls at the halfway point.

5.015. Verniers.

A vernier is an auxiliary scale attached to the main scale to enable subdivisions of the main scale to be read accurately. If the zero of the vernier scale is placed at the reading to be interpolated, some dividing mark on the vernier will coincide with a dividing mark on the main scale above the reading (figure 5.03-3). Suppose this is the n th mark from the vernier's zero; then, measuring from the two marks that coincide, the reading is a distance n vernier divisions and n (B/A) scale divisions below this point. If the main scale marking below the reading to be interpolated is p main scale divisions below the coincident marks on both scales, the reading is $(p - n B/A)$ scale divisions above the main scale marking.

For any vernier where A vernier divisions correspond to B scale divisions, read the main scale division immediately preceding the vernier zero and to this add a fraction $(p - n B/A)$ of a division, where the n th vernier mark coincides with a main scale mark. In general, it is not necessary to compute the fraction $(p - n B/A)$, for verniers are usually calibrated for direct reading. Figures 5.03-4 and 5.03-5 are examples of two vernier readings.

Figure 5.03-1. Parallax error.

Figure 5.03-2. Interpolation by eye.

Figure 5.03-3. Illustrating the theory of the vernier.

Figure 5.03-4. Theodolite vertical scale, degrees and minutes. Reading = $16^{\circ} 49''$.

Figure 5.03-5. Barometer, inches. Reading = 29.684.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.016. Form Entries.

A great deal of meteorological information is read daily from the record tapes and tabulated on prepared forms. These tabulations must be both accurate and neat.

5.016-1. Accuracy.

Due to the large mass of data taken from record tapes, it would be uneconomical to roll back all tapes and check each form entry made from them. Some entries, such as the wet and dry-bulb temperatures or the tenths of sky cover, do not appear on record tapes and therefore cannot be checked when one person is on duty by himself. For these and other reasons, the greater part of the responsibility for accurate form entries must be assumed by the observers. This is a responsibility which cannot be taken lightly. It requires critical examination of each figure recorded, making comparisons to see that all entries are in agreement with each other, and otherwise maintaining constant vigilance.

5.016-2. Neatness.

All form entries must be neat. While neatness is a quality which is naturally easier for some than for others, the following general rules will prove helpful and should be complied with by all personnel:

- A. Write as slowly as necessary to insure legibility.
- B. Use a pencil which is neither too hard nor too soft. Generally speaking, a #3 fits this requirement better than any other.
- C. Never mark over an incorrect entry when correcting a mistake. Use an eraser. (Bear in mind, however, that it is never permissible to erase form entries made by another person--see 5.018-1(a).)

5.017. Rule for the Disposal of Decimals.

When computations or observations require the disposal of decimals, the following procedure will be observed:

1. If the decimal to be disposed of is greater than 5, or is 5 with a remainder, the preceding digit will be increased by 1.
2. If the decimal to be disposed of is 5 exactly, the preceding digit will be increased by 1 when odd, and will remain unchanged when even; the result will always be an even number.
3. If the decimal to be disposed of is less than 5, the preceding digit will remain unchanged.

5.018. Checking Procedures.5.018-1. General Rules Used in Checking.

It is permissible for any person to correct errors of his own by using

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an eraser. It is never permissible, however, to erase entries made by another.

- B. When errors are found in another's work, corrections are made by a red pencil without erasing the original entries; then left for re-checking.
- C. Except in the case where a person has a check on himself, as when totaling a column of figures, the sum of which is already known, it is never permissible to place red checks by one's own entries.
- D. Any person who checks data is responsible both for its accuracy and for its completeness in every detail.
- E. Checking assigned specifically to the #2 shift (see 5.017-2) is the responsibility of the forecasters.

5.018-2. Daily Schedule of Checking.

The daily routine of checking is summarized in Table 5.01-1.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

TABLE 5.01-1.
DAILY ROUTINE SCHEDULE OF CHECKING

<u>Form #</u>	<u>Data Checked</u>	<u>Job Done By</u>	<u>Procedure</u>
R-143	1. Hourly directions recorded in columns 3, 6, and 10.	Anyone at any time convenient	Check each hourly with template. Follow 5.022.
	2. Direction table and prevailing wind direction at the bottom of the form.	#2 shift	Follow instructions in 5.11(a).
	3. Totals and averages for columns 3 and 10 (for form R-2877).	#2 shift	Obvious.
R-1973	All entries.	#2 shift	Follow instructions in 5.08.
R-1974	All entries.	#2 shift	Follow instructions in 5.09.
R-1975	1. Entries in columns 14 and 15.	#2 shift	Follow instructions in 5.102, (a) and (b).
	2. Entries in columns 12 and 13.	#1 shift	Follow instructions in 5.103, (a) and (b).
R-1976	All entries.	#2 shift	Follow instructions in 5.12.
R-2877	All entries.	#2 shift	Follow instructions in 5.11.
Summary of monthly hourly precipitation. (unnumbered)	All entries.	#2 shift	Follow instructions in 5.13.

DAILY ROUTINE WIND LOG

R-143-X

HW - 622 Building. Date _____

Time (PST) 1	7 ft.	50 ft.		100 ft.	200 ft.		300 ft.		400 ft.	
	Speed 2	Dir. 3	Speed 4	Speed 5	Dir. 6	Speed 7	Dir. 8	Speed 9	Dir. 10	Speed 11
00 - 01										
01 - 02										
02 - 03										
03 - 04										
04 - 05										
05 - 06										
06 - 07										
07 - 08										
08 - 09										
09 - 10										
10 - 11										
11 - 12										
12 - 13										
13 - 14										
14 - 15										
15 - 16										
16 - 17										
17 - 18										
18 - 19										
19 - 20										
20 - 21										
21 - 22										
22 - 23										
23 - 24										
Total										
Average										

Number of hours from each direction (5 ft. level)

ENE	NE	ESE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE

Prevailing Direction _____

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.02. ENTRIES ON FORM R-143, "DAILY HOURLY WIND LOG".5.021. Wind Speed.

From the velocity tapes determine and record, at each of the specified levels, that speed, to the nearest whole mile per hour, which best represents the average over each of the hourly periods specified by column one. In determining average hourly speeds, observe the principals illustrated by the three examples of figure 5.01.

5.022. Wind Direction.

From each of the direction tapes determine and record the most representative direction, expressed to 16 points of the compass, for each of the hourly periods specified by column one. Use variable or calm, whichever is more appropriate (see figure 5.02-8-11), for wind direction when none of the 16 compass points seems representative. In all wind direction determinations, observe the following basic principals:

1. Avoid bias. There is a human tendency, in case of any doubt, to favor the cardinal directions (N, NE, E, etc.) to the neglect of the intermediate directions (NNE, ENE, etc.). Do not do this. In case of doubt between two adjacent points of the compass, choose the more clockwise of the two points.
2. In case of equal time from each of two different directions, choose the direction of highest speed as being the one most representative.
3. Do not choose any direction as being "most representative" for an hour unless there is a minimum of 20 minutes of time from that direction. The required 20 minutes need not, however, be consecutive.
4. If there is zero speed during a portion of an hour, then determine the most representative direction from only that portion of the hour during which there is detectable speed.
5. Do not use "variable" as an expression of wind direction in case of a steady shifting wind--even though the shift may be so rapid that all quadrants are represented and there is less than 20 minutes of time from any one direction.
6. Do not record any direction in conjunction with zero speed. If a direction is indicated while the speed trace shows zero, proceed as per the instructions accompanying figure 5.02-11.

With the foregoing fundamental rules well in mind, determine the hourly directions by first finding which of the categories listed below is most descriptive of a particular direction trace, and then applying the methods outlined in the illustrations which follow.

Category 1. Steady wind in one direction for an entire hour. Figure 5.02-1 (the trace from 5 to 6).

Category 2. Steady wind in one direction for a portion of an hour. Figure 5.02-1 (the trace from 4 to 5), and also figure 5.02-2.

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- Category 3. Steady wind from each of two directions during the same hour. Figure 5.02-3.
- Category 4. A continuously shifting wind with the shifts alternating between clockwise and counter-clockwise. Figures 5.02-4-5.
- Category 5. A continuously backing or veering wind. Figures 5.02-6-7-71.
- Category 6. Variable all quadrants with little or no preference for any one direction. Back and forth (apparently random) motions of the recorder pen leave such an erratic trace as to make highly questionable the determination of direction accurately to within $22\frac{1}{2}$ degrees. Figures 5.02-8-9.
- Category 7. Wind highly variable and in all quadrants, but with some significant preference for one direction. Figure 5.02-10.
- Category 8. Calm (no wind). The direction trace lacks the oscillatory characteristics which it invariably has when the wind is blowing. Figure 5.02-11.

Figure 5.01. DETERMINING DAILY HOURLY WIND SPEEDS FOR ENTRY ON FORM R-143-B.

FIGURE 5.02-1. DETERMINATION OF WIND DIRECTIONS.

From 5 to 6 - Steady wind in one direction
for an entire hour (category 1)

The problem in this case is merely one of determining which of the 16 points of the compass comes closest to the actual trace. It obviously is WNW.

From 4 to 5 - Steady wind in one direction
for a portion of an hour (category 2)

The wind shifts from W to WNW at about 40 minutes past the beginning of the hour. The most representative direction for the hour, however, is quite clearly W. In all such shifts, choose the direction from which the wind blew the longest.

FIGURE 5.02-2. DETERMINATION OF WIND DIRECTIONS.

From 8 to 9 - Steady wind in one direction for a portion of an hour (category 2)

Actually it is possible to classify the wind from 8 to 9 in category "steady wind from each of two directions during the same hour" (# 3). However, it appears that the wind was in a state of flux until about 8:35, after which it settled on a direction which is more representative for the hour than the NNW which prevailed for the first 25 minutes. It remains then, to decide whether the trace from 8:35 to 9 comes closest to the W or to the NNW zone. It appears that most of the ink is spread in the W zone, making this the most representative direction for the hour.

FIGURE 5.02-3. DETERMINATION OF WIND DIRECTIONS.

From 8 to 9 - Steady wind from each of two directions during the same hour (category 3)

In this case, there was a sudden shift in the wind direction from SW to WNW. Each of the two directions are clearly marked out, and the choice is obviously between these two. SW prevailed over the greater portion of the hour and is therefore the most representative direction for that hour.

In rare cases, there may be more than two directions which are clearly defined during the same hour. In this case, use the same principal. That is, choose the direction which endured the longest. Remember, however, that a direction must endure for at least 20 minutes to be representative for an hour. In any case where one must choose between more than two directions in the same hour, there is a strong suspicion that the direction should be called "variable all quadrants".

FIGURE 5.02-4. DETERMINATION OF WIND DIRECTIONS.

Continuous shifting of the wind, with the shifts alternating between the clockwise and counter-clockwise (Category 4)

The 2-hour trace from 11 to 1 illustrates this type of shifting. In such a case, choose the mean direction about which the shifting takes place. ESE, then, is clearly the most representative direction from 1100 until 1230, and is the direction to record for the hour between 1100 and 1200. For the next hour, there is considerably more question on direction because of the shift toward the NE at about 1230. A close inspection shows that E is clearly not representative. With this direction eliminated from consideration, the choice lies between ESE and ENE. The latter of these is slightly more representative because of the greater amount of ink spread within the shaded area denoting the ENE zone.

FIGURE 5.02-5. DETERMINATION OF WIND DIRECTIONS.

Continuous shifting of the wind, with the shifts being in both the clockwise and counterclockwise directions (category 4)

This is another illustration of the type of shifting wind trace shown in 5.02-4. In this case, however, we must consider the steady wind from the SW before the clockwise shift began. Because of less than 20 minutes duration from the SW, this direction is clearly not representative for the hour between 10 and 11. With SW eliminated from consideration, WNW is without doubt the most representative, since this catches the mean of the shift from W to NW, and then back to W again.

FIGURE 5.02-6. DETERMINATION OF WIND DIRECTIONS.

Continuous backing or veering of the wind for an entire hour (category 5 - Example 1)

In the hour from 03 to 04, the wind backed from S to W, or a total of 270 degrees. If we were to take the mean of this shift (sometimes permissible in cases of total shifts of 90 degrees or less) we would get NE. We find, however, that the trace was in the NE zone only about 5 minutes. This direction, then, is in no way representative of the wind from 3 to 4. In fact the shift is so continuous and rapid that no direction can be said to be truly representative. We cannot call the direction "variable all quadrants" because to do so would violate number 5 of the fundamental rules for determining wind directions. How then shall we determine a direction from 3 to 4?

If we go back to the hour from 2 to 3, we find that the wind was from each of two different directions - something near W for 35 or 40 minutes and something near S for 20 or 25 minutes. The former of these was chosen as being most representative from 2 to 3. This means that the latter, although it endured for nearly one-half hour, was not mentioned in the records. In such a case, it is best to combine the record for the last part of the previous hour to the first part of the current hour. If we do this we find that SSE is best. Although SSE is not truly representative for the particular time interval specified, it is representative for at least 30 minutes, part of which time falls within the hour in question. Under the circumstances it is the best entry for wind direction between 3 and 4.

FIGURE 5.02-7. DETERMINATION OF WIND DIRECTIONS.

Continuous backing or veering of the wind for an entire hour
(Category 5 - Example 2)

The hour from 11 to Mdn illustrates continuous veering of the wind from W to N. We find by inspecting the trace that it lies within both the W and NNW zones for 20 minutes or longer. The choice, then, lies between these two directions. NNW is more representative for two reasons:

- (1) The time from NNW is slightly greater,
- (2) The mid-point of the shift from W to N is NW. NNW lies closer to this mid-point than does W.

FIGURE 5.02-71. DETERMINATION OF WIND DIRECTIONS.

Continuous backing or veering of the wind for an entire hour
(Category 5 - Example 3)

The hour from 11 to Mnt illustrates continuous backing of the wind from NW to WSW. As in figure 5.02-7, the trace lies within two direction zones (in this case W and WSW) for at least 20 minutes. In this case, however, the time from each zone is about equal - roughly 20 minutes from each direction. In spite of this, W is more representative than WSW because it is the direction which lies nearest to the mid-point of the shift.

FIGURE 5.02-8. DETERMINATION OF WIND DIRECTIONS.

Example 1 of category 6 "Variable All Quadrants"

The trace from 6 to 8 is typical of one made by a wind whose direction is so variable as to render impractical or even impossible the determination of any representative direction. In this case the only time during which a direction is clearly defined is the 30-minute period from 6:45 to 7:15. Although SSE prevailed during this period, it cannot be said to be representative of either or both of the hourly periods. Therefore "variable all quadrants" is the only possible entry of wind direction, either from 6 to 7, or from 7 to 8.

FIGURE 5.02-9. DETERMINATION OF WIND DIRECTIONS.

Example 2 of category 6 "Variable All Quadrants"

During the hour from 2 to 3, there may be a slight preference shown for something near N. However, the exact direction, expressed to 16 points of the compass, is at least very indefinite and does not have the necessary 20 minutes duration. Therefore "Variable All Quadrants" is the correct entry for wind direction.

During the hour from 5 to 6, neither S nor SE contains the necessary 20 minutes duration. Hence, for this hour also, the correct entry for wind direction is "V" - meaning "Variable All Quadrants".

FIGURE 5.02-10. DETERMINATION OF WIND DIRECTIONS.
(Categories 6 and 7)

Direction analysis during a highly variable period.

This trace of wind direction which covers a period of 6 hours, from 1100 to 1700, shows how variable and erratic that a trace may be, and yet when examined closely from hour to hour, representative directions may be determined. The direction analysis for the period is as follows:

Period From To	Most repre- sentative dir. °	Remarks
1100 1200	"V"	Here there is a preference shown for wind from southerly directions. The one which endured the longest, CSW, falls just short of the required 20 minutes in order to be considered representative for the hour.
1200 1300	"V"	Same situation as for the previous hour. SSW is fairly well defined from 1220 until 1240. However, there is a period near 1225 in which the wind was not SSW. When this period is subtracted, we have about 15% of CSW altogether during the hour. This is not enough.
1300 1400	ENE	Although very irregular, the trace nevertheless appears to follow a clearly defined direction between 1320 and 1350. This is 30 minutes - more than the required length of time for a representative direction for an hour. The direction during this 30 minutes is rather questionable between ENE and E. The latter portion of the period seems to decide the issue slightly in favor of ENE.
1400 1500	SSW	This direction appears to be representative for the period from 1405 to 1435 (30 minutes)
1500 1600	WSW or "V"	WSW is the direction which prevails from 1540 to 1600. This is 20 minutes - the bare minimum amount of time for a direction which can be called representative for an hour. However, there were portions of this 20-minute period that were variable all quadrants. Thus it is very questionable whether or not WSW prevailed for a sufficiently long time to be called "representative" for the hour.
1600 1700	WNW	The trace is still very irregular and ill-defined. However, an inspection of the marginal line at the right shows that practically all of the variation in direction was within the west half-circle. Hence, "Variable All Quadrants", although not technically wrong for this hour, is nevertheless not as representative as some westerly direction. The choice lies between WNW and W. The former of these is more representative because of the greater amount of ink spread within that zone.

FIGURE 5.02-11 DETERMINATION OF WIND DIRECTIONS.

Example of category 8 "Calm", or zero wind speed.

The hour from 6 to 7 above is a good example of how the direction trace looks when the speed is zero. The trace need not necessarily be a straight line. However, it lacks the showing of oscillatory motions which are invariably present whenever there is any wind.

In cases like the above, "Cm" is recorded for direction and "0" for speed.

In cases where the speed is zero, but the direction trace does not have the general characteristics of the one shown above, proceed as follows:

- 1) For speed, record 1 or 2 mph. This recognizes that for a wind of very low speed, the force generated by it may not be sufficient to overcome the friction of the brushes bearing on the commutator.
- 2) For direction, record whatever is indicated -- in accordance with the foregoing principals.

R-14--K [7-52]

DAILY HOURLY TEMPERATURE LOG

BW - 622 BUILDING. DATE _____

Time (PST)	So. 1			15 m							*Differences	
	1 10 min	2 15 min	3 35 min	4 1 h	5 50 min	6 100 min	7 200 min	8 250 min	9 300 min	10 400 min	11 200/3	12 250/50
0030												
0130												
0230												
0330												
0430												
0530												
0630												
0730												
0830												
0930												
1030												
1130												
1230												
1330												
1430												
1530												
1630												
1730												
1830												
1930												
2030												
2130												
2230												
2330												
Total												
Avg.												

*Differences in minutes as follows:

200/3 200 ft. temperature minus 20 ft. temperature
250/50 250 ft. temperature minus 50 ft. temperature

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.03 ENTRIES ON FORM R-144, "DAILY HOURLY TEMPERATURE LOG"

5.031 Soil Temperatures

In columns 2-4 enter, to the nearest 0.1 degree, the temperatures as observed from the lower micromax for the times specified by column 1. The printing scheme is as follows:

<u>Point Number</u>	<u>Color</u>	<u>Subsurface Soil Level (inches)</u>
1	Red	0- $\frac{1}{2}$
2	Black	36
3	Red	0- $\frac{1}{2}$
4	Green	15

5.032 Air Temperatures

1. In columns 5-11 enter, to the nearest 0.1 degree, the temperatures as observed from the upper micromax for the times specified by column 1. The printing scheme is as follows:

<u>Point Number</u>	<u>Color</u>	<u>Height Above Ground Surface (feet)</u>
1	Red	3
-	Blue	50
-	Black	100
-	Violet	150 (not recorded)
-	Green	200
-	Black	250
-	Yellow	300
8	Black	400

2. In columns 12 and 13, enter temperature differences as follows:

Column 12 (200/3) = Temperature at 200-ft. level minus temperature at 3-ft. level.

Column 13 (250/50) = Temperature at 250-ft. level minus temperature at 50-ft. level.

P-109-K

DAILY HOUR BY BAROMETRIC PRESSURE COMPUTATIONS
 RV - CAP BUILDING, DATE _____

Time (PST)	Barograph		Station Press. 4	Temperature (°F)			Height (Ft.)			MSL Press.	
	Obs. 2	Corr. 3		Pre- sented 5	12 Hrs ago 6	Mean 7	Table II 8	Table III 9	Diff. 10	Feet 11	Inches 12
0030											
0130											
0230											
0330											
0430											
0530											
0630											
0730											
0830											
0930											
1030											
1130											
1230											
1330											
1430											
1530											
1630											
1730											
1830											
1930											
2030											
2130											
2230											
2330											
Total											
Mean											

SIX - HOURLY STATION PRESSURE COMPUTATIONS.

Time (P. S. T.)

	0430	1030	1630	2230	Total
Attached Thermom. (°F)					
Obs. Barometer (Inches)					
Corre. (Inches)					
Station Pressure (Inches)					
Barograph Reading					
Barograph Correction					

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.04 ENTRIES ON FORM R-109, "DAILY HOURLY BAROMETRIC PRESSURE COMPUTATIONS"5.041 Six-Hourly Observations of the Mercurial Barometer

1. Read the mercurial barometer to the nearest 0.001 inch or to the nearest 0.1 millibar (whichever is appropriate for the barometer in use) and the attached thermometer to the nearest 0.5 degree.
2. Record the values observed in (1) in the spaces provided in the table at the bottom of the form.
3. From appropriate tables for reduction of mercury column to standard temperature (filed in the Appendix of this Manual) obtain and record the correction corresponding to the observed values of pressure and temperature.
4. Subtract the correction found in (3) from the observed pressure found in (1). This gives the station pressure which is recorded either in millibars or in inches in the bottom space.

5.042 Hourly Observations of the Barograph and Computations of Station and Sea Level Pressure

1. Read the barograph to the nearest 0.005 inch and record the result in column 2.
2. At 0430, 1030, 1630, and 2230 observe the mercurial barometer as well as the barograph and obtain the station pressure as per instructions given in 5.041. Record this value of station pressure, always in inches, in column 4 opposite the appropriate time printed in column 1.
3. Subtract the pressure recorded in column 4 from that recorded opposite it in column 1. This gives the correction which is recorded in column 3 and is applied to all subsequent hourly barograph observations until the next 6-hourly observation of the mercurial barometer.
4. In columns 5 and 6 record, to the nearest 0.1 degree, temperatures both for the present and for 12 hours ago. Use the same temperatures as those recorded in column 5 of the "Daily Hourly Temperature Log" (form R-144).
5. In column 7 record, to the nearest 0.1 degree, the average of the temperatures in columns 5 and 6.
6. From the sea level pressure reduction tables, record to the nearest 0.01 inch in column 11, the pressure corresponding to the temperature in column 7 and to the station pressure (rounded to the nearest 0.01 inch) in column 4. Except in extreme conditions of temperature or pressure, where one or both of these parameters fall outside the range of the reduction tables, no entries are necessary for columns 8-10.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.04. ENTRIES ON FORM R-109, "DAILY HOURLY BAROMETRIC PRESSURE COMPUTATIONS"5.042 Hourly Observations of the Barograph and Computations of Station and Sea Level Pressure (Continued)

7. When sea level reduction tables are not applicable, it is then necessary to use tables entitled "Determination of Heights by Barometer". These tables are filed in the Appendix of this Manual. To apply them, read in Table II the height in feet corresponding to the temperature of column 7. Record the result in column 8. In Table III read the height in feet corresponding to the station pressure of column 4 and record the result in column 9. Record in column 10 the result obtained by taking height in column 9 minus height in column 8. Then in column 11 record from Table III the pressure to the nearest 0.01 inch corresponding to the height in column 10.
8. In column 12 record from conversion tables the pressure to the nearest 0.1 millibar corresponding to the entry in column 11.

* Copy 5 Only

TABLE I-A

REDUCTION OF THE BAROMETER TO STANDARD TEMPERATURE*

Attached Ther- mometer Fahren- heit	Mercurial Barometer Reading in Inches									
	(All Corrections are to be Subtracted)									
	28.4	28.6	28.8	29.0	29.2	29.4	29.6	29.8	30.0	30.2
58.0	.076	.076	.077	.077	.078	.078	.079	.079	.080	.080
58.5	.077	.077	.078	.078	.079	.080	.080	.081	.081	.082
59.0	.073	.079	.079	.080	.080	.081	.081	.082	.083	.083
59.5	.079	.080	.081	.081	.082	.082	.083	.083	.084	.084
60.0	.080	.081	.082	.082	.083	.084	.084	.085	.085	.086
60.5	.081	.083	.083	.084	.084	.085	.085	.086	.087	.087
61.0	.083	.084	.084	.085	.086	.086	.087	.087	.088	.089
61.5	.085	.085	.086	.086	.087	.087	.088	.089	.089	.090
62.0	.086	.086	.087	.088	.088	.089	.089	.090	.091	.091
62.5	.087	.088	.088	.089	.090	.090	.091	.091	.092	.093
63.0	.088	.089	.090	.090	.091	.091	.092	.093	.093	.094
63.5	.090	.090	.091	.092	.092	.093	.093	.094	.095	.095
64.0	.091	.092	.092	.093	.093	.094	.095	.095	.096	.097
64.5	.092	.093	.093	.094	.095	.095	.096	.097	.097	.098
65.0	.093	.094	.095	.095	.096	.097	.097	.098	.099	.099
65.5	.095	.095	.096	.097	.097	.098	.099	.099	.100	.101
66.0	.096	.097	.097	.098	.099	.099	.100	.101	.101	.102
66.5	.097	.098	.099	.099	.100	.101	.101	.102	.103	.103
67.0	.099	.099	.100	.101	.101	.102	.103	.103	.104	.105
67.5	.100	.101	.101	.102	.103	.103	.104	.105	.106	.106
68.0	.101	.102	.103	.103	.104	.105	.105	.106	.107	.108
68.5	.102	.103	.104	.105	.105	.106	.107	.107	.108	.109
69.0	.104	.104	.105	.106	.107	.107	.108	.109	.110	.110
69.5	.105	.106	.106	.107	.108	.109	.109	.110	.111	.112
70.0	.106	.107	.108	.109	.109	.110	.111	.112	.112	.113
70.5	.108	.108	.109	.110	.111	.111	.112	.113	.114	.114
71.0	.109	.110	.110	.111	.112	.113	.113	.114	.115	.116
71.5	.110	.111	.112	.112	.113	.114	.115	.116	.116	.117
72.0	.111	.112	.113	.114	.115	.115	.116	.117	.118	.118
72.5	.113	.113	.114	.115	.116	.117	.117	.118	.119	.120
73.0	.114	.115	.116	.116	.117	.118	.119	.120	.120	.121
73.5	.115	.116	.117	.118	.118	.119	.120	.121	.122	.123
74.0	.117	.117	.118	.119	.120	.121	.121	.122	.123	.124
74.5	.118	.119	.119	.120	.121	.122	.123	.124	.124	.125
75.0	.119	.120	.121	.122	.122	.123	.124	.125	.126	.127
75.5	.120	.121	.122	.123	.124	.125	.125	.126	.127	.128
76.0	.122	.122	.123	.124	.125	.126	.127	.128	.128	.129
76.5	.123	.124	.125	.126	.127	.128	.129	.129	.130	.131
77.0	.124	.125	.126	.127	.128	.129	.129	.130	.131	.132
77.5	.125	.126	.127	.128	.129	.130	.131	.132	.132	.133

*From table 44 of SMITHSONIAN METEOROLOGICAL TABLES.

TABLE I-B

REDUCTION OF THE BAROMETER TO STANDARD TEMPERATURE*

Attached Ther- mometer Fahren- heit	Mercurial Barometer Reading in Inches									
	(All Corrections are to be Subtracted)									
	28.4	28.6	28.8	29.0	29.2	29.4	29.6	29.8	30.0	30.2
78.0	.127	.128	.129	.129	.130	.131	.132	.133	.134	.135
78.5	.128	.129	.130	.131	.132	.133	.133	.134	.135	.136
79.0	.129	.130	.131	.132	.133	.134	.135	.136	.137	.137
79.5	.131	.131	.132	.133	.134	.135	.136	.137	.138	.139
80.0	.132	.133	.134	.135	.136	.136	.137	.138	.139	.140
80.5	.133	.134	.135	.136	.137	.138	.139	.140	.141	.142
81.0	.134	.135	.136	.137	.138	.139	.140	.141	.142	.143
81.5	.136	.137	.138	.139	.139	.140	.141	.142	.143	.144
82.0	.137	.138	.139	.140	.141	.142	.143	.144	.145	.146
82.5	.138	.139	.140	.141	.142	.143	.144	.145	.146	.147
83.0	.139	.140	.141	.142	.143	.144	.145	.146	.147	.148
83.5	.141	.142	.143	.144	.145	.146	.147	.148	.149	.150
84.0	.142	.143	.144	.145	.146	.147	.148	.149	.150	.151
84.5	.143	.144	.145	.146	.147	.148	.149	.150	.151	.152
85.0	.145	.146	.147	.148	.149	.150	.151	.152	.153	.154
85.5	.146	.147	.148	.149	.150	.151	.152	.153	.154	.155
86.0	.147	.148	.149	.150	.151	.152	.153	.154	.155	.156
86.5	.148	.149	.151	.152	.153	.154	.155	.156	.157	.158
87.0	.150	.151	.152	.153	.154	.155	.156	.157	.158	.159
87.5	.151	.152	.153	.154	.155	.156	.157	.158	.159	.161
88.0	.152	.153	.154	.155	.157	.158	.159	.160	.161	.162
88.5	.154	.155	.156	.157	.158	.159	.160	.161	.162	.163
89.0	.155	.156	.157	.158	.159	.160	.161	.162	.164	.165
89.5	.156	.157	.158	.159	.160	.162	.163	.164	.165	.166
90.0	.157	.158	.160	.161	.162	.163	.164	.165	.166	.167
90.5	.159	.160	.161	.162	.163	.164	.165	.166	.168	.169
91.0	.160	.161	.162	.163	.164	.166	.167	.168	.169	.170
91.5	.161	.162	.163	.165	.166	.167	.168	.169	.170	.171
92.0	.162	.164	.165	.166	.167	.168	.169	.170	.172	.173
92.5	.164	.165	.166	.167	.168	.169	.171	.172	.173	.174
93.0	.165	.166	.167	.168	.170	.171	.172	.173	.174	.175
93.5	.166	.167	.169	.170	.171	.172	.173	.174	.176	.177
94.0	.168	.169	.170	.171	.172	.173	.175	.176	.177	.178
94.5	.169	.170	.171	.172	.174	.175	.176	.177	.178	.179
95.0	.170	.171	.172	.174	.175	.176	.177	.178	.180	.181
95.5	.171	.173	.174	.175	.176	.177	.179	.180	.181	.182
96.0	.173	.174	.175	.176	.177	.179	.180	.181	.182	.184
96.5	.174	.175	.176	.178	.179	.180	.181	.182	.184	.185
97.0	.175	.176	.178	.179	.180	.181	.183	.184	.185	.186
97.5	.176	.178	.179	.180	.181	.183	.184	.185	.186	.188

*From table 44 of SMITHSONIAN METEOROLOGICAL TABLES.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.05 ENTRIES ON FORM R-108, "DAILY HOURLY PSYCHROMETRIC COMPUTATIONS"

Note: Entries on this form are made only at 3-hourly intervals corresponding to the times of psychrometric observations (0130, 0430, 0730, ----- 2230).

1. Observe the dry and wet bulb temperatures and enter these to the nearest 0.1 degree in columns 2 and 3, respectively.
2. Compute the wet bulb depression and record its value in column 4.
3. From the hygograph, observe the current humidity and also the humidity at each of the two times indicated by column 1 since the time of the last 3-hourly psychrometric observation. Record these three values of humidity to the nearest whole percent in column 7.
4. From the thermograph, observe the temperature corresponding to the time of each humidity entry in column 7. Record these three temperatures to the nearest whole degree in column 11.
5. With the psychrometric slide rule, compute the dew point and relative humidity corresponding to the psychrometric data of columns 2-4. Follow the computing instructions printed on the slide rule. Record the dew point to the nearest 0.1 degree in column 5 and to the nearest whole degree on the same line in column 10. Record the relative humidity to the nearest whole percent on the same line in both columns 6 and 9.
6. Take column 6 entry minus column 7 entry and record the result on the same line in column 8.
7. For times intermediate to those of the 3-hourly observations, proceed as follows to get the necessary entries for columns 8-10.
 - A. Consider the 3-hourly corrections in column 8 and pro-rate the differences for the intermediate hourly periods.
 - B. Add algebraically the entries of columns 7 and 8 and enter the results in column 9.
 - C. With the psychrometric slide rule, compute the dew points corresponding to the temperatures in column 11 and the relative humidities in column 9. Enter these to the nearest whole degree in column 10.

DAILY HOURLY PSYCHOMETRIC LOG

HAPO 622 BUILDING.

DATE _____

[illegible]

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.05. ENTRIES ON FORM R-108-D "DAILY HOURLY PSYCHROMETRIC LOG."

1. Each hour on the half-hour enter, to the nearest 0.1 degree in columns 5-10, the dew point temperature at each of the specified levels.
2. In column 2 enter, to the nearest 0.1 degree, the dry bulb temperature taken from column 5 of form R-144-X "Daily Hourly Temperature Log."
3. Using tables which are provided, look up the wet bulb temperature corresponding to the dry bulb temperature of column 2 and the dew point temperature of column 5 (both rounded to the nearest whole degree). Record this temperature, to the nearest whole degree, in column 3.
4. By use of the psychrometric slide rule calculate the relative humidity corresponding to the dry bulb temperature of column 2 and the dew point temperature of column 5. Record this value of humidity, to the nearest whole percent, in column 4.

SURFACE WEATHER OBSERVATIONS

11
12
13
14

[illegible]

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.06 ENTRIES ON FORM R-98, "SURFACE WEATHER OBSERVATIONS".5.061 General

Many of the entries on this form are obtained by visual inspection of meteorological conditions without the aid of recording instruments. These entries are of utmost importance and nothing except the most pressing demands should take precedence over them. Observations required for the entries must convey a continuous and accurate picture of all meteorological situations encountered at the station.

5.062 Use of WBAN Circular N "Manual of Surface Observations".

Circular N will be used as the exclusive guide in determining the proper entries for the observed conditions reported in Columns 2-3, 7-8, and 12 of Form R-98. The portions of Circular N herein referred to have been altered, as found necessary, to make them completely applicable for use at this station.

5.063 Time (Column 1)

Entries will always be with respect to Pacific Standard Time expressed in terms of the 24-hour clock. 2359 indicates the end of a day. 0000 indicates the beginning of a day. Ordinarily, entries are to the nearest 5-minutes. For extremely important phenomena, however, (tornadoes or earthquakes for example) time entries are always given to the nearest minute.

5.064 Ceiling and Sky, Total Sky Cover (Columns 2-3)

Reference: Circular N, Chapter I, entitled "Clouds and Obscuring Phenomena".

Use the same procedure as for entries on WBAN-10 given in the above reference, Paragraphs 1510, 1511, and 1530, pages 13-16. Also enter appropriate remarks in Column 12 -- see above reference, Paragraph 1520, page 15. Bear in mind that the column numbers of WBAN-10 do not correspond to those of R-98.

5.065 Cloud Types by Layer (Columns 4-6)

Reference: United States Weather Bureau Cloud Code Chart.

In these columns write the code figures conforming to the above reference for the various cloud types observed. Begin with the lowest cloud layer and work upward. If two or more types of clouds near the same level are observed, the order of precedence in reporting will be governed by the order in which they are numbered in the above reference. If more than three layers of clouds are observed, those higher layers which cannot be reported in Columns 4-6 will be reported in Column 12.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.06 ENTRIES ON FORM R-98, "SURFACE WEATHER OBSERVATIONS".5.065 Cloud Types by Layer (Columns 4-6)5.065-1 Examples:

<u>Example Number</u>	<u>Type(s) of Clouds Observed</u>		<u>Form Entries</u>			
	<u>Chart #</u>	<u>Designation</u>	<u>Col.4</u>	<u>Col.5</u>	<u>Col.6</u>	<u>Col.12</u>
1	1	Cumulus Humilis	L1	L3	M8	H2
	3	Cumulonimbus				
	23	Alto cumulus Castellatus				
	27	Cirrus Densus				
2	19	Alto cumulus Cumulogenitus	M6	H5		
	31	Cirrus below 45°				
3	33	Cirro Stratus covering the whole sky				H7

Note from the above examples that the order of entry is dependent upon relative, not actual, heights. Thus either low, middle, or high clouds may be reported in Column 4, or, in the case of three different types of low clouds, Column 6 will contain an entry for low clouds.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.06 ENTRIES ON FORM R-98, "SURFACE WEATHER OBSERVATIONS".5.065 Cloud Types by Layer (Columns 4-6)5.065-2 Times for Making Entries of Cloud Types

Entries of cloud types are scheduled for the following times:

0130	1030	1630
0430	1330	1930
0730		2230

However, if the sky symbol in Column 2 is "X" (meaning that the sky is obscured) it is obvious that no entries are possible for Columns 4-6.

5.066 Visibility (Column 7)

Reference: Circular N, Chapter II, Entitled "Visibility".

Use the same procedure as for entries on WBAN-10, given in the above reference, Paragraph 2410, page 24. Also enter appropriate remarks in Column 12 --- see above reference, Paragraph 2420, page 24. Bear in mind that the column numbers of WBAN-10 do not correspond to those of R-98.

5.067 Weather and/or Obstructions to Vision (Column 8)

Reference: Circular N, Chapter III, Entitled "Atmospheric Phenomena".

Use the same procedure as for entries on WBAN-10, given in the above reference, Paragraph 3900, page 35. Also enter appropriate remarks in Column 12 --- see above reference, Paragraph 3920, page 36. Bear in mind that the column numbers of WBAN-10 do not correspond to those of R-98.

5.068 Sea Level Pressure (Column 9)

Simply copy the entries from Column 12 of Form R-109 "Daily Hourly Barometric Pressure Computations". In addition, directly above each third entry (0130, 0430, ---, 2230), enter in red a 3-figure number to indicate the pressure tendency and net 3-hour change. The first digit will correspond to the standard U. S. Weather Bureau Barometric Tendency Code. The last two digits will indicate the net change in tenths of millibars since the last 3-hourly observation. The number 714, for example, shows that the barometer is falling unsteadily and is now 1.4 millibars lower than it was three hours ago.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.06 ENTRIES ON FORM R-98. "SURFACE WEATHER OBSERVATIONS".5.069 Temperature and Dewpoint (Column 10)

Copy the entries from Columns 11 and 10, respectively, of Form R-108 "Daily Hourly Psychrometric Computations". Separate these entries by a slant line, as illustrated below, where 48 is the temperature and 36 the dewpoint:

48/36

5.0610 Wind (Column 11)

Entries in this column will be both the direction and ~~speed~~ of the wind at the 50-ft. level. The direction will be either the nearest point of a 16-point compass, or calm. The speed will be to the nearest whole mile per hour. Both direction and speed will be those considered most representative for a ~~one~~⁵-minute interval immediately preceding observation time.

5.0610-1 Gustiness

Report gustiness of the wind by affixing a "+" immediately after the one-minute wind speed and then in remarks (Column 12) entering the peak speed of the gusts observed during the previous 15 minutes.

Example:

Column 11Column 12

SW 25+

G 39

As criteria for gustiness, use the stipulations of Circular N, Paragraph 8310, page 93.

5.0611 Remarks (Column 12)

Summarized below are references previously cited for use as a guide in making entries in Column 12:

Circular N	Paragraph 1520	Page 15
	Paragraph 2410	Page 24
	Paragraph 3920	Page 36
This Manual	5.065 (last sentence)	
	5.0610-1 (example)	

The above references do not stipulate every possible form of entry for Column 12. It is left to the observer to enter in Column 12 every piece of information which may in any way be useful or which may add meaning to other data reported.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.06 ENTRIES ON FORM R-98, "SURFACE WEATHER OBSERVATIONS".5.0612 Observer (Column 13)

The person making an observation will insert his initials in this column. If two or more cooperate in an observation, only the one who takes the visual data out-of-doors should insert his initials.

5.0613 Time of Taking Observations

All observations reported in Columns 2-12 will be taken hourly on the half-hour, except where special observations, as specified below, are required.

5.0614 Criteria for Taking Special Observations

Special observations are taken to provide information on significant developments in meteorological occurring at other than scheduled times. A "Special" will be taken whenever one or more of the elements listed below have changed in the amount specified.

5.0614-1 Ceiling

- (1) The ceiling decreases to less than 1500 feet, or increases to 1500 feet or more.

5.0614-2 Visibility

- (1) The visibility decreases to

- (a) 1/4 mile
- (b) 1 mile
- (c) 6 miles

- (2) The visibility increases to

- (a) 6 miles
- (b) 1 mile
- (c) 1/4 mile

5.0614-3 Tornado

- (1) Is observed
- (2) Disappears from sight

5.0614-4 Thunderstorm

- (1) Begins
- (2) Ends

5.0614-5 Precipitation

- (1) Hail (other than small) begins or ends

5-1972-4 6-31

2

fall snow, sleet, hail, or ice on the ground is included in snow depth.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.07 ENTRIES ON FORM R-1972, "DAILY HOURLY PRECIPITATION MEASUREMENTS"5.071 Entries on This Form Are Required:

1. Hourly on the hour whenever precipitation in any form, amount, character, or intensity occurs.
2. Every six hours (0400, 1000, 1600, and 2200) whenever there is any snow, sleet, hail, or ice on the ground but no precipitation is occurring.

5.072 Whenever Entries on This Form Are Required as Specified Above, Observe the Following Rules:

1. Stamp the date on either the top line or, if previous entries appear on the form, on the next available line. After completion of date for any particular day, leave a blank line for totals before beginning entries for a new day.
2. Insert the hour of the day in column 1. The first entry will be for the hour after which precipitation began. The last entry will be for the hour after which no further precipitation occurred.
3. Insert in column 2, opposite each entry in column 1, the cumulative total of all water in the gage since last gage-emptying time. Enter this figure to the nearest 0.01 inch. Use "T" (trace) to denote an amount too small to measure. If there is snow on the ground, enter the depth to the nearest 0.1 inch in column 3.
4. Enter in column 4, a symbol for each form of precipitation which occurred since the time of the previous hourly observation. Exclude notations for precipitation character or intensity.
5. Enter in column 5, the water equivalent of all precipitation since the time of the previous hourly observation. If precipitation is confined to liquid form, the entry in column 5, corresponding to any hour shown in column 1, is found from column 2 by taking the entry for that hour and subtracting the entry for the previous hour.
6. If precipitation is in the form of snow, sleet, or hail record in column 6 the amount which accumulated on the ground during the past hour. This is found by taking the entry for the current hour in column 3 and subtracting the entry directly about it.
7. In column 7, include remarks to show:
 - A. Times of beginning and ending of precipitation.
 - B. Times when gage is emptied.
 - C. Times when precipitation changes from one type, or combination of types, to 100% of one type.
 - D. Any other information required for a complete understanding of all entries appearing in columns 1-6.

B-1973-X

Hanford Works Meteorology Station

MONTHLY DAILY SUMMARY OF FOG AND MISCELLANEOUS PHENOMENA

Month _____

Date	All Fog (Viz. 0 to 6 mi.)				Dense Fog (Viz. $\frac{1}{2}$ mi. or less)				Date	Misc. Phenomena
	Time (PST)		Duration		Time (PST)		Duration			
	From	To	Hours	Min.	From	To	Hours	Min.		
1	2	3	4	5	6	7	8	9	10	11
									1	
									2	
									3	
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
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									17	
									18	
									19	
									20	
									21	
									22	
									23	
									24	
									25	
									26	
									27	
									28	
									29	
									30	
									31	
Sum										

In column 11, list the occurrence of the following phenomena.

Tornado	BD	IC
Earthquake	BS	
Thunder	TL	
Hail	HS	

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.08 ENTRIES ON FORM R-1973, "MONTHLY DAILY SUMMARY OF FOG AND MISCELLANEOUS PHENOMENA"

5.081. Entries in Columns 1-5.

Make entries in these columns for any and all notations of F, GF, or IF in column 9 of the "Surface Weather Observation" form (R-98). List the date of occurrence in column 1 and the beginning and ending times of each period of fog in columns 2 and 3. From these entries, compute entries for columns 4 and 5.

5.082. Entries in Columns 6-9.

Make entries in these columns to show times during which visibility in fog is restricted to 1/4 mile or less.

5.083. Entries in Column 11.

In this column note the occurrence of any of the phenomena listed at the bottom right of the form. A thorough search of columns 9 and 13 of the "Surface Weather Observation" form is necessary for this. Symbols used are interpreted as follows:

BD - Blowing Dust
BS - Blowing Snow
DL - Distant Lightning
DS - Drifting Snow
IC - Ice Crystals
D - Dust
K - Smoke
T - Thunderstorm

Hanford Works Meteorology Station

Month _____

[illegible]

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.09. ENTRIES ON FORM R-1974. "MONTHLY DAILY SUMMARY OF PRECIPITATION"

1. Make all entries from the data on form R-1972 (Daily Hourly Precipitation Measurements).
2. Determine the beginning and ending times of each period of precipitation and record these in columns 2 and 3, respectively.
3. From the entries in columns 2 and 3, compute the entries for columns 4 and 5.
4. In column 6, enter the water equivalent of all precipitation occurring within each of the periods specified by columns 2-5.
5. Fill in as many of the columns 7-14 as necessary to show both the water equivalent of each form of precipitation and the unmelted depth of each form of frozen precipitation.

R-1975-X

STATION _____ MONTH _____

[illegible]

HW-24567

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.10 ENTRIES ON FORM R-1975, "MONTHLY DAILY TEMPERATURE EXTREMES"

5.101 General

Take all necessary temperature data for this form from instruments located in the shelter NW of the tower. These instruments include a Taylor maximum thermometer and a Taylor minimum thermometer, each mounted on a Townsend support, and a Taylor Six's combination maximum and minimum thermometer. Take observations three times per day as follows:

0730
1630
Midnight (0000)

5.102 Procedure for 0730

1. Before going out-of-doors, check the speedomax recorder chart for the time of over-night low and enter this time in column 15. This will always be the first entry for any date specified in column 1.
2. If the time in column 15 is between 0000 and 0730, observe the minimum temperature from the Townsend support minimum thermometer and record its value in column 14. Otherwise, obtain the entry for column 14 by reading the cold (left) side of the Six's (hereinafter designated the "U") thermometer.
3. Reset the index on the heat (right) side of the "U" thermometer.

5.103 Procedure for 1630

1. Before going out-of-doors, determine from the speedomax recorder chart the time of highest temperature after sunrise and record it in column 13. Also ascertain whether or not the temperature at the time recorded in column 13 is the highest so far for the day (since 0000). This is usually, although not always, the case.
2. If the highest temperature for the day so far occurs at the time recorded in column 13 (the normal case), read the maximum temperature since sunrise from the Taylor maximum thermometer and record its value in column 12. Otherwise obtain the entry for column 12 by reading the heat side of the "U" thermometer.
3. Reset the index on the cold side of the "U" thermometer.
4. Compute the temperature range by taking the entry in column 12 minus the entry in column 14. Record this in column 16.

Note: On rare occasions, the highest temperature between sunrise and sunset will not yet have been reached by 1630. On such occasions, merely reset the index on the cold side of the "U" thermometer and delay the taking of data for columns 12 and 13 until such time as the temperature begins to fall.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.10 ENTRIES ON FORM R-1975, "MONTHLY DAILY TEMPERATURE EXTREMES"5.104 Procedure for 0000

1. Observe the highest and lowest temperatures from the Townsend support thermometers and record these in columns 2 and 3, respectively.
2. Using the procedure outlined in 4.061, reset the maximum thermometer and record the setting in column 9.
3. Also using the procedure of 4.061, reset the index of the minimum thermometer.
4. After return to the building, inspect the speedomax recorder chart for the times of highest and lowest temperatures between midnight and midnight and record these times in columns 10 and 11.
5. From the entries in columns 2, 3, and 6, make the necessary calculations for columns 4, 5, 7 and 8 as follows:
 - A. Column 4 (range) = entry in column 2 minus entry in column 3.
 - B. Column 5 (mean) =
$$\frac{\text{Maximum plus Minimum}}{2}$$

When necessary, dispose of decimals by application of the rule given in 5.017.

- C. Column 7 (departure from normal) = entry in column 5 minus entry in column 6, entries in the latter column being provided by the supervisor.
- D. Column 8 (degree days) = 65 degrees minus the entry in column 5, negative differences being counted as zero.

MONTHLY DAILY RENT OUR INDEX

[illegible]

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.11 ENTRIES ON FORM R-1, "MONTHLY DAILY WIND SUMMARY"

1. Determine the prevailing wind direction, expressed to eight points of the compass, and enter it in column 2. To determine this direction, proceed as follows:
 - A. From the daily hourly wind log (form R-143) count the number of hours of each of the directions in column 3, tabulate them in the table at the bottom, and make sure that the total of the numbers in the table is equal to 24.
 - B. Assign one-half the intermediate directions to each of the adjacent cardinal directions and determine the cardinal direction for which the total is greatest. Refer to table 5.11 below for illustrative examples.

TABLE 5.11
DETERMINATION OF DAILY PREVAILING WIND DIRECTION

	<u>NNE</u>	<u>NE</u>	<u>ENE</u>	<u>E</u>	<u>ESE</u>	<u>SE</u>	<u>SSE</u>	<u>S</u>	<u>SSW</u>	<u>SW</u>	<u>WSW</u>	<u>W</u>	<u>WNW</u>	<u>NW</u>	<u>NNW</u>	<u>N</u>	<u>V & Cm</u>
(a)					2					1	1	6	5	6	2	1	
(b)				3	2	1			4	1			1	1			11
(c)											7	3	7	6	1		

Case (a) $W = 6 + 1/2 + 2 - 1/2 = 9$ NW totals to $1/2$ hour more than W and is therefore considered the prevailing direction.
 $NW = 6 + 2 - 1/2 + 1 = 9 - 1/2$

Case (b) $Vbl. + Cm. = 11$ Variable and Calm account for most of the wind on this date. The prevailing direction, however, must be one of the 8 cardinal points of the compass. In this case it is E.
 $E = 3 + 1 = 4$
 $SW = 1 + 2 = 3$

Case (c) $W = 3 + 3 - 1/2 + 3 - 1/2 = 10$ W and NW total the same. However, if we total the number of hours from each octant, we get the following result:
 $NW = 6 + 3 - 1/2 + 1/2 = 10$

$$W = 3 + 7 + 7 = 17$$

$$NW = 6 + 7 + 1 = 14$$

Since the W octant contains the greater total, W is considered the prevailing direction.

2. Take the Daily Hourly Wind Log and determine, to the nearest 0.1 mile per hour, the average speeds for the 50-foot and 100-foot levels. Enter these in columns 7 and 8, respectively.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.11 ENTRIES ON FORM R-2877, "MONTHLY DAILY WIND SUMMARY" (CON'T)

3. Inspect the #8, #5, and #1 velocity tapes and from each select from the 24-hour period between midnight and midnight, both the peak gust to the nearest whole mile per hour and the time of its occurrence to the nearest five minutes. Record these observations in columns 4, 5, 7, 8, 11, and 12.
4. Inspect the #4, #3, and #1 direction tapes and determine the directions, expressed to 16 points of the compass, at the times given in columns 5, 8, and 12. Record these directions in columns 6, 9, and 13.

R-1976-X

Hanford Work M. Biology Station

MONTHLY DAILY SUMMARY OF SKY COVER, PRESSURE, HUMIDITY, AND FROST

Date	Sky Cover (tenths)		Bar. Pressure (Inches)			Rel.	Frontal Passages and Chinook Intrusions
	Total	Avg	Avg Station	Sea Level Highest	Lowest	Hum (%) Avg	
1	2	3	4	5	6	7	8
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
Sum							
Avg							

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.12 ENTRIES ON FORM R-1976, "MONTHLY DAILY SUMMARY OF SKY COVER, PRESSURE, HUMIDITY, AND FRONTS"

1. On the "Surface Weather Observations" form, add the 24 hourly entries of sky cover from 0030 to 2330 and record the total in column 2.
2. Divide the entry of column 2 by 24 and record this average, expressed to the nearest whole number from 0 to 10, in column 3.
3. From the "Daily Hourly Barometric Pressure Computations" form, determine the average of the hourly values for station pressure and record this, without the first significant figure, to the nearest 0.001 inch, in column 4.
4. Also from the pressure log, underline in red and blue, respectively, the highest and lowest of the hourly values of MSL pressure in inches and record these to the nearest 0.01 inch in columns 5 and 6.
5. From the "Daily Hourly Psychrometric Computations" form, determine the average of the hourly entries for adjusted values of relative humidity and record this to the nearest whole percent in column 7.
6. In column 8 record the occurrence of frontal passages and chinook inversions, using notations as follows:

KFR - Cold Front
WFR - Warm Front
CK - Chinook Inversion

Also record, to the nearest five minutes, the times of frontal passages and the times of beginning and ending of chinook inversions. Thus, a chinook inversion lasting from 0015 to 0740, and a warm front passing at the latter time, would be recorded as:

CK 0015 - 0740; WFR 0740

A. Criteria for Determining the Passage of Fronts

Experience at this station has shown that some fronts are so sharp and well-defined that there can be no doubt about their occurrence and no difficulty encountered in selecting accurately their times of passage. In other cases, however, the fronts are so diffuse and changes associated with them are so minute that there can be much doubt as to time of passage. In some cases it is even difficult to ascertain whether or not a front passed at all. In still other cases difficulty is experienced in deciding whether or not a certain front is a warm one or a cold one. These cases emphasize the necessity for standardization of procedures for making the required notations of frontal passages. Hence the following rules will be observed:

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.12 ENTRIES ON FORM R-1976, "MONTHLY DAILY SUMMARY OF SKY COVER, PRESSURE, HUMIDITY, AND FRONTS"A. Criteria For Determining the Passage of Fronts (Continued)

- (1) Do not record the passage of any front not shown on the weather maps unless indications of a passage are so definite as to leave no reasonable doubt about the existence of a front which the weather maps do not show.
- (2) Whenever the weather maps do show that a front passed our station, then examine all record tapes and attempt to pick out the time of passage. Omit recording of the front only in cases where indications of one are either nonexistent or are so indefinite or contradictory that the time of passage cannot be accurately selected.
- (3) Use the weather maps as a guide in locating times of frontal passages. However, select these times solely from the indications of the 622 building record tapes. On May 12, 1952, (figure 5.04-1) the weather maps should show a cold front approaching the station at 1630 and having already passed the station at 2230. Our record tapes all show that the front passed the station within a few minutes of 2125. This then, is the time recorded, regardless of what the weather maps may show.
- (4) In figure 5.04-1, all record tapes point to the same time (2125) as the time of frontal passage. In some cases, however, there will be definite indications of a frontal passage, but disagreement among the various tapes as to the exact time of passage. In such cases, select the time of temperature discontinuity (time when the fall or rise begins) for the time of frontal passage.
- (5) Be careful not to confuse temperature discontinuities associated with fronts with sudden changes which may be attributed to other factors, such as sunrise or sunset, onset of, or sudden changes in intensity of, precipitation, sudden disappearance of, or emergence from, the sun behind a thick cloud bank.
- (6) Always consider the normal diurnal influences in selecting times of frontal passages. On the morning of a sunny day, for example, a temperature discontinuity caused by the passage of a cold front may show as nothing more than a temporary interruption in the normal rising trend of temperature at this time. Figure 5.04-2 shows a case where the surface (#1) temperature actually rose during passage of a cold front. This was merely because the normal nocturnal surface inversion had set in. The 400-foot (#8) temperature shows the expected discontinuity coincident with a cold front passage and the time (2040) checks with the time of wind shift.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.12 ENTRIES ON FORM R-1976, "MONTHLY DAILY SUMMARY OF SKY COVER, PRESSURE, HUMIDITY, AND FRONTS"A. Criteria For Determining the Passage of Fronts (Continued)

- (7) Use only two designations for frontal passages: (a) warm front (WFR), and (b) cold front (KFR). When another type of frontal passage is indicated by the weather maps, classify it as either "warm" or "cold", according to the character of the temperature discontinuity shown by the record tapes.
- (8) Occasionally during the winter, a cold front passage is indicated by the weather maps while a warm front passage is indicated by the character of the temperature discontinuity shown by the record tapes. In such a case, use the weather map designation, but include remarks to show that the cold front had "warm front characteristics".

Temperatures from 3 ft.
to 400 ft.

1 - Temperature at 3 ft.
8 - Temperature at 400 ft.

FIGURE 5.04-2. WIND AND TEMPERATURE TRACES SHOWING THE COLD FRONT PASSAGE OCCURRING AT 2040 ON 21 APRIL, 1952.

STANDARD OF MONTANA HOURLY

HW - 622 BUILDING, MONTANA

LEVEL

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

TOTAL

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.13. ENTRIES ON UNNUMBERED FORM "SUMMARY OF MONTHLY HOURLY PRECIPITATION".

1. Copy the hourly entries from column ~~five~~⁵, form R-1972, and enter the data in the appropriate columns of this form.
2. After entering the hourly amounts, add them and enter the total in the appropriate column at the right of the form.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.14 DETERMINING THE FLOW PATTERN AND DILUTION FACTOR FOR 200-AREA STACK EFFLUENTS5.141 Definition of Terms

1. Flow pattern refers to the flow characteristics of stack off-gases. There are two main types of flow patterns: (1) aloft, and (2) "to the ground". In the former pattern (figure 5.03-top) stack off-gases remain aloft, or at least do not come to the ground within five miles of the point of emission. In the latter type pattern (figure 5.03-bottom) the stack effluents do not remain aloft, but come to the ground relatively close to the point of emission.

2. Dilution Factor

The term "dilution factor", as used here, is understood to be the ratio of concentrations given below:

$$R = \frac{\text{Concentration of particles emitted from a continuous point source 200 feet above ground surface.}}{\text{Maximum concentrations of particles reaching the ground from a continuous point source 200 feet above ground surface.}}$$

When stack effluents remain aloft the denominator of the above becomes zero and R becomes infinite. This corresponds to the aloft flow pattern described in (1).

5.142 Relationship Between Flow Patterns and Meteorological Factors

The most important meteorological factors related to the behavior of stack effluents are (1) wind speed at the level of emission, and (2) stability. The latter of these is, in turn, a function of the vertical temperature profile. The interrelationship between the shape of the temperature profile and the flow pattern of stack effluents is well illustrated in figures I to IV of the drawings under the caption "Atmospheric Factors Affect Stack Patterns".

5.143 The Interrelationship Between Wind Speed, Temperature Profile, and Dilution Factor

The graph entitled "Least Dilutions vs. Stability and Wind Velocity" is used at this station to determine the dilution factor for all metal dissolution operations in the 200 Areas. The graph is used hourly to determine the dilution factor considered most representative for each one-hour time interval. The wind velocity, $\bar{U}$, is shown as abscissa, is the speed at 200 feet averaged over the nominal hour, as from 0100 to 0200. The stability, ΔT , shown as ordinate, is the instantaneous temperature difference observed hourly on the half hour, as at 0130, for a height interval of 200 feet. ΔT is usually taken as:

$$\Delta T_1 = T_{200} - T_g$$

where the numerical subscripts refer to the height above ground surface at

24367

OBSERVATIONAL PROCEDURES AND FORM ENTRIES

5.14 DETERMINING THE FLOW PATTERN AND DILUTION FACTOR FOR 200-AREA STACK EFFLUENTS

5.143 The Interrelationship Between Wind Speed, Temperature Profile, and Dilution Factor (Continued)

which the temperatures, T in degrees fahrenheit, are taken. In some cases, however, (see 5.144) ΔT is taken as:

$$\Delta T_b = T_{250} - T_{50}$$

Knowing $\bar{U}$ and ΔT , it is a simple matter to obtain the dilution factor from the curved lines on the graph. The dilution is rounded to the nearest 50 for factors under 1000, and to the nearest 100 for factors equal to or greater than 1000. It is recorded as a multiple of 100 on the monthly hourly summary form (i.e., 5-1/2 denotes 550 dilutions, and 16 denotes 1600 dilutions).

5.144 Selection of the Height Interval for ΔT

On form R-144, an hourly record is kept of both $T_{200} - T_3$ and $T_{250} - T_{50}$.

Question: Which of the above values of ΔT should be used with $\bar{U}$ to obtain the dilution factor?

Answer: Use $T_{200} - T_3$ except as follows:

1. The sign (plus or minus) of $T_{200} - T_3$ different from the sign of $T_{250} - T_{50}$.
2. The flow pattern is "to the ground" when the sign of both ΔT 's is plus.
3. The lapse in ΔT_b is greater than in ΔT_a .

5.145 Determination of Flow Pattern ("Aloft" or "To the Ground")

In both 5.143 and 5.144 it was assumed that the flow pattern was "to the ground". In all such cases the graph of "Least Dilutions vs. Stability and Wind Velocity" may be used to obtain the dilution factor for any combination of values of $\bar{U}$ and ΔT . This graph, however, cannot be used to determine the flow pattern.

In nearly all cases of inversions with wind speed at stack-top below 10 mph, the flow pattern will be aloft. In practically all cases of wind speeds in excess of 25 mph, the flow pattern will be "to the ground".

With wind speeds of between 10 and 25 mph, however, there quite frequently are cases of questionable flow patterns. In such cases the observer must decide as best he can which of the two is most representative for the current meteorological situation. There are no set rules. There is, however, one valuable aid for eliminating guess-work in the determination of flow pattern. This is the character of the wind (see 5.146).

Atmospheric Factors Affect Smoke Plume

FIGURE I

FIGURE II

FIGURE III

FIGURE IV

Near dawn smoke plumes usually level off above top of stack and remain aloft for many miles. Stable atmospheric conditions cause stable temperature stratification called "inversion" (I) which retards vertical mixing of lower atmospheric layers. Ground concentrations of effluent are very small. After dawn, warming of surface layers causes "lapse" condition (II). Top edge of plume stays about horizontal, bottom edge lowers, smoke concentrations are relatively high. Lapse usually lasts until early evening and vertical mixing brings effluent to the ground (III). Later as earth cools an inversion forms at surface and grows to a height beyond that of plume (IV)

The above graphs are reproduced from those appearing in the article "Air Pollution and its Health Aspects" by W.T. Ingram, collaborating with A.J. Lanza, G.H. Strom, and M.L. Barad (now at Hanford Works). The article appears in the September, 1950, issue of the magazine HEALTH NEWS published by the New York State Department of Health, Albany, New York.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.14 DETERMINING THE FLOW PATTERN AND DILUTION FACTOR FOR 200-AREA STACK EFFLUENTS5.146 The Use of Wind Character as a Means of Determining Flow Patterns

Two radically different conditions of wind character under similar conditions of speed and direction are illustrated in figure 5.10. Here the mean wind for the hour preceding midnight is near 20 mph from the NW octant in both (1) and (2). In (1), however, the oscillatory motions about the mean are very pronounced, while in (2) they are insignificant by comparison. Gusty conditions are always associated with instability, while non-gusty conditions are associated with stability. Hence, with reference again to figure 5.10, one would expect to find the flow pattern "to the ground" in (1) and "aloft" in (2), even though the mean speed and the time of day in each case are the same. Sometimes the wind trace may show an abrupt change in character without an abrupt change in speed. Figure 5.11 illustrates this. Here the change in speed from about 8 mph at 2015 to about 23 mph at 2130 is quite gradual. The character, on the other hand, changes abruptly near 2045. In this particular instance (4-21-52), there is a marked decrease in stability near 2045. This time, therefore, is coincident with a change in flow pattern from "aloft" to "to the ground".

LEAST DILUTIONS VS. STABILITY AND WIND VELOCITY

FIGURE 5.10. TWO TYPES OF WIND CHARACTER UNDER SIMILAR CONDITIONS OF SPEED AND DIRECTION.

(1) Aug. 4, 1950. Wind character gusty.

(2) Aug. 12, 1950. Wind character not gusty.

FIGURE 5.11. An actual trace of wind speed showing an abrupt change in character without an abrupt change in speed.

FIGURE 5.05

EVALUATION OF THE SOLAR RADIATION TRACE FOR A
PORTION OF JULY 12, 1956

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.15 ENTRIES ON FORM X-746 "DAILY HOURLY LOG OF SOLAR RADIATION."5.151. Preliminary Procedure and Sample Evaluations

A necessary prerequisite to making form entries is the sketching of evaluation lines on the chart. If the trace has no pronounced breaks in it, as between 1200 and 1300 (figure 5.05), a single line is drawn such that the area subtended above it is visually equal to that subtended below it. Between 1200 and 1300 (figure 5.05) the position of this line is obviously at 1.26.

If the trace does contain pronounced breaks, as between 1100 and 1200 (figure 5.05) the steps in the evaluation procedure are listed below in the order in which they should be executed.

1. At or near points of discontinuity, draw intermediate time lines as AB and CD in figure 5.05.
2. Between each two adjacent time lines draw a line subtending visually equal positive and negative areas. These lines may either be horizontal (as between 1100 and 1200), or sloping (as between 0600 and 0700). Where the trace is fairly smooth it is usually preferable to draw sloping lines as such lines usually subtend small areas which are more easily and accurately compared than are large areas.
3. List, in column form on the chart for each one-hour time interval (as in column E) the value (or average value) of each of the lines constructed in step 2. In making up this listing it is customary to begin at the end of the hour and work backward toward the beginning.
4. The time scale on the chart approximates 1 inch = 1 hour. Therefore, by use of a "10" scale, list (as in column F) the decimal portion of the hour through which each of the lines constructed in step 2 is applicable.
5. By use of a calculating machine, take the weighted average of each of the listed products between one-hour time intervals. Between 1100 and 1200, this average is

$$\sum \frac{(126)(70) + 115(16) + (93)(14)}{10^4}$$

The divisor 10^4 results from the custom of omitting decimals from all figures written on the chart. It is of course necessary that, in each such calculation, the sum of the multipliers be equal to 10,000.

OBSERVATIONAL PROCEDURES AND FORM ENTRIES5.15 ENTRIES ON FORM X-746 "DAILY HOURLY LOG OF SOLAR RADIATION (Contd.)5.152. Use of Form X-746

- (a) Begin a new form on the first day of each month. Data for the first 16 days is entered on one side and data for the remainder of the month is entered on the back side.
- (b) Enter the day of the month in each of the columns under "Date."
- (c) For each day, opposite each of the hours shown at the left, enter the average value of solar radiation to the nearest 0.01 langley per minute. Refer to 5.141 for instructions on obtaining these entries. Enter 0 for all hours in which no radiation shows on the trace. Enter T for each hour of average radiation ≤ 0.005 langley per minute.
- (d) At the bottom of the form enter, for each day, (1) the sum of the hourly entries, and (2) the number of langleys of solar radiation. The latter figure is obtained by multiplying the sum by 60 and rounding the result to the nearest whole langley.

5.153. Checking Procedure

The checking procedure consists of making independent computations of each of the hourly entries. Where the same result is obtained, a red check is placed beside the original entry. Otherwise a new entry is made in red directly above the original entry and a recheck made to resolve the difference. All checking and rechecking are ordinarily done only on the #2 and #3 shifts.

DAILY HOURLY LOG OF SOLAR RADIATION

Hourly averages (gm. cal./sq. cm./min.) and daily totals (langleys*) of solar radiation (direct and diffuse) received on a horizontal surface:

HW - 622 Building. Month _____

Hour (PST)	Date											
04-05												
05-06												
06-07												
07-08												
08-09												
09-10												
10-11												
11-12												
12-13												
13-14												
14-15												
15-16												
16-17												
17-18												
18-19												
19-20												
Sum												
No. of Langleys												

* 1 langley = 1 gram calorie per square centimeter

X-746

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING

5.16. CARD PUNCHING

5.161. IBM 820779 For Hourly Surface Observations

Reference: Manual of Card Punching (WBAN)

5.161-1. General

One card is required for each hourly observation made on the half-hour. Thus 24 cards per day are

[illegible]

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5.161-5. Columns 24-56

Follow the reference instructions, pages 15-23,
along with the following additional instructions:

- a. In columns 25-29, show very light intensity by punching the appropriate symbols for light intensity.
- b. Punch values for dewpoint, dry bulb, wet bulb, and relative humidity (columns 36-38 and 47-55) only at 3 hourly intervals beginning at 0130.

5.161-6. Columns 57-79

Do not punch these columns except to show the types of clouds present at 3 hourly intervals beginning at 0130. For doing this, follow the reference instructions given in item (2), page 24.

[REDACTED]

[REDACTED]

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING5.16. CARD PUNCHING5.162. IBM 762656 For Summary of Day

Reference: Manual of Card Punching (WBAN)

5.162-1. General

One card per day is required. Data necessary for punching are taken from the following forms:

- a. R-98 "Surface Weather Observations"
- b. R-108 "Daily Hourly Psychrometric Computations"
- c. R-1972 "Daily Hourly Precipitation Measurements"
- d. R-1975 "Monthly Daily Temperature Extremes"

5.162-2. Columns 1-9

Do not punch in these columns.

5.162-3. Columns 10-50

Follow the reference instructions, pages 45-52, along with the following additional instructions:

- a. Use data from the 50 foot level for punching peak gust data (columns 28-35).
- b. Use Data from column 9 of the Psychrometric Log for punching relative humidity extremes (columns 36-40)
- c. To insure proper punching of columns 41-50, it is necessary that the "Weather" and "Remarks" columns of the Surface Observation Log be inspected thoroughly.

5.162-4. Columns 51-80

Do not punch in these columns.

[illegible]

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING5.16. CARD PUNCHING5.163. IBM 775100 For Winds Aloft ObservationsReference: Manual of Card Punching (WBAN)

5.163-1. General. IBM card 775100 is used both for pibals taken at the meteorology station and for rawinsondes taken by the U.S. Army at HAPO. One card is required for each scheduled observation, regardless of whether or not a scheduled pibal or rawinsonde is actually taken. If a scheduled observation is not taken, then columns 13-16 and 19 are punched but the others are left blank.

5.163-2. Columns 1-12. Do not punch in these columns.

5.163-3. Columns 13-16. Follow the reference instructions, pages 58-59, but use PST rather than GCT. The scheduled observation times are at hours 01, 07, 13, and 19.

5.163-4. Columns 17-19. In columns 17 and 18, punch the actual time of the start of the observation to the nearest hour using PST. In column 19, punch as specified below.

- 1 if a scheduled observation is taken.
- 0 if a scheduled observation is not taken.

5.163-5. Columns 20-47. Follow the reference instructions, paragraph 3, page 60. Data for the columns are obtained as specified below.

Height (Meters)	Local Pibal Minute No.	Army Rawin Zone Identifi- cation No.
Sfc.	*	0
500	2	2
1000	4	3
1500	7	4
2000	9	5
2500	12	6
3000	15	7

*Use the direction and speed shown by the 50-ft. wind recorders at the time of the actual start of the observation.

Tables are provided for converting miles per hour to meters per second and degrees of azimuth to direction codes.

5.163-6. Columns 48-79. Data are not recorded for levels above 3000 meters. Hence these columns are left blank.

5.163-7. Column 80. Punch the appropriate number as specified by the table below.

- 0 - Single theodolite pibal
- 1 - Double theodolite pibal
- 9 - Army rawinsonde

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING5.16. CARD PUNCHING5.163. IBM 775100 for Winds Aloft Observations

Reference: Manual of Card Punching (WBAN)

5.163-1. General

One card is required for each scheduled pibal. Thus, four cards per day are used, regardless of whether or not all scheduled pibals are actually taken. Data necessary for the card punching are taken from form R-145 entitled "Pilot Balloon Ascension Report".

5.163-2. Columns 1-12

Do not punch in these columns.

5.163-3. Columns 13-80

Follow the reference instructions, pages 58-61. The specified heights, in meters, are equated to the times after balloon release in the following manner.

500 m	=	#2 minute
1000 m	=	#4 minute
1500 m	=	#6 minute
2000 m	=	#9 minute
2500 m	=	#12 minute
3000 m	=	#15 minute
4000 m	=	#20 minute

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING

5.16. CARD PUNCHING

5.164. IBM 5081 for Temperatures Not Observed at 622 Building

Reference: Manual of Card Punching (WBAN)

5.164-1. General

One card per day is required for each off-site station. Data necessary for punching are read directly from the appropriate thermograph charts. Although these cards do not have titled column headings, they are punched as indicated by exhibit 4.

5.164-2. Columns 1-9

Do not punch in these columns.

5.164-3. Columns 10-11

Follow the reference instructions on page 8.

5.164-4. Columns 12-13

Do not punch in these columns.

5.164-5. Columns 14-49

Punch the temperatures at 30 minutes past each odd hour -- using the reference instructions for maximum temperature on page 45. If any or all temperatures are missing for a particular day, use the "Y" overpunch in the left hand column for the appropriate hour or hours.

STATION 18

1

12-01-54

12

12

HOURLY WEATHER OBS STATION 18-7148 MS	0030				0130				0230				0330				0430				0530					
	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED	DIRECTION	SPEED		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

EXHIBIT 5

5.165-3. Wind Speed

Wind speed is obtained by visual averaging, to the nearest whole unit of speed, the chart trace for one-hour periods. Two digits must be marked for every speed. Thus, in exhibit 5, an average speed of 9 units from 0200 to 0300 is coded "09". Both calms and missing data are marked "00".

OBSERVATIONAL PROCEDURES, FORM ENTRIES, AND CARD PUNCHING5.16. CARD PUNCHING5.16j. IBM 713446 MS For Transcription of Hourly Wind Observations at Off-Site Stations.5.165-1. General.

These cards are not punched. Instead they are marked by a pencil equipped with IBM mark sensing lead. The cards are supplied by Numerical Analysis with following data printed on them:

- a. Station Number
- b. Hour Code
 - "1" indicates hours 0030 through 0530
 - "2" indicates hours 0630 through 1130
 - "3" indicates hours 1230 through 1730
 - "4" indicates hours 1830 through 2330
- c. Date (Month-Day-Year)
- d. Hours (six on each card printed in the column headings)

In exhibit 5, a card is shown which is prepared for transcription of data from Station 18 on 12-1-54. Between the station number and the date is the code figure "1" which corresponds to the hours printed in the column headings. These hours are understood to be the mid-points of the hourly periods over which data are summarized.

5.165-2. Wind Direction.

Wind direction is read from the tapes in accordance with the rules specified in 5.02, pages 1-2. Data are transcribed to the card by marking lines through the numbers corresponding to those of the following code:

<u>Direction</u>	<u>Code</u>	<u>Direction</u>	<u>Code</u>
Missing	00	SSW	09
NNE	01	SW	10
NE	02	WSW	11
ENE	03	W	12
E	04	WNW	13
ESE	05	NW	14
SE	06	NNW	15
SSE	07	N	16
S	08	Vbl	17
		Calm	18

In exhibit 5, under 0230, code figure "14" is marked. This means that NW is the most representative direction for the one-hour period from 0200 to 0300.

SECTION 6 WEATHER FORECASTING

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WEATHER FORECASTING

6.01 INTRODUCTION

This section is concerned only with essential details of the various types of forecasts and with the rules used to determine their accuracy. Such subjects as weather map analysis and the techniques of forecasting are beyond the scope of this manual.

WEATHER FORECASTING6.02 TYPES OF FORECASTS ISSUED

The forecasts for which this station is responsible are as follows:

- (1) 8-hour production forecasts.
- (2) 24-hour general forecasts.
- (3) Special forecasts.

In addition to the above, this station issues the U.S. Weather Bureau's 5-day and 30-day forecasts to interested plant personnel having official use for them. Both are received over the teletype -- the former at 0415 on Tuesdays and Fridays; the latter at 1614 on the Tuesday or Friday nearest the 14th and next-to-last day of each month. These forecasts are dealt with more completely in 6.05.

8-HOUR PRODUCTION FORECASTS

HW - 622 BLDG. DATE May 14, 1952

Time (PST)								
08	09	10	11	12	13	14	15	16

#1 SHIFT FORECAST COVERING PERIOD FROM 0800 TO 1600-PST		Wind <u>Fcst.</u> <u>W</u>
Festr. <u>REK</u>		Dcn <u>Actl.</u>
Score: Wind Dcn. _____		Wind <u>Fcst.</u> <u>10</u>
Wind Speed _____		Speed <u>Actl.</u>
Dilution _____		Dilu- <u>Fcst.</u> <u>7</u>
<u>Pcpn &/or Fog</u>		Tions <u>Actl.</u>
Total Score _____		Pcpn. <u>Fcst.</u> <u>None</u> → <u>Showers</u>
		&/or Fog <u>Actl.</u>

[illegible]

		00	01	02	03	04	05	06	07	08	
#3 SHIFT FORECAST COVERING PERIOD FROM 0000 TO 0800-PST		Wind	Fest. W								
		Den	Actl.								
Festr. JT		Wind	Fest. 15		→		10		→		
Score: Wind Den.		Speed	Actl.								
Wind Speed		Dilutions	Fest. 15		→		A		→ 5		
Dilution			Actl.								
Peppn. For For		Peppn.	Festl.		←		None		→		
		For For	Actl.								
Total Score											

WEATHER FORECASTS

6.01. GENERAL

The Meteorology station issues, and is responsible for, three types of forecasts as listed below:

1. 8-hour production.
2. 24-hour general.
3. Special.

The station also issues, but is not responsible for, 5-day forecasts received over the teletype from the United States Weather Bureau. It is the purpose of this section to (1) specify what information each type forecast should contain and (2) set forth the policy used in evaluating the accuracy of each.

6.02. 8-HOUR PRODUCTION FORECASTS

Three of these forecasts are prepared daily and phoned to the 200-Area separations plants approximately 45 minutes before each shift change hour. Valid time begins on the shift change hour. The form used in preparing these forecasts (sample reproduced from those of May 14, 1952) specifies the information which they should contain. Wind directions and speeds apply to the 200-foot level. Dilutions are in 100's and are verified as specified in 5.14.

6.03. VERIFICATION AND GRADING PROCEDURES: PRODUCTION FORECASTS

Recording of the observed components of a production forecast is done, on an hour-by-hour basis, by the forecaster on duty during the valid period. Subsequently the forecast is graded in accordance with the schedule shown in table 1.

In this table, the column labeled "Forecast" gives permissible forecasts for each component, while the column labeled "Verify" gives the observed conditions under which those predicted can be considered correct.

TABLE 1. PERMISSIBLE FORECASTS VS. OBSERVED
CONDITIONS REQUIRED FOR VERIFICATION

WIND DIRECTION

(3-1/2 points for each hour correct; 28 points for 8 hours correct)

<u>Forecast</u>	<u>Verify</u>
Any direction on 8-point compass	Any direction in same quadrant as that predicted.
Variable	Variable all quadrants; also any direction during a period of extreme short-term variation from the prevailing direction or during a period of no particular persistence in any one quadrant.

WIND SPEED (mph)

(2 points for each hour correct; 16 points for 8 hours correct)

<u>Forecast</u>	<u>Verify</u>	
2*	0-6	*When 2 mph is predicted the direction portion of the forecast is automatically considered correct during all hours of observed speed 2 mph or less.
5	2-10	
10	6-17	
15	10-24	
25	18-38	
35	7 25	

DILUTION (100's)

(4 points for each hour correct; 32 points for 8 hours correct)

<u>Forecast</u>	<u>Verify</u>	
3	5 or less	*A forecast of 1500 dilutions is also considered correct during hours of aloft observations providing the predicted speed is within the range considered correct and providing also that T200-T3 is less than 48.0 degrees F.
5	3-7 1/2	
7	5-11	
10	7-18	
15	10 or 7*	
A	Aloft	

PRECIPITATION AND/OR FOG

(3 points for each hour correct; 24 points for 8 hours correct)

<u>Forecast</u>	<u>Verify</u>	<u>Forecast</u>	<u>Verify</u>
R	R, RW, ZR, L*	R or S	See P-8
RW	R, RW, SP, A	F	F, CF, IF, L, SG
S	S, SW, SG*	CF	CF, F observed within 3 miles of station, but not at the station.
SW	S, SW, SP, AP		

*Providing the forecast symbol
Includes a minus-sign suffix.

6.03-1. MISCELLANEOUS PRECIPITATION-FOG GRADING RULES

- (1) Whenever measurable precipitation, or fog not classified as ground fog, occurs at any time within the valid period, and none is forecast, or vice versa, each hour and fraction of an hour, up to a maximum of 4 hours so affected, is considered as 2 hours wrong.
- (2) When precipitation and fog occur simultaneously, only the precipitation need be forecast.
- (3) Precipitation which does not total to a measurable amount within an 8-hour valid period need not be forecast. If it is forecast, however, it is considered entirely right, providing the most appropriate precipitation symbol from table 1 is used and minus sign is suffixed thereto.
- (4) An unqualified forecast of precipitation requires, for full verification, occurrence at the station.
- (5) A forecast of precipitation qualified by "scattered" requires, for full verification, only that the phenomenon be observed from the station and that the qualifying adjective be appropriate for the conditions subsequently observed.
- (6) A forecast of precipitation qualified by "occasional" or "intermittent" requires, for full verification, occurrence at the station and, in addition, requires that the qualifying adjective be appropriate. However, such a forecast is considered entirely correct if periods of observed precipitation are separated by as much as 6 hours.
- (7) If the forecast time of beginning or ending of precipitation or fog is within 2 hours of that actually observed, 1 hour of tolerance is granted in the grading.

Some precipitation-fog forecasts which are not entirely correct may receive half credit. Such cases are listed in the table below.

TABLE 2. PRECIPITATION AND/OR FOG
FORECASTS RECEIVING ONE-HALF CREDIT

<u>Forecast</u>	<u>Observed</u>
(1) Precipitation (no intensity specified)	Precipitation with total amount too small to measure.
(2) Precipitation (light intensity specified)	Precipitation of moderate intensity.*
(3) Precipitation (qualified by the words "occasional" or "intermittent")	Steady precipitation.
(4) Precipitation (qualified by the word "scattered")	Precipitation in which the qualifying term is not appropriate, but total amount at station less than 0.10 inch.
(5) Precipitation (not qualified by the word "scattered")	Precipitation from, but not at, the station.
(6) Precipitation (rain specified)	Snow.
(7) Precipitation (snow specified)	Rain.
(8) Precipitation ("Rain or snow" specified)	Precipitation in which one or the other should have been specified.
(9) Precipitation	Fog not classified as ground fog.
(10) Fog	Fog from, but not at, the station.

*Any period of observed moderate intensity affects the entire period of forecast light intensity.

6.03-2. MISCELLANEOUS GRADING RULES FOR WIND
AND DILUTION FORECASTS

1. Temporary deviations of observed conditions from those prevailing during a valid period, or portion thereof, need not be forecast. Below is an example.

TABLE 3. HOURLY WIND AND DILUTION
OBSERVATIONS DURING AN 8-HOUR PRODUCTION
FORECAST PERIOD: MAY 17, 1957

	<u>16-17</u>	<u>17-18</u>	<u>18-19</u>	<u>19-20</u>	<u>20-21</u>	<u>21-22</u>	<u>22-23</u>	<u>23-24</u>
Wind Direction	SE	SSE	E	WSW	SW	W	S	SE
Wind Speed	20	15	8	9	10	4	1	7
Dilutions	14	13	A	11	8-1/2	A	A	8-1/2

Assuming 24 points for the precipitation-fog portion of the forecast, the following prediction on the other components would have earned a grade of 100%:

S for 8 hours
10 mph for 8 hours
1000 dilutions for 8 hours

2. Significant changes in observed conditions, without a return to those formerly prevailing, do need to be forecast. Below is an example.

TABLE 4. HOURLY WIND AND DILUTION OBSERVATIONS
DURING AN 8-HOUR PRODUCTION FORECAST
PERIOD: JANUARY 13, 1957

	<u>16-17</u>	<u>17-18</u>	<u>18-19</u>	<u>19-20</u>	<u>20-21</u>	<u>21-22</u>	<u>22-23</u>	<u>23-24</u>
Wind Direction	NW	NW	NW	NW	NNW	Cm	NE	ENE
Wind Speed	14	14	16	13	4	0	1	1
Dilutions	10	12	12	11	6 1/2	8	5 1/2	5

Assuming 24 points for the precipitation-fog portion of the forecast, the following prediction on the other components would have earned a grade of 100%.

NW for 8 hours
10 (or 15) mph for 4 hours; 2 mph for 4 hours
1000 dilutions for 4 hours; 700 dilutions for 4 hours

It should be noted that, in this case, if the change in prevailing speed to near calm conditions had been foreseen, it would not have been necessary to predict the change in prevailing direction from NW to NE.

3. Whenever significant changes occur and the forecasts covering the period both before and after are the best permissible as defined in table 1, then, if the time of the observed change is within 2 hours of that forecast, 1 hour of tolerance is granted in grading. Below is an example.

TABLE 5. HOURLY WIND AND DILUTION OBSERVATIONS
DURING AN 8-HOUR PRODUCTION FORECAST
PERIOD: MARCH 10, 1957

	<u>16-17</u>	<u>17-18</u>	<u>18-19</u>	<u>19-20</u>	<u>20-21</u>	<u>21-22</u>	<u>22-23</u>	<u>23-24</u>
Wind Direction	W	W	W	W	WNW	S	ESE	S
Wind Speed	24	21	13	6	2	3	2	7
Dilutions	16	14	11	A	A	A	A	A

In the above example, the best permissible forecasts before and after change would have been:

	<u>Before</u>	<u>After</u>
Wind Direction	W	SE
Wind Speed	15	5
Dilutions	1500	A

Any or all of the above could have been forecast for either 1 hour more or 1 hour less time than actually observed without any loss of grade points. Two hours of error in timing would have resulted in only 1 hour being considered wrong.

6.04. 24-HOUR GENERAL FORECASTS

These forecasts are prepared daily at 0700 and 1500 and contain the outlook on the following, in the order listed.

1. Prevailing sky condition.
2. Weather (if any is expected).
3. Wind (if average speeds of 15 mph or higher are expected).
4. Temperature extremes.

Weather is herein understood to mean precipitation, thunderstorms, fog, or any combination thereof. Wind is understood to mean average speeds observed at the 50-foot level. Temperature extremes are understood to mean the highest from sunrise to sunset and the lowest overnight even though, in rare instances, these extremes may occur outside of a period for which a forecast is valid.

For convenience in predicting expected changes in meteorological conditions, various sub-periods are used. These are defined below in terms of Pacific Standard Time.

<u>Time of Forecast Preparation</u>	<u>Designation</u>	<u>Sub-Period</u> <u>Valid Time</u>
0700	Today	0800 to 2000
	Tonight	2000 to 0800
	This evening	1600 to 2400
1500	This evening	1600 to 2400
	Tonight	1600 to 0400
	Tomorrow (name of day to be specified)	0400 to 1600

Other sub-periods occasionally used are morning (sunrise to 1200), and afternoon (1200 to sunset). The adjective "early" appended to a sub-period is understood to mean the first 4 hours of that period, while the adjective "late" is understood to mean the last 4 hours.

6.04-1. TERMINOLOGY

Many different terms are used in describing expected conditions with respect to sky, weather, and wind. It is therefore desirable that the forecaster, the forecast grader, and the customer all have a common understanding of the meaning of such terms. These are explained in tables 6 and 7. It should be further understood that, except as hereinafter specified, all verification of forecasts is on the basis of records kept at the Meteorology Station.

Two terms hereinafter used, but not defined in the tables, need explanation. These are

- (1) Hanford Area. This is defined as an area including Richland and extending west and north from there to points within the visibility range of the Meteorology Station. The area excludes the Blue Mountain vicinity although cloud formations over these mountains can frequently be seen from the Meteorology Station.
- (2) Observing Stations. These are the Meteorology Station and Richland.

TABLE 6. GLOSSARY OF TERMS USED IN FORECASTING
SKY CONDITION AND WEATHER

Clear. Sky cover, either opaque or transparent, 0.3 or less.

Fair. Sky cover, if any, thin, or, if opaque, 0.5 or less. In effect, this means the absence of a ceiling.

Note: The complete absence of any weather, even of scattered showers, is implicit in forecasts of clear or fair. Forecasts of "generally fair" are graded exactly the same as forecasts of fair since any exceptions to fair weather must be predicted.

Table 6 Con't

Partly Cloudy. Sky cover 0.4 to 0.7 if opaque; 0.4 to overcast if transparent.

Cloudy. Sky cover 0.8 to overcast, either transparent or opaque.

Considerable Cloudiness. Prevailing sky cover 0.6 to overcast.

Mostly Cloudy.

Generally Cloudy.

} Prevailing sky cover 0.8 to overcast.

Variable Cloudiness. No clearly-defined prevailing amount of sky cover. Variations within the valid period may run zero to ten-tenths.

Increasing Cloudiness. Either (1) progressive lowering and thickening of an overcast which is initially high and thin, or (2) progressively larger amounts of sky cover, starting with values of 0.3 or lower.

Decreasing Cloudiness. Sky cover initially 0.8 to overcast, decreasing in amount slowly enough so that clear sky does not prevail within the valid period.

Clearing. Same as decreasing cloudiness except that the decrease in sky cover may be rapid with clear sky prevailing during the valid period.

Rain. Rain at either or both of the observing stations.

Snow. Snow at either or both of the observing stations.

Rain or Snow. Any one or combination of conditions listed below.

- (1) Rain at the Station but snow at higher elevations within the Hanford Area.
- (2) Snow at the Station but rain at lower elevations within the Hanford Area.
- (3) The occurrence of simultaneous rain and snow at either or both of the observing stations.
- (4) Rain changing to snow, or vice versa, at either or both of the observing stations.
- (5) Rain at sub-freezing temperatures, or snow at above-freezing temperatures, at either or both of the observing stations.
- (6) The occurrence of sleet at either or both of the observing stations.

Table 6 Con't

Showers. Rain, snow pellets, or hail from cumuliiform clouds at either or both of the observing stations.

Scattered Showers. Same as showers except that precipitation may be observed from, not necessarily at, one or both of the observing stations. This term is not appropriate for use in the case of a widespread or severe storm affecting the entire Hanford Area.

(1) Snow Showers or
(2) Scattered Snow
Showers.

(1) Same as showers and (2) same as scattered showers except that, in both cases, snow and/or snow pellets are the implied forms of precipitation.

Snow Flurries. Same as snow, snow showers, or scattered snow showers with amounts, if any, at both of the observing stations light (less than 1/2 inch, unmelted).

Thunderstorms. Audible thunder, with or without precipitation, at either or both of the observing stations.

Scattered Thunderstorms. Same as thunderstorms with some evidence of thunderstorm activity (such as lightning static on the radio) but with thunder not necessarily audible at either of the observing stations. This term is not appropriate for use in the case of thunderstorm activity affecting the entire Hanford Area.

Showers and Thunderstorms. Same as thunderstorms except that precipitation, either in connection with, or apart from, a period of audible thunder, is implied.

Thundershowers. Same as thunderstorms except that precipitation in connection with a period of audible thunder is implied. Either this term or "showers and thunderstorms" is preferable for use when large amounts of precipitation (0.15 inch or more) occur in connection with a period of audible thunder.

Showers or Thundershowers. Generally the same as showers and thunderstorms. The latter term however, being more positive with respect to thunderstorms, is much more appropriate for use in the case of major storms with lightning strikes within the Hanford Area. "Showers or thundershowers", on the other hand, is the preferable term in cases of showers with some evidence of thunderstorm activity but with thunder not necessarily audible at either of the observing stations.

Fog. Fog, ice fog, ground fog, drizzle, freezing drizzle, or snow grains at either or both of the observing stations.

Patches of Fog. Fog visible at one or more low places within the Hanford Area but not general over the area.

Cloudy or Foggy. Either (1) sky cover 0.8 to overcast with one or more periods of fog, or (2) ceiling continuously lower than 2500 feet, with or without fog.

TABLE 7. GLOSSARY OF TERMS USED IN
FORECASTING WIND SPEEDS

Light Winds. Less than 8 mph.

Gentle Winds. 8-12 mph.

Moderate Winds. 13-18 mph.

Fresh Winds. 19-24 mph.

Strong Winds. }
High Winds. } Greater than 24 mph.

Windy. Winds with short-period averages exceeding 18 mph over a considerable length of time or exceeding 25 mph for periods as short as one hour.

Increasing Winds. Progressively higher speeds within the valid period, beginning with gentle or lower and increasing to fresh or higher.

Decreasing Winds. Progressively lower speeds within the valid period, beginning with fresh or higher and subsiding to gentle or lower.

Figures in table 7 refer to average (not necessarily hourly average) speeds at the 50-foot level of the Meteorology Tower. Wind predictions can be verified on the basis of Richland data only in cases where one of the following is forecast and cannot be considered correct on the basis of observations taken at the Meteorology Station:

Strong winds
Windy
Winds 20-30 mph
Winds >25 mph

As suggested above, wind may be predicted by use of speed ranges rather than by use of the descriptive terms of table 7. Ranges generally in use are 0-10, 5-15, 10-20, 15-25, 20-30, and >25 mph. Larger ranges, such as 10-25 mph, can be used if desired. When done, however, the observed speeds are expected to vary over the stated range during the period of validity.

6.04-2. THE FORECAST NARRATIVE

1. Descriptive terms for describing expected sky condition, weather, and wind should be limited to those given in tables 6 and 7. In addition, use of these terms should be consistent with their meaning. For example, the forecast

Fair today and tonight with early morning fog

contradicts the meaning of the term "fair". The forecast should read

Fair today and tonight except for early morning fog

When desired, of course, certain terms in tables 6 and 7 can be combined, such as:

- (1) Clear to partly cloudy
- (2) Moderate to fresh winds

or qualified, such as

- (1) Intermittent light rain
- (2) Occasionally windy

However, certain of these terms may not be combined. "Fair to partly cloudy", for example, would not be a sensible forecast because the term "fair" implies the absence of a ceiling but not of sky cover which may be as much as ten-tenths.

- 2. Statements made in the forecast narrative should be concise. Detail should be avoided, especially when dealing with items of little or no concern to the average customer. Even in the case of a major storm extending through most of a 24-hour valid period, a forecast of "Mostly cloudy with occasional rain tonight and Tuesday" is less positive and less likely to attract a customer's attention to forthcoming major weather than a simple forecast of "Rain tonight and Tuesday".

- 3. While brevity is desirable, it should not be attained at the expense of explicitness. In the two examples below, inclusion of the words in parenthesis is necessary to eliminate customer speculation on the expected duration of the phenomena predicted.

- (1) Partly cloudy tonight and Tuesday with scattered showers Tuesday. Windy (all period).
- (2) Cloudy tonight and Tuesday with rain beginning late tonight (and continuing Tuesday).

6.04-3. THE GRADE-POINT SCHEDULE

In evaluating the accuracy of a forecast, a certain number of grade-points, specified in the table below, has arbitrarily been assigned to each component.

<u>Component</u>	<u>Grade-Points</u>
Sky condition	25
Weather	25
Wind	20
Maximum temperature	15
Minimum temperature	15
Total	100

A forecast which can be considered correct with respect to each component receives a grade of 100. The deduction for inaccuracy in any component is in increments of 5 up to the full number of points indicated for that component in the above table.

6.04-4. ADMINISTRATION OF THE GRADE-POINT SCHEDULE

Value to the customer has been the major consideration in development of a system for administering the grade-point system. If, for example, weather changes from fair to foul, or vice versa, and the change is not predicted, the omitted item is the very one which would give the forecast its greatest value. The grading procedure, explained in the examples which follow, reflects the seriousness of such omissions to the extent that it is not likely that a forecaster will "bust one" and still escape with a good grade.

Example 1. Forecast: Cloudy today and tonight.
Observed: Cloudy all period with rain (0.08 inch) late at night.

The most significant observed condition was the occurrence of rain - an event not mentioned in the forecast. To the customer who must make advance preparation for rain, it can be assumed that the value of the above forecast is negative, not positive, even though there was no weather during a considerable portion of the valid period. No credit can therefore be allowed this component of the forecast. The deduction would amount to 25 points.

Example 2. Forecast: Fair today and tonight.
Observed: Slowly increasing cloudiness until midnight followed by rain thereafter.

Fair is the worst possible forecast for valid periods in which precipitation is observed. Therefore, when fair is predicted in the face of these observed conditions, and can be considered correct during only a portion of the valid period, the forecast is graded as though "clear" had been predicted. In this instance, although there may not have been a ceiling during the day, a forecast of "clear" cannot be considered correct for sky-cover amounts greater than 0.3, regardless of ceiling conditions. Accordingly, there would be a 25-point deduction for sky and, from Example 1, it is obvious that there would also be a 25-point deduction for weather.

Example 3. Forecast: Partly cloudy today and tonight.
Observed: Cloudy most of the period with measurable rain in Richland (but not at the Station) during the night.

Since forecast customers are distributed throughout the Hanford Area, precipitation occurring at any part of the area should be predicted even though it does not affect the Meteorology Station. In this case, since no measurable amount occurred at the Station, no deduction for the weather component can be made. To compensate for this, however, the sky component is graded down more severely than otherwise would be the case. Since sky condition and weather are related to each other in nature, these two components are graded as related, not as individual entities. In the above forecast, the term used to describe the expected state of sky was not the best which could have been selected from table 6. Therefore, little credit can be given this portion of the forecast. The deduction for sky would amount to 20 points.

Example 4. Forecast: Cloudy today and tonight with rain tonight.
Observed: Cloudy all period with measurable rain in Richland (although none occurred at the Station) during the night.

Although no rain fell at the Meteorology Station, it should be obvious from Example 3 that its occurrence in Richland verified the above forecast completely. Hence there would be no deduction whatever for either the sky or weather components.

Example 5. Forecast: Clear tonight. Considerable cloudiness with scattered showers Tuesday.
Observed: Clear at night. Much cumulus and scattered shower activity Tuesday with a thunderstorm observed at the station.

Whenever a thunderstorm occurs at the station, no forecast which avoids mention of thunderstorms can be considered entirely correct. In the above case, however, since all other sky and weather factors were accurately predicted, the deduction on the weather component would be very nominal - 5 points.

Example 6. Forecast: Considerable cloudiness with scattered showers today and tonight.
Observed: Considerable cloudiness all period with scattered showers during the day.

Although the prediction of scattered showers during the night was not verified by subsequent observations, it must be noted that there was no change in prevailing sky condition and that this prevailing sky condition was correctly predicted. Therefore, in line with the reasoning of Example 3, the above forecast would be subject to no deductions whatever for either sky or weather. If the sky had cleared at night, there would of course have been deductions for both of these components.

Example 7. Forecast: Fair today and tonight.
Observed: Clear during the day. Increasing cloudiness during the night.

The deduction for the sky component, in this case, might be 5, 10, or 15 points, depending upon the prevailing transparency of the overcast, height and length of time of ceiling, and whether or not precipitation at a distance was observed.

Example 8. Forecast: Partly cloudy with scattered thunderstorms today and tonight.
Observed: Cloudy most of the period with widespread and locally severe thunderstorms during the day and with rain most of the night.

As stated in table 6, the adjective "scattered" is not appropriate for use in a forecast when subsequent storms of considerable magnitude affecting the entire Hanford Area are observed. Furthermore, as stated in table 6, a forecast of thunderstorms alone implies that all precipitation will be associated with thunderstorms. This was not the case in the above example. Appropriate deductions would be 15 points for sky and 20 points for weather.

Example 9. Forecast: Partly cloudy tonight and Thursday with thunderstorms tonight.
Observed: Cloudy most of the period with thunderstorms during the evening and with rain continuing most of the remainder of the night.

Since rain continued for a considerable time beyond the period of audible thunder, it is obvious from table 6 that both showers and thunderstorms should have been predicted. However, since the above constitutes an unqualified prediction of some very significant weather, deductions for inaccuracies are held to a minimum. Adequate deductions in this case would be 10 points for predicting partly cloudy instead of cloudy and 5 points for failure to mention precipitation.

Example 10. Forecast: Mostly cloudy with occasional rain today and tonight.
Observed: Mostly clear.

It is just as bad to forecast unfavorable weather and not get it as vice versa. Hence this forecast would be subject to the same deductions as that of Example 2 (25 points for sky and 25 points for weather).

Example 11. Forecast: Clear today. Increasing cloudiness this evening followed by rain late tonight.
Observed: Clear during the day. Increasing cloudiness at night. No rain fell during the valid period although it did begin later during the morning.

Although the grading procedure is severe on forecasts of fair weather when foul is subsequently observed, or vice versa, it is very liberal with forecasts which predict significant changes when these changes are subsequently observed. In the instant case, although no rain fell during the valid period, the forecast enabled customers who needed to prepare for rain to do so. Had these customers waited until the subsequent 0700 forecast, there might not have been time to prepare. Because the forecaster in this example specified "late" on the beginning of rain, his predictions on sky and weather must be considered excellent and subject to no deductions whatever.

Example 12. Forecast: Fair today. Rain tonight.
Observed: Increasing cloudiness followed by .05 inch of rain during the day. Clear at night.

As suggested in Example 11, predicting the time of a significant weather event is not considered as important as predicting the event itself. In this example, however, the periods of forecast fair and foul weather were the complete reverse of those subsequently observed. Hence, both the sky and weather components must be considered wrong in their entirety and a deduction of 25 points made for each.

Example 13. Forecast: Partly cloudy today. Fair tonight.
Observed: High thin overcast all period.

An observed high thin overcast will verify forecasts of both fair and partly cloudy. However, when a change is predicted, such a change must be subsequently observed if the forecast is to receive maximum credit. In this case, since the predicted change was a minor one, and since no weather was involved, the deduction for sky would be a nominal one of 5 points.

Example 14. Forecast: Fair tonight and Tuesday.

Observed: Clear except for a period of fog from 0500 to 1000 on Tuesday.

Fog is not generally regarded to be as adverse a weather factor as precipitation. Hence a miss on forecasting fog is not graded down as severely as a miss on forecasting precipitation. In this case an appropriate deduction would be 30 points - 15 for weather and 15 for the obscured sky during the period of fog. Had the fog continued for the balance of the day on Tuesday, then the total deduction would be 40 points - 25 for weather and 15 for sky.

Example 15. Forecast: Increasing cloudiness today followed by rain tonight.

Observed: Increasing cloudiness during the day followed by rain and fog during the evening and continuous fog after midnight.

Fog which occurs simultaneously with precipitation need not be predicted. In this example, since fog continued for a significant length of time after the rain had ceased, it should have been predicted. However, because this was such an excellent forecast with respect to other conditions, failure to predict fog would be considered trivial and subject only to a token deduction of 5 points.

Example 16. Forecast: Mostly cloudy or foggy today and tonight.

Observed: Foggy all period.

Whenever qualifying adjectives are used in a forecast, such adjectives must be considered appropriate if the forecast is to be subject to no deductions. In this case, use of the word "mostly" was not appropriate, either with regard to sky or to weather. Hence 5 points would be deducted for each of these components.

Example 17. Forecast: Winds 5-15 mph.

Observed: Winds generally light but with strong speeds and gusts to 50 mph during a brief period of evening thunderstorm activity.

A prediction of significant winds should always be included ⁱⁿ a forecast when average speeds of 15 mph or more are observed during 3 or more hours of the valid period or if average speeds exceeding 20 mph are observed for as little as one hour of the period. Ordinarily, if observed speeds differ only briefly from those predicted, the wind portion of the forecast is considered at least partially correct. In the instant case, however, observed speeds were so strong as to be potentially damaging. Failure to predict wind of more than 15 mph in such cases is at a cost of 20 points.

Example 18. Forecast: Winds generally light but with strong speeds briefly during thunderstorms.

Observed: Winds 0-10 mph all period.

Regardless of prevailing conditions, it is just as important not to mention potentially damaging speeds when they do not subsequently occur as vice versa. Hence the deduction for wind in this case would amount to 20 points - the same as in Example 17.

Example 19. Forecast: Moderate to strong winds today and tonight.
Observed: Strong winds all period.

Wind is expected to vary within the limits of speeds predicted. Moderate is not an appropriate term in this case. Hence the forecast can be considered only half right: deduction - 10 points.

Example 20. Forecast: Windy today and tonight.
Observed: Fresh to strong speeds during the afternoon and again late at night. Speeds otherwise were light.

Although occasionally windy would have been a better forecast in this case, the important thing to note is that adverse wind conditions affecting both the day and night portions of the valid period were correctly foreseen at a time when little or no wind was observed. The above must therefore be considered an excellent forecast with regard to wind and subject to no deduction whatever for this component.

It is, of course, not possible to write down examples to cover all situations which may be encountered in grading a forecast with respect to sky, weather, and wind. Basic steps in this procedure are:

- (1) Write a brief narrative of observed conditions.
- (2) Compare the observed conditions with those predicted.
- (3) From this comparison decide on the appropriateness of terms used in the forecast and, when inaccuracies are apparent, make deductions which are appropriate.

The foregoing examples should provide an adequate guide for use in step 3.

6.04-41. TEMPERATURE FORECASTS

When the difference between a predicted and observed extreme amounts to	There is a deduction of
5 degrees or less	No points
From 6 to 9 degrees	10 points
More than 9 degrees	15 points

6.05. SPECIAL FORECASTS

Special forecasts differ from the two types previously discussed in that

- (1) They deal with fewer meteorological elements (frequently with only one).

- (2) They are not issued routinely but only on request. Some requests, however, are on a "standing order" basis.
- (3) The valid periods vary according to the requirements of each individual customer.

The grading procedure for special forecasts is also unlike that of the other-type forecasts. The former are considered either right or wrong. This procedure is the equivalent of making all grades either 100 or 0. In some cases, however, a special forecast is considered neither right nor wrong and given neither an "OK" nor a "No". In this category are forecasts

- (1) Too indefinite to be of value, such as "A small chance for a few scattered showers".
- (2) Almost certain to be correct, such as "Winds less than 50 mph".
- (3) Issued to personnel for some purpose other than for official plant business - to the Richland High School, for example.
- (4) Not predicting anything, such as "gusts to 35 mph" issued at a time when wind of substantial speed is already blowing.

Extremely doubtful forecasts sometimes are given neither "OK" nor "No", but such cases are held to a minimum. When a special forecast is half right and half wrong, and is issued to two customers, standard procedure is to give one "OK" and one "No".

Occasionally a "No" is given without the issuance of a forecast. If, for example, a customer maintains a standing order for a thunderstorm warning, and such warning is not given in advance of thunderstorm occurrence at the station, the responsible forecaster is tagged with a "No".

Wherever possible, forecasts made during the first hour of a shift should be based on expectations of the previous shift. For example, if a party calls at 0830 for control burning conditions for the day, the forecast should be based on the wind speeds predicted on the Production Forecast and the "OK" or "No" verification assigned to the #1 shift.

Decision as to whether a special forecast is right or wrong can only be made by comparing observed conditions with those predicted. It is therefore essential that each person who makes a "Special" observe these rules:

- (1) Give the name of the customer and the time of forecast issuance.
- (2) Write a narrative of the forecast as given to the customer.
- (3) If the customer volunteers information on why he wishes the forecast, this also should be included in the narrative. Such information is sometimes very helpful in arriving at a decision of "OK" or "No".

6.06 5-DAY FORECASTS

These forecasts are based entirely on USB reports received via teletype. Five-day forecasts are modified for the Hanford Area. In doing so, however, the expectations of the Weather Bureau are not altered. This procedure is illustrated below.

As Received On the Teletype (Valid Period 0830P, June 19, to 0830P, June 24).

3. ERI OREG ERI WASH AND IDA.
COOLING TREND TENDS AVGG BLO NML E WASH E OREG AND NEAR NML IDA.
MAX MOSTLY IN 70S NMLS IN 4CS. A FEW SHWRS AND PSBL TSHWRS
MOS LY OORG OVR WEEKEND.

An appropriate modification of the above for the Hanford Area would be:

A few showers or thundershowers occurring mostly over the week end. Cooling trend with temperatures averaging below normal.

Normal max. 84. Normal min. 57.

The normals given are those of the Meteorology Station for June 21. This date approximates the mid-point of the valid period specified above.

Since 5-day forecasts are essentially those Weather Bureau, Meteorology Station personnel are not graded on them.

End

WEATHER FORECASTING6.05 SPECIAL FORECASTS6.05-1 Introduction

Special forecasts differ from all other forecasts in the following respects:

- (1) They are not prepared at fixed times, but are issued only as requested by the customer. Some requests, however, (see 6.05-4) are on a "standing order" basis.
- (2) They do not deal with fixed meteorological conditions, but deal only with those in which the customer is interested.

All special forecasts are written in ink in the station log book (see 3.06). Write-ups should include a clear, concise statement of what forecast was given, to whom it was given, and at what time. Other pertinent information should also be given. Examples follow:

6.05-2 Examples

Example #1 (January 24, 1952). W. W. McIntosh called at 1400 to inquire about the weather outlook for some aerial reconnaissance in the area during the next few days. He was advised that a series of storms was approaching this area and that intermittent rain, snow, and poor visibility were in prospect. He was further advised that Saturday (the 26th) seemed to be the earliest possible date on which favorable conditions could be anticipated.

Example #2 (December 26, 1951). Roads and Streets of Richland called at 1320 to ask how much longer the current snow storm would last. They wanted the information to use as a guide in planning the cleaning and sanding of Richland streets. They were advised that the storm would continue past midnight.

Example #3 (April 28, 1952). D. E. Peterson of Separations at 271-T Building called at 0900 for a forecast on surface winds expected today. He wished the forecast to use as a guide in the proposed moving of some radioactive dust. He was advised that surface speeds would average about 15 mph with gusts reaching 20-25 mph.

6.05-3 Dissemination

Dissemination of special forecasts is restricted to plant personnel having some need for them in the performance of official business. Except where requests for forecasts are on a "standing order" basis, telephone calls originate with the customer.

6.05-4 "Standing Order" Requests6.05-41 From Electrical Distribution Unit

Electrical Distribution requests that they be given a forecast of any thunderstorm activity expected within a 100-mile radius of the station or of any high wind storm expected to effect the Hanford Works area. Forecasts of these disturbances are desired 2-4 hours in advance of their actual occurrence. The telephone number is 7321. Criteria for issuing and for verifying these forecasts are presented in table 6.05-1.

WEATHER FORECASTING

6.05 SPECIAL FORECASTS

6.05-4 "Standing Order" Requests

6.05-41 From Electrical Distribution Unit (continued)

Table 6.04-1 Criteria For Issuing and For Verifying
Forecasts to Electrical Distribution.

<u>Forecast Element</u>	<u>Forecast Required if</u>	<u>Forecast Verified if</u>
	35	
Wind	Gusts as high as 35 mph are observed at the meteorology tower, 50-ft. level.	<p>(1) Gusts as high as 30 mph are observed at the meteorology tower, 50-ft. level.</p> <p>(2) The speed, time of onset, and duration of the wind are in reasonable agreement with those actually observed.</p> <p>(3) The required wind speed is not observed at the meteorology tower, but winds which may unquestionably be classed as strong, are observed in Richland or elsewhere on the Hanford Works.</p>
Thunderstorm	A thunderstorm is observed at the meteorology station.	<p>(1) A thunderstorm is observed either at the meteorology station or at any other point within a 100-mile radius* of the meteorology station.</p> <p>(2) Cumulonimbus clouds accompanied by electrical discharge static on the radio are observed at the meteorology station**.</p>

6.05-41.1 Responsibility for Forecasts to Electrical Distribution

Responsibility for forecasts to Electrical Distribution lies with the regular forecasters on duty at the meteorology station, and in accordance with the following schedule.

* If a thunderstorm forecast is verified on the basis of thunderstorms observed at any point other than at the meteorology station, then the forecast must be made in advance of the observed thunderstorm at the station in question.

** The forecast must be made before the static is observed, however.

Note: No thunderstorm forecast may be verified on the basis of distant lightning observed at the meteorology station, unless the lightning is sufficiently close to produce static on the radio.

END

**DATE
FILMED**

5 / 3 / 93