# CHAPTER 11
# METEOROLOGICAL MEASUREMENTS

## 11.1 INTRODUCTION

Two types of meteorological measurements were required: rainfall and wind velocity. The rainfall measurements were used by the Pavement Group to evaluate the effects of rainfall on road deterioration. The wind velocity measurements were required for the fuel consumption studies.

## 11.2 RAIN GAUGE

Two types of rain gauges were used. One was a simple graduated plastic pot as shown in Figure 11.1. It is made of clear plastic sheets which are joined with plastic cement. The design permits mounting with nails or screws to a post, or inserting the strengthened spade into the soil. It has no moving parts and, apart from cleaning, needs no maintenance. The amount of rainfall is read from a dual scale molded in the front face of the device. Graduations are in both inches and millimeters. Its resolution is to one-tenth of an inch with a range of 5 inches. This device is a simple accumulator. To obtain rainfall data it must be read periodically and at appropriate times.

The second type of rain gauge is pictured in Figure 11.2 and it is manufactured by Texas Electronics, INC. Two of these devices were used. They consist of a rainfall sensor, which works as a tipping bucket, connected to an electrical accumulator, fitted with a paper chart recorder. The chart recorder paper is driven at a given number of centimeters per hour. Therefore, the amount of rainfall occurring at any time of day or night, over a period of months, may be determined by reading the chart recording. The resolution is to one-tenth of an inch with a range extending to infinity because the chart recorder goes from zero to ten inches and back to zero to start over again.

This unit was designed for a power source of 110 volts, 50Hz. It was necessary to place the unit in remote locations where power was not always available. Therefore, the Instrumentation Group constructed small inverters to power the rain gauges from 12 volt storage batteries. The inverter produces 110 V AC at 50Hz. An example of the output from the rain gauge is pictured in Figure 11.3. A more complete description of the rain gauge and the inverter are covered in a

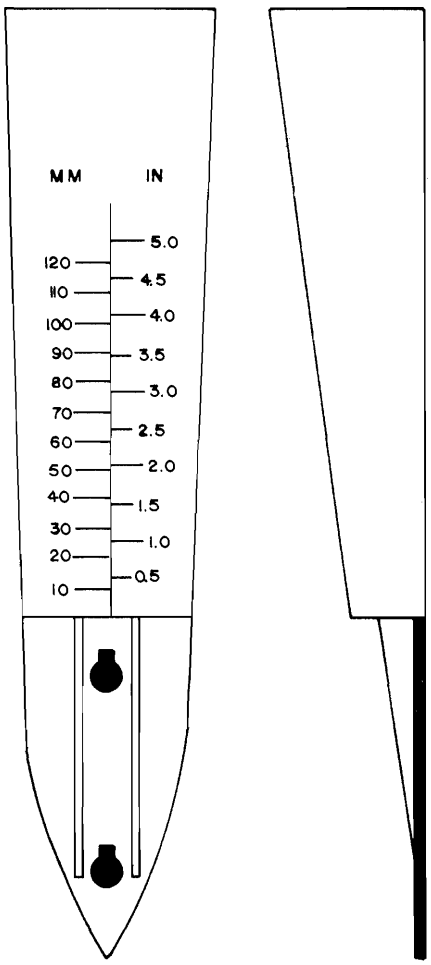



FIGURE 11.1 - PLASTIC POT RAIN GAUGE

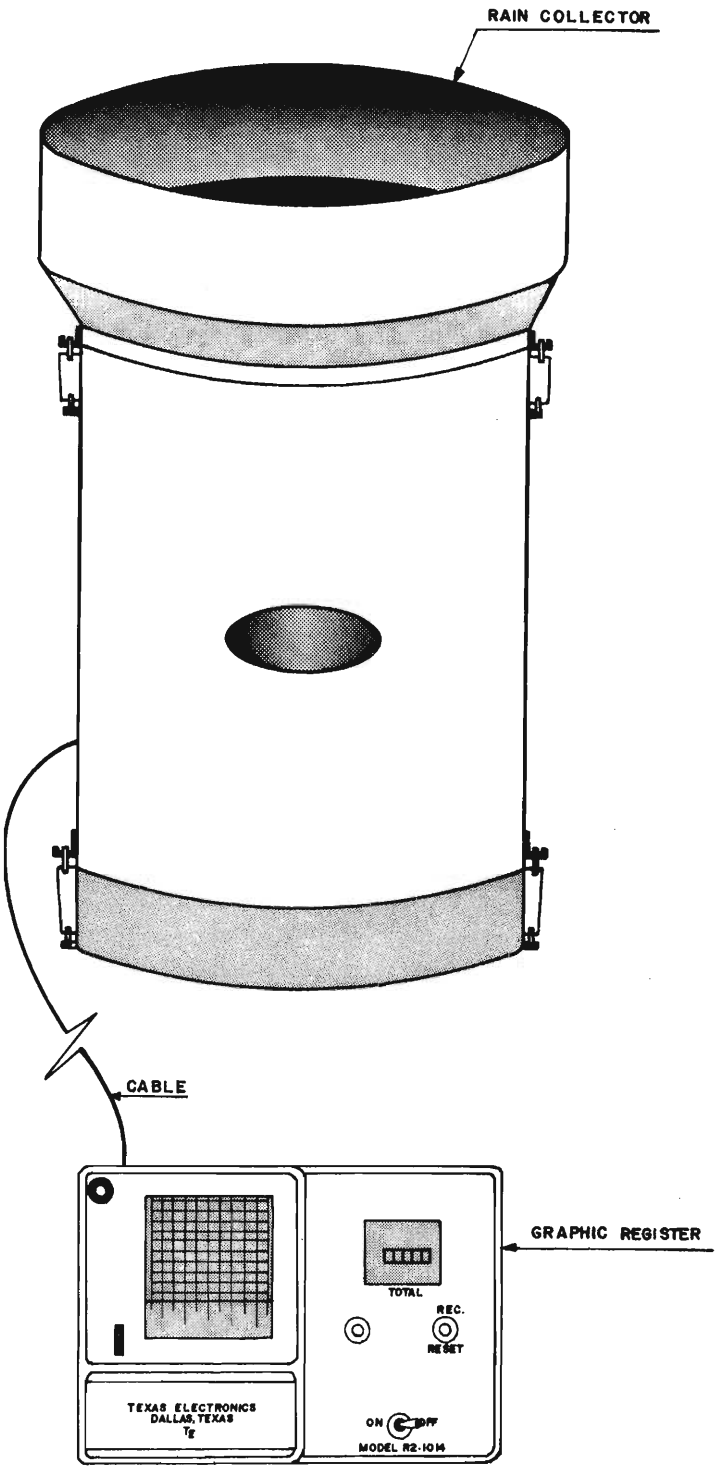



FIGURE 11.2 - AUTOMATIC ELECTRONIC RAIN GAUGE

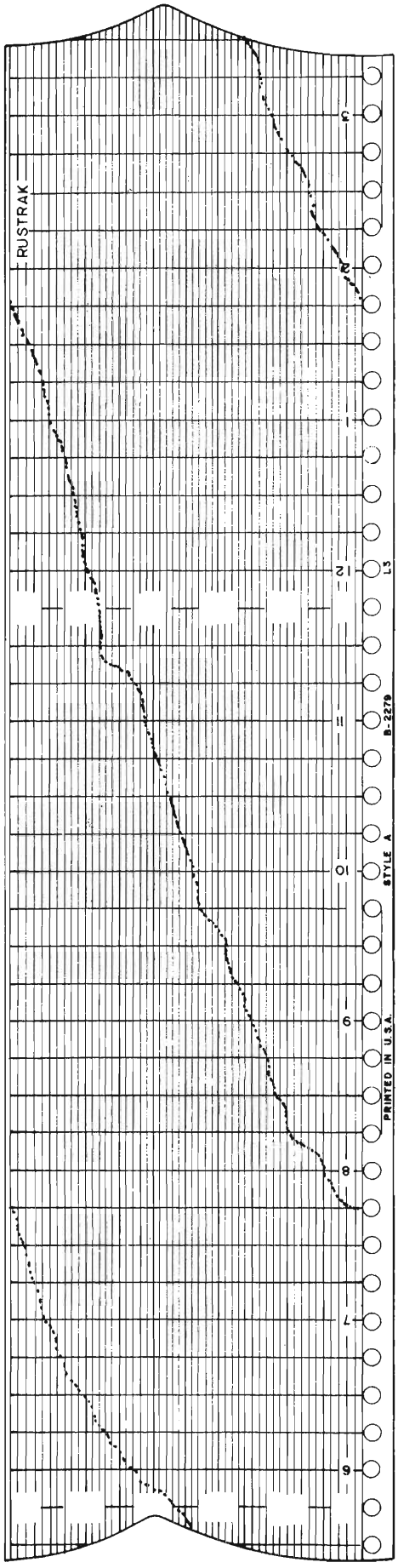



FIGURE 11.3 - RAIN GAUGE OUTPUT

Project Instrumentation Memo (Buller, "Rain Gauges").

### 11.2.1 *Maintenance*

Both recording rain gauges were damaged by careless handling. One of the recorders was damaged beyond repair when the chart recorder pointer was broken off while changing the chart paper.

The DC-to-AC inverters were temperature-sensitive and would drift from the 50Hz, causing an inaccurate drive speed for the chart paper. A potential problem was main power failure that occurred frequently during rain storms. If the instruments had been powered solely by local power, a much greater time measurement error could have been experienced.

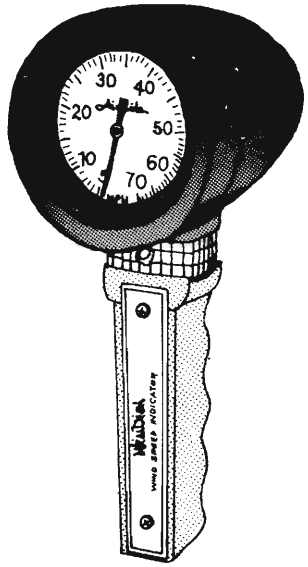
### 11.2.2 *Recommended Maintenance Facilities*

One electronics technician
Volt-ohm meter
Hand tools

## 11.3 *WIND METER*

The wind speed indicator used is pictured in Figures 11.4 and 11.5. It is manufactured by Airguide Instrument Company. It is a hand-held unit which is pointed into the wind by the operator. The wind speed is read directly from the instrument dial. The manufacturer makes models reading in meters per second or miles per hour. Also, the manufacturer has available a model with a compass for determining wind direction. The project model read in miles per hour.

Despite harsh treatment, the wind meter stood up extremely well. The resolution is to one mile per hour from 5 MPH to 70 MPH. No attempt was made to check its accuracy more precisely.



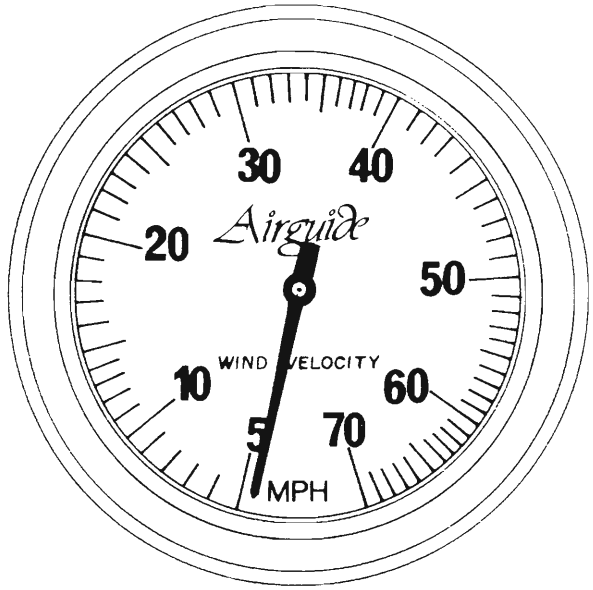




FIGURE 11.4 - WIND SPEED INDICATOR

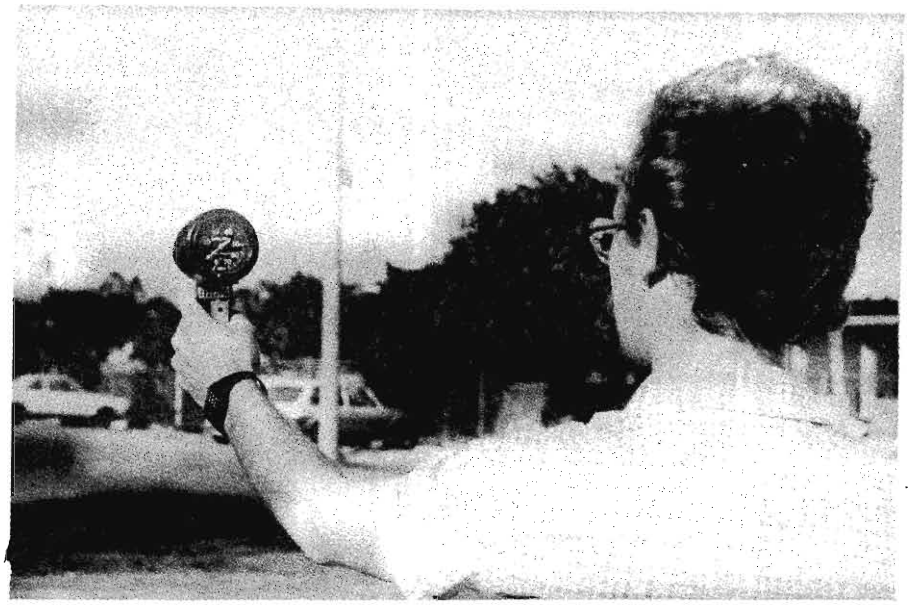


FIGURE 11.5 - WIND METER IN USE