

HISTORY OF WEATHER OBSERVATIONS  
San Antonio, Texas  
1846 - 1955

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# HISTORY OF WEATHER OBSERVATIONS

San Antonio, Texas

1846 – 1955

Gary K. Grice

## INTRODUCTION

### Historical Overview

San Antonio is located in Bexar County in south Texas (Figure 1). The San Antonio River runs through the center of downtown with a number of significant creeks cutting through the surrounding territory. The river and most of the creeks originate along the Texas Hill Country immediately northwest of the city.

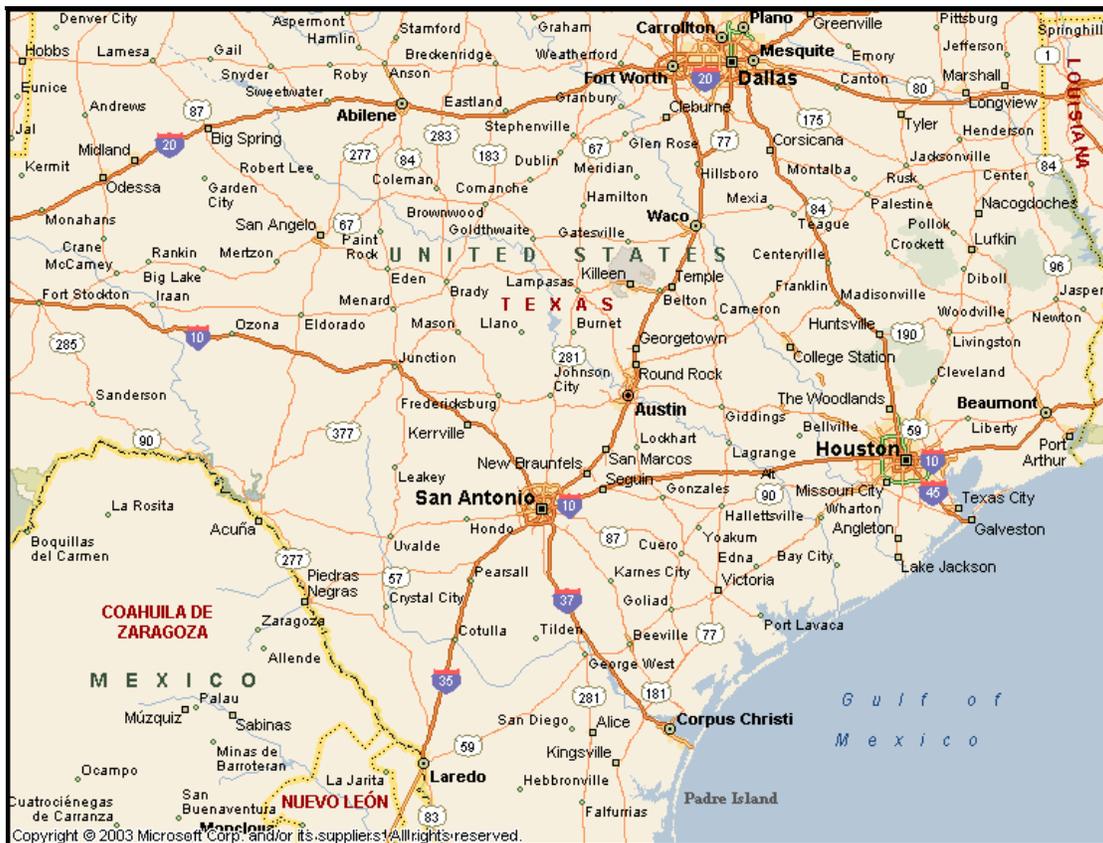


Figure 1. Current map of Texas showing the location of San Antonio. East-west distance across the map is approximately 550 miles.

The San Antonio River served as a center of American Indian activity before European explorers arrived. The area was explored by Spanish expeditions in 1691 and

again in 1709. The city's name originated from the San Antonio de Bexar Presidio that was founded in 1718. Because of its unique location, five missions were established along the San Antonio River during the early 18<sup>th</sup> Century. By 1778, the population of San Antonio had grown to 2,060 people. The population remained about the same, or decreased during the next 67 years until Texas joined the United States in 1845.

San Antonio was the center of military battles with Mexico during the early 19<sup>th</sup> Century. Uprisings in Texas as early as 1813 were put down by Mexican troops, with unrest continuing until Texas achieved its independence in April 1836.

Bexar County was organized by the Republic of Texas in December 1836 and San Antonio was chartered in January 1837 as the county seat. After Texas joined the Union in 1845, San Antonio grew rapidly, with the city becoming a servicing and distribution center for western settlers. In 1850, 3,488 people lived in the city, and by 1860, the population had grown to 8,235 people, making San Antonio the largest city in Texas.

During the Civil War, San Antonio served as a Confederate depot. However, the city was far from most of the fighting and not damaged by the conflict. After the Civil War, San Antonio prospered, with a number of different areas contributing to the economy. The cattle industry was an important source of revenue with the city serving as a center for the ranching community. During the late 1800s, San Antonio was the southern center for cattle drives. Trading, mercantile, and the military also benefited the city. Because of its proximity to the Mexican border, San Antonio was the hub of military activities.

The first railroad was built through San Antonio in 1877, opening markets to the east. Subsequent railways were built in the 1880s. The increased transportation and commerce resulted in an influx of more people and by 1900; the population had grown to over 53,000 people. From the beginning, San Antonio was a blend of cultures as Mexican, German, French, and United States citizens moved to the area.

San Antonio continued to prosper and grow during much of the early and mid 20<sup>th</sup> Century. However, Houston and Dallas grew faster resulting in San Antonio becoming the third largest city in Texas around 1930. In 1960, the population was 587,718 people.

Since the mid 1800s, the Alamo City has been a hub for military bases. Beginning in the mid 1840s, the U.S. Army established several bases within the immediate vicinity of San Antonio, with the military presence continuing through the 20<sup>th</sup> Century. During World War I and World War II, the military presence increased significantly. Fort Sam Houston Army Base, Kelly Air Force Base, Randolph Air Force Base, Brooks Air Force Base and Lackland Air Force Base have been important military bases in San Antonio for many years.

Aviation has been an integral part of San Antonio history beginning as early as 1915 when three people came together to create the “Stinson School of Flying.” These three individuals were Marjorie, Katherine, and Eddie Stinson—all with a passion for aviation. Katherine was the fourth licensed female pilot in the U.S. and Marjorie was the ninth licensed female pilot in the world.

The Stinsons petitioned the City Council for the school and were able to rent 500 acres in the southern part of the city (7 miles south southeast of downtown) for the school and airfield. Charles Lindbergh kept an airplane at Stinson while he was stationed at Brooks Field.

Aviation quickly matured just before and during World War I causing restrictions on civilian flying. Consequently, during the First World War, the City of San Antonio assumed responsibility for operating Stinson Airfield. From the end of the war to the late 1920s Stinson Field primarily was used by barnstormers; however, during the Depression, American, Braniff, and Eastern Airlines began flying into the airport, encouraged by a new terminal built by the Works Progress Administration (WPA). That terminal was the center of weather observations during the 1930s and 1940s and remains in existence today.

The name of the field was changed from “Stinson” to “Windburn” on 15 October 1927 in honor of a reporter killed in an airplane crash. The field was renamed Stinson Field on 15 July 1936 in honor of the original founders.

During World War II, the Army Air Corps managed Stinson Field as a training facility, increasing the number of buildings and making improvements. Beginning in the mid 1940s, commercial aviation moved to the new San Antonio International Airport in the northern part of the city, leaving Stinson Field to the general aviation community.

The San Antonio International Airport is located approximately 7.5 miles north northeast of downtown and 13 miles north of Stinson. In 1941, the city purchased 1,200 acres of land north of the city limits to construct the new airport. After World War II, commercial aviation moved from Stinson Field to the new municipal airport which immediately became the hub for aviation activities in the area. In 1951 a new terminal was started at the airport and was completed in 1953. That municipal airport continues as the San Antonio International Airport of today.

The first weather observation for San Antonio in the NCDC (National Climatic Data Center) database was on 1 January 1846 and was taken by the U.S. Army Medical Department at Camp Almus near the Alamo. Only two months of observations were available for Camp Almus (January and February 1846) with March through June 1846 observations at Camp Concepcion (at the Concepcion Mission approximately two and one-half miles south of the Alamo).

Weather observations by Army surgeons ceased in the NCDC database on 1 July 1846 but resumed on 21 June 1849, continuing (but with data gaps) into 1861.

These observations were taken in downtown San Antonio somewhere between Military Plaza and the Alamo. Although observations are absent in the NCDC database from late 1852 until 1857, available documentation indicates the Army fort (and hospital) remained in downtown San Antonio for the entire period from the late 1840s until 1861, i.e., the beginning of the Civil War.

Weather observations in the NCDC database resumed in 1870, although the U.S. Army post was reestablished in San Antonio in 1865. The observations likely were again taken downtown. The fort closed in 1873 and weather observations ceased; however, the post was reestablished in 1875, although weather observations did not resume in the NCDC database until 1889. The last observations by Army surgeons were in 1892. The observations from 1889 through 1892 were taken at Fort Sam Houston.

Weather observations by Smithsonian Institution observers were taken in 1851 and also from 1870 through 1873. Smithsonian observations likely were taken near downtown.

Signal Service observations began in 1877 and continued until 1883 when the office was closed. The office reopened in 1885 and continued until observing responsibility was assumed by the Weather Bureau on 1 July 1891. Signal Service observations were taken near downtown from 1877 until 1883 and taken at Fort Sam Houston from 1885 to 1891.

Weather Bureau observations were made in downtown San Antonio from 1891 until 1939. In 1939, official Weather Bureau observations were moved to Stinson Field, located approximately seven miles south-southeast of downtown. First weather observations at Stinson were taken in 1932 by the Department of Commerce Airways Radio Station, with the Weather Bureau assuming observing responsibilities in 1938.

Official Weather Bureau observations were taken at Stinson Field from 1939 to 1942. In 1942, the Weather Bureau office moved to the San Antonio Municipal Airport, located approximately 13 miles north of Stinson. Observations were taken at the Municipal Airport through 1955.

Figure 2 shows the general locations of weather observations taken in San Antonio from 1846 through 1955.



**Figure 2. Current map of San Antonio showing the general locations of stations along the weather observational path at San Antonio from 1846 through 1955. General dates for the observations are based on data in the NCDC database. North is at the top of the page. East-west distance across the map is approximately 23 miles.**

### Goal of the Study

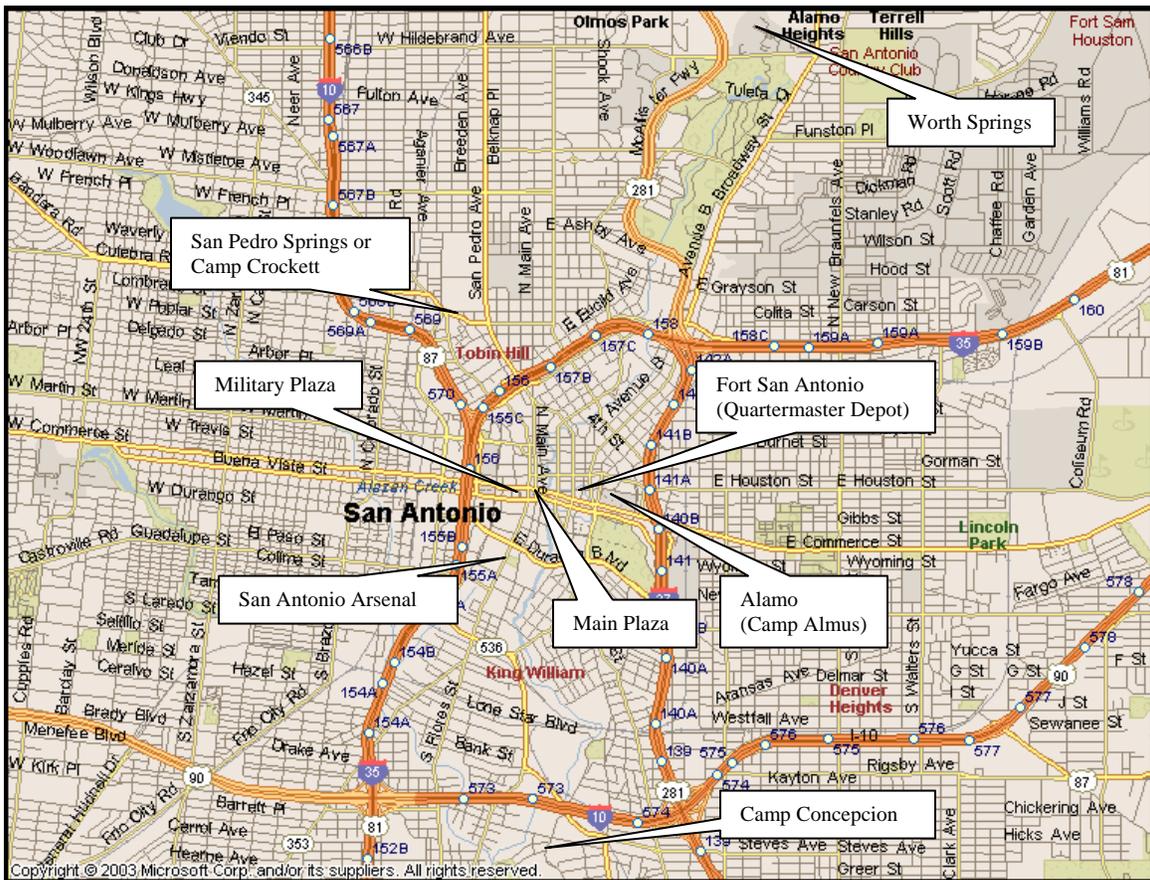
The goal of this study is to document the primary weather observational path at San Antonio, TX leading to the Weather Bureau observing program in the first half of the 20<sup>th</sup> Century. Descriptions of San Antonio weather observations since the mid 1950s are available through obtainable climatic records, with the challenge being to identify and define the roots of the path that began in the 1800s and continued through times of significant transition in the early 1900s. Extrinsic observations, i.e., those by voluntary (or cooperative) observers, are considered in relation to the beginning of the central observational stream eventually established by the Army surgeons, Signal Service, and Weather Bureau. This does not minimize the importance of these collateral observations, but rather focuses on the original events that led to the routine, formal weather observing program of modern times.

## LOCATION OF OBSERVATIONS

### Weather Observations by Army Surgeons (1846 – 1892)

Due to the United States war and subsequent unrest with Mexico, along with the proximity of San Antonio to the Mexican border, a number of U.S. Army forts were located in the immediate vicinity of downtown during the 1840s and 1850s. Unfortunately, available literature was sketchy regarding the locations of the various posts around the downtown area. Also, history experts at the Fort Sam Houston Museum, at the Daughters of the Republic of Texas Library, and at the San Antonio Conservation Society all stated little is known about these early forts.

U.S. Army troops were stationed at five separate locations around downtown San Antonio during the 1840s and 1850s. Figure 3 shows the approximate locations of U.S. Army troops near downtown San Antonio in the 1840s and 1850s.



**Figure 3.** Current map of San Antonio showing the approximate locations of U.S. Army troops near downtown during the 1840s and 1850s. North is at the top of the page. East-west distance across the map is approximately seven miles.

In the fall of 1845, the Second United States Dragoons established Camp Almus (spelled as “Almos” in the NCDC database) at the Alamo. At the same time, a fort was established at Mission Concepcion, located approximately two and one-half miles south of the Alamo. At Camp Almus the enlisted men were quartered on Military Plaza. Additional buildings from Military Plaza to the Alamo later were occupied by Army troops and officers, with the Alamo becoming a storage depot.

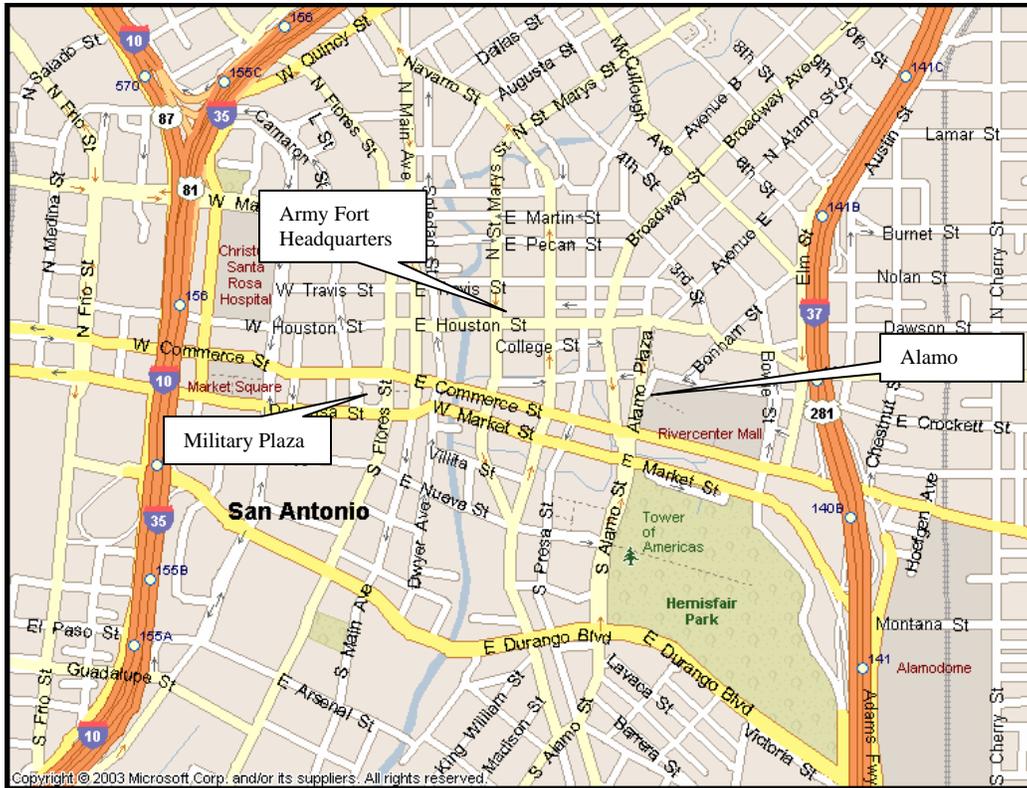
In 1846, approximately 2,500 U.S. soldiers were encamped at Camp Crockett, located near San Pedro Springs, approximately one and one-half miles northwest of downtown San Antonio. During the late 1840s, U.S. troops were stationed near Worth Springs, located approximately three and one-half miles northeast of downtown.

From the late 1840s until the start of the Civil War in 1861, San Antonio was the center of supply for the U.S. Army. Numerous buildings from Military Plaza to the Alamo were leased by the Army. A U.S. Surgeon General publication stated, “The buildings used as barracks, hospital, and store-houses are, with the exception of the Alamo, the property of private citizens, and are rented by the government.” The military presence in downtown San Antonio (also called Fort San Antonio) increased during the 1850s with the San Antonio Arsenal established approximately one mile southwest of the Alamo in 1859. Because of the concentration of Army troops near downtown, the hospital (and consequently weather observations by Army Surgeons), was located in the downtown area from 1849 to 1861 (based on conversations with historians at the Fort Sam Houston Museum and Daughters of the Republic of Texas Library).

According to the NCDC database, the first weather observations in San Antonio were made on 1 January 1846 at Camp Almus near the Alamo. Observations also were taken at Camp Almus in February 1846 and moved to Camp Concepcion (at the Concepcion Mission approximately two and one-half miles south of the Alamo) on 1 March 1846, where the observations continued through 30 June 1846. Weather observations in the NCDC database for San Antonio cease on 1 July 1846, but resumed on 21 June 1849, continuing (but with gaps in the data) into 1861. Observations may have been made elsewhere, although records could not be found.

Although no confirmation could be found, weather observations by the Army surgeons most likely were taken at, or very near the hospital, as was customary at other Army forts. According to available information on the observing forms and from the literature, as well as opinions of local history experts at the Fort Sam Houston Museum and Daughters of the Republic of Texas Library, the U.S. Army hospital(s) was located somewhere in downtown San Antonio from the late 1840s until 1861. However, the possibility exists that the hospital may not have remained at the same residence during this period. From the late 1840s until 1861, Fort San Antonio extended from Military Plaza on the west, to the Alamo (which was a supply depot) on the east—a distance of approximately one-half mile. Army Headquarters was located in the Vance House at approximately 205 East Houston Street (current address of the site; see Figure 4). Considering the size of the post, and that the hospital was in a leased private residence, the location of the hospital (and accordingly the weather observations) may have moved

within the downtown area sometime during the late 1840s to 1861. However, according to the local historians, the hospital would have remained somewhere within the downtown area.



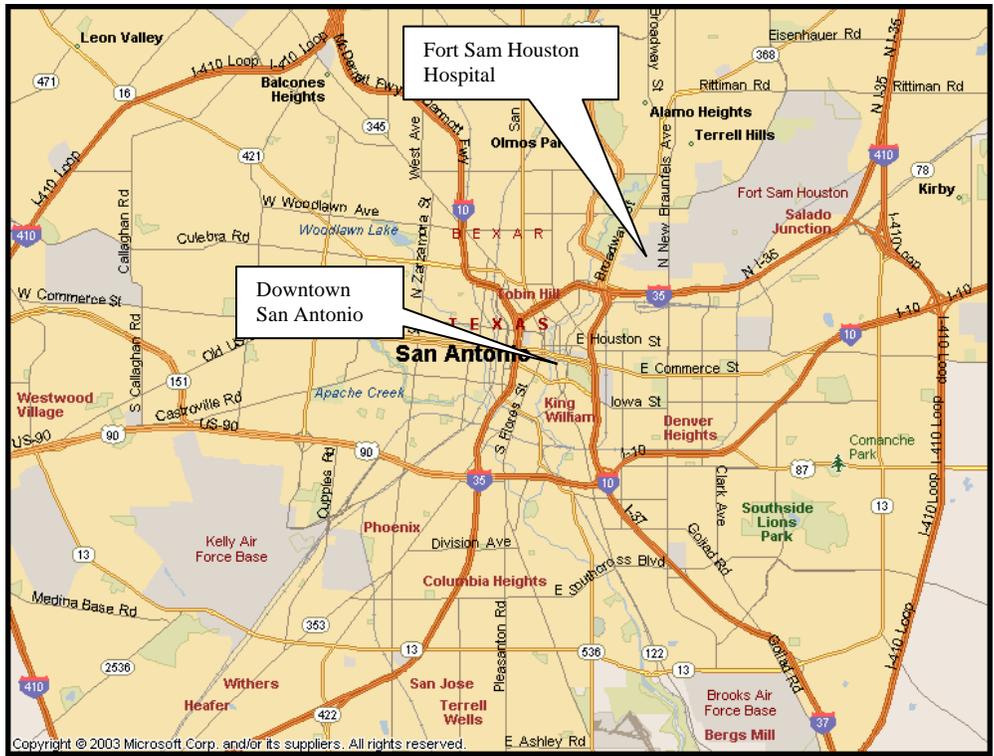
**Figure 4. Current map of downtown San Antonio showing the general area where the Army fort was located in the mid 1800s. North is at the top of the page and the east-west distance across the map is approximately two miles.**

Observations were missing from the NCDC database from 1 November 1852 through 31 July 1857. It could not be determined as to whether weather observations actually were taken during this time and were only missing in the NCDC database. The Army headquarters (of the Eighth Military Department) were relocated from San Antonio to Corpus Christi from 1853 through 1856; however, the main supply depot remained in San Antonio.

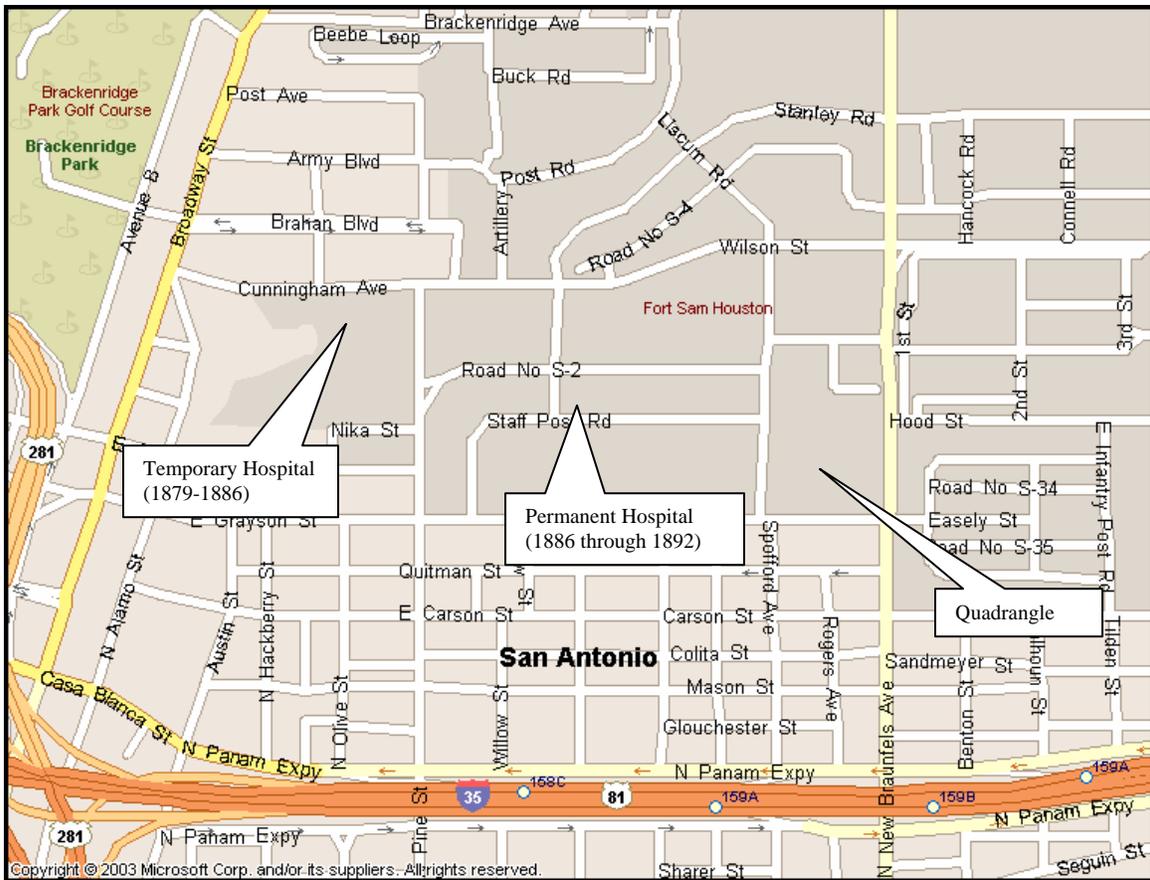
Cessation of fort operations and weather observations, were caused by the Civil War in 1861. Although the fort was reestablished in 1865, weather observations in the NCDC database did not resume until 1 January 1870. Army Surgeon General publications stated the location of the fort after the Civil War, i.e., in 1865, was again in downtown San Antonio. The documents also stated the hospital was again located in a private residence (exact location not specified). Although the hospital may not have been in the same residence as before the Civil War, the Surgeon General documents indicated

the hospital was somewhere in downtown San Antonio. The Fort Sam Houston Museum Historian stated the U.S. Army hospital was located within a couple of blocks, and south or southeast of the Alamo after the Civil War.

The fort was closed in August 1873 and observations ceased in the NCDC database 1 August 1873. Although the Army fort returned to San Antonio in August 1875, the NCDC database was absent of weather observations by Army surgeons at San Antonio from 1 August 1873 until 1 January 1889—a period of over 15 years. The final weather observation in the NCDC database for the U.S. Army Medical Department was on 29 February 1892. Most likely, the observations from 1 January 1889 through 29 February 1892 were taken at the hospital (built in 1886) at Fort Sam Houston (approximately two and one-quarter miles northeast of downtown; see Figure 5) since that was the Army fort in San Antonio beginning in 1879. According to the Fort Sam Houston Museum Historian, a temporary U.S. Army hospital was located at Fort Sam Houston in 1879 with the permanent hospital built in 1886. Figure 6 shows the locations of the temporary and permanent hospitals at Fort Sam Houston. Army surgeons likely took observations at Fort Sam Houston as early as 1879, continuing through February 1892.



**Figure 5. Current map of San Antonio showing the locations of Fort Sam Houston and the downtown area. North is at the top of the page. East-west distance across the map is approximately 15 miles.**



**Figure 6. Current map of Fort Sam Houston (western part) showing the locations of the temporary and permanent hospitals. Also shown is the Quadrangle where the U.S. Signal Service took weather observations from 1885 to 1891. North is at the top of the page. The east-west distance across the map is approximately one and one-quarter miles.**

Coordinates for the temporary hospital location are 29°26'48"N 98°28'18"W and the elevation 678 feet. Coordinates for the permanent hospital location are 29°26'43"N 98°28'1"W and the elevation 722 feet.

### **Smithsonian Institution Observers (1851, 1870 - 1873)**

The first weather observation in the NCDC database for San Antonio under the Smithsonian Institution program was taken by Mr. James Henderson on 1 January 1851. According to Smithsonian records, Mr. Henderson took weather observations in San Antonio during the year of 1851, but the NCDC database contains observations from 1 January 1851 through 31 August 1851. No information could be found as to the exact location of the observations, but the station likely was somewhere near the downtown area. Elevation was listed as 564 feet above sea level.

Dr. Fred Pettersen, a physician, was the next Smithsonian observer in San Antonio. The NCDC database and Smithsonian records indicated Dr. Pettersen began

taking weather observation on 1 June 1870 and continued through 31 May 1873. Observations in the NCDC database during this period were sporadic, especially during early 1871. No information could be found as to the exact location of the observations, but the station likely was somewhere near the downtown area. Elevation was listed as 564 feet above sea level. According to local Signal Service records, Dr. Pettersen served as an informal advisor to the staff of the early Signal Service office.

### **Signal Service Offices (1875-1891)**

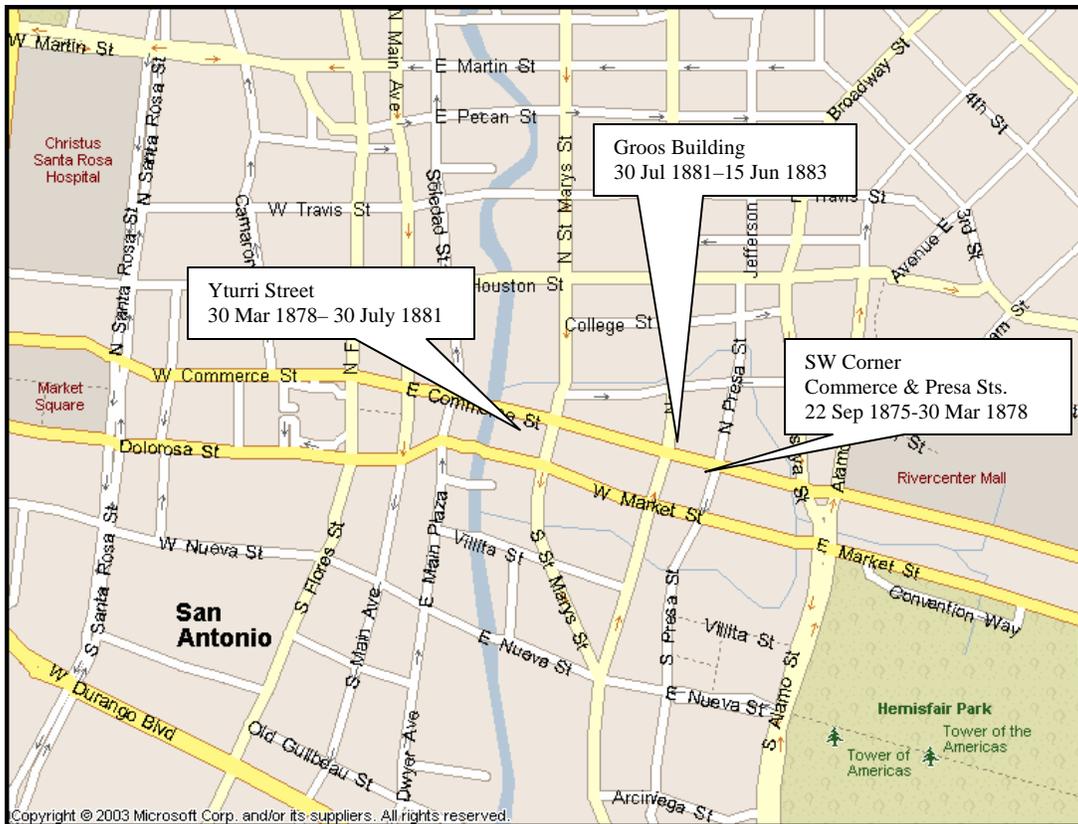
NOTE – All Signal Service station elevations in this report are for office barometers unless otherwise indicated. All elevations related to barometers in this report are above sea level unless otherwise indicated.

NOTE - From 1877 to 1888, the U.S. Signal Service conducted 7 inspections of its San Antonio weather office. The inspection reports, available at the National Archives and Records Administration (NARA), contained drawings and textual information regarding office location, weather instrument placement, and instrument exposure. The quantity and quality of information varied, depending primarily on the inspector. However, these reports contained revealing information not available from other sources, especially with regard to instrument location and exposure. Inspections of the San Antonio Signal Service office were conducted on the following dates:

28 March-13 April 1877	12-14 September 1885
21 December 1877	17-21 March 1888
23-27 May 1880	24- 26 January 1889
3-6 March 1885	

Signal Service annual reports listed the San Antonio office as being established on 22 September 1875 and meteorological reports starting 20 January 1876. However, first observations in the NCDC database were in April 1877. The observations in 1876 may have been limited, i.e., taken once daily, not telegraphed to Signal Service Headquarters, and then mailed to Washington DC at the end of the month (as was customary for a number of Signal Service offices with degraded observing responsibility). The 1877 Annual Report stated the San Antonio office was designated a full reporting station on 21 May 1877.

Figure 7 shows the locations of the downtown Signal Service observing stations from 22 September 1875 through 15 June 1883. The office was closed on 15 June 1883 and reopened 7 March 1885 at Fort Sam Houston.



**Figure 7. Current map of San Antonio showing locations of downtown Signal Service observing stations from 22 September 1875 through 15 June 1883. North is at the top of the map. East-west distance across the map is approximately one mile.**

22 September 1875 – 30 March 1878

Signal Service inspection reports in March/April 1877 and December 1877, as well as the annual reports, suggested the initial Signal Service office in San Antonio was located somewhere on Commerce Street but the exact location was not specified. Both reports stated the office was collocated with the Western Union telegraph office. The 1877-78 City Directory stated the Western Union office was located at 94 Commerce Street. Unfortunately, the literature contained no reference to the exact location of this address. First documentation was the 1885 Sanborn Insurance Maps; however street numbering changed in San Antonio between 1878 and 1885. The solution was to review the 1877-78 and 1887 city directories for all businesses located on Commerce Street. Thirty-nine businesses were found with addresses on Commerce Street in 1877-78 and in 1887. A quick plot of the addresses revealed the businesses that had moved during the period and those which were at the same location in both 1877-78 and 1887. This address revealed the address of the Signal Service office from 22 September 1875 through 30 March 1878 to be on the southwest corner of West Commerce (1885 designation) and Presa Streets (see Figure 7). The 1878 annual report stated the office moved from this location on 30 March 1878. Elevation of the barometer was listed as

667 feet above sea level. Coordinates for this site are 29°25'26"N 98°29'21"W and ground elevation 642 feet.

Weather Bureau Station History documents (prepared in the 1940s and 1950s) stated the Signal Service office in San Antonio was located in the Yturria Building, between Main and Market Streets, from 1 February 1877 to 30 July 1881. However, information in the Signal Service inspection and annual reports at the time was definitive, especially on the date of the move.

30 March 1878 – 30 July 1881

- Located on the east side of Yturri Street between Main and Market Streets
- Located approximately 900 feet west northwest of previous station on the southwest corner of Commerce and Presa Streets
- Elevation listed as 677 feet
- Coordinates 29°25'48"N 98°29'31"W, ground elevation 642 feet

Yturri Street extended south from Commerce Street through Market Street and intersected Commerce Street just west of the intersection of that street with St. Marys Street. Yturri Street no longer exists but can be found on old maps of San Antonio, e.g., Sanborn Insurance Maps.

30 July 1881 – 15 June 1883

- Groos Building on the northeast corner of Commerce and Navarro Streets
- Located approximately 700 feet east of building on Yturri Street
- Elevation listed as 673 feet
- GPS coordinates 29°25'27"N 98°29'24"W, ground elevation 645 feet

Weather Bureau historical documents and the Local Climatological Data publications spelled the name of this building as "Gross." According to the Historian at the San Antonio Conservation Society, the name is pronounced as "Gross" but spelled as "Groos." The latter spelling is listed in documents published during the period.

15 June 1883 – 7 March 1885 (Office closed)

The Signal Service office in San Antonio was closed 15 June 1883 and reestablished 1 January 1885, although weather observations did not resume until 7 March 1885. This closure was stated in the Signal Service annual reports and supported by lack of weather observations in the NCDC database from 16 June 1883 to 7 March 1885.



*City Offices (1891-1941)*

15 July 1891 – 1 February 1892

- Dulling Building, northwest corner of East Commerce and Alamo Streets
- Office located in the tower of the building
- Located two miles southwest of previous observing station at Fort Sam Houston
- Elevation listed as 705 feet
- GPS coordinates 29°25'25"N 98°29'16"W, ground elevation 650 feet

1 February 1892 – 1 July 1895

- Alamo Insurance Building, southwest corner Navarro and College Streets, third floor
- Located approximately 770 feet northwest of the Dulling Building site
- Elevation listed as 679 feet
- GPS coordinates 29°25'35"N 98°29'21"W, ground elevation 648 feet

1 July 1895 – 1 May 1900

- Maverick Bldg, southwest corner of Alamo Plaza and Houston Street, Room 9
- Located approximately 850 feet east of the Alamo Insurance Building site
- Elevation listed as 693 feet
- GPS coordinates 29°25'35"N 98°29'13"W, ground elevation 652 feet

1 May 1900 – 30 June 1914

- Hicks Building, northwest corner Avenue C (renamed Broadway Street in 1926) and East Houston Street
- Office located on the fourth floor of the building in rooms 35, 36, and 51
- Room numbers later renumbered to 408, 409, and 425; no change in location
- Located approximately 370 feet west of the Maverick Building site
- Elevation listed as 705 feet
- GPS coordinates 29°25'34"N 98°29'16"W, ground elevation 652 feet

30 June 1914 – 1 July 1930

- State Bank and Trust Building, 313 East Houston Street
- Name of building changed to the Russell Building in April 1919
- Name of building changed to Central Trust Building in December 1925
- Office located in rooms 904, 905, and 906
- Located approximately 415 feet west of the Hicks Building
- Elevation listed as 750 feet
- GPS coordinates 29°25'35"N 98°29'21"W, ground elevation 648 feet

1 July 1930 – 24 October 1937

- Alamo National Bank Building, Commerce and St. Mary's Streets
- Office located on the 22<sup>nd</sup> floor in rooms 2201, 2202, and 2203
- Located approximately 1,000 feet southwest of the State Bank Building site
- Elevation listed as 879 feet
- GPS coordinates 29°25'26"N 98°29'30"W, ground elevation 642 feet

24 October 1937 – 2 January 1941

- Federal Building, northeast corner Alamo Plaza and Houston Street
- Office located on 5<sup>th</sup> floor in rooms 533 and 535 (northwest part of building)
- Also called Post Office and Court Rooms, and Court House
- Located three-tenths mile northeast of the Alamo National Bank Building site
- Elevation listed as 738 feet, changed to 731 feet in May 1938
- GPS coordinates 29°25'35"N 98°29'13"W, ground elevation 652 feet

Official weather observing responsibility was transferred from the city office to the Weather Bureau station at Stinson Field on 30 June 1939. At that time, weather observations at the city office were discontinued except for partial observations. The city office and airport office were consolidated at Stinson Field on 2 January 1941.

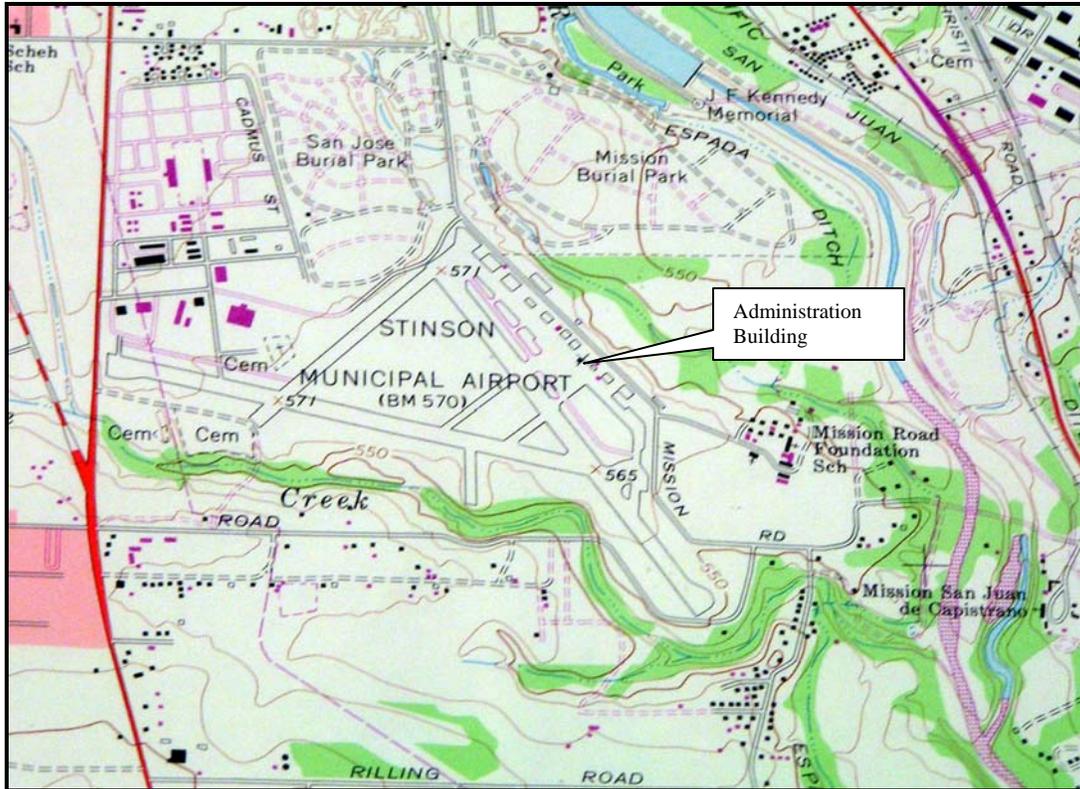
#### *Airport Offices (1932-1955)*

1932-27 December 1938

According to sketchy records, the first aviation weather observations were taken at a Department of Commerce Airways Radio Station located near Stinson Field (see Figure 2 for location of Stinson Field). Exact location of the station could not be determined other than it was approximately two miles from the airport. According to Weather Bureau inspection reports, this observing station was established 16 July 1930. Elevation of the barometer was listed as 580 feet above sea level.

On 29 June 1937, the airways radio station moved to the Airport Administration Building at Stinson Field (Room No. 4). A Weather Bureau observing station was not established at Stinson until 27 December 1938. During the early and mid 1930s, official weather observations were taken at the Weather Bureau city office.

Figure 9 shows the location of the Administration Building at Stinson Field. GPS coordinates for the Administration Building are 29°20'24"N 98°28'5"W, ground elevation 577 feet.



**Figure 9. USGS topographical map (1967) showing Stinson Airport and location of the Administration Building. Topographical contours are at 10 foot intervals. North is at the top of the page. East-west distance across the map is approximately one and one-half miles.**

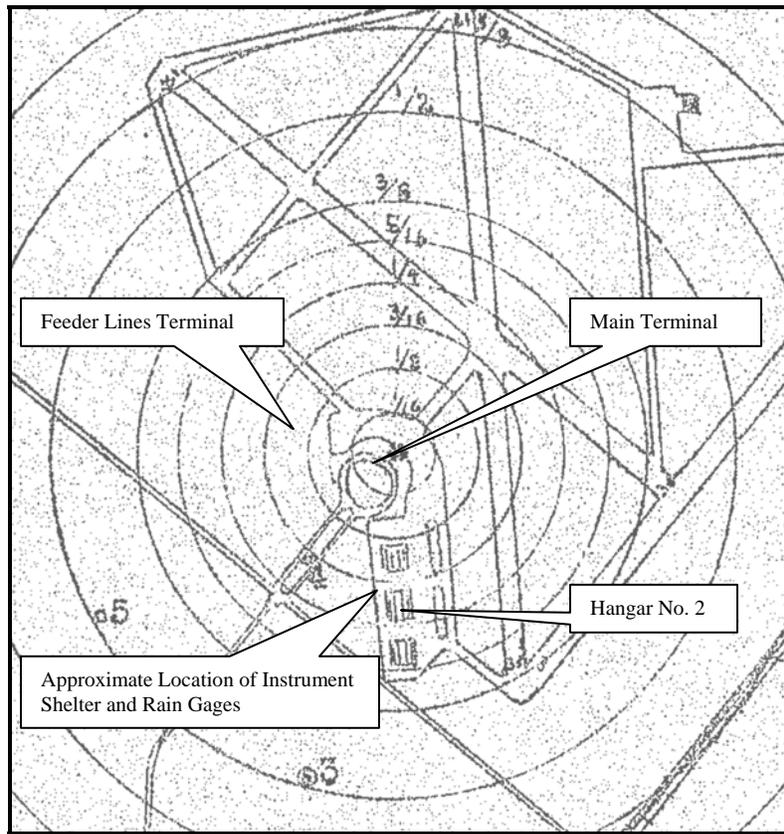
27 December 1938 – 14 July 1942

- Weather Bureau office in the Administration Building at Stinson Field, 2<sup>nd</sup> floor (Room 206)
- Elevation listed as 582 feet
- Located seven miles southeast of the Federal Building site
- Record observations transferred from city office to airport 30 June 1939
- Weather Bureau offices consolidated at airport 2 January 1941
- GPS coordinates for the Administration Building are 29°20'24"N 98°28'5"W, ground elevation 577 feet

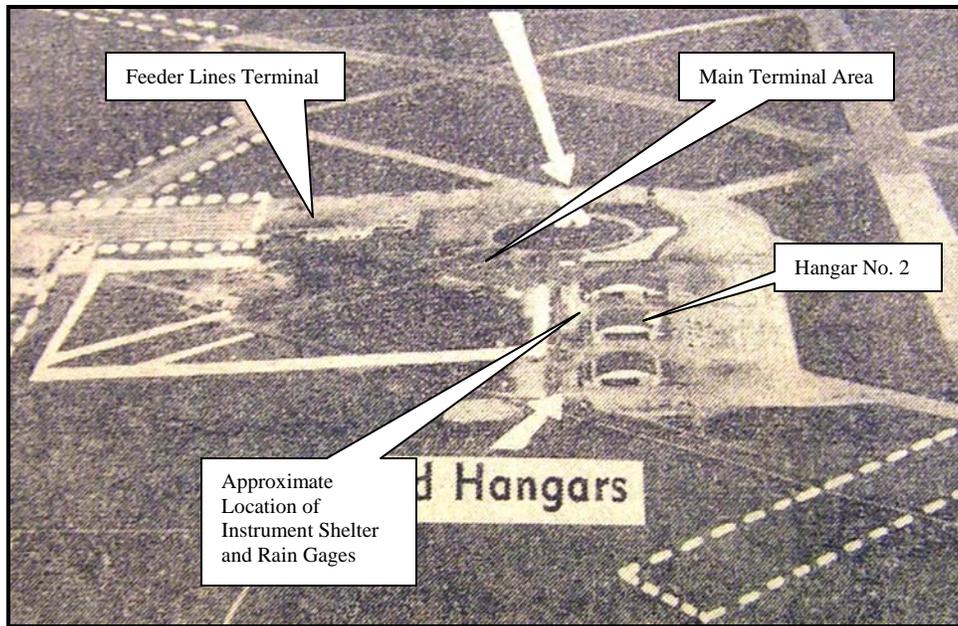
14 July 1942 – 15 August 1953

- East Lean-to, Hangar No. 2, San Antonio Airport (see Figure 2)
- Located at the intersection of North Loop and Wetmore Roads
- Located 12.8 miles north of Stinson Field
- Elevation listed as 792 feet
- Official coordinates for the airport 29°32'1"N 98°28'11"W, ground elevation 809 feet

Hangar No. 2 at the San Antonio Municipal Airport (at the intersection of North Loop and Wetmore Roads), was oriented north-south. The first parts of the hangar to be built were the extreme east and west sides, each called a lean-to. The Weather Bureau office was located in the east lean-to (in the northern part of the lean-to). The weather instruments were located northwest of the west lean-to. Figures 10 and 11 show the locations of Hangar No. 2 and the Feeder Lines Terminal Building where weather observations were taken from 14 July 1942 through 1955.



**Figure 10. Weather Bureau visibility map (28 December 1944) showing the locations of Hangar No.2 and the Feeders Lines Terminal where weather observations were taken from 2 July 1942 through 1955. North is at the top of the figure and east-west distance across the map is approximately one and one-quarter mile. From the official station history files at the National Climatic Data Center.**



**Figure 11. Aerial photograph of the San Antonio International Airport showing the locations of Hangar No.2 and the Feeder Lines Terminal where weather observations were taken from 2 July 1942 through 1955. North is at the top of the figure and east-west distance is approximately one-half mile. Courtesy of the San Antonio Public Library.**

15 August 1953 through 1955

- Feeder Lines Terminal Building (Room 2), San Antonio International Airport (same airport; different building)
- Address of the terminal was 311 North Terminal Drive
- Located 1,200 feet northwest of the East Lean-To, Hangar No. 2 site
- Elevation listed as 796 feet
- Official coordinates for the airport 29°32' 1"N 98°28' 11"W, ground elevation 809 feet

## **INSTRUMENTATION**

### **Weather Observations by Army Surgeons (1846– 1892)**

According to the NCDC database, the first observation in San Antonio was on 1 January 1846 at Camp Almus which was located near the Alamo. Observations were taken at Camp Almus in January and February 1846, and moved to Camp Concepcion (approximately two and one-half miles south of the Alamo) for the period March through June 1846.

Temperature, clearness of the sky, wind (direction and force), and cloud movement were measured/observed at sunrise, 9 a.m., 3 p.m., and 9 p.m. Wet bulb temperature was measured at sunrise and 3 p.m. and significant weather recorded in the Remarks section of the form. This station had a thermometer, hygrometer, and likely a wind vane (wind force probably was estimated). This station did not have a rain gage.

A gap in observations existed from 1 July 1846 through 20 June 1849. On 21 June 1849, weather observations resumed by Army surgeons with the station located in the immediate downtown area, somewhere between Military Plaza and the Alamo. Initial weather measurements/observations consisted of the following parameters:

1. Temperature (Fahrenheit) – Measured four times daily (Sunrise, 9:00 a.m., 3:00 p.m., and 9:00 p.m.).
2. Clearness of the sky – Four times daily (amount of clear sky at the hour of observation expressed from “0” to “10,” with “0” indicating completely cloudy and “10” indicating no clouds)
3. Wind direction and force – Four times daily (direction expressed on an eight-point compass and wind force (subjectively determined) expressed on a scale from “0” for calm conditions, to “10” for a “violent hurricane”; e.g., SW4)
4. Clouds – Four times daily (direction from which the clouds were moving (eight-point compass) and cloud movement expressed on the same scale used for the force of the surface wind, i.e., “0” for no movement to “10” for movement corresponding to a “violent hurricane,” e.g., NE2 or SE1)
5. Wet bulb temperature at sunrise and 3 p.m.
6. Significant weather recorded in the “Remarks” section.

Pressure and rainfall initially were not measured at the San Antonio fort. A note on the July 1849 form stated, “There is no barometer or attached thermometer at the post, and no rain gages.” Daily precipitation was recorded beginning August 1849 (beginning, ending, and 24 hour amount). Wet bulb temperatures ceased to be recorded on 1 February 1850 and were not included through 31 October 1852, the last observation in the NCDC database until 1 August 1857.

Figures 12A and 12B are examples of the initial observations.

1849		Barometer.				Thermometer attached.				Thermometer detached.					Clearness of the Sky.				Wi	
July		Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Daily Mean.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.
1										78	77	84	80	81	5	5	9	5	1	2
2										79	79	82	80	80	5	7	9	2	1	2
3										77	78	84	81	80.5	6	5	9	5	1	1
4										78	81	86	82	81.5	6	9	9	5	1	1
5										78	81	84	82	81.5	5	8	9	5	1	1
6										78	79	85	81	81.5	6	5	9	5	1	1
7										77	80	85	80	81	5	7	9	6	1	3
8										78	79	86	81	82	5	8	9	5	1	3
9										79	81	86	81	82.5	4	9	9	5	1	3
10										79	80	85	81	81.5	5	8	9	5	1	2
11										79	79	85	81	82	6	9	9	6	1	1
12										79	80	86	81	82.5	6	9	9	6	1	1

Figure 12A. Weather observation form for the Army fort in downtown San Antonio, TX for July 1849 (left side of observation form). The top part of the form is shown to improve readability. From the official station history files at the National Climatic Data Center.

FORM NO. 3.		METEOROLOGICAL REGISTER.				Lat. 29° 26' 30" N				Long. 99° 55' W				Alt. of Bar. above sea level				REMARKS.	
Clearness of the Sky.		Wind.				Clouds.				Wet Bulb.		Rain.							
3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 P.M.	Began	Ended	Quantity.					
9	5	1	1	2	1	1	1	1	0	74	80								
9	2	1	1	2	1	1	1	0	74	79									
9	3	1	1	1	1	1	1	1	75	80									
9	4	1	1	1	1	1	1	1	74	80									
9	5	1	1	1	1	1	1	0	75	80									
9	6	1	1	1	1	1	1	0	74	81									
9	7	1	1	1	1	1	1	0	75	81									
9	8	1	1	1	1	1	1	0	74	82									
9	9	1	1	1	1	1	1	0	75	82									
9	10	1	1	1	1	1	1	0	74	81									
9	11	1	1	1	1	1	1	0	75	81									
9	12	1	1	1	1	1	1	0	75	82									

I would have transcribed this register, but have no blank to spare.

Figure 12B. Weather observation form for the Army fort in downtown San Antonio, TX for July 1849 (right side of observation form). The top part of the form is shown to improve readability. From the official station history files at the National Climatic Data Center.

Initially, it appears the San Antonio surgeons had a thermometer, hygrometer, and possibly a wind vane. Wind force likely was estimated. In August 1849, a rain gage was added. No specific information was found regarding the location, exposure, or type of weather instruments used. During the 1840s, 1850s, and 1860s, the U.S. Army Surgeon General issued general information and instructions regarding weather instruments used by field surgeons. The reports under this contract for Fort Gibson, OK, Fort Snelling, MN, and Fort Union, NM contain detailed information from these documents (see Bibliography).

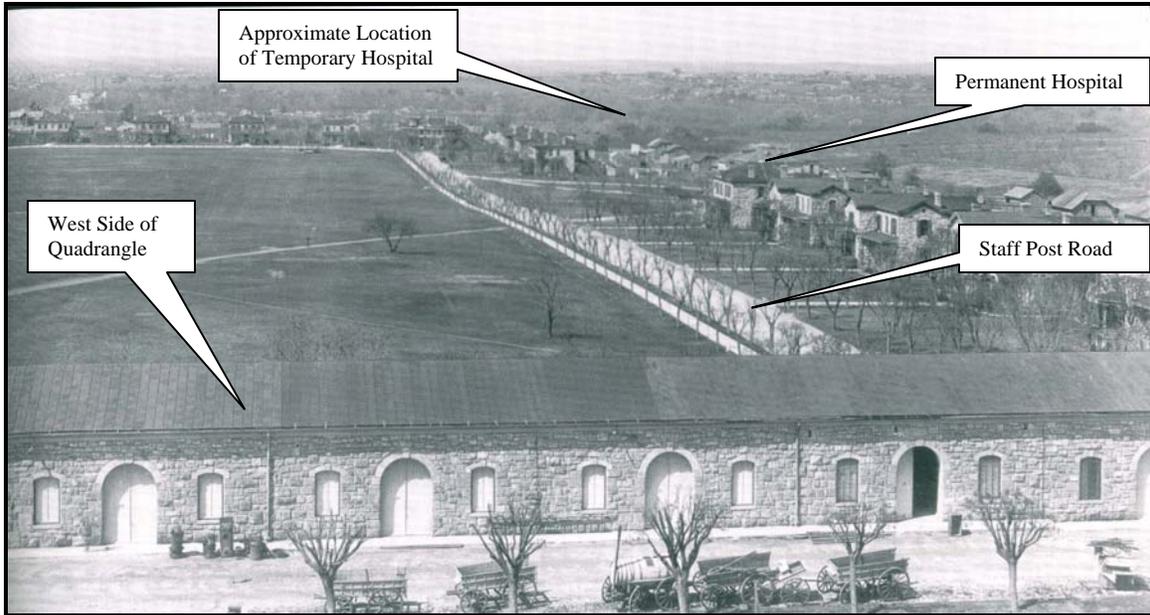
No observations were recorded in the NCDC database from 1 November 1852 through 31 July 1857. Observations by the Army Medical Department in San Antonio resumed 1 August 1857, likely at/near the same location, i.e., in downtown at/near the hospital. No mention was made as to whether the Army surgeons did not take observations from November 1852 through July 1857 or whether the forms had been lost over the years. However, the fort remained in downtown San Antonio during this period.

Observations at San Antonio beginning 1 August 1857 indicated temperature, atmospheric moisture (dew point temperature), wind direction/force, and weather (cloudy or fair) were measured/observed at 7:00 a.m., 2:00 p.m., and 9:00 p.m. daily. Beginning/ending of precipitation and amount also were recorded daily, as well as significant weather in the Remarks Section. The station continued to have a thermometer, hygrometer, rain gage, and likely a wind vane. Weather observations continued until 31 March 1861 when the U.S. Army post was closed due to the Civil War.

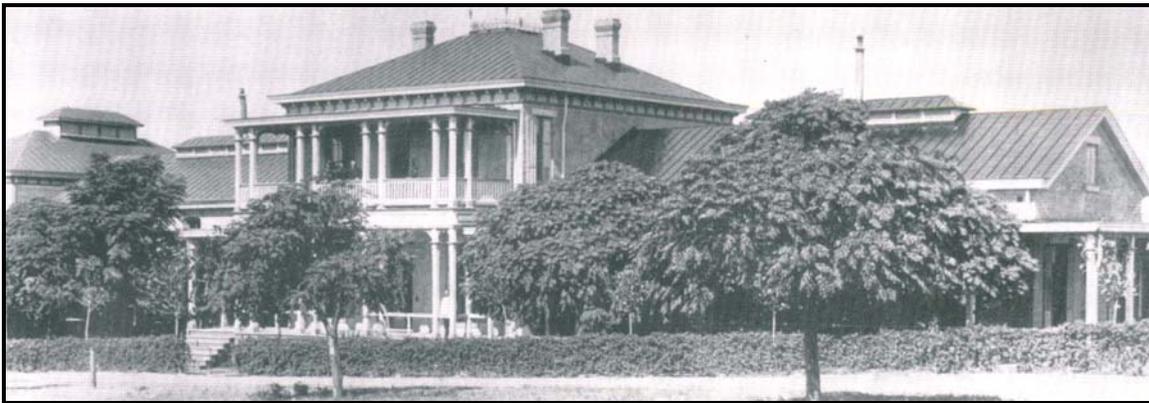
Observations resumed in the NCDC database on 1 January 1870, although the fort reopened in 1865. At that time maximum and minimum thermometers were added to the station (in addition to the previous instruments). However, this station still did not have a barometer since no pressure readings were recorded.

The observation form for August 1871 stated, “Minimum thermometer deemed unreliable” and minimum temperature readings ceased on 19 August 1871. A note on the February 1873 form stated the maximum thermometer was out-of-order and neither maximum nor minimum temperatures were recorded beginning 1 March 1873. Minimum temperature observations resumed 1 April 1873 and maximum temperature observations started 1 June 1873. All observations ceased 31 July 1873 because the fort was closed.

Although the U.S. Army fort returned to San Antonio in August 1875, a gap of over 15 years exists in the NCDC database for weather observations by Army surgeons at San Antonio. The last observation was 31 July 1873 with observations resuming in the database on 1 January 1889. Available resources indicated Army facilities moved to Fort Sam Houston in 1879 so the observations from 1889 into 1892 (listed in the NCDC database) were taken at the permanent hospital (built in 1886) at Fort Sam Houston (approximately two and one-quarter miles northeast of downtown). Figure 13 shows the locations of the temporary and permanent hospitals at Fort Sam Houston and Figure 14 is a photograph of the permanent hospital.



**Figure 13. Locations of the temporary and permanent hospitals at Fort Sam Houston (circa 1880s). View is west from the Quadrangle’s watchtower located in the center of the Quadrangle. Courtesy of the Fort Sam Houston Military Museum.**



**Figure 14. The permanent Army hospital constructed in 1886 (time of photograph approximately 1890). View is northwest. Courtesy of the Fort Sam Houston Museum.**

Most likely, surgeons took observations at Fort Sam Houston from around 1879 (when the fort was constructed) through the 1880s since the post was a major facility with a hospital and medical staff. Any weather observations taken from 1875 to 1879 would have been taken near downtown where the hospital was located. The final weather observation by the Army Medical Department for San Antonio in the NCDC database was on 29 February 1892.

In mid 1888, the Army Medical Department changed observing requirements for field surgeons, including Fort Sam Houston. The form was simplified with the following parameters recorded:

1. Maximum and minimum temperatures
2. Precipitation – Beginning, end, and daily amount
3. General direction of the wind (one value listed for the day)

These parameters were measured/observed at Fort Sam Houston in 1889, continuing through the final observation in the NCDC database on 29 February 1892. This station had a maximum thermometer, minimum thermometer, rain gage, and wind vane.

### **Smithsonian Institution Observers (1851, 1870-1873)**

According to the NCDC database, James Henderson took weather observations for the Smithsonian Institution from 1 January 1851 through 31 August 1851. Mr. Henderson observed/measured temperature, precipitation, clearness of the sky, wind direction and force, and cloud movement. All observations except precipitation were made at sunrise, 9 a.m., 3 p.m., and 9 p.m. Precipitation included beginning/ending times and daily amount. Remarks regarding the daily weather also were included. Based on the observations, this station had a thermometer, rain gage, and probably a wind vane. Wind force was most likely estimated. No information could be found regarding the type and location of weather instruments used by Mr. Henderson.. See the report on Minneapolis/St. Paul, MN (under this contract; see Bibliography) for additional information on weather observing instruments and instructions used by Smithsonian observers.

Dr. Fred Pettersen began taking weather observations on 1 June 1870 (according to the NCDC database) with the last observation 31 May 1873. Initially, Dr. Pettersen measured/observed temperature; precipitation; amount, type, and movement of clouds; wind direction and force; and dew point. All observations except precipitation were made at 7 a.m, 2 p.m, and 9 p.m. Precipitation included the beginning/ending times and daily amount. Remarks regarding the daily weather also were included. Based on the observations, this station had a thermometer, rain gage, hygrometer, and probably a wind vane. Wind force was most likely estimated. On 1 April 1871, Dr. Pettersen began taking barometric observations.

On the December 1871 observation form, Dr. Pettersen wrote the following note:

“The barometer used is from B. Pike N.Y. The thermometer and hygrometer are from James Green N.Y., also the standard thermometer, maximum and minimum thermometers I use are from R&J Beck in London. I have also thermometers for solar and terrestrial radiation from the last named firm.”

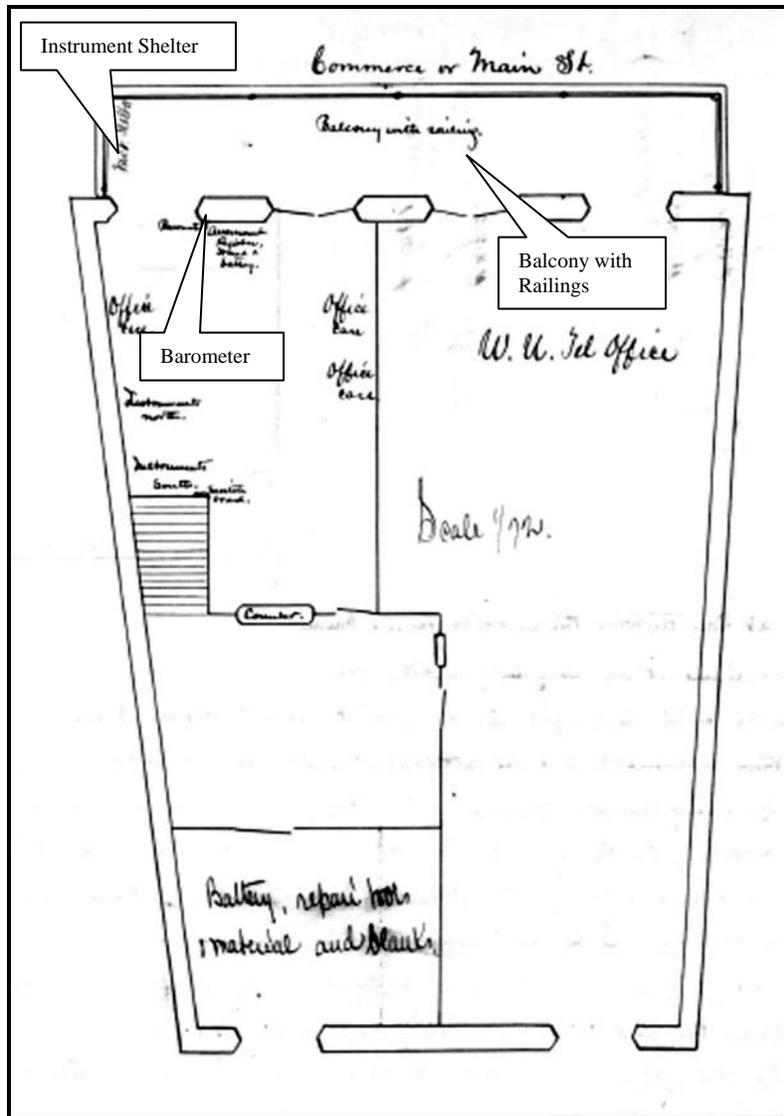
On the March 1872 observation form, Dr. Pettersen mentions an “Ozonemeter” that he was using as an experiment. His note could not be completely translated because of illegible writing, but he refers to Smithsonian Institution instructions.

See the report on Minneapolis/St. Paul, MN (under this contract; see Bibliography) for additional information on weather observing instruments and instructions used by Smithsonian observers.

### **Signal Service Observations (1875-1891)**

NOTE - Army surgeons took weather observations based on local times, as opposed to the U.S. Signal Service which took observations based on Washington DC times. Based on Meridian Time used by the Signal Service Office in San Antonio, observations were taken 86 minutes earlier than listed on the forms, e.g., a 7 a.m. observation actually was taken at 5:34 a.m. Recorded observations at 7 a.m. by Army surgeons were also taken at 7 a.m.

**22 September 1875 – 30 March 1878** – Signal Service office located on the southwest corner of Commerce and Presa Streets. Based on recorded heights of the barometer and thermometers, the office was on the second floor of the building. Two inspection reports were conducted at this station, 28 March – 13 April 1877 and 21 December 1877. Figure 15 shows the locations of the weather instruments in this Signal Service office.



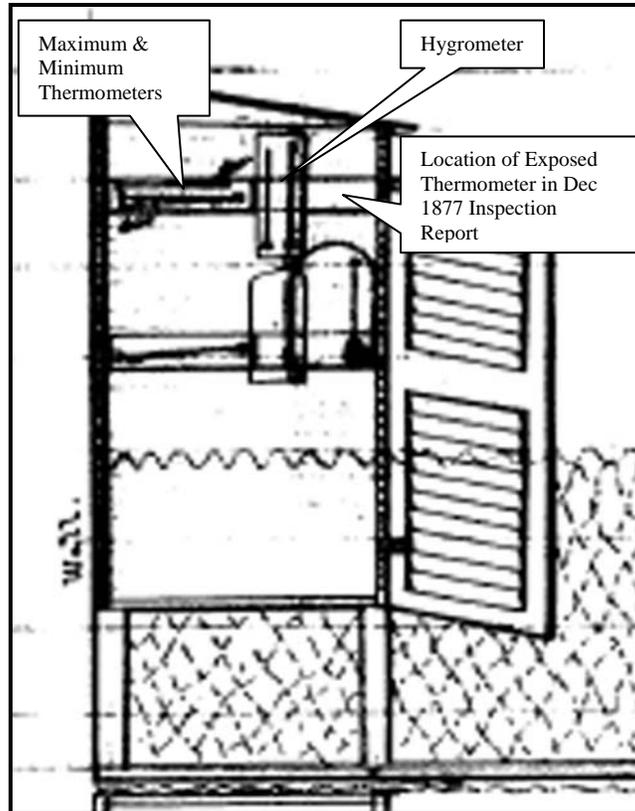
**Figure 15. Weather instruments in Signal Service office (13 April 1877). North is at the top of the figure. From the National Archives and Records Administration.**

Barometer – The barometer was on the north wall to the office (Figure 15). The barometer was listed as 17 feet above ground and 667 feet above sea level.

Instrument Shelter – The instrument shelter was located on the west end of a north-facing balcony (Figure 15), outside the northwest corner of the office. The shelter was constructed of unpainted pine and was listed as approximately seven feet high, three feet wide, and two feet deep.

Based on the inspection reports, the shelter was not placed in the window, but was on the north-facing balcony, opening to the east. To observe the instruments in the shelter, Signal Service observers had to open the shelter from the balcony.

Figure 16 is a drawing of the instrument shelter. The exposed thermometer and hygrometer were 19 feet above ground and the maximum/minimum thermometers 20 feet above ground.



**Figure 16. Drawing of the instrument shelter on the balcony outside the Signal Service office (13 April 1877). View is west. Two sets of instruments appear to be indicated in the drawing. The inspection report on 21 December 1877 indicated all the thermometers were on the same level. From the National Archives and Records Administration.**

Rain Gages – The rain gage was located on the roof of the building, 33 feet above ground.

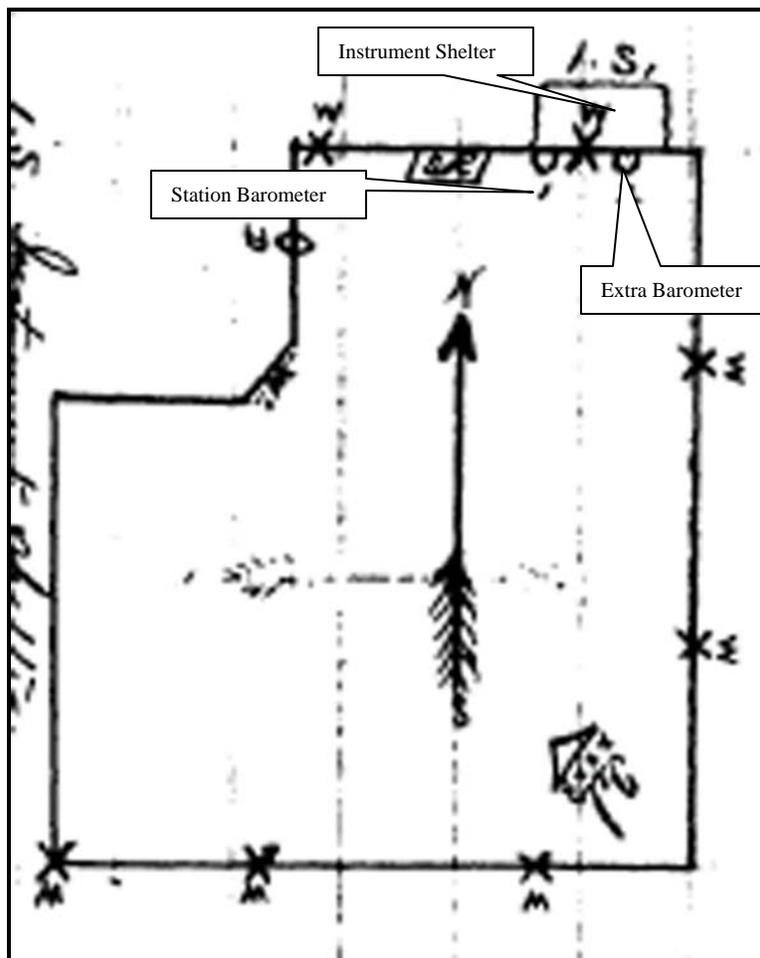
Wind Instruments – The wind instruments were located on the roof 35 feet above ground. This station also had an anemoscope.

**30 March 1878 – 30 July 1881** – Signal Service office on the east side of Yturri Street. One inspection report was prepared for this office, 23-27 May 1880.

Barometer – The barometers (station and extra) were located near the instrument shelter, near a window, in the northeast corner of the office (Figure 17).

Elevation of the barometer was listed as 677 feet above sea level and 15 feet above ground.

Instrument Shelter – The window instrument shelter was located in a window in the northeast corner of the office (Figure 17). The shelter was approximately five feet high, three feet wide, and two feet deep. The instruments were suspended approximately two feet from the bottom of the shelter and one foot, three inches from the window panes. The exposed thermometer and hygrometer were 16 feet above ground and the maximum/minimum thermometers 18 feet above ground.

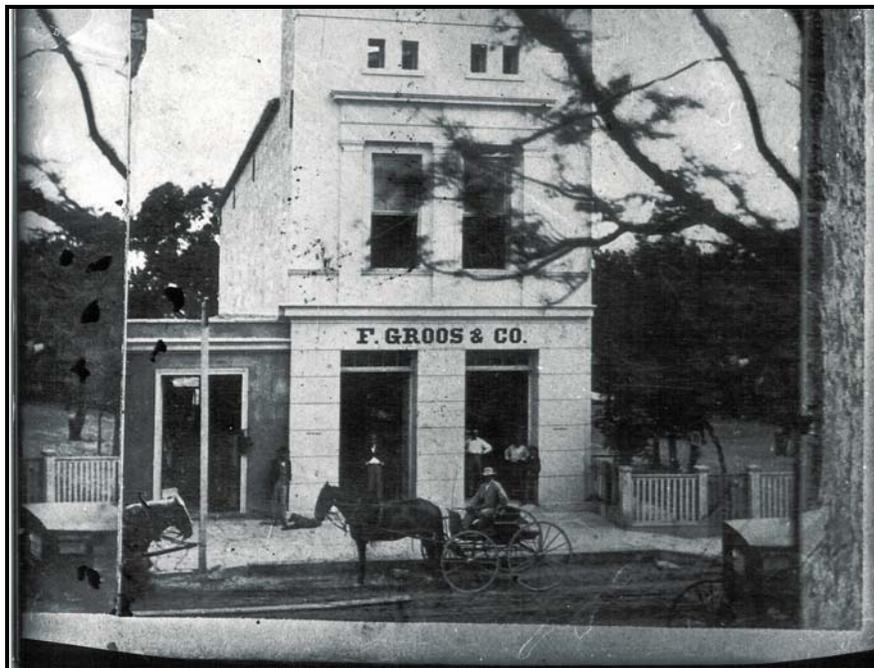


**Figure 17. Signal Service office and weather instruments in building on east side of Yturri Street (23-27 May 1880). North is at the top of the figure. From the National Archives and Records Administration.**

Rain Gage – The rain gage was on the roof of the building and was 32 feet above ground. Exposure was rated as good.

Wind Instruments – The wind instruments were on the roof of the building. The anemometer was 33 feet above ground and the wind vane 31 feet above ground. This station also had an anemoscope. Exposure was rated as good.

**30 July 1881 – 15 June 1883** – Signal Service office located in the Groos Building on the northeast corner of Commerce and Navarro Streets. No Signal Service inspection reports were available for this station. Only information available was from Signal Service annual reports and Weather Bureau station history documents. Figure 18 shows the building.



**Figure 18. Photograph of the Groos Building (circa 1870) located on the northeast corner of Navarro and Commerce Streets. Commerce Street is in front of the building. View is north northeast. Courtesy of San Antonio Conservation Society Foundation (Ernst Raba Collection).**

Barometer – The barometer was 673 feet above sea level. Since two barometers were at the previous station, this site likely was similar.

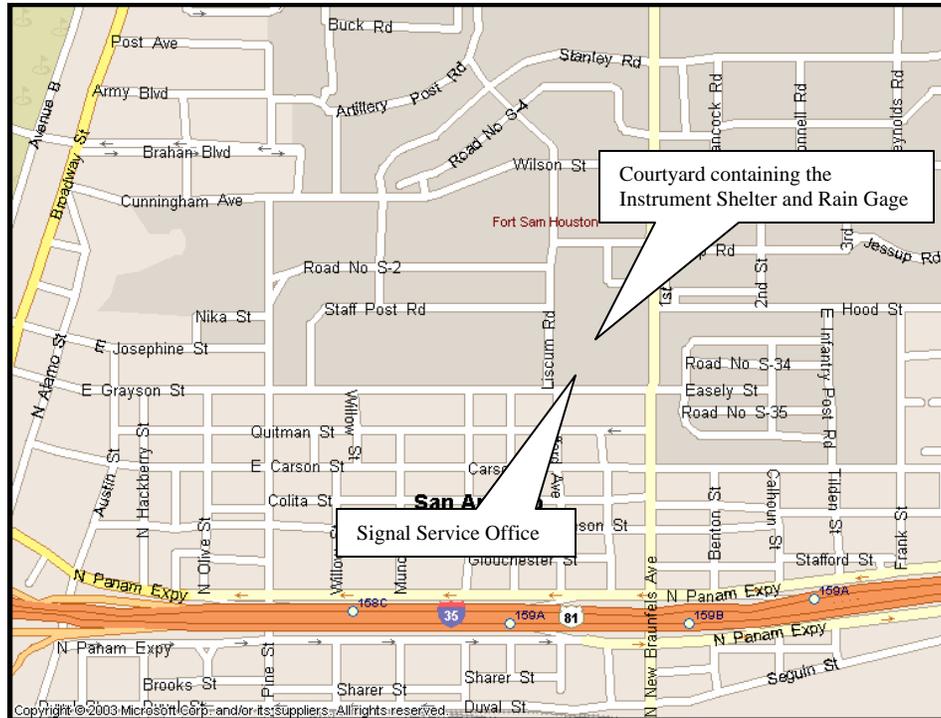
Instrument Shelter – The instruments in the shelter were approximately 22 feet above ground. Considering the height of the rain gage above ground, and assuming the rain gage was on the roof of the building, the instrument shelter likely was a window type.

Rain Gage – The rain gage was 37 feet above ground.

Wind Instruments – Although this station probably had wind instruments, no information could be found regarding location.

**15 June 1883 – 7 March 1885 – Office closed.**

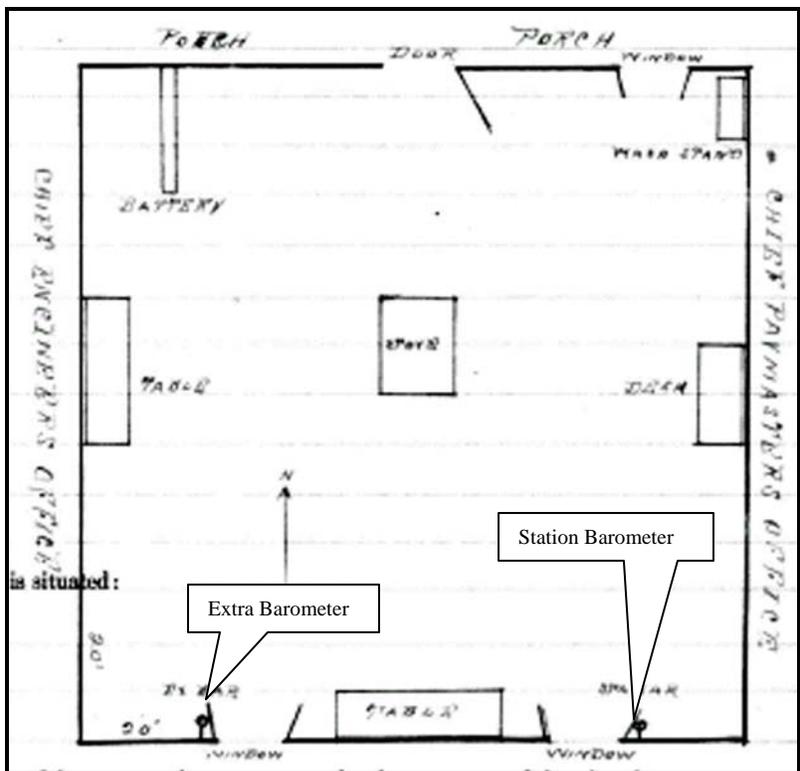
**7 March 1885 – 15 July 1891 – Signal Service office located in the Headquarters Building in the Department of Texas on the Quadrangle at Fort Sam Houston. The barometers were located in the office, wind instruments were on the roof of the building, and the instrument shelter and rain gage in the Quadrangle courtyard just north of the Headquarters Building. Figure 19 shows the location of the office and courtyard at Fort Sam Houston.**



**Figure 19. Current map of Fort Sam Houston showing the locations of the Signal Service office and courtyard containing the instrument shelter and rain gage. North is at the top of the figure. East-west distance across the map approximately one and one-third mile.**

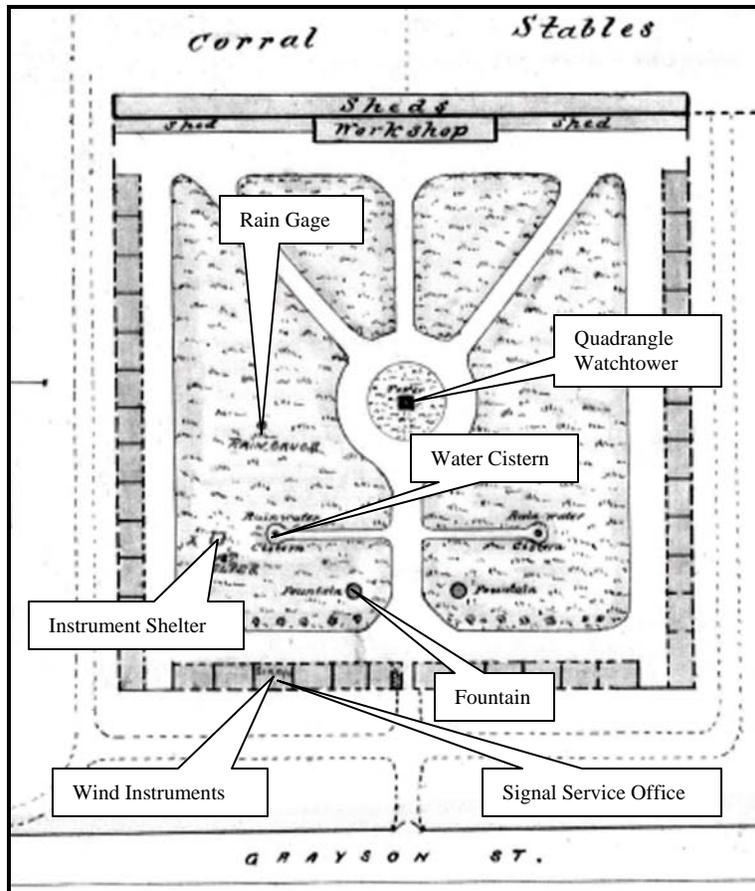
Four inspections were conducted at this station on the following dates: 3-6 March 1885, 12-14 September 1885, 17-21 March 1888, and 24-26 January 1889.

Barometer – The barometers (station and extra) were located on the south wall of the Signal Service office (Figure 20). Both barometers were located adjacent to windows. Elevation of the barometers was listed as 770 feet above sea level and 20 feet above ground.



**Figure 20. Drawing of the Signal Service office in the Headquarters Building (Quadrangle), Department of Texas, at Fort Sam Houston (3-6 March 1885). North is at the top of the figure. From the National Archives and Records Administration.**

Instrument Shelter – The instrument shelter was located on supports over sod in the Quadrangle courtyard just north of the office (Figure 21). Signal Service records indicated the instrument shelter was a standard type that was three feet high, three feet wide, and three feet deep.



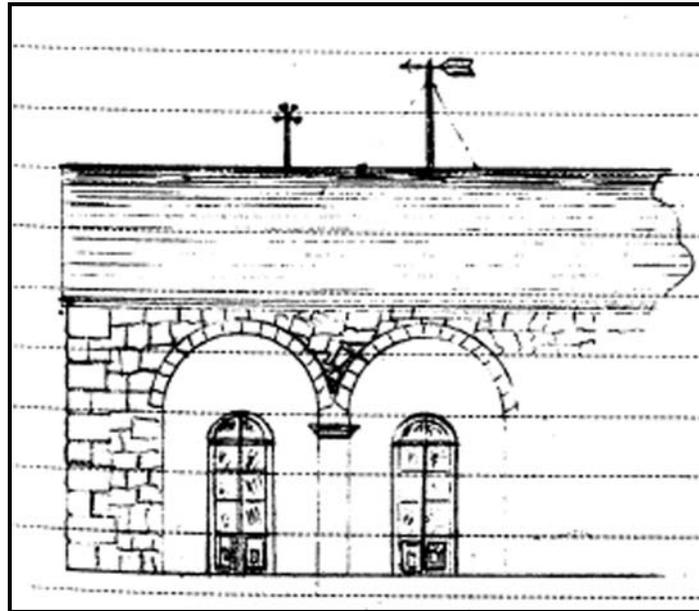
**Figure 21. Signal Service office and Quadrangle courtyard at Fort Sam Houston (3-6 March 1885). North is at the top of the figure. From the National Archives and Records Administration.**

The exposed thermometer and hygrometer were 16 above ground and the maximum/minimum thermometers were 17 feet above ground. No mention was made as to the possible impact of the fountain or water cistern on instruments in the instrument shelter.

Rain Gages – The standard 8 inch rain gage was located in the courtyard north of the office (Figure 21). The gage was 182 feet north of the buildings to the south and 83 feet east of the buildings located to the west. The top of the gage was 1 foot above ground. The inspection report on 17-21 March 1888 stated the station had one standard brass gage and one standard galvanized gage.

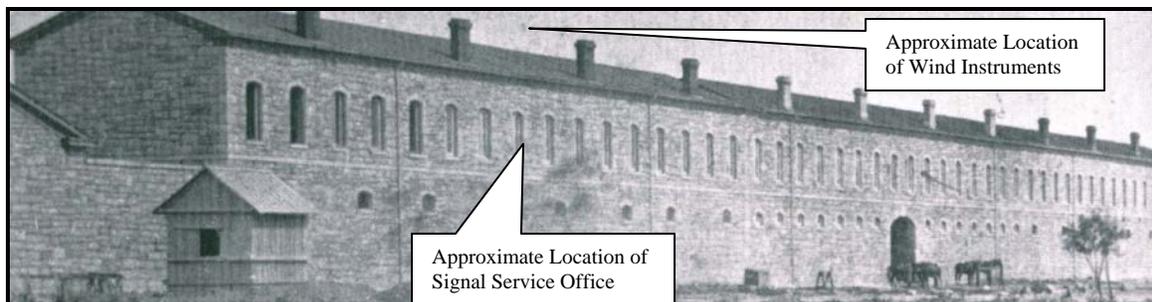
Wind Instruments – The wind instruments were on the roof of the Department Headquarters Building (Figure 21). The anemometer was 42 feet above ground and the large wind vane (12 foot) was 44 feet above ground. The wind vane was changed to a four-foot type between September 1885 and March 1888. An anemoscope also was on the roof. Inspection reports stated the exposure of the

wind instruments was excellent with no influences from higher buildings. Figure 22 is a drawing of the wind instruments in March 1888.



**Figure 22. Anemometer and wind vane on top of the Signal Service office and Department Headquarters Building (17-21 March 1888). Direction is either north or south (not specified), likely looking north. From the National Archives and Records Administration.**

Figure 23 is a photograph of the south side of the Fort Sam Houston Quadrangle showing the location of the Signal Service office and wind instruments.



**Figure 23. South side of the Fort Sam Houston Quadrangle (circa 1880) showing the locations of the Signal Service office and wind instruments. View is northeast. Courtesy of the Fort Sam Houston Museum.**

Additional Equipment/Information – A note in the San Antonio log book on 6 March 1885 stated, “Instrument shelter was purchased from E.I. Gray for \$50.”

## Weather Bureau Observations (1891-1955)

### *City Offices (1891-1941)*

Weather Bureau assumed observing responsibility in San Antonio on 15 July 1891.

**15 July 1891 – 1 February 1892** – Weather Bureau office in the Dulling Building at the northwest corner of East Commerce and Alamo Streets. Figure 24 shows the building.



**Figure 24. Dulling Building (circa 1915) looking northwest. East Commerce Street is in the foreground with Alamo Street (also called Alamo Plaza) to the right of the photograph. The building originally had two towers on the roof, on the west side and on the east side. The Weather Bureau office was located in one of the towers (exact tower not specified). Courtesy of the San Antonio Conservation Society Foundation.**

Weather Bureau records for this station were incomplete. Information for this station was based on records from the last Signal Service office, as well as Weather Bureau annual reports.

Barometer – Elevation of the barometer was 705 feet above sea level (from Weather Bureau annual report). This station likely had two barometers.

Instrument Shelter – The dry bulb thermometer and psychrometer were located 58 feet above ground. The instrument shelter was on the roof of the building.

Rain Gages – A standard 8 inch rain gage was located 50 feet above ground. This station may have had two rain gages, but information was incomplete. The gages likely were on the roof of the building.

Wind Instruments – The wind instruments were 85 feet above ground and likely on the roof.

**1 February 1892 – 1 July 1895** – Weather Bureau office on the third floor of the Alamo Insurance Building on the southwest corner of College and Navarro Streets. Figure 25 shows the building.



**Figure 25. Alamo Insurance Building looking northwest (circa 1896). Courtesy of the San Antonio Conservation Society Foundation.**

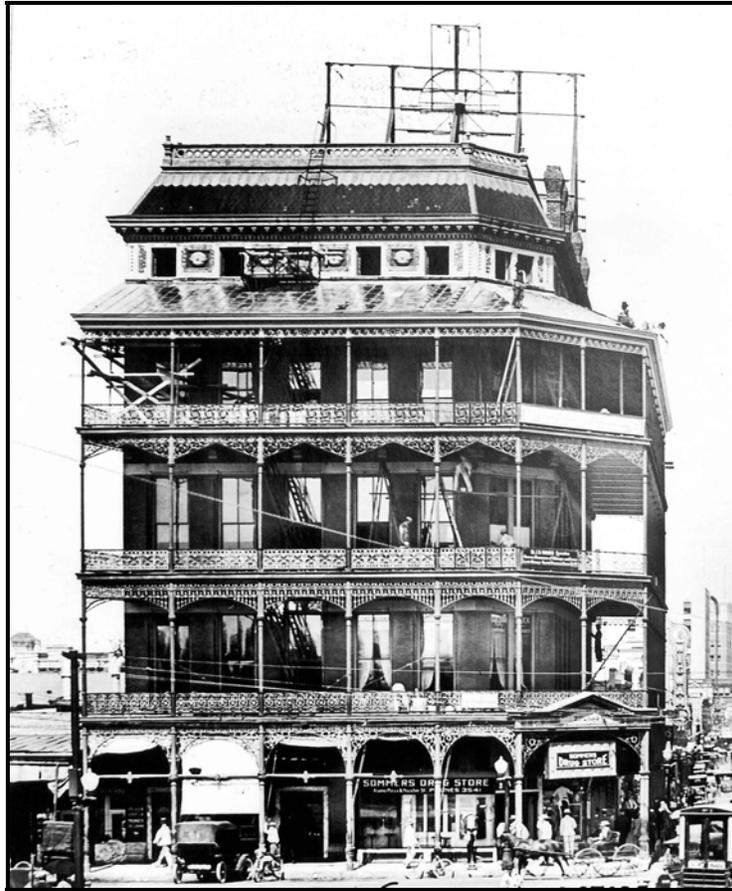
Barometer – Elevation of the barometer was 679 feet above sea level. This station likely had two barometers, but records were incomplete.

Instrument Shelter – The dry bulb thermometer, maximum/minimum thermometers, and psychrometer were 66 feet above ground. The instrument shelter was on the roof.

Rain Gages – The standard 8 inch rain gage was 60 feet above ground. This station likely had two rain gages but records were incomplete. The rain gage(s) likely was on the roof.

Wind Instruments – The wind instruments were 75 feet above ground and likely on the roof.

**1 July 1895 – 1 May 1900** – Weather Bureau office in the Maverick Building at the southwest corner of Alamo Plaza and Houston Street. Figure 26 is a photograph of the Maverick Building.



**Figure 26. Maverick Building located on the southwest corner of Alamo Plaza and Houston Street (circa 1910). View is west. Courtesy of the San Antonio Conservation Society Foundation.**

Barometer – Elevation of the barometers (operational and extra) was 693 feet above sea level. Original elevation of the barometers (11 February 1896) was listed as 704 feet but was re-calculated to 693 feet on 4 January 1900. A barograph was located at this station (installation date not specified).

Instrument Shelter – The standard instrument shelter was on the roof of the building with the floor of the shelter 14 feet above the roof. The dry bulb thermometer, maximum/minimum thermometers, and psychrometer were 15 feet above the roof and 95 feet above ground.

Rain Gages – The standard 8 inch rain gage was 3 feet above the roof and 81 feet above ground.

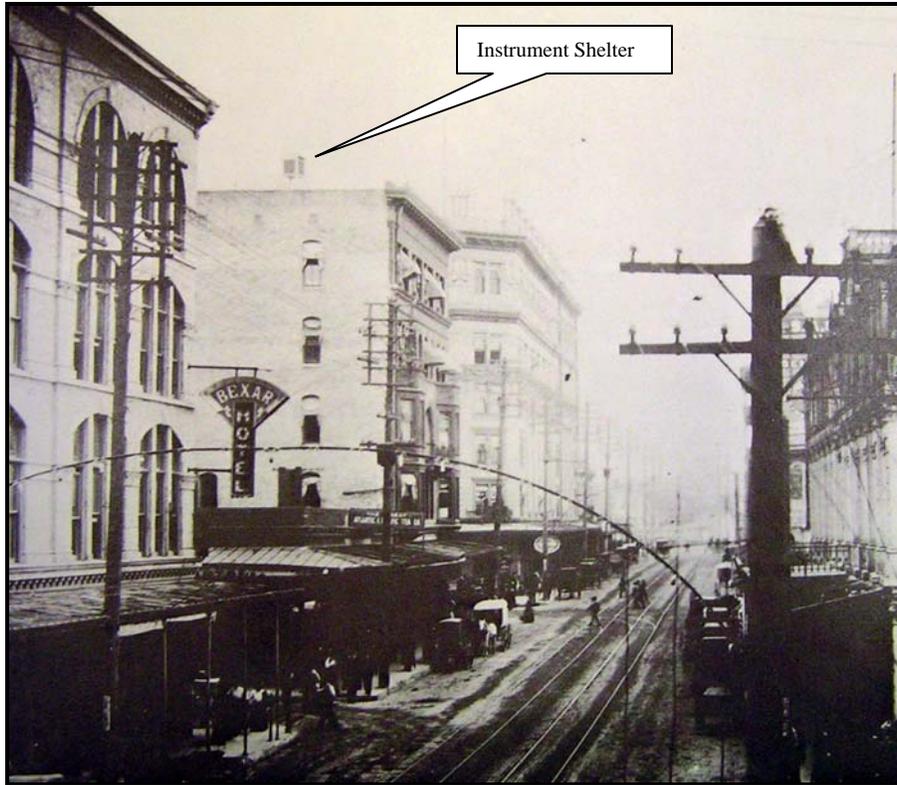
Wind Instruments – The anemometer was 23 feet above the roof and 104 feet above ground. The wind vane was 24 feet above the roof and 105 feet above ground.

**1 May 1900 – 30 June 1914** – Weather Bureau office on the fourth floor of the Hicks Building at Avenue C (renamed Broadway Street in 1926) and East Houston Street.

Barometer – Elevation of the barometers was 705 feet above sea level. Weather Bureau Station History and Station Location forms prepared in the 1950s stated the elevation of the barometer to be 697 feet. However, the “Report of Elevation and Position of Instruments,” as well as the cover sheets on the “Original Monthly Record of Observations” from May 1900 through June 1914 all indicated the elevation to be 705 feet. Weather Bureau annual reports listed the elevation of the barometers as 701 feet.

Instrument Shelter – The standard instrument shelter was on the roof of the Hicks Building. The shelter was approximately 3 feet long, 3 feet wide and 2 feet high. The floor of the shelter was 10 feet above the roof. The dry bulb thermometer, maximum/minimum thermometers, and psychrometer initially were listed as 67 feet above ground. On 1 March 1901, the height of the thermometers was changed to 11 feet above the roof and 80 feet above ground.

According to the San Antonio Weather Bureau log book, the instrument shelter was painted on the following days: 1 October 1902, 18 April 1904, 7 July 1907, 1 July 1909, and 17 February 1913. The following note was included on 1 May 1900: “Instrument shelter not yet completed on the roof of the Hicks Building, but the instruments were placed in position in the new location and observations started with the 8 a.m. observation. Increase in station elevation was four feet.” No mention was made as to when the instrument shelter was installed. Figures 27 and 28 show the instrument shelter on top of the Hicks Building.



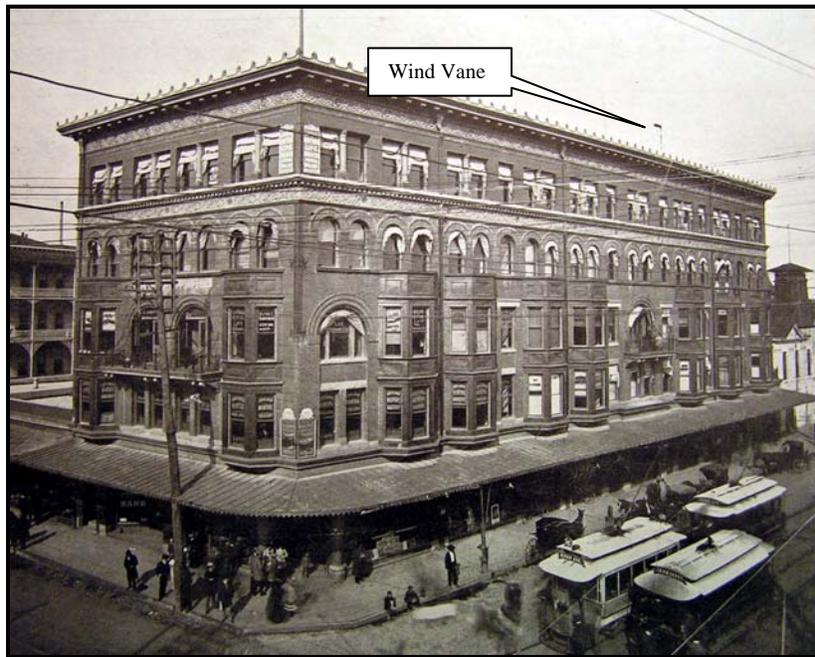
**Figure 27. Weather Bureau instrument shelter on roof of the Hicks Building (circa 1905). View is east northeast. Street shown is photograph is East Houston Street. Courtesy of the Daughters of the Republic of Texas Library.**



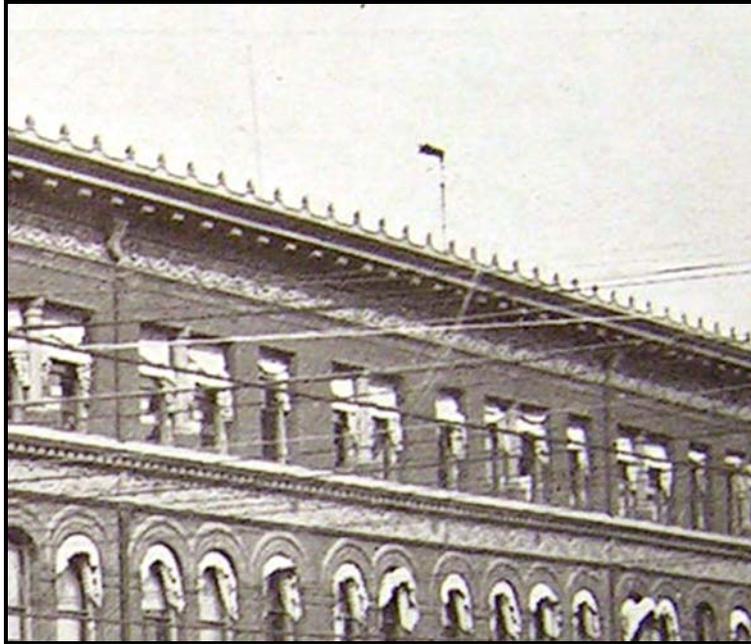
**Figure 28. Enlargement of Figure 27 showing the instrument shelter on the roof of the Hicks Building. View is east northeast. Note that the door to the instrument shelter appears to be facing south. Courtesy of the Daughters of the Republic of Texas Library.**

Rain Gages – The standard 8 inch rain gage initially was 58 above ground. On 1 March 1901, the elevation of the gage changed to 3 feet above the roof and 72 feet above ground. A tipping bucket rain gage was installed on 7 November 1902.

Wind Instruments – Initially, the wind instruments were 77 feet above ground. On 1 March 1901, the anemometer was changed to 19 feet above the roof and 91 feet above ground and the wind vane was 20 feet above the roof and 92 feet above ground. Figures 29 and 30 show the wind vane on top of the Hicks Building.



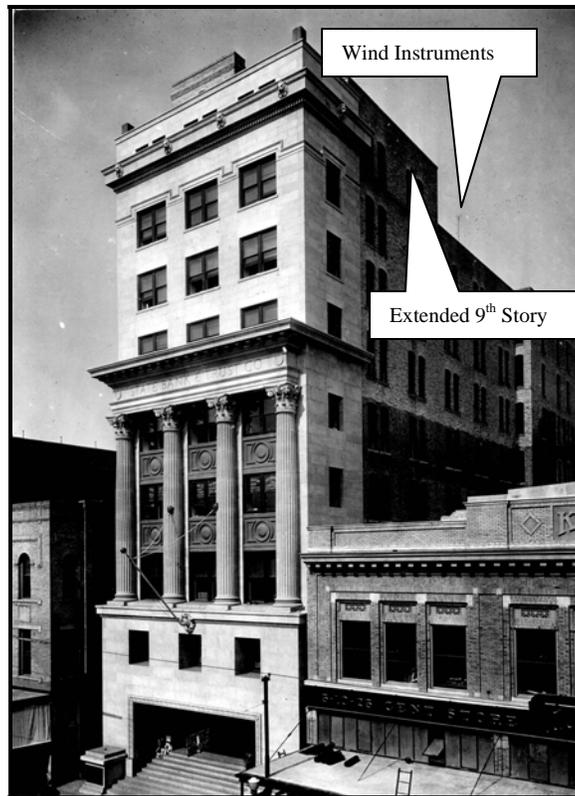
**Figures 29. Hicks Building showing the Weather Bureau wind vane (circa 1905). View is northwest. East Houston Street is in the lower left of the photograph and Avenue C (renamed Broadway Street in 1926) is shown in the lower right. Courtesy of the San Antonio Conservation Society Foundation.**



**Figure 30. Enlargement of Figure 29 showing the wind vane on top of the Hicks Building. View is northwest. Courtesy of the San Antonio Conservation Society Foundation.**

Additional Equipment/Information – A sunshine recorder was installed 7 November 1902. The recorder was 16 feet above the roof and 87 feet above ground.

**30 June 1914 – 1 July 1930** – Weather Bureau office located in the State Bank and Trust Building at 313 East Houston Street (Figure 31).



**Figure 31. State Bank and Trust Building located on 313 East Houston Street (19 November 1914). View is northwest. Weather Bureau offices were on the top floor of the building (extended ninth story). From the official station history files at the National Climatic Data Center.**

Barometer – Elevation of the barometers was 750 feet above sea level. The elevation of the barometers initially was listed as 758 feet with a later survey (7 June 1916) changing the elevation to 750 feet.

Instrument Shelter – The standard instrument shelter was located on the roof of the building. The shelter was approximately 3 feet long, 3 feet wide and 3 feet high, with the floor of the shelter 10 feet above the roof. The dry bulb thermometer, maximum/minimum thermometers, and psychrometer were 10 feet above the roof and 109 feet above ground. The instruments were raised to 119 feet above ground on 12 May 1916. A letter from the Official in Charge on 14 June 1916 stated:

“Owing to alterations in the building, begun April 12, 1916, the instrument shelter, rain and snow gages were moved to a temporary position on the roof over the office rooms; change in elevation above ground +12 feet; and on May 12, 1916, to a permanent position on the roof of the extended 9<sup>th</sup> story; change in elevation above ground + 10 feet. The elevations of

other instruments were not affected nor their positions disturbed by the alterations.”

Elevation of the instrument shelter from 12 April 1916 to 12 May 1916 was 121 feet above ground. An electric light was installed in the shelter around 8 August 1919.

According to the San Antonio log book, the instrument shelter was painted on the following days: 18 August 1914, 7 June 1915, 29 June 1916, 8 June 1917, 23 June 1919, 8 June 1920, 11 July 1921, 5 July 1922, 20 June 1924, 15 June 1925, 30 June 1926, and 26 July 1928 (entries in log book ended shortly after 26 July 1928).

Rain Gages – The tipping bucket and standard 8 inch rain gages were 3 feet above the roof and 102 feet above ground. The gages were raised to 114 feet above ground on 12 April 1916 (see note in section on instrument shelter) and changed to 112 feet above ground on 12 May 1916.

Wind Instruments – The anemometer was 22 feet above the roof and 132 feet above ground. The wind vane was 23 feet above the roof and 133 feet above ground (Figure 31).

**1 July 1930 – 24 October 1937** – Weather Bureau office located in the Alamo National Bank Building at Commerce and St. Mary’s Streets. Figure 32 is a drawing of the building.



**Figure 32. Alamo National Bank looking west (circa 1940s). Street to the right of the building is West Commerce Street and the street in front of the building is St. Mary’s Street. From the San Antonio Municipal Library.**

Barometer – Elevation of the barometers was 879 feet above sea level. A barograph arrived on-station on 27 October 1931.

Instrument Shelter – The standard instrument shelter was on the roof of the building and was 3 feet long, 3 feet wide, and 4 feet high, with the floor of the shelter 10 feet above the roof. The dry bulb thermometer, maximum/minimum thermometers, and psychrometer were 11 feet above the roof of the building and 243 feet above ground. Exposure of the instrument shelter and attendant instruments was rated as satisfactory. The shelter was changed 21 May 1937.

Rain Gages – The tipping bucket and standard 8 inch rain gage were 4 feet above the roof and 235 feet above ground. Exposure of the rain gages was rated as satisfactory.

Wind Instruments – The anemometer was 19 feet above the roof and 301 feet above ground. The wind vane (3-foot) was 21 feet above the roof and 303 feet above ground. Exposure of the wind instruments was rated as satisfactory.

Additional Equipment/Information – Three-hourly airway observations began at this office on 16 July 1930. Hourly observations began at this office on 14 May 1933. The observations were telephoned to the Department of Commerce radio station in San Antonio for transmittal to Kansas, MO.

**24 October 1937 – 2 January 1941** – Weather Bureau office located in the Federal Building at northeast corner of Alamo Plaza and East Houston Street. Figure 33 is a current photograph of the Federal Building.



**Figure 33. Current photograph of the Federal Building located on the northeast corner of Alamo Plaza and East Houston Street. View is north northeast. Photograph taken by author.**

Initial elevations for the weather instruments at this station were listed in Weather Bureau records incorrectly, i.e., being a few feet off due to a survey error. The error was corrected by mid 1938.

Official weather observing responsibility was transferred from the city office to the Weather Bureau office at Stinson Field on 30 June 1939. At that time, weather observations at the city office were discontinued except for partial observations. The Weather Bureau city office and airport office were consolidated at Stinson Field on 2 January 1941.

Barometer – Elevation of the barometers was 738 feet above sea level. Two barometers were located in a wooden box fastened to the north side of room 533 (operational room). Weather Bureau inspections stated the barometers were on a thick wall and free from sunshine and vibration. A Weather Bureau report (Description of Installation and Exposure of Instrumental Equipment and Surroundings) stated a barograph (Friez and Son) was located at this site. The barograph was on an instrument stand near the center of room 533. No information could be found as to when the barograph was first installed. In May 1938, the elevation of the barometer changed to 731 feet (no explanation was given).

Figure 34 is a schematic showing the location of the weather instruments on the roof of the Federal Building and Figure 35 is a photograph of the instruments.

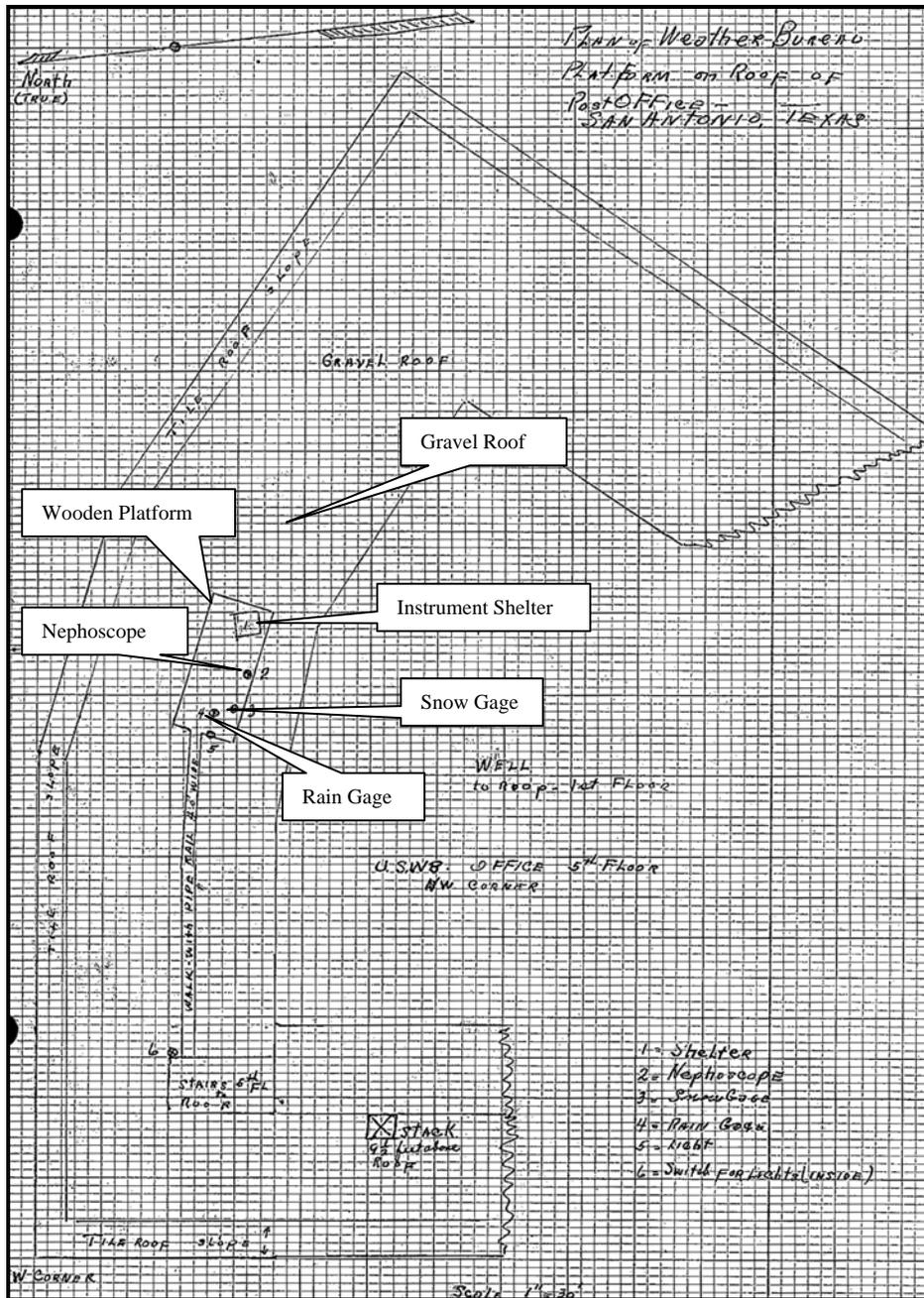
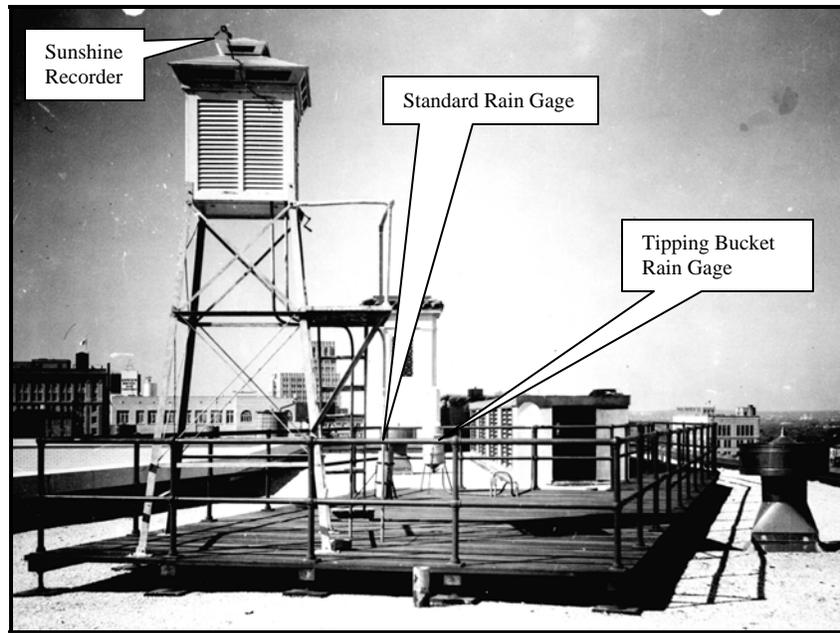


Figure 34. Drawing showing the location of Weather Bureau instruments on the roof of the Federal Building (12 December 1937). North is to the left of the figure. Weather Bureau office was located on the 5<sup>th</sup> floor in the northwest part of the building. From the official station history files at the National Climatic Data Center.



**Figure 35. Weather instruments on the roof of the Federal Building (10 December 1937). View is west. From the official station history files at the National Climatic Data Center.**

Instrument Shelter – The standard instrument shelter was located on the roof of the building and was 3 feet long, 3 feet wide, and 3 feet high, with the floor of the shelter 10 feet above the roof. The dry bulb thermometer, maximum/minimum thermometers, and psychrometer were 12 feet above the roof and 111 feet above ground. A thermograph also was in the shelter but no date was given as to when it was first installed.

Rain Gages – The tipping bucket and standard 8 inch rain gages were 4 feet above the roof and 103 feet above ground. Exposure was rated as good.

Wind Instruments – The wind instruments were left on the roof of the Alamo National Bank Building with no change in elevation. A Weather Bureau inspection report on 5 April 1937 stated the following:

“The plan to retain the wind instruments on the roof of the Alamo National Bank Building, when removal to new Federal quarters is accomplished, is sound, as there would be serious interference with wind records in the new location.”

Another report on 12 December 1937 contained the following:

“Post Office has five stories and an attic. Across the street is a high building, hence the exposure was considered too low for wind instruments on this building, and they were not moved. The exposure on the Alamo National Building is good.”

The anemometer was a 4-cup variety and the wind vane a 4-foot metal type.

Additional Equipment/Information – A nephoscope was located at this station, as well as a sunshine recorder and telethermoscope. The sunshine recorder was on top of the instrument shelter. Exposure of the sunshine recorder was rated as good.

#### *Airport Offices (1932-1955)*

The history of Stinson Airport in south San Antonio is long and rich. The field was established in 1915 and weather instruments were installed at the Department of Commerce Airways Radio Station near Stinson Field (within two miles of the field) in 1930. Weather Bureau records indicated that in April 1932, a sling psychrometer and aneroid barometer were located at the airways radio station. On 29 June 1937, the airways radio station moved to the Administration Building at Stinson Field. A Weather Bureau observing station was not established at Stinson until 27 December 1938. During the early and mid 1930s, official weather observations were taken at the Weather Bureau city office.

A Weather Bureau inspection was conducted at the Department of Commerce Airways Radio Station on 27 September 1934, indicating this station had the following instruments:

- An aneroid barometer – elevation 580 feet above sea level
- An airways instrument shelter with the base of the shelter approximately five feet above ground
- An exposed thermometer and sling psychrometer were in the shelter – the instruments were approximately six feet above ground
- An anemometer (3-cup) and wind vane (3-foot metal) located approximately 7 feet above the roof of the building and 20 feet above ground
- By March 1937, a rain gage was added to the station and was one foot above ground (type of gage not specified)

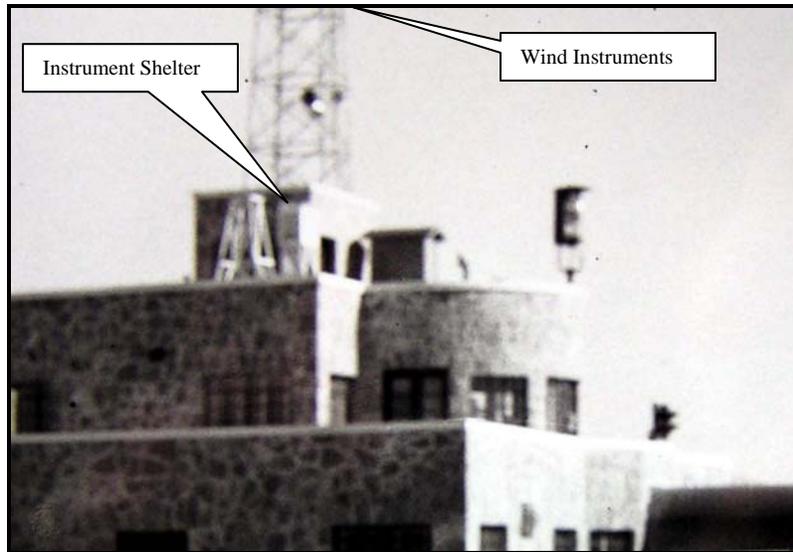
A Weather Bureau inspection report on 11 October 1935 stated the Department of Commerce radio operators took all weather observations at this station.

On 29 June 1937, the airways radio station moved to the Administration Building at Stinson Field. According to Weather Bureau inspection reports, the following instruments were located at this station:

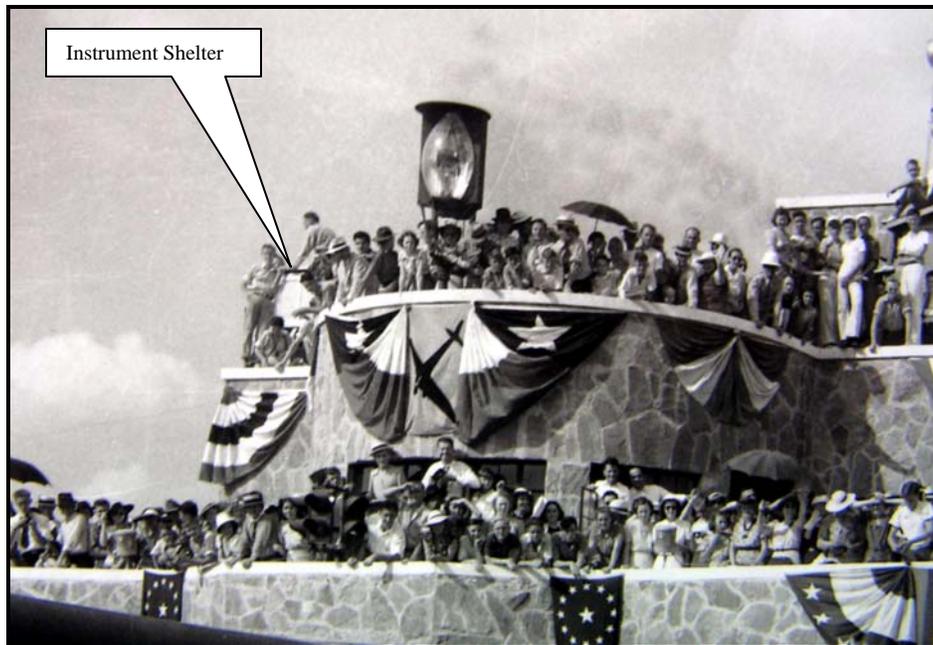
- An aneroid barometer and seven-day barograph – elevation 581 feet
- A cotton region instrument shelter with the base of the shelter approximately five feet above the roof of the second floor
- An exposed thermometer, fan psychrometer, and maximum/minimum thermometers were in the shelter – the instruments were approximately six

- feet above the roof of the Administration Building and 29 feet above ground
- A standard eight-inch rain gage – three feet above the roof of the second floor and 26 feet above ground
- An anemometer (3-cup) and wind vane (3-foot metal) located on a tower over the Administration Building, 60 feet above ground

Figures 36 and 37 show different perspectives of the instrument shelter used by the Department of Commerce Airways Radio Station.



**Figure 36. Instrument shelter used by the Department of Commerce Airways Radio Station observers (20 January 1938). Shelter is on the roof of the second floor of the Stinson Airport Administration Building. Wind instruments were at top of the tower. View is southeast. Courtesy of the Stinson Municipal Airport Manager.**

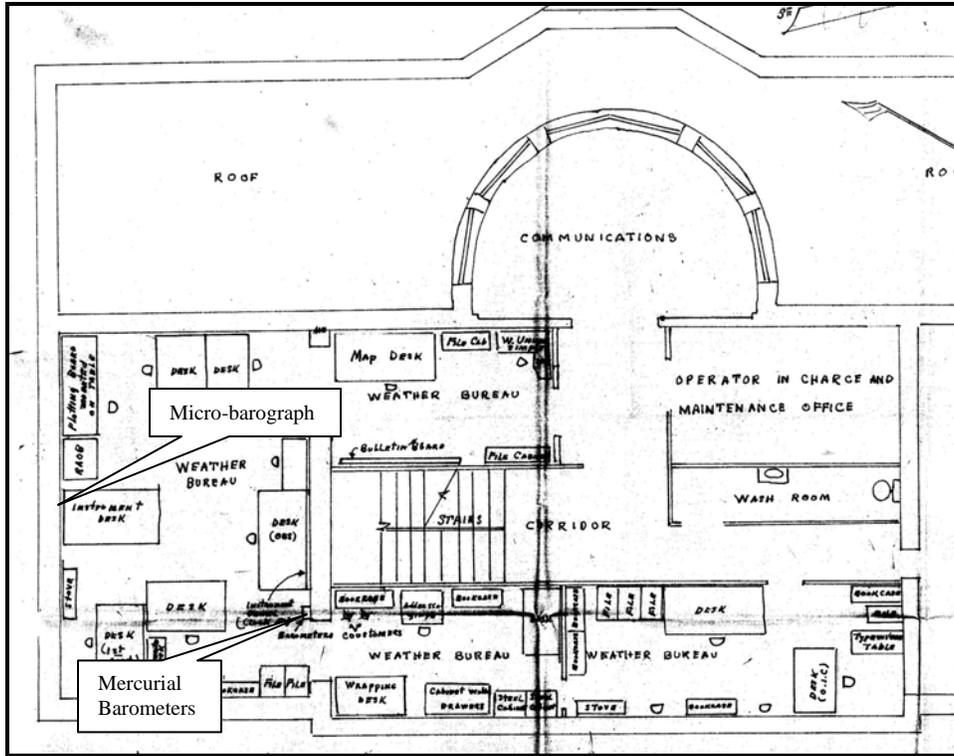


**Figure 37. Instrument shelter used by the Department of Commerce Airways Radio Station observers (25 August 1938). Shelter is on the roof of the second floor of the Stinson Airport Administration Building. View is north northeast. Courtesy of the Stinson Municipal Airport Manager.**

**27 December 1938 – 14 July 1942** – Weather Bureau office located on the 2<sup>nd</sup> floor of the Administration Building at Stinson Field.

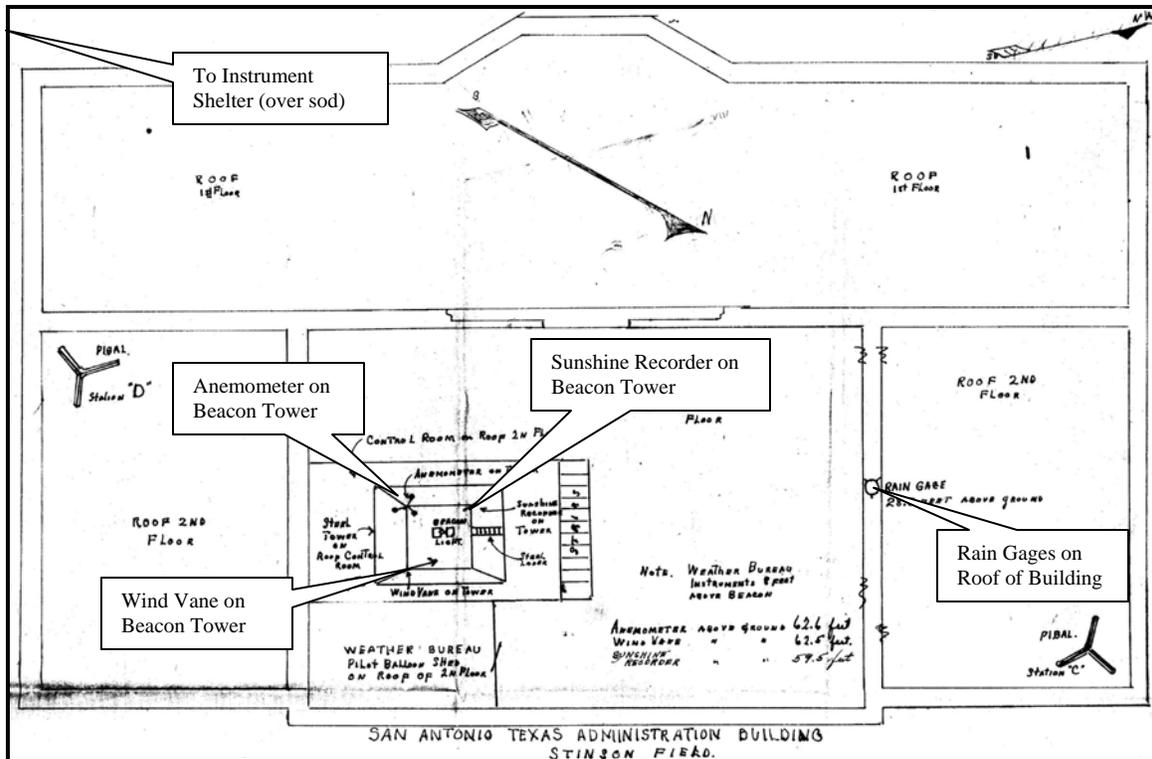
Official weather observing responsibility was transferred from the city office to the Weather Bureau office at Stinson Field on 30 June 1939, and all Weather Bureau offices were consolidated at the Stinson Field Administration Building on 2 January 1941.

Barometer – The two mercurial barometers (H.J. Green) were mounted on an interior wall in the Weather Bureau office (Figure 38). The micro-barograph (Friez) was mounted on a shelf of the instrument panel. Elevation of the barometers was 582 feet above sea level and 15 feet above ground. On 1 July 1939, an aneroid barometer and micro-barograph (4-day) were added to the station. Weather Bureau records indicated the aneroid barometer was removed from the station by early 1940.



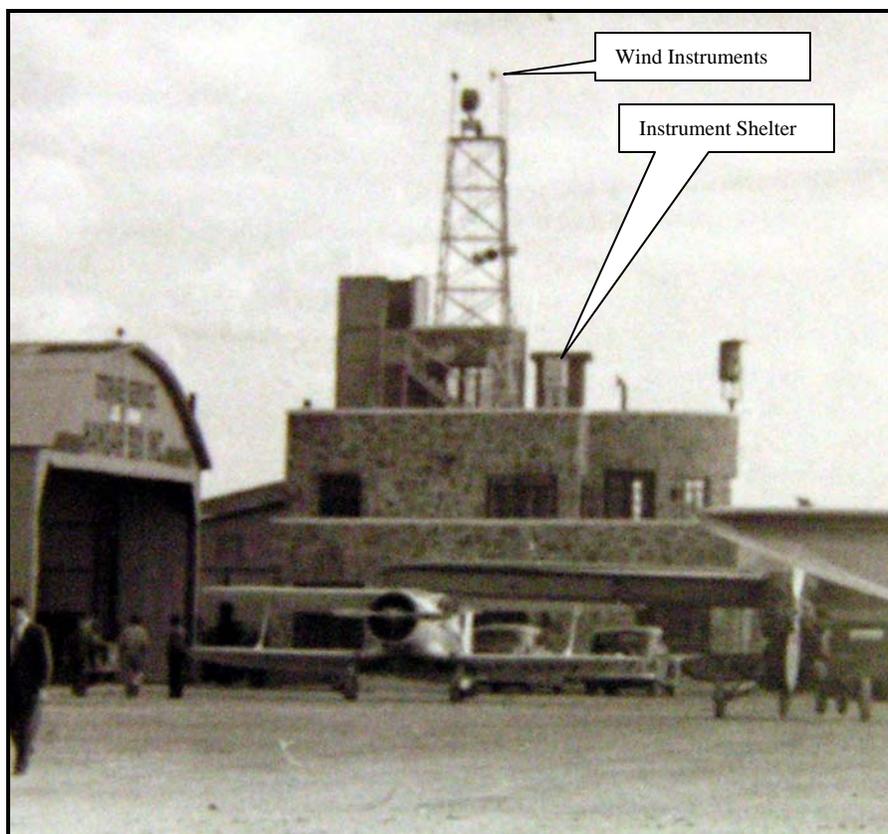
**Figure 38. Drawing of the Weather Bureau office on the second floor of the Airport Administration Building at Stinson Field (January 1941), showing the locations of the barometers. North is towards the lower right. From the official station history files at the National Climatic Data Center.**

Figure 39 shows the locations of the weather instruments on the roof and nearby the Administration Building on 2 January 1941.



**Figure 39. Drawing of the roof of the Airport Administration Building at Stinson Field (January 1941), showing the locations of instrument shelter, rain gage, and wind instruments. North is towards the lower right of the figure. From the official station history files at the National Climatic Data Center.**

Instrument Shelter – The airway instrument shelter was located on the roof of the Administration Building (Figure 40), with the height of the shelter floor approximately 5 feet above the roof and 28 feet above ground. The shelter was two feet high, two feet wide, and two feet deep. The shelter contained an exposed thermometer, psychrometer (fan), and maximum/minimum thermometers. On 1 July 1939, the instrument shelter was changed to a cotton region type, but remained on the roof.



**Figure 40. Instrument shelter and wind instruments used by the Weather Bureau observers (15 January 1939). Shelter was on the roof of the second floor of the Stinson Airport Administration Building and wind instruments were on the tower. View is southeast. Courtesy of the Stinson Municipal Airport Manager.**

On 2 January 1941, the instrument shelter from the city office was moved to Stinson Field to a location over grass (over grass) south of the Administration Building. This shelter was a large type (three feet high, three feet wide, and three feet deep). The dry bulb thermometer, fan psychrometer, and maximum/minimum thermometers were moved from the roof of the Administration Building to the shelter over grass on 21 February 1941. The exposed thermometer and psychrometer were approximately seven feet above ground and the maximum/minimum thermometers eight feet above ground. Also at that time a thermograph was added to the shelter.

Rain Gages – The standard 8 inch rain gage was on the roof of the Administration Building and was approximately 3 feet above the roof and 29 feet above ground. On 1 July 1939, the rain gage was moved to a location over ground (exact location not specified). On 2 January 1941, a tipping bucket rain gage was added to the station and was located on the roof of the Administration Building (Figure 39). The standard rain gage remained located over grass at a site near the building.

Wind Instruments – The wind instruments were on the roof of the beacon tower on the roof of the Administration Building (Figures 39 and 40). The anemometer (3-cup) was 35 feet above the roof and 59 feet above ground. The wind vane (3-foot metal) was 36 above the roof and 60 feet above ground. Around January 1940 (exact date not specified), the wind vane was changed to a four-foot wooden variety. Between 27 July 1940 and 22 January 1941, the anemometer and wind vane were raised to 40 feet above the roof and 63 feet above ground.

Additional Equipment/Information – The sunshine recorder was on the roof of the beacon tower atop the Administration Building. Radiosonde observations began at San Antonio on 1 April 1941.

On 18 January 1950 a Supplementary Aeronautical Weather Reporting Station (SAWRS) was established at Stinson Field. The SAWRS continued until 30 June 1953.

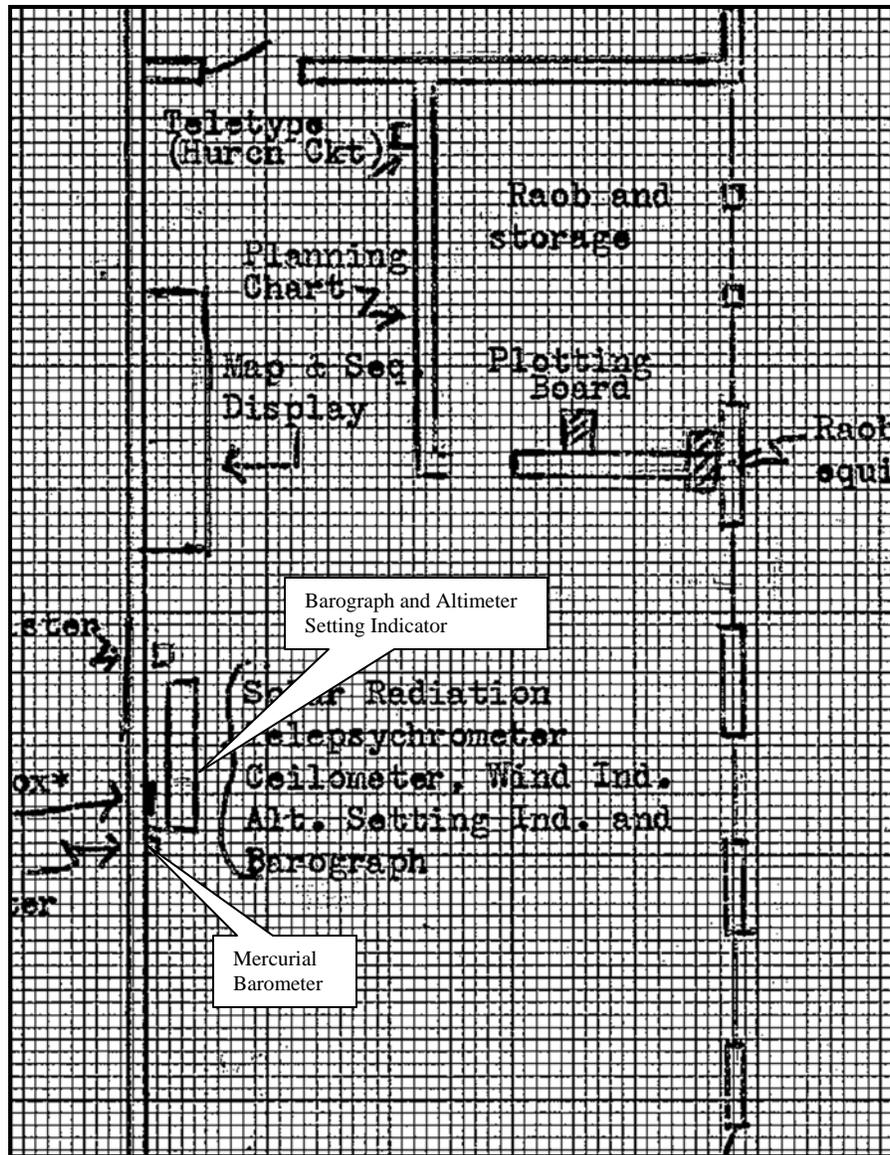
**14 July 1942 – 15 August 1953** – Weather Bureau office located in the northern part of the east lean-to, Hangar No. 2 at the San Antonio Airport (intersection of North Loop and Wetmore Roads).

Barometer – The mercurial barometers (H.J. Green) were hung on the west wall of the office (Figure 41). The barograph (Friez, Micro) set on a shelf on the west wall of the office just south of the mercurial barometers. The barometers were 792 feet above sea level and approximately 3 feet above ground. An altimeter setting indicator (Kollsman) was installed on 17 October 1948 and was located just above the barograph. When the altimeter setting indicator was installed, the extra mercurial barometer was removed from the office.



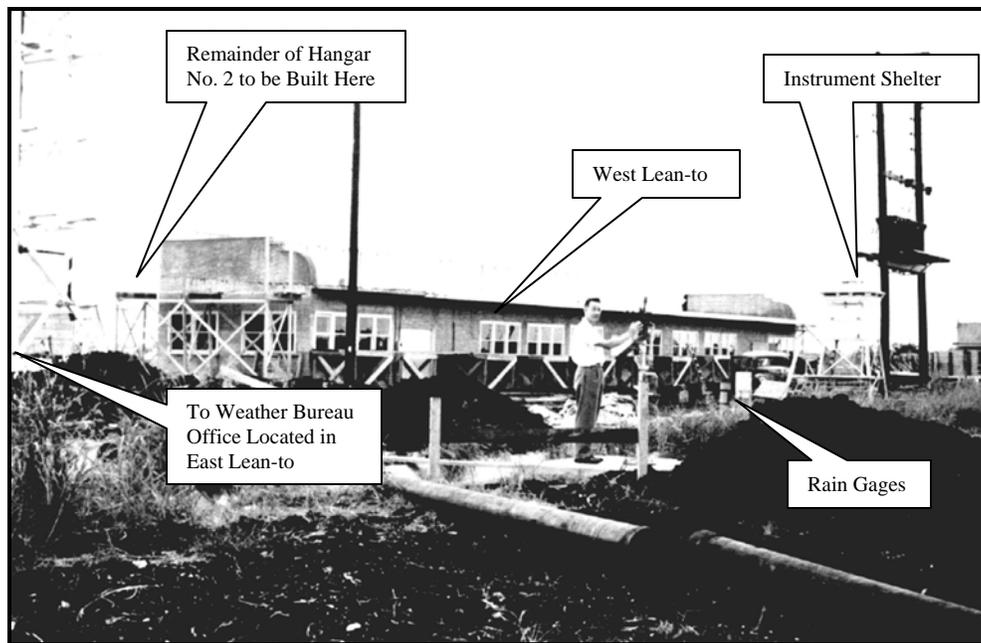
**Figure 41. Photograph of the Weather Bureau office in the east lean-to, Hangar No. 2, Municipal Airport (22 August 1942) showing the mercurial barometers and barograph. View is northwest. From the official station history files at the National Climatic Data Center.**

Figure 42 is a drawing showing the locations of the barometers, barograph, and altimeter setting indicator on the west wall of the office in June 1951. From available resources, the pressure measuring instruments remained essentially unchanged from 14 July 1942 until moved to the new station on 15 August 1953.

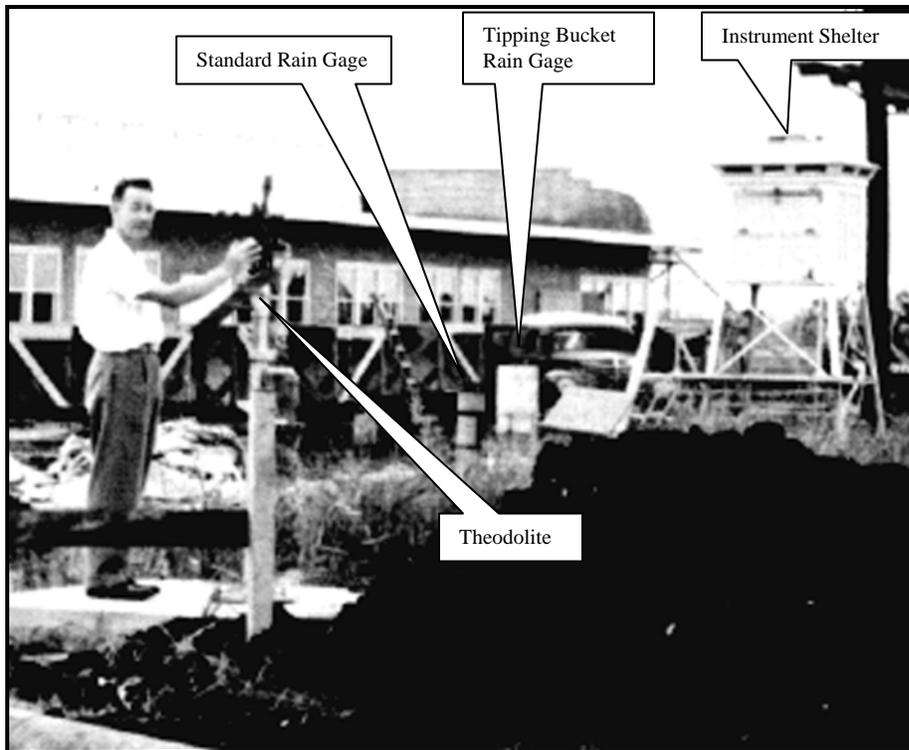


**Figure 42. Weather Bureau office in east lean-to of Hangar No. 2 on 1 June 1951, showing locations of the pressure measuring instruments. North is at the top of the page. From the official station history files at the National Climatic Data Center.**

Instrument Shelter – The large type instrument shelter was located northwest of the west lean-to (Figures 43 and 44; the office was in the east lean-to). The dry bulb thermometer, maximum/minimum thermometers (Taylor), and psychrometer (Friez Whirling) were eight feet above ground. A thermograph (Friez) also was in the shelter. A Telepsychrometer (L&N Micromax) was installed 17 October 1948 (four feet above ground). Exposure was rated as good.



**Figure 43. Instrument shelter and rain gages in relation to the west lean-to (22 August 1942). View is southeast. Weather Bureau office was located in the east lean-to located outside photograph to the left. The instrument shelter and rain gages were approximately 235 feet west northwest of the Weather Bureau office. From the official station history files at the National Climatic Data Center.**

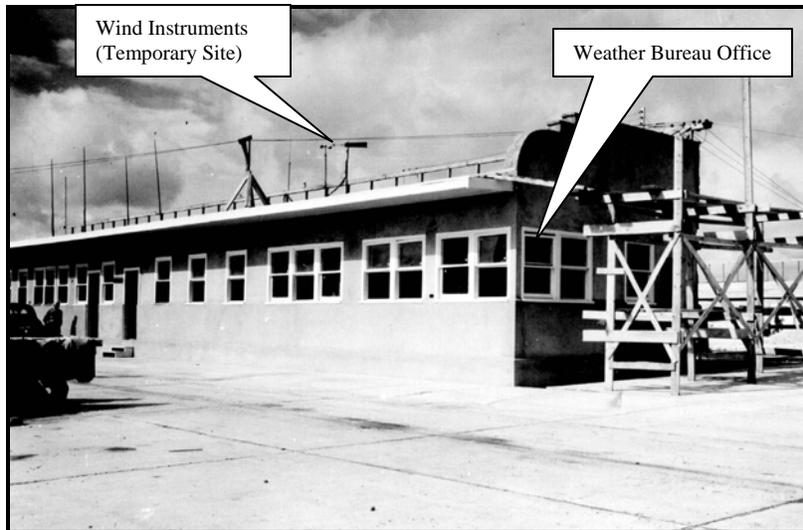


**Figure 44. Enlargement of Figure 43 showing instrument shelter and rain gages in relation to the west lean-to (22 August 1942). View is southeast. From the official station history files at the National Climatic Data Center.**

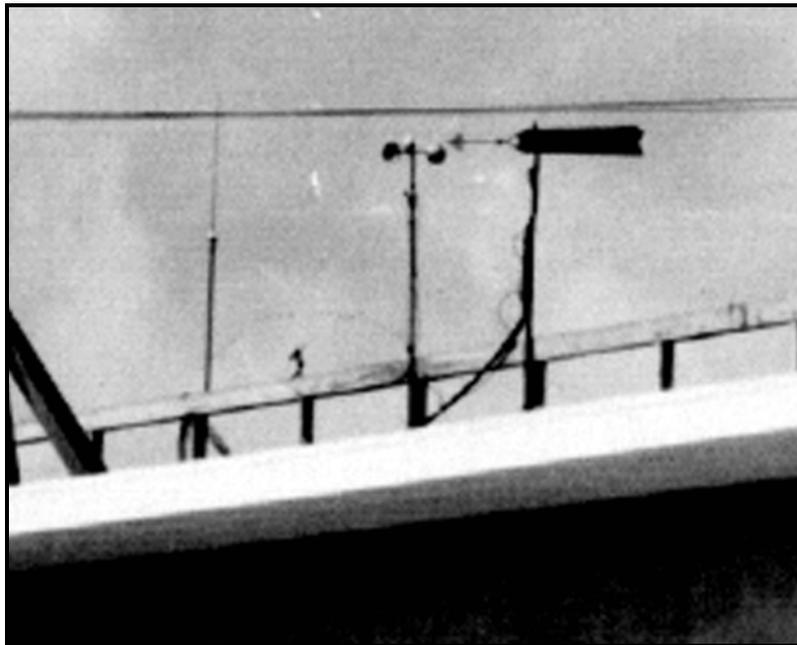
According to Weather Bureau reports, the instrument shelter was located over sod through most of the 1940s, with a gravel parking lot nearby in the late 1940s. By December 1951, the reports indicated the gravel parking lot had been paved.

Rain Gages – The 10-inch tipping bucket (Friez) and standard 8-inch rain gage were located near the instrument shelter, northwest of the hangar west lean-to (Figures 43 and 44). The gages were 4 feet above ground. Exposure was rated as excellent.

Wind Instruments – The wind instruments were installed temporarily on the roof of the east lean-to (Figures 45 and 46). The anemometer (Friez) and wind vane were 7 feet above the roof and 22 feet above ground. Exposure was rated as good.

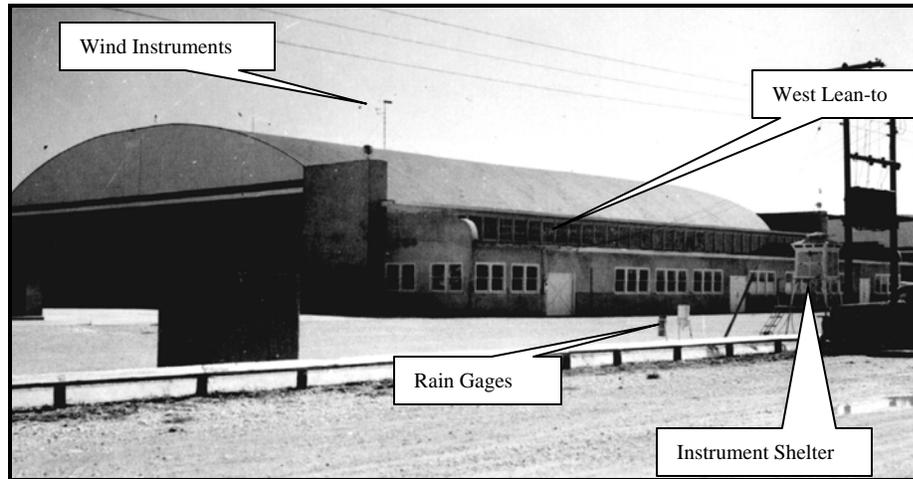


**Figure 45. East lean-to of Hangar No. 2 at the Municipal Airport, showing the location of the wind instruments and Weather Bureau office (22 August 1942). The wind instruments were at a temporary position until the hangar was completed. Main hangar was built to the right (west) of the lean-to. View is southwest. From the official station history files at the National Climatic Data Center.**

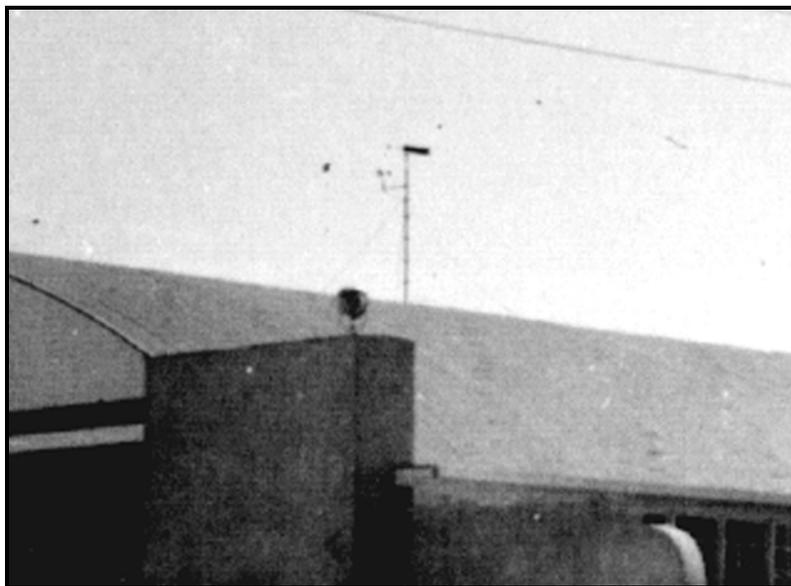


**Figure 46. Enlargement of Figure 45 showing the wind instruments in the temporary location on top of the east lean-to (22 August 1942). View is southwest. From the official station history files at the National Climatic Data Center.**

On 16 January 1943, the wind instruments were moved to the just completed hangar. The anemometer was 15 feet above the roof of the hangar and 51 feet above ground. The wind vane was 16 feet above the hangar roof and 52 feet above ground. Figures 47 and 48 show the completed hangar, along with the weather instruments.

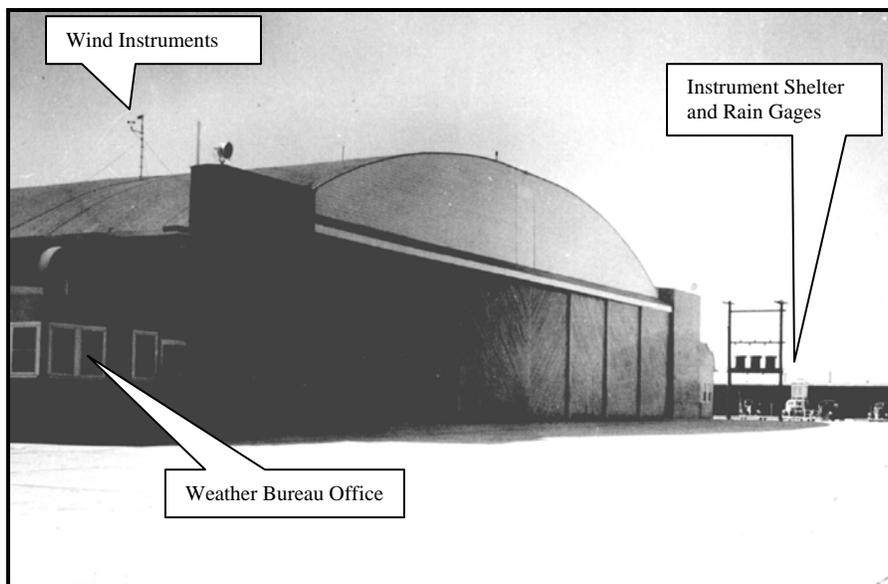


**Figure 47. Completed hangar with Weather Bureau wind instruments on the roof (16 November 1943). Also shown are the rain gages and instrument shelter. View is southeast. From the official station history files at the National Climatic Data Center.**

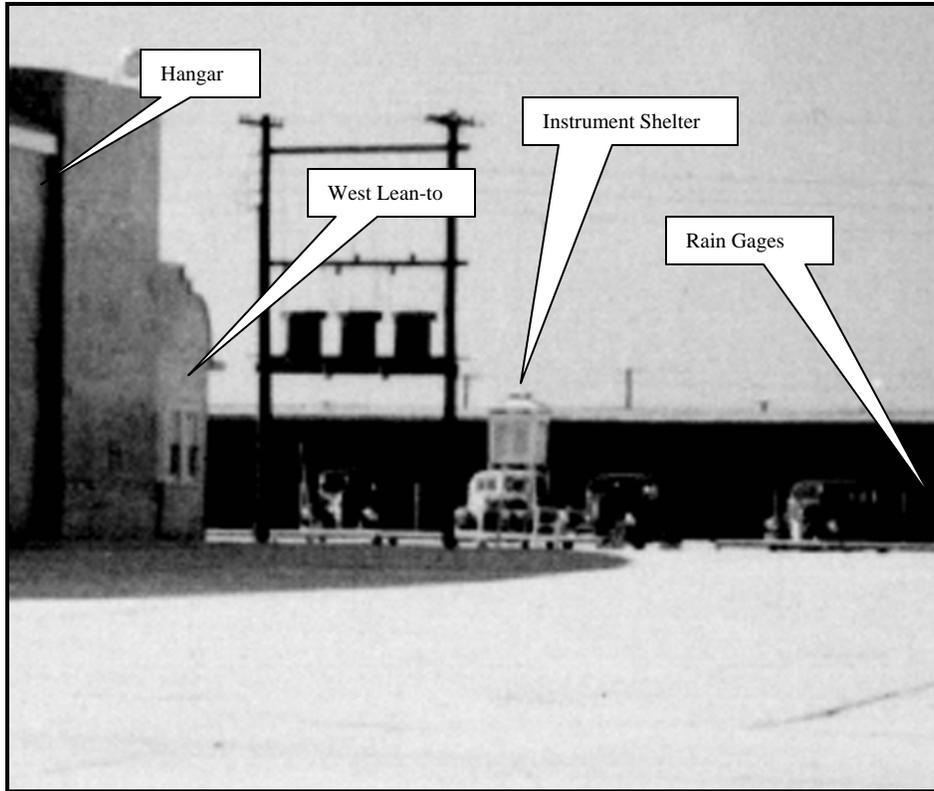


**Figure 48. Enlargement of Figure 47 showing anemometer and wind vane on the roof of Hangar No. 2 (16 November 1943). View is southeast. From the official station history files at the National Climatic Data Center.**

Figures 49 and 50 show the Weather Bureau instruments at Hangar No. 2 with a perspective to the southwest.

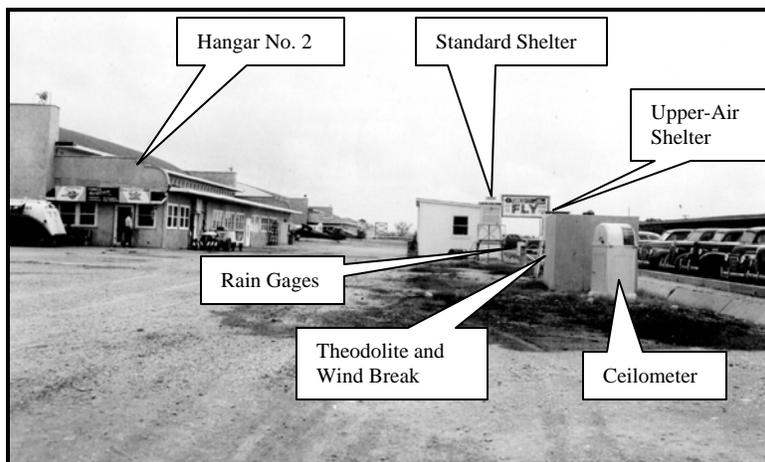


**Figure 49. Hangar No.2 and Weather Bureau instruments (16 November 1943). View is southwest. From the official station history files at the National Climatic Data Center.**

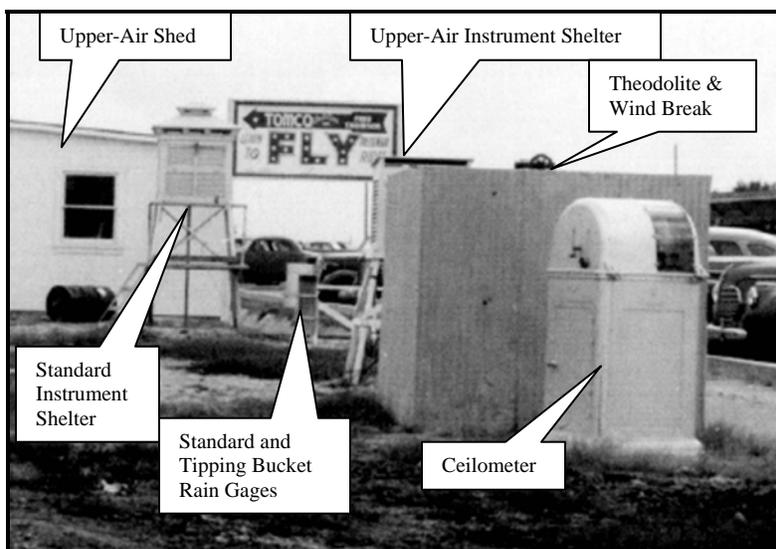


**Figure 50. Enlargement of Figure 49 the showing instrument shelter and rain gages (16 November 1943). View is southwest. From the official station history files at the National Climatic Data Center.**

Figures 51 and 52 show the weather instruments at this station in November 1946.

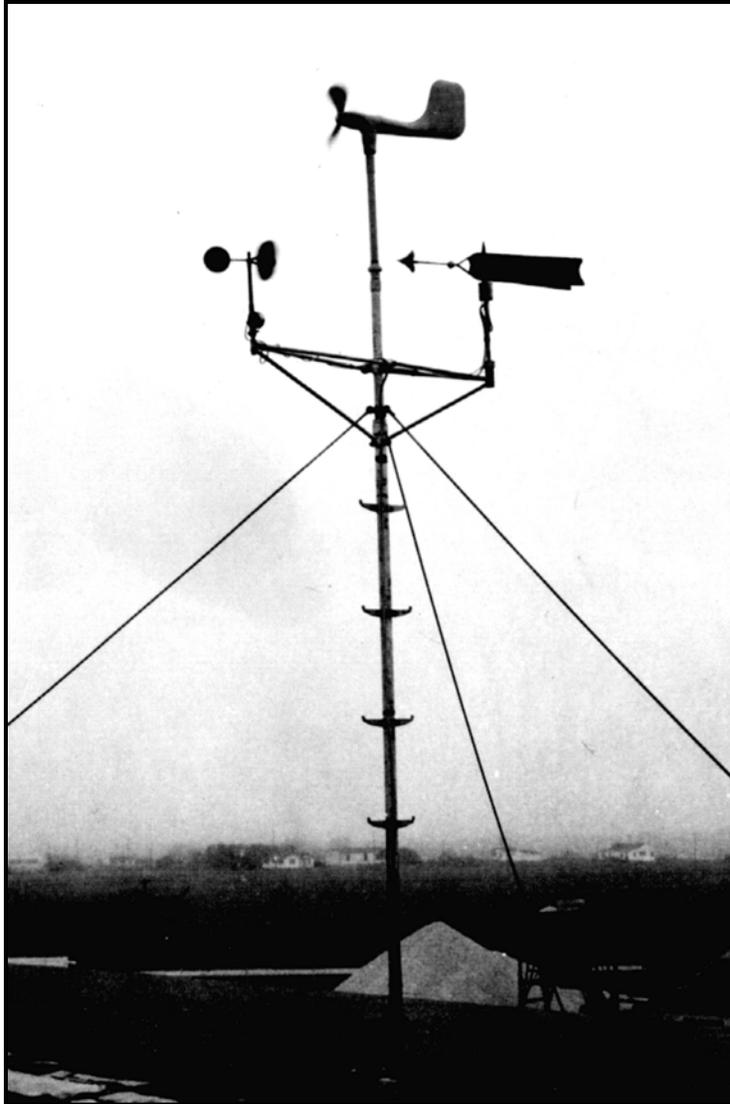


**Figure 51. Instrument shelters (standard and upper air), rain gages, ceilometer detector, theodolite (and wind break), and upper-air shed (behind standard instrument shelter) at Hangar No. 2 (20 November 1946). View is south. From the official station history files at the National Climatic Data Center.**



**Figure 52. Enlargement of Figure 51 showing weather instruments at Hangar No. 2 (20 November 1946). View is south. From the official station history files at the National Climatic Data Center.**

In late 1947 or early 1948, a “Windial” (made by Friez) was added to the support on top of the hangar containing the anemometer and wind vane. Figure 53 shows the three instruments in February 1948.



**Figure 53. Wind instruments on top of Hangar No. 2 (27 February 1948). Direction of photograph not specified. From the official station history files at the National Climatic Data Center.**

Additional Equipment/Information – The sunshine recorder was mounted on the radiosonde antenna support on top of the hangar. The recorder was 4 feet above the hangar roof and 40 feet above ground.

According to Weather Bureau records, an upper-air instrument shelter was added to the station between September 1943 and September 1944. Initially, this shelter was located just west northwest of Hangar No. 2, but was moved farther west between 26 October 1946 and 1 April 1949. Figures 54 and 55 show the locations of the instruments in October 1948 and April 1949.

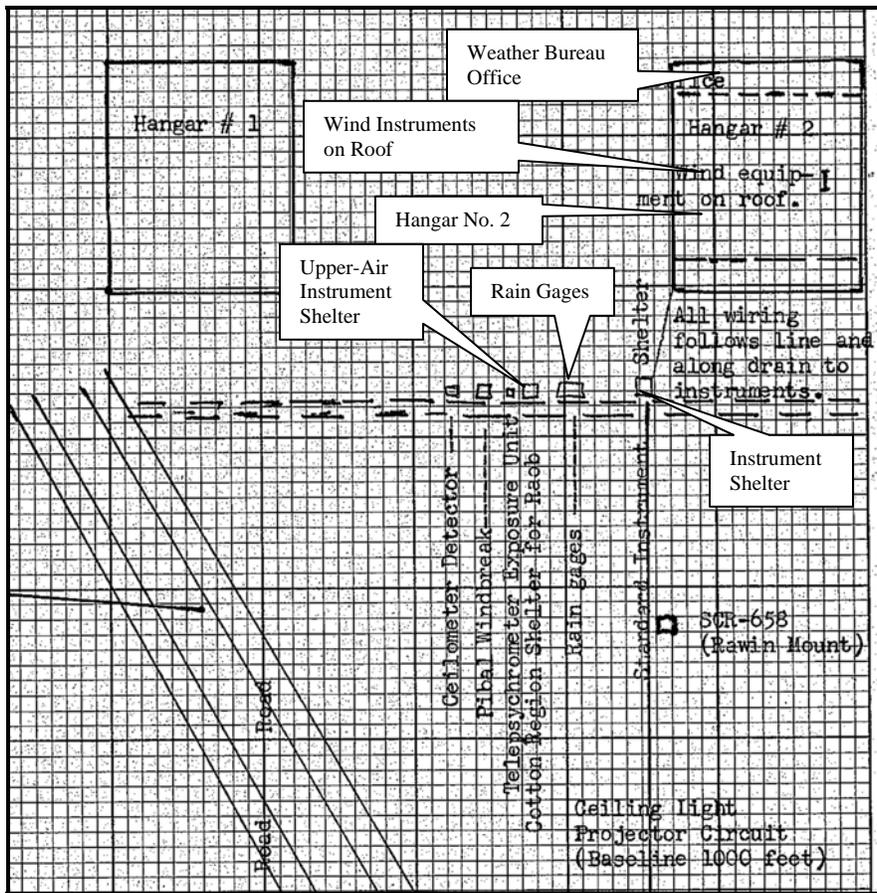
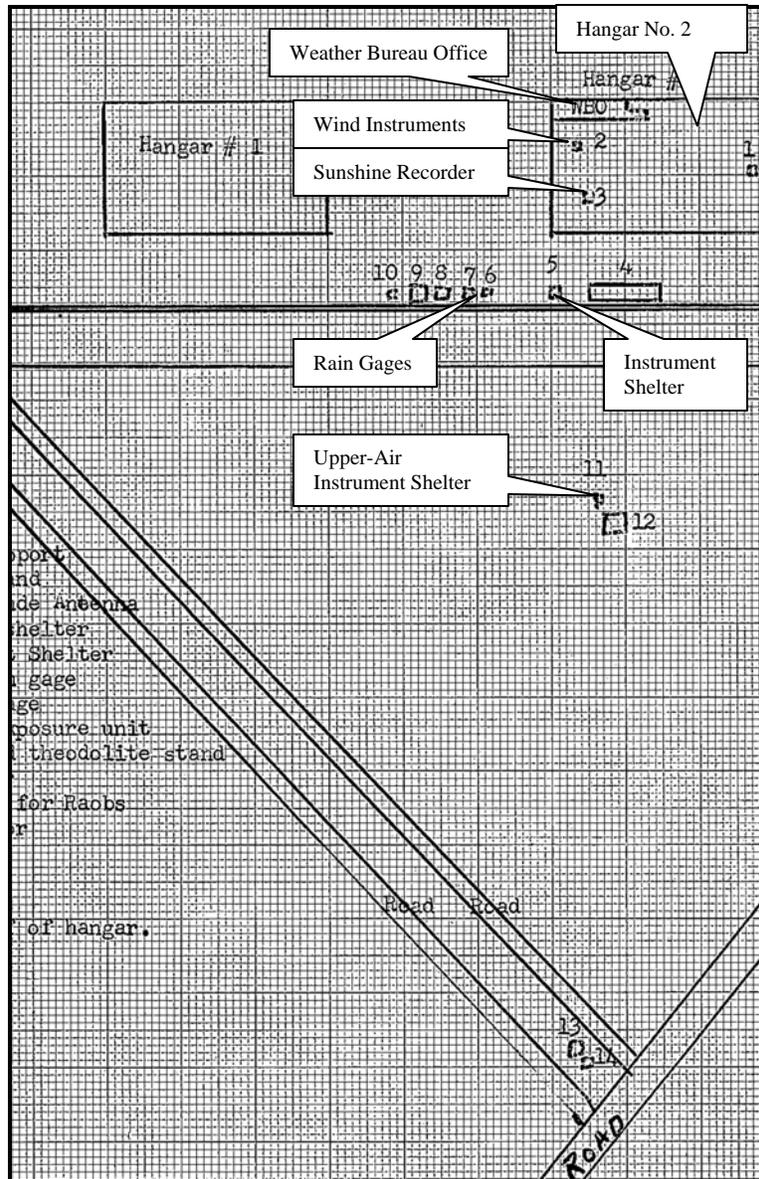


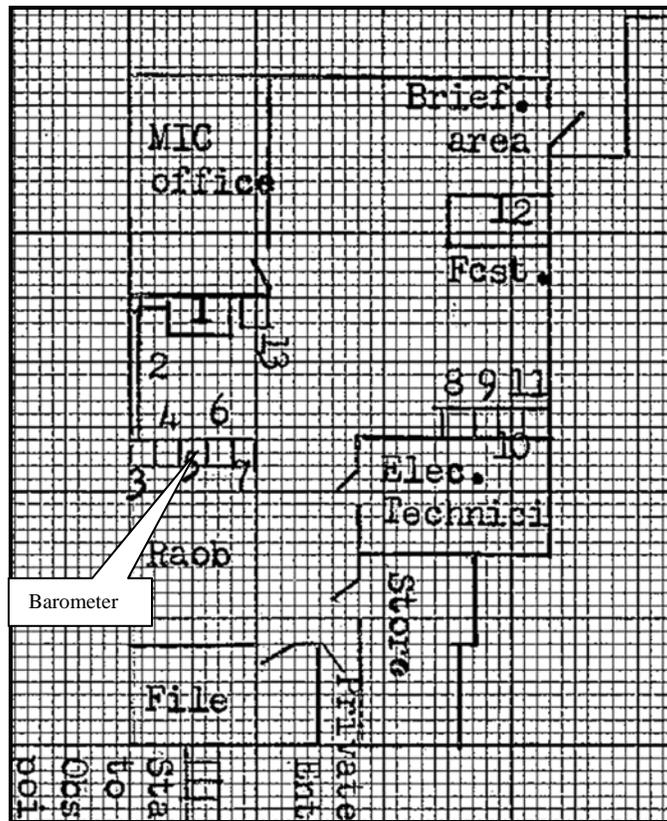
Figure 54. Drawing showing the locations of the weather instruments around Hangar No. 2 (26 October 1948). North is to the left of the drawing. From the official station history files at the National Climatic Data Center.



**Figure 55. Drawing showing the locations of the weather instruments around Hangar No. 2 (1 April 1949). North is to the left of the drawing. From the official station history files at the National Climatic Data Center.**

**15 August 1953 through 1955** – Weather Bureau office located in the Feeder Lines Terminal Building at the San Antonio International Airport (same airport, different building).

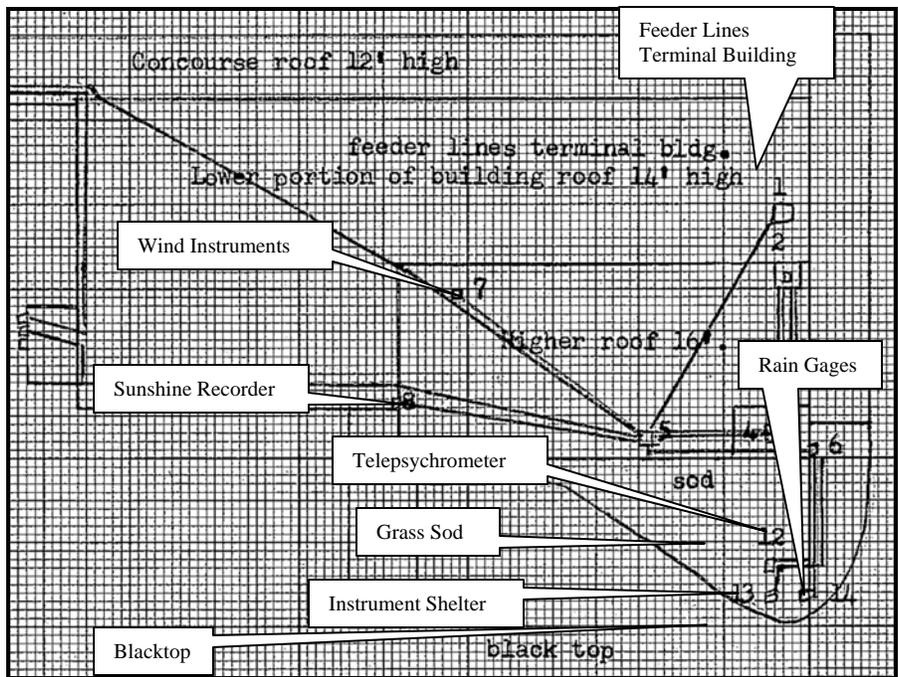
Barometer – The barometer was mounted on an interior wall in the south part of the office (Figure 56). Elevation of the barometer was 796 feet above sea level. This station also had a barograph (Friez) and an altimeter setting indicator (Kollsman).



**Figure 56. Diagram of the Weather Bureau office in the Feeder Lines Terminal at the San Antonio International Airport (15 August 1953), showing location of the barometer. North is to the right of the figure. From the official station history files at the National Climatic Data Center.**

Instrument Shelter – The instrument shelter was located over grass sod 32 feet south of the Feeder Lines Terminal Building. The floor of the shelter was four feet above ground. The instrument shelter contained a dry bulb thermometer, maximum/minimum thermometers (Taylor), hygrometer, and a thermograph (Friez). A Telepsychrometer was located near the shelter.

A blacktop ramp was located near the shelter (Figure 57). The Weather Bureau report on 15 August 1953 stated: “Blacktop paved area on three sides of both instrument shelter and Telepsychrometer, distance from shelter 12 feet to the south, 17 feet to the west, and 18 feet to the east; from Telepsychrometer 18 feet to the south, 17 feet to the west, and 18 feet to the east. Stone building 16 feet high, 32 feet north of instrument shelter and 26 feet north of Telepsychrometer.”



**Figure 57. Diagram of the Feeder Lines Terminal at the San Antonio International Airport (15 August 1953), showing locations of the instrument shelter, Telepsychrometer, rain gages, and wind instruments. North is at the top of the figure. From the official station history files at the National Climatic Data Center.**

Rain Gages – The tipping bucket gage (Friez) was four feet above ground and the standard eight inch rain gage was 3 feet above ground. The rain gages were mounted on a concrete slab just east of the instrument shelter. The gages were 32 feet south of the terminal building which was 16 feet high. The Weather Bureau report stated there were no other obstructions in the area.

Wind Instruments – The wind instruments were located on the roof of the terminal building (Figure 57). The anemometer was 15 feet above the roof of the terminal and 31 feet above ground. The wind vane was 17 feet above the roof and 33 feet above ground.

Additional Equipment/Information – The sunshine recorder (Eppley) was located on the roof of the terminal. A 10 centimeter radar was installed 29 September 1954.

## OTHER OBSERVATIONS

Figure 58 shows locations of significant observations in the vicinity of San Antonio during the 19<sup>th</sup> and early 20<sup>th</sup> centuries. Smithsonian observations were taken at New Wied, TX from 1 January 1851 through 29 February 1856. New Wied was located on the Guadalupe River approximately 3 miles north of New Braunfels and 31 miles northeast of downtown San Antonio. The first observer was listed as L.C. Ervendberg. In 1846, an epidemic caused the death of more than 300 settlers in New Braunfels, leaving a number of orphaned children. Louis Cachand Ervendberg assumed responsibility for raising and educating those orphans who could not be placed with relatives. Mr. Ervendberg established the Western Texas Orphan Asylum at New Wied. He also took weather observations for the Smithsonian Institution.

At New Wied, temperature, clearness of the sky, wind (direction and force), and cloud movement were measured/observed at sunrise, 9 a.m., 3 p.m., and 9 p.m. Wet bulb temperature was measured at sunrise and 3 p.m. and significant weather recorded in the Remarks section of the form. Beginning, ending, and 24-hour precipitation also were recorded. This station had a thermometer, hygrometer, rain gage, and likely a wind vane (wind force probably was estimated). Observation times were later changed to 7 a.m., 2 p.m., and 9 p.m.

Smithsonian observations were taken at New Braunfels, TX (approximately 29 miles northeast of San Antonio) from 1 March 1856 through 31 December 1859. Atmospheric pressure, temperature, clouds (amount and movement), wind (direction and force), and wet bulb temperature were measured/observed at 9 a.m., 2 p.m., and 9 p.m. Beginning, ending, and 24-hour precipitation also were recorded. This station had a barometer, thermometer, hygrometer, rain gage, and likely a wind vane (wind force probably was estimated).

Voluntary/cooperative observations also were taken at New Braunfels from 1 December 1888 through 1955. This station had a thermometer, maximum/minimum thermometers, rain gage, and likely a wind vane. The *Texas Substation History* document stated this station also had a cotton region instrument shelter.

Voluntary observations were taken at Gallinas, TX (located approximately 21 miles south of San Antonio) from 1 January 1889 through 31 August 1892. The document, *Texas Substation History*, stated that observations began in January 1885, but the first observation in the NCDC database was 1 January 1889. This station had a thermometer, maximum/minimum thermometers, rain gage, and likely a wind vane.

According to the *Texas Substation History*, weather observations were taken at Boerne, TX (approximately 30 miles northwest of San Antonio) beginning in September 1876 and continuing through 1955. Only significant break in observing history was from July 1880 through December 1881. The station only had a standard rain gage from

September 1876 through June 1892. Beginning in July 1892, the station had a standard rain gage, maximum/minimum thermometers, and a cotton region instrument shelter.

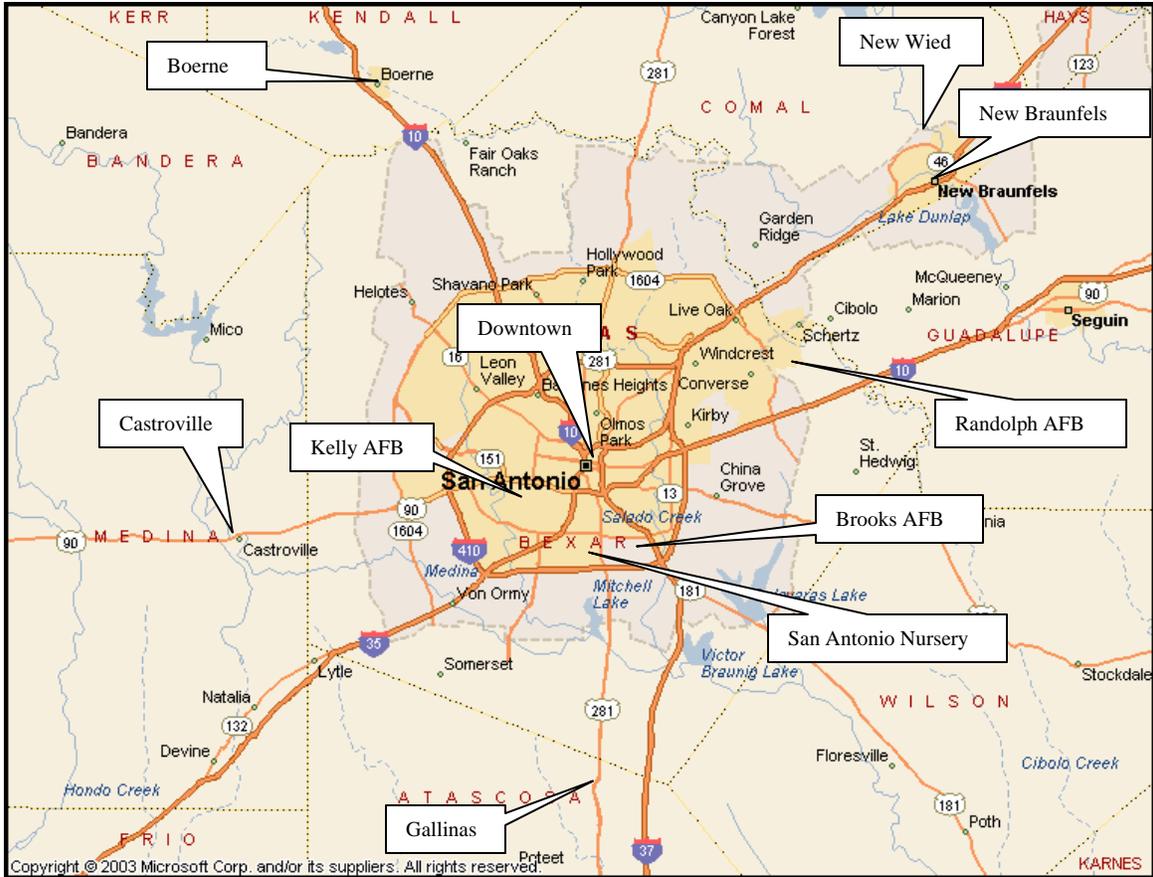
Weather observations were taken near Castroville, TX (approximately 24 miles west southwest of San Antonio) from August 1877 through 1955. A significant observing gap existed from April 1882 through March 1899. The station had a standard rain gage from August 1877 through March 1901. From 1 April 1901 through 1955 the station had a standard rain gage, maximum/minimum thermometers, and a cotton region instrument shelter.

Weather observations were taken at the San Antonio Nursery (approximately six miles south of downtown) from 1 January 1896 through 1955. Significant observing gaps occurred from 1 September 1900 to 31 August 1904 and 1 January 1936 through 30 April 1937. The station originally had a standard rain gage, maximum/minimum thermometers, and a cotton region instrument shelter. Beginning 1 May 1937 the station only had a rain gage, with a recording rain gage added 8 August 1839.

Weather observations were taken at three military bases in the San Antonio area. Kelly Air Force base had its beginnings in 1916 when the site was selected for an air field. According to the NCDC database, the first weather observation at the base was on 6 December 1918. At that time, the station had a thermometer, thermograph, hygrometer, hygrograph, maximum/minimum thermometers, wind instruments, and a rain gage. A barometer was added 13 October 1919. First hourly aviation weather observation in the NCDC database for Kelly AFB was on 15 July 1937.

Brooks AFB was established on 16 February 1918 by the U.S. Army Signal Corps. First hourly aviation observation in the NCDC database was on 1 January 1949; however, observations began much earlier. Weather Bureau documents stated the station was established on 10 February 1944. At that time, the station had a mercurial barometer, rain gage, psychrometer, thermograph, maximum/minimum thermometers, and cotton region instrument shelter. According to the report, the station did not have wind instruments on 10 February 1944. Wind instruments were added at a later date.

Randolph Air Force Base was dedicated on 20 June 1930 and the weather station established in 1931 (according to Weather Bureau records). The first information available in the NCDC database regarding weather instruments was on 6 May 1942. At that time the station had an exposed thermometer, maximum/minimum thermometers, thermograph, psychrometer, hygrograph, two mercurial barometers, standard rain gage, weighing rain gage, wind instruments, and a cotton region instrument shelter.



**Figure 58. Approximate locations of significant observers near to San Antonio. North is at the top of the page. Distance across the figure (horizontal) is approximately 73 miles. Information plotted on a current map of Texas.**

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## **APPENDIX**

### **Methodology**

Station history files at the National Climatic Data Center (NCDC) provided critical information beginning in 1846, i.e., during observations taken by the Army surgeons near downtown San Antonio, and continued with the Smithsonian Institution observers, Signal Service, and into the early part of the 20<sup>th</sup> Century under the U.S. Weather Bureau.

Entries from local Climate Record Books at the NCDC provided the backbone for locations and general exposures for instrument shelters (especially thermometers), rain gages, and anemometers/wind vanes for the San Antonio stations (city and airport locations) from April 1877 into the 1950s (Signal Service and Weather Bureau years). Numerous Station History reports prepared in the 20<sup>th</sup> Century were instrumental in defining specific instrument elevations at the Signal Service and Weather Bureau City Offices, at the Department of Commerce Airways Radio Station, and at Weather Bureau Airport Stations.

Specific building names and street addresses from different sources confirmed the locations of the Signal Service and Weather Bureau city offices from 1877 through 1955. During the latter time period of this study, Weather Bureau officials routinely documented station history and instrument status through forms entitled, "Description of Topography and Exposure of Instruments," "Report of Elevation and Position of Instruments," and "Surface Weather Observations." Information on these forms provided significant detail regarding San Antonio city offices, as well as the stations at the airports.

Tracking office location and instrument exposure on a yearly basis was important to ensure no information gaps existed. This yearly information was obtained from the Annual Reports of the Chief Signal Officer for the 1870s, 1880s, and early 1890s, as well as from the Annual Reports of the Weather Bureau from 1892 through 1930 (detailed Weather Bureau Annual Reports stopped in 1930 to save money during the Depression). Weather Bureau Annual Reports were more complete for this project than Signal Service versions. Information consistency for the 1940s and early 1950s was maintained from the wealth of Weather Bureau historical records during that time period.

Also helpful were cover sheets of the Original Monthly Record of Observations, beginning in February 1892 through December 1948. These forms provided a near continuous record of elevations for station barometers, thermometers, rain gages, and wind instruments.

Considerable information regarding the early Signal Service observing stations in San Antonio was available from seven station inspection reports. These inspections

were conducted by Signal Service headquarters and are archived at the National Archives and Records Administration (NARA). These inspection reports have been scanned and are available in the NCDC database. These inspections provided drawings and detailed textual information on the placement and exposure of weather instruments at the Signal Service stations in San Antonio.

Nineteen station log books of Signal Service and Weather Bureau activities at the San Antonio office from 1877 into the 1930s were helpful in this study. These log books contain extensive information regarding the evolution of the San Antonio office during the late 1800s and early 20<sup>th</sup> Century. These books were very helpful in answering specific questions regarding station and instrument location.

Information regarding duration of observations by Smithsonian Institution weather observers in the San Antonio area was obtained from yearly Smithsonian Institution reports, as well as from the NCDC data base.

The Fort Sam Houston Museum provided photographs and information regarding the history of the fort. In particular, locations of the U.S. Army hospitals and the Signal Service office at Fort Sam Houston were better defined based on these data. Considerable information and photographs were obtained from the San Antonio Municipal Library and the Daughters of the Republic of Texas (DRT) Library. Information from the Municipal and DRT Libraries was helpful in addressing questions during the 1800s and early 1900s. A number of photographs of downtown buildings (which housed Signal Service and Weather Bureau observing stations) were obtained from the San Antonio Conservation Society. Photographs of Stinson Field during the 1930s and 1940s were obtained from the Stinson Airport Manager.

General historic information for the San Antonio area was found on various web sites. Other information and data sources checked (by person, telephone, or through the Internet) during this study were: the U.S. Army Medical Department Museum at Fort Sam Houston, Witte Museum, Institute of Texan Cultures Library, University of Texas at San Antonio Library, Our Lady of the Lake University Special Collections and Library, St. Mary's University Library, Trinity University Library, Texas Air Museum, Texas Historical Commission, Center for American History at the University of Texas, National Archives and Records Administration Southwest Region, Texas State Library and Archives, and the San Antonio Genealogical and Historical Society. Also, relevant information regarding the Weather Bureau and Signal Service was obtained from the Dallas, TX Public Library, Oklahoma State University Library, and the NOAA Library.