SAND2017-8979R

SANDIA NATIONAL LABORATORIES,
TONOPAH TEST RANGE ASKANIA TOWER
(Building 02-00)
Station 2
Tonopah Test Range
Nye County
Nevada

HAER No. NV-XXXX

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Oakland, California

HISTORIC AMERICAN ENGINEERING RECORD

SANDIA NATIONAL LABORATORIES, TONOPAH TEST RANGE
ASKANIA TOWER
(BUILDING 02-00)

Location:	Station 2, Sandia National Laboratories' Tonopah Test Range, Nye County, Nevada
Date of Construction:	1956
Engineers/Architects:	SNL Plant Engineering
Builders:	Reynolds Electrical and Engineering Company, Inc.
Present Owner:	U.S. Department of Energy/National Nuclear Security Administration
Present Use:	None. Tower is no longer in use.
Significance:	The Askania Tower (Building 02-00) was built in 1956 as part of the first wave of construction at the newly established Tonopah Test Range (TTR). Located at Station 2, near the primary target area at the range, the tower was one of the first four built to house Askania phototheodolites used in tracking test units dropped from aircraft. The Askania Tower (Building 02-00) is a contributing element to the Sandia National Laboratories Tonopah Test Range Historic District. Building 02-00 supported TTR's role as an outdoor laboratory and was built in 1956 when the range was first established. The building served as, and generally represents, a key tracking and data capture facility at TTR during its period of significance. The period of significance for the historic district is 1956-1989; 02-00 is a contributing element for 1956-1970.

Part I. HISTORICAL INFORMATION

A. Physical History[1]

1. **Date of erection:**
   1956

2. **Architect:**
   SNL Plant Engineering

3. **Original and subsequent owners, occupants, uses:**
   The Askania Tower (Building 02-00) was built and used in support of nuclear weapon design testing activities at SNL TTR. SNL, a government-owned, contractor-operated facility, is owned by the U.S. DOE/NNSA.

4. **Builder, contractor, suppliers:**
   Reynolds Electrical and Engineering Company, Inc. (REECo)

5. **Original plans and constructions:**
   REECo built the Askania Tower (Building 02-00) late in 1956 as part of the initial set of construction supporting testing at the new TTR. It was part of a small set of control and tracking facilities in use during the first drop tests at the range in February 1957. It was a metal tower shell around a concrete pedestal with a metal staircase winding around to the top level, on which an Askania phototheodolite was mounted and covered in a protective dome.

6. **Alterations and additions:**
   The Askania phototheodolites were replaced with Contraves cinetheodolites beginning in the early 1960s. Building 02-00 is the last remaining Askania tower standing at TTR—the others were replaced with Contraves towers. The instrumentation was changed to Contraves at 02-00. Later—most likely in the 1980s—Building 02-00 was removed from service and the instrumentation was removed. The tower itself has not been modified.

B. Historical Context:

The Askania Tower (Building 02-00) was built late in 1956 as part of the initial construction at TTR in preparation for the first tests in February 1957. Located at Station 2, near the primary target area at the range, the 20' tower was one of the

[1] The following building drawings were used in determining the correct dates of the physical history of Building 02-00: "N-1, 2 & 3 and A-1, 2, 3, 4, 5 & 6, 12' x 20' Tower Structure, Tonopah Site," Drawing 87582, Sheet 8 of 48, July 1956; and "Tonopah Testing Range, Station Layout," Drawing T-C110, November 27, 1956.

first four built to hold Askania phototheodolites used in tracking test units dropped from aircraft. (Figures 1 and 2)

Early SNL History

SNL began as Z Division, the engineering group of Los Alamos National Laboratory (LANL).[2] LANL was established during World War II (WWII) as the scientific design entity within the Manhattan Engineer District (MED) tasked with the development of atomic weapons. LANL scientists successfully tested the first atomic device at Trinity Site near Alamogordo, New Mexico, on July 16, 1945. On August 6 and 9, 1945, the U.S. deployed the first two atomic bombs against Japan, ending WWII.[3]

In July 1945, around the time of the Trinity test, LANL director J. Robert Oppenheimer gathered up several engineering functions into Z Division. In September 1945, Z Division began moving to Sandia Base, a U.S. Army base just east of Kirtland Air Force Base (KAFB),[4] outside of Albuquerque. Oppenheimer moved Z Division from the main site to alleviate crowded conditions at LANL, to work more closely with the military, and to take advantage of the nearby KAFB airfield for testing.

Z Division originally designed, tested, and oversaw the production of all of the non-nuclear systems on a nuclear weapon. It also had responsibility for training the military in assembly and handling of the weapons, testing completed weapon designs at offsite testing facilities, and supporting full-scale nuclear tests.

In 1946, with passage of the Atomic Energy Act and President Truman's signature, Congress created the Atomic Energy Commission (AEC) to oversee the development and management of new nuclear weapons and atomic energy applications.

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[2] Los Alamos National Laboratory (LANL) is referred to by its current name. Originally, LANL was identified as Los Alamos Scientific Laboratory. It became a national laboratory via legislation passed in 1979.

[3] The account of the Manhattan Project and SNL's early history is from Necah Stewart Furman, Sandia National Laboratories: the Postwar Decade (Albuquerque: New Mexico, 1990); Gregg Herken, The Winning Weapon: The Atomic Bomb in the Cold War, 1945-1950 (New York: Alfred Knopf, 1980); Leland Johnson, Sandia National Laboratories: A History of Exceptional Service in the National Interest (Albuquerque: Sandia National Laboratories, 1997); Charles R. Loeber, Building the Bombs: A History of the Nuclear Weapons Complex, Second Edition (Albuquerque: Sandia National Laboratories, 2005); Rebecca Ullrich, Michael Anne Sullivan, Cynthia Martin, and Dick Gerdes, Sandia in the Cold War and Post-Cold War Periods: A Statement of Historic Context for Sandia National Laboratories/New Mexico, SAND2010-4971P (Albuquerque: Sandia National Laboratories, 2010); and Peter Westwick, The National Labs: Science in an American System, 1947-1974 (Cambridge: Harvard University Press, 2003).

[4] Kirtland Air Force Base is referred to here by its current name. It was originally called the Albuquerque Army Air Base. It was renamed Kirtland Army Airfield in 1942 in honor of aviation pioneer Colonel Roy C. Kirtland. It, Sandia Army Base, and Manzano Army Base merged into Kirtland Air Force Base (KAFB) in 1971.

The AEC took over all MED activities and properties on January 1, 1947. Z Division continued to provide ordnance engineering for nuclear weapon designs. Plans included having Z Division function as the production and assembly site for the growing nuclear weapons complex. Z Division also participated in and supported all post-WWII nuclear tests.

On April 1, 1948, Z Division became Sandia Laboratory, a separate branch of LANL. The following year, on November 1, 1949, Sandia Corporation, a wholly owned subsidiary of Western Electric, took over management of the lab, which became a separate entity from LANL.[5] The core mission of ordnance engineering for nuclear weapons, including testing and production of non-nuclear components remained the same.

As part of its design efforts, SNL conducted environmental tests on each component, weapon sub-system, and final weapon design. Over time, testing was done in off-the-shelf environmental test equipment in SNL/NM buildings, in large test facilities built to the south of the main SNL/NM Tech Area, and at remote sites with space and facilities for drop-testing components and prototypes.

Establishing Tonopah Test Range
SNL's early testing activities included ballistic studies of weapon shapes—dropping test devices from aircraft to determine how and where they fell. Drop tests were also used to test the operation of weapon subsystems in flight. In its first months as Z Division, the lab established a practice bombing range west of Los Lunas, New Mexico. By December 1945, the Z Division field test group was setting up equipment at the Los Lunas test range.

While arrangements were underway at the Los Lunas range, the MED received permission to let Z Division use the Salton Sea Test Base as well. The U.S. Navy established a test range at the Salton Sea in southern California during WWII.[6] In June 1946, the U.S. Navy's buildings at the site were transferred to the U.S. Army for use as a bombing range by Z Division.

Sitting approximately 200 feet below sea level and offering excellent testing weather for most of the year, the Salton Sea site allowed Z Division to test ballistic performance in dense, sea-level atmospheric conditions unavailable in New Mexico. It had a water impact area and, later, a land target. SNL used the site until 1960.

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[5] Sandia Corporation became Sandia National Laboratories (SNL) via legislation passed in 1979. It will be referred to as SNL throughout the remainder of this report.
[6] This was the Naval Auxiliary Air Station at Salton Sea. During WWII, the MED also occasionally used the site as a low-altitude bombing range.

By the mid-1950s, the Salton Sea Test Base experienced tension between a growing number of weapon programs requiring testing and general population growth in the area. Increased population to the west blew in additional haze in the air, limiting visibility for instruments and cameras. The growing population in the nearby Imperial Valley filled in previously open land, restricting opportunities to place tracking stations further out from the target points. Finally, bombing approaches became more complicated as commercial airways increased in the area.

The AEC and SNL launched a search for a new test site. A variety of sites were considered. Potential sites near Salton Sea were small and posed similar problems to the Sea itself. A temporary site was established in 1954 on the bed of Yucca Lake, within the AEC's Nevada Test Site, while scouting continued for an area that could accommodate low-altitude as well as high-altitude approaches. Multiple sites in Arizona, Virginia, Texas, and Colorado were reviewed and excluded.

An area known as Cactus Flats in the northwestern section of the Las Vegas Bombing and Gunnery Range (now Nellis Air Force Base) presented a series of dry lake beds stretching north-south in a long valley between the Cactus Range to the west and the Kawich Range to the east. Used as a practice bombing range during WWII, the site offered a set of potential impact points in the dry lake beds and good flying weather. The Air Force authorized AEC use of the property for SNL for five years beginning November 9, 1956. Approximately 35 miles southeast of Tonopah, Nevada, the site was named Tonopah Test Range.

In the fall of 1956, SNL selected Pork Lake, the northernmost in the string of lake beds, as the primary impact point for drop tests and began construction of facilities. SNL's Plant Engineering Department was responsible for design and the Reynolds Electrical & Engineering Company (REECo) undertook construction work. The AEC had an existing contract with REECo to provide maintenance for the Nevada Test Site further south on the Las Vegas Bombing and Gunnery Range and extended that to cover TTR construction. In 1958, a contract was placed with REECo for TTR operation and maintenance activities.

Planning for facilities and operations at the site included laying out the stations from which tests would be observed, photographed, and tracked (Figure 3). The stations were identified on maps of the range and revealed the expectation that flights would be tracked along the east and west sides of the dry lake beds, concentrating on the main target in the dry lake bed at the north end (Figure 11). Ultimately, additional targets and stations would be added toward the south, but the initial construction focus was on Pork Lake. In addition to lights and night-camera stations installed around the target area, construction in the first months included four instrument stations for tracking test units and data collection.

The stations at TTR are identified by specific coordinates on the map—most house one or more pieces of tracking/recording equipment.[7] The larger stations—including multiple facilities and a variety of instrumentation—were absorbed into and became identified as Areas. Thus, Station 3, which included an Askania phototheodolite tower in the early years, is almost never referred to as Station 3—it is Area 3 or the Control Point and includes the main control tower and many support facilities for operating the range. Buildings and structures are usually numbered based on their location (for example, Building 09-50 is an observation bunker in Area 9; Building 02-00 is at Station 2).

The tracking and recording equipment used at the range is deployed at the stations to provide multiple views and recordings of a test. Radar units identify and track the test delivery aircraft as it approaches the range and throughout the test, offering spatial position information. Telemetry stations capture information transmitted from the delivery aircraft and (in later years) from the test unit itself. The Askania phototheodolites, high-speed cameras, and telescopes capture test images and annotate the film with the time, azimuth, and elevation of the test item. Later analysis of the data from multiple phototheodolites allows calculation of precisely where the test unit was throughout the test.

The first four stations established by the end of January 1957 and provided with Askania phototheodolite towers and instrumentation were Station 1, Station 2, Station 3 (at Area 3, the Control Point), and Station 4 (Figures 9 and 10). Station 1, 2 miles northwest of the impact area, had an Askania phototheodolite on a tower, a tracking telescope, and a trailer-mounted M-33 radar. Station 2 was 3 miles south of the target and featured an Askania phototheodolite on a tower (Building 02-00) and a tracking telescope (Building 02-01). Three miles further south was Station 3, the Control Point, which had an Askania phototheodolite on a tower, a tracking telescope, and project offices, weather station, control consoles, darkroom facilities, and a generator building. Two miles south of Area 3 and on the southern end of the flight path, was Station 4, which had an Askania phototheodolite on a tower and an SCR-584 radar. (Figure 11)

Testing began on February 4, 1957, with drop tests done both during the day and at night. By the summer, testing included rocket launches. Rocket testing was added to the site as part of the preparation for the Operation Hardtack series of nuclear test shots in the Pacific, scheduled for 1958. To support ground-launched tests, SNL created a rocket launch capability in Area 9 (including Station 9, but with additional facilities), northeast of the main target at TTR. The facilities

[7] In later years, stations had concrete pads to place mobile Contraves cinetheodolite units as they were needed for particular tests. The early years of testing did not enjoy such flexibility.

constructed by REECo during the summer of 1957 included two rocket launchers, an assembly building, a control bunker, and various camera stands.

Demand for both drop and rocket testing continued after the initial rounds for which the first facilities were built and the site extended its capabilities in response. Planned construction continued—Station 2 received Building 02-01, a tracking telescope and dome, for example (Figure 6; NV-XXXX-4). The AEC approved an expansion and improvement program for the site in early 1959. The USAF also extended the permit for SNL's operations until March 31, 1969. On September 1, 1960, TTR was named Sandia's permanent test range and the Salton Sea Test Base range was closed.

The range expansion was swift and extensive. Additional tracking and data capture stations were added along the line of flight to the target, support facilities at the Control Point were expanded, the weather station at the Control Point was moved to the west side of the range, and a Control Tower was added. The target impact area on Pork Lake was supplemented with a concrete hard target.

In 1960, the Askania phototheodolites were replaced with Contraves cinetheodolites. Three of the four Askania towers were removed, leaving the tower at Station 2 (Building 02-00), which received new instrumentation. New towers were built at additional stations for the new Contraves instruments.

Beginning in 1969, TTR moved to introduce mobile Contraves units to its arsenal of tracking and data capture instrumentation. The first pad for a mobile unit was poured at Station 37 in 1969 and the first mobile Contraves cinetheodolite—a Model C—was assembled at TTR in 1970. TTR purchased the Model F Contraves ca. 1980 and installed them in the mobile trailers after that. Over time, the mobile contrives lifting mechanisms, trailers, and pads have been redesigned and renovated.

Once the mobile Contraves were introduced, the stationary units at the towers fell out of use. The tower at Station 2 (Building 02-00) has not been used in decades. Its instrumentation has long since been removed and it is not maintained as there is no expectation that it will be brought back into service.

Part II. ARCHITECTURAL INFORMATION

A. General Statement:

1. **Architectural character:**
   Building 02-00 is a tower (NV-XXXX-1, -2; Figure 12). It is a simple design with no interior space. Its core is a poured reinforced concrete pedestal (Figure 7). The outside shell is steel (Figure 8). A metal staircase with an outside handrail winds from the tower's base to the top level, which is circled by a safety handrail. The tower top has mounts for the theodolite instrumentation, which is not extant (NV-XXXX-3).

2. **Condition of fabric:**
   Poor.

B. Description of Exterior:

1. **Overall dimensions:**
   The tower is 20' tall and 12' in diameter.

2. **Foundation:**
   The tower rests on poured concrete.

3. **Walls:**
   The exterior of the tower is a steel skin (NV-XXXX-1). Curved bands of steel are welded together to form the tube that covers the interior concrete pedestal (Figure 8).

4. **Structural system, framing:**
   The interior pedestal of the tower is reinforced concrete. The exterior cover and frame for the tower top are steel. The initial design is said to be based on the design of the camera towers also installed at TTR in the late 1956/early 1957 time period (Figures 4 and 5). It is the steel cylinder that was similar; the camera tower cylinders were filled with earth, not the concrete pedestals used in the Askania towers.

5. **Porches, stoops, balconies, porticoes, bulkheads**:
   At the top of the tower, a small balcony extends from the west side approximately 4'. It is braced with 3 steel bars that attach from the outer edge of the balcony to the side of the tower below. The balcony is at the top of the stairs, allowing personnel to move around the edge of the tower and to access the dome. The steel handrail from the stairway extends around the balcony and on around the edge of the tower. A small light on a curved pole extends from the top rail of the balcony's handrail.

6. **Stairways:**

A two-flight steel staircase winds from the tower's base around the exterior to the top level. There is a short metal landing half way up the tower and a metal handrail on the outside edge of the stairway (NV-XXXX-1). A steel floor grating landing at the top continues into a small balcony space extending beyond the tower's edge on the west side (NV-XXXX-2).

7. **Chimneys:**
   The Askania Tower has no chimneys.

8. **Openings:**
   a. **Doorways and doors:**
      Building 02-00 has no exterior doors or doorways.

   b. **Windows and shutters:**
      There are no windows in the building.

9. **Roof:**
   The top of the tower is concrete—it is the top of the concrete pedestal that forms the core of the tower. It is flat and is edged with the steel layer that forms the outer skin of the tower (NV-XXXX-3).

   A small balcony with a metal floor grating extends from the west side of the tower. A metal pole holding a camera extends from the handrail near the top of the stairway and a small curved pole holds a light extending from the balcony handrail. (NV-XXXX-2)

C. **Description of Interior:**
   Building 02-00 does not have interior rooms. The tower's concrete pedestal forms the interior, which is covered with an exterior steel skin.

   1. **Stairways:**
      There are no interior stairways in 02-00.

   2. **Flooring:**
      The top of the tower is concrete with a metal base on top for the theodolite mount (NV-XXXX-3).

   3. **Wall and ceiling finish:**
      There are no interior walls or ceiling.

   4. **Openings:**
      a. **Doorways and doors:**
         There are no interior doors.

b. Windows:
The Askania Tower has no interior windows.

5. Decorative features and trim:
Building 02-00 is utilitarian in design and does not display any decorative features.

6. Hardware:
The stairway is bolted to the metal outer skin of the tower and is supported with metal braces that bolt to the outer wall (NV-XXXX-1, -2). All parts are steel and original.

7. Mechanical Equipment:

a. Heating, air conditioning, ventilation:
The building has no HVAC.

b. Lighting:
There is no interior lighting. There is a light mounted on a curved pole extending from the balcony handrail on the top of the tower (NV-XXXX-2).

c. Plumbing:
Building 02-00 has no plumbing.

8. Original Furnishings:
Building 02-00 houses no furniture. The instrumentation has been removed.

9. Description of Equipment:
The original phototheodolite and the later cinetheodolite have been removed from the top of the tower (NV-XXXX-3).

D. Site:

1. Historic landscape design:
There is no historic landscape design associated with the test facilities at TTR in general or Building 02-00 specifically. The area around the tower is cleared. The landscape surrounding Station 2 is native vegetation (NV-XXXX-1, -2, -4).

2. Outbuildings:
Building 02-00 has no outbuildings. It is located at Station 2, which also has an ME-16 Tracking Telescope (Building 02-01) and a small, younger CMU building (Building 02-51) that once housed other range functions (NV-XXXX-2, -4).

Part III. SOURCES OF INFORMATION

A. Architectural Drawings:

Architectural drawings are held in the SNL Facilities Library, with copies at TTR.

"N-1, 2 & 3 and A-1, 2, 3, 4, 5 & 6, 12' x 20' Tower Structure, Tonopah Site," Drawing 87582, Sheet 8 of 48, July 1956.

"Tonopah Testing Range, Station Layout," Drawing T-C110, November 27, 1956.

B. Early Views:

An early aerial photograph of Station 2 is included in the figures for this report, as are photographs of the construction of the Askania towers at TTR.

C. Interviews:

Although there were several discussions with current TTR staff regarding the Askania and Contraves towers, Station 2, and the tracking and data collection activities related to testing at the range, no formal interviews were recorded.

D. Bibliography:

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Contraves. *Electronic Optical Tracking System, Mode F Digital.* Contraves Digital Cinetheodolite Manual. Zurich: Contraves AG, n.d.

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Ullrich, Rebecca, Jayne Aaron, and Judy Berryman. *Historic Building Survey: Sandia National Laboratories' Tonopah Test Range, Nye County, Nevada. Volume II: Survey and Historic Resource Inventory Forms.* SAND2005-5109P. Albuquerque: Sandia National Laboratories, 2005.

Ullrich, Rebecca A., Michael Anne Sullivan, Cynthia Martin, and Dick Gerdes. *Sandia in the Cold War and Post-Cold War Periods: A Statement of Historic Context for Sandia National Laboratories/New Mexico.* SAND2010-4971P. Albuquerque: Sandia National Laboratories, 2010.

Westwick, Peter. *The National Labs: Science in an American System, 1947-1974.* Cambridge: Harvard University Press, 2003.

E. Likely Sources Not Yet Investigated:

The literature on the history of theodolites, phototheodolites, cinetheodolites, and the Askania and Contraves companies was not fully investigated for this report. More information is available on these topics.

F. Supplemental Material:

None.

Part IV. PROJECT INFORMATION

This report was prepared by Rebecca Ullrich of the SNL[8] Corporate Archives and History Program.

In 2005, DOE/NNSA/SSO completed consultation with the Nevada State Historic Preservation Officer (SHPO) regarding the historic significance and eligibility of the Sandia National Laboratories Tonopah Test Range Historic District for the National Register of Historic Places. DOE determined that fifty buildings located at SNL's Tonopah Test Range were eligible as a district based on the Secretary of the Interior's Criteria for Eligibility. Building 02-00 was one of the buildings identified as part of the district and is a contributing element to it.

Large- and medium-format photographs of the contributing elements within the district were taken by SNL photographers Jim Galli, Joseph M. Bonaguidi, and William Suderman. Clair Blackburn and Jerry Elliston provided information on range facilities management and maintenance. Myra O'Canna, SNL Corporate Archivist, provided research advice, access to relevant collections, and copies of historical photographs. Joe Bonaguidi and Jessica Small of the SNL NEPA Program oversaw the project.

[8] Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Figure 1 USGS 1:100,000 Topo Map.
USGS TOPO MAP MARKED TO INDICATE CONTRIBUTING ELEMENTS WITHIN THE SANDIA NATIONAL LABORATORIES TONOPAH TEST RANGE HISTORIC DISTRICT, INCLUDING STATION 2

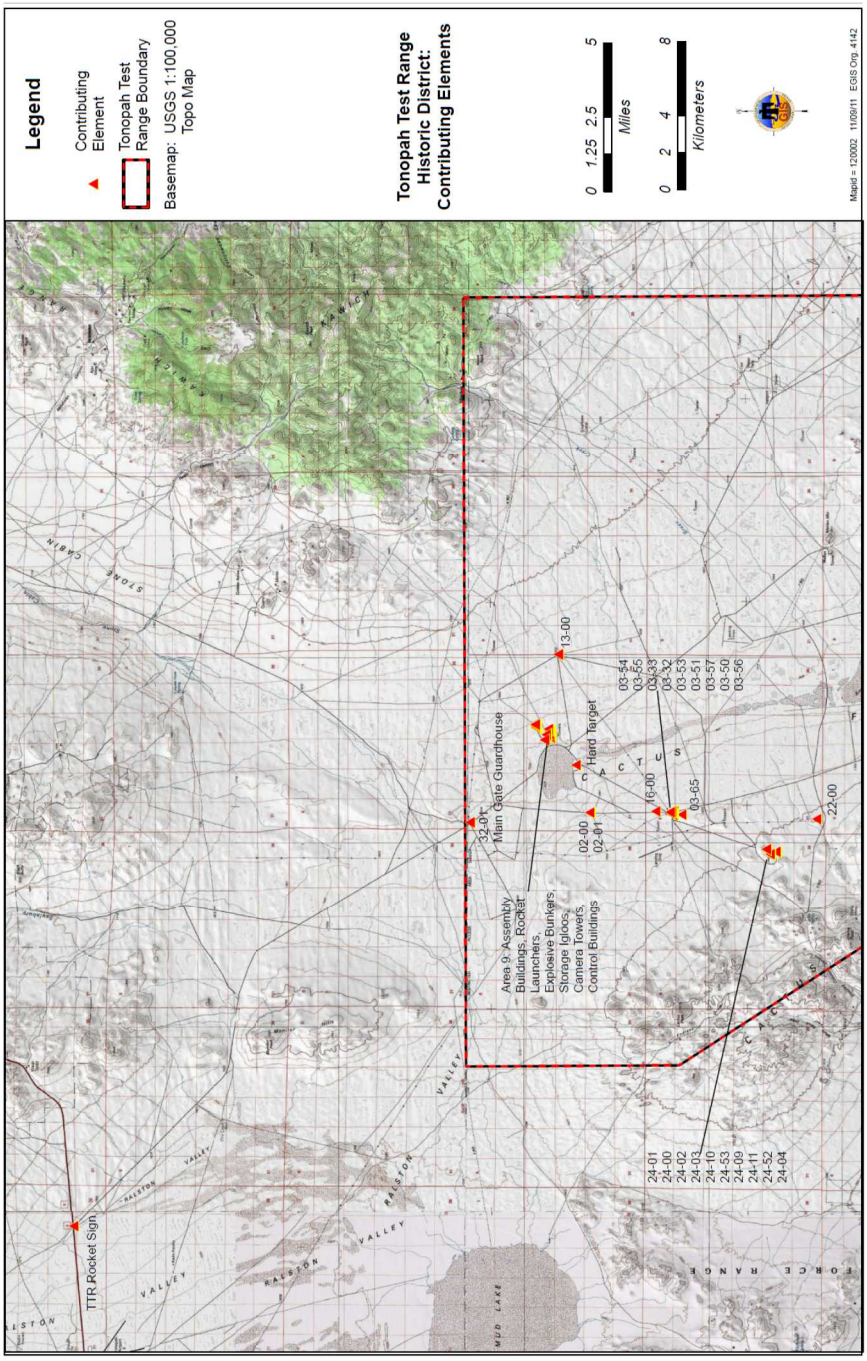

Figure 2 USGS 1:24,000 Topo Map.
USGS TOPO MAP MARKED TO INDICATE CONTRIBUTING ELEMENTS WITHIN THE SANDIA NATIONAL LABORATORIES TONOPAH TEST RANGE HISTORIC DISTRICT; NORTH PORTION OF TONOPAH TEST RANGE; INCLUDING STATION 2, WITH BUILDING 02-00

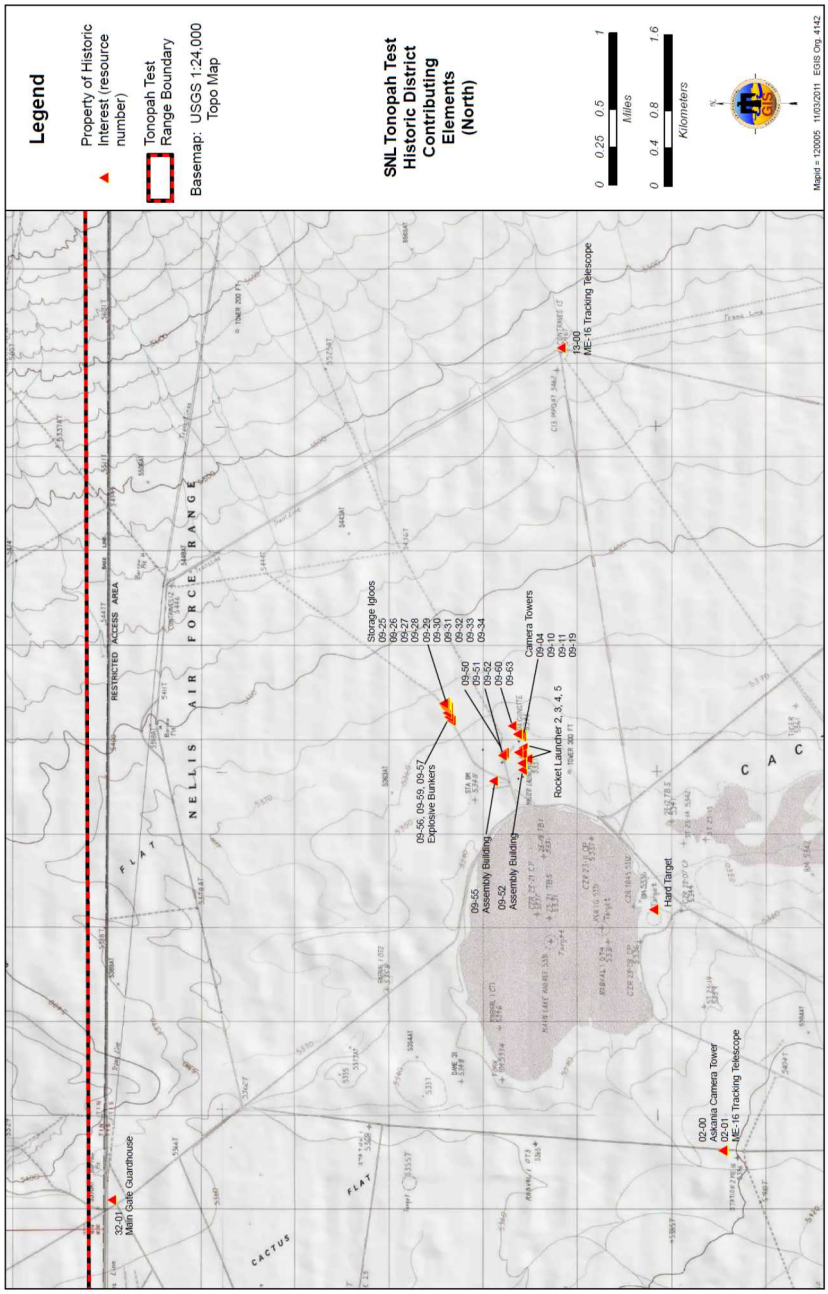

Figure 3 Reynolds Electrical and Engineering Co., Inc., "Tonopah Testing Range, Station Layout," Drawing T-C110, November 27, 1956.
TONOPAH TEST RANGE, ORIGINAL TRACKING STATION PLAN;
STATION 2 IS NEAR THE RIGHT EDGE OF THE DETAIL CIRCLE

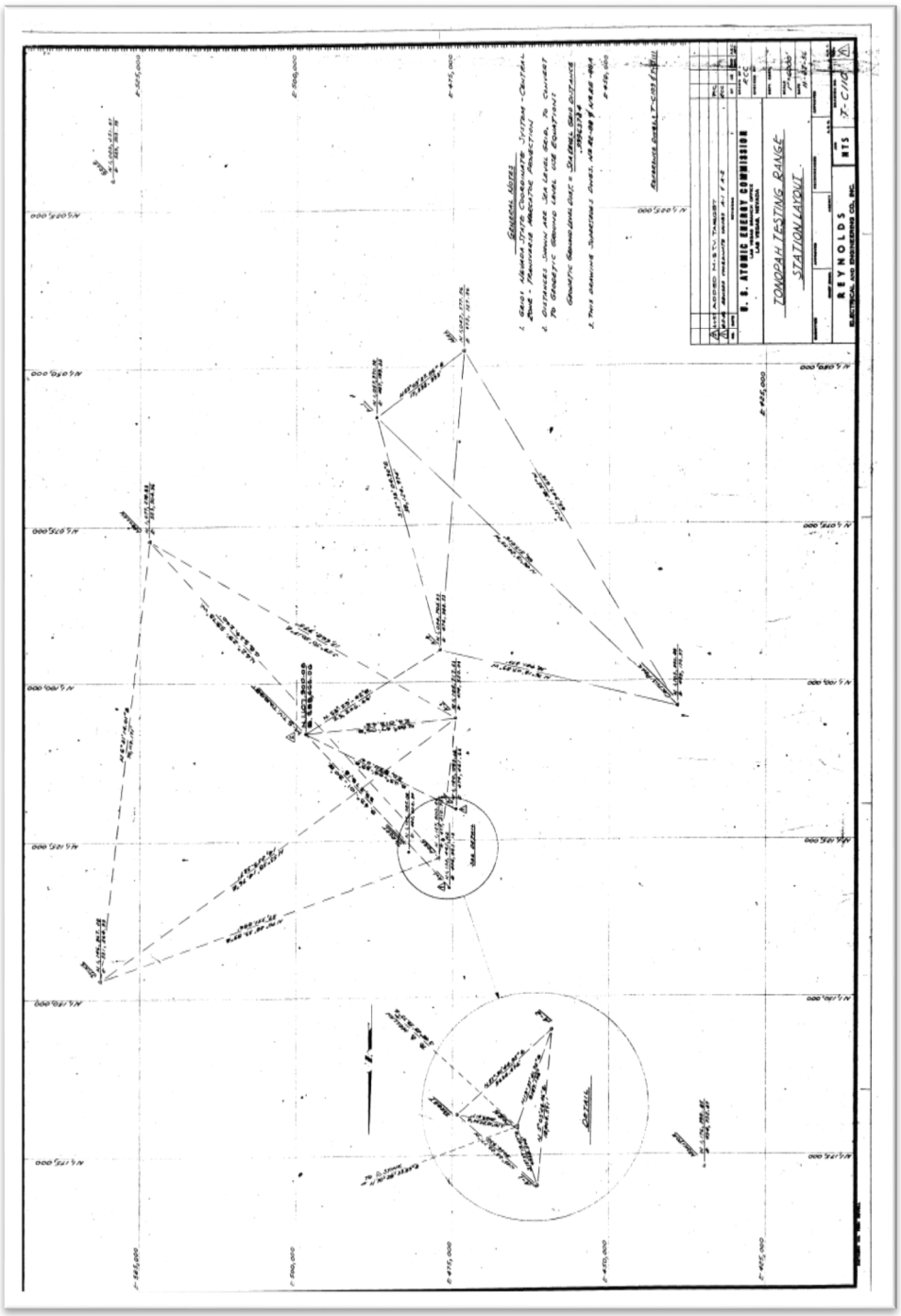

Figure 4 Plant Engineering, "N-1, 2 & 3 Top Structures, Tonopah Site," Drawing 87582, Sheet 10 of 48, July 1956.
PLAN FOR CAMERA TOWERS INSTALLED AT TONOPAH TEST RANGE; DESIGN USED AS BASE FOR ASKANIA TOWER DESIGN

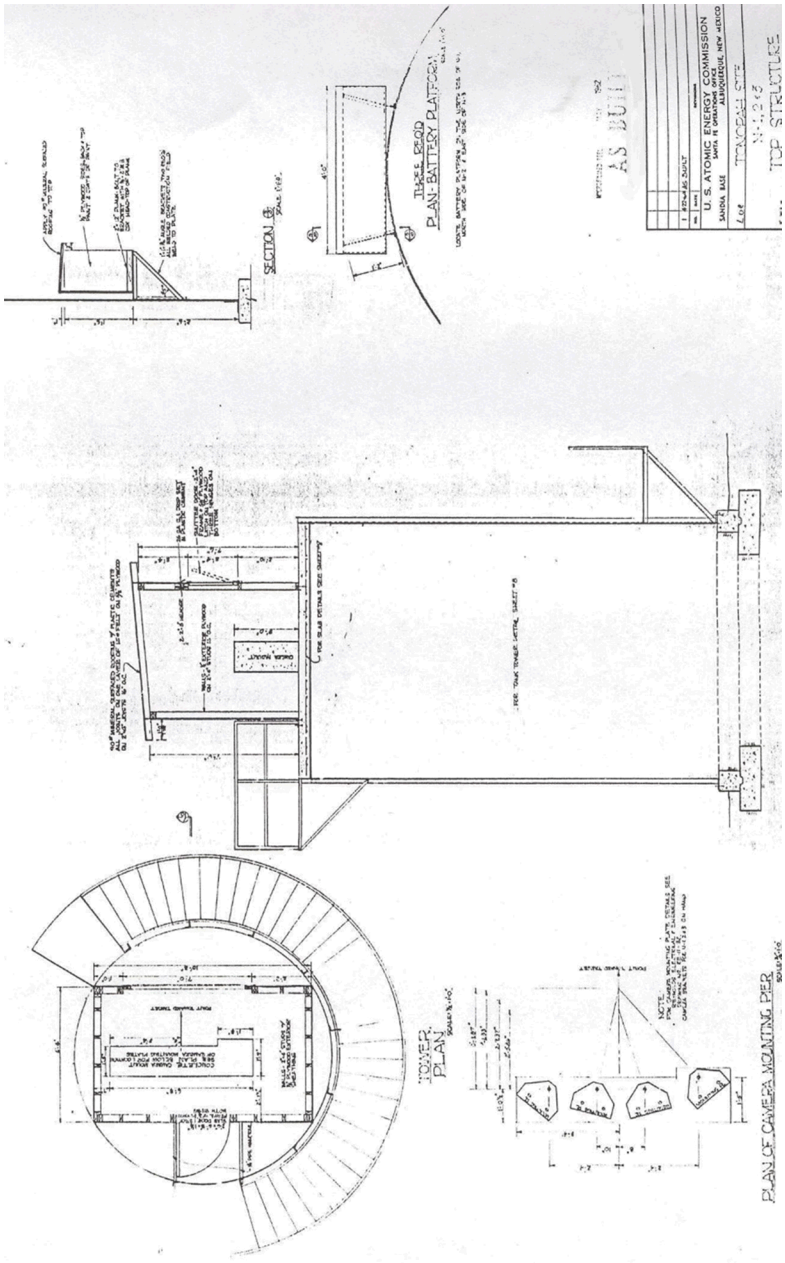

Figure 5 Plant Engineering, "N-1, 2 & 3 and A-1, 2, 3, 4, 5 & 6, 12' x 20' Tower Structure, Tonopah Site," Drawing 87582, Sheet 8 of 48, July 1956. PLAN FOR ORIGINAL SIX ASKANIA TOWERS BUILT AT TONOPAH AND IN PLACE WHEN TESTING BEGAN IN 1957

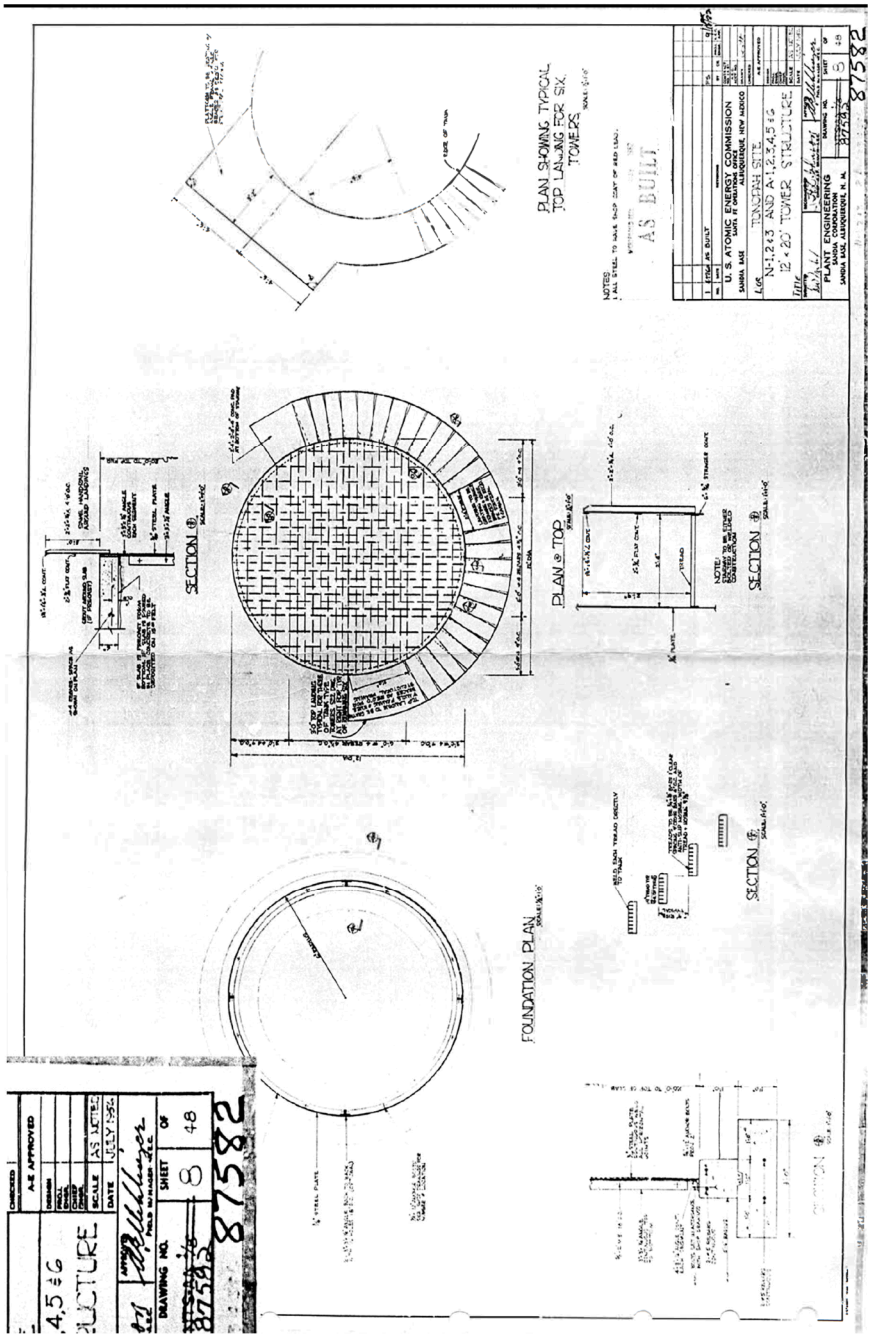

Figure 6 Photographer unknown. nd.
ASKANIA TOWER, BUILDING 02-00; STATION 2 AERIAL; TOWER (BUILDING 02-00) AND TELESCOPE LOCATION (BUILDING 02-01) VISIBLE (DOME NOT ON TELESCOPE STAND)

Figure 7 Photographer unknown. 1956.
CONSTRUCTION AT TONOPAH TEST RANGE; INSTALLATION OF INITIAL SET OF TRACKING STATIONS; CONCRETE PEDESTAL FOR ASKANIA TOWER

Figure 8 Photographer unknown. 1956.
CONSTRUCTION AT TONOPAH TEST RANGE; INSTALLATION OF INITIAL SET OF TRACKING STATIONS; METAL SKIN FOR ASKANIA TOWER AT STATION 4

Figure 9 Photographer unknown. Ca. 1957.
COMPLETED ASKANIA TOWER AFTER FIRST PHASE OF CONSTRUCTION AT TTR; CONSTRUCTION COMPLETE WITH DOME ON AND PHOTOTHEODOLITE INSTALLED

Figure 10 Photographer unknown. ND.
ASKANIA PHOTOTHEODOLITE

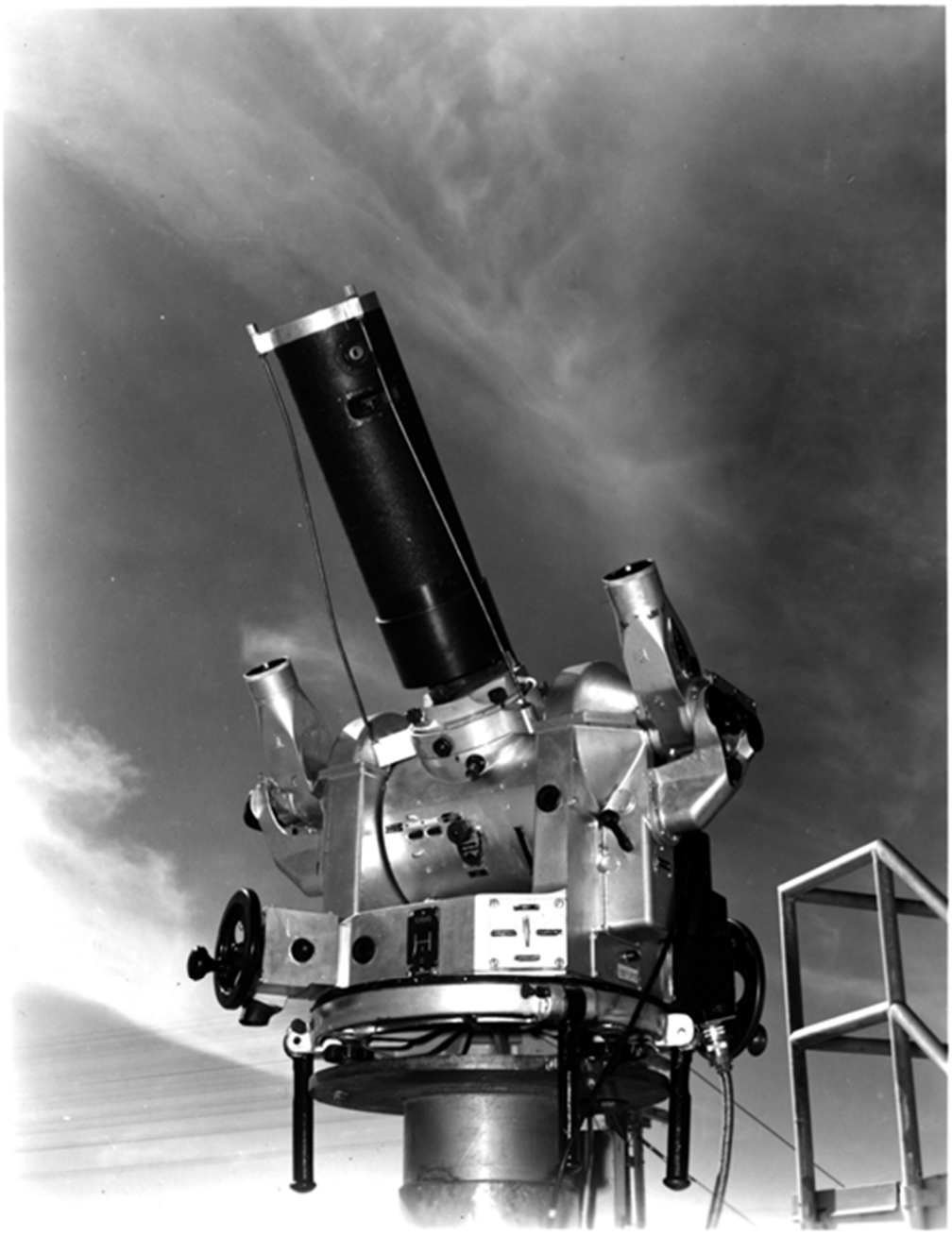

Figure 11 Sandia Corporation, *Tonopah Test Range,* brochure (Albuquerque, New Mexico: Sandia Corporation, 1966), 7-8.
RANGE LOCATION AND FACILITIES; LAYOUT OF STATIONS AT TONOPAH TEST RANGE IN 1966

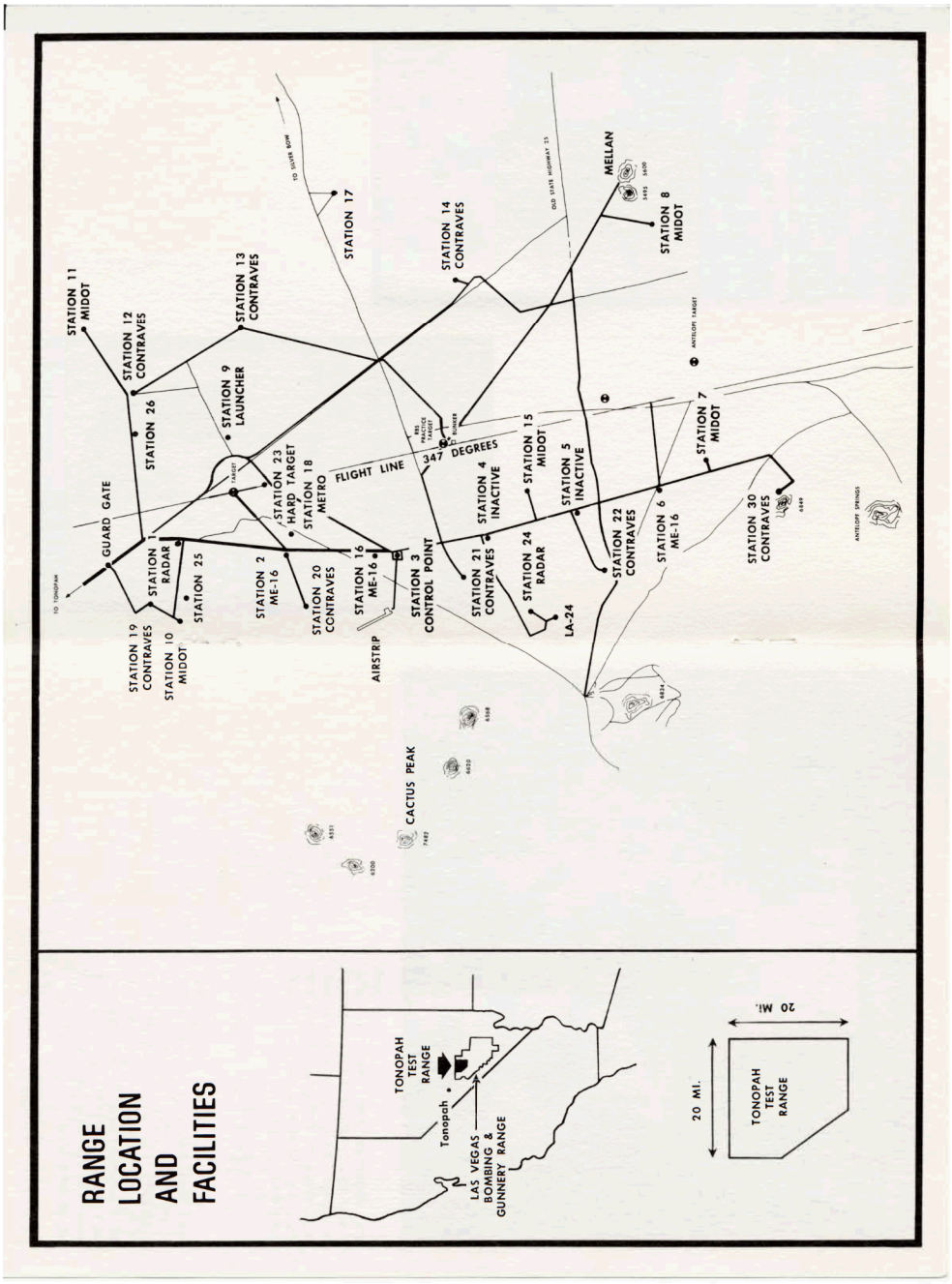

Figure 12 Clair Blackburn, Photographer. 2009.
STATION 2; ASKANIA TOWER, BUILDING 02-00; THEODOLITE INSTRUMENTATION AND DOME REMOVED; STAIRS AND SAFETY RAILING INTACT

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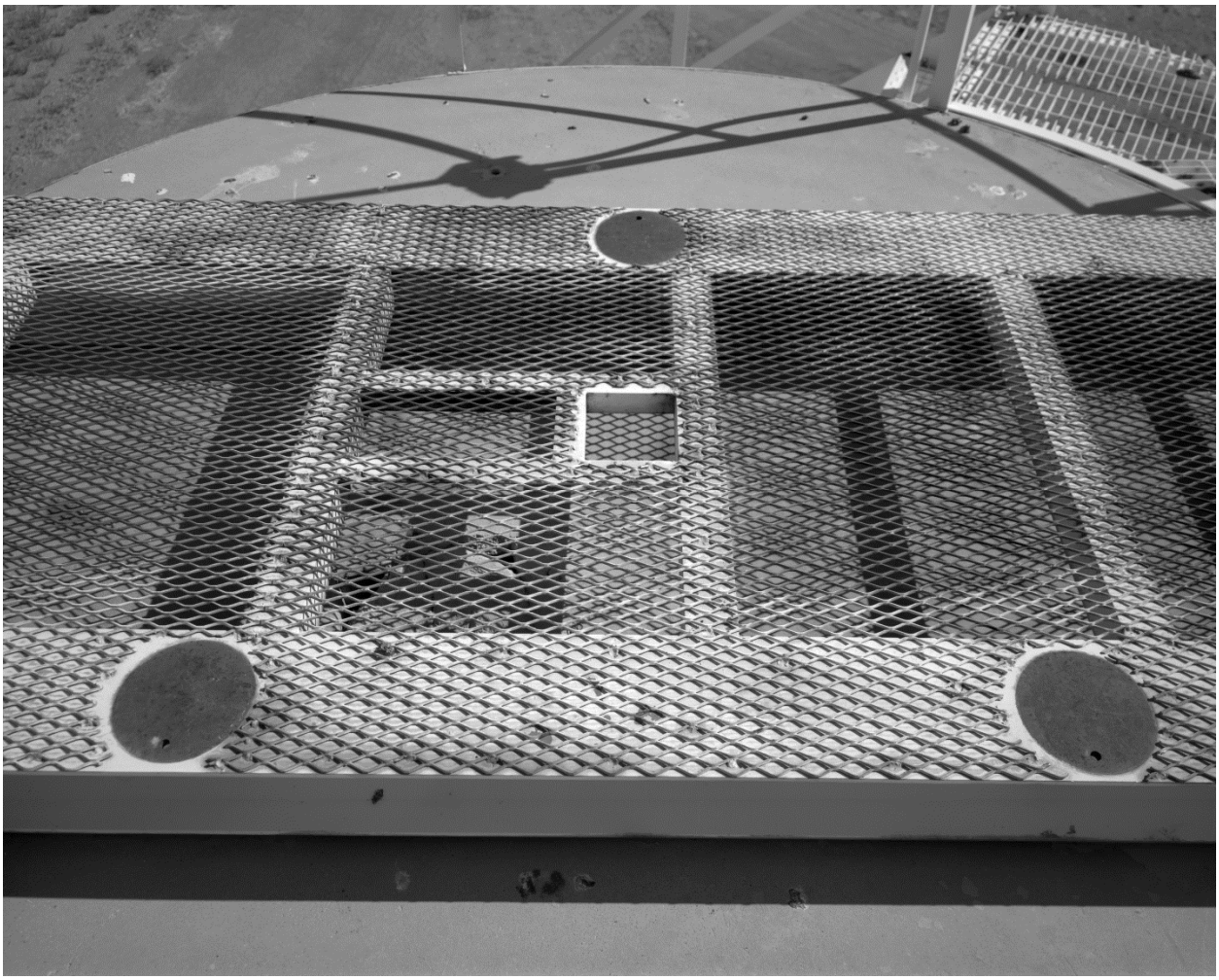
NV-XXXX-1 William Suderman, Photographer. August 10, 2004.
BUILDING 02-00, ASKANIA TOWER, EXTERIOR; EAST SIDES OF TOWER AND BUILDING 02-50; STEEL OUTER WALL OF TOWER; METAL STAIRCASE WINDING UP SIDE OF TOWER; METAL HANDRAIL AROUND TOP OF TOWER; TRACKING CAMERA AND RELATED EQUIPMENT NO LONGER PRESENT; VIEW FROM EAST

NV-XXXX-2 William Suderman, Photographer. August 10, 2004.
BUILDING 02-00, ASKANIA TOWER, EXTERIOR; SOUTH SIDES OF BUILDING 02-50 AND TOWER; VIEW FROM SOUTH

NV-XXXX-3 Joseph M. Bonaguidi, Photographer. August 10, 2004.
BUILDING 02-00, ASKANIA TOWER, EXTERIOR; TOP OF TOWER; STEEL GRATE ON METAL FRAME WITH ATTACHMENT SPACES FOR MOUNTING ASKANIA INSTRUMENT; STAIRWAY LANDING VISIBLE IN RIGHT BACKGROUND; VIEW FROM NORTH AND ABOVE



NV-XXXX-4 William Suderman, Photographer, August 10, 2004.
BUILDING 02-01, ME-16 TRACKING TELESCOPE AT STATION 2; BUILDING 02-00, ASKANIA TOWER VISIBLE IN BACK RIGHT OF PHOTOGRAPH; RELATIONSHIP OF ELEMENTS AT STATION 2; VIEW FROM SOUTH