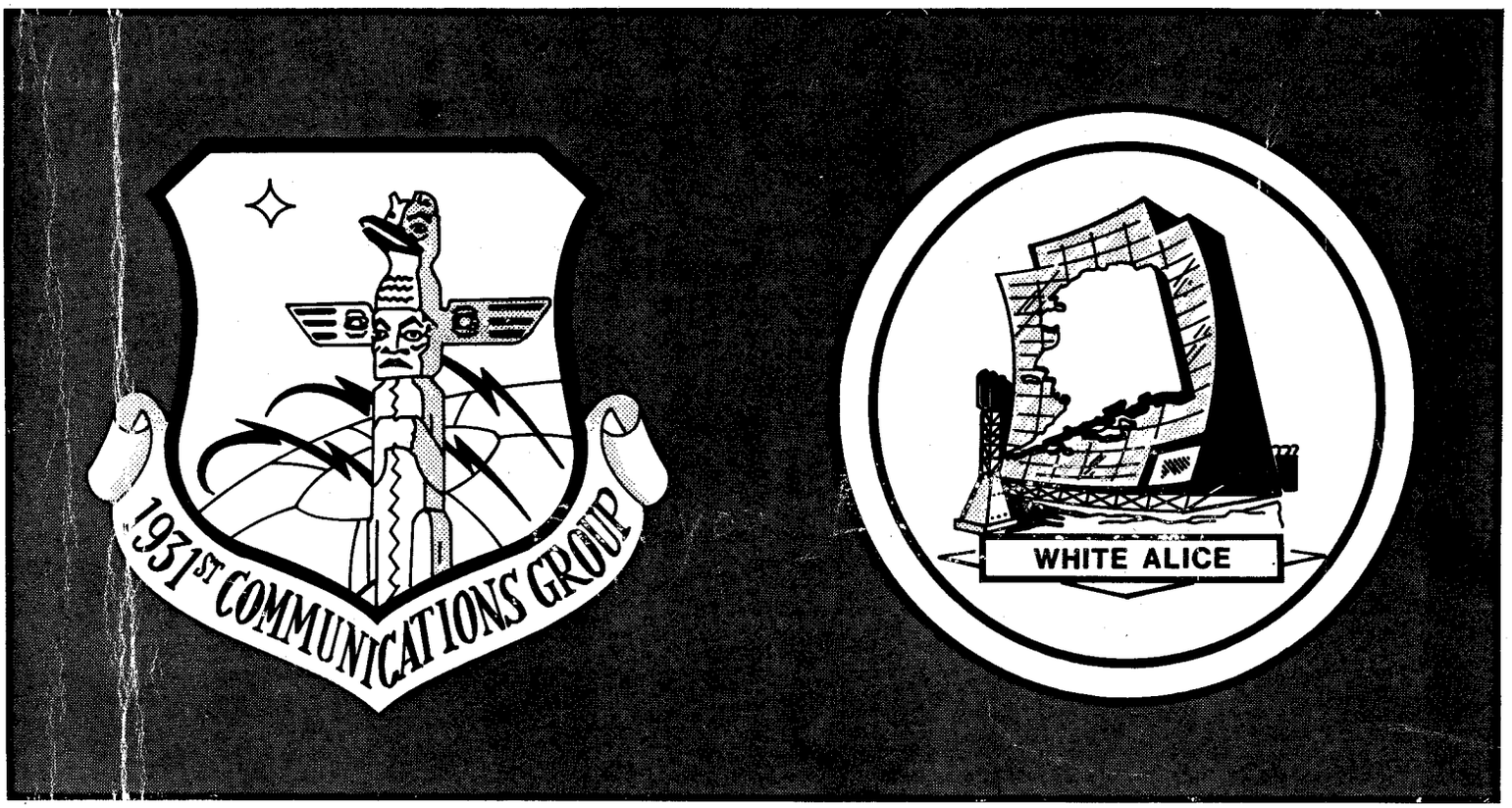
Historical Overview and Inventory

White Alice Communications System



US Army Corps
of Engineers
Alaska District

APRIL 1988

HISTORICAL OVERVIEW AND INVENTORY:

WHITE ALICE COMMUNICATIONS SYSTEM

prepared for

United States Air Force
Alaskan Air Command
Elmendorf Air Force Base
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Alaska District
April 1988

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SUMMARY

In this report, the White Alice Communications System (WACS) is discussed in terms of its historic significance. Its origin, function, and demise are described. The first part of the report discusses the history of communications in Alaska and the military's fundamental role in its development. The historic context of World War II, the Cold War, and the United States' need for over-the-pole defense are noted along with the technological developments that made White Alice possible. The various phases of construction of the system are described and typical station descriptions are presented. Brief individual descriptions, representative as-built drawings and photographs are included, as well as a map of the system. A glossary and bibliography are also included.

This report basically summarizes the findings of a Section 106 review investigation concerning the eligibility of the White Alice System to the National Register of Historic Places, as per the National Historic Preservation Act of 1966, as amended. Section 106 was activated by the Alaskan Air Command's need to demolish their White Alice stations while taking into account their historic value. Thus, this report fulfills a compliance function as well as an informational one. Any omissions or errors are the responsibility of the author.

The cover consists of two logos. On the left is the emblem of the 1931st Communications Wing as it looked in the 1950's. On the right is the emblem that the Western Electric Company used during its involvement with White Alice. The emblems were provided by Sgt. Dennis Bonewitz, Historian, 1931st Communications Wing.

ACKNOWLEDGMENTS

Many people's efforts went into this project. The author gratefully acknowledges, at the Alaskan Air Command, Marvin Thomasson, Project Manager (DEPC), and Moira Dennis and Paul Heimsath, Real Estate, for their continuing effort in obtaining information and their moral support. Also recognized at AAC are Amy Wickstrom and Col. J.E. Smith for supporting the project. Wayne Fordham, Air Force Historic Preservation Officer, in Washington D.C., visited Alaska, saw the need for the study, and also supported it. 1931st Communications Wing Historian, Sgt. Dennis Bonewitz, provided most of the written source material on which the study is based. TSgt. Raymond Baker was my initial contact at AAC. As Wing Historian, he completed a monograph on White Alice and brought it to my attention just prior to his departure to Andrews AFB. Sgt. Bonewitz' records were supplemented by John Cloe's, AAC Historian. Peggy Crawford, 21st Civil Engineering Squadron, provided access to the Air Force's as-built drawings and went out of her way on several occasions to accomodate my requests. Mont Beale, director of Real Estate, 21st CES, provided insight into many of the WACS sites and showed me a video tape of most of the northern installations. It was Mr. Beale who officially closed most of the WACS sites. Jake Tuckerman, 1930th Communications Squadron, on the other hand, opened many of the White Alice sites. He explained to me how the system worked in its heyday and helped put telecommunications in an understandable context.

At the Alaska District Corps of Engineers, my supervisor, William Lloyd, was a necessary sounding board. Mr. Lloyd worked on the BMEWS WACS installations and therefore read my drafts with a critical eye. Wendell Moore, chief of Survey, was involved with WACS and AC&W from its earliest days and provided background information for the report. Linda Wester and Karl Lauterbach, of Mr. Moore's staff, computed the laborious UTM's, which figure importantly in the compliance package submitted to the State Historic Preservation Office (SHPO). Debbie Helman and Chris Christley provided access to the Corps' as-built drawings and provided all topographic maps necessary for the SHPO compliance package. Norma Gonzalez, Real Estate, provided access to old files concerning the sale of White Alice to ALASCOM. Colt Denfeld and the Defense Environmental Restoration Program provided useful background information and reports. In the drafting section, Monty Henninger designed and executed the cover and Doris Smith drew the system map. Karen Pontius turned the manuscript into a finished product. Former District Photographer, Jim Stuhler, now of Fort Richardson, contributed his time to photograph the Rabbit Creek WACS facility to National Park Service standards.

This project could not have been completed without the help of ALASCOM. Joyce Zitzow and Paul Slooter, real estate, helped me focus the study and provided some of the original written documentation, unavailable elsewhere. Ms. Zitzow took me to the Neklasson Lake WACS facility and introduced me to Kaye Horton, site director. Mr. Horton gave me a tour of the installation and explained how it worked and how it has changed through time. George Howard and Bob Wyatt, ALASCOM toll center, took a

group of us to the Rabbit Creek WACS on two different occasions and allowed the site to be photographed. They also provided a tour of the toll center and answered many questions on microwaves, tropo systems and long-haul communications in general.

At the State Historic Preservation Office, Judy Bittner, SHPO, provided general guidance and kept the project on track. Jo Antonson, State Historian, and Paul Chattey, State Architectural Historian, were my principal contacts and were always available to answer questions large and small. Steve Klingler and Greg Dixon, Office of History and Archaeology, helped with the locational data and provided state numbers for all 71 WACS sites. At the National Park Service, Alaska Regional Office, Sandy Faulkner, HABS/HAER coordinator, gave unselfishly of her time and always had a fresh idea to share. Bill Hanable reviewed the draft and provided valuable comments. At the Advisory Council on Historic Preservation, Western Office, Brit Storey reviewed the project, kept it on track and injected a sense of humor, when possible. At the Forest Service in Anchorage, John Mattson lent his expertise based on his experience with mitigation of the Boswell Bay WACS.

All of these people contributed to the White Alice project. It could not have been done without their help.

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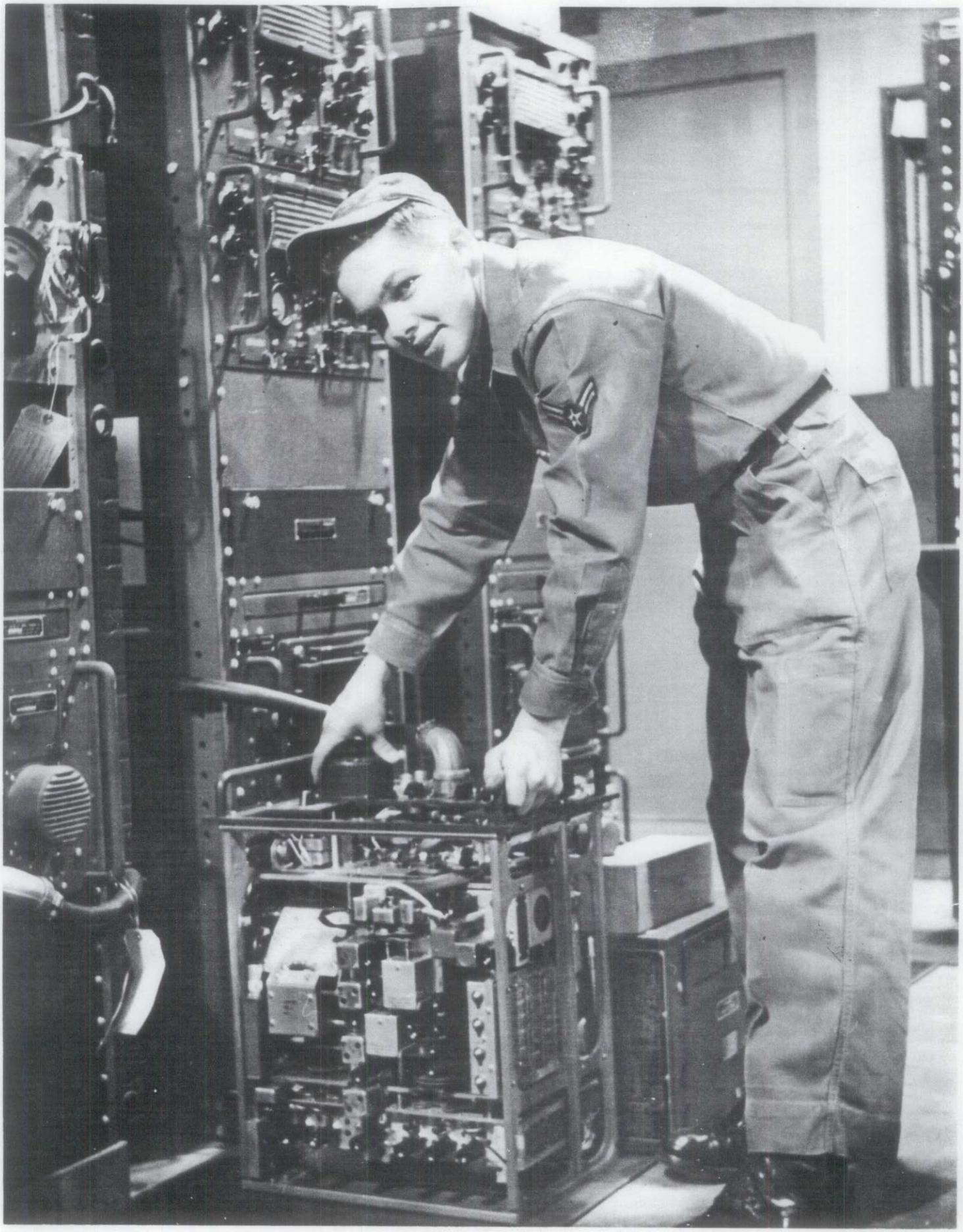
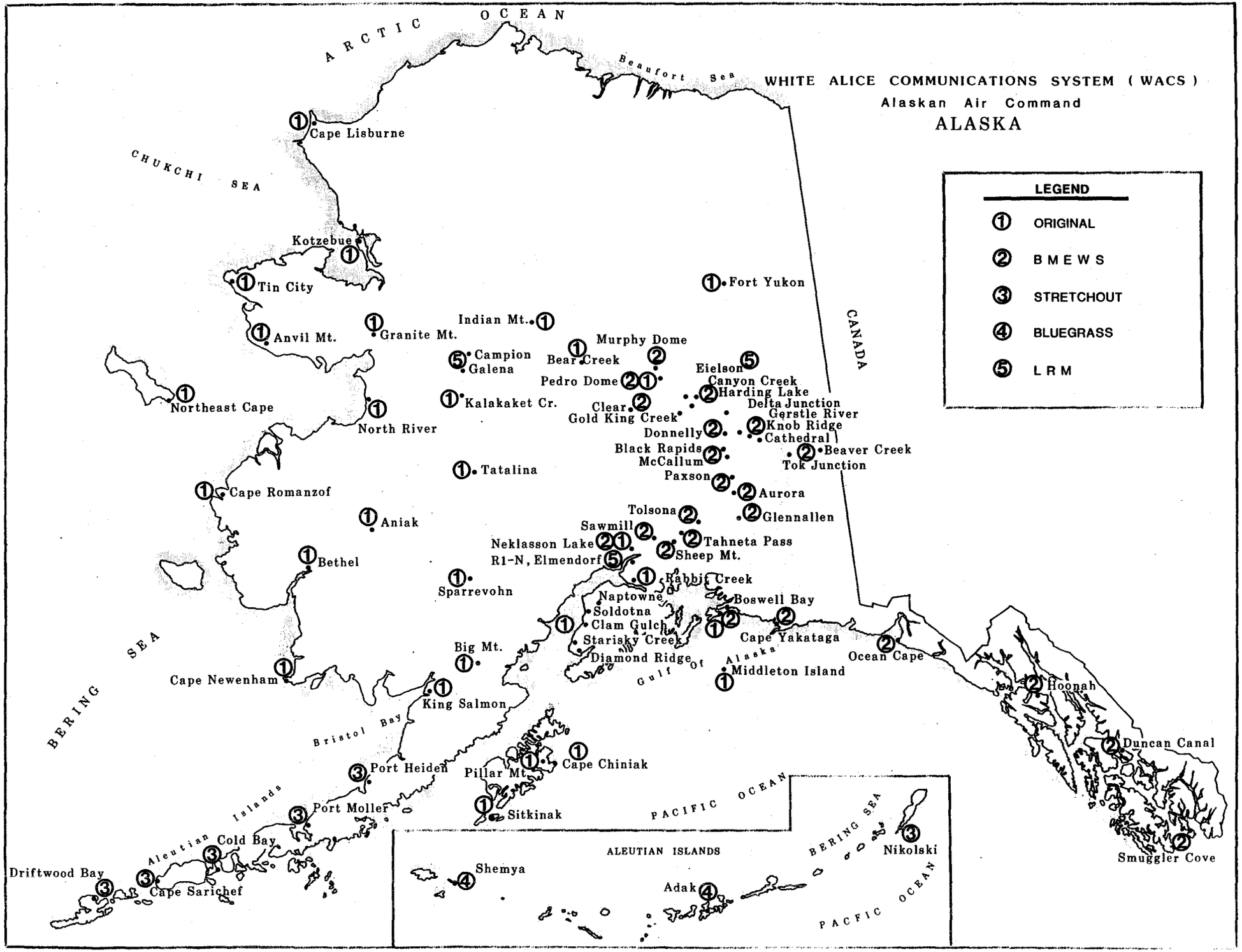


WHITE ALICE: HISTORIC PERSPECTIVE

The White Alice Communications system (WACS) in Alaska is significant in the areas of communications and the military. Although less than 50 years old (the original two installations, Boswell Bay and Neklasson Lake, opened in 1956), the WACS is historically significant because it was perceived as vital to national defense. It is an example of a technology that evolved so rapidly that its development, achievement peak, and obsolescence occurred within 10 years. Militarily, the system is a significant example of the extent to which the nation would go to avoid another Pearl Harbor. During the Cold War Era, the United States kept a high state of military preparedness and the civilian population was psychologically keyed to a state of war. The WACS reflects this period in American history.

Prior to the installation of the WACS, communications were so primitive that only one telephone call could travel between Fairbanks and Nome at a time. Telecommunications functioned strictly by line-of-sight and there was no way to make long distance "hops" for rapid transmission of information. Simultaneous, multi-voice channels were only dreamt of. WACS changed all that. A new technology, involving the beaming of radio signals from a parabolic transmitting antenna, up to the sky, and back down to a receiving antenna, enabled remote areas of Alaska to be in contact with each other. The idea of bouncing radio signals into the atmosphere, in this case, the troposphere, and receiving that same signal 200 miles away, was truly revolutionary in its day. In fact, it would have reminded some Alaskans of Jules Verne or Buck Rogers. As revolutionary as the WACS was, it was eclipsed by another technology less than a generation later. In the mid-1960's, after WACS was in place, to telephone the "lower '48", the Anchorage resident could only place the call at one place located downtown. Until the mid-1970's, television broadcasts were flown up daily from Seattle. If Seattle was fogged in, yesterday's six o'clock news was rebroadcast. Satellite technology has changed all that. Satellite telecommunications also rendered White Alice obsolete. The remaining tropo stations which dot the landscape are being demolished. The smaller microwave stations are still in use, although they are no longer state-of-the-art.

The history of communications in Alaska is synonymous with the role of the military. Beginning with WAMCATS (see below) at the turn of the century, a project which intimately involved then Lieutenant Billy Mitchell, the task of long-distance communications fell to the War Department. During the Gold Rush, when garrisons were built to keep law and order, telegraph lines spanned the state and relayed important information back to Washington, D.C. The military provided Alaska's only communications links to the lower '48 until the advent of satellite technology. This means, of course, that the U.S. Air Force and the U.S. Army were responsible for the inception, construction, operations and maintenance of the WACS. The Cold War Era and the Nation's concern for national defense were the impetus for the WACS and the related systems discussed below. Projects such as White Alice were always designed for a military mission, although they increasingly served the private sector as well. Finally, with the passage


WHITE ALICE COMMUNICATIONS SYSTEM (WACS)
Alaskan Air Command
ALASKA
LEGEND
1 ORIGINAL
2 B M E W S
3 STRETCHOUT
4 BLUEGRASS
5 L R M
ARCTIC OCEAN
Beaufort Sea
CHUKCHI SEA
CANADA
BERING SEA
Bristol Bay
Gulf of Alaska
PACIFIC OCEAN
Aleutian Islands
ALEUTIAN ISLANDS
Cape Lisburne
Kotzebue
Tin City
Fort Yukon
Anvil Mt.
Granite Mt.
Indian Mt.
Murphy Dome
Bear Creek
Campion
Galena
Eielson
Pedro Dome
Canyon Creek
Harding Lake
Delta Junction
Gerstle River
Clear
Gold King Creek
Knob Ridge
Donnelly
Cathedral
Black Rapids
Beaver Creek
McCallum
Tok Junction
Paxson
Aurora
Glennallen
Tolsona
Sawmill
Tahneta Pass
Neklasson Lake
R1-N, Elmendorf
Sheep Mt.
Rabbit Creek
Naptowne
Boswell Bay
Soldotna
Clam Gulch
Cape Yakataga
Starisky Creek
Diamond Ridge
Middleton Island
Ocean Cape
Hoonah
Duncan Canal
Smuggler Cove
Northeast Cape
North River
Kalakaket Cr.
Tatalina
Cape Romanzof
Aniak
Bethel
Sparrevohn
Big Mt.
Cape Newenham
King Salmon
Port Heiden
Pillar Mt.
Cape Chiniak
Port Moller
Sitkinak
Cold Bay
Driftwood Bay
Cape Sarichef
Shemya
Adak
Nikolski

of the "Alaska Communications Disposal Act," in 1967, the military began to divest itself of this responsibility. Today, long-distance telecommunications is accomplished by private corporations.

What is striking about the history of communications in Alaska is that the same challenges have faced each major project from the earliest plans up until the satellite era, beginning in the 1960's: extremes in weather; unexplored, vast and inhospitable stretches of terrain, and extreme isolation. As long ago as the 1850's, telegraph lines were proposed for Russian Alaska to facilitate communications between North American and Eurasia. The Western Union Telegraph Expedition (WUTE) began construction in a line in about 1866, but it was never completed. Remnants can be seen on the Seward Peninsula. The first functioning telegraph was the Washington-Alaska Military Cable and Telegraph System (WAMCATS), completed by 1904.

It was the Gold Rush with its influx of prospectors and the founding of garrisons to preserve the peace in early population centers that created the need for WAMCATS. Although the system was military, the act of Congress authorizing its construction specifically stated that commercial service would be provided when possible. WAMCATS overland routes consisted of single poles supporting a wire, where possible, or a tripod in muskeg and swamp. The lines connected Fort Egbert (Eagle) to Fort Liscum (Valdez) and Fort Gibbon (Tanana) to St. Michael. Later, a submarine cable was laid from Skagway to Seattle, a distance of 1710 miles. The world's longest wireless section, 107 miles, jumped the distance between Port Safety (near Nome) and St. Michael (Jenne and Mitchell 1982). This is also believed to be the first wireless telegraph system in the world which handled commercial messages and the first point-to-point wireless channel on the American continent for commercial operations.

WAMCATS lines lasted longer than the five years expected, but as sections gave out, wireless communication replaced open wire sections. In 1936, Congress recognized WAMCATS as the Alaska Communications System (ACS). ACS sites became the locations for the increasingly popular radio telephone. By 1934, Marshal, St. Michael, Juneau, Ketchikan, Fairbanks, Nome and Bethel had radio telephones. The system was maintained by the military (the War Department), although the location of some radio-phones in the local store facilitated transfer to commercial ownership in some instances. By the late 1930's, WAMCATS lines were failing in many places. Disturbances brought about by the Northern Lights inhibited high frequency (HF) radio communications. Medium frequency (MF) transmission was not affected by these disturbances, thus, medium frequency was modernized and expanded, while older high frequency systems were not.

The early buildup of World War II garrisons in Alaska brought teletype and teletypewriter (TWX) capabilities to the military. The Japanese attacks on Fort Mears at Dutch Harbor, with the inability of Fort Mears to contact Fort Glenn 80 miles to the west for air support, resulted in the loss of human life and equipment. Immediate communications upgrading was an absolute necessity. Subsequently, the ACS was expanded from 200 personnel in 1940 to 2000 in 1944.

Among the more heroic and monumental tasks during World War II was the stringing of an open wire pole line by the military the length of the CANOL (Canadian Oil) pipeline (a part of which later became the Alaska Highway) in 1942. In mid-November, with a Washington, D.C. imposed 1 December deadline, conditions were less than perfect:

> "A warm Chinook wind had blown for several days, taking out the ice bridges across the rivers. A snowstorm leaving record amounts of snow followed the Chinook and drifts of three or more meters encountered...Three ton trucks were driven over half frozen rivers where the ice would dip and sag. Men floundered through two meter snow drifts and strung wire by oil lamps, flash lights, and automobile headlights in temperatures of 30 degrees below zero" (Jenne and Mitchell 1982: 16).

To close the gap just east of the Alaska/Canada border, 50 miles of swamp had to be crossed in the summer. Twenty men from the 255th Signal Construction Company and two Indian guides on pack horses completed the task by 1 October 1943. The muskeg was belly deep on the horses and the men were wet for four weeks at a time. Their motto became: "Through muck and mire, we string our wire." On 1 December, placement of the last segment of line enabled the deadline to be met.

World War II increased people's awareness of Alaska and its strategic role in any ensuing conflicts. While memories of the War in the Pacific were still fresh, the U.S. military realized the continued need to protect America's back door. Alaska might still be Seward's Folly to some, but the attacks on Dutch Harbor and occupation of Kiska and Attu served as grim reminders that the U.S. could be attacked from the North Pacific. Of course, the Japanese government had been defeated, but the Union of Soviet Socialist Republics was becoming increasingly expansionist and militaristic in western Europe. Soon after the end of the war, Rumania, Poland and East Germany fell under Communist rule and the domination of Eastern Europe was completed in 1949. In a speech in Fulton, MO, in 1946, former British Prime Minister Winston Churchill coined the phrase "Iron Curtain" to characterize the Soviet stance in Europe. "Iron Curtain" became a catchword symbolizing a threatening, malevolent force. The threat of Communist revolution and takeover in newly emerging former European colonies was sometimes real and sometimes imagined. The watchwords of the day became containment and balance of power. The late 1940's-early 1950's was a time of tremendous tension and happenings of global significance, including the formation of NATO, birth of Palestine and the Korean War. In 1949, the Soviets exploded the atomic bomb and the Communist conquest of China was completed.

In the meantime, plans for the defense of North America and Alaska figured prominently. There were already many installations in place from the overnight buildup during World War II, although most had been deactivated Following a visit to Alaskan military bases in 1947 by General Dwight D. Eisenhower, a major rebuilding of Alaskan Air Command facilities was undertaken. One of AAC's first goals was construction of a permanent Aircraft Control and Warning (AC&W) system. They relied on remnants of the World War II system and there was no overall control of

the system, just localized warnings that would have to be relayed in other ways. The existing air defense system was improved and a new radar system developed. By 1952, the following AC&W sites were operational: Cape Lisburne, Cape Newenham, Cape Romanzof, Tin City, Northeast Cape, Campion, Tatalina, King Salmon, Indian Mt., Sparrevohn, Murphy Dome and Fire Island (near Anchorage). Other sites became operational in later years.

The post-war years saw revamping of the submarine cable network and overland routes, always with increased capacity in the number of voice channels. ACS manual switchboards for commercial needs appeared in Glennallen, Tok, Delta Junction, Fairbanks, Anchorage, Juneau and Ketchikan. In the grip of the Cold War, plans were begun as early as 1947 for a system to defend against over-the-pole attack from the Soviet Union. Construction of added AC&W and ACS sites took place during the late 1940's and early 1950's. The foes of severe weather conditions and primitive living conditions were commonplace. A member of the First Communications Squadron, Griffis AFB, wrote in his diary:

> "The team has been living in tents with mud up to our knees, working 12 to 14 hours a day, and eating B rations [canned food]. We had to haul the radar equipment seven miles over dangerous mountain roads to the tower. There were times we had to walk up the mountain due to lack of transportation....We have worked in snow, sleet and fog until we were either soaked to the skin or our hands got so cold that we could hardly work. Many times the team returned from their work too late for chow and had to eat peanut butter and jelly sandwiches" (Cloe and Monaghan 1984: 167).

In 1948, experiments had begun to ascertain which type of communications would benefit Alaska and the AC&W system. The Distant Early Warning (DEW-line) system was also on the drawing board, and would be constructed beginning in 1952, with the Barter Island finished first as the "trial balloon." Initial experimentation showed that using VHF, reliable voice communications could be obtained for distances of up to 200 miles. Thus, the decision was made by the Air Force to incorporate this new system and pre-existing microwave technology. It soon became apparent that VHF had problems. The AC&W radar jammed VHF signals, and it was the AC&W stations that the new system was supposed to support. This frustration led to formation of the Alaska Communications Study group in 1954, comprised of government representatives whose task it was to come up with better idea. This group, in turn, asked the Bell System to recommend an economic way to create a communications system for Alaska. The demands placed on such a system would be large. It had to span long distances in inaccessible areas. It had to be dependable despite frequent storms, long winters, intense cold, wind and heat; and the disturbance of the Northern Lights. Because the system was to function for the military and civilian sectors, it had to have the ability to carry many voice and telegraph channels simultaneously. Bell recommended to the Defense Department the construction of a relatively new system, the forward propagation tropospheric scatter system. Because of the tremendous cost involved in constructing and managing a remote tropo site, more traditional, smaller and manageable microwave facilities would be used where possible. These would be constructed along the road system every 50 miles or so. This recommendation was accepted by the Air Force and Western Electric Company

(WECO) was awarded the contract in 1955. The U.S. Army Corps of Engineers, Alaska District, selected and surveyed all original WACS sites, handled all contracting and constructed 11 of the original 31. The saga of surveying the sites is a story in itself. Consider the one fact that experimental transmission towers had to be set up at each potential WACS site during the winter months and that the tower and accompanying equipment weighed 14 tons. WECO constructed 20 stations and installed the electronics equipment in all White Alice installations.

There are two stories concerning the origin of the name "White Alice". The first is that Alice was an acronym for Alaska Integrated Communications Enterprise (Baker 1987). Because the code name had to consist of two words, White was selected because it seemed appropriate to for long Alaskan winters. However, Alice White turned out to be the name of a silent screen actress. Rather than scrap the name, the two words were transposed. "White Alice" seemed more suitable. Another story simply maintains that the Air Force chose White Alice for no particular reason and that it was not an acronym for anything. The association with snow, ice and white has made White Alice a memorable name--one easily associated with remote mountain tops and man-made structures framed in ice and snow.

White Alice successfully linked AC&W sites and DEW-line sites into a cohesive network, and relayed communications back to Elmendorf AFB and Eielson AFB. Additionally, two routes linked the Ballistic Missile Early Warning Site (BMEWS) at Clear AFB to NORAD headquarters in Colorado. The cost of the system was formidable. The estimated cost to build it was 38 million dollars. However, the first phase of construction actually cost 3 and 1/2 times that, or 113 million dollars. The government estimate for construction os Sitkinak, for example, was $755,711. When the District Engineer opened the bid packages, he was amazed to find the lowest bid was $943,000. The other bids were over $1,000,000. A negotiated price of $3,000,000 for the North River (Unalakleet) station set the precedent for future cost estimates (Alaskan Air Command 1956a, 1956b; WECO 1957). The combination of tightening budgets, spiralling costs, the threat of a steel strike, and the severity of the 1956-57 winter delayed completion of the original network from 1957 to March 1959.

1962 additions to the system--BMEWS, Stretchout--drove the cost up to an unheard of 300 million dollars. This incredible leap in cost was due to many factors. For example, WECO had assumed that remote tropo sites would require six station attendants and one 25 KW generator. In reality, 20 people and a 120 to 180 KW generator were required. When asked about the initial project's enormous cost, the commander of the Alaskan Air Command, Brigadier General K.H. Gibson, was quoted as saying: "Americans are great believers in insurance, and White Alice is a blue chip policy" (Roche N.D.).

As with previous communications projects, building White Alice was a monumental task:

> "Despite deep snow and sub-zero cold, the job had to start at once if tight schedules were to be kept. The first task was to select the sites..Some were easy to reach. Most were atop mountains far from

> civilization. Siting and testing parties got there by dogsled, by tractor, by helicopter and by shoe leather...Trips to mountain tops through the clutching snow and the howling wind had to be repeated--and repeated...Fourteen tons of equipment were required to erect a 50-foot temporary tower at each site...On numerous occasions, the men were forced to surrender before the onslaught of cold, wind and snow and were immobilized for days, even weeks. This ordeal of waiting was of times made doubly galling by the knowledge that supplies and parts needed for the job were only a few miles distant but inaccessible because the white wall of winter had become impenetrable" (Western Electric Company N.D.).

At its height, in the early 60s, WACS contained 1 1/2 million miles of circuitry--enough wire to encircle the globe 57 times. It was an example of the latest and most sophisticated telecommunications technology in the world, combining, as it did, conventional microwave with new forward propagation tropospheric scatter. Yet, even before the original 33 stations had been completed, a new technology appeared which would soon render WACS obsolete. On 4 October 1957, the Soviet Union launched Sputnik, the first man-made satellite. Ironically, it was not until 26 March 1958 that the original White Alice system was dedicated on Elmendorf AFB. If Sputnik was the first nail in the coffin, Telstar, the first experimental communications satellite, launched in 1962, was the penultimate. The launching of the first viable communications satellite, SATCOM, in 1973, was the last.

In 1967, Congress passed Public Law 90-135. "Alaska Communications Disposal Act," for the purpose of transferring U.S. government-owned long-haul communications facilities in Alaska. Since the early days of WAMCATS, the military had provided long-distance communications for the entire state. This era came to an end. Bids were solicited in 1968 for taking over WACS. The following year, RCA established RCA Alaska Communications, Inc.(now ALASCOM) and became the successful bidder. In 1970, the Public Utilities Commission granted authority to Alascom for takeover of the system and the U.S. Army Corps of Engineers handled all real estate transfers (see Baker 1987). This extremely complicated process took 13 years, and included several lease arrangements and negotiations, notably sale of the BMEWS A Route prior to final approval of the sale. (see Baker 1987 for a detailed account of the WACS sale). With the advent of communications satellites in 1973, the tropo stations were simply out of date, although the TD-2 stations continue to provide necessary system redundancy. Because the Air Force had not intended WACS to fulfill all communications needs in Alaska, and perhaps because Sputnik and Telstar spelled doom for the system, WACS was not upgraded or refurbished to compete with such a rapidly changing technology. During the 1970's, solid state electronics and satellites became commonplace, while White Alice continued on a slower trajectory using klystron vacuum tubes. White Alice will be remembered as the project that "..served the nation's defense and..let Alaska speak" (Western Electric Company N.D.). WACS' technology revolutionized telecommunications in the 1950's only to be as greatly eclipsed in less than a generation's time by an equally revolutionary technology.

Today, in the late-1980's, satellite technology is commonplace. New developments will inevitably improve and replace what we currently take for granted. For example, fiber optic cables with almost limitless voice capabilities are being tested and are replacing underwater wire cables. More amazing is Project Meteorburst, already in limited use in some parts of Alaska by the Federal government. Instead of bouncing a signal off the troposphere, a unique idea 35 years ago, the signal is deflected from the trails of passing meteors and beamed with high accuracy to the receiving antenna. Without the original concept that went into the WACS tropospheric scatter system, Meteorburst might still be years in the future.

DESCRIPTION OF THE SYSTEM

The White Alice Communications System (WACS) in Alaska was built in various phases, eventually consisting of 71 separate facilities. Components of the system were far flung, ranging from Cape Lisburne, on the North Slope of Alaska, in the north; to Northeast Cape, on Saint Lawrence Island, Bering Strait, in the west; to Shemya, near the end of the Aleutian Chain, in the southwest; to Smuggler Cove, in the Alexander Archipelago, in the southeast; to Beaver Creek, near the Canadian border to the east. Components of such a vast system were naturally located in a variety of local environments and extremes of all kinds were the rule, not the exception. Local environment was one of the few parameters which allowed for any variation in design or layout because the installations were utilitarian in nature and all served the same function (see "standard" floor plans at the end of this section). The other two major variables were 1) whether a military facility already existed at the site, and 2) the type of communications used. In many cases, Aircraft Control and Warning (AC&W) sites or Distant Early Warning (DEW-line) installations were already established at a particular location and White Alice equipment was installed as backup communications for the in-place function. In these cases, existing facilities were used. The two different communications types were "tropo" stations and TD-2 microwave stations. Tropo stations, short for forward propagation tropospheric scatter (FPTS), were found in isolated areas and TD-2's were, and still are, found along major road systems. TD-2, in contrast to tropo, does not stand for anything in particular. It is like a car model; "Porsche 911," for example. There were several larger facilities where the two networks overlapped, containing TD-2 microwave towers and tropo antennas. TD-2's and tropos needed different site configurations. They will be described below.

Of the 31 original WACS facilities, 22 were tropo installations. Tropos were, at the time, a dramatic new form of ultra high frequency (UHF) radio able to leap up to 200 miles by bouncing part of their signal off the troposphere. At the transmitting site, telephone conversations and telegraph messages were combined into a single radio signal. A "feed horn" in front of a "billboard" or "movie screen" antenna sprayed the signal against the parabolic antenna surface, which beamed the signal toward the horizon. The small portion that was not lost was deflected downward by the troposphere, about five miles above the earth. Tropo equipment was so sensitive, it could capture one ten-trillionth of the transmitted signal and still make sense of it. The deflected signal was caught by another billboard antenna and, if necessary, amplified and sent on to the next WACS facility. So revolutionary was this technology in 1955, when it was first put into use in Alaska, and elsewhere, that an article written 11 years later identified three alternative hypotheses to explain the tropospheric propagation mechanism (Gunther 1966)

Six of the 31 installations were the more conventional microwave stations; smaller [consisting of a radio relay building and a microwave tower], more accessible and easier to maintain and operate. Three of the facilities

combined tropo and TD-2 microwave antennas together. The original 31 installations are listed in Table 1, below, by type.

The tropo facilities tended to be much larger than the microwave installations and were often located near AC&W sites. When a WACS site was located at the same site as another military site, it was called a "colocated" facility because dorms, mess, auto maintenance shops, and other buildings were usually shared instead of constructing new ones. Of the 31 original sites, 14 were colocated. These are indicated by an asterisk in Table 1.

It took the U.S. Army Corps of Engineers, Alaska District, and the Western Electric Company (WECO), three years to build the original WACS system for the Air Force. The original contract had been for 30 million dollars, but, due to several cost overruns, the project cost on the order of 113 million dollars. The next segment of WACS to be constructed was a series of TD-2 microwave installations to support the Ballistic Missile Early

TABLE ONE
THE ORIGINAL WHITE ALICE SYSTEM

Tropo		Micro	Tropo/micro
Aniak	*Kotzebue	Clam Gulch	Neklasson Lake
Anvil Mt.	*Cape Lisburne	Naptowne	*Diamond Ridge
Bear Creek	*Middleton Island	Rabbit Creek	Pedro Dome
*Bethel	*Cape Newenham	R1-N	
Big Mt.	*North River	Soldotna	
Boswell Bay	*Northeast Cape	Starisky Creek	
*Fort Yukon	Pillar Mountain		
Granite Mt.	*Cape Romanzof		
*Indian Mt..	*Sparrevohn		
Kalakaket Cr.	*Tatalina		
*King Salmon	*Tin City		

Warning System (BMEWS) at Clear Air Force Base. This phase of White Alice provided a dual communications route to the "Lower 48", one going down the southeast coast (the A Route) to the Ketchikan-Seattle submarine cable, and the other, going east to the Canadian border (B Route) through Canada, down to the lower 48. The ultimate destination of both routes was NORAD in Colorado. Because of this, they were also called the Rearward Communications system. These stations are listed in Table 2, on the next page.

TABLE TWO
THE BMEWS NETWORK

A Route		B Route
Aurora	McCallum	Beaver Creek
Black Rapids	Murphy Dome	Canyon Creek
Boswell Bay	Neklasson Lake	Cathedral
Cape Yakataga	Ocean Cape	Delta Junction
Clear	Paxson	Gerstle River
Donnelly Dome	Pedro Dome	Gold King Creek
Duncan Canal	Sawmill	Knob Ridge
Glennallen	Sheep Mt.	Tok Junction
Harding Lake	Smuggler Cove	
Hoonah	Tahneta Pass	
	Tolsona	

From this list, it is obvious that there is some overlap with the original system. This is because many sites had more than one function, or began with one specific function and added others. Such added functions are called "overbuilds" and denote an addition of certain communications capabilities, rather than a change in site configuration.

Project Stretchout, the next phase, was begun in 1959 and finished in the mid-1960's. This project extended the DEW line system down through the Alaska Peninsula and the Aleutian Chain. WACS capabilities were added on to the installations listed below, in Table 3.

TABLE THREE
PROJECT STRETCHOUT

Cape Sarichef	Nikolski
Cold Bay	Port Heiden
Driftwood Bay	Port Moller

Additionally, King Salmon WACS was overbuilt to include DEW-line capabilities. The Cold Bay facility functioned as the hub for this segment of the WACS. The last major buildup was project Bluegrass which provided an extension to Adak and Shemya. Also added at this time were Alaska Telephone Switching Station (ATSS-4A) capabilities to Big Mountain, Kalakaket Creek, Pedro Dome and Neklasson Lake. These four installations were hubs for the entire network because their circuitry was diversified--if one facility malfunctioned, the other three could communicate. These four facilities varied in layout and function. "Nek" Lake and Pedro Dome combined tropo and microwave functions. "Kal" Creek, while basically tropo, initially had a microwave link to Campion. Big Mt. was strictly tropo. Operation Bluegrass also added a 50 kw tropo shot from Fort Yukon to Barter Island, thus tying the north coast DEW-line into the main WACS system. Fort Yukon, as well as Adak, Nikolski, and Shemya

WACS were the four installations to have 120 foot billboard antennas. This was because of the difficult terrain and long distances, or "hops," to be travelled along the Aleutian Chain and from the Interior, over the Brooks Range, to the north coast.

WACS microwave capabilities were added at pre-existing locations in the mid 60's. These were on the active Air Force bases of Campion, Eielson, Elmendorf and Galena. These consisted of WACS rented office space in existing buildings on Air Force installations. They received signals from other microwave and tropo stations and provided telephone service to the base.

There were two other facilities, at Cape Chiniak and Sitkinak, both in the Kodiak archipelago. These installations were intended for use as WACS facilities, although Cape Chiniak was previously designed as an AC&W site. Technology was developing so rapidly during the 1950's that these two installations were rendered obsolete by project Stretchout even before they opened. Thus, Sitkinak was never finished and Cape Chiniak later became a Pacific Range Tracking Site.

Documentation on the White Alice system is voluminous. Below are descriptions of two representative WACS sites Similar documentation is available for most, but not all, of the 71 facilities. Included throughout this report are representative as-built drawings and photographs of both the tropo and the TD-2 type stations. An example of a large WACS facility with both tropo and microwave antennas is Pedro Dome:

> "The station consists of a 15,024 sf communication center, auto maintenance shop, a water fire pump station, a small warehouse, and diesel and mo-gas storage tanks. The communication center was built in 1957, and most of the other improvements were also built in 1957.
>
> "The Communications Center and Attached Power Plant Room together with the dormitory wing contains a total floor area of 15,024 sf. The building is "T" shaped, with the top of the"T" containing the power and equipment room that measures 40' x 256', m/l {measured length}, and the base of the "T" being the dormitory, kitchen area and dining room measuring 35' x 134', m/l. In addition there is a 20' x 35' warehouse addition and a 6' x 20' addition off the kitchen. The building has a concrete foundation with a concrete slab floor, frame insulated walls with asbestos shingle siding, and a flat, built-up, hot tar roof with aluminum flashing and galvanized sheet metal scuppers. The building is heated with American Standard, oil-fired, hot water boilers, 346 MBH, that provides forced air heat to the building.
>
> "The dormitory wing has a dining room, kitchen, walk-in cooler and freezer, storage room, laundry room, community bathroom, boiler room and ten dormitory rooms.
>
> "The dining room has asbestos tile floor, sheetrock walls with hardboard wainscot, acoustical tile ceiling, incandescent lights, and double hung metal windows with storm sash.

"The kitchen has asbestos floor, painted hardboard walls and ceiling, and stainless steel cabinets, counters and dishwasher. The station uses the walk-in cooler, but the walk-in freezer is not in operation. "The bathroom has asbestos tile floor, sheetrock walls and ceiling and contains 10 white fixtures, including 3 sinks, 2 urinals, 3 toilets and 2 showers.

"The dormitory rooms have asbestos tile floors, hardboard walls and ceiling and double hung metal windows with storm sash.
"The boiler room has painted concrete floor, hardboard walls and ceiling and contains the oil-fired hot water boilers that heat the entire building.

"The main equipment wing of the building has an asbestos tile floor, and hardboard walls and ceiling. It has double hung metal windows with storm sash. Off the equipment wing is a warehouse annex, the exterior walls and roof being corrugated fiberglass. It interior finish is similar to the equipment wing.

"The power plant room has painted concrete floors, hardboard walls and ceiling, and double hung metal windows with storm sash. This room houses four Chicago Pneumatic 6-cylinder diesel engines with 150 KW GE generators.

"This building is 21 years old {in 1978}, well maintained and shows little deferred maintenance.

"The Auto Maintenance Shop measures 41' x 51', m/l , for a total floor area of 2,050 sf. This building has a concrete foundation with a concrete slab floor. it is a steel, I-beam constructed building with insulated corrugated aluminum walls and roof. The interior has painted plywood walls and ceiling. Embedded in the floor are six steel strips for track vehicles. The building is heated with a National-US Radiator boiler, oil-fired, 486,000 BTU, with an enclosed antifreeze system, to six suspended heaters. The boiler room is lined with sheet asbestos on the walls and ceiling. This building has an overhead crane and two truck doors measuring 14' x 16' and 12' x 14', both chain operated. This building is 14 years old, in good condition and shows little deferred maintenance {in 1978}.

"The Water Fire Pump Station Building measures 13' x 17', m/l , for a total floor area of 228 sf. It has a concrete foundation and concrete floor, woodframe construction with asbestos shake siding and flat built-up hot tar roof. It has insulated walls lined with hardboard wainscot and ceiling. This building houses a 6-cylinder Continental gas engine to operate the fire pump. It is heated with a 10 KW electric heater. It has double solid core wood exterior doors.

"Adjacent to this building is an insulated water storage tank with a capacity of 216,000 gallons. These facilities are in good condition and show little deferred maintenance.

"The Quonset-type Warehouse Building measures 15' x 22', m/l , for a total area of 330 sf (the computer printout shows 594 sf). This building has steel frame with hardboard exterior and interior with a wood floor and a sliding wood access door. It is wired for light. The building is in poor condition.

"The Water Pumphouse Building is located near the base of Pedro Dome and houses the water well and diesel engine that pumps the water up the hill to the station. This building measures 12' x 12', m/l , for a total area of 144 sf. It has a concrete foundation and floor, corrugated steel siding and a flat built-up roof with double metal doors and insulated walls and ceiling lined with hardboard. This building has suffered some vandalism, and at the time of inspection (1978) was in fair condition.

"The station has two above ground diesel storage tanks with a capacity of 470 barrels. There is also a 1,000 gallon mo-gas tank with dispenser. The vehicle parking lot is 220 sq. yds. The station is not fenced" (Follett and Associates 1978: 205-207).

Beyond these improvements, tropo stations are practically defined by their huge billboard antennas. There were three sizes of antennas. The smallest was the 30' circular dish. The mammoth 60' and 120' antennas were "billboard" or "movie screen" shaped. Photographs of all types are found at theback of this report. While they may have appeared flat at first glance, they were actually parabolic. The 30' antennas operated at 1 KW, and the 60' and 120' antennas operated at 10 KW and 50 KW, respectively. In front of each antenna was a "feedhorn" which directed the signal onto the antenna where it was then projected out and up. Tropo antennas were always found in pairs and sited slightly one behind the other. This was because the altitude of the troposphere varies, and depending on the position of the bottommost layer, either one transmitter or the other, depending in turn on its distance relative to the receiving antenna, would carry the signal more effectively than the other at a given time. A single 60' antenna weighed 15 tons.

The TD-2 microwave facilities were much smaller and are simpler to describe. Most generally consisted of one power and equipment building and one microwave tower topped by 'cornucopia' shaped antennas. The towers beamed telephone and telegraph signals by line of sight. Each tower was constructed only as high as necessary to see the station antennas adjacent to it in the network. To ensure the two antennas were of compatible height, they were suspended from helicopters until the signal beamed from one to the other. Only then were the cornucopia antennas placed on the towers. The following extract describes the improvements at the Rabbit Creek Radio Relay Station:

"The station consists of a one-story, steel frame, concrete block building that measures 24' x 51', m/l (measured length), for a total area of 1,246 sf. It was built in 1957. Other facilities include one diesel storage tank with a pipeline to the diesel powered standby generator, a sanitary latrine, chain line fence and vehicle parking.

"The Radio Relay Building is steel frame, concrete block, with concrete foundation and concrete slab floor. Steel truss girders support the corrugated steel roofing over 2" x 6" T & G fir. The walls are 14' to the eaves. The building has solid core wood exterior and interior doors with good quality hardware. It is heated with a McPhearson oil-fired furnace, 110,000 BTU, that provides forced air heat to the building. The building has no plumbing and no windows.

"The radio equipment room has painted concrete floor, painted concrete walls and is open to the under side of the steel truss girders and roof.

"The standby emergency power room has a painted concrete floor, painted concrete block walls, and is open to the roof. This room houses a 2-cylinder General Motors diesel engine, with 20 KW Delco generator.

"The site has one diesel storage tank with 100 barrel capacity, a 213 sq. yd. vehicle parking lot, and is fenced with 543 lineal feet of 8' chain link fence with 3 barb wires.

"Sanitary facilities are provided by a 16 sf plywood outhouse.

This station was built in 1957, is in good condition inside and out, has been well maintained and shows little deferred maintenance" (Follett and Associates 1978: 230).

The Rabbit Creek facility is an active repeater station as shown in photo 1 of the Historic American Engineering Record photographs following this description. After the photographs is a set of representative as-built drawings of radio relay stations. The ones included in this report are from the Sawmill and Cathedral facilities because the Rabbit Creek as-built file is too incomplete to give a good picture of how it works. The as-built drawings are followed by a site plan and floor plan of the Rabbit Creek installation.

An active repeater of the Rabbit Creek, Cathedral, and Sawmill type amplifies a microwave signal and sends it on to the next station. A passive repeater, on the other hand, has no active parts and is merely a billboard which functions as an optically aligned reflector, much as a mirror reflects a beam of light. It deflects its signal off of a series of such billboards to its final destination. In southcentral Alaska, a passive repeater system functions between Anchorage and Seward. A passive billboard is prominent as one drives south along the Seward Highway, leaving Anchorage. One can be seen across Turnagain Arm on Penguin Peak. The Rabbit Creek station, however, is more complex than this system.

Microwave signals are received at the Rabbit Creek facility from the Anchorage toll center near Elmendorf Air Force Base and from Naptowne, another repeater station, on the Kenai Peninsula. When Rabbit Creek was first opened, signals were received from R1-N. All of these installations were part of the WACS and the Anchorage toll center was the Anchorage ACS. The microwave signal enters one of two cornucopia antennas (shown in

photos 2 and 3) which sit on top of the 53 foot TD-2 microwave tower. One cornucopia faces Naptowne and the other faces the Anchorage toll center. The signals travel down waveguides, entering the radio relay building (photos 4 and 5). Straight sections of waveguides are constructed of copper while curved sections are coated with dense rubber, with copper inside. Note in these photos that there are four waveguides which converge about 10 feet above the ground as they leave the tower and enter the building. This is because two go to each cornucopia and one receives the signal, while the other transmits it. Photo 6 shows the waveguides after entering the radio relay building. The two which bend immediately toward the back of the top of the photo connect to Naptowne while the two running across the top of the photo connect to the Anchorage toll radio. Photo 7 is a close up of the Anchorage toll center radio. One can clearly see the waveguide terminals. The one on the left is the receiver and the one on the right is the transmitter. After the signal is received it is amplified and then goes through a process of filtering and mixing. It then goes through to the transmitter, passing through a transmodulator and several transamplifiers before ascending the waveguide and leaving the building. Photo 8 is a view down the same bay shown in photos 6 and 7. It shows, on the left, from the front to the back of the photo, a new alarm system, storage locker, Anchorage toll TD-2 receiver and transmitter, a test banks, and the original VHF communications radio which functions to provide service channels to Naptowne. Coming back along the wall is the cooling system for the equipment, a storage cabinet, the Naptowne TD-2 receiver and transmitter, the air supply for the waveguide apparatus,and another storage cabinet. On the sketch plan, note that the two transmitter/receivers each have a cabinet labelled "protect." Each "protect" cabinet contains a duplicate transmitter/receiver complex. Both carry the same traffic, but if there is a problem with one, the other is switched into action from the Soldotna WACS or from the Anchorage Toll Center. The Naptowne WACS, identical to the Rabbit Creek facility, does not have this switching capability. The corridor described above is the heart of the radio relay station.

The equipment in the corridor closer to the door provides power to the office. Photo 9 shows, from right to left (front to back), the AC power panel, a 24 volt volt rectifier and a converter/rectifier which converts AC current to DC current, a 24/48 volt DC-DC converter, a fuse panel and two 12 volt rectifiers. The rectifiers are connected to the 12 volt batteries in the left half of the photo. Photo 10 shows a bank of 24 volt batteries used for back up power. they are connected to the 24/48 volt DC-DC converter. Photo 11 shows the fuse panel next to the door. If a fuse fails, the worker on duty simply matches it to the one on the panel, removes it and replaces it with the correct fuse. Photo 12, the 20 Kw generator (the original one) is located in the emergency power room, adjacent to the radio equipment room. If all else fails, the generator can run the station for several hours. It is serviced twice a month.

What follows are brief descriptions for all 71 WACS facilities. The BMEWS facilities are presented in tabular form because they are so similar. In some instances, particularly tower height or distance to the next station, data are not available. This may be because the data were never recorded for that particular facility, the data have been lost, or the data have

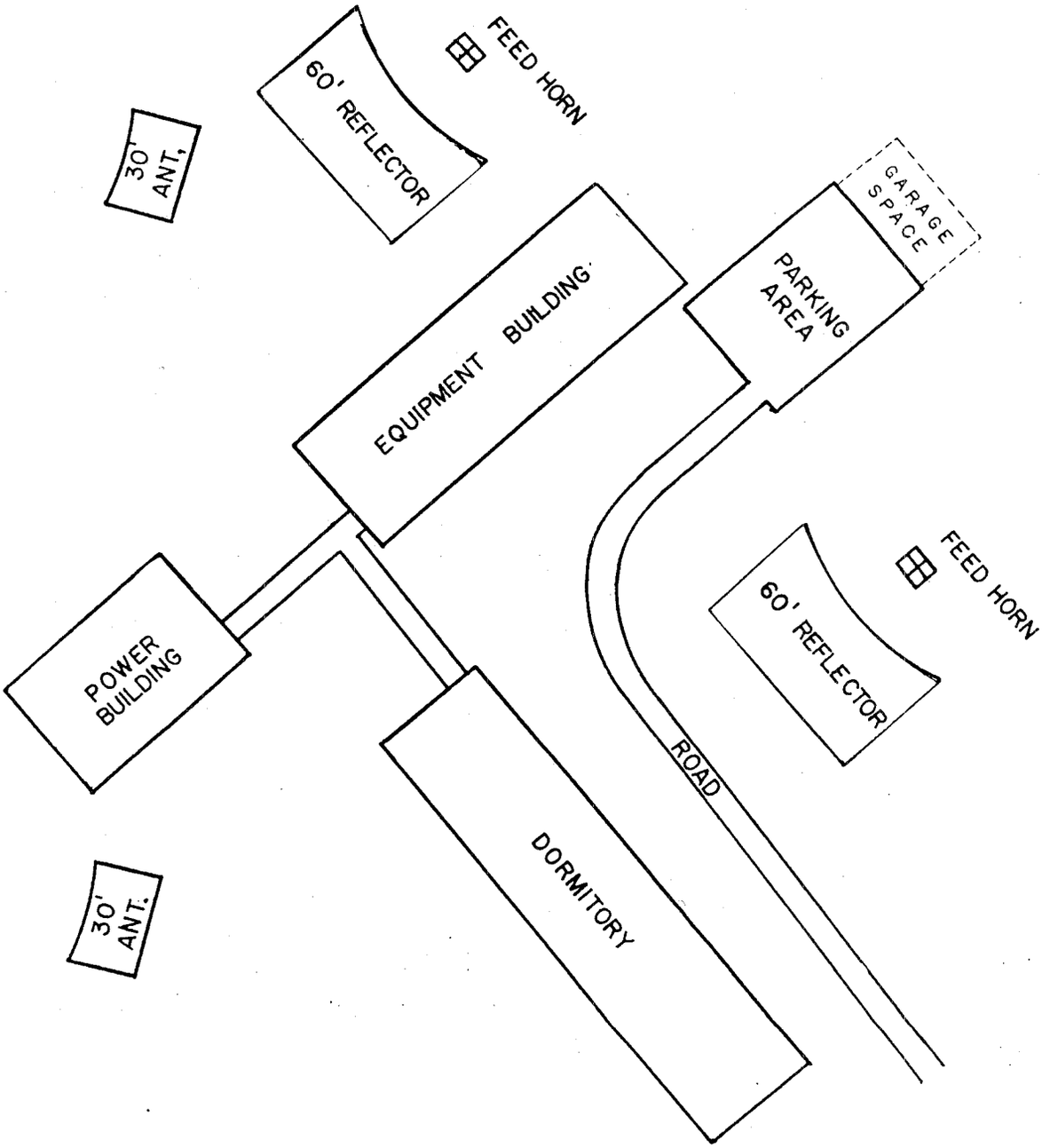
not yet been retrieved from the tremendous amount of archival material available. Archival material, mostly as-built drawings, measures in the 1000's of cubic feet.

Installations are listed by phase of construction (original, BMEWS, Stretchout, Bluegrass, and later additions) and within this category, they are listed alphabetically. Included are as-built drawings and photographs of various installations which are referenced in text and immediately follow it. In referring to communications antennas, the following standardizations are assumed and not always stated. Tropo antennas occur in pairs; 60 and 120 foot antennas are of the billboard shape, while 30 foot antennas are circular; all are parabolic; TD-2 microwave towers occur singly, but have paths to two or more destinations as indicated.

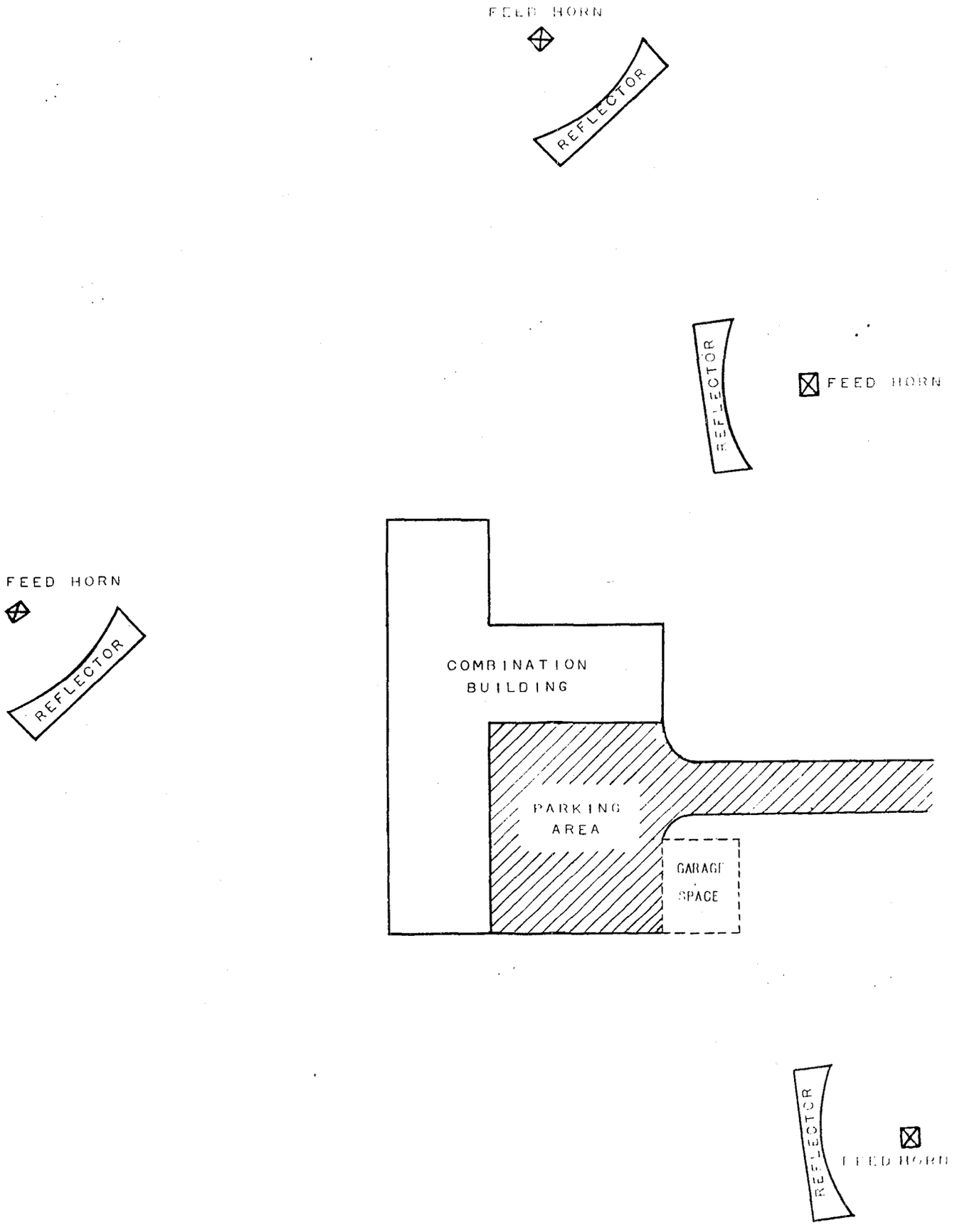
INDEX TO "STANDARD" PLOT AND FLOOR PLANS

1. Typical plot plan, separate buildings (FPTS station).
2. Typical plot plan, combined building (FPTS station).
3. Typical plot plan, TD-2.
4. Typical floor plans, communication and power buildings.
5. Typical floor plan--dormitory, elevation A.

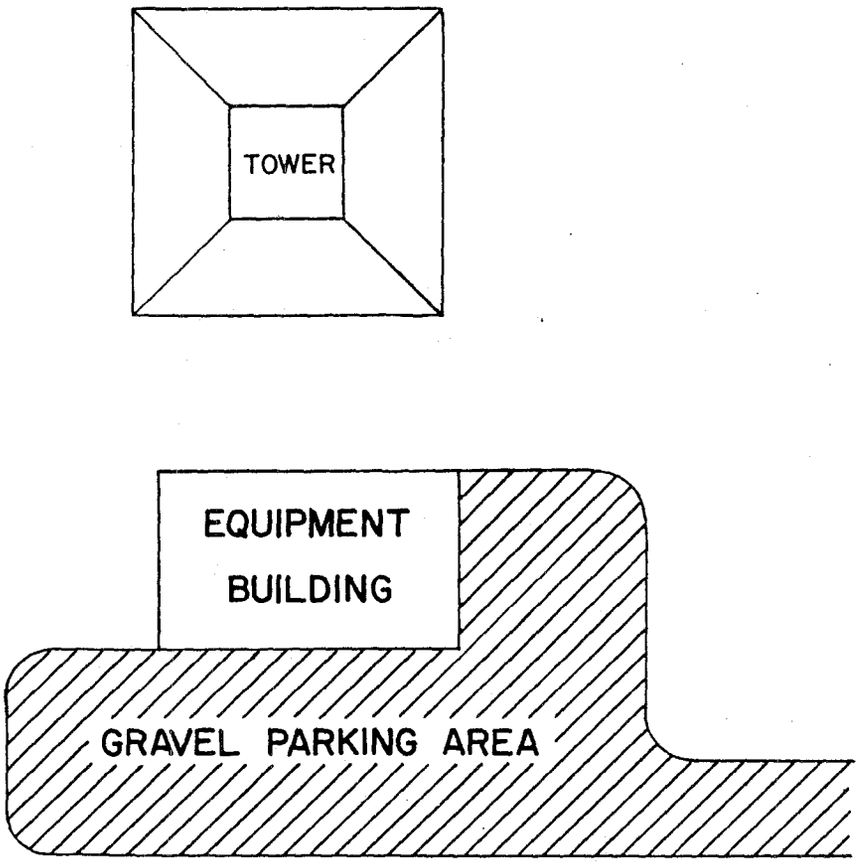
Source: Western Electric Company, 1958, The White Alice Network Plan of Operation (2 Vols.). New York: Defense Projects Division, Western Electric Co.



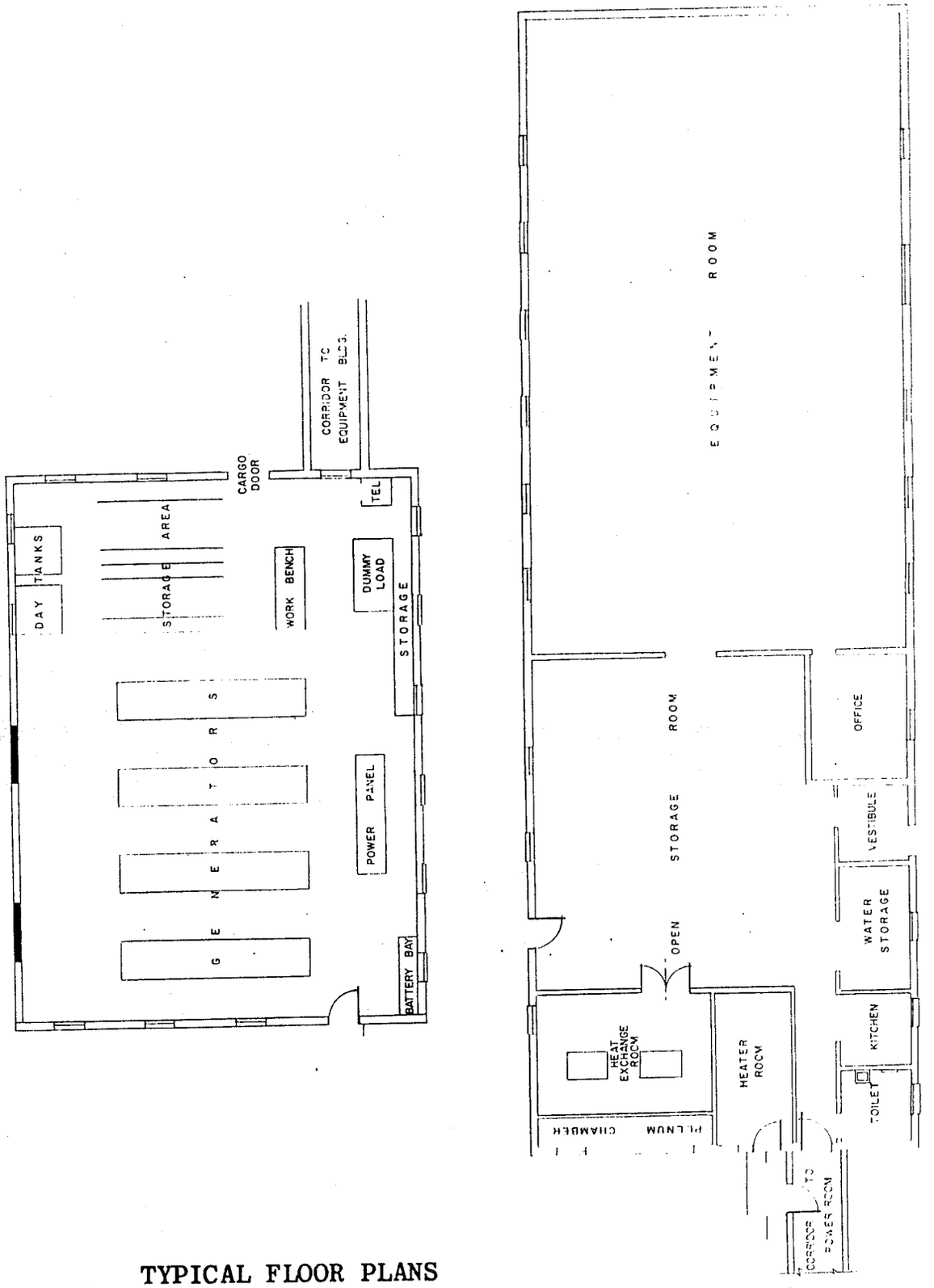
TYPICAL PLOT PLAN
SEPARATE BUILDINGS



TYPICAL PLOT PLAN
COMBINED BUILDING

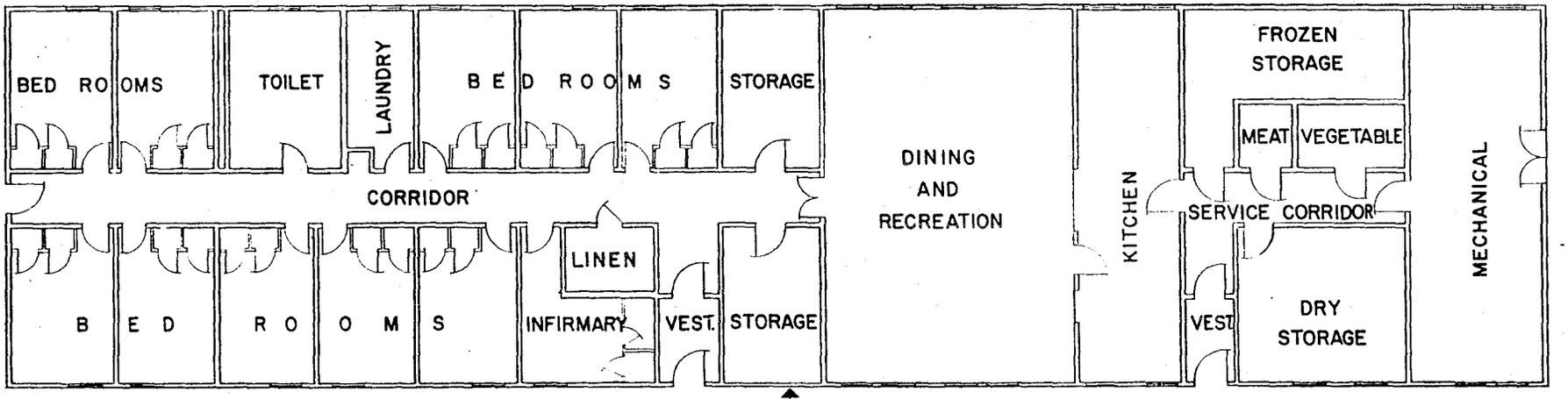


TYPICAL PLOT PLAN
TD-2

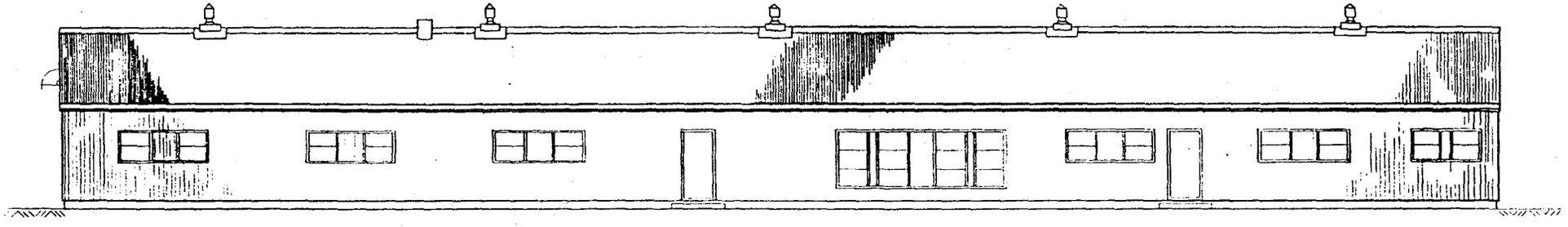


TYPICAL FLOOR PLANS

COMMUNICATION AND POWER BUILDINGS



ELEVATION A
FLOOR PLAN



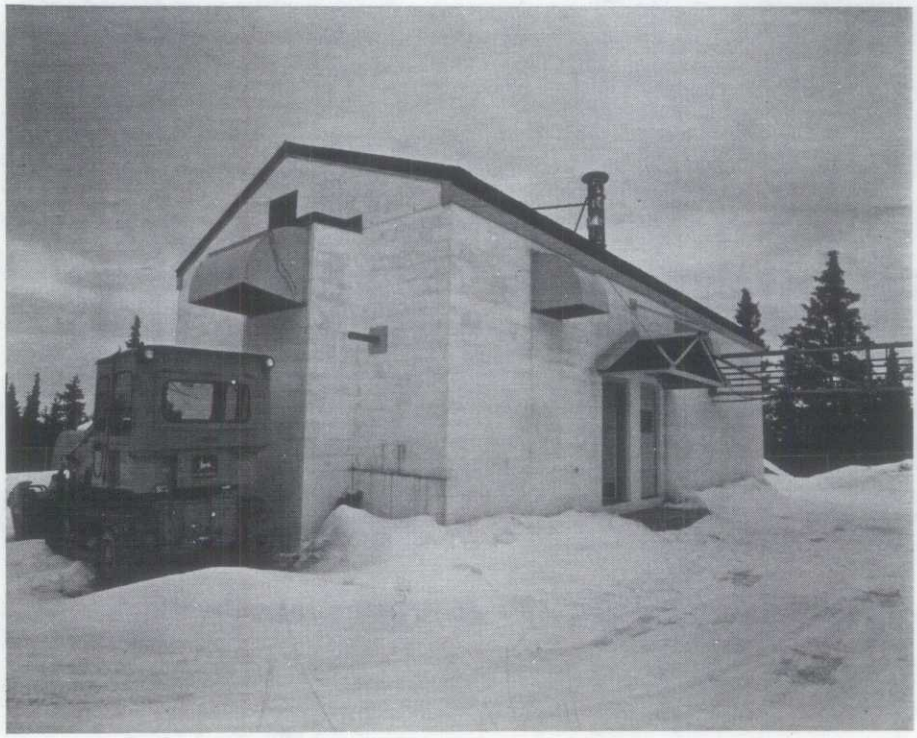
ELEVATION A

TYPICAL FLOOR PLAN — DORMITORY

INDEX TO HISTORIC AMERICAN ENGINEERING RECORD PHOTOGRAPHS
RABBIT CREEK RADIO RELAY STATION

1. Radio relay building, view to northwest. Note entrance of waveguides into building.
2. Radio relay building, view to southeast showing TD-2 tower. Cornucopia in front faces Anchorage toll center.
3. View to northwest of TD-2 tower. Cornucopia in front of picture faces Naptowne.
4. Connection of waveguides to TD-2 tower.
5. Entry of waveguides into radio relay building.
6. Waveguides as they enter radio relay building.
7. Anchorage toll center receiver/transmitter.
8. Bay showing VHF voice communications, transmitters/receivers, etc.
9. Bay showing equipment which powers the station.
10. Backup power supply.
11. Backup fuse panel.
12. 20 kw generator.

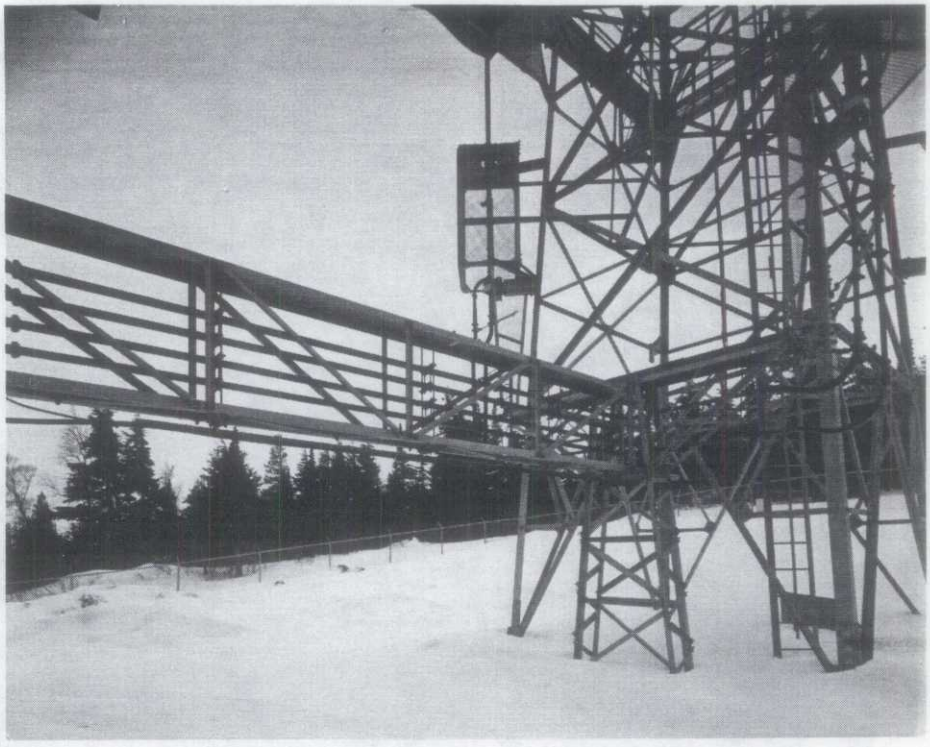
Photographed by James E. Stuhler.



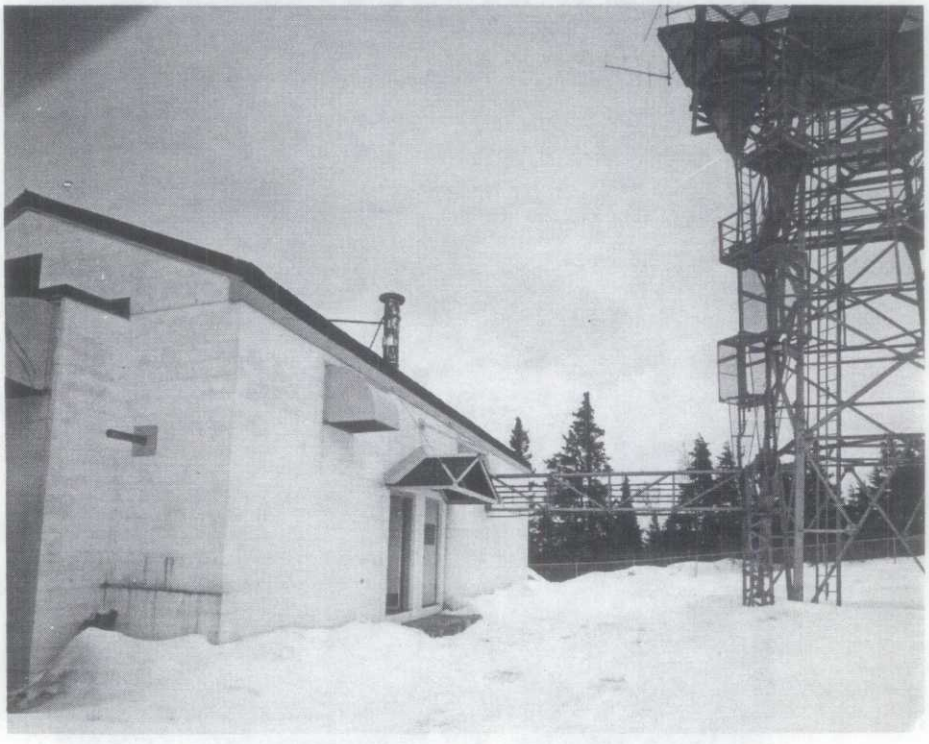
1. Radio relay building, view to northwest.

2. Radio relay building, view to southeast, showing TD-2 tower.

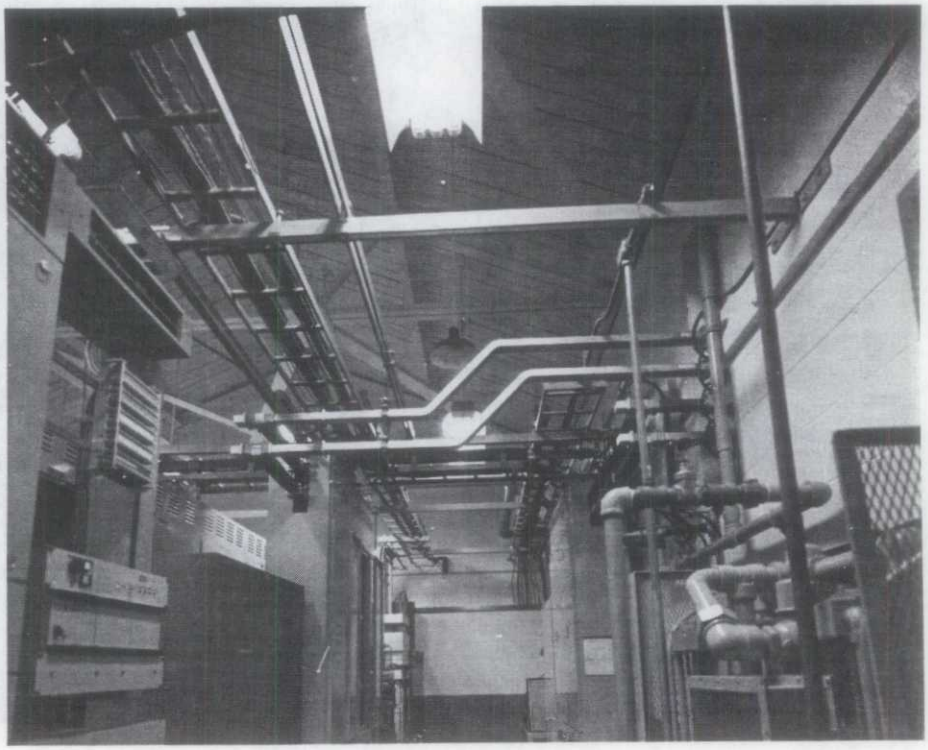
3. View to northwest with TD-2 tower.



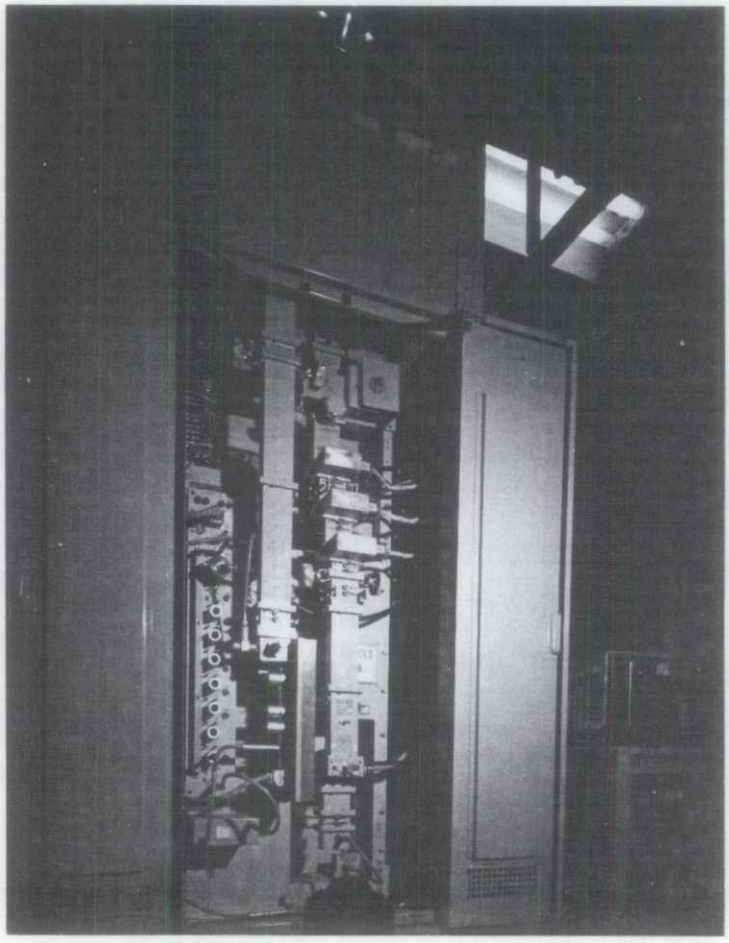
4. Connection of waveguides to TD-2 tower.



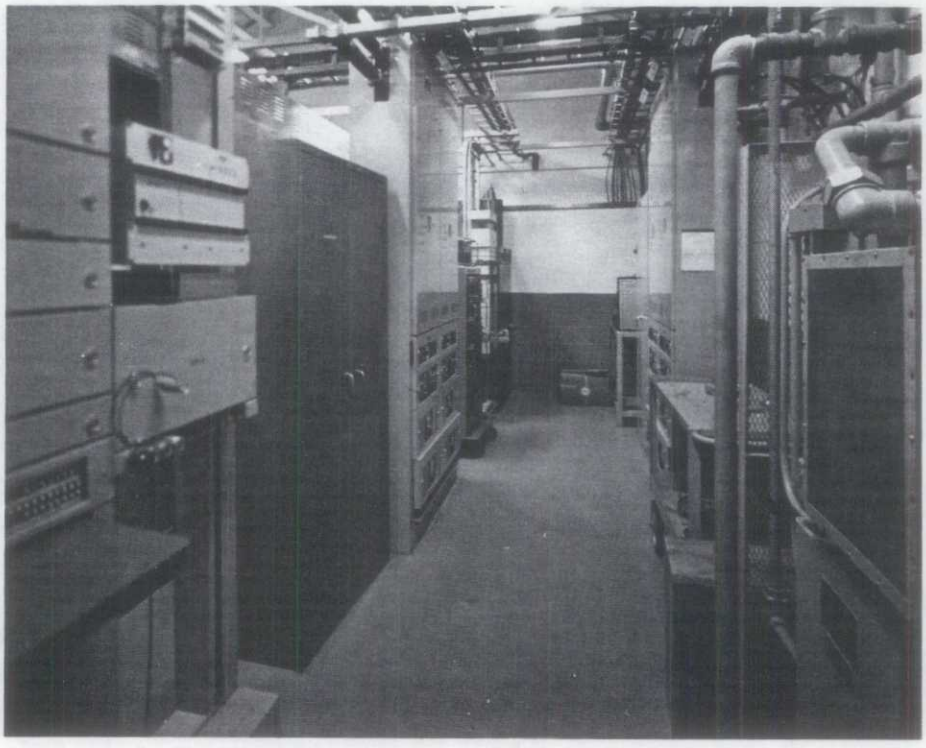
5. Entry of waveguides into building.



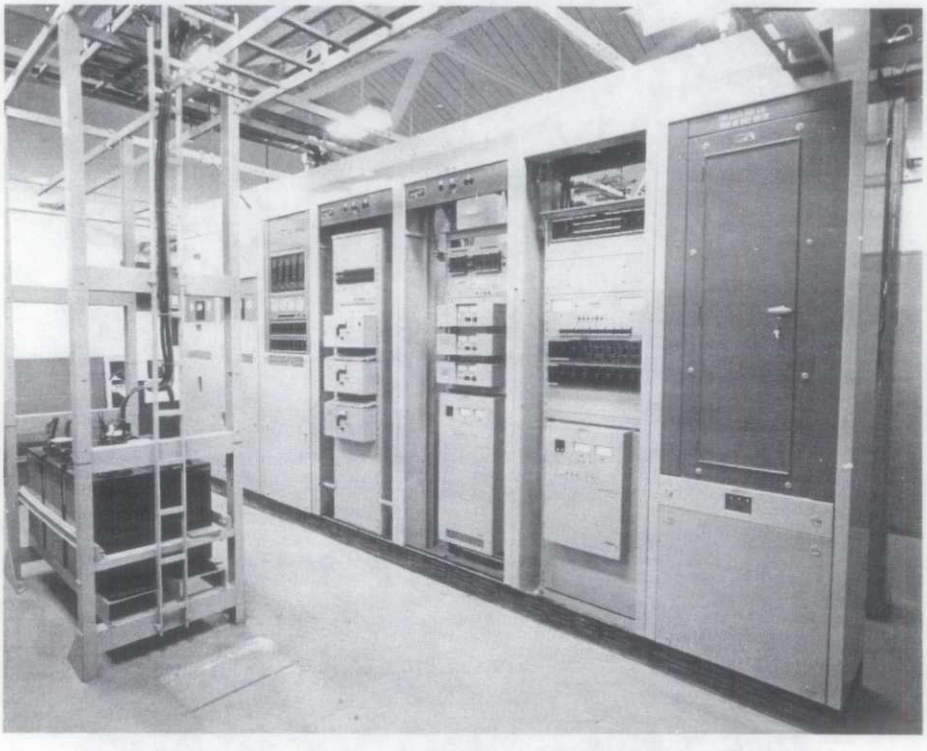
6. Waveguides as they enter the building.



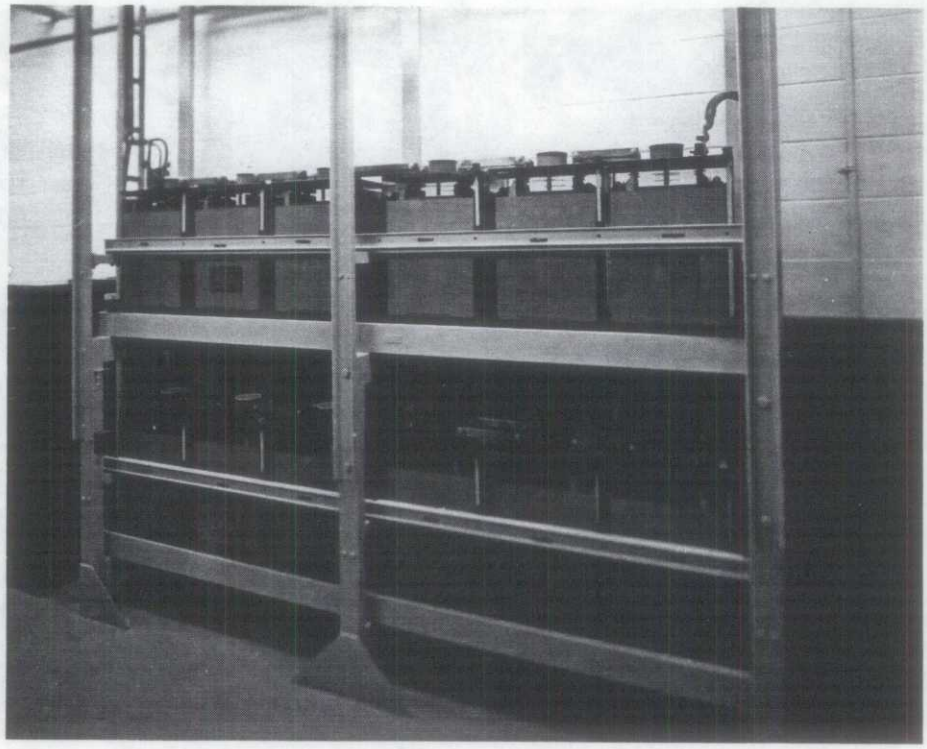
7. Anchorage toll center receiver/transmitter.



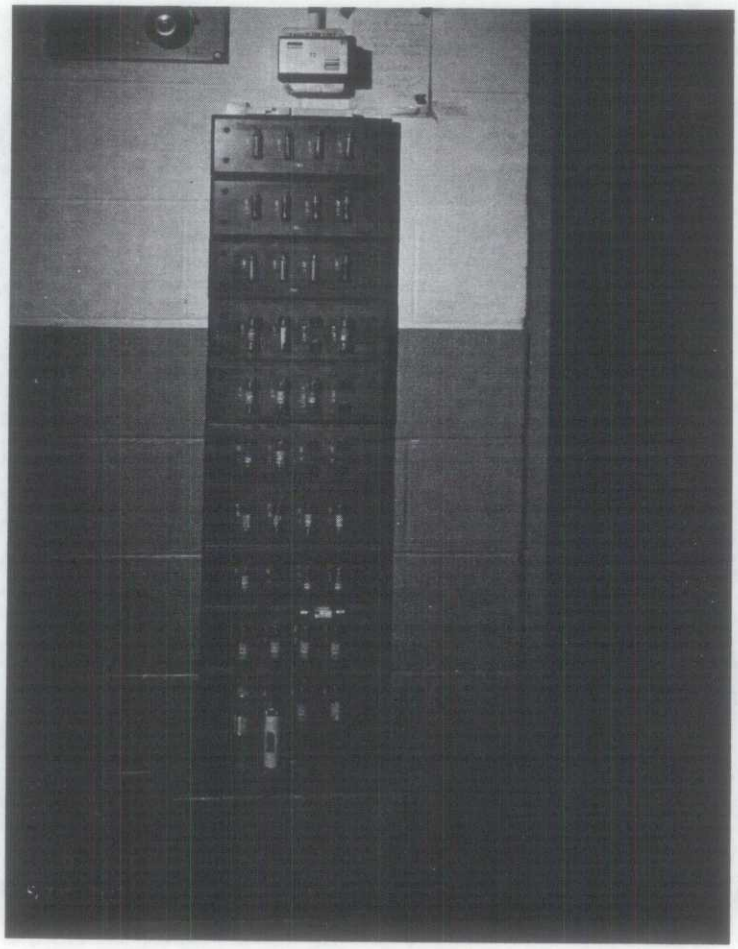
8. Bay showing VHF voice communications, transmitters/receivers, etc.



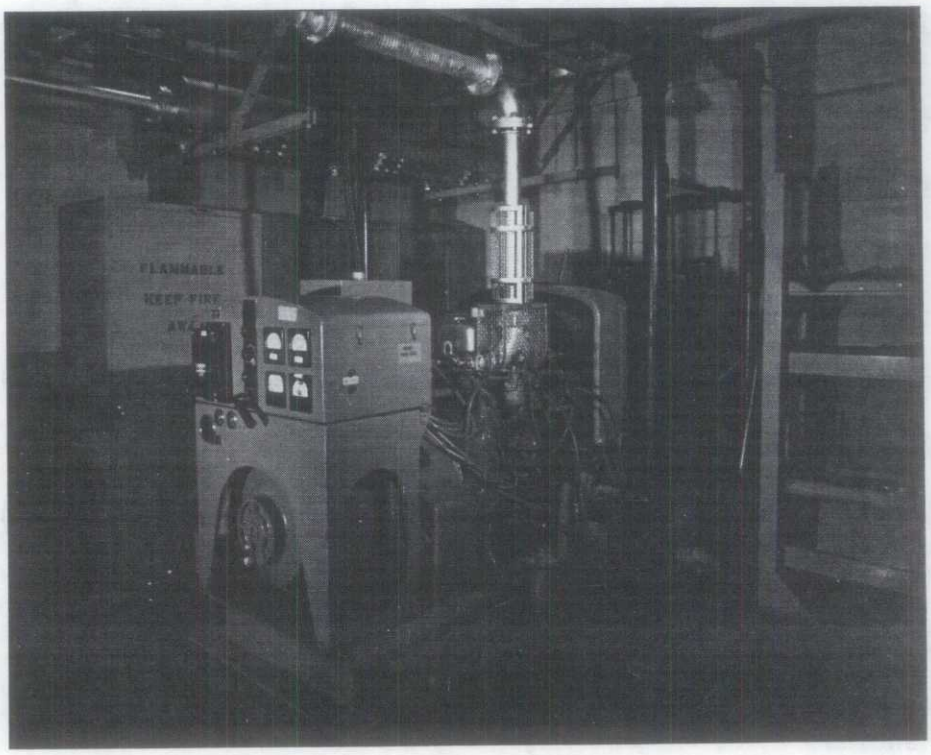
9. Bay showing equipment which powers the station.



10. Backup power supply.



11. Backup fuse panel.



12. 20 kw generator.

All photographs of Rabbit Creek by James E. Stuhler

HISTORIC AMERICAN ENGINEERING RECORD, ACCOMPANYING AS-BUILT DRAWINGS, TD-2 MICROWAVE (RADIO RELAY) STATIONS

1. Cathedral AFS, cover sheet.
2. Cathedral, general plan.
3. Cathedral, plot plan and vicinity map.
4. Cathedral, radio relay building, structural.
5. Cathedral, radio relay building, wall sections & misc. details.
6. Cathedral, POL system, plan and details.
7. Cathedral, electrical distribution (note wave guide details).
8. Cathedral, 212.5' type "H" tower, structural.
9. Cathedral, electrical distribution (tower schematic).
10. Sawmill AFS, radio relay building, architectural floor plan and schedules.
11. Sawmill, radio relay building, architectural elevations.
12. Sawmill, radio relay building, wall sections and misc. details.
13. Sawmill, waveguide details I.
14. Sawmill, waveguide details II.

All as-built drawings courtesy 21st Civil Engineering Squadron.

CORPS OF ENGINEERS

U.S. ARMY

CATHEDRAL A.F.S., ALASKA

REARWARD COMMUNICATION FACILITIES

U.S. ARMY ENGINEER DISTRICT, ALASKA

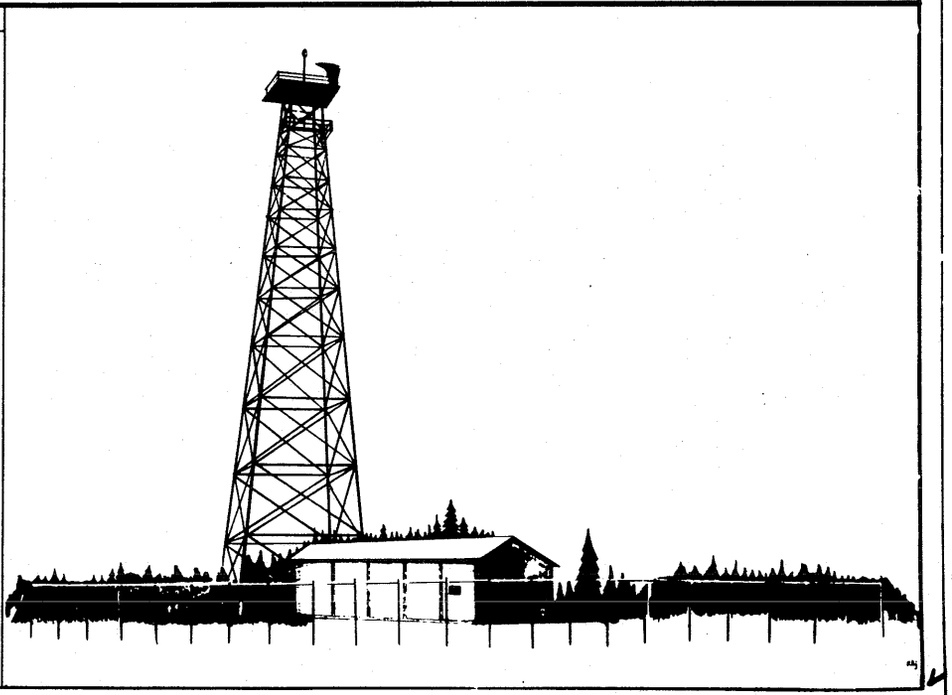
CORPS OF ENGINEERS

ANCHORAGE, ALASKA

SCHEDULE OF DRAWINGS

DRAWING TITLE		DRAWING NO.
PLOT PLAN & VICINITY MAP		AS-BLT AW 16-06-1488
ROADS & GRADING		AS-BLT AW 11-01-1017
	GENERAL PLAN	SHEET 1 OF 7
	SITE PLAN	2
	SECTIONS & DETAILS	3
	ACCESS ROAD PLAN & PROFILE 1	4
	ACCESS ROAD PLAN & PROFILE 2	5
	ACCESS ROAD PLAN & PROFILE 3	6
	EXCAVATION SECTIONS	7
RADIO RELAY BLDG.		AS-BLT AW 38-17-07
ARCHITECTURAL	FLOOR PLAN & SCHEDULES	SHEET 1 OF
	ELEVATIONS	2
	WALL SECTIONS & MISC. DETAILS METAL PANEL OPTION	4
	MISCELLANEOUS DETAILS	6
STRUCTURAL		
	FOUNDATION, FLOOR PLAN & SECTIONS METAL PANEL OPTION	12
	ROOF FRAMING PLAN, SECTIONS & DETAILS - METAL PANEL OPTION	13
	FRAMING ELEVATIONS - METAL PANEL OPTION	14
	RIGID FRAME, SECTION & DETAILS	15
MECHANICAL	HEAT, VENT & PLUMBING PLAN	16
ELECTRICAL	LIGHTING & POWER PLANS	17
	SCHEDULES & DETAILS	18
	OBSTRUCTION LIGHT CONTROL PANEL	19

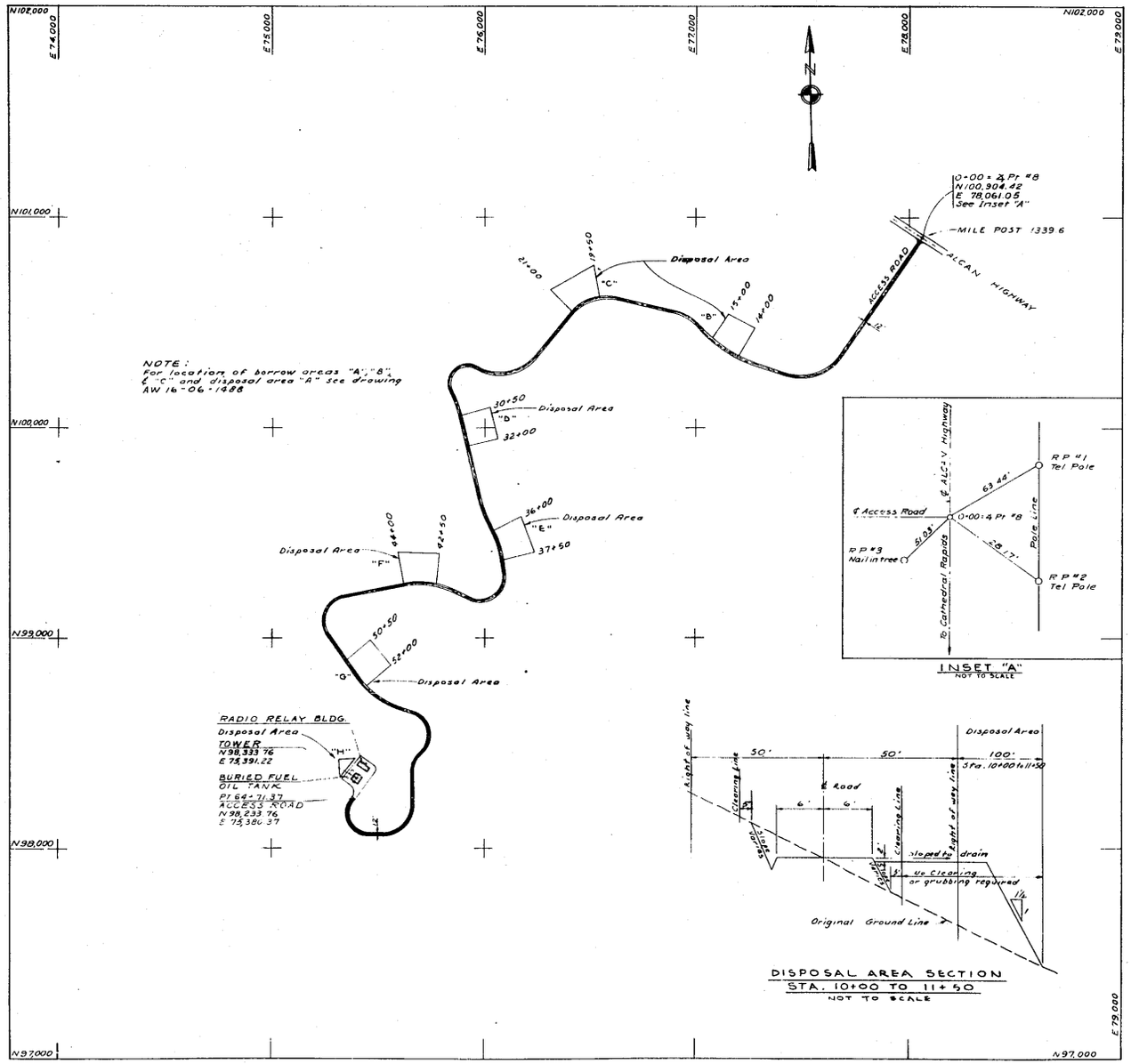
DRAWING TITLE		DRAWING NO.
212-1/2 FT. TYPE "H" TOWER		AS-BLT AW 35-03-115
STRUCTURAL	FOUNDATION PLAN, SECTIONS & DETAILS	SHEET 1 OF 1
POL SYSTEM		AS-BLT AW 78-10-17
	PLAN & DETAILS	SHEET 1 OF 1
ELECTRICAL DISTRIBUTION		AS-BLT AW 71-03-610
	DETAILS - 1	SHEET 1 OF 3
	DETAILS - 2	2
	DETAILS - 3	3



SERIAL NO. ENG. 95-507-60-25

CORPS OF ENGINEERS

U. S. ARMY



INSET "A"
NOT TO SCALE

DISPOSAL AREA SECTION
STA. 10+00 TO 11+50
NOT TO SCALE

GRAPHIC SCALE: 1" = 200'

REFERENCE NO. RG-1

LEGEND

TC This Contract
Road, Existing
Road, T.C.
Structure, T.C.

For General Notes see REF RG-2

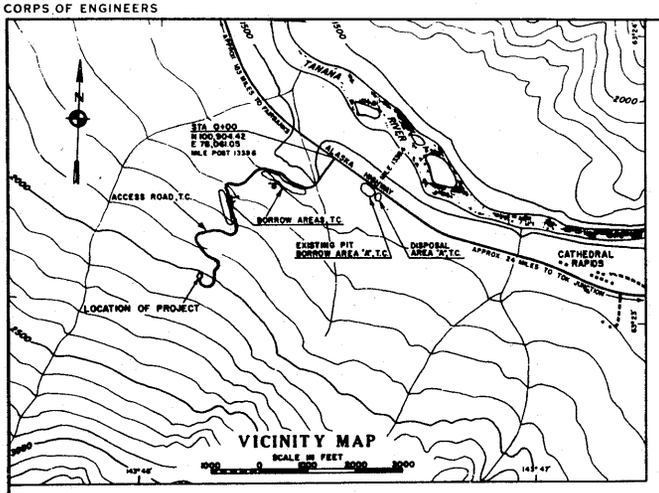
THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

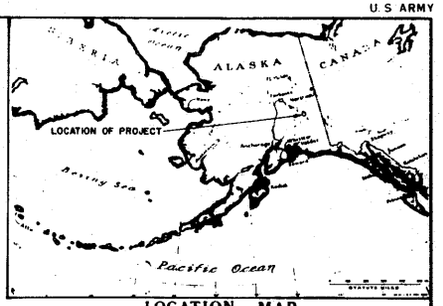
INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA		U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA	
DESIGNED:	CATHEDRAL A.F.S., ALASKA		
DRAWN:	REARWARD COMMUNICATION FACILITIES		
TRACED:	ROADS & GRADING		
CHECKED:	GENERAL PLAN		
SUBMITTED:			
RECOMMENDED:	APPROVED: Alf Littleton RESIDENT ENGINEER	DATE 22 March 1974	
PRIME CONTRACTOR		SCALE 1" = 200'	SPEC. NO.
APPROVED:		DRAWING NUMBER AS-BLT AW 11-01-1017	
DATE		SHEET 1 OF 7	

SERIAL NO. ENG. 95-507-60-25

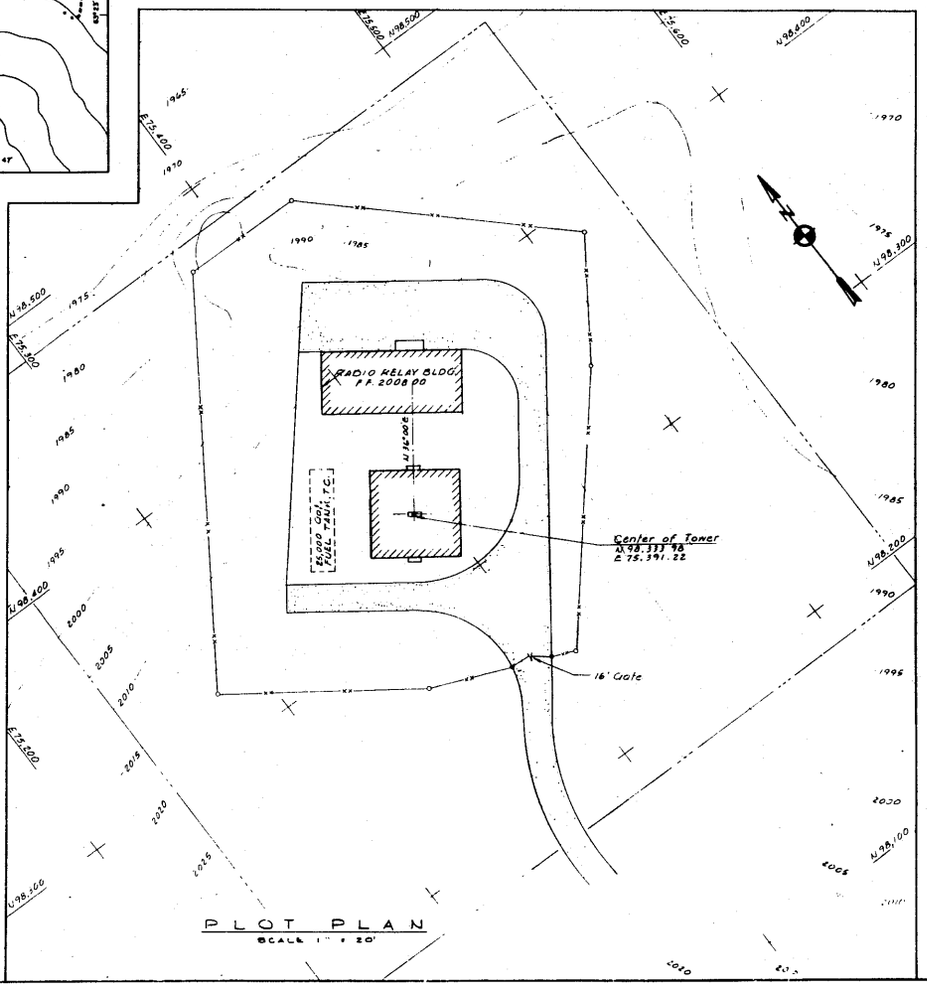
CORPS OF ENGINEERS

U.S. ARMY





LOCATION MAP



LEGEND

T.C	This Contract
	Structure, T.C.
	Road & Parking Area, T.C.
	Clearing Limits, T.C.
-x-x-	Fence, T.C.

NOTES:

1. DATUM OF COORDINATES is the first order U.S.C. & G.S. triangulation station "YARICH" with true geodetic bearing to YARICH AZ. MK. Projection is plane rectangular, tangent at the origin, with assumed grid coordinates N 100,000 E 100,000.
2. ELEVATIONS are based on the first order U.S.C. & G.S. bench mark P-18 at 1557.70 feet above MSL on Seward - Anchorage - Valdez datum of 1929.
3. CONTOURS obtained from the following topography plates SURVEYED by U.S. ARMY ENGINEER DISTRICT, July 1959
   F-11 Rev A, D-11, D-10 Rev A,
   D-9 Rev A, E-11 Rev A
4. Right of way of Haines - Fairbanks pipeline was not available for borrow area or disposal of waste materials.
5. For Disposal Areas along Access Road see Dwg. AW 11-01-1017 SHEET 1

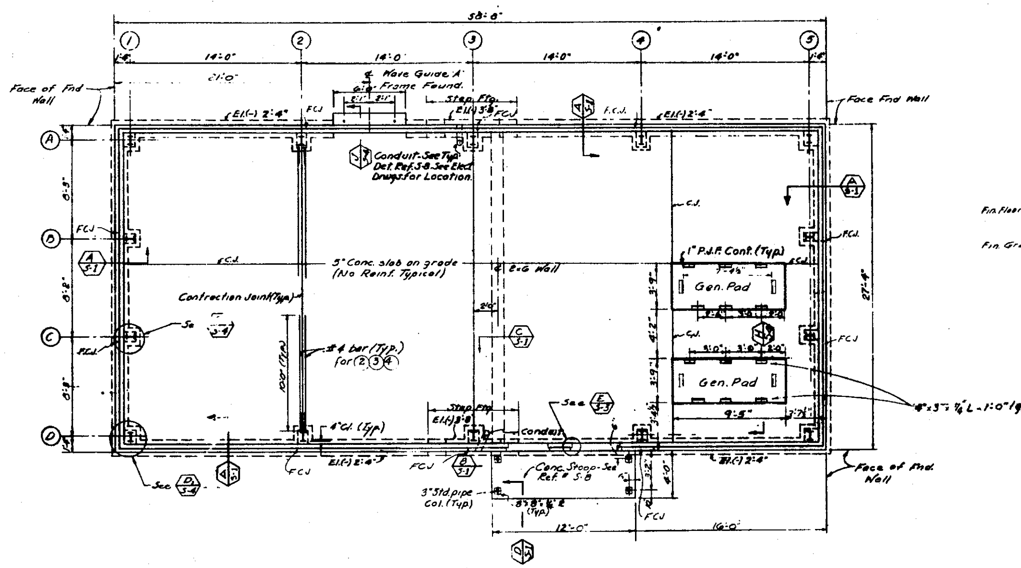
THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA		U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA	
DESIGNED		CATHEDRAL A.F.S., ALASKA	
DRAWN		REARWARD COMMUNICATION FACILITIES	
TRACED		PLOT PLAN & VICINITY MAP	
CHECKED			
SUBMITTED			
RECOMMENDED: PRIME CONTRACTOR		APPROVED: Carl Chester RESIDENT ENGINEER	DATE 24 March 1961
APPROVED: DATE		SCALE As Shown	DWG. NO. AS-BLT AW 16-06-1488
		DRAWING NUMBER	SHEET 1 OF 1

SERIAL NO. ENG. 95-507-60-25

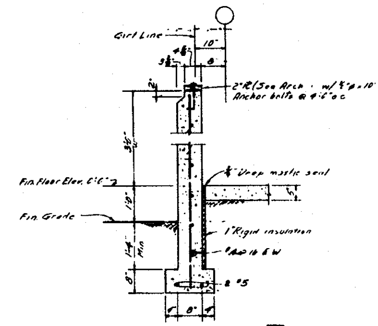
CORPS OF ENGINEERS

U. S. ARMY



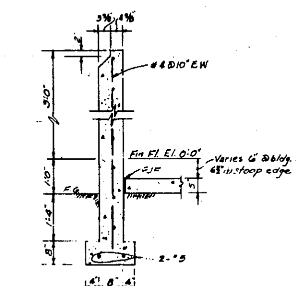
FOUNDATION & FLOOR PLAN

SCALE 1/4" = 1'-0"



SECTION (A / S-1)

SCALE 1/4" = 1'-0"



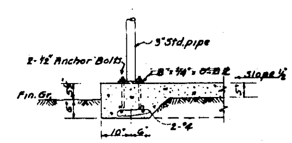
SECTION (B / S-1)

SCALE: 3/4" = 1'-0"

GENERAL NOTES

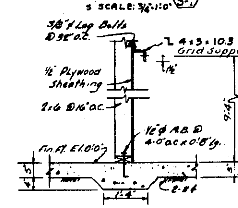
1. DESIGN LOADINGS:
   - ROOF LIVE LOAD = 30 PSF
   - WIND = 20 PSF
     - PRESSURE = 18 PSF
     - SUCTION = 12 PSF
   - SEISMIC ZONE -
2. ALLOWABLE DESIGN STRESSES:
   - CONCRETE, f'c = 2500 PSI @ 28 DAYS (ACI CODE)
   - REINFORCING STEEL, fs = 20,000 PSI (INTERMEDIATE GRADE WITH DEFORMATIONS CONFORMING TO ASTM A 305-56T)
   - STRUCTURAL STEEL, fs = 20,000 PSI (AISC CODE)
   - SOIL BEARING = 5000 PSF
   - NOTE: ALLOWABLE STRESSES INCREASED ONE-THIRD WHEN WIND OR EARTHQUAKE LOADS ARE COMBINED WITH LIVE AND DEAD LOADS.
3. REINFORCING DETAILS IN ACCORDANCE WITH ACI DETAILING MANUAL 315-57.
4. ALL ELEVATIONS SHOWN ARE BASED ON A DATUM OF FINISHED FIRST FLOOR = 0'-0".
5. ALL FOOTING ELEVATIONS ARE TO TOP OF FOOTINGS.
6. ALL 8" POURED CONCRETE WALLS REINFORCED WITH #4 AT 10" EACH WAY AT CENTERLINE OF WALL UNLESS OTHERWISE NOTED. OPENINGS IN POURED CONCRETE WALLS HAVE 2-#5 BARS EACH EDGE EXTENDING 2'-0" BEYOND OPENING AND 1-#5 x 4'-0" LONG DIAGONAL AT CORNERS.
7. SEE REF. NO. S-8 FOR CRACK CONTROL JOINT DETAIL IN CONCRETE WALLS. SEE FOUNDATION PLAN, REF. NO. S-3 FOR LOCATION OF JOINTS IN FOUNDATION. SEE ARCHITECTURAL DRAWINGS FOR LOCATION OF JOINTS ABOVE FOUNDATION.
8. C.J. DENOTES CONTRACTION JOINT; F.C.J. DENOTES FOUNDATION CRACK CONTROL JOINT; P.J.F. DENOTES 1/2" PREMOLDED JOINT FILLER WITH 3/4" MASTIC SEALER.
9. ALL PREMOLDED EXPANSION JOINTS SEALED WITH A MASTIC SEALER. SEE SPECIFICATIONS.
10. TACK WELDED ALL STEEL CLIPS TO FRAMES, COLUMNS, AND CLIP ANGLES AFTER ERECTION OF WALLS.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION



SECTION (D / S-1)

SCALE: 3/4" = 1'-0"



SECTION (C / S-1)

SCALE 3/4" = 1'-0"

GRAPHIC SCALE: 3/4" = 1'-0"

GRAPHIC SCALE: 1/4" = 1'-0"

REFERENCE NO. S-1

REV	DATE	ENG. NO.	ACTION	DESCRIPTION	BY	APP'D

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC.
CONSTRUCTION CONTRACTORS
FAIRBANKS, ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
OFFICE OF THE RESIDENT ENGINEER
FT. GREELY, ALASKA

DESIGNED:
DRAWN:
TRACED:
CHECKED:
SUBMITTED:

CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
RADIO RELAY BLDG.
STRUCTURAL
FOUNDATION, FLOOR PLAN & SECTIONS
METAL PANEL

RECOMMENDED: PRIME CONTRACTOR

APPROVED: Carl [illegible] RESIDENT ENGINEER

DATE: 22 March [illegible]

APPROVED:

DATE

SCALE: AS SHOWN

SPEC. NO.

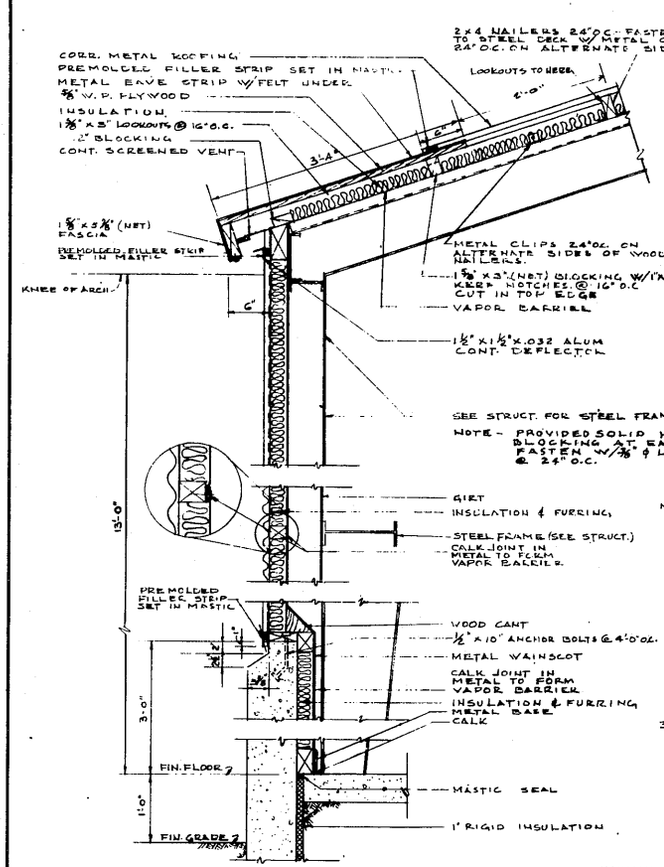
DRAWING NUMBER: AS-BLT AW 38-17-07

SHEET 1/2 OF

SERIAL NO. ENG. 95-507-60-25

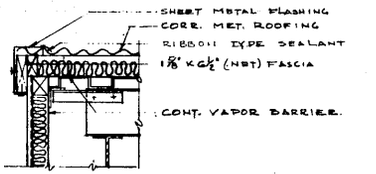
CORPS OF ENGINEERS

U. S. ARMY

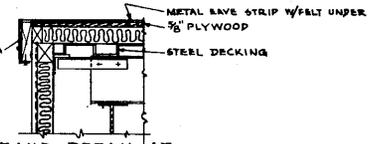


TYPICAL WALL SECTION (A A-5)

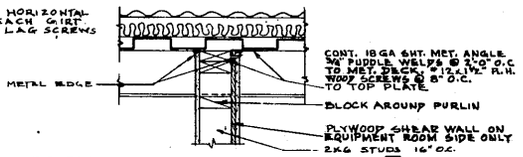
SCALE - 1 1/2" = 1'-0"



RAKE DETAIL (C A-5)

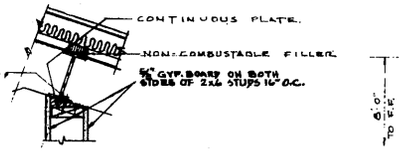


RAKE DETAIL AT METAL EAVE STRIP (D A-5)



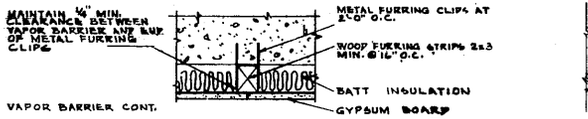
DETAIL OF INTERIOR SHEAR WALL (E A-5)

SCALE 1 1/2" = 1'-0"

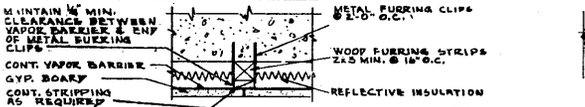


DETAIL OF INTERIOR FIRE PARTITION (F A-5)

SCALE 1 1/2" = 1'-0"

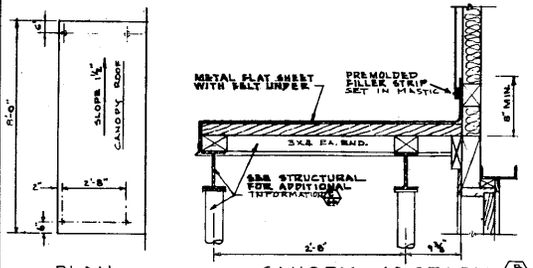


NON-REFLECTIVE INSULATION ON CONCRETE WALLS (G A-5)



REFLECTIVE INSULATION ON CONCRETE WALLS (H A-5)

SCALE 3"=1'-0"

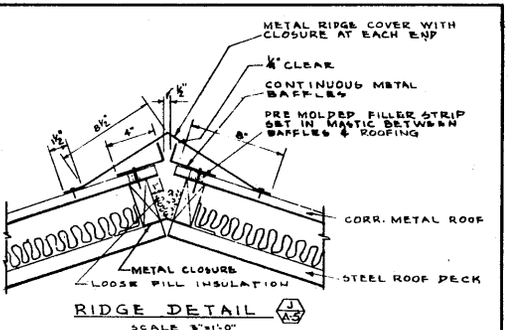


PLAN

SCALE 1/2" = 1'-0"

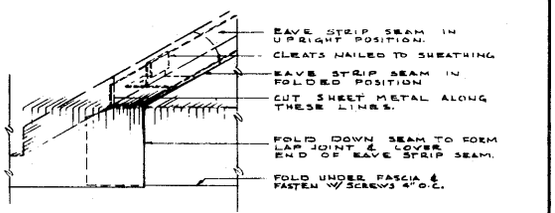
CANOPY SECTION (D A-5)

SCALE 1 1/2" = 1'-0"



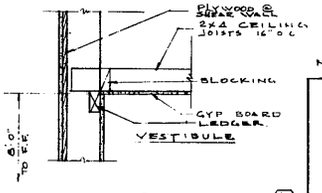
RIDGE DETAIL (J A-5)

SCALE 3"=1'-0"



DETAIL AT END OF EAVE STRIP SEAM (M A-5)

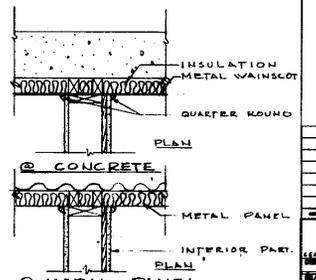
NO SCALE



CEILING @ VESTIBULE (L A-5)

SCALE 1 1/2" = 1'-0"

NOTE - ALL MASTIC IN ROOF CONSTRUCTION POLYSULPHIDE SEALING COMPOUND



DETAIL INTERIOR PARTITION @ EXTERIOR WALLS (K A-5)

SCALE, - 1 1/2" = 1'-0"

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

S.S. MULLEN, INC. CONSTRUCTION CONTRACTORS SEATTLE WASHINGTON

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER ELMENDORF AFB, ALASKA

SAWMILL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
RADIO RELAY BLDG.
ARCHITECTURAL
WALL SECTIONS & MISC. DETAILS
METAL PANEL OPTION

APPROVED: John E. Mooney, RESIDENT ENGINEER

SCALE: AS Shown

DRAWING NUMBER: AS-BLT AW 55-10-77

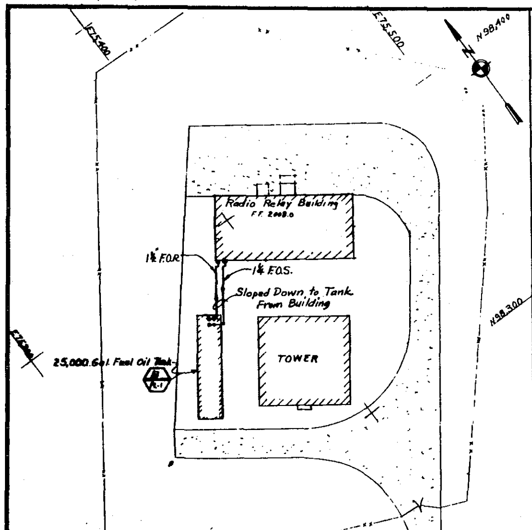
SHEET 5 OF

REFERENCE NO. A-5

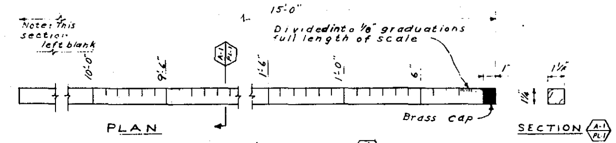
SERIAL NO. ENG. 95-507- 60-63

CORPS OF ENGINEERS

U. S. ARMY



SITE PLAN
SCALE: 1" = 20'



DETAIL OF STICK GAGE A/PL-1
NOT TO SCALE

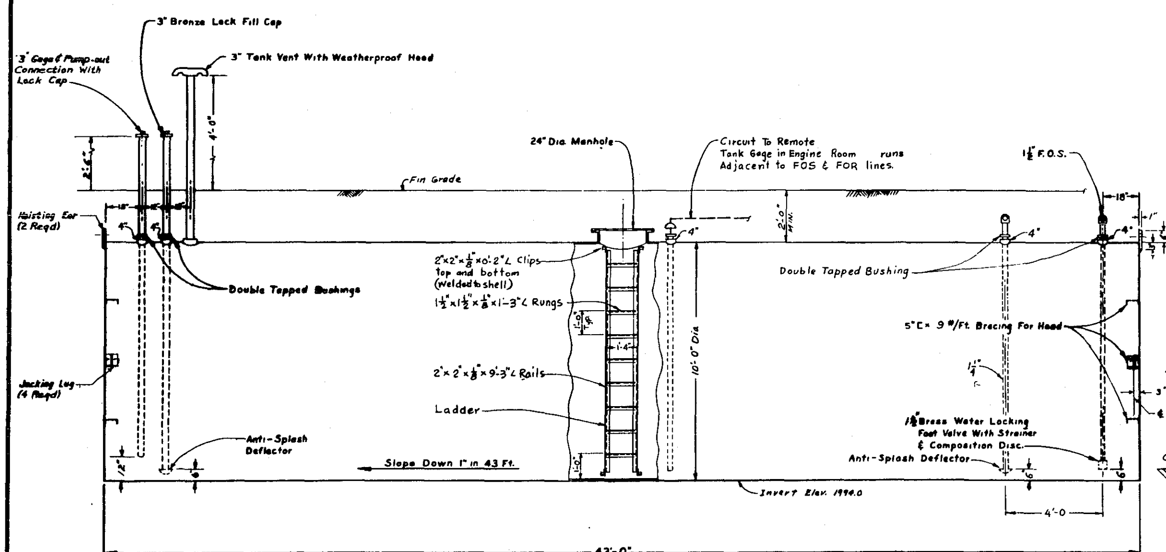
LEGEND

T.C.	THIS CONTRACT
▭	BUILDINGS, T.C.
FOS	FUEL OIL SUPPLY
FOR	FUEL OIL RETURN
—‖—	UNION

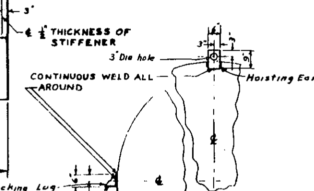
GENERAL NOTES

ALL FUEL OIL PIPING PROVIDED WITH ADEQUATE SWING JOINTS AT TANK & BUILDING TO MINIMIZE STRESSES RESULTING FROM SETTLEMENT.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION



ELEVATION 25,000 GALLON FUEL OIL STORAGE TANK B/PL-1
SCALE: ¼" = 1'-0"



SECTION B-1/PL-1

GRAPHIC SCALE: 1" = 20'
GRAPHIC SCALE: 1/8" = 1'-0"

REFERENCE NO. PL-1

REV.	DATE	DWG. NO.	ACTION	DESCRIPTION	BY	APPR.

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC.
CONSTRUCTION CONTRACTORS
FAIRBANKS, ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
OFFICE OF THE RESIDENT ENGINEER
FT. GREELY, ALASKA

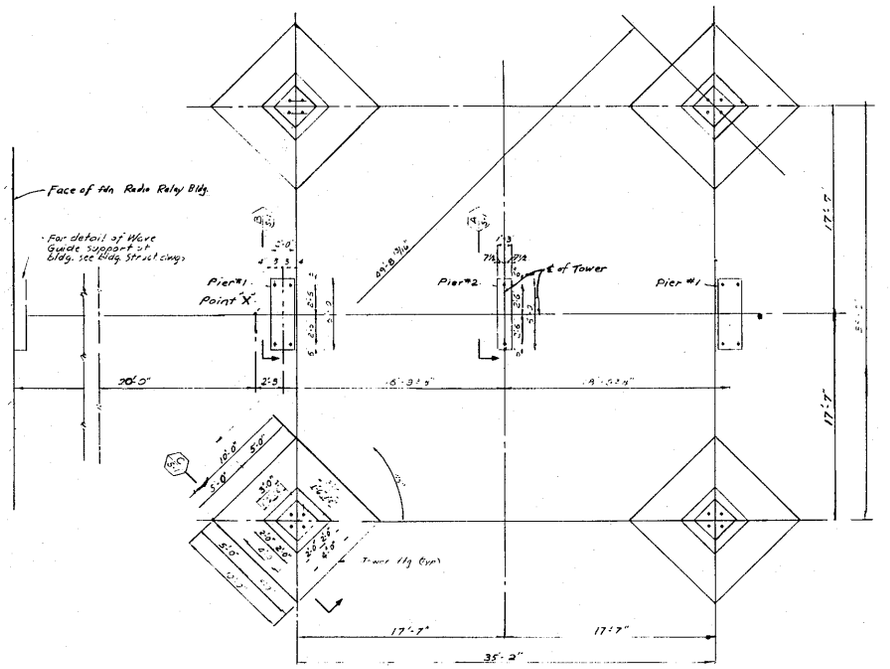
CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
POL SYSTEM
PLAN & DETAILS

RECOMMENDED: [signature] FOR THE CONTRACTOR
APPROVED: Carl [signature] RESIDENT ENGINEER
DATE: 22 March 1961
SCALE: AS SHOWN
APPROVED:
DATE
DRAWING NUMBER: AS-BLT AW 78-10-17
SHEET 1 OF 1

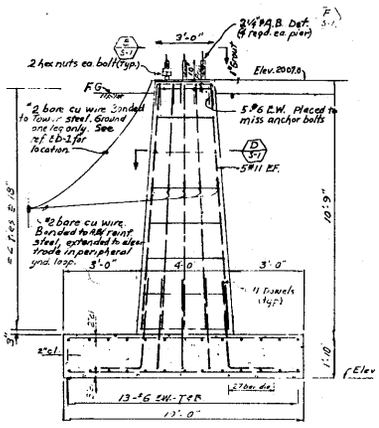
SERIAL NO. ENG. 95-507-60-25

CORPS OF ENGINEERS

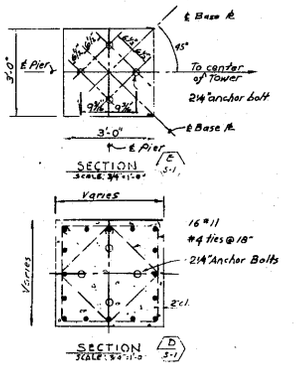
U. S. ARMY

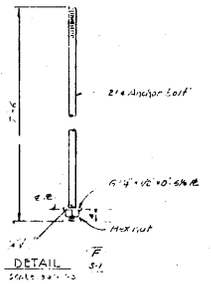


FOUNDATION PLAN



SECTION

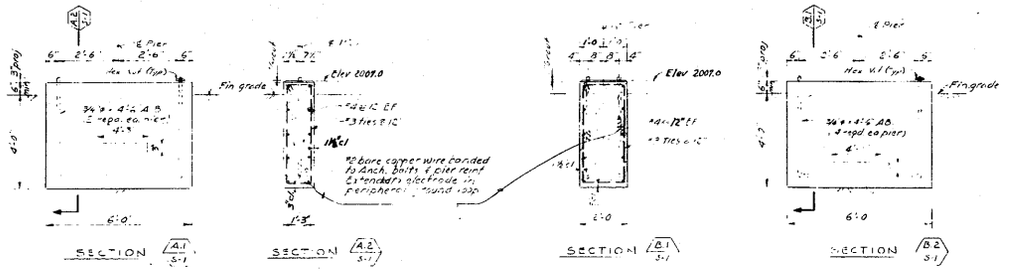




GENERAL NOTES

1. DESIGN LOADS:
   WIND = 30 PSF
   SNOW = 70 PSF
   SEISMIC ZONE = II
   SOIL = 1000#/FT², ϕ = 30°
   MAX. TOWER LEG REACTION
   DOWNWARD = 231.0K
   UPWARD = 173.1K
   SHEAR = 19.2K
2. DESIGN STRESSES:
   CONCRETE - f'c = 3,500 PSI
   fs = 20,000 PSI (INTERMEDIATE GRADE WITH DEFORMATIONS CONFORMING TO ASTM-A305-56T).
   SOIL BEARING = 5,000 PSF
3. ANCHOR BOLTS CONFORM TO ASTM A-107, C1015 TO C1020 STEEL. GALVANIZED 1'-0" OF LENGTH OF THREADED ENDS OF ALL ANCHOR BOLTS, AND GALVANIZED NUTS. NUTS HAVE HEX. HEAD.
4. ANCHOR BOLTS ACCURATELY LOCATED AND SECURELY SUPPORTED WHILE PLACING CONCRETE.
5. PROVIDED DOWELS IN FTG. OF SAME SIZE AND NUMBER AS VERTICAL PEDESTAL REINFORCEMENT AND EXTENDED DOWELS INTO PEDESTAL A MIN. OF 27 BAR DIA. DOWELS HAVE A BEND OF 27 BAR DIA. IN FTG.
6. ALL REINFORCING STEEL AND ANCHOR BOLTS GROUNDED AS SHOWN ON DRAWINGS. WHERE NORMAL LAPPING AND TYING DOES NOT PROVIDE AN ADEQUATE CONN. STEEL WAS BONDED TOGETHER WITH #10 IRON WIRE.
7. PROVIDED 10' OF SLACK IN #2 BARE COPPER WIRE CONNECTED TO TOWER STEEL REINF. & ANCHOR BOLTS.
8. FOR LOCATION OF ELECTRODES IN GROUND LOOP, SEE ELECTRICAL DISTRIBUTION DRAWINGS, SHEET ED-1.
9. ANCHOR BOLTS CONTRACTOR FURNISHED.
10. PROVIDED 1" NON-SHRINK GROUT UNDER ALL BASE PLATES.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION



PIER NO. 2

PIER NO. 1

GRAPHIC SCALE: 3/16" = 1'-0"

GRAPHIC SCALE: 1/2" = 1'-0"

GRAPHIC SCALE: 1/4" = 1'-0"

REFERENCE NO. S-1

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & LIPIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA

DESIGNED: DRAWN: TRACED: CHECKED: SUBMITTED: RECOMMENDED: APPROVED: APPROVED: DATE

CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
212-1/2 FT TYPE "H" TOWER
STRUCTURAL
FOUNDATION PLAN
SECTIONS & DETAILS

RESIDENT ENGINEER

DATE 22 March 1961

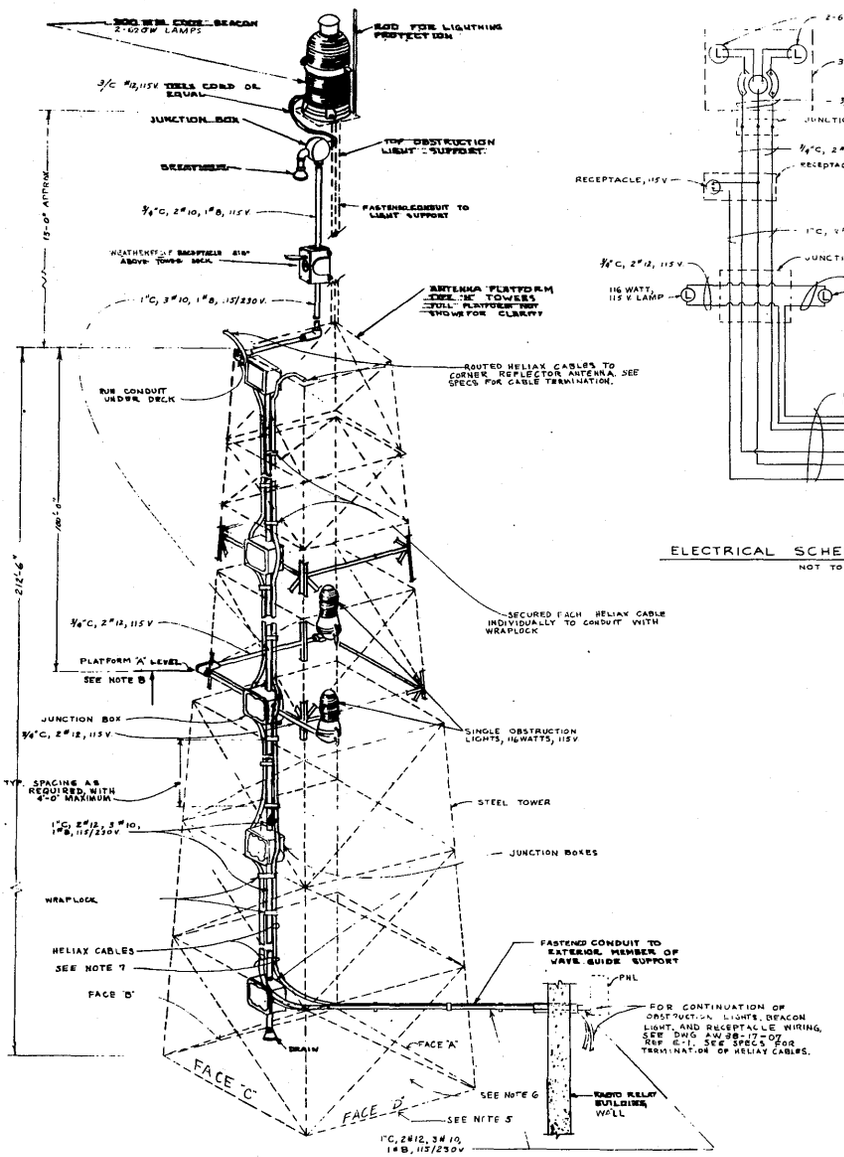
SCALE AS NOTED SPEC. NO.

DRAWING NUMBER AS-BLT AW 35-03-116

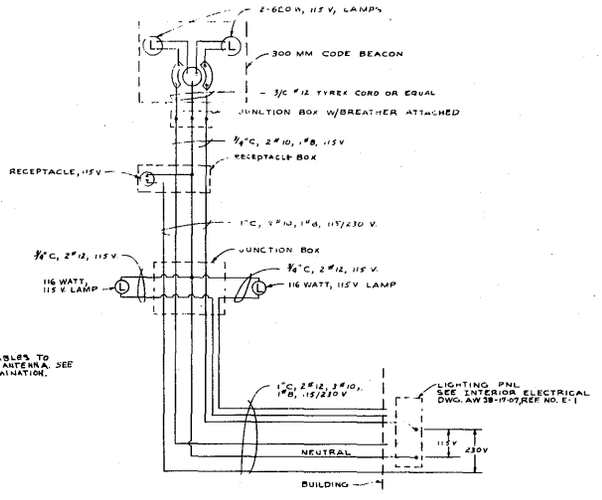
SHEET 1 OF 1

SERIAL NO. ENG. 95-507-60-25

CORPS OF ENGINEERS



ELECTRICAL DETAILS OF TOWER
NOT TO SCALE



ELECTRICAL SCHEMATIC DIAGRAM
NOT TO SCALE

NOTES

1. JUNCTION BOXES EQUIPPED WITH CABLE SUPPORTS.
2. BEACONS, OBSTRUCTION LIGHTS WIRING AND FITTINGS MEET REQUIREMENTS OF F.C.C., C.A.A. AND NATIONAL ELECTRIC CODE.
3. CONDUIT, ETC. FASTENED SECURELY TO TOWER AND WAVE GUIDE SUPPORTS WITH WRAP LOCK OR EQUAL.
4. FOR SITING PLAN, SEE ROAD AND GRADING DWG AW-11-01-1017, RG-2.
5. FACE "D" FACES RADIO RELAY BUILDING.
6. LADDER IS INSTALLED DIAGONALLY BETWEEN FACES "A" AND "D".
7. CONDUIT AND HELIAX CABLE VERTICAL RUNS INSTALLED ADJACENT TO LADDER BUT SO NOT INTERFERE WITH CLIMBING SPACE.
8. PLATFORM "A" HAS WALKWAY TO EITHER SIDE OF LADDER TO SERVICE OBSTRUCTION LIGHTS.

9. HELIAX CABLE IS GOV'T. FURNISHED AND CONTRACTOR INSTALLED.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

NO.	DATE	DWG NO	ACTION	DESCRIPTION	BY	APP'D

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA

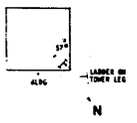
DESIGNED:
DRAWN:
TRACED:
CHECKED:
QUANTITIES:

CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
ELECTRICAL DISTRIBUTION
DETAILS-2

RECOMMENDED: PROJECT CONSTRUCTION ENGINEER
APPROVED: Carl Gibson DISTRICT ENGINEER
DATE: 23 March 1961
APPROVED: DATE
SCALE: NONE
DRAWING NUMBER: AS-BLT AW 71-03-610
SHEET 2 OF 5

REFERENCE NO. ED-2

SERIAL NO. ENG. 95-507-60-25



SECT A-A

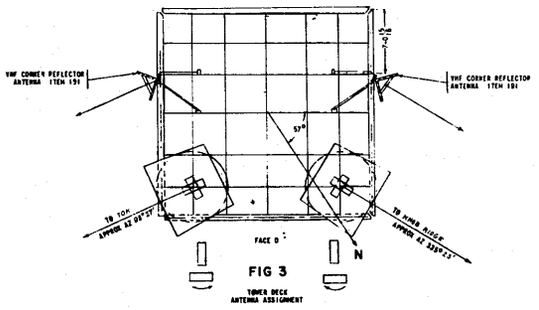
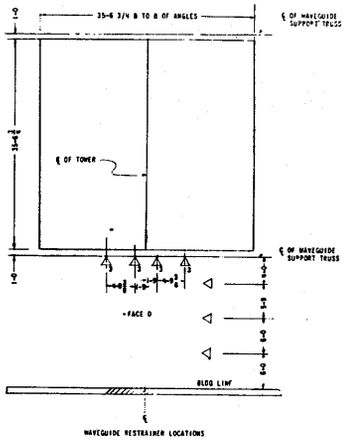


FIG 3
TOWER DECK ANTENNA ASSIGNMENT



WAVEGUIDE RESTRAINER LOCATIONS

NOTES

1. WHEN RESTRAINERS ARE INSTALLED, PARTS ASSEMBLED WITH SUFFICIENT TIGHTNESS TO PREVENT RATTLE, BUT STILL PERMIT SLIDING MOTION SUCH AS THAT CAUSED BY TEMPERATURE EFFECTS ON LONG RUNS.
2. EQUIPMENT DESIGNATED BY ITEM NUMBERS IS DESCRIBED IN SPECIFICATIONS AND IS GOVERNMENT-FURNISHED, CONTRACTOR INSTALLED
3. SYMBOLIZES THE COUPLER POLARITY AND DENOTES THE DIRECTION THE FLEXIBLE WAVEGUIDE AND COUPLER IS TWISTED WHEN ORIENTING THE ANTENNA.
4. ◁ DENOTES RESTRAINER LOCATIONS.
5. RESTRAINERS ARE ASSEMBLED AS FOLLOWS:
   ◁ 1 (1) H-229-863 G-1 RESTRAINER SUPPORT E/W
   (2) G-2 RESTRAINER, ITEM 107 AND 108.
   SEE WECO SKETCH 105, FIG. 1 OF ERECTION DRAWINGS.
   ◁ 3 (1) H-229-841 G-5 RESTRAINER SUPPORT, ITEM 106
   SEE WECO SKETCH 105, FIG. 1 OF ERECTION DRAWINGS.
6. CAUTION: RECTANGULAR WAVEGUIDE STACKED IN EXACT ARRANGEMENT SHOWN.

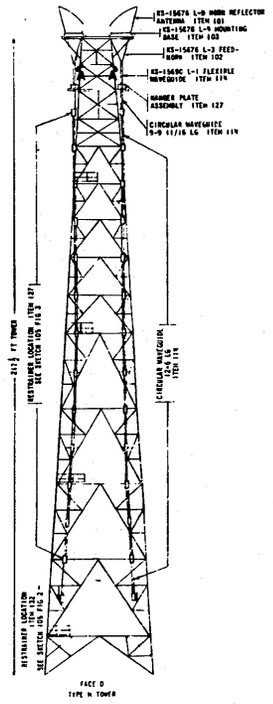


FIG 1
ANTENNA AND CIRCULAR WAVEGUIDE INSTALLATION

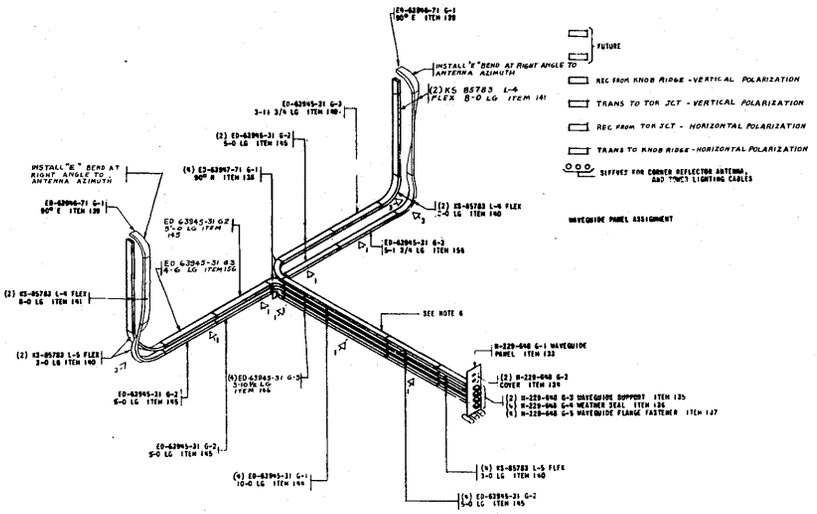


FIG 2
RECTANGULAR WAVEGUIDE INSTALLATION

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

NO	DATE	DWG NO	REVISION	BY	APP'D

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA

DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED
RECOMMENDED — DATE — PUBLIC CONTRACTOR

CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
ELECTRICAL DISTRIBUTION
DETAILS-3

APPROVED — RESIDENT ENGINEER — DATE 12 March 1971

APPROVED: — DATE

SCALE AS NOTED — SPEC. NO.

DRAWING NUMBER AS-BLT AW 71-03-610

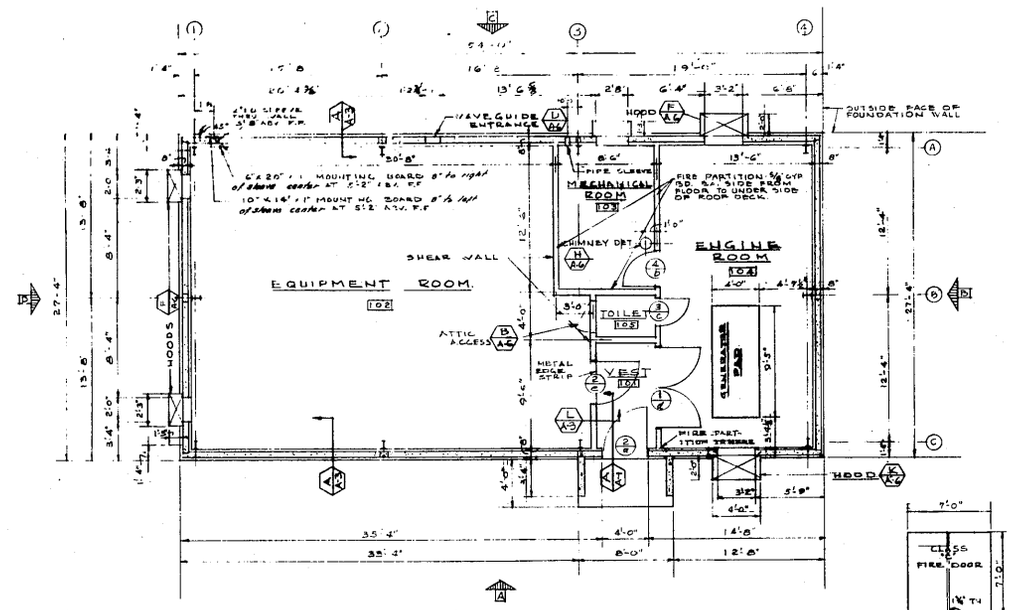
SHEET 3 OF 3

REFERENCE NO. ED-3

SERIAL NO. ENG. 95-507-60-25

CORPS OF ENGINEERS

U. S. ARMY

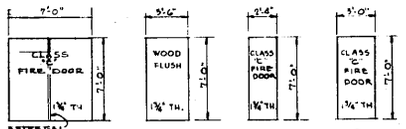


FLOOR PLAN

SCALE - 1/8"=1'-0"

SECTION A/A-1

SEE ELEVATION "X" ON SHEET 19



DOOR SCHEDULE

SCALE 1/4"=1'-0"

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

INTERIOR FINISH SCHEDULE FOR METAL PANEL WALL OPTION.

NO.	ROOM	FLOOR MAT.	FLOOR FIN.	BASE MAT.	BASE HT.	WALLS MAT.	WALLS FIN.	WAINSCOT MAT.	WAINSCOT FIN.	WAINSCOT HT.	CEILING MAT.	CEILING FIN.	CEILING HT.	TRIM MAT.	TRIM FIN.	REMARKS.
101	VESTIBULE	B	-	G	1	D.G	2	C.G	1	4'-0"	D	3	8'-0"	E.G	1	
102	EQUIPMENT	A	5	G	1	D.G	2	C.G	1	4'-0"	H	3	VAR.	E	1	
103	MECHANICAL	B	-	G	1	D.G	2	G.P	1	4'-0"	H	3	VAR.	E.G	1	
104	ENGINE	B	-	G	1	D.G	2	G.P	1	4'-0"	H	3	VAR.	E.G	1	
105	TOILET	B	-	G	1	D	2	C	1	4'-0"	D	3	8'-0"	G	1	

GENERAL NOTES

1 Unless otherwise noted all part. were 2"X6" studs on 16" centers

2 Finish was omitted in attic except on firewalls.

3 The plan and elevations shown depicts Conc. Tilt-up Option, and ME I-- PANEL OPTION Used this contract conforms

SYMBOL KEY

SECTION OR DETAIL — SECT. OR DET. LETTER / SECT. OR DET. SHEET NO.

CUTTING SECTION — SECT. LETTER / SECT. SHEET NO.

DOOR — DOOR TYPE / HARDWARE

ELEVATION

ROOM NUMBER 102

MATERIAL KEY

A-VINYL TILE
B-CONCRETE (NOTE NO.6)
C-HARD BOARD(PREFINISHED)
D-GYPSUM BOARD
E-WOOD
F-RUBBER
G-METAL
H-METAL(EXPOSED DECK)
P-PLYWOOD

COLOR KEY

1. 26329 BLUE GRAY
2. 36463 LIGHT GRAY.
3. 37778 OFF WHITE
4. BLACK
5. NO. 461 - TRIESTE GRAY.

FINISH NOTES

1. PAINT COLOR NUMBERS ARE FROM FED. STANDARD NO.595.
2. VINYL TILE COLOR & PATTERN SHALL BE SIMILAR TO COLOR NUMBER SHOWN IN COLOR KEY WHICH ARE FROM THE 1959 CATALOGUE OF THE ARMSTRONG CORK CO., LANCASTER, PENN.
3. EXTERIOR CONC. BLOCK PAINTED COLOR NO.16492
4. EXPOSED EXTERIOR WOOD & METAL PAINTED COLOR NO. 16473.
5. EXTERIOR PAINT COLOR NO'S INDICATE COLOR ONLY LUSTER AS SPECIFIED.
6. ALL INTERIOR EXPOSED CONCRETE FLOORS FINISHED WITH HARDENER.
7. METAL BASE A STANDARD MANUFACTURED ITEM

MATERIAL LEGEND

WOOD FRAME
CONCRETE
INSULATION (BLANKET OR BATTS)
INSULATION (RIGID)

REFERENCE NO. A-1

NO.	DATE	DWN. NO.	ACTION	DESCRIPTION	BY	APP'D
2	5-13-63			Revised Interior Per Schedule for Conc. Tilt-Up Construction	EC	MF

S.S. MULLEN, INC. CONSTRUCTION CONTRACTORS SEATTLE WASHINGTON

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER ANCHORAGE ALASKA

DESIGNED:
DRAWN:
TRACED:
CHECKED:
SUBMITTED:
RECOMMENDED: S.A. Brink CONST. CONTRACTOR
APPROVED: APPD. John E. Maring ACTG. RESIDENT ENGINEER
DATE 6 Mar 63
SCALE
DRAWING NUMBER AS BLT AW 35-19-71 SHT. 1 OF 19
SPEC. NO.

SAWMILL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
RADIO RELAY BLDG
ARCHITECTURAL
FLOOR PLAN & SCHEDULES

SERIAL NO. ENG. 95-507- 60-63

CORPS OF ENGINEERS

U. S. ARMY

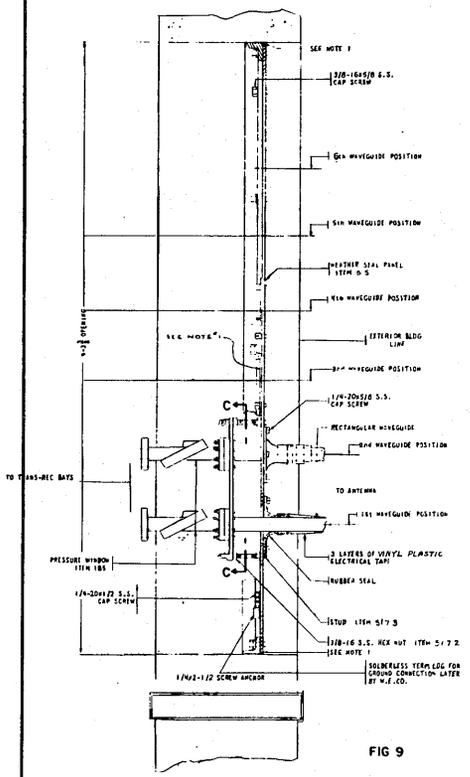
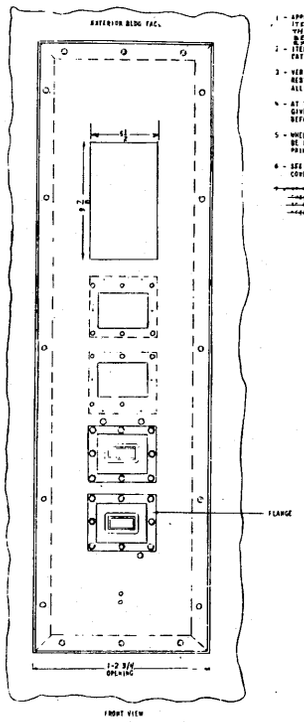


FIG 9



MANUFACTURING NOTES

1 - APPLY POLYSULPHIDE ALUMINUM PUTTY ITEM 180 BETWEEN PLATES AND/OR THE MOUNTING FRAME ANGLE IRON BRACES AFTER ASSEMBLY.

2 - ITEM NUMBERS NOTED ARE LISTED IN ESS SPECIFICATIONS SECTION B.

3 - VERTICAL LOCATIONS OF FLANGES MAY VARY IN RESTRAINERS DUE TO ACCUMULATION OR LOSS IN OVER-ALL TOLERANCES.

4 - AT TIME OF INSTALLATION EACH GASKET SHALL BE GIVEN A LIGHT COAT OF NON-CORRING DCR COMPOUND BEFORE INSERTING INTO FLANGE GROOVES.

5 - WHERE GALVANIZING HAS BEEN DAMAGED THE AREA SHALL BE PAINTED WITH TWO COATS OF ZINC DUST-OXIDE PRIMER.

6 - SEE SKETCH 109 FOR DETAILS OF RGSF/U WAVEGUIDE COVER PLATE.

		10-7-59	
		1	

CHANGED NOTE 1 ADDED SEE NOTE 1 TO FIG 9

		1-4-60	
		2	

DELETED FLEX HG REST.

8-12-60

NOTES

1. INFORMATION SHOWN ON THIS DRAWING IS FROM W.E. SKETCH NO. 105

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

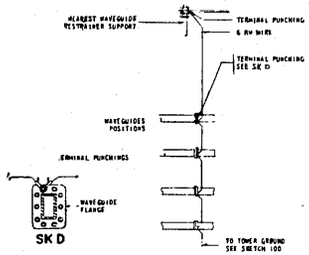


FIG 10

WAVEGUIDE GROUND ITEM

INSTALL AT CONVENIENT POINT NEAR BASE OF TOWER

ENGINEERING NOTES

1

SK-105

TYPICAL TD-2 WAVEGUIDE RESTRAINING AND SUPPORT ASSEMBLIES

WESTERN ELECTRIC COMPANY, INC. DEFENSE PROJECTS DIVISION

SHT. NO. 105

SK 105

MK.	DATE	SHT. NO.	ACTION	DESCRIPTION	BY	APP'D

S.S. MULLEN, INC. CONSTRUCTION CONTRACTORS SEATTLE WASHINGTON

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER ANCHORAGE ALASKA

SAWMILL A.F.S. ALASKA
REARWARD COMMUNICATION FACILITIES
ELECTRICAL DISTRIBUTION
WAVEGUIDE DETAILS I

DESIGNED:
DRAWN:
TRACED:
CHECKED:
SUBMITTED: CHIEF SECTION

RECOMMENDED: G.A. Brinda PRIME CONTRACTOR
APPROVED: 2nd Lt. John E. Mueing FIELD ENGR. MILWAUKEE
DATE: Dec '61

APPROVED:
DATE

SCALE
DRG. NO.
DRAWING NUMBER
AS BLT AW 71-03-661
SHEET 5 OF 6

SERIAL NO. ENG 95-507-60-63

CORPS OF ENGINEERS

U. S. ARMY

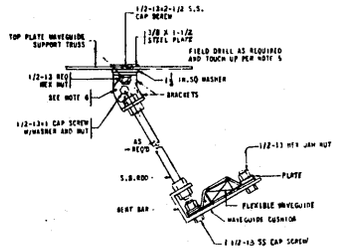
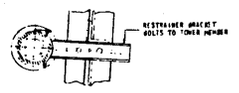


FIG 1

RESTRAINER AND SUPPORT FOR FLEXIBLE WAVEGUIDE G-5 ITEM



SECT A-A

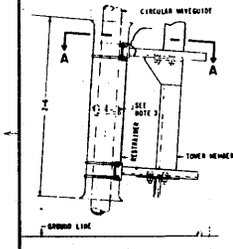


FIG 2

RESTRAINER ASSEMBLY ITEM 508

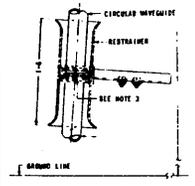


FIG 3

RESTRAINER ASSEMBLY ITEM 508

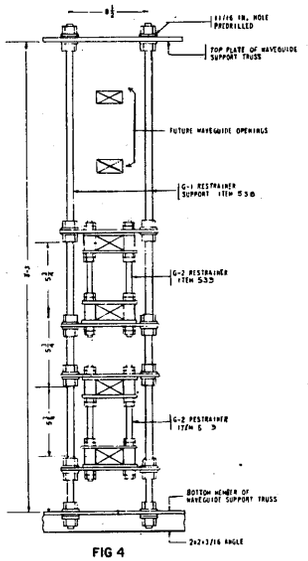
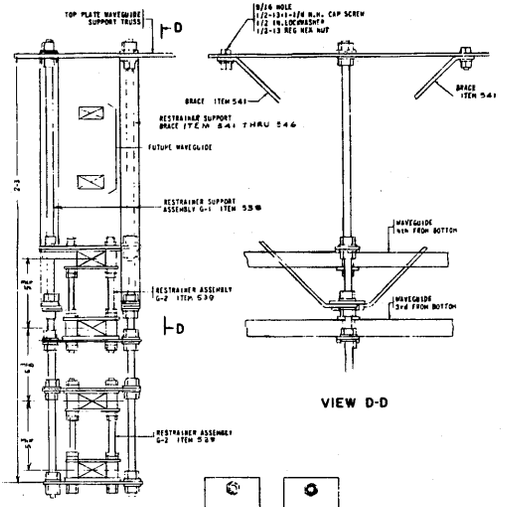


FIG 4

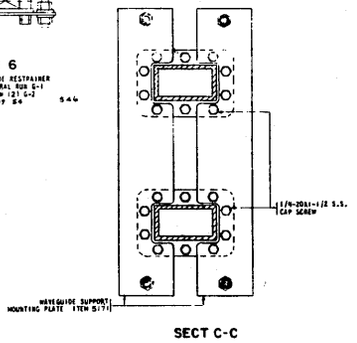
RIGID WAVEGUIDE RESTRAINER AND SUPPORT G-1 E/W (2) G-2 ITEM 53



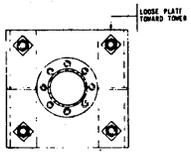
VIEW D-D

FIG 6

RIGID WAVEGUIDE RESTRAINER SUPPORT-LATERAL RUN G-1 W/BRACE E/W (2) G-2 ITEMS 539 697 54 546



SECT C-C



SECT B-B

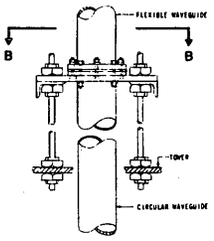
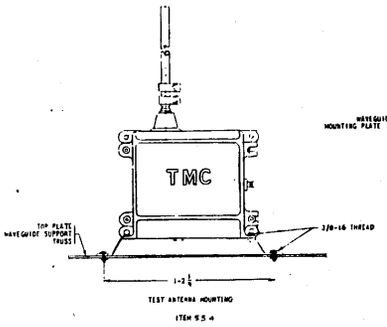


FIG 5

HANGER PLATE ASSEMBLY ITEM 508



TEST ANTENNA MOUNTING ITEM 554

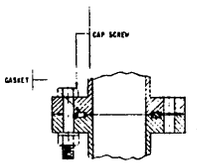


FIG 8

RECTANGULAR WAVEGUIDE TYPICAL FLANGE CONNECTION

NOTES

1. INFORMATION SHOWN ON THIS DRAWING IS FROM W.E. SKETCH NO. 105

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

MK	DATE	END NO.	ACTION	DESCRIPTION	BY	APP'D

S.S. MULLEN, INC.
CONSTRUCTION CONTRACTORS
SEATTLE WASHINGTON

U.S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
OFFICE OF THE RESIDENT ENGINEER
ANCHORAGE ALASKA

DESIGNED:
DRAWN:
TRACED:
CHECKED:
SUBMITTED:
RECOMMENDED: J.J. Brizendine PRIME CONTRACTOR
APPROVED: Lt. Col. John E. Moring RESIDENT ENGINEER
DATE 6 Mar 61
APPROVED:
DATE

SAWMILL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
ELECTRICAL DISTRIBUTION
WAVEGUIDE DETAILS II

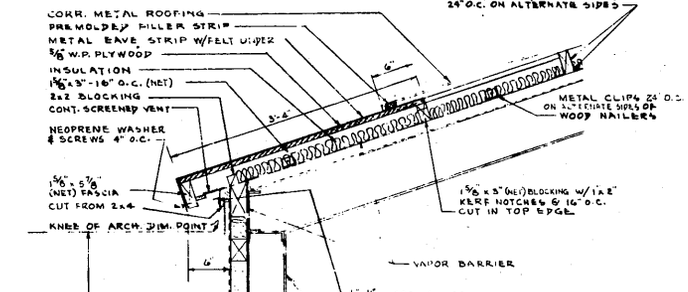
SCALE
SPEC. NO.
DRAWING NUMBER
AS BLT AW 71-05-651
SHEET 4 OF 4

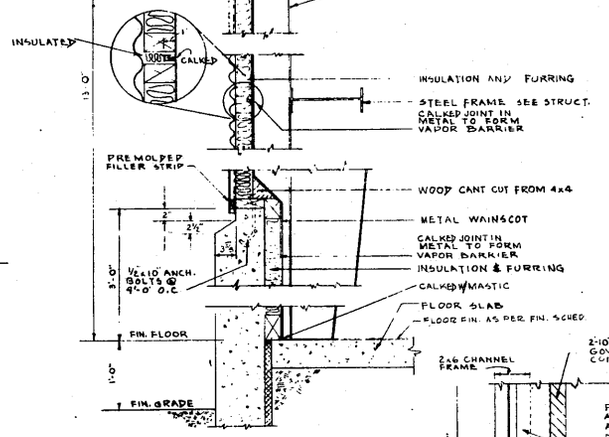
SK 105

SERIAL NO ENG. 95-507-60-63

CORPS OF ENGINEERS

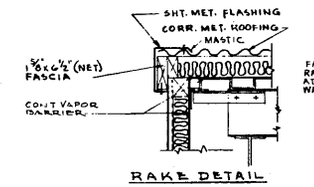
U. S. ARMY





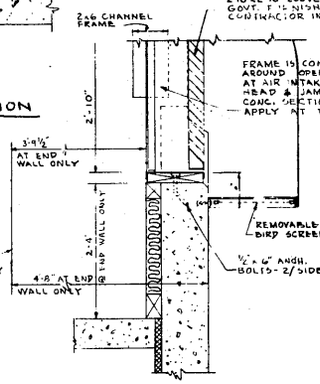
TYPICAL WALL SECTION

SCALE 1½" = 1'-0"

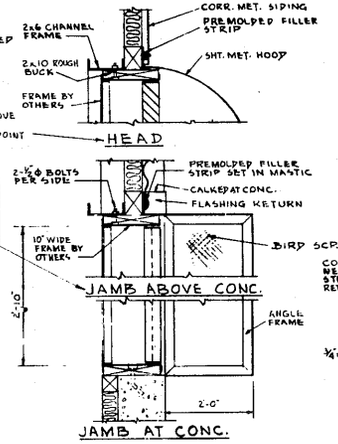


RAKE DETAIL

SCALE 1½" = 1'-0"



SILL



JAMB AT CONC.

ENGINE VENTILATION EXHAUST HOOD DETAILS

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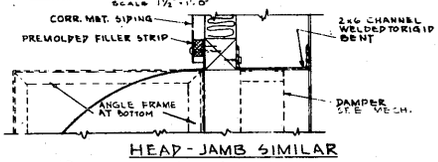
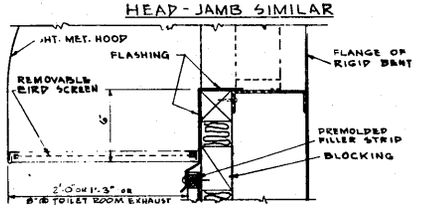


HEAD - JAMB SIMILAR



HOOD DETAIL

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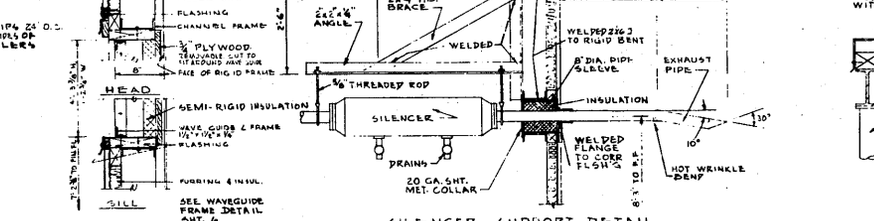
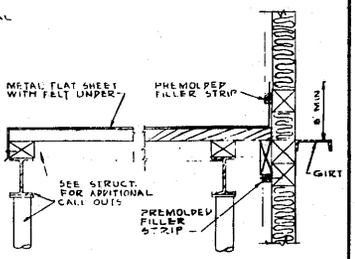


WAVE GUIDE OPENING DETAIL

SCALE 1½" = 1'-0"

SILENCER SUPPORT DETAIL

SCALE 1"=1'-0"



CANOPY SECTION

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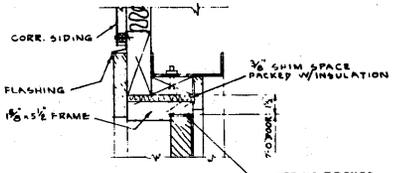
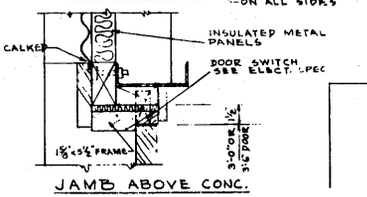
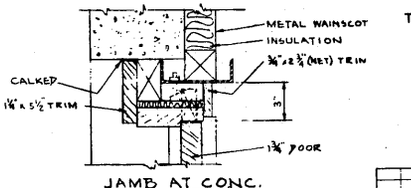


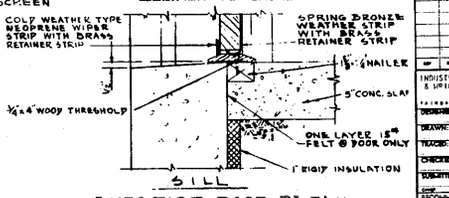
DOOR HEAD



JAMB ABOVE CONC.



JAMB AT CONC.



SILL

EXTERIOR DOOR DETAIL

SCALE 3"=1'-0"

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

REFERENCE NO. A-3

Sheet #5 Optional N.I.C.

BY	DATE	REVISION	DESCRIPTION	BY	APP'D

INDUSTRIAL & COMMERCIAL CONSTRUCTION, INC. & WRIGHTS TRUCK & TRACTOR SERVICE, INC. CONSTRUCTION CONTRACTORS FAIRBANKS ALASKA

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER FT. GREELY, ALASKA

DESIGNED:
DRAWN:
TRACED:
CHECKED:
SUBMITTED:

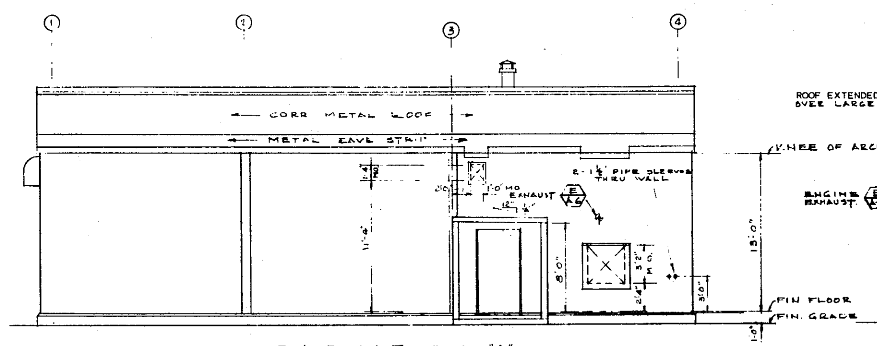
CATHEDRAL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
RADIO RELAY BLDG.
ARCHITECTURAL
WALL SECTIONS & MISC. DETAILS
METAL PANEL OPTION

DATE RECOMMENDED: APPROVED: Carl Peterson RESIDENT ENGINEER DATE 22 March 1961

APPROVED: DATE

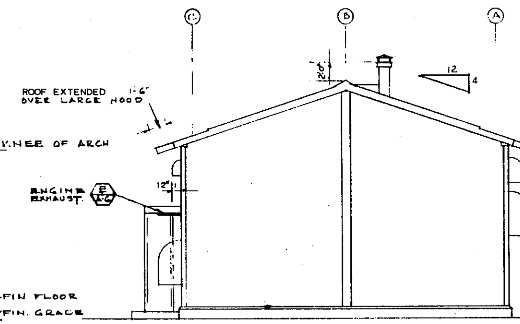
SCALE AS SHOWN DWG. NO. AS-BLT AW 38-17-07 SHEET 4 OF

SERIAL NO. ENG. 95-507-60-25



ELEVATION "A"

SCALE - ⅛" = 1'-0"



ELEVATION "B"

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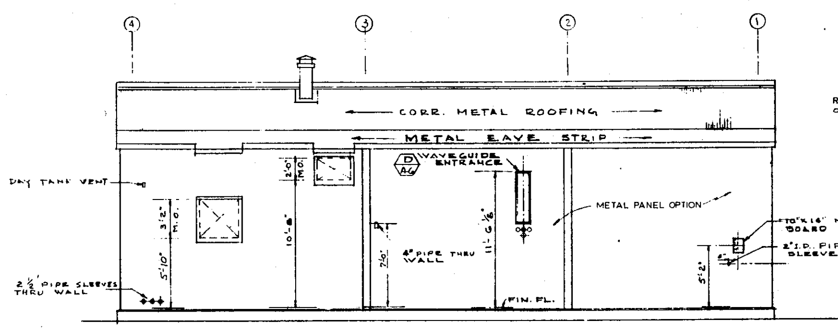

ELEVATION "C"

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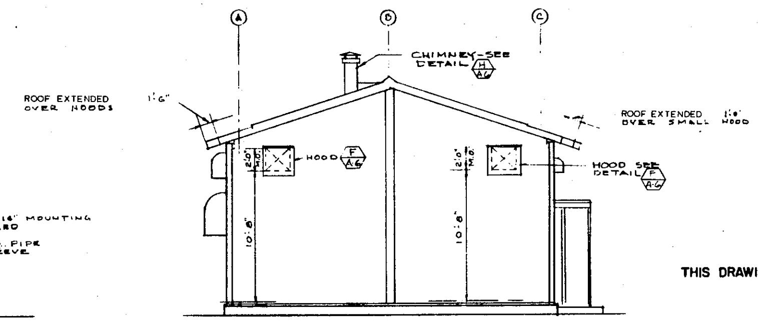


ELEVATION "D"

SCALE - ⅛" = 1'-0"

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

NOTE: ELEVATIONS ARE SHOWN FOR CONCRETE TILT-UP OPTION ONLY. ELEVATIONS FOR OTHER OPTIONS ARE SIMILAR. CONCRETE FOUNDATION WALLS EXTEND UP 5'-0" ABOVE FINISH FLOOR ON METAL PANEL OPTION SEE SHEET REFERENCE NO. A-5

NOTE METAL PANEL OPTION USED.

REFERENCE NO. A-2

REV	DATE	DESCRIPTION	BY
A	6-1963	Modified Storm Porch	E.C.

S.S. MULLEN, INC. CONSTRUCTION CONTRACTORS SEATTLE WASHINGTON

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER ANCHORAGE ALASKA

SAWMILL A.F.S., ALASKA
REARWARD COMMUNICATION FACILITIES
RADIO RELAY BLDG.
ARCHITECTURAL
ELEVATIONS

DESIGNED: DRAWN: TRACED: CHECKED: SUBMITTED:

RECOMMENDED: S.J. Bisardi PRIME CONTRACTOR

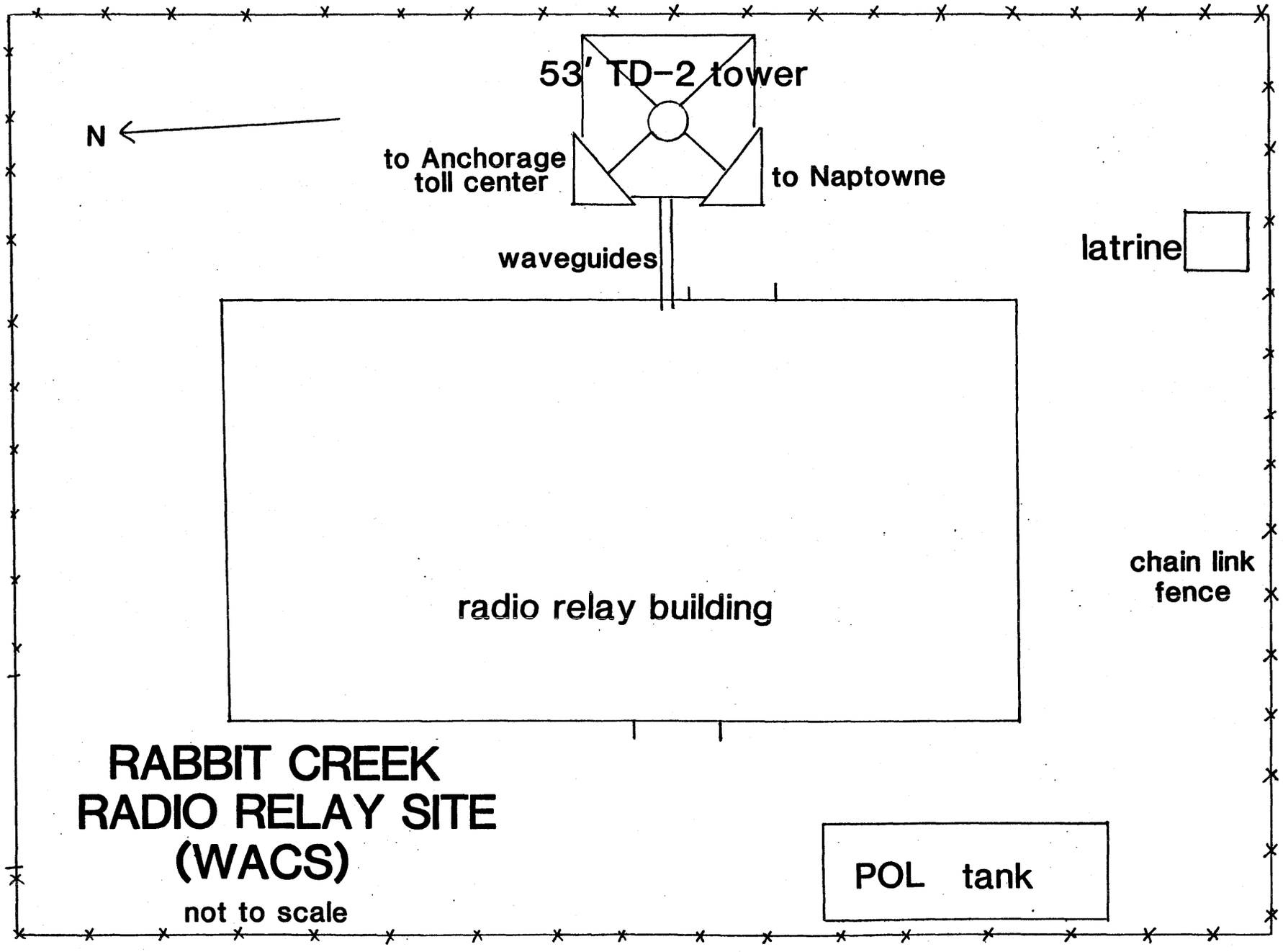
APPROVED: John E. Mazing Asst. RESIDENT ENGINEER DATE 6 Mar '61

AS BLT A-W 36-18-77

SERIAL NO. ENG. 95-507- 60-63

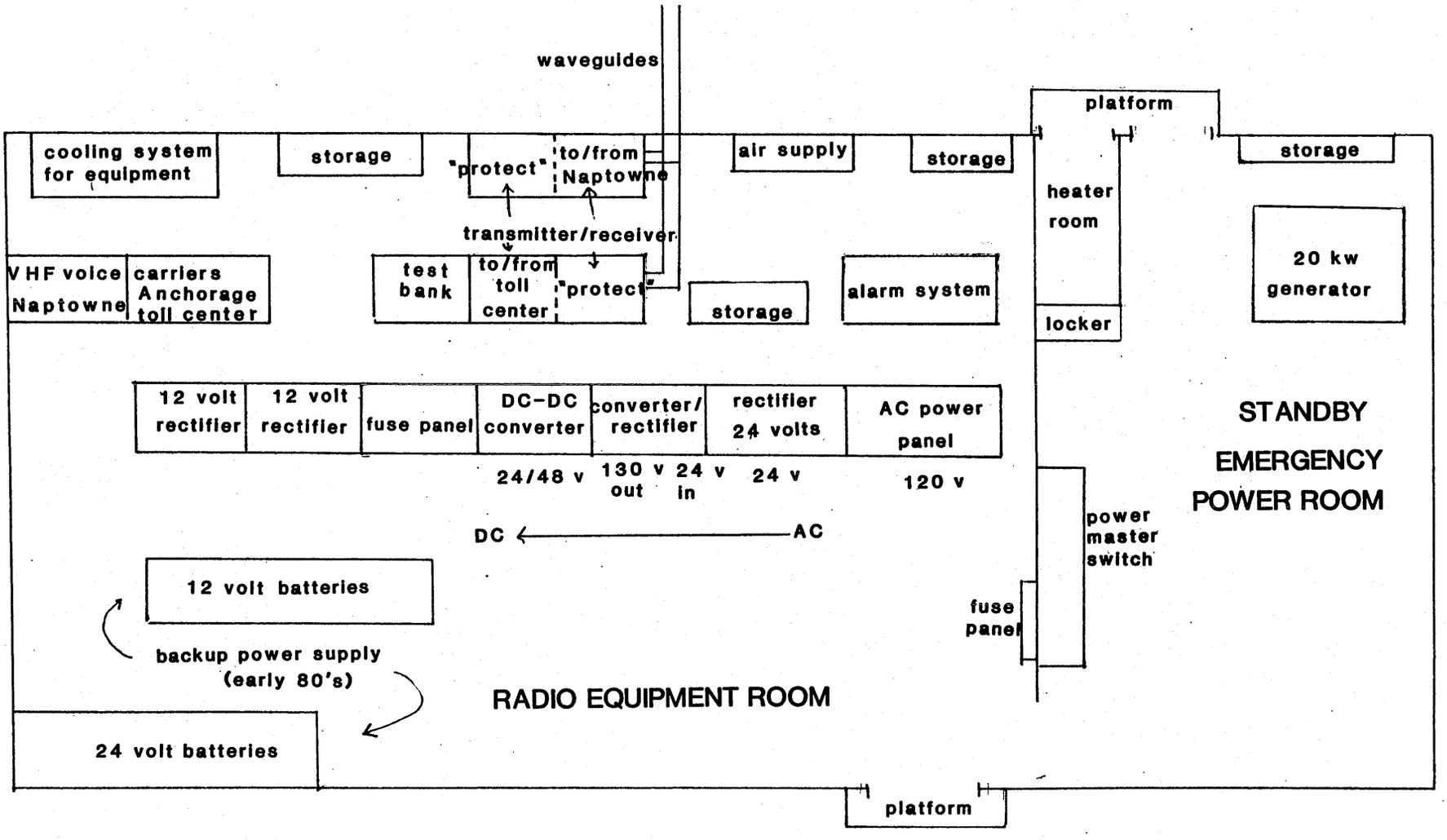
OTHER DOCUMENTATION

1. Site plan, Rabbit Creek Radio Relay Station.
2. Plan view, interior, radio relay building, Rabbit Creek facility.



RABBIT CREEK RADIO RELAY SITE (WACS)

not to scale



FLOOR PLAN, RABBIT CREEK RADIO RELAY STATION (WACS)

INVENTORY

Original White Alice Network

ANIAK

Aniak was a tropo facility which functioned as the link between Bethel and Sparrevohn. It was constructed between 1955 and 1958 and officially activated on 14 January 1958. It was closed in 1979 and is currently owned by the State which may use part or all of the facilities for educational purposes. Original improvements include a large (6080 sf) equipment and power building and a 12-person dormitory (4750 sf). Three POL tanks had a combined capacity of 7000 barrels of fuel. Aniak has two sets of billboard antennas: one pair of 60' antennas transmits to Bethel, 96 miles away, while the other 60' pair faces Sparrevohn, 135 miles distant. All antennas are deiced. They are painted in a checkerboard pattern because the facility is in the flightpath for the Aniak airport (photo 3).

ANVIL MOUNTAIN (NOME)

Anvil Mountain was a tropo facility linking Granite Mountain and Northeast Cape on Saint Lawrence Island. It was constructed in 1957 and opened on 9 January 1958. It was deactivated in 1978. The main improvement was a 6720 sf equipment/power building. No dormitory was needed because lodging was obtained in Nome. There was one 1600 barrel POL tank on site. In the mid-70's, a pair of transportable 30' dish antennas was added to bypass the link to Northeast Cape. Originally, two 60' antennas faced Northeast Cape 126 away and a second set faced Granite Mountain, 136 miles away.

BEAR CREEK (TANANA)

Bear Creek was a tropo station linking Indian Mountain, Kalakaket Creek and Pedro Dome. It was constructed during 1956 and 1957 and officially activated on 6 January 1979. It originally had a 7200 sf equipment and power building and a 16-person dormitory (5200 sf). One pair of 60' antennas faced Kalakaket Creek, 155 miles away and a second pair linked Pedro Dome, a distance of 130 miles (photos 6 and 7). A pair of 30' dishes linked Indian Mountain, 75 miles away. There was also a microwave link to the Tanana FAA.

BETHEL

Bethel was a three-way tropo link between Aniak, Cape Newenham and Cape Romanzof. It was constructed during 1957 and activated on 18 January 1958. It was deactivated in 1979. Some improvements may be taken over by KYUK, the regional educational TV channel. The original equipment and power building was 6720 sf. No dormitory was needed. The one POL tank had a 6500 barrel capacity. This impressive site boasted three pairs of 60' antennas. They faced Aniak (96 miles), Cape Romanzof (152 miles) and Cape Newenham (147 miles). All were deiced. Personnel stationed at Bethel WACS used many facilities at the nearby AC&W site.

BIG MOUNTAIN (ILIAMNA)

This tropo station linked Diamond Ridge, King Salmon and Sparrevohn. ATSS switching capability was added in 1969 (photos 5 and 13). It was constructed between 1956 and 1957 and opened 7 September 1957. It was closed on 27 April 1979. The equipment and power building measured 40 by 180 feet (7200 sf) and a 16-person dormitory (5200 sf) was also located there. One pair of 60'antennas faced Diamond Ridge, 128 miles away. A second faced Sparrevohn, 120 miles distant. A pair of 30' dishes linked King Salmon, 70 miles south. Big Mountain, Neklasson Lake, Pedro Dome and Kalakaket Creek were linked by ATSS switch. These facilities form a large rectangle and are linked so that if one facility failed, could still communicate the other three stations. For example, if Neklasson Lake needed to beam information to Pedro Dome, but Big Mountain was 'down,' the information could be beamed to Kalakaket Creek and then to Pedro Dome, bypassing Big Mountain.

BOSWELL BAY (HINCHENBROOK)

Boswell Bay was one of the first stations activated, constructed in 1955 and 1956, and activated on 29 November 1956. It was a tropo station linking Middleton Island and Neklasson Lake. A pair of 30' antennas faced Middleton Island, 69 miles away and a pair of 60' billboards faced Neklasson Lake, 133 miles distant. Its equipment building was 4600 sf and its separate power building was 2500 sf (see photos 9-11). There was also a 16-person, 5200 sf dormitory. There were several POL tanks and smaller out-buildings. The facility could be reached only by air. It was demolished in 1987 after extensive historic documentation. Under the guidance of the National Park Service, the State Historic Preservation Office and the Advisory Council on Historic Preservation, Boswell Bay WACS was determined Eligible for the National Register of Historic Places. Archival quality photographs have been deposited at the Library of Congress in Washington, DC and several thousand as-built drawings are on file at the University of Alaska, Anchorage archives.

CAPE CHINIAK

Cape Chiniak was intended as a combination tropo/microwave station, but was never opened as a WACS facility. It was planned as an AC&W site and had a microwave link to Pillar Mountain. Because the construction of the Aleutian DEW line in 1959 mitigated the need for an AC&W site, there was no need for a WACS facility either. The site was virtually completed, however. It did become operational, however, as a Pacific Range Tracking Site in 1958-59.

CLAM GULCH (KENAI R1-S)

This is a TD-2 microwave radio relay station with paths 26 miles north to Soldotna and 26 miles south to Diamond Ridge. It was constructed during 1955 and 1956 and opened on 30 March 1957. Improvements include an equipment/power building (1250 sf), the 275' TD-2 tower and a chain link fence. It is owned by Alascom and still in use.

DIAMOND RIDGE (HOMER)

Diamond Ridge is a combination tropo/TD-2 facility. The 63' TD-2 tower is a link to Starisky Creek, 14 miles north. Two 60' billboard antennas link Pillar Mountain, 135 miles south, and a second pair link Big Mountain, 128 miles away. It was constructed in 1956-57 and opened on 30 March 1957. The equipment and power building (6100 sf) houses the communications center, power generator, radio equipment and operators rooms. There is also a 720 sf auto maintenance shop and a 45 sf water supply building. POL storage is contained in four tanks totalling 1000 barrels. Diamond Ridge was acquired by Alascom in 1983 and is still in use. The billboard antennas have been removed.

FORT YUKON

Fort Yukon was originally linked to Pedro Dome, 124 miles south by a pair of 60' billboard antennas. 120' antennas were added in 1961-62 to connect to the DEW-line station at Barter Island as part of project Stretchout. It was constructed in 1956-1957, and prior to that time, had been an AC&W site. Improvements include the 4960 sf equipment/power building, three smaller 'out buildings,' a septic tank and four POL tanks totalling 10,200 gallons.

GRANITE MOUNTAIN (HAYCOCK, CANDLE)

This facility was a tropo link to three other stations. One pair of 60' antennas faced North River 108 miles northwest. A second set faced Anvil Mountain, near Nome, 136 miles away. A pair of 30' dishes also linked Kotzebue, 105 miles west. It was constructed in 1956 and 1957 and activated on 25 May 1957. It was leased to Alascom in 1976. The equipment/power building is 7520 sf and the dormitory is 5200 sf. POL storage is provided by three tanks with a total capacity of 7000 barrels.

INDIAN MOUNTAIN

This tropo station was linked by two 30' dish antennas to Bear Creek, 75 miles away. It was constructed in 1956 and 1957 and opened on 7 February 1958. The 4480 sf equipment building was originally comprised of four separate buildings. They were replaced by one composite building in 1961 at a cost of $2,280,000. POL storage was provided by three tanks totaling 2550 barrels. Indian Mountain was colocated with an AC&W site. The AC&W site was constructed in 1951 by the 807th Engineer Aviation Battalion who had constructed the World War II airstrips on Umnak and Adak Islands.

KALAKAKET CREEK (KAL CREEK)

Kal Creek was a combined tropo/TD-2 microwave station. It provided a link to North River, 118 miles away, with 60' antennas; a link to Bear Creek 155 miles away, with 60' antennas, and a link to Tatalina, 107 miles distant, with a pair of 30' dish antennas. A microwave link to Campion and Galena was added. It was constructed in 1956 and 1957 and opened on 25 May 1957. ATSS switching capabilities were added during project Stretchout (see Big Mountain entry). The equipment/power building was 7520 sf and 16-person dormitory was 5200 sf. POL storage consisted of three tanks totalling 7000 barrels.

KING SALMON (NAKNEK)

This tropo station was linked to Big Mountain, 70 miles away, by two 30' dish antennas. It was constructed in 1956 and 1957 and opened 25 May 1957. During project Stretchout, King Salmon became the link for the Aleutian DEW-line system with the main WACS network. Its equipment and power building is 4160 sf and POL storage is comprised of three tanks totalling 3000 barrels. It is located on an active Air Force Base which provides some facilities. Other facilities are provided by the nearby AC&W site.

KOTZEBUE

This tropo station linked Granite Mountain, 105 miles east, by a pair of 30' antennas and Lisburne, 168 miles to the north, by a pair of 60' billboard antennas (photo 8; as-builts 7, 8). Construction began in 1956 and the station opened on 25 May 1957. The equipment and power building is 5280 sf. POL storage is provided by three tanks totalling 7950 barrels. The buildings are abandoned but reportedly in good condition. The state of Alaska may convert the facility into a minimum security prison. The 30' and 60' antennas have been demolished. Kotzebue WACS is colocated with an old AC&W site.

CAPE LISBURNE

This facility was linked by 60' tropo antennas to Kotzebue, 168 miles south, and to Point Lay DEW-line station by a second pair of billboard antennas. It was constructed in 1956-57 and opened on 29 August 1957. Lisburne was the only "seasonal" WACS, not in use during the winter. The equipment and power building was2960 sf. This was replaced by a "showplace" composite building in 1968-70, which boasted a two-story foyer, "Simulating an airy summer atmosphere." It had a colorful interior and lavish lighting. The building cost 6.5 million dollars to build in 1968-70. A tramway was added in 1963 for 1.35 million dollars. POL storage was accomplished by two 400 barrel tanks. Lisburne was the northernmost WACS facility.

MIDDLETON ISLAND

This was one of the first facilities to open. It was constructed in 1956 and opened on 29 November 1956. The first telephone call to use the WACS went through Middleton Island via Neklasson Lake. It has been turned over to the Federal Aviation Administration and most of the island is owned by a private group of lawyers, MIDICO. A pair of 60' billboard antennas linked Boswell Bay, 69 miles to the north, and a second set linked Neklasson Lake, 130 miles north. The equipment and power building was 4300 sf and constructed in six sections. POL storage was provided by three small tanks. Site condition is apparently good. The tropo equipment has been removed although the antennas are still standing. Middleton Island was an AC&W reserve site along with Ohlson Mountain, Cape Chiniak, Sitkinak, Fire Island, and Murphy Dome. Several FAA personnel are stationed at the facility. Middleton Island was a remote station and considered a difficult post. A Mr. Flanley of Federal Electric was quoted in the Wall Street Journal as saying: "One of our best men couldn't take

Middleton Island; it's windswept, small, and bare as a baby's bottom. He got claustrophobia there; we moved him to another station and he's all right" (WECO 1957).

NAPTOWNE (KENAI R1-N)

Naptowne is a radio relay station with a 250' TD-2 microwave tower with paths 48 miles north to Rabbit Creek and 17 miles south to Soldotna. It was constructed in 1955-56 and opened 18 January 1957. It was acquired by Alascom in 1983 and is still functioning. It consists of a 1200 sf equipment and power building, a 16 sf sanitary latrine, two POL tanks totalling a 200 barrel capacity and a 595' long chain link fence.

NEKLASSON LAKE (NEK LAKE, WASILLA)

Nek Lake functioned as a tropo link to Boswell Bay, 130 miles to the south, and also had a TD-2 microwave link to Elmendorf AFB. Nek Lake and Boswell Bay were the first two WACS stations to become operational (29 November 1956). During Project Stretchout, this facility became a switching station and was incorporated into BMEWS, A Route. The equipment and power building (5710 sf) was built in seven sections and included the communications center, power plant room, switchboard room, pump station, radio facility room, microwave equipment room and office control equipment room. There was also a paint shed and a 250 gallon POL storage tank. None of the original equipment, with the exception of a backup generator, remains. The 60' tropo antennas, while not in use, are still standing. Nek Lake is easily accessible from Anchorage, near Palmer.

CAPE NEWENHAM

Cape Newenham's 60' antennas faced Bethel, 147 miles away (photo 4, as-built 1). This facility was constructed in 1957 and opened on 18 January 1958. Its main function today is as a Minimally Attended Radar (MAR) site with its characteristic golfball configuration. The WACS site consisted of a 5280 sf equipment and power building, a 4750 sf 12-person dormitory and two 475 gallon POL storage tanks. Newenham also had one of the few tramways in the WACS system. It collapsed early during its operation but no one was hurt. The composite building (equipment and power building) was revamped in 1974 at a cost of over six million dollars. The site has been demolished.

NORTH RIVER (UNALAKLEET)

This was a combination tropo/microwave site with 60' antennas connecting Granite Mountain, 108 miles to the east and Kalakaket Creek, 118 miles southeast. A microwave like to the nearby Unalakleet AC&W site was also in place. It was constructed in 1957 and opened on 13 September of that year. Its equipment and power building was 6720 sf and its 12-person dormitory was 4750 sf. POL storage was a combined capacity of 11,200 barrels. Many AC&W facilities were used and the facility was accessible by road from Unalakleet. However, the military-constructed bridge across the Unalakleet River was prone to wash out because of spring flooding, so at times, the WACS personnel were isolated. The site is now abandoned and heavily vandalized.

NORTHEAST CAPE

Northeast Cape is located on St. Lawrence, certainly one of the more isolated WACS installations. It functioned as a relay station between Anvil Mountain, 126 miles east, near Nome and Tin City, near Point Hope, 161 miles away. In both cases, pairs of 60' antennas were used. It was constructed in 1957 and became operational on 17 February 1958. The composite, or equipment and power, building was 5280 sf. POL storage was accomplished by one 500 barrel tank. Because it was colocated with an AC&W site, dorm and recreation facilities were located there.

PEDRO DOME (GILMORE)

Pedro Dome was a combined tropo/micro station. 60' antennas faced Fort Yukon, 124 miles away and a second pair linked Bear Creek, 130 miles to the south. A 75' TD-2 tower interconnected with Fairbanks Alaska Communications Site (ACS), 15 miles away, Harding Lake, Murphy Dome and Eielson AFB. The station was constructed in 1957 and opened on 6 January 1958. It was incorporated into the BMEWS, A Route, in the mid-60s. The equipment and power building was 9120 sf and the attached 16-person dormitory was 5200 sf. Also on site were a warehouse, water pumphouse, auto maintenance building, fire pump station and POL storage with 470 barrel capacity.

PILLAR MOUNTAIN (KODIAK)

Pillar Mountain was a tropo station linking Diamond Ridge 135 miles north by 60' antennas. An original intention of Western Electric was to have Pillar Mt. also link Sitkinak, 107 miles away. However, when project Stretchout was completed, Sitkinak was unnecessary, so this link was never made. Pillar Mt. also served other government and private entities--U.S. Navy, F.A.A. and R.C.A., for example. The Navy was linked via Cape Chiniak, another station intended as a WACS but, like Sitkinak, never opened as such. Pillar Mountain was constructed in 1957 and opened on 26 April of that year. All components were not completed until 1966. The composite building was 4960 sf, and there were also an auto maintenance building, water and fire pump building, water storage tank and POL storage The facility is now abandoned and is pending conveyance and possible use by the City of Kodiak.

RABBIT CREEK (POTTER, R1-S)

Rabbit Creek was an unattended TD-2 microwave radio relay station between Naptowne, 48 miles south, and R1-N, on Elmendorf AFB, 12 miles north. It was built in 1955-56 and opened on 18 January 1957. It was acquired by Alascom in 1983 and still functions as it did originally. The site consists of a 1200 sf equipment building, a latrine, and a 100 barrel POL tank. Because it contains most of its original equipment and is so well maintained, it was chosen for archival recordation to National Park Service standards during the course of this project. The photographs, copies of which are in this report, will be sent to the Library of Congress in Washington, D.C. and representative as-built drawings will be deposited at the University of Alaska, Anchorage archives. The reason why Rabbit Creek as-builts do not appear in this report is because there are

only three in existence, and these are not original. Because the TD-2 stations are all virtually identical, Sawmill and Cathedral as-builts are used instead for report purposes.

R1-N (ANCHORAGE R1-N)

This is an unattended TD-2 microwave relay station which connects Neklasson Lake, 32 miles east, Rabbit Creek, 12 miles south, and Anchorage ACS (Alascom toll center), 3 miles south. It was constructed in 1956 and opened on 29 November of that year. While it is located on Elmendorf AFB, Alascom owns the microwave equipment. It consists of a small equipment and power building and the TD-2 tower.

CAPE ROMANZOF

This was a tropo station linking Bethel, 152 miles away, by 60' billboard antennas. It was constructed in 1956 and 1957 and opened on 15 February 1958. Minimally Attended Radar (MAR) facilities were added in the mid-1960's, and this continues to be the station's main function. The original site consisted of a 5280 sf composite building, a 4750 sf 12-person dormitory and 2000 barrel capacity POL storage tanks. It was colocated with an AC&W site where other facilities were available. It is now abandoned except for the MAR facility.

SITKINAK

Sitkinak had been intended as a link to Pillar Mountain, 107 miles to the north, but was rendered obsolete by Project Stretchout. The facility was 79% completed when it was abandoned.

SOLDOTNA (KENAI)

Soldotna is an active TD-2 microwave radio relay station, with paths 17 miles north to Naptowne and 26 miles south to Clam Gulch Photo 12). It was opened in 1957 and acquired by Alascom in 1983. The original site included a 4550 sf equipment building, a 12-person 4580 sf dormitory, a garage and maintenance shop (1560 sf), a Fire pump house and water control building (206 sf) and a 240 barrel POL tank. It serves its original purpose, contains much of the original equipment, but has been somewhat remodelled.

SPARREVOHN

Sparrevohn, which has been demolished, was a three-way tropo relay station. It linked Big Mountain, 120 miles away, with 60' antennas; Aniak, 135 miles away, with a second pair of 60' antennas, and Tatalina, a distance of 127 miles, with a set of 30' antennas. It was constructed in 1956 and 1957, and became operational on 26 October of 1957. It was deactivated in 1979. Its composite building was 5760 sf, and its 16-person dormitory was 5200 sf. POL storage consisted of three tanks totalling 6200 barrels capacity.

Sparrevohn was the hardest facility to build and one of the most costly. The site was not accessible by land or water. Survey gear was initially parachuted in 1951. Initial construction was accomplished by the 813th Engineer Aviation Battalion, who built the runway on Amchitka Island in World War II. Because the area was so poorly known at the time, survey equipment was dropped on the wrong summit at least once. On another occasion, a D-9 Caterpillar was being lowered from a helicopter by cable. The cable snapped and the Cat hurled into the top of the mountain, instead of coming to rest on top of it. When an airstrip was finally cleared, it was found to have a slope of 12 degrees. A sheer cliff is situated at one end of the airstrip. 1960 modifications to the composite building cost in excess of 1.6 million dollars.

STARISKY CREEK (HOMER R1-N)

Starisky Creek is an unattended main route microwave relay station linking Diamond Ridge, 14 miles south, and Clam Gulch, 26 miles north. It was constructed in 1955 and 1956 and opened on 30 March 1957. It was declared excess in 1979 and acquired by Alascom. It consists of a 1200 sf equipment building, an outhouse, and a 100 barrel POL tank. It performs the same function as it did in 1957 and much of the original equipment is left.

TATALINA (McGRATH, TAKOTNA)

Tatalina, which has been demolished, was a tropo link between Sparrevohn, 127 miles away, and Kalakaket Creek, 107 miles away. Both links used two 30' dish antennas. It was constructed in 1956 and 1957 and opened on 27 October, 1957. It was deactivated in 1979 but a Minimally Attended Radar (MAR) facility still functions. There is also a microwave link to Galena FAA. The equipment building was 4160 sf and POL storage was accomplished by three tanks with a total of 1325 barrels capacity. Many facilities were available at the neighboring AC&W site.

TIN CITY (WALES)

Tin City communicated with Northeast Cape, on St. Lawrence, 161 miles southwest, with 60' antennas. Later temporary 30' circular antennas were added to link Anvil Mountain and Tin City, bypassing Northeast Cape. the facility was constructed in 1957 and opened on 18 February 1958. The composite building was 4960 sf and there were two POL storage tanks totalling 950 barrels capacity Other facilities were available at the AC&W site, 1.5 miles away. A passenger tramway was added in 1963 to transport workers from base camp to top camp (WACS). The cost to construct this and the Cape Lisburne tramway was almost 1.4 million dollars. Repairs in 1967 and 1968 to the composite building were 4.6 million dollars.

THE BMEWS (BALLISTIC MISSILE EARLY WARNING SYSTEM)/REARWARD COMMUNICATIONS

Because most of these stations are so similar, the majority of them will not be described separately. Most consisted of a radio relay building, a POL tank, and a TD-2 tower. They were constructed exactly the same as the earlier TD-2's, such as Naptowne, Soldotna or Rabbit Creek. They were all constructed in 1960 and opened in 1960 or 1961. Some had latrines and auto maintenance shops. In the following list, the station name is listed, whether it belonged to the A or B Route, the stations to which it was linked, and the mileages to the links appear in parentheses.

Station	TD-2 Links
AURORA (A)	Glennallen (25); Paxson (40)
BEAVER CREEK (B)	Tok (41); Mt. Dave, Canada (43)
BLACK RAPIDS (A)	Donnelly Dome (19); McCallum (20)
CANYON CREEK (B)	Gold King Creek; Delta Junction (35)
CATHEDRAL (B)	Knob Ridge (20); Tok (25)
CLEAR (A; BMEWS hub)	Murphy Dome; Gold King Creek
DELTA JUNCTION (B)	Gerstle River (28); Canyon Creek (35)
DONNELLY DOME (B)	Black Rapids (20); Harding Lake (54); Delta Junction (18)
GERSTLE RIVER	Delta Junction (27); Knob Ridge (31)
GLENNALLEN (A)	Aurora (25); Tolsona (20)
GOLD KING CREEK (B)	Clear (60); Canyon Creek
HARDING LAKE (A)	Donnelly Dome (54); Pedro Dome (46)
KNOB RIDGE (B)	Cathedral (20); Gerstle River (31)
McCALLUM (A)	Black Rapids (19); Paxson (20)
MURPHY DOME (A)	Pedro Dome; Clear
PAXSON (A)	Aurora (40); McCallum (20)
SAWMILL (A)	Neklasson Lake (33); Sheep Mountain (22)
SHEEP MOUNTAIN (A)	Tahneta Pass (12); Sawmill (22)
TAHNETA PASS (A)	Sheep Mountain (12); Tolsona (42)
TOK JUNCTION (B)	Beaver Creek (41); Cathedral (25)
TOLSONA (A)	Tahneta Pass (42); Glennallen (20)

The following five BMEWS stations are of the tropo type and were part of the A Route. All links, unless specified otherwise, are 60' antennas. Site configuration is based on the older stations described for the original WACS tropo installations.

DUNCAN CANAL	Smuggler Cove; Hoonah
HOONAH	Duncan Canal; Ocean Cape; TD-2 link to Lena Point
OCEAN CAPE	Cape Yakataga; Hoonah
SMUGGLER COVE	Duncan Canal; remote link to DEW-line
CAPE YAKATAGA (photo 14)	Ocean Cape; Boswell Bay

PROJECT STRETCHOUT

Construction on Project Stretchout began in the late 1950's. Because the six stations were configured somewhat differently and had various functions, they will be described separately. All of the stations were tropos and they functioned, overall, as the Aleutian DEW-line system. It was during this phase of WACS construction that 120' billboard antennas were first used. While the 60' antennas had been successful elsewhere, 120' antennas were still in the planning stage when they were constructed in the Aleutians. The facilities were built in the 1950's, and DEW-line capabilities functioned until the late 1960's.

COLD BAY

Cold Bay became the hub of the Aleutian DEW-line system and connected back to the main WACS network at King Salmon. It was also the headquarters for the 714 AC&W squadron. the facility was constructed in 1958, opened in 1959, and deactivated in 1979. MAR capability was added in the 1970's. 60' antennas beamed signals 105 miles to Port Moller and 92 miles to Cape Sarichef. The original site consisted of a composite building which housed the dormitory and the communications equipment as well. Additional facilities were available at the nearby ACS site. The original cost for Cold Bay and Cape Sarichef together was almost eight million dollars. Improvements and repair to the composite building in 1971 cost 2.5 million dollars. The installation has been demolished.

DRIFTWOOD BAY (UNALASKA)

Driftwood Bay reached west 106 miles to Nikolski and east 93 miles to Cape Sarichef. 60' antennas were employed. The station was opened in 1959 and deactivated in 1977. It has been vandalized extensively, which is rather surprising because it is such a remote site.

NIKOLSKI

Nikolski not only functioned as a component of the western DEW-line, it served the Navy, FAA, and other agencies as well. It communicated with Driftwood Bay, 106 miles to the east, via 30' antennas; Atka, 233 miles to the west, with 60' antennas, and Adak, 341 miles west, with 120' antennas. It cost five million dollars to build

PORT HEIDEN

Port Heiden communicated directly with King Salmon, 141 miles up the Alaska Peninsula and with Port Moller, 100 miles down the Alaska Peninsula utilizing 60' antennas in both cases. It was opened in 1959 and deactivated in 1978. The original site included a 15,000 sf composite building, a 400 sf water storage tanks, a 90 sf water pump house, a 140 sf ammunition storage structure and fuel storage tanks totalling 540,000 gallons in capacity. This abandoned site has been heavily vandalized and is in a state of "decomposition". It cost 3.5 million dollars to build.

PORT MOLLER

Port Heiden and Port Moller were virtually identical in site composition and configuration. 60' antennas communicated with Cold Bay, 105 miles to the west, and with Port Heiden, 100 miles away. It has been ransacked and free standing water is present is all buildings. The original cost to build Port Moller was 4.4 million dollars. It may have cost to build than Port Heiden because it is a less accessible spot.

CAPE SARICHEF

Cape Sarichef, now in private hands, was built on top of a levelled cinder cone. A problem during construction and all during occupation of the site was volcanic ash and dust which got into all the machinery and bothered the personnel as well. One pair of 60' antennas communicated with Driftwood Bay, 93 miles to the west, while the other pair faced Cold Bay, 92 miles to the east. The initial cost of Cape Sarichef and Cold Bay together was almost eight million dollars.

PROJECT BLUEGRASS

Project Bluegrass extended the WACS to the end of the Aleutian Chain. Adak and Shemya became operational in the late 1960's and were deactivated in the late 1970's. They have been demolished, although the composite building on Shemya has been stripped, remodelled and has been reused for other purposes. Due to the remoteness of these facilities, only 120' billboard antennas could be used (photo 2; as-builts 2-6). As mentioned above, use of this size antenna was still in the planning stage. When erected during Stretchout and Bluegrass, they had never been used before. Adak communicated with Nikolski to the east, 341 miles distant and with Shemya, an incredible 393 miles to the west. Shemya was the end link to Adak and the WACS system on the mainland and also had communications capabilities with the Coast Guard installation on Attu.

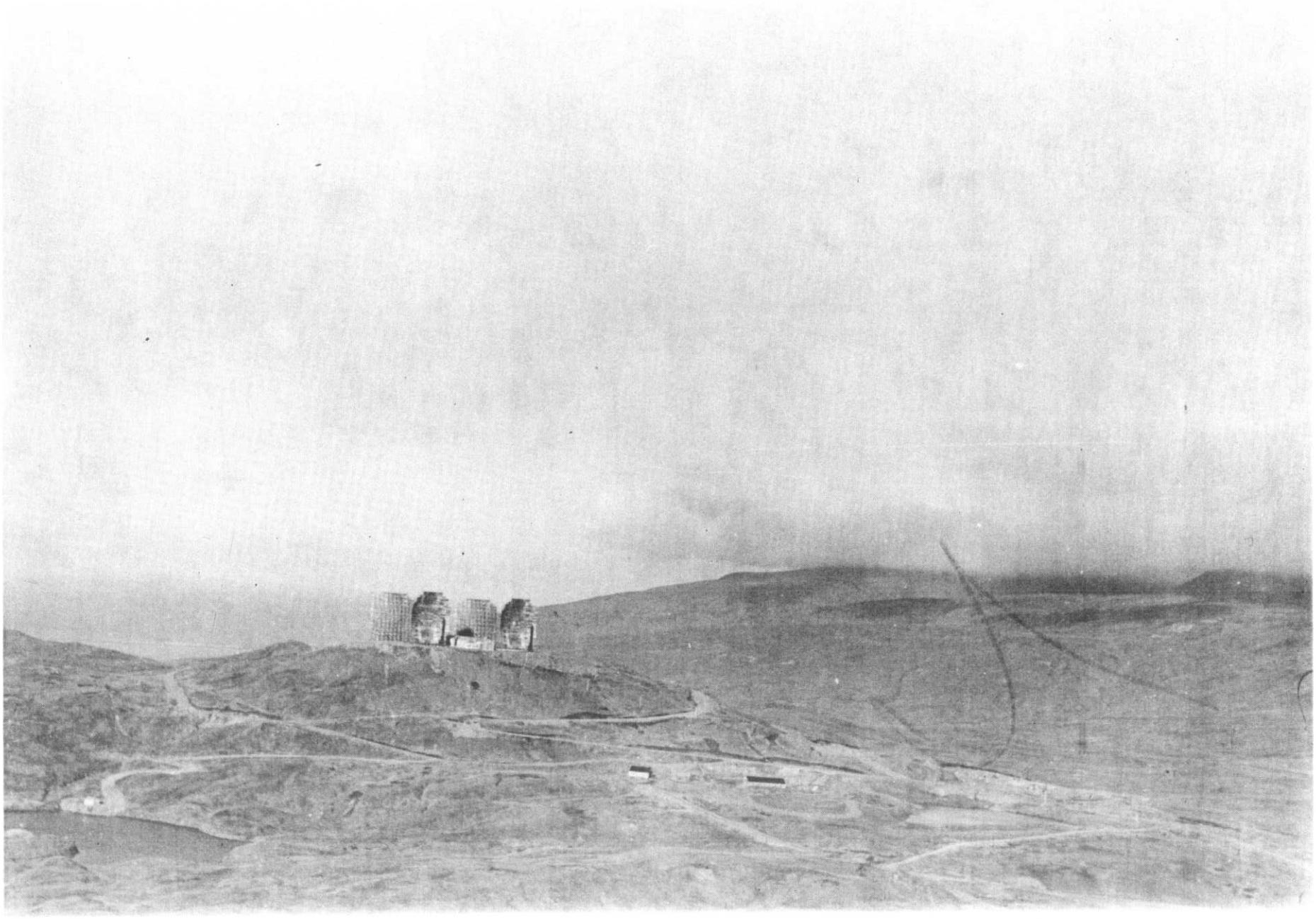
LIGHT ROUTE MICROWAVE FACILITIES (LRM)

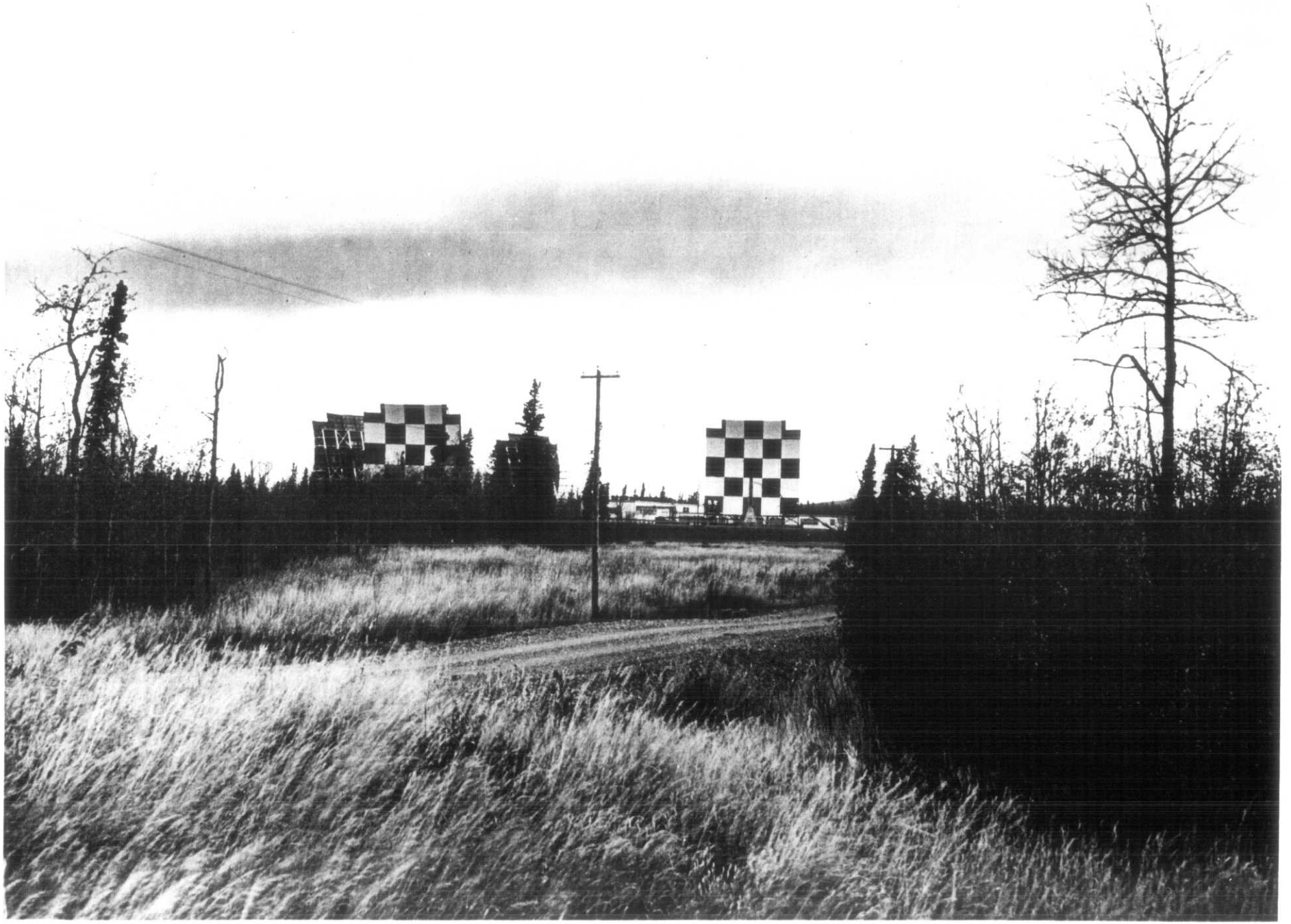
LRM's date to the 1960's and provided telephone service to the Air Force Bases on which they were located. They also connected into the WACS system. Pre-existing facilities were used and the WACS rented office space in them. The Campion AFB WACS connected to Kalakaket Creek and Galena. Eielson AFB had a microwave path to Pedro Dome. The Elmendorf AFB facility connected to R1-N and, finally, Galena was linked to Campion and Kalakaket Creek.

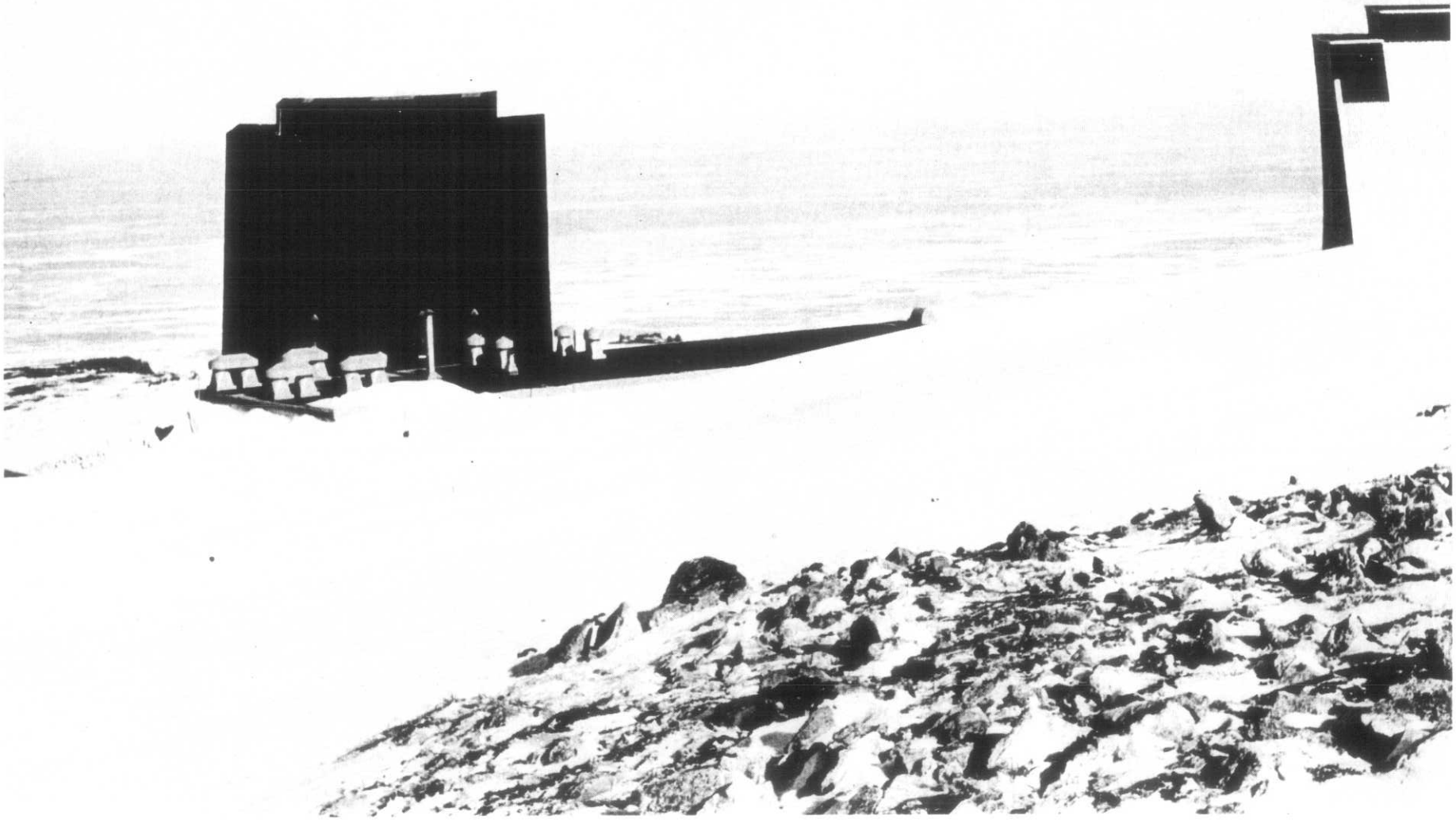
INDEX TO PHOTOGRAPHS

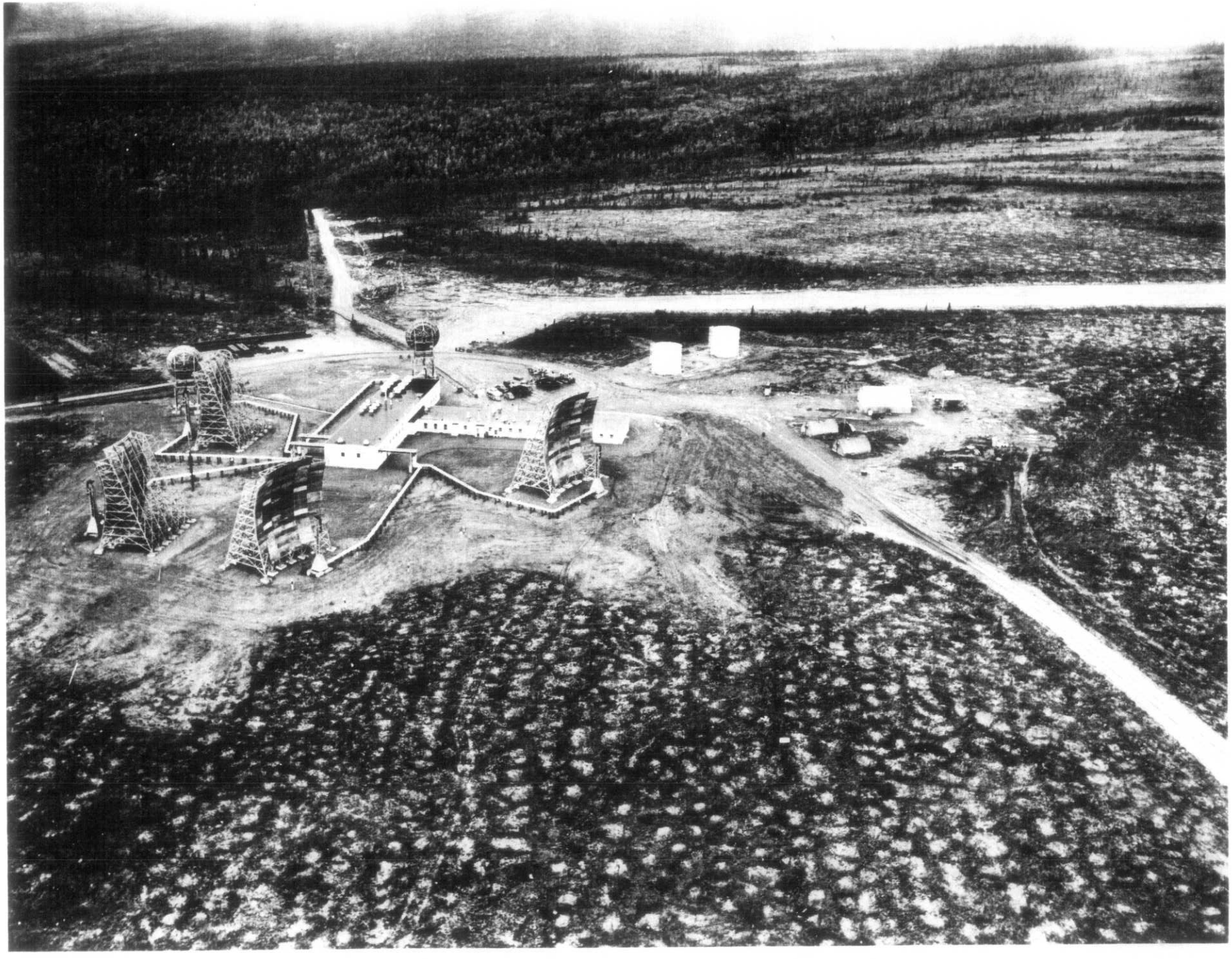
1. Airman 2nd Class Alfred J. Thurman on assignment at Pillar Mountain WACS (front of report).
2. Adak complex with 120' antennas.
3. Aniak facility. Note checkerboard 60' antennas.
4. Cape Newenham WACS, winter, 1960.
5. Big Mountain from the air.
6. Bear Creek, aerial shot, summer.
7. Bear Creek, winter.
8. Kotzebue WACS with 30' and 60' antennas.
9. Boswell Bay, interior; power plant power panels.
10. Boswell Bay, interior; power plant detail.
11. Boswell Bay, interior; generator.
12. Soldotna, TD2 microwave tower.
13. Big Mountain 30' antennas.
14. Cape Yakataga, 60' antenna.
15. Anchorage ACS, telephone operator (after Historic Perspective section).

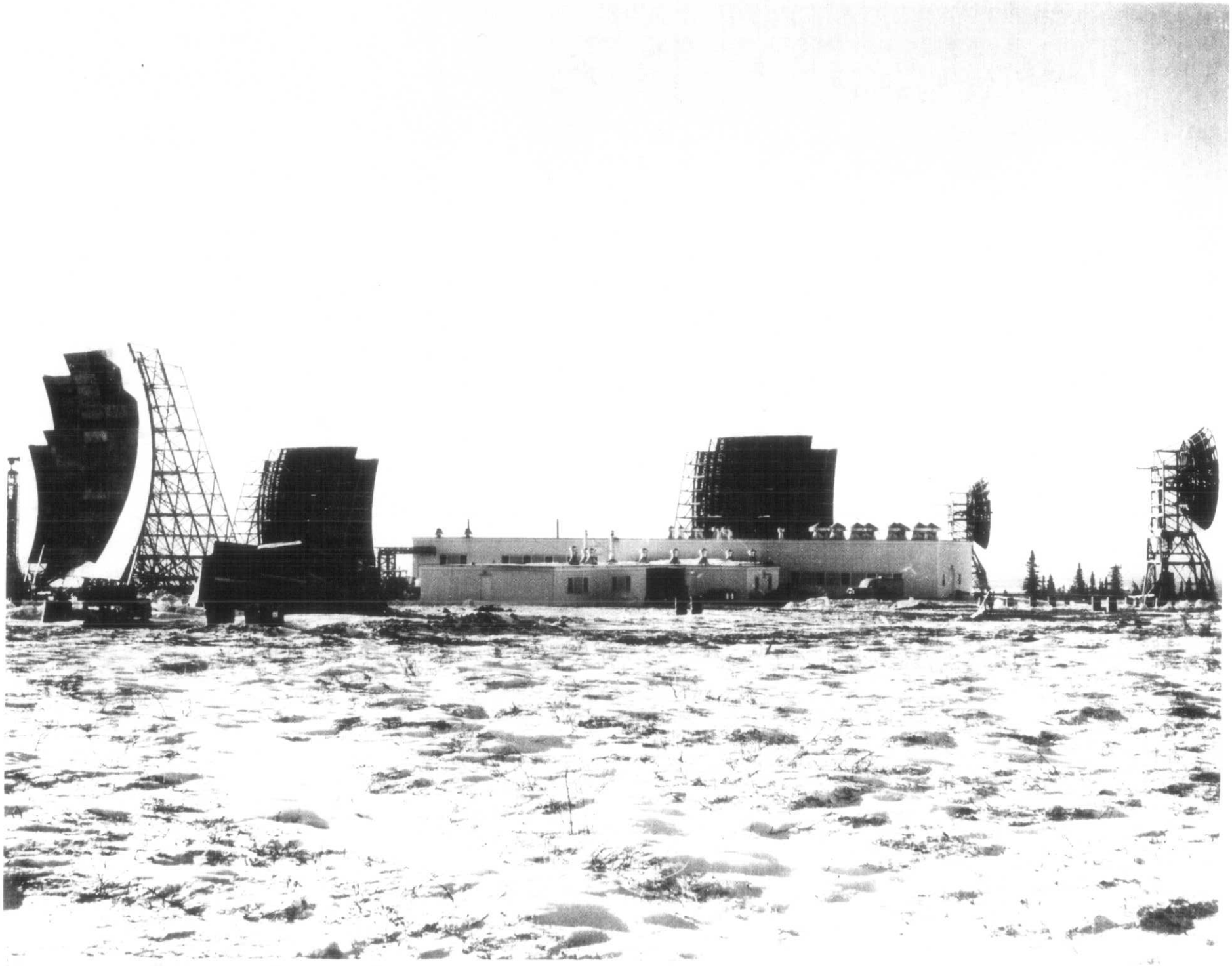
All photos courtesy History Office, Alaskan Air Command. All photos date between 1957 and 1962.

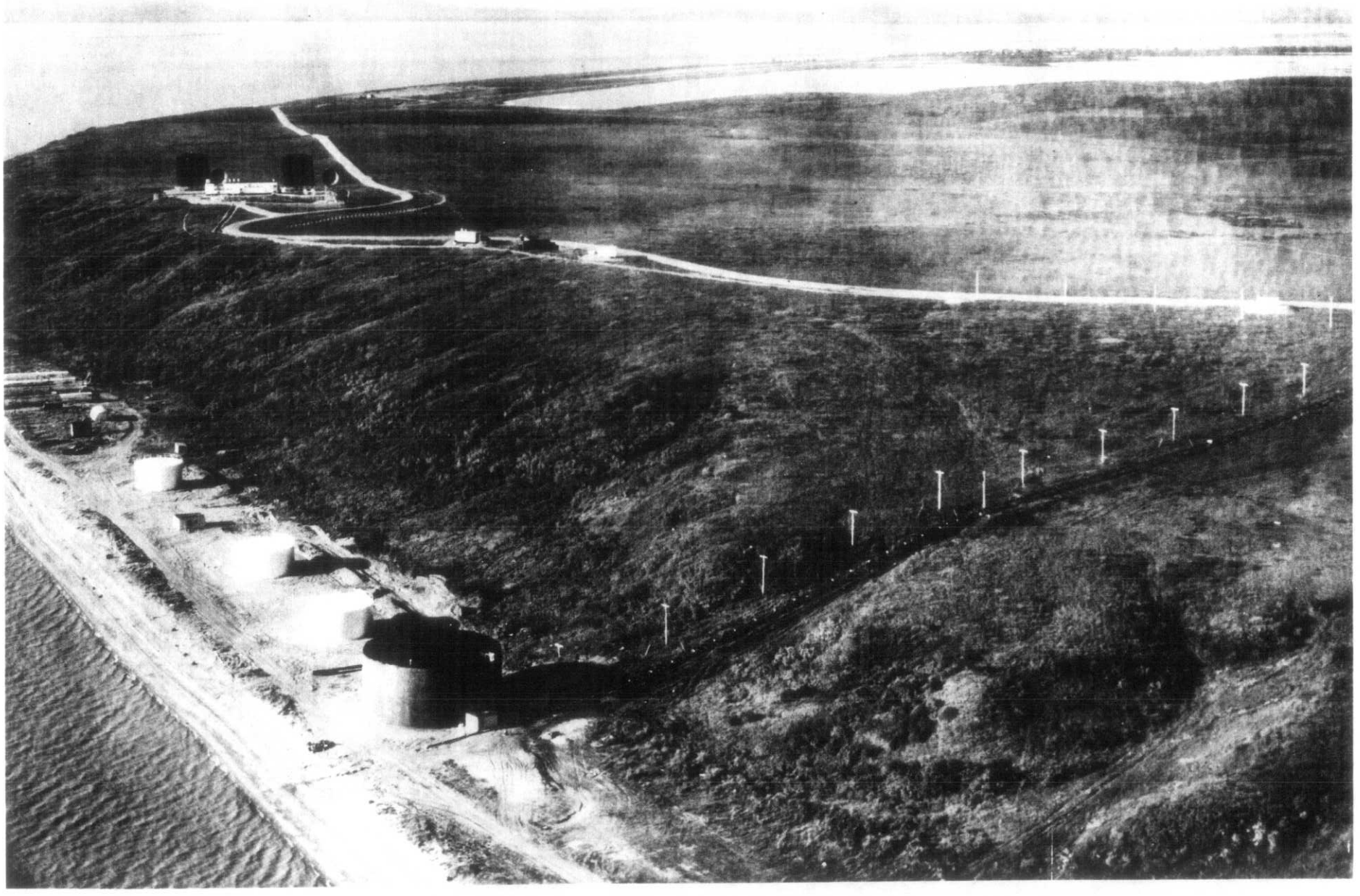


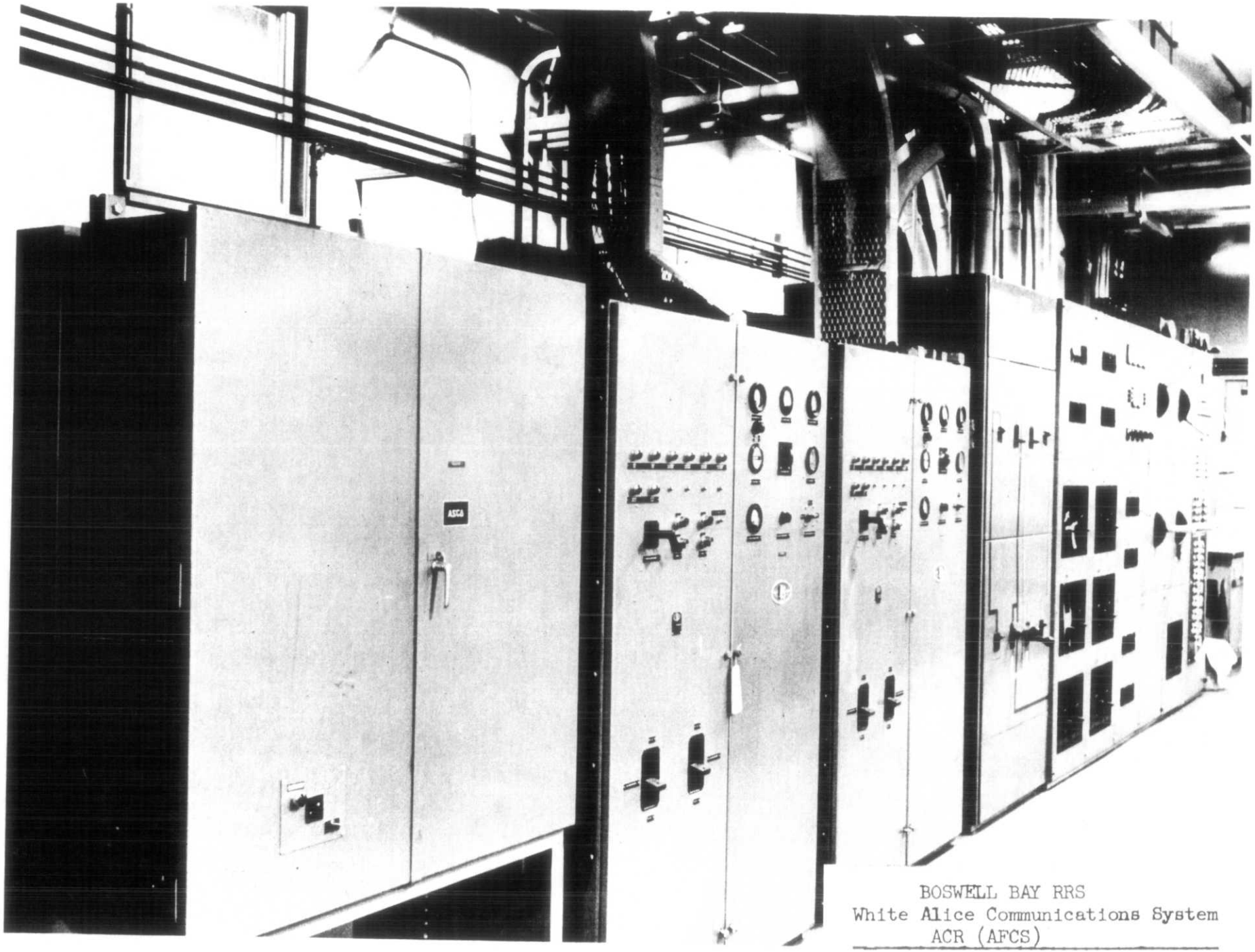






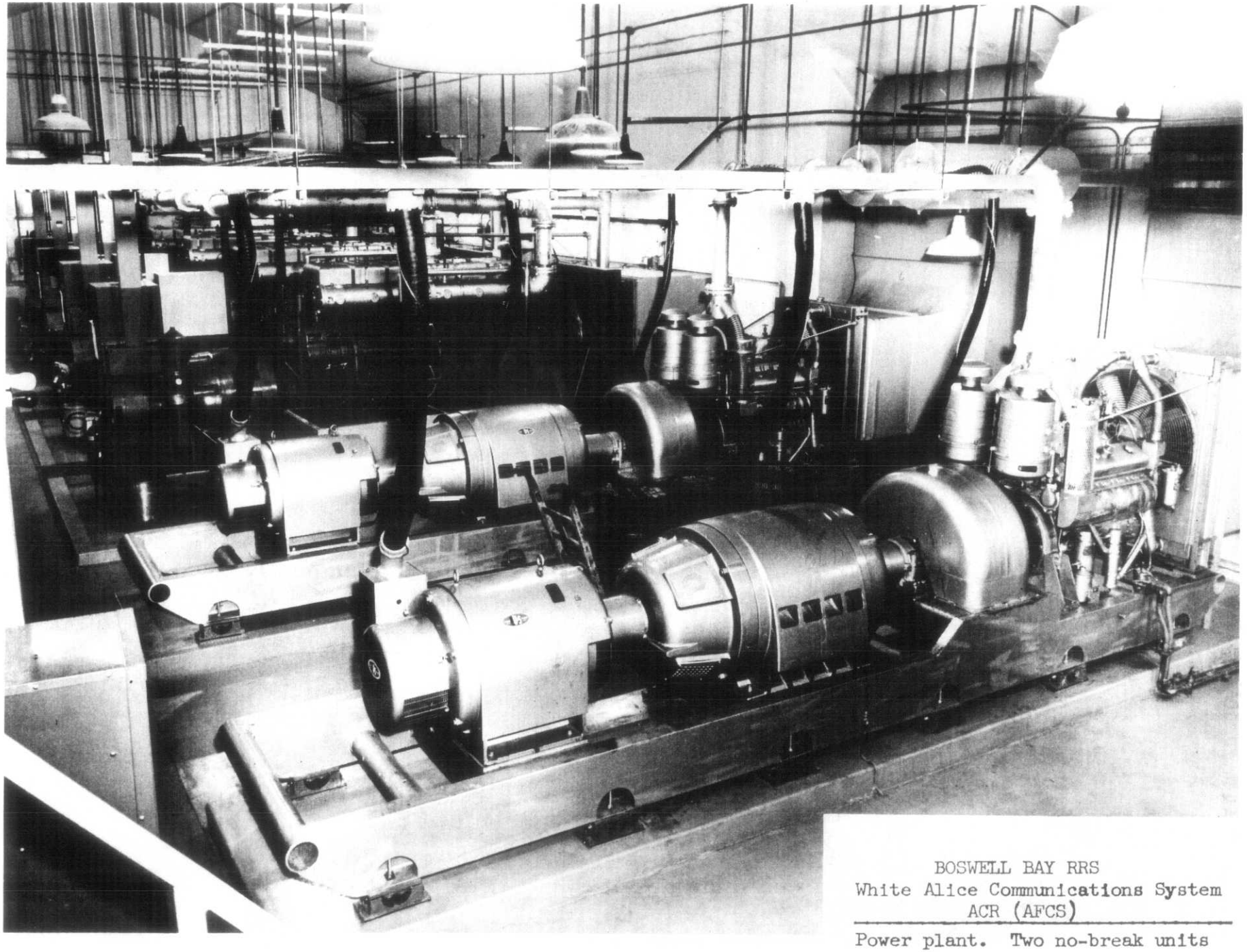






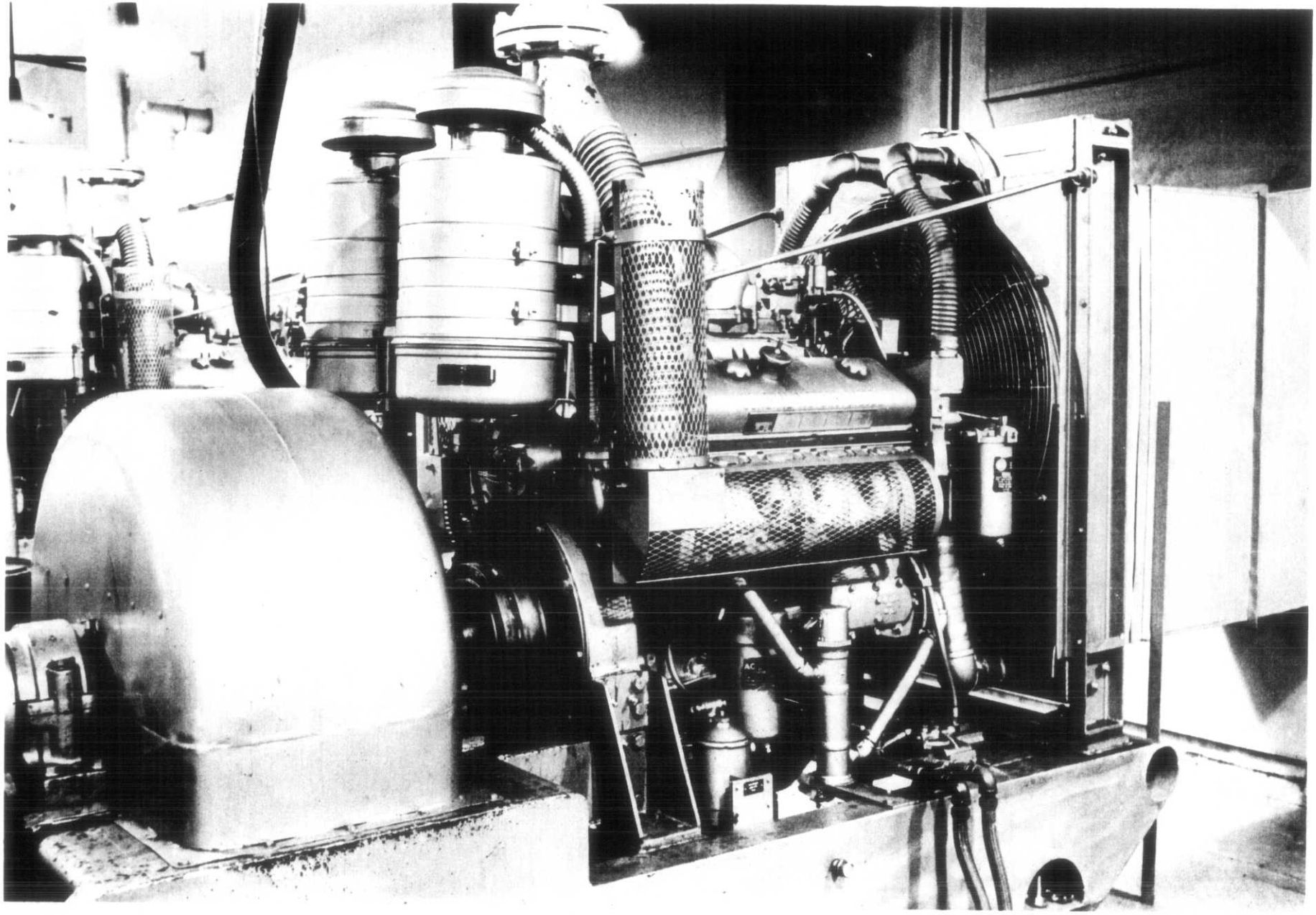
BOSWELL BAY RRS
White Alice Communications System
ACR (AFCS)

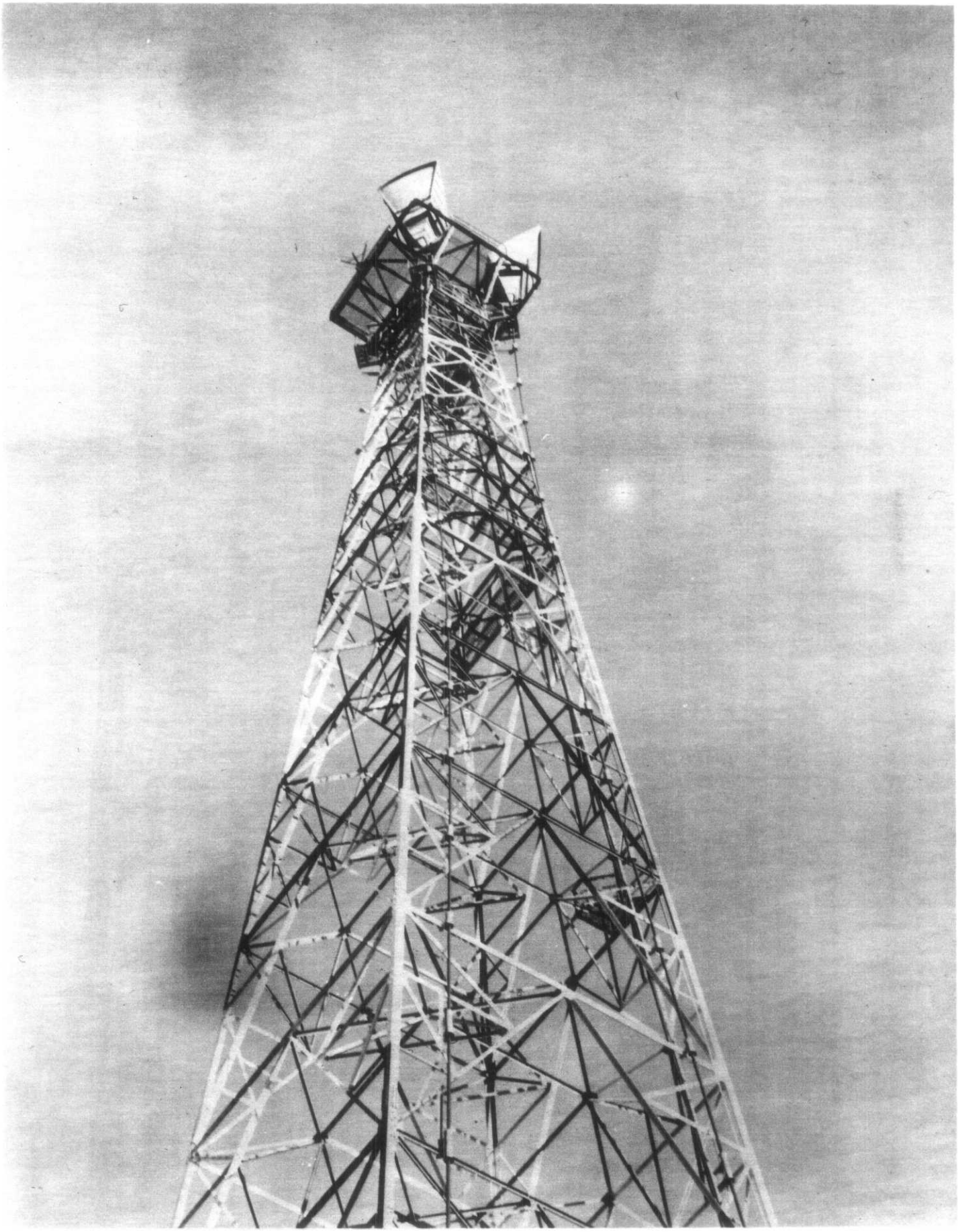
Power Plant Power Panels

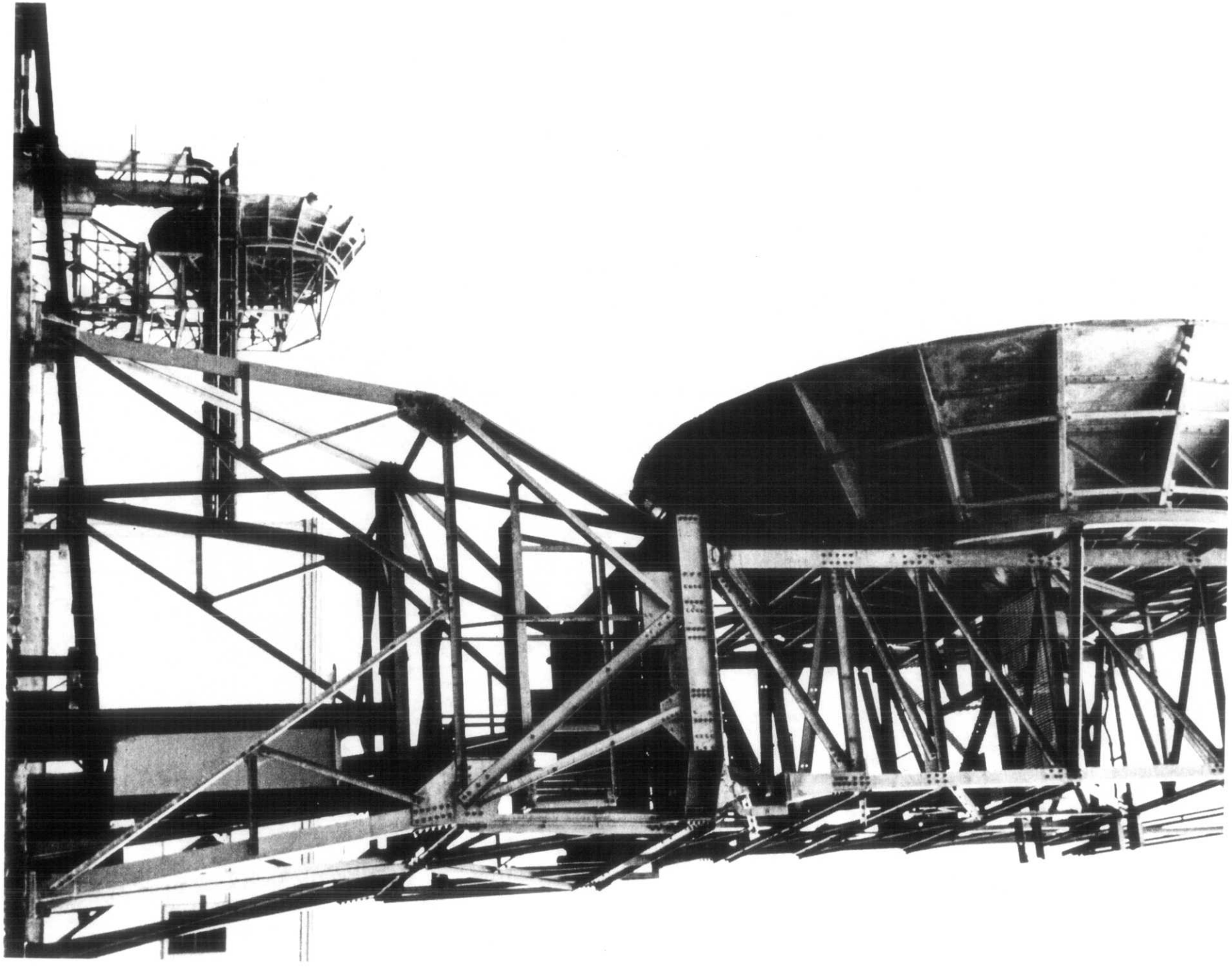


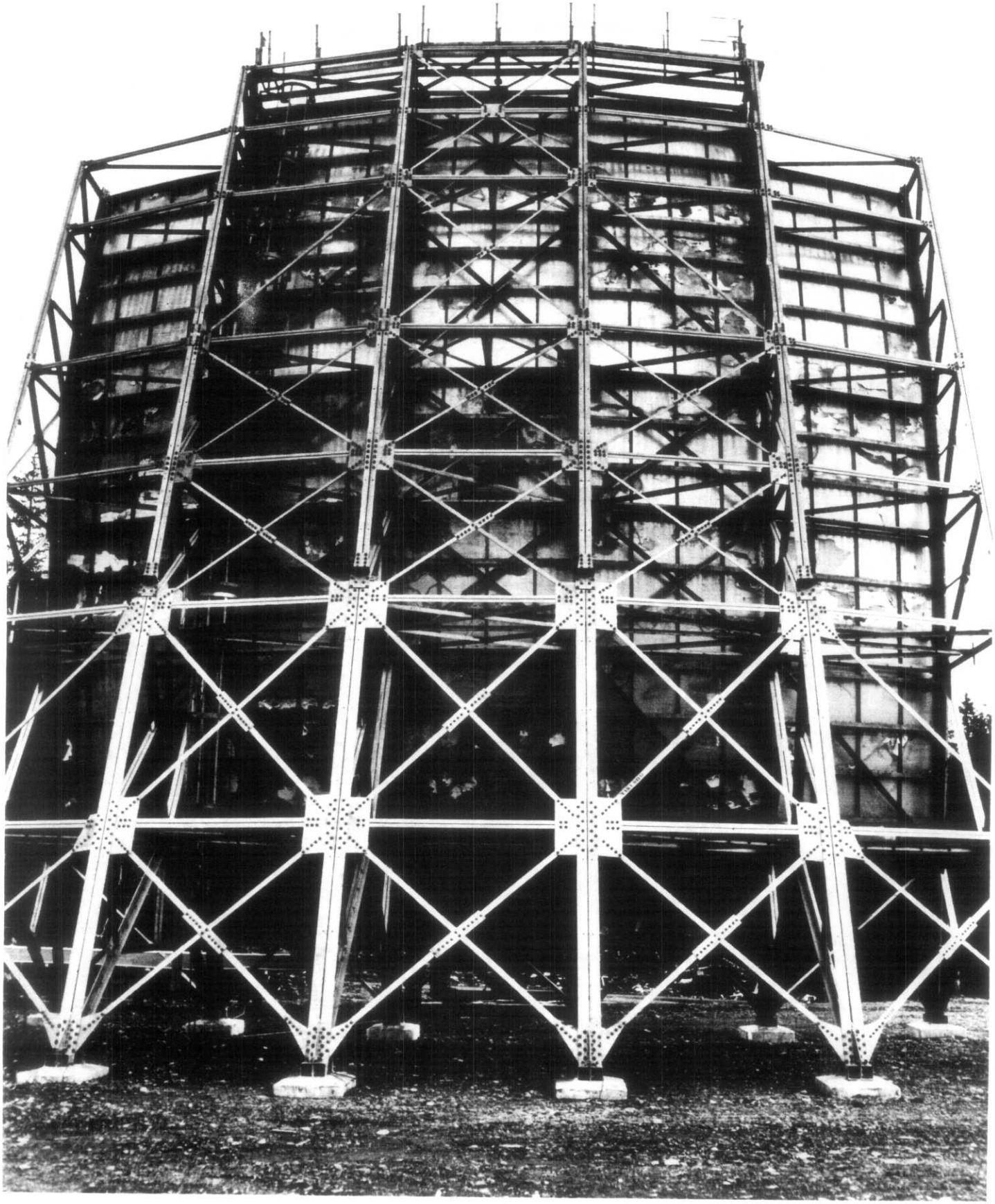
BOSWELL BAY RRS
White Alice Communications System
ACR (AFCS)

Power plant. Two no-break units in foreground, four 150KW Chicago Pneumatics to rear.









INDEX TO AS-BUILT DRAWINGS

1. Plan, Profile and Schematic for Type I WACS Station, thought to represent Cape Newenham. Pencil on linen, Ernest M. Lindeman, 1950.

2. Cover sheet, Shemya AFS, showing 120' tropo antennas.

3. Shemya, 120' tropo antennas, foundations plan, sections and details.

4. Shemya, 120' feed horn tower, wave guide supports; plans, sections and details.

5. Shemya, 120' feed horn tower; wave guide runs, plan and profile.

6. Shemya, Site plan.

7. Kotzebue, 30' antenna assembly.

8. Kotzebue, 30' antenna assembly, structural members.

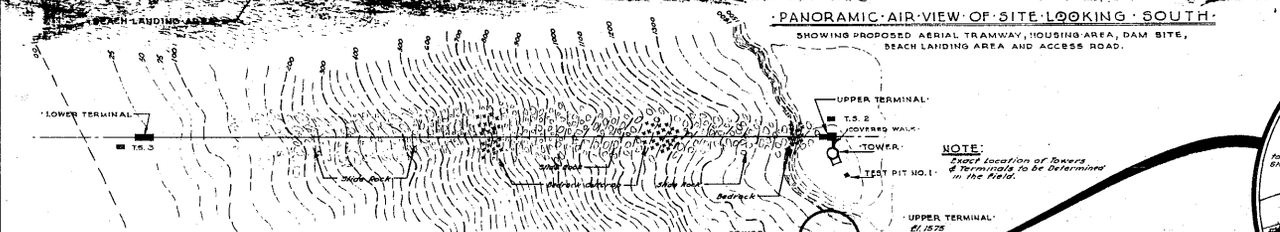
As built-drawings courtesy, Alaska District Corps of Engineers.

CORPS OF ENGINEERS

U. S. ARMY

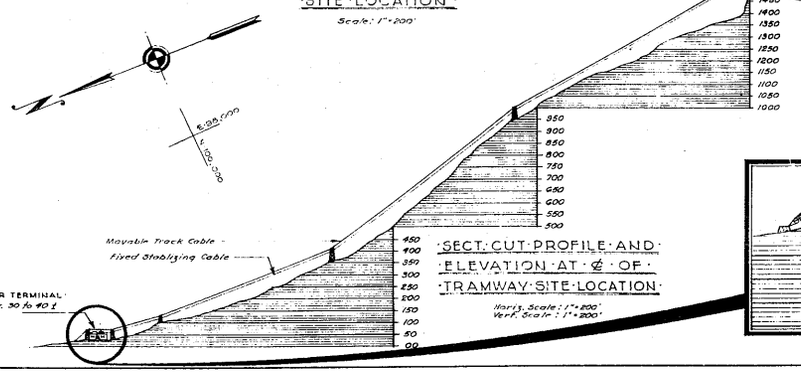
PANORAMIC AIR VIEW OF SITE LOOKING SOUTH

SHOWING PROPOSED AERIAL TRAMWAY, HOUSING AREA, DAM SITE, BEACH LANDING AREA AND ACCESS ROAD.



PLAN OF TRAMWAY SITE LOCATION

Scale: 1" = 200'

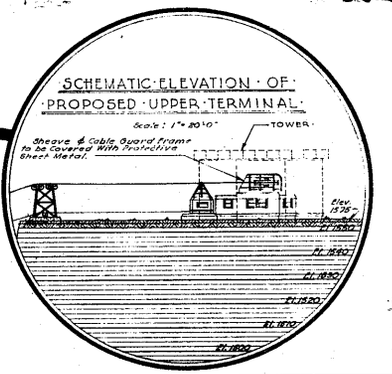


SECT. CUT PROFILE AND ELEVATION AT ℄ OF TRAMWAY SITE LOCATION

Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 200'

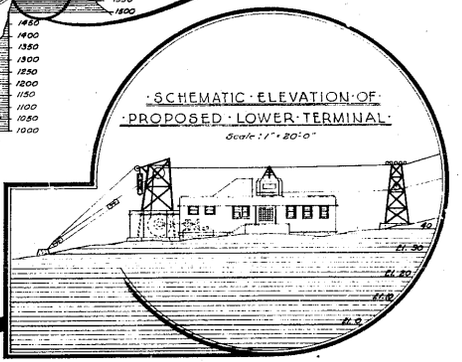
SCHEMATIC ELEVATION OF PROPOSED UPPER TERMINAL

Scale: 1" = 20'-0"



SCHEMATIC ELEVATION OF PROPOSED LOWER TERMINAL

Scale: 1" = 20'-0"



TEST PIT DATA

LEGEND

NOTE:

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS
U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
ANCHORAGE, ALASKA

DESIGNED: ERNEST W. LINDEMAN
DRAWN: [illegible]
TRACED: E.W.L.
CHECKED:
SUBMITTED:
RECOMMENDED:
APPROVED:
DATE

ROADS, STREETS & DRAINAGE
FOR TYPE I STATION
UTILITIES (AERIAL TRAMWAY)
PLAN, PROFILE & SCHEMATIC

JOHNSON
DATE
SCALE AS SHOWN
DRAWING NUMBER
16-01-01
SHEET 9 OF 9

FILE 01-12 SERIAL NO. S95-507-50-18

CORPS OF ENGINEERS

U.S. ARMY

SHEMYA A.F.S., ALASKA

COMMUNICATION FACILITY

U.S. ARMY ENGINEER DISTRICT, ALASKA

CORPS OF ENGINEERS

ANCHORAGE, ALASKA

SCHEDULE OF DRAWINGS

AS-BUILT

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	SITE PLAN	SHEET 1 OF 3
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	EXCAVATION SECTIONS	3
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	MISC. DETAILS - 1	4
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	SHELTER ADDITION PANELING (A-SHT. 15-B), SHELTER ADDITION, DETAILS (15-C)	5B, 5C
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	POWER PLAN & DETAILS	13
	[illegible] SCHEDULES & DETAILS	14
	[illegible] DIAGRAM & SCHEDULES	15
	[illegible]	16
	[illegible]	17
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	PLAN 2	3
	PLAN 3	4
	PLAN 4	5
	[illegible] 5	6
	[illegible]	7
	[illegible]	8

DRAWING TITLE		DRAWING NO.
WATER & SEWER REHAB. - SCHEDULE "C" AIR CONDITIONING - SCHEDULE "D" SECURITY FENCING - SCHEDULE "E"		
	LOCATION MAP - VICINITY MAP	AW 16-06-1549 SHEET 1 OF 1
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ELECTRICAL	PLANS & DETAILS	3
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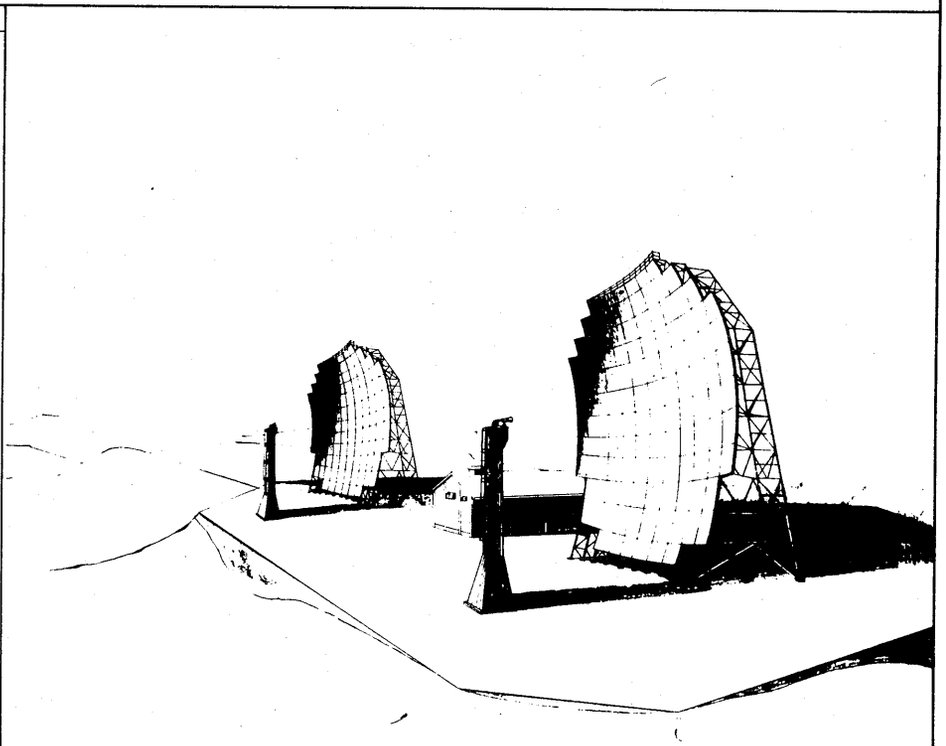
SECURITY FENCING - ROADS & GRADING		11-01-1060
	PLAN & DETAILS	SHEET 1 OF 2
	[illegible]	2



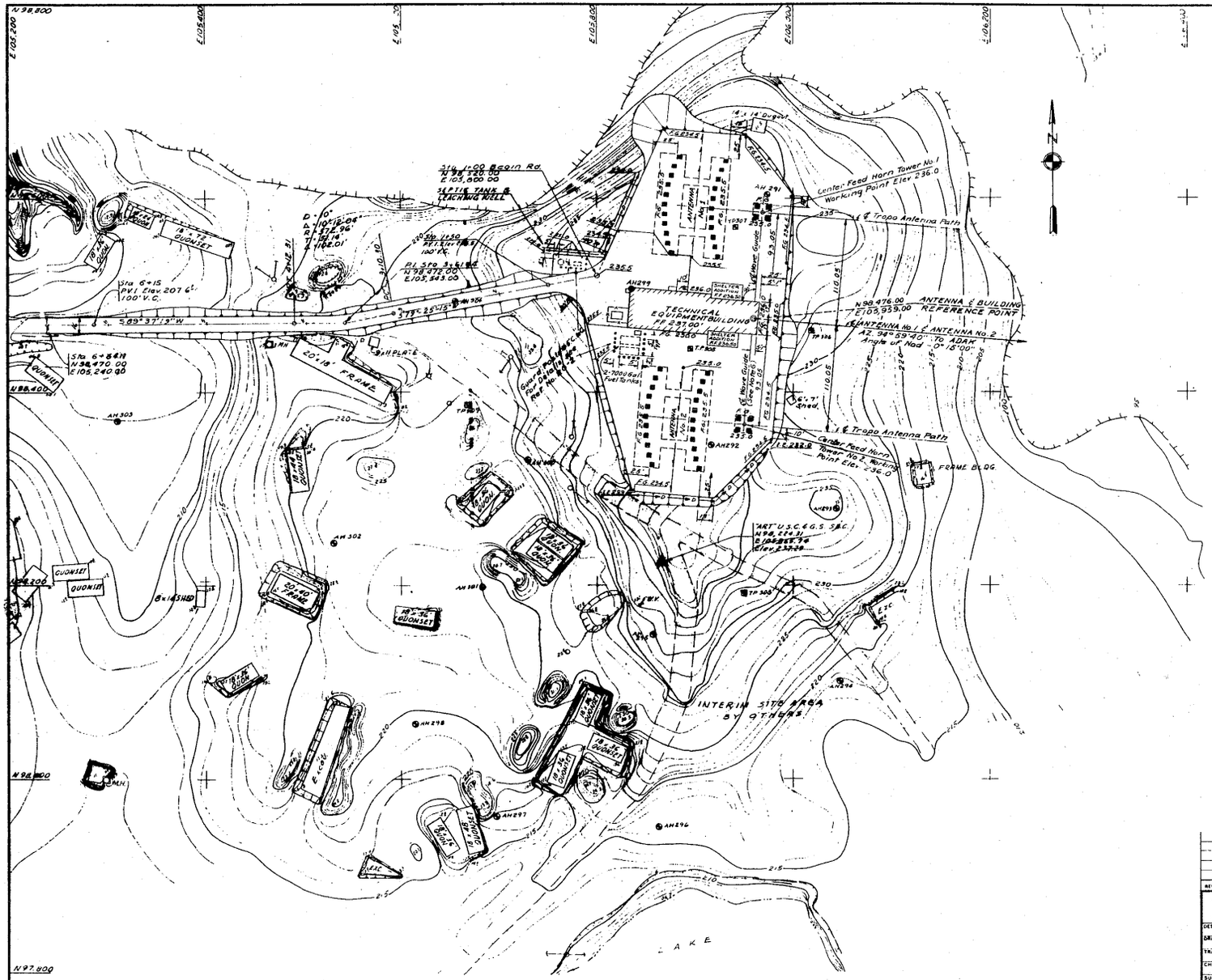
SCHEDULES "B", "C", "D", & "E" DA 1430

AS-BUILT

SERIAL NO. ENG. 95-507-60-48

CORPS OF ENGINEERS

U. S. ARMY



LEGEND

- BUILDING.
- BUILDINGS OR STRUCTURES.
- TOWER PIERS & FOUNDATION.
- CRUSHED GRAVEL SURFACING.
- GRAVEL ROAD.
- CUT & FILL SLOPE.
- CUT SLOPE.
- TRANSFORMER SUBSTATION. SEE ELECT. DISTRIBUTION DWGS FOR DETAILS
- FINISH GRADE ELEVATION.
- TP TEST PIT
- AH AUGER HOLE
- POLE & GUY, EXISTING
- SWALE.
- DITCH.
- SURVEY TRIANGULATION STATION

GENERAL NOTES

1. ORIGIN OF PLANE RECTANGULAR GRID COORDINATES:
   U.S.E. TRIANGULATION STATION "FOR" 1943
   N100,000 E100,000
   LATITUDE AND LONGITUDE ADJUSTED TO N.A.D. 1927
   ELEVATION DATUM - M.L.L.W. - 353.03 FROM GANNET SURVEY OF 1934
2. SURVEYED BY DISTRICT ENGINEER'S OFFICE MAY 1960.
3. FOR SECTIONS AND DETAILS, SEE REF. NO. RG-2.
4. FOR EXPLORATION DATA, SEE SPECIFICATIONS.
5. FILLS OVER 6' HAVE SLOPES OF 1 ON 1-1/2 AND FILLS UNDER 6' HAVE SLOPES OF 1 ON 2. ALL CUT SLOPES ARE 1 ON 1-1/2 EXCEPT WHERE INDICATED OTHERWISE.
6. FOR LOCATION OF WAVEGUIDE SUPPORTS, SEE STRUCTURAL DRAWINGS.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

REV	DATE	R.F.A. (ENG.NO)	ACTION	DESCRIPTION	BY	APPD

B-E-C-K McLAUGHLIN & ASSOCIATES
CONSTRUCTION CONTRACTORS
SEATTLE WASH

U.S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
OFFICE OF THE RESIDENT ENGINEER
SHEMYA ALASKA

DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED

SHEMYA A F S, ALASKA
COMMUNICATION FACILITY
ROADS & GRADING
SITE PLAN

RECOMMENDED
PRIME CONTRACTOR

APPROVED Ellen H. Noyes
RESIDENT ENGINEER
DATE 5-17-61

APPROVED
DATE

SCALE 1" = 200' SPEC NO.

DRAWING NUMBER
AS-BLT AW11-01-1035
SHEET 1 OF 3

DA 1430

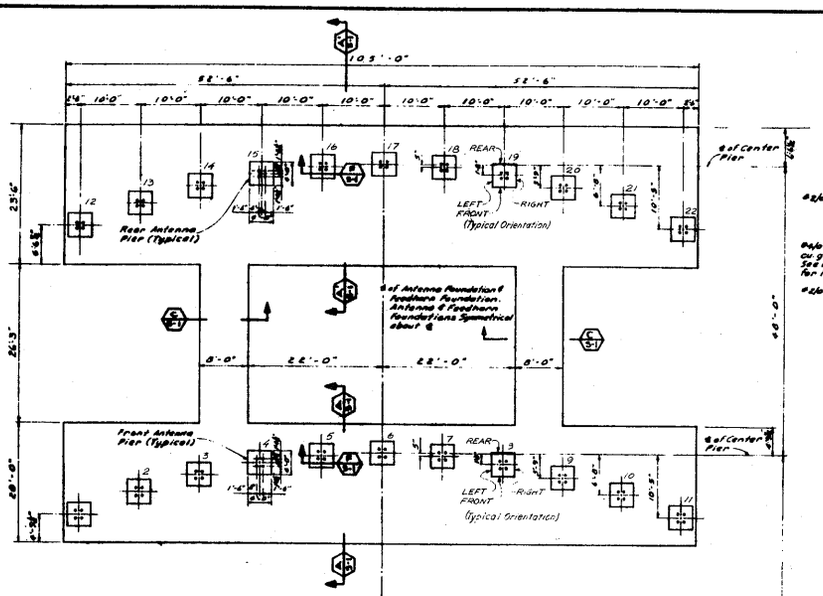
REFERENCE NO. RG-1

DA. 1430-192

SERIAL NO. ENG. 95-507-60-48

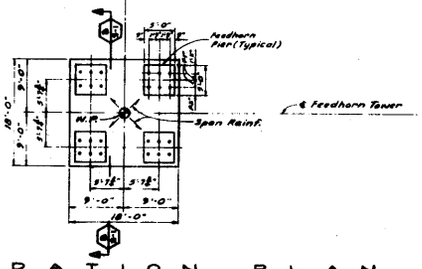
CORPS OF ENGINEERS

U. S. ARMY



FOUNDATION PLAN

SCALE 1/8" = 1'-0"



NOTE: Exceptions to restael placement as shown in section (D S-1)

Antenna #1:

#11 and 2 #8 bars on front and rear faces of columns 1,2,3,4,5,6,7,8,9,10 and 11. 5th bar from corner, each way, is #6's. Otherwise as shown in section (D S-1)

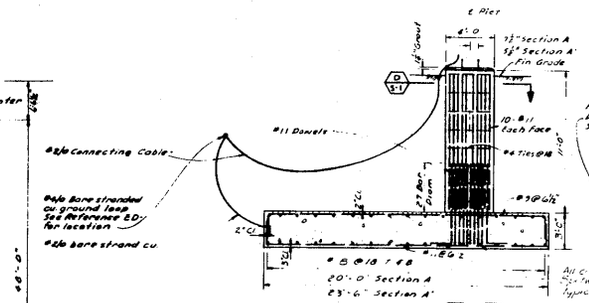
Antenna #2:

9 #11, 1 #9 and 1 #7 on front and rear faces of columns 12,13,14,15,16,17 and 18. 3rd bar from right corner is #9, 5th bar from left corner is #7.

9 #11 and 5 #8 on front and rear faces of columns 19, 20 and 21. 4th, 6th, 7th, 9th and 10th bar from left is #5.

9 #11 and 2 #9 on front and rear faces of column 22. 5th bar from corner, each way, is #9.

Otherwise as shown in section (D S-1)

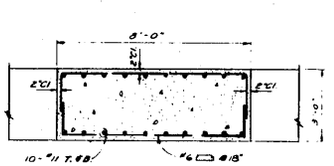


SECTION (A S-1) (A' S-1)

SCALE 1/4" = 1'-0"

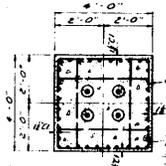
SECTION (B S-1)

SCALE 1/4" = 1'-0"



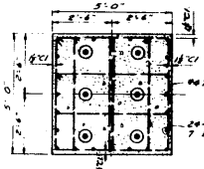
SECTION (C S-1)

SCALE 1/4" = 1'-0"



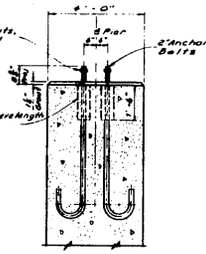
SECTION (D S-1)

SCALE 1/4" = 1'-0"



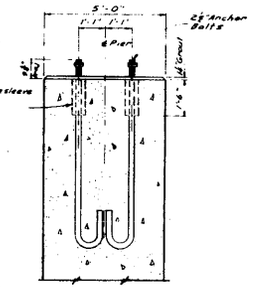
SECTION (E S-1)

SCALE 1/4" = 1'-0"



SECTION (F S-1)

SCALE 1/4" = 1'-0"



DETAIL (G S-1)

SCALE 1/4" = 1'-0"

GENERAL NOTES

1. DESIGN LOADS: DESIGN LOADS OBTAINED FROM BLAW-KNOX CO. DRAWING PDW-106-G.

TRUSS REACTIONS:

FRONT PIER	REAR PIER	DOWNWARD	UPLIFT	SHEAR
INT. TRUSS		300.6k		112.0k
INT. TRUSS			137.8k	58.7k
	INT. TRUSS	252.0k		72.0k
	INT. TRUSS		153.6k	50.4k
END TRUSS		290.7k		117.5k
END TRUSS			136.3k	81.6k
	END TRUSS	255.0k		80.1k
	END TRUSS		156.0k	81.6k

FEEDHORN TOWER REACTIONS (DIAGONAL WIND MAX. PER LEG):
UPLIFT = 113.6k
DOWNWARD = 125.0k
SHEAR = 16.5k

2. DESIGN STRESSES:
CONCRETE, f'c = 2,500 PSI
fs = 20,000 PSI (I.G. CONFORMING TO ASTM A-305-56T)
SOIL, ALLOWABLE BEARING = 5,000 PSF
WEIGHT = 100 PCF
ϕ = 30°

3. ALL PIERS GROUNDED. FOUNDATION AND FEEDHORN WITH #2/0 BARE STRANDED COPPER WIRE, BRAZED TO STRUCTURAL STEEL AND REINF. WITH THERMIT CONNECTIONS. BONDING PROVIDED BETWEEN ALL STRUCTURAL STEEL AND REINFORCING STEEL AND CONNECTIONS SHOT WELDED. FOR LOCATION OF GROUNDING SEE ELECTRICAL DISTRIBUTION DRAWING, REFERENCE NO. ED-8

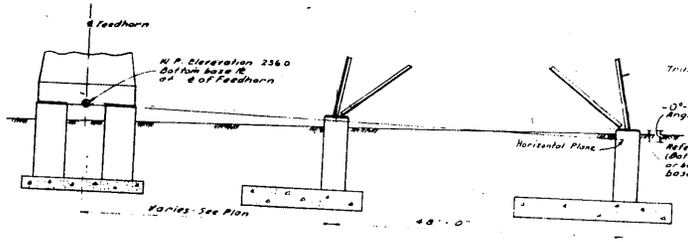
4. ANGLE-OF-NOD SHOWN ON THE FOUNDATION PLAN IS APPROXIMATE.

5. ALL DIMENSIONS AND TOLERANCES VERIFIED WITH MFG ERECTION PLANS.

6. WORKING POINT ELEVATION SHOWN IS BOTTOM OF BASE PLATES AT CENTERLINE OF FEEDHORN.

7. NON-SHRINK GROUT PROVIDED UNDER ALL BASE PLATES.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION



ELEVATION THRU ANTENNA & FEEDHORN
(INDICATING LOCATION OF FOUNDATION FOR ANGLE OF NOD)
NOT TO SCALE

GRAPHIC SCALE: 1/8" = 1'-0" | GRAPHIC SCALE: 1/16" = 1'-0" | GRAPHIC SCALE: 1/32" = 1'-0"

REFERENCE NO. S-1

REV	DATE	BY	DESCRIPTION	BY	APPD

B-E-C-M McLAUGHLIN & ASSOCIATES CONSTRUCTION CONTRACTORS SEATTLE WASH

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER SHEMYA ALASKA

DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED

SHEMYA A.F.S., ALASKA
COMMUNICATION FACILITY
120 FT. TROPO ANTENNA FOUNDATION
STRUCTURAL
FOUNDATION PLAN, SECTIONS & DETAILS

RECOMMENDED PRIME CONTRACTOR

APPROVED Ellis H. Thompson RESIDENT ENGINEER DATE 5-17-61

APPROVED DATE

SCALE AS NOTED SPEC. NO.

DRAWING NUMBER AS-BLT AW35-03-132

SHEET 1 OF 3

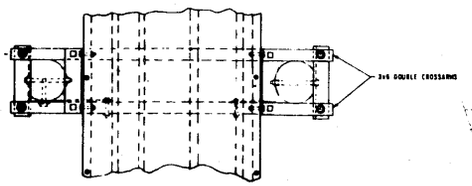
SERIAL NO. ENG. 95-507-60-48

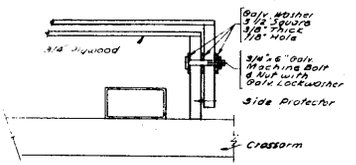
DA 1430

DA-1420-132

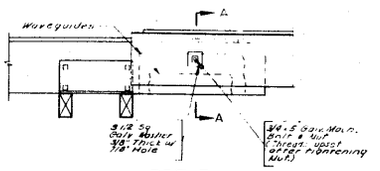
CORPS OF ENGINEERS

U. S. ARMY

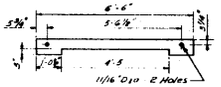




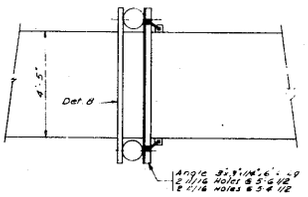
SECT. A-A
SCALE: 1 1/2" = 1 FT.



DET. 7
SCALE: 1" = 1'



DET. 8
YOKE BLOCK 2x8x6'-6"
SCALE: 1/2" = 1 FT.



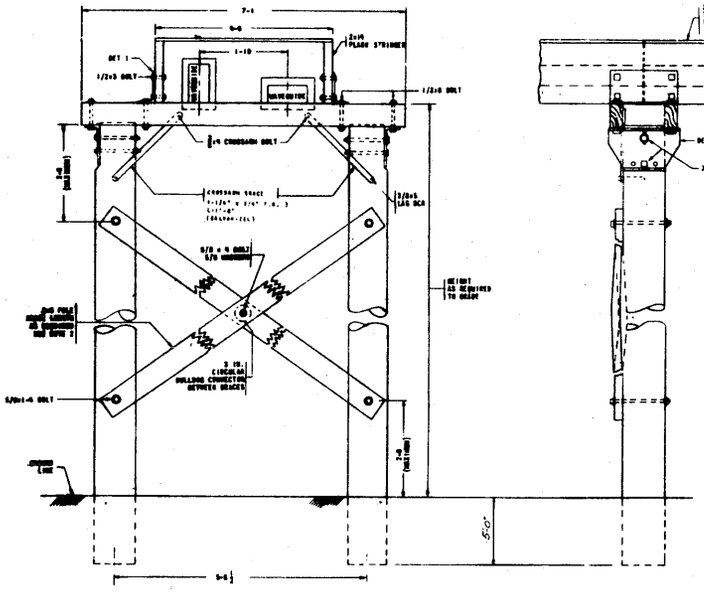


FIG 1
TYPICAL DOUBLE WAVEGUIDE SUPPORT AND PROTECTION
NO SCALE

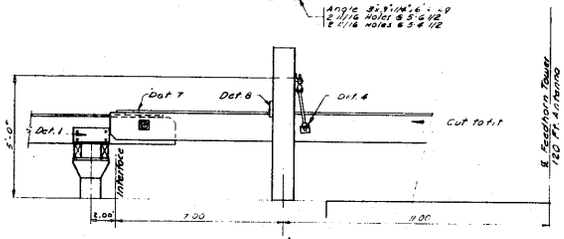
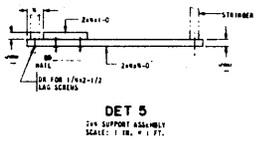
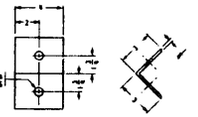


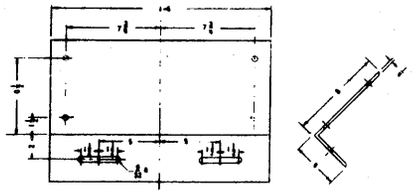
FIG. 3
120 FT. Antenna
Waveguide Protection



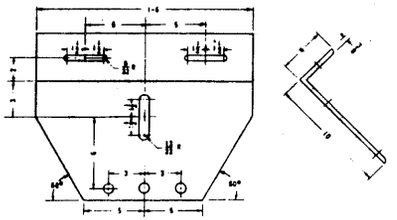
DET 5
2x6 SUPPORT ASSEMBLY
SCALE: 1 IN. = 1 FT.



DET 4
ANGLE IRON
SCALE: 1/4 IN. = 1 IN.



DET 1
SCALE: 1/2 IN. = 1 IN.



DET 2
SCALE: 1/2 IN. = 1 IN.

GENERAL NOTES

1. DESIGN STRESSES:
   TIMBER, fc ⊥ 380 PSI
   fb = 1,100 PSI
   E = 1,200,000 PSI
   STEEL, fs = 20,000 PSI
2. BRACING — INSTALLED WHEN WAVEGUIDE SUPPORT IS 10' OR MORE ABOVE FINISH GRADE. BRACES CROSS AT A LOCATION MIDWAY BETWEEN FINISH GRADE AND BOTTOM OF CROSSARM.
3. STUB POLES — CLASS X DOUGLAS FIR AND PRESSURE TREATED.

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

REV	DATE	A-E-C-K APPROVED	ACTION	DESCRIPTION	BY	APPD

A-E-C-K McLAUGHLIN & ASSOCIATES
CONSTRUCTION CONTRACTORS
SEATTLE WASH

US ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
OFFICE OF THE RESIDENT ENGINEER
SHEMYA ALASKA

DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED

SHEMYA A.F.S., ALASKA
COMMUNICATION FACILITY
120 FT. FEED HORN TOWER
STRUCTURAL
WAVE GUIDE SUPPORTS PLAN, SECTIONS & DETAILS

RECOMMENDED — PRIME CONTRACTOR
APPROVED — RESIDENT ENGINEER — DATE 5-17-51
APPROVED — DATE
SCALE: 1"=1'-0" SPEC NO
DRAWING NUMBER AS-BLT AW 35-03-132
SHEET 2 OF 3

REFERENCE NO. S-2

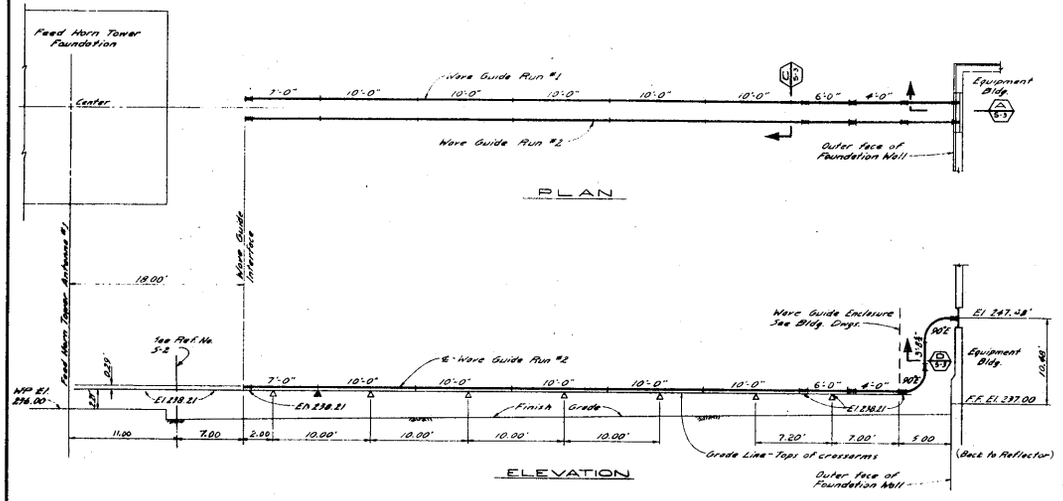
DA-14-50-182

SERIAL NO. ENG. 95-507-60-48

DA 1490

CORPS OF ENGINEERS

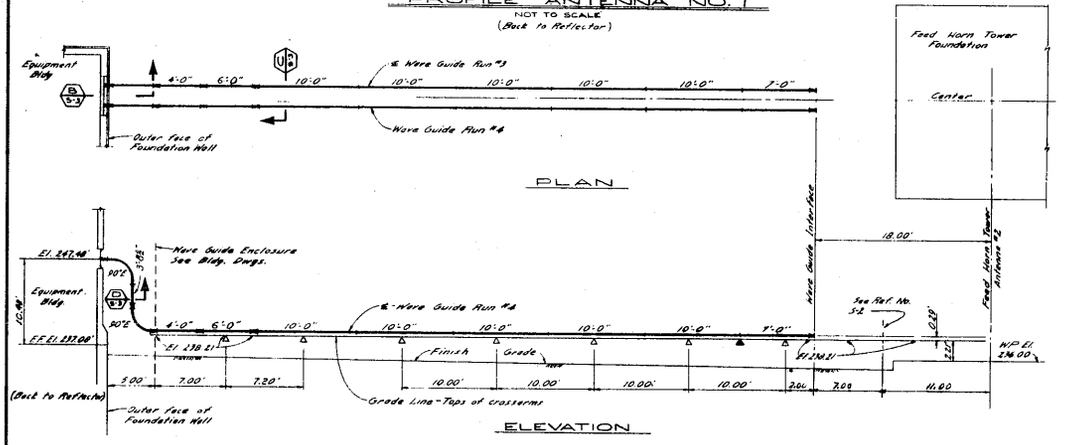
U. S. ARMY



PROFILE ANTENNA NO. 1

NOT TO SCALE

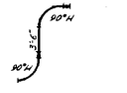
(Back to Reflector)



PROFILE ANTENNA NO. 2

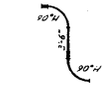
NOT TO SCALE

(Back to Reflector)



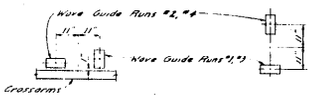
SECTION A S-3

NOT TO SCALE



SECTION B S-3

NOT TO SCALE

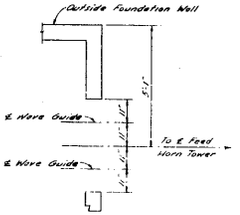


SECTION C S-3

NOT TO SCALE

SECTION D S-3

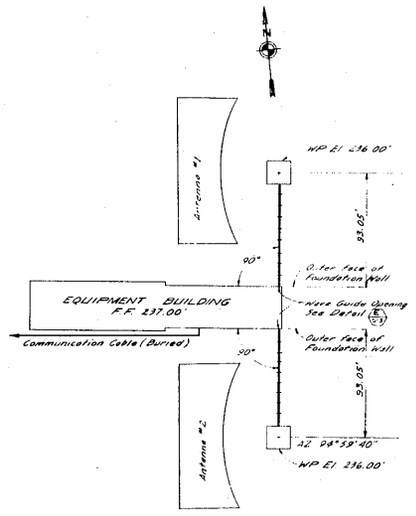
NOT TO SCALE



DETAIL E S-3

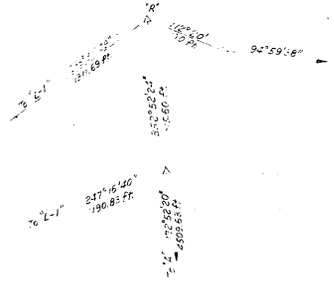
NOT TO SCALE

Wave Guide Opening North and South Sides



SITE PLAN

SCALE 1"=40'



GEODETIC ____ DATA

SYMBOLS

- Wave guide supports
- Communication Cable
- Wave guide support and flexstrainer Location see Dwg. AW35-03-132 Ref. S-2 for details of support
- Flexible Wave Guide length 8 3/16"
- 10'-0" Straight Rigid Wave Guide (length above)
- 90°E Rigid Wave Guide Bend Letter "E" or "H" indicates plane of bend Degree of bend as indicated
- Wave Guide Anchor

THIS DRAWING SHOWS AS-BUILT CONSTRUCTION

REV	DATE	BY & CHKD	ACTION	DESCRIPTION	BY	APPD

B-E-C-K McLAUGHLIN & ASSOCIATES CONSTRUCTION CONTRACTORS SEATTLE WASH

U S ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS OFFICE OF THE RESIDENT ENGINEER SHEMYA ALASKA

DESIGNED

DRAWN

TRACED

CHECKED

SUBMITTED

SHEMYA A F S, ALASKA
COMMUNICATION FACILITY
120 FT. FEED HORN TOWER
STRUCTURAL
WAVE GUIDE RUNS, PLAN & PROFILE

RECOMMENDED PRIME CONTRACTOR

APPROVED Ellis N. Morgan RESIDENT ENGINEER DATE 5-17-61

APPROVED DATE

SCALE AS SHOWN SPEC NO.

DRAWING NUMBER AS-BLT AW 35-03-132

SHEET 3 OF 3

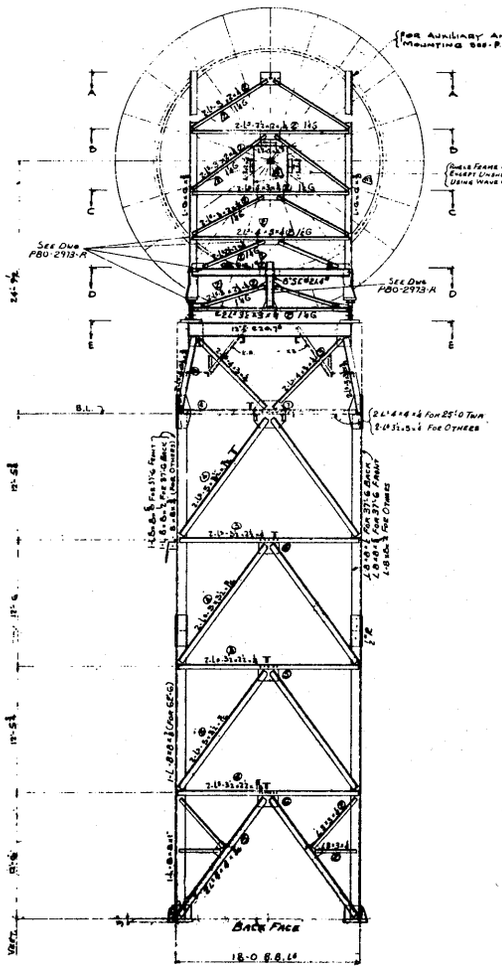
REFERENCE NO. S-3

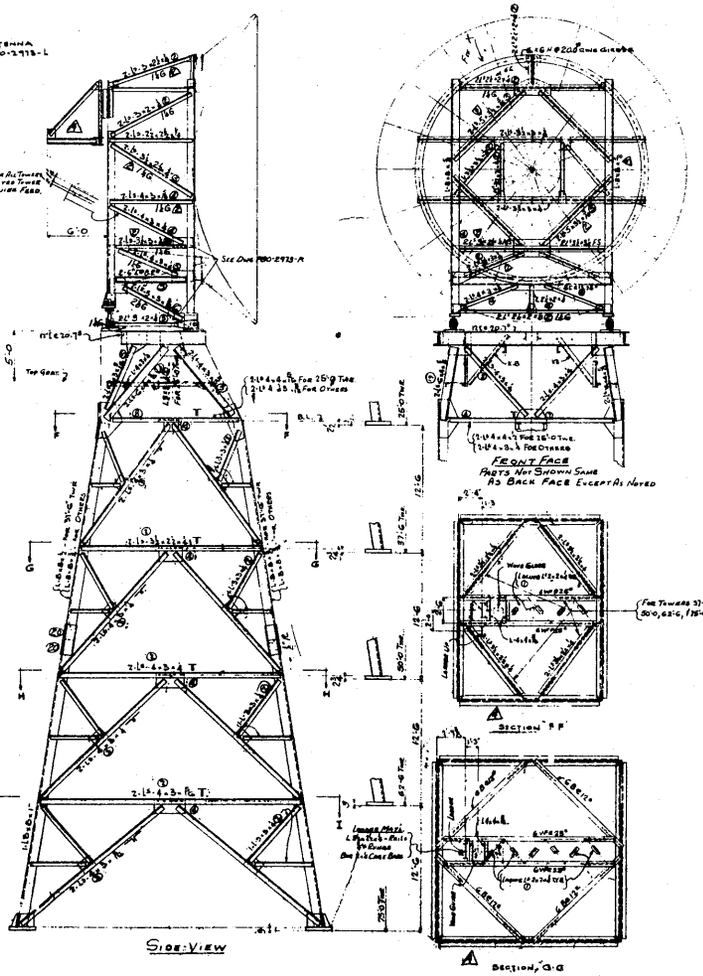
SERIAL NO. ENG. 95-507-60-48

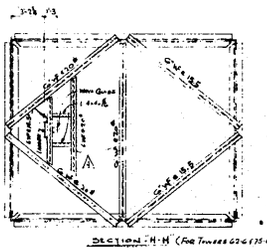
DA-11-30-182

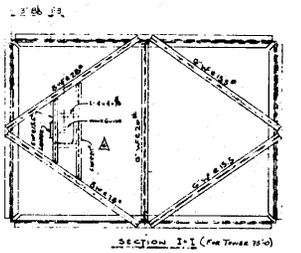
DA1430

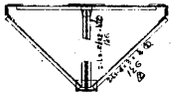
DRAWING NO. P 80-2713-AE

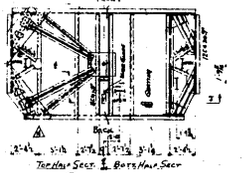


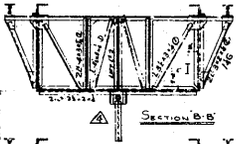


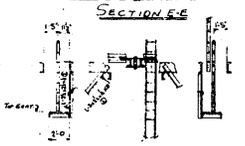


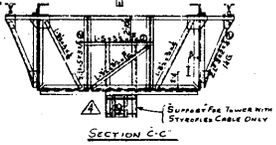


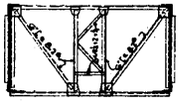


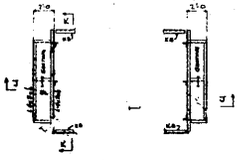


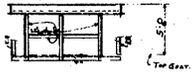












PROPOSAL NO.		REVISIONS		
PROPOSAL	DATE	NO.	REVISED FROM	DATE
		1	CHGD SIZES	11/4/53
		2	CHGD SIZES	11/24/53
		3	CHGD SIZES	1/4/54
		4	GENERAL	

BLAW-KNOX COMPANY
BLAW-KNOX EQUIPMENT DIVISION
PITTSBURGH

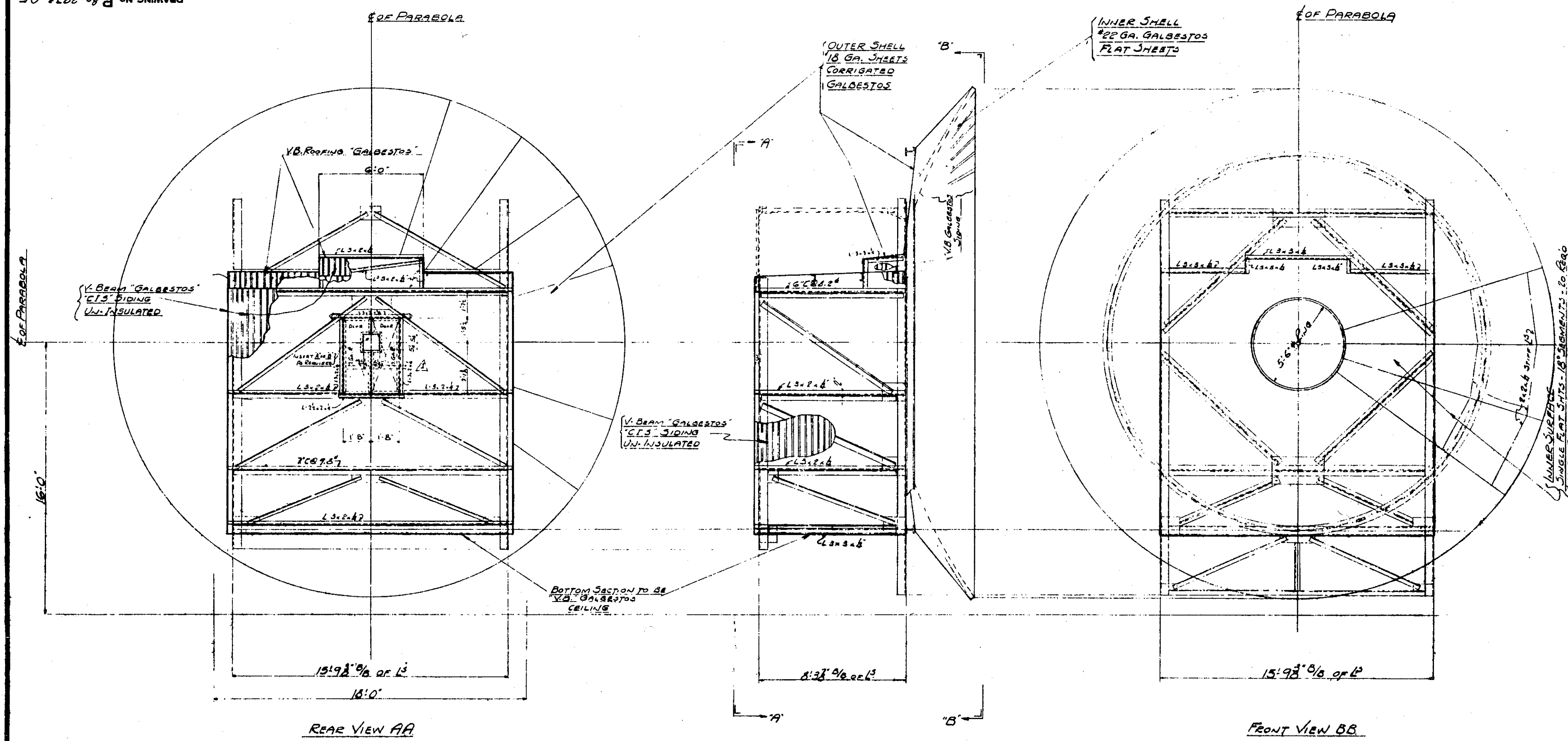
G51879 ANTENNA ASSEMBLY
SIZES OF STRUCTURAL MEMBERS
KOTZEBUE ALASKA

In Charge of: [illegible]
Made: J.S.D.
Check:
Approved:
Date: 11-9-53
Scale:

CONTRACT KR 92

DRAWING No. P 80-2713-AE

SERIAL NO. ENG. 95-507-56-52



INSERT "A" (2 REQ.) EACH TOWER FOR SHEETED TOWER USING STYROFLEX CABLE

INSERT "B" (1 REQ.) EACH TOWER FOR SHEETED TOWER USING WAVE GUIDE

NOTES:
EXISTING MAT'L SHOWED IN DOT-DASH.
ADDITIONAL STRUCTURAL MEMBERS REQUIRED FOR SUPPORTING COVER SHOWN IN FULL.

PROPOSAL NO.		REVISIONS		
PROPOSAL	DATE	No.	REVISED FROM	DATE
		1	GENERAL	1/3/56

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BLAW-KNOX COMPANY
BLAW-KNOX EQUIPMENT DIVISION
PITTSBURGH

O.S.-18129 ANTENNA ASSEMBLY
STRUCTURAL STEEL REQUIRED FOR DE-ICING EQUIPMENT

HTN
CONTRACT KR-92
KOTZEBUE ALASKA
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CONCLUSION

In the 1950's, White Alice symbolized the Cold War Era and was conceived and constructed by men and women who had lived through World War II, remembering it vividly. While the WACS was not the first FPTS system to become operational, it was certainly the system which took the greatest effort to create. The physical remains of the system reflects a time when such an effort was considered necessary to protect our country from the threat of another global conflict. The WACS was the most sophisticated technology of its day, but it was outmoded soon after it was constructed with the advent of satellite technology. It will be remembered as a necessary stage in the development of telecommunications and as a product of a time in the not so distant past when the Cold War was at its height.

GLOSSARY

Acronyms

AACS: Airways and Air Communications Service

ACS: Alaska Communication System (or Site)

AC&W: Aircraft Control and Warning

ATSS: Alaska Telephone Switching Station

BMEWS: Ballistic Missile Early Warning System

DEW: Distant Early Warning

FPTS: Forward Propagation Tropospheric Scatter

NORAD: North American Air Defense

RRS: Radio Relay Station (or Site)

TWX: Teletypewriter

WACS: White Alice Communications System (or Site)

WAMCATS: Washington-Alaska Military Cable and Telegraph System

WECO: Western Electric Company

WUTE: Western Union Telegraph Expedition

Technical terms

Amplifier: Device that controls energy from a power source in an electronic system. It has the effect of increasing the strength of an electrical quantity such as voltage, current, or power.

Antenna: Antennas are transducers that convert current or voltage into electromagnetic fields, and vice versa. They are used to send and receive radio-frequency waves such as those from AM and FM radios.

Carrier wave: Commonly a radio-frequency electromagnetic wave used to carry information. Some characteristic of the wave, such as amplitude or frequency, is modified for this purpose.

Circuit: A circuit is the complete path of electric current, including the energy source. Current will flow in a closed circuit but it will not flow in an open circuit.

Converter: Changes electrical current from one kind to another; electronic device that changes the frequency of a radio signal.

Current: Flow of electrons.

Generator: Machine that converts mechanical energy into electrical energy.

Inverter: An electronic circuit that "turns the signal upside down." They are used in almost all electronic devices. They change a positive pulse to a negative one.

Klystron: an electron tube used to amplify or generate radio waves of microwave range frequencies by means of velocity modulation.

Microwave: form of electromagnetic radiation with frequencies between 1 GHz (1000 MHz) and 300 GHz {30 cm.-1 mm.}.

Modulate: Changing some characteristic of a radio-frequency carrier wave so as to transmit intelligence from one point to another.

Propagation: transmission.

Receiver: Electronic device that recovers information from a carrier wave and amplifies it for further use.

Rectifier: device which changes AC current to DC current.

Repeater: a machine or device which amplifies a signal.

Solid-state: Refers to transistors and integrated circuits. Differentiates between vacuum tubes and devices that are "solid" in nature.

Switch: An electrical/electronic device that may beset to allow current to flow (closed) or to block current flow (open). When the switch is off, an open circuit exists and current cannot flow. When the switch is on, a closed circuit exists and current flows.

Translator: Device which determines and explains a signal.

Transmitter: A device that transmits information.

Troposphere: Lowest region of Earth's atmosphere.

Vacuum tube: An amplifying device that has its elements inside an evacuated enclosure, such as glass or metal.

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