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Eligibility Assessment of TA-52-1 and TA-52-11: The Ultra-High Temperature Reactor Experiment (UHTREX) Complex

LANL Fiscal Year 2020 Footprint Reduction

Historic Building Survey Report No. 382

Survey No. 1243

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared for: the U.S. Department of Energy/National Nuclear Security Administration, Los Alamos Field Office

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE), National Nuclear Security Administration, Los Alamos Field Office (NA-LA) requests the State Historic Preservation Officer (SHPO) to concur with the eligibility determinations contained in this report for Buildings 1 and 11 in Technical Area 52 (TA-52) at Los Alamos National Laboratory (LANL or the Laboratory).

Triad National Security LLC cultural resources staff have completed the evaluation of two buildings, called the UHTREX Complex, for inclusion in the National Register of Historic Places (Register). This complex includes the UHTREX Reactor Building (TA-52-1), and an associated Mechanical Assembly Building (TA-52-11). As part of LANL's Footprint Reduction Program, both facilities of the UHTREX Complex are scheduled for characterization and demolition. In addition to evaluating their eligibility in the Register, the properties at TA-52 were assessed for potential adaptive reuse, long-term preservation, and public interpretation.

Based on the findings in this assessment report, both TA-52-1 and TA-52-11 have been determined to not be eligible for inclusion in the Register. The history of the UHTREX Complex lacks association with *exceptionally* significant Cold War events of scientific developments. Both TA-52-1 and TA-52-11 lack the necessary internal historic integrity suitable for long-term preservation or public interpretation. And both facilities contain legacy radioactive contamination, which prohibits their reuse. In addition to its loss of integrity and context, TA-52-11 has been determined ineligible due to its status as a support building of secondary or minor importance.

In compliance with Section 106 and Section 110 of the National Historic Preservation Act of 1966, as amended, and with the *Programmatic Agreement among the U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Field Office, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation Concerning Management of the Historic Properties at Los Alamos National Laboratory, Los Alamos, New Mexico*, the SHPO is requested to concur with the eligibility determinations contained in this report for the UHTREX Complex in TA-52.

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INTRODUCTION

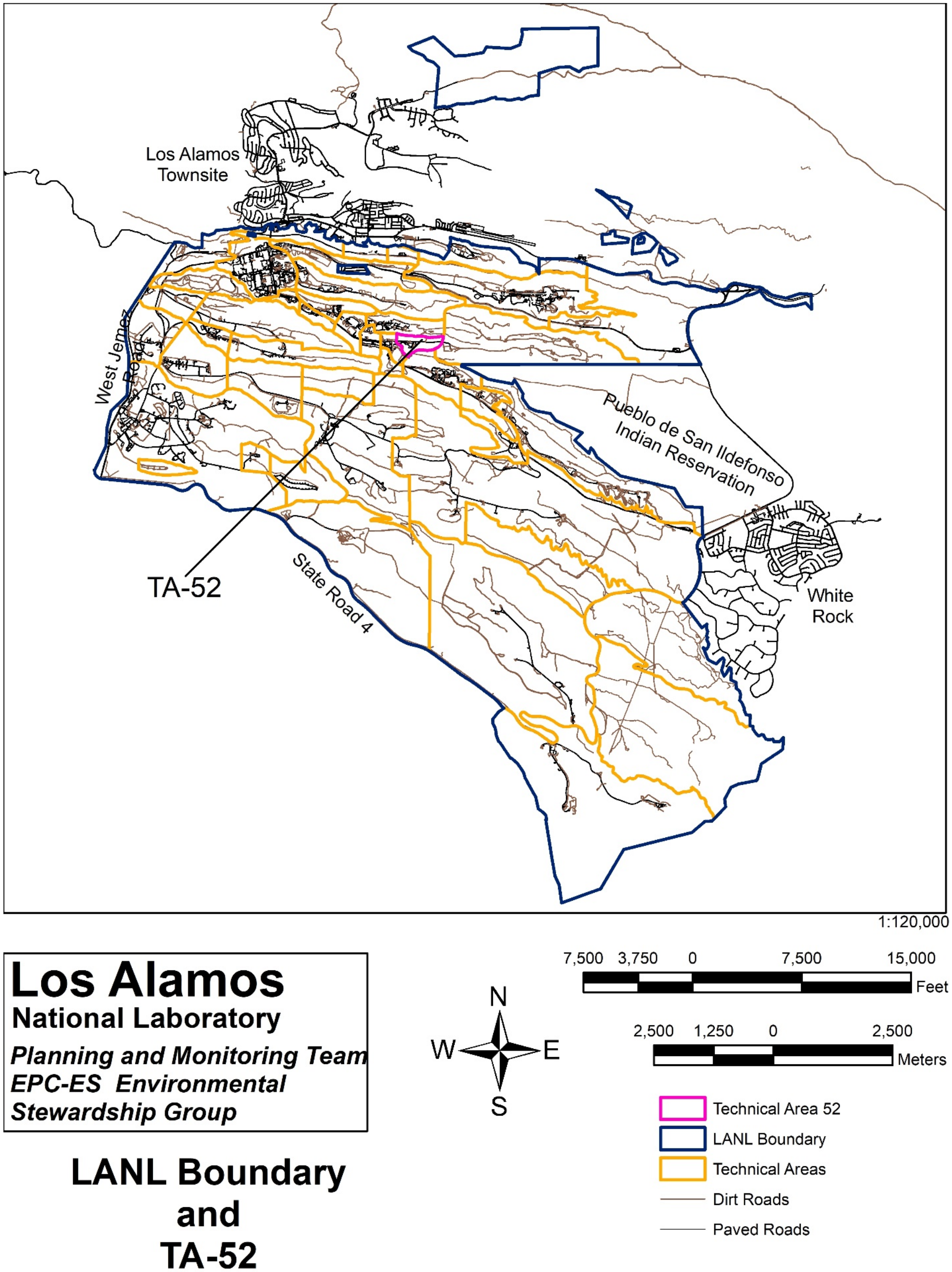
The U.S. Department of Energy (DOE), National Nuclear Security Administration, Los Alamos Field Office (NA-LA) evaluated two Cold War-era buildings at Technical Area (TA) 52, Los Alamos National Laboratory (LANL or the Laboratory), for listing in the National Register of Historic Places (Register). As part of LANL's Footprint Reduction Program, these buildings are scheduled for characterization and eventual demolition. In addition to Register evaluation, the properties were assessed for their long-term preservation and public interpretation potential.

Historic Property Eligibility Assessment

In compliance with Section 106 and Section 110 of the National Historic Preservation Act of 1966, as amended, and with the *Programmatic Agreement among the U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Field Office, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation Concerning Management of the Historic Properties at Los Alamos National Laboratory, Los Alamos, New Mexico*, this report provides eligibility evaluations for Building 1 and Building 11 located at TA-52. Work processes carried out at TA-52 supported Cold War reactor technology. Historical context information about activities at TA-52, property descriptions, and recommendations for Register eligibility are included in this report. A discussion of the multiple property method used to evaluate these properties is also included. APPENDIX A includes historic building inventory forms for the two buildings.

Survey Methods

Information about the properties herein was gathered during field surveys and literature research. Architectural and engineering elements of the properties were documented, and photographs were taken as part of the survey work. LANL records research was also conducted using primary and secondary source documents. In addition, field surveys at TA-52 were conducted in 2019 by LANL Environmental Stewardship Group's cultural resource's management staff.


Los Alamos Townsite
West Jemez Road
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White Rock
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Los Alamos National Laboratory
Planning and Monitoring Team EPC-ES Environmental Stewardship Group
LANL Boundary and TA-52
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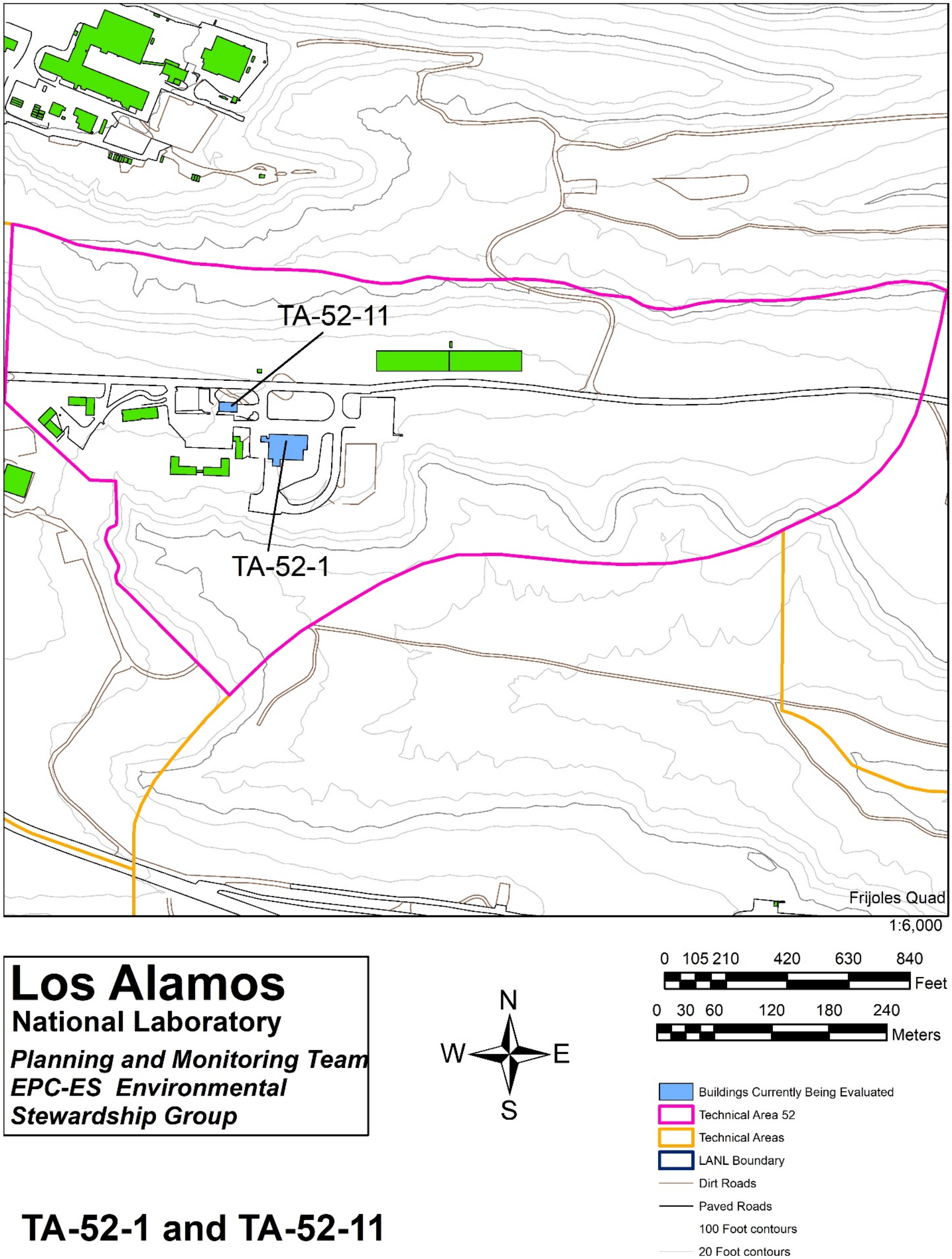
Technical Area 52
LANL Boundary
Technical Areas
Dirt Roads
Paved Roads

Map 1


TA-52-11
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National Laboratory
Planning and Monitoring Team
EPC-ES Environmental
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0 30 60 120 180 240
Meters
Buildings Currently Being Evaluated
Technical Area 52
Technical Areas
LANL Boundary
Dirt Roads
Paved Roads
100 Foot contours
20 Foot contours
TA-52-1 and TA-52-11

Map 2

HISTORICAL OVERVIEW

Manhattan Project (1942–1946)

In 1939, Albert Einstein wrote a letter to President Franklin Roosevelt alerting him to the possible threat of a German atomic bomb (Rothman 1992). President Roosevelt, acting on Einstein's concerns, gave approval to develop the world's first atomic bomb and appointed Brigadier General Leslie Groves to head the "Manhattan Project." Groves, in turn, chose Robert Oppenheimer to coordinate the design of the bomb.

A single, secure, research facility was proposed to coordinate the scientific development of the Manhattan Project. General Groves had several criteria: security, isolation, good water supply, adequate transportation network, suitable climate, available labor force, and locale west of the Mississippi, "at least 200 miles from any international border or the West Coast" (Rothman 1992). In 1942, Oppenheimer, who had visited the Pajarito Plateau on a horseback trip, suggested the Los Alamos Ranch School be the location for the Manhattan Project. Oppenheimer and his staff moved to Los Alamos in early 1943 to begin work. From these beginnings, recruitment of the country's "best scientific talent" and the construction of technical buildings were top priorities (LANL 1995, p. 8). The University of California agreed to operate the site, code-named "Project Y", under contract with the government (Rothman 1992). Although the fission bomb was conceptually attainable, many difficulties stood in the way of producing a usable weapon. Technical problems included timing the release of energy from fissionable material and overcoming engineering challenges related to producing a deliverable weapon. Nuclear material and high explosive studies were of immediate importance (LANL 1995).

Two bomb designs appeared to be the most promising: a uranium "gun" device and a plutonium "implosion" device. The gun device involved shooting one subcritical mass of uranium-235 into another at sufficient speed to avoid pre-detonation. Together, the two subcritical masses would form a supercritical mass, which would release a tremendous amount of nuclear energy (Hoddeson et al. 1998). This method led to the development of the "Little Boy" device. Because it was conceptually simple, "Little Boy" was never tested before its use at Hiroshima. Scientists were less confident about the plutonium implosion design, which used shaped high explosives to compress a subcritical mass of plutonium-239. The symmetrical compression would increase the density of the fissionable material and cause a critical reaction (Hoddeson et al. 1998).

In 1944, the uncertainties surrounding the plutonium implosion device necessitated a search for an appropriate test site for the implosion design, later used in the "Fat Man" device. Manhattan Project personnel chose the Alamogordo Bombing Range in south-central New Mexico for the location of the test. A trial run involving 100 tons of trinitrotoluene (TNT) was conducted at this test site ("Trinity Site") on May 7, 1945. This dress rehearsal provided measurement data and simulated the dispersal of radioactive products (LANL 1995). The Trinity test was planned for July and its objectives were "to characterize the nature of the implosion, measure the release of nuclear energy, and assess the damage" (LANL 1995, p. 11). The world's first atomic device, Trinity, was successfully detonated in the early morning of July 16, 1945 (LANL 1995). Little Boy, the untested uranium gun device, was exploded on August 6, 1945, over the Japanese city of Hiroshima, and then on August 9, 1945, Fat Man was exploded over Nagasaki, essentially ending the war with Japan.

Early Cold War Era (1946–1956)

The future of the early Laboratory was in question after the end of WWII. Many scientists and site workers left Los Alamos and went back to their pre-war livelihoods. Norris Bradbury was appointed director in 1945 of the Laboratory following Oppenheimer's return to his pre-WWII duties (LANL 1993). Bradbury felt that the nation needed "a laboratory for research into military applications of nuclear energy" (LANL 1993, p. 62). In late 1945, General Groves directed Los Alamos to begin stockpiling and developing additional atomic weapons (Gosling 2001). Post-war weapon assembly work was now tasked to Los Alamos's Z Division, now Sandia National Laboratory, which had been relocated to Kirtland Air Force Base in nearby Albuquerque, New Mexico (Gosling 2001).

In 1946, Los Alamos became involved in "Operation Crossroads," the United States' first postwar nuclear test, and the first of many atmospheric tests performed in the Pacific. Later in the year, the U.S. Atomic Energy Commission (AEC) was established to act as a civilian steward for the new atomic technology born of WWII. The AEC formally took over the Laboratory from the Army-led Manhattan Engineer District in 1947, making a commitment to retain Los Alamos as a permanent weapons facility.

With the beginning of the Cold War in 1947, weapons research once again became a national priority. Weapons research at Los Alamos, spearheaded by Edward Teller and Stanislaw Ulam, focused on the development of the hydrogen bomb, the feasibility of which had been discussed seriously at Los Alamos as early as 1946. The simmering Cold War came to a full boil in late 1949 with the successful test of "Joe I," the Soviet Union's first atomic bomb. In January 1950, President Truman approved the development of the hydrogen bomb: Truman's decision led to the remobilization of the country's weapons laboratories and production plants (LANL 2001). The year 1950 also marked the initial meeting of Los Alamos's "Family Committee" – a committee tasked with developing the first two thermonuclear devices in response to President Truman's directives (LANL 2001).

In 1951, the Nevada Proving Ground (now the Nevada Test Site [NTS]) was established (Fehner and Gosling 2000). Development of the site was rapid, culminating with the detonation of "Ranger Able" on January 27, 1951, the first atmospheric test conducted in the continental United States (US) since 1945 (U.S. DOE 2015). In the same year, Los Alamos directed "Operation Greenhouse" in the Pacific and successfully conducted the first test of the thermonuclear principle, known as "George," as well as "Item," the first test of a fission weapon boosted by a fusion reaction (U.S. DOE 2015). In 1952, the first full-scale thermonuclear device, known as "Mike," was detonated at Enewetak Atoll in the Pacific (LANL 1993).[1] The Soviet Union responded with a successful fusion demonstration in August 1953, followed by a test of a hydrogen bomb in 1955, signaling an acceleration in the arms race between the US and the USSR (LANL 2001). By 1956, Los Alamos had successfully tested a new generation of high explosives (plastic-bonded explosives) and had begun to make improvements to the primary stage of a nuclear weapon (LANL 2001).

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[1] A better understanding of the Marshall Islands language has permitted a more accurate transliteration of Marshall Island names into English. Enewetak is now the preferred spelling (formerly Eniwetok).

Although weapons research and development has always played a major role in the history of Los Alamos National Laboratory, other key themes for the years 1942–1956 include: supercomputing advancements, fundamental biomedical and health physics research, high explosives and reactor research and development, pioneering physics research, and the development of the field of high-speed photography (McGehee & Garcia 1999). The early Cold War era at Los Alamos ended in 1956, a date that marks the completion of all basic nuclear weapons design: later research focused on the engineering of nuclear weapons to fit specific delivery systems. The year 1956 was also the last year that Los Alamos was a closed facility, the gates into the Los Alamos town site came down in 1957.

Late Cold War Era (1956–1990)

The late Cold War era saw Los Alamos' continued support of the atmospheric testing programs in the Pacific and at NTS. In 1957, the first of many underground tests at NTS was conducted. Other defense mission undertakings included: treaty and test ban verification programs (e.g., the satellite detection of nuclear explosions), research and development of space-based weapons, and continued involvement with stockpile stewardship issues. Non-weapons undertaking supported nuclear medicine, genetic studies, National Aeronautics and Space Administration collaborations, superconducting research, contained fusion reaction research, and other types of energy research (McGehee & Garcia 1999).

End of the Cold War to Recent Times (1990–2006)

The transition from the Cold War era to the post-Cold War period, initiated by the collapse of the Soviet Union at the end of 1991, prompted a period of profound change throughout Los Alamos. Because international treaties restricted and then halted the testing of nuclear weapons, Laboratory scientists had to devise new methods of ensuring the safety and reliability of the nation's nuclear stockpile. The last underground nuclear test conducted by the US occurred in 1992 (U.S. DOE 2015). In the years following, the Laboratory has developed sophisticated methods of analyzing the viability of weapons as part of the Stockpile Stewardship Program.

While weapons research remains the Laboratory's prime mission, scientists throughout Los Alamos conduct research in a wide variety of disciplines. Los Alamos became host to one of three national centers of human genome studies and made other major advances in human-health research, culminating in increased bioforensic research aimed at thwarting biological terrorism (Machen et al. 2010). The Laboratory continues to make huge advances in computing capacity and capabilities, spurred by the need to solve the increasingly complex codes required for weapon certification. A number of Laboratory experiments fly on satellites to conduct research in the space sciences, and Los Alamos scientists provide valuable scientific and technical expertise in support of homeland-security issues.

LANL HISTORICAL THEMES

Historical themes are themes that specifically relate to the important contexts and developments at LANL. They involve a more in-depth review that emphasizes the local historical context, trends, and interrelationships. Several key historical themes have been identified in the Cultural Resources Management Plan (CRMP) (LANL 2017) and they include:

- Weapons Research, Development, Testing and Stockpile Support
- Supercomputing
- Reactor Technology
- Biomedical/Health Physics
- Strategic and Supporting Research
- Environment/Waste Management
- Administrative and Social History
- Architectural History

Reactor Technology is the key theme associated with the evaluated buildings in this report.

Reactor Technology Development at Los Alamos

Reactors have been developed and used at LANL since the institution's origins during the Manhattan Project. Reactor technology in Los Alamos has served a diverse range of purposes, such as providing fundamental nuclear measurements essential to the development of the first atomic bombs, producing radioisotopes for research projects, conducting criticality experiments (i.e., to determine when a chain reaction would occur in fissionable materials), and powering rockets in space (Machen et al. 2010).

Research Reactors

A nuclear reactor was needed in Los Alamos during the Second World War to verify the theories for calculating the critical masses of uranium and plutonium, for determining the effects of various tamper materials on critical mass, for measuring fission cross sections, and for providing scientists with experience in assembling a supercritical system (Bunker 1983; Hoddeson et al. 1998). Reactors were also needed for measuring neutron-capture and scattering cross sections of other materials, particularly those under consideration as moderators and reflectors. Thus, Enrico Fermi advocated construction at Los Alamos of what was to become the world's third research reactor - following the construction of CP-1 at Chicago's Stagg Field and the X-10 Pile in Oak Ridge, Tennessee (Rosenthal 2010). Nicknamed the Water Boiler, this reactor was the first homogeneous liquid-fuel reactor and the first reactor to be fueled by enriched uranium-235 (Machen et al. 2010). Eventually, three versions of this reactor design were built, all based upon the same concept. Known successively as LOPO (for low power), HYPO (for high power), and SUPO (for super power), their neutron fluxes were used for many measurements important to the weapon program during the war and after (Machen et al. 2010).

LOPO, which achieved criticality in May 1944, was used to determine the critical mass of simple fuel configurations and to test new reactor concepts. HYPO, similar to its forebear, ran many of the key neutron measurements needed in the design of the early atomic bombs. By 1950, higher neutron fluxes were needed for basic nuclear research, leading to the construction of SUPO. The neutron production of SUPO was used to obtain accurate values for weapon yields, but its contributions to fundamental nuclear science went beyond the development of nuclear explosives. During the 1950s, the Laboratory's Health Division used SUPO to conduct pioneering research on the effects of neutron, beta, and gamma radiation on test animals, resulting in data that provided major guidance for setting radiation exposure limits for humans. SUPO, the last of the Water Boiler series, was not deactivated until 1974 (Bunker 1983).

The Water Boiler reactors were located in Los Alamos Canyon which, in 1946, became the site of the world's first fast neutron plutonium reactor. Dubbed Clementine, the reactor was designed primarily as a high-intensity fission-neutron source for nuclear experiments (Machen et al. 2010). Clementine was proposed, designed, and built during the latter half of the Manhattan Project on the basis that it would provide a much needed high-intensity fission-neutron source and as a means of exploring the adaptability of plutonium as a nuclear fuel. Clementine provided data of great utility to theorists engaged at that time in the design of both fission and fusion bombs, as well as invaluable experience in the design and control of fast reactors.

Clementine achieved full power in March 1949 and remained operational until December 1952, when a fuel rod ruptured and released plutonium into its mercury coolant system (Bunker 1983). Plans to replace Clementine were put into place almost immediately, with conceptual designs completed by the end of 1953 and construction activities beginning shortly thereafter. The first criticality measurements on this new reactor, called Omega West, were made in June 1956 (Machen et al. 2010). By the end of the year, Omega West operated at a power level of one to two megawatts of thermal energy (Machen et al. 2010).

Although Omega West and Clementine were used to test technological principles behind plutonium as a nuclear fuel source, the reactors—much like the Water Boiler series—were constructed strictly as research tools. Major basic and applied research activities demonstrated the reactors' versatility and usefulness to Los Alamos scientists, which included:

- Measurement of weapon yields by comparison fission counting,
- Neutron radiography of weapon components,
- Studies of the structure and dynamics of condensed matter by neutron scattering,
- Studies of the long-term behavior of components used in weapons,
- In-core testing of fuels and components for advanced power-reactor systems,
- Measurement of post-shutdown heat evolution from reactor fuels,
- In-core testing of plasma thermocouples,
- Studies of nuclear cross sections and energy levels by neutron-capture gamma-ray spectroscopy,
- Nondestructive elemental assay of materials by neutron-activation analysis,
- Production of radioisotopes for scientific research (Bunker 1983).

The Omega West reactor remained in service throughout the Cold War and early post-Cold War eras. In 1992, after 36 years of operation, Omega West was shut down. The reactor and accompanying support facilities were decommissioned over the course of the next eleven years. (LANL 2003; Harvey et al. 2004).

Power Reactors

Beginning in the late 1930s, scientists realized that the tremendous heat produced by nuclear fission held unparalleled economic and military potential. In a power reactor, energy is released by the fission process, and continuous fission—a chain reaction—is maintained in the reactor core. Despite its theoretical potential, serious research in nuclear fission as a commercial power source was limited by the economic and strategic considerations of the Second World War. The appeal of nuclear energy, with its incredible power density, was revisited by the United States as it asserted increased geopolitical prominence in the postwar era.

In 1947, under the direction of the Atomic Energy Commission, the US government was eager to promote nuclear reactor research for military and commercial purposes, such as nuclear propulsion and electrical power generation, respectively (Buck 1983). These early initiatives produced a number of prominent milestones in the early 1950s. The first successful demonstration of electrical power from nuclear energy was conducted on December 20, 1951 (Buck 1983). By May 1955, the *USS Nautilus*, the world's first nuclear-powered naval vessel, underwent its first sea trials. The success of these two projects substantially influenced the direction of nuclear reactor research in the US (Buck 1983).

In comparison to other AEC-managed reactor programs in the early postwar era, the nuclear reactors produced by Los Alamos were constructed primarily as research tools. Although the Water Boiler and Omega West reactor designs were capable of producing substantial amounts of heat, none were ever constructed to yield useful electrical power. Reactor programs designed for military and commercial applications, such as rocket propulsion and electrical power respectively, would not take shape until the middle of the 1950s (Machen et al. 2010).

Many of the earliest power reactor programs in Los Alamos were focused on portable power sources for the military. Several compact power reactor designs, beginning with the LAPRE (Los Alamos Power Reactor Experiment) series, were built and tested at Los Alamos between 1955 and 1963. The LAPRE reactor series used a liquid-based fuel solution composed of highly enriched uranium dioxide dissolved in 95 percent phosphoric acid (Clark et al. 1960). Scientists in Los Alamos realized that this novel solution allowed a reactor to operate as a constant-temperature energy source whose thermal and electrical output could easily change based on external load demand (Machen et al. 2010).

Criticality experiments began with LAPRE I on February 15, 1956. LAPRE II, completed in 1959, proved the soundness of the liquid-based fuel principle up to its maximum power of 800 kilowatts (Clark et al. 1960). However, fuel containment proved difficult due to the use of corrosive phosphoric acid, which led to the termination of the project in 1960 (Bunker 1983; Machen et al. 2010).

Another early project on power reactors was the development of a fast reactor fueled by molten plutonium and cooled by molten sodium. The thrust of this program was to explore the problems involved in using plutonium fuel in fast breeder reactors. The initial design, LAMPRE I (Los Alamos Molten Plutonium Reactor Experiment I), called for a reactor which could produce an output of at least 20 megawatts of thermal energy (Machen et al. 2010). LAMPRE I was operated successfully for several thousand hours following initial criticality in early 1961. One of the major LAMPRE-related research efforts was to learn how to minimize corrosion of tantalumclad reactor components that were exposed to the molten fuel and coolant. By the middle of 1963, LAMPRE I had served its intended purpose and was shut down.

When LAMPRE I's sodium cooling loop was shut down in 1963 (after more than 20,000 hours of operation), the most extensive and successful test of high-temperature sodium-cooling conducted up to that time came to an end (Machen et al. 2010). Although the Laboratory had planned to build a successor, LAPMRE II, the AEC chose to prioritize development of reactors that used blended uranium fuel over pure plutonium, ending the LAMPRE experiment (Bunker 1983; LASL 1967).

Project Rover

Using the experience gained in their pioneering reactor development endeavors, Los Alamos scientists expanded their power reactor research programs during the late Cold War. From 1955 to 1972, the Laboratory developed fission reactors for Project Rover, a program designed to meet the needs of potential interplanetary missions—such as a manned mission to Mars (Machen et al. 2010; Schultz et al. 2019). Though chemically powered rockets developed in the early 1960s were capable of supporting the nation's Intercontinental Ballistic Missile Program, uncertainties persisted that a chemically powered rocket would be capable of propelling enough mass to another planet in the solar system. To provide an alternative to existing chemical rocket technology, scientists working on the Rover Program studied and built test reactors that could be used in a nuclear-powered rocket. A cool gas would be passed through a hot reactor powered by atomic energy; as the superheated gas shot out of a nozzle, the resulting improvements in fuel efficiency and propulsion would exceed the capabilities of equivalent chemically powered rockets (Machen et al. 2010).

Los Alamos scientists developed a series of four reactors to understand the underlying principles of nuclear-rocket reactor technology. The Laboratory designed the Kiwi reactor series to develop the basic technology of nuclear thermal rockets; the Phoebus reactor to test designs for interplanetary voyages; the Peewee-1 reactor to test smaller, more compact reactor designs; and Nuclear Furnace-1" reactor to test advanced fuels and designs for reducing emissions of radioactive material into the atmosphere. These reactors were tested at the Nevada Test Site (Figure 1). Project Rover successfully demonstrated that a nuclear reactor could be used to heat liquid hydrogen for spacecraft propulsion. However, in 1969, the nation's plans for human exploration of Mars were abandoned, and Project Rover was canceled in the early 1970s (LANL 1983a; Machen et al. 2010).

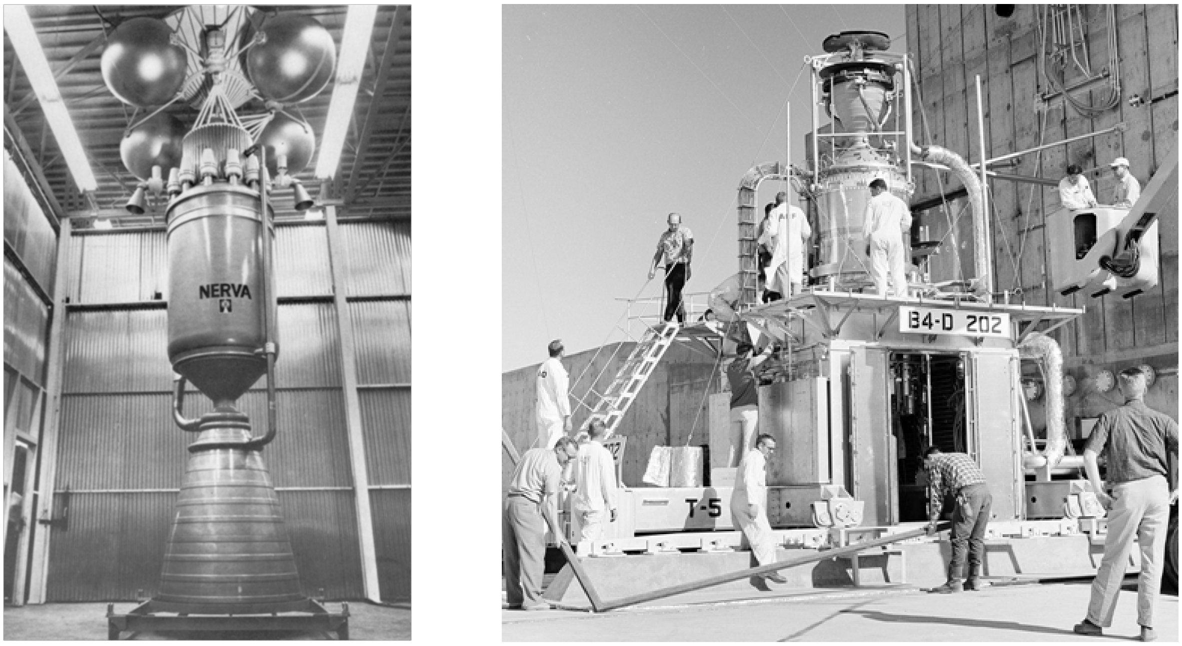

Figure 1. The Project Rover nuclear reactor (photo at left) was designed to power rockets. Compressed hydrogen in the spheres at the top flowed through the reactor core (center) and formed a jet as it exited the nozzle at the bottom (LANL 1983a). The Laboratory's Kiwi B-4D reactor (photo at right) being readied for a "hot run" in May 1964 (LASL 1964a).

Ultra-High Temperature Reactor Experiment

The Ultra-High Temperature Reactor Experiment (UHTREX) was developed as a spinoff of Project Rover. Applying Project Rover's research programs high temperature materials science and fuel rod fabrication, UHTREX was created by LANL as a technology demonstration for a category of reactors known as High Temperature Gas-Cooled Reactors (HTGRs).

The technical and scientific origins of the UHTREX Program began in January 1958 as part of the Turret reactor project (LASL 1969; Richardson and Strachwitz 1959). From the outset, the research program intended to create a "nitrogen-cooled graphite-moderated nuclear reactor experiment" that could produce up to 20 megawatts of electrical energy (Hammond et al. 1958).

The "Turret" reactor's namesake came from the design of its horizontally rotating core and fuel loading mechanism, which resembled the loading of a gun turret (Hammond et al. 1958). Slugs of uranium fuel would be inserted into stationary loading ports, and then inserted into the reactor by means of a hydraulic ram. Passing through the reactor, the fuel elements would have been discharged into a central chute for reprocessing (Hammond et al. 1958) (Figure 2).

Unlike water-cooled nuclear reactors of the period, the scientists of the Turret Reactor Research Group intended to operate the reactor at temperatures up to 1300 °F. To maintain such a high operating temperature, Turret's nuclear core would have to be cooled by nitrogen gas and surrounded by graphite for neutron moderation and thermal insulation (Hammond et al. 1958; Richardson and Strachwitz 1959). The reactor fuel rods, composed of unclad uranium-impregnated graphite, were to be manufactured by the same laboratory groups responsible for project Rover's high-temperature fuel components (Hammond et al. 1958; Schultz et al. 2019).

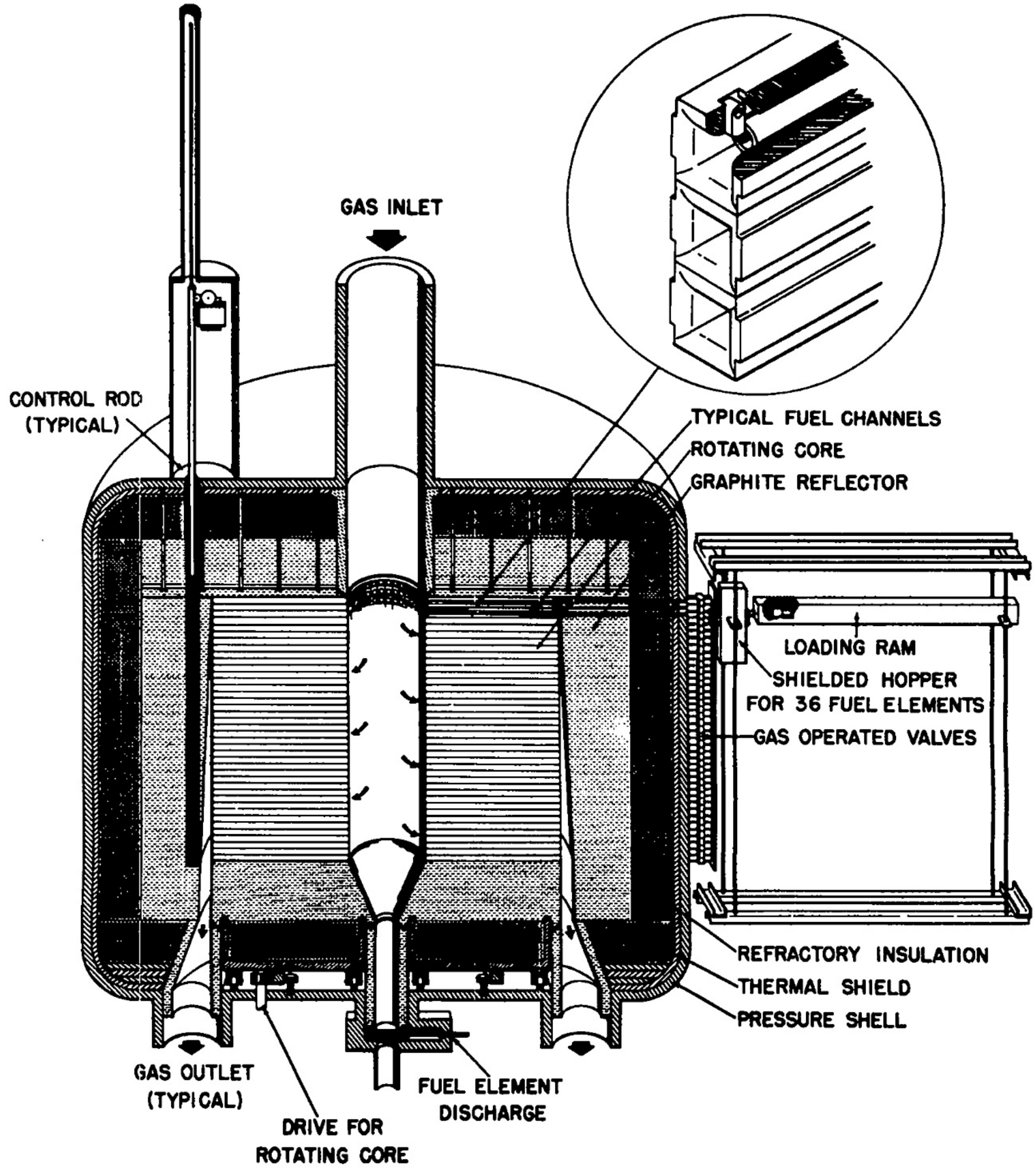

Figure 2. A schematic of the Turret reactor core from Hammond et al. (LA-2198). Fuel elements, composed of unclad uranium-impregnated graphite, were to be inserted remotely by means of a hydraulic ram while the reactor operated at full power. To limit the contamination of personnel and equipment, the fuel channels were designed to rotate around the core's central axis to a series of shielded hoppers (left side of diagram). Once the refueling process was complete, the spent elements would be ejected into a central channel to be retrieved for reprocessing. (Hammond et al. 1958). UHTREX retained nearly all the elements of Turret's core design.

Research and development on the Turret reactor proceeded for a little over a year before funding was terminated in early 1961. The suspension, however, proved to be short-lived. By May 1961, the Turret reactor program was revived as UHTREX (LASL 1964b). Management of the new reactor program was spearheaded by the newly developed Reactor Development (K) Division, comprised mostly of staff that had been affiliated with the Turret reactor program. K Division would be responsible for overseeing the design and construction of the reactor and its related support facilities in Technical Area 52.

Applying Project Rover's research in high temperature materials science and copying the basic design of the Turret reactor's pressure vessel and fuel loading mechanism, UHTREX became the Laboratory's sole contribution to the burgeoning field of High Temperature Gas-Cooled Reactors (HTGR). Construction of the UHTREX reactor building (TA-52-1) began in July 1962, with most of the reactor components installed between February 1964 and June 1966 (LASL 1969). After the reactor installation was completed, low power nuclear criticality was achieved in August 1967 (LASL 1969). In June 1968, as UHTREX approached its peak operating temperature, K Division created the UHTREX Experiments and Reactor Gas Technology Group (K-5) to oversee experiments related to the reactor's fuel elements, operating temperature, and coolant system (Schilling 1969). K-5 remained involved with the development of UHTREX until February 1970 when the AEC defunded the program and the reactor was shut down (LANL 1983b).

HISTORIC CONTEXT OF GAS-COOLED REACTOR TECHNOLOGY

Gas-Cooled Reactors: General Description, Advantages, and Challenges

Despite the number of experiments and technology demonstrations conducted in the US, Western Europe, Japan, and China since 1960, gas-cooled reactors are largely treated as experimental research tools. Very few gas-cooled designs have ever been incorporated into US power infrastructure, and those employing the technology have been operated as large-scale technology demonstrations (Everett III and Kohler 1978; Rofer 2015). Nonetheless, the history of gas-cooled reactors continues to have an enduring legacy on the history of nuclear technology.

Unlike most nuclear reactors that use superheated water, gas-cooled reactors use an inert compressed gas, typically helium, to cool the reactor core and generate steam for electricity. One of the most significant advantages of a gas-cooled reactor is the ability to operate at temperatures beyond the thermal limits of water-cooled nuclear reactors. While modern reactors using highly pressurized water can operate at temperatures between 200-300 °C (392-572 °F), most HTGR designs are designed to operate at temperatures two to three times the most advanced water-cooled designs (GE Hitachi Nuclear Energy 2007; Mcdowell et al. 2011; Mitsubishi Heavy Industries 2019).

A gas-cooled reactor's increased operating temperature has several advantages. A hotter operating temperature means a greater amount of thermal energy is produced per unit of fuel, increasing power efficiency for electrical generation. The higher operating temperature also means that a gas-cooled reactor is ideal for producing large quantities of heat that can be exploited for energy-intensive industrial processes, including oil extraction, seawater desalination, and the production of gaseous hydrogen (IAEA 2012a; Mcdowell 2011).

In addition, gas-cooled reactors are designed to be passively safe, primarily by limiting the dependence on the coolant to provide neutron shielding and moderation. Unlike water, which also serves as a neutron moderator, most gas-cooled reactors use solid moderators to control the rate of nuclear fission (IEE 2005). Because HTGRs depend on this passive moderation as part of their nuclear safety controls, an accident leading to a loss of coolant in a gas-cooled reactor will not lead to an uncontrolled fission reaction (IAEA 2012b). Graphite, a common moderating material for both historic and contemporary gas-cooled reactor designs, retains its structure and rigidity at temperatures in excess of 2,500 °F (IAEA 2012b; Petersen 1967).

Gas-cooled reactors have a number of technical complexities in comparison to water-cooled designs. HTGRs require extensive engineering and robust construction for their pressure vessels and fuel components and are, on average, physically larger than water-cooled designs that produce an equivalent amount of power (Kupitz and Dee 1984). This size difference creates a corresponding decrease in power density, which can be problematic in areas where space is at a premium. Fuel components and cooling systems in HTGRs must be designed to operate at extreme temperatures for extended periods of time without material fatigue due to sustained thermal stress.

The choice of coolant for a gas-cooled reactor is crucial. To prevent the release of radiological contamination and limit the wear of reactor components, a coolant gas used in an HTGR must satisfy three criteria. The coolant has to possess a low neutron cross section to limit the potential for the coolant to become radioactive. The gas must be chemically inert to prevent the corrosion of the reactor pressure vessel, coolant system, or fuel components at full power. And the gas must have a high specific heat capacity to efficiently transfer thermal energy.

Throughout the 1940s and 50s, scientists from US, Soviet Union, and Western Europe experimented with a variety of coolant gasses—carbon dioxide, nitrogen, and helium—in prototype gas-cooled reactor designs (Kupitz and Dee 1984; Richardson and Strachwitz 1959). By 1959, the global scientific consensus assumed helium to be the most useful cooling medium for gas-cooled reactors due to its chemical, thermal, and nuclear characteristics (Richardson and Stratchwitz 1959).

History of Gas-Cooled Reactor Technology

Early Research

In September 1947, scientists from Oak Ridge National Laboratory initiated a research program to study the feasibility of gas-cooled reactors for electrical power and industrial process heat (McCullough 1947; Rosenthal 2010). Within a year, scientists from Oak Ridge's Clinton Engineer Works designed a theoretical gas-cooled reactor concept known as the Daniels Pile (Rosenthal 2010). Many of the Daniels Pile's notable features, including the use of high-pressure helium coolant and solid graphite moderator, were revolutionary and influenced the design of equivalent reactor technology worldwide (Mcdowell 2011; Rosenthal 2010). The AEC readily sponsored Oak Ridge's research on gas-cooled reactors, eager to promote the technology as a practical demonstration of the peaceful use of nuclear energy (Buck 1983; Rosenthal 2010).

By the early 1950s, gas-cooled reactor technology had developed into a rapidly growing subfield of nuclear science and engineering. The field proved to be highly competitive, with over 500 scientific papers, articles, reports, and books published on theory and operation of gas-cooled reactors between January 1948 and May 1959 (Richardson and Strachwitz 1959). The majority of this research came from five nations: the US, Soviet Union, France, United Kingdom, and West Germany, although the governments of Japan, Belgium, and the Netherlands provided a number of notable technical contributions (Richardson and Strachwitz 1959).

At the close of the decade, many of the fundamental technical challenges had given way to well-defined reactor proposals, with the US, France, and the United Kingdom devoting serious analysis to the economics of the technology as a supplement, or replacement, of water-cooled reactors. This led to a broad variety of research proposals and reactor prototypes—cooled by carbon dioxide, nitrogen, and helium—with varying levels of interest and national commitment (Richardson and Strachwitz 1959). As the 1950s came to a close, a relatively mature gas-cooled reactor design emerged as a serious commercial contender: the Magnox reactor (Kupitz and Dee 1984; Jensen and Nonbøl 1999).

Magnox - The First Successful Gas-Cooled Reactor Concept

In 1955, the theory of gas-cooled reactors had matured to the point where commercial exploitation of the technology was economically feasible. Arguably the most successful of these early commercial efforts was the Magnox reactor, developed by the United Kingdom's Atomic Energy Authority (UKAEA) (Richardson and Strachwitz 1959). Magnox reactors, named after the non-oxidizing magnesium alloy used to clad the fuel rods of the reactor core, use pressurized carbon dioxide as their coolant (Kupitz and Dee 1984). The fuel assemblies, using natural uranium, were inserted in a graphite core and managed by control rods similar to those found in water-cooled reactors (Jensen and Nonbøl 1999).

Although the operating temperature of the Magnox design is limited by the melting point of the magnesium alloy, it proved the commercial viability of gas cooling technology. The first Magnox reactor, built in Calder Hall on the east coast of Scotland, was connected to Great Britain's power grid in the latter half of 1956. Investment in the reactor accelerated dramatically in the latter 1950s and, within four years, a total of twelve reactors based on the Magnox system had been constructed in the United Kingdom and France (Kupitz and Dee 1984; Jensen and Nonbøl 1999).

The American Response to Magnox

American research on gas-cooled reactor technology had progressed steadily throughout the early 1950s, but the dramatic commercial and technical success of Magnox shocked the political leadership of the US. Magnox reactors proved that gas cooling was feasible, and the lack of an equivalent domestic design was seen as an embarrassment to the US nuclear research community (Rosenthal 2010). One of the major reasons for this disparity in gas cooling technology was the influence of the military in power reactor design.

Because of the limited density and neutron moderating properties of high-pressure gas, many early gas-cooled reactor designs demanded larger pressure vessels and thicker radiation shielding than water-cooled reactors (Kupitz and Dee 1984). The relative compactness of water-cooled reactors had been attractive to the military, especially the US Navy, where space considerations were the predominant driver of reactor research and development since 1946 (Rosenthal 2010). According to Murray Rosenthal, Associate Director for Advanced Energy Systems at Oak Ridge National Laboratory:

> *"Hyman Rickover and his crew came to Oak Ridge in 1946 for training in nuclear engineering and while here chose water cooling over gas cooling for submarines. The course of U.S. power reactors was thus set. The technology developed in the Navy Program gave pressurized and boiling water reactors a lead that was hard to overcome"* (Rosenthal 2010) [2].

After 1956, a renewed effort was made to bridge the power density gap between water and gas-cooled reactors. Members from the Congressional Joint Committee on Atomic Energy directed the AEC to spur the development of domestic HTGR research, allowing for funding to be disbursed to a broad spectrum of national laboratories and private industries (Rosenthal 2010). While the AEC focused the majority of the program's funding to the Clinton Engineer Works in Tennessee, at least ten organizations participated in the government-led effort. [3]

To minimize the power density disparity between water and gas-cooled reactors, scientists in the US devoted research towards ever increasing operating temperatures. As soon as a comprehensive analysis of the Magnox design was undertaken by the AEC, American scientists realized it would be incapable of meeting the ambitious technical challenges of a domestically produced HTGR (Rosenthal 2010). The magnesium fuel cladding and corrosive carbon dioxide coolant could not safely exceed an operating temperature 770 °F without damaging the pressure vessel and fuel components (Jensen and Nonbøl 1999).

Tackling these limitations required a new approach to high temperature reactor design and would lead to the development of the HTGR. The HTGR principle, in theory, addressed the power density problem by combining high-pressure helium and new advances in high temperature materials to effectively double the Magnox reactor's coolant temperatures (Kupitz and Dee 1984). Early assessments of the technology demonstrated that, at full power, a HTGR could achieve a thermal efficiency comparable to water-cooled reactors (IEE 2005).

Between 1957 and 1970, the AEC sponsored a broad swath of research projects to produce a commercially viable HTGR. These investments, funded under the U.S. Civil Nuclear Program, produced several noteworthy technical milestones (Rosenthal 2010). Experiments with the Oak Ridge Research Reactor in the early 1960s proved that helium was a feasible cooling medium for high temperature reactors (Rosenthal 2010). In 1963, a team of researchers from Oak Ridge and Idaho National Laboratory collaborated with the Jülich Research Center in West Germany to create the first tri-structural isotropic (TRISO) reactor fuels designed to withstand temperatures above 3,000 °F (IAEA 2010; U.S. DOE 2019). And, in 1967, the first commercial HTGR was connected to the nation's power grid (Everett III and Kohler 1978).

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[2] Hyman Rickover is commonly referred as the "Father of the Nuclear Navy" for to his advocacy of nuclear propulsion and direct involvement in the certification the U.S. Navy's first nuclear-powered naval vessels. Rickover held the position of Director of Naval Reactors for 33 years, from February 1949 to February 1982, and his authority over the design and planning of pressurized water reactors was major influence in civilian nuclear energy research for decades (Duncan 1990).

[3] According to Richardson and Strachwitz (1959), American firms working on AEC-sponsored gas-cooled reactor research included: Oak Ridge National Laboratory, Los Alamos Scientific Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Idaho National Laboratory, Chicago University Metallurgical Laboratory, General Dynamics Corporation, General Electric Corporation, DuPont de Nemours Inc., Henry J. Kaiser Company, and the American Car and Foundry Company.

Peach Bottom Unit 1, an electrical generating station constructed by the Gulf General Atomic Company, became the first commercial HTGR in the US. The reactor facility and its components were designed, built, and tested by a consortium of private industries with support by the AEC between 1958 and 1966 (Everett III and Kohler 1978). After passing its certification requirements, Peach Bottom Unit 1 achieved full criticality and reached its designed operating temperature in June 1967. The Philadelphia Electric Company, the owners of the Peach Bottom Plant, operated the reactor until October 1974 when it was deactivated and decommissioned according to plans approved by the Advisory Council on Reactor Safeguards (Everett III and Kohler 1978).

The Peach Bottom reactor was not the only commercial demonstration of a HTGR generating station. The Public Service Company of Colorado contracted Gulf General Atomic Company to build a reactor capable of generating 330 megawatts of electrical power. This reactor, known as the Fort St. Vrain Nuclear Generating Station, achieved criticality in 1974 and began producing power for commercial use in July 1979 (Copinger and Moses 2003). Fort St. Vrain operated at full power for slightly over a decade before being deactivated in August 1989. While substantially more powerful to its commercial predecessor, the Fort St. Vrain reactor adopted many of the same fundamental principles as the Peach Bottom reactor and remains the longest-operating commercial HTGR in American history (Copinger and Moses 2003).

Los Alamos in the Context of American HTGR Research

Research and development in nuclear reactors for power generation were relatively a late priority for the scientists of Los Alamos. In comparison to other institutions, such as Argonne, Brookhaven, and Oak Ridge, who shifted to commercial reactor development by 1950, it would take until 1955 for Los Alamos to develop their first power reactor prototypes (Buck 1983; Bunker 1983). This was due in large part to the unique scientific challenges facing the laboratory during its transition from the Manhattan Project.

Many of Los Alamos' earliest reactors were constructed specifically as research tools; designed almost exclusively to produce high-intensity neutron sources to solve specific challenges in nuclear physics, nuclear medicine, and materials science with limited consideration for commercial applications (Machen et al. 2010). Even in the transition from research to power reactors, many of Los Alamos' proposals were designed to fit specific non-commercial niches, such as power plants for remote military outposts (Machen et al. 2010). LAPRE I and II, constructed in 1956 and 1959, respectively, are emblematic of the laboratory's research focus of the period: experimental reactors designed with novel fuel configurations to maximize power density while minimizing reactor volume (Bunker 1983; Clark et al. 1960).

Commercial gas-cooled reactor research emerged as a priority for Los Alamos in early 1958 with the development of Turret Program. Turret was seen as a direct spinoff of Project Rover, adopting many industrial techniques used to fabricate high temperature fuel components for the Kiwi reactor (LASL 1969; Machen et al. 2010; Schultz et al. 2019). Early documents related to the Turret Program called for a graphite-moderated and nitrogen-cooled reactor, which could produce three megawatts of thermal power (Hammond et al. 1958). After the development period of approximately eighteen months, Turret was announced to the public (LASL 1964b). Despite early enthusiasm, funding for the project was terminated in early 1961 and replaced with the Ultra High Temperature Reactor Experiment (LASL 1969).

The prime scientific objectives of UHTREX were threefold (LASL 1964b):

- To study the behavior of reactor components in extreme temperature environments above and beyond any contemporary water or gas-cooled design,
- To determine if fuel reprocessing costs could be reduced by using unclad, uncoated, fuel rods instead of conventionally sealed fuel sources, and
- To study the effects of heat transfer and thermal corrosion on unclad fuel by injecting helium gas directly into the reactor core, rather than by a segregated coolant loop.

In addition to its scientific mission, UHTREX was intended to study approaches in lowering costs associated with creating electricity and process heat compared to other contemporary gas-cooled nuclear reactor designs (LASL 1964b). While many of UHTREX's features were functionally similar to Turret, the nitrogen coolant system was replaced with helium and extensively modified to operate at a temperature of 2,400 °F (LASL 1969). At full power, UHTREX was designed to exceed the operating temperatures of any contemporary HTGR experiments by approximately 575 °F (Kupitz and Dee 1984).

Termination of the UHTREX Program

LANL scientists had high expectations for UHTREX once it reached its peak operating temperature in June 1969. However, by February 1970, reactor operations were terminated, and TA-52-1 was shut down (Bunker 1983). All UHTREX research activities, with the exception of a single study concerning the reactor's unclad fuel components, were suspended by March 1970 (Weintraub 1970).

UHTREX's abrupt closure in early 1970 was the result of shifting federal priorities. Milton Shaw, Director of the AEC's Reactor Development and Testing Division, chose to refocus the U.S. Civil Nuclear Program towards the development of fast breeder reactors (LANL 1983a, 1983b). At the time of Director Shaw's decision in 1970, concerns had emerged that the supply of uranium within the US was too limited to meet the nation's energy demands (U.S. Congress 1972). In addition to predicting dramatic increases in megawatt capacity, a 1967 AEC report on civilian nuclear power reaffirmed the promise of breeder reactors to meet long-term energy needs (Buck 1983). Breeder reactors were seen as a technological solution to make the most of what was believed to be very limited uranium reserves. By producing plutonium from the neutron bombardment of natural uranium metal, breeder reactors could make more fuel than they consumed.

To accelerate fast breeder development, the Reactor Development and Testing Division suspended virtually all federal research funding for other experimental nuclear reactor designs, including the HTGR. The impact of the AEC decision on Los Alamos was immediate. With the exception of Project Rover and the Liquid Metal Fast Breeder Reactor, the reactor research program in Los Alamos was effectively suspended (Bunker 1983). By June 1970, K Division and its associated research programs were permanently dissolved. Most of the scientists and technical staff involved with UHTREX Program were reassigned to other divisions or transferred to research projects outside of the Laboratory (LANL 1983b). Nationwide, the AEC's decision would lead to suspension of HTGR research and development for approximately fourteen years (Kupitz and Dee 1984).

DESCRIPTION OF TECHNICAL AREA

TA-52 (Reactor Development Site) Historical Background

TA-52 was originally identified as the Reactor Development (RD) Site because it was developed specifically for TA-52-1, the reactor building, (formerly RD-1) and its support building, TA-52-11, (formerly RD-11). The original site was suitable because it had an exclusion area, where the site could be controlled with fences, geographic features, and posted notices.

As a nuclear reactor facility, the design of TA-52-1 and its reactor vessel had to conform to regulations established by the AEC (U.S. Federal Register 1961). Specific requirements for siting nuclear facilities prior to 1967 were relatively limited, however, with federal authorities "not specify(ing) a permissible population density or total population" within a low population zone "because the situation may vary from case to case" (U.S. Federal Register 1961). However, the geographic location of TA-52 allowed for the UHTREX reactor facility to be placed in a location with a generally low population density. Analysis by laboratory personnel in 1962 assessed the permanent population to be approximately 7,000 individuals within a twenty mile radius of the site (Taschek 1962).

As the 1960s progressed, reactor safety became an important and complex public policy issue with bitter debates over the probability of accidents and requirements for necessary safe distance (Walker and Wellock 2010). The scientists of K Division determined TA-52 to be a safe location due to its security and remoteness. A single road, Puye Road, was the only access to the site (Taschek 1962) (Figure 3). The nearest facility at the time of construction was a mile away and offered access to Beta Site, a little used portion of the laboratory. In addition to its remoteness, physical access to the site was limited on the east and west by fences and on the other two sides by the precipitous mesa edges (LASL 1967).

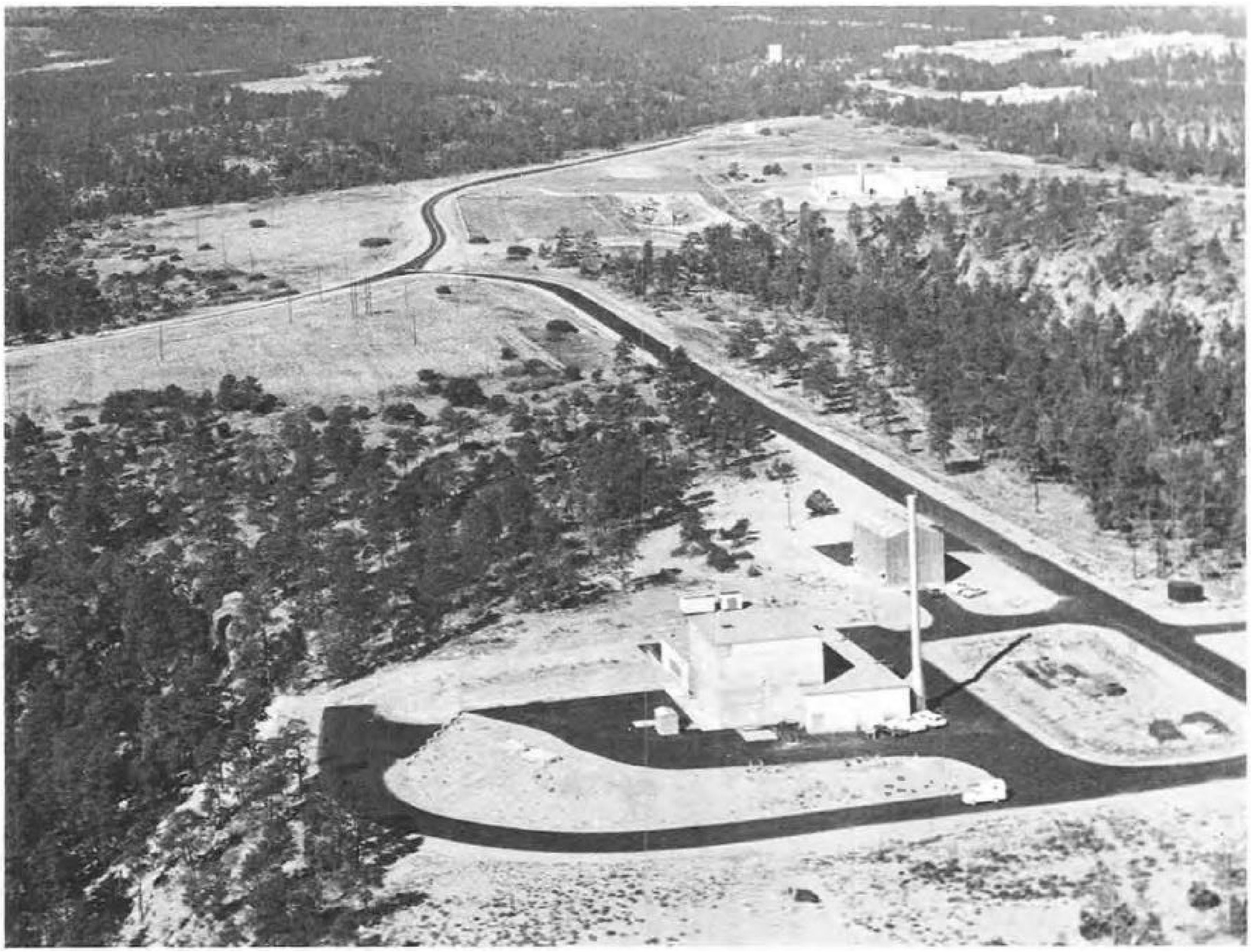

Figure 3. Looking northwest at the UHTREX complex, with TA-52-1 (foreground, center-right) and TA-52-11 (background, right). To the left of the picture is Mortandad Canyon and to the right is Cañada de Buey.

UHTREX Historical Background and Reactor Features

UHTREX was constructed for the AEC and operated at full power by Los Alamos Scientific Laboratory (LASL) (now Los Alamos National Laboratory) for one year (Salazar and Elder 1993). Although UHTREX went critical on August 3, 1967, it was operated at low power for nearly two years and did not reach its design temperature of 2,400 °F until June 24, 1969 (Weintraub 1970). During this period of low power operation, reactor components and systems were thoroughly studied. As part of the testing phase, the reactor was shut down and reactivated to examine fuel elements, control rod design, neutron flux, thermal distribution, and coolant flow (Schilling 1969) (Figure 4). Information related to these findings were published over an eight-year period of study, starting in 1961, and published in quarterly reports by LASL.

Construction on the reactor buildings started in July 1962 and was completed in February 1964. Following its construction, the components arrived steadily throughout the latter half of the decade. The reactor pressure vessel arrived in August 1965; the core was installed in June 1966; criticality at low power was achieved in August 1967; and design power operation began in late June of 1969 (LASL 1969).

Figure 4. Hurshel Ainsworth and Richard W. Johnson check the UHTREX fuel-element hole spacing

The purpose of the UHTREX was to operate a graphite moderated helium gas-cooled reactor at temperatures beyond contemporary HTGR prototypes, as well as investigating the behavior of such reactors at extreme temperatures, particularly in the production of power and industrial process heat (LASL 1968). The fuel rods used in UHTREX were similar to Project Rover, composed of enriched uranium suspended in a mixture of compressed graphite without protective cladding (Weintraub 1970). The reactor featured a rotating core that could be fueled while the reactor was operating at full power. The reactor was originally designed both as a technology demonstration and as an experimental platform. Members of K Division were hopeful that additional research and development programs would develop as an outgrowth of UHTREX during the design phase (LANL 1983b). Meetings were held to discuss the possibility of collaborations between LASL, Gulf General Atomic, and Oak Ridge National Laboratory to exploit the scientific and commercial potential of the reactor. However, none of the proposed initiatives materialized due to the abrupt termination of the program (LANL 1983b).

Reactor Design and Features

The UHTREX core was composed of a vertical hollow rotating cylinder constructed of solid graphite. The cylinder was 70 in. OD×23 in. ID×39 in. high. The core had 312 fuel channels. The channels were equally spaced radially around the core at 15-degree intervals arranged in 13 separate layers of 24 channels each. Each channel held up to four fuel elements and extended completely through to the inside of the cylinder. At full power, the reactor produced approximately three MW of thermal energy (Weintraub 1970).

The core could be refueled remotely while at full power. Refueling involved rotating the core to the channel containing the element requiring replacement and pushing in a new element (Tascheck 1962). The used element would be pushed out into the center and fall to the base of the reactor to be collected. At full power the reactor used up one to six fuel elements per day depending on enrichment and the porosity of the fuel element (Weintraub 1970).

UHTREX had the following specifications: (Tascheck 1962; Weintraub 1970)

- Fuel - highly enriched uranium
- Rated power - 3 MW (thermal)
- Core construction material - graphite
- Moderator - graphite
- Reactor vessel - carbon steel sphere 13 ft. 2 in. diameter 1.75 inches thickness
- Fuel channels - 312 channels; each one is 1.1 in. ID, 23.5 in. long and holds up to 4 fuel elements
- Fuel element - 1 in. OD, 0.5 in. ID and 5.5 in. long (25.4 mm x 12.7 mm x 139.7 mm)
- Core power density - 1.3 W/cc
- Fuel utilization - up to 50%
- Coolant - helium at 500 psi (3.45 MPa)
- Coolant temperature - inlet 1600 °F, Outlet 2400 °F (871 °C and 1316 °C)
- Coolant flow rate - 10,250 pounds per hour (1.294 kg/s)

Technical Advantages and Disadvantages of the UHTREX Design

A typical pressurized water nuclear reactor prevents coolant from directly interacting with the nuclear fuel. This is done through physical barriers and engineered components, such as sealing nuclear fuel inside specialized metallic cladding, or running coolant through piping that is isolated from the fuel assemblies (Tascheck 1962). These measures prevent contamination of the coolant by keeping fission products segregated and isolated to reactor’s fuel components.

The disadvantages of a sealed fuel assembly include the buildup of fission products inside the fuel elements. Fission byproducts act as a nuclear poison, ultimately leading to poor efficiency well before a significant portion of the fuel is used up. With a high enough ratio of poisonous fission byproducts, a cladded fuel system requires a constant stream of refueling, which is a cost and time-intensive process.

Compounding the buildup of fission byproducts, maximum safe operating temperatures for fuel rods and coolant systems are often significantly lower than the temperatures capable of being produced by a HTGR. Common alloys used to clad fuel assemblies and coolant systems cannot safely operate for extended periods of time without being subjected to considerable thermal stress as the reactor cycles between power levels. Over long periods of operation, this thermal stress can lead to material fatigue. This thermal bottleneck reduces the efficiency and power density of a gas-cooled reactor.

The UHTREX reactor used un-clad porous carbon extruded fuel elements each shaped like a long hollow cylinder. The fuel elements were manufactured by vacuum impregnating the porous carbon cylinders with aqueous uranyl nitrate solution then air drying and baking them in a furnace, ultimately producing a uranium oxide coating tightly held in a porous graphite matrix. This fuel was expected to be substantially less expensive to manufacture compared to the fuel rods used by contemporary gas and water-cooled reactors (Weintraub 1970).

The porosity of the pellets allowed several theoretical benefits. When operated at full power, UHTREX was capable of sustaining a maximum temperature of 2,400 °F, which was approximately 650 °F hotter any other HTGR prototype prior to 1985 (Kupitz and Dee 1984). The direct interaction with the coolant stream would allow fission byproducts to migrate out of the fuel to be filtered, processed, and disposed (Tascheck 1962). This fuel arrangement allowed for a higher percentage of fuel to be burned up before the pellet needed replacement (up to 50 percent) (Tascheck 1962; Weintraub 1970).

A significant disadvantage to porous reactor fuel is that the entire cooling loop, including all pumps, compressors, and heat exchangers, would become highly contaminated with fission products. Contamination caused by a potential coolant leak would pose a significant danger to personnel and the environment. The high contamination levels within the coolant stream were identified as an impediment to refueling the reactor while operating at full power. Therefore, the reactor was designed to be remotely loaded using the Minotaur manipulator.

Related Developments at UHTREX

Minotaur, a manipulator designed for remote reactor refueling, was developed specifically for UHTREX (LASL 1964b). Manipulators, such as the Minotaur, were ubiquitous at the Laboratory and specifically used to manipulate hazardous materials remotely, protecting users from potential exposure hazards (LASL 1964c). During the construction and installation phase of UHTREX, the Minotaur manipulator was assembled in TA-52-11.

A computer program was developed by James H. Griffin, a mechanical engineer in the LASL Construction Planning Group, to analyze the stresses caused by the thermal expansion of the piping systems needed for UHTREX. The program took 18 months to design and was later adapted to a variety of computer systems and programming languages (LASL 1964d).

Termination of the Program and Decommissioning

When funding was suspended for the UHTREX Program, the reactor was shut down and defueled in 1970. DOE funded decommissioning activities that began in 1988, which involved removing the reactor, control systems, and associated components. Work to decommission the facility was completed in September 1990, at a cost of $2,900,000, or approximately $5,700,000 adjusted for inflation at the time of this report (Salazar and Elder 1993). During the decommissioning of the UHTREX reactor, many of the outside support structures (e.g., waste lines, a pump station, a heat dump station and heat exchanger, a filter pit, and a 100 foot high steel stack) associated with the facility were removed. The decommissioning provided approximately 12,000 square feet of office and storage space for other Laboratory activities (Salazar and Elder 1993).

MULTIPLE PROPERTY METHOD OF EVALUATION

The two properties at TA-52 were evaluated using a multiple property documentation approach. This systematic approach serves as a useful evaluation tool to determine the historical significance of a group of thematically related properties, such as those located at UHTREX Complex (Figure 5). A key element of the multiple property documentation approach is context. Contexts provide information about historical patterns and trends and have clearly defined themes, geographical areas, and chronological periods (U.S. NPS 1999).

Figure 5. Overview of Ultra High Temperature Reactor (UHTREX) Complex looking toward the southwest. TA-52-1 is located on the left side of the image, TA-52-11 is to the right.

These potentially eligible structures are technologically related and were in use during the late Cold War era at Los Alamos (1956–1990). As discussed in *LANL Historical Themes* section, the properties are linked to one specific subtheme underlying one of the LANL-wide Cold War historical themes, *Reactor Technology*, identified by CRMP (LANL 2017). Decisions relating to final eligibility recommendations were based on the type of property, the level of physical integrity, and associations with significant themes and related impacts to those themes.

Associated Property Types

The multiple property documentation approach requires the identification of property types that are associated with historical contexts. This identification facilitates the evaluation of individual properties within the broader complex of properties being reviewed. Properties are compared with other historical resources that have similar histories and similar physical characteristics (Hanford Site 1999a).

There are two general property types associated with TA-52's historical themes.

1. **Laboratory-Processing-Testing Buildings or Structures** such as test cells and laser facilities.
2. **Support Buildings and Structures** such as warehouses, storage buildings, water tanks, utilities, and waste treatment facilities.

Laboratory-processing-testing buildings or structures located at TA-52 are associated with the technical functions underlying the main Cold War theme of *Reactor Technology*. Specific activities carried out in this type of property solely supported UHTREX.

Laboratory-processing-testing buildings and structures, in this case TA-52-1, are facilities whose form and shape occurred from the essential needs of the equipment they housed. The type of activities carried out in each building or structure also determines the configuration of interior space. At TA-52-1, its blocky mass was formed based on the need to encase the nuclear reactor and requisite mechanical equipment according to AEC regulations (U.S. Federal Register 1961). Reinforced concrete is the primary construction material used when designing a facility for chemicals and radioactive materials research because concrete is inherently secure, durable, and easily cleaned.

Support buildings and structures were originally built to support Cold War research and development. Like laboratory-processing-testing buildings and structures, support facilities are divided into two subcategories. "First tier" support properties, such as TA-52-11, are primarily buildings and include machine shops, warehouses, power plants, and significant water tanks. TA-52-11 was the machine shop used in the initial assembly, maintenance, and repair of the UHTREX reactor in building TA-52-1. The building was also used in the construction of the Minotaur manipulator, which was installed in TA-52-1 prior to 1967.

Integrity

Although significant historic properties may be eligible for the Register based on associations with historical events and contexts, integrity must be determined for all buildings that, on first-cut, are considered eligible. LANL historic buildings staff have developed four integrity codes to better assess potentially eligible properties.

Level 1. Excellent Integrity—the property is still closely associated with its primary context and retains integrity of location, design, setting, workmanship, materials, feeling, and association. Little or no remodeling has occurred to the property and all remodeling is in keeping with its associated historic context and significant use period.

Level 2. Good Integrity—the property's interior and exterior retain historic feeling and character, but most of the original equipment may be gone. The property may have had minor remodeling.

Level 3. Fair Integrity—a property in this category should retain original location, setting, association, and exterior design. All associated interior machinery and equipment may be absent, but the key question is "Is this property still recognizable to a contemporary of the building's historic period?"

Level 4. Poor Integrity—the property has no connection with the historically significant setting, feeling, and context. Major changes to the property have occurred. The property would be unrecognizable to a contemporary.

The integrity requirements for properties eligible for listing under Criterion A of the National Register of Historic Places are less stringent than for those properties eligible under Criterion C.

A historically significant property with a Level 3 integrity could still be eligible, especially if an element of historical uniqueness is involved. Properties eligible under Criterion C should have no lower than a Level 2 integrity. Level 4 integrity properties are not eligible for the Register.

Themes

Activities within TA-52 can be grouped under one subtheme that support the technical area's main Cold War scientific themes, *Reactor Technology.* Because the reuse history of these facilities has been limited to office use and document shredding with no significant contributions to any other themes listed in the CRMP, both of the evaluated facilities are linked to this single theme.

Eligibility Criteria

In order to be eligible under Criterion A, support buildings and structures must have functioned as significant support facilities within an associated historical context (Hanford Site 1999b). "First tier" support and laboratory-processing-testing properties, if linked to a historically significant context and 50 years old or older, may be eligible for the Register. If less than 50 years old, support properties must be exceptionally significant. "Second tier" support and laboratory-processing-testing properties, primarily structures, are usually not eligible for the Register (even if they are 50 years old or older) because of the minor role they played in history.

Laboratory-processing-testing buildings and structures do not need to possess an integrity of both exterior and interior features in order to be eligible for the National Register under Criterion A. In cases where original equipment has been removed, a property can still be considered significant for its historical associations. Laboratory-processing-testing, administration, and security properties need only retain original location, setting, association, feeling, and exterior design to maintain significant historical integrity under Criterion A.

Properties eligible under Criterion C have to meet a more stringent standard of physical integrity. However, additions and remodeling that reflect changing scientific missions are acceptable under Criterion C (Hanford Site 1999b).

In assessing the properties of the UHTREX Complex, the following determinations were made:

- Due to its short period of experimental use, limited association with novel scientific advancements, and lack of an enduring technical legacy, the experimental history of UHTREX does not satisfy requirements for Register eligibility under Criterion A.

- The UHTREX Program was not affiliated with any important or highly recognized persons related to the history of Cold War science and technology to satisfy requirements for Register eligibility under Criterion B.

- Neither TA-52-1 nor TA-52-11 possess sufficient integrity or uniqueness in design or purpose to satisfy requirements for Register eligibility under Criterion C.

- Neither TA-52-1 nor TA-52-11 possess sufficient historical integrity to yield important information related to the UHTREX Program or the broader state of Cold War reactor technology and, therefore, do not satisfy requirements for Register eligibility under Criterion D.

In specific respect to Criterion A, the UHTREX program did not make a significant contribution to the history of Cold War reactor technology in the United States.

As a research program, UHTREX was positioned relatively late in the history of High Temperature Gas-Cooled Reactors. Contemporary documentation by Richardson and Strachwitz (1959) indicates that most the fundamental scientific research on HTGRs had been established by other laboratories in the US and Western Europe well before UHTREX or its technological antecedent—the Turret reactor—were proposed in 1958. In comparison to other Los Alamos reactor research and development programs, such as LAPRE and LAMPRE, UHTREX was an iterative application of Project Rover's fundamental research. The scientific and engineering principles behind Project Rover, however, proved to be unsuitable for a commercial HTGR.

TA-52-1 and its associated reactor had a relatively short period of experimental use, producing power from August 1967 until February 1970. This period, while extensively covered in public-facing Los Alamos publications such as *The Atom*, did not translate into an enduring scientific or technological legacy. By the time UHTREX had reached low power criticality in 1967, competing HTGR programs in the US had successfully demonstrated similar nuclear reactors for commercial use, such as the Peach Bottom Unit 1 facility in Pennsylvania.

None of UHTREX's unique design features, such as its unclad fuel elements, unsegregated coolant loops, or rotating fuel core, have been used since the program's abandonment. As noted by IEE (2005), Kupitz and Dee (1984), and McDowell et al. (2011), all HTGR experiments post-1970 have been based on improvements to the Magnox, Peach Bottom, and Fort St. Vrain reactors. UHTREX's fuel design, originally lauded for its theoretical economic benefits, has been supplanted by high temperature fuel technologies developed by Oak Ridge National Laboratory and the Jülich Research Center in Germany (IAEA 2010). The reactor's reliance on an unsegregated helium cooling loop, considered to be crucial for increased thermal performance was abandoned due to its potential for radiological contamination—a concern which had been noted as early as 1958 by Hammond et al.

UHTREX's technical and scientific legacy is generally limited to the duration of the experiment and did not contribute either broadly to the advancement of Cold War nuclear research or fundamentally to the specific study of High Temperature Gas-Cooled Reactors. Many retrospective articles and publications produced by Los Alamos National Laboratory during the Cold War era, such as Bunker (1983) and LANL (1983b), discuss UHTREX and its associated facilities primarily as a historical footnote—noteworthy more for the abrupt suspension of the program rather than its technical achievements. Sampled surveys of public literature on HTGR technology, including IAEA (2010, 2012b), IEE (2005), Kupitz and Dee (1984), and McDowell et al. (2011) completely omit UHTREX from the historical record.

In specific respect to Criterion C, both buildings of the UHTREX Complex have been assessed as possessing fair integrity and lack the stringent standards warranted for Register eligibility. Additionally, as a support facility, buildings like TA-52-11 are generally not considered for Register evaluation under Criterion C unless they possess specific design considerations for exceptionally significant equipment.

Though the UHTREX Complex still possesses original location, setting, association, and most exterior design elements, a lack of internal features and equipment has degraded the historical integrity of both facilities. The historic integrity of both TA-52-1 and TA-52-11 have been compromised due to phases of decontamination, decommissioning, and reuse between 1970 and 1990 (LASL 1971; Salazar and Elder 1993). Because of these activities, initiated before the UHTREX Complex reached an age suitable for Register evaluation, neither TA-52-1 nor TA-52-11 retain significant material affiliation with the larger historic context of Cold War reactor research.

The buildings of the UHTREX Complex do not convey or embody historically unique characteristics that could supersede their loss of internal historic integrity. Both TA-52-1 and TA-52-11 were constructed with standard construction methods, details, and materials. In the particular case of TA-52-1, the building was constructed in conformity to AEC construction and licensure guidelines on nuclear reactor facilities (Taschek 1962; U.S. Federal Register 1961, 1967).

Description of the UHTREX Complex:

The reactor building, TA-52-1, was the first building constructed and established in the technical area, the Reactor Development Site. It was designed in 1962 by W.C. Kruger and Associates. The firm worked from criteria developed by K-Division and the Engineering Department of LASL (now LANL). The structure and site development were completed by McKee General Contractor, Inc. of Santa Fe, New Mexico, for the cost of $1,670,000. Installation of equipment was completed by Los Alamos Constructors, Inc, a division of the Zia Company, a local maintenance contract to the AEC, from design criteria prepared by and under the direction of K-Division and the Engineering Department of LASL. K-Division was responsible for facility operations.

Figure 6. Building TA-52-11, east end

TA-52-11 was constructed later in 1962 LASL (Figure 6). The building housed machine tools and other equipment used in the initial assembly of, and to be used for the maintenance and repair of, UHTREX system components. TA-52-11 would continue to support assembly, fabrication, and routine maintenance operations for the UHTREX Program until its termination in February 1970.

Construction of both buildings was essentially complete by the end of 1962, and the reactor vessel was procured and installed later that same year. The reactor vessel was fabricated by Nooter Corporation of St. Louis, Missouri, an industry leader in the fabrication of tanks and boilers. By 1965, most of the major components of the UHTREX reactor had been installed in TA-52-1.

In February 1970, the UHTREX Program was terminated and, by mid-year the reactor was shut down and defueled. Some reactor related equipment was removed from TA-52-1 in late 1970, and the rest was secured in controlled areas to prevent radiation exposure to personnel. Some rooms were locked, and signs were posted to prevent accidental entry. The rest of the reactor building was used by Q Division (later N Division) and others as office and non-radiological experiment space.

In early 1971, TA-52-11 was converted from a mechanical assembly building to support document destruction activities (LASL 1971). Equipment related to the UHTREX Program was removed from the facility and the east side of the building was reconfigured to accommodate a large industrial shredder. TA-52-11 has supported document shredding activities since its conversion.

PROPERTY DESCRIPTION (TA-52-1)

Technical Area: 52
Building Number: 1

Original Function: Nuclear Reactor
Current Function: None
Date Constructed: 1962

Associated Theme: Reactor Technology
Property Type: Laboratory-Processing-Testing Buildings or Structures
Integrity: Fair
Core: Yes
Eligibility: No

Buildings with same floorplan within TA: none

North Elevation

East and North Elevations

South Elevation

West Elevation

Architectural Description

TA-52-1 is a fairly simple building in footprint, massing, and elevation. A single reinforced concrete structure housed the reactor and the associated experimental, operational, and support facilities. The main portion of the building, the area that housed the reactor, is a cast in place concrete building with walls in some places that are five feet thick. Concrete masonry units were also used.

The main reactor room rises 39 ft above ground and extends approximately 39 ft underground, with multiple levels. The building is approximately 85 ft 3 in. by 119 ft 6 in. Foundations and structural framing are reinforced concrete. There are some areas that have open web steel joists that support the roof. Roofing is a built-up composite system with gravel ballast.

While the exterior of the building is quite simple, the interior has various levels and interior spaces. The building has several levels underground and one level above ground, which includes a high-bay space. Figure 7 indicates the various levels and some of the less accessible spaces of the building. The building's levels are arranged into four levels, originally labeled Ground Level, Operational Level, Basement Level, and Sub-basement Level which are now labeled First Floor, Basement, Sub-basement, and Sub-basement A, respectively. Many areas are devoted to mechanical, electrical, and other utility support functions.

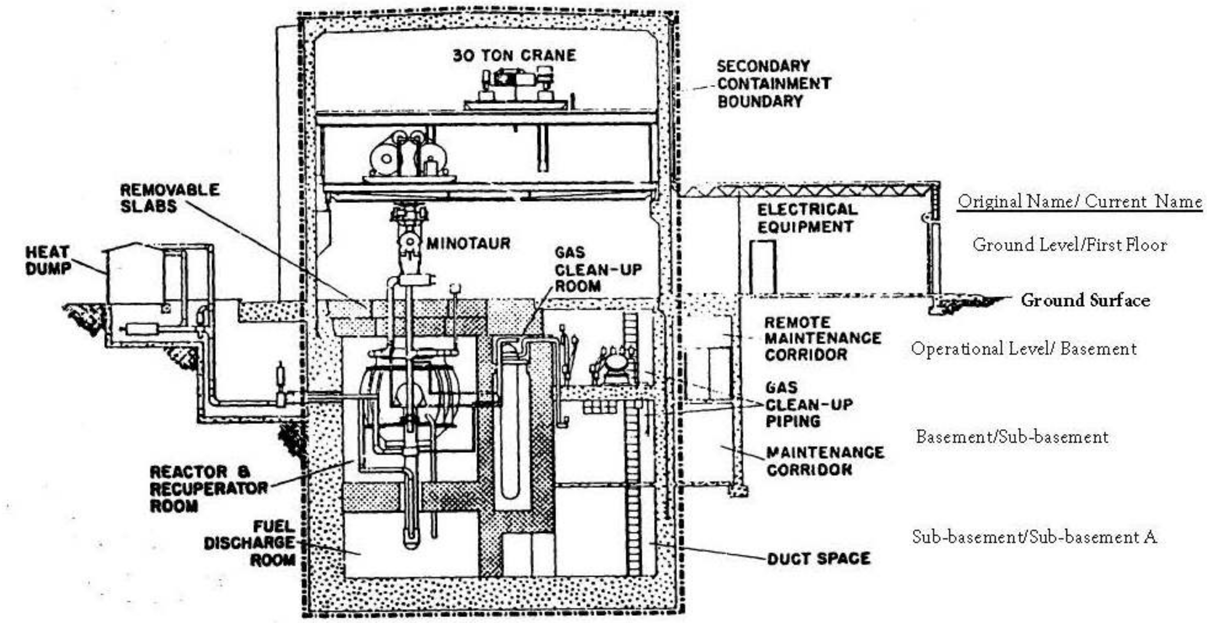

Figure 7. Cutaway of UHTREX reactor room, including Minotaur manipulator.

The sub-basement (originally labeled basement) level housed the reactor, a recuperator room, a remote maintenance corridor, a large mechanical equipment room, one restroom, and six offices with no windows. The sub-basement A level (originally labeled sub-basement) housed a fuel discharge room, below the recuperator room in the sub-basement, a gas storage area, and duct space. Access to these sub-basement A areas is by service ladders. Two exit stairs from the sub-basement level provide access to the first floor (originally labeled ground floor).

The basement level (originally labeled operational level), contained the upper part of the reactor recuperator room, gas cleanup room, and gas cleanup piping. Another maintenance corridor was on this level as well as a cell operating room and the control room. There are hot restrooms, cold restrooms, a locker room, a health office, and the operation's office on this level. A hot restroom is where workers from contaminated areas could use the restroom and remove clothing that was contaminated before exiting the facility. The land was contoured to provide for access to a loading dock on the south side of the building. The cell operating room and the control room have direct access to this loading dock.

The first floor (originally labeled ground level) is the largest level of the facility and contains a large ventilation equipment room, a boiler room, an electrical equipment room, exhaust filter room, and a utility room that are shielded for protection by the reinforced concrete walls around the reactor. This level was considered secondary containment in the event of an emergency. The first floor/ground level room, above the reactor and recuperator room, housed the Minotaur manipulator and a 30 Ton crane. The floor in the room above the reactor consists of a removal floor slabs to allow for the crane and manipulator use and maintenance on the reactor vessel. The main entry to the facility is located on the west end of the building. An office addition was added at the entry in 1978.

Two outside structures associated with the facility were removed during early (1989-1991) decommissioning and decontamination activities at the facility. These structures included a neutralization/pump station and a 100-foot high steel-ventilation exhaust stack, with a solid concrete block foundation that tapered in size from 8 ft, 6 in. diameter at the base to 4 ft in diameter at the top.

Historical Background

Construction of TA-52-1 began in 1962 and was completed in 1964. The building originally housed the both the UHTREX reactor and associated support facilities. These facilities included a control room, offices, and mechanical equipment rooms. TA-52-1 supported the UHTREX Program until February 1970, when reactor operations were suspended. After 1970, areas surrounding the reactor were secured to prevent the spread of radiological contamination.

Following the suspension of the UHTREX Program, TA-52-1 was converted to office and non-radiological laboratory space, with an addition completed to the ground floor entry in 1978. From 1988 to 1990, the facility underwent decontamination and decommissioning to remove legacy radiological materials from the facility. During this process, the UHTREX reactor vessel coolant system and other mechanical components were removed from the building and disposed.

Determination of Eligibility

This building does not qualify for listing in the National Register of Historic Places as a significant property. Because of the limited contributions of the UHTREX Program to the broad historical patterns of Cold War reactor science and technology, building TA-52-1 does not meet Register standards for significance under Criterion A.

The building is not associated with the history of persons whose specific contributions have been demonstrably important to local, state, or national historic contexts and, therefore, does not meet Register standards for significance under Criterion B.

While the landscape surrounding TA-52-1 does retain large-scale external evidence of its industrial character, the simple and functional design of TA-52-1 does not outwardly embody a distinctive type or method of construction. Because of the building's intended use as a nuclear reactor facility, TA-52-1 conforms to nationally standardized guidelines and construction methods established by the AEC during the 1960s. Therefore, due to its lack of historical uniqueness and loss of internal integrity, building TA-52-1 does not meet Register standards for significance under Criterion C.

The internal historic integrity of TA-52-1 has been compromised and contributes to the building's overall assessment as fair. Many character-defining components, such as remote manipulators, hot cells, coolant pumps, and the reactor vessel, were removed from the building due to legacy radiological contamination between 1988 and 1990 (Salazar and Elder 1993). Non-contaminated equipment and materials such as lead blocks, cabinets, and electronic components were either recycled, salvaged, or otherwise disposed of as miscellaneous waste (Salazar and Elder 1993). Because of its compromised integrity, no data related to the operation of the UHTREX reactor during its period of operation can be obtained that is above and beyond the information provided by existing historical documentation. Therefore, the physical structure of TA-52-1 does not possess adequate information potential on the history of HTGR research to meet Register standards for significance under Criterion D.

PROPERTY DESCRIPTION (TA-52-11)

Technical Area: 52
Building Number: 11

Original Function: Mechanical Assembly Building
Current Function: Document Shredder Facility
Date Constructed: 1962

Associated Theme: Reactor Technology
Property Type: Support Building (1st Tier)
Integrity: Fair
Core: Yes
Eligibility: No

Buildings with same floorplan within TA: none

South Elevation

West Elevation

East Elevation

North Elevation

Architectural Description

TA-52-11, a single room building, measuring 33 ft. 4 in. by 61 ft. 11 in. It currently contains roll-up doors, which replaced the original sliding doors (16 ft. by 16 ft. dual sliders on a rail), on each end. A restroom is at northeast corner of the space. The building has a steel structural frame with pier footings and a reinforced slab and an on-grade foundation. The building is 28 ft. high at the eave line. Additional pier footing provided support for a crane. The building is insulated and covered with corrugated galvanized steel on the roof and walls. There are twelve translucent panels that provide natural light into the space. The building was designed with a 6 in. curb with drains all around the floor, a system meant to contain liquids in case of spills. There are two personnel doors on the south side of the building.

Historical Background

TA-52-11, constructed in 1962, was built as a mechanical assembly building to support work associated with TA-52-1. This support building housed machine tools and other equipment that were fabricated onsite during the initial assembly of UHTREX and its supporting components, including the fabrication of the Minotaur manipulator. Following the assembly of the reactor, the building was used for routine maintenance and repair of TA-52-1. After the shutdown of the UHTREX reactor, a large document shredder for LANL-wide use was installed in the facility and is still in use today (LASL 1971).

Determination of Eligibility

This building does not qualify for listing in the National Register of Historic Places as a significant property.

Support facilities like TA-52-11 can be considered eligible for the Register if they contribute to broad patterns of American history. However, due to the UHTREX Program's limited contributions to the theme of Cold War reactor science and technology, and lack of association to significant persons, TA-52-11 does not meet Register standards for significance under either Criteria A or B.

As a support facility of secondary or minor importance, buildings like TA-52-11 generally do not qualify for Register consideration under Criteria C or D unless they possess specific design considerations for exceptionally significant equipment. Due to its conversion as a document shredding facility, TA-52-11 has lost most of its internal historical integrity related to the UHTREX Program and no longer possesses significant material affiliations to the broader historical patterns of Cold War science and technology. Therefore, TA-52-11 does not meet Register standards for significance under either Criteria C or D.

NATIONAL REGISTER ELIGIBILITY RECOMMENDATIONS

Properties Determined Not Eligible for the National Register of Historic Places

Not all LANL properties constructed within the Laboratory's Manhattan Project and Cold War periods of significance possess either association or characteristics which make them eligible for the National Register of Historic Places (LANL 2017). In some cases, a property is of secondary or minor importance and does not contribute to the understanding of the key historical events or scientific developments that have taken place at Los Alamos.

For example, some properties have served a purely support function and do not adequately illustrate the historical themes shaping the history of the Laboratory. In other cases, properties associated significant to Laboratory events have been modified to such an extent that the loss of physical integrity has impacted their status as Register-eligible properties. These properties have been determined not eligible for the National Register of Historic Places.

The eligibility determination for the UHTREX Complex is based on the following analyses:

1. The assessed properties contain legacy radioactive and chemical contamination, making them difficult to reuse and severely limiting adaptive reuse strategies.
2. The UHTREX Complex's association with significant persons or scientific advancements are limited and do not merit eligibility for the Register under Criteria A or B. Many of the theories and principles underlying the development of High Temperature Gas-Cooled Reactors were well-established by the time of the UHTREX Complex's construction in the early 1960s.
   a. The UHTREX Complex had a relatively short operational life, with less than three years of partial and full-power operation, in comparison to other contemporary commercial and government-managed HTGR programs.
   b. Due to its status as a commercial application of Project Rover, UHTREX did not independently contribute to the advancement of reactor research and development within Los Alamos National Laboratory.
   c. The UHTREX Program abruptly ended without producing a substantive and independent technical legacy. Features unique to the UHTREX reactor—such as its high operating temperature, use of unclad fuel rods, and horizontally-rotating core—have not substantially contributed to the state of reactor research following the program's termination in 1970.
3. The buildings of the UHTREX Complex are not especially unique in their design and purpose to merit further consideration under Criterion C.
   a. Neither TA-52-1 nor TA-52-11 are sufficiently remarkable or unique in their architectural character as laboratories and support facilities. Their design and construction represent standard construction methods, materials, and details that align with their utilitarian function in compliance with federal regulations

for nuclear facilities. In addition, loss of equipment from the UHTREX assembly period diminishes further consideration of TA-52-11 as an eligible support facility under this criterion.

b. Many exterior contributing attributes have been removed that would add value to Building TA-52-1's integrity, such as the neutralization/pump station and exhaust stack. The removal of these significant features no longer inform about the building's function or help convey its significance. With these types of reactor facilities, this potential loss of integrity is not always a reason in and by itself for non-eligibility. The compromised external and internal nature of the facilities, however, provides greater credibility for a determination of ineligibility.

4. The historic integrity of TA-52-1 and TA-52-11 have been compromised. Both facilities were designed to house equipment related to the UHTREX Program, but historically contributing materials and equipment were removed before the facility reached an age suitable for Register evaluation to support other Laboratory programs and operational functions. This loss of equipment has degraded the historic integrity of both buildings and limits their overall physical association with the historic theme of Reactor Technology. The loss of pertinent artifacts and equipment related to the UHTREX Program prevents further consideration under Criterion D.

   a. Internally, TA-52-1 no longer contains the workmanship, feeling, or association with the UHTREX Program. Between 1988 and 1990, TA-52-1 underwent a decontamination and decommissioning process that facilitated the removal of the UHTREX reactor vessel, control systems, and associated mechanical equipment. The lack of artifacts and experimental equipment affiliated with the UHTREX Program, substantially limits the historical provenance and research of TA-52-1.

   b. TA-52-11 was converted into a routine support building whose functions included document shredding, standard mechanical repairs, and fabrication operations. Equipment affiliated with the assembly of the UHTREX building was removed from TA-52-11 during this conversion process in late 1970, limiting its potential consideration for Register eligibility.

CONCLUSION

In compliance with Section 106 and Section 110 of the National Historic Preservation Act of 1966, as amended, and with the *Programmatic Agreement among DOE; NNSA, Los Alamos Field Office; the New Mexico State Historic Preservation Office; and the Advisory Council on Historic Preservation Concerning Management of the Historic Properties at Los Alamos National Laboratory, Los Alamos, New Mexico*; the State Historic Preservation Officer is requested to concur with the eligibility determinations contained in this report for TA-52-1 and TA-52-11, the UHTREX Complex.

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Appendix A.

Historic Building Inventory Forms with Selected Photographs and Building Drawings for TA-52-1 and TA-52-11

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LANL TA- Building # 52-0001

Camera XIT-TSS Laboratory Photography

Frame #s di140506188 through di140506197

Surveyor(s) Kari Garcia; Charlene Brown

Date December 8 & 9, 2014; July 3, 2019

Los Alamos National Laboratory RMT
Historic Building Survey Form

Building Name: UHTREX | UTMs easting: 383578 | northing: 3969133 | zone: 13

Legal Description: Map: Frijoles Quad | tnsp: 19N | range: 06E | sec: 22

Current Use/ Function: Vacant | Original Use/ Function: Nuclear Reactor Research Building

Date (estimated): | Date (actual): 1965 | Property Type: Laboratory/Processing

Type of Construction

Pre-Fabricated Metal ☐ Steel Frame ☐ Wood Frame ☐ CMU ☑ Reinforced Concrete ☑

Other Type of Construction: | # of Stories: 4

Foundation Reinforced Concrete

Exterior CMU-Exterior ☑ Reinforced Concrete-Exterior ☑ Steel (galvanized) ☐ Steel (corrugated) ☐

Wood Siding ☐ Asbestos Shingles-Exterior ☐ In-Fill Panels ☐ Other-Exterior:

Exterior Treatment (painted, stuccoed, etc): Painted CMU, Exposed Concrete

Exterior Features (docks, speakers, lights, signs, etc): Retaining wall; wall mounted security lights through out; loading dock; fixed, steel roof access ladders

Addition CMU-Addition ☑ Reinforced Concrete-Addition ☐ Steel (galvanized)- Addition ☑ Wood ☐

Steel (corrugated)-Addition ☑ Asbestos Shingles-Addition ☐ Other- Addition:

Exterior Treatment-Addition: Metal panel at dock. Addition at northwest, painted CMU.

Exterior Features-Addition:

Roof Form Slanted/Shed ☑ Gable ☐ Other Roof Type:

Degree of Pitch/ Slope: Slight

Roof Materials Corrugated Metal ☐ Rolled Asphalt ☐ Asbestos Shingles ☐ 4-Ply Built Up ☑

Other Roof Materials:

Window Type Casement ☐ Single Hung Sash ☐ Double Hung Sash ☑ Fixed Window ☐

Other Window Type: Hopper

# of Each Window Type/ Comments: Two, two-pane, aluminum, sash windows; four, steel-casement windows with 2 over 2 lights; one, horizontal window with AC unit

Glass Type Clear ☑ Wire Glass ☑ Opaque ☐ Painted Glass ☑ Glass Block ☐

Light Pattern:

Door Type Personnel Door Types

Exterior: Fire Door ☑ Single ☑ Double ☑ Roll-up ☑ Sliding ☐ Hollow Metal ☑ Solid Wood ☐ 1/2 Glazed ☑ Paneled ☐ Louvered ☐ Painted ☑

Interior: Fire Door ☑ Single ☑ Double ☑ Roll-up ☐ Sliding ☐ Hollow Metal ☑ Solid Wood ☑ 1/2 Glazed ☑ Paneled ☐ Louvered ☑ Painted ☐

Equipment Door Types

Exterior: Fire Door ☑ Single ☐ Double ☑ Roll-up ☑ Sliding ☐ Hollow Metal ☐ Solid Wood ☐ 1/2 Glazed ☐ Paneled ☐ Louvered ☐ Painted ☑

Interior: Fire Door ☐ Single ☐ Double ☑ Roll-up ☐ Sliding ☐ Hollow Metal ☐ Solid Metal ☑ 1/2 Glazed ☐ Paneled ☐ Louvered ☐ Painted ☐

# of Each Door Type/Comments: EXTERIOR DOORS: Four, roll-up, steel equipment doors; four, steel, double-leaf, personnel doors, two with ½ glass vision panel; and two, steel, single-leaf, personnel doors. INTERIOR DOORS: Three personnel doors, single-leaf, flush-panel, hollow-metal, with ½ glass vision panel; approximately fourteen, hollow-metal, flush-panel, single-leaf, personnel doors; six personnel doors, hollow-metal with ½ glass and metal louvers; four personnel doors, hollow-metal with metal louvers; ten personnel, hollow-metal, flush-panel doors with 10” X 10” vision panel; two, 3’-6” by 7' 0" solid steel doors - rated for 10 p.s.i test pressure; and one 7/16” steel-plate with grid of steel channels.

Interior Wall Gypsum Board ☑ Reinforced Concrete- Interior ☑

CMU- Interior ☑ Plywood ☐ Other- Interior

In-Wall Electrical Wiring ☑ On-Wall Electrical Wiring ☑

Ceiling Drop Ceiling ☑

Interior Comments (Equipment, etc): Ceilings are also exposed open web steel joists and reinforced concrete

Degree of Remodeling Minor

Condition Excellent ☐ Good ☐ Fair ☑ Deteriorating ☐ Contaminated ☑ Burned ☐

Associated Buildings ☑

If yes, list building names and #s: TA-52-11

Integrity Fair

Significance Of Interest (associated with LANL/DOE themes)

Eligible Under Criterion A ☐ B ☐ C ☐ D ☐ Not Eligible ☑

DOE Themes

Nuclear Weapon Components and Assembly ☐ Nuclear Weapon Design and Testing ☐ Nuclear Propulsion ☐

Peaceful Uses: Plowshare, Nuclear Medicine, Nuclear Energy, Nuclear Science ☑ Energy and Environment: Research and Design Projects ☐

LANL Themes

Weapons Research and Design, Testing, and Stockpile Support ☐ Super Computing ☐

Reactor Technology ☑ Biomedical/Health Physics ☐ Strategic and Supporting Research ☐

Environment/Waste Management ☐ Administration and Social History ☐ Architectural History ☐

Recommendations/ Additional Comments

Architectural Features (elevations)

TA-51-0001 is a fairly simple building in footprint, massing, and elevation. A single reinforced concreted structure housed the reactor and the associated experimental, operational, and support facilities. The main portion of the building, the area that housed the reactor, is a cast in place concrete building with walls in some places that are five feet thick. Concrete masonry units were also used.

The main reactor room rises 39 ft above ground and extends approximately 39 ft underground, with multiple levels. The building is approximately 85 ft 3 in. by 119 ft 6 in. Foundations and structural framing are reinforced concrete. There are some areas that have open web steel joists that support the roof. Roofing is a built up composite system with gravel ballast.

While the exterior of the building is quite simple, the interior has various levels and interior spaces. The building has several levels underground and one level above ground which includes a high-bay space. Figure 12 indicates the various levels and some of the less accessible spaces of the building. The building's levels are arranged into four levels, originally labeled Ground Level, Operational Level, Basement Level, and Sub-basement Level which are now labeled First Floor, Basement, Sub-basement, and Sub-basement A respectively. Many areas are devoted to mechanical, electrical, and other utility support functions.

The sub-basement (originally labeled basement) level housed the reactor, a recuperator room, a remote maintenance corridor, a large mechanical equipment room, one restroom, and six offices with no windows. The sub-basement A level (originally labeled sub-basement) housed a fuel discharge room, below the recuperator room in the sub-basement, a gas storage area, and duct space. Access to these sub-basement A areas is by service ladders. Two exit stairs from the sub-basement level provide access to the first floor (originally labeled ground floor).

The basement level (originally labeled operational level), contained the upper part of the reactor recuperator room, gas cleanup room, and gas cleanup piping. Another maintenance corridor was on this level as well as a cell operating room and the control room. There are hot restrooms, cold restrooms, a locker room, a health office, and the operation's office on this level. A hot restroom is where workers from contaminated areas could use the restroom and remove clothing that was contaminated before exiting the facility. The land was contoured to provide for access to a loading dock on the south side of the building. The cell operating room and the control room have direct access to this loading dock.

The first floor (originally labeled ground level) is the largest level of the facility and contains a large ventilation equipment room, a boiler room, an electrical equipment room, exhaust filter room, and a utility room, that are shielded for protection by the reinforced concrete walls around the reactor. This level was considered secondary containment in the event of an emergency. The first floor/ground level room, above the reactor and recuperator room, housed the Minotaur manipulator and a 30 ton crane. The floor in the room above the reactor consists of a removal floor slabs to allow for the crane and manipulator use and maintenance on the reactor vessel. The main entry to the facility is located on the west end of the building. An office addition, was added at the entry in 1978.

Two outside structures associated with the facility were removed during early (1989-1991) decommissioning and decontamination activities at the facility. These structures included a neutralization/pump station and a 100-foot high steel-ventilation exhaust stack, with a solid concrete block foundation, that tapered in size from a 8 ft, 6 in. diameter base to 4 ft in diameter at the top.

Total sq ft 32,893 gross

Architect/ Builder
Architect: W.C. Kruger and Associates, Santa Fe, New Mexico
Builder: McKee General Contractor, Inc. Santa Fe, New Mexico

Alterations An office addition was added in 1978. A later addition was constructed next to the basement dock after 1978.

ENG-C 31853
Sheet 21 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Floor Plan - Ground Level
January 30, 1962

ENG-C 31854
Sheet 22 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Floor Plan - Operational Level
January 30, 1962

ENG-C 31855
Sheet 23 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Floor Plan - Basement & Sub-Basement
January 30, 1962

ENG-C 31863
Sheet 31 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Elevations
January 30, 1962

ENG-C 31864
Sheet 32 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Sections
January 30, 1962

ENG-C 31865
Sheet 33 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Sections
January 30, 1962

ENG-C 31866
Sheet 34 of 106
TA-52, Building RD-1 (TA-52-1)
UHTREX Facilities
Architectural - Stair Plans & Sections
January 30, 1962

ENG-C 43398
Sheet 1 of 6
TA-52, Building RD-1 (TA-52-1)
Office Addition
Arch: Floor Plan, Roof Plan and Notes
January 13, 1978

ENG-C 43398
Sheet 2 of 6
TA-52, Building RD-1 (TA-52-1)
Office Addition
Struct: Elevations, Sections
January 13, 1978

ENG-AB 669
Sheet 1 of 3
TA-52, Building 1
UHTREX Building
As-Built Record Floor Plan
Arch: Sub-Basement & Sub-Basement A Floor Plan
August 19, 1996

ENG-AB 669
Sheet 2 of 3
TA-52, Building 1
UHTREX Building
As-Built Record Floor Plan
Arch: Basement Floor Plan
August 19, 1996

ENG- AB 669
Sheet 3 of 3
TA-52, Building 1
UHTREX Building
As-Built Record Floor Plan
Arch: First & Mezzanine Floor Plan
August 19, 1996

TA-52-1 North elevation

TA-52-1 East and north elevations

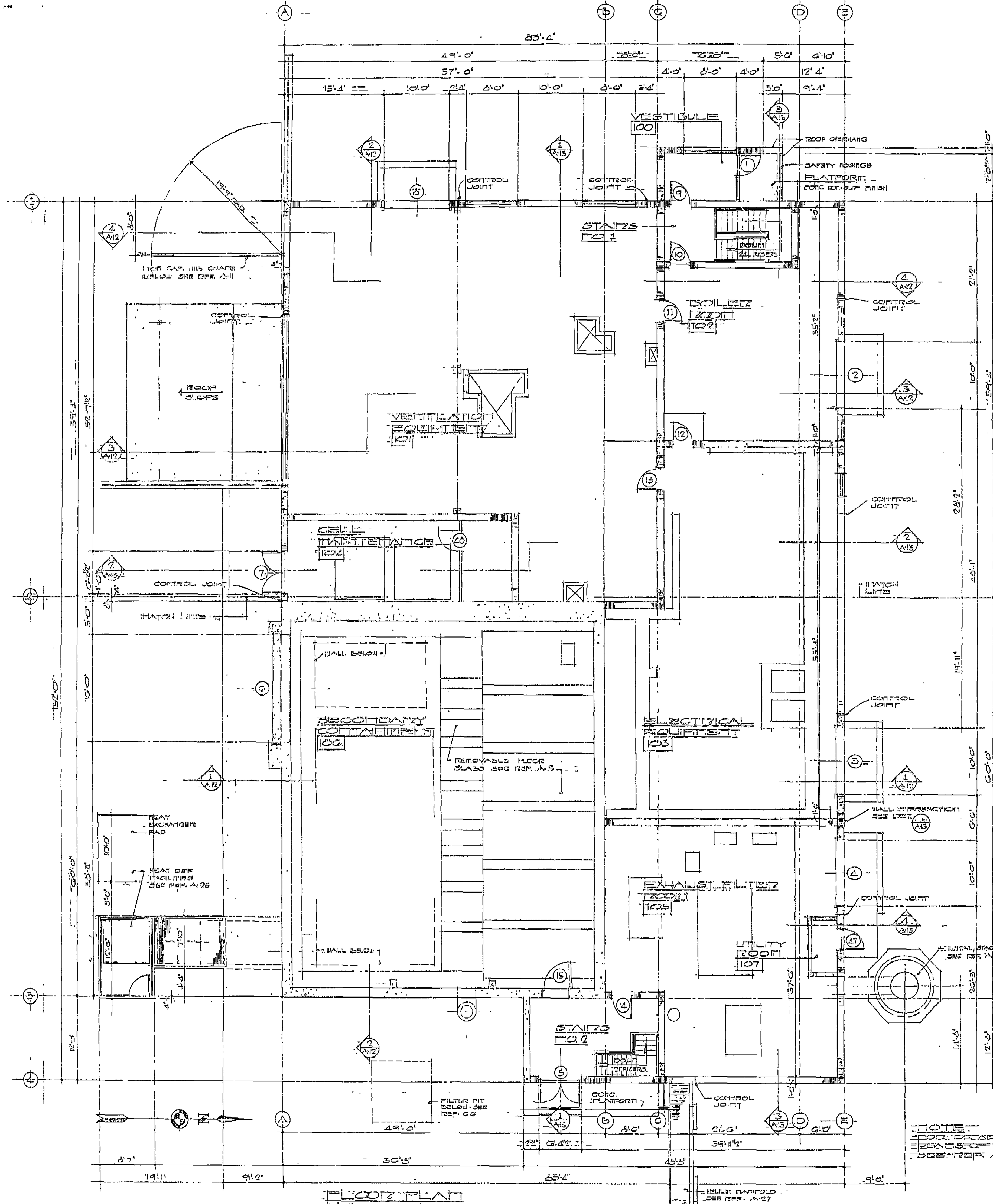
TA-52-1 South and east elevations

TA-52-1 South elevation (eastern portion)

TA-52-1 South elevation (western portion)

TA-52-1 West elevation (southern portion)


TA-52-1 West elevation (northern portion)



FLOOR PLAN
GROUND LEVEL
SCALE 1/8" = 1'-0"

RECORD DRAWING
THIS DRAWING REPRESENTS
THE CONSTRUCTION AS BUILT.
SUBMITTED
RECOMMENDED
APPROVED

ROOM FINISH SCHEDULE

Level	Room or Space	Room Number	Floor: Vinyl Asbestos Tile	Floor: Ceramic Tile	Floor: Concrete	Floor: Concrete Protective Coating	Floor: Asphalt Tile	Floor: 3/8" St. Plate liner Protective Coating	Base/Wain.: Glazed Struct. Facing Units	Base/Wain.: Wait	Base/Wain.: Glazed Struct. Facing Units 40" high	Base/Wain.: 3/8" St. Plate liner Protective Coating	Walls: Glazed Struct. Facing Units	Walls: Concrete	Walls: Concrete Protective Coating	Walls: Masonry Units	Walls: Steel Plate liner Protective Coating	Ceiling: Concrete	Ceiling: Concrete Protective Coating	Ceiling: Steel Plate liner Protective Coating	Ceiling: Exposed Construction	Ceiling: Acoustical Tile	Ceil'g Height	Remarks
Ground Level	Ventilation Equip	101			•									•		•					•		15'-7"	
Ground Level	Boiler Room	102			•											•					•		15'-7"	
Ground Level	Electrical Equip	103			•									•		•					•		15'-1"	
Ground Level	Cell Maintenance	104			•									•		•					•		14'-7"	
Ground Level	Exhaust Filter Rm	105			•									•		•					•		15'-7"	
Ground Level	Secondary Contain.	106				•											•			•			37'-0"	Removable conc. slab floor
Ground Level	Stairs No 1						•			•						•					•			See ref. A-14
Ground Level	Stairs No 2				•									•		•					•			See ref. A-14
Ground Level	Vestibule	100					•			•						•					•		8'-8"	
Ground Level	Utility Room	107			•											•		•					8'-8"	
Operation Level	Hall	201					•			•				•		•		•					12'-0"	△1
Operation Level	Control Room	202								•				•								•	9'-0"	Raised alum. panel floor
Operation Level	Operations Office	203					•			•				•		•		•					7'-0"	
Operation Level	Storage	204			•									•		•		•					12'-0"	
Operation Level	Health Office	205					•			•				•		•		•					12'-0"	
Operation Level	Cold Toilet	206		•					•		•			•		•		•					12'-0"	
Operation Level	Janitor's Closet	207		•					•		•					•		•					12'-0"	
Operation Level	Locker Room	208		•					•		•			•		•		•					12'-0"	
Operation Level	Hot Toilet	209		△1		•					•					•		•					12'-0"	
Operation Level	Janitor's Closet	210				•					•					•			•				12'-0"	Protective coating above wainscot
Operation Level	Cell Oper. Area	211				•						•	•		•				•				12'-0"	See note below
Operation Level	Transfer Lock	212						•									•			•			12'-0"	
Operation Level	Transfer Cell	213						•									•			•			12'-0"	
Operation Level	Hall	214				•							•		•				•				12'-0"	
Operation Level	Remote Maint. Corr.	215				•									•				•				11'-8"	
Operation Level	Gas Clean-up Piping	216				•									•				•				10'-8"	
Operation Level	Fuel Charging	217				•									•								11'-0"	
Operation Level	Stairs No 1						•			•				•							•			See ref. A-14
Operation Level	Stairs No 2				•									•							•			See ref. A-14
Basement Level	Electrical Equip.	301	•											•		•		•					8'-10"	
Basement Level	Hall	302	•											•		•		•					10'-0"	
Basement Level	Sump Room	303				•									•				•				10'-10"	
Basement Level	Equipment Access	304			•									•				•					10'-10"	
Basement Level	Mechanical Equip	305				•									•				•				9'-2"	
Basement Level	Maintenance Corr	306			•										•				•				10'-8"	
Basement Level	Gas Clean-up Piping	307				•									•				•				11'-4"	
Basement Level	Gas Clean-up Room	308				•									•					•			24'-0"	
Basement Level	Reactor Drive	309				•									•				•				7'-0"	
Basement Level	Reactor Enclosure	310				•									•								20'-0"	
Basement Level	Toilet	311		•					•		•			•		•		•					10'-6"	
Basement Level	Office	312	•							•				•		•						•	10'-6"	
Basement Level	Office	313	•							•				•		•						•	8'-10"	
Basement Level	Office	314	•							•				•		•						•	8'-10"	
Basement Level	Office	315	•							•				•		•						•	8'-10"	
Basement Level	Office	316	•							•				•		•						•	8'-10"	
Basement Level	Office	317	•							•				•		•						•	8'-10"	
Basement Level	Stairs No 1		•							•				•							•			See ref. A-14
Basement Level	Stairs No 2				•									•							•			See ref. A-14
Sub-Basement	Duct Space	401				•									•				•				12'-0"	
Sub-Basement	Fuel Discharge Rm	402				•									•				•				9'-0"	
Sub-Basement	Gas Storage	403				•									•				•				24'-0"	

NOTE:
- See hot cell details ref. A-22 for extent of 3/8" steel plate wainscot in cell operating area.

△2 NOTE.
All concrete floors not receiving protective coating shall be smooth integral finish.

NOTE:
AEC / C: Denotes items commission furnished & contractor installed.
AEC / AEC: Denotes items commission furnished & commission installed. Contractor to provide rough-in.

NOTE:
For detailed floor plans of this area, see ref. A-4 & A-5

CROSS REFERENCE SYMBOL
- Detail or section number.
- Reference number on which detail or section is drawn

KEY TO MATERIALS
- Earth
- Concrete
- Magnetite concrete
- Metal
- Lead
- Masonry units
- Wood rough
- Wood finish
- Insulation
- Glazed structural facing units

No	Date	Revisions	By	Ck	Proj. Engr.	A.E.C. App.
3	6-5-68	21.2 of 104 / 21.2 106				
△1	11-28-62	Deleted Floor Tile Room 209	M			
△2		REVISED PER CD NO. 1	JDW			

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

ARCHITECTURAL - FLOOR PLAN - GROUND LEVEL

UHTREX FACILITIES
LOS ALAMOS NEW MEXICO
BLDG RD-1 TA-52

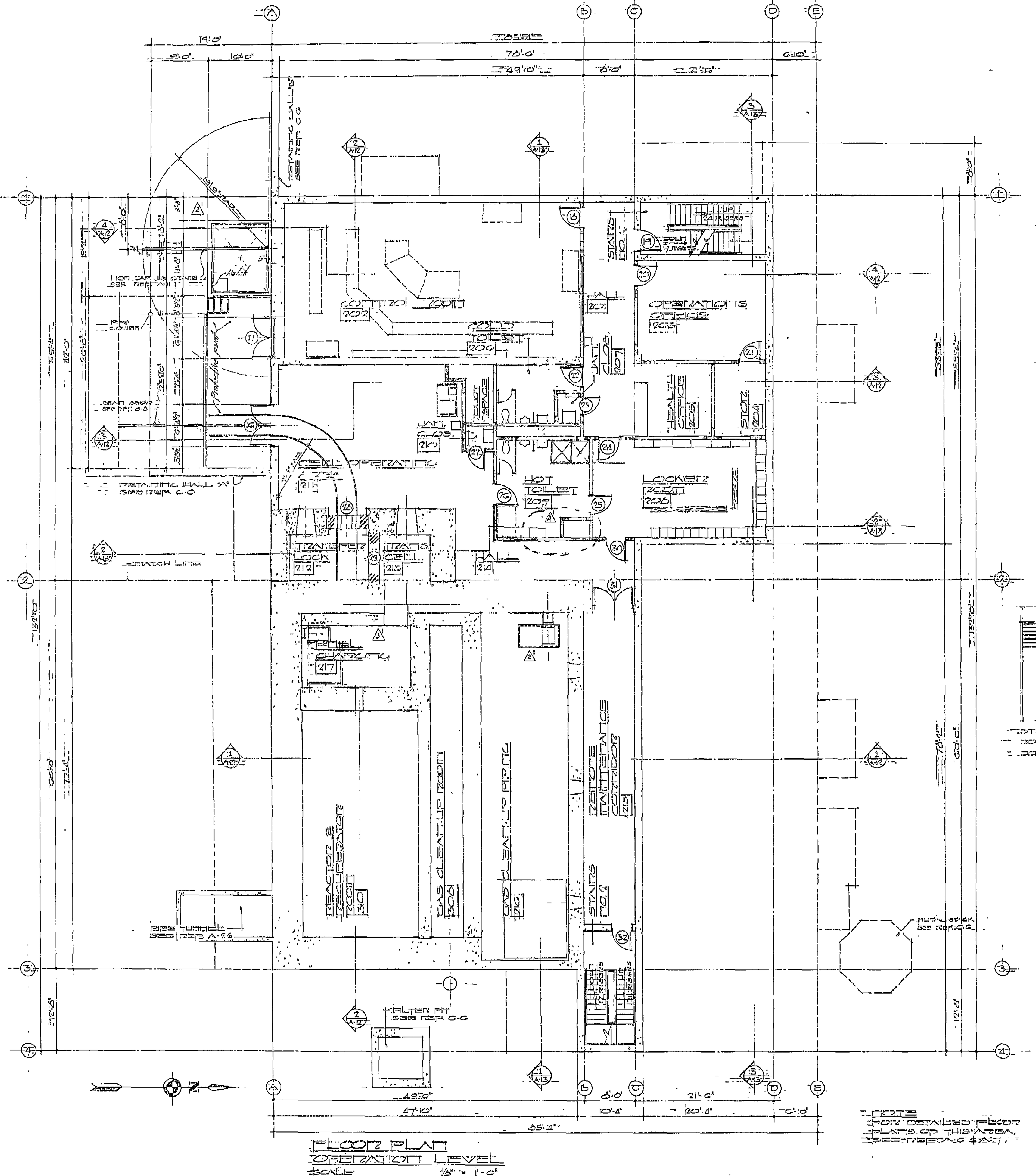
Contract No. (A-E): AT(29-1)-1670
A.E.C. Acct. No.:
Drawn: M.S. R.T.
Checked: LV
A-E Approved
Design:
Proj. Engr.:
Chief Engr.:
Scale: AS SHOWN
Date: JAN. 30, 1962

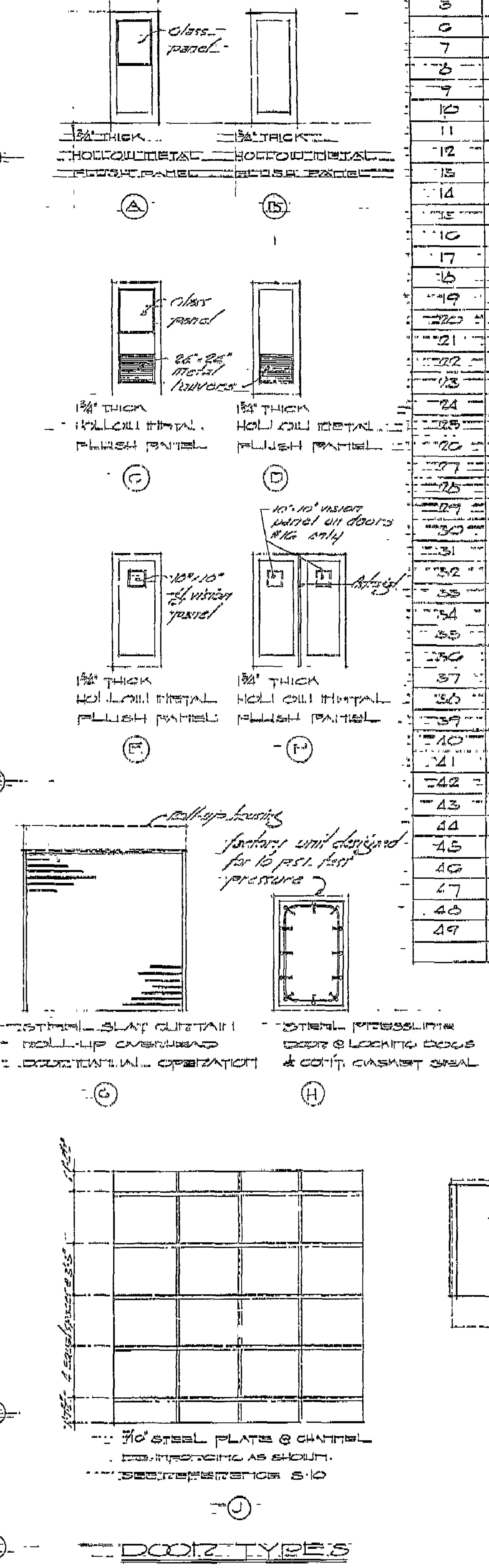
Submitted: Architect - Engineer
Recommended: A.E.C.
Approved: A.E.C.

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC.
SANTA FE, NEW MEXICO

Reference: A-1
Drawing No.: LA-EZ-4/1.2
Sheet: 21.2 of 106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31853	21	_	106	3





DOOR TYPES

DOOR SCHEDULE

DOOR NO	DOOR TYPE	FRAME TYPE	THRESH	HDWARE SET	DOOR SIZE	REMARKS
1	A	F-F	METAL	H.W.-1	3'-0"×7'-0"	
2	G	B-B			10'-0"×10'-0"	SEAL ON DR. BOTTOM
3	G	B-B			10'-0"×10'-0"	DO
4	G	B-B			10'-0"×10'-0"	DO
5	F	A-A	METAL	H.W.-5	2 3'-0"×7'-0"	CLASS "B" LABEL
6	J	E-E			10'-0"×10'-0"	
7	F	A-A	METAL	H.W.-5	2-3'-0"×7'-0"	
8	G	B-B			10'-0"×10'-0"	SEAL ON DR. BOTTOM.
9	B	A-A		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
10	B ⚠1	A-A	M.D.S.	H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
11	B	A-A		H.W.-4	3'-0"×7'-0"	CLASS "B" LABEL
12	D	A-A		H.W.-4	3'-0"×7'-0"	CLASS "B" LABEL
13	B	A-A		H.W.-4	3'-0"×7'-0"	CLASS "B" LABEL
14	B	A-A		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
15	H	D-D	[illegible]		3'-0"×7'-0"	
16	F	C-C		H.W.-6	2-3'-0"×7'-0"	AUTOMATIC DOOR BOTTOMS
17	F	C-C	METAL	H.W.-7	2-3'-0"×7'-0"	
18	B	A-A		H.W.-4	3'-4"×7'-0"	
19	B	C-C		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
20	C	A-A		H.W.-4	3'-4"×7'-0"	
21	B	A-A	M.D.S.	H.W.-4	3'-0"×7'-0"	
22	B	A-A	M.D.S.	H.W.-3	3'-0"×7'-0"	
23	B	A-A	M.D.S.	H.W.-7	2'-8"×7'-0"	
24	D	A-A	M.D.S.	H.W.-8	3'-0"×7'-0"	
25	D	A-A		H.W.-8	3'-0"×7'-0"	
26	B	A-A		H.W.-8	3'-0"×7'-0"	
27	B	A-A		H.W.-7	2'-8"×7'-0"	
28	K	C-C			7'-7½"×7'-4¼"	
29	K	C-C			7'-7½"×7'-4¼"	
30	B	A-A		H.W.-10	3'-0"×7'-0"	
31	F	C-C		H.W.-11	2-3'-0"×7'-0"	WEATHERSTRIPPED
32	B	C-C		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
33	F	C-C	METAL	H.W.-13	2-4'-0"×7'-10" ⚠2	
34	F	C-C	METAL	H.W.-14	2-3'-0"×7'-0"	
35	E	C-C		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
36	C	C-C		H.W.-4	3'-4"×7'-0"	
37	D	C-C	M.D.S.	H.W.-4	3'-4"×7'-0"	
38	B	C-C		H.W.-3	3'-0"×7'-0"	CLASS "B" LABEL
39	H	D-D	[illegible]		3'-0"×7'-0"	
40	B	A-A	M.D.S.	H.W.-3	3'-0"×7'-0"	
41	C	A-A		H.W.-4	3'-4"×7'-0"	
42	C	A-A		H.W.-4	3'-4"×7'-0"	
43	C	A-A		H.W.-4	3'-4"×7'-0"	
44	C	A-A		H.W.-4	3'-4"×7'-0"	
45	C	A-A		H.W.-4	3'-4"×7'-0"	
46	C	A-A		H.W.-4	3'-4"×7'-0"	
47	B	A-A	METAL	H.W.-2	3'-0"×7'-0"	
48	B				3'-0"×6'-8"	
49	B	A-A		H.W.-2	3'-0"×6'-8"	Louvered ⚠4

RECORD DRAWING
THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT.

NO	DATE	REVISIONS	BY	CK.	PROJ. ENGR	A.E.C. APP.
⚠4	3/22/63	Enlarged Duct Chase				
⚠3	3-19-63	Changed Fuel conveyor - Added Magnetite Conc	M			
⚠2	10-4-62	Enlarged Equip Hatch & Door No 33. Louvered Door 49	NJM			
⚠1		REVISE PER ADD NO. 1	JDW			

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

ARCHITECTURAL - FLOOR PLAN - OPERATION LEVEL

UHTREX FACILITIES
LOS ALAMOS NEW MEXICO
BLDG. RD-1 TA-52

CONTRACT NO (A-E) AT(29-1)-1670
A E C ACCT NO.
DRAWN M.S.
CHECKED L V
A-E APPROVED
DESIGN
PROJ ENGR
CHIEF ENGR.
SCALE AS SHOWN
DATE JAN. 30, 1962

SUBMITTED ARCHITECT - ENGINEER
RECOMMENDED A E C
APPROVED

REFERENCE A-2

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC.
SANTA FE, NEW MEXICO

DRAWING NO. LA-EZ-4/2.4
SHEET 22.4 OF 106

⚠ 6-5-68 REV: WAS SHT. 22.4 OF 104
NOW SHT. 22.4 OF 106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31854	22	_	106	5

NO	DATE	REVISIONS	BY	CK.	PROJ. ENGR	A.E.C. APP
3	3-21-63	Relocated Fuel Conveyor Sleeve, Rm 309				
2	10-4-62	Enlarged Access 304 & Door 33	NJM			
1		REVISED PER ADD NO 1	JDW			

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

CONTRACT NO (A-E) AT(29-1)-1670
A.E.C. ACCT NO.
DRAWN M.S
CHECKED LV

ARCHITECTURAL - FLOOR PLAN - BASEMENT & SUB-BASEMENT

A-E APPROVED
DESIGN
PROJ ENGR
CHIEF ENGR.
SCALE AS SHOWN
DATE JAN. 30, 1962

UHTREX FACILITIES

LOS ALAMOS — NEW MEXICO
BLDG RD-1 — TA-52

SUBMITTED — ARCHITECT - ENGINEER
RECOMMENDED — A.E.C.
APPROVED

REFERENCE **A-3**

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC.
SANTA FE, NEW MEXICO

DRAWING NO LA-EZ-4/3.3 — SHEET 23.3 OF 106

6-5-68 REV. WAS SHT. 23.3 OF 104, NOW SHT. 23.3 OF 106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31855	23	_	106	3

RECORD DRAWING

THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT.

SUBMITTED ARCHITECT-ENGINEER

RECOMMENDED

APPROVED

W. C. KRUGER & ASSOC. ARCHITECTS-ENGINEERS, INC., SUBMIT THIS DRAWING AS A RECORD OF THE CONSTRUCTION AT THE TIME OF ACCEPTANCE BY THE A. E. C. AND ASSUME NO RESPONSIBILITY FOR ALTERATIONS OR CHANGES IN THE STRUCTURE BY OTHER AGENCIES SUBSEQUENT TO THAT DATE.

NO	DATE	REVISIONS	BY	CK.	PROJ ENGR.	A.E.C. APP.
1	6-5-68	31 OF 104				
		NOW 31 106				

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

ARCHITECTURAL - ELEVATIONS

UHTREX FACILITIES

LOS ALAMOS — BLDG RE — NEW MEXICO — TA-52

CONTRACT NO. (A-E)	AT(29-1)1670
A E C ACCT. NO	
DRAWN	
CHECKED	
A-E APPROVED	
DESIGN	
PROJ ENGR	
CHIEF ENGR	
SCALE	AS SHOWN
DATE	JAN. 30, 1962

SUBMITTED ARCHITECT - ENGINEER | RECOMMENDED A.E.C. | APPROVED A.E.C.

REFERENCE A-11

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC
SANTA FE, NEW MEXICO

DRAWING NO.	SHEET	OF
LA-EZ-4/11	31	106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31863	31	_	106	1

RECORD DRAWING
THIS DRAWING REPRESENTS
THE CONSTRUCTION AS BUILT.

SUBMITTED ______ ARCHITECT-ENGINEER
RECOMMENDED ______
APPROVED ______

W. C. KRUGER & ASSOCIATES, ARCHITECTS-ENGINEERS, INC. SUBMIT THIS DRAWING AS A RECORD OF THE CONSTRUCTION AT THE TIME OF ACCEPTANCE BY THE A. E. C., AND ASSUME NO RESPONSIBILITY FOR ALTERATIONS OR CHANGES IN THE STRUCTURE BY OTHER AGENCIES SUBSEQUENT TO THAT DATE.

NO	DATE	REVISIONS	BY
3	6-5-68	322 109	
		322 106	
2	3-19-63	Added Magnetite Concrete	M
1	10-22	RELOCATED WALL	RLZ

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

ARCHITECTURAL - SECTIONS

UHTREX FACILITIES
LOS ALAMOS Bldg. BD-1 — NEW MEXICO TA-52

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC
SANTA FE, NEW MEXICO

CONTRACT NO. (A-E) AT(29-1)1070
DRAWN M.F.
CHECKED L.V.
SCALE AS SHOWN
DATE JAN. 30, 1962
REFERENCE A-12
DRAWING NO. LA-EZ-4/12.2
SHEET 322 OF 106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31864	32	_	106	3

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31865	33	_	106	2

RECORD DRAWING
THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT.
SUBMITTED ARCHITECT-ENGINEER
RECOMMENDED
APPROVED

W. C. KRUGER & ASSOCIATES, ARCHITECTS-ENGINEERS INC., SUBMIT THIS DRAWING AS A RECORD OF THE CONSTRUCTION AT THE TIME OF ACCEPTANCE BY THE A. E. C., AND ASSUME NO RESPONSIBILITY FOR ALTERATIONS OR CHANGES IN THE STRUCTURE BY OTHER AGENCIES SUBSEQUENT TO THAT DATE.

NO	DATE	REVISIONS	BY	CK	PROJ ENGR	A E C APP
2	6-5-66	[illegible] WA 341 OF 109				
		[illegible] 34.1 26				
1	11-8-62	ADDED DEMINSIONS	RZ			

U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS AREA OFFICE
LOS ALAMOS, NEW MEXICO

ARCHITECTURAL - STAIR PLANS & SECTIONS

UHTREX FACILITIES
LOS ALAMOS NEW MEXICO
BLDG. RD-1 TA-52

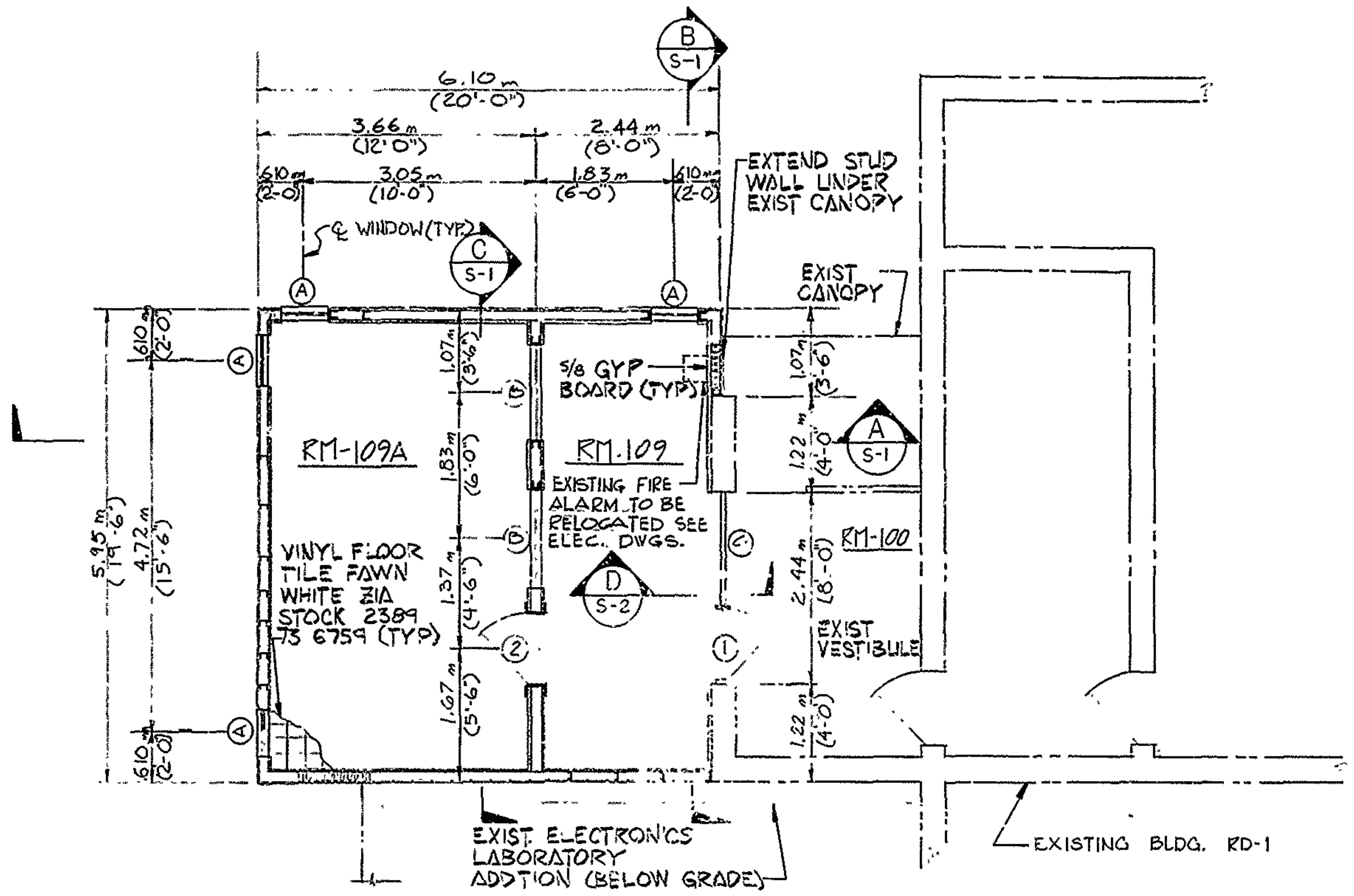
SUBMITTED ARCHITECT-ENGINEER | RECOMMENDED A.E.C. | APPROVED A.E.C.

W. C. KRUGER AND ASSOCIATES
ARCHITECTS - ENGINEERS INC.
SANTA FE, NEW MEXICO

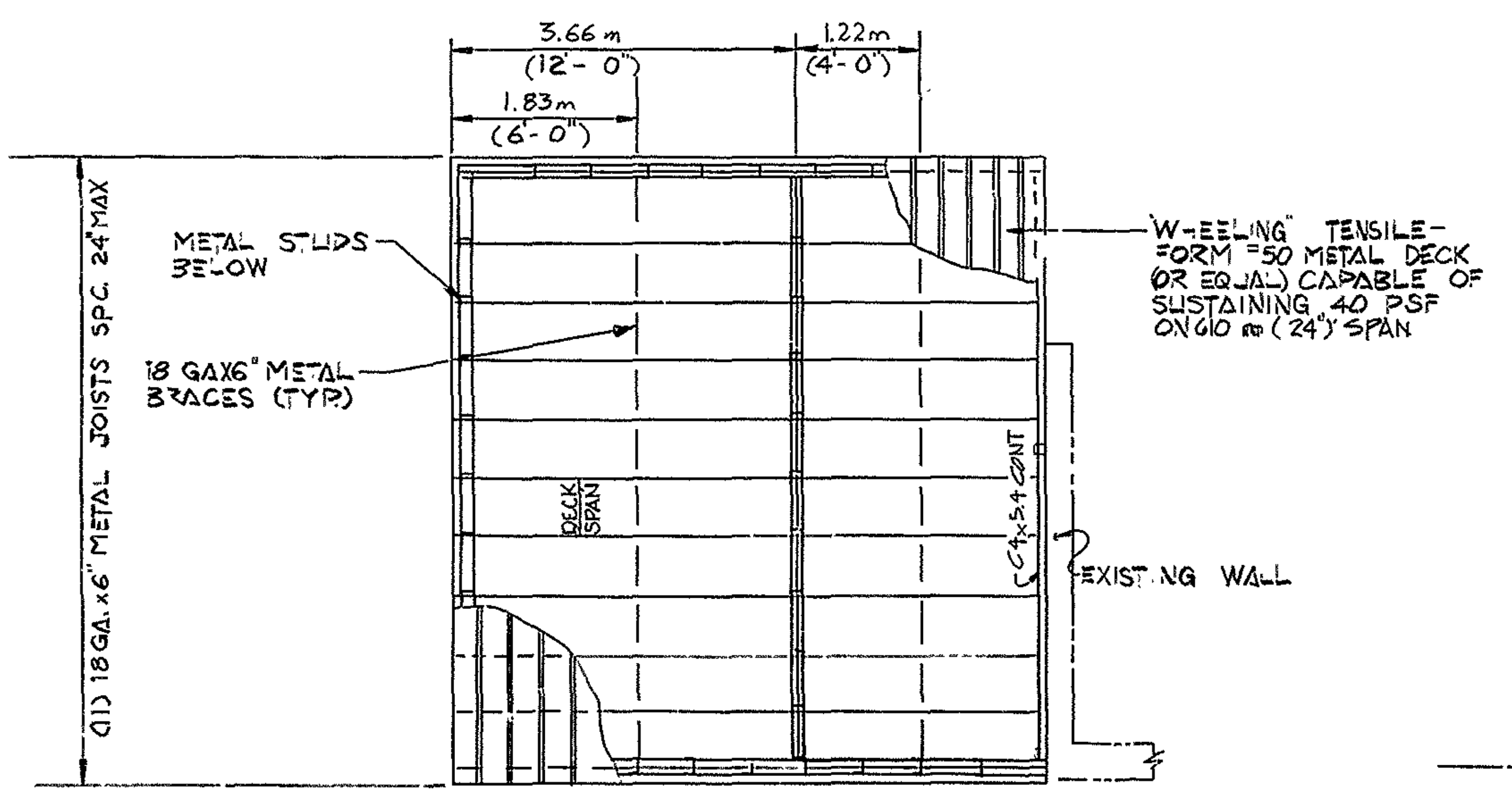
CONTRACT NO. (A-F) AT(29-1)1670
A.E.C. ACCT. NO
DRAWN M.S.
CHECKED L.V.
A-E APPROVED
DESIGN
PROJ ENGR.
CHIEF ENGR
SCALE AS SHOWN
DATE JAN 30, 1962

REFERENCE A-14
DRAWING NO LA-EZ-4/141 SHEET 34.1 OF 106

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31866	34	_	106	2

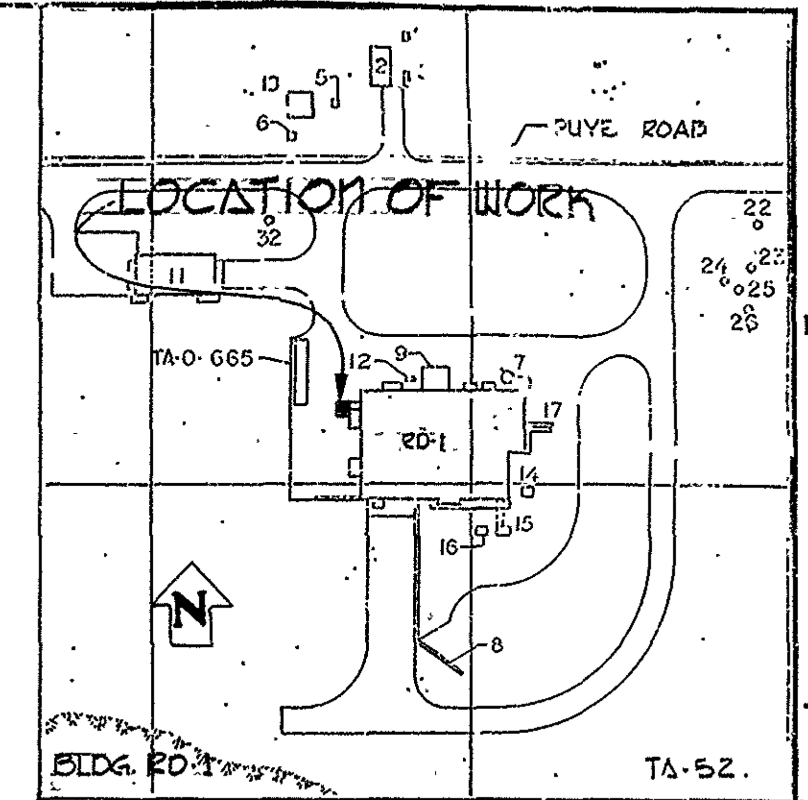


FLOOR PLAN
SCALE 1:48 (1/4"=1'-0")



ROOF FRAMING PLAN
SCALE 1:48 (1/4"=1'-0")

LEGEND
- - - - EXISTING CONSTRUCTION
——— NEW CONSTRUCTION



LOCATION PLAN

GENERAL NOTES

1. DESIGN LOADS — DL — LL
   ROOF — 10 PSF — 30 PSF (SNOW)
   STRUCTURE — 30 PSF
   FLOOR — 100 PSF
   WIND-30 PSF PER ANSI A58.1
2. DO NOT SCALE DRAWINGS FOR CONSTRUCTION DIMENSIONS.
3. FIELD VERIFY DIMENSIONS PRIOR TO SHOP FABRICATION.
4. REPAIR ALL AREAS DAMAGED DURING CONSTRUCTION TO MATCH EXISTINC ADJACENT AREAS.
5. KEEP WORK SITE IN ORDERLY CONDITION AND AT PROJECT COMPLETION, REMOVE ALL WASTE. LEAVE WORK SITE IN A CONDITION ACCEPTABLE TO THE ENG-1, INSPECTOR.
6. DISPOSE OF ALL REMOVED MATERIAL AS DIRECTED BY ENG-1, UNLESS NOTED.
7. VERIFY UNDERGROUND UTILITY LOCATIONS BEFORE EXCAVATING.
8. COMPACT FILL MATERIAL IN 200mm (8") MAX. LIFTS TO THE FOLLOWING PERCENTAGES OF MAX. DENSITY:
   95% SUBGRADE, FILL AND BACKFILL UNDER STRUCTURES AND PAVING
   90% STRUCTURE BACKFILL AND EMBACKMENTS
   85% GENERAL AREA GRADING NOT INCLUDED ABOVE.
9. ALL CONCRETE WORK SHALL BE PER ACI 301, F'c=27.6 MPa (4000PSI), GRADE 40 REINF.
10. ALL STRUCTURAL STEEL SHALL BE A36 UNLESS NOTED, AISC TYPE 2 FRAMING.
11. ALL BOLTED CONNECTIONS SHALL BE A307, UNLESS NOTED,
12. ALL WELDING SHALL BE PER AWS D1.1, E70XX ELECTRODES.
13. ERECT STRUCTURAL STEEL PER AISC CODE OF STANDARD PRACTICE, SECTION 7..
14. PROVIDE 40 mm (1-1/2") ROOM NUMBER DECALS, GOLD WITH BLACK BORDER, ON FRAMES ABOVE DOORS. SPRAY WITH CLEAR KRYLON.
15. PAINT THE INTERIOR OF BOTH ROOMS WITH SUNNY WHITE Y-6 PPG P2303.
16. COAL TAR PITCH FOR HOT-APPLICATION TO ROOF SHALL CONFORM TO ASTM SPEC.. N. D-450-71 TYPE A AND SHALL BE OF THE GRADE REQ'D. FOR THE SLOPE OF THE ROOF.

THIS JOB M[illegible] INSPECTED AND ANY CHANGES APPROVED BY ENG-1
M. VIGIL PHONE 5920

SI METRIC DRAWING

NO	DATE	CLASS REVIEW	REVIEWER	REVISIONS	BY	CHKD	GRP	DO	ENG GP	ENGR DO	ERDA APP

AUTHORIZED FOR
SECURITY 32933
SAFETY 32927
HEALTH 32929
FIRE PR. 32928
DIVISION [illegible]
GROUP HHH
COMM 32934
ENG-1 32917
ENG-4 32924
ENG-12
ENG-11 32925
H-7 32930-31
H-1 32926

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
LOS ALAMOS AREA OFFICE - LOS ALAMOS, NEW MEXICO

OFFICE ADDITION
ARCH: FLOOR PLAN, ROOF PLAN AND NOTES
BLDG. RD-1 TA-52

CONTRACT NO (A-E)
ERDA ACCT NO
DRAWN E. TRUJILLO
CHECKED W.S.
A. E. APPROVED
DESIGN SULLIVAN
CHECKED FC. Hunt
SECTION [signature]
SCALE NOTED
DATE 1/13/78

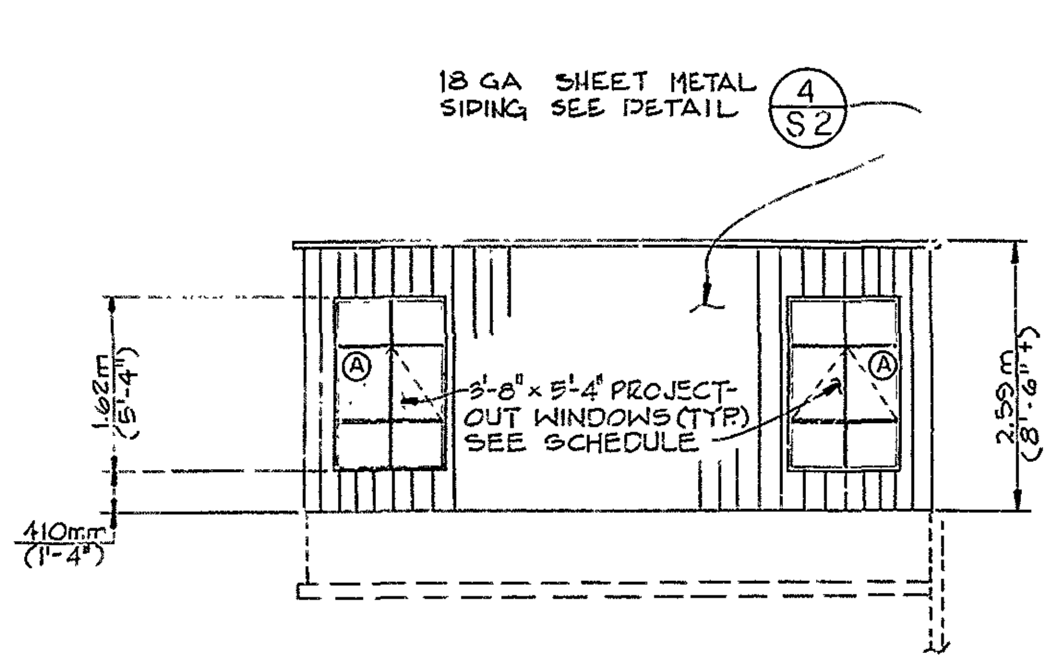
SUBMITTED [signature] RECOMMENDED R.T. Henning APPROVED [signature] 1/13/78

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
ENGINEERING DEPT. LOS ALAMOS, N. M.

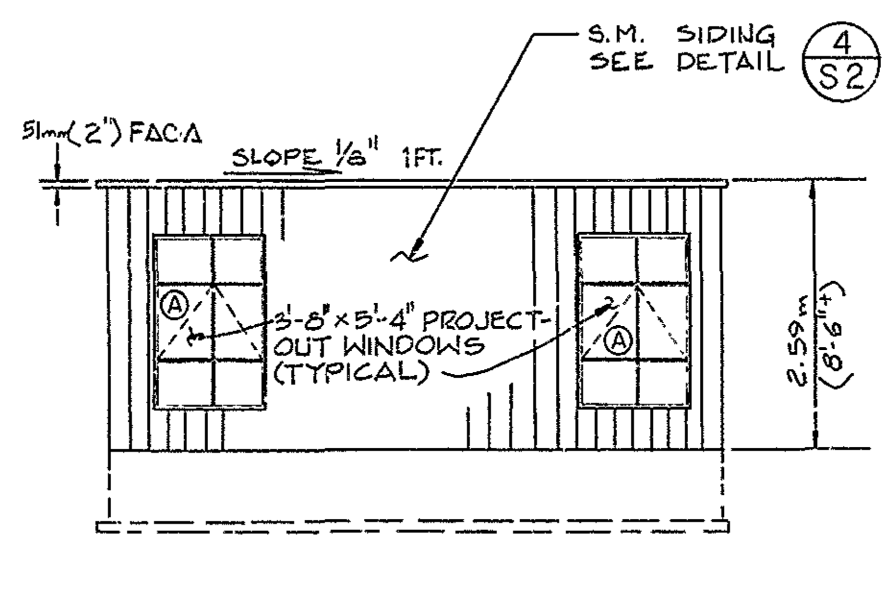
ERDA DRAWING NO
SHEET A-1 OF 1/6

CLASSIFICATION U REVIEWER R.T. Henning DATE 12/2/77
BA
LAB JOB NO 5756-52
L.A.S.L. DWG. NO. ENG-C 43398

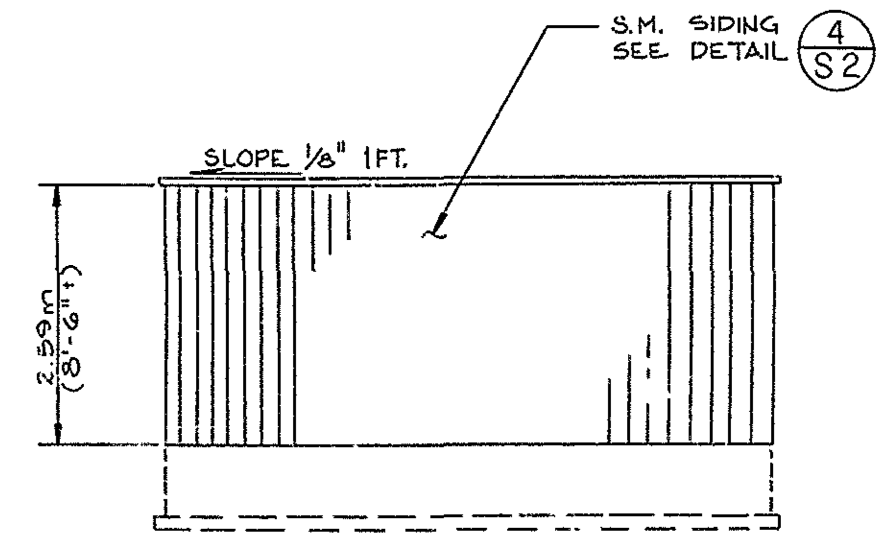
[illegible] LOGGED TO VAULT



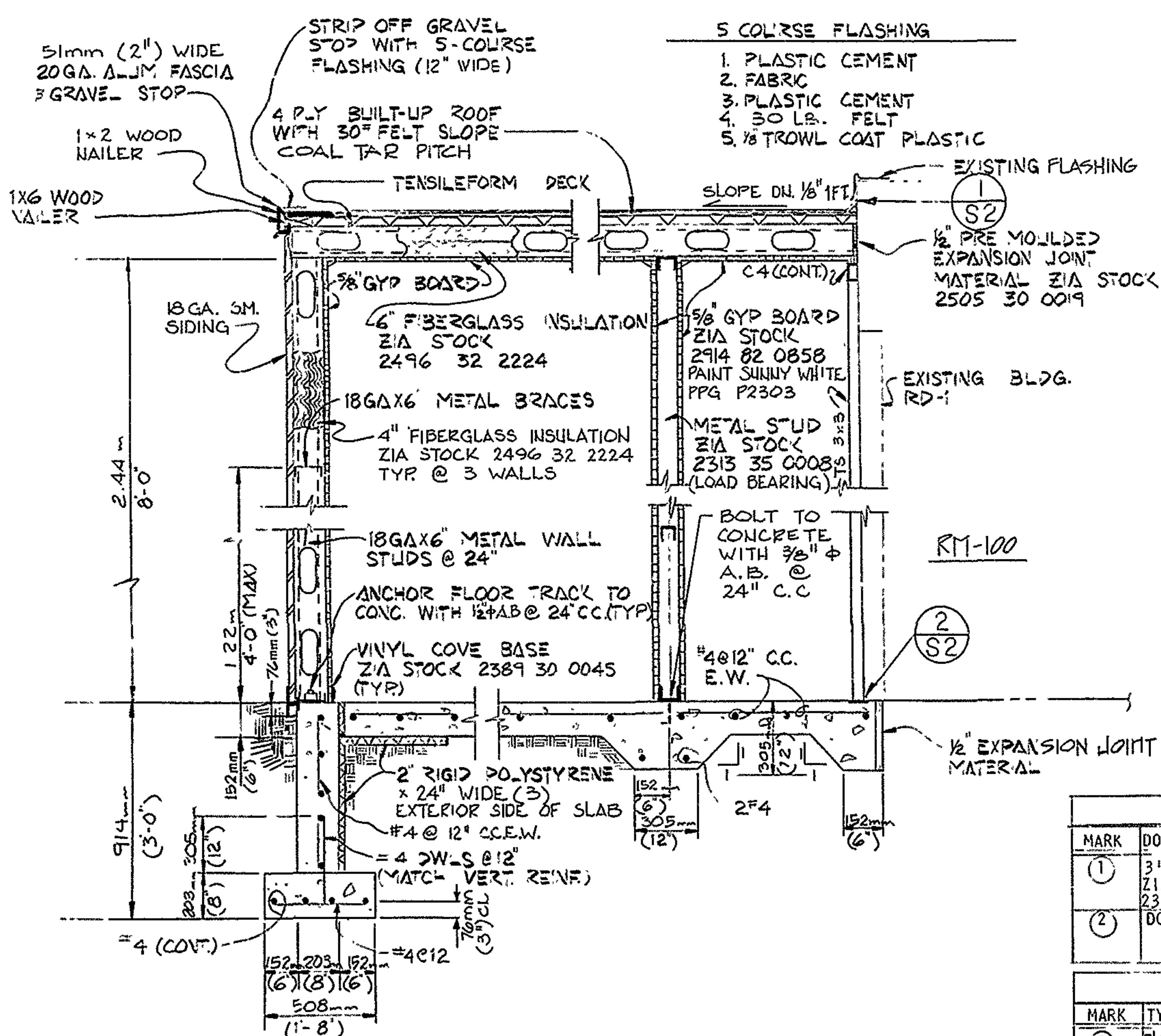
WEST ELEVATION
SCALE 1:48(1/4 1'-0")



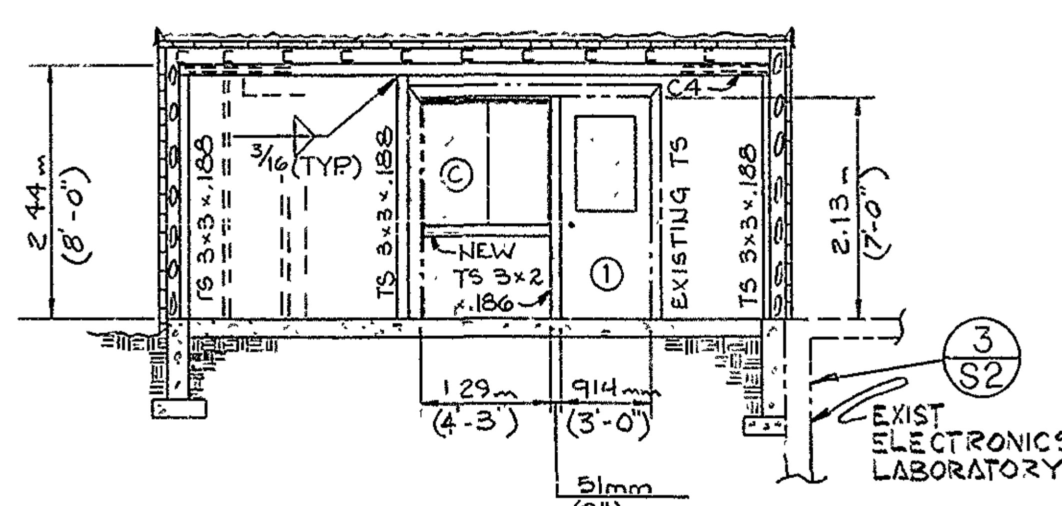
NORTH ELEVATION
SCALE 1:48(1/4 1'-0")



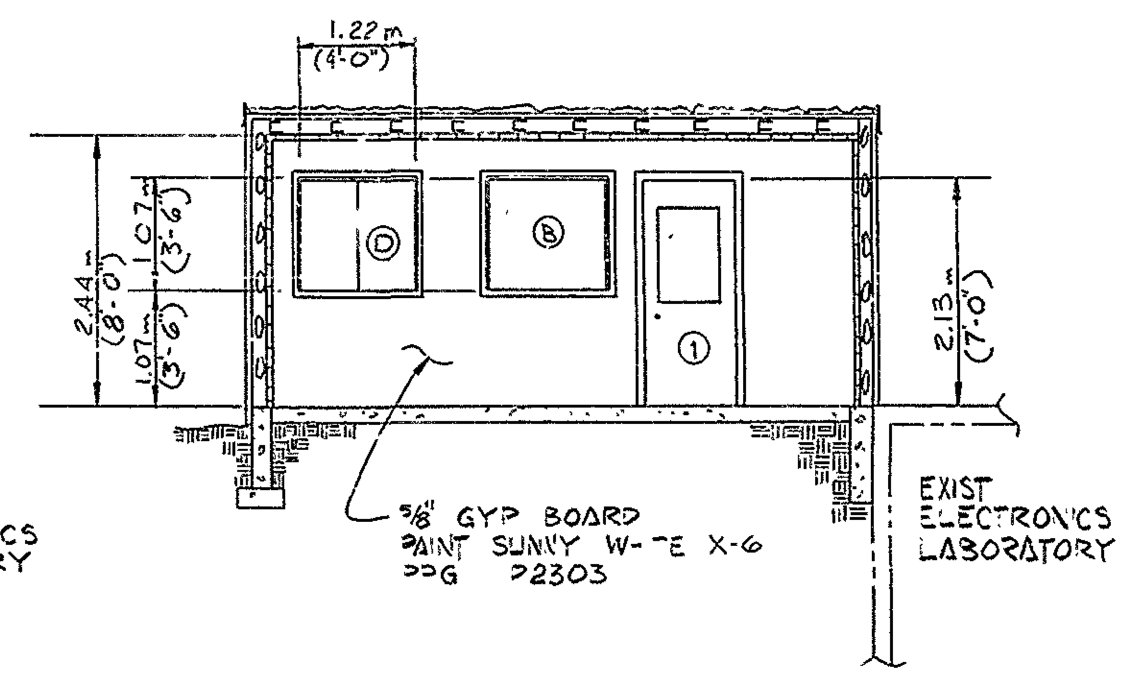
SOUTH ELEVATION
SCALE 1:48 (1/4 1'-0")



SECTION A/A-1
SCALE 1:16 (3/4 1'-0")



SECTION B/A-1
SCALE 1:48(1/4 1-0")



SECTION C/A-1
SCALE 1:48 (1/4 1'-0")

DOOR SCHEDULE

MARK	DOOR SIZE	GLASS	HARDWARE	KICK PLATE	CLOSER	PANIC BAR	REMARKS
(1)	3'X7'X1 3/4 ZIA STOCK 2312 00 1030	24"X36" WIRE-GLASS	CYL. LOCK SET TO FIT BEST CORE	14 GA.X6" ALUM.	YES	YES	HOLLOW CORE METAL
(2)	DO	DO	ZIA STOCK #2549 16 0079	DO	NO	YES	DO

WINDOW SCHEDULE

MARK	TYPE	GLAZING	WINDOW MEMBERS	HARDWARE	SCREENS	REMARKS
(A)	3'-8"×5'-4" PROJECT OUT	(1) 1/4" PLATE	6063-T5 EXTRUDED ALUMINUM	CAM LOCKING HANDLES	NONE	FACTORY GLAZED CLEAR, GRADE "B" GLASS
(B)	4'X3'6" FIXED	1/4" PL	STUD FRAMES	NONE	NONE	FIXED WINDOWS
(C)	SLIDING	SEE SH. S-2		FINGER PULL ZIA STOCK 2653 31 0025	DO	SEE TYP. SECTIONS ON SH. S-2
(D)	SLIDING	(2) TYPE "B" 1/4"X26X48	STUD FRAMES ALUM. SLIDING WINDOW TRACK	DO	DO	CONST. SIMILAR TO SEC. D/A-1

SI METRIC DRAWING

NO	DATE	CLASS REVIEW	REVIEWER	REVISIONS	BY	CHKD	GRP	DO	ENG GP	ENG-4 DC	ERDA APP
△				REFER TO AS BUILT	RD						

MF

AUTHORIZED FOR	
SECURITY	32933
SAFETY	32927
HEALTH	32929
FIRE PR	32928
DIVISION	
GROUP	H H H
COMM	32934
ENG-1	32917
ENG-4	32924
ENG-12	
ENG-11 32925	
H-7 32930-31	
H-1 32926	

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
LOS ALAMOS AREA OFFICE - LOS ALAMOS, NEW MEXICO

OFFICE ADDITION

STRUCT: ELEVATIONS , SECTIONS

BLDG: RD-1 TA-52

CONTRACT NO (A-E)	
ERDA ACCT NO	
DRAWN	C. TRUJILLO
CHECKED	W. S.
A. E. APPROVED	
DESIGN	SULLIVAN
CHECKED	P.C. Hunt
SECTION	
SCALE	NOTED
DATE	1/13/78

SUBMITTED / RECOMMENDED R.F. Henning / APPROVED 1/13/78

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
ENGINEERING DEPT LOS ALAMOS, N M

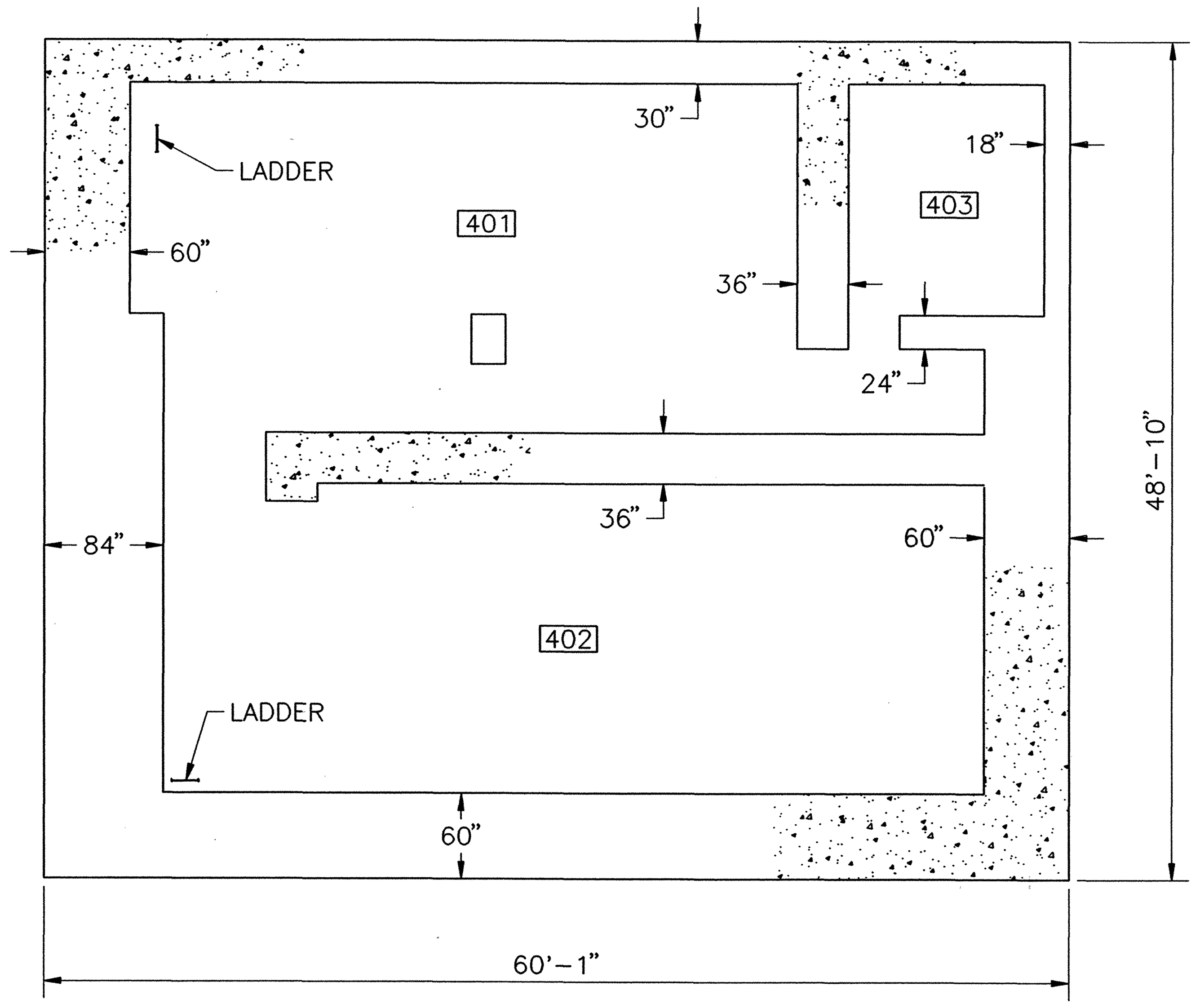
ERDA DRAWING NO
SHEET S-1 2 OF 6

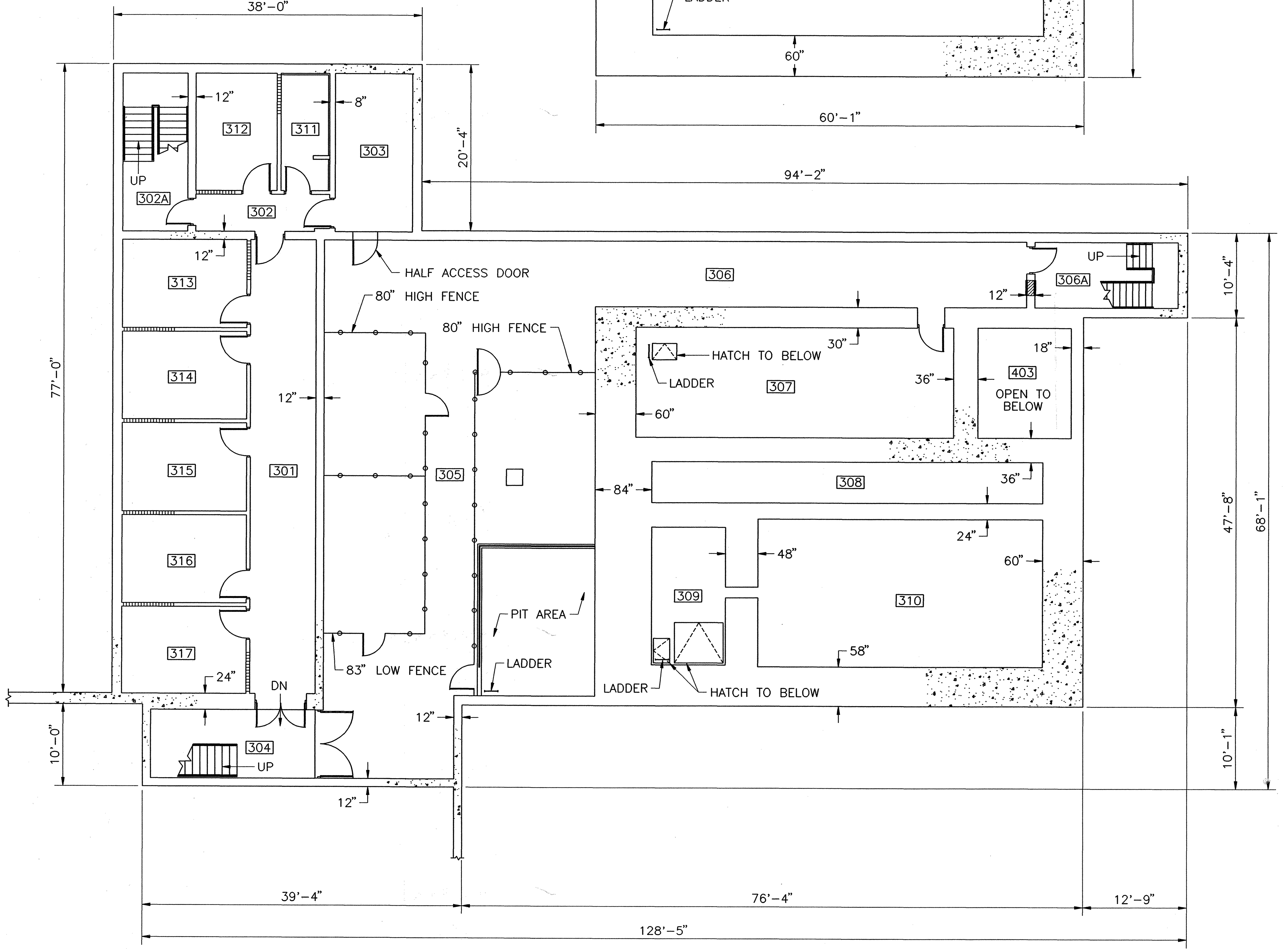
CLASSIFICATION U REVIEWER R.F. Henning DATE 12/2/77

BA
LAB JOB NO 5756-52
L A S L DWG NO ENG-C43398

SUB-BASEMENT-A PLAN

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





SUB-BASEMENT FLOOR PLAN

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

8 6 4 2 0 8 16 32

GRAPHIC SCALE

N

ROOM INFORMATION CHART					
RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
301	501	307	699	315	175
302	90	308	393	316	175
302A	169	309	294	317	180
303	197	310	706	401	872
304	195	311	94	402	935
305	1857	312	156	403	255
306	814	313	179		
306A	151	314	175		

TOTAL ROOM NET SQUARE FOOTAGE (THIS SHEET) = 9,262

GROSS SQUARE FOOTAGE (THIS SHEET) = 11,164

TOTAL ROOM NET SQUARE FOOTAGE (BUILDING) = 28,434

GROSS SQUARE FOOTAGE (BUILDING) = 32,893

LEGEND

- CONCRETE
- CONCRETE BLOCK
- LOUVER
- CHAIN LINK FENCE
- COLUMNS

NOTES

1. ALL EXTERIOR WALLS ARE 14" THICK UNLESS OTHERWISE NOTED.
2. ALL INTERIOR WALLS ARE 6" THICK UNLESS OTHERWISE NOTED.
3. REFERENCE DRAWING ENG-R3267.
4. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS. AREAS SHOWN ARE ROUNDED TO THE NEAREST SQUARE FOOT.
5. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, VAULTS, AND ENCLOSED PASSAGES.
6. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.
7. UNABLE TO FIELD VERIFY ROOMS 307, 308, 309, 310, 401, 402, AND 403. DIMENSIONS WERE TAKEN FROM CONSTRUCTION DRAWING NUMBERS: C-31858, 31859, 31861, AND 31862.

MF	NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

JOHNSON CONTROLS

AS-BUILT RECORD FLOOR PLAN
UTHREX BUILDING

ARCH: SUB-BASEMENT & SUB-BASEMENT-A FLOOR PLAN

DRAWN: D. TIDEMAN (D. Tideman)
VERIFIED: DWI/RS/LB (DWT)
CHECKED: C. SANDOVAL
DATE: 8-19-96

BLDG 1 TA-52

SUBMITTED: DUANE VIGIL (DS for Duane Vigil 10-10-96)

APPROVED FOR RELEASE: LARRY BAYS (Larry Bays)

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 3 (1/3)

CLASSIFICATION U — REVIEWER T. GUSDORF — DATE 12-19-96

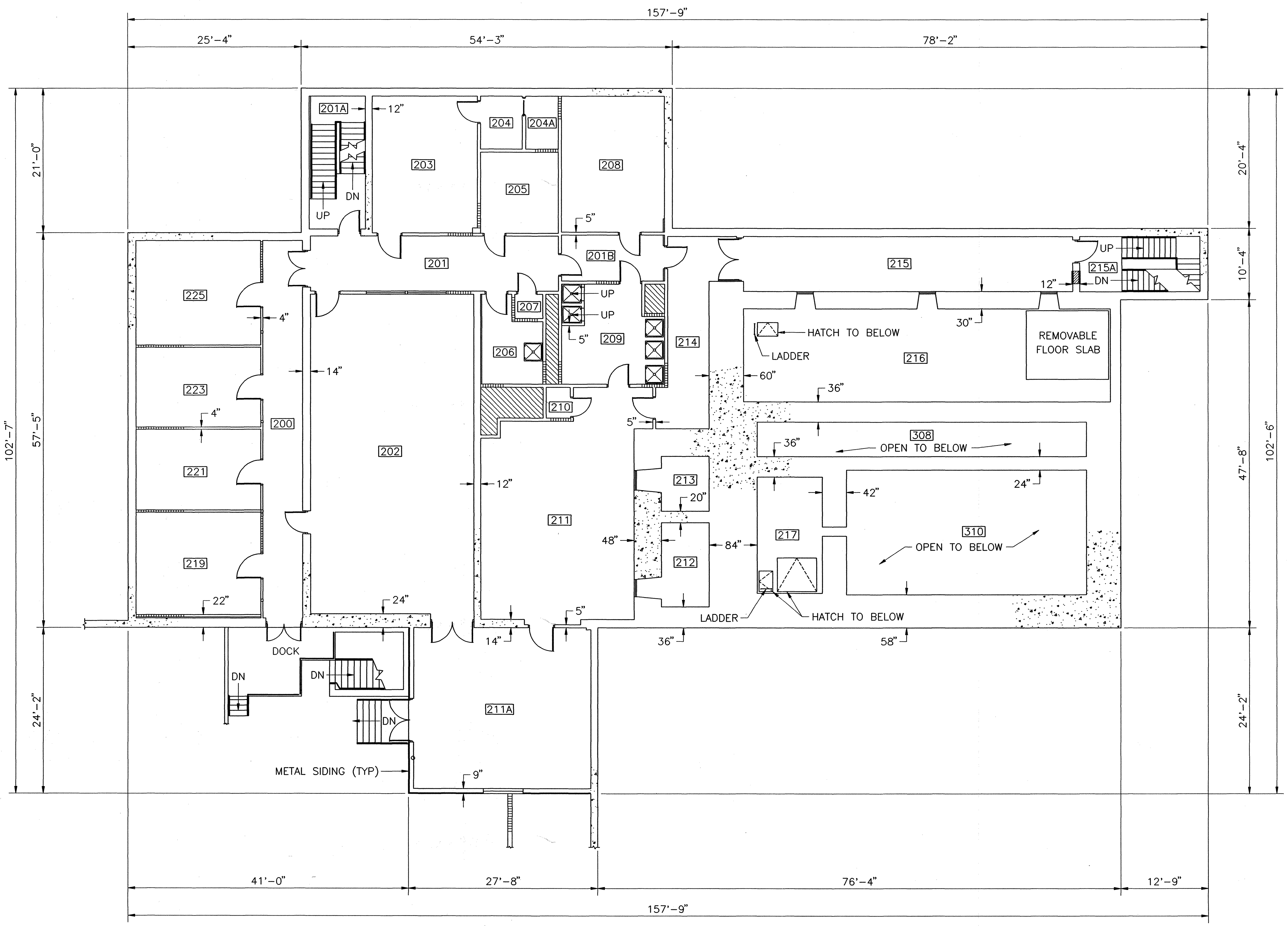
PROJECT ID 7556

DRAWING NO AB669

REV

JCI NO 91-011

FIELD VERIFIED 5-7-96



BASEMENT FLOOR PLAN

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

8 6 4 2 0 8 16 32
GRAPHIC SCALE

N

ROOM INFORMATION CHART

RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
200	360	207	18	215A	151
201	314	208	305	216	911
201A	172	209	218	217	298
201B	110	210	19	219	277
202	1172	211	793	221	221
203	323	211A	619	223	219
204	52	212	150	225	282
204A	41	213	124	UTILITY 2	103
205	144	214	296		
206	115	215	452		

TOTAL ROOM NET SQUARE FOOTAGE (THIS SHEET) = 8,259

GROSS SQUARE FOOTAGE (THIS SHEET) = 10,296

TOTAL ROOM NET SQUARE FOOTAGE (BUILDING) = 28,434

GROSS SQUARE FOOTAGE (BUILDING) = 32,893

LEGEND

- CONCRETE
- CONCRETE BLOCK
- LOUVER
- UTILITY SPACE
- WINDOW
- WOOD OR METAL STUD
- COLUMNS

NOTES

1. ALL EXTERIOR WALLS ARE 14" THICK UNLESS OTHERWISE NOTED.
2. ALL INTERIOR WALLS ARE 6" THICK UNLESS OTHERWISE NOTED.
3. REFERENCE DRAWING ENG-R3268.
4. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS. AREAS SHOWN ARE ROUNDED TO THE NEAREST SQUARE FOOT.
5. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, VAULTS, AND ENCLOSED PASSAGES.
6. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.
7. UNABLE TO FIELD VERIFY ROOMS 212, 213, 216, 217, 308, & 310. DIMENSIONS WERE TAKEN FROM CONSTRUCTION DRAWING NUMBERS: C-31858, 31859, 31861, AND 31862.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

JOHNSON CONTROLS

AS-BUILT RECORD FLOOR PLAN
UTHREX BUILDING
ARCH: BASEMENT FLOOR PLAN

BLDG 1 TA-52

DRAWN	D. TIDEMAN
VERIFIED	DWT/RG/LB
CHECKED	E. SANDOVAL
DATE	8-19-96

SUBMITTED: DUANE VIGIL 10/10/96
APPROVED FOR RELEASE: LARRY BAYS

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 2 OF 3

CLASSIFICATION U — REVIEWER T. GUSDORF — DATE 12-19-96

PROJECT ID 7556 — DRAWING NO AB669 — REV

JCI NO 91-011

FIELD VERIFIED 5-7-96

ROOM INFORMATION CHART

RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
10A	313	101A	32	105B	170
10B	21	101B	54	105C	166
10C	7	101C	30	106	2040
10D	157	102	787	108	243
24D	73	103	1827	109	154
24E	10	104	374	109A	214
100	90	104A	122	MZ106	128
100A	182	105	758	UTILITY 1	16
101	2790	105A	155		

TOTAL ROOM NET SQUARE FOOTAGE (THIS SHEET) = 10,913

GROSS SQUARE FOOTAGE (THIS SHEET) = 11,433

TOTAL ROOM NET SQUARE FOOTAGE (BUILDING) = 28,434

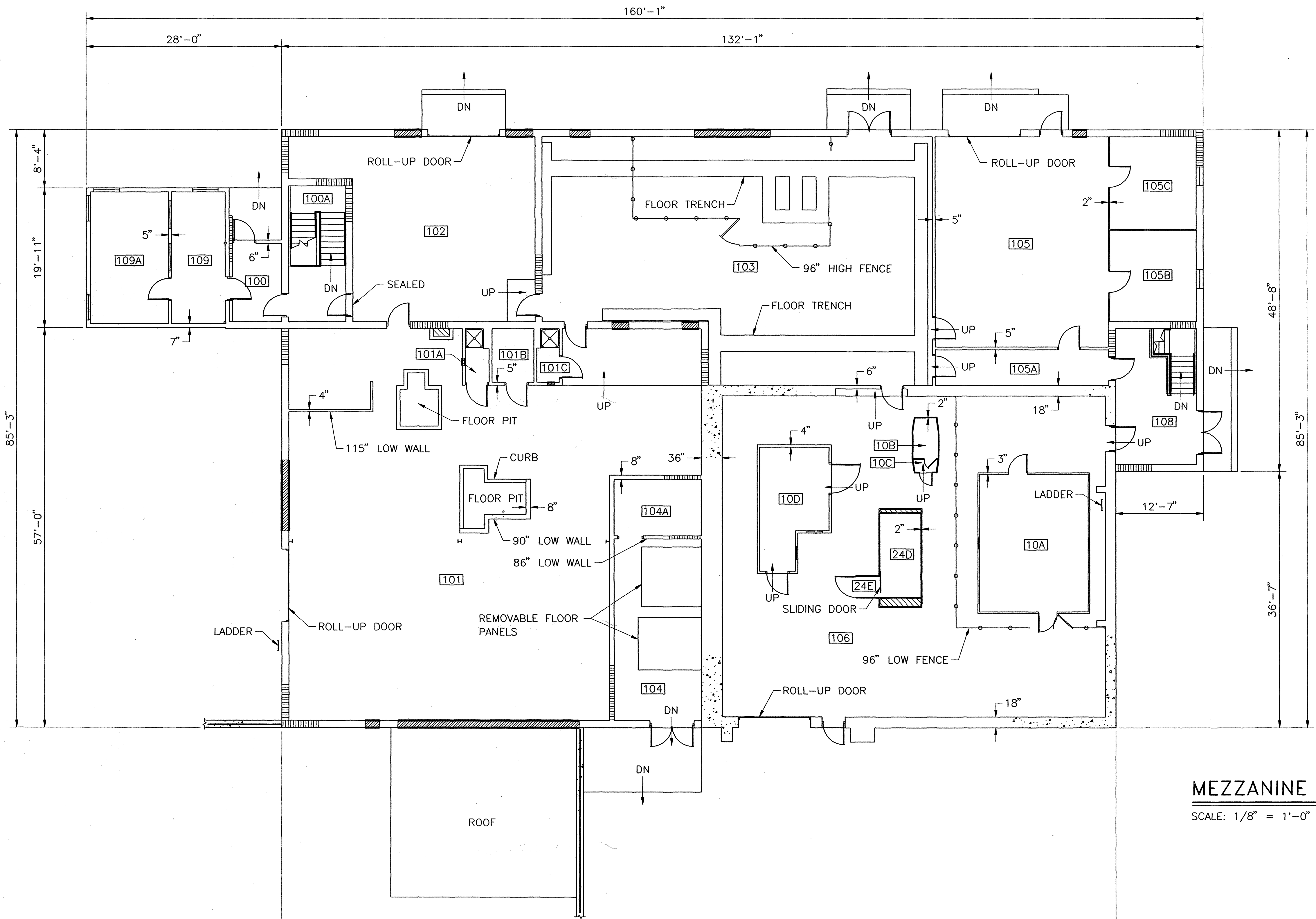
GROSS SQUARE FOOTAGE (BUILDING) = 32,893

LEGEND

- CONCRETE
- CONCRETE BLOCK
- LOUVER
- UTILITY SPACE
- WINDOW
- WOOD OR METAL STUD
- CHAIN LINK FENCE
- COLUMNS

NOTES

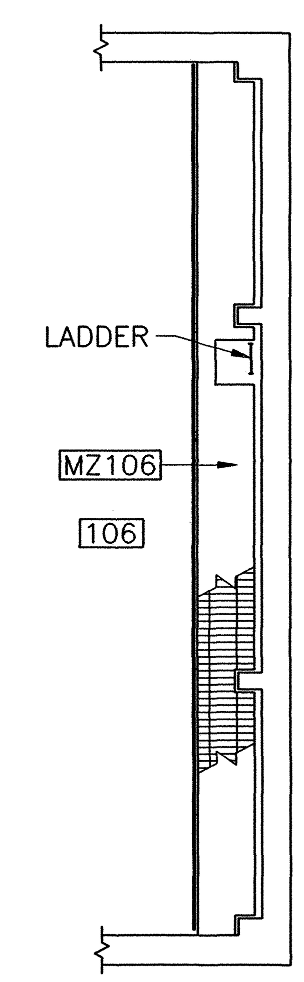
1. ALL EXTERIOR WALLS ARE 12" THICK UNLESS OTHERWISE NOTED.
2. ALL INTERIOR WALLS ARE 12" THICK UNLESS OTHERWISE NOTED.
3. REFERENCE DRAWING ENG-R3269.
4. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS. AREAS SHOWN ARE ROUNDED TO THE NEAREST SQUARE FOOT.
5. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, VAULTS, AND ENCLOSED PASSAGES.
6. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.



FIRST FLOOR PLAN

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

8 6 4 2 0 8 16 32
GRAPHIC SCALE



MEZZANINE ABOVE 106

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

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

JOHNSON CONTROLS

AS-BUILT RECORD FLOOR PLAN
UTHREX BUILDING

ARCH: FIRST & MEZZANINE FLOOR PLAN

DRAWN: D. TIDEMAN
VERIFIED: DWT/PS/LB
CHECKED: SANDOVAL
DATE: 8-19-96

BLDG 1 TA-52

SUBMITTED: DUANE VIGIL — OKS FOR DUANE VIGIL 10-10-96
APPROVED FOR RELEASE: LARRY BAYS

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 3 — 3 OF 3

CLASSIFICATION U — REVIEWER T. GUSDORF — DATE 12-19-96

PROJECT ID 7556 — DRAWING NO AB669 — REV

JCI NO 91-011

FIELD VERIFIED 5-7-96

LANL TA- Building # 52-0011

Camera XIT-TSS Laboratory Photography

Frame #s TA-52-0011_1 through TA-52-0011_12

Surveyor(s) Kari Garcia; Charlene Brown

Date December 8 & 9, 2014; July 3, 2019

Los Alamos National Laboratory RMT
Historic Building Survey Form

Building Name: Mechanical Assembly Building | UTMs easting: 383552 | northing: 3969160 | zone: 13

Legal Description: Map: Frijoles Quad | tnsp: T19 | range: 06E | sec: 22

Current Use/ Function: LANL Shredding Operations | Original Use/ Function: Shop/Mechanical Building

Date (estimated): | Date (actual): 1965 | Property Type: Support

Type of Construction

Pre-Fabricated Metal ☐ Steel Frame ☑ Wood Frame ☐ CMU ☐ Reinforced Concrete ☐

Other Type of Construction: | # of Stories: 1

Foundation Reinforced Concrete

Exterior CMU-Exterior ☐ Reinforced Concrete-Exterior ☐ Steel (galvanized) ☐ Steel (corrugated) ☑

Wood Siding ☐ Asbestos Shingles-Exterior ☐ In-Fill Panels ☐ Other-Exterior:

Exterior Treatment (painted, stuccoed, etc):

Exterior Features (docks, speakers, lights, signs, etc): Vents and lights.

Addition CMU-Addition ☐ Reinforced Concrete-Addition ☐ Steel (galvanized)- Addition ☐ Wood ☐

Steel (corrugated)-Addition ☐ Asbestos Shingles-Addition ☐ Other- Addition:

Exterior Treatment-Addition:

Exterior Features-Addition:

Roof Form Slanted/Shed ☐ Gable ☑ Other Roof Type:

Degree of Pitch/ Slope: Moderate

Roof Materials Corrugated Metal ☑ Rolled Asphalt ☐ Asbestos Shingles ☐ 4-Ply Built Up ☐

Other Roof Materials: Translucent ceiling panels to provide natural light.

Window Type Casement ☐ Single Hung Sash ☐ Double Hung Sash ☐ Fixed Window ☐

Other Window Type:

# of Each Window Type/ Comments:

Glass Type Clear ☐ Wire Glass ☐ Opaque ☐ Painted Glass ☐ Glass Block ☐

Light Pattern:

Door Type Personnel Door Types Exterior Fire Door ☐ Single ☑ Double ☐ Roll-up ☐ Sliding ☐

Hollow Metal ☑ Solid Wood ☐ 1/2 Glazed ☑ Paneled ☐
Louvered ☐ Painted ☐

Interior
Fire Door ☐ Single ☐ Double ☐ Roll-up ☐ Sliding ☐
Hollow Metal ☐ Solid Wood ☑ 1/2 Glazed ☐ Paneled ☐
Louvered ☑ Painted ☐

Equipment Door Types

Exterior
Fire Door ☐ Single ☐ Double ☐ Roll-up ☑ Sliding ☐
Hollow Metal ☐ Solid Wood ☐ 1/2 Glazed ☐ Paneled ☐
Louvered ☐ Painted ☐

Interior
Fire Door ☐ Single ☐ Double ☐ Roll-up ☐ Sliding ☐
Hollow Metal ☐ Solid Metal ☐ 1/2 Glazed ☐ Paneled ☐
Louvered ☐ Painted ☐

# of Each Door Type/Comments: 2 single hollow-metal, 1/2 glazed personnel doors, 1 single solid wood with louvers personnel door, and 2 roll-up equipment doors.

Interior Wall Gypsum Board ☐ Reinforced Concrete- Interior ☐

CMU- Interior ☐ Plywood ☐ Other- Interior

In-Wall Electrical Wiring ☐ On-Wall Electrical Wiring ☑

Ceiling Drop Ceiling ☐

Interior Comments (Equipment, etc)

Degree of Remodeling Minor

Condition Excellent ☐ Good ☑ Fair ☐ Deteriorating ☐ Contaminated ☐ Burned ☐

Associated Buildings ☐

If yes, list building names and #s TA-52-1

Integrity Good

Significance None

Eligible Under Criterion A ☐ B ☐ C ☐ D ☐ Not Eligible ☑

DOE Themes

Nuclear Weapon Components and Assembly ☐
Nuclear Weapon Design and Testing ☐
Nuclear Propulsion ☐
Peaceful Uses: Plowshare, Nuclear Medicine, Nuclear Energy, Nuclear Science ☑
Energy and Environment: Research and Design Projects ☐

LANL Themes

Weapons Research and Design, Testing, and Stockpile Support ☐ Super Computing ☐

Reactor Technology ☑ Biomedical/Health Physics ☐ Strategic and Supporting Research ☐

Environment/Waste Management ☐ Administration and Social History ☐ Architectural History ☐

Recommendations/ Additional Comments

Architectural Features (elevations)

TA-52-11, a single room building, measuring 33 ft 4 in. by 61 ft 11 in. It currently contains roll-up doors, which replaced the original sliding doors (16 feet by 16 feet dual sliders on a rail), on each end. A restroom is at northeast corner of the space. The building has a steel structural frame with pier footings and a reinforced slab and an on-grade foundation. The building is 28 feet high at the eave line. Additional pier footing provided support for a crane. The building is insulated and covered with corrugated galvanized steel on the roof and walls. There are twelve translucent panels that provide natural light into the space. The building was designed with a 6 in. curb with drains all around the floor, a system meant to contain liquids in case of spills. There are two personnel doors on the south side of the building.

Total sq ft 2064

Architect/ Builder

Architect: W.C. Kruger and Associates, Santa Fe, New Mexico
Builder: McKee General Contractor, Inc. Santa Fe, New Mexico

Alterations

Use function changed to LANL paper shredding operations in 1970.

List of Drawings (Cntrl + Enter for para break)

ENG-C 31933
Sheet 101 of 106
TA-52, Building RD-1 (TA-52-11)
UHTREX Facilities
Mechanical Assembly building
Architectural - Plans and Details
August 27, 1962

ENG-C 31934
Sheet 102 of 106
TA-52, Building RD-11 (TA-52-11)
UHTREX Facilities
Mechanical Assembly Building
Architectural - Elevations and Details
August 27, 1962

ENG-C 27718
Sheet 1 of 1
TA-52, Building RD-11 (TA-52-11)
Roll-up Door Installation
Sections & Details
May 24, 1966

ENG-C 28455
Sheet 1 of 5
TA-52, Building RD-1 (TA-52-11)
Mechanical Assembly Building
5-Ton Bridge Mounting Crane
Bldg. Modification Details
June 11, 1964

ENG-C 23103
Sheet 1 of 4
TA-52, Building RD-11 (TA-52-11)
UHTREX Facilities
Minotaur Mock-up
Structural
January 22, 1963

ENG-C 38801
Sheet 1 of 4
TA-52, Building RD-11 (TA-52-11)
Document Shredder Installation
Architectural: Site & Plot Plans, Floor Plan, Section & Foundation Plan
August 10, 1970

ENG-C 38803
Sheet 3 of 4
Ta-52, Building RD-11 (TA-52-11)
Document Shredder Installation
Mechanical
August 10, 1970

ENG-AB 776
TA-52, Building 11
Mechanical Assembly Building
As-Built Record Floor Plan
Arch: Record Floor Plan
October 20, 1997

TA-52-11 East elevation

TA-52-11 South and east elevations

TA-52-11 South elevation

TA-52-11 West and south elevations

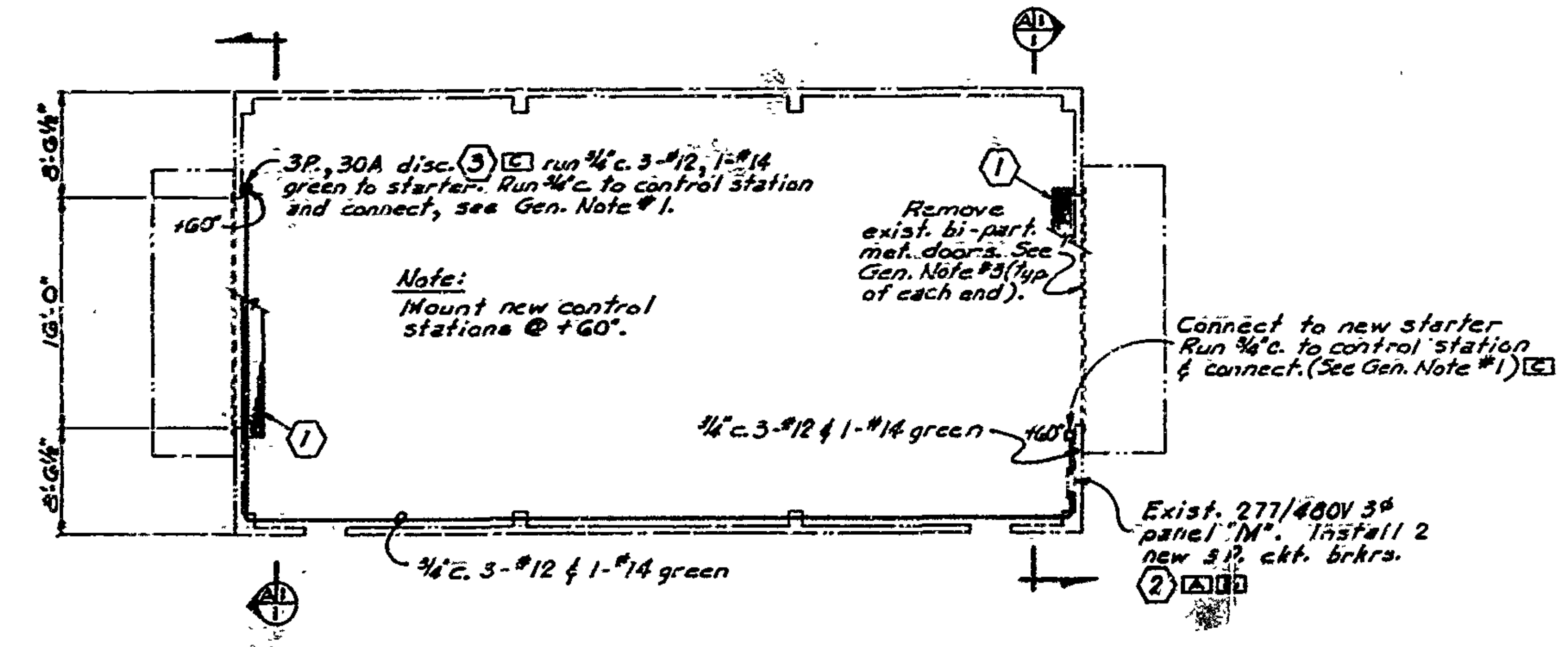
TA-52-11 North and west elevations

TA-52-11 West elevation

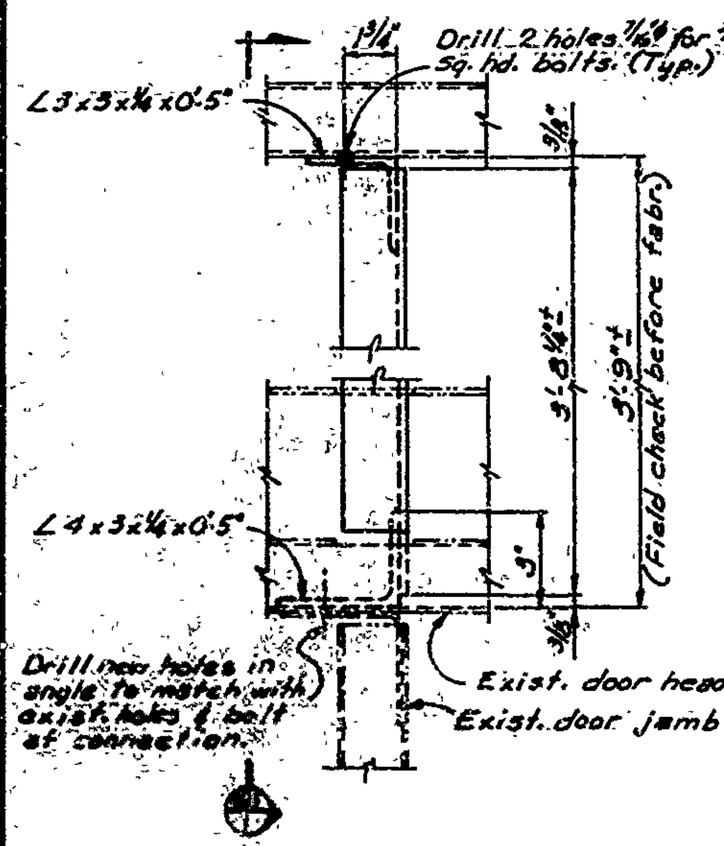
TA-52-11 North elevation

Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31933	101	_	106	1

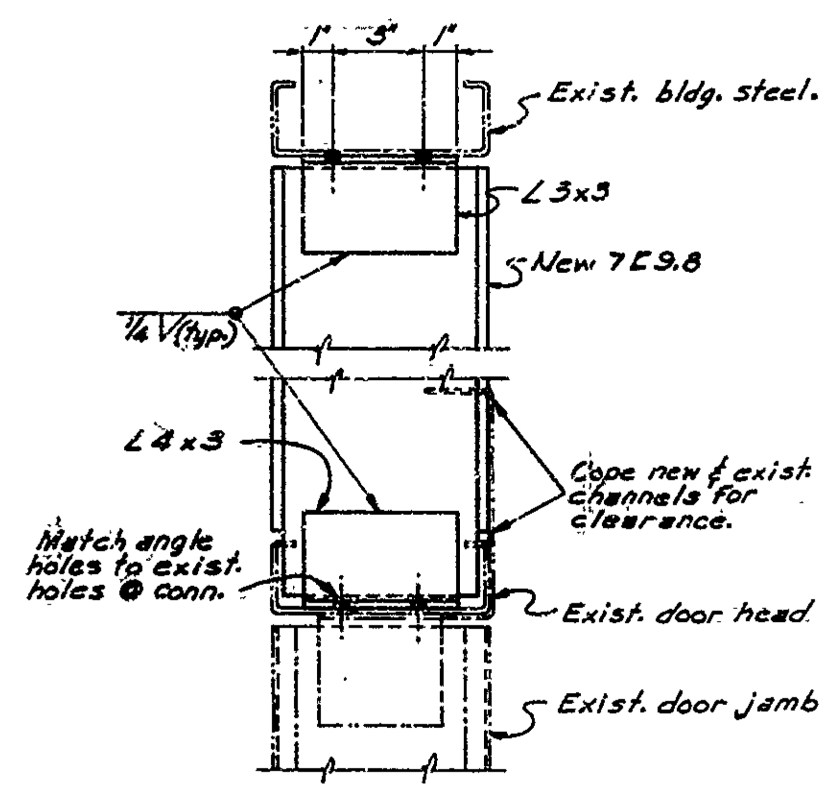
Prefix	Drawing number	Sheet number	Sheet suffix	Number of sheets	Revision number
C	31934	102	_	106	1



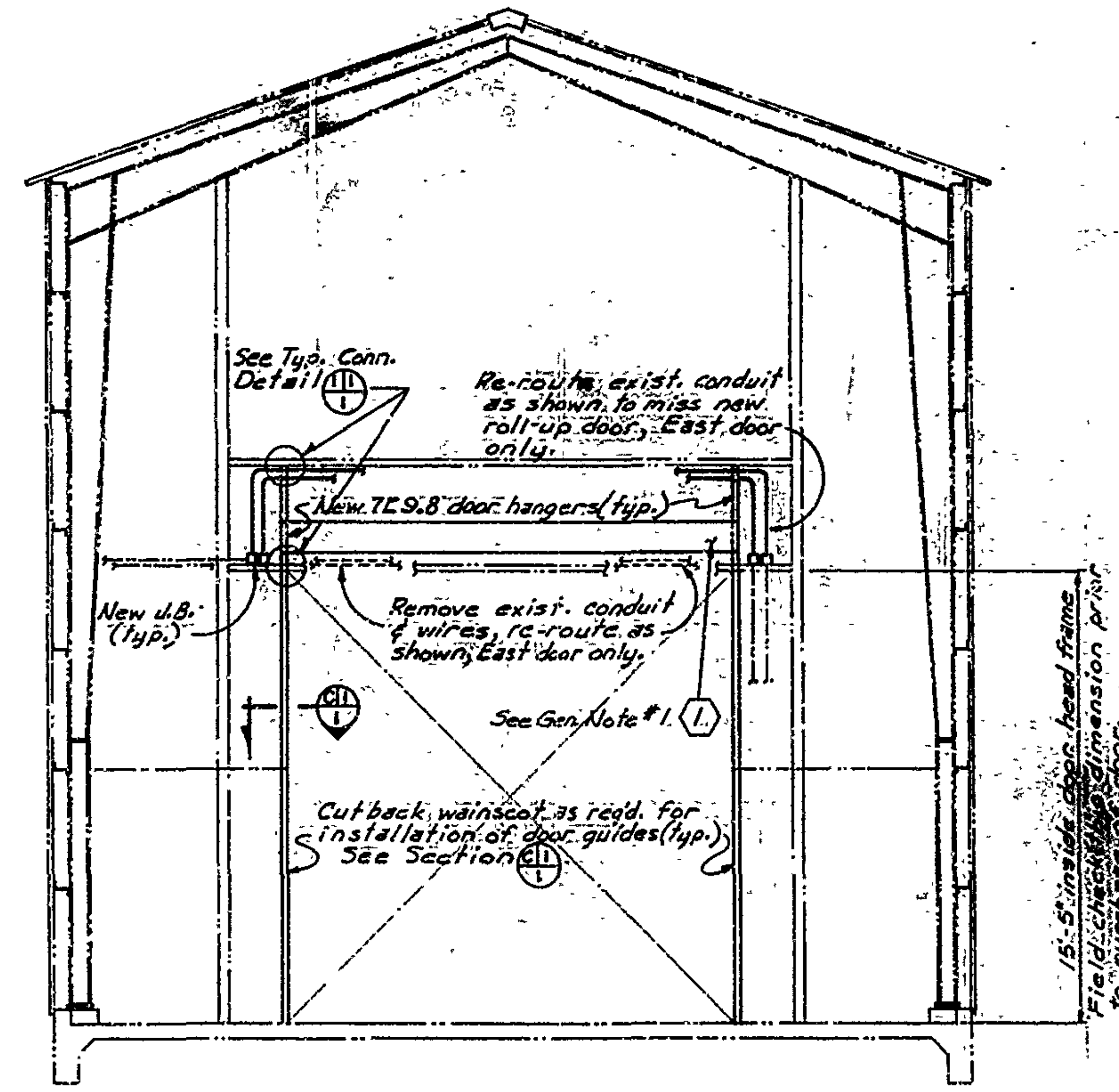
PLAN
Scale: ⅛" = 1'-0"



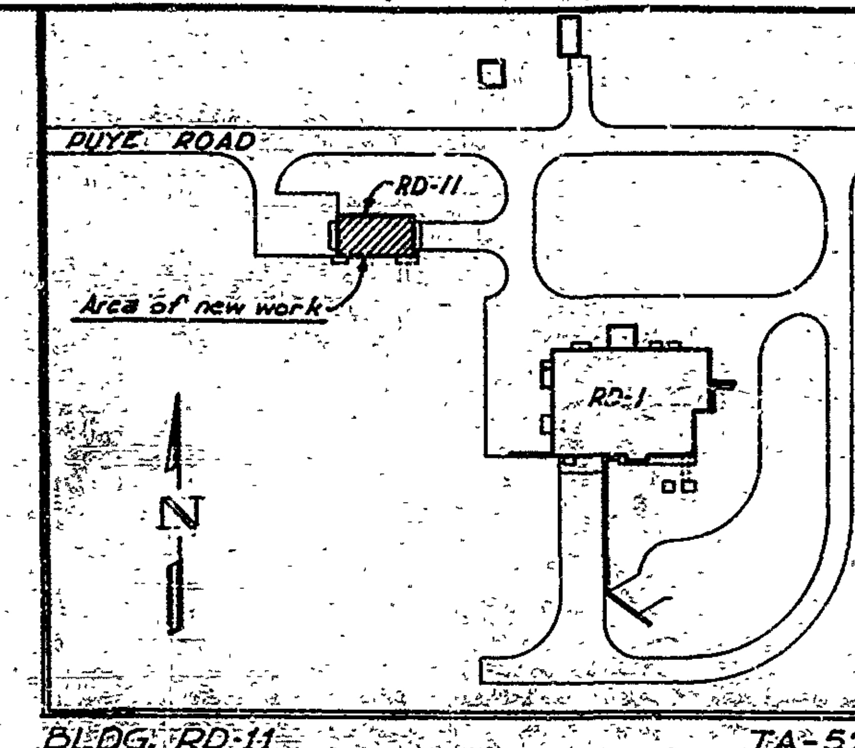
TYPICAL CONNECTION DETAIL
Scale: 3" = 1'-0"



ELEVATION
Scale: 3" = 1'-0"



ELEVATION
Scale: ¼" = 1'-0"



LOCATION PLAN

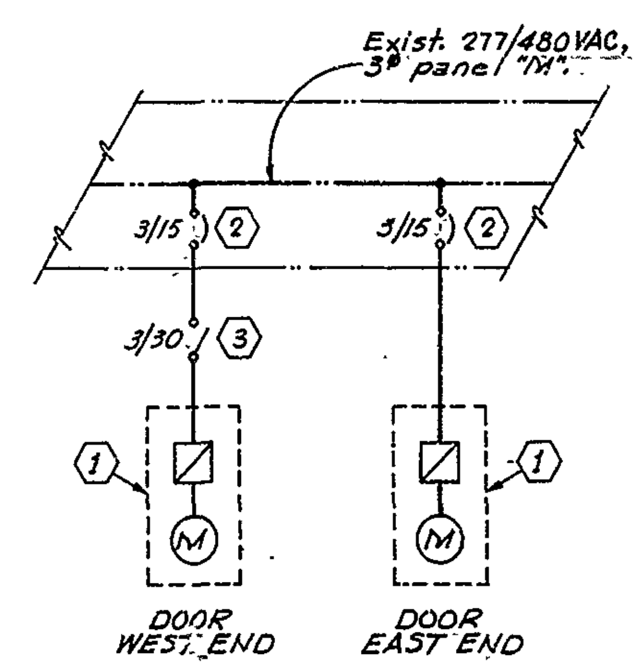
GENERAL NOTES

1. Contractor shall install rolling doors in accordance with manufacturers installation instructions and wiring diagrams.
2. Paint rolling doors and all new steel surfaces with one coat of gray "Totrust" Nº 51. Paint number refers to LASL "Manual of Paint and Sign Standards".
3. Disposal of all removed materials shall be made by LASL Group Eng-4.
4. The entire electrical installation shall be in accordance with the current rules of the NEC.
5. All raceway and the frames and enclosures of electrical equipment shall be bonded to the building grounding system. The equipment ground conductor shall be insulated type TW and green in color.
6. All branch circuits shall be identified at the panel and all individual circuit breakers and switches shall be identified by means of nameplates. See nameplate schedule.
7. All conduit runs shall be routed to suit building and building structure. EMT may be substituted for rigid conduit where field conditions warrant.
8. All wiring shall be insulated type TW unless otherwise indicated.

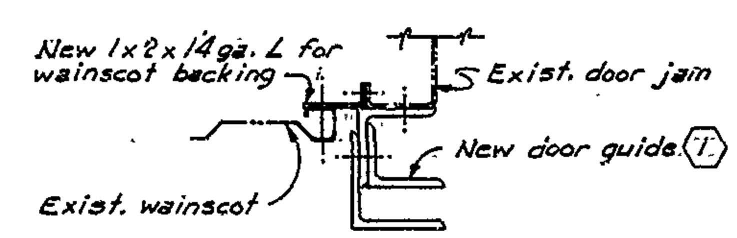
NAMEPLATE SCHEDULE

SYM.	Nº REQ'D.	ENGRAVING
A	1	ROLLING DOOR-EAST END
B	1	ROLLING DOOR-WEST END
C	2	440V, 3φ, 60~ FROM PANEL "M"

All nameplates shall be supplied by LASL Group Engineering 4 and shall be 1/16" thick Phenolic, ⅜" x 2¼" black with white core. Letter size shall be 3/32".



SINGLE LINE DIAGRAM
No Scale



SECTION
No Scale

LIST OF EQUIPMENT

ITEM	REQ'D.	DESCRIPTION	MANUFACTURER & CATALOG NUMBER	FURNISHED BY
(1)	#2	Rolling service door, clear opening 16'-0" wide x 15'-5" high, designed for 20 p.s.f. wind load, door designed to transfer dead load to jambs. 440V, 3φ, 60~ motor, spring operated, with reversing magnetic starter, integral 440-110VAC, 1φ control transformer and 120VAC 1φ key operated NEMA 1 control station for surface mounting marked UP, DOWN and STOP. Door speed approx. 50 f.p.m. The door shall include the following - 1. Guides and brackets necessary for installation. 2. Automatic brake. 3. Auxiliary chain operator. 4. Pre-wired electrical device to stop downward travel of door on contact with an object. 5. Weather tight door including weather stripping on guides, bottom and hood baffle. 6. One shop coat of rust inhibiting primer. 7. Control wiring diagrams and installation instructions. Bidder shall furnish H.P. rating of motor furnished.	The Cookson Co. Type FCM-B	Contractor
(2)	2	Circuit breaker 600VAC, 3 pole, 50 amp frame, 15 amp trip moulded case breaker only, to fit in space in exist. 277/480VAC panel "M" G.E. type NHCB, style 2, plant H.	General Electric (No substitution)	Contractor
(3)	1	Disconnect switch, heavy duty 600VAC, 3 pole not fusible, 30 amp, in NEMA-1 general purpose enclosure.	Square D Nº A81341	Contractor

The list of equipment is intended only as an aid in estimating and material take-off and does not necessarily include all items required. Except as noted, catalog numbers are given as reference only; equal approved substitutions may be made.

Submit bids to LASL Engineering Department for review prior to purchase.

ENG.-4 EQUIPMENT CODE LIST

ITEM Nº	Nº REQ'D.	INSCRIPTION TA-BLDG.	PREFIX NO.	CODE TAG LOCATION	UNIT LOCATION
(1)	1	52-11	DRU-1	DOOR	ROOM-1
(1)	1	52-11	DRUM-1	MOTOR BASE	ROOM-1
(1)	1	52-11	DRU-2	DOOR	ROOM-1
(1)	1	52-11	DRUM-2	MOTOR BASE	ROOM-1

LEGEND

New ————
Existing —··—
Hidden or to be removed as noted - - - -

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY ENG-4 WILDE PHONE 7-5811

NO.	DATE	REVISIONS	BY	CHKD	GRP.	R.O.	GRP. LDR.	ENG. R.O.

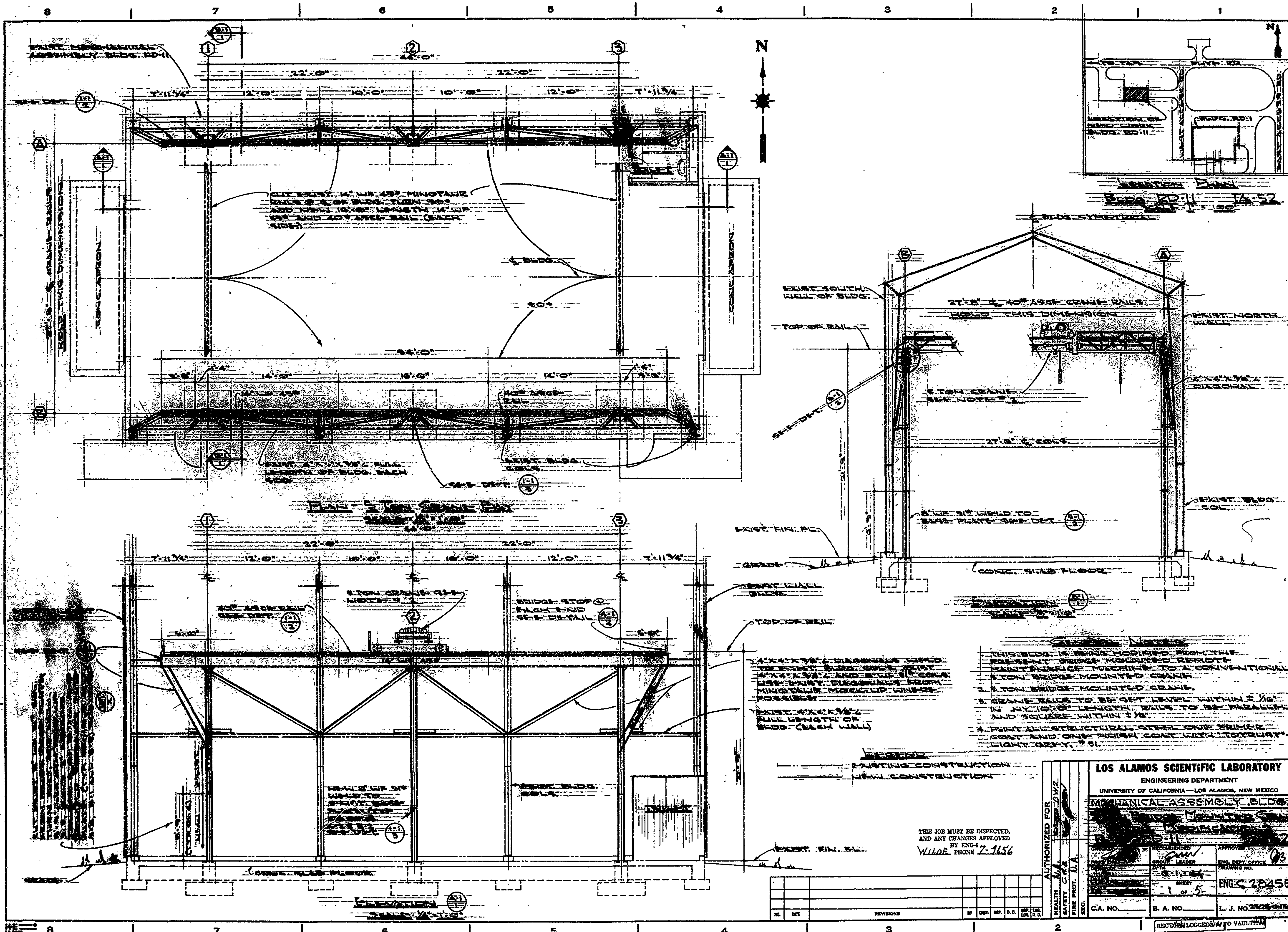
AUTHORIZED FOR: HEALTH N.A. K-4 [signature]; SAFETY C.M.B. K-00 [signature]; FIRE PROT. N.A.; SEC. N.A.

LOS ALAMOS SCIENTIFIC LABORATORY
ENGINEERING DEPARTMENT
UNIVERSITY OF CALIFORNIA—LOS ALAMOS, NEW MEXICO

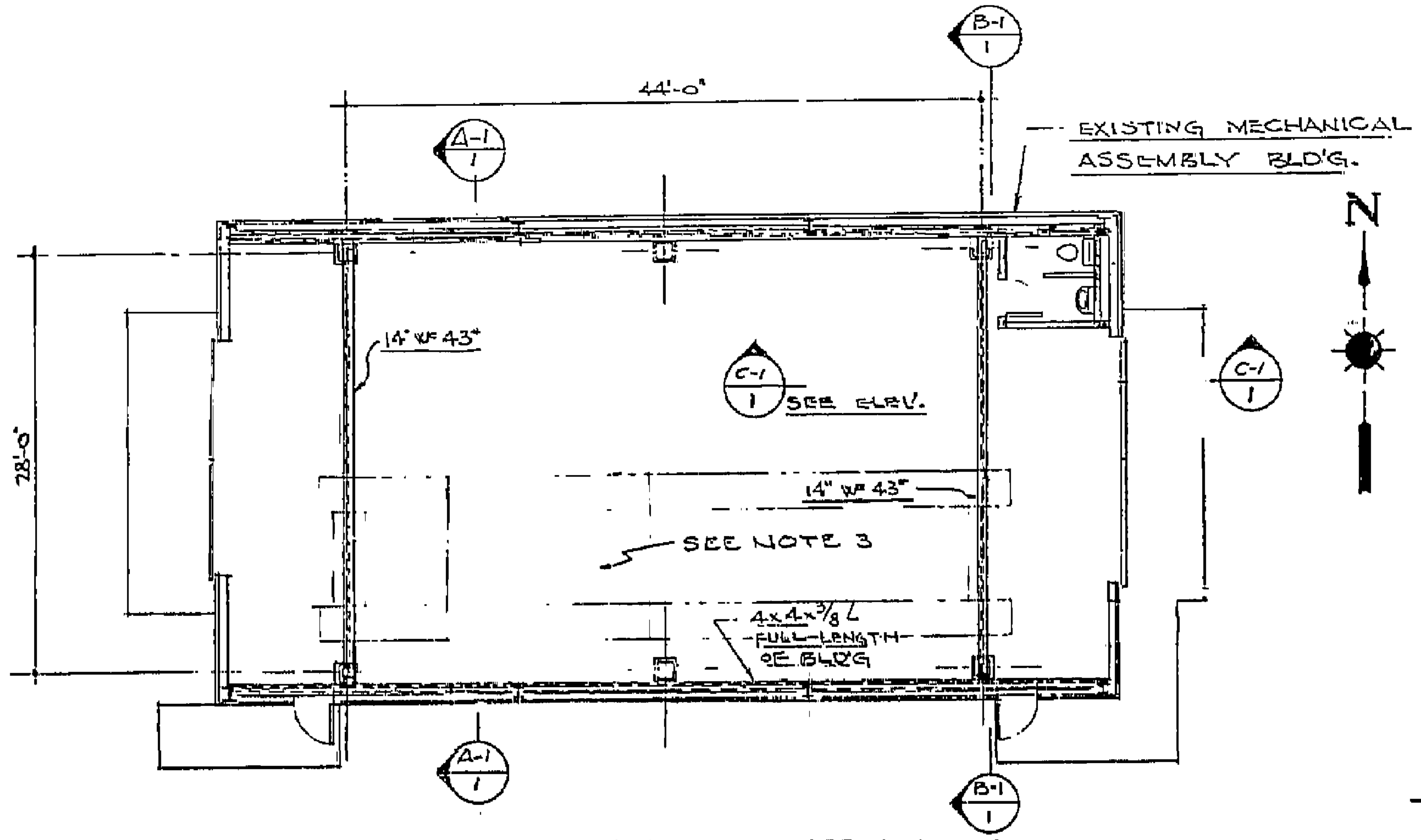
ROLL-UP DOOR INSTALLATION SECTIONS & DETAILS-CONDUIT PLAN & SINGLE LINE DIAGRAM
BLDG. RD-11 TA-52

CHECKED W.E. PROJ. ENG.	RECOMMENDED [signature] GROUP LEADER	APPROVED [signature] for LPR ENG. DEPT. OFFICE
DESIGNER W.E.	DATE MAY 24, 1966	DRAWING NO.
DRAWN DeLucero SCALE As noted	SHEET 1 OF 1	ENG C-27716
C.A. NO.	B. A. NO.	L. J. NO. 3442-52

RECT'D LOGGED TO VAULT

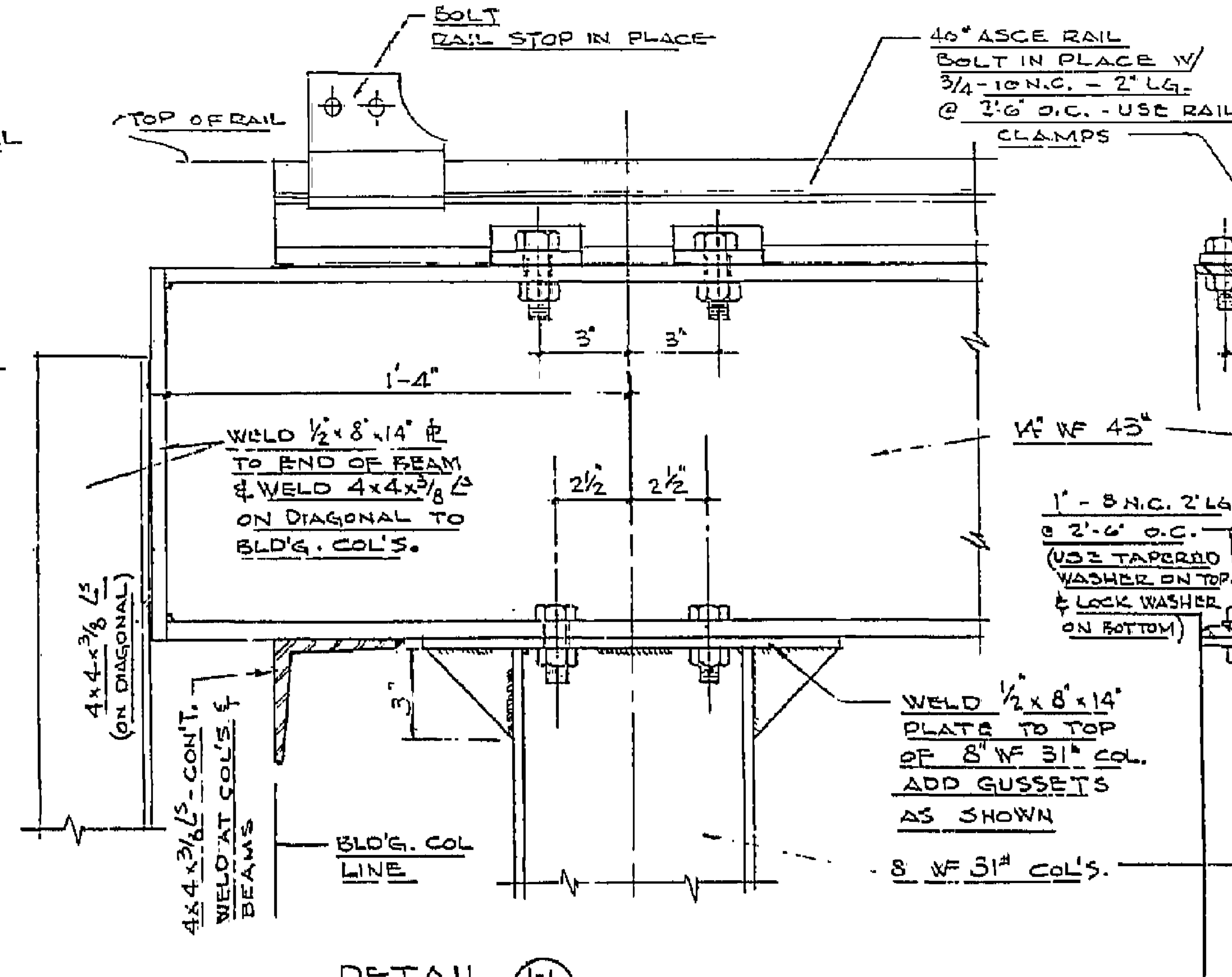


PLAN - 5 TON CRANE BAY
ELEVATION
GENERAL NOTES
THIS BLDG. IS BEING MODIFIED FROM THE PRESENT BRIDGE MOUNTED REMOTE MAINTENANCE MACHINE TO A CONVENTIONAL 5 TON BRIDGE MOUNTED CRANE.
2. 5 TON BRIDGE MOUNTED CRANE.
3. CRANE RAILS TO BE SET LEVEL WITHIN ± 1/16" IN ANY 10'-0" LENGTH. RAILS TO BE PARALLEL AND SQUARE WITHIN ± 1/8".
4. PAINT ALL STRUCTURAL STEEL ONE PRIMER COAT AND ONE FINISH COAT WITH "TOTRUST" LIGHT GREY, #51.
LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION
LOCATION PLAN
BLDG. RD-11 TA-57
THIS JOB MUST BE INSPECTED, AND ANY CHANGES APPROVED BY ENG-4
WILDE PHONE 7-9656
LOS ALAMOS SCIENTIFIC LABORATORY
ENGINEERING DEPARTMENT
UNIVERSITY OF CALIFORNIA—LOS ALAMOS, NEW MEXICO
MECHANICAL ASSEMBLY BLDG.
AUTHORIZED FOR
HEALTH
SAFETY
FIRE PROT.
SEC.
RECOMMENDED
GROUP LEADER
APPROVED
ENG. DEPT. OFFICE
DRAWING NO.
SHEET 1 OF 5
ENG-C 28458
C.A. NO.
B. A. NO.
L. J. NO.
REVISIONS
BY
CHK'D
GRP.
D.O.
RECD LOGGED TO VAULT



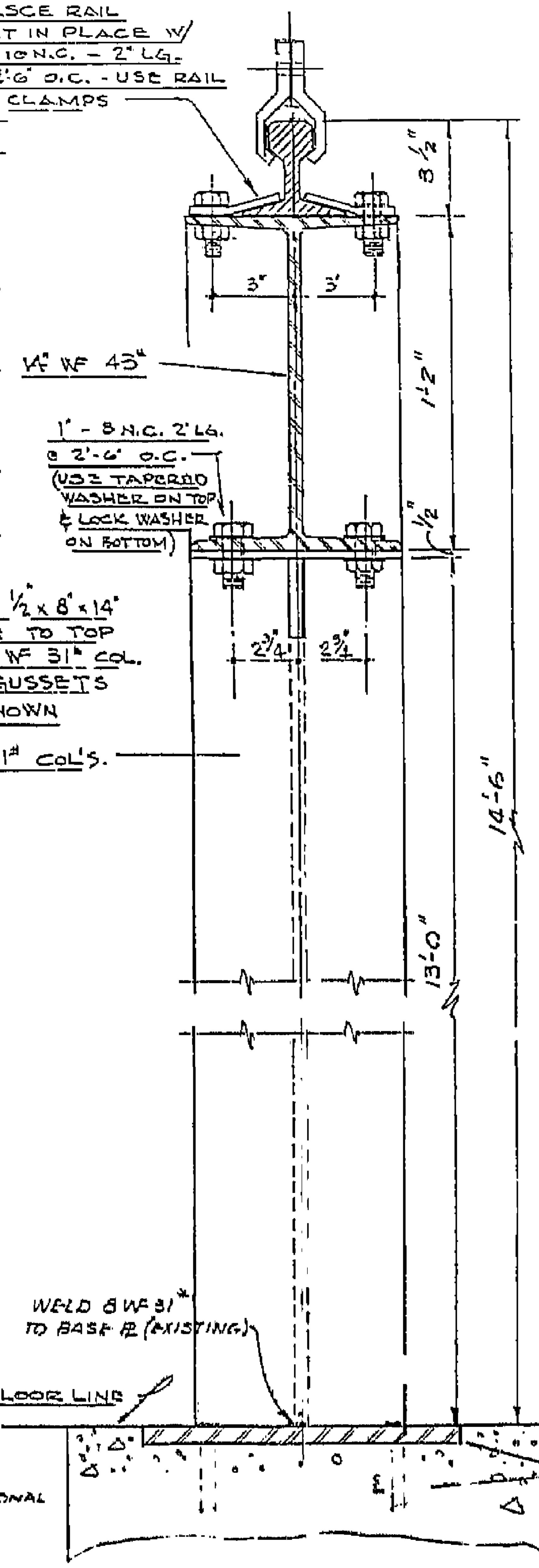
PLAN — SHOWING LOCATION OF CRANE BAY

SCALE 1/8" = 1'-0"



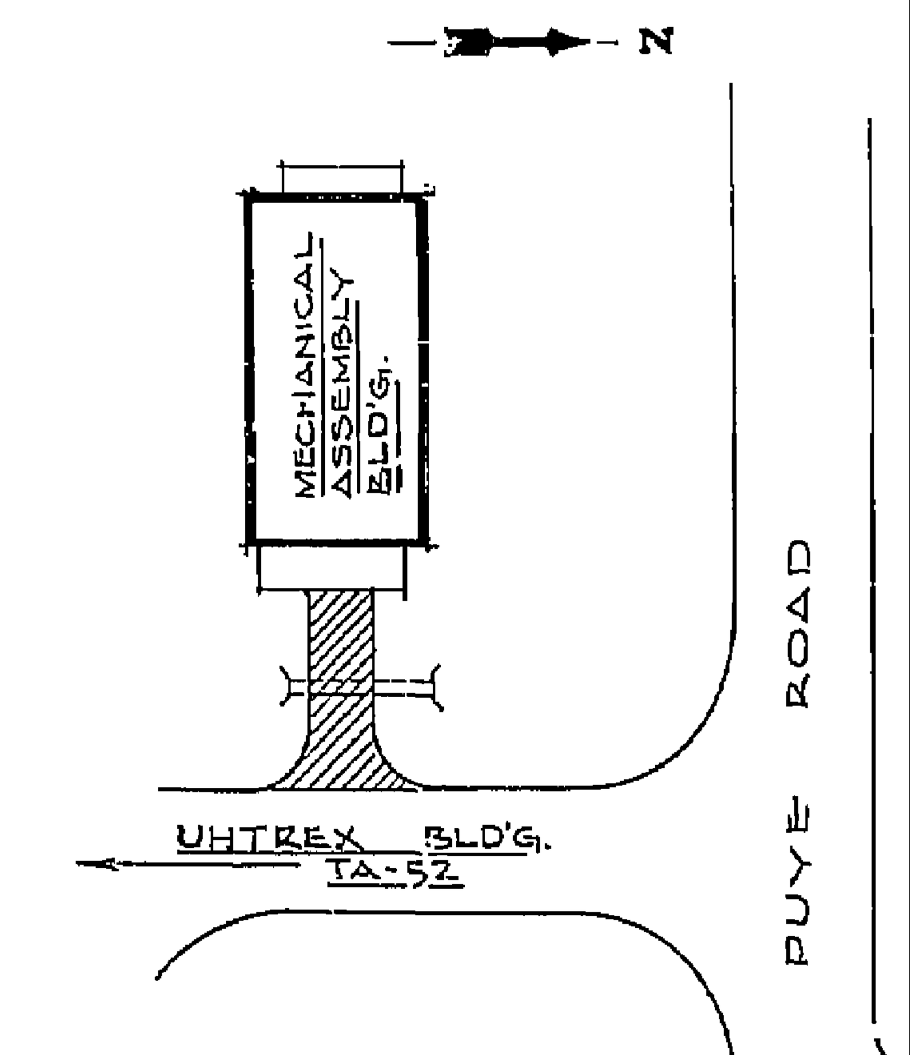
DETAIL (1-1) SHOWING COLUMN & BEAM

SCALE — 3" = 1'-0"



DETAIL (2-1)

SCALE 3" = 1'-0"

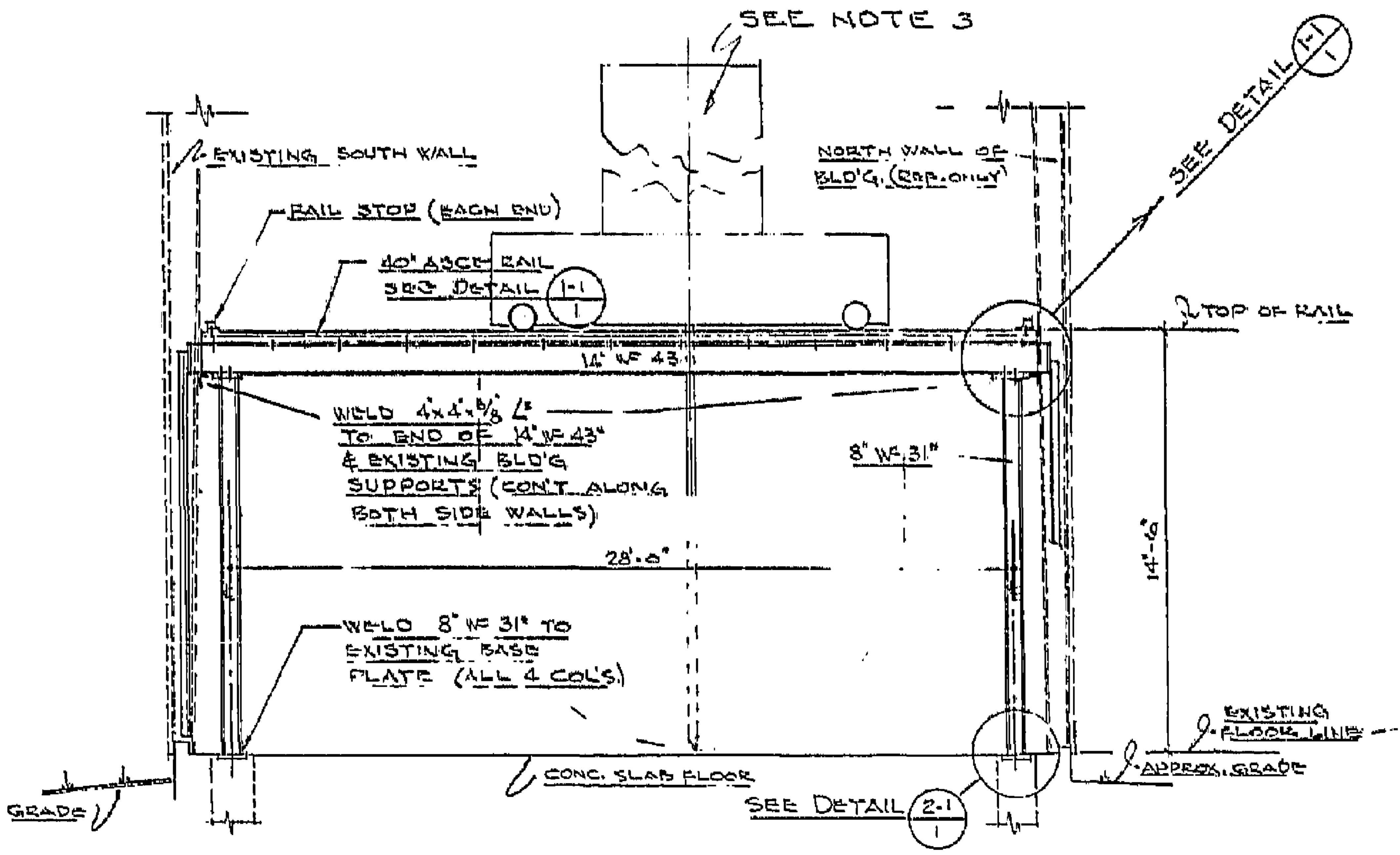


LOCATION PLAN

SCALE 1" = 50'

GENERAL NOTES:

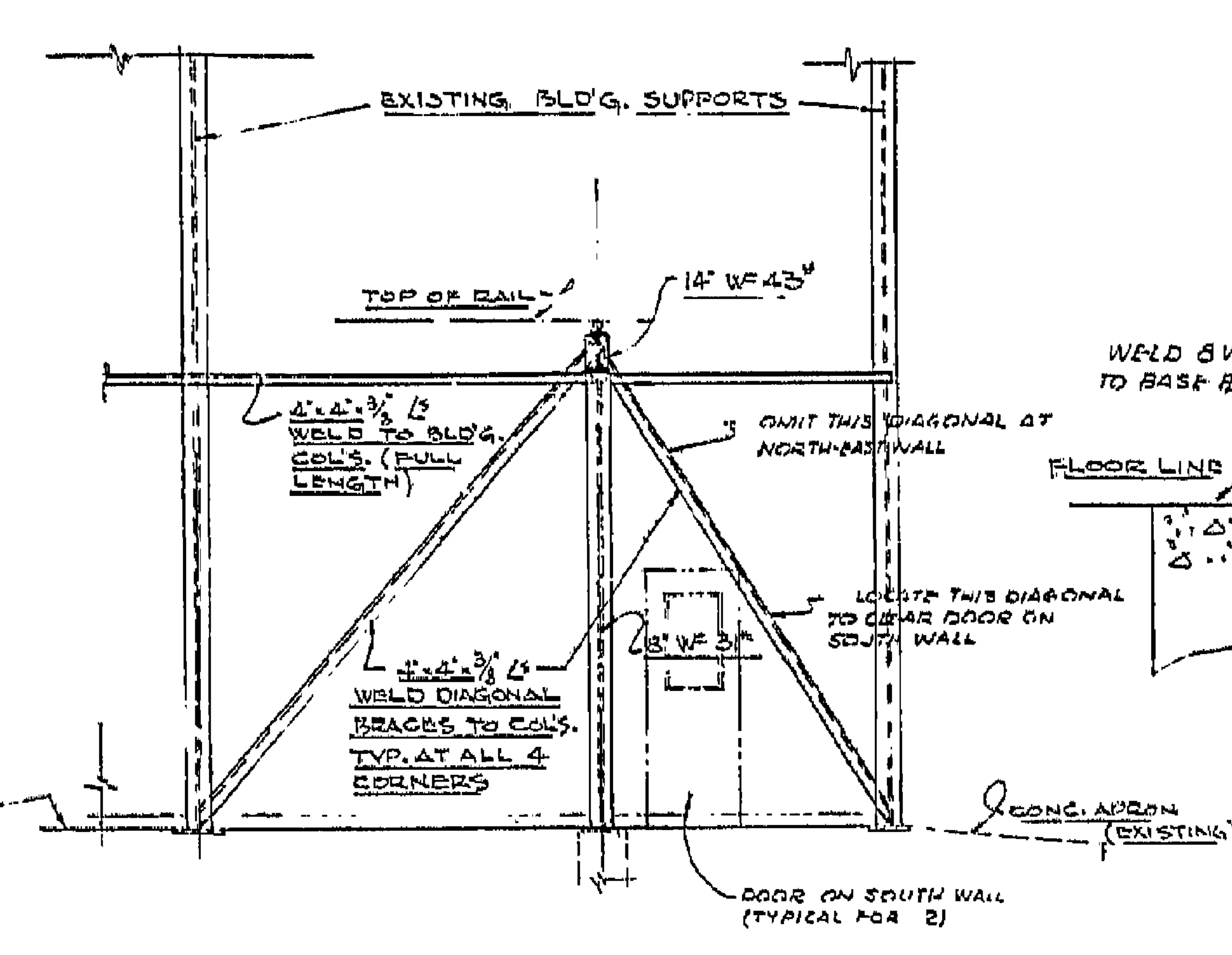
1. PAINT ALL STRUCTURAL STEEL ONE PRIMER COAT AND ONE FINISH COAT WITH 'TOTRUST'-LIGHT GRAY.
2. MINOTAUR FURNISHED BY L.A.S.L. INSTALLED BY CONTRACTOR. INSTALLATION TO COMPLY WITH MANUFACTURERS INSTRUCTIONS AND SPECS. THIS WILL REQUIRE REMOVING AND REPLACING A 20 FT. SQ. SECTION OF ROOF.
3. CRANE RAILS TO BE SET LEVEL WITHIN ± 1/16 IN ANY 10'-0" LENGTH. RAILS TO BE PARALLEL AND SQUARE WITHIN ± 1/8".
4. STRUCTURAL STEEL FOR THIS JOB ORDERED ON W.O. 6882603



ELEVATION (A-1) & (B-1)

TYPICAL CONSTRUCTION

SCALE 1/4" = 1'-0"



ELEVATION (C-1)

SCALE 1/4" = 1'-0"

B. A. NO. ______ LAB JOB NO. 2325B-52

THIS JOB MUST ... AND ANY CHANGE ...

NO.	DATE	REVISIONS	BY	CHKD	GRP. LDR.	ENG D.O.

AUTHORIZED FOR — HEALTH — SAFETY — FIRE PROTECT. — SEC. NOT APPLICABLE

LOS ALAMOS SCIENTIFIC LABORATORY

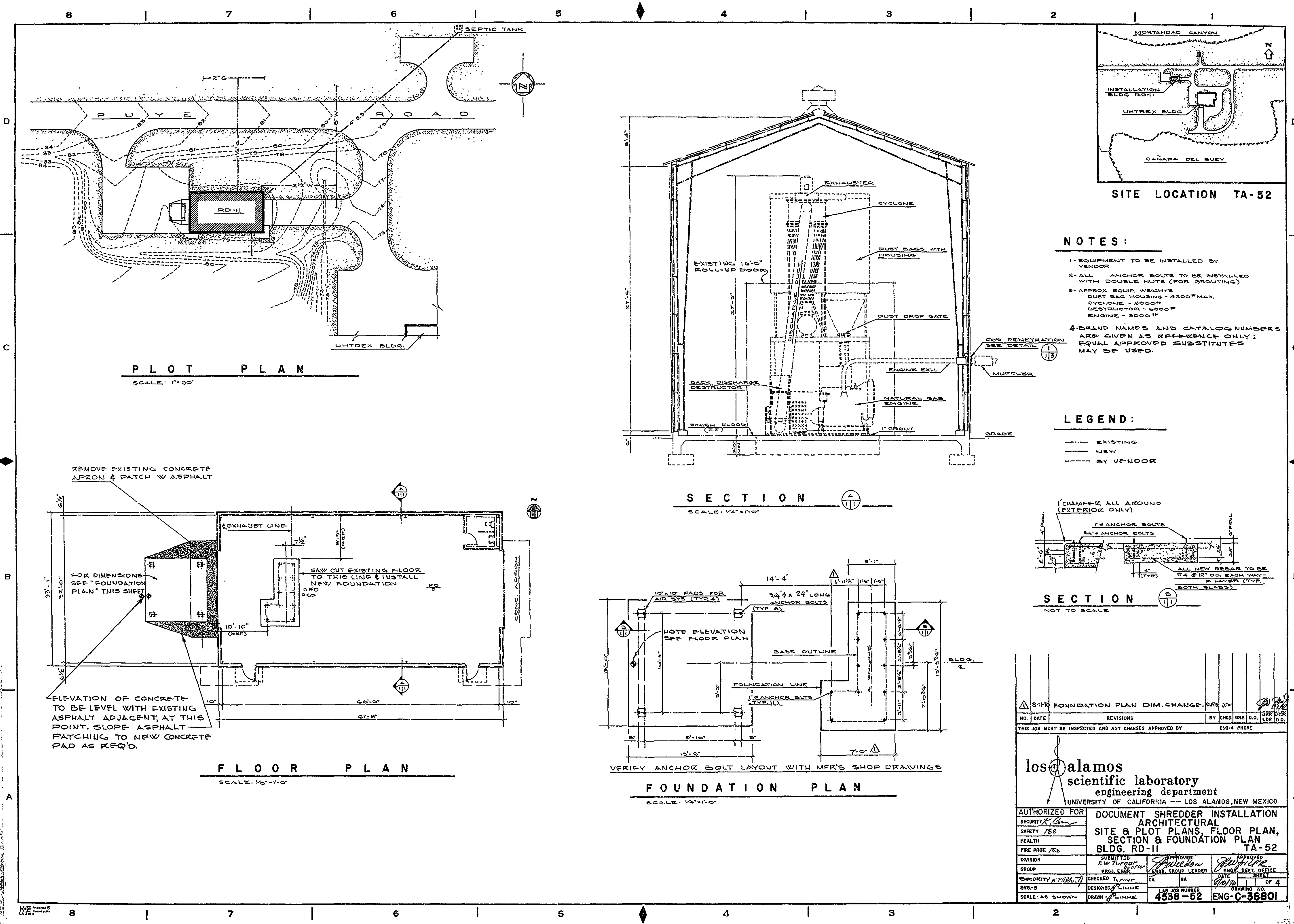
ENGINEERING DEPARTMENT

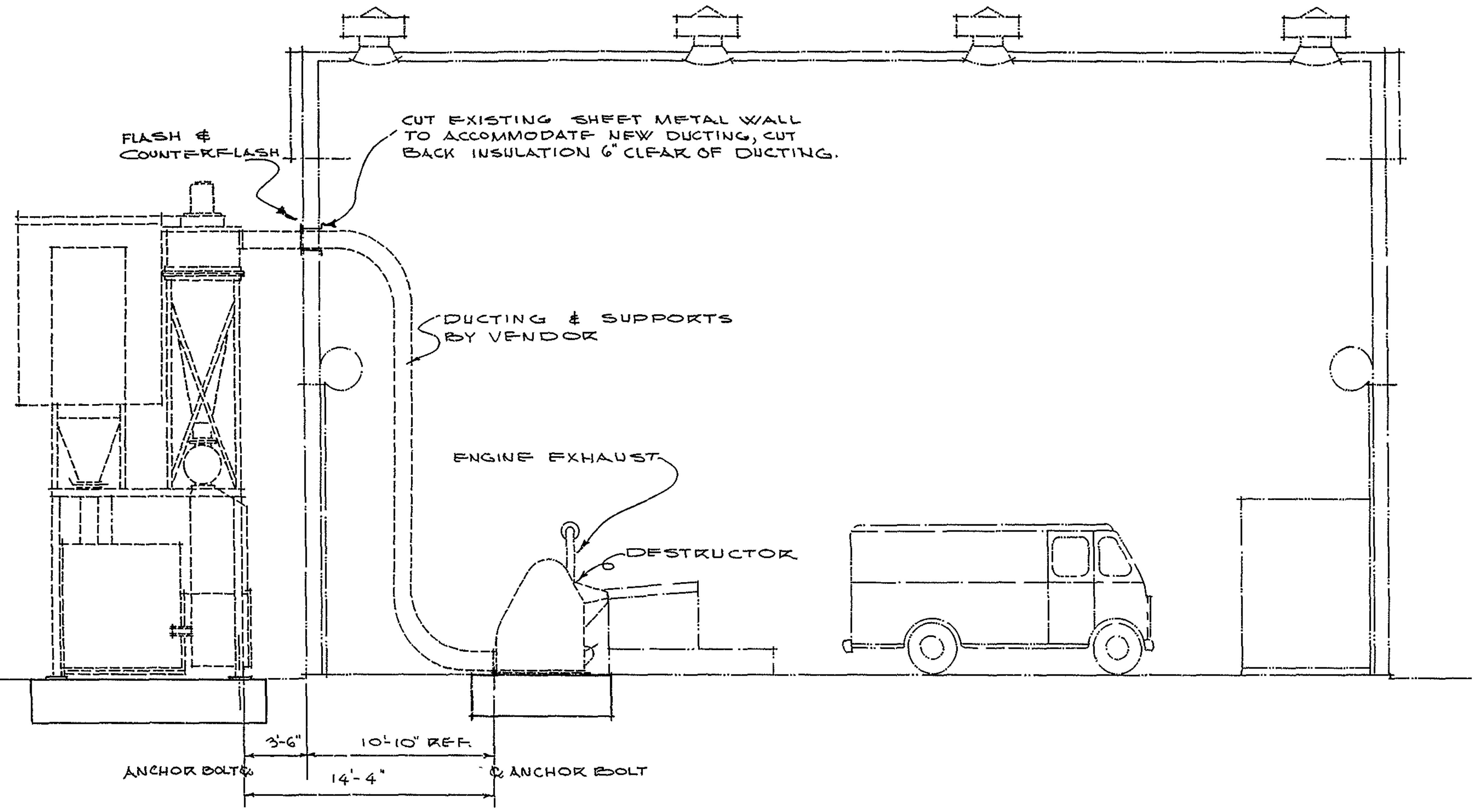
UNIVERSITY OF CALIFORNIA — LOS ALAMOS, NEW MEXICO

UHTREX FACILITIES
MINOTAUR MOCK-UP
STRUCTURAL

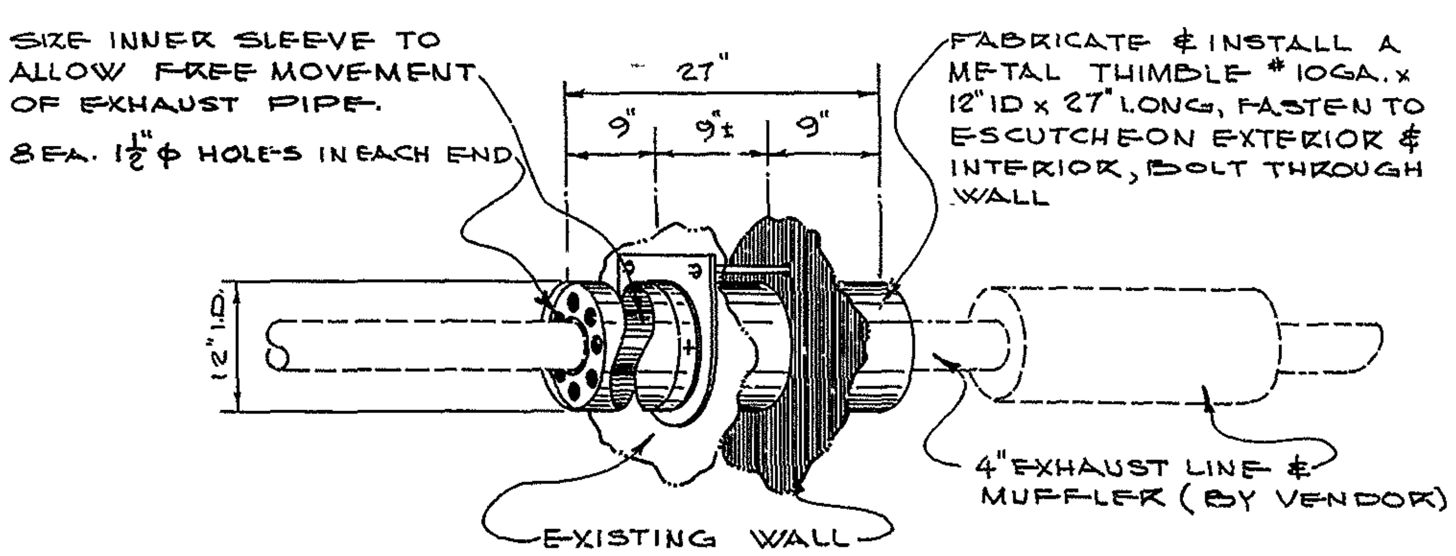
BLD'G. RD-11 TA-52

CHECKED	RECOMMENDED	APPROVED
PROJ. ENG.	GROUP LEADER	ENG. DEPT. OFFICE
DESIGNER	DATE	DRAWING NO.
DRAWN McCRACKEN	SHEET 1 OF 4	ENG-C-23103
SCALE AS NOTED		


SEPTIC TANK
P U Y E R O A D
RD-11
UHTREX BLDG.
PLOT PLAN
SCALE: 1"=30'
MORTANDAD CANYON
INSTALLATION BLDG RD-11
UHTREX BLDG
CAÑADA DEL BUEY
SITE LOCATION TA-52
EXHAUSTER
CYCLONE
DUST BAGS WITH HOUSING
EXISTING 16'-0" ROLL-UP DOOR
DISCHARGE
DUST DROP GATE
FOR PENETRATION SEE DETAIL
MUFFLER
ENGINE EXH.
BACK DISCHARGE DESTRUCTOR
NATURAL GAS ENGINE
FINISH FLOOR
1" GROUT
GRADE
SECTION
SCALE: 1/4"=1'-0"
NOTES:
1- EQUIPMENT TO BE INSTALLED BY VENDOR
2- ALL ANCHOR BOLTS TO BE INSTALLED WITH DOUBLE NUTS (FOR GROUTING)
3- APPROX EQUIP. WEIGHTS
DUST BAG HOUSING - 4200# MAX.
CYCLONE - 2000#
DESTRUCTOR - 6000#
ENGINE - 3000#
4- BRAND NAMES AND CATALOG NUMBERS ARE GIVEN AS REFERENCE ONLY; EQUAL APPROVED SUBSTITUTES MAY BE USED.
LEGEND:
EXISTING
NEW
BY VENDOR
REMOVE EXISTING CONCRETE APRON & PATCH W ASPHALT
EXHAUST LINE
FOR DIMENSIONS SEE "FOUNDATION PLAN" THIS SHEET
SAW CUT EXISTING FLOOR TO THIS LINE & INSTALL NEW FOUNDATION
CONC. APRON
ELEVATION OF CONCRETE TO BE LEVEL WITH EXISTING ASPHALT ADJACENT AT THIS POINT. SLOPE ASPHALT PATCHING TO NEW CONCRETE PAD AS REQ'D.
60'-0"
61'-8"
FLOOR PLAN
SCALE: 1/8"=1'-0"
10"x10" PADS FOR AIR SYS (TYP. 4)
3/4" ϕ x 24" LONG ANCHOR BOLTS (TYP 8)
NOTE ELEVATION SEE FLOOR PLAN
BASE OUTLINE
FOUNDATION LINE
1" ϕ ANCHOR BLTS (TYP. 11)
BLDG. ℄
14'-4"
13'-6"
7'-0"
VERIFY ANCHOR BOLT LAYOUT WITH MFR'S SHOP DRAWINGS
FOUNDATION PLAN
SCALE: 1/4"=1'-0"
1" CHAMFER ALL AROUND (EXTERIOR ONLY)
1" ϕ ANCHOR BOLTS
3/4" ϕ ANCHOR BOLTS
ALL NEW REBAR TO BE #4 @ 12" O.C. EACH WAY- 2 LAYER (TYP. BOTH SLABS)
SECTION
NOT TO SCALE
8-11-70 FOUNDATION PLAN DIM. CHANGE
NO. DATE REVISIONS BY CHKD GRP. D.O.
THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY ENG-4 PHONE
los alamos scientific laboratory
engineering department
UNIVERSITY OF CALIFORNIA — LOS ALAMOS, NEW MEXICO
AUTHORIZED FOR
SECURITY
SAFETY
HEALTH
FIRE PROT.
DIVISION
GROUP
ENG.-5
SCALE: AS SHOWN
DOCUMENT SHREDDER INSTALLATION
ARCHITECTURAL
SITE & PLOT PLANS, FLOOR PLAN, SECTION & FOUNDATION PLAN
BLDG. RD-11 TA-52
SUBMITTED
PROJ. ENGR.
APPROVED
ENGR. GROUP LEADER
APPROVED
ENGR. DEPT. OFFICE
CHECKED
DESIGNED
DRAWN
LAB JOB NUMBER
4538-52
DRAWING NO.
ENG-C-38801
SHEET 1 OF 4



SECTION (A/2|3)



METAL THIMBLE DETAIL (1/1|3)

SCALE 1" = 1'-0"

NO.	DATE	REVISIONS	BY	CHKD	GRP.	D.O.	GRP. LDR	ENGR. D.O.

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY ENG-4 PHONE

los alamos scientific laboratory
engineering department
UNIVERSITY OF CALIFORNIA — LOS ALAMOS, NEW MEXICO

AUTHORIZED FOR
SECURITY
SAFETY TEE
HEALTH
FIRE PROT TEE
DIVISION
GROUP
SECURITY
ENG-5

DOCUMENT SHREDDER INSTALLATION
MECHANICAL

BLDG RD-11 TA-52

SUBMITTED R W Turner by DRW PROJ ENGR
APPROVED ENGR. GROUP LEADER
APPROVED ENGR. DEPT. OFFICE
CHECKED R Hemphill
DESIGNED R Hemphill
DRAWN STERNER
CA
BA
LAB JOB NUMBER 4538-52
DATE 8/10/70
SHEET 3 OF 4
DRAWING NO. ENG-C-38803

ROOM INFORMATION CHART

RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
100	1878	100A	45		

TOTAL ROOM NET SQUARE FOOTAGE (BUILDING) = 1,923

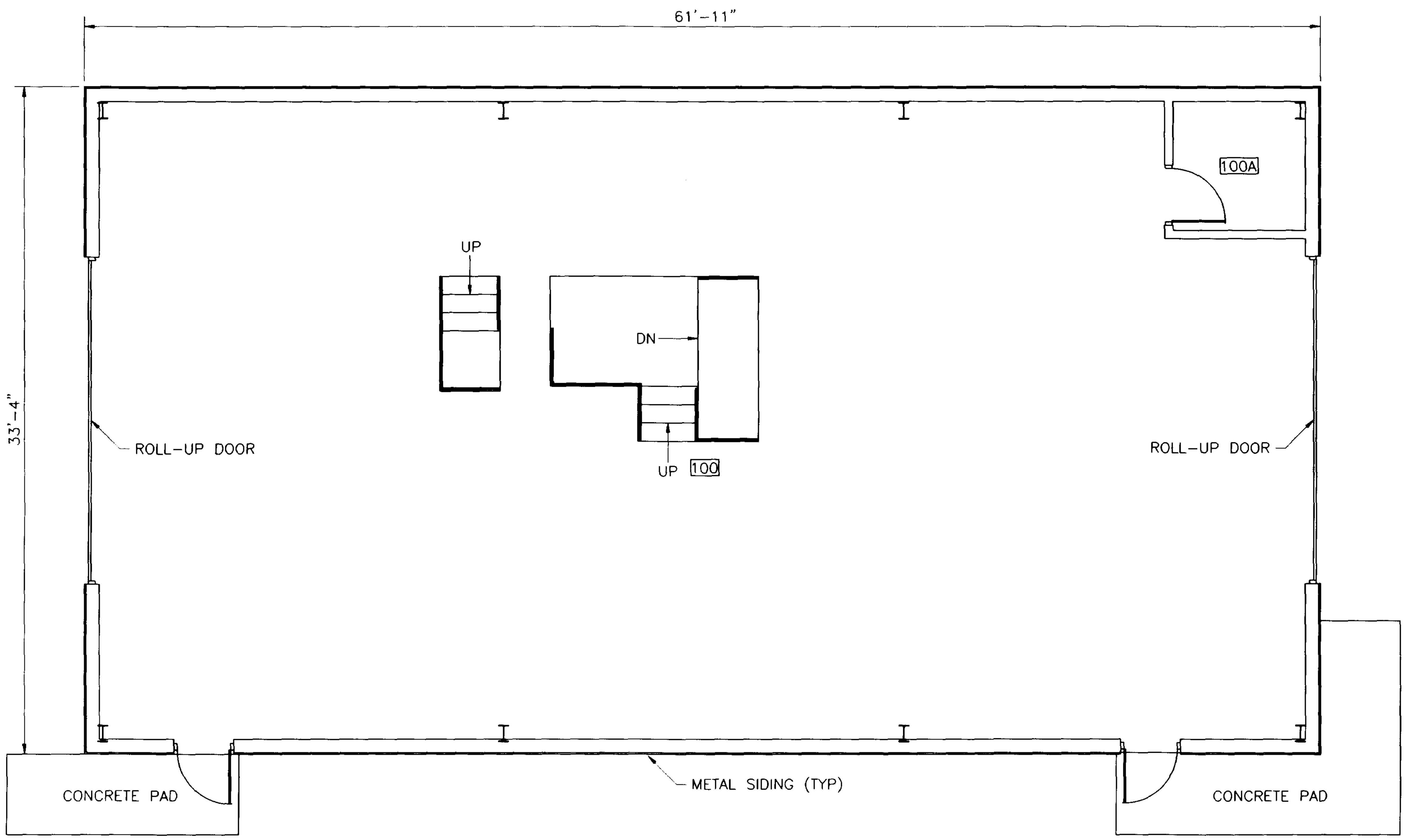
GROSS SQUARE FOOTAGE (BUILDING) = 2,064

LEGEND

(wall symbol)	WOOD OR METAL STUD
I	COLUMNS

NOTES

1. ALL EXTERIOR WALLS ARE 9" THICK UNLESS OTHERWISE NOTED.
2. ALL INTERIOR WALLS ARE 5" THICK UNLESS OTHERWISE NOTED.
3. REFERENCE DRAWING ENG-R3311.
4. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS. AREAS SHOWN ARE ROUNDED TO THE NEAREST SQUARE FOOT.
5. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, VAULTS, AND ENCLOSED PASSAGES.
6. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.



RECORD FLOOR PLAN

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

4 3 2 1 0 4 8 16
GRAPHIC SCALE

N

FIELD VERIFIED 9-11-96

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

JOHNSON CONTROLS

AS-BUILT RECORD FLOOR PLAN
MECHANICAL ASSEMBLY BUILDING
ARCH: RECORD FLOOR PLAN

DRAWN	A. MARTINEZ
VERIFIED	AB/RL
CHECKED	C. SANDOVAL
DATE	10-20-97

BLDG 11 TA-52

SUBMITTED DUANE VIGIL [signature]

APPROVED FOR RELEASE LARRY BAYS [signature]

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION U REVIEWER T. GUSDORF [signature] DATE 12-9-97

PROJECT ID 7556 DRAWING NO AB776 REV

JCI NO 91-011