Stanley R. Mickelsen Safeguard Complex
Vicinity of Nekoma, Cavalier County, North Dakota

Historic American Engineering Record Documentation for the Stanley R. Mickelsen Safeguard Complex

(HAER Number ND-9)

Volume 2
Architectural Data, and Photographs

September 1996

(Photos taken 5-18 October 1992)

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Not always present.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 401)
At gate between Avenue A and Tactical Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-A

PHOTOGRAPH

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HISTORIC AMERICAN ENGINEERING RECORD

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
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(BUILDING 401)
At gate between Avenue A and Tactical Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-A

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-A-1	VIEW FROM WEST TO EAST OF LIMITED AREA SENTRY STATION, MISSILE SITE CONTROL BUILDING CAN BE SEEN ON LEFT

HAER ND-9-A Photo List - MSR Limited Area Sentry Station

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 401)

HAER No. ND-9-A

Location: At gate between Avenue A and Tactical Road, Nekoma Vicinity, Cavalier County, North Dakota.

Significance: This station controlled the sally-port gates that permitted access into the Limited Area.[1]

Description: The Limited Area Sentry Station (LASS) was a one-story, concrete building of permanent construction that had electric, water, and sewer utilities, as well as heating and exhaust units.[2] The roof is of metal decking on steel framing, rigid insulation, and built-up roofing.

History: The Ralph M. Parsons Company designed the LASS. Chris Berg, Inc., was responsible for the building of the LASS, which was completed on 3 November 1972 at an approximate cost to the Government of $51,000. Activity was terminated at the building on 3 September 1976, with final closure 1 week later.

Sources:

Western Electric Co., Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual, No. 004, 30 September: p. 9-1.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 28.

Endnotes:

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[1] Western Electric Co., Inc., 1971. SAFEGUARD Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual, No. 004, 30 September: p. 9-1

[2] U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen SAFEGUARD Complex in Vicinity of Grand Forks, North Dakota, no date: p. 28

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE CONTROL BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 430)
Northeast of Tactical Road; southeast of Tactical Road South
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-B

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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HISTORIC AMERICAN ENGINEERING RECORD

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MISSILE SITE CONTROL BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 430)
MSCB is Northeast of Tactical Road; southeast of Tactical Road South
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-B

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-B-1	NORTHEAST FACE OF MISSILE SITE CONTROL BUILDING, COMMONLY KNOWN AS THE MISSILE SITE RADAR BUILDING, SHOWING OPEN BLAST DOOR #BD2. THIS EMERGENCY ESCAPE, AT STAIR NO. 12, IS NEMP/RFI-SHIELDED AND 16" THICK. THE LARGE CIRCLE IN THE CENTER IS THE RADAR FACE, ALSO KNOW AS THE ANTENNAE ARRAY APERTURE. THE SMALL CIRCLE TO THE RIGHT OF THE RADAR FACE IS THE "Q" CHANNEL. THE ANNTENNAE ATOP THE TURRET PROVIDED LIGTNING PROTECTION FORTHE BUILDING
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ND-9-B-4	SOUTHWEST FACE OF MISSILE SITE CONTROL BUILDING
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ND-9-B-13 MISSILE SITE CONTROL BUILDING, THIRD AND FOURTH FLOOR INTERIOR, SHOWING EAST CORNER AND FORMER ELECTRICAL EQUIPMENT AREA, ROOM #306. THIS BUILDING WAS SALVAGED AND SEALED IN THE 1970'S; THE LOWER FLOORS ALSO SUFFERED FLOODING

ND-9-B-14 Photographic copy of photograph, dated 21 July 1971 (original print in possession of U.S. Space & Strategic Defense Command Historic Office [CSSD-HO], Huntsville, AL). Photographer Unknown. VIEW OF MISSILE SITE CONTROL BUILDING TURRET WALL DURING EARLY CONSTRUCTION, ILLUSTRATING THE MASSIVE AMOUNT OF REBAR UTILIZED IN THE PROJECT.

ND-9-B-15 Photographic copy of photograph, dated 30 August 1971 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. VIEW (SOUTHWEST TO NORTHEAST) OF MISSILE SITE CONTROL BUILDING. OF PARTICULAR INTEREST IS THE UNCOMPLETED SUBTERRANEAN PORTION AND THE WORKERS, WHO GIVE AN INDICATION OF THE ACTUAL SCALE OF THE BUILDING. IN THE FOREGROUND CAN BE SEEN THE BEGINNING OF THE HEAT SINK

ND-9-B-16 Photographic copy of photograph, dated 30 August 1971 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. CLOSER VIEW OF MISSILE SITE CONTROL BUILDING TURRET

ND-9-B-17 Photographic copy of photograph, dated 20 April 1972 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. LATER VIEW OF MISSILE SITE CONTROL BUILDING. OF INTEREST IS THE ESCAPE TUNNEL, WHICH WAS EVENTUALLY BURIED UNDERGROUND

ND-9-B-18 Photographic copy of photograph, dated 20 April 1972 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. VIEW OF MISSILE SITE CONTROL BUILDING INTERIOR. AT THE INTERIOR OF THE TURRET, ONE CAN SEE THE INSPECTION FIXTURE (FURNISHED BY THE WEAPON SYSTEM CONTRACTOR) BEING INSTALLED ON THE ANTENNA ARRAY SUPPORT RING. THIS FIXTURE WAS USED TO CHECK THE LOCATIONS OF THE TAPPED HOLES THROUGH 36 SHEAR KEY LUGS

ND-9-B-19 Photographic copy photograph, dated 12 August 1992 (original print in possession of Hal Ledbetter, Dynetics, Inc., Huntsville, AL). Hal Ledbetter, photographer. VIEWOF MISSILE SITE CONTROL BUILDING PERSONNEL EQUIPMENT AND UTILITY TUNNEL (PEUT). FLOOD DAMAGE IS EVIDENT DESPITE LIMITED LIGHTING

ND-9-B-21 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers,Huntsville Division). SECTIONS "B" AND "C"

ND-9-B-22 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ROOF PLAN

ND-9-B-23 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTIAL UNDERFLOOR PLAN OF FIRST FLOOR

ND-9-B-24 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). COMPOSITE FIRST FLOOR PLAN

ND-9-B-25 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). COMPOSITE MEZZANINE FLOOR PLAN

ND-9-B-26 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). COMPOSITE SECOND FLOOR PLAN

ND-9-B-27 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps ofEngineers, Huntsville Division). COMPOSITE REMOVABLE THIRD FLOOR AND DUPLEXER AREA

ND-9-B-28 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). INTERIOR ELEVATIONS, THIRD FLOOR

ND-9-B-29 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). COMPOSITE FOURTH FLOOR PLAN, EQUIPMENT AND ACCESS PLATFORMS

ND-9-B-30 Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). INTERIOR ELEVATIONS, FOURTH FLOOR

ND-9-B-31 CUTAWAY Profile drawing of the Missile Site Radar Control Building

HAER ND-9-B Photo List - MSR Missile Site Control Building

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Photo list:

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE CONTROL BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(Building 430)

HAER No. ND-9-B

INTRODUCTION

Location: The Missile Site Radar (MSR) site is located in Section 14 and 15, Township 159 North, Range 60 West of the Principal Meridian, Nekoma Vicinity, Cavalier County, North Dakota. The site is approximately 100 highway miles northwest of the city of Grand Forks, North Dakota, and adjacent to State Highway 1. The Missile Site Control Building (MSCB) is located northeast of the Tactical Road and southeast of Tactical Road South.

Township and Range: Listed on following page.

Date of Construction: 28 April 1970 through 3 January 1973.

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers. This structure was nuclear hardened, that is, designed to withstand a nearby nuclear blast. Both the MSR with its data processing center and its power plant were nuclear hardened. The MSR was designed to be self-contained in case of attack. The MSR was a phased array radar, its beams were steered electronically instead of using heavy moving antennas. Rather than a large dish, this radar has thousands of small antenna built into each face. The MSR had a detection range of several hundred miles. It provided more precise, close-in target data than the PAR. The MSR was to ready interceptors (Spartan and Sprint missiles) for launch and then was to guide them to intercept. The MSR had four faces allowing it to operate against attackers from any direction. A research and development version of the MSR had been built at the Kwajalein Missile Range (in the Marshall Islands.) However, that version was not built partially underground like the MSR at SRMSC.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX

TOWNSHIP AND RANGE

Beginning at the Southwest corner of Section 14;

thence North 88°12'10" East along the South line of said Section 14, 3,290.09 feet;

thence North 01°34'03" West, 560.08 feet;

thence South 88°12'56" West, 250.21 feet;

thence North 01°33'24" West, 2,080.13 feet to the North line of the SE-¼ said Section 14;

thence South 88°12'00" West along said North line, 397.89 feet to the Southeast corner of the NW-¼ of said Section 14;

thence North 01°34'30" West along the East line of said NW-¼, 705.00 feet;

thence South 85°35'56" West, 1,548.79 feet;

thence South 28°24'14" West, 444.99 feet;

thence South 88°12'51" West, 872.64 feet to the East line of Section 15;

thence South 01°33'31" East along said East line, 435.48 feet; thence South 88°12'00" West, 100.00 feet;

thence South 88°50'48" West, 2,534.30 feet to the East line of the SW-¼ of said Section 15;

thence South 43°04'22" West, 682.62 feet;

thence North 46°55'38" West, 20.00 feet;

thence South 43°04'22" West, 1,466.74 feet;

thence along a 01°38'45" curve to the left, 803.78 feet;

thence South 33°18'34" East, 273.70 feet;

thence North 86°48'29" East, 1,266.36 feet;

thence South 01°35'47" East, 141.71 feet to the South line of said Section 15; thence North 88°12'29" East along said South line, 3,242.48 feet to a point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: Excavation for the MSCB began 6 April 1970. Structural concrete for the MSCB base slab was first poured on 18 June.[1] The Beneficial Occupancy Date (the allocated time for completion of the MSCB "shell" and installation of tactical support equipment) was established as 1 January 1973. The MSCB was released for occupancy to the SAFSCOM Site Activation Team on 3 January of that year.[2]

2. Architect(s): Design of all MSR tactical facilities including the MSCB was accomplished by the Ralph M. Parsons Company.[3] The Missile Site Radar itself was designed by the Raytheon Company.

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved SAFSCOM and were established as operational elements for the Safeguard system; SAFCMD soon assumed operation/maintenance responsibility.[4] The U.S. Army Air Defense Command (ARADCOM), manned by Army Surveillance Battalion, Grand Forks, was the using command.[5]

On 10 February 1976, this Safeguard facility was "abandoned in place" and put in inactive status. "Abandonment in Place" is defined as closure and seal-up of facilities to reduce potential hazards and keep care and custody to a minimum.

> MSR facilities were salvaged in 1977 and all tactical facilities secured; a portion of the site was briefly utilized by the General Services Administration. In 1982, the nontechnical facilities were declared excess by the Department of Defense and given to the Department of Interior for interim use. In 1984, the U.S. Army reacquired the nontechnical facilities to provide the Strategic Defense Initiative Organization (SDIO) timely support in the event a decision was made to deploy a ballistic missile defense system.[6]
> As of December 1991, the U.S. Army Strategic Defense Command obtained accountability for the property. It remains in inactive status under this organization, now known as the U.S. Army Space and Strategic Defense Command.[7]

4. Builders, Contractors, Suppliers: To help construct the facilities, consulting engineers and construction contractors, in addition to the aforementioned, were employed. These were Morrison-Knudsen and Associates, responsible for all MSR and PAR tactical facilities construction, including the MSCB. Their contract award totaled $137,858,850 and was dated 31 March 1970.

5. Original Plans and Construction: The MSCB was to be roofed in by October 1971 and occupied by the Weapon System Contractor a few months later.

General site excavation began for the MSCB on 6 April 1970 and continued through mid-May, at which point foundation excavation and sealing commenced and forms were placed for the concrete subslab.[8] On 18 June, the first structural concrete pouring for the base slab began, and by late August, 70 percent of the MSCB first floor and south and east walls were complete.[9] The first-floor-level slabs and walls were totally complete by mid-September, and false work and steel placement began for the second-floor slab. Fear that schedule slippage and the onset of freezing temperatures would, for all purposes, halt production resulted in an acceleration to two 10-hour, 6-day shifts a week from early October to 19 November. This allowed the second-floor slab to be finished to "seal in" the building for interior winter work, and as a result, M-KA was allowed an additional 18 days to complete the building plus negotiated cost settlements of approximately $2.5 million.[10]

During design and construction of the MSCB, the primary concern regarded offsetting the effects of nuclear electromagnetic pulse (EMP); this would result from electromagnetic fields created by detonation of a nuclear warhead within a critical distance of the site(s). In some cases, extra protection was needed against radio frequency interference (RFI), a specific band in the electromagnetic wave spectrum which could result from lightning, static, and internally generated sources, as well as warhead detonation.[11] Shielding against EMP/RFI was necessary to offset adverse effects on the electrical and electronic elements of the weapon system (e.g., damage from electrical surge or from induced currents; malfunction due to spurious signals, RFI "drowning" of true signals, or spurious flux).[12]

Since some three-fifths of the MSCB required EMP/RFI shielding and neither the building's welded rebar nor its embedded wire mesh provided the required attenuation, it was decided that a metal liner-plate shielding would be utilized for the entire building.[13] The use of 11-gauge steel was preferred as it could not only be electrically welded at its seams but could also be utilized as form material when pouring the concrete walls and structures.[14]

At this juncture the decision on how to line the MSCB was between three potential scenarios: (1) an exterior steel shield, (2) steel liner plate on the inside face of the exterior walls, on the first floor slab, and under the building and turret roof, or (3) a room-by-room steel liner plating of the walls, ceilings, and floors.[15] Though more extensive, the latter option proved preferable due to its reliability, the ease of repair and testing, and cost-effectiveness.[16]

In October, cutting, placing, welding, and testing of this liner plate began, and in mid-November, fabrication, installation, and painting of conduit and heat sink cooling lines were underway. By 7 December, as temperatures dipped as low as -25°F, completion of the MSCB second floor effectively closed in the lower level. Any remaining openings were sealed off, and this, combined with gas-fired furnaces, allowed work to continue inside the building.

On 30 March 1971, outside work resumed and concrete pouring could recommence. Progress was impeded somewhat by labor disputes, precipitation, and the annual load limits placed on state highways (to protect them during spring thaw), but by the third week in August, the third-level walls and fourth-floor slab were in place.[17] Completing the fourth floor, however, would be problematic; there was a delay in shipment of the antenna support rings, which had to be emplaced to continue work.

The antenna emplacement proved to be one of the most critical construction problems encountered at the MSCB. Holes had to be left in the upper two levels to accommodate the later arrival (May 1972) of four huge, 36-segment antenna support rings; potentially a setback in schedule, the blocked-off areas were merely winterized by temporary timber and plywood boxes.[18] Once they arrived, the support rings would have to be assembled, installed, and test-aligned before the adjoining wall surfaces could be filled in with concrete.[19] The ring and the support system constitute a tremendous load (each antenna weighed approximately 455,000 pounds) and necessitated a major engineering effort to insure that the permanent structure was not overstressed.[20] In order to block out the spaces, it was necessary to transfer the loads from the ring/support system to the building itself, a problem since the ring had to be set to machine tolerances of within 0.05 in.[21] Machine alignment of the 36 shear keys, positioned with a special test fixture, proved to be the solution; the fixture checked alignment of the plane in which the ring was set to within 15 minutes of angle.[22] The antenna ring's supports were provided by the use of towers and radial framework supported on the fourth-level slab.[23]

By September's end, the fourth-level slab and walls were complete and the roof capped.[24] With the MSCB fully closed in, little winterization was required, and by 31 December 1971, 53 percent of the mechanical and 42 percent of the electrical work were completed.[25]
From May through July of 1972, the four turret rings were assembled, aligned, and set in concrete.[26] On 3 January 1973, the MSCB was transferred to the SAFSCOM Site Activation Team, and Western Electric Company employees began installation and testing of tactical equipment.[27]

Interestingly, only the northeast and northwest radar faces were ever fully completed and activated before the complex was deactivated.[28] In February 1976, activity was terminated at the MSCB. Final closure occurred on 16 September 1977. During this time, all missiles were removed from the MSR site, missile silos were sealed, and the MSCB itself was salvaged (removal of support beams, stair rails, etc.) and sealed.[29]

These salvage operations created openings which permitted rainfall, melting snow and groundwater to enter the building and flood the first two levels. In December 1989, an on-site environmental inspection found polychlorinated biphenyls (PCBs) in the MSCB.

Within a year the U.S. Environmental Protection Agency (EPA) issued a Notice of Noncompliance against the SRMSC for violations of the Toxic Substances Control Act, and a major effort was undertaken to test, remove, and dispose of all PCB-containing sludge and debris and pump out many millions of gallons of water.[30] It was assumed that a number of PCB-containing equipment items might be located under the water flooding the MSCB and Missile Site Radar Power Plant (MSRPP).[31] The U.S. Army Strategic Defense Command, along with the Omaha District and the U.S. Army Corps of Engineers, Huntsville, completed the cleanup.[32] By 23 January 1992, all structures were dewatered.

Other PCB-related work included:

- Removal of approximately 150 tons of delaminated building material and debris from the MSCB lower level (Bridge Crane Rooms, Room 129, Ballast Room, Electrical Repair Shop and connected rooms) and MSRPP (Prime Mover Modules 1 & 2, Motor Generator Room)[33]

- Removal of RFI capacitors and adjacent debris and floor tiles from rooms 242/243 and 253[34]

- Removal of RFI capacitors and adjacent debris and floor tiles from rooms 129, Ballast Room, and the Electrical Repair Shop (removing the entire steel floor)[35]

- Removal of lighting ballasts from the MSCB mezzanine (100 total), second floor (1336 total), third floor (173 total), fourth floor (40 total), tunnel (873 total), and power plant tunnel (233 total)[36]

- Removal of RF filters from the MSCB mezzanine (8 total), second floor (122 total), third floor (16 total), fourth floor (14 total), MSCB tunnel (78 total), and power plant tunnel (10 total)[37]

- Removal of 1 inch of concrete from the upper portion of the MSCB unloading dock[38]

Although the extent has not been determined, some additional alteration to the building's interior may have occurred during a testing phase in 1977. On 9 November 1976, word was received from the Safeguard Project Office to retain certain items at the MSCB to support Federal Aviation Agency (FAA) and Defense Nuclear Agency (DNA) explosive testing. Requested for use were rooms 113, 114, 130, 132, and 142; a corridor; rooms 241, 242, and 243 (after all floor installed equipment had been removed); and the MSCB's utilities and elevator. It was stated that, "after testing, exterior damage to the facilities will be repaired and the facilities restored to a weathertight, secure condition," but added, "interior damage need not be repaired."[39]

The DNA performed the explosive tests for the FAA during July. They were considered successful in developing criteria for hardening baggage storage and locker areas of airport terminals to contain the explosive effects of small expedient bombs.[40] The extent of any interior damage to the MSCB has not been determined. Regardless, the corrosion and water damage caused by the later flooding would primarily have affected the two floors wherein the testing occurred and undoubtedly accelerated the room's deterioration.

PART II. ARCHITECTURAL INFORMATION

A. General Statement

Design criteria required that both the MSCB and its power plant sustain the effects of a nuclear attack with all critical systems remaining operational.[41] As a result, the MSCB was hardened and designed to contain both the MSR and all tactical operational control functions associated with surveillance, target acquisition, and Safeguard missile guidance and control.[42] Maintaining its own support facilities, the MSCB could completely seal itself up, permitting uninterrupted operation (including its air supply) during and after enemy attack, even when the outside environment became intolerable.[43] Protection was thus afforded both to personnel and the intricate machinery powering and powered by the radar faces.

The MSCB is the heart of the MSR complex; it monitored and controlled its onsite Sprint and Spartan missile fields and four Remote Sprint Launch sites and provided the terminal defense line for nearby MINUTEMAN missile fields, protecting a geographic area of approximately 600 by 900 mi.[44] It contained equipment capable of detecting and identifying multiple enemy targets, destroying them via the launch and guidance of its interceptor missiles, Spartan and Sprint. The equipment required for this task included radar, data processing equipment, control and monitoring equipment, and environmental and test support equipment.[45] The weight of the building is estimated to be 160 million pounds.

The MSCB is a massive, partially buried reinforced concrete building with five levels, and the predominant structure at the MSR site. The major portion of the building (two stories) is subterranean; the height of the exposed section is approximately 75 ft, and it contains the four phased-array radar antenna faces.[46] This above-ground area is often referred to as the "turret" of the MSCB. Its peculiar polyhedral shape resembles that of a cropped pyramid. The MSCB has 2 ft of earth cover over the high underground portion (225 ft^2 by 65 ft).[47] In order to meet established structural design criteria, rigorous dynamic analysis was accomplished. The building's configuration was also influenced by the need to optimize its radars' performance.

1. Architectural Character: The MSCB merits recording by reason of its steel-reinforced liner-plate shielded design which protects it against nuclear weapon effects and its role in early ballistic missile defense and as a pivotal figure in the SRMSC the only antiballistic site ever completed in the United States as a whole.

2. Condition: Structurally sound, the MSCB has been in inactive status since 1978. Prior to this, the building was salvaged, permitting later flood damage.[48]

B. Description of Exterior

1. Overall Dimensions: The overall dimensions of the MSCB are 127,384 ft^2, with the usable area encompassing four major floors (two subterranean and two located within the turret) and several mezzanines.

The underground building volume has dimensions of 231 ft by 231 ft by 53 ft in height, whereas the above-ground exposed antenna turret has outside base dimensions of 136 ft by 136 ft. Turret walls are sloped at an angle of 56 degrees from the vertical, and its height is 79 ft with a 39-foot square roof.[49]

2. Foundations: The MSCB foundation is a 4-foot thick slab, thickened at outer walls and at concentrations of load-bearing areas.[50] The foundation mat design employed a combination of flat slab, one-way, and two-way slab systems for vertical loads, and is designed as a diaphragm for lateral loads.[51]

3. Walls: Exterior walls (3 ft thick) were designed for vertical load bearing and as one-way or two-way slabs for dynamic lateral loads normal to the walls. In addition, they were designed as shear walls to resist dynamic loads due to nuclear weapons effects and soil pressures parallel to walls.[52] The walls, including the subterranean portion, were covered with a waterproof coating.[53]

4. Structural System, Framing: MSCB design considered an average concrete strength of 5,000 psi and reinforcement with a 60 ksi yield and included a considerable number of 18S bars.[54] The concrete was required to have a 28-day strength of 4,000 psi and a 1-year strength of 5,000 psi; MSCB design loads were developed considering the results of dynamic analysis.[55] The reinforcing steel of the MSCB shell allowed for a limited degree of EMP attenuation.[56]

Lightning protection for the MSR site was provided via installation of nine air terminals on the turret roof of the MSCB connected by down-conductors to the buried ground loop and to the MSRPP ground counterpoise grid; air terminals were also provided for each diesel air intake/exhaust stack, cooling tower, and public utility substation.[57] Not only the MSCB but the fences, lighting standards, and radar antennae were all equipped with lightning protection.[58]

Corrosion protection was provided for buried conductors such as electrical/communication conduits, utility piping, exterior steel shielding (as in the Sprint Launch Station) and the grounding counterpoise.[59]

5. Radar: Attachment for the radar antenna and antenna adaptor consists of a heavy steel antenna support ring installed in each of the four turret faces, consisting of a 30-foot inner-diameter steel ring with 36 shear keys; each was spaced equally about the perimeter to support the load, and the ring itself was embedded in concrete, leaving the inner diameter as the perimeter turret opening. The steel ring does not contribute to the strength or stiffness of the opening. The rings, fabricated of rolled steel plate, were electrically and magnetically continuous, and continuously welded to the building's steel liner plate.[60] The shear keys support the weight of the antenna (over 400,000 pounds), and were designed to resist transient loads due to wind, earthquakes, and nuclear weapons effects. The weight on the shear keys was in directions normal to the plane of the ring, tangential to the ring and radially from the ring centroid.[61]

Three equipment items were exposed directly to the potential of nuclear burst and thus were designed to withstand dynamic pressure and thermal loadings rather than building motions. They are listed as follows:

Antenna Array Support Structure Because of its importance and potential vulnerability, the array (two homogeneous plates connected by a continuum of tubes) received the most careful attention and accurate analysis of any part of the system. Vibration of the array was known to cause signal distortion and attenuation, so the array center deflection was limited to 0.5 in.

Antenna Adaptor The antenna adaptor was a donut-shaped structure which functioned as a support for the MSR array.

Q-channel Antenna The Q-channel antenna was a circular plate with a hole, supported at both the inner and the outer circumference. The "plate" was actually a sandwich of three plates, the outer plate was copper, the inner plate was steel, and the center plate was transit.[62]

For each of the four radar apertures, a RF gasket was installed to ensure shielding continuity between the antenna ring, support structure, and adaptor.[63]

6. Openings:

a. Doors Two 16-inch-thick emergency escape doors, one on the second floor (No. 278), the other on the third (No. 310), provided egress as well as protection. The door leaves were heavy, blast resistant steel plates with gas seals (to exclude radiation) and conductive gaskets (for shielding continuity).[64] Both were operated manually and pneumatically. Door No. 278 provided egress from an EMP-shielded area into an escape tunnel, and Door No. 310 was located at a third-floor EMP/RFI shielding zone.[65] Both were similar in construction and operation, providing passage openings of 3 ft by 7 ft.[66] Each door was locally operated and provided with a means to permit remote monitoring and securing from the Equipment Readiness Center.

b. Tunnels The MSCB has three tunnels: an emergency escape; the Personnel, Equipment, and Utility Tunnel (PEUT); and the Launch Area Utility Tunnel (LAUT).

Emergency Escape The 100-foot-long emergency escape tunnel was located on the second floor. Extending from the north side of the MSCB to an unloading dock and ramp, the 13-foot, 10-inch by 12-foot, 2-inch corrugated metal plate arch tunnel was equipped with handrails and had bituminous flooring; only 55 ft were subterranean.[67]

PEUT The MSCB was accessed by its power plant through the PEUT, Facility 0435. The PEUT was a hardened, reinforced concrete, buried structure which had an integrally formed two-story, separately shielded communications vault, sewage pump room, and utility entry mezzanine on one side.[68] The lower portion allowed personnel and equipment ingress and egress.[69]

The upper level was utilized for routing the MSCB electrical conduits, as well as conduits for fire alarm, security, warning and communication circuits, transmitter oil, cooling and heating water piping services, and makeup environmental air supply and return ducts between structures.[70] This tunnel also contained lift pumps for sewage and industrial waste. Electrical power for the launch area was also routed through the PEUT to the junction with the LAUT. A separately shielded two-level communication vault was provided for entry of intersite and intrasite communication cables. Out-to-out dimensions are 50 ft by 38 ft by 36 ft in height.[71] Flexible junctions (to permit differential movement) were provided for all utility connections to the MSCB and the MSRPP. A flexible liner-plate shielding connection provided EMP protection at the MSCB junction.[72] The tunnel's interior walls were also lined with 11-gauge sheet steel.

All services entering the MSCB through the PEUT were routed through steel pipe, conduits, or metal ducts which were seal-welded to the liner-plate shielding or to the steel bulkhead at the point of penetration.[73] A steel barrier (bulkhead) located near the MSRPP end served as the point of entry to the liner-plate shielding for all utilities from the MSRPP. The bulkhead was provided with a shielded personnel and equipment door. The two-level communication vault was shielded as an EMP/RFI zone. Space was provided in the communication vault for the installation of EMP filters and/or suppressors on incoming communication cables.[74] The exterior underground surface of the PEUT was provided with a waterproof coating.[75]

This hardened, underground utility tunnel housed all services between the MSCB and the Missile Site Launch Area, including circuits for 4,160 volt primary electrical power, instrumentation, communication, and monitoring and control.[76] The LAUT also provides access between the MSCB and the Missile Site Launch Area.

The LAUT was constructed of corrugated iron pipe and consisted of three basic sections: a 7-foot diameter section joined to the PEUT and the cable entry structure (CES) and attached to the MSCB at Room 201; a 8-foot diameter section between the CES and the Launch Field terminating at an underground concrete shielded structure identified as terminal structure "A" (TS-A); a 7-foot diameter section of LAUT between TS-A and a similar structure, TS-B, in the Launch Area.[77] A flexible wire cloth and copper sheet joint were provided at the MSCB and LAUT junction for electrical continuity between the tunnel walls and liner-plate shield to permit differential movement between structures.

The LAUT was designed with continuously welded seams and structural penetrations all inspected by the magnetic particle process. The tunnel provided continuity in the EMP/RFI shielding of the MSCB. All wiring other than Weapon Systems Contractor (WSC) cables were contained in electrically-continuous conduits where routed through the LAUT, whereas sensitive WSC data communication cables were equipped with RFI filters in the CES for additional protection.[78]

The WSC data communication cable was routed through the LAUT on open trays. The tunnel sections were connected to the PEUT and CES by the flexible wire mesh junctions. The exterior underground surface of the LAUT was provided with a waterproof coating.[79]

c. Security Penetrations Capped sleeves, welded to the liner plate, were provided with space allocated for installation of appropriate filters; filters were installed in the security circuits at the penetration of the EMP/RFI shielding zones.

d. Other Penetrations Numerous penetrations of the MSCB exterior (building shell) surfaces were present. They included:

- Antenna array apertures, one in each sloping wall of the turret, four total
- Antenna washdown pipes, one automatic and one manual adjacent to each aperture, eight total
- Very Low Frequency (VLF) antenna opening in the roof of the turret, one total
- Q-channel antenna opening, one in each sloping wall of the turret, four total
- Transmitter warning horn cableways, one in each of the four sloping walls of the turret

- Vent for the Inert Gas (SF_6) Pressurization System in the sloping north wall of the turret, one total
- Telephone and electrical outlets, one telephone, and two electrical near the base of each sloping wall of the turret, 12 total
- Hose bibs, one near the base of each sloping wall of the turret, one total
- Waveguide entry for Weapon System Equipment (WSE) in the vertical east wall below the third-floor level, one total
- Emergency Escape Hatch in the roof of the CES, one total (This hatch was provided with a blast-hardened, EMP/RFI-shield gasketed cover to be welded shut when material handling operations were completed. Escape hatch for the LAUT (in TS-B) could be opened from the inside only.)[80]

Piping, tunnels, conduit, and sleeves were welded to ground grid fans. The interface with the tunnels and the PEUT included flexible connections as required for shock strains.[81]

7. Roof Characteristics: The turret roof was composed of concrete with elastomeric roofing.[82] It is 140 ft^2 in plan and designed both to carry vertical loads and to transfer lateral loads to the shear walls.[83] The subterranean roof is concrete with earth backfill.

C. Description of Interior

Each room, corridor, and separate enclosure was individually lined to avoid compromising the structural integrity of junctions between interior floors, walls, and columns and the exterior walls, roof, and floor slabs. Concrete columns were covered with steel liner-plate welded at the seams and at floor and ceiling junctions.[84] Only interior non-load-bearing partitions separating rooms in the same shielding zones were exceptions. Here the liner-plate shielding was permitted to penetrate partition junctions at the floor, ceiling, and walls.

Areas within the MSCB with differing shielding requirements were separated into "zones." There were 10 separate EMP/RFI zones required for Weapon System Equipment (WSE), and the remainder of the building was an EMP-only shielding zone for protection of tactical support equipment (TSE). The 10 EMP/RFI zones were designated as zones RA through RN; the remainder of the building was designated as the E-1 zone.[85]

Typically, the MSCB liner plate was supplied in 4 ft by 10 ft sheets butted together and held in place against the concrete walls and ceilings by embedded weld studs attached to the liner plate on 2-foot centers.[86] An embedded backup bar was provided behind each liner plate seam and all seams were continuously welded and inspected by the magnetic particle process to ensure no flaws or gaps would compromise the shielding continuity.[87]

1. Floor Plans: The MSCB had approximately 127,384 ft^2 of usable floor area (out of 162,522 ft^2 of total area). There are two subterranean main floors, and two above-ground turret floors which housed weapon and tactical support equipment associated with the four phased arrays. The floor system in the MSCB consisted of three elements: a structural floor, air plenum, and cable routing space. The structural floor, or main load supporting element, was reinforced concrete slab supporting all the loads between the vertical support members, walls, and columns. Above this, the air plenum was formed by a 6-inch reinforced concrete slab called the raised floor, supported by steel frames and supporting all tributary loads above itself, transmitting them to the structural floor. A removable floor, composed of 2 ft by 2 ft panels supported by steel posts, formed the cable routing space above the raised floor and air plenum.[88]

The floors were designed as either flat slabs, one-way, or two-way slabs to carry vertical loads. In addition, they were designed as diaphragms to transfer lateral loads to the shear walls.[89]

Liner-plate room shielding for each floor of the MSCB was bonded to the adjacent floor shielding by 0.125-by-2-inch steel jumpers located on 2-foot centers around the building perimeter walls.[90]

Floor space within the building is allotted on the concept that the radar has priority over other equipment. Consequently, to minimize RF and power losses and to optimize radar performance, all RF and electronic links between the antenna arrays and associated radar equipment were designed to be equal and of minimal length. To meet these requirements, the radar equipment, except for the transmitter elements, occupies the floor areas immediately below the turret.[91]

a. Basement Beneath the oil pumping room and transmitter area on the first floor was the basement oil storage area. This area contained oil storage tanks and industrial, sanitary, and oil waste sumps.[92] The underside of certain first-floor rooms can also be seen.

b. First Floor The first floor contained the life support storage and area; a corridor; transmitter cooling and control rooms; an oil pumping room; High Voltage Power Source (HVPS) rooms (nos. 1 and 2) with control rooms (nos. 1 and 2); a klystron room; tube treatment room; elevator machine room; and miscellaneous repair shops, vestibules, storage areas, and air locks.[93]

c. Mezzanine A mezzanine contained digital rack power supply rooms; a technical supply management center; parts storage; miscellaneous shafts and restrooms; and the upper level of some first floor rooms.[94]

d. Second Floor The second floor contained electronics areas (including Missile Site Data Processing [MSDP]); Equipment Readiness Center (ERC) and System Readiness Verification (SRV) rooms; Ballistic Missile Defense Center (BMDOC); Army Air Defense Operation Center (AADOC); offices; computer rooms; mechanical and electrical equipment rooms; a crypto room; data terminal room; tape handler room; calibration rooms; administration and storage rooms; microwave room; corridors; and miscellaneous repair, vestibule, and service rooms.[95]

The command and control areas and tape handler room had removable floors, permitting changes to cabling and equipment without affecting the concrete floors. Ducts constructed for air conditioning and cabling allowed them to be routed through the floor.[96]

The interior areas of both the first and second floors were shielded from any exterior EMP influence by liner plate on walls, floors, and ceilings; by RFI-gasketed, blast-hardened exterior doors; by the peripheral welding to the liner plate of all penetrations for conduits, ducts, and piping; and by waveguides in airducts.[97] Openings between rooms within the same shielding zone were lined for shielding continuity but were not equipped with shielded doors, waveguides, or electrical filters.[98]

e. Third Floor and Duplexer Platform The third floor occupies the lower portion of the turret. This floor contained mechanical and electrical equipment rooms, a telephone closet, drive amplifier racks, cable fallout equipment, control/monitor equipment, and associated cooling equipment. The third floor was removable.[99]

In the center of the third floor was an RF-shielded paramp (parameter amplifier) room, with an RF duplexer area located directly above which held microwave devices associated with the radar receivers. Access to the third floor was by stairs and the equipment elevator; personnel access above the third floor was by ladder; equipment access was by hoists.[100]

The interior areas of the third floor (and the duplexer area) were shielded from any exterior EMP influence by liner plate on walls, floors, and ceilings; by RFI-gasketed, blast-hardened exterior doors; by the peripheral welding to the liner plate of all penetrations for conduits, ducts, and piping; and by waveguides in airducts.[101] Openings between rooms within the same shielding zone were lined for shielding continuity but were not equipped with shielded doors, waveguides, or electrical filters.[102]

f. Fourth Floor The fourth floor housed and supported the four phased-array antennae, four Quality ("Q") antennae, RF chambers, feed-horn comparators, and cooling equipment.[103] A shock-isolated platform situated above the fourth floor contained the antenna support equipment; the antennae were oriented at 90 degrees from one another, with each array line-of-sight displaced 56 degrees from vertical.[104]
The interior areas of the fourth floor (and the equipment and access platforms) were shielded from any exterior EMP influence by liner plate on walls, floors, and ceilings; by RFI-gasketed, blast-hardened exterior doors; by the peripheral welding to the liner plate of all penetrations for conduits, ducts, and piping; and by waveguides in airducts.[105] Openings between rooms within the same shielding zone were lined for shielding continuity but were not equipped with shielded doors, waveguides, or electrical filters.[106]

2. Stairways: There were a total of 16 sets of stairs in the MSCB, all removed during the salvaging process. The first level stairs had a VAT finish.
An elevator and stairway No. 1 extended from the first floor (Room 118 and 119) to the Duplexer Area.[107]

Room 126 was Stairway No. 2 and provided passage between the first floor, mezzanine, and second floor.[108]

Stairway No. 3 originated in room 108 and accessed the second floor.[109]

Stairway No. 4 originated near room 102 and accessed the mezzanine.[110]

Stairway No. 5 (from room 125) provided passage to the mezzanine (near room M2).[111]

Stairway No. 6 originated in the mezzanine and accessed room 229, the MSR electronics area.

Stairway No. 7 originated in room 239 and accessed a small mezzanine above.[112]

Stairway No. 8 originated near room 257.[113]

Stairway No. 9 exited from room 252.[114]

Stairway No. 10 exited from room 250, leading to the 3rd floor.[115]

Stairway No. 11 exited near Mechanical Equipment Area 305, allowing access to the removable third floor area.[116]

Stairway No. 12 exited from the third floor.[117]

Stairways No. 13 and 14 exited from near Mechanical Equipment Areas 306 and 304, respectively, to the removable third floor.[118]

Stairways No. 15 and 16 originated near the Duplexer Area and accessed the Cable Support Area.[119]

3. Flooring: About 60 percent of the MSCB floor area was shielded for RFI/EMP protection of sensitive WSE.[120]

The original floor finishes in the MSCB were as follows:

All basement floors were of liner plate.[121]

The first level had heavy-duty epoxy over concrete (27 rooms); vinyl asbestos tile (VAT) (vestibules and Maintenance Data System rooms 121 and 122); standard epoxy (custodian's and men's rooms); steel plate ground plane (6 rooms); and liner plate with epoxy paint (9 rooms).[122]

The mezzanine had heavy-duty epoxy (7 rooms); VAT (2 rooms); removable VAT panels (2 rooms); and standard epoxy (2 rooms).[123]

The second level had heavy-duty epoxy (30 rooms); VAT (12 rooms); removable VAT panels (15 rooms); and standard epoxy (7 rooms); liner plate with epoxy paint (crypto and cable entry rooms).[124]

The third level had heavy-duty epoxy (5 rooms); removable VAT panels (2 rooms); standard epoxy (telephone closet).[125]

The duplexer area/corridor was predominately heavy-duty epoxy flooring; metal grating (cable support area).[126]

The fourth level had all liner plate with epoxy paint.[127]

4. Wall and Ceiling Finish: The original wall finish in the MSCB was as follows:

The basement finish was liner plate, and HVPS rooms were exposed concrete underneath.[128]

The first level was liner plate (all rooms); gypboard (5 rooms); and wire partitions (4 rooms).[129]

The mezzanine had liner plate (all rooms), and gypboard (5 rooms).[130]

The second level had liner plate (58 rooms); gypboard (30 of the 58 rooms); gypboard without liner plate (7 rooms); acoustical treatment (14 rooms); exposed concrete (2 rooms); wire partitions (2 rooms); and exposed metal studs (equipment room 213).[131]

The third level had liner plate (all rooms) and exposed concrete (equipment areas).[132]

The duplexer area had all liner plate.[133]

The fourth level had all liner plate.[134]

The 1.5-foot-thick interior walls were vertical load-bearing walls, one-way slabs for dynamic lateral loads normal to the wall, and shear walls to resist dynamic lateral loads parallel to the walls.[135] All interior walls and ceilings were lined with an 11-gauge steel liner plate continuously welded at all seams.

The original ceiling finish in the MSCB was as follows:

The basement was of exposed concrete.[136]

The first level was liner plate (4 rooms), gypboard (3 rooms), and acoustical treatment (HVPS No. 2 control room).[137]

The mezzanine was liner plate (12 rooms) and gypboard (men's room and vestibule).[138]

The second level was liner plate (34 rooms); gypboard (11 rooms); acoustical treatment (10 rooms); luminous ceiling (6 rooms); and metal decking (4 rooms).[139]

The third level was liner plate (telephone closet & paramp room) and structural grid (mechanical equipment areas & antenna electronics room).[140]

The duplexer area was all liner plate.[141]

The fourth level was also entirely liner plate.[142]

The building perimeter wall shielding on each floor was interconnected with adjacent floor shielding by strap conductors through the concrete slabs separating the floors. Additional shielding was provided by the reinforcing steel embedded in structural concrete, the ground system, and the earth cover.[143]

5. Openings:

a. Doors Thirty shielded doors were present within the MSCB. Doors between rooms within the same EMP/RFI shielding zones were conventional, whereas those separating or bounding the zones had a sheet steel jacket and either conductive gaskets or metal finger stock encompassing the perimeter to ensure and electrical continuity with the door's enclosing frame or casing; the casing was seal-welded to the liner plate.[144]

The MSCB had four ventilation system fire doors which were capable of containing fire within specific areas. Two were located between the transmitter cooling room (No. 310) and the oil pumping room (No. 131); one was located between the microwave room (No. 248) and corridor No. 247.[145] The doors operated as guillotines, closing off ventilation system air flow at these critical ducting points.[146]

6. Mechanical Equipment:

To survive the shock environment within the structure, equipment was either ruggedized (for example, waterlines included surge arresters to prevent equipment damage) or "shock isolated," wherein flexible connections were required between hard-mounted lines and the equipment in question to provide for the possibility of substantial blast-induced relative motion.[147]

In other words, components and subassemblies were not directly attached to the doors and walls of the MSCB. Rather, they were mounted to structures which attached to the building. For example, relays, circuit boards, and pumps were mounted typically in open frame racks, which were mounted to the building floor. Special mountings were provided for equipment considered vibration-sensitive and junctions (with flexible joints) to and between structures to allow shock-induced differential displacements without structural rupture.[148] Many items of electronic equipment and the majority of electrical and mechanical support equipment were mounted in this way. Also, partitions, suspended ceilings, raised floors, pipe runs, ducting, electrical conduits, and cable trays were designed to withstand the computed internal shock environment.

Via galvanized rigid-steel conduits to the substation transformer primaries, the main source of electrical power was distributed from shielded and grounded switchgear in the MSRPP to all electrical loads within the MSCB.[149] All conduits and ducts entering the RFI shielded areas were equipped with filters designed to attenuate RFI. All anchorage for equipment cable trays, duct work, and cabinets was attached directly to steel bearing plates which were embedded in the concrete and continuously welded to the steel liner plate to maintain shielding integrity.[150]

a. Communications Public address and television systems serviced the MSCB; also available were black, red, and maintenance telephone systems. The black telephone system was used for normal intra- and inter-building communications, as well as linking to off-site telephones. The red telephone system was employed in high-level tactical communications.[151]

Red and maintenance telephone conduits originated in the liner plate shielded area of the MSRPP, whereas television and black telephone conduits entered from a rebar shielded area.[152] Each of these steel conduits had conductive and permeable joints and were peripherally welded to the metal barrier in the PEUT and to the liner-plate shielding at each penetration.[153] At the penetrations for RFI containment/exclusion rooms, spaces were provided for the RFI filters.[154]

b. Heating, Air Conditioning, Ventilation The MSCB was provided with electrical energy, antenna cooling water, high purity water, hot water, nitrogen, ventilating air, and compressed air by the MSRPP.

The MSCB had 14 air-handling units, 13 cooling coils (ranging in capacity from 13,300 to 66,350 cubic feet per minute [CFM]), and 12 heating coils (ranging in capacity from 750 to 32,800 CFM).[155]

Thirteen supply fans (ranging in capacity from 4,400 to 27,700 CFM) serviced the heating coils and two exhaust fans (located in the mechanical equipment room) served the toilet room (7,800 CFM) and as general exhaust (2,200 CFM).[156]

All air ducts routed between adjacent shielding zones were equipped with waveguide-below-cutoff type filters at penetrations of EMP/RFI shielding zones. These waveguides were seal-welded to the air ducts and to lined openings provided in structural wall shielding. Air ducts routed between rooms in the same shielding zone were welded to the framed openings for structural support only. The number of air ducts penetrating shielding zones was minimized by ensuring mechanical and electrical rooms were included within the same zones as the WSE they served.[157]

c. Lighting Console rooms in the MSCB contained a dual lighting system, consisting of a general (50 foot-candles) system, with wall-mounted dimming controls; the latter system could override the former.[158] Illumination was generally florescent, with fixtures equipped with safety locks, diffusers, and louvers to preclude accidental dislodging of fluorescent contents.[159] In both the electronic and transmitter control rooms, the lighting design and location allowed control over illumination levels wherein observation of oscilloscopes was necessary.[160]

d. Plumbing Water for the SRMSC was provided from 10 wells through a 58-mile waterline from the Fordville Aquifer to the PAR and MSR sites. The water supply system had the capability of delivering 1,000 gallons of water per minute.[161]

All MSCB water systems originated in the MSRPP, entering via flexible pipe sections at the MSRPP-PEUT interface, were seal-welded in the PEUT at the shielding barrier, and included flexible sections at the PEUT-MSCB interface.[162] Waterlines included surge arresters to prevent equipment damage.

All piping penetrations (liquid and compressed air) between shielding zones included the use of steel pipe equipped with a flange circumferentially welded to the liner plate at the point of shielding penetration.[163] A straight section of steel pipe at each penetration was designed to function as a waveguide-below-cutoff.[164]

D. Site

1. General Setting and Orientation: The MSR site housed the comparatively short-ranged MSR and nearly half of the SRMSC defensive missiles. It was located on approximately 431.66 acres of land, 102 mi northwest of Grand Forks and 12 mi south of Langdon, close to the tiny agrarian town of Nekoma. About 25 air mi separate the MSR from the PAR. The site is 17 to 31 mi from the four Remote Sprint Launch Sites. The site was divided into a controlled area, limited area, and community center area.

2. Historic Landscape and Design: With the exception of urban and built-up areas, the entire area (83 percent) within 1.2 mi of the MSR site is agricultural. Urban and built-up areas include Nekoma, farmsteads, roads, and the Soo Line Railroad, which runs NW-SE and passes 0.5 mi to the SW of the MSR. Wooded land cover is less than 5 percent.[165]

There is little topographic relief in the area. The lowest point is 1,600 ft above mean sea level (msl), and the highest point is 1,630 ft above msl.[166]

PART III. SOURCES OF INFORMATION

A. Original Architectural Drawings

Original drawings for the MSCB were prepared by The Ralph Parsons Company, Architects-Engineers, Los Angeles, California.

B. Interviews

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Endnotes:

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[6]U.S. Army Corps of Engineers, 1989: 1.

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[21]Ibid.

[22]Ibid.

[23]Ibid.

[24]Kitchens, 1978: 88.

[25]Ibid.: 105.

[26]Ibid.: 106.

[27]Ibid.: 109.

[28]Thomas, Earl, 1992.

[29]U.S. Army Strategic Defense Command, 1991: 1-6.

[30]Ibid.: 1-4.

[31]U.S. Army Corps of Engineers, 1992: 10.

[32]U.S. Army Strategic Defense Command, 1991: 1-4.

[33]Ibid.: 57-58.

[34]Ibid.: 78.

[35]Ibid.: 81, 83, 84.

[36]Ibid.: 156.

[37]Ibid.: 164-165.

[38]Ibid.: 167.

[39]Hightower, L.N., 1976.

[40]Ballistic Missile Defense Organization, 1977: 111-116.

[41]Ibid.: 3.

[42]Ibid.: 9.

[43]Western Electric Co., Inc., 1971: 2-1.

[44]Ibid.: 2-1, 2-2.

[45]Ibid.: 2-2.

[46]U.S. Army Corps of Engineers, 1974b: 9.

[47]U.S. Army Corps of Engineers, 1972a: 10-1.

[48]U.S. Army Strategic Defense Command, 1991: 1-4.

[49]U.S. Army Corps of Engineers, 1974b: 3.

[50]U.S. Army Corps of Engineers, 1974a: 35.

[51]U.S. Army Corps of Engineers, 1974b: 9.

[52]Ibid.

[53]U.S. Army Corps of Engineers, 1972a: 10-1.

[54]Ibid.: 10.

[55]Ibid.

[56]U.S. Army Corps of Engineers, 1972b: 10.

[57]U.S. Army Corps of Engineers, 1972a: 9-3/4.

[58]Ibid.: 4-19/20.

[59]Ibid.: 3-2.

[60]Ibid.: 8.

[61]U.S. Army Corps of Engineers, 1974b: 9.

[62]U.S. Army Corps of Engineers, 1989: 4.

[63]U.S. Army Corps of Engineers, 1972b.

[64]U.S. Army Corps of Engineers, 1972a: 10-9, 10-10.

[65]Western Electric, 1971: 3-10.

[66]Ibid.

[67]U.S. Army Corps of Engineers, 1974a: 39.

[68]U.S. Army Corps of Engineers, 1974b: 10.

[69]Ibid.: 10.

[70]Ibid.: 10-11.

[71]Ibid.: 11.

[72]Ibid.

[73]U.S. Army Corps of Engineers, 1972b: 28.

[74]U.S. Army Corps of Engineers, 1972a: 10-12.

[75]Ibid.: 7-1/2.

[76]U.S. Army Corps of Engineers, 1974b: 12.

[77]U.S. Army Corps of Engineers, 1972a: 10-12.

[78]Ibid.: 10-12, 10-13.

[79]Ibid.: 7-1/2.

[80]Ibid.: 10-10.

[81]U.S. Army Corps of Engineers, 1972b: 68.

[82]U.S. Army Corps of Engineers, 1974a: 39.

[83]U.S. Army Corps of Engineers, 1989: 4.

[84]U.S. Army Corps of Engineers, 1972a: 10-2.

[85]Ibid.: 10-3.

[86]U.S. Army Corps of Engineers, 1972a: 10-2.

[87]Ibid.: 10-2.

[88]U.S. Army Corps of Engineers, 1989: 4.

[89]U.S. Army Corps of Engineers, 1974b: 10.

[90]U.S. Army Corps of Engineers, 1972b: 10.

[91]Western Electric Company, Inc., 1971: 3-1.

[92]Ibid.: 3-2.

[93]U.S. Army Corps of Engineers, 1974a: 36.

[94]Ibid.

[95]Ibid.

[96]Western Electric Company, Inc., 1971: 3-1.

[97]U.S. Army Corps of Engineers, 1972b: 12.

[98]Ibid.

[99]U.S. Army Corps of Engineers, 1974a: 36.

[100]Western Electric Company, Inc., 1972b: 16.

[101]U.S. Army Corps of Engineers, 1972b: 16.

[102]Ibid.: 16.

[103]Western Electric Company, Inc., 1971: 3-2.

[104]Ibid.

[105]U.S. Army Corps of Engineers, 1972b: 16.

[106]Ibid.

[107]Western Electric, 1971: 3-16.

[108]Ibid.

[109]Ibid.: 3-15.

[110]Ibid.

[111]Ibid.: 3-16.

[112]Ralph M. Parsons Co., 1970.

[113]Western Electric, 1971: 3-70.

[114]Ibid.: 3-69.

[115]Ibid.: 3-68.

[116]Ibid.: 3-72.

[117]Ibid.

[118]Ibid.

[119]Ibid.: 3-74.

[120]U.S. Army Corps of Engineers, 1974b: 10.

[121]U.S. Army Corps of Engineers, 1974a: 37.

[122]Ibid.: 36, 37.

[123]Ibid.: 37.

[124]Ibid.

[125]Ibid.

[126]Ibid.

[127]Ibid.

[128]Ibid.

[129]Ibid.

[130]Ibid.

[131]Ibid.: 38.

[132]Ibid.

[133]Ibid.

[134]Ibid.

[135]U.S. Army Corps of Engineers, 1974b: 9.

[136]U.S. Army Corps of Engineers, 1974a: 38.

[137]Ibid.

[138]Ibid.

[139]Ibid.

[140]Ibid.

[141]Ibid.

[142]Ibid.

[143]U.S. Army Corps of Engineers, 1972a: 10-2.

[144]Ibid.: 10-9.

[145]Western Electric Company, Inc., 1971: 3-11.

[146]Ibid.

[147]U.S. Army Corps of Engineers, 1974b: 3.

[148]U.S. Army Corps of Engineers, 1972a: 8-1/2.

[149]Ibid.: 11-1.

[150]Ibid.: 10.

[151]Western Electric Company, Inc., 1971: 3-12.

[152]U.S. Army Corps of Engineers, 1972b: 28.

[153]Ibid.

[154]Ibid.

[155]U.S. Army Corps of Engineers, 1974a: 39.

[156]Ibid.: 40.

[157]U.S. Army Corps of Engineers, 1972a: 13-1.

[158]Western Electric, 1971: 3-12.

[159]Ibid.

[160]Ibid.

[161]U.S. Army Corps of Engineers, 1974b: 2.

[162]U.S. Army Corps of Engineers, 1972a: 18-2.

[163]Ibid.: 12-1/2.

[164]U.S. Army Corps of Engineers, 1972a: 10-9.

[165]Leitch, 1992: 9.

[166]Ibid.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
UNIVERSAL MISSILE BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 455)
Between Tactical Road South and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-C

PHOTOGRAPH

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Between Tactical Road South and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-C

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-C-1	VIEW FROM MISSILE SITE CONTROL BUILDING (SOUTHEAST TO NORTHWEST) OF UNIVERSAL MISSILE BUILDING. NOTE EARTH MOUNDING. ON THE FAR RIGHT CAN BE SEEN THE EXIT TUNNEL; THE SMALL "BOXES" ON TOP ARE THE ROOF VENTILATORS. THIS BUILDING WAS SALVAGED AND SEALED AFTER SITE INACTIVATION
ND-9-C-2	Photographic copy of original design drawing, dated January 1970 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). FIRST FLOOR PLAN
ND-9-C-3	Photographic copy of original design drawing, dated January 1970 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). UPPER AREA AND ROOF PLANS
ND-9-C-4	Photographic copy of original design drawing, dated January 1970 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ELEVATIONS

HAER ND-9-C Photo List - Universal Missile Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, UNIVERSAL MISSILE BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX) (BUILDING 455)

HAER No. ND-9-C

Location: Between Tactical Road South and Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota.

Significance: Universal Missile Building (UMB) operations centered around initial preparation of missile sections, with space for unpacking, assembly, and checkout of SPARTAN and SPRINT missile components.[1] It serviced either one SPRINT or one SPARTAN missile at a time.

Description: The UMB was a reinforced concrete, hardened, non-debris-forming, single-story structure with earth embankment covering the roof and three sides. (Non-debris-forming means that, if hit, it would not send debris flying.) The building had 4,284 ft^2 of floor area. It contained a high bay section equipped with a 10-ton bridge crane and a low roof utility section for support equipment, documents, and spare parts areas. Out-to-out building dimensions were 119 by 36 ft in plan and 25 ft in height at the high bay and 14 ft in height at the low roof area.[2]

Personnel access was by way of a docking area and emergency egress through a 27-foot, 4-inch corrugated metal pipe tunnel. The building was situated away from the launch stations, since it was not designed to withstand any accidental detonation that might occur in the wake of the detonation of propellants in those areas.[3]

History: The Ralph M. Parsons Co. designed the UMB. Construction by Morrison-Knudsen and Associates was completed on 3 November 1972, at an estimated cost of $710,200. Activity at the UMB was terminated on 7 October 1976.

Sources:

[1]U.S. Army Corps of Engineers, 1972. Hardness Program, EMP, EMP-RFI Protection MSR, for SAFEGUARD TSE Ground Facilities, Volume 1, July: p. 10-15.

[2]U.S. Army Corps of Engineers, 1974. SAFEGUARD – A Step Toward Peace, undated: p. 12.

[3]Western Electric Company, Inc., 1971. SAFEGUARD Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 5-1.

Endnotes:

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1. U.S. Army Corps of Engineers, 1972: p. 10-15.

2. U.S. Army Corps of Engineers, 1974: p. 12.

3. Western Electric Company, Inc., 1971: p. 5-1.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 460)
On Patrol Road at entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-D

PHOTOGRAPH

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 460)
On Patrol Road at entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO ND-9-D

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-D-1	VIEW FROM WEST TO EAST OF EXCLUSION AREA SENTRY BUILDING. A PORTION OF THE WARHEAD HANDLING BUILDING CAN BE SEEN ON THE LEFT. LAUNCH AREA IS IN THE BACKGROUND

HAER ND-9-D Photo List - Exclusion Area Sentry Station

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, EXCLUSION AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)

(BUILDING 460)

HAER No. ND-9-D

Location: On Patrol Road at entrance to Missile Field, Nekoma Vicinity, Cavalier County, North Dakota.

Significance: The Exclusion Area Sentry Station (EASS) controlled access into the Exclusion Area, where the Missile Launch Area and Warhead Handling Building were located.

Description: The EASS is a one-story, non-debris-producing building of permanent construction. It has concrete foundation walls, 8 ft below frost depth, and a concrete roof slab with elastomeric roofing.[1] It has a gross floor area of 399 ft.[2]

History: The EASS was designed by the Ralph M. Parsons Company. Construction by Chris Berg, Inc., was completed on 8 November 1972, at an approximate cost of $24,000. Activity at the EASS was terminated on 30 September 1976, with final closure on 25 September 1977.

Sources:

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 49.

Ibid.

Endnotes:

[1] U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen SAFEGUARD Complex in Vicinity of Grand Forks, North Dakota, no date: p. 49.

[2] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
WARHEAD HANDLING BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 456)
Within Exclusion Area
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-E

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Within Exclusion Area
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-E

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-E-1	VIEW FROM SOUTHWEST TO NORTHEAST OF WARHEAD HANDLING BUILDING. NOTE EARTH EMBANKMENT. THE PERSONNEL ENTRANCE (LEFT) AND EQUIPMENT ENTRANCE CAN CLEARLY BE SEEN IN CENTER OF PHOTOGRAPH. TO THE RIGHT IS THE EMERGENCY EXIT TUNNEL CONSTRUCTED OF CORRUGATED METAL PIPE. THIS BUILDING WAS SALVAGED AND SEALED AFTER SITE INACTIVATION
ND-9-E-2	Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). FLOOR PLAN AND SCHEDULES
ND-9-E-3	Photographic copy of original design drawing, dated January 1970, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SECTIONS

HAER ND-9-E Photo List - Warhead Handling Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, WARHEAD HANDLING BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)

(BUILDING 456)

HAER No. ND-9-E

Location: Within Exclusion Area, Nekoma Vicinity, Cavalier County, North Dakota.

Significance: The building provided temporary storage for Sprint warhead sections and space for checkout and temporary storage of Spartan warhead sections prior to their installation on the missiles within their launch cells/chambers within the respective silos. This building also provided for replacement of selected components of the Spartan warhead section fairing assembly.[1] The fairing was a structure that reduced air resistance or drag.

Description: The Warhead Handling Building (WHB) is a reinforced concrete, non-debris-forming, single-story structure with earth embankment covering the roof and three sides. The building had approximately 1,421 ft^2 of floor area with out-to-out dimensions of 35 by 43 ft in plan and 27 ft in height. The building was equipped with a 5-ton monorail hoist.[2] The WHB required only its rebar and earthen shielding (18 db attenuation) for electromagnetic pulse (EMP) protection.[3] On its east side, there is a 52-foot corrugated metal emergency exit tunnel.

History: The Ralph M. Parsons Co. designed the WHB. Construction by Morrison-Knudsen and Associates was completed on 3 November 1972 at an approximate cost of $315,000. Activity at the WHB was terminated on 7 October 1976; final closure occurred on 15 July 1977.

Sources:

U.S. Army Corps of Engineers, 1971. Personnel Orientation Guide, HNDDSP-71-52-ED-S, 15 November: p. 1-36.

U.S. Army Corps of Engineers, 1974. Safeguard – A Step Toward Peace, undated: p. 12.

U.S. Army Corps of Engineers, 1972. Hardness Program, EMP, EMP-RFI Protection MSR, for Safeguard TSE Ground Facilities, Volume 1, July: p. 4-4.

Endnotes:

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[1] U.S. Army Corps of Engineers, 1971.

[2] U.S. Army Corps of Engineers, 1974: p. 12.

[3] U.S. Army Corps of Engineers, 1972: p. 4-4.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE LAUNCH AREA
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(FACILITIES 501-530, 541-556)
Within Exclusion Area
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-F

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(FACILITIES 501-530, 541-556)
Within Exclusion Area
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-F

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-F-1 VIEW TOP OF WARHEAD HANDLING BUILDING (NORTHWEST TO SOUTHEAST) OF MISSILE LAUNCH AREA. SPRINT SILOS ARE SEEN ON THE LEFT, SPARTAN SILOS ON THE RIGHT, AND THE MISSILE SITE CONTROL BUILDING IN THE DISTANT BACKGROUND AND TO THE RIGHT. LAUNCH AREA ANTENNAE AND LAUNCH CHAMBER COVERS CAN BE SEEN

ND-9-F-2 VIEW FROM MISSILE SITE CONTROL BUILDING (SOUTH TO NORTH) OF MISSILELAUNCH AREA, SHOWING WARHEAD HANDLING BUILDING IN BACKGROUND

ND-9-F-3 VIEW FROM MISSILE SITE CONTROL BUILDING (SOUTHEAST TO NORTHWEST) OF MISSILE LAUNCH AREA SHOWING UNIVERSAL MISSILE BUILDING ON LEFT AND WARHEAD HANDLING BUILDING IN BACKGROUND

ND-9-F-4 Photographic copy of photograph, dated 12 August 1992 (original print in possession of Hal Ledbetter, Dynetics., Huntsville, AL). Hal Ledbetter, Photographer. VIEW (LOOKING SOUTH) OF MISSILE LAUNCH AREA, SPARTAN SILOS, MISSILE SITE CONTROL BUILDING CAN BE SEEN IN BACKGROUND

ND-9-F-5 Photographic copy of photograph, dated June 1993 (original print in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, photographer. VIEW OF SPARTAN SILO "HEADWORKS." IN FRONT CENTER IS PERSONNEL ACCESS HATCH LEADING TO LAUNCH PREPARATION EQUIPMENT VAULT (LPEV); ON RIGHT IS LAUNCH AREA ANTENNA; BEHIND ARE THE TWO LAUNCH CELL PROTECTIVE COVERS

ND-9-F-6 Photographic copy of photograph, dated June 1993 (original print in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. VIEW WITHIN SPARTAN MISSILE SILO. LAUNCH RAIL IS LOCATED IN THE NORTH SECTION OF ALL SILOS. AT RIGHT IS MECHANICAL ELECTRICAL EQUIPMENT VAULT. TOP OF PHOTO IS UP, BOTTOM IS DOWN

ND-9-F-7 Photographic copy of photograph, dated June 1993 (original print in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. VIEW INTO SPRINT SILO

ND-9-F-8 Photographic copy of photograph, dated 12 August 1992 (original print in possession of Hal Ledbetter, Dynetics, Inc., Huntsville, AL). Hal Ledbetter, Photographer. VIEW OF MINUTEMAN MISSILE SILO NEAR STANLEY R. MICKELSEN SAFEGUARD COMPLEX. EXACT LOCATION UNKNOWN. WHITE POLE WITH POINTED TOP IS SIMILAR TO LIGHTING ARRESTORS THAT WERE PRESENT IN THE MSR COMPLEX

ND-9-F-9 Photographic copy of photograph, date unknown (original print in possession of James E. Zielinski, Earth Tech, Huntsville, AL). Pan American World Airways, Photographer. AERIAL VIEW (NORTH TO SOUTH) OF MISSILE LAUNCH AREA. WARHEAD HANDLING BUILDING CAN BE SEEN AT THE BOTTOM CENTER OF THE PICTURE AND THE UNIVERSAL MISSILE BUILDING IN THE MIDDLE RIGHT. IN THE DISTANCE CAN BE SEEN THE MISSILE SITE CONTROL BUILDING AND RELATED STRUCTURES

ND-9-F-10 Photographic copy photograph, dated 1 October 1970 (original print in possession of CSSD-HO, Huntsville, AL). Morrison-Knudsen Company and Associates, Photographer. VIEW OF 43-FOOT HIGH MIDSECTION OF SPARTAN LAUNCH TUBE AND EXHAUST CHAMBER AS IT WAS BEING PREPARED FOR SPRINT MISSILE SILO LINERS, PRIOR TO THEIR INSTALLATION WITHIN THE SUBSURFACE HOLES AT THE MISSILE LAUNCH SITE (JUNE 1971). NOTE THE SILO LINER AT RIGHT; ATOP THIS IS THE LAUNCH PREPARATION EQUIPMENT CHAMBER (LPEC)

ND-9-F-11 Photographic copy of photograph, dated June 1971 (original in he possession of James F. Zielinski, Earth Tech, Huntsville, AL). Photographer unknown. VIEW OF SPRINT MISSILE SILO LINERS, PRIOR TO THEIR INSTALLATION WITHIN THE SUBSURFACE HOLES AT THE MISSILE LAUNCH SITE (June 1971). NOTE THE SILO LINER AT RIGHT; ATOP THIS IS THE LAUNCH PREPARATION EQUIPMENT CHAMBER (LPEC)

ND-9-F-12 Photographic copy of a photograph (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. COMPARISON OF SPARTAN AND SPRINT MISSILES. THE SPRINT MISSILE IS ON THE LEFT; THE SPARTAN MISSILE IS ON THE RIGHT

ND-9-F-13 Photographic copy of photograph (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. VIEW OF ROCKET MODELS, ALLOWING A COMPARISON OF THE SPARTAN, GALOSH (USSR), MINUTE MAN III, AND SS-9 (USSR) MISSILES

ND-9-F-14 Photographic copy of original design drawing, dated January 1970, revised 15 June 1973 (original in the possession of the U.S. Army Corps of Engineers, Huntsville Division). SPARTAN ~~LAUNCH STATION CONCRETE SECTIONS~~ Launch Station Plan

ND-9-F-15 Photographic copy of original design drawing, dated January 1970, revised 2 January 1973 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SPARTAN LAUNCH STATION CONCRETE SECTIONS.

ND-9-F-16 Photographic copy of original design drawing, dated May 1971, revised 16 April 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SPRINT LAUNCH STATION AND ANTENNA FOUNDATION, PLANS, SECTION DETAILS

HAER ND-9-F Photo List - Missile Launch Area

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE LAUNCH AREA
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(FACILITIES 501-530, 541-556)

HAER No. ND-9-F

Location: Within Exclusion Area, Nekoma Vicinity, Cavalier County, North Dakota.

Significance: The Missile Launch Area comprised the Spartan (facilities 501-530) and Sprint (facilities 541-556) Launch Stations, allowing for both long- and short-range defense against every Intercontinental Ballistic Missile.

Description: The Spartan launch station (LS), was a reinforced, rectangular concrete structure inside a missile cell (silo), 9 by 9 by 72 ft, sloping downrange 5 degrees from the vertical.[1] Each of the 30 Spartan LSs had a storage chamber for the missiles, an exhaust duct for gas removal during firing, and a Launch Preparation and Equipment Vault above a Mechanical and Electrical Equipment Vault (both 11.5 by 9 ft underground and used for installation/maintenance).[2] The LS cover would automatically open in tactical situations.

Each LS had a Launch Area Antenna (LAA), consisting of a reradiating horn mounted in an 18-inch diameter steel pipe; the pipe and its internal conduit had a weatherproofed cover.[3]

The silos had a center-to-center separation distance of 73 ft and were laid out in parallel rows.[4] The LS, itself, extended approximately 6 inches above ground level.[5]

The foundation of each of the 16 steel, cylindrical Sprint LSs was buried vertically underground to a depth of some 32 ft and had an inner diameter of approximately 9.5 ft.[6] Each was closed with a hatch and had a Launch Preparation Equipment Chamber and an antenna (similar to the Spartan's) on a concrete base.[7]

When operational, each cell contained a Sprint missile that would be launched by a gas-propelled piston through its cell cover, which would be explosively fragmented to allow the missile's exit.[8]

History: The Sprint and Spartan stations of the Missile Launch Area were designed by the Ralph M. Parsons Co. and constructed by Morrison-Knudsen and Associates; they were basically completed by 3 January 1973. Approximate costs were $40,000 per Spartan silo and $50,000 for each Sprint. During deactivation of the site (late September 1976), the Sprint and Spartan missiles and warheads, as well as the launch equipment and the Sprint canister, were removed.[9] The silo covers were then sealed.

Sources:

U.S. Army Corps of Engineers, 1989. Final Report, Dismantlement of Facilities, Stanley R. Mickelsen Safeguard Complex, September: p. 5.

Ibid.

Ibid.

Ibid.

U.S. Army Corps of Engineers, 1971. Personnel Orientation Guide, HNDDSP-71.52-ED-S, 15 November: p. 1-38.

U.S. Army Strategic Defense Command, 1991. Preliminary Building Availability and Conditions Survey, Stanley R. Mickelsen Safeguard Complex, 13 December: p. 148.

U.S. Army [Safeguard Systems Command], "Information Summary, The Safeguard Ballistic Missile Defense System, Description and History," (Huntsville, AL, circa 1971), p. 7.

U.S. Army Strategic Defense Command, op. cit.

Ibid.

Endnotes:

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[1] U.S. Army Corps of Engineers, 1989: p. 5.

[2] Ibid.

[3] Ibid.

[4] Ibid.

[5] U.S. army Corps of Engineers, 1971: p. 1-38.

[6] Ibid.

[7] U.S. Army Strategic Defense Command, 1991: p. 148.

[8] U.S. Army Strategic Defense Command, op. cit.

[9] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
FRESH WATERPUMP HOUSE
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 369)
One block northwest of Limited Area Sentry Station, just off Avenue A
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-G

PHOTOGRAPH

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National Park Service
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Denver, Colorado 80225-0287

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HAER NO. ND-9-G

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
FRESH WATER PUMP HOUSE
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 369)
One block northwest of Limited Access Sentry Station, just off Avenue A
Nekoma Vicinity
Cavalier County
North Dakota

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-G-1 VIEW FROM SOUTHWEST TO NORTHEAST OF FRESH WATER PUMP HOUSE

HAER ND-9-G Photo List - Fresh Water Pump House

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
INSTALLATION HEADQUARTERS BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING S301)
South of Fourth Street and Avenue A intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-H

PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, INSTALLATION HEADQUARTERS BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX) (BUILDING S301)
South of Fourth Street and Avenue A intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-H

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-H-1	VIEW FROM NORTH TO SOUTH (NORTH FACE) OF INSTALLATION HEADQUARTERS BUILDING (AREA ENGINEER'S DURING CONSTRUCTION)
ND-9-H-2	VIEW FROM SOUTHEAST TO NORTHWEST (EAST FACE) OF INSTALLATION HEADQUARTERS BUILDING, SHOWING "H" CONFIGURATION

HAER ND-9-H Photo List - Installation Headquarters Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
AREA ENGINEER/ADMINISTRATION BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 304)
South of Avenue A and Avenue J intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-I

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
AREA ENGINEER /ADMINISTRATION BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 304)
South of Avenue A and Avenue J intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-I

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-I-1	VIEW FROM NORTHEAST TO SOUTHWEST OF AREA ENGINEER/ADMINISTRATION BUILDING

HAER ND-9-I Photo List - Area Engineer / Administration Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
INDUSTRIAL BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 364)
One block southwest of Limited Area Sentry Station
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-J

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, INDUSTRIAL BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 364)
One block southwest of Limited Area Sentry Station
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-J

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-J-1	VIEW FROM SOUTHWEST TO NORTHEAST OF INDUSTRIAL BUILDING. FAR RIGHT DOORS LEAD TO VEHICLE SERVICE AND MAINTENANCE BAYS

HAER ND-9-J Photo List - Industrial Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
FAMILY HOUSING UNITS
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(FACILITIES 027-088)
In area bounded by Tenth Street North, Avenue A, and Avenue J
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-K

PHOTOGRAPHS

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, FAMILY HOUSING UNITS (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
In area bounded by Tenth Street North, Avenue A, and Avenue
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-K

Benjamin Halpen, Photographer, 5-18 October 1992

ND-9-K-1 VIEW FROM EAST TO WEST OF FAMILY HOUSING UNIT (TWO -BEDROOM DUPLEX; #48A & 48 B). THIS STRUCTURE WAS LOCATED ON 8TH STREET SOUTH. NO HOUSING SITES REMAIN ON THE GROUND

ND-9-K-2 FIEW FROM EAST TO WEST OF FAMILY HOUSING UNIT(DUPLEX; EITHER #27 OR #87, AS ONLY THE 7 ISVISIBLE). UNIT #27 WAS THREE-BEDROOM AND LOCATED ON 9TH STREET SOUTH. UNIT #87 WAS A TWO-BEDROOM LOCATED ON 4TH STREET NORTH. THESE HOUSING UNITS HAVE BEEN REMOVED

NOTE: ALL 50 DUPLEX HOUSING UNITS HAVE BEEN REMOVED FROMTHE MSRSITE. TEN WERE PROVIDED TO THE DUNSEITH COMMUNITY BETTERMENT CLUB; THE REMAINDER HAD BEEN REMOVED TO CAVALIER AIR FORCE STATION AND GRAND FORKS AIR FORCE BASE IN THE 1970'S. ALL 50 UNITS FOUNDATIONS HAVE BEEN DEMOLISHED.

HAER ND-9-K Photo List - Family Housing Units

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
POST CHAPEL
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 340)
On Avenue A, North of softball field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-L

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, POST CHAPEL
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 340)
On Avenue A, North of softball field
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-L

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-L-1	VIEW FROM SOUTHEAST TO NORTHWEST OF POST CHAPEL. THE CHAPEL ANNEX, OF TRAILER TYPE CONSTRUCTION, HAS BEEN DEMOLISHED

HAER ND-9-L Photo List - Post Chapel

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
GYMNASIUM
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 346)
South of Avenue A, East of softball field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-M

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, GYMNASIUM
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 346)
South of Avenue A, East of softball field
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-M

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-M-1 VIEW FROM NORTHEAST TO SOUTHWEST OF GYMNASIUM

HAER ND-9-M Photo List - Gymnasium

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
COMMUNITY CENTER
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 350)
Southwest of Avenue B and First Street intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-N

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, COMMUNITY CENTER
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 350)
Southwest of Avenue B and First Street intersection
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-N

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-N-1	VIEW FROM SOUTHWEST TO NORTHEAST OF COMMUNITY CENTER

HAER ND-9-N Photo List - Community Center

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ND-9-N-1

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 801)
Intersection of Service Road C and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-O

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX) (BUILDING 801)
Intersection of service road C and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-O

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-O-1 VIEW FROM WEST TO EAST OF LIMITED ACCESS SENTRY STATION

ND-9-O-2 CLOSER VIEW FROM WEST TO EAST OF LIMITED ACCESS SENTRY STATION, SHOWING SALLY PORT. SEEN IN THE LEFT BACKGROUND IS THE FUEL OIL PUMPING STATION (BUILDING #805)

HAER ND-9-O Photo List - Limited Area Sentry Station

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX) (BUILDING 801)

HAER No. ND-9-O

Location: Intersection of Service Road C and Service Road A, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Village of Mountain Vicinity, Pembina County.

Significance: The Limited Area Sentry Station (LASS) is located adjacent to Service Road A in such a manner whereby ingress/egress for the Limited Area cannot be accomplished without passing through control facilities (electric gates 1 and 2 and turnstiles 1 and 2) of the sentry station.[1]

Description: This one-story building of soft construction has a gross floor area of 3,431 ft^2.[2] "Soft" facilities were neither hardened nor steel-reinforced.

The LASS foundations are 8-foot-deep concrete footings; its exterior walls are concrete block; its insulated roof, with built-up roofing, is metal decking on a steel frame.[3] The floor is slab at grade, and the floor coverings are epoxy (four rooms) and VAT (eleven rooms).[4]

History: The LASS was designed by the Ralph M. Parsons Co. Construction by Morrison-Knudsen and Associates began on 3 May 1971 and was completed by 14 June 1972.

Sources:

Western Electric, 1971. Perimeter Acquisition Radar Site Assembly (PARSA) Complex Physical Description, Initial Draft Copy, Theory Manual No. 006, 30 September: p. 5-1.

U.S. Army Corps of Engineers, 1974. Safeguard A Step Toward Peace: p. 14.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota: p. 116.

Ibid.

Endnotes:

[1] Western Electric, 1971. Perimeter Acquisition Radar Site Assembly (PARSA) Complex Physical Description, Initial Draft Copy, Theory Manual No. 006, 30 September: p. 5-1.

[2] U.S. Army Corps of Engineers, 1974. Safeguard A Step Toward Peace: p. 14.

[3] U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota: p. 116.

[4] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 830)
(Cavalier Air Force Station)
Limited Access Area, between Limited Access Patrol Road and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-P

Actual Location: *Village of Mountain Vicinity*
Pembina County

PHOTOGRAPHS

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR BUILDING — HAER No. ND-9-P
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 830)
(Cavalier Air Force Station)
PAR Site located approx. 1.5 miles south of Concrete, ND; South of State Highway 5
PARB in limited Access Area, between Limited Access Patrol Road and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

Actual Location *Village of Mountain Vicinity*
Pembina

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-P-1 VIEW TOWARD SOUTH, FACADE (NORTH SIDE OR "A" WALL) OF PERIMETER ACQUISITION RADAR BUILDING. THE GLOBE ON THE UPPER LEFT IS A SHELTER HOUSING THE HERCULES TRACKER ANTENNA. TO THE RIGHT IS THE UTILITY TUNNEL LEADING TO THE PAR POWER PLANT. THE ANTENNAE FOR THE PAR ARE CONTAINED IN THE LARGE LIGHTER-TONED SHAPE COVERING MOST OF THE WALL

ND-9-P-2 VIEW TOWARD EAST, WEST FACE ("D" WALL) OF PERIMETER ACQUISITION RADAR BUILDING WITH SUBTERRANEAN POWER PLANTS DIESEL ENGINE INTAKE (THE SMALLER COLUMN) AND EXHAUST SEEN IN FOREGROUND. BEHIND THE GLOBE IS THE VERY LOW FREQUENCY (VLP) ANTENNA

ND-9-P-3 DISTANT VIEW TOWARD EAST, WEST FACE OF PERIMETER ACQUISITION RADAR BUILDING WITH DATA LINK SATELLITE DISH ON SOUTH SIDE

ND-9-P-4 VIEW TOWARD NORTH, SOUTH FACE ("C" WALL) OF PERIMETER ACQUISITION RADAR BUILDING SHOWING ENTRY (FORMER DOCKING FACILITY) ON LEFT, BEHIND SATELLITE DISH. ON THE BOTTOM RIGHT CAN BE SEEN THE KNOCKOUT PANEL PROVIDED FOR A FUTURE TUNNEL THAT WAS NEVER USED. THE TWO "HOLES" ABOVE ARE REFERRED TO AS BIRDSCREENS, THE UPPER AIR INTAKE, ON THE FIFTH LEVEL, INCORPORATES A PLENUM CHAMBER (#510e), AS DOES THE LOWER (#2M8A) AIR EXHAUST, LOCATED ON THE SECOND LEVEL MESSANINE

ND-9-P-5 VIEW TOWARD WEST, EAST FACE ("B" WALL) OF PERIMETER ACQUISITION RADAR BUILDING

ND-9-P-6 VIEW TOWARD SOUTHEAST, NORTHWEST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING, WITH VIEW OF PAR POWER PLANT

ND-9-P-7 DISTANT VIEW TOWARD SOUTHEAST, NORTHWEST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING. COOLING TOWERS CAN BE SEEN ON THE FAR RIGHT

ND-9-P-8	VIEW TOWARD NORTHEAST, SOUTHWEST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING SHOWING ACCESSWAY #101 LEADING INTO PAR POWER PLANT FROM SERVICE ROAD B IN FOREGROUND
ND-9-P-9	VIEW TOWARD NORTHEAST, SOUTHWEST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING SHOWING, FROM LEFT TO RIGHT, FUEL OIL PUMP STATION, COOLING TOWERS, POWER PLANT, AND DIESEL INTAKE/EXHAUST
ND-9-P-10	VIEW TOWARD NORTHWEST, SOUTHWEST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING, SHOWING DOCKING FACILITY. LEFT OF THE KNOCKOUT PANEL ON LOWER RIGHT IS EMERGENCY EXIT BLAST DOOR #BD5/#127
ND-9-P-11	VIEW TOWARD SOUTHWEST, NORTHEAST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING
ND-9-P-12	DISTANT VIEW TOWARD SOUTHWEST, NORTHEAST OBLIQUE OF PERIMETER ACQUISITION RADAR BUILDING, WITH VIEW OF SITE GROUNDS
ND-9-P-13	OUTER BLAST DOOR #BD4A/#101 IN OPEN POSITIONS AT ENTRANCE OF PERIMETER ACQUISITION RADAR BUILDING
ND-9-P-14	INNER DOUBLE BLAST DOOR ENTRANCE TO PERIMETER ACQUISITION RADAR BUILDING SECURITY AREA
ND-9-P-15	FRONT SECURITY ENTRANCE TO THE PERIMETER ACQUISITION RADAR BUILDING, SHOWING ROTO GATES 1 AND 2 AND ENTRANCE DOOR TO SECURITY OPERATIONS CONTROL CENTER (SOCC), ROOM #108
ND-9-P-16	PERIMETER ACQUISITION RADAR BUILDING ROOM #102, ELECTRICAL EQUIPMENT ROOM; THE PRIME POWER DISTRIBUTION SYSTEM. EXCELLENT EXAMPLE OF ENDULUM-TYPE SHOCK ISOLATION. THE GREY CABINET AND BARREL ASSEMBLE IS PART OF THE POLYCHLORINATED BIPHENYL (PCB) RETROFILL PROJECT
ND-9-P-17	PERIMETER ACQUISITION RADAR BUILDING ROOM #105, MECHANICAL EQUIPMENT ROOM NO. 1; SIGN READS: HEAT EXCHANGERS (SHELL AND TUBE TYPE). PROVIDE PRECISE TEMPERATURE CONTROL OF WATER FOR COOLING CRITICAL ELECTRONIC EQUIPMENT
ND-9-P-18	PERIMETER ACQUISITION RADAR BUILDING ROOM #105, DEIONIZERS (FILTER TANKS) FOR DATA PROCESSOR COOLING AND ICE BACKUP; SIGN READS: DEIONIZER UNITS PROVIDE HIGH-PURITY WATER BY REMOVAL OF OXYGEN, AND ORGANIC AND MINERAL CONTENT FROM WATER
ND-9-P-19	PERIMETER ACQUISITION RADAR BUILDING ROOM #105; SIGN READS: THREE 660-TON TRANE CHILLERS, EACH CHILLER CAN SUPPLY ENOUGH COOLING FOR APPROXIMATELY 250 AVERAGE AIR-CONDITIONED HOMES
ND-9-P-20	PERIMETER ACQUISITION RADAR BUILDING ROOM #105, SHOCK-ISOLATED PLATFORM FOR CHILLERS IS EASILY SEEN ON THE RIGHT
ND-9-P-21	PERIMETER ACQUISITION RADAR BUILDING ROOM #200, ELECTRICAL EQUIPMENT ROOM

ND-9-P-22 PERIMETER ACQUISITION RADAR BUILDING ROOM #201, PHASE SHIFTER SERVICE PLATFORM (LEVEL TWO)

ND-9-P-23 PERIMETER ACQUISITION RADAR BUILDING ROOM #202, MECHANICAL EQUIPMENT ROOM NO. 2

ND-9-P-24 PERIMETER ACQUISITION RADAR BUILDING ROOM #203, COMMUNICATIONS ROOM

ND-9-P-25 PERIMETER ACQUISITION RADAR BUILDING ROOM #2M4 (MESSANINE), POWER SUPPLY ROOM; COMPUTER POWER SUPPLY ON LEFT AND WATER FLOW ON RIGHT. THIS ROOM IS DIRECTLY BELOW DATA PROCESSING AREA (ROOM #318). SIGN ON RIGHT READS: HIGH PURITY WATER DIGITAL RACK

ND-9-P-26 PERIMETER ACQUISITION RADAR BUILDING ROOM #301, TRANSMITTER AREA NO. 2; POWER SUPPLY ASSEMBLY (IN FOREGROUND) AND AMPLIFIER MODULATORS

ND-9-P-27 PERIMETER ACQUISITION RADAR BUILDING ROOM #301, POWER SUPPLY ASSEMBLY

ND-9-P-28 PERIMETER ACQUISITION RADAR BUILDING ROOM #302, SIGNAL PROCESS AND ANALOG RECEIVER ROOM

ND-9-P-29 PERIMETER ACQUISITION RADAR BUILDING ROOM #318, DATA PROCESSING SYSTEM AREA; DATA PROCESSOR MAINTENANCE AND OPERATIONS CENTER, SHOWING DATA PROCESSING CONSOLES

ND-9-P-30 PERIMETER ACQUISITION RADAR BUILDING ROOM #318, SHOWING RADAR CONTROL CONSOLE AND LINE PRINTERS

ND-9-P-31 PERIMETER ACQUISITION RADAR BUILDING ROOM #318, DATA STORAGE "RACKS"; SIGNS READ: M&D CONTROLLER, LOGIC CONTROL BUFFER, DATA TRANSMISSION CONTROLLER

ND-9-P-32 PERIMETER ACQUISITION RADAR BUILDING ROOM #318, CLOSE-UP OF RACK SHOWING LOGIC CHASSIS

ND-9-P-33 PERIMETER ACQUISITION RADAR BUILDING ROOM #320, PERIMETER ACQUISITION RADAR OPERATIONS CENTER (PAROC), CONTAINS THE TACTICAL COMMAND AND CONTROL GROUP EQUIPMENT REQUIRED TO CONTROL THE PAR SITE. SHOWING SPACETRACK MONITOR CONSOLE

ND-9-P-34 PERIMETER ACQUISITION RADAR BUILDING ROOM #325, TAPE HANDLER ROOM

ND-9-P-35 PERIMETER ACQUISITION RADAR BUILDING ROOM #325, SHOWING HARD DISC DRIVE

ND-9-P-36 37 PERIMETER ACQUISITION RADAR BUILDING, PHASE SHIFTER SERVICE PLATFORM; LEVEL THREE

ND-9-P-37 38 PERIMETER ACQUISITION RADAR BUILDING, PHASE SHIFTER SERVICE PLATFORM, LEVEL THREE; THIS SHOWS THE COAXIAL SWITCHES AND TRANSMITTER OUTPUT ASSEMBLY (LOCATED ONLY ON THIS LEVEL)

ND-9-P-~~38~~ 39 PERIMETER ACQUISITION RADAR BUILDING ROOM #414, DIGITAL/ELECTRICAL REPAIR SHOP; SHOWING WORK AREAS AVAILABLE FOR MAINTENANCE AND EQUIPMENT REPAIR

ND-9-P-~~39~~ 36 PERIMETER ACQUISITION RADAR BUILDING ROOM #504, TECHNICAL MAINTENANCE AND REPAIR CENTER (TMRC) AND TACTICAL SUPPORT EQUIPMENT (TSE) STORAGE AREA; STORAGE-TRAVEL WAVE TUBES

ND-9-P-40 PERIMETER ACQUISITION RADAR BUILDING ROOM #510B, CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) AIR FILTER ROOM NO. 1

ND-9-P-41 PERIMETER ACQUISITION RADAR BUILDING RADAR ELEMENT AND COAXIAL DISPLAY, WITH DRAWING OF TYPICAL ANTENNA SECTION. DRAWING, FROM LEFT TO RIGHT, SHOWS ELEMENT, ALUMINUM GROUND PLANE, CABLE CONNECTORS AND HARDWARE, CABLE, AND BACK-UP RING. GREY AREA IS THE CONCRETE WALL

ND-9-P-42 PERIMETER ACQUISITION RADAR BUILDING PLAQUE, COMMEMORATING PARRANSFERRAL FROM U.S. ARMY BALLISTIC MISSILE DEFENSE ORGANIZATION TO U.S. AIR FORCE AEROSPACE DEFENSE COMMAND (DATED 1 OCTOBER 1977)

ND-9-P-43 Photographic copy of photograph, dated September 1973 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. AERIAL VIEW (SOUTHWEST TO NORTHEAST) OF PERIMETER ACQUISITION RADAR BUILDING, SHOWING TACTICAL AND NONTACTICAL SUPPORT BUILDINGS. FROM LEST HAND CORNER, NOTE STORAGE BUILDING (#709); TO THE RIGHT, GYMNASIUM (#715). NEXT ROW, LEFT TO BOQ (#708); BACHELOR'S ENLISTED MEN'S QUARTERS (#720). ABOVE #720 CAN BE SEEN INDUSTRIAL BUILDING (#730), AND ABOVE THAT, A SUBSTATION (#740). BELOW PARB, TO LEFT AND RIGHT, ARE PARPP EXHAUST SHAFTS AND HEAT SINK (#813)

ND-9-P-44 Photographic copy of photograph, dated 1 October 1970 (original print in possession of CSSD-HO, Huntsville, AL). Morrison-Knudsen and Associates, Photographer. VIEW OF LACING AND PLACING OF REBAR STEEL FOR AN OUTSIDE WALL OF THE PERIMETER ACQUISITION RADAR BUILDING

ND-9-P-45 Photographic copy of photograph, dated October 1970 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. AERIAL MID-CONSTRUCTION VIEW (NORTHEAST TO SOUTHWEST) OF PERIMETER ACQUISITION RADAR BUILDING AND PAR POWER PLANT. THESE BUILDING WERE APPROXIMATELY 33% COMPLETE AT THE TIME

ND-9-P-46 Photographic copy of photograph, dated 21 August 1972 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. VIEW FROM BELOW OF THE SLOPING PERIMETER ACQUISITION RADAR BUILDING FACE OR "RADAR EYE," MPHASIZING A PORTION OF THE OVER 6,800 RADAR PENETRATIONS

ND-9-P-47 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SECTION "A-A" (ARCHITECTURAL)

ND-9-P-48 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SECTION "B-B" ARCHITECTURAL)

ND-9-P-49 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). SECTION "C-C" ARCHITECTURAL)

ND-9-P-50 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ELEVATIONS A AND B

ND-9-P-51 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ELEVATIONS C AND D

ND-9-P-52 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ROOF PLAN

ND-9-P-53 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTITION PLAN, FIRST LEVEL

ND-9-P-54 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTITION PLAN, SECOND LEVEL

ND-9-P-55 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTITION PLAN, THIRD LEVEL

ND-9-P-56 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTITION PLAN, FOURTH LEVEL

ND-9-P-57 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PARTITION PLAN, FIFTH LEVEL

ND-9-P-58 CUTAWAY PROFILE DRAWING OF THE PERIMTER AQUISITION RADAR

HAER ND-9-P Photo List - Perimeter Acquisition Radar Building

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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Click P

Photo list:

ND-9-P-1 thru ND-9-P-58

HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,

PERIMETER ACQUISITION RADAR BUILDING

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)

(Building 830)

(Cavalier Air Force Station)

HAER No. ND-9-P

Location: The Perimeter Acquisition Radar Building (PARB) is located in Sections 32 and 33, Township 161 North, Range 56 West of the Fifth Principal Meridian, Village of Mountain Vicinity, Pembina County, North Dakota. For shelving purposes, Nekoma vicinity, Cavalier County, has been assigned as the location. The PAR site is approximately 67 air miles north-northwest of Grand Forks, North Dakota. Within the complex, the PARB is found in the limited Access Area, between the Limited Access Road and Service Road A.

Township and Range: Listed on following page.

Date of Construction: 31 March 1970 through 21 August 1972.

Present Owner: U. S. Department of the Army.

Present Use: Currently designated Cavalier Air Force Station operating under the 10th Space Warning Squadron, Air Force Space Command, the PAR site is part of the Satellite Surveillance Network. It also maintains a submarine-launched ballistic missile and intercontinental ballistic missile early warning mission.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers. The Perimeter Acquisition Radar Building (PARB) is the only structure of its kind and size in the world. A unique massive, structure, for some time it was the second largest building in the state of North Dakota. The structure, which is steel reinforced concrete, was built to withstand a nuclear blast, termed nuclear hardened. The Perimeter Acquisition Radar is a long-range, phased array radar. It faces north and provides surveillance over the polar region. It can detect and track multiple targets. After the termination of the Safeguard system, the PAR became part of the missile early warning network and has remained operational to date.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX

TOWNSHIP AND RANGE

Beginning at the Northwest corner of said Section 33;

thence North 88°04'56" East along the North line of said Section 33, 327.99 feet;

thence South 01°45'55" East, 1,319.83 feet to the South line of the N-1/2 NW-1/4 of said Section 33;

thence North 88°04'56" East along said South line, 1,755.50 feet;

thence South 44°55'04" East, 1,608.66 feet;

thence South 00°04'56" West, 1,453.43 feet;

thence North 89°55'04" West, 3,140.07 feet to the East line of Section 32;

thence South 01°44'14" East along said East line, 300.00 feet; thence North 89°55'04" West, 1,150.00 feet;

thence North 01°44'14" West, 300.00 feet;

thence North 89°55'04" West, 917.53 feet;

thence North 00°04'56" East, 1,135.24 feet to the South line of the NE-1/4 of said Section 32;

thence North 88°15'52" East along said South line, 681.43 feet;

thence North 00°16'24" East, 1,072.55 feet;

thence South 89°43'36" East, 1,100.00 feet;

thence North 22°27'53" East, 516.92 feet to the East line of said Section 32;

thence North 01°44'36" West along said East line, 1,134.83 feet to the point of beginning.[A]

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The Beneficial Occupancy Date (for buildings and internal support equipment) for the Perimeter Acquisition Radar Building (PARB) was set for and reached on 21 August 1972, at an approximate $5.1-million cost. Operation of the Perimeter Acquisition Radar (PAR), the first full-scale model in existence, began in June 1973.[1] By early October, the PAR had been tested at full power and successfully tracked earth-orbiting satellites of wide-ranging dimensions.[2]

2. Architect(s): The PARB design was under the supervision of the U.S. Army Corps of Engineers, Huntsville; the contractor responsible for designing the building and its related facilities was Ammann & Whitney.[3] The prime contractor for the radar itself was the General Electric Company.[4]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved SAFSCOM and were established as operational elements for the Safeguard System; SAFCMD assumed operation/maintenance responsibility on 1 October under Brigadier General Robert M. Mullens.[5] The U.S. Army Air Defense Command (ARADCOM), staffed by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[6]

The SAFCMD assumption of responsibility for the Safeguard system coincided with the system's Equipment Readiness Date, whereupon it was officially named the "Stanley R. Mickelsen Safeguard Complex." The BMDOA remained under administrative control of ARADCOM until 17 December, when ARADCOM was disestablished.[7]

Phased-array radars eliminated the slow, mechanical pointing of antennae, substituting an electronic system for steering radar beams at high speeds. The elements were reported as radiating at 442 MHz with a power of 1.1 kilowatt (kW) each. The PAR had an azimuth coverage of approximately 120^{o}, a resolution less than 1.5 km, and a missile detection range believed to be about 3,300 km (2,071.4 mi).[106] The range is limited by line-of-sight. The earth is round and hence, targets can only be detected once they breach the horizon. Unlike a conventional dish-type radar, whose beam is steered by heavy moving equipment, the PAR beam was directed electronically by its data processor through its antennae. It could change its scan to any point in its coverage area within a few millionths of a second. As with the MSR, the computer that steered the beam could follow several targets simultaneously by ordering a sequence of beams in the appropriate direction, creating a wide, low resolution beam when searching, or a sharp, thin beam when tracking. Target information provided by the PAR was refined with successive scans and was concurrently transmitted to the central logic and control sites, the Safeguard computer housed on the second floor of the MSCB, for use in developing engagement data. The PAR was used to detect, track, and transfer to the MSR the targets at ranges and altitudes suitable for Spartan intercept; it did not plan, select, or guide them. Other targets detected early with trajectories unsuitable for Spartan were delegated to the MSR for Sprint interception. With an approximate volume of 121,763.1 cubic meters (m^3) (4,300,000 cubic feet [ft^3]) the PARB remains a massive structure. It was, at the time of its completion on 21 August 1972, the largest radar facility in the world. The size and shape of the PARB were based primarily on the radar antenna requirements and the equipment that needed to be sheltered. The building contained approximately 155,143 m^2 (167,000 ft^2) of floor area, of which about half was for weapon system equipment (WSE), related shops, and storage areas. The other half was for tactical support equipment (TSE) and related support areas.

During summer 1975, Aerospace Defense Command (ADCOM) studies indicated the radar was capable of early warning capabilities and, with certain modifications, could be used as an important element in the North American Air Defense (NORAD) attack assessment system.[8] This would play a vital role in the PARB's immediate future. By December of 1975, word was received that Congress had restricted funds for continuation of SRMSC operation, though the Senate made provisions to continue utilization of the PARB. SAFCMD immediately initiated planning procedures to phase down operations, yet provide for the continuation of the PAR under the operational command of the Commander in Chief, Air Defense (CINCAD), and the PAR site transfer to the U.S. Air Force (USAF).[9]

By 10 February 1976, the assignment of SRMSC for the purposes of Ballistic Missile Defense was terminated. In compliance with Congressional guidance, however, the PAR was to be converted to a PAR Attack Characterization System (PACS); functional PACS design was also completed that month.[10] A period was required to modify the PARB's existing software to meet its new mission and, in the interim, it continued its previous Safeguard role.[11]

Efforts to modify the PAR software were successfully completed from May (when the PAR began tracking known satellites for the NORAD Space Defense Center) through July.[12]

On 1 September 1976, the PAR became the PAR Operations Division of the PAR Management Office, Ballistic Missile Defense Systems Command (BMDSCOM) and remained under the operational command and control of CINCAD as a sensor in the NORAD surveillance network.[13] In November, however, a budget decision decreed that PAR would not be transferred to the USAF but, instead, would be dismantled with the rest of the SRMSC; an Army appeal brought about a reversal of this decision (30 November) and a reaffirmation that the PAR site would indeed transfer to the USAF the following October.[14]

The PACS achieved Initial Operating Capability on 10 December 1976 and was operationally linked to the NORAD combat operations computer on 3 January 1977.[15] By 26 May, a baselined, dual capability had been assigned to the PAR system for both the PACS and support of the Space Tracking and Detection System (SPADATS).[16]

Responsibility for the PAR's tactical operation was assumed by USAF personnel on 22 August 1977, though the Army still managed the site.[17] Permit No. DACA 45-4-77-6232 sanctioned the transfer of the PAR site to the USAF for five years, effective 1 October. On 3 October 1977, the PARB was officially transferred to the USAF as the PACS for the Commander in Chief, ADCOM. As part of the USAF Spacetrack network, the PACS site was officially designated the "Concrete Early Warning Station" after the nearby town of Concrete, North Dakota.[18] Once under the 10th Missile Warning Squadron, Space Command, the site was renamed the Cavalier Air Force Station.[19]

The USAF renewed the permit on 30 September of 1982, 1987, and 1992.[20] In 1992, a proposal to transfer the site back to the Army was considered. This did not in fact occur; rather, the permit was extended 3 months, then again for another 9 months, and in August 1993, a new amendment extended the period from 1 October 1993 through 30 September 1996.[21]

4. Builder, Contractor(s), Suppliers: Many contractors were employed in helping to construct the PAR facilities. Of three bids received, the joint Morrison-Knudsen, Inc., Peter Kiewit Sons' Co., Fischbach & Moore Inc., and C.H. Leavell & Co. bid for construction of the PAR site and Missile Site Radar site tactical facilities was the lowest at $137,858,850. This effort by Morrison-Knudsen and Associates (M-KA) was formally accepted on 31 March 1970 as the lowest competitive bid, constituting the largest single construction contract awarded by the Corps of Engineers until that time.[22]

5. Original Plans and Construction: Groundbreaking ceremonies and general site excavation began for the PARB on 6 April 1970; site preparation continued through mid-May, at which point foundation excavation and sealing commenced and forms were placed for the concrete subslab.[23] The first pouring of structural concrete for the PARB base slab took place on 18 June 1970, and by August the PARB was 100-percent complete throughout the first floor slab.[24] The immediate goal for the first construction season was to have the first and second levels of the PARB shell enclosed to permit relatively normal interior work during the freezing conditions of the North Dakota winter.[25] The 1st floor slab was completed on 13 August.[26] By mid-September, the first-floor level walls were finished and false work and steel placement began for the second-floor slab. Fear that schedule slippage and the onset of harsh temperatures would, for all purposes, halt production resulted in an acceleration to two ten-hour, six-day shifts a week from early October through November. This allowed the pouring of the second-floor

slab to "seal in" the building and, as a result, M-KA was allowed an additional 22 days to conclude the PARB's construction plus negotiated cost settlements of approximately $2.5 million.[27]

A primary concern with the PARB design regarded offsetting the potential damage of nuclear weapon effects (electric surges, induced currents, spurious signals, etc.) which would result in the event of nearby detonation of an enemy warhead. Other sources of RFI included lightning, static, and internally generated sources (such as support equipment). Hardening of the building through its concrete and reinforcement by steel rebar would serve to deflect the force of the shock wave, but extra protection was needed against the electromagnetic waves.

To protect the PARB electrical components from magnetic and electric fields known as electromagnetic pulse (EMP), a single continuous steel shielding envelope was provided for the interior of the building and its utility tunnel; this shielding was designated as Type E.[28] Special areas and rooms, designated as Type R, also required shielding protection from radio frequency interference (RFI).[29] In addition, the PARB and all electronic and electrical systems, utility tunnel, and buried electric conductive material were interconnected through an internal grounding and bonding system to earth through controlled paths.[30] The design drawings for the PARB and its utility tunnel designated the liner plate as 11-gauge (-inch) steel, ASTM A570, Grade C, but at the contractor's option, 10-gauge (2/15-inch) steel plate was generally used.[31] Thicker plates were used where required, such as at the finger beams at the Antenna or "A"-wall, hangers, and floor support plates.[32]

The last structural concrete placement for the PARB second floor was made on 23 December 1970. At this point, cutting, placing, welding, and testing of the liner plate began. Fabrication, installation, and painting of conduit and heat sink cooling lines were already underway.[33]

It was 30 March 1971 before construction could resume in earnest, whereupon outside work, predominately concrete pouring, recommenced.[34]

During construction there were various frustrations, including several design changes in both buildings and tactical support equipment.[35] The first major modification, due to criteria change, altered 90 percent of the SRMSC drawings at a cost of approximately $2 million.[36] Progress at the PARB was also impeded somewhat by labor disputes, precipitation, and the annual load limits placed on state highways to protect them during spring thaw, but by September the remaining floor slabs and walls had been poured.[37] The roof concrete (27 October) and "A"-wall (23 October) construction were soon completed, as well.[38] At this point, installation of tactical equipment and systems, doors, wall partitions, and other detail work began, continuing through the winter without the previously required winterization.

Most of late 1971 was spent setting and welding liner plate, installing blast doors and phase shifter platforms, erecting metal partitions, and assembling shock isolation platforms.[39]

Construction of the "A"-wall had proved perhaps the most demanding aspect of the job; determining the manner in which power cables from the exposed antenna elements would be fed through the concrete wall to the interior phase shifters was a complicated challenge. A very precise revolving laser, mounted on the "A"-wall, allowed control of the erection of the antenna ground plane within the allowable tolerance, and as it rotated over the face, targets were placed where necessary as each steel or aluminum member was aligned.[40] Spring and summer 1972 saw painters, electricians, and plasterers undertaking interior finishing work and completing the elevator shaft. While outside, the installation of some 6,888 external radar elements on the "A"-wall was accomplished by Western Electric Company (WECo) workers.[41] Several hundred PAR elements were "dummies," allowing the active elements to see the same electrical environment.

The BOD for the PARB was met on schedule, 21 August 1972 and, at this point, WECo moved in to begin installation and testing of tactical equipment.[42] Mechanical and electrical installation and testing was completed by 31 January 1973.[43] As part of the testing, verification, and acceptance of the Safeguard weapons system, the PAR began operating that June. The initial alignment of the PAR was completed by August 1973, and it was during this month that the first satellite track and the first radio-star track were successfully accomplished.[44] The radar was tested at full power four months later[45].

6. Alterations and Additions: One potential addition to PARB construction was provided for but never occurred. Review of as-built drawings for the PARB indicates the presence of a "knockout panel" on its south wall, first level. During construction, the anticipation of a future expansion of the PARB necessitated allowances in the existing shielding design to accommodate the shielding requirements of such an action. This panel was provided for the tunnel that would be required if another antenna building were added (or a second face, which would necessitate a second power plant).[46] Its construction would allow the existing liner plate to be joined to that of any future tunnel.

Prior to Safeguard inactivation, action was pending on several modifications for PAR Tactical Support Equipment (TSE) which would increase hardness to specified levels. In December 1976, it was decided these modifications (to meet both hardness and EMP criteria) would not be incorporated.[47]

Currently, the facility is undergoing removal of polychlorinated biphenyls (PCBs) or retrofill of transformers with nonhazardous fluid.

Following a 1989 survey, asbestos was removed from any PARB surfaces deemed likely to release airborne particulates into the open spaces above metal office wall panels.[48]

PART II. ARCHITECTURAL INFORMATION

A. General Statement

The PARB is a concrete, steel-reinforced building consisting of five floors with a mezzanine between the second and third floor. Almost square, the building's North wall ("A" wall) slopes 25° from the vertical.

The building size and shape were based primarily on the antenna and antenna ground plane requirements and the equipment that needed to be sheltered.[49] It was influenced by:

- Size, number, and orientation of the antenna apertures
- Projected expendability requirements
- Need for weapon system survivability
- Specified mission and/or potential threats[50]

The PARB's design reflects criteria required to sustain the effects of nuclear attack with all critical systems operational. The PARB was designed with protection against nuclear weapons effects such as overpressure and shock spectra taken into account:

PARB design considered a concrete average strength of 5,000 psi and reinforcement with a 75 ksi yield. The concrete was required to have a 28-day strength of 4,000 psi and a one-year strength of 5,000 psi. The reinforcement conformed to ASTM Grade 75 with additional requirements resulting in a ductility comparable to Grade 40 material. Reinforced concrete members were proportioned on the basis of ultimate strength design methods for concrete, using unity for the load factor and the capacity reduction factor. Computed design capacities were increased to account for the increase in strength that results from rapid strain rate effects.[51]

To maintain the structural integrity as well as the EMP integrity of the floor slab-to-wall interface, a shear key design was developed to satisfy the strength requirements.[52] Approximately 1,714,500 ft^3 of concrete and 8,700 tons of reinforcing steel (rebar) were required for the PARB.[53]

The PARB has a gross building volume, above grade, of 4,275,500 ft^3.

1. Architectural Character: The PARB merits recording by reason of its steel-reinforced, liner plate-shielded design which protected it against nuclear weapon effects, its role in early ballistic missile defense, and as the central figure in the SRMSC--the only antiballistic missile site ever constructed in the free world.[54]

2. Condition

P

B. Description of Exterior

1. Overall Dimensions

2. Foundations: The base slab is 8 ft thick, except at the edges under the exterior walls, where it increases to 10 ft in thickness.[55] Its dimensions are 204 by 213 ft. The first-floor slab is also covered by the EMP-shielding envelope.[56]

3. Walls: The side walls vary in thickness from 8.5 ft at the base tapering to 3.5 ft at the roof; these thicknesses were determined based on a horizontal stress equal to one-tenth of the ultimate dynamic compressive stress (625 psi).[57]

At the base of the side wall, reinforcement on each face consists of two diagonal layers of #11 reinforcing bars at 1 ft in each direction and one layer of #11 reinforcing bars at 1 ft both vertically and horizontally.[58]

"A"-wall The "A"-wall, which supports the radar antenna, contains over 6,500 4-inch diameter pipe sleeve penetrations required for coaxial cables "feeding" the antenna cables.[59] There are 45 different pipe configurations; each "tube" has a double bend and is surrounded by rebar. This wall, uniformly 7 ft thick behind the antenna ground plane, varies from 7.5 ft at its base to 4 ft at the roof at either side of the ground plane.[60]

At each penetration, the EMP liner plate is welded to a 0.5 in flange plate, except at the cable slots, where a perforated continuous 1.5-inch plate is used.[61]

The thousands of external radar elements on the face of the "A"-wall are within 1 in of true position. The total hardware for the 120-foot diameter, 0.25-inch tolerance radar "eye" consists of 245,828 individual bolts, screws, washers, gaskets, seals, frames, plates, and channels. The area directly behind this wall is devoted to the radar phase shifter components.[62] The PAR range was 1,200 to 1,800 nautical miles (UHF frequency), with a peak power of 14.3 milliwatts.

4. Structural Systems:

a. Reinforced Concrete The structural design loads for the PARB were developed considering the results of nuclear blast loads. The design includes a shear wall structure with flat slab floors acting as diaphragms which transmit the lateral blast loads to the walls.[63] In addition to the normal shear (or parallel) loads, the walls are loaded by simultaneous blast pressures perpendicular to the surfaces. Shear wall reinforcement, highest at the base and reduced with building height, averaged approximately 60 lb/ft^2 of wall area.[64]

b. Lightning Protection from lightning is furnished by air terminals spaced on the PARB's roof; the spacing is less for those terminals located near the "A"-wall, in order to furnish greater protection. The terminals are interconnected with copper cable and brought to downleads on the exterior of each wall which, in turn, connect to the external counterpoise.[65] This counterpoise is installed around the PARB and interconnects with the Perimeter Acquisition Radar Power Plant (PARPP) ground grid, site lighting grounding system, and the site fence grounding system, as well.[66]

c. Grounding All currents induced by EMP, lightning, and electrical system faults are dissipated along controlled paths by a grounding and bonding system which is both internal and external to the PARB.[67]

5. Radar: The typical support module frames for the 1-inch thick aluminum ground plane were prefabricated in sections 13 by 2.5 ft. The frames, an arrangement of steel channel shapes connected to the "A"-wall by steel angles, were attached to it by means of cast-in-place bolt inserts. A series of diagonal aluminum channels were bolted to the outer side of the steel support modules to provide for attachment of the 1-inch thick aluminum ground plane. Slotted bolt holes are provided in the support module frames to allow for installation adjustments needed on the ground plane. In order to provide a weather seal between the aluminum ground plane and the "A"-wall, a steel plate edge seal was installed around the plane's periphery. The antenna assembly of the ground plane support modules, ground plane, and edge seal was designed to withstand the effects of nuclear detonation. Precise controls assured compliance with the tight tolerance of +0.5 inches in flatness over the erected surface of the ground plane.[68]

6. Openings:

a. Doors The PARB has five blast doors, three of which lead to the exterior of the building.[69] The blast doors are composed of structural steel frames with steel facings and are filled with concrete for radiation shielding.[70] There is an emergency escape hatch provided in the roof. All PARB doors are grounded.

The personnel entrance to the PARB, consisting of a pair of interlocked blast doors separated by a vestibule to form a blast lock, is located on the south side at the first-floor level. Equipment access is through a rear entry enclosed with 10.5 by 11.33 ft of sliding blast door.[71]

The personnel entrance is EMP-protected by the complete lining of the walls, floor, and ceiling of Vestibule 115, enclosed at both ends by shielded, steel-lined blast doors (BD4A and BD4B) with RFI/EMP gaskets to ensure a liner plate/door seal.[72] Blast doors BD4A and BD4B are swing-type and electro-pneumatic actuated. Door BD4A is located in Blast Lock Room 115. Door BD4B is located between Blast Lock Room 115 and the decontamination area, Room 116A.

The equipment access entrance is EMP-protected by the complete lining of the walls, floor, and ceiling of Vestibule 123, enclosed at both ends by shielded, steel-lined doors. The outer door (BD3) has a pneumatic seal to ensure EMP integrity as it expands and forces the steel door plate flush with its frame.[73] Blast door BD3 is a sliding type, size to allow equipment access. The door is suspended from a set of trucks traveling on an overhead rail. The door is equipped with inflatable seals around the periphery to maintain an environmentally tight enclosure and a heating cable to prevent it from freezing shut.[74]

Emergency Escape Hatch EEH1, located above Roof Access Chamber Room 521, provides an emergency exit from upper levels of the PARB to the roof.[75] The hatch is manually unlocked and locked by a handwheel-actuated jackscrew.

b. Loading Dock Facility 831, the Loading and Unloading Dock, is located on the south side of the building, near the personnel entrance.

c. Other Penetrations Other PARB openings and penetrations include:

- Air intake and exhaust
- Antenna De-icing System (32 locations)
- Drains and waste system
- Electrical and mechanical penetrations
- Decontamination Area exhaust
- Very Low Frequency (VLF) Antenna
- High Purity Water Supply[76]

7. Roof Characteristics: The PARB roof measures 148 ft by 194 ft. It slopes towards the rear of the building, with drains provided on either side. A very low frequency (VLF) antenna, serving the Precision Frequency and Time Generator (PFTG), a lightning protection system conforming to the *National Fire Protection Agency No. 78 Lightning Protection Code*, and aircraft warning lights are also located on the PARB roof.[77] The lightning protection system is designed not to interfere with radar beams nor to act as a source of debris under nuclear attack; it is accessed by a secure hatch.[78] The PARB roof is covered by a EMP shielding envelope of 11-gauge minimum thickness, low carbon steel sheet.[79]

C. Description of the Interior

A continuously welded steel plate liner provides a single internal shield envelope penetrating the floor slabs at the intersection with the exterior walls and at the columns at the roof and base slabs; it also covers the inside face of the exterior walls and the PAR's utility tunnel.[80]

Two elevators, one 10 by 18 ft utilized for up to 25,000 lb of freight, the other, 4 by 6 ft for moving personnel and with a 3,000-pound capacity, are present in the PARB.[81]

PARB RFI/EMP-shielded areas include:

- Power Supply Room
- Communications, Telephone Company (Telco) Power Supply, Crypto, and Data Terminal Rooms
- Exciter Room
- Signal Processing Analog and Receiver Room
- Screen Room
- Calibration Test Equipment and Repair Room

EMP-shielded areas include:

- PAR Utility Tunnel
- PARB, except where RFI/EMP-Hardened[82]

1. Floor Plans: The PARB contains approximately 167,000 ft^2 of floor area; approximately one-half for Weapon System Equipment (WSE), related shops, and storage areas and the other for TSE and related support areas.[83]

Floors in the PARB vary in plan from 198 by 186 ft to 154 by 186 ft (at the fifth floor).[84] The floor slabs are typically 3-feet thick, with support columns generally 25 to 29 ft on centers and exterior wall construction joints provided at each floor and midway between floors.[85]

Each of the PARB's five full floor levels has approximately 22 ft of clear height and is connected by an elevator and multiple stairs. Between the second and third levels is a mezzanine floor; a series of narrow interior service floors accommodates the building.[86]

At the sloping "A"-wall interface along the horizontal extent of the antenna, the slotting of the floor slabs in the second through the fifth levels allows passage of electronic cables through the wall's penetrations. The spacing of these penetrations only permitted the concrete slots separating them to be 7 in width. In order to maintain the structural integrity of the connection of the floor slab to the "A"-wall, a steel built-up member with a welded end cap is set in the concrete section of the floor slab and attached to the inclined wall by a series of post-tensioned, high-strength bolts extending through the wall. To ensure EMP continuity, the beam end cap is welded to the wall shelf providing a welded closure cap over the bolts penetrating the "A"-wall. Since the series of relatively thin beams between slots provide negligible resistance to the horizontal shear, the solid section of the floor slab to either side of the slotted zone is required to transmit higher diaphragm shear to the shear wall.[87]

a. First Floor The first level contains the Security Operations Control Center (SOCC), mechanical and electrical equipment rooms, a phase shifter room, corridors, vestibules, a decontamination area, personnel areas, a plumbing equipment room, freight elevator shafts, mechanical space, and stairwells.[88]

The entire first floor is encompassed by EMP shielding; rooms 115 and 123, along with Antenna De-icing Panels 1&2, 3&4, 5&6, and 7&8, are also provided with RFI shielding.[89]

b. Second Floor The second level contains a phase shifter room, mechanical and electrical equipment room, communication room, classrooms, personnel areas, offices, life support room, telco power supply room, vestibules, stairwells, storage room, and medical area.[90]

The second floor has EMP shielding; the communications room (203) and the telco power supply room (204) are provided with RFI shielding.[91]

c. Mezzanine The mezzanine contains a mechanical equipment room; vestibules; power supply room; corridor; data processing heat exchanger room; available space; exhaust plenum; and stairwells.[92]

The power supply room (2M4) for the digital area and the 2M1 vestibule are the only rooms on the mezzanine level that have RFI shielding in addition to the EMP shielding; however, Stair 4 (2M3) is also shielded and leads to the third floor.[93]

d. Third Floor The third floor contains a phase shifter and transmitter room, signal processing analog and receiver room, crypto room, data terminal room, administration area, exciter room, digital area, PAR Operations Center (PAROC), office spaces, Equipment Readiness Center (ERC), tape handling and storage rooms, toilet, storage available space, System Readiness Verification (SRV) room, corridors, vestibules, and stairwells.[94]

The majority of the third-floor rooms are EMP/RFI shielded: signal processing analog and receiver room (302), crypto room (304), data terminal room (305), exciter room (316), digital area (318), ERC (323), PAROC and command dais (323), tape handler room (325), SRV room (337), tape storage room (326), spare parts storage (338), Corridor 311, Office 321, and a vestibule (324).[95]

e. Fourth Floor The fourth level consists of a phase shifter room, mechanical and electrical equipment rooms, available space, Technical Maintenance Repair Center (TMRC) and repair shops, storage, Material Data System (MDS) room, calibration rooms, screen room, corridor, vestibules, and stairwells.[96]

On the fourth floor, the screen room (420) and the Calibration Test Equipment Repair (CTER) room (417) are RFI-shielded.[97]

f. Fifth Floor The fifth floor contains a phase shifter room, storage, Traveling Wave Tube (TWT), test area, antenna de-icing room, mechanical equipment air intake room, Chemical, Biological, and Radiological (C.B.R.) filter rooms, maintenance and supply data processing room, corridor, vestibules, and stairwells.[98] On the fifth floor, RFI shielding is reserved for the antenna de-icing panels nos. 9 & 10, 11 & 12, 13 & 14, and 15 & 16.[99]

2. Stairways: Stairways 1 (room 112), 2 (room 133), and 3 (room 114) originate on the first level and they, along with a passenger elevator (room 130), allow access to other PARB levels.[100]

Stairways 1, 2, 3, and 5 (room 203), as well as the passenger elevator, access the second floor.[101]

Entrance to the second level mezzanine is facilitated via stairways 1, 2, 3, or 4 and the passenger/freight (room 129) elevators.[102]

Stairways 1 and 2 and the passenger/freight elevators lead to level 3; a spiral staircase (stairway 5) is a secure passageway between rooms 308 and 203; Stairway 4 connects the secured areas of the mezzanine with those of the digital processing equipment area.[103]

Stairways 1 and 2 and the passenger/freight elevators access the fourth floor level.[104]

Stairways 1 and 2 and the passenger/freight elevators access the fifth floor level, and the PARB roof is accessed via a ladder in vestibule 520 and through a secured hatch.[105]

All PARB staircases are grounded.[106]

3. Flooring: The original PARB floor finishes were as follows:

First floor epoxy paint (19 rooms); vinyl asbestos tile (VAT) (3 rooms); troweled on epoxy (9 rooms); exposed concrete (2 rooms).

Second floor VAT (26 rooms); troweled on epoxy (14 rooms); exposed concrete (7 rooms).

Mezzanine epoxy paint (Vestibule 2M1); exposed concrete (11 rooms); raised flooring (2 rooms).

Third floor VAT (9 rooms); troweled on epoxy (2 rooms); exposed concrete (10 rooms); raised flooring (14 rooms).

Fourth floor VAT (9 rooms); troweled on epoxy (toilet and janitor's closet); exposed concrete (15 rooms).

Fifth floor VAT (3 rooms); troweled on epoxy (toilet and Janitor's Closet [JC]); exposed concrete (15 rooms).[107]

4. Wall and Ceiling Finish: The PARB original wall finishes were as follows:

First floor liner plate with concrete (23 rooms); acoustical treatment (SOCC), Room 108; exposed concrete (3 rooms); wire mesh partitions (3 rooms).

Second floor liner plate with concrete (34 rooms); acoustical treatment (2 rooms); wire mesh partitions (2 rooms); liner plate (6 office rooms).

Mezzanine liner plate with concrete (9 rooms); wire mesh partition (2 rooms); exposed concrete (exhaust plenum).

Third floor liner plate with concrete (13 rooms); wire mesh partitions (2 rooms); liner plate (16 rooms); liner plate with acoustical treatment (2 rooms); liquid glaze (2 rooms).

Fourth floor liner plate with concrete (16 rooms); acoustical treatment (5 rooms); liner plate (8 rooms); liquid glaze (toilet and J.C.).

Fifth floor liner plate with concrete (14 rooms); exposed concrete (fresh air plenum); wire mesh partitions (2 rooms); liner plate (4 rooms); liquid glaze (2 rooms).[108]

Ceiling Finish The original PARB ceiling finishes were as follows:

First floor liner plate (blast locks, shafts); liquid glaze (showers); exposed concrete (all other).

Second floor acoustical finish (office rooms); metal with concrete (some offices); exposed concrete (all other rooms).

Mezzanine - liner plate (3 rooms); exposed concrete (all other rooms).

Third floor liner plate (9 rooms); exposed concrete (15 rooms); acoustical treatment (9 rooms); luminous ceiling (3 rooms).

Fourth floor liner plate (6 rooms); exposed concrete (all other rooms).

Fifth floor exposed concrete (air plenum); exposed concrete with liner plate (Stair was 2); liner plate (all other rooms).[109]

5. Openings:

a. Doors The PARB had two interior blast doors and 14 shielded doors. Blast door BD1 in Room 510 allows entry to the PARB air supply chamber. Door BD2 in Room 2M8 allows entry to the PARB air exhaust chamber for inspection and debris removal. Each door is grounded and when closed and locked, RFI-sealed. Interior raised doors were designed to withstand the computed internal shock environment.

6. Mechanical Equipment: In order to survive the shock environment within the PARB, equipment was either ruggedized or shock isolated, and flexible connections were required between hard-mounted lines and shock-isolate equipment to provide for any blast-induced relative motion.[110]

Over 300 platforms were shock isolated.[111] Sizes ranged from very small panel platforms (2 ft^2) with no isolators to very large platforms (3,000 ft^2) with 60 isolators.[112] Over 1,200 isolators were utilized with static load capacities of 64 to 20,000 lb.[113] Dynamic load capacities varied from 128 to 40,000 lb.[114] The largest supported load was 26,000 lb.[115] Both helical coil springs and air springs were utilized for shock isolation platform support in either pendulum or underfloor configurations. Air springs were employed for spring loads in excess of 2,000 lb. Below this load level, coil spring assemblies were used.

A great amount of the electronic equipment, as well as a majority of the electrical and mechanical support equipment, was mounted on such platforms, designed to reduce the vertical shock load(s) to approximately 0.5 gravity force or less, including rocking modes.[116] Since the platforms are supported by long pendulums, horizontal shock would be substantially lower than the vertical and, in most cases, not greater than 0.05 gravity force.[117]

At each floor level, the radar phase shifter components extend from the floor slab to the underside of the ceiling. It is supported on structural steel with a service platform at each half floor level. The service platforms are hung from the underside of the upper floor slabs and the roof, with special connection details at the base of the phase shifter support columns at each floor surface to prevent the transfer of vertical floor slab loads under blast load conditions. Plastic design was used for the structural steel elements.[118]

The electrical distribution system is designed to provide precise as well as conventionally regulated power without interruption or damage under nuclear attack.[119] This requirement mandated a design to control exposure of sensitive electrical circuits and components to EMP. The effect of EMP on an unshielded system would induce a current on a conductor, e.g., a conduit, which can damage or cause serious perturbations to vital electronic components in the system.[120] The PARB's RFI-protective shielding is used either to contain equipment which is itself an RF source (RF containment areas) or to protect equipment highly susceptible to such emissions (RF exclusion).[121]

All electrical systems serving equipment within RFI-shielded zones include RF in-line filters at the shielding penetration.[122] In addition, all PARB steel phase shifter support platforms are grounded.[123]

The PARB support systems include networks of ducts, piping conduits, power lines, communication lines, monitoring and control cabling, chillers, heat exchangers, air handling units, transformers, switchgear and other mechanical and electrical equipment.

a. Communications   Communications lines run through buried conduit.[124] The communications systems includes black, red, and maintenance telephone systems, as well as a public address system and closed circuit television.[125]

b. Heating, Air Conditioning, Ventilation   The PARB was provided with electrical energy, antenna cooling water, high purity water, hot water, nitrogen, ventilating air, and compressed air by the PARPP. These systems provide power, air, and water cooling and satisfy special purity and environmental requirements necessary for the successful operation of the electrical equipment and radar system.[126]

The PARB's heat source originates in the PARPP; four additional heating coils and 55 zone duct heaters augment this.[127]

There are 28 air conditioning units in the PARB.[128]

Three general exhaust fans (Room 2M8) and two decontamination area fans (Room 134) supply the PARB with ventilation.[129]

In order to protect the PARPP from the effects of both chemical/biological warfare attack and nuclear radiation, the ventilation system was equipped with CBR filters. Additionally, special design was required to insure that all building apertures be tightly sealed against external air bearing CBR contaminants.[130]

c. Lighting PARB interior lighting included four different systems, as follows:

- General fluorescent, with average intensity of 50 foot-candles at 30 in above finished floor surfaces.

- Console dual (variable and general), with variable lighting situated so as to prevent glare/reflection on the cathode-ray tubes in console equipment working areas; average intensity 0 to 30 foot-candles (dimmer provided); variable system can override general.

- Special provided in critical areas from a nonbreak bus; minimum light intensity of 30 percent of normal level.

- Emergency for safe PARB ingress/egress, critical security and control stations; supplied by wall-mounted, battery-operated units.[131]

d. Plumbing Water supply for the PARB and the PAR site was provided from 10 wells through a 63-mile waterline from the Fordville Aquifer to the PAR site.[132] The water supply system had the capability of delivering some 1,000 gal of water per minute needed to aid in electronic equipment support and temperature control.[133] Designed for the internal shock environment and to offset the increased susceptibility due to the length between PAR facilities, the systems included surge attenuators to attenuate pressure buildup and the damage it would have on the piping and equipment.[134] The PARB's water was processed through its power plant.

D. Site

1. General Setting and Orientation: The PAR site provided the long-range eye of the Safeguard system, with a detection range of over 1,000 mi as required for surveillance, detection, and tracking of intercontinental ballistic missiles (ICBMs) for SPARTAN missile intercept. This site is located on 279 ac of land, 90 road mi northwest of Grand Forks and 24 mi east of Langdon, North Dakota and is divided into a Controlled Area, a Limited Area, and Community Center Area.

2. Historic Landscape and Design: The PAR is located in western Pembina County, 2 mi south of Highway 5, just north-northwest of the town of Mountain. Except for built-up areas (e.g., farmsteads, roads), the entire area (90 percent) within 656 ft is agricultural, with 20 percent of it wooded. There is great topographic relief near the PAR site (the most prominent feature being the Pembina Hills), primarily because of the Red River Escarpment; the low point of 1,060 ft above mean sea level (msl) and high point of 1,390 ft above msl demonstrate this. The PAR, itself, is about 1,175 ft above msl.[135]

PART III. SOURCES OF INFORMATION

A. Original Architectural Drawings

Original drawings for the PARB were prepared by Ammann and Whitney, Consultants-Engineers, New York, New York.

B. Interviews

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Prepared By: James Edward Zielinski
Environmental Specialist
EARTH TECH
December 1994

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[4]JANE'S, 1976: 591.

[5]Kitchens, 1978: 112.

[6]Ibid.: 105.

[7]Ballistic Missile Defense Systems Command, 1975: I-1.

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[9]Ballistic Missile Defense Organization, 1976: II-2.

[10]Ibid.: V-2.

[11]Ibid.: V-2.

[12]Ibid.: V-3.

[13]Ibid.: II-2.

[14]Ballistic Missile Defense Organization, 1977b: II-4.

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[33]Kitchens, 1974: 72.

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[36]Thomas, Earl, 1992.

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[38]Ballistic Missile Defense Systems Command, 1974: 4-4.

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[83]U.S. Army Corps of Engineers, 1974b: 5.

[84]U.S. Army Corps of Engineers, 1989: 4.

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[86]U.S. Army Corps of Engineers, 1974b: 5.

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,, UTILITY TUNNEL
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 825)
Between Limited Access Patrol Road and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-Q

Actual Location: *Village of Mountain Vicinity*
Pembina County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, UTILITY TUNNEL
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(FACILITY 825)
Between Limited Access Patrol Road and Service Road A
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-Q

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-Q-1 VIEW (FACING INTO PERIMETER ACQUISITION RADAR BUILDING) THROUGH FIRST LEVEL OF UTILITY TUNNEL. THIS TUNNEL CONNECTS THE PARB WITH ITS POWER PLANT

ND-9-Q-2 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). UTILITY TUNNEL PLAN, SECTIONS, AND DETAILS

HAER ND-9-Q Photo List - Utility Tunnel

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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Click Q

Photo list:

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX, UTILITY TUNNEL
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(FACILITY 825)

HAER No. ND-9-Q

Location: Between Limited Access Patrol Road and Service Road A, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Village of Mountain Vicinity, Pembina County.

Significance: The tunnel provides access for personnel and utilities between the Perimeter Acquisition Radar Building (PARB) and its power plant.

Description: Connection of utilities between the Perimeter Acquisition Radar Power Plant (PARPP) and the PARB is provided through a concrete tunnel 21 by 14 ft high.[1] This concrete was 3 ft thick at the ceiling and floor and had 4-foot-thick walls. An internal electromagnetic pulse (EMP) shield similar to that in the PARB was also required for this tunnel. A 5-inch structural gap or joint (packed with compressible polyurethane foam strip and elastomeric sealant) is present between the tunnel and the PARB to permit relative movement between them during nuclear attack conditions.[2] Flexible connections at the tunnel-PARB interface (at the PARB's "D" or west wall) were also provided for the tunnel's piping and electrical conduits, and a flexible steel wire cloth/copper foil gasket surrounding the tunnel cross section provides the EMP continuity.[3]

History: The utility tunnel was designed by Ammann and Whitney Consulting Engineers. Construction by Morrison-Knudsen and Associates began on 5 August 1971 and was completed on 17 November 1972.

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Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR POWER PLANT
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(FACILITY 820)
In Limited Access Area, Southwest of PARB at end of Service Road B
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-R

Actual Location: *Village of Mountain Vicinity*
Pembina County

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

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HISTORIC AMERICAN ENGINEERING RECORD

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In Limited Access Area, Southwest of PARB at end of Service Road B
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-R

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-R-1 VIEW FROM SOUTH TO NORTH OF PERIMETER ACQUISITION RADAR POWERPLANT DIESEL ENGINE EXHAUST AND THE SMALLER ENGINE INTAKE. ON THE RIGHT IS THE VENTILATING AIR INTAKE/EXHAUST, DISTINGUISHABLE BY ITS SQUARE SHAPE, WHEREAS THE DIESEL COLUMNS ARE RECTANGULAR

ND-9-R-2 PERIMETER ACQUISITION RADAR POWER PLANT ACCESSWAY 101, SHOWING EQUIPMENT BLAST LOCK#102 ENTRANCE FOR FIRE TRUCKS AND EQUIPMENT. AN UNDERGROUND STRUCTURE AT ITS ORIGIN, THE 177-FOOT LONG ACCESSWAY IS ABOVE GROUND AT ITS SOUTH END, TERMINATING IN THE PARKING LOT OF SERVICE ROAD B

ND-9-R-3 VIEW FROM DOORWAY OF PERIMETER ACQUISITION RADAR POWER PLANT, GENERATOR M1 (LOWER LEVEL), ROOM #115

ND-9-R-4 VIEW FROM REAR OF ROOM OF PERIMETER ACQUISITION RADAR POWER PLANT, GENERATOR M1 (LOWER LEVEL), SHOWING FUEL TANKS

ND-9-R-5 VIEW FROM ABOVE AND REAR OF ROOM (FACING CORRIDOR DOORWAY) OF PERIMETER ACQUISITION RADAR POWER PLANT, GENERATOR M1 (LOWER LEVEL)

ND-9-R-6 PERIMETER ACQUISITION RADAR POWER PLANT, GENERATOR M1 (LOWER LEVEL), AIR INTAKES

ND-9-R-7 PERIMETER ACQUISITION RADAR POWER PLANT ROOM #202, BATTERY EQUIPMENT ROOM; SHOWING BATTERY ROOM (IN BACKGROUND) AND MULTIPLE SOURCE POWER CONVERTER (IN FOREGROUND). THE PICTURE OFFERS ANOTHER LOOK AT THE SHOCK-ISOLATION SYSTEM DEVELOPED FOR EACH PLATFORM

ND-9-R-8 PERIMETER ACQUISITION RADAR POWER PLANT ROOM #211, BATTERY ROOM; SHOWING BATTERY RACKS. THE DC POWER OF THESE BATTERIES IS DISTRIBUTED TO MOTOR-CONTROL CENTERS, THE ANNUNCIATOR SYSTEM, AND FIRE ALARM AND TRIPPING CIRCUITS

ND-9-R-9 VIEW OF SOUTHEAST CORNER OF PERIMETER ACQUISITION RADAR POWER PLANT FROM ROOM #214, CONTROL ROOM; SHOWING CENTRAL MONITORING STATION CONSOLE IN FOREGROUND. WELL AND BOOSTER CONTROL PANEL IN LEFT BACKGROUND AND ELECTRIC POWER MANAGEMENT PANEL ON FAR RIGHT

ND-9-R-10 PERIMETER ACQUISITION RADAR POWER PLANT (UPPER LEVEL) ROOM #219E, STATION SERVICES ROOM; SHOWING AIR COMPRESSORS WHICH PROVIDE DIESEL GENERATORS WITH INTERNAL POWER KICK-ON

ND-9-R-11 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). LOWER LEVEL PLAN

ND-9-R-12 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). UPPER LOWER LEVEL PLAN

ND-9-R-13 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). TYPICAL MODULE SECTION

HAER ND-9-R Photo List - Perimeter Acquisition Radar Power Plant

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR POWER PLANT
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 820)

HAER No. ND-9-R

Location: In Limited Access Area, Southwest of Perimeter Acquisition Radar Building (PARB) at end of Service Road B, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Village of Mountain Vicinity, Pembina County.

Significance: The Perimeter Acquisition Radar Power Plant (PARPP) houses the power generator equipment, transformers, controls, and switch gear and provides electrical energy and other utilities to the PARB.

Description: The PARPP is a two-level, mounded, concrete, hardened building with a gross floor area of 75,015 ft^2. The earth-covered concrete roof has eight intake and exhaust stacks projecting above grade.[1] The exterior underground surface of the PARPP was provided with a waterproof coating.

The PARPP utilizes five Cooper-Bessemer (diesel) generating units with a total installed capacity of 15 megawatts.[2] Each unit occupies a separate prime-mover module room, each of which has a mezzanine.[3]

A cable room is located between the second-level control room and the first-level shop area.[4] A hardened tunnel, the only authorized access between the two, connects the PARPP with the PARB and allows personnel/equipment access; however, two emergency exits allow egress from the building, and the lower level has an accessway of 177 by 16 ft.[5] The Communication Vault of the PARPP is shielded against electromagnetic pulse (EMP) and radio frequency interference.[6] The PARPP, itself, is shielded against EMP by the reinforcing bars in its concrete walls.[7] It is located in the radar "deadzone" of the PAR.

History: The PARPP was designed by Black and Veatch Consulting Engineers. Construction by Morrison-Knudsen and Associates began in April 1970. The first diesel generator was emplaced in July of 1971; by December, all five were installed and the plant was roofed.[8] Construction was completed on 8 November 1972 at an approximate cost of $40,703,000.

Sources:

Leitch, Jay A., 1992. Correspondence to The Earth Technology Corporation regarding land use at the Stanley R. Mickelsen Safeguard Complex, 24 September.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota: p. 120.

U.S. Army Corps of Engineers, 1971. Personnel Orientation Guide, HNDDSP-71-52-ED-S, 15 November: p. 1-18.

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site Complex Physical Description Manual No. 004, 30 September: p. 4-1.

Ibid.

U.S. Army Corps of Engineers, 1972. Hardness Program, EMP, EMP-RFI Protection MSR, for Safeguard TSE Ground Facilities, Volume 1, July: p. 3-3.

U.S. Army Corps of Engineers, 1971. Personnel Orientation Guide, HNDDSP-71.52-ED-S, 15 November: p. 1-1.

Kitchens, James H. III, 1978. A History of the Huntsville Division, U.S. Army Corps of Engineers, 1967-1976, 6 September: p. 89.

Endnotes:

[1] Leitch, Jay A., 1992: 10.

[2] U.S. Army Corps of Engineers, 1974a: p. 120.

[3] U.S. Army Corps of Engineers, Personnel Orientation Guide, HNDDSP-71-52-ED-S, 15 November: p. 1-18.

[4] Western Electric, 1971: 4-1.

[5] Ibid.

[6] U.S. Army Corps of Engineers, 1972b: 3-3.

[7] U.S. Army Corps of Engineers, 1971: 1-1.

[8] Kitchens, James H. III, 1978.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
COOLING TOWER
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 809)
In Limited Access Area, between Service Roads D and A
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-S

Actual Location: Village of Mountain Vicinity
Pembina County

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, COOLING TOWER
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 809)
In Limited Access Area, between Service Roads D and A
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO.ND-9-S

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-S-1 VIEW FROM SOUTHWEST TO NORTHEAST OF COOLING TOWERS FOR PERIMETER ACQUISITION RADAR BUILDING AND PAR POWER PLANT

HAER ND-9-S Photo List - Cooling Tower

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, COOLING TOWER

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,

PERIMETER ACQUISITION RADAR COMPLEX)

(BUILDING 809)

HAER No. ND-9-S

Location: In Limited Access Area between Service Roads D and A, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Village of Mountain Vicinity, Pembina County.

Significance: The tower provided cooling water to the Perimeter Acquisition Radar Power Plant during normal surveillance operations.[1]

Description: The four-cell, 923-square-foot tower is of nonhardened construction with a 8-foot-deep concrete foundation and is equipped with electrical and water supplies.[2] The tower has electric and water facilities and an 11,400-gallon-per-minute capacity.

History: The cooling tower was designed by Ammann and Whitney Construction Engineers. Construction by Morrison-Knudsen and Associates began on 22 March 1971 and was completed on 17 November 1972, at an approximate cost of $67,000.

Sources:

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen SAFEGUARD Complex in Vicinity of Grand Forks, North Dakota, undated: p. 118.

Ibid.: p. 116.

Endnotes:

[1] U.S. Army Corps of Engineers, 1974: 118.

[2] Ibid., 116.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1
Just South of Ramsey-Cavalier County line and 3 mi West of Hampden, ND
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-T

Actual Location: Hampden Vicinity
Ramsey County

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
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Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1
Just South of Ramsey-Cavalier County line and 3 mi West of Hampden, ND
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-T

Actual Location: *Hampden Vicinity*
Ramsey County

Benjamin Halpen, Photographer, 5-18 October 1992

ND-9-T-1 OVERVIEW (LOOKING NORTH) OF REMOTE LAUNCH SITE #1

ND-9-T-2 Photographic copy of photograph, dated September 1973 (original in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. AERIAL PHOTOGRAPH (WEST TO 0EAST) OF REMOTE SPRINT LAUNCH SITE #1. IN BACKGROUND ARE WASTE STABILIZATION POUNDS. ON NEXT ROW ARE THE SPRINT CELLS. IN FOREGROUND ARE THE REMOTE LAUNCH OPERATIONS BUILDING ON LEFT AND THE LIMITED AREA SENTRY STATION ON RIGHT. THE VIEW ILLUSTRATES THE RELATIVELY FLAT TOPOGRAPHY OF THE SRMSC AREA Benjamin Halpern, 5-18 October 1992

HAER ND-9-T Photo List - Remote Sprint Launch Site #1

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #1)

HAER No. ND-9-T

Location: Near Service Road exit from Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Hampden vicinity, Ramsey County.

Location: Remote Sprint Launch (RSL) Site #1 is located in the SE-1/4 of Section 1, Township 158 North, Range 62 West of the Fifth Principal Meridian, Ramsey County, North Dakota.

Township and Range: Listed on following page.

Date of Construction: 1 September 1971 through 20 November 1973 (RSL #1).

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers. One of four remote launch sites at the Missile Site Radar (MSR) site, the Remote Sprint Launch (RSL) Site #1 facility has 12 Sprint missile silos.[1] These silos and the others at the SRCMS reprsent the total number of launch silos allowed under the Strategic Arms Limitation Treaty and its 1974 protocol.

Description: The Remote Sprint Launch Site (RSL) #1 is one of four RSLs. The four RSL sites, which were located within 10 to 20 mi of the Missle Site Control Building (MSCB), were in the general area of the Minuteman missiles which they were to defend. Each occupied from 37 to 45 acres of land. The sites were composed of sentry stations, heat sinks, fuel storage tanks, waste stabilization ponds, a Sprint missile launch area containing 12 to 16 Sprint launch stations, and a buried, reinforced concrete remote launch operations builidng (RLOB), which controlled and monitored the RSL sites as the MSCB directed.

RSL #1 is situated on 40.61 acres located approximately 1,560 ft above mean sea level (msl) and situated in the southeast quarter of Section 1, Township 158 North, Range 62 West of the Fifth Principal Meridian, Ramsey County, North Dakota.[2]

Historians: James E. Zielinski, Environmental Specialist, and Frances Martin, Historian, July 1996.

REMOTE SPRINT LAUNCH SITE 1

Commencing at the Southeast corner of said Section 1;

thence North 01_19'45" West along the East line of said Section 1, 960.10 feet to the point of beginning;

thence South 88_40'16" West, 1,326.33 feet;

thence South 01_04'24" East, 954.18 feet to the South line of said Section 1;

thence South 88_55'36" West along said South line 169.09 feet;

thence North 01_21'29" West, 2,023.63 feet;

thence North 88_40'17" East, 1,500.69 feet to the East line of said Section 1;

thence South 01_19'45" East along said East line, 1,070.11 feet to the point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The date of completion for Remote Sprint Launch (RSL) Site #1 was 20 November 1973.[3]

2. Architects: It was decided that the smaller-scaled, less-demanding RSL sites should be separate from the main Missile Site Radar (MSR)/Perimeter Acquisition Radar (PAR) bidding package.[4] Work began on this RSL site on 30 August 1971 following the design of the Leo A. Daly Company.[5]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred Stanley R. Mickelsen Safeguard Complex (SRMSC) site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved the SAFSCOM and were established as the operational elements for the SRMSC; the SAFCMD soon assumed operation/maintenance responsibility.[6] The U.S. Army Air Defense Command (ARADCOM), manned by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[7]

On 10 February 1976, all Safeguard facilities except the PAR were "abandoned in place" and put in caretaker status. All RSL sites are presently owned by the U.S. Government. The U.S. Army Corps of Engineers (Omaha District) and General Services Administration had land authority through December 1991.[8] From late 1991 to the present, RSL #1 along with the other RSL's have remained in caretaker status, overseen by the U.S. Army Space and Strategic Defense Command (USASSDC).[9]

4. Builder, Contractors, Suppliers: The construction contractors were Woerfel Corporation and Towne Realty, Inc., which were awarded a contract for RSL sites #1 and #4 on 30 August 1971 for the amount of $7,870,533.[10] Chris Berg, Inc., designed and erected the support facilities.[11]

5. Original Plans and Construction: The Safeguard program was officially inaugurated in March 1969.[12] However, original plans for the RSL sites were altered somewhat in 1970 by the announcement of a "Modified Phase II Safeguard," with the addition of extra Sprint missiles mandating two additional RSL sites, for a total of four.[13] Construction on RSL #1 began in earnest the following year.

By the close of the 1971 construction season in November, varying degrees of progress had been made. The RSL #1 site had only site grading, fencing, preliminary fencing, and limited preparatory work completed at the time.[14] The inclement weather delayed actual RSL #1 construction until 13 April 1972.

Various engineering changes and the difficulty of the undertaking for Woerfel Corporation and Towne Realty, Inc., theretofore concerned primarily with simpler tasks such as residential construction, delayed the completion of the RSL sites.[15] Completion of each site slipped in scheduling by about 3 months.[16] The Sprint missiles arrived at the SRMSC in April 1975.[17]

6. Alterations and Additions: By 1977 all missiles had been removed from the silo launchers, and the silos were sealed.[18]

PART II. SOURCES OF INFORMATION

A. Original Architectural Drawings

The original RSL drawings were prepared by The Leo A. Daly Company, Architects-Engineers, St. Louis, Missouri.

B. Interview

Kane, Tom, 1996. Interview with Kane, Engineer, Office of the Deputy Chief of Staff for Installations, Environment and Logistics, USASSDC, at USASSDC, Huntville, AL., 15 July.

C. Bibliography

1. Primary and Unpublished Sources:

FACT SHEET, U.S. Army Strategic Defense Command, Public Affairs Office, "Stanley R. Mickelsen Safeguard Complex," undated.

Kitchens, James H. III, 1978. A History of the Huntsville Division, U.S. Army Corps of Engineers 1967-1976, 6 September.

U.S. Army Corps of Engineers, 1974a. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex, undated.

U.S. Army Corps of Engineers, 1974b. Safeguard--A Step Toward Peace, No date.

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), 13 December.

Western Electric, 1971. Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site (MSCC/FS) Complex Physical Description, Manual No. 004, 30 September.

Historians: James E. Zielinski, Environmental Specialist, and Frances Martin, Historian, 1996.

Endnotes:

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[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974a: Appendix A.

[3] Kitchens, 1978: 111.

[4] Ibid.: 49.

[5] U.S. Army Corps of Engineers, 1974, b: iii.

[6] Kitchens, 1978: 112.

[7] Ibid.: 105.

[8] U.S. Army Corps of Engineers, 1991: 7.

[9] U.S. Army Space and Strategic Defense Command, 1993: 2-3.

[10] Kitchens, 1978: 89.

[11] U.S. Army Corps of Engineers, 1974b: iii.

[12] Kitchens, 1978: 58.

[13] Ibid.

[14] Ibid.: 89.

[15] Ibid.: 111.

[16] Ibid.: 111.

[17] Ibid.: 111.

[18] U.S. Army Strategic Defense Command, 1991: 1-6.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1)
(FACILITY 1101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-U

Actual Location: *Hampton Vicinity*
Ramsey County

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #1) (BUILDING 1101) HAER NO.ND-9-U

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO.ND-9-U

Actual Location: *Hampden Vicinity*
Ramsey County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-U-1 VIEW (LOOKING NORTH) OF LIMITED AREA SENTRY STATION

ND-9-U-2 Photographic copy of original design drawing, dated May 1971, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). FLOOR PLAN, FINISH SCHEDULE, AND ROOF PLAN

ND-9-U-3 Photographic copy of original design drawing, dated May 1971, revised 1 May 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). ELEVATIONS AND DETAILS

HAER ND-9-U Photo List - Limited Area Sentry Station

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #1)

(BUILDING 1101)

HAER No. ND-9-U

Location: Between Access Road and Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Hampden Vicinity, Ramsey County.

Significance: Similar to the Limited Access Sentry Station (LASS) at the Missile Site Radar (MSR) site, this station controlled the sally-port gates that permitted entrance into the Remote Sprint Launch (RSL) Site #1 facility.[1]

Description: The LASS is a one-story, concrete building (2,259 ft^2) of permanent construction that had electric, water, and sewer utilities, as well as heating and exhaust units.[2] The roof is suspended concrete slab with elastomeric roofing, and the floor is slab on grade.[3] The LASS is considered "soft" (nonhardened) and expendable under an environment of nuclear weapons effects.

History: The LASS was designed by the Ralph M. Parsons Co. Construction by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 10 August 1973 at an approximate cost of $50,000.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 175.

Ibid.

Endnotes:

[1] Western Electric, 1971: p. 11-2.
[2] U.S. Army Corps of Engineers, 1974: p. 175.
[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1110)
Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-V

Actual Location: *Hampden Vicinity*
Ramsey County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
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Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-V

Actual Location: *Hampden Vicinity*
Ramsey County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-V-1 VIEW (SOUTHWEST TO NORTHEAST) OF REMOTE LAUNCH OPERATIONS BUILDING, SHOWING DIESEL EXHAUST SHAFT ON THE LEFT AND INTAKE SHAFT ON THE RIGHT. TO THE FAR RIGHT IS THE TUNNEL ENTRANCE

HAER ND-9-V Photo List - Remote Launch Operations Building

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1110)

HAER No.: ND-9-V

Location: Near Service Road exit from Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Hampden vicinity, Ramsey County.

Location: Remote Sprint Launch (RSL) Site #1 is located in the SE-1/4 of Section 1, Township 158 North, Range 62 West of the Fifth Principal Meridian, Ramsey County, North Dakota.

Township and Range: Listed on following page.

Date of Construction: 1 September 1971 through 20 November 1973 (RSL #1).

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

REMOTE SPRINT LAUNCH SITE 1

Commencing at the Southeast corner of said Section 1;

thence North 01°19'45" West along the East line of said Section 1, 960.10 feet to the point of beginning;

thence South 88°40'16" West, 1,326.33 feet;

thence South 01°04'24" East, 954.18 feet to the South line of said Section 1;

thence South 88°55'36" West along said South line 169.09 feet;

thence North 01°21'29" West, 2,023.63 feet;

thence North 88°40'17" East, 1,500.69 feet to the East line of said Section 1;

thence South 01°19'45" East along said East line, 1,070.11 feet to the point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The date of completion for Remote Sprint Launch (RSL) Site #1 was 20 November 1973.[1] The Remote Launch Operations Building (RLOB) was completed on that same date.

2. Architects: It was decided that the smaller-scaled, less-demanding RSL sites should be separate from the main Missile Site Radar (MSR)/Perimeter Acquisition Radar (PAR) bidding package.[2] Work began on this RSL site on 30 August 1971 following the design of the Leo A. Daly Company.[3]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred Stanley R. Mickelsen Safeguard Complex (SRMSC) site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved the SAFSCOM and were established as the operational elements for the SRMSC; the SAFCMD soon assumed operation/maintenance responsibility.[4] The U.S. Army Air Defense Command (ARADCOM), manned by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[5]

On 10 February 1976, all Safeguard facilities except the PAR were "abandoned in place" and put in inactive status. All RSL sites are presently owned by the U.S. Government. The U.S. Army Corps of Engineers (Omaha District) and General Services Administration had land authority through December 1991.[6] The abandoned RLOB remains in inactive status, overseen by the U.S. Army Space and Strategic Defense Command (USASSDC).[7]

4. Builder, Contractors, Suppliers: The construction contractors were Woerfel Corporation and Towne Realty, Inc., which were awarded a contract for RSL sites #1 and #4 on 30 August 1971 for the amount of $7,870,533.[8] Chris Berg, Inc., designed and erected the support facilities.[9]

5. Original Plans and Construction: The Safeguard program was officially inaugurated in March 1969.[10] However, original plans for the RSL sites were altered somewhat in 1970 by the announcement of a "Modified Phase II Safeguard," with the addition of extra Sprint missiles mandating two additional RSL sites, for a total of four.[11] Construction on RSL #1 began in earnest the following year.

By the close of the 1971 construction season in November, varying degrees of progress had been made. The RSL #1 site had only site grading, fencing, preliminary fencing, and limited preparatory work completed at the time.[12]

The inclement weather delayed actual RSL #1 construction until 13 April 1972. Design and erection of associated "soft" support facilities by Chris Berg, Inc., also took place in 1972.[13] Construction of RLOB #1110 began on 9 May 1972; mechanical and electrical installation took place between 15 October 1972 and 20 November 1973.

Various engineering changes and the difficulty of the undertaking for Woerfel Corporation and Towne Realty, Inc., theretofore concerned primarily with simpler tasks such as residential construction, delayed the completion of the RSL sites.[14] Completion of each site slipped in scheduling by about 3 months.[15] On 20 November 1973, RLOB #1110 was completed. Its beneficial occupancy date had been 11 July. The Sprint missiles arrived at the SRMSC in April 1975.[16]

6. Alterations and Additions: By 1977 all missiles had been removed from the silo launchers, the silos were sealed, and the RLOB salvaged and sealed as part of the SRMSC deactivation phase.[17] At this point, the RLOB was essentially "abandoned in place."

In December 1989, an on-site environmental inspection found various facilities containing polychlorinated biphenyls (PCBs); this resulted in testing, disposal, and cleanup of these items. The USASSDC, along with the Omaha District and Huntsville Division of the Army Corps of Engineers, completed the cleanup.[18]

Much remediation has been performed within the RSL areas regarding PCB contamination.[19] Lighting ballasts containing small amounts of PCBs were removed from all RSL sites from June through November 1991. Lighting ballasts removed totaled 262.[20] Radio Frequency (RF) filters were removed that same year, totaling 82.[21]

PART II. ARCHITECTURAL INFORMATION

A. General Statement

The RLOBs are earth-covered, steel-reinforced concrete buildings with 36 rooms. They contained the equipment and facilities to support Sprint missile operation and house personnel working at each RSL[22]. THE RLOB's were the nerve center of each remote launch site. Communications would be maintained between the RLOB's and the MSR to allow firing of the missiles against incoming missiles.

Though the hardened building provided protection against potential shock spectra and blast loads, the RLOBs required shielding to ensure that they would also withstand the secondary effects of nuclear attack. This shielding could protect occupants and equipment from nuclear electromagnetic pulse (EMP), radio-frequency interference (RFI), radiation overpressure, ground shock, thermal radiation, and dust.[23]

At each RSL site, EMP/RFI-hardened areas include the Sprint launch stations (except the mechanical and electrical equipment vaults which were only EMP-hardened).[24] The RLOB rooms were shielded as required.

The U.S. Army Corps of Engineers provided data indicating which rooms were shielded at all four RSL sites. These rooms included the Communications Equipment room (101); cable vault room (102); crypto room (103); cable vault room (105); the Sprint Remote Control Equipment (SRCE) room (108); and the battery room (125).[25]

Design of the RSL sites was considered much simpler, less pressing, and less expensive than that of the other predominant SRMSC tactical facilities, and, unlike them, the RSL history is almost exclusively associated with Safeguard and not with the earlier Sentinel system.[26] The RLOBs, except for their entry tunnels, are identical.

1. Architectural Character: The RLOB merits recording is by reason of its: steel-reinforced, liner-plate shielded design which protected it against nuclear weapon effects, role in early ballistic missile defenses, and role as a pivotal figure at SRMSC (the only antiballistic site ever completed in the United States).

2. Condition of Fabric: The RLOB facilities are considerably deteriorated.

B. Description of Exterior

The dimensions of the various RLOBs were practically standardized, with only minor differences.[27] The RLOBs are all single-story, hardened structures of concrete with a partial upper level. The intake and exhaust stacks extend above grade on these subterranean buildings.[28] The exterior was provided with a waterproof coating.

1. Overall Dimensions: The approximate exterior dimensions of the RLOB are: length, 142 ft; width, 80 ft; and height, 17.5 ft.[29]

2. Foundations: The RLOB foundations are reinforced concrete slab.[30] The floor slab is 31 in thick and has a 4-inch-thick sub-slab.[31]

3. Walls: Exterior, reinforced-concrete walls are 2.5 ft in thickness.[32]

4. Structural System, Framing: The RLOBs were composed of concrete, reinforced with rebar and lined with steel plate.

5. Openings:

a. Doors Each RLOB has four blast doors, a radiation door, and an emergency escape hatch.[33]

b. Tunnels The entrance tunnels are the only deviation from the generally identical plan of the four RLOBs. RLOB #1110 has a 90-foot concrete entry tunnel with elastomeric roofing and an area of 1,032 ft^2; entrance at the lower level is underground but rises to ground level at the outside entrance, where a transformer pad (126 ft^2) is located.[34]

6. Roof Characteristics: The RLOB roof is concrete slab with intake and exhaust stacks projecting above ground.[35] The roof slab is 2 ft thick and is covered with 3 ft of earth fill.[36]

C. Description of the Interior

1. Floor Plans: The RLOBs have approximately 11,956 ft^2 of gross floor area.[37] Some 15 percent of the area was EMP/RFI-shielded in order to protect sensitive equipment.[38]

The roof and floors were designed as either flat, one-way, or two-way slabs to carry vertical loads. In addition, they were designed as diaphragms to transfer lateral loads to the shear walls.

a. Main Level The main level contains equipment rooms (including the SRCE room), cable vaults, vestibules, corridors, personnel areas, Chemical, Bacteriological, and Radiological (CBR) filter rooms, power and battery rooms, a Security Operations Control Console (SOCC) room, a fan room, and a crypto room.[39]

b. Upper Level The upper level contains a storage room and a fan room.[40]

2. Flooring: The floor finish for the RLOBs was as follows: epoxy over concrete (16 rooms); concrete floor hardener (13 rooms); vinyl asbestos tile (VAT) (5 rooms); VAT on shock-isolated platforms and painted liner plate (communication and crypto rooms); and VAT on removable panels (SRCE room).[41]

3. Wall and Ceiling Finish: Each RLOB room, corridor, and separate enclosure was individually lined with 11-gauge steel liner plate to avoid compromising the structural integrity of junctions between interior floors, walls, and columns and the exterior walls, roof, and floor slabs.[42] The RLOB wall finish was as follows: exposed concrete (22 rooms); concrete with gypboard (6 rooms); liner plate (6 rooms); and acoustical treatment (2 rooms).[43]

The RLOB ceiling finish was as follows: exposed concrete (24 rooms); acoustical lay-in panel (7 rooms); and liner plate (6 rooms).[44]

4. Openings: Apertures resulting from utilities and other systems entering the RLOB were possible sources of contamination and required preventive measures. All conduits and ducts entering the RFI-shielded areas were equipped with filters designed to attenuate RFI.[45]

a. Doors Each RLOB has 7 shielded doors. Doors in interior walls between rooms within the same EMP/RFI shielding zone were conventional. Doors in walls separating or bounding EMP/RFI shielding zones were provided with a sheet steel jacket and conductive gaskets or metal finger stock around the perimeter to assure electrical continuity with the door casing, which was seal-welded to the liner plate. Each door is a hinged recessed contact mechanism type; Door 101 is a double door, whereas doors 102, 103, 105, 108, 108A, and 125 are all single doors.[46]

5. Mechanical Equipment: As in the Missile Site Control Building (MSCB) and Perimeter Acquisition Radar Building (PARB), sensitive technical and support equipment was protected from the potential nuclear shock environment through the use of shock-isolation platforms.[47]

All anchorage for equipment cable trays, duct work, and cabinets was attached directly to steel bearing plates which were embedded in the concrete and continuously welded to the steel liner plate to maintain shielding integrity.

In addition to missile control equipment, each RLOB had logic-to-relay converters and other equipment to provide a communications link between the MSCB, the RLOBs, and the Sprint missile farms.[48]

Also unique to the RSL sites was the method for protecting critical utilities and systems:

> It was not economical to concentrate the lines in one location and use a corrugated structure such as was utilized at the PAR and MSR facilities. A low compressive strength (6 psi) foam insulation was placed around individual lines and groups of lines which, in turn, was protected from normal soil pressures with a layer of higher strength foam insulation. Expansion joints were utilized in the lines inside the foam jacket, where required, to withstand longitudinal forces.[49]

a. Communications Communications between the RSL sites were routed through the MSCB and provided by the Safeguard Communications Agency (SAFCA).[50]

b. Electrical Under normal conditions, a commercial substation supplied power for the RSL sites, but during attack/alert conditions or power outages, power would be supplied via gas turbine generators located within the RLOB.[51] During attack, combustion air for these turbines would be provided through an extensive air-filtering/scrubbing system and uninterruptable or "no-break" power (both 208 and 460 volts) for mission critical loads provided through a rectifier-battery-motor-generator system, with battery storage capacity of 4 to 6 minutes.[52]

c. Heating, Air Conditioning, Ventilation Nine main electric duct heaters supported the RLOB: two 154,000 BTUH; four 10,240 BTUH; one 3,413 BTUH; one 5,120 BTUH; and one 13,700 BTUH.[53] There were also various air handling units available, including one in Room 100A (7,000 CFM with a 78,500 BTUH heating coil) and one in Room 100B (7,000 CFM with a 78,500 BTUH heating coil).[54]
There were seven main air handling units: two 6,600 CFM; two 7,000 CFM; two 17,000 CFM; and one 6,000 CFM.[55] The following air handling units were also for indirect expansion air conditioning: Room 100A (7,000 CFM with a 216,000 BTUH cooling coil); Room 100B (7,000 CFM with a 216,000 BTUH cooling coil); Room 200A (7,400 CFM with a 218,000 BTUH cooling coil); Room 200B (7,400 CFM with a 218,000 BTUH cooling coil); Room 300A (18,000 CFM with a 270,000 BTUH cooling coil); and Room 300B (18,000 CFM with a 270,000 BTUH cooling coil).[56]

The RLOBs contain three exhaust fans and two supply fans, as follows: exhaust - toilet (300 CFM); battery room (400 CFM); decontamination room (500 CFM); and supply - CBR filter room (two at 2,300 CFM).[57]

d. Lighting Lighting surrounded the Sprint field mound and the exclusion and limited areas; these were lit during periods of darkness by commercial lamps mounted on poles.[58]

e. Plumbing At RSL #1, two underground steel tanks with a capacity of 27,500 gal each (approximately a 2-week supply) held water brought to the site by truck; there was no surface water present.[59]

The water storage tank fill was located adjacent to the Limited Area Sentry Station (LASS); water was distributed from the tanks to the water treatment equipment located in the respective RLOBs.[60] Waterlines included surge arresters to prevent equipment damage.

f. Grounding and Cathodic Protection System In order to counter electrical surges from a nuclear blast, a grid constructed of steel conductors 16 by 16 ft on centers and welded at each connection was buried some 1.5 ft underground. Known as a grounding counterpoise, the grid had 10-foot-long steel rods, spaced 16 ft apart, connected to it and driven into the ground at its perimeter. Welded to the grid at intervals of 32 ft were magnesium sacrificial anodes, which provided cathodic protection. The RSL buildings, fences, tanks, conduits, and pipes were connected to the counterpoise. Electrical activity could be measured by means of reference test stations composed of a meter and an underground probe.[61]

D. Site

The four RSL sites, which were located within 10 to 20 mi of the MSCB, were in the general area of the MINUTEMAN missiles which they were to defend. Each occupied from 37 to 45 acres of land. The sites were composed of sentry stations, heat sinks, fuel storage tanks, waste stabilization ponds, a Sprint missile launch area containing 12 to 16 Sprint launch stations, and a buried, reinforced concrete RLOB, which controlled and monitored the RSL sites as the MSCB directed.

1. General Setting and Orientation: RSL #1 is situated on 40.61 acres located approximately 1,560 ft above mean sea level (msl) and situated in the southeast quarter of Section 1, Township 158 North, Range 62 West of the Fifth Principal Meridian, Ramsey County, North Dakota.[62]

2. Historic Landscape and Design:

Land Use In the four-county area of the SRMSC, land use is almost exclusively agricultural; the landscape is dominated by cultivated crops, farmsteads, wetlands, wooded stream banks, shelterbelts, municipal skylines (primarily grain elevators and water towers), and radio and microwave towers. The rural landscape is relatively flat, drained by intermittent streams to the Red River. The most prominent natural landscape feature is the Pembina Hills along the Pembina Escarpment near RSL #3.[63]

RSL #1 is in northern Ramsey County about 0.8 mi south of Cavalier County and 3 mi west of the small town of Hampden; 96 percent of the area within 6,562 ft is agricultural with less than 3 percent wooded and occasional wetlands. The limited topographic relief ranges from 1,544 ft to 1,575 ft msl, with RSL #1 at 1,555 ft msl.[64]

PART III. SOURCES OF INFORMATION

A. Original Architectural Drawings

The original RSL drawings were prepared by The Leo A. Daly Company, Architects-Engineers, St. Louis, Missouri.

B. Interviews

Danghtry, James, 1992. Interview with Danghtry, SAFSCOM PAR Facility Project Engineer (1969 - 1973), at Teledyne Brown Engineering, 1 September.

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Leitch, Jay A., 1992b. Correspondence to The Earth Technology Corporation regarding land use at SRMSC, RLS sites, 1 October.

2. Secondary and Published Sources:

Aviation Week and Space Technology, 1975. "Army Widens Ballistic Missile Research," 8 December.

Coon, Randall C., et al., 1976. The Impact of the Safeguard Antiballistic Missile System Construction on Northeastern North Dakota, Agricultural Economics Report No. 101, Department of Agricultural Economics, North Dakota State University, April.

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U.S. Army Corps of Engineers, 1974c. EMP/RFI Interface Evaluation, for USAEDH Safeguard Tactical Ground Facilities Hardness Program-EMP, Volume X, Remote Launch Site (RLS) Penetration Data Equipment Data Analysis, November.

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), 13 December.

U.S. Army Corps of Engineers, 1992. PCB Removal, Transportation, and Disposal Report, Stanley R. Mickelsen Safeguard Complex and Remote Launch Sites, Nekoma, North Dakota, February.

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Western Electric, 1974. Safeguard - Overall Safeguard System Description, Theory Manual No. T001, 31 August.

Prepared by: James Edward Zielinski
Environmental Specialist
EARTH TECH
December 1994

Endnotes:

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[1]Kitchens, 1978: 111.

[2]Ibid.: 49.

[3]U.S. Army Corps of Engineers, 1974b: iii.

[4]Kitchens, 1978: 112.

[5]Ibid.: 105.

[6]U.S. Army Corps of Engineers, 1991: 7.

[7]U.S. Army Space and Strategic Defense Command, 1993: 2-3.

[8]Kitchens, 1978: 89.

[9]U.S. Army Corps of Engineers, 1974b: iii.

[10]Kitchens, 1978: 58.

[11]Ibid.

[12]Ibid.: 89.

[13]Ibid.: 89.

[14]Ibid.: 111.

[15]Ibid.: 111.

[16]Ibid.: 111.

[17]U.S. Army Strategic Defense Command, 1991: 1-6.

[18]Ibid.: 1-4.

[19]U.S. Army Corps of Engineers, 1992: 14-15.

[20]Ibid.: 156.

[21]Ibid.: 164-165.

[22]Western Electric, 1971: 11-2.

[23]U.S. Army Corps of Engineers, 1974b: 18.

[24]U.S. Army Corps of Engineers, 1972b: 3-2, 3-4.

[25]U.S. Army Corps of Engineers, 1974c: 1-2.

[26]Kitchens, 1978: 20.

[27]U.S. Army Corps of Engineers, 1974a: 176.

[28]U.S. Army Corps of Engineers, 1974b: 18.

[29]Ibid.: 18.

[30]U.S. Army Corps of Engineers, 1974a: 176.

[31]U.S. Army Corps of Engineers, 1974b: 18.

[32]Ibid.

[33]Ibid.

[34]U.S. Army Corps of Engineers, 1974a: 176.

[35]Ibid.: 176.

[36]U.S. Army Corps of Engineers, 1974b: 18.

[37]U.S. Army Corps of Engineers, 1974a: 176.

[38]U.S. Army Corps of Engineers, 1974b: 18.

[39]U.S. Army Corps of Engineers, 1974a: 176.

[40]U.S. Army Corps of Engineers, 1974a: 176.

[41]Ibid.

[42]U.S. Army Corps of Engineers, 1974b: 18.

[43]U.S. Army Corps of Engineers, 1974a: 176.

[44]Ibid.

[45]U.S. Army Corps of Engineers, 1974b: 18.

[46]U.S. Army Corps of Engineers, 1977: 1-1.

[47]Ibid.

[48]Western Electric Company, Inc., 1974: 2-13.

[49]U.S. Army Corps of Engineers, 1974b: 18-19.

[50]Western Electric, 1971: 11-1.

[51]U.S. Army Corps of Engineers, 1974b: 18.

[52]Ibid.

[53]U.S. Army Corps of Engineers, 1974a: 177.

[54]Ibid.

[55]Ibid.

[56]Ibid.

[57]Ibid.

[58]Western Electric Company, Inc., 1971: 11-1.

[59]U.S. Army Corps of Engineers, 1974a: 172.

[60]Western Electric Company, Inc., 1971: 11-1.

[61]Western Electric Company, Inc., 1971: 1-11.

[62]U.S. Army Corps of Engineers, 1974a: Appendix A.

[63]Leitch, 1992a: 3-4.

[64]Leitch, 1992b: 13.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-W

Actual Location: Hampden Vicinity
Ramsey County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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**STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota**

HAER No. ND-9-W

Actual Location ***Hampden Vicinity
Ramsey County***

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-W-1 **VIEW (NORTHWEST TO SOUTHEAST) OF EXCLUSION AREA SENTRY STATION AND MISSILE FIELD. COVERS FOR TWELVE SPRINT SILOS CAN BE SEEN ON THE LEFT**

HAER ND-9-W Photo List - Exclusion Area Sentry Station

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #1)
(BUILDING 1115)

HAER No. ND-9-W

Location: At Service Road entrance to Missile Field, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Hampden Vicinity, Ramsey County.

Significance: The Exclusion Area Sentry Station (EASS) controlled ingress/egress of the Remote Sprint Launch (RSL) Site #1 Exclusion Area.[1]

Description: This one-man sentry station, with approximately 38 ft^2 of gross floor area, is a one-story, concrete building of permanent construction that had electric light and power, two security windows, and one security door.[2] The roof is concrete slab with elastomeric roofing, and the floor is slab on grade.[3] The EASS is of "soft" (nonhardened) construction.

History: The EASS was designed by the Ralph M. Parsons Co. Construction by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 20 September 1973, at an approximate cost of $11,600.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 178.

Ibid.

Endnotes:

[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 178.

[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #2
West of Mile Marker 220 on State Route 1, 6.0 miles North of Langdon, ND
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-X

Actual Location: Langdon Vicinity
Cavalier County

PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD

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REMOTE SPRINT LAUNCH SITE #2
West of Mile Marker 220 on State Route 1, 6.0 miles North of Langdon, ND
Nekoma Vicinity
Cavalier County
North Dakota

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-X-1 OVERVIEW (LOOKING WEST) OF REMOTE SPRINT LAUNCH SITE #2

ND-9-X-2 Photographic copy of photograph, dated September 1971 (original print in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. AERIAL VIEW LOOKING NORTH OF REMOTE SPRINT LAUNCH SITE #2, DURING CONSTRUCTION. IN THE FOREGROUND IS THE REMOTE LAUNCH OPERATIONS BUILDING (RLOB);SPRINT SILOS ARE BEING INSTALLED IN THE BACKGROUND

ND-9-X-3 Photographic copy of photograph (original print in possession of James E. Zielinski, Earth Tech, Huntsville, AL). Photographer Unknown. AERIAL VIEW (SOUTHWEST TO NORTHEAST) OF REMOTE SPRINT LAUNCH SITE #2, NEARING COMPLETION. THE RLOB HAS BEEN EARTH-MOUNDED. THE LIMITED ACCESS SENTRY STATION CAN BE SEEN IN THE PAR RIGHT FOREGROUND, BEHIND IT ARE THE WASTE STABILIZATION PONDS. BARELY DISCERNIBLE IS THE EXCLUSION AREA SENTRY STATION AT THE ENTRANCE TO THE SPRINT FIELD

HAER ND-9-X Photo List - Remote Sprint Launch Site #2

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HAER No. ND-9-Y

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #2)
(BUILDING 2101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

Actual Location: *Langdon Vicinity*
Cavalier County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #2)
(BUILDING 2101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-Y

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-Y-1 VIEW (LOOKING WEST) OF LIMITED AREA SENTRY STATION

HAER ND-9-Y Photo List - Limited Area Sentry Station

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #2)

(BUILDING 2101)

HAER No. ND-9-Y

Location: Between Access Road and Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location: Langdon Vicinity, Cavalier County.

Significance: Identical to the Limited Area Sentry Station (LASS) at Remote Sprint Launch (RSL) Site #1, this station controlled the sally-port gates that permitted entrance into the RSL #2 facility.[1]

Description: The LASS is a one-story, concrete building (2,259 ft^2) of permanent construction that had electric, water, and sewer utilities, as well as heating and exhaust units.[2] The roof is suspended concrete slab with elastomeric roofing.[3] The floor is slab on grade. The LASS is of "soft" (nonhardened) construction.

History: The LASS was designed by the Ralph M. Parsons Co. Construction by Woerfel Corp.-Towne Realty, Inc., began on 22 July 1971 and was completed on 15 June 1973 at an approximate cost of $50,000.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 175.

Ibid.

Endnotes:

[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 175.

[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #2)
(BUILDING 2110)
Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-Z

Actual Location: *Langdon Vicinity*
Cavalier County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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Near Service Road exit from Patrol Road
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HAER NO. ND-9-Z

Actual Location: *Langdon Vcinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-Z-1 REMOTE LAUNCH OPERATIONS BUILDING, SHOWING DIESEL EXHAUST (LEFT) AND INTAKE (RIGHT) SHAFTS, AND TUNNEL ENTRANCE ON THE FAR RIGHT

HAER ND-9-Z Photo List - Remote Launch Operations Building

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #2)
(BUILDING 2110)

HAER No.: ND-9-Z

Location: Near Service Road exit from Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Langdon vicinity, Cavalier County.

Location: Remote Sentinel Launch (RSL) Site #2 is located in Sections 16, 17, 20, and 21, Township 162 North, Range 60 West of the Fifth Principal Meridian, Cavalier County, North Dakota.

Township and Range: Listed on following page.

Date of Construction: 26 March 1971 through 26 September 1973 (RSL #2).

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

REMOTE SPRINT LAUNCH SITE 2

Commencing at the Northwest corner of Section 21;

thence South 01°32'56" East along the West line of said Section 21, 100.00 feet to the point of beginning;

thence North 88°18'54" East, 1,000.00 feet thence North 01°32'36" West, 100.00 feet to the South line of Section 16 thence North 01°29'26" West, 100.00 feet;

thence South 88°18'54" West, 600.00 feet;

thence North 01°29'26" West, 950.00 feet;

thence South 88°18'54" West, 400.00 feet to the East line of Section 17;

thence South 88°23'04" West, 850.00 feet;

thence South 01°29'26" East, 1,050.00 feet to the North line of Section 20;

thence South 01°33'06" East, 100.00 feet thence North 88°23'04" East, 850.00 feet to the East line of said Section 20 and to the point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The date of completion for Remote Sentinel Launch (RSL) Site #2 was 26 September 1973.[1] The Remote Launch Operations Building (RLOB) was completed on that same date.

2. Architects: It was decided that the smaller-scaled, less-demanding RSL sites should be separate from the main Missile Site Radar (MSR)/Perimeter Acquisition Radar (PAR) bidding package.[2] Construction began on this RSL site on 26 March 1971 following the design of the Leo A. Daly Company.[3]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred Stanley R. Mickelsen Safeguard COMPLEX (SRMSC) site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved the SAFSCOM and were established as the operational elements for the SRMSC; the SAFCMD soon assumed operation/maintenance responsibility.[4] The U.S. Army Air Defense Command (ARADCOM), manned by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[5]

On 10 February 1976, all Safeguard facilities except the PAR were "abandoned in place" and put in inactive status. All RSL sites are presently owned by the U.S. Government. The U.S. Army Corps of Engineers (Omaha District) and General Services Administration had land authority through December 1991.[6] The abandoned RLOB remains in inactive status, overseen by the U.S. Army Space and Strategic Defense Command (USASSDC).[7]

4. Builder, Contractors, Suppliers: The construction contractors were Woerfel Corporation and Towne Realty, Inc., which were awarded a contract for RSL sites #2 and #3 on 26 March 1971 for the amount of $7,630,950.[8] Chris Berg, Inc., designed and erected the support facilities.[9]

5. Original Plans and Construction: The Safeguard program was officially inaugurated in March 1969.[10] However, original plans for the RSL sites were altered somewhat in 1970 by the announcement of a "Modified Phase II Safeguard," with the addition of extra Sentinel missiles mandating two additional RSL sites, for a total of four.[11] Work on RSL #2 began in earnest the following year.

Construction of RLOB #2110 began on 23 May 1971. By the close of the 1971 construction season in November, varying degrees of progress had been made. RSL sites #2 and #3 had all prefabricated steel Sentinel cells emplaced and both Remote Launch Operations Building (RLOB) "shells" completed, which allowed interior construction during the harsh winter[12]. Design and erection of associated "soft" support facilities by Chris Berg, Inc., also took place in 1971.[13] Mechanical and electrical installation took place between 1 June 1972 and September 1973.

Various engineering changes and the difficulty of the undertaking for Woerfel Corporation and Towne Realty, Inc., theretofore concerned primarily with simpler tasks such as residential construction, delayed the completion of the RSL sites.[14] Completion of each site slipped in scheduling by about 3 months.[15] On 26 September 1973, RLOB #2110 was essentially completed. Its beneficial occupancy date had been 15 June. The Sentinel missiles arrived at the SRMSC in April 1975.[16]

6. Alterations and Additions: By 1977 all missiles had been removed from the silo launchers, the silos were sealed, and the RLOB salvaged and sealed as part of the SRMSC deactivation phase.[17] At this point, the RLOB was "abandoned in place."
In December 1989, an on-site environmental inspection found various facilities containing polychlorinated biphenyls (PCBs); this resulted in testing, disposal, and cleanup of these items. The USASSDC, along with the Omaha District and Huntsville Division of the Army Corps of Engineers, completed the cleanup.[18]

Much remediation has been performed within the RSL areas regarding PCB contamination.[19] Lighting ballasts containing small amounts of PCBs were removed from all RSL sites from June through November 1991. Lighting ballasts removed totaled 173.[20] Radio Frequency (RF) filters were removed that same year, totaling 76.[21]

PART II. ARCHITECTURAL INFORMATION

A. General Statement

The RLOBs are earth-covered, steel-reinforced concrete buildings with 36 rooms. They contained the equipment and facilities to support Sentinel missile operation and house personnel working at each RSL[22].

Though the hardened building provided protection against potential shock spectra and blast loads, the RLOBs required shielding to ensure that they would also withstand the secondary effects of nuclear attack. This shielding could protect occupants and equipment from nuclear electromagnetic pulse (EMP), radio-frequency interference (RFI), radiation overpressure, ground shock, thermal radiation, and dust.[23]

At each RSL site, EMP/RFI-hardened areas include the Sprint launch stations (except the mechanical and electrical equipment vaults which were only EMP-hardened).[24] RLOB rooms were shielded as required.

The U.S. Army Corps of Engineers provided data indicating which rooms were shielded at all four RSL sites. These rooms included the Communications Equipment room (101); cable vault room (102); crypto room (103); cable vault room (105); the Sentinel Remote Control Equipment (SRCE) room (108); and battery room (125).[25]

Design of the RSL sites was considered much simpler, less pressing, and less expensive than that of the other predominant SRMSC tactical facilities, and, unlike them, the RSL history is almost exclusively associated with Safeguard and not with the earlier Sentinel system.[26] The RLOBs, except for their entry tunnels, are identical.

1. Architectural Character: The RLOB merits recording by reason of its steel-reinforced, liner-plate shielded design which protected it against nuclear weapon effects and its role in early ballistic missile defense and as a pivotal figure in the SRMSC the only antiballistic site ever completed in the United States as a whole.

2. Condition of Fabric: The RLOB facilities are considerably deteriorated.

B. Description of Exterior

The dimensions of the various RLOBs were practically standardized, with only minor differences.[27] The RLOBs are all single-story, hardened structures of concrete with a partial upper level. The intake and exhaust stacks extend above grade on these subterranean buildings.[28] The exterior was provided with a waterproof coating.

1. Overall Dimensions: The approximate exterior dimensions of the RLOB are: length, 142 ft; width, 80 ft; and height, 17.5 ft.[29]

2. Foundations: The RLOB foundations are reinforced concrete slab.[30] The floor slab is 31 in thick and has a 4-inch-thick sub-slab.[31]

3. Walls: Exterior, reinforced-concrete walls are 2.5 ft in thickness.[32]

4. Structural System, Framing: The RLOBs were composed of concrete, reinforced with rebar and lined with steel plate.

5. Openings:

a. Doors Each RLOB has four blast doors, a radiation door, and an emergency escape hatch.[33]

b. Tunnels The entrance tunnels are the only deviation from the generally identical plan of the four RLOBs.[34] RLOB #2110 has a 77-foot, concrete tunnel with elastomeric roofing and an area of 922 ft^2.[35]

6. Roof Characteristics: The RLOB roof is concrete slab with intake and exhaust stacks projecting above ground.[36] The roof slab is 2 ft thick and is covered with 3 ft of earth fill.[37]

C. Description of the Interior

1. Floor Plans: The RLOBs have approximately 11,956 ft^2 of gross floor area.[38] Some 15 percent of the area was EMP/RFI-shielded in order to protect sensitive equipment.[39]

The roof and floors were designed as either flat, one-way, or two-way slabs to carry vertical loads. In addition, they were designed as diaphragms to transfer lateral loads to the shear walls.

a. Main Level The main level contains equipment rooms (including the SRCE room), cable vaults, vestibules, corridors, personnel areas, Chemical, Bacteriological, and Radiological (CBR) filter rooms, power and battery rooms, a Security Operations Control Console (SOCC) room, a fan room, and a crypto room.[40]

b. Upper Level The upper level contains a storage room and a fan room.[41]

2. Flooring: The floor finish for the RLOBs was as follows: epoxy over concrete (16 rooms); concrete floor hardener (13 rooms); vinyl asbestos tile (VAT) (5 rooms); VAT on shock-isolated platforms and painted liner plate (communication and crypto rooms); and VAT on removable panels (SRCE room).[42]

3. Wall and Ceiling Finish: Each RLOB room, corridor, and separate enclosure was individually lined with 11-gauge steel liner plate to avoid compromising the structural integrity of junctions between interior floors, walls, and columns and the exterior walls, roof, and floor slabs.[43] The RLOB wall finish was as follows: exposed concrete (22 rooms); concrete with gypboard (6 rooms); liner plate (6 rooms); and acoustical treatment (2 rooms).[44]

The RLOB ceiling finish was as follows: exposed concrete (24 rooms); acoustical lay-in panel (7 rooms); and liner plate (6 rooms).[45]

4. Openings: Apertures resulting from utilities and other systems entering the RLOB were possible sources of contamination and required preventive measures. All conduits and ducts entering RFI-shielded areas were equipped with filters designed to attenuate RFI.[46]

a. Doors Each RLOB has 7 shielded doors. Doors in interior walls between rooms within the same EMP/RFI shielding zone were conventional. Doors in walls separating or bounding EMP/RFI shielding zones were provided with a sheet steel jacket and conductive gaskets or metal finger stock around the perimeter to assure electrical continuity with the door casing, which was seal-welded to the liner plate. Each door is a hinged recessed contact mechanism type; Door 101 is a double door, whereas doors 102, 103, 105, 108, 108A, and 125 are all single doors.[47]

5. Mechanical Equipment: As in the Missile Site Control Building (MSCB) and Perimeter Acquisition Radar Building (PARB), sensitive technical and support equipment was protected from the potential nuclear shock environment through the use of shock-isolation platforms.[48]

All anchorage for equipment cable trays, duct work, and cabinets was attached directly to steel bearing plates which were embedded in the concrete and continuously welded to the steel liner plate to maintain shielding integrity.

In addition to missile control equipment, each RLOB had logic-to-relay converters and other equipment to provide a communications link between the MSCB, the RLOBs, and the Sentinel missile farms.[49]

Also unique to the RSL sites was the method for protecting critical utilities and systems:

It was not economical to concentrate the lines in one location and use a corrugated structure such as was utilized at the PAR and MSR facilities. A low compressive strength (6 psi) foam insulation was placed around individual lines and groups of lines which, in turn, was protected from normal soil pressures with a layer of higher strength foam insulation. Expansion joints were utilized in the lines inside the foam jacket, where required, to withstand longitudinal forces.[50]

a. Communications Communications between the RSL sites were routed through the MSCB and provided by the Safeguard Communications Agency (SAFCA).[51]

b. Electrical Under normal conditions, a commercial substation supplied power for the RSL sites, but during attack/alert conditions or power outages, power would be supplied via gas turbine generators located within the RLOB.[52] During attack, combustion air for these turbines would be provided through an extensive air-filtering/scrubbing system and uninterruptable or "no-break" power (both 208 and 460 volts) for mission critical loads provided through a rectifier-battery-motor-generator system, with battery storage capacity of 4 to 6 minutes.[53]

c. Heating, Air Conditioning, Ventilation Nine main electric duct heaters supported the RLOB: two 154,000 BTUH; four 10,240 BTUH; one 3,413 BTUH; one 5,120 BTUH; and one 13,700 BTUH.[54] There were also various air handling units available, including one in Room 100A (7,000 CFM with a 78,500 BTUH heating coil) and one in Room 100B (7,000 CFM with a 78,500 BTUH heating coil).[55]
There were seven main air handling units: two 6,600 CFM; two 7,000 CFM; two 17,000 CFM; and one 6,000 CFM.[56] The following air handling units were also for indirect expansion air conditioning: Room 100A (7,000 CFM with a 216,000 BTUH cooling coil); Room 100B (7,000 CFM with a 216,000 BTUH cooling coil); Room 200A (7,400 CFM with a 218,000 BTUH cooling coil); Room 200B (7,400 CFM with a 218,000 BTUH cooling coil); Room 300A (18,000 CFM with a 270,000 BTUH cooling coil); and Room 300B (18,000 CFM with a 270,000 BTUH cooling coil).[57]

The RLOBs contain three exhaust fans and two supply fans, as follows: exhaust - toilet (300 CFM); battery room (400 CFM); decontamination room (500 CFM); and supply - CBR filter room (two at 2,300 CFM).[58]

d. Lighting Lighting surrounded the Sentinel field mound and the exclusion and limited areas; these were lit during periods of darkness by commercial lamps mounted on poles.[59]

e. Plumbing At RSL #2, two underground steel tanks with a capacity of 27,500 gal each (approximately a 2-week supply) held water brought to the site by truck; there was no surface water present.[60]

The water storage tank fill was located adjacent to the Limited Area Sentry Station (LASS); water was distributed from the tanks to the water treatment equipment located in the respective RLOBs.[61] Waterlines included surge arresters to prevent equipment damage.

f. Grounding and Cathodic Protection System In order to counter electrical surges from a nuclear blast, a grid constructed of steel conductors 16 by 16 ft on centers and welded at each connection was buried some 1.5 ft underground. Known as a grounding counterpoise, the grid had 10-foot-long steel rods, spaced 16 ft apart, connected to it and driven into the ground at its perimeter. Welded to the grid at intervals of 32 ft were magnesium sacrificial anodes, which provided cathodic protection. The RSL buildings, fences, tanks, conduits, and pipes were connected to the counterpoise. Electrical activity could be measured by means of reference test stations composed of a meter and an underground probe.[62]

D. Site

The four RSL sites, which were located within 10 to 20 mi of the MSCB, were in the general area of the Minuteman missiles which they were to defend. Each occupied from 37 to 45 acres of land. The sites were composed of sentry stations, heat sinks, fuel storage tanks, waste stabilization ponds, a Sentinel missile launch area containing 12 to 16 Sprint launch stations, and a buried, reinforced concrete RLOB, which controlled and monitored the RSL sites as the MSCB directed.

1. General Setting and Orientation: RSL #2 is situated on 35.75 acres situated in sections 16, 17, 20, and 21, Township 162 North, Range 60 West of the Fifth Principal Meridian, Cavalier County, North Dakota.[63]

2. Historic Landscape and Design:

Land Use In the four-county area of the SRMSC, land use is almost exclusively agricultural; the landscape is dominated by cultivated crops, farmsteads, wetlands, wooded stream banks, shelterbelts, municipal skylines (primarily grain elevators and water towers), and radio and microwave towers. The rural landscape is relatively flat, drained by intermittent streams to the Red River. The most prominent natural landscape feature is the Pembina Hills along the Pembina Escarpment near RSL #3.[64]

RSL #2 is in Cavalier County about 8 mi north-northwest of Langdon and about 12 mi south of the Canadian border; 96 percent of the area within 6,562 ft is agricultural with less than 3 percent wooded and occasional wetlands.[65] The limited topographic relief ranges from 1,575 ft to 1,610 ft above msl, with RSL #2 at 1,603 ft above msl.[66]

Part III. SOURCES OF INFORMATION

A. Original Architectural Drawings

The original RSL drawings were prepared by The Leo A. Daly Company, Architects-Engineers, St. Louis, Missouri.

B. Interviews

Daughtry, James, 1992. Interview with Daughtry, SAFSCOM PAR Facility Project Engineer (1969 - 1973), at Teledyne Brown Engineering, 1 September.

Thomas, Earl, 1992. Interview with Thomas, Advanced Program Specialist, at Teledyne Brown Engineering, 18 August.

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Leitch, Jay A., 1992b. Correspondence to The Earth Technology Corporation regarding land use at SRMSC, RLS sites, 1 October.

2. Secondary and Published Sources:

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Coon, Randall C., et al., 1976. The Impact of the Safeguard Antiballistic Missile System Construction on Northeastern North Dakota, Agricultural Economics Report No. 101, Department of Agricultural Economics, North Dakota State University, April.

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Hotz, Robert, 1975. "Pitfalls of SALT 1," Aviation Week and Space Technology, 24 November.

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U.S. Army Corps of Engineers, 1974c. EMP/RFI Interface Evaluation, for USAEDH Safeguard Tactical Ground Facilities Hardness Program-EMP, Volume X, Remote Launch Site (RLS) Penetration Data Equipment Data Analysis, November.

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), 13 December.

U.S. Army Corps of Engineers, 1992. PCB Removal, Transportation, and Disposal Report, Stanley R. Mickelsen Safeguard Complex and Remote Launch Sites, Nekoma, North Dakota, February.

U.S. Army Strategic Defense Command, 1991. Preliminary Building Availability and Conditions Survey, SRMSC, 13 December.

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Wade, Nicholas, 1974. "Safeguard: Disputed Weapon Nears Readiness on Plains of North Dakota," Science, Vol. 185, pp. 1137-1140, 27 September.

Western Electric, 1971. Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site (MSCC/FS) Complex Physical Description, Manual No. 004, 30 September.

Western Electric, 1974. Safeguard - Overall Safeguard System Description, Theory Manual No. T001, 31 August.

Prepared by: James Edward Zielinski
Environmental Specialist
EARTH TECH
December 1994

Endnotes:

[1]Kitchens, 1978: 111.

[2]Ibid.: 49.

[3]U.S. Army Corps of Engineers, 1974b: iii.

[4]Kitchens, 1978: 112.

[5]Ibid.: 105.

[6]U.S. Army Corps of Engineers, 1991: 7.

[7]U.S. Army Space and Strategic Defense Command, 1993: 2-3.

[8]Kitchens, 1978: 89.

[9]U.S. Army Corps of Engineers, 1974b: iii.

[10]Kitchens, 1978: 58.

[11]Ibid.

[12]Ibid.: 89.

[13]Ibid.: 89.

[14]Ibid.: 111.

[15]Ibid.: 111.

[16]Ibid.: 111.

[17]U.S. Army Strategic Defense Command, 1991: 1-6.

[18]Ibid.: 1-4.

[19]U.S. Army Corps of Engineers, 1992: 14-15.

[20]Ibid.: 156.

[21]Ibid.: 164-165.

[22]Western Electric, 1971: 11-2.

[23]U.S. Army Corps of Engineers, 1974b: 18.

[24]U.S. Army Corps of Engineers, 1972b: 3-2, 3-4.

[25]U.S. Army Corps of Engineers, 1974c: 1-2.

[26]Kitchens, 1978: 20.

[27]U.S. Army Corps of Engineers, 1974a: 176.

[28]U.S. Army Corps of Engineers, 1974b: 18.

[29]Ibid.: 18.

[30]U.S. Army Corps of Engineers, 1974a: 176.

[31]U.S. Army Corps of Engineers, 1974b: 18.

[32]Ibid.

[33]Ibid.

[34]U.S. Army Corps of Engineers, 1974a: 176.

[35]Ibid.: 176, 193, 206, 220.

[36]Ibid.: 176.

[37]U.S. Army Corps of Engineers, 1974b: 18.

[38]U.S. Army Corps of Engineers, 1974a: 176.

[39]U.S. Army Corps of Engineers, 1974b: 18.

[40]U.S. Army Corps of Engineers, 1974a: 176.

[41]U.S. Army Corps of Engineers, 1974a: 176.

[42]Ibid.

[43]U.S. Army Corps of Engineers, 1974b: 18.

[44]U.S. Army Corps of Engineers, 1974a: 176.

[45]Ibid.

[46]U.S. Army Corps of Engineers, 1974b: 18.

[47]U.S. Army Corps of Engineers, 1977: 1-1.

[48]Ibid.

[49]Western Electric Company, Inc., 1974: 2-13.

[50]U.S. Army Corps of Engineers, 1974b: 18-19.

[51]Western Electric, 1971: 11-1.

[52]U.S. Army Corps of Engineers, 1974b: 18.

[53]Ibid.

[54]U.S. Army Corps of Engineers, 1974a: 177.

[55]Ibid.

[56]Ibid.

[57]Ibid.

[58]Ibid.

[59]Western Electric Company, Inc., 1971: 11-1.

[60]U.S. Army Corps of Engineers, 1974a: 172.

[61]Western Electric Company, Inc., 1971: 11-1.

[62]Western Electric Company, Inc., 1971: 1-11.

[63]Ibid.

[6464]Leitch, 1992a: 3-4.

[65]Ibid.: 14.

[66]Ibid.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #2)
(BUILDING 2115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AA

Actual Location: *Langdon Vicinity*
Cavalier County

WRITTEN AND HISTORICAL DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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Actual Location: *Langdon Vicinity*
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Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AA-1 Photographic copy of original design drawing, dated May 1971, revised 2 January 1974 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). PLANS, ELEVATIONS, DETAILS

HAER ND-9-AA Photo List - Exclusion Area Sentry Station

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, EXCLUSION AREA SENTRY STATION

STANLEY R. MICKELSEN SAFEGUARD COMPLEX REMOTE SPRINT LAUNCH SITE #2)

(BUILDING 2115)

HAER No. ND-9-AA

Location: This building is located at the Service Road entrance to the Missile Field, Nekoma Vicinity, Cavalier County, North Dakota. Actual location is Langdon Vicinity, Cavalier County.

Significance: The Exclusion Area Sentry Station (EASS) controlled ingress/egress of the Remote Sprint Launch (RSL) Site #2 Exclusion Area.[1]

Description: This one-man sentry station, with approximately 38 ft^2 of gross floor area, is a one-story, concrete building of permanent construction that had electric light and power, two security windows, and one security door.[2] The roof is concrete slab with elastomeric roofing.[3] The floor is slab on grade. The EASS is of "soft" (nonhardened) construction.

History: The EASS was designed by the Ralph M. Parsons Co. Construction, by Woerfel Corp.-Towne Realty, Inc., began on 22 July 1971 and was completed on 15 June 1973, at an approximate cost of $11,600.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 178.

Ibid.

Endnotes:

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[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 178.

[3] Ibid.

Historian: James Zielinski, Environmental Specialist, 1994.E.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #3
North of State Route 5, approximately 10 mi Southwest of Walhalla, ND
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AB

Actual Location: *Langdon Vicinity*
Cavalier County

PHOTOGRAPH

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #3 — HAER NO ND-9-AB
North of State Route 5, approximately 10 mi Southwest of Walhalla, ND
Nekoma Vicinity
Cavalier County
North Dakota

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AB-1 OVERALL VIEW FROM SOUTH TO NORTH OF REMOTE SPRINT LAUNCH SPRINT LAUNCH SITE #3. REMOTE LAUNCH OPERATIONS BUILDING ON LEFT, EXCLUSION AREA SENTRY STATION AT DISTNAT CENTER, AND LIMITED AREA SENTRY STATION ON RIGHT

HAER ND-9-AB Photo List - Remote Sprint Launch Site #3

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #3)
(BUILDING 3101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AC

Actual Location: *Langdon Vicinity*
Cavalier County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #3) (BUILDING 3101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AC

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AC-1 VIEW FROM SOUTH TO NORTH OF LIMITED AREA SENTRY STATION

HAER ND-9-AC Photo List - Limited Area Sentry Station

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #3)

(BUILDING 3101)

HAER No. ND-9-AC

Location: Between Access Road and Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Langdon Vicinity, Cavalier County.

Significance: Identical to the Limited Area Sentry Station (LASS) at Remote Sprint Launch (RSL) Site #2, this station controlled the sally-port gates that permitted entrance into the RSL #3 facility.[1]

Description: The LASS is a one-story, concrete building (2,258 ft^2) of permanent construction that had electric, water, and sewer utilities, as well as heating and exhaust units.[2] The roof is suspended concrete slab with elastomeric roofing.[3] The floor is slab on grade. The LASS is of "soft" (nonhardened) construction.

History: The LASS was designed by the Ralph M. Parsons Co. Construction by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 2 July 1973 at an approximate cost of $50,000.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 175.

Ibid.

Endnotes:

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[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 175.

[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #3)
(BUILDING 3110)
Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AD

Actual Location: *Langdon Vicinity*
Cavalier County

PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD

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Near Service Road exit form Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AD

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AD-1 VIEW FROM SOUTHEAST TO NORTHWEST OF REMOTE LAUNCH OPERATIONS BUILDING, SHOWING DIESEL EXHAUST AND INTAKE SHAFTS, WITH TUNNEL ON THE RIGHT

ND-9-AD-2 Photographic copy of a photograph, dated June 1993 (original print in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. TUNNEL ENTRANCE TO REMOTE LAUNCH OPERATIONS BUILDING

ND-9-AD-3 Photographic copy of a photograph, dated June 1993 (original print in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. INTERIOR OF REMOTE LAUNCH OPERATIONS BUILDING, ROOM UNKNOWN, DEMONSTRATING THE RESULT OF SALVAGING OPERATIONS. NOTE THE CEILING TILES HAVE BEEN REMOVED

ND-9-AD-4 Photographic copy of photograph taken from paste-up negatives for U.S. Army Corps of Engineers document GF-500-MCP, entitled "Grand Forks Site RLS Army Operating Drawings, Master Composite Photographs for SAFEGUARD TSE Systems and Equipment," Page 9, dated 1 September 1974 (original document and negatives in possession of U.S. Army Corps of Engineers, Huntsville, AL). Photographer Unknown.

VIEW OF REMOTE LAUNCH OPERATIONS BUILDING EXTERIOR (SOUTHWEST CORNER), PRIOR TO EARTH MOUNDING. A,B,C, AND D ARE HEAT EXCHANGERS HX-1102B, HX-1102A, HX-1101B, AND HX-1101A, RESPECTIVELY. THE HEAT EXCHANGERS TRANSFERRED HEAT FROM THE COOLING WATER TO THE OUTSIDE AIR DURING THE NORMAL OPERATING MODE. ON THE FAR RIGHT IS THE AIR EXHAUST SHAFT

ND-9-AD-5 Photographic copy of photograph taken from paste-up negatives for U.S. Army Corps of Engineers document GF-500-MCP, entitled "Grand Forks Site RLS Army Operating Drawings, Master Composite Photographs for SAFEGUARD TSE Systems and Equipment," Page 9, dated 1 September 1974 (original document and negatives in possession of U.S. Army Corps of Engineers, Huntsville, AL). Photographer Unknown.

VIEW OF PNEUMATIC CONTROL PANEL REGULATING ENTRANCE TO WAITING ROOM #116. THE PANEL ACTIVATED THE PNEUMATIC EYLINDER FOR OPENING AND CLOSING OF BLAST DOORS #116 AND #118. A ROTARY AIR MOTOR ACTUATED LOCKING AND UNLOCKING OF THE DOORS.

ND-9-AD-6 Photographic copy of photograph taken from paste-up negatives for U.S. Army Corps of Engineers document GF-500-MCP, entitled "Grand Forks Site RLS Army Operating Drawings, Master Composite Photographs for SAFEGUARD TSE Systems and Equipment," Page 9, dated 1 September 1974 (original document and negatives in possession of U.S. Army Corps of Engineers, Huntsville, AL). Photographer Unknown.

VIEW OF REMOTE LAUNCH OPERATIONS BUILDING, POWER GENERATION ROOM #124, SHOWING NO-BREAK UNITS NB-1002 (A) AND NB-1001 (B). THIS EQUIPMENT CONSISTED OF A 150 HORSEPOWER, D.C. OPERATIONAL MOTOR WHICH DROVE, ON EACH END OF THE EXTENDED SHAFT, A 70 KW GENERATOR AND A 30 KW GENERATOR UNIT. IT WAS DESIGNED TO PROVIDE CONTINUOUS POWER SERVICE FOR LAUNCH EQUIPMENT. IN PARTICULAR, THE PHOTO IS AN EXCELLENT REPRESENTATION OF THE SHOCK ISOLATION SCHEME, AS EVIDENCED BY THE SUPPORTING AIR SPRINGS AND EQUIPMENT PLATFORM

ND-9-AD-7 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army corps of Engineers, Huntsville Division). FLOOR PLAN

ND-9-AD-8 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army corps of Engineers, Huntsville Division). ROOF AND TUNNEL PLAN

ND-9-AD-9 Photographic copy of original as-built drawing, dated 10 July 1973 (original drawing in the possession of U.S. Army corps of Engineers, Huntsville Division). BUILDING CROSS SECTIONS

HAER ND-9-AD Photo List - Remote Launch Operations Building

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HISTORIC AMERICAN ENGINEERING RECORD
STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #3)
(BUILDING 3110)

HAER No.: ND-9-AD

Location: Near Service Road exit from Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Langdon vicinity, Cavalier County.

Location: Remote Sprint Launch (RSL) Site #3 is located in the E-1/2 SW-1/4 of Section 14, Township 161 North, Range 57 West of the Fifth Principal Meridian, Cavalier County, North Dakota.

Township and Range: Listed on following page.

Date of Construction: 26 March 1971 through 26 September 1973 (RSL #3).

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

REMOTE SPRINT LAUNCH SITE 3

Commencing at the Southwest corner of said Section 14;

thence North 88°20'41" East along the South line of said Section 14, 1,320.66 feet;

thence North 01°39'19" West, 100.00 feet to a point on the North right-of-way line of State Highway No. 5, said point being the point of beginning;

thence continuing along the last described course, 1,725.00 feet;

thence North 88°20'41" East, 1,250.00 feet;

thence South 01°39'19" East, 1,250.00 feet;

thence South 88°20'41" West, 575.00 feet;

thence South 01°39'19" East, 475.00 feet to the North right-of-way line of State Highway No. 5;

thence South 88°20'41" West along North right-of-way line, 675.00 feet to the point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The date of completion for Remote Sprint Launch (RSL) Site #3 was 26 September 1973.[1] The Remote Launch Operations Building (RLOB) was completed on that same date.

2. Architects: It was decided that the smaller-scaled, less-demanding RSL sites should be separate from the main Missile Site Radar(MSR)/Perimeter Acquisition Radar (PAR) bidding package.[2] Construction began on this RSL site on March 1971 following the design of the Leo A. Daly Company.[3]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred Stanley R. Mickelsen Safeguard Complex (SRMSC) site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved the SAFSCOM and were established as the operational elements for the SRMSC; the SAFCMD soon assumed operation/maintenance responsibility.[4] The U.S. Army Air Defense Command (ARADCOM), manned by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[5]

On 10 February 1976, all Safeguard facilities except the PAR were "abandoned in place" and put in inactive status. All RSL sites are presently owned by the U.S. Government. The U.S. Army Corps of Engineers (Omaha District) and General Services Administration had land authority through December 1991.[6] The abandoned RLOB remains in inactive status, overseen by the U.S. Army Space and Strategic Defense Command (USASSDC).[7]

4. Builder, Contractors, Suppliers: The construction contractors were Woerfel Corporation and Towne Realty, Inc., which were awarded a contract for RSL sites #2 and #3 on 26 March 1971 for the amount of $7,630,950.[8] Chris Berg, Inc., designed and erected the support facilities.[9]

5. Original Plans and Construction: The Safeguard program was officially inaugurated in March 1969.[10] However, original plans for the RSL sites were altered somewhat in 1970 by the announcement of a "Modified Phase II Safeguard," with the addition of extra Sprint missiles mandating two additional RSL sites, for a total of four.[11] Construction on RSL #3 began in earnest the following year.

Work on RLOB #3110 began on 23 June 1971. By the close of the 1971 construction season in November, varying degrees of progress had been made. RSL sites #2 and #3 had all prefabricated steel Sprint cells emplaced and both Remote Launch Operations Building (RLOB) "shells" completed, which allowed interior construction during the harsh winter[12]. Design and erection of associated "soft" support facilities by Chris Berg, Inc., also took place in 1971.[13]

Various engineering changes and the difficulty of the undertaking for Woerfel Corporation and Towne Realty, Inc., theretofore concerned primarily with simpler tasks such as residential construction, delayed the completion of the RSL sites.[14] Completion of each site slipped in scheduling by about 3 months.[15] For example, RLOB #3110 was completed on 26 September, though its, beneficial occupancy date had been 5 July. The Sprint missiles arrived at the SRMSC in April 1975.[16]

6. Alterations and Additions: By 1977 all missiles had been removed from the silo launchers, the silos were sealed, and the RLOB salvaged and sealed as part of the SRMSC deactivation phase.[17] At this point, the RLOB was essentially "abandoned in place."

In December 1989, an on-site environmental inspection found various facilities containing polychlorinated biphenyls (PCBs); this resulted in testing, disposal, and cleanup of these items. The USASSDC, along with the Omaha District and Huntsville Division of the Army Corps of Engineers, completed the cleanup.[18]

Much remediation has been performed within the RSL areas regarding PCB contamination.[19] Lighting ballasts containing small amounts of PCBs were removed from all RSL sites from June through November 1991. Lighting ballasts removed totaled 196.[20] Radio Frequency (RF) filters were removed that same year, totaling 85.[21]

PART II. ARCHITECTURAL INFORMATION

A. General Statement

The RLOBs are earth-covered, steel-reinforced concrete buildings with 36 rooms. They contained the equipment and facilities to support Sprint missile operation and house personnel working at each RSL[22].

Though the hardened building provided protection against potential shock specter and blast loads, the RLOBs required shielding to ensure that they would also withstand the secondary effects of nuclear attack. This shielding could protect occupants and equipment from nuclear electromagnetic pulse (EMP), radio-frequency interference (RFI), radiation overpressure, ground shock, thermal radiation, and dust.[23]

At each RSL site, EMP/RFI-hardened areas include the Sprint launch stations (except the mechanical and electrical equipment vaults, which were only EMP-hardened).[24] RLOB rooms were shielded as required.

Using RLOB #3110 as an example, the U.S. Army Corps of Engineers provided data indicating which rooms were shielded at all four RSL sites. These rooms included the Communications Equipment room (101); cable vault room (102); crypto room (103); cable vault room (105); the Sprint Remote Control Equipment (SRCE) room (108); and battery room (125).[25]

Design of the RSL sites was considered much simpler, less pressing, and less expensive than that of the other predominant SRMSC tactical facilities, and, unlike them, the RSL history is almost exclusively associated with Safeguard and not with the earlier Sentinel system.[26] The RLOBs, except for their entry tunnel, are identical.

1. Architectural Character: The RLOB merits recording by reason of its steel-reinforced, liner-plate shielded design which protected it against nuclear weapon effects and its role in early ballistic missile defense and as a pivotal figure in the SRMSC the only antiballistic site ever completed in the United States as a whole.

2. Condition of Fabric: The RLOB facilities are considerably deteriorated.

B. Description of Exterior

The dimensions of the various RLOBs were practically standardized, with only minor differences.[27] The RLOBs are all single-story, hardened structures of concrete with a partial upper level. The intake and exhaust stacks extend above grade on these subterranean buildings.[28] The exterior was provided with a waterproof coating.

1. Overall Dimensions: The approximate exterior dimensions of the RLOB are: length, 142 ft; width, 80 ft; and height, 17.5 ft.[29]

2. Foundations: The RLOB foundations are reinforced concrete slab.[30] The floor slab is 31 in thick and has a 4-inch-thick sub-slab.[31]

3. Walls: Exterior, reinforced-concrete walls are 2.5 ft in thickness.[32]

4. Structural System, Framing: The RLOBs were composed of concrete, reinforced with rebar and lined with steel plate.

5. Openings:

a. Doors Each RLOB has four blast doors, a radiation door, and an emergency escape hatch.[33]
b. Tunnels The entrance tunnels are the only deviation from the generally identical plan of the four RLOBs. The concrete tunnel at RLOB #3110 is 74 ft with elastomeric roofing and an area of 886 ft^2.[34]

6. Roof Characteristics: The RLOB roof is concrete slab with intake and exhaust stacks projecting above ground.[35] The roof slab is 2 ft thick and is covered with 3 ft of earth fill.[36]

C. Description of the Interior

1. Floor Plans: The RLOBs have approximately 11,956 ft^2 of gross floor area.[37] Some 15 percent of the area was EMP/RFI-shielded in order to protect sensitive equipment.[38]

The roof and floors were designed as either flat, one-way, or two-way slabs to carry vertical loads. In addition, they were designed as diaphragms to transfer lateral loads to the shear walls.

a. Main Level The main level contains equipment rooms (including the SRCE room), cable vaults, vestibules, corridors, personnel areas, Chemical, Bacteriological, and Radiological (CBR) filter rooms, power and battery rooms, a Security Operation, Control Console (SOCC) room, a fan room, and a crypto room.[39]

b. Upper Level The upper level contains a storage room and a fan room.[40]

2. Flooring: The floor finish for the RLOBs was as follows: epoxy over concrete (16 rooms); concrete floor hardener (13 rooms); vinyl asbestos tile (VAT) (5 rooms); VAT on shock-isolated platforms and painted liner plate (communication and crypto rooms); and VAT on removable panels (SRCE room).[41]

3. Wall and Ceiling Finish: Each RLOB room, corridor, and separate enclosure was individually lined with 11-gauge steel liner plate to avoid compromising the structural integrity of junctions between interior floors, walls, and columns and the exterior walls, roof, and floor slabs.[42] The RLOB wall finish was as follows: exposed concrete (22 rooms); concrete with gypboard (6 rooms); liner plate (6 rooms); and acoustical treatment (2 rooms).[43]

The RLOB ceiling finish was as follows: exposed concrete (24 rooms); acoustical lay-in panel (7 rooms); and liner plate (6 rooms).[44]

4. Openings: Apertures resulting from utilities and other systems entering the RLOB were possible sources of contamination and required preventive measures. All conduits and ducts entering the RFI-shielded areas were equipped with filters designed to attenuate RFI.[45]

a. Doors Each RLOB has 7 shielded doors. Doors in interior walls between rooms within the same EMP/RFI shielding zone were conventional. Doors in walls separating or bounding EMP/RFI shielding zones were provided with a sheet steel jacket and conductive gaskets or metal finger stock around the perimeter to assure electrical continuity with the door casing, which was seal-welded to the liner plate. Each door is a hinged recessed contact mechanism type; Door 101 is a double door, whereas doors 102, 103, 105, 108, 108A, and 125 are all single doors.[46]

5. Mechanical Equipment: As in the Missile Site Control Building (MSCB) and Perimeter Acquisition Radar Building (PARB), sensitive technical and support equipment was protected from the potential nuclear shock environment through the use of shock-isolation platforms.[47]

All anchorage for equipment cable trays, duct work, and cabinets was attached directly to steel bearing plates which were embedded in the concrete and continuously welded to the steel liner plate to maintain shielding integrity.

In addition to missile control equipment, each RLOB had logic-to-relay converters and other equipment to provide a communications link between the MSCB, the RLOBs, and the Sprint missile farms.[48]

Also unique to the RSL sites was the method for protecting critical utilities and systems:

It was not economical to concentrate the lines in one location and use a corrugated structure such as was utilized at the PAR and MSR facilities. A low compressive strength (6 psi) foam insulation was placed around individual lines and groups of lines which, in turn, was protected from normal soil pressures with a layer of higher strength foam insulation. Expansion joints were utilized in the lines inside the foam jacket, where required, to withstand longitudinal forces.[49]

a. Communications Communications between the RSL sites were routed through the MSCB and provided by the Safeguard Communications Agency (SAFCA).[50]

b. Electrical Under normal conditions, a commercial substation supplied power for the RSL sites, but during attack/alert conditions or power outages, power would be supplied via gas turbine generators located within the RLOB.[51] During attack, combustion air for these turbines would be provided through an extensive air-filtering/scrubbing system and uninterruptable or "no-break" power (both 208 and 460 volts) for mission critical loads provided through a rectifier-battery-motor-generator system, with battery storage capacity of 4 to 6 minutes.[52]

c. Heating, Air Conditioning, Ventilation Nine main electric duct heaters supported the RLOB: two 154,000 BTUH; four 10,240 BTUH; one 3,413 BTUH; one 5,120 BTUH; and one 13,700 BTUH.[53] There were also various air handling units available, including one in Room 100A (7,000 CFM with a 78,500 BTUH heating coil) and one in Room 100B (7,000 CFM with a 78,500 BTUH heating coil).[54]
There were seven main air handling units: two 6,600 CFM; two 7,000 CFM; two 17,000 CFM; and one 6,000 CFM.[55] The following air handling units were also for indirect expansion air conditioning: Room 100A (7,000 CFM with a 216,000 BTUH cooling coil); Room 100B (7,000 CFM with a 216,000 BTUH cooling coil); Room 200A (7,400 CFM with a 218,000 BTUH cooling coil); Room 200B (7,400 CFM with a 218,000 BTUH cooling coil); Room 300A (18,000 CFM with a 270,000 BTUH cooling coil); and Room 300B (18,000 CFM with a 270,000 BTUH cooling coil).[56]

The RLOBs contain three exhaust fans and two supply fans, as follows: exhaust - toilet (300 CFM); battery room (400 CFM); decontamination room (500 CFM); and supply - CBR filter room (two at 2,300 CFM).[57]

d. Lighting Lighting surrounded the Sprint field mound and the exclusion and limited areas; these were lit during periods of darkness by commercial lamps mounted on poles.[58]

e. Plumbing The water system at RSL #3 was unique to that site. The Senator Young Dam intake provided water to RSL #3 via a pump station (Building 5401); it maintained an authorized pumping rate of 10 gal per minute.[59] Water was stored in two 27,500-gallon underground steel tanks.

f. Grounding and Cathodic Protection System In order to counter electrical surges from a nuclear blast, a grid constructed of steel conductors 16 by 16 ft on centers and welded at each connection was buried some 1.5 ft underground. Known as a grounding counterpoise, the grid had 10-foot-long steel rods, spaced 16 ft apart, connected to it and driven into the ground at its perimeter. Welded to the grid at intervals of 32 ft were magnesium sacrificial anodes, which provided cathodic protection. The RSL buildings, fences, tanks, conduits, and pipes were connected to the counterpoise. Electrical activity could be measured by means of reference test stations composed of a meter and an underground probe.[60]

D. Site

The four RSL sites, which were located within 10 to 20 mi of the MSCB, were in the general area of the MINUTEMAN missiles which they were to defend. Each occupied from 37 to 45 acres of land. The sites were composed of sentry stations, heat sinks, fuel storage tanks, waste stabilization ponds, a Sprint missile launch area containing 12 to 16 Sprint launch stations, and a buried, reinforced concrete RLOB, which controlled and monitored the RSL sites as the MSCB directed.

1. General Setting and Orientation: RSL #3 is situated on 43.22 acres of land situated in the eastern half and southwestern quarter of Section 14, Township 161 North, Range 57 West of the Fifth Principal Meridian, Cavalier County, North Dakota.[61]

2. Historic Landscape and Design:

Land Use In the four-county area of the SRMSC, land use is almost exclusively agricultural; the landscape is dominated by cultivated crops, farmsteads, wetlands, wooded stream banks, shelterbelts, municipal skylines (primarily grain elevators and water towers), and radio and microwave towers. The rural landscape is relatively flat, drained by intermittent streams to the Red River. The most prominent natural landscape feature is the Pembina Hills along the Pembina Escarpment near RSL #3.[62]

RSL #3 is in Cavalier County, about 17 mi east of Cavalier County and 5 mi north of the PAR site; approximately 50 percent of the area within 6,562 ft is agricultural with about 45 percent wooded and occasional, though limited, wetlands.[63] The considerable topographic relief ranges from 1,280 ft to 1,540 ft above msl, with RSL #3 at 1,500 ft above msl.[64]

PART III. SOURCES OF INFORMATION

A. Original Architectural Drawings

The original RSL drawings were prepared by The Leo A. Daly Company, Architects-Engineers, St. Louis, Missouri.

B. Interviews

Daughtry, James, 1992. Interview with Daughtry, SAFSCOM PAR Facility Project Engineer (1969 - 1973), at Teledyne Brown Engineering, 1 September.

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U.S. Army Strategic Defense Command, 1991. Preliminary Building Availability and Conditions Survey, SRMSC, 13 December.

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Western Electric, 1971. Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site (MSCC/FS) Complex Physical Description, Manual No. 004, 30 September.

Western Electric, 1974. Safeguard - Overall Safeguard System Description, Theory Manual No. T001, 31 August.

Prepared by: James Edward Zielinski
Environmental Specialist
EARTH TECH
December 1994

Endnotes:

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[1]Kitchens, 1978: 111.

[2]Ibid.: 49.

[3]U.S. Army Corps of Engineers, 1974b: iii.

[4]Kitchens, 1978: 112.

[5]Ibid.: 105.

[6]U.S. Army Corps of Engineers, 1991: 7.

[7]U.S. Army Space and Strategic Defense Command, 1993: 2-3.

[8]Kitchens, 1978: 89.

[9]U.S. Army Corps of Engineers, 1974b: iii.

[10]Kitchens, 1978: 58.

[11]Ibid.

[12]Ibid.: 89.

[13]Ibid.: 89.

[14]Ibid.: 111.

[15]Ibid.: 111.

[16]Ibid.: 111.

[17]U.S. Army Strategic Defense Command, 1991: 1-6.

[18]Ibid.: 1-4.

[19]U.S. Army Corps of Engineers, 1992: 14-15.

[20]Ibid.: 156.

[21]Ibid.: 164-165.

[22]Western Electric, 1971: 11-2.

[23]U.S. Army Corps of Engineers, 1974b: 18.

[24]U.S. Army Corps of Engineers, 1972b: 3-2, 3-4.

[25]U.S. Army Corps of Engineers, 1974c: 1-2.

[26]Kitchens, 1978: 20.

[27]U.S. Army Corps of Engineers, 1974a: 176.

[28]U.S. Army Corps of Engineers, 1974b: 18.

[29]Ibid.: 18.

[30]U.S. Army Corps of Engineers, 1974a: 176.

[31]U.S. Army Corps of Engineers, 1974b: 18.

[32]Ibid.

[33]Ibid.

[34]Ibid.: 176, 193, 206, 220.

[35]Ibid.: 176.

[36]U.S. Army Corps of Engineers, 1974b: 18.

[37]U.S. Army Corps of Engineers, 1974a: 176.

[38]U.S. Army Corps of Engineers, 1974b: 18.

[39]U.S. Army Corps of Engineers, 1974a: 176.

[40]U.S. Army Corps of Engineers, 1974a: 176.

[41]Ibid.

[42]U.S. Army Corps of Engineers, 1974b: 18.

[43]U.S. Army Corps of Engineers, 1974a: 176.

[44]Ibid.

[45]U.S. Army Corps of Engineers, 1974b: 18.

[46]U.S. Army Corps of Engineers, 1977: 1-1.

[47]Ibid.

[48]Western Electric Company, Inc., 1974: 2-13.

[49]U.S. Army Corps of Engineers, 1974b: 18-19.

[50]Western Electric, 1971: 11-1.

[51]U.S. Army Corps of Engineers, 1974b: 18.

[52]Ibid.

[53]U.S. Army Corps of Engineers, 1974a: 177.

[54]Ibid.

[55]Ibid.

[56]Ibid.

[57]Ibid.

[58]Western Electric Company, Inc., 1971: 11-1.

[59]U.S. Army Corps of Engineers, 1991: 214.

[60]Western Electric Company, Inc., 1971: 1-11.

[61]Ibid.

[62]Leitch, 1992a: 3-4.

[63]Ibid.: 15.

[64]Ibid.: 15.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKLENSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #3)
(BUILDING 3115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AE

Actual Location: Langdon Vicinity
Cavalier County

PHOTOGRAPHS

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

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At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AE

Actual Location: *Langdon Vicinity*
Cavalier County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AE-1 VIEW FROM SOUTHWEST TO NORTHEAST OF EXCLUSION AREA SENTRY STATION AND MISSILE FIELD. COVERS FOR SIXTEEN SPRINT SILOS CAN BE SEEN

ND-9-AE-2 Photographic copy of photograph, dated June 1993 (original in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. CLOSE-UP VIEW OF SPRINT CELL AT MISSILE FIELD OF REMOTE SPRINT LAUNCH SITE #3, WITH LAUNCH CELL COVER MARKED "INERT." ADJACENT AND TO THE RIGHT IS THE LAUNCH PREPARATION EQUIPMENT CHAMBER (LPEC) COVER. OTHER CELL COVERS CAN BE SEEN IN THE BACKGROUND

HAER ND-9-AE Photo List - Exclusion Area Sentry Station

The low quality images from the HAER ND-9 photo copy are not included in this PDF.

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, EXCLUSION AREA SENTRY STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #3)

(BUILDING 3115)

HAER No. ND-9-AE

Location: At Service Road entrance to Missile Field, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Landon Vicinity, Cavalier County.

Significance: The Exclusion Area Sentry Station (EASS) controlled ingress/egress of the Remote Sprint Launch (RSL) Site #3 Exclusion Area.[1]

Description: This one-man sentry station, with approximately 38 ft^2 of gross floor area, is a one-story, concrete building of permanent construction that had electric light and power, two security windows, and one security door.[2] The roof is concrete slab with elastomeric roofing.[3] The floor is slab on grade. The EASS is of "soft" (nonhardened) construction.

History: The EASS was designed by the Ralph M. Parsons Co. Construction, by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 6 August 1973, at an approximate cost of $9,300.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 178.

Ibid.

Endnotes:

[1] Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 178.

[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #4
North of State Highway 17, approximately 9 mi Northwest of Adams, ND
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AF

Actual Location: Fairdale Vicinity
Walsh County

PHOTOGRAPHS

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH #4 — HAER NO. ND-9-AF
North of State Highway 17, approx. 9 mi northwest of Adams, ND.
Nekoma Vicinity
Cavalier County
North Dakota

Actual Location: *Fairdale Vicinity*
Walsh County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AF-1 OVERVIEW (NORTHEAST TO SOUTHWEST) OF REMOTE SPRINT LAUNCH SITE #4. IN CENTER IS LIMITED AREA SENTRY STATION, JUST BEHIND IT CAN BE SEEN THE EXHAUST AND INTAKE SHAFTS FOR THE REMOTE LAUNCH OPERATIONS BUILDING, AND TO THE FAR RIGHT IS THE EXCLUSION AREA SENTRY STATION

ND-9-AF-2 Photographic copy of photograph, dated September 1973 (original in possession of CSSD-HO, Huntsville, AL). Photographer Unknown. AERIAL VIEW (NORTHWEST TO SOUTHEAST) OF REMOTE SPRINT LAUNCH SITE #4 DURING CONSTRUCTION. IN THE BACKGROUND ARE THE WASTE STABILIZATION PONDS. IN THE FOREGROUND, LEFT TO RIGHT, ARE THE REMOTE LAUNCH OPERATIONS BUILDING, THE EXCLUSION AREA SENTRY STATIONS, AND THE SPRINT LAUNCH CELLS

HAER ND-9-AF Photo List - Remote Sprint Launch Site #4

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
LIMITED AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #4)
(BUILDING 4101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AG

Actual Location: *Fairdale Vicinity*
Walsh County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

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Denver, Colorado 80225-0287

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(BUILDING 4101)
Between Access Road and Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AG

Actual Location: *Fairdale Vicinity*
Walsh County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AG-1 VIEW FROM EAST TO WEST OF LIMITED AREA SENTRY STATION

HAER ND-9-AG Photo List - Limited Area Sentry Station

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, LIMITED AREA SENTRY STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #4)

(BUILDING 4101)

HAER No. ND-9-AG

Location: Between Access Road and Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Fairdale Vicinity, Walsh County.

Significance: Identical to the Limited Area Sentry Station (LASS) at Remote Sprint Launch (RSL) Site #1, this station controlled the sally-port gates that permitted entrance into the RSL #4 facility.[1]

Description: The LASS was a one-story, concrete building (2,259 ft^2) of permanent construction that had electric, water, and sewer utilities, as well as heating and exhaust units.[2] The roof is suspended concrete slab with elastomeric roofing.[3] The floor is slab on grade. The LASS is of "soft" (nonhardened) construction.

In July 1977, this LASS was used by the Federal Aviation Agency and the Defense Nuclear Agency to test simulated terrorist bomb blast effects; interior damage was only slight, with no structural damage.[4] The tests were successful in developing criteria for hardening baggage storage and locker areas of airport terminals to contain the explosion effects of small expedient bombs.[5]

History: The LASS was designed by the Ralph M. Parsons Co. Construction by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 24 August 1973 at an approximate cost of $50,000.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 175.

Ibid.

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), Huntsville Division, 13 December: p. 205.

Ballistic Missile Defense Organization, 1977. Annual Historic Review (RCS CSH15-6 (R3))(u), 1 October 1976 to 30 September 1977, Volume I, undated: p. 111-16.

Endnotes:

[1] Western Electric, 1971: p. 11-2.
[2] U.S. Army Corps of Engineers, 1974: p. 175.
[3] Ibid.
[4] U.S. Army Corps of Engineers, 1991: p. 205.
[5] Ballistic Missile Defense Organization, 1977. Annual Historic Review (RCS CSH15-6 (R3))(u), 1 October 1976 to 30 September 1977, Volume I, undated: p. 111-16.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE LAUNCH OPERATIONS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #4)
(BUILDING 4110)
Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AH

Actual Location: *Fairdale Vicinity*
Walsh County

PHOTOGRAPH

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #4)
(BUILDING 4110)
Near Service Road exit from Patrol Road
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AH

Actual Location: *Fairdale Vicinity*
Walsh County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AH-1 VIEW FROM NORTHEAST TO SOUTHWEST OF REMOTE LAUNCH OPERATIONS BUILDING, SHOWING (LEFT TO RIGHT) DIESEL EXHAUST, DIESEL INTAKE, AND ENTRANCE TUNNEL

HAER ND-9-AH Photo List - Remote Launch Operations Building

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HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,

REMOTE LAUNCH OPERATIONS BUILDING

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #4)

(BUILDING 4110)

HAER No.: ND-9-AH

Location: Near Service Road exit from Patrol Road, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Fairdale vicinity, Walsh County.

Location: RSL Site #4 is located in the E-1/2 E-1/2 of Section 28 and the W-1/2 W-1/2 of Section 27, Township 158 North, Range 59 West of the Fifth Principal Meridian, Walsh County, North Dakota.

Township and Range: Listed on following page.

Date of Construction: 1 September 1971 through 3 November 1973 (RSL #4).

Present Owner: U.S. Department of the Army.

Present Use: Caretaker Status.

Significance: It is believed that the plans for deployment and initiation of construction of this facility were instrumental in obtaining Soviet agreement to the Anti-Ballistic Missile Treaty and a subsequent decline in Cold War hostilities between the Superpowers.

Historian: James E. Zielinski, Environmental Specialist, December 1994.

REMOTE SPRINT LAUNCH SITE 4

Commencing at the Northeast corner of said Section 28;

thence South 88°24'11" West along the North line of said Section 28, 75.01 feet;

thence South 01°32'55" East, 2,639.58 feet;

thence to the North line of the NE-1/4 SE-1/4 of said Section 28;

thence South 01°33'12" East, 575.21 feet;

thence South 88°29'40" West, 1,160.11 feet;

thence South 01°33'12" East, 1,321.15 feet;

thence North 88°26'43" East, 1,235.15 feet to the West line of said Section 27;

thence North 01°33'17" West along said West line 758.55 feet;

thence North 88°26'56" East, 75.01 feet;

thence North 01°33'19" West, 1,136.10 feet to the North line of the NW-1/4 SW-1/4 of said Section 27;

thence North 01°32'54" West, 2,640.00 feet to the North line of said Section 27;

thence South 88°43'26" West, 75.00 feet to the point of beginning.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Erection: The date of completion for Remote Sprint Launch (RSL) Site #4 was 5 November 1973.[1] The Remote Launch Operations Building (RLOB) was completed on that same date.

2. Architects: It was decided that the smaller-scaled, less-demanding RSL sites should be separate from the main Missile Site Radar (MSR)/Perimeter Acquisition Radar (PAR) bidding package.[2] Work began on this RSL site on 30 August 1971 following the design of the Leo A. Daly Company.[3]

3. Original and Subsequent Owners: In August 1972, the U.S. Army Corps of Engineers transferred Stanley R. Mickelsen Safeguard Complex (SRMSC) site responsibility to the U.S. Army Safeguard System Command (SAFSCOM). On 3 September 1974, the U.S. Army Safeguard Command (SAFCMD) and the Ballistic Missile Defense Operations Activity (BMDOA) relieved the SAFSCOM and were established as the operational elements for the SRMSC; the SAFCMD soon assumed operation/maintenance responsibility.[4] The U.S. Army Air Defense Command (ARADCOM), manned by the Army Surveillance Battalion, Grand Forks, North Dakota, was the using command.[5]

On 10 February 1976, all Safeguard facilities except the PAR were "abandoned in place" and put in inactive status. All RSL sites are presently owned by the U.S. Government. The U.S. Army Corps of Engineers (Omaha District) and General Services Administration had land authority through December 1991.[6] The abandoned RLOB remains in inactive status, overseen by the U.S. Army Space and Strategic Defense Command (USASSDC).[7]

4. Builder, Contractors, Suppliers: The construction contractors were Woerfel Corporation and Towne Realty, Inc., which were awarded a contract for RSL sites #1 and #4 on 30 August 1971 for the amount of $7,870,533.[8] Chris Berg, Inc., designed and erected the support facilities.[9]

5. Original Plans and Construction: The Safeguard program was officially inaugurated in March 1969.[10] However, original plans for the RSL sites were altered somewhat in 1970 by the announcement of a "Modified Phase II Safeguard," with the addition of extra Sprint missiles mandating two additional RSL sites, for a total of four.[11] Construction on RSL #4 began in earnest the following year.

By the close of the 1971 construction season in November, varying degrees of progress had been made. The RSL #4 site had only site grading, fencing, preliminary fencing, and limited preparatory work completed at the time.[12] The inclement weather delayed actual RSL #4 construction until 13 April 1972. Design and erection of associated "soft" support facilities by Chris Berg, Inc., also took place in 1972.[13] Construction of RLOB #4110 began on 9 May 1972; mechanical and electrical installation took place between 15 October 1972 and 5 November 1973.

Various engineering changes and the difficulty of the undertaking for Woerfel Corporation and Towne Realty, Inc., theretofore concerned primarily with simpler tasks such as residential construction, delayed the completion of the RSL sites.[14] Completion of each site slipped in scheduling by about 3 months.[15] On 5 November 1973, RLOB #4110 was completed. Its beneficial occupancy date had been 15 August. The Sprint missiles arrived at the SRMSC in April 1975.[16]

6. Alterations and Additions: By 1977 all missiles had been removed from the silo launchers, the silos were sealed, and the RLOB salvaged and sealed as part of the SRMSC deactivation phase.[17] At this point, the RLOB was essentially "abandoned in place."
In December 1989, an on-site environmental inspection found various facilities containing polychlorinated biphenyls (PCBs); this resulted in testing, disposal, and cleanup of these items. The USASSDC, along with the Omaha District and Huntsville Division of the Army Corps of Engineers, completed the cleanup.[18]

Much remediation has been performed within the RSL areas regarding PCB contamination. Following a 23 July 1991 collection of soil and destructive samples from a stained RSL #4 concrete transformer pad, it was determined that elevated concentrations of PCBs (specifically Aroclor 1254) existed. Approximately 3 inches (in) of concrete were removed from the upper portion of the pad, and soil around its perimeter was excavated to a depth of 6 in.[19]

Lighting ballasts containing small amounts of PCBs were removed from all RSL sites from June through November 1991. Lighting ballasts removed totaled 147.[20] Radio Frequency (RF) filters were removed that same year, totaling 75.[21]

PART II. ARCHITECTURAL INFORMATION

A. General Statement

The RLOBs are earth-covered, steel-reinforced concrete buildings with 36 rooms. They contained the equipment and facilities to support Sprint missile operation and house personnel working at each RSL[22].

Though the hardened building provided protection against potential shock spectra and blast loads, the RLOBs required shielding to ensure that they would also withstand the secondary effects of nuclear attack. This shielding could protect occupants and equipment from nuclear electromagnetic pulse (EMP), radio-frequency interference (RFI), radiation overpressure, ground shock, thermal radiation, and dust.[23]

At each RSL site, EMP/RFI-hardened areas include the Sprint launch stations (except the mechanical and electrical equipment vaults, which were only EMP-hardened).[24] RLOB rooms were shielded as required.

The U.S. Army Corps of Engineers provided data indicating which rooms were shielded at all four RSL sites. These rooms included the Communications Equipment room (101); cable vault room (102); crypto room (103); cable vault room (105); the Sprint Remote Control Equipment (SRCE) room (108); and battery room (125).[25]

Design of the RSL sites was considered much simpler, less pressing, and less expensive than that of the other predominant SRMSC tactical facilities, and, unlike them, the RSL history is almost exclusively associated with Safeguard and not with the earlier Sentinel system.[26] The RLOBs, except for their entry tunnels, are identical.

1. Architectural Character: The RLOB merits recording by reason of its: steel-reinforced, liner-plate shielded design which protected it against nuclear weapon effects, its role in early ballistic missile defense, and role as a pivotal figure at SRMSC (the only antiballistic site ever completed in the United States).

2. Condition of Fabric: The RLOB facilities are considerably deteriorated.

B. Description of Exterior

The dimensions of the various RLOBs were practically standardized, with only minor differences.[27] The RLOBs are all single-story, hardened structures of concrete with a partial upper level. The intake and exhaust stacks extend above grade on these subterranean buildings.[28] The exterior was provided with a waterproof coating.

1. Overall Dimensions: The approximate exterior dimensions of the RLOB are: length, 142 ft; width, 80 ft; and height, 17.5 ft.[29]

2. Foundations: The RLOB foundations are reinforced concrete slab.[30] The floor slab is 31 in thick and has a 4-inch-thick sub-slab.[31]

3. Walls: Exterior, reinforced-concrete walls are 2.5 ft in thickness.[32]

4. Structural System, Framing: The RLOBs were composed of concrete, reinforced with rebar and lined with steel plate.

5. Openings:

a. Doors Each RLOB has four blast doors, a radiation door, and an emergency escape hatch.[33]
b. Tunnels The entrance tunnels are the only deviation from the generally identical plan of the four RLOBs. RLOB #4110 has the longest tunnel, at 103 ft and 1,175 ft^2 in area.[34] Constructed of concrete, the tunnel was provided with elastomeric roofing.

6. Roof Characteristics: The RLOB roof is concrete slab with intake and exhaust stacks projecting above ground.[35] The roof slab is 2 ft thick and is covered with 3 ft of earth fill.[36]

C. Description of the Interior

1. Floor Plans: The RLOBs have approximately 11,956 ft^2 of gross floor area.[37] Some 15 percent of the area was EMP/RFI-shielded in order to protect sensitive equipment.[38]

The roof and floors were designed as either flat, one-way, or two-way slabs to carry vertical loads. In addition, they were designed as diaphragms to transfer lateral loads to the shear walls.

a. Main Level The main level contains equipment rooms (including the SRCE room), cable vaults, vestibules, corridors, personnel areas, Chemical, Bacteriological, and Radiological (CBR) filter rooms, power and battery rooms, a Security Operations Control Console (SOCC) room, a fan room, and a crypto room.[39]

b. Upper Level The upper level contains a storage room and a fan room.[40]

2. Flooring: The floor finish for the RLOBs was as follows: epoxy over concrete (16 rooms); concrete floor hardener (13 rooms); vinyl asbestos tile (VAT) (5 rooms); VAT on shock-isolated platforms and painted liner plate (communication and crypto rooms); and VAT on removable panels (SRCE room).[41]

3. Wall and Ceiling Finish: Each RLOB room, corridor, and separate enclosure was individually lined with 11-gauge steel liner plate to avoid compromising the structural integrity of junctions between interior floors, walls, and columns and the exterior walls, roof, and floor slabs.[42] The RLOB wall finish was as follows: exposed concrete (22 rooms); concrete with gypboard (6 rooms); liner plate (6 rooms); and acoustical treatment (2 rooms).[43]

The RLOB ceiling finish was as follows: exposed concrete (24 rooms); acoustical lay-in panel (7 rooms); and liner plate (6 rooms).[44]

4. Openings: Apertures resulting from utilities and other systems entering the RLOB were possible sources of contamination and required preventive measures. All conduits and ducts entering the RFI-shielded areas were equipped with filters designed to attenuate RFI.[45]

a. Doors Each RLOB has 7 shielded doors. Doors in interior walls between rooms within the same EMP/RFI shielding zone were conventional. Doors in walls separating or bounding EMP/RFI shielding zones were provided with a sheet steel jacket and conductive gaskets or metal finger stock around the perimeter to assure electrical continuity with the door casing which was seal-welded to the liner plate. Each door is a hinged recessed contact mechanism type; Door 101 is a double door, whereas doors 102, 103, 105, 108, 108A, and 125 are all single doors.[46]

5. Mechanical Equipment: As in the Missile Site Control Building (MSCB) and Perimeter Acquisition Radar Building (PARB), sensitive technical and support equipment was protected from the potential nuclear shock environment through the use of shock-isolation platforms.[47]

All anchorage for equipment cable trays, duct work, and cabinets was attached directly to steel bearing plates which were embedded in the concrete and continuously welded to the steel liner plate to maintain shielding integrity.

In addition to missile control equipment, each RLOB had logic-to-relay converters and other equipment to provide a communications link between the MSCB, the RLOBs, and the Sprint missile farms.[48]

Also unique to the RSL sites was the method for protecting critical utilities and systems:

It was not economical to concentrate the lines in one location and use a corrugated structure such as was utilized at the PAR and MSR facilities. A low compressive strength (6 psi) foam insulation was placed around individual lines and groups of lines which, in turn, was protected from normal soil pressures with a layer of higher strength foam insulation. Expansion joints were utilized in the lines inside the foam jacket, where required, to withstand longitudinal forces.[49]

a. Communications Communications between the RSL sites were routed through the MSCB and provided by the Safeguard Communications Agency (SAFCA).[50]

b. Electrical Under normal conditions, a commercial substation supplied power for the RSL sites, but during attack/alert conditions or power outages, power would be supplied via gas turbine generators located within the RLOB.[51] During attack, combustion air for these turbines would be provided through an extensive air-filtering/scrubbing system and uninterruptable or "no-break" power (both 208 and 460 volts) for mission critical loads provided through a rectifier-battery-motor-generator system, with battery storage capacity of 4 to 6 minutes.[52]

c. Heating, Air Conditioning, Ventilation Nine main electric duct heaters supported the RLOB: two 154,000 BTUH; four 10,240 BTUH; one 3,413 BTUH; one 5,120 BTUH; and one 13,700 BTUH.[53] There were also various air handling units available, including one in Room 100A (7,000 CFM with a 78,500 BTUH heating coil) and one in Room 100B (7,000 CFM with a 78,500 BTUH heating coil).[54]
There were seven main air handling units: two 6,600 CFM; two 7,000 CFM; two 17,000 CFM; and one 6,000 CFM.[55] The following air handling units were also for indirect expansion air conditioning: Room 100A (7,000 CFM with a 216,000 BTUH cooling coil); Room 100B (7,000 CFM with a 216,000 BTUH cooling coil); Room 200A (7,400 CFM with a 218,000 BTUH cooling coil); Room 200B (7,400 CFM with a 218,000 BTUH cooling coil); Room 300A (18,000 CFM with a 270,000 BTUH cooling coil); and Room 300B (18,000 CFM with a 270,000 BTUH cooling coil).[56]

The RLOBs contain three exhaust fans and two supply fans, as follows: exhaust - toilet (300 CFM); battery room (400 CFM); decontamination room (500 CFM); and supply - CBR filter room (two at 2,300 CFM).[57]

d. Lighting Lighting surrounded the Sprint field mound and the exclusion and limited areas; these were lit during periods of darkness by commercial lamps mounted on poles.[58]

e. Plumbing At RSL #4, two underground steel tanks with a capacity of 27,500 gal each (approximately a 2-week supply) held water brought to the site by truck; there was no surface water present.[59]

The water storage tank fill was located adjacent to the Limited Area Sentry Station (LASS); water was distributed from the tanks to the water treatment equipment located in the respective RLOBs.[60] Waterlines included surge arresters to prevent equipment damage.

f. Grounding and Cathodic Protection System In order to counter electrical surges from a nuclear blast, a grid constructed of steel conductors 16 by 16 ft on centers and welded at each connection was buried some 1.5 ft underground. Known as a grounding counterpoise, the grid had 10-foot-long steel rods, spaced 16 ft apart, connected to it and driven into the ground at its perimeter. Welded to the grid at intervals of 32 ft were magnesium sacrificial anodes, which provided cathodic protection. The RSL buildings, fences, tanks, conduits, and pipes were connected to the counterpoise. Electrical activity could be measured by means of reference test stations composed of a meter and an underground probe.[61]

D. Site

The four RSL sites, which were located within 10 to 20 mi of the MSCB, were in the general area of the MINUTEMAN missiles which they were to defend. Each occupied from 37 to 45 acres of land. The sites were composed of sentry stations, heat sinks, fuel storage tanks, waste stabilization ponds, a Sprint missile launch area containing 12 to 16 Sprint launch stations, and a buried, reinforced concrete RLOB, which controlled and monitored the RSL sites as the MSCB directed.

1. General Setting and Orientation: RSL #4 is situated on 50 acres of land situated in the eastern half of Section 28 and the western half of Section 27, Township 158 North, Range 59 West of the Fifth Principal Meridian, Walsh County, North Dakota.[62]

2. Historic Landscape and Design:

Land Use In the four-county area of the SRMSC, land use is almost exclusively agricultural; the landscape is dominated by cultivated crops, farmsteads, wetlands, wooded stream banks, shelterbelts, municipal skylines (primarily grain elevators and water towers), and radio and microwave towers. The rural landscape is relatively flat, drained by intermittent streams to the Red River. The most prominent natural landscape feature is the Pembina Hills along the Pembina Escarpment near RSL #3.[63]

RSL #4 is about 1.5 mi southwest of Fairdale in Walsh County; 96 percent of the area within 6,562 ft is agricultural with less than 3 percent wooded and occasional wetlands.[64] The limited topographic relief ranges from 1,584 ft to 1,640 ft above msl, with RSL #1 at 1,603 ft above msl.[65]

PART III. SOURCES OF INFORMATION

A. Original Architectural Drawings

The original RSL drawings were prepared by The Leo A. Daly Company, Architects-Engineers, St. Louis, Missouri.

B. Interviews

Daughtry, James, 1992. Interview with Daughtry, SAFSCOM PAR Facility Project Engineer (1969 - 1973), at Teledyne Brown Engineering, 1 September.

Thomas, Earl, 1992. Interview with Thomas, Advanced Program Specialist, at Teledyne Brown Engineering, 18 August.

C. Bibliography

1. Primary and Unpublished Sources:

Air Force Space Command, 1992. Review Draft, Environmental Assessment of the Transition of Cavalier Air Force Station to the Army, July.

Leitch, Jay A., 1992a. Correspondence to The Earth Technology Corporation regarding land use at SRMSC, PAR & MSR sites, 24 September.

Leitch, Jay A., 1992b. Correspondence to The Earth Technology Corporation regarding land use at SRMSC, RLS sites, 1 October.

2. Secondary and Published Sources:

Aviation Week and Space Technology, 1975. "Army Widens Ballistic Missile Research," 8 December.

Coon, Randall C., et al., 1976. The Impact of the Safeguard Antiballistic Missile System Construction on Northeastern North Dakota, Agricultural Economics Report No. 101, Department of Agricultural Economics, North Dakota State University, April.

FACT SHEET, U.S. Army Strategic Defense Command, Public Affairs Office, "Stanley R. Mickelsen Safeguard Complex," undated.

Hohenemser, Burt, 1972. "National Insecurity," Environment, Vol. 14, No. 8, October.

Hotz, Robert, 1975. "Pitfalls of SALT 1," Aviation Week and Space Technology, 24 November.

JANE'S, 1973-74. Weapons System, published by Jane's Publishing Col., Ltd., London, England.

JANE'S, 1975. Weapons System, published by Jane's Publishing Col., Ltd., London, England.

Kitchens, James H. III, 1978. A History of the Huntsville Division, U.S. Army Corps of Engineers 1967-1976, 6 September.

Teledyne Brown Engineering, Safeguard Ballistic Missile Defense, Employee Informational Brochure, undated.

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U.S. Army Corps of Engineers, 1972b. Hardness Program-EMP, EMP-RFI Protection MSR, for Safeguard TSE Ground Facilities, Volume 2, July.

U.S. Army Corps of Engineers, 1974a. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex, undated.

U.S. Army Corps of Engineers, 1974b. Safeguard--A Step Toward Peace, No date.

U.S. Army Corps of Engineers, 1974c. EMP/RFI Interface Evaluation, for USAEDH Safeguard Tactical Ground Facilities Hardness Program-EMP, Volume X, Remote Launch Site (RLS) Penetration Data Equipment Data Analysis, November.

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), 13 December.

U.S. Army Corps of Engineers, 1992. PCB Removal, Transportation, and Disposal Report, Stanley R. Mickelsen Safeguard Complex and Remote Launch Sites, Nekoma, North Dakota, February.

U.S. Army Strategic Defense Command, 1991. Preliminary Building Availability and Conditions Survey, SRMSC, 13 December.

U.S. News and World Report, 1969. "If You're Puzzled about ABM ," 25 August.

Wade, Nicholas, 1974. "Safeguard: Disputed Weapon Nears Readiness on Plains of North Dakota," Science, Vol. 185, pp. 1137-1140, 27 September.

Western Electric, 1971. Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site (MSCC/FS) Complex Physical Description, Manual No. 004, 30 September.

Western Electric, 1974. Safeguard - Overall Safeguard System Description, Theory Manual No. T001, 31 August.

Prepared by: James Edward Zielinski
Environmental Specialist
EARTH TECH
December 1994

Endnotes:

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[1]Kitchens, 1978: 111.

[2]Ibid.: 49.

[3]U.S. Army Corps of Engineers, 1974b: iii.

[4]Kitchens, 1978: 112.

[5]Ibid.: 105.

[6]U.S. Army Corps of Engineers, 1991: 7.

[7]U.S. Army Space and Strategic Defense Command, 1993: 2-3.

[8]Kitchens, 1978: 89.

[9]U.S. Army Corps of Engineers, 1974b: iii.

[10]Kitchens, 1978: 58.

[11]Ibid.

[12]Ibid.: 89.

[13]Ibid.: 89.

[14]Ibid.: 111.

[15]Ibid.: 111.

[16]Ibid.: 111.

[17]U.S. Army Strategic Defense Command, 1991: 1-6.

[18]Ibid.: 1-4.

[19]U.S. Army Corps of Engineers, 1992: 14-15.

[20]Ibid.: 156.

[21]Ibid.: 164-165.

[22]Western Electric, 1971: 11-2.

[23]U.S. Army Corps of Engineers, 1974b: 18.

[24]U.S. Army Corps of Engineers, 1972b: 3-2, 3-4.

[25]U.S. Army Corps of Engineers, 1974c: 1-2.

[26]Kitchens, 1978: 20.

[27]U.S. Army Corps of Engineers, 1974a: 176.

[28]U.S. Army Corps of Engineers, 1974b: 18.

[29]Ibid.: 18.

[30]U.S. Army Corps of Engineers, 1974a: 176.

[31]U.S. Army Corps of Engineers, 1974b: 18.

[32]Ibid.

[33]Ibid.

[34]Ibid.: 176, 193, 206, 220.

[35]Ibid.: 176.

[36]U.S. Army Corps of Engineers, 1974b: 18.

[37]U.S. Army Corps of Engineers, 1974a: 176.

[38]U.S. Army Corps of Engineers, 1974b: 18.

[39]U.S. Army Corps of Engineers, 1974a: 176.

[40]U.S. Army Corps of Engineers, 1974a: 176.

[41]Ibid.

[42]U.S. Army Corps of Engineers, 1974b: 18.

[43]U.S. Army Corps of Engineers, 1974a: 176.

[44]Ibid.

[45]U.S. Army Corps of Engineers, 1974b: 18.

[46]U.S. Army Corps of Engineers, 1977: p. 1-1.

[47]Ibid.

[48]Western Electric Company, Inc., 1974: 2-13.

[49]U.S. Army Corps of Engineers, 1974b: 18-19.

[50]Western Electric, 1971: 11-1.

[51]U.S. Army Corps of Engineers, 1974b: 18.

[52]Ibid.

[53]U.S. Army Corps of Engineers, 1974a: 177.

[54]Ibid.

[55]Ibid.

[56]Ibid.

[57]Ibid.

[58]Western Electric Company, Inc., 1971: 11-1.

[59]U.S. Army Corps of Engineers, 1974a: 172.

[60]Western Electric Company, Inc., 1971: 11-1.

[61]Western Electric Company, Inc., 1971: 1-11.

[62]Ibid.

[63]Leitch, 1992a: 3-4.

[64]Ibid.: 16.

[65]Ibid.: 16.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
EXCLUSION AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
REMOTE SPRINT LAUNCH SITE #4)
(BUILDING 4115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AI

Actual Location: *Fairdale Vicinity*
Walsh County

PHOTOGRAPH

WRITTEN AND HISTORICAL DATA

Historic American Engineering Record
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Department of the Interior
Denver, Colorado 80225-0287

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, EXCLUSION AREA SENTRY STATION (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #4) (BUILDING 4115)
At Service Road entrance to Missile Field
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AI

Actual Location: *Fairdale Vicinity*
Walsh County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AI-1 VIEW FROM SOUTHEAST TO NORTHWEST OF EXCLUSION AREA SENTRY STATION (FAR RIGHT) AND MISSILE FIELD. COVERS FOR FOURTEEN SPRINT SILOS CAN BE SEEN

HAER ND-9-AI Photo List - Exclusion Area Sentry Station

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,

EXCLUSION AREA SENTRY STATION

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, REMOTE SPRINT LAUNCH SITE #4)

(BUILDING 4115)

HAER No. ND-9-AI

Location: At Service Road entrance to Missile Field, Nekoma Vicinity, Cavalier County, North Dakota. Actual Location, Fairdale Vicinity, Walsh County.

Significance: The Exclusion Area Sentry Station (EASS) controlled ingress/egress of the Remote Sprint Launch (RSL) Site #4 Exclusion Area.[1]

Description: This one-man sentry station, with approximately 38 ft^2 of gross floor area, is a one-story, concrete building of permanent construction that had electric light and power, two security windows, and one security door.[2] The roof is concrete slab with elastomeric roofing.[3] The floor is slab on grade. The EASS is of "soft" (nonhardened) construction.

History: The EASS was designed by the Ralph M. Parsons Co. Construction, by Woerfel Corp.-Towne Realty, Inc., began on 9 May 1972 and was completed on 14 September 1973, at an approximate cost of $9,300.

Sources:

Western Electric Company, Inc., 1971. Safeguard Initial Draft Copy Theory Manual, Missile Site Control Center/Firing Site, Complex Physical Description, Manual No. 004, 30 September: p. 11-2.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 178.

Ibid.

Endnotes:

[1]Western Electric, 1971: p. 11-2.

[2] U.S. Army Corps of Engineers, 1974: p. 178.

[3] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
RESIDENT ENGINEERS OFFICE BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 705)
Southeast of intersection of PAR Access Road and Fourth Avenue
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AJ

Actual Location: *Village of Mountain Vincinity*
Pembina County

PHOTOGRAPH

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, RESIDENT ENGINEER'S OFFICE BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX) (BUILDING 750)
Southeast of intersection of PAR Access Road and Fourth Avenue
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AJ

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AJ-1 VIEW FROM WEST TO EAST OF PAR SITE RESIDENT ENGINEER'S OFFICE BUILDING (REOB)

HAER ND-9-AJ Photo List - Resident Engineers Office Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
COMMUNITY CENTER
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING707)
South of Fourth Avenue
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AK

Actual Location: *Village of Mountain Vincinity*
Pembina County

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, COMMUNITY CENTER (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX) (BUILDING 707)
South of Fourth Avenue
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AK

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AK-1 VIEW FROM SOUTHEAST TO NORTHWEST OF PAR SITE COMMUNITY CENTER

HAER ND-9-AK Photo List - Community Center

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
BACHELOR OFFICERS' QUARTERS
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING708)
North of Second Avenue; South of Metal and Woodworking Shop #706
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AL

Actual Location: *Village of Mountain Vincinity*
Pembina County

PHOTOGRAPH

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 708)
North of Second Avenue; South of Metal and woodworking shop #706
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AL

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AL-1 VIEW FROM SOUTHEAST TO NORTHWEST OF PAR SITE BACHELOR OFFICERS' QUARTERS

HAER ND-9-AL Photo List - Bachelor Officers' Quarters

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
STORAGE BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 709)
Across street from Family Housing Units 110 and 111
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AM

Actual Location: *Village of Mountain Vincinity*
Pembina County

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, STORAGE BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 709)
Across street from Family Housing Units 110 and 111
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AM

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AM-1 VIEW FROM EAST TO WEST OF PAR SITE STORAGE BUILDING; FORMERLY PAR DISPENSARY

HAER ND-9-AM Photo List - Storage Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 720)
South of Second Avenue and West of Electrical Switch Station #2
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AN

Actual Location: *Village of Mountain Vincinity*
Pembina County

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 720)
North of Second Avenue and West of Electrical Switch Station #2
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AN

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AN-1 VIEW FROM NORTHEAST TO SOUTHWEST OF PAR SITE SENTRY STATION; FORMERLY THE BACHELORS' ENLISTED MEN'S QUARTERS (BEQ)

HAER ND-9-AN Photo List - Sentry Station

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
CONTROLLED AREA SENTRY STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING726)
On Access Road at entrance to Perimeter Acquisition Radar Site
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AO

Actual Location: *Village of Mountain Vincinity*
Pembina County

PHOTOGRAPH

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CONTROLLED AREA SENTRY
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 726)
On Access Road at entrance to Perimeter Acquisition Radar Site
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AO

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AO-1 SOUTHEAST OBLIQUE (SOUTHEAST TO NORTHWEST) OF CONTROLLED AREA SENTRY STATION/VISITOR CENTER

HAER ND-9-AO Photo List - Controlled Area Sentry Station

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
INDUSTRIAL BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 730)
On Service Road C
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AP

Actual Location: *Village of Mountain Vincinity*
Pembina County

PHOTOGRAPH

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(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 730)
On Service Road C
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO.ND-9-AP

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AP-1 VIEW FROM WEST TO EAST OF PAR SITE INDUSTRIAL BUILDING

HAER ND-9-AP Photo List - Industrial Building

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX, FRESH WATER PUMP HOUSE
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 735)
In Limited Access Area, on Patrol Road next to Open Storage Reservoir #736
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AQ

Actual Location: *Village of Mountain Vincinity*
Pembina County

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FRESH WATER PUMP HOUSE
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 735)
In Limited Access Area, on Patrol Road South of Open Storage Reservoir #736
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AQ

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AQ-1 VIEW FROM SOUTHWEST TO NORTHEAST OF PAR SITE FRESH WATER PUMPHOUSE

HAER ND-9-AQ Photo List - Fresh Water Pump House

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STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
FUEL OIL PUMP STATION
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
PERIMETER ACQUISITON RADAR COMPLEX)
(BUILDING 805)
In Limited Access Area between Service Roads A and D
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AR

Actual Location: *Village of Mountain Vincinity*
Pembina County

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PERIMETER ACQUISITION RADAR COMPLEX)
(BUILDING 805)
In Limited Access Area between Service Roads A and D
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AR

Actual Location: *Village of Mountain Vicinity*
Pembina County

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AR-1 VIEW FROM SOUTHWEST TO NORTHEAST OF FUEL OIL PUMP STATION, SHOWING COOLING TOWERS TO RIGHT. THE TOPS OF LIQUID NITROGEN STORAGE TANKS A & B CAN BE SEEN ABOVE THE STATION ROOF. IN THE FOREGROUND, LEFT TO RIGHT, CAN BE SEEN THE COVERS FOR DIESEL FUEL TANKS NO'S 9 (STRUCTURE #819), 8 (#818), 7 (#817), AND 6 (#816). AT RIGHT OF CENTER, NEXT TO THE STATION, ARE NO'S 1 (#803) AND 2 (#804). IN DISTANT BACKGROUND ARE NO'S 3 (#806), 4 (#807, 5 (#808). NO'S 3 AND 4 ARE 12,000-GALLON TANKS, THE REST HOLD 50,000 GALLONS EACH

HAER ND-9-AR Photo List - Fuel Oil Pump Station

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Photo list:

ND-9-AR-1

HISTORIC AMERICAN ENGINEERING RECORD

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, FUEL OIL PUMP STATION

(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, PERIMETER ACQUISITION RADAR COMPLEX)

(BUILDING 805)

HAER No. ND-9-AR

Location: In Limited Access Area between Service Roads A and D, Nekoma Vicinity, Cavalier County, North Dakota. Actual location, Village of Mountain Vicinity, Pembina County.

Significance: This building stored and provided fuel oil for the Perimeter Acquisition Radar (PAR) tactical area.

Description: This building is a two story, "soft" (nonhardened), permanent structure (1,050 ft^2) with a concrete slab roof and (underground) foundation, concrete walls, and floors of concrete with hardener.[1] The roof is concrete slab. The underground, lower level consists of a pump room; the upper level consists of the control room and entry.[2] Three fuel pumps have a capacity of 50 gallons per minute (gpm); a sump pump has a capacity of 35 gpm.[3] Five 50,000-gallon underground storage tanks (USTs) and two 12,000-gallon holding tanks are situated adjacent to the west and south portions of the building, respectively; to the north are two 3,000-gallon, above-ground nitrogen tanks and a 4,000-gallon acid storage tank.[4]

History: The fuel oil building was designed by Ammann and Whitney Consulting Engineers. Construction, by Morrison-Knudsen and Associates, was completed on 17 November 1972 at an approximate cost of $205,000.

Sources:

U.S. Army Corps of Engineers, 1991. Initial Deployment at Stanley R. Mickelsen Safeguard Complex (SRMSC), Huntsville Division, 13 December: p. 1-1.

U.S. Army Corps of Engineers, 1974. Analysis of Existing Facilities at Stanley R. Mickelsen Safeguard Complex in Vicinity of Grand Forks, North Dakota, undated: p. 117.

U.S. Army Corps of Engineers, 1975. Master Plan Analysis of Existing Facilities, Stanley R. Mickelsen Safeguard Complex, MSR Site, PAR Site, RSL 1, 2, 3, 4: p. 24.

Ibid.

Endnotes:

[1] U.S. Army Corps of Engineers, 1991: p. 1-1.

[2] U.S. Army Corps of Engineers, 1974.

[3] U.S. Army Corps of Engineers, 1975: p. 24.

[4] Ibid.

Historian: James E. Zielinski, Environmental Specialist, 1994.

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
ADMINISTRATIVE HEADQUARTERS BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 360)
In Controlled Area just off Avenue A and East of Pump House
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AS

PHOTOGRAPH

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, ADMINISTRATIVE HEADQUARTERS BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX) (BUILDING 360)
In Controlled Area Just off Avenue A and East of Pump House
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AS

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AS-1 VIEW FORM SOUTHEAST TO NORTHWEST OF ADMINISTRATION BUILDING. COMMUNITY CENTER CAN BE SEEN IN FAR LEFT BACKGROUND

HAER ND-9-AS Photo List - Administrative Headquarters Building

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Photo list:

ND-9-AS-1

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
POLAR TELEPHONE BUILDING
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 371)
South of Avenue A and West of Industrial Building
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AT

PHOTOGRAPH

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, POLAR TELEPHONE BUILDING (STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX) (BUILDING 371)
South of Avenue A and West of Industrial Building
Nekoma Vicinity
Cavalier County
North Dakota

HAER NO. ND-9-AT

Benjamin Halpern, Photographer, 5-18 October 1992

ND-9-AT-1 Photographic copy of photograph, dated June 1993 (original in possession of CSSD-HO, Huntsville, AL). Gerald Greenwood, Photographer. VIEW FROM SOUTHEAST TO NORTHWEST OF POLAR TELEPHONE BUILDING.

HAER ND-9-AT Photo List - Polar Telephone Building

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Photo list:

ND-9-AT-1

STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR POWER PLANT
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX,
MISSILE SITE RADAR COMPLEX)
(BUILDING 440)
MSRPP is Southeast of, and adjacent to, the MSCB
Nekoma Vicinity
Cavalier County
North Dakota

HAER No. ND-9-AU

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

STANLEY R. MICKELSEN SAFEGUARD COMPLEX, HAER NO. ND-9-AU
MISSILE SITE RADAR POWER PLANT
(STANLEY R. MICKELSEN SAFEGUARD COMPLEX, MISSILE SITE RADAR COMPLEX)
(BUILDING 440)
The MSRPP is Southeast of, and adjacent to, the Missile Site Control Building
Nekoma Vicinity
Cavalier County
North Dakota

ND-9-AU-1 Photographic copy of original design drawing, dated January 1970, revised 24 May 1972 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). MSRPP GENERAL FLOOR PLAN, LOWER LEVEL

ND-9-AU-2 Photographic copy of original design drawing, dated January 1970, revised 13 August 1971 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). MSRPP GENERAL FLOOR PLAN, UPPER LEVEL

ND-9-AU-3 Photographic copy of original design drawing, dated January 1970, revised 12 March 1971 (original Army Operational Drawing in the possession of U.S. Army Corps of Engineers, Huntsville Division). MSRPP INTERIOR ELEVATIONS, CORRIDORS #216, UPPER AND LOWER LEVELS

HAER ND-9-AU Photo List - Missile Site Radar Power Plant

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ND-9-AU-1 thru ND-9-AU-3