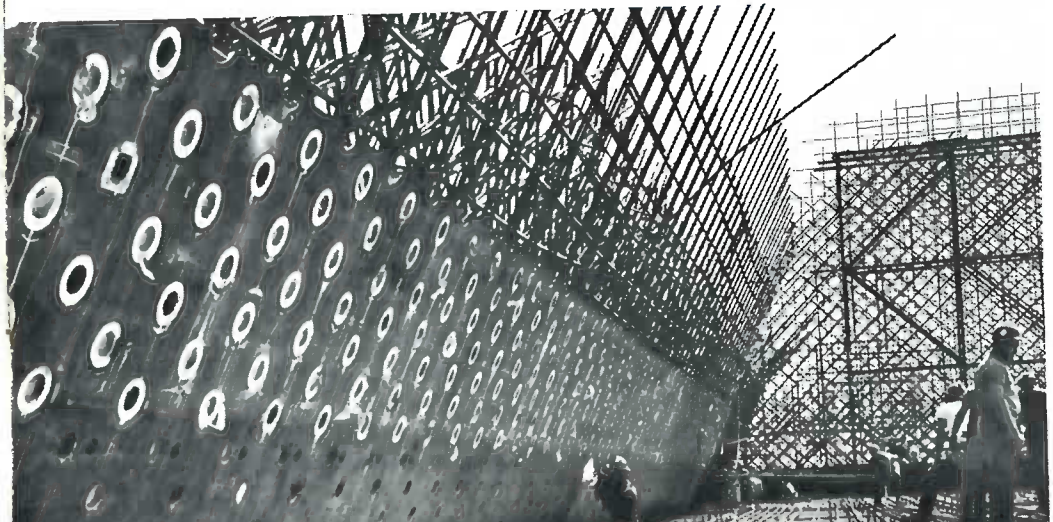
SAFEGUARD: 2300-MAN CONSTRUCTION FORCE AT WORK ON FIRST U.S. COMPLEX FOR BALLISTIC MISSILE DEFENSE

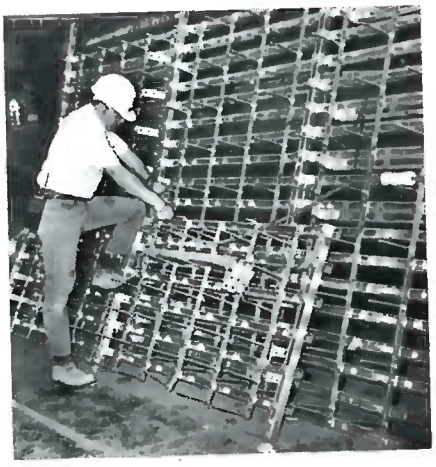
TWO POWERFUL RADAR installations enclosed by incredibly massive buildings whose concrete walls — three, six and even eight feet thick—are strengthened by webs of reinforcing steel placed at densities seldom attempted. Two completely buried power plants, housed in superstrong concrete-and-steel structures and of such capacities that either could serve the entire electrical demand of a small city. A "field" of subsurface silo-like missile sites, laced and lined with steel and backfilled with concrete, for two-stage Sprint missiles and longer-range three-stage Spartan missiles.

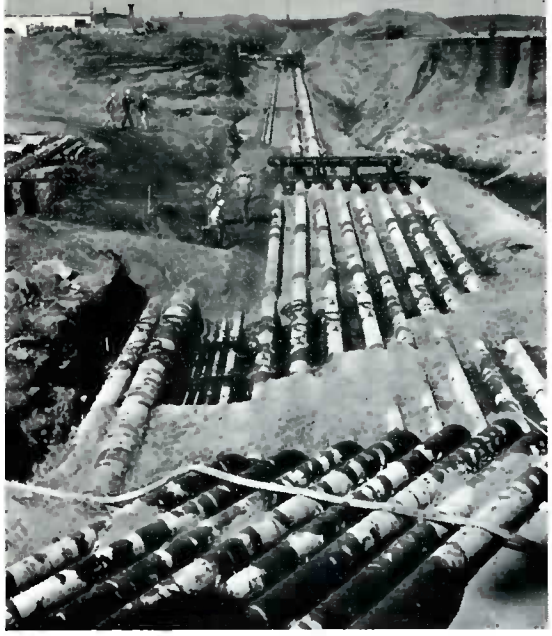
Such, in brief, are the main "components" of the nation's first Safeguard missile defense complex, an array of unprecedented space-age facilities now at the peak of construction on plains of North Dakota.

Builder of these complicated first-of-a-kind facilities, located at two separate sites near the northeastern town of Langdon, is a joint-venture

ABOVE, Perimeter Acquisition Radar Building looms above one of two sites of Safeguard complex in North Dakota. BELOW, pattern on PAR's sloping north wall indicates coaxial cable penetrations (over 6,000 total) for antenna array system. RIGHT, terminal grid is among gear required in vast program of outfitting work.







ABOVE, LEFT, fuel and water lines are part of 200,000-foot piping program; RIGHT, wrappings of re-steel near completion on top portions of Spartan missile silos.

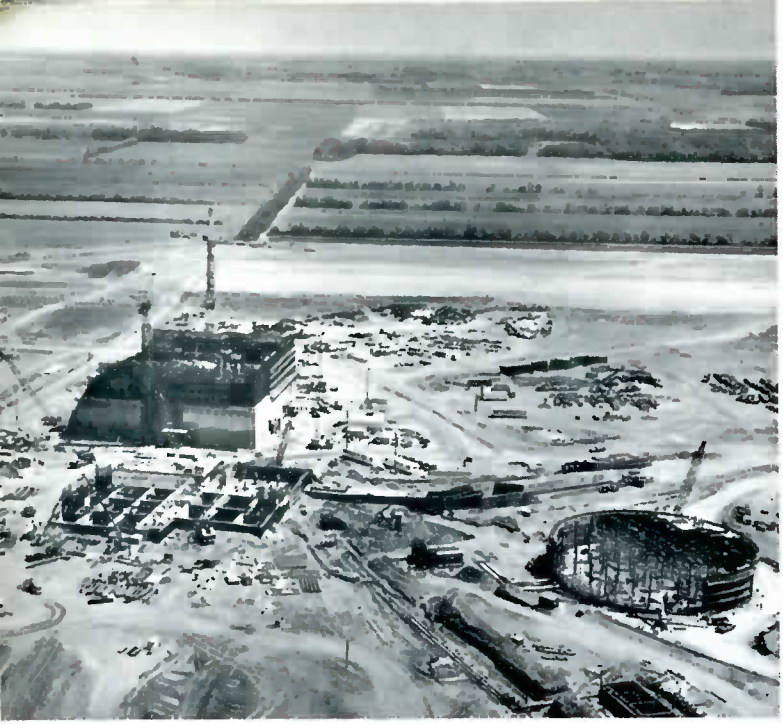
contracting team sponsored by Morrison-Knudsen Company. With 2,300 men now employed on structural and outfitting operations, the joint venture expects to finish the project, on schedule, in early 1973.

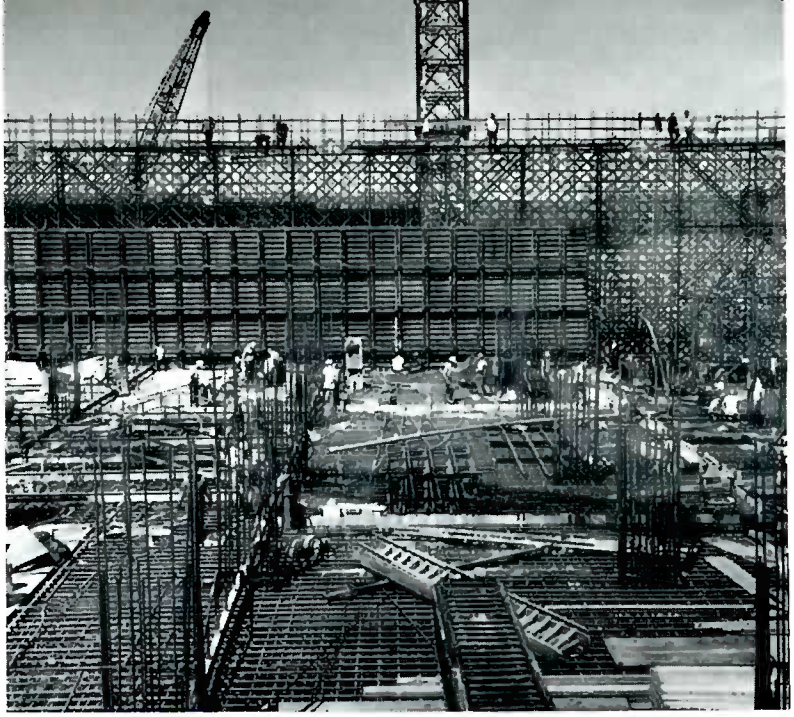
Then, only the installation of classified equipment (principally certain radar, instrumentation and armament gear) will remain to bring the complex to operational status. With final tasks accomplished, this newest addition to U.S. defensive might will be capable of detecting, and, by means of the Spartans and Sprints, intercepting and destroying approaching enemy missiles before they reach their targets.

Morrison - Knudsen Company & Associates—Peter Kiewit Sons' Co., Fischbach and Moore, Incorporated, and C. H. Leavell & Co. are participants—is building the complex under a $137,858,850 contract awarded on April 1, 1970, by the U. S. Army Corps of Engineers. Rarely has a single contract covered so many diversified large-scale activities. Earthmoving, concrete work, steel erection, paving, piping, wiring, and installation of tens of thousands of items of mechanical and electrical equipment are all advancing on a high-speed schedule.

Most of the project's structural work is expected to be finished this year. By last month, the builders

ABOVE, LEFT, sketch of Missile Site Control Building, with 78-foot-high turret atop structure reaching 48 feet beneath surface; RIGHT, sketch of 125-foot-high PAR building, with long-range antenna on north wall. BELOW, aerial view of MSR site shows 7.5-million-gallon heat sink (left), power plant (front) and control building.





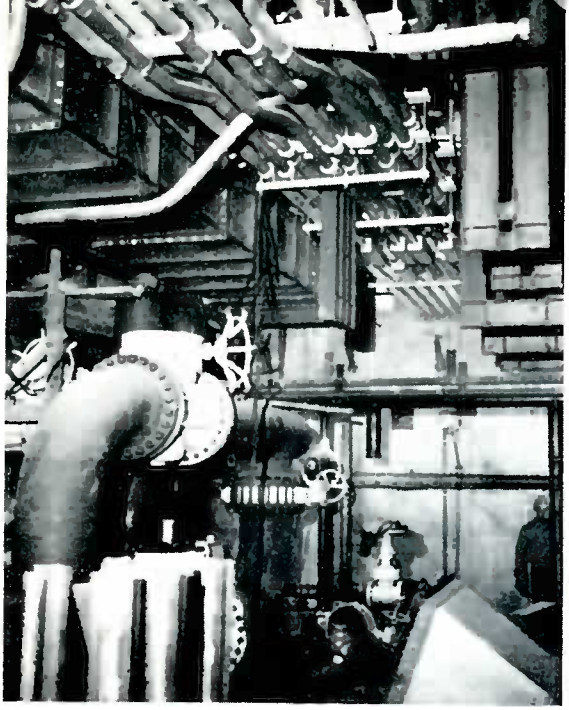
ABOVE, LEFT, aerial view shows PAR building along with powerhouse (to be buried) and heat sink; RIGHT, reinforcing steel (project total: 50-million pounds) goes into PAR building in densities sometimes exceeding 300 pounds per yard of concrete.

had completed more than 1.6-million cubic yards of excavation and structure backfill, 116,000 of a total 176,000 yards of concrete, 36.4-million of a total 50-million pounds of reinforcing steel, and more than 4,000 of 10,000 tons of structural steel.

Primarily, these voluminous quantities of materials are required to erect four principal buildings, two at each construction site. They are:

—Perimeter Acquisition Radar Building, 28 miles east of Langdon. This 208x198-foot structure, 125 feet high and enclosing five levels, is now reaching upward from the third level. As outer walls are completed, they are covered on all interior surfaces with heavy steel plate to shield against electromagnetic impulses. The north wall of the blocky building slants backward on a 25-degree angle and will ultimately be penetrated by more than 6,000 pipes, reaching through the seven-foot face, that are being embedded in the concrete to carry coaxial cables for an antenna array system. Functions of the "PAR" will be to search the skies and, should approaching missiles be detected, determine instantly their number, speed, direction and probable targets.

ABOVE, from left across page, G. W. Gilfillan, resident manager of M-K and associates, Col. John L. Lillibridge, area engineer of Corps of Engineers; C. W. Marsh, general supt., Norman Burgess, project manager, and Jack Granger, project engineer, all at PAR site; Bob Bostwick, MSR project manager, and A. D. Poteat, general construction manager. BELOW, LEFT, clockwise around table, Jim Rutherford, business manager, Keith Price, mechanical department manager, K. W. Smith, project counsel, Resident Manager Gilfillan, General Construction Manager Poteat, W. M. Watkins, electrical department manager, and Oscar I. Paulson, chief engineer; RIGHT, from left, J. R. Carroll, assistant chief engineer, Dale Wolff, cost engineer, R. L. Tucker, scheduling engineer, Pat Stricklin, G.F.P. engineer, Mike Ciaverella, modifications engineer, J. G. Oldham, materials engineer, and Chief Engineer Paulson.



LEFT, room in lower level of PAR is outfitted during interior operations in which major portion of conduit, piping and equipment is secured to spring-loaded platforms and suspension systems for purposes of shock isolation. ABOVE, one of project's fleet of 10 mobile cranes travels roadway around heat sink at MSR site.

—Perimeter Acquisition Radar Power Plant, located close beside the PAR building. A 178x216-foot facility, 45 feet in height and completely buried, it will supply the PAR with 14.4 megawatts of power and other utilities as well. Complete outfitting here includes the installation of five diesel-driven generator units weighing more than 100 tons apiece.

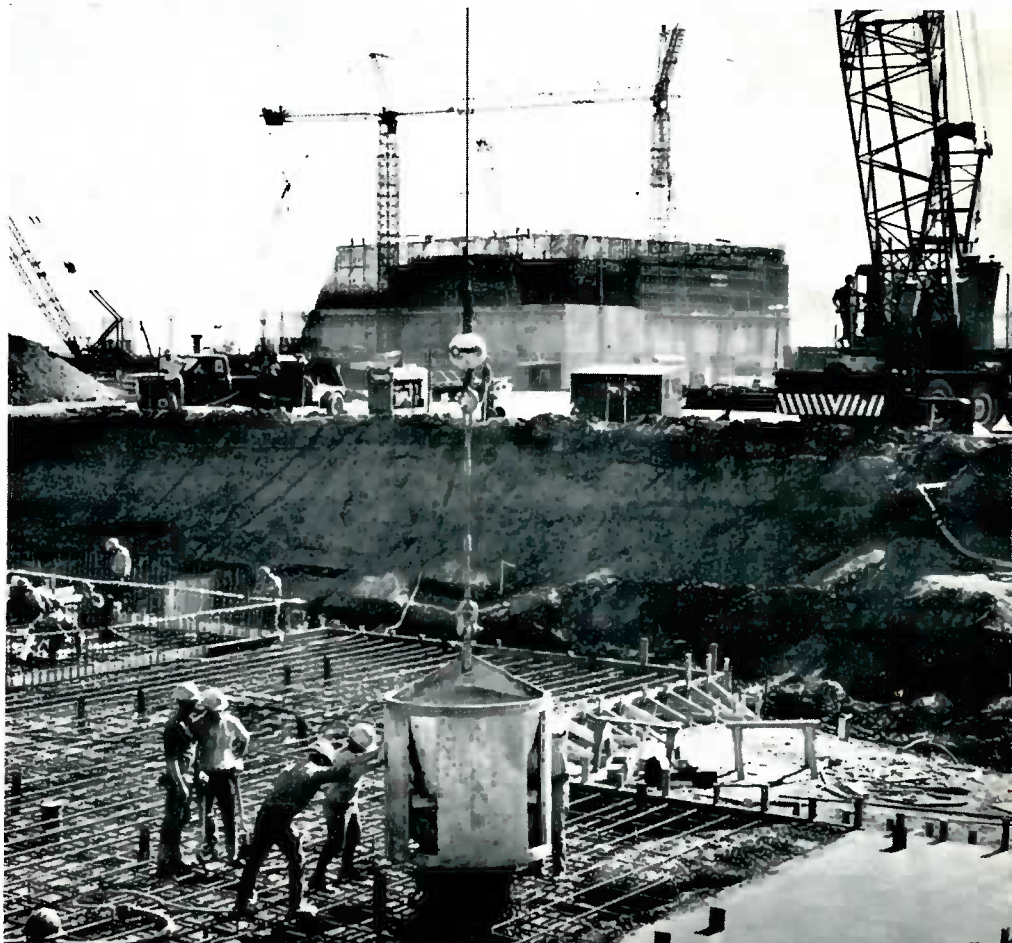
—Missile Site Control Building (MSCB), 10 miles south of Langdon. With dimensions of 231x231 feet and an over-all height of 126 feet, the structure has three main levels below ground and will be capped by a turret with radar antennas on each of its four sides. Now reaching upward past the third level, the building is sealed throughout its interior with steel-plate shielding. Purposes of the MSCB include search, threat verification, discrimination, target tracking and missile tracking.

—Missile Site Radar Power Plant, located beside the MSCB. As at the PAR site, this 179x301-foot building will be buried. With six generating units, it will have a total capacity of 17.3 megawatts.

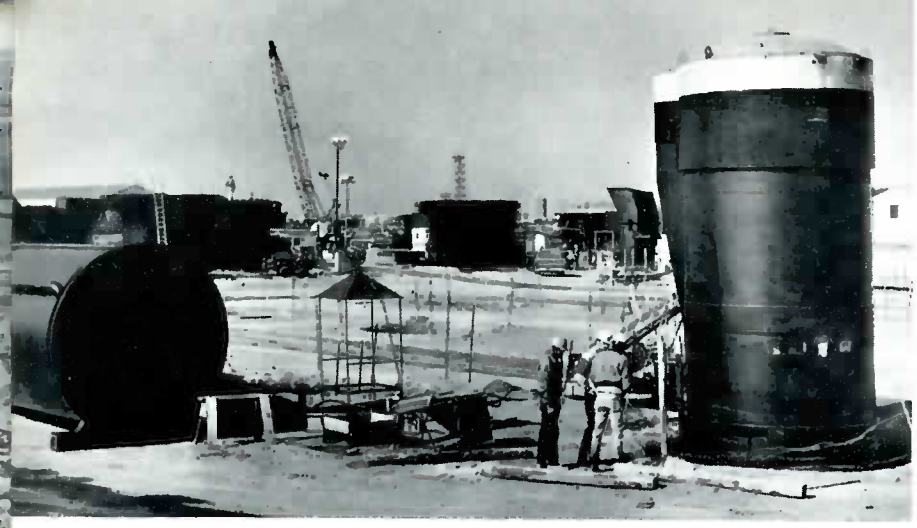
Among "lesser" structures are two huge heat sinks—with capacities of approximately 7.5- and 4-million gallons — that are part of each site's cooling system, and dozens of other appurtenances ranging from warhead and missile services buildings to cooling towers to sentry stations. Still other facilities include roads, waste treatment plants, 125,000 - gallon fuel tanks, pipe and equipment tunnels, and electrical substations.

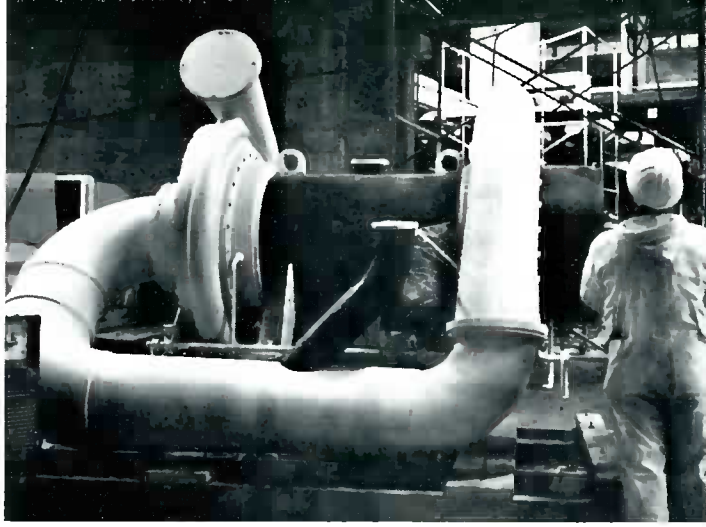
The missile field is located near the MSCB. Shafts for silos to house Spartans and Sprints have been opened here by auger and clamshell excavation. The Spartan silos, now nearing completion, reach 73 feet below ground. Each consists essentially of a steel liner, with launch and exhaust tubes and an equipment room, wrapped in a cocoon of reinforcing steel and backfilled with concrete. The Sprint silos, 31 feet deep, are constructed of prefabricated steel shells that are also encased in concrete.

The major buildings, beginning below ground level with the exception of the PAR building, are like icebergs in that they conceal vast portions of the project. As these structures are erected—by the use of two tower cranes and a fleet of



RIGHT, concrete is placed in appurtenance near PAR building as part of construction program requiring total of 176,000 cubic yards of concrete and 2,366,375 square feet of form work.





ABOVE, LEFT, steel shell for 31-foot-deep silo to house Sprint missile is prepared for installation in shaft; RIGHT, mechanical gear is moved into PAR building.

mobile cranes at each site—their interior reaches are being outfitted with thousands upon thousands of items of equipment, along with more than 500 miles of wiring and some 200,000 feet of piping. The equipment, in many areas requiring shock-isolated spring-mounted platforms, varies from pumps and compressors to circuit breaker panels, oil purifiers for amplifier modulators, digital rack power supply gear, radio frequency filters, and pressure, temperature and flow control monitor sets. Piping, much of it shock-mounted by means of spring-loaded supports suspended from ceilings, ranges from quarter-inch tubing to 36-inch lines that have plug valves weighing 11,500 pounds apiece. All of these items, mundane and sophisticated alike, go into maze-like systems for cooling water, air conditioning, fuel, control monitoring, fire protection, and dozens of other purposes.

ABOVE, at PAR site, from left, (front) Jack Spruill, asst. ironworker supt., General superintendent Marsh, Hans Bromaeus, asst. supt., Larry Barlogi, excavation supt., Clarence Farmer, building supt., Leon Lensing, asst. supt., Ray Hender, asst. supt., Lee Zook, asst. supt., and Brien Goodale, concrete supt.; (back) John Ashby, asst. equipment supt., Vern Griff, asst. carpenter supt., Harry Wilson, finishing supt., Garland Holtsclaw, ironworker supt., L. J. Richardson, electrical supt., Jack Tracy, general carpenter supt., Lonnie Godsey, asst. concrete supt., E. M. Bush, electrical supt., Larry W. Nelson, piping supt., Wally Powell, excavation supt., and Jeff Sams, piping supt. BELOW, at MSR site, from left, (front) D. L. Backus, excavation supt., and B. F. McClendon, shift supt.; (back) M. H. Hoechendorf, warehouse manager, J. R. Elliott, mechanical supt., Asa Gilfillan, field supt., R. B. Wisdom, concrete supt., L. W. Swanson, general supt., V. W. Wallace, safety supervisor, V. J. Knieffel, carpenter supt., W. A. Hughes, reinforcing steel coordinator, and P. R. Potts, equipment supt. RIGHT, from left, R. E. Lawrence, project mechanical engineer, J. F. Robinson, mechanical general supt., and M. V. Swanson, mechanical supt.

Behind these efforts, requiring hundreds of thousands of drawings, blueprints and plans, are monumental tasks of logistics, planning and co-ordination to assure that materials from hundreds of manufacturers arrive as needed.

G. W. "Bill" Gilfillan directs this immense construction program as resident manager of Morrison-Knudsen & Associates, while Col. John Lillibridge is in direct charge as area engineer of the U.S. Army Corps of Engineers.

A. D. Poteat is general construction manager of the M-K-sponsored joint venture. Oscar I. Paulson is chief engineer and James G. Rutherford is business manager.

Keith Price is manager of mechanical work, W. M. Watkins is manager of electrical work, J. R. Carroll is assistant chief engineer, C. A. Williams is assistant business manager.

At the PAR site, Norman Burgess is project manager, C. W. Marsh is general superintendent and Jack Granger is project engineer.

At the MSR site, Bob Bostwick is project manager, L. W. Swanson is general superintendent, and D. A. Kuehl is project engineer.

Under the direction of these and scores of other top flight construction, engineering and administrative supervisors, swift progress continues without letup at one of the most challenging projects in this era of challenging construction.