
Appendix C
“Maintaining Engineer Readiness”
The Military Engineer
January/February 1977

“To be prepared for war is the most effectual means of preserving the peace.”

George Washington

Maintaining Engineer Readiness

By Lt. Gen. J.W. Morris
Chief of Engineers, United States Army

In a future war, the United States probably will not be afforded a lengthy mobilization period. As a result, the peacetime Army must be ready to assume a wartime posture quickly and effectively. The Army Corps of Engineers has a vital role in maintaining the national strength in war or peace. This includes the traditional combat engineering and construction support provided to the Army by Engineer troop units. It also includes a lesser known, but nonetheless important, element—maintaining a nationwide construction organization that can be rapidly mobilized to support a war effort. During peacetime, much of the Corps' effort is devoted to the civil works program. In war, this engineering and construction capability can be quickly and efficiently shifted to military projects, as was clearly demonstrated during World War II and the Korean War. Officers who had served in the civil works program were well prepared to assume the complex responsibilities of supporting a large Army in war. Today, the Corps is dedicated to ensuring the continuation of this unique mobilization capability.



Lt. Gen. John W. Morris

THROUGHOUT most of its history, the Corps has been active in civil works construction. This mission led to the establishment of a highly decentralized, nationwide organization capable of performing large-scale construction projects. By 1939, the field organization of the Corps had grown to 11 Divisions with 46 Districts, staffed by 225 officers and 49,000 civilians. The primary missions were execution of the civil works program and the construction of fortifications in the United States. The Corps also had the wartime function of military engineering and construction in theaters of operation.

After the war began in Europe, the military construction program increased greatly. The Quartermaster Corps, the agency responsible for military construction in the United States, was handicapped in its ability to expand with this program because its field organization and experience in large-scale construction were limited. Meanwhile, Congressional appropriations for civil works projects were lessening as preparations for war assumed greater importance. To alleviate some of the pressure on the Quartermaster and to take advantage of the existing Engineer capabilities of a skilled work force and a nationwide organization, the Chief of Staff of the Army assigned Army Air Corps construction to the Corps of Engineers in November 1940. Within two weeks, the Corps began taking over projects already under way and by April 1941 had assumed \$200 million in Air Corps construction. A year after the transfer, the Engineers had put in place \$396 million in construction. The Corps' outstanding performance led Secretary of War Henry L. Stimson to write:

“It has performed these heavy tasks with its usual efficiency and thoroughness.”

Mission expanded

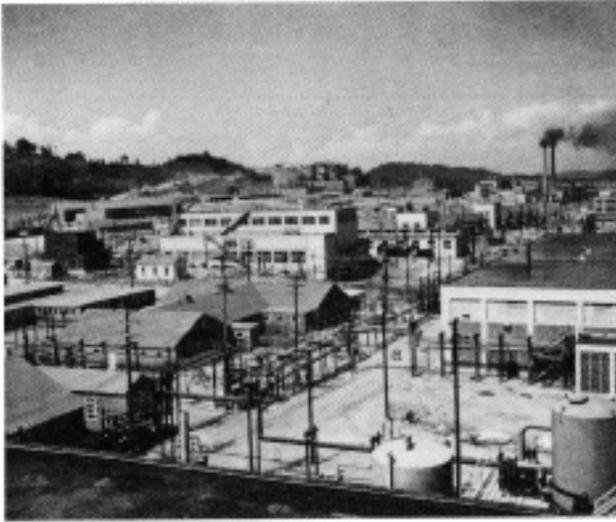
The total military construction mission was reassigned from the Quartermaster Corps to the Corps of Engineers on December 16, 1941. The consolidation of the Quartermaster's Construction Division and the Corps of Engineers brought together nearly 600,000 people, including contractor personnel, who formed probably the world's largest construction organization.

The Corps was quickly involved in a massive construction program to support the war effort. In the seven months following Pearl Harbor, Congress appropriated over \$10 billion in construction funds. The civil works structure was quickly adapted to absorb this newly acquired workload. Division and District boundaries were redrawn and headquarters relocated to accommodate changing requirements. New Districts were created and old ones abolished as dictated by the volume and location of work. Prewar strength of 49,000 was expanded to 185,000 by mid-1942. On the first anniversary of the bombing of Pearl Harbor, the war construction program, authorized at over \$10 billion, was 85 percent complete.

The effect of this rapid expansion can be visualized by examining a typical District. In December 1940, the Tulsa District had 499 people engaged in civil works programs. With the assignment of several Air Corps projects, the District grew to 800 people in six months. Growth increased significantly after Pearl Harbor, and

Reprinted from **THE MILITARY ENGINEER** for January-February 1977

Copyright by The Society of American Military Engineers



One of the elements of the Corps' wartime Manhattan Project

the District reached a peak strength of 3,250 in 1942. During the war years, the Tulsa District placed \$800 million in military construction.

In January 1942, lines of communication across the Pacific to Australia were threatened by the Japanese advance. At this time, the civil works organization based at Honolulu, working with American construction firms available in the area, was able to develop the so-called Southwest Passage, a chain of airfields from Hawaii, Canton Island, Fiji, and New Caledonia to Australia and the Philippines. This combined organization also supervised construction projects in Australia for the United States Army forces there.

The Corps' most notable achievement during the war was the creation of the atomic bomb. In August 1942, the Manhattan District was organized to design and construct the facilities necessary to support the development of the bomb. Much of its staff was drawn from existing Districts. In September 1942, Gen. Leslie R. Groves, an Engineer officer, was appointed the director of the Manhattan Project, with the responsibility of creating the atomic bomb and directing all aspects of the project. This \$2 billion effort included the acquisition of over 530,000 acres of real estate, the construction of industrial facilities, and the direction of 45,000 military, civilian, and contractor personnel.

During World War II, the Corps executed an \$11 billion domestic military construction program that was instrumental in assuring victory in the war. With its flexibility to adapt to changing missions, the Corps was able to deliver the facilities needed to support a four-million-man Army.

Mobilized again

At the end of World War II, the Corps briefly returned to its normal peacetime activities. Following the invasion of South Korea in 1950, the Corps again undertook a massive military construction program by shifting its work force from civil works to military construc-

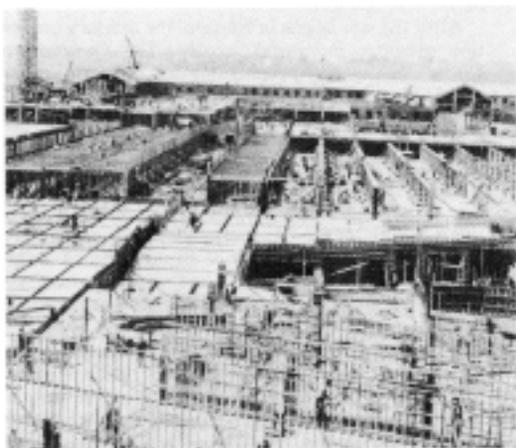
tion. By 1952, the program had grown to \$2.8 billion. This work included the construction of five Air Force bases in Morocco. A new District was created and staffed by personnel from existing Districts. It was given six months to bring these bases to a state of at least minimum readiness. The deadline was met; in fact, planes began landing at one of the bases only 64 days after construction began.

The Tulsa and Mobile Districts, along with their sister Districts,, again shifted their efforts from civil works to military construction. The Tulsa District, from a 1950 workload of \$17 million in civil works and \$1 million in military construction, made a smooth transition to a military construction program and placed about \$150 million in military construction contracts during the war. The Mobile District underwent a similar transformation as its military program grew from \$4 million to \$100 million and its work force devoted to the military construction effort expanded from 91 to 413.

Twice in less than 20 years, teams of military and civilian men and women had shifted their efforts from civil works to military construction, thus showing the value of having an existing engineering and construction organization that could be mobilized rapidly to meet the nation's military construction needs during wartime.

Civil works training

The civil works program of the Corps of Engineers provides unique training opportunities for officers. A veteran of the 1927 Mississippi River flood said of the experience: "In physical and mental strain, a prolonged high-water fight on threatened levees can only be compared with real war." In 1932, Gen. Douglas MacArthur, who was a Corps of Engineers officer, recognized the importance of this training when he said that the civil works program "furnishes officers of the Corps with the finest possible peacetime training in the manifold construction, engineering, and procurement tasks that devolve upon them in time of war."



The Pentagon was completed by the Corps in 1943

The importance of this training was realized in World War II. Many officers assumed positions where their experience in civil works was invaluable. In 1947, General of the Army Dwight D. Eisenhower said: "I believe the rivers and harbors (program) does more to train our Engineers in the large conceptions by which they did their job in war than anything else they could do." General Eisenhower's views were echoed by the British Engineer-in-Chief who wrote: "I have always been firmly of the opinion that this type of training is not only desirable but essential, and my experience in two large theaters during World War II most fully confirmed that view. There was no type of civil works project that did not have its counterpart in war, and often on a huge scale."

These views on the carryover of civil works experience into wartime situations are emphasized in the words of Brig. Gen. B.L. Robinson, former Assistant District Engineer in Honolulu.

On the morning of December 7, 1941, within less than an hour after the Sunday attack on Pearl Harbor by the Japanese, the District Engineer and I proceeded to mobilize the District headquarters. A provisional regiment was formed of civilian District and contractors' employees. Arms and munitions were procured and issued. The unit was assigned, under military command, to a sector of Honolulu for beach defense, at that time it being anticipated that a Japanese force might attempt a landing.

Knowing that engineer material would be in short supply and heavy demand, major construction materials such as lumber, cement and hardware in the hands of commercial firms were impounded by blanket purchase order for immediate use by the Army, Navy, and Air Force. The District by-similar action impounded and rationed all fuel supplies. Contractors' equipment and forces engaged on construction of permanent buildings for army installations were diverted to the construction of fortifications and other facilities for troops. In fact, all construction activities of a permanent nature were stopped and forces instantly diverted to the active support of military activities. This transition, maintaining orderly contractual relationships, was made possible by the fact that the Engineer District, while essentially a civilian organization, was under the control of the military.

The Cold War

The Corps has not been mobilized since the Korean War, but it has taken on several large construction programs essential to the national interest in the interval. The launching of Sputnik I in 1957 shocked the American people and focused attention on the serious gap that existed between the American and Russian space programs. In 1958, the National Aeronautics and Space Administration (NASA) was created, and an urgent program for the early launching of American satellites was begun. The Corps was selected by NASA to serve as its prime construction agent in the billion dollar program to build ground launch and support facilities. NASA's reasons for selecting the Corps illustrate the value of an existing engineering and construction organization with capabilities for major construction. The reasons include:

It had demonstrated in two world wars and in lesser conflicts its ability to organize, design, and effectively direct the construction of military and public works programs.

It had demonstrated in two world wars and in lesser conflicts its ability to organize, design, and effectively direct the construction of military and public works programs.

It enjoyed an excellent reputation and had earned the respect of the engineering profession, the construction industry, and the scientific community.

It had acquired extensive experience over the years in the negotiation and administration of thousands of contracts annually.

Its network of Division and District offices had accumulated an intimate working knowledge of local conditions, resources, and capabilities in each of the geographical areas assigned. It maintained excellent relations with local officials and governmental bodies.

It was to a great extent self-sufficient in its operations in that it was organized so as to perform its own fiscal, supply, legal, real estate, contract, and other administrative services without dependence on other agencies.

Timing and cost considerations made it impractical and uneconomical for NASA to attempt to develop its own engineering and construction ability which could have duplicated, at great cost, that ability already possessed by the Corps.

At the height of the construction program, five Divisions and eight Districts were participants. The Canal District was organized solely to support the space program at the Kennedy Space Center. The program included the construction of facilities at the Kennedy Space Center, the Mississippi Test Facility, the Manned Spacecraft Center at Houston, the Marshall Space Flight Center at Huntsville, the White Sands Missile Range, the NASA Flight Research Center at Edwards Air Force Base, the Sacramento Test Facility, and the Electronic Research Center at Boston.

Similar large-scale construction efforts have since been conducted in support of the ICBM and Safeguard programs. These major peacetime efforts show the



The power-generating capacity of the multipurpose Dworshak Dam in Idaho is currently being expanded



Vertical Assembly Building at the Kennedy Space Center was the largest building constructed in the world

Corps' ability to respond effectively to major engineering challenges facing the nation. The fact that other government agencies selected the Corps to perform these projects demonstrates their recognition of the Corps' unique capabilities. In each instance, many key engineers were transferred from other Corps Districts and Divisions on short notice.

The Corps today

The missions of the Corps of Engineers are being carried out by an organization consisting of a headquarters in Washington, D.C. and 14 Divisions, 39 Districts, and five Research and Development Laboratories throughout the United States and in selected areas overseas. Eleven Divisions and 36 Districts are involved in the civil works program, and 10 Divisions and 14 Districts are engaged in military construction. This organization is staffed by 860 military and 42,000 civilian-personnel.

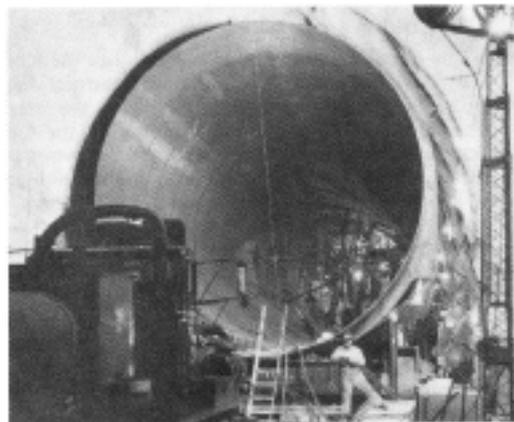
The civil works program is more comprehensive and complex today than ever before. The FY 1977 program is funded at \$2.6 billion and is executed by three-quarters of the Corps' work force. It focuses on the efficient development of the nation's water resources. Navigation is the oldest civil works function. Water carriers, the major movers of energy supplies, fertilizers, and agricultural commodities, provide the least expensive and least energy consumptive mode of transportation. The Corps is responsible for ensuring the orderly development of the inland waterways system as an integral part of the over-all transportation network. This includes not only the construction of new facilities, but also the maintenance, operation, and improvement of existing locks and dams.

Through its nationwide organization, the Corps assists in recovery from various national disasters. More importantly, preventive measures undertaken since the 1930's have resulted in an estimated savings of \$6 for every dollar invested. In recent years, the emphasis

has shifted from structural to nonstructural alternatives for flood damage prevention. The nonstructural solution provides for the preservation of the undeveloped flood plain, or, if it is occupied, moving people and buildings from the area subject to flooding. This allows the flood plain to be retained as a recreation site or green area that will not be adversely affected by periodic flooding. When a dam is required for flood protection, it is always developed as a multipurpose project that provides other benefits such as water supply, hydroelectric power, fish and wildlife enhancement, and recreation.

One of the most complex aspects of the civil works program is balancing developmental needs against environmental concerns. The Corps assesses the environmental impact of each project and incorporates methods of mitigating damage into the design. In addition, it is actively engaged in protecting America's valuable wetlands and in regulating construction, discharges, and dredging in the nation's waters. The Corps is dedicated to preserving and protecting our natural resources for the use and enjoyment of future generations.

The civil works organization retains the same flexible, highly decentralized structure that has served our nation so admirably in war and peace. It is staffed by dedicated professionals possessing a wide range of planning, engineering, and construction management skills. The mobilization of manpower, materials, and equipment for a major construction effort in peace involves many of the same problems and requires many of the same skills needed to perform massive military construction programs and to manage large-scale logistics efforts in wartime. The civil works program offers a unique training opportunity for Engineer officers. The civil works organization provides a rapid mobilization capability that may prove decisive in a future war. If the need should arise, the Army Corps of Engineers stands ready to switch from peacetime civil works activities to support of the National Defense in war and to provide the engineering and construction base so necessary for success on the modern battlefield.



Diversion tunnel under construction at New Melones Dam, California, another of the Corps' multipurpose dams