

AD-A278 314



2

1993
Executive Research Project
A82

Joint Standards for Contingency Construction

DTIC
ELECTE
APR 20 1994

Lieutenant Colonel
James T. Scott
U.S. Army

Faculty Research Advisor
Mr. James E. Toth

This document has been approved
for public release and sale; its
distribution is unlimited.



The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-6000

94-11888



2598

94 4 19 066

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY N/A			3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution Statement A: Approved for public release; distribution is unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A			5. MONITORING ORGANIZATION REPORT NUMBER(S) Same	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NDU-ICAF-93-A82			7a. NAME OF MONITORING ORGANIZATION National Defense University	
6a. NAME OF PERFORMING ORGANIZATION Industrial College of the Armed Forces		6b. OFFICE SYMBOL (If applicable) ICAF-FAP	7b. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000	
6c. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	10. SOURCE OF FUNDING NUMBERS	
8c. ADDRESS (City, State, and ZIP Code)		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
				WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) <i>Joint Standards for Contingency Construction</i>				
12. PERSONAL AUTHOR(S) <i>James I. Scott</i>				
13a. TYPE OF REPORT Research		13b. TIME COVERED FROM <i>Aug 92</i> TO <i>Apr 93</i>		14. DATE OF REPORT (Year, Month, Day) April 1993
15. PAGE COUNT 31				
16. SUPPLEMENTARY NOTATION				
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) SEE ATTACHED				
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Judy Clark			22b. TELEPHONE (Include Area Code) (202) 475-1889	22c. OFFICE SYMBOL ICAF-FAP

Abstract

The difficulties encountered during planning, design and construction of facilities to support forces deployed in the Persian Gulf conflict were not unique. Past conflicts had highlighted the same problems with lack of standard designs, late introduction of supporting engineers and funding limitations. The Services have developed separate standard facility systems in recognition of the efficiency gained by pre-planning for support of their components during contingencies. Service philosophies account for some of the differences between the systems. This is evident when comparing standards of individual Service facilities designed to satisfy similar mission requirements. Efforts are currently underway to automate the existing systems, incorporating computer assisted design and drafting as well as construction management software. The three systems should be consolidated into a single joint standard facility system that meets Service philosophies and contributes to effective planning for contingency support. Additionally, execution of the contingency construction can be enhanced by early introduction of manpower (engineers) and timely authorization of construction spending by Congress.

1993
Executive Research Project
A82

Joint Standards for Contingency Construction

Lieutenant Colonel
James T. Scott
U.S. Army

Faculty Research Advisor
Mr. James E. Toth



The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-6000

Accession For		
NTIS	CRA&I	☒
DTIC	TAB	☐
Unannounced		☐
Justification		
By		
Distribution/		
Availability Codes		
Dist	Avail and/or Special	
A-1		

DISCLAIMER

This research report represents the views of the author and does not necessarily reflect the official opinion of the Industrial College of the Armed Forces, the National Defense University, or the Department of Defense.

This document is the property of the United States Government and is not to be reproduced in whole or in part for distribution outside the federal executive branch without permission of the Director of Research and Publications, Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C. 20319-6000.

JOINT STANDARDS
FOR
CONTINGENCY CONSTRUCTION

INTRODUCTION

We have a responsibility to provide our Service members with the best available resources to accomplish their assigned missions. These resources include the facilities that support their operations. The individual Services have developed facility systems designed to support their components during contingency operations. Central Command, in charge of our most recent deployment to the Persian Gulf War, highlighted the fact that joint construction requirements were difficult to plan, design and construct. This was attributed to having to work with three Service unique facility systems.

The purpose of this study is to determine whether a Department of Defense standard facility system would improve the capability of a unified command to rapidly project military forces into an area of operations. A facility is defined by the Department of Defense as a real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement and underlying land. For the sake of simplifying the discussion, I will confine my review to buildings and shelters. I will also examine the impact of resource availability (manpower and funding), on the timely execution of the requirements. My review will include our past construction

experience, as well as our existing doctrine and planning efforts. I will conclude with recommendations as to where our future planning should be directed.

OUR PAST EXPERIENCE

World War II, Vietnam and the Persian Gulf War provide experience for our future planning efforts to support our combat forces with facilities.

World War II

Initially during World War II, the British War Office supported the United States Armed Forces with facility design. But as sufficient labor became available, a U.S. engineer organization was developed. Although U.S. and British units were similar, differences in organization, equipment and operational procedures required some changes to the War Office's standard plans to accommodate the U.S. units. "Standards were developed for virtually all construction projects of a recurring nature. These covered scales of accommodations, types of huts approved for various uses, standard designs for utilities, ... adopted layouts of services and buildings...and similar items." (1)

The Navy Bureau of Yards and Docks, developed Service-unique facility designs to support its advance bases. The Quonset Hut was one of the standardized building units. The design was copied from the British Nissen hut. It was easily transported and erected, thus easing the burden for local materials and labor to construct. Although the huts were originally intended for

housing, 86 different interior floor plans were developed to satisfy other needs to include dispensaries, latrines, administration and storage. More than one hundred and fifty thousand of these standard facilities were purchased by the Navy during the war.(1)

The Chief Engineer in the European Theater of Operations concluded that "The Allied Expeditionary Forces general construction manual and drawings covering all types of standard installations was an exceedingly useful publication. It is believed that something similar should be prepared in a theater before any large program is embarked on. It is probable that such a manual can be better prepared in the theater where all conditions are better known than in the Zone of the Interior in advance of a particular campaign." (3)

Vietnam

The base development plan for the Vietnam conflict envisioned a \$1 billion construction program over a two-year period. "At the beginning of the program there were no set standards except limitations on living space and the general admonition that facilities would be minimum and austere. The basic principle in establishing construction standards was to provide the required facilities for the expected duration of use as cheaply as possible. Theater standards were developed to minimize costs and time. These standards were based on three factors: the mission of the unit for which the facilities were provided, the permanency of units in a given location, and the

philosophy of each military Service. The problem with establishing standards was complicated by variations in philosophies and the peculiar characteristics of the war. ... The wide disparity of construction standards between the Services in Vietnam was particularly evident in cantonment construction. Air Force planners contended that a \$100 million base was not a transient facility and wanted more for their money in durable construction. They felt that pilots and electronics technicians lost efficiency when forced to live like combat troops. This caused dissatisfaction between the troops of different Services living in the same general area." (4)

Persian Gulf War

The Gulf War served to highlight the disparities between Services as noted in Vietnam. The initial planning effort for introduction of forces was frustrated by the fact that there were three different Service facility planning systems. The tremendous amount of Host Nation Support available clouded this issue since the Services were able to make use of accommodations and storage facilities that already existed in country. Had Saudi Arabia been unable or unwilling to provide accommodations and facilities, the disparities would have been even more evident.

As a result of CINCCENT's decision to maximize the number of ground combat units early in the conflict, the supporting logistics units were late arriving. The logistics structure did not mature until mid-November. And it seemed that the supporting

engineers were constantly trying to catch up with the ever expanding combat force. The Army was probably most affected by the late arrival of support forces. The Army classifies its construction engineers as Echelon Above Corps support forces, which dictates that they will arrive well after the need for them has become most evident. The Air Force recognizes their engineers as an integral part of the base support package and deploys them with or in advance of the combat units. Further, in recognition of the need for rapid base development, the Air Force has purchased support systems for bases with little infrastructure in place. These systems consist of housekeeping sets that provide shelter and support facilities that allow units to independently conduct operations similar to operations from fixed theater installations.

Although the initial deployments to the Gulf proceeded smoothly in the areas with established infrastructure, commanders encountered problems as the units moved away from the built-up areas. CINCCENT decided early on that construction would be planned using austere standards, only the minimum necessary to sustain the force. This limited the amount of construction required. Additionally, insufficient funding was initially available for construction. This further constrained the amount of construction accomplished.

Reliance on standardization speeded the construction effort. Vietnam era designs were updated to account for the Gulf conditions. Construction contracts were awarded for a number of

facilities to include base camps, field latrines and showers, helicopter sunshades and parking areas. In addition to the traditional construction, a number of expeditionary shelter systems were used to include: clam shell, tension fabric (sprung), seamless arch (K span), festival tents and automatic K span. These supported the logistics storage and maintenance needs. (9)

Observations

Some degree of standardization has proven useful during each conflict. The development of construction standards and subsequent planning efforts are more efficient when standardization amongst the Services is accomplished. But Service philosophies differed with regards to interpreting how to apply the stated standards to Service doctrine. The resulting inequity in facilities provided, served to cause dissatisfaction amongst the members of different Services.

Issues Beyond Standardization

Beyond the standardization issue are two additional areas of concern that retard our ability to provide facilities for our units in a timely and efficient manner. I will discuss both the issues and possible solutions at this point in the paper and then concentrate the remainder of the paper on the issue of standardization.

First is the strategy of the commander. We have seen it in past conflicts and will see it again in the future. Fighters are the first on the ground in a conflict and for good reason. But

the introduction of engineers is often excessively delayed, resulting in late construction of facilities that the fighters need to support them. The commanders must realize that the short term gain of early introduction of fighters will be quickly negated by the long term drop in fighting efficiency resulting from the lack of support facilities. Some method of balancing the force introduced into the theater must be undertaken. The engineer and supporting staff must make their point loud and clear about their ability to support the plan without facilities.

The second area of concern is budgetary. Past conflicts have suffered from insufficient funding for facility construction. The first roadblock is the dollar limitation on individual facility construction. Beyond established limits, Congressional approval must be received. This lengthy approval process exacerbates the problems of late-arriving engineers. The dollar limitations become the design drivers, not the intended function, and utility and quality are sacrificed. Projects are developed that provide less than complete and useable facilities, in order to circumvent the rules with regards to funding limits. And the effect of these actions is further degradation of efficiency. But in addition to the individual facility limitations, overall spending limits have also impacted past construction programs.

To overcome these impediments an immediate increase in individual facility limitations and overall construction program funding must be agreed to at the same time that the decision to

commit forces is made. To facilitate this agreement, selected scenarios can be developed based upon commitment of forces in an areas with minimal supporting infrastructure. The cost for typical supporting facilities can be estimated and presented to Congress for review. When an actual deployment is necessary, the haggling over construction details can be avoided and the more serious question of commitment of U S forces with adequate facilities to support them can be addressed. A heads-up decision can be made with anticipated costs projected.

Now with those two areas addressed, I will proceed to examine the issue of standardization itself.

EXISTING DOCTRINE AND PLANNING

The Joint Staff, the Services and the commanders all have a part to play in the development of a plan to provide facilities for contingencies. As a result of this division of responsibility, we find ourselves working with a very cumbersome, time consuming process. It is beneficial to review this system to determine where possible improvements can be made.

Joint Doctrine

Joint Pub 4-04, Joint Doctrine for Civil Engineer Support, provides the current construction standards to be used in contingency operations. It addresses the issue by stating, "Contingency construction standards provide construction criteria that minimize engineer efforts while providing facilities of a quality consistent with the mission requirements, personnel

health, safety, and the expected availability of construction resources. Where mission requirements are similar, facilities are constructed to the same standards by all Services. Construction requirements may be met by commercial off-the-shelf building systems which are austere and rapidly erectable, yet have a life span which exceeds the temporary standard, providing that alternative is more cost or operationally effective." It goes on to define two standards for contingency construction:

"Initial standard:

- (a) Characterized by austere facilities requiring minimal engineer effort.
- (b) Intended for immediate austere operational use by units upon arrival in theater for a limited time ranging up to six months (depending on the specific facility).
- (C) May require replacement by more substantial or durable facilities during the course of operations.

Temporary standard:

- (a) Characterized by minimum facilities.
- (b) Intended to increase efficiency of operations, for use extending to 24 months.
- (c) Provides for sustained operations.
- (d) In some cases, temporary standard replaces initial standard. Where mission requirements dictate, temporary standard construction can be used from the start of an operation." (5)

Combatant commanders are tasked with the responsibility to develop and execute operations plans to accomplish strategic and operational objectives. Civil engineering support is a part of these plans. The Services are tasked to support development and execution of these plans. Each Service has developed systems that allow their components to draw from a pool of standardized facility designs to support their deploying units.

Army Facilities Component System

The Army's standard design system is contained in a series of Army technical manuals entitled the Army Facility Component System (AFCS). "It is intended for use by: base development planners in determining facilities required to support Army functions; engineer commands or units in preparing and issuing construction drawings; construction personnel in the requisitioning of materials and the actual construction of facilities; and supply personnel in identifying and supplying construction material. ... The AFCS uses a building block concept to permit maximum flexibility." (6) The building blocks are items (construction materials and equipment), facilities themselves and installations (groups of facilities).

The four-manual set that contains the AFCS is physically bulky, cumbersome to use and difficult to update. In its current form, it would not be called "user-friendly." There is an effort underway to automate the AFCS, using Computer Aided Design and Drafting (CADD) and project management software packages. The result will be a "user-friendly" standard planning system that is

simple to transport, quick and easy to use, and easy to update.

Updates to the AFCS are currently undertaken when doctrine, organizations, equipment or materials change. New facilities are developed at the request of commands fielding new organizations or equipment.

Advanced Base Functional Components

The Navy's standard design system is contained in a series of Navy Publications entitled the Advanced Base Functional Components System (ABFC). "As a tool of naval logistics, the Navy ABFC system is the quantitative expression and measurement of planning, procurement, assembly and shipping of material and personnel that is necessary to satisfy facility support requirements. A component is a grouping of personnel and material requirements that are designed to perform a specific function or to accomplish a particular mission at an advanced base. Facilities and assemblies support components in the ABFC system, but can be used for interim peacetime use, both overseas and in the continental United States (CONUS). The facility and assembly drawings are detailed construction drawings, not definitives, and the material lists ... are complete bills of material, except for the requirements of site preparation." (7) ABFC was developed after World War II and modified with the experience gained in Korea and Vietnam. It is just as bulky, cumbersome to use and difficult to update as the AFCS. Efforts are currently underway to automate the system.

Bare Base Conceptual Planning Guide

The Air Force's standard planning system is contained in Air Force publication entitled Bare Base Conceptual Planning Guide.

"A bare base, by definition, is a site with a usable runway, taxiway, parking areas and a source of water that can be made potable. ...This bare base concept requires mobile facilities, utilities and support equipment that can be rapidly deployed and installed." The planning guide consolidates information from a number of technical sources and allows the preparation of detailed plans for the development of a bare base. Planning for this system started in the 1950's after experiencing the difficulty of moving tactical units forward to keep up with the advancing forces. Each move had required building new facilities or erecting tents and substandard billets while performing maintenance in the open. The initial deployment kits consisted of tentage, generators and support equipment, but was found to be too bulky and consumed a great deal of time to emplace. Through redesign, the package was made more air transportable and was called Harvest Eagle. Further efforts produced hardwall shelters that served as their own shipping containers and were transportable in a C-130. This system became known as Harvest Bare. "The nucleus of today's bare base infrastructure centers around the enhanced version of earlier Harvest Eagle and Harvest Bare equipment. ... Harvest Eagle consists mainly of soft-wall shelters and support equipment generally used on deployments of short duration. One complete package provides enough tents and

housekeeping items to bed down a force of 1100 people. Harvest Bare centers around hardwall construction and modern technology. In addition to housekeeping, this package includes vehicular support, general aircraft maintenance, specific weapons systems, and a broad base of logistics support for sustained operations of a 4500-person wing. Due to the high cost of equipment and airlift, Harvest Bare is usually reserved for deployments of extended duration." (8) The Bare Base Planning Guide appears very comprehensive and easy to use. It is not so bulky as to discourage its use or update as necessary.

Civil Engineering Support Plan

All of the Service-unique standard facility systems provide information used in the development of the CINC's Civil Engineering Support Plan (CESP). Based upon the units to be deployed, facility requirements can be compared to assets available. The resulting facility deficiency can then be translated into material and construction effort requirements. The existing means for producing this analysis is called the Civil Engineering Support Plan Generator (CESPG). It is slow and produces volumes of paper which can be difficult to use. Having to draw upon three Service unique systems for information can also introduce error. The CESPG addresses requirements only to the point of force deployment. There is a Joint Staff initiative to develop a tool called the Joint Engineer Planning and Execution System (JEPES). This will perform the function of the CESPG but will go a step further to address the scheduling and

execution of the necessary construction in theater. Any simplification of the supporting files, to include the standard design systems would enhance the effectiveness of this tool.

ARGUMENTS FOR STANDARDIZATION

Each of the Service-unique standard facility systems have been evolving over time to incorporate changes in doctrine, organization, equipment and materials. Coordination has been accomplished between the Services to avoid duplication of design effort for common facilities. The utility of incorporating pre-engineered building systems into the standard planning has been recognized. Yet as far as we have progressed in our efforts to achieve jointness within the military we continue to maintain three separate facility systems. There are a number of arguments that would support some degree of standardization amongst the Services if not the development of a single standard facility system for all Services.

Common Standards

As noted earlier, joint doctrine has established the standards for facilities. The primary determinant is the anticipated length of use. Further it calls for the same standards to be used by all Services with similar mission requirements.

Common Functions

All of the Services perform several common functions. These include but are not limited to administration, billeting, storage

and maintenance. Although the size of the facility may vary based upon the size of the unit it supports, the basic specifications for the facility will remain the same. All of the Services currently use a building block approach in their systems. The same approach could be applied in a new single standard facility system. A limited number of different sized facilities could be designed for each category of function performed. Quantities of standard facilities could be adjusted, according to the size of the unit supported. Although the layout of the individual facilities may vary on the individual base or installation, the facilities themselves could be standardized.

Simplified Planning

Preparation of the Civil Engineering Support Plan could be simplified by reducing the number of files currently feeding the Civil Engineering Support Plan Generator. Also, maintenance of these files could be reduced by adopting the single standard. As the automation of the joint planning system moves forward, the actual execution of the planned engineering support can be made easier. With a single standard, construction estimates can be simplified and the process of scheduling construction streamlined. The Army has an initiative currently underway called the Theater Construction Management System (TCMS). "Users start at the definitive level and then mix and match from standard AFCS or user-created components to create facilities and to group them into installations. The data generated are then used in conjunction with commercial CAD and project management

software to produce drawings, set priorities, assign resources, and track the status of the projects. Comprehensive bills of material, construction estimates, and associated drawings are packaged for rapid transmission to the constructing agency. TCMS makes it possible to quickly find and adapt the right standard design to the mission at hand and also allows the construction of the facility to be scheduled, tracked, and reported."(10) The time may be right to consolidate Service efforts and produce an automated standard facility system that would contribute to simplified joint planning.

Equity

With the adoption of the single standard for buildings and structures, equity amongst members of different Services assigned in the same area could be achieved. Arguments will be heard on both sides of this issue with some saying that certain features of facilities are essential for the health and welfare of their Service members while others will attack such features as frivolous. These differences show up not only in a hostile environment but during peace time as well. It is worth reviewing the following to get a feeling for the difference in Service philosophies.

The Assistant Secretary of Defense for Installations, Robert A. Stone, cited a number of differences between Air Force and Army installations and provided an assessment of these differences in a March, 1988 letter to the Chief of Staff, United States European Command (EUCOM). The letter was prompted by a

visit to EUCOM in the wake of budget cuts to construction and building maintenance and repair accounts. Although a great deal of emphasis has been placed on changing this through the Army of Excellence program, current funding cuts will undoubtedly have an adverse effect in the future. I believe that some of the comments relating to garrison facilities apply equally as well to contingency support. Mr Stone wrote:

(Of the Army) "Plans to provide barely human (let alone excellent) work places and living places for soldiers are being effectively eliminated. There is potential for this trend to lead to demoralization, which is a far worse consequence than the inevitable loss of re-enlistments."

(Of the Air Force)

- " The dormitory room is the Air Man's castle."
- " billeting facilities for enlisted and officers are comparable to a nice motel."

- " maintenance facilities sparkle."
- " dining halls are more attractive."

(Of the Army)

- " Barracks rooms are nobody's castle; they are clearly Army Facilities."
- " billeting is usually closer in quality to the barracks than to the Marriott."
- " maintenance facilities look like 'Joe's Garage.' When the weather is bad, maintenance is practically impossible. The atmosphere is dehumanizing."

"The differences reflect what's important to the two Services. ... The Air Force cares about an airman's attitude toward the dining hall or the barracks. ... The (Air Force) commander is likely to view his main job as taking care of the airmen; ... The (Army) installation commander views his job as seeing to the mission of the installation; the garrison operation is often beneath him. ... So why does the Army care so little about soldiers' workplaces, ... And why does the Air Force care so much? ... it has to do with how officers in the two Services think of themselves and of the people they lead. Army leaders think of themselves as leaders of soldiers in ground warfare; 'mud soldiers' who in war won't have any need for fancy barracks ... well-equipped maintenance facilities, ... Air Force leaders think of themselves as aviators, dependent for survival in peacetime and in war on the airmen maintaining the airplanes properly. They fight any hint of satisfaction with imperfection, because they know that imperfection leads to death." (11)

Differences were recognized in the Vietnam conflict as the Air Force sought to provide more durable construction to support its major Air Base investments. And this philosophy difference is evident in the planning for future conflicts by the Services. For instance, the modular structures contained in the Air Force "harvest" system exceed the standards other Services can afford for contingency construction. It is one of the areas that must be addressed if acceptable standards designs are to be developed. The point to be remembered is that the morale of the Service

member can have just as great an impact on efficiency as the physical health. And the perceived inequity of facilities in past conflicts has impacted on morale. Whatever standard is adopted should be just that, the standard for the area.

ARGUMENTS AGAINST STANDARDIZATION

Arguments for consolidation within the Services are frequently countered with concern for degradation in standards, and loss of ingenuity and healthy competition. And this fact must not be down-played. Without the innovation of creative engineers we would lose the flexibility to respond to changing conditions. The difference in Service philosophies accounts for many of the differences between Service facilities supporting similar functions. The acceptance of a single Service standard beyond what is currently used can be costly to Services that must adjust upwards. Care must be taken to balance the requirements with the resources available. Even if initial cost is not a factor, the bulk of modular structures may be unacceptable from a transportation viewpoint. During times of decreasing budgets, the initial cost might very well be found to be prohibitive for modular structures like those found in the Air Force systems.

Expertise

For many people, the idea of a single consolidated facility system brings to mind a group of "purple suited" engineers trying to satisfy everyone's needs with a single all purpose facility. And the result is that no one is satisfied. Further, there will

be concern for the ability of one Service engineer to develop facilities that effectively support another Service's mission. The familiarity that individual Service engineers develop, working regularly within the Service, helps them anticipate some of the needs associated with new mission requirements. This fact argues quite effectively against consolidating the responsibility for design development in a single joint cell.

SO WHAT SHOULD WE HAVE IN COMMON?

Design standards

I believe that a common design standard should be adopted by all Services. This standard should be based on mission requirements so as to provide facilities of equal standard where missions are the same. This is, in fact, called for in current joint doctrine. For example, soldiers and sailors assigned to a depot facility co-located with an air base should have similar comforts available to them as provided to the airmen assigned to the base. This should address the inequity issue that has come up in past conflicts and has been the potential source of morale problems. Services will continue to generate needs for facilities based on changes to equipment, personnel and unit missions, but similar facility needs should be satisfied by a single design standard. Naturally the standard will differ for expeditionary, temporary and more permanent needs as well as being adjusted for the climatic conditions.

Data Base

To address the issue of quick and efficient planning, a common data base should be developed incorporating all of the Services designs and associated information. Drawing from this common data base, joint planners could estimate the magnitude of engineer effort and resources necessary to support a particular deployment. Additionally this would facilitate the operation of regional contingency construction management cells as established in the Persian Gulf conflict to coordinate construction programs.

CONCLUSION

The efficiency of using standard designs was realized in past contingencies and is recognized in planning for the future. But each of the Services has developed their own facility system rather than contribute to a single joint system. Service philosophies contribute to variations in standards incorporated in similar facilities within the separate systems. A single standard facility system should be developed to simplify the tasks of planning, designing and constructing contingency facility requirements. This system should incorporate individual Service developed, jointly reviewed, facility designs that satisfy the contingency construction requirements and adhere to joint design standards. Also, efforts should be undertaken to insure that adequate manpower and funding are available in a timely fashion to construct the facilities.

RECOMMENDATIONS

Design Data Base

The Joint Staff should continue to take the lead in the establishment of a single facility data base. The Joint Engineer Planning and Execution System (JEPES), when fully developed, will respond to this need. Automation can be used to exploit the existing automated drafting and construction management software available and greatly speed the planning process. Reviews and updates can be accomplished efficiently. And transportability and use of the system will be enhanced, over the current bulky voluminous individual Service systems.

Standard Designs

Individual Service designs for facilities should be jointly reviewed to insure that comparable standards are being incorporated into facilities designed to satisfy similar Service missions. Duplication should be eliminated so as to ease the planning process. As in the past, some compromise will probably be necessary with a resulting rise in facility standards for the Navy and Army. Although some reviews are informally accomplished now by the individual Service engineers, a formal review process will build jointness into the system and lend a degree of credibility to the final product. Housing and community support facilities should be the initial area of emphasis for design standardization. When individuals, performing comparable missions, see that their living conditions are comparable with members of other Services, potential morale problems can be

avoided. The advantages of using expeditionary shelter systems such as the k-span and clam shell should be exploited in the logistics support areas where they have been most successfully used in the past. Adaptation of these systems to satisfy housing needs requires further research.

Contingency Planning

Although the inclination will still be for the commander to introduce "fighters" before support troops, information from a jointly developed data base can be used to keep him fully informed of the impact of his decisions on the rate of overall expeditionary force introduction, which is a function of throughput and its enhancement.

Contingency Construction Funding

With a credible product in hand, the task of educating Congress on the facility requirements to support envisioned contingencies, can be undertaken. The problems associated with delays in funding necessary construction can then be avoided when a conflict occurs.

ENDNOTES

1. Final Report of the Chief Engineer European Theater of Operations 1942-1945. 1945.
2. "Building the Navy's Bases in World War II". History of the Bureau of Yards and Docks and the Civil Engineer Corps 1940 - 1946. Department of the Navy, Washington, D.C. 1947.
3. Final Report of the Chief Engineer European Theater of Operations 1942-1945. 1945.
4. Dunn, Carroll. Vietnam Studies. Base Development in South Vietnam 1965 - 1970. Department of the Army, Washington, D.C. 1972.
5. Joint Pub 4-04. Joint Doctrine For Civil Engineering Support.
6. Army Technical Manual 5-302. Army Facilities Components System. Department of the Army, Washington, D.C.
7. Naval Facilities Publication 437. Advanced Base Functional Component Facilities Planning Guide. Department of the Navy, Washington, D.C.
8. Air Force Pamphlet 93-12. Bare Base Conceptual Planning Guide. Department of the Air Force, Washington, D.C. (Draft).
9. Final Report to Congress. Conduct of the Persian Gulf War. Department of Defense. 1992.
10. Albert J. Bush, III. "Sustainment Engineering". The Military Engineer. August 1992.
11. Stone, Robert. Letter to Chief of Staff, United States European Command. March 1988.

SELECTED BIBLIOGRAPHY

1. Tregaskis, Richard. "Southeast Asia: Building the Bases" The History of Construction in Southeast Asia. Department of the Navy, Washington, D.C. 1975.
2. Hatch, Henry and McDonald, Janet. "Corps of Engineers: Laying the Groundwork for Theater Operations". Military Review. March 1992.
3. Mulcahy, Terrance. "Engineer Support in the COMMZ". Military Review. March 1992.
4. Dod, Karl. "The Corps of Engineers: The War Against Japan". U.S. Army in World War II. United States Army, Washington, D.C. 1966.

5. Beck, Alfred and others. "The Corps of Engineers: The War Against Germany". U.S. Army in World War II. United States Army, Washington, D.C. 1985.

6. "City in the Sand". The Military Engineer. November-December, 1991.

7. "They Came. They Saw. They Built.". Airman. September, 1991.