WORLD WAR II AND THE U.S. ARMY MOBILIZATION PROGRAM:

A History of 700 and 800 Series Cantonment Construction

including

Historic American Buildings Survey
Mitigation Documentation

for

Camp Edwards, Massachusetts
Fort McCoy, Wisconsin

Legacy Resources Management Program
United States Department of Defense

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A HISTORY OF 700 AND 800 SERIES CANTONMENT CONSTRUCTION

Diane Shaw Wasch
Perry Bush
Keith Landreth, et al.
James Glass, Ph.D.

Arlene R. Kriv, Editor

Legacy Resources Management Program
United States Department of Defense

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National Park Service
Cultural Resources
HABS/HAER

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PART I

THE HISTORICAL CONTEXT OF WORLD WAR II MOBILIZATION CONSTRUCTION

by Diane Shaw Wasch and Perry Bush

Figure 1 Fort Story, VA 1940

INTRODUCTION

In response to the German army's invasion of continental Europe, the United States quickened mobilizing for war in June 1940. Through legislation supported by President Roosevelt, Congress appropriated over a billion dollars for the construction of munitions plants, seacoast defenses, and rifle manufacturing. In addition, the monies were used to implement a program of construction that created facilities to house a new and expanded army. Before the G.I.'s could fight abroad, they had to be housed and trained in the continental United States. The building program began in earnest in the fall and, responding to current military events, rapidly surged forward. In fall 1939, the army consisted of little more than 200,000 men, a number that, while relatively small, nevertheless strained the War Department's housing capacity. By November 1944, however, the army was able to provide adequate housing for over 6 million troops in the United States alone. While a small proportion were billeted in tents, most of these troops were lodged, fed, and supplied in more than thirty thousand "temporary" wooden buildings, nearly all of them constructed in a few short years. Only 270,000 out of the total 6 million troops were lodged in buildings labeled "permanent." Altogether, by the close of the war the nation had witnessed a program of military construction which had few parallels in world history.[1]

Focusing exclusively on the immediate crisis, the army built its mobilization structures with the expectation that they would be "temporary," lasting from five to twenty years. Nearly forty-five years later, however, an army inventory in March 1985 showed that nearly 24,000 of these "temporary" World War II buildings were still standing and that a large but undetermined number were still in use. While the existence of these buildings testifies to the soundness of army construction, their condition nevertheless deteriorated in subsequent years. As maintenance costs climbed higher, it became clear to military planners that the army of the 1980s could no longer be housed either comfortably or inexpensively in 1940s army barracks. In 1983, Senate Report 97-440 called upon the army to "dispose" of its World War II temporary buildings by 1990 and replace them, according to army specifications, with "off-the-shelf pre-engineered steel frame buildings." To replace in a few short years 24,000 buildings, scattered over 159 installations in 39 states, would require a massive construction push equal to that of 1940-41. The Senate concluded that--barring a national emergency--this would remain unlikely. Even so, the army appears to have begun the task. By early February 1984, General M.R. Thurman, vice chief of staff, had approved a plan to raze over 38 million square feet of World War II-era buildings by 1990, which constituted over a third of the army's inventory of such buildings.[2]

These buildings, however, are historically important. Sheltering few celebrities, their architecture is straightforward, based on simple calculations of cost, efficiency and speed of construction. Yet for forty years, millions of American "citizen-soldiers" passed through these buildings on their way to the battlefields of Western Europe, the South Pacific, Korea, and Vietnam. These structures loom large in the memories of millions of present-day Americans, for whom military service was a central, formative experience. From the perspective of social history--which documents the historical experiences of "ordinary" individuals or "the masses"--these simple structures are as historically important as any mansion. From the perspective of architectural history, the war mobilization buildings are significant for their design, construction and technological innovation. Techniques such as the standardization of plans, prefabrication of units, and assembly-line approach to construction were largely pioneered in the construction of these mobilization structures. They were also partially responsible for raising the building standards to include such

Figure 2 Typical mobilization camp site.

amenities as central heating, indoor plumbing and electricity. Mobilization construction also had a tremendous impact on the economy, facilitating the recovery of the building industry following the Great Depression. Thus, in order to preserve the historical heritage of World War II mobilization buildings, these structures require mitigative documentation before they are demolished.

It would be a daunting task to document 24,000 buildings scattered over the continental United States. Fortunately, because of the standardization of army construction during the war years, the general history of mobilization construction is applicable to most World War II camps and forts. Beginning in World War I, the army developed a comprehensive set of standardized building designs which could be used interchangeably in creating a camp. This "600 Series" set of drawings was the basis for subsequent army design programs. World War II mobilization construction progressively evolved from the 600 Series into the 700 Series, 800 Series, Modified Theater-of-Operations (T.O.) Series, and T.O. 700 Series. Since the T.O. variants were minimalist structures, they did not survive the postwar period. Only the 700 and 800 Series remain today. By exploring these series carefully and examining their development, we can evaluate the physical characteristics and social dimensions of World War II temporary buildings without reference to one specific site.

While the standardization of building design eases the task of individually mitigating 24,000 buildings, the large number of different building types makes it difficult to be comprehensive. For instance, in a drawing index dated January 1943, the repeatedly-revised 700 Series included plans for numerous administration buildings, bakeries, barracks, laundries, guard houses, mess halls, stables, post exchanges and motor repair shops, to name just a selection. The scope of this overview is too limited to discuss adequately all of these building types, even briefly. Instead, we will confine ourselves to just one type of structure, which can be considered the single most important structure in World War II army housing: the barrack within which the enlisted men were housed. The barrack was, and remains so today, the most prevalent structure in army camp plans. Nine thousand of the army's present-day inventory of 23,880 mobilization buildings are barracks, constituting a third of all existing buildings. Individual post buildings during World War II reflected a similar arrangement. At Massachusetts' Camp Edwards, for example, barracks composed 422 of the 1,179 buildings erected early in the war. If we are forced to identify one particular type of structure as the focus of this study, the army's basic barrack provides the most representative example of army construction during the World War II period.[3]

While focusing on the barrack type, this essay will attempt to address the following questions: Who planned and designed the mobilization structures? Why did the buildings take the shape they did? What was the military context that gave rise to their construction? What changes were made to these structures during the war years, and why? Why did one series of buildings give way to another? While answers to such questions will not satisfy the need for additional site-specific mitigation, a broad overview will provide a general historical framework for future documentation.

Figure 3 Basic barrack (700 Series), 1941.

Figure 4 Historic view of 700 Series cantonments.

OVERVIEW

THE ROOTS OF THE 700 SERIES

To begin exploring the shape and design of World War II army barracks it is necessary to begin several years before the war, and trace the development of the construction drawings in the 1930s. Originally, the army advocated the extensive use of prefabricated wooden buildings; troops or unskilled workers could erect them easily and even break them down and transport them from one place to another if necessary. In 1936, in response to the General Staff, Colonel Hugo E. Pitz of the Quartermaster Corps reported that his office was investigating steel prefabricated officers' quarters as another housing option. The appeal of prefabs was increased when the men of the Civilian Conservation Corps (CCC) were able to build them at their camps for the low cost of $160 per man. In spite of their appeal, the buildings did not meet the army's heating and space requirements, and the army was concerned that the trade unions would object to troops putting them up anyway. Yet faced with a scanty construction budget, the General Staff continued to hold out for prefabricated housing.[4] While an advisor, William Starrett, warned that such buildings would be a "disappointment, if not a disaster," the General Staff continued to toy with the prefab option into the early 1940s.

By August 1939, the Quartermaster Corps, though advertising for bids on a "modified CCC type of structure," had decided that "the CCC buildings were not entirely suitable for regular army use" and that "a two story type having better facilities . . . can be built at less cost." This still left some latitude as to what kind of two-story type would be built. As war clouds gathered in Europe, the Quartermaster Corps deliberated whether to use a two-story, "temporary" wood structure--modeled after the 700 Series--or a prefabricated, "semi-permanent" steel building. As late as November 20, 1939, the Assistant Chief of Staff argued for the "possibility of using a type of construction which will be more substantial than the wooden mobilization type now contemplated in the 700 series," and directed the Quartermaster General to prepare plans and specifications for a steel prefab structure. With the coming of the war emergency, however, economy and speed became the critical factors, ensuring that the War Department would turn to temporary wooden structures to house the new army.[5]

The roots of the 700 Series go back to 1928, when the General Staff granted permission to the Quartermaster Corps to update the World War I cantonment drawings. A few rough sketches gained G-4's approval early in 1929, but this was only a tentative beginning.[6] When Colonel Charles D. Hartman, who had served in the Construction Division of the Quartermaster Corps during the World War I, returned to head the division in 1934 he discovered that the 700 Series drawings were in poor shape, consisting only of a few tracings for barracks, mess-halls and storehouses. Though severely hampered by a lack of funds--"we had no money," Hartman recalled later--he called for a complete revision of the drawings. In 1935, the Chief of Staff ordered that a complete revision be made, using whatever funds the Construction Division could scrape together from the Works Progress Administration (WPA) appropriations.[7]

In spring 1937, an initial set of revised drawings went up to the General Staff for approval. By fall 1938, Hartman had appropriated over $250,000 in work relief funds to obtain a warehouse for his group of about eighty architects and draftsmen, and plans began to progress steadily. Yet for what purpose, no one could say exactly; for the prevailing army plan for mobilization--the Protective Mobilization Plan of 1938--envisioned little actual construction. It called for an initial force of 400,000 men, which would

Figure 5 Experimental steel barrack, Camp Grant, 1941.

subsequently be increased to 1 million within eight months of mobilization day. The troops would be housed in existing facilities and tents only for the initial mobilization. Shortly thereafter, they would be sent overseas to complete their training, thereby vacating the facilities for new troops. It was perhaps for this reason that Hartman was able to acquire only limited funds to design wooden mobilization structures, and why he ran into trouble getting many of the plans approved. How could the army justify the construction of cantonment structures when the only existing mobilization plan did not require them? As General A. Owen Seaman, who served under general of the Army Henry H. Arnold as the Quartermaster General of the Construction Division, admitted in spring 1941: "I didn't think we would ever need these cantonments." For this reason, Seaman denounced the mobilization structures as "cigar boxes" and for a while would accept no plan based on mobilization-type barracks.

Widepread isolationist sentiment in the United States also contributed to Seaman's position. Additionally, the Nye Committee's investigation of defense contracting during World War I increased anti-war attitudes among the American public. Though willing to defend U.S. borders if attacked, many Americans--not just extreme pacifists but mainstream citizens as well--viewed the lives of U.S. soldiers lost in Europe as a tragic waste and were determined to keep the country out of any future European conflict. With two wide oceans on the east and west and amiable neighbors on the north and south, many Americans had a hard time envisioning a cause for hostilities outside of Europe. Why invest much energy in planning a war mobilization effort that, twenty years after "The War To End All Wars," may never come? Seaman admitted, at a time when war once again suddenly seemed likely: "I don't think myself or anybody else

ever contemplated we would have the army that we have now. . . . Or that we would have a war."[8] Isolationist sentiment thus ran deep, even in the army.

THE EMERGENCY

The German invasion of Poland on September 1, 1939, and the consequent beginning of World War II sparked U.S. military construction. On September 8, 1939, Roosevelt proclaimed a limited national emergency. Among other measures of defense preparation, this executive order expanded the army from 210,000 to 227,000 soldiers and increased the national guard by 100,000 troops. At first, these new troops were housed in tents, but the army quickly decided to provide "temporary shelter" for them. Consequently, the 700 Series was implemented.[9] Army memos indicate that the construction division began building 700 Series barracks at various camps that fall.[10] Hartman's draftsmen could thus satisfy themselves with the limited but real utilization of their product. Throughout the winter, army command anticipated a major emergency. This expectation was underscored in early March 1940 when Chief of Staff Marshall asked Hartman how long it would take to house 2 million men. Still, the period of "phony war" following the immediate outbreak of hostilities shook few peoples' confidence in the basic viability of the Protective Mobilization Plan. With the extent of isolationist sentiment in the country and in Congress--where isolationist "irreconcilables" fought Roosevelt's war buildup tooth and nail--any further mobilization seemed impossible.[11]

Then came the German blitzkrieg in the low countries. By April 1940, German armies occupied Denmark and Norway; by the end of May, after equally rapid attacks, they had overrun Belgium and the Netherlands. France fell in June, and across the channel England prepared for an expected invasion. Acoss the Atlantic, these events galvanized both Congress and the President into action. Roosevelt requested and received two vast sums of military-designated money. First, in mid-May, Roosevelt asked that additional $732 million be added to the Military Appropriations Bill for fiscal year 1941. The funds would cover increased war production and the expansion of the regular army to 280,000 men. The bill shot through Congress for Roosevelt's signature in mid-June, with over $133 million earmarked for construction. Referring to the "almost incredible events of the past two weeks," Roosevelt went back to Congress on May 31 with another request for "over a billion dollars." Signed into law on June 26, this "First Supplemental National Defense Appropriation Act for 1941" increased army strength again--to 375,000 men--and made an additional $84 million available for construction, including funds to house the new troops. The events of the ensuing months would reveal that this was only the beginning. While the Protective Mobilization Plan ostensibly continued as the plan under which the army mobilized, in terms of housing construction, it was effectively ignored as the nation moved irrevocably down the path towards war. By fall 1940, the Construction Division of the Quartermaster Corps was fully immersed in war mobilization construction.[12]

THE CONTEXT FOR THE PLANS

The nature of the new emergency and the novelty of peacetime war mobilization shocked the American public in spring and summer 1940. "You never conceived that the Congress would authorize peacetime mobilization," Senator Ralph O. Brewster from Maine told Lt. Col. Francis J. Wilson of G-4 in the Truman Committee Hearings. He stated that ". . . Congress apparently fooled the War Department in that

respect. And I will agree that a record of 150 years possibly justified your conclusions." For throughout American history, beginning with Washington's famous farewell address warning against standing armies, Americans have studiously avoided large armies in times of peace. Only when war had come did the country mobilize and the troops were always mustered out soon after the hostilities were over. The novelty of peacetime military mobilization of an army was particularly significant for the Construction Division of the Quartermaster Corps. With the country at an uneasy peace, such sudden mobilization had profound ramifications for camp construction and barracks design. And as stated earlier, the Protective Mobilization Plan had not envisioned a war mobilization program with large-scale construction of army housing beyond the level of tents and mess facilities.[13]

With German armies on the English Channel, the housing expectations of the Protective Mobilization Plan had to be totally reevaluated. For suddenly, the European option was no longer viable. With France gone, England had major problems housing soldiers from several European countries in addition to their own soldiers. Thus, there was little room to train American troops. Thus, unexpectedly, the War Department faced a new situation that required a new type of barrack. For the first time, it had to accomodate a huge standing army that would remain in the domestic U.S. for an indefinite period. According to Lt. General Edmund B. Gregory, the new Quartermaster General in 1940, army command had a hard time grasping this new reality. "They just couldn't seem to get [the original Protective Mobilization Plan] out of their heads. . .," and "they would need a place in which to train successive groups of people," he complained. In addition, the approval of the draft in fall 1940 assured the conscription of a substantial number of men, most of them "citizen-soldiers who would need housing and training facilities."[14]

Not only did troops stationed indefinitely in the United States require better accommodations than did troops on a brief stopover on their way overseas, but increased public expectations as to what constituted decent and healthy facilities also played a part in reassessing the design of army accommodations. The rise in the standard of living since World War I, in spite of the depression, and the million concerned mothers raising their voices in the public sphere were determinative factors in the shifting conceptions of acceptable army housing during this period. For example, a witness to the House hearings on defense construction in spring 1941 displayed to the congressmen a letter from a citizen who had worked on World War I camp construction. Comparing Massachusetts' Camp Edwards to World War I camps he claimed, "Barracks at Edwards are well heated and ventilated and have washrooms, toilets, showers and drinking founts in them. This all adds to the cost, but I, as a citizen, think our boys deserve these comforts." In numerous letters from alarmed constituents, congressmen read about rumors or suspicions that draftees might be suffering from inadequate conditions. Texas Senator Tom Connally received a letter from a woman in Lancaster, Texas, who wrote to inform him that "soldiers are walking in continuous snow and ice without overshoes or leggings . . . some of the boys are sick with flu due, no doubt, to lack of overshoes. Can anything be done to relieve this situation?" Senator Wiley of Wisconsin received a report from a woman in Wausau, Wisconsin, who wrote that "At present there are some 60,000 national guards at Camp McCoy . . . they are living in a swamp with inadequate quarters and have no food. Many of them are sick . . ."[15]

The political pressure engendered by the widespread concern over army accommodations affected upon legislation, particularly the Selective Service Act. Passed in September 1940, the bill explicitly specified that no one would be sworn into the service unless the government had made adequate provision "for such shelter, sanitary facilities, water supplies, heating and lighting arrangements, medical care and hospital arrangements . . . as may be determined . . . to be essential to public and personal health." To a large degree, this requirement limited the War Department's troop housing considerations. Even if the international situation had permitted the Protective Mobilization Plan's rather limited mobilization housing reminiscent of World War I, public opinion in 1940 clearly would not have countenanced it. Instead, the sheltering requirements of the Selective Service Act were "instrumental," Colonel Chamberlin of G-4 told

the Truman Committee, "in causing the War Department to decide to build the type of shelter which we have built." Finally, the public pressure for adequate army housing had reverberations at the highest level of public dialogue--that of presidential politics. Nineteen hundred forty was an election year, and in the fall Republican candidate Wendell Wilkie charged that, contrary to the legislation, the camps would not be ready when the first troops moved in. Roosevelt promised in response: ". . . I can give assurance to the mothers and fathers of America that each and every one of their boys in training will be well housed."[16]

In summary, a variety of factors in summer and fall 1940 influenced the design and construction of barracks by the Construction Division. Contrary to all prior expectations and planning, the War Department suddenly faced building a vast number of more substantial structures in the United States, all of which would house an expanded army for an indeterminate length of time. Moreover, tangible public pressure assured that these buildings would reflect the standards to which American citizens had become accustomed. This meant that the structures would be well-heated, well-lit, and well-insulated. They would have indoor plumbing and they would be solidly constructed and built to last for a number of years. It should be pointed out that permanent construction was not a consideration. Peacetime mobilization was still a novelty in the American experience; therefore no one envisioned that the new army would be permanent. Thus, the buildings would be temporary--built to last five to twenty years. When the war was over the army would disband down to its professional core, as it had done after other wars. Indeed, as will be explored below, one of the criticisms of the 800 Series was that it was "too permanent." Yet at the same time, no longer could citizen-soldiers be housed in rough canvas tents quickly thrown up in a vacant field, or in warehouses converted to dormitories. The times and the public demanded something more substantial. And by fall 1940, events were coming together to ensure that whatever the army built, it would have to go up in a hurry.[17]

FINALIZING THE PLANS

It was at this point that Hartman's lonely and under-funded work on the 700 Series in the 1930s suddenly became important. The Construction Division had not been totally unprepared for the emergency in spring 1940. For thanks to Hartman's foresight, the Quartermaster Corps already had drawings for wooden mobilization buildings which seemed exactly what the new situation required. Or did they have such plans? After a stint in California, Hartman returned to Washington in March 1940 to head the Construction Division. After a conference with chief of staff Marshall, he became convinced that mobilization would soon be underway, and thus immediately went to check on the plans that they had drawn up in the 1930s. There Hartman ran into an unpleasant discovery. In his absence, someone had markedly altered the plans, changing them so they could no longer be used. Furthermore, the remainder of the plans had disappeared. In Hartman's words, "I checked with the Construction Division, G-4, and found that their plans had been destroyed."[18]

Given that the Construction Division was building 700 Series structures in fall 1939 in response to Roosevelt's declaration of a "limited emergency," it is hard to imagine that Hartman could not lay his hands on any serviceable plans outside of Washington. In fact, a memo to G-4 in September 1939 reveals that at least some 700 Series plans were "in the hands" of the zone constructing quartermaster at Fort Sam Houston in Texas. Furthermore, it is equally unimaginable that Hartman, faced with the loss of a significant part of several years' work, left any stone unturned in his search for the plans. At any rate, he had no other choice but to "take some of the older employees" who were "able to redraw the essential plans before we had to start work in the field." Hartman also made use of an impressive array of expert advice in the redrawing process. Among those brought in as experts to serve on a "Construction Advisory

Committee" were John Hogan, President of the American Society of Civil Engineers, Stephen Voorhees, past President of the American Institute of Architects, Alonzo Hammond, President of the American Engineering Council, and Malcom Pirnie, General Chairman of the Construction League of America. With this sort of leadership, the engineers and architects at the Ft. Myers warehouse cum design studio were able to deliver the drawings--the latest, revised version of the 700 Series--on time.

When completed, the drawings offered blueprints of over 300 assorted structures. Though a much more detailed examination will be offered later, here we might briefly note that the barrack type incorporated changes reflecting a longer troop occupancy and higher living standards. Instead of stoves, the barracks included a central heating system. Though the drawings included Plan No. 700-1185, in which plumbing facilities were in a separate building, the barracks were modeled almost exclusively on Plan No. 700-1165, with toilets and showers inside each structure. Durability was an important consideration as well. The barrack drawings substituted concrete foundation piers for the wood piers in the 600 Series of the World War I era, and also added termite shields. Another important change, especially from a visual aspect, was the addition of "aqua medias," an overhanging eave unit which circumscribed the building above the first-floor windows and served to keep water off the structure, which was an important consideration on all-wood buildings.[19]

The War Department quickly accepted these new mobilization structures as the standard for army construction. In fact, Hartman specified that the revised drawings were standard as of July 19, 1940, and that constructing quartermasters should destroy all prior "obsolete" plans immediately. As the schedule for construction began that summer, the War Department issued its first basic directive on its construction policy on June 15, 1940. According to Alice Rose in *Military Construction in the United States Under the Direction of the Quartermaster Corps and the Corps of Engineers*, the document laid down the fundamental principles under which the department's huge construction program was to be executed.

The War Department envisioned that the cantonments would be built on 125-man company blocks. Each company unit would contain two 63-man barracks (the housing capacity of the basic Plan No. 700-1165) with inside lavatories, one mess hall, one recreation building, and one supply building. For extensions of the camp, the directive ordered that more 63-man barracks be added and the mess hall capacity in each company unit increased. Moreover, the directive went on to mandate that permanent construction on posts would be suspended: from then on the Construction Division would be concerned only with temporary construction. The War Department explicitly charged the bulk of barracks construction to the Quartermaster Corps, and intervened in what would be a continuing problem throughout the camp construction: the tendency of individual constructing quartermasters to change the mobilization plans to fit local conditions or their own peculiar needs. The General Staff thus ordered the Quartermaster Corps to furnish all concerned with "a complete set of plans for mobilization construction and revisions thereof," for "only standard buildings of the mobilization type will be constructed for increases in the army." Army command went on to order strict adherence to these plans, though welcoming "constructive recommendations for changes of design for future building." Finally, it should be pointed out that the War Department still planned a limited use of tents--at least one aspect of the old Protective Mobilization Plan that was still respected. As will be pointed out below, in areas in which the winter temperature rarely dipped below twenty degrees--mostly in the deep south--tents were the preferred housing option, though this still required wood-frame construction as well as wooden mess and administration facilities.[20]

In the space of no more than three months, the Construction Division of the Quartermaster Corps made the transition from an agency planning for mobilization to one charged with a vast construction program. Suddenly it was awarded an unprecedented amount of funding (though it would pale in comparison with the monies to come). Suddenly it had identifiable goals for troop housing and approved, set plans from which to build. By late summer 1940, the only item that was not quite clear was the amount of troops that

the Quartermaster Corps would need to house. And as events unfolded, the Quartermaster Corps quickly saw that the number would be substantial.

THE MAGNITUDE OF THE TASK

By August 1940, recent expansions of the army totaled about 300,000 men, a number that strained the army's housing capacity. In all probability, the Quartermaster Corps was unable to billet the additional 75,000 troops the President had ordered enlisted that June. Yet this was only the beginning of rapid expansion. On August 27, Congress finally approved pending legislation to federalize the national guard. By September 9, it had appropriated $128 million with which to house these 100,000 men who, the Construction Division was told, would be arriving for service on October 15. The Quartermaster Corps would be expected to provide shelter and facilities for these new troops by that date.[21]

Even more ominous was the coming of the draft. On September 16, 1940, President Roosevelt signed the Burke-Wadsworth Bill (the Selective Service Act) which implemented the draft. It was followed by the "Third Supplemental Defense Appropriations Bill" of September 24, 1940, that included $310 million for shelter for the draftees. The largest slice of funds for camp construction became available just "as the leaves were beginning to fall," stated General Richard C. Marshall, Jr. The onset of fall was important; the bulk of camp construction would have to take place in the winter months.[22] Winter construction would be difficult, but the scheduled arrival of troops prohibited the delay of construction until spring. Indeed, the induction timetables formulated by the War Department kept the pressure on the Construction Division full throttle. The raw numbers alone spoke of a crisis.

Housing the federalized guard was a nightmare in itself. As Lenore Fine and Jesse A. Remington point out in *The Corps of Engineers: Construction in the United States*, "counting from 9 September, the day appropriations became available, Hartman had one week to three months to ready camps for the guard divisions." Of course, regular troops and guardsmen could be expected to tough it out for a while with tents and latrines. Yet Congress had made it abundantly clear that this was not acceptable for draftees: "snug barracks, toilets, showers, heating and electric lights would have to be available when they arrived." The Construction Division could expect the draftees to arrive by November 15, with a total of 400,000 conscripted by the middle of January. The call-up schedules issued by the Selective Service noted that this would be merely the first surge of a rapidly advancing tide. The Quartermaster Corps, of course, would need to house them all. The Construction Advisory Committee calculated in October 1940 that facilities would be needed to accommodate 700,000 men as of February 1941, as well as 400,000 more that would be arriving between April and June.[23]

Not only did the Construction Division have to deal with these troops; it also faced the additional task of building facilities for the Air Corps. Throughout World War II the Air Force was a part of the army. It wasn't until after the war that the Air Force became a distinct service of the armed forces. This meant that the construction of the facilities for the Air Corps initially fell under the purview of the Quartermaster Corps, until this task was transferred to the Corps of Engineers in December 1940. With the rapid expansion of the Air Corps in World War II and the scope and variety of its building program, facilities construction quickly developed into a whole new building "front," particularly after the Corps of Engineers took it over. The limited focus of this study, however, precludes a specific examination of Air Corps construction (though technically this remained a significant part of army construction). It is only important here to note that a significant aspect of the first stage of the mobilization effort included a major barracks construction program on new air bases.

By the late 1930s, the War Department was working steadily to advance U.S. air power. And by April 1940, the Quartermaster Corps was already working on about $91 million worth of Air Corps construction, 45 percent of it in the domestic United States. Then, in response to the German blitzkrieg, which demonstrated the substantial power of enemy air bombing, Roosevelt quickly turned to a frightened American public and pressed for the vastly increased expansion of U.S. air power. In his emergency defense authorizations in June 1940, the President received large funds for this purpose. Much of this money was quickly poured into the Corp of Engineers' hands for the construction of runways and hangars; for the emergence of air power had just begun to stimulate the new science of airport engineering, and the Corp of Engineers rushed into this new field.[24] On a more mundane level the Quartermaster Corps worked hard in the summer and fall 1940 to provide housing for new pilots in training. Between September 1940 and January 1941, thirteen air stations for pilot training were scheduled for completion, most of them supplying required facilities for hundreds of men. An examination of the design of the required structures reveals that they were of the standard 700 Series construction, including the basic Plan No. 700-1165 for a barrack and its matching Plan No. 700-1116 for a mess hall.[25]

BUILDING THE CAMPS

The volume of new construction was indeed overwhelming. The Construction Division plunged into the work in early fall, getting underway even before all the money had been appropriated. Borrowing $29 million from the president's "blank-check fund" enabled the constructing quartermasters to wade into the task around Labor Day, beginning, for example, one of the first camps--Camp Edwards--on September 12. Due to the haste and the timing involved, there were problems with supply, with contracting, with labor, and with administration. A project of this magnitude could not escape such problems. The wartime congressional investigating committees--including the one in which Harry Truman began his rise to fame--came into being as a result of these various problems. In spite of the difficulties, the camps went up.[26]

In terms of administration, the construction quartermaster was the on-site boss at all the construction sites. It was his responsibility to come up with the design for layout and deal with the contractors. For these duties he was held responsible by headquarters. The larger administrative structure of the Construction Division varied with the commands of two different chiefs during the years 1940-41. Brigadier General Hartman, recently promoted from the rank of Colonel, formed the core of his policy around the contractors. He selected the best architectural and engineering firms available and awarded them, in Fine and Remington's words, "a large measure of independence." Constructing quartermasters were ordered to "go the contractor's way, so long as fundamental laws are not violated and the government's interests are protected." Although Hartman preferred this policy, as events turned out it gave him relentless trouble. One of the reasons for the Truman Committee's vigilance was the suspicion that the contractors were more active in protecting their own interests than the Government's.[27] Brehon Somervell, taking over for Hartman in December 1940, wisely believed in a much more decentralized organization. Accordingly, he set up nine territorial construction zones in early 1941, each headed by a zone constructing quartermaster who was responsible to him. The zone offices functioned as Construction Divisions in miniature, altogether accomplishing many of the tasks formerly done in Washington. To Somervell, the zone constructing quartermasters were crucial; they were the "backbone" of his organization. He told his staff in February 1941 that "the Zone Quartermasters must function. If they don't, we won't." Still, like Hartman, Somervell retained control over structure design, contracts, and other advisory and directive matters.[28]

In a nation still by all accounts in a severe economic depression, obtaining enough labor was not a problem. The Associated General Contractors of America estimated some 8 million men unemployed in spring 1940. When construction began the contractors were forced to turn away thousands of applicants:

Figure 6 *Cantoment construction, Camp Edwards, Massachusetts, 1940.*

Figure 7 Workers involved in construction, Camp Ord, California.

29,000 at Maryland's Fort Meade and 36,000 at North Carolina's Fort Bragg. Skilled workers, however,were harder to find than unskilled laborers. A nationwide survey by the Bureau of Labor Statistics, Department of Labor, in summer 1940 revealed only 366,000 unemployed workmen skilled in the construction trades. Moreover, many skilled carpenters had found employment with the WPA. By moving to temporary defense work, such men risked losing their relief status. Thus, few left the WPA to work for the War Department. Contractors were simply forced to devise strategies to alleviate the skilled labor shortage.[29]

A common practice was to divide construction teams into highly specialized units, each performing a single task. In an assembly line approach, the workers travelled from building to building constructing their discrete portion. Another strategy was to use some simple prefabrication; this worked well at Camp Blanding in Florida. The contractor there erected a sawmill at his lumber yard and manufactured buildings in sections. Lastly, the simplicity of the structures guaranteed that unskilled workers would be able to assemble them with ease. The construction manager at Camp Edwards stated that ". . . simple framing drawings were provided that enabled building the camp on time with a high percentage of unskilled workers." And as the pace of the camp construction program quickened, contractors hired such workers at a corresponding pace. Fine and Remington record that the number of men employed on military construction projects rose from 5,380 in July 1940 to 396,255 in January 1941.[30]

Consistent with the terms of decentralization, the organization of labor was managed by the individual contractor. The central Construction Division refused to intervene in a contractor's recruiting methods, and expressed no preference regarding the use of union or non-union labor. The vast majority of these workers were thus hired by the contractor for whom they worked. Fine and Remington claim that some of the workers were paid by the WPA and others by the army. Yet WPA funds were always limited to barracks construction, and in February 1942 the War Department ruled that WPA funds for labor were no longer to be used for any temporary mobilization construction.

As organized labor became increasingly powerful during the early 1940s, soldiers were not permitted to engage in construction in the continental United States. Organized labor was active in camp construction in other ways as well. Discontent with the War Department's expressed indifference to the closed or open shop, unions mounted an organization drive as the pace of camp construction increased. In the early months of the war emergency, the unions were able to make steady progress--though not without some necessary measures. A strike of carpenters at Fort Meade, for example, resulted in the union winning its demand for higher wages.[31]

As it turned out, labor troubles ranked relatively low on the list of the Construction Division's problems. Many of the difficulties arrived with the selection of the site. An ideal site for a camp was located on flat, well-drained but solid land that was cheap and easily obtainable but still close to centers of population and transportation and with a ready and bounteous water supply. Sometimes, for a variety of reasons, the Construction Division faced building at sites that fell far short of this ideal. For instance, the site for Camp Blanding was pushed through by enthusiastic members of the Florida National Guard, who picked a beautiful, lush spot, covered with vines and palmettos, right next to sparkling Kingsley Lake in central Florida. When the constructing quartermasters began work, they discovered less attractive aspects: large patches of swampland and heavily timbered areas requiring extensive clearing. Two million cubic yards of earth needed to be brought in, and still the drainage at the camp--much of it two feet below the lake level--was exceedingly poor. Moreover, the "high-capillary" soil functioned to pull water to the surface. Construction workers called the Florida soil "sugar sand" and lamented that "We're building this camp on a sponge." Consequently, Blanding cost $17 million beyond the original estimate.[32]

Other selected camp sites had similar problems. Indiantown Gap in Pennsylvania was planned on a thin strip of rolling land at the base of a mountain. This necessitated a "string-bean layout" with miles of extra roads and utilities that increased construction expenditures. Construction workers quickly discovered another problem: heavy shale beneath the surface, requiring power shovels and backhoes in excavation. As a result of these unforseeable difficulties, Indiantown Gap ran $8 million beyond the original estimate. The construction of Fort Leonard Wood in southwest Missouri also faced problems. Located amidst 65,000 acres of easily obtainable national forest land, with plenty of water available nearby, initially it seemed like an ideal spot. After the decision to build the camp was finalized, the Quartermaster Corps discovered to its chagrin that the nearest railhead was in the town of Newburg, twenty-five miles to the northeast. The problem was finally "solved" by building a spur track into the camp that, passing through the foothills of the Ozarks and over the Big Piney river, cost $3 million and took five months to build.[33]

The weather during winter 1940-41 posed another, more serious, problem which affected nearly all of the construction sites. Construction in inclement weather would be difficult in any year but by all accounts that winter was "abnormally severe." One can only imagine the difficulties and hardships occurring in camps in the north and along the eastern seaboard, where freezing temperatures were experienced during what was expected to be the mildest of winters. At Fort Devens in Massachusetts, for instance, crews labored hard digging sewer and water-line ditches in the frozen ground, for frost had penetrated to a depth of four feet. At Pine Top in New York State, workers poured concrete in sub-zero conditions. In other regions of the country it rained almost continuously, turning construction sites into seas of mud. Conditions

were so unfavorable at Leonard Wood that the heavy hauling of supplies and equipment in and out of the camp was stopped for three weeks in January while roads of crushed rock were laid down. A similar problem occurred at Camp Hulen, on Texas' Gulf Coast, where troops tethered pet ducks in front of their tents while road crews slogged it out in the mud and construction costs soared. Across the continent, California experienced "the wettest season in a generation." "We are completely flooded out here. . . ," the contractor at San Luis Obispo reported to Somervell, and ". . . we have had a whole season's rainfall in about ten days." Baton Rouge endured its worst rainy season in a decade. And Topeka recorded its wettest season "in the history of the weather bureau." Altogether, the weather was a disaster.[34]

Still, camp construction proceeded, and in spite of the obstacles, made remarkable speed. The rapidity of camp construction was due to several interrelated factors. First, the division of labor among the construction crews played a big part, as described above. Second, the standardization of the building plans was key to a speedy erection. Not only did building standardization enable crews to pick up speed, but it also made possible a third factor: the precutting of lumber and prefabricating of units. The plans could be sent, as at Fort Ord, to a central carpentry shop where the floor beams, wall columns, roof, rafters, bridging, joists and bracing could all be cut to shape, regardless of what particular barracks they were for. In an advertisement in *The Constructor* entitled "Rolling out the Barracks," one company boasted that it could turn out "4800 completed rafters" and "12,000 studs" every eight hours, and then asked "Can you match such production?" "This method," the company pledged, "will save you layout time, material handling, cutting time, hiring and erection time." Whatever the final factors, by March 1941 the

Figure 8 "Building the Camps:" An historic view of 700 Series cantonment construction.

constructing quartermasters and their contractors were finishing buildings at a breakneck pace. At Fort Ord buildings were finished at a pace of one every fifty-four minutes.[35]

As the camps neared completion, the Quartermaster Corps could point to some impressive accomplishments. In spite of the problems with the sites, labor turmoil and the trials of winter, the first camps were finished by spring 1941. And the total number of buildings at some of the camps revealed successful, albeit hard, work. By April 1941, 1,054 buildings--mostly barracks, mess halls, and administration buildings--had been completed at Indiantown Gap. Twelve hundred structures dotted the landscape at Ft. Ord; 1,400 buildings, constituting facilities for 30,000 troops, had been completed at Camp Edwards by June 1941. By the last day of June, the Construction Division of the Quartermaster Corps had provided shelter for 1,200,000 soldiers. With housing capacity for only 300,000 the previous August, the Quartermaster Corps had completed a construction program to adequately house almost a million men in little over ten months.[36] The completed camps served as ample evidence for Secretary of War Stimpson's claim that ". . . no major country in the world . . . has ever before housed its military forces in so brief a time and upon so adequate a scale for ministering to their necessities and comforts."[37]

This massive program included much more than just building barracks and mess halls. The American people demanded a fair amount of army comfort for their soldiers. By the time a camp was considered complete, it not only had the appearance of an army camp, it also maintained many of the conveniences and functions of a city. In his annual report of 1941, Stimson noted:

> A program of housing involving the construction of over 40 veritable cities qualified to receive populations running from a minimum of 10,000 to a maximum of over 60,000 inhabitants and containing all the necessary utilities and conveniences including recreation buildings, theaters, service clubs, chapels, athletic areas, hospitals, bakeries, laundries and cold storage plants, was carried through on time and with a minimum of hardship to the troops.[38]

In some cases, these "camp-cities" grew so large as to dwarf nearby civilian cities, even state capitals. For example, Fort Bragg's troop population greatly exceeded the population of the state capital at Raleigh, while the soldiers at Camp Blanding totaled a population five times that of Tallahassee, Florida's capital city.[39]

These accomplishments were partially recognized by the general public due, in part, to a very active publicity campaign that was run out of Somervell's office. In the doldrums of winter when construction was besieged by problems, *Time* magazine lambasted the "bumbling quartermasters." By the time the camps approached completion, however, media coverage took on a more laudatory air. The similarity between articles in various construction industry publications, such as the *Engineering News-Record* and *The Constructor*, indicate that they were using Construction-Division press releases almost verbatim, suggesting the emergence of a more favorable position toward the Construction Division's efforts. An independently written article in *Fortune*, as well, praised the "half-horse, half-alligator toughness" of the constructing quartermasters.

Figure 9 Chapel (700 Series) at Fort Meade, Maryland, 1953.

Figure 10 Interior view of Regimental Chapel (700 Series), Camp Shelby, Mississippi

Figure 11 *World War II barrack interior.*

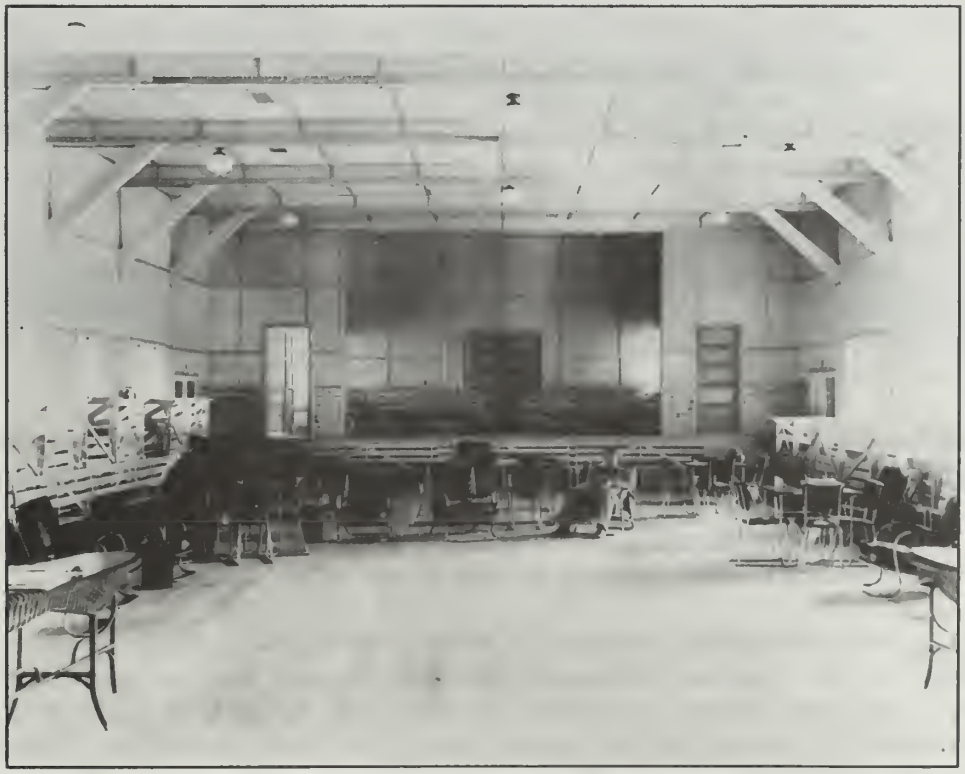


Figure 12 *Interior view of Recreation Center.*

HOUSING FOR BLACKS, WOMEN, AND PRISONERS OF WAR

During World War II, Jim Crow laws of racial segregation were still widely practiced in the United States. The belief in "separate but equal" facilities for black and whites--embodied juridically in the 1894 Supreme Court decision, Plessy v. Ferguson--was exercised by the army in housing black troops. There were no special drawings for black housing, although "from the morale standpoint, it [was] believed highly desirable to house all colored troops in one area." In the South, segregation was accommodated further by adding separate toilet facilities for blacks in theaters.[40]

In contrast, the Women's Army Corps (WAC) received "separate but better" facilities. Standards for housing the WACs were established in April 1943. They stated that "standards for housing the Women's Army Corps should be higher than those for the housing of male personnel, with additional changes where differences between men and women necessitated such changes and adjustment."[41]

The women's barracks had their own drawings, including a plan for new construction and a plan for remodelling existing enlisted men's barracks.[42] Female occupancy was accommodated by the installation of toilet partitions and doors; the subdivision of showers and hanging of shower curtains; the hanging of window curtains; the construction of a closed corridor from T.O. buildings to latrines; the inclusion of laundry tubs and ironing boards; replacing fire-escape ladders with stairs; and adding a beauty parlor to the company grouping. In addition, women's housing was located at least fifty yards from the nearest men's housing.[43]

Standards for prisoner of war (POW) housing were governed by the Geneva Convention of 1929 which required that POW camps provide housing that was sanitary, healthful, adequately heated and lighted and generally conformed to the detaining power's troop facilities.[44] Public opinion influenced the War Department's decision to install POW camps farther away from settled areas and to use their labor only when civilian manpower was unavailable.

Housing POWs was a new experience for the United States. In World War I, POWs were held behind the lines in theater-of-operations buildings. State-side POW housing, like mobilization construction, was based upon standardized plans. Each facility included prisoner barracks, guard barracks, administration buildings, a warehouse and utility area, hospital compound, and a recreation area all within a stockade guarded by watch towers.

The POW barrack, Plan No. 800-350, did not include inside toilets or showers. Reminiscent of the drawings in the first 700 Series, a separate latrine and bath house was provided. In keeping with the Geneva Convention's regulation that POWs may be interned in enclosed camps, but not confined or imprisoned, the non-detention barracks were not divided into cells. In fact, the POW barrack was based on the same components as the enlisted men's standard barrack, Plan No. 800-443.

The cantonment construction program between the years 1940-41 was a mammoth undertaking. The size and design of the camps were comparable to cities, complete with site selection and planning requirements, utility needs, grading and paving concerns, as well as large-scale construction. The sheer volume of mobilization structures that was needed in the United States mandated an efficient method of construction. This objective was fulfilled through standardization.

Figure 13 *World War II internment barracks, Camp McCoy, Wisconsin.*

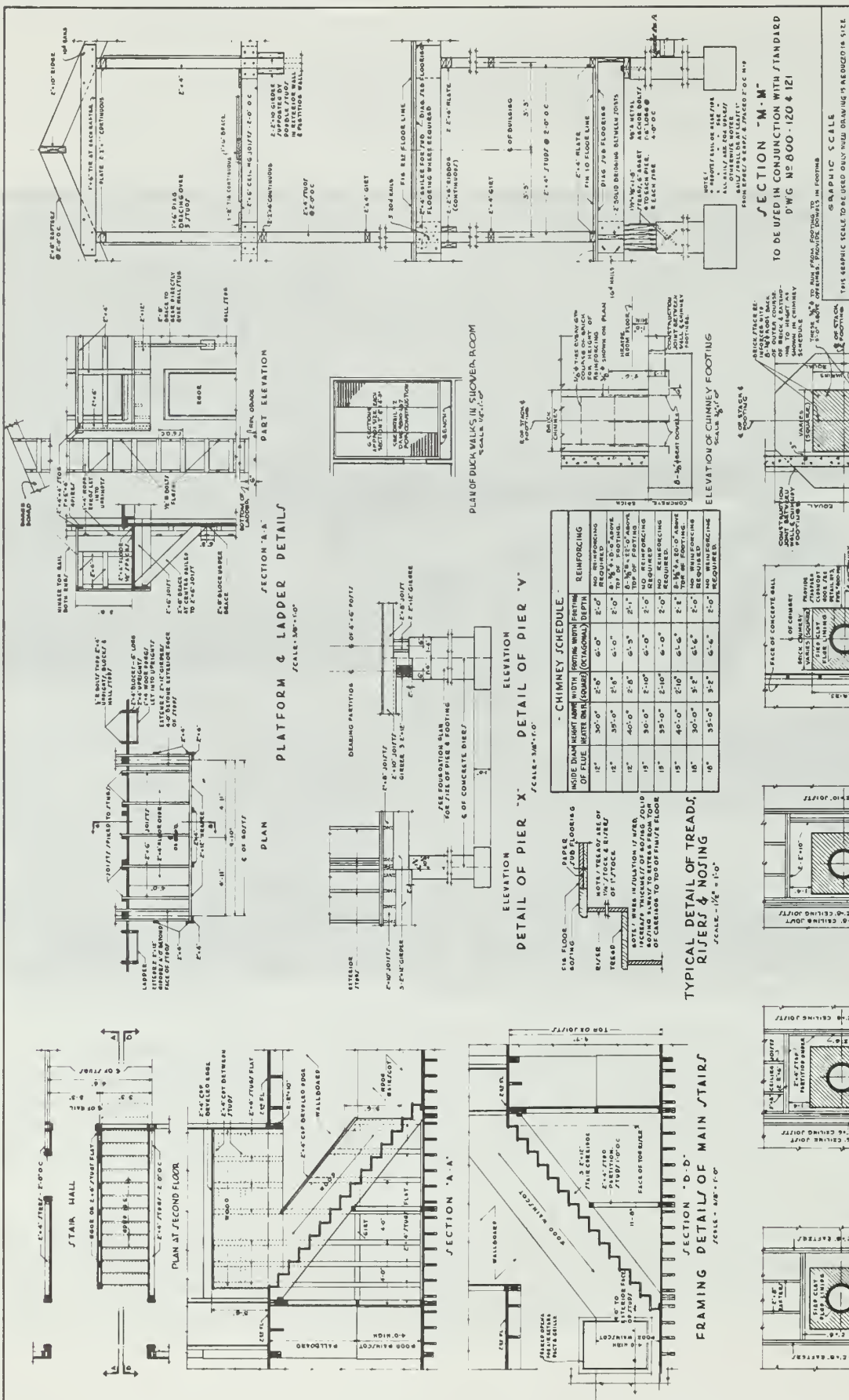


Figure 14 Drawing 800-445, basic barrack plan.

THE MOBILIZATION DRAWINGS

DESIGN PRINCIPLES AND CRITERIA

In preparing mobilization construction plans, Brig. Gen. Hartman was guided by five principles: speed, simplicity, conservation of materials, flexibility and safety. These criteria were used to guide the construction program throughout the duration of the war.[45] Throughout the stages of the construction program, speed was given the highest priority. The Selective Service Act stipulated that troops could not be called up unless satisfactory shelter was in place. Thus, expansion of the army in 1941 generated a second major construction push. Speed was necessary in design as well as construction so that the buildings could be erected quickly and easily.

In the interest of achieving speed, simplicity came into play. *The Engineering Manual* stated that simplicity was the primary prerequisite for speed and was essential in reducing labor, material, and transportation requirements. Any cost benefits resulting from simple construction materials and methods were also appreciated, although cost was not a notable concern. The manual further stated that:

> Wood has been used for substantially all troop housing requirements. Standard size lumber is used throughout, and where possible, in standard lengths. Complex framing details are avoided, and interior finishes generally omitted. Equipment of standard makes and capacities, readily procurable, is utilized to maximum advantage. Interior electrical work, plumbing, and other mechanical facilities are kept to bare necessities.[46]

As mentioned earlier, simplicity in construction enabled unskilled and semi-skilled workers to be hired to build the camps. This was important not only for wage savings, but also later in the war when a skilled-labor shortage developed.

Conservation of materials, the third criterion, was an increasingly important factor in the design and construction of camps and individual cantonments. Due to combat equipment and vehicle needs during an actual war, wood would be more plentiful during war than would metals. Thus early proposals for steel barracks were rejected by the General Staff.[47] As the war progressed, however, even certain types and grades of lumber became difficult to obtain. Thus, conservation was encouraged by the use of substitute materials such as felt and gypsum wallboard for wooden, wall sheathing.[48]

Flexibility was a double concern. The specifications needed to be flexible enough to accommodate substitutions of available suitable materials without requiring major structural revisions. The structures themselves also needed to be adaptable to alternate uses. For example, the barrack was designed for 63-man capacity; yet it was also large enough to permit additional bunking.[49]

Finally, safety factors had to be taken into account. *The Engineering Manual*, however, reveals that safety factors were a low priority:

> The temporary character of the construction program, the large number of buildings of identical types, and the necessity of conserving materials, transportation, and labor justify the adoption of safety factors substantially lower that those in common use prior to the present emergency. . . . Warehouses, barracks, etc. warrant low safety factors, in view of the large number of these buildings required, the comparative small loss through the failure of such structures, as compared with overall savings in cost, material, transportation, equipment, and labor.[50]

Although minimal, the safety standards were nonetheless adequate for the short-term use offered by a temporary building.

In addition to the aforementioned criteria, Hartman had to comply with War Department standards for the development of the 700 Series plans. The June 15, 1940, "War Department Construction Policy" required that "mobilization type temporary construction" be provided where additional shelter was required.[51] The July 18, 1940, "Supplement to War Department Construction Policy" specifically stated:

> For additional shelter, the War Department plans to provide housing where practicable on the basis of 125-man blocks, consisting of two barracks (63-man capacity with inside lavatories), one mess hall (170-man capacity), one recreation building, and one supply building, and such facilities as will make them habitable. . .
>
> Frequent changes of station and strength of units during the present emergency make impractical any attempt to build for a specific unit. The block system specified above with the layout so arranged that additional 63-man barracks can be added to bring units to war strength, will furnish sufficient flexibility to accommodate any type unit. . .
>
> Evidence is accumulating in the War Department that Commanders in the field are in some cases attempting to change the type plans for mobilization buildings. In order to save time, only standard buildings of the mobilization type will be used for the shelter necessitated by the increases in the Army, unless specific authority in each case is obtained from The Quartermaster General.[52]

The July 18, 1940, "Supplemental Policy" is a viable indicator that the mobilization construction program had progressed in only three months from a generally conceived initiative to a program with specific objectives.

None of Hartman's design principles articulated what these mobilization buildings were to look like or how they were to function. For this, he based his drawings on the 600 Series plans of World War I. Still, Hartman's designs reflected the technological improvements achieved over the subsequent years. Indoor barrack lavatories replaced separate latrines and bath houses, central heating replaced stoves, iron pipes replaced wood staves, and garages replaced the outdated stables.[53] While structural evolutions since World War I mandated some changes in appearance, the overall domestic look and scale was retained with six-over-six double-hung windows, wood-drop siding, and two-story height.[54]

Description of Plan No. 700-1165, Enlisted Men's Barrack

The standard 63-man barrack, developed by Hartman's design team, was 29'-6" wide by 80' long, and two stories tall. Construction materials and techniques were similar to any other mobilization construction structure. The wooden sill rested on concrete or masonry footings which were initially capped with galvanized or painted metal sheets that functioned as termite barriers. The framing was of wood platform construction, generally spaced on 3'-0" centers, with diagonally laid 1" wood sheathing or panels of gypsum board nailed on the studs which, in turn, were covered with building paper and then wood drop siding. Wood joists and girders braced the floors, and early reports of shrinkage led to a double flooring system of flooring sheathing sandwiched between a diagonally laid sub-floor and a top floor. Windows were usually wood sash, but steel was also used. Double-hung windows were more common than casement, but in either case the panes were divided into smaller lights, six-over-six or eight-over-eight being common. Continuous eaves--referred to as aqua medias--capped all windows on the first and second stories. One end of the barracks was used for the heating plant and wet areas, and was therefore placed over a concrete slab foundation.

Hot-air heaters with circulatory fans heated the barracks. The heating system was adaptable to local fuel supplies. Chimneys were set four feet from the exterior wall and were composed of brick at the

Figure 15 *700 Series barrack with double-hung windows, wood drop siding & two-story height, 1941.*

bottom and steel at top. The roof was wood-framed, sheathed, and covered with a mineral-surfaced prepared roofing material. Interiors were left unfinished.[55] The draftiness of these structures was illuminated in a report on barracks heating which stated: "It is not necessary to supply outside air to the circulatory fan as the windows and air leakage provide sufficient ventilation."[56]

Like the other building plans of the mobilization construction program, a single barrack plan was actually composed of several standardized plans. Plan No. 700-1165 also included instructions to use other standardized mobilization drawings for specific construction details. Used in a particular combination, the individual plans, specifying instructions for the various components of the building, produced a barrack formula. Furthermore, these plans could be rearranged to create altogether different mobilization buildings. The plans for buildings such as the barrack, mess hall, and company administration/storehouses, which formed the core of each company's physical organization, demonstrate that each distinct building shared many common components. For example, the electrical, heating, and plumbing details were identical for many building types, and the structural plan for any 29'-6" wide building was the same.

Appendix A shows the specific plans necessary for the 700 Series barrack, and the subsequent 800 Series barrack. Many of the same individual plans appear within the formulas for 800 Series building types. Clearly, the various components were used over and over again in various permutations throughout cantonment construction.

The decision to use cantonments of wood was predicated upon the climate of the camp. Generally, tent camps were used in the south (the +20 degrees zone) and cantonments in the north (the 0 degrees and -20

FORMULAS FOR TYPICAL MOBILIZATION BUILDINGS

63 and 74-Man Barrack
Plan No. 700-1165

Plan No.	Description
700-241	Electrical Plan
700-245	Shelving, etc.
700-1165	Basic Plan
700-1166	Floor and Roof Framing
700-1167	Building Elevations
700-1168	Wall Sections
700-1169	Toilet and Heater Room Details
700-1170	Plumbing
700-1171	Heating
700-1171.1	Alternate Heating Layout
700-3068	Standard Details
700-3070	Standard Details
700-3094	Standard Plumbing Details
700-3099	Standard Electrical Details

63 and 74-Man Barracks
Plan No. 800-443

Plan No.	Description
800-120	29'-6" Wide Building - Bearing Partitions
800-121	29'-6" Wide Building - Bearing Partitions
800-134	29'-6" Wide Building with Two Rows of Posts 9'-10"
800-135	29'-6" Wide Building with Two Rows of Posts 9'-10"
800-142	Alt. Platform Construction 25'-0" and 29'-6" Wide Buildings
800-151	Standard Window Details
800-154	Standard Door Details
800-157	Standard Toilet Room Details
800-185	Interior & Exterior Details
800-186	Interior & Exterior Details
800-187	Interior & Exterior Details
800-190	Metal Smoke Pipe and Cement Asbestos Flue Details
800-194	Standard Plumbing Details
800-196	Standard Heating Details, Warm Air Heating, Smoke Pipes
800-443	Basic Barrack Plan
800-444	Framing Elevation
800-445	Miscellaneous Details
800-446	Electrical and Plumbing Details
800-447	Heating Details

228-Man Mess Hall
Plan No. 800-851

Plan No.	Description
800-101	25'-0" Wide Building Clear Span - One Story - Structural
800-174	Miscellaneous Details - Mess Halls
800-175	Miscellaneous Details - Mess Halls
800-176	Miscellaneous Details - Mess Halls
800-177	Miscellaneous Details - Mess Halls
800-178	Miscellaneous Details - Mess Halls
800-189	Miscellaneous Details - Mess Halls - Architectural
800-190	Metal Smoke Pipe and Cement Asbestos Flue Details
800-194	Standard Plumbing Details
800-199	Standard Electrical Details
800-851	Basic Plan
800-852	248-Man capacity

Storehouse and Company Administration Building
Plan No. 800-661

Plan No.	Description
800-100	25'-0" Wide Building - Clear Span - One Story-Architectural
800-101	25'-0" Wide Building - Clear Span - One Story-Structural
800-151	Standard Window Details
800-154	Standard Door Details
800-157	Standard Toilet Room Details
800-182	Miscellaneous Details, Porches, Breeching & Interior Details
800-185	Miscellaneous Interior & Exterior Details
800-186	Miscellaneous Interior & Exterior Details
800-187	Miscellaneous Interior & Exterior Details
800-190	Metal Smoke Pipe and Cement Asbestos Flue Details
800-199	Standard Electrical Details
800-459	Basic Plan

Source: War Department, Office of the Corps of Engineers, Construction Division, "Index of Mobilization Buildings," Revised January 26, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 735.

degrees zones).[57] Even with their inherent obsolescence, cantonments were still preferred because they were cheap, easy to erect, adequate for shelter and built with readily available material. The supervising architect of the Construction Division recalled:

> You can't . . . build anything designed to stand three or four years that will stand up at all. One strange thing is that it is a good deal cheaper to put people in temporary wooden buildings than to put them in tents. You can't get the amount of tentage you'd need in a mobilization. Of course, there's always been a certain amount of tentage in the Army. When the Army's on the move, you've got to have it.[58]

Thus climatic conditions and the limited feasibility of tentage convinced the army to focus on cantonments.

CONSTRUCTING THE BARRACKS

Lumber in Mobilization Construction

In keeping with the primary emphasis on speed, the mobilization plans provided the quickest, simplest method of erecting a building. The decision to use wooden structures meshed neatly with the emphasis on speed. Wooden buildings were classified by the army as "temporary," thus they did not require a high degree of finish or even structural solidity. In addition, balloon or platform construction was relatively simple to erect and thus required few skilled, and hence expensive, laborers. The goal was to erect labor and cost-efficient structures quickly while maintaining the minimal standards of comfort and longevity. According to Frank E. Lamphere, then Chief of Engineering, Hartman was all "for keeping the structures flimsy," something akin to a "cardboard box."[59] Hartman thus faced the challenge of building minimal structures which would last for a limited period of time and not much longer.

Once the decision was made to use temporary wooden construction, Hartman set out to design structures using the most economical types of lumber. As early as 1938-39 he had replaced earlier construction specifications which called for greater than 14'-0" lengths with shorter lengths which would be available locally. Using standard sizes of lumber enabled the army to predict its lumber needs and to stockpile lumber as it became available. Once he became aware of a lumber industry excess of 10'-0" lengths, Hartman revised the mobilization plans to utilize that length. When those lengths were exhausted, he revised the plans accordingly.[60] Another benefit of standardization was that it readily accommodated experimentation with precut and prefabricated parts.

It was difficult, however, to observe quality control when procuring such massive quantities of lumber. As the peacetime mobilization effort expanded into a full-fledged war effort, the demands for lumber outstripped its availability. *The Engineering Manual* codified the procedures neccessary to mitigate the problems accompanying the use of unseasoned lumber. The manual recommended that timber be stacked for air drying or seasoning under temporary shed roofs whenever possible in order to reduce the moisture content of the timber, which had increased during the war effort due to time constraints. The time between delivery and actual construction often made this process impossible.[61]

Framing and Methods

Once a camp site was selected and contracts awarded for the actual construction, an assembly line approach to production was utilized.[62] Construction crews were divided into highly specialized teams. Instead of delegating responsibilities according to professional expertise--e.g., carpentry would be performed by carpenters only--each stage in the construction process, constituted by a multitude of tasks, was handled by a different crew. Thus one framing crew did the first floor, while another did the second. The use of platform construction, in which the second floor was built on top and attached to a completed first floor, enabled such a separation of crews. The crews would follow each other from building to building, each accomplishing its part of the construction process in succession. Contractors turned to subcontractors for special phases of the project, such as electrical, plumbing, heating, and excavation. Whereas the architectural plans were forwarded by the Quartermaster General's office, the contractors were responsible primarily for the engineering aspects of camp construction such as the grading and paving. The *Engineering News-Record* reported that the assembly-line technique was used extensively at Camp Edwards and Indiantown Gap; presumably it was used at many other camp sites as well.

The first step was for transit crews to mark foundations in each area on batter boards. Finished

Figure 16 Barracks under construction, Camp Leonard Wood, Missouri.

first-floor levels were marked at the corners by level parties. The foundation crew then set the pier footings. Footings sizes varied according to soil conditions and building loads. The greater the load on the column, the larger the footing would be. Hence, a 5'-0" high, 8" square column would rest on a 16" square footing; a 9'-0" high, 10" square column would sit on a 16" square footing.[63] Preliminary plumbing would also be laid at this time.

Meanwhile, the lumber was being prepared. Once the lumber was delivered to the site, rows of power saws were set up in a portable saw mill. The repeated use of standardized lengths enabled the carpenters to turn out quantities of lumber quickly, after which it was promptly funnelled to the construction crews. Rafters, sheathing, headers, studs, joists, cripples, collar beams, canopy rafters, canopy braces, second-story platform braces, stair stringers and more could be precut with tremendous manpower savings.[64] At Fort Meade, it was calculated that a four-saw hook-up produced 150 rafters an hour and could produce as many as 300 or more in that time.[65]

Ready for framing, a building's construction crew was further subdivided. One group laid only the first floor framing. Then the plumbing crew would return to finish the above-floor installation. Another crew assembled the wall frames on the ground and raised them. Frequently the walls would be completely sided before erection, and the window openings cut out with power saws; in other instances the siding might be applied after the walls were raised.[66] The aqua medias over the first floor windows were assembled either as part of the second-story wall panels and were inserted into a slot between the first and second floors, or in some cases they were merely "falsework" and nailed on afterwards.[67] The aqua medias, whether as a continual band or as individual units, capped all first-floor windows in a cantonment. The next crew completed the second story, and yet another constructed the roof. Roofs were covered with bituminous roll roofing on sheathing. As soon as framing was completed the electrical and heating systems could be installed. Similarly, window and door units would be installed after the framing and siding was complete.

In order to keep the cantonment construction running smoothly, shifts were carefully calculated and superintendents were assigned to each phase of construction and each construction crew. All these divisions of labor were intended to keep the pace of construction at a maximum level. As the directives all proclaimed, speed was of the essence.

The Shortcomings of Speed

Despite the simplification and routinization of construction methods, the priority of speed occasionally resulted in poor construction. In February 1941, the Construction Division urged greater care in conforming to specifications, noting that "insufficient nailing, omission of scabs and bracing, use of lumber far below specified grade, bad framing, and faulty installation" were undermining the cantonment program.[68]

An example of poor-quality construction, even when specifications were followed, was illustrated in the investigation of construction at an Air Corps station. Specifically, the complaint read:

> This building was constructed of unseasoned lumber, using 8d finishing nails resulting in the sheeting being badly warped and on May 6, [1941,] less than six weeks after completion, during a light rain the roof leaked in numerous places; in addition to faulty roofing the siding was placed over the diagonal sheeting using 8d finishing nails which allowed not more than one inch of nails to penetrate the studding of the frame work and in many places the nails did not penetrate the studding at all; at the present time the siding is warped and loose around the entire building, leaving large cracks throughout the wall rendering the building unsuitable for use as a storehouse for valuable equipment, without being reroofed and resided.[69]

The excuse offered was that the received orders directed "that construction be undertaken in the most expeditious manner possible and without delay." Despite rejecting several truckloads of lumber, the field commander was eventually forced to accept lumber with excessive moisture or else further delay the project. The moisture content was increased by rainfall, which further dampened the uncovered lumber. No shelter was provided for the lumber because none was authorized at this early date. Not surprisingly, once the drying process began, the lumber contracted and cracks appeared. In response to the accusations concerning the failure of the nails, it was noted that galvanized nails were specified and the only galvanized nails available were finishing nails instead of the common construction nails necessary for sturdy construction.[70] Thus, even following the rules could still result in substandard construction.

Figure 17 World War II cantoment construction.

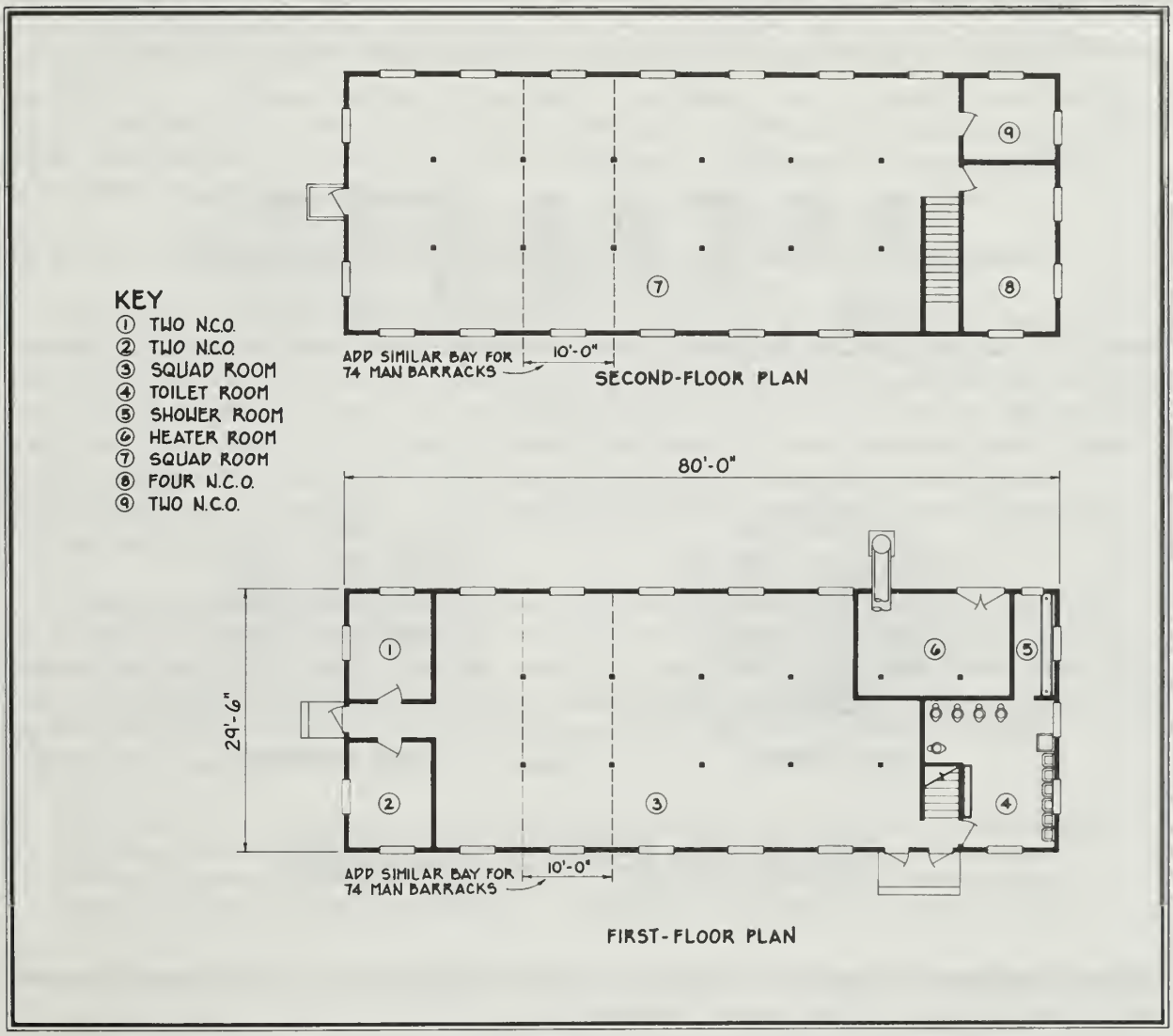


Figure 18 *Floor plans of 45 & 63 Men Barracks - 700 Series.*

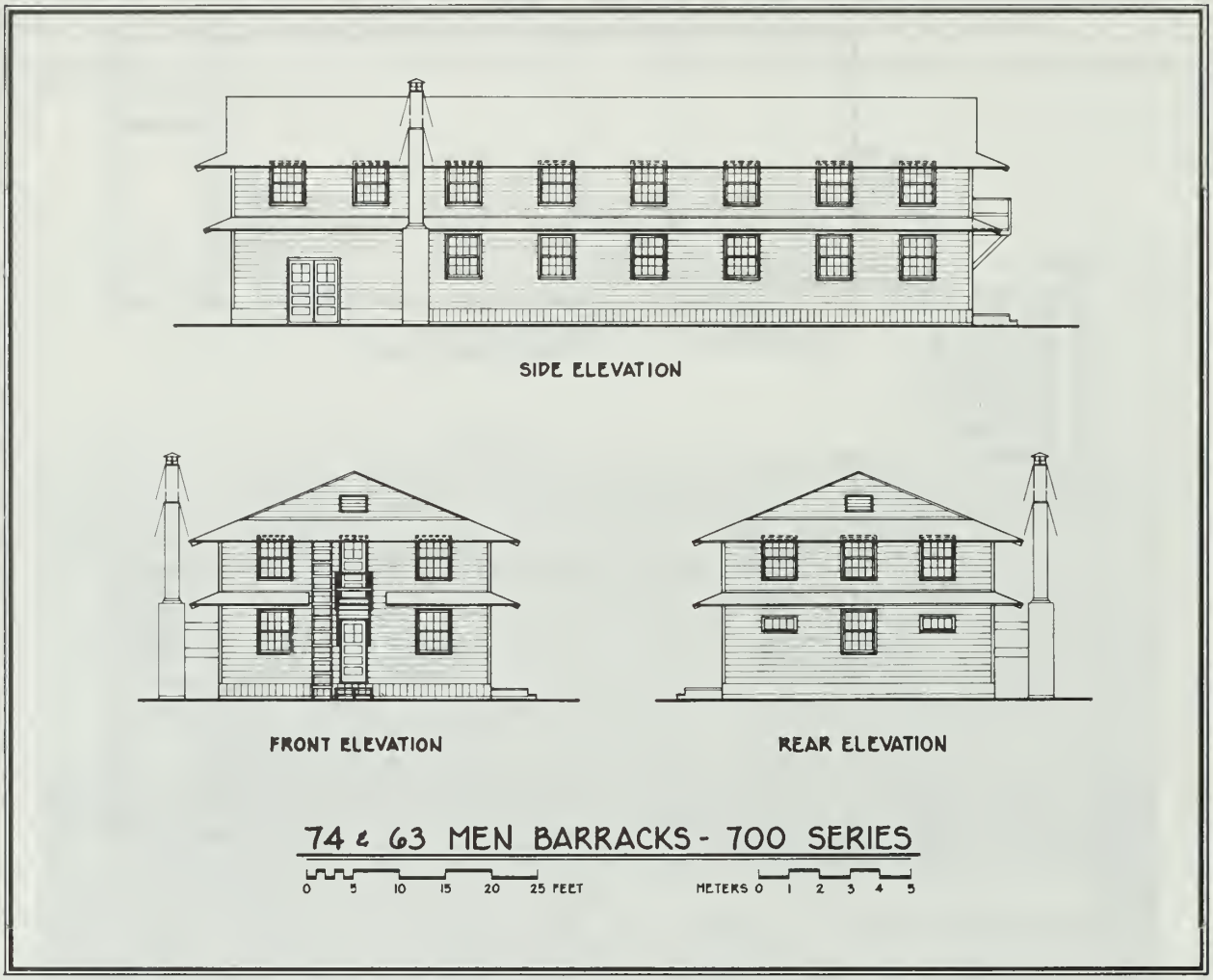


Figure 19 Elevations of 45 & 63 Men Barracks - 700 Series.

EVOLUTION OF THE 700 SERIES

By summer 1940, construction was well underway. At the same time, the design section was producing new drawings and revising the "old" ones as they were needed.[71] The 63-man barrack, Plan No. 700-1165, which was most frequently used in the cantonments, also evolved over time. The following sections document the changes made to the 63-man barrack. As many of the structural changes were also applicable to other mobilization structures, the barrack provides a model for understanding the changing character of army mobilization construction. By tracing how and why the barracks changed, it is possible to gain insight into the army's mobilization construction program as a whole as well as how it responded specifically to shortages, to modifications in army strength and organization, and even to public opinion.

Barracks: Their Relationship to the Standard Battalion Block and Troop Organization

The early mobilization drawings included plans for a number of barracks with different capacities, including 25-, 45-, and 63-man units. Despite the June 15, 1940, and July 18, 1940, War Department construction policies stating that the 63-man barrack would be utilized, other capacities continued to be used. Part of the problem, which was recognized by the design section at the time, was that the army simply could not state definitively what size, shape, and capacity the army units would take.[72] New warfare techniques since World War I had rendered the old organizations obsolete and the new organizations were still evolving. It was not until early fall 1940, that specific types of cantonment buildings were developed.[73]

Troop organization as a factor in cantonment design was a two-pronged concern. First, camps needed to be planned so as to facilitate quick access to training grounds, rifle and artillery ranges and armored division grounds. Hence, barracks needed to be located near the periphery of the camp, with easy access and egress. Second, barracks were organized so that regiments of troops scheduled to fight together could also be trained together in semi-autonomous groups.[74] *Engineering News-Record* explained the organization of troops within a camp:

> Six buildings completed the company group--three barracks, a mess hall, a storehouse and a recreation building. Six company units are placed together to form a regiment group which include (in addition to the company buildings) headquarters administration buildings, infirmary, barracks for the headquarters company, regimental cold storage building, truck garage and fire house. Regimental groups are separate from each other by 250-ft. open strips as a fire break.[75]

As the division training plans changed, so did site planning. For example, the "Schedule of Basic Housing Requirements" for a Motorized Triangular Division was subdivided into nine units: Division Headquarters, Headquarters and Military Police Company, Reconnaissance Training, Signal Company, three Infantry Regiments, Division Artillery, Engineers Battalion, and Quartermaster Battalion. Thus the organization of the units, as described in the above *Engineering News-Record* article, would be adapted to the new division organizations.

The key to determining a barrack's capacity was the overall size of a company. By October 1940, the decision had been made that for triangular divisions a 63- and not 45-man barrack should be used.[76] One year later, the triangular division had been modified.[77] As troop organizations became codified, new directives were issued which explained the type of layout, the capacity, and the number of barracks.[78] Throughout, building schedules were to be coordinated with typical layout plans.[79]

SCHEDULE OF BASIC HOUSING REQUIREMENTS FOR MOTORIZED TRIANGULAR DIVISION

For a Company Echelon:

Building Type	Plan Number	Number of Buildings
74-Man Barracks	800-443	224
112-Man Mess Hall	800-847	27
172-Man Mess Hall	800-849	9
228-Man Mess Hall	800-851	44
Company Administration and Storehouse	800-661	80
Recreation	800-459	40
Recreation	800-460	44

For a Battalion Echelon:

Building Type	Plan Number	Number of Buildings
Administration	800-222	11
Administration	800-210	5
Storehouse	800-663	7
Post Exchange	800-531	2
Recreation	700-310	2
Infirmary	800-1429	2

For a Regimental Echelon:

Building Type	Plan Number	Number of Buildings
Administration	800-210	4
Storehouse	800-664	4
Post Exchange	800-480	4
Recreation	700-310	4
Infirmary	800-1429	4

For a Division Echelon:

Building Type	Plan Number	Number of Buildings
Administration	800-204	1
Administration	800-210	1
Storehouse	800-664	1
Post Office	800-217	1
Post Exchange	800-480	1
Div. Com. Sch. (Mod.)	800-443	2
362-Seat Chapel	800-550	5
Service Club	800-1290	1
Guest House	700-1290	1
Dental Clinic	800-1432	1

For Officers' Quarters:

Building Type	Plan Number	Number of Buildings
Division Commander	800-306	1
Brigade Commander	800-307	2
Regimental Commander	800-308	3
Officers' Quarters	800-317	15
Officers' Mess Hall	800-851	6
Officers' Day Room	800-451	6
Officers' Day Room	800-809	1

For Motor Park Facilities:

Building Type	Plan Number	Number of Buildings
Motor Repair Shop	800-606	23
Oil House	700-384	23
Wash Rack	700-348	23
Grease Rack	800-1026	23
Motor Repair Shop	800-1390	1

For Motor Fuel Facilities:

Building Type	Plan Number	Number of Buildings
Stations	800-601	5
Tanks	800-65-	15
Nozzles	800-616	48

For Guard House Facilities:

Building Type	Plan Number	Number of Buildings
Unit Guardhouse	800-1007	8

Source: Office of the Quartermaster General, Construction Division, "Schedule of Basic Housing Requirements, Motorized Triangular Division." Washington National Records Center, RG 77 - Entry 107 - Box 803.

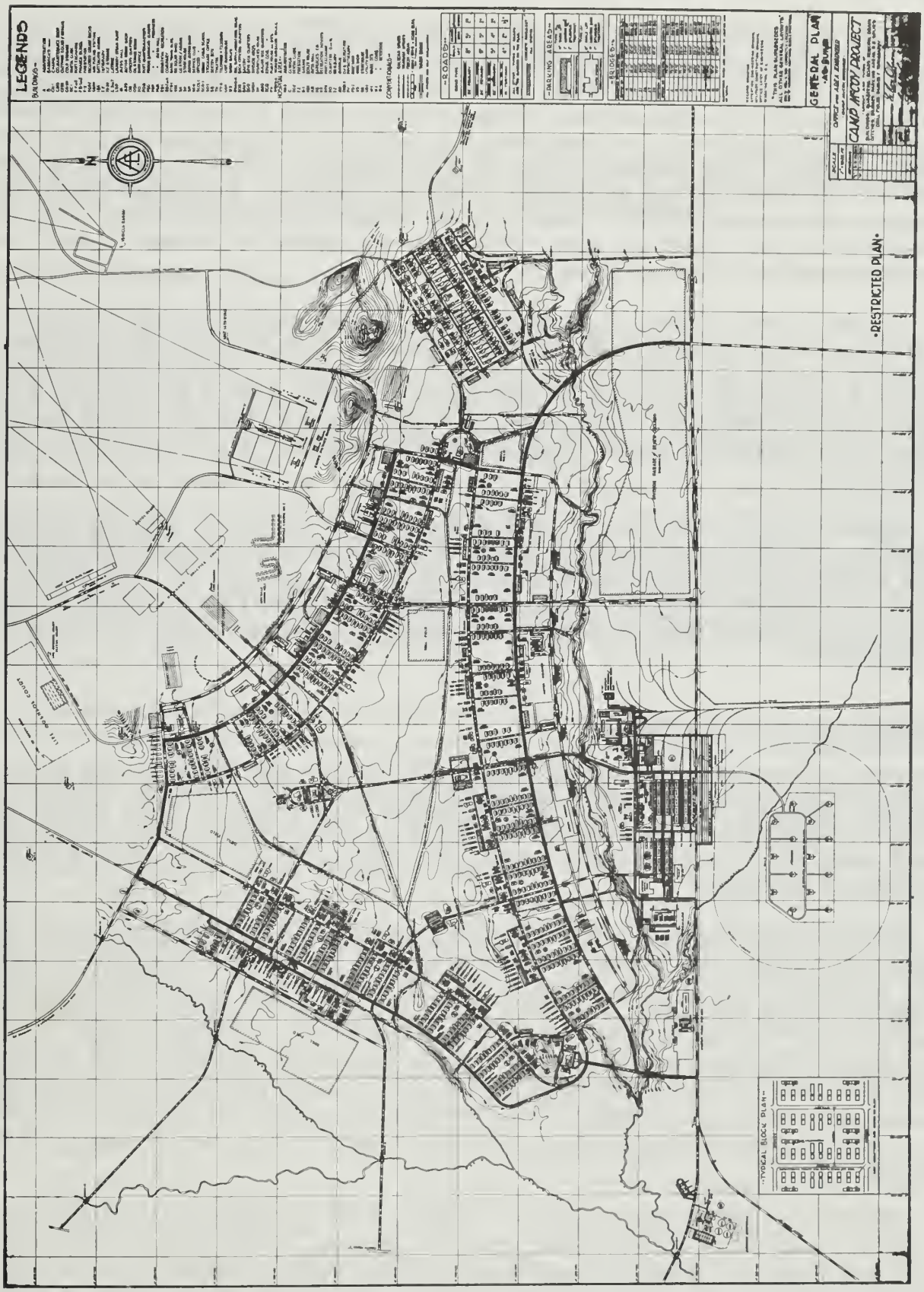


Figure 20 Triangular Division layout, Camp McCoy.

As early as January 1941, the engineering branch had reviewed the organization and troop capacities of the various divisions and had determined that the 63-man barrack was suitable only for the quartermaster battalion.[80] It suggested that using 74-man barracks would save space, materials, and concomitantly, money. Specifically, the engineering branch calculated that the substitution of 74-man barracks for 63-man barracks at a triangular division camp would require forty-two fewer barracks and hence save in materials, labor, and utilities totaling approximately $421,000. The substitution of 74-man barracks for 63-man barracks at an Armored Division would reduce the number of barracks by 28 and would effect a cost savings of approximately $326,000.[81] Simply a one-bay elongation of the 63-man barrack, a sketch of the proposed 74-man barrack was drawn in May and it was approved for inclusion in the list of standardized mobilization drawings in July 1941.[82]

In the July 15, 1941, "Revision of Basic Barracks Plans," Casey also suggested revisions to both the 63- and 74-man barracks, including "certain structural improvements in the foundations and bracing, self-supporting chimney in place of guy-supported smoke stacks, improvements to heating system to reduce fire risk, insulation improvements, additional hot water and shower facilities, as well as shelf and coat rack for each occupant."[83] While some of these improvements were made to the Plan No. 700-1165 barrack, others were incorporated in a new set of plans, designated the 800 Series, which were still in the process of being designed.[84]

During the process of construction, the 700 Series was constantly being revised. There were frustrated reports from constructing quartermasters that construction had to be stopped and ripped out to accommodate new directives, often for minor changes which had no significant impact on the overall structure.[85] Finally, the Construction Division established a policy stipulating that revised plans should be incorporated into current construction, unless the cantonment's advanced stage of planning or actual construction made it impractical.[86]

Industry Input and Public Opinion

In the interest of improving the 700 Series, the design section was guardedly open to comments from the field. Attempting to strike a balance between beneficial improvements and wasteful luxuries, and between centralized control over designs and efficient field decisions, the Adjutant General permitted the local constructing quartermasters to adapt the plans to accommodate local conditions, providing that the modifications were minor.

The Construction Division also had to strike a balance between army decisions, industry comments and special interest groups. With the army's decision to use lumber for the mobilization construction, the brick, tile, and concrete industries lodged protests that they were being boxed out of a lucrative market, that temporary buildings were wasteful of tax dollars, and that the availability of materials should dictate what was used where. Likewise, the lumber industry protested when the army opened bid solicitations to steel prefabricators. Addressing the aethetic and moral aspects of construction, Eleanor Roosevelt and W.H. Harrison, head of the Advisory Commission to the Council of National Defense (NDAC), felt that the camps' streets should be curved rather than on a orthogonal grid and urged the construction of churches on the bases.[87] Moreover, they were in agreement with the painting industry that the camps should be painted.[88]

The NDAC assisted the War Department in predicting future procurement needs and appropriate industries in preparing for wartime demands. In fall 1940, the NDAC, with the concurrence of Hartman, contracted with the well-known Chicago architectural and engineering firm of Holabird and Root to review the plans. Generally, the review was favorable, with the added comment that there should be greater

experimentation with alternate materials such as steel and tile, and that site planning should take into better account the natural topography. Too late to effect these recommendations at current cantonments, Holabird and Root urged that they be implemented in the construction push under consideration for the spring 1941 Selective Service call. [89]

G-4's decision that spring to permit construction plans to deviate from the standard plans allowed the field to take advantage of local materials and conditions. By January 1942, however, steel prefabrication was no longer permitted as the metals would be needed for combat equipment.[90]

The New Construction Division

The NDAC was not the only group of experts to whom the Construction Division turned to for advice. Among the many changes implemented by Somervell when he replaced Hartman as chief of the Construction Division in winter 1940-41 was the recruitment of a new group of professionals. In contrast to Hartman's advisors who were retained on a consultancy basis, these professionals became, for a time, actual employees of the Construction Division. Among them were A.J. Hammond, president of the American Engineering Council; George E. Bergstrom, President of the American Institute of Architects; Frederick Fowler, President of the American Society of Civil Engineers; and Warren McBryde, past President of the American Society of Mechanical Engineers. Finally, Somervell was able to persuade the Corps of Engineers to "loan" him three engineering officers to fill three key positions, with the understanding that they would have to be returned in June. Among these officers was Hugh Casey, widely regarded as one of the most brilliant young engineers in the army. He would take over as chief of the design and engineering section under the supervision of Somervell. These men, particularly Casey and Bergstrom, would prove to be especially important in the revisions and changes to barrack design in spring and summer 1941.[91]

Somervell had several agendas to advance with his restructured organization. One was to control the spiraling costs of the construction program. One month after assuming his position, Somervell stated that "nothing aside from crookedness will subject this office to criticism as will exorbitant costs. Dementia dollaritis must be stamped out."[92] Rather than control costs, however, it appears that Somervell only mitigated the impact of increased costs. For example, as delays in the construction program led to cost increases, Somervell responded by ordering studies of the causes of delays. One cost-overrun study estimated that 25-35 percent of the increases were due to the cost of labor and material, 50-60 percent to additional requirements, and 15-25 percent to changes in plans and underestimations of costs. Another study attributed the majority of cost overruns to haste, both in site selection and actual construction. Moreover, by attributing the construction delays to the unavoidable costs of the start-up program under Hartman, Somervell was able to deflect criticism away from himself and towards his predecessor.[93] In order to generate favorable industry press accounts, Somervell hired George Holmes to serve as a public relations agent. Yet, appropriations continued to be approved in light of the need for wartime construction. Somervell thus inherited a program that, while in good shape, still needed to provide additional housing quickly for an expanding army while avoiding the mistakes made in the start-up program. And even though economical measures were important, they were still secondary to speed.[94]

In reorganizing the Construction Division, Somervell clarified the duties of G-3 and G-4; the former would be responsible for proper site selection and the latter would oversee the construction on those sites. In addition, Somervell initiated review of the standard plans and layouts and began to calculate housing requirements for another million men. In this regard, he reconsidered the army's reluctance to use brick, tile, and other products excluded by the original specifications.[95] The 700 Series thus came under intense scrutiny. In response, northern construction was bolstered. Roofing members were increased in size, the number and size of bracing members were increased, and bolted roof and bracing members were

strengthened.[96] As details were altered, stresses refigured, and specifications rewritten, a new series was beginning to take shape under the direction of Somervell.

The changes that Somervell initiated during his tenure were but a precursor to a more significant transformation that occurred when the entire building program was transferred over to the Corps of Engineers. There had long been a rivalry between the two Construction Divisions of the army--the Quartermaster Corps and the Corps of Engineers. In fall 1941, a group of engineering officers, headed by chief of engineers Julian Schley and special assistant M.J. Madigan, saw an opportunity to consolidate all the army's construction activities. Influenced by both favorable sentiment toward the Corps of Engineers in Congress and also considerable congressional dissatisfaction with the Quartermaster Corps' handling of the cantonment construction program, this small group quickly gained the support of the War Department. Fending off proposals to establish a separate Construction Division and gaining the crucial backing of President Roosevelt, Madigan maneuvered through Congress a bill turning over all war construction to the Corps of Engineers. It was signed by Roosevelt on December 1, 1941. Overall, the consolidation between the two divisions went smoothly. Constructing quartermasters were free to transfer into equivalent positions in the Corps of Engineers. The quartermaster zones were easily transformed into engineering districts, and many zone constructing quartermasters became district engineers.[97]

The initial mobilization push to construct facilities for a 1,400,000-man army was essentially complete by late summer 1941. Yet, the work of the Construction Division did not cease. Through impressive arguments before congressional committees beginning in May, Somervell had secured funds to continue building. In July, a supplemental appropriation passed with pleading from Chief of Staff Marshall. After fierce congressional debates, the bill--including $90 million for camps and cantonments--received Roosevelt's signature on August 25. The War Department's most compelling argument for military expenditure was made not in Congress but in the newspapers. Any congressman following the international situation through the media could predict quite easily that the nation might soon enter the war. In the west, Japan continued to take over portions of southeast Asia. In the east, Hitler had invaded Russia, and recurrent Axis sinking of American ships brought the United States closer to the edge of the conflict. It was quite obvious to Roosevelt and other military leaders that, in addition to lend-lease, the embargo of oil to Japan and other non-military measures of containment, the army would have to continue to expand. In addition to other purposes, the bill signed by Roosevelt included funds to expand the army by an additional 400,000 men, bringing the total force to 1,727,000.[98]

The enlistment estimates of military planners ranged far beyond the 400,000 men added to the military machine early that fall 1941. As early as June 1940, one plan had estimated a total mobilization force of 4 million men by spring 1942, while "the victory program" formulated in September 1941 envisaged a total force of almost 9 million "to defeat our potential enemies." Realistically, even after Pearl Harbor, G-4 contemplated more modest but still substantial increases. By January 1942, the War Department estimated 3 million men would be needed as soon as possible. On January 1, 1942, a "training and mobilization plan" submitted by G-3 set the total troop strength of the army at 3,317,000 soldiers.[99]

However large the first huge mobilization program was in 1940-41, the peak had yet to come. As of June 28, 1941, the Quartermaster Corps had completed 100 defense projects and had 324 underway. By that December, the Quartermaster Corps had completed 375 separate projects, including sixty-one camps. Two hundred twenty more camps were underway, with ten camps and eighty-seven "miscellaneous troop facilities" also under construction.[100] In January 1942, a memo to George C. Marshall from then Assistant Chief of Staff Somervell still called for more. Somervell stated that the 3 million-man army would require "at least 21 new camps of 35,000 [soldiers] each."[101]

EVOLUTION OF THE 800 SERIES

Description of the 800 Series

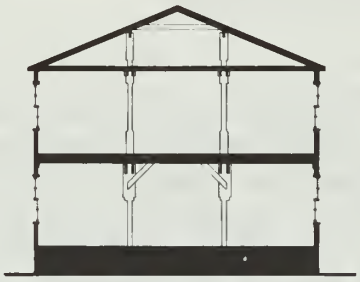
Contemporaneous with the revisions of the 700 Series, Somervell's chief architect, George E. Bergstrom, was at work on the new 800 Series. Lieutenant Colonel Hugh J. Casey of the Construction Division stated the reasons why an 800 Series building was both necessary and better than its 700 equivalent: 1) the building was more functional; 2) it was more liveable; 3) it was structurally safer since its solid construction protected against poor grades of lumber; 4) it was better adapted to the organization of army divisions; 5) the cost per building was higher, but fewer buildings would be needed; and 6) the decrease in number of building would decrease utility costs.[102] In sum, the 800 Series was billed as a "leaner but meaner" structure.

An analysis of the new 800 Series barrack, Plan No. 800-443, illustrates Casey's points. The essential plan and shape of the barrack was unchanged; it was still two stories, with drop siding. However, unnecessary embellishments were stripped and the structural systems were strengthened. For example, Bergstrom's balloon construction provided greater rigidity than did platform construction, since the studs rose the full two stories in a single length without having to be spliced. In the previous case of platform construction, the second story was not an integral part of the structure; rather it was a separate unit fastened on top to a base. The 800 Series improved upon the design of the 700 Series in several significant ways. Studs were placed 2'-0" on center, and floor and roof construction were strengthened. Additional bracing was provided in earthquake areas. Squad rooms were larger: the exterior first-floor wall height was increased to 9'-7" from 9'-2-1/4". The second-floor exterior wall height increase was even more significant--8'-9" instead of 7'-3-1/2"--thus opening the possibility of double bunking. The posts on the first floor remained the same--6" x 6"--but for the enlarged second floor they were increased from the 4" x 4" of the 700 Series to 6" x 6". Details included heavier roofing paper, and refinements to the heating and plumbing details.[103]

Casey's rationale that the 800 Series was better suited to the organization of army units and was more cost-efficient than the 700 Series was, in fact, spurious. Basing his conclusion on a comparison between Plan No. 700-1165 (63-man barrack) and Plan No. 800-443 (74-man barrack), Casey neglected to notice that Plan No. 700-1165 already offered both 63- and 74-man capacities, and that the 74-man unit had been approved and used. Similarly, a 63-man option was integral to Plan No. 800-443. The purported savings in number of buildings and utilities in the 800 Series had, in fact, already been achieved with the 700 Series 74-man barrack. Thus, there is no indication that the 800 Series 74-man barrack achieved any savings over the 700 Series equivalent.[104]

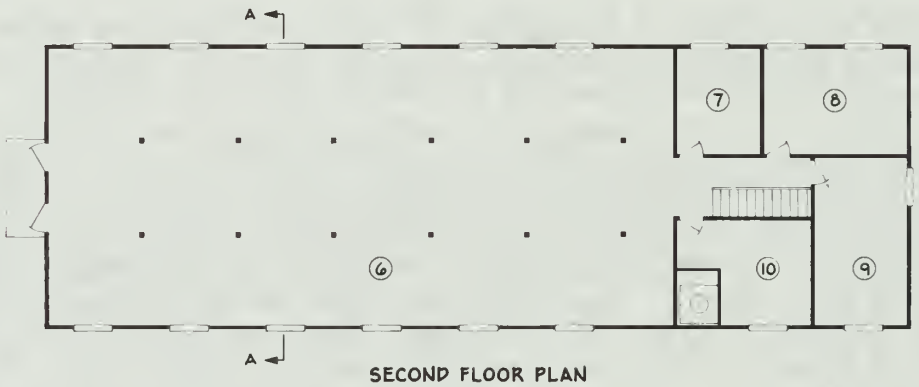
Reactions to the 800 Series

The new and improved series was not without its opponents. The strongest complaint was that the majority of the changes could have, and in some cases had, been incorporated into the 700 Series, such as the removal of the aqua medias and termite shields.[105] The 800 Series was also criticized for being too solid for the mandated "temporary" construction. While earthquake-proofing was seen by some as a sound consideration for west coast cantonments, others pejoratively termed it a "California" type.[106] Similarly, hurricane-proofing was considered to be of negligible value. While one of the draftsmen praised the structures as "excellent," as having a "longer life, sturdier, and more spacious" construction, the chief of the design section criticized the plans as having "too many long life" precautions for use in temporary

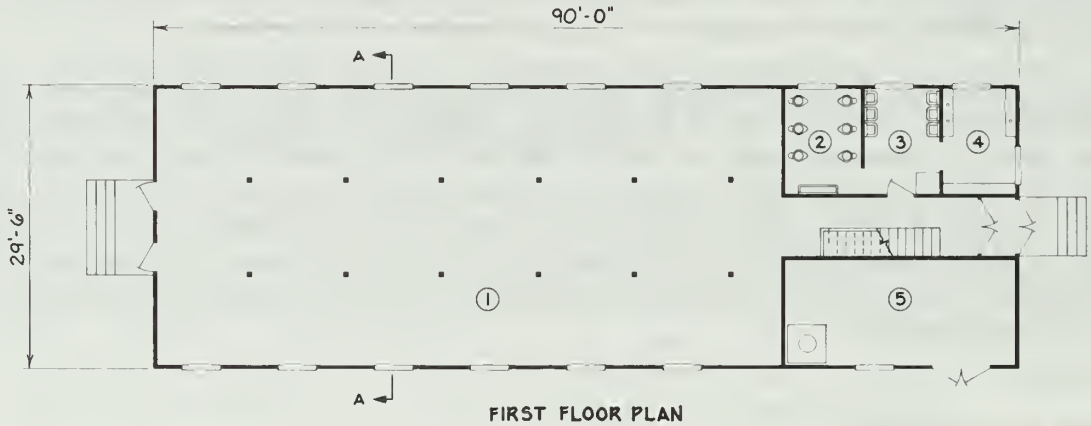


SECTION A-A

KEY
① SQUAD ROOM
② TOILET ROOM
③ WASH ROOM
④ SHOWER ROOM
⑤ HEATER ROOM
⑥ SQUAD ROOM
⑦ TWO N.C.O.
⑧ THREE N.C.O.
⑨ THREE N.C.O.
⑩ TWO N.C.O.



SECOND FLOOR PLAN



FIRST FLOOR PLAN

74 & 63 MEN BARRACKS - 800 SERIES

0 5 10 15 20 25 FEET

METERS 0 1 2 3 4 5

Figure 21 Floor plans of 74 & 63 Men Barracks - 800 Series.

Figure 22 *Elevations of 74 & 63 Men Barracks - 800 Series.*

construction."[107] Resistance to the 800 Series also came from the field. From Fort Leonard Wood, the report came that the field command preferred certain 700 Series buildings because they were more suitable for the needs of the camp and were less expensive.[108]

The Office of Production Management charged that certain specified lengths of lumber for balloon construction would be difficult to obtain in large quantities and that the odd sizes would result in excessive carpenters' labor. Somervell acquiesced and shortened some buildings' specifications, thereby decreasing the strength of a structure in areas not threatened by hurricanes or earthquakes.[109]

The reasons for the development of the controversial 800 Series remain unclear today. The creation of a series that required more and larger timbers, and was built more solidly than before, flew in the face of the conservation ethic which had permeated the construction planning effort. Some structural revisions may have been needed to ensure safety, but they could have been incorporated into the 700 Series. Similarly, the streamlining of details could also have been achieved in the 700 Series without massive revisions. What, then, was the impetus behind the 800 Series?

It may be as simple as Casey's defense that only a new series could adequately address the changing needs of the construction program. Whereas Hartman had been pushed to act quickly, Somervell had the time and clout to assemble "all the big fish from industry" including Bergstrom who, in turn, pulled in experienced architects and engineers.[110] It is plausible that Somervell's new construction team simply wanted to build higher caliber buildings.

Professional reputations and ambitions as well shaped the design process. Fine and Remington's interviews with members of the Construction Division paint a picture of a coterie of experts who wanted to utilize their expertise, or build their careers, even though the program may not have required it. Colonel Leslie R. Groves remarked that the temporary nature of the cantonments were not the sort of architecture that would make its creators proud. Similarly, the tensions among the Hartman group and the fancier Somervell team were recorded by Remington: "Bergstrom was the guiding light of the 800 Series, I gathered that the old crowd didn't think too much of Bergstrom and the great geese Somervell brought in."[111]

Use of the 800 Series

By early fall 1941, both the revised 700 Series and new 800 Series had been approved and were ready for use in the field. The inclusive "New Index of Standard Plans for Mobilization Type Buildings" came with clear directions: the plans for temporary buildings not listed had not been authorized, since they had either been revised or altogether eliminated. Moreover, the 700 Series plans were to be replaced by the corresponding 800 Series plans, except in special circumstances. For example, the 700 Series could be used when constructing extensions to existing 700 Series buildings, constructing new buildings in 700 Series type camps, or when an 800 Series plan was unsuitable or unavailable.[112] Revisions to camp layout plans show that both 700 and 800 Series buildings were used in a single camp.[113]

Thus, even before the U.S. entry into the war in December 1941, a new roster of camps were in the planning stages using the new 800 Series drawings that Casey and Bergstrom had produced. Nine sites for new camps had been approved as early as May 2, 1941, and the architect-engineers that had been selected began work on plans and specifications. Two weeks later the Adjutant General issued orders to corps area commanders to investigate sites for an additional fourteen camps; these sites were approved in the third week of July 1941. In the fall, these camps were planned and bids were advertised. Architect-engineers were also hired and contracts were signed. By July 30, the War Department reported that sixteen new

"triangular division" camps had been approved, with two more required. Additionally, it noted that four "armored division" sites and two antiaircraft sites were required and had been approved.[114]

The new camps that were approved and planned in summer and fall 1941, based upon the new 800 Series, were to be built following a different procedure than that used in previous camps. *Engineering News-Record* reported that "the modified plan results from experience gained in the original camp program, combined with the fact that more time is available for study and design."[115] Preliminary site checks confirm that these new cantonments were built using the 800 Series. As certain building types had no 800 Series equivalent, a predominantly 800 Series camp would also have a few 700 Series buildings, such as a recreation building, motor repair shop, and one or more guest houses.[116]

One of the designers of the series, Captain Christian F. Dreyer, stated in 1959 that the 800 Series was used extensively during the wartime period. Since the Construction Division had invested a great amount of time and effort into creating such drawings, the general rule seemed to be that new camps approved and planned during this time span would be based upon the 800 Series drawings.[117]

EVOLUTION OF MODIFIED THEATER OF OPERATIONS AND T.O. 700 SERIES CONSTRUCTION

The U.S. entry into the war necessitated a reorganization of construction policies. The shift in focus from a defensive war to an all-out press for victory gave munitions and combat equipment production highest priority. The rapid expansion of the army required rapid construction, but the diversion of critical materials to combat-needs production restricted the construction industry's access to building supplies. Funds, however, continued to be appropriated for additional cantonment construction and the plans approved before Pearl Harbor continued to be implemented.

However, wartime restrictions curtailed the time, money and material available to build such structures. Thus before long, the War Department ordered the Construction Division to forgo the 800 as well as the 700 Series buildings and erect instead structures which were cheaper and more temporary. By October 1942, the 800 Series had been cancelled.[118] Clearly, the exigencies of war had a great effect upon the nature of construction.

In the end, however, the Quartermaster Corps--and after the transfer, the Corps of Engineers--were able to provide all the troop housing the army needed, whatever the number was. Their progress was astounding: the total housing capacity was increased from 315,000 men in January 1941 to 2.4 million by June 1942 and 4.6 million by January 1943.[119]

Shortages and Conservation of Materials

Even before the United States became involved in the war, shortages of material influenced the evolution of the building program. Revisions to the early specifications forecasted that metals were and would continue to be scarce; hence the use of metals or galvanizing were to be greatly reduced.[120] By early 1942, it became obvious that the old construction program, whether 700 or 800 Series, would have to be revised. Within months, the predicted shortages of material turned into actual shortages. The use of substitute materials was expressly directed: shortages of copper led to the adoption of plastic screens, rubber led to asphalt or fiber filler in expansion joints and jute led to paraffin-coated cotton braid. What had been metal roof ventilators, pipes, and manhole covers were now made of wood, gypsum board, or

cement asbestos. Dispensable components such as rain spouts and gutters were eliminated. In February 1942, the Office of the Corps of Engineers listed 300 substitute materials for critical materials. A year later, the list had grown to 35 pages.[121]

By spring 1942, lumber had also become a critical material. The problem was not a lack of timber per se; instead it was the shortage of skilled labor and machinery to mill it.[122] In order to continue building the cantonments, it was necessary to alter the specifications. In May 1942, the field was thus directed to purchase all the 2" x 2" and 2" x 3" boards, tongue and groove decking, bridging, sills, timbers, plates and headers in random lengths. Moreover, they were to specify rough timbers and posts and to use one grade lower than was actually specified, except when framing. Plans were altered to accept the random widths and lengths that were available. Finally, balloon construction was to be avoided, since it required the scarce longer lengths of lumber. The next month, Bergstrom's sturdy 800 Series was cut back further; in Plan Nos. 800-120 and 800-121, 2" x 6" studs were replaced with 2" x 4"s, and every other knee brace was to be eliminated as well as those for windows and doors.[123]

Tent camps, too, were affected by war mobilization. The cost of maintenance, plus the shortage of canvas, resulted in their conversion to hutments. A hutment was created by removing the pyramidal canvas roof and replacing it with a solid sheathed roof constructed over 2" x 4" bracing. The prefabricated 16'-0" x 16'-0" wall frame remained the same.[124]

In order to compensate for the labor shortage, the army experimented with prefabricated barracks based on CCC camp designs that were easy to erect. These temporary, demountable buildings were of wood construction; even the foundation posts were wood which had been dipped in creosote as a preservative. Erected in panel units and joined by lag screws, an individual building could be completed in three hours.[125]

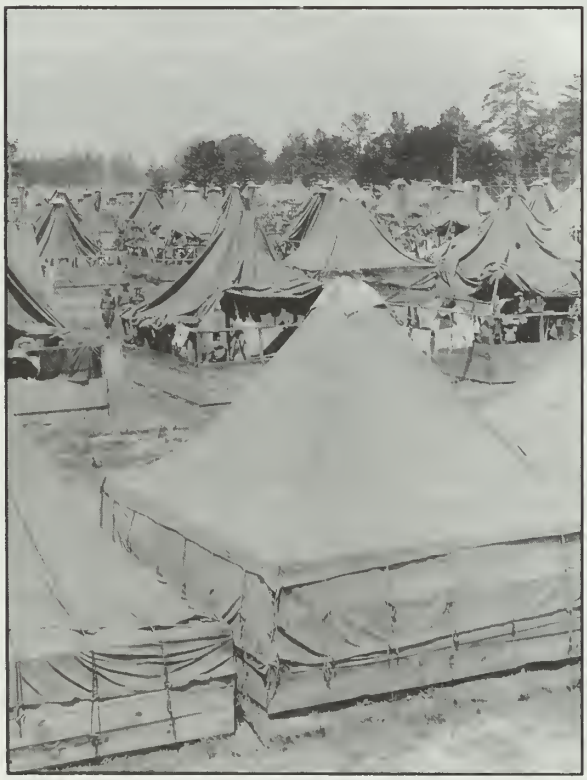


Figure 23 Tents at Camp Wheeler, Georgia, 1917.

Figure 24 Hutments at Fort Sill, Oklahoma, 1942.

Alternatives to New Construction

The army's attempts to deal with the material and labor shortages did not, however, satisfy the conflicting conservation and construction objectives. Alternatives to new construction were needed. One policy was to take control of hotels and apartment buildings and house troops therein.[126] Another was to reintroduce the idea of double bunking.

Double bunking was an idea that had been considered in 1940 and subsequently rejected. Nonetheless, by building the typical barrack on 60 square feet of floor per man with 720 cubic feet of air space per man, the Construction Division had left room open for emergency crowding. When the idea resurfaced in 1941, the Surgeon General was extremely opposed to the practice of double bunking, arguing that it significantly increased the transmission of respiratory diseases.[127] But the idea of double bunking was never completely shelved. One month after the Medical Corps' denouncement of double bunking, a quartermaster memorandum reported that both the 800 and 700 Series barracks were structurally adequate to house double the intended capacity, but that the lavatory facilities could accommodate only a 25 percent increase.[128]

Under the influence of war conditions, a study was produced in July 1942 that reexamined the possibility of double bunking. By mapping where extra bunks could be fitted, the Chief of Engineers devised a chart showing various expanded capacities for each type of barrack in use. Despite a recommendation that double bunking be limited only to the reduction of 50 square feet of floor space and 450 cubic feet of air space per man, Somervell endorsed the most extreme proposal that reduced floor space to 40 square feet and air space to 375 cubic feet per man. The results were as follows:[129]

Plan	Original Capacity	New Capacity
T.O. 11.4M	32	50
700-1165	63	91
700-1175M	45	74
700-1185	63	92
700-1185M	63	95
800-443	63	91
800-443	74	105

None of these stop-gap measures, however, provided sufficient shelter for the number of troops needed for war. Required to provide additional shelter on an emergency basis, forced to avoid certain types of lumbers, glues, canvas, and metals, the Corps of Engineers maximized construction by using a building type that did not require critical materials: the theater-of-operations.

Modified Theater-of-Operations Construction

Hitherto, theater-of-operations (T.O.) construction had been used only at the theaters of war. These structures were of the most temporary kind, essentially consisting of flimsy framing, batten and tar paper sheathing. Believing the T.O. type to be too crude for stateside troops, a modified theater-of-operations type was developed. It was in February 1942 that the T.O. construction was modified for use in the Zone of Interior and circular letters detailed the changes to be made. The following April, the "War Department Construction Policy, Zone of the Interior" ordered:

> Construction at camps, posts, and stations will be Theater of Operations type modified, or mobilization type temporary construction. Modified Theater of Operations type construction will be used for all new camps. Mobilization type temporary construction may be used in the expansion of existing posts, camps, and stations when this type of construction has been

Figure 25 Theater-of-Operations type, Camp McCoy.

previously used, and for those projects where advance planning has been completed and construction will be seriously delayed by revising the construction type.[130]

This policy was further articulated two months in June with the following directive:

In general, all construction shall be of the cheapest, temporary character with structural stability only sufficient to meet the needs of the service which the structure is intended to fulfill during the period of its contemplated war use.[131]

In light of these measures of expediency, it is not surprising that the 800 Series was cancelled by October and superceded by T.O. 11.4.[132]

In order to modify existing T.O. plans as quickly as possible, district engineers throughout the country were assigned specific plans to design. The result was a one-story structure with wood or concrete floors, whose studs and rafters were 4'-0" on center, with 15 lb. felt sheathing and magazine stoves or space heaters for heat. Latrines were in separate buildings.[133] While then Major Smith was proud of the efficiency in designing the structures, another member of the Construction Division focused on the inadequacies of the structures calling them "a sorry thing, with a safety factor of one."[134] Clearly, speed was emphasized over comfort. This position was echoed in a field report: "Having in mind that this is to be 'theatre-of-operations' type construction, from which it may be assumed that less than normal comfort in the way of facilities for the troops would be acceptable, it is my opinion that occupancy can be obtained by February 1 without the AA [almost highest priority] treatment."[135] And so T.O. structures--the most temporary form of army housing--were erected on bases across the country.

Although a Modified T.O. was the preferred building type, allowance was made for continued construction of the 700 and 800 Series. The black sheathing made T.O. housing hot in tropical climates and the flimsy construction made them unsuitable for cold climates. Colonel Groves, Chief of Engineers, permitted district engineers to use alternative plans for frigid or tropical type buildings if local climate conditions so dictated.[136]

By October 1942, the Modified T.O. type of construction had been superceded by the T.O. 700 Series. In making the change, the Chief of Engineers stated:

> Experience has shown that the original Theater of Operations drawings issued in conjunction with Technical Manual 5-283 and the Modified Theater of Operations drawings (11 point M Series) are not sufficiently flexible for use over the entire United States, nor have the designs been completely satisfactory in utilizing presently available construction materials.[137]

Description of the T.O. 700 Series and the "New" 700 Series

The new 32-man standard T.O. 700-5500 barrack replaced the 700-1165, 700-1165M, 700-1185, 700-1185M, 700-1100, 700-1150, 700-1443, 800-443, 800-437, T.O. 11.4 and T.O. 11.4.M. *See Appendix.* Twenty feet wide and 100' long, the barrack was similar to its Modified T.O. predecessor. It was still built with framing 4'-0" on center, but its structural weaknesses were bolstered by additional bracing. The greatest difference appears to be the increased comfort the new series provided. Buildings were better insulated and ventilated. The tar-paper and batten siding of the T.O. 11.4 was augmented by options to use horizontal siding, vertical siding, cement asbestos shingles, exterior type plywood, and a variety of treated wall boards. Interiors were equipped with modest amenities such as coat racks and shelves. These structures, too, were candidates for double-bunking, and plans were specifically prepared showing different bunk layouts for various capacities. As in the earlier series, the T.O. 700 Series was based on a set of stock standardized plans. Thus, the elements of the T.O. 700-5500 barrack could be found in other building types of the same series.

At the same time, the 700 Series was again revised. The "new" 700 Series was coded by a four-digit suffix, rather than the three-digit prefix of the past. These buildings, classified as "mobilization and WAAC Buildings and Facilities" were designed to eliminate the duplication that had occurred among the 700 and 800 Series by superceding both. The new 700 Series plans specifically copied the "economical" 700 Series framing where it was "feasible and advantageous," while retaining the floor layouts of the 800 Series.[138] The plans were not intended to compete with the T.O. 700 Series and thus did not duplicate building types provided in the T.O. 700 Series.

Camp layouts were also revised. For example a triangular division, once built around seventy-nine companies of four, 74-man barracks of the 800-443 drawings, were now based on ninety-one companies in fifteen, 32-man units of the T.O. 700-5500 drawings. Floors were of wood construction except in dry regions where concrete and tile on grade was used. Millwork was of standard design. Overhanging eaves were eliminated as standard practice. And the usual conservation measures such as the use of metal substitutes were applied. Like previous temporary buildings, these structures were still quite minimal. An Inspector General report complained that "as designed that unit is little more than self-supporting as to superstructure, being incapable of resisting snow and wind loads of more than moderate intensity."[139]

BUILDING COMPONENTS

Aqua Medias

Aqua medias were noticeable features of the 700 Series cantonments. Alternately called canopies, rain hoods, pents, or eyebrows, the aqua medias over the windows elicited the attention of the construction industry press. An article, accompanied by photographic illustrations, noted:

> The 1940 barracks have adopted a tropical item known as "aquamedias" which, in simple terms, is a skirt over the first floor windows which permits them to be left open during rainstorms without getting the cots wet.[140]

The explanation that the aqua medias protected the cots inside the barracks during rain was reported in numerous articles.[141] A captain in the design section later recalled that the aqua medias actually served a two-fold purpose: 1) to allow better ventilation during rain without getting the cots wet; and 2) to keep the sides of the buildings and windows from excessive weathering and rotting.[142]

Aqua medias fell into disfavor, however, by 1941. Apparently the type of aqua media that was inserted into the slot between the first and second floors was prone to water seepage. Oakum, a caulking substitute, had been used with questionable success in sealing the cracks. A March 1941 memorandum tersely stated:

> Media aqua details have been revised to avoid look-outs [the supporting rafters] being framed through the siding and sheathing. . . .The subject of the media aqua is now under discussion and no decision has been rendered as yet.[143]

A study by the architectural reviewing committee concluded that the aqua medias were generally superfluous except "in localities where periodically heavy rains are prevalent, such the Panama or other tropical area." Furthermore, the installation of these redundant sun and rain shades required extra bracing and special cutting and fitting of sheathing and siding around the supporting members. Not only might these leak, but the extra detail delayed construction and added cost. Estimating future construction for an additional 804,760 men, the committee concluded that $6,259,260 could be saved by eliminating the aqua medias over the windows on the long walls and gable ends.[144] Bergstrom subsequently ordered the aqua medias to be omitted on "buildings of the new program [800 Series] and on the buildings of the present program [700 Series] that have not been started."[145] Aqua medias were also eliminated on the T.O. 700 Series and subsequent 700 Series. General Dreyer later reported that removal of the aqua medias from standard plans had been a mistake, despite the structural superiority of the 800 Series.[146] *[See Drawings: 700-1167.]*

Chimneys

The most common 700 Series chimney was the external chimney which was placed four feet from the building, with a brick base, and metal stack supported by guy wires. The 800 Series integrated the chimney within the building core, and the chimney became an internal stack, although external chimneys also continued to be built in the 800 Series.[147] The *Repairs and Utilities 1939-1945 History* provided instructions for replacements of outside and inside stacks.[148] Chimney specifications required that they be designed for wind pressures of 15 pounds per square foot on the projected area with tension not to exceed 20 pounds per square inch in the straight brickwork.[149] *[See Drawings 800-145, 6150-12-B].*

Fire Egress and Hazards

Although barracks were structurally minimalist, and members of the Design Section believed safety to be of lowest priority, the subject of fire egress received a modicum of attention. Second-story fire exits

consisted of a balcony, usually at the gable end opposite the heater room, with three railed-in sides. The unenclosed side opened to a ladder which was nailed to the wall.

The industry press made note of the fire exits in the articles on cantonment building, perhaps to minimize potential fears that the wooden city might be a fire trap. In early 1941, the fire exits were reviewed for sufficiency, and it was recommended that the ladder rungs be inserted into the ladder string, rather than merely joined with nails. A request for a review of the safety of the open balcony resulted in a hinged guard rail being installed.[150]

The barracks' heating rooms were redesigned in September 1941. The essence of the directive was that no part of any furnace, plenum, or smoke pipe should be within 6 inches of any fire-retardant wall or ceiling surface, or within 18 inches of any unprotected wall or ceiling. Three methods of remedying unsatisfactory heating room installations in temporary barracks were suggested: 1) lowering the furnace or plenum chamber; 2) installing asbestos baffle board along furnace and duct; or 3) removing the ceiling or wall, notching out the joists, and installing asbestos baffle board.[151]

Even after the decision was made to use T.O. 700 Series construction, with stove heat and one-story buildings, fire ladders were still attached to exterior walls. As will be noted below in greater detail, WAC housing, even of the Modified T.O. or latest 700 Series type, was provided with fire escape staircases rather than ladders.

Figure 26 800 Series barrack with fire exit at rear.

Figure 27 Detail of aqua medias.

Flooring

As the first division within the armed services to mobilize, the Air Corps was unfortunately subjected to the trials and errors of the mobilization construction program's first application. In February 1940, the Air Corps reported that, despite using correctly dried lumber, the floors contracted excessively. Shrinkage was attributed to the drying effect of the furnace heat. To rectify the situation, a double floor was used, with building paper laid between the subfloor and the finished floor.[152] Apparently there was a delay in integrating expertise with action. In 1941, the Air Corps continued to experience flooring problems, this time with gaps in the second floor.[153] The policy of using double flooring, with sheathing in between, was used in cantonment construction and was subsequently codified in *The Engineering Manual.*[154]

The Repairs and Utilities 1939-1945 History expounds upon the problems that floors presented and notes that Repairs and Utilities was responsible for remedying such problems. The history noted that the shortage of lumber combined with the speed of construction during 1941-43 resulted in the use of lower-grade wood and poor workmanship in general. By 1942, the floors suffered 1/4" wide cracks, raised grain, splintered woods and segments torn out, and uneven joints. Consequently, the engineers devised a substitute floor system of a felt-backed floor covering over a plywood underlay.[155]

Structurally, as well as in finishing, cantonment flooring was open to revision. Bergstrom's initial plans for the 800 Series included 3" x 14" beams for many floors. The Board of Review suggested that 2" x 12"s be substituted since these were more readily available. Dreyer opposed the change, in part on the grounds that it would require 15 percent more in board feet of lumber. Bergstrom elected to go with the 2" x 12" size, pencilling in the margin of Dreyer's report that "standard sizes readily available are to be preferred & every effort for standardization encouraged."[156]

Figure 28 700 Series barrack with external chimney.

One of the greatest differences between the original T.O. buildings and Modified T.O. buildings was the addition of floors. Rather than sitting on dirt, the Modified T.O. barrack was raised on a wood or, in arid climates, concrete floor. The T.O. 700 Series included provisions for both types of floors in separate drawings, as well as modifications to the structural plans to accommodate the differences.

Foundations

The standardized plans prepared by the Construction Division began from the sill up. The foundation work was the responsibility of the constructing quartermaster working in conjunction with his contractors. Since the topography of each site was different, it was impossible to devise a standard foundation plan. Nonetheless, certain guidelines were specified. For example, the wood foundations of World War I gave way to concrete block or masonry footings. Later, this was changed to poured concrete in order to accommodate inside lavatories and central heating facilities, which required concrete slab foundations.[157]

Heating and Ventilation

Central heating of the barracks exemplified the technological progress that had been made since the 600 Series was developed. Remembering a World War I barrack, an old soldier recalled: "The method of heating was a hot-air furnace in the middle of the room. If you were not near the heater it was hard to keep warm."[158] By World War II, however, central air was standard for barracks and other small army buildings.[159] *The Military Engineer* explained how the system worked:

> The type of heating unit installed is adjustable to the available local fuel, whether it be anthracite or bituminous coal, oil or gas. The hot air heaters employ circulatory fans for distributing the heat through over-head metal ducts with dampers to regulate the flow being set on all lateral ducts. For heating systems employing coal, coal boxes are provided in the rear of the building directly behind the heater room.[160]

Despite optimistic expectations (even Holabird and Root endorsed the idea), the heating system proved to be highly ineffective.[161] During the first winter of mobilization in 1941, complaints about the heating system, from both soldier and commander alike, were received from the field. The self-adjusting thermostats were either flawed or improperly set; the result was that the barracks were constantly being overheated. Reports from the field suggested that the temperature control system be fine-tuned, or else the mechanism be made tamper-proof.[162]

Figure 29 *View of boiler.*

In the summertime, overheating was also a problem. Screens were expressly used to permit open windows and the second floor of the barracks had screened ventilators punched in the ceilings. The problem of overheating was particularly acute in the black tar-papered Modified T.O. buildings. Steps were taken to correct the conditions in officer and cadet barracks by adding gable-end louvers and roof ventilators.[163] The record is silent, however, on the plight of the common soldier.

Like other aspects of building construction during wartime, heating systems were affected by the scarcity of critical building materials. Thus, metal duct work was changed to pressed wood and asbestos boards; copper convectors were replaced by cast-iron radiators; and steel high-pressure boilers were changed to low-pressure ones. With the transition to Modified T.O.

construction, space heaters were used for all but the largest buildings and hospitals.[164] Similarly, the T.O. 700 Series barracks had stove heaters. Barracks in warmer zones had one or two heaters whereas barracks in colder zones had up to six as well as having greater insulation.

Insulation and Winterizing

The basic barrack for temperate zones consisted of framed studs covered with diagonally laid 1" wood sheathing, covered with building paper and drop siding. The sheathing paper improved thermal insulation and weather protection and acted as a vapor barrier. In some cases, instead of wooden sheathing, gypsum board with an exterior facing of black waterproof paper was used. The gypsum board formed a tighter seal than the 1" sheathing boards and the waterproof facing adequately replaced the sheathing paper. The drop siding could be nailed directly to the wall sheathing.[165] The interiors of the temperate zone barracks, however, were not finished and there was no insulation in the walls, floors, or ceilings.

In colder zones, provisions were made for greater insulation. These included lining the inside face of exterior wall and ceilings with Celotex; covering the walls with a 4'-0" high wood wainscot; constructing a storm vestibule on all entrance doors except heater room doors; and installing a storm sash on each window.[166] A 1941 Air Corps request for additional winterizing was turned down for the following reason:

> Construction authorized in the -20 degrees zone was designed for low temperatures and the buildings were specially sealed in accordance with economy and period of contemplated occupancy. Attention is invited to the fact that all heated buildings in the -20 degrees zone have sealed interiors.[167]

In January 1942, new plans were approved for "storm entrance shelters" for the 700 Series barrack, 800 Series barrack, and prison-type barrack. An alternate plan for an interior vestibule for the 800 Series barrack was rejected.[168]

Figure 30 View of insulation.

Painting

The original plan of cantonments had left the wood siding unpainted.[169] In October 1940, after failing to persuade the Chief of Engineering that cantonments should be painted, the Painting and Decorating Contractors of America (PDCA) directed their lobbying efforts toward H.W. Harrison and the Advisory Commission to the Council of Nations (NDAC).[170] Protesting the omission of painting from cantonment specifications, the PDCA pleaded:

> It is the painting that makes it habitable, gives it appearance and beauty, makes it sanitary for occupancy, prevents insects and termites from attacking it, and, to a degree, adds fireproofing qualities. Painting also makes a building damp-proof. Buildings that are painted keep up the morale of our boys, add cheer and sometimes prevent despondency. It will be a forlorn contrast for our boys to be brought from their painted and decorated homes and offices to Government buildings that are neither protected nor beautified with paint. Buildings are drab, dreary and unlivable unless they are painted, to say nothing of the protective value that paint adds. . . It is no economy to the Government to omit the painting on these temporary buildings. For generations paint has been the acceptable protective coating on buildings to withstand the elements.[171]

Within the month, the War Department had reviewed the matter and issued a directive that the exteriors of all mobilization buildings were to be painted a "standard ivory color, with doors of warm gray."[172]

The fact that only exteriors and not interiors (except for hospitals and mess halls which were painted for sanitary reasons) were painted suggests that the War Department believed paint to be of protective rather than aesthetic value. Yet, army documents reveal that the War Department, in consultation with the Forest Products Laboratory, determined that deferring painting maintenance would not, in fact impair the life of the building. Thus, it is possible to assume that paint was more than a protective device; it had, as PDCA suggested, an aesthetic dimension that in the context of army housing might serve to boost morale.[173]

Plumbing

A major change that took place in barrack design between the 600 Series barrack of World War I and the 700 Series barrack of World War II was an improvement in indoor plumbing.[174] Reflecting an increased standard of living by World War II, lavatories were designed to be placed inside the barracks although early plans are unclear whether this was the general policy. An early plan for toilet facilities stated:

> A closed pit latrine, slightly enlarged to accommodate a stove for heating and provided with ventilation so as to avoid their becoming too obnoxious, is being planned. A method for heating water in the showers has been developed.[175]

Lavatories were subsequently integrated with the barracks unit, but a diagram comparing tent camp to cantonment layout notes that the latrines were to remain if facilities were not provided in barracks.[176] Air Corps barracks had the first internal lavatories which, along with the heating plant, were placed on a concrete slab on grade instead of on a frame floor. This reduced the risk of fire, rotting, and freezing of plumbing pipes below the floor.[177] This system was adopted for subsequent barracks lavatory construction.

Once the decision was made to move the plumbing indoors, the only question was how far to take this convenience. Army records are full of requests for additional toilet facilities in buildings. Eventually, plumbing facilities were introduced into all occupied buildings.[178] Toilet facilities in the barracks generally consisted of urinal troughs and closet bowls without partitions, and wash basins. Gang showers in the 63-man barrack had four shower heads (up from three originally) and the 74-man barrack had six. Duck boards were added later, as were shallow pans for athlete's foot disinfectant. The drying area had benches for dressing, a drinking fountain, and a slop sink. Windows had opaque glass.[179]

Standard plumbing fixtures became an essential feature of army housing by World War II. And when steel, copper, and brass became scarce during wartime, substitutes were used: vitreous china replaced steel; hardboard and cement asbestos showers replaced tubs; and cast iron and plastics replaced brass fittings.[180] Finally, when the shortages of materials led to the adoption of the T.O. 700 Series, lavatories and bath houses were moved back outside to separate buildings. [*See Drawings 700-241, 700-1170, 800-157, 800-194, 800-207, 800-446, 800-513, 800-850.*]

Figure 31 Sinks and toilets.

Figure 32 Urinals and wash tub.

Roofing

Structurally, the roofs of the 700 and 800 Series were adequate until the United States entered the war. The diversion of materials crucial to the war effort, such as steel, necessitated all timber roofing, even on long-span auditoriums or hangars, where steel trusses had been used before. The high demand for lumber had the effect of further weakening the roofing, as the minimum grades of lumbers were continually downgraded to accommodate the increasing demand upon limited supplies. *The Engineering Manual*, noting the reduction in quality of lumber, required that 1450 pound stress lumber be used where 1200 pound was usual. In addition, it required that bolted roof connections be used to strengthen the system. Barrack roofs were designed for a wind load of 10 pounds per square foot on the vertical projection. For theaters and other large roofs, the load was increased to 20 pounds. Allowance was also made for hurricane precautions, as developed by the local builders.[181]

Due to the lack of knowledge in the use and care of unseasoned and ungraded lumber, particularly in trusses, trouble developed after a year. By 1943, shrinkage of unseasoned lumber caused connector bolts to loosen. Consequently, joint strength was weakened and trusses sagged. Either through carelessness or shortage, steel split-ring timber connectors were occasionally omitted and grooves for the connectors and bolt holes were improperly cut and located. Rather than re-roofing structures, stop-gap methods of roof repair were undertaken unless severe conditions were present.[182]

As with the flooring situation, Air Corps construction first exhibited the weaknesses of the roofing plans. And indeed the flaws were severe--the roofs leaked and they collapsed. The Sturgis Papers document how an Air Corps roof leaked just six weeks after erection.[183] More dramatically, a 1,000-man theater roof at Fort Benning, Georgia collapsed minutes prior to the opening of the building.[184]

Like other components in mobilization construction, roofs were subjected to minimal standards. War Department reviews of accidents like those mentioned above concluded that roof failure could be attributed to three basic causes: 1) improper application of roofing material due to poor workmanship resulting from haste or poor protection of materials; 2) the use of unsuitable roofing materials, such as unseasoned sheathing or too-light roofing paper; or 3) damage by strong winds.[185]

The solution was to refigure stresses and to redefine the specifications. In October 1940, the Construction Division switched its roofing material from the less expensive black roofing paper to the red or green SSR 521 Federal Specification Roofing. The new roofing material was 25 pounds heavier than the black paper, with a life expectancy of five to seven years. Although the cost was $0.60 greater per square foot installed, the improvement in performance warranted the switch. Even heavier roofing was used for the 800 Series.[186]

The roofing was rolled horizontally with side laps of not less than 2" and end laps no less than 4". The roofing was doubled over the ridge, and it was turned up at least 6" under the eaves and aqua medias.[187]

Siding

In June 1940, there was still some question about the siding material to be used on the cantonments. Wood drop siding had been used previously and the Construction Division recommended that its use be continued. However, it also considered using prepared roofing paper for wall sheathing which was cheaper to procure and could be installed with unskilled labor.[188] This minimalist approach was not implemented, however, until the advent of the Modified T.O. construction.

Although wood drop siding was preferred for cantonment buildings, steel siding on cantonment buildings was also used experimentally.[189] Not to be confused with a steel prefab, a steel-sided building was timber framed. Stud spacing was reduced from 3'-0" to 2'-0", diagonal bracing was added for stiffness, and 1/2" fiber board was placed between the studs and siding. The 26-gauge, galvanized steel siding was rolled in 2'-0" x 10'-0" sheets and pressed to resemble clapboards. To insure that the buildings would match the rest of the cantonment, the steel sheets were zinc coated, and then roller coated with a baked on "zinc dust-zinc oxide primer." This served as a base coat which would accept the field paint applied after erection.[190]

Developed just prior to Pearl Harbor, there is no indication that wood siding was used after. Rather, the short-lived experiment's significance to the overall study of cantonment construction is its illustration of how important the "cantonment look" was to the design section. As in the case of steel prefabs, the "wooden" shape and detailing of a barrack was not inherent in a steel design. The only reason to press "clapboards" in the steel was to fit the aesthetic template which the designers used.[191]

Similarly, the decision to use cement-asbestos shingles also reflected a desire to achieve the domestic look and feel of the drop-sided barracks. The specifications directed that the shingles be a wood grain texture and that they be painted. Shingles were only to be used upon the approval of the Office of the Quartermaster General.[192]

The Modified T.O. buildings were sided with 15 lb. felt and batten construction. The improved T.O. 700 Series offered a greater variety of sidings which, while including the felt board and batten option, also allowed for more traditional finishes such as horizontal siding.

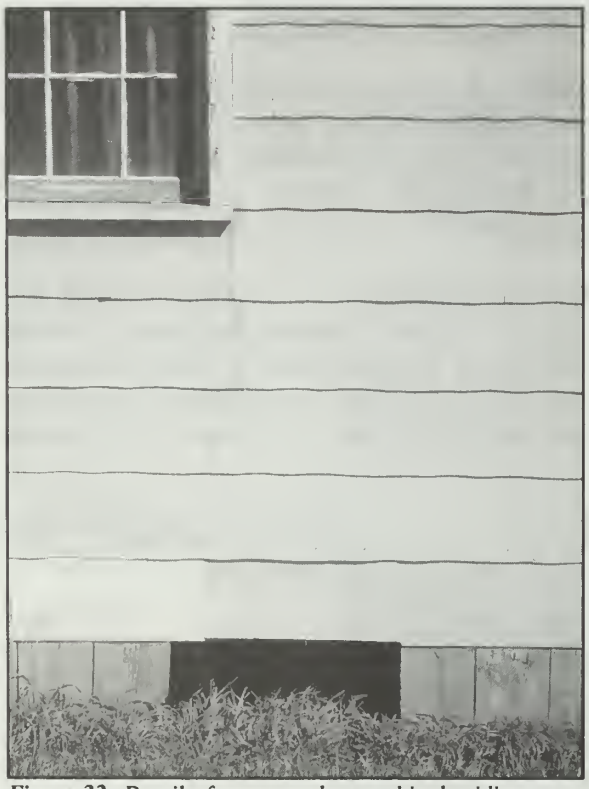


Figure 33 Detail of cement-asbestos shingle siding.

Termite Shields

Termites were a major threat to an all-wood cantonment. Thus, the concrete or masonry piers on which the wooden sill rested were capped by a sheet of galvanized metal with downward crimped edges. In theory, termites which crawled up the pier would be unable to navigate upside down and around the metal plate separating the pier from the wood building. As zinc became scarce, galvanized metal was replaced by painted metal.

The architectural reviewing committee determined in 1941 that termite shields were neither cost- nor termite-effective. The incorrect installation of the shields further minimized their efficacy. Thus, the committee recommended that the termite shields be omitted from construction plans. If the shields had been left off, it was estimated that $3 million could have been saved in the 1940 construction program. The committee recommended that the shields be used only on temporary structures which might be preserved over the five-year period.[193] Two weeks later, the

field was directed "to omit termite protection . . . on buildings of the new program [800 Series] and on the buildings of the present program [700 Series] that have not been started."[194] It is therefore likely that many buildings of the 700 Series were constructed without aqua medias or termite shields.

Nonetheless, precautions were still taken to inhibit termite infestation. The solution found was clearly detailed in an article on camp construction:

> The termite shields that were so noticeable on buildings constructed in the earlier camps are conspicuous by their absence from this design. Experience has shown that the best preventatives of termite damage are a thoroughly clean earth surface under the building, a distance of at least 8 in. between the earth and the nearest wood, and good ventilation throughout the space beneath the floor, with ample provision for periodic inspection of this space. It was therefore decided to omit the termite shield in this design and provide the proper number and spacing of vents and crawl holes in the exterior wall. This resulted in a further savings in construction costs and, as the termite shields had been galvanized iron, a saving of critical material.[195]

The change in policy towards termite shields had repercussions for the construction of skirting. The skirting had originally been hung around the perimeter of the sill "with a view to order and appearance." Ship lap skirting was used in the 20 degrees zone and vertical random-width boards were used in the 0 and -20 degrees zones.[196] Skirts for buildings with no termite shields had the openings cut in the skirting for observation and ventilation. [*See Drawing 700-1163*].

Windows

Whether in the standard wood barracks or experimental prefab barracks, the windows were of multiple-pane construction, usually six-over-six-light or eight-over-eight light double-hung wooden sash. Some windows were of steel construction, typically casement or pivoted. The use of the multiple-light style continued the window treatment of the 600 Series, and was retained through all the revisions to the 700, 800, Modified T.O., and T.O. 700 Series, although the 800 Series and its successors' lights were reduced from 10" x 12" to 9" x 12". Reducing the size of the window panes, however, sometimes required different studding around the openings. In the interest of "livability and comfort" the windows were fully screened. When metals became critical commodities, the steel sashes were phased out and copper screens were replaced with plastic screens. [*See Drawing 800-151*].

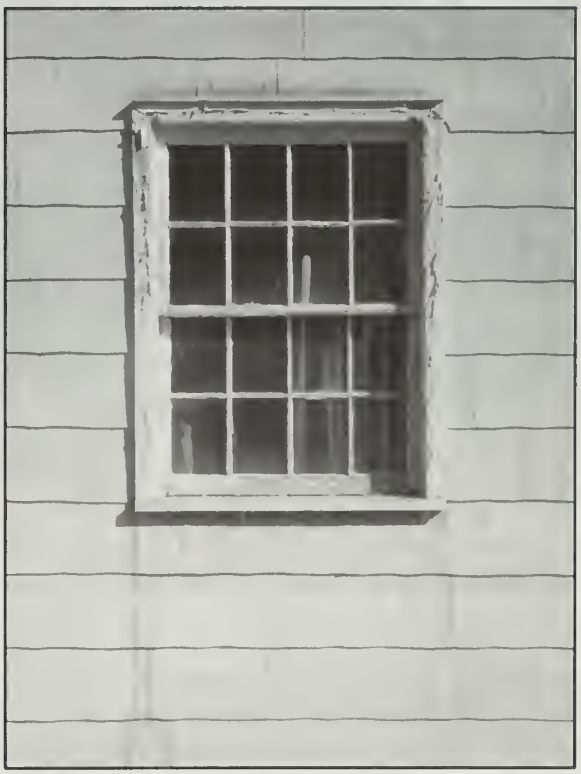


Figure 34 Window detail.

Figure 35 Historic view of 700 Series cantonments.

CONCLUSION

In little more than three years, the temporary mobilization construction program designed and erected army cantonments which provided facilities for over 5 million soldiers. As a top engineering officer declared in March 1942, "We must win the battle of materials just as surely as General MacArthur must win the battle of the South Pacific. Ours here at home will also be a tough battle."[197] Despite start-up problems and occasional errors in design judgement, the temporary mobilization construction program met the wartime challenge and even initiated techniques that would become standard in the post-war years.

In a mobilization program unprecedented in American history, the two construction branches of the army successfully accommodated every new quota of troop housing assigned them. Belying the charge that isolationist sentiment kept the nation unprepared for war, the Construction Division of the Quartermaster Corps and the Corps of Engineers had completed facilities to house, feed, and supply a million and a half troops by the time of Pearl Harbor--an increase in the troop housing capacity of 1,200,000 men in the preceding year and a half.

Contemporary criticisms that the program was bogged down by supply and weather delays, seemingly damning at the time, have proven inconsequential. The cantonments, after all, were built and used to house troops with a degree of health and comfort unknown to U.S. troops in previous wars. Far more relevant criticism of the construction program would be that the structures were over-designed if the primary objective were to erect temporary structures. The tendency to over-design was most pronounced in the 800 Series. As demonstrated above, whatever advantages the 800 Series buildings offered--a 74-man barracks, savings in the elimination of aqua medias and termite shields--had been simultaneously incorporated into the 700 Series. What the 800 Series buildings offered was sturdier, more enduring and thus more costly features of construction. In light of the growing material shortages of the early 1940s, the decision to use the 800 Series seems misguided, unless the objective was to build better buildings in order to provide better housing.

It is vital to remember that both the 700 and 800 Series were developed before the country went to war. Thus the army's designs were not tightly strictured by the material and financial shortages which characterized the war years. As demonstrated earlier, the one and only mobilization plan the army had when it suddenly faced the crisis of 1940, the Protective Mobilization Plan, turned out to be worthless in regard to housing. Subsequent mobilization plans of the 700 and 800 Series allowed for some of the comforts of home. Within months of entering the war, army planners realized that expediency must rule and thus began the shift towards the less comfortable but more cost- and time-efficient theater of operations type structures.

Although the cantonments were designed and constructed to meet the demands of expediency, they were also able to incorporate technological improvements that had become standard by the early 1940s. Like many American homes, the barracks included indoor plumbing, and central, forced-air heating. And by the 1930s electricity was no longer considered a luxury but a standard utility, a belief that was reflected in the work of the New Deal's Rural Electrification Administration, which was created to bring electricity to most rural homes. The soldiers, consequently, would be able to light their barracks with the flick of a switch. A professional army with long-term soldiers could perhaps operate by different, military standards. But these boys were citizen soldiers. They would do their stint of service and then return to civilian life when the crisis was over. In their bases they would get the basic comforts that many if not most Americans were used to, no more and no less.

The same expectation applied not only to barracks but to the cantonments altogether. Not only would the army make every attempt to give the boys the comforts of home, but would invest precious time and money to make the camps look like home. The millions of dollars spent to paint the buildings could be justified, as noted above, on the grounds of preservation. For buildings that were meant to last only a few years, the preservation argument seemed illogical. An equally important reason was morale. The painting lobby struck a sensitive nerve when it argued that ". . . it will be a forlorn contrast for our boys to be brought from their painted and decorated homes to government buildings that are neither protected nor beautified with paint."[198] Similarly, the construction division did not need to design a chapel. Considerable time and expense could have been saved by using the recreation halls. Yet the army, on Eleanor Roosevelt's urging, calculated that it made a big difference to soldier morale. Thus, the Construction Division built a church that looked like a church, with a steeple and a cross, with pews and a lectern and an altar rail. From the outside, the 700 Series chapel would have not looked out of place in a New England village. Never mind the fact that not too many of the soldiers came from areas without quaint churches, fresh paint jobs, forced-air heating or even indoor plumbing. The army supplied them with these things because they were what American citizens by 1940 were supposed to have.

But in meeting the goal of a high standard of living, the army simultaneously endangered the objective of impermanence. Ironically, both the 700 and 800 Series failed to meet their temporary expectations--buildings of both series still stand today. The costlier 800 Series has weathered the years better, thus supporting complaints of the 1940s that it was overdesigned for its purpose. That both series continue to exist is testimony to the soundness of the architectural design, if not the decision to approve the designs. However, one must remember that at the time these series were developed, a time of haste and uncertainty, it was believed that a wooden building would inevitably be temporary. Indeed, the military still considers wooden structures temporary.

These structures represented a building technology that would soon sweep the country. Standardized plans, prefabrication of units, specialized construction crews accomplishing only one aspect of construction: in the push for speed in the mobilization construction a variety of construction techniques were developed that would soon have mass application. It remained for large developers after the war (and defense housing contractors during the war) to take these techniques developed by military contractors and apply them to the civilian construction industry. Millions of veterans would soon return home with the expectation that they too would be able to achieve the American dream, constituted primarily by home ownership. And, with help from the G.I. Bill, many of them would purchase a home in the new suburban developments springing up all over the country that were built in a similar manner to their old army barracks. If nothing else, the pressure of mobilization helped give birth to a mass construction industry that would shape the character of American life in the postwar period.

NOTES:

1. Lenore Fine and Jesse Remington, The Corps of Engineers: Construction in the United States, The U.S. Army in World War II Series, Washington, D.C.: Office of the Chief of Military History, U.S. Army. 1972, 111-112. (Hereafter cited as Fine and Remington). Alice Rose, Military Construction in the United States Under the Direction of the Quartermaster Corps and the Corps of Engineers, 238, Office of History, U.S. Army Corps of Engineers, Fort Belvoir, Virginia, Box VII-24, (The manuscript is hereafter referred to as Rose, and the archives as the Fort Belvoir Office of History). John J. O'Brien to Commanding General, Army Service Forces, "Overall Housing Capacity," November 15, 1944, Washington National Records Center, Record Group 77 - Entry 107 - Box 784. (For the full title of Record Groups used in this study, see the Bibliography.)

2. Corps of Engineers, Housing Support Center -- Environmental Resources, Information Paper 27, June, 1985. Department of the Army, "Policy on the Disposal of World War II Temporary Buildings," February 27, 1984, Fort Belvoir Office of History, Box V-7.

3. Drawing Index, "Mobilization Buildings and Facilities, obsolete," January 26, 1943, Washington National Records Center, RG 77 - Entry 106 - Box 746. DAEN-ZCF-B, Information Paper, June 27, 1985. Jesse Remington and Lenore Fine, "Engineering for Command Construction," Drafts, Fort Belvoir Office of History, Box VII-35. (Hereafter referred to as "Fine and Remington Draft").

4. Fine and Remington, 68, 96. Memorandum, Col. Pitz to Paul Baade, Assistant Chief of Staff, [Untitled], November 19, 1936, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

5. Louis Johnson, Under-Secretary of War, to Rep. Ross Collins, August 9, 1939, Fort Belvoir Office of History, Box VII-4. George Tyner, Assistant Chief of Staff, to QMG and Adjutant General, "Plans and specifications for cantonment construction," November 20, 1939, Office of History, Box VII-4. Fine and Remington Draft, 3-6.

6. G-4 was a branch of the army's policy-making authority, the army General Staff in Washington. The General Staff was headed, of course, by the Chief of Staff, and had five sections, each a source of assistance in helping him govern the administration of the army. G-4 was the section concerned with supply, construction, and transportation. Other sections were G-1, personnel and administration; G-2, intelligence; G-3, operations and training; and the Assistant Chief of Staff, war plans and Division for War Planning. See Truman Committee Hearings, Part I, p. 237-238.

7. Fine and Remington, 68-69, 71.

8. Fine and Remington, 68-69, 71,73,95. Special Senate Committee, Investigation of the National Defense Program, 77th Cong., 1st sess., 1941, Part 7, 2021, 2040-2041, 239-240. (Hereafter cited as "Truman Committee Hearings").

9. The reason it seems that the army did not house these new troops in tents, as one would expect with the Protective Mobilization Plan, is that this was not a war mobilization effort. There was no European "front," where these troops would be sent to soon after mobilization. Thus, these troops, as would become the general rule, had to be housed indefinitely in the domestic United States. Hence they were billeted in "temporary" wood structures, designed to last for the duration of the emergency period, because the American public believed that a war period was an aberration and therefore temporary.

10. The early cantonments included Fort Benning, Georgia; Camp Ord, California; Fort Knox, Tennessee; Camp Jackson, South Carolina; Fort Dix, New Jersey; Camp Custer, Michigan; Fort Edwards, Massachusetts; Camp Blanding, Florida; Camp Shelby, Mississippi; Camp Robinson; Camp Claiborne, Louisiana; San Louis Obispo, California; Camp Forrest; Camp George Meade, Maryland; Indiantown Gap, Pennsylvania.

11. Rose, 328-329. George Tyner, Assistant Chief of Staff, "Establishment of a basis for revision of the construction program," November 4, 1939, Fort Belvoir Office of History, Box VII-4. Disposition Slip, G-4, "Temporary construction with increase in army to 227,000," November 20, 1939, Office of History, Box VII-4. Fine and Remington, 103, 108, 116.

12. Fine and Remington, 111-113. Truman Committee Hearings, Part 1, 246-247.

13. Truman Committee Hearings, Part 1, 239-240, 243, 247-248. Rose, 331-334.

14. Fine and Remington, Notes of interview with General Gregory, June 29, 1955, Fort Belvoir Office of History, Box VII-36A. Brehon Somervell, "The Temporary Emergency Construction Program," The Constructor 23 (July 1941): 73.

15. House Committee on Military Affairs, 77th Congress, 1st Sess., Hearings, Inquiry as to National Defense Construction, Part I, 107. (Hereafter cited as "House Committee Hearings.") Office of the Adjutant General, Record of Communication Received, from Sen. Tom Connally to War Department, January 24, 1943, National Archives, RG 407 - Entry 363 - Box 4451 (Camp McCoy). Senator Alex Wiley to General E.S. Adams, August 28, 1940, National Archives, RG 407 - Entry 363 - Box 4451 (Camp McCoy).

16. Legislation quoted in Rose, 336-337. Truman Committee Hearings, Part I, 244. Roosevelt quoted in Fine and Remington, 162.

17. On 800 Series, see Col. Leavey, Chief, Engineering Section, to Major Casey, Chief, Design Section, "Standard specification for temporary housing," July 14, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. Also see Fine and Remington, 351.

18. Fine and Remington, Questions for Hartman and replies, Fort Belvoir Office of History, Box VII-37. Truman Committee Hearings, Part 7, 2042. Fine and Remington, 115. Nobody could determine at the time what happened to the 700 Series plans, and of course the answer is even more elusive after almost 50 years. Perhaps the most accurate speculation is that of Mrs. Pagan, who served as Hartman's secretary for a number of decades. According to her, General Seaman, who had a reputation as something of a heavy drinker, could have destroyed the plans, "especially if he'd had one too many." In addition, Mrs. Pagan mentioned that General R.C. Moore of the General Staff might also have been responsible. See Interview, Fine and Remington with Mrs. Pagan, March 8, 1957, Fort Belvoir Office of History, Box VII-36B.

19. George Tyner, Assistant Chief of Staff, to Adjutant General, "Construction of temporary tent camp at Fort Sam Houston, Texas," September 20, 1939, Fort Belvoir Office of History, Box VII-4. Fine and Remington, Questions for Hartman and replies, Office of History, Box VII-37. Fine and Remington, 115-116.

20. Hartman to General R.C. Moore of General Staff, "Plans for mobilization type buildings," July 19, 1940, National Archives, RG 165 - Entry 234 - Box 424. War Department, Adjutant General's Office, "War Department Construction Policy," June 15, 1940, Washington National Records Center, RG 92 - Entry 1980 - Box 699. Can also be found as an appendix in Rose. "Emergency Cantonment Construction," The Military Engineer 33 (January-February 1941): 6-8. Engineering News-Record 127 (June 19, 1941): 66. Also see War Department, Adjutant General's Office, "War Department Construction Policy," August 19, 1941, included as appendix in Rose. Construction Section, Advisory Commission, "Troop Housing Project," October 10, 1940, National Archives, RG 107 - Entry 23 - Box 894.

21. Construction Advisory Committee, "Troop Housing Project," Oct 10, 1940, National Archives, RG 107 - Entry 23 - Box 894. Rose, 334. Fine and Remington, 149-150.

22. Rose, 334. Fine and Remington, 114, 150-151.

23. Fine and Remington, 199-200. Construction Advisory Committee, "Troop Housing Project," October 10, 1940, National Archives, RG 107 - Entry 23 - Box 894.

24. Though the Corps of Engineers did not take over all Air Corps construction until December of 1940, they entered the field of airport engineering much earlier. Rose, for instance, notes that by the fall of 1940 the Civil Aeronautics Administration awarded $321 million to the engineers for building and improving approximately 600 civil airports in the United States. See Rose, 14.

25. Rose, 10-13. Adjutant General to Quartermaster General, "Emergency Construction for Air Corps pilot training program," June 24, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 701.

26. As mentioned earlier, a detailed history of the army's war mobilization construction program is beyond the scope of this study. Fortunately, Fine and Remington's *The Corps of Engineers: Construction in the United States* provides a thorough history on this subject. This paper will only briefly explore a few issues in camp construction concerning administration and labor, and some problems common to many of the camps.

"Army begins work of Housing increased forces," Engineering News-Record 126 (August 29, 1940): 21. "Handling a 20,000 man crew on a camp job," Engineering News-Record 127 (June 19, 1941): 66.

27. To be sure, Hartman's policy of relying on the most competent and well-respected contractors in the field had its benefits as well. For instance, one of the principal contractors of Camp Edwards, Walsh Construction Company, performed a major service for the Construction Division. Working on one of the first camps, the Walsh people discovered that the information necessary to complete any one building was scattered over hundreds of individual drawings. To expedite the building process, Walsh employed a group of senior draftsmen who assembled and coordinated this information on a single sheet, obviously contributing a great deal to

construction efficiency. Major Groves of the Construction Division was so pleased with these working drawings that he asked the contractor for fifty sets of prints for reproduction, which he promised to send to all other camp builders. See letter from D.G. Aronberg, Vice President of Walsh Construction Company, to August Sperl, August 13, 1956, in Fine and Remington interviews, Fort Belvoir Office of History, Box VII-36A.

28. Fine and Remington, 205, 263.

29. Fine and Remington, 121, 223, 122.

30. Fine and Remington, 221, 234. Engineering News-Record 127 (June 19, 1941): 68. "A Thousand Buildings in 5 Months," Engineering News-Record 127 (March 27, 1941): 73.

31. Fine and Remington, 221-223, 228. War Department order on WPA restrictions, February 21, 1942, included as appendix in Rose.

32. Fine and Remington, 140. "Camps for 1,418,000," Fortune, (May 1941): 63, 155-156.

33. Fine and Remington, 207-208. Fortune (May 1941): 63, 155-156, 158. "Building a Camp in the Wilderness," Engineering News-Record 127 (May 8, 1941): 87.

34. Fine and Remington, 280-283. Fortune, (May 1941): 63, 155. "Building a Camp in the Wilderness," Engineering News-Record 127 (May 8, 1941). Quotes from San Luis Obispo and Topeka taken from Fine and Remington, 282.

35. "Army Camp in 4 Months," Western Construction News 15 (November 1940): 376. Advertisement in The Constructor 23 (May 194): 5. "A building every 54 min. at Ft. Ord," Engineering News Record 127 (March 27, 1941): 75-76. "New building every 54 minutes marks army camp construction pace at Fort Ord, Calif.," Construction Methods 23 (April 1941).

36. "A Building Every 54 Minutes at Fort Ord," Engineering News-Record 127 (March 27, 1941); "Handling a 20,000 man Crew on a Camp Job," Engineering News-Record 127 (June 19, 1941): 66-68. Somervell, "The Temporary Emergency Construction Program," The Constructor 23 (July 1941): 71-74. War Department, Office of the Quartermaster General, Report on the Activities of the Construction Division, July 1, 1940 - July 1, 1941, Fort Belvoir Office of History, Box VII-2.

37. Somervell recognized the value of publicity and worked hard and successfully to garner enthusiasm for the Construction Division. To this end, he hired George Holmes, a professional public relations expert, who mounted a full scale publicity campaign for the Quartermaster Corps' Construction program. See Fine and Remington, 372-378. Time quoted in Fine and Remington, 259. Fortune (May 1941): 56. Report of the Secretary of War, 1941, 3.

38. Annual Report of the Secretary of War, 1941, 3. National Archives.

39. War Department, Report on the Activities of the Construction Division, 1940-1941, 9, Fort Belvoir Office of History, Box VII-2.

40. Rose, 310 citing WD. AAF., CO at McDill Field to CG of 3rd AF, "Housing for Colored Troops," May 31, 1941. John R. Hardin, Major, Corps of Engineers, Chief, Construction Section, to The Quartermaster General, "Recommended Alterations to Improve the Functional and Structural Characteristics of Temporary Mobilization Type Buildings," August 1, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 496.

41. War Department, Repairs and Utilities 1939-1945 History, 112, Fort Belvoir Office of History, Box VII-38.

42. Newly constructed WAC Modified T.O. barracks were referenced by Plan No. T.O. 700-5510, and converted Theater of Operations barracks were on Plan No. T.O. 700-2311. The "new" 700 Series WAC barracks were drawn up on Plan No. 700-3560; the converted barracks was Plan No. 700-3575. "Typical List of Facilities to be Provided by New Construction or Conversion for Members of the Women's Army Auxiliary Corps," April 15, 1943, National Archives, RG 407 - Entry 360 - Box 3880.

43. War Department, Repairs and Utilities 1939-1945 History, 112 - 14, Fort Belvoir Office of History, Box VII-38. Engineering Manual, Chapter X, Part III, Paragraph 10-21, Corps of Engineers Library. Rose, 428.

44. Information for this section was taken from Arthur Kruse, "Custody of Prisoners of War in the United States," The Military Engineer 28 (February 1946): 70-74.

45. Engineering Manual, Chapter X, Part I, Paragraph 10-04. Corps of Engineers Library.

46. Engineering Manual, Chapter X, Part I, Paragraph 10-04b. Corps of Engineers Library.

47. Fine and Remington Draft, 26-27, Fort Belvoir Office of History, Box VII-35. Interview, Remington with W.R. Deininger, March 13, 1959, Fort Belvoir Office of History, Box VII-36A.

48. Engineering Manual, Chapter X, Part I, Paragraph 10-04d. Corps of Engineering Library.

49. Engineering Manual, Chapter X, Part I, Paragraph 10-04c. Corps of Engineers Library.

50. Engineering Manual, Chapter X, Part I, Paragraph 10-04e. Corps of Engineering Library.

51. As early as 1937, the Quartermaster General enunciated its reason for selecting temporary construction for emergency construction, concluding that "semi-permanent type are neither one thing nor another and become a source of great expense and trouble after their original use has passed." See, Fine and Remington Draft, 4-5, Fort Belvoir Office of History, Box VII-35.

52. "War Department Construction Policy," June 15, 1940. "Supplement to War Department Construction Policy," July 18, 1940. Both in Washington National Records Center, RG 77 - Entry 107 - Box 784.

53. Fine and Remington, 116 and 123.

54. Equally important, the new 700 Series differed from its predecessor series in intended use. Whereas World War I cantonments sheltered troops for a very short time before they were sent overseas for training, the rapid fall of Europe forced the U.S. to recognize that training would have to be done state-side. Thus the mobilization would be of an indefinite, but prolonged, duration. See Part I, Section II above.

55. Rose, 414. Chief, Troop Unit to Design Section - Major Smith. "Engineering Data, Mobilization Buildings," May 16, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 710.

56. DeWolfe H. Miller, 1st Lieut. Quartermaster Corps to The Quartermaster General, "Barrack Heating," May 21, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 732.

57. Although tent camps were quicker to erect, and less expensive in initial materials, over a five-year period the maintenance cost of a tent camp made it similar to a cantonment. Canvas tent roofs needed to be replaced every six months and the Sibley stoves every year. H.B. Nurse, Major, Quartermaster Corps, to The Assistant Chief of Staff, G-4, "Comparative Costs Tents vs. Cantonment Camps," September 19, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 729. See also, Rose, 408, 413.

58. Interview, Fine and Remington with Mr. Luther M. Leisenring, June 5, 1957, Fort Belvoir Office of History, Box VII-36A.

59. Interview, Fine and Remington with Col. Frank E. Lamphere, June 26, 1956, Fort Belvoir Office of History, Box VII-36A.

60. Truman Committee Hearings, Testimony of General Hartman, 2041. Fine and Remington, 156. Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

61. Engineering Manual, Chapter XI, Part V, Paragraph 11-33. Corps of Engineers Library.

62. This section was written using the following listed articles. Where specific measurements or fort details are provided, a specific page is footnoted in the text. "Housing the New Army," Engineering News-Record 126 (October 24, 1940) 43-47. "Army Camp in 4 Months," Western Construction News 15 (November 1940) 376-77. "Streamlined Cutting," American Builder 63 (January 1941): 44-45. "Emergency Cantonment Construction," The Military Engineer 33 (January-February 1941): 6-9. "A Building Every 54 Min. at Fort Ord," Engineering News-Record 127 (March 27, 1941) 75-76. "Rolling Out the Barracks," The Constructor 23 (April 1941): 23. "Handling a 20,000-Man Crew on a Camp Job," Engineering News-Record 127 (June 19, 1941): 66-68.

63. "Emergency Cantonment Construction," 9.

64. "Rolling out the Barracks," 23.

65. "Streamlined Cutting," 44.

66. At Camp Edwards, one-story buildings were sheathed before raising, and two-story structures were sheathed after being raised to position. "Handling a 20,000-Man Crew on a Camp Job," 67.

67. "A Building Every 54 Min. at Fort Ord," 7.

68. Rose, 36, citing Construction Division Letter No. 59. "Conformity to Specifications." February 1, 1941.

69. Sturgis Papers. Fort Belvoir Office of History, Box 15, Folder 81.

70. Sturgis Papers. Fort Belvoir Office of History, Box 15, Folder 81.

71. See, for example, M.B. Birdseye, Major, Quartermaster General, Assistant, to The Adjutant General. "Temporary Construction," July 21, 1940, Washington National Records Center, RG 77 - Entry 107 - Box 803. In that memo Birdseye states that some posts and stations are constructing temporary buildings whose plans have been superceded. The list of buildings for which there were new drawings included the 700-1165 63-man barrack with lavatory, 700-1185 63-man barrack with lavatory, 700-1175 45-man barrack with lavatory, and the 700-1195 25-man barrack with lavatory.

72. Truman Committee Hearings, Testimony of General Hartman, 2042.

73. Rose, 28. Fine and Remington, 169.

74. Rose, 356, 37-38.

75. "Handling a 20,000-Man Crew on a Camp Job," Engineering News-Record 127 (June 19, 1941): 66. See also, R.A. Wheeler, Brigadier General, Acting Assistant Chief of Staff, to Lt. Col. Smith, Design Section, Office Constructing Quartermaster, October 13, 1941, National Archives, RG 165 - Entry 234 - Box 418.

76. Nurse, Executive Office, Office of the Quartermaster General, to Fixed Fee Branch, "Housing the Increase to War Strength," October 14, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

77. "Typical Regiment Layout for Square or Triangular Division," September 9, 1940, Marked "superseded." See also, Plan No. 614-100, "Typical Battalion Block Layout to Provide increased Strength of Units for Triangular Division," September 19, 1940, Revised October 18, 1940. See also, Plan No. 614-179, "Typical Layout - Diagram for a Triangular Division," August 19, 1941, Revised October 7, 1941. All located in Washington National Records Center, RG 77 - Entry 107 - Box 746.

78. See, for example, War Department, The Adjutant General, to Chief of Arms and Services, Commanding Generals of All Corps Areas, and Commanding Officers of Exempted Stations, "Supplement No. 2 to War Department Construction Policy," August 7, 1941. Reproduced in Rose, Appendix I. This shows requirements for a square division tent camp, a Triangular Division and Square Division cantonment.

79. J. Brackinridge, Adjutant General, to The Quartermaster General, "Basic Requirements and Authorities for Housing Troops," August 1, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 784.

80. Value, Liaison Section, to Chief, Engineering Branch, "Company Strength," January 22, 1941. Washington National Records Center, RG 92 - Entry 1890 - Box 725.

81. Hugh J. Casey, Lieut. Colonel, C.E., Assistant, to Assistant Chief of Staff G-4, "Revision of Basic Barracks Plans," July 15, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725. Fine and Remington Draft, 39, Fort Belvoir Office of History, Box VII-35.

82. Rose, 37. See also, J.G. Brackinridge, Adjutant General, to The Quartermaster General, [Untitled], July 24, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 784.

83. Hugh J. Casey, Lieut. Colonel, C.E., Assistant, to Assistant Chief of Staff G-4, "Revision of Basic Barracks Plans," July 15, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

84. The addition of a 10'-0" bay allowed for the necessary increase in lavatory facilities; the toilets, wash basins and sinks were increased to six. See "War Department General Staff Disposition Form," July 22, 1941, National Archives, RG 407 - Entry 360 - Box 3970. While on inspection of Fort George Meade in Maryland, it was observed that the soldiers had jerry-rigged a system of a coat hook and shelf by each bunk. New barracks plans were ordered which would provide a "shelf and pole for coat hangers behind each cot." Executive Office, Construction Division, to Field Service Branch, General Service Division, "Report of Inspection, Ft. George B. Meade, Md., by Messrs. Richardson, Higdon, Clark and Cline on May 6, 1941," June 21, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730. How these recommendations were enacted can be seen in Figure 4. Reports from the Air Corps were also reviewed in revising the plans. See, Hugh J. Casey, Lieut. Col., C.E. to Chief of Engineers, "Recommended Alterations to Improve the Functional and Structural Characteristics of Temporary Mobilization Type Buildings," August 9, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 496.

85. "Memorandum on Modifications, Additions, and Revisions to Standard Plans and Specifications for Theater of Operations and mobilization Type Building Necessary Prior to Advertisement For Bids," January 1942. See also, S.D. Sturgis, Jr., Lt. Col., Corps of Engineers, District Engineer, to The Chief of Engineers, "Delays in the Execution of Construction at Air Corps Projects," January 14, 1942. Both in the Sturgis Papers, Fort Belvoir Office of History, Box 14, Folder 80.

86. Rose, 36, citing Construction Division Letter No. 87. "Policy in Regard to Changes in Construction to Conform to Revised Plans," February 11, 1941. See also, The Adjutant General, to The Chief of Engineers, "Deviation from Standard Construction Plans, Mobilization Type Structures," April 8, 1941. Washington National Records Center, RG 92 - Entry 1890 - Box 710.

87. The preference for curvilinear streets arose from the "City Beautiful" movement of the early 20th century. City and park planners, such as Frederick Law Olmsted and his son, advocated the curvilinear street as more aesthetically pleasing as well as cost-efficient. Leon Zach, who was responsible for site planning, had worked with the junior Olmsted. This may account for the curving lines of the triangular division layout.

88. Fine and Remington, 170-173. See also, Interview, Remington and Fine with Col. Frank E. Lamphere, June 26, 1956, Fort Belvoir Office of History, Box VII-36A. For a detailed discussion of the painting issue, see Section VI.H. below.

89. A.C. Johnson, "Cantonment Design and Construction," September 24, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 729. W.H. Harrison, NDAC, to Honorable Robert P. Patterson, The Assistant Secretary of War, "Cantonment Design and Construction," October 16, 1940, National Archives, RG 107 - Entry 23 - Box 894. In fact, Holabird and Root were subsequently hired to design eight barracks of alternate materials (including concrete block, steel frame, and hollow tile) at Camp Grant in Illinois. These barracks resembled the wood barracks in size and scale. Even the casement windows retained the individual lights. "Experimental Barracks at Camp Grant." Engineering News-Record 127 (May 22, 1941): 50-53. Use of alternate materials at other camps was sporadic, and will probably only come to light after camp inventories are taken.

90. Fine and Remington Draft, 29, Fort Belvoir Office of History, Box VII-35. Telegram from Reybold, Chief of Engineers, to Mr. Flint, Globe Wernicke Company, January 24, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 784.

91. Fine and Remington, 265-266, 333.

92. Fine and Remington, 276.

93. Brehon Somervell, Lt. Col. CE, to Maj. R.C. Moore, Deputy Chief of Staff, [Untitled], February 6, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 719. See also, Fine and Remington, 294, 373.

94. Rose, 35, citing Construction Division Letter No. 27.

95. Fine and Remington, 343.

96. Construction Division Letter 81, "Revisions to Standard Mobilization Building Detail Drawings," February 10, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 1.

97. Fine and Remington provide a much more detailed and complete study of this transfer, see 440-476.

98. Fine and Remington, 408-415.

99. Fine and Remington, 498. Robert Patterson, Under-Secretary of War, to General Somervell, Assistant Chief of Staff, January 1, 1942, National Archives, RG 165 - Entry 234 - Box 469. Somervell to Chief of Staff, "Subject: Construction of New Camps," January 1, 1942, National Archives, RG 165 - Entry 234 - Box 469.

100. "Chronology of the use of advance planning funds for new camps," undated, National Archives, RG 107 - Entry 23 - Box 894. Fine and Remington, 417.

101. Somervell to Chief of Staff, January 1, 1942, National Archives, RG 165 - Entry 234 - Box 469.

102. Fine and Remington, 351 citing Conf., Casey with Maj. Hardin, Maj. Plank, and Harold A. Kemp of OCE, July 23, 1941, Fort Belvoir Office of History, Box VII-35.

103. Moore, Chief, Design Section, to Chief, Engineering Branch, "Approval of 800 Series Drawings," October 29, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 754. Major Boeckh, Construction Estimating Unit, Design Section, to Chief, Design Section, "Difference in Construction of 63-Man and 74-Man Barracks," July 7, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725. Engineering Manual, Chapter X, Part I, Paragraph 10-03b, Corps of Engineers Library. See also, Fine and Remington, 350-51. Rose, 318 and 375.

104. Major Boeckh, Construction Estimating Unit, Design Section, to Chief, Design Section, "Difference in Construction of 63-Man and 74-Man Barracks," July 7, 1941. Hugh J. Casey, Lieut. Colonel, CE, to Assistant Chief of Staff, "Revisions of Basic Barracks Plans," July 15, 1941. Both in Washington National Records Center, RG 92 - Entry 1890 - Box 725. The Army command's misconception that the 700 Series barrack meant 63-man and the 800 Series barrack meant 74-man was erroneously perpetuated in the Truman Committee hearings. See, Report of Present Procedures on Matters in Report No. 480, Part 2 (Camps and Cantonments) of the Senate Committee Investigating the National Defense Program, January 16, 1942, Fort Belvoir Office of History, Box V-10.

105. Fine and Remington, 351. Then Captain Dreyer believed that the aqua medias were functionally important to the barracks and that their removal ultimately increased maintenance costs. Dreyer also criticized the 800 Series barracks in terms of their architectural worth and personal comfort. Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

106. "Frame Buildings for a Western Cantonment," Civil Engineering 13 (June 1943): 269-271. Interview, Remington with Mr. W.R. with Deininger, March 13, 1959, Fort Belvoir Office of History, Box VII-36A. Engineering Manual, Chapter X, Part II, Paragraphs 11-06 and 11.10, Corps of Engineers Library.

107. Interview, Remington with Mr. Simon Sandler, March 6, 1959, Fort Belvoir Office of History, Box VII-36B. Leavey, Chief, Design Section, Engineering Branch, to Chief, Engineering Branch, Construction Division, "Standard Specifications for Temporary Housing," July 14, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729.

108. "Report on Inspection of Quartermaster Activities by Maj. Gerald R. Tyler of December 9, 1941 Meeting at Fort Leonard Wood," December 15, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729.

109. Fine and Remington, 351. There also appears to have been confusion over whether and when Bergstrom was proposing to use balloon or platform construction. For example, an internal memorandum explains that the 22' post in a barracks drawing was actually two splined posts. Farrar, Architecture Unit, to Chief, Design Section, "Mobilization Type Structures," July 18, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730.

110. Interview, Fine and Remington with General Renshaw, June 25, 1959, Fort Belvoir Office of History, Box VII-36B.

111. Comments, General L.R. Groves, Fort Belvoir Office of History, Box VII-37. Interview, Remington with Mr. W.R. Deininger, March 13, 1959, Fort Belvoir Office of History, Box VII-36A.

112. John R. Hardin, Major, Corps of Engineers, Chief, Construction Section, to The Quartermaster General, "Drawings for Mobilization Type Buildings," August 4, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 496. The Air Corps command noted that they would issue similar directives to their division and district engineers. See, Circular Letter, "Airfield Construction - Standard Plans and Specifications for Mobilization Type Buildings," August 27, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 495. For example, the Air Corps adopted the 74-man barracks as standard two weeks after it was approved for cantonment construction. See, Frank M. Kennedy, Colonel, Air Corps, Chief, Buildings & Grounds Division, "Additions of Standard Barracks 74 Man Type to Standard List of Mobilization Type Buildings," August 13, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 496.

113. For example, Fort Gordon in Augusta, Georgia erected both 700 Series and 800 Series barracks in June 1942. Telephone conversation, Lisa Collins, Real Property Administrator, Engineering Services, with author, August 10, 1988. It was more common for a camp to have a mixed Series plan, by using the new 800 Series drawings augmented by unchanged 700 Series buildings. See, e.g., Appendix II.

114. The nine original camps were to be located in Blackston, Virginia; Columbus, Indiana; Augusta, Georgia; Cookson Hills, Oklahoma; Neosho, Missouri; Fort Smith, Arkansas; Santa Maria Lompoc, California; Eugene, Oregon; and Medford, Oregon. See, "Engineering contracts awarded for nine new army cantonments," Engineering News-Record 127 (Mary 29, 1941): 3.

The 14 additional camps were to be located in Bastrop, Texas; Paris, Texas; Waco, Texas; Fort Huachuca, Arizona; Venice, Florida; West Yellowstone, Montana; Colorado Springs, Colorado; Corvallis, Oregon; Durham, North Carolina; Marysville, California; Morganfield, Kentucky; a site spanning both Hopkinsville, Kentucky and Clarksville, Tennessee; Ozark, Alabama; and the expansion of the old Camp McCoy, Wisconsin. "New Army Building Program," The Constructor 23 (September 1941): 33.

By January 1942, the plans had been slightly revised and clarified. The following five cantonments had been awarded or were actually under construction: Blackstone, Virginia; Gordon, Georgia; Ozark, Alabama; Bastrop, Texas; Fort Huachuca, Arizona. The following ten cantonments were in advanced stages of planning: Centerville, Missouri; Lewiston, Illinois; Killeen, Texas; Gainesville, Texas; Chillicothe, Ohio; Paris, Texas; Morganfield, Kentucky; Camp McCoy, Wisconsin; Corvallis, Oregon; Marysville, California. See, "Camps Awarded and/or Underway [and] Advanced Planning - Camps," January 22, 1942, National Archives, RG 107 - Entry 23 - Box 894.

115. "Engineering Contracts awarded for nine new army cantonments," Engineering News-Record 127 (May 29, 1941): 3.

116. Telephone inquiries from author to Camp Carson, Colorado; Fort Campbell, Kentucky; Fort Rucker, Alabama; Fort Gordon, Georgia; Camp Adair, Oregon, Camp Beale, California; Camp Pickett, Virginia, August 10, 1988. See also, HABS photographs of Camp McCoy (Fort McCoy {HABS No. WI-308}, Sparta vicinity, Monroe County, Wisconsin).

117. There were, of course, many exceptions to the rule. For instance, engineers at Ft. Gordon in Georgia built 700 Series barracks in the spring of 1942 along side of 800 Series barracks. Perhaps the most fitting conclusion here is that, while most commanders seemed to have a predilection for the new drawings, each commander turned to the structure most suitable for the needs of his post, and such conditions varied.

118. Telephone interview, Mr. Owen at Ft. Rucker with author, August 10, 1988. Telephone interview, Mr. Graham at Ft. Carson with author, August 10, 1988. Interview, Fine and Remington with General C.F. Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36a. Circular Letter 2105/Construction Division No. 545. "File Index Numbers for Standard Construction Drawings," October 19, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 746. This document lists the key series numbers of building plans. The 700 Series and T.O. 700 Series are given, but there is no 800 Series. The Engineering Manual notes that the 800 Series had been discontinued because it "proved to be more strongly built than necessary, and the cost was unduly high." Chapter X, Part I, Paragraph 10-03b (October 1943), Corps of Engineers Library.

119. "Camps awarded and/or underway," [undated], National Archives, RG 107 - Entry 23 - Box 894. War Department, Corps of Engineers, Monthly Progress Report, 128, February 28, 1943, Corps of Engineers Library. "Chronology of the use of advance planning funds for new camps," undated, National Archives, RG 107 - Entry 23 - Box 894. Fine and Remington, 417.

120. Smith, Executive Office, Design Section to Colonel Casey, "Standard Specifications for Temporary Housing 3400-E Tentative," July 19, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729.

121. Fine and Remington, 526, 531, 534. "Conservation Construction," December 1943, Washington National Records Center, RG 92 - Entry 1890 - Box 701.

122. Fine and Remington, 546, 549.

123. Circular Letter No. 1662/Construction Division No. 447, "Revision to Framing Details on Standard Drawings Nos. 800-100 and 800-101," June 1, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 706. Fine and Remington, 547.

124. Rose, 424. See also, V.H. Jacobs, Adjutant General, to The Chief of Engineers, "Conversion of Permanent Tent Camps Into Hutments," January 30, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 754.

125. "War-Front Type Barracks Built in Record Time," Engineering News-Record 128 (July 16, 1942): 68-69. Demountable CCC buildings were also moved to army camps. See, "CCC Buildings Salvaged for Army Camps," Engineering News-Record 129 (July 15, 1943): 92-94.

126. Fine and Remington, 483, 532-33.

127. George Hall,. Lt. Col., Corps of Engineers, Chief, Construction Section, to General Kingman, "Barracks Space Allotments," September 19, 1940. See also, John R. Hall, Colonel, Medical Corps, to The Quartermaster General, [Untitled], September 22, 1941. Both in Washington National Records Center, RG 77 - Entry 107 - Box 731.

128. Included in the estimation was the established projection that at any one time 4% of the occupants would be hospitalized. It was also noted that the second floor of the 700-1165 barracks were not tall enough to accommodate double bunking. Robert B. Field, Major QMC, Assistant, to Chief of Engineers, [Untitled], October 2, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725. See also, John R. Hardin, Lieut. Colonel, Corps of Engineers, Chief, Construction Section, to Colonel Frank M. Kennedy, Chief, Building and Grounds Division, [Untitled], October 30, 1941, Washington National Records Center, RG 77 - Entry 107 - Box 784.

129. Rose, 431-32. Fine and Remington, 559-560. See also, Thomas M. Robbins, Major General, Assistant Chief of Engineers, to Colonel Pierson, Requirements Division, "Capacity Barracks," July 4, 1942. E. Reybold, Major General, Chief of Engineers, to Commanding General, Services of Supply, "Double-Bunking of Camps and Air Force Stations," September 21, 1942. Both in Washington National Records Center, RG 77 - Entry 107 - Box 784.

130. "War Department Construction Policy, Zone of the Interior." Reproduced in U.S. Command & General Staff School. Construction. (Fort Leavenworth, Kansas: 1942), 106-07.

131. War Department, "Directive for War-Time Construction," June 1, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 735.

132. "T-of-O Equivalents for Mobilization Type Buildings," March 3, 1942, reproduced in Rose, Appendix 1.

133. Engineering Manual, Chapter X, Part I, Paragraph 10-03c, Corps of Engineers Library.

134. Interview, Fine and Remington with Major General A. C. Smith, March 1, 1955, Fort Belvoir Office of History, Box VII-36B. Interview, Fine and Remington with General Christian F. Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

135. W.V. Kahler, to Mr. M.J. Madigan, "Request for AA Priority - Camp Claiborne, Louisiana," January 12, 1942, National Archives, RG 107 - Entry 23 - Box 894.

136. Telegram from Colonel Groves, Chief of Engineers, to All Division Engineers, June 1, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 804.

137. Circular Letter No. 2105/Construction Division No. 535, "File Index Numbers for Standard Construction Drawings," October 19, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 746.

138. Circular Letter No. 2105/Construction Division No. 545, "File Index Numbers for Standard Construction Drawings," October 19, 1942, Washington National Records Center, RG 77 - Entry 107 -Box 746.

139. Arthur Allen, Major, IGD, to The Inspector General, "Emergency Type Barracks," May 28, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 481. Rose, 427 citing WD. AGF. Assistant Adjutant General, to Commanding General, Service of Supply, "Construction for Triangular Infantry Divisions," May 30, 1942. Engineering Manual, Chapter X, Part II, Paragraph 10-10b, Corps of Engineers Library. See also, "Memorandum to Accompany File Index Numbers for Standard Construction Drawings," January 26, 1943, Washington National Records Center, RG 77 - Entry 107 - Box 746. See also, "Comments on Plans and Specifications Submitted to O.C.E. for Review," February 2, 1943, Washington National Records Center, RG 77 - Entry 107 - Box 746. How the new barracks took advantage of local materials was examined in "New Barrack Design Saves Lumber," Engineering News-Record 130 (November 2, 1944): 68-69.

140. "Emergency Cantonment Construction," The Military Engineer 33 (January-February 1941): 8.

141. "Fort Devens Construction Employs 14,000 Men on 1,011 Wood Buildings," Construction Methods 23 (March 1941): 44. "Central Wood Mill Precuts All Framing Lumber for 14,000,000 Army Camp," Construction Methods 23 (February 1941): 38. "Housing the New Army," Engineering News-Record 126 (October 24, 1940): 44.

142. Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

143. Robert D. Field, Major Quartermaster Corps, to Zone Const. QM #6, [Untitled], March 30, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730.

144. Reviewing Committee, Chas. T. Higham, H.R. Doswell, Benedict Farrar, to Mr. Bergstrom, "Hoods and Canopies on Barracks Buildings," March 13, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

145. Bergstrom, Chief, Architecture Group, to Executive Officer, Design & Engineering Section, "Revisions of Drawings for Temporary Mobilization Housing," Washington National Records Center, RG 92 - Entry 1890 - Box 725.

146. Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

147. Compare "Housing the New Army," Engineering-News Record 126 (October 25, 1940): 44 with "The Battle of Production," The Constructor 25 (July 1943): 75. See also Mobilization Drawing No. 800-443. Photographs of the Camp McCoy Field Reports also show an external chimney on an 800 Series barracks.

148. War Department, Repairs and Utilities 1939-1945 History, 111, Fort Belvoir Office of History, Box VII-38.

149. Engineering Manual, Chapter XI, Part II, Paragraph 11-09, Corps of Engineers Library.

150. E.L. Van Sickel, SCQM, to Captain Rafferty, "Suggested Change in Plans of 63 Man Barracks," January 14, 1941. Scheid, Engineering & Design, to Capt. Rafferty, Operations, [Untitled], January 18, 1941. Both in Washington National Records Center, RG 92 - Entry 1890 - Box 725. W.H. Harrison, Office of Production Management, to General B.B. Somervell, February 4, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. Construction Division Letter No. 10, "Revisions to Standard Detail Drawings," February 25, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 1. Construction Division Letter No. 181, "Revisions to Standard Mobilization Buildings," March 28, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 2.

151. Construction Division Letter No. 299, "Fire Hazard - Existing Standard Mobilization Buildings," June 13, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 2. See also, G.F. Lewis, Lt. Colonel, Quartermaster Corps, to Zone Constructing, Quartermaster, Zone VIII (pencilled in "For Each and All Zones"), "Fire Hazards - Existing Standard Mobilization Buildings -- Heating Rooms," September 13, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 732.

152. Gen. E.B. Gregory, Colonel, Quartermaster Crops, Acting The Quartermaster General, to The Assistant Chief of Staff, G-4, [Untitled], February 21, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 699.

153. Rose, 319, citing WD. OCAC to GC and CO of 11 Air Corps Activities, "Correction of Unsatisfactory Flooring (Second Floor) in Temporary Cantonment Type Barracks." May 23, 1941.

154. Engineering Manual, Chapter X, Part I, Paragraph 10-03a, Corps of Engineers Library.

155. War Department, Repairs and Utilities 1939-1945 History, 100-02, Fort Belvoir Office of History, Box VII-38. "Tentative Draft of Additions to 'Floor Covering' Section RU 0602.02," Washington National Records Center, RG 77 - Entry 107 - Box 481.

156. Capt. Dreyer to Major Casey, "OM-1 Building," March 28, 1941. Mr. Bergstrom to Major Casey, "OM-1 Bldg," April 2, 1941. Both in Washington National Records Center, RG 92 - Entry 1890 - Box 710.

157. Engineering Manual, Chapter X, Part I, Paragraph 10-03, Corps of Engineers Library. See also, House Committee Hearings, April 1, 1941, Part I, 107.

158. House Committee Hearings, April 1, 1941, Part I, 106.

159. Engineering Manual, Chapter X, Part I, Paragraph 10-02b, Corps of Engineers Library.

160. "Emergency Cantonment Construction:" The Military Engineer 33 (January-February 1941): 8. In other cases, such as at Camp McCoy in Wisconsin, the coal boxes were placed between the furnace room doors of two adjacent barracks.

161. W. H. Harrison, Advisory Commission of the Council of National Defense, to General Charles D. Hartman, [Untitled,] November 6, 1940, Washington National Records Center, RG 92 - Entry 1890 - Box 732.

162. Jerry V. Matejka, Lt. Col, GSC, to Lt. Col. F.F. Hall, "Comments and Suggestions for New Camps," March 18, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. Report on "Inspection of Fort George G. Meade," May 12, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730. DeWolfe H. Miller, 1st Lieut., Quartermaster Corps, to The Quartermaster General, "Barrack Heating," May 21, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 732.

163. Cross Index 625, From Hdqtrs Southeast Army Air Forces Trng Center, Maxwell Fld, Ala., August 19, 1942, Washington National Records Center, RG 77- Entry 107 - Box 784.

164. Engineering Manual, Chapter X, Part I, Paragraph 10-02b, Corps of Engineers Library.

165. Allen, Ground Troop Section, Engineering Branch to Troop Facilities Section, Operations Branch, "Standard Specifications for Temporary Housing," February 23, 1942, Washington National Records Center, RG 77 - Entry 107 - Box 746. See also, Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

166. J.L. Person, Captain, Corps of Engineers, Assistant Chief, Construction Program, to The Chief of the Air Corps, "Winterproofing Cantonment-type Construction," August 26, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. See also: "Office of the Quartermaster General; Construction Division; Plan No. 800-120; Mobilization Buildings; 29'-6" Wide Bldg. - Bearing Partitions; Two Story; Architectural; Typical Plan, Elevation & Sections," dated May 28, 1941. This drawing shows the wainscot, insulation board, and floor insulation for -20 degrees zone.

167. John B. Cooley, Adjutant General, to the Chief of the Army Air Forces, "Winterproofing Cantonment-type Construction. Various Stations," October 29, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. For the correspondence leading up to this decision, see also, Frank M. Kennedy, Colonel, Air Corps, Chief, Building & Grounds Division, to The Adjutant General, "Winterproofing Cantonment-type Construction," September 3, 1941. And John B. Cooley, Adjutant General, to The Quartermaster General, "Winterproofing Cantonment-type Construction. Various Stations," October 10, 1941. Both at Washington National Records Center, RG 92 - Entry 1890 - Box 729.

168. Herman T. Johnson, Major, CE, Executive Officer, Engineering Branch to The Adjutant General, "Storm Entrance Shelters," January 5, 1942. V.H. Jacobs, Adjutant General, to the Chief of Engineers, "Storm Entrance Shelters," January 15, 1942. Both at Washington National Records Center, RG 77 - Entry 107 - Box 784.

169. War Department, Reports and Utilities 1939-1945 History, 97, Fort Belvoir Office of History, Box VII-38.

170. Interview, Remington and Fine with Col. Frank E. Lamphere, June 26, 1956, Fort Belvoir Office of History, Box VII-36A.

171. G.S. Stuart, Executive Director, PDCA, to W.H. Harrison, Director of Construction, Council of National Defense, [Untitled], October 1, 1940, National Archives, RG 107 - Entry 23 - Box 894.

172. "War Department Construction Policy, Supplement No. 7," November 4, 1940, Reproduced in the Sturgis Papers, Fort Belvoir Office of History, Box 15, Folder 81. See also, W.H. Harrison, Director, Construction Section, to George S. Stuart, PDCA, [Undated], National Archives, RG 107 - Entry 23 - Box 894. See also, "Standard Specifications for Temporary Housing, Specification No. 1700-E. Addendum Nos. 13 and 17 (January 17, 1941, and February 21, 1941), Fort Belvoir Office of History, Box V-7.

173. War Department, Repairs and Utilities 1939-1945 History, 98-99, Fort Belvoir Office of History, Box VII-38.

174. Describing World War I lavatory facilities, an old soldier recalled, Upton had a poor water and sewer system of a temporary character, water lines were of wood, would not stand much pressure, and were always leaking. . . Barracks at Upton had no toilets or washrooms and soldiers had to go maybe a block or two outdoors to a detached building to wash or use the latrine day or night in all kinds of weather; this may in part have been the cause of so much flu in World War camps. House Committee Hearing, April 1, 1941, Part I, 107.

175. C.D. Hartman, Col., QMC, to Brigadier General R.C. Moore, Assistant Chief of Staff, G-4, "Plans for Mobilization Type Buildings," July 19, 1940, National Archives, RG 165 - Entry 234 - Box 424.

176. "Emergency Cantonment Construction," The Military Engineer 33 (January-February 1941): 6.

177. H.E. Pitz, Colonel, Quartermaster Corps, Assistant, to The Adjutant General, [Untitled], March 15, 1940, Washington National Records Center, RG 92 - Entry 2102 - Box 1.

178. Jerry V. Matejka, Lt. Col. GSC, to Lt. Col, F.F. Hall, "Comments and Suggestions for New Camps," March 18, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. Lloyd D. Brown, Lt. Col. GSC to Lt. Col. Hall, "Camp Construction," March 18, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 729. Report of "Inspection Trip to Fort George G. Meade," May 12, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730. Engineering Manual, Chapter X, Part I, Paragraph 10-03a, Corps of Engineers Library.

179. Construction Division Letter No. 90, "Additional Shower Heads for 63-Man Barracks," February 13, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 1. Engineering Manual, Chapter X, Part II, Paragraph 10-10g, Corps of Engineers Library. "Report of Inspection Trip to Fort George G. Meade," May 12, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 730.

180. Engineering Manual, Chapter X, Part I, Paragraph 10-02b, Corps of Engineers Library. See also, "Standard Specifications for Temporary Housing, Specifications No. 8000-E. Addendum No. 5," (February 16, 1942), Fort Belvoir Office of History, Box V-7.

181. Engineering Manual, Chapter X, Part I, Paragraph 10-03a; Chapter XI, Part II, Paragraph 11-09; Chapter XI, Part V, Paragraphs 11-29 and 11-31, Corps of Engineers Library.

182. War Department, Repairs and Utilities 1939-1945 History, 104-05, Fort Belvoir Office of History, Box VII-38.

183. Sturgis Papers, Fort Belvoir Office of History, Box 15, Folder 81.

184. War Department, Repairs and Utilities 1939-1945 History, 105-06, Fort Belvoir Office of History, Box VII-38.

185. War Department, Repairs and Utilities 1939-1945 History, 95, Fort Belvoir Office of History, Box VII-38.

186. C.D. Hartman, Brigadier General, Quartermaster Corps, to The Assistant Secretary of War, [Untitled], October 4, 1940. Robert P. Patterson, The Assistant Secretary of War, to Brig. General Charles D. Hartman, Assistant Quartermaster General, "Roofing of Cantonment Housing," October 8, 1940. Both in National Archives, RG 107 - Entry 23 - Box 894.

187. "Standard Specifications for Temporary Housing, Specification No. 1700-E. Addendum No. 7," (November 12, 1940), Fort Belvoir Office of History, Box V-7.

188. S.J. Chamberlin, Lt. Col., General Staff, Chief, Construction Branch, to General Moore, "Type of siding used in temporary construction," June 21, 1940, National Archives, RG 165 - Entry 234 - Box 418.

189. Possibly Fort Sill. See Interview, Fine and Remington with General Christian Dreyer, February 27, 1959, Fort Belvoir Office of History, Box VII-36A.

190. "Steel Siding for Cantonment Buildings," The Constructor 23 (October 1941): 42.

191. "Standard Specifications for Temporary Housing, Specifications No. 1700-E. Addendum No. 6," (October 30, 1940), Fort Belvoir Office of History, Box V-7.

192. "Standard Specifications for Temporary Housing, Specifications No. 1700-E, Addendum No. 10," (December 9, 1940), Fort Belvoir Office of History, Box V-7.

193. Reviewing Committee, Chas. T. Higham, H.R. Doswell, Benedict Farrar, to Mr. Bergstrom, "Termite Shields," March 13, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

194. Smith, Executive Officer, Engineering & Design Section, to Executive Officer, Architectural Group, Engineering & Design Section, [Untitled], April 8, 1941. Bergstrom, Chief, Architectural Group, to Executive Officer, Design & Engineering Section, "Revisions of Drawings for Temporary Mobilization Housing," April 10, 1941. Both in Washington National Records Center, RG 92 - Entry 1890 - Box 725. An indication of how haphazardly directives were disseminated to the field is seen in the reminder six months later that termite shields had been eliminated. Construction Division Letter No. 487, "Elimination of Termite Protection," September 26, 1941, Washington National Records Center, RG 92 - Entry 2102 - Box 4.

195. "Frame Buildings for a Western Cantonment," Civil Engineering 13 (June 1943): 269-271.

196. "Housing the New Army," Engineering News-Record 126 (October 24, 1940): 44. Construction Division Letter No. 8, "Skirting Details," February 10, 1941. Washington National Records Center, RG 92 - Entry 2102 - Box 1. Leavey, Chief of the Engineering Branch, recommended that the skirting be altogether eliminated, arguing that it could have saved $2,000,000 in the 1940 construction program. He rejected the argument that the costly skirting was necessary for appearance, but recognized that skirting could have insulation benefits. Leavey, Chief, Engineering Branch, to Chief Constructing Division, "Termite Protection, Hoods and Canopies on Barracks Buildings," March 28, 1941, Washington National Records Center, RG 92 - Entry 1890 - Box 725.

197. Fine and Remington, 522.

198. G.S. Stuart, Executive Director, Painting and Decorating Contractors of America, to W.H. Harrison, Director of Construction, National Defense Advisory Council, [Untitled], October 1, 1940, National Archives, RG 107 - Entry 23 - Box 894.

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A History of 700 and 800 Series Cantonment Construction

including

Historic American Buildings Survey
Mitigation Documentation

for

Camp Edwards, Massachusetts
Fort McCoy, Wisconsin

Legacy Resources Management Program
United States Department of Defense
* * *
United States Department of the Interior
National Park Service
Historic American Buildings Survey/
Historic American Engineering Record