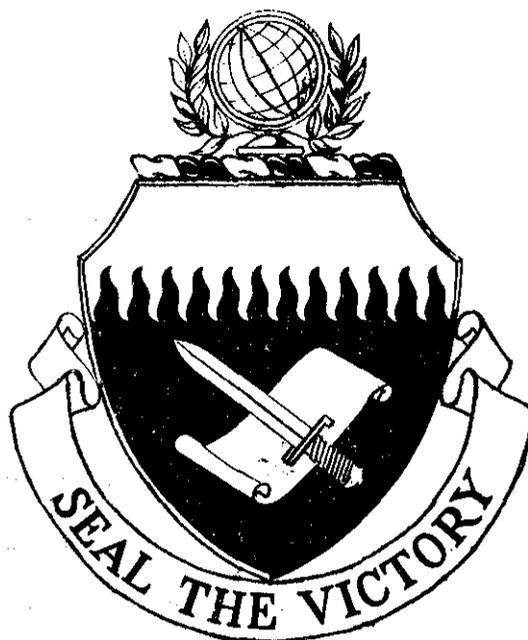


US ARMY
CIVIL AFFAIRS SCHOOL



PUBLIC WORKS
AND UTILITIES

This publication is provided for resident and extension course instruction at the U. S. Army Civil Affairs School only. It reflects the current thought of this school and conforms to printed Department of the Army doctrine as closely as possible.

US ARMY
CIVIL AFFAIRS SCHOOL
Fort Gordon, Georgia

While this text deals specifically with the organization, function and operation within the category of Public Works and Utilities, it does not attempt to cover the complete cycle of command and staff relationships. A concise review of the broad aspects of Civil Affairs Staff and Unit Organization, concept of operations to include the interrelationships of Staff functions with unit operations is contained in ST 41-150 Civil Affairs Command and Staff Relationships. That text should be read first, or in conjunction with this text.

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GENERAL

SECTION I. INTRODUCTION

1. Preface:

The function of Public Works and Utilities is a vital element of civil affairs activities and operations. The essentiality of public works and utilities in peacetime, situations short of war, to include cold war, limited and general wars, is obvious. Its influence on individuals and the nation has grown immensely during the past decade. Health and progress are dependent upon public works and utilities. The ability of a nation to mobilize for war is dependent upon the many elements involved in public works and utilities. The speed with which all economy is reutilized is dependent upon such utilities.

2. Purpose and Scope:

a. This special text is intended as a guide for civil affairs personnel who may be called upon to perform the public works and utilities function as a member of a G5 staff section, a public works and utilities officer of a civil affairs unit staff, or as a member of a civil affairs public works and utilities team, in an environment of peace, situations short of war to include cold war, limited or general wars, under either nuclear or conventional conditions. In any military operations higher authority will publish instructions which will provide specific guidance to the commander exercising civil affairs authority and for staffs and units which deal with public works and utilities.

b. The written material, suggested reports, surveys and checklists included in this text indicate the organization and functions of Public Works and Utilities personnel of a CA organization under general or normal type of operations. The text covers the suggested reports, surveys and checklists needed to administer and control the public works and public utilities of an occupied territory. These have been compiled from all existing references and represent the norm of the functions and duties of the team. All reports, surveys, and checklists included in the text are suggestions only and must be adapted to situations actually encountered. The text shows the coordination between this team and other teams in all areas where there is an overlapping of jurisdiction and duty, and where requirements of the mission indicate a reliance upon another team for assistance. The relation between CA units and army engineer units is indicated because

the scope of CA activities is limited in some cases by the assignment of Army engineer troops to road and bridge repairs, rehabilitation of water works, and similar projects. Specialized terms not defined in the text are defined in the glossary.

OPERATIONAL PROCEDURES: NATIONAL, REGIONAL AND LOCAL

SECTION I. GENERAL AND SPECIFIC FUNCTIONS AND RESPONSIBILITIES

3. Civil Affairs Public Works and Utilities Staff and Team Officer:

a. Duties: The Public Works and Utilities officer directs and controls construction, rehabilitation, and maintenance of public works and utilities. He plans and designs construction of public utilities, such as waterworks and sewage disposal systems; plans and directs construction, or rehabilitation and maintenance of such facilities as railroads, street railways, highways, harbors, canals, pipelines, power and light facilities, waterworks, sewage disposal systems, housing and public buildings; directs inspection or tests of water supplies, sewage and sewage treatment, and garbage and refuse disposal. He reports findings, makes recommendations, and serves as technical consultant on problems relating to construction, maintenance, and operation of public works and utilities.

b. Qualifications:

(1) A Public Works and Utilities officer must be able to perform the above-mentioned duties. He must have a thorough knowledge of the organization, mission, and operations of engineer construction and utilities units. He should have had military or civilian supervisory engineering experience in the design, construction, operation, or maintenance of public works and utilities; and college training in an appropriate field of engineering, or equivalent military or civilian experience in public works and utilities, or with air, motor, and rail transportation organizations.

(2) In view of the sanitation aspects of the public works and utilities functions, the public works and utilities officer will no doubt be required to serve as a technical consultant with the public health sanitary engineer on the engineering aspects of a preventive medicine and environmental sanitation program including such phases as water supply, medical facilities planning, swimming pools and natural bathing places, waste disposal including industrial waste, plumbing, industrial hygiene, industrial hygiene engineering, radiological hygiene and safety, housing, including heating, lighting, and ventilation, air conditioning, disinfection, and accident prevention. He should therefore be qualified to perform such duties and have had some experience in sanitary, public health or industrial hygiene engineering.

c. Specific Functions: See FM 41-5, Joint Manual of Civil Affairs, and FM 41-15 Civil Affairs Units.

4. Public Works and Utilities Staff Officer:

a. The Civil Affairs (G5) section may be organized in branches along functional lines representing the four categories of functions, i.e., governmental, economics, public facilities and special, or a combination thereof; along staff lines, i.e., personnel and administration, intelligence, plans and operations, and logistics; or a combination of staff and functional branches. In joint headquarters the section might be organized along either staff or functional lines or a combination thereof with added branches to take care of matters peculiar to the Navy, Marine Corps and Air Force. In joint combined headquarters additional branches may be formed necessary to handle national matters. Regardless of the civil affairs staff section organization, one or more officers will be concerned with the supervision of public works and utilities within the area of civil affairs operations in addition to the normal functions of the staff officer as an adviser and planner. He will be concerned with related matters arising during peacetime, in situations short of war, to include cold war and operations arising during limited or general wars.

b. In peacetime the public works and utilities staff officer will be concerned with planning and training. He will be concerned with civil emergencies, including civil defense and disaster relief; area and comparative studies on a covered-wide basis with respect to such facilities as water, gas, waste disposal, electrical and other power systems and restoration or introduction of such facilities; manpower resources within the skills required; methods and techniques of simplified training in required skills to overcome manpower shortages in fields encompassed by public works and utilities; availability of power, fuel and replacement materiel; and other considerations essential to the success of the military mission, furtherance of national policies, and compliance with international legal obligations. During civil emergencies he will maintain close liaison with both military and local authorities in the survey of damage; requirements for rehabilitation; allocation of public utilities for civilian and military use; assurance of police protection of essential facilities, and obtaining essential public utilities services from military sources.

c. In situations short of war, to include the cold war, the public works and utilities staff officer will be concerned with the fields mentioned in b. However, in addition, if in an overseas area he will be concerned with checking the correctness of area studies by on the ground surveys; the extent of the authority granted by the

host country, express or implied, with respect to public works and utilities, labor, local procurement of materiel, fuel and power. He will be engaged in planning for possible future hot-war operations; determination, in coordination with the economic officer, of the effect of his plans on the economy of the country, particularly its ability to support planned assistance. His contacts with local officials and others within the sphere of his activities will increase and his advice and assistance will be sought or volunteered to the extent of his authority. The public works and utilities staff officer will also be interested in the availability of technicians and with the development of simplified training techniques which may be employed to develop required technicians where skilled manpower shortages exist; matters relating to the allocation of public utilities for military use and in obtaining public utilities services for civilian use; and performing such other acts as will assure the greatest local population cooperation and establish good military-civil relationships. So long as US diplomatic representation is present in the area the military commander may be limited in his operations and in his relationships with the local population, its government and institutions. Close liaison will be maintained with U. S. diplomatic officials under such circumstances and with other governmental agencies.

d. (1) During limited or general war, the Public Works and Utilities officer will be concerned with all the above-mentioned functions to a greater or lesser degree. He will be concerned with the review and revision of area studies, plans and orders; analysis of the organization, functions and authority of regulatory agencies; recommendations as to the desired extent of operation of civilian facilities by military agencies; determination of requirements of public utilities for labor, technical assistance, replacement parts, fuel and power; recommendations as to the allocation of public utilities for civilian and military use; development of requirements of supplies and materials for use by public utilities; obtaining essential public utilities services from military sources; and recommends priorities for restoration of public utilities and services. He will be concerned with requirements for and rehabilitation and maintenance of public buildings, electrical generating plants and distribution systems, water, gas and sanitation facilities, primary roads and streets, bridges and port facilities. The public works and utilities staff officer will be concerned with recommendations relating to the establishment or re-establishment, within command policy, of the local public works and utilities administrative system; the development of policies relating to the rehabilitation and operations of such systems; policies relating to the selection screening of administrative personnel; programs for the operation of public works and utilities;

and supervision of the activities of local governmental agencies, when restored, in effecting rehabilitation of public works and utilities. In any situation where atomics are to be employed, the public works and utilities staff officer will no doubt be called upon to advise on matters of target selection, effect of atomics upon machinery and equipment normally employed in public works and utilities operations.

(2) The above enumeration of the functions of the public works and utilities staff officer is not all inclusive. Some of the considerations involved in the performance of his functions under varying circumstances have been listed. The functions of the Public Works and Utilities officer cuts across the field of other staff officers in the civil affairs (G5) section and in the CA unit headquarters. For example, ports and port facilities would involve matters of interest to the Public Transportation officer, Economics officer, Legal officer, and Civilian Supply officer. As a consequence, most of the considerations and activities of the Public Works and Utilities officer would require coordination with the other civil affairs staff officers. In joint and joint-combined operations the requirement for coordination would be even greater due to the varied interests of the services and nationalities involved as well as differences in techniques, habits, and knowledge of the various aspects included within the function. Further because of the technicalities inherent in public works and utilities means of communication to provide a common ground for understanding and cooperation must be advised through close coordination and liaison. Of equal importance is the liaison which the Public Works and Utilities officer must maintain with public works and utilities staff officers of higher, lower and lateral headquarters, Civil Affairs Public Works and Utilities teams; engineer, transportation and other staff officers having closely related functions of other headquarters and units; liaison with intelligence units; allied staffs and units; and local government and utilities agencies and personnel. The Public Works and Utilities officer must secure a policy position as to the extent and scope of his authority to effect liaison outside his own headquarters at the earliest practicable date.

(3) Public works and utilities staff officers should bear in mind while formulating plans that, in areas under military control, either at the request of the government concerned, or because the US and allied forces have displaced the local government, public works and utilities initially will be operated and maintained by U. S. and allied forces until such time as local agencies are considered capable of handling the matter in a satisfactory manner. Because of the importance of the function, staff officers concerned with the supervision of public works and utilities should ensure the safeguarding thereof, their records and other operating impedimenta and, so far as policy will permit,

re-establish those elements thereof which are essential to the military effort and necessary to maintain the minimum standards of life in the area. When operable, the objective should not be to establish a new system, but to place or continue in operation the existing public works and utilities making only the changes required to accomplish the objective of the Theater Army commander or higher authority.

(4) It is the theory of supervision and control of local public works and utilities that control or supervision should be of an indirect, rather than of a direct nature. The local public works and utilities system should be utilized to the maximum extent, and if there is a chain of authority on responsibility within the system, it should be used to transmit instructions to the lower systems in preference to instructions through CA channels. This also would be true with respect to quasi-governmental or cooperate agencies which may control public works and utilities within the area. In other words, if a situation requiring correction should come to light in the lower level of a public utility, the appropriate public works and utilities staff officer or team should inform the highest administrative agency of that fact, state the corrective action desired, and that the administrative agency should then give the necessary instructions to the lower agency through whatever channel it has available. As the civil affairs administration of an area is temporary in nature, policies relating to individuals should preserve basic rights and changes in administration, e.g., from private to public, should be held to the minimum and then preserve property rights to the fullest extent.

SECTION II. PUBLIC WORKS AND UTILITIES TEAMS' ORGANIZATION AND FUNCTIONS

5. Organization:

The Public Works and Utilities teams are cellular in nature and organized in three different sizes as indicated in TOE 41-500 (See Appendix I).

6. Functions:

a. The functions of the Public Works and Utilities teams are generally set forth in FM 41-5, Joint Manual of Civil Affairs, and FM 41-15, Civil Affairs Units.

b. Public works and utilities teams must be capable of operating during periods of peace, under conditions short of war (to include cold war), and in limited or general wars.

c. In peacetime the public works and utilities teams normally will be engaged in the development of area and comparative studies relating to public works and utilities and laws related thereto. They will develop plans for military aid to the civil authorities in civil emergencies, e.g., civil defense and disasters. Close coordination should be effected between the teams and the public works and utilities of the area in which the team is located, as well as with those elements within the military establishment having an interest in that field. Surveys should be made disclosing availability of alternate or substitute public works and facilities, sources of replacement items and manpower capable of maintaining and operating such facilities. In that regard studies should be made indicating areas in which the physically handicapped would be utilized and in which a training program is developed and designed to meet forceable manpower shortages in the field of public works and utilities.

d. During periods of cold war, the public works and utilities teams will, when operating in the United States, assist to the fullest extent in perpetuating friendly relations between the military and the civil population. Measures for the security of public works and utilities will be planned and discussed with local authorities to the extent permitted by policy announced by higher authority. Requirements for manpower and natural resources will be developed and appropriate training programs inaugurated to insure continuity of essential public works and utilities. Every effort will be made to reach the workers and assist them in any way feasible. Operations outside the United States will be governed by agreements or arrangements made with the local governments. Liaison will be established and maintained with local agencies in the field of public works and utilities to insure mutual cooperation and eliminate friction. The extent of such liaison will be dictated by policy of higher authority.

e. In situations short of war, public works and utilities teams will be guided in their activities by the terms of the arrangements under which our forces are in the area. Their advice and assistance to local authorities and agencies will no doubt be sought. Before acting on any such requests, clearance should be obtained from the CA unit of which the team is a part. Care will always be exercised to insure that any assistance rendered will be of mutual help and that it does not reflect unfavorably upon our forces or our Government. Labor relationships will be carefully watched. All activities will be directed toward mutual understanding and cooperation. In these

circumstances guidance will be forthcoming from United States diplomatic representatives in the area with whom the closest coordination will be maintained. Area studies prepared during peacetime will be checked and contingency plans will be reviewed and revised to accord with the situation found to exist from actual observation. The technical capacity of available manpower should be studied with the end in view of establishing technical training facilities which may be warranted.

f. The foregoing must not be considered as being an all-inclusive listing of the activities of the public works and utilities teams in time of peace or in situations short of war.

SECTION III. PUBLIC WORKS AND UTILITIES TEAM OPERATIONS

7. a. In limited and general wars the operations of the public works and utilities teams generally fall into two phases, i.e., combat and post combat. Within the combat phase, the scope of the operations and functions performed will vary between the combat zone and the communications zone, will vary with the military environment, and will vary in magnitude in the extent nuclear weapons are employed. The activities of the post combat phase will also be varied depending upon policy, attitude of the people and other factors. No clear line of demarcation can be drawn between the two phases. The functions will merge from one phase to the other without precise timing.

General Scope of Activities:

(1) Public Buildings:

- (a) Survey and classification of public buildings and structures.
- (b) Rehabilitation of public buildings and structures.
- (c) Maintenance of public buildings and structures.

(2) Electricity:

- (a) Survey of public and private generating plants and distribution systems.
- (b) Rehabilitation of generating plants and distribution systems.
- (c) Operation and maintenance of electric system.

(d) Furnishing street lighting.

(e) Furnishing power for public transit systems.

(f) Rationing electricity.

(3) Water:

(a) Survey of public and private water supply and distribution systems.

(b) Rehabilitation of supply, storage and filtration plants, and distribution mains.

(c) Testing of water.

(d) Operation and maintenance of water system.

(e) Rationing water.

(4) Sanitation:

(a) Survey of sewage system and garbage collection and disposal facilities.

(b) Rehabilitation of sewers and sewage disposal plants.

(c) Rehabilitation of garbage collection equipment and incineration plants.

(d) Operation and maintenance of sewage disposal plants, incineration plants, and sanitary fills.

(5) Gas:

(a) Survey of public and private gas facilities.

(b) Rehabilitation of gas generating and storage plants, high pressure pipe lines, and distribution mains.

(c) Operation and maintenance of gas facilities.

(d) Rationing gas.

(6) Roads and Streets:

- (a) Survey of public roads and streets.
- (b) Removal of debris from roads and streets.
- (c) Repair and maintenance of roads and streets.
- (d) Furnishing and erection of street name signs.

(7) Bridges:

- (a) Survey of bridges.
- (b) Repair of bridges wherever feasible.
- (c) Posting load limit signs for all usable bridges.
- (d) Removal of unsafe structures.

(8) Port Facilities:

- (a) Survey of public and private port facilities.
- (b) Repair docks and material handling facilities.
- (c) Operation and maintenance of port facilities.

8. Combat Phase:

a. General:

(1) During the combat phase of a military operation the Public Works and Utilities teams are primarily concerned with measures that will insure the local civilian population the minimum utility services required to prevent disease and unrest.

(2) The needs of the military forces for utilities which can aid in military operations has to be considered as well as essential public utilities services which may be supplied from military sources.

(3) Each function of public works and utilities is discussed in terms of its relationship to operations in the combat phase.

b. Public Buildings:

(1) The situation in the combat phase may permit only emergency measures for repair of public buildings. Any expedient

measures to be taken should be viewed with the thought that permanent repair will follow in the post-combat phase.

(2) Many of the public buildings will be damaged to such an extent that their use during the combat phase will be limited. Steps should be taken immediately to survey all public buildings to determine extent of damage and emergency measures required for their use.

(a) Prepare report of survey in accordance with form shown in Appendix III, Example 13.

(b) Prepare estimate of time, materials and labor required to accomplish emergency repairs.

(c) Report action taken to date to restore facility to original use.

(3) Prepare plan of action for emergency repair of public buildings needed by the military and for essential civilian use. Liaison should be established with Army Engineer units in the area. Once the plan is approved by the CA unit commander, the team in coordination with other interested CA teams should cause local agencies to commence required rehabilitation.

9. Electricity:

a. Electric service is of primary importance in connection with the restoration of essential public services. It may be possible to obtain electricity from other areas; however, experience indicates that electric transmission lines will be damaged beyond the capability of expedient measures, hence little emphasis should be placed upon obtaining electricity from other areas. Temporary repairs, cannibalization of equipment and assistance from Army Engineer units will constitute the main activities during the combat phase.

b. Steps should be taken immediately to survey all public and private generating plants and distribution systems to determine extent of damage and emergency measures required for their use.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 8.

(2) Prepare estimate of time, materials and labor required to accomplish emergency repairs.

(3) Report action taken to date to restore facility.

c. Prepare plan of action for emergency repair of electric generating and distribution system.

d. Establish liaison with Army Engineer units in the area.

10. Water:

a. Extensive damage to pumping stations, purification plants, and distribution mains will restrict the amount of water available. In addition, the water sources may become contaminated.

b. Steps should be taken immediately to survey all public and private water supply, purification, and distribution systems to determine extent of damage and emergency measures required.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 7.

(2) Prepare estimate of time, materials and labor required to accomplish emergency repairs.

(3) Report action taken to date to restore water service.

c. Prepare plan of action for restoration of emergency water service.

(1) Emergency measures may include any or all of the following:

(a) Establish water supply points.

(b) Distribute water from supply point to distributing points by tank truck.

(c) Lay rapid joint pipe above-ground to distributing points.

(d) Install emergency chlorinating equipment in distribution network.

(2) Establish liaison with Army Engineer units in the area.

d. Implementation of emergency water service should be coordinated with Public Health and Public Safety with respect to restrictions and enforcement.

e. In the early stages of the combat phase, water will be rationed to insure an equitable distribution.

11. Sewage Disposal:

a. Extensive damage to disposal plants and collecting sewer systems together with lack of water may result in complete breakdown of sewage disposal system.

b. Steps should be taken immediately to survey the system to determine extent of damage and emergency measures required.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 16.

(2) Prepare estimate of time, materials and labor required to accomplish emergency repairs.

(3) Report action taken to date to restore service.

c. Prepare plan of action for restoration of emergency sewage disposal.

(1) Emergency measures may include any or all of the following:

(a) Establish public pit latrines.

(b) Forbid use of flush toilets when no water is available.

(c) Establish collection service by vehicles for disposal in sanitary fill, or pond.

(2) Establish liaison with Army Engineer units in the area.

d. Implementation of emergency sewage service should be coordinated with Public Health and Public Safety with respect to restrictions, and enforcement.

12. Garbage and Rubbish Disposal:

a. The immediate removal and disposal of garbage and rubbish is necessary to prevent disease.

b. Steps should be taken immediately to survey all collection and disposal facilities.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 14.

(2) Prepare estimate of time, materials, and labor required to accomplish emergency service.

(3) Report action taken to date to restore service.

c. Prepare plan of action for restoring emergency service.

(1) Emergency measures may include any or all of the following:

(a) Establish burning area.

(b) Establish sanitary fill.

(c) Use non-flammable rubbish as fill for repair of bombed areas.

d. Implementation of emergency measures should be coordinated with Public Health.

13. Gas:

a. Gas service may be of primary importance in an area where gas is used for heating buildings; however, little can be accomplished during the combat phase to restore service due to the fire hazard.

b. Steps should be taken immediately to survey all public and private gas generating plants, storage facilities, pipe lines, and distribution mains to determine extent of damage and emergency measures required to prevent fires.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 15.

(2) Report action taken to date to restore service.

c. Prepare plan of action for restoring emergency service.

(1) Emergency measures may include any or all of the following:

(a) Close master valve.

(b) Inform all users to close house service valve until service is restored.

(c) Repair mains.

d. Implementation of emergency measures should be coordinated with Public Safety.

14. Roads and Streets:

a. During the combat phase, the Army engineers have responsibility for all roads used by the armed forces. Roads needed for civilian use will be the responsibility of Public Works and Utilities teams. In the early stages, road repairs will be limited to clearing debris and filling in craters to render the more important roads passable. However, it is the further responsibility of the Public Works and Utilities teams to marshal local resources to assist in maintaining roads used for military purposes to the fullest extent possible.

b. Steps should be taken immediately to survey all roads and streets which are not included in the Army network, to determine extent of damage and emergency measures required to render the more important roads passable.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 9.

(2) Prepare estimate of time, materials, and labor required to accomplish emergency repairs.

(3) Report action taken to date to render more important roads passable. Include in such report local capabilities to support the military effort in rehabilitating MSR's through the area.

c. Prepare plan of action for opening more important roads to civilian traffic.

d. Establish liaison with Army Engineer units in the area.

15. Bridges:

a. During the combat phase, the Army Engineers have responsibility for all bridges located on roads used by the Armed forces. Bridges on roads needed for civilian use will be the responsibility of Public Works and Utilities team. In the early stages, bridge repairs will be limited to emergency measures. However, as in the case of roads and streets, local resources will be marshalled to the extent possible to assist the Engineer effort.

b. Steps should be taken immediately to survey bridges on roads and streets, which are not included in the Army network, to determine extent of damage and emergency measures required.

(1) Prepare report of survey in accordance with form shown in Appendix III, Example 11.

(2) Prepare estimate of time, materials, and labor required to accomplish emergency repairs.

(3) Report action taken to date to repair bridges. Include in such report local capabilities to support the military effort in rehabilitating or building bridges in the area.

c. Prepare plan of action for repairing essential bridges. Emergency measures may include any or all of the following:

(1) Use logs and heavy timbers to replace stringers of damaged spans.

(2) A ferry system may be used to cross deep rivers where bridge repairs are impracticable.

(3) A ford may be easily constructed for crossing shallow rivers during low water seasons.

d. Establish liaison with Army Engineer units in the area.

16. Port Facilities:

Port facilities are normally under control of the Navy, Army Engineers and elements of the Transportation Corps during the combat phase. Public Works and Utilities teams should cooperate with these services in the procurement of labor and materials from civilian sources, and aid in every way possible to further the military effort by rehabilitating port warehouse, docks and similar facilities. Particular attention should be given to rehabilitation which can further economic restoration when the military forces hand over the area for local use.

17. Priorities and Emergency Measures:

a. During the combat phase, shortages of materials and qualified labor would normally prohibit extensive repairs of damaged utilities. Emergency measures necessary to re-establish utility services will be initiated in accordance with a priority list dictated by the exigencies of the local situation.

b. In general, priority of tasks will be in the following order:

(1) Clearance of debris from vital roads and bridges.

(2) Emergency electrical power.

(3) Emergency water supply.

(4) Sanitary measures.

(a) Sewage disposal.

(b) Garbage disposal.

(5) Rehabilitation of hospitals or other vital buildings.

c. Each utility service must be organized to accomplish emergency repairs. Personnel must be organized in crews to accomplish specific tasks. The location of all repair parts and standby equipment must be charted and quantities tabulated. Once organized these crews can go into action as soon as trouble occurs.

18. Conservation and Rationing:

a. Seldom, in time of war, does a situation exist where there is not a necessity for instituting a program of conservation and rationing. Rationing of electricity, water, and gas will usually be necessary as a part of the conservation program.

b. During all phases of operation a shortage of equipment and parts will exist. Damage to vital equipment will render utility systems inoperative. It will be necessary to employ cannibalization methods by using the parts of several damaged pieces of equipment to make one operable.

c. The enforcement function in the combat phase is an important one. The civilian population should be impressed with the serious intention of CA to establish, maintain, and control utility services as the situation requires. Among the duties involved in the enforcement function are:

(1) Inspection:

(a) Inspection should be frequent.

(b) Inspection should be concerned with the possibility of diversion to black-market activities.

(c) Inspection should establish the legitimacy of complaints.

(2) Reports:

(a) Reports should be evaluated to determine effectiveness of controls.

(b) Reports may serve as a basis for action to insure compliance.

(3) Violators should be prosecuted promptly and findings should be publicized.

19. Security:

a. Provide for personnel security at all times.

b. Provide for security of vital buildings, bridges, and utility plants. Guards should be secured from civilian sources through the Public Safety teams.

20. Reports:

a. During the combat phase of a military operation, reports are extremely important as a basis for formulation of policy to be instituted in the post combat phase. In the early stages of the combat phase, a thorough reconnaissance must be made to learn the immediate conditions, damages to buildings, structures and utilities, and the needs of the military forces and civilian population. Report of reconnaissance should be made on Vicinity Report Forms shown in the Appendix.

b. Effective administration of public works and utilities during the early stages of operations is dependent upon early implementation of the following:

(1) Control over incoming and outgoing reports.

(2) Creation of a routine report control system.

(3) Establishment of a filing system for reports.

21. Maintenance Functions:

a. Maintenance of buildings and equipment during the combat phase is important because repair parts are usually not available. The operation of utility plants should be in the hands of experienced personnel.

b. Civilian operating personnel should be retained or returned to their jobs on a temporary basis with retention subject to C.I.C. check.

c. A comprehensive maintenance program for each utility system must be formulated at once and established as a standing operating procedure.

22. General Statement - Post Combat Phase:

a. This is a period of transition between the uncertain conditions of the combat stage and stabilized conditions. During the combat stage the primary mission of CA units is to assist the military. In the post combat phase, the mission of CA units is to assist the re-establishment of the economy of the area consistent with theater policy.

b. During the combat phase only emergency measures and hasty repairs could be accomplished. Now a program should be initiated to accomplish more permanent restoration and rehabilitation. New construction having a direct bearing on the welfare and economy of the country should be given consideration.

23. Public Buildings:

a. Supervision of the rehabilitation of public buildings for use by military and civil agencies will still be an important function during the post combat phase. The main elements of this supervision are:

(1) Inspection and survey - to include the drafting of plans showing location, number and type of buildings to be rehabilitated and for whom occupancy is being prepared.

(2) Coordination of civilian custodians and building service employees with civilian public works agencies in matters of repair, renovation and rehabilitation.

(3) Establishment of a separate supervisory agency for authority, planning and direction of all public building rehabilitation.

(4) Re-establishment of prewar agencies governing public buildings in matters of engineering construction and design and supply of building materials. Accomplishment of this will involve coordination with other CA agencies in fields of Public Finance, Labor, Legal and Public Safety, but mainly with Commerce and Industry.

b. Upon completion of major building repairs the element of upkeep and maintenance becomes important. Civil custodial agencies should be charged with this function. CA Public Works and Utilities teams should have only the inspection of custodial services and the coordination work of assignment of public buildings to military and civil agencies and provision of maintenance supplies and equipment for the upkeep of public buildings.

24. Electricity:

a. Supervision of the restoration of electric service will be an important function during the post combat phase. The main elements of this supervision are:

(1) Survey of Power Producing Facilities: Detailed plans for long range restoration of power producing facilities can only be made after the objectives of the occupation are known and detailed information is known regarding conditions of the power plants and distribution facilities. The power requirements of civil, industrial and military groups must be determined by actual survey. This latter will be a guide as to the immediate goal of the restoration.

(2) Organization for Restoration of Power Plants: The bulk of the technical skills and labor should come from former power plant personnel. Some assistance, in matters of replacement generators and transformers, etc. can be expected from military and other sources outside the occupied territory but, as experience has proven, repair of generating and transforming equipment was accomplished by salvage and cannibalization methods.

b. Certain major power transmission lines and generating stations may be placed under army engineers' supervision. This will relieve CA Public Works and Utilities personnel of some of their responsibilities.

c. Major repairs to power plants and long distance transmission lines will depend upon importation of equipment and supplies or restoration of the basic industries supplying the items required. The reconstruction of hydroelectric plants requires a long period of time and will generally be deferred. Diesel generating plants should be built to supply necessary power until hydro or thermoelectric plants can be reconstructed.

25. Water:

During the combat phase of operations only emergency measures should be taken to supply the minimum civilian needs. During the post-combat phase the existing water supply, normally, will be entirely inadequate. A great demand for water will arise for both civilian and industrial use. Therefore, immediate measures must be taken to restore present facilities by instituting a system of permanent repair and, if necessary, plan for new construction for future use. A thorough reconnaissance and survey of present purification plants, distribution networks, pumping stations, impounding reservoirs, dams, etc. should be accomplished immediately. Also, the availability of proper purification supplies should be investigated. In the following paragraphs these points will be more thoroughly discussed.

(1) Purification Plants: Improper purification of water is a definite health hazard and therefore is most important in priority remedies; repairs must be started at once. It should be understood that in the purification of water many processes are used; namely, screening, aeration, coagulation, sedimentation, odor removal, filtration and disinfection. Also, testing is important to ensure proper purification. If some of the facilities are damaged all of the above processes can be eliminated except chlorination and filtration. Do not condemn the entire plant for usage simply because one step in the purification process is damaged or inoperative. An understanding is necessary of the steps which can or cannot be omitted and the various methods of accomplishing the above mentioned processes. Once the plant is in operation few personnel are needed in its operation and maintenance. Under good supervision, skilled personnel can be trained to maintain and operate a water purification plant within two months. Separate maintenance should be accomplished on a daily, weekly, monthly and annual basis. At all times, equipment must be kept clean and lubricated while overhauls of equipment should be accomplished per maintenance schedules and when necessary. With regard to maintenance of water purification plants, the following must be considered:

(a) Driving equipment and accessories (electric motors, engines, belt drives).

(b) Pumps (sealing rings, cavitation, test performance, packing, impellers, bearings).

(c) Filtration beds (sand, gravel beds, bottom, troughs).

(d) Chemical feeders (leaks, valves, water system, gas system, vacuum relief, solution tube, food indicators, drive mechanism).

(e) Operating tables and panels (cables, wires, leaks, pressure pipe lines, diaphragms, guage floats).

(f) Aeration equipment (spray nozzles, pipes, manifolds, diffusers, leaks).

(2) Distribution Network: The method by which water is supplied to the population includes clear water reservoirs, mains, sub-mains and hydrants. These normally will be disrupted and a program of permanent restoration and rebuilding will have to be initiated. This is important since broken and leaking mains will permit loss of water, contamination and reduction in pressure. Thus, broken sections of mains must be located, then repaired or replaced. Hydrants for distribution and fire fighting must be repaired or replaced. Clear

water reservoirs must be maintained so an adequate supply of pure water will be available in emergency and peak load periods. Repair crews should be organized. With the plan of the network, these crews must make comprehensive checks and necessary repairs. Once the system is in normal operation little other than routine maintenance will be necessary. Maintenance that should be periodically conducted follows:

(a) Hydrants and mains - tightness of nozzles, leakage, pressure, valves, operating nut, joints.

(b) Elevated and ground storage tanks, ladders, roof, sway bracing, structural forms, base and base plates, locks and roof latches, tank light latches, heating systems, elevated tanks, leaks, interior.

(3) Pumping Stations: Where gravity feed systems are not used pumping stations have to be employed to maintain adequate pressure and deliver water to all parts of the system. Repairs should begin at once. Consideration must be given to details. An example of this is found in the selection of pumps. Pumps must be designed to perform the needs of the system and must fit exacting performance characteristics. Operation of pumping stations can be conducted by very few trained personnel. Maintenance measures that apply to driving equipment, pumps and control equipment are as stated under paragraph (1) above, which was entitled purification plants.

(4) Impounding Reservoirs and Dams: When water is obtained from sources having variable flow, impounding reservoirs are necessary to store water needed during low flow periods. Natural lakes used as a supply source are considered impounding reservoirs. Impounding reservoirs are also desirable in swiftly moving streams and rivers to provide still water at the intake. This type of reservoir functions to a certain extent as a sedimentation basin, relieving the load on the filtration plant. Inspections should be made of all impounding reservoirs and dams. Damages are most likely to occur to the dams, spillways and intakes, thus, rendering the reservoir useless until repairs are completed. Therefore, construction teams should be organized, supplies and equipment needed should be procured and restoration started as soon as possible. After the damage has been repaired operations can be accomplished by few trained personnel. Maintenance of pumps and driving equipment are conducted as outlined in previous paragraphs. Other maintenance to be carried out is outlined below.

(a) Spillways - kept free from trash and debris.

(b) Gates - inspect and lubricate.

(c) Concrete and masonry dams - stop leakage and protect against ice thrust.

(d) Earth and rockfill dams - stop leakage and keep slopes well sodded and graveled.

(e) Intakes - clean screens and racks.

26. Sewage Disposal:

Consideration of public sanitation should have been given primary attention during the combat phase. Because this field is so very important to the prevention of disease among humans, it should be a major concern of all CA units and teams. The existing sewage system (including plants and collection systems) may be found to be in conditions ranging from slight disruption to total destruction. The procedures to be followed in instituting repairs and re-operation of plants will require separate plans of action for each individual instance.

a. Survey of Sewage Facilities: A survey of sewage facilities must be made to determine the plan, design, and operating condition of the collection system including sewers, mains and the pumping stations. A separate survey should be made of each treatment plant to determine the general condition of the plant and its productive capacity. Mechanical drawings and flow charts should be obtained to aid in the diagnosis of damaged equipment and processes. The survey of the treatment plant should be made in sections to facilitate the planning of the repair and restoration of the plant to former operating efficiency. This survey of the plants should cover primary and secondary treatment processes.

b. Organization for Operation and Maintenance: Having completed the inspection of the sewage systems, a plan of action for control and supervision of the operation and maintenance of sewage systems can be made. Former civil employees must be interviewed, screened and assigned to the staff of the treatment plant. Employees formerly connected with sewer system maintenance will be similarly handled. If great damages to the systems exist, special construction crews should be organized. Assistance of Army Engineer troops may be necessary in this connection. Plant personnel should include civilian sanitary engineers, superintendents and foremen. They should be given the fullest possible authority over personnel under their direction. Once the plant operations are resumed under CA supervision, inspections should be made to determine operating efficiency and enforcement of preventive maintenance to eliminate wear and breakage of hard to duplicate equipment.

c. Supply and Operational Reports: CA Public Works and Utilities teams should organize a system of supply and stock record control for each system. Supply should include control and furnishing of expendable stock, material and standby equipment necessary for efficient plant operation. Sources of supply should not include military supply channels unless unobtainable from civilian sources. Operational reports to the unit should be made and submitted in accordance with directives and regulations. Labor records, daily and monthly logs, and records covering supplies and expenditures may be used in compiling these reports.

27. Garbage, Refuse Collection and Disposal:

Garbage and refuse collection and disposal should be given prime consideration since proper collection and disposal must be conducted regularly to assure the health of the community. Incomplete or inadequate collection or disposal may attract flies, mosquitos and rodents or create fire hazards. As soon as possible, a survey should be made of the existing collection and disposal facilities, the extent of damage and the adequacy of the present system noted. Immediate measures should be taken to reinstitute complete collection service and repair damaged existing facilities. Consideration may be given to the future construction of additional facilities, if necessary.

a. To institute adequately a system of garbage and refuse collection and disposal the following must be considered:

(1) Collections: After survey has been completed, and in conjunction with civilian authorities, an adequate collection system should be put into operation on a uniform schedule.

(2) Personnel: The number of personnel needed will be dependent upon the size of the area and extent of facilities. Supervisors in charge of collection routes and at disposal sites should be selected on a basis of prior experience, if possible. Drivers and helpers for the trucks and at disposal sites will complete the personnel needed for operations and supervision. Also, personnel for the maintenance of proper records should be chosen. Personnel should be procured through coordination with the CA Labor teams.

(3) Trucks: Coordination should be effected with the Public Transportation teams to provide adequate trucks for the collection of garbage and refuse. Considering the methods of disposal some trucks may be allocated to the removal of combustible types of garbage and refuse; and others to the removal of non-combustible types.

(4) Methods of Disposal: Methods of disposal to be used will depend largely on the facilities available and the methods employed previously. The following methods can be employed in the disposal of garbage and refuse.

(a) **Animals** - Edible garbage should be fed to animals, not only as a means of disposal, but to aid the country's economy.

(b) **Sanitary fill** - The sanitary fill principle is simple - garbage and refuse are dumped in trenches, compacted and covered each day. The advantage of this method lies in its speed of construction and minimum of cost.

(c) **Incinerators** - Incinerators are used to dispose of combustible garbage and refuse by burning. The size of the incinerator is dependent upon the population being served. Non-combustible material can be disposed of by the sanitary fill process.

(d) **Burning pits** - Burning pits can be of either masonry or earthen construction. They serve the same purpose as incinerators - disposal of combustible material by burning. These must be periodically cleaned and dumped into trenches built for the purpose and covered.

28. Gas Production and Distribution Systems:

Administration and control of the operation, maintenance and distribution of gas producer plants and systems is a separate and distinct area of responsibility. The distributing system may be either by underground pipelines or by compressed gas tanks; transported either by truck or rail. The producer plants vary as to design and type of fuel used. It is difficult to set down any hard rules governing the control of the plants due to this variation. Wood, peat, lignite, bituminous coal, anthracite and coke may be used to charge the producer. Although the gas is universally manufactured by the passage of air and steam blasts through burning beds of coal or fuel there is great variation of design and construction. Generally, the procedure to follow in assuming control and supervision of gas plants should be to institute a survey of the entire system, obtain exact information on the operation of each plant and determine the fuel and supply requirements for the production of the required quantity of producer gas. Former plant personnel should be interviewed, screened and used to restaff the plants. Reconstruction of damaged distribution mains and gas holders should be considered separately or in conjunction with any general program of repair being conducted to reconstruct water, gas and sewer mains below city streets. Coordination with other CA teams agencies is indicated in matters of obtaining fuel for producer operation and in matters of rationing producer gas to essential industry or domestic use. It should be remembered that reports and statistics will have to be compiled and forwarded to higher headquarters on a monthly or quarterly basis. Complete records of all activities and operations must be initiated and maintained.

29. Roads and Streets:

a. The main use of roads in the post-combat phase will be made by civilians, rather than by military forces. Certain main highways may still be under direct control of army engineers, but even these roads may be used by civilians and the repair and maintenance of these roads may be undertaken by civilian road and highway departments. The bulk of the road work to be accomplished will exist as repair and maintenance. Little new construction should take place.

b. Types of Maintenance: Three types of road maintenance may be employed by CA Public Works and Utilities teams:

(1) Operational Maintenance: This covers snow and ice removal, improvement of road shoulders, cleaning of ditches.

(2) Preventive Maintenance: Preventive maintenance corrects faults in their early stages, thus preventing need for major repairs, etc. This work is divided into two general classifications: continuous and periodic preventive maintenance.

(3) Repair Maintenance: This is divided into emergency and major repairs. Emergency repairs correct breakdowns of pavements; storm or accident damage. Major repairs are limited to the resurfacing of streets.

c. Standards of Road Maintenance: Wartime standards of maintenance limit maintenance work to prevention of breakdown of roads. Generally, the standard of maintenance established will be a balance between restoration to former peacetime condition and the limits imposed by lack of time, labor and equipment.

d. Organization for Road Repair: Essentially, road and pavement maintenance involves the correction of surface deterioration, deformation and wear, together with maintaining a dry, stable sub-grade. Most road and pavement maintenance operations are seasonal and can be anticipated. Materials, labor and equipment can be available at the right time and place, only if advance inspection and planning is undertaken. With the work outlined, civilian road patrol gangs can be kept busy doing the correct job at the correct time. Supervisors, foremen and key workmen must know what is expected of them and must know the overall plans for road repairs.

e. Supervision of Civilian Highway Departments: Supervision of civilian highway departments and street departments (in cities) entails the inspection of key personnel, records and routine inspection of streets and roads. Personnel should be inspected to determine if they are performing their responsibilities; records should be inspected

to determine correctness of entries and adequacy of type of records being maintained. Spot or routine road inspections will determine the overall efficiency and progress of each department.

30. Bridges:

Administration and control of bridges in the post-combat phase will, in most cases, be handled in connection with the repair and maintenance of roads. Wartime conditions may cause the damage or destruction of all important highway bridges. Because of this, special organization and attention will be necessary for all major bridges. Existing civil highway departments can be augmented by establishing a bridge construction section within the highway department. Engineering services will be needed for the redesigning of bridges. Supply and construction material yards or dumps will require establishment of certain items of equipment such as demolition sets, pile drivers, heavy cranes and air compressors which may have to be requisitioned through military channels. Cement, timber, bolts and structural steel members will have to be acquired from civil sources or sources beyond occupied territory. In this manner, it is clearly indicated that the prewar road and bridge maintenance agencies will not have adequate facilities and the establishment of a special civilian bridge construction agency is of prime necessity.

31. Port Facilities:

a. Repair and reconstruction of wharves, piers and shore structures, dredging of main channels and berthing areas and renovation of cargo handling equipment will be performed by military units generally. There are, however, certain areas of responsibility for Public Works and Utilities teams. The first responsibility may be to procure former port authorities, harbor masters, dock workers or wharfingers and equipment operating engineers for service in the repair and reconstruction of a port. Additionally, screening of these personnel, cooperation with CA Labor teams and personnel reports for use by the unit to which the team is assigned will be required.

b. The second responsibility deals with the provision of civil port supplies for use by the army and navy repair and salvage personnel. The location, survey and inventory of these supplies will require special attention by CA Public Works and Utilities teams.

32. Priorities:

a. No clear line of demarcation can be drawn between the combat and post-combat phase of operations. Priorities will have to be assigned for all tasks until such time as sufficient materials, supplies and labor are available for all required work.

b. During the post-combat phase the trend should be toward the lessening of strict control by CA Public Works and Utilities teams.

c. Rehabilitation or reconstruction projects must be fully coordinated so that the completed work will be a usable facility and not lacking in any vital utility service.

33. Conservation and Rationing:

a. Conservation and rationing programs instituted during the combat phase should be continued until no longer required. As operations progress the need for utility services will normally increase faster than the increase in supply, hence the enforcement function will continue to be an important one during the post-combat phase.

b. Inspections and reports initiated during the combat phase should be continued. Rations for water, electricity, and gas should be increased as soon as practicable, with lessening of control by CA Public Works and Utilities teams.

34. Security:

Security of vital buildings, bridges, and utility plants should continue as long as danger from sabotage exists.

35. Reports:

a. Reports will be submitted by the team to its CA unit. The type and frequency of submission will be determined by the unit commander based on actual conditions in the area and requirements of higher headquarters. A separate report should be submitted for each branch of Public Works and Utilities.

b. All reports that are not self-explanatory should be accompanied by a set of instructions printed on the same page which defines terms used and outlines method of computation to be utilized. Reports, surveys, and charts will furnish as complete an estimate of the situation as possible. Initial reports are designed to furnish primary information. As the situation progresses, more detailed information is submitted on subsequent surveys and reports.

36. Maintenance Functions:

Maintenance programs initiated during the combat phase should be continued during the post-combat phase. Supply and procurement will present a major problem until the industry and transportation of the country have been rehabilitated. The greatest possible use should be made of local resources.

37. General Conclusions Concerning Public Works and Utilities Functions in the Post-Combat Phase:

A study of paragraphs 22 through 36 establishes the following conclusions:

a. Proper fulfillment of public works and utilities functions is vital to the accomplishment of the occupational mission.

b. A good public works and utilities program is essential to the economic rehabilitation of an area under military control.

c. Ration controls are necessary to insure an equitable distribution of water, electricity, and gas.

d. The scope of public works and utilities operations is dependent upon the following factors:

(1) The economy of the country occupied.

(2) The type of operation being conducted.

(3) The amount of rehabilitation needed.

(4) Theater policy.

e. The functions listed are not all-inclusive.

f. Public Works and Utilities teams must coordinate closely with other CA teams to accomplish their mission.

38. Liaison with Other CA Teams:

The interrelationship of the functional teams in the CA unit is particularly noticeable. No one team is capable of performing its duties and functions without the advice and assistance of the functional specialists in the other teams of that organization. The Public Works and Utilities team should coordinate their activities as indicated in the following paragraphs.

a. Commerce and Industry Team:

(1) Supply electricity and gas to essential commercial and industrial establishments.

(2) Furnish water and sewage disposal to essential industry.

b. Food and Agriculture Team:

Supply electricity and water for agricultural production.

c. Property Control Team:

(1) Property control and inventory.

d. Public Finance Team:

(1) Securing funds for operation of public utility service.

(2) Securing funds for payroll needs of civil agencies operating public utilities.

(3) Budgeting.

e. Public Safety Team:

(1) Securing guards for safeguarding buildings, bridges, and utility plants.

(2) Enforcement of ordinances relating to public works and utilities.

(3) Enforcement of rationing regulations.

f. Public Health Team:

(1) Emergency measures for sewage disposal.

(2) Emergency measures for garbage and refuse disposal.

(3) Purification of water.

g. Public Education Team:

Rehabilitation of public school buildings.

h. Labor Team:

Obtaining labor for rehabilitation, reconstruction and operation of utilities.

i. Legal Team:

(1) To assure that proper authority exists to support orders and proclamations relating to public works and utilities operations.

(2) Appropriateness of local laws relating to public works and utilities and changes, if any is required.

j. Public Transportation Team:

Repair of port facilities, roads and bridges required for public transportation.

k. Public Information Team:

Dissemination of regulations pertaining to the use of electricity, gas, and water.

39. General Conclusions Concerning Liaison with CA Teams:

The teams listed above and the areas of coordination that have been delineated are not all-inclusive. The teams with which any other team must coordinate to complete its mission are dependent on the situation at any given time and the mission of the team. The preceding paragraph is intended to provide CA Public Works and Utilities teams with some ideas as to the importance of coordination and the degree to which functions overlap.

40. Liaison with Other Organizations:

Public Works and Utilities teams must maintain liaison with military engineer units and civilian agencies concerned with utilities in order to perform their assigned mission through mutual assistance, and prevent overlap of duties. The authority and extent thereof to maintain liaison with units of higher, lower and adjacent commands must be determined early in the operation.

41. Laws to be Considered:

a. Laws relating to administration, control, and distribution of utility services.

b. Laws relating to procurement.

c. Laws relating to rationing.

d. Laws relating to enforcement of rationing and penalty specifications.

42. Area Study:

CA units normally will have considered studies of an area before they move into that area. The purpose of area training is to acquaint personnel with the country in which they may operate and the conditions to be found therein. Some or all of the following subjects are properly included in an area study.

- a. Geography and topography.
- b. Language.
- c. Morals and social habits.
- d. Economy.
- e. History.
- f. Political organization.
- g. Commercial aspects.
- h. Educational system.
- i. Religious beliefs.
- j. Local laws pertaining to each function.

43. Specific Area Study Outline:

Public Works and Utilities teams should acquaint themselves with the following subjects:

- a. Public Works:
 - (1) Public buildings.
 - (2) Public roads and buildings.
- b. Public Utilities:
 - (1) Electricity.
 - (2) Water.
 - (3) Gas.
 - (4) Sewage disposal.
 - (5) Garbage and refuse disposal.
 - (6) Port facilities.

c. With each of the above, a detailed site study should be undertaken covering history of ownership, government control, location and capacity of principal utility plants, standby or reserve capacity, and plant management.

44. Organization and Functional Charts:

The purpose of this section is to illustrate through schematic diagrams the organization and functions of the Public Works and Utilities team. The following charts are included in Appendix I:

- a. Team Coordination Chart - Example 2
- b. Team Functional Chart - Example 3
- c. Team Operational Chart - Example 4
- d. Team Organizational Chart - Example 5

CHAPTER 3

CHECK LISTS AND REPORTS

SECTION I. CHECK LISTS

45. General Statement on Check Lists:

A check list is an enumeration of the duties which must be performed to accomplish a given mission. Flexibility of plan and personnel must always be considered, therefore the check lists should be considered only in the nature of a general list which will be modified to fit the situation. Two check lists will be considered in this section; a 24-hour check list, and a check list for the first 30 days. Both of these lists enumerate the steps necessary to insure the successful accomplishment of the public works and utilities functions with the least expenditure of time and energy.

46. 24-Hour Check List:

The 24-hour check list (Appendix II, Example 1) is a listing of the duties which must be accomplished within 24 hours of the time a specific mission is undertaken. The items shown in this list are not in order of importance nor in chronological sequence. The list is designed for the combat phase of operations.

47. Action Taken First 30 Days:

The check list covering first 30 days is divided into sections covering the major categories of activities. Order of importance and chronological sequence is avoided. It covers the requirements of the team regarding administration, supply, and operational procedures. This list is furnished as a guide for Public Works and Utilities teams in the accomplishment of the function.

SECTION II. FORMS AND REPORTS

48. General Statement on Reports:

Since it is impossible at higher levels to make field inspections of all areas of operation, lower echelons must gather and submit informational and statistical data regarding their area of jurisdiction. All echelons of the CA organization must maintain an adequate system of recording the data gathered in their areas. This is done through the proper use of reports.

49. Outline Relative to Reports:

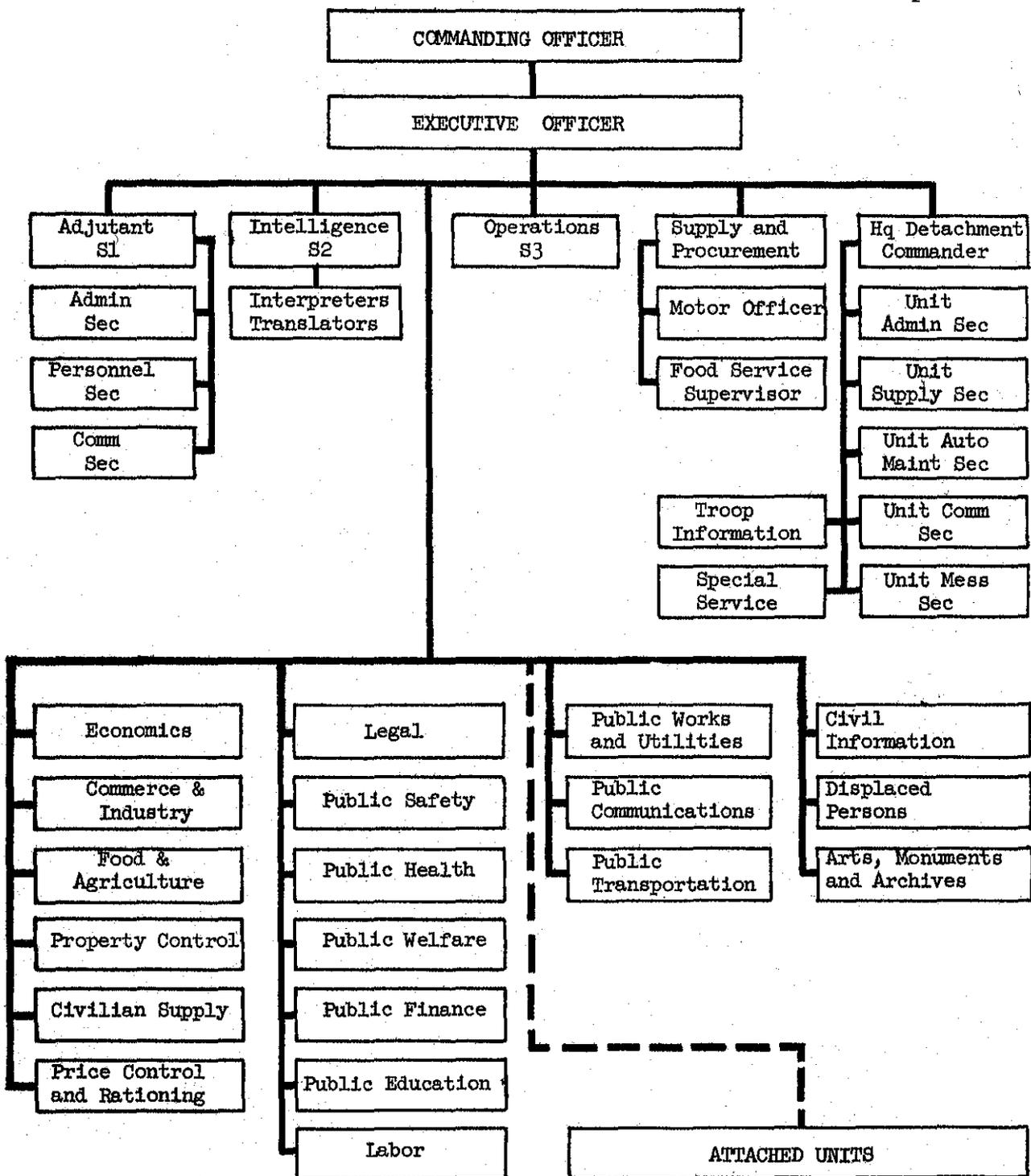
The outline relative to reports (Appendix III) is presented to familiarize Public Works and Utilities personnel with the various types of reports and methods of submission that can be employed during operations. It distinguishes between statistical and functional reports, methods and frequency of submission, and channels to be followed.

50. Vicinity Reports:

The vicinity report is a report of a particular vicinity or area. It is an initial report limited in scope, to expedite its processing, and contains only that information which is necessary to make the preliminary estimate of the situation. A separate report should be submitted for each branch of the Public Works and Utilities team.

51. Survey Reports:

The survey report is a more detailed account of existing conditions. From this report the CA unit to which the Public Works and Utilities team is assigned can make a more detailed estimate of the situation. A separate report should be submitted for each branch of Public Works and Utilities team.



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PUBLIC WORKS AND UTILITIES TEAM

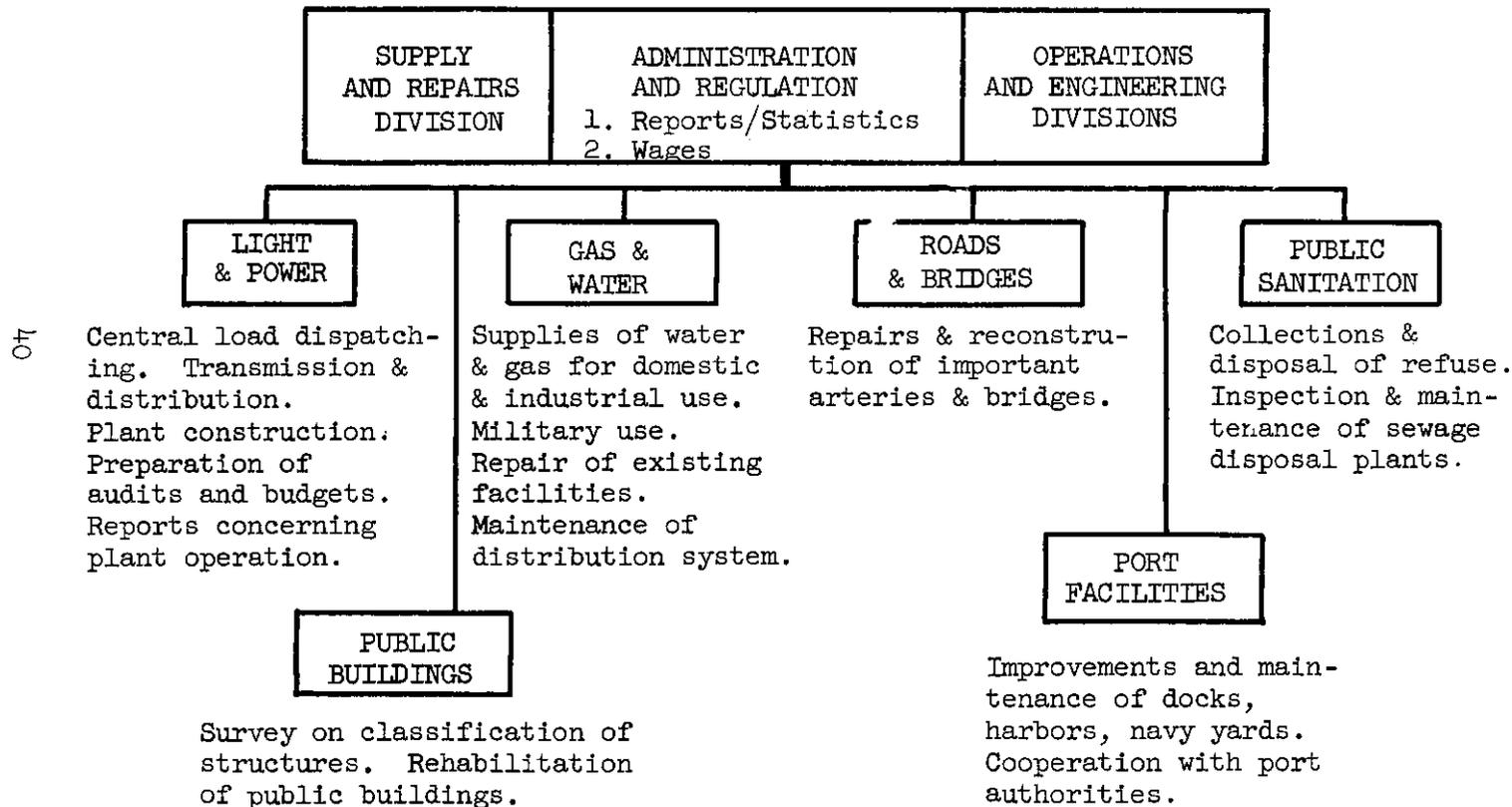
Team Coordination Chart

SECTION	TEAM INVOLVED	AREA OF COORDINATION
Economics	Commerce & Industry	Supply electricity & gas to essential commercial/industrial establishments.
	Food & Agriculture	Supply electricity & water for agricultural production.
	Property Control	Property control and inventory of property.
	Public Finance	Securing funds for the operation of public gas, water, and electric plants, civilian commissions, depts., bureaus, etc. and funds for payroll needs of these agencies.
	Public Safety	Police matters, enforcement of ordinances, proclamations, etc., relating to public works and utilities. The safeguarding of plants, bldgs. bridges, etc.
	Public Health	Prevention of diseases, removal and disposal of all garbage refuse and sewage matter.
	Public Education	Rehabilitation and restoration of public school buildings.
	Labor	Obtaining of labor for rehabilitation and reconstruction work and skilled labor for the operation of power, water and gas plants.
	Legal	Assures that proper authority exists to support orders and proclamations and that laws are appropriate and adequate.

SECTION	TEAM INVOLVED	AREA OF COORDINATION
Public Facilities	Public Transportation	Repair of port facilities, roads and bridges for their usage.
Special Functions	Public Information	Dissemination of proclamations and orders pertaining to the use of electricity, gas and water.

PUBLIC WORKS AND UTILITIES TEAM

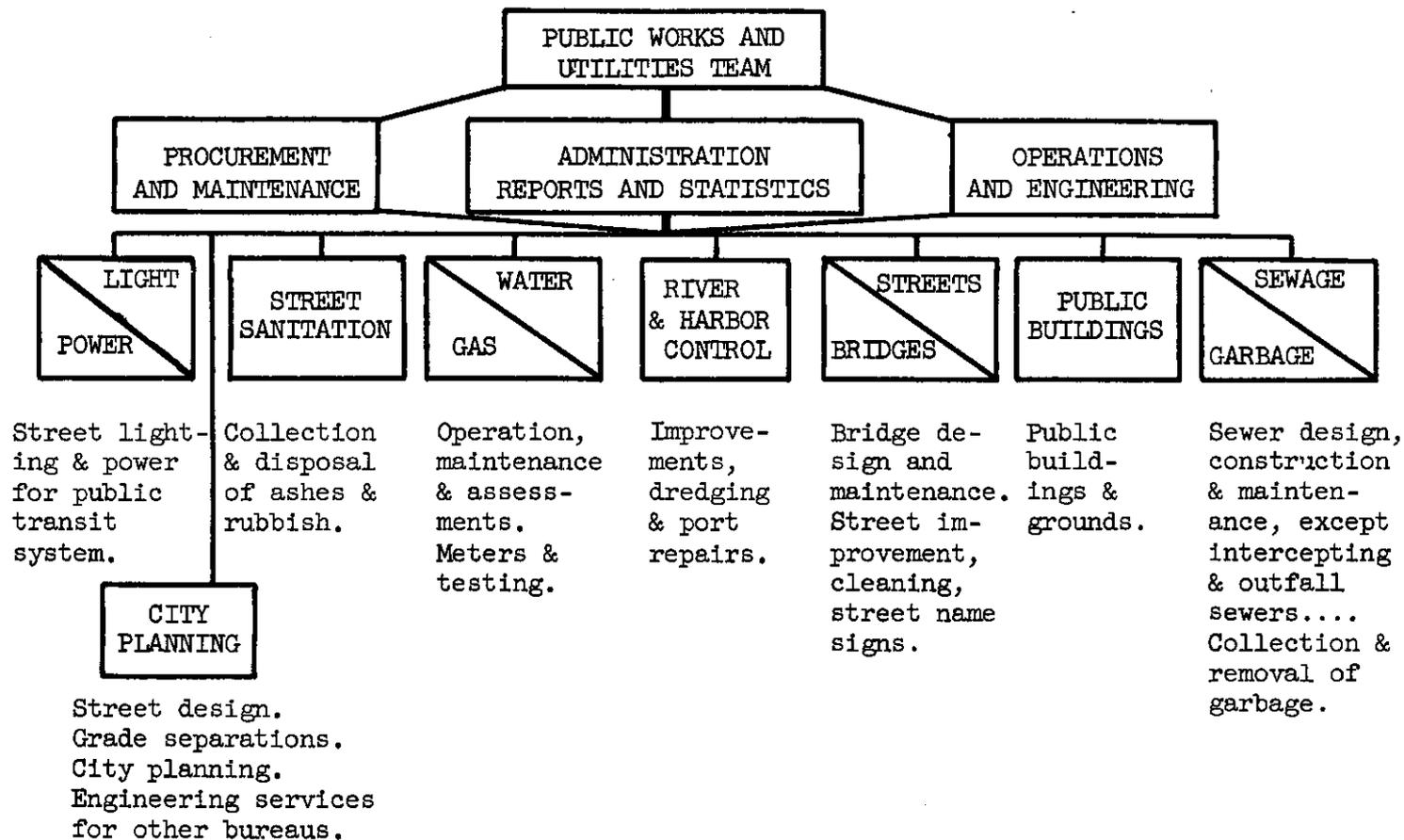
FUNCTIONAL CHART



PUBLIC WORKS AND UTILITIES TEAM

OPERATIONAL CHART

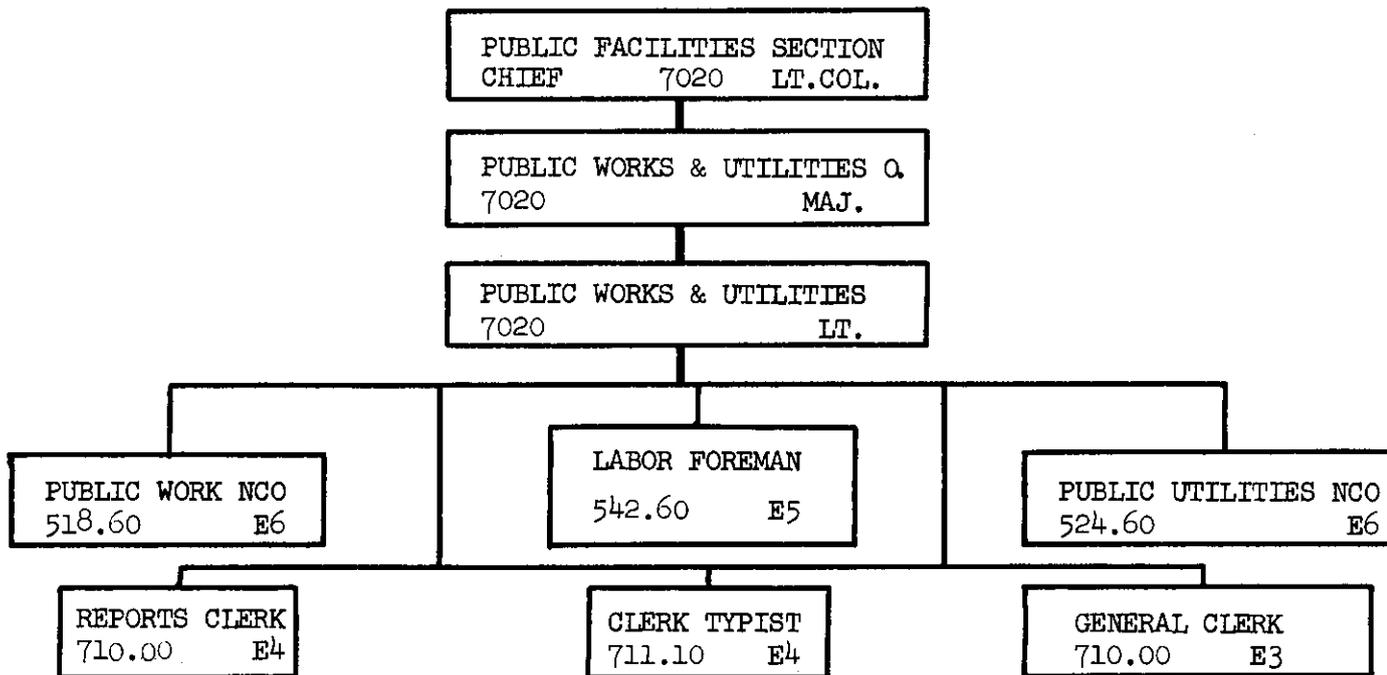
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PUBLIC WORKS AND UTILITIES TEAM (SC)

Organizational Chart

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CHECK LISTS

PUBLIC WORKS AND UTILITIES TEAM

24 Hour Check List

- 1. Establish priority for protection of all vital installations, i.e. power plants, gas works, water works, sewage disposal plants.
- 2. Determine delineation of responsibility of Public Works and Utilities teams and other military units for control of public utilities. If other units are in control, determine the assistance needed to restore utilities to operating condition with regard to equipment, material and labor.
- 3. Contact officials of utility companies for interrogation and screening. Remove all policy making officials and impound all records.
- 4. Contact CIC to obtain a "Black List" of persons to be removed from office in your area.
- 5. Recommend a central location for your headquarters and report establishment to your unit.
- 6. Reconnoiter your area of responsibility to determine conditions of water, sewerage, gas and power plants. If possible, selected civilian officials should accompany you on this reconnaissance.
- 7. Determine if it is necessary to ration water.
- 8. Coordinate with the Public Safety team on matters of protection of installations and the arrest or detention of undesirable public utility officials.
- 9. Provide for your own security at all times.

CHECK LISTS

PUBLIC WORKS AND UTILITIES TEAM

Check List On Action Taken During First Thirty DaysGeneral

- 1. Repair and restore the essential public utilities to assure minimum needs of gas, water and electricity to civilian population.
- 2. Where necessary, institute a system of rationing to provide adequate gas, water and electricity to meet minimum needs of domestic requirements and industry.
- 3. Initiate a program of conservation to preserve vital utilities and issue necessary orders and proclamations for conservation and use of utilities.
- 4. Coordinate with other teams (refer to team coordination chart) in all areas of operations where other team services are necessary.
- 5. Impound all records, maps, documents pertaining to public works and utilities.
- 6. Determine resources available for repair and reconstruction work.
- 7. Recommend and establish team headquarters.
- 8. Cause orders and proclamations regarding public works and utilities to be disseminated to civil and industrial groups as required.

Surveys and Reports

- 9. Require civil agencies to submit reports and surveys as required.
- 10. Issue necessary instructions to local authorities regarding routine and special reports forms and surveys and establish control charts for the control of submission of these reports. Establish frequency of submission of all reports.

REPORTS

SURVEY INDEX OF
PUBLIC WORKS AND UTILITIESPurpose of
the Index

The purpose of this survey index is to assist in the preparation of necessary surveys by outlining classifications, units of measures and component parts of public works and utilities property. Without some standardization of the technical and engineering terminology used in reports and surveys much confusion can arise from the interpretation of reports which fail to use correct terms and units of measure. Therefore, this index is necessary to unify and simplify useful and standard words and units of measure required in the preparation of various reports. Another important element of this index is the establishment of the minimum and basic terms used in reports, forms, surveys and plans. An example of this would be a report concerning sewage pumping stations. The person making the report will consult the survey index and obtain the minimum titles of component terms which should be utilized if this report is to be considered complete regarding items of equipment used in a typical sewage pumping station.

BUILDINGS AND STRUCTURES

Classification Unit of measure Component parts Unit of measure and data

Buildings

Permanent
Temporary

Total square feet
(floor area)
Total designed
housing capacity

Apartment bldg.
Residence
Storage
Recreation
Hospital
Libraries
City Halls
Schools
Orphanages
Railroad Depots
Miscellaneous

Designation and type
Building number
Size, main buildings
Wings, basement
How heated
Fire protection
facilities, type
Number floors includ-
ing basement
Hot water capacity gals.
Materials:
Foundation
Floor
Walls
Roof
Number of Apts.
Utility connections
Number and size:
Water
Sewer
Electric
Gas
Steam
Date Completed
Designed capacity
Sq. ft. floor area
above basement

Classification	Unit of measure	Component parts	Unit of measure and data
Dock Warehouses	Square feet	Piling	Number
Wharves and ferryslips	Square feet	Deck and deck supports	Material, type
			Square feet
		Mooring facilities	Material, type
			Number
Approaches	Kind		
	Square feet		
Channels	Square yard	Channels	Material, type
			Square yard
		Turning basins and anchorage areas	Dimensions
			Square yard
Seawalls, Jetties, etc.	Linear feet	Seawalls	Linear feet
			Material, type
		Jetties	Linear feet
			Material, type
		Breakwater	Linear feet
			Material, type
Miscellaneous structures	\$ Value	Such items as fences, walls, storage tanks, flagpoles, etc.	Dimensions
			Structural material
			Unit of measure:
			(Square feet Square yard Linear feet Capacity)

Classification	Unit of measure	Component parts	Unit of measure and data
Concrete - - - - -	Square yard	Road - - - - -	Name of location
		Culverts	Number
			Tonnage capacity
		Bridges	Linear feet
			Material, type
		Surface	Thickness
			Length, miles
			Width, feet
		Base - - - - -	Square yard
			Type
Bituminous, - - - high type	Square yard	Road	Name or location
		Culverts - - - - -	Tonnage capacity
			Number
		Surface area	Thickness, inches
			Length, miles
			Width, feet
		Base - - - - -	Square yard
			Type
		Bridges	Linear feet
			Material, type
Gravel, - - - - - stabilized, etc.	Square yard	Road - - - - -	Name or location
		Culverts	Tonnage capacity
			Number
		Bridges	Linear feet
			Material, type
		Surface area	Material, type
			Thickness, inches
			Width, feet
		Base - - - - -	Square yards
			Type

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Classification	Unit of measure	Component parts	Unit of measure and data
Parking areas - -	Square yard	<ul style="list-style-type: none"> Parking areas Type Surface area 	<ul style="list-style-type: none"> Name or location Tonnage capacity Type Material, type Thickness, inches Length, miles Width, feet Square yard
Aprons - - - - -	Square yard	<ul style="list-style-type: none"> Aprons Base Surface area 	<ul style="list-style-type: none"> Name or location Type Material, type Thickness, inches Length, miles Width, feet Square yard
Runways - - - - -	Square yard	<ul style="list-style-type: none"> Runway Base Surface area 	<ul style="list-style-type: none"> Name or location Type Material, type Thickness, inches Length, feet Width, feet Square yard

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WATER SYSTEM

Classification	Unit of measure	Component parts	Unit of measure and data
Water mains	Linear feet	C. I. mains - - - -	Linear ft. and Diameter
		Steel mains - - - -	Linear ft. and Diameter
		Nonferrous mains	Linear ft. and Diameter
			Material
Water service lines	Linear feet	Valves - - - - -	Number
		Service lines - -	Linear ft.
		Valves - - - - -	Number
		Hydrants - - - - -	Number
		Meters	Number Make Size
Water pumping station (mgd)	Wells and intakes (number and capacity)	Impounding reservoir (capacity)	Length Height Type Reservoir capacity mgd
		Under-water intake	Source Capacity mgd
		Wells and intakes	Type construction Bore, Max.-Min. depth Casing, size, kind, depth Capacity, specific Capacity, gpm Screen Static water level Max. draw-down

Classification	Unit of measure	Component parts	Unit of measure and data
Water pumping station mgd Continued	Wells and intakes (number and capacity)-con. Storage (ground, elevated) (capacity) Source	Central and re-pumped (Capacity) Reservoir - - - - Elevated tanks	Location Kind and Make Type and serial number Size and Capacity gpm Depth of setting Design head Driving unit and Drive Hp-ph-cy Speed and Control equipment Number Capacity Type Number Capacity Type
Water Filtration plant (Gravity or forced feed) (List where equipment is mfgd)	Filters number unit capacity (mgd)	Mixing chamber - - Clear well - - - -	Number units Type Dimensions Materials Capacity, gals. Number units Type Materials Dimensions Capacity, gals. Backwash equipment Number units Type Dimensions Materials Capacity, gals.

Classification	Unit of measure	Component parts	Unit of measure and data
Water Filtration plant	Filters number unit capacity (mgd)	- - - - -	Make Type Number of units and size
(Continued)			Material Capacity, gpm
(Gravity or forced feed) (List where equipment is mfgd)		Softener Equip- ment number units	Type of zeolite Exchange capacity, kilograms Cubic feet zeolite
			Location Type
		Chlorinators - - - (capacity)	Chemical Capacity, Max. pounds Tanks, number and size Drive
			Type
		Ammoniators - - -	Chemical Capacity, Max. pounds Tanks, number and size Drive
			Location Type
		Dry feeders - - -	Chemical Capacity, Max. pounds Tanks, number and size Drive
			Location Type and Chemical
		Solution feeders -	Capacity, Max. pounds Tanks, number and size Drive

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SEWER SYSTEM

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Classification	Unit of measure	Component parts	Unit of measure and data	
Sanitary sewer mains, 8 ft. and over	Linear feet - - - -	Main sewers - - - -	Linear feet and Diameter	
			Manholes	Number
Sanitary house laterals, 6 in. and under	Linear feet - - - -	House laterals - -	Linear feet and Diameter	
Storm sewers - - -	Linear feet - - - -	Mains - - - - -	Linear feet and Diameter	
			Manholes - - - - -	Number
			Catch basins - - -	Number
			Station - - - - -	Type
Sewage pumping stations	Mgd - - - - -	Pumps - - - - -	Number	
			Gpm capacity	
			Type	
Sewage treatment plant	Total capacity (mgd)	Driver - - - - -	Type	
			Hp	
			Grit chamber (number of units)	Number of units
				Inside dimensions
			Grit removal mechanism	Number
				Name of mfr.
			Screen chamber (number of units)	Size
				Number of units
			Comminutor - - - -	Inside dimensions
				Number
Mechanical rake -	Name of mfr.			
	Mfr. size number			
Screening grinder	Number			
	Name of mfr.			
			Cu. ft. per hour	

Classification Unit of measure Component parts Unit of measure and data

Sewage treatment Total capacity
plant (mgd)

(Continued)

Bar screen - - - - -	Number Name of mfr. Dimensions
Primary filters (number of units) - - - - -	Number units Inside dimensions
Rotary distributor - - - - -	Number Name of mfr. Size and number arms
Fixed nozzles - - - - -	Number Name of mfr. Size
Dosing siphon - - - - -	Number Name of mfr. Mfr. size and gpm
Aeration tanks activated sludge	Number units Inside dimensions
Diffusers - - - - -	Number Name of mfr. Dimensions
Mechanical - - - - - aerators	Number Name of mfr. Gpm
Blowers - - - - -	Number Name of mfr. Cu. ft. per min.
Return sludge pumps - - - - -	Number Name of mfr. Gal. per min.
Secondary settling tanks (number of units)	Number of units Inside dimensions

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APPENDIX IV
Example 4 (Continued)

Classification	Unit of measure	Component parts	Unit of measure and data
Sewage treatment plant	Total capacity (mgd)	Sludge collectors	Number Name of mfr. Dimensions
(Continued)		Sludge pumps - - -	Number Name of mfr. Gal. per min.
		Sludge digestors or Imhoff sludge compartments	Number of units Inside dimensions
		Stirring mech. - -	Number
		Covers - - - - -	Number Name of mfr. Dimensions
		Under drains - - -	Number
		Ventilating blowers	Number Name of mfr. Cu. ft. per min.
		Recirculating pumps	Number Name of mfr. Gal. per min.
		Preaeration tank (number of units)	Number of units Inside dimensions
		Diffusers - - - -	Number Name of mfr. Dimensions
		Blowers - - - - -	Number Name of mfr. Cu. ft. per min.
		Mechanical aerator	Number Name of mfr. Gal. per min.

Classification	Unit of measure	Component parts	Unit of measure and data
Sewage treatment plant	Total capacity, (mgd)	Primary settling tank or Imhoff settling compartments	Number of units Inside dimensions
(Continued)		Sludge collection mechanism	Number Name of mfr. Dimensions
		Sludge pumps - - -	Number Name of mfr. Gpm
		Skimmer - - - - -	Number Name of mfr. Dimensions
		Dosing chamber (number of units)	Number of units Inside dimensions
		Gas meters - - - -	Number Name of mfr. Cu. ft. per min.
		Flame traps - - -	Number Name of mfr. Pipe size
		Pressure relief - flame trap	Number Name of mfr. Pipe size
		Drip trap - - - -	Number Name of mfr. Pipe size
		Boiler - - - - -	Number Name of mfr. Btu/hr.
		Hot water pumps	Number and Gpm Name of mfr.

Classification	Unit of measure	Component parts	Unit of measure and data
Sewage treatment plant (Continued)	Total capacity (mgd)	Hot water blender	Number Name of mfr. Pipe size
		Thermometers-----	Number
		Manometers-----	Number
		Waste gas blowers	Number Name of mfr. Pipe size
		Chlorine contact chamber (number units)	Number units Inside dimensions
		Chlorinator - - -	Number Name of mfr. Lb. per 24 hr.
		Sludge drying beds or lagoons (number units)	Number units Inside dimensions
		Sludge grinder - -	Number Name of mfr. Cu. ft. per hr.
		Septic tanks	Number of units Inside dimensions
		Sewage flow meters	Number Name of mfr. Mgd
		Water pumps - - -	Number Name of mfr. Gpm
		Sump pumps - - - -	Number Name of mfr. Gpm
		Gas engines	Number and hp Name of mfr.

ELECTRIC SYSTEM

Classification Unit of measure Component parts Unit of measure and data

Generating plant	Kva capacity	<ul style="list-style-type: none"> Generators - - - - Primary mover - - Switchboard - - - - Switchboard - - - - Oil circuit breakers - - - - Disconnecting switches - - - - Fuse cut-outs - - Regulators (secondary) - - 	Number of units
			Type
			Mfr.
			Serial Number
			Kva
			Voltage
			Phase
			Cycle
Power factor			
	Number of units		
	Type		
	Hp.		
	Materials		
	Dimensions		
	Number panels		
	Number feeders		
	Materials		
	Dimensions		
	Number panels		
	Number feeders		
	Secondary number		
	Feeders number		
	Secondary number		
	Feeders number		
	Secondary number		
	Feeders number		
	Bus. number		
	Feeders number		

Classification	Unit of measure	Component parts	Unit of measure and data
Generating plant (Continued)	Number feeders	Lightning arrester	Secondary number Feeders number
		Air-brake switches	Secondary number Feeders number
		Main transformers	Number Mfr. Type Serial number Kva Voltage ratio Phase Cycle
		Oil circuit breakers	Primary number Incoming line number
		Air-brake switches	Primary number Incoming line number
		Fuse cut-outs	Primary number Income line number
Substation Equipment	Kva capacity	Regulators (primary)	Bus. number Incoming line number
		Disconnecting switches	Primary number Incoming line number
		Lightning arrestors	Primary number Incoming line number
Transmission lines	Linear feet	Lines	Pole ft.
		Poles	Number
Overhead distribution lines	Linear feet	Lines	Pole ft.
		Poles	Number

Classification	Unit of measure	Component parts	Unit of measure and data
ELECTRIC SYSTEM			
(continued)			
Overhead services	Number - - - - -	Service - - - - -	Number Linear ft.
		Meters - - - - -	Number single-phase Number 2-phase Number 3-phase
Underground distribution lines	Linear feet - - - - -	Lines - - - - -	Linear ft.
		Manholes - - - - -	Number
Underground services	Number - - - - -	Services - - - - -	Number Linear ft.
		Conduit - - - - -	Linear ft. Type material
		Lights with film cutouts	Number Total lumens
		Lights with series transformers	Number Total lumens
Street lighting	Number lights - - -	Lights with multiple transformers	Number Total lumens
		Street light transformers	Indoor Outdoor
Distribution line transformers	Kva capacity - - - - -	Transformers - - - - -	Number Type Serial number Kva Voltage ratio Phase
Distribution system	Capacity - - - - -	Mains - - - - -	Linear ft.
		Services - - - - -	Number Linear ft.
		Manholes - - - - -	Number

Classification Unit of measure Component parts Unit of measure and data

Distribution system

Linear feet

Meters - - - - -

Valves - - - - -

Regulators - - - - -

Number
Mfr. Size
Number
Mfr. Size
Number
Mfr. Size

INCINERATORS

98

Incinerators

Tons capacity
Number of incinerators

Furnaces - - - - -

Stack - - - - -

Blowers - - - - -

Motors - - - - -

Number
Mfr. Serial number
Standard Army or commercial (forced, natural) draft
Size or capacity
Height
Diameter
Number
Mfr. Serial number
Type
Size or capacity
Number
Mfr. Serial number
Type
Size or capacity

Name of City	Water		Surface Water			Impounding Reservoir *	Purchased	No. of House Connections
	Ground Wells	Springs	Lakes	Rivers	Streams			

*Note: Where impounding reservoirs are located give type of construction e.g. masonry, capacity, concrete, masonry concrete, earth covered, etc.

Identification of Road	Type of Surface	Width or Number of Lanes	Load Capacity	Civil Agency Responsible for Maintenance	Length of Road in miles	Condition of Road and Remarks

PRINCIPLE USE OF ELECTRIC POWER

Plan Location	Percent Used By Military	Percent Used In Industry	Percent Used In Private Homes	Percent Used By Municipal Government	Percent Used by Transportation

CONSUMPTION OF ELECTRIC POWER												
IN _____ AREA DURING (Year) _____												
Millions of KWH	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
												



Produced in Area



Brought into Area

MONTHLY COMPARISON OF ELECTRIC POWER
CONSUMPTION AND GENERATION
FOR _____

Item	Quantity KW		Change Oct to Nov		Percent of Total Consumption	
	Oct	Nov	KW	%	Oct	Nov
Consumption						
Generation						
Hydro						
Brown Coal						
Hard Coal						
Fuel Oil						
Net Incoming						

ELECTRIC POWER GENERATING CAPACITY					
OF _____ AREA		DATE _____			
Item	Generation Type				
	Total KW	Hydro	Soft Coal	Hard Coal	Fuel Oil
Installed Capacity					
Operable Capacity					
Capacity in Service As Percent of Installed					
As Percent of Operable					

ANNUAL FORECAST

Date.....

Estimate for State ofSubmitted by
(Title)

Months of

1. Water requirements (in 1000 cubic meters per month). Quarters Beginning Years Total

Military	.....	.....	.....	.....	.....	.....	.....
Domestic	.....	.....	.....	.....	.....	.....	.....
Industrial	.....	.....	.....	.....	.....	.....	.....
Losses	.....	.....	.....	.....	.....	.....	.....

2. Production (In 1000 cubic meters per month)

Pumped	.....	.....	.....	.....	.....	.....	.....
Gravity	.....	.....	.....	.....	.....	.....	.....

83

3. Fuel Requirements (In Metric Tons)

Brown Coal	.....	.....	.....	.....	.....	.....	.....
Hard Coal	.....	.....	.....	.....	.....	.....	.....
Fuel Oil	.....	.....	.....	.....	.....	.....	.....
Other (Name)	.....	.....	.....	.....	.....	.....	.....

4. Critical supplies and materials (Operation) (Attach separate sheets)

5. Critical equipment and materials (Maintenance) (Attach separate sheets)

6. Critical equipment and materials for rehabilitation (Attach separate sheets)

Notes: This report to be made quarterly as of 1 January, 1 April, 1 July and 1 October. Quantities for each item shall be given by months for the first six months and by quarters for the second six month period. Report only of communities of 2000 population having service.

Estimate for State of Submitted by.....

Months of.....

1. Sewage Disposal Plant Date (Population Served)			Years
	Months of	Quarter Beginning	Total
Military	.....	.....	.....
Civilian	.....	.....	.....

2. Number of Sewage Disposal Works (No. of individual plants)			
In full operation.....	.....	.....	.....
In need of rehabilitation.....	.....	.....	.....

16

3. Fuel requirements for pumping (In metric tons)			
Brown Coal	.....	.....	.....
Hard Coal	.....	.....	.....
Fuel Oil	.....	.....	.....
Other (Name)	.....	.....	.....

- 4. Supplies and material (Operation) (Attach separate sheet)
- 5. Equipment and materials (Maintenance) (Attach separate sheet)
- 6. Equipment and materials for rehabilitation (Attach separate sheet)

Notes: This report to be made quarterly as of 1 January, 1 April, 1 July and 1 October. Quantities for each item shall be given by months for the first six months and by quarters for the second six month period. Report only on communities of 2,000 population having service.

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AERATION	Spraying or otherwise exposing water to air to reduce objectionable tastes and odors.
BOD	Biochemical oxygen demand or the amount of oxygen required to produce stable effluent.
BRIDGING	A method of stiffening floor joists and partition studs, by cutting pieces in between.
BTU	British thermal unit or 1/180th of the heat required to raise the temperature of 1 lb. of water from 32 to 212 F.
CATCH BASIN	Chamber or well designed to keep grit and debris out of a sewer.
CHLORINATION	The disinfection (destruction of disease producing micro-organisms) of water by adding chlorine in the form of a gas or calcium hypochlorite.
CIVIL AFFAIRS ORGANIZATION (UNIT)	A military unit charged with the responsibility of enforcing orders and proclamations of the supreme commander and his staffs regarding CA operations as required by military necessity, obligations under international law and interests of national policy of the U.S.A.
CLARIFICATION	Process of removing suspended and colloidal matter from a turbid liquid.
COAGULATION	The formation of masses of gelatinous precipitates in water by adding alum or other suitable chemicals for clarifying water.
COMPLETE WATER PURIFICATION SYSTEM	A system which completely treats raw water by removing colloiddally suspended particles, bad tastes and odors and harmful bacteria.
COURSE	A continued layer of bricks or stones in buildings; the term is also applicable to slates, shingles, etc.
CU FT	Cubic feet or ft ³ .
DIGESTION	Biochemical decomposition of organic matter to form mineral and simpler organic compounds.

DOCK	A slip between two piers to receive vessels.
DRAW DOWN	The difference between static water level and pumping level.
EFFLUENT	Partly or completely treated sewage flowing out of a sewage treatment device.
FIRE DEMAND	The quantity of water required for fire extinguishment in a given area.
GPM	Gallons per minute.
GRAVITY SYSTEM	System in which all sewage flows on descending grades from source; one requiring no pumping.
INFLUENT	Sewage, raw or partially treated, flowing into any sewage treatment device.
INTEGRATED ELECTRIC POWER SYSTEM	A system of interconnected power distribution from two or more power plants.
JETTY	Structure built out into the water to check currents and protect the harbor.
KV	Kilo volts - unit of electric potential - 1000 volts.
KVA	Kilo volt amperes - 1000 volt amperes.
KW	Kilo watt - unit of electric power - 1000 watts.
KW-PEAK LOAD	The maximum load demand during any given period, which will be one hour or, maximum KWH generated or transmitted or transformed for one continuous hour.
LEACHING	Escape of water or sewage from a dry well or cesspool into surrounding permeable soil.
LOAD FACTOR	The ratio of average load during a given period to the maximum load for one hour during that period.
M.E.P.	Mean effective pressure.

METRIC TONS	Metric system weight equal to 2204.6 lbs.
MGD	Million of gallons per day.
MVA	Mega volt amperes - 1000 KVA
MW	Mega watt - million watts - 1000 KW.
NET GENERATION	KWH delivered to the generating station bus for delivery to the system. This is KWH generated less KWH used in the station for station auxiliaries (pumps, fans, exciters, lights, etc.)
POTABLE	Term describing clean, relatively pure water considered satisfactory for domestic consumption.
POWER FACTOR	The proportion of the energy in an AC circuit, represented by the product (volts x amperes) that can be applied to useful work.
PPM	Parts per million by weight.
PRIMARY ROAD	This term denotes a road having gentle curves, minimum grades, good drainage, well surfaced or graded, well planned intersections and absence of narrow bridges.
PUBLIC UTILITIES	As used in this manual, all gaseous fuel, power and light, sewerage and water services provided for public consumption or use.
PUBLIC ADMINISTRATOR	One who is charged with the responsibility of directing the activities and operations of one or several public offices, departments or bureaus.
PUBLIC BUILDING	Any structure that is owned, operated or used by municipal, state and national authority in the conduct of some governmental function or activity: Example - public school, hospital, etc.
PUBLIC WORKS	A collective term used to denote all buildings, roads and bridges, and other facilities which are erected for public use and supported by public funds.

SECONDARY ROAD	This term denotes a road characterized by any one of the following: sharp curves, steep grades, poor drainage, rough surface, bad intersections and narrow bridges.
SEWAGE	Refuse, liquids or matter carried off in pipes or conduits.
SEWERAGE SYSTEM	A collecting system of sewers and appurtenances.
SOP	Standard operating procedure.
STATIC WATER LEVEL	Level or elevation of water in the well before pumping.
STRINGER	A long horizontal timber to connect uprights in a frame, or to support a floor or the like.
SYSTEM PEAK LOAD	The simultaneous KW peak loads of all stations supplying an integrated "system" for one hour. (Hour must be designated.)

TABLE OF CONVERSION FACTORS:--

1 foot	-----	30.480 cm
1 yard	-----	0.9144 m
1 mile	-----	1.6093 km
1 sq.in.	-----	6.4516 sq.cm
1 kilogram	-----	2.2046 lb avoird.
1 short ton	-----	0.9072 metric ton
1 psi	-----	0.7031 gm. per sq.mm
1 hp-hr.	-----	0.7456 kw-hr
1 btu	-----	0.2520 kg-cal
1 kw-hr.	-----	3411.5 btu
1 cheval-vapeur	-----	0.9863 hp

V REPORT	Vicinity Report - A preliminary investigation of public works and utilities for purposes of making an initial survey of damaged areas, civil personnel and initial steps for restoration of facilities.
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CHECK LISTS

11. Make surveys to determine status of public works and utilities regarding operating conditions, extent of damages, production records, past and present, etc. Utilize civilian agencies for surveys.

Safety of Plants and Bridges

12. Contact public safety officers and establish system of guarding all plants and bridges. Obtain necessary guards to protect vital areas.

Personnel

13. Remove, where necessary, policy making officials and appoint temporary substitutes to fill the vacancies. Secure the most competent civilian administrator available after screening.
14. Begin survey of all employees of public works organizations and utility plants to determine percentage of employees available for back to work status.
15. Screen all personnel and cooperate with Special Branch in accordance with special directives.

Administration

16. Organize the headquarters for Public Works and Utilities, to accomplish the control of the various utilities and public works in the area of operations. Assure that administration, supply and procurement, and operations and engineering will be continuously maintained for each agency.
17. Prepare reports and surveys needed for administration and control of public works and utilities. These may be based upon examples contained in this manual.
18. Establish a message center and maintain the following records for administration of public works and utilities headquarters. Special control charts, inventory charts and forms, engineering and operational flow charts and diagrams will be augmented as the situation demands. Records to be maintained are:
- a. In and out journal.

CHECK LISTS

- b. Daily journal or log.
- c. Routine report control chart.
- d. Filing system for orders, memoranda, etc.
- e. Suspense or tickler file.

Political Activities

- 19. Establish early contact with all civilian agencies with whom the team will operate and supervise. Interview the officials and key staff members of these agencies and gather all data pertaining to public works and utilities to enable planning for immediate control and operations.
- 20. Issue to the civilian agencies referred to in the preceding paragraph, the necessary orders and proclamations regarding control of all public works and utilities. These orders will contain information regarding restoration and resumed operations of power plants, gas plants, water and sewerage works, and port facilities.
- 21. Establish contact with civil political agencies having either direct or indirect control of public works and utilities and appraise them of all orders, instructions and proclamations relevant to public works and utilities.

Supply and Procurement

- 22. Make a thorough reconnaissance of all public works and utilities buildings, warehouses and plants and inventory all supplies, repair parts and stocks of materials.
- 23. Maintain adequate supply levels at all power, water, gas and sewerage plants and create a system of stock control for the quantity of supplies for these plants. Procure needed supplies from military and civilian sources.
- 24. For maintenance and repair of roads and bridges initiate a survey of quarry operations in area, material yards and asphalt and cement plants and create a material location map showing location of these supplies and facilities. Maintain

CHECK LISTS

adequate records of quarry and road supply plant output and transportation facilities available for distribution of road building and bridge repairing machinery and materials.

25. Request warehouse and supply yard facilities for safe storage of all supplies needed for repair, rehabilitation and restoration of all public works and utilities.

Operations

26. Assume control and responsibility for the following public works and utilities:
- Public buildings - except churches, museums, libraries, and scientific buildings.
 - Public roads and bridges.
 - Port facilities.
 - Electricity generating plants and distribution systems.
 - Water filtration plants and distribution systems.
 - Gas manufacturing plants and systems.
 - Sewage disposal plants and systems.
 - Garbage plants and facilities.
27. Create an operations and engineering branch or division for all planning, control, repairs and emergency service work. Utilize civilian personnel to assist in operations and engineering.
28. Establish and request of the commander of the CA unit to which your team is assigned all assistance from other military sources for special engineering supplies and equipment needed for control and rehabilitation work.

Special

29. Operations within a very large city or heavily populated areas call for special planning and consideration.

REPORTS

GENERAL OUTLINE RELATIVE TO REPORTS

1. By whom submitted.

Reports should be submitted, as required, to the CA unit to which the team is assigned.

2. Frequency and number of copies.

The frequency of reports and the number of copies to be submitted should be determined from CA unit SOP.

3. Channels.

The channels through which reports will flow should be determined by established SOP. Civilian reports should be made to the team headquarters.

4. Types of reports.

a. Statistical

(1) Production and consumption.

(2) Personnel.

(3) Capacity.

(4) Engineering.

(5) Material.

b. Functional.

(1) Detailed functional information regarding specific duties.

(2) Detailed functional information regarding specific works and utilities.

c. Narrative.

(1) Statement regarding public works and utilities covering accomplishments to date.

REPORTS

(2) Summary of activities undertaken and progress of same.

(3) Summary of problems encountered and measures taken to reduce these problems.

(4) Personal comments relative to public works and utilities.

d. Field reports.

These reports are intended to give a quick overall picture of conditions.

5. Method of transmission.

a. Phone.

b. Telegraph or teletypewriter.

c. Messenger.

d. Mail.

6. Frequency of submission.

a. Daily.

b. Bi-weekly or weekly.

c. Semi-monthly and monthly.

d. Quarterly.

e. Semi-annually and annually.

7. Reports should be submitted in both English and in the local language if feasible.

REPORTS

PUBLIC WORKS AND UTILITIES

VICINITY REPORT
(Water Works and Sewage)

(Number)

(Date)

1. INSTRUCTIONS: An initial survey of your area will be made to determine status and location of targets listed in paragraph two (2) below. Information must be as accurate as time will permit. Name or recommend reliable, competent, civilian administrator for management of each facility or service. This report will be submitted to this headquarters in _____ days. Results may be in tabular form.

2. TARGETS:

a. Water Works and Sewage

(1) What is extent of damage, if any, to waterworks, sewerage systems and water and sewer mains?

(2) What is availability of labor, materials, equipment and technical skill in area and percentage of same? Show location of all items.

b. Civilian Personnel

(1) What are the names of administrative and technical personnel presently employed and percentage of same?

(2) What percentage of former personnel are available for a back to work status?

c. General (What are the estimated emergency needs? What is the existing quality and quantity of water?)

d. Garbage Collection and Disposal

(1) What facilities exist for collection and disposal of garbage?

(2) What disposition is made presently of garbage?

REPORTS

3. ESTIMATE OF THE SITUATION: (Briefly describe difficulties encountered. What is needed with regard to time, labor, materials and equipment necessary to restore systems to operation?)

4. ACTION TAKEN: (Describe action taken prior to this report with regards to initial steps in establishing control of and initial restoration of facilities.)

5. RECOMMENDATIONS: (List recommendations you feel are necessary to the overall situation, and those you deem necessary for immediate action or priority.)

REPORTS

PUBLIC WORKS AND UTILITIES

VICINITY REPORT
(Power Plants)

(Number)

(Date)

1. INSTRUCTIONS: An initial survey of your area will be made to determine status and location of targets listed in paragraph two (2) below. Information must be as accurate as time will permit. Name or recommend reliable, competent, civilian administrator for management of each facility or service. This report will be submitted to this headquarters in _____ days. Result may be in tabular form.

2. TARGETS:

a. What is the operating condition of principal hydroelectric and thermoelectric power plants in your area? Indicate by percentage figures.

b. What percentage of the power plant employees are available for a back to work status?

c. Are there any stockpiles of usable equipment in your area? If so, show location by nearest town.

3. ESTIMATE OF THE SITUATION: (Prepare your general estimate concerning time estimate of restoration of power service within one, three, and six month periods. Indicate difficulties expected with civil employees.)

4. ACTION TAKEN: (At the time of the report, indicate your action taken with regard to control and initial steps of restoration.)

5. RECOMMENDATIONS: (State plan of action you would recommend regarding power plants within your area.)

REPORTS

PUBLIC WORKS AND UTILITIES

VICINITY REPORT
(Roads and Bridges)

(Number)

(Date)

1. INSTRUCTIONS: An initial survey of your area will be made to determine status and location of targets listed in paragraph two (2) below. Information must be as accurate as time will permit. Name or recommend reliable, competent, civilian administrator for management of each facility or service. This report will be submitted to this headquarters in _____ days.

2. TARGETS:

a. Roads which are available for:

(1) Light vehicular traffic?

(2) Heavy vehicular traffic?

(3) One or two way traffic?

b. Bridges (Which roads are blocked by damaged bridges? Report if repairs are in progress.)

c. Civilian Personnel (What percentage of highway department personnel are available for back to work status?)

d. Machinery and Supplies (Show location of road building machinery, road materials and bridge supplies.)

3. ESTIMATE OF THE SITUATION: (Give a general estimate of the time and materials needed to repair roads and bridges for limited use.)4. ACTION TAKEN: (Report what has been done up to the time of submitting this report regarding repair and maintenance and initial steps taken for traffic control.)5. RECOMMENDATIONS: (State plan of action you would recommend regarding roads and bridges in your area.)

REPORTS

PUBLIC WORKS AND UTILITIES

VICINITY REPORT
(Port Facilities)

(Number)

(Date)

1. INSTRUCTIONS: An initial survey of your area will be made to determine status and location of targets listed in paragraph two (2) below. Information must be as accurate as time will permit. Name or recommend reliable, competent, civilian administrator for management of each facility or service. This report will be submitted to this headquarters in _____ days. Results may be in tabular form.

2. TARGETS:

a. Port Facilities (What percentage of port facilities have been destroyed? Report to include docking facilities, piers, quays, cranes and port warehouses.)

b. Civilian Personnel (What percentage of civilian port authorities are available for duty?)

3. ESTIMATE OF THE SITUATION: (Include a general estimate of the time and materials needed to repair port facilities for limited use.)

4. ACTION TAKEN: (Report what has been done up to the time of submitting this report regarding control and initial steps of restoration.)

5. RECOMMENDATIONS: (What are your recommendations on the future restoration of these port facilities?)

REPORTS

PUBLIC WORKS AND UTILITIES

VICINITY REPORT
(Public Buildings)

(Number)

(Date)

1. INSTRUCTIONS: An initial survey of your area will be made to determine status and location of targets listed in paragraph two (2) below. Information must be as accurate as time will permit. Name or recommend reliable, competent, civilian administrator for management of each facility or service. This report will be submitted to this headquarters in days. Results may be in tabular form.

2. TARGETS:

a. Public Buildings (Roughly indicate the approximate number of usable public buildings in your area.)

b. What is the present status of these buildings regarding occupancy?

3. ESTIMATE OF THE SITUATION: (Prepare an estimate showing number of buildings expected to be added or taken off the available list.)

4. ACTION TAKEN: (At time of the report, indicate your action taken with regard to control and initial steps of restoration.)

5. RECOMMENDATIONS: (State plan of action you would recommend regarding public buildings within your area.)

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Waterworks, Supply and Distribution Systems

1. Give exact location, by coordinates and name of town, of each waterworks in your area.
2. What is the population served by each works?
3. Are any of these waterworks inter-connected? If so, explain.
4. What are the estimated emergency water requirements?
5. What is the quality of water in each waterworks? Include color, taste and odor.
6. What type of purification system is in use? Also list steps and rated output of each purification process i. e. aeration, coagulation, sedimentation, filtering, chlorination, etc.
7. List the extent of damage to waterworks and the distribution system.
8. For each damaged installation, indicate the necessary labor, materials, supplies and equipment to restore the waterworks and distribution system to:
 - a. Partial operation.
 - b. Normal operation.
9. What is the total capacity of each plant in gallons per day?
10. What are the capacities of the impounding and clear water reservoirs?
11. Furnish the names of technical and administrative personnel presently employed or available in the area.
12. What is the availability of labor, materials, supplies and equipment?

REPORTS

13. What is the type of ownership in each waterworks system? (municipal, federal or private)

14. What civilian agency is responsible for administering water works?

15. What are the most critical supplies and equipment needed together with the estimated quantity?

16. What is the inventory of water treatment supplies on hand; and what is the daily consumption of these supplies?

17. What water pressure is maintained in the distribution system?

18. Furnish a diagram of the distribution system showing the damaged areas and the extent of the damage.

19. What are the water resources for each waterworks, including an indication of adequacy? These resources are to include wells, rivers, lakes, and impounding reservoirs.

20. What action has been taken prior to the time of making this survey to restore the waterwork facilities to normal or near normal operation?

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Electric Power Plants

1. What is the number of power plants in the area? (Differentiate between thermo and hydro-electric, standby and prime source.)
2. What are the areas (cities, provinces) served by each of these plants?
3. Are these plants inter-connected or do they serve separate, independent areas?
4. Give the exact location of each power plant by map coordinates and/or city location.
5. Is the plant governmentally, municipally, cooperatively or privately owned?
6. Furnish list of administrative, supervisory and technical personnel presently employed and those available. Indicate job title, name of personnel and present vacancies.
7. Furnish a flow chart of each major plant giving a visual picture of operations from fuel or water source to main bus bar.
8. Give a brief description of the types of equipment located in the power plant, the manufacturer and the rated capacity, i.e. boilers, steam or water turbines, condensers, water treatment equipment, fans and pumps, preheaters, economizers, etc. (Consult survey index.)
9. List extent of damage to the plant equipment.
10. List extent of damage to buildings.
11. If the plant has been damaged, estimate the labor, materials, equipment, technical advice and time required for restoration of the plant to:
 - a. Partial operation.
 - b. Normal operation.

(If this information cannot be given at present, estimate the date it will be available.)

REPORTS

12. What are the most critically needed equipment, materials, supplies, labor and technical advice required for the operation and emergency repair of the power plant?

13. List the fuels used at thermo-electric plants together with the inventory on hand and the estimated daily use.

14. Give the location of stockpiles of needed materials in the area and furnish an inventory of these materials as soon as possible.

15. What is the availability of labor, materials, equipment and technical skill in the area?

16. Furnish layout of power distribution network showing sub-stations, transformers, line specifications, voltages, pole or tower specifications, etc.

17. List damage to the power distribution system.

18. What is the present power production of each plant in KW? If none, please state none.

19. Show accomplishments to date regarding the restoration of the power producing facilities.

20. List any important problems encountered which are not covered by this survey.

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of City Streets

1. Prepare and submit a map or overlay of the city streets showing the truck routes, highways routes and main boulevards.
2. Give the approximate total mileage of improved city streets.
3. Give a brief estimate of the condition of the streets including name, surface, load capacity and the width.
4. Indicate the number of personnel available for maintenance and construction of the city streets.
5. If the streets are damaged, what is the estimated time, labor and materials needed to repair same?
6. List the civilian agency responsible for supervising the construction and maintenance of the city streets.
7. Specify the street building materials, construction and maintenance equipment available for immediate usage.
8. To date, what action has been taken to repair or maintain the streets?

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Public Highways

1. Furnish a map showing the main primary and secondary roads in your area and the critically damaged areas in this road network.
2. Show the width of roads and type of road surfaces. (concrete, macadam, etc.)
3. Show the road mileage between major towns and cities.
4. Indicate the load capacities of the roads.
5. What is the general state of repair of the highways?
6. What governmental or municipal agency is responsible for maintaining the roads?
7. Are labor, material and equipment available for maintaining the roads? Give an estimate of the amount or number.
8. List the maintenance personnel, to include those on the job and those available in the area.
9. List the job title vacancies that have to be filled, emphasizing the most critical.
10. Outline any action, to date, taken to restore or repair the highway system.

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Bridges

1. Furnish a map or overlay showing the location of main highway bridges.
2. Furnish a list of the above bridges showing their coordinate locations.
3. Indicate the former and present capacity (in tons) of each bridge.
4. What is the extent of the damage to each main bridge?
5. Can the damaged bridges be utilized in their present condition?
6. If the damaged bridges cannot be used in their present condition, what is needed for repairs or reconstruction?
7. Submit a complete description of each main bridge, to include number of spans, the span length, width and number of lanes, materials, approaches, overhead clearance, and height above stream.
8. What bridge construction material and equipment is on hand or available in your area? Show the location of same on a map or overlay.
9. What is the governmental agency controlling bridges in the area of jurisdiction?
10. List maintenance personnel giving those with an on-the-job status and those available in the area.
11. List job title vacancies which should be filled.
12. What action has been taken to date regarding restoration of the bridges?

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Port Facilities

1. What percentage of the port facilities have been completely destroyed i.e. quays, piers, cranes, warehouses, etc.?
2. What percentage of the port facilities have only been partially damaged and what is the extent of this damage?
3. Determine the time, labor, material and equipment needed to restore port facilities to:
 - a. Partial operation.
 - b. Normal operation.
4. What is the availability of labor, materials and equipment in the area to aid in the restoration of these port facilities?
5. What agency is responsible for the maintenance of various port facilities? (Such as railway service, dredging, and dock maintenance.)
6. List damage to facilities not mentioned above.
7. What current action is being taken to restore the port facilities?
8. Include a map of suitable scale to show layout of the port facilities. The length and width of all usable piers and quays are to be indicated. Shade each damaged or destroyed area in different shade or tone. Locate the positions of wrecked ships and obstacles on this map.

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Public Buildings

1. Give the location of all important public buildings in your area. (Show the location and name.)
2. What is the normal usage of the building?
3. Who is responsible for the management and operation of the public building?
4. List building custodians.
5. List building materials on hand or available in your area.
6. Submit a list of building laborers and craftsmen presently employed or available.
7. What is the type of building construction of each major public building? Should include single or multi-storied, brick, masonry, or wood, type of heating, etc.
8. Submit classification of damage to public buildings as follows:

TYPE A Totally demolished.

TYPE B Partially damaged structures available only for their material salvage value.

TYPE C Structures which may be occupied after minor repairs are made.
9. Give the estimated time, labor and material needed to repair TYPE C buildings.
10. What is the present plan for the repair and rehabilitation of public buildings?
11. Complete and return all forms attached to the survey questionnaire as soon as possible.

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Garbage Collection and Disposal

1. What facilities are available for garbage disposal? (Include incinerators, dumps and burial grounds.)
2. What is the condition of the above mentioned facilities and their capacities?
3. Are the garbage disposal facilities municipally or privately owned?
4. Can the garbage be fed to animals; or is any attempt made to segregate the garbage and refuse?
5. What are the locations of the dumps?
6. If any of the disposal facilities are damaged, what are the length of time, labor and materials needed to repair the disposal facilities?
7. What is the number of employees normally employed and presently employed in the collection and disposal of the garbage?
8. What facilities are available for the refuse and garbage collection? (Include trucks, wagons, carts.)
9. Are present collection facilities adequate?
10. What action has been taken, to date, to restore the facilities to normal or near normal operating condition?

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Gas Producing Facilities

1. Give the estimated quantity (volumetric under standard conditions) needed for essential military, civilian and industrial use.
2. What is the quantity of gas available from present facilities?
3. Give the exact locations of gas manufacturing plants.
4. What is the condition of each gas producing plant in your area and the extent of damage to same?
5. If possible, obtain a layout of each gas plant.
6. Submit a diagram or plan of the gas distribution system in your area. Indicate all damaged areas.
7. Furnish a chart showing types of jobs performed in each gas works, together with the names of the personnel currently filling these positions.
8. Submit the monthly production reports of each plant for the past five years. Utilize old plant records.
9. Are the plants privately, municipally or governmentally owned?
10. What type of gas does each plant produce? Indicate the mean calorific value measured in BTU per cubic foot for each type of gas.
11. Indicate governmental agencies exercising supervision over the gas producing industry.
12. State required time, labor, material and equipment to restore all damaged plants to:
 - a. Partial operation.
 - b. Normal operation.

REPORTS

13. What stock piles of coal do the coke-oven gas plants have on hand? Denote the average daily consumption of coal.

14. Give the location and size of gas holders and the CU. FT. of stored gas in each holder.

15. What action has been taken to date regarding control, operation, repair and maintenance?

REPORTS

PUBLIC WORKS AND UTILITIES SURVEY REPORT

Survey of Sewers and Sewerage Systems

1. List the number and location by map coordinates of the sewage disposal plants together with the area and population each serves.
 2. What is the capacity of each plant in gallons of raw sewage per day?
 3. Are the plants governmentally, municipally, cooperatively or privately owned?
 4. Furnish list of administrative, supervisory and technical personnel presently employed. List additional personnel available, but not presently employed. Show job title, name of employee and existing vacancies.
 5. Furnish flow chart, if possible, of each plant giving visual picture of operations from initial influent to disposal of final effluent.
 6. Give a brief description of the type of equipment located in the disposal plant, the manufacturers, rated capacity, etc. See chart in annex.
 7. List the extent of damage to the plant and equipment, if any.
 8. If damaged, what is needed with regard to labor, materials, equipment, technical advice and time, to restore plant to:
 - a. Partial operation.
 - b. Normal operation.
- (If this information cannot be given at present, estimate the date it will be available.)
9. What are the most critically needed equipment, materials, supplies, labor and technical advice required for the operation and emergency repairs of disposal plants?

REPORTS

10. List the fuels used, inventory on hand and the quantity used daily.
11. Give the location of stockpiles of needed material and equipment by map coordinates and furnish an inventory of same, if possible.
12. What is the availability of labor, materials, supplies and equipment?
13. Where is the discharge point for the final effluent from each plant?
14. Is the present system adequate for the needs of the area?
15. What purification methods are used and what is the effectiveness of these methods?
16. Furnish plan of sewerage system showing locations of damages and the extent of damages. Also, what is being done to repair these damages?
17. Are storm waters and domestic sewage carried in the same ditch?
18. Are sewage pumping plants in use and if so, give the location and condition of these stations?
19. What tests are being taken of the sewage and what laboratory facilities are available?
20. If there are no sewage disposal plants in the area, indicate the method of sewage disposal.
21. What is the percentage of the population, rural and urban, served by the treatment plant?
22. Does the plant perform primary or complete treatment of the sewage?
23. What percentage of the sewerage system serves residents?
24. What is the percentage of residents, or homes served by septic tanks?
25. To date, what action has been taken regarding control and reconstruction of sewerage facilities?