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OVERHEAD DISTRIBUTION FOR FACILITY ENGINEERING ACTIVITIES

Prepared by

Engineer Studies Group
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April 1976

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This study of Facility Engineering (FE) overhead distribution defines current Army, Navy, and Air Force methods. Cost distribution is qualitatively compared to productive labor output. Two overhead distribution methods are developed for determining the cost of specific FE services. One method focuses on the Director of Facility Engineering (DFAE) installation level. It applies all overhead cost elements at that level to the direct labor output of the productive shops. The second method identifies installation level cost elements which directly contribute to the FE effort and distributes them to the DFAE direct labor output.

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ABSTRACT

This study of Facility Engineering overhead distribution defines methods currently being used by the Army, Navy, and Air Force and qualitatively compares the distribution of costs to productive labor output.

Two methods of overhead distribution are developed to permit determination of the total cost of providing specific Facility Engineering services. One method focuses upon the Director of Facility Engineering (DFAE) organizational installation level and applies all elements of overhead costs at that level to the direct labor output of the productive shops. The second method identifies and distributes elements of cost at the installation level which directly contribute to the Facility Engineering effort to the DFAE direct labor output.

OVERHEAD DISTRIBUTION FOR FACILITY ENGINEERING ACTIVITIES

1. Purpose. This report provides a compendium of Facility Engineer (FE) overhead distribution systems currently being used by the armed services. It also develops two overhead methods suitable for determining in-house costs associated with FE work accomplishment.

2. Scope. This report:

a. Summarizes overhead systems currently used by the Army, Navy, and Air Force (Annex A).

b. Provides a qualitative comparison of the overhead systems investigated (Annex A).

c. Designates a method of identifying overhead costs and distributing them within the Army Director of Facility Engineering (DFAE) organization at installation level (Annex B).

d. Designates a method of identifying installation costs associated with supporting the DFAE. The method also covers distribution of those costs to the DFAE (Annex C).

e. The Directorate of Facility Engineering, OCE, has requested that the Engineer Studies Group (ESG) address the overhead topic within the overall framework of a larger study entitled Management of Facilities Engineering Project. This report addresses only the overhead portion of that study.

3. Background.

a. General. In the FE environment, a constant or decreasing work force faces an ever-increasing demand for services. Thus, FE must increase its reliance on contract accomplishment. Forty to fifty percent of all Army maintenance and repair is now being done by contract, and the Department of Defense (DOD) is actively stressing increased contracting of DFAE functions. Detailed cost comparisons between contract and in-house accomplishment of real property maintenance activities (RPMA) have been hampered by the inability of Army FE personnel to accurately determine the in-house cost of providing specific maintenance or service functions. The data necessary for more accurate economic analyses could be developed by identifying organizational overhead and distributing it to the productive element providing the maintenance or service.

b. Value and uses of overhead accounting.

(1) The basic purpose of an overhead system is to identify and distribute, in some equitable fashion, those expenses which are not directly associated with a specific product or service. The primary reasons for wanting to do this fall within two general categories.

(a) Profit and loss motive. When an organization is responsible for recouping the total cost of its operation through the media of pricing its output product or service, it is imperative that

all costs are identified and distributed. The industrial-funded activities within the services operate on a zero profit-loss objective.

(b) Management tools and internal control. A variety of management decisions can be based on knowledge of overhead costs. Expensive overhead elements are automatically highlighted for special attention. Management's organizing and controlling functions are assisted by overhead information, especially in a profit-oriented activity.

(2) The uses of overhead in the Army FE environment include the following.

(a) The FE could recoup more of the cost of providing services to reimbursable accounts by distributing overhead costs among the existing shop rates. However, unless there are substantial reimbursable accounts on an installation, the dollar amount represented by DFAE overhead will be relatively insignificant.

(b) Overhead elements could be analyzed by considering their contribution to the operation in light of their cost. Organizational or personnel changes could bring costs in line with preconceived standards. Historical tracking of overhead costs could also help analysts focus on particular organization elements which need attention.

(c) Highlighting costs of each overhead element would enable managers to monitor and control the costs' impact in relation to the output.

(d) A manager who monitors more than one FE could use overhead ratios as a basis of comparison. This provides a type of teeth-to-tail ratio; however, there are several items such as degree of contracting and level of manning which must be considered in this application.

(e) The more accurate in-house cost obtained by the application of overhead provides a more equitable basis for comparing in-house and contract costs. Total in-house cost data should help decide whether to terminate or initiate contracts for FE functions. When the functions to be contracted are of such magnitude that they will impact on other base operations activities, the costs associated with those activities should be considered.

(3) Guidance received during this project focused study efforts on developing an overhead system for comparing in-house and contract costs. The overhead systems presented in Annexes B and C were designed with this purpose as the primary design factor; however, these systems are adaptable to all of the uses outlined. When used for comparative analysis, the overhead systems would be selectively applied on an as-required basis. Only that function being considered for contract would be analyzed, and the application would be static; i.e., not continuously maintained. The other uses, which encompass management tools and recouping costs from reimbursable customers, would require application

of the overhead method to all organizational elements on a more continuous or active basis.

4. General Method. The study efforts evolved around two primary tasks. The first was to define and display the overhead systems currently used by the services. The second task was to design an overhead identification and distribution method which would facilitate determination of the total cost associated with accomplishing specific FE functions.

a. Definition of current overhead systems. Extensive field trips and interviews during this phase helped in defining the Army, Navy, and Air Force overhead and accounting systems. The Naval Facilities Engineering Command (NAVFAC) and the Maintenance and Management Division of the Air Force Director of Civil Engineering were most helpful in providing necessary briefings and documentation as well as arranging for field trips to their subordinate units. Information obtained during this phase provided a basis for comparing the various systems. It also provided the background necessary to developing more refined overhead methods.

b. Formulation of an overhead method for total cost determination. There are two distinct levels at which an FE overhead accounting system can be applied: the DFAE level and the installation support activity level.

(1) A method was developed for identifying overhead costs within the DFAE organization and distributing them to the FE productive elements. The method provides the general concept and procedures

necessary for applying internal overhead costs to specific functions, thereby permitting calculation of the total in-house cost. The installation support organization provides the DFAE many services which are required in order to accomplish the FE mission. The overhead method developed for the internal DFAE organization does not account for the installation support costs. This restriction is palatable as long as the function being investigated is relatively minor and has little or no impact on the installation support organization.

(2) A second overhead method was developed; it identifies and distributes installation support costs to accommodate these cases where significant functions were to be analyzed for contract accomplishment. This rather involved method is required only when contracting the function being analyzed would significantly change the size of the in-house work force.

5. Current Army Overhead Systems. The Army uses two labor and cost accounting or overhead systems. Army Materiel Command (AMC) installations organized under an Army Industrial Fund (AIF) Charter use the AIF system. All other installations funded by appropriation use the second and more common system.

a. The AIF system uses business management techniques to insure that operations are conducted as efficiently and economically as possible. Within this context, all costs are accounted for and are applied to the

product or service produced by the AIF activity. The AIF's financial objectives are to manage effectively, to pass on all operation costs to the product or tenant, and to achieve a zero profit-loss balance at fiscal year's end. The Army concept of support is based on the garrison organization providing an integrated package of support to the activities or tenants on the installation. The AIF system does not alter the Army's support concept. The entire base operation functions as a business, accounting for all funded costs and distributing them to the tenant(s) in some equitable fashion. Unfortunately, the DFAE organization is not a totally separate system in the accounting process. The DFAE uses the services of the other base operations activities in the same manner as on an appropriated installation. The time and resulting base operation activities' expenditures for supporting the DFAE are not accounted for and charged to the DFAE. These costs are accumulated in an installation overhead charge which is charged to the tenant as part of the total support package concept. This system of overhead distribution does not provide the detailed information necessary to define the total cost of doing specific FE functions.

b. The overhead system used on Army-appropriated installations uses shop rates to distribute personnel costs to job orders and detailed cost accounts. Supervision, leave, training, and fringe benefit costs are accounted for at shop level. Personnel costs associated with typical overhead organizational elements (such as Administration, Work Coordination

Office, and the Supply and Storage Division) are charged to job orders whenever possible. It is more common, however, that these costs are credited against catch-all type accounts such as Management and Engineering (M6000), Facilities Engineering Supply (M9600), and Command Administrative Services (N2000). The manpower distribution within the DFAE organization places from 15 to 20 percent of the manpower in the overhead elements. Thus, the inability to relate these costs to specific items of work prevents the FE from knowing the total cost of performing a function. In addition to not fully accounting for DFAE costs, the present system does not distribute any of the costs associated with support received from other garrison activities. In short, the current overhead system does not provide enough cost detail to determine the true DFAE or installation cost of accomplishing specific FE functions.

6. Current Navy Method of Overhead Distribution. Like the Army, the Navy used two methods of overhead accounting. The Public Works Center (PWC) is the FE organization utilized in the Navy Industrial Fund (NIF) system, and the Public Works Department (PWD) is the FE organization for normal appropriated operations.

a. The PWC cost accounting system is characterized by a strict control of all costs at the FE level. This is in contrast to the Army which applies the industrial fund at base operations level rather than the FE level. The cost accounting method is extremely detailed and is outlined in Annex A. The advantage of establishing the industrial fund

at the PWC or FE level is that all elements of cost are identified and distributed to the products and services produced by the PWC. The PWC organization is designed to be self-supporting. Therefore, overhead elements normally found in the installation support organization are organic to the PWC. Although this feature simplifies control and costing of these support elements, it appears to limit the PWC application to relatively large-scale operations. The PWC's internal cost accounting method provides the information necessary to compute the total cost of providing each FE function, to include normal installation support costs.

b. The PWD is equivalent to the Army's FE organization on an appropriated installation. Compared to the PWC, it is not funded by industrial funds, is more limited in size and support capability, and receives nonreimbursable support from other base operation activities. The PWD accounting system does not identify and distribute overhead costs to the direct labor output of the productive elements. Since reimbursement of all costs is not an objective for the PWD, catch-all accounts are used to accumulate administration, engineering, and overhead costs. Neither in-house costs nor total costs of accomplishing FE functions can be determined accurately from the PWD accounting system.

7. Air Force Overhead Accounting Method. The Air Force uses the Base Engineer Automated Management System (BEAMS) for labor and cost accounting purposes. The overhead accounting system is based on using shop rates to distribute costs. The Air Force shop rate computation is

more comprehensive than the Army's in that some material and vehicle costs of the organizational elements are included. Neither the costs associated with Base Civil Engineer overhead elements nor the support received from other base activities (Comptroller, Supply, Civilian Personnel) are distributed to specific orders or to customers. The current Air Force accounting system cannot provide accurate estimates of in-house costs incurred accomplishing an FE service or function.

8. Comparison of Currently Used Overhead Systems. The overhead identification and distribution systems discussed previously vary as to complexity and general procedure. The basic characteristics of each system are dictated by the functions assigned to the engineer elements and the accounting requirements inherent to the support concepts involved. Figure 1 is a qualitative comparison of engineer functions assigned to the FE element under each of the systems. This figure shows those cost elements which are added to the direct labor rate and charged to the customer.

a. The industrial fund concept demands complete cost identification and distribution of all expenses to products or services produced by the organization. The Navy PWC method of cost identification and distribution is the only method used by the services which isolates the FE function in the accounting process. All costs associated with the PWC and all support to the PWC are identified and distributed. The total cost of providing each service can be readily obtained. The AIF method

QUALITATIVE COMPARISON CHART

Element of Comparison	Army AIF	Army Appropriated (Shop Rate)	Navy PWC	Navy PWD	Air Force (Shop Rate)
Functions of Facility Engineer					
Repair & Maintenance of Facilities	X	X	X	X	X
Operation & Maintenance of Utilities	X	X	X	X	X
Refuse Collection	X	X	X	X	X
Fire Protection	X	X			X
Supply (For FE Operations)	X	X	X		
Housing Management			X	X	X
Housing Furniture and Equipment					X
Base Transportation			X	X	
Transportation Maintenance (Base)			X	X	
Base Communications			X	X	
Troop Command Function					X
Contracting Officer (Under Certain Conditions)			X	X	
Element of Cost Applied to Direct Labor Rate					
Shop Supervision	X	X[a/]	X	X	X
FE Overhead Above Shop Level	X[b/]		X		
Installation Support (e.g., Comptroller, CPO Procurement)	X[c/]		X		
Shop Stock Materials			X		X
Vehicle Costs			X		X
Facility Maintenance (FE Utilized Facilities)	X[c/]		X		
Utility Costs (Used by FE)	X[c/]		X		
Other					
Profit-Loss Motive	X[d/]		X		

a/ General foreman position in utilities and buildings and grounds divisions is sometimes charged to management and engineering account and therefore is not distributed to the direct labor hour.

b/ DFAE overhead elements above shop level are integrated into the installation overhead rate. The installation overhead rate is applied to the DFAE direct labor hour; however, the DFAE portion of the rate cannot be identified.

c/ Part of the installation overhead rate.

d/ Profit-loss balance at installation level and not DFAE.

Figure 1

used by AMC installations focuses on the whole garrison support organization of which the DFAE is only a part. All expenses to the garrison support organization are identified and distributed; however, there are no accurate cost interfaces among the various support elements within the garrison organization. Because of this, the total cost of performing specific FE functions cannot be determined.

b. The Army, Navy, and Air Force's shop rate system used for the appropriated bases identifies and distributes only shop level overhead costs. The Air Force shop rate system is the most comprehensive in that it includes some material and equipment costs. In some cases, the Army and Navy charge these costs to the specific job order or cost account rather than include them in the shop rate. The expenses associated with the FE organization's overhead functions (e.g., Work Coordination, Engineering, and Supply) are normally charged to overhead accounts and are not distributed to work orders or customers. Because the FE receives free support from other garrison activities, the total cost of providing specific engineer services cannot be determined.

9. Overhead Method of Identifying and Distributing DFAE Organizational Costs.

a. The accounting system DFAE now uses does not permit all costs to be identified and distributed to productive functions. Fifteen to twenty percent of DFAE personnel are assigned to overhead functional

elements. Very little of this effort and associated personnel costs is distributed to specific job orders or passed on to reimbursable customers. This accounting shortfall prevents an accurate determination of the in-house work cost associated with any specific FE function. The first phase provided information on several promising systems which could provide a more comprehensive accounting of Army overhead costs.

b. The overhead identification and distribution method developed for the DFAE organization distributes identifiable costs to the direct labor rate of the productive shops. The general system is one of classifying each DFAE organizational element as being either overhead or productive. Relationships among overhead and productive elements are then defined to permit a logical distribution of overhead costs. Overhead rates are computed for each overhead element and applied to the appropriate productive shops. The overhead rates in conjunction with the existing shop rate system yield a direct labor cost which represents the total in-house expense for that function. Figure 2 is an example of total cost computation for the Paint Section--a productive element of the DFAE organization. The overhead rates shown are for illustration only and are not representative of actual costs. The resultant rate for the Paint Section, $10.17 per hour in this example, represents the DFAE cost of fielding a productive painter for a period of 1 hour. When compared to the local labor rate or used in a job-cost estimate for comparison between contract and in-house costs, the FE can more accurately assess the economic advantages of either mode of work accomplishment.

TOTAL IN-HOUSE COST

Paint Section Shop Rate		$ 8.98
Overhead		
General Administrative Overhead		$ .15
Administrative Office		
Real Property	.02	
Budget and Statistics	.10	
Master Planning	.03	
Service Overhead		$ 1.04
Material Coordination	.08	
Work Reception	.21	
Scheduler/Analyst	.02	
Supply and Storage Division	.60	
Organizational Maintenance	.13	
Rate for Paint Section		$10.17/hr

Figure 2

c. The economic analysis of a particular job being considered for contract should compare the cost of in-house work accomplishment with the contract accomplishment cost to the DFAE. Figure 3 shows use of productive element shop rates which include the DFAE overhead costs and some of the costs which should be considered in the economic analysis.

d. Annex B provides the detailed procedure for the DFAE overhead system. It is based on the current organizational structure.

IN-HOUSE VERSUS CONTRACT COST COMPARISON

Job Estimate:

1,000-hr Productive Effort

I. Estimated DFAE Cost:

$10.17[a] x 1,000 = $10,170 + Materials

II. Cost to DFAE if Function were Contracted

Contract Inspection $10.17[a] x Estimated Time = _____

Engineering and Services $10.50[b] x 8[c] hr = _____

Contractor Bid $ _____

Total Contract Cost $ _____

a/ Total cost shop rate for the DFAE productive element involved in the job.
b/ Total cost shop rate.
c/ Estimated time required to prepare specifications and contract package.

Figure 3

10. Overhead Method of Accounting for Installation Support Costs to the DFAE.

a. The Army concept of garrison or installation support centralizes support functions at installation level. Support services are provided to installation support activities, tenants, and satellite activities. Except for reimbursable accounts, these services are provided free to the user and are not strictly accounted for. In an attempt to more accurately define the total Army cost of doing the FE

mission at installation level, the cost of installation support to the DFAE must be identified and distributed. Since the primary use of this more comprehensive cost figure is for comparing in-house with contract costs for major FE functions, actual distribution of funds is not required or anticipated.

b. The sequence of identifying and distributing installation support to the DFAE is quite similar to the overhead system designed for the internal DFAE organization. The installation organization is first analyzed to identify those elements which support the DFAE in some reasonably significant manner. Since these elements support the entire installation, each identified element must be analyzed to determine what share of its cost should be chargeable to the DFAE. This is primarily accomplished by identifying DFAE workload in terms of the manning yardstick[1/] used to staff the support element. The relationships between the support elements and the DFAE productive elements is then defined in order to permit calculation of overhead rates and distribution of overhead costs to the productive elements. Before the installation overhead costs can be applied to the DFAE, each element must be evaluated to determine if there is a positive or negative relationship to overhead workload when the FE function is contracted. For example, if a major function is contracted and the DFAE work force is reduced, the

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1/ DA, HQ, DA Pam 570-551, Staffing Guide for US Army Garrisons. 21 Jan 72.

workloads of the Civilian Personnel Office (CPO) will decrease, the Program and Budget Division of the Comptroller will stay about the same, and the Procurement Division of the Director of Industrial Operations will increase. This relationship will determine if overhead costs should be added or subtracted when the in-house and contract cost comparison figures are calculated. Using this overhead distribution system, the DFAE cost of accomplishing a major function would now include shop rates or direct labor costs, DFAE overhead costs, and installation costs associated with supporting the DFAE. This composite cost figure will facilitate development of a much more accurate cost comparison between contract and in-house accomplishment of major FE functions.

c. Annex C shows the detailed procedure for the installation overhead system.

11. Summary.

a. This report capsulates overhead systems presently being used by the armed services and thus provides a reference document for FE personnel. Labor and cost accounting methods are detailed enough to provide a general knowledge and understanding of the various systems. Information in Annex A should satisfy any inquiries concerning procedure and basic characteristics of counterpart systems.

b. Qualitative comparisons of the overhead systems are provided to help the reader match capabilities and functional responsibilities.

Attention is focused on the overhead system's ability to distribute operational costs to the direct labor rates of the productive functions.

c. One main study objective was to define an overhead accounting method whereby the FE could compute, within reasonable limitations, the total cost of accomplishing a specific function. This information is required in order to properly assess relative economic benefits between in-house and contract work accomplishment. If the FE function being analyzed for total cost is relatively minor in magnitude, then the overhead method developed for the DFAE organization (Annex B) will provide the necessary total cost data. If the function being analyzed for contract accomplishment is large enough to cause a change in installation support requirements, then the costs associated with it should be included in the cost analysis. Because the method used to identify and distribute the installation support costs (Annex C) is rather detailed and time consuming, ESG recommends that it be used only when major support changes are anticipated.

12. Conclusions.

a. The Army concept of nonreimbursable centralized garrison support does not lend itself to total cost accounting procedures by functional elements. Costs associated with base operations support to the DFAE are not identified and distributed to the DFAE via the existing Army Management Structure (AMS) accounting system.

b. All overhead costs within the DFAE organization are not distributed to the productive output. The AMS permits distribution of most overhead costs to catch-all or overhead cost accounts which are not further distributed to the productive elements.

c. The Navy PWC has the only overhead accounting system in the armed services which accurately distributes all costs to the direct labor output. If desirable, the PWC's overhead identification and distribution method can serve as a guide for expansion of other systems.

d. Total cost identification and distribution to productive DFAE elements are not desirable under the current concept of Army centralized support. The DFAE shop rates would increase markedly due to inclusion of overhead costs and would be highlighted in comparison to other service organizations who do not charge overhead costs. Unless the zero profit-loss objective is established for each garrison support element (i.e., a change in support concept), then the DFAE should not distribute overhead costs.

e. Some management decisions and control functions can be enhanced by knowledge of overhead data. Internal use of the overhead methods developed in this report can be of extreme value in economically comparing in-house and contractor work accomplishment and in answering many cost-type questions asked of FEs.

LAST PAGE OF MAIN PAPER

ANNEX A

QUALITATIVE COMPARISON AND SUMMARY OF EXISTING ARMY, NAVY, AND AIR FORCE OVERHEAD SYSTEMS

ANNEX A

QUALITATIVE COMPARISON AND SUMMARY OF EXISTING
ARMY, NAVY, AND AIR FORCE OVERHEAD SYSTEMS

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1. Purpose. This annex summarizes the overhead systems that the Army, Navy, and Air Force are currently using in the FE field. Qualitative comparisons among the systems should provide a capsulated reference source for the FE community.

2. Army Overhead Systems. The Army has two basic systems of overhead accounting. AMC installations primarily use the AIF, and other installations use the more common appropriation fund system. Each system will be developed separately according to the accounting and general

support concepts peculiar to each. In general, the Army does not have an overhead accounting system which permits distribution of all operation costs to the DFAE productive elements. The total cost of doing a specific FE function cannot be isolated to permit accurate contract/in-house cost comparisons or overhead and support cost management analysis. The DFAE organization structure is the same whether the installation uses the AIF or appropriation fund.

a. The overhead system associated with the AIF is more sophisticated and certainly more comprehensive than its counterpart in the Army system. This is not surprising since the AIF's primary objective is to use business management techniques to insure that operations are conducted most efficiently and economically. This system is predicated on determining the proper direct costs of operation and, in turn, the proper relationship between overhead expenses and direct costs. The AIF system does not alter the Army's concept of support--a concept based on the garrison organization providing an integrated package of support to the activities or tenants on the installation. The entire base operations organization functions as a business; it accounts for all funded costs and distributes them to the tenant(s). Unfortunately, the DFAE organization is not isolated as a totally separate system in the accounting process. The DFAE uses the services of the other base operations' activities. However, the time and cost of the support are not accounted for

and charged to the DFAE. These costs are accumulated in an installation overhead charge which is distributed to the tenant as part of the total support package concept. This system of overhead distribution does not provide the detailed information necessary to define the total cost of the FE mission. The AIF system does not have a cost accounting system which defines the financial interface between the DFAE and other installation elements.

(1) AR 37-100, which develops the financial administration guidance for AIF activities, permits wide latitude in administering the various base operations activities. Though procedural details vary, AIF installations of the AMC generally administer FE functions as summarized below.

(a) Services associated with J, K, and M accounts are provided to tenant activities as part of the installation support package. Each tenant pays a prorated share of the support package's cost. That share is computed based on a series of formulas which relate consumption (or usage) to cost. In this sense, there is an owner-renter relationship between the installation and tenants.

(b) The level of service and the cost of the installation support package are established by the Program, Budget Advisory Committee (PBAC) within the framework of the normal budgeting cycle.

Tenant activities are an integral part of the PBAC and directly influence the annual work plan and level of service for the FE area.

(c) The L account, consisting of alterations and minor construction, is paid for by the tenant who requests specific projects. The approval authority for the projects lies within the requestor's chain of command. The L-account transactions are a contractor-client relationship where the tenant receives the construction or alteration services he is able to pay for. For those projects which are accomplished by the DFAE work force, the installation overhead is added to the DFAE direct-labor or shop rate charge.

(d) The shop rate is calculated in the same manner as outlined in AR 37-108. All DFAE costs not associated with productive shops are part of the Installation General Administrative Expense and contribute to the installation overhead rate.

(2) The AIF system provides a management and accounting system which identifies and distributes the costs of base operations support to the tenant organizations. Since the installation provides a total package of support, the accounting procedures need not identify the intraorganizational relationships and distribute appropriate overhead costs to each productive element (i.e., the DFAE shops).

b. Army-appropriated installations which are not under the AIF system use a system of shop rates for distributing labor-related costs to the detailed cost accounts in the AMS.[1/] Shop rates are expressed in dollars per productive labor hour and are charged to work orders or cost accounts by DFAE organizational elements. Figure A-1 illustrates computation of a shop rate for a carpenter shop. This is a relatively simple method of charging the cost of that shop to the account codes of activities that use its services. The wage rates of individual workers are averaged to permit one standard rate independent of the workman's grade. Shop overhead (in the form of supervisor and known nonproductive time) is compensated for in the computation procedure.

(1) The shop rate system permits distribution of labor costs to the J, K, L, and M subaccounts based on the productive labor force time expenditures. There is a problem, however, with accounting for and distributing labor costs related to organizational elements classified as overhead or support. The manpower distribution of the DFAE organization is 80 to 85 percent in operating or productive divisions (e.g., Utilities and Buildings and Grounds) and the rest

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1/ DA, HQ, AR 37-100-75, Financial Administration, The Army Management Structure (AMS). Nov 73.

EXAMPLE OF COMPUTATION OF SHOP RATE FOR A
FACILITY ENGINEER CARPENTER SHOP

a.	Total annual salary (28 employees including supervisors)		$185,245.00
b.	Plus: Government costs for employees' benefits (locally developed)--normally 7 to 10 percent		15,745.83
c.	Total annual government cost		$200,990.83
d.	Available hours per employee per year		2,080 hours
e.	Less: Nonproductive hours		
	(1) Average leave (sick and annual)[a/]	240 hours	
	(2) Holidays (computed locally)	72 hours	
	(3) Maintenance and cleanup of shop and shop equipment--1/4 hour per day for 220 days (if applicable)	55 hours	
	(4) Other nonproductive hours, mandatory conferences and meetings, administrative leave	50 hours	417 hours
f.	Average productive time per carpenter shop employee per year		1,663 hours
g.	Productive time of 26 craft employees (28 less 2 shop supervisors) (26 x 1,663)		43,238 hours
h.	Average shop rate per hour ($200,990.83) (divided by 43,238)		$4.66

a/ Use historical data on annual and sick leave to assist in estimating this item.

Figure A-1

in overhead support elements (e.g., Work Coordination Office and Supply and Storage Division). Shop rates are calculated for each organizational element that does work categorized in more than one subaccount. For example, the Engineering and Services element of the Engineering, Plans, and Real Property Office may spend some man-hours designing a maintenance project for a hospital. A shop rate is used to charge their costs to a Job Order and K2500 subaccount. The Engineering and Service element time that cannot be charged to specific job orders or subaccounts is charged to a catch-all account, M6100 (Management and Engineering). Other overhead elements distribute appropriate portions of their labor costs to the detailed cost codes in a similar manner. Some personnel in the DFAE organization (i.e., the Administrative Office) are not paid out of the J, K, L, or M accounts. Thus, their costs cannot be distributed via shop rate or any other method. The Administrative Office's personnel costs are charged to the Command Administrative Services (N 2000) account.

(2) The shop rate method used to charge the labor costs of work performed to AMS subaccounts is not a fully effective overhead system. This is mainly because AMS and its general accounting procedures do not distribute all overhead expenses to the end product or service. The concept is not predicated on reimbursement from the user;

therefore, the accounting system is not structured to accomplish this objective. The method only distributes labor costs of productive elements and portions of overhead labor costs that can be identified with specific work orders and accounts. It does not distribute all personnel costs associated with the DFAE organization to the appropriate productive elements. If it did, the total DFAE cost of performing a productive function could be determined. The costs associated with overhead functions (e.g., work coordination and administration) are accounted for in subaccounts independent of the productive accounts.

(3) In addition, costs of support received by the DFAE from other installation activities are neither identified nor distributed to DFAE accounts. For example, the installation comptroller provides the DFAE nonreimbursable program and accounting support as part of its basic mission.

3. Navy Overhead Systems. The Navy has two basic organizations for accomplishing its public works function in support of Naval shore activities. The PWC is an NIF activity which provides public works support to a geographical area which normally contains many customers. The PWC organization contains most, if not all, the overhead support elements necessary for its operation. The PWD provides support on a more limited scale and depends heavily on mission support from other

shore activities. There are basic differences in the functions performed by the Navy Public Works Officer (PWO) and the Army FE. The Navy PWO has a broader range of missions than his counterparts in the Army and Air Force. In addition to those functions accomplished by the Army DFAE, Public Works assigned tasks include housing administration, operation, and maintenance of the base motor transport fleet, telephone services, and (in some cases) new construction as the Resident Officer in Charge of Construction (ROICC). The PWO does not have fire protection responsibility. These additional responsibilities are reflected in organizational differences.

a. The PWC is an industrial-funded activity; however, it differs drastically from the Army DFAE under the AIF system. The PWC is a self-contained, single-function (Public Works) organization that identifies and distributes all operation costs to its customers. The primary difference between the Army and Navy is the level at which the industrial fund concept is applied. In the Army, the entire base operations function is industrially funded. Accounting procedures and the zero profit-loss motive are designed to facilitate the entire support package operation and not each support element. The NIF is applied directly to the Public Works level. All costs into and within the PWC are identified and distributed through the productive functions to the

customers. The total costs of performing various functions are readily available from the PWC accounting system.

(1) Figure A-2 shows the PWC organization. Each organizational element shown is further subdivided by function or craft to facilitate general accounting and overhead distribution. The PWC at Norfolk, Virginia was the data source for this phase of the investigation. The Norfolk PWC identified 19 organizational elements and 53 cost interfaces which required overhead cost identification and distribution. Each organizational element has over 40 items of expense to account for in determining the element's operating cost. The PWC's overhead method is the most complex and thorough system used by any of the services.

(2) The basic steps involved in establishing the PWC overhead system are outlined below.

(a) The organizational elements are classified as either overhead or productive cost centers. Productive elements directly interface with a customer by providing a service. The time spent by a productive element worker in providing that service is the basis for charging the customer and is the distribution media for all overhead costs. Overhead elements are those which support the productive elements and do not directly interface with the customer.

NAVY PUBLIC WORKS CENTER ORGANIZATION

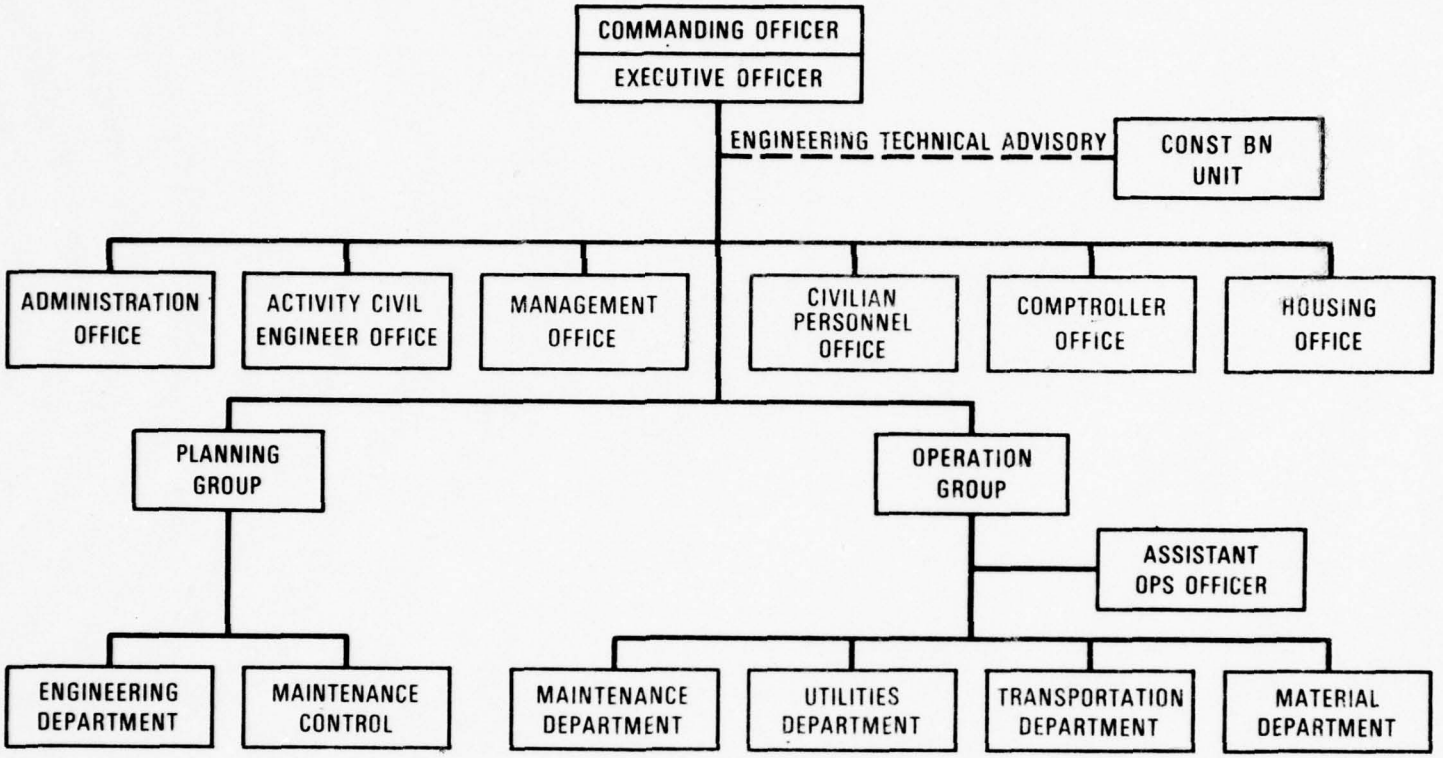

Figure A-2

(b) The relationships between overhead and productive cost centers are defined. This step establishes the matrix which channels the proper mix of overhead costs to each productive cost center. Figure A-3 illustrates a distribution matrix. Productive cost centers are listed across the top and overhead elements down the left-hand side. An "X" indicates that some overhead costs generated by the overhead cost center will be charged to the productive cost center.

(c) The costs and workload of each cost center are estimated for the budget period. This detailed estimate provides a basic data base from which initial overhead rates can be established. Figure A-4 is an example of a cost center budget for the maintenance element. It delineates direct costs, productive labor availability, overhead cost of the Maintenance Cost Center, overhead cost from the PWC overhead elements (which are chargeable to the Maintenance element), and the resultant overhead rate that will be applied to each direct labor hour expended by the Maintenance Cost Center. Even though the maintenance element has been defined as a productive cost center, overhead personnel positions (e.g., supervisors and administrative personnel) can easily be accounted for as overhead costs.

(d) Cost and workload estimates are periodically compared with actual operations. Overhead rates are adjusted as necessary to achieve a zero profit-loss status at year's end.

COST DISTRIBUTION MATRIX

Overhead Cost Center	Productive Cost Center									
	Housing	Engineering	Inspection	Maintenance	Janitorial	Utilities	Telephone	Transportation Operator	Quickline Repair	Transportation Maintenance
Admin	X	X	X	X	X	X	X	X	X	X
Civ Pers Ofc	X	X	X	X	X	X	X	X	X	X
Compt	X	X	X	X	X	X	X	X	X	X
Mgt	X	X	X	X	X	X	X	X	X	X
Maint Con				X						
Mat Trans				X		X				
Mat Admin				X		X		X	X	X
Trans Store									X	X
Trans Admin								X	X	X

Figure A-3

COST CENTER BUDGET

PERIOD: _____ TO _____

Cost Center Number and Title	500 Maintenance	Hours	Amount ($)
Direct Cost:			
Materials			839,030
Labor			2,075,930
Contractual Services:			
Commercial			781,890
Other/Government			116,830
Other Costs			178,100
Total Direct Cost			3,991,780
Overhead Applied:			
Production			631,590
General and Administrative			584,580
Total Cost of Production			5,207,950
Less: Interdepartmental Transfers			150,980
Net Total		293,760	5,056,970
Overhead Cost:			
Supervision		31,963	302,498
Other Salaries and Wages		9,181	62,409
Operation Dispatcher and Svc Sta Attendant			
Time Waiting for Parts/Equipment		52	370
Standby Time		466	3,050
Overtime Premium Pay			350
Overhead Work Performed by Prod Workers		1,180	7,200
Misc Production Jobs		326	1,800
Allowed Time			19,000
Telephone Services			4,400
Electricity			13,628
Steam			18,280
Gas			
Water			900
Sewage			1,200
Other Utilities			
Janitorial Services			3,900
Pest Control Services			240
Use of Public Works Center Transp Equip			64,000
Refuse and Garbage Services			1,480
Materials and Supplies			20,700
Purchase of Office Furniture and Equip			300
Purchase of Shop Equipment			10,740
Equipment Rental			3,070
Navy Industrial Fund Purchased Equip			3,000
Maintenance and Repair--Bldgs			19,155
Maintenance and Repair--Grounds			2,000
Repair of Office Furniture and Equip			300
Maintenance and Repair of Shop Equip			10,500
Rearranging of Facilities			5,300
Emergency/Service Work			7,500
Defective Work and Spoilage			1,200
Travel			350
Training		719	7,500
Printing and Reproduction			250
Unallocable Costs			
Subtotal			
Inventory Adjustments			
Excess Material and Material Losses			
Donations			
Beneficial Suggestions			
Labor Distribution Variance			
Labor Acceleration Variance			
Station Support Cost			
Automatic Data Processing Support Cost			
Contract Administration (Credit)			
Total Cost Center		43,887	596,570
G&A Overhead Allocated to Prod Cost Centers			584,730
Total Overhead Costs			1,181,300
Applied Overhead Rate Per Direct Labor Hour			4.14

Figure A-4

(3) Overhead rates are intensively monitored at the PWC and at NAVFAC. The total cost perspective provided by the PWC method facilitates control and management decisions. Readily available data detail the cost of providing each service.

b. The PWD is the engineering organization which provides FE-type support on those Navy shore installations not serviced by a PWC.

(1) Figure A-5 illustrates a standard PWD organization. In contrast to the PWC organization, the PWD does not have organic support capability in the functional areas of Comptroller, Civilian Personnel, or Material (supply). Other base activities satisfy PWD support requirements on a nonreimbursable basis. This support arrangement prevents determination of the total cost of engineer support services.

(2) The Navy maintenance management system[2/] establishes a basic framework for labor classification and accountability. Targets or acceptable ranges are established to permit management by exception techniques to be applied to overhead/productive ratio indicators.

(a) Labor classification codes represent categories of overhead and productive work on which manpower is used. The codes are Navy-wide standard and appear on the individual worker time card and

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2/ DN, NAVFAC Maintenance Management of Public Works and Public Utilities, MO-321. May 73.

PUBLIC WORKS DEPARTMENT ORGANIZATION

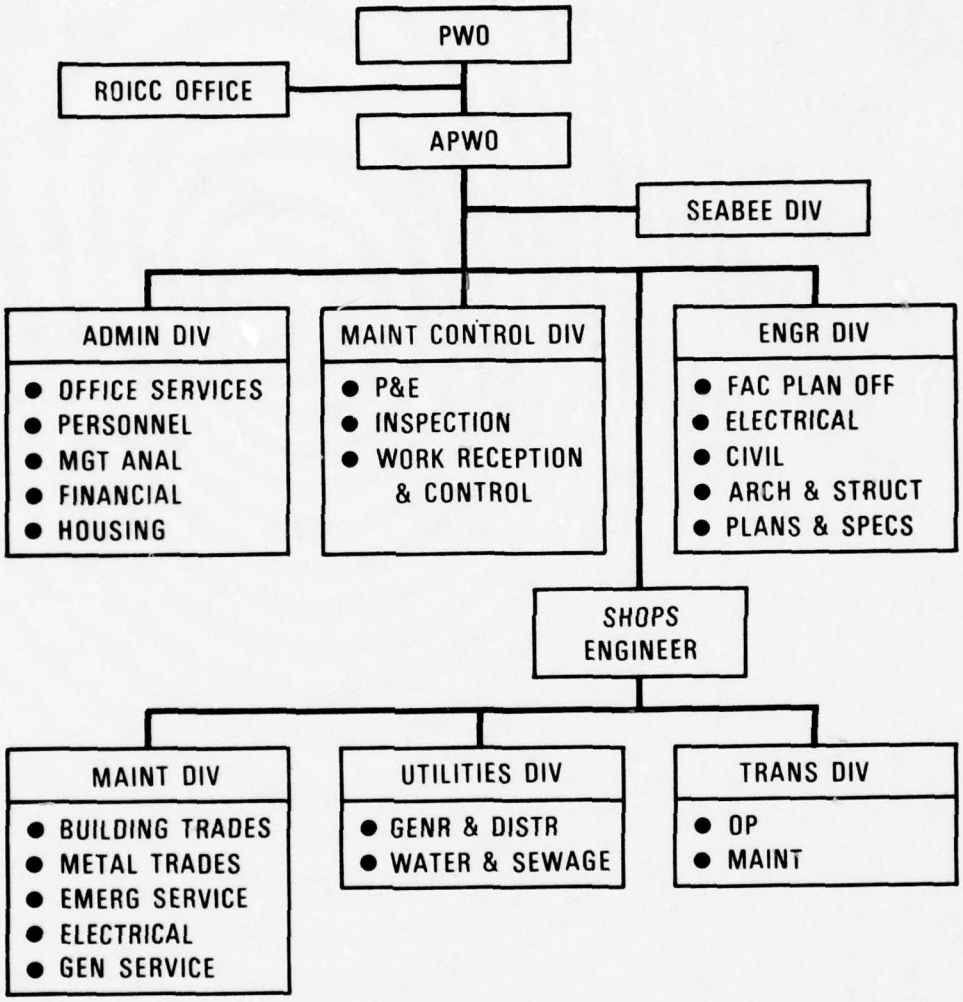

Figure A-5

various labor control reports. The various codes are defined below and provide an insight into how the Navy defines overhead and productive labor categories.

1. Productive labor.

a. Service Work. This code is applied to all productive nonemergency work (which is 16 hours or less) performed under Emergency or Service Work Authorization.

b. Emergency Work. This code identifies all labor required to correct or repair a condition caused by a breakdown or an emergency. It is not restricted to that portion accomplished under an Emergency or Service Work Authorization, but includes all labor subsequently authorized as a Minor Work Authorization or Specific Job Order. Use this code to accumulate the total hours expended to correct conditions classified as emergency.

c. Dynamic Equipment Inspection/Service. This code identifies the time expended while performing dynamic equipment inspections and service.

d. Standing Job Orders-Not Estimated. This code identifies all productive work (other than Emergency or Service Work Authorization and Minor Work Authorizations) that is authorized on a Standing Job Order and has not been estimated.

e. Standing Job Orders-Estimated. This code identifies all productive work that is authorized on Standing Job Orders and has been planned, estimated, and scheduled. Emergency or Service Work Authorizations and Minor Work Authorizations are not included in this code.

f. Minor Work Authorizations. Minor work is work that exceeds that authorized by an Emergency or Service Work Authorization and less than that authorized by a Specific Job Order. Minor work is planned and estimated, using Engineered Performance Standards where applicable, and scheduled on the Work Center Schedule Board. Costs are not collected on individual jobs but are accumulated against a Standing Job Order for each appropriate functional or cost account.

g. Specific Job Orders. Specific Job Orders authorize the accomplishment of a specific amount of work that is carefully planned and estimated, scheduled, and for which individual job costs are desired for financial and performance evaluation.

2. Overhead labor.

a. Rework. This is all labor used to correct faulty PWD work regardless of the code previously applied. Faulty work includes such items as faulty craftsmanship and design error on the part of the PWD Engineering Division.

b. Supervision. This includes all supervisors and that part of a leader's time while on supervision.

c. Shop Indirect. This code will identify the following types of labor.

(1) All labor not directly chargeable to productive work; this includes maintenance schedulers and shop planners.

(2) Time spent by personnel in each work center on the maintenance and repair of PWD shop equipment and power tools.

(3) Time expended by nongraded PWD personnel in storing and issuing of materials in shops, stores, or in centralized direct procurement materials storage areas.

(4) The time all personnel spend cleaning their work areas in the Public Works shops. It does not include work assigned to a regular janitorial force.

d. Allowed Time. This code identifies the following types of labor.

(1) Nonproductive time required for official business. It includes such items as training classes, safety meetings, medical attention, physical examinations, blood donations, participation in charity and bond campaigns, shop committee meetings, and appointments concerning personnel problems.

(2) All time (0.2 hours or more) required to cover time lost by personnel waiting for materials, tools, parts, equipment (including equipment breakdown), transportation, completion of work by other crafts, and security or safety clearance.

(3) Nonproductive time such as administrative leave, excused tardiness, and time lost in excess of 0.2 hours as a result of inclement weather when in a pay status. This code also includes mandatory pay time for employees reporting for duty but sent home because of inclement weather.

(4) All productive time in excess of 0.2 hours that is lost while employees are waiting work assignment. This includes PWD-generated errors resulting in time lost waiting for clarification of (or changes in) the job's scope. Delays caused by customer-requested changes shall be charged to the customer's job and recorded as productive time.

e. General Office and Clerical. Self-explanatory.

f. Leave. This code identifies all approved absences for sick, annual, and military leave; holiday pay; terminal leave; jury duty; and all other leave for which pay is received.

(b) Acceptable ranges have been established for the labor classification codes. These guidelines or ranges provide the PWO a standard for use in evaluating utilization of his labor force.

Figure A-6 provides the acceptable ranges that would be appropriate for labor codes in either the maintenance or utility divisions.[3/] An additional target of 25 to 30 percent has been established for total PWD departmental overhead. This would reflect the total number of PWD personnel not assigned to the maintenance, utilities, and transportation divisions.

(3) The maintenance management system keeps the PWD aware of overhead/productive ratios. Standards or acceptable ranges have been established and are routinely monitored. Overhead costs are not calculated and distributed to the jobs or customers as is customary in the PWC. The Navy accounting system[4/] provides for the accumulation of administration, engineering, and other overhead expenses under budget functional category P (Other Engineer Support). Costs associated with these functions are charged to the appropriate P-account and are not distributed to productive or direct labor output.

4. Air Force Overhead Systems. The Air Force Base Civil Engineer organization and functions differ from the Army and the Navy. Figure A-7 illustrates the standard organization. In addition to the functional responsibilities common to the Army, the Base Civil Engineer is responsible for family housing management--including government-owned furniture and equipment. It also is responsible for a large military command mission

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3/ DN, NAVFAC, Maintenance/Utilities Labor Control Report. Jun 67.
4/ DN, Office of the Comptroller, NAVCOMPT Manual. Undated.

NAVY STANDARDS FOR LABOR CLASSIFICATION CODES

Control Element	Acceptable Range (%)
Overhead	
Rework	.3- .6
Supervision	6.0- 7.6
Shop Indirect	5.0- 6.0
Allowed Time	2.0- 3.0
General Office and Clerical	1.5- 2.5
Leave	14.0-18.0
Total Division Overhead	28.0-32.0
Productive	
Service	6.0- 9.0
Emergency Work	1.5- 2.5
Dynamic Equipment and Inspection Equipment	1.5- 3.0
Standing Job Orders-Not Estimated	--
Standing Job Orders-Estimated	20.0-25.0
Minor Work	--
Specific Job Orders	30.0-35.0
Total Productive	68.0-72.0

Figure A-6

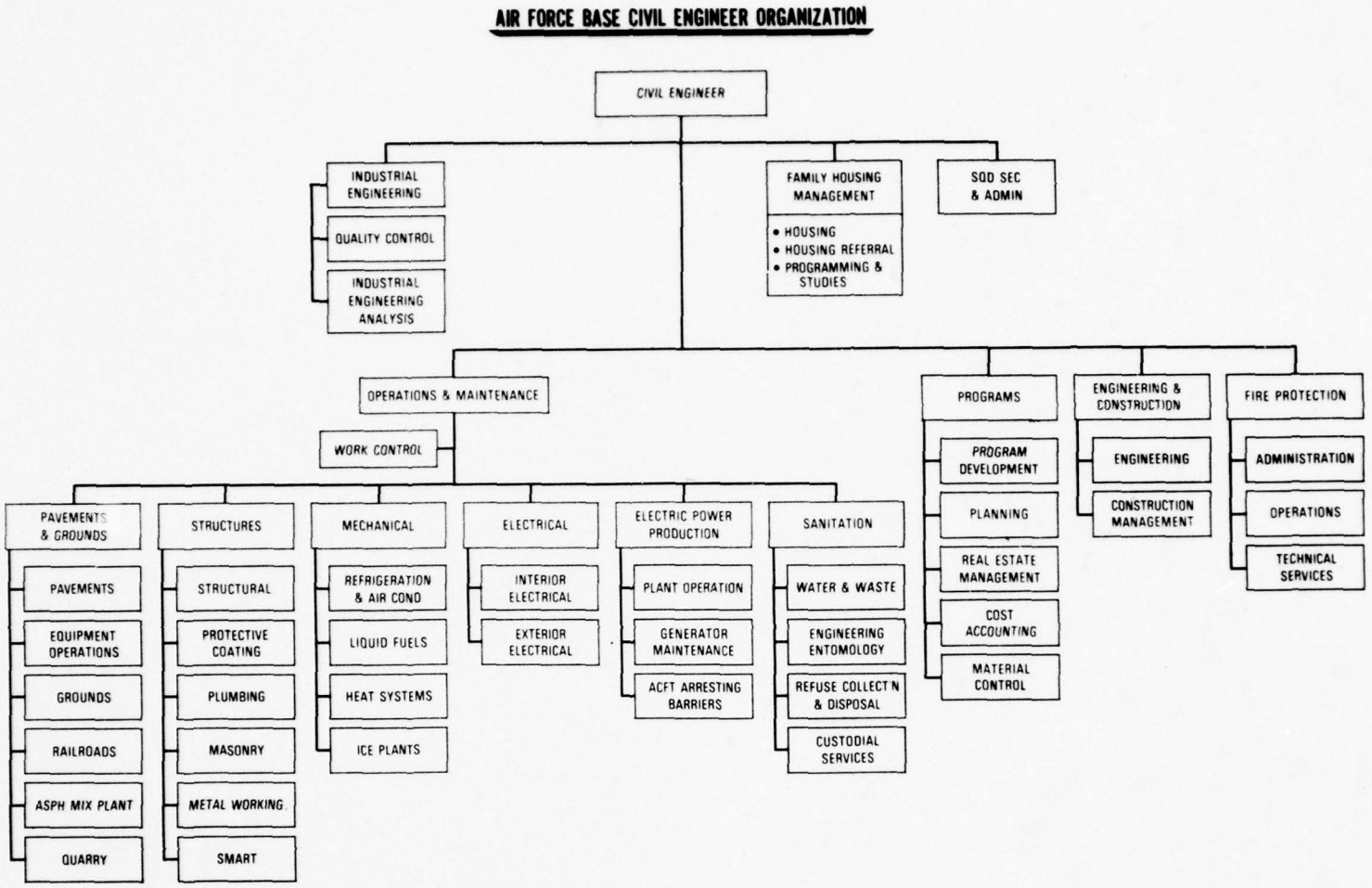
AIR FORCE BASE CIVIL ENGINEER ORGANIZATION
CIVIL ENGINEER
INDUSTRIAL ENGINEERING
QUALITY CONTROL
INDUSTRIAL ENGINEERING ANALYSIS
FAMILY HOUSING MANAGEMENT
• HOUSING
• HOUSING REFERRAL
• PROGRAMMING & STUDIES
SQD SEC & ADMIN
OPERATIONS & MAINTENANCE
WORK CONTROL
PAVEMENTS & GROUNDS
PAVEMENTS
EQUIPMENT OPERATIONS
GROUNDS
RAILROADS
ASPH MIX PLANT
QUARRY
STRUCTURES
STRUCTURAL
PROTECTIVE COATING
PLUMBING
MASONRY
METAL WORKING
SMART
MECHANICAL
REFRIGERATION & AIR COND
LIQUID FUELS
HEAT SYSTEMS
ICE PLANTS
ELECTRICAL
INTERIOR ELECTRICAL
EXTERIOR ELECTRICAL
ELECTRIC POWER PRODUCTION
PLANT OPERATION
GENERATOR MAINTENANCE
ACFT ARRESTING BARRIERS
SANITATION
WATER & WASTE
ENGINEERING ENTOMOLOGY
REFUSE COLLECT'N & DISPOSAL
CUSTODIAL SERVICES
PROGRAMS
PROGRAM DEVELOPMENT
PLANNING
REAL ESTATE MANAGEMENT
COST ACCOUNTING
MATERIAL CONTROL
ENGINEERING & CONSTRUCTION
ENGINEERING
CONSTRUCTION MANAGEMENT
FIRE PROTECTION
ADMINISTRATION
OPERATIONS
TECHNICAL SERVICES

Figure A-7

associated with the officers and airmen assigned to the Base Civil Engineer Squadron. The Air Force Engineer does not have an organic supply capability; however, this is being circumvented somewhat by a wide application of the Contractor Operated Parts and Supply System (COPAS).

a. The labor reporting system utilized within the BEAMS is fairly sophisticated and is designed to distribute man-hours and costs to the proper work orders and cost account codes. The system primarily consists of accounting procedures represented by Labor Utilization Codes (LUC), Exception Time Accounting (ETA), Actual Time Accounting (ATA) methods, and shop rate computations. These ultimately permit the distribution of costs to the account codes. Each of these will be briefly defined in order to provide a conceptual understanding of the Air Force method.

(1) LUC. LUCs are used to identify the kinds of work that various organization elements perform. Each organization element or cost center uses one or more LUC to account for the total productive and overhead man-hours available. The LUCs are listed below. Detailed definitions for each of the codes can be obtained from Chapter 2 of AFM 85-200.[5/]

(a) Recurring maintenance.

(b) Service calls.

(c) Minor construction job order.

(d) Other job orders.

5/ DAF, HQ, AFM 85-200, Civil Engineering, General--The Base Engineer Automated Management System. 1 Feb 75. (Hereafter referred to as AFM 85-200.)

(e) Minor construction work orders.

(f) Direct scheduled work.

(g) Other work orders.

(h) Operations and services.

(i) Self-help labor.

(j) Exception time accounting labor.

(k) Supervision.

(l) Training.

(m) TDY.

(n) Military duty not related to RPMA activities.

(o) Leave.

(p) Productive indirect:

1. Nonjob-related meetings.

2. Shop cleanup, vehicle cleaning, etc.

3. Compensatory time.

(q) Lag time.

(r) Overtime.

(s) Loaned labor.

(2) ETA. This accounting method is used for personnel assigned to cost centers and who are working under a single cost account code. This method of accounting for costs is different because labor assigned is automatically charged to a cost account via an LUC. Special accounting is required only when a person works for some other cost account or changes status (e.g., going on leave).

(3) ATA. This method is used for those personnel assigned to elements involved in work chargeable to more than one cost account code. Productive hours are directly charged to the work order by LUCs. Overhead or indirect hours are charged to the appropriate LUC and are not applied to the work order.

(4) Shop rate computation. Each year the Base Civil Engineer develops shop rates for ATA and ETA cost centers. The ATA shop rate is simply the cost center expense divided by the estimated direct man-hours. It is reviewed at least quarterly and must be approved at major command level before input to the BEAMS file. Each basic element of the shop rate is described below.

(a) Cost center expense. Air Force Regulation[6/] establishes those items of expense which can be included in computing a shop rate. Any deviations must be approved by the major command. Appropriate elements are as follows.

1. Military personnel costs.

2. Civilian personnel cost summary.

3. Expense of Airlift Service Industrial Fund (ASIF) transportation--TDY.

4. Per diem and incidental expenses--TDY.

5. Foreign national personnel, indirect hire labor contracts with foreign governments.

6/ DAF, HQ, AFM 85-200.

6. Material: Medical-Dental Division Air Force Stock Fund (AFSF) Issues/Turn-ins.[7/]

7. Material: System Support Division, AFSF Issues/Turn-ins.[7/]

8. Material: Clothing Division, AFSF/Turn-ins.[7/]

9. Material: Base Procured Other Supplies AFSF Issues/Turn-ins.[7/]

10. Material: Base Procured Other Supplies and Materials--Non-AFSF.[7/]

11. Equipment: Medical-Dental Division, AFSF Issues/Turn-ins.[7/]

12. Equipment: General Support Division, AFSF Issues/Turn-ins.[7/]

13. Vehicle Maintenance Expenses, Vehicle Maintenance Shop, and Vehicle Service Station.

(b) Estimated direct man-hours. The estimated direct man-hours are based on the estimated assigned strength of a cost center, multiplied by 2,080 hours (standard 8-hour work day), less all federal and appropriate foreign holidays. This total must be adjusted for estimated loaned and borrowed hours and then multiplied by the availability rate of the cost center. The result will provide the estimated direct man-hours. The availability rate is the number of direct man-hours expended

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7/ Only those supplies, materials, and equipment not directly related to a production work order number will be included.

by a cost center during a set time period divided by the total man-hours (direct plus indirect) expended during the same period.

(c) Example computation:

1. Fixed cost center expense.

Description	Estimated Expense
Military Personnel Expense	$23,000
Civilian Pay	14,000
Travel and Per Diem	700
Supplies	1,500
Vehicle Rental Charges	1,200
Total	$40,400

2. Estimated direct man-hours.

6 employees x 2,080 available hours/yr = 12,480 hours

Availability rate = 67 percent

Total hours x availability rate = estimated direct hours

12,480 x .67 = 8,361.60 = estimated direct hours

3. Formula.

$$\frac{\text{Total Estimated Expense}}{\text{Total Estimated Direct Hours}} = \text{Shop Rate}$$

$$\frac{\$40,400.00}{8,361.60 \text{ hours}} = \$4.832/\text{hours}$$

b. The Air Force shop rate method of accounting for and distributing shop costs is comprehensive because it includes personnel and some material and vehicle costs. Historical data of LUCs per cost center should provide a reasonably accurate estimate of the availability rate.

5. Qualitative Comparison of Systems. The labor and cost accounting systems which have been discussed in this annex are designed to function within specific parameters. Basic objectives and accounting requirements differ drastically among the systems. Industrial-funded systems are designed to account for and distribute all costs to achieve a zero profit-loss financial condition. Appropriated installations function on the concept of centralized support with all nonreimbursable customers extracting support from the installation according to their need and the amount of support available. Because profit-loss is not a factor, detailed accounting is neither required nor desired. Realizing these basic differences in objectives and resultant information accounting requirements, meaningful comparison cannot be made without understanding the overall system requirements. For example, the Navy PWC has the most comprehensive overhead system of any of the services. Though highly satisfactory in operating within the NIF arena, it would be excessive and expensive in the Army-appropriated fund installation environment. Figure A-8 is a graphical comparison of the systems discussed in this annex.

QUALITATIVE COMPARISON CHART

Element of Comparison	Army AIF	Army Appropriated (Shop Rate)	Navy PWC	Navy PWD	Air Force (Shop Rate)
Functions of Facility Engineer					
Repair & Maintenance of Facilities	X	X	X	X	X
Operation & Maintenance of Utilities	X	X	X	X	X
Refuse Collection	X	X	X	X	X
Fire Protection	X	X			X
Supply (For FE Operations)	X	X	X		
Housing Management			X	X	X
Housing Furniture and Equipment					X
Base Transportation			X	X	
Transportation Maintenance (Base)			X	X	
Base Communications			X	X	
Troop Command Function					X
Contracting Officer (Under Certain Conditions)			X	X	
Element of Cost Applied to Direct Labor Rate					
Shop Supervision	X	X[a/]	X	X	X
FE Overhead Above Shop Level	X[b/]		X		
Installation Support (e.g., Comptroller, CPO Procurement)	X[c/]		X		
Shop Stock Materials			X		X
Vehicle Costs			X		X
Facility Maintenance (FE Utilized Facilities)	X[c/]		X		
Utility Costs (Used by FE)	X[c/]		X		
Other					
Profit-Loss Motive	X[d/]		X		

a/ General foreman position in utilities and buildings and grounds divisions is sometimes charged to management and engineering account and therefore is not distributed to the direct labor hour.

b/ DFAE overhead elements above shop level are integrated into the installation overhead rate. The installation overhead rate is applied to the DFAE direct labor hour; however, the DFAE portion of the rate cannot be identified.

c/ Part of the installation overhead rate.

d/ Profit-loss balance at installation level and not DFAE.

Figure A-8

a. The Navy PWC has the most detailed overhead system and isolates the total cost of performing major functions. The system uses a common overhead figure for all maintenance work; therefore, extracting subfunctions such as metalwork or electrical repair would require a slight expansion of the system. Expansion would be in the form of defining the functional shop of interest as a productive cost center and preparing a detailed budget (Figure A-4) for that shop. The total cost of that function would then be available.

b. The AIF system does not provide the detailed cost data which the DFAE needs in order to determine the total cost of specific DFAE functions. The accounting system focuses on the installation level where the integrated support package concept is achieved. In the accounting procedures, support package elements (e.g., the DFAE) are not isolated sufficiently to identify all internal or support costs from other installation support elements. The Navy PWC system focuses directly at the FE function so all support costs can be identified and distributed to the productive functions.

c. The Air Force method of shop rate computation is more comprehensive than the Army's because it includes more than just personnel-related costs. The labor and cost accounting methods of the Air Force base engineer are tailored for use in the BEAMS system. This automated approach imparts certain physical characteristics to the accounting system.

LAST PAGE OF ANNEX A

ANNEX B

OVERHEAD SYSTEM FOR THE DIRECTORATE OF FACILITY ENGINEERING ORGANIZATION

ANNEX B

OVERHEAD SYSTEM FOR THE DIRECTORATE OF FACILITY ENGINEERING ORGANIZATION

Paragraph		Page
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1. Purpose. This annex develops an overhead accounting and distribution method for the DFAE organization. The overhead method provides a framework for identifying overhead elements within the DFAE organization and distributing their costs to the shop's productive or direct labor output. Identifying all costs and distributing them to a productive function or service permits a more accurate analysis of in-house costs to contract costs. The FE does not now have a system which permits him to determine the total in-house cost of doing a particular function or

fielding a productive craftsman. This lack of information prevents reasonable economic comparisons between the government cost of operations and local contract. The FE can use the overhead method developed in this annex to compare in-house costs of a particular function with a contract proposal, or he can use it on a continual basis across all DFAE functions.

2. General Method. The central theme of an overhead distribution method is to identify overhead costs, apply them to the organization's productive elements, and then distribute the entire cost of operations to the appropriate customer or cost account. The overhead method developed for the DFAE organization consists of four steps:

a. Classifying the organizational elements as either overhead or productive elements. If a particular function is being considered for contract accomplishment, that function and associated organizational element are classified as a productive element.

b. Defining the relationships among the overhead and productive elements. An accurate definition of these relationships permits proper distribution of overhead costs to those productive elements receiving selected overhead services.

c. Calculating overhead rates for the overhead elements and shop rates for the productive elements. Depending on the desired detail of cost comparison, the DFAE's current shop rate calculations can be expanded to include material, equipment, and other identifiable costs.

d. Calculating the composite overhead rate for the productive element(s). This is accomplished by construction of a cost formula based on results of a, b, and c.

3. Classification of Organizational Elements. Functional elements must be defined as either overhead or productive in order to distribute them to the DFAE's output or productive functions. Figure B-1 illustrates the DFAE organization. The organizational elements have been coded to reflect a possible classification scheme. The classification categories are defined below.

a. The overhead classification has been divided into two categories to facilitate more accurate distribution of costs.

(1) General administrative elements provide services and support to the entire organization. The general administrative costs will be distributed to each productive element according to the direct labor strength in that shop. The FE and his secretary, the Administrative Office, Budget and Statistics Branch, Master Planning Branch, and the Real Property Branch are all classified in the general administrative overhead category. Caution should be exercised when trying to determine only the DFAE costs (e.g., those associated with the J, K, L, and M accounts). For example, the Administrative Office personnel expenses are paid by the Command Administrative Services (N 2000) account which is not an element of the DFAE budget. Therefore, the Administrative

CLASSIFICATION OF FACILITY ENGINEER ORGANIZATIONAL ELEMENTS

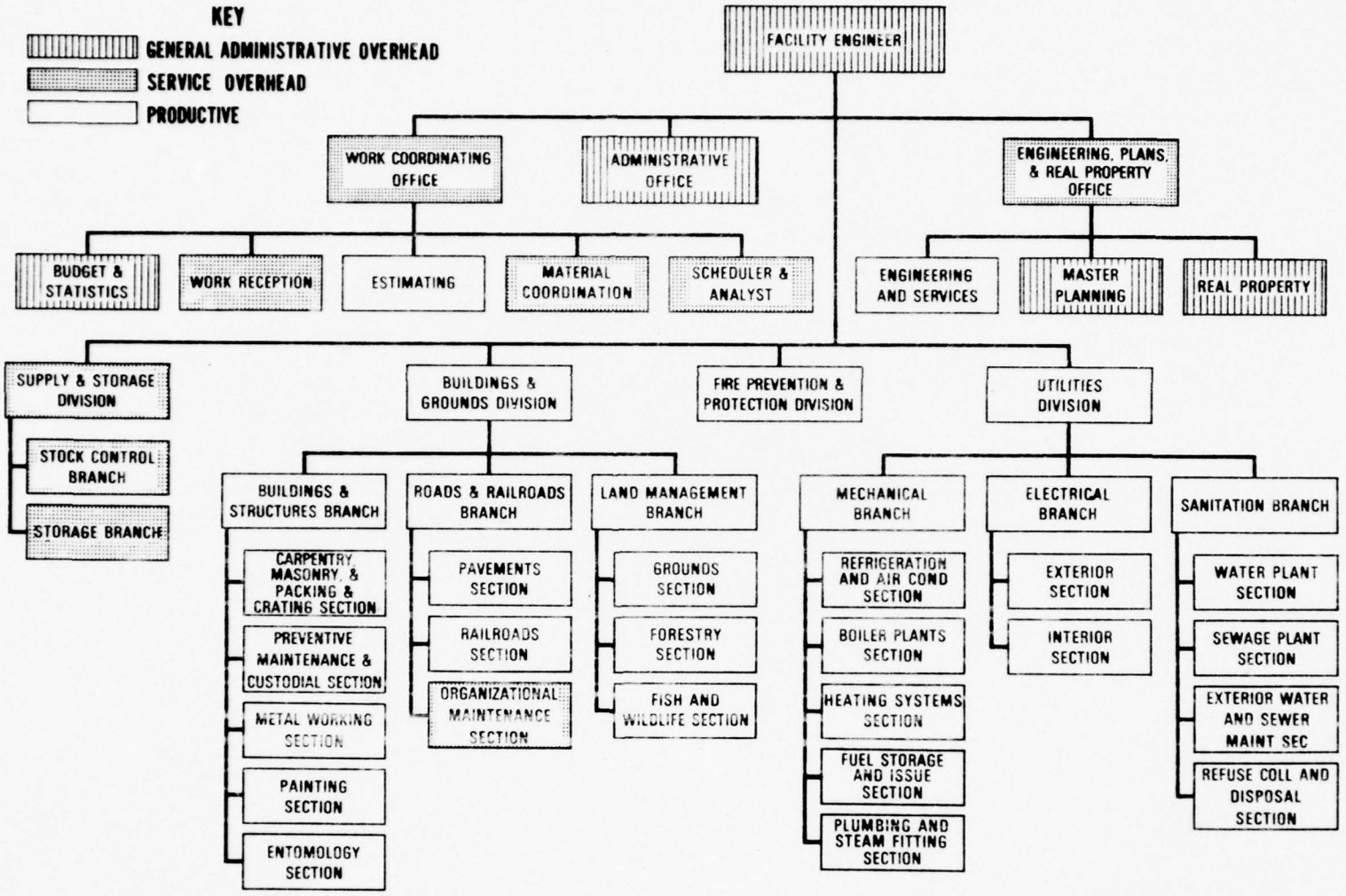

Figure B-1

Office personnel expenses should not be distributed to the productive elements as a DFAE expense.

(2) Service elements of overhead provide services and support to some of the productive elements. The total costs of the service elements will be distributed only to those productive elements using the services. The following DFAE elements are logical candidates for the service overhead category: the Work Reception, Material Coordination, and Scheduler/Analyst Branches of the Work Coordinating Office; the Supply and Storage Division; and the Organizational Maintenance section of the Buildings and Grounds Division. The latter element was chosen because it provides maintenance support to the Utilities Division.

b. The productive elements of the DFAE organization provide a direct service or product to the facilities or customers on the supported installation. The direct labor hours associated with the productive elements can be identified with a specific job order or work/service item. The number of direct labor hours available in each productive element is the basis for distribution of overhead costs. The Engineering and Services, and Estimating Branches; and the Fire Prevention and Protection, Utilities, and Buildings and Grounds Divisions are classified as productive elements. Overhead positions and costs within these productive elements are classified and accounted for during shop rate computation.

4. Relationship Among Overhead and Productive Elements. In an overhead distribution system, the productive elements should support the costs of only those overhead elements from which it receives support. To insure a proper distribution, the support relationships among the organizational elements must be defined. Figure B-2 is a matrix which illustrates the overhead elements directly supporting each productive element. But, these overhead elements are not independent, because they receive support from other overhead elements. These support relationships need not be defined because the distribution vehicle is the direct labor hours of the productive elements.

5. Shop Rates. The shop rate is the current method of distributing personnel costs at shop level. Annex A, paragraph 2g, provides detailed guidance and an example of shop rate computation. In order to account for and distribute as many DFAE costs as possible, the shop rate should be expanded to reflect all elements of expense at the shop level. The elements of expense must be directly related to the J, K, L, and M cost accounts since we are operating strictly within the DFAE arena. Both the Navy PWC and the Air Force Civil Engineer system have more comprehensive shop rate systems which could serve as an expansion guide. Both of these systems are discussed in Annex A.

6. Overhead Element Rate. The Overhead Element Rate (OER) distributes overhead element costs to the direct labor hours within the appropriate

COST DISTRIBUTION MATRIX

Overhead Element	Production Element				
	Estimating	Engineering & Services	Buildings & Grounds	Fire Prevention	Utilities
General Administrative					
Administrative Office	X	X	X	X	X
Real Property	X	X	X	X	X
Budget & Statistics	X	X	X	X	X
Master Planning	X	X	X	X	X
Service					
Material Coordination			X		X
Work Reception			X		X
Scheduler/Analyst	X	X	X		X
Supply & Storage Div			X		X
Organizational Maint			X		X

Figure B-2

productive elements. An OER is calculated for each overhead element; however, a single General Administrative (GA) overhead rate can be computed since the direct labor hour distribution base is common to all the GA overhead elements.

a. The two items of information essential to computing an OER are the overhead element costs and the number of productive direct labor hours available to distribute the costs.

(1) The overhead element costs are the sum of all costs associated with the overhead function being performed. The costs will include all personnel and fringe benefit expenses, material used, and any contract costs (e.g., an architect-engineer (A&E) contract for master planning). These costs could be an estimate of next year's expenses (such as used for normal shop rate computation), or they could be based on the most current operating data. The method used would depend on the reason for determining the cost data.

(2) Shop rate data are used to compute the number of productive direct labor hours. The estimated productive time (item g in shop rate computation example, Figure A-1) is the estimate of productive effort available in that particular shop for a 1-year period. The number of productive hours that form the distribution base for any given overhead element can be determined from the cost distribution matrix (Figure B-2). It is the sum of estimated productive times of each productive element which uses that overhead service.

b. Figure B-3 illustrates the mechanics of determining an OER for a service overhead element.

OVERHEAD ELEMENT COMPUTATION

Overhead Element: Work Reception

Overhead Element Cost: $ 132,500/yr

Labor & Related Costs
Materials
Contracted Services

Distribution: Buildings & Grounds Div
Utility Div

Directed Labor Hours for Distribution: 615,264 hr

Buildings & Grounds Div (335,920 hr)
Utilities Div (279,344 hr)

$$\text{Work Reception Rate} = \frac{\$132,500/\text{yr}}{615,264\ \text{hr}} = .215\ \text{dol/hr}$$

Figure B-3

7. Cost Formulas. The general cost formula appropriate for any productive element is:

Direct Labor Rate ($/hr) = Shop Rate + General Administration Overhead + Appropriate Service Overhead Charge

As an example, the Estimating Branch's direct labor rate would consist of its shop rate plus its fair share of the Real Property, Budget and Statistics, and Master Planning Branches (which are GA elements) and plus its fair share of Scheduler/Analyst Branch--the only service overhead element which supports the Estimating Branch (see Figure B-2). Note that the Administrative Office is not included as an overhead element.

LAST PAGE OF ANNEX B

ANNEX C

OVERHEAD SYSTEM TO DETERMINE COST OF
INSTALLATION SUPPORT TO THE DFAE

ANNEX C

OVERHEAD SYSTEM TO DETERMINE COST OF INSTALLATION SUPPORT TO THE DFAE

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1. Purpose. This annex develops a method for identifying the DFAE's installation support costs. Once identified and quantified, the installation support costs will be distributed via an overhead distribution method to the direct labor output of the DFAE productive elements. The total cost data associated with the DFAE function or subfunctions will permit more accurate economic comparisons between government RPMA operations and contractor accomplishment. Distribution of installation costs to the DFAE functions is appropriate only when major functions are being considered for contract accomplishment. Those installation costs identified should be saved if a portion of the DFAE in-house work force is eliminated

by a contractor force. The installation costs become meaningful only when a fairly large personnel shift would result; therefore, this rather laborious step should only be applied when analyzing major DFAE functions.

2. General Method. The overhead method for identifying installation costs and distributing them to the appropriate DFAE operations consists of four steps.

a. The installation organization is analyzed to determine which base operations activities provide significant support to the DFAE.

b. Once the supporting activities have been identified, each must be evaluated to determine what fair share of that activity's expense should be applied to the DFAE.

c. The activities are classified into GA and service overhead categories so that they can be distributed through the DFAE organization in the same manner as outlined in Annex B.

d. The direction of workload variance for the support activities must be evaluated as a function of the work accomplishment mode. Some installation activity workloads will increase with increased contracting while others will decrease. This variance must be known before installation costs can be properly applied in the in-house contractor economic analysis.

3. Identification of Installation Support Elements. The primary mission of the assigned garrison force is to support the resident

activities or units on the installation. The DFAE is an integrated part of the garrison structure and functions within the support organization. The various base operations elements provide and receive mutual support in accomplishing the overall support mission.

a. The FE receives significant amounts of support from many of the base operations activities. Figure C-1 illustrates an installation organization. It highlights installation activities which provide sizable support to the DFAE.

b. Organizational elements which are staffed to support the installation's military population are not considered major support elements. This is because of the FE organization's low level of military manning.

c. The activities which have been chosen to illustrate this overhead method should be carefully analyzed and modified to conform to the situation at the installation in question.

4. Fair Share Cost Determination. Since the base operation activities support many customers in addition to the DFAE, it is necessary to factor out the DFAE's fair share of the expense.

a. To accurately assess support costs of services provided to the FE, each directorate would have to accomplish overhead calculations similar to the system developed for the DFAE (Annex B). This additional accounting workload is beyond that required by the AMS and the other

INSTALLATION ORGANIZATION

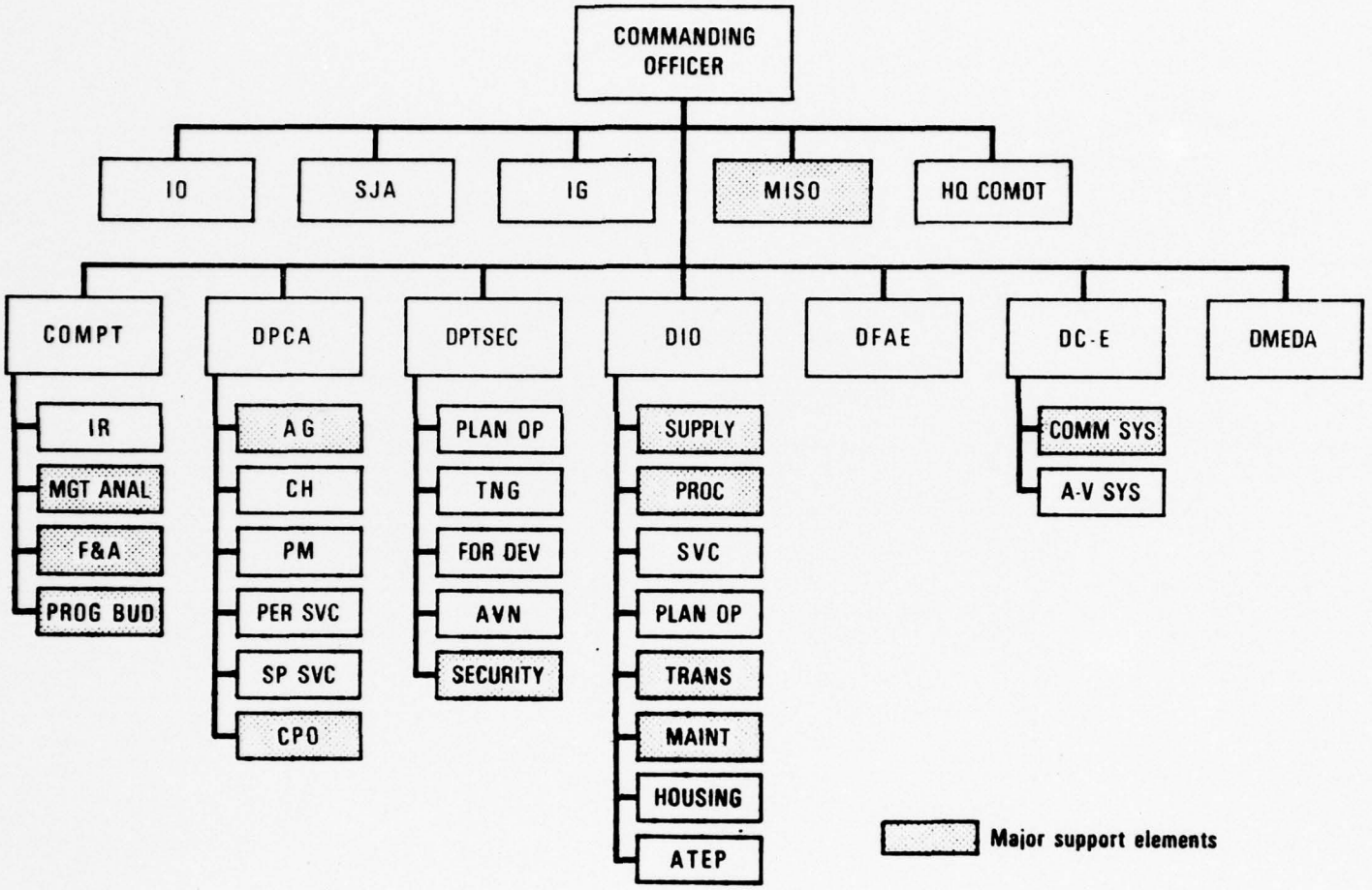

Figure C-1

directorates probably would not undertake it for the sole use of the FE. In lieu of this more accurate but laborious system, an abbreviated concept has been developed which isolates fair share costs.

b. The identified base operations elements are analyzed in light of manning criteria developed in the appropriate staffing guide for US Army garrisons.[1/] Whenever possible, the work elements which define level of manning are used to apportion DFAE's proper share of the operation expense. The reasons for this are twofold.

(1) Organizational elements that are staffed based on population strengths including the DFAE can be readily identified and accounted for with population ratio distribution factors.

(2) Reductions in work elements caused by contracting DFAE functions can be directly related to personnel positions on the installation staff. Costs associated with these positions can then be accounted for in contract versus in-house cost comparisons.

c. Figure C-2 displays the basis or yardstick for organizational staffing and the recommended distribution factor for significant base operation activities. Accounting procedures utilized within activities may make the recommended distribution factor impractical to

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1/ DA, HQ, DA Pam 570-551, Staffing Guide for US Army Garrisons. 21 Jan 72.

INSTALLATION ACTIVITY SUMMARY DATA

Base Operations Element	Manning Basis	Recommended Distribution Factor	Variance Trend
Management Information Systems Office			
Systems Analysis & Programming Branch	Military & Civilian Population	DFAE Population/Total	Reduce only by specific workload assumed by the contractor which will directly reduce DFAE requirements from MISO
Machine Operations Branch			
Machine Operations	No. Machines & Shifts	DFAE Machine Time/Total	
Key Punch	No. Cards Punched	DFAE Card Punched/Total	
Comptroller			
Management Analysis Division			
Management Analysis	Military & Civilian Population	DFAE Population/Total	Decrease in proportion
Work Measurement	Population Covered by Engr Standards	Appropriate DFAE Population/Total	Decrease in proportion
Finance and Accounting Division			
Data Conversion Branch	No. Cards Punched	DFAE Card Workload/Total	Reduce only if contractor provides punched card input of DFAE information.
Pay/Examination Branch			
Civilian Pay	No. Civilian Accounts	DFAE Civilian Population/Total Civ	Decrease in proportion
Travel Section	No. Vouchers Processed	No. DFAE Vouchers/Total	Depends on function(s) contracted
Commercial Accounts	No. Invoices Processed	No. DFAE Invoices/Total	Decrease if supplies furnished by the contractor
Accounting Branch			
Control	Documents Processed	No. DFAE Documents/Total	Would not change unless entire DFAE function was contracted and AMS accounting procedures were no longer appropriate.
Accounts Maintenance	Documents Processed	No. DFAE Documents/Total	
Analysis & Reconciliation	Documents Processed	No. DFAE Documents/Total	
Disbursing Branch	No. Transactions	DFAE Transactions/Total	Little or no change in workload anticipated
Program and Budget Division	Population	Total DFAE Population/Total	Little or no change in workload anticipated
Director of Personnel & Community Activities			
Adjutant General Division			
Records Administration & Forms Control	Supported Population	DFAE Populations/Supported Pop	No change anticipated
Publications	No. Line Items	DFAE Line Items/Total	No change anticipated
Duplicating	No. Impressions Made	DFAE Workload/Total	Decrease in proportion
Civilian Personnel Division			
Total Division	Civilian Population	DFAE Civilian Population/Total	Decrease in proportion. Initial surge workload association with termination of in-house work force will occur.
Director of Plans, Training & Security			
Security Division	Population	DFAE Population/Total	Decrease in proportion
Plans and Training Division	Population	DFAE Population/Total	Decrease in proportion
Force Development Division	Population	DFAE Population/Total	Decrease in proportion

(Figure C-2 Continued on Next Page)

INSTALLATION ACTIVITY SUMMARY DATA--Continued

Base Operations Element	Manning Basis	Recommended Distribution Factor	Variance Trend
Director of Industrial Operations			
Office, Administration, Management	Population	DFAE Population/Total	Decrease in proportion
Supply Division			
Property Control			
Material Management	Local Survey	Distribute with Storage	(1) If contract uses government-furnished materials, no change will result
Self-service Supply Center	Dollar Value of Sales	Dollar DFAE Business/Total Sales	
Storage Section	Military & Civilian Population	DFAE Population/Total	(2) For contractor-furnished material contracts, decrease in proportion
Inventory	Local Survey	Distribute with Storage	
Property Disposal	No. Transactions	No. DFAE Transactions/Total	
Procurement Division			
Purchasing	No. Actions	No. DFAE Actions/Total	Same as (1) and (2) above
Contracts	No. Actions	No. DFAE Actions/Total	Increase with contracting DFAE functions
Plans and Operations Division	Population	DFAE Population/Total	No workload correlation
Transportation Division			
Movements Branch			
Material Movements	No. Shipments Processed	DFAE Shipments/Total	See Supply Division comments above.
Terminal Warehouse	Tons Handled Through Warehouse	DFAE Tons Handled/Total Handled	
Transportation Branch			
Driver Selection, Testing & Licensing	No. Driver Tests Administered	DFAE Driver Tests/Total	Decrease in proportion
Motor Transport Maintenance	No. Administrative Vehicles Supported	Appropriate DFAE Vehicle Number/ Total Maintained	Decrease in proportion
Motor Transport Inspection	No. Administrative Vehicles Supported	Appropriate DFAE Vehicle Number/ Total	Decrease in proportion
Maintenance Division			
Production Planning & Control			
Shop Operations Branch			
Tactical & Support Vehicle Section			
Wheeled Vehicle Section	No. Jobs Completed	DFAE Jobs/Total	Decrease in proportion if the vehicles and equipment are turned in as a result of going contract or the contractor provides maintenance as part of the contract.
General Support Equipment	No. Jobs Completed	DFAE Jobs/Total	
Special Purpose Equipment & Repair	No. Jobs Completed	DFAE Jobs/Total	
Director of Communications Electronics			
Communications Systems Division			
Telephone Maintenance	No. Telephones in Operation	DFAE Telephones/Total	No change anticipated--costs could be charged to the contractor

Figure C-2

calculate. In those cases, the available data should be used to obtain the most accurate and practical distribution factor.

5. Distribution of Installation Support Costs. Since the object of determining the installation support costs is to more accurately picture the total cost of a major DFAE function, identified costs must be distributed to the DFAE productive elements. The installation support costs can be superimposed on the overhead distribution system developed in Annex B. The interface between the installation support costs and the DFAE overhead system lies in the cost distribution matrix. Figure C-3 shows a possible distribution scheme. The overhead element rate would be calculated in the same manner as in Annex B and would then become a cost element in the productive element cost formulas.

6. Variance of Installation Support as a Function of Contracting. The amount of support received from the various installation activities will generally fluctuate as a function of DFAE work force strength and the amount of FE functions accomplished under contract. Unfortunately, the support workload does not fluctuate uniformly over all the support elements. For example, contracting out a major DFAE function could cause problems. It could cause a sizable decrease in the DFAE work force; the CPO workload would probably go down, the Program and Budget Division's (Comptroller's Office) workload would stay the same, and the Contracting Branch (Procurment Division of the Director of Industrial

COST DISTRIBUTION MATRIX

Installation Element	DFAE Productive Element				
	Estimating	Engineering & Services	Buildings & Grounds	Fire Prevention	Utilities
Management Information Systems Office (MISO)	X	X	X	X	X
Comptroller	X	X	X	X	X
Adjutant General	X	X	X	X	X
Civilian Personnel Office	X	X	X	X	X
Communications	X	X	X	X	X
Supply			X		X
Procurement			X		X
Transportation			X	X	X
Maintenance			X	X	X

Figure C-3

Operations) workload would increase. The economic analysis associated with determining the desirability of contract versus in-house accomplishment of the DFAE function must weigh these relationships in order to properly debit or credit the support costs. Figure C-2 is an estimate of variance trends for the installation support.

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ANNEX D

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