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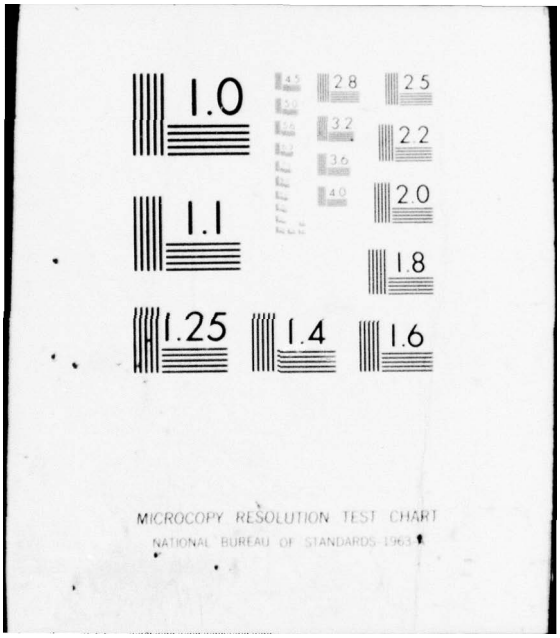
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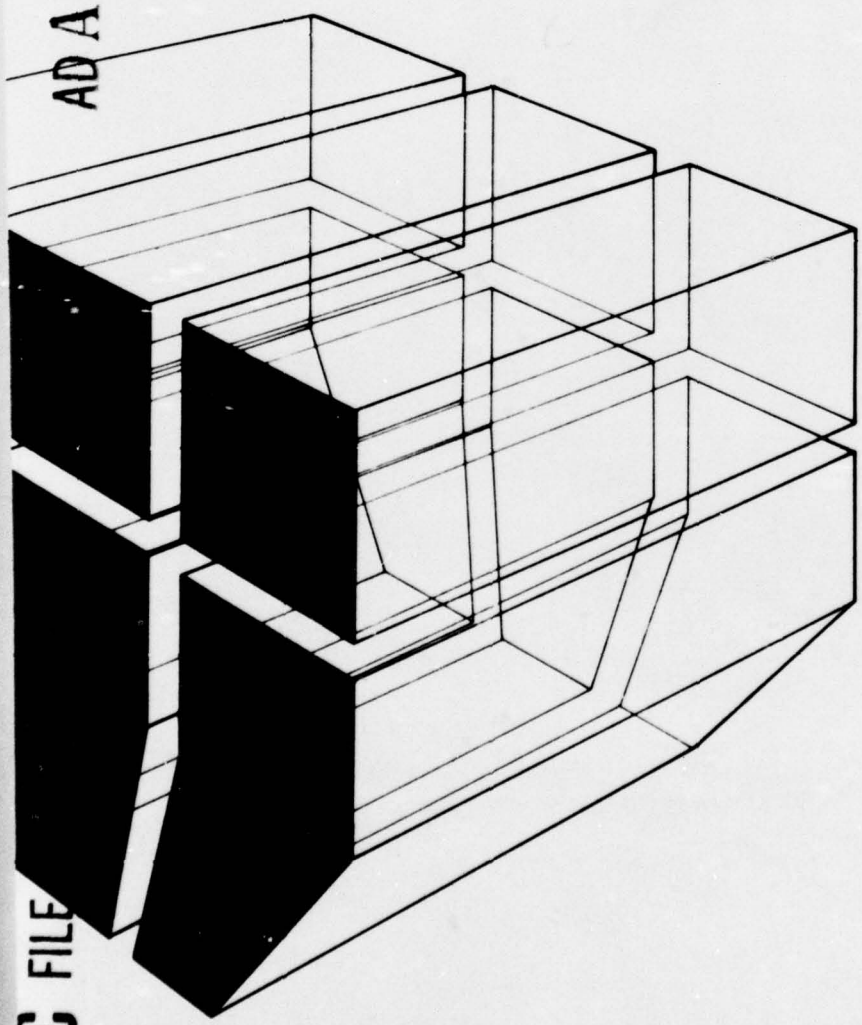

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TECHNICAL REPORT D-76
March 1977

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A SYSTEMS APPROACH TO CONSTRUCTION OF RECREATIONAL AREA FACILITIES VOLUME I: PROGRAM METHODOLOGY



by
Edward J. Worrel

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This report describes a program conducted by (This laboratory) the U.S. Army Construction Engineering Research Laboratory in conjunction with the U.S. Army Engineer Division, Ohio River, for the procurement of 78 industrialized sanitary facilities. Performance specifications and two-step formal advertising procedures were used to obtain the desired facilities. The low bid price was 53 percent of the conventional construction government estimate. (cont. on p 2)

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The cost savings did not result from a particular design for sanitary facilities, but from the definition of the project and the manner in which the facilities were procured. Given a sufficient number of facilities within a particular geographic region, builders can reduce material costs through bulk purchasing, and labor costs through the learning-curve phenomenon. The labor cost savings, which is the significant one, can only be achieved if the builder is performing in its area of specialization; a sizable part of the builder's savings will be passed on to the purchaser only if other builders who are also permitted to achieve such savings are in competition. The key to the approach is performance specifications, which describe the facility requirements so that builders can propose individualized solutions suited to their particular skills; thus, performance specifications put other builders in competition on the same basis.

This report is in two volumes. Volume I describes the methodology followed during the course of this program and includes detailed documentation of each stage, the procurement guidelines and program implementation procedures. Volume II presents the Request for Technical Proposal, including the performance specifications and the evaluation documentation.

FOREWORD

This research was conducted for the Civil Works Directorate, Office of the Chief of Engineers (OCE), under reimbursable order number CWIS 31104. The OCE technical monitors were Mr. Lucien Guthrie and Mr. George Gibson.

The work was performed by the Master Planning and Systems Building Branch, Habitability and Planning Division, U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL. The CERL principal investigator was Mr. Edward J. Worrel. The principal consultant for the project was Mr. David M. Pellish.

Appreciation for their assistance in conducting the program is expressed to Mr. A. O. Kauranen and Mr. R. E. DeLozier, U.S. Army Engineer Division, Ohio River; Mr. W. E. Showers and Mr. J. Theobald, U.S. Army Engineer District, Louisville; Mr. P. Schwartz and Mr. F. McAleavey, U.S. Army Engineer District, Fort Worth; Dr. D. Gordon Bagby, Mr. Michael G. Carroll, Mr. Richard L. Schneider, and Mr. Thomas A. Kenney, CERL; the Evaluation Board members; and Ohio River Division and District representatives who participated in the program.

Dr. D. Gordon Bagby is Chief of the Master Planning and Systems Building Branch. Dr. Robert M. Dinnat is Chief of the Habitability and Planning Division. COL J. E. Hays is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.

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A SYSTEMS APPROACH TO CONSTRUCTION OF RECREATIONAL AREA FACILITIES VOLUME I

1 INTRODUCTION

Background

In 1974, the Office of the Chief of Engineers (OCE) reviewed the cost per square foot for facilities constructed at Corps of Engineers reservoirs between the years 1965 and 1975 and adjusted them to reflect 1975 costs. The adjusted cost per square foot reflected a 108 percent increase from the 1965 cost, as shown in Tables 1 and 2. This escalation was verified by the Index of Wholesale Price of Material for all construction materials. In 1965 the index was 95.8; by October 1975 it had risen to 175.9 (Figure 1), an increase of 84 percent. OCE determined that the escalating construction cost necessitated the development of new procedures to obtain facilities required at Corps reservoir areas. The U.S. Army Construction Engineering Research Laboratory (CERL) was tasked with developing this methodology.

Objective and Scope

The objective of this study was to develop a methodology for obtaining facilities at reduced cost for Corps reservoirs which could be implemented by Corps of Engineers Division and District offices. The methodology was to include procurement procedures, specifications, evaluation documentation, and program implementation procedures.

Approach

An initial investigation of the high cost of comfort stations and washhouses at Corps of Engineers' recreational areas indicated that comfort station costs per square foot were best explained by Eq 1, which relates cost directly to the distance from urban areas and inversely to the number of participating bidders:

$$CSQFT = 27.61 - \underset{(2.34)}{5.13}\,(BID) + \underset{(3.92)}{0.52}\,(DIST) \qquad [Eq\ 1]$$

where CSQFT = cost per square foot
BID = number of bidders submitting proposals on project
DIST = distance (in miles) between project site and nearest urban area.

This conclusion led researchers to consider using buildings composed of components manufactured in a factory, because, by definition, they are transportable. A statistical comparison between (1) the costs of conventionally constructed comfort stations and washhouses and (2) available prefabricated counterparts and information accumulated from industrialized building manufacturers suggested that significant cost savings could be realized through the "learning curve"* phenomenon if designs were standardized, and through volume production spreading fixed costs over larger numbers of units.

However, it was necessary to determine whether the Corps sanitary facility program had sufficient volume and design uniformity to result in savings and whether any production-, procurement-, and design-compatible firms were available to serve a market within an economical shipping radius. Investigation of these questions revealed encouraging results. First, Corps sanitary facilities are typically limited to two models—comfort stations and washhouses. A few facilities are modified somewhat, but the design is usually standardized. Second, the Corps has an active sanitary facility construction program. Several Divisions had master plans for construction of a minimum of 100 facilities over the next several years. The U.S. Army Engineer Division, Ohio River, identified a master plan detailing an FY 76-77 construction program of 233 facilities. Finally, the greatest number of production-, procurement-, and design-compatible firms is in the midwest, contiguous with the demand in the Ohio River Division (Figure 2).

Since all three conditions were satisfied by the Ohio River Division (ORD), it was selected as a possible site for an all-inclusive program involving the procurement of industrialized sanitary facilities. On 20 September 1974 ORD decided to allocate a substantial number of facilities programmed for construction to the industrialized building program. This report describes the procedures used in the program and the program results. Chapter 2 contains an overview of the six project stages and presents information on the required data to be collected, performance specifications, two-

*The "learning curve" phenomenon is an organization of tasks designed to increase productivity through repetition of a series of identical operations. Research has determined that if a worker becomes sufficiently knowledgeable about a task to be performed, the associated labor productivity will increase rapidly. (From *Industrialized Housing*, Joint Economic Committee, Subcommittee on Urban Affairs [U.S. Congress, 1969], pp 227 and 228.)

Table 1
Comfort Station Costs Adjusted to 1975 Costs

Comfort Station Cost	Sq Ft (m^2)	Heated	Cost Per Sq Ft (m^2)	Month & Year Constructed	Adjusted Cost Per Sq Ft (m^2)
12,000	341 (30.6)	N	35.19 (392.15)	Oct. 64	74.64 (831.35)
14,929	368 (33.1)	N	40.57 (451.02)	Mar. 65	84.19 (933.61)
12,500	341 (30.6)	N	36.66 (408.49)	Apr. 65	76.07 (845.57)
20,000	341 (30.6)	N	58.65 (653.59)	Nov. 65	121.72 (1352.93)
14,132	384 (34.5)	N	36.80 (409.62)	Nov. 65	76.37 (847.91)
19,000	512 (46.0)	Y	37.11 (413.04)	Feb. 66	73.84 (821.94)
16,275	384 (34.5)	–	42.38 (471.73)	Apr. 66	84.33 (938.74)
21,281	341 (30.6)	N	62.41 (695.45)	Jun. 66	124.17 (1383.94)
18,000	341 (30.6)	N	52.78 (588.23)	Jul. 66	105.03 (1170.57)
16,500	384 (34.5)	N	42.97 (478.26)	Aug. 66	85.49 (951.73)
14,000	384 (34.5)	N	36.46 (405.79)	Aug. 66	84.32 (937.37)
28,700	341 (30.6)	N	84.16 (937.90)	Nov. 66	167.46 (1866.42)
20,000	227.6 (20.5)	Y	87.87 (975.60)	Apr. 67	169.60 (1882.90)
24,900	341 (30.6)	–	73.02 (813.72)	Jun. 67	140.93 (1570.47)
22,000	384 (34.5)	N	57.29 (637.68)	Aug. 67	110.57 (1230.72)
14,500	227.6 (20.5)	Y	63.71 (707.31)	Mar. 68	114.91 (1273.15)
21,500	384 (34.5)	N	55.99 (623.18)	Mar. 68	100.99 (1121.72)
22,963	323 (29.0)	N	71.09 (791.82)	May 68	128.23 (1425.27)
22,000	384 (34.5)	N	57.29 (637.68)	May 68	103.34 (1147.82)
22,500	384 (34.5)	N	58.59 (652.17)	Jun. 68	105.69 (1173.90)
15,500	384 (34.5)	N	40.36 (449.27)	Jun. 68	72.81 (803.68)
28,434	635 (57.1)	Y	44.78 (497.96)	Jun. 68	80.77 (896.32)
16,404	227.6 (20.5)	Y	72.07 (800.19)	Nov. 68	130.00 (1440.34)
14,760	246 (22.1)	N	60.00 (667.87)	Aug. 69	98.14 (1095.30)
18,840	313 (28.1)	N	60.19 (670.46)	Aug. 69	98.45 (1099.55)
25,960	465 (41.8)	N	55.83 (621.05)	Aug. 69	91.31 (1018.52)
16,500	227.6 (20.5)	Y	72.49 (804.87)	Jun. 70	112.84 (1255.59)
13,075	227.6 (20.5)	Y	57.45 (637.80)	Jun. 70	89.41 (994.96)
28,400	312.3 (28.0)	Y	90.94 (1014.28)	Jun. 70	141.54 (1582.27)
25,000	384 (34.5)	N	65.10 (724.63)	Jun. 70	101.33 (1130.42)
12,000	230.8 (20.7)	N	51.99 (579.71)	Oct. 70	80.92 (904.34)
25,108	314 (28.2)	N	79.96 (890.35)	Oct. 70	124.46 (1388.94)
16,096	227.6 (20.5)	Y	70.72 (785.17)	Dec. 70	110.07 (1224.86)
19,600	290 (26.1)	N	67.59 (750.95)	Mar. 71	92.51 (1028.80)
24,000	227.6 (20.5)	Y	105.45 (1170.73)	Jun. 71	144.34 (1603.90)
30,557	384 (34.5)	N	79.57 (886.28)	Jun. 71	108.92 (1214.20)
35,571	332 (29.8)	N	107.14 (1193.65)	Sep. 71	146.65 (1635.30)
23,000	312.3 (28.0)	Y	73.70 (821.42)	Oct. 71	100.81 (1117.13)
32,700	279.8 (25.2)	Y	118.99 (1297.61)	Jun. 72	147.22 (1596.06)
27,524	373 (33.5)	N	73.79 (821.61)	Aug. 72	91.29 (1018.79)
30,000	303.96 (27.3)	Y	98.70 (1098.90)	Jun. 73	112.71 (1252.74)
32,000	312.3 (28.0)	Y	102.46 (1142.85)	Jun. 73	117.02 (1302.84)
29,000	354 (31.8)	N	81.92 (911.94)	Jun. 73	93.55 (1039.61)
19,200	367 (33.0)	N	52.32 (581.81)	Jun. 73	59.74 (663.26)
18,969	432 (38.8)	N	43.91 (488.89)	Jun. 73	50.15 (557.33)

Table 2
Washhouse Costs Adjusted to 1975 Costs

Washhouse Cost	Sq Ft (m^2)	Heated	Cost Per Sq Ft (m^2)	Month & Year Constructed	Adjusted Cost Per Sq Ft (m^2)
32,200	431.98 (38.8)	N	74.54 (829.89)	Apr. 67	143.86 (1601.68)
26,299	424.65 (38.2)	Y	61.93 (688.45)	Nov. 68	111.71 (1239.21)
23,050	419.5 (37.8)	Y	54.95 (609.78)	Jun. 70	85.52 (951.25)
23,281	419.5 (37.8)	Y	55.50 (615.89)	Dec. 70	86.38 (960.78)
29,300	419.5 (37.8)	Y	69.84 (775.13)	Jun. 71	95.60 (1061.92)
50,088	1005 (90.4)	Y	49.84 (554.07)	Aug. 71	68.22 (759.07)
45,960	1005 (90.4)	N	45.73 (508.40)	Aug. 71	62.50 (696.50)
45,000	1207.7 (108.6)	Y	37.26 (414.36)	Oct. 71	51.00 (567.67)
49,300	1279.7 (115.2)	Y	38.52 (427.95)	Jul. 72	47.66 (530.65)
48,681	849 (76.4)	N	57.34 (637.18)	Aug. 72	70.94 (790.10)
83,000	1367 (123.0)	–	60.72 (674.79)	Aug. 72	75.12 (836.73)
66,917	448 (40.3)	Y	149.37 (1660.47)	Nov. 72	184.80 (2042.37)
65,000	1300 (117.0)	N	50.00 (555.55)	Jan. 73	57.10 (633.32)
62,000	1232.2 (110.8)	Y	50.32 (559.56)	Jun. 73	57.46 (637.89)
60,000	1249.7 (112.5)	Y	48.01 (533.33)	Jun. 73	54.83 (607.99)
50,000	993 (89.3)	Y	50.35 (559.91)	Jun. 73	57.50 (638.29)

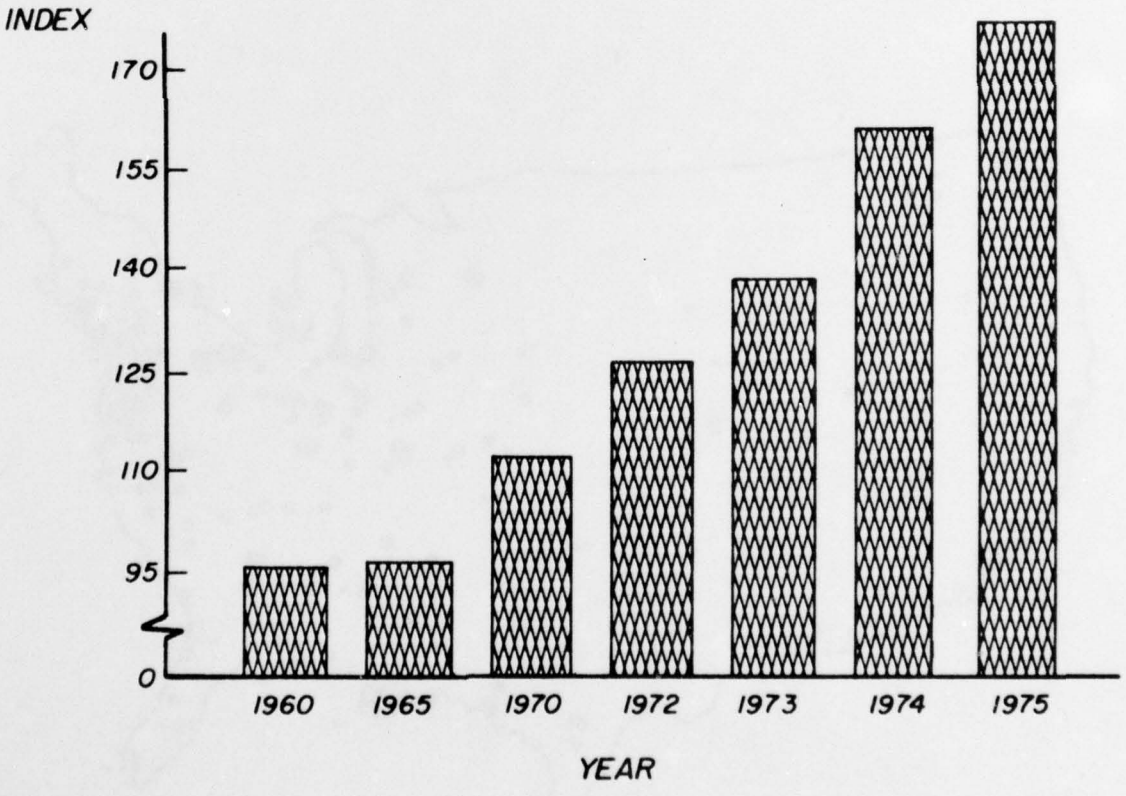


Figure 1. Construction material—index of wholesale price of materials.

step formal advertising procurement procedures, and production information on the required facilities.

Chapter 3 discusses the three key elements which separated this construction program from others cost savings, maintenance of the aesthetics of the buildings, and the innovations throughout the program.

Chapter 4 presents the procedures which should be followed when implementing a similar program in Corps of Engineers Divisions or Districts and discusses the use and responsibilities of a project manager. Chapter 5 contains conclusions and recommendations.

2 OVERVIEW OF PROJECT STAGES

General

The industrialized sanitary facility program was both a construction program and a research project which combined or adapted current procedures and innovative techniques. Since the project was a prototype program, this was also the first time that the Corps of Engineers had participated in procuring the number of facilities obtained during this program. The potential for "lessons learned" was very high, and all anticipated required activities were undertaken to observe and record difficulties, investigate their causes, and, ultimately, develop a successful methodology. The program was divided into six stages to permit successful coordination and control:

1. Data collection
2. Development of performance specifications
3. Step 1 of two-step formal advertising
4. Step 2 of two-step formal advertising
5. Construction of prototype facility
6. Construction of the required facilities.

To insure that all of the required activities were accomplished, researchers developed a flow chart for the program. A modification of the initial flow chart is



Figure 2. Main plant location of industrialized building firms (respondents to survey).

presented in Appendix A and discussed in Chapter 4. This chapter details the procedures comprising each of the six stages, as well as the efforts taken to promote coordination.

Because of the number of agencies involved in the program, one overriding difficulty was insuring that all agencies, including CERL, the four Districts within ORD—Nashville, Huntington, Pittsburgh, and Louisville—and the states of Indiana, Ohio, Kentucky, New York, Pennsylvania, and West Virginia, were totally coordinated throughout the program. To minimize the coordination problem within the Districts, ORD named Mr. William E. Showers of the Louisville District as the Division coordinator. All Districts were required to supply their sanitary facility requirements to Mr. Showers for inclusion in the overall program requirements. Mr. Showers forwarded the consolidated requirements to CERL and worked closely in developing the final ORD requirements. Coordination of the states to insure that their design and state requirements were received and analyzed for conformance to the Districts' and Division's requirements was accomplished through meetings at key decision-making points between Corps and state personnel having the authority and responsibility to discuss differences in requirements and develop a consolidated program.

Data Collection

The first step of the data collection was to determine the procurement procedures available for procuring a large group of facilities. CERL determined that the Department of Defense has two methods of executing a program of this type: two-step formal advertising and one-step competitive negotiation. These are the only DOD procurement techniques which allow use of performance specifications; these specifications are the only design procedure allowing industrialized building products to compete without arbitrary restrictions. CERL has found that using performance specifications increases the number of firms competing in a particular program. The formal advertising process does not adequately accommodate the performance specification technique. Although CERL initially identified one-step competitive negotiation as the most versatile method, further investigation indicated that its use is currently restricted to family housing. Two-step formal advertising (TSFA) was therefore chosen. In October 1974, the Chief Counsel for the Corps of Engineers Civil Works Directorate reviewed and concurred with CERL's legal and technical reasons for using TSFA. (Additional discussion on the use of TSFA is contained in Chapter 3, and Appendix B contains the procedures for use of TSFA.)

In November 1974, CERL presented its proposal for overcoming the high cost of sanitary facilities to ORD, which expressed concern with maintaining aesthetic considerations, variety of building designs, and vandal-proof facilities. As identified in Appendix F, these requirements became the underlying theme for the program and the specifications. ORD concurred with CERL's approach to the problem and the overall approach of the program, and tentatively agreed on: (1) a schedule of meetings to be held at District and state offices to gather design criteria; (2) procedures for the development and review of the performance specifications; and (3) the definition of major program milestones. The ORD Districts attended the meeting and were requested to arrange a meeting between CERL researchers and the appropriate state officials to familiarize them with the program and solicit their support.

In December 1974, CERL held an industrialized building state-of-the-art symposium to inform industrialized building manufacturers of the program, determine their interest, and be informed by the industry of the feasibility of such a venture and possible areas of concern. More than 50 manufacturers were invited in order to insure that the industry was well-represented and that their comments would enable CERL to develop realistic performance specifications. Manufacturers from 11 states, including California, New York, Texas, and Minnesota, attended the meeting. A brief questionnaire designed to provide information on the industry's capability (Appendix C) was distributed to all attendees. Responses indicated that:

1. Most companies do not install their units; it is the purchaser's responsibility to do so.
2. Most companies do not limit delivery distance.
3. Companies were willing to respond to either performance specifications, descriptive specifications, or fixed design and specification.
4. Tooling-up for such a program would take between 30 and 120 days.
5. Number of facilities that could be produced during a 6-month period ranged from 144 to 500.
6. All manufacturers had a willingness/capability to provide different exterior finishes.

Points 1 and 5 were not substantiated during the program, but the manufacturers' willingness to respond to performance specifications and capability to provide different exterior finishes were important results.

Prior to a visit to each District to gather the design requirements, a questionnaire (Appendix D) was

distributed to obtain information on plumbing design requirements, reservoir procedural methods, and general comfort station features. This information familiarized the personnel visiting the Districts with existing and projected facility needs.

From 13 to 16 January 1975, CERL representatives visited the Pittsburgh, Huntington, and Nashville Districts to discuss the requirements for sanitary facilities scheduled to be built during FY 76-77. This information was combined with previously gathered information from Louisville District to establish tentative design criteria requirements for sanitary facilities built by ORD (Appendix E). CERL analyzed this information with regard to feasibility, known industry capability, and the design requirements of ORD and the states of Indiana, Kentucky, and Ohio (Appendix F). Since the overall objective in developing the design requirements was to develop a single solution acceptable to all organizations, emphasis was placed on developing sufficient facility standardization to achieve cost reductions.

In a joint meeting on 24 January 1975, CERL presented its recommended design criteria to ORD, Louisville District, and Fort Worth District (CERL's co-writers of the performance specifications).

One of CERL's major concerns at the start of the sanitary facility program was the number of units projected for construction throughout ORD during FY 76/77. In the initial briefing to ORD, CERL stipulated that a sufficiently large volume of units should be allocated to the program to insure cost savings from repetitions in production of a standard unit. The discussion with industry representatives on the feasibility of producing sanitary facilities through industrialized methods indicated that cost reductions could be achieved after production of several units if the design of the facilities could be standardized. Since the requirements of sanitary facilities do not vary substantially from one unit to another, it was determined that cost savings could be achieved if the number of desired facilities was reduced below 100. The Districts, in keeping with industry recommendations, decided their reservoir area program could be satisfied with a comfort station unit and a washhouse unit.

In the meetings held at the District offices, representatives were requested to identify the District's projected sanitary facility construction program for FY 76/77 (Table 3).

Table 3
ORD Projected Sanitary Facility Construction Program
FY 76/77

	Comfort Station Unit	Washhouse Unit	Total Facilities
Nashville	23	14	37
Pittsburgh	20	None	20
Huntington	38	34	72
Louisville	86	18	104
TOTAL	167	66	233

At the January 1975 joint meeting, ORD personnel reviewed the figures presented in Table 3 and decided to identify 78 units for construction under the industrialized sanitary facility program. The exact breakout and sites for the specified units were to be determined and specified prior to 1 March 1975. Figure 3 shows the locations of the projects selected.

Development of Performance Specifications

Development of the performance specifications was a very critical phase of the program. Performance specifications are to identify the functions required to be performed rather than the exact details of the required product. Requirements were specified in a general form so as not to exclude manufacturers having the capability of constructing similar required items. The specifications established maximum and minimum levels of performance and were kept as simple as possible, identifying what was not acceptable in order to prevent contractor errors.

During the initial development of the performance specifications, copies of the Indiana and Ohio building codes were purchased to insure that the state codes would be followed. Additionally, sanitary health codes of all participating states were obtained to insure that none of the regulations were excluded. These procedures were required to insure that the participating states would rapidly approve the performance specifications and subsequent designs when they were submitted.

During development of the performance specifications, participating states requested that certain design criteria be written to meet their existing state practices. Throughout the gathering of the design criteria, all participating agencies were reminded that such tailoring would be extremely costly; in the past, several similar programs had failed because they tailored the criteria to meet different factions' demands. When an additional

requirement was identified, it was analyzed to insure that the prescribed procedures used by the majority of agencies were not sacrificed. A good example of one of the few tailorings of the performance specifications in this program was the State of Indiana's requirement for a specific locking system. The following phrase was included in the performance specification:

> ALL LOCKS SHALL BE PROVIDED WITH HEAVY DUTY (7K) CYLINDERS AS MANUFACTURED BY BEST UNIVERSAL LOCK CO. INC., INDIANAPOLIS, INDIANA. PERMANENT CORES FOR CYLINDERS WILL BE FURNISHED BY THE DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA, FOR BUILDINGS CONSTRUCTED IN INDIANA. CONSTRUCTION CORES FOR ALL LOCKS SHALL BE FURNISHED BY THE CONTRACTOR.

A copy of the initial draft of the performance specifications was forwarded to each participating organization for review and comment. This procedure corresponded with the use of matrix management* followed throughout the program. A meeting was held to review the performance specifications from the standpoint of their not describing the requirements in performance language, not adequately covering a requirement, and/or specifying an item that should be

*Discussion is contained in Chapter 3, Prerequisite 6.

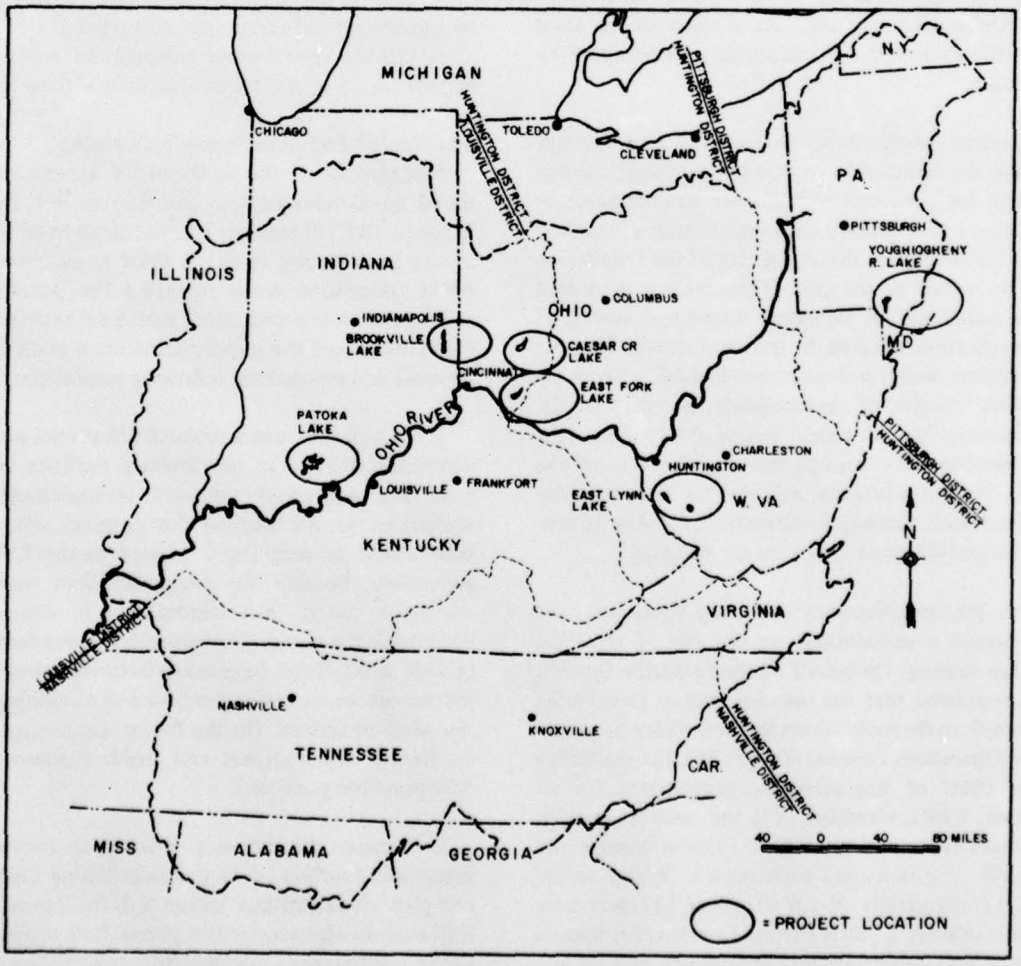


Figure 3. Projects receiving industrialized sanitary facilities.

eliminated. The persons attending this meeting were required to (1) be totally familiar with the program, (2) have the authority to approve any modifications to the facility requirements, and (3) be totally familiar with their organizations' comments and those of the other agencies and be able to discuss ramifications of proposed comments.

To insure that all organizations were aware of comments developed by other agencies, comments were sent to all organizations participating in the program several weeks prior to the review meeting. Since CERL assisted Fort Worth District in developing the initial performance specifications, copies of all comments from all organizations were forwarded to CERL for consolidation. CERL reviewed all comments and common areas of concern and drafted alternative performance specifications to facilitate the discussions during the review meetings. As a result of the total review, the alternative specifications were accepted by all agencies.

The initial specifications required the manufacturer to design the foundation to support the facility. Corps personnel (or their contractor) were to construct the foundation in accordance with specifications furnished by the manufacturer; the actual cost of the foundation would be added to the cost of the facility submitted by the manufacturer. However, subsequent review of the specification resulted in the requirement that the manufacturer design and construct the facility's foundation. This transfer of responsibility insured that the manufacturer had complete responsibility from the initial development through the final erection of the facility. Thus, this program followed the lines normally associated with turnkey construction. Volume II contains the specifications issued for the program.

After the specifications had been developed, the Corps issued a moratorium on the use of electrical resistance heating. On behalf of the Louisville District, CERL requested that the sanitary facility program be excepted from the moratorium by the Utilities Engineering and Operations Division (DAEN-FEU) at the Office of the Chief of Engineers. As justification for an exception, CERL identified: (1) the comfort stations would have approximately 1000 ft (92.9 m^2) and would use 9 kW of power, and each shower facility would require approximately 56 kW of power; (2) there were no other utilities at each project location; (3) natural gas was not always available; (4) although fuel oil and propane gas could be used, cost would be prohibitive; (5) it was anticipated that all bidders would choose electrical power for heating and ventilating; and (6) the enforcement of the injunction would jeopardize the procurement action which had begun prior to the moratorium. DAEN-FEU responded that the reservoir parks were under the jurisdiction of the Civil Works Directorate, and therefore the moratorium was not applicable to these facilities. The letter further suggested that for Civil Works projects, electrical resistance heating should be used only where other heating systems are not practicable. The letter recommended the following actions:

1. Provide minimum capacity electrical space heating and water heating equipment. Design temperature for space heating should be 65°F (18°C) maximum.
2. Omit space heating for those facilities that will not be operated regularly during the winter months. (The use of portable chemical latrines during these months may be an acceptable alternative.)
3. Provide vandal-proof temperature controls that are not readily accessible to occupants of these facilities.

Step One of Two-Step Formal Advertising

Completion of the performance specification initiated the development of the Request for Technical Proposal (RFTP) package and notification to industry of the forthcoming contract. Prior to issuance of the RFTP, discussion arose regarding the possibility of setting aside this procurement action for small business. CERL examined the requirements for a small business set-aside and reached the following conclusions:

1. This project was a research effort endeavoring to determine whether or not sanitary facilities could be built less expensively through standardization and repetition. At the start of this program, determining who would or would not respond to the RFTP was impossible, because the design solutions were being requested rather than dictated as in conventional construction projects. Consequently, respondents could include small firms, large manufacturing corporations, individuals, or consortia comprised of a combination of the aforementioned. (In the future, experience should ameliorate this problem and make a more reliable determination possible.)

2. Because this two-step solicitation required the design and erection of 78 buildings having unique and complex characteristics within a 1- to 2-year period, respondents were required to possess both sophisticated design skills and management capabilities. CERL believed that small conventional construction firms unacquainted with industrialized methods would not

ADVANCE NOTICE TO BIDDERS

INVITATION NUMBER: DACW27-75-B-0089

DATE: 30 APR 75

TITLE OF PROJECT and LOCATION

INDUSTRIALIZED BUILDING, SANITARY FACILITIES

DISTRICT: LOUISVILLE

LOCATED IN VARIED DESIGNATED RECREATIONAL SITES IN THE LOUISVILLE, HUNTINGTON, AND PITTSBURGH DISTRICTS, OHIO RIVER DIVISION.

DESCRIPTION OF WORK TO BE DONE or SUPPLIES TO BE FURNISHED: CONSISTS OF FABRICATING & CONSTRUCTING/ERECTING APPROX. 56 TOILET BLDGS. & 14 WASH BLDGS. CONSTRUCTION/ERECTION WILL BE AT SITES BY THE SAME BIDDER. IT IS THE INTENT TO ACCOMPLISH THE ABOVE WORK BY TWO-STEP ADVERTISING AS FOLLOWS:
STEP 1: TECHNICAL PROPOSALS WILL BE RECEIVED & EVALUATED. NO COST OR PRICING TO BE INCLUDED.
STEP 2: FIRMS QUALIFIED UNDER STEP 1 WILL BE REQUESTED TO SUBMIT A BID BASED ON BIDDER'S OWN TECHNICAL PROPOSALS.
IT IS ANTICIPATED THAT INVITATIONS UNDER STEP 2 WILL BE ISSUED ABOUT 1 AUG 75.

INVITATION TO BE ISSUED ABOUT	BIDS WILL BE OPENED ABOUT	AFTER RECEIPT OF NOTICE TO PROCEED, WORK WILL	WORK TO BE COMPLETED	LIQUIDATED DAMAGES	BOND REQUIREMENTS			ESTIMATED VALUE:	
					BID	Performance	Payment	FROM	TO
12 MAY 75	*19 JUN 75	COMMENCE WITHIN ** DAYS.	**		** %	** %	** %	$500,000	$1,000,000

Plans and specifications will not be sent until required REMITTANCE has been received by this office. Telephone inquiries may be directed to Louisville, Ky. Area Code 502 (Technical INFO - 582-5651) (PLANS & SPECS REQUEST - 582-5706)
REQUESTS for plans and specifications should reach this office NO LATER THAN:

05 JUN 75

No. of Sheets of drawings per set	DRAWING CHARGES PER SET	
	HALF SIZE $	FULL SIZE $

(Detach along dotted lines and mail to address shown on reverse side.)

QTY	ADVANCE NOTICE TO BIDDERS REQUEST CARD	
	INVITATION NUMBER: DACW27-75-B-0089	DATE:
	SETS HALF-SIZE DRAWINGS W/SPECS: $	☐ SETS Of Specifications
	SETS FULL-SIZE DRAWINGS W/SPECS: $	
	Enclosed is payment of $	for drawings and/or specifications.
	We expect to submit a bid as prime contractor.	
	We expect to act as subcontractor or supplier.	
	PLEASE REMOVE OUR NAME FROM YOUR MAILING LIST.	
	WE ARE CLASSED AS ☐ SMALL BUSINESS *	WE ARE CLASSED AS ☐ LARGE BUSINESS
FIRM NAME		
STREET ADDRESS		
MAILING ADDRESS		
CITY, STATE ZIP CODE		
PHONE NO.		

* Street address will be used for mailing of telegraphic messages, if any.

INFORMATION on OBTAINING PLANS, SPECIFICATIONS & BID PAPERS
There will be a NON-REFUNDABLE charge for drawings and specifications. Charges for drawings will be at the rate of 50¢ per sheet for full size and 10¢ per sheet for half-size drawings. The maximum charge for any complete set of half-size drawings and specifications will be $10.00. The maximum charge for any set of full size drawings and specifications will be $25.00. Individual drawing sheets may be purchased at the rate of 50¢ for full size and 10¢ for half-size prints with a minimum charge of $1.00. Single sets of specifications alone will be available without charge to properly interested applicants. A charge of $1.00 each will be made for additional sets of specifications. Payments for drawings and specifications must accompany any request and may be in the form of check or money order payable to "Treasurer of the United States" or cash. PAYMENTS FOR DRAWINGS AND SPECIFICATIONS WILL NOT BE REFUNDED AND DRAWINGS AND SPECIFICATIONS NEED NOT BE RETURNED.

Plans and specifications will be on display in the U.S. Army Engineer District Offices in Louisville, Ky., Huntington, W. Va., Nashville, Tenn., Pittsburgh, Pa., & Chicago, Ill., and the U.S. Army Engineer Division Office, Cincinnati, O.; in plan rooms of Associated General Contractors, F.W. Dodge Corporation, and other similar commercial service offices in this area.
A small business concern in the construction industry is a concern that (1) is independently owned and operated, (2) is not dominant in its field of operation, and (3) the average receipts of the concern and its affiliates for the preceding 3 years are $7,500,000 or less. Small business --Special Trade Contractors shall be as in accordance with ASPR 1-701.1(a) (2)(a).

The card in the lower left hand corner is for your use in obtaining plans and specifications.

*FOR STEP 1.

**TO BE SPECIFIED IN STEP 2.

ENG FORM 3132-R
Rev. 22 May 74

Figure 4. Advance notice to bidders.

be able to submit acceptable and timely solutions at a reasonable cost. Therefore, CERL strongly recommended that the procurement action not be set aside for small business.

The Louisville District received a call from the Atlanta Small Business Association (SBA), which believed that a fair and reasonable price could be received from a small business; the SBA was willing, based on the information they had received, to make this program a test case. CERL informed the Louisville District that if this case came before the required officials, it would not be set aside for small business because of the nature of the program. After additional discussions with the SBA regional representative, Louisville District decided not to set aside this program for small businesses, and no additional discussions ensued.

On 6 May 1975 an advance Notice to Bidders was issued (see Figure 4) in conjunction with the *Commerce Business Daily* Procurement Notification, under section 54, Prefabricated Structures and Scaffolding (Figure 5). During the fourth week of the advertising period, a midterm conference was held at Louisville District with representatives of participating firms to discuss the performance specifications and to clarify any ambiguous areas in the specifications. During this meeting, Corps representatives were available to discuss detailed characteristics of reservoir areas referenced in the RFTP. Attendance at the meeting was optional for the bidders. At the conclusion of this meeting, an amendment of solicitation was issued that modified the specifications and detailed other pertinent RFTP changes resulting from the meeting.

54 Prefabricated Structures and Scaffolding

● 54 – FABRICATE AND CONSTRUCT/ERECT APPROX 56 TOILET BLDGS AND 14 WASH BLDGS. This proposed procurement will be a two-step formal advertisement. Step-one of the procurement will be avail o/a May 75. This is the initial package of a potential 5-year program designed to supply 200-300 packaged sanitary facilities within the Ohio River Div. – Destns to be furnished are varied designated recreational sites located in the Louisville, Huntington, and Pittsburgh Engineer Dists., Ohio River Div. – RFTP DACW27-75-B-0089 – RFTP due date of Step-one 17 Jun 75. (P122)

US Army Engineer Dist., Louisville
600 Federal Place, Louisville, KY 40202

Figure 5. *Commerce Business Daily* procurement notification.

On 8 July 1975, 13 proposals were received from industry with regard to the RFTP. The contracting officer convened the initial evaluation board meeting at the Louisville District on 15 July 1975. Volume II contains the documentation used by the evaluation board. Participating in this board were personnel from ORD, CERL, Huntington and Louisville Districts, and representatives from the states of Indiana, Ohio, and West Virginia.

The mandate of the evaluation board, which included an aesthetic design board and an acceptable product board, was to identify those proposals which successfully met the minimum performance requirements specified in the RFTP. To insure that an accurate and unbiased evaluation was conducted, all board members were registered professionals. The aesthetic design board consisted of Corps and state architects who reviewed and evaluated all material related to design aesthetics and appearance to determine whether the proposals were acceptable. Board members independently completed the evaluation document which accompanied each proposal. The acceptable product board consisted of personnel from CERL who assisted the evaluation board in determining whether proposals were acceptable. This board operated on an "on-call" basis and evaluated only products and methods of construction/fabrication unfamiliar to the members of the evaluation board.

To insure that the likes or dislikes of a particular architect did not bias evaluation of a manufacturer, the criteria for disqualifying a design were (1) a majority of aesthetic design board members were required to identify an area of design as nonresponsive, or (2) the total sum of nonresponsive areas had to be greater than a preestablished factor. The factor was defined as the number of aesthetic design areas multiplied by 1.75.

At the conclusion of the step-one evaluation, six of the 13 proposals were considered to have the aesthetic attributes described in the specification, but each contained some flaw or discrepancy in design or facility layout. The evaluation board determined that these proposals should be revised to make them acceptable before step-two bids were requested. It was recommended to the contracting officer that the six proposals be identified as acceptable with minor modifications and that those modifications be identified for revision.

In other programs of this type, manufacturers whose proposals were acceptable with minor modifications had not been allowed to modify their proposed designs.

However, since the intent of this program was to solicit as many manufacturers as possible, the manufacturers were allowed to revise their proposals if the modification did not require a total redesign or the design was not aesthetically unacceptable.

The remaining seven proposals were judged aesthetically unacceptable, even though in at least one instance, the proposer had followed the specifications very closely. One manufacturer, upon receipt of the notice that his proposal was nonresponsive for failure to comply with the aesthetic requirements of the RFTP, decided to lodge a protest with the contracting officer. CERL wrote a legal memorandum (Appendix G) to the contracting officer in response to the protest. In a meeting with the manufacturer, it was determined that the aesthetic clauses identified in the RFTP had been informally discussed with the General Accounting Office (GAO) and were legal because: (1) aesthetic is a proper factor to specify as a minimum requirement; (2) the aesthetic clause in the RFTP (1.1.4) is an acceptable clause to specify an aesthetic requirement; and (3) the proposal was evaluated fairly, and the results were reasonable without any evidence of fraud, abuse of authority, or arbitrary action.

In the preparation for the second step of the two-step formal advertising procedure, a revised schedule which considered the additional evaluation of the manufacturers' proposals that were acceptable with minor modifications was required. A meeting was held with ORD and Louisville District to establish a feasible schedule. The nature of this program, the ramifications of winter construction, and the requirement to test and evaluate a prototype facility prior to the construction of the required facilities necessitated a tight schedule. Any schedule which identified the completion of the prototype facility at Brookville Lake Reservoir after the start of winter was not acceptable because of the need to insure that the prototype facility was evaluated* during the winter and the winning bidder allowed to use these months for tooling up for the remaining facilities. Manufacturers were asked about the schedule to insure that the program did not impede or in any way constrain their design development process. All except one of the manufacturers were willing to express their requirements regarding the questions asked (Appendix H). Thus, CERL was able to determine the requirements for a tight schedule that were within the capabilities of the manufacturers. The identified schedule (Figure 6) was considered to be tight but realistic.

On 3 September 1975 a second meeting of the evaluation board was convened at the Louisville District office to reevaluate the designs previously identified as acceptable with minor modifications. Of the six proposals received for additional evaluation, five were considered to be acceptable for step-two formal advertising procedures—those of Ohio Building Products, Inc., Mosser Construction, Inc., Ren Corp., KDM Construction Co., and the Associated Plumbing Supply Co. of Indiana, Inc. (APSCO). The one unacceptable proposal was revised satisfactorily with regard to space requirements and layout, but the exterior treatment offered virtually no diversification in the use of materials and was judged unacceptable. The consensus of the evaluation board was that certain inexpensive modifications could have been made to the proposed structure which would have made the appearance aesthetically acceptable. In view of the closeness of the step-two bidding period and the availability of five acceptable proposals, the board did not execute the prerogative of going back to the unacceptable proposer. It was recommended to the contracting officer that the five acceptable proposals identified above be allowed to participate in step-two bidding.

Step Two of Two-Step Formal Advertising

The five acceptable manufacturers were notified of their participation in this stage of the program. The remaining manufacturers were sent a detailed description identifying where the proposals fell short of the specifications. Each acceptable manufacturer was required to supply costs in the areas identified in Figure 7. In preparation for the bid opening, CERL developed the conventional construction government estimate based on comfort stations and washhouses constructed from 1965 to 1975 (Tables 1 and 2). The following information was developed:

1. Average cost per square foot of 46 comfort stations constructed for the Corps of Engineers during the period 1965 to 1975 (adjusted to 1975 price levels): \$105.99 (\$1140.87/m^2).
2. Average size of comfort stations in sanitary facility proposals: 555 sq ft (51.6 m^2).
3. Total estimated construction cost per comfort station (built conventionally): \$58,824.
4. Average cost per square foot of 18 washhouses constructed for the Corps of Engineers from 1965 to 1975 (adjusted to 1975 price levels): \$88.54 (\$953.04/m^2).

*A review of similar programs identified that evaluation of the prototype facility was necessary to illuminate those items requiring modifications which were undetected during previous evaluation.

Activity	Milestone
Identify manufacturers' required modifications	8 August
Discuss modification with Louisville District representatives	11-15 August
Required modification submitted to Louisville District	29 August
Evaluate modifications	5 September
Receive approval of design from states; states identify required exterior treatment	9 September
Notify acceptable proposals by telegram	9 September
Follow-up notification of acceptable proposals by letter	9 September
Open manufacturers' bids	30 September
Award contract	7 October
Submit bid bonds	17 October
Give notice to proceed (NTP); request preparation of foundation information/drawings	17 October
Conduct preconstruction conference with involved Districts and firm; request quality control program and foundation drawings	22 October
Begin foundation work at Brookville Lake	27 October*
Complete Brookville Lake foundation	6 November
Submit contract drawings and specifications for review and approval	28 October*
Approve contract drawings and specifications	6 November
Complete construction of Brookville Lake facility	22 December

*Not considered to be a major milestone.

Figure 6. Sanitary facility schedule from evaluation to construction of prototype facility.

STANDARD FORM 36, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

CONTINUATION SHEET

REF. NO. OF DOC. BEING CONTD: DACW27- 75 B 0089 | PAGE 1 OF 2

NAME OF OFFEROR OR CONTRACTOR

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	Industrialized Buildings, Sanitary Facilities in accordance with the Request for Technical Proposal dated 12 May 1975, your proposal approved under Step I and the Provisions of this SF 33 (Step II) Building prices will include fabrication and delivery.				
	BROOKVILLE LAKE, INDIANA Exterior Treatment - TYPE A				
1.	Toilet Buildings, heated	2	Ea		
2.	Site preparation erection and testing	1	Job	for	
	ALUM CREEK, WEST VA Exterior Treatment - TYPE A				
3.	Toilet Buildings, unheated	8	Ea		
4.	Wash buildings heated	2	Ea		
5.	Wash buildings, unheated	2	Ea		
6.	Site Preparation erection and testing	1	Job	for	
7.	Access to Site (estimated)	7,500	Ln. Ft.		
	EAST LYNN WEST VA Exterior Treatment - TYPE A				
8.	Toilet Buildings, unheated	2	Ea		
9.	Wash Buildings, unheated	2	Ea		
10.	Site preparation erection and testing	1	Job		
11.	Access to Site (estimated)	500	Ln.	Ft.	
	YOUGHIOGHENY, PA Exterior Treatment - TYPE A				
12.	Toilet Building, heated	1	Ea	for	
13.	Toilet Building, unheated	1	Ea	for	
14.	Site preparation erection and testing	1	Job	for	
15.	Access to Site (estimated)	320	Ln.	Ft.	

36-108-12

Figure 7. Bid schedule.

STANDARD FORM 36, JULY 1966 GENERAL SERVICES ADMINISTRATION FED. PROC. REG. (41 CFR) 1-16.101	**CONTINUATION SHEET**	REF. NO. OF DOC. BEING CONT'D DACW27- 75 B -0089	PAGE 2 OF 2

NAME OF OFFEROR OR CONTRACTOR

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CAESAR CREEK LAKE, OHIO Exterior Treatment - TYPE A				
16.	Toilet buildings heated	13	Ea		
17.	Wash buildings, heated	7	Ea		
18.	Site preparation erection and testing	1	Job	for	
19.	Access to Site (estimated)	8150	Ln.	Ft.	
	EAST FORK LAKE, OHIO Exterior Treatment - TYPE A				
20.	Toilet buildings, heated	10	Ea		
21.	Wash buildings, heated	7	Ea		
22.	Site preparation erection and testing	1	Job	for	
23.	Access to Site (estimated)	8000	Ln.	Ft.	
	PATOKA LAKE, INDIANA Exterior Treatment - TYPE A				
24.	Toilet buildings, unheated	13	Ea		
25.	Wash buildings, unheated	8	Ea		
26.	Site preparation erection and testing	1	Job	for	
27.	Access to Site (estimated)	9700	Ln.	Ft.	
	TOTAL				
	Location of Fabricating Plant: _____				

36-108-12

Figure 7 (cont'd)

5. Average size of washhouses in sanitary facility proposals: 873 sq ft (81.1 m^2).

6. Total estimated construction cost per washhouse (built conventionally): $77,295.

Using this information, the conventional construction costs estimate for this program was determined to be $5,105,460: $2,941,200 for 50 comfort stations and $2,164,260 for 28 washhouses.

As identified in Table 4, the winning low bid was supplied by Associated Plumbing Supply Company of Indiana, Inc. (APSCO), Fort Wayne, IN, at approximately 53 percent of the conventional construction government estimate. Figures 8, 9, and 10 are drawings of the proposed facilities supplied by APSCO during the initial submission.

Subsequent to the opening of the bids, a general meeting was held with APSCO to (1) establish a date for the preconstruction conference and who would attend; (2) identify how the payments would be accomplished (the contract combined aspects of both a supply contract and construction contract); (3) request a formal schedule from the contractor for the dates of the erection of the buildings at all sites; (4) request a set of footing and foundation drawings and samples of aggregate and shingles indicating color selection (not previously identified) be furnished at the preconstruction conference; and (5) establish a date for submission of drawings and specification (10 days after preconstruction conference).

Table 4
Distribution of Bids and Relationship to Conventional Construction Government Estimate

Firms	Bid ($)	Percent of Estimate
APSCO Fort Wayne, IN	2,689,434.50	53
Mosser Construction, Inc. Fremont, OH	3,529,350.00	69
Ren Corporation Muncie, IN	4,826,208.00	95
KDM Construction Co. Richmond, IN	4,366,882.00	86
Ohio Building Products, Inc. Willoughby Hills, OH	4,072,420.00	80

The preconstruction conference was held 4 November 1975 by Louisville District. During this meeting, the District covered the provisions of the contract; furnished the forms for the supply contract and construction contract requirements; and discussed the labor relations aspect and the requirement for the appropriate posting at the job site, the requirement for reproducible drawings and specifications, safety, value engineering, and auditing. APSCO presented their construction quality control program, submitted one set of blue-line drawings of footing and foundation for approval, and requested two complete sets of site drawings in accordance with the specifications.

Prototype Facility Construction

The prototype facility was completed at Brookville Lake Reservoir, IN, 23 December 1975. For approximately 1 month, testing and evaluation were conducted to insure that the facility met the requirements of the performance specifications. Among the tests conducted were impact, sustained loading, and measurement of light levels. CERL submitted documents of the test results and recommendations for modification to the remaining facilities to the Louisville District, which maintained the responsibility for implementing the recommendations. Appendix J contains pictures of the Brookville Lake prototype facility.

Construction of Required Facilities

Production and erection of the required facilities have now been initiated. CERL monitored the initial facilities in the production phase of the project to observe and record the procedures used. It is believed that monitoring was and will continue to be an essential activity for subsequent projects of this type until sufficient documentation on production and erection procedures is acquired. The following is a description of the activities at one site—Caesar Creek Lake Reservoir, OH.

The initial activity APSCO performed at this site was forming and pouring of the slabs. Each slab had the plumbing installed and the forms for the shower and sump drains completed prior to pouring. During the pouring of the concrete, the slabs were troweled smooth. Templates were placed to mark the holes to be drilled in the slab which would later receive the anchor bolts for securing the concrete panels to the slab. All slabs were completed and ready to receive the panels several months prior to the erection of the facility. Erection of the facility was accomplished with a four-person crew: a foreman who operated the crane; a second person who assisted in unloading the panels

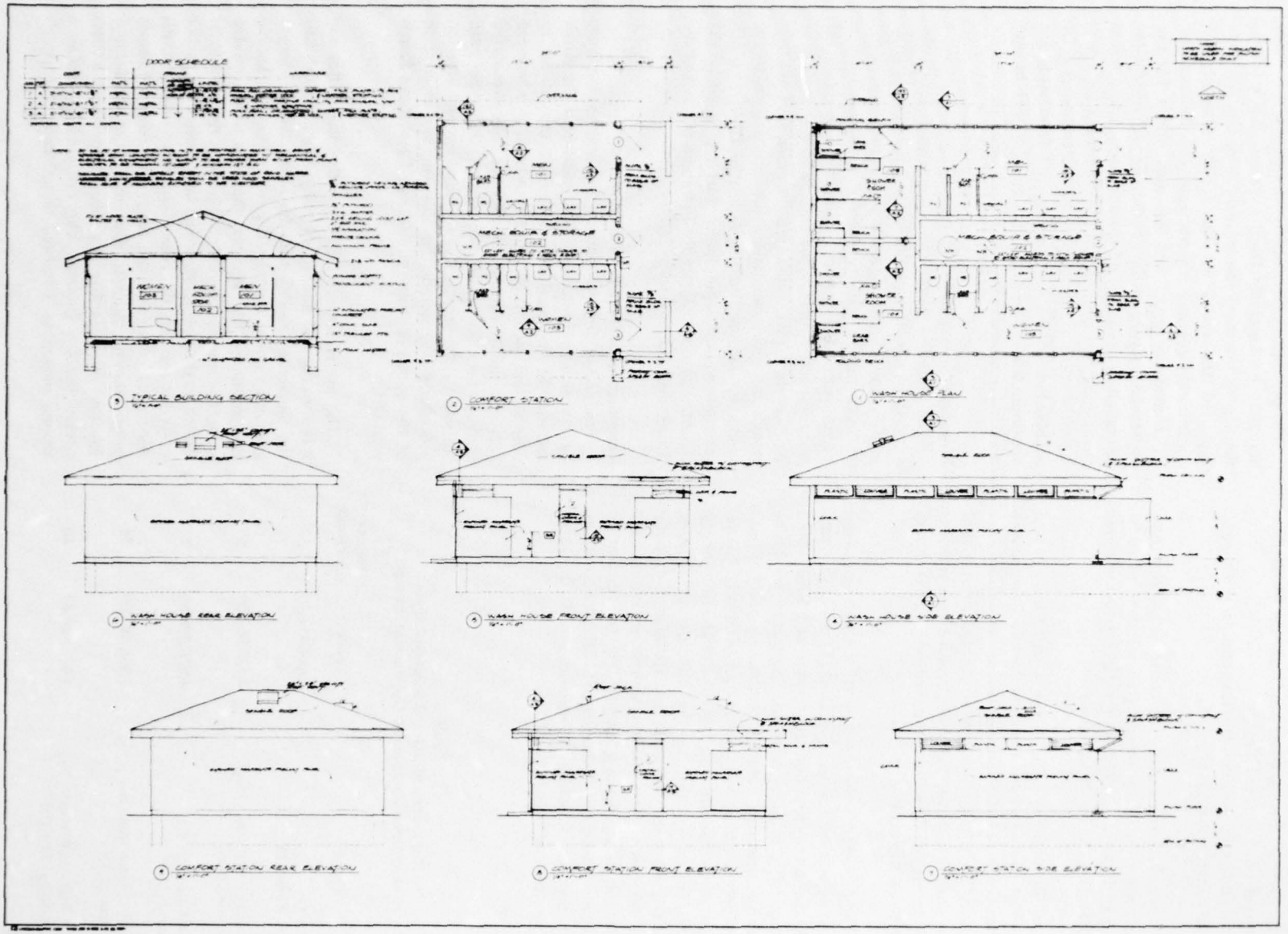


Figure 8. Architectural drawing, sheet A1, supplied by APSCO.

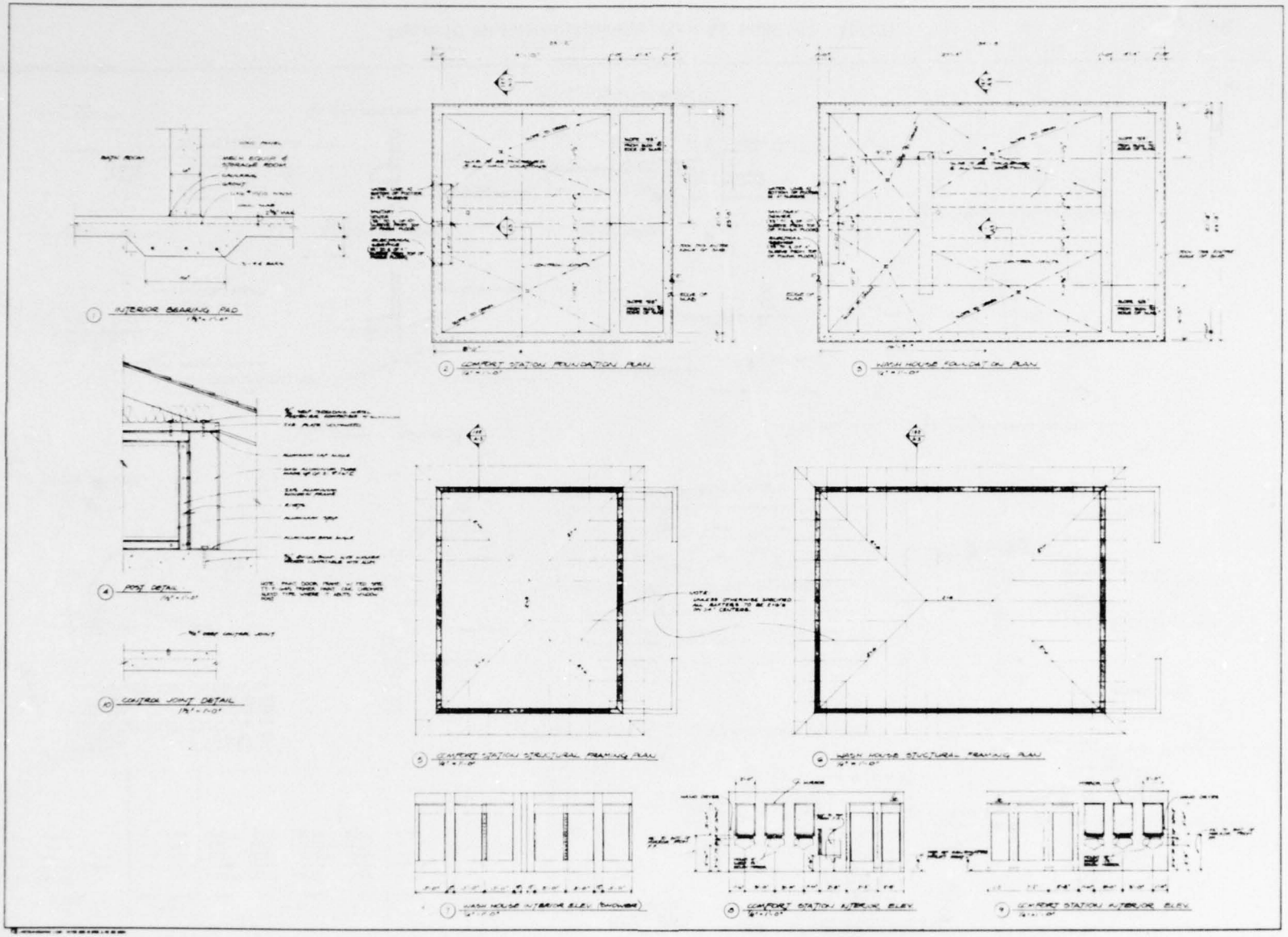


Figure 9. Architectural drawing, sheet A2, supplied by APSCO.

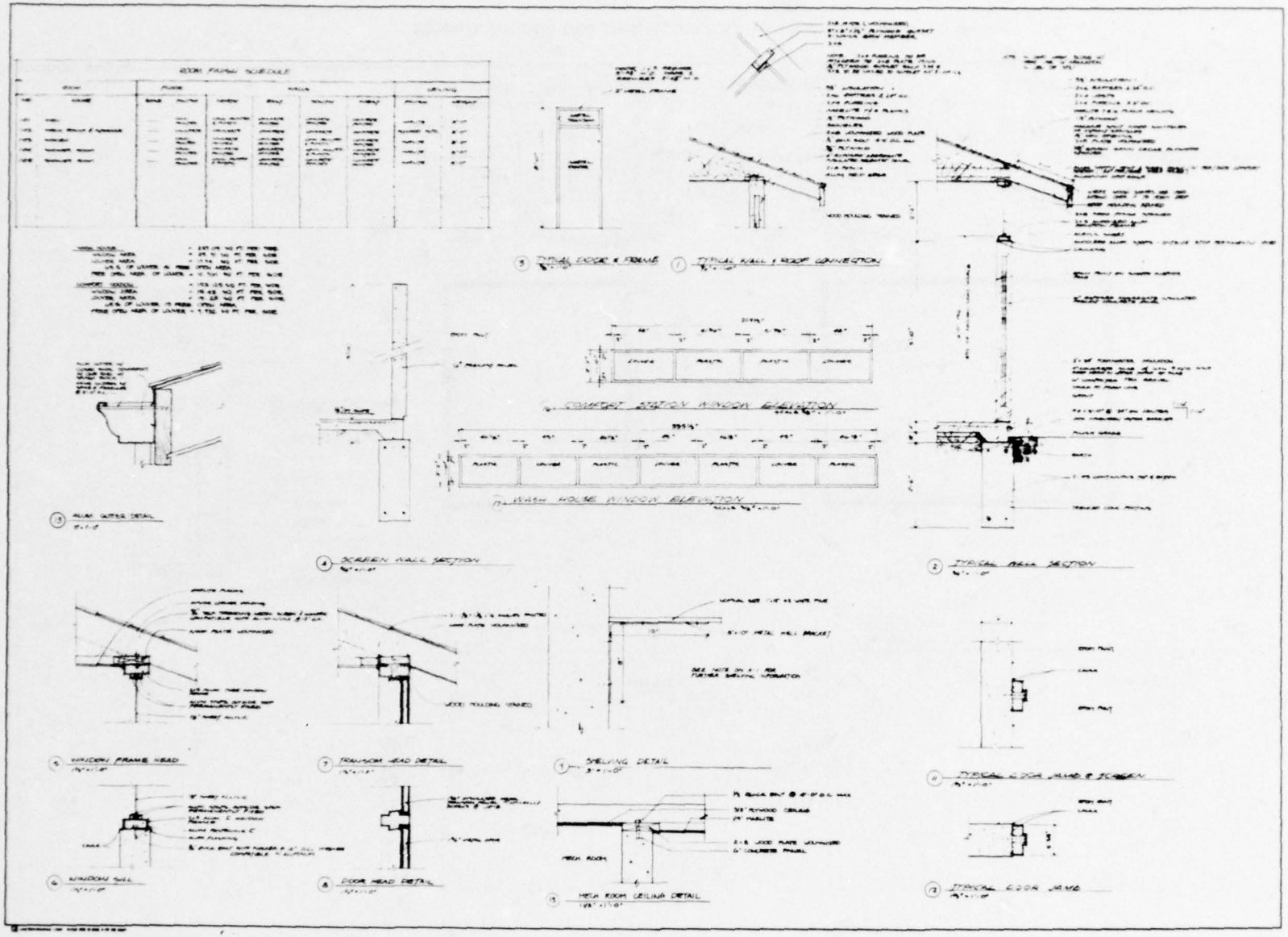


Figure 10. Architectural drawing, sheet A3, supplied by APSCO.

from the truck and leveled the panels when they were in place; a third person who troweled the grout and placed the neoprene base pads between the slab and the panel prior to the panel being placed on the slab; and a fourth person responsible for mixing the grout and placing the anchor bolts in the slab as the panels were removed from the truck.

In preparation for the concrete wall panels, the slab and the holes which had been drilled previously to receive the anchor bolts were thoroughly cleaned. Chalk lines outlining the position of the panels were marked on the slab to insure proper placing of the grout.

When the erection actually began, one of the interior plumbing walls which separates the mechanical space from the toilet room was removed from the truck. While the panel was suspended from the crane, anchor bolts were screwed into the nuts which had previously been set in the base of the wall panel. Two different types of grout were placed within the chalk lines previously drawn. A grout having a curing inhibitor was poured into the holes to contain the anchor bolts. The second grout, which had a thicker consistency, was placed within the chalk lines to form a bed for the panels. Neoprene pads and leveling pads were also placed within the chalk lines every 3 ft (0.9 m).

After these activities were completed, the crane placed the panel on the slab in its final resting position. Final measurements were made to insure that the panel was in its proper position. If adjustments were necessary, a crowbar was used to move the panel into the required position. A temporary cable and channel were attached to the first panel to maintain the plumbed position until a second panel was positioned. The crane cables were released so that the process could be repeated for the next panel.

The second panel chosen for the process was a panel which, when positioned, would be perpendicular to the first panel; this was required to structurally stabilize the first panel. The positioning process described above was then repeated for the next panel. After the second panel was positioned, the two panels were bolted together and the temporary stabilization cables were removed for the placement of the remaining panels.

The remaining panels were selected and placed so they could be bolted to and supported by the previously positioned panels. In the overall process, the interior walls were erected first, then the end walls, the front exterior walls, the side wall, and finally the short wall that protects or screens the front entrance. When the concrete panels containing the doors were erected, a special jig was used to insure that the walls were plumb so the door frames could be properly fitted later. All three doors—the mechanical room, the men's restroom, and the women's restroom—used exactly the same jig.

Four additional crews performed on-site work before the facility was accepted by the Corps. The carpenters inserted the side windows and doors, framed the roof, sheath and shingled the roof, and completed the trim work around the edges of the roof. The electrical contractor installed all required electrical wiring, including wiring of the mechanical space, wiring above the ceiling for any of the required lighting, inserting circuitry required by the hand dryer and wall sockets, and installation of lights at the front entrance of the building. The paint crew caulked and painted the interior spaces and the exterior trim. The finishing crew installed the plumbing fixtures and toilet partitions.

3 DISCUSSION OF KEY ELEMENTS

Three key elements separate this program from others: cost savings, maintenance of the facility aesthetics, and innovations throughout the program. This chapter discusses these three areas.

Cost Savings

The actual cost saving achieved by this program was, as previously discussed, 47 percent of the conventional construction government estimate. There is another source of cost savings which may not be readily identifiable—the cost associated with designing and procuring a single facility. A conservative estimate of the time required to design one facility is 100 hours. Thus, designing 78 facilities might require approximately 7800 man-hours. The total man-hours worked on this program by Corps personnel during the past year and a half amount to about 65 to 75 percent of the normal requirement. Thus, this program has achieved both cost savings per square foot and cost savings in man-hours of production. Since 95 percent of the required documentation has been developed, further implementation of the program will result in additional savings.

Maintenance of Facility Aesthetics

The Request for Technical Proposal (RFTP) contained statements early in the document identifying that each proposal would be reviewed and evaluated on

its own merits and that the aesthetics of the proposal would be evaluated by a team of registered architects. The following sentences were included in the RFTP and were followed during the evaluation:

> DESIGN OF THESE FACILITIES SHALL BE AESTHETICALLY PLEASING. COMPATIBILITY WITH THE NATURAL ENVIRONMENT IS REQUIRED. FACILITIES SHOULD PRESENT A HARMONIOUS APPEARANCE WHICH BLENDS WITH THE PARK SCENERY. SUBMITTALS WILL BE EVALUATED BY A BOARD TO BE DESIGNATED BY THE U.S. ARMY ENGINEER DISTRICT, LOUISVILLE. WHEN THE CORPS OF ENGINEERS REVIEW DETERMINES THAT A PROPOSED BUILDING IS UNATTRACTIVE, EVEN THOUGH MEETING ALL THE STANDARDS BELOW, IT WILL BE JUDGED NONRESPONSIVE.

Another requirement was to have a variety of designs and exterior treatments. This was identified in the RFTP with the following statements:

> VARIETY IN DESIGN IMAGE, MATERIALS AND COLORS IS TO BE PROVIDED FOR THE EXTERIOR PERMITTING SEVERAL STANDARD EXTERIOR MATERIAL SELECTIONS BY USING AGENCY. A MINIMUM OF THREE EXTERIOR TREATMENTS AND ONE INTERIOR TREATMENT ARE TO BE SUBMITTED IN THE STEP ONE PROPOSAL FOR EVALUATION. ANY PLAN AND BUILDING FORM OR SHAPE THAT MEETS THE SPACE AND AESTHETIC REQUIREMENTS MAY BE PROPOSED.

The following statement was used to describe the exterior walls of the facilities:

> EXTERIOR MATERIALS OF BRICK, STONE, AND WOOD ARE TO BE USED IN THEIR NATURAL STATE. FINISHED WOOD SHALL BE STAINED OR PAINTED IN ACCORDANCE WITH AN EXTERIOR PAINTING REQUIREMENT IDENTIFIED IN THE PERFORMANCE SPECIFICATIONS.

Innovative Elements

Industrialized building technology has different prerequisites for successful procurement and subsequent utilization than conventional technology. It offers time, cost, and quality benefits because of the efficiencies of prefabrication and the product-development potentials of an industrial environment. To achieve these benefits and successfully apply the industrialized building technology, certain prerequisites must be accomplished. To accomplish these prerequisites, innovation must occur throughout a program. The industrialized sanitary facility program solved the following prerequisites: (1) development of continuity, repetition, and sufficient volume, (2) use of an alternative procurement process, (3) use of an alternative strategy for communicating project requirements, (4) revision of roles and responsibilities of the participants in the procurement process, (5) combination of multiple contracts, and (6) matrix management. A description of these prerequisites and associated innovative solutions follows.

Prerequisite 1. Development of Continuity, Repetition, and Sufficient Volume

Explanation. To create a climate encouraging capital investment for a new product and to maximize the cost benefits of existing industrialized products (i.e., volume discounts and learning curve efficiencies), it is necessary to have predictable, repetitive buying patterns of sufficient volume and similar design requirements.

Innovative Solutions. This program aggregated individual construction requirements into one large procurement package using two techniques—across-district (multi-base buying) and fiscal year (multi-year buying) boundaries. The ultimate package was sufficient to maximize competition yet minimize costs: 13 manufacturers responded to the RFTP and the resulting low bid price was 53 percent of the conventional construction government estimate.

ORD and Louisville District indicated that a smaller program would have been more desirable; the participation of many states complicated the overall administration of the program, and the bonding requirements precluded the participation of many small firms, thereby reducing competition. CERL believes, however, that the low bids received in this solicitation were direct consequences of the repetition and standardization obtained by large-scale production. Data suggest that a reduction in program scope from 76 to 40 facilities would have engendered a 20 to 30 percent increase in per unit costs to the contractor and ultimately to the government. In addition, the argument that "the large program reduced competition" has two sides; at least one contractor stated that had the project not been as large, their firm would not have been interested in participating in the program.

Prerequisite 2. Utilization of an Alternative Procurement Process

Explanation. The traditional procurement process of formal advertising, while adequately accommodating the state of the art of conventional building technology, does not fit well with that of industrialized building technology. Private concerns or other agencies increasingly use a bid-design building system. The main advantage of the bid-design-build process is that it requests instead of dictates a solution. In this way, the manufacturer is a major participant in the process, providing substantial input to the design and typical solution in the market place, rather than being required to respond to an arbitrary hardware solution developed by a third person. The Department of Defense has two methods to execute a bid-design-build process—two-step formal advertising (TSFA) and one-step competitive negotiation.

Innovative Solution. This program originally chose one-step competitive negotiation as being the most versatile method; however, its use is currently restricted to procurement involving family housing. TSFA was therefore eventually used. ORD and Louisville District indicated that they felt TSFA should not have been used in this program, since the program did not fulfill the conditions required for its use set forth in ASPR 2-502[1] (i.e., the agency must not have the capability to write a prescriptive specification). They also felt that since they had an acceptable design (the winning submittal), that they would request it in all subsequent procurement actions rather than using two-step formal advertising again.

CERL believes that (1) the original decision to use TSFA was correct, and (2) sufficient precedents exist to continue use of TSFA in future industrialized sanitary facility projects. There are legal and technical justifications for using TSFA in this project and in future projects.

The technical reasons for using TSFA in this project were primarily based on the premise that industrialized buildings are pre-engineered commercial products, each with unique design and technical details. As such, they can be procured most economically and effectively with open unrestricted competition via a performance specifications approach. Since the industrialized building industry is such a volatile, nonstandard industry and the Corps must insure that the facilities they procure are aesthetically and technically acceptable, it was necessary for the Corps to require submission of technical proposals for evaluations of responsiveness.

The legal reasons justifying the use of TSFA include the Department of Defense's procurement policy concerning commercial products of different design; the formal advertising technique's failure to allow for the submission and evaluation of technical proposals (which is the entire reason for creation of the TSFA method) and to use other design strategies besides the performance concept with any degree of success; ER 1180-1-7's[2] conditions for when to use TSFA, ASPR 2-501[3], 502, and the results of 3 years of research by the GSA's Public Building Service (PBS) into whether TSFA was an acceptable method to use in procuring industrialized building components. Their research indicated that it was. The General Accounting Office (GAO) agreed, and PBS is currently using the TSFA method for its systems building projects. OCE's legal counsel for Civil Works concurred in CERL's decision to use TSFA after reviewing the above considerations on 15 October 1974.

Continued use of TSFA for future industrialized projects can be justified because (1) the conditions for TSFA's use have not changed and (2) even if they have, other laws and regulations more fundamental than the one sentence at issue in ASPR 2-501* preempt that regulation. Today, the industrialized building industry is as diverse, volatile, unpredictable, and unknown as it was when this project began. The exposure to five acceptable designs in this program does not enable the Corps to accommodate the industrialized building industry with a conventional, descriptive design. Rather, for the foreseeable future, the performance specification/proposal submission/evaluation syndrome will

[1] "Procurement by Formal Advertising, Part 5—Two Step Formal Advertising; General," *ASPR 2-502* (Department of the Army, 2 October 1975).

[2] "DOD Policy and Procedural Guidance for the Use of One-Step Competitive Negotiation and Two-Step Formal Advertising Procurement Procedures in the Acquisition of Facilities," *ER 1180-1-7* (Department of Defense, 20 December 1973).

[3] "Procurement by Formal Advertising, Part 5—Two Step Formal Advertising; Conditions For Use," *ASPR 2-501* (Department of the Army, 2 October 1975).

*From Legal Memorandum by Mike Carroll, CERL legal advisor (5 May 1976), "An objective of this method is to permit the development of a sufficient descriptive and not unduly restrictive statement of the Government's requirement . . . so the subsequent procurements may be made by formal advertising."

probably have to be repeated if the Corps desires to continue the cost and time savings of the original project.

Second, the one troubling sentence at issue in ASPR 2-502 is overshadowed and preempted by the most fundamental procurement rule of all—requirements should be stated in an unrestrictive fashion so as to achieve maximum competition. (See 41 USC 253 (a); 10 USC 2304 (g); 10 USC 2305; ASPR 1-300.1; ASPR 1-1201; ASPR 18-107; FPR 1-1.301-1.) If, in fact, the abandonment of TSFA/procurement specification method in favor of a formal advertising/descriptive specification method would in any way restrict competition and/or increase cost of industrialized buildings, then the regulation requiring such a conversion is preempted by the fundamental need to spend tax monies in the "best interests of the public."

In response to a request by ORD, CERL prepared a legal memorandum documenting these justifications for continued use of TSFA (Appendix I) and forwarded it to the Directorate of Civil Works' legal counsel for critique and approval. The Civil Works legal counsel concurred on the continued use of TSFA as long as (1) the industrialized building industry remains nonstandard to the point that no one descriptive design accommodates the majority of industrialized buildings, and (2) the reasons for the continued use of TSFA are documented for that procurement.

TSFA does create some practical problems for Districts. Evaluating the submitted technical proposals is both difficult and time-consuming. Although GAO will not upset their technical determination "unless there is clear evidence of fraud, abuse of authority or arbitrary action" (see 48 Comp. Gen. 49 [1968], 10G.C. 406; B-161613 [August 28, 1967]; B-165771 [April 28, 1969]), evaluators are often concerned with possible litigation as a result of the determinations. These practical problems may make development of a procurement solution using the advantages of TSFA but minimizing its disadvantages necessary.

Prerequisite 3. Use of an Alternative Strategy for Communicating Project Requirements

Explanation. Providing detailed drawings and specifications is the standard communication technique used in the conventional process which dictates only one technical solution. However, any set of criteria may result in a variety of different solutions. Thus, the performance concept, emerging communication approach seeks different solutions to a problem. It details the functions to be performed with minimum reference to the procedures to be used. If drawings are included, they are line drawings which do not mention dimensions.

Innovative Solution. This program had simple line drawings with references only to minimum or maximum dimensions identified in the specifications. The dimensions were illustrative and not mandatory. Responding manufacturers felt that it was stimulating to bid on documents that did not dictate a solution. Over the past 3 years, CERL has directed work toward developing performance specifications and the capability to maintain the desired aesthetic appearance of Corps of Engineers facilities using this type of specification. CERL has found that use of performance specifications has actually increased the number of competing firms in programs, while maintaining the functional capabilities and quality of the facilities.

Prerequisite 4. Revised Role and Responsibility of the Participants in the Procurement Process

Explanation. New processes and new communication strategies required revised roles and responsibilities. For example, the manufacturer becomes a major participant in the process, since he/she develops and produces the hardware and is in the best position to decide the most economical solution to the functional requirements.

Innovative Solution. CERL held a state-of-the-art symposium with the manufacturers early in the project both to learn what levels of performance were feasible and to enable the manufacturers to have significant input into the project. Additionally, the procurement process chosen enabled the manufacturer to be the prime contractor, as opposed to the traditional general contractor. During the fourth week of the advertising period, a midterm conference with representatives of participating firms was held at the Louisville District to discuss the performance specification and have the manufacturers identify any areas which were ambiguous in the specifications. Prior to establishing a delivery schedule, each responsive (with minor modification) firm was contacted to gather production and erection capability information and to insure that the program would not impose a requirement beyond the winning bidder's capabilities. In all instances when a decision was required which could impact the participating firms, each manufacturer was contacted and given an opportunity to provide input into the project.

Prerequisite 5. Combination of Multiple Contracts

Explanation. The state of the art of industrialized building is such that not everything is in-system. The portion of work out-of-system usually requires a separate contract action, since the system's manufacturers are only interested and trained in their system. Some people feel this increases risk, while others argue that the increase is an illusion and that the benefits of this approach greatly outweigh any increase in risk.

Innovative Solution. This program had two separate activities, one out-of-system and one in-system. The Corps was responsible for performing the initial simple site work (such as staking a clearing, constructing roads and sidewalks, and connecting utilities); the winning bidder was responsible for providing the finished building in place. ORD and Louisville District favored this type of turnkey procurement. However, they noted that many of these facilities were being constructed faster than anticipated, so that some facilities would be erected as much as 2 years ahead of reservoir completion. Revising the contract to make the buildings available on demand was considered, but this was determined not to be a viable alternative. Louisville District also stated that contract administration for a combination construction-supply package typical of industrialized construction should be simplified and clarified.

Prerequisite 6. Matrix Management

Explanation. Traditionally, activities and decisions occur unilaterally. However, coordination among team members at key points increases efficiency, reduces misunderstanding, and is vital to the successful execution of novel processes and techniques.

Innovative Solutions. In this program, Corps and state personnel having the responsibility and authority to discuss differences in requirements and to arrive at a consolidated program met at key decision-making points. One of the main reasons for the success of the program was that all key personnel (planners, architects, specification writers, budget personnel, cost estimators, legal personnel, etc.) were involved initially and throughout the entire program, including the evaluation of the proposals. The states of Ohio, Indiana, and West Virginia provided registered architects for the evaluation board to insure that their requirements were known and that the acceptable designs would be readily approved by the states.

When debriefings were held with ORD and Louisville District to coordinate "lessons learned" from the program, the key persons involved throughout the program were consulted again.

4 MAJOR PROGRAM IMPLEMENTATION PROCEDURES

Since some procedures proposed for this program deviated from normal practice*, implementation procedures were developed to facilitate the adoption of the program. The flow chart documenting the participants and their activities (Appendix A) indicates that most participants perform the same functions as in previous programs. The only major additions are the early involvement of all persons and the assignment of a project manager.

The project manager should have the authority and responsibility to gather the required information, establish milestones, and make decisions based on the information which has been gathered. The person in this position should also have direct access to Division or District Engineers or their coordinators when making a decision which could potentially impact a program. The project manager should be involved in the program from its inception through the construction of the prototype facility or until completion of production of the required facilities.

Another important aspect of implementing this program is to insure that the funding identified by the conventional construction cost estimate is available. The following items should be handled with extreme care:

1. The contract should be designated as a continuing contract unless the monies for the total project are available in the fiscal year in which the program is bid.

2. ER 1180-1-1 paragraph 7-671.4[4], *Funds Available for Payment* should be referenced for continuing contracts. Subparagraph (e) should have the phrase "the

*For example, a Design/Development Team consisting of representatives from each organization participating in the program should be formed to bring organizations which impact the program at various stages together as a unit.

[4]"Contracts, Engineering Contract Instructions," Change 14, *ER 1180-1-1* (Department of Defense, 24 March 1972).

remainder of FY and" inserted between the words "during" and "subsequent."

3. When identifying the amount of money to be allocated for *Funds Available for Payment*, a small portion of those funds totally available can be specified, knowing that other funds have been or will be committed. This strategy is recommended so as not to influence the firms developing the potential bid package.

Two major procedures which should continue to be used in future programs are two-step formal advertising and the performance specification. CERL initially chose the TSFA method because performance specifications are the only design procedure which allows system building products to compete without arbitrary restrictions. The only DOD procurement techniques available which allow the use of performance specification are TSFA and One-Step Competitive Negotiation. Since One-Step is currently restricted to family housing, TSFA was chosen. Chapter 3 contains detailed discussions of both procedures.

5 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

As a result of the Ohio River Division (ORD) sanitary facility program, the Corps of Engineers was able to develop a methodology for obtaining facilities at Corps reservoir areas which can substantially reduce the costs of such facilities. The methodology consists of performance specifications, evaluation documentation, and procurement and program implementation procedures. CERL, ORD, and Louisville District developed a list of items that require consideration prior to initiating a similar project (Figure 11).

The objective of the ORD program was to reduce the costs of sanitary facilities within the Division without compromising the buildings' structural integrity or aesthetics. All involved agencies agreed that this program was extremely successful. Previous costs of conventionally constructed sanitary facilities in Ohio River Division ranged from $75 to $100/sq ft ($805 to $1075/$m^2$). This program yielded costs of approximately $35/sq ft ($375/m^2).

Several major technical advances were made in the program. The more important ones were the mass purchase and production of 78 identically constructed facilities and the treatment of the facility aesthetics. It was the first time that the Corps of Engineers had participated in procuring this number of facilities.

1. Insure that a Division or District wants to do this type of program.

2. Insure that one has command support.

3. If involved, cooperation of the states is essential – do not bypass them; maintain coordination.

4. For the first job in a region, performance specification and two-step procurement are essential (follow-on actions will require evaluation of the circumstances at the time).

5. Sufficient volume is necessary to take advantage of the learning curve phenomenon to gain cost savings.

a. Seventy-eight units are obviously satisfactory, as borne out by the Louisville/ORD results. Whether 20 is enough is undetermined.

b. The benefits (cost savings) gained by volume purchase must be carefully weighed against (1) coordination problems among states and other agencies, (2) scheduling and operation timing to accommodate the site preparation requirements and changes, (3) bonding and financial issues, and (4) potential Operation and Maintenance fund curtailment.

6. Insure that a prototype facility is included and evaluated against the specifications in a site setting, not at the factory.

7. For two-step procurement, a mid-term bidding conference is desirable.

8. The contract should spell out on what basis the contractor is to be paid.

9. A follow-on maintainability report within a year of construction of initial facilities is desirable.

10. Value Engineering will not be involved in most instances.

11. Initial jobs should include CERL as consultants.

Figure 11. Checklist for potential users of industrialized buildings for sanitary facilities.

At the conclusion of step one of the TSFA procedures, the Corps had five design proposals that were acceptable for the second phase of the procurement sequence. Any one of those submittals could have won the competition.

There were no restrictions on the type of manufacturer or method applied to the construction/erection of the facility. Industrialized builders were allowed to compete with conventional builders.

In conclusion, the sanitary facility project required many innovations to satisfy the necessary prerequisites. It is not claimed that all prerequisites have been met, because the necessary continuity and repetition are really only met if the specifications are standardized and purchases continue over a period of time. Nor is it proposed that following all of the prerequisites will insure success, because a bias, prejudice, or bad decision at any stage of the process can nullify all other positive efforts. However, the more successful a project is at satisfying the necessary prerequisites for a healthy industrialized building environment, the more likely that project will yield the anticipated successful results.

Recommendations

It is recommended that TSFA and performance specifications be used in future programs of this type.

However, because TSFA creates additional work for Districts and raises concern over possible litigation as a result of the determinations, development of a continuing, open prequalification system is recommended. This procurement solution would use the advantages of TSFA (performance specification) while minimizing its disadvantages.

The logical question to ask following the initiation of construction of the required facilities was "should this program be extended to Corps-wide application?" To answer this question, data were gathered on the number and type of sanitary facilities projected for construction by Corps of Engineers Civil Works District during FY 77 and 78 and the *Dodge Digest Cost of Construction Index*[5] for cities throughout the United States. Historical data from the *Dodge Digest* were gathered to identify the 1975 local construction cost index and provide an indication where high costs exist and may be reduced. The projections of the number of facilities scheduled for construction (Table 5) were gathered to identify the Districts within a given area that can aggregate a sufficient volume of business to motivate industry to respond to an RFTP. Figure 12 shows the data on a map for analysis of potential regional volume.

The data can be analyzed within Division boundaries or across Division boundaries. In most instances, within Division boundaries is preferred because of the program's required coordination. However, in the absence of sufficient volume within a Division, several District requirements must be aggregated across Division boundaries to obtain the potential cost savings. The data contained in Figure 12 indicate that the groupings in Table 6 are feasible for future programs. Additional groupings of Districts not contained in Table 6 may be possible.

The next step was to analyze the feasible combinations with respect to the data obtained for the *Dodge Digest* to determine if there is potential cost savings. To facilitate this analysis, the city index data points* were recorded on a map (Figure 13) and contour lines drawn to connect constant construction cost index levels. An example will help illustrate the meaning of the contour lines. If two contour lines are adjacent to one another and one is marked 80 and the other 90, the cost index levels between these two points escalate from 80 to 90, as shown in Figure 14. If a line marked 90 is next to the contour line marked 90, the region between these two lines is known as a ridge, and the cost index levels between these two lines are approximately the same.

If a city such as Fort Worth, TX has an index of 80, the cost of construction in New York City is approximately 25 percent higher than that of Fort Worth. Thus, if two identical buildings are conventionally constructed in New York and Fort Worth, the former building can be expected to cost more. The information in Figure 13 is valuable for planning future programs, because it identifies those regions which are experiencing high conventional construction costs and are feasible for an off-site systems approach to construction, with potential high savings. Those areas with a lower cost index are still feasible for cost savings, but the savings may not be as great as in high cost areas. The facilities in the ORD program were within an area bounded by the 80 and 90 contour lines. Thus, cost savings are likely to be achieved in most areas in the country where

[5] *Dodge Digest of Building Costs and Specifications*, 20th ed. (McGraw-Hill Information Systems Co., 1975).

*The *Dodge Digest* uses New York City as 100, and other cities' costs are equated to it based on experienced construction cost.

sufficient facility aggregation and design uniformity can be obtained. The *Dodge Digest* cost index data suggest that the South Atlantic Division is not experiencing as high a cost of facilities as the Ohio River Division, indicating that savings there may not be as great.

Since this program was the first of its type, additional data must be gathered on the number of facilities required to be aggregated for cost savings in the various regions of the country. However, the projected data on the FY 77/78 comfort station and washhouse construction program indicate that there is a sufficient number of facilities which can be aggregated into a program for continuation of the procedures used in the Ohio River Division. It is recommended that several programs from the groups identified in Table 6 be initiated immediately.

Table 5
Projected Division/District FY 77/78 Comfort Station and Washhouse Construction Program

DIVISIONS AND DISTRICTS:	Contact and Phone Number	Number of Comfort Stations		Number of Washhouses		Remarks
		77	78	77	78	
U. S. Army Engineer Division, Lower Mississippi Valley						
U. S. Army Engineer District, Memphis	Environmental Resource Section 222-3857	Ø	1	1	1	1 project
U. S. Army Engineer District, New Orleans	Recreation Resource Management Branch 687-1121 X493	Ø	1	6	2	3 projects
U. S. Army Engineer District, St. Louis	Project Planning Branch 278-2122	5*	6*	2	4	*Includes 2 vault types, 2 projects
U. S. Army Engineer District, Vicksburg	Environmental Analysis Branch 542-4544	44*	Cont	14	Cont	3 projects 4 projects *Includes 18 vault types
U. S. Army Engineer Division, Missouri River						
U. S. Army Engineer District, Kansas City	Basin Planning Branch 758-3403	6	33	4	25	8 projects
U. S. Army Engineer District, Omaha	Engineering Design Branch 864-4468	17	Cont	5	Cont	1 project
U. S. Army Engineer Division, New England	Environmental Analysis Branch 839-7552	1	5	1	Ø	7 projects
U. S. Army Engineer Division, North Atlantic						
U. S. Army Engineer District, Baltimore	Project Planning Branch 922-4970	Ø	8*	Ø	1	1 project, *includes 3 vault types, not included 1 bath house (waterborne)
U. S. Army Engineer District, New York	Environmental and Economics Branch 264-4662	1*	Ø	Ø	Ø	*located at West Point
U. S. Army Engineer District, Norfolk	Design Branch 924-3757	9*	Cont	6	Cont	1 project, *includes 5 comfort stations with shelter, does not include 1 bath house
U. S. Army Engineer District, Philadelphia	Design Branch 597-4753	Ø	Ø	Ø	Ø	

Table 5 (con't)

DIVISIONS AND DISTRICTS:	Contact and Phone Number	Number of Comfort Stations 77	78	Number of Washhouses 77	78	Remarks
U. S. Army Engineer Division, North Central						
U. S. Army Engineer District, Buffalo	Environmental Resource Branch 473-2454	Ø	Ø	Ø	Ø	
U. S. Army Engineer District, Chicago	Project Development Branch 353-6517	1	Ø	Ø	Ø	1 project
U. S. Army Engineer District, Detroit	Project Development Branch 226-6775	Ø	Ø	Ø	Ø	
U. S. Army Engineer District, Rock Island	Operations Branch 360-6332	22	Ø	Ø	Ø	1 project
U. S. Army Engineer District, St. Paul	Project Operations Branch 725-7561	1	Ø	1	Ø	2 projects
U. S. Army Engineer Division, North Pacific						
U. S. Army Engineer District, Portland	Recreational/Planning Section 424-4451	7	Cont	6	Cont	5 projects
U. S. Army Engineer District, Seattle	Civil Design Section 399-3445	7	Cont	1	Cont	3 projects
U. S. Army Engineer District, Walla Walla	Land Use and Environmental Section 442-5310	13	2	Ø	Ø	7 projects
U. S. Army Engineer Division, Ohio River						
U. S. Army Engineer District, Huntington	Technical Engineering Branch–ORD 684-3025	8	20	7	4	*Includes 11 vault 7 projects
U. S. Army Engineer District, Louisville	Technical Engineering Branch–ORD 684-3025	Ø	1	1	Ø	1 project
U. S. Army Engineer District, Nashville	Technical Engineering Branch–ORD 684-3025	3	2	Ø	2	5 projects
U. S. Army Engineer District, Pittsburgh	Technical Engineering Branch–ORD 684-3025	2	6	Ø	Ø	2 projects *Includes 4 vault
U. S. Army Engineer Division, South Atlantic						
U. S. Army Engineer District, Charleston	Environmental Resource Branch 677-4258	Ø	Ø	1	Ø	1 project
U. S. Army Engineer District, Jacksonville	Recreational Section 946-2400	4	2	Ø	Ø	@local flood control projects
U. S. Army Engineer District, Mobile	Environmental Resource Branch 534-2654	21*	Cont	7**	2	**same facilities continued in FY 78, *includes 12 vault type
U. S. Army Engineer District, Savannah	Recreational Branch 287-8325	18	17	9	9	3 projects
U. S. Army Engineer District, Wilmington	Master Planning Section	1	10	1	4	2 projects
U. S. Army Engineer Division, South Pacific						
U. S. Army Engineer District, Los Angeles	Environmental Resource Branch 798-5413	3	9	2	3	3 projects (77), 10 projects (78)

Table 5 (con't)

DIVISIONS AND DISTRICTS:	Contact and Phone Number	Number of Comfort Stations 77	78	Number of Washhouses 77	78	Remarks
U. S. Army Engineer District, Sacramento	Operations Branch 448-2326	5	4	6	8	4 projects (77), 2 projects (78)
U. S. Army Engineer District, San Francisco	Civil Design Section 556-8978	Ø	1	Ø	Ø	Plan to construct 5 residence (single family) @ 1 project
U. S. Army Engineer Division, Southwestern						
U. S. Army Engineer District, Albuquerque	Environmental Resource Section 474-3577	5*	Cont	2	Cont	*include 2 vaults; 3 projects
U. S. Army Engineer District, Galveston	Environmental Resource Branch 527-6312	Ø	Ø	Ø	Ø	
U. S. Army Engineer District, Little Rock	Environmental Resource Branch 740-5751	14	4 (min)	Ø	Ø	7 projects
U. S. Army Engineer District, Fort Worth	Program Development Branch 334-3892	6	n/avail	Ø	n/avail	4 projects
U. S. Army Engineer District, Tulsa	Environmental Resource Branch 736-7878	10*	26**	Ø	4	*Include 7 vault; **Include 24 vault; 2 projects

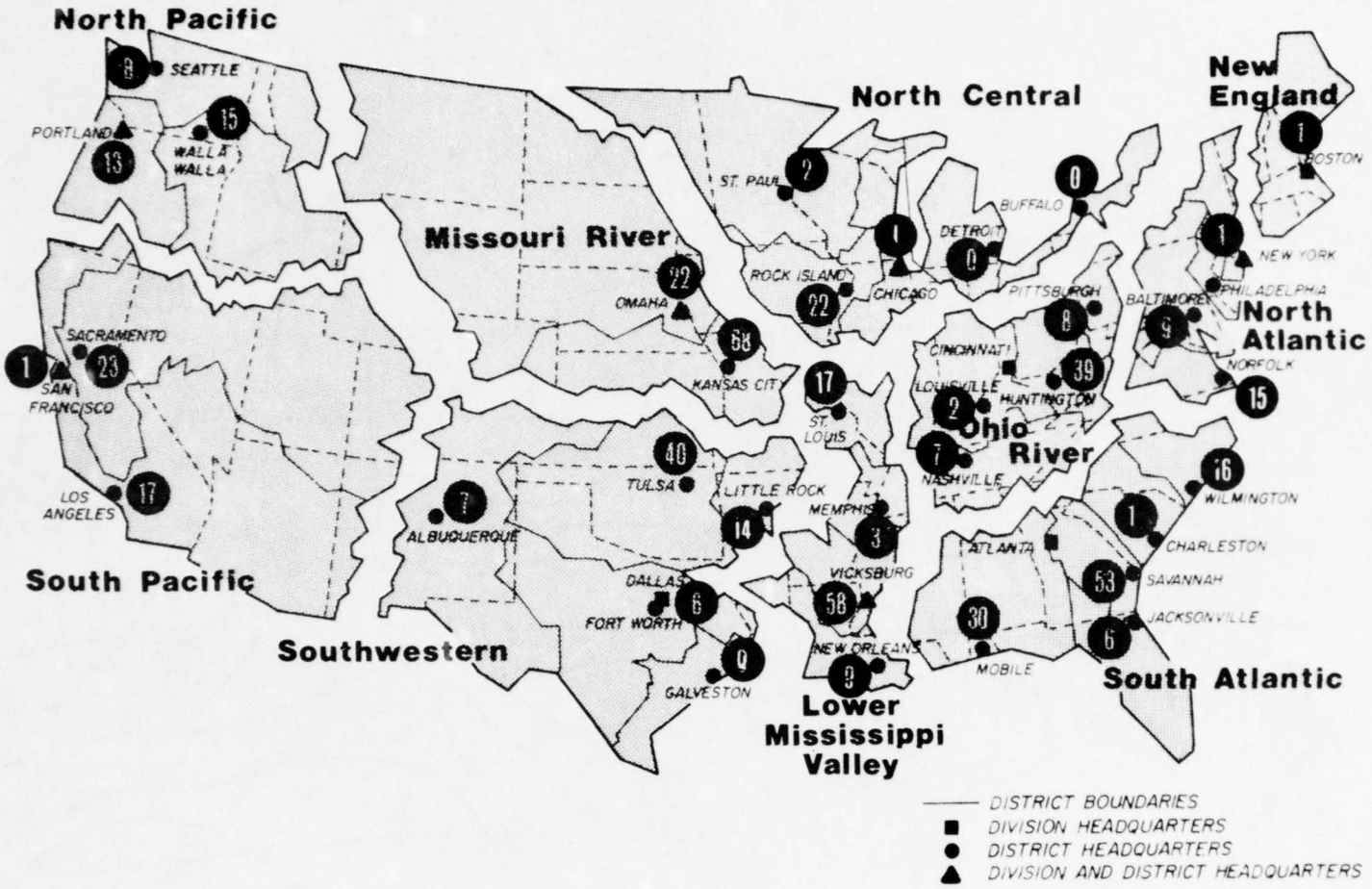


Figure 12. Total FY 77/78 construction program for civil works Divisions and Districts.

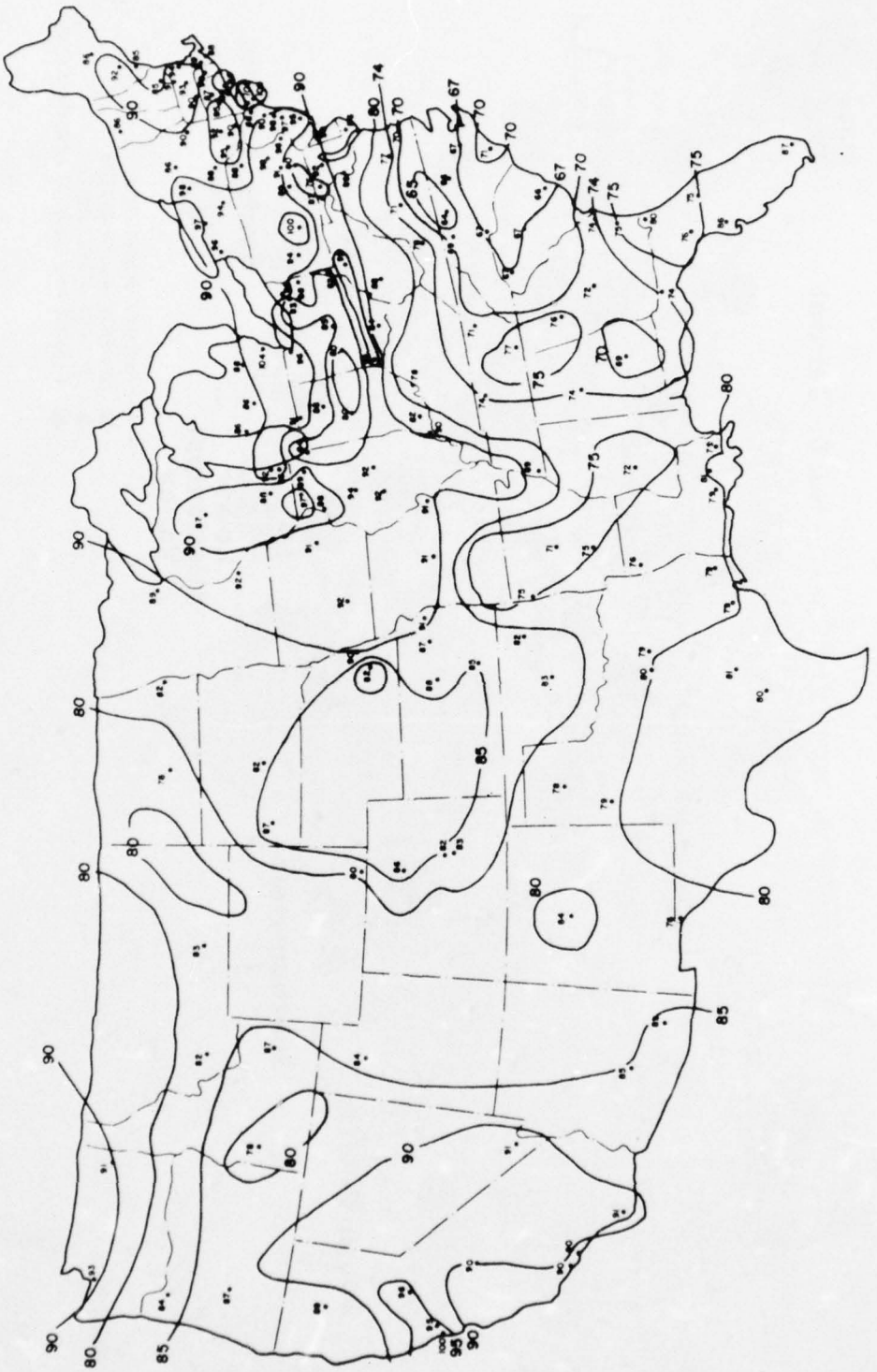


Figure 13. *Dodge Digest* city index data points.

Table 6
Division and District Groups of FY 77/78 Construction Requirements

	Group		Number of Facilities
Group A	North Pacific Division		36
Group B	South Pacific Division		41
Group C	Missouri River Division		90
Group D	Omaha		22
	Kansas City		68
	Rock Island		22
		TOTAL	112
Group E	Kansas City		68
	Tulsa		40
	Little Rock		14
	St. Louis		17
		TOTAL	139
Group F	Vicksburg		58
	New Orleans		9
		TOTAL	67
Group G	Mobile		30
	Savannah		53
		TOTAL	83
Group H	South Atlantic Division		106
Group I	Tulsa		40
	Little Rock		14
		TOTAL	54

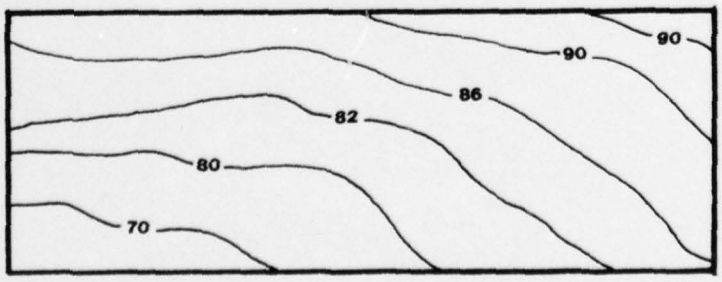
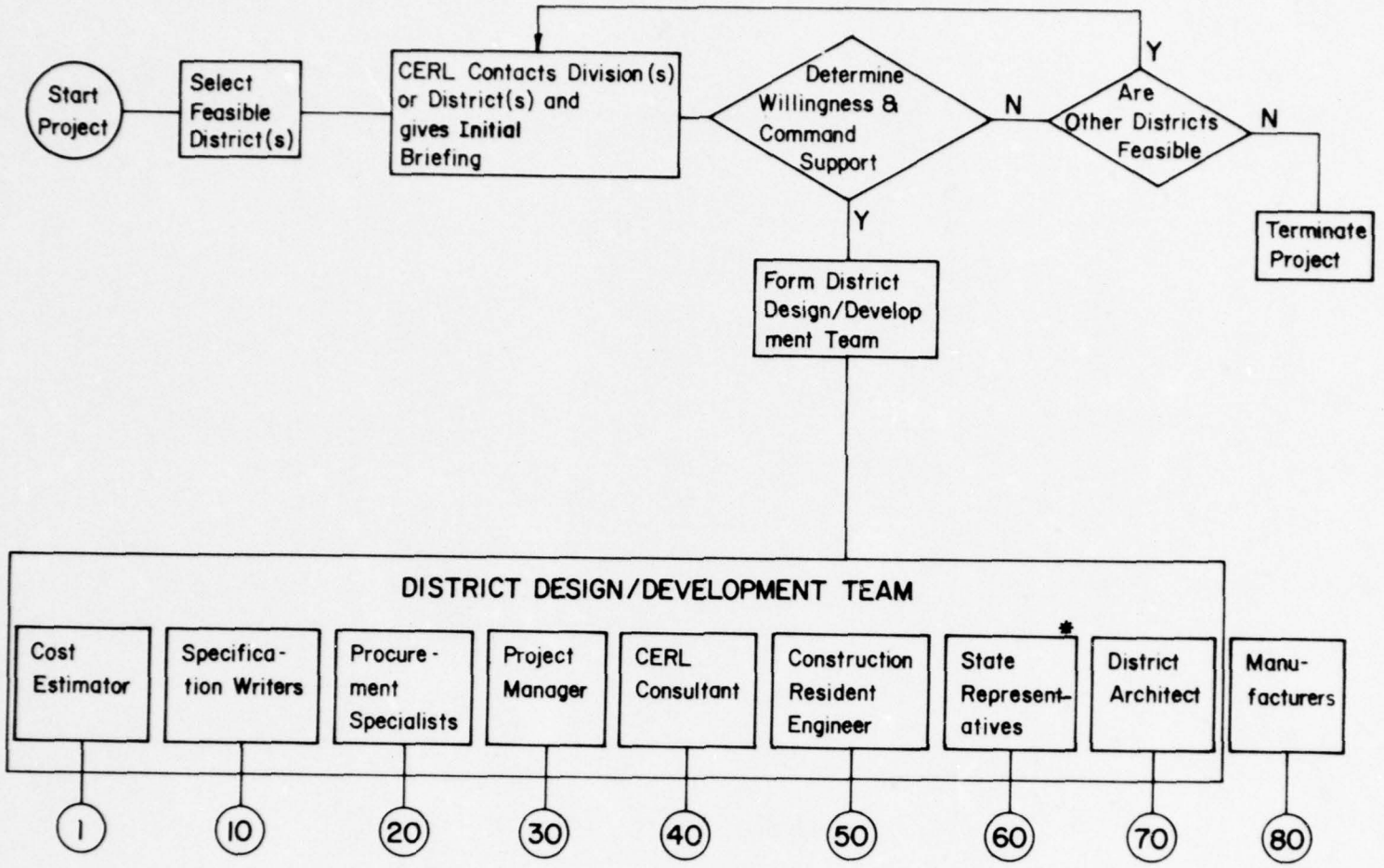


Figure 14. Example contour lines.

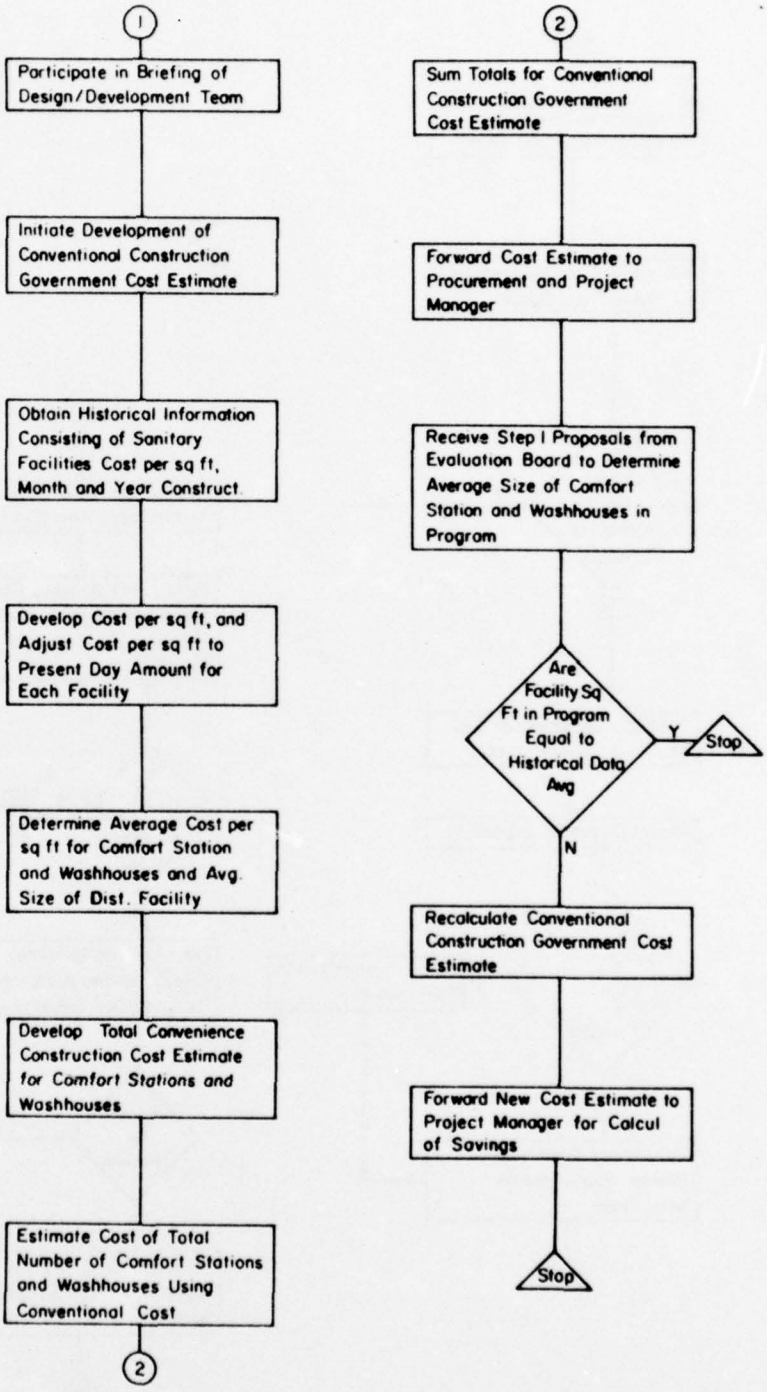
APPENDIX A: PROGRAM IMPLEMENTATION FLOW CHART

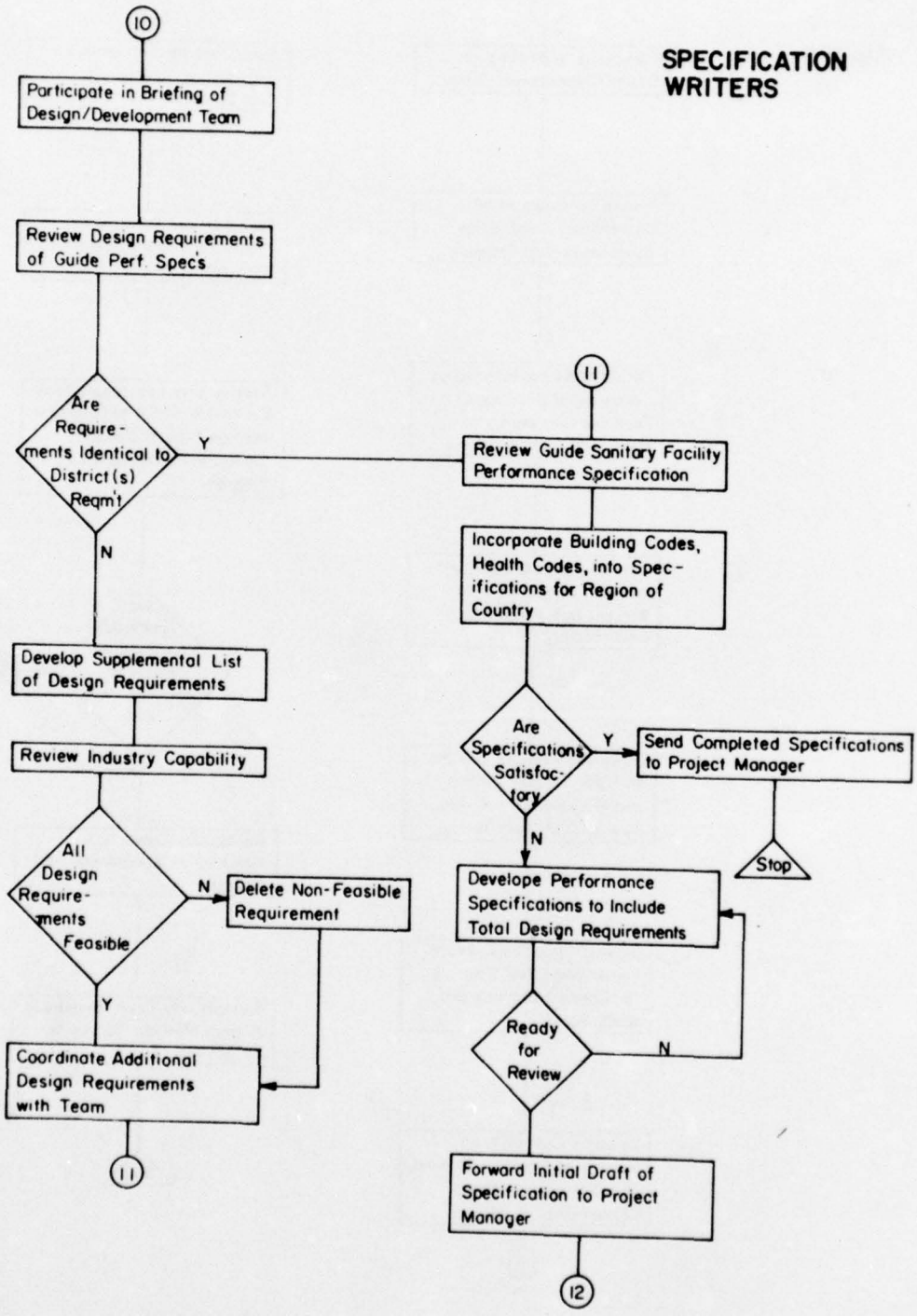
PRECEDING PAGE BLANK-NOT FILMED

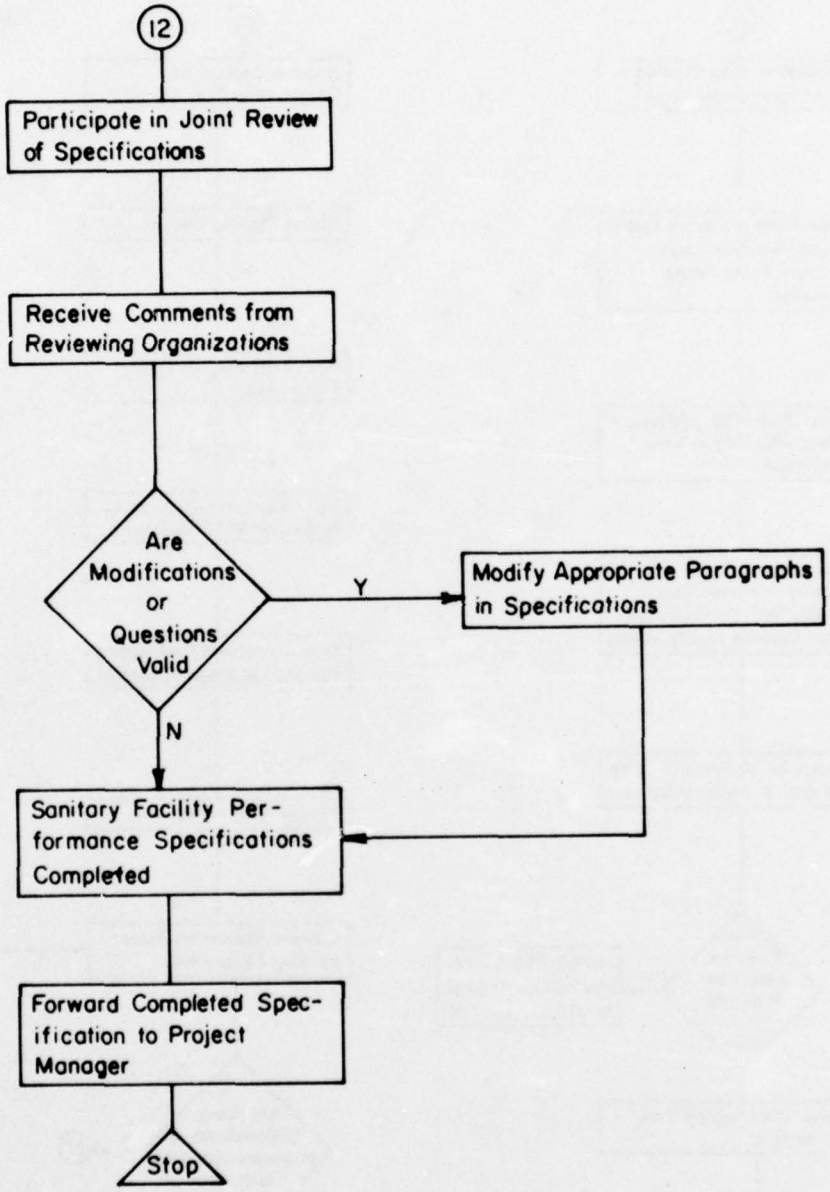


*IF REPRESENTATION OF STATES IS REQUIRED, EACH STATE SHOULD PROVIDE AN ARCHITECT FOR THE TEAM

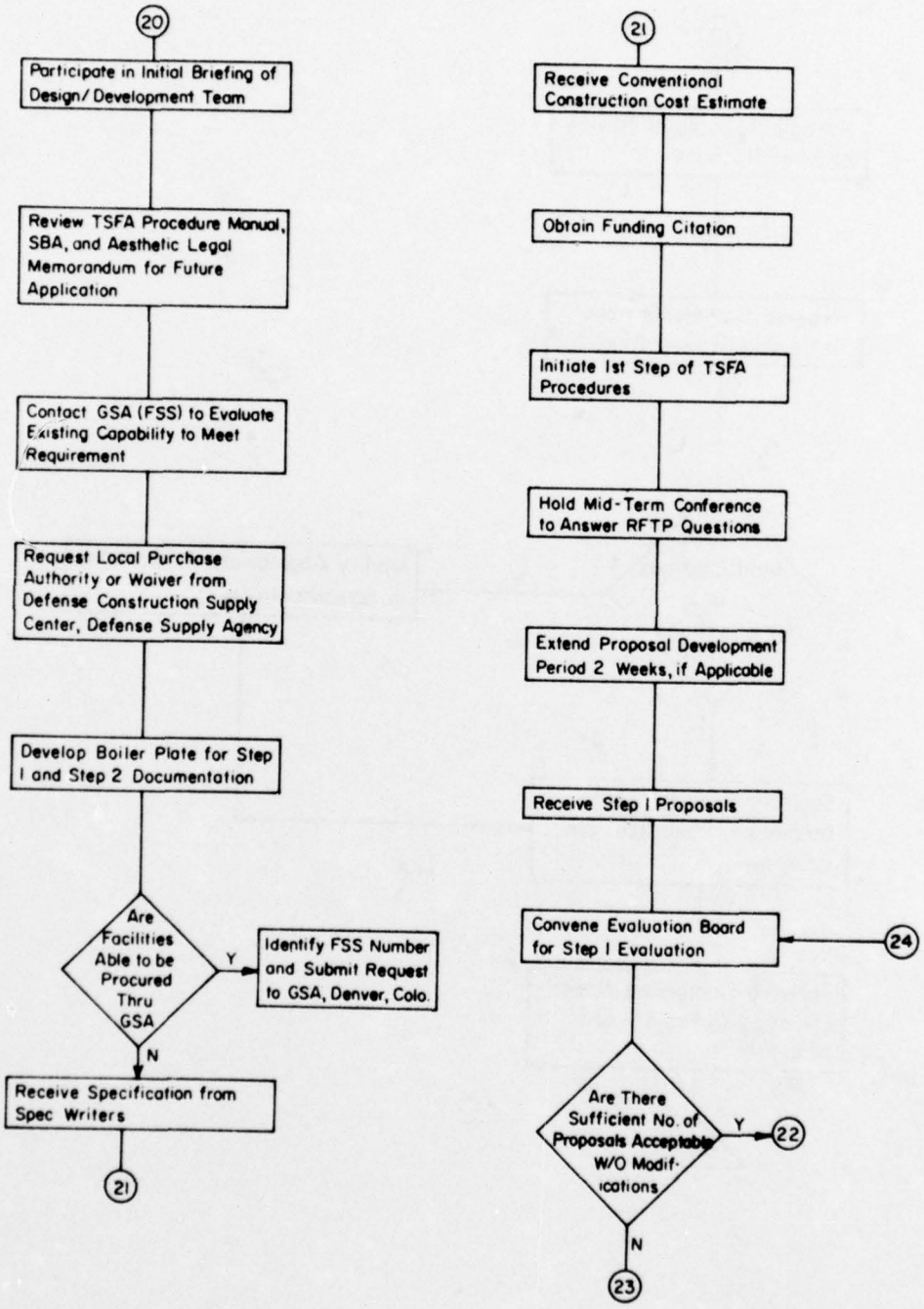
COST ESTIMATOR

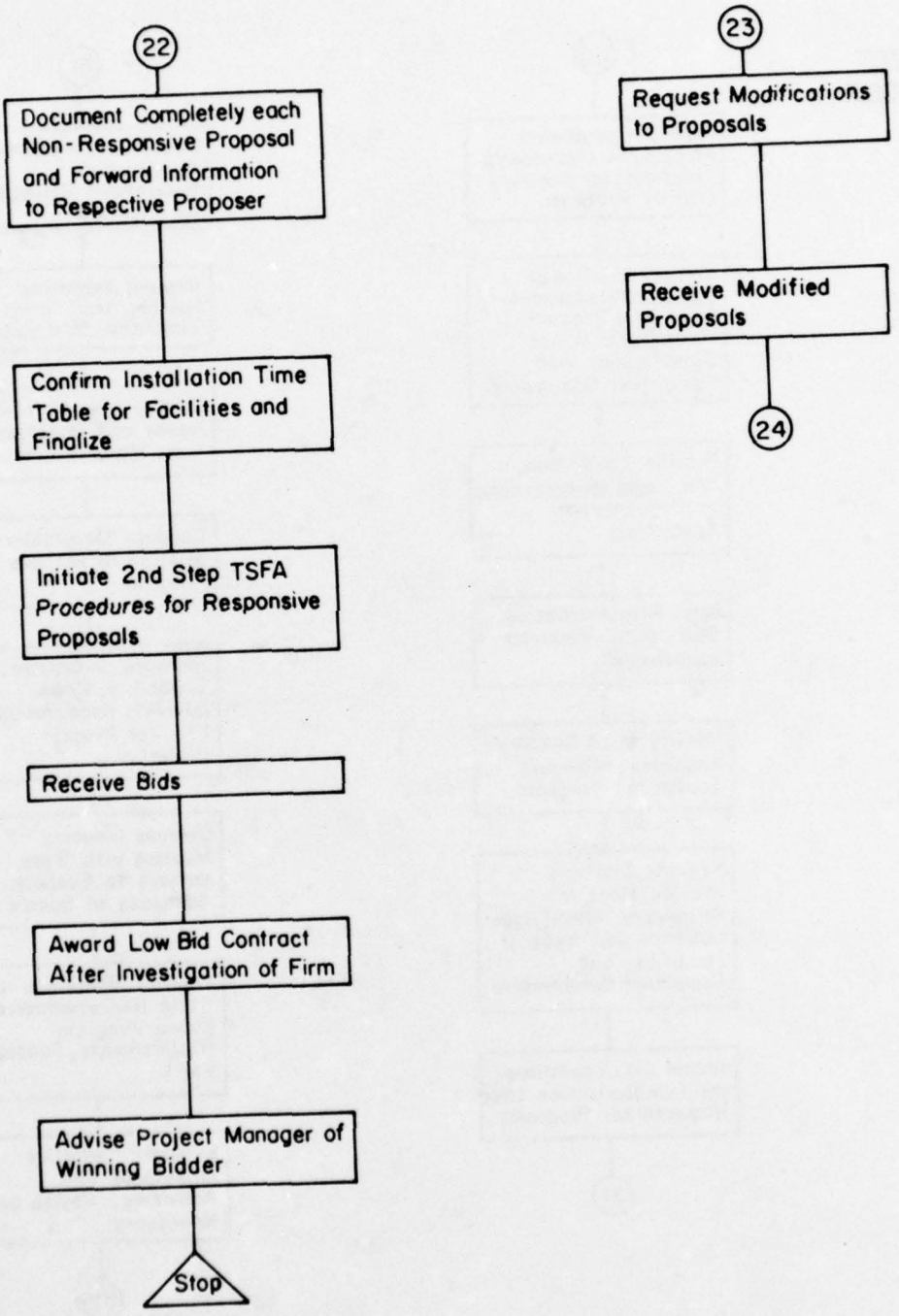



SPECIFICATION WRITERS
10
Participate in Briefing of Design/Development Team
Review Design Requirements of Guide Perf. Spec's
Are Require-ments Identical to District(s) Reqm't
Y
N
11
Review Guide Sanitary Facility Performance Specification
Incorporate Building Codes, Health Codes, into Spec-ifications for Region of Country
Develop Supplemental List of Design Requirements
Review Industry Capability
All Design Require-ments Feasible
N
Delete Non-Feasible Requirement
Y
Coordinate Additional Design Requirements with Team
11
Are Specifications Satisfac-tory
Y
Send Completed Specifications to Project Manager
Stop
N
Develope Performance Specifications to Include Total Design Requirements
Ready for Review
N
Forward Initial Draft of Specification to Project Manager
12

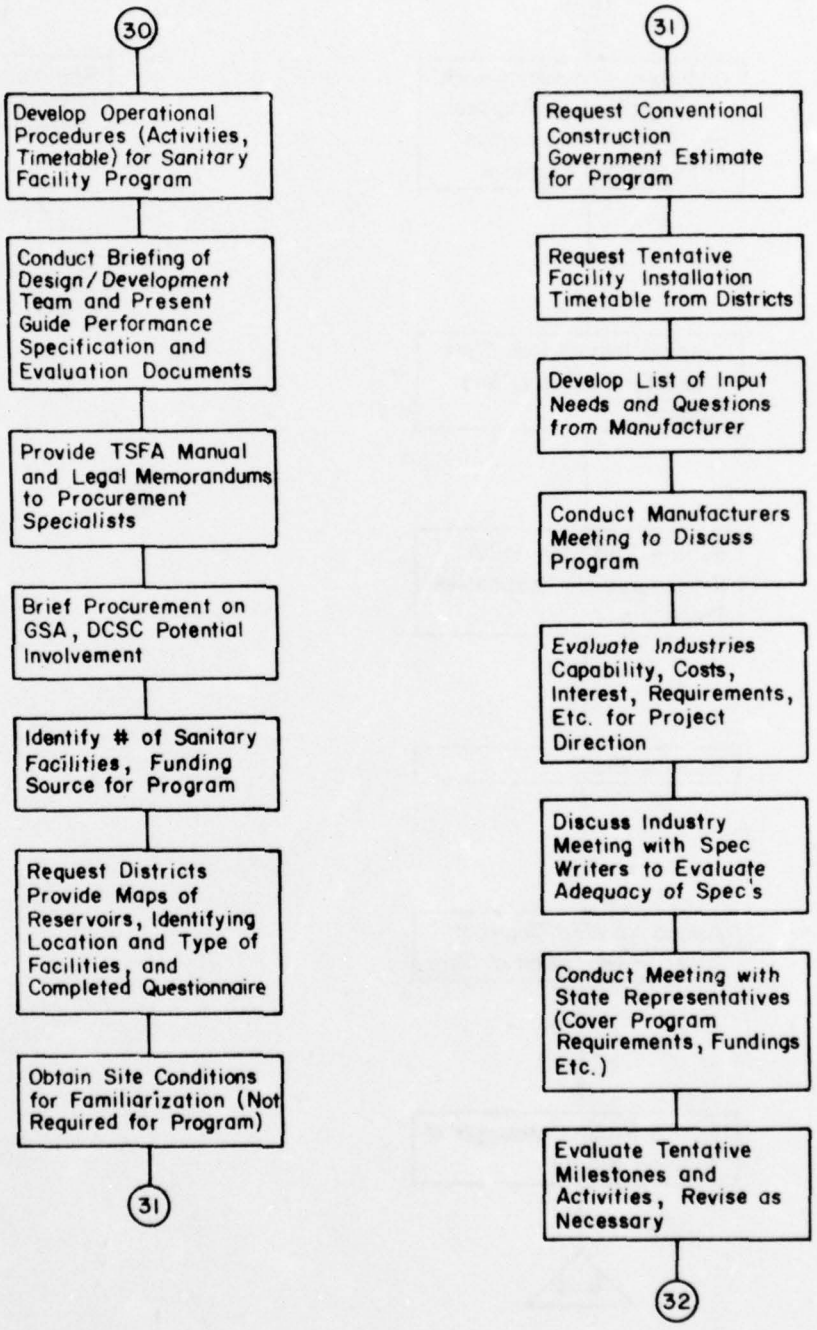

12
Participate in Joint Review of Specifications
Receive Comments from Reviewing Organizations
Are Modifications or Questions Valid
Y
Modify Appropriate Paragraphs in Specifications
N
Sanitary Facility Performance Specifications Completed
Forward Completed Specification to Project Manager
Stop

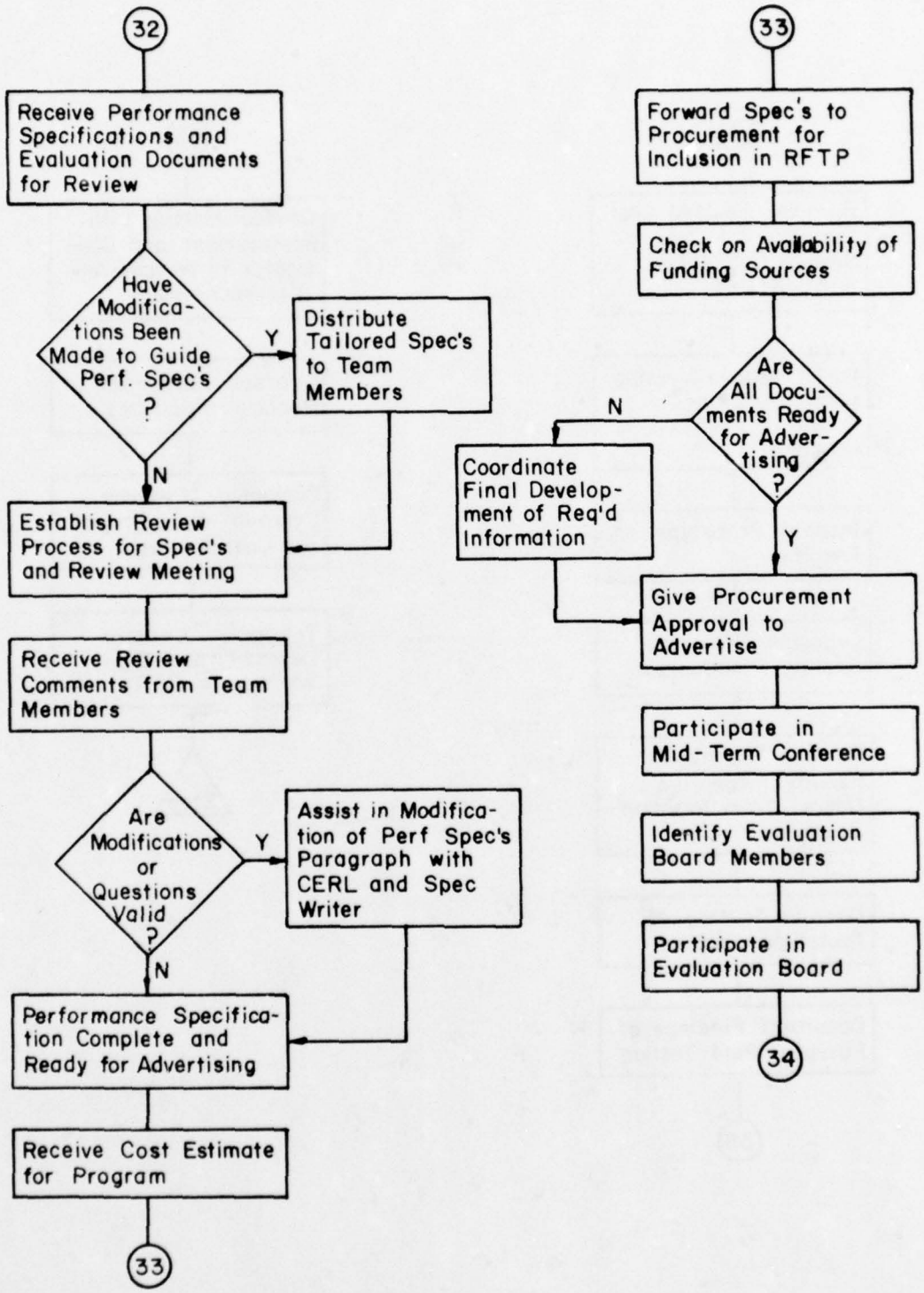
PROCUREMENT SPECIALIST

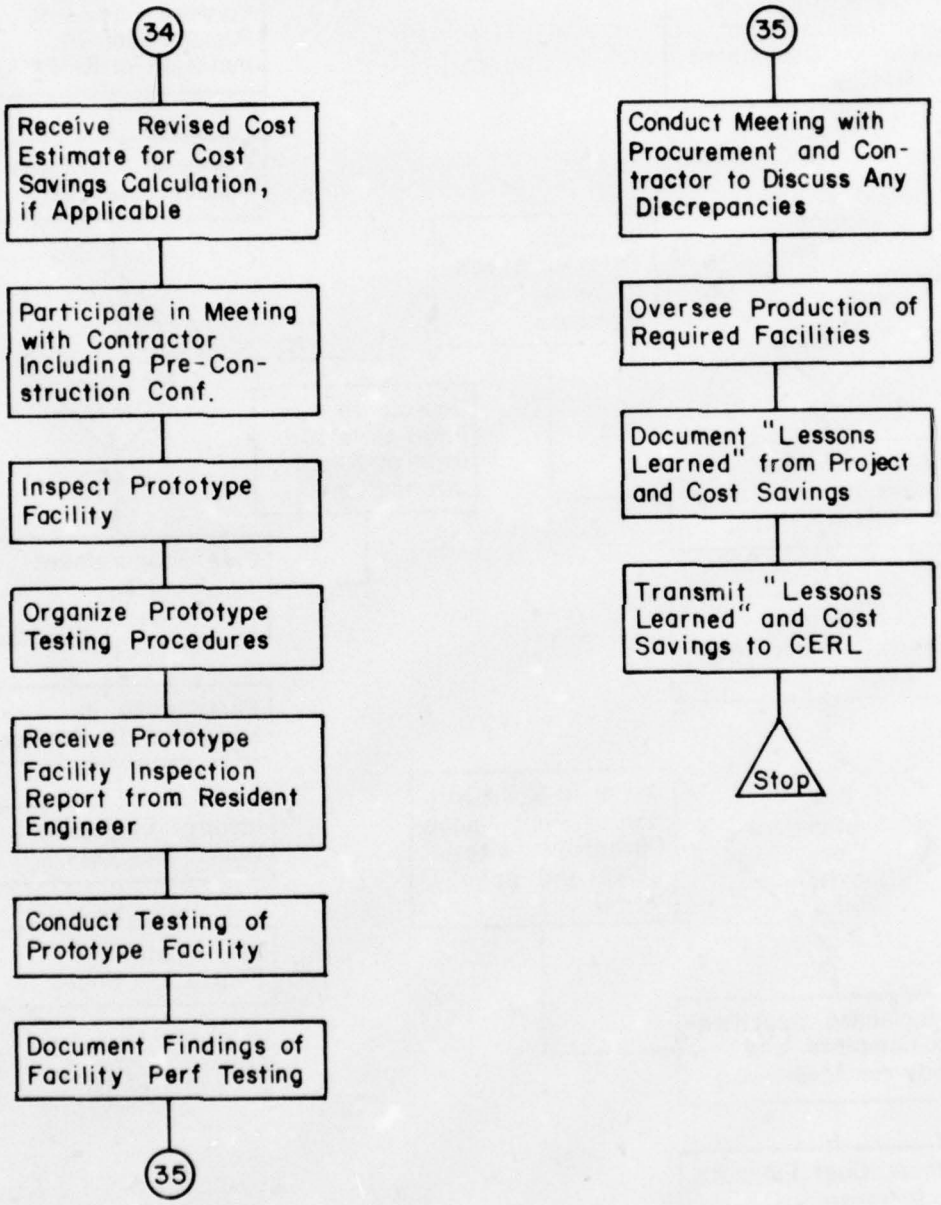



22
Document Completely each Non-Responsive Proposal and Forward Information to Respective Proposer
Confirm Installation Time Table for Facilities and Finalize
Initiate 2nd Step TSFA *Procedures* for Responsive Proposals
Receive Bids
Award Low Bid Contract After Investigation of Firm
Advise Project Manager of Winning Bidder
Stop
23
Request Modifications to Proposals
Receive Modified Proposals
24

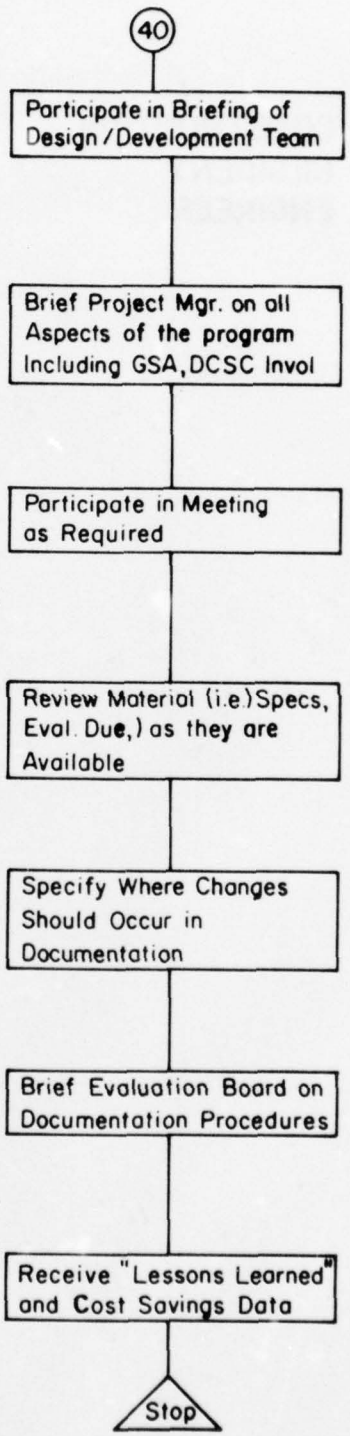
PROJECT MANAGER



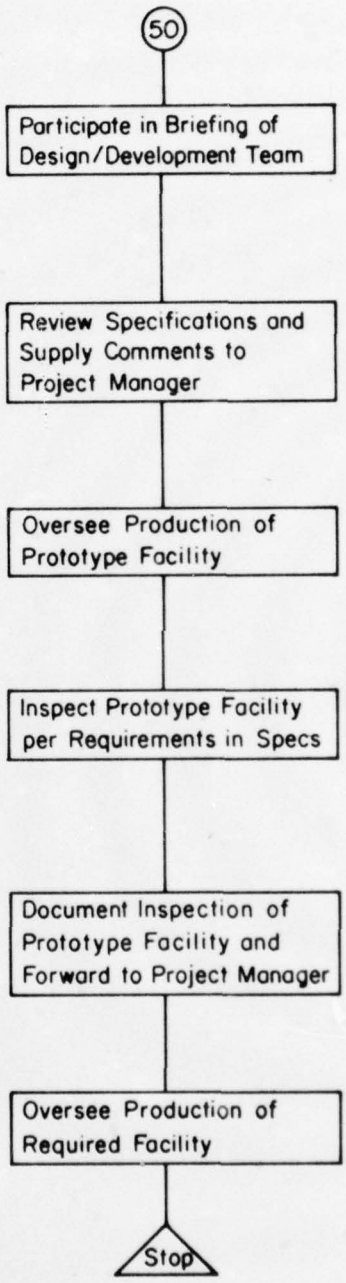

32
Receive Performance Specifications and Evaluation Documents for Review
Have Modifications Been Made to Guide Perf. Spec's ?
Y
Distribute Tailored Spec's to Team Members
N
Establish Review Process for Spec's and Review Meeting
Receive Review Comments from Team Members
Are Modifications or Questions Valid ?
Y
Assist in Modification of Perf Spec's Paragraph with CERL and Spec Writer
N
Performance Specification Complete and Ready for Advertising
Receive Cost Estimate for Program
33
33
Forward Spec's to Procurement for Inclusion in RFTP
Check on Availability of Funding Sources
Are All Documents Ready for Advertising ?
N
Coordinate Final Development of Req'd Information
Y
Give Procurement Approval to Advertise
Participate in Mid-Term Conference
Identify Evaluation Board Members
Participate in Evaluation Board
34


34
Receive Revised Cost Estimate for Cost Savings Calculation, if Applicable
Participate in Meeting with Contractor Including Pre-Construction Conf.
Inspect Prototype Facility
Organize Prototype Testing Procedures
Receive Prototype Facility Inspection Report from Resident Engineer
Conduct Testing of Prototype Facility
Document Findings of Facility Perf Testing
35
35
Conduct Meeting with Procurement and Contractor to Discuss Any Discrepancies
Oversee Production of Required Facilities
Document "Lessons Learned" from Project and Cost Savings
Transmit "Lessons Learned" and Cost Savings to CERL
Stop

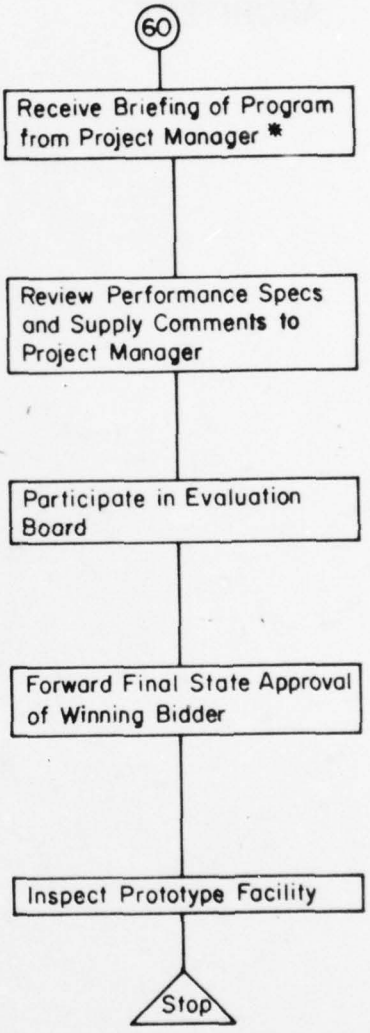
CERL CONSULTANT



CONSTRUCTION RESIDENT ENGINEER

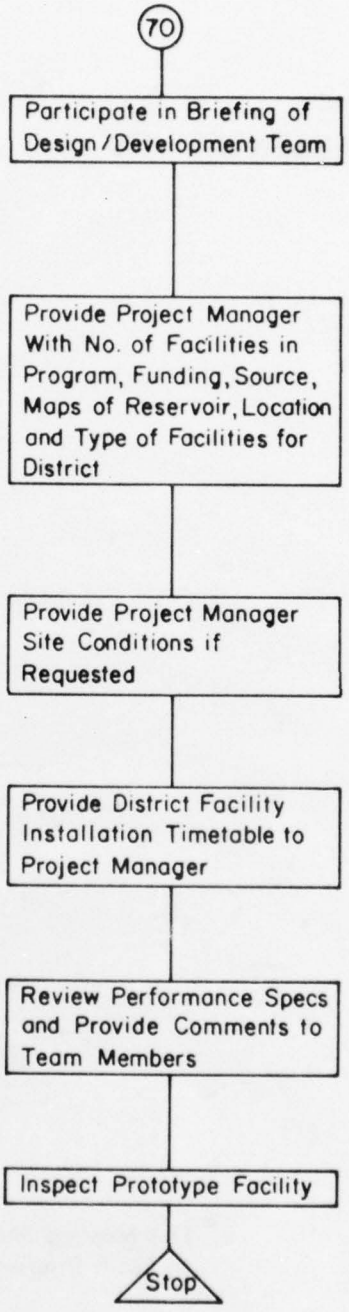


STATE REPRESENTATIVES

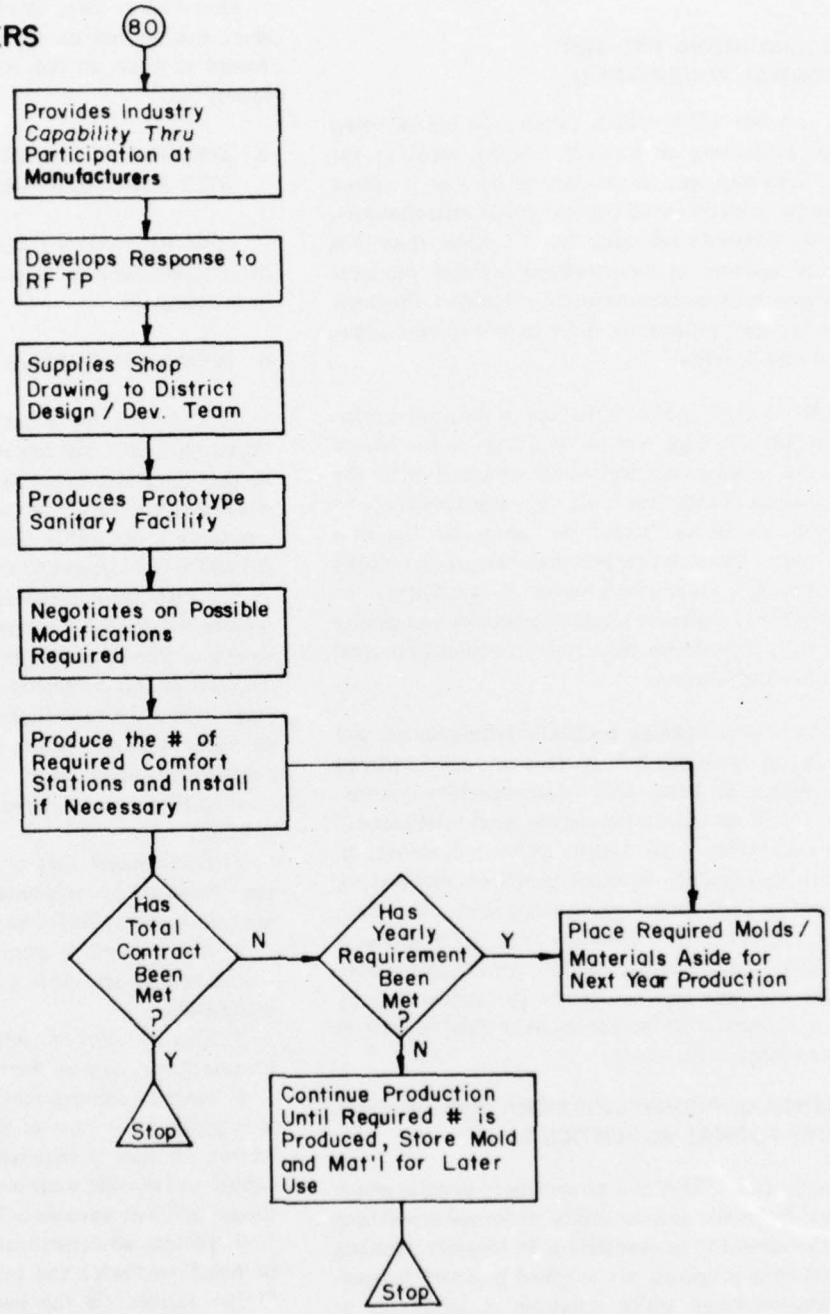


* This Meeting Should Occur Subsequent to Team Briefing

DISTRICT ARCHITECT



MANUFACTURERS



APPENDIX B: PROCEDURES FOR UTILIZATION OF TWO-STEP FORMAL ADVERTISING*

1 BACKGROUND TWO-STEP FORMAL ADVERTISING

In October 1974, CERL decided to use two-step formal advertising to procure sanitary facilities for ORD. Two-step was chosen largely because it allows for the participation of all building products/techniques, not just conventional ones. For example, there has been an increase in industrialized building product/techniques such as panel or modular builders. Procured correctly, they potentially offer improved cost, time, and quality benefits.

CERL research indicates that one of the main reasons for the present high cost of buildings is the use of restrictive procurement techniques which allow for the participation of only one building product/technique—the conventional or "stick-built" approach. Use of a more open, unrestrictive procurement process allows all potential products/techniques to participate. In this way the free-market forces of economy and quality rather than an arbitrary, restrictive procurement process determine the solution.

Conventional building products/techniques are not excluded in two-step. Rather, they are merely denied the privilege of being in a noncompetitive posture. Hopefully, some innovative conventional solutions will result. Given the cost factors present, however, an industrialized builder—whether panelized, modular, or whatever—is in the most propitious position to submit a low, responsive bid. However, whichever product/technique submits the winning bid, the maximum cost, quality, and time benefits can be guaranteed only by using a nonrestrictive procurement technique such as two-step formal advertising.

2 GENERAL PRINCIPLES/OPERATION OF TWO-STEP FORMAL ADVERTISING

Simply put, TSFA is a procurement process which bridges the public accountability of formal advertising with the versatility of negotiation. In step one, requests for technical proposals are solicited pursuant to specifications/drawings which establish a minimum or "threshold" level of acceptability. Submitted proposals are evaluated by technical experts to determine if they are "responsive"—i.e., whether they meet or exceed the minimum threshold.

Step two is then, in effect, an invitation for bid, since bidders bid on their own responsive proposal. Award is made to the responsive proposal with the lowest bid.

3 SPECIFIC MECHANICS AND RULES OF TWO-STEP FORMAL ADVERTISING

Table B1 presents the specific mechanics and rules or considerations for two-step formal advertising used in this program.

4 SPECIAL CONCERNS

1. Note that the bidder is being asked to provide a "total package." The impact on wage rates appears to be that the Davis-Bacon Act will only apply to on-site work and not to off-site work, even though such off-site work is ostensibly construction. (See Comp. Gen. B-148076 (1963); and 43 Comp. Gen. 84).
2. CERL recommends holding a preproposal conference during the proposal period (during the fourth week) to answer questions/problems about the RFTP. The end of this conference would also be a convenient time to end the submittal of corrections to the RFTP by bidders. Also, where a correction is submitted and subsequently accepted, the Corps should send an addendum to all proposers apprising them of this correction/revision.
3. Recommend that copies of pertinent pages of the referenced guides/manuals/standards that proposers are held accountable for be provided on request.
4. Recommend, if permissible, progress payments with a certain percent (e.g., 10 percent) retained until completion.
5. Identify sites in step one, and state that the manufacturer can view them.
6. Identify delivery schedule in step two. If desired, it is possible for time of delivery to be an evaluation factor. All that is required is to establish a delivery date(s) and provide some evaluation factor for each day the offered date exceeds or betters the established date.
7. Formal advertisement specifies that award will be based on "price and other factors." One of these "other factors" is the projected "maintenance and operating costs." Where the basis for the computation of a bid evaluation factor is clearly spelled out in step one, in such terms as to give the bidder a reasonably clear idea of how the evaluation factor will work, then such evaluation is valid. (See 36 Comp. Gen. 380 (1956).)

*Prepared by Mr. M. G. Carroll, CERL Legal Advisor, April 1975.

Table B1
Specific Mechanics and Rules of Two-Step Formal Advertising

Mechanics	Special Rules/Considerations
Step One	
1. The RFTP may be in the form of a letter, known as a *Letter Request for Technical Proposal (LRFTP).*	
2. The RFTP must contain, at a minimum:	See generally ASPR 2-5031
a. The best practicable description of the supplies or services required	Note: Effort has been made to state requirements in as unrestrictive a fashion as possible so as to encourage competition. Acceptable/unacceptable parameters were based as much as possible on functions and bonafide needs. Hopefully, all arbitrary, unnecessary requirements have been removed or revised.
b. *Notification of the intent to conduct the procurement in* two steps and the actions involved	
c. *The requirements of the technical proposal,* i.e., the necessary details such as drawings, data, presentations, etc., to be submitted	Note: To make an accurate, thorough evaluation, perhaps more than concept drawings, perhaps even working drawings should be requested. The point is that enough data must be requested to make an accurate, reliable evaluation.
d. The criteria for evaluating the technical proposal; these *should consist of design, manufacturing, testing, and* performance requirements	It is important to note that technical evaluations will be upheld by the GAO "unless there is clear evidence of fraud, abuse of authority, or arbitrary action." (48 Comp. Gen 49 (1968), 10 G.C. 406; B-161613 (Aug 28, 1967); B-165771 (April 28, 1969). Nevertheless, all efforts should be made to perform as accurate and reliable an evaluation as possible. A letter from E. J. Worrel, CERL, identified CERL's recommendation for the technical team. Note also that the specifications contain an "aesthetically pleasing" requirement to be evaluated by a team of architects. This test should be repeated in the evaluation section as an evaluation criteria. CERL also recommends that a clause be used to provide that during the evaluation, the evaluation team may, if it deems *necessary, require* the bidder to supply testing certification of the item in question. The team should make this request only when necessary. Requests should be cognizant of the close of *the proposal period.* Wherever a requirement is made for a bidder to provide laboratory certification, the following clause should be used per 33 Comp. Gen. 573, "*The contractor shall submit proof that the (state the item)* which he proposes to furnish under this specification conforms to the standards of the (list appropriate testing organizations). *The label of (listed testing organizations)* shall be accepted as conforming to this requirement. *In lieu of this label,* the contractor may submit a written certification from any nationally recognized testing agency, adequately equipped and competent to perform such services, *that the (state item)* has been tested and conforms to the standards, including methods of test, of the (listed testing organizations)."
e. A statement that the technical proposals shall not include prices or pricing information	

Table B1 (con't)

Mechanics	Special Rules/Considerations
f. The date or date and hour by which the proposal must be received and the Late Technical Proposals provision in ASPR 7-2002.3 (this replaces paragraphs 7 and 8 of Standard Form 33A)	Note: State clearly whether or not late proposals will be accepted. If they are to be considered, there should be nothing in the RFTP inconsistent with such considerations. (See 52 Comp. Gen. 726 [1973].
g. A statement that in the second step of the procurement only bids based upon technical proposals determined to be acceptable, either initially or as a result of discussions, will be considered for awards; and that each bid in the second step must be based on the bidder's own technical proposals	
h. A statement that offerors are advised to submit proposals which are fully and clearly acceptable without additional explanation or information, since the government may make a final determination as to whether a proposal is acceptable or unacceptable solely on the basis of the proposal as submitted and proceed with the second step without requesting further information from any offeror; however, if the government deems it necessary to obtain sufficient acceptable proposals to assure adequate price competition in the second step or deems it otherwise desirable in its best interest, the government may, in its sole discretion, request additional information from offerors of proposals which the government considers reasonably susceptible of being made acceptable by additional information clarifying or supplementing but not basically changing any proposal as submitted, and, for this purpose, the government may discuss any such proposal with the offeror	
i. A statement that each source submitting an unacceptable technical proposal will be so notified upon completion of the technical evaluation of his proposal, and final determination of such unacceptability	
j. A statement either that only one technical proposal may be submitted by each offeror or that multiple technical proposals may be submitted. When compliance with specification permits utilization of essentially different technical approaches, it is generally in the interest of the government to authorize the submission of multiple proposals. If multiple proposals are authorized, the request shall include the clause in ASPR 7-2003.36.	Note: A low bid in the second step on a technical proposal found acceptable under step one is eligible for award even though the bid also included an unacceptable alternative. (46 Comp. Gen. 807).
3. Also, although the Government's delivery or performance requirements are not evaluation factors under step one, information about those requirements may be of assistance to potential bidders in determining whether or not to submit a technical proposal. Accordingly, a request for technical proposals may contain a statement indicating what the Government's probable contract delivery or performance requirements will be. The statement shall also advise that such information is not binding on the Government and that the Government's actual delivery or performance requirements will be contained in invitations for bids issued under step two.	
4. After receipt of the proposals:	
a. Every precaution shall be taken to safeguard technical proposals against disclosure to unauthorized persons	Note: Trade secrets and/or patents must be protected. However, recent amendments to the Freedom of Information Act

Table B1 (con't)

Mechanics	Special Rules/Considerations
	might cause some problems. Therefore check with legal counsel when requests for others' RFTPs are made. Jane Lipton (FTS: 8-202-693-7070/7057), OCE legal counsel, has been assigned the task of answering questions such as these at OCE level. 46 Comp. Gen. 34 (1966) says technical proposals shall be withheld from public examination where the proposal is designated "proprietary" by the offeror either orally or in writing. Also see ASPR 18-910.
b. Technical proposals submitting data marked in accordance with ASPR 3-507.1 shall be accepted and handled in accordance with the paragraph	
c. Any reference to price or cost shall be removed.	
5. Furthermore:	
a. The contracting officer shall establish a time period within which technical proposals will be evaluated. The time period may vary from procurement to procurement depending on the complexity and number of proposals involved. However, it is essential that the evaluation of technical proposals by all personnel concerned with the procurement, as well as any subsequent discussion with sources submitting technical proposals, be completed expeditiously.	Note: Tentative evaluation period is from 3 July 1975 to 31 July 1975.
b. Technical evaluation of the proposals shall be based on the criteria contained in the request for technical proposals and such evaluation shall not include consideration of capacity or credit as defined in ASPR 1-705.4. The proposals as submitted shall be categorized as either (1) Acceptable, (2) Reasonably susceptible to being made acceptable by additional information clarifying or supplementing, but not basically changing the proposal as submitted, or (3) Unacceptable.	
Any proposal which modifies, or fails to conform to the essential requirements or specifications of, the request for technical proposals shall be considered nonresponsive and categorized as unacceptable. If the contracting officer determines that there are sufficient proposals in category 1 above to assure adequate price competition under step two and that further time, effort, and delay to make additional proposals acceptable and thereby increase competition would not be in the best interest of the government, he/she may proceed directly with step two. Otherwise, the contracting officer shall request bidders under proposals in category 2 above to submit additional information, setting forth to the extent practicable the nature of the deficiencies in the proposal as submitted or the nature of the additional information required. The contracting officer may also arrange discussions for this purpose. In initiating requests for additional information, the contracting officer shall fix an appropriate time for bidders to conclude discussions, if any, submit all additional information, and incorporate such additional information as part of their proposals as submitted. Such time may be extended at the discretion of the contracting officer. If the additional information incorporated as part of a proposal within the final time fixed by the contracting officer	Note: The Corps does not have to go to category 2 proposals for curative action if there are enough category 1 proposals to insure adequate competition.

Table B1 (con't)

Mechanics	Special Rules/Considerations
establishes that the proposal is acceptable, it shall be so categorized. Otherwise, it shall be categorized as unacceptable.	
c. Upon final determination that a technical proposal is unacceptable, the contracting officer shall promptly notify the source submitting the proposal of that fact. The notice shall state that revision of the proposal will not be considered, and shall indicate, in general terms, the basis for the determination; for example, the rejection was based on failure to furnish sufficient information or on an unacceptable engineering approach.	
d. Consideration of late technical proposals is governed by the procedure in ASPR 3-506.	Note: GAO feels there is no reason for refusing to consider late proposals, but since an offeror should be able to rely on what the RFTP says, state clearly what the policy says.
e. If, as a result of the evaluation of technical proposals, it appears necessary to discontinue two-step formal advertising, a statement setting forth the full facts and circumstances shall be made a part of the contract file. Each source will be notified in writing of the discontinuance and the reason therefore. When step one results in no acceptable technical proposals or only one acceptable technical proposal, the procurement may be continued by negotiation under the authority of ASPR 3-210.2 (iii). (But see ASPR 3-210.3.)	
Step Two	
Upon completion of step one, a formally advertised procurement in accordance with Parts 2, 3, and 4 of this Appendix will be conducted, except that invitations for bids–	
1. Will be issued only to those sources whose technical proposals have been evaluated and determined to be acceptable under step one	
2. Will include the provision in ASPR 7-2003.37	
3. Will prominently state that the supplies or services to be procured will be in accordance with the specifications and the bidder's technical proposal, as finally accepted, under the request for technical proposal. This should be accomplished in the item description by a provision substantially in the form of the following example.	Note: The bidder's own detailed specifications will be incorporated into the contract and he will have to comply with them.
Radio antenna, in accordance with Exhibit No. _____ dated _____ *(use other description of specifications as appropriate)* and your Technical Proposal _____ *(insert specific identification of the bidder's proposal including any revision thereof as finally accepted)* incorporated herein by reference. Nothing contained in said Technical Proposal shall constitute a waiver of any of the provisions of said Exhibit (or specifications).	Note: The bidder remains liable for his solution even though the government has evaluated it and found it "responsive."
d. Will not be synopsized (see Section I, Part 10) or publicly posted (see 2-203.2), except that the names of firms which have submitted acceptable technical proposals in the first step of two-step formal advertising will be listed in the *Commerce Business Daily* for the benefit of prospective subcontractors in accordance with 1-1003.6 (a) (2).	

APPENDIX C: STATE-OF-THE-ART SYMPOSIUM QUESTIONNAIRE

1. What arrangements does your company make for the installation of your units?

____ Company utilizes own engineer and crew.
____ Company utilizes own engineer and local crew.
____ Company subcontracts out entire job.
____ None. Purchaser installs units.

2. Please indicate the maximum delivery distance your company desires. _____ miles.

3. Indicate your interest in responding to:

a. performance specifications 1 2 3 4 5
b. descriptive specifications 1 2 3 4 5
c. fixed design and specifications 1 2 3 4 5

(1 = high degree of interest, 5 = no interest)

4. Approximately how many days would be required to "tool-up" for a job similar to our program?
_____days.

5. Approximately how many units, similar to those identified in our program could be produced in a 6-month period? _____units.

6. Do you have a willingness/capability to provide different exterior finishes?

Yes 1
No 2

APPENDIX D: BACKGROUND AND PROCEDURAL QUESTIONNAIRE

The following questionnaire has been developed to obtain background information on your recreational areas, related procedural methods, and comfort station facilities (both present and projected). Please answer the following questions on a separate sheet and reference the appropriate question number. Use the attached forms when answering questions 3, 4, and 10.

Reservoir Procedural Methods

1. Will reservoir/Corps personnel arrange for site preparation? (foundation, water supply, waste piping, electrical, walkways, etc.)

2. Will reservoir/Corps personnel be able to set up and/or construct comfort stations?

3. What state, local, or other codes and regulations are applicable to the construction of comfort station facilities? (Please cite full reference if it is available).

Comfort Station Facility Information

4. Provide a breakdown of all existing comfort stations at reservoir site. Use attached sheet titled: *Existing Comfort Stations.* (See example below.)

5. Provide a breakdown of projected comfort station needs over the next five years. Use attached sheet titled *Projected Comfort Station Needs.* The sum total should correspond to the number identified to Ohio River Division personnel. See example on preceding page.

6. What percentage of the projected comfort stations has had the fuel and water inputs identified?

fuel _____
water _____

7. List the most common theft, vandalism, and misuse problems confronting comfort stations. Identify nature, frequency, and extent of damages.

8. What percentage of the projected comfort station facilities need to be accessible to the physically handicapped? Review ER 1110-1-102 dated 10 March 1972 before responding to this question. If possible, identify these comfort stations on the same form completed for question #5, using the "additional information" area.

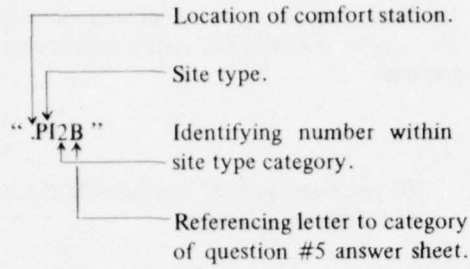
9. What is the expected life of a comfort station?

Recreational Area Information

10. Identify on a topographic map of the reservoir, the locations of the proposed comfort stations. Identify the location on the map by a dot, with a letter, a number, and another letter beside the dot. For example:

EXISTING COMFORT STATIONS

CATEGORIES	TOTAL NUMBER OF STATIONS WITH SUCH FACILITIES	SITES															MEN				WOMEN			LAUN.		TREATMENT					ADDITIONAL INFORMATION
		OVERLOOK (OV)	VISTA (VI)	BOATING (BG)	TENT CAMP (TE)	TRAILER CAMP (TR)	GROUP CAMP (GC)	PRIMITIVE CAMP (PC)	PICNIC (PI)	SWIMMING (SW)	TRAIL (TL)	FISHING (FI)	HUNTING (HU)	NATURE (NA)	OTHER (O)		TOILET(S)	URINAL(S)	LAVATORIES	SHOWER(S)	TOILET(S)	LAVATORIES	SHOWER(S)	WASHER(S)	DRYER(S)	WATERBORNE	PIT	VAULT	CHEMICAL	OTHER	
A	7	1							3	1	2						2	2	3	0	4	3	0	0	0	7					
B	2								2								1	2	2	2	2	3	2	1	1	1		1			
C	10												5	5			1	1	1	0	1	1	0	0	0			10			
D																															



11. Are recreational areas/comfort stations ever closed to the public? If so, please describe the circumstances in detail.

Design Requirements Information

12. The questions which follow have been developed to gather *some* of your specific design requirements for comfort stations. All questions relate to possible fixture types. There are three possible answers per question: no specific requirement, yes, and no. You are asked to identify the appropriate answer by either checking the provided space or circling the code number.

A *no specific requirement* answer will be interpreted as meaning that any fixture which meets the performance requirements will be acceptable by you.

A *yes* answer will be interpreted to mean that this is the only type of fixture which will be acceptable by your District.

A *no* answer will be interpreted as meaning that under no circumstances will this type of fixture be acceptable by your District.

Since all submittals by manufacturers will be required to meet the same level of performance, the primary consideration should be the configuration of the fixture. With this in mind, it is hoped that all will be checked "no specific requirement," so that no manufacturer will be precluded from using a fixture which he has already incorporated into the product. *However, if your District has a specific requirement, please indicate it.*

For each of the following fixture type, indicate if a specific design requirement has been established.

a. Toilets

(1) ___ No specific requirement to exclude any of the fixtures below.

(2) Indicate whether acceptable or unacceptable.

	Yes	No
seats	1	2
seat covers (lids)	1	2
floor mounted	1	2
wall hung	1	2
flush valve	1	2
vitreous china	1	2
cast iron	1	2
cast aluminum	1	2
stainless steel	1	2

b. Lavatories

(1) ___ No specific requirement to exclude any of the fixtures below.

(2) Indicate whether acceptable or unacceptable.

	Yes	No
public access to trap cleanouts	1	2
manually operated faucets	1	2
service sink	1	2
vitreous china	1	2
cast iron	1	2
stainless steel	1	2

c. Urinals

(1) ___ No specific requirement to exclude any of the fixtures listed below.

(2) Indicate whether acceptable or unacceptable.

	Yes	No
trough type	1	2
wall hung	1	2
floor mounted	1	2
stall mounted	1	2
vitreous china	1	2
cast iron	1	2
cast aluminum	1	2
stainless steel	1	2

Note: Vitreous china, cast iron, cast aluminum are coated with a nonporous material available in colors. Stainless steel is polished.

d. Showers

(1) ___ No requirement to exclude any of the fixtures listed below.

(2) Indicate whether acceptable or unacceptable.

	Yes	No
individual stalls	1	2
column	1	2
self-closing faucets	1	2
manually operated faucets	1	2
anti-scald mechanism	1	2

13. Is there a color requirement for fixtures?

Yes . . .1
No 2

(If yes, please identify.)

14. Describe cleaning activities for comfort stations provided by reservoir.

15. Is there ever a need to enlarge comfort stations once they have been constructed?

Yes . . .1
No 2

(If yes, cite circumstances, possible occurrences, examples, and extent of changes.)

16. Have maximum and minimum dimensions and distances been established for fixtures in your comfort stations?

Yes . . .1
No 2

(If yes, please provide sketches with the dimensions and distances indicated.)

APPENDIX E: DISTRICT DESIGN REQUIREMENTS MATRIX

Requirement	Louisville	Pittsburgh	Huntington	Nashville
Aesthetic	Material variety. Natural materials with durable qualities. Exterior color variety. Rectangular shape with gable roofs. No demand for variety of interior finishes or color. All units cannot be exactly the same image. High importance placed on aesthetics.	Variety of image expression is not demanded. High importance placed on aesthetics.	Variety of image expression is demanded. High importance placed on aesthetics.	Flexibility of choice. High importance placed on aesthetics.
Construction Labor Force	Construction performed on contract basis. Possible use of work programs.	Construction to be performed by outside personnel.	Construction to be performed by outside personnel.	Construction can either be done by District personnel or through outside contact.
Maintenance Schedules and Tasks	Allow minimum maintenance. Routine maintenance through outside contract. Units cleaned usually once/day, but as much as three times/day. Units cleaned by hosing down.	Units cleaned two to three times/day depending on usage. Allow for minimum maintenance.	Maintenance cost is very high, as are repair and replacement costs. Allow for minimum maintenance. Units cleaned by hosing down.	Units cleaned once/day by general hosing down. Allow for minimum maintenance.
Inspection and Security	Minimum inspection.	Minimum in existence.	Minimum inspection.	Many sites remote and minimum inspection.
Schedules of Use	Units in use 24 hours/day. Seasonal usage of units with 35 percent of units remaining open in the winter season. Closed units winterized by draining water and introducing antifreeze into fixtures.	Units in use 24 hours/day. Seasonal usage with a low percentage open during the winter.	Units open 24 hours/day. Minimum of one unit per dam site open all year. Winter usage of recreational facilities at Corps sites is increasing.	Units open 24 hours/day. Seasonal usage with low percentage open during the winter.

Requirement	Louisville	Pittsburgh	Huntington	Nashville
Functional Life Expected	50 years for exterior shell. Fixtures less/ undetermined.	Permanent with maintenance.	25 years.	25 years.
Layout and Design	Water cut-offs, drain valves, electrical controls should be inaccessible to the public and inside the unit. Sewer and water connections are preferred at the ends of a pipe chase. Cut-off valves should be supplied for lavatories.	Fixtures are placed by accepted dimensional standards or by manufacturers' recommendations. Rain gutters are used. Project sites established an overall design "theme" and resist mixing new units. Modular units restricted due to storage problems. 36 to 42 in. (0.9 to 1.1 m) frost depth.	40 percent of units are to be located below the 25-year flood level. Special space set aside for maintenance supplies. Handicap shower benches to be designed with impact loading in mind.	Minimum dimension of pipe chase/storage set at 5 ft (1.5 m).
Accessibility to Handicapped	All units must have capability.	Minimum of one facility per project site.	All should have the capability.	Minimum of one per project site.
Soil Bearing Characteristics				
Energy Inputs	Underground electrical.	Electrical, underground access is preferred; allow for overhead service. Future availability of energy type might vary, allow for different sources.	Underground electric.	Underground electric.
Water Inputs	Potable and of sufficient pressure for flush valves.	Potable and of sufficient pressure for flush valves.	Potable and sufficient.	Potable and sufficient.
Necessary Fixtures and Functions				
(1) Laundry	Sinks, space for machines.	Tubs only.	Tubs only in washhouse.	Tubs only.
(2) Vending	Space provided.	No requirement.	No requirement.	No requirement.
(3) Drinking Fountain	Outside.	Outside.	Optional.	Optional.

Requirement	Louisville	Pittsburgh	Huntington	Nashville
(4) Exterior Faucet	Yes.	Yes.	No requirement.	Optional.
(5) Hot and Cold Water	Yes, self-controlled.	In showers; cold only in lavatories.	Tempered water in showers.	Yes, self-controlled.
(6) Self-Closing Faucet	Yes.	Yes.	No.	In showers.
(7) Anti-Scald Equipment	No requirement.	Tempered water in showers.	Tempered water in showers.	No requirement.
(8) Public Elec. Outlet	No.	Yes, in washhouse for shave.	No requirement.	No requirement.
(9) Hand Dryers	Electric.	Paper towels.	Electric.	Electric.
(10) Special Hardware	Flush-mounted valves.	Wcs with locked tanks.	Stainless steel mirrors.	Hose connection for cleaning.
(11) Other	Floor drains.	Floor drains, stainless steel mirrors.	Flush valves.	
Quality and control of:				
(1) Lighting	Electric, 30 f.c., photo-cells and switching.	Interior lights on 24 hours provide exterior entrance light. 30 f.c. or less, light interiors. Timer, photocells, switches.	Electrical, 30 f.c. over lavs, 10 f.c. general.	Phased lighting, 24-hour lights, photocells, trigger additional electrical, 30 f.c. photocells and switches.
(2) Ventilation	Power ventilator.	Power ventilator.	Power ventilator.	Gravity ventilation.
(3) Tempered Air	To 50°F (10°C).	50° to 60°F (10° to 16°C).	65°F (18°C).	65°F (18°C).
(4) Acoustics	Sound separation between men's and women's.	No requirement.	No requirement.	No requirement.
Applicable Codes, Standards, Requirements	None identified.	National electrical code, local and state codes if possible.	Strict state codes.	None identified.
Labor Restrictions	None identified.	None identified.	None identified.	None identified.
Live Loads	Wind load @ 30 lb/sq ft (146.47 kg m^2) Eq. load–none.	Wind load @ 30 lb/sq ft (146.47 kg/ m^2) Eq. load–none.	Wind load @ 30 lb/sq ft (146.47 kg/ m^2) Eq. load–none.	Wind load @ 30 lb/sq ft (146.47 kg/ m^2) Eq. load–none.
Current Problems and Degrees of Severity	Vandalism of facility large problem at non-fee sites.	Vandalism is an extreme problem; mirrors most frequently damaged.	Vandalism is an extreme problem.	Vandalism is a problem.

APPENDIX F:
SPECIFIC DESIGN REQUIREMENTS

1. REQUIRED FACILITY QUALITIES/ CHARACTERISTICS

a. Aesthetic–High Value
   (1) Exterior Treatment
      (a) Exterior finishes must be able to be compatible with the different environments in each District.
      (b) Color and material choice for varying locations is preferable.
      (c) Original choice must be flexible, but all units at a single project site may be of the same material and color.
      (d) General environment to be compatible with is a natural environment–woodlands, few built structures, gently rolling hills.
   (2) Interior Treatment–Low emphasis on aesthetic–no variety demanded–standard interiors.

b. Maintenance
   (1) Minimum maintenance should be allowed for, as well as ease of cleaning in shortest time.
   (2) Flexibility of replacement should be allowed.
   (3) Hose-down cleanability.
   (4) Flooring material, if included in a design solution, must be extremely durable.

c. Security–facilities open 24 hours/day, but provisions should be made for locking on seasonal basis.
   (1) Facility design and choice of fixtures should take into account problem of vandalism and abusive use.

d. Building life expectancy–permanent facility, 25-year life expectancy.

e. Layout
   (1) All main controls–electricity, water, etc.–should be inaccessible to the public.
   (2) Electricity, plumbing, building, shall follow most restrictive state code regulations.
   (3) Provision for storage of daily supplies shall be provided in an area inaccessible to public users.
   (4) Prevention of damage to fixtures and plumbing due to subjection to freezing temperature shall be made for all units, whether in use or closed during the winter months.
   (5) Water spray from the shower stall should not be directed so that it enters the dressing compartment.
   (6) Pitched roofs are *considered* a necessity due to problems of heavy snow load and life cycle considerations.
   (7) All facilities considered will have water-borne sewage disposal only.
   (8) Shelving shall be provided in a supply storage area with a minimum of 20 lin ft (6.1 m), 1 ft (0.3 m) in width.

f. Handicap requirements–all facilities must be capable of being accessible to the handicapped, currently a one unit per site minimum is maintained.

g. Energy input–the major power source will be electricity, with underground service. Allowance should be made for overhead service, but majority preferred access underground.

h. Fixtures
   (1) All fixtures should be designed to be *vandal-resistant*. (Also special hardware)
   (2) An outside drinking fountain with water supply faucet (self-closing) should be supplied.
   (3) Hot water–self-controlled.
   (4) Control over water being left on.
   (5) Public electrical supply–interior.
   (6) Hand drying (electric).

i. Lighting
   (1) 30 f.c. over lavatory.
   (2) Control–photocells and switch not accessible to public.
   (3) Provision for supplemental natural lighting.

j. Ventilation
   (1) Power ventilator. One per comfort station and one per washhouse. Manual switch.
   (2) Provision for supplemental natural ventilation.

k. Temperature
   (1) Provision for heating of facilities in use during colder months (with minimal outside temperature of 15°F [-26°C]) to a level of 50° to 60°F (10° to 16°C).
   (2) All facilities must be capable of accepting heating.
   (3) A facility having heating must be insulated.
   (4) Heating controls must be inaccessible to the public.

2. SANITARY FACILITY FIXTURES

The following fixtures have been selected for use in the ORD Sanitary Facility Program. They are based on design criteria gathered from ORL, ORH, and ORN.

a. Washhouses
   (1) Men

Three shower units (one for handicapped):
with soap dish
private dressing space
bench
hot and cold water (public water control)
clothes hooks (two)
One service sink per side
Hot water generator
Floor drains as needed
Powered exhaust system
Water supply for maintenance only (protected); *hose bib in pipe chase*
Connection piping and wiring as needed
Lighting—30 foot-candles
Heating system as needed
Public water control valves in showers and for lavatories
Drain in dressing area.

(2) Women
Same as above

b. Comfort Stations and Fixtures

(1) Men
Two water closets (one for handicapped)
Three lavatories
One urinal
Toilet partitions with doors for water closets only, door swings out (gravity closed spring)
Hot water generator with heating system as needed
Hot and cold water supply for all lavatories
Mirrors for each lavatory
Powered exhaust system
Toilet paper dispensers (Double roll fixture per water closet)
Water supply (protected) for cleaning purposes
Floor drains as needed
Provision for hand drying, one electric hand dryer (vandal-resistant)
Handicap grab bars as needed
Storage for supplies and replaceables in pipe chase
Connection piping and wiring as needed
Lighting—30 foot-candles over sink, 10-20 foot-candles general
Public use electrical outlet for each lavatory.

(2) Women
Three water closets (one for handicapped)
Three lavatories
Napkin disposal per water closet
Otherwise same as above

APPENDIX G: LEGAL MEMORANDUM ON AESTHETIC CLAUSE IN TWO-STEP FORMAL ADVERTISING PROCUREMENT

LEGAL MEMORANDUM

FROM: Mike Carroll
CERL Legal Advisor
30 September 1975

SUBJECT: Aesthetics Clause in Two-Step Advertising Procurement

FACTS: In October of 1974, CERL and ORD decided to use the contracting method known as two-step formal advertising for the procurement of sanitary facilities for ORD. Two-step was chosen primarily due to the belief that its use would increase competition.

CERL research indicated that the conventional contracting method of formal advertising limited effective competition to only conventional building products. The highly detailed design which accompanies a formal advertising procurement is a restriction on pre-engineered, industrialized products whose design details are established before any procurement action. The only technique to allow industrialized products to compete without costly, perhaps prohibitive retooling, relearning, and redesigning is the performance concept. The performance concept lets the proposer furnish the design and technical solutions to the Corps' performance or functional requirements. The only DOD contracting methods which allow for the solicitation of proposals via performance specifications are two-step formal advertising and one-step competitive negotiation. Since ER 1180-1-7 limits the use of one-step to only family housing projects, two-step formal advertising remained the only method to maximize the competition among all building solutions–industrial as well as conventional.

A drawback to the use of two-step is the loss of control over the appearance or aesthetics of the building. Whereas in conventional procurements the Corps has total control over the aesthetics of the building it solicits for construction bids, in a two-step procurement the proposer develops the solution and, therefore, controls the aesthetics.

To insure that solutions are aesthetically acceptable, the Corps inserted the following clause (ξ1.1.4) in the technical specifications:

> "1.1.4 Design of these facilities shall be aesthetically pleasing. Compatibility with the natural environment is required. Facilities should present a harmonious appearance which blends with the park scenery. Submittals will be evaluated by a board to be designated by the U.S. Army Engineer District, Louisville. Where the Corps of Engineers reviewers determine that a proposed building is unattractive, even though meeting all the standards below, it will be judged non-responsive."

Pursuant to clause 1.1.4, the proposal of the party in question was judged non-responsive by a panel of architects.

QUESTIONS PRESENTED: (1) Is aesthetics a proper and acceptable factor to cite as a specification demanding responsiveness? (2) Is clause 1.1.4 an acceptable clause to specify aesthetics? (3) Was the evaluation of the proposal fair and reasonable?

SHORT ANSWER: (1) Aesthetics *is* a proper factor to specify as a minimum requirement. (2) Clause 1.1.4 *is* an acceptable clause to specify an aesthetic requirement. (3) The proposal was evaluated fairly, and the results were reasonable without any evidence of fraud, abuse of authority, or arbitrary action.

DISCUSSION/CONCLUSIONS:

Question (1):

(a) The aesthetic factor is a critical factor in any building. Conventional design strategy remains the favored strategy largely because it allows the owner/client to maintain control over the appearance of the building. This lack of control of appearance is a major obstacle to the increased use of industrialized building technology.

The DOD Construction Criteria Manual, DOD 4270.1M, recognizing the importance of aesthetics, requires that:

> "5-1.2 IMPROVED DESIGN: All aspects of design should be carefully weighed by the designers with respect to the functional requirements of the project and the local conditions, but *particular emphasis* should be placed on architectural design, *especially layout and arrangement.*
>
> A. Excellence of architectural design should rank with economy of construction and functional efficiency as prime requisites for all military construc-

tion projects. It should be recognized that good design does not imply added expense, and can often mean economies, and that it behooves DOD to set a high standard for architectural design. Proper design requires an attention to architectural detail and a concern for an *aesthetic* solution to the problem of integrating the overall design of the facility with its functional requirements.

B. Special emphasis shall be placed on the quality of the architectural design since it vitally affects the longevity, economics, usefulness, efficiency, *attractiveness*, and livability of most facilities. A prime requirement of the architectural design shall be the *attractiveness* of both the interior and exterior of facilities."

(b) Industrialized building products are pre-engineered. Their efficiency depends upon continuity and repetition. Industrialized products are not as flexible as conventional, craft products; adjustment to a mandated design with details different from their pre-engineered products would be far more costly for the industrialized manufacturer than for the conventional building team. For this reason the descriptively detailed specifications and drawings in a formal advertising procurement restrict industrialized building products from competing. This borders on violating the most basic procurement law, which is to encourage competition by minimizing unnecessary restrictions. (See: 41 USC 253 (a); 10 USC 2304 (g); ASPR 1-300.1; ASPR 1-1201 (a); and ASPR 18-107.)

The only procurement methods which allow industrialized building products to compete equally with conventional products are two-step formal advertising and one-step competitive negotiation. One-step's use is currently restricted to family housing projects.

To maximize competition, two-step does not impose non-functional, arbitrary design constraints on the proposer; rather, it lists only its functional requirements. While this encourages competition, it leaves no control over aesthetics absent (sic) a criteria and procedure such as clause 1.1.4.

(c) If clause 1.1.4 is not a valid specification, then the Corps would not use two-step in the future since it is imperative that the owner/client has some control over the appearance of the building. Clause 1.1.4 represents the best, if not only, technique to bridge the time, cost, quality advantages of increased competition with the need to have an architecturally acceptable design.

(d) Therefore, it is acceptable to specify aesthetics as a requirement in a two-step formal advertising procurement for a building.

Question (2):

(a) Aesthetics is a difficult, if not impossible, factor to quantify. Since architects are certified professionals who determine the aesthetics of every building they design, having a panel of architects judge the architectural acceptability of various designs is both a valid criteria and evaluation process. To hold otherwise denies the reality of the architects' traditional role, qualification, and the authority they exercise over the aesthetics of buildings in the conventional process. If this procedure/clause is not valid, then no other procedure is valid since no other profession is trained and qualified and utilized to make aesthetic determinations over buildings.

(b) For these reasons, clause 1.1.4 is an acceptable clause to specify the aesthetic requirement.

Question (3):

(a) While technical evaluations should be as accurate as possible, no technical determination can be "proven" in the literal sense, given the unknowns in physical science. Rather, the accuracy of evaluations depends upon probabilities, with factors such as the qualifications of the evaluators being an influence on the probability.

Largely for this reason, the General Accounting Office will uphold technical evaluations "unless there is clear evidence of fraud, abuse of authority or arbitrary action." (48 Comp. Gen 49 [1968], 10 G.C. 406; B-161613 [Aug. 28, 1967]; B-165771 [April 28, 1969].)

(b) Not only was there no "fraud, abuse of authority or arbitrary evaluation" concerning this proposal, there also were no lesser errors such as simple negligence. An entire week was spent by a qualified team to carefully evaluate proposals for responsiveness—especially aesthetics. The evaluations were fair, reasonable, and professionally competent.

APPENDIX H: MANUFACTURERS' CAPABILITY QUESTIONNAIRE AND REPLIES

MANUFACTURERS' QUESTIONNAIRE

1. After notice to proceed, how many calendar days will be required to commence work?

2. After award of contracts, how many calendar days will be required to prepare and submit for approval complete final design documents and specification?

3. After notice to proceed, how many calendar days will be required to submit a quality control plan?

4. If you were notified that your proposal was acceptable, how many days would be required for you to submit a bid?

5. To determine costs, would you need to have the actual site staked?

6. What length of time do you anticipate will be required to complete your foundation work?

7. What length of time do you anticipate will be required to complete the Brookville Lake facility after approval of drawings and specifications?

MANUFACTURERS' REPLIES

Replies to Length of Activity Questions (length in calendar days)

FIRM	Ohio Building Products	A.G.I.	Mosser Construction Company	APSCO	KDM Construction Company
QUESTION					
1	10	0-5 days		10 days	10
2	30	14-21 days	Required questions in writing	10 days	30
3	5	0-5 days		5 days	5
4	30	5-7 days		30 days	21 days
5	NO*	NO**		NO*	NO+
6	3 days	21 days		10 days++	7 days
7	60 days	55#		30 days	less than 60

* Not required, if an extra was defined such that rock, hard pan, or 15- to 20-in. (0.4 to 0.5 m) trees are additions.

** The general area within 100 yd (91.4 m) is sufficient.

+ An extra should be identified with contingencies.

++ With no rock or hard pan.

Fabrication could be conducted as foundation work is being completed.

APPENDIX I: LEGAL MEMORANDUM ON CONTINUED USE OF TWO-STEP FORMAL ADVERTISING

LEGAL MEMORANDUM

FROM: Mike Carroll
CERL Legal Advisor
5 May 1976

SUBJECT: Continued Use of Two-Step Formal Advertising in Future Procurements of Industrialized Sanitary Facilities by ORD.

FACTS:

Background. Early in the project, approximately 20 September 1974, CERL undertook an investigation of the optimum procurement procedure to use in executing a procurement action for a large group of industrialized sanitary facilities. For the reasons articulated in later paragraphs, two-step formal advertising (TSFA) was identified as the optimum technique.

In early October of 1974, a personal visit was made to the office of Pete Ippolito, then Chief Counsel for Civil Works at OCE. After the presentation of CERL's legal and technical reasons to use TSFA, Mr. Ippolito concurred that it was the correct procurement technique to use.

Then on 17 October 1974, a letter entitled "Procurement Methods for Industrialized Sanitary Facilities" was sent by Dr. Gordon Bagby of CERL to Lucien Guthrie, OCE Technical Monitor for the industrialized sanitary program. The letter stated that CERL had chosen the TSFA method as well as articulating the basic reasons for such choice. OCE concurred in the choice.

Finally, in April of 1975, CERL prepared a "how-to-do-it" manual for Louisville District in the use of the TSFA method while procuring buildings. The introduction summarized the key reasons for using the TSFA method.

Reason for Choosing TSFA Method. CERL chose the TSFA method because the only design technique available to allow industrialized building products to compete without arbitrary restrictions was the performance specification technique. And the only DOD procurement techniques available which allow for the use of the performance specification technique were TSFA and One-Step Competitive Negotiation (NEG). The formal advertising process did not and could not adequately accommodate the performance specification technique. Following is a more detailed discussion of these conclusions.

Nature of Industrialized Building Products. Industrialized building products are pre-engineered, "on-the-shelf," products whose design and technical details are established prior to any procurement action. Being industrialized products, the factory machinery, worker's training, materials orders, and existing shop drawings are all geared to the existing product—a pre-engineered building. There are many such industrial builders capable of delivering a finished building product—up to 4000 by some estimates. And each proprietary building product is unique in some fashion; no two manufacturers' products are exact in every technical and design detail. What then would be the result of imposing upon that industry a highly detailed descriptive specification and drawing?

In all probability not even one of the industrialized building products would match exactly the details of the descriptive specifications and drawings. As a result, if any one of the industrialized builders wanted to bid on the project, he/she would have to undergo costly, perhaps prohibitive, retooling, relearning, and redesigning. This detailed design is an arbitrary restriction which unnecessarily increases the cost to the government and restricts competition when you consider that:

1. The particular detailed design is but one solution, among an infinite number of possible solutions, to the Corps' needs;

2. The majority of the pre-engineered buildings are of a design which, in all probability, meets the Corps' needs; and

3. There is another technique—the performance concept—which can translate the Corps' needs to the building industry without arbitrarily restricting competition and increasing costs.

The Corps' mission is to manage the building process in such a way as to obtain certain built-features at the best cost to the public. These built-features are usually stated in the beginning (at the DD Form 1391, and Project Development Brochure Stage) as general

end-results such as "BOQ must be a 40-year building, capable of housing 250 men." Converting those desired end-results into a detailed drawing with descriptive specifications is but one design strategy to use in acquiring the end-results at the best cost to the public. Using the performance concept is yet another design technique. In certain situations, it can be a better technique to use in procuring products/services.

Industrialized buildings represent products better procured via performance specifications than via the conventional, descriptive design strategy. And as the following quote from the DOD taken during Senate testimony indicates, performance specifications are a better technique to use when procuring commercially available products, each with unique design features.

> "Our specification policy is twofold. It is to state only our actual minimum need and to describe what we need so as to stimulate maximum competition . . . For example, there are occasions when the use of a design specification will accomplish this result as, for instance, where the item was developed for the Government and can be exactly reproduced by any capable manufacturer without further development. On other occasions, the use of performance specifications may better assure competition being obtained as, for instance, *where the Government requirement can be met by any one of a number of commercially designed and available products* . . .
> . . . many items of equipment, such as tractors, earthmoving equipment, laundry equipment, and so forth, are available on the commercial market. Such items are commercially *designed and each manufacturer's design differs markedly from his competitor's.* Each manufacturer is tooled up to make equipment to his own design and it would be very expensive to require him to construct equipment to some competitor's or to Government design.
> In these cases, we use performance specifications so that competition can be obtained from every firm which regularly makes a suitable commercial product. Such a specification *fosters competition* in these situations and *avoids the favoritism* which would occur if we adopted one company's design or a Government design which was more nearly like the design of one company than that of others. Such a specification also *avoids special retooling* and *production starting costs* and, hence, *results in lower prices* to the Government. Performance specifications frequently are also used when no suitable commercial item is available and when there is no standardized Government design. In such cases where, in the opinion of the buying activity, the design problem is well within the capabilities of a number of competent firms having design staffs, purchase will be made against a performance specification and the design details left to the contractor. In this way it is possible to get competition for items of specialized military usage, but such competition is necessarily confined to firms which are competent to design and build equipment meeting the military performance requirement."[1]
>
> (Emphasis Added)

Failure of the Formal Advertising Technique to Accommodate Industrialized Buildings. Formal advertising is a highly detailed procurement technique. Any deviation from its strictures converts the procurement action, ipso facto, into a negotiated action. As will be shown by the following examples, it is not feasible or practicable to use a formal advertising technique to procure industrialized buildings regardless of the design strategy used. For the examples, assume there are at least three industrialized building firms, A, B, and C, each manufacturing an end-product with design features different than their competitor's products.

1. Use Performance Specification Strategy: A performance specification states only the end-result desired rather than the means to achieve it. As such, unless the item being procured is a highly stable, predictable end-item such as an automobile, you must ask the bidders to submit technical and design proposals for the Corps to evaluate for "responsiveness" to the performance specifications. Otherwise, A could merely submit a $1,000 bid, B a $10,000 bid, and C a $100,000 bid. How would the Corps know what the bidders are willing to deliver for that amount? How could the Corps reject A's bid on aesthetics grounds—as was done in the pilot project—since it doesn't even know what A is promising to deliver? And does the Corps want to wait until contract performance to discover A's product is totally unacceptable when it could have known this at bid evaluation time had they but requested proposal submittals?

Clearly, in the case of industrialized building products it is not acceptable Corps practice to merely receive a cash bid in response to the advertisement of performance specifications or purchase descriptions. What is additionally needed is the submission from

[1] Hearings on Procurement Before the Subcommittee on Procurement of the Senate Committee on Armed Services, 8, 9 Feb. 1960, p 20.

industry of technical and design proposals to the Corps for evaluation of the proposal's responsiveness to the performance specifications. The formal advertising technique does *not* allow for the submission and subsequent evaluation of technical and design proposals. Only TSFA and NEG allow this practice.

Performance specifications can be used with a formal advertising technique where the end-item being procured is so stable and predictable that there is little risk of receiving an unacceptable product. For example, Ford, General Motors, and Chrysler can merely submit a cash bid in response to a performance specification for an automobile, and the contracting officer can be relatively sure of the end-products he'll receive. Unfortunately, the industrialized building industry is not as stable and predictable as the auto industry.

The wording of Public Law (10 USC § 2305 [b]) reinforces the notion that formal advertising must use only those specification strategies which demand a bid response and not a proposal response. 10 USC § 2305(b) provides that:

> "The specifications in *invitations for bids* must contain the necessary language and attachments, and *must* be sufficiently *descriptive* in language and attachments, to permit full and free competition. If the specs in an invitation for bids do not carry the necessary *descriptive* language and attachments, or if those attachments are not accessible to all competent and reliable bidders, the invitation is invalid and no award may be made."

2. Use a Brand-Name Strategy: One design technique is to somehow choose which industrialized building product is desired—usually via an informal, probably illegal, prequalification of known systems—and then merely name that system in a procurement. The following rules and considerations apply to the use of this technique.

a. "It is a procurement technique of last resort which is strictly limited by regulation."[2] ASPR 1-1206 says the technique may be used "only when an adequate specification or a more detailed purchase description cannot feasibly be made available by means other than reverse engineering . . . in time for the procurement under consideration."

b. *Even if* the use of the "or-equal" technique is justified, the rules applicable to its proper execution convert it to a performance concept approach.* Therefore, there is no possibility of using a brand name with an "or-equal" clause to bypass the performance concept. Rather the use of the "or-equal" clause merely makes the solicitation redundant, if not confusing.

c. It is unrealistic to "know" what is available among the industrialized building field given its state of the art. For example, there were 13 industrialized building firms at the CERL symposium to determine the feasibility of the ORD industrialized sanitary facilities project. Yet when proposals were eventually submitted 8 months later, not one of the 13 firms at the symposium was among the bidders. In fact, CERL had no previous knowledge of any of the eventual bidders. What if CERL had picked the product of one of the symposium attendees and advertised it instead of using the performance concept?

3. Use a Reverse-Engineering Strategy: Another descriptive strategy is reverse-engineering. Reverse-engineering is the practice of designing a "Chinese copy" of a proprietary product and then advertising that design. Where the product being sought is non-standard and commercially available in differing design solutions, this technique is obviously *restrictive* insofar as it includes any nonfunctional design requirements not essential to the government needs.** Furthermore, it is merely a ruse to mask a "brand-name" buy. Therefore, all of the rules and considerations articulated above under the discussion of the brand-name strategy apply equally here.

[2]CPT Michael Gengler, "Brand Name of Equal Without Tears," *The U. S. Air Force (JAG) Law Review*, Vol 14, No. 4 (July 1973), p 280.

*When using the words "or equal," the specifier must detail *what it is* that must be equaled. Regulations require that the "what it is" are the essential "salient physical, functional, or other characteristics of the referenced products." (See ASPR 1-1206.2) Failure to list these "salient characteristics" is restrictive of competition and requires cancellation of the IFB (38 Comp. Gen. 345 [1958]; 38 Comp. Gen. 291 [1958]). These "salient functional" features are in the nature of neutral performance specs. In fact, if they include so many design characteristics that only the brand-name or a "Chinese copy" could meet the requirements, it is probably also restrictive of competition and requires cancellation of the IFB (45 Comp. Gen. 462 [1966], 8 G. C. 110).

**In a specification describing a truck produced by one manufacturer, the Comptroller General found it to be unduly restrictive of competition even though the truck could have been duplicated by any other manufacturer, since the producer whose regular product was described in the specification obviously would obtain a distinct competitive advantage over the others who would be required to retool, redesign, etc., to meet the specification. 39 Comp. Gen. 101 (1959).

4. Use a Multiple Reverse-Engineering Strategy: To address the problem of designing only one firm's product, a design strategy used in some Corps projects for industrialized building is to descriptively design every available system and advertise all of them as acceptable products. The problems with this technique are:

a. The specifier or designer must know what all the possible design solutions are. Even if he does—which is highly unlikely—he only knows them at the time of design development, not at the moment of advertising. And the use of any "or-equal" clause to circumvent these concerns generates the problems associated with the "or-equal" clause as discussed above.

b. This technique is inefficient and redundant. Why have an expensive information system requiring constant monitoring of an amorphous, rapidly evolving industry, and why then advertise to industry a panoply of their own designs, when you can harness the whole phenomenon very simply, at the time of the actual procurement, by way of performance specifications?

c. Third, the listing and describing of alternatives leaves unclear what the "minimum needs" of the government are as required by law and regulation.[3] It is generally accepted that different products may be compared so as to choose from them essential functions and characteristics to combine into one description of the government's minimum needs.[4] However, the mere solicitation of "Chinese copies" of various design solutions leaves each potential bidder or proposer uncertain as to precisely what the government's minimum needs are.

In conclusion, CERL research indicated that the formal advertising could not accommodate a performance specification design strategy wherein interested parties submitted technical proposals in response to the specifications. Furthermore, alternate design strategies more amenable to the formal advertising technique were either illegal, inefficient, ineffective, or, at best, redundant.

Ability of the TSFA and NEG Procurement Technique to Use Performance Specification With Subsequent Proposal Submittal/Evaluation. The two remaining procurement techniques, TSFA and Competitive NEG, do lend themselves to a performance specification strategy wherein interested parties can submit technical proposals for evaluation by the Corps.[5] Unfortunately, their use is restricted.

One-step competitive negotiation is limited in use to only family housing projects.[6] The ER limiting NEG is applicable to not only military construction but also civil works construction.[7]

TSFA was not similarly limited by ER 1180-1-7 since it met condition C(1) of the enclosed memo:

> "II. TYPES OF FACILITY PROJECTS SUITABLE FOR USE OF TWO-STEP FORMAL ADVERTISING PROCEDURES.
>
> . . . 1. Various facility types when performance specifications must be utilized to accommodate industrialized construction (building system) components and concepts."

As expressed earlier under the heading "Failure of Formal Advertising Technique to Accommodate Industrialized Buildings," the only design strategy available to procure industrialized components effectively, efficiently, and within legal and regulatory structures, is the performance concept. Therefore the condition is met.

The remaining consideration was ASPR 2-501 and 2-502 which delineated the purposes and conditions for use of TSFA. Clearly the prime purpose of TSFA is to allow for the solicitation of technical proposals from industry via performance specifications where and when it is impractical (e.g., restricted competition) to use descriptive specifications. This is precisely the situation existing in the industrialized building industry.

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[3] ASPR 1-1201(a); 15 Comp. Gen 974 (1936); 47 Comp. Gen. 175 (1967); and 47 Comp. Gen 236 (1967). See also 39 Comp. Gen. 570 (1960); 2 G. C. 140; Comp. Gen. 529 (1965).

[4] See 48 Comp. Gen. 441 at 446 (1968); 47 Comp. Gen. 409 at 414 (1968); 41 Comp. Gen 348 at 350 (1961); and 38 Comp. Gen. 291 at 294 (1968).

[5] ER 1180-1-7, 25 MAR 74, Enclosure: "DOD Policy and Procedural Guidance for the Use of One-Step Competitive Negotiation (One-Step) and Two-Step Formal Advertising Procurement Procedures in the Acquisition of Facilities," Memo from ASD (I&L), 20 DEC 1973.

[6] *Ibid.*, p 6.

[7] Interview with Pete Ippolito, General Counsel–Civil Works, Office of the Chief of Engineers, 21 October 1974.

It is, of course, possible for the Corps to use conventional descriptive specifications and drawings. But the result would be the arbitrary restriction from competition of industrialized builders. Only the conventional craft or "cottage" segment of the building industry could compete freely. This is, in fact, the only segment which has been bidding on past ORD sanitary projects. CERL research indicated that the reason for the inordinately high costs of sanitary facilities in the ORD was because the industrialized segment of the building industry was systematically excluded from competition via the descriptive design strategy. Therefore, in an attempt to lower costs by allowing industrialized builders to compete, the performance specification strategy was chosen. This design strategy required submittals of technical proposals and, therefore, clearly met the intent and purpose of TSFA.

The remaining consideration was the future use of TSFA. At first glance, ASPR 2-501, to wit:

> "An objective of this method is to permit the development of a sufficiently descriptive and not unduly restrictive statement of the Government's requirement . . . so the subsequent procurements may be made by conventional formal advertising."

implies that TSFA can be used only once.

ISSUES PRESENTED:

(1) Was TSFA the most appropriate procurement technique to use in the ORD industrialized sanitary facilities project?, and

(2) Is it legally appropriate to use the TSFA procurement technique in future procurements by ORD Districts for industrialized sanitary facilities?

SHORT ANSWER:

(1) Yes, clearly TSFA was the most appropriate procurement technique to use in the situation.

(2) Yes, TSFA can be used again because (a) the condition for its non-use is not yet met; and (b) even if the condition were met, other laws and regulations more fundamental than the one sentence at issue in ASPR 2-501 preempt the regulation at issue and require the continued use of TSFA in procurements for industrialized buildings.

DISCUSSION:

(1) As discussed above, in terms of the nature of industrialized buildings products and the necessary design strategy to use in procuring them without being "unduly restrictive," clearly the choice of TSFA was correct. ER 1180-107, DOD policy on buying products of differing design characteristics, 10 USC 2305(b), the aforementioned shortcomings of other design and procurement alternatives, ASPR 2-501, 502, and the analysis of OCE General Counsel for Civil Works supports this. Furthermore, the Public Building Service of the General Services Administration (PBS of GSA) spent 3 years during the late 1960s examining the legal feasibility of using a TSFA method to procure building subsystems. The results of the research, eventually concurred in by the GAO, indicated TSFA was an appropriate procurement method. PBS of GSA continues to use TSFA with success and without protest for its building projects which involve buying industrialized subsystems via performance specifications.

(2) The continued use of TSFA is appropriate for two reasons:

(a) Given the state of the art of industrialized building products, ORD does not possess the information and descriptive design strategy to procure industrialized buildings in a highly competitive, unrestrictive fashion. The industrialized building products are not standardized and, therefore, are not amenable to any descriptive design discipline. The numbers of building firms are difficult to know since they enter and leave the market so quickly. One estimate places the number at around 4000 building concerns. There is even disagreement about how to characterize the various industrialized builders. One classification indicates there are "closed" and "open" industrialized builders. Another classification based on building method, indicated there are "panel," "box," "sandwich," and "modular" systems. In sum the industrialized building industry is highly volatile and non-standard. Therefore, it is unlikely that on the basis of only 13 bids, ORD now possesses the ability to execute a descriptive design which adequately captures the industry. In fact, as proof of the industry's volatility, not one of the 13 proposers were attendees at the pre-bid symposium at Chicago. CERL, with all of its research of manufacturers' information, and with a pre-bid symposium designed to reveal who would be the bidders, did not know or anticipate any of the eventual bidders.

(b) Even if it could be argued that the condition for abandoning TSFA to use formal advertising has been met, there is an additional reason to continue TSFA's use—preemption. In apparent conflict with the one sentence in ASPR 2-502 at issue, is the most fundamental procurement rule—achieve maximum competition.[8]

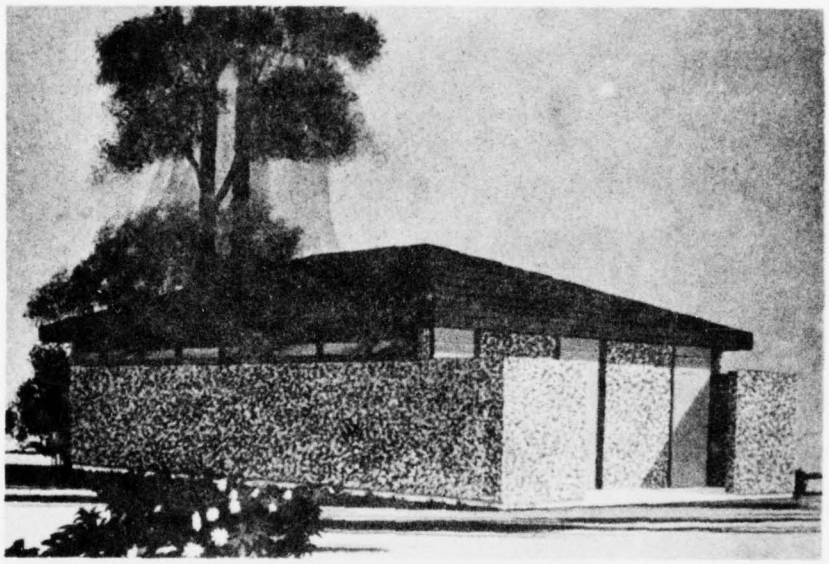
Maximum competition was achieved in the ORD pilot project and the resultant bids attest to that fact. The variables have not changed; the technical and legal reasons which pointed to TSFA as the optimum procurement technique remain the same. Adopting another design strategy or procurement technique at this point will probably not duplicate the 50 percent savings enjoyed in the original procurement.

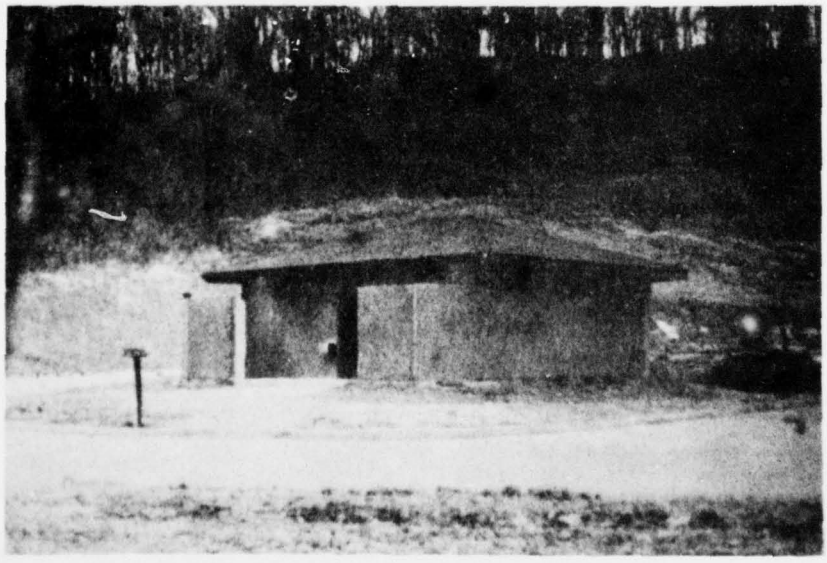
Placing precedents in perspective, clearly the paramount consideration is to repeat the competitive atmosphere which resulted in all bidders bidding below the government estimate with the low bid 50 percent below the estimate. This preempts the fact that a Corps District might now have the capability to design an industrialized sanitary facility. Despite the proliferation of laws and regulations, the benchmark guiding all procurement decisions remains relatively the same as it did in 1975; namely, "maximize competition, obtain reasonable prices, and assure accountability of public officials for public transactions."[9]

[8] 41 USC § 253(a); 10 USC § 2304(g); 10 USC § 2305; ASPR 1-300.1; ASPR 1-1201; ASPR 18-107; FPR 1-1.301.1.

[9] Commission on Government Procurement, Report of the *Commission on Government Procurement*, Washington, D. C.: GPO #5255-00007), Vol I, p 1.

APPENDIX J: PICTURES OF BROOKVILLE LAKE PROTOTYPE FACILITY







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Basin Planning Branch
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Environmental Resource
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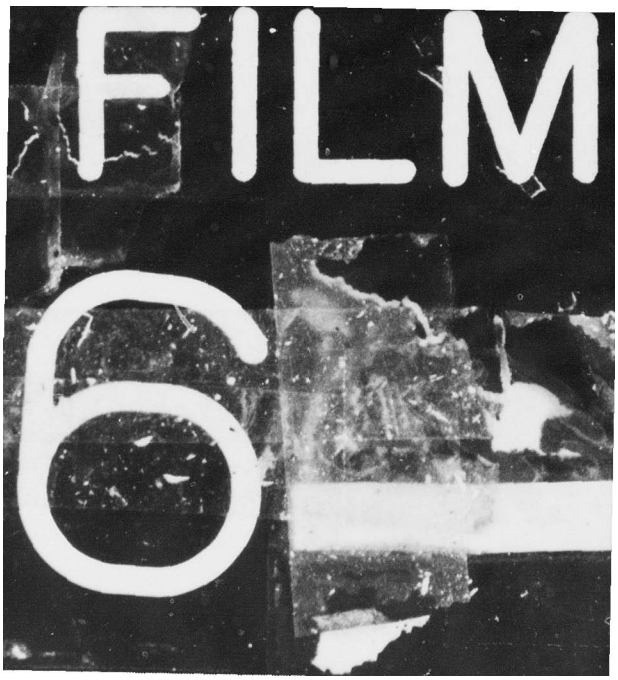
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