VALUE ENGINEERING

Prepared For

THE ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY

5th Edition

The McGraw-Hill Book Company

July 1979

BY

Lawrence D. Miles

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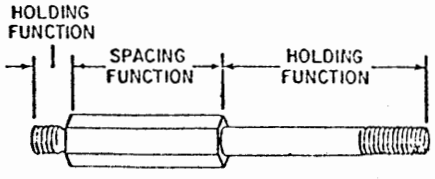

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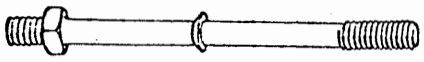

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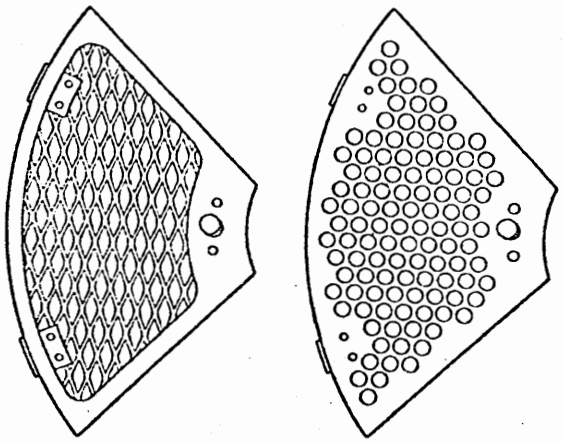

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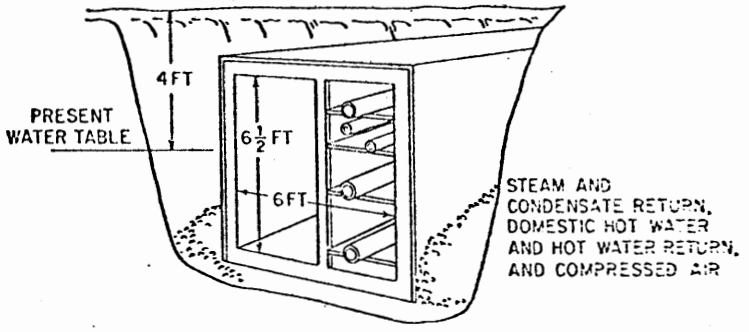

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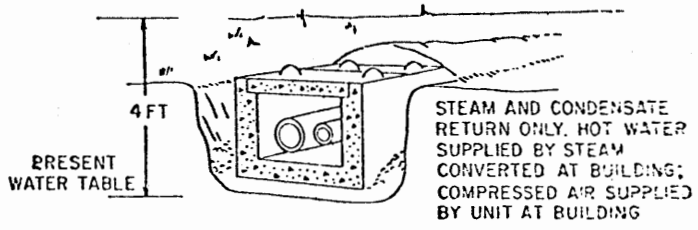

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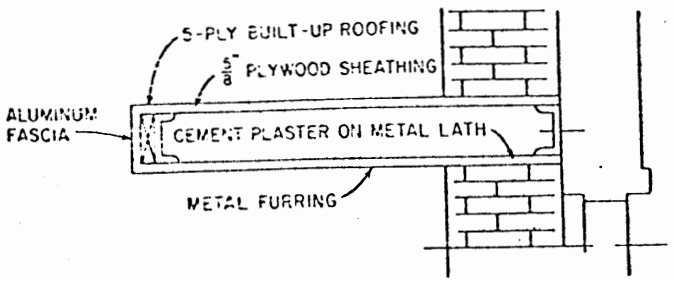

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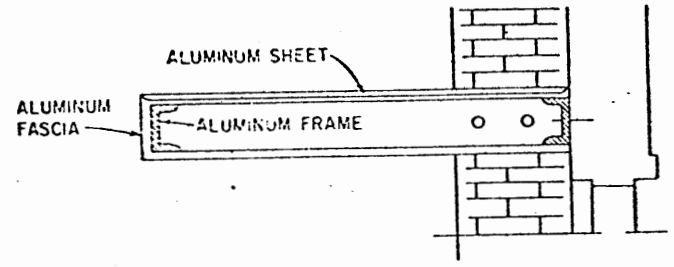

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V A L U E E N G I N E E R I N G

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A thinking system used to develop decision criteria when it is important to secure as much as possible of what is wanted from each unit of resource used. Resource may be money, time,material,labor,space,energy or whatever. The system is unique in that it effectively uses both knowledge and creativity, and also provides step-by-step techniques for maximizing the benefits from both. It promotes development of alternatives suitable for the future as well as the present. It does this by sharply identifying and deeply studying each function which the customer or user wants, then collecting knowledge and causing creativity to achieve that with minimal resources. Resources are converted into costs for direct meaningful comparisons. 15% to 40% reduction in the required resources often results.

APPLICATION. 1. In the design,manufacturing and purchasing of mechanical,electrical,chemical and other products. 2. In administrative groups, private or public where the task is to achieve accomplishment through people. 3. In all areas of social service work - hospitals,insurance services,colleges. 4.In Architectural design and/or construction. 5. In Development and Research. It may be called Value Engineering,Value Management or Value Analysis.

THE APPROACH - FUNCTION STUDY. All use of resources, all costs are to provide specific functions which the customer or user wants. Functions will be of two types. USE function, which does something the user wants done, and AESTHETIC function, which pleases him and causes him to select this one. Value Engineering uses a planned app-

roach for intensive and effective utilization of every applicable technique. It requires the development of sufficient skill in the application of enough techniques to bring into clear view, a liberal number of value alternatives. Each function is understood,identified, clarified and named. Functions the user really wants are sorted and identified.

VALUE. is defined as the proper function for the least resources. Best value then, is the full functions desired for the lowest cost achievable. The VALUE of a FUNCTION becomes a vital measure. It is the lowest cost of secureing it - after knowledge collection and after penetrating creativity. Having this measure, high effort is made to achieve it near its value.

The system is used to improve value in either or both of two situations. 1. The product or service as used or as planned may provide 100% of the functions the user wants but lower costs may be needed. The system then holds those functions but achieves them at lower cost. 2. The product or service has deficiencies,does not perform the functions the user wants,lacks quality,so also lacks good value. The system uses knowledge and creativity to correct those defficiencies,providing the functions wanted, while, at the same time,holding the use of resources - costs - at a minimum.

EVALUATION OF FUNCTION BY COMPARISON. When functions have been identified, clarified,understood and specified, great help comes from the answer to the question,

"How much is the lowest cost which,under our conditions, would provide the described function?". This answer is developed by comparisons. However, this evaluation is not made by comparisons to the past. These values are established by other valid comparisons. How might an important portion of the function be accomplished, and what would that cost. How would that function be accomplished in a different industry, a different country, under very different conditions, and what would it cost? Compare with larger items, compare with smaller items,compare with similar items or services and their costs. If there is no comparison, there is no evaluation.

Often this task of creatively evaluating the function, of itself brings a good answer to the problem. For Exampie. The Navy was building 1000 landing crafts. One function was to "contain 200 gallons of gasoline". The best quotation was $520.each. The function was evaluated by comparisons. How else could 200 gallons be contained and what would each cost? 1. 4-50 gallon drums would at that time cost $25. total. 2. a standard 250 gallon oil tank often used with oil burners in homes cost $30. Also other comparisons. Pick $30. for a base. Some connections, some piping and perhaps some coatings would be needed, so $50. was picked for the Value of the Function. Non-combat life of 8 years was desired. The Navy changed to four drums, separated them into two groups of 2,giving better battle protection, put in the needed valves and fittings. Cost became $80.each,$80,000 instead of $520,000 for the job.

MINIMIZES NORMAL HUMAN NEGATIVES. The system with its intense emphasis on functions and with depth searches for knowledge and with constant effective creativity, built into step-by-step techniques offsets many human traits which retard or stop beneficial change. Some of the ever-present human retardants are: 1. Our thoughts follow their own habit pattern. 2.Any decision to change, if proven wrong, brings embarassment. 3. Making a change always brings personal risk to the decision maker. 4. Decisions based upon sound general criteria often do not fit the specific. 5. The required good decision may be contrary to "What we normally want to do". 6. Subjective coloring of attitudes of important people in the area makes good decisions difficult without sound objective data. 7. Decisions vital to profitability are often made by persons not accountable for profits. 8. Obscure cause-and-effect relationships in some matters causing costs, allow decisions injuring value. 9. Feelings are strictly personal, yet they always influence and often control decisions effecting Value.10. Most environments are hazardous to the new, or to a change. Sound, objective alternatives developed by the Value Engineering Problem solving system do much to overcome these human retardants.

JOB PLAN OF THE PROBLEM SOLVING SYSTEM. First, all minds are "tuned" to work on exactly the same problem at exactly the same time. This often requires 20 minutes to 2 hours.

In the *job plan* the problems are recognized and faced, with the functions to be accomplished clearly in mind. It is a five-step process. First, information surrounding the problem area is intensively and extensively secured. Then it is thoroughly analyzed for meaning and *sense of direction.* Next the essential creative work is done. Afterward and separately, the judicial work is done, followed by suitable developmental work. Each of the first four steps is a different type of mental activity. Each is exclusively followed and thoroughly completed before *any* of the other steps are begun.

1. *Information Step*

The foundation for effectiveness is built in the information step. What are the facts? What are the truths? What have been thought to be truths? Only when thorough and complete knowledge of the situation is obtained can valuable new thinking be done. Often, when complete information is in view, good solutions grow rapidly. Carefully separate out the assumptions. Review each. Determine if facts can be substituted for parts of the assumptions. Seriously question assumptions of long standing.

What is to be accomplished? What is it that the customer really needs or wants? What are the desirable characteristics with respect to size, weight, appearance, durability, etc.? Secure all pertinent information: costs, quantities, vendors, drawings, specifications, planning cards, and manufacturing methods data as well as actual samples of parts and assemblies where practicable. In the case of new products, secure all information that is available: all design concepts, preliminary sketches and drawings, preliminary cost estimates, etc.

2. *Analysis Step*

In the analysis step, extensive essential "function" thinking is developed. Functions are "evaluated," and problem setting is made precise. Functions are separated for single study and then are grouped as needed for best solution. Moreover, it is readily discerned that, in effect, the preceding information step is an essential prerequisite to precise and final problem setting.

What are the meanings? What are the total problems? The individual problems? The reasonable goals and plans? What are the key problems to be solved first? What solutions seem reasonable? What end result is reasonable? What steps—first, second, third, etc.—are indicated? What additional information is required? What unlisted assumptions are being made? Are the assumptions now valid? What solutions does it make sense to search for? Approximately what savings or benefits might each of the best approaches bring? Exactly what parts of the problem or overall problems should we seek out better solutions for first? What specific needs, when well met by better solutions, would "unlock" very beneficial solutions for the project?

3. *Creativity Step*

Einstein said that when there is a problem to be solved, "Creativity is more important than knowledge." Having acquired understanding and information, we have laid the foundation for the application of various techniques to generate every possible solution to the overall problems involved, to the parts of problems, and to the individual problems. To derive the fullest benefit from our creative power, we must now encourage free use of the imagination.

It is useful to consider the human mind as containing certain knowledge *bits*, or pieces, and an ability to bring these diverse knowledge bits, which have never before appeared in the "same mental picture," together into one focus long enough to consider "What benefits to my present project might result if I combined them in the solution?" In this concept good useful creativity is maximized if the individual is in possession of two factors: (1) the knowledge bits required to deal with the task at hand and (2) the mental ability to readily join diverse, unrelated bits of knowledge into one temporary picture.

A chemical not yet compounded does not exist, and a metal not yet developed does not exist—not because they are not possible, but because the required combination of creativity and knowledge has not yet been associated.

4. *Judgment Step*

What approaches show the greatest promise of yield and accomplishment? Do not discard ideas. Develop and improve the better ones. Study intensely ideas with high dollar value, determine their limitations with great objectivity, and then seek to eliminate, overcome, or minimize the objections.

Which approaches are now ready for the development planning step? Which should be referred back through another cycle of information, analysis, and/or creativity step? What solution has so many advantages that the minimizing of its specific disadvantage becomes the new principal problem?

5. *Development Planning Step*

One person performs this step, consulting others as required and assigning specific actions to others as appropriate for development.

Select the best specialists for consultation.

Select the best vendors for consultation.

Establish a program of investigation that will provide the latest information on, and the latest capabilities of, each of the approaches that shows promise.

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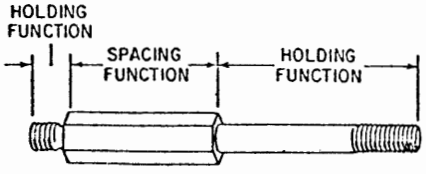

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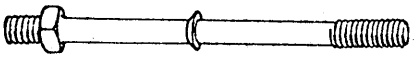

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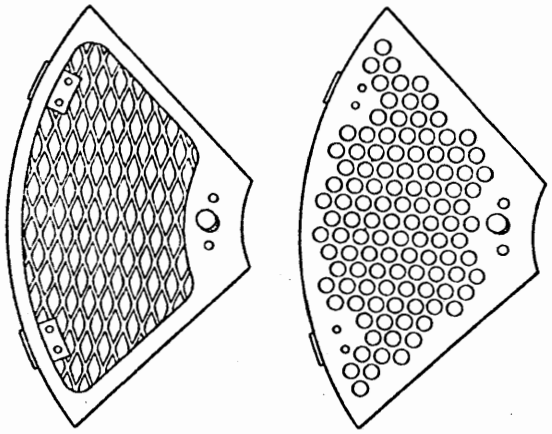

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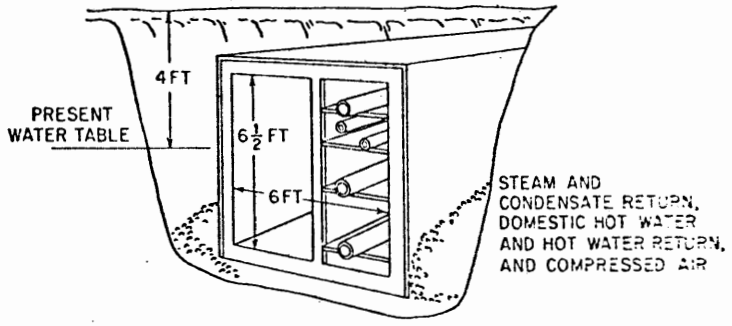

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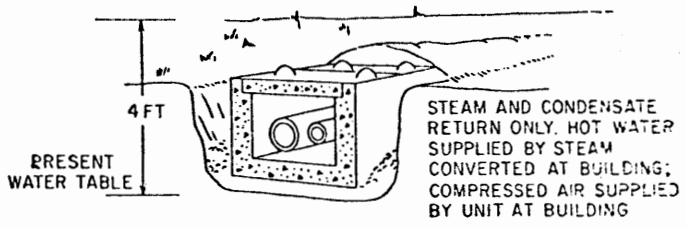

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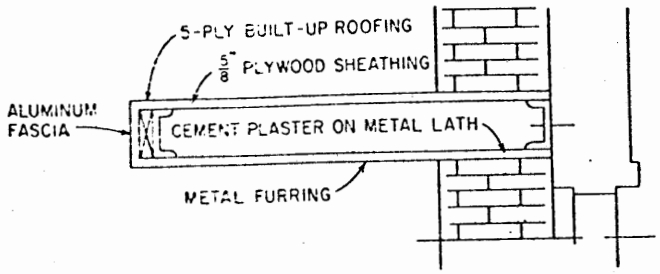

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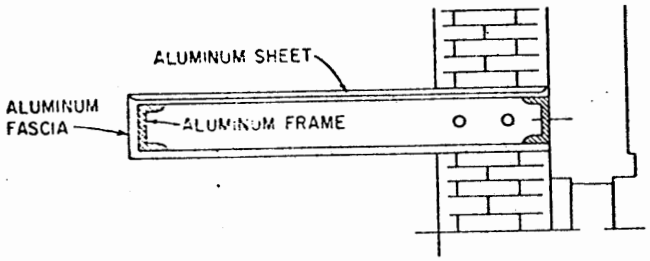

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