

COST CONTROL IN HOSPITAL DESIGN AND CONSTRUCTION

A TALK BY

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Today's difficult construction budget problems stem from several causes. The least of these is the unpredictability of the escalation of building costs, and yet that is the excuse most commonly given and unfortunately it is generally accepted. The acceptance of that excuse is probably the reason why so little is being done about exposing the much more significant causes. In our opinion these causes are:

First -- Initial haste and inaccuracy in defining the purpose and scope of the project. A hospital board decides that more beds are needed. In the early stages little thought is given to what that means in the way of increased ancillary facilities. Frequently, the use of the existing building is inadequately considered. The present and future role of the hospital in the community is not carefully analyzed. The new concept of the hospital as the community health center may not be evaluated. Thought is not given to the continuing education of the staff and what that means. In other words, in language which all of us in this room understand, there is no real program. The medical staff wants more hotel beds for sick people as fast as possible.

Second -- Even with a good program, the early estimating techniques are lacking in background and experience. It is far too common to say a new hospital costs \$X/bed for \$Y/square foot, or that the alterations to the existing building can be done for \$Z/square foot. These broad and erroneous methods of estimating are based on the assumption that all hospitals are alike -- that all of the various service departments are directly related to the bed count. Actually, hospitals vary considerably in the size and complexity of their laboratories, outpatient facilities, operating suites, obstetrical usage, radiology, dietary, and even storage areas. These different functions also have differing costs.

Third -- Even with a good program and the use of a good early estimating technique, changes are made in the program -- in the scope of the job -- in the architectural concept -- in the sophistication of the mechanical systems -- without evaluating the effect on the cost and on the previously established budget. Consideration is not adequately given as to whether these changes in concept are worth the price being paid for them -- and even if they are worth it, are there funds available to pay for them.

The fourth cause of the budget trouble is failure to allow adequately if at all for building cost escalation. It is unbelievably common to base estimates on today's prices without considering that a couple of years may go by before contractors' bids are actually taken. In our work we never make an estimate without pegging it to the date when bids will be taken and without indicating a probable escalation factor if the job is delayed beyond that date. Our glass ball may not give the right answer all the time, but our escalation projection is usually not off more than 1 or 2%.

Over a period of 20 years, it has been our experience that these factors can be controlled within a narrow range.

First, let's discuss programs. I am sure the preparation of an adequate program is high in the priority list of things which you require of an institution seeking fund assistance from you. From our point of view we feel we can render the most help to our clients if they employ us at the earliest moment in the consideration of the project. This means that we can establish the earliest budget using our own techniques, and it thus avoids a lot of backtracking and disillusionment later if we have to tell the client that his budget established by a less reliable method is inadequate.

When we are employed at this early stage, we find all kinds of programs -- from excellent ones to none at all and all the stages in between. Incomplete and inadequate programs are usually self-evident, and it is not difficult to convince a client that the requirement for a program is a fundamental prerequisite for a good early budget determination. The program may be written by the hospital administration with the help of the medical staff. Some of the best we have seen come from that source -- they have the advantage of a deep knowledge and experience with the problems of the particular institution. They may be written by a hospital consultant -- and their degree of excellence depends on the capability of the consultant.

We ourselves do not write hospital programs. However, we do give our clients a comparative evaluation of their programs with our background of statistical information about program areas by category of space. We are careful to point out to the client that a variation from these averages does not mean that his programmed needs are wrong. It does mean that he should examine any excess or deficiencies to make sure that in his particular hospital there is a reason for them. We have had to make clear to our own staff that you cannot create a program based on averages -- you cannot design a hospital from a

handbook. If you try to do this, you take no account of progress and you are apt to proliferate the mistakes of the past. So much for programs.

Let us now discuss early estimating techniques or what we call program budgeting. What we require of the program is the net usable area of the various categories of space or hospital functions. From our own experience figures, over a period of years, we have developed what we consider to be reasonable ratios of gross area to net area by hospital function. Using these ratios we develop the gross area figures. We have also developed standard costs per square foot of gross area by function. Our costs are adjusted to allow for local labor rates by the individual trade. We have this information for almost every town in the United States.

Our costs are also adjusted by a time factor -- based upon the time differential between our base time and the time when bids will be taken. This is estimating the escalation factor. This involves increases in wages during the last recorded year, as well as a knowledge as to when wage rates come up again for negotiation with the unions. This information is generally available. This also involves some educated guessing.

Our costs also take into account construction conditions which might be peculiar to this site or this hospital -- this might be plus or minus from our average assumptions. Examples might be difficult foundation problems, material delivery or storage problems, unusual weather conditions, keeping the existing hospital in operation, etc.

Having determined the adjustment factors for building costs by trade, for time and for difficulty of construction, we calculate the cost of the structure by function.

The budget, however, must be a total project budget. In addition to the cost of the structure, we must include site improvements, utility connections, fixed and movable equipment, fees of various kinds, surveys, borings, legal and administrative expense, resident inspection, and a project contingency.

For subsequent cost control, especially in making estimates from schematic plans, we have subdivided the structure into 15 building systems. All of our cost units by hospital function are subdivided for our use by these systems.

Having developed the total project budget from a written program, the board of the hospital can review this in the light of the funds which can be raised. Frequently, the program may

exceed this potential and must be reduced. When that decision is reached, the architect can be authorized to develop schematic plans. The architect now has a program, a budget, and an outline specification on which the budget is based.

However, continuing cost control is most important if this program budget is to be maintained throughout the design process. Let me briefly describe the steps we follow.

When the architect submits his initial schematic plan, we first make an area analysis. This shows the net and gross area by hospital function on the plan and compares them item by item with the net and gross areas called for in the program and program budget. Any differences are pointed out by us as well as the reasons for the differences and a statement as to what can be done to correct them. This analysis frequently shows up both excesses and deficiencies in meeting the program. This analysis is most important because in our experience more money is wasted in all types of buildings through excessive gross to net ratios than is wasted in details of design.

We also prepare a "systems" building cost estimate from these plans. Schematic plans are not sufficiently complete to make a meaningful estimate by building trade as we later do, and

that is why we devised the technique of systems estimating. At this point in the design process these are the only quantities that are measurable. We can, however, compare this cost with the "systems" estimate developed for the program budget. If there are any significant differences, we account for them and tell the client what can be done about it. We also prepare a list of suggested savings whether or not they are needed to meet the budget.

When the "design development" drawings are completed, we go through almost exactly the same procedure as we did for the "schematic" plans. Again a list of suggested savings is submitted -- again we make an area analysis. The finally approved "design development" drawings are the basis for the working drawings or contract documents.

During the preparation of working drawings, the major hazard is that the client, the architect or the engineers may depart from the scope of work covered by the previous approved drawings. If any change by anyone is under consideration, we ask to be notified in advance so that we can submit an estimate of the cost. This enables the client to determine whether the change in scope is worth the cost and whether he has the funds

to pay for it. As a further check on any deviation from the design development drawings, we periodically visit the offices of the architects and engineers to keep abreast of what is going on.

When working drawings and specifications are substantially complete except for final dimensional and coordination checking in the architect's office, it is our practice to make what we call a pre-bid estimate. Frequently, we are asked why we go to this trouble and expense when you soon have actual bids to tell you the score. From our point of view, we consider this a most important estimate. We take off quantities just as the contractors will do it.

We have specialized mechanical estimators who take off the complete piping details just as the mechanical contractors do, and we do the same for the electrical work. This is the first time we have been able to see the architectural, structural, and mechanical plans at one time. The specifications are now complete specifications. Our pre-bid estimate serves these purposes:

1. It is a final check on the total cost to make sure it is in line with the budget.

2. It gives us a chance to scrutinize architectural details to see if there are any unusually expensive ones that could be simplified without impairing quality.
3. This estimate serves the important purpose of being an accurate check on the reasonableness of the bids -- of detecting a market condition or lack of competitive figuring which may warrant throwing out all the bids and rebidding later.
4. It establishes a table of values by trade for use in determining the proper amount of contractors' monthly requisitions or for being a base for subsequent negotiation with the contractor if such proves necessary or desirable.
5. By converting the pre-bid estimate by trade back into a building "systems" estimate we are able to keep our unit costs by building "system" and by hospital function constantly updated.

During the actual construction of the building, there is still need for cost control. There is that old ghost -- the change order -- the extra. Generally, there are three sources of these. One -- unforeseen job conditions -- another, mistakes in the plans and specifications (and these do happen) -- and the third source is changed thinking on the owner's or architect's part. There isn't much you can do about the first two except to make sure they are priced realistically -- that a complete breakdown of cost is supplied by the contractor and that whoever represents

the owner in such matters is knowledgeable and tough. Where changed thinking is the cause, we follow this practice and find it helpful. The change is first discussed with us by the architect and the owner to determine the most economical approach to making the change. We make an approximate estimate of cost without any plans. This gives the owner a chance to judge whether the proposed change is worth further exploration before any expense is involved in changing the plans. If the owner wants the change, the handling then takes the normal course. It is important that the cumulative cost of changes be kept constantly in mind so that management can be alerted at an early date if the construction contingency allowance is not going to be adequate.

Because of the time it has taken to describe this cost control process, it may sound complicated. Actually, it is a simple process because it is an orderly process. In the past 12 months we have computerized much of it. It requires use of one of the most sophisticated computers in this part of the country. We have a console in our office directly connected to it.

Our technique is not foolproof. We have tried to systematically eliminate as many of the unknowns as possible in developing meaningful early estimates. Although we are a small company, we plow back a substantial part of our income into research -- into continuously updating our data and our methods.

Last year the measurable savings we produced for our clients was about \$56,000,000. There were many others not measurable. It is not often that our clients have budget trouble and when they do, it is usually not too serious.

We do provide a separate service to institutions who have not had our cost control and face the miserable situation of finding the bids over the budget. Of these, we get about one a month. In these cases, we tabulate for the owner's consideration all the suggested items on which savings can be made without complete redesign. On most of these jobs, we can usually get them back in line or close to it. If we do not and the possible savings are not adequate to meet the funds available, the owner has a basis for weighing the cost of complete redesign with the delays and escalation involved against the cost of getting additional funds.

This, briefly, is the story of our efforts to combat the four significant causes of budget trouble in the planning and construction of hospitals -- let me list them again:

1. Lack of a well-thought-out program.
2. Poor early estimating techniques.
3. Failure to relate changes in scope to their cost.
4. Inadequate allowance for escalation.