CONCEPTUAL PROPOSAL

FOR

PRIVATE FINANCING AND LEASEBACK

FOR

THE PUBLIC WORKS SERVICE CENTER

THE DEPARTMENT OF PUBLIC WORKS

CITY OF MARQUETTE

MR. MICHAEL A. ETELAMAKI, P.E.

PUBLIC WORKS DIRECTOR

BY: NORTHERN DEVELOPERS
MARQUETTE, MICHIGAN 49855

DATE: SEPTEMBER 19, 1984

TABLE OF CONTENTS

TABLE OF CONTENTS	i
INTRODUCTION	ii
OUTLINE OF PRESENTATION	1
FEASIBILITY STUDY	3
TEAM CONCEPT BULLETIN	22
COMPARISON OF CONSTRUCTION SCHEDULES	27

INTRODUCTION

In these times of resistance to higher taxes and municipa budget increases, there are alternatives to Public Financing o Public Facilities. A prime alternative is private financing of privately owned facility exclusively for use by the public agenc or agencies. The facility is leased to the public agency o terms negotiated between the private developer - builder and th public agency. These terms can be arranged to help the Cit maintain a relatively fixed budget for the facility over a perio of time. The advantages to the public body are many; th disadvantages are few, if any.

This presentation is being made to inform you of thi method, and to inform you that we, as Northern Developers, ar available to provide this facility to you.

OUTLINE OF PRESENTATION

I. Review of Feasibility Study of 1983

A. Review Findings of Study

B. Preliminary Plan Review

C. Cost Savings' of doing Now vs. Future

II. Advantages' of Development-with-Leaseback Construction vs Conventional Plan and Spec Construction

A. Private Sector Financing

1. No bond issue, referendum, or associated fees.

2. No capital outlay budget requirements for building lease payment only - time and cost.

B. Defined maintenance tailored to lessee's requirements

1. Leaky roofs

2. HVAC problems

3. Painting problems

4. Structural problems

III. The Concept - Development-with-Leaseback Construction vs. Conventional Plan and Spec Construction

1. Team concept - see enclosed article

2. No construction headaches for the Lessee

3. Beneficial occupancy time is much faster - see enclosed schedule

4. Construction cost is developer's responsibility - developer provides space at a specified cost to lessee.

5. Quality Control - Lessee hires outisde, independent consultant to insue that Developer/Owner will provide value he is paying for in lease payments.

IV. Northern Developers Qualifications

A. H.U.D. Senior Citizen Housing Project, Ironwood, Michigan

B. Michigan Bell Building, Ironwood, Michigan/done under the name of Industrial Service Co.

C. Team Concept Construction by a Principal of the Developer (Industrial Piping Co.)

1. D & N Building, Marquette - Reference: Mr. Kenneth Seaton

2. L.S. & I. Railroad Central Shops Building - Reference: Mr. Robert DeGabriele

D. Sundberg, Carlson & Associates, Inc. Qualifications - See Sundberg, Carlson & Associates History & Qualifications.

A PRELIMINARY FEASIBILITY ANALYSIS

OF

ALTERNATIVES

FOR

THE PUBLIC WORKS

SERVICE CENTER

THE DEPARTMENT OF PUBLIC WORKS

CITY OF MARQUETTE

MR. MICHAEL A. ETELAMAKI, P.E.
PUBLIC WORKS DIRECTOR

SUNDBERG, CARLSON AND ASSOCIATES, INC.
101 SOUTH FRONT STREET, SUITE 305
MARQUETTE, MICHIGAN 49855

TABLE OF CONTENTS

TABLE OF CONTENTS	i
INTRODUCTION	1
DISCUSSION OF ALTERNATIVES	2
ECONOMIC DECISION	5
TABLE 1	8
SUMMARY AND RECOMMENDATION	9
REFERENCES	1
APPENDIX	11
ATTACHMENTS	BLAK COVER

INTRODUCTION

During recent times, it has become obvious that something needs to be done to improve the Public Works Service Center Facilities.

The existing Public Works Garage-Warehouse Service Center was constructed in about 1962, with various additions through 1976. The useful life at the time of construction was estimated to be 45 years for the 1962 building; and 25 years for the 1973 additions.

The remaining functional life is estimated to be 15 years unless certain major capital improvements are to be made. However, it must be noted here that the building was constructed as a warehouse, and is therefore presently being used to a large part, for functions it was not designed for. Herein lies the problem to be investigated.

Since the facility, as is, is being used for other than for what it was intended, it presents itself as an obstacle to efficient, cost-effective public works. In recognizing this problem, the City of Marquette Public Works Department, has engaged Sundberg, Carlson and Associates, Inc. to analyze various alternatives and to recommend the preliminary feasible alternative for a public works service center. The following alternatives have been analyzed:

(1) Do nothing: Remain at the existing facility as is.

(2) Remodel the existing facility to more adequately function as it's intended to.

(3) Construct a new facility in a more centralized location.

METHOD OF ANALYSIS

This analysis has been made on the basis of uniform annual cost. The reasons for this are several:

(1) The lives of the alternatives are different.

(2) The "benefits" in any of the alternatives are the same. The differences in costs are "benefits" or savings, which can be accounted for more readily as differences in annual costs.

(3) There are many irreducibles associated with replacement comparisons, particularly in the public works sector.

(4) An additional evaluation of energy savings based on an escalation rate of 10%, with the savings applied to an investment at 10% has been done for a comparison.

Other factors considered in this analysis, are the facts that:

(1) Only reducible, known savings estimates were used to evaluate the "improvement" alternatives.

(2) As equipment ages, maintenance increases, and thus, the need for efficient maintenance increases, i.e., a facility being misused presently, will cost more as the misuse increases.

(3) The interest rate used is based upon the fact that this analyst feels that the taxpayer deserves a rate of return better than the cost of money. If bonds are at 8%, 10% seems a fair value to use.

(4) It is assumed that no expansion of services will be required in the future.

Table 1 on page 8 summarizes the uniform annual cost calculations. Appendix 1 contains the calculations used to arrive at the amounts used in the categories for annual costs. Kindly refer to these as you read the following pages.

Discussion of Alternatives

Alternative "A":

Do nothing, remain at the facility.

The existing facility has several deficiencies which manifest themselves as costs, and inefficient operations. The major deficiencies are:

(1) Lack of efficient maintenance areas, traffic flows, storage areas, and work station separation, which manifest themselves in higher labor costs per vehicle or service maintained; higher attrition of materials due to damage; lost time injuries; high cleanup costs; low employee morale; incomplete maintenance, and high supervision costs.

(2) High energy costs. The costs based on 1981 dollars were about $1.91 per square foot. Total energy costs for a facility of this type range from $ .47 to $9.62 per square foot.

(3) Location. The location is at the far end of town where the majority of work is done. This location cost manifests itself in higher management costs, high transportation costs, and higher equipment wear and tear, and higher labor costs.

(4) The facility has high maintenance costs. These costs are due to age, the use of the facility for a purpose other than it was designed for, and improper or inadequate building systems, i.e., plumbing, heating, ventilating, etc.

(5) The facility presently needs a new roof.

(6) The facility is probably overstaffed to make up for the loss of efficiency. The decrease in staff has not been taken into account as a savings.

(7) Reduction in life of vehicles, primarily parks and recreation, due to location and methods of salt storage.

Alternate B:

Remodel the existing facility.

Attachment A shows a feasible remodelling schematic. It is felt implementation of this plan would have the following effects:

(1) Reduce vehicle/equipment maintenance costs due to improved traffic flow, maintenance station separation, material flow, and storage areas. It is estimated this will save 4 to 5 percent of the maintenance budget.

(2) Reduce utility/energy costs by approximately 10%, unless the existing structure envelope is remodelled significantly more than included in the remodelling cost.

(3) Reduce attrition costs of materials and parts due to damage/losses. This amount is included in the savings in item 1 above.

(4) Improve employee morale to the extent of improved working conditions and facilities.

(5) A reduction in facilities maintenance costs, if the new roof is put on the existing structure, and if the drainage system is improved.

However, the remodelled facilities would have the following disadvantages:

(1) Higher than required management/administration costs due to distance from City Hall and Engineering, and the separate facilities for Administration and Engineering.

(2) Higher than required transportation, utilities maintenance, and removal and supervision costs due to distance from the major work areas.

(3) Higher than normal energy costs, due to existing structure deficiencies which are unrepairable without a complete new envelope.

(4) Deterioration of parks/recs vehicles due to salt storage building proximity to theirs.

(5) It would require a substantial outlay of capital.

(6) Disruption of ongoing maintenance during construction, and the cost of moving, removing, and relocating existing equipment, tools, materials, parts, and furnishings.

Alternative C

Construct and relocate to a new, centrally located facility.

Attachments B&C show schematic layouts for potential new facilities on a suggested site. Implementation of either of these plans would have the following effects:

(1) Reduce of vehicle/equipment maintenance costs to a minimum standard which could be set by providing the most efficient layout possible for traffic flow, vehicle upkeep, storage, materials/parts storage and work station separation.

(2) Reduce energy costs to a minimum, within current energy code requirements by using the most energy efficient materials and equipment for building systems.

(3) Reduce of lost time accidents due to lack of adequate lighting and personnel mobility paths.

(4) Reduce transportation costs, utility and street maintenance costs, snow removal costs, and supervision costs due to location nearer higher maintenance work area.

(5) Reduce management/administration costs due to location of management/engineering in same facility.

(6) Increase employee morale greatly, since new facilities can be fit to employee's needs in the conception, and due to new equipment and tools.

(7) Reduce facilities maintenance costs to a minimum by using materials most suited for the use and environment.

(8) Reduce materials/parts attrition due to loss and damage.

(9) Reduce overtime requirements by increasing efficiency to the optimum.

(10) Provide location for snow removal dump site, at a central location.

(11) Provide potential for reduction in work force personnel, by one maintenance worker and by one clerical worker.

The construction of and relocation to a new facility would have the following disadvantages:

(1) A large initial capital outlay fund would be required.

(2) Moving of existing tools, equipment, vehicles, materials, parts, and furniture from the existing facility.

Discussion of Economic Decision

As shown in Table 1, the uniform annual costs indicate that the do nothing alternative is economically the thing to do. However, a large number of factors which must be considered are the "irreducibles", i.e., those factors which cannot be reduced to socially estimate monetary terms at this time. These are factors which must be evaluated on judgement as applied to decisions which might have marginal economic differences. The following factors are considered "irreducibles", in the case of "A" and "B" versus "C", and "A" versus "B".

(1) The potential for reduction in employees due to centralized effort.

(2) The potential for substantial reduction in vehicle/equipment maintenance costs.

(3) The potential for a reduction in supervisory personnel.

(4) The potential for better control of operations.

(5) The potential for better communications up and down the chain of command; including City Hall.

(6) The capability to meet the need for increased maintenance capacity, say in the case of increased road/water/sewer maintenance miles due to the annexing of another area to the City.

(7) The fact that the current facility does not now and will not, without major expenditures, effectively meet the needs of a public works service center.

Our experience with these factors indicates, the following:

(1) The centralized location of an or units maintenance facility tends to eliminate duplicate effort due to

reductions in "non-productive" travel times. This, in combination, with a more organized vehicle service area reduces maintenance time requirements and allows more even scheduling of preventative maintenance. The fact that the new facility idea above combines the management, engineering and supervision in one location suggests that secretarial/clerk skills could be combined. We feel that "C" would reduce personnel by one clerical and one maintenance II worker or mechanic, assuming maintenance needs are not expanded.

(2) Whenever road mileage is evened-out or reduced and preventative maintenance is increased, vehicle maintenance costs are reduced. In most cases, several small improvements will snowball into a larger improvement, than expected. It is estimated herein that vehicle maintenance costs will be reduced by approximately 12%, where in reality this figure could optimistically, due to the compounding effects of organized parts, a central maintenance manual library, better supervision, etc., be 25%.

(3) The centralization of management, engineering, and production operations will increase communications and control, and thus reducing the response time, misunderstandings, and erroneous decisions. This is a difficult item to put a number on but Liebel (4) indicates savings in "production" can vary from 2 to [illegible] percent of production costs. Better communications result from the line to upper management and vice-versa. This can have a very productive effect in the generation of ideas, improving morale, and increasing productivity.

The factors discussed above are difficult to place a monetary value on, but are known to have varying degrees of positive production effects, when acted upon.

Another factor not taken into account in the economic factors indicated in Table 1 is the salvage of the existing facility. Presently, this value is given as $351,000.00. If the present salvage value is applied, i.e., the existing facility is sold within the year, this value could be applied to the principal, thus reducing that amount to $1,640,[illegible].00. This would lower the equivalent annual costs to $7[illegible],959.00, which very nearly equals the equivalent annual cost of the existing facility. However, bear in mind that the existing facility will only last 15 years and, then a new facility will be needed. Experience tells us that it will cost much more by then to build a new facility.

Another factor worthy of consideration is the escalation of energy costs. Government estimates indicate a doubling of energy costs by the year 1985, based on 1974 prices.

Based on 1982 data and increases of the past two years, an escalation rate of 10% is a realistic number. Applying this escalation rate to the savings over the 55 year life, the present worth of those savings for "B" over "A" is $200,000.00; similarily for "C" over "A" that savings is $400,000.00. This means a considerable savings in money and energy over the life of the capital invested. If we apply the present worth of these savings to the capital being invested now, the equivalent annual costs of "C" as compared to "A" is $696,938.00 versus 764,946.00, respectively.

SUMMARY AND RECOMMENDATION

Three alternatives were analyzed. Alternative "A" was the "status-quo" alternative; alternative "B" was to remodel the existing facility, and alternative "C" was to construct and relocate to a new centrally located facility. A fourth alternative, a combination of alternatives "B" and "C" was considered initially, but is was considered economically unfeasible due to the large estimated cost of remodelling just a portion of the existing facility, and due to the split operations costs.

Initial economic evaluation, based on equivalent annual costs, rendered the following:

"A" = $744,946.00 for a 15 year life

"B" = $764,829.00 for a 33 year life

"C" = $737,959.00 for a 55 year life

Consideration of the salvage value of $360,000.00 for the existing facility in Alternative "C" yielded an equivalent annual cost of $700,959.00.

Consideration of the equivalent present worth of future escalated energy savings, using at a 10% interest rate and a 10% escalation rate for energy costs, yields an equivalent annual cost for "C", as compared to "A", of $696,936.00.

It was found that the many irreducible factors involved weigh heavily in favor of a new facility, and it is estimated that these will lead to an economic savings of 5% of the operating costs.

It is recommended that further detailed study and preliminary design be done for Alternative "C", construction of, and relocation to, a new centrally located Public Works Service Center.

References

1. Grant, Ireson, and leavenworth, "Principles of Engineering Economy", 6th Edition; New York: The ronald Press Co., 1970

2. Apple, J.M.: "Plant Layout and Materials Handling", 3rd Edition; New York: The Ronald Press Co., 1976

3. Bovay; H.E., Jr.; "Handbook of Mechanical and Electrical Systems for Buildings", New York: McGraw Hill Book Co. 1981

4. Niebel, B.A.; "Industrial Economics and Management", 8th Edition; New York: McGraw-Hill Book Co., 1967

APPENDIX

Sundberg, Carlson And Associates, Inc.

Consulting Engineers, Land Surveyors & Construction Managers

101 S. Front St. • Marquette MI 49855 — CALCULATION SHEET — 1600 Breitung Ave. • Kingsford

CLIENT: CITY OF MARQUETTE PUBLIC WORKS DEPT.		CLIENT PROJ. NO.
		BCA JOB. NO. 212-124
CALCULATED BY: AJM	SCALE	SHEET 1 OF
CHECKED BY	DATE 2-02-83	FIELD BOOK NO.

EXISTING FACILITIES COSTS - CURRENTLY - DO NOTHING

SALVAGE VALUE = $360,000.00

FACILITY
OPERATING COSTS:

ENERGY (GAS & ELECTRICITY) = $26,700.00 — 1981 & 82

GAS: $18,000.00 → INCREASE ~ 25%

ELECTRICITY: $8,700.00 → INCREASE @ 4%

ESCALATION AVE ≈ 10%

MAINTENANCE OUTSIDE CONTRACTS ≈ $5,000.00 FROM

MISCELLANEOUS MAINTENANCE ≈ $42,000.00 FROM

Vehicle Mile Cost = $\frac{205,000 + 818,000}{880,000}$ = $1.163 per mile

Sundberg, Carlson And Associates, Inc.
Consulting Engineers, Land Surveyors & Construction Managers
101 S. Front St. • Marquette MI 49855 CALCULATION SHEET 1500 Breitung Ave. • Kingsford MI

CLIENT CITY OF MARQUETTE PUBLIC WORKS DEP'T.		CLIENT PROJ. NO.
		SCA JOB. NO. 212-124
CALCULATED BY	SCALE	SHEET 3 OF
CHECKED BY	DATE	FIELD BOOK NO.

Moves/vehicle while maintaining : daily moves/vehicle
Lost time @ 15 minutes per move

3 moves per day - presently 3 vehicles need to be mov
to relocate 1 for alternate servicing

$3 \times 3 \text{ people} \times \frac{15 \text{ minutes}}{60} \times 250 \times \$8.60 \frac{\text{ave}}{\text{hr}} \times 1.22 \frac{}{\$ \text{P/R}} = \$5,90$

$\frac{1600 \text{ tons} \times 2000}{135} \approx 23,300 \text{ FT.}^3$ SALT.

Costs for new building

Capital Cost
2,000,000 @ 8%

<u>Operating & maintenance costs:</u>

Energy costs for facility are estimated at:
New facilities of this type are estimated to use ≈ 30-50% less energy than pre 1973 structures
∴ for new facility $40,000 x .60 = $24,000 per year

upkeep costs ≈ 1% of new bldg value = $20,000/year

<u>Benefits</u>

① Management time ≈ ($30,000/yr)

② Better downtown maintenance

③ Faster bypass maintenance

④ Less distances for maintence vehicles to travel.
Assume 3.5 miles saved/per vehicle trip estimate total vehicle miles = 880,000 per year ÷ 250 days
$\frac{3520 \text{ veh mi}}{3.5 \text{ veh day}}$ ≈ 100 $\frac{\text{miles}}{\text{day}}$ at an average cost of

100 x 365 x 1.163 = ($42,449.50)/year - normal main

(6) 2-25-83 0826

Steve Lawry - Cleaning up to free people + 8 hrs. →
Sweeping, Cleaning drains, cleaning floors
High pressure,

Lose aggregates - waste factor 2%-5%
$500-1000
Extra handling

Pipe, Valves, & Fittings → Service Boxes, etc

Lost time due → $1000.00

Enterprise St. to - former school bus garage
Corner McLellan/West Ridge - Former UPS

Presque Isle/Hawley - probably be condemned

Division St. - Quarry Pond - needs new roof
$14,000.00

Lower Harbor - essentially useless, except for evidence storage
Parks - winter storage

Problem w/ that bldg - no adequate drainage
+ floor waste gets into san. sewer, plugged
+ needs regular sand traps
+ 4-5 times year clean out w/ vacuum trucks
1/2 hr + 1/2 hr x 2 x 4.5 hrs.
+ pressure rodder/vacuum truck - rental.

Biggest problem: lack of adequate work stations, fluids, lighting

Parks Dep't

Salt storage w/ respect to parks equip't - takes a toll → city ends up doing body.
vehicle life - 4 pu - 2 yrs from life
Body: 1 person - 3-4 times/year x 2 days + mate
200/ve

Energy Cost Estimates

Current value = $40,000.00

Since we can go to better distribution on lighting i a more efficient system, lighting (electrical costs) can b reduced by approximately 21% or $900.00

Energy costs of the current facility can be reduced by approximately 20% with a new addition by going to a different system in the shop area or approx. $3600

$4500.00

In a new facility energy costs will be approximately : warehouse + repair .30 / □ x 35,000 = 10,500

office .45 / □ x 8000 □ = $3600

$14,100

Assume we can reduce other utilities by 15% $14,535

28,635

Existing Facility

Sand = 50 x 20 x .75 = [illegible] truck loads of sand.

43 x 1.25 x 2 x 1.163 = $125.00 per year, saved on sandi[illegible]

Time saved - labor - assume 1/2 of trips would be 10 minutes less trip, wag[illegible]

43 + 69 = 112 x .50 x 8.57 hr x 1.22 = $586.00 per year.

Additional morale improvements

1. less lost time due to illness, absenteism, etc.
2. enthusiasm due to more facilities, better, positive work a[illegible]
3. Savings in 1 job at 9.21 per hour since lost time moves, etc, would save that in 1 day. 9.21 x 2080 x 1.2[illegible]
4. Savings to taxpayers of [illegible] job @ 4.75/hr.
   4.75 x 2080 x 1.22 = $12,057.
5. Eliminate 1/2 of overtime for maintenance or 1/4 of $41,000.
   $10,250.00 - extra hours due to time lost in maintenan[illegible] during shift.
6. $42,000 in misc maintenance around bldgs.
7. $30,000 in mgmt expense/per year.

ALTERNATE 1

Remodel Existing Bldg.

New Life

Additions = 40 years (due to attachment to existing) 3000 + 9600 = 12,600

Existing Bldg Shop = .25* 8200 FT.² 9,200

Warehouse = 60 - 25 = 35 8060 FT.² + 6912 FT.² 14,972

35,772

TOTAL SERVICE LIFE (WGTD) = 33 years.

New Facility Life = 55 years

*Existing Facility as is w/new roof

*As maintenance facility → less than adequate presently.

Rcd 7/1:

MANAGEMENT METHODS COMMITTEE BULLETIN

Management Methods
Bulletin No. 53

Subject: Team Concept in Construction
Date: August, 1975
File: Job Management
Replaces: None

TEAM CONCEPT IN CONSTRUCTION

Dear MCAA Member:

The Team Concept in construction has been around for many years and has been referred to by many names. Since this type of work is a part of the business of nearly all mechanical contractors, we have published this bulletin so that the organization of a team can be discussed along with the advantages and disadvantages of this approach.

The Team Concept should not be confused with the Construction Management approach. The Construction Manager may be part of the Team Concept approach, but most often he is employed only as the Owner's representative and a project of that type would not have any of the advantages that can be achieved under the Team Concept.

THE MANAGEMENT METHODS COMMITTE

Donald E. Whitney, Chairman
Marvin Brown, Jr.
William M. Hamm, Jr.
Richard A. Ide
Howard E. Kraft
James E. Massart
E. W. Tompkins, Jr.

Management Methods
Bulletin No. 53

SUBJECT: Team Concept in Const
DATE: August, 1975
FILE: Job Management
REPLACES: None

TEAM CONCEPT

THE TEAM ORGANIZATION

The "Team Concept" for building a project has in the past been a "Design and Build" concept since speaking of the team as a unit, the group works together and does accomplish the design work and the construction of the project. However, the Mechanical Contractor's involvement in the project may not be as a design firm but as the constructor furnishing input from the standpoint of the contractor as to costs and construction considerations.

The usual team makeup will be the Owner or Developer, Architect, Engineer, General Contractor, Mechanical Contractor, and Electrical Contractor as a minimum which will cover all of the specializations necessary to design and build the job. Note that the Owner of the job is considered as being on the team and is a very important element for efficient and rapid resolution of any matters which require the Owner's decision.

There may be additional organizations in the team to contribute their expertise in a certain specialization depending on the magnitude and importance of that work to the design/development effort. For instance, the structural engineer and possibly a structural firm may be involved; possibly, as another example, fire protection systems must be considered throughout in a particular type of building and the early involvement of the fire protection contractor must be in the team arrangements.

HOW TEAMS ARE FORMED

It is nice to be with a selected group to develop and build a large building or factory but this just doesn't happen every day and, most likely, many contractors have not gone through a team job from start to finish.

Most often the Mechanical Contractor is one of several companies invited to present their qualifications and then be interviewed. The invitation often comes from the Contractor who may have already been selected or, as some instances, all contractors have gone in as a team the sales pitch on a team basis.

An invitation of this sort usually requests certain information about the company including general infor basic organization, annual volume, list of project construction, backlog in dollar volume, financial sta references, and the names of personnel to be used on

Other questions which may be asked relate to h contractor would propose to organize the job, how h propose to work with the designers, handle the const what cost control and labor monitoring control sys has and, many times, his approach to schedul familiarity with CPM or Pert System.

So while he might be involved in a team through of a number of circumstances, from a case where h seek to form a team for a particular project to situation where he might be picked along with other c ors by the Owner, most frequently the opportunit about through an invitation or selection by a Contractor that the Mechanical Contractor is acquain or who believes he needs someone of the Mechanical C or's size and qualifications.

QUALIFICATIONS TO BE IN "TEAMS"

In discussing the qualifications to handle the me contracting responsibilities in the team effort, the f four (4) items are listed:

1. Estimating Capability
2. Engineering Capability
3. Experience with the Team Concept
4. Construction Capability

These are not necessarily in order of importance.

Estimating Capability is extremely important in handling the various cost determinations necessary to test out various design approaches and arrive fairly quickly at the right numbers for comparison. The contractor members of the team must have extensive background in pricing buildings of all types and, also, it is very important that he has cost records from past work and past bids.

It is often helpful to be able to give a fairly realistic opinion of what cost or cost differences might be or, at least, which of two (2) choices would be the most expensive and some indication of what magnitude of differences there might be. In some team jobs, the estimating requirements begin with a budget derived from the sketchiest information and this estimate is refined several times as more information and actual layouts become available until the time when drawings and specifications are fairly complete and definitive and the information is available for a conventional estimate of the project. In other cases, the final price of the job must be set from only a plot plan and/or representative floor plans and all contractual information must be established, including a firm price or maximum price prior to having anything else to work with. As you can see, this is one of the most difficult but also most important capabilities that must be provided to the team as a Mechanical Contractor.

The second item mentioned above, *Engineering Capability*, is also quite essential in order to have a position of being able to participate in the design of (even though not designing) the HVAC and Plumbing systems. Here, it is a matter of understanding system options, code requirements, and the practical considerations of the various types of plants or systems that might be mentioned. Being able to relate, as mentioned above, the engineering approach to the cost and degree of difficulty from a mechanical contracting standpoint is what is done in the team effort.

The third item mentioned above, which is *Experience With The Team Concept*, is one of the most important requirements and yet not the most difficult provided that the two (2) previous items, *Estimating* and *Engineering*, are fairly adequate.

The Team Concept is not a method where there is just one and only one way of doing things. The job and the leading team members will most likely establish the program to be followed so an item of prime importance is to understand the program and the schedule of meetings and requirements as they pertain to what the Mechanical Contractor is supposed to do. The main thing, then, is to work seriously and diligently on the information he is to have available to him and to be well prepared with the assigned work and any other information or concepts he wants to propose. The best team members and the ones most appreciated are those who have done their homework well, and not necessarily those who can boast of extensive experience.

The last item, *Construction Capability*, is also qu obviously absolutely essential and after all the other prepa tory work is completed and in good shape, top performanc what will cap off the effort for a successful project.

THE OPERATION OF THE TEAM

1. *Establish Preliminary Design and Criteria*
   The purpose here is to define the type of structure i probably the type of construction. For instance, a st frame building or poured concrete, and determination the size of the building such as the number of square fi number of floors, height information, etc. It will established where the building will be built, on w specific piece of property, and this will allow investigat of the area for utilities, etc. The schedule for the pro from the beginning of conceptual planning and estimat through completion of working drawings and construct should be established. Decisions on design criteria to gov HVAC systems and plumbing must be made at least c preliminary basis. The location of equipment rooms central plants and information on any special usage a such as computer rooms, cafeterias, etc. must be es lished. The arrangement of lease areas must be determi and it will help considerably if a copy of the proposed le agreement between the Owner and his tenants can obtained.

2. *Preliminary Budget*
   At this point, it may be intended to establish a commi price on the project. There are two (2) approache setting budgets that are generally used. In one instance, Owner and his consultants establish a budget for the en project which, at that cost, makes it a feasible project a as the Owner and his financial people are concerned. next requirement then is to divide the budget into various items it covers with an allowance for each elem such as the land and associated costs, architect's engineering fees, general construction, mechanical electrical. If each part of the overall project is withi allocation of funds, the project is feasible. In this appro the cost of the project is the beginning, and design planning to fit that cost are the functions of the team.

   Another approach is for each of the team membe propose a budget for the portion of the project unde responsibility and either following criteria for the jo initiating criteria in explanation of the budget propose each phase. The total budget is then compiled and test the Owner and his financial people to determine i project is feasible. If this is determined to be an accep budget and, understanding that this budgeting is act done prior to design, the team then goes to work wit design people to go through the process of design/dev ment to the established budget. It can happen that factors may be involved or come to light durin design/development phase that would possibly put th out of the money and it may either be postpon abandoned, or the entire team must repeat the process

3. *Feasibility Analysis*

The first factor involved in the feasibility analysis is the *proforma*, which is the developed estimate of the Owner's total costs as compared to the revenue he anticipates making for the purpose of determining whether or not the proposed project will produce acceptable profit. Involved also in the study of feasibility is the availability of financing and these two (2) functions are closely interlocked. It is normally not the duty of the Mechanical Contractor to work the *proforma* but he might be involved in some of the estimates of tenant finish or unit cost for various tenant work or possibly in maintenance and operating costs.

4. *Construction Start Before Completion of Working Drawings*

It is usual that a job on the team basis will be started as soon as the Owner is satisfied that his project is feasible and that the costs are correct. Also the final commitment on financing and availability of funds is a determining factor. Construction can be started as soon as foundation drawings are completed and can progress as detailed design drawings are being prepared. This will result in the building being completed and producing income well ahead of a project which is contracted under the bid system.

5. *Working Drawing Preparation*

Team members work in close cooperation to control the costs as the construction documents are being prepared.

6. *Final Price and Contract*

Except in the case where a firm price is negotiated on the first preliminary drawings, the final firm price is estimated from the completed working drawings to determine that the job is designed within the budget originally established or possibly to see if savings have been generated. It is desirable at that point to receive a fixed price contract for the job. This will also provide the Owner with a guaranteed cost. There are also, however, jobs where the guaranteed maximum is established with a fixed fee and usually with a participation in savings. The optimum team work occurs when an "Incentive Type" contract is used where the Owner participates in any savings that might be generated.

7. *Schedule*

Jobs run on a team basis should be carefully scheduled under the supervision of the General Contractor for the best results.

8. *Construction*

The team spirit can prevail throughout the entire project and all of the team members benefit from the maximum cooperation.

ADVANTAGES OF THE TEAM APPROACH

1. Before the expensive detail design work is undertaken, the team checks out the job for a realistic balance between the technical considerations and the necessary economical considerations. Thus, the Owner or developer can determine whether his project is feasible on a cost-t basis.

2. Financing can be arranged based on a firm commi instead of budget figures that might ultimately pr inaccurate.

3. Early project completion because construction c and material can be procured while final con documents are being completed.

4. The contracting side of the team will have a controlling construction details and techniques to more building for less money and in a shorter time

   There are many examples that could be discuss choice of materials or choice of job configuration changes which came about in the design/dev process have taken substantial sums of money fro costs. It can be shown that the Team Concep "Incentive Type" construction contract afford th many benefits in these areas over bidding of jobs.

5. Under the "Team" system of construction all advantages are extended to the client to the end lowest possible project cost can be achieved. I readily shown that this program and an "Incenti construction contract afford the client the *n* benefit of competitive buying, the *maximum* cont equipment and materials to be used in his buil *maximum* assurance of on-time and on-budget del the best possible conditions for top efficiency and ance of all individuals and firms involved in the pro

DISADVANTAGES OF THE TEAM APPROA

1. To be able to participate fully in the Team Appr Mechanical Contractor must have a staff of hig petent people that are immediately available to pa Many times the quality of the Mechanical Con judged by his proposal and by his representative proper personnel must handle this.

2. If the Mechanical Contractor attempts to parti every project that he hears about, he will soon many of these are "blue sky" and that he has spen time, money, and travel expense with nothing to it. *Be selective!*

3. If other team members are in another city, th necessitate many out-of-town trips. Then if all pre expenses are not reimbursible, the Mechanical C may end up with a low profit job, even though he the successful team.

4. The paper work on a large cost-plus project of th staggering. Unless all of the accounting and billin reimbursible, the Mechanical Contractor could hav

hidden expense. This applies to your controller's time when audits are required.

5. Many Owners and General Contractors feel that a negotiated job should carry a low fee. This is not reasonable because of the expertise required of the Mechanical Contractor, as outlined above, and of the fact that the contractor must supply his best project engineers and supervision to the job because of the team relationship. If the Mechanical Contractor cannot get a reasonable return from the job, he may be better off pursuing other types of contracts

6. On large projects, the changes may come so fast that the Mechanical Engineer cannot handle them At this point, the Mechanical Contractor may have to get involved in drafting and layout in order to keep the job moving. Make sure that you have these personnel available and that their costs are reimbursible.

7. When the project is going to be fixed price or cost-plus a maximum, the contractor has to use great skill v pricing the job, especially when using less-than-com working drawings. If he is too conservative, the job wil go. If he is too low, he will have a problem later.

SUMMARY

The Team Concept has been used for many years in se of its various forms and names. The term "Team Concep used in this article refers to the projects where all members are involved from the very start, and espec before any working plans and specifications are develc This allows for input from the contractors into the desigr this is probably the point that gives the one largest advar to the Owner.

Many projects have been completed on a Team Cor basis and the Mechanical Contractor can look forward to method of construction being a part of our business ir future.