Partnering in Construction: A Concept Designed for Continual Improvement

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Abstract

PARTNERING IN CONSTRUCTION:

A CONCEPT DESIGNED FOR CONTINUAL IMPROVEMENT

A paper submitted in fulfillment
of the requirements of
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by

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Partnering is a relatively new process, but early results are very promising.

"Partnering is a strategy for success. In over three years' experience we have (1) virtually eliminated time growth, (2) substantially reduced cost growth, (3) experienced no new litigation, (4) reduced paperwork by 2/3, (5) gained new respect for our industry partners, and (6) are HAVING FUN!"

Colonel Charles E. Cowan
U.S. Army Corps of Engineers, Portland District
(Mr. Cowan became Director of the Arizona Department of Transportation in June 1991)

"Partnering is much more than a buzzword, a philosophy or an attitude. It is a structured management process that is effective on all sizes of construction projects to focus the attention of all the parties on problem resolution, without prolonged disputes or litigation. All experienced contractors realize that good working relationships are essential for successful, profitable projects. I am committed to the Partnering process—it works!"

Richard A. Lewis
Vice President
Granite Construction Company

"Partnering has enabled us to accomplish, through a concentration of resources, much more than we otherwise could have. Both organizations have had difficulties but we are now enjoying the opportunity that Partnering offers to apply continuous improvement and quality programs. The greater trust and sharing between owner and contractor open many doors. Our partnership has expanded into upstream technology work and downstream plant and maintenance support. I see a great deal of potential remaining."

Don Rasmussen
Director of Engineering, Polyolefin Division
Union Carbide Chemicals and Plastics Company, Inc.

"We view partnering as a way to enhance the client-consultant relationship. Having a written charter, signed by the parties, provides a positive framework for teaming efforts Contracts used to define specific actions and requirements are prone to adversarial and defensive postures by the parties. The goal of partnering is to ensure that communication and teamwork will be maximized to produce the best results for all partners."

David F. Evans, P.E., P.L.S.
David Evans and Associates, Inc.
Engineers, Surveyors, Planners, Landscape Architects, Scientists

"From first hand experience and simply put, Partnering is a leadership concept wherein contractors and owners deal with each other with trust, honor, and equity. It assures a project will be completed on time, within budget, and with final payment made on project acceptance and not five years later in a court of appropriate jurisdiction. What have you got to lose? Trust me, it works."

Michael B. Murphy
Executive Vice President
Cooney McHugh Company, a Division of Donald B Murphy Contractors, Inc.

"Unwarranted conflicts in our business are about to bury us all. Partnering is a concept that helps us focus on what the true outcome of a project should be and how we can get there. We at Sundt are neophytes at Partnering, but you can bet we are going to get much better at it."

J. Doug Pruitt
Executive Vice President
Sundt Corp

"The essence of AGC's Partnering Program is to establish a working relationship with owners and other construction team members before a project starts so that relationships of trust are secured before the first concrete is poured or steel put in place. When that happens, when earned trust reigns, our projects will have the best foundations for success."

Marvin M. Black
President
Associated General Contractors of America

* Reproduced from "Partnering: A Concept For Success," Associated General Contractors of America (AGC), September 1991.

ABSTRACT

In recent years the number of claims filed in the U.S. courts has continued to increase. The use of arbitration, mediation and other alternate dispute resolution techniques are not enough. Claims are expensive and takes a long time to resolve, create bad feeling between parties, and are counter-productive. Today's focus in the construction industry is claim avoidance and resolving claims when they occur. Partnering is one way of doing this.

A recent study published in the California Lawyer showed that in 1990, 142 companies that used partnering saved more than $100 million in litigation expenses.(i) Partnering is an alternate construction management strategy aimed at improving the owner-contractor relationship. It seeks to produce organizational change to resolve the traditional problems with claims, costs overruns, construction delays, adversarial relationships, litigation and a "win-lose" climate. With partnering the owner, contractor, architect/engineer, subcontractors, and all the other parties contract to have the same goal: a quality project delivered on time and within budget. It is about team-building, creating mutual trust and respect for one anothers' respective roles in the construction process, sharing risks, improving communication and cooperation, improving quality and productivity, increasing opportunity for innovation, reducing costs, expediting schedules and improving employee morale. Partnering, if successful, will develop a "win-win" attitude among all team players.

In this paper we will look at: the benefits of partnering to each individual party, the potential problems with partnering, and the development of the partnering process. We will evaluate the qualitative and quantitative results from our survey questionnaire sent out to 50 general contractors, 50 architect/engineers, and 50 owner/developers. We will graphically present these results in the form of bar charts, and will perform hypothesis tests to determine which groups had the most amount of agreement. We will also compare our data results with our research results.

Next, we will look at partnering at work on the Portland District of the Corps of Engineers' Bonneville Navigation Lock Project. We will look at the development of the partnering process, the implementation, and the results of the first contract: The Diaphragm Wall Project. This project was awarded to S.J. Groves & Sons in early 1989 with an approximate value of $34 million, and resulted in value engineering saving of $1.8 million.

We will conclude by showing how partnering will work if an environment of trust, commitment and active participation can be built. In order for "partnering to work, work must be put into partnering." When partnering works, the only loser will be the lawyers and arbitrators.

A.) BACKGROUND

The construction industry is a very competitive, high-risk business. This competitiveness and perception of conflicting objectives among owners, contractors, architect/engineers, subcontractors and suppliers has resulted in, at times, adversarial and unrewarding relationships. The system is set-up so that each party acts individually. Each party has its own separate set of goals & objectives, management styles and operating procedures. Each makes decisions based on the goals and objectives of their own organization without consideration of the impact on the other parties. Communication between the parties is restricted and usually very formal. Lack of communication, conflicting objectives and fear of risk has resulted in a work environment full of distrust and disagreement. These disagreements or disputes, if not resolved, will result in claims that will be settled either by an arbitrator or by litigation through the courts. Either way, claims are expensive and counter-productive to everyone's effort to complete a quality product on time and within budget.

However, every year the number of construction claims increases. In 1988, it is estimated that the total value of construction claims filed through the U.S. court systems were in excess of $1.5 billion. It is further estimated that of this $1.5 billion filed, $650,000,000 is recovered and that claim settlements take in excess of 6 months (with a norm of 4 to 6 years) from time of filing.[1] A construction claim is

defined as a request by the first party for "additional compensation" for events caused by a second party and was beyond the first party's ability to control. They are most often caused by misunderstandings; inadequate contract documents; omissions and changes in plans and specifications; errors that cause work delays; or late payments. Funds that could be used for additional construction are being used in legal fees and in court costs.

The growth of claims during the period of 1983-1989 can also be illustrated by looking at the American Arbitration Association (AAA) data (See Table 1). In 1983, 2675 claims were brought before the association with a value of $466,300,000. By 1988, the number of claims grew to 4940 with a total value of $786,000,000, average annual increases of 13.2% and 11.2%, respectively.[2] By 1991, over 6000 cases were administered by the AAA.

TABLE 1 - GROWTH OF CLAIMS (1983-1989)

YEAR	NO. OF CASES	INCREASE	VALUE (1988 $)	INCREASE
1983	2675	-	$466,300,000	53%
1984	3150	17.8%	$510,200,000	11.6%
1985	3735	18.6%	$630,520,000	21.2%
1986	4317	15.6%	$703,950,000	11.6%
1987	4582	6.1%	$752,000,000	6.8%
1988	4940	7.8%	$786,000,000	4.5%

* Based on American Arbitration Association Data, 1983-1988. Reproduced from "Claims Avoidance and Resolution," by William G. Clark, 1990.

Fed up with pointing fingers and litigating expensive lawsuits in the legal system, the construction industry has in recent years adapted Alternate Dispute Resolution (ADR) techniques to resolve disagreements. These alternate means include: mediation, mini-trials, dispute review boards, expedited dispute settlement, and open face-to-face negotiation. Similar to arbitration, mini-trials and dispute review boards require a third neutral party to make a binding decision. Where as with mediation, expedited dispute settlement, and open negotiation the two disputing parties are forced together and work things out between themselves. All these techniques are designed to resolve disputes more quickly and at a lower cost. It is estimated that 90% of all disputes are resolved by one these techniques, or by arbitration, prior to it becoming a formal claim and to the courts.[3]

Even with the increased use of Alternate Dispute Resolution techniques, the portion of all disputes (claims) going to arbitration or litigation is increasing. Also with ADRs third parties are often called upon to make binding decisions. These third parties are not as familiar with the case as the participants, and do not have a stake in the outcome. Finally, ADR does not eliminate the combativeness or tension between the two parties which can affect working relations on future projects. Therefore, finding alternate ways of resolving disputes is not enough. Today's focus in the construction industry is claim avoidance and resolving disputes when they occur. Partnering is one way of doing this.[4]

This paper will study partnering, an increasingly used construction management strategy aimed at improving client-contractor relations. The Associated General Contractors of America (AGC), a national association for contractors, strongly believes that the time has come for all parties in the construction process to step forward and work together to take control of this costly and intolerable situation with claims. AGC wants to change the old notion that in order for some to win, someone else must lose. AGC wants to develop a "win/win" attitude among all the team players.[5]

B.) WHAT IS PARTNERING ?

Partnering is an alternate management process that seeks to produce organizational change to resolve the traditional problems with claims, cost overruns, construction delays, adversarial relationships, litigation, and a "win/lose" climate. With partnering the owner, contractor, architect/ engineer, subcontractors, and all the other parties contract to have the same goal: a quality project delivered on time and within budget. Partnering is a team-building process which creates mutual trust and respect for one anothers' respective roles in the construction process and recognizes the risks inherent within these roles.[6] It is about risk-sharing, improving communication and cooperation, improving quality and productivity, increasing opportunity for innovation, reducing costs, increasing goodwill and continual improvement of goods and services.[7]

The partnering concept is not a new way of doing business. It is going back to the "old way" of doing business when a person's word was their bond and people accepted responsibility for their actions. Today, in the construction industry, partnering formalizes this agreement.

Partnering in the private-sector generally involves a long-term commitment between an owner and a construction firm to meld together to achieve common goals & objectives on a project or a series of projects. In the public-sector partnering usually begins after the award of the contract and

focuses on creating an atmosphere that is conducive to enhancing communication and minimizing disputes.[8]

There is no standard format for partnering. According to the Construction Industry Institute (CII) of Austin, Texas, "there are almost as many variations to partnering as there are companies involved." However, they state that trust, long-term commitment, and shared vision are the common threads. According to Donald C. Mosley, Ph.D., professor of management at the University of South Alabama and consultant on construction projects using partnering, "the partnering process is to design for each project an effective problem-finding/ problem-solving management team composed of personnel from both parties, thus creating a single culture with one set of goals and objectives for the project".[9] The AGC believes that the partnering process should attempt to establish working relationships among the parties through a mutually-developed, formal strategy of commitment and communication. It should attempt to create an environment where trust and teamwork prevent disputes, foster a bond to everyone's benefit, and facilitate the completion of a successful project.[10]

C.) BENEFITS FROM PARTNERING

On a project level, partnering can develop harmonious work relationships, reduce costs, paperwork and litigation while improving construction quality. On a human level, it can ease stress, restore goodwill and enhance the simple satisfaction of going to work in the morning.[11] The partnering process empowers project personnel from all parties with the freedom and authority to accept responsibility, and to do their jobs by encouraging the decision making and problem solving at the lowest possible level of authority. It encourages everyone to take pride in their efforts, and tell them its OK to get along with others. Partnering provides the opportunity for public-sector contractors to achieve some of the benefits of closer personal contact, which are possible with negotiated or design-build contracts.

The following is a list of individual benefits to each of the parties as outlined by the AGC:

Benefits To Owner/Developer:

* Reduced exposure to litigation through open communication and issue resolution strategies.
* Lower risk of cost overruns and delays because of better time and cost control over the project.
* Better quality product because efforts are focused on the ultimate goal and not misdirected to adversarial concerns.
* Potential to expedite project through efficient implementation of the contract.
* Open communication and unfiltered information allow for more efficient resolution of problems.
* Lower administrative costs because of elimination of building defense cases.

* Increased opportunity for innovation through open communication and element of trust, especially in the development of value engineering changes and constructability improvements.
* Need of trained in-house personnel is eliminated.
* Increased opportunity for a financially successful project because of non-adversarial win-win attitude.

Benefits to the General Contractor:

* Reduced exposure to litigation through communication and issue resolution strategies.
* Increased productivity because of elimination of building defense cases. Also, frees the contractor to concentrate more of its time and effort on quality issues.
* Expedited decision making with issue resolution strategies.
* Better time and cost control over the project.
* Lower risk of cost overruns and delays because of better time and cost control over project.
* Long-term work load allows the contractor to better allocate their resources.
* Association with recognized industry leaders is attractive from a marketing standpoint. Allows for positive promotion of the company without any additional advertising costs.
* Improved working relations on project will allow contractor to better compete on future projects.
* Improved employee attitudes. Easing stress and improving goodwill allows the employees to be happier and be more productive team-members.
* Increased opportunity for a financially successful project because of non-adversarial win-win attitude.

Benefits to the Architect/Engineer:

* Reduced exposure to litigation through communication and issue resolution strategies.
* Minimized exposure to liability for document deficiencies through early identification of problems, continuous evaluation, and cooperative, prompt resolution which can minimize cost impacts.
* Enhanced role in decision-making process, as an active team member in providing interpretation of design intent and solutions to problems.
* Reduced administrative costs because of elimination of building defense cases and avoidance of claim administration and defense costs.
* Increased opportunity for a financially successful project because of non-adversarial win-win attitude.

Benefits to Subcontractors and Suppliers:

* Reduced exposure to litigation through communication and issue resolution strategies.
* Equal involvement in project increases the opportunity for innovation and implementation of value engineering in work.
* Potential to improve cash flow due to fewer disputes and withheld payments.
* Improved decision making avoids costly claims and saves time and money.
* Enhanced role in decision making process as an active team-member.
* Increased opportunity for a financially successful project because of non-adversarial win-win attitude.

By easing stress, improving goodwill and working harmoniously with others, team-members develop a new mode of thinking about dealing with people. Among the project personnel and within the team-member's own organization, work can become more meaningful and fun. The by-product of demonstrating integrity and fair dealing is the trust and respect of others. In the long run, this trust and respect can produce a reputation for the firm that money cannot buy.

D.) POTENTIAL PROBLEMS WITH PARTNERING

To be successful the partnering process requires that all the parties "buy-in to" the concept, truly commit to it, and actively participate. In her study of partnerships in many types of organizations, Rosabeth Moss Kanter observed the following difficulties in achieving successful partnering:[12]

1.) Changing Corporate Culture - It is human nature to resist change. However, in order for partnering to be successful it requires each organization to open up to outsiders, share goals, transfer some of its authority to the partnership, and adapt to new ideas. In order for a company to change and fully commit to the partnership it takes trust, and this trust takes time to develop. Can forming the partnership wait?

2.) A Shift in Business Conditions - A partnership begins with a set of goals and objectives intended to last the life of the project. If conditions change and the project is behind schedule, or if unanticipated technical problems and cost overruns arise, the strategy within each organization may revert back to an "us" versus "them" attitude. All parties must recognize and value the primary goals of each other and strive for commitment to the partnering objectives when the project encounters difficulties if partnering is to be successful.

3.) Uneven Levels of Commitment - Unevenness of commitment often develops from the basic differences between the organizations and the roles they play within the construction process. Every effort is needed by all involved parties to balance the commitment on all sides.

4.) Failure to Share Information - Partnering requires timely communication of information and the maintenance of open and direct lines of communication among all members of the partnering team. Problems need to be surfaced and solved on-site by the site team whenever possible. Partnering will fail if it is only used for routine matters while important issues are sent from the job-site back to the respective home offices and back to the job-site prior to any interaction.

5.) Lack of Momentum - A partnership requires nurturing and development throughout the life of the project. After the initial workshop, it is easy to get back into the routine of daily activities and ignore the partnering process. Each party must actively participate and constantly work to maintain the health of the partnership.

6.) Too Close For Comfort - This potential problem was not mentioned by Ms. Kanter, but it is a valid concern. Partnering may bring the parties "too close," not allowing for enough distance between the parties to maintain objectivity and proper oversight of the project. We learned in MGMT 522, Behavioral Science for Management, that it is just as important to manage the amount of agreement within a cohesive group as it is to manage the disagreement. This problem is called "groupthink," and arises when members of decision making groups become motivated to avoid being too harsh in their judgments of their colleagues' ideas. They adopt soft lines of criticism. At meetings, all the members are amicable and seek complete concurrence on every important issue with no bickering or conflict to spoil the cozy atmosphere.13 This problem can limit creativity, especially in the areas of value engineering and constructability improvements. Team-members need to be able to brainstrom, and someone needs to play "devil's advocate" on each issue, to come up with the best solution (decision).

7.) Relaxing of Contract Requirements - It is a concern by some that the owner may relax contract requirements in the interest of maintaining harmonious work relationships. Partnering should not mean that the owner's needs are outweighed by the needs of the partnership. Therefore, the partnership should follow the contract requirements. However, this does not mean that the other parties are not free to make suggestions and recommendations to alter the contract, if it will benefit all the parties involved.

Kanter also describes the "six I's" that are found in successful relationships: Importance, Investment, Interdependence, Integration, Information and Institutionalization. If a relationship is important enough to both parties, it will justify an investment of time and resources into the project, and they recognize their interdependence. To keep the

partnering process working, the parties integrate their communication and activities, and keep each other informed. Finally, the commitment is such that the partnering process activities are institutionalized into the organizations through contracts. When the six "I's" are in place, according to Kanter, the trust necessary for a successful partnership can develop. Figure 1, illustrates this step-by-step process to successful partnering that builds on itself upwards.

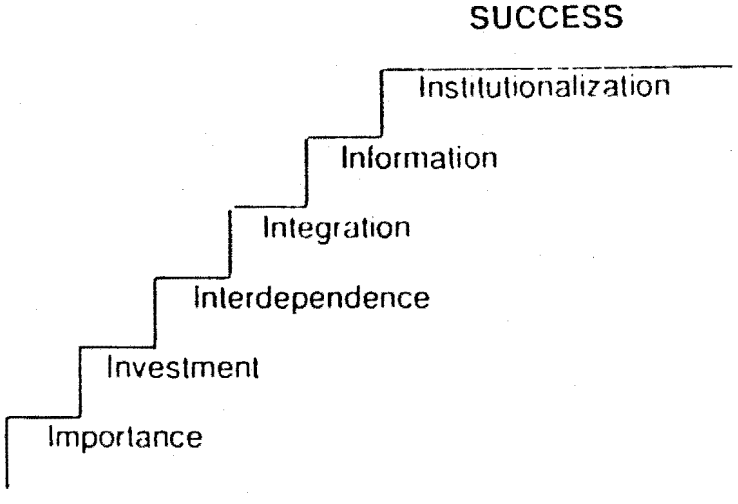


FIGURE 1 - STEPS TO SUCCESSFUL PARTNERING

* Reproduced from "Becoming Pals: Pooling, Allying, and Linking Across Companies," by Rosabeth Moss Kanter, 1989.

E.) THE PARTNERING PROCESS

Partnering is usually established through a structured and facilitated process. Since all projects are different, different partnering processes are developed for each project. The process should be designed to provide an environment for developing the cooperative attitudes and commitment needed to drive the partnership.[14]

The following is a suggested step-by-step guide for the development of a partnering process, as outlined by Moore, Mosley & Slagle's Guidelines for "Win-Win" Project Management. To simplify this model, we will just follow the development of this process between the owner and the general contractor:

1.) Educate Your Organization - Whether you are the owner or contractor, you must educate your organization about partnering before attempting a project using the concept.

2.) Begin Early - If partnering is to be used effectively, the decision to use it by the owner and contractor, needs to be made as early as possible, and the process initiated before the contract is awarded. On public projects, the solicitation for bids should make the partnering intentions clear. See Appendix A, for a sample of Special Provisions for Project Specification. The essential words in this statement are "voluntary" and "cost-sharing." To work, partnering must be a process that both parties want and are willing to pay for.

3.) Commitment from Top Management - Because of the additional efforts, new behaviors and upfront costs required for partnering, top levels of management in both organizations needs to be fully committed to the concept and process from the start. Without continuous commitment and active support of top management, the process will have little chance of success. The commitment must clearly run from the top down.

4.) Select Members of the Project Team - The number of participants from each party will vary from project to project. However, the core of the partnering effort will be the on-site managers. Included in this group are the resident engineers from both organizations, and their associates. The site team is the primary contact point in the partnering process. Most of the interorganizational communication, problem-solving, and decision making will take place within this group. In addition, each group will have a Home Office Support Team composed of staff involved with planning, scheduling and purchasing. Care must be used to provide a balanced team. If the team is "loaded" with owner personnel, the contractor might feel outnumbered and perceive their role as being unequal. The total number should be kept as small as possible to facilitate teamwork, and new team-members should be brought in as needed.

5.) Identify A "Champion" - No matter how committed management and team participants are, the partnership will not run itself. In order to track, care for, and build the process, individuals from each organization must be assigned responsibilities for maintaining the momentum of the partnership throughout the life of the project. These individuals will provide the administrative and logistical support that is required to make it work. These activities include: scheduling, arranging for follow-up meetings, distributing information to all parties, and following-up on procedures and plans developed in the partnering meeting.

6.) Select Facilitators - Teamwork, trust and open communication are needed to sustain the process, and facilitators are recommended to build and maintain these qualities. Facilitators are neutral third parties, who are objective and skilled in team-building and group dynamics. They preside over meetings, gather information, and assist the teams in reaching consensus on decisions. Selecting a competent facilitator to direct the partnership is a very important part of the process.

7.) Conduct Initial Workshop - To build the foundation for a successful partnering effort, an initial facilitated workshop should be scheduled as soon as possible after the award of the contract. This workshop should be conducted at a neutral location away from the job-site and the offices of the participants, and all key players should participate. A "retreat" atmosphere away from the workplace will foster group dynamics. The goals of the workshop are to open communications, develop a team spirit, establish partnering goals, develop a plan to attain them, and gain commitment to the plan. This plan is referred to as the Partnering Charter.

Other workshop activities should include:

a.) Team-building exercises, and examinations of each groups experiences from previous projects.

b.) Development of an issue resolution process. Key players design their own systems for resolving issues on the project. This system should focus highly on issues, while at the same time, focus highly on team relationships. See Figure 2 - Conflict Resolution Model. The players should discuss potential problems and the way they would like to see them handled. They need to decide on a process which is timely and will avoid costly delays.

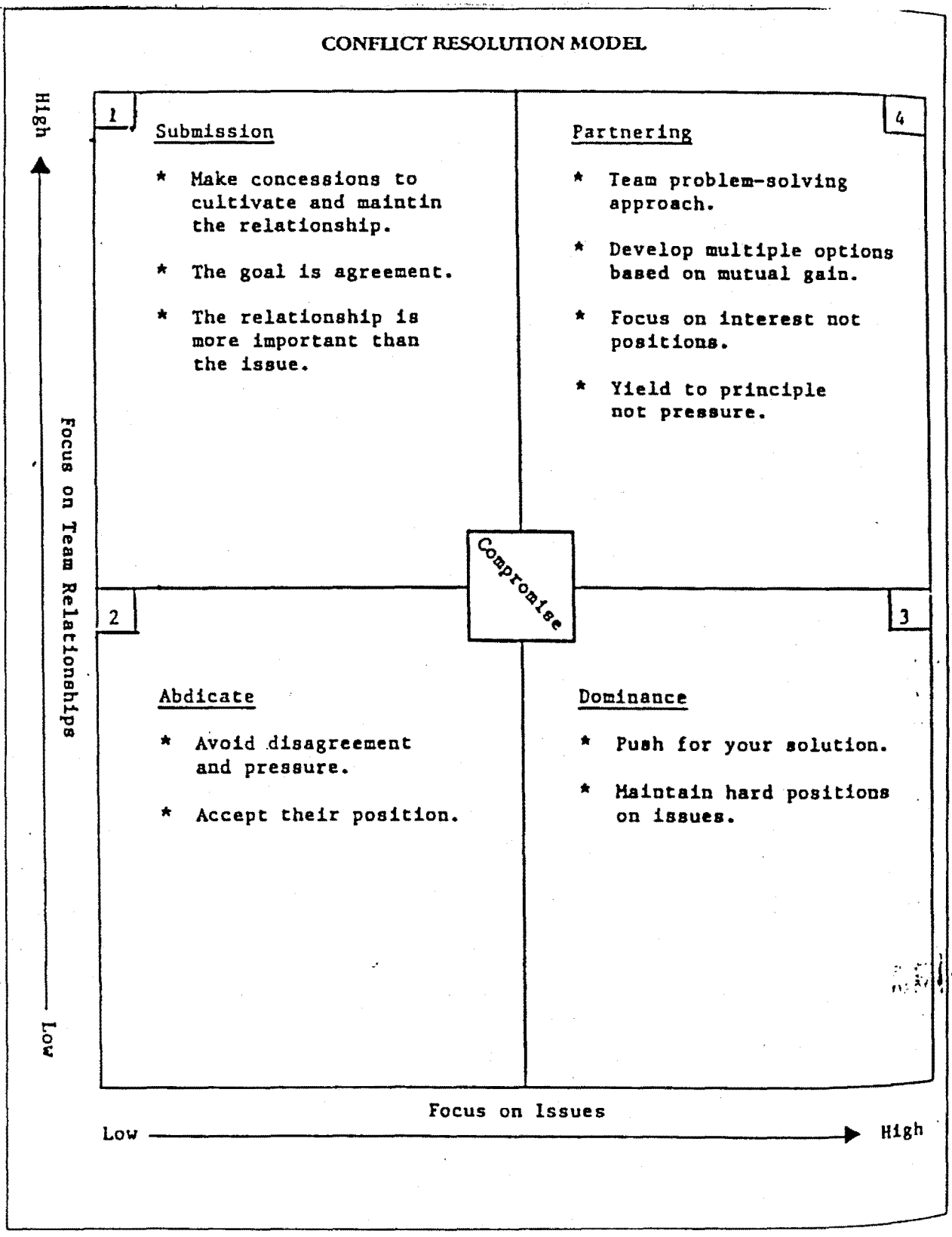
c.) Discussion of Individual Roles & Concerns: Workshop discussions should define each key player's role and the importance of that role. Players' experiences (good and bad) should be put on the table. A goal of the workshop should be to develop a high-trust culture which encourages everyone to express their ideas and contribute to the solution. Risks and potentially difficult areas of the contract should be discussed openly, and everyone should be made aware of the potential for value engineering. Understanding other parties' roles and concerns, and seeing one's place in the partnership, helps build a team attitude. In the workshop, individuals grow to know and understand the personalities they will be working with, and know that they can help prevent problems before they occur.

8.) Periodic Evaluation - Follow-up sessions should be scheduled at regular intervals to reinforce team-building skills and access the progress of the partnership. These follow-up activities are essential for maintaining the momentum of the partnership and keeping it on-track. These sessions also offer an opportunity to engage in team problem solving of current project issues, and revise the Partnering Charter in view of present project status.

9.) Final Evaluation - Final evaluations are a way of learning from the experiences of the project. Closure and celebration are important human considerations to reward for a team-effort and a job well-done.

These nine steps can contribute to the creation of a climate within which a healthy partnership can grow and evolve. When successful, the implementation of partnering merges two or more previously independent entities into one team, at least for the duration of the project. The partnering process is summarized in the chart: Evolution of the Partnering Relationship (Figure 3).

FIGURE 2



* Reproduced from "Partnering in the Construction Industry: Win-Win Strategic Management in Action," by Mosley, Moore, Slagle & Burns, 1991.

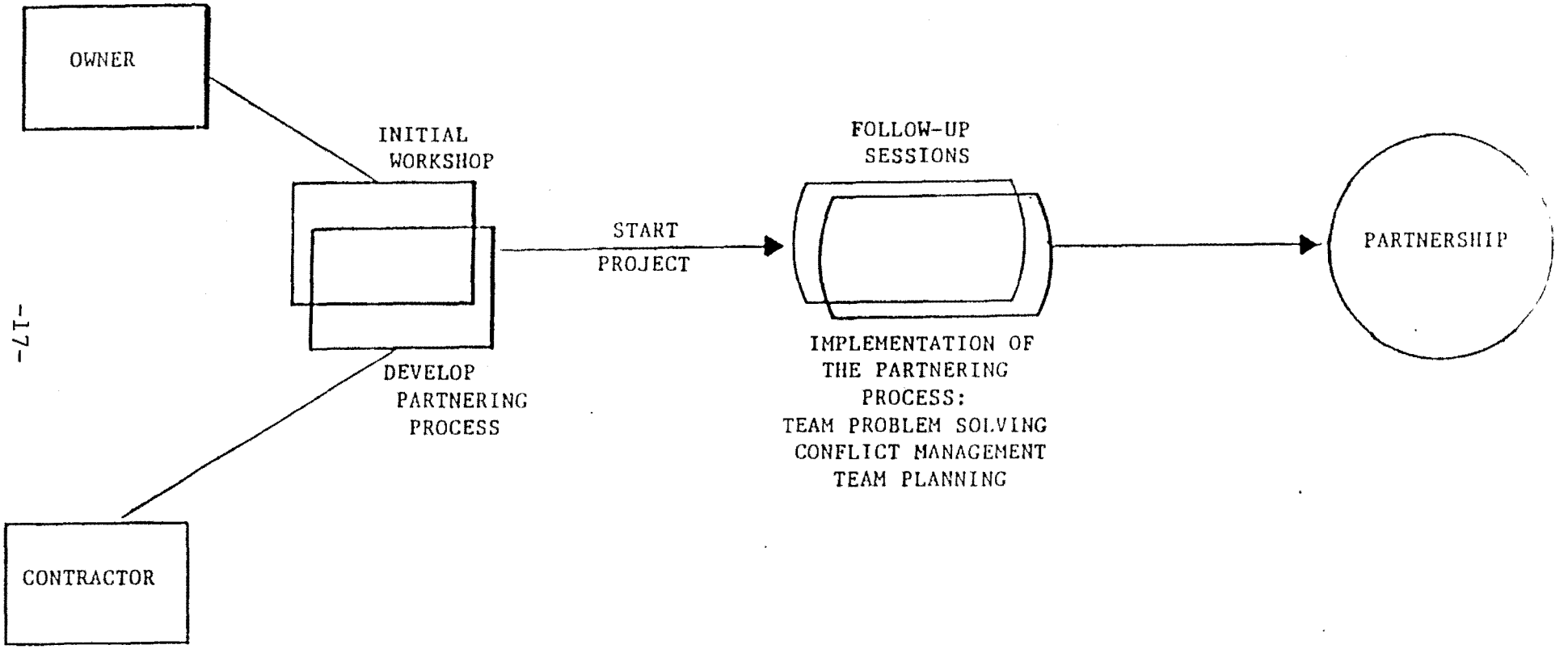


FIGURE 3 - EVOLUTION OF THE PARTNERING RELATIONSHIP

* Reproduced from "Partnering: Guidelines for Win-Win Project Management, by Moore, Mosley & Slagle, 1992

A.) CONSTRUCTING THE SURVEY QUESTIONNAIRE

In order to find out the actual use of partnering in the construction industry, it was necessary to develop a survey questionnaire. It was decided from the start that in order to facilitate more responses, a questionnaire using qualitative and quantitative measures would be preferred to that of using a short answer format. Also, we wanted to obtain a wide range of ideas and opinions, so instead of directing this questionnaire only to the contractors, we decided to include the other two major players in the construction process: the owner/developer and the architect/engineer.

The next step was to decide what we wanted to find out from the survey. We decided to focus in the areas of: their knowledge and use of new strategic management methods; their current working relations with the other parties; the number of claims they deal with; the effects of partnering, if they have used it; and would they use partnering if it was proposed to them. We wanted to develop questions that would cover the entire spectrum surrounding partnering, but at the same time, would not get too personal, be brief, and be relatively easy to answer.

The first fourteen (14) questions of the survey were general in nature, and applicable to all firms whether they had participated in partnering or not. The first question deals with their company's familiarity with new concepts practiced in the construction industry including: team-building, group

awareness, conflict management, value engineering, total quality management and partnering. Questions #2 through #9 are quantitative, and deals with their working relationship with the other two parties, as well as with the subcontractors and the suppliers. Questions include their ratings of the other parties in regards to: communication, handling of concerns & problems, cooperation, timeliness of responses to issues, and overall working relationship. We deliberately omitted personal questions like how much they trusted each party, and what they liked or disliked about working with each party.

Questions #10 to #12 deal with claims; the number filed by the firm, the number filed against the firm, and the method by which they would most often be handled. Again, we wanted to be general and not get too personal, like asking exactly how many claims were filed, against which party, and for how much. We are interested in more of a trend over the last three years, and whether the number of claims having being going up or down. Questions #13 and #14 are YES/NO, and deal with their company's participation in any types of quality improvement, productivity improvement or partnering program over the last three years.

Questions #15 through #26 involve only the firms which have been participated in a partnering program, and attempts to find out how it was introduced to the company, how it was implemented, and the results of their involvement. Questions #15 through #23 are qualitative, and asks: what was the main reason the company got involved; who was the partnering program

initially proposed by; what portion of the company was involved; where and when was the introductory meeting or workshop held; was the meeting/workshop administered by some neutral party; were qualitative or quantitative measures set-up to measure the effects of the partnering program; the impact the company's participation with partnering had on the company as a whole; and their top level management's commitment to this partnering program. Questions #25 and #26 are quantitative, and asks the company to rank the amount of teamwork they had with each of the other parties at the completion of the project; and their overall rating of the effectiveness of partnering. Finally, Question #26 is YES/NO and asks whether there was a final meeting/workshop at the end of the project to discuss the results of the partnership.

Questions #27 through #31 apply to all the firms again. Here we get a little more personal which is the main reason for putting it at the end of our questionnaire. Question #27 asks would the company participate in partnering on future projects if it was proposed to them. If they would not participate, Question #28 asks them what would be their reason for not participating. Question #29 attempts to get an idea of the size of the firm by asking them for their average annual volume of business over the last three years. Question #30 asks them whether their company's profitability has been going up or down over the last three years. Finally, Question #31 is quantitative and asks what type of projects the company works

on, whether it's all public, all private, or a combination of both. A copy of the completed survey questionnaire is enclosed in Appendix B-1.

Now that we have a completed survey questionnaire, the next step was to get it into the proper hands. We had initially decided to send out twenty-five (25) questionnaires to each of the three groups, for a total of 75 surveys. However, after meeting with the Director of the Engineering Management Program it was recommended that this number be doubled to get a representative sample since many will not be responding.

We went to the Oregon-Columbia Chapter of the Associated General Contractors (AGC) in Wilsonville to get a listing of its members and affiliates on the West Coast, which include the states of Washington, California, Oregon and Arizona. This list included the names, addresses, telephone numbers and key points of contact within each firm; and included all the major trades as well as a section for its clients, subcontractors, suppliers, lawyers and architect & engineers. We felt it was necessary to try to keep the participants as close as possible to facilitate the timeliness of responses and keep them applicable to our local culture. We attempted to reach a wide cross-section of owners and developers; including government agencies, commercial developers, home-builders and large corporations. We also tried to reach a wide range of general contractors including: heavy/highway, structural building and industrial.

A cover letter was written which introduced who we were, the purpose of the questionnaire, a brief summary on the concept of partnering, what we wanted to gain from the survey, and who this questionnaire was being sent to. To improve the questionnaire return rate, we also decided to offer a sharing of the survey results incentive, assurance of individual and company anonymity of their participation, and a self-addressed-stamped-envelope for its return. We also decided to limit the survey response period to one month and pleaded for a prompt reply. A sample of the cover letter is enclosed in Appendix B-2. The questionnaires were sent out and addressed to the Vice President of Construction Operations of each firm. Whenever possible, we tried to direct the questionnaire towards a particular person within a company rather than to a title or position.

B.) LITERATURE SEARCH

The purpose of the literature search was to collect research information on the topics of: partnering, claims (litigation & arbitration, also), total quality management, dispute resolution techniques, and team-building. We wanted to increase our knowledge on partnering and its surrounding areas, find out its importance and use in industry, and gather information to either support or dispute our survey results.

Since the concept of partnering in the construction industry is fairly new, published books are non-existent. We had to resort mostly to technical and trade journals to obtain most of our information.

To find recent articles and writings on these topics, we first went to the basement of Millar's Library at Portland State University. Using the American Business Index's (ABI) index to Business Periodicals and Information Access Company's InfoTrac EF, we were able to perform a computer search on these topics. These two systems hold recent business articles from July 1986 through September 1992. We performed both a key word search and topic search, and obtained a printed listing.

After getting a listing of the articles, the first thing we had to do was determine which articles were relevant to our literature search and which articles were not. The next step was to locate the periodicals in which they were written. First, we used PSU's List of Serials, which contained only a few of the periodicals we were looking for such as Civil Engineering, Engineering News-Records and the Arbitration Journal. We then went to the Oregon Inter-Library Loan Department, and using the Oregon Regional Union List of Serials (ORULS), 9th edition, 1992, on micro-fiche, we could find out which libraries in Oregon had the periodicals we needed.

We made a trip down to Corvallis and used Oregon State University's Kerr Library to obtain our articles in periodicals such as: The Project Management Journal, The Constructor, Cost

Engineering, National Productivity Review, and Highway & Heavy Construction. We went over to the University of Portland's Library and obtained articles off the micro-fiche from the American Association of Cost Engineers (AACE) Transactions. We also went to the Portland Library Main Branch Downtown to obtain articles in Building Design & Construction, and The Contractor. In total we obtained 21 articles, see Bibliography at the end of this paper for complete listing.

In a brief review of these articles we discovered that the U.S. Army Corps of Engineers and the Associated General Contractors of America (AGC) were big advocators of partnering. We contacted Paul Huebschman, geologist for the U.S. Army Corps of Engineers Portland District and fellow EMP student at Portland State, and obtained the Corps of Engineers' manual for partnering called "Partnering: A Strategy for Excellence." We also went to the Oregon-Columbia Chapter of the AGC in Wilsonville and obtained their manual called "Partnering: A Concept for Success." The results of this literature search are incorporated throughout this paper.

A.) SURVEY RESULTS

From the fifty survey questionnaires sent out to each group (including the General Contractor, Architect/Engineer, and Owner/Developer), the number of responses were 32, 27 and 24, respectively; with response rates of 62.7%, 54% and 48%, respectively (See Appendix D-1). We were very pleased with these response rates. However, we still need to make some assumptions and identify some potential flaws with our survey questionnaire before we proceed.

First, in order not to over-emphasize the actual use or importance of partnering in the construction industry, we need to assume that most of the respondents have already used or are already familiar with partnering. It is likely that of the firms not responding, most of them have not participated and are not familiar with this concept. Second, because we sent questionnaires to randomly selected firms, we assumed that each group is going to have an equal understanding of partnering and would be equally likely to respond. Did this random selection lead to any sampling error within and between the groups? Also, is our survey sample population large enough for us to draw any statistical conclusions? Last, is the length of our survey period (one month) long enough for us to get all the responses back? These flaws and assumptions need to be considered in our evaluation of data results.

We will briefly analyze the survey responses and compare results between the groups. For comparison of qualitative (multiple answer) questions, we will use percentages to contrast the groups since the number of respondents from each group are unequal. Complete data results of all three groups are included in Appendix C. Graphical analysis, in the form of bar charts, are included in Appendix D to illustrate these results. Finally, hypothesis testing of the quantitative questions are included in Appendix E, which compares the amount of agreement of results between the groups.

A.1. QUALITATIVE DATA RESULTS:

Question #1 - Concept Familiarity

CONCEPT	G/C	A/E	O/D
Team Building	84.38%	62.96%	87.50%
Group Awareness	37.50%	33.33%	33.33%
Conflict Management	56.25%	48.15%	45.83%
Value Engineering	93.75%	92.59%	83.33%
Total Quality Mgmt.	78.13%	77.78%	62.50%
Partnering	81.25%	70.37%	54.17%

Most of the firms are familiar with the concepts of team building, value engineering, TQM and partnering. Fewer of them are as familiar with the group dynamic concepts: group awareness and conflict management. Overall, the general contractor group appears to have the greatest grasp on these concepts, followed by the architect/engineer. The owner/ developer is least familiar, which is to be expected since they are the party which is the least involved in the actual construction of the project. See Appendix D-2 for graphical analysis.

Question #10 - Number of Claims Filed By the Company.

	G/C	A/E	O/D
Drastic Increase	3.33%	0%	4.35%
Slight Increase	16.67%	12.50%	4.35%
About the Same	63.33%	83.33%	86.96%
Slight Decrease	10.00%	4.17%	4.35%
Drastic Decrease	6.67%	0%	0%

Most of the respondents stated they were involved in very few claims, if any, over the past three years. As a result the most common answer to this question is about the same. See Appendix D-3 for graphical analysis.

Question #11 - Number of Claims Against the Company.

	G/C	A/E	O/D
Drastic Increase	3.45%	4.17%	0%
Slight Increase	6.90%	16.67%	4.35%
About the Same	62.07%	70.83%	86.96%
Slight Decrease	17.24%	8.33%	8.70%
Drastic Decrease	10.34%	0%	0%

Again, most of the respondents stated that they have had very few, if any, claims filed against them over the past three years. Hence, the most common answer to this question is about the same. See Appendix D-4 for graphical analysis.

Question #12 - Most Common Method for Handling Claims.

	G/C	A/E	O/D
Court Litigation	3.13%	8.33%	8.33%
Mediation	15.63%	16.67%	25.00%
Arbitration	15.63%	25.00%	20.83%
Mini-Trials	6.25%	0%	0%
Dispute Rev. Boards	6.25%	4.17%	0%
Negotiation	50.00%	33.33%	37.50%
Other	3.13%	12.50%	8.33%

All of the groups stated that open face-to-face negotiation is their main method for resolving claims or disputes, followed by mediation and arbitration. Very few used mini-trials or dispute review boards. Less than 10% of the companies stated that court litigation was their most common method for handling claims. See Appendix D-5 for graphical analysis.

Question #13 - Participation in Total Quality Management.

	G/C	A/E	O/D
Yes	68.75%	81.48%	54.17%
No	31.25%	18.52%	45.17%

The architect/engineer group appears to be the most involved in quality & productivity improvement programs, followed by the general contractor. Again, the owner/developer has the least amount of participation. See Appendix D-6 for graphical analysis.

Question #14 - Participation in Partnering Program.

	G/C	A/E	O/D
Yes	50.00%	40.74%	50.00%
No	50.00%	59.26%	50.00%

About half of the general contractors and owner/developers have participated in some type of partnering program. The architect/engineer group had the fewest percentage of participants. See Appendix D-7 for graphical analysis.

Questions #15 to #26 involve only the sixteen general contractors, fourteen architect/engineers, and eleven owner/developers who have participated in a partnering program. Percentages are only of those who have participated.

Question #15 - Main Reason For Getting Involved In Partnering.

REASON	G/C	A/E	O/D
Only to Get a Job	0%	3.70%	0%
Improve Work Relations	29.73%	18.52%	20.83%
Improve Quality	16.22%	29.63%	20.83%
Reduce Costs	10.81%	14.81%	33.33%
Marketing Tool	10.81%	14.81%	0%
To Avoid Claims	18.92%	7.41%	16.67%
Better Compete	13.51%	11.11%	4.17%
None of the Above	0%	0%	4.17%

The general contractor group stated that the main reason that they would partner is to improve working relations with others on the construction site. The architect/engineer group stated that the main reason that they would partner is to improve quality and workmanship of the product. Finally, the owner/developer would partner mainly to reduce costs. These reasons seem to make sense, as each group has different individual objectives it wants to achieve. See Appendix D-8 for graphical analysis.

Question #16 - Partnering Program Initially Proposed By Whom?

	G/C	A/E	O/D
Owner/Developer	33.33%	58.33%	69.23%
Architect/Engineer	14.29%	33.33%	7.69%
General Contractor	52.38%	8.33%	23.08%
Subcontractor	0%	0%	0%
Supplier	0%	0%	0%

The owner/developer group and the general contractor group appear to be the most common initiators of the partnering process. Each of these two groups claims that it was the party that initially proposed the program. The architect/engineer group states that the partnering program was initiated by the owner/developer on the projects which they have been involved. Overall, it would appear that the owner/developer would be the party most likely to initiate this program. See Appendix D-9 for graphical analysis.

Question #17 - Portion Of Your Company Involved In Partnering.

	G/C	A/E	O/D
Only Top Level Mgmt.	11.76%	23.08%	26.67%
Salaried Employees	23.53%	7.69%	0%
Only Managers	17.65%	15.38%	20.00%
Job-site Employees	5.88%	0%	13.33%
All Employees	29.41%	46.15%	33.33%
Random Employees	11.76%	7.69%	6.67%
Only One Or A Few	0%	0%	0%

The most common response by all the groups is that virtually all employees in the company participated in the partnering process, followed by top level management, and employees considered to be managers. Only construction site employees, and one or select few had the least responses. See Appendix D-10 for graphical analysis.

Question #18 - Location of Initial Workshop/Meeting.

	G/C	A/E	O/D
On O/D Premises	15.79%	33.33%	58.33%
On A/E Premises	21.05%	25.00%	16.67%
On G/C Premises	15.79%	8.33%	0%
At Neutral Site	47.37%	25.00%	16.67%
Other	0%	8.33%	8.33%

The general contractor group stated that a neutral site was the most common location of the introductory workshop/ meeting. The architect/engineer and the owner/developer groups said that the owner/developer's premises was the most common location, which would make sense since both groups both said

that the owner/developer was the initiator of the program. The contractor's premise and other locations, which most commonly included the job-site location, had the fewest number of responses. See Appendix D-11 for graphical analysis.

Question #19 - When the Initial Workshop/Meeting Conducted.

	G/C	A/E	O/D
During Business Hrs.	75.00%	90.00%	83.33%
After Business Hrs.	0%	0%	0%
Both During & After	25.00%	10.00%	8.33%
Other	0%	0%	8.33%

Clearly, the most common response by all the groups is that the introductory meeting/workshop was conducted during business hours. See Appendix D-12 for graphical analysis.

Question #20 - Was this Initial Workshop/Meeting Facilitated?

	G/C	A/E	O/D
Yes	50.00%	18.18%	9.09%
No	50.00%	81.82%	90.91%

The most common response is NO, this initial meeting/ workshop was not administered (facilitated) by some neutral third party. Only half the general contractors said that they had a facilitator on their partnering projects. See Appendix D-13 for graphical analysis.

Question #21 - Were Measures Set-Up to Monitor Partnering?

	G/C	A/E	O/D
No Measures/No Monitor	12.50%	45.45%	18.18%
No Measures/Visual	18.75%	27.27%	36.36%
Measures/No Follow-Up	0%	0%	0%
Measures/Used Often	68.75%	27.27%	36.36%
Other	0%	0%	9.09%

There appears to be no clear answers here. The general contractor group's most common response is that measures were set-up early and used often. The architect/engineer's most common response is no measures/no monitoring. The owner/ developer's most common responses are no measures/no monitoring, and measures were set-up early and used often. No responses were received from any of the groups stating that measures were set-up but not followed up on. See Appendix D-14 for graphical analysis. From the graph, most likely answer would probably be that measures were set-up early and used often.

Question #22 - Impact of Partnering On Company.

	G/C	A/E	O/D
No Change	12.50%	18.18%	50.00%
Very Little	25.00%	36.36%	0%
Some Changes	43.75%	36.36%	50.00%
Major Changes	12.50%	9.09%	0%
Total Restructure	6.25%	0%	0%
Other	0%	0%	0%

Some changes appears to be the most common response to the the impact of the company's participation in partnering having on the company as a whole. Very few respondents said that partnering resulted in major changes or total restructure. Therefore, it appears that the partnering program resulted in some changes but not all that much, in most of our respondent's companies. See Appendix D-15 for graphical analysis.

Question #23 - Top Management's Commitment to Partnering.

	G/C	A/E	O/D
None	0%	0%	0%
Low	0%	0%	0%
Medium	25.00%	54.55%	16.67%
High	31.25%	18.18%	25.00%
Very High	43.75%	27.27%	58.33%

Both the general contractors and owner/developers most common response was that their top managements' commitment to this partnering program was very high. The architect/ engineer's most common response was that their top management's commitment was only medium. Notice that no responses were received for none or low commitment from top management. See Appendix D-16 for graphical analysis.

Question #26 - Final Workshop To Discuss Partnering Results.

	G/C	A/E	O/D
Yes	75.00%	36.36%	41.67%
No	25.00%	63.64%	58.33%

The results here appear to be inconsistent. The general contractors state that final workshops were held at the end of projects to discuss the results of the partnership. Most of the architect/engineers and owner/develops said that there were no final workshop. See Appendix D-17 for graphical analysis.

Questions #27 through #31 are again directed to all the participants of the survey.

Question #27 - Partnering Proposed On Future Projects.

	G/C	A/E	O/D
Readily Accept	93.75%	84.62%	70.83%
Reluctantly Accept	3.13%	7.69%	12.50%
Accept/Last Resort	3.13%	0%	4.17%
Decline	0%	7.69%	12.50%

The answer here is clear. All the groups would readily accept to form partnerships on future construction projects. However, most of the respondents said that they would readily accept only under the right conditions, such as: knowing and being able to develop a rapport with the owner; and forming a team with reliable players. See Appendix D-18 for graphical analysis.

Question #28 - Reason For Declining To Partner.

	G/C	A/E	O/D
No Benefit	0%	50%	50%
Like Things Now	0%	0%	25%
Costs To Much/Imple.	0%	0%	0%
All the Above	100%	0%	0%
Other	0%	50%	25%

The results of this question is insignificant since out of the eighty-three (83) survey responses received, only seven of the respondents [1 GC, 2 AEs & 4 ODs] stated that they would not be willing to participate in partnering, which is 8.4% of the total. However, we do learn that the owner/developer group is the group which would most likely stay away, which would make sense because they are the party funding the project and would have the ultimate say in the development of the construction process. The general contractor and the architect/engineer are hired by the owner/developer. The owner/developer group stated "don't feel it will benefit us" and "like things the way they are now" as the reasons for not participating. No graphical analysis.

Question #29 - Average Annual Volume of Business.

	G/C	A/E	O/D
Less than $500,000	0%	11.11%	0%
$500,000 - $1 Mill	3.13%	18.52%	0%
$1 Mill - $5 Mill	0%	25.93%	18.18%
$5 Mill - $20 Mill	46.88%	25.93%	36.36%
$20 Mill - $50 Mill	3.13%	3.70%	27.27%
$50 Mill-$100 Mill	15.63%	0%	9.09%
Over $100 Mill	31.25%	14.81%	9.09%

The purpose of this question is to get an idea of the relative size of the firms within a particular group, based on their average volume of business over the last three years. It would not make much sense to contrast the size across the groups, because each group has different functions and performs different tasks in the construction process, thereby generating different revenues. However, from our survey we can determine that: 96.87% of the general contractor respondents did an average of over $5 million per year, with almost half the firms being in the $5-$20 million range; 81.49% of the architect/ engineers did less than $20 million, with about half the firms being in the $1-$5 million range; and 81.81% of the owner/ developers are in the $1-$50 million range. See Appendix D-19 for graphical analysis.

Question #30 - Company Profitability Over Last Three Years.

	G/C	A/E	O/D
Declining	12.50%	11.11%	23.81%
About the Same	50.00%	44.44%	57.14%
Improving	37.50%	44.44%	19.05%

The most common response by all three groups, to company profitability over the last three years, is about the same. The general contractor group and architect/engineer group showed more firms with improving profits than declining. Whereas, the owner/developer had more firms with declining profits than increasing. See Appendix D-20 for graphical analysis.

A.2. QUANTITATIVE DATA RESULTS:

In our survey questionnaire, we had eleven questions which are quantitative in nature. In them we asked the respondents to rank their relationship with the other parties on the construction project, on certain topics; and to rank themselves. A scale of one to five was used; where one (1) was the worst or most negative response, on the left; to five (5), the best or most positive response, on the right. In our analysis of each question, we will evaluate the sample mean ($\bar{X}$) and sample standard deviation (s). In the event of a tie between two groups in sample mean, the group with the lower standard deviation would be preferred because its data indicates more consistency.

Question #2 - Communication With Other Parties.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	4.00	0.750	4.04	0.649	---	---
A/E	3.97	0.728	---	---	4.50	0.764
G/C	---	---	3.62	0.625	4.36	0.979
Subs.	4.00	0.791	2.80	0.615	3.44	0.876
Suppliers	3.94	0.704	3.10	0.707	3.33	0.891

The general contractor ranks their communication the best with the owner/developer; architect/engineer ranks communication the best with the owner/developer; and the owner/developer ranks communication best with the architect/engineer. The architect/engineers seems to have the most agreement within the group, as they have the lowest overall standard deviation.

Question #3 - Acknowledging Concerns and Problems.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	4.06	1.059	4.19	0.722	---	---
A/E	4.03	1.045	---	---	4.54	0.763
G/C	---	---	4.04	0.881	4.32	1.103
Subs.	4.09	0.843	3.38	0.949	3.50	1.034
Suppliers	4.06	0.747	3.38	1.073	3.46	1.033

The general contractor ranks the subcontractor as best in acknowledging concerns and problems. The architect/engineer ranks the owner/developer as best, and the owner/developer ranks the architect/engineer as best. Both the architect/ engineer and the owner/developer views that the suppliers and subcontractors are the worst, whereas, the general contractor view them among the best. Again, the architect/engineer group seems to have the most agreement within the group, even though it is not as high as in the previous question.

Question #4 - Handling Concerns and Problems.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	3.94	0.827	4.37	0.554	---	---
A/E	3.91	0.765	---	---	4.54	0.763
G/C	---	---	4.15	0.705	4.50	0.723
Subs.	4.13	0.740	3.88	1.130	3.67	0.836
Suppliers	4.06	0.704	3.80	0.894	3.70	1.054

Again, the general contractor ranks the subcontractor as best in handling concerns and problems; the architect/engineer ranks the owner/developer as best; and the owner/developer ranks the architect/engineer as best. There is no clear indication of which group has the most amount of agreement within the group.

Question #5 - Cooperation With The Other Parties.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	4.13	0.820	4.44	0.497	---	---
A/E	4.00	0.829	---	---	4.46	0.763
G/C	---	---	3.78	0.786	4.32	0.700
Subs.	4.06	0.747	3.33	0.850	3.64	0.932
Suppliers	4.06	0.658	3.33	0.745	3.50	1.118

The general contractor ranks the owner/developer as the best in cooperation. The architect/engineer also ranks the owner/developer as the best. The owner/developer ranks the architect/engineer as the best. Again, the architect/engineer group seems to have the most amount of agreement.

Question #6 - Your Company's Response Time.

G/C		A/E		O/D	
$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
4.33	0.567	4.46	0.560	4.44	0.808

All of the groups rate their response times highly, and close to prompt and timely (5.00). Again, the architect/engineer group has the most agreement within it.

Question #7 - Other Parties' Response Time.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	2.98	1.135	3.48	0.833	---	---
A/E	2.94	0.933	---	---	4.21	0.815
G/C	---	---	3.70	0.761	4.09	0.793
Subs.	3.25	0.968	3.29	0.841	3.50	0.989
Suppliers	3.03	1.062	3.26	0.674	3.19	0.852

The general contractor ranks the subcontractor as having the quickest response time when issues are raised. The architect/engineer ranks the general contractor as the quickest, and the owner/developer ranks the architect/engineer as the quickest. All of the groups rank their own response times (Question #6) as being faster than that of the other parties on the construction project. Is there any biases in how one views themselves versus that of others?

Question #8 - Other Party Does.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	3.63	0.992	3.89	0.685	---	---
A/E	3.63	0.893	---	---	4.33	0.687
G/C	---	---	3.59	0.991	4.14	0.967
Subs.	3.59	0.824	3.38	1.033	3.83	1.062
Suppliers	3.44	0.864	3.46	0.815	3.70	0.900

The general contractor ranks the architect/engineer as best in doing what they say they are going to do. The architect/engineer ranks the owner/developer as the best, and the owner/developer ranks the architect/engineer as the best. Again, there is no clear answer to which group has the most agreement.

Question #9 - Overall Working Relationship.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	4.27	0.790	4.11	0.497	---	---
A/E	4.05	0.814	---	---	4.40	0.901
G/C	---	---	3.89	0.629	4.33	1.080
Subs.	4.13	0.696	3.58	0.812	3.80	1.052
Suppliers	4.09	0.630	3.52	0.574	3.48	1.006

The general contractor ranks the owner/developer as the group which it has the overall best working relationship with. The architect/engineer also ranks the owner/developer as the best, and the owner/developer ranks the architect/engineer as the best. The architect/engineer group appears to have the most amount of agreement within it.

Question #24 and #25 involve only the sixteen general contractors, fourteen architect/engineers, and eleven owner/developers who have participated in a partnering program.

Question #24 - Amount of Teamwork Resulting From Partnership.

	G/C		A/E		O/D	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
O/D	4.19	0.634	4.09	0.668	---	---
A/E	4.19	0.527	---	---	4.27	0.617
G/C	---	---	4.18	0.936	4.20	0.600
Subs.	3.87	0.499	3.80	0.872	4.00	0.775
Suppliers	3.93	0.573	3.60	0.800	3.78	0.629

At the completion of the project, the general contractor felt that partnering resulted in the most teamwork with the architect/engineer. The architect/engineer felt it developed the most teamwork with the general contractor; and the owner developer felt it developed the most teamwork with the architect/engineer. The general contractor group appears to have the most amount of agreement in it as indicated by its overall smallest standard deviation.

Question #25 - At Completion Of Project Partnering Resulted In.

G/C		A/E		O/D	
$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
4.03	0.838	3.64	0.481	4.36	0.606

The owner/developer group ranked the results of partnering the highest. The architect/engineer ranked it the lowest. These responses are consistent with those in Question #23, in which the owner/developer ranked their top level management's commitment as very high, whereas, the architect/engineer ranked their commitment as only medium. The architect/engineer group has the most amount of agreement within it as indicated by its smallest standard deviation.

Question #31 - Type Of Project Firm Works On.

G/C		A/E		O/D	
$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
3.53	1.250	3.20	1.002	4.40	1.346

The general contractor respondents at 3.53, indicates on average, a little more that half of its project are of the private nature. Same with the architect/engineer respondents at 3.20. The owner/developer respondents 4.40, indicates on most of its projects are closer to all private. Note that the high standard deviations by all three groups indicates very little consistency (agreement) within group.

A.3. HYPOTHESIS TESTING

Very often we are called upon to make decisions about populations on the basis of sample information. These decisions are called statistical decisions. In attempting to make decisions, we must make assumptions or guesses about the populations involved. These assumptions, which may or may not be true, are called statistical hypothesis.[15]

In some cases, we formulate a statistical hypothesis for the sole purpose of accepting or rejecting or nullifying it. In our problem we will formulate the hypothesis that there is no essential difference between the two groups and the way they view their working relationship with each of the other groups, as well as the way they view their relationship with each other. Any observed observed differences are due merely to fluctuation in sampling from the same population. This hypothesis is called the null hypothesis, and will be denoted by Ho.

Any hypothesis that differs from the null hypothesis is called an alternate hypothesis, and is denoted by Ha. In this problem Ha will be: there is a significant difference between the two groups.

Tests which enable us to determine whether observed samples differ significantly from the expected results, and helps us decide to whether to accept or reject a hypothesis, are called "test of significance." A Type I error is rejecting a hypothesis when it should be accepted. A Type II error is

accepting a hypothesis when it should be rejected. In testing a hypothesis, the maximum probability which we would be willing to risk a Type I error is called the significance level. For this problem we will test our groups at the 5% and 1% significance level. Here, we are 95% and 99%, respectively, confident that we have made the right decision.

Since we are dealing with relatively small populations, we felt that it would not be appropriate to perform our test using a normal distribution. We have decided to perform our test using a small sampling theory called Student's t distribution. Here, we consider from each population: the sample size (N), sample mean (X), and standard deviation (s). We will calculate t and incorporate the number of degrees of freedom (DOF) into arriving at our accept/reject limits (See Appendix F). Note that as N increases, the sample distribution more represents that of a normal distribution. We will perform our test using a "two-tailed" test.

To test for statistical significance between the three groups of respondents, we will use hypothesis testing to test the equality between the means of populations, two groups at a time. Therefore, we will need to conduct three separate tests to cover all three combinations.

Our first hypothesis test will be General Contractors Response versus Architect/Engineers Response (See Appendix E-1 for complete results of this test):

If μ_{GC} and μ_{AE} denotes the mean of responses from the general contractor group and architect/engineer group, respectively, we have to decide between the two hypothesis:

Ho: $\mu_{GC} = \mu_{AE}$ and there is no essential difference between the two groups and the way the view their working relationship with each of the other groups, and the way they view their relations with each other.

Ha: $\mu_{GC} \neq \mu_{AE}$ and there is a significant difference between the two groups.

Under hypothesis Ho:

$$t = \frac{\overline{X1} - \overline{X2}}{\sigma \sqrt{1/N1 + 1/N2}}$$

Where $$\sigma = \sqrt{\frac{N1s1^2 + N1s2^2}{N1 + N2 - 2}}$$

SAMPLE CALCULATION: Question #9, overall work relationship between the general contractor and the architect/engineer.

$$\sigma = \sqrt{\frac{(32)(0.814)^2 + (27)(0.629)^2}{32 + 27 - 2}} = 0.748$$

$$t = \frac{4.047 - 3.889}{(0.748)\sqrt{1/32 + 1/27}} = 0.808$$

Degrees of Freedom: D.O.F. = 32 + 27 - 2 = 57

From Appendix F: Limits of t. (Remember "two-tailed" test)

At 1% Significance Level, t(0.995) = $\pm$2.67 ACCEPT Ho

At 5% Significance Level, t(0.975) = $\pm$2.01 ALSO ACCEPT Ho

In our sample calculation, we obtained a "t" value of 0.808. At significance confident levels of 1% and 5%, our limits for t are $\pm$2.67 and $\pm$2.01, respectively. Therefore, we would accept hypothesis at both test levels, and conclude that there is essentially no difference between the way the general contractor and architect/engineer view their working relationship with each other. A total of thirty-five (35) tests were performed between the general contractor and the architect/engineer. At the one percent (1%) significance level, twenty-seven (27) hypotheses were accepted and eight (8) hypotheses were rejected. At the five percent (5%) significance level, twenty-five (25) hypotheses were accepted and ten (10) hypotheses were rejected. The thirty-five tests produced an average t value of 1.59.

This same hypothesis test was performed between the general contractor responses and the owner/developer responses. Complete results of these tests are included in Appendix E-2. At the one percent (1%) significance level, twenty-nine (29) hypotheses were accepted and six (6) hypotheses were rejected. At the five percent (5%) significance level, twenty (20) hypotheses were accepted and fifteen (15) hypotheses were rejected. The thirty-five tests produced an average t value of 1.77.

A third hypothesis test was performed between the architect/engineer responses and the owner/developer responses. Complete results of these tests are included in Appendix E-3. At the one percent (1%) significance level, thirty (30)

hypotheses were accepted and five (5) hypotheses were rejected. At the five percent (5%) significance level, twenty seven (27) hypotheses were accepted and eight (8) hypotheses were rejected. The thirty-five tests produced an average t value of 1.29.

A summary of hypothesis testing results are included in Table 2 - Hypothesis Testing Results.

TABLE 2 - HYPOTHESIS TESTING RESULTS

TEST	1% Sign. Level Accept	Reject	5% Sign. Level Accept	Reject	Avg t
#1) GC vs. A/E	27	8	25	10	1.59
#2) GC vs. O/D	29	6	20	15	1.77
#3) A/E vs. O/D	30	5	27	8	1.29

Clearly, the architect/engineer vs. owner/developer responses have the most agreement at both levels of significance, as is indicated by the most accepted hypotheses (30 and 27, respectively) and the lowest average t value (1.29). The lowest average t value indicates the least amount of overall deviation from respective means, within a group of hypotheses.

The second choice is not as clear. At the 99% confidence level, we would prefer the general contractor vs. owner/ developer responses because it had more accepted hypotheses (29). However, at the 95% confidence level, we would prefer the general contractor vs. architect/engineer responses because it had more accepted hypotheses (25). The lower average t value (1.59) would prefer the GC vs A/E responses.

B.) RESEARCH RESULTS

Most of the literature search material on partnering involved background information, introduction of the concept of partnering, the development of the partnering process, and projects which have used partnering. The concept of partnering is fairly new to the construction industry, therefore long-term results are not supported by that many facts.

However, in 1988 the Construction Industry Institute (CII) of Austin, Texas, a national forum for research in the U.S. construction industry, formed a twenty-man task force to study the effects of partnering. As a part of its research the CII developed a partnering questionnaire and issued it to seven owners and eleven contractors who were known to be involved in partnering agreements, to solicit their perspective views on partnering.[16] It was discovered that there was very little disagreement between the owner and the contractor. Both wanted a safe job and a quality product, completed on time and within budget. A summary of results are presented in Table 3.

TABLE 3 - EFFECTS OF PARTNERING ON QUALITY & PERFORMANCE

Statement	Percent Agreement Contractor	Owner
Project Schedules/More Dependable	91%	86%
Fewer Engineering Errors/Omissions	91%	100%
Safety will improve in terms of:		
a) Frequency Ration	73%	43%
b) Severity Ration	73%	43%
Constructability Will Improve	100%	71%
Resource Planning Will Improve	100%	100%
Innovation Will Improve Performance	91%	100%

* Reproduced from "Partnering: Contracting for the Future," by Scott T. Baker, 1990.

The survey participants were also asked to qualify their cost improvement expectations. As the survey was based on responses from actual partnering experiences rather than theory, it is interesting to note the similarities between the two groups. See cost summary in Table 4.

TABLE 4 - COST OF PARTNERING

Project	Percent Cost Change Contractor	Owner
Overall Cost	-5%	-5%
Owner Cost	-11%	-10%
Contractor Profits	+4%	+9%
Project Schedule	-5%	-6%

* Reproduced from "Partnering: Contracting for the Future," by Scott T. Baker, 1990.

Other preliminary findings by the Task Force are:

* There is a great deal of industry interest in partnering.
* Both owners and contractors feel that schedules will be improved and that costs will be reduced with partnering.
* The construction industry, as a whole, has a long way to go.
* Partnering takes time to develop and is, therefore, not a "quick fix." Focus is on long-term benefits and not short-term difficulties.
* Partnering requires a cultural change or a paradigm shift.
* Partnering requires a commitment from top management.
* The primary driving forces for partnering arrangements are improved quality, lower life-cycle costs, and lower fixed resources requirements.
* Partnering is a quantum advancement beyond even an "evergreen" contracting approach.
* A team focus on total quality management is better served by the partnering culture. Emphasis is for the team to perform the right job, on time, the first time, every time.
* Improvements in safety, profitability, resource planning, market responsiveness, and innovation are possible with partnering.

C.) SUMMARY OF RESULTS

In this section of the paper we will try to compare our survey results with what we have learned about partnering in our research.

From our survey questionnaire, we can conclude that most of the respondents are familiar with the concepts of: team building, value engineering, total quality management and partnering. Fewer respondents are as familiar with the group dynamic concepts of group awareness and conflict management. Overall, the general contractors appear to be the group most familiar with all of these concepts.

In evaluating the working relationships between the groups, we conclude that the general contractor views their overall working relationship best with the owner/developer; the architect/engineer also views the best relationship with the owner/developer; and the owner/developer views the best relationship with the architect/engineer. The owner/developer and architect/engineer consistently rank the subcontractors and suppliers near the bottom. This would make sense because the work by the subcontractors and suppliers go through the general contractor, therefore, the A/E and O/D would have little contact with them.

Most of the respondents said that they were involved in very few, if any claims over the past three years, and did not see claims as being a problem. Therefore, the most common answer to these two questions are about the same. If they did

encounter a claim or dispute, the most common method for resolution is open face-to-face negotiation. Respondents stating they had very few claims, if any, is contradictory to our research finding that the number of claims filed have been on the increase over the last eight years. However, all three groups had less than 10% responses for court litigation as the most common method for handling claims, which is consistent with our findings that over 90% of all claims or disputes are resolved without going to court.

The group most actively participating in quality and productivity improvement programs is the architect/engineers. Next, the groups most actively participating in partnering are the general contractor and the owner/developer, about half from each group.

We wanted to find out the effects & results of partnering by the respondents who have previously participated. The most common response to the main reason for getting involved was: by the general contractor was to improve working relations with others on the construction site; by the architect/engineer was to improve quality and workmanship; and by the owner/developer was to reduce overall costs.

Survey shows that the partnering program was most often initiated by the owner/developer, with virtually all company employees (from all the parties) participating. Our research confirms that most projects using partnering are initiated by the owner and that all employees need to participate.

The initial workshop was most often held on the owner/ developer's premise, during normal business hours, and was not facilitated by a third neutral party. Our research contradicts all three of these three survey conclusions. Initial workshops need to be held away from the offices of its participants and the jobsite, at a neutral location, in a "retreat" like atmosphere, over a weekend period (after business hours), and needs to be facilitated by a neutral third party familiar with team-building and group dynamics.

We were not able to get a clear answer from our survey on whether measures were set-up by the partnerships to evaluate the effects of partnering. The general contractor's most common response was that measure were set-up early on and used often; the architect/engineer's most common response was no measures and no monitoring; and the owner/developers could not decide between - no measures but we can see the benefits and problems, or measures were set-up early and used often. Research says that measures need to be implemented and follow-up sessions scheduled at regular intervals to reinforce partnering skills and evaluate the progress. Constant evaluation is needed to keep the partnership on-track and to maintain the momentum.

The impact of partnering on their company: the most common survey response was some changes; with very few answering no major changes or total restructure. Research found that partnering requires a cultural change or a paradigm

shift. We are not sure how to quantify this change to a particular firm.

Top management's commitment to partnering: most common survey response is very high by the general contractor and owner/developer, only medium for the architect/engineer. Overall, these results seem to be consistent with research findings that top level management must be fully committed to the concept and process from the start, and this commitment must run from the top down.

At the completion of the project, the general contractor felt it developed the most teamwork with the architect/ engineer; the architect/engineer felt it developed the most teamwork with the general contractor; and the owner/developer felt it developed the most teamwork with the architect/ engineer. The owner/developer ranked the results of partnering the highest, followed by the general contractors and the architect/engineers.

We were not able to determine from our survey whether there was a final workshop to discuss results of partnering or not; the general contractors said there was; the architect/ engineers and owner/developer seems to indicate there was not.

Finally, our survey finds that of all respondents, 83% would readily accept to partner on future projects if it was proposed. Only seven respondents stated that they would decline, with four of them being the owner/developer.

The most common response to company profitability over the last three years is about the same. This is probably a result of the recessionary times we have been in over the last couple of years. However, the general contractor and architect/ engineer showed more firms with improving profits than declining.

The general contractor and the architect/engineer showed that a little more than half of their projects were of the private nature; the owner/developers indicated that most of their projects are private. There is very little consistency or agreement within each group as is indicated by the high standard of deviations by all three groups.

Last, in our hypothesis testing, we were able to conclude that the architect/engineer vs. owner/developer responses had the most agreement at both of our test levels (1% and 5% significance levels) by having the most accepted hypothesis and lowest overall average "t" value.

A.) BACKGROUND

The Portland District of the Corps of Engineers (COE) has used partnering on its projects since 1989, and has found it to be a very valuable management technique. Partnering provides an opportunity for the COE to work effectively with the contractor and form a forum where they can discuss issues and develop mutually acceptable solutions. On a variety of projects, some of them quite large, COE has seen impressive benefits in cost containment, on-schedule completion, value engineering savings, safety records, and organizational morale.

The work on replacement of the navigation locks at Bonneville Dam on the Columbia River began in 1986. The overall project is estimated to cost $330 million and is scheduled to be completed in 1993. Four separate contracts were developed for this project, utilizing partnering. The first is the Diaphragm Wall Project, contract was awarded in early 1989 to S.J. Groves & Sons, and had an approximate value of $34 million. The second project was the Hatchery Wells Project, awarded in October 1989 to Morrison-Knudsen, and had an approximate value of $5 million. The third project was the construction of the Main Locks, contract was awarded in March 1990 to a joint venture between Kiewit Pacific Company and Al Johnson Construction Co., approximate value $140 million. A fourth project for the construction of the Upriver Lock was awarded around this same time to Torno of America, approximate value not given.

The overlapping of contracts and the unpredictable site conditions were going to make the management of this overall project very difficult. Coordination of activities is going to be critical, so a high degree of cooperation is needed by all parties. In addition, the site at Bonneville Dam is quite congested, and it houses a variety of functions that must be accommodated during construction:

1) The existing navigation lock must be kept in operation.
2) Operation of the two powerhouses at the dam supplying the Northwest power net's electricity must not be affected.
3) The main power line of the Union Pacific Railroad runs within 30 feet of the new lock at one point, and must be protected.
4) The visitor's center at the dam attracts some 400,000 visitors per year. COE wants to minimize the effects of construction on visitor flow.
5) This section of the Columbia is a popular fishing area, with many anglers frequently present. Consideration must be given for their safety.

To limit our study on this project, we will only look at the development of the partnering process, implementation and results of the first partnering project: The Diaphragm Wall Project between The Corps and S.J. Groves & Sons.

The walls, 48 inches thick and up to 150 feet deep, form the upstream approach to the lock. They are of reinforced concrete and steel pile construction, constructed using the slurry trench method. The need to stabilize slide activity made special demands on the walls. Details of the underground soil conditions were initially unknown, so there was a risk and uncertainty about some important aspects of construction. COE felt partnering would help work through some of these issues.

B.) PARTNERING SEEN AS A SOLUTION

The Corps of Engineers (COE) knew it was going to be very difficult to adequately address the many complex and interacting issues within these four contracts. The COE saw partnering as a way to effectively manage the conflicting issues. Colonel Charles Cowan, Commander of the Portland District at the time (now with the Arizona Department of Transportation), made a presentation on partnering at the pre-bid conference. A clause was put into the contract that invited the successful low bidder to participate in a partnering approach to the project.

After bids were opened, Col. Cowan met with Bev Troutman, executive vice president for S.J. Groves & Sons, to get his concurrence and support for partnering. This meeting set the tone of cooperation for the partnering process. It was decided to send the COE's resident engineer and Groves' project manager to a week-long seminar at the Covey Leadership Institute prior to the start of the project. This was done so that the two key leaders would get to know one another in advance and be acquainted with the "win-win" philosophy taught by the Institute.

C.) INITIAL PARTNERING WORKSHOP

The initial partnering workshop was held in Lincoln City, Oregon, on the weekend of April 26-28, 1989. The setting was the beautiful Oregon Coast and was a neutral site, away from the jobsite and the offices. Don Mosley and Jeanne Maes from the Synergistic Consulting Group were employed as the facilitators. Their strategy was for Don to act as the organizer, and Jeanne to be more process oriented and keep track of what was going on.

The workshop first focused on establishing mutual understanding of the partnering concept. Topics included the conscious decision to change the way of thinking about owner/ contractor relationships; development of trust through making and keeping commitments; and establishment of win-win systems and relationships. A pre-workshop questionnaire was administered to assist in the evaluation of attitudes, teamwork and processes important to successful partnering.

Next, a series of exercises demonstrated the synergy of the team, showing that team solutions to a problem are almost always better than individual solutions. Activities also developed personal and group insights into the reasons why individuals react the way they do in given situations. The focus was also on: expediting the processes through which the teams form; develop self- and group-awareness that is vital to effective team functioning; conflict resolution techniques; and finally, the development of a specific set of mutually agreed goal and objectives for the project (Partnering Charter).

Last, a post-workshop questionnaire was administered to seek any differences from pre-workshop questionnaire. Jeanne detected that even despite higher management support of partnering, there was still a great deal of skepticism among the workshop participants.

D.) PROJECT GOALS

The project goals, jointly developed by the project team:

* Complete the project to meet the designed intent.
* Contract completion without need for litigation.
* Value engineering savings of $1 million.
* Control cost growth to less than 2%.
* Finish project 60 days ahead of scheduled completion.
* No delay or impact to following contracts.
* No lost time to injuries.
* Construct and administer the contract so that all the contractors and suppliers are treated fairly.
* Provide safe visitor access and minimize disruption to all Bonneville Lock and Dam facilities.

E.) IMPLEMENTATION/EVALUATION

From the start, weekly meetings were held by the team members to evaluate the progress of the project, up date the schedule, and reinforce team-building skills learned in the workshop. Team members were encouraged to raise issues so that they can be quickly dealt with. It was soon discovered by all team members that the primary role of the COE engineering group was not to play "traffic cop," but was to play "problem solver." After this point, all team members became very supportive and committed to the partnering process.

F.) PARTNERING RESULTS

The Diaphragm Wall Project was completed in February 1991, about one month ahead of schedule. The results of the partnering process were outstanding:

* Two-thirds (2/3) reduction in letters and case-building paperwork relative to comparable projects.
* Value engineering savings of over $1.8 million on a $34 million contract (5.3% savings).
* Controllable costs growth were held to 3.3%, compared with a typical 10% growth over the life of a construction project.
* Completed about 30 days ahead of schedule.
* No lost-time injuries, compared to an industry-wide accident rate of 6.9%.

G.) FINAL WORKSHOP

At the completion of the project a four hour final workshop was held on December 3, 1990, prior to the celebration and awards luncheon sponsored by the Corps. Results of the partnering process were discussed and a questionnaire was administered asking: 1) What worked well and should be continued? 2) What did not work well and should be omitted in future projects? 3) What should we start on future projects that we did not do on this partnering project?

The primary complaint of the workshop was "that it should have been longer." The participants also felt that partnering could be improved on future projects by getting it into the lower levels in both organizations sooner; and bringing in subcontractors in the formulation of goals and objectives.

H.) CONCLUSION

Partnering on this project was a tremendous success because of three interdependent causal variables. First, the leadership and support of partnering by the top management of both the COE and the contractor. Senior management got involved up front then delegates authority, and held the on-site people accountable. This forces the issue resolution process down to the lowest possible level, then escalates if necessary. Second, the open communications and the participative shared leadership created by the on-site management team. Third, early involvement and participation by the COE's home office support team, engineering group, and technical group. As one team member quoted: "they were focused on partnering, brought it in early, and stayed with it all the way."

We interviewed Mr. David Brown, Project Manager for the Corps of Engineers. He said that the Corps and S.J. Groves had a very close and excellent relationship on this project. If he had things to do over, he said that the Corps should approach partnering being a little less "cocky" and with a little less attitude, such as the Corps knows everything and this is the way we would like things done. The Corps should not try to dominate the partnership, and that they should have the sincere desire to learn, just like the other team members. He also said that in the development of the partnering process that there are no "cookbook answers," just guidelines to follow.

It is crucial to get all team members involved and up to speed as early in the process as possible.

We had similar responses from our interview with Bill Olge, Project Manager for S.J. Groves & Sons who is now with Guy F. Atkinson in South San Francisco. He also said that the overall relationship with the Corps was very good. The value engineering incentive motivated S.J. Groves to be more creative and to come up with better alternate methods of construction. Costs saving were split-up among team members. Partnering was unique to the company at the time, and he was very skeptical at first. However, as the process began to evolve he could see the development of teamwork and active participation between all team members. If he had things to do over, he would want to try and duplicate this working relationship, but would want to include the subcontractors into the process earlier.

In our research on partnering, we were able to conclude that partnering was first used in the construction industry to reduce claims and improve working relations with others. However, as we have shown throughout this paper, partnering can lead to a lot more, such as: reducing paperwork, improving quality & productivity, expediting project schedule, reducing cost, improving employee morale, increasing opportunity for innovation, and improving goodwill.

We have also learned that in order for the partnering process to be successful, all of the participants must "buy-in" to the concept, truly commit to it, and actively participate. Partnering requires the leadership and commitment from the top level management of each organization, a cultural change or paradigm shift within each firm, and moving from an "we vs. them" mode of thinking to just "us." All participants must understand the concept of partnering and its value. The process must start early on, and must be constantly monitored and evaluated to keep up the momentum, and keep it on track.

Partnering will not work if the parties involved are not willing to share information, resist change, or are looking for a "quick-fix" to problems. The partnering process will also not work if: the owner is not willing to transfer some of its authority to the partnership; members treating it as a "fad"; or when one party tries to dominate the team. Partnering takes time to develop, and focuses on long term benefits.

We have also learned that there is no standard format for partnering, and partnering can be altered to suit any type of project and of any size. Because all projects are different, a different partnering process must be developed for each project. As David Brown, of the Corps of Engineers put it, there are "no cook book answers" in developing a partnering process, only guidelines to follow. The process should be designed to provide an environment for the developing the cooperative attitudes and commitment needed to drive the partnership.

Partnering will not completely eliminate the problems of managing a project, or the filing of claims. However it does create an environment of trust, commitment and shared vision. It develops a process to resolve problems quickly and to everyone's advantage. There is no question that partnering will work, but "in order for partnering to work, we must work at partnering." When partnering works the only losers in the process will be the lawyers.[17]

SECTION VI: APPENDICES

APPENDIX A:
SAMPLE PROVISION FOR PROJECT SPECIFICATIONS*

PARTNERING. The Owner intends to encourage the foundation of a cohesive partnership with the Contractor and its subcontractors. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance, intended to achieve completion within budget, on schedule, and in accordance with plans and specifications.

This partnership will be bilateral in makeup, and participation will be totally voluntary. Any cost associated with effectuating this partnership will be agreed to by both parties and will be shared equally with no change in contract price. To implement this partnership initiative, it is anticipated that within 60 days of Notice to Proceed the Contractor's on-site project manager and the Owner's on-site representative will attend a partnership development seminar followed by a team-building workshop to be attended by the Contractor's key on-site staff and Owner's personnel. Follow-up workshops will be held periodically throughout the duration of the contract as agreed to by the Contractor and Owner.

An integral aspect of partnering is the resolution of disputes in a timely, professional, and non-adversarial manner. Alternative dispute resolution (ADR) methodologies will be encouraged in place of the more formal dispute resolution procedures. ADR will assist in promoting and maintaining an amicable working relationship to preserve the partnership. ADR in this context is intended to be a voluntary, non-binding procedure available for use by the parties to this contract to resolve any dispute that may arise during performance.

* Reproduced from "Partnering: A Concept For Success," Associated General Contractors of America (AGC), September 1991.

APPENDIX B

SAMPLE SURVEY QUESTIONNAIRE

APPENDIX B-1: SAMPLE SURVEY QUESTIONNAIRE

Portland State University
Engineering Management Program
EMGT 506 - Special Project

Partnering In Construction Survey Questionnaire

The concept of Partnering in Construction was developed by the Associated General Contractors of America (AGC), and was designed to try to eliminate the distrust and litigation between the owner, contractors, architects/engineers, subcontractors and suppliers. Distrust and litigation could be both expensive and counter-productive in reaching the common goal of completing a quality project on time and within budget. Partnering is about establishing an environment of earned trust before construction starts, and an agreement that the parties can work out solutions to problems among themselves without resorting to litigation.

> Partnering: A Concept For Success, focuses on team building, creating mutual trust and respect between all the parties, developing harmonious relationships out at the jobsite, and recognizing the fact that problems will occur but that they can be dealt with without litigation. Partnering wants to change the old notion that in order for someone to win someone else must lose. AGC wants to develop a "win/win" attitude among the team members.

(1) Are you or anyone in your firm familiar with any of the following concepts:

Team Building	_____
Group Awareness	_____
Conflict Management	_____
Value Engineering	_____
Total Quality Management	_____
Partnering	_____

Comments: _____
_____
_____

(2) Communication between your company and the other parties on construction projects are:

	Difficult with much Misunderstanding				Open, Honest, Free-Flow of Information
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(3) Concerns and problems between your company and the other parties are acknowledged:

	Only when they can't be Ignored				At First Sign
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(4) Concerns and problems between your company and the other parties are handled by:

	Sweeping it under the Rug				Dealt with Quickly and Directly
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(5) Cooperation between your company and the other parties are:

	Non-Existent				Characteristic of all Phases of Work
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(6) When issues are raised, your company's response is:

	Extremely Slow				Prompt and Timely
	1	2	3	4	5

(7) When issues are raised the other party's response is:

	Extremely Slow				Prompt and Timely
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(8) When issues are raised, the other parties:

	Say One Thing But Do Another				Do What They Say They'll Do
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(9) Overall, how would you rate your company's working relationship on construction projects with the other parties.

	Extremely Adversarial		Neutral		Excellent
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(10) Over the past three years has the annual number of claims made by your company against other parties on a construction projects:

Drastically Increased _____
Slightly Increased _____
About the Same _____
Slightly Decreased _____
Drastically Decreased _____

Additional Comments: _____

(11) Over this same three year period has the number of claims filed against your company:

Drastically Increased _____
Slightly Increased _____
About the Same _____
Slightly Decreased _____
Drastically Decreased _____

Additional Comments: _____

(12) Over the past three to five years, what has been the most common method for handling disputes:

Court Litigation _____
Mediation _____
Arbitration _____
Mini-Trials _____
Dispute Review Boards _____
Other _____ _____

Additional Comments: _____

(13) Has anyone in your company participated in any type of quality improvement or productivity program over the last three years?

Yes _____ No _____

(14) Has your company participated in any type of partnering program over the last three years.

Yes _____ No _____

* If your company has not participated in any type of partnering program, please proceed to question #27.

(15) If your company has participated in a partnering program on a construction project, what was the main reason for getting involved?

- Strictly For Getting a Job _____
- To Improve Working Relations With Others _____
- To Improve Quality/Productivity _____
- To Reduce Costs _____
- To Use as a Marketing Tool _____
- To Avoid Claims _____
- To Better Compete on Future Projects _____
- None of the Above _____

Additional Comments: _____

(16) The partnering program was initially proposed by whom?

- Owner/Developer _____
- Architect/Engineer _____
- General Contractor _____
- Subcontractor _____
- Suppliers _____

Additional Comments: _____

(17) What portion of your company was involved in this partnering program?

- Only Top Level Management _____
- Only Salaried Employees _____
- Only Employees Considered to be Managers _____
- Only Employees At the Construction Site _____
- Virtually All Employees _____
- A Random Cross-Section of Employees _____
- Only One or a Select Few _____

Additional Comments: _____

(18) Where was the introductory meeting/workshop on the partnering program held?

- On the Owner/Developers Premises _____
- On the Architect/Engineers Premises _____
- On the Contractor's Premises _____
- At a Neutral Site _____
- Other _____ _____

Additional Comments: _____

(19) When was this introductory meeting/workshop conducted?

- During Business Hours _____
- After Business Hours/Weekend _____
- Some During Business Hours & Some After _____
- Other _____ _____

Additional Comments: _____

(20) Was the meeting/workshop administered (facilitated) by some neutral party?

Yes _____ No _____

If YES, by whom? _____

(21) Were qualitative or quantitative measures set-up by your company to monitor the effects of this partnering program?

- No measures/No monitoring. _____
- No measures were set-up, but we can see the benefits and problems with it. _____
- Measures were set-up but not followed up on. _____
- Measures were set-up early on and used often in our strive toward continual improvement. _____
- Other _____ _____

Additional Comments: _____

(22) What impact has your company's participation in partnering on this project had on the company as a whole?

- No Change _____
- Very Little _____
- Some Changes _____
- Major Changes _____
- Total Restructure _____
- Other _____

Additional Comments: _____

(23) How would you rate your top management's commitment towards this partnering program?

None _____
Low _____
Medium _____
High _____
Very High _____

Additional Comments: _____

(24) At the completion of the project, the amount of teamwork between your company and the other parties were:

	Little or No Sense of Teamwork				A Much Greater Sense of Teamwork Than On Similar Projects
Architect/Engineer	1	2	3	4	5
General Contractor	1	2	3	4	5
Subcontractor	1	2	3	4	5
Suppliers	1	2	3	4	5

(25) At the completion of the project, it is your opinion that partnering resulted in:

Things Being No Better Than On Other Projects			This Project Moved Along Noticeably More Smoothly Than Most	
1	2	3	4	5

(26) At the end of the project, was there a final meeting/ workshop to discuss the results of the partnership?

Yes _____ No _____

(27) In the future, should your company be approached about forming a partnership on a construction project, you would:

Readily Accept _____
Reluctantly Accept _____
Accept Only as Last Resort _____
Decline _____

Additional Comments: _____

(28) Should response to previous question be DECLINE, what would be the main reason your firm would not use partnering:

Don't feel it will benefit us. _____
Like things the way they are now. _____
Cost too much to implement. _____
All of the above. _____
Other _____ _____

Additional Comments: _____

(29) Over the past three years, your company's average annual volume of business was:

Less than $500,000 _____
$500,000 - $1 Million _____
$1 Million - $5 Million _____
$5 Million - $20 Million _____
$20 Million - $50 Million _____
$50 Million - $100 Million _____
Over $100 Million _____

(30) Over the past three years, company profitably has been:

Declining _____
About the Same _____
Improving _____

(31) Your company mostly works on what type of projects?

All Public		Half/Half		All Private
1	2	3	4	5

* Thank You. Your participation in answering this questionnaire is greatly appreciated.

APPENDIX B-2: SAMPLE COVER LETTER

4334 SE Evergreen St.
Portland, Oregon 97206
October 10, 1992

I am a Graduate Student at Portland State University, and am presently completing my Masters of Science in Engineering Management. To finish my curriculum I need to complete a special project. I have selected the topic of Partnering in Construction.

Partnering is a fairly new concept used in the construction industry where the owner, architect/engineer, general contractor and subcontractors get together and contract to have the same goal: a quality project, on time and within budget. It focuses on team-building; earning trust and respect; and eliminating litigation.

This is a research project, and I am interested in the working relationships between different the parties on construction projects; the amount of litigation going on; the different types of quality improvement and partnering programs tried; how these programs were introduced, implemented and monitored; and whether partnering made for a better or worse project.

I have enclosed a survey questionnaire which covers all of these areas. A few minutes of your time in completely this survey would be greatly appreciated. This survey is being sent to fifty owners/developers, fifty architect/engineers, and fifty contractors. Your results will be compiled as a group, and individual results will be revealed to no one. Please do not put your name or company name on the survey. I have enclosed a self-addressed stamped envelope for your convenience.

I can offer you little incentive or rewards for filling out this questionnaire other than informing you that I would be happy to send you a copy of the tabulated results of the three main parties. Since time is of the essence, please reply by November 10, 1992. Thank you for your time.

Sincerely yours,

Gordon D. Lee

Telephone: (503) 775-2180

APPENDIX C-1

GENERAL CONTRACTOR SURVEY RESPONSE — RECEIVED: 32 OF 51 SURVEYS — RESPONSE RATE: 62.7%

QUESTIONS	TOTAL	%	SUM	AVERAGE	VAR	STD DEV
DID THEY RESPOND?	32.0	100.00%				
(1) CONCEPTS:						
TEAM BUILDING	27.0	84.38%				
GROUP AWARENESS	12.0	37.50%				
CONFLICT MANAGEMENT	18.0	56.25%				
VALUE ENGINEERING	30.0	93.75%				
TOTAL QUALITY MGMT	25.0	78.13%				
PARTNERING	26.0	81.25%				
(2) COMMUNICATION:						
OWNER/DEVELOPER	32.0		128.0	4.000	0.563	0.750
ARCHITECT/ENGINEER	32.0		127.0	3.969	0.530	0.728
SUBCONTRACTOR	32.0		128.0	4.000	0.625	0.791
SUPPLIERS	32.0		126.0	3.938	0.496	0.704
(3) ACKNOWLEDGE PROBLEMS:						
OWNER/DEVELOPER	32.0		130.0	4.063	1.121	1.059
ARCHITECT/ENGINEER	32.0		129.0	4.031	1.093	1.045
SUBCONTRACTOR	32.0		131.0	4.094	0.710	0.843
SUPPLIERS	32.0		130.0	4.063	0.559	0.747
(4) HANDLING PROBLEMS:						
OWNER/DEVELOPER	32.0		126.0	3.938	0.684	0.827
ARCHITECT/ENGINEER	32.0		125.0	3.906	0.585	0.765
SUBCONTRACTOR	32.0		132.0	4.125	0.547	0.740
SUPPLIERS	32.0		130.0	4.063	0.496	0.704
(5) COOPERATION:						
OWNER/DEVELOPER	32.0		132.0	4.125	0.672	0.820
ARCHITECT/ENGINEER	32.0		128.0	4.000	0.688	0.829
SUBCONTRACTOR	32.0		130.0	4.063	0.559	0.747
SUPPLIERS	32.0		130.0	4.063	0.434	0.658
(6) YOUR RESPONSE TIME	32.0		138.5	4.328	0.322	0.567
(7) OTHERS RESPONSE TIME:						
OWNER/DEVELOPER	32.0		95.5	2.984	1.289	1.135
ARCHITECT/ENGINEER	32.0		94.0	2.938	0.871	0.933
SUBCONTRACTOR	32.0		104.0	3.250	0.938	0.968
SUPPLIERS	31.0		94.0	3.032	1.128	1.062
(8) OTHER PARTY DOES:						
OWNER/DEVELOPER	32.0		116.0	3.625	0.984	0.992
ARCHITECT/ENGINEER	32.0		116.0	3.625	0.797	0.893
SUBCONTRACTOR	32.0		115.0	3.594	0.679	0.824
SUPPLIERS	32.0		110.0	3.438	0.746	0.864
(9) WORK RELATIONSHIP:						
OWNER/DEVELOPER	32.0		136.5	4.266	0.625	0.790
ARCHITECT/ENGINEER	32.0		129.5	4.047	0.662	0.814
SUBCONTRACTOR	32.0		132.0	4.125	0.484	0.696
SUPPLIERS	32.0		131.0	4.094	0.397	0.630

(10) CLAIMS FILED BY YOU:

DRASTIC INCREASE	1.0	3.33%
SLIGHT INCREASE	5.0	16.67%
ABOUT THE SAME	19.0	63.33%
SLIGHT DECREASE	3.0	10.00%
DRASTIC DECREASE	2.0	6.67%

(11) CLAIMS AGAINST:

DRASTIC INCREASE	1.0	3.45%
SLIGHT INCREASE	2.0	6.90%
ABOUT THE SAME	18.0	62.07%
SLIGHT DECREASE	5.0	17.24%
DRASTIC DECREASE	3.0	10.34%

(12) HANDLING DISPUTES:

COURT LITIGATION	1.0	3.13%
MEDIATION	5.0	15.63%
ARBITRATION	5.0	15.63%
MINI-TRIALS	2.0	6.25%
DISPUTE REV. BOARD	2.0	6.25%
NEGOTIATION	16.0	50.00%
OTHER	1.0	3.13%

(13) TQM PROGRAM-3 YRS

YES	22.0	68.75%
NO	10.0	31.25%

(14) PARTNERING PROGRAM

YES	16.0	50.00%
NO	16.0	50.00%

(15) MAIN REASON PARTNER:

GET A JOB	0.0	0.00%
IMPROVE RELATION	11.0	29.73%
IMPROVE QUALITY	6.0	16.22%
REDUCE COSTS	4.0	10.81%
MARKETING TOOL	4.0	10.81%
AVOID CLAIMS	7.0	18.92%
TO BETTER COMPETE	5.0	13.51%
NONE OF THE ABOVE	0.0	0.00%

(16) PROPOSED BY WHOM?

OWNER/DEVELOPER	7.0	33.33%
ARCHITECT/ENGINEER	3.0	14.29%
GENERAL CONTRACTOR	11.0	52.38%
SUBCONTRACTOR	0.0	0.00%
SUPPLIER	0.0	0.00%

(17) COMPANY INVOLVEMENT:

TOP LEVEL MGMT.	2.0	11.76%
SALARIED EMPLOYEES	4.0	23.53%
ONLY MANAGERS	3.0	17.65%
JOBSITE EMPLOYEES	1.0	5.88%
ALL EMPLOYEES	5.0	29.41%
RANDOM EMPLOYEES	2.0	11.76%
ONLY ONE OR A FEW	0.0	0.00%

(18) INITIAL MEETING:						
ON O/D PREMISES	3.0	15.79%				
ON A/E PREMISES	4.0	21.05%				
ON CONTRACTOR PRE.	3.0	15.79%				
AT NEUTRAL SITE	9.0	47.37%				
OTHER	0.0	0.00%				
(19) MEETING CONDUCTED:						
DURING BUSINESS HRS	12.0	75.00%				
AFTER BUSINESS HRS	0.0	0.00%				
BOTH DURING & AFTER	4.0	25.00%				
OTHER	0.0	0.00%				
(20) MEET. ADMINISTERED?						
YES	8.0	50.00%				
NO	8.0	50.00%				
(21) MEASURES SET-UP?						
NO MEASURE/NO MONITOR	2.0	12.50%				
NO MEASURES/VISUAL	3.0	18.75%				
MEASURES/NO FOLLOWUP	0.0	0.00%				
MEASURES/USED OFTEN	11.0	68.75%				
OTHER	0.0	0.00%				
(22) IMPACT OF PARTNER:						
NO CHANGE	2.0	12.50%				
VERY LITTLE	4.0	25.00%				
SOME CHANGES	7.0	43.75%				
MAJOR CHANGES	2.0	12.50%				
TOTAL RESTRUCTURE	1.0	6.25%				
OTHER	0.0	0.00%				
(23) TOP MGMT COMMITMENT:						
NONE	0.0	0.00%				
LOW	0.0	0.00%				
MEDIUM	4.0	25.00%				
HIGH	5.0	31.25%				
VERY HIGH	7.0	43.75%				
(24) AMOUNT OF TEAMWORK:						
OWNER/DEVELOPER	16.0		67.0	4.188	0.402	0.634
ARCHITECT/ENGINEER	16.0		67.0	4.188	0.277	0.527
SUBCONTRACTOR	15.0		58.0	3.867	0.249	0.499
SUPPLIERS	15.0		59.0	3.933	0.329	0.573
(25) PARTNER RESULTED IN:	16.0		64.5	4.031	0.702	0.838
(26) FINAL WORKSHOP?						
YES	12.0	75.00%				
NO	4.0	25.00%				
(27) FUTURE PARTNERING:						
READILY ACCEPT	30.0	93.75%				
RELUCTANTLY ACCEPT	1.0	3.13%				
ACCEPT/LAST RESORT	1.0	3.13%				
DECLINE	0.0	0.00%				

(28) REASON FOR DECLINE:						
NO BENEFIT	0.0	0.00%				
LIKE THINGS NOW	0.0	0.00%				
COSTS TOO MUCH	0.0	0.00%				
ALL THE ABOVE	1.0	100.00%				
OTHER	0.0	0.00%				
(29) VOLUME OF BUSINESS:						
LESS THAN $500,000	0.0	0.00%				
$500,000 - $1 MILL	1.0	3.13%				
$1 MILL - $5 MILL	0.0	0.00%				
$5 MILL - $20 MILL	15.0	46.88%				
$20 MILL - $50 MILL	1.0	3.13%				
$50 MILL-$100 MILL	5.0	15.63%				
OVER $100 MILL	10.0	31.25%				
(30) COMPANY PROFITS:						
DECLINING	4.0	12.50%				
ABOUT THE SAME	16.0	50.00%				
IMPROVING	12.0	37.50%				
(31) TYPES OF PROJECTS:	32.0		113.0	3.531	1.562	1.250

APPENDIX C-2

ARCHITECT/ENGINEER SURVEY RESPONSE — RECEIVED: 27 OF 50 SURVEYS — RESPONSE RATE: 54.0%

QUESTIONS	TOTAL	%	SUM	AVERAGE	VAR	STD DEV
DID THEY RESPOND?	27.0	100.00%				
(1) CONCEPTS:						
TEAM BUILDING	17.0	62.96%				
GROUP AWARENESS	9.0	33.33%				
CONFLICT MANAGEMENT	13.0	48.15%				
VALUE ENGINEERING	25.0	92.59%				
TOTAL QUALITY MGMT	21.0	77.78%				
PARTNERING	19.0	70.37%				
(2) COMMUNICATION:						
OWNER/DEVELOPER	26.0		105.0	4.038	0.422	0.649
GENERAL CONTRACTOR	26.0		94.0	3.615	0.391	0.625
SUBCONTRACTOR	22.0		61.5	2.795	0.379	0.615
SUPPLIERS	24.0		74.5	3.104	0.500	0.707
(3) ACKNOWLEDGE PROBLEMS:						
OWNER/DEVELOPER	27.0		113.0	4.185	0.521	0.722
GENERAL CONTRACTOR	27.0		109.0	4.037	0.776	0.881
SUBCONTRACTOR	24.0		81.0	3.375	0.901	0.949
SUPPLIERS	24.0		81.0	3.375	1.151	1.073
(4) HANDLING PROBLEMS:						
OWNER/DEVELOPER	27.0		118.0	4.370	0.307	0.554
GENERAL CONTRACTOR	27.0		112.0	4.148	0.497	0.705
SUBCONTRACTOR	24.0		93.0	3.875	1.276	1.130
SUPPLIERS	25.0		95.0	3.800	0.800	0.894
(5) COOPERATION:						
OWNER/DEVELOPER	27.0		120.0	4.444	0.247	0.497
GENERAL CONTRACTOR	27.0		102.0	3.778	0.617	0.786
SUBCONTRACTOR	24.0		80.0	3.333	0.722	0.850
SUPPLIERS	24.0		80.0	3.333	0.556	0.745
(6) YOUR RESPONSE TIME	27.0		120.5	4.463	0.313	0.560
(7) OTHERS RESPONSE TIME:						
OWNER/DEVELOPER	27.0		94.0	3.481	0.694	0.833
GENERAL CONTRACTOR	27.0		100.0	3.704	0.579	0.761
SUBCONTRACTOR	24.0		79.0	3.292	0.707	0.841
SUPPLIERS	23.0		75.0	3.261	0.454	0.674
(8) OTHER PARTY DOES:						
OWNER/DEVELOPER	27.0		105.0	3.889	0.469	0.685
GENERAL CONTRACTOR	27.0		97.0	3.593	0.982	0.991
SUBCONTRACTOR	24.0		81.0	3.375	1.068	1.033
SUPPLIERS	24.0		83.0	3.458	0.665	0.815
(9) WORK RELATIONSHIP:						
OWNER/DEVELOPER	27.0		111.0	4.111	0.247	0.497
GENERAL CONTRACTOR	27.0		105.0	3.889	0.395	0.629
SUBCONTRACTOR	24.0		86.0	3.583	0.660	0.812
SUPPLIERS	25.0		88.0	3.520	0.330	0.574

(10) CLAIMS FILED BY YOU:

DRASTIC INCREASE	0.0	0.00%
SLIGHT INCREASE	3.0	12.50%
ABOUT THE SAME	20.0	83.33%
SLIGHT DECREASE	1.0	4.17%
DRASTIC DECREASE	0.0	0.00%

(11) CLAIMS AGAINST:

DRASTIC INCREASE	1.0	4.17%
SLIGHT INCREASE	4.0	16.67%
ABOUT THE SAME	17.0	70.83%
SLIGHT DECREASE	2.0	8.33%
DRASTIC DECREASE	0.0	0.00%

(12) HANDLING DISPUTES:

COURT LITIGATION	2.0	8.33%
MEDIATION	4.0	16.67%
ARBITRATION	6.0	25.00%
MINI-TRIALS	0.0	0.00%
DISPUTE REV. BOARD	1.0	4.17%
NEGOTIATION	8.0	33.33%
OTHER	3.0	12.50%

(13) TQM PROGRAM-3 YRS

YES	22.0	81.48%
NO	5.0	18.52%

(14) PARTNERING PROGRAM

YES	11.0	40.74%
NO	16.0	59.26%

(15) MAIN REASON PARTNER:

GET A JOB	1.0	3.70%
IMPROVE RELATION	5.0	18.52%
IMPROVE QUALITY	8.0	29.63%
REDUCE COSTS	4.0	14.81%
MARKETING TOOL	4.0	14.81%
AVOID CLAIMS	2.0	7.41%
TO BETTER COMPETE	3.0	11.11%
NONE OF THE ABOVE	0.0	0.00%

(16) PROPOSED BY WHOM?

OWNER/DEVELOPER	7.0	58.33%
ARCHITECT/ENGINEER	4.0	33.33%
GENERAL CONTRACTOR	1.0	8.33%
SUBCONTRACTOR	0.0	0.00%
SUPPLIER	0.0	0.00%

(17) COMPANY INVOLVEMENT:

TOP LEVEL MGMT.	3.0	23.08%
SALARIED EMPLOYEES	1.0	7.69%
ONLY MANAGERS	2.0	15.38%
JOBSITE EMPLOYEES	0.0	0.00%
ALL EMPLOYEES	6.0	46.15%
RANDOM EMPLOYEES	1.0	7.69%
ONLY ONE OR A FEW	0.0	0.00%

(18) INITIAL MEETING:

ON O/D PREMISES	4.0	33.33%
ON A/E PREMISES	3.0	25.00%
ON CONTRACTOR PRE.	1.0	8.33%
AT NEUTRAL SITE	3.0	25.00%
OTHER	1.0	8.33%

(19) MEETING CONDUCTED:

DURING BUSINESS HRS	9.0	90.00%
AFTER BUSINESS HRS	0.0	0.00%
BOTH DURING & AFTER	1.0	10.00%
OTHER	0.0	0.00%

(20) MEET. ADMINISTERED?

YES	2.0	18.18%
NO	9.0	81.82%

(21) MEASURES SET-UP?

NO MEASURE/NO MONITOR	5.0	45.45%
NO MEASURES/VISUAL	3.0	27.27%
MEASURES/NO FOLLOWUP	0.0	0.00%
MEASURES/USED OFTEN	3.0	27.27%
OTHER	0.0	0.00%

(22) IMPACT OF PARTNER:

NO CHANGE	2.0	18.18%
VERY LITTLE	4.0	36.36%
SOME CHANGES	4.0	36.36%
MAJOR CHANGES	1.0	9.09%
TOTAL RESTRUCTURE	0.0	0.00%
OTHER	0.0	0.00%

(23) TOP MGMT COMMITMENT:

NONE	0.0	0.00%
LOW	0.0	0.00%
MEDIUM	6.0	54.55%
HIGH	2.0	18.18%
VERY HIGH	3.0	27.27%

(24) AMOUNT OF TEAMWORK:

OWNER/DEVELOPER	11.0		45.0	4.091	0.446	0.668
GENERAL CONTRACTOR	11.0		46.0	4.182	0.876	0.936
SUBCONTRACTOR	10.0		38.0	3.800	0.760	0.872
SUPPLIERS	10.0		36.0	3.600	0.640	0.800
(25) PARTNER RESULTED IN:	11.0		40.0	3.636	0.231	0.481

(26) FINAL WORKSHOP?

YES	4.0	36.36%
NO	7.0	63.64%

(27) FUTURE PARTNERING:

READILY ACCEPT	22.0	84.62%
RELUCTANTLY ACCEPT	2.0	7.69%
ACCEPT/LAST RESORT	0.0	0.00%
DECLINE	2.0	7.69%

(28) REASON FOR DECLINE:						
NO BENEFIT	1.0	50.00%				
LIKE THINGS NOW	0.0	0.00%				
COSTS TOO MUCH	0.0	0.00%				
ALL THE ABOVE	0.0	0.00%				
OTHER	1.0	50.00%				
(29) VOLUME OF BUSINESS:						
LESS THAN $500,000	3.0	11.11%				
$500,000 - $1 MILL	5.0	18.52%				
$1 MILL - $5 MILL	7.0	25.93%				
$5 MILL - $20 MILL	7.0	25.93%				
$20 MILL - $50 MILL	1.0	3.70%				
$50 MILL-$100 MILL	0.0	0.00%				
OVER $100 MILL	4.0	14.81%				
(30) COMPANY PROFITS:						
DECLINING	3.0	11.11%				
ABOUT THE SAME	12.0	44.44%				
IMPROVING	12.0	44.44%				
(31) TYPES OF PROJECTS:	27.0		86.5	3.204	1.005	1.002

APPENDIX C-3

OWNER/DEVELOPER SURVEY RESPONSE — RECEIVED: 24 OF 50 SURVEYS — RESPONSE RATE: 48.0%

QUESTIONS	TOTAL	%	SUM	AVERAGE	VAR	STD DEV
DID THEY RESPOND?	24.0	100.00%				
(1) CONCEPTS:						
TEAM BUILDING	21.0	87.50%				
GROUP AWARENESS	8.0	33.33%				
CONFLICT MANAGEMENT	11.0	45.83%				
VALUE ENGINEERING	20.0	83.33%				
TOTAL QUALITY MGMT	15.0	62.50%				
PARTNERING	13.0	54.17%				
(2) COMMUNICATION:						
ARCHITECT/ENGINEER	24.0		108.0	4.500	0.583	0.764
GENERAL CONTRACTOR	22.0		96.0	4.364	0.959	0.979
SUBCONTRACTOR	23.0		79.0	3.435	0.767	0.876
SUPPLIERS	21.0		70.0	3.333	0.794	0.891
(3) ACKNOWLEDGE PROBLEMS:						
ARCHITECT/ENGINEER	24.0		109.0	4.542	0.582	0.763
GENERAL CONTRACTOR	22.0		95.0	4.318	1.217	1.103
SUBCONTRACTOR	22.0		77.0	3.500	1.068	1.034
SUPPLIERS	22.0		76.0	3.455	1.066	1.033
(4) HANDLING PROBLEMS:						
ARCHITECT/ENGINEER	24.0		109.0	4.542	0.582	0.763
GENERAL CONTRACTOR	22.0		99.0	4.500	0.523	0.723
SUBCONTRACTOR	21.0		77.0	3.667	0.698	0.836
SUPPLIERS	20.0		74.0	3.700	1.110	1.054
(5) COOPERATION:						
ARCHITECT/ENGINEER	24.0		107.0	4.458	0.582	0.763
GENERAL CONTRACTOR	22.0		95.0	4.318	0.490	0.700
SUBCONTRACTOR	22.0		80.0	3.636	0.868	0.932
SUPPLIERS	22.0		77.0	3.500	1.250	1.118
(6) YOUR RESPONSE TIME	24.0		106.5	4.438	0.652	0.808
(7) OTHERS RESPONSE TIME:						
ARCHITECT/ENGINEER	24.0		101.0	4.208	0.665	0.815
GENERAL CONTRACTOR	22.0		90.0	4.091	0.628	0.793
SUBCONTRACTOR	22.0		77.0	3.500	0.977	0.989
SUPPLIERS	21.0		67.0	3.190	0.726	0.852
(8) OTHER PARTY DOES:						
ARCHITECT/ENGINEER	24.0		104.0	4.333	0.472	0.687
GENERAL CONTRACTOR	22.0		91.0	4.136	0.936	0.967
SUBCONTRACTOR	21.0		80.5	3.833	1.127	1.062
SUPPLIERS	20.0		74.0	3.700	0.810	0.900
(9) WORK RELATIONSHIP:						
ARCHITECT/ENGINEER	24.0		105.5	4.396	0.812	0.901
GENERAL CONTRACTOR	23.0		99.5	4.326	1.165	1.080
SUBCONTRACTOR	22.0		83.5	3.795	1.106	1.052
SUPPLIERS	21.0		73.0	3.476	1.011	1.006

(10) CLAIMS FILED BY YOU:

DRASTIC INCREASE	1.0	4.35%
SLIGHT INCREASE	1.0	4.35%
ABOUT THE SAME	20.0	86.96%
SLIGHT DECREASE	1.0	4.35%
DRASTIC DECREASE	0.0	0.00%

(11) CLAIMS AGAINST:

DRASTIC INCREASE	0.0	0.00%
SLIGHT INCREASE	1.0	4.35%
ABOUT THE SAME	20.0	86.96%
SLIGHT DECREASE	2.0	8.70%
DRASTIC DECREASE	0.0	0.00%

(12) HANDLING DISPUTES:

COURT LITIGATION	2.0	8.33%
MEDIATION	6.0	25.00%
ARBITRATION	5.0	20.83%
MINI-TRIALS	0.0	0.00%
DISPUTE REV. BOARD	0.0	0.00%
NEGOTIATION	9.0	37.50%
OTHER	2.0	8.33%

(13) TQM PROGRAM-3 YRS

YES	13.0	54.17%
NO	11.0	45.83%

(14) PARTNERING PROGRAM

YES	12.0	50.00%
NO	12.0	50.00%

(15) MAIN REASON PARTNER:

GET A JOB	0.0	0.00%
IMPROVE RELATION	5.0	20.83%
IMPROVE QUALITY	5.0	20.83%
REDUCE COSTS	8.0	33.33%
MARKETING TOOL	0.0	0.00%
AVOID CLAIMS	4.0	16.67%
TO BETTER COMPETE	1.0	4.17%
NONE OF THE ABOVE	1.0	4.17%

(16) PROPOSED BY WHOM?

OWNER/DEVELOPER	9.0	69.23%
ARCHITECT/ENGINEER	1.0	7.69%
GENERAL CONTRACTOR	3.0	23.08%
SUBCONTRACTOR	0.0	0.00%
SUPPLIER	0.0	0.00%

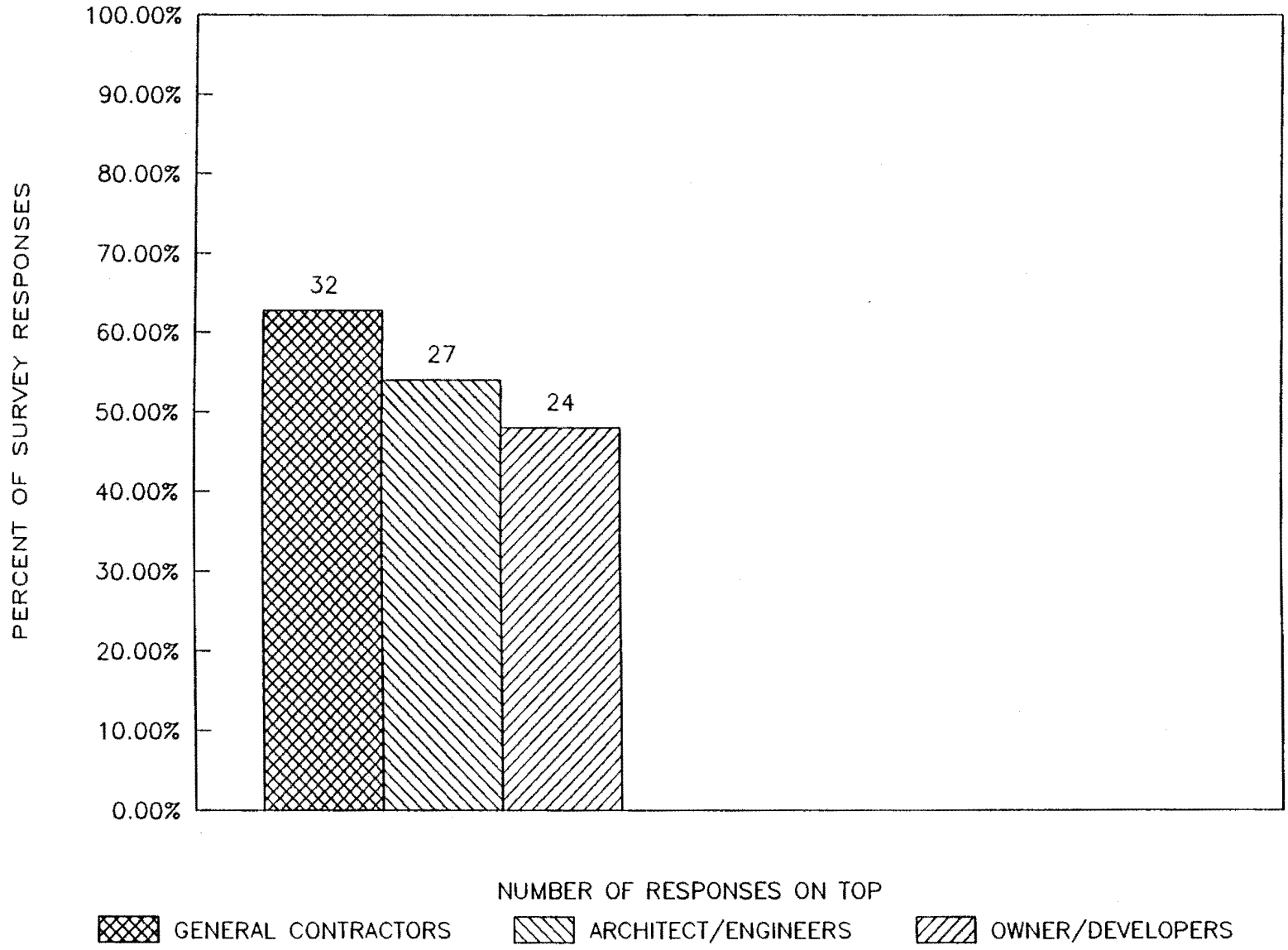
(17) COMPANY INVOLVEMENT:

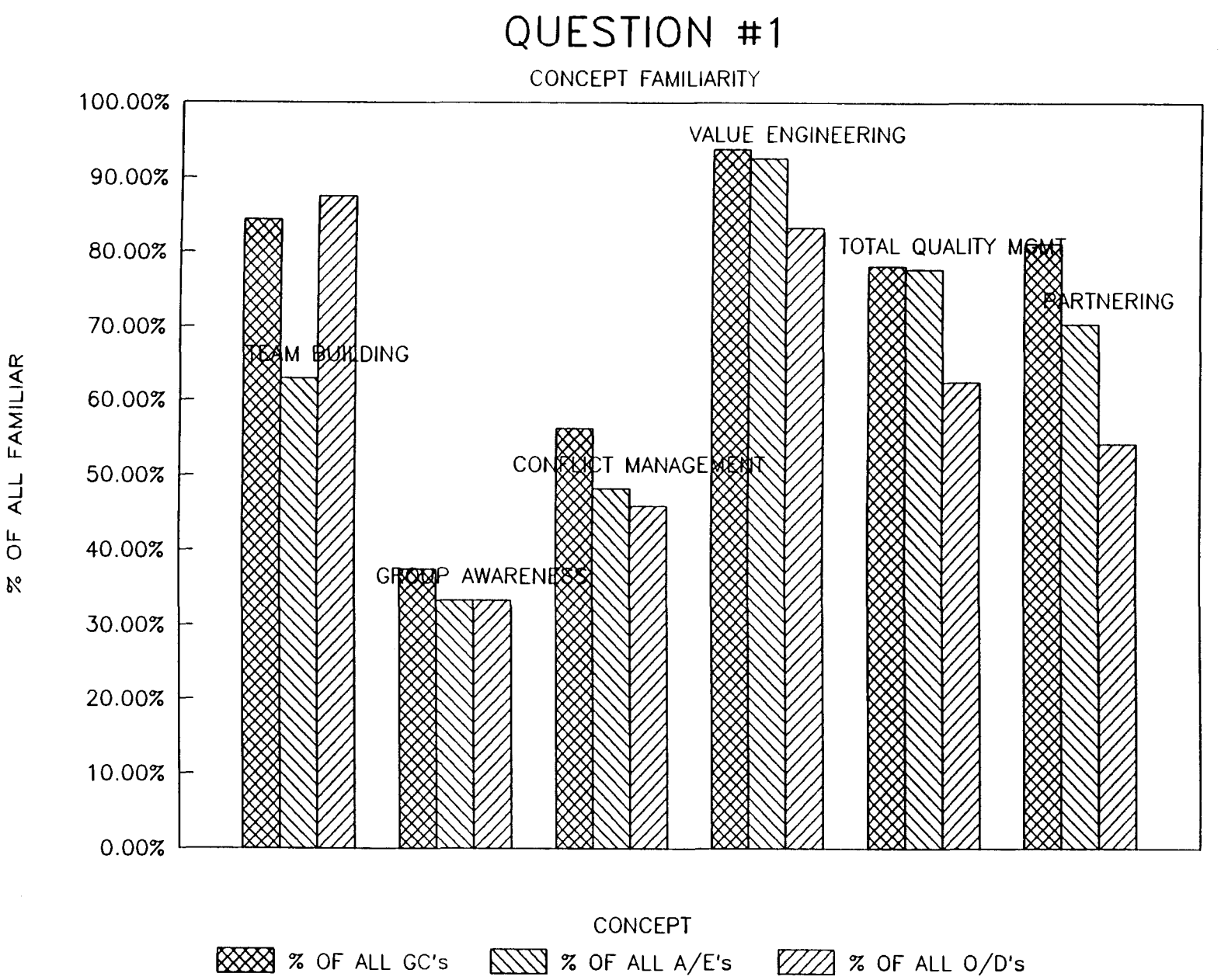
TOP LEVEL MGMT.	4.0	26.67%
SALARIED EMPLOYEES	0.0	0.00%
ONLY MANAGERS	3.0	20.00%
JOBSITE EMPLOYEES	2.0	13.33%
ALL EMPLOYEES	5.0	33.33%
RANDOM EMPLOYEES	1.0	6.67%
ONLY ONE OR A FEW	0.0	0.00%

(18) INITIAL MEETING:						
ON O/D PREMISES	7.0	58.33%				
ON A/E PREMISES	2.0	16.67%				
ON CONTRACTOR PRE.	0.0	0.00%				
AT NEUTRAL SITE	2.0	16.67%				
OTHER	1.0	8.33%				
(19) MEETING CONDUCTED:						
DURING BUSINESS HRS	10.0	83.33%				
AFTER BUSINESS HRS	0.0	0.00%				
BOTH DURING & AFTER	1.0	8.33%				
OTHER	1.0	8.33%				
(20) MEET. ADMINISTERED?						
YES	1.0	9.09%				
NO	10.0	90.91%				
(21) MEASURES SET-UP?						
NO MEASURE/NO MONITOR	2.0	18.18%				
NO MEASURES/VISUAL	4.0	36.36%				
MEASURES/NO FOLLOWUP	0.0	0.00%				
MEASURES/USED OFTEN	4.0	36.36%				
OTHER	1.0	9.09%				
(22) IMPACT OF PARTNER:						
NO CHANGE	6.0	50.00%				
VERY LITTLE	0.0	0.00%				
SOME CHANGES	6.0	50.00%				
MAJOR CHANGES	0.0	0.00%				
TOTAL RESTRUCTURE	0.0	0.00%				
OTHER	0.0	0.00%				
(23) TOP MGMT COMMITMENT:						
NONE	0.0	0.00%				
LOW	0.0	0.00%				
MEDIUM	2.0	16.67%				
HIGH	3.0	25.00%				
VERY HIGH	7.0	58.33%				
(24) AMOUNT OF TEAMWORK:						
ARCHITECT/ENGINEER	11.0		47.0	4.273	0.380	0.617
GENERAL CONTRACTOR	10.0		42.0	4.200	0.360	0.600
SUBCONTRACTOR	10.0		40.0	4.000	0.600	0.775
SUPPLIERS	9.0		34.0	3.778	0.395	0.629
(25) PARTNER RESULTED IN:	11.0		48.0	4.364	0.368	0.606
(26) FINAL WORKSHOP?						
YES	5.0	41.67%				
NO	7.0	58.33%				
(27) FUTURE PARTNERING:						
READILY ACCEPT	17.0	70.83%				
RELUCTANTLY ACCEPT	3.0	12.50%				
ACCEPT/LAST RESORT	1.0	4.17%				
DECLINE	3.0	12.50%				

(28) REASON FOR DECLINE:						
NO BENEFIT	2.0	50.00%				
LIKE THINGS NOW	1.0	25.00%				
COSTS TOO MUCH	0.0	0.00%				
ALL THE ABOVE	0.0	0.00%				
OTHER	1.0	25.00%				
(29) VOLUME OF BUSINESS:						
LESS THAN $500,000	0.0	0.00%				
$500,000 - $1 MILL	0.0	0.00%				
$1 MILL - $5 MILL	4.0	18.18%				
$5 MILL - $20 MILL	8.0	36.36%				
$20 MILL - $50 MILL	6.0	27.27%				
$50 MILL-$100 MILL	2.0	9.09%				
OVER $100 MILL	2.0	9.09%				
(30) COMPANY PROFITS:						
DECLINING	5.0	23.81%				
ABOUT THE SAME	12.0	57.14%				
IMPROVING	4.0	19.05%				
(31) TYPES OF PROJECTS:	24.0		105.5	4.396	1.812	1.346

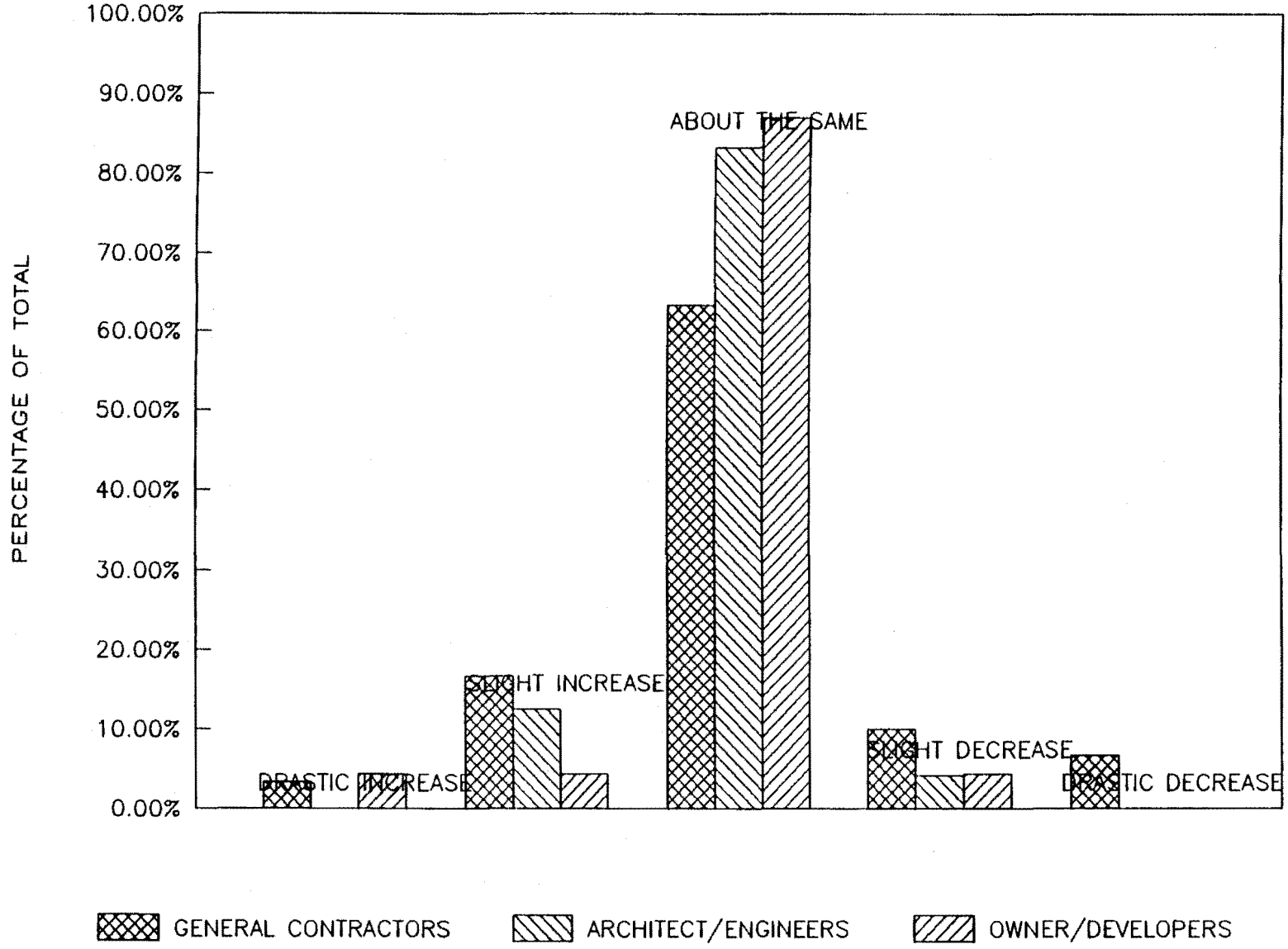
SURVEY RESPONSE RATE




QUESTION #1
CONCEPT FAMILIARITY
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
% OF ALL FAMILIAR
TEAM BUILDING
GROUP AWARENESS
CONFLICT MANAGEMENT
VALUE ENGINEERING
TOTAL QUALITY MGMT
PARTNERING
CONCEPT
% OF ALL GC's
% OF ALL A/E's
% OF ALL O/D's

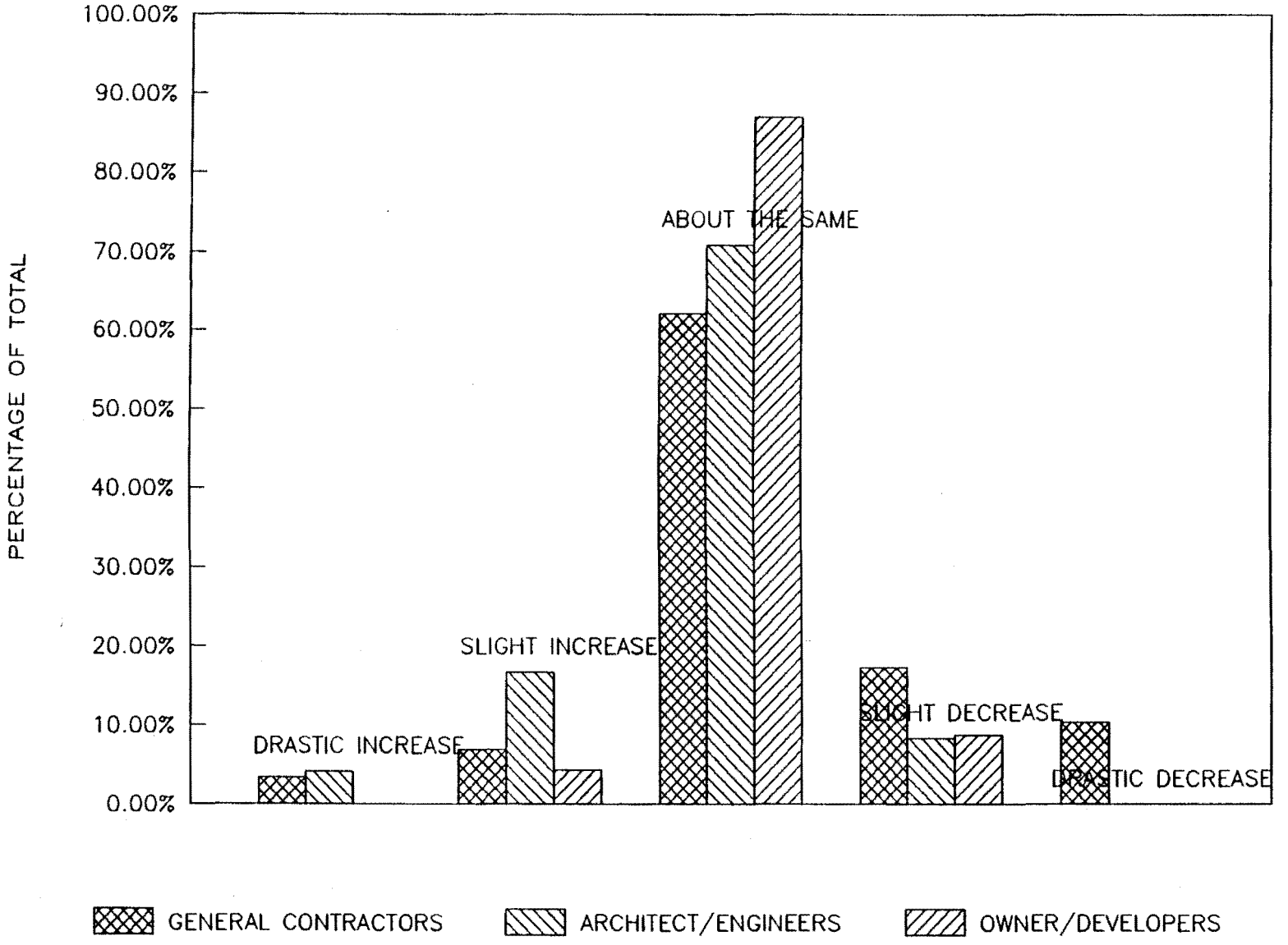
QUESTION #10

CLAIMS FILED BY COMPANY



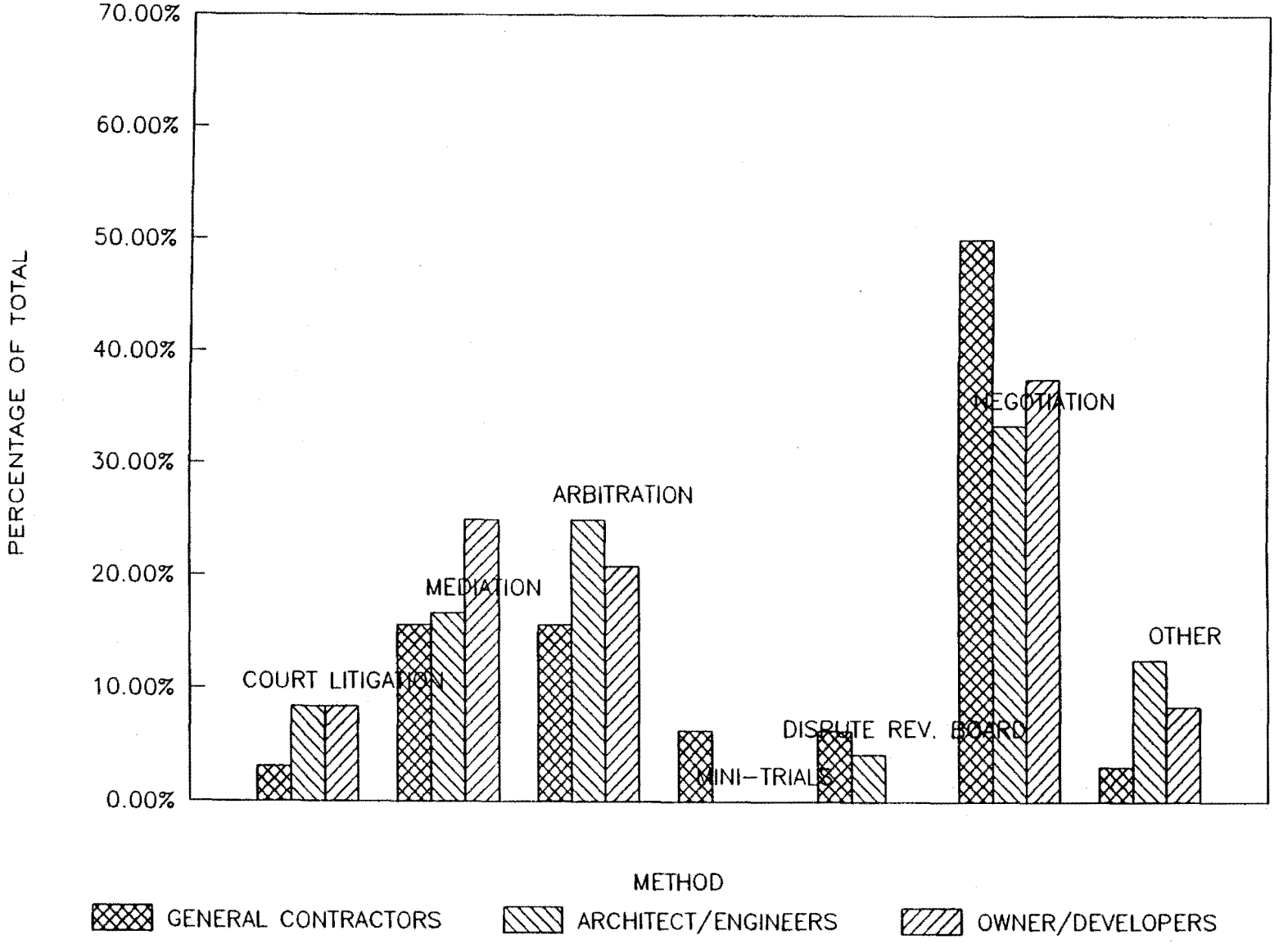
QUESTION #11

CLAIMS AGAINST YOUR COMPANY



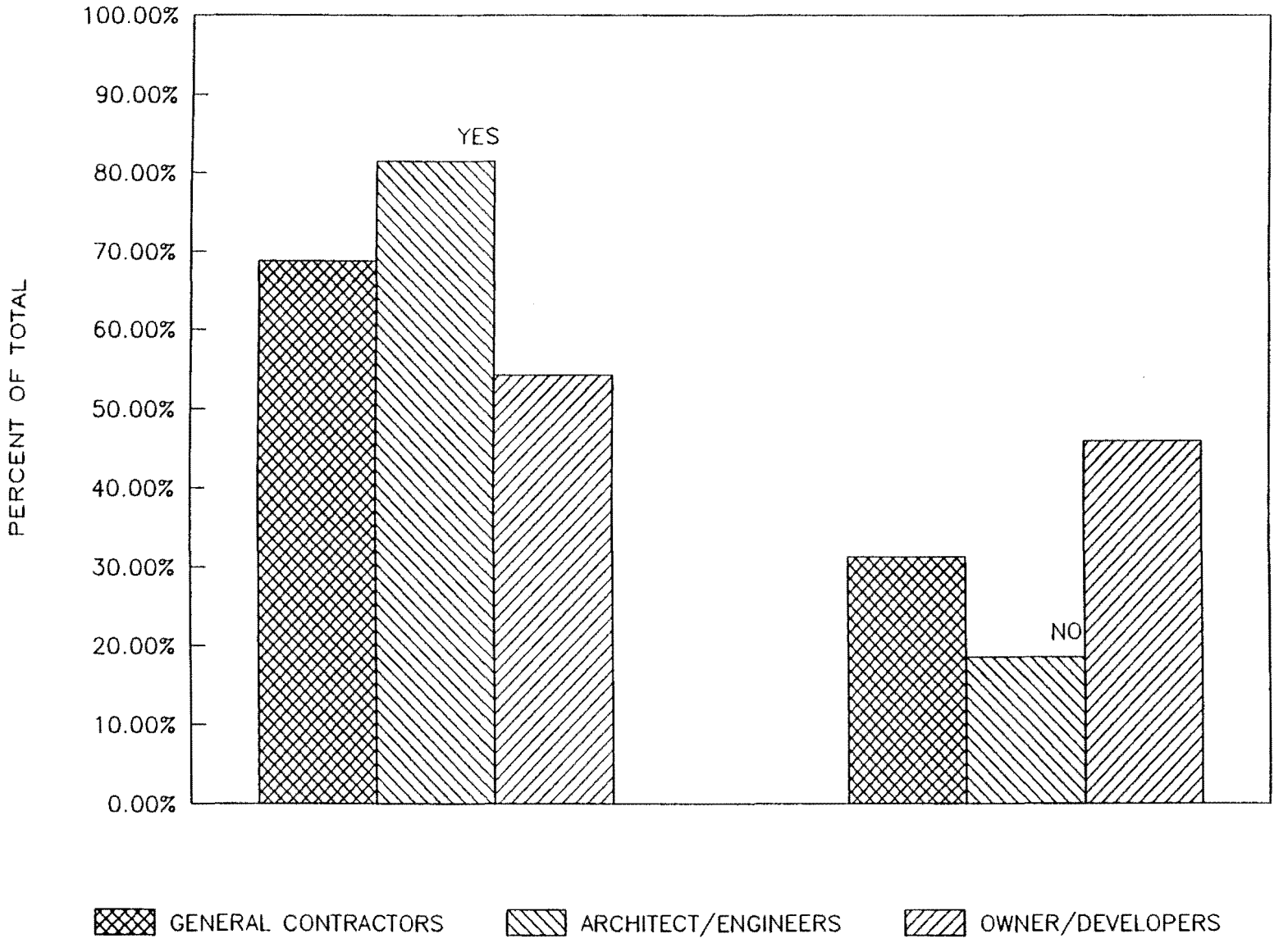
QUESTION #12

HANDLING OF DISPUTES



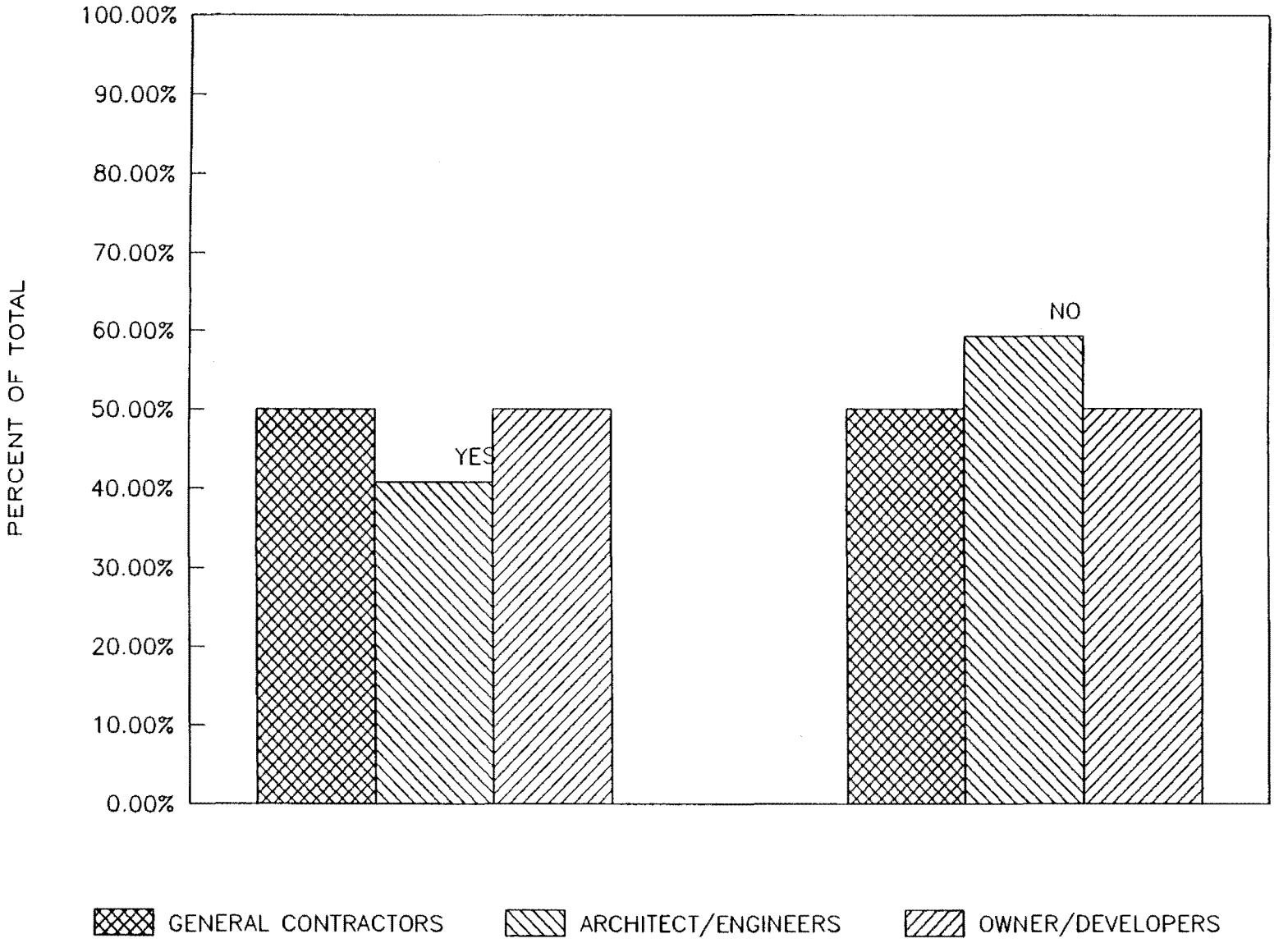
QUESTION #13

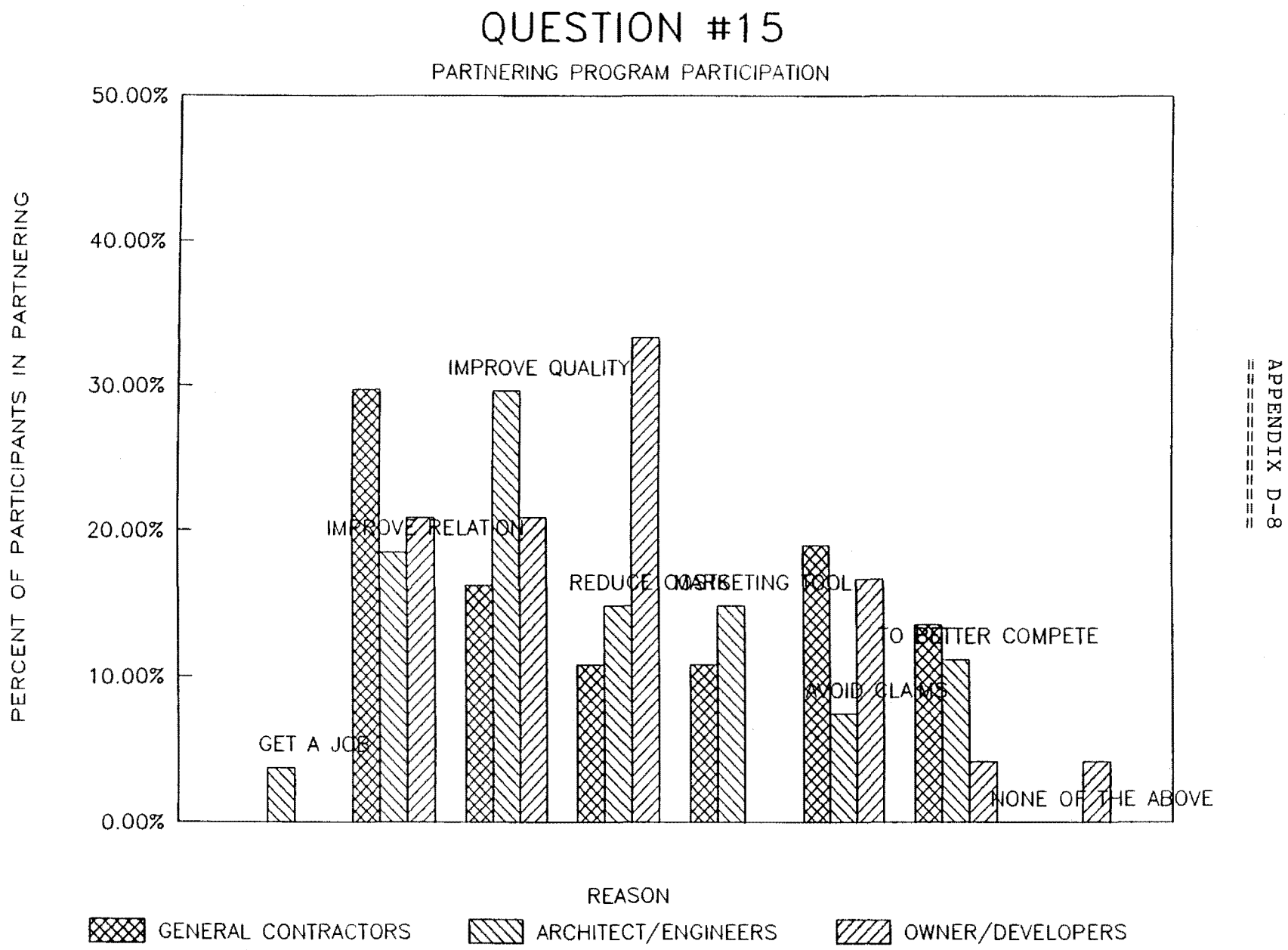
TQM PROGRAM PARTICIPATION



QUESTION #14

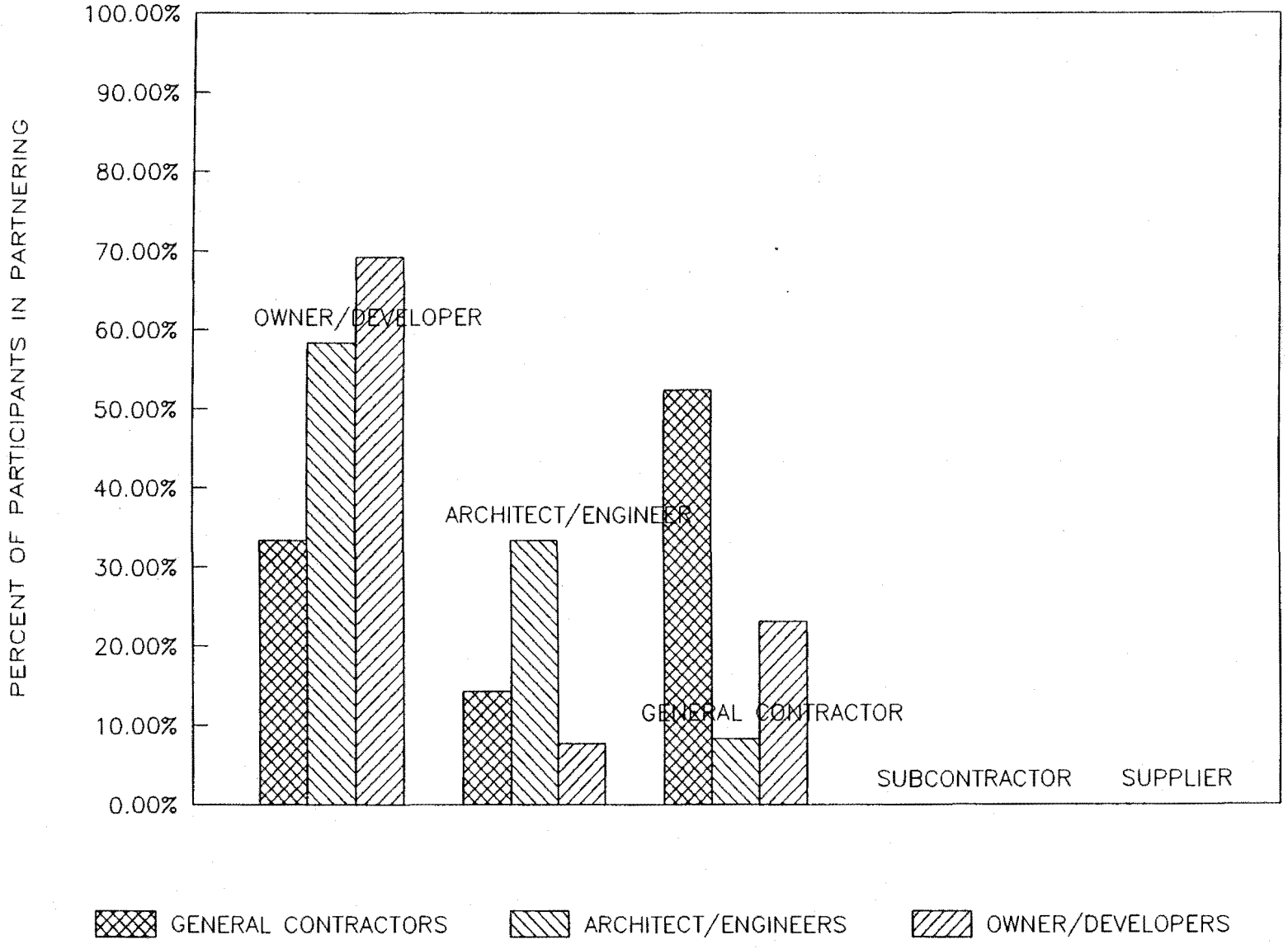
PARTNERING PROGRAM PARTICIPATION




QUESTION #15
PARTNERING PROGRAM PARTICIPATION
PERCENT OF PARTICIPANTS IN PARTNERING
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
GET A JOB
IMPROVE QUALITY
REDUCE COSTS
TO BETTER COMPETE
AVOID CLAIMS
NONE OF THE ABOVE
REASON
GENERAL CONTRACTORS
ARCHITECT/ENGINEERS
OWNER/DEVELOPERS

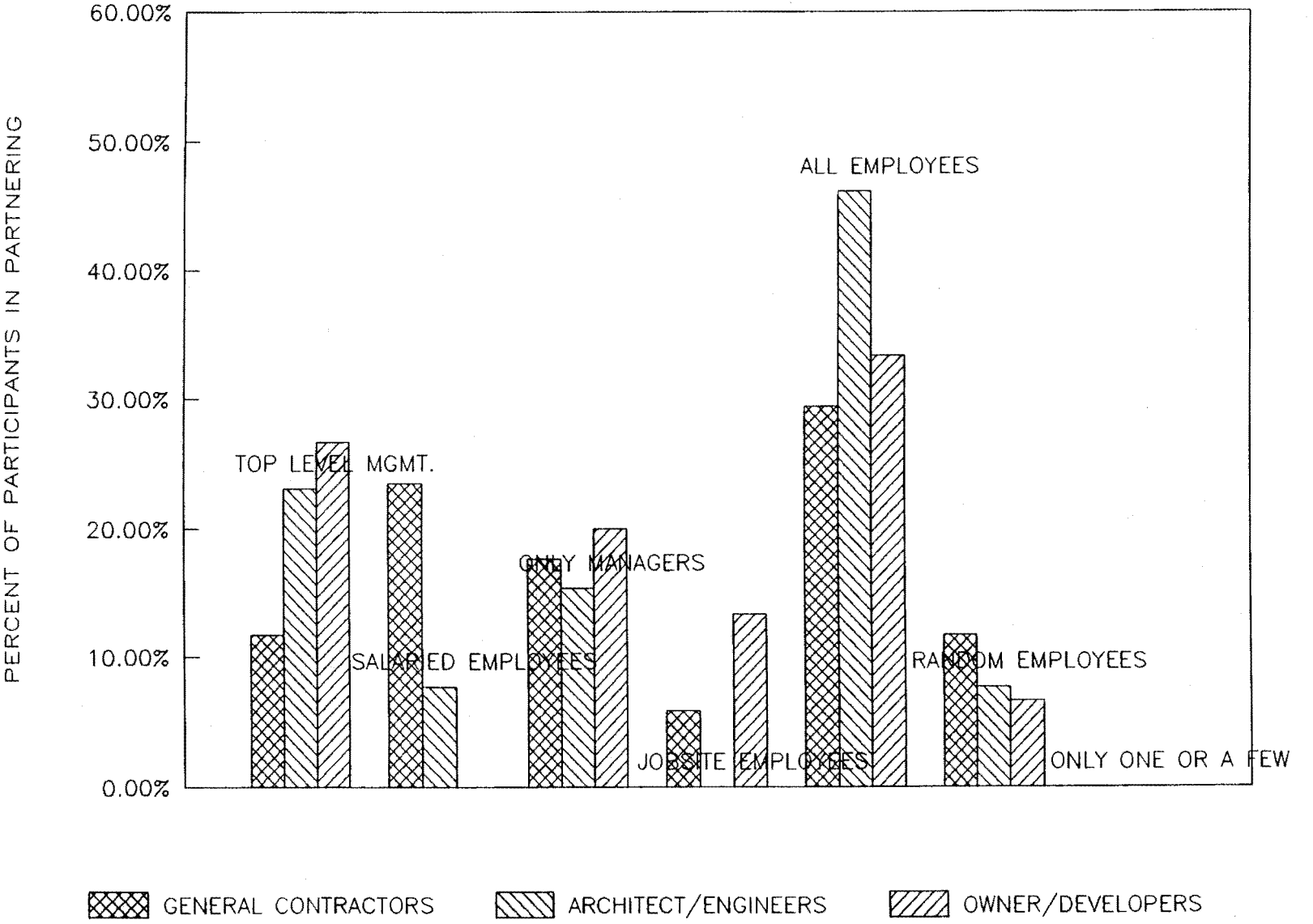
QUESTION #16

PARTNERING PROGRAM PROPOSED BY WHOM?



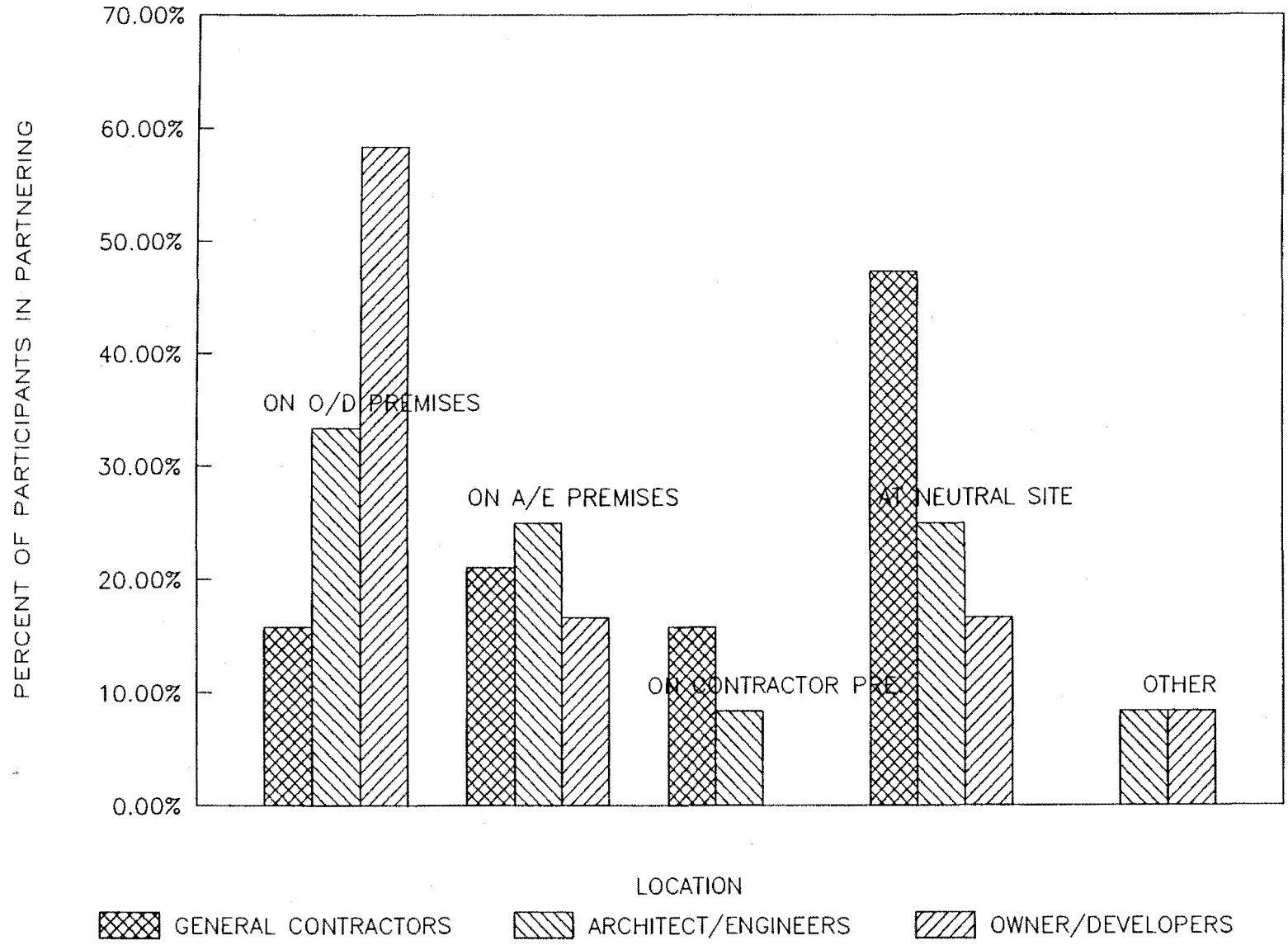
QUESTION #17

PORTION OF COMPANY INVOLVED



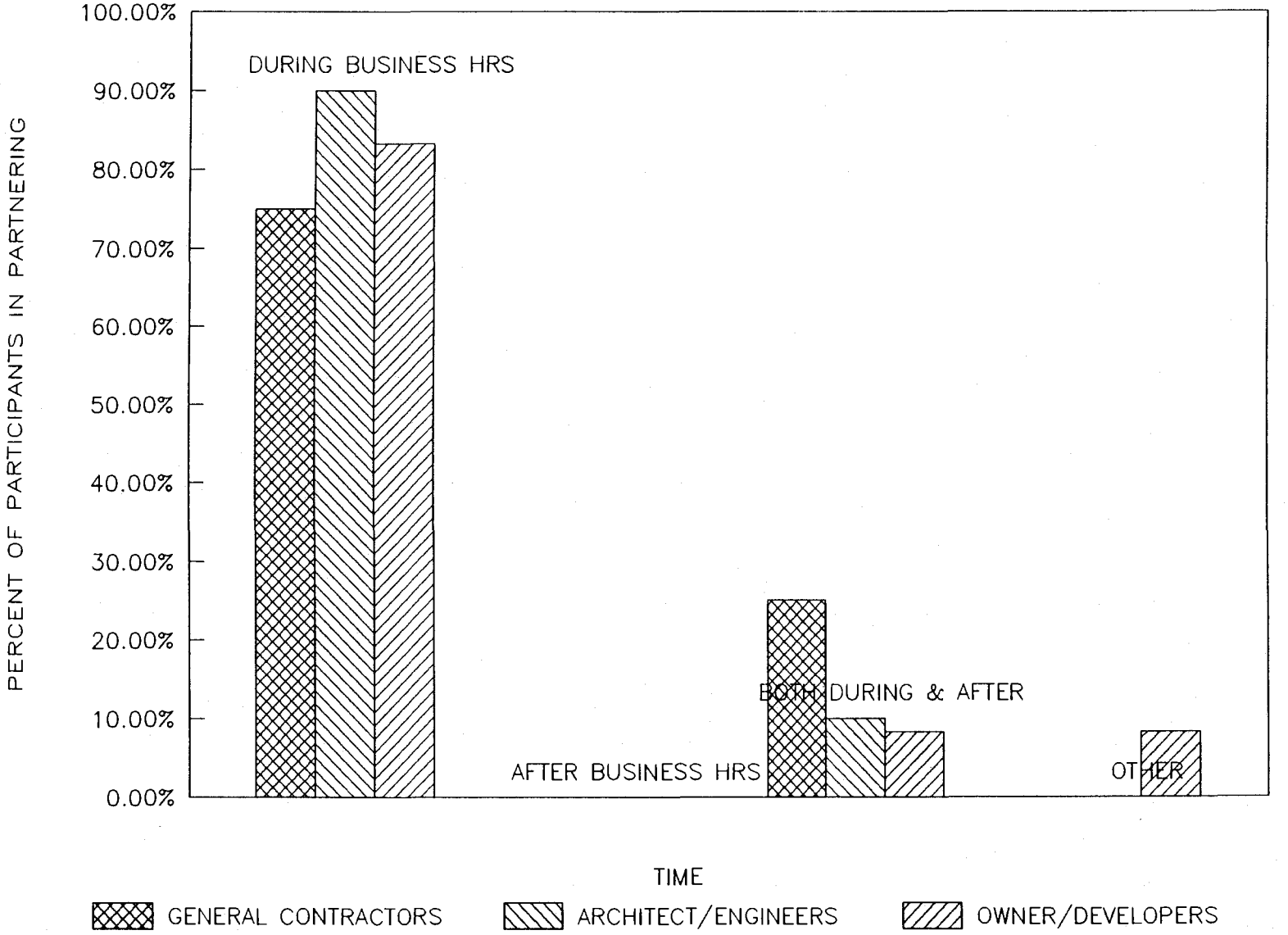
QUESTION #18

INITIAL MEETING HELD AT



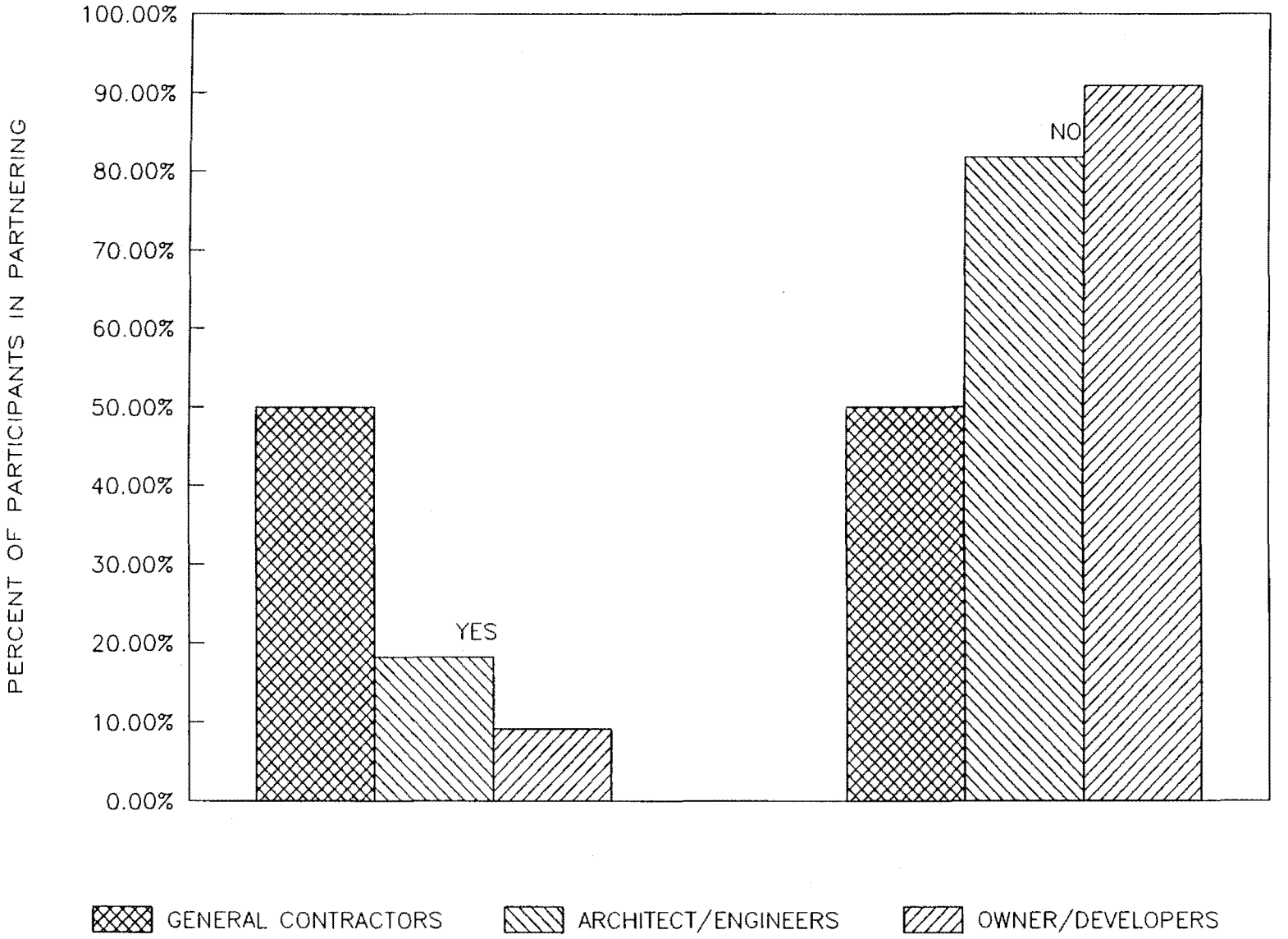
QUESTION #19

WHEN WAS MEETING CONDUCTED?



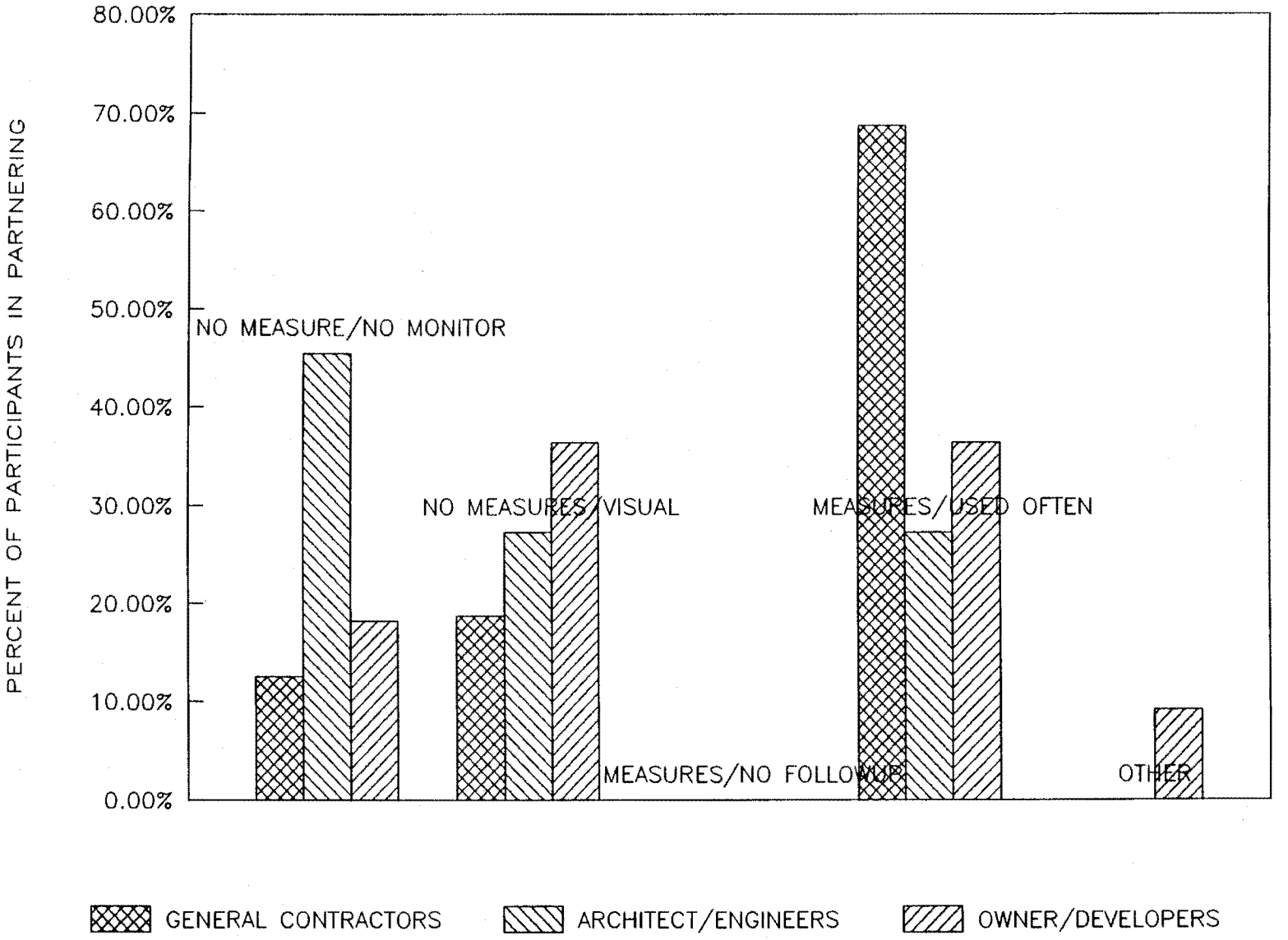
QUESTION #20

WAS THE MEETING FACILITATED?



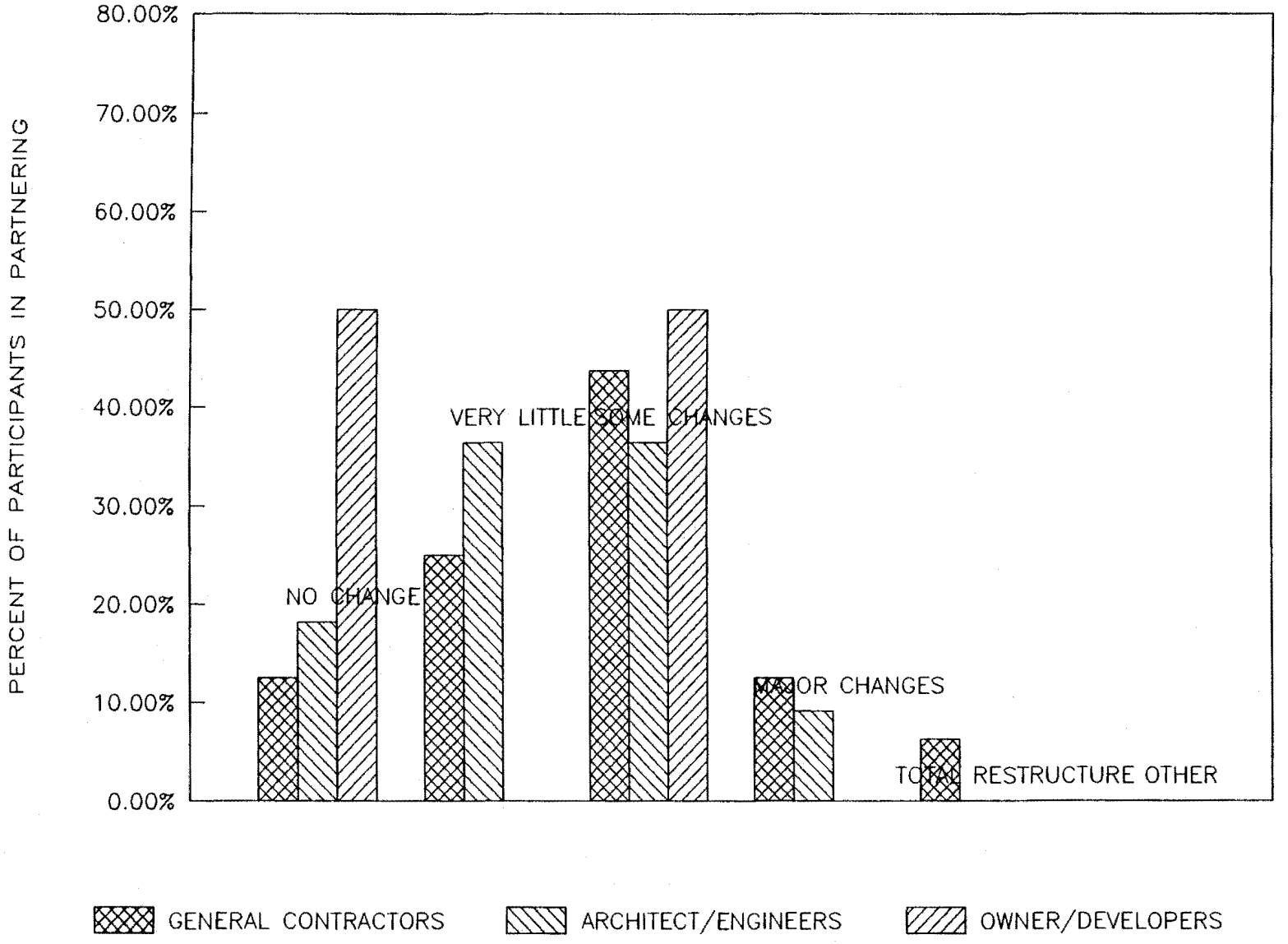
QUESTION #21

WERE MEASURES SET-UP TO MONITOR



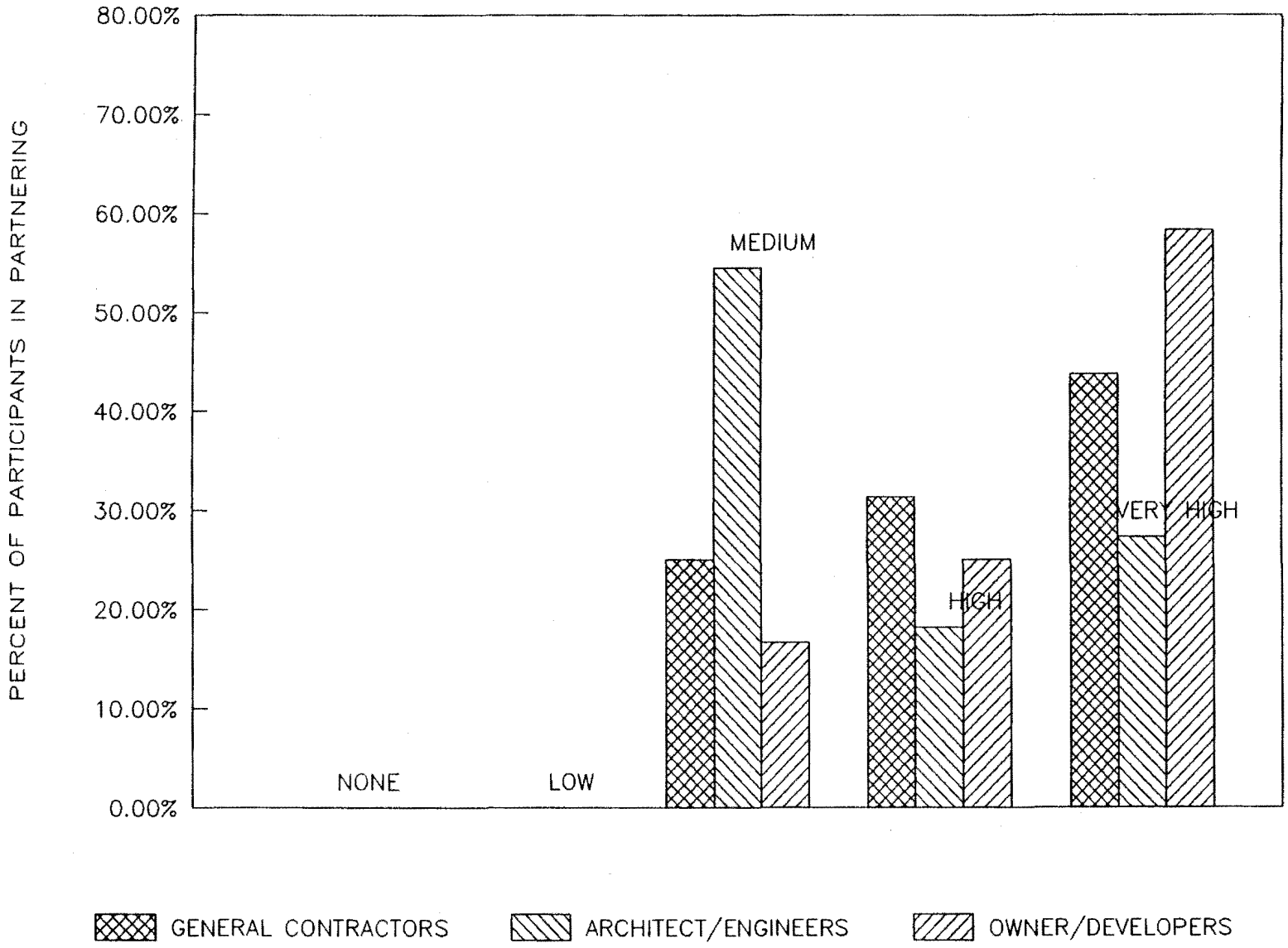
QUESTION #22

IMPACT OF PARTNERING ON COMPANY



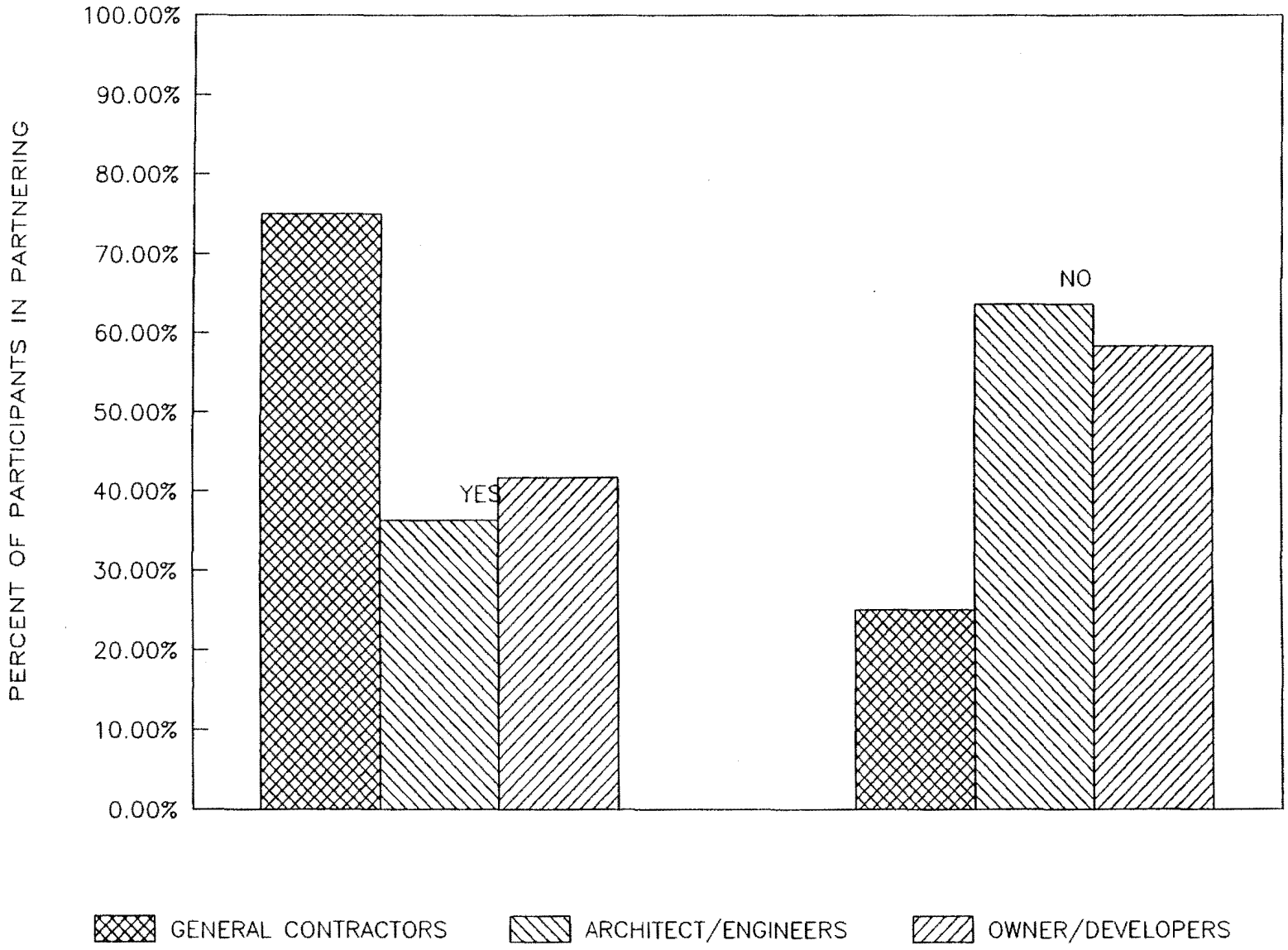
QUESTION #23

TOP MANAGEMENT'S COMMITMENT



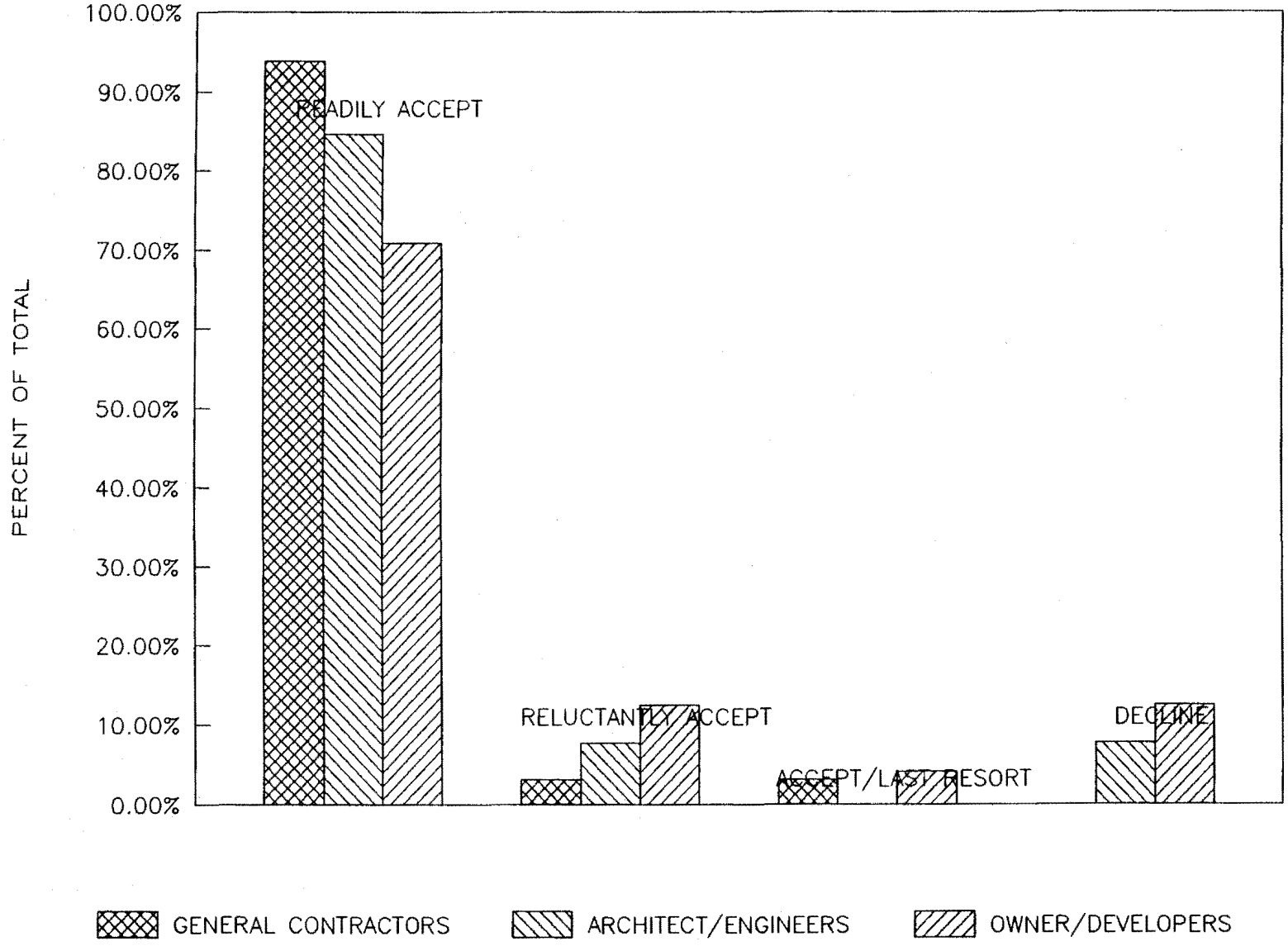
QUESTION #26

WAS THERE A FINAL WORKSHOP?



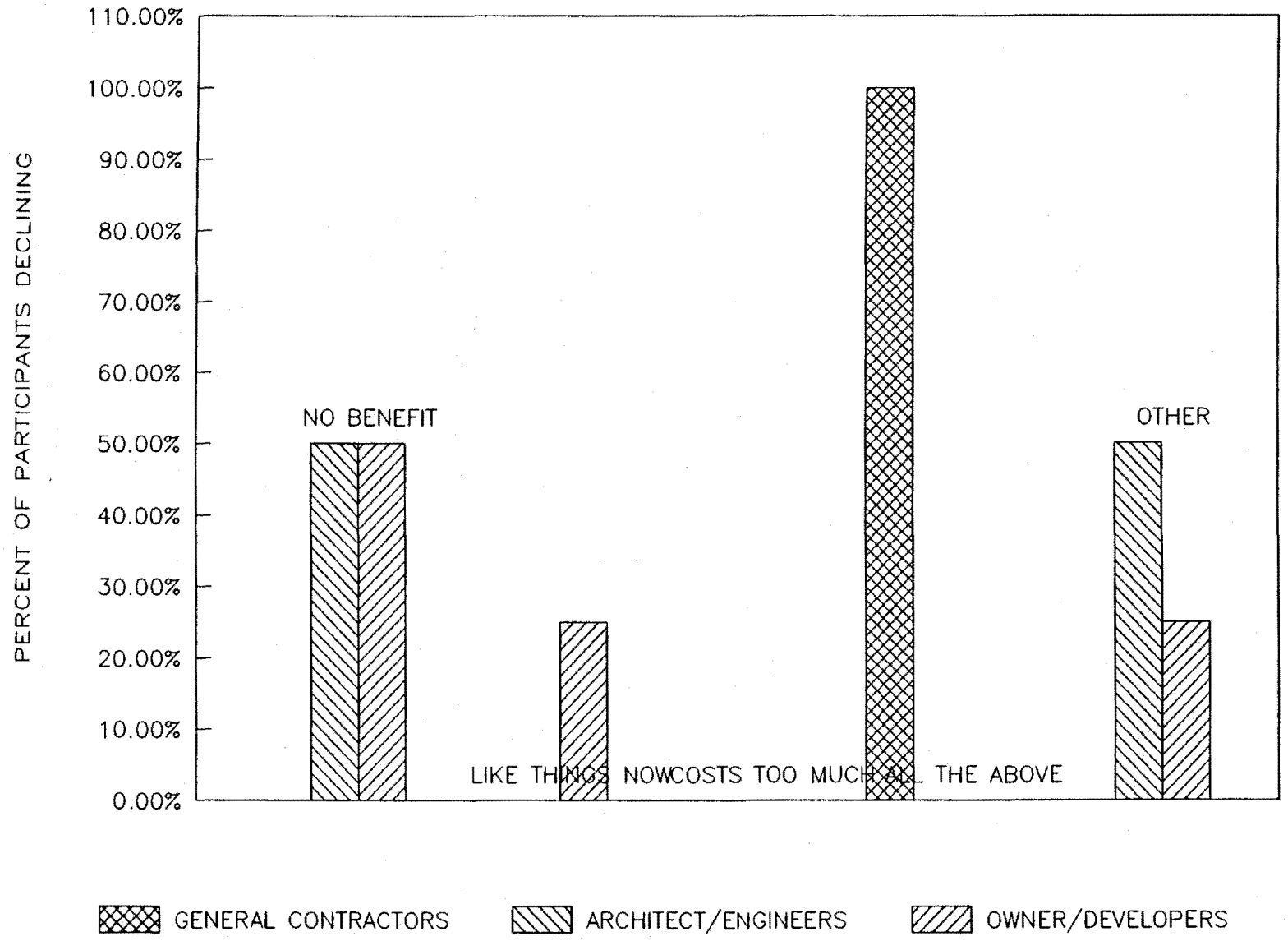
QUESTION #27

PARTNERING PROPOSED ON FUTURE PROJECTS



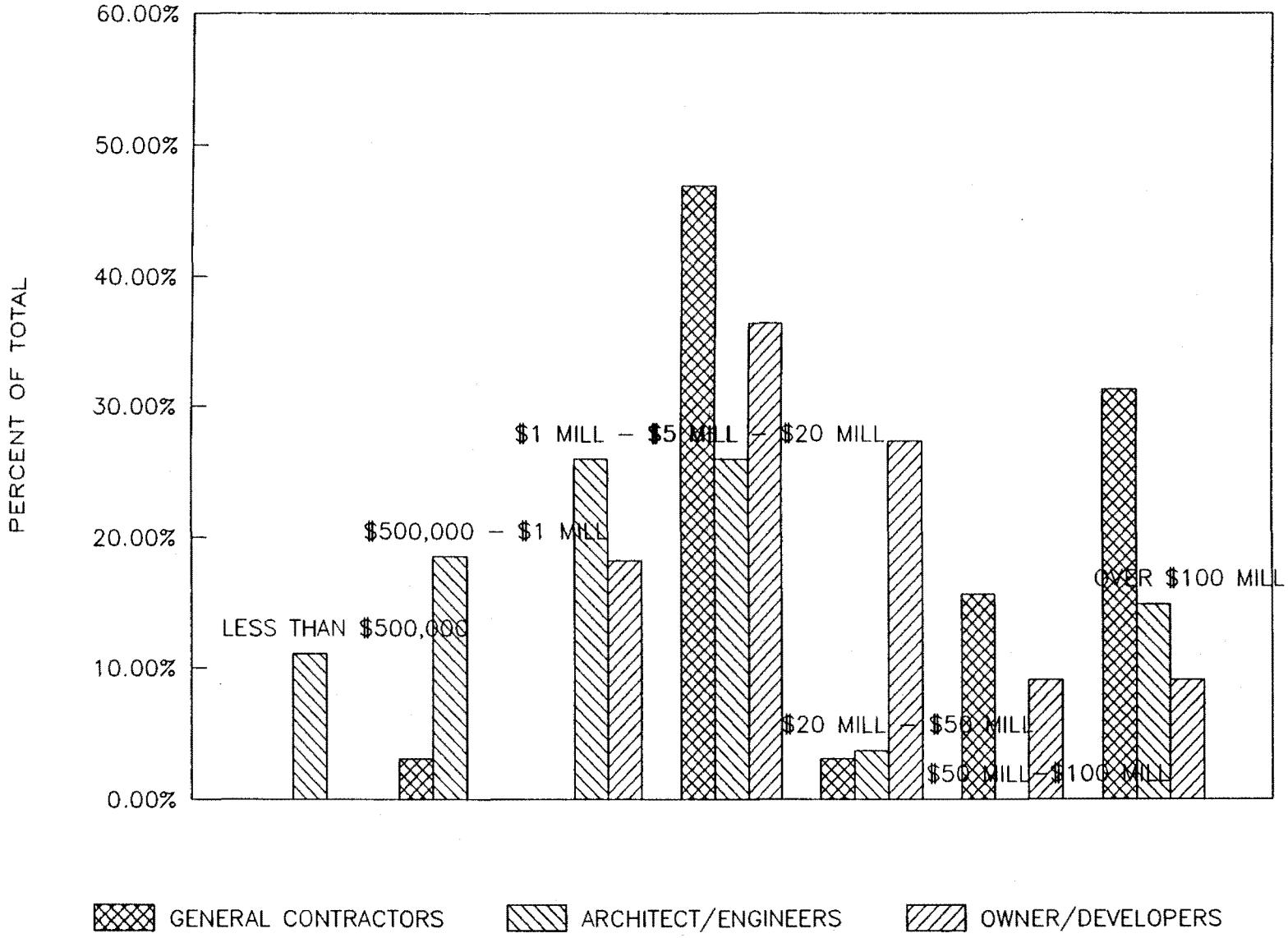
QUESTION #28

REASON FOR DECLINING



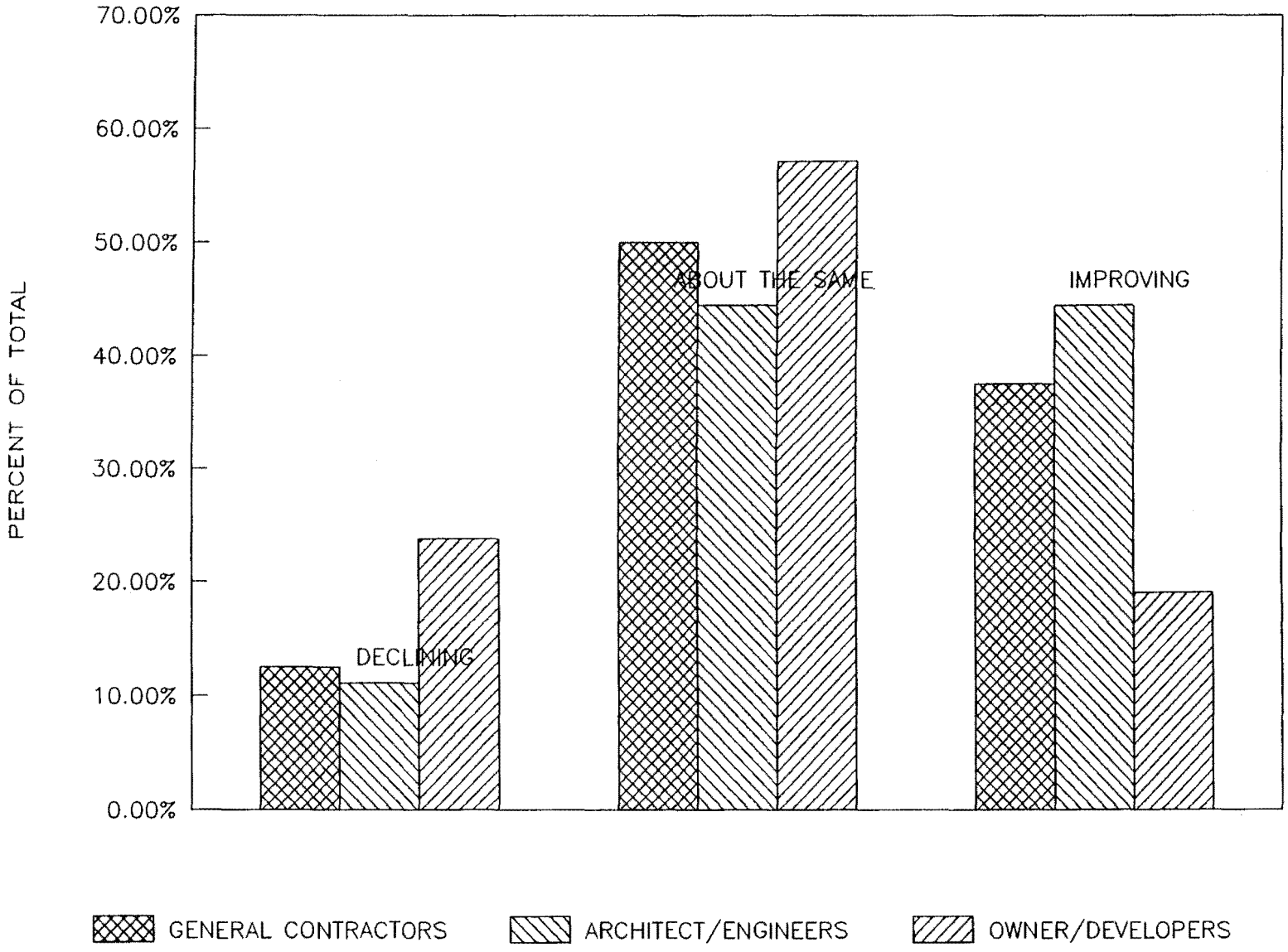
QUESTION #29

AVERAGE ANNUAL VOLUME OF BUSINESS



QUESTION #30

COMPANY PROFITABILITY OVER LAST 3-YEARS



APPENDIX E-1

HYPOTHESIS TESTING
GENERAL CONTRACTOR'S RESPONSES vs. ARCHITECT/ENGINEER RESPONSES

μ_{GC} and μ_{AE} denotes the mean of the responses from the general contractor group and architect/engineer group, respectively. We have to decide between the two hypothesis:

$H_0: \mu_{GC} = \mu_{AE}$, and there is no essential difference between the two groups and the way they view their working relationship with each of the other groups, and the way they view their relationship with each other.

$H_1: \mu_{GC} \neq \mu_{AE}$, and there is a significant difference between the two groups.

Under Hypothesis H_0 :	SIGMA	DOF	t	1% Significance Level		5% Significance Level		ABSOLUTE VALUE ABS(t)
(2) COMMUNICATION:								
OWNER/DEVELOPER	0.7191	56	-0.2026	-2.67	ACCEPT	-2.01	ACCEPT	0.2026
GC AND A/E	0.6959	56	1.9231	2.67	ACCEPT	2.01	ACCEPT	1.9231
SUBCONTRACTOR	0.7381	52	5.8924	2.68	REJECT	2.01	REJECT	5.8924
SUPPLIERS	0.7183	54	4.2961	2.67	REJECT	2.01	REJECT	4.2961
(3) ACKNOWLEDGE PROBLEMS:								
OWNER/DEVELOPER	0.9361	57	-0.5015	-2.67	ACCEPT	-2.01	ACCEPT	0.5015
GC AND A/E	0.9906	57	-0.0224	2.67	ACCEPT	2.01	ACCEPT	0.0224
SUBCONTRACTOR	0.9062	54	2.9373	2.68	REJECT	2.01	REJECT	2.9373
SUPPLIERS	0.9179	54	2.7736	2.68	REJECT	2.01	REJECT	2.7736
(4) HANDLING PROBLEMS:								
OWNER/DEVELOPER	0.7275	57	-2.2768	-2.67	ACCEPT	-2.01	REJECT	2.2768
GC AND A/E	0.7507	57	-1.2330	-2.67	ACCEPT	-2.01	ACCEPT	1.2330
SUBCONTRACTOR	0.9440	54	0.9807	2.68	ACCEPT	2.01	ACCEPT	0.9807
SUPPLIERS	0.8076	55	1.2176	2.67	ACCEPT	2.01	ACCEPT	1.2176
(5) COOPERATION:								
OWNER/DEVELOPER	0.7030	57	-1.7390	-2.67	ACCEPT	-2.01	ACCEPT	1.7390
GC AND A/E	0.8236	57	1.0325	2.67	ACCEPT	2.01	ACCEPT	1.0325
SUBCONTRACTOR	0.8075	54	3.3442	2.68	REJECT	2.01	REJECT	3.3442
SUPPLIERS	0.7098	54	3.8042	2.68	REJECT	2.01	REJECT	3.8042
(6) YOUR RESPONSE TIME	0.5738	57	-0.8992	-2.67	ACCEPT	-2.01	ACCEPT	0.8992
(7) OTHERS RESPONSE TIME:								
OWNER/DEVELOPER	1.0258	57	-1.8544	-2.67	ACCEPT	-2.01	ACCEPT	1.8544
GC AND A/E	0.8736	57	-3.3562	-2.67	REJECT	-2.01	REJECT	3.3562
SUBCONTRACTOR	0.9325	54	-0.1655	-2.68	ACCEPT	2.01	ACCEPT	0.1655
SUPPLIERS	0.9344	52	-0.8890	-2.68	ACCEPT	-2.01	ACCEPT	0.8890
(8) OTHER PARTY DOES:								
OWNER/DEVELOPER	0.8803	57	-1.1472	-2.67	ACCEPT	-2.01	ACCEPT	1.1472
GC AND A/E	0.9553	57	0.1298	2.67	ACCEPT	2.01	ACCEPT	0.1298
SUBCONTRACTOR	0.9363	54	0.8652	2.68	ACCEPT	2.01	ACCEPT	0.8652
SUPPLIERS	0.8589	54	-0.0898	-2.68	ACCEPT	2.01	ACCEPT	0.0898

(9) WORK RELATIONSHIP:								
OWNER/DEVELOPER	0.6839	57	0.8646	2.67	ACCEPT	2.01	ACCEPT	0.8646
GC AND A/E	0.7475	57	0.8088	2.67	ACCEPT	2.01	ACCEPT	0.8088
SUBCONTRACTOR	0.7617	54	2.6334	2.68	ACCEPT	2.01	REJECT	2.6334
SUPPLIERS	0.6173	55	3.4820	2.68	REJECT	2.01	REJECT	3.4820
(24) AMOUNT OF TEAMWORK:								
OWNER/DEVELOPER	0.6737	25	0.3661	2.80	ACCEPT	2.06	ACCEPT	0.3661
GC AND A/E	0.7503	25	0.0193	2.80	ACCEPT	2.06	ACCEPT	0.0193
SUBCONTRACTOR	0.7020	23	0.2326	2.82	ACCEPT	2.07	ACCEPT	0.2326
SUPPLIERS	0.7020	23	1.1632	2.82	ACCEPT	2.07	ACCEPT	1.1632
(25) PARTNER RESULTED IN:	0.7424	25	1.3580	2.80	ACCEPT	2.06	ACCEPT	1.3580
(31) TYPES OF PROJECTS:	1.1630	57	1.0778	2.67	ACCEPT	2.01	ACCEPT	1.0778

t(AVG) = 1.5880

APPENDIX E-2

HYPOTHESIS TESTING
GENERAL CONTRACTOR RESPONSES vs. OWNER/DEVELOPER RESPONSES

M_{GC} and M_{O} denotes the mean of the responses from the general contractor group and owner/developer group, respectively. We have to decide between the two hypothesis:

H_0: $M_{GC}=M_{O}$, and there is no essential difference between the two groups and the way they view their working relationship with each of the other groups, and the way they view their relationship with each other.

H_a: $M_{GC}\neq M_{O}$, and there is a significant difference between the two groups.

Under Hypothesis H_0 :

	SIGMA	DOF	t	1% Significance Level		5% Significance Level		ABSOLUTE VALUE ABS(t)
(2) COMMUNICATION:								
GC AND O/D	0.8670	52	-1.5143	-2.68	ACCEPT	-2.01	ACCEPT	1.5143
ARCHITECT/ENGINEER	0.7573	54	-2.5979	-2.68	ACCEPT	-2.01	REJECT	2.5979
SUBCONTRACTOR	0.8429	53	2.4531	2.68	ACCEPT	2.01	REJECT	2.4531
SUPPLIERS	0.7988	51	2.6932	2.68	REJECT	2.01	REJECT	2.6932
(3) ACKNOWLEDGE PROBLEMS:								
GC AND O/D	1.0976	52	-0.8411	-2.68	ACCEPT	-2.01	ACCEPT	0.8411
ARCHITECT/ENGINEER	0.9519	54	-1.9858	-2.68	ACCEPT	-2.01	ACCEPT	1.9858
SUBCONTRACTOR	0.9428	52	2.2740	2.68	ACCEPT	2.01	REJECT	2.2740
SUPPLIERS	0.8915	52	2.4622	2.68	ACCEPT	2.01	REJECT	2.4622
(4) HANDLING PROBLEMS:								
GC AND O/D	0.8011	52	-2.5351	-2.68	ACCEPT	-2.01	REJECT	2.5351
ARCHITECT/ENGINEER	0.7779	54	-3.0250	-2.68	REJECT	-2.01	REJECT	3.0250
SUBCONTRACTOR	0.7942	51	2.0550	2.68	ACCEPT	2.01	REJECT	2.0550
SUPPLIERS	0.8726	50	1.4573	2.69	ACCEPT	2.01	ACCEPT	1.4573
(5) COOPERATION:								
GC AND O/D	0.7878	52	-0.8854	-2.68	ACCEPT	-2.01	ACCEPT	0.8854
ARCHITECT/ENGINEER	0.8160	54	-2.0800	-2.68	ACCEPT	-2.01	REJECT	2.0800
SUBCONTRACTOR	0.8431	52	1.8249	2.68	ACCEPT	2.01	ACCEPT	1.8249
SUPPLIERS	0.8920	52	2.2769	2.68	ACCEPT	2.01	REJECT	2.2769
(6) YOUR RESPONSE TIME	0.6934	54	-0.5842	-2.68	ACCEPT	-2.01	ACCEPT	0.5842
(7) OTHERS RESPONSE TIME:								
GC AND O/D	1.0290	52	-3.8827	-2.68	REJECT	-2.01	REJECT	3.8827
ARCHITECT/ENGINEER	0.9010	54	-5.2236	-2.68	REJECT	-2.01	REJECT	5.2236
SUBCONTRACTOR	0.9952	52	-0.9070	-2.68	ACCEPT	-2.01	ACCEPT	0.9070
SUPPLIERS	1.0021	50	-0.5587	-2.68	ACCEPT	-2.01	ACCEPT	0.5587
(8) OTHER PARTY DOES:								
GC AND O/D	1.0009	52	-1.8448	-2.68	ACCEPT	-2.01	ACCEPT	1.8448
ARCHITECT/ENGINEER	0.8259	54	-3.1761	-2.68	REJECT	-2.01	REJECT	3.1761
SUBCONTRACTOR	0.9434	51	-0.9043	-2.68	ACCEPT	-2.01	ACCEPT	0.9043
SUPPLIERS	0.8953	50	-1.0286	-2.68	ACCEPT	-2.01	ACCEPT	1.0286

(9) WORK RELATIONSHIP:								
GC AND O/D	0.9397	53	-0.2354	-2.68	ACCEPT	-2.01	ACCEPT	0.2354
ARCHITECT/ENGINEER	0.8678	54	-1.4891	-2.68	ACCEPT	-2.01	ACCEPT	1.4891
SUBCONTRACTOR	0.8752	52	1.3596	2.68	ACCEPT	2.01	ACCEPT	1.3596
SUPPLIERS	0.8160	51	2.6949	2.68	REJECT	2.01	REJECT	2.6949
(24) AMOUNT OF TEAMWORK:								
GC AND O/D	0.6467	24	-0.0479	-2.80	ACCEPT	-2.07	ACCEPT	0.0479
ARCHITECT/ENGINEER	0.5872	25	-0.3706	-2.80	ACCEPT	-2.07	ACCEPT	0.3706
SUBCONTRACTOR	0.6505	23	-0.5021	-2.82	ACCEPT	-2.08	ACCEPT	0.5021
SUPPLIERS	0.6212	22	0.5939	2.82	ACCEPT	2.08	ACCEPT	0.5939
(25) PARTNER RESULTED IN:	0.7818	25	-1.0855	-2.81	ACCEPT	-2.01	ACCEPT	1.0855
(31) TYPES OF PROJECTS:	1.3156	54	-2.4338	-2.68	ACCEPT	-2.01	REJECT	2.4338

t(AVG) = 1.7681

APPENDIX E-3

HYPOTHESIS TESTING
ARCHITECT/ENGINEER RESPONSE vs. OWNER/DEVELOPER RESPONSE

μ_{AE} and μ_{OD} denotes the mean of responses from the architect/engineer group and owner/developer group, respectively. We have to decide between the two hypothesis:

H_0: $\mu_{AE} = \mu_{OD}$ and there is no essential difference between the two groups and the way they view their working relationshio with each of the other groups, and the way they view their relationship with each other.

H_A: $\mu_{AE} \neq \mu_{OD}$, and there is a significant difference between the two groups.

Under Hypothesis H_0 :

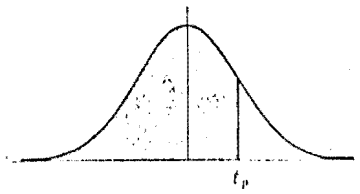
	SIGMA	DOF	t	1% Significance Level		5% Significance Level		ABSOLUTE VALUE ABS(t)
(2) COMMUNICATION:								
A/E AND O/D	0.7211	48	-2.2610	-2.69	ACCEPT	-2.02	REJECT	2.2610
GENERAL CONTRACTOR	0.8242	46	-3.1341	-2.70	REJECT	-2.02	REJECT	3.1341
SUBCONTRACTOR	0.7773	43	-2.7580	-2.70	REJECT	-2.02	REJECT	2.7580
SUPPLIERS	0.8163	43	-0.9395	-2.70	ACCEPT	-2.02	ACCEPT	0.9395
(3) ACKNOWLEDGE PROBLEMS:								
A/E AND O/D	0.7564	49	-1.6800	-2.69	ACCEPT	-2.02	ACCEPT	1.6800
GENERAL CONTRACTOR	1.0078	47	-0.9713	-2.70	ACCEPT	-2.02	ACCEPT	0.9713
SUBCONTRACTOR	1.0127	44	-0.4182	-2.70	ACCEPT	-2.02	ACCEPT	0.4182
SUPPLIERS	1.0775	44	-0.2501	-2.70	ACCEPT	-2.02	ACCEPT	0.2501
(4) HANDLING PROBLEMS:								
A/E AND O/D	0.6739	49	-0.9060	-2.69	ACCEPT	-2.02	ACCEPT	0.9060
GENERAL CONTRACTOR	0.7280	47	-1.6828	-2.70	ACCEPT	-2.02	ACCEPT	1.6828
SUBCONTRACTOR	1.0263	43	0.6793	2.70	ACCEPT	2.02	ACCEPT	0.6793
SUPPLIERS	0.9907	43	0.3365	-2.70	ACCEPT	-2.02	ACCEPT	0.3365
(5) COOPERATION:								
A/E AND O/D	0.6488	49	-0.0763	-2.69	ACCEPT	-2.02	ACCEPT	0.0763
GENERAL CONTRACTOR	0.7641	47	-2.4625	-2.70	ACCEPT	-2.02	REJECT	2.4625
SUBCONTRACTOR	0.9098	44	-1.1284	-2.70	ACCEPT	-2.02	ACCEPT	1.1284
SUPPLIERS	0.9633	44	-0.5861	-2.70	ACCEPT	-2.02	ACCEPT	0.5861
(6) YOUR RESPONSE TIME	0.7016	49	0.1294	2.69	ACCEPT	2.02	ACCEPT	0.1294
(7) OTHERS RESPONSE TIME:								
A/E AND O/D	0.8415	49	-3.0788	-2.69	REJECT	-2.02	REJECT	3.0788
GENERAL CONTRACTOR	0.7915	47	-1.7032	-2.70	ACCEPT	-2.02	ACCEPT	1.7032
SUBCONTRACTOR	0.9349	44	-0.7550	-2.70	ACCEPT	-2.02	ACCEPT	0.7550
SUPPLIERS	0.7818	42	0.2983	2.70	ACCEPT	-2.02	ACCEPT	0.2983
(8) OTHER PARTY DOES:								
A/E AND O/D	0.6999	49	-2.2637	-2.69	ACCEPT	-2.02	REJECT	2.2637
GENERAL CONTRACTOR	1.0012	47	-1.8911	-2.70	ACCEPT	-2.02	ACCEPT	1.8911
SUBCONTRACTOR	1.0707	43	-1.4326	-2.70	ACCEPT	-2.02	ACCEPT	1.4326
SUPPLIERS	0.8750	42	-0.9122	-2.70	ACCEPT	-2.02	ACCEPT	0.9122

(9) WORK RELATIONSHIP:								
A/E AND O/D	0.7306	49	-1.3891	-2.69	ACCEPT	-2.02	ACCEPT	1.3891
GENERAL CONTRACTOR	0.8835	48	-1.7439	-2.69	ACCEPT	-2.02	ACCEPT	1.7439
SUBCONTRACTOR	0.9554	44	-0.7522	-2.70	ACCEPT	-2.02	ACCEPT	0.7522
SUPPLIERS	0.8185	44	0.1808	2.70	ACCEPT	2.02	ACCEPT	0.1808
(24) AMOUNT OF TEAMWORK:								
A/E AND O/D	0.6742	20	-0.6325	-2.90	ACCEPT	-2.11	ACCEPT	0.6325
GENERAL CONTRACTOR	0.8347	19	-0.0499	-2.92	ACCEPT	-2.12	ACCEPT	0.0499
SUBCONTRACTOR	0.8692	18	-0.5145	-2.95	ACCEPT	-2.13	ACCEPT	0.5145
SUPPLIERS	0.7653	17	-0.5056	-2.95	ACCEPT	-2.13	ACCEPT	0.5056
(25) PARTNER RESULTED IN:	0.5741	20	-2.9711	-2.90	REJECT	-2.11	REJECT	2.9711
(31) TYPES OF PROJECTS:	1.2005	49	-3.5397	-2.69	REJECT	-2.02	REJECT	3.5397

t(AVG) = 1.2861

APPENDIX F

Percentile Values (t_p) for Student's t Distribution with ν Degrees of Freedom (shaded area = p)



ν	$t_{.995}$	$t_{.99}$	$t_{.975}$	$t_{.95}$	$t_{.90}$	$t_{.80}$	$t_{.75}$	$t_{.70}$	$t_{.60}$	$t_{.55}$
1	63.66	31.82	12.71	6.31	3.08	1.376	1.000	.727	.325	.158
2	9.92	6.96	4.30	2.92	1.89	1.061	.816	.617	.289	.142
3	5.84	4.54	3.18	2.35	1.64	.978	.765	.584	.277	.137
4	4.60	3.75	2.78	2.13	1.53	.941	.741	.569	.271	.134
5	4.03	3.36	2.57	2.02	1.48	.920	.727	.559	.267	.132
6	3.71	3.14	2.45	1.94	1.44	.906	.718	.553	.265	.131
7	3.50	3.00	2.36	1.90	1.42	.896	.711	.549	.263	.130
8	3.36	2.90	2.31	1.86	1.40	.889	.706	.546	.262	.130
9	3.25	2.82	2.26	1.83	1.38	.883	.703	.543	.261	.129
10	3.17	2.76	2.23	1.81	1.37	.879	.700	.542	.260	.129
11	3.11	2.72	2.20	1.80	1.36	.876	.697	.540	.260	.129
12	3.06	2.68	2.18	1.78	1.36	.873	.695	.539	.259	.128
13	3.01	2.65	2.16	1.77	1.35	.870	.694	.538	.259	.128
14	2.98	2.62	2.14	1.76	1.34	.868	.692	.537	.258	.128
15	2.95	2.60	2.13	1.75	1.34	.866	.691	.536	.258	.128
16	2.92	2.58	2.12	1.75	1.34	.865	.690	.535	.258	.128
17	2.90	2.57	2.11	1.74	1.33	.863	.689	.534	.257	.128
18	2.88	2.55	2.10	1.73	1.33	.862	.688	.534	.257	.127
19	2.86	2.54	2.09	1.73	1.33	.861	.688	.533	.257	.127
20	2.84	2.53	2.09	1.72	1.32	.860	.687	.533	.257	.127
21	2.83	2.52	2.08	1.72	1.32	.859	.686	.532	.257	.127
22	2.82	2.51	2.07	1.72	1.32	.858	.686	.532	.256	.127
23	2.81	2.50	2.07	1.71	1.32	.858	.685	.532	.256	.127
24	2.80	2.49	2.06	1.71	1.32	.857	.685	.531	.256	.127
25	2.79	2.48	2.06	1.71	1.32	.856	.684	.531	.256	.127
26	2.78	2.48	2.06	1.71	1.32	.856	.684	.531	.256	.127
27	2.77	2.47	2.05	1.70	1.31	.855	.684	.531	.256	.127
28	2.76	2.47	2.05	1.70	1.31	.855	.683	.530	.256	.127
29	2.76	2.46	2.04	1.70	1.31	.854	.683	.530	.256	.127
30	2.75	2.46	2.04	1.70	1.31	.854	.683	.530	.256	.127
40	2.70	2.42	2.02	1.68	1.30	.851	.681	.529	.255	.126
60	2.66	2.39	2.00	1.67	1.30	.848	.679	.527	.254	.126
120	2.62	2.36	1.98	1.66	1.29	.845	.677	.526	.254	.126
∞	2.58	2.33	1.96	1.645	1.28	.842	.674	.524	.253	.126

Source: R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research* (5th edition), Table III, Oliver and Boyd Ltd., Edinburgh, by permission of the authors and publishers.

APPENDIX G

EMP PROGRAM RELEVANT TO PROJECT

EMGT 541: Engineering Management Concepts and Principles

Application of fundamental concepts used in Engineering Management. Understanding technical organizations; and understanding communication, motivation & leadership theories. Use of project management techniques.

CE 484: Engineering Project Management

Planning, organization, operation and control of engineering projects. Progress reporting and monitoring information systems. Use of value engineering.

MGMT 522: Behavioral Science for Management

Understanding of communication, cooperation, leadership, decision-making & motivation concepts. Also understanding of corporate culture, socialization, group dynamics, and change related to effectiveness. Management of disagreement as well as agreement (i.e. "groupthink").

ST 314: Statistics for Engineers

Application of statistical decision-making theory. Use of hypothesis testing using Student's "t" Distribution.

REFERENCES

i) Hunter, Keith W. and Hoenig, Jim, "Dispute Resolution and Avoidance Techniques in the Construction Industry," Arbitration Journal, September 1992, Vol. 47, No. 3, pp. 18.

1) Clark, William G., "Claims Avoidance and Resolution," American Association of Cost Engineers (AACE) Transactions, 1990, pp. R.1.1-R.1.6.

2) Ibid., pp. R.1.1.

3) Hunter & Hoenig, op. cit., pp. 16.

4) ENR Legal, "Industry Takes Aim At Claims," Engineering News-Records, November 18, 1991, Vol. 227., No. 20, pp. 12, col. 1.

5) Associated General Contractors of America, "Partnering - A Concept For Success," AGC of America, September 1991, pp. 1.

6) Ibid., pp. 1.

7) ENR Feature: Contracts, "Partnering Pays Off On Projects," Engineering News-Records, October 14, 1991, Vol. 223, No. 15, pp. 25.

8) Ibid., pp. 25.

9) Moore, Mosley & Slagle, "Partnering: Guidelines for Win-Win Project Management," Project Management Journal, March 1992, Vol. 23, No. 1, pp. 18, col. 1.

10) AGC of America, op. cit., pp. 2.

11) Tarricone, Paul, "Howdy, Partner," Civil Engineering, March 1992, Vol. 62, No. 3, pp. 72, col. 1.

12) Kanter, Rosabeth Moss, "Becoming Pals, Allying and Linking Across Companies," Academy of Management Executives, 1989, Vol. 3, No. 3, pp. 183-193.

13) Janis, Irving L., "Groupthink", Psychology Today, November 1971, pp. 378-384.

14) Moore, Mosley & Slagle, op. cit., pp. 18, col. 2.

15) Spiegel, Murray R., "Theory and Problems of Statistics," Schaum's Outline Series, 2nd edition, McGraw-Hill, Inc., 1992, pp. 206.

16) Baker, Scott T., "Partnering: Contracting for the Future," Cost Engineering, April 1990, Vol. 32, No. 4, pp. 11.

17) Moore, Mosley & Slagle, op. cit., pp. 21, col. 2.

BIBLIOGRAPHY

Associated General Contractors of America, "Partnering: A Concept for Success," AGC of America, September 1991, pp. 1-18.

Baker, Scott T., "Partnering: Contracting for the Future," Cost Engineering, April 1990, Vol. 32, No. 4, pp. 7-12.

Business & Project News, "Corps of Engineers Initiates Joint-Partner R&D Program," Building Design & Construction, October 1989, pp. 14.

Chase, Gerald W., "Getting Serious About Quality," Constructor, September 1991, pp.18-19.

Civil Engineering News, "Florida Picks a Partner," Civil Engineering, May 1992, Vol. 63, No. 5, pp. 20-21.

Clark, William G., "Claims Avoidance and Resolution," American Association of Cost Engineers (AACE) Transactions, 1990, pp. R.1.1-R.1.6.

Contractor: News, "Partnering' Prescribed for Contracting's Ills," Contractor, May 1991, Vol. 38., No. 5, pp. 1.

The Corps of Engineering, "Partnering: A Strategy for Excellence," Portland District U.S. Army Corps of Engineers, September 1991, Partnering Project Manual.

ENR Editorials, "Words Are Not Enough to Curb Litigation," Engineering News-Records, November 18, 1991, Vol. 227, No. 20, pp. 70.

ENR Legal, "Industry Takes Aim At Claims," Engineering News-Records, November 18, 1991, Vol. 227, No. 20, pp. 12.

Henderson, Thomas R., "Analysis of Construction Disputes and Strategies for Cost Minimization," Cost Engineering, November 1991, Vol. 33, No. 11, pp. 17-21.

Hunter, Keith W., Hoenig, Jim, "Dispute Resolution and Avoidance Techniques in the Construction Industry," Arbitration Journal, Vol. 47, No. 3, pp. 16-18.

Keen, Edward S., "Future Direction in the Engineering and Construction Industry," Cost Engineering, Vol. 33, No. 5, pp. 17-23.

Klemens, Thomas L., "Huge Concrete Project Puts Partnering to the Test," Highway & Heavy Construction, December 1991, Vol. 134, No. 14, pp. 26-29.

Manzanera, Ignacio and Bubshait, Khaled A., "Improve Your Profits by Understanding Claim Analysis," American Association of Cost Engineers (AACE) Transactions, 1991, pp. E.5.1-E.5.7.

McManamy, Rob, "ENR Cover Story: Quiet Revolution Brews for Settling Disputes," Engineering News-Records, August 29, 1991, Vol. 227, No. 8, pp. 21-23.

Moore, Carl, Mosley, Donald & Slagle, Michelle, "Partnering: Guidelines for Win-Win Project Management," Project Management Journal, March 1992, Vol. 23, No. 1, pp. 18-21.

Mosley, Donald, Moore, Carl, Slagle, Michelle & Burns, Daniel, "Partnering in the Construction Industry: Win-Win Strategic Management in Action," National Productivity Review, Summer 1991, Vol. 10, No. 3, pp. 319-325.

Neil, James M., "Incentives-Powerful Tools for Owners," Cost Engineering, January 1991, Vol. 33, No. 1, pp. 19-22.

Quality Construction, "Partnering", Constructor, October 1991, pp. 26-29.

Ray, Michael C., "Public Agency Construction Claims Costing-An Analysis," Cost Engineering, Vol. 31, No. 3, pp. 12-16.

Schriener, Judy, "ENR Feature: Contracts, Partnering Paying Off On Projects," Engineering News-Records, October 14, 1991, Vol. 227, No. 15, pp. 25-27.

Short, Judy, "Quality Construction: Pre-Construction Teamwork," Constructor, October 1991, pp. 30-32.

Spielgel, Murray R., Schaum's Outline Series: Theory and Problems of Statistics, 2nd Edition, McGraw-Hill, Inc., New York, 1992,

Tarricone, Paul, "Howdy, Partner," Civil Engineering, March 1992, Vol. 62, No. 3, pp. 72-74.