Overhead Costs in Building Construction in Saudi Arabia

by

Mohammad Humoud Al-Shahri

A Thesis Presented to the

FACULTY OF THE COLLEGE OF GRADUATE STUDIES

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN, SAUDI ARABIA

In Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

CONSTRUCTION ENGINEERING AND MANAGEMENT

June, 1997
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COLLEGE OF GRADUATE STUDIES

This thesis, written by MOHAMMAD HUMOUD AL-SHAHRI, under the direction of his thesis committee, and approved by all the members, has been presented to and accepted by the Dean, college of Graduate Studies, in partial fulfillment of the requirements for the Degree of

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I dedicate this work to my parents, my wife and my children.
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THESIS ABSTRACT

NAME OF STUDENT : Mohammad Humoud Al-Shahri
TITLE OF STUDY : Overhead Costs in Building Construction in Saudi Arabia
MAJOR FIELD : Construction Engineering and Management
DATE OF DEGREE : June 1997

This research studies Overhead (OH) Costs in building construction in Saudi Arabia including overhead awareness among contractors, overhead effect on contractors' performance and applied methods to identify, estimate, allocate and control overhead costs.

It was found that contractors classify construction OH costs into company (co.) and project OH costs. Results indicate that contractors have high co. OH costs with unorganized efforts to control them. Total direct costs for a project are the most frequently used base for allocating co. OH costs followed by expected project duration. Automobile and equipment, head office, labor related costs, and financing costs were found to be the highest attributes to co. OH costs. Contractors reported that delayed payments, lack of new projects, cost inflation, and government regulation represent the major causes for increased co. OH costs. Contractors’ need for work, type of contract, and number of competitors have the highest effect on the amount of co. OH allocated to a project.

Survey indicates project OH costs are within acceptable range. However, project OH costs are rising due to delayed payments, client requirements, and cost inflation.

MASTER OF SCIENCE DEGREE

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

DHAHRAN, SAUDI ARABIA

JUNE, 1997
هذه الرسالة تبحث في العديد من القضايا المتعلقة بالتكاليف العامة الغير مباشرة الخاصة بتشييد المباني في المملكة العربية السعودية بما في ذلك وعي المقاولين بهذه التكاليف، تأثيرها على أداء المقاولين والطرق المستخدمة لحساب هذه التكاليف والتحكم بها.

وقد من خلال البحث أن هذه التكاليف تنقسم إلى تكاليف عامة للشركة وتتكاليف عملا للمشروع. وتشير النتائج أن التكليف العامة للشركة مرتفعة والجهود المبذولة للتحكم بها غير منتظمة. وجد أيضاً أن التكاليف المباشرة للمشروع هي الأكثر استعمالا كأساس لحساب التكليف العامة للشركة التي يجب على المشروع تغطيتها. كذلك وجد أن تكاليف المعدات والآلات وتكاليف المكتب الرئيسي ثم التكاليف المتعلقة باليد العاملة وتكاليف المالية هي أعلى ما تشمله التكاليف العامة للشركة. وجد أيضاً أن أثار الدفعات المستحقة للمقاول وفقاً للمشروع الجديدة والمتضخم تمتلك أهم الأسباب لأراحت التكاليف العامة للشركة. تبين كذلك أن حاجة المقاول للمشروع ونوع العقد المستخدم في المشروع وعدد المتنازلين هي العوامل الرئيسية في تحديد ما يمكن تغطيته من التكاليف العامة للشركة من مشروع ما.

بالنسبة للتكليف العامة للمشروع فإنه تبين من البحث أن نسبة هذه التكاليف مقبوله، ولكنها في ارتفاع مستمر بسبب تأخر دفعات المقاولين والمتطلبات العامة للعقد وتضخم الأسعار.

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جامعة الملك فهد للبترول والمعادن
الظهران، المملكة العربية السعودية
صرفت 1418 هـ
CHAPTER 1

INTRODUCTION

In the construction industry, there is no single skill of more importance than cost estimation. Inadequate project cost estimation is the second major cause of contractors failure in the US (Adrian 1979). Cost estimation is important because contracting in construction is based on financial commitment made by contractors toward owners, commitment to execute the project as per the contract requirements for a pre-construction estimated fixed amount of money. Construction cost estimation, however, is the process of forecasting the probable costs of a given project. Hence, accuracy in estimation is fundamental to success in contracting. Unfortunately accuracy and comprehensiveness in cost estimation are delicate issues and can be easily affected by many different parameters. Each parameter must be properly addressed to maintain an acceptable level of accuracy in the process. Overhead (OH) costs are only one side of estimation in construction but are extremely important because they can be easily overlooked. In fact, neglecting OH has forced some contractors
out of business because these costs constitute a fair amount of total construction costs (Dagostino 1989). Total OH costs may vary from 8 to 30 percent of the sum of materials, labor, and equipment costs or from 12 to 50 percent of the labor costs, depending on the project characteristics (Pulver 1969).

In addition, the construction industry in Saudi Arabia has come under severe pressure due to declining government spending on construction, which accounts for approximately 67 percent of the nation’s construction volume (Bubshait and Al-Musaid 1992). In the late 1970’s and early 1980’s government spending on construction projects reached 15 percent of the gross national product (GNP), which placed high demand on contractors’ services leading them to bid high, realizing a comfortable rate of return (Shash and Zamel 1993, and United Nation National Accounts 1982). At that time, accuracy in cost estimation did not mean much to many contractors. OH costs were even at a lower level of importance. Now, construction is in recession due to the near completion of huge infrastructure projects and to a steep decline in oil prices (Shash and Zamel 1993). According to ASHARQ ALAWSAT newspaper No. 6223 dated 12 Dec. 1995, the average government spending on the construction sector, including operation and maintenance contracts, has dropped to only 8.7 percent of the gross national product in the past five years, which still means billions of Saudi riyals every year but almost half the previous demand on contractors’ services. This has forced contractors to work under severe competitive conditions to deliver projects at minimum costs and with higher quality leaving only minimal profit margin. In fact, some contractors are already out of business and some take projects to cover
actual costs without profit. By doing so, many contractors are just trying to stay in business.

At all times high efficiency and total cost management are fundamentals to success in any free market economy, which has been the case in Saudi Arabia since the start of the five years development plans thirty years ago. However, the issue becomes extremely important with the emergence of a global economy and the free trade agreements that are expected to be implemented in the near future. Under these conditions, contractors are compelled to trim out the fat that has accumulated during more comfortable times and find ways to reduce OH burden non-billable costs. In light of this discussion, the importance of studying OH costs cannot be under-estimated. It is the intent of this research to highlight the facts and recommend steps for improvement in the existing practice among local contractors regarding OH costs in building construction. Hopefully, this will be a step towards better financial performance of local contractors.

1.1 PROBLEM STATEMENT

This research is directed toward the following questions:

1- How do contractors see OH costs and their effect on performance?

2- What methods are currently used to identify, estimate, allocate, and control OH costs?

3- What are the advantages /disadvantages of the existing practice.
1.2 SIGNIFICANCE OF THE RESEARCH

The ultimate objective for a construction contractor is to receive an acceptable rate of return on his investments in the construction business. Knowing that, construction contracting, in most cases, is structured on contractors’ commitment to execute the work for a predetermined estimated lump sum amount of money, which is reached in a competitive bidding environment. Hence, accuracy in forecasting future events cost-wise is of crucial importance. In fact, accurate cost estimation not only leads to competitive advantage and better market share but also safeguards against business failure and bankruptcy. Furthermore, accurate cost estimation is essential in the measurement of a firm’s efficiency and in profit recognition. Efficiency is a measure of the relationship between resources consumed and products produced. If resources used to produce a specific product are not accurately included then product pricing is not correct, profit recognition is not reachable and a firm’s efficiency cannot be measured (Tishlias 1992).

In order to perform accurate cost estimation, a contractor needs to cover all direct and indirect OH costs, which constitute the two major types of expenses in construction. Estimating direct costs has received most of the attention and reasonable results have been achieved in accurately estimating material, labor and equipment costs, yet many contractors face difficulty in maintaining an acceptable rate of return due to cost overrun which can be blamed for many reasons but surely for high OH costs in part. OH costs in construction vary from one company to
another but always constitute a significant sum of any construction firm's expenses (Dagostino 1989). Hence, accurate estimation of OH costs is as important as it is for direct materials, labor and equipment costs. In fact, a contractor's success is to a great extent dependent on the level of accuracy in OH costs estimation and the degree of control practiced during the construction phase. However, overhead costs are not as easy to deal with as direct costs. Many factors contribute to this phenomenon.

The difficulty in dealing with OH costs has many aspects. First, contractors who do not allow enough for OH costs in their bids suffer cost overrun which can lead to total collapse of the business. On the other hand, contractors who include OH costs in their bids but over-estimate or mis-locate OH costs have little chance of winning new jobs and accordingly may go out of business. Added to the difficulty in considering OH costs is the fact that many items of OH costs are, by nature, time related expenses such as the cost of supervising the construction work at site; and thus, these OH costs are really in direct proportion with actual project execution time. Unfortunately project schedule is subject to extensions due to many unforeseen and uncontrollable circumstances no matter how detailed and comprehensive the project planning is. This dilemma is said to be the most difficult issue to deal with in estimating overhead costs (Collier 1984).

Second, OH costs may constitute an even more crucial factor for some contractors. Contractors who subcontract all or nearly all of the sub-trades are left only with OH costs and the desired rate of return to decide upon because competitors will have equal and off-setting bids from subcontractors. Assuming that the rate of return is equal, then the only factor
to determine the lowest bidder is OH costs, which makes it extremely important for those contractors to reduce OH costs to optimum levels (Taylor 1994).

Third, it is also of great importance for contractors to know their OH costs for certain practical reasons. In case of project delay for reasons beyond the contractor's liability, he may be entitled to delay compensation based on actual incurred OH costs. The US Army Corps of Engineers, for instance, allows contractors and sub-contractors to submit OH cost estimations with needed backup documentation. If OH rate is approved, it is used on possible future change orders or litigation (Sarvi 1992 and Taylor 1994). Furthermore, in cost plus contracts, contractors have to know their OH costs to be able to recover them by billing their clients correctly.

From a cost containment point of view, it is fundamental for contractors to carefully observe OH costs. Since cost containment is an ongoing and continuous effort to reduce production costs by focusing on areas of greatest opportunity, OH costs are a good place to start cost containment as these costs tend to grow fast and in a wasteful manner. Containing OH costs not only reduces overall product cost but also improves quality of products or services and gives more flexibility to the company in facing competition and market changes (Tatikonda, L.U. and Tatikonda, R.J. 1993).

Among the reasons which necessitate examining OH costs is the fact that as the construction industry increasingly employs sophisticated technologies, so the percentage of OH costs to total production costs increases. Construction costs used to consist primarily of labor, material and equipment costs. Today contractors have to pay the costs for the technical advancement utilized in the production process which cannot be
directly assigned to a specific work item. An example is the cost of utilizing advanced computers to control production operations, to prepare project schedules, to prepare drawings, or the expenses needed to perform some of the tests.

It is even of more importance to study OH costs in construction in Saudi Arabia for the following reasons:-

1- OH costs in the construction industry in Saudi Arabia are expected to be at high levels because the construction market for the past twenty five years has had an unstable profile. Saudi experienced a construction boom in the 1970’s and 1980’s which led to a rapid growth in construction firms. In order to properly visualize the huge growth in the construction industry, government spending on construction can be used as a comparison. In the first five year development plan (1970-1975) spending was SR 80 billion but increased to SR 800 billion in the second development plan (1975-1980) (Stevens and Al-Dulaijan 1989). Such rapid growth usually causes high OH costs because contractors need to quickly purchase equipment, expand their offices, recruit more manpower, establish camps and other similar measures which are needed to handle additional work loads. Since the late 1980’s and up to now (1997) the local construction industry has been in recession, which also reflects on high OH costs because contractors cannot make enough revenue to cover OH costs. According to Dr. Abdulaziz Al-Dokail, who is the president of the Consulting Center for Investment and Financing (CCIF), the construction industry is the sector most sensitive to
recession or growth within any economy (Al-Dokail, A. 1996). The explanation of this comment is that in a recession, contractors do no or little work. As a result they not only make no profit, but even more critically they find it difficult to pay OH costs. This could be only the beginning of the problem; the situation deteriorates even more in trying to recover these OH costs by including them in forthcoming projects because this leads to less competitive bids (Collier 1984). Furthermore, the construction sector is expected to grow, according to some conservative studies, by 10 percent in the coming years with an estimated value of SR 148 billion in the coming five years (Al-Bassam, 1996 and Al-Dokail 1996). This reactivates the problem contractors usually face; at which level should OH costs be maintained in order to secure or increase their market shares? Today, more than ever, Saudi contractors need to minimize OH costs in order to secure their business nation-wide and possibly compete against foreign contractors world-wide in a free global trade environment, especially with the extension of the General Agreement on Tariffs and Trade. The present situation makes it imperative for contractors to become more efficient.

2- Funding for the construction industry in Saudi Arabia comes mainly from the government. Approximately 67 percent of the nation's construction industry volume is carried out by the government sector (Bubshait and Al-Musaid 1992). A major portion of the remaining percentage is also carried out by organizations using government-like contracting procedures. In both cases, the
procurement regulations require that the project be awarded to the lowest bidder which, in turn, requires contractors to reduce their bids to the lowest possible level in order to win the bid. Reducing OH costs helps in achieving this critical goal and thus helps contractors increasing, or at least securing, their market share.

In the environment of intense competition, declining profit margins, and shrinking market shares, the only way to stay competitive is to reduce and control cost while maintaining quality products. OH costs constitute a good starting point to achieve cost reduction because they act as a silent killer of retained earning. Furthermore, OH costs go up continuously and never go down on their own, which yields higher production costs (Snodgrass 1991). Given this scenario, finding ways to reduce and control OH costs will continue to gain importance as a management tool to the cost dilemma.

In his book, Construction Estimating, Adrian expressed his personal experience in this regard: "It has been the author’s experience that an estimate more often proves inaccurate because of an error in determining overhead costs than an error in direct labor, material, or equipment estimates. Nevertheless, the accuracy of the overall estimate is only as good as the weakest link. The estimator may obtain a near 100 percent accurate determination of a proposed project’s direct labor, material, and equipment costs, but if he misses the mark for his overhead estimate, the effect could be disastrous" (Adrian 1982). The major effect of overlooking overhead costs was also emphasized by Dagostino: "overhead cost constitutes a large percentage of costs on the job. Failure to allow
sufficient amounts for overhead has forced many firms to go out of business “ (Dagostino 1989). According to A. E. Lew, company OH is perhaps one of the main reasons why so many contractors are unable to realize profits, or even to stay in business. Obviously, if the company does not know its true OH costs, then a failure in recovering these costs will result in financial collapse. Also if company OH costs are not known, then it will be impossible to control them (Lew 1987). Another indication of the importance of reducing OH costs can also be found in a survey conducted by Industry Week magazine in 1988. The survey indicates that approximately 78 percent of the responding managers and executives are seriously concerned about OH costs and that 16.6 percent are moderately concerned. Moreover, 91.7 percent of the companies surveyed have already taken determined steps in an effort to reduce OH costs (Sheridan 1988). In another study, Dun and Bradstreet Corp. reported that economic factors, among ten other factors, constitute the most significant failure cause in business and account for 59.8 percent of failure cases. Within the economic factors, bad profit and high interest rates represent the most crucial and leading causes for business failure. OH costs are strongly related to the no profit situation and fully represent the high interest rates case (Kangari, R., 1988)

Taking into consideration these points, it is difficult to underestimate the crucial effect of OH costs in construction contracting. Thus, OH costs among local contractors need to be explored and evaluated in order to manage them and reduce their effect on contractors’ performance.
1.3 RESEARCH OBJECTIVE

The research objectives are:

1- Thoroughly review literature related to OH costs in building construction.

2- Investigate the present contractors' awareness regarding OH identification, estimation, allocation, and control.

1.4 SCOPE AND LIMITATION

As mentioned in the study objective, focus will be on OH costs from a construction cost estimation and control point of view and will avoid discussing the issue from cost accounting aspects unless it is necessary to make the argument clearer. Furthermore, the study will be limited to large building contractors as classified by the Agency of Contractors Classification of Ministry of Public Works and Housing (MPWH). This includes building contractors of the first, second, and third grade. Furthermore, the research will be limited to contractors who are located in the eastern province of Saudi Arabia. Building contractors are chosen for the following reasons:

1- Large building contractors constitute the majority of all Saudi contractors and perform the largest portion of the construction industry volume and thus have a higher potential for financial performance improvement.
2 - Large contractors are expected to have qualified management with documented procedures and organized files which will help in two ways. First, the study will be easier to conduct and with more reliable information and findings. Second, research finding may be better evaluated by what is assumed to be professional management. This will lead to a greater tendency to consider research recommendations.

3 - Conducting the research with only building contractors maximizes homogeneity and minimizes variability, which adds to the reliability of the findings.

4 - Lack of resources and limited time frame to conduct the research.

Location-wise, the eastern province was selected because it is easily accessible to the researcher, yet it equally represents the situation nationwide. Extending the research to include other Saudi cities will not add to the research but will consume more resources. More about the study population and sample will be explained in Chapter 3.
CHAPTER 2

LITERATURE REVIEW

Literature review is an important part of this study as it represents one of the research objectives and also because it establishes a comparison base regarding OH costs in building construction. Overhead (OH) costs are a well established topic in construction estimating literature. At least one section was devoted to OH costs in nearly all construction cost estimating books the researcher has come across. In professional journals the extent to which the issue is covered is much less. Moreover, the nature of the published papers are general and do not tackle specific concerns. Only some papers which present how to deal with OH costs in case of delay or litigation were found. During literature collection special attention was paid to find information on contractors' perception regarding overhead costs, how to reduce them, and their effect on contractors' performance. Nothing was found on this regard. For different industries, however, many papers were found and will be examined as secondary data whenever appropriate.
In this chapter, the literature reviewed will be presented in the following main points:-

- Cost estimation in construction
- OH costs in construction
- Company OH costs
- Project OH costs
- OH management

2.1 COST ESTIMATION IN CONSTRUCTION

In performing construction work, contractors are required to prepare a project cost estimate which is a forecast of probable future costs of the project. In doing so, contractors usually go through two basic steps. First, they use contract documents to determine the quantities of work to be performed. This quantity take-off step is relatively simple and straightforward as it needs only a careful examination of contract documents to translate drawings and specifications into quantities. Second, a cost estimate for these quantities takes place which is a more involved step and requires experience in costing skills. Cost estimation ends by compiling all costs to form the bid proposal. There are many different ways in which project cost items are compiled to form a project cost estimate but the most commonly used cost estimation procedure is to estimate construction costs
that will be paid against labor, material, equipment and sub-contractors' expenses and then add the other hidden costs, such as OH costs, which can not be included in the direct production operations as illustrated in Figure 2.1 (Adrian 1983).

The output of this estimation process is a significant financial commitment made by the contractor towards the client, which will hold the contractor legally responsible for performing the construction work as per the contract documents. For that specific reason the cost estimation process is considered to be a very important step in construction contracting. A good cost estimate can be looked at as the basis on which the contractor wins or loses construction jobs and accordingly determines the potential profit. If a contractor over-estimates project costs, his bid will be less competitive and subsequently fail to get the job, leading to financial loss. If, on the other hand, the estimate is lower than the actual costs needed to construct the project, the result may be even worse. In this case, the contractor will have a bigger chance of winning the bid and executing the project, but this will lead once again to financial loss because he will need to pay from his pocket to fully construct the project as per contract requirements. In light of this introduction, it is obvious that accurate and comprehensive cost estimation is fundamental to success in construction contracting as it dictates the financial performance of contractors, which is the most important objective that leads contractors to invest their time and money resources in the extremely risky construction business (Adrian 1982).
FIGURE 2-1

In order for the contractor to establish an accurate cost estimation, he needs to include all expenses incurred in constructing the project. When looking at project construction costs, there are either direct or indirect costs as illustrated in Figure 2.2. Direct costs are those costs incurred in physically constructing or helping to construct a project. These direct costs
can be easily identified as being totally and directly related to a specific project and thus can be easily added to the project cost. Indirect costs, on the other hand, are those costs incurred by the contractor in running his business but cannot be entirely charged to a specific project because they benefit either the organization as a whole or more than one project in a manner which makes it practically difficult to segregate the share of each project.

![Diagram of total costs]

**FIGURE 2-2**
Classification of Construction Costs. (Collier, 1974, p. 200)

Project costs can be categorized in different ways depending on the way these costs are treated during cost estimation and during the
construction phase. The most commonly used classification considers material, labor, equipment, and project O&H costs as direct costs and considers company O&H, contingencies, and profit as indirect costs (Collier 1974 and Means Estimating Handbook 1990). Table 2-1 shows types of construction costs as classified by Means Estimating Handbook 1990.

<table>
<thead>
<tr>
<th>DIRECT COSTS</th>
<th>INDIRECT COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Taxes and Insurance</td>
</tr>
<tr>
<td>Labor</td>
<td>Overhead</td>
</tr>
<tr>
<td>Equipment</td>
<td>Profit</td>
</tr>
<tr>
<td>Subcontractors</td>
<td>Contingencies</td>
</tr>
<tr>
<td>Project Overhead</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2-1</th>
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At this point it is important to understand that there are only two methods by which any type of construction cost is incorporated in the project cost estimate. A cost can be either directly estimated or can be allocated. Cost estimation means a forecasting of future cost of a certain item based on a known number of production units needed to construct that item, such as number of cubic meters of concrete needed to construct a project. The second term, cost allocation, also aims at forecasting the future cost of an activity but without knowing for certain the number of production units needed or consumed by that item, and thus the cost of
that activity is added to the project cost only by approximation. A general rule in cost estimation is to minimize cost allocation as the accuracy of the cost estimate declines when cost allocation is used. Cost allocation as a replacement for cost estimation is usually used only when direct cost estimate is not practically possible or when the cost of performing an accurate cost estimate is more than the benefit gained from a more accurate cost estimate.

2.2 OH COSTS IN CONSTRUCTION

OH costs in their broad perception, whether a direct or indirect project cost, have numerous definitions that can be found in books and professional journals. Some definitions are:

- OH in The American Heritage Dictionary is the operating expenses of a business, including the costs of rent, utilities, and taxes, and excluding labors and materials.

- In his book Controlling Overhead, Tipper defines OH as those charges which cannot be attributed exclusively to a single product or service (Tipper, 1966).

- OH has been defined by Fultz in his book Overhead as a summary of expenses that benefit more than one cost objective (Fultz, 1980).
• The Institute of Management Accountants defines OH as a cost item that is common to two or more cost objectives and cannot be identified specifically with any one of the cost objectives in an economically feasible manner (Tatikonda, L.U. and Tatikonda, R.J. 1993).

• According to The Armed Services Procurement Regulation of the US Department Of Defense (DOD), an indirect or OH is one which because of its incidence, for a common or joint objective, is not readily subject to treatment as a direct cost. Furthermore, minor direct cost items may be considered to be indirect costs for reasons of practicality. After direct costs have been determined and directly charged to contracts or other work as appropriate, indirect costs are those remaining to be allocated to several classes (Fultz, 1980).

• Cilensik defines OH as those costs which are not a component of the actual construction work but are incurred by the contractor to support the work (Cilensek, 1991).

• Another interesting one-statement definition of OH is: the ratio of a firm’s additional cost burden to its bill-able cost (Norris, 1987).

It can be said that all these definitions have the same spirit but reflect OH costs from different angles. Practically, what to include as an overhead
cost is an important question for contractors. Different organizations have different OH items but a general rule is that if the cost needed to perform a more precise measurement is greater than the benefit received, then the cost should be treated as an overhead expense (Fultz, 1980). OH costs can be categorized in many different ways. It is usually left up to the contractor to decide how to organize them. One way is to classify OH costs according to their components and in this case there will be general conditions OH costs such as mobilization, temporary safety barricades, and traffic control measures which are usually required by the contract general condition clauses. There will be, also, equipment OH costs, bonds OH costs, insurance OH costs, home office OH costs and so on. Another classification is to simply divide OH costs into three main types. The first is time related OH costs such as the cost of supervising the project, which increases as the project construction duration increases. The second type is fixed OH costs such as the costs of mobilization or site fencing. The third type is OH costs that are related to the project value such as bonds and insurance costs (Jones, 1996). However the most commonly used classification is much simpler. OH costs are divided into two categories: company overhead costs and project overhead costs (Adrian, 1982 and Dagestino, 1989). This classification will be used in this study because as said earlier, it is commonly used among contractors.

In this classification, OH costs are regarded as direct costs once and as indirect costs in another instance as shown in Figure 2-2. When they can be exclusively attributed to a specific project, OH costs are really direct cost and should be treated as such. In case project OH costs are treated like indirect costs, as appeared in some cost classifications, then accuracy in the
project cost estimate declines significantly. The argument here is that project OH costs are solely caused by the project in hand and thus can be estimated rather than allocated to the project cost estimate. Cost allocation as an alternative to cost estimation should be minimized if accuracy in costing is to be maintained. Project OH costs will be presented in greater detail in section 2.4.

The other type of OH costs are company OH costs, which are caused by company operations in general and/or by expenses that are incurred by the company in the construction sites but cannot be easily charged to a specific project. For that reason these costs are considered indirect costs. Here, contractors are forced to incorporate these costs in the project estimate through allocation. Although cost allocation as an alternative to cost estimation does not give the same level of accuracy there are, nevertheless, certain measures which help contractors maintain an acceptable level of accuracy, as explained in detail in Company OH Costs section 2.3.

2.3 COMPANY OVERHEAD COSTS

Company OH is also called general and administrative OH (G&A OH) and includes all costs incurred by the construction firm in maintaining the firm in business and supporting the production process but are not directly related to a specific project (Adrian, 1982). Another definition for company OH is "those costs which are not readily chargeable to one particular project - they represent the cost of doing business and fixed expenses that must be paid by the contractor "
(Dagostino, 1989). A third definition is "those costs which are incurred to operate and manage the construction business and the majority of these costs are incurred to obtain work and to support the field construction activities" (Cilensek, 1991). According to A. E. Lew, company OH is perhaps one of the main reasons why so many contractors are unable to realize a profit, or even to stay in business. Obviously, if the company does not know its true OH costs, then a failure in recovering these costs will result in financial collapse. Also if company OH costs are not known, then it will be impossible to control them (Lew 1987).

Company OH costs, like other costs, vary considerably from time to time depending upon market conditions, nature of the project, and the internal objectives of the company regarding business growth and orientation, but they range from 8 to 15 percent of the total construction volume (Pulver, 1969). These expenses must be paid back to the company or else financial difficulties are inevitable. No doubt the best approach in dealing with company OH costs is to directly charge each project the actual expenses that will be incurred, provided an accurate estimation is reachable. Unfortunately this is not the case with company OH costs and thus, contractors are forced to allocate their general expenses proportionally among undertaken projects (Pulver, 1969). Clearly, the objective of the allocation process is to regain every riyal spent as a company OH cost, no more and no less, on all projects performed by the company over a defined period of time. In the Mc-Graw Hill Contractors Management Handbook, OH costs are easy enough to identify in total, but extremely difficult to spread among a company's various jobs because these costs can only be realistically allocated if a fairly accurate estimate of
total sales volume can be made. If a company's annual volume can be projected within reasonably narrow limits, OH costs can be charged to projects with almost the same accuracy as direct job costs (O'Brien, J. and Zilly, R., 1971). If, however, the allocation process fails to claim some of the company "OH costs, then a distortion in the company financial statement will result. The magnitude of the distortion, in this case, equals the amount of the un-allocated OH costs, which are better known as underapplied OH costs. The question that always arises: why should company expenses be paid back by forthcoming projects? Simply because without the support of the company head office there would be no projects. Furthermore, if company OH costs are not loaded or absorbed by undertaken projects, then how else can contractors recover their company general expenses? All manufacturers and retailers recover their general expenses by adding them proportionally to the cost of their products when computing the selling price and there is no reason why contractors should not do the same, but making sure to keep an eye on the competition level surrounding the project (Franks 1984 and Walker 1973).

It should be noted, however, that although cost allocation for company OH costs is of great value in solving this problem, its use should be limited to cost items that cannot be easily estimated directly. The reason is that no matter how professional and delicate the allocation process is, direct cost estimation is still far more accurate. Using cost estimation rather than cost allocation increases the accuracy of the project cost estimation leading a contractor to be more competitive. A schematic layout of the allocation process is exhibited in Figure 2-3.
In order to properly recover company OH costs through the use of the allocation concept, a contractor must decide on two important steps. First, the basis for the allocation process should be determined. Second, the mechanism by which a contractor determines the amount of company OH costs that will be applied to a specific project is decided (Adrian 1982).
With regard to the first step, different bases can be used as an allocation base such as labor costs, labor and material costs, total costs including equipment costs, estimated duration of the project, or number of projects that are expected to be received at current year (Adrian 1982). However, in most of the cases, a company uses only one base to allocate company OH costs during bidding. Usually contractors select one method based on the nature of construction activities performed by the company and the cost accounting system used. For example, contractors who usually perform the same type of projects with little or no changes in the design can allocate their company OH based on the area of the project in hand or the expected number of projects to be constructed this year as a base for allocation. On the other hand, contractors who perform labor intensive projects may use direct labor cost as an allocation base because it reflects the most accurate scale and the predominant cost type. Total direct costs, including labor and material cost (and equipment cost, if it is treated as a direct cost), is often used by building contractors. The second most common base is the direct labor cost for the project (Adrian 1982). Some contractors use the expected duration needed to construct the project as an allocation base. The argument here is that most of company OH costs are a function of time such as company head office expenses. Thus, the longer the project takes to be completed, the more company OH costs are incurred. Although this method is not widely used, it could significantly improve the accuracy in company OH allocation provided estimated duration is right (Adrian 1982).

In the second step of the allocation process, the amount of company OH costs which should be loaded to a given project is figured out. In
almost all cases this is done by calculating a recovery percentage that takes into consideration last year's actual construction volume and the current year's expected work load (Adrian 1982, Cilensek 1991, and Dagostino 1989). The calculated rate should be checked frequently so that it properly reflects the company general expenses. The calculated rate comes as a reflection of the magnitude of a firm's general expenses, volume of construction, and the company's gross margin. Each of these factors changes continuously. If the recovery rate does not claim accurately the company OH costs, then the company will lose. The recovery rate will either be high, leading the company to lose its competitive ability, or will be low, causing the company to lose some or all expected profit (Adrian 1982 and Collier 1984).

Probably, the most commonly used allocation mechanism is to total all company OH costs for a given accounting period (fiscal year) and scale them against the total direct costs for the same period, which gives the percentage of company OH costs that can be applied to forthcoming projects (Adrian 1982 and Franks 1984). After the OH rate is calculated, it is added to the total estimated direct costs of the project in hand as explained in the following example. Calculations are shown in Figure 2-4.

In this example it is assumed that a construction firm uses the sum of direct labor and material costs as a base for allocating company OH costs and that the firm calculates company OH rate annually. In the first step, an estimate of the current year company OH costs, which need to be recovered by current year projects, is performed using last year's actual costs with some changes. An allowance for a cost inflation of 10 percent is assumed based on the market trends. Also a firm growth (or contraction)
is estimated to cost $23,000. Although the estimation of the current year's company OH costs may lack accuracy, it usually satisfies the purpose unless there is a major increase or decrease in the inflation rate or the amount of company OH costs. Clearly, if business volume suddenly increases without a corresponding increase in company OH costs, then the company is even better off because OH recovery rate will be reduced due to business expansion and company OH burden covered by each project will be reduced accordingly. On the other hand, if construction volume decreases dramatically without a corresponding reduction in the company's general expenses then the situation becomes critical because the limited number of projects may fail to compensate the company for its general expenses.

In the second step, the amount of the allocation base is calculated, which is in this case the total cost of labor and material for all projects performed last year. Usually this piece of information is extracted from cost files which necessitate keeping accurate cost data. In the third step the OH allocation rate is figured out by dividing estimated company OH costs (calculated in the first step) by the amount of allocation base, which is the cost of labor and material cost.

Finally, company OH recovery rate is applied to an in-hand project by multiplying it by the sum of labor and material cost for that project. The result is the burden amount that has to be carried by the project in-hand. Company OH recovery rate is then used to include company OH costs during pricing new projects for the current year (Adrian 1982). In order to maintain accurate company OH rate, contractors need to update the ratio as frequently as possible because the rate is dependent on many
factors that can change dramatically as time passes. Preferably an annual review of company OH recovery rate is made, which seems to be adequate and also convenient because most contractors prepare an annual financial statement (Adrian 1982 and Cilensek 1991).

Step 1: Estimate of company annual OH costs

| Last year’s company OH costs | $270,000 |
| 10 % Inflation | 27,000 |
| Firm Growth | 23,000 |
| Estimated company OH costs this year | $320,000 |

Step 2: Estimate of value of basis for allocation

| Estimated construction volume | $4,000,000 |
| Gross margin 20% | 800,000 |
| Labor & material costs | 3,200,000 |

Step 3: Company OH allocation rate

\[
\text{Estimated company OH costs (320,000)} - \frac{\text{10%}}{\text{Labor & material costs (3,200,000)}}
\]

Step 4: Company OH cost to apply to a specific project

| Project estimated labor & material costs | $500,000 |
| OH to apply (500,000 X 10 %) | 50,000 |
| Project cost | $550,000 |

**FIGURE 2-4**

- Overhead Allocation Process (Adrian 1982, p. 469)
Although the method explained above lacks accuracy, it is widely used among construction contractors because it is easily applicable to almost all types of construction projects. The reason accuracy is not obtained is that the amount of OH costs added to a given project does not take into account the efforts exerted by the company’s main office to win and manage different projects, which differ considerably from one project to another. Accuracy is also negatively affected because the allocated costs depend on two parameters which are figured out only through estimation. The first parameter is company OH recovery rate which is calculated based on last year’s company general expenses and last year’s direct costs. Both costs are subject to significant changes. The second parameter is the direct cost of the project in-hand, which is also estimated.

Understanding company OH costs and the allocation process is never complete without understanding the relationship between these costs and undertaken projects. As mentioned earlier, the only way to recover company OH costs is to distribute them in one way or another among all projects. After all, it is the company effort that brings about projects and thus, projects should pay back for this effort (Franks, 1984). The serious problem occurs when the outcome of this allocation turns out to be a non-competitively high bid because the amount of company OH that needs to be allocated is high or because the number of projects undertaken is low. Only a few contracting companies can escape the fact that most projects, if not all, are let through competitive bidding and thus it is of vital importance to reduce company OH costs and to deal with the allocation
puzzle in a delicate manner to recover all company OH costs on one hand and maintain competitive edge on the other. A contractor who is keen to win the bid may choose to under-estimate company OH in order to increase his chances of winning the bid. In doing so, the contractor usually takes into consideration long term objectives rather than the in-hand project (Adrian 1982, Collier 1984, and Franks 1984). However, sooner or later, uncovered OH costs have to be regained by allocating them to future projects or else financial difficulties are inevitable. Although the issue is said to be one of the most recent puzzling features of construction contracting the overall approach to this dilemma is that a contractor should try to maximize the volume of projects that can be handled with the existing OH costs (Ward 1992). This is also another disadvantage of using cost allocation.

It must be noted, however, that in deciding the final amount of company OH that has to be added to project direct costs, contractors may not exactly use figures coming out of the calculation. Instead they sense other factors such as the complexity of the project, the competition level, or payment schedule.

Company OH costs can be categorized many different ways. It is generally up to the contractor to decide on how to classify these costs. The availability of cost estimators and cost accountants usually affects the way contractors classify and group their company OH costs. It is preferable, however, to establish a detailed classification because such classification helps maintain precise information, which yields correct and quick decision making in the company. In all cases, however, it is preferable to maintain a standard procedure for company OH costs within the company.
(Jones 1996). Such a procedure shall contain OH cost classification, estimation, control, and allocation. Major company OH costs are summarized in Table 2-2.

- Head Office Expenses
- Head Office Staff Wages
- Warehouses, Workshops and Camps
- Automobile Expenses
- Miscellaneous

- Insurance
- Taxes and Social Security
- Fees
- Uncollected Receivables

Table 2-2
Company OH costs

2.3.1 HEAD OFFICE EXPENSES

Head office expenses are used sometimes to represent all company OH costs but they, in fact, represent expenses which are initiated by head office only. Contractors establish head offices to administer and promote their overall business. A comfortable and well-equipped office not only help employees to be productive but also helps present the firm to potential clients. However, it must be clearly understood that all head office costs, like all company OH costs, are common and cannot be
exclusively assigned to a specific project. Items that are commonly included in head office expenses are:

- Office rent (or owning) cost
- Furniture and fixtures - including depreciation
- Office supplies - stationary, document reproduction, and postage
- Utilities - power, telephone, and telegraph
- Head office miscellaneous costs

Head office miscellaneous costs include, but are not limited to, public relations, marketing, advertising, donation, training, proposal preparing and association dues. These costs which are sometimes under-estimated by contractors are important because they allow contractors to reach out for potential clients and represent the company to the public. To many contractors, government dues (taxes), and company permit costs are considered head office costs. It is advisable, however, to segregate any of these costs if their magnitude justifies establishing a separate cost code. According to Means Estimating Handbook (1990) head office expenses can reach 9.2 percent of annual labor costs or 7.7 percent of annual material and labor costs.

2.3.2 HEAD OFFICE STAFF WAGES

Salaries for head office staff include monthly wages and other financial compensations such as overtime, bonus, the cost of health
services, accommodation, travel and entertainment costs which are paid to
head office staff. Head office staff may include employees working outside
the main office at company warehouses, yards, camps, and other company
workers who cannot be practically assigned to a specific project. Some
contractors prefer to segregate senior management salaries from head
office salaries for practical reasons. Some other contractors include salaries
for head office staff in head office expenses to simplify accounting work.

2.3.3 COMPANY WAREHOUSES, WORKSHOPS and CAMPS

In many instances large contractors need to acquire and operate other
supporting facilities such as warehouses, workshops, yards and camps.
Costs for these facilities can exceed head office costs and constitute a
notable sum. Some contractors prefer to rent such facilities instead of
owning them, which gives contractors more flexibility in case of business
slow down or when a specific project is over. Costs for rented facilities,
however, would be higher than owning costs but are economically
justified and affordable for short term. Owning costs include operation,
maintenance and depreciation costs.

2.3.4 AUTOMOBILE EXPENSES

Automobile expenses constitute a considerable part of contractors’
general expenses due to the need to transport head office staff and,
sometimes, construction workers back and forth every day. Also many of
the head office staff need flexibility in moving from office to construction
sites, which necessitates owning enough vehicles. Automobile expenses
usually include owning costs. Owning costs cover the cost of buying, operating, maintaining, and depreciation costs.

Automobile expenses as part of the company OH costs may include the costs of equipment needed to construct projects. However, this is not usually the case especially for medium or large firms. Small contractors have limited usage of equipment and may chose to treat equipment costs as an OH cost. On the other hand, large contractors spend a significant sum of money on equipment, which justifies the establishment of a self-standing cost account for equipment. Another reason for not including equipment costs in company OH costs is that the rate at which equipment is used differs substantially from one project to another, which requires contractors to treat equipment costs as direct costs to maintain accuracy in cost estimation. In this case it is advisable to set up a rental cost to recover equipment expenses charges on a project by project bases. However, there are two instances where equipment costs have to be treated as company OH costs: when equipment is standing idle at slack periods, or when equipment is bought for a specific need at a specific project but still has useful life after project completion (Walker 1973).

2.3.5 INSURANCE

Insurance is defined as "a device for the reduction of uncertainty of one party, called the insured, through the transfer of particular risks to another party, called the insurer, who offers a restoration, at least in part, of economic losses suffered by the insured" (Pfeffer, 1974). Insurance costs in construction were classified as indirect costs, but not OH cost, by Means Estimating Handbook 1990 as in table 2-1. However, in this study, as in
many texts, insurance costs are considered OH cost. Certain types of insurance costs will be treated as company OH when required by the company as a whole and other insurance costs will be treated as project OH costs when needed for a specific project.

Construction contractors are by nature performing an extremely risky business that might affect themselves, their client, construction workers, or the community. Some of the most common causes for contractors' failure in performing their contractual obligations are: unforeseen price rises, abnormal labor conditions, fire, failure of subcontractors, unavailability of materials, unforeseen restrictions (Walker 1973). To reduce the effect of these risks, and many others, contractors are requested by law or by project owners to buy many different types of insurance. In addition, contractors voluntarily buy some other insurance to protect their interest. Almost everything can be insured at a price. A construction contractor, therefore, needs to carefully evaluate his risks and study available options in dealing with them.

The premiums a contractor pays as an insurance are strongly and directly related to the contractor's reputation and accident records. Contractors need to maintain a good reputation and efficient safety program in order to minimize insurance premiums (Adrian 1983). These costs constitute a significant sum of money each year but cannot be exclusively assigned to a single project as they cover the company operations and assets in general and thus, are treated as company OH. There will be instances, nevertheless, where an overlapping between insurance costs chargeable to Company OH and insurance costs chargeable to project OH exists. It is better, however, to keep insurance
costs as separate as possible so that accuracy in project cost estimation is maintained (Walker 1973).

In Saudi Arabia, construction insurance comes in second place among other types of insurance, just after marine insurance. To conceive the huge size of construction insurance in Saudi Arabia, in one year, 1980, the locally presented insurance was $200,000,000 (Zaki 1993). Cost of insurance is one of the most important OH costs and sometimes determines the orientation of business in construction.

Practically speaking there are many different types of insurance that cover almost every risk in construction. In fact, types of insurance are flexible in nature and aim at making construction contracting risk-free so long as contractors are willing to pay. Furthermore, insurance policies are a reflection of the prevailing trends in the construction industry and the economical conditions. It will be difficult, therefore, to explain all types of construction insurance but some of the more commonly used construction insurance policies are presented hereinafter :-

- **Worker's Compensation and Employer's Liability Insurance**

  Worker's compensation insurance is used to provide the statutory benefits required by law to an employee who is hurt or killed as a result of employment (Barrie and Paulson 1992). In addition to providing the legal benefits, the standard workmen's insurance compensation policy covers employer's liability insurance against claims for bodily injury or disease arising out of employment (Walker 1973). In some countries mandatory funds were established to play the role of the
guarantee agency. In other countries the majority of worker’s compensation insurance is provided by private insurance companies. In Saudi Arabia, the general organization for social insurance (GOSI), which is a government bureau, regulates workforce insurance.

Premiums are typically computed based upon payroll taking into consideration contractors’ safety records and the extent of the insurance cover. Premiums, usually, range from 1 percent for office workers to 30 percent for steel erection workers but average 18.1 percent. Because worker’s insurance constitutes a significant sum, contractors are advised to establish a sensible safety program to keep accident rate low and carefully classify their workforce in order to obtain insurance at optimum premiums. In Saudi Arabia the premium is 2 percent of the payroll regardless of the nature of the work performed but increases to 4 percent for contractors who neglect safety measures required by authorities (GOSI, Social Insurance Program 1984).

Costs for workers’ compensation insurance are considered in general a company OH cost because the workforce usually work in many construction sites within relatively short periods of time, which makes it practically difficult to segregate insurance costs project-wise. In the case where a workforce is totally utilized at a specific project, then the premium is treated as project OH as explained in 2.4.2. If, however, workers’ insurance costs can be directly added to
labor cost during project cost estimation, then insurance cost is not an OH cost any more but a labor cost.

- **Comprehensive General Liability Insurance**

  Also known as Contractor's Public Liability Insurance. This insurance protects a contractor against liability imposed by law for negligent acts occurring in the conduct of business which result in bodily injury to any person not in his employment or damage to the property of others (Barrie and Paulson 1992, and Pulver 1969). The rates are usually based upon labor payroll ranging from about 0.25 to 0.7 percent for bodily injuries and from 0.15 to 0.3 percent for property damage depending on the nature of the contractor's activities, policy limits, and the amount of policy. The total cost usually ranges from 0.4 to 0.95 percent of payroll (Walker 1973). Excess liability insurance may be preferred by many contractors to protect themselves in the event of a catastrophic loss. Costs for excess liability insurance are dependent upon the perceived risks (Barrie and Paulson 1992). Again, this insurance is in general a company OH cost but in rare cases it is considered a project OH cost when it can be exclusively assigned to a specific project.
• **Equipment Floater Policy**

A large building contractor usually possesses different types of construction equipment which represent a huge investment but are subject to many risks. To properly protect this investment, equipment is usually insured. Equipment insurance provides coverage for damage to mobile and stationary construction equipment which is not subject to motor vehicle registration such as cars. Cars, trucks, and other equipment subject to motor vehicle registration are covered in automobile liability insurance. Premiums for equipment floater are computed periodically based upon the estimated value of the contractor’s equipment and based upon the rental rate for rented or leased equipment. Equipment insurance is usually made to fit a contractor's particular needs depending on the equipment working environment (Barrie and Paulson 1992, and Walker 1973). If certain equipment is totally devoted to a specific project, then the contractor may choose to consider its insurance a project OH cost.

• **Automobile Liability Insurance**

Bodily injury or property damage caused by contractors' owned and hired automobiles is covered by this insurance which can be comprehensive or limited insurance. The rate is usually computed based on the size and weight, condition of the vehicle, and the geographical characteristics of the
working place (Adrian 1982). Again, if some vehicles are utilized in a particular project alone, then the insurance cost of these vehicles is a project OH cost.

- **Payroll Taxes and Insurance**

  Pay roll taxes and insurance are mandated in many countries to insure full compensations to employees during employment and to help in providing unemployment benefits or social security. The rate varies from country to country but reaches 6 percent of the wages (Barrie and Paulson 1992). Depending on the cost accounting system, some contractors choose to include these costs with labor cost and, accordingly, incorporate these costs in the project estimate directly without the need for allocation, which adds to the accuracy of the estimation process (Pulver 1969).

- **Head Office Insurance**

  Head office insurance is another important company OH cost which may be computed with head office costs or with insurance cost; the latter is more appropriate due to the importance of insurance as it represents a contract with an external party. Costs for head office insurance depend on the covered risks which, in turn, depend on the location, size, and components of the office.
2.3.6 TAXES and PERMITS

Construction contractors are required to pay taxes just like any businessmen. Taxes and permits differ from bonds and insurance because they are collected by governmental agencies. There are different types of taxes and permits which also vary from country to country. Maybe the most important taxes are income taxes which can be as high as 10 percent of net declared profit. In Saudi Arabia, Al-zakah is paid and equals 2.5 percent of adjusted net income. Permits, on the other hand, are needed because they help regulate the practice of construction contracting in general. Different permits are usually needed to start and continue in the construction business. Examples are municipality, police, and safety measures permits. Usually the costs for these permits are nominal but they have to be considered as company OH cost.

2.3.7 FEES

This includes technical and legal consulting fees paid as a compensation for services needed by the company from time to time. Contractors may need legal services to collect receivables. In many cases, lawyers' services are needed before entering into contracts to verify contract clauses and in claim management, which usually costs a notable sum (Lew 1987). Consulting services are also needed by contractors especially in auditing, accounting, management, and engineering.

2.3.8 UNCOLLECTED RECEIVABLES

The overall economic climate affects the way a contractor collects his receivables and accordingly affects the cash flow of the company.
Depending upon the timing of uncollected payments, a contractor has to look for external support which can constitute a notable company OH cost. To minimize the effect of such events, sound cash management has to be followed (Lew 1987). Uncollected receivables may also include payments which can not be collected at all due to out of control conditions. An example is the payments withheld by the project owner for legitimate reasons.

2.3.9 MISCELLANEOUS

Sometimes contractors encounter different general costs which cannot be classified within one of the above mentioned categories. For cost accounting and cost estimation purposes such expenses can be contained in what is called miscellaneous costs.

2.4 PROJECT OVERHEAD COSTS

Project OH is also called job site overhead or general condition OH (Dagostino 1989). Project OH costs comprise the contractor's expenses in managing the project at the job site. It is the cost specific to a project, but not specific to a trade or work item (Cilensek 1991 and Taylor 1994). Unlike company OH costs, project OH costs can be estimated with fair accuracy, which necessitates that contractors carefully examine contract conditions to properly cover project OH costs. Contractors who choose to go the easy way and recover project OH costs through setting a percentage of direct costs may end up over- or under-estimating these costs which
may lead to incorrect bid. The components of project OH costs vary considerably among projects, depending upon project size, type, location, consultant, and project owner (Walker 1973). This situation makes it incorrect to include project OH costs as a percentage of project direct costs. The amount of project OH differs from one project to another but goes from 10 to 30 percent or more of the sum of material, labor, and equipment costs (Means Interior Estimating 1987). Pulver in his book Construction Estimates and Costs says that project OH is 5 to 10 percent or more of material, labor, and equipment costs. In the US the most common types of project OH costs, which are also the most significant in regard to their amounts, are bonds, insurance, and financing cost (Adrian 1982).

Project OH discussion is never complete without discussing project planning because many items in project OH costs are directly proportional to project duration. Components such as supervision and project financing costs are estimated based on the forecasted duration of the project. In order for the contractor to be competitive and win the bid, a project plan has to be prepared with the best combination of resources to finish the job in optimal time. This optimal time is the base for estimating many project OH costs. It must be clear that the project OH cost estimate is as accurate as the project planning and for that reason it is said that estimating project OH cost is perhaps the most difficult type of cost to estimate with reasonable accuracy especially for big and complex projects (Collier 1984).

There are, widely speaking, three main sub-groups of project OH costs. In the first group come those items the contractor needs to furnish for the conduct of the job as a whole which are usually required by contract conditions such as bid and performance bonds. Second are items
which the contractor may furnish to expedite or improve the construction activities at site. These measures may benefit all or just a single activity or trade. Examples are the cost of some temporary facilities which are not necessarily required by the contract but are needed by the contractor’s work force or the cost of an equipment such as a crane which if employed will expedite the work and help achieve required progress. Third, the contractor may need or may be asked to use outside professional services as part of the work such as technical consultation from engineering firms. Again classification of OH costs is dependent on whether an OH cost can be estimated directly as a project cost or has to be allocated because the cost cannot be segregated on a project by project level. Major project OH costs are shown on Table 2-3

- Surety Bonds
- Project Insurance
- Financing Cost
- Supervision Cost

<table>
<thead>
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<th>Table 2-3 Project OH costs</th>
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<td>Equipment Costs</td>
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<td>Miscellaneous Costs</td>
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Following is a detailed presentation of what is typically included as project OH costs:-

2.4.1 SURETY BONDS

Surety bond is defined as a third party guarantee for the performance of construction contract obligation (Barrie and Paulson, 1992). The purpose
of construction bonds is to protect the interest of the project owner and/or a third party because they force the contractor to seriously consider that all contract obligations must be met in a professional manner or he will lose his bonds (Adrian, 1982). Contractor's bonds are those bonds supplied by the contractor to other parties and they vary depending on the nature and size of the project on one hand and on the contractor's reputation on the other hand. It must be mentioned, however, that there are other bonds which are submitted by external parties to the benefit of the contractor such as material supply bond, which is submitted by the material supplier to the contractor to ensure steady and on-time quality material to be used in the project. These types of bonds will not be included in the contractor's bonds article because they don't constitute an OH cost as the premium of these bonds is not paid by the contractor. The most commonly required bonds are:

- **Bid Bond**

  The project owner commonly requires contractors to submit a bid bond which protects against financial disadvantages in the event a contractor submits a bid but refuses to sign an agreement later on or in the event the contractor is unable to construct the project. The bid bond assures the owner that all participating contractors are seriously taking all needed measures in examining contract documents and preparing the proposal or they might lose the bid bond which equals 5 to 20 percent of the proposal amount.
Furthermore, bid bond is of the forfeiture (loss by default) type which gives the owner a direct right of action to contact the supplier of the bid bond and collect it. This may constitute a financial impact in case the proposal is not carefully prepared and, as a result, a contractor chooses to withdraw. Contractors usually buy bid bonds from a surety company at a nominal charge which is added to the project estimate. The charges for bid bonds for projects awarded to other contractors cannot be recovered unless added to overall company OH. Also the whole amount of bid bonds which is collected by the owner for a case of default from the contractor’s side is recovered as company OH. Some project owners replace bid bond with another form of bid security such as certified checks, which represent an even greater challenge to contractors because such bid security needs cash availability. When the contract is awarded to a particular contractor, his bid bond or certified check is held until he signs the contract and submits his performance bond. Then the bid bond or certified check is returned to him (Adrian 1982, Fisk 1992, and Barrie and Paulson 1992).

In Saudi Arabia bid bonds are required in all government projects but not for projects of semi-government agencies like ARAMCO (Arabian-American Oil Company). Government contracts call for only a one percent bid bond but in practice contractors obtain a bond which is slightly higher than the required 1 percent so that their bid value cannot be known by banks or their competitors prior to bid opening. The annual rate
of the bond from a commercial bank is 0.25 to 0.75 percent of bond value. The bid bonds are usually valid for 3 to 6 months (Stevens and Al-Dulaijan 1989).

- **Performance Bond**

  A performance bond is a bond submitted by the contractor after signing the contract. The purpose of such a bond is to guarantee the satisfactory fulfillment of contract requirements by the contractor. It safeguards the owner against loss resulting from the failure of the contractor to complete the work as per contract requirements. The amount of the performance bond varies widely from 20 to 100 percent of the contract value. This amount is guaranteed to be available by the bonding (surety) company to complete the contract in the event of default by the contractor (Barrie and Paulson 1992, and Walker 1973). The surety company enters into an agreement with the contractors by which it retains the right to recover costs from the contractor for his failure to complete the project. In providing this bond, the surety company shares the risk the contractor has in not being able to complete the project. Because of this risk, the surety company examines contractor's financial capabilities and reputation in addition to the risk conditions of the project and its duration (Adrian 1982). The premium paid by contractors for this bond varies depending upon the above mentioned factors in conjunction with market conditions. For ordinary construction work, with two years
duration, the premium is about 1.5 percent of the contract amount (Pulver 1969, Walker 1973).

In Saudi Arabia, government contracts stipulate only 5 percent performance bond where semi-government agencies like ARAMCO call for 10 percent or more of contract bid value. Furthermore, performance bonds expire only at final acceptance of the project, which takes place after initial acceptance has been made and a guarantee period of at least one year has passed. Contractors in this case are compelled to deposit 20 to 35 percent of the bond value as cash margin value kept at the bank (Stevens and Al-Dulaijan 1989).

- **Payment Bond**

The purpose of payment bond is to guarantee prompt payment by the contractor to all those furnishing labor and/or material to the project. It is usually requested by the owner to ensure the existence of enough manpower at all times and also to ensure the proper deliveries of materials in regard to time, quantity, and quality. In practice, labor and material payment bond can be separated into two bonds if the client chooses. Under a payment bond, the bonding company guarantees the payment of all legitimate bills which compensate for work or material used at the project (Fisk 1992). It must be noted, however, that many private sector clients choose to use one combined bond that gathers performance and payment bond. Regardless of the way it
is arranged, the bond's cost has to be included as project OH cost. A two years payment bond usually costs contractors 1 percent of the contract amount for the first $100,000 and less for the remaining amount of the contract (Walker 1973).

- **Maintenance Bond**

  Sometimes project owners need the construction contractor to perform maintenance tasks for a period of time after the completion of construction. In this case, a maintenance bond is submitted by the contractor which guarantees the project owner that the contractor performs his maintenance duties as specified in the contract (Pulver 1969). The maintenance bond may also be required just to guarantee the project owner that the contractor will satisfactorily correct all defects of workmanship and materials for a specific time following construction completion. Time stipulated in the maintenance bond usually lasts one to three years.

- **License or Permit Bonds**

  Some license or permit bonds are usually submitted by the contractor to the project owner to guarantee his compliance with local codes and regulation during the project construction phase. The costs of these bonds are treated as project OH cost as they exclusively serve a specific project. In other instances, however,
local agencies require the contractors to submit license or permit bonds to guarantee their compliance with codes and regulation. In this case, the costs of such bonds are general and thus treated as company OH costs as explained in article 2.3.4 (Adrian 1982 and Walker 1973). If the contractor, however, operates outside his routine area of work to construct a specific project, then all bonds of this nature should be estimated as project OH costs even if such bonds are broad in nature (Walker 1973). The costs of license and permit bonds vary from city to city but usually depend on the type and size of the project.

2.4.2 PROJECT INSURANCE

There are many types of insurance the contractor may need to buy while executing a construction project. Insurance, in general, is required by law, by project owner or by the contractor himself to cover risks that are associated with the project. The amount of premiums paid by a contractor is greatly dependent upon his past experience and reputation. As in company insurance discussed in section 2.3.4, types of project insurance are, in part, a reflection of market and economic conditions but are flexible in nature to relieve contractors when facing different types of risks. Each contractor should carefully examine the project in hand to be able to foresee project risks and accordingly decide on how to manage them through insurance. Discussed below are only some of the commonly used types of project insurance:-
• **Workers' Compensation Insurance**

As explained in company OH article 2.3.4 this type of insurance is usually considered company OH cost. However, there are instances where some work force is totally and separately devoted to a specific project which helps in treating workers' compensation insurance as a direct OH cost for that project. The nature and rate of this cost are as described previously in section 2.3.4.

• **Contractual Liability Insurance**

Also called contractual coverage and applies to protect a contractor when he assumes the legal liability of others, the owner, designer, consultant or other designated party. Rates depend on the nature and the extent of exposure to risks (Barrie and Paulson 1992, and Adrian 1982).

• **Contractor's Protective Insurance**

Contractor's protective insurance is designed to protect contractors against injuries to other than the contractor members or damages to the public arising out of operations carried out by subcontractors. Contractors can decrease the chances of having accidents of this nature by dealing with
experienced subcontractors. Premiums are based on contract value at a rate of 0.01 to 0.04 percent (Adrian 1982 and Walker 1973).

- **Builder's Risk Insurance**

Builder's risk insurance is also called Product Liability Insurance or Property Damage Insurance. It is designed to protect a contractor against liability for a totally or partially damaged building or other component of the project. It also covers damaged material and equipment not yet incorporated into the project but located at the project site or during transportation of these items to the project site. Insurance policies usually include risks such as: fire, windstorm, traffic accidents, and vandalism. Instead of specifying risks by name, a contractor may ask for all risks coverage, which provides protection from all perils except those specifically excluded. Exclusions usually include war, nuclear incident, faulty design, faulty material, faulty workmanship, earthquake and flood. However, some exclusions can be eliminated for an additional premium. Rates depend upon the range the insurance policy covers in addition to the size and nature of the project (Barrie and Paulson 1992 and Adrian 1982).
2.4.3 FINANCING COST

A construction contractor is almost constantly spending well in advance of expected income, which makes it imperative for him to clearly visualize his future financial strength in order to avoid unexpected cash problems which may be catastrophic. In his estimate, a contractor should add the cost of financing the project, which is usually paid by the contractor to a bank that credits him as the project progresses to help him overcome cash flow shortage during construction. The amount of the financing cost (interest) depends on the economic conditions, the size and duration of the loan, and the creditability of the contractor but can reach a significant sum of total project cost. Needless to emphasize the importance of project planning at this stage, because project financing cost is strongly dependent on the project duration (Adrian 1982).

In determining the project financing cost, a contractor, as a first step, compute cash inflows and cash outflows based upon the project plan. In the second step, a resultant cash flow which represents the difference between cash in and cash out as the project progresses is generated. If the difference at any point of time is a surplus (positive), then the contractor does not need external financial support at that particular time and surplus cash can be used at more difficult times. However, if the difference between cash in and cash out is overdraft (negative), then the contractor needs to pump cash into the project from his pocket or get financial support through loans from external sources. The amount and time of loans can be figured out from this relationship. At this point, project financing cost shall be calculated and treated as project OH cost (Adrian 1982).
Saudi contractors used to enjoy 20 percent advance payment at no interest or fee until the early 1980's when the construction industry underwent a drastic changes as explained in chapter 1. In 1982 advance payments were reduced to 10 percent but are currently seldom offered (Stevens and Al-Dulaijan 1989). This situation on one hand and delayed payments on the other hand forced contractors, especially large contractors and joint venture construction firms, to borrow money from commercial banks, which created another project OH cost. The financing carried out by banks has different scenarios such as overdraft, short loans, progress payment financing, medium or long term loans. Costs for these financing facilities differ greatly depending on many factors but can exceed 10 percent of total loan amount (Stevens and Al-Dulaijan 1989).

If, however, a contractor chooses to depend on his own financial resources to fund the construction of the project then he should also estimate the project financing cost based on a minimum rate of return which reflects other possible investment chances the contractor may find in the market.

2.4.4 SUPERVISION COST

Project supervision cost includes wages and other benefits of the project manager, engineers, superintendents, foremen, clerks and security personnel. In large projects, the supervision team may include many specialists such as project architect, planning, procurement, safety, quality assurance and quality control engineers. This cost is considered project OH only if totally chargeable to a single specific project. If one or more of
the personnel serve in other projects, then that cost must be proportionally shared by these projects. If it is not possible or not practical to segregate the cost project-wise, then that cost must be treated as a company OH cost. The way to include these costs in the project cost is simply to estimate the salary and other benefits of the project supervising workforce in conjunction with the entire estimated time the workforce will be required on the project (Walker 1973). The importance of proper activity planning and scheduling cannot be under-estimated at this point as it helps in reducing project OH cost by reducing construction time to optimal levels.

2.4.5 COSTS OF TEMPORARY CONSTRUCTIONS

These are costs that are incurred in constructing the temporary facilities that are needed at construction site. Temporary constructions are either required by the contract special conditions such as site fencing or by the contractor to help him construct the project in one way or another such as site detour for traffic control or a fabrication shed. Temporary facilities differ greatly from one project to another and thus it is recommended that the contractor prepares a check list so that no temporary construction is overlooked. Accordingly, the cost of temporary facilities differ but can cost a significant sum of money especially for large projects or projects to be constructed in remote areas. Some governmental contracts in Saudi Arabia allow contractors to bill 10 percent of contract value for mobilization, which mainly covers temporary constructions. Temporary construction includes but is not limited to:-
• **Site Office**

Includes the cost of providing a temporary office for use by owner, consultant, or the contractor himself. Cost also includes office expenses such as power, water, telephone, and office equipment. Some contracts specify the size, construction type, equipment and furniture for the temporary office. For that it is important to carefully examine contract requirements. Whether the temporary office belongs to the contractor or is rented, a suitable cost has to be assigned for maintenance. If the temporary site office belongs to the contractor, then a depreciation cost has to be considered (Dagostino 1989).

• **Site Utilities**

Includes the costs of temporary water, power, communication, sewage, warehouses, tool shed, fabrication shed, workshops, drainage, and removing and replacing public utilities (Dagostino 1989 and Walker 1973). Contract documents and site conditions must be examined in order to properly estimate the cost of these items. In small projects it may be enough to use existing utilities after coordination with the project owner and local authorities. However, for larger project it may be necessary to make special arrangement or establish sufficient units at additional cost. For example, a contractor may need to install poles, extensive cabling, or install transformers. In some cases, contractors may
decide not to bid because of the high cost of such requirements especially if a contractor is in doubt that these items may not be used in a manner that justifies acquiring them.

- **Site Safety, Security and Protection Measures**

  Safety, security and protection measures are extremely important because they safeguard against accidents, natural catastrophes, and vandalism, and they help in preventing financial losses and in maintaining good accident record. This, in turn, reduces influenced insurance premiums. Safety, security and protection measures include :-

  - Traffic arrangements; roads, signs, ramps, and detours
  - Fire protection
  - Fencing
  - Control gates and watchmen

- **Temporary Camp Facilities**

  Large size projects, especially those which are located in remote areas require much more than just a site office. Costs for temporary facilities needed at large projects constitute a serious challenge for many contractors as they significantly affect the
bid/no bid decision. Temporary facilities for huge projects include, but are not limited to, the following:-

- Barracks
- Messhall
- Clinic
- Laundry
- Recreation Hall
- Sports Facilities

2.4.6 COST OF REPAIR WORK

As construction work progresses, a contractor may cause some damage to other parts of the project, to adjacent buildings, or to other properties (Adrian 1982). In this case, he will be required to repair such items, which means additional project OH costs. In other instances damage may be caused by other parties working in the project or can be a result of vandalism. In these cases the contractor will bear the cost needed to rectify damages if not covered by insurance. Cost of repair cannot be estimated at project bid stage but contractors usually assume repair cost based on previous experience.
2.4.7 EQUIPMENT COSTS

Equipment costs are seldom treated as company OH costs; however, most building contractors regard equipment costs as project OH because they cannot be assigned to a specific work item. Exceptional among these costs are equipment costs which are used in a manner that allows them to be segregated on an activity by activity base. There are usually many types and sizes of equipment that are needed in building construction such as: power generators, pumps, elevators, forklifts, cranes, loaders, trucks and batch plants. Equipment costs include operation, maintenance and depreciation costs.

2.4.8 MISCELLANEOUS

Miscellaneous items include, but are not limited to:-

- *Site Survey*
- *Site Clean up*
- *Photographing*
- *Small Tools and Consumables*
- *Job Signs*
- *Protection for New Construction*
- *Building Permits*
- *Samples Costs*
• **Scaffolding costs**

Project OH costs as listed above are by no means exhaustive. In fact, each project is, to a certain extent, unique and may contain different OH items. For that, it is important for the cost estimators to carefully examine contract documents and thoroughly check site conditions in order to accurately estimate project OH costs (Adrian 1982).

### 2.5 OH COST MANAGEMENT

OH costs, like all costs, are subject to the usual cost management efforts. The management objective regarding OH cost is to succeed in controlling them towards accomplishing company objectives. In this section a brief discussion of OH cost control efforts will be presented. The discussion will display the efforts put forth by some leading manufacturers and accountants which reflect their experience and which may be used in construction contracting. It should be noted, however, that much of the past OH cost control efforts were focused on cost allocation methods. Finding a better way of allocating company OH costs is not necessarily the best solution to controlling ever-increasing OH costs. Instead, companies' efforts should focus on eliminating unneeded OH costs or at least reducing them, which cannot be achieved unless the true causes of OH costs are identified and judged in accordance with companies' overall strategies. Cost allocation should be used only when
elimination, reduction, or tractability efforts are exhausted (Tatikonda, L.U. and Tatikonda, R.J. 1991). Explained hereinafter are some ideas regarding better allocation and control of OH costs:

2.5.1 OH COST ALLOCATION USING ACTIVITY BASED COSTING

Cost allocation, as a practice to incorporate indirect costs into the product cost used to satisfy managers in pricing their products because indirect costs were in general much lower than current levels. This implies that the result of cost allocation would not significantly affect the final bid. Product costs used to consist primarily of direct material and labor costs. Today OH costs constitute up to 30 percent of the production costs and this figure is even on the rise, which makes cost allocation an invalid approach simply because extremely important decisions are based on distorted cost information. Furthermore, if substantial advancements take place in an industry, then the costing system must also incorporate these advancements if it is to provide valuable information to decision makers. One of the substantial changes in today's production is that an increased proportion of total costs do not change with volume but rather exist as shared costs (Drury 1990).

In an effort to minimize the drawbacks of traditional accounting systems, an alternative accounting method called Activity Based Costing (ABC) could be tried. The premise of this method is simply to obtain better understanding of cost behavior by tracing activities causing costs, especially indirect costs, which helps in accurately pricing products. Under ABC, costs are either short-term or long-term variable costs. Short-
term variable costs are volume related and traditionally called variable costs or direct costs. On the other hand, long-term variable costs only vary with the extent to which the activity is performed. Moreover, this variation is limited and slowly obtained. For example, head office cost for a construction contractor is really a long-term variable cost which slowly changes even if the contractor is not working at full capacity. Furthermore, the change in this cost is limited unless there is a vital change in work load (Drury 1990).

**ABC** tries to obtain greater understanding of cost behavior to be able to accurately determine product costs. It does so by understanding the forces behind costs which are called cost drivers. A cost driver is defined as the activity or transaction which significantly determines the magnitude of the cost. Therefore, if head office cost is driven, presumably, by marketing, new projects pricing, support site operations, accounting, etc., then these activities would be the cost drives for head office cost. **ABC** suggests that an accurate and fair recovery of this indirect cost is possible if cost is assigned to different projects based on these cost drives by knowing how much of each activity is directed to a particular project. Cost drivers are thus used as a cost assigning base instead of traditional allocation bases and it is from that concept **ABC** gets its strength. Needless to mention that short-term variable costs are more easily assigned to product total cost using volume related cost drivers such as material or man-hours consumed. The allocation of indirect costs (OH costs) as suggested by **ABC** is shown in **Figure 4-5**.
Stage 1: Determine what activities are performed by company resources.
Stage 2: Attribute costs to products based on their use of resources.

Figure 4-5
Assignment process for OH costs using Activity Based Costing-ABC (Copper and Kaplan, 1991, p. 270)

The major distinction between ABC and traditional costing systems is that ABC claims that volume related cost drivers are not necessarily the
correct way to incorporate long-term variable costs, that is OH costs (Copper and Kaplan 1988, and Drury 1990). The reason is that ABC is a more relevant approach for costing products than traditional costing systems simply because it forces deeper tracibility of costs to products. The main factors here are activities and their associated drivers. The logic behind the ABC approach is if an activity is not used by a product, then the product should not absorb any of that activity’s cost (Raffish 1991). However, implementing ABC needs more detailed insight into OH costs and how they are spent, which consumes more resources, especially in the beginning. However, the problem of excessive OH costs gets more aggressive as the benefits of ABC become greater.

According to Copper and Kaplan, introducing ABC system results in far more accurate product costing. However, the use of ABC system in construction is not yet documented and may have some limitations due to the fact that the construction industry has unique characteristics. First, unlike the case in many industries, construction costs are determined before the production process starts, which means that almost all costs are only predicted. Second, each construction project is unique and thus has different production arrangements, which cause different cost components. Third, company OH costs significantly vary from time to time depending on many factors and the number of projects which is not known when project costing is performed. Fourth, there are, sometimes, many cost drivers for the same OH cost. This leads to inconsistency in the amount of burden OH costs each project has to handle. In spite of that, ABC system may be used to reduce the severity of the problem by concentrating on major company OH costs and try to overcome obstacles
in the way to implement ABC in construction. In any event, this important approach will be examined in the survey so that it can be better evaluated.

2.5.2 OH COST REDUCTION

Although much of the past OH cost control effort was focused on finding more appropriate cost allocation methods, sound OH cost management needs to focus on eliminating or at least reducing OH costs to their optimal level through the use of traditional cost control measures. After all, cost allocation is only a way to incorporate a company's indirect costs into project cost and not intended to reduce OH costs, which is the real objective in an environment of ever-increasing competition. Optimal OH level is one that allows the firm to accomplish its strategic goals at the lowest possible general expense. In the February 1989 issue of the Australian Accountant, Dale explained why it seems to be difficult to measure the effectiveness of OH costs and thus to reduce them (Dale 1989):

- OH costs are generated by indirect activities which are not clearly defined. Direct costs are generated by clearly defined scope in order to meet production and quality requirements and as a base for payments collection. In contrast, OH costs are usually related to administrative requirements and long term objectives. This makes it more difficult to measure the effectiveness of OH costs. This, in turn, leads to OH growth without justification.
• All indirect activities are considered vital for the survival of the company and thus any reduction in activity level or quality will render the affected department inoperable. However, in reality many OH costs are not volume sensitive but they are the direct results of inefficiency, bureaucracy, or complexity in the production process.

• The costs of indirect activities are never accurately known. In addition the share of the individual product is only predicted using cost allocation which leads to distorted product cost. This situation makes any effort to reduce OH costs lack clarity.

• Cutting OH costs usually affects executives first, which sometimes generates a defensive mechanism among top management and may shift the blame for excess OH costs to misleading causes.

• Some companies lack clear long term plans regarding business orientation, which causes confusion regarding OH spending priorities.

There are, nevertheless, some signs which indicate that OH costs are reaching unacceptable levels. The first and foremost signs is when a contractor finds it is difficult to realize profit although estimated direct
costs are close to actual costs according to cost control reports or when competitors' prices are unrealistically low (Raffish 1991). Practical steps to manage OH costs towards elimination or at least reduction are then needed to avoid unwanted sequences. Some of traditional cost reduction steps are as follows :-

2.5.2.1 Organization Auditing

The first and foremost step is to identify the real causes of OH costs which can be achieved through internal or external auditing. In order to achieve this goal, contractors can use one or more of the following techniques (Tatikonda, Lakshmi and Tatikonda, Rao 1993):-

1- **Causes and Effect (Fish Bone) Diagram.** This approach helps in identifying and analyzing the hidden causes of excess OH costs. The approach is shown in Figure 2-6 and consists of four steps:-

- Define the problem which is, in this case, excess OH costs.

- Identify the broad potential causes which may have led to the problem. For example fraud, excess quantity in company warehouses, or surplus manpower.

- Identify the potential causes for each main cause, identified above, which may have caused excess OH cost.
• Evaluate each cause in order to take necessary action to eliminate, control, or reduce its effect.

Figure 2-6
Causes and Effect (Fish Bone) Diagram

2- Pareto Analysis. Also known as the 80 /20 rule. While the causes and effect diagram considers the potential causes of the problem under investigation, Pareto analysis segregates the significant few causes from many trivial causes. The concept of this approach is that almost 80 percent of the problem is caused by only 20 percent of the apparent causes.
3- *Value Analysis*. Also called value engineering and is an extremely powerful cost control tool. It focuses on judging economic resources consumed, which is in this case OH cost, versus the actual benefit or value received as a result. Based on this investigation a decision is made as to eliminate, reduce, or even expand the costs needed by the function to accomplish the benefit. Obviously, if some costs are associated with unidentified activities then there is no need to spend on these activities.

2.5.2.2 Control OH Costs

Controlling business costs should always be an important management concern. Contractors can control OH costs through some traditional common sense measures that significantly reduce OH costs because these measures are easy to practice on a day-by-day level without special arrangement (Gandhi 1996). Following are some of these measures:-

1- *Employ The Most Qualified Staff*. Highly qualified staff, usually, increase organization output by 10 percent at least, as reported by the Institute of Industrial Engineers (IIE). Valuable contribution to the employing organization in particular and to the industry in general is one of the major driving forces for many of the professional experts. Their guidance helps greatly in
avoiding many of the missteps that often cause increased costs (Gandhi 1996).

2- *Maintain An Open Office Environment.* An open office environment means that employees at different levels know to a great extent the company objectives and accordingly are given the possibility to participate in achieving these objectives. Furthermore, employees are given the chance to speak out their ideas, express their creativity, and point out errors, thus generating confidence in their abilities. This leads to a highly motivated working environment and makes employees understand and support organization decisions (Gandhi 1996).

3- *Provide Complete, Up-to-date Training and Resources.* Employing the latest technologies and training staff keep organizations at a high competitive level and create a feeling among employees that the company cares for them and satisfies their career requirements, which increases their loyalty and results in minimizing waste including OH costs (Gandhi 1996).

4- *Place a Very High Priority on Quality.* Company emphasis on doing the work right the first time helps the company in three ways. It increases discipline among employees, which helps in reducing waste including OH costs. Second, it helps in creating a
good reputation for the company, which also reflects on OH costs especially insurance and financial costs. Third, quality work decreases the chances of spending on claims and, as a result, reduces OH costs (Gandhi 1996).

5- Link Spending on OH Costs With Strategic Goal. OH costs are highly affected by the strategic plan of the construction firm. Decisions like increasing the number of employees, size of head office, opening new branches, buying equipment, size and number of projects to be executed are only some examples of factors affecting OH costs which are directly linked to the strategic goals of the company. In doing so, the contractor need to sense the future market. Recession can seriously reduce the financing ability of the firm and makes winning new jobs difficult leading to unabsorbed OH costs. During active market, income is usually sufficient to sustain company growth (David 1992 and Gandhi 1996).

6- Challenging the Starting Base. Approving new budgets based on previous budgets automatically closes the eyes to previous inefficient spending and encourages incremental budgets because costs become legitimized. As a result, costs which were approved based on previous business priorities are retained long after the priorities have changed (David 1992). As explained earlier, approval of OH costs has to be performed in accordance with
current valid plans and not as a gathering of cumulative mistakes or outdated priorities.

7- *Budget Details.* An excess of details in the budget is as harmful as a lack of details. Excessive details often give the impression that every riyal spent is justified and hence misses the chance of properly evaluating OH spending. On the other hand, lack of details generally leads to distribution of OH costs based on perception or crises and not on advanced planning which takes into consideration actual needs (David 1992).

8- *Adopting a Multitasking Management.* OH costs can be better controlled if the firm adopts a multitasking management strategy where many types of construction works can be handled by shared resources when ever possible. After all, a company that utilizes its resources in many different ways is in a better position to survive. Likewise, an engineer who can do different types of projects is an easier employee to retain at bad times. This also reflects on OH costs because the less layoffs and recruitment the less OH costs. A versatile employee can be easily shifted from one job to another (Gandhi 1996).

9- *Avoid Premature Spending Cuts.* Under market pressure, during tough times, contractors may be forced to take decisions to cut
OH costs haphazardly to conserve cash. Cutting OH costs indiscriminately is dangerous because it may yield an even worse situation. In particular, cutting OH costs on items such as new equipment and technology, searching new markets and bonuses, must be carefully studied in advance. Cuts on these items may impair the firm's competitiveness beyond recovery. Like cholesterol, there are good and bad OH costs. A contractor must not cut on OH costs which tend to open new horizons regarding improving his current practice and business future (Gandhi 1996).

10- Employ Bench Marking Costing Technique. This relatively new technique can be used to establish budgets for different departments or task groups by scaling activities involved to already established departments, who are operating satisfactorily, taking into consideration similarities and differences.

It should be noted, however, that none of these steps is particularly new or sufficient. The idea here is to obtain a cumulative effect out of traditional cost control measures (Gandhi 1996).
CHAPTER 3

RESEARCH METHODOLOGY

This research has an exploratory nature since it aims to uncover contractors' perceptions and practice regarding overhead costs. Hence, an opinion survey is conducted to find out the characteristics of the sample, which represents building contractors in Saudi Arabia. In this chapter, research methodology will be presented as follows:

- Data required.
- Data collection.
- Population and sample.
- Interview sessions.
- Data analysis.

3.1 DATA REQUIRED

Date required for this research can be divided into two parts. The first is a literature review and is necessitated by the first objective and also
to establish a comparison between local and international practice regarding OH costs. In that respect, the researcher has conducted an extensive literature collection and review aiming to include comprehensive and up-to-date knowledge on the research topic. This part is presented in chapter 2. The second major part of the required data is a survey that will cover the requirements established in the remaining research objectives. In particular, the survey will seek data related to the following issues:

- Contractors' awareness of the existence of OH costs, their amounts and their effect on contractors' performance.

- Actual procedures related to identifying, estimating, allocating and control of OH costs.

- Advantages and disadvantages associated with the methods used.

- Areas which have potential for improvement.

3.2 DATA COLLECTION

Required data was gathered through personal interviews with the highest possible representative responsible for project cost estimation in the organization of the contractors participating in the survey. In most cases, general managers, construction managers, or managers of the estimation group were interviewed. Personal interviews were used because they have some advantages over other possible data collection methods. Among the advantages :-
1- Rate of response is high compared to rate of response in a mailed collection method.

2- Clarity and consensus regarding interview questions will be enhanced among contractors participating in the study.

3- The presence of the interviewer decreases the number of no answer responses.

Data needed for the research was collected via a questionnaire which was developed based on a thorough review of related literature to reflect the existing level of OH costs and how local contractors deal with them. While designing the questionnaire it was thought that it would be difficult to receive quantitative answers since contractors' decisions regarding OH might be taken on the basis of experience and instantaneous judgment rather than on a well-established policy. For that, the questionnaire needed to be wide in nature yet deep in following different possible methods that contractors may use. The questionnaire has four parts, covering the construction firm, OH costs in general, company OH costs, and project OH costs.

The first part contains 22 questions eliciting general information about the participating contractor, such as contractor's years of experience, annual construction volume, average number of permanent and temporary employees, number of engineers and number of cost estimators, maximum and average project size, number of area branches, percentage of projects awarded under competitive bidding contracts, percentage of projects
performed using lump sum contracts, and average percentage of work subcontracted.

The second part contains 8 questions about OH in general which explores the contractors' background regarding OH in its broad aspects and how contractors feel about it, which mainly will satisfies the second objective. In particular this part addressed the following points: definition of OH costs and their types, percentage of OH costs to annual construction volume, whether current level of OH costs is acceptable, whether OH costs badly effect contractor's performance at present, whether OH costs were an important issue in the past, whether contractors think OH costs will be of greater importance in the future, and whether contractors think OH costs can be controlled.

The third part has 17 questions asking in particular about company OH costs. The questions cover the following items: definition of company OH, percentage of company OH costs to annual construction volume and to project direct costs, whether the existing level of company OH is satisfactory, method of allocating company OH costs to project bid and why this method is used, what factors affect the amount of company OH costs allocated to a given project, what constitutes company OH costs, whether company OH has increased or decreased in the past years and what factors have led to that, whether contractors believe that their existing cost accounting system is effective in estimating and allocating company OH costs or whether there is a need for a more accurate allocation method such as activity based costing (ABC) system and finally whether contractors believe that company OH can be controlled.
The fourth and final part contains 11 questions tackling important issues regarding project OH costs. It addresses issues like; the percentage of project OH costs to direct costs of the project, whether project OH has increased or decreased in the past years and for what causes, what are the components of project OH costs and in what percentage, method of estimating project OH costs and why it is used, factors affecting the amount of project OH costs, and whether contractors are taking practical steps to reduce them. Survey questions have three different shapes:-

1- Open-ended questions, which are needed to find out contractors' knowledge and background regarding OH definition.

2- Multiple choice questions which are structured to reflect contractor's choice regarding well defined points such as the method by which company OH costs are allocated to a specific project or the percentage of project OH costs to project direct costs. Choices listed as possible answers were arrived at from the literature review.

3- Questions that measure the degree of agreement the participating contractors have regarding hypothetical statements constructed from the literature review. The answers to these questions were measured on a five-point scale where number five reflects total agreement with the statement and number one reflects total disagreement. Interview questions appear in appendix A.
3.3 POPULATION and SAMPLE

The population of this study is all building contractors classified by MPWH in the first three grades for Saudi contractors and in the first five grades for foreign contractors who, according to MPWH, can bid for projects of SR 50 million. The total number of those contractors are 230 (MWPH classification 1989). Based on that population, a sample will be designed to reflect a confidence level of 95 percent as shown in Table 3-1.

<table>
<thead>
<tr>
<th>MPWH Grade</th>
<th>Project Size in Million SR.</th>
<th>No. of Contractors</th>
<th>Percentage to Total Population</th>
<th>Sample Size (rounded)</th>
<th>Sample Percentage to Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Above 200</td>
<td>22</td>
<td>09.6%</td>
<td>6</td>
<td>08.8%</td>
</tr>
<tr>
<td>2</td>
<td>Up to 200</td>
<td>57</td>
<td>24.8%</td>
<td>17</td>
<td>25.0%</td>
</tr>
<tr>
<td>3</td>
<td>Up to 50</td>
<td>151</td>
<td>65.6%</td>
<td>45</td>
<td>66.2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>230</td>
<td>100.0%</td>
<td>68</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 3-1
Population and Sample

Using Kish equation (1965, p.50) the sample of 68 contractors can be calculated as follows:

\[ n = \frac{n^*}{[1 + (n^* / N)]} \]

where:

80
\[ n^* = \frac{S^2}{V^2} = \frac{(0.5)^2}{(0.051)^2} = 96.12 \]

\[ n = \frac{96.12}{[1 + (\frac{96.12}{230})]} = 67.79 \text{ say 68} \]

where:

- \( n^* \) = Sample size from an infinite population.
- \( n \) = Sample size from a finite population.
- \( N \) = Total population.
- \( V \) = Standard error of sampling population = \( r / t = 0.1 / 1.96 \)
  = 0.0510
  since \( r = 0.1 \)
  and \( t = 1.961 \) at Confidence level = 95% and \( r = 0.1 \)
- \( S \) = Standard deviation of the sample
- \( S^2 \) = The variance of population elements
  = \( P (1 - P) \); Maximum at \( P = 0.5 \)
  = 0.5 (1 - 0.5) = (0.5)^2

### 3.4 INTERVIEW SESSIONS

During proposal preparation and at the beginning of conducting the survey it was thought that the elements of the sample would be selected using tables of random numbers to ensure randomness, independence, and representativeness. However, it was practically very difficult to use tables of random numbers because the number of contractors who are available in the eastern province and who satisfy the sample requirements were less
than half the research population. Furthermore, some of those contractors were not willing to participate in the survey. This situation necessitated that the researcher contacted almost every large building contractor in the area and asked him to participate in the survey so that 68 participants could be gathered.

In many interviews, the questionnaire was explained to the contractor and then left to be answered later according to the contractor’s request. Some contractors needed sometimes to go back to their files to extract information. In this case, an appointment was set to come back and go through the answers with the contractor to make sure answers were clear and complete. In other instances, contractor’s representatives just checked some files and gave immediate answers, thus giving reliability to the answers because they come from documented sources. The average time needed to complete one questionnaire was two hours if information was ready. Total number of collected questionnaires was 61.

3.5 DATA ANALYSIS

Answers, other than answers to open-ended questions, were coded and entered into a PC computer statistical analysis software which is part of excel program. Statistical functions in excel are capable of providing basic statistical parameters such as analysis of variance, importance index, spearman’s correlation, means, median, standard deviation, range, frequencies, and many other functions.

Treatment of open-ended questions, which mainly asked about OH costs definitions, was performed by grouping answers to every open-
ended question according to pre-set possibilities extracted from literature and then the number of occurrences were counted percentage-wise.
CHAPTER 4

RESULTS and ANALYSIS

This chapter includes the results and analyses of the survey which was performed to reflect the local understanding and practice regarding OH costs. As explained in research methodology (chapter 3) the sample size is 68 building contractors which are classified as grade 1, 2, or 3 according to the MPWH contractors’ classification. Unfortunately the number of participating contractors were only 61 which is less than the sample size by 6 contractors, representing 8.8% of the sample. The reason for the shortage is that almost all contractors who are located in the eastern province and who satisfy the sample requirements were contacted and asked to participate in the research. The overwhelming majority cooperated and answered the questionnaire but 12 contractors refused because the questionnaire touches what they consider confidential information. Another 4 contractors, who actually agreed to respond, were not able to successfully complete the questionnaire for different reasons. All questionnaires, with the exception of seven, were filled in during or after personal interviews to explain the contents of the survey and maximize the number of questions answered. The other seven
questionnaires were sent to companies' head offices in Riyadh but were also explained to the people responsible by telephone.

Results for part one of the questionnaire, which investigates the participating contractors' characteristics, are detailed in Appendix B. However, one of the important findings here was that only 28% of the respondent contractors are classified as building contractors. The remaining 72% are described as general contractors and are classified in building construction as well as in different types of construction such as piping, industrial, or road construction. Furthermore, their estimation and accounting systems do not differentiate between OH costs pertaining to building projects and other types of projects, which makes it practically difficult to separate building OH costs.

Survey results are divided into four parts. The first part shows contractors' characteristics and is presented in appendix B. Results which reveal the facts regarding OH costs are shown hereinafter in three main sections which go parallel to the information lay-out in the literature review (Chapter 2). Hopefully, this will make it easier for the reader to follow and compare whenever needed. The three sections are:

- OH Cost Awareness
- Company OH Cost
- Project OH Cost

In each of the three sections the results of the research are presented first and then followed by a discussion that explains the results.
Furthermore, a brief comparison between information in the literature and survey results is made whenever possible.

4.1 OH COSTS AWARENESS

In order for any contractor to properly reflect his judgment on OH issues, it is first important to check what is the contractor’s basic understanding of OH costs in general. This awareness is investigated in this section and the results are as follow:

4.1.1 What is an OH Cost

The first question in this section was simply: what is an OH cost? This was an open-ended question and 61 answers were observed. The answers are classified as follows:

- 39 participants defined OH cost as general expenses such as head office costs, housing costs, transportation, supervision costs.

- 14 participants defined OH cost as the indirect costs which are needed to run the company yet are not part of the direct construction production cost but are added to the project cost estimate to cover them up. Examples were mentioned as head office costs, housing costs, insurance and supervision costs.

- 08 participants defined OH cost as indirect costs needed to support the construction company but are not construction costs and cannot be solely caused by single activity or transaction. There are two types of
OH costs. The first is the company OH cost such as head office costs and the second type is the project OH cost such as the cost of temporary constructions.

Above results reveal that 64% of the sample did not properly define OH costs and directly jumped to examples of OH costs. Another 23% of the sample defined OH cost with a reasonably accurate definition by stating that OH cost is not part of the actual construction production cost but is an indirect cost. Only 13% of the sample have the proper definition of OH cost, which can be sensed in their definition especially by stating that OH cost is an indirect construction cost which cannot be attributed to a single cause (project or activity) and also by stating that there are two types of OH cost which are company and project OH costs.

Above results also indicate that even large contractors do not have a unified or even proper understanding of the term OH costs, which suggests that the awareness of OH costs should be enhanced in order to reach a stage where more accurate cost estimate can be achieved so that a contractor's overall construction costs can be reduced and his competitiveness increased.

4.1.2 Types of OH Costs

Question 24 inquires about the different types of OH costs that are considered by contractors. Construction literature indicates that there are two basic types which are company OH cost and project OH cost. However, contractors may consider the two types separately or they may calculate their OH costs all together without segregation. The question contained these two
options plus a third option which is added for a third possible way of classifying OH costs. The results are shown in Table 4-1.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All OH costs together</td>
<td>08</td>
<td>13.1</td>
<td>08</td>
<td>13.1</td>
</tr>
<tr>
<td>Co. OH &amp; Proj. OH</td>
<td>53</td>
<td>86.9</td>
<td>61</td>
<td>100.0</td>
</tr>
<tr>
<td>Other</td>
<td>00</td>
<td>0.0</td>
<td>00</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Table 4-1**

**TYPES OF OH COSTS**

Looking at these results, it can be clearly said that the majority (87%) of the respondents classify OH costs into two types: Company OH costs and project OH costs, which matches the classification found in the literature.

4.1.3 Percentage of OH Costs

A very important point was raised in question 25 which discusses the percentage of OH costs compared to the annual construction volume. This point derives its importance from the fact that the size of the problem under investigation is to a great extent determined by the size of OH costs compared to the overall construction volume. The higher the ratio, the serious the problem becomes. Results are shown in Table 4-2.

As mentioned earlier in chapter 2, total OH costs do not usually exceed 15 percent of the annual construction volume in the United States. Locally, only 48 percent of the contractors have 15 percent OH costs or
The remaining 52 percent have a higher percentage, indicating that OH costs present a serious challenge locally. The overall percentage is 16.8 which is also higher than ratio found in the literature.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or less</td>
<td>04</td>
<td>06.6</td>
<td>04</td>
<td>06.6</td>
</tr>
<tr>
<td>11-15</td>
<td>25</td>
<td>41.0</td>
<td>29</td>
<td>47.6</td>
</tr>
<tr>
<td>16-20</td>
<td>16</td>
<td>26.2</td>
<td>45</td>
<td>73.8</td>
</tr>
<tr>
<td>21-25</td>
<td>13</td>
<td>21.3</td>
<td>58</td>
<td>95.1</td>
</tr>
<tr>
<td>Above 25</td>
<td>03</td>
<td>04.9</td>
<td>61</td>
<td>100.0</td>
</tr>
<tr>
<td>Not Calculated</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4-2
Ratio of total OH Costs to Annual Construction Volume

Those contractors with high OH rate may lose the ability to compete in the future. In addition, they are currently losing because they are spending on OH expenses more than they should. Furthermore, this result indicates that OH costs are a good candidate for construction cost reduction efforts.

4.1.4 Contractors’ Perception Regarding OH Costs

The last five questions in this section (q. 26 to 30) investigate the overall perception the contractors have regarding OH costs. The questions ask whether the current level of OH costs is acceptable, whether OH costs badly affect the contractors’ performance, was OH costs an important cost factor in the past,
will OH costs be of greater importance in the future, and finally whether contractors believe that OH costs can be controlled. These questions are important because they indirectly explain contractors' behavior regarding OH costs. If, for example contractors think that the current OH level is acceptable, then it is expected that there will be no efforts to reduce it. In evaluating contractors' answers for these answers a five-point scale is used where 1 represents a strongly agree answer and 5 represents a strongly disagree answer. A cumulative average is then calculated using the frequency for each answer multiplied by its weight and then divided by the number of gathered answers. The cumulative average reflects the overall perception contractors have regarding asked topics. The five questions are answered in Table 4-3.

<table>
<thead>
<tr>
<th>Parameter under investigation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
<th>Ave.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH level is now acceptable</td>
<td>08</td>
<td>09</td>
<td>09</td>
<td>23</td>
<td>12</td>
<td>61</td>
<td>3.36</td>
</tr>
<tr>
<td></td>
<td>13 %</td>
<td>15 %</td>
<td>15 %</td>
<td>38 %</td>
<td>20 %</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>OH badly affects performance</td>
<td>14</td>
<td>26</td>
<td>13</td>
<td>07</td>
<td>01</td>
<td>61</td>
<td>2.26</td>
</tr>
<tr>
<td></td>
<td>23 %</td>
<td>43 %</td>
<td>21 %</td>
<td>11 %</td>
<td>02 %</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>OH was not an important issue in the past</td>
<td>05</td>
<td>13</td>
<td>13</td>
<td>19</td>
<td>09</td>
<td>59</td>
<td>3.24</td>
</tr>
<tr>
<td></td>
<td>09 %</td>
<td>22 %</td>
<td>22 %</td>
<td>32 %</td>
<td>15 %</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>OH will be of greater importance in the future</td>
<td>39</td>
<td>14</td>
<td>05</td>
<td>00</td>
<td>00</td>
<td>58</td>
<td>1.41</td>
</tr>
<tr>
<td></td>
<td>67 %</td>
<td>24 %</td>
<td>09 %</td>
<td>00 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>OH can be monitored and controlled</td>
<td>05</td>
<td>03</td>
<td>18</td>
<td>23</td>
<td>09</td>
<td>58</td>
<td>3.48</td>
</tr>
<tr>
<td></td>
<td>09 %</td>
<td>05 %</td>
<td>31 %</td>
<td>40 %</td>
<td>15 %</td>
<td>100 %</td>
<td></td>
</tr>
</tbody>
</table>

1 = Strongly agree  2 = Agree  3 = Neutral  4 = Disagree  5 = Strongly disagree

Table 4-3
Contractors' perception regarding OH costs
Above results show the following:

- Only 28 percent of the sample accept the current level of OH costs whereas 58 percent think it is not acceptable.

- 66 percent of the sample think OH costs badly affect their performance whereas 13 percent disagree with this assumption.

- 31 percent of the surveyed contractors think OH costs were not an important issue in the past whereas 47 percent think OH costs were important.

- 91 percent of the respondent contractors believe that OH costs will be of greater importance in the future, which means that OH indirect costs will be of greater effect on contractors’ performance.

- 14 percent of the contractors think OH costs can be monitored and controlled. Another 55 percent conceive that OH costs cannot be monitored and controlled. This consequence may reflect on the measures which may be taken by contractors to reduce OH costs.

These results indicate that the majority of contractors are not satisfied with OH costs and they are facing problems in managing them. This should encourage contractors to investigate the issue in an effort to reduce the negative effect of OH costs.
4.2 COMPANY OH COSTS

Company OH (co. OH) costs are by far the most important type of OH costs because as explained earlier in Chapter 2 they constitute a serious challenge to contractors as to how to recover them in a balanced manner and because they, unlike project OH costs, affect contractors’ performance in all projects. This section contains results pertaining to co. OH costs.

4.2.1 What is Company OH Cost?

The first question in this section inquires about the meaning of co. OH cost. This was an open-ended question and 60 answers were observed. The answers can be grouped as:

- 43 percent of the participants defined OH cost as the permanent set-up costs that are needed for all previous, on-going and future projects. Examples are head office expenses and taxes.

- 57 participants defined OH cost by directly mentioning examples of co. OH costs such as head office expenses, salaries, and camp costs.

The answers reveal that 43 percent of the sample successfully defined co. OH costs whereas the remaining 57 percent jumped directly to examples of co. OH costs without really defining them. Both parties did not clearly state that a co. OH cost cannot be solely caused by a single project and thus has to be recovered by letting many projects share the cost.
4.2.2 Ratio of Company OH Cost to Project Direct Cost

The percentage of co. OH costs to project direct costs is an important measure which quantifies the burden cost the project at hand has to carry in sharing company expenses. The lower the percentage the higher the chances of winning bids, assuming of course that direct costs are competitive themselves. As explained in Chapter 2, this percentage can be minimized by reducing co. OH costs in the first place and secondly by working more projects because having more projects means co. OH will be distributed among a higher number of projects. Results for this question are shown in Table 4-4 and Figure 4-1:

<table>
<thead>
<tr>
<th>Ratio of Co. OH to direct cost</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum. Freq.</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-05</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>06-10</td>
<td>16</td>
<td>26.2</td>
<td>16</td>
<td>26.2</td>
</tr>
<tr>
<td>11-15</td>
<td>23</td>
<td>37.3</td>
<td>39</td>
<td>63.5</td>
</tr>
<tr>
<td>16-20</td>
<td>09</td>
<td>14.8</td>
<td>48</td>
<td>78.3</td>
</tr>
<tr>
<td>Above 20</td>
<td>04</td>
<td>06.6</td>
<td>52</td>
<td>84.9</td>
</tr>
<tr>
<td>Not Calculated</td>
<td>09</td>
<td>15.1</td>
<td>61</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4-4
Ratio of company OH to project direct costs
Reviewed literature did not specify a particular percentage of co. OH in the project final bid value. However, there are indications that 6 to 10 percent is an acceptable range (Means Estimating Handbook 1990). Results from the survey show that while 15.1 percent of contractors do not calculate the ratio, only 26.2 percent of the contractors have 10 (or less) percent of their project bid
value as burden costs initiated by company expenses. The remaining 58.7 percent add more than 10 percent of the project direct costs as a co. OH cost. In fact, 14.8 percent of the contractors surveyed reported that their ratio is 16-20 percent and 6.6 percent have 20 or above of their bid value as co. OH costs, which is a dangerous level. Overall percentage is 12.9 which is higher than literature available figures. Again this indicates how serious the issue of co. OH is and the need to focus efforts on reducing co. OH costs.

4.2.3 Ratio of Company OH Cost to Annual Construction Volume

Another important scale for co. OH costs is the ratio of co. OH to annual construction volume. In Table 4-2 the ratio of total OH costs was compared to annual construction volume, but here, project OH costs are excluded because they, to many contractors, are considered project direct costs. Thus the ratio of co. OH to annual construction volume has to be investigated separately. Construction literature shows that the ratio of co. OH costs to annual construction volume differs greatly but for large contractors ranges from 8 to 15 percent. Results for this question are shown in Table 4-5 and Figure 4-2.

Looking at the results, it can be seen that 54.1 percent of the respondent contractors have 15 percent (or less) of their annual construction volume as a co. OH, which is an acceptable range if compared to the figures found in literature. However, the remaining significant percentage of the contractors (45.9%) have more than 15 percent of their annual construction volume as co. OH. The result emphasizes the need to reduce construction indirect costs. The overall ratio is 14.3 percent.
Table 4-5
Ratio of company OH to annual construction volume

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>00-05</td>
<td>02</td>
<td>03.3</td>
<td>02</td>
<td>03.3</td>
</tr>
<tr>
<td>06-10</td>
<td>10</td>
<td>16.4</td>
<td>12</td>
<td>19.7</td>
</tr>
<tr>
<td>11-15</td>
<td>21</td>
<td>34.4</td>
<td>33</td>
<td>54.1</td>
</tr>
<tr>
<td>16-20</td>
<td>25</td>
<td>41.0</td>
<td>58</td>
<td>95.1</td>
</tr>
<tr>
<td>Above 20</td>
<td>03</td>
<td>04.9</td>
<td>61</td>
<td>100.0</td>
</tr>
<tr>
<td>Not calculated</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 4-2
Ratio of company OH to annual construction costs
4.2.4 Perceptions Regarding Company OH Cost

Contractors' perception regarding co. OH costs are investigated in this section in three aspects. First, contractors were asked what is the degree of acceptance of the current level of co. OH costs. Second, they were asked whether co. OH increased or decreased during the past five years. Third, what, from their perspective, are the reasons for such an increase or decrease? Contractors' response on these three points helps in understanding contractors' attitudes toward co. OH and thus explains their management style regarding this issue. Results are as follows:

4.2.4.1 Level of Acceptance of Company OH

Results in Table 4-6 indicate that only 28.3 percent of the contractors accept the current level of co. OH whereas 45.0 percent think the current level is high. Having this impression helps in pursuing efforts to study and reduce co. OH costs.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly accepted</td>
<td>03</td>
<td>05.0</td>
<td>03</td>
<td>05.0</td>
</tr>
<tr>
<td>Accepted</td>
<td>14</td>
<td>23.3</td>
<td>17</td>
<td>28.3</td>
</tr>
<tr>
<td>Neutral</td>
<td>16</td>
<td>26.7</td>
<td>33</td>
<td>55.0</td>
</tr>
<tr>
<td>Not accepted</td>
<td>22</td>
<td>36.7</td>
<td>55</td>
<td>91.7</td>
</tr>
<tr>
<td>Strongly not accepted</td>
<td>05</td>
<td>08.3</td>
<td>60</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4-6
Level of acceptance of current company OH cost
4.2.4.2 Changes in Company OH Costs

Results on whether contractors believe that co. OH has increased or decreased lately are shown in Table 4-7. It is clear that the majority of contractors think that co. OH costs have increased during the past years.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased</td>
<td>47</td>
<td>77.0</td>
<td>47</td>
<td>77.0</td>
</tr>
<tr>
<td>Decreased</td>
<td>08</td>
<td>13.2</td>
<td>55</td>
<td>90.2</td>
</tr>
<tr>
<td>Didn’t change</td>
<td>06</td>
<td>09.8</td>
<td>61</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4-7
Changes in company OH costs

4.2.4.3 Reasons for Increased Co. OH costs

Potential causes for increased co. OH costs are investigated in this question. Knowing the major sources of high co. OH costs helps in concentrating efforts towards specific causes. Seven potential causes were identified and evaluated as shown in Table 4-8 and Figure 4-3. In evaluating these results (and similar results) an important index was calculated to reflect the relative effectiveness of the criteria under investigation. The importance index was calculated using the following formula:

\[ I = \sum_{i=1}^{2} [(a_i + x_i) / 5] 100 \% \]
Where $I =$ importance index; $a_i =$ constant expressing the weight of the $i$th response, where $a_i = 1, 2, 3, 4, 5$ for $i = 1, 2, 3, 4, 5$ respectively; $x_i =$ frequency of the $i$th response given as a percentage of total responses for each cause or factor; $i =$ response category index where $i = 1, 2, 3, 4, 5$; $x_1 =$ frequency of strongly agree responses; $x_2 =$ frequency of agree responses; $x_3 =$ frequency of neutral responses; $x_4 =$ frequency of disagree responses; $x_5 =$ frequency of strongly disagree responses.

<table>
<thead>
<tr>
<th>Reason for Increased Co. OH costs</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Total</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Lack of new projects (recession)</td>
<td>27</td>
<td>15</td>
<td>06</td>
<td>07</td>
<td>06</td>
<td>61</td>
<td>76.4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>44%</td>
<td>25%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Cost inflation</td>
<td>14</td>
<td>19</td>
<td>13</td>
<td>10</td>
<td>05</td>
<td>61</td>
<td>68.8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>23%</td>
<td>32%</td>
<td>21%</td>
<td>16%</td>
<td>08%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) Delayed payments</td>
<td>24</td>
<td>18</td>
<td>11</td>
<td>06</td>
<td>02</td>
<td>61</td>
<td>78.4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>39%</td>
<td>30%</td>
<td>18%</td>
<td>10%</td>
<td>03%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) Government regulation</td>
<td>10</td>
<td>19</td>
<td>20</td>
<td>05</td>
<td>07</td>
<td>61</td>
<td>67.2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>31%</td>
<td>34%</td>
<td>08%</td>
<td>11%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) Increased marketing cost</td>
<td>17</td>
<td>06</td>
<td>17</td>
<td>11</td>
<td>10</td>
<td>61</td>
<td>63.0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>28%</td>
<td>10%</td>
<td>28%</td>
<td>18%</td>
<td>16%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F) Client related reasons</td>
<td>19</td>
<td>10</td>
<td>12</td>
<td>05</td>
<td>15</td>
<td>61</td>
<td>64.2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>31%</td>
<td>16%</td>
<td>20%</td>
<td>08%</td>
<td>25%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G) Firm’s growth</td>
<td>23</td>
<td>04</td>
<td>16</td>
<td>03</td>
<td>15</td>
<td>61</td>
<td>65.6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>37%</td>
<td>07%</td>
<td>26%</td>
<td>05%</td>
<td>25%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H) Other (internal mistakes)</td>
<td>00</td>
<td>08</td>
<td>06</td>
<td>05</td>
<td>00</td>
<td>19</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>42%</td>
<td>32%</td>
<td>26%</td>
<td>00%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 = Strongly agree  4 = Agree  3 = Neutral  2 = Disagree  1 = Strongly disagree

Table 4-8
Reasons for increased company OH costs
Figure 4-3
Importance index for causes of increased company OH costs

When analyzing causes of increased co. OH, it must be noted that some causes of increased co. OH costs are inter-related, which makes it difficult to evaluate them individually. For example, a decision to expand the company, which stands as a cause of increased co. OH costs by itself, involves also marketing costs and constitutes an inter-organization mistake if taken at the wrong time. Looking at results, causes of increased co. OH costs can be arranged in their order of effectiveness as follows:

1. Delayed payments. This factor affects co. OH in two ways. First, it forces a contractor to look for external financial support which means
additional co. OH costs. Second, delayed payments affect the bid/no bid decision. When contractors decide not to bid because of delayed payments, the rate and the effect of co. OH become larger even if its magnitude remains the same. Its effect becomes damaging because the no bid decision implies fewer projects which means co. OH costs are not distributed among sufficient projects.

2. Lack of new projects. If there are not enough new projects, then the level of competition among contractors becomes seriously sharp, which not only reduces profit margin but also makes contractors delay the issue of recovering co. OH costs hoping for another chance to recover them. Again, this cause may not lead to a direct increase in co. OH costs but it makes existing OH costs more damaging to the company. Nevertheless, lack of new projects may directly lead to an increase in co. OH costs because lack of projects strongly affects the decision of down-sizing and its accompanied costs. One important example in this situation is the financial loss accompanying a contractor's decision to liquidate his assets such as equipment, camps, or work shops.

3. Cost inflation. Contractors think that inflation is the third cause for increased co. OH costs. Company OH consumes many different types of commodities and services which in general transfers overall inflation rate to company expenses.

4. Government regulations. Government regulations came as the fourth reason for increased co. OH costs. Increased costs to recruit manpower
from abroad and make their stay and work legal in the Kingdom have affected co. OH costs as many contractors consider such costs a co. OH cost.

5. **Firm's growth.** Company's strategy regarding expanding to new working horizons or even shrinking to a smaller size company has significant accompanying costs. Expanding construction activities may involve recruiting more manpower, expanding head office, buying more equipment, or negotiating a loan. On the other hand, down-sizing involves getting rid of surplus manpower, reducing or changing head office, or liquidating equipment and batching plants which usually takes place in bad times leading to high co. OH costs.

6. **Client related requirements.** It is true that most co. OH costs are not related directly to project requirements and thus are not related to client requirements. However, there are instances where a project needs certain equipment or other costly items which cannot be exclusively recovered by including their costs in the project at hand. Such costs are treated as a co. OH cost. The result of the survey regarding this point sets it in the sixth position as a reason for increased co. OH costs.

7. **Increased spending on marketing.** It is normal for construction firms to look for new clients because only a limited number of clients will be continuously involved in building projects. Also, during recession many contractors will put their full efforts into finding new markets which
involves extra spending. Increased spending on marketing came in the seventh and last place among factors leading to increased co. OH costs.

8. *Wrong management decisions.* Only 19 contractors (31% of the sample) considered their inter-organization mistakes a source for increased co. OH costs. The severity of this factor can’t be compared with other factors because of sample scale difference. A wide spectrum of examples were mentioned here, such as inefficiency in managing company head office and improperly expanding business.

4.2.5 Distribution of Company OH Cost

Co. OH costs have many possible components that can be considered. In the following question the percentage of the most commonly included items are determined. The importance of this analysis is that it gives a chance to know which co. OH cost items consume most of company expenses and as a result tells where to concentrate efforts to reduce co. OH costs. Seven major cost categories were identified from construction literature and an eighth open category was also added for a possible additional cost category. Results are shown in Table 4-9 and Figure 4-4. When analyzing survey results, it is known that co. OH has no standard classification and thus contractors differ in the component of their co. OH. To avoid mis-interpreting results, weighted evaluation is used to correctly position co. OH cost categories.
<table>
<thead>
<tr>
<th>Distribution of Co. OH cost</th>
<th>0-5%</th>
<th>6-10%</th>
<th>11-15%</th>
<th>16-20%</th>
<th>Over 20%</th>
<th>Total</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Head office staff</td>
<td>08%</td>
<td>34%</td>
<td>03%</td>
<td>11%</td>
<td>05%</td>
<td>61%</td>
<td>100%</td>
<td>50.4</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>56%</td>
<td>05%</td>
<td>18%</td>
<td>08%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Travel expenses</td>
<td>38%</td>
<td>15%</td>
<td>08%</td>
<td>00%</td>
<td>00%</td>
<td>61%</td>
<td>100%</td>
<td>30.2</td>
</tr>
<tr>
<td></td>
<td>63%</td>
<td>24%</td>
<td>13%</td>
<td>00%</td>
<td>00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) Auto. &amp; Eq. Expenses</td>
<td>00%</td>
<td>10%</td>
<td>22%</td>
<td>13%</td>
<td>16%</td>
<td>61%</td>
<td>100%</td>
<td>71.4</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>16%</td>
<td>37%</td>
<td>21%</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) Head office expenses</td>
<td>01%</td>
<td>08%</td>
<td>23%</td>
<td>21%</td>
<td>08%</td>
<td>61%</td>
<td>100%</td>
<td>68.8</td>
</tr>
<tr>
<td></td>
<td>02%</td>
<td>13%</td>
<td>38%</td>
<td>34%</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) Insurance &amp; taxes</td>
<td>42%</td>
<td>14%</td>
<td>04%</td>
<td>01%</td>
<td>00%</td>
<td>61%</td>
<td>100%</td>
<td>28.2</td>
</tr>
<tr>
<td></td>
<td>68%</td>
<td>23%</td>
<td>07%</td>
<td>02%</td>
<td>00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F) Labor health, travel, recruitment</td>
<td>00%</td>
<td>05%</td>
<td>37%</td>
<td>16%</td>
<td>03%</td>
<td>61%</td>
<td>100%</td>
<td>65.6</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>08%</td>
<td>61%</td>
<td>26%</td>
<td>05%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G) Marketing</td>
<td>47%</td>
<td>14%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>61%</td>
<td>100%</td>
<td>24.6</td>
</tr>
<tr>
<td></td>
<td>77%</td>
<td>23%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H) Financing cost</td>
<td>00%</td>
<td>05%</td>
<td>12%</td>
<td>11%</td>
<td>00%</td>
<td>28%</td>
<td>00%</td>
<td>64.2</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>18%</td>
<td>43%</td>
<td>39%</td>
<td>00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I) Other</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
</tr>
</tbody>
</table>

Ranges from very low (0 to 5%) = 1 To very high (over 20%) = 5

Table 4-9
Classification of company OH costs
Figure 4-4
Importance index for components of company OH cost
Survey results show factors affecting co. OH costs can be arranged as follows:

1. **Automobile and equipment costs** are the highest co. OH cost category and they account for 11 percent and above of the total co. OH costs for the overwhelming majority of the surveyed contractors. It must be noted, however, that many large contractors prefer to consider equipment cost a direct project cost.

2. **Head office expenses** are the second highest category and constitute 11 percent and above of total co. OH costs for the majority of the contractors. Head office expenses include (but are not limited to) office rental, utilities, furniture, stationary items, fee for technical or legal consultation which is of a general nature.

3. **Labor related costs** are the third highest cost category. However, it must be noted that labor costs in this case do not include labor wages but mean labor recruitment, health cost, residence, work permit, and other similar costs.

4. **Financing costs** can be a co. OH cost or a project OH cost. When needed by the company as a whole or when needed by many projects and cannot be specifically used by a project, then it is considered co. OH. This type of cost came in the fourth place among types of co. OH costs. Results show that 28 contractors representing 46 percent of the sample use external financial support. The cost of such support ranges from 11
to 20 percent of co. OH costs for the majority of those contractors who use external financing.

5. **Head office staff expenses** are in fifth place with the majority of the responding contractors saying they account for 10 percent or less of the total co. OH costs.

6. **Insurance costs** came in sixth place, providing around 5 percent of the total co. OH expenses for most of the contractors.

7. **Marketing costs** which account for less than 5 percent of co. OH came in the seventh and last position among co. OH categories.

### 4.2.6 Allocation of Company OH Cost

Managing co. OH costs has many challenging aspects but the most serious one is recovering company expenses in a balanced manner that will not affect a contractor's ability to compete. This section deals with the allocation of co. OH costs in three aspects. What allocation base is used, why a particular base is used, and factors affecting the amount of co. OH costs each project has to carry. Results are presented hereinafter.

#### 4.2.6.1 Co. OH allocation base

In Table 4-10 the allocation base is investigated. There are at least seven possible bases which can be used to estimate the amount of co. OH that has to be allocated to a project at hand. These bases are: (1) project duration as preliminarily scheduled during bidding; (2) expected
number of projects for the current year; (3) project total bid value including all direct costs plus contingency (if calculated) and profit; (4) estimated cost for material; (5) estimated cost for material and labor; (6) estimated cost for material, labor and equipment; (7) estimated costs for direct resources as mentioned in the previous base plus project OH cost; (8) fixed amount is added to the project estimate regardless of any other factors. Another option is also placed in case co. OH costs are not included in the project estimate.

<table>
<thead>
<tr>
<th>Co. OH Allocation base</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Project duration</td>
<td>14</td>
<td>23</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>B) Number of projects</td>
<td>01</td>
<td>02</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>C) Project bid value</td>
<td>00</td>
<td>00</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>D) Material cost</td>
<td>00</td>
<td>00</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>E) Material &amp; labor cost</td>
<td>10</td>
<td>16</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td>F) Material, labor &amp; eq. Cost</td>
<td>13</td>
<td>21</td>
<td>38</td>
<td>62</td>
</tr>
<tr>
<td>G) Direct cost including proj. OH</td>
<td>23</td>
<td>38</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>H) Fixed amount is added</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>J) Company OH is not included</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>J) Other......................</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-10
Base used to allocate company OH cost

While the literature reviewed and presented in Chapter 2 shows that total direct costs (excluding project OH, contingency and profit) are used too often as an allocation base followed by labor costs as a second base in use in the United States, local results reveal that total direct costs
including project OH is the most frequently used base (38%). In second place comes the project duration (23%). In the third sequence come the direct costs for material, labor and equipment but excluding project OH (21%), followed by material and labor costs (16%). In the fifth and last place comes the expected number of projects with a very low frequency (2%). It must be noted, however that labor cost is not used as a base although it comes in the second place in the literature. The other listed bases are not used locally.

4.2.6.2 Motivations behind using a particular allocation base

It is understood that using a particular base is greatly dependent on the nature of company and projects. This point was investigated and results are shown in Table 4-11.

<table>
<thead>
<tr>
<th>Reason why a particular allocation method is used</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum. Freq.</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects are similar in nature</td>
<td>09</td>
<td>15</td>
<td>09</td>
<td>15</td>
</tr>
<tr>
<td>Co. OH is a time related spending</td>
<td>17</td>
<td>28</td>
<td>26</td>
<td>43</td>
</tr>
<tr>
<td>Co. OH is related to direct costs</td>
<td>29</td>
<td>47</td>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td>Ease in using this base</td>
<td>06</td>
<td>10</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-11
Reasons behind using a particular allocation method

Looking at results, it is clear that most of the contractors (47%) believe that co. OH is closely related to the estimated direct costs of the project and thus direct costs are used as an allocation base. In the second
sequence, 28% of the responding contractors see CO. OH as a function of
time expense. Some other contractors (15%) think that projects are
similar in nature and thus they either depend on the number of projects
as a base for calculating the CO. OH shared by a given project or they set
a relatively fixed amount of money as a CO. OH each project has to
recover. In the last position 10% of the contractors said they use
whatever base they are using because it is easy to use.

Company CO. OH is a time driven type of cost more than a size driven cost.
However direct costs, which are a project size indication, are used as an
allocation base because it is easier to estimate them whereas estimating
time needed to finish the project is costly and not as accurate. Estimating
direct costs can be achieved from contract documents whereas
estimating project duration needs expert planners who set activities,
production rates, scheduling resources and other steps which are time
consuming and costly especially at the bidding stage. As a result,
contractors use direct costs as a measure for CO. OH costs.

4.2.6.3 Factors affecting the magnitude of CO. OH allocated to projects
Although the amount of CO. OH that has to be paid back by a project to
compensate for company general expenses is calculated using the
allocation process as described in Chapter 2, many contractors combine
their practical experience with the result of the calculation. In many
instances, decision makers in contracting firms do not honestly adhere to
figures coming from project estimators but change CO. OH rate to higher
or lower values. Contractors may choose to do so because of the nature
of the contract, the size and complexity of the project, the contractor’s
need for work, financial causes, the contractor's experience with the client, the degree to which subcontractors services are needed, or the number of contractors competing to win the project which may not be known at bidding time. These factors are investigated and results are listed in Table 4-12 and Figure 4-5. Results reveal that factors affecting the amount of co. OH loaded to a given project can be arranged as follows:

1. **Contractor need for work.** It is understood that contractors tend to underestimate co. OH when they do not have the freedom to properly include it. Having this factor in the first place indicates that local practice is in full agreement with this concept.

2. **Type of contract.** The type of contract, which formulates the relationship between clients and contractors, affects the allocation of co. OH because it dictates the way contractors include their co. OH costs. Also, different contracts have different conditions regarding OH costs in particular. For example, cost plus contracts treat OH costs in a clearly defined manner which affects the way contractors can claim their co. OH costs. However, most of the contracts used locally are lump sum contracts which do not interfere in the way contractors calculate their OH costs, yet it encourages contractors to minimize the amount of OH costs included in the bid.
<table>
<thead>
<tr>
<th>Factors affecting Co. OH allocation</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Total</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Type of contract</td>
<td>22</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>60</td>
<td>67.6</td>
<td>2</td>
</tr>
<tr>
<td>B) Project complexity, location &amp; size</td>
<td>01</td>
<td>19</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>60</td>
<td>50.4</td>
<td>6</td>
</tr>
<tr>
<td>C) Need for work</td>
<td>16</td>
<td>22</td>
<td>11</td>
<td>11</td>
<td>07</td>
<td>60</td>
<td>71.6</td>
<td>1</td>
</tr>
<tr>
<td>D) Payment schedule</td>
<td>00</td>
<td>16</td>
<td>20</td>
<td>19</td>
<td>19</td>
<td>60</td>
<td>42.4</td>
<td>7</td>
</tr>
<tr>
<td>E) Contractor’s cash availability</td>
<td>05</td>
<td>23</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>51.0</td>
<td>5</td>
</tr>
<tr>
<td>F) Client’s strictness in supervision</td>
<td>00</td>
<td>12</td>
<td>21</td>
<td>24</td>
<td>21</td>
<td>60</td>
<td>38.0</td>
<td>8</td>
</tr>
<tr>
<td>G) Percentage of subcontracted work</td>
<td>07</td>
<td>16</td>
<td>16</td>
<td>07</td>
<td>07</td>
<td>60</td>
<td>58.4</td>
<td>4</td>
</tr>
<tr>
<td>H) Number of competitors</td>
<td>12</td>
<td>19</td>
<td>13</td>
<td>07</td>
<td>07</td>
<td>60</td>
<td>66.6</td>
<td>3</td>
</tr>
<tr>
<td>I) OTHER</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

5 = Strongly agree  4 = Agree  3 = Neutral  2 = Disagree  1 = Strongly disagree

Table 4-12
Factors affecting the amount of company OH allocated to a particular project
Figure 4-5
Importance index for factors affecting the amount of company OH allocated to a particular project
3. **Number of competitors.** At all times, contractors study carefully the chances of winning a project in conjunction with the surrounding level of competitiveness. The higher the competition, the lower the amount of co. OH allocated even if this means that co. OH is not fully recovered in the short run. Having the number of competitors in third position among factors affecting the allocation of co. OH emphasizes the importance of this factor.

4. **Percentage of subcontracted work.** Theoretically speaking, the percentage of subcontracted work should not affect the amount of co. OH allocation because co. OH costs are generated by the company and not by the project. However, results put this factor in the fourth place.

5. **Contractor’s cash availability.** Contractor’s cash availability as an internal matter affects the co. OH allocation process because it is a scale as to how far a contractor can go in underestimating his co. OH without facing serious financial consequences. Clearly, a financially sound contractor has the ability to postpone, if needed, a fair co. OH allocation till better times come. On the contrary, a contractor with financial difficulties will be forced to fairly include his co. OH, which limits his chances of winning the bid.

6. **Project complexity, location and size.** Co. OH is not in direct relation with project characteristics. However, project complexity, location, and size tend to encourage contractors not to under-allocate co. OH costs.
There are no clear explanations for this phenomenon except that complex, remote, and large projects force contractors to carefully study each and every aspect of the project so that a project bid, when submitted, properly reflects a safe expectation of future events simply because failure in such projects is catastrophic to contractors.

7. **Payment schedule.** Seemingly, there is no relation between co. OH and payment schedule or payment expectations. In construction, however, payments interfere in every decision including OH allocation. Furthermore, payment schedule effect on the co. OH allocation process can be understood from the contractor’s financial strength point of view as explained earlier in this section. However, the results in Table 4-12 show this factor holds only minimal importance in co. OH allocation decision.

8. **Client’s strictness in supervision.** There is no direct relation between co. OH and the degree of rigidity in client’s supervision, which is also apparent from the survey results.

4.2.6.4 **Frequency of checking OH rate**

One of the major mistakes contractors commit in allocating their co. OH is using the same OH rate year in and year out without bothering to check the validity of the rate. This results in under- or over-estimating co. OH costs. Construction cost estimation and accounting books recommend that OH rate be checked annually while results shown in
Table 4-13 also indicate that 85 % of the contractors surveyed do the same. The rest of the sample check OH rate arbitrarily when they feel it is needed.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>06 months</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>12 months</td>
<td>52</td>
<td>85</td>
<td>52</td>
<td>85</td>
</tr>
<tr>
<td>18 months</td>
<td>00</td>
<td>00</td>
<td>52</td>
<td>85</td>
</tr>
<tr>
<td>24 months</td>
<td>00</td>
<td>00</td>
<td>52</td>
<td>85</td>
</tr>
<tr>
<td>No fixed schedule</td>
<td>09</td>
<td>15</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-13
Intervals for checking company OH rate

4.2.6.5 Contractors' perception regarding OH cost allocation

In this section four points which reflect contractors' perception regarding co. OH cost allocation are examined. Survey results in Table 4-14 cite that 80 percent of the contractors do appreciate the importance of using the right allocation approach. The remaining 20 percent reported neutral response. The second statement investigates contractors' evaluation of their current allocation method. In this respect, 64 percent of the sample regards the currently-in-use methods sufficient but 7 percent of the sample totally disagree with this idea. In the third question, only 48 percent of the contractors expressed their agreement with the idea that more cost pools, as bases for co. OH allocation, yield a better cost
tractability and thus result in a more accurate OH cost allocation. Neutral response, however, represents 35 percent of all answers, which is a high percentage.

<table>
<thead>
<tr>
<th>Factors related to allocation method</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Tot.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using the right allocation method is vital for the contractors</td>
<td>00</td>
<td>00</td>
<td>12</td>
<td>26</td>
<td>23</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>00%</td>
<td>20%</td>
<td>42%</td>
<td>38%</td>
<td>100%</td>
</tr>
<tr>
<td>• Currently used method is effective</td>
<td>04</td>
<td>00</td>
<td>18</td>
<td>25</td>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>07%</td>
<td>00%</td>
<td>29%</td>
<td>41%</td>
<td>25%</td>
<td>100%</td>
</tr>
<tr>
<td>• Accurate allocation can be achieved if more cost pools are used</td>
<td>00</td>
<td>10</td>
<td>21</td>
<td>17</td>
<td>12</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>00%</td>
<td>17%</td>
<td>35%</td>
<td>28%</td>
<td>20%</td>
<td>100%</td>
</tr>
<tr>
<td>• Better allocation can be achieved if activity based costing (ABC) is used</td>
<td>06</td>
<td>00</td>
<td>22</td>
<td>16</td>
<td>09</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>11%</td>
<td>00%</td>
<td>42%</td>
<td>30%</td>
<td>17%</td>
<td>100%</td>
</tr>
</tbody>
</table>

1 = Strongly disagree  2 = Disagree  3 = Neutral  4 = Agree  5 = Strongly agree

Table 4-14
Contractors’ perception regarding company OH allocation

Activity based costing (ABC) was investigated as a relatively new cost accounting method which relies on the concept of relating costs to the activities causing them. The idea was totally new to many contractors, which necessitated that the concept be explained to them in order to gauge their perception. In spite of that, only 53 contractors made their judgment on the issue. Results show that while 47 percent of the contractors surveyed agree or strongly agree on the ABC approach, 11
percent strongly disagree but 42 percent of the sample have neutral response. In discussing the concept, many contractors had the impression that although the theory behind ABC is valid, it may be difficult to apply in the construction industry because company resources are continuously performing many activities in a manner which makes tractability very difficult.

4.2.7 Controlling Company OH Cost

Correctly reducing co. OH costs necessitates the implementation of a cost control process which takes into consideration overall organization strategic objectives. This point was investigated in this question which asks contractors to specify efforts taken to reduce or control co. OH costs. Results are summarized in Table 4-15

<table>
<thead>
<tr>
<th>Efforts to reduce co. OH costs</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum. Freq.</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) No efforts are exerted</td>
<td>14</td>
<td>23</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>B) Steps are taken to reduce co. OH</td>
<td>47</td>
<td>77</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-15
Rate of applying steps to reduce co. OH costs

Results in Table 4-15 indicate that 77 percent of the contractors do apply a cost control plan for co. OH costs. In the second part of this question contractors were asked to explain their cost control plans. Answers can be divided into two groups. First, the majority of contractors (87 percent) explained their cost
control plans as an instantaneous decision aimed at cutting co. OH costs which came as a reaction to high OH rates. Such actions cannot be called a cost control plan as they are not part of a comprehensive understanding of the issue. A comprehensive understanding shall have objective setting, execution plan, monitoring and correction. Those contractors have the impression that they have cost control plans while they do not. Many examples are mentioned in this regard such as: reducing the size and staff of main office, renting facilities for offices and accommodation instead of building them, recruiting manpower with lower wages and who can handle a wider range of tasks, sharing head office resources with sister companies, reducing equipment and plant costs by selling surplus equipment, and reducing or canceling overtime and bonuses.

On the other hand, 13 percent of contractors who have reported having a cost control plans for co. OH costs described comprehensive plans which have a cost target to be met, a work plan to achieve target, checking variances to evaluate progress and taking necessary corrective actions. Described cost control plans have two aspects. First, reducing co. OH costs by eliminating unneeded expenses on the spot to achieve quick results to safeguard the firm against bankruptcy during the peak period of the problem. Second, a cost control process is implemented for all expenses, including co. OH costs. This process is greatly affected by the overall business objectives which sense available chances and potential clients. The co. OH part of the process does not significantly differ from other cost control processes; it includes setting a target cost for co. OH, putting rules and regulations for spending, monitoring progress periodically, and taking corrective actions when needed. There are times, however, when sudden changes in the work load occur, that flexible measures are instantaneously implemented to cope with the changes because
contractors cannot afford to lose new work chances as a result of implementing an OH cost control plan.

4.2.8 Additional Comments and Recommendations

Participants were also asked if they have additional comments or suggestions regarding company OH costs. Only six contractors answered. Two points can be drawn from their answers. First, the unstable construction market makes it difficult for contractors to decide on the optimum level of OH costs that enables contractors to win and administer large projects and at the same time does not financially deplete the company. This factor was also sensed as a major reason for increased co. OH costs when lack of new projects was evaluated second among causes of increased co. OH costs in Table 4-8. Second, there are new types of OH costs which were not previously known to Saudi contractors, such as insurance and financial costs which are project OH costs in general but can be considered company OH costs in many instances. These costs are on the rise and local contractors have minimal control over them. Contractors who mentioned these costs suggested that government should be involved to help contractors find a middle way with banks and other surety groups.

4.3 PROJECT OH COSTS

Project OH costs are the second type of OH costs in the construction industry which are solely caused by projects and thus can be directly
added to project cost estimate during bidding. In this section, survey results regarding project OH costs are presented. Results discuss definition of project OH, its percentage to project direct costs, contractors' perception regarding project OH, types of project OH costs, how it is estimated, factors affecting the size of project OH, and efforts exerted to control project OH costs.

4.3.1 What is Project OH Cost?

Contractors were asked to identify project OH costs in the first question. This was an open-ended question and 61 answers were observed. All contractors defined project OH costs correctly but with different degrees of clarity. In fact all contractors surveyed defined the term as those costs specific to a project but not to a work item within the project. Many examples were mentioned among which are supervision cost and temporary constructions. Does this clarity in the meaning of the term imply that project OH costs are more comfortably managed?

4.3.2 Ratio of Project OH Cost to Project Direct Cost

This question aims to quantify project OH costs compared to project material, labor, and equipment costs. According to the literature, project OH costs vary from one project to another but range from 5 to 30 percent of material, labor, and equipment total costs as detailed in chapter 2. Results in Table 4-16 indicate that project OH costs for the majority of contractors range from 11 to 20 percent of direct costs, which is an
acceptable range compared to data found in the literature. The overall ratio is 14.9 percent.

<table>
<thead>
<tr>
<th>Ratio of project OH to project direct costs</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum. Freq.</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-05</td>
<td>01</td>
<td>02</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>06-10</td>
<td>11</td>
<td>18</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>11-15</td>
<td>23</td>
<td>38</td>
<td>35</td>
<td>58</td>
</tr>
<tr>
<td>16-20</td>
<td>16</td>
<td>26</td>
<td>51</td>
<td>84</td>
</tr>
<tr>
<td>21-25</td>
<td>10</td>
<td>16</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>26-30</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>NOT CALCULATED</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-16
Ratio of project OH to project direct costs

4.3.3 Contractors' Perception Regarding Project OH Costs

Contractors' perception regarding project OH costs are investigated in this section in three aspects. First, whether project OH has increased or decreased during the past five years. Second, what are the reasons for such an increase or decrease? Third, what is the degree of acceptance of the current level of project OH costs? Knowing contractors' response to these points helps in directing efforts towards reducing project OH costs. Results are shown as follows:
4.3.3.1 Changes in project OH costs

Results in Table 4-17 clearly show that the overwhelming majority of contractors believe that project OH has increased during the past years.

<table>
<thead>
<tr>
<th>Directions in project OH cost</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum. Freq.</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased</td>
<td>56</td>
<td>92</td>
<td>56</td>
<td>92</td>
</tr>
<tr>
<td>Decreased</td>
<td>02</td>
<td>03</td>
<td>58</td>
<td>95</td>
</tr>
<tr>
<td>No change</td>
<td>03</td>
<td>05</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-17
Directions in project OH cost

4.3.3.2 Reasons for increased project OH costs

Knowing reasons for increased project OH costs helps in directing efforts needed to control them. Seven potential causes for increased project OH costs were identified and examined as shown in Table 4-18 and Figure 4-6. Results order potential causes as follows:

1. *Delayed payments and financing costs.* In contractors' judgment, the first factor which has caused increased project OH costs is delayed payments and the second is financing cost. The two factors are put together because they are strongly interrelated. Contractors who suffer from the consequences of delayed payments usually look for external financial support. Even those contractors who do not need financial
support add a certain rate as a compensation for financing the project from their own resources.

<table>
<thead>
<tr>
<th>Reasons for increased project OH</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Total</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Lack of new projects</td>
<td>07</td>
<td>06</td>
<td>16</td>
<td>21</td>
<td>11</td>
<td>61</td>
<td>52.4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>11 %</td>
<td>10 %</td>
<td>26 %</td>
<td>35 %</td>
<td>18 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Cost inflation</td>
<td>21</td>
<td>07</td>
<td>06</td>
<td>16</td>
<td>11</td>
<td>61</td>
<td>63.6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>35 %</td>
<td>11 %</td>
<td>10 %</td>
<td>26 %</td>
<td>18 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) Delayed payments</td>
<td>40</td>
<td>12</td>
<td>09</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>90.2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>65 %</td>
<td>20 %</td>
<td>15 %</td>
<td>00 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) Government regulation</td>
<td>07</td>
<td>13</td>
<td>16</td>
<td>22</td>
<td>03</td>
<td>61</td>
<td>59.6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>11 %</td>
<td>21 %</td>
<td>26 %</td>
<td>37 %</td>
<td>05 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) Increased financing cost</td>
<td>34</td>
<td>02</td>
<td>11</td>
<td>10</td>
<td>04</td>
<td>61</td>
<td>77.0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>56 %</td>
<td>03 %</td>
<td>18 %</td>
<td>16 %</td>
<td>07 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F) Client related requirements</td>
<td>09</td>
<td>18</td>
<td>20</td>
<td>05</td>
<td>09</td>
<td>61</td>
<td>64.2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15 %</td>
<td>30 %</td>
<td>32 %</td>
<td>08 %</td>
<td>15 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G) Firm’s growth</td>
<td>00</td>
<td>12</td>
<td>10</td>
<td>13</td>
<td>26</td>
<td>61</td>
<td>42.6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>00 %</td>
<td>20 %</td>
<td>16 %</td>
<td>21 %</td>
<td>43 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H) Other</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>00</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>00 %</td>
<td>00 %</td>
<td>00 %</td>
<td>00 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 = Strongly agree  4 = Agree  3 = Neutral  2 = Disagree  1 = Strongly disagree

Table 4-18
Reasons for increased project OH costs
Figure 4-6
Importance index for causes of increased project OH costs
2. **Client requirements.** The third factor for increased project OH is client requirements. Included in this factor are bid bond, performance bond, insurance, supervision costs, and temporary constructions.

3. **Cost inflation.** Project OH activities consume many resources such as manpower, material and equipment (if included as project OH). Increased prices for these resources reflect on project OH.

4. **Government regulations.** Contractors place this factor fourth. However, regulations causing such an increase are not investigated here as they are beyond the scope of the research.

5. **Lack of new projects.** Project OH costs are generated by project nature and not affected by the external environment, which makes it difficult to explain why lack of new projects is considered a cause for increased project OH costs. However, it must be noted that this factor came with a low mean value and just before the last factor (firm’s growth), which indicates that its effect on project OH costs is weak.

6. **Firm’s growth.** As said earlier, project OH is a function of the project itself and not of external circumstances. This minimizes the effect of firm’s growth on project OH. Results confirm this understanding.
4.3.3.3 Acceptance of current rate of project OH

The amount of project OH differs from one project to another, which makes it difficult to sense its acceptance among contractors. However, because the contractors surveyed usually use government or semi-government contracts in their projects, project requirements are similar in their nature. Results in Table 4-19 reflect contractors’ opinion on the issue.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly accepted</td>
<td>27</td>
<td>45</td>
<td>27</td>
<td>45</td>
</tr>
<tr>
<td>Accepted</td>
<td>13</td>
<td>21</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Neutral</td>
<td>16</td>
<td>26</td>
<td>56</td>
<td>92</td>
</tr>
<tr>
<td>Not accepted</td>
<td>05</td>
<td>08</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>Strongly not accepted</td>
<td>00</td>
<td>00</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-19
Level of acceptance of current project OH costs

4.3.4 Distribution of Project OH Cost

The structure of project OH is examined in this question. There are traditional types of project OH costs as mentioned in chapter 2. Reviewed literature does not quantify these types because they differ from one contractor to another and from time to time depending on the nature of projects and on the company accounting system. However, some references place supervision
cost, temporary construction, and equipment cost (if included as a project OH cost) at the top of the list. Results for project OH distribution are shown in Table 4-20 and Figure 4-7. Results arrange types of project OH costs as follows:

<table>
<thead>
<tr>
<th>Types of project OH costs</th>
<th>0-5%</th>
<th>6-10%</th>
<th>11-15%</th>
<th>16-20%</th>
<th>Over 20%</th>
<th>Item not included</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervision cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>including staff wages</td>
<td>00%</td>
<td>02%</td>
<td>03%</td>
<td>23%</td>
<td>33%</td>
<td>00%</td>
<td>88.6</td>
<td>1</td>
</tr>
<tr>
<td>Insurance, taxes &amp; bonds</td>
<td>38%</td>
<td>21%</td>
<td>02%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>29.2</td>
<td>7</td>
</tr>
<tr>
<td>Estimate contingency &amp; unforeseen conditions</td>
<td>16%</td>
<td>37%</td>
<td>08%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>37.4</td>
<td>6</td>
</tr>
<tr>
<td>Temporary construction</td>
<td>04%</td>
<td>10%</td>
<td>06%</td>
<td>14%</td>
<td>27%</td>
<td>00%</td>
<td>76.4</td>
<td>3</td>
</tr>
<tr>
<td>Cost of rework</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>61%</td>
<td>28.2*</td>
<td>8</td>
</tr>
<tr>
<td>Financing cost</td>
<td>00%</td>
<td>00%</td>
<td>28%</td>
<td>09%</td>
<td>00%</td>
<td>00%</td>
<td>64.8*</td>
<td>4</td>
</tr>
<tr>
<td>Profit</td>
<td>00%</td>
<td>07%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>54%</td>
<td>40.0*</td>
<td>5</td>
</tr>
<tr>
<td>Equipment cost</td>
<td>00%</td>
<td>00%</td>
<td>02%</td>
<td>01%</td>
<td>07%</td>
<td>51%</td>
<td>82.0*</td>
<td>2</td>
</tr>
<tr>
<td>Other .....................</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

N=61
0-5 % (very low) =1 & over 20% (very high) =5

* For contractors who include this item as a project OH cost

Table 4-20
Classification of project OH costs

128
Figure 4-7
Importance index for project OH components
1. *Supervision costs:* Supervision costs are the highest project OH cost with 54 percent of the respondent contractors having above 20 percent of their average project OH costs as supervision costs. Supervision costs include, but are not limited to, project staff wages and site management costs.

2. *Equipment costs:* Among surveyed contractors, only 16 percent consider equipment cost a project OH cost. The remaining 84 percent estimate equipment cost as they do for material and labor costs. This is understood because the contractors surveyed usually execute large projects which need a lot of earth-moving work or similar equipment-intensive activities. In this case, equipment costs constitute a significant part of total costs and cannot be treated as a project OH cost. However, even large contractors may need to consider equipment cost as a project OH cost. This is true in small projects or when equipment costs cannot practically be traced to specific work items. When equipment costs are considered project OH costs, then they become the second highest project OH cost. In this case, they constitute more than 20 percent of the project OH for 70 percent of those contractors who consider equipment cost a project OH cost.

3. *Temporary constructions:* Clients usually require contractors to construct temporary facilities needed during the execution of the project. In case the contract does not specify separate pay items for such facilities, contractors have no choice but to treat these costs as a project OH cost.
Survey results reveal that temporary constructions take more than 16 percent of total project OH costs for 67% of respondent.

4. Financing costs: Contractors may seek external financial support to proceed in a specific project. Such support has a price which cannot be loaded on the company nor on a specific trade within the project and thus considered a project OH cost. Only 39 percent of the contractors surveyed do not need external financing of their projects. The majority of the remaining contractors have a financing cost ranging from 11 to 15 percent of total project OH costs.

5. Profit: Only 11 percent of the respondent contractors reported that they consider profit as part of project OH costs. Profit constitutes 6 to 10 percent of project OH costs for all contractors who include it.

6. Estimate contingency and unforeseen conditions: Contractors add to their project cost estimate an additional sum for errors in the estimate and unforeseen conditions which may yield additional costs. Results show that such amounts range from 0 to 5 percent for 26 percent of the contractors and from 6 to 10 percent of project OH for 61 percent of contractors.

7. Insurance, taxes, and bonds: These are costs needed by all projects to secure clients financially and legally against accidents, mistakes, or omissions. They represent 0 to 5 percent for the majority of the contractors.
8. **Cost of rework:** Results indicate that the cost of rework does not itself stand as a project OH cost. Instead, such costs are included in the estimate contingency.

4.3.5 Estimation of Project OH Costs

Three aspects are covered in this section. First, how project OH costs are estimated. Second, why a particular method is used. Third, what the factors affecting project OH costs are.

4.3.5.1 **Estimating project OH costs.**

In this question, contractors were asked to identify the method used to incorporate project OH in the project estimate. Results in Table 4-21 indicate that the contractors surveyed use only two methods. The majority estimate project OH costs directly from the contract documents by checking contract requirements and estimate resources needed by the project such as manpower needed to supervise work at the construction site or temporary construction. The other method uses project total direct costs as a base to calculate project OH costs and is used by 29 percent of the contractors surveyed.
### Methods used to include project OH costs in the project bid

<table>
<thead>
<tr>
<th>Method</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum Freq</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate from contract documents</td>
<td>42</td>
<td>71</td>
<td>42</td>
<td>71</td>
</tr>
<tr>
<td>Relatively fixed amount</td>
<td>00</td>
<td>00</td>
<td>42</td>
<td>71</td>
</tr>
<tr>
<td>Percentage of labor cost</td>
<td>00</td>
<td>00</td>
<td>42</td>
<td>71</td>
</tr>
<tr>
<td>Percentage of material cost</td>
<td>00</td>
<td>00</td>
<td>42</td>
<td>71</td>
</tr>
<tr>
<td>Percentage of material &amp; labor cost</td>
<td>00</td>
<td>00</td>
<td>42</td>
<td>71</td>
</tr>
<tr>
<td>Percentage of all direct costs</td>
<td>17</td>
<td>29</td>
<td>59</td>
<td>100</td>
</tr>
<tr>
<td>Project OH is not estimated</td>
<td>00</td>
<td>00</td>
<td>59</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>00</td>
<td>00</td>
<td>59</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-21
Method used to estimate project OH cost

#### 4.3.5.2 Why a particular method to estimate project OH costs is used?

Contractors were also asked why they use these methods to estimate project OH costs. Answers in Table 4-22 show that 67 of the contractors do so because contract documents, particularly contract special conditions and bill of quantities, allow them to directly or indirectly quantify project OH costs. Another 21 percent of the surveyed contractors use direct costs as a base for calculating project OH costs because the two costs are related. Only 12 percent of the respondents gave other reasons for their philosophy behind using a particular cost estimation method for project OH costs. In fact, most project OH costs are time-related but the time factor was not appreciated in contractors' response.
<table>
<thead>
<tr>
<th>Reasons why a particular method is used</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum Freq</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects are similar in nature</td>
<td>04</td>
<td>07</td>
<td>04</td>
<td>07</td>
</tr>
<tr>
<td>Project OH is mainly a time related expense</td>
<td>03</td>
<td>05</td>
<td>07</td>
<td>12</td>
</tr>
<tr>
<td>Project OH can be easily related to direct costs</td>
<td>13</td>
<td>21</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>Contract documents allow for estimation</td>
<td>41</td>
<td>67</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>Other ..................................</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-22
Reasons behind using a particular method in estimating project OH

4.3.5.3 *Factors affecting project OH costs*

Usually, contractors depend upon contract documents and check lists to figure out project OH costs. But like co. OH costs, there are other factors which affect contractors' final decision in determining project OH. These factors could be contract type, the amount of subcontracted work, project nature, payment schedule, contractor's need for work, number of competitors, and client's reputation as to how he supervises the work. Survey results regarding these factors are presented in table 4-23 and Figure 4-8. Results reveal that factors affecting project OH can be arranged in the following order:
1. **Project complexity, location & size:** Project characteristics are the most important factors in determining project OH costs. Project complexity, location, and size are well studied by contractors as they greatly affect project OH. These factors are usually easily checked through site visits and contract documents. Important items of project OH costs such as supervision cost, equipment cost, temporary constructions are solely determined based on project complexity, location, and size.

<table>
<thead>
<tr>
<th>Factors Affecting project OH</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Tot</th>
<th>Index %</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Type of contract</td>
<td>03</td>
<td>10</td>
<td>11</td>
<td>37</td>
<td>00</td>
<td>61</td>
<td>53.2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>05 %</td>
<td>16 %</td>
<td>18 %</td>
<td>61 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Project complexity,</td>
<td>29</td>
<td>15</td>
<td>16</td>
<td>01</td>
<td>00</td>
<td>61</td>
<td>83.6</td>
<td>1</td>
</tr>
<tr>
<td>location &amp; size</td>
<td>47 %</td>
<td>25 %</td>
<td>26 %</td>
<td>02 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) Need for work</td>
<td>10</td>
<td>17</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td>61</td>
<td>61.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>16 %</td>
<td>28 %</td>
<td>20 %</td>
<td>16 %</td>
<td>20 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) Payment schedule</td>
<td>02</td>
<td>22</td>
<td>33</td>
<td>04</td>
<td>00</td>
<td>61</td>
<td>64.6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>03 %</td>
<td>36 %</td>
<td>54 %</td>
<td>07 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) Contractor cash availability</td>
<td>00</td>
<td>07</td>
<td>23</td>
<td>04</td>
<td>27</td>
<td>61</td>
<td>43.2</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>00 %</td>
<td>11 %</td>
<td>38 %</td>
<td>07 %</td>
<td>44 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F) Client's strictness in supervision</td>
<td>11</td>
<td>14</td>
<td>22</td>
<td>08</td>
<td>00</td>
<td>56</td>
<td>56.4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>20 %</td>
<td>25 %</td>
<td>12 %</td>
<td>14 %</td>
<td>00 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G) Subcontracted work ratio</td>
<td>28</td>
<td>13</td>
<td>12</td>
<td>07</td>
<td>01</td>
<td>61</td>
<td>79.6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>46 %</td>
<td>21 %</td>
<td>20 %</td>
<td>11 %</td>
<td>02 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H) Number of competitors</td>
<td>07</td>
<td>12</td>
<td>09</td>
<td>19</td>
<td>61</td>
<td>100 %</td>
<td>50.2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>12 %</td>
<td>24 %</td>
<td>17 %</td>
<td>15 %</td>
<td>32 %</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I) Other....................</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>00</td>
<td>N/A</td>
</tr>
</tbody>
</table>

5 = Strongly agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly disagree

Table 4-23
Factors affecting the project OH costs

Figure 4-8
Importance index for factors affecting project OH costs

2. Percentage of subcontracted work: Each part of the project has its attached project OH costs. Sub-contracting parts of the project transfer much of these OH costs from the main contractor's estimate to the sub-contractor's estimate. However, contractors need to properly evaluate subcontractors' bids (which include their OH costs) in order not to lose competitiveness.

3. Payment schedule: Financing cost is determined based on the expected (scheduled) progress and corresponding payments received from clients. This factor came third in affecting project OH costs. As the time between invoices being submitted and payments being collected increases, so the cost of external financial support increases.

4. Need for work: Contractors' need for work has no direct impact on project OH costs because these costs are project driven and not company driven. However, this factor came fourth, which is difficult to explain.

5. Client's strictness in supervision: Contractors surveyed evaluated this factor in the fifth order among factors affecting amount of project OH costs. The reason could be that some contract requirements which are part of project OH costs are negotiable during the construction phase. Furthermore, quality control and safety plans, which constitute part of project OH costs, are also affected by the extent to which clients practice strict supervision.
6. **Type of contract:** Project OH costs are affected by contract type because some contracts, like the cost plus contracts, specify separate pay item for OH costs while other contracts do not. Generally speaking, contractors put as much OH costs as circumstances allow. Concealing OH costs, co. or project, within pay items is preferred by contractors because it helps recover project OH costs without being strictly traced by clients. Of course, this is possible only if other circumstances allow.

7. **Number of competitors:** Theoretically speaking, there is no relation between project OH and the number of competitors because as said earlier, project OH costs are initiated from within the project. This justifies having this factor towards the end of the list and with low mean value.

8. **Contractors cash availability:** Contractors with cash availability have a chance of canceling project financing cost and reducing fines paid to banks and other surety groups for their services. This factor came in last place among factors affecting project OH costs because not all contractors need financing costs and because insurance and tax costs are low.

4.3.6 **Controlling Project OH Cost**

Some project OH costs are to a great extent affected by factors beyond the contractor’s control. However, there are measures which, if implemented lead to reduced project OH. In this question, contractors were asked whether they
implement a cost control plan for project OH or not and to explain such plans if in use. Results are in Table 4-24.

<table>
<thead>
<tr>
<th>Rate of implementing a cost control plan</th>
<th>Freq</th>
<th>Percent</th>
<th>Cum. Freq</th>
<th>Cum. Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Not implemented</td>
<td>47</td>
<td>77</td>
<td>42</td>
<td>69</td>
</tr>
<tr>
<td>B) Implemented</td>
<td>14</td>
<td>23</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-24
Rate of implementing a cost control plan on project OH costs

The percentage of contractors who claim to implement cost control plans on project OH costs is only 23 percent whereas the percentage for implementing cost control plans on co. OH costs is 77 percent. However, explanations presented for such plans only show some common cost reduction measures which cannot formulate a real cost control plan because they lack the four major components of any cost control plan: target cost, execution, monitoring, correction. Contractors may exert less effort to control project OH costs because they have the impression that project OH costs are project, not company, driven which means owners shall compensate contractors for them like any other direct costs. Furthermore, the consequences of high project OH costs are not as serious as those for co. OH costs. Contractors who implement cost reduction measures mentioned the following actions:

- Accurately estimating project OH costs from documents and check lists in the first place.
• Practicing proper activity planning and scheduling to help in accurately estimating project duration, which deeply affects supervision and financing costs.

• Proper site management to maintain progress as scheduled and to limit delays.

• When planning for mobilization or temporary constructions, contractors try to save site offices, camps, and workshops for future projects.

• Recruit engineers and supervisors with low wages and deploy the lowest possible number of staff to administer the project.

• Use client’s available resources whenever possible on a rental basis rather than arranging for new facilities.

4.3.7 Additional Comments and Recommendations

Participants were asked if they have additional comments or suggestions regarding project OH costs. Only two contractors answered this question. Their main concern is rising financing and insurance costs, which was also reported in section 4.2.8 for co. OH costs. These costs constitute a significant amount (15 to 25 percent for some contractors, see Table 4-20) of the project OH cost, yet contractors have no control over them.
CHAPTER 5

SUMMARY, CONCLUSION and RECOMMENDATION

5.1 SUMMARY

Chapter 1 of this study (Introduction) covers the following topics:

- **Problem statement**, which focuses on contractors' perception regarding OH costs and what methods are used to estimate, allocate, and control them.

- **Significance of the research**: construction contracting is, cost-wise, based on the financial commitment made by contractors to execute the projects for a predetermined estimated lump sum amount of money which makes accuracy in forecasting future costs extremely important. In order to achieve accurate cost estimation, contractors have to consider indirect costs (OH costs). The importance of accurately estimating OH costs and fairly recovering them increases during times of recession and tough competition.
• **Research objectives** are to review literature related to OH costs and to investigate contractors’ awareness regarding OH costs.

• **Scope and limitations:** the study will be limited to building OH costs for large contractors in the eastern province of Saudi Arabia.

Chapter 2 concentrates on literature review and is divided into five sections as follows:

• **Cost estimation in construction:** in construction, the cost estimation process starts by quantifying material, manpower, equipment, and indirect resources needed to execute the project and then by pricing these resources. This needs up-to-date information regarding costs and experience in deciding important issues such as the rate at which co. OH costs have to be included. Types and classification of construction costs are also discussed here.

• **OH costs in construction:** definitions and types of construction OH costs are presented in this section. OH costs have many definitions but in general they mean costs that are incurred by construction contractors which cannot easily or directly be attributed to a separate work item within the project (project OH cost) or for a specific project handled by the company (co. OH cost).

• **Company OH costs** include company costs which are incurred by the construction company in maintaining the business and running or supporting the production process but are not directly related to a specific project. Methods to estimate and allocate co. OH costs are
presented in detail in this section. The relationship between company work load and OH costs are extremely delicate and very difficult to balance during recession because contractors suffer from two opposite forces. They need to recover co. OH costs and, at the same time, maintain a competitive bid. Major components of co. OH costs such as head office, automobile, insurance, taxes, fees, warehouses, and uncollected receivables are explained in this section.

- **Project OH costs**, which include project costs which cannot be distinctively caused by a specific work item within the project and encompass supervision cost, surety bonds, insurance, project financing, temporary constructions, cost of repair, miscellaneous costs, and equipment costs sometimes.

- **OH management.** Contractors objectives regarding OH costs have to be, in the first place, directed towards reducing unneeded OH costs and minimizing the use of cost allocation process because it diminishes the accuracy of the cost estimation process. Second, contractors have to enhance alternatives or improve the currently used OH allocation process. In doing so, tools such as activity based costing, organization auditing, and other cost control techniques are useful.

In chapter 3 the research methodology was explained. A series of structured interviews was conducted to collect information about contractors' understanding of OH cost, its effect on contractors' performance, types of OH cost, company OH percentage to annual
construction volume, its components, how company OH cost is estimated, and how contractors control it. For project OH cost similar topics were also covered. Data was collected through interviews made with a sample of 61 contractors. Data obtained from the survey was analyzed using statistical functions available in Microsoft Excel 7.

Chapter 4 contains the research results and results analysis which are divided into three major sections: OH cost awareness, co. OH costs, and project OH costs. Major findings are in section 5.2

5.2 FINDINGS and CONCLUSIONS

Major findings and conclusions are as follows:

5.2.1 OH Awareness

1. Respondents lack a unified understanding of OH costs. However, there is a common agreement that construction OH costs are of two types: company OH cost and project OH cost.

2. About 52 percent of the contractors surveyed have a high rate of OH costs if compared to data found in the literature.

3. Contractors’ perception regarding OH costs are:

   • 58 percent think the current level of OH costs is high.
   • 66 percent think OH cost badly affects contractors’ performance.
• 47 percent think OH cost was an important part of construction costs in the past.

• 91 percent think OH cost will be of greater importance in the future.

• Only 14 percent think OH cost can be monitored and controlled.

5.2.2 Company OH

1. Only 43 percent of respondents correctly defined co. OH costs.

2. About 73 percent of the respondents have above 10 percent of their project bid value coming from co. OH costs, which is a high level.

3. About 46 percent of contractors have a high level (15 % or above) of their annual construction volume coming from co. OH costs.

4. Contractors’ perception regarding co. OH costs can be summarized as follows:
   • 45 percent think the current level of co. OH is high.
   • 77 percent think co. OH costs have increased in the past five years.
   • Delayed payments, lack of new projects, and cost inflation are found to be the major causes for increased co. OH costs.
5. Automobile and equipment, head office expenses, labor related costs, and financing costs constitute the highest contributes to co. OH costs.

6. Findings regarding co. OH allocation are:

- The most commonly used allocation base is project total direct costs (38%) followed by project duration (23%). In third place comes the total of material, labor and equipment costs (21) and finally comes the total of material and labor costs (16%).

- Beside using the above allocation methods, contractors study other factors to decide on the final amount of co. OH to be allocated to a project. Contractor need for work, type of contract, number of competitors, and percentage of subcontracted work are the most important factors affecting the final decision regarding co. OH costs allocated to a project.

- Contractors' perception regarding co. OH allocation is determined as follows:
  
  * The majority (80%) think that using the right allocation method is vital for contractors. A smaller percentage (64%) think that the current allocation method is sufficient.

  * About half the contractors agreed that using more cost pools as a base for calculating allocated co. OH costs will result in more accurate cost allocation. Neutral response was high (35%).
* Activity based costing (ABC) is a new term to many contractors. When explained as an alternative to traditional costing systems that can result in more accurately allocated co. OH 47 percent agreed. Neutral response was 42 percent and 11 percent did not agree.

7. About 10 percent of the contractors surveyed have cost control plans implemented to reduce co. OH costs. Another 67 percent take haphazard measures to reduce co. OH costs. Only 23 percent reported they have no measures to reduce co. OH costs.

8. Contractors’ free comments are:

- The unstable construction market (lack of new construction projects) makes it difficult for contractors to maintain optimal co. OH level.

- Financing and insurance costs are rising, imposed mainly by banks and they need further regulation by government.

5.2.3 Project OH

1. All contractors surveyed correctly defined project OH costs as those costs specific to a project but not to a particular work item.

2. Project OH percentage to project direct costs ranges from 11 to 20 percent for 64 percent of contractors surveyed.
3. The majority of contractors think project OH has increased in the past years due to delayed payments, financing cost, and client requirements.

4. Supervision costs, equipment costs (when included as a project OH cost), temporary constructions, and financing costs are found to be the highest contributes to project OH costs.

5. Findings regarding estimating project OH costs are:

   • Direct estimation of project OH costs from contract documents is used by 71 percent of the contractors surveyed while 29 percent calculate project OH costs as a percentage of total direct costs of the project.

   • The reason for using the first approach is that contract documents allow for such direct estimation.

   • Project nature (complexity, location, and size), percentage of subcontracted work, payment schedule, need of work, and client’s strictness are found to be the most effective attributes to the final decision regarding the amount of project OH costs.

6. Only 23 percent of the respondents have taken some measures to control project OH costs.

7. Contractors’ free comments are that rising financing cost is becoming of major concern to many contractors.
5.3 RECOMMENDATIONS

Based on information found in the reviewed literature and research findings, the following measures are recommended so that construction OH costs can be better contained:

5.3.1 Recommendations for company OH costs:

1. Contractors need to be better informed about OH costs through short courses, seminars, professional and scientific societies. Contractors should be aware of the benefits of reduced co. OH costs to their organization and to the construction industry. Less OH means more efficient organization.

2. Contractors should, practically speaking, plan to maintain optimal levels of co. OH costs, thus reaching two objectives at the same time: to eliminate unneeded spending and to be able to secure or increase the firm’s market share in accordance with its strategic objectives.

3. Activity based costing can be used to achieve a more accurate recovery of co. OH costs.

4. Contractors are recommended to establish cost control plans to help reduce co. OH costs. Such plans should contain cost objectives, implementation steps, monitoring, and corrective actions.
5. Contractors should not undermine the benefits of the following measures in reducing co. OH costs:

- Maintaining sound safety programs helps reduce insurance costs.
- Contractors to increase cost awareness among their employees, set group cost targets with incentive plans and subsequently share the success with employees to enforce their interest in saving cost.
- Customer satisfaction helps in maintaining good reputation, which helps in obtaining loans and other financial services at lower costs.
- Applying the right combination of resources, which allows maximum utilization of co. head office manpower.

5.3.2 Recommendations for project OH costs:

1. Contractors and project owners should try to resolve the problem of delayed payments in order to reduce financing costs.

2. Contractors should implement cost control measures on supervision costs, equipment costs, temporary constructions, and financing costs as these items constitute the major project OH costs.

3. Project owners should minimize OH related requirements in their contract documents so that project OH costs can be reduced. This would be of reciprocal benefit to project owners.
5.3.3 Recommendations for future studies:

1. Future study can be conducted to investigate financing costs.

2. Study the suitability of currently used accounting system to the construction industry.

3. Similar study can be conducted to investigate the OH issues for small and medium contractors.
APPENDIX A

INTERVIEW QUESTIONS
TO: ________________________________
Att: ______________________________
Date: ______________________________
Tel: ___________ Fax: ______________

THIS RESEARCH IS SPONSORED BY
KING FAHAD UNIVERSITY OF PETROLEUM AND MINERALS
CONSTRUCTION ENGINEERING AND MANAGEMENT DEPARTMENT

BUILDING CONSTRUCTION OVERHEAD (OH) COSTS IN SAUDI ARABIA
INTERVIEW QUESTIONS

- All responses will remain fully confidential and for academic research only.
- Answer by putting a check mark next to the appropriate choice.
- Please remember that the benefits of this study depend greatly on the accuracy of your answers.
- Return this questionnaire as soon as possible.
- Return questionnaire to: MOHAMMAD H. AL-SHABRI
  P.O. BOX 409 KFUPM
  DHAHRAH, 31261
  TEL. 8403232 fax 8441075
PART ONE: GENERAL QUESTIONS ABOUT YOUR FIRM

1. Name of the firm (optional)

2. Address (optional)

3. Respondent's name (optional)

4. Respondent's title

5. Type of registration
   a) Saudi co.   b) foreign co.   c) joint venture

6. Type of contractor
   a) building   b) engineering   c) industrial   d) other

7. Firm's experience (in years)
   a) less than 5   b) 6-10   c) 11-15   d) 16-20   e) over 20

8. Annual construction volume (million sr)
   a) up to 30   b) 31-60   c) 61-80   d) 81-100   e) above 100

9. Ministry of public works and housing classification in building construction
   a) 1st grade   b) 2nd grade   c) 3rd grade   d) 4th grade   e) 5th grade

10. Average number of permanent employees
    a) up to 50   b) 51-200   c) 201-350   d) 351-500   e) over 500

11. Average number of temporary employees
    a) up to 30   b) 31-60   c) 61-90   d) 91-120   e) over 120

12. Number of engineers
    a) up to 5   b) 6-10   c) 11-15   d) 16-20   e) over 20

13. Number of cost estimators
    a) 3 or less   b) 4-5   c) 6-7   d) 8-9   e) 10 or above

14. Value of construction equipment (million sr)
    a) under 10   b) 10-20   c) 21-30   d) 31-40   e) over 40

15. Maximum job size (million sr)
    a) up to 20   b) 21-30   c) 31-40   d) 41-50   e) over 50

16. Average job size (million sr)
    a) less than 5   b) 5-10   c) 11-15   d) 16-20   e) above 20
17. Average job duration (in years)
   a) 1/2 under 1  b) 1-2 under 2  c) 2-3 under 3  d) 3-4 under 4  e) over 4

18. Number of area branches (not project site office)
   a) none  b) 1  c) 2  d) 3  e) 4 or more

19. Percentage of projects awarded to the company under competitive bidding
   a) 0-20%  b) 21-40%  c) 41-60%  d) 61-80%  e) 81-100%

20. Percentage of projects performed using lump sum contracts
   a) 0-20%  b) 21-40%  c) 41-60%  d) 61-80%  e) 81-100%

21. Average amount of work given to subcontractors
   a) 0-15%  b) 16-30%  c) 31-45%  d) 46-60%  e) 61-100%

22. Percentage of equipment leased/rented by the company
   a) 0-15%  b) 16-30%  c) 31-45%  d) 46-60%  e) 61-100%

PART TWO: QUESTIONS ABOUT OVERHEAD (OH) COST IN GENERAL

23. What does “OH cost” mean to you?

24. What are the types of OH you consider?
   a) all OH costs as a whole  b) company OH and project OH  c) other

25. Percentage of total OH cost to annual construction volume is
   a) less than 10%  b) 10-14%  c) 15-19%
   d) 20-24%  e) 25% or above  f) not calculated

To what extent do you agree with the following:

26. OH level is now acceptable
   Agree: 5  4  3  2  1

27. OH cost badly affects our performance at present
   Agree: 5  4  3  2  1

28. OH was not an important issue in the past
   Agree: 5  4  3  2  1

29. OH will be of greater importance in the future
   Agree: 5  4  3  2  1

30. OH costs can be monitored & controlled
   Agree: 5  4  3  2  1
PART THREE: QUESTIONS ABOUT GENERAL & ADMIN. (G&A) OH COST

31. What is company OH?

32. Average percentage of company OH cost to project direct cost is
   a) 0 - 5 %
   b) 6 - 10 %
   c) 11- 15 %
   d) 16 - 20 %
   e) above 20 %
   f) not calculated

33. Average percentage of company OH to annual construction volume is
   a) 0 - 5 %
   b) 6 -10 %
   c) 11- 15 %
   d) 16 - 20 %
   e) above 20 %
   f) not calculated

   agree..................disagree

34. The existing level of company OH is satisfactory

35. In the past 5 years, company OH
   a) increased
   b) decreased
   c) didn't change

36. Company OH increased or decreased due to
   a) lack of new projects
   b) cost inflation
   c) delayed payments
   d) government regulations
   e) increased marketing spending
   f) client related requirements
   g) firm's strategy (growth)
   h) other (specify)

37. Company OH can be divided percentage-wise into the following items:

<table>
<thead>
<tr>
<th>0-5%</th>
<th>6-10%</th>
<th>11-15%</th>
<th>16-20%</th>
<th>over 20%</th>
</tr>
</thead>
</table>
   a) head office employees’ salaries
   b) travel & entertainment
   c) automobile & equipment expenses
   d) head office rent, supplies & tele.
   e) insurance & taxes
   f) labor (health, housing & recruit.)
g) marketing
h) other (specify)

38. How do you include (allocate) company OH in the project bid?
   a) last year company OH costs allocated to a project based on its estimated duration
   b) last year company OH costs allocated to a project based on number of projects
   c) predetermined percentage of project bid value (company OH rate)
   d) predetermined percentage of project estimated material cost
   e) predetermined percentage of project estimated material & labor cost
   f) predetermined percentage of project estimated material, labor & equipment cost
   g) predetermined percentage of project total estimated direct cost including proj. OH
   h) company OH is not included in the project bid
   i) other (specify)

39. Above method is used because
   a) projects are similar in nature          b) company OH is mainly a time related spending
   c) company is mainly a direct cost related spending      d) other (specify)

40. Company OH allocated to a specific project is affected by

<table>
<thead>
<tr>
<th>Factor</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) type of contract</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>b) project complexity, location &amp; size</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>c) need for work</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>d) payment schedule</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>e) contractor cash availability</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>f) rigidity in following specs. by client</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>g) percentage of subcontracted work</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>h) number of competitors</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>i) other (specify)</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

41. Using the right allocation sys. is vital for the contractors | 5    | 4      | 3   |
42. Currently used allocation method is effective | 5    | 4      | 3   |
43. Company OH can be more accurately allocated if more cost pools are used as a base for allocation | 5    | 4      | 3   |
44. Company OH can be more accurately allocated using activity based costing (abc) | 5    | 4      | 3   |
45. How often do you check company OH rate? (in years)
   a) 1/2       b) 1       c) 1 1/2       d) 2       e) above 2

46. To maintain acceptable rate of company OH costs, cost reduction/control efforts are taken
   a) no       b) yes (explain)
   .................................................................
   ...................................................................
   ...................................................................
   ...................................................................
   ...................................................................

47. Do you have additional comments regarding company OH?
   ...................................................................
   ...................................................................
   ...................................................................

PART FOUR: QUESTIONS ABOUT PROJECT OH COST

48. What is project OH?
   ...................................................................
   ...................................................................
   ...................................................................
   ...................................................................

49. Average percentage of project OH cost to project direct cost is
   a) 0 -5 %       b) 6 -10 %       c) 11- 15 %       d) 16-20 %
   e) 21- 25 %     f) 26-30       g) above 30 %     h) not calculated

50. In the past 5 years, project OH
   a) increased     b) decreased   c) didn't change

51. Project OH increased or decreased due to
   ...................... agree............. disagree

   a) lack of new projects
   b) cost inflation
   c) delayed payments
   d) government regulations
   e) project financing cost increased


158
52. The existing level of project OH is satisfactory ........................................... 5 4 3 2 1

53. Project OH can be divided percentage-wise into the following items:

<table>
<thead>
<tr>
<th>type of project OH cost</th>
<th>0-5%</th>
<th>6-10%</th>
<th>11-5%</th>
<th>16-20%</th>
<th>over 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) supervision costs &amp; staff wages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) insurance, taxes &amp; bonds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) unforeseen conditions / contingency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) temporary construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) cost of rework</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) project financing cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g) profit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) equipment cost</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>j) other (specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

54. How do you include project OH cost in the project bid?
   a) detailed estimate from contract documents and prepared schedule
   b) fixed amount depending on similar past experience and expected project duration
   c) predetermined percentage of labor cost
   d) predetermined percentage of material cost
   e) predetermined percentage of material & labor cost
   f) predetermined percentage of total direct cost (material, labor & equip. costs)
   g) project OH is not estimated
   h) other (specify)..............................................................

55. Above method is used because
   a) projects are similar in nature
   b) project OH is mainly a time related spending
   c) project OH can be easily related to direct cost
   d) contract documents allow for detailed estimation of project OH
   e) other(specify)......................................................................
56. Amount of project OH cost allocated to a specific project is affected by

<table>
<thead>
<tr>
<th></th>
<th>high</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) type of contract</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>b) project location, complexity &amp; size</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>c) need for work</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>d) payment schedule</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>e) contractor cash availability</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>f) rigidity in following specs. by client</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>g) percentage of subcontracted work</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>h) number of competitors</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>i) other (specify)</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

57. Are you making a planed effort to reduce / control project OH cost?

a) no  
b) yes (explain) ..............................................................

58. Do you have additional comments regarding project OH?

........................................................................................................

thank you very much for your cooperation
APPENDIX B

CONTRACTORS’ CHARACTERISTICS
<table>
<thead>
<tr>
<th>RESPONDENT'S TITLE</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL MANAGER</td>
<td>22</td>
<td>36</td>
<td>22</td>
<td>36</td>
</tr>
<tr>
<td>PROJECT MANAGER</td>
<td>13</td>
<td>21</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>COST ESTIMATOR</td>
<td>26</td>
<td>43</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>ACCOUNTANTS</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-1**
RESPONDENT'S TITLE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING</td>
<td>26</td>
<td>43</td>
<td>26</td>
<td>43</td>
</tr>
<tr>
<td>ENGINEERING</td>
<td>00</td>
<td>00</td>
<td>26</td>
<td>43</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>00</td>
<td>00</td>
<td>26</td>
<td>43</td>
</tr>
<tr>
<td>GEN. CONSTRUCTION</td>
<td>35</td>
<td>57</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-2**
TYPE OF CONTRACTING REGISTRATION
<table>
<thead>
<tr>
<th>EXPERIENCE (YEARS)</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESS THAN 5</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>06-10</td>
<td>09</td>
<td>15</td>
<td>09</td>
<td>15</td>
</tr>
<tr>
<td>11-15</td>
<td>14</td>
<td>23</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>16-20</td>
<td>14</td>
<td>23</td>
<td>37</td>
<td>61</td>
</tr>
<tr>
<td>ABOVE 20</td>
<td>24</td>
<td>39</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-3**  
*Firms' Experience*

<table>
<thead>
<tr>
<th>CONSTRUCTION VOLUME (MILLION, SR)</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 30</td>
<td>12</td>
<td>20</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>31-60</td>
<td>22</td>
<td>36</td>
<td>34</td>
<td>56</td>
</tr>
<tr>
<td>61-80</td>
<td>7</td>
<td>11</td>
<td>41</td>
<td>67</td>
</tr>
<tr>
<td>81-100</td>
<td>6</td>
<td>10</td>
<td>47</td>
<td>77</td>
</tr>
<tr>
<td>OVER 100</td>
<td>14</td>
<td>23</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-4**  
*Annual Construction Volume*
<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>FREQ</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ST GRADE</td>
<td>14</td>
<td>23</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>2ND GRADE</td>
<td>19</td>
<td>31</td>
<td>33</td>
<td>54</td>
</tr>
<tr>
<td>3RD GRADE</td>
<td>27</td>
<td>44</td>
<td>60</td>
<td>98</td>
</tr>
<tr>
<td>4TH GRADE</td>
<td>01</td>
<td>02</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>5TH GRADE</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-5**
MPWH CLASSIFICATION

<table>
<thead>
<tr>
<th>PERMANENT EMPLOYEES</th>
<th>FREQ</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 50</td>
<td>03</td>
<td>05</td>
<td>03</td>
<td>05</td>
</tr>
<tr>
<td>51-200</td>
<td>14</td>
<td>23</td>
<td>17</td>
<td>28</td>
</tr>
<tr>
<td>201-350</td>
<td>27</td>
<td>44</td>
<td>44</td>
<td>72</td>
</tr>
<tr>
<td>351-500</td>
<td>05</td>
<td>08</td>
<td>49</td>
<td>80</td>
</tr>
<tr>
<td>OVER 500</td>
<td>12</td>
<td>20</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-6**
NUMBER OF PERMANENT EMPLOYEES
<table>
<thead>
<tr>
<th>TEMPORARY EMPLOYEES</th>
<th>FREQ</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 30</td>
<td>24</td>
<td>39</td>
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<td>39</td>
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<tr>
<td>31- 60</td>
<td>13</td>
<td>21</td>
<td>37</td>
<td>60</td>
</tr>
<tr>
<td>61- 90</td>
<td>17</td>
<td>28</td>
<td>54</td>
<td>88</td>
</tr>
<tr>
<td>91- 120</td>
<td>01</td>
<td>02</td>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td>OVER 120</td>
<td>06</td>
<td>10</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-7**
**NUMBER OF TEMPORARY EMPLOYEES**

<table>
<thead>
<tr>
<th>NO. OF ENGINEERS</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 5</td>
<td>03</td>
<td>05</td>
<td>03</td>
<td>05</td>
</tr>
<tr>
<td>06- 10</td>
<td>15</td>
<td>25</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>11- 15</td>
<td>12</td>
<td>20</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>16- 20</td>
<td>08</td>
<td>13</td>
<td>38</td>
<td>63</td>
</tr>
<tr>
<td>OVER 20</td>
<td>23</td>
<td>37</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-8**
**NUMBER OF ENGINEERS**
### TABLE B-9
**NUMBER OF COST ESTIMATORS**

<table>
<thead>
<tr>
<th>COST ESTIMATORS</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 OR LESS</td>
<td>19</td>
<td>31</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>4-5</td>
<td>14</td>
<td>23</td>
<td>33</td>
<td>54</td>
</tr>
<tr>
<td>6-7</td>
<td>08</td>
<td>13</td>
<td>41</td>
<td>67</td>
</tr>
<tr>
<td>8-9</td>
<td>06</td>
<td>10</td>
<td>47</td>
<td>77</td>
</tr>
<tr>
<td>10 OR ABOVE</td>
<td>14</td>
<td>23</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

### TABLE B-10
**VALUE OF CONST. EQUIPMENT (MILLION SR)**

<table>
<thead>
<tr>
<th>VALUE OF EQUIPMENT</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDER 10</td>
<td>12</td>
<td>20</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>10-20</td>
<td>15</td>
<td>24</td>
<td>27</td>
<td>44</td>
</tr>
<tr>
<td>21-30</td>
<td>06</td>
<td>10</td>
<td>33</td>
<td>54</td>
</tr>
<tr>
<td>31-40</td>
<td>15</td>
<td>25</td>
<td>48</td>
<td>79</td>
</tr>
<tr>
<td>OVER 40</td>
<td>13</td>
<td>21</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>MAX. JOB SIZE</td>
<td>FREQ.</td>
<td>PERCENT</td>
<td>CUM. FREQ.</td>
<td>CUM. PERCENT</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>---------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>UP TO 20</td>
<td>12</td>
<td>20</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>21-30</td>
<td>03</td>
<td>05</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>31-40</td>
<td>03</td>
<td>05</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>41-50</td>
<td>13</td>
<td>21</td>
<td>31</td>
<td>51</td>
</tr>
<tr>
<td>OVER 50</td>
<td>30</td>
<td>49</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-11**
**MAXIMUM JOB SIZE (MILLION SR)**

<table>
<thead>
<tr>
<th>AVE. JOB SIZE</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESS THAN 5</td>
<td>06</td>
<td>10</td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td>05-10</td>
<td>19</td>
<td>31</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td>11-15</td>
<td>11</td>
<td>18</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>16-20</td>
<td>13</td>
<td>21</td>
<td>49</td>
<td>80</td>
</tr>
<tr>
<td>ABOVE 20</td>
<td>12</td>
<td>20</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-12**
**AVERAGE JOB SIZE (MILLION SR)**
### Table B-13
**Average Job Duration (in Years)**

<table>
<thead>
<tr>
<th>AVE. JOB DURATION</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESS THAN 1 YEAR</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>1- UNDER 2 YEAR</td>
<td>45</td>
<td>73</td>
<td>45</td>
<td>73</td>
</tr>
<tr>
<td>2- UNDER 3 YEAR</td>
<td>15</td>
<td>25</td>
<td>60</td>
<td>98</td>
</tr>
<tr>
<td>3- UNDER 4 YEAR</td>
<td>01</td>
<td>02</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>4- UNDER 5 YEAR</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table B-14
**Number of Area Branches**

<table>
<thead>
<tr>
<th>NO. OF BRANCHES</th>
<th>FREQ</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>12</td>
<td>20</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>41</td>
<td>37</td>
<td>61</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>16</td>
<td>47</td>
<td>77</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>16</td>
<td>57</td>
<td>93</td>
</tr>
<tr>
<td>4 OR MORE</td>
<td>04</td>
<td>07</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>COMPETITIVE BIDDING WORK (%)</td>
<td>FREQ.</td>
<td>PERCENT</td>
<td>CUM. FREQ.</td>
<td>CUM. PERCENT</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>---------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>00-20</td>
<td>01</td>
<td>02</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>21-40</td>
<td>05</td>
<td>08</td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td>41-60</td>
<td>05</td>
<td>08</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>61-80</td>
<td>16</td>
<td>26</td>
<td>27</td>
<td>44</td>
</tr>
<tr>
<td>81-100</td>
<td>34</td>
<td>56</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-15**
PERCENTAGE OF WORK PERFORMED UNDER COMPETITIVE BIDDING

<table>
<thead>
<tr>
<th>LUMP SUM CONTRACTS (%)</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-20</td>
<td>07</td>
<td>11</td>
<td>07</td>
<td>11</td>
</tr>
<tr>
<td>21-40</td>
<td>05</td>
<td>08</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>41-60</td>
<td>00</td>
<td>00</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>61-80</td>
<td>06</td>
<td>10</td>
<td>18</td>
<td>29</td>
</tr>
<tr>
<td>81-100</td>
<td>43</td>
<td>71</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-16**
PERCENTAGE OF WORK PERFORMED USING LUMP SUM CONTRACTS
<table>
<thead>
<tr>
<th>SUBCONTRACTED WORK (%)</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-15</td>
<td>32</td>
<td>52</td>
<td>32</td>
<td>52</td>
</tr>
<tr>
<td>16-30</td>
<td>18</td>
<td>30</td>
<td>50</td>
<td>82</td>
</tr>
<tr>
<td>31-45</td>
<td>10</td>
<td>16</td>
<td>60</td>
<td>98</td>
</tr>
<tr>
<td>46-60</td>
<td>01</td>
<td>02</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>61-100</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-17**
PERCENTAGE OF WORK SUBCONTRACTED IN AVERAGE JOB

<table>
<thead>
<tr>
<th>PERCENTAGE OF EQ. LEASED OR RENTED</th>
<th>FREQ.</th>
<th>PERCENT</th>
<th>CUM. FREQ.</th>
<th>CUM. PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-15 %</td>
<td>28</td>
<td>46</td>
<td>28</td>
<td>46</td>
</tr>
<tr>
<td>16-30 %</td>
<td>24</td>
<td>39</td>
<td>52</td>
<td>85</td>
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<tr>
<td>31-45 %</td>
<td>06</td>
<td>10</td>
<td>58</td>
<td>95</td>
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<tr>
<td>46-60 %</td>
<td>03</td>
<td>05</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>61-100 %</td>
<td>00</td>
<td>00</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table B-18**
PERCENTAGE OF EQUIPMENT LEASED OR RENTED IN AVERAGE JOB
APPENDIX C

REFERENCES


VITA

Mohammed Hamoud Al-Shahri was born in Taif (Saudi Arabia) in 1962 and finished high school in 1980 from Thaquief high school. In 1985 he received his Bachelor of Science Degree in Architectural Engineering with Honors from University of Petroleum and Minerals (UPM). Then, he started his professional career by joining Bectel Company as a field engineer in Jubail Project till late 1987. In 1988 he joined Ministry of Defense and Aviation and worked as Chief of Engineering Department at King Faisl Military City (KFMC) in Khamis Mushayt and still working their. He attended and participated in more than 15 seminars and short courses. He received a Master Degree in Construction Engineering and Management from the same university in 1997.