CHAPTER III

Discussion of the Problems

3.1 Background

Professional Food Equipment, Ltd. (PFE) was established in 1974, with the support from the Board of Investment (BoI) of Thailand. The mission of the company has been to manufacture quality stainless steel commercial kitchen equipment for hotels, restaurants, flight kitchen, as well as government and other commercial establishments in Thailand. In general, the majority of the company's sales are in the form of turnkey projects, meaning that the company does the supply and installation of the foodservice equipment according to the customer's requirements given in the kitchen plans and specifications.

In the beginning, the company was set up as a small job shop of around 20 workers, and with an annual turnover of less than one million baht. With the expansion of the Thai economy, especially in the tourism industry, the hospitality businesses flourished, and so did PFE. At present, there are over 300 employees in the company, and the annual turnover is in the 200+ million baht. Although, the organisation has grown quite large, and so have the projects the company had been involved with, many things are still done the "old fashioned" way. For small project, the traditional way of working might be acceptable, however, with the size and amount of work involve in the newer projects, more efficient and effective ways of working must be used. This chapter will discuss the current problems facing the company, with respect to the planning and cost controlling aspects of the projects.

3.2 Current Organisation

In order to manage the project-related activities, from sales, all the way to the commission of the project, the company is organised into 3 major departments, excluding the support functions, as shown in the Figure 3.1.

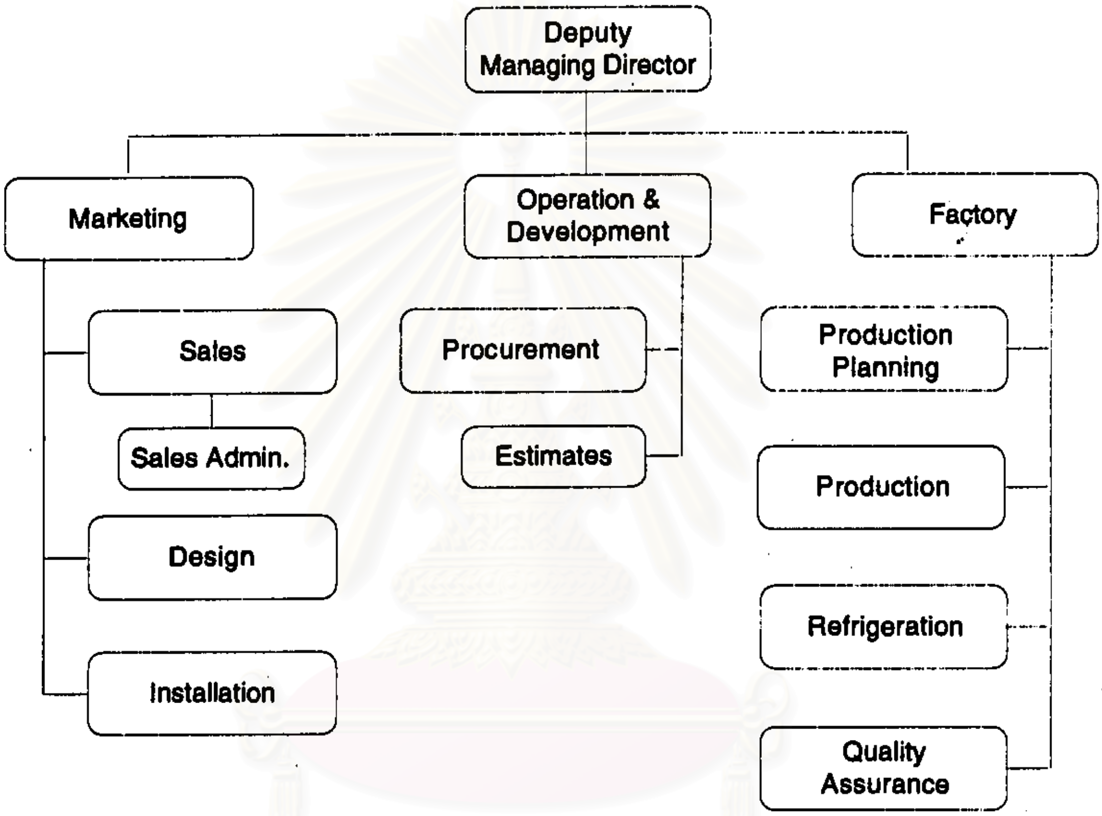

Figure 3.1: The Project Organisation Chart

3.3 Project Life Cycle

The life cycle of a turnkey project in a foodservice equipment industry has 4 distinct phases: Conception, Planning, Implementation, and Test-run and Commissioning.

1) Conception

Firstly, the requirements from the potential customer are gathered and translated into kitchen layouts, perspective drawings, and specifications by the Design Department. In the design stage, a list of equipment needed for this project is also compiled, and the first round of make-or-buy decisions are made to determine imported and locally made equipment. Next, the list of equipment, together with necessary drawings and specifications, are used by the estimator to create Bill of Materials (BoMs) for each equipment. These information are used to calculate the estimated project cost, which are later prepared into a quotation by the Sales Administrative Staffs and submitted for bidding.

2) Planning

In an event that the quotation submitted for bidding are met with satisfaction, and the project is awarded to the company, the Sales Administrative Staff would issue one copy of the job order (see Appendix C) to the factory, one copy to the Installation Department, and other copy to the Purchasing Department. After the receipt of the necessary document, the Installation Supervisor would have to verify the job site condition, and feed back information to the Factory Manager for further action. At the factory, the Production Planning Supervisor receives the job order from the Factory Manager, calculates the labour requirements for the new project, checks the available resources, allocates appropriate production time slots for the equipment basing on the date required confirmed by the Installation Department, and updates the Master Production Schedule accordingly. While the production schedule is being worked out, the Drafting Section in the factory, at the same time, proceeds to make the production drawings for the locally fabricated items, and issues the requirements for sheet metals of each equipment. After that, the Material Take-off Staff would go through the list of equipment in the project, works out the raw materials requirements for each product, and issue a "Requisition From Stock" form for use in the production.

3) <u>Implementation</u>

After the Purchase Department receives the job order, it would make a plan to order the imported and buy-out items for the project so that they would arrive in time for installation and test-run before the date required. Barring from any unscheduled events, the rest of the equipment, which are the locally made items, are manufactured according to the Master Production Schedule issued by the Production Planning Department. The steps involve in the production are:

i) Forming

Forming process involves the cutting, layout (drawing of bending/folding lines on the metal sheet blanks), and bending of sheet metals into desired forms of various shapes and sizes according to the production drawings.

ii) Assembly

Assembly is the process that transforms the blanks into a product primarily by welding.

iii) Finishing

Because the assembled product may not have the required finish, the equipment are polished off for the proper final look.

iv) Technics

Certain equipment do require further works on the gas piping and burners, plumbing, and electrical wiring, thus are sent to the "Technics" section for the fittings of the technical components.

v) Refrigeration

Similar to the "Technics" section, the Refrigeration section is solely reserved for the works on all of the cooling equipment in the project, such as refrigerators, freezers, ice bins, and any other equipment that require thermal insulations and/or refrigeration systems.

After the equipment is completed from its production, it is inspected by a Quality Control Inspector at the final stage, before being put into the storage and ready to be dispatched upon the request from the Installation Department.

When the job site is ready, the Installation Department would request the factory to deliver the equipment for installation. Usually, exhaust hoods are the first items that get delivered to the job site as they need to be fixed above other equipment. However, the rest of the equipment are not given priorities, and are delivered as soon as they are ready. When delivered to the job site, these equipment are installed at the locations as specified in the kitchen plan.

4) Test-run and Commissioning

After all equipment in a kitchen area have been installed, the ones with either mechanical or electrical systems are test-run to ensure that they perform according to specifications. The project is deemed completed when all equipment are tested as required, and a summary of test reports are submitted to the customer for acceptance. Figure 3.2 shows the work flow of typical turnkey foodservice equipment project.

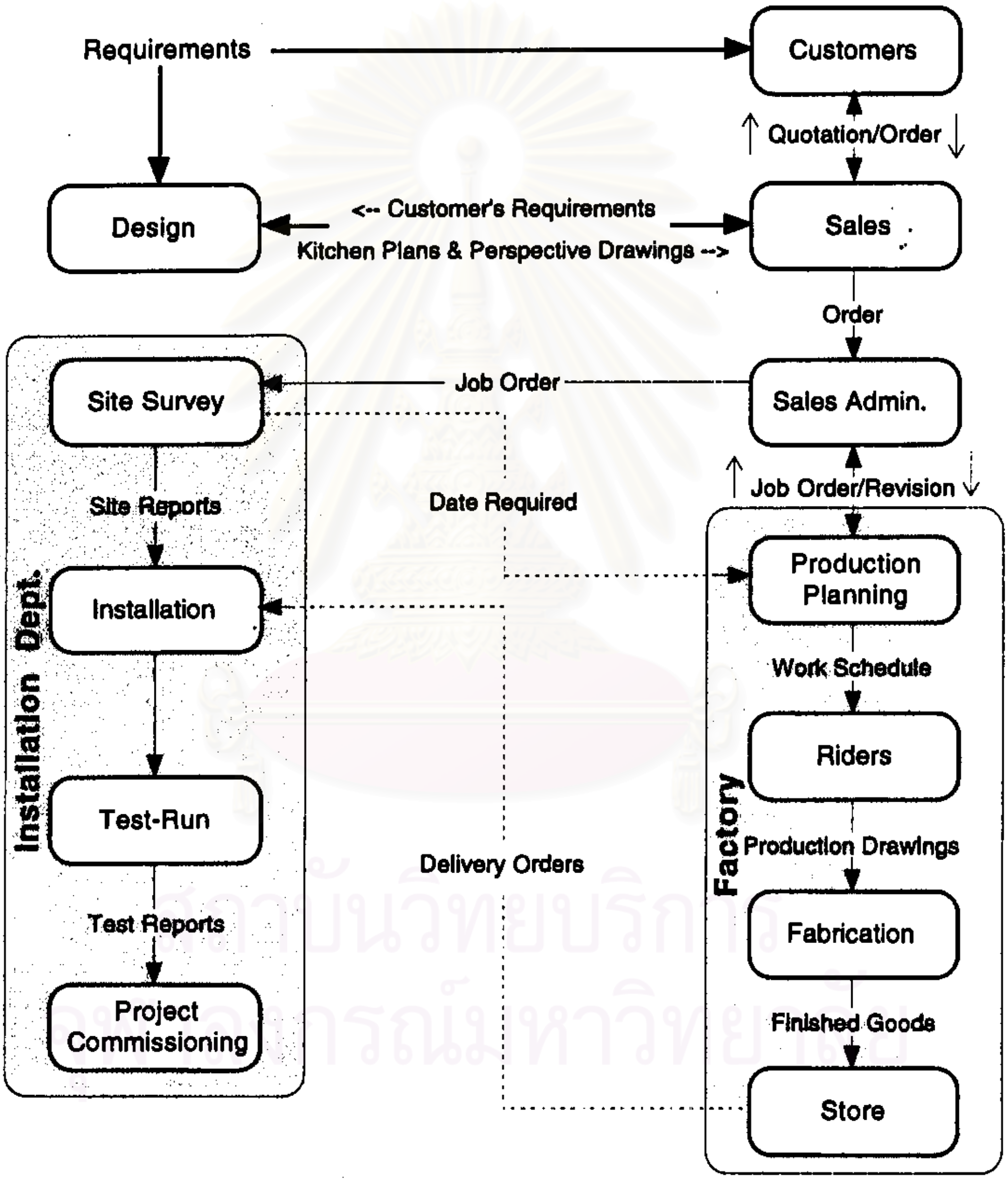

Figure 3.2: Typical Work Flow For A Kitchen Project

3.3 Present Conditions

Although more than 75 percent of the company's turnover comes from project sales, it can be noticed from the organisation chart (Figure 3.1) that the company has been structured into a functional organisation, which is neither effective nor efficient way to handle project activities. As previously mentioned above that after an order of a kitchen project is received from the customer, the sales administration would pass the information to the factory, Purchase Department, and Installation Department for references and further actions. While the factory concentrates on the production of the required equipment to meet the delivery schedule, the Installation Department only concerns with the installation works. Any project-related problems are often coordinated at the managerial levels. Despite the fact that a project can be completed by such coordination between the two departments, it is inefficient and ineffective. Some information often got lost along the way, or arrive too slowly, and in the process, cause problems which could have otherwise been avoided. With no one to take direct responsibilities on the project, and no proper system to handle the project tasks appropriately, problems are inevitable. These problems are common in all projects, but differ from one project to the other only in their magnitude. In order to better illustrate the problem, an investigation on the project, The New Bangkok Hotel (Job No. P205/96) was carried out. The results from the finding would be studied, and possible improvements to the present problems would also be suggested.

The investigation into the performance of The New Bangkok Hotel has yielded several problems which are very typical of this type of project. These are:-

1. <u>Late Delivery</u>

A simple sounded problem could be the results of many difficulties in the organisation, and how the project was executed. The major causes are attributed to the followings:-

1.1 Production Material Shortages

The shortage of production materials is a regular occurrence at the factory. This is due to the fact that there is no system for material requirement planning implemented at all. The problem is largely caused by the fact that the BoMs which had been worked out for use in the project cost estimation stage were not used during the actual production phase of the project. Instead, the factory chose to make their own BoMs for the equipment separately after the project is awarded. Since the factory does not know or has never been bothered to worked out what raw materials are needed for the production in advance, shortages of raw materials occur. This is especially true for the long-lead-time materials, which does not have the opportunity to be reserved beforehand. The electronic controllers for refrigeration equipment, which have a lead time of 2 months, and other items in high demand, such as gas burners, are among many items which suffer from the shortages most. Since they are considered to be the critical parts of some equipment, their late deliveries directly lead to the delays in the production, subsequent deliveries, and installation of these products. The information on part shortages, which resulted in the production suspension of certain equipment in the New Bangkok Hotel, was obtained from the Production Planning and Control Department (PPC), using the "Shortage of Materials Report" form (see Appendix D), and are summarised in the Table 3.1.

No. of Occurrenc	Item No.	Part Short	Part Description	Delay (days)
1	9	P63101005	Electronic Controller w/1 Power relay	17
2	9	P61010035	Compressor, HBP	22
3	15R	P63102005	Electronic Controller w/2 Power relay	17
4	15R	P61010120	Compressor, LBP	22
5	30	P63102005	Electronic Controller w/1 Power relay	17
6	30	P61010130	Compressor, LBP	22
7	76	P30301030	Gas Burner, KB-7	8
8	DB-01	P63101005	Electronic Controller w/1 Power relay	17
9	DB-01	P61010035	Compressor, HBP	22
10	DB-04	P27005045	Brass drein	3
11	DB-05	P63101005	Electronic Controller w/1 Power relay	17
12	DB-05	P81010035	Compressor, HBP	22
13	BF-04	P42111045	Strip Heater, 560W	4
14	BF-04	U81001025	Heat Resistance Silicone	8
15	BF-10	P63101005	Electronic Controller w/1 Power relay	17
16	BF-10	P61010105	Compressor, HBP	22
17	BF-11	P61010060	Compressor, LBP	22
18	BQ-88	P66010010	Isocyanate	2
19	BQ-88	P66010005	Polyol	2
20	5	P27005045	Brass drain	3

Table 3.1: Material Shortages as Recorded by the PPC -- New Bangkok Hotel

1.2 Work Overload

An equally important cause that result in late deliveries is the fact that there is no resources planning during the project costs estimation stage. Since the demand for kitchen projects are somewhat seasonal, being slowed down in the beginning of the year, and pick up towards the end of the year (see Appendix E), the chance that many projects due around the same time is high. However, when the estimator prepares a quotation, this factor was not taken into account, and the project is submitted for a bid without knowing if it would lead to schedule conflicts with the existing project, or even new projects to be awarded or not. Table 3.2 shows the capacity of the factory at the time when the New Bangkok Hotel was quoted.

Project No.	ManHr. Required during the Cost Estimation Phase of P205/96 (11/96 - 1/97)
On Hand	
C-38/257 (A-1)	600.00
C-39/015	798.00
O-094/96	2,140.00
O-167/96	955.00
O-212/96	1,163.00
O-39/151	2,591.00
O-39/231	177.00
P-039/96	225.00
P-164/96	7,641.50
P-166/96	3,978.50
P-171/96	125.00
P-38/187	286.00
P-39/133	269.00
P-39/182	266.00
P-218/96	1,238.00
P-39/190	792.00
U-039/96	112.00
U-040/96	120.00
Subtotal	*23,477.00*
Quoted*	
P-205/96	4,821.00
P-220/96	228.00
P-225/96	333.00
P-228/96	486.00
P-230/96	619.00
P-232-96	317.00
P-233/96	800.00
P-238/96	179.00
Subtotal	*7,783.00*
Total MHr.	31,260.00
MHr. available	28,485.20
Estimated MHr. shortage	-2,774.80

* These are the projects defined by the Sales Department as having a very high tendency to be awarded to the company (Classification "S") , and would require the production between 11/96 - 01/97.

Table 3.2: Production Capacity at the time of the New Bangkok Hotel's Quotation

1.3 Poor Co-ordinations between Production and Installation Departments

Lastly, with the success of a project relying on the quality of the coordination between the Production and Installation Department, project delays occur. This has a lot to do with the way the company was structured. Being setup as a functional organisation, practically every department only concerned with their own work, and have difficult time coordinating across functions. As a result, the information passing between departments are often slow and sometimes lacking the necessary details, causing critical data to easily slips through the communication cracks. With no one to actually take the direct responsibility of the project, it usually takes some times for even a simple problem to get rectified. The lack of good coordination could also lead to nonconforming products being produced as certain conditions at the job site changes, but the change is not passed along to the persons concerned in a timely manner.

Not only does the lack of a person-in-charge for the project causes information breakdowns between the Production and Installation Department, the way these two departments handle the project information is also different from one another. While a significant amount of the production information can be readily retrieved and stored in a makeshift computerised databases at the factory, the Installation Department, on the other hand, still does everything on paper. Since the project information can not be readily accessed across department, it makes the monitoring and controlling of the project activities difficult, and again, could also lead to nonconformed products being manufactured, and subsequent delivery delays.

Some examples of the nonconformance of products, which can be resulted from poor communications, and lead to the delays of the project schedule, as its replacements have to be made, are:

i) wrong physical dimensions
ii) incomplete accessories
iii) wrong type of equipment made

2. <u>Large Amount of Cost Variances</u>

Having investigated into the case of the New Bangkok Hotel, it was discovered that the project costs estimation at that time did not concur with the actual project costs. Although the Estimator calculated the prices for each equipment from their BoMs in order to come up with as accurate project cost as possible, the cost variances were still high. Despite the information from Appendix F, which showed the total project cost variance at 17.39 percent, upon a closer observation it could be noticed that:

1) The cost variance of the production were much higher than that of the entire project. While the variance of the Direct Material was close to 39 percent, the variance of the Direct Labour was around 25 percent. This put the total variance of the locally fabricated items at over 35 percent for the entire project.

2) As the prices of the imported equipment had been committed by the overseas suppliers, they are much more accurate than the locally made equipment. At around 8 percent of cost variance, the imported equipment has helped to reduce the cost variances of the entire project to 22.53 percent, excluding the installation works.

3) Without taking into account the installation charges, the cost variance for the New Bangkok Hotel was around 22.53 percent, as mentioned above. However, when the installation costs were added to the estimated costs, as well as the actual costs, the project costs variance was brought down to around 17 percent. This can be deceiving for the people who would like to see as little cost variances as possible, because it turned out that the installation cost was "overspent" by a hefty 106 percent.

The above findings reflect typical project costing problems experienced by the company. Although the highly positive average variance indicated that the company was making money from the project, excluding the nominal profit mark-ups, it also pointed towards the potential loss of opportunity in other sales efforts. Just as too much positive variance is bad for the business opportunity, too much negative variance would indicate the loss of money in the project. The reasons for the deviations of the actual costs from the estimated values could be attributed to:

2.1 Discrepancy between the estimated and the actual BoMs.

Since many equipment sold by the company were custom-made, their Bill of Materials (BoM) had to be worked out during the costs estimation stage of the project in order to determine the cost price of each equipment. However, when the project was awarded, and the order for the equipment passed into the factory for production, the BoMs that were used to estimate the cost were not committed to. Instead, the factory established the new sets of BoMs for each equipment by themselves for use in their production. The factory's version of BoMs were almost certainly different than that of the Estimator's.

And as if these differences were not enough, whenever the type and/or the amount of actual materials, as well as labour requirements for a product, were changed due to the revision of the design, the information on such variations was never been fed back to the Estimator for their future references. Since the Estimator and the Factory are using different sets of BoMs to calculate the project costs, the problem with high cost variances is inevitable. Table 3.3 - 3.5 show an example of these differences. Here the BoM of a Double Sink Table (model WS224000) which was used in cost estimation is compared with the factory's version of the same product. However, since the BoMs are described differently, they must first be converted into the same basis before any comparison can be made.

Description	Unit	Qty.
Top Plate	sht	1.06
Sink ss 16 ga.	sht	0.59
Bracing d.1" 6m.	l	1.12
ss. gusset	pc	6
footing	pc	6
ss leg, d 1.1/2" 6m	l	0.8
Faucet B1128	set	1
Brass drain d.2" w/ overflow	set	2
water acc.	set	2
drain acc.	set	2

Table 3.3: The BoM of a Double Sink Table -- Estimate Department Version.

Description	Unit	Qty.
SS. Sheet No. 16 size 4' x 8' (304-2B) Thk. 1.5 mm.	sq.m	4.91
SS. leg, d 1.1/2" 6m	m	4.8
SS. Bracing d.1" 6m.	m	6.72
SS. gusset	pc	6
SS. footing	pc	6
Faucet, model B1123 (floor mount)	set	1
Brass drain d.2" w/ overflow	set	2
water acc.	set	2
drain acc.	set	2

Table 3.4: The BoM of Estimate Department is converted as close to the same basis as that of the factory's as possible.

Part ID	Sectio	Part Description	Unit	Qty.
R111016040	2	SS. Sheet No. 16 size 4' x 8' (304-2B) Thk. 1.5 mm.	sq.m	4.951
R311120005	5	SS. Tube d 1.1/2' x 6 m. Thk. 1.2 mm. (Polishing)	m.	5
R311000005	5	SS. Tube d 1' x 6 m. Thk. 1.2 mm. (Polishing)	m.	6
P16111005	5	SS. Gusset -- Type B	ea.	6
P16101005	5	SS. FOOTING 1.1/2' (2')	ea.	6
P16005045	5	SS. triangular corner (small)	ea.	2
P16005010	5	SS. rim corner (large)	ea.	2
P16005040	5	SS. triangular corner (large)	ea.	8
P21001035	7	FAUCETS, model B - 1123 (deck mount)	set	1
R331000005	7	Pipe: G.I. d. 1" x 6 m. BSM	m.	1.2
P27010050	7	Brass overflow, d. 1.1/4"	ea.	2
P27005066	7	O-RING: d. 44 mm., 6.3 mm. (thk)	ea.	2
P27005045	7	Brass drain w/ closing lever, d.2"	set	2
P25072010	7	Coupling: G.I., d. 1"	ea.	2
P25022005	7	Elbow90, reducing: d. 1.1/4" -> 1"	ea.	2
P11011035	7	BOLT SS. d 1/4' x 3/4', tapered	ea.	2
P27020005	7	Strainer	ea.	2
P25012005	7	Elbow90, G.I., d. 1"	ea.	2

Table 3.5: The Factory's version of the Double Sink Table's BoM.

2.2 Lack of Cost Controlling Measures

Because of the lack of person directly in-charge of the project, and together with the fact that the information system for the project is practically nonexistence, the actual usage of direct materials and direct labour in the project activities are rather difficult to monitor and control. Also, although the installation costs of the project included in the project estimated cost, they, too, are not controlled during the project implementation phase. This is demonstrated by the lack of information on the materials and labour consumption by the installation activities. The only data available on the project installation costs were the total materials consumed, and total labour used, both of which came after the project had concluded, thus they were of very little use in terms of project monitoring and control.

Without the necessary monitoring and control functions, the current schedule as well as costs performance of the project can not be known until after the entire project had completed, and the Accounting Department has summarised all the expenses incurred by the project activities. By that time, it would be too late to control anything.

2.3 Over-estimation.

Because the Purchase Department wanted to be absolutely certain that they could buy manufacturing parts for the equipment at the price they have committed with the Estimator, they literally increase the prices given to the Estimator at the time of making the quotation. This "price hike" is somewhere between 20-50 percent higher than the actual price, depending on how often the parts are bought. And since the prices of the stainless steel sheets, which are the main raw materials of the foodservice equipment (averaging around 50 percent of the total equipment cost), are rather steady throughout the year (see Appendix G), this contingency for price variation is unjustifiably too high. If not properly calculated, it could result in the uncompetitiveness and ultimate loss of opportunities for the company. Table 3.6 below shows the most frequently used type of stainless steel sheets and the contingency in their cost estimates.

Type	Estimated (Bht./sq.m)	Actual (Bht./sq.m)	% error
304-2B, No.16	769.3	537.8	30.1
304-2B, No. 18	456.9	339.8	25.6
304-2B, No. 20	677.9	447.7	34.0
430-HL, No. 22	386.3	258.5	33.1
430-BA, No. 22	470.3	269.2	42.8

Table 3.6: Stainless Steel Prices Comparisons

3. Incomplete Costs Contributors

When the estimator estimated the cost for the locally manufactured items, only two factors were considered: Direct Materials, and Direct Labour.

Cost Price (CP) = Direct Material (DM) + Direct Labour (DL)

Where :

DM consists of 1. Estimated costs of production materials.

and DL consists of 1. Estimated labour cost for production.

2. Estimated costs of installation work

From the above formula, it was observed that neither direct materials to be used for installation works, nor the factory overheads were clearly isolated from other costs for easier control. While the former was actually lumped together with the estimated labour costs for installation, the latter was included in the profit mark-up factor. As a result of lacking clear-cut information on the project costs, the company could not be positively confident on the amount of discounts it could give to the potential customers.

As previously mentioned, there seems to be less cost variations on the imported items (see also Appendix E). This was because the prices used to calculate the project costs were committed by the overseas suppliers, and there were no major foreseeable factors which could have affected the actual landed cost. However, because the landed costs of imported goods are calculated from the CIF Bangkok prices [12] plus the import duties of the equipment, they could be affected if any of the following uncontrollable factors change:

1. Freight Charges
2. Exchange Rates
3. Clearing Charges
4. Import Duty Rates

4. <u>Poor Management in Installation Department</u>

In the past, the Installation Department had been plagued with many problems due to the unorganised ways of working. The closest they came to the word "planning" was the very rough Schedule of Work that determined when major project activities would take place (see Figure 3.3). The problems with the rough schedule are: (1) The "Fabrication" schedule was not based on the actual factory's production

[12] CIF Bangkok price is the price of the goods, inclusive of the insurance fee, and the freight costs, as arrived at the Bangkok Port.

plan, but rather, it was predicted by the Installation Department that the production of equipment would likely to occur around that period of time. (2) The schedule is so rough that it is of very little use for planning and control of project activities. Although memorandum from the Installation Department indicating which kitchen would be needed, and by what date, are often sent to the factory, they still lack the details of equipment priorities, which are the crucial information for the production due to the fact that there are many types of equipment in a given kitchen, and not all of them are needed at the same time.

Beside the problems with the schedule being lacked of details, another problems of equal, if not more, importance is the inefficient use of resources in the department. The two key areas that have to be improved are in the use of human resources, and the use of the installation materials. Firstly, during the installation stage, there are no proper planning of the entire project done at all. Instead, the installation of equipment were planned on a daily basis, based on the amount of work done in the yesterdays. Secondly, when the installation workers request for installation materials, there are no guidelines for issuing these parts. Because the DM of installation materials are not calculated during the cost estimation phase, how much materials should be taken for the day of installation work is merely based on personal judgment.

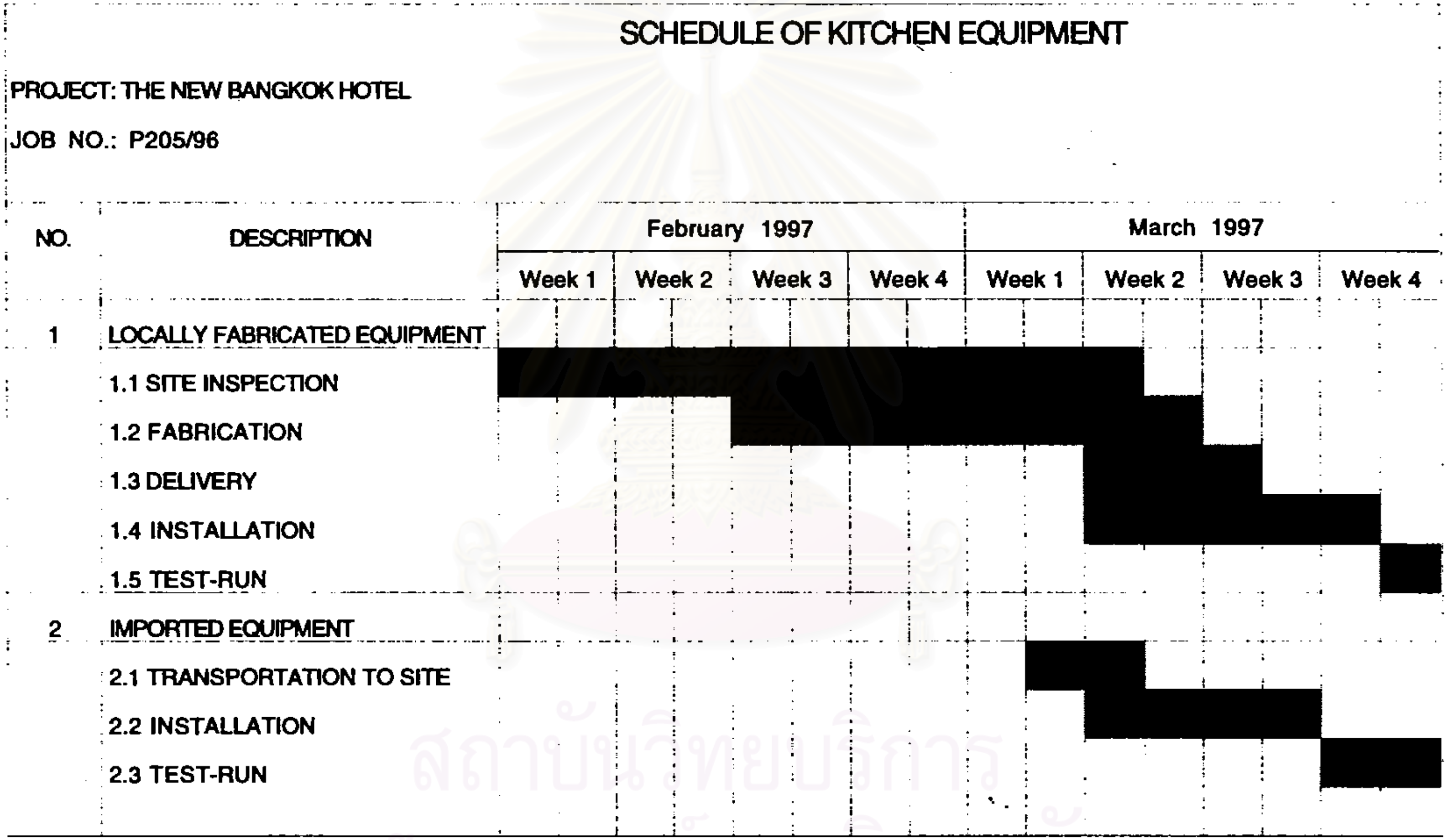

Figure 3.3: The Current Schedule of Work as Used by the Installation Department