Title: The Second Stage Expressway Sector B Part 1 in Bangkok Thailand

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Abstract: This following paper and attached appendixes analyze the project management of the Second Stage Expressway Sector B Part 1 by using the project management concept. I was one of the representatives of CH. Karnchang Co., Ltd assigned to work in this project as a mechanical engineering in the superstructure department of Joint Construction Management unit.

The Second Stage Expressway Sector B Part 1 in Bangkok Thailand

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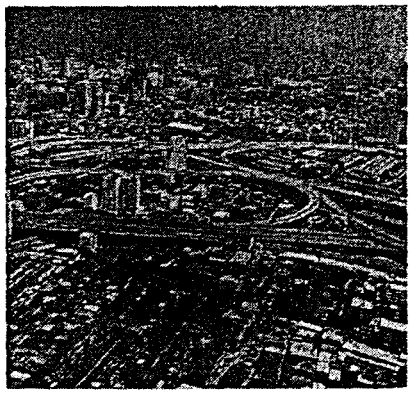
PROJECT MANAGEMENT IN
ENGINEERING AND TECHNOLOGY

Dr. Dundar F. Kocaoglu

INDIVIDUAL STUDY PROJECT

THE SECOND STAGE EXPRESSWAY SECTOR B PART 1 IN BANGKOK THAILAND



by Nathasit Gerdsri

May 28, 1997

THE SECOND STAGE EXPRESSWAY SECTOR B PART 1

BANGKOK , THAILAND

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PREFACE

This following paper and attached appendixes analyze the project management of the Second Stage Expressway Sector B Part 1 by using the project management concept. I were one of representatives of CH. KARNCHANG CO.,Ltd assigned to work in this project as a mechanical engineer in the superstructure department of Joint Construction Management unit.

This project was at the middle level of complexity and uncertainty. It contained many unique and unfamiliar issues. It had to be systematically managed to solve problems and satisfy needs within tight scheduling and budgetary constrains under limited resource. There was greater need for teamwork and the conbined expertise of multi disciplines. Moreover, this project also faced with some non-academic issues such as culture issue since it is a joint venture project from three nations.

Finally, I want to thank Dr. Sombat Kitjalaksana, project manager, and Mr. Pairat Prom-in, manager of my department, superstructure, for review, instruct, and illustrate the overall picture of this project.

BACKGROUND

Due to the traffic congestion problem, the Thai Government commanded the Expressway Transit Authority of Thailand (ETA) to study the feasibility of new expressway route. After feasibility study, ETA delineated the second stage expressway route and then proposed this project to the cabinet. After cabinet approved it, ETA invited many domestic and foreign construction companies to bid this project.

In March, 1990, BECL (Bangkok Expressway Company Limited) was awarded a 30 years build-transfer-operate concession of SES from The Expressway Transit Authority of Thailand (ETA)

The Joint Venture BBCT (JV. BBCT) found on March 14th, 1994, entered into an agreement with BECL to design, plan, organize, manage, procure, construct, commission and maintain The Second Stage Expressway, Sector B, Part 1 in Bangkok (SES sector B, Part I)

The JV.BBCT was proposed to be established under the joint venture of (1) CH. KARNCHANG CO.,Ltd; (2) BILFINGER+BERGER; (3) TOKYU CONSTRUCTION CO.,Ltd; (4) CH. KARNCHANG - TOKYU CONSTRUCTION CO.,Ltd.

The volume of SES sector B part 1 was around 10 billion baht ($ 400 million). The total distance was 10 km (6.25 miles). The project boundary was from the North at Khlong-PaPa to the South at Bang-Khao. On the way, it pass though many business area. (shown in appendix A). The project was started from Mar 1,94 to Oct 19,96, duration 2 years and 7 months.

Since the agreement between JV. BBCT and BECL was turnkey construction, the scopes of JV. BBCT responsibility were to survey, design, plan, organize, manage, procure, construct, commission and maintain. The scope and sequence of civil work were clearing construction area, design, piling, foundation and column construction, segmental deck erection, and finishing work included parapet casting, asphalt coating, and traffic control system.

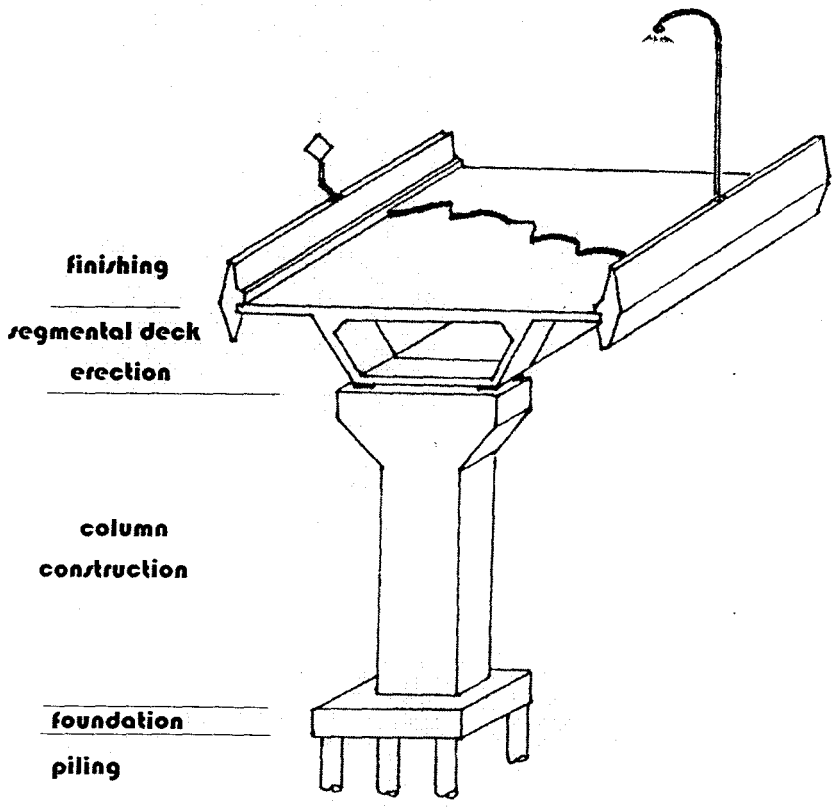

Fig 1. Scope and sequence of civil work

PROJECT MANAGEMENT

The objective of this project was to construct the expressway according to cost, time and performance requirements. This activity was unique in that it was the first time that CH. KARNCHANG CO.,Ltd had jointed with a foreign company. This project contained the complexity of technology and required various skills. Its organization structure was a pure project organization. Since the project was a new undertaking, it possessed uncertainty and risk. Therefore, it was necessary to have the project management to ensure the success.

PROJECT LIFE CYCLE

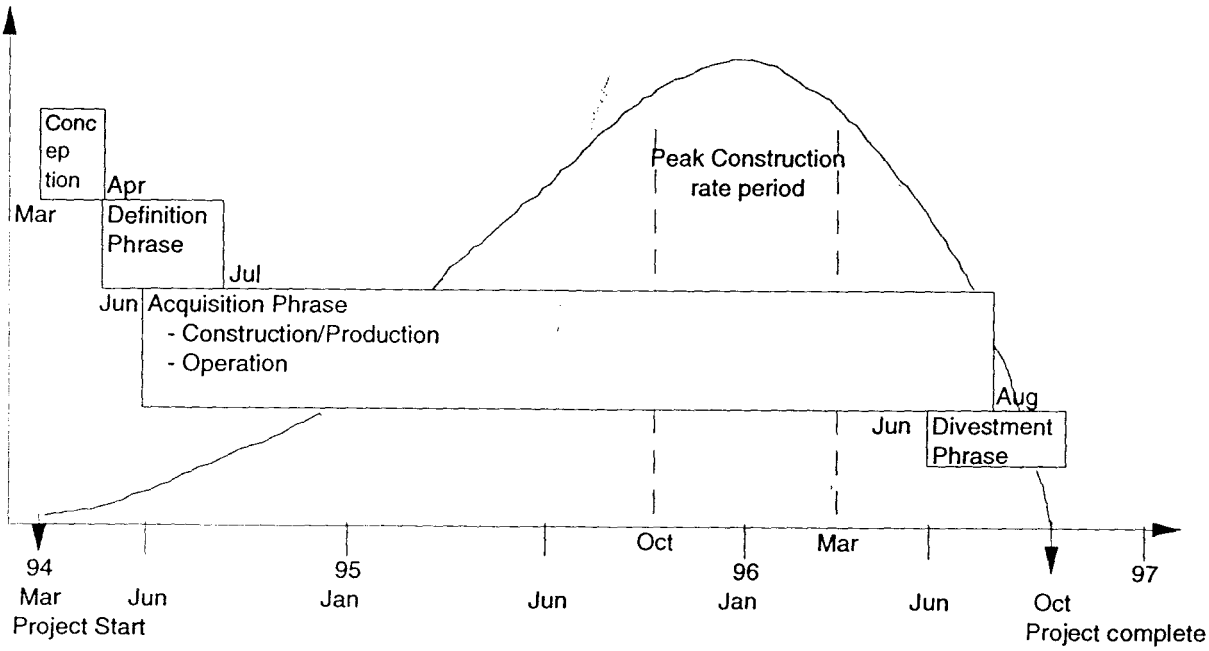

Fig 2. Project life cycle of SES

The project life cycle is model for dividing a project into logical phases or stages which indicate the type of tasks or activities conducted within a period of time, conception, definition, acquisition, and divestment phase.

The conception phase includes the activities of formulating the problem, defining needs, requirements, and system solution, evaluating alternatives, and developing an organization and plans to conduct the project.

The definition phase includes the activities of approving the solution in conception phase, preparing of detailed plan and procedure, and implementing.

The acquisition phase includes various stages of final design and preparation, development, procurement, construction / production, and implementation.

The divestment phase includes the development of plans, technology, and manpower transferring.

In this project, the Second Stage Expressway, Sector B, Part 1, after BECL awarded the concession of the SES contract from ETA. BECL widely offered the turn key construction contract to many construction companies. There were many construction companies interested in bidding this contract. JV. BBCT, one of bidders, award the turnkey construction contract.

In the conception phase, before JV. BBCT bade this contract, they determined all of BECL needs and compared with their capacity. They examined alternative ways of accomplishing the project objectives. BECL requirements were time, cost, and

performance. BECL set the construction period in 2 years and 7 months under limited budget and performance in quality and safety. JV. BBCT board determined all criteria and found that the constrains are time and budget. Therefore, they had to prepare well in human and non-human resource such as material and machinery to accomplish the time and budget constrains. They reduced uncertainty and risk by making a long-term contract for material supply and machinery rental while the significant personnel and manpower were recruited from parent companies, CH. KARNCHANG CO.,Ltd, BILFINGER+BERGER, TOKYU CONSTRUCTION CO.,Ltd., and CH. KARNCHANG- TOKYU CONSTRUCTION CO.,Ltd. Moreover, they also used intensive project planning and scheduling. The duration of this phase was around one and half month.

In the definition phase, after JV.BBCT awarded the turn key construction contract from BECL. They began to design in details and firmly identified of human and non-human resource requirements. They also had to identify where the high risk and uncertainty existed. They established the final organization. They assigned the survey team to keep the exact survey data from construction area and began to design the standard type at the same time. The duration of this phase was around 4 months.

In the acquisition phase, their construction team began to construct while technical team had to clear all detail designs. The quality control team had responsibility to check and control the work from the construction team. After some constructions had been finished, they had to began to evaluate the sufficiency of project to meet actual operating conditions. The duration of this phase was around 26 months

In the divestment phase, this project would be completed in Oct, 1996 whereas some activities such as piling, foundation , and column construction had been completed since Jun, 1996; therefore, project manager had to plan to transfer significant personnel back to parent companies while terminated other workers. Fortunately, JV. BBCT awarded another expressway construction contract, The Second Stage Expressway, Sector C plus (shown in appendix A) in JUL, 1996, so JV. BBCT board had to change divestment plan. The new divestment plan was to transfer all resources to the new project. This phase took around 3 months.

SES PROJECT ORGANIZATION

Expressway and Rapid Transit Authority of Thailand (ETA) was a project owner. Bangkok Expressway Company Limited (BECL) was a concessionaire. ETA waged Independent Design Checker (IDC) and Independent Certification Engineer (ICE) to inspect BECL's work. IDC 's responsibility was to monitor the permanent design of the permanent work. ICE 's responsibility was to certify the raw material and control quality. Both IDC and ICE directly reported to ETA.

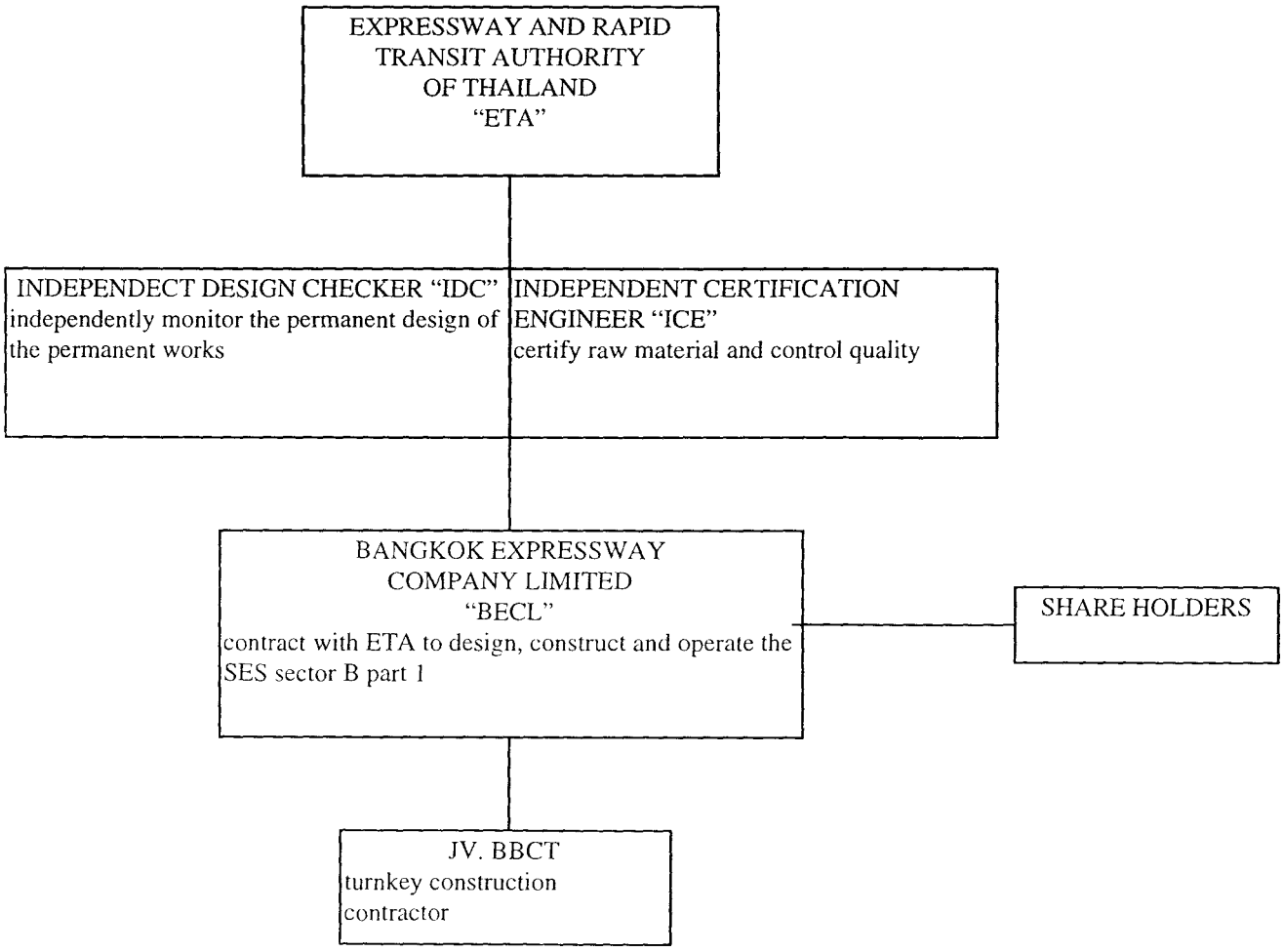

Fig 3. SES Project Organization

JV. BBCT ORGANIZATION

Since JV. BBCT was a joint venture company, it was necessary for the parent companies, CH. KARNCHANG CO.,Ltd, BILFINGER+BERGER, TOKYU CONSTRUCTION CO.,Ltd., and CH. KARNCHANG- TOKYU CONSTRUCTION CO.,Ltd., to send their representatives to be the members of joint venture board, committee, and some significant positions.

The JV. BBCT 's organization was divided into two units. The first one is Joint Project Management (JPM) and another one is Joint Construction Management (JCM). The JPM 's major responsibility was to instruct JCM . While both JPM and JCM had to share their supervision and coordination each other.

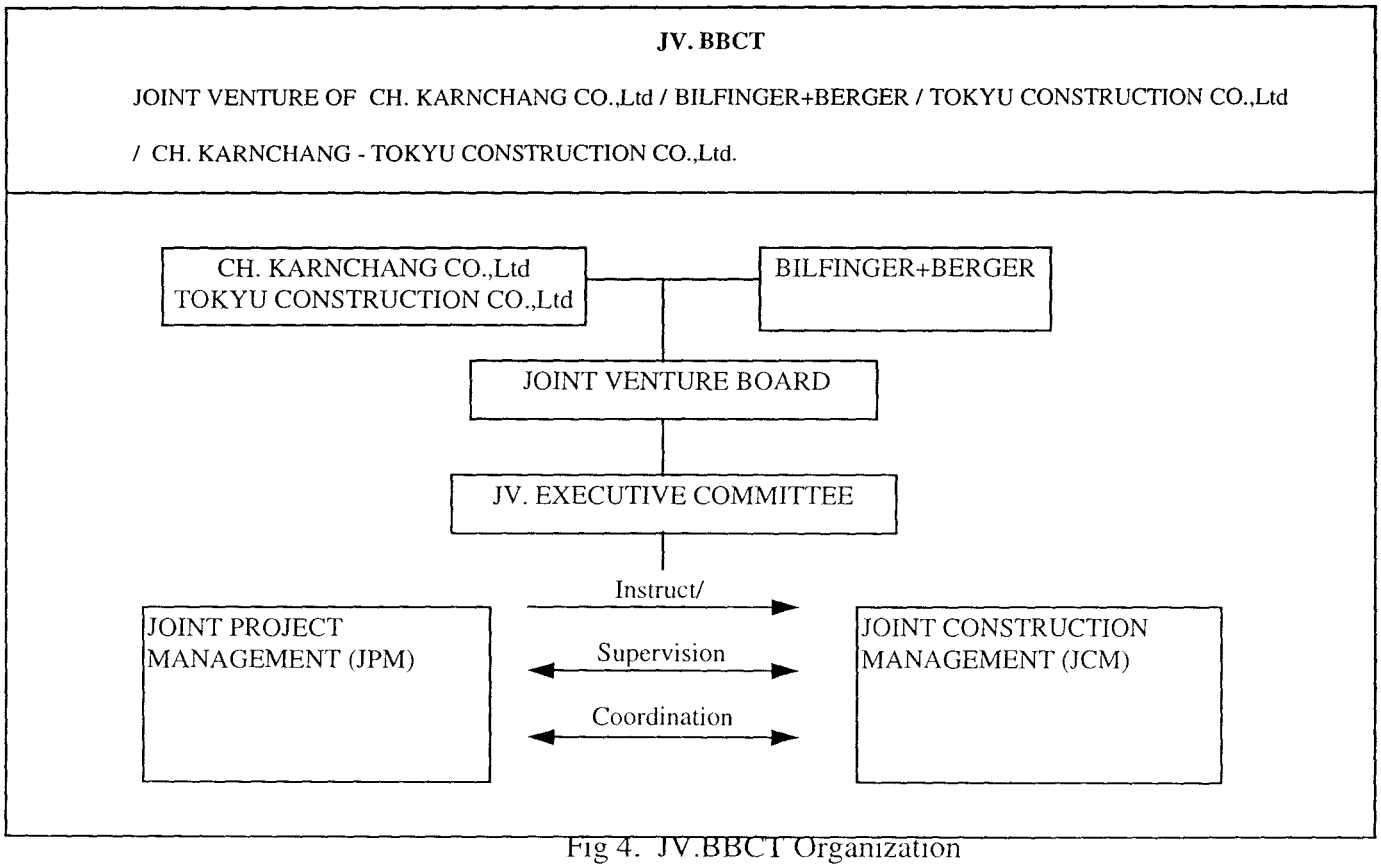

Fig 4. JV.BBCT Organization

In Joint Project Management unit (JPM), JPM played a role as a project office. Their major duties were for linking construction team, concessionaire, and project owner. They were responsible in all aspects of project management except construction management such as contracting, technical supporting, cost controlling, and quality controlling . JPM organization were divided into five divisions, Contract Management Divisions, Technical Management Divisions, Cost Control / Logistics Divisions, Quality Control Divisions, and Commercial Management Divisions. (shown in appendix B)

In Joint Construction Management unit (JCM), their major responsibility was to direct construction according to the schedule by providing all necessary supply and machinery. There were composed of six departments, Commercial Department, Engineering Department, Mechanical Department, Superstructure Department, and two Substructure Departments separated by site area. (shown in appendix C)

RESPONSIBILITY OF THE PROJECT MANAGER AND CO-PROJECT MANAGER OF JOINT PROJECT MANAGEMENT UNIT

Dr. Sombat, the Vice President of CH..KARNCHANG, was a project manager. His responsibilities are to

- Report the formulation of the problem, the definition of BECL needs, and the proposal of alternatives to the JV. Executive Committee during the conception phase.

- Report the preparation of the detailed plan and identification of the human and non-human resource requirement to the JV. Executive Committee for preparing and recruiting staff from the parent companies during the definition phase.
- Prepare the detailed plan, procedure, policies, job descriptions, and contract during the definition phase.
- Control quality and cost along the project life cycle
- Coordinate and report the progress to the contract owner, BECL and concession owner, ETA along the project life cycle
- Plan to transfer all resource during the divestment phase after project was accomplished.

Although he was a vice president of CH. KARNCHANG CO.,Ltd , he still did not have an authority to recruit the construction director and other high level managers of JCM who were representatives of CH. KARNCHANG CO.,Ltd because of the his seniority; however, he could informally propose name to the CH. KARNCHANG representative in the JV. Executive Committee because he got a lot of credits from other high-level mangers in CH. KARNCHANG.

Mr. Mamo, the representative of BILFINGER+BERGER company, was a co-project manager (CO-PM). His responsibilities was quite the same as project manager. The difference between PM and CO-PM responsibility was only the coordination. PM responsibility was to coordinate with ETA, concession owner. Whereas CO-PM coordinated with the Independent Design Checker (IDC), the Independent Certification Engineer (ICE), and BECL.

RESPONSIBILITY OF DIVISION MANAGER OF JOINT PROJECT MANAGEMENT UNIT

MANAGER OF	NAME	RESPONSIBILITY
Contract Management Division	Mr. Whiting	• identify and resolve any ambiguity to ensure that the scope of work and contractual conditions are compatible.
Technical Management Division	Mr. Ferguson	• design temporary and permanent works • sets out the process for I. preparation and distribution of shop drawing II. management of truss design III. preparation and approval of utility design

MANAGER OF	NAME	RESPONSIBILITY
Cost Control/Logistic Division	Mr.Senda	• compare the actual costs with the current performance budget. • prepare three-month balance sheet
Quality Control Division	Mr.Labor	• sets out the overall process for planning, carrying out and certifying conformance of construction work. • control over supplier which shall be sufficient to ensure supplied product meets specification
Commercial Management Division	Mr.Vorapote	• accounting and financing

PROJECT MANAGER'S BACKGROUND AND CHARACTERISTIC

To be successful project manager, no matter how much formal authority he possess, tend to reply upon knowledge, experience, and personal relationships for influence. To build expect-based power, effective project manager must be perceived as technologically and administratively competent. To build referent-based power, he must develop effective interpersonal, persuasion, and negotiation skills.

Dr. Sombat's backgrounds and characteristics support him to play a role as SES project manager very well. He has many distinct characteristics that are required for a

qualified project manager. His characteristics can be categorized in four categories, personal characteristics, behavioral skill, general business skill, and technical skills.

He has a leadership characteristic. He can persuade and mole all members of his teams to be a single. He can convey his idea in the practical term which is easy for other persons to understand. He has good interpersonal, negotiation and compromise skills. In this project, those skills are very necessary because he had to play many roles at the same time. Sometimes he had to negotiate with ETA and BECL whereas compromise among other partners. In his educational background, he graduated doctoral degree in civil engineering, so undoubtedly, why he could see and understand overall picture very well. Moreover, he also had a general business and management skills. He can not only translate business requirements into project and system requirements but also concern in concept of profitability.

Therefore, his background and characteristic could reduce the numbers and degree of conflicts and support the project to smoothly proceed and accomplish in the final.

CONFLICTS

Since this project was very big, time was a serious constrain; moreover, it was the first time for CH. KARNCHANG, BILFINGER+BERGER, TOKYU CONSTRUCTION, CH. KARNCHANG - TOKYU CONSTRUCTION as joint venture partners. Therefore, it was not strange to appear some conflicts among partners. The conflicts can be

categorized according to project life cycle; conception, definition, acquisition, and divestment phase.

In the conception phase, this phase was to consider the project before bade from BECL. Almost of conflicts were among joint venture partners about priorities. They had to allot units of stock and roughly divide responsibility and authority.

In the definition phase, this phase occurred after JV. BBCT awarded the contract from BECL. Most of conflicts were still among partners about the priorities. They had to clearly identify responsibility and authority; moreover, they had to set procedure and schedule.

In the acquisition phase, most of conflicts were between JPM and JCM about schedules. In the beginning of this phase, JCM had a lot of construction problems that caused project delay from the initial schedule since they were not familiar with the technologies, so they required to spend more times in learning period.

In the divestment phase, the schedule still were conflicts. Beside they had some conflicts about personnel and resource transferring.

PROJECT ADMINISTRATION

The appropriate project administration can reduce numbers and release the degree of conflict. The below table show the administration of this project.

SYSTEM ELEMENT	RESPONSIBILITIES OF	NOTE
Internal Coordination between PM and CM	Project Manager CO-Project Manager	Weekly coordination meeting

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PROJECT ADMINISTRATION

The main function of project administration and review meeting was to identify where the project was deviating from the plan so corrective action could quickly be taken. During meeting, participants focused on 1) current problems with work, schedule or costs, and how they should be resolve. 2) problems likely to arise in the future, and

3) opportunities to improve project performance. Furthermore, the appropriate project administration could reduce numbers and release the degree of conflict. The below table show the administration of this project.

SYSTEM ELEMENT	RESPONSIBILITIES OF	NOTE
Internal Coordination between PM and CM	Project Manager CO-Project Manager	Weekly coordination meeting
Work Group (land acquisition)	Project Manager	Weekly meeting to review land acquisition progress and actions.
Design	Technical Manager	Fortnight design meeting to review progress and action
ETA coordination	Project Manager	Monthly coordination meeting with ETA, concession owner
IDC coordination	CO-Project Manager	Monthly coordination meeting
ICE coordination	CO-Project Manager	Monthly coordination meeting
BECL Works in Progress	CO-Project Manager	Monthly progress review meeting
Quality Review Meetings	Quality Manager	Fortnight Quality review meeting
Weekly CM meeting	Construction Director	Review and action planning for work completed in past week and forecast for forthcoming week.

PROJECT PLANNING AND SCHEDULING

The project planning strives to minimize uncertainty, avoid cost and scheduling overruns, and uphold project performance requirements.

The project schedules show the timing of work and are the basis of resource allocation, cost estimation, and performance tracking. There were different types of schedules used in this project. That were divided into hierarchy; low, intermediate, and bottom level according to amount of detail requirements. The top hierarchy of bar charts were set by JPM whereas the intermediate and bottom hierarchy of bar charts were set by JCM. (the Gantt chart and PERT attached in Appendix D and E are the intermediate level schedules.) From PERT chart, the critical path was started from clearly identify all requirements → roughly develop plan → set organization → clearly define priority and procure → prepare for land acquisition → civil work. Although they had some problems and conflicts in conception and definition phase, they did quite well. But in acquisition phase they faced with the construction problems. They could not construct column on schedule since it had many construction constrains in the business area. They allow to work during the night time only. The delay of column construction would cause the overall delay. Since the deck erection stage required fixed period. Each truss could completely erect a bridge span in 3-4 days. They had six launching trusses. Therefore, PM and construction director decided to avoid the overall delay by fabricating one truss more. (The picture of segmental deck erection method is shown in fig 5)

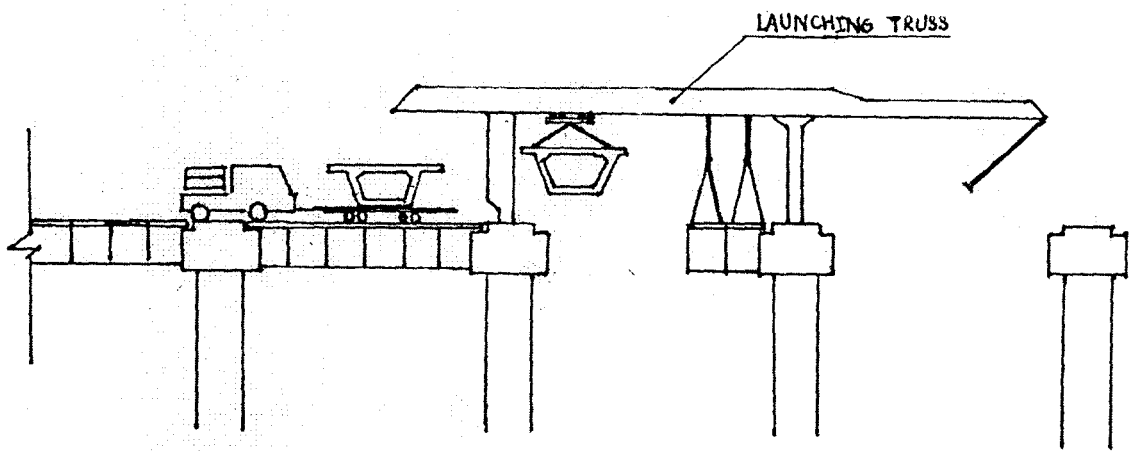


Fig 5. Segmental deck erection method

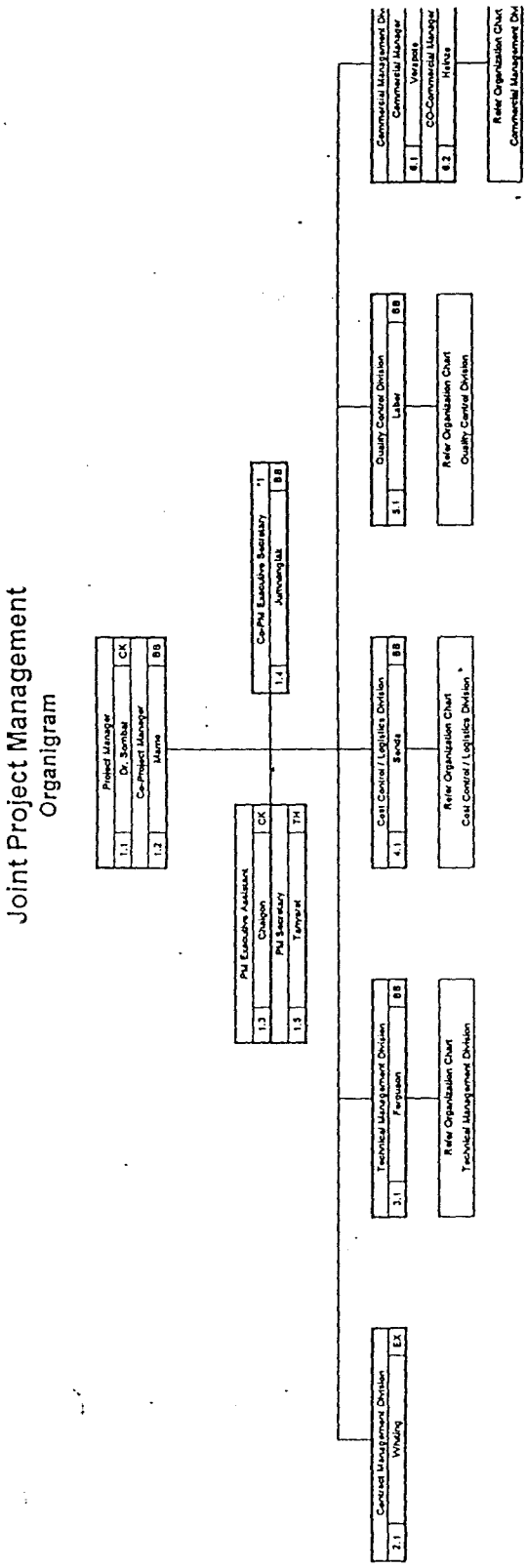
RECOMMENDATION

- PM and other managers had to illustrate the overall picture to their team members and explain how their duties were important and effected to the critical path if they were delayed.
- The scheduling processes should be planned not only from top-down direction but also bottom-up. The action team should explain what obstruction was while the scheduling team should explain how it effected the critical path. PM and other managers had to pay attention and make decision to solve problem immediately at the right time.

- The project management concept can be applied to every projects; however, some parts of project management concept such as organization and authority management style should be differently done. PM has to concern about the culture if he manages project in aboard. In this project, it was composed of three foreign construction companies from different countries, so there were three cultures; Thai, German, and Japanese. All cultures are completely different such as the way to show their opinion. German show their opinion in implicit way while Thai choose the explicit way since Thai society culture is relied on not only qualification but also seniority. Therefore, if project is joint venture with foreign company, all members should be trained to understand other culture before work.
- The informal meeting and party among all team members should be set at least one time a month. The benefit is that they can exchange their idea and job experience.
- PM should mold everyone to be a single team by regardless parent companies which they come from. The sole image can reduce numbers and degree of conflicts. This is very necessary and important to fulfill the weakness of the joint venture company.

APPENDIX B : THE ORGANIZATION CHART OF JOINT PROJECT

MANAGEMENT UNIT



APPENDIX C : THE ORGANIZATION CHART OF JOINT CONSTRUCTION MANAGEMENT UNIT