

Contrastive Analysis of EPC Project Designing Process in Domestic and Overseas

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Abstract

This article simply introduces each phase of the EPC project designing in domestic and overseas and detailed interprets the designing process at home and abroad. Meanwhile, the specific comparison and analysis are made in connection with the domestic and overseas designing process, and we take a natural gas processing plant conducted in Pakistan as an example to summary the accumulated experience in the projects we have done before, also we have made it an comparison with the projects we've conducted domestically, and then to analyze the difference so as to guide and make example for the successive projects that will be conducted overseas.

Keywords

EPC Project; Designing Phase; Design process; Contrastive Analysis.

1. Over view

Based on the rich and long term experience of domestic and overseas EPC projects operation, combined with the experience of conventional practice of foreign turnkey projects, we make a contrastive analysis of the designing process, analyze the similarities and differences of designing process between the domestic and overseas, and we hope that it can be useful to guide and use for reference in the future overseas projects.

2. Division of the designing phase

2.1 Domestic designing phase

Conceptual design, feasibility study, preliminary design and construction drawing design make up the most common domestic designing phases, while not every project needs each of these four stages (Table 1).

Table 1 Table of Domestic Designing Phases

Designing Phase	Domestic Description	Level of Detail	Corresponding Investment
Feasibility Study			Estimating Costs
Schematic design	Conceptual design	The level of detail shall meet the requirements of making the preliminary designing documentation and the estimating costs controlling.	Estimating Costs
Preliminary Design	Basic Design	The level of detail shall meet the requirements of making the constructional bidding documentation, main equipment & materials ordering and the constructional designing files.	Budget Estimate
Construction drawing design	Detailed Design	The level of detail shall meet the requirements of purchasing the equipment & materials, fabricating the unconventional equipment and constructing works.	Budget

2.2 Overseas designing phase

The overseas designing works can be divided into the following 5 phases: 3 G1 |5 W1 i, g% K(h U/ e+ l.

Concept Design;

B. FEED (Front End of Engineering Design), (Not obligatory for every project);

C. Basic Design;

D. Detail Design;

E. As-Built Drawing Design.

If the mature processing package is available, the basic and detailed design comprises the designing works overseas. While the basic design means that, based on the processing package, according to the feature and input condition of the project, transferring the processing package into the engineering approaches as the base of the detailed design. The overseas basic design is much deeper than the domestic preliminary design. The PFDSS design, first edition of PIDS design, data sheet of the equipment, instruments and cables & lines, enquiry and ordering of the key equipment, inquiry of the most equipment, 30% study and modeling works of the pipeline routing, study of the electrical & instrument routing, the enquiry and ordering work of long term equipment, such as electricians & instrument; While the detailed design means, according to the designing standards and codes, transferring the basic designing files into drawings that can be used to guide the instruction works as well as to meet the requirements of the procurement.

3. Designing Process

3.1 Designing Process in Domestic Projects

See the Flow Fig. 1 of the Designing Process for Domestic Projects.

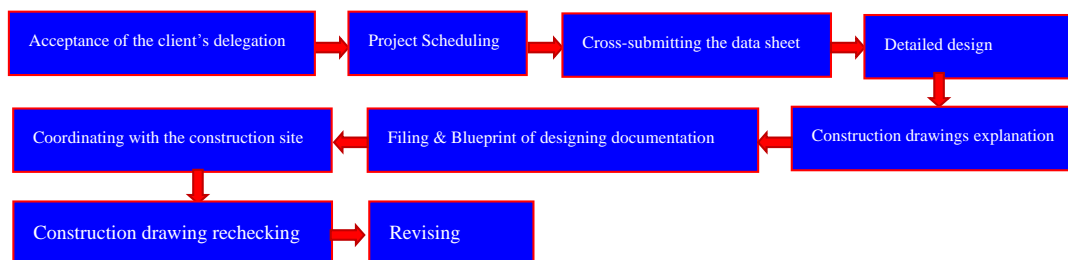


Fig. 1 Diagram of the domestic design processing

Note: The domestic project designing starts with acceptance of the client's delegation, one common way is that the client gives the Designing Engagement Letter to the designer, the other is carried out by a bidding form, and it usually refers to the Bid-winning Notice. While the later one is much more commoner overseas, and this form is more and more prevalent in domestic engineering market.

The edition of the designing files is less than that of the overseas. Generally, we have only one edition, i.e. 0 Version. Only if necessary or something unusual happens, the updated versions or Engineering Changed Order will be used.

3.2 Design Process in Overseas Projects

The designing process refers to Chart 2 while the Chart 3 shows the approval process of the designing process. The basic design which made by ZEL Corporation in Pakistan is just like what we called as preliminary design in China. The level of designing detail shall meet the requirement of the tendering and bidding works, and the technological parameter shows in the tendering documents. The technical and commercial proposal comprises the bidding documents. The project will start up when the Bid-winning Notice is acceptance, and the project department will be established, and then the project kicking-off meeting, the designing works will be conducted according to the requirements of the tendering documents and contract.

The layout chat, PIDS and PFDSS will be most essential documents to make communication with the client in the designing inspection meeting and these three kinds of documents shall be completed in the first phase.

In the designing inspection meeting, the concerned designing problems will be discussed and solved together between the engineering department staff and client, thus the bidding documents shall be well interpreted before the meeting, while the MEMO shall also be well recorded in connection with the questions discussed in the meeting to serve as proof of the designing and claim issues.

The prepared layout chat, PIDS and PFDSS will be submitted to the client for approval, and after getting approval, the HAZOP will be conducted. The chairman, professional specialists, client, designers and so on shall be invited beforehand to attend the HAZOP meeting. All the presents in the meeting will discuss the safety and feasibility of the PIDS and draw an analysis report. Usually, one week after the HAZOP, the closure report shall be submitted and client's confirmation and signature is needed within seven working days, then the PIDS will be complete.

The designing, submitting and approving of the data & calculation sheet are needed especially for the equipment and valves designing. It is necessary to submit the data & calculation sheet for valves model selection works. Sometimes the parameter needs to be submitted by the manufactures, while the manufactures have not been selected yet by the purchasing department, so it will affect the designing process. Because the manufactures' calculation and simulation are badly depended, while the problems such as different format, low quality of the submitted drawings will have negative effects.

The equipment orders shall also be approved, and the purchasing works start after getting the approval, which is different from that in domestic. The drawings submitted by the manufacturers always change a lot, even they have been updated up to Revision 0, the change happens. Actually, there is no measure to solve this kind of problems for the design & purchasing departments. Every time when the change happens, they will make a TQ to negotiate with the client, usually it will take a lot of time to deliver and receive the messages.

The design of three-dimensional piping, based on the skidded manufacture's parameter, is what we called as installation drawing. It can be divided into 30%, 60% and 90% these three stages. Because of the uncertain issues of the exceptive valves, the designing work cannot be closed.

4. Comparison between the Domestic & Overseas Designing

1. Designing process is highlighted in overseas, and the client (or representative of client) checks and controls each key point of the designing process.
2. The overseas client (or representative of client) lays emphasis on the details of the designing documents, especially format of the serial No. and edition etc.
3. The designing documents start with the Version A, and the submit it to the client, if not approved (there are some different ideas about the DRC), the Version B will be submitted to the clients (modified documents plus reply about the DRC), if the Version B still not be adopted, then the Version C is needed till getting the approval by the client about the DRC (Approval plus No Comment). After that, the Version O will be re-submitted and maybe it will be updated to another version later.
4. The data & calculation sheet are attached great importance in the designing process, especially the key parameters appearing in the calculation sheet. It is the philosophy, basis and reason etc. not the experience practice that are needed.
5. There is no installation drawing in overseas designing process, while the design of three-dimensional piping is stressed.
6. The client pays great attention to the codes and standards. There is executing codes in 667 Project even in the interior aspects, such as the codes for painting, lining and surface treatment, while the

165-4-SPM-058 is a kind of code attached in the tendering documents. What’s more, the rust removal and painting work are detailed required against the pipelines, equipments and steel structures.

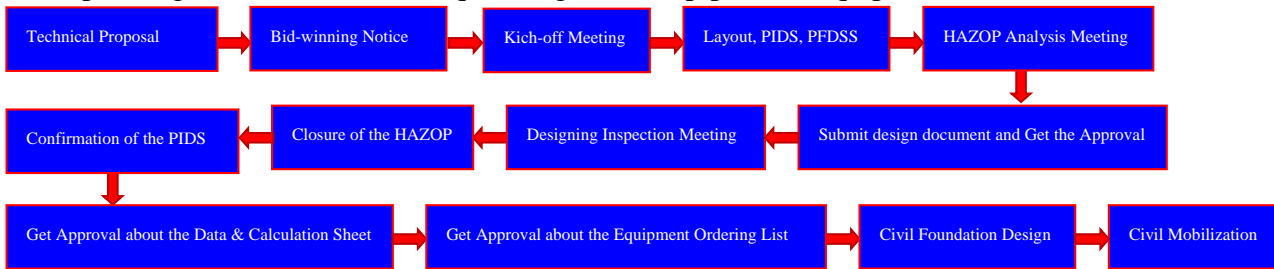


Fig. 2 Diagram of the designing Process

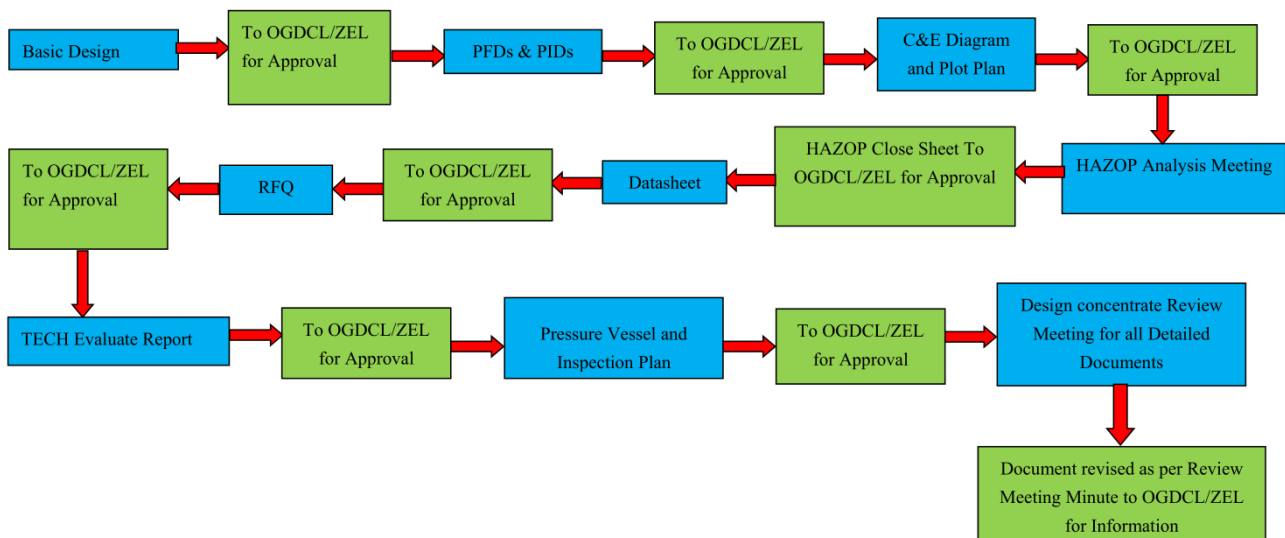


Fig. 3 Approval Process of Designing Documents for the 667 Project

5. Conclusion

(1). The leadership shall pay great attention to the quality of the designing work, do not be penny-wise and pound-foolish;

(2). The designers shall be pretty prudent and the supervisors shall be rigorously control even a quite small designing error.

Some errors, like the faults about name of the drawings, document number, edition, pages, name of the project, project number and so on shall be completely eradicated. If these errors appear, that means the low quality of the designing work even though with a quite good designing parameter and processing.

(3). Multi- channel communication is the key to enhance the designing efficiency. The multi-channel and efficient communication ways (like letters, interview, telephones calls, meetings etc.) are badly needed. Compared with letters and Emails, interview is much more direct, efficient immediate.

(4). Only one same voice is needed against the designing works for each professional designer. The parameter of the data sheet shall be highly unified for a same project.

(5). Usually, there is more than one designing company for one project, and each company with different levels. The division of the working interfaces, docking points, the unified use of the designing format shall be coordinated and managed integratedly. One way is that the designing sub-contracting is banned; the other way is that to cooperate with another company with great designing capacity. No matter which way to choose, to enhance the inner capacity of coordination & management is badly required for the designing department in the project.