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PRE-CONTRACTING PROCEDURES FOR FERTILIZER AND CHEMICAL PROCESS PLANTS

Prepared By

NATIONAL DESIGN & INDUSTRIAL SERVICES CORPORATION, LTD.

On Behalf Of

BOARD OF INDUSTRIAL MANAGEMENT

PRE-CONTRACTING PROCEDURES FOR FERTILIZER AND CHEMICAL PROCESSING PLANTS.

Objectives of Pre-contracting Procedures.

1. The objectives of having defined pre-contracting procedures are really to lay down a methodology to be followed under which the potential contractors feel that they are getting a "fiar deal".

2. In addition and this is particularly important for public sector organisations, fair play in contracting should not only be done but it should also appear to have been done. This is an essential part of accountability.

3. In Private Sector projects, where the entire financing arrangements are of a private nature, obviously detailed Contracting Methods are not required. In fact many large companies tend to go to the same know-how and/or Engineering suppliers, who have built them successful plants in the past. This is an acceptable procedure when an individual has control of all the funds. With current costs of Fertilizer and Chemical Plants, developing countries seldom have such entrepreneurs. In general loans from International Agencies are needed and in all such cases, proper pre-contracting procedures have to be followed.

4. The present document lays down a methodology for such procedures and because it has been undertaken by a public sector Corporation is naturally aimed at public sector projects, but is equally valid for other projects.

5. The document has not detailed Appraisal Methods for bids. Since this is a more controversial subject and is being separately discussed. An appendix to thie document detail-

ing the draft appraisal methods suggested to the Board of Industrial Management, is given as a suggestion.

Planning for the Project.

6. The results from an operating project cannot be better than the extent and quality of planning and execution which had been undertaken for the project. A number of persons and agencies are usually involved for the setting up of a project. Each one has its own limitations and bias. The planning has to be very discreet, objectives need clear definition. A thorough knowledge of the needs, expenses for the project and preconditions for technical and commercial success is necessary. A properly conceived, thoroughly studied and completely defined parameters of the project are a must, not only for the success of the project, but also to draw up proper documentation for tendering and Contract. The appraisal for a new project need intensive and extensive study of the market(local and export) requirements and projections followed by a feasibility study.

7. The feasibility study should be carefully prepared and all relevant data should be procured. This data should help in deciding on the plant size and its economics, the sources quality and extent of raw materials and their economics; the availability of services like fuel, power, water, steam and the way these will be provided. The most economic process which has sufficiently established its soundness for normally, at least 3 to 5 years depending on the complexity and project size; suitability of site and means of communication (Road, Rail, Water-ways, Telephone, Telex etc.) available or required to be developed. Having decided on the site all relevant

meteorological, soil and stratographic data should be collected. The feasibility study should also give broad outlines of equipment, land needed, civil works required, a preliminary estimate of project implementation schedule, needs and type of personnel and services for implementation and operation proposed financial structure and preliminary estimates of the project cost. Depending on the availability of manpower, experience and machinery resources. It should also advise on the extent of local and foreign involvement in the project implementation. It should, also identify if there would be need for specialised training of personnel for implementing, erection and operation.

8. A thorough and objective study is a pre-requisite for a successful venture. In particular, in analysing various alternative processes, enough consideration should be given to the history of operations and performance of plants based on these processes. In the absence of sufficient published information and personal experience, it is certainly desirable that a team of two technologists (in the same or closely related field or persons having sufficient technical background) are deputed abroad to examine the operational characteristics of such plants. Such a team should visit at least two similar sized units based on the more viable process, hold discussions about the performance of the process and the equipment and see for themselves (if possible) the operational record of production , break-downs and on-stream factor of the plant and seek the advice of the operating plant engineers to guard against pit-falls.

9. At a very early stage in the project, a decision must be made as to the type of Contract which it is proposed to consider.

Tender specifications for process plants can be of four basic types:-

(a) Tenders for know-how and basic engineering only, with all the detailed engineering and procurement being undertaken in the developing country. This is where, largely but not entirely, the equipment is to be manufactured within the country itself.

(b) Tenders for fixed price on know-how, basic and detailed engineering, and for procurement services with the actual procurement of equipment for the plant being undertaken on an individual item basis, with the client participating in the procurement. This is the preferred method of the World Bank, ADB and most financing agencies for large projects.

(c) Tenders for the supply of complete plant and equipment within specified battery limits, either on a C & F or FOB basis.

(d) Complete turn-key contracts including erection and Civil Engineering.

10. The choice of the type of contract must vary from case to case. Normally plants of a standard type and costing less than $10 million are tendered for on a complete plant supply basis (9(c)above) and large projects are contracted with fixed fees, and actual costs for individual equipment(9(b) above). However in certain cases such a refineries, the turn-key method (9(d) above) is fairly standard.

11. One additional constraint which may effect the choice of the type of contract must be mentioned. This is the question of the availability of foreign exchange. If foreign exchange is short, and local money freely available, contracts of the type requiring a maximum of local manufacture (9(a)above) or a mixed purchase of equipment (such as 9(b) above) are less expensive in foreign exchange. If the reverse is the case, then a turn-key project could be considered. It should be emphasised that the higher the risk of the Contractor, the higher will be the cost.

Prequalification of Bidders:

12. Before asking bids from all and sundry, it is desirable to limit these only to such Engineering/Equipment manufacturing companies who are sufficiently conversant with the work, have enough sound experience in similar projects, can provide sufficient references [illegible] and performance data of the plants set up by them. They have sound financial position, enough available engineering manpower to be allocated for the project, had experience of setting up similar sized plants preferably in countries of similar level of technical advancement. This is particularly necessary where the project cost is $1.0 million or more. No company who has built less than two plants in similar/larger size for the same product, should be considered for the bids.

13. In order to obtain best response to explore the competent bidders, it is advisable to put a notice in a couple of European/American and Japanese newspapers, Financial/ Technical newspapers or Journals having large circulation. Copies of notice should also be sent to the foreign Embassies of such developed countries where

reputed engineering/manufacturing companies for Engineering or manufacturing such plants could be situated. In the case of the centrally planned countries, including, off course, the embassies of China, U.S.S.R. and East European countries, a direct contact can be made through the embassies with the relevant export organizations.

14. The prequalification notice should contain particulars of the project. Capacity, product, particular process if it has been selected; otherwise it should request outlines of the process which the interested bidders could offer, project location, approximate date of starting work on the project, and the type of contract which is envisaged. Some information on the method of procurement, last date for the supply of the informa-tion required from bidders and address of client to whom it is to be sent.

The notice should request information from the organisations interested to bid on the following points:-

(a) Past experience on similar plants.

(b) Present work load and availability of personnel, or if Contract requires construction or other equipment, availability of equipment.

(c) Location of each plant or equipment supplied by the bidder.

(d) Capacity of each plant or equipment supplied by the bidder, and know-how on which based

(e) Identification of plants using the offered process or equipment.

(f) Date of start-up of each plant(actual or planned), and on-stream factor during each of first 3-years, for operating plants.

(g) Whether any of the plants using the process or equipment can be visited by the engineers of the Corporation, and if so, the notice period required.

(h) In the case of plants in operation, the exact function of the bidder in each case(Engineering, Supply of the entire plant, supply of parts of the plant etc.), should be requested.

(i) Whether the Contractor proposes to use outside partners, Consultants etc. If so particulars of such parties.

(j) Experience in developing countries, including references ofother chemical plants than the type requested.

(k) Last Balance Sheet. This may be waived for Private Limited Companies. In the latter case some indication of financial position should be obtained.

(l) Bank References.

(m) Whether Companies are involved or have been involved in any litigation. However, while these are being clarified, issue of tenders should not be held up to other bidders.

18. The notice should preferably provide enough time to enable the interested bidders to submit useful information. A period of 5-6 weeks should be enough unless the client is in an extra-ordinary hurry, when the interested parties could be requested to send in information within 3-4 weeks.

16. As a result of information which may be received on the issue of such prequalification notice, some companies who have sufficient and good references in similar projects, sound financial position, enough competent technical manpower to spare for the job, can be identified; so that bids for the plant are restricted only to a few prospective and competent bidders rather than to all and sundry.

Bid documents:

17. While the notification has been issued and even before that, the client should by himself, or with the help of a competent consultant, draw up a comprehensive tender document. This document should include every information about the project, client and that required of the bidder:-

(a) Complete details about the proposed project should be explicitly provided viz., capacity of plant(whether in single/multiple streams), product with specifications(with variations if permissible), available raw materials(or raw materials proposed to be procured) with their specifications(the specifications should be sufficiently reliable and representative), fuel and other utilities and their availability, financial procedures and payment terms, project location, information on sponsoring agency, and its relation with government or other organisations, limitations to be kept in view.

The tender specification should also state:-

(a) The proposed areas for the storage of raw materials and auxiliary materials(if required on site), intermediate products and finished products with proposed capacities(these off course could be changed depending on the final design acceptance)as well as the type of the storage.

(b) Type of handling facilities for the storages.

(c) Any special process, product or effluent treatment which the client desire to specify.

18. A brief description of the financing arrangements, with any restrictions in bidding, if suppliers credit is required it should be stated along with preferred conditions.

19. The data on site should be sufficiently complete viz available area, topography; any infra-structure if available; communication facilities(Road/Rail),the potential and limitation of transport means for carrying largest sized equipment(in size and weight), materials and products to and from the site to ports/other places. Monthly meteorological data of site in particular and monthly average meteorological data of the country; in general seismic data; data on dust storms their frequency, intensity maximum velocities,suspension and period of occurrence; effluent disposal methods and municipal regulations(if any), soil and sub surface water data, source and quality of water, extreme temperatures of water during summer and winter.

20. The tender should also define the Battery Limits of the plant, facilities of packing, internal movement and for power production (if needed) or its equipment. Mention should also be made about preference for the design standards to be used. In case if specific national standards for certain equipments are required, these should be stated.

21. All utilities which are to be included as part of the bid should be clearly specified. In case if canal/river water is to be used, then water analysis over the year together with seasonal variations in flow should be stated. The type and composition(including any harmful components) of Fuel to be used should be stated.

22. The list and specifications of equipment which can be available within the country and Government restrictions on the import of certain items of equipment alongwith their specifications should be clearly indicated.

23. In case the bidder is expected to arrange site Management and or erection supervision, then the extent of his involvement should be stated and he should be expected to give details for the service.

24. The bidders should be requested to give detailed information and accept the conditions of the tender regarding type of contract(whether Engineering,Cost plus, lump-some, turn-key etc.).The bidder should confirm that they are bidding for the process selected by the client. In case if the bidders offer a different process they should state so and explain the comparative advantages of the process over that requested by the client. A new process, which has not proved its success in at least three different plants of similar size shall not normally be accepted. Same is to be considered for the know-how. The bidders should agree with the financial terms and restrictions(if any) or may suggest reasonable modifications.

25. The bidders should be requested to explain the process (whether that requested or the alternative being offered) in detail with flow diagram, depicting conditions of mass flow, temperatures, pressures and compositions at various positions in the process. They should include consumption of materials and utilities/unit of the product or per hour or per day of operation. The specifications of materials, utilities and products be explicitly stated by the bidders. Conditions,quantities, quality and method of disposal of effluents(if harmful) should be explained.

26. The bidder is expected to detail the services which may be required of him under the type of the tender. For contracts of the total supply of equipment, within the Battery limits detailed list of all the required equipment(if possible rough sizes and approximate weights be given in any case these will be required for the larger pieces of Equipment) with materials of construction and numbers of each,stand-by pieces of equipment which is considered desirable for the smooth operation of the plant.

27. The exclusions must be specifically stated. It will be understood that excluding the stated exclusions the rest of the equipment offered by the bidder should form a complete operateable plant. Any piece of equipment necessary for completion of the plant,within the Battery limits not detailed nor specifically excluded in the bid will be on account of the bidder.

28. The type, class(preferably maker also) and list of complete instruments for measurement and control necessary for the efficient and safe operation and control of the plant should be provided. Wherever manual control is involved, it should be specifically stated. Details of control panel mounted instruments for control with their modes should be detailed along with their system(pneumatic,electrical or electronic) of working.

29. The extent of essential spares(detail list itemwise) expected to last for the initial 2 years requirements be given.

30. The bidder is expected to give the following information also:-

(a) Design Capacity of each unit of equipment of the plant(for all major units).

(b) Normal operational capacity of equipment and the plant as a whole.

(c) Guaranteed capacity of plant units(of individual process units) and the plant itself.

(d) On stream factor of each plant unit.

(e) In case of the moving/rotating equipment, the type of drive; and type of machine (viz centrifugal/reciprocating compressor, plate/packed column,tube and shell/plate type/coil type/jacketed heat exchangers etc.)

31. (a) The bidders must state special conditions and specifications of supplies and services which they expect the clients to provide.

(b) The period of delivery with break up of schedule(Bar chart)for various activities viz. Engineering, enquiries, orders, inspection expediting and procurement,shipping, layout, civil work at site, erection, commissioning and guarantees test should be given and extent of accuracy on these time estimates should be stated.

(c) Method of procurement(whether it will be by orders jointly by the Engineers and Client/ client,if terms of payments need modification than those stated in the tenders, commission to any agents on placement of orders (percentage, currency and particulars about the agent), whether procurement will be done by international bids for equipment(in case it is a condition of the loan giving agencies) or by asking limited bids from some selected vendors, extent and statement of proprietary items of equipment.
Extent of equipment which may be possible to purchase locally.

(d) Wherever the bidder consider Deviations from Tender requirements to be necessary (including Design Standards), he may expressly statese in his offer and preferably provide an indox for all such deviations to allow proper check.

32. The bidders should also give the following information:-

(a) Registered Name and legal address of the bidding company, executive to be directly involved with the project and the location of the design offices.

(b) Detail of experience in the particular field viz list of all plants for similar process with sizes; dates of contracts, start up and reaching of 100% capacity,on stream factor, plants using the process as offered, and the plants which can be visited by representative(s) of the client on prior notice.

(c) Experience of key personnel who will be assigned the project work.

(d) Present work load of the company and prospective loading.

(e) Arrangements that the company could make for training the personnel of the client in process,maintenance and quality control.

(f) Agents(Associates of the bidders in the client's country) and commissions payable to them.

(g) Arrangement of purchasing equipment with in the country of the client.

Guarantees:

33. In developing countries the degree to which Guarantees have been obtained in a contract have often governed the success of a project as well as its timely implementation. Therefore Guarantees should be explicitly enumerated in the tender specifications. Although all the types and extent of guarantees may not be forthcoming. In such cases a clear indication should be provided for "Absolute Guarantees" and while deciding on the bids, due importance should be given to the bidders who undertake this commitment.

34. The bidder is required to explicitly state guarantees both Absolute and Penaltiable ones. The absolute guarantees should be that for capacity, product quality and effluent quality. These have to remain within the limits specified in the tender. In case of varia-tions from the limits to the extent of 5% in capacity and 1% in specifications the bidder will state the Penalties payable for such variation upto the stated limits. The plant will not be acceptable below 95% capacity. In case if the total plant consist of a number of units which are being offered by different bidders then guarantees for 100% capacity and quality must be given by the bidders for each plant.

35. The absolute guarantees desired for effluents will depend on the plant location, municipal/state laws, facilities for treatment and disposal which should be provided in the tender.

36. The bidder must specify penalties for defaulting in commitments which effect the schedule of supplies and the cost of manufacture from the plant. These consist of factors like documents giving load drawings for civil engineering(as identified in Annexure 1). Timely supply

of management, erection and start-up personnel consumption rate of the raw materials, catalysts, utilities, quality and quantity of harmful effluents. These limits must comply with the guarantees mentioned in the bid. In case of variations on the actual guarantee tests, these variations will be liable to penalties; rate of which the bidder must state. The details about penalties can be discussed at the stage when contract is being finalised.

37. The tenders must specify the minimum period to demonstrate the guarantees the mechanics of guarantee tests, demonstration of the mechanical soundness and stability of the plant. In the conditions existing in the developing countries the plant stability should be demonstrated at least for a period 15 days and guarantee tests run for at least 7 consecutive days; although it will be desirable to have these demonstrated over twice this time. Where the plant is producing more than one alternate products then the guarantee tests on each product be demonstrated for at least 3 continuous days. The procedures for notification and monitoring guarantee tests should be specifically laid down in the tender documents, as well as the International analytical methods to be used.

38. The bidder must guarantee the supply of complete plant with-in Battery limits particularly all other equipment which has not been specifically excluded. All equipment supplied under contract should be guaranteed for mechanical soundness and against mechanical defects for a period of 12 months after start up or 18 months after supply of the equipment. The bidder should give/obtain warranty for useful life in case of materials like catalysts, MEA,activated carbon etc. etc.

39. The tender must state the maximum liability(may be 10%) for non fulfilment of conditions except for absolute guarantees, the latter will be subject to no limitation.

40. The tender specifications should request that the technical proposal be separated from the price proposal and the latter be sent under a separate sealed cover. The last date for the receipt of proposals should at least be 6 months(min.4 months) from the date of issue of tender specifications. If any extension is considered during the pendency of the proposals, then this may be communicated telegraphically to all the intending bidders.

41. The tenders should also lay down the date, time and place for the public opening of the bids. The tenders should preferably require a summary of the price proposal in a form common for all the bidders.

Information required to enable proper Appraisal.

42. In order to compare different proposals, in the ultimate analysis the main factors are the total cost of the project (and the equipment being supplied), and the cost of manufacture.

43. If it is a turn-key project, and if all the major elements of cost(consumption of raw materials and utilities etc.) are being guaranteed, the comparison is easy.

44. In the case of Contracts with total supply of equipment C&F or F.O.B.(Contracts of type 9(c) above), the only other major component in the cost structure would be the Civil Engineering costs. In such cases an approximate size of all the process plant buildings, including the

number of floors should be requested. If any equipment requires concrete tanks or concrete basins, these must also be requested to be clearly indicated.

45. In the case of fixed fee contracts, with cost reimbursable or direct equipment purchase, the main difficulty arises in estimating the overall cost of the project. In the event that the Contractor is prepared to give a guarantee(generally an upper limit guarantee) then this may be used. The entire draft appraisal method for the Board of Industrial Management is given in Appendix I which discusses this aspect in detail.

Clarifications:

46. It is often observed that the equipment detailed in the technical offer is either;

(a) short of certain pieces of equipment
(b) has been prepared in much larger or smaller sizes than necessary
(c) type (e.g. for pumps,compressors etc.)not stated
(d) capacities and materials of construction have been ommitted
(e) in case of moving equipment type of drive, rpm/stroke,per mt. etc. not given.
(f) consumption figures for materials and or utilities have been ommitted or given vaguely
(g) specifications of raw materials required, product and effluents if different from Tenders Specifications have not been indicated. The bidders should explicitly mention so; otherwise the specifications of tender shall be deemed to be the basis of the offer.
(h) break up of time schedule or any part of the service(in bar chart) may be missing.

47. These or any other items of information missing in the Technical offer need very careful examination and all such points causing doubt must be clarified by issuing a questionnaire soon after the receipt of the offer. The bidder should be requested to reply to the clarifications asked within 4 weeks(or at least to Major points which may be affecting costs). The bidder may be informed that if in addition to the questionnaire sent to him, that as a result of further examination of the offer some more facts needed clarification then he will be informed latter. Early replies will be essential to enable certain comparisons between different offers ahead of the date fixed for the opening of price offer. The changes in price as a result of the clarifications submitted by the bidder should be sent in a separate sealed cover (marked changes in price), since these will be opened along with their main price offer.

48. The date of receipt of technical proposals and opening of price bids should be separated by at least 10 weeks to enable the client or its consultants to obtain clarifications in certain matters in the technical bid proposal needing explanation from the bidders for purpose of analysing all the bids on the same level. The extent of price differences(+ or -)in the price of the plant as a consequence of clarifications resulting in reducing/increasing equipment could also be obtained while obtaining clarifications.

49. The tenders should state that the bidders at their discretion could visit the client for clarifications on tenders/questions arising out of their technical proposals. The bidders may be informed to send their representatives (if they so desire) to witness the public opening of bids. The tenders should include a clause that the client using his own discretion can reject any/all bids without assigning any reason.

Form of the Price Offer:

80. The tenders should provide that the price bids are prepared in a detailed form giving fees/prices separately for each item viz;

(a) the fixed fees like Know-how, Engineering, procurement, inspection, supervision of erection, erection (in case if it is to be the contractor's responsibility), civil works (as in erection), Man month/Man day charges for the contractors staff at site or engaged for the job out of his home office, per diem allowances and other facilities for the contractors personnel at site.

(b) Indicative Costs:
The estimated cost of the complete plant should be given with best of accuracy. The tenders should specify the limits of the accuracy and the extent of which these are guaranteed above the upper limits.

(c) Escalation formula for indicative price of the plant as well as other variable costs e.g. for personnels say after 1 year, Man months for each category of jobs and prices/man month.

Bid Opening.

81. While opening the price offers the summary of prices together with any plus/minus due to clarifications need be announced. The prices in the currency of offer should be read out and converted on the prevailing rate of exchange as available on the opening day of the offer.

82. The price offers shall be opened, publicly as stipulated in the tender. The representative(s) of the bidders if present can witness the same. Considering all Technical

offers are acceptable only two to three bidders quoting lower prices(by significant amount) be marked for further discussions/negotia tions etc, who could be informed separately after the price offers etc. have been examined.

53. The marked bidders should be informed to join in further discussions(say after 3 days to 1 week depending on the complexity of evaluation). The representatives should have authority to negotiate on Guarantees; confirm/ modify consumptions, time of delivery and even prices of certain services. If their representatives can join earlier well and good, otherwise they may send such a team within 2/3 weeks for this purpose.

54. Where more than one party is involved on similar services/ supplies, then discussions with these should better be staggered by one week; otherwise these could be held simultaneously(e.g. morning with one party and afternoon with the other); but this may not be practicable for more than two bidders at one time. During the intervening time between price bid opening and discussions the offers have to be economically evaluated.

Bid Evaluation:

55. The methodology of bid evaluation can vary from plant to plant and on type of contract. Appendix I indicates the methodology for large process plants, suggested in Pakistan for the Board of Industrial Management.

56. In addition to a price and cost of manufacture bid analysis, factors which must be considered are:-

(i) That the process offered is either the same as requested(provided change has not been permitted)or a better and sufficiently established process has been offered, the general reputation of the process is known to be good.

(ii) The standing of the company for having put up a number of similar plants(in similar/ larger sizes), the successful commissioning, the time taken in setting up the same and the experience of the key personnel likely to handle the offered project.

(iii) General reputat ion and Financial standing of the bidding company as to its competence, cooperativeness,reputat ion in meeting guarantees.

(iv) Schedule of completing the project and the extent to which the bidder is prepared to guarantee the same.

(v) The extent to which bidder is prepared to undertake the Absolute Guarantees and Penaltiable Guarantees.

(vi) Plans for the training of clients personnel.

(vii) Differences if any in quality of products and availability of Trade names(if desired), and export rights.

(viii) Reliability of equipment which is being offered if any historical knowledge for the critical pieces of equipment is available.

(ix) Period to attain 100% capacity(if warranted).

57. There is no absolute method to evaluate bids. The system has to incorporate all such factors that may affect the plant at a lower cost,lesser cost of production,plant reliability,mechanical soundness, shortest possible time in setting up and reaching 100% capacity, least breakdowns etc. The methodology given in Appendix I partly covers these and other factors, by the use of a Discounted Cash Flow Method.

Procurement:

88. Procedure for procurement should be clearly stated in the tender specifications. The role of the bidder for drawing out complete specification of equipment arranging to obtain enquiries for equipment, analysing bids for equipment, recommendations on equipment and preparing orders in the name of the client etc. should be stated.

The procurement document shall be issued in the name of the client, and no commission will be payable for the purchase of equipment to any one except to the registered agent in the clients country. The name of the agent and amount payable shall have to be given.

In case if procurement is to be done on International Financing basis, then a copy of the relevant guide lines should be provided to the bidders.

Payment Terms

89. a) The terms of payment for various services should preferably be included in the tenders. In case the bidders want some changes in these terms, they should explicitly state so in their price bid. The terms of payment for the bidder (contractor), should be staggered over the period and progress of each activity leaving at least 10% from each activity to be payable at the successful demonstration of guaratee tests or within 6 months of mechanical completion; in case if guarantee tests cannot be undertaken for want of client's supplies.

b) If payments are made through Letters of Credit, the mode and conditions should be stated. If the payments are to be made by International financing agencies; their modes of payment should be explained; If the payments is from certain tied loans or credits, the conditions of payment from

these funds should be stated. Where the supplier's credits are to be arranged by the bidders they should give the conditions of such credit.

Contractor's Obligations:

80. The services to be rendered by the bidders will depend upon the scope of the contract envisaged, which may be one of the types indicated under paragraph 9 above.

The bidders should be advised to quote the fees and prices separately for each of the service expected to be rendered by them.

81. The salient features of the contract being envisaged could be indicated the Tender Specification's but should not be made rigorously binding on the bidders so that they are not scared away at this stage,since bid preparation itself is quite time consuming and expensive for the bidders and if he feels that at the end the conditions may become a hurdle, he may loose interest in it.

82. The Tender document should state that all price offers shall be kept open for at least 4 month and preferably 6 months to enable bid evaluation and discussions.

Negotiations with bidders:

83. If only one bid is received, then the project needs re-bidding. Some more names of the likely bidders (the bidders however must qualify the minimum requirements to participate in the tenders, which could be somewhat relaxed in case rebidding is done). As pointed out earlier two to three bidders for each section(lowest, next lower in capital cost, as well as one with highest D.C.F. and well established process) should be selected for further discussions.

84. In case international Financing is involved, then negotiation on prices can not be done except some genuine reductions, by further reducing the scope of supplies (without sacrificing the plant reliability, ease of maintenance, schedule, guarantees, capacity, product and effluent quality).

85. Before initiating the discussions it is necessary that the evaluation of bids had been discreetly examined, salient results summarised, capital cost of equipment(including reductions/increase as a result of clarifications) on FOB/C&F basis (on similar basis for all bidders) is available. In case of FOB bids, the shipment, clearance and forwarding charges, insurance etc. need also working out. Before negotiations all bids should be analysed on equal basis.

86. In case if prices can not be further negotiated under the terms of loan or other limitations, still certain other factors can be negotiated which have bearing on the overall project cost eg:

a) That the bidder having finalised his Engineering for a unit including materials shall obtain approval of clients Technical Consultant, and modifications advised provided these do not affect the soundness of the final plant shall be incorporated in the design without any additional cost to the client.

b) The type of buildings essential (wherever needed) for certain sections would need discussions to adopt a pragmatic concept, off-course keeping in mind the requirements of operation, equipment materials etc. Similarly the layout allowing economic use of space (without sacrificing process, erection and maintenance requirements).

Timely advice on site development, foundation drawings or loads (in case the civil engineering is clients responsibility), approximate space and strategy for storage of equipment on site prior to erection, erection tools and tackles required for economic and early erection of equipment, type and extent of technical manpower for erection (with approximate dates of requirement) commissioning and operation phases.

67. Discussions on all such items for which the information is not discreet or needs further elucidation or improvements could be explored. A competent Technical Advisor if available should be associated. These discussions are held to explore the bidder who would be most suited for setting up the project economically, in reasonably shorter time with sound equipment and designs, training of personnel, meeting guarantees and other Technical needs of the project.

Submission of Tenders

68. The tender specifications should advise that all tenders should be marked Tender for the"_____Plant". The price offers should be in a separate sealed cover" and the Technical offer should be in a separate cover. The Technical offers have to be opened earlier to examine, and study the extent of equipment, process details, variable cost of production based on raw materials and utilities, sort out excess or larger equipment off sites and other works than that essentially required and bring all the tenders on the same level for purpose of comparasion.

The bidders should be warned that prices of various items of service must be given separately and not lumped together.

APPENDIX I

Methods of Bid Evaluation

1. There are a number of methods of bid evaluation among these are:-

   (i) a point system method.

   (ii) a single cost analysis method to find out the lowest cost of manufacture.

   (iii) more sophisticated methodologies, where not only the capacity of the plant, but the anticipated performance of the plant is taken into account. There can be varying degrees of sophistication in this system also.

2. In all cases, the overall cost difference (if not the overall capital cost) for each offer, and the relative cost of manufacture for each bid has to be evaluated. In subsequent sections of this chapter the methods of undertaking this are discussed.

3. The point system is based upon allocating percentage points to each factor.

4. As an example, Consulting Company give the following point system to a large process plant:-

Contractor Experience.	30%
Guaranteed Maximum Erected Cost.	20%
Equipment - reliability and experience.	15%
Operating costs and guarantees.	10%
Training Programme.	5%
	100%

5. It will be seen that this point system was heavily biased in favour of experienced processes. Even if these processes were older and even if the cost of manufacture was twice as high, others could not match the high marks given to Contractor and equipment experience.

All point systems basically give weightage in one way or another .

6. The method of evaluating on Cost of Manufacture basis, is a reasonable preliminary method of costing.

The simplest method is to take the estimated Capital Costs broken down into erected cost of machinery and equipment and Civil Engineering (See next section), and take depreciation (10% on machinery, and 5% on Civil Engineering) interest (average 10%), and add to them the cost of raw materials and utilities to provide the cost of manufacture.

7. However, this type of calculation does not take into account the experience of the bidder, the availability of training and other factors. A rough valuation can be made from the data on actual operating plants. Thus if one party has built 3 plants in the last 3 years, which are operating at 100% capacity, and the other only 1 plant than 100% capacity. Capacity should be taken for the first party, and a standard 90% for the second party.

8. The above preliminary calculations are sufficient to choose the final bidders to be called for negotiation. However as a matter of policy:-

(a) The lowest bidder.

(b) Bidders offering a higher quality of product.

or special trade-names permitting easier export should also be included in the bidders called for the final negotiations.

(e) Should any doubt arise about the value of the better product, this can be easily calculated by a simple calculation. Thus if the quality of the product of party A above fetched a price of Rs.150 per ton higher than Party B, it will be seen that as the difference in costs of manufacture (as above) is Rs.127 per ton, party A is again in the field. This, of course, requires a careful market analysis in the difference in price between different types of products (such as synthetic yarn).

9. In all such calculations, it has been assumed that the plant sizes are the same. Sometimes the standard sizes of the suppliers as different, and one party may offer a guaranteed plant of 5000 metric tons/year, and another 5000 long tons/year equivalent to 5090 metric tons/year. Where the difference is within 2%, no changes need to be considered, and the different guaranteed figures may be taken in the above calculation.

10. However if the difference in the sizes of plants is large, this can result in serious bid distortions, as a plant of twice the capacity costs only about 65% more. In cases where plants of two different sizes are to be considered, then this should be included in the tender specification.

11. The difficulty arises where the plant sizes offered have small differences say 12,000 tons/year against 15,000 tons/year, with a tender for 12,000 tons/year.

If the market can support 15,000 tons/year, then it is suggested that the other selected bidders should also be asked to quote for a 15,000 tons/year plant, or the nearest available size.

12. A simple comparative method is to recognise that process plants follow the rule:-

$$\frac{C}{C_o} = \frac{P}{P_o}^{0.65}$$

Where C = Guaranteed Capacity and P = Price.

It is suggested that the price actually given for a larger size plant be "corrected" to the plant size asked for in the tender by the above calculation, and then the comparison made at the capacity requested in the tender.

13. Turning now to more sophisticated methods of bid evaluation, one suggested method is outlined below. This method has been used for large process plants in Pakistan, and has been accepted by both the World Bank and ADB. The method of calculating, for each separate factor is given below. It should be emphasised that the method has to be modified to meet changed conditions, or different situations.

14. The method lies in first calculating, the different cost of the project as follows (the methods are discussed in the next section):

(i) Erected cost of Plant.
(ii) Civil Engineering Costs.
(iii) Any other variable costs e.g. cost of training etc.
(iv) Common Costs.

The total of items (i), (ii), (iii) and (iv) would give the total project cost.

15. The next step lies in calculating the costs of manufacture. These can be broken up into:-

(i) Fixed Annual Costs:

(a) Depreciation on 14(i) and 14(ii).
(b) Interest on the entire investment (10%).
(c) Fixed Plant Overheads (supervision, head office expenses etc.)
(d) Labour.
(e) Rent, Factory Taxes etc.
(f) Any other fixed annual fees e.g. for Technical Assistance.
(g) Any other fixed annual costs..

(ii) Variable Costs per unit in production (tons or number or other units).

(a) Raw Materials.
(b) Auxiliary material inputs.
(c) All utilities.
(d) Royalties (if based on production).
(e) Any other variable input.

(iii) The total fixed annual costs divided by the guaranteed production, gives the fixed costs per unit of production and the total of the variable cost gives the variable cost per unit of production.

16. The same problem with regard to the capacities of plants as stated above in 9 can arise, and should be sorted out in the same manner as given in 9 to 12 inclusive above, and the cost under 15 above

adjusted accordingly.

17. The sales prices of the product (plus the cost of any by-product produced) must now be estimated on an annual basis at the guaranteed capacity of the plant.

18. The basic calculation, at 100% capacity and constant sales price for all parties, now involves a 10 year discounted cash flow to find out, the accepted position.

19. A sample calculation is given below:-

£ Millions	Party A.	Party B.	Difference of B to Party A.	DCF (10%) at year 0.
Capital Cost(Year=0)	300.00	350.00	-50.00	- 50.00
Annual Profit (Sales Price minus cost of manufacture, per unit of production multiplied by Guaranteed Production).				
Year 1	135.00	140.00	5.00	4.50
Year 2	135.00	140.00	5.00	4.05
Year 3	135.00	140.00	5.00	3.65
Year 4	135.00	140.00	5.00	3.28
Year 5	135.00	140.00	5.00	2.95
Year 6	135.00	140.00	5.00	2.65
Year 7	135.00	140.00	5.00	2.39
Year 8	135.00	140.00	5.00	2.15
Year 9	135.00	140.00	5.00	1.94
Year 10	135.00	140.00	5.00	1.74
Total DCF Difference in favour of B on Cost of Manufacture:-				+ 29.3
Net Difference in favour of Party A				20.7

The tenders should include a clause that the client using his own discretion can reject any/all bids without assigning any reason.

20. It will be seen that above represents a simple DCF calculation, with all other factors being constant., and needs no further comments. On the above calculation with a 10-year life of the plant, Party A is better ($ 50 million in plant costs difference against $ 29.3 million at DCF in profits). It will be noticed that if the plant life was longer, party B would improve, although beyond about 15 years the DCF saving becomes relatively small per year.

21. One factor which has not been considered above is the scrap value of the plant buildings and land etc. the end of the 10 year period. If the higher capital cost for Party B contained large storages, or more land, or possibly more scrap value equipment (overhead cranes, steel structures etc.) and if these in the 10th year be worth a high amount, then this would make a material difference. Hence an additional line to the calculation above needs to be added.

	Party A	Party B	Difference	DCF to year zero.
Total DCF at 10th	-	-	-	+ 29.3
Scrap Value(10 year	25.00	75.00	+ 55.00	+ 21.2
			Total Difference	+ 50.5
			Less Difference in Capital Cost	- 50.0
				0.5

The decision now gives in favour of Party B although it is not significant and could be ignored; particularly in view of the uncertainty in the 10th year scrap value.

22. It should be pointed out that it is hard to estimate scrap values at a 10 year interval, but this is the recommended OECD procedure and followed by the German lending agency, KFW. It is suggested that land, usable buildings, and if available, the plant weight at scrap value, be used for making such calculations, or they may be avoided altogether. In actual practice, however , a plant with a higher capital value is bound to have a higher scrap value and hence a percentage of say 10% on capital costs (except land, which should not be discounted and taken even after 10 years at present worth i.e. 10% escalation per year in land prices is assumed) may be taken for all normal purposes. The calculation under para 21 for the particular example given would then be not as favourable to Party B.

23. The above is a simple DCF calculation and changes have to be made in the above calculations for other factors. The first of these is sales value.

24. If in the above case, the plant was a synthetic fibre yarn plant and Party B was offering yarn with a much better trade name than Party A, the difference should be estimated by a careful market survey and the DCF calculation repeated, with naturally a high profit for Party B.

25. We may now modify the calculation to take into account the experience of the bidders. Suppose in the calculation contained in para 19 above

the actual profit had been calculated as follows:

(in million $)

	Party A.	Party B.
Sales Price (A)	$ 300.0	$ 300.0
Cost of Manufacture:		
Fixed Costs.	65.0	70.0
Variable Costs.	100.0	90.0
	165.0	160.0
Profit.	135.0	140.0

26. This would mean that (assuming that variable costs are directly proportionate to production and this assumption is generally good), the cost of manufacture and profitability at different rates of production would be as follows:-

Production Rate.	50%	65%	75%	90%	100%
Party A - Fixed.	130.0	100.0	86.7	72.2	65.0
- Variable.	100.0	100.0	100.0	100.0	100.0
Total Cost:	230.0	200.0	186.7	172.2	165.0
- Profitability	70.0	100.0	113.3	127.8	135.0
Party B - Fixed.	140.0	107.0	93.3	77.8	70.0
- Variable.	95.0	90.0	90.0	90.0	90.0
Total Cost:	245.0	197.7	183.3	167.8	160.0
- Profitability.	60.0	102.3	116.7	132.2	140.0

27. The actual factor for production capacity to be attained by the plant in 5 years, now represents a value judgement and includes such factors as

experience, training etc. of the Know-how suppliers and the Engineering Company and in particular the number of working plants and their record.

28. Basically all Corporations should make their own value judgement on the processes and experience being offered, and this should be undertaken in consultation with all Technical personnel and Consultants, if any.

29. A suggested method, for parties whose plants have reached 100% operation in developed countries, in 2 to 3 years, was as follows (for a fertiliser plant) and accepted by the World Bank:

No. of plants of comparable size.	2	5	10	20
1st year production	50%	65%	75%	75%
2nd year production	65%	75%	90%	100%
3rd year production	75%	90%	100%	100%
4th year production	90%	100%	100%	100%
5th year production	100%	100%	100%	100%

It should be pointed out that the World Bank and some other agencies do not like it to reach 100% production, but only 90-95% and adjustments need to be made accordingly for such cases.

30. Now assuming that in the above calculation (with common sales price), party B had 10 working plants of the size requested, and Party A only 2 such plants, then the profitability would be altered

in the first few years as follows:

	PARTY A			PARTY B		
	Production %	Profitability	DCF to year zero	Production %	Profitability	DCF to year zero
1st year.	50%	70.0	63.0	75%	116.7	105.0
2nd year.	65%	100.0	81.0	90%	132.2	107.1
3rd year.	75%	113.3	82.6	100%	140.0	102.1
4th year.	90%	127.8	83.8	100%	140.0	91.9
5th year.	100%	135.0	97.7	100%	140.0	82.7
6th year.	100%	135.0	71.7	100%	140.0	74.4
7th year.	100%	135.0	64.6	100%	140.0	66.9
8th year.	100%	135.0	58.1	100%	140.0	60.3
9th year.	100%	135.0	52.3	100%	140.0	54.2
10th year.	100%	135.00	47.1	100%	140.0	48.8
Total DCF Profit.			683.9			793.4
Difference in favour of B.				=		+ 109.5

It will be seen that the choice now clearly favours Party B.

31. It would be emphasised that the above represents the methodology to be adopted. The actual capacity in each year of operation to be adopted must depend upon the type of plant and the process. As an example, Caustic Soda plants from reputable suppliers would not need the differential experience analysis made in 25. On the other hand relatively new processes may need even further advantage being given to experience. It is suggested that Corporations establish factors for the number of plants working to be used in each of the categories above, for different processes.

32. It will be noticed that the lowest category given above is 2 working plants.

33. Adjustment to the DCF method can also be made for parties which can establish a plant earlier.

34. DCF calculations of this nature based upon a time factor have a very sharp effect, and hence must be based upon definite time guarantees, and not on "pious hopes". This is to be emphasised.

35. Finally one other factor which must be considered is the question of the financial standing of the bidder. This must be given careful consideration, and if there are any doubts whatsoever, a specific performance bond should be requested.

36. An examination of the foregoing method using a Discounted Cash Flow (DCF) will show that, with few exceptions, it is only the relative <u>difference</u> in Capital Costs, and the costs of manufacture that are important. Absolute numbers are only important under para 25 for the overall capital costs, and under 33 for the overall costs of manufacture, and in both cases, errors of upto 10% or even more in the common costs (not the <u>difference</u>, however) should not be serious. In any case these are discussed further. It becomes necessary now to consider the methods for calculating the various <u>difference</u> first, and the total costs.

<u>Differences in Capital Costs</u>

37. The differences in Capital Costs really consist

of:

(a) The C&F cost of Machinery.

(b) To this must be added the duties (if any), clearance and other charges, inland freight etc.

(c) Supervision of Erection, Start-up and commissioning.

(d) Other erection charges, including all risks Construction and Erection Insurance. (CAR AND EAR).

(e) Civil Engineering differences.

(f) Technical assistance fees or capitalised royalties (if any).

(g) Training fees (if any).

(h) Interest charges during erection on the foreign loan.

All other capital costs, are generally common.

38. The C&F cost of machinery can be further broken down into:

(a) Know-how and Basic Engineering (sometimes called Front End Engineering).

(b) Detailed Engineering.

(c) Procurement Costs.

(d) Inspection Costs.

(e) FOB Costs of Plant and Equipment.

(f) Sea Freight.

(g) Marine Insurance.

39. The calculation of the costs for different types of contracts may now be considered separately.

40. The first and foremost work to be undertaken is to bring all bidders on an equal basis, and within clearly defined limits. In all bid tabulation the comparative statements should include a detailed statement showing:-

(i) Bid price, with full details.

(ii) Additions made to bid to account for missing equipment, with detail and price of each addition.

(iii) Additions made to bid to account for inadequate size or other factors of equipment, with details.

(iv) Substractions for extra supply, with details.

(v) Additions made to the bid for inadequate services.

41. In addition for services, a detailed statement should be prepared indicating the time schedule, and man-hours and daily rates on which fees are calculated.

42. Similarly comparative statements on guarantees offered, and consumption of raw materials and utilities should be prepared.

43. All discrepancies should have been discussed with the suppliers at the questionnaire stage, or the discussion stage, and clarifications obtained in writing.

44. It would be better to first discuss Contracts of the type given in article 9(c) i.e. where a C&F (or FOB) firm price is given.

45. Where the price is a C&F firm price and all Contractors have been brought on an equal basis of supply after discussion, as above, to this only Marine Insurance needs to be added, and this can be roughly estimated at 1.5%.

46. Where only FOB costs are given, then freight has to be added. It is suggested that where offers from different parts of the world are given, a C&F price should be requested. However, sometimes substantial freight rebates are available, and hence FOB contracts are better. Nevertheless the suppliers should be asked to give optional C&F prices and these used for comparison. If very great freight differentials are noted, this should be carefully investigated, otherwise sometimes difficulties later arise.

47. Where firm prices are not given, but only escalatable prices, the indices (see section 2) on which the prices are given, should be examined for the last 12 months, a monthly escalation rate worked out and this multiplied by the delivery times gives the escalation, which should then be used to correct the C&F price given by the Contractor. It should be emphasised that a minimum 0.5% per month escalation rate should be used.

48. To the C&F prices worked out as above, the actual applicable duties should be added as well as other clearance days and inland freight should be added.

49. The supervision of erection must be based upon Contractors daily rates for supervision personnel together with a bar chart schedule. This should be carefully scrutinised and discussed at some length with each supplier. In general, practice

has shown that the total man-months involved are very similar. To these should be added start-up and commissioning charges for a period equal to the period in which guarantees are to be performed. Contractors should also be requested for anticipated Vendor's personnel man-months.

50. The costs of erection for process plants vary from country to country (in Pakistan they are about 17% of the C&F cost of equipment), depending on the size of the plant. This is for plants with substantial piping and instrumentation. This includes the foreign exchange costs of Vendors specialists.

51. Other erection charges include the purchase or hire of erection machinery. These are generally constant for most plants, unless very heavy items are involved where some differences need to be added. All risk erection can be estimated at 1% of the C&F machinery costs and workmen's compensation insurance at 0.25%.

52. In general Civil Engineering costs for most plants with generally similar processes are not far different. However where the covered areas are different (outside mounted equipment against inside mounted equipment) these can be different. Costs are also different where gravity flow systems with tall buildings, or pump/conveyor systems with single storey buildings are quoted. Such factors should be considered based upon the Civil Engineering areas given by the bidder.

53. All storage sizes for raw materials, intermediate and finished products, and handling methods should be brought upon an equivalent level, preferably at the tender level, or at the questionnaire level.

54. Care should be taken to see that all effluent or noxious fume treatment systems have been included, at the same level.

55. Technical fees during the plant start-up, capitalised royalties, and other payments should be compared at actuals.

56. A payment schedule, should be obtained from each supplier, and interest charges until commercial production (generally 3 to 5 months after start-up) should be added. The interest charges should be actual where loan conditions are known or 10% if not known. This is for the foreign loan only.

57. In the case of Contracts of the type 9 (c) the C&F costs are well established, as they form part of the firm price quotation. In the case of other Contracts, particularly of type 9 (b), they need to be calculated for comparison.

The elements of these Contracts, to establish the C&F costs are:-

(i) Basic Know-how and Engineering.
(ii) Detailed Engineering Costs.
(iii) Equipment Procurement Costs.
(iv) Inspection Costs.
(v) Any special fees, or Capitalised royalties.
(vi) FOB Costs of the equipment.
(vii) Sea Freight.

58. All the costs under (i) to (v) above are covered in the tender quotation, and are known for each party. (vii) has already been discussed above.

59. The main problem in contracts of the type 9 (b) involves the establishment of the FOB costs of the Plant and Equipment. Various methods have been established for this, and these may be considered. In all cases, however, the method to be adopted should be the same for all companies and should be made clear at the time of the tender.

60. The Upper limit method. Here the Contractors are required to give an upper limit quotation with costs being shared (generally 50% each) if the equipment FOB price (or sometimes the total prices, including all the factors under 57 above) is above or below, this upper limit. This type of clause, often adopted by American Companies leads to a high, but safe capital cost estimate.

61. If upper limit costs are available, for purposes of the bid comparison, they should normally be reduced by 10%, as this element is always added by the bidders. However, if estimates are well-known (e.g. Sulphuric Acid plants) this would not be required.

62. The next is the Guaranteed Maximum Plant Price. In this case bidders are required to guarantee that the plant costs (all costs under 57) would not go beyond a certain limit, and penalties are imposed beyond this limit. If acceptable to engineering contractors, this is a very acceptable method.

63. Sometimes Contractors are prepared to give Guaranteed Maximum Erected Plant Prices, but in such cases the erection must be in their hands, or even Guaranteed Maximum Erected Plant and Building Costs. The latter however almost approaches a turn-key price. However, these are rare (except in certain Industries e.g. Refineries), although for comparison these are important.

64. In all the prices under para 60 to 63 should be emphasised that penalties should be substantial to make them realistic.

65. In the absence of any of the above, "indicative prices" are only available from the Contractors. In such cases these will need checking, and Contractors must be asked to give full details of equipment, including sizes and capacities of all specialised equipment.

66. Thereafter, competent personnel (particularly Consultants familiar with the technique) can estimate the difference in estimated Capital Costs. An examination of the methods of bid evaluation above indicates that only a difference in prices is required in nearly all cases of evaluation. It should be emphasised that these reports are highly technical, and one report on a project was over 100 pages.

67. Where actual C&F costs of plants which have been built by different contractors are available (and can be checked by independant sources) then these can be cross-checked against the figures calculated above. In some cases, International cost reports and comparisons are available for checking.

68. However, if the methods under 65 to 67 are adopted, a difference of 5% or in new processes 10% is possible, and hence unless there are major differences which can be already identified, such as by a detailed study, the indicative FOB equipment costs, if within these limits could be averaged. Therefore the Fixed Costs of the quotation i.e. the items under 57 (i) to 57(v) will be the controlling factors.

69. It should be emphasised that in all such plant cost estimates escalation must be brought to an equivalent basis, except where tied loans are concerned, where the escalation of the country from which tied loans are given, should be taken into account, as already discussed above.

70. It is difficult to predict the future charges in currency conversion rates, particularly as repayment is over 10-years. Therefore, in general prevailing exchange rates should be taken for comparison except in currencies which are known to be "soft".

71. The production capacity to be used for all calculations considered above should be the guaranteed capacity. To bring it to an annual guaranteed capacity, it should be multiplied by standard operating days, which vary from 300 to 330 (depending on the plant) for 3-shift plants, and from 250 to 300 days for 1-shift (with one weekly holiday) plants. Each Corporation should establish a standard for the plant, at the time of tender discussions. If this can be based upon past records of the

Contractors operating plants, this would be valuable.

78. Where Contractors have accepted absolute guarantees, the absolute guarantee figures should be taken. Where one contractor has accepted absolute guarantees, and another has not, either the party not giving absolute guarantees should be eliminated, or alternately the offered plant capacity reduced by 5 to 10% for comparison purposes (particularly DCF) depending on the type of plant.

APPENDIX II

PART I

SERVICES TO BE PERFORMED BY CONTRACTOR SUPPLYING TOTAL PLANT

I. DESIGN

1. Obtain and pay for the necessary know-how and patent rights.
2. Undertake the basic process design and engineering of the plant.
3. Provide complete lay-out and load drawings and approve the structural, civil and architectural engineering of the project, which will be done locally.
4. Undertake the mechanical, chemical and electrical engineering of the project, and any other services normally undertaken by design engineers, such as piping, instrumentation, heat insulation etc. Provide detailed drawings where required.
5. Prepare the design calculations.

II. PROCUREMENT

1. Supply all equipment FOB.
2. Arrange to ship all equipment C&F Karachi if required by Client.
3. Identify suitable equipment which can be fabricated in Pakistan within the project time-schedules and assist in obtaining such equipment.
4. Prepare a schedule of equipment deliveries and regularly follow up with suppliers to meet this schedule.
5. Undertake Material and Shop inspection and sea-worthy packing inspection, and expedite despatch of goods.

6. Obtain, check and submit Proforma Invoices, Packing Lists etc.
7. Report routinely to client on purchases.

III. DETAILED PLANNING

1. Prepare detailed project schedule and critical path network.
2. Prepare drawings to be sent to the field.
3. Assist in typing-in inter-plant and services facilities.
4. a) Develop erection programme in association with client and its Consultants.
   b) Provide lists of erection equipment.
5. Submit progress report to client and advise on steps to expedite installation and start-up.
6. Determine requirements of outside transport facilities for transportation of equipment to site.
7. Arrange for overseas training of key personnel as required.

IV. ERECTION, START-UP, OPERATION

1. Assist in the supervision of site preparation.
2. Perform the overall supervision of erection of the plant supplied, including provision for Vendor's specialists.
3. Supervise in detail the installation of the equipment and field fabrication of the plant supplied.
4. Expedite the contracts for supply of equipment etc.
5. Provide the required information so that certificates of completion can be prepared.
6. Recommend an organizational structure for the plant including man-power requirements, operators and technical personnel.

7. Provide workshop, engineering and assembly drawings to scale for all field and Pakistan fabricated equipment and services.
8. Obtain, compile and draw-up operating manuals including analytical procedures and maintenance instructions.
9. Recommend inventory requirements for chemicals, and supplies and assist in preparation of spare parts list and inventories.
10. Assist in the initial procurement of chemicals, supplies and spare parts.
11. Establish start-up schedule.
12. Commission equipment in collaboration with individual equipment suppliers, if any.
13. Undertake plant start-up.
14. Supervise initial plant operation.
15. After discussions with client and the Consultants, draw-up the protocol for guarantee tests.
16. Perform guarantee tests to contractual stipulations.

V. EQUIPMENT TO BE PURCHASED ON COST PLUS BASIS

1. Procedure to be followed as in Part II.

APPENDIX II

PART II

SERVICES TO BE PROVIDED BY AN ENGINEERING CONTRACTOR

These will include:

I. **KNOW-HOW**

Obtain the process license and know-how packages for the plant for the agreed licensor.

II. **PLANNING (FIRST STAGE).**

1. Determine procedures for the:-
   (a) Design of the services.
   (b) Purchase of equipment and materials.
   (c) Construction and Commissioning of the Plant for approval by Client.
2. Provide functional specifications of the plant.
3. Draw up a preliminary time schedule and network for the Engineering, Equipment, Procurement, Construction and Commissioning of the plant. Identify Critical Equipment.
4. At an appropriate date, draw up a schedule showing cash disbursements and the time when these disbursements are anticipated.
5. Assist in the estimation of Site requirements.
6. Provide a detailed plant layout.
7. Assist in Planning Studies.
8. Draw up a line wiring diagram.
9. Draw up a system flow diagram.
10. Tabulate design data.
11. Draw up equipment specifications including erection tools and materials.
12. Prepare a detailed plan for utilities.

13. Prepare a plan for training of skilled workers, technicians and engineers.
14. Assist in preparing staff organisation charts and procedures, within his plant.
15. Prepare a list of reliable international suppliers of equipment, for pre-qualification purposes.

III. DESIGNING

16. Under-take the detailed engineering of the plant and utilities.
17. Provide the load and line lay-out data required to complete the civil, structural and architectural designs for the project.
18. Approve the structural, civil and architectural engineering of the project, which will be done locally.
19. Undertake the mechanical,chemical and electrical engineering of the project, and any other services normally undertaken by design engineers such as piping, instrumentation, heat insulation etc.
20. Prepare the design calculations.

IV. PROCUREMENT OF EQUIPMENT

21. Identify long-delivery items for expeditious procurement.
22. Identify suitable equipment which can be fabricated in Pakistan within the project time-schedules and assist in obtaining such equipment.
23. Prepare bid documents on behalf of client and invite tenders from prequalified vendors.
24. Prepare analysis of tender bids and make purchase recommendation to client.
25. Prepare contract documents for the purchase of materials and equipment and for field purchases by client.

26. Prepare a schedule of equipment deliveries and regularly follow up with suppliers to meet this schedule.
27. Undertake Material and shop inspection and sea-worthy packing inspection, and expedite despatch of goods.
28. Obtain, check and submit Proforma Invoices, Packing lists etc.
29. Report routinely to client on expenditures made on purchases.

V. PLANNING (SECOND STAGE)

30. Prepare detailed project schedule and critical patch network.
31. Prepare drawings to be sent to the field.
32. Assist in tying-in inter-plant and services facilities.
33. Develop erection programme in association with client's Consultants.
34. Submit progress report to Client and advise on steps to expediture installation and start-up.
35. Determine requirements of outside transport facilities for transportation of equipment to site.
36. Arrange for overseas training of key personnel as required.

VI. ERECTION, START-UP AND OPERATION

37. Assist in the supervision of site preparation.
38. Perform the overall supervision of construction and erection of the plant supplied.
39. Supervise in detail the installation of the equipment and field fabrication of the plant supplied.
40. Expedite the contracts for supply of equipment etc.
41. Provide the required information so that certificates of completion can be prepared.

42. Recommend an organisation structure for the plant including manpower requirements, operators and technical personnel.

43. Provide workshop, engineering and assembly drawings to scale for all equipment and services.

44. Obtain, compile and draw-up operating manuals including analytical procedures and maintenance instructions.

45. Recommend inventory requirements for chemicals, catalysts and supplies and assist in preparation of spare parts list and inventories.

46. Assist in the initial procurement of chemicals, catalysts, supplies and spare parts.

47. Establish start-up schedule.

48. Commission equipment in collaboration with equipment suppliers.

49. Undertake plant start-up.

50. Supervise initial plant operation.

51. After discussions with client, draw-up the protocol for guarantee tests.

52. Perform guarantee tests to contractual stipulations.

VII. PROJECT TIME AND COST CONTROL AND REPORTING

53. Set up effective procedures for controlling and regularly reporting to client project progress in terms of Time and Costs throughout all phases of the expansion program.

APPENDIX II

CHECK LIST OF UTILITIES AND OFF-SITES

1. Power Generation.
2. Steam Generation, and Distribution.
3. Electrical Transformation and Distribution.
4. Cooling Water Towers.
5. Cooling Water distribution.
6. Chilled water production and distribution.
7. Process water, and distribution.
8. Boiler Feed water, and arrangements.
9. Condensate Recovery, treatment and Distribution.
10. Canal or River water Treatment.
11. Fuel Supply system(incl.storage if other than gas)
12. Inert Gas.
13. Compressed air.
14. Instrument air.
15. Effluent Treatment and disposal.
16. Safety facilities and equipment
17. Fire fighting Equipment, and distribution system.
18. Structural work such as Pipe Bridge.
19. Workshop facilities.
20. Mobile Maintenance Facilities.
21. Spare Parts Warehouse.
22. Internal Telephone and Call System.
23. Laboratory Equipment.
24. In-plant Test Equipment.
25. Any Special Office Equipment.
26. Detailed List of erection equipment, particularly for heavy equipment.

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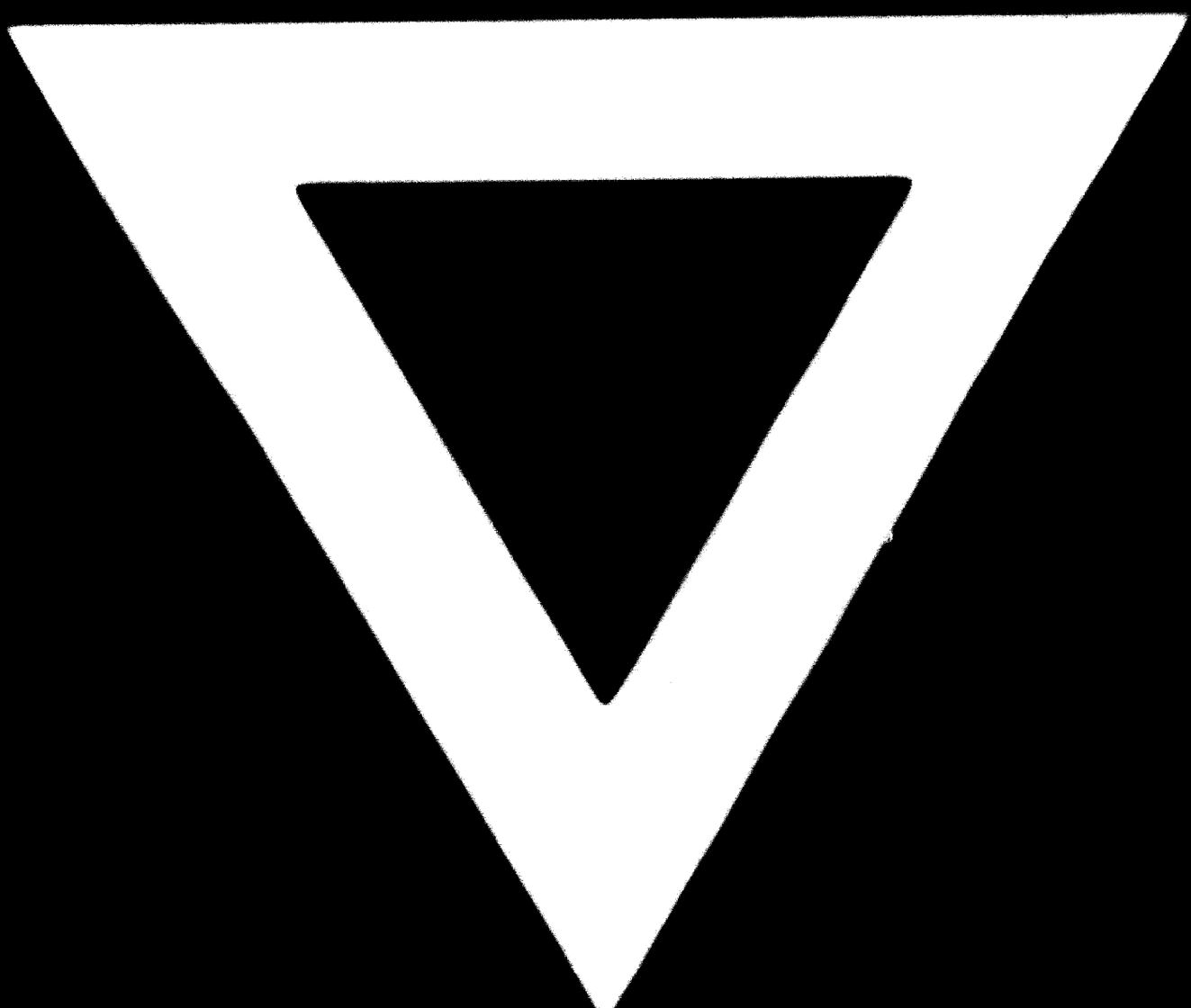

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