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PROJECT IMPLEMENTATION AND CONTRACTING FOR FERTILIZER FACTORIES IN INDIA

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In order to reduce the foreign exchange outflow and to ensure maximum utilization of services and fabrication facilities in India, the fertilizer projects, especially in public sector, are being implemented on the basis of Basic design obtained from foreign collaborators for carrying out the detailed engineering and procurement, construction and project management by Indian firms. Technical assistance for supervision of detailed engineering and for construction and commissioning are also provided by the collaborators. In view of the multiplicity of agencies involved in such an implementation, there are as many as seven or eight agreements or contracts between the different parties, in addition to hundreds of purchase orders/contracts for procurement and construction. Differences between "Turn Key" implementation and joint execution (by foreign engineering firm, Indian engineering firm and owner) of fertilizer projects are discussed. In spite of some of the difficulties in defining the responsibilities clearly and identifying the defaulter in case of shortfall in output or non-fulfilment of operating guarantees, for a developing country this phase, concomitant with the association difficulties, is worth going through. Only such a step would enable the indigenous engineering firm to replace totally the foreign contractor and enable execution on "Turn-key" basis with a single contract with the project owner, undertaking all the responsibilities on part of the indigenous engineering firms.

PROJECT IMPLEMENTATION AND CONTRACTING FOR FERTILIZER PROJECTS IN INDIA

The implementation of a fertilizer project involves the following activities:

a. Basic engineering - chemical engineering design
b. Detailed engineering
c. Procurement of hardware
d. Site construction work including civil works and erection
e. Starting up and
f. Plant operation

2. In many countries including some of the advanced countries, the project owner entrusts the entire responsibility from Basic engineering to the completion of commissioning to one engineering contractor on a 'Turn-key' basis. At the end of the performance tests to establish the capacity and the product quality at the prescribed consumption rates, the plant is accpeted by the owner (Fig.1). Fertilizer projects set up in India immediately after independence followed this pattern.

3. The availability of abundant qualified technical personnel concomitant with the need to reduce foreign exchange outflow let to a progressive indigenisation of the different activities like civil works and erection which were excluded from the scope of the engineering contractor and carried out by the owner, with the help of expatriate personnel for assistance during construction (Fig. 2). The Indian engineering firm at this stage provided the role of a "consultant' in assisting the project owner in the selection of the engineering contractor and the formulation of the project details.

4. The next generation of fertilizer projects that have come up in the country since the late sixties, has been greater involvement of the Indian engineering firms than ever before. The role of the foreign engineering contractor is confined to supply of Basic engineering, based on which Indian engineering firms take up the responsibility of detailed engineering and procurement. The Indian engineering firm and the project owner carry out the civil works and erection in a mutually agreed manner, utilising the services of expatriate personnel for assistance in erection and commissioning(Fig.3) In some of the projects, the Indian engineering firm includes the responsibility for erection under his scope, in addition to the detailed engineering and procurement.

5. The reduction in foreign exchange outflow and the greater involvement of the Indian engineering firms and as a consequence, a better utilisation of Indian engineering manpower have generally favoured arrangement under 3 in preference to "Tunr-Key" under arrangement 1 and the modified 'Turn key' arrangement under 2. This arrangement also enabled the development of indigenous fabrication industry.

6. This does not mean that the arrangement under 3 is the only arrangement followed for implementation of fertilizer projects in India today. This could be said to be true generally of fertilizer projects in public sector. The private sector projects have generally accepted the 'Turn key' manner of implementation since this calls for lesser efforts on the part of the owner and the entire responsibility can be assigned to the contractor. But, even in private sector, the trend in recent years in some of the private sector firms endowed with qualified engineering personnel, follows that of public sector, by which the owner has undertaken some of the responsibilities of construction and procurement of indigenous equipment and machinery on himself, still leaving the procurement of imported equipment to the foreign engineering contractor. On the other hand, there are a few

instances where even in the public sector, the role of a foreign engineering contractor is somewhat larger than that undertaken by the foreign engineering contractor under arrangement 3.

7. Arrangements 1 and 2 involve only two active partners, the foreign engineering firm and the project owner. Arrangement 3 involves at least 3 agencies even in the simplest case.

i) the foreign engineering firm who supplies Basic engineering;

ii) the Indian engineering firm who carried out Detailed engineering, procurement and construction services;

and iii) the project owner, an Indian firm.

8. A fertilizer project, even in its simplest form as a urea producing unit, involves at least 3 basic units, ammonia, urea and steam generation units, besides the different off-sites. The steam generation unit is usually obtained as a package unit. In some cases, the foreign engineering contractor for ammonia supplies basic engineering for urea also. Quite often, they happen to be different especially when Basic Engineering contractors for ammonia and urea are individually decided by global tenders as necessitated by guidelines of procurement prescribed and aid giving agencies and governments. With separate engineering contractors for ammonia and urea, the number of agencies involved increase correspondingly.

9. In some of the projects undertaken in India, for instance, the coal based project where the process route adopted for manufacture of ammonia from coal has followed a process scheme different from the traditional route for conversion of natural gas or naphtha to ammonia, three foreign firms are involved for supply of Basic engineering for the different sections of the ammonia plant itself. There is a separate foreign engineering contractor for supply of Basic engineering for the urea plant. The number of agencies involved in the execution of the project is then six.

10. In case the imported equipment for the project is obtained under a supplier's credit, from a supplier who happens to be different from the engineering contractor, the number of agencies involved increases correspondingly. The engagement of a separate consultant in select cases also adds to the number of agencies.

11. The extent to which the different activities are within the scope of particular contracts varies widely depending on the nature of the process plant and the special circumstances. Each contract would appear to be unique, requiring 'tailor made' contract conditions within the general framework of provisions. The extent of role played by the foreign and Indian engineering contractors is usually decided by:

i) source of foreign exchange
ii) the process adopted; and
iii) extent of availability of relevant technology and capability within the country.

12. Contracts for implementation of a project under arrangement 3, involving multiple agencies have to be necessarily different with regard to the number of contracts and obligations, from the 'Turnk key' arrangement under 1 or the modified arrangement under 2, where only two agencies are involved.

13. For a simple project involving an ammonia and a urea plant, executed with know-hows from two different foreign contractors by an Indian engineering firm on behalf of the owner and the steam generatior plant being executed as a package plant, the different contracts that would be required are represented in Figure - 4.

Contract - 1 : Foreign Engineering Contractor(Ammonia) and Indian Engineering contractor for supply of Basic Engineering (Ammonia).

Contract - 2 : Similar contract for Urea

Contract - 3 : Contract between Indian engineering contractor and project owner for carrying out detailed engineering and procurement of the plants and for carrying out civil works and erection of the plants.

Contract - 4 : Contract between foreign engineering contractor and project owner/Indian engineering contractor to provide expatriate personnel for supervision during erection and commissioning of Ammonia.

Contract - 5 : Similar contract for Urea.

14. In addition, the following contracts are likely to be additional depending upon the mode of financing of foreign exchange:

Contract - 6 : Contract between project owner and supplier from a foreign country in the event of a supplier's credit.

or Contract between project owner and a supplier from a foreign country who acts as a procurement agent, in the event of a tied country to country credit, for procurement from a particular country offering credit.

or Contract agreemet between project owner and the financing agency say World Bank or other aid giving agency for the grant of foreign exchange for imported equipment in the event of procurement by owner/Indian Engineering firm.

In a few cases, some of the engineering firms insist on supplying a few proprietary equipment under which condition only, the guarantees on capacity or consumption of utilities are agreed, An additional contract, therefore, may result one for Ammonia and another for Urea.

15. The number of contracts involved would thus range from five to eight and the number of agencies three to four. The involvement of a multitude of agencies, as against one individual foreign engineering contractor in a 'turn key' arrangement spreads the responsibilities over a larger number of agencies. For a project owner, as a private financier in India, this arrangement appears to be cumbersome and

rather avoidable. Such an arrangement is, however, preferred in public sector on account of the benefits to the nation by way of value added to the engineering industry and the enrichment of design and engineering capability.

16. Whether a 'turn key' contract, or a contract jointly executed by the differentagencies the guarantees that an owner expects from the contractrs cover:

i. Plant output

ii. Product quality and operating requirements - specific consumption figures for raw materials and utilities

iii. Patent liability

iv. Workmanship of equipment and machinery

v. Time schedule for supply of hardware and construction

vi. Cost of plant.

17. In a 'Turn key' arrangement, based on lump sum contracts, the responsibility of the project owner is limited to making available the requisite funds and labour as and when needed, but all other responsibilities are undertaken by the contractor. In the mode of joint execution as illustrated under arrangement 3, the difficulties usually encountered in defining the deficiencies with respect to the different points above and identifying agencies responsible for this tend to become difficult as discussed below:

i. <u>Plant Output</u>

The responsibility of the foreign contractor is the supply of Basic engineering documentation, based on which the Indian engineering firm proceeds with detailed engineering and procurement. Due to Governmental regulations and foreign exchange limitations, the suppliers of the different equipment and machinery do not necessarily fall into the foreign contractor's acceptability. In some cases, supplies from countries, whose suppliers would not have been considered by the foreign engineering firms even for qualification for bidding, wouldhave to be accepted because they are the only ones to

offer credit for import of equipment. In such an event, the foreign engineering firm restricts its responsibility to design data only. In case of limitations in the capacity of the plant, endless exercies are involved to identify whether the deficiency in the plant arises on account of faulty design data or inferior performance of the machinery.

ii. Product quality and specific consumption figures

The selection of foreign engineering contracts for supply of basic engineering documentation is based on competitive tenders. In addition to the fees for the supply of Basic engineering documentation, indicative figures are obtained from them for the capital costs based on their process schemes, along with the specific consumption figures for raw materials and utilities for comparison of the different offers. But, both these figures are not binding on the foreign engineering firms, because the suppliers ultimately chosen for different equipment happen to be different from the ones which have been taken for consumption of these indicative figures by the collaborators. A clever collaborator can win the contract by giving unrealistic figures for the capital costs and specific consumption figures and can easily wriggle out of these indicated figures, because of the difference in suppliers. Contracts entered into with the foreign collaborators carry a provision that the actual consumption figures would depend on the vendors chosen for the project, though indicative figures are included in the contract and serve no useful purpose. It stresses the need for a careful scrutiny of the capital costs, sizes of individual equipment, provision of installed and warehouse spares, the power consumption of the various drives, capacity of therunning machinery at the time ofselection of the engineering contractor. A thorough knowledge on the part of the Indian engineering contractor covering all the intricacies of the process and equipment involved is unavoidable. At early stages of the development of indigenous capability, when the indigenous firms are not trained well, some problems are bound to be faced.

iii. Patent Liability

The liability of the foreign engineering firm with respect to patent liability does not vary much between the 'Turn key' arrangement and joint execution arrangement.

iv. Workmanship of equipment and machinery

In a 'turn key' arrangement it is usually possible to define the last date of shipment, and workmanship guarantees are either linked to this date or to the date of commissioning of the equipment. But, in a piece-meal procurement by the owner or on his behalf by the Indian engineering firm, the purchases are made on the basis of individual purchase orders/contracts. For some of the items delivered early in the project, the workmanship guarantees are likely to expire before the commissioning of the said equipment. The responsibility of the Indian engineering firm lies in seeing that deliveries are not staggered over a large aperiod, and that proper planning is done even at the phase of issuing tenders so that short delivery items are not procured very early. A detailed schedule, based on realistic equipment deliveries consistent with erection requirements is imperative.

v. Time Schedule

The responsibility of the foreign engineering firm gets restricted to the timely supply of Basic engineering documentation. He is not responsible for the supply or for the construction of the equipment. Since, very often the owner is also involved in the process of selection of suppliers and erection contractors, the responsibility cannot be fully ascribed to the Indian engineering firm either. Further, in a few cases where utilisation of credit is involved, the owner enters into an agreement with a foreign supplier directly for supply of equipment. In such cases, it is very difficult to hold one agency responsible for the time schedule of the project.

The construction is usually carried out by the Indian engineering firm on behalf of the owner, or by the owner himself, services of expatriate personnel of the foreign engineering contractor are utilised for advisory services, on perediem basis. The involvment of such exptriate personnel, unfortunately, is never to the same extent as that of the foreign personnel deputed by the engineering firm for erection under his responsibility. Still, the foreign engineering contractor insists on posting a large number of expatriate personnel, the question of deciding the number of personnel adequate for the job often being the bone of contention between the owner and foreign collaborator. Here again, the will of the foreign contractor is likely to prevail, since he raises a "bogey" of guarantee for performance of the plant. The per-diem charges are subject to escalation, and as such cannot be fixed in the beginning. In case of delays, the retention of expatriate personnel and that oo at escalated rates adds considerably to the project cost. Very often, one would fix that the personnel deputed are freshers with little experience. Surprisingly, one would find that owner's representatives insist on deputing engineers to India who had not visited India on earlier assignments in the past few years, to reduce their liabilities.

During that trial runs and commissioning and for performance tests, some of the engineering firms insist on brining down to India even people at operator's levels, in spite of the fact that a country like India has competent, qualified, experienced personnel available for the job. Here again, the will of the foreign collaborators is likely to prevail on the plea that the presence of their personnel is necessary to fulfil guarantees of performance and specific consumptions. It would be seen that in many cases, the foreign exchange outflow on account of the expatriate personnel would be much more than what one would realise by way of penalties, if the specified guarantees are not attained in actual operation, even if one is successful in making the foreign collaborators accept the deficiency as his default.

vi. Costs of Plant

As compared to a 'turn key' arrangements, there is a tendency on the part of the engineering contractor to supply specifications rather liberally at the first instance and to add equipment, valves, piping etc., without any demur till very late in the project. Since the responsibility for time and cost lies with the Indian counterpart, the foreign firm comes out with such changes without any hesitation. Such additions would have reduced the profit margin of the foreign collaborator in case of "Tunr key" projects. Plants under joint execution tend to be costilier.

In one case, the specifications furnished to us for a 100 tpd phosphoric acid plant for engineering by our firm, were essentially same as that adopted by the foreign firm for 1165 tpd plant on "Turn key" basis.

Another disadvantage is that if the initial performance tests indicate a shortfall in capacity, the foreign collaborator suggests substantial additions for improvement of the capacity. Since the liability of the contractor is restricted to a small gum, he is not careful about additions/changes adding substantial costs to the owner. For a project of an investment of about US $ 180 million, the maximum liability of the engineering contractors for ammonia and urea on all accounts of capacity, quality etc., work out to a maximum of about U.S. $ 5 million.

This aspect would again highlight the need for adequate competence of the Indian engineering firm in judging the adequacy of the design specifications supplied by the collaborator, to avoid overruns in cost and time at the late stage of the project. In procurement of items piece meal, we find that a two stage bidding by which all the technical details and commercial points other than prices are obtained initially, and prices obtained along with the technical offer in a sealed cover are opened later after all technical clarifications, with plus/minus adjustments in prices ..

on the basis of discussions. This arrangement has been adopted for items where the scope differs from vendor to vendor, and where the offers to be evaluated are not many.

vii. General

For an engineering firm like ours, the Planning and Development Division of Fertilizer Corporation of India, it is likely that we have to work with 3 or 4 foreign engineering collaborators on the same project or different projects where arrangements so provide, the foreign collaborators station a few expatriate personnel in our offices for supervision of detailed engineering. A few firms agree to use of our engineering standards; other insist on their engineering standards being adopted in toto. This leads to non-standardisation and changes in drafting practices, and computer facilities and programmes developed by us are not possible to be utilised.

It does not mean that "Turn key" method has all advantages only. In a "Turn key" implementation, one has to ensure a clear definition of the scope of the work, both in its technical content and the commercial contractual basis of the project before finalisation of the contract. The supplier would like to stick to the contract terms and avoid improvements with an effect on cost and time. So long as he is satisfied that the contractual commitments on capacity can be met during the 4 or 5 days' guarantee test run, he is likely to avoid improvements which are likely to prove economical in the long run. It is also likely that sub-standard machines are supplied, which may just the short period of guarantee tests and workmanship guarantees but may not be able to withstand the operating life of 10-12 years. The joint execution arrangement at present adopted for projects in India helps to develop a base for indigenous technology, to utilise the technical manpower in the country in engineering, procurement, construction and project management and to develop the indigenous fabrication industry hand in hand with the development of

the industry in question. The selection of best equipment at competitive rates to the satisfaction of the owner is enabled in case the equipment are procured under International Competitive Bidding as in the case of World Bank loans. The option for developing countries, therefore, lies in favour of the path chosen by us, irrespective of some of the problems in handling multiple contracts, identifying deficiencies and defining responsibilities.

19. With the coming in age of the Indian engineering firms, and a greater understanding of their technical capability by the foreign collaborators after a close association in a number of projects, there are less problems than before. We, so far, had projects varying in capacities, varying in feedstocks and process routes, and varying in foreign exchange financing arrangements. We have worked with different collaborators. In recent projects undertaken with IDA (World Bank) credit, we have been able to demonstrate that execution of a project under the joint execution arrangement compares with respect to cost and time as favourably as "Turn key" arrangement. One can hope for a day in the near future, when the Indian engineering firm totally replaces the foreign engineering firm and undertakes the responsibility for the entire project under "Turn key" concept. The project owner would then have to negotiate with only one agency, the Indian engineering firm for the implementation of a project, and the contracting arrangement would revert to a simple form involving only two agencies.

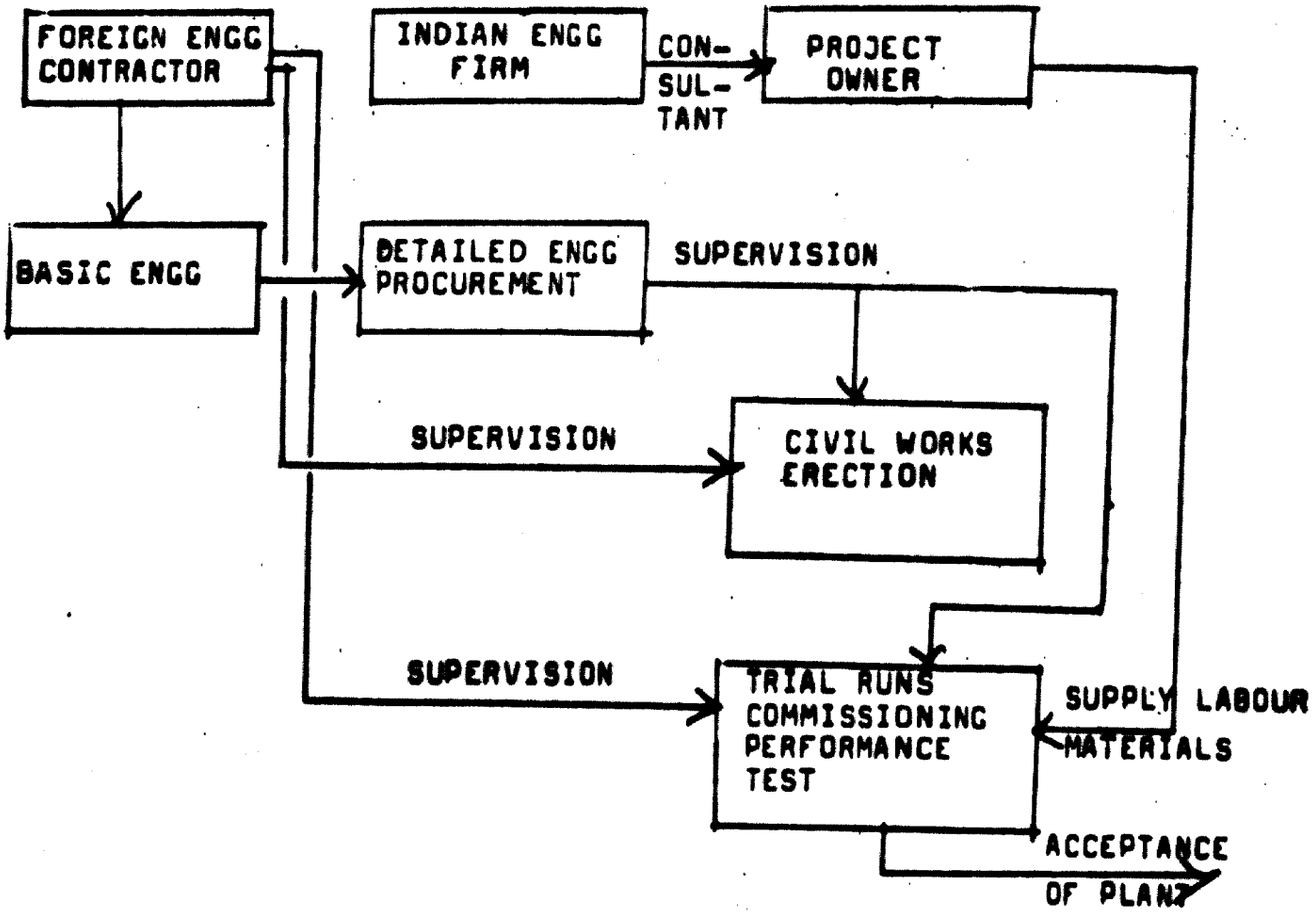


FIG. 3 JOINT EXECUTION ARRANGEMENT

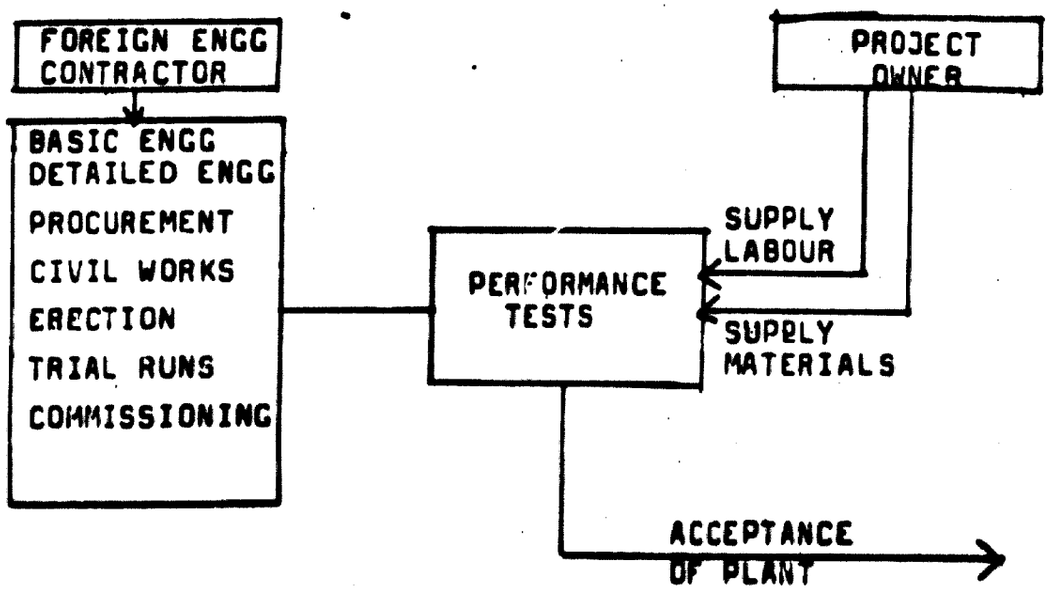


FIG. 1 TURN-KEY ARRANGEMENT

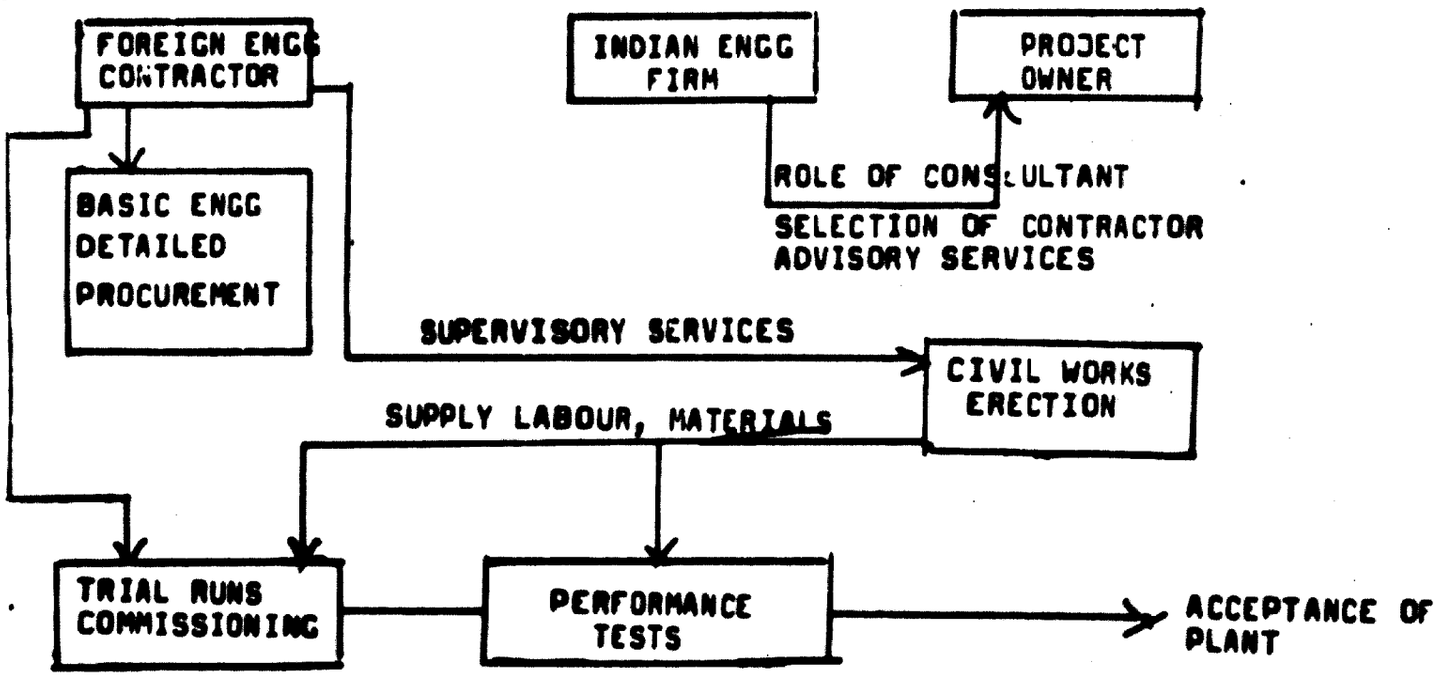
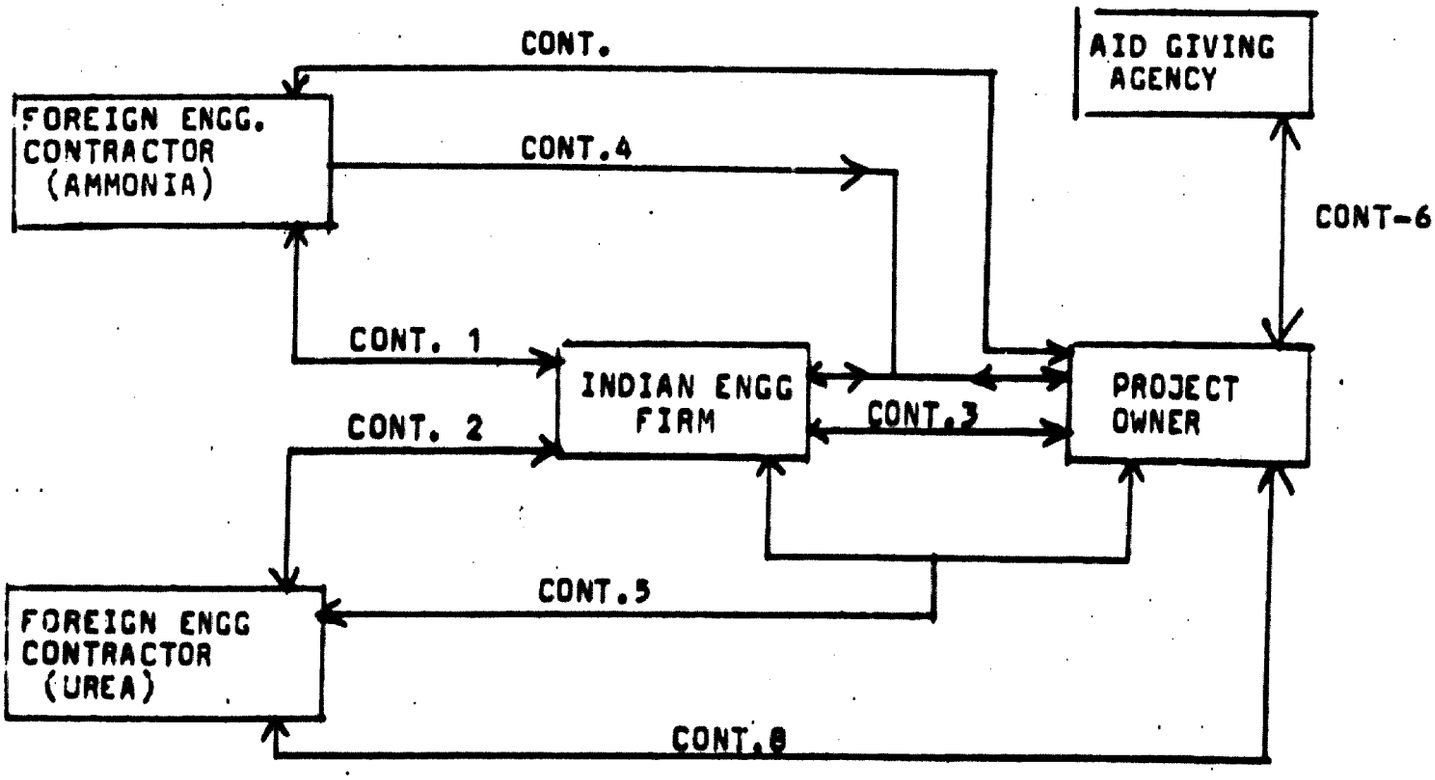


FIG. 2. MODIFIED "RUN-KEY" ARRANGEMENT



CONTRACT 1: Foreign Engg contractor (Ammonia) and Indian Engg firm for supply of Basic Engineering (Ammonia)

CONTRACT 2: Similar Contract for Urea

CONTRACT 3: Between Indian Engg Firm and Owner for carrying out Detailed Engg, procurement, civil works and erection on behalf of Owner.

CONTRACT 4: CONTRACT between foreign engg contractor(Ammonia) and owner/ Indian Engg Firm for providing expatriate personnel for assistance in construction and commissioning.

CONTRACT 5: Similar contract for Urea

CONTRACT 6: Between Aid giving agency and owner for foreign exchange requirement of plant.

CONTRACT 7: Supply of Proprietary Equipment for Ammonia

CONTRACT 8: Similar contract for Urea

Fig. 4: CONTRACT AGREEMENTS FOR A FERTILIZER PROJECT UNDER JOINT EXECUTION ARRANGEMENT

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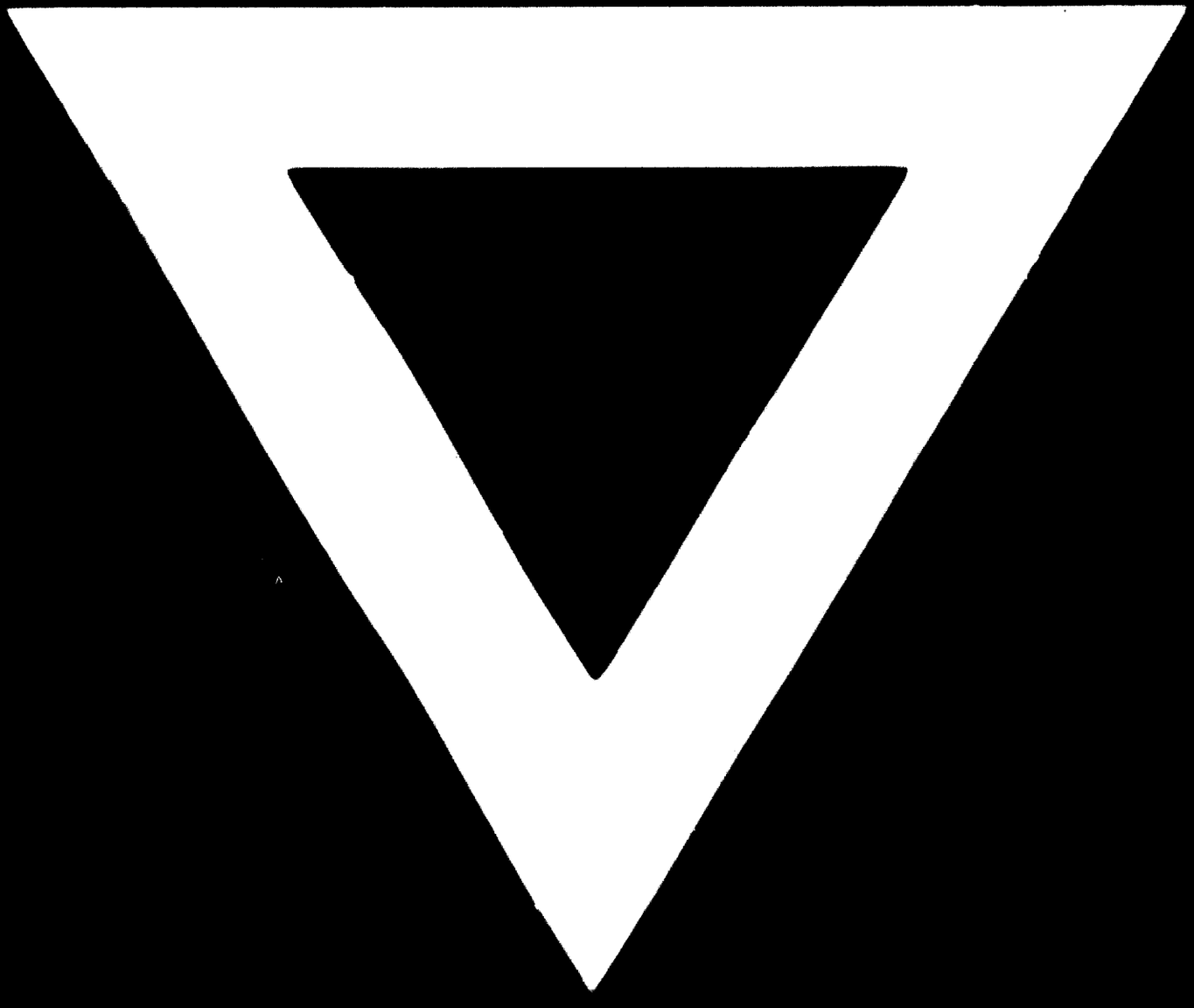

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