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**FOUNDRY FORGE PROJECT**

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### Introduction:

In dealing with the subject, at the outset, we have to consider the following distinctive stages through which a Project takes shape.

- (a) Conception stage
- (b) Investigation stage
- (c) Decision stage; and
- (d) Execution stage.

### Conception stage:

India has formulated a certain broad pattern of industrial development suiting its economy. The establishment of various plants and projects is accordingly made for attaining economic development in its successive Five-Year Plans which have become the main plank on which the development of the country is being realised. Like any Plans of economic development the main objectives can be listed as under:

- i) An increase in per capita income
- ii) High level of employment
- iii) Equilibrium in country's balance of payment.

Even though these three main objectives can be the ultimate goals, a happy balance between these three will have to be struck since, if carried to the excess, one may adversely affect the others.

General: With extremely limited number of right type of technically qualified men, slow growth of capital formation within the country and difficulty in getting foreign development loans, countries like India are faced to perform almost a political, economic and social miracle which would transform them into modern industrial nations within the shortest possible period as against nearly a century taken by other countries in the past. The size of the world having diminished with the rapid growth of communication, science, and technology, people in the region of these developing countries are in intimate contact with the progress in other parts of the world. The enthusiasm of these young and vigorous developing nations tends to draw

parallels with those advanced countries so as to reach the same destination for which others started long before them and are naturally ahead of them. The society and the governments of the countries in this region have, therefore, to cope with this tremendous upsurge of national aspirations for economic betterment.

The Plans of our country are based on a broad strategy of economic development which will ensure that economy expands rapidly and becomes self reliant and self generating within the shortest possible period (Please refer graph 'Anticipated Trend of National Income' placed at Annexure 1). While agriculture and industry are regarded as closely linked parts of the same process of development, industry is assigned a leading role in securing rapid economic advances (Please refer table 'Sectoral shares in National Income' and graph 'Distribution in National Income' placed at Annexure 2 (a) and 2 (b) respectively). For sustained industrial growth iron, coal and oil are the basic requirements. India has large industrial resources and therefore, a considerable potential for industrial development. Our resources provide a large and growing domestic market and places us in a favourable position to produce machinery and a wide range of engineering, chemical and electrical goods needed for development.

Indian Five Year Plans I, II and III: The First  
Five Year Plan of this country covering the period 1951-56 envisaged a total outlay of Rs.38,600 millions. Out of this total investment, Rs.1,700 millions were earmarked for industries. The outlay on the public sector undertakings in the First Five Year Plan was extremely limited. The First Five Year Plan achieved an 18% increase in National income in five years. Then an ambitious Second Five Year Plan envisaging a total investment of Rs.67,500 million was formulated. Industry had a much larger share in this Plan than in the earlier one, namely, Rs.8,900 millions. The public sector came to play an increasingly important role in the Second Five Year Plan with the establishment of the steel plants, coal projects and heavy engineering industries in the public sector.

The foundations of industrial development were thus strengthened by the establishment of new basic

industries and also by the rapid expansion of key industries such as steel, heavy chemicals and power. Being the first attempt at planning the national economy, the First Five Year Plan naturally did not result in a well embracing integrated planning. The Second Five Year Plan on the other hand consisted of more rigid framework of physical planning. The Third Five Year Plan would, however, seem to justify the belief that the planning process in India has come to stay and will thus satisfy the progress and implementation by providing the super structure for a self generating economy. The period of this particular Foundry Forge Project falls within the scope of the Second and Third Five Year Plans.

An endeavour was made in the First Five Year Plan to expand the existing industrial capacities. In the Second and Third Five Year Plans, however, particular emphasis was laid on the development of basic and heavy industries as one of the main plan objectives. It is recognised that such industries will significantly increase national income and employment only in the long run but it is expected that with the acquisition of capital, skills and technical know-how, the growth of the economy will also become self sustaining and increasingly independent of foreign assistance.

It is with this objective the country's technological and economic resources, to make heavy machinery covering a significant range, were mobilized in establishing the following big projects under Heavy Engineering Corporation Limited, Ranchi, (Government of India):

- i) Heavy Machine Building Plant
- ii) Heavy Machine Tool Plant
- iii) Foundry Forge Plant
- iv) Coal Mining & Machinery Plant  
(Now transferred under a separate Corporation as Mining & Allied Machinery Corporation)

The ministry concerned, viz. the then Ministry of Commerce and Industry, on the background of the overall plan as formulated by the Planning Commission, was responsible in meeting the idea in its conception and desirability stage. The objective was to minimize, if not eliminate, imports of heavy machinery and also to

serve as the vital core of a self-reliant and self generating economy beyond the take off stage

In the conception stage of a project, in addition to the above, another important aspect which is also to be considered is the employment potential. In this particular case i.e. HEAVY Engineering Corporation, however, it seems that the direct employment potential was not a weighing factor even though indirectly it may have contributed towards the growth in related industrial fields.

It was conceived that the above project shall cater to the needs of the Heavy Machine Tools Industry and Machinery and Equipment required for the steel plants and Coal Mining Industries. In view of the above the Foundry Forge Plant had to be captive primarily to the needs of the Heavy Machine Building Plant and Heavy Machine Tools Plant of Heavy Engineering Corporation Limited with respect to their requirements of castings and forgings specially in the heavier weight range above 15-20 tons which were not being produced earlier in the country.

Investigation stage:

In the investigation stage of a project which may ultimately lead to the feasibility stage, the following criteria have to be taken into account:

- (a) Demand forecast with reference to time sequence based on survey;
- (b) Availability of raw materials;
- (c) Location;
- (d) Technical know-how;
- (e) Product mix;
- (f) Dimensions of investment involved; and
- (d) Foreign exchange element.

Although, the criteria and problems in setting up of an industrial project as outlined above are common to a certain extent we have to bear in mind the fact that these are necessarily and always influenced by the environment in the country - its traditions and social background -, the stage of industrial development both regarding basic industries and other ancillary industries that are needed for such projects and the pattern of economy set for the nation as a whole. At present in India, for the

development of various projects, proposals are made by the concerned ministry on the basis of data available from within its agencies or through special studies conducted by bodies like National Council of Applied Economic Research, National Statistical Institute etc., regarding various aspects including demand aspect. The technical feasibility is then further examined by the technical wing attached to the ministry. Use is also made of the advice of experts in the line, either local or foreign. A scheme thus formulated is thereafter forwarded for consideration of the Planning Commission. After further scrutiny by the experts attached to the Planning Commission, the same is included in the Five Year Plan on the basis of Plan priorities.

The most important accounting price (Scarcity value) for industrial planning is probably the valuation given to foreign exchange since almost any industrial project to reduce imports will appear profitable if this value is set high enough. In an optimum development plan, the accounting price of foreign exchange would be equal both to the incremental cost of earning foreign exchange through exports and to the incremental cost of saving foreign exchange through import substitution. Thus, while formulating projects, the Indian Planners, as part of a broad based policy, endeavour to indicate a gradual shift towards import replacement in case of basic capital goods for which a favourable resource base of raw materials exists.

Keeping the above in view, in the case of Foundry Forge Project on the basis of preliminary study independently conducted during the year 1955 regarding the requirements of the country with reference to grey iron castings, steel castings, and forgings, a certain quantum of production was decided as the basis for inviting offers for setting up this Plant by the Government. A look at the Import and Export graph for the years 1958-65 placed at Annexure 3 will reveal the trend of imports in which likely value of castings and forgings can be apportioned. Significant contribution was anticipated to be made by this Project in this region. The setting up and commissioning of this Project thus, had a vital role in reducing the



increasingly widening gap between the earnings and the expenditure of foreign exchange, releasing the strain on national economy, besides laying the foundation of a metallurgical base for heavy machinery industry.

The location of the project is naturally decided by the proximity to the raw materials required as well as other facilities such as power, transport, communication and industrial labour. In the case of Foundry Forge Project it was logical to locate this Plant in the industrial belt of India, close to the existing steel plants. Ranchi was thus chosen as a suitable site.

Decision stage:

Investigations carried as outlined above lead the Planners to a stage of giving them a concept of the problem, sufficiently quantifiable, though not precise. For arriving at a decision they can adopt any one of the following three methods:

- (a) A consultant, either local or foreign, is appointed to give a finalised scheme as a Detailed Project Report;
- (b) An expert committee may be asked to give details based on which the Government may invite global tenders; or
- (c) In urgent cases, negotiations may be straight-away started with a few selected parties for submission of a Detailed Project Report.

As a result either a package deal on the basis of sources of finance may be entered into with collaborators or the Detailed Project Report submitted may form the basis for inviting global tenders for execution of the project. A Project for a new plant normally may be processed adopting the course as under (a) above, while expansion schemes may be executed on the basis of (b) and (c). The final decision further is then made to enter into a contract with a collaborator on the basis of the acceptance of the Detailed Project Report as submitted or with any amendments, if necessary. This decision forms the basis of the execution of the Project, and the accepted contents of the Detailed Project Report become the criteria for Project evaluation. In this decision stage the ministry concerned, the ministry of finance, the Planning Commission and the Cabinet are all involved.

The Detailed Project Report deals with the aspect of initial formulation of the Project regarding the requirements on the following:

- i) Appraisal of demand aspect
- ii) Appraisal of engineering and technical aspects;
- iii) Appraisal of foreign exchange requirements;
- iv) Appraisal of manpower requirements; and
- v) Appraisal of the economic aspects of the Project.

At the decision stage various factors, however, may lead to changes in parameters of the Detailed Project Report. The historical background of the Foundry Forge Project is worth mentioning in this context.

Brief historical background of Foundry Forge Project: On the basis of preliminary study independently conducted during 1956 regarding the requirement of grey iron castings, steel castings and forgings, the following quantum of production was decided as the basis for inviting offers for setting up this Plant by Government:

Steel castings (Max. piece weight: 40 tons)	.. 11,630 T/year
Grey Iron castings (Max. piece weight: 60 tons)	.. 31,620 T/year
Forgings (Max. piece weight: 40 tons)	.. 27,246 T/year

While the offers received from various firms were being scrutinised, the negotiations for establishment of a Heavy Machine Building Plant were simultaneously being made with Soviet Agency. It was suggested by the Soviets that there must be an independent forge and foundry as a part of Heavy Machine Building Unit. Two choices were then open for decision by the Government:

- i) To scrap the original plans and start on the basis of new figures; or
- ii) To revise the original plans so as to dovetail these with the requirements of Heavy Machine Building Plant in its several production stages.

The latter choice was made. It was finalised that Foundry Forge Plant will be set up primarily to feed the Heavy Machine Building Plant with heavy castings

and forgings, and in addition to cater for a part of the demands of other industries in the country. The programme of commissioning was envisaged in successive stages like I, II, III/I and III/II stages so as to correspond to the requirement of castings and forgings of Heavy Machine Building Plant. In the meantime Government decided to establish a Heavy Machine Tools Plant at Ranchi, the requirements of which with respect to castings and forgings were hence further incorporated into the production parameters of the Foundry Forge Project. Experts from Technoexpert, Prague, Czechoslovakia were chosen as collaborators for the task of setting and commissioning of this Project. The technical as well as financial parameters of the Foundry Forge Project as finalised may be seen at Annexures 4 and 5 respectively.

Execution stage:

The gigantic nature of the task and its complexity can be gauged when we look to the physical quantum of work involved in planning, co-ordinating and execution in the field of civil construction, structural fabrication, erection, machinery installation and final commissioning of the Plant with the positioning of requisite manpower. The various activities mentioned above, besides have to conform to a set time schedule, and financial limits. In a qualitative aspect, the decision about setting up of this Project meant the creation of six major units viz. pattern shop, grey iron and non-ferrous foundry, steel foundry, fettling shop, forge shop and rough machine shop, besides auxiliary units like tool room and installation workshop having capacities stipulated earlier along with provision for production and supply of the associated industrial gases and power. In quantitative terms it meant the following:

i) Execution of civil engineering works	.. Rs. 353,844 million
ii) Fabrication and matching of structurals	.. Rs. 49,650 tons
iii) Installation of machinery	.. Rs. 435.322 million
iv) Provision of manpower	.. 8,159
v) Period for execution	1st quarter 1961 to 2nd quarter 1969.

Sources of finance and other related aspects:

For the purpose of actual execution of the Project, each ministry makes a provision in their yearly budget which is put up to the Parliament for approval so that the financial resources for the Project is earmarked by the Government of India through the allotment made to the various ministries. The ministry's responsibility is to keep periodical watch on performance of the targets allotted and the yearly performance is judged by the Parliament through the various committees appointed for the purpose viz. The Estimates Committee, the Public Accounts Committee. Now this function is being entrusted to a Public Sector Committee appointed by the Parliament.

A system of budgetary control is normally introduced which comes into operation even before the construction work is under-taken. On the basis of each year's activities of the project, may be construction or production, the budget is planned. While preparing the budget due consideration is also given to the various sources from which the revenue is made available viz. sales, loans etc. At the same time suitable provision is also made for risk and uncertainty and the increase in cost of materials involved. Usually, it is not uncommon in case where the gestation period is rather long to introduce an escalation factor to cover the increase in labour and purchase costs of certain items.

Earning forecasts: Public undertakings are required to prepare a timely budget for the construction as well as for production, and also the requirements of funds from the Government. At the time of preparing such budgets which are submitted to the Parliament through the ministry, the undertaking is also expected to indicate the sales which will be made by it during the year. In fact all the public undertakings prepare five year forecasts indicating the receipt, expenditure and expected profit. Please see the attached statement 'Financial Results' placed at Annexure 6.

Budgetted Balance-sheet: The budgetted balance-sheet reflects the movement on the assets, liabilities and the net worth of the undertaking. An attempt is being made to have a monthly balance sheet in order to have the full benefit of this system. It will probably take some time before full benefits can be derived.

Appraisal of Commercial Profitability: Normally the sale price of a manufactured product is the sum of all costs plus the profit which will be earned on the capital invested. Unfortunately, this is seldom achieved as there are several factors affecting the sale price. In countries having mixed economies, however, competition is the most important force in pricing. Company management can control its cost and capital, and hold them at or below the level of any competitor. They cannot, however, control the profit margin of the competitors nor un-informed competitive pricing which covers less or low margins on some lines with excessive margins on others.

It is customary for the Chief Executive, the Managing Director or the General Manager who has profit responsibility for the Project to make final decisions on the prices within the policy laid by the Board. Pricing decisions especially for heavy industries of this nature are based upon the objective of securing the most profitable volume and assortment of sales over a long period of time rather than on meeting the prices of all significant competitors on every product simply to secure volume and retain or gain position in the industry.

Pricing for Return on capital invested: The return on capital invested forms the most tangible tool for the measurement and control of profit. Therefore, the market price decided is such which will ensure the desired percentage return on capital invested.

Setting intra-company trading prices: Intra-company trading prices are those prices charged to one unit of an enterprise for products produced in another unit of the same enterprise. The enterprise may be Corporation in its entity for which financial statements are prepared and income-tax returns are filed. When a Corporation owns several projects completely, they may sell their products to each other. The prices applied to these transactions are intra-company prices which may or may not include profit depending upon the policy laid down. Since tax considerations requires careful dealings regarding Corporation's tax liability, the price for intra-company sales is usually the same as those charged to outside customers. However, there may be products traded between such Projects which are

sold to outside customers. Where this is true, the problem of price determination are the same as those of inter-company trading except that mere cost is not acceptable as an intra-company trading price.

Pricing policy in Foundry Forge Project: In the Foundry Forge Project, the construction work is still in progress. Only an initial production has been started of Grey Iron Castings and Non-ferrous Castings which are available for sale to outsiders besides supplied to Heavy Machine Building Plant and Heavy Machine Tools Plant.

In the initial stages when the Plant capacity and facilities cannot be fully utilised resulting in high costs of production, it will not be possible for the Corporation to compete with the market, if the products are to be sold on cost including profit. With a view to utilise the manpower and machinery to the extent possible and to enable the workers to improve their skills, it becomes necessary to accept orders from outside parties notwithstanding the fact that losses are bound to arise in the initial stages. This is perhaps unavoidable since the new project has to make a break through to establish a reputation in the market for the products manufactured by it. Information on various economic indices of the Foundry Forge Project is placed at Annexure 7.

It has been proposed as a general policy in the initial stages that the selling prices of the products be fixed at such rates as the market can bear i.e. ruling market prices for indigenous products and landed cost in respect of the imported category.

In the cases of machinery and equipment which have been or are being imported, Government of India generally allow preference in price to the extent of about 25% for indigenous manufacturers. This factor is also borne in mind to secure orders at prices above the landed cost to the extent possible. The above pricing policy is reviewed every year.

Technical aspects in execution: A number of reasons can cause delay in timely execution of a Project. In a heavy engineering project where huge investments are involved, the strict adherence to

the time schedule plays a very decisive role on the total national economy of the country, since investments are huge and likely repercussions of the delay may throw, in general, a series of reactions which the country can ill afford. All the economies of the work and the commissioning of the project must therefore be viewed from this angle. For example, in case of Foundry Forge Project, a days delay in commissioning the Project may mean a production loss of nearly Rs.1.3 millions.

Among the major delays, the first one to be listed will be the site condition. Taking the case of Foundry Forge Project again, on the basis of initial investigation on the site, the load bearing capacity of the soil was assumed as  $3.5 \text{ kg/cm}^2$ , whereas later, through investigations carried out at site on an extensive area showed that the soil had a safe bearing capacity of  $1.5 \text{ kg/cm}^2$  only, and as such, for heavy loads anticipated in the main buildings piling had to be resorted to. "Calveid" and "Hochtasser Wissl" systems of piling were successfully employed for execution of the work. This additional work and the necessity of piling did affect initially the progress and cost of construction work.

It has been the experience, especially in heavy engineering projects, that delay has been caused for want of timely supply of the steel structures mainly due to non-availability of designed sections of steel in the country and in sufficient quantity for fabrication of heavy steel structures. Recourse then had to be taken for import of such steel sections at a later date; however, this factor also had considerable effect on the original time schedule and cost thereof.

The increase in cost of construction over that of the Detailed Project Report with respect of I and II stages of the Foundry Forge Project is Rs.90.4 million as given under:

	<u>Rs per Detailed</u>	<u>Rs per</u>	<u>Increase</u>
	<u>Project Report.</u>	<u>assessment</u>	
	<u>(Rupees in million)</u>		
A. Civil works	71.6	126.5	55.0
B. Structural steel	47.4	76.1	28.7
C. Railway sidings	7.7	14.4	6.7
Total	<u>126.7</u>	<u>217.1</u>	<u>90.4</u>

In brief, the reasons for increase in cost over that of Detailed Project Report of the Foundry Forge Project may be summarized as below:

- A. (i) Due to piling - Of the total increase of Rs.55.0 million, piling alone accounts for Rs.11.4 million;
- (ii) General rise in construction cost after the Detailed Project Report was prepared;
- (iii) In the original estimate at certain places Czech standards were adopted by Messrs Technoexpert which were different from Indian standards. Also the schedule of rates was supplied to Messrs Technoexpert on the basis of construction in Bhilai area while it was found that construction cost in Ranchi is higher than in Bhilai.
- B. Increase in quantities of steel on the basis of Detailed Working Drawings.
- C. (i) Use of steel trough sleepers in place of wooden sleepers;
- (ii) Provision of light trolley track, electric cable crossings and miscellaneous works not provided in the Detailed Project Report;
- (iii) Increase in costs of material and labour in supplying and laying BG tracks, and
- (iv) Increase in length of drainage and other different items of works.

Review of performance as on date: Briefly the progress so far achieved in the various fields of activity can be stated as follows:

(i) Civil engineering work	35.50%
(ii) Structural fabrication	29.00%
(iii) Machinery erection	11.20%
(iv) Production capacities established	5%

(Please see Activity Index graph at Annexure 8)

There is an anticipated extension in the time schedule by about two years on I and II stages and the total estimates are also likely to go up by 21.87% (Please see attached graph 'Increase in construction cost' placed at Annexure 9 & 9 (a)).

Schedule of the completion of the project and reaching its full rated capacity: We have so far touched . . . the aspects of the planning and execution of a project and the various problems that have to be faced up to the construction stage. In the gigantic size heavy engineering projects, the gestation period is generally long. It is therefore of utmost importance



that in this capital intensive enterprise, the revenue should start flowing in at as early stage as possible by means of commissioning part production units of the Project wherever feasible. As will be evident from the construction schedule of the Foundry Forge Project (Please see graph placed at Annexure 10) the construction activity for II stage will be over by the end of 1968. Advantage has been taken to commence production in part units of the production shops at the same time while construction activity is continuing with the above objective in view. The commissioning and activity index in respect of year-wise progress of production of this project can be seen from the graph mentioned earlier at Annexure 8. It is anticipated that the above Project will reach the yearly break-even point some time in the year 1969 and the cumulative break-even point in 1972 as shown in the graph at Annexure 11 (a) and 11 (b).

Raw materials for a project are generally procured from:

- (a) Indigenous resources;
- (b) Foreign suppliers under aid/grants or Rupee payment arrangements; and
- (c) Foreign suppliers against free foreign exchange.

Every endeavour is made to explore the indigenous market in order to conserve the foreign exchange as far as possible. As is well known, the developing countries of this region are having agreements with various industrially advanced countries of the West. Preference is given to procurement of materials from such countries with whom long term loan arrangements exist. In certain cases, however, import has to be resorted to from free foreign exchange areas e.g. for certain ferro alloys, non-ferrous metals, graphite electrodes for electric arc melting furnace etc. The requirement of foreign exchange on this account, however, will be progressively eliminated. The trend showing the decrease in this field can be seen from graph 'Foreign Exchange Requirement' placed at Annexure 12.

Project in Private Sector: As the project to which reference has been made in this study belongs to the public sector, emphasis has been laid on the procedures and the systems of evaluation as applied to the

cases in public sector. The problems connected with the evaluation of a project in the private sector are more or less the same, so far as the planning and decision stages are concerned, as they have to make reference to the Ministry before the project is included in the National Plan, and obtain the green signal for going ahead with the scheme. Similarly the problems during the execution stage, eg. raw materials, transport facilities etc., have to be faced by the private sector in the same manner as by the public sector. It is only in respect of the pricing policy that the private sector has different considerations in formulating the same. Whereas emphasis is laid in the public sector on the far-reaching social and regional implications, profit aspect is more emphasized in the projects in private sector.

In the absence of complete centralization, the government in this region can adopt various measures to influence, but not determine, the actual course of investment in the private sector. The programmes for private sector are generally worked out in close collaboration with the representatives of the industries and of the ministries, on the basis of a careful assessment of the scope for expansion in various fields. Estimates of investment outlay, in the private sector are at best, a balanced judgements as to what is feasible and desirable.

Conclusion:

Development of human resources: The importance of developing human resources and creating the necessary social climate for rapid economic development has become increasingly apparent, as implementation of the Five Year Plans has gone forward. The basic questions are:

- (a) Adequacy of the resources provided;
- (b) Decisions as to priorities;
- (c) Importance of quality in training and supply of competent personnel; and
- (d) Effective regional growth.

These are some of the numerous problems of implementation in each field. Critical attention has to be given invariably to each of them.

It has been observed that a number of big projects are planned to be executed at the same time. These projects being under different ministries are executed by different agencies. As the resources of the country for raw materials, trained personnel, foreign exchange etc. are limited and similar priority is given to all such projects, there arises a conflict in carrying out the work for all of them successfully and simultaneously. Therefore, it is suggested that if a central co-ordinating board could be formed to look after the common interest and aims of all the projects and also to look into the needs of each of them, this could facilitate and help proper and smooth completion of each project successfully.

Site location: The size of a project also plays a vital role in its overall completion within target dates. The determination of the optimum scale of a plant must take into account the pattern of growth of demand as well as its projected level at the end of a given planning period. If a plant is designed for the present demand, it will have to be expanded as demand increases and will not realize the economies that result from installing larger equipment initially. On the other hand, if a plant is designed for the output expected in ten years time, it may operate at less than half of capacity initially and the return on the investment in the early years will be correspondingly lower.

Concentration of industries and the construction of large factories in developing countries is likely to produce serious difficulties as regards the supply of raw materials, water, fuel and power, housing, and other facilities. Since the basic industries such as steel and chemicals usually affect the location of industries that supply them with inputs or use their outputs, the decision on the magnitude of one of these basic plants may have far-reaching effect on the regional development of the economy. For this reason, the important decisions as to scale of output should be made in the context of regional development programmes that take into account the supplies of the more important inputs and the future pattern of growth.

In case of Foundry Forge Project a definite set back was faced due to the procurement problem of roughly 43,000 tons of structural steel. It has taken a rigorous chasing of 2-3 years to procure this quantity of steel, thereby delaying the project by a period of two years.

It is therefore felt that in view of the factors outlined above, it would be desirable for the developing countries to have medium sized, economically feasible industrial units in preference to large complexes. These medium sized units would have an advantage of giving earlier returns, thereby in addition, releasing the strain on the National economy.

Basic preliminary data: The preliminary data on which the project is built has to be carefully compiled and precisely assessed. This is essential since the cost and completion of the project depend entirely on original basic data because any deviation in this is likely to affect the above.

Rationalization of Steel Section: Certain necessary measures could be taken for the provisioning of steel for fabrication in order to cut down the delays. The first and the foremost of these measures would be to roll in the country only a very limited number of standardized sections in sufficiently large quantities. Necessary steps have already been taken to implement this.

It would be very useful if a buffer stock of various steel sections is maintained at different places in the country. These buffer stocks would not only be a guide to the designer but will also serve as alternative sections or would go to make up any shortage of steel for fabrication.

It has also been found useful to give alternative section on the drawing itself for such items which do not involve major corrections in the drawing in cases where the alternative sections have to be used.

Close association of the design office, procurement section and the fabrication shop can play a very important part in the quick execution of the work.

Central project evaluation body: At present no definite agencies have been established in the country for evaluation of projects. The evaluation of the performance is done by the Ministry concerned. From time to time various studies are also undertaken in

this respect through bodies like National Council of Applied Economic Research, Tata Institute of Social Science, Indian Statistical Institute, and the Perspective Planning Division of the Planning Commission.

Necessity has been felt that there be a central Intra-project body entrusted with the job of collecting reliable and up-to-date technical as well as economic data and supply these to various industries before they undertake establishment of future projects. This has acquired vital importance in recent years in view of the fact that Government has been making increasingly heavy investments in a wide gamut of industries and will be doing so in future as a part of its declared policy.

Now that we, in India, have already reached a certain stage of industrialization we should have enough data collected from the various industries, and the experience gained therefrom can be usefully employed in the formulation of a new projects. It would thus be desirable to have central industrial formulation and evaluation bodies for various groups of industries viz. steel, heavy engineering, heavy electricals etc., which, from the time a project is conceived, would be in a position to give feasibility report, technical project report and economics of the project. Such a body would have an advantage that all the technical know-how which is at present compartmentalised in the country among the individual industrial units, would be used as a national asset, and can also be made available for the use of other developing countries of the region.

Rational financial control: As the various public undertakings are initially entrusted with the ministries concerned to start with, financial control is more or less on the Governmental pattern. Before the expenditure is incurred every proposal is examined at various stages with the result that many a time the concurrence to the proposals is delayed. What is needed is a dynamic financial control by which the yearly budget is submitted by the executives in a scientific way which is approved by the top management in consultation with the Finance, so that the executives have a free hand to execute the work within the

budget limit. The evaluation of the performances is done by the top executive on the basis of the periodical returns received from the departments concerned on the actual performance vis-a-vis the budgeted figures. Management audit may be conducted periodically to review or assess the performances for likely action.

Foreign exchange requirement: Foreign exchange requirements are estimated in relation to the projects and schemes proposed to be included in the plan. For many of the projects only rough estimates are available at the state of formulating a plan and a fair number of guesses have to be made. Precision in the foreign exchange requirements of a project is therefore an essentiality which must be ensured either by providing the necessary escalation factor or by the global market survey of the categories of machinery and equipment to be imported while preparing the Detailed Project Report.

Management: Management in a developing country is a new concept. The Manager in such a country has to grapple with the situation of shortages in resources, technical manpower, indigenous and foreign capital and trained managerial talent. This means that the top man vested with sufficient powers along with his team must be appointed at the start of a project itself who should be responsible for planning, erection and bringing the factory to the rated capacity of production. It should be his responsibility to look after the construction, recruitment, procurement and all other relevant problems of the project and co-ordinate all the different phases of execution towards reaching the stage of its production targets against the set time sequence.

Nucleus of skilled personnel: The foremost difficulty, however, in executing the project is the acute shortage of skilled and trained personnel suitable for carrying out intricate and complicated works. It would be advisable if a nucleus of such workers is formed well in the beginning of the project so that they could be trained for different jobs which may come up in permanent set up of the factory.

Role of outside agencies in construction phase:

Regarding the construction aspects of the project, it is felt that instead of organising it departmentally the work as far as possible be entrusted to outside agencies. This will result in faster pace in execution and will relieve the management of extraneous burdens and consequently they may devote their energy to other primary fields of responsibility. There would be no problems of retrenchment or absorbing the surplus construction staff into production after orientation training. The pace of positioning men for production gets interrupted; Besides, the cost of training and non-utility period further affects the overall efficiency and economics of the plant. The training cost which should be separate item thus gets involved and the apparent economies do not reflect a true picture of functioning. The quality of work in case of execution by outside agencies, however, has to be checked frequently and strictly. The Bilal Steel Plant can be taken as an example where the construction, civil and mechanical erection work was awarded to the contractors and was supervised departmentally, with extremely satisfactory results.

Centralised co-ordination: It has been the practice so far that the execution of the project has been divided into multi phases viz. planning, designing, construction, erection, production etc. This creates an exaggerated emphasis on each of the phases, thereby losing sight of the main target or aim of the plant. It is therefore suggested that project should be executed as a whole without such compartmental phase-wise divisioning. Instead of these phases, all the works should be closely co-ordinated keeping in view that production should be achieved at the earliest.

Frequent changes in original concept: Too many changes should not be made frequently in the original concept of the project, for example, the inclusion of other various items of production not originally provided in the plan or the expansion of the project before completing the initial stage itself. This creates lot of difficulties in planning, redrawing the schedules, processing, procurement and execution thereby, invariably affecting and delaying even the original completion of schedule and production programme.

Progress evaluations: Based on the return flow of information from the concerned projects in the sphere of follow-up action and execution, there are three main steps for securing an adequate and up-to-date evaluation of progress:

- (a) There must be a well established operational programme and schedules against which progress can be judged. The type of schedule being used by Foundry Forge Project may be seen at Annexure 13;
- (b) For each sector a system of statistical and other returns (M.E.T. programme Evaluation and Review Technique) must be instituted on the basis of which the responsible authorities may report at regular intervals, adding to their reports a certain qualitative assessment. For checking up the progress at a glance and comparative achievement the typical control forms as used in Foundry Forge Project can be seen at Annexure 14 and 15; and
- (c) There should be regular and frequent appraisal of performance with minimum time lag in reporting. A system of short term reporting should be built in so that remedial steps can be taken and problems anticipated at an early enough stage.

Before concluding this study I would very much like to express my thanks to the Chairman, Management of Heavy Engineering Corporation Limited and the General Manager, Foundry Forge Project for giving their kind consent to use and publish the Technical and Statistical data of the Foundry Forge Project for this paper. My thanks are also due to the Czech experts, my colleagues in Foundry Forge Project and friends who have extended their kind help for giving necessary guidance in compilation of this paper.

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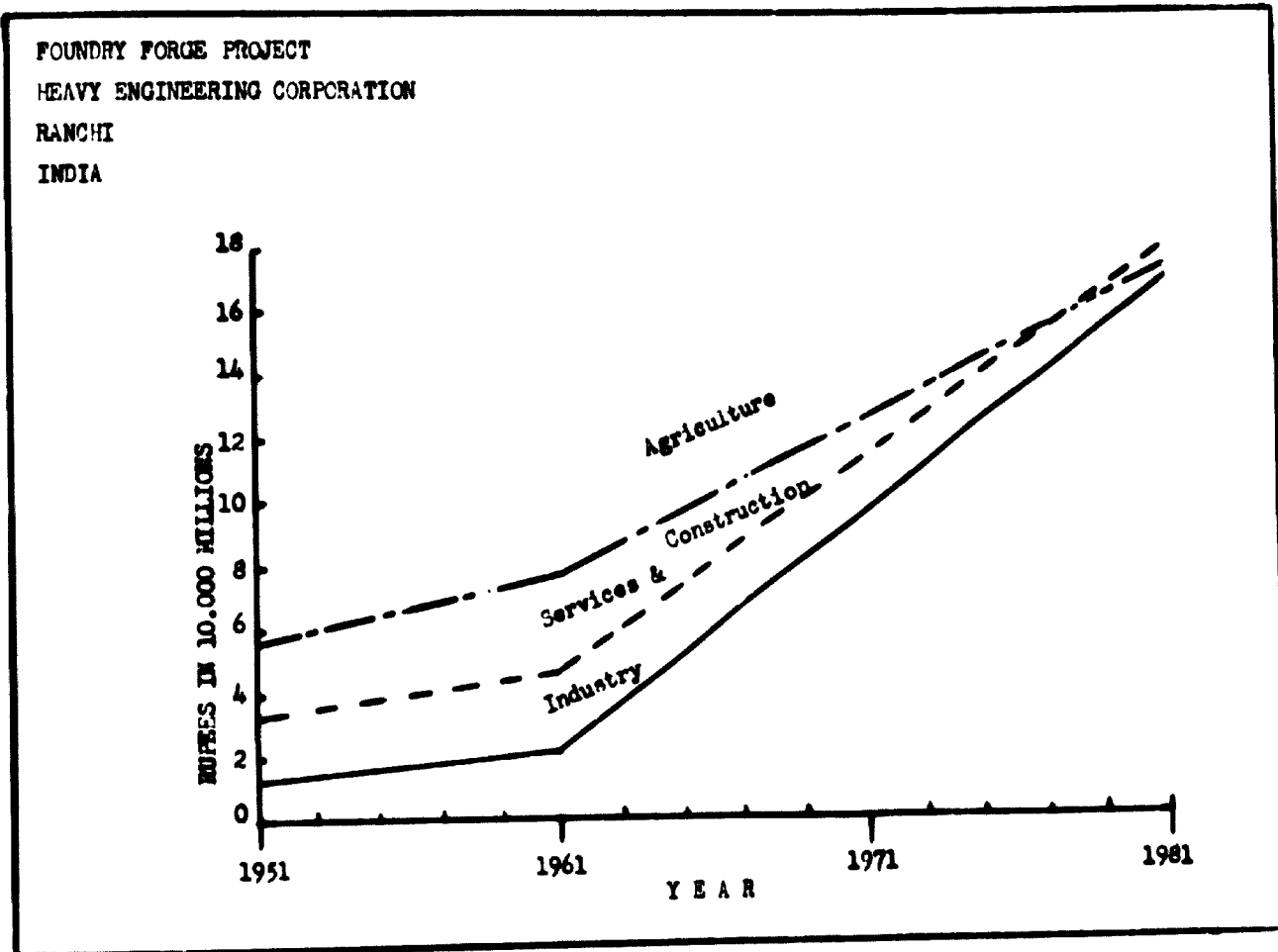


REFERENCES

1. Formulating Industrial Development Programmes (United Nations publication, also No.: 61.II.F.7).
2. Government of India, Economic Survey, 1964-65.
3. Ministry of Information and Broadcasting, Our Second Five-Year Plan. (India)
4. Government of India, Third Five-Year Plan.
5. National Council of Applied Economic Research, Looking Ahead: Prospects of India's Economy and Trade in 1981, New Delhi.
6. Ministry of Finance, India: Pocket Book of Economic Information.
7. Tata Industries Private, Ltd., Statistical Outline Of India, Bombay, 1964.
8. S.T. Raja, The Role of manager in the Process of Industrialization. Ranchi, NCDC, India.
9. National Productivity Council Journal, Special Issue on Inter-Firm Comparison, Vol.No.3, July- September 1964.

ANNEXURE

Annex 1 - Anticipated Trend in National Income

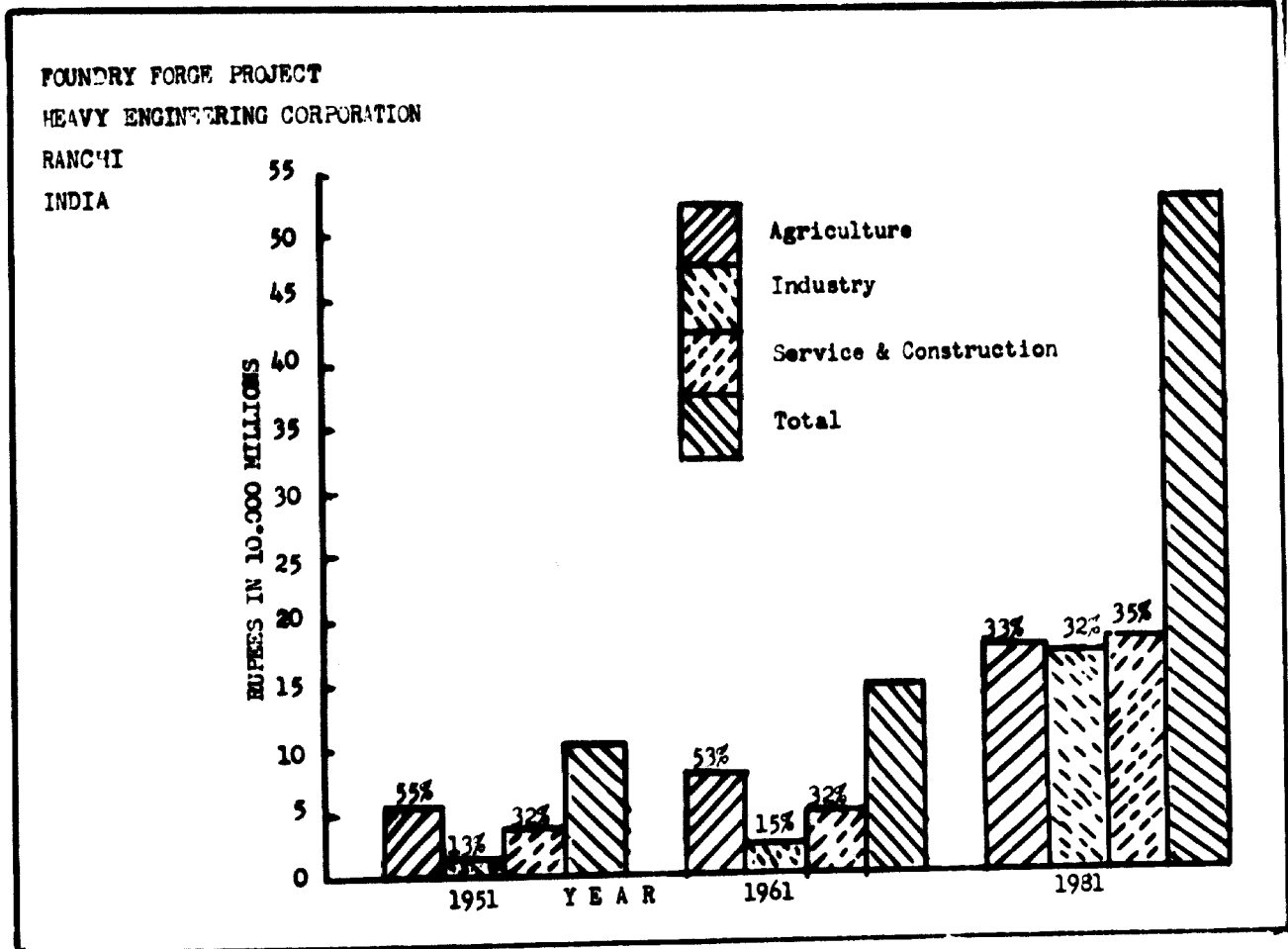


Annex 2(a) - Sectoral Shares in National Income

(Value in million of Rs.)

Sector	1951		1961		1981	
	Value	Percent	Value	Percent	Value	Percent
Agriculture	56,500	55,200	76,800	53,000	173,100	32,900
Mining	800	800	1,500	1,100	12,000	2,300
Large Scale Industry	6,000	5,900	10,800	7,400	129,600	24,700
Small Scale Industry	6,600	6,400	9,200	6,300	29,800	5,700
Services and Construction	32,500	31,700	46,700	32,200	180,900	34,400
TOTAL	102,400	100,000	145,000	100,000	525,400	100,000

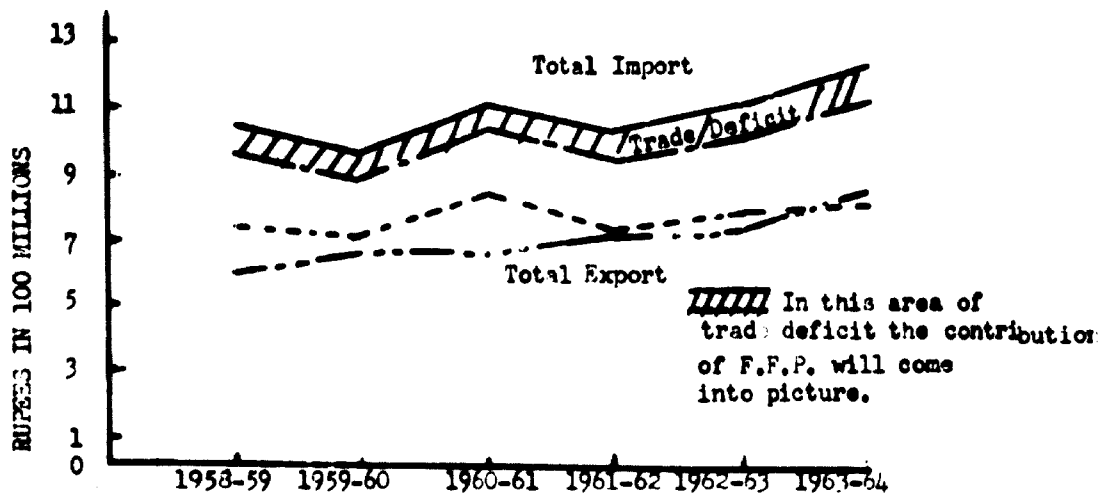
Annex 2(b) - Distribution in National Income



Percent  
2,900  
2,300  
4,700  
5,700  
4,400  
0,000

Annex 3 - Foreign Trade

FOUNDRY FORGE PROJECT  
HEAVY ENGINEERING CORPORATION  
RANCHI , INDIA



- - - ■ Shows imports other than capital equipment, machinery, vehicles, locomotives ships, air crafts etc. and parts.
- - - ■ Shows imports other than castings and forgings.

Annex 4 - Technical Parameters

1. Gray Iron Foundry:

Shaped castings (Max. piece weight 100 T)	33,345 T/year
Rolls	11,540 T/year
Ingot moulds	1,110 T/year

2. Steel Foundry:

Shaped castings (Max. piece weight 90T)	40,182 T/year
Rolls	6,200 T/year
Ingot	42,000 T/year

3. Non-ferrous Foundry:

Castings (Cu. base alloys) (Max. piece weight 1000 kg)	664 T/year
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4. Forge Shop:

Free forgings*	50,118 T/year
(Max. piece weight 90 T)	
Die forgings	3,045 T/year

5. Rough Machining Shop:

Production (Volume in rough weight)	68,050 T/year
Production (Volume in finished weight)	60,385 T/year
(Max. piece weight 100 T)	

6. Machining Shop for Rolls:

Rolls	21,310 T/year
(Max. piece weight 60 T)	

\*including 6000 Ton Press.

Annex 5 - Financial Structure

(Rupees in million)

<u>Description</u>	<u>Total Reesed Project cost estimate</u>	<u>Total expenditure to the end of April '65</u>
A. Payment to Collaborators for DPR, working drawings, technological documentation, organisation manual and incidental expenses	25.1	17.872
B. Plant and machinery including imported materials for construction tools, furniture, fixtures, construction equipment etc. including customs duty, insurance, clearing charges etc.	435,322	147.993
C. Civil construction works, including plant buildings, temporary construction, enabling works, railway sidings etc.	353.844	132.634
D. Erection of Plant and equipment	75.1	6.026
E. Salaries, allowances and other expenses of foreign experts	62.696	16.467
F. Training of Indian engineers abroad	7.00	1.687
G. Salaries, allowances, advances and other additional expenses	<u>37.2</u>	<u>20.231</u>
TOTAL	<u>996.262</u>	<u>342.912</u>

In a public undertaking like Foundry Forge Project, the fixed capital requirement for the initial investment is made available by the Government by way of share capital and/or loans while the individual project is expected to raise the working capital by availing of short term loans from commercial banks. The cash budget is at present prepared every year and a constant review being done every month so as to see that the cash requirements are properly planned and met.

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of April '65

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993  
634  
026  
467  
687  
233  
912

Annex 6 - Statement of Financial Results, Forestry Farms Project

Year	Capital outlay during the year		Total outlay by end of year	Working Capital	Interest charges		Depre- ciation	Total	Wages and Salaries
	Constructive- tion	Machinery			Working capital	Factory and township			
Up to									
1963-64	68.7	62.5	131.2	-	-	-	-	-	-
1964-65	73.4	45.2	249.8	-	-	-	-	-	-
1965-66	75.0	39.7	364.5	10	0.6	5.4	16.0	1.0	1.3
1966-67	71.9	64.8	508.2	40	2.4	18.4	20.8	16.0	2.4
1967-68	86.6	77.4	665.2	80	4.8	22.9	27.7	25.0	6.4
1968-69	81.5	48.5	795.2	90	5.4	27.4	32.8	33.0	11.0
1969-70	78.8	21.2	895.2	70	4.2	30.9	35.1	40.0	16.7
1970-71	42.3	2.7	940.2	60	3.6	33.4	37.0	45.0	25.7
1971-72	34.0	1.0	975.2	75	4.5	34.4	38.9	47.0	27.8
1972-73	28.0	1.0	996.3	85	5.1	34.9	40.0	48.5	30.8
1973-74	-	-	-	95	5.7	35.4	41.1	50.0	32.1
1974-75	-	-	-	100	6.0	35.4	41.4	50.0	35.8
1975-76	-	-	-	100	6.0	35.4	41.4	50.0	36.0
	-	-	-	100	6.0	35.4	41.4	50.0	38.5

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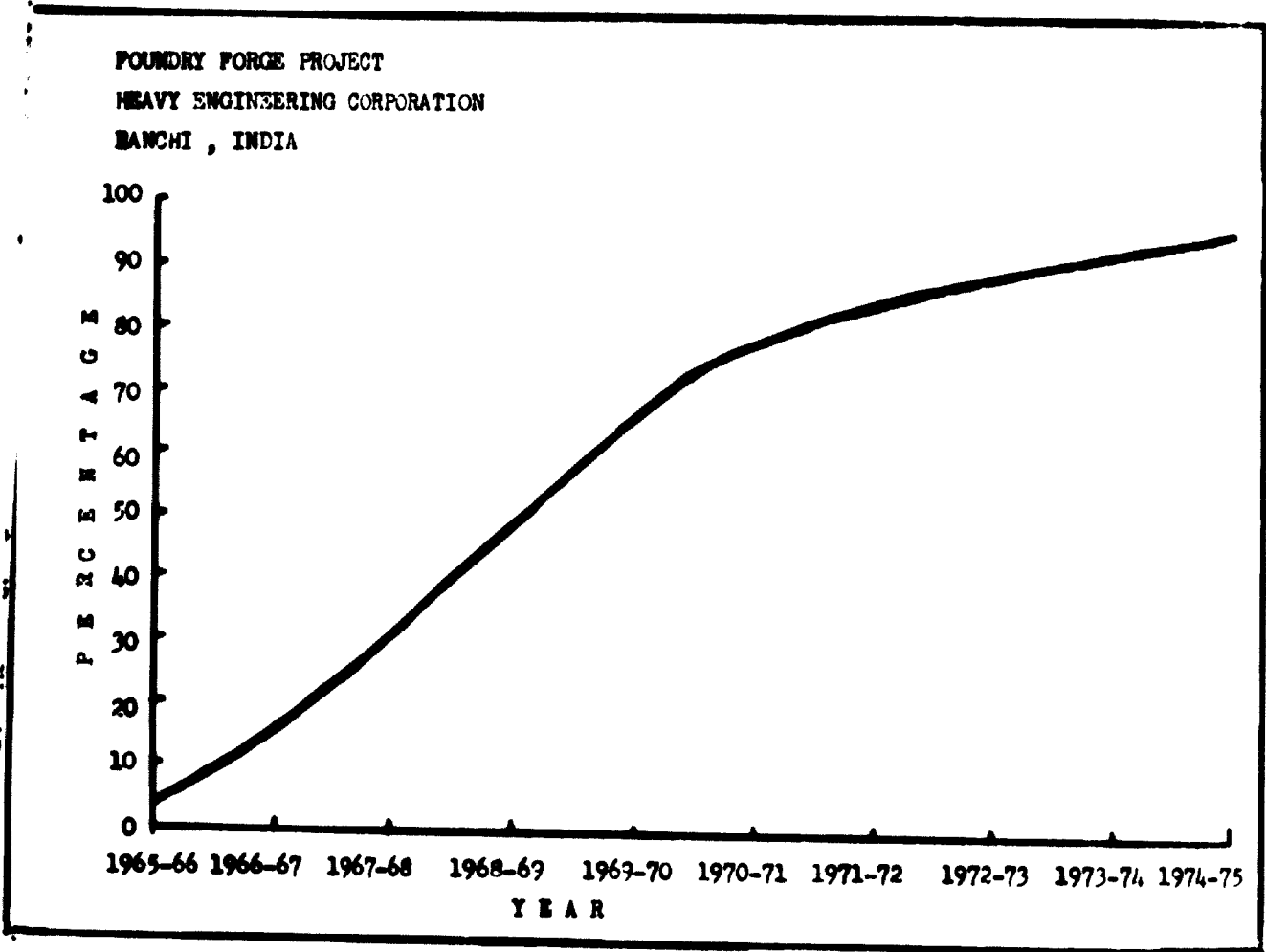
Annex 7 - Economic Indices After Completion

	(Anticipated)	
	<u>Rupees in million</u>	<u>Ratio</u>
Trading profit (Before charging interest on borrowings, depreciation and taxation)	<u>167.3</u>	1:5.96
Total capital employed	996.3	
Trading profit (After charging interest on borrowings, depreciation and taxation)	<u>68.9</u>	1:14.46
Total capital employed	996.3	
Trading profit (Before charging interest on borrowings, depreciation and taxation)	<u>167.3</u>	1:2.42
Sales	404.5	
Trading profit (After charging interest on borrowings, depreciation and taxation)	<u>68.9</u>	1:5.87
Sales	404.5	

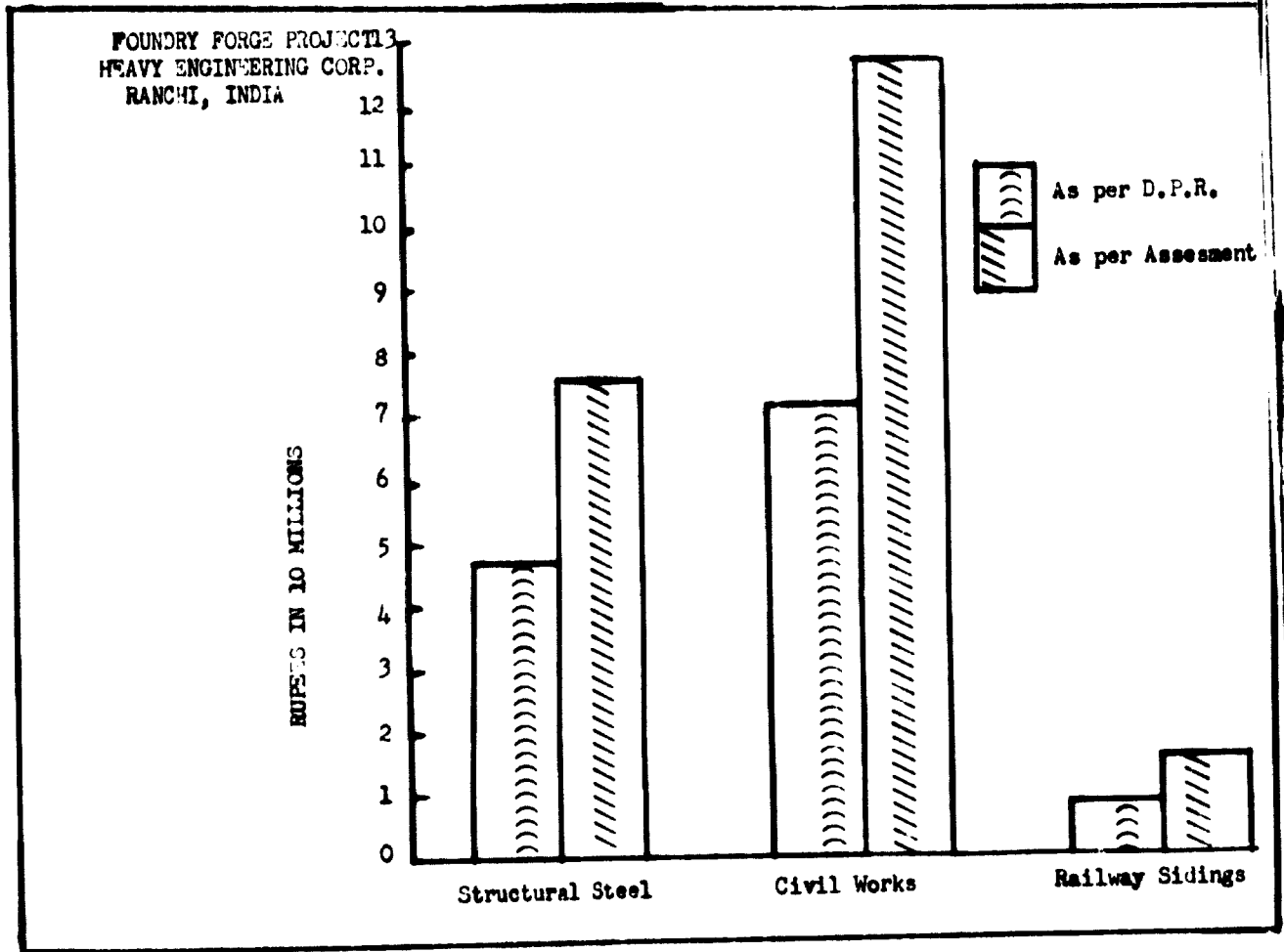
UTILISATION OF INVESTMENT RATIO

	(Anticipated)	
<u>Sales</u> Total capital employed	<u>404.5</u> 996.3	1:2.45
<u>Fixed Assets</u> Total capital employed	<u>804.3</u> 996.3	1:1.24
<u>Sales</u> Fixed assets	<u>404.5</u> 804.3	1:2

Annex 8 - Activity Index

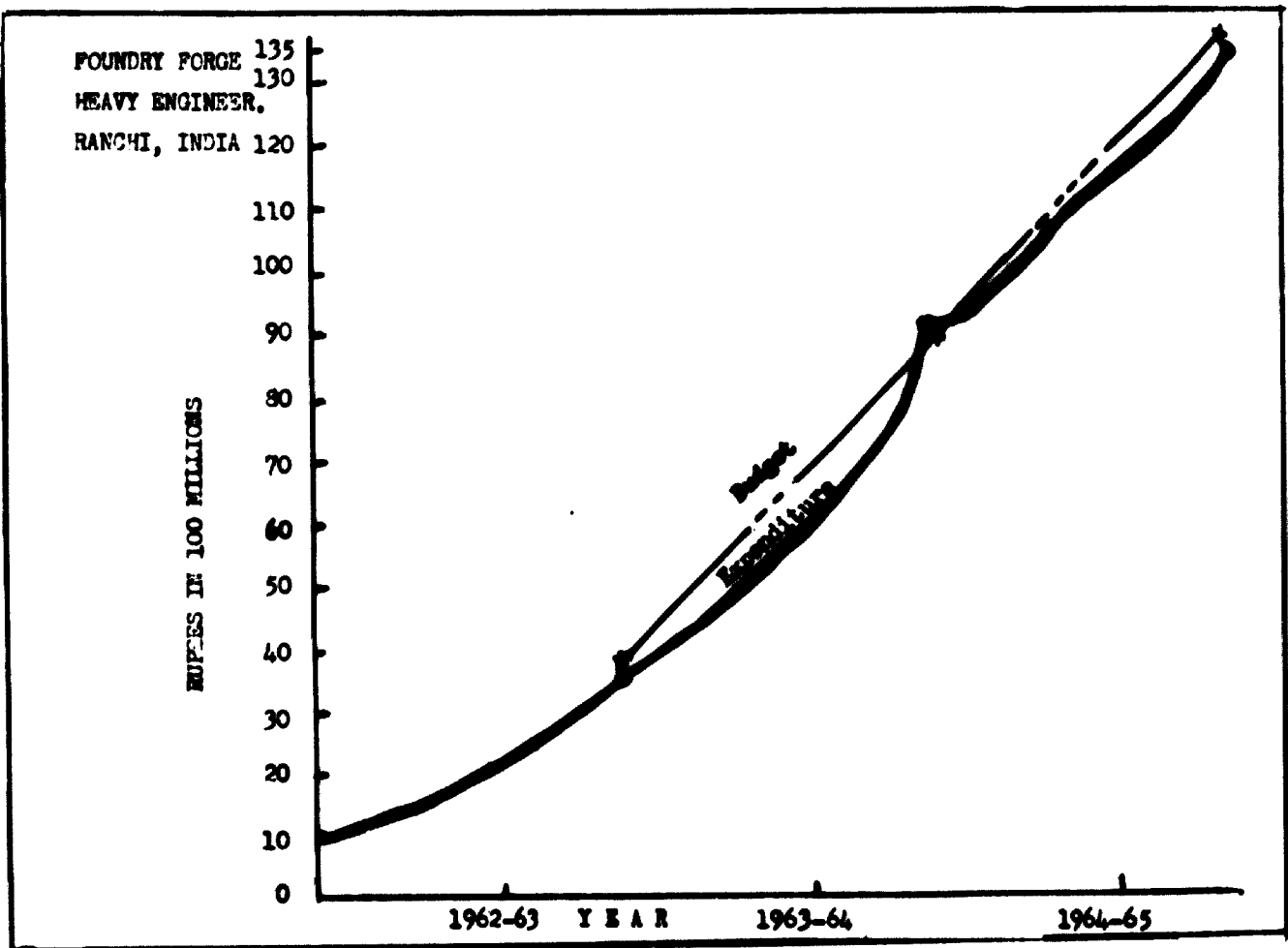


Annex 9 - Increase in Construction Cost



1974-75

Annex 9 (a) - Trend in Expenditure on Works Cumulative As Against Budget

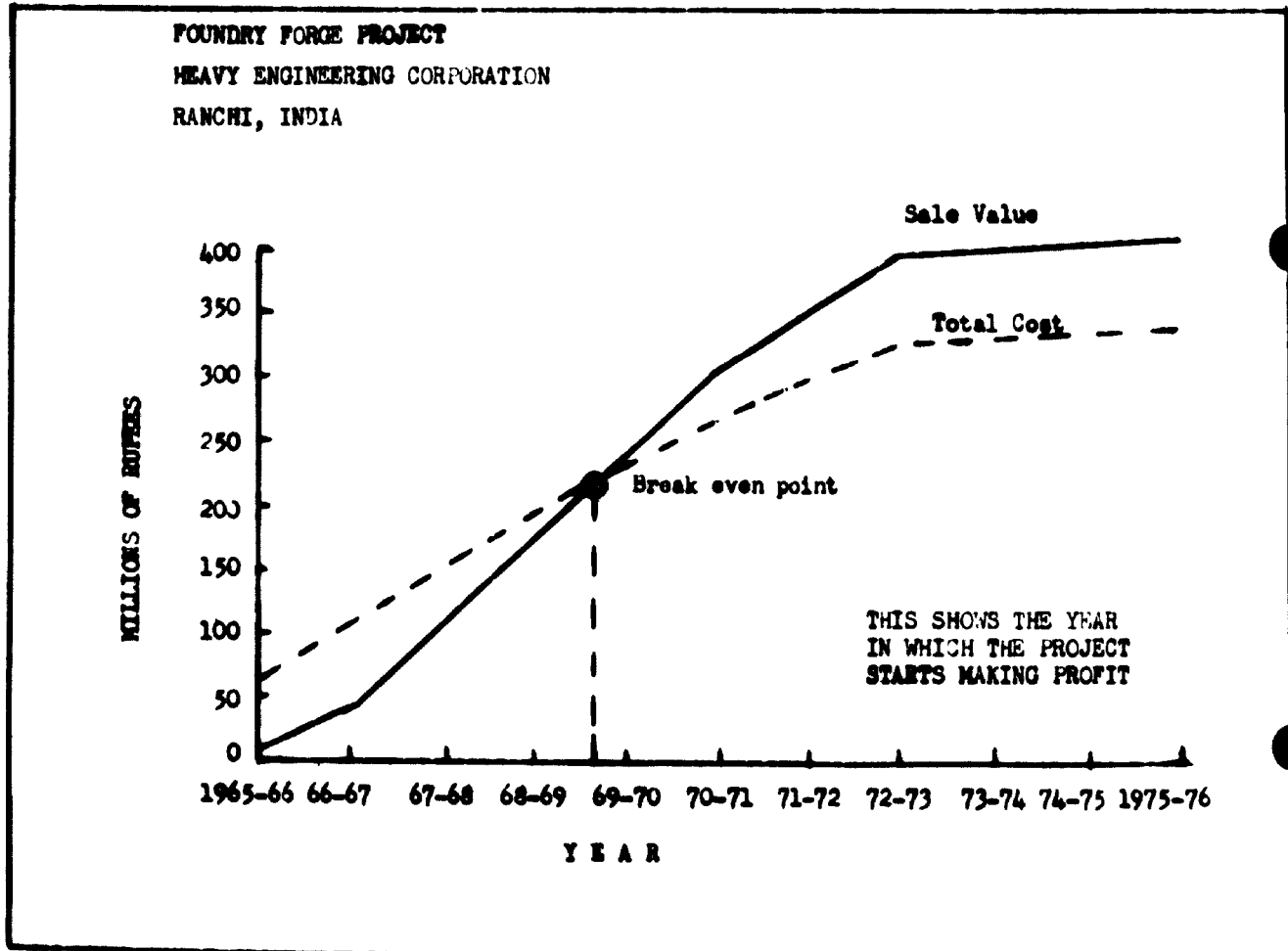


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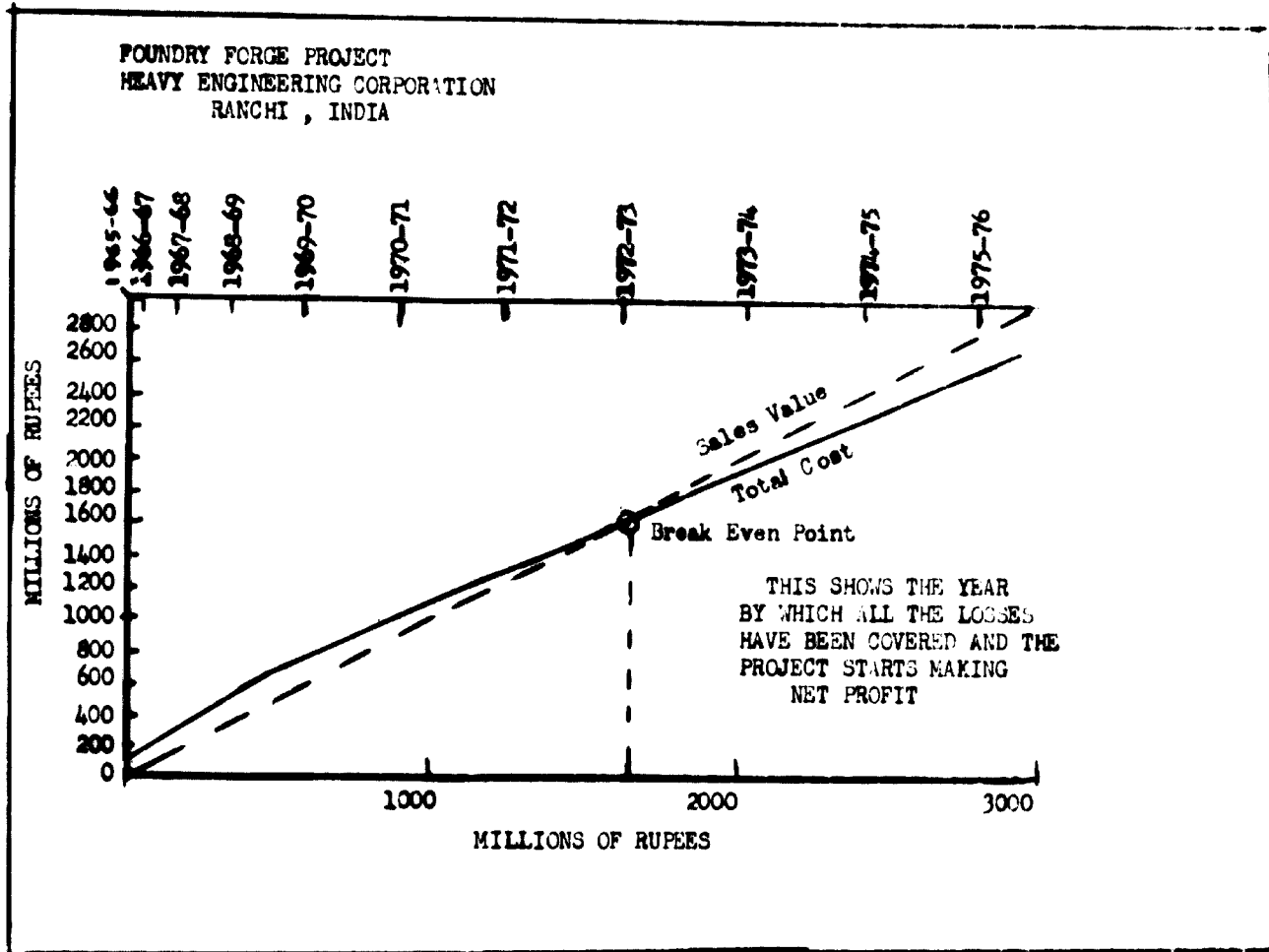
Annex 10 - Revised and Combined I and II Stage Programme

	<u>G.I. and W.P. Foundry</u>	<u>Steel Foundry</u>	<u>Forge Shop</u>	<u>Rough M/e Shop</u>	<u>Fettling Shop</u>
Completion of construction work (1st stage)	30-6-65	31-8-66	31-8-66	31-5-66	31-8-65
Completion of construction work (2nd stage)	31-12-65	31-12-66	31-8-66	31-8-66	31-1-66
RECENT PROGRAMME	1-9-66	Dec.67	Dec.68	Mid-67	Mid-67

Annex 11 (a) - Break Even Graph (Yearly)



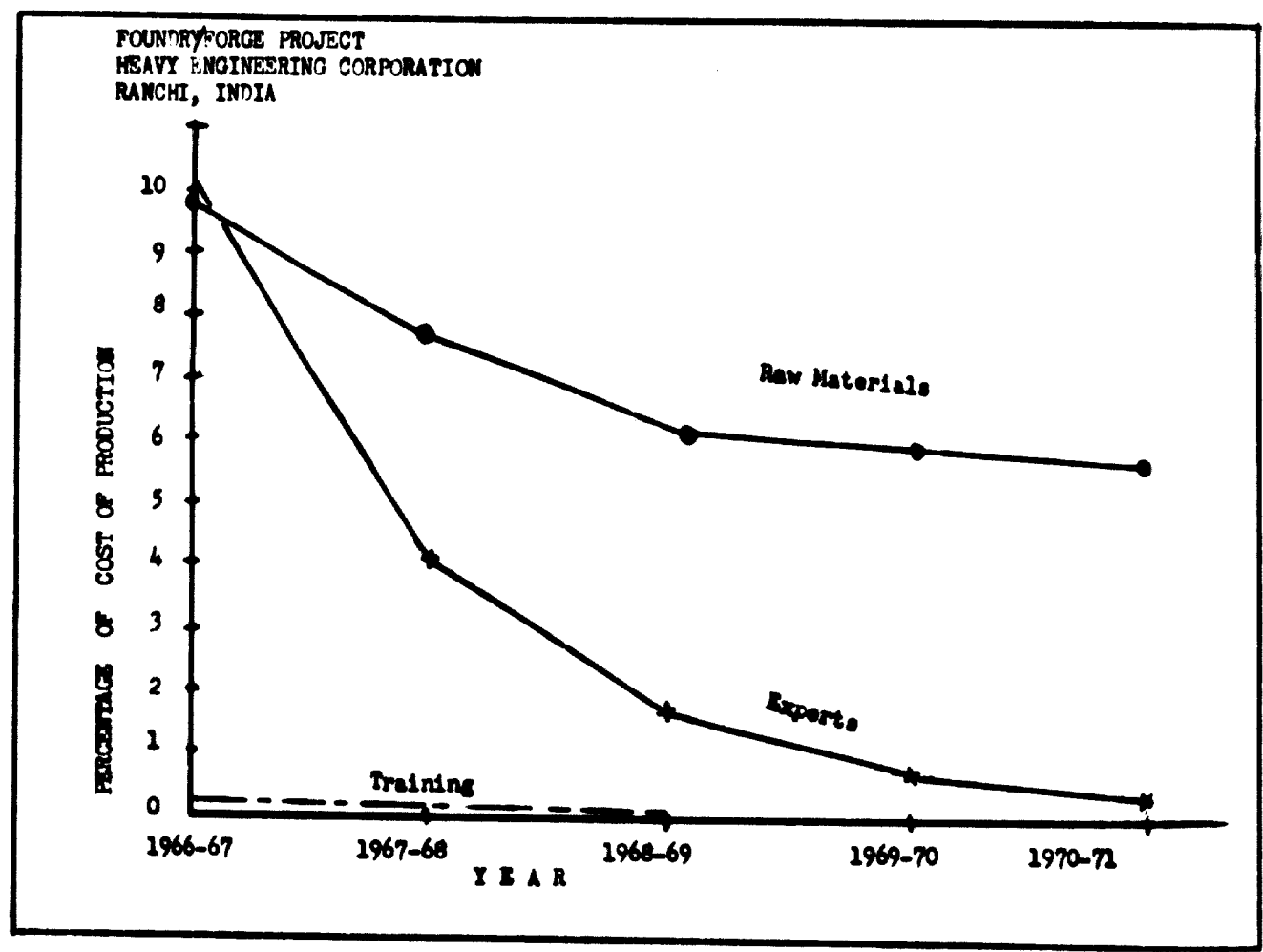
Annex 11 (b) - Break Even Graph (Cumulative)



75-76

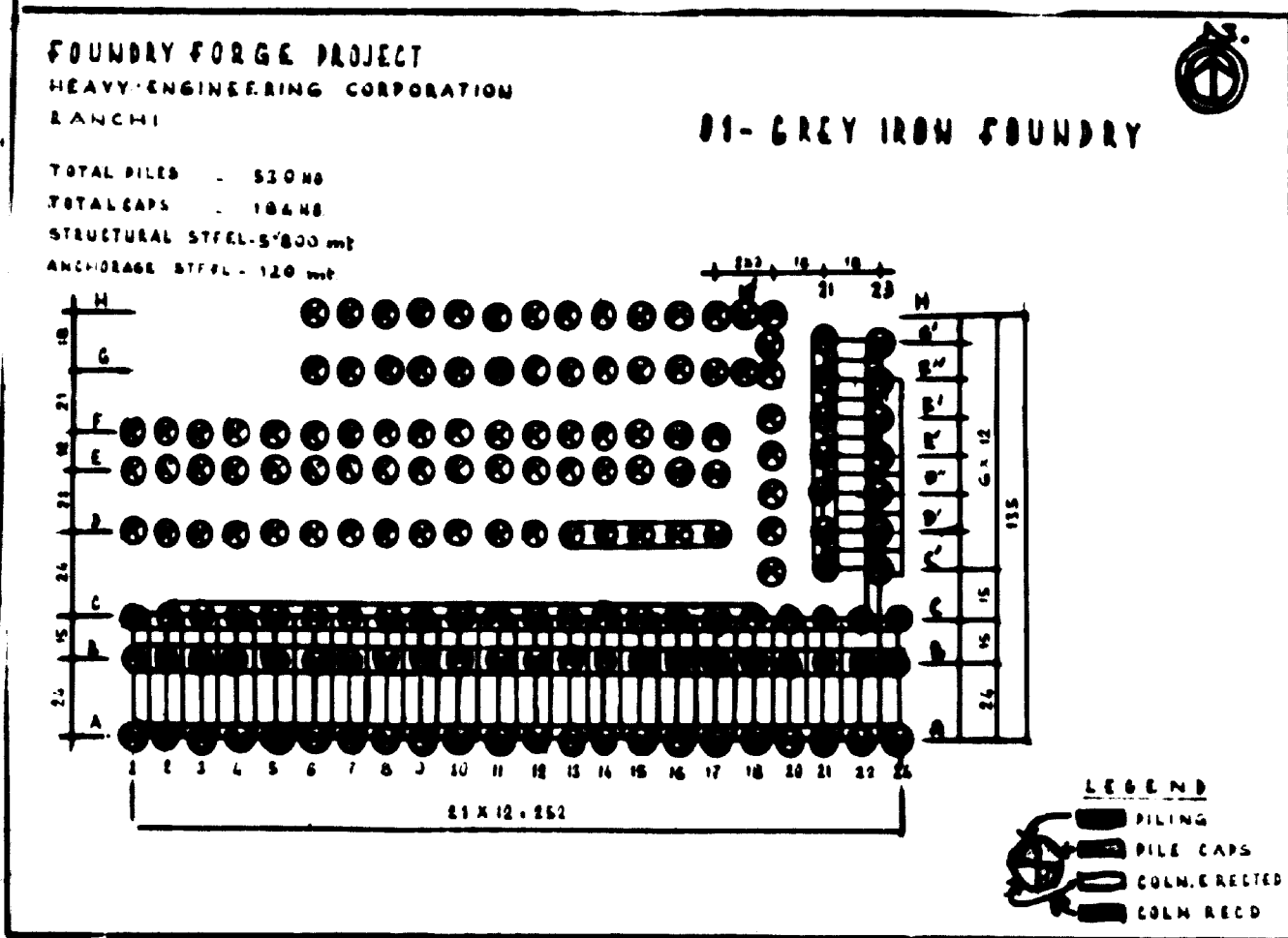


Annex 12 - Foreign Exchange Requirement for Production



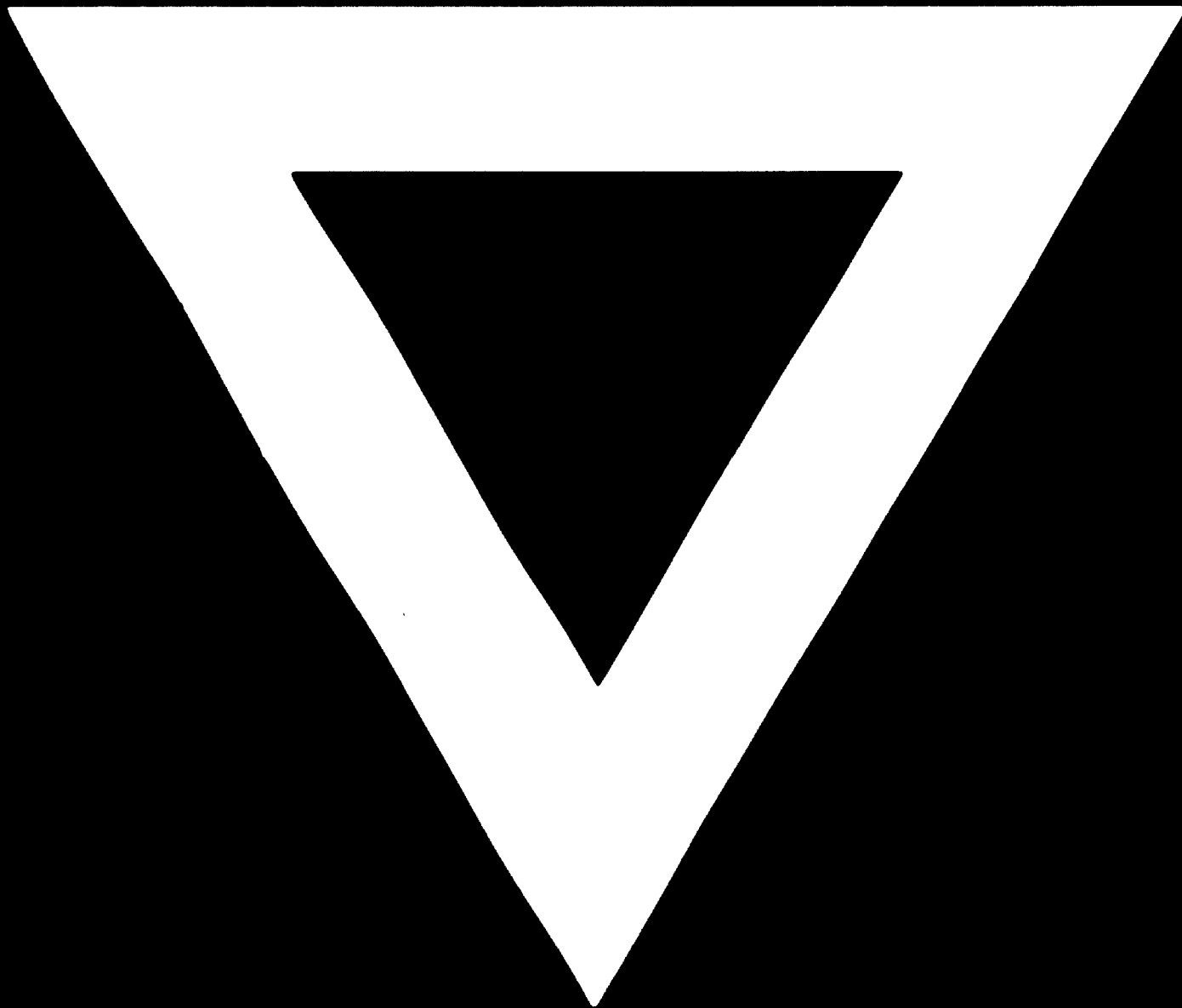


Annex 14 - Typical Control Chart for Progress of Civil and Structural Work





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