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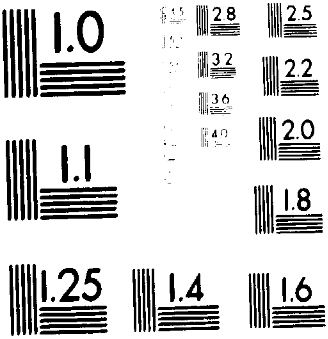

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English

TECHNO-ECONOMIC STUDY

FOR THE ESTABLISHMENT OF A MINI STEEL

PLANT IN AFGHANISTAN

SI/AFG/81/803

Prepared for the Government of the Democratic Republic of Afghanistan by the United Nations Industrial Development Organization executing agency for the United Nations Development Programme

United Nations Industrial Development Organization

Vienna

This report has not been cleared with the United Nations Development Organization, which does not therefore, necessarily share views presented.

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Supplements

INTRODUCTION

The team organized for the preparation of the techno-economic study work with a work-meeting organized and participated by the UNDP Kabul. During the meeting Mr. E. Kawa, President of Planning Department, Ministry of Mines and Industries, representing the Afgan party expressed his request that the team should prepare a study on the basis of which the Afgan Government could make decision on the basic questions of the realization of the mini-steel plant based on the local techno-economic study available iron and steel scrapings base. It means that the techno-economic study should reach the next stage of the investment process, the Feasibility Study stage both in its content and in its profoundity as much as the data and information available make it possible. In order to satisfy this request the team was promised to get quickly all the necessary data and information and to fulfil maximally other necessary conditions.

After getting over the initial difficulties of acquiring data and information within the limits of the particular local circumstances the team did its best to fulfil the request, i.e. where the available data and other conditions make it possible, the profoundness of the techno-economic study reaches the requirements of a Feasibility Study, in some cases it also surpasses.

During the preparation of the study the team could always rely on the assistance of the whole active apparatus of the Board for Techno-

-Economical Studies, Planning Department, Ministry of Mines and Industries, especially on

Mr. M. Y. Noori
Mr. A. G. Wolesmel
Mr. Nasir Ahmad

for the selfsacrificing and active work of whom the team wants to express its thanks.

The team would like to express its special thanks to Mr. Daud Soroush, General President of Central Authority for Buildings and Town Planning, for his outstanding help he gave us in the field of sound foundations of the data and in the field of production of the technical conditions of the preparation of the techno-economic study.

The team says thank you to all of the official personnel of the government, to the experts, to its colleauges who - besides their every-day work - could devote time to contribute to our work by supplying of data, expression of ideas and professional advice and in this way they also took part in the foundation of this techno-economic study.

Last but not least the team expresses its thanks to the colleauges of the UNDP in Kabul, expecially to:

Mr. Ingolf Schuetz-Mülller, Resident Representative
Mrs. Ingeborg Kaul, Deputy Resident Representative
Mr. Abdul Q Yari, National Officer

for the political realition-making and excellent organizing activity with which they helped us through the difficulties of the work.

Remakrs

In the following TES will mean techno-economic study and MSP will mean mini-steel plant.
When considering time, please read European year 1983 as year 1362 according to Afghan calendar.

1. EXECUTIVE SUMMARY

1.1. Project background and history

- The aim of this techno-economic study presented herewith is to secure a techno-economical study for the Afgan Government, on the basis of which they can decide whether a steel metallurgical plant (mini steel plant) should be put into practice, if yes, where, when and of what kind.

- The location and name of the proposed metallurgical plants are as follows:

  1) MSP in North

     Proposed area: Mazare Sharif
     Company seat: 18-20 km from Mazare Sharif at close quarters of the chemical fertilizer plant.

2) MSP in Pul-i-Charki

Proposed area: Kabul, Pul-i-Charki industrial area

Company seat: the territory of the three existing millworks.

The above two plants have no vertical connection, they are not versions of each other, but they are the two independent units of a complex development.

- The decisive, limiting factors in solving the problem are as follows:

  a) The plants should be set up for meeting the domestic demands.

  b) Existing iron and steel waste are the basic primary materials.

  c) The location and the capacity to be planned are limited first all by the storage basis and quantities of the basic material, by the transport conditions in Afghanistan and by the possibilities of energy supply (first of all that of the electrical power).

  d) The proposed MSP should strenghten the development program of the Afgan economy and should improve the level of the economy.

1.2. Market and plant capacity

- The demand of the Afgan national economy for iron metallurgical products has not been significant, during the past decades its average was about 13 thousand tons per year.

- By the introduction of the industrialization the demand showed significant increase and in 1360-1362 it reached the value of 40-41 thousand tons per year. The development of the building industry was the primary reason of the demand-growth and it will primordially determine the tendency of demands during the forthcoming decades.

- On the basis of the sizing up of requirements and on that of the prognostic calculations the demand for the products of the iron metallurgical industry will exceed 100 thousand tons by 1371, it can be estimated as 126 thousand tons.

- The values of the deliveries of the proposed plants in the year of the running-in (in 1371) are as follows:

  a) MSP in North

  2161.6 million Afs (43.2 million dollars)

  b) MSP in Pul-i-Charki

  634.8 million Afs (12.7 million dollars)

  The total sales receipts of the two plants:

  2796.4 million Afs (55.9 million dollars)

- Proposed production program of the plants (in 1371):

  a) MSP in North

Bloom	8.4×10^3 t	229.1×10^6 Afs
Roller bar	28.5×10^3 t	922.6×10^6 Afs
Wire	31.5×10^3 t	1010.9×10^6 Afs

  b) MSP in Pul-i-Charki

  Small dimension rolled section steel

  20×10^3 t 634.8×10^6 Afs

- The total finished product capacity of the two plants:

88.4×10^3 t / year of which:

. the capacity of the MSP in North 68.4×10^3 t

. the capacity of the MSP in Pul-i-Charki 20.0×10^3 t

- The setting up of the two-basis production capacity was made necessary by the economic, provision and transport circumstances reasoned in detail in Chapter 3.10.

1.3. Materials and inputs

The material-demands of the period after the running-in are introduced in detail in Appendix 33. and 34.
The value of the used materials on yearly level, on price level of 1361 for the period of the running-in:

Denomination	MSP in North	MSP in Pul-i-Charki	TOTAL
Raw materials	447.3×10^6 Afs	138.1×10^6 Afs	585.4×10^6 Afs
- import	114.7 - " -	35.8 - " -	150.5 - " -
	(2.3×10^6 \$)	(0.7×10^6 \$)	(3.0×10^6 \$)
Other materials	228.6×10^6 Afs	56.9×10^6 Afs	285.5×10^6 Afs
- import	155,6 - " -	43.1 - " -	198.7 - " -
	(3.1×10^6 \$)	(0.9×10^6 \$)	(4.0×10^6 \$)
Replacements	129.8×10^6 Afs	24.5×10^6 Afs	154.3×10^6 Afs
- import	56.9 - " -	10.7 - " -	67.6 - " -
	($1.1. \times 10^6$ \$)	(0.3×10^6 \$)	(1.4×10^6 \$)
Energy	104.7×10^6 Afs	34.6×10^6 Afs	139.3×10^6 Afs
Other materials	17.0 - " -	4.7 - " -	21.7 - " -
Total materials	797.6×10^6 Afs	234.3×10^6 Afs	1031.9×10^6 Afs
- import	371.4 - " -	114.5 - " -	485.9 - " -
	(7.4×10^6 \$)	(2.3×10^6 \$)	(9.7×10^6 \$)

Nearly 53 % of the materials to be used are from inland (in value)

47 % comes from imports, the main elements of which are as follows:

- ferrous alloying additions
- slag-forming agents
- graphite electrodes
- attachments of primary equipment
- refractories.

Their order of magnitude is significant, but they represent only an insignificant proportion of the actual metallurgical import. Their import will inevitably be necessary during the first 10 years of the operation, but after this period - depending on the development of the Afgan industry - its quantity will decrease and the import of some materials could hold off. Naturally, the materials have been taken into account on the prices most probably applicable for the period of using.

1.4. Location and site

How to choose the locations and the sites - it caused the greatest problem for the team, as there were neither appropriate maps, nor the designers' tour of inspection of the spot was organizable.

The proposed location has been determined first of all on the basis of four criteria:

- The regional localization and magnitude of the steel and iron waste, on the basis of the optimal transport costs.

- On the basis of the possibilities of electric power supply.

- **On the basis of the intention to make maximal use of the** existing possibilities.

- On the basis of securing the accordance with the aims of the industrial policy.

Acccording to the above listed two fields could be considered:

a) A MSP with bigger capacity in the northern industrial area, in the Mazare Sharif region.

b) A MSP with smaller capacity in the Kabul region.

- In determining the location in the northern industrial area first of all the possibility for the use of natural gas, making use of the communal facilities and the abundance in water of the area were decisive for the location nearby the chemical fertilizer plant.

- In the Kabul region the development of the already existing millworks, the utilization of their territory means the best economic efficiency solution.

There were no soil mechanical data for pointing out the site.

1.5. Project engineering

- Proposed technology in both territories are as follows:

  . preparation of waste
  . steel melting in electric arc furnace

. steel casting into semi-processed ingot in continuous casting machine

a) In MSP in North arc-type continuous casting machine

b) In MSP in Pul-i-Charki horizontal continuous casting machine

. finish rolling

a) In MSP in North ingot, bar and wire rolling

b) In MSP in Pul-i-Charki rolling of rolled section (angle steel, flat iron, I-U holders, etc.)

According to the above outlined technology the following location is planned taking into account the magnitude of the production capacity:

<u>In MSP in North</u>

. waste preparatory (piece cutter, agglomerating plant) machinery with the necessary material handling possibilities,
. two 15-ton electric arc furnace with the necessary complementary and tending machinery,
. one arched, two-fiber continuous casting machine with tending units and cooling bench,
. one complete ingot, bar and wire rolling with the necessary attachments, tending units,
. one limestone kiln with the complementary machinery,
. one oxygen generator plant with the necessary complementary machinery,

- service factory with the necessary equipment
- closed backwinding water system necessary for the operation of the metallurgical plant
- electric substation
- gas receiving station
- hydraulic and pneumatic power room
- social facilities
- inner road network
- necessary offices.

The installation costs necessary for the realization of the above listed items are as follows:

MSP in North

Denomination	Foreign 10^3 \$	Local 10^6 Afs	Total 10^6 Afs
Know-how	500	-	25.0
Machinery and equipment	29.339	1.3	1.468.7
Buildings	2.210	427.0	537.5
T O T A L	32.049	428.3	2.031,2

MSP in Pul-i-Charki

- waste preparatory (piece cutter, agglomerating plant) machinery with the necessary material handling equipment,
- one 8-ton electric arc furnace with the necessary auxiliary and tending machinery,
- one one-fiber horizontal continuous casting machine without secondary cooling with the necessary tending machinery and

cooling bench,

- closed, backwinding water system necessary for the metallurgical plants,
- electric substation,
- power room.

All the other necessary equipments are disposable in the territory of the millworks, the costs necessary for the reconstruction or for the amplification are not calculated in this project.

Investment costs necessary for the realization of the project:

MSP in Pul-i-Charki

Denomination	Foreign 10^3 \$	Local 10^6 Afs	Total 10^6 Afs
Know-how	1.000	-	50
Machinery and equipment	5.435	8.9	280.7
Buildings	-	80.8	80.8
T O T A L	6.435	89.7	411.5

1.6. Plant Organization and overhead costs

On the basis of the analysis of the costs arising in the different phases of the production the following cost-centers were determined because of the basic identity of the technologies at both firms:

- cost center of steel production
- cost center of continuous casting
- cost center of skin rolling.

Taking into consideration the organizational structure proposed in the opportunity study and considered to be right by us, the general costs are as follows:

In the year of running-in on estimated prices

Denomination	MSP in North 10^6 Afs	MSP in Pul-i-Charki 10^6 Afs	Total 10^6 Afs
Operational general costs	332.1	90.7	422.8
Administrative general costs	76.4	20.6	97.0
Depreciation costs	138.5	22.7	161.2
T O T A L	547.0	134.0	681.0

The banking charges are similar to the category of the general costs and as the investment is capital-intensive, the role of costs and its consequence, the interest charges are significant.

For financing the investment the team suggests the following:

In case of MSP in North

Formation of Afgan-foreign mixed company

Rate of foreign capital: 49 % = $1155{,}7 \times 10^6$ Afs

Participation of the Afgan government 51 % = $1202{,}8 \times 10^6$ Afs

Up to the 41 % of the relevant participation the state capital investment	$= 493,3x10^6$ Afs
Foreign capital loan for covering the missing 59 %	$= 709.5x10^6$ Afs

In case of MSP in Pul-i-Charki

The reconstruction of the already existing millworks is to be financed by the present owners. The means of the further development are partly to be given by the state up to $329,2x10^6$ Afs, for the missing $107.4x10^6$ Afs the millworks being transformed into a mixed company are to take up foreign loan.

The above listed costs cover not only the investment cost, but also the costs of the preliminary operation (cold tests).

1.7. Manpower

- The manpower demand of the proposed metallurgical plants can be met.
  The training of the labour forces and that of the experts of the key-posts should be secured already at the decision-making stage of the investment in the way suggested in the second chapter.

- Manpower demand of the MSP in North:

Workers	364 persons
Employees	79 persons
Engineers	25 persons
T O T A L:	468 persons

- The manpower demand of the MSP in Pul-i-Charki:

Workers	155	persons
Employees	36	persons
Engineers	7	persons
T O T A L:	198	persons

The manpower demand of Pul-i-Charki contains the manpower demand of the existing millworks, as well.

1.8. Implementation scheduling

The basic question of the investment - whether to invest and if yes, where - can be decided on the basis of the TES. For reaching the final, detailed decision a Feasibility Study should be prepared, an executing organization should be formed, the training should be carried out, etc. All these mean significant costs, too.

10^6 Afs

Denomination	MSP in North	MSP in Pul-i-Charki	Total
Planning costs	23.3	5.0	28.3
Cost of the activity of executing apparatus	295.3	62.8	358.1
T O T A L	318.6	67.8	386.4

According to the schedule of the TES the investment would start in both places in the beginning of 1365 and would end by the second part of 1386 (3,5 years). This is a real period for the realization and by that time the investment can be prepared.

The production would start in 1368 and would reach its nominal capacity in 3 years (in 1371). This is a real and feasible idea.

The real data of the preparation can be read in Chapter 9.

1.9. Financial and economic evaluation

1.9.1. Total investment cost

Description	MSP in North	MSP in Pul-i-Charki	Total
Land and site preparation	75.9	10.8	86.7
Civil engineering works	465.6	70.0	535.6
Technology and equipment	1.493.7	280.7	1.774.4
Pre-production capital costs	323.7	75.1	398.8
Working capital	2.267,5	101.8	2.369.3
Total investment costs	4.626.4	538.4	5.164.8

1.9.2. Project financing

The possibilities of financing are not the same in the two plants, because the MSP in North is a firm with foreign capital participation; the MSP in Pul-i-Charki consists of three private plants. It would be advisable to put the latter under common leadership and with state capital investment to transform them into a mixed company. In accordance with the existing situation the suggestion of the TES is as follows:

1.9.2.1. Project financing of MSP in North

	10^6 Afs	Proportion in %
Total investment cost	4.626.4	
Foreign capital (not loan)	1.155.7	25,0 %
Afgan state capital spending	493.3	10,7 %
Investment loan (foreign)	709.5	15,3 %
Afgan state capital (after investment)	2.267.5	49,0 %
Total capital investment	4.626.4	100,0 %

The above listed capital demand will not arise at the same time, but 95 % of it will arise during 5 years. The detailed schedule can be read in Appendix 57.

1.9.2.2. Project financing of MSP in Pul-i-Charki

	10^6 Afs	Proportion in %
Total investment cost	538,4	
State capital spending (for investment)	329,2	61,1 %
Foreign investment loan	107.4	20,0 %
Working capital spending of present owners after the investment	101.8	18,9 %
Total capital investment	538.4	100 %

1.9.3. Total production costs

10^6 Afs (1371, year of running-in)

Description	MSP in North	MSP in Pul-i-Charki	Total
Factory costs	1.362.0	391.0	1.753,0
Administrative overheads	76.4	20.6	97.0
Sales and distribution costs	44.3	13.0	57.3
Operating costs	1.482.7	424.6	1.907.3
Financial costs	50.3	7.5	57.8
Depreciation costs	138.5	22.7	161.2
TOTAL	1.671.5	454.8	2.126.3

1.9.4. Financial evaluation

Description	In terms of	MSP in North	MSP in Pul-i-Charki
Not present value	10^6 Afs	4.626.4	538.4
Internal rate of return	%	4.0	22.01
Pay-back period	year	10.7	6.5
Simple rate of return	%	9.2	30.2
Break-even point	10^3 t	49.1	7.6
Min. capacity (feasible)	%	49.1	38.8
Gross profit/sales (7 year average)	%	10.6	22.3
Net profit/sales (7 year average	%	9.1	18.5

1.9.5. National economic evaluation

The national economy needs rolled steel products, which are used first of all in the building industry. The investment improves the balance of foreign exchange of the foreign trade. In the long term the realization secures possibility for the development of other industrial sectors, as well.

1.10. Conclusions

As a result of the TES the conclusion is that it would be advisable, logical and economical to form a mini steel plant in the northern industrial area of Afghanistan and in Kabul with a total capacity of about 100×10^3 t/year.

- There is market demand for the products planned to be produced in the mini steel plant, which - without the mini steel plant - can be obtained through import, only. This import would mean 30×10^6 dollars burden for the Afgan national economy in the planned running-in year (1371) of the MSP.

- The acquisition from imports would harden the burdens of the national economy because of the high transportation costs the proposed home production secures the formation of a more favourable price level.

- Steel and iron waste is the basic raw material of the planned MSP. During the planned life of the MSP (20 years) it will be disposable in the necessary quantity in the area proposed for the plant.

- During the 20 year running of the proposed mini steel plant a signifivant decrease of the iron and steel waste stocks should be foreseen, but it does not mean anything else, but that by that time it would be advisable to form the exploration and the reducing to metal of the Hagigak ore by direct reduction method, on the basis of which the raw material demand of the MSP could be secured for ever.

- The development introduced is economical, meets the requirements expressed by the competent authorities in the second Chapter, although there are also some disadvantageous factors in connection with the realization of the mini steel plant.

- The realization of the investment requires the investment of significant capital, the assuring of which can cause some difficulties.

- In case of providing the capital necessary for the development, significant profit will be secured by the invested capital, but there are development areas which may secure more favourable rates of profit than the capital invested in the steel metallurgy.

- The iron waste of the southern territories can be processed in the proposed mini steel plant only with very low economic efficiency indicatiors. Because of the territorial localization of the waste in the southern territories, the location of the MSP cannot be realized at the necessary profitability level. For solving the problem it would be advisable to lift the restriction of the iron and steel waste export.

The proposed realization schedule of the mini steel plant can be kept without any difficulties in case the necessary capital is secured.

It is suggested that the development should start with the development of the plant in Pul-i-Charki, because:

  - it demands significantly lower capital investment,
  - the economical results are very favourable,
  - in case of sole realization the time of realization can be reduced which - in consequence of the quicker running-in period - can promote the improvement of the results and the financial conditions of the realization of the northern MSP.

The realization of the MSP in North should take place in the second phase, but it is advisable to cut the time as short as possible between the two stages, because the MSP in North plays a more significant role in the satisfaction of the demands of the most dinamic Afghan industry than the plant in Pul-i-Charki.

2. PROJECT BACKGROUND AND HISTORY

2.1. Introduction of the assignment, contractual and work contracts

TESCO-UVATERV entered into a contract with the UNIDO, on the basis of which a three-member group of experts executed advisory service at the competent authorities of the Afghan government in the field of steel metallurgy. In course of the advisory activity the group prepared the Technical Economic Study (Prefeasibility Study) for the preparation of the realization of a mini steel plant with a capacity of about 100.000 t/year. The text of the contract can be read in Appendix 1.

For the performance of the contract a group of experts arrived in Kabul on 23rd April, 1983:

Dr. László Dolgos	- Metallurgical Engineer
Endre Kardos	- Metallurgical Engineer
János Molnår	- Metallurgical Engineer-Economist

The group established contact with the MMI in the organization of UNDP.

The group carried out its work according to the labour plan attached in Appendix 2.

The group collected the data and information necessary for the performance of the work during the negotiations and consultations organized by the BTES and through written publications.
In course of the acquisition of information the group had negotiations and consultations with the organizations and persons

listed in Appendix 3.

During the negotiations and consultations a quastionnaire (See Appendix 4.) - serving the knowledge of the demand for rolled steel products - was handed over to the competent ministries and authorities. A questionary (Appendix 5.) that could enable us to get acquainted with the steel import was sent to the office of statistics.

For the survey of the waste basis - as the group did not get permission for leaving the inner area - the BTES set up groups that carried out their work on the basis of the questionnaire and instructions outlined in Appendix 6.

2.2. Background

2.2.1. In setting up the steel industry the "Feasibility Study for an Integrated Iron and Steel Plant in Afghanistan" is the first significant work written by Creusot-loire/Demag in March, 1974. This study suggest the building up of the whole iron metallurgical verticum, the main units and production volume of which are as follows:

Haigak iron ore mine	240 kt	ore production
Shabashak coal mine	300 kt	coal production
Doab coking and	124 kt	coke production
briquetter	63 kt	briquette production
Sekar iron and	152 kt	crude iron production
steel works	143 kt	fam ingot production
Kabul rolling mill	130 kt	production of rolled products.

50 kt from the production would have served for home use, 80 kt (62 %) would have been exported.

Besides the above listed plants the building of a lime-burning plant (with a capacity of 20 kt/year) and that of an oxygen factory (with a capacity of 10 million Nm^3/year) was also suggested. The electric energy demand necessary for the operation and production would have been 68 million kWh/year. The estimated costs of the investment on 1974 price level:

- coke and briquette production	66,8	million	FRF	+ 357,8	Afs
- crude iron	53,7	"	"	+ 287,8	"
- steel production	46,0	"	"	+ 246,6	"
- continuous foundry	27,6	"	"	+ 148,0	"
- facilities	53,5	"	"	+ -	
- rolling mill	59,4	"	"	+ 318,0	"
T O T A L:	288,8	"	"	+ 1358,0	million Afs

The team feels some problems in connection with the conception of the Study, on the basis of which the basic principle of the proposed development, the traditional technological chain: production of crude iron - steel production with converter - continuous casting - fine rolling was not taken over for the establishment of the mini steel plant at the present phase of the industrialization.

The market analysis of the Study is deserving, as it gives an opportunity to determine the real market demand on the basis of the production and import data of the years 1342-1350 (1963-1971) and the results of the past years and gives opportunity also for the decreasing of miscalculation.

2.2.2. The immediate antecedent of the TES is the Opportunity Study (O.S.) (Author: M.P. Kuntic) made in March, 1980 on the basis of a Unido assignment proposes a mini steel plant with a basis of 16-20 kt/year steel scrap. The plant would consist of die-casting and ingot rolling with electric arc steel production or of electric arch steel production and continuous casting. Analysing the market conditions it prognostizes 100-125 kt per year Afghan steel-demand for the years after the start up of the mini steel plant.

As a basic aim of the mini steel plant the author of the O.S. determines the satisfaction of the ingot demand of the rolling mill. The characteristic key data of the O.S. are as follows:

. prognostic rolled product demand of Afghanistan in 1368 (1989-1990)		100-125 kt/year
. production capacity of the mini steel plant		16-20 kt/year
. rolled product demand of Afghanistan at present level		27 kt/year
. Steel scrap stocks of Afghanistan (present + potential)		400-500 kt/year
. durability of steel plant		20 years
. electric power demand of mini steel plant		7,0-7,5 MW
. water demand of mini steel plant		65 m^3/hour
. staff of mini steel plant	"A" version	286 persons
	"B" version	260 persons

. the realization cost of mini steel plant:

"A_1" version (ingot production + rolling with new rolling mill)
$5,46 \times 10^6$ US \$ + $164,8 \times 10^6$ Afs = $403,3 \times 10^6$ Afs

"A_2" version (ingot production + rolling used rolling mill)
$3,36 \times 10^6$ US \$ + $164,8 \times 10^6$ Afs = $312,0 \times 10^6$ Afs

"B" version (with continuous casting)
$3,01 \times 10^6$ US \$ + $164,8 \times 10^6$ Afs = $278,6 \times 10^6$ Afs

. economic result after the whole running-in:

sales receipts	200×10^6 Afs/year
sales tax+fee (12 %)	- $19,2 \times 10^6$ Afs/year
net sales receipts	$180,8 \times 10^6$ Afs/year
Total production cost	$145,2 \times 10^6$ Afs/year
Gross result	$35,6 \times 10^6$ Afs/year
Returns proportional to the value	17,8 %
Returns proportional to the engage assest	
"A_1" version	8,8 %
"A_2" version	11,4 %
"B" version	12,7 %

Our present TES accepts the following concept of the O.S. as starting basis. The mini steel plant should:

- use electric arc furnace connected with continuous casting as basic technology;
- steel crap is the raw material basis;
- the inner market, the quantity of the scrap (present and potential) and the utilizable electric power mean the limits

of the capacity to be realized.

Because of the changes having taken place during the past 3 years (since the preparation of the O.S.) all the basic data (market, raw material basis, energy supply possibilities) had to be brought up-to-date which determine the parameters of the mini steel plant proposed in our TES.

2.3. Analysis of the development of the Afghan economic situation

The mini steel plant proposed in our TES would mean the establishment of a new industry in Afghanistan, therefore great importance must be attributed to the analysis of the situation and possibilities of the national economy.

The most characteristic data of the Afghan economy of the past five years can be read in Appendix 7.
The following can be laid down from the date of the Appendix:

- Afghanistan is predominantly an agricultural country. The proportion of the agriculture is 70 % of the national product. The agricultural activity is not intensive. The territorial character of the country is not too favourable from the point of view of the agriculture. This is well illustrated by the fact that the agricultural activity is carried out on 58 % of the territory of the country, bot on 79 % of this only pastoral animal growing is carried out. 39 % of the country's territory cannot be used for agriculture purposes. On the basis of the above listed, of the climatic-economic conditions the conclusion can be drawn that the development of the agriculture, the propagation of the intensive farming is an important, but not sufficient condition of the increasing of the national economy, of the national welfare. This is corroborated by the fact that the equipping level of the agricultural plants, their degree of supply with machinery and equipment is at a very low level.

- After the agriculture the mining-power sector is the second national economic branch. The participation of this combined industry was only about 14 % of the national product during the past 5 years. The number of the industrial firms is between 250-280. 38 % of them are state-owned or state-private mixed enterprises. 62 % of the firms are private enterprises. The branch and sectoral structure of the firm:

26 %	food-industrial firms (under state control:		5 %)
24 %	ligh industrial firms (under state control:		2 %)
15 %	electrical power producer	"	15 %
14 %	chemistry - chemical engineering	"	2 %
7 %	printing industrial firms	"	7 %
6 %	metal processing industry in engineering industry	"	1 %
4 %	building industry		3 %
3 %	wood and paper industry	"	2 %
4 %	mining	"	1 %

38,5 % of the production value of the industrial plants are given by the firms under state control or by the mixed firms. The production of the private firms is 61,5 % of which is produced by the handicraft industry, 13,8 % by the services. The average production per year per factory is illustrated well by the size of the production units: $100,1 \times 10^6$ Afs ($1,18 \times 10^6$ US $).

The bulk of the industrial firms belongs to the category of the small or handicraft industry and even the biggest enterprises can be classed among the middle category. The listed statistical data contain some errors, because certain firms, for example the rolling mills of Pul-i-Charki are included in the statistics, but they have not been working for more than 2 years.

These errors do not change the character of the conclusion to be drawn. The above listed facts show that the task is to develop the industrial and building industrial firms for the development of the Afghan national economy, but this is required also by the development of the agricultural branch, as the development of the intensive economy cannot be realized without mechanization, without the general spreading of appliances. And this presumes the industrial background of the country to be at a certain level with certain structure which does not exist for the time being. The necessary development of the industry and building industry demands the use of metallurgical semi- and final products of a higher quality and particularly of bigger quantity, which can be at present carried out - for lack of home metallurgical plant - through imports. The growth of the import is limited by the export-import balance. (For the time being its balance is positive). The possibilities for the growth of the export - which mean the condition of the bigger import - are limited. The formation of the metallurgical basis became inevitably necessary at a rate same as that of the industrial development or from time to time even at higher rates. This fact is also emphasized by the geographic situation and the communication facilities of Afghanistan which - because of the high transportation costs raise the rentability of a properly dimensioned metallurgy.

- The transport possibilities of Afghanistan are strongly limited. The country has no railway. The total length of the road network is 18.974 km, but only 15 % of it has firm paving and nearly 30 % is signed cart-road which knowing the geographic configuration and the soil structure means that these cart-roads are not suitable for transport of goods.
  This fact is also reflected by the number of trucks; there are hardly more than 20.000 lorries in the country. These follow that the significant extension and establishment of roads suitable for transport of bulk product, the increase of the number of means of transportation are one of the basic pre-conditions of the industrialization. This concerns first of all the conditions of the establishment of the metallurgy, as the raw materials, auxiliary materials, energies and the users cannot be found in the same place. So both because of the possibilities of the performance of the necessary transports and the transport tarifs the location of the metallurgy should be very carefully studied and chosen.

- The climate of Afghanistan is of continental character, but there are significant differences between certain territories. The next table gives a good summary:

Territory	Kabul	Bamiyan	Mazari-Sharif	Baghlan
Denomination				
Average max. of temperature °C	19,6	15,3	23,9	22,9
Average min. of temperature °C	4,2	-0,2	10,3	7,9
Average max. rainfall mm	524,0	194,0	289,0	413,0
Average min. rainfall mm	176,0	88,0	57,0	117,0
Max. speed of wind m/sec.	35,0	22,0	28,0	11,8
Average number of rainy days	57,0	21,0	45,0	50,0
Average number of snowy days	16,3	19,0	10,0	12,0
Max. thickness of snow cm	45,0	12,0	15,0	45,0

The table shows well that the number of rainy days is relatively low.

The quantity of the precipitation is relatively small, though there are significant differences.

Following from the above listed date the water output of the rivers also differs, which is well illustrated by the next list.

Name of river / Charact. data	Bamyan-sekari	Konav	Szandhab (Kanduz)	Kabul	Logar
Watershed area km^2	5000	3800	8900	2500	2200
Water output max. (m^3/sec.)	59,7	12,5	70,1	169,0	85,0
Water output min. (m^3/sec.)	0,30	1,05	9,0	0,07	0,02
Months abounding in water	V-VI	X-XI	V-VI	IV	IV
	VII-VIII	XII-I	VII-VIII	V	III
Small water output	XII-I	IX			

The above list contains naturally only the rive of the territories interesting from the point of view of the establishment of metallurgy. Because of the high water damand of the metallurgy, besides the rivers other water sources may also be necessary. On the basis of the Soviet water research prepared in 1965 it can be stated that:

in the region of Shabashak the water output of the underground cistern is enough only for satisfying the present demand. In the region of Kabul on the basis of measuring 6 wells called Bogzani in dry weather it can be stated that there are significant cisterns under the surface: the water output of the wells can be calculated as 30, 37, 16,6, 100, 100, 80 liter/sec. from 2,9 - 8,5 m depth, i.e. they can secure water output enough for the establishment of a metallurgical plant.

- From the point of view of seism Afghanistan cannot be considered to be a quiet territory. The earthquakes of different stregth are frequent. For instance in the region of Komar in 1956 an earthquake of the strength of 7,6 according to Richter Scale was registered which caused significant losses. The areas important from the point of view of the industry and of the mineral resources are in the earthquake-danger zone which must be taken into consideration when deciding the costs of the development and first of all in the period of the planning and impementation.

2.4. The aims of the industrial policy of Afghanistan

We tried to get profound information about the aims of the industrial policy of Afghanistan (in the long run) in several ministries and also in the Central Planning Board. As the Afghan national economy has only one year plans for the time being, and all the competent authorities unanimously expressed their opinion that about 2 years are necessary for the preparation of a middle run plan (five-year) that is why it was not possible to acquire genuine information about the long-term planning as an established system.

The aims of the Afghan industrial policy can be outlined as follows (for about 20 years) on the basis of the opinion of the Afghan experts, on that of the knowledge of the economic situation in Afghanistan and of our experience.

. The stabilization of the national economy and the reconversion of the production level of the former decade are the aims of the present period.

- The realization of a dinamic flat-building program, the solving of water supplying difficulties in Kabul and in the northern industrial region.
- The dinamic development, modernization of the traditional industries such as the food industry and light industry.
- The development of the agriculture which gives the raw material to the traditional branches of the industry; the propagation of the intensive economy; the dinamic raise of the level of the mechanization.
- The fulfilment of a country-wide program for the modernization and the development of the road network, the development of the railway taking into consideration the demand of the planned industrial centres.
- The development of the engineering industry necessary for the development of the agriculture, the establishment of the background of engineering industry.
- Securing the energy supply meeting the requirements of the development of the industry for the gradual increase of the electrical energy production and the natural gas production and supply.
- The establishment of the steel metallurgy, the background industry for the development of the production of the engineering industry fundamentally based on the steel scrap basis.
- The continuous realization of the use of the Afghan ore resources.
- The enlargement of the steel metallurgical project based on the use of the ore resources.
- The fulfilment of other tasks not yet seen, but serving the development of the country.

2.5. The present and future possibilities of the resources connected with the realization of the mini steel plant.

2.5.1. Availability of scrap

The authors of the TES accepted the idea of the O.S. suggesting that the mini steel plant should be based on the use of the Afghan steel scrap, as the iron and steel scrap stocks are significant in Afghanistan and the use of the national resources is of vital interest for the Afghan economy.

Because of the differences in the estimations concerning the iron and steel scrap stocks, and also for the control of the influence of the 3 years in the data of the O.S. a country-wide survey of the scrap was necessary. Its details are shown in Appendix 1.
Here we would like to sum up the conclusions concerning the scrap stocks as follows:

The iron and steel scrap stocks of Afghanistan will reach the quantity of 7-800 thousand tons by the time of putting into operation the mini steel plant (1368-1369).
The significant scrap stocks can be found mainly at two sites, being 300 kms far from each other: in the northern mining and industrial area and in the region of Kabul.

The state of the steel and iron scrap stocks is not static, in accordance with the rithm of the industrialization it feeds on the sphere of both the reproduction and the investment, the degree of the increase can be estimated as 3 - 5 % reflected to the starting level of the stocks (700 thousand tons).

Taking into consideration the potential quantity of the scrap summed up above, the 20 year life-time of the electric arc furnace plant and the 1,2 - 2,6 thousand tons/year scrap use of the present and future steel and iron foundries, the capacity of the mini steel plant to be set up solely on scrap basis is as follows:

$$Q_{min} = \frac{(700+700x0,03x20) -20x1,2}{20} = \frac{700+420-24}{20} = \underline{54,8 \text{ thousand t/year}}$$

$$Q_{max} = \frac{(800+800x0,05x20) -20x2,5}{20} = \frac{800+800-50}{20} = \underline{77,5 \text{ thousand t/year}}$$

The 50-75 thousand tons/year theoretically possible production capacity of the mini steel plant is naturally influenced by the localization of the scrap. The consequences of delivery and the planned time and technology for the use of the ore resources mean also some rentability problems. Influenced by these, the capacity chosen for the development and its reasoning can be read in some variations in Chapter 3.

2.5.2. Availability of mineral resources

Concerning the reserves of subsoil wealth, Afghanistan has significant mineral resources, among which iron ore needs special evaluation from the point of view of the mini steel plant. The geological exploration of the iron ore started in 1342-43 (1963-64) and the appraisal of the reserves is still not finished. According to the geological, experimental and process data 1750-2000 million tons of good quality ore was determined in the region of Hagiga with an average of 60-65 % of Fe content. The thickness of the reserve-bed is 3.400 m. The analysis of the ore was made in 1351-52 (1972-73) in the laboratories of Creusot-Loire, the most important results of which is know by the team are as follows:

The average composition of the ore:

Fe	64,0 % (+0_2 27,52)
$Si0_2$	7,0 %
Ca0	0,2 %
Al_20_3	0,3 %
Mg0	0,1 %
P_20_5	0,1 %
Mn0	0,02 %
S	0,1 %
Ignition loss:	0,56 %
TOTAL:	100,0 %

Specific weight		4,41 - 4,04
Humidity (average)		0,32 - 0,40
Porosity (average)		11,2 -19,5
Limpiness	$>$ 60	47 % - 55 %
	20 - 60	29 % - 25 %
	6 - 20	15 %
	$<$6	7 % - 5 %

On the basis of the results of the meteorological research, mining activity can be carried out during seven months of the year. On the basis of the data of the iron ore treasure already revealed it can be stated that the mine is able to secure sufficient ore for the production of 11-13 million tons of crude iron every year during one hundred years of exploration. The possibilities of the utilization of this world-ranking ore treasure can be as follows:

A.) The opening of the ore mine and the export of the ore to the neighbouring countries with advanced crude iron production. The organization of transport system is necessary for the export of the great quantities and this demand extraordinary great capital invest because of the geographical conditions of the given territory.

B.) The establishment of a complex integrated metallurgy works on the basis of the coal mines in Shabashak region to be opened and that of the ore treasure near the ore mine. (By the establishment of coal coking works, blast-furnace, steel producing converters, continuous casting foundries, rolling mills.) Its economical magnitude is some million tons/year, that is why the integrated works should produce for exports. Therefore the realization demand significant additional investment and the capital demand of the realization is enormous in itself, so the realization of this variation demand the use of great quantities of foreign capital.

C.) The realization of the production of metallic sponge iron by the establishment of a direc-production metallurgical works in the neighbourhood of the ore-mine (production of a modest quantity of ore). There are two fields for use of the product:

On the one hand it would serve as raw material for the mini steel plant suggested by the team in the territory of Afghanistan, during the period of its future expansion and of the significant decrease of the steel scrap stocks. On the other hand it would mean significant export goods for the Afghan foreign trade. The organization of the transport system is necessary in this case also. The demand for investment capital of this version is also important, but the team considers its realization also real in the prospect of 10-15 years and it can be the basis of the future realization of the version "B".

For the foundation of the version "C" the clarification of many questions is necessary (the performance of the pilot plant, experimental production) so that answer could be given for the technological-economical questions of the localization.

2.5.3. Availability of energy resources

The metallurgical industry has significant energy demand that is why its present production and future possibilities should be examined.

A. Electric energy supply

During the past 10 years' development of Afghanistan the production and the use of the electric power developed without diminishing. (See Appendix 7.). The problems of the electric power supply of the past 1 - 2 years were due to the failures of energy network. Nearly 80 % of the electric power is secured by water power stations with a capacity of 20 - 70 MW and low operational costs, a quantity of about 20 % is secured by steam power stations. The electric power-producing capacity of Afghanistan is 280 - 320 MW. This volume is relatively modest and for the time being more new consumption demand (e.g. mini steel plant) can be satisfied only in very few territories. According to the oral information gained in the Ministry of Energy the satisfaction of the 25 - 30 MW energy damand of the mini steel plant is possible only at the following territories:

- Pul-khumuri northern industrial area (150 kms from Kabul)
- Kunduz northern industrial area (220 kms from Kabul)
- Mazare Sherif northern industrial area (270 kms from Kabul)
- Kandahar southern part of the country (450 kms from Kabul)

The import electric energy from the Soviet Union also figures in the development of the energy base. Its power supply is 250 - 300 MW and the wire will be led to the integrated copper works near Kabul - being in the first phase of its development - on 220 KV strain stress-level. Its planned building and implementation is due by 1367-68 (duration 5 - 6 years). In this case there will be opportunities for limited supply of electric power necessary for the establishment of the mini steel plant in Kabul or in its area.

B. Natural gas and mineral oil

The quarry of natural gas of Afghanistan can be found in the area of Shiberghan (Jozjan territory, northern borderland) and the natural gas stocks are estimated to be bigger than 100.000 million m^3.

This reserve is enough for 30-35 years presuming the present level of exploitation (2800 million m^3/year).
A smaller quantity of mineral oil can be found in the area of Kohi Agnot and Aghdarya, the reserves revealed are estimated to amount to 11 - 13 million tons.

C. Coal

The coal production and first of all the coal reserves of the country are significant. The coal production level was between 125 and 220 thousand tons during the past 6 years.
The coal reserves of the three most important workir, coal mines (Isputha, Karkar, Dare Suf) are estimated to be 90 million tons. It must be completed by the Shabashaki coal quarry which is considered to be the biggest in Afghanistan (2400 m thick).
The Creusot-Loir firm pointed out that the latter is suitable for the production of foundry coke, though - for the showing of this - some semi-plant experiments are necessary.
The coal treasure of the country is sufficient for more than 300 years even with an exploitation three times higher than now.
The quality level of the coal treasure is shown by the following analytical data:

Characteristics	Quarries of the coal treasure			
	Ispustha	Karkar	Dare-Suf	Shabashak
Volatile matter %	25,8	36,8	28,7	40,9
Fixed carbon %	51,9	46,1	51,7	53,5
Ashes %	22,3	17,5	19,6	5,6
Calorific value MJ/kg	25,0	27,4	27,0	28,4
Estimated reserves 10^6t	2,0	12,0	75,0	approx. 120,0

2.5.4. Availability of labour force

The manpower supply is one of the most important conditions in the metallurgy, as on one hand successful production can not be carried out without the theoretical and practical knowledge of the processes, on the other hand metallurgical work means a higher than the average burden for those people performing the work (damage caused by the heat and the noise, nerve burden bigger than the average, etc.) that is why great attention should be paid to the education and to the financial appreciation of those working in the metallurgical industry and relevant measures should be taken before the starting production.

The establishment of the mini steel plant does not mean mass openings, so that can be secured without difficultues on the basis of the manpower balance of the country (manpower reserve is 200.000 persons/year in the average of five years). The following measures seem to be necessary for the preparation of the manpower:

- 3-5 persons should be trained in a country with developed metallurgy for obtaining metallurgical engineer degree (duration of training: 6 years)
- At least one year post-graduate study should be secured for the graduated metallurgical engineers so that they could obtain practical experience abroad possibly in a mini steel plant.

- In order to secure the training of the metallurgical skilled workers of the key posts, 5-10 persons should by yearly trained in the vocational schools of countries with developed metallurgy (duration of training: 3-4 years).

  The first 2-3 classes of the skilled workers would need the opportunity to work 1-2 years in a mini steel plant abroad as skilled workers before starting their work in their workshop in Afghanistan.

- After the star-up of plant the nation-wide education and vocational training of metallurgical skilled workers should be solved with the help of the experts studied abroad.

2.6. The situation and the future possibilities of the present works connected with the mini steel plant

Two mini rolling mills (Ahmed Re Rolling Mill and Century Re Rolling Mill) worked under private management in the Pul-i-Charki area during the past years: 90 mm thick ingot was the raw material of the above two rolling mills; 5, 6, 8, 10 mm (in diameter) round steel or 20 x 3-5 mm flat or angle bar were the rolled products. The total capacity of the two rolling mills is estimated to 4-5 thousand tons.
The two rolling mills have not been working for about 4 years, because the owners left the country and the building and the roofing of one of them (Ahmed Re R. M.) has collapsed. The works are in bad state, this fact is well illustrated by the conditions of Appendix 8.

Besides the above two rolling mills the establishment of a third rolling mill of the same size has been started also in the Pul-i-Charki industrial area. The owners: A. Ianyatulla and F. Rahman have built a 15 x 60 = 900 m^3 ground space hall in an enclosed piece of ground of about 3500 m^3 and they bought a second hand rolling mill from Pakistan, the half of which has already arrived and is stored in the hall. The second part is not yet delivered. The transformer house is also ready in which an oil-cooling transformer with a capacity of 750 kVA and of 15.000/400 transmission was placed (not yet connected) which is practically the same as the one in the Ahmed Re Rolling Mill.

The Afghan Planning Board sees the opportunity that on practical purposes the three nearby rolling mills would be joined under common management, presumably under the management of the owners: Mr. Ianyatulla and Mr. F. Rahman. Under the common supervision the rolling mills can be put into work again. The costs of the reconstruction are estimated as 172.000,- USD + 20 million Afs by the UNDP experts dealing with the reconstruction of the rilling mills. We agree with the implementation of the reconstruction and consider it as a forthcoming fact regarding the mini steel plant. It means that by the time of the implementation of the mini steel plant 8-9 thousand tons of 90 mm ingot are to be calculated as the material demand of the three working rolling mills.

2.7. General conclusions in connection with the mini steel plant concerning its magnitude, determination of the limits statable on the basis of the background information

The idea of the establishment of the mini steel plant comes from the interest of the national economy and it has reality, because there is steel scrap and significant steel demand, in the country, so the capacity of the plant is the main question.

The third Chapter shows the market side in detail from which it comes clear that - taking into consideration the development of the next years - the capacity to be planned can even exceed 100.000 tons/year. This is fortified by the O.S. prepared in the same subject in 1980.

The potential magnitude and the territorial localization of the scrap serving as its raw material are the fundamental limits of the capacity of the mini steel plant.

Theoretically on the basis of the potential stocks (Chapter 2.5.1.) 55-80 thousand tons/year capacity is the real size of the mini steel plant. The geographical localization of the origin and of the present stores of the steel scrap shows that the waste concentrates in three areas:

<u>Kabul and its neighbouring area:</u>

35 % of the national stocks = 245-280 thousand tons

<u>Northern industrial area:</u>

50 % of the national stocks = 350-400 thousand tons

<u>Southern agricultural industrial area:</u>

15 % of the national stocks = 105-120 thousand tons

The possible capacity of the mini steel plant based on three basis can be calculated by the next formula taking into consideration the 20 year life-time of the plant and the potential waste developing during the next years.

$$K = \frac{(Q + Q \times u \times n) - n \times o}{n}$$

K = capacity

Q = present waste stock

u = value of yearly development in percentage of waste

n = number of years

o = scrap demand of foundries

<u>Capacity in Kabul$_{min.}$</u>

$$\frac{(245+245x0,03x20) -20x1,2}{20} = \frac{245+147-24}{20} = \underline{18,4 \text{ Kt/year}}$$

<u>Capacity in Kabul$_{max.}$</u>

$$\frac{(280+280x0,05x20) -20x2,5}{20} = \frac{280+280-50}{20} = \underline{25,5 \text{ Kt/year}}$$

So the optimal capacity of the mini steel plant to be established in Kabul is 22 Kt/year because of the limits of the scrap base. If the scrap (cca. 8 Kt/year) of the southern part of the country will be processed in the steel works to be planned in the region of Kabul, as it does not worth establishing an independent steel processing plant on the basis of the southern part of the country, the capacity of the Kabul steel plant can be determined in about 20-30 Kt/year.

It is advisable to establish another mini steel plant in the northern industrial and mining area of the country, and in this territory it should also be taken into consideration that the processing of the Haigak ore treasure can be started in 15 years after the opening of mini steel plant and the possibilities of developing the capacity of the mini steel plant will be given at the same time with the processing of the ore treasure.

Taking into consideration the above, the capacity limit proposed for the northern part of the country is as follows:

$$Q_{min.} = \frac{3501350x0,03x15}{15} = \frac{350+157,5}{15} = \underline{33,8\ Kt/year}$$

$$Q_{max.} = \frac{400+400x0,05x15}{15} = \frac{400+300}{15} = \underline{46,6\ Kt/year}$$

So, on the basis of the scrap base the capacity of the northern mini steel plant can be chosen between 30 and 50 Kt/year. The mini steel plant conception to be implemented on the listed two basis keeps the costs of transportation also on optimal level concerning the transportation of both the scrap and the finished products.

The possibilities for drawing the necessary electric energy mean the other fundamental limit of the size of the mini steel plant.

Electric power necessary for the mini steel plant is for the time being missing in the region of Kabul, but as a result of the information gained from different sources it can be pointed out that in the period of the implementation of the electric transmission-line to be built to the integrated

copper works (after 5 years) the electric capacity available from the network will be 5-10 MW.
One 10 ton or two 5 ton furnaces can work with this electric power which means 15-25 Kt/year steel producing capacity.

In the northern industrial area there are opportunities for electric power drawing in the following towns:

Pul-i-khomri
Kunduz
Mazare Sharif.

The electric power to be drawn in these territories can be estimated to 18-27 MW in the period of the implementation of the mini steel plant that gives the opportunity for operating a furnace of 15 or 25 tons with a steel producing capacity of 50-70 Kt/year. So the limits caused by the possibilities of electric power drawing are nearly the same as that of the scrap base, they do not modify basically their characteristics, but they stimulate the selection of the smaller production capacity in Kabul, and that of the bigger one in the northern industrial area.

The magnitude of the mini steel plant is influenced also by the investment costs, as in the present situation of the country the minimalization of the costs is of utmost importance. The magnitude is even rather influenced by the level of the mechanization-automatization and the economical expectations to be reached that is why - due to lack of numerical data - this factor is not handled as a capacity limiting factor.

2.8. Rentability aims of the mini steel plant

The mini steel plant will belong to the category of either state-owned or state-owned-mixed firms. According to the current economic regulations the next tax system must be considered for the firms.:

turnover tax 2 %
profit tax 20 %
contribution to communal and
city development 1 %

Besides bearing the burdens of the above listed tax system the result of the year after the runnin-in period should reach 20 % (proportionate to value) and in this case the establishment of the mini steel plant will be a contribution to the increase of profitability and the foreign exchange balance of the national economy, to the proportional development of the national economy.

2.9. Planning and implementation costs of the mini steel plant

The performance of the following preparatory works is necessary for the implementation after the relevant decision is taken on national economy level:

- soil mechanical examinations on the territories marked out for development, their analysis; drawing conclusions for the foundation, building structure and public utilities to be used,

. preparation of a feasibility study (investment programe) the elaboration of the technologies chosen on technical plan-level,

. collection of offers for the machinery to be bought and their use for the foundation of the feasibility study,

The estimated costs of the listed tasks are included in Appendix 9, the overall total sum of which is $0,566 \times 10^6$ USD, e.g. $28,3 \times 10^6$ Afs.

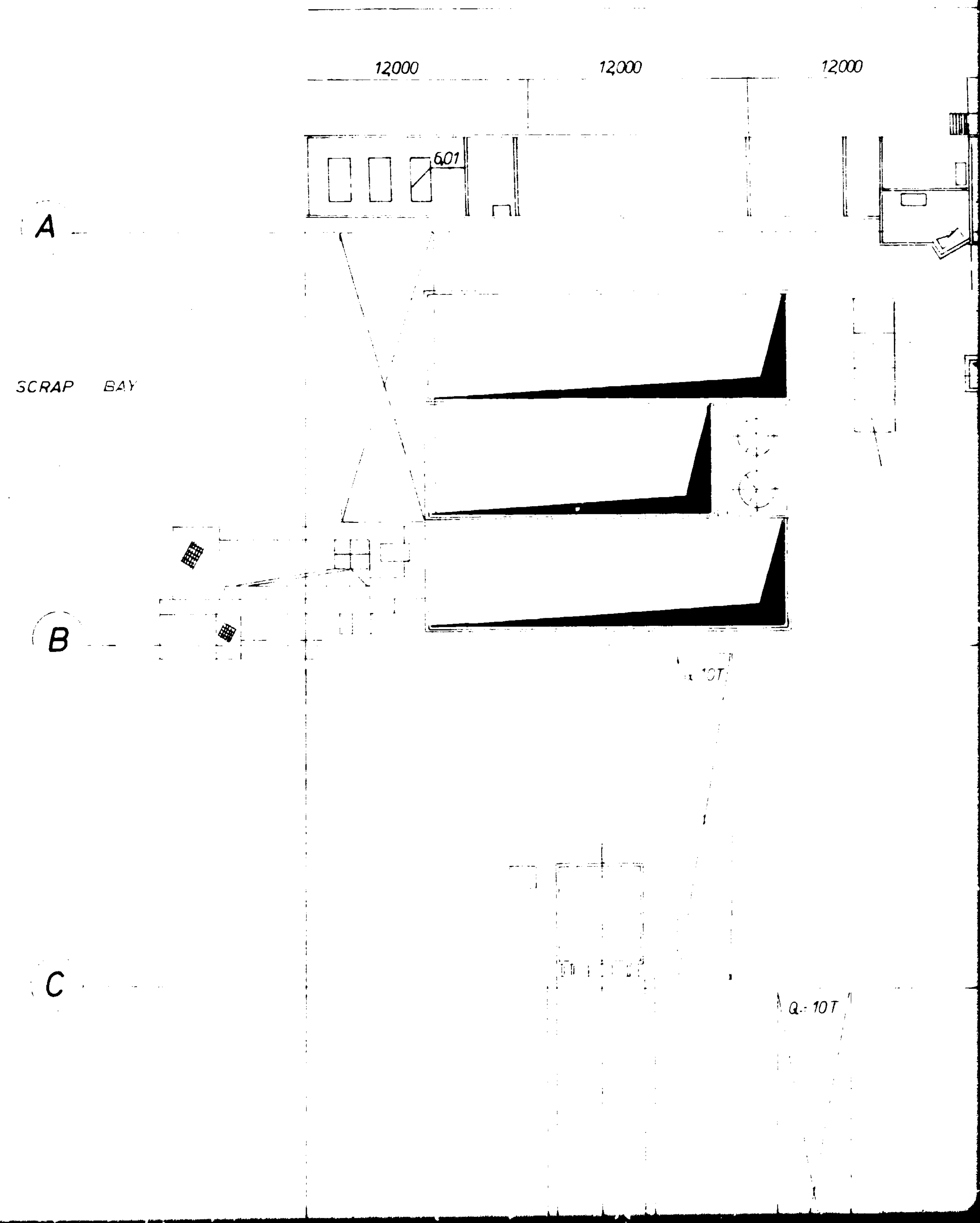
3. MARKET AND PLANT CAPACITY

The exploration of the market possibilities has definite significance from the point of view of the implementation of the investment. Therefore the clarification of this question is of vital importance. All the available studies, information received from the experts of the economic policy-making authorities were used for the analysis of the market situation, all the information were controlled by the team with the help of the statistical data which were asked to be sent in.
The data or rather the tendencies drawn from them were compared with the trend of the steel industry in the developing or rather in the less-developed countries, so the conclusions in the following may be considered to be well-established in spite of the fact that personal experience was collected only in Kabul, e.g. there was no opportunity to get country-wide experience (just like the writers of the O.S.).

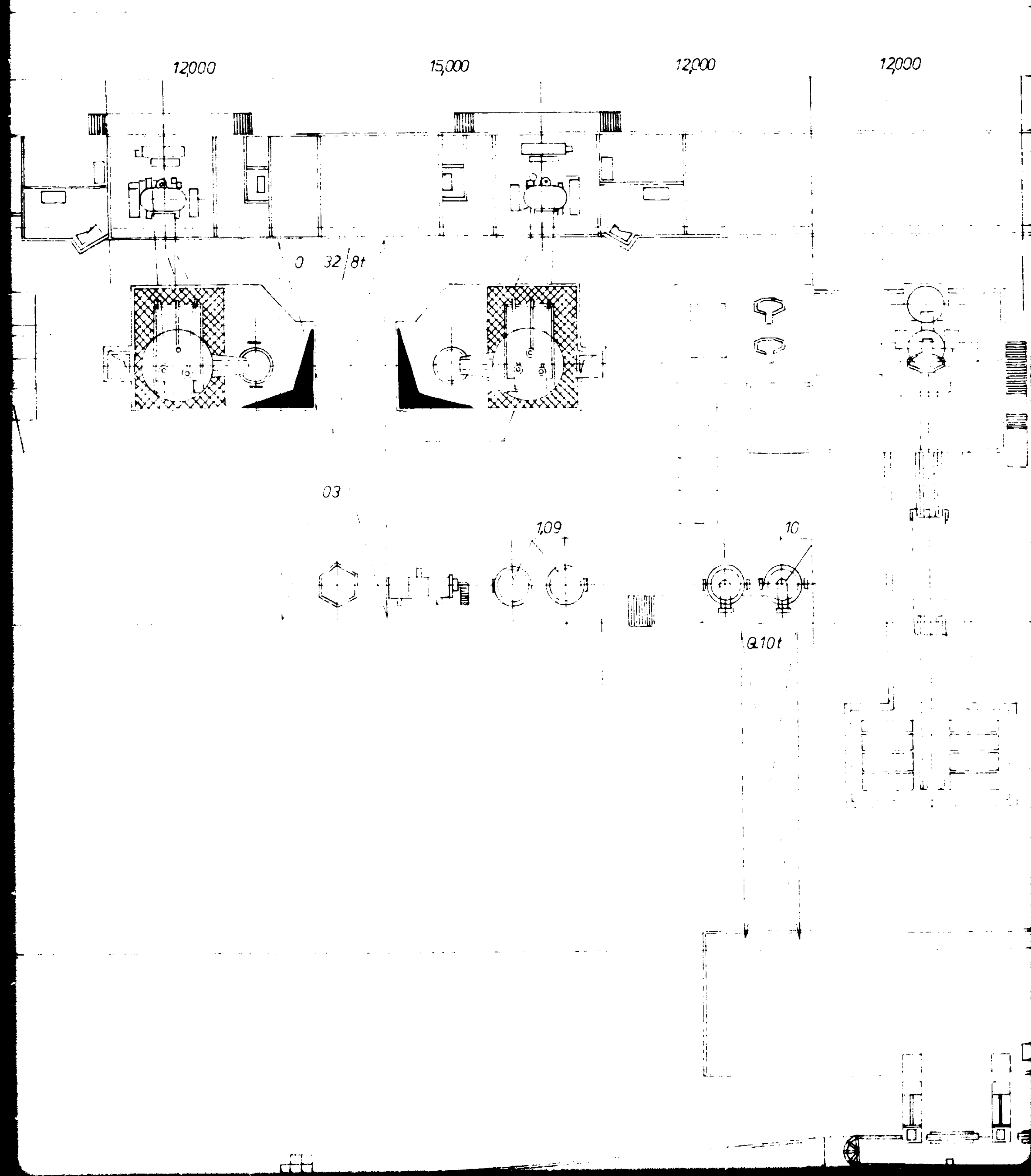
Analysing the market possibilities the team realized three fixed basic aspects that determine at the same time the limits of the analysis:

- in optimal case the first phase of the mini steel plant can start its production in 1367-68 and can run up to its nominal capacity by 1370-71,
- the capacity of the mini steel plant to be established can aim only the partical satisfaction of the national demand. Due to the high development of the steel industries in the neighbouring countries and mainly because of the limiting factor of the transport possibilities its production for export is not justified,

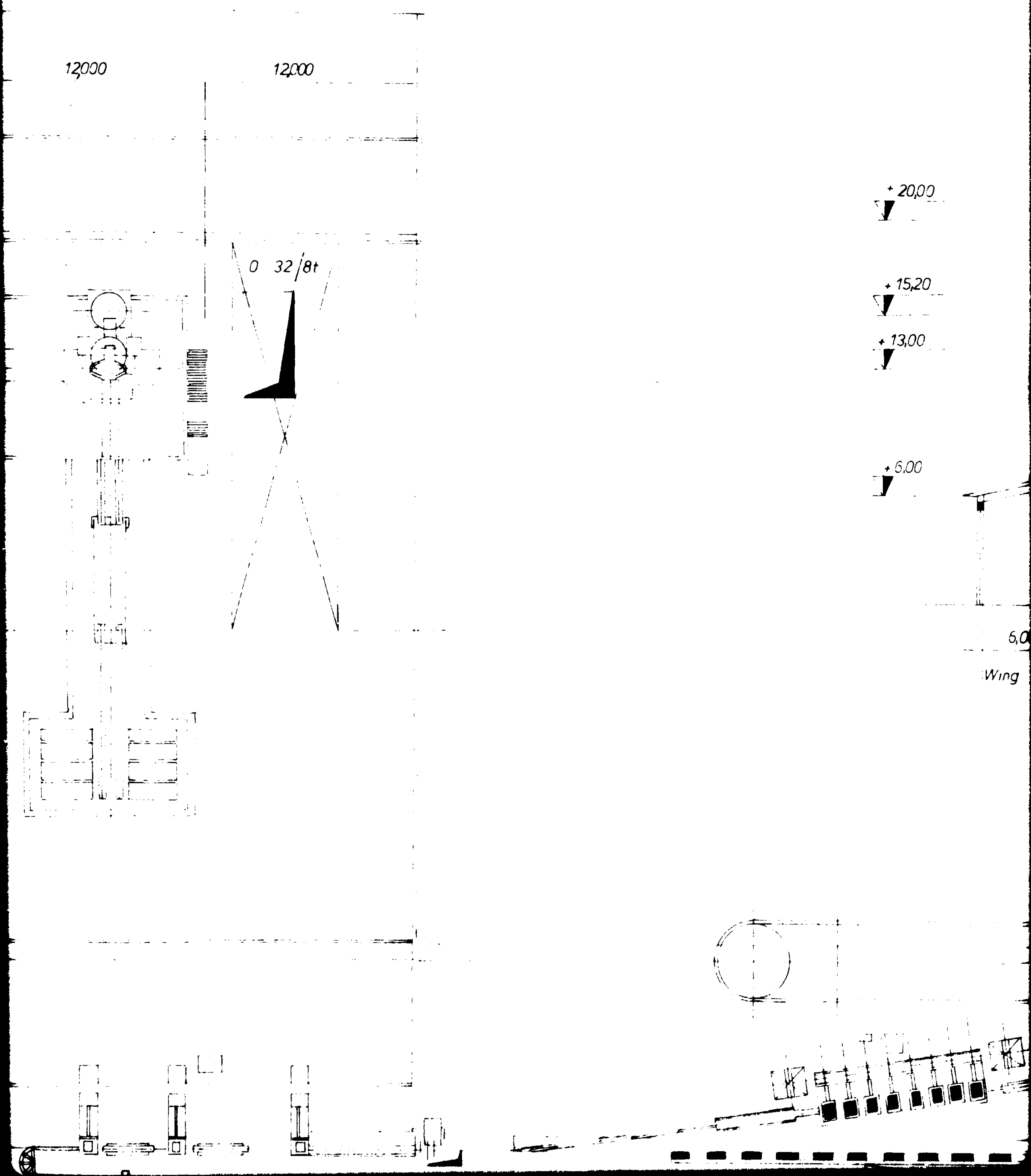
SECTION 1



SECTION 2



SECTION 3



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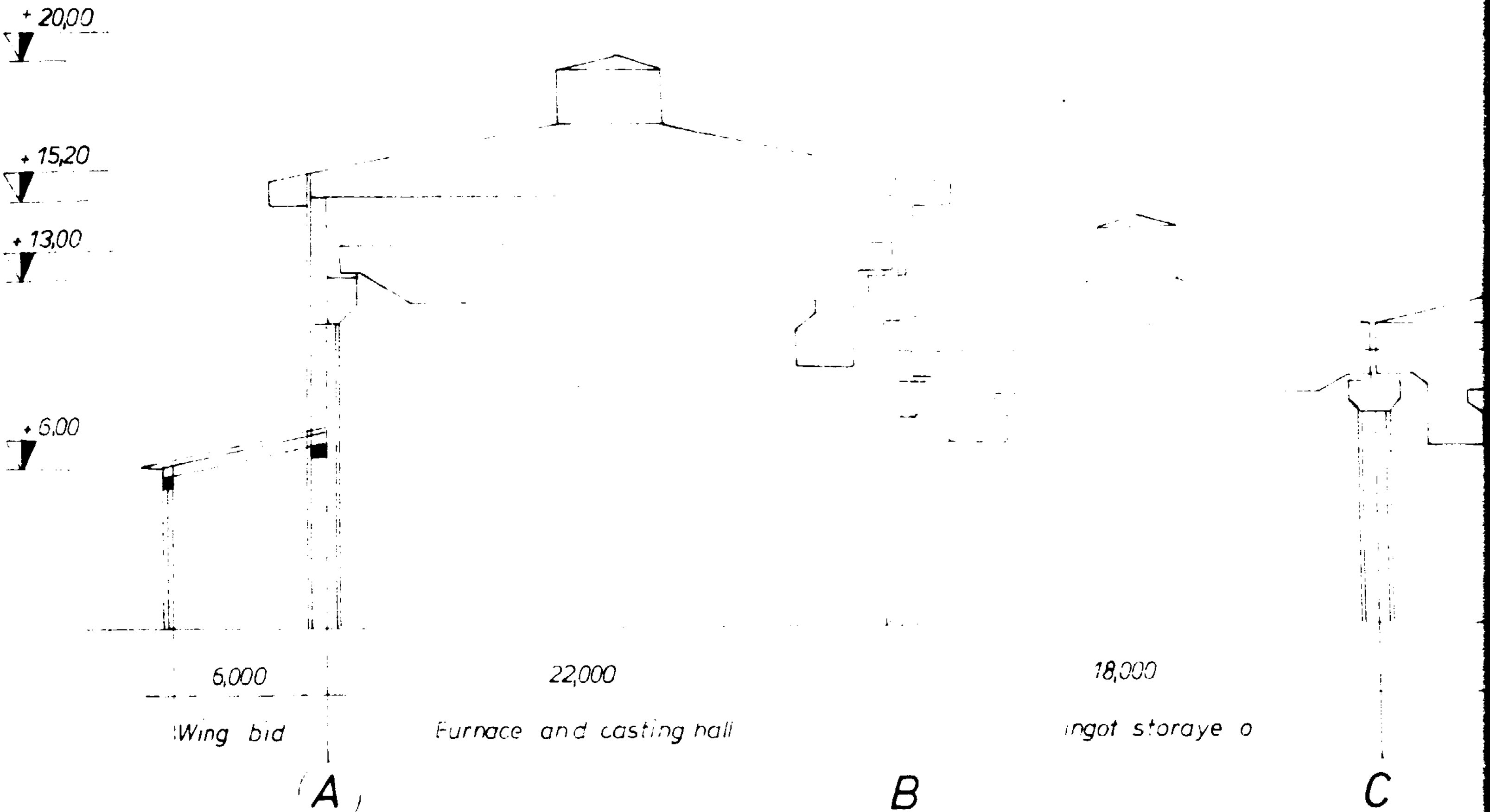
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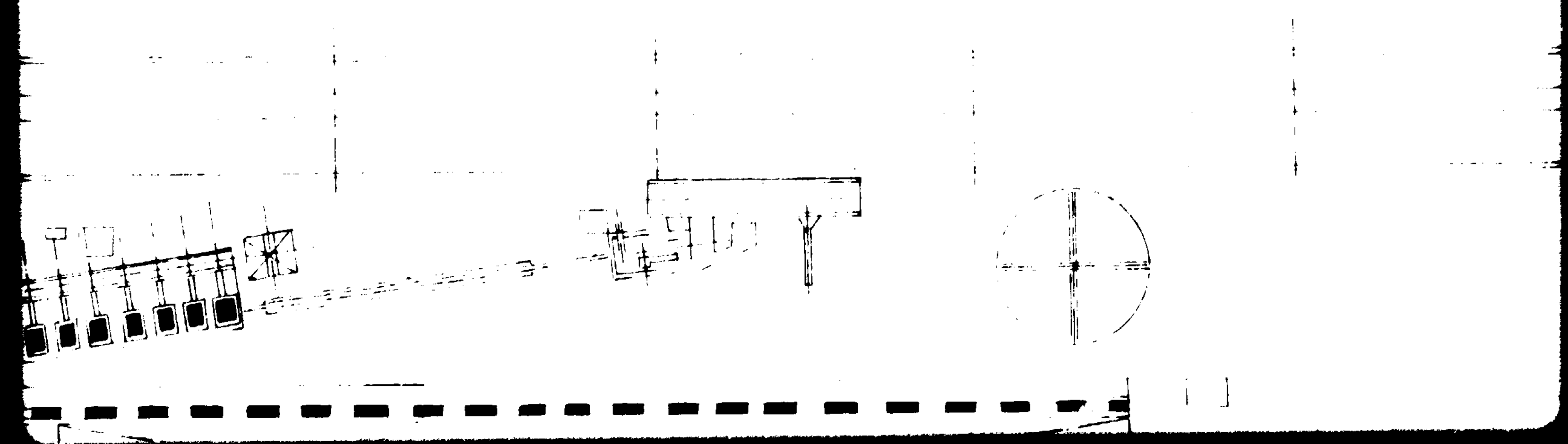
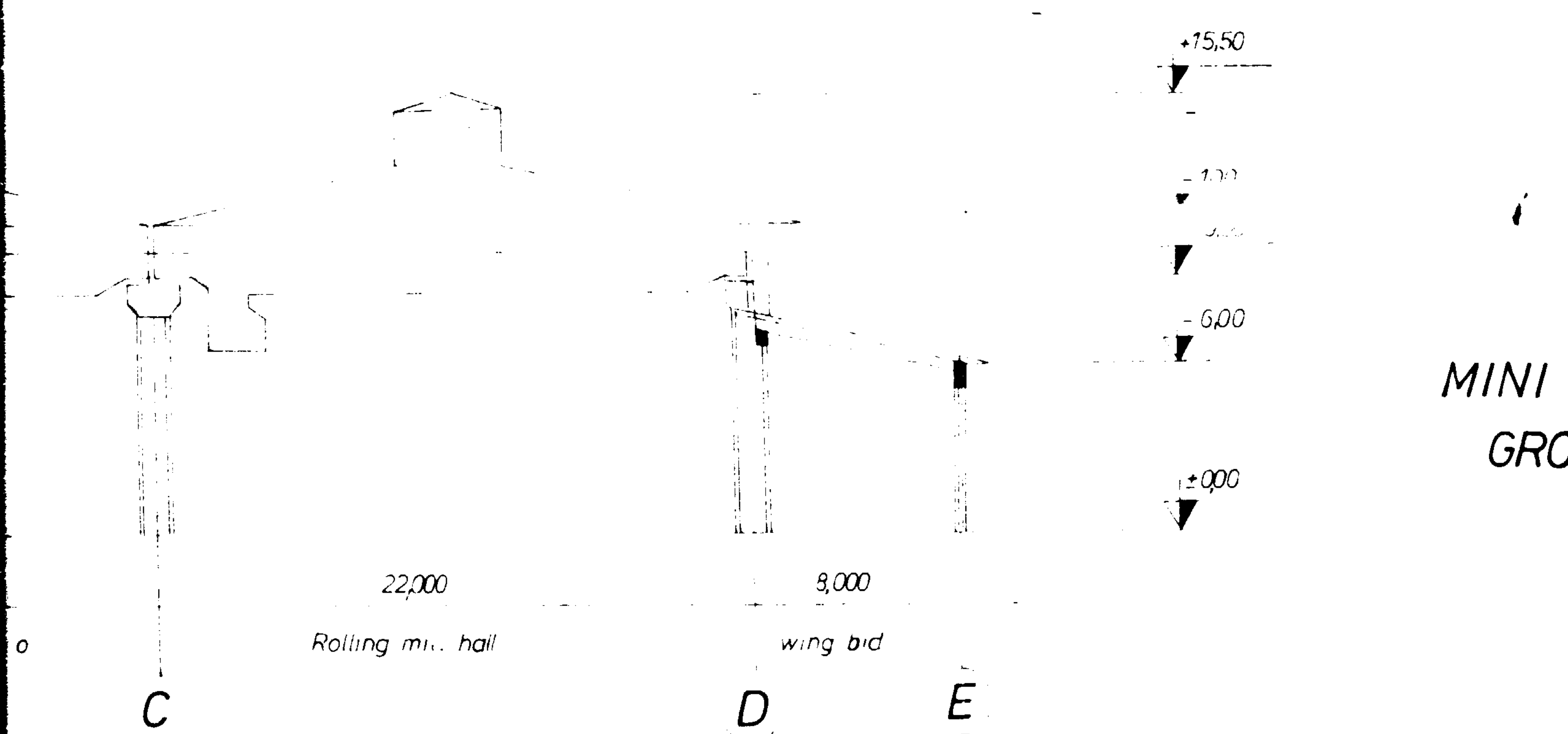
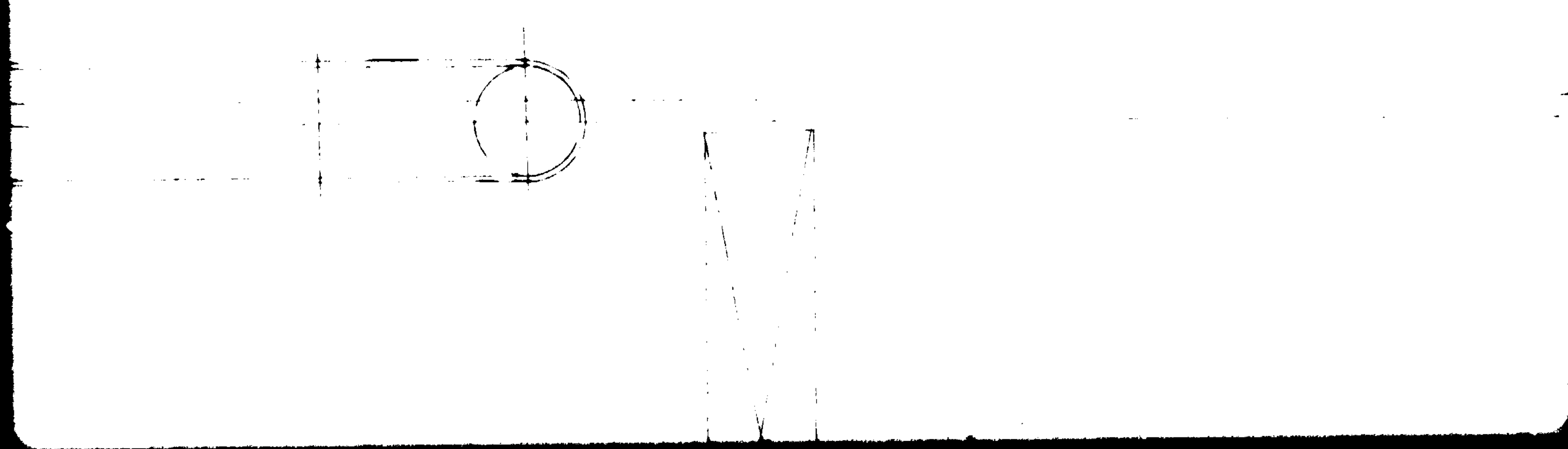


SECTION 5





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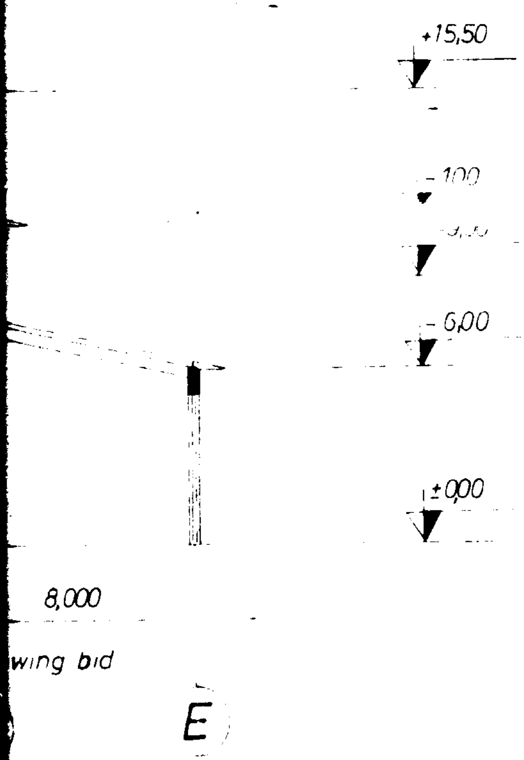
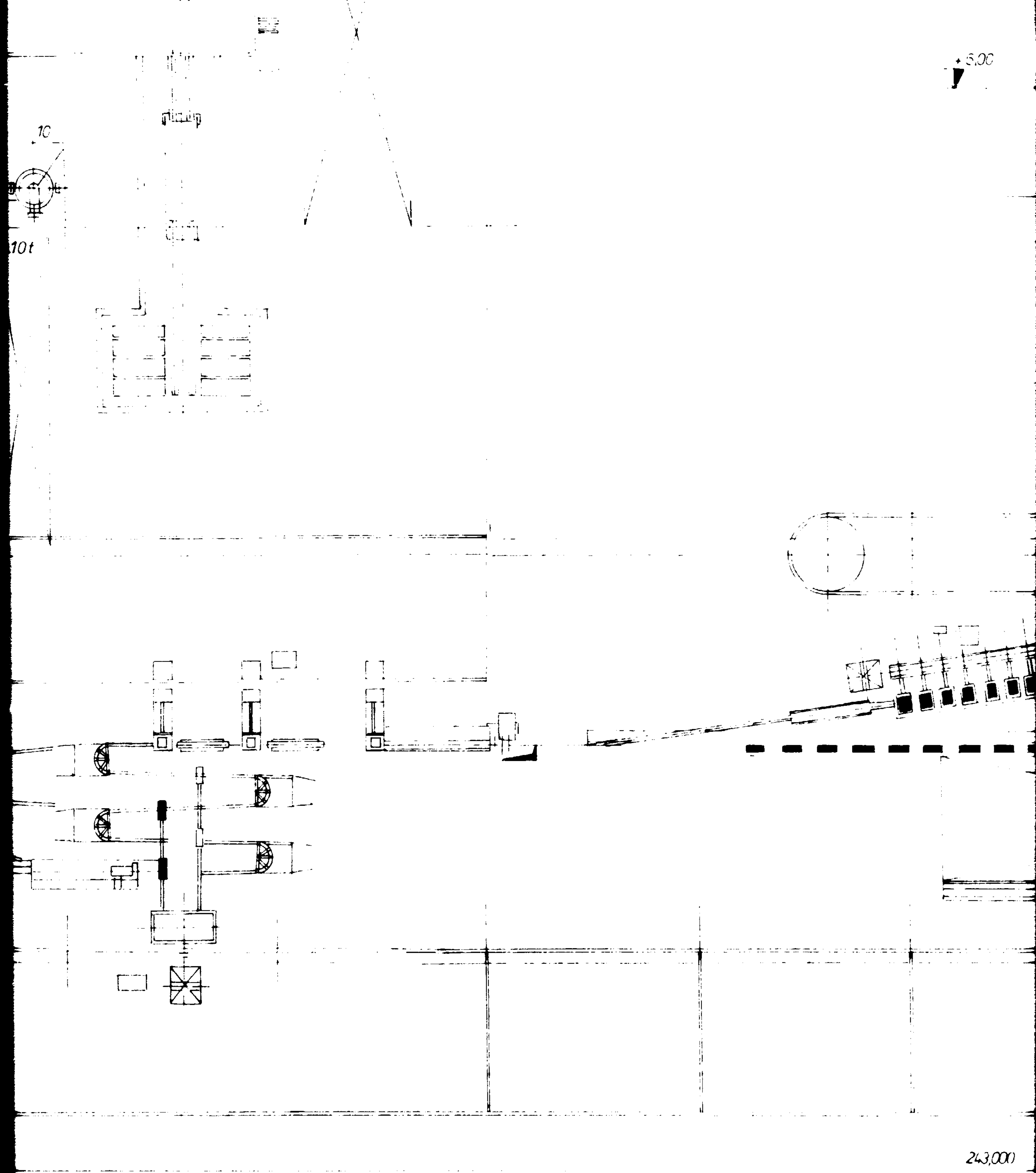


MINI STEEL PLANT
GROUND PLAN

SECTION 7

SECTION 8



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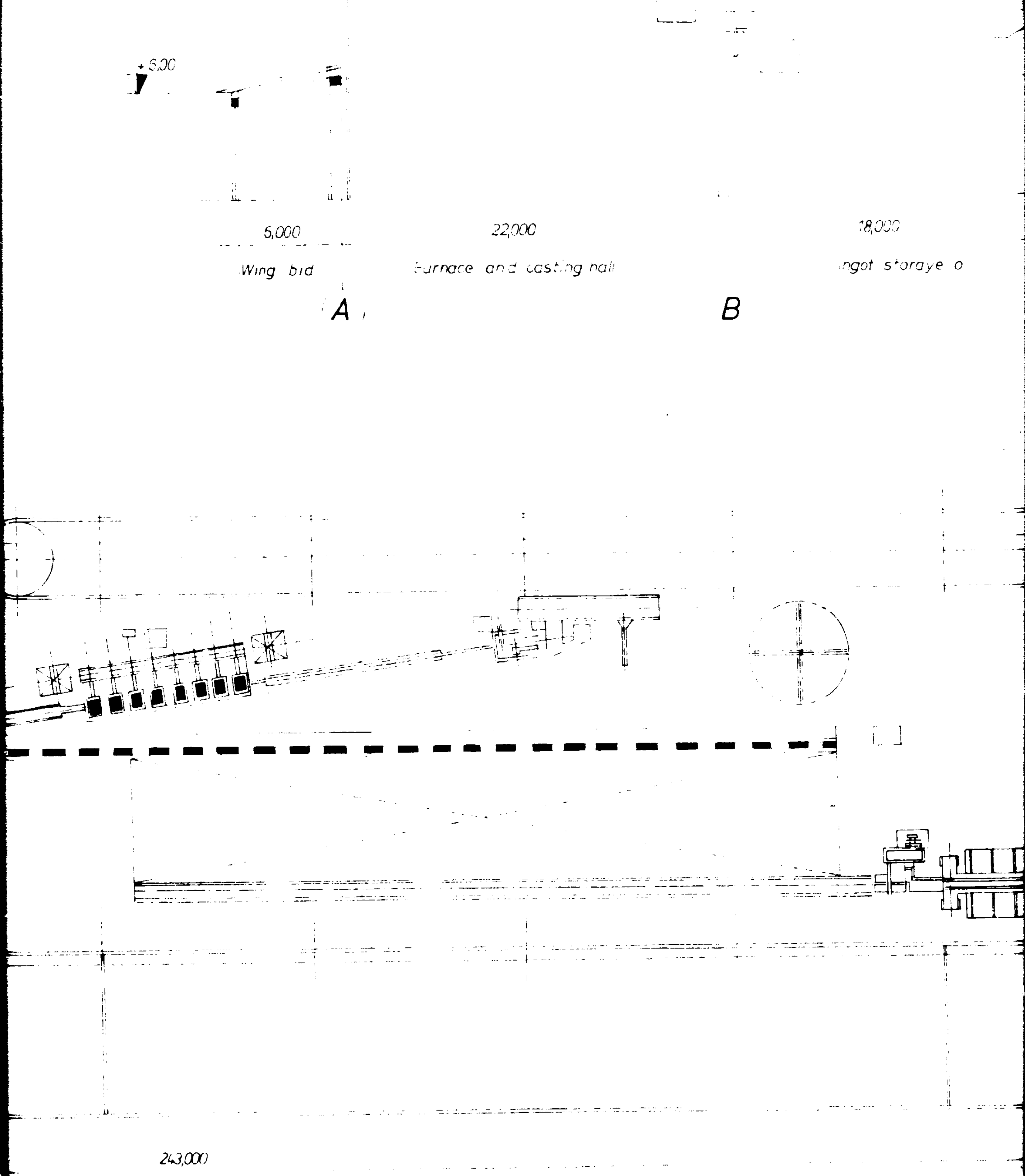

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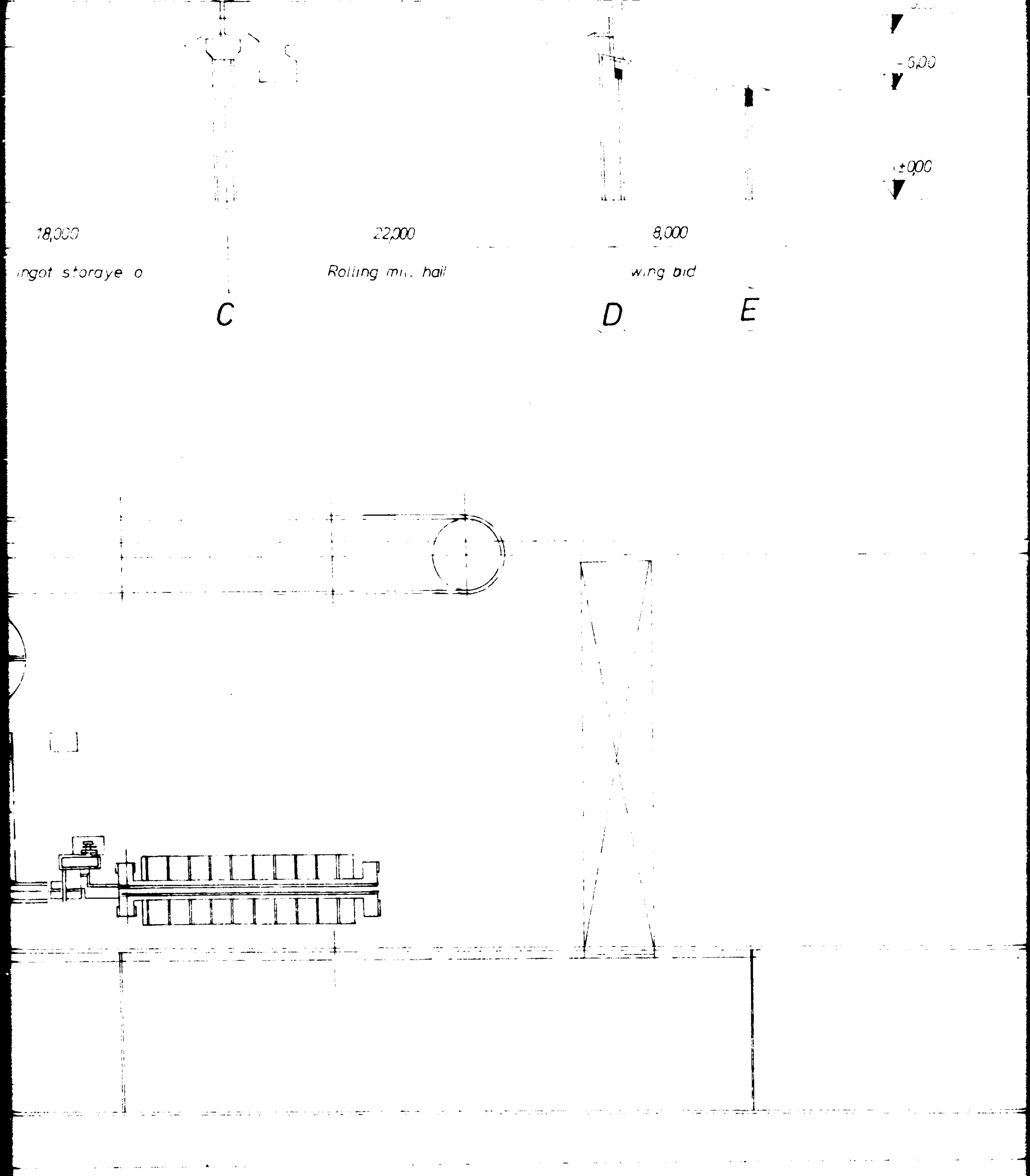
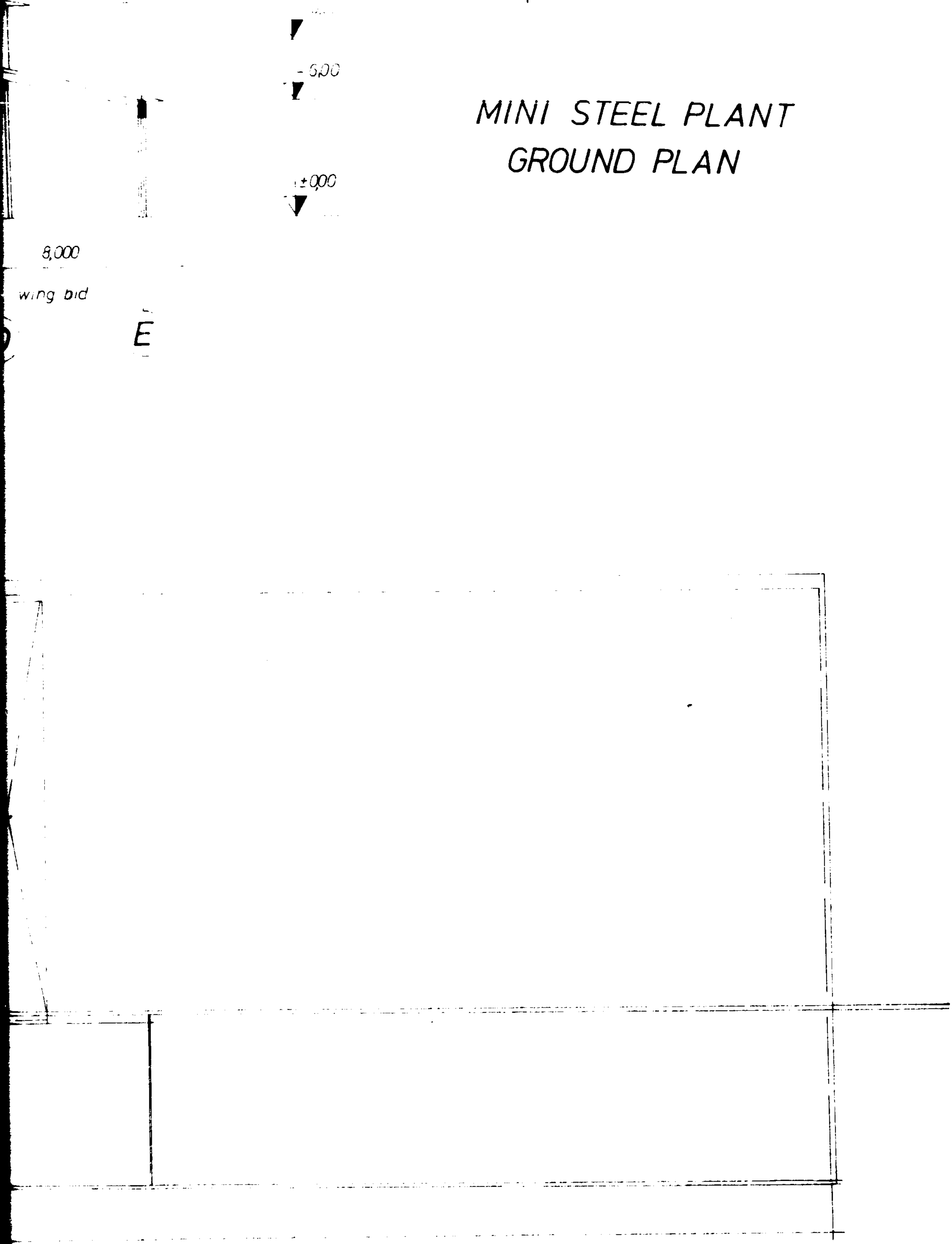


SECTION 11



SECTION 12

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. the economic trend of the past five years is not sufficient for the prognostization of the future, it must be completed with the analysis of the development of the former years and with the consequences coming from theories concerning industrial development policy.

3.1. Determination of the market demand

3.1.1. The analysis of the tendency in steel imports

As there are not steel metallurgical plants in Afghanistan, the tendency of the steel consumption of the last period can be concluded from the tendency of the steel imports. The tendency of the steel imports is comprehensively showed in Appendix 10.:

. the yearly growth of the steel imports for general production purposes was 6,28 % during the 13 years before 1358 (1979). The deviation from this average was over $\pm$ 8 % in some years,

. the average growth rate of the four years after 1358 (1979) was 29,5 %,

. the average growth rate is 9,8 % per year during the examined 17 years. Analysing the imports, its structure must also be examined. The examination of the structure is showed in Appendix 11. The main conclusions to be drawn from this Appendix are as follows:

a) The quantity of the rolled section steel (angle, bar, steel channel, I-beam, etc.) developed from the value of $0,2 \times 10^3$ t/year to $8,1 \times 10^3$ t/year during the 17 years examined.

b) The quantity of the bars and wires developed from $3,3 \times 10^3$ t/year to $18,7 \times 10^3$ t/year.

c) The quantity of pipe developed from $0,2 \times 10^3$ t/year to $0,8 \times 10^3$ t/year.

During these years significant fluctuation is showed in the quantity of the groups of products listed above. In some years certain groups of products were missing from the imports (e.g. plate-band).

Besides the above mentioned groups of products the rate of the other category increased enorously in some cases (e.g. the other category reached 80-56 % in 1355-56). That is why its structure must be examined by all means. It can be stated that the spare-parts import of the disassembled cars was significant during these years and the repercussions of the extensive imports of that years can still be experienced in the second-hand spare--parts market of the bazaar in Kabul, as about 50.000 kgs of spare-parts are stocked in the 15.000 m^2 territory of Payonchouki and Kothesonga, 50-55 % of which is already representing steel scrap. The characteristic figures of the import tendency are shown in Appendix 12 - in terms of the changes in the prices. The average price of certain groups of products can be found out easily and it also can be stated that as a consequence of the industrial development of the country the burdens of the steel imports are gradually diminishing, the decrease of which means a reasonable economic objective for laying the foundations of the national metallurgy.

3.1.2. Analysis of the tendency of domestic demand

As there is no local iron metallurgical producing base fundamentally the tendency of importation shows the tendency of domestic consumption demand for iron metallurgical and rolled products with the comment that the tendency of demand is kept back because of the imports limitations to a certain extent and because of the transportation limits caused by the geographical and road conditions in Afghanistan.

It is to be stated on the basis of the analysis of the import structure, of the oral information received from the experts and leaders in the industry and building industry and on the basis of the few questionnaires having arrived back that the building industry has an important role in the tendency of the demand for iron metallurgical rolled products. Besides the building industry the demand of the Angalak Metal Works and the Pul-iCharki rolling mills - starting the operation again after reconstruction - are remarkable.
The tendency of the demand of agriculture, of other - mostly small and handicraft-size - state-owned and private industrial units cannot be estimated as no reliable information is available concerning the tendency of their development. Their rolled products consumption means 10 % of the whole consumption, that is why they do not significantly influence the conclusions to be drawn on the tendency of demand.

The present steel demand is shown by the following data (the average of the years 1360-61)

Group of products	Building industry	Jangalak	Other	Total
Reinforcing bars	3,2	-	-	3,2
Round bars	17,5	0,7	0,2	18,4
Sections	7,0	0,6	0,3	7,9
Tubes	0,2	-	0,1	0,3
Profiles	1,6	-	0,1	0,7
Plates	2,3	0,6	0,1	3,9
Angles	0,6	-	0,1	0,7
Miscellaneous	0,5	0,1	0,1	0,7
T O T A L	32,9	2,0	1,9	36,8

The evaluation of the above data shows that the steel consumption per head is very low.

$$\text{Steel consumption per head} = \frac{36{,}8 \times 10^3 \text{ kg}}{16{,}36 \times 16 \times 10^6 \text{ pers.}} = 2{,}25 \text{ kg/person}$$

For the evaluation of the result see some characteristic data and some data from the neighbouring countries in 1976.

England: 348 kg/person
USA: 670 kg/person
Soviet Union: 566 kg/person
India: 13 kg/person
Iran: 147 kg/person
Pakistan: 7 kg/person
Japan: 535 kg/person

These data show that industrialization is the characteristic tendency in Afghanistan during the next period, and this would result in the significant growth of steel-demand.

3.1.3. Territorial analysis of the market demand

In the course of evaluation of the market great attention should be paid to the tendency of the territorial demand expecially in a country where the geography and the population is rather distributed.

Afghanistan can be divoded into four regions on the basis of the localization of the population and industry.

1. Kabul industrial area (Kabul Kapisa, Parvan, Wordek, Logar, Nangahar, Loghman, Kumara)
   Territory: $54,8 \times 10^3$ km^2 (8,4 % of the territory of Afghanistan)
   Population: $4,2 \times 10^6$ persons (30,5 % of the population of Afghanistan)
   Density of population: 76,6 persons/km^2
   Number of significant towns: 8 13,9 %)

2. Northern industrial area (Taghar, Baghlan, Kunduz, Samadham, Balkh, Jozjan, Forgab, Bamgan, Badaskhshan)
   Territory: 178×10^3 km^2 (27,3 % of the territory of Afghanistan)
   Population: $4,6 \times 10^6$ persons (33,5 % of the population of Afghanistan)
   Density of population: 25,5 persons/km^2
   Number of significant towns: 26 (44,8 %)

3. Middle-Afghanistan (Ghazi, Paktia, Bagghis, Zabul, Uruzgon, Ghor)

Territory: 159,5x10^3 persons (19,6 % of the population of Afghanistan)

Population: 2,7x10^6 persons (19,6 % of the population of Afghanistan)

Density of population: 16,8 persons/km^2

Number of significant towns: 10 (17,2 %)

4. Southwest Afghanistan (Herat, Forah, Nimróz, Helmend, Kandahar)

Territory: 259,9x10^3 km^2 (39,8 % of the territory of Afghanistan)

Population: 2,3x10^6 persons (16,7 % of the population of Afghanistan)

Density of population: 9,1 person/km^2

Number of significant towns: 14 (24,1 %

The above, to a certain extent arbitrary, division means regions significantly differing from each other, which is suitable for determining the market demands. The distribution of the market demand on the basis of territorial principle depends on the population living in the given territory, on the density of population, on the number of urban settlements and on the decisions concerning industrial development.

The previous data are given, the decisions of the policy making sphere concerning industrial development - mostly received during the consultation in the planning committee - are taken into consideration with a factory of 1,35 for the Kabul area and with a factory of 1,1 for the northern territory by the next calculation:

Territory	Index population x density of population x no. of towns x factory		Demand per index	Demand of the territory 10^3 t	Portion %
Kabul indust. area	4,2x76,6x8x1,35 =	3474,6	0,04857	16,9	45,9
Northern ind. area	4,6x25,5x26x1.1 =	3354,8	0,04857	16,3	44,3
Middle Afghanistan	2,7x16,8x10x1 =	453,6	0,04857	2,2	6,0
Sothwest Afghanistan	2,3x9,1x14x1 =	293,0	0,04857	1,4	3,8
AFGHANISTAN		7576,0	0,04857	36,8	100,0

The above calculation shows well that 90 % of the demand on rolled iron metallurgical products appears in the Kabul and in the Northern Industrial Area, so the localization of the future mini steel plant should be determined within these limits.

3.1.4. Determination of the market demand of the next decade

The demand on rolled products in the next decade can be estimated on the basis of the prognostic made by the important consumers. Appendix 13. and 14. shows the own prognostic of the two largest industrial branches. Starting from the actual consumption of the years 1360-61 tendency of demand can be summed up as follows:

	1360		1361		1371		Average development of 10 years
	t	%	t	%	t	%	%/year
Total demand of building indust.	30150	100	36850	122,1	89900	298,2	9,3
Demand of Jangalak Factory	1850	100	2200	118,9	3700	200	5,3
Ingot demand of Pul-i-Charki *	-	-	-	-	(7000)*	-	-
Other demand **	2500	100	1950	78,0	4400	176,0	8,5
TOTAL DEMAND	34500	100	41000	118,8	100.000	289,9	9,3

Note: * From the 7000 t raw material demand of the Pul-i-Charki rolling mill the output of 5000 t are finished products a part of which can satisfy the consumers' demand and the quantity of finished products of Pul-i-Charki was used for this calculation to avoid cumulation. (7000 - 5000 = 2000)

** In 1360-61 other demand was determined on the basis of the difference of the imports and the consumption data given by the first two consumers (due to the lack of own source). The figures may differ from the reality because of the changes in the stocks, but they are satisfactory for estimation of the tendencies.

The above consumption prognostic is necessary, but not enough for the approximation of reality. That is why the above mentioned data were controlled with the help of matematical models on the basis and with analysis of the consumption data of the past period. Appendix 15 shows the consumption of the past (for the period of 1344-1362 on the basis of the data available); on the basis of which it can be stated:

- Between 1344 and 1353, during 9 years the average rate of development was very modest: 1,6 % yearly.

- During the 4 years between 1353 and 1357 development accelerated and though there is significant difference between the development of the certain years, the average rate reached 17,6 %.

- The development increased between 1357 and 1362; 24,6 % was the average rate.

In our estimation the lower limit of the future demand on steel consumption can be supposed as identical with the average rate of the past 18 years. This rate complies with the present technical level, but it also represents the dinamics of the last years. This trend of development is described by a parabola, the starting point of which goes through the 7,7 x 10^3 t point of real consumption in 1344 and its point of finishing the past is at 41×10^3 t of the year of 1361. The average growth rate of the past 17 years: Q_{17}

$$Q_{17} = \sqrt[17]{\frac{41,0}{7,7}} = 1,103 \quad \text{e.g. in average } \underline{10,3\ \%/\text{year}}$$

The above data determines the lower limit of the rate of development in the next 10 years, e.g. the steel demand arising in 1371 = Q_{71} :

$$Q_{71} = (1,103)^{10} \times 41 = 109,65 \times 10^3 \text{ t}$$

We estimate the production determinable by the average growth of the years 1353-1362 as the upper limit of the growth of demand on steel.

$$Q_9 = \sqrt[8]{\frac{41,0}{8,9}} = 1,21 \quad \text{e.g. average yearly growth } \underline{21\ \%}$$

The demand means the upper limit of the growth rate in 1371:

$$Q_{71} = (1,21)^{10} \times 41 = \underline{276,7 \times 10^3 \text{ t}}$$

The possible difference between the two marking diagrams is over 250 % in the tenth year, that is why it is necessary to determine the most probable trend diagram.
Determining this the realistic growth rate without regress for the period of 1356-62 is e.g.

$$Q_r = \sqrt[6]{\frac{41,0}{20,9}} = 1,119 \quad \text{e.g. the average yearly growth: } \underline{11,9\ \%}$$

The realistic demand on steel is the year of 1371:

$$Q_{71r} = (1,119)^{10} \times 41 = \underline{126,2 \times 10^3 \text{ t.}}$$

The above prognostics are described in Appendix 15. Because of the good approximation the parabola could be replaced by a straight line in the period examined. In Appendix 15 the prognostic of the Opportunity Study was also shown for control and illustration which - though it was made on the basis of an entirely different principle in 1359 - shows a good equality with the realistic trend of period under survey.

The team controlled the trend of the future demand with other method, too; namely with the index of steel consumption calculated on the basis of the trend of the national income.
On the basis of the estimated character of the figures we can state without numerical demonstration that we got a result equal to the realistic trend.

We examined the difference between the prognostic made by the users and the realistic value, and its reason separately. The difference was 26 %, whcih cannot be objected in itself.
The prognostic of the other demand - which represents a small value comparing with that of the building industry - is underestimated; fundamentally that is the reason of the difference. Its development will be more dinamic just as the influence of the development of the building industry.
Appendix 16. contains the tendency of the realistic market demand by year and by group of products on the basis of the prognostic made for the tendency of the demand.

This demand can represent the necessary magnitude of the capacity of the mini steel plant from market side.

3.2. Establishment of marketing system

The establishment of a unified and efficient correspondance between the consumers and the producers - that is the objective of the marketing system, on the basis of which the present and future satisfaction of the market demand should be secured without any problem.

On the development level of Afghanistan the assistance to users in solving their technical-economic problems is also one of the task of the marketing network. The traditional trade activity naturally also belongs to the scope of marketing:

- Collecting and systemizing the orders
- Programming the transport demand
- Stocking and executing commissions
- Organizing transportation
- Financial settlements

As the future mini steel plant will produce relatively simple products and its volume is also modest, service activity is not needed because of its character.
That is why marketing system should be also planned as a modest one.

3.2.1. Proposal for the establishment of the marketing system

The marketing department should belong to the directorate and concerning its localization it should work in the centre of the mini steel plant. It is profitable to organize some branch offices and one or two stores as well as a commissioning station outside the seat of the mini steel plant which would make it possible to establish reasonable programming, transport, storing and sale facilities.

It is profitable to establish (to rent) branch offices and stores in the following towns:

- Shiberghan
- Kabul
- Kandahar
- Herat

Besides the above mentioned facilities the establishment of 1-1 person branch offices is also advisable in the significant industrial areas, maximun in 7-10 places.

The total staff of the marketing department can be planned with a total of about 15-20 persons. Appendix 17. contains the details concerning the establishment of the marketing organization.

3.2.2. Possible alternatives of sale and their evaluation

Meeting the domestic demand can be the objective of the sale in case of the possible mini steel plant variations. All kinds of rolled and steel products can not be produced in the future mini steel plant, because in this case the volume of investment stocks would reach such a level which could be exploited only in case of large-scale production, but this is limited by the possibilities of the local market. Appendix 18. shows in some variations the kinds and quantities of steel products that could be available from domestic production by establishing the mini steel plant.

Variation no. 4 is selected from the six versions, which can be used for determining the possibilities and for carrying out the necessary economic selection. The numerical data of sale are shown in Appendix 19., 20. and 21. in their details and in total. In case of each sale-variation the fact was considered that Afghanistan has three rolling mills which are not working for the time being, but their putting into operation is already decided. The single producing unit got letter "C" and practically it is involved in all development and sale variations.

Plant "A means the steel plant to be established in the northern industrial area.
Plant "B" means the extension of Jangalak Metal Works.
The indexes of the letters mean the variations of the development.
The fundamental objective of the sale variations is to meet the demand on rolled steel products of the Afghan national

economy, and at the same time to be also economical.

In sale variation no. I. 101.800 tons of steel products would be sold in the year of running-in (1371). Deducting 7100 tons of ingot to be sold as rolling mill raw material the quantity of rolled steel products would be 94.700 tons which means 80 % of the total Afghan demand. The satisfaction of the demand can be characterized as follows:

- Level of satisfaction of demand on rolled ingot: 100 %
- Level of satisfaction of demand on round steel and wire: 96 %
- The demand on drawn wire and bar thicker than 90 mm will not be satisfied
- Satisfaction level of rolled section steel: 97 %
  Only the importation of the special holders will be necessary.
- All the other rolled and formed steel products should be secured from imports. Their total quantity will reach 20.400 tons in 1371
- The quantity of rolled steel products to be supplied from the total imports is 23.800 tons, e.g. 20 % of the total demand in the first variation.

In variation no.II. 108.500 tons of steel product will be sold in the year of running-in (1371). Deducting 21.200 tons, the vertical transports between the new mini steel plant and the Pul-i-Charki rolling mills we will get the result that 87.300 tons will be sold for satisfying the national demand; this is 73,7 % of the total demand.

The satisfaction of the demand can be characterized as follows:

- Level of satisfaction of demand on rolled ingot: 100 %
- Level of satisfaction of demand on round steel and wire: 96 %
- Satisfaction level of rolled section steel: 70 %
  Because of the production limits of the rolling mill the big holders and the special rolled section steel will be imported.
- All the other rolled and formed steel products will be imported (20.400 t)
- The quantity of the total necessary steel import is 31.200 tons in the second variation, this is 26,3 % of the total demand.

In variation no. III. 88.400 tons of rolled steel products will be sold and this is not decreased by the vertical deliveries of the metallurgical plant.

The satisfaction of demand can be characterized with the following figures:

- Level of satisfaction of demand on rolled ingot: 100 %
- Level of satisfaction of demand on round steel and wire: 96 %
- Satisfaction level of rolled section steel: 74 %
  Because of the production limits of the rolling mill the big holders will be imported.
- All the other rolled and formed steel products are to be imported.

- The quantity of the total necessary import is 30.100 tons, its proportion is 25,4 %.

In variation no. IV. 82.600 tons of steel products will be sold in the year of running-in (1371); after deducting 7.900 tons, the vertical delivery of the steel plants 74.700 tons remain for satisfying the domestic demand, e.g. 63 % of the demand.

The satisfaction of the demand can be characterized with the following figures:

- Level of satisfaction of demand on rolled ingot: 100 %
- Level of satisfaction of demand on round steel and wire: 96 %
- Satisfaction level of rolled section steel: 23 %
- All the other rolled and formed steel products are to be imported. (20.400 t)
- The quantity of the necessary import is 43.800 tons in the fourth variation, its rate: 37,0 %.

One-one definite development variation is connected to the above listed sale variations with certain production capacity and production scheduling.

For forming sale unit prices the data of Appendix XII. were used which contain the tendency of the prices of the steel imports. In our opinion the rentability of the future steel production can be correctly evaluated in case of Afghan prices are the same as that of the world market.

The prices formed cannot be standard, that is why the use of 1,035 price indes is considered to be real on the basis of the evaluation of the numerical data of Appendix XII., and therefore the starting basic prices of 1361 are actualized by this price index for the years planned for sale.

Appendix 22. contains the technical, profitability, sale and transport evaluation of the sale variation of Appendix 19., 20., 21. made on the basis of the above calculations. According to Appendix 22. variation no. 4. is the best followed by variation no. 3., e.g. these two variations are the most suitable for the Afghan economy.
We would get to the same result if we take into consideration the magniture of the scrap basis outlined in Chapter 2. and the limiting factors of the electric power. It means that variation no. 1. and no. 2. will be left out from the further examination, as they cannot be adjusted economically and harmonically to the 10-15 year period of development of the Afghan industrialization.

Variation no. 4. as a possible variation was checked together with the management of the Jangalak Metal Works, as it concerns the planned development of the factory or rather it would need the remodelling of the plan already existing.

As a result of the consultations with the directorate of the factory and with the experts participating in the consultations the team excluded also this variation from the recommendations.

<u>The reasons:</u>

. The space for the development within the factory does not enable the further enlargement of the foundry hall.

- According to the development plans of the city Kabul the extension of the foundry proposed by the team would meet difficulties both because of the environment protection and the overburdened energy network.

- The directorate of the Jangalak Metal Works does not intend to broaden the production profile with the production of cast ingot.

3.3. Introduction to the proposed production capacity

3.3.1. The schematic introduction to the production capacities of the sale variations outlined and swept away in Chapter 3.2., the reasons of the judgement

Introduction to variation no. 1.

The mini steel plant (A_1) to be established in the northern industrial area is the fundamental basis of the development, which is connected with the renewed rolling mills under common directorate (C_O) in the one-shift Kabul area (Pul-i-Charki).

The steel production, the ingot production with continuous casting mean the task of only the mini steel plant A_1 of which the bar and wire rolling mills of the mini steel plant will make rolled ingot, bar and wire and the rolling mill for rolled steel will do the rolling of big rolled sections.

The production of the small-size rolled section steel would be done by the Pul-i-Charki rolling mill (C_O) from the ingot made by continuous casting in the A_1 mini steel plant.

The production capacity of the A_1 mini steel plant:

- Production of liquid steel: 111 x 10^3 t/year
- Ingot made by continuous casting: 105,1 x 10^3 t/year
- Rolled ingot, bar and wire: 68,4 x 10^3 t/year
- Rolled section steel: 20 x 10^3 t/year

The capacity of C_O rolling mill:

- Rolled section steel: 6,3 x 10^3 t/year

The reason of rejecting variation no. 1.

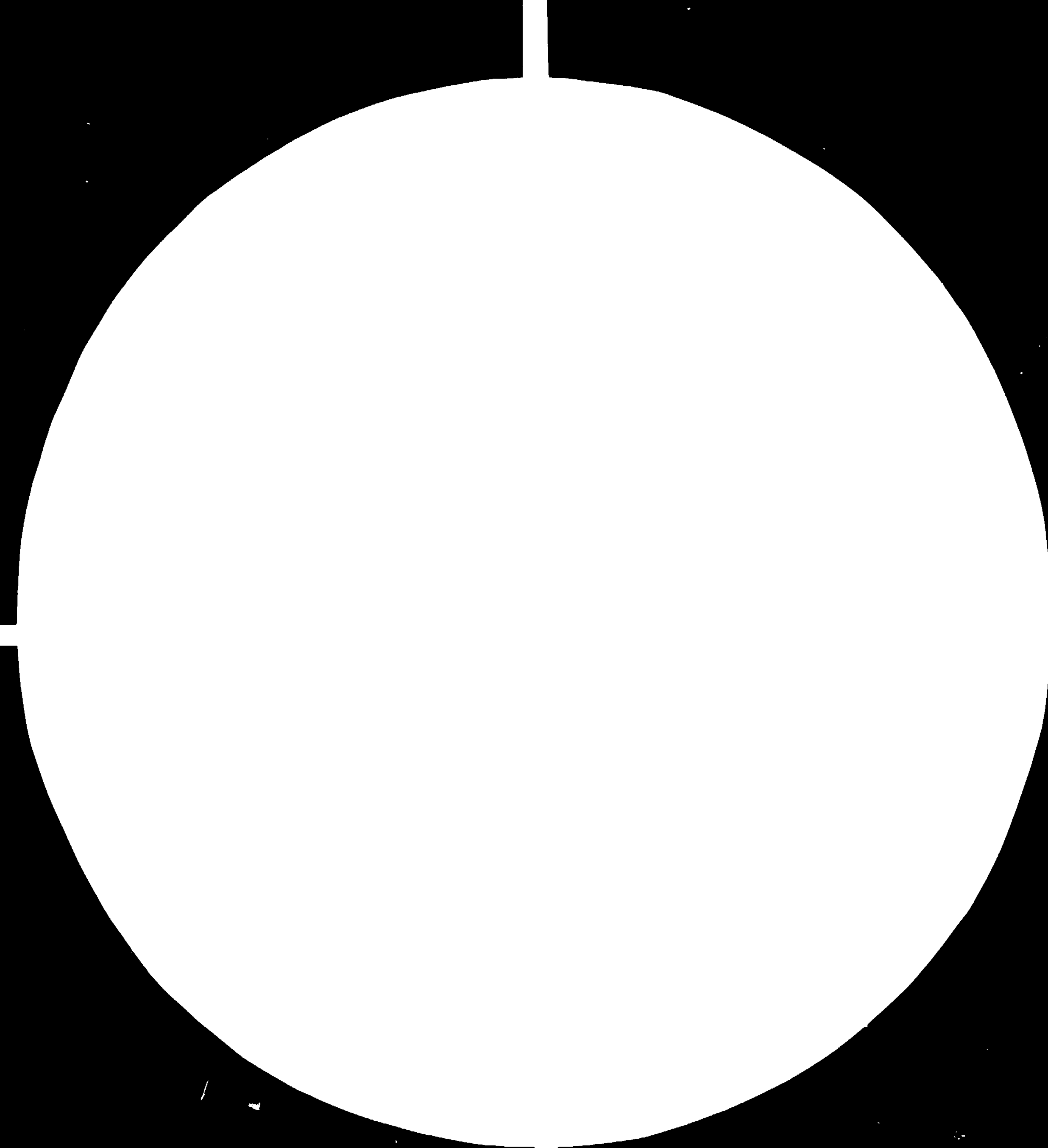
- The 27,3 % of the necessary scrap is not available in the northern industrial area in the long run, it must be delivered from the far Kabul region to the mini steel plant with high expenditures (63,9 x 10^6 Afs/year).

- The plant operating costs of the production of crude steel, of ingot made by continuous casting, of bar and wire production are the highest in this variation.

- As a consequence of this the capital costs and the amortization costs are the highest in this variation.

- The amortization cost per 1 ton final product is the highest in this variation.

The data and calculations documenting the above mentioned conclusions can be found in Appendix 23., 24., 25., 26., 27. and 29.



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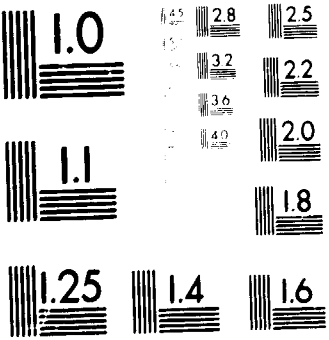

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Introduction to variation no. 2.

The mini steel plant to be estaolished in the nor+hern industrial area is the fundamental base of the development in this case.
The mini steel plant does not produce rolled section steel, but it satisfies the demand on ingot made by continuous casting necessary for the three-shift operation of the Pul-i--Charki rolling mill (C_1). The bar and wire rolling mill is the same as that of the first variation.

The production capacity of the A_2 mini steel plant:

- Production of liquid steel 102,6 x 10^3 t/year
- Ingot made by continuous casting 96,8 x 10^3 t/year
- Rolled ingot, bar and wire 68,4 x 10^3 t/year

The production capacity of the C_1 (Pul-i-Charki) rolling mills:

- Rolled section sttel 18,9 x 10^3 t/year.

The reasons of rejecting variation no. 2.

- The 21,3 % of the scrap necessary according to variation no. 2. is not available in the northern industrial area in the long run, it should be delivered to the mini steel plant from the Kabul region with high expenditures (46,1 x 10^6 Afs per year).

- The plant operating costs of the production of crude steel, of ingot made by continuous casting, of bar and wire production are high.

- The capital costs and the amortization costs are high.

The data and calculations supporting the above can be read in Appendix 23., 24., 25., 26., 27., 28. and 29.

Introduction to variation no. 4.

The mini steel plant proposed to be established (A_3) is the basis of the development in this case, too. However the mini steel plant has no vertical connection with Pul-i-Charki rolling mills (C_O). The A_3 mini steel plant is a closed unit in this case. It produces bars, ingots and wires.

The production of the raw material for the C_O Pul-i-Charki rolling mills would be carried out in the Jangalak Metal Works. The Jangalak Metal Works will be developed in the forthcoming years (the plans are already made). The metallurgical part of the Jangalak development contains the replacement of the arc furnace of 0,5 ton insert-mass by a 1,5 ton one.

The present cupola furnace will cease to exist. With this development the present 600 t/year quantity of the casting production is planned to be developed to 2000 t/year. (The producing capacity of the new furnace is about 3500 t/year at full operation.)
According to this variation when developing the Jangalak Metal Works the establishment of an arc furnace of 3,5-4 t insert-mass should be made possible by the enlargement of the melting house and in case of the three-shift use of the two new furnaces it would secure the opportunity for the development of the foundry and for the production of liquid steel necessary for satisfying the one-shift demand of the

Pul-i-Charki rolling mills.

The insert material of the rolling mill would also be made in the Jangalak Metal Works by special die casting.

As this production method demands great professional knowledge from the producer, it is advisable to introduce this only at places where the arc furnace melting has traditions therefore we suggest this method first of all in Jangalak Metal Works.

<u>The capacity of the A_3 mini steel plant in this case</u>

- Production of liquid steel 80,1 x 10^3 t/year
- Ingot made by continuous casting 75,6 x 10^3 t/year
- Production of bar, ingot, wire 68,4 x 10^3 t/year

<u>The capacity of the Jangalak B_1 steel producing base</u>

- Production of liquid steel (only for ingot casting)
  9,0 x 10^3 t/year
- Production of cast ingot 7,9 x 10^3 t/year

<u>The capacity of the C_0 Pul-i-Charki rolling mills</u>

- Production of rolled section steel 6,3 x 10^3 t/year

<u>The reasons of rejecting variations no. 4.</u>

- The conditions (area, energy) of enlarging the planned development of Jangalak according to variation no. 4. is not realizable.

- The enlargement is not in accordance with the urban development plans of Kabul.

- The technological solution of variation no. 4. cannot be considered to be up-to-date (though it is one of the most economical solutions for the use of the Jangalak scrap base during the period of transition!).

The data supporting the above conclusions are included in Appendix 23., 24., 25., 26., 27., 28., 29. and 30.

3.3.2. Introduction to the proposed production capacity

In Chapter 3.3.1. the rejection of variation 1., 2., and 4. are reasoned. Consequently variation no. 3. is proposed for realization on the basis of the evaluation made. The production capacity proposed can be characterized as follows:

- In the territory of Afghanistan two steel metallurgical plants can be established which are functionally related to the location and to the magnitude of the scrap base such as to the possibilities of electric energy drawing while - being independent of each other - their scrap bases are complementary to each other from the point of view of forming the demand.

- The proposed two metallurgical plants produce rolled products, ingot, bar, wire and rolled section steel by processing steel scrap; this way significant raw material demand of the Afghan economy can be satisfied.

- The two metallurgical plants can be realized either at the same time or in different times.

- The A_3 mini steel plant to be established in the northern industrial area means the bigger unit of the proposed production capacity.

The production capacity of this mini steel plant is as follows:

- Produc_ion capacity of liquid steel 80,1 x 10^3 t/year
- Production capacity of ingot made by continuous casting 75,6 x 10^3 t/year
- Production capacity of ingot, bar and wire 68, 4 x 10^3 t/year

- The renewed rolling mills and their development and amplification mean the smaller unit of the proposed production capacity in the Kabul Pul-i-Charki area. The production capacity of Pul-i-Charki can be characterized by the following:

- Production capacity for liquid steel 23,7 x 10^3 t/year
- Horizontal continuous casting of ingot 22,4 x 10^3 t/year
- Rolling capacity for rolled section steel (renewed) 20,0 x 10^3 t/year

- The verticum (C_2) means smaller capacity considers the running and the amplification of the three rolling mills.

- The present one and those to be renewed and finished during the next years - under common management to be the basis of the development. The costs relating to the fusion, to the renewal and to the amplification of the three rolling mills are not considered as if they would belong to the costs of the realization of the mini steel plant, because these are the costs of the renewal and the restoration of the present plant and that is handled by other experts of the UNIDO.

The data calculations of Appendix 23., 24., 25., 26., 27., 28., 29., 30. and 31 prove the rentability of this variation.

The variations already discussed and rejected are excluded from the further elaboration. The markings used up till now will naturally remain in use in a simplified form, e.g.:

Marking "A" means the mini steel plant to be built in the northern industrial area.

Marking "C" stands for the development of Pul-i-Charki.

The indexes will not be used in the followings, as they have no further distinctive role.

The formation and development of the plant A and C proposed above are not the alternatives of each other, but they are the two poles of the uniform development. These can be the two phases of the development in case of shifted development.

The simultaneous implementation of the two poles is proposed, but if financial or other obstacles do not make it possible, the beginning with the Pul-i-Charki development seems to be more advisable and economic first of all due to industrial-policy reasons.

The Pul-i-Charki development can theoretically be simplified, i.e. the building of the melting works do not have to be followed necessarily by the establishment of the horizontal continuous casting machine.

During the period of the one-shift production the casting machine can be substituted by the chill from casted ingot production introduced in variation no. 4.
This is considered to be acceptable only as a solution of provisional character.

4. MATERIALS AND INPUTS

On the basis of the reasons detailed in Chapter 3. the planned sale volume and the production capacity are determined. Also on the basis of the reasons outlined in detail in Chapter 3. it is also decided that the production capacity will be implemented in two territories (northern industrial area and Pul-i-Charki) independent of each other, in two steel metallurgical vertical also independent of each other that is why the present Chapter is made in the form of two sub-chapter.

The first one details the necessities of the development and the production of the mini steel plant marked "A" to be established in the northern industrial area, the second one detailes that of the Pul-i-Charki rolling mills.

The technology of the implementation of the production capacity proposed in Chapter 3. will be introduced in detail in the next Chapters. We fix in this Chapter only that the fundamental production processes are as follows in both territories:

- Electric arc furnace steel production on scrap basis
- Continuous ingot casting
- Hot rolling.

The differences of the plants proposed in the two territories are on the one hand in the volume, on the other hand in the technological solution of the continuous casting and last in the technological differences caused by the differences of the rolled products.

4.1. Materials and inputs for the mini steel plant marked "A" to be established in the northern industrial area

The basic data for the production of the mini steel plant are as follows:

- Production of liquid steel 80.100 t/year
- Ingot made by continuous casting 75.600 t/year
- Rolled products (ingot, bar,wire) 68.400 t/year
  in case of running-in (100 % utilization of capacity).

4.1.1. Raw materials

4.1.1.1. The steel and iron scrap are the most important raw materials

The quantity of the scrap necessary for the production in a year:

80.100 x 1,145 = 91.714 t

The returning scrap of the steel production:

80.100 x 0,031 = 2483,1 t

The returning scrap of the ingot made by continuous casting:

75.600 x 0,05 = 2780,0 t

The returning scrap of the rolling mill:

68.400 x 0,10 = 6840 t

The scrap necessary for the continuous production:

91.714,5 - (2438,1 + 3780 + 6840) = 78.611,4 t/year

As there are scrap stocks in the neighbouring industrial areas and the supply can be secured continuously, one month (30 days) stock is sufficient for the continuous production taking into consideration the work demand of the preparation (selection, cutting, pressing, etc.) of the scrap. During the winter period the stocks should be increased to 90 day ones because of the difficulties in transportation, but in such a way that the stock should diminish to a 30 day level by the end of the winter.

The data for the stock and the transportation are as follows:

- Basic stock (30 days) $= \dfrac{91.714,5}{12} = \underline{7650\ t}$

- Average daily use $\dfrac{91.714,5}{270} \doteq \underline{340\ t}$

- Average daily formation of own scrap $= \dfrac{13.103,1}{270} = \underline{48\ t}$

- Average daily demand on scrap = 340 - 48 = $\underline{292\ t}$

- Average daily demand on transportation calculating with the use of 15 t lorries and presuming the volume weight of the scrap as 0,6 t/m^3 (load volume of the 15 t lorry is about 10 m^3)

- Number of truck loads $= \dfrac{292\ t}{10 \times 0,6} = \underline{49\ \text{truck loads/day}}$

- Number of lorries for transportation presuming two-shift transportation:

  a) transporting within 15 km (time requirements)
  (rate of this transportation = 50/78,6 = 64 %)

Unloading with crane	30 minutes
Delivery (there & back)	36 minutes
Loading	60 minutes
Time demand of one truck load - total	126 minutes

Number of deliveries per day per lorry $= \frac{2x8x60x0,8}{126} = \underline{6}$

b) Time demand of transportation within 80 km

(rate of this transportation $= \frac{78,6 - 50}{78,6} = 36\ \%$)

Unloading with crane	30 minutes
Delivery time (there & back)	192 minutes
Loading	60 minutes
Time demand of one truck load - total	282 minutes

Number of deliveries per day per lorry $= \frac{2x8x60x0,8}{282} = \underline{2,7}$

Average number of deliveries $= \frac{0,64x6+0,34x2,7}{1} = \underline{4,8 / day}$

Average number of lorries used continuously $= \frac{49}{4,8} = \underline{10\ pcs}$

Appendix 32. contains the instruction about the monthly stocks, the rate of use, the schedule of transportation which consequences are the following:

- Chronological average of steel scrap stocks 11.032,9 t/month
- Average value of the steel scrap stocks $46,34x10^6$ Afs/month
- Average monthly value of scrap to be bought $27,51x10^6$ Afs/month

Chapter 1. contains the detailed survey of the steel scrap stocks. Chapter 2. gives suggestions concerning the method and organization of collecting the scrap, that is why in this chapter the basic connections are introduced without details being the following:

- Significant iron and steel scrap stocks are accumulated in the northern industrial area mainly in the Mazare Sharif region reaching 50 % of the national stocks, the magnitude of which will reach 350-400 x 10^3 tons by the time of putting the plant into operation.

- In the plants of the northern industrial area the quantity of the iron and steel scrap occuring regularly can be estimated as 10-15 x 10^3 tons which comes from the regular waste of partly the reconstruction activities partly the present production.

- It is not proposed to establish an independent firm for collecting the scrap. According to our proposal the collection of scrap is made and organized by a material supplying department to be organized within the organizational structure of the using firm in co-operation with the local retail dealers.

- The prices figuring in Appendix 32. are those attributed from the world market prices which are delivery prices in the collecting territory.

The transportation costs are not included in the price, it is charged to the costs of the production. The price index of the steel and iron scrap figuring in the Appendix can be considered as basic price at the price level of 1361) and can be calculated as 1.030 for the next 10 year period.

This figure was taken into consideration when calculation the costs.

4.1.1.2. <u>The group of ferrous compositions is essential raw material</u>

First of all the ferromanganese and the ferrosilicon are the most frequently used compositions with 60-65 % of alloying material content.

The necessary ferrous compositions are not available in Afghanistan that is why we have to calculate with permanent import.

The quantity required is as follows:

$$80.100 \times 0{,}013 = \underline{1041{,}3 \text{ t/year}}$$

Their price is about 600 US $/ton on the world market, on the basis of which the clearing price is 30.000 Afs/ton.

The price index of the ferrous compositions can be estimated to be 1,04 on the basis of the tendencies of the past years.

Because of the acquisition problems of the import the 90 day stock-level should be kept necessarily, transportation is advisable ones in three months in the middle of the period.

Stock-level = 260 tons; value of stocks = $7{,}8 \times 10^6$ Afs
Monthly use = 87 tons; value of used materials = $2{,}61\times10^6$ Afs.

4.1.1.3. Iron ore is an important material in the production

Yearly necessity of iron ore is as follows:

80.100 x 0,053 = 4245 tons/year

The ore stocks and their quality (at Hagigaki in Afghanistan) go far to suit the use demand, but till the starting of the surface mining or mining, imported iron ore must be calculated with, the price of which is 16–18 US $/ton on the world market. According to this the clearing price is 800 Afs/ton.

The price index can be expected to be 1,035 for the next 10 years.

Due to the import 90 day stock must be calculated, so the stock level is 1060 tons, the stock value is 0,85 x 10^6 Afs.

Monthly use: 354 tons, value of it: 0,3 x 10^6 Afs/month

4.1.1.4. Limestone is essential for the production

Yearly necessity of limestone: 80.100 x 0,030 = 2403 t/year

Limestone is available at several quarries in Afghanistan.
Its price is: 1.000 Afs/ton, i.e. 20 USD/ton.

Prior to the steel production the preparation of the limestone (lime-burning) is made in the lime-kiln to be implemented in the plant.

A 30 day stock is necessary, so the stock level is 200 tons.
Stock value: 0,2 x 10^6 Afs.

Monthly use: 200 tons. Value of limestone used: 0,2 x 10^6 Afs.

The price trend of the limestone is expected to be 1,035 during the next 10 years.

4.1.1.5. Fluorite is necessary for the production

Yearly necessity: 80.100 x 0,012 = 961,2 t/year

The fluorite is an important material of the steel metallurgy, on the world market it is sold according to standard specifications. Afghanistan has to import it.
Its price is 200 USD/ton, i.e. 10.000 Afs/ton on the world market.

Because of impors 90 day stock must be calculated with.

Stock level: 240 tons. Value of stock: 2,4 x 10^6 Afs.

Monthly use: 80 tons. Value of fluorite used: 0,8 x 10^6 Afs/month.

The price index of the fluorite is expected to be 1,04 during the next 10 years.

4.1.1.6. Breeze

It is one of the most important auxiliaries of the economical steel production based on scrap basis, yearly demand is:

80.100 x 0,02 = 1602 tons/year

The price of breeze on the world market is: 320 USD/ton.
It is to be imported.

Its domestic price is: 16.000 Afs/ton. It is easily available, so 30 day stock must be kept.

Stock level: 133,5 tons. Value of stock: 41 x 10^6 Afs.

Monthly use: 133,5 tons. Value of breeze used: 2,1 x 10^6 Afs/month.

The price index of the breeze is expected to be 1,025 during the next 10 years.

4.1.1.7. Graphite electrodes

They are essential means of steel production in furnace.

Yearly demand id: 80.100 x 0,007 = 560,7 tons/year. It is available from import.

The import price is: 1.600 USD/ton. i.e. 80.000 Afs/ton.

There is standard for the graphite electrodes of the electric arc furnaces, they can be ordered on this basis. Because of its high value 1,5 month stock is reasonable.

Stock level: 70 tons. Value of stock: 5,6 x 10^6 Afs.

Monthly use: 46,7 tons. Value of use: 3,7 x 10^6 Afs.

Expected price index of the electrodes: 1,045.

4.1.2. Auxiliaries

4.1.2.1. Refractory materials for steel production, continuous casting and rolling

Yearly necessity:

- The refractory material demand of the steel production

  80.100 x 0,025 = 2002,5 t/year

The world market price of furnace masoning materials: 720 USD/t, i.e. 36.000 Afs/t.

. The refractory material demand of the continuous casting:

75.600 x 0,015 = 1134,0 t/year

Their world market price is: 180 USD/t, i.e. 9.000 Afs/t.

. The refractory material demand of the rolling mill:

68.400 x 0,0018 = 123,1 t/year

Their world market price is: 170 USD/t, i.e. 8.500 Afs/t.

Total demand on refractory materials

Denomination	Yearly quantity in tons	Price Afs/t	Yearly use 10^6 Afs
Arc furnace	2002,5	36.000	72.09
Continuous casting	1134,0	9.000	10.21
Rolling mill	123,1	8.500	1.05
T O T A L:	3259,6	25.570,6	83,35

A 4 month (120 days) stock is necessary for the import and the security production.

Stock level: 1086,5 tons. Value of stock: 27,78 x 10^6 Afs.

The monthly use is not characteristic, the reconstruction of the furnace is cyclic (for example the life-time of the cover can reach 120 charges, that of the bottom can be even 2000 charges).

4.1.2.2. Treating tools for casting and rolling

- Use of crystalliting: 75.600 x 0,012 = 90,72 t/year
  Material to be imported.
  Import price: 1.200 USD/t, i.e. 60.000 Afs/t.

- Use of rolls: 68.400 x 0,0025 = 171,0 t/year.
  Material to be imported.
  Import price: 1.000 USD/t, i.e. 50.000 Afs/t.

- Other tools: 68.400 x 0,0006 = 41,0 t/year
  Material to be imported.
  Import price: 700 USD/t, i.e. 35.000 Afs/t.

Total demand on treating tools

Denomination	Yearly quantity in tons	Price Afs/t	Yearly use 10^6 Afs
Crystalliter	90,72	60.000	5,44
Rolls	171,00	50.000	8,55
Others	41,00	35.000	1,44
T O T A L:	302,72	50,971,2	15,43

The magnitude of tools stock is half a year (180 days) because of flexibility of programming and time demand of reoperatings of tools.

Stock level: 151,4 tons. Value of stock: 7,72 x 10^6 Afs.

Monthly use: 25,2 tons. Value of tools used: 1,29 x 10^6 Afs per month.

4.3.1. Materials for maintenance

The materials for maintenance belong to two groups in every factory unit, on the one hand they are traditional materials to be obtained in trade, e.g. shafts, round steels, ingots, rolled section steels, sheets, welding materials, etc., on the other hand they are subassembed reserve spare parts secured in the framework of contract with equipment suppliers.

The total yearly cost of maintenance is fixed in 10 % of the value of the machinery/equipment; 20 % of which is co-operational expenditure on wages, 35 % is subassembled spare parts, 45 % is maintenance material available in trade.

Cost of maintenance

Factory unit	Maint. cost yearly	Coop.mount. cost	Comm. maint. cost	Subassemb. spare p. cost	Total
Steel prod.	49,1	9,8	22,1	17,2	39,3
Continuous casting	39,0	7,8	17,5	13,7	31,2
Rolling mill	74,1	14,8	33,4	25,9	59,3
T O T A L	162,2	32,4	73,0	56,8	129,8
Est. average prices (Afs/t)	-	-	21250,0	42500,0	27206,0
Yearly quant./t	-	-	3435	1336	4771

One-month stock is enough from the commercial materials = 286,3 t

its value: $6,1 \times 10^6$ Afs

Six-month stock is necessary from the subassembled spare

parts = 668,0 t

its value: $28,4 \times 10^6$ Afs

TOTAL STOCK: 954,3 t, its value: $34,5 \times 10^6$ Afs

The price index of the maintenance material can be estimated to be 1,035.

4.1.4. Public utilities

4.1.4.1. Energy resources

Electric power means the most important energy resource for the mini steel plant. The electric energy is used in three ways:

Thermic, technological energy	from 15 KV network
Motor energy	from 380 V network
Lighting energy	from 220 V network

In all the three cases 50 Hz alternating current is used. Electric power can be drawn from the 22 KW power transmission line to be built from the Soviet Union with the building up of the electric network. The costs of the supply are included in the cost estimation of this study.

The next table shows the yearly use of electric energy broken down according to factory units.

Factory unit	15 KV MWh	380 V MWh	220 V MWh	Total MWh	Value of electr. power 10^6 Afs/y
Steel production	50863,5	1602,0	160,2	52625,7	78,9
Continuous casting	-	2116,8	151,2	2268,0	3,4
Rolling	-	7524,0	342,0	7866,0	11,8
T O T A L	50862,5	11242,8	653,4	62759,7	94,1
Use of shift 1	16954,5	3935,0	-	20889,5	31,3
Use of shift 2	16954,5	3653,9	265,0	20873,4	31,3
Use of shift 3	16954,5	3653,9	388,4	20996,8	31,5

Price of the electric power: 1,5 Afs/KWh.

Price index: 1,035.

Natural gas is also significant energy ehich is available in case of Mazare Sharif localization. In this case other energy sources are not necessary. If the establishment is not in the region of Mazare Sharif, fuel oil should be used instead of natural gas.

a) Use of natural gas

Denomination of factory	Normal m^3/year	Unit price Afs/Nm^3	Value 10^6 Afs
Steel production	2002,5	1,6	3,2
Rolling	4617,0	1,6	7,4
T O T A L	6619,5	1,6	10,6

b) Use of fuel oil

Denomination of factory	ton/year	Unit price Afs/Nm^3	Value 10^6 Afs
Steel production	1698,4	17000	28,9
Rolling	3898,8	17000	66,3
T O T A L	5597,2	17000	95,2

c) Use of mixed fuel: natural gas and fuel oil

Denomination of factory		Price	Value 10^6 Afs
Steel production	2002,5 Nm^3 gas	1,6 Afs/Nm^3	3,2
Rolling	3898,8 t oil	17.000 Afs/t	66,3
T O T A L	-	-	69,5

To avoid the distorting influence of the price rates variation C was used in the study.

The price index of the fuel can be estimated to be 1,035.

Other energy sources are also necessary such as oxygen and compressed air, but these are produced in the own verticum of the plant. The electric power necessary for their production is included in the demand on motor electric power.

4.1.4.2. Public utilities

The mini steel plant has its own industrial water network and water treatment plant. The supply can be secured from own well. There is no output of industrial waste water.

The mini steel plant needs only the outlet of biological sewage which should be joined to the urban sewarage network.

The mini steel plant keeps the air contamination within the prescribed level as the furnaces will be equippped with smoke and gas purifyers.

4.2. Materials and inputs for the Pul-i-Charki development marked "C"

The statements are the same as those of Chapter 4.1.
In the following the differences and the numerical data will be introduced.

The basic production data are as follows:

. Production of liquid steel:	23.700 t/year
. Production of ingot mad by continuous casting:	22.400 t/year
. Production of rolled section steel:	20.000 t/year

4.2.1. Raw materials

4.2.1.1. Steel and iron scrap

Necessary quantity of these materials:

23.700 x 1,145 = 27.136,5 t/year

Returning scrap of steel production:

23.700 x 0,031 = 734,7 t/year

Returning scrap of continuous casting:

22.400 x 0,005 = 112,0 t/year

Returning scrap of rolling of rolled section steel:

20.000 x 0,105 = 2.100 t/year

Steel scrap necessary for the production process:

27.136,5 - (734,7 + 112,0 + 2.100) = 24.189,8 t/year

90 % of the scrap is stored in the territory of the Jangalak Metal Works (at the time of the opening of the plant it is about 100.000 tons). Two week stock is enough in the territory of the factory. The distance is five km.

Stock level: 1.130 tons   Value of stock: 1,8 x 10^6 Afs.

Use: 2.015,8 t/month. Value of materials to be used:
8,5 x 10^6 Afs/month.

Transportation is continuous and steady. Number of lorries engaged in transportation is as follows:

. Daily demand on transportation = $\frac{2015,8}{25}$ = 80,6 tons

. Time demand of one 15 ton lorry: about 100 minutes.

. Daily number of turn-rounds of the lorry (in 2 shifts):

$$\frac{2 \times 8 \times 60 \times 0,8}{100} = \underline{7,68}$$

. Necessary No. of truck loads/day = $\frac{80,6}{10 \times 0,6}$ = 13,4

. Number of lorries necessary = $\frac{13,4}{7,68}$ = $\underline{2 \text{ pcs}}$

4.2.1.2. Ferrous alloyings

Quantity necessary of ferrous alloyings:

23.700 x 0,013 = 308,1 t/year.

Its value: 9,2 x 10^6 Afs.

1800 ~~...~~ / 130 = 13,5. 1350 Afs/t

90 day stock:

Stock level: 77,0 tons

Monthly use: 25,7 tons

Value of stock: 2,3 x 10^6 Afs

Value of materials to be used: 0,77 x 10^6 Afs

4.2.1.3. Iron ore

Quantity necessary of iron ore:

23.700 x 0,053 = 1.256,1 t/year

Its value: 10^6 Afs/year

90 day stock:

Stock level: 314 t/year — Its value: 0,25 x 10^6 Afs

Monthly use: 104,2 tons — Its value: 0,08 x 10^6 Afs

4.2.1.4. Limestone

Necessary quantity of limestone:

23.700 x 0,03 = 711 t/year

Its value: 0,7 x 10^6 Afs/year

30 day stock:

Stock level: 59,3 t/year — Value of stock: 0,06 x 10^6 Afs

Monthly use: 59,3 tons — Its value: 0,06 x 10^6 Afs

4.2.1.5. Fluorite

Necessary quantity of fluorite:

23.700 x 0,012 = 284,4 t/year

Its value: 2,8 x 10^6 Afs

90 day stock:

Stock level: 71,1 t/year — Value of stock: 0,7 x 10^6 Afs

Monthly use: 23,7 t/year — Value: 0,2 x 10^6 Afs

4.2.1.6. Breeze

Necessary quantity of breeze:

23.700 x 0,02 = 474,0 t/year

Its value: 7,6 x 10^6 Afs

30 day stock:

Stock level: 39,5 t/year — Value of stock: 0,6 x 10^6 Afs

Monthly use: 39,5 t/year — Value: 0,6 x 10^6 Afs

4.2.1.7. Graphite electrodes

Necessary quantity of graphite electrodes:

23.700 x 0,008 = 189,6 t/year

Its value: 15,2 x 10^6 Afs

45 day stock:

Stock level: 23,7 t/year — Value of stock: 1,9 x 10^6 Afs

Monthly use: 15,8 t/year — Value: 1,3 x 10^6 Afs

4.2.2. Auxiliaries

4.2.2.1. Refractory materials

Refractory material demand of steel production and continuous casting is as follows:

23.700 x 0,025 = 592,5 t/year Its value: 21,3x10^6 Afs

Refractory material demand of the rolling mill:

20.000 x 0,0025 = 50,0 t/year   Its value: 0,4 x 10^6 Afs

Factory unit	Yearly quantity tons	Price Afs/t	Yearly use 10^6 Afs
Steel production + continuous casting	592,5	36.000	21,3
Rolling	50,0	8.500	0,4
T O T A L	642,5	33.774,3	21,7

120 day stock:

Stock level: 211,2 t/year   Value of stock: 7,1 x 10^6 Afs

4.2.2.2. Treating tools

Use of crystalliters:

23.700 x 0,005 = 118,5 t/year   Its value: 7,1 x 10^6 Afs/year

Use of rolls:

20.000 x 0,0028 = 56,0 t/year   Its value: 2,8 x 10^6 Afs/year

Use of other tools:

20.000 x 0,012 = 24 t/year   Its value: 0,8 x 10^6 Afs/year

Total demand on tools

Denomination	Yearly Quantity t	Unit price Afs/t	Yearly use 10^6 Afs
Crystalliters	118,5	60.000	7,1
Rolls	56,0	50.000	2,8
Other tools	24,0	35.000	C,8
T O T A L	198,5	53.904,2	10,7

180 day stock

Stock level: 99,3 t/year   Value of stock: 5,4 x 10^6 Afs

Monthly use: 16,5 t/year   Value: 0,9 x 10^6 Afs

4.2.3. Maintenance materials

Factory unit name	Maint. cost yearly 10^6Afs	Coop. works 10^6Afs	Commerc. materials 10^6 Afs	Subassembl. spare parts 10^6 Afs	Total
Steel production	20,7	4,2	9,3	7,2	16,5
Rolling	10,0	2,0	5,4	3,5	8,0
T O T A L	30,7	6,2	13,8	10,7	24,5
Estimated average	-	-	21.250 Afs/t	42.500 Afs/t	27.186 Afs/t
Yearly quantity			649,4 t	251,8 t	901,2 t

Stock of commercial materials:

30 day stock: 54,1 t/year Its value: 1,1 x 10^6 Afs

Subassembled reserve:

180 day stock: 125,9 t/year Its value: 5,4 x 10^6 Afs

TOTAL STOCK: 180,0 t/year Its value: 6,5 x 10^6 Afs

4.2.4. Public utilities

4.2.4.1. Energy resources

Denomination of factory unit	15 KV MWh	380 V MWh	220 V MWh	Total MWh	Value of electric power 10^6Afs/y
Steel product. + cont. casting	15.168,0	639,0	71,1	15.876,0	23,8
Rolling	-	2700,0	100,0	2.800,0	4,2
T O T A L	15.168,0	3339,9	171,1	18.676,0	18,0
1st shift	5.056,0	1169,0	-	6.225,0	9,3
2nd shift	5.056,0	1085,4	85,0	6.226,4	9,3
3rd shift	5.056,0	1085,5	86,1	6.227,6	9,4

<u>Demand on fuel oil</u> (in Pul-i-Charki natural gas is not available)

Factory unit	t/year	Unit price Afs/ton	Value: 10^6 Afs
Steel production + continuous casting	284,4	17.000	4,8
Rolling	1.200,0	17.000	20,4
T O T A L	1.484,4	17.000	25,2

<u>Stock:</u>

Stock level: 61,5 t/year — Value of stock: 1,1 x 10^6 Afs

Monthly use: 123,7 t/month — Its value: 2,1 x 10^6 Afs

4.2.4.2. Public utilities

The statements are the same as in Chapter 4.1.4.2.

Appendix 34. contains the table of materials listed in Chapter 4.2.

5. LOCATION AND SITE

The next series of objectives should be realized optimally when determining the site of the metallurgical plants to be established.

- The transportation possibilities of Afghanistan are limited and expensive that is why the transportation necessities should be limited at the minimal level both in case of the realization of the finish product and in that of the raw materials.

- The plant should be located at such a site where the drawing of electric power can be solved in order to build up the necessary capacity of 27 and 7 MW.

- Natural gas or fuel are important energy resources for the metallurgical plants: the first is domestic, the latter one comes from import. The location should possibly demand the use of national energies.

- The demand on water of the metallurgy is significant that is why the site should be rich in water.

- Deriving from the character of the mini steel plant the demand on staff is not significant in comparison with the population of Afghanistan, but the characteristics of the metallurgical plants (three shifts, hot workshop, noise, heat, etc.) demand on industrialized territorial background.

The site of location should secure the lodging and provision (housing conditions, shop system, etc.) of the workers.

- The determined site should correspond to the line of policy concerning industrial development of the country on the long run.

5.1. Location

The optimal solution of the above objectives means the appropriate choice of the location. In this respect our work is oriented to three basic objectives.

1. Territorial location of the scrap base (bases)
2. Analysis of the market demand-territory by territory
3. Possibilities of electric power supply.

The next table is made by grouping the data of the above criteria according to the territories introduced in the four big chapters and in Chapter 3.1.3:

Territorial units	Rate of scrap %	Market demand %	Possibilities for drawing electric power	Evaluation
Northern industrial area	50	44,3	Mazare Sharif Pul-i-Charki	possible
Kabul industrial area	35	45,9	Kabul, but in a strongly limited qty	limited possibility
Middle-Afghanistan	10	6,0	-	excluded
South-West Afghanistan	5	3,8	Kandahar	excluded

According to the above table we arrived to the conclusion that Middle Afghanistan and South-West Afghanistan may be excluded; more exactly the following counties: Ghasi, Paktia, Badghis, Zabul, Uruzgan, Ghov, Paktika, Herat, Farak, Nimroz, Helmend, Kandahar.

All the basic reasons of the location in the northern industrial area are available, but the following facts mean significant problems:

- Nearly 50 % of the market demand arises in the Kabul area and 35 % of the raw material of the steel production is also to be found of this area, the storing of which causes problems for the area already now.

- As a first step the team examined the possibilities of a mini steel plant to be established in the northern area with bigger and wider range of manufacture (variation 1. and 2.).
Because of the transportation, first of all because of the costs of the transportation of the scrap from Kabul and that of the transportation of the products back these variations were excluded as they are not profitable.

- The solution of the problem (according to variation 3.) is in the compromise in location which calculates with the reconstruction and fusion of the Kabul Pul-i-Charki rolling mills and suggests their development to vertical plants for using the factories and sites already existing. The electric energy drawing is the main limiting factor of the Kabul location and the magnitude to be established should confirm with this.
On the other hand this corresponds to the possible capacity of the rolling mills and with the plant magnitude deriving from the scrap stocks of the area.

The above listed reasons make clear the suggested solution, i.e. that the metallurgical base is advisable to be established in two areas:

- About $80x10^3$ t capacity in the northern industrial area
- About $23x10^3$ t capacity in the Kabul industrial area.

5.1.1. Choice of location for the 80.000 t/year capacity M.S.P.

The territories in question are determined by the possibilities of electric power drawing which is possible in the following areas:

- Mazare Sharif
- Pul-i-Khumuri
- Kunduz

The evaluation of the above listed areas is as follows:

Mazare Sharif

- 75 % of the scrap in the northern industrial area can be found and developed there.
- Domestic natural gas is available in this territory.
- It is rich in water, the water demand can be satisfied on relatively low costs.
- The industrial background of the territory is secured.
- The conditions of manpower supply are good, it is a developing industrial town, the supply is organized.
- Public utilities are in advanced stage in the town, the biological sewage of the mini steel plant does not cause any problem.

- The soil mechanical characteristics of the territory are suitable for the implementation of the project of the mini steel plant on relatively low costs.

- The development of Mazare Sharif is one of the objectives of industrial development policy in Afghanistan.

- The town is situated on the main road of the country fairly near to the northern border, relatively far from the other parts of the country, far from Kabul, too.

- The area is suitable for establishing the mini steel plant from every aspects. Its only disadvantage is that it is in the border zone of the northern industrial area, 770 kms from Kabul.

Pul-i-Khumuri

- The town lies in the centre of the northern industrial area, it is the most favourable territory from the point of view of the transportation.

- The bulk of the raw materials of the mini steel plant is not stored in this district of the northern industrial area and it does not originate there.

- The territory has some industrial background, but it is not so developed as in Mazare Sharif.

- Public utilities of the town are poor, the biological sewage of the mini steel plant may cause problems.

- The town is rich in water, the satisfaction of the water demand of the mini steel plant will not cause problems.

- Because of the soil mechanical data and geographic conditions the buildings need costly foundations.

- The town is situated at the main road of the country.

- The natural gas treasure cannot be used in this area. Building of pipe-line is possible, but its costs are significant and it is not included in the policy concerning industrial development.

On the basis of the above listed aspects this territory is less suitable for the establishment of the mini steel plant comparing with Mazare Sharif.

Kunduz

This is the least suitable area for the location of the mini steel plant from three possible ones because:

- It is situated in the border zone of the northern industrial area and not at the main road.

- Due to its geological characteristics the costs of the building would be the highest here.

- The transportation costs of the scrap serving as raw material would be the highest here.

- The using possibilities of natural gas are insufficient.

- The industrial background is relatively weak.

Our suggestion is to locate the mini steel plant in Mazare Sharif on the basis of the above outlined reasons, but the location possibilities of Pul-i-Kumuri can not be excluded.

5.1.2. Choice of location for the 23.000 t/year capacity M.S.P.

In the Kabul area the Pul-i-Charki industrial area means the only reality for establishing the mini steel plant.

5.2. Site

5.2.1. Choice of site for the 80.000 t/year capacity M.S.P.

The team examined the establishment of the mini steel plant in two territories:

a) In Mazare Sharif on the sites to be found in the map in Appendix 20.

b) At the chemical fertilizer plant 20 kms from the town marked on the map in Appendix 2.

We consider both territories as suitable, but - from the point of view of the urban development - the establishment at the chemical fertilizer factory seems to be more favourable, we suggest this solution.

5.2.2. Choice of site for the 23.000 t/year capacity M.S.P.

As we suggest the development, the extension into full verticum of the rolling mills already existing and their leading under common management; a site of the establishment is given in the territory of one of the rolling mills near to Kabul shown on the map in Appendix 3.

The 23.000 t/year capacity mini steel plant needs 1 hectare (cca. 9000 m^2, which is available in the territory of the given factories.

5.3. Notes to Chapter 5.

When preparing this study we were not in the position to make all the necessary steps in support of determining the site because:

- there were obstacles of the survey on the spot necessary for determining the site;

- maps were not available in suitable size necessary for determining the site;

- data about soil mechanics were not available during the preparation of the study.

6. PROJECT ENGINEERING

We do not deal with the selection of the technological process of the proposed development in the framework of this TES, because this task was already fulfilled by the writers of the ⁿ.S., the conclusions drawn by them are acceptable, we agree with them, i.e. the technology chosen is the following both in connection with "A" and "C":

. Preparation of steel scrap
. Electric arc furnace steel production on scrap base
. Continuous ingot casting
. Rolling into bar, ingot, wire (in plant "A")
. Rolling into rolled section steel (in plant "C")

The detailed introduction to the production technology of plant "A" means the basis to the introduction, plant "C" is introduced in such a profoundity which is reasoned by the differences.

The lay-out plans attached to Appendix 4. belong to the general introduction.

6.1. Description of the various factory units and short explanation of the applied technology for M.S.P. in north

6.1.1.1. Steel works

The parts of the steel works are as follows:

. raw material preparation area
. melting shop
. casting shop
. ingot storing area

Raw material preparation area

Steel scrap delivered to the plant will be stored in the scrap yard and it will be selected by means of a mobile loading machine. Motor car debris are prepared for disassembling which is done by hand and/or cutting torch. Disassembled debris and house-hold scraps are then handled by a baling press, whereas any other type of scrap coming in, as well as the plant's own returns coming from the rolling mill, are cut to the required size by alligator shears. Steel scrap thus prepared will be transported to the raw material storing bunkers in the furnace hall by means of a bridge crane provided with a polyp-grab or with a lifting magnet.

The raw material preparation area is working in 2 shifts.

Melting and casting shop, ingot storage area

The deep bunkers in the furnace hall contain a stock of charge material fashioned in a chargeable size, sufficient for several days. Bridge cranes provided with lifting magnets transport the prepared steel scrap from the raw material storing bunkers into the charging buckets of the furnaces. After weighing, the buckets are emptied into the furnaces with the help of the bridge cranes. The melting shop includes two stee-producing electric arc furnaces of 15 ton nominal capacity each, producing in a one-slag process the liquid steel required for the continuous casting shop. The melting shop is provided with all auxiliary equipment required for the operation of the two steel-producing arc furnaces.
Liquid steel is tapped into bottom-pouring ladles transported by

the casting crane onto the intermediate ladle of the continuous casting shop. Through a well-harmonized operation of the two steel -producing arc furnaces the possibility of the regular feeding of the continuous casting machine may be assured.

The two-strand continuous casting machine is suitable to cast continuously cast ingots of 90 x 90 mm or 130 x 130 mm (or any size between these limits), and to cut them to size.

Ingots cut to size are stored in the ingot storing area and handled by a bridge crane provided with a lifting magnet.

The melting and casting shop, as well as the ingot storing area are working in 3 shifts.

6.1.1.2. Rolling mill

A bridge crane, provided with a lifting magnet and having a working capacity of 25 to 28 tons/hour, transports the ingots from the ingot storing area to the pusher-type furnace of the rolling mill.

Ingots pre-heated to rolling temperature in the pusher-type furnace, are rolled to the required size by the rolling mill consisting of:

- a three-high roughing train,
- two-high intermediate trains and
- a two-high continuous finishing train.

It is provided with the necessary cooling benches, coil-cooler conveyor, flying shears, and all other necessary auxiliary equipment.

The rolling mill delivers as finished products: reinforcing steel wires of 6-10 mm diameter in coils of appr. 300 kg, and reinforcing steel rods of 12-32 mm diameter and 12 m length in bundles.
Two bridge cranes are operating in the rolling mill. The rolling mill works in 2 shifts.

6.1.1.3. Auxiliary establishments

Electric energy supply

The electric energy supply of the mini-steel plant is assured by the use of the 15 kV national network. The supply system extends from the sub-station inside the plant.

Total built-in electric energy demand of the whole plant amounts to approx 26 MW.

An emergency power generating unit of 200 kW is also necessary for the power supply in the case of failure of the national network for units which must absolutely be kept in operation (cranes, lighting, etc.).

Water supply

Water consumption of the steel plant and the rolling mill is high.
The water supply is a closed system, and assures the cooling of the most important equipment of the plant, even in case of the electrical fall-out.
The system assures the suitable purification to the outlet.

Supply of compressed air

The supply of compressed air is assured by using a screw-compressor.
For the supply of compressed air no labour is required.

Quality control

Quality control is an indispensable, essential element in a steel plant and a rolling mill, but it is also required in connection with the water supply.
Number of shifts at quality control: 3.

Maintenance shop

Troublefree operation of the mechanical and electric equipment in the various factory sections is an essential condition of continuous production activity.

The maintenance shop includes the following workshops:

- locksmith and fitter shop
- cutter shop
- electric repair shop
- spare parts storage
- tools storage

Number of shifts:

- for maintenance 2 shifts
- for preventive super-

Storage of finished products

The rolled products will be stored on an open-air storage area and loaded on trucks by cranes.

Internal and general transportation

The raw materials and the finished products will be transported within the plant's area by trucks and fork-lifts.
For general transportation purposes 15 tons capacity trucks are to be considered.

6.1.2. General technical data

6.1.2.1. Time utilization; Production capacity

- Effective working time: 300 days / year
  50 weeks / year
  17 shifts / week
  3 shifts / day
  8 hours / day

Production capacity

a) In the Steel Work: 75.600 t/year of continuously cast carbon steel of commercial quality, in 90 mm x 90 mm x 4000 mm billets.

b) In the Rolling Mill: 68.400 t/year of rolled products of which:
appr. 38.000 t/year of Ø 6-10 mm and 12 mm in coils
appr. 30.400 t/year of Ø 14-32 mm in bars.

Electric energy

Total power demand of which:	appr. 27 MW
. for the Steel Work	appr. 18 MW
. for the Rolling Mill	appr. 9 MW
Simultaneously required power supply	appr. 18 MW
Voltage levels:	15 kV 50 C 0,4 kV, 50 C.

Water supply

Recirculated water quantities:

. in the Steel Work	appr. 385 m^3/h
. in the Rolling Mill	appr. 450 m^3/h
TOTAL QUANTITY:	835 m^3/h

Refill-water requirement of the system: appr. 70 m^3/h

Compressed air supply

Maximum consumption:

. in the Steel Work	appr. 300 Nm^3/h
. in the Rolling Mill	appr. 1000 Nm^3/h

Natural gas

Total joint consumption in
Steel Work and Rolling Mill max. 17.000 Nm^3/day

Specific raw material demand

(Informatory Data)

a) per 1 ton of liquid steel:

- Steel scrap	1.132 kg
- Slag-forming agents	75 kg
- Ferro-alloying agents	13 kg
- Iron ore	3 kg
- Electrodes	7 kg
- Refractories	50 kg
- Natural gas	30 Nm^3
- Electric power	635 kWh

b) per 1 ton of rolled product:

- Billets	1.060 kg
- Fuel oil	68 kg
- Electric power	120 kWh
- Lubricating oil	0,6 kg
- Rolls	1,5 kg

6.1.3. Space requirements and architectural features

Technological buildings

The technological buildings are forming one single block. There are three parallelly built main halls provided with oranes, each of which is connected with a wing. In the main halls and in the wings are the technological equipment installed.

6.1.3.1. Furnace- and casting hall: Scrap preparation area

The furnace- and casting halls are built in a manner to form one block with the scrap preparation area.
The length of the hall is transversally closed along by row of columns No. "1.".

In its full length, the hall is provided with a crane.

- Furnace hall	22m x 108 m
- Scrap disassembling area	22 x 72 m
- Height of the crane rail	+ 13 m
- Clear height inside the hall	15 m
- Number of cranes	2
- Max. crane loadability	32 t

Along row of columns "D" there is an extension wing of 6 m span connected with the furnace hall.
This extension takes up the laboratory, the foreman's office, the furnace transformer- and H.T. switch-gear room.

The furnace hall has concrete flooring, while the floor of the scrap preparation area has no concrete flooring.

The whole block is protected against rainfall. It has no walls, only a separation wall along the row of columns "D" between the furnace hall and the extension wing.

6.1.3.2. Billet storing hall; Storing area for refractories and additives

The billet storing hall has been designed in a manner to form one block with the area for the storage of refractories, slag--forming agents and other additives.
The length of the hall is transversally closed along row of columns No. "L".

Full length of the hall is 15 x 12 m = 180 m of which only 108 m length is provided with cranes.

Main data on the hall are as follows:

- Billet storing hall area	18 x 108 m
- Storing area for refractories, slag-forming agents and additives	18 x 72 m
- Height of the crane rail	+ 9 m
- Clear height inside the hall	11 m
- Number of cranes	2
- Max. crane loadability	10 t

The full ground floor area of the hall is made of concrete; the hall is protected against rainfall, but has no surrounding walls.

6.1.3.3. Hall of the rolling mill

The hall has a span of 22.0 m and a length of 16 x 12,0 = 192,0 m provided with floor, walls and roofing, whereas the crane track continues in the open area outdoors for a further length of 4 x 12.0 m. The outdoor section of the crane track does not require any bedding, roofing or side walls.

Clear height of the hall is approx. 11 m. Along the full length of the hall on 15 ton and one 10 ton capacity crane are moving on rails at a height of + 9.0 m. The floor of the hall is made of concrete, foundations of the machines are of reinforced concrete. The hall is partly closed, made in the same manner as the previously mentioned halls. The roofing is of asbestos cement corrugated plates.

Along the full length of row of columns "A" the hall is connected with an extension wing having a span of 8 m, and a clear height of approx. 6 m. This extension building will house several workshops. The room (length 48 m, span 10 m, clear height 7 m) for the electric supply, the transformers and the switchboards will be located also within this extension.

A 3-ton capacity crane is working in the extension wing, for a length of 48 m.

6.1.3.4. Buildings for service facilities - maintenance workshop hall

The hall has a span of 18 m, with a length of 90 m and a clear height of approx. 8 m. It includes a 3-ton crane moving along the full length of the hall, on rail, at a height of + 6.0 m. It is a closed hall, with asbestos-cement corrugated plate roofing. The floor is of concrete, and there is no requirement for special machine foundations.

Buildings for water supply

a) Building for drinking-water and industrial-water treatment

The building has a ground surface of 18 x 18 m and a clear height of 5 m, having a reinforced concrete structure. The floor is made of concrete: the pumps do not require any special foundation. The hall has a span of 9 m and includes a 3-ton capacity inside--assembly crane.

b) Machine and pump-house for cooling-water purification

The building has a ground surface of 12 x 36 m, and a clear height of 4 m, made of reinforced concrete structure. It includes a 3-ton capacity inside-assembly crane. The hall has a span of 12 m, the floor is of concrete, and no special foundation is required.

c) Cooled water storing basin

There are 8 reinforced concrete basins built in one unit, having a useful volume of 100 m^3 each, and placed on 0.0 level (ground level). The basins have a clear height of 3 m and cover made of light roofing. The purpose of this roofing is the protection against sunlight and rough contaminations, only. The sidewalls of the basins support the cooling towers. As the cooling towers cover approx. 70 % of the basins, the light roofing is required to cover approx. 30 % of the basins, only.

d) Warm water storing basins

There are 3 reinforced concrete basins built in one unit, having a useful volume of 100 m^3 each, and sunk below ground level. Each basin has a ground surface area of 6x6 m, they are surrounded by hand-railings and covered with light roofing against sunlight and rough contamination.

e) Mud sedimentation basins

There are 2 reinforced concrete basins built in one unit, 2 m deep, having a ground surface area of 6x20 m each, and sunk into the ground. These basins are open at the top.

f) Scala sedimentation basins

There are 3 reinforced concrete basins built in one unit, 2 m deep, having a ground surface area of 6x20 m each, and sunk below ground level. These basins are open at the top.

g) Neutralizing pit

It is a reinforced concrete pit sunk into the ground, having a useful volume of 50 m^3 and provided with an acid-resistant coating.

h) Digestion (resolving) basin

It is a reinforced concrete tank sunk below ground level, having a ground surface area of 6x6 m.

i) Pits for pumps and measuring instruments

There are approximately 40 pits sunk below ground level and having altogether a volume of 300 m^3.

j) Fundations for steel tanks and machines in outdoor location

It makes altogether approx. 300 m^3 of tank and machine foundations.

k) Earth works required for water pipe laying

Excavation of approx. 5000 m^3 earth is required.

l) Foundation for steel water tower

According to point 7 c of your former proposal.

Office and welfare bloc

The office building includes offiece rooms, converence rooms, telephone and telex rooms, etc. for the technical and economic management and administrative staff - approx. 40 persons.

It also includes locker rooms, showers, canteen and kitchen, etc., for approx. 120-140 persons per shift.

Porters' lodges and scale houses are built in a unic bloc: the two rooms are of approx. 60 m^3 volume.

Storing tanks for fuel oil

Steel tanks sunk into the gound, for the storing of approx. 70-80 tons of fuel oil are required.

Road system within the factory area

A two-lane road system interconnecting the various buildings, having a length of 1300 m, with asphalt topping is to be considered.

Fencing around the plant

In a length of approx. 1000 m, executed in the locally usual manner.

6.1.3.5. Description of the equipment

6.1.3.5.1. Raw material preparation area

ONE Mobile loading machine moving on caterpillar designed to allow the adding of a polyp grab.

Loading capacity:	max. 16 t
Beam length:	max. 20 m

TEN Cutting torches to be operated by oxygen - Natural gas.

TEN Acetylene generating equipment of mobile design.

Generating capacity: max. 1200 litres/hour

Operating pressure: max. 1,5 atm.

ONE Cutting shears to cut pipes, plates, bars, up to Ø 6 mm thickness.

ONE Scrap baling press

Bale dimensions: 500 x 500 x 300 mm

ONE Bridge scale

Weighing capacity: 30 tons

Weighing platform: 10.000 x 3000 mm

ONE Bridge crane

Span: 20,5 m

Loading capacity 10 t

Lifting height 12 m

ONE Lifting magnet with power supply equipment

Power requirement: approx. 8,5 kW

Weight: 1840 kg

Diameter of magnet approx. 1330 mm

TWO Polyp grabs

Designed to be suspendable to a crane-hook or to a mobile loading machine.

Volume: approx. 1,5 m^3

6.1.3.5.2. Melting and casting shop. Ingot storage area

ONE Electronic bridge scale

Weighing capacity	max. 60 t
Weighing platform	4000 x 3800 mm

TWO Bridge cranes

Loading capacity	10 tons
Span	20,5 m

ONE Lifting magnet with electric power supply equipment

Power requirement	approx. 8,5 kW
Weight	1840 kg
Diameter of magnet	approx. 1330 m

ONE ELECTRIC ARC FURNACE

Furnace capacity	2o tons
Charging method	by bucket of 10.5 m^3
Diameter of furnace shell	39oo mm
Diameter of graphite electrodes	350 mm
Electrode actuation	hydraulic
Clamping of electrodes	by spring
Loosening of electrodes	hydraulic
Tilting of shell	hydraulic
Tilting angle:	
in direction of spout	abt. 40°
in direction of door	abt. 12°
Pressure of hydraulic system	24 bar
Door actuation	hydraulic

Rated capacity of furnace transformer	9000 kVA
Maximum capacity of furnace transform.	13000 kVA
Secondary voltage	270-100 V
Capacity of reactor	1000 kVar
Rating of auxiliary equipment	25 kW
Connection voltage: furnace transform.	15 kV, 50 Hz
auxiliary equpmt.	3x380 V, 50 Hz
Cooling system	open circuit water-cooling
Cooling-water input temperature	max. 25 °C
Cooling-water output temperature	max. 50 °C
Hardness of cooling-water	8 °GH

Consumption data

Specific power consumption of melt-down	430 kWh/ton ± 5 %
Melt-down time (1520 °C)	66 min. ± 5 %
Cooling water consumption	32 m^3/h 8 °GH
Specific graph.te electrode consumption	5-7 kg/ton

ONE Casting crane

Load capacity	32/12.5 t
Span	20.5 m
Speed of bridge	approx. 60 m/sec.
Lifting speed	approx. 5/0,5 m/sec.
Power demand	approx. 80 kW

ONE 2 STRAND CONTINUOUS CASTING MACHINE

consisting of:

a) structural steel-work

b) Mechanical equipment for continuous casting machine

c) Equipment for casting billet section (from 90 x 90 mm to 130 x 130 mm)

d) Water cooling system

e) Hydraulic system

f) Compressed air system

g) Mould lubrication system

f) Machine lubrication system

i) Steam removal system

j) Control instrumentation

k) Electrical equipment for continuous casting machine

l) Mechanical equipment for billet removal

m) Electrical equipment for billet removal

n) Electric cables and lighting.

Design limits

- Product grade	plain carbon steel for reinforced concrete
- Cast billet size	from 90x90 mm to 130x130 mm
- Mould type	curved 5 m radius
- Billet length	4 metres max.
- Machine speed	6 m/sec. max.
- Heat size	25 tons
- Number of strands	two
- Cutting device	automatic

a) Structiral steel-work

Structural steel-work is supporting the casting platform, the service platform and the machine components. Structural steel-work also consists of: stairways, handrailing, static support for ladle during casting, cooling chamber, miscellaneous steel-work, slag chutes, etc.

b) <u>Mechanical equipment for continuous casting machine</u>

The main equipments are as follows:

. tundish equipped with nozzle changing device, tundish car with drive, supports for oscillating tables, independent oscillating drives,

. guide groups with rollers for cooling and bending of billet equipped with piping and water spray system,

. billet straightening groups with water-cooled rollers equipped with driving rollers,

. billet automatic cutting to length and related equipment.

c) <u>Equipment for casting billet, section from 90x90 mm to 130x130 mm</u>

The main equipments are as follows:

Mold bodies, copper molds, straight and being roller guides groups, dummy bars, etc.

d) <u>Water cooling system</u>

Water cooling for molds, chamber and machine parts is requested. The water cooling system is to be completed of piping, flanges, manual and motorized valves.

e) <u>Hydraulic system</u>

All systems are to be completed of hydraulic units, pumps motors, cylinders, etc.

f) <u>Compressed air system</u>

It is comprising of distribution piping within the machine, valves, pressure requlators, etc.

g) <u>Mold lubrication system</u>

It is to be completed of lubrication units, motor-pumps, oil tanks, oil flow adjustable from the casting platform, piping, fittings, etc.

f) <u>Machine lubrication system</u>

Centralized automatic grease lubrication system for shear moving parts complete of distribution, piping, fixings, adjustable flow, etc. is also requested.

i) <u>Spray chamber steam removal system</u>

It is comprising of steel temperature indicatiors, moulds, water cooling system instrumentation for indicating water temperature, pressure and water flow, as well as:

- chamber cooling system instrumentation for indicating pressure and water flow,
- machine parts cooling system instrumentation,
- casting speed indicators,
- mould oscillation frequency indicators,
- casting time indicator,
- compressed air indicator,
- miscellaneous instruments.

k) Electrical equipment for continuous casting machine

Complete set of A.C. and D.C. motors.
All required electric remote controlled equipments.
Electric equipment for control and motor protection, entry electric cabinets and distribution.
Cabinets for strand controls. Instument control panels.

l) Mechanical equipment for billet removal

Billet roller tables, dummy bar roller tables, billet transfer tables, billet collecting bed and related transmissions, etc.

m) Electrical equipment for billet removal

All required A.C. motors, remote control electric equipment for motor control and protection. Electric panels, control pulpitc etc.

n) Electric cables and lighting

All electric cable and wiring within the continuous casting machine plant.
Lighting system within the casting machine.

SIX Bottom-pouring ladles
Volume 16 tons

ONE Two-stand ladle-heating equipment

ONE Ladle cooling equipment
The ladles are cooled by means of air-blowers.

TWELVE Containers for material transport.

ONE Motor truck to transport the containers

Diesel driven motor car provided with a hydraulic lifting device to transport the material storing containers.

EIGHT Slag trays

Volume	approx. 0,5 m^3
Material	cast iron

ONE Stopper drying furnace

TWO Balances

The balances are provided with dial indication and are used to the weighing of the alloying agents and other additives, up to a weighing limit of 500 kg.

TWO Bridge cranes

Load capacity	10 tons
Span	16,5 m
Lifting height	12 m

TWO Billet loading magnets serving to load

90 x 90 x 4000 mm size continuously cast billets.

HAND tools

Comprising all kinds of hand tools used in a steel plant, and in a number calculated for the required manpower.

6.1.3.5.3. Rolling mill

Pusher-type reheating furnace (Technical data)

Material to reheat	square billets 90x90x4000 mm

Rated production	25 + 28 t/hour of billets of the above size
Billet progress	on one row
Combustion fuels	natural gas

Technical description

It is a furnace with two different burner areas and billets progressing on one row.
The billets, loaded by the pusher, go first through the pre-heating tunnel where they are lapped on tap by the combustion products.
They proceed to the proper heating area and at last to the uniformization area where they are side-discharged.
In the first part of the path the billets are supported by metal guides; in the heating and uniformization areas by sole with ceramic guides incorporated showing a high resistance to wear and to the thermochemical action of slag.

6.1.3.5.3.1. Machinery for rolling mill

ONE Pawl-type billet charger-pusher

Chargeable billets:	from (90x90 to 130x130) x 4000 mm on one row
Pushing force:	60.000 kg max.
Travel:	1.000 mm max.

ONE Wheeled discharger

Pushing force:	500 kg max.
Forwarding speed:	1.5 m/sec.
Pushing head travel:	7.000 mm

ONE Discharging roller

dia. 265 mm by 800 mm barrel length

ONE Roller table designed to convey the billets to the 420 mm dia. roughing train.

Length	11 m

6 Powered rollers dia. 265 mm by 700 mm barrel length

5 Powered rollers dia. 265 mm by 400 mm barrel length

ONE Flywheel for the driving unit of the train.

The flywheel is completed with:

1 semielastic pin coupling at motor side

1 gear coupling with shear pins at gear box side.

ONE Simple reduction gear box with a built-in 3-high pinion stand.

Transmittable power	1100 kW
Service factor	2,5
Reduction ratio	1 to 6.25
	(750 m to 120 Rpm approx.)
Pinion centres	420 mm

TWO 3-high roll stands, designed for rolls mounted on fabric bearings.

Roll dia.	460-400 mm
Barrel length	1400 & 1200 mm respectively

The stands are complete with:

- shoe plate complete with anchoring bolts
- 3 articulated-wobbler spindles complete with coupling boxes

. 3 wobbler spindles, complete with coupling boxes

. 2 spindle supports

Mechanization before the 420 mm train, consisting of:

a) Fixed table on duty at the first stand
length: 10.4 m
11 powered rollers dia. 265 mm by 1400 mm barrel length

The table complete with:

1 set of shaped rollers for transportation of big ovals
1 set of chutes for semiautomatic rolling

b) Roller table after the fixed table
length: 5.5 m
5 powered 2-groove rollers for oval transportation

c) Repeater with rear liftable wall between the 1st and the 2nd stand

pitch: 3000 mm

d) Repeater with rear liftable wall on duty at the 2nd stand

pitch: 2000 mm

Mechanization after the 420 mm train, consisting of:

a) Tilting table on duty at the first stand
length: 7.2 m
8 powered rollers dia. 265 mm by 1100 mm barrel length

The table is supplied with:

1 set of guides for semiautomatic rolling

b) Roller table after the tilting table

length: 6 m

6 powered rollers dia. 265 mm by 1100 mm barrel length

c) Roller table beside the tilting table

length: 32 m

26 powered rollers dia. 185 mm by 300 mm barrel length.

The roller table is completed with a switch designed to convey the rolled stock from the low pass to the high pass.

d) Repeater with rear liftable wall on duty at the 2nd stand
pitch: 1200 mm

e) Roller table at entry side of 1st stand Ø 300 mm
length: 6 m
5 rollers dia. 185 mm by 700 barrel length.

ONE Flying shear with rotary blades for cropping or emergency chopping.
Max. cutting capacity at 850 °C for steels having a cold tensile strength of 80 kg/mm^2; 1600 mm^2 sections

Speed of rolled stock: from 2,5 to 5 m/sec.

The shear is completed with:

a) 1 pinch roll at entry side of shear
roll dia.: 320 mm max.

b) 1 pneumatic-opening trough for discharge of chopped pieces.

ONE Pinch-roll located between the 120 and 300 mm trains
roll dia.: 320 mm max.

ONE Oval Turner with rotary box at entry side of the 1st stand
the 300 mm train
pneumatic rotation control.
Conveying troughs between the 300 mm and 420 mm trains
length: about 90 m

ONE Gear box with two 2-high built-in pinion stands

Transmittable power	1100 kW
Service factor	2
Pinion centres	300 mm

The unit is completed with:

. 1 speed change gear with two output speeds
. 1 gear coupling with safety pins at input side

FOUR 2-high roll stands designed for rolls mounted on roller bearings.

Roll dia. 330/290 mm by 700 mm barrel lenght

The stands are completed with:

. 4 base plates of welded steel
. 4 articulated-wobbler spindles, completed with coupling boxes
. 4 wobbler spindles complete with coupling boxes
. 4 spindle supports.

THREE 2-high, horizontal, independently driven rolling groups

Transmittable power: 300 kW

Service factor: 2

Pinion centres 300 mm

Roll dia. 330/290 mm by 700 mm barrel length.

Each group comprises of:

- . 1 input gear coupling with safety pins
- . 1 gear box with built-in 2-high pinion stand
- . 1 2-high roll stand designed for rolls mounted on roller bearings
- . 2 articulated spindles complete with coupling boxes and support
- . anchoring base plate for roll stand and gear box.

Mechanization of 300 mm dia. train comprising of:

a) 4 Repeaters with rear liftable wall on duty at the cross-country train.

pitch: 1600 mm

Each repeater is supplied with a pneumatic bar turner.

b) 2 Vertical loopers on duty between the groops

length: 3.5 m

c) Conveying troughs

length: 30 mm approx.

ONE Roller table designed to take the bars to the cooling bed.

length: 6 m

5 powered rollers dia. 185 mm by 700 mm barrel length.

ONE Flying shear with rotary knives, designed for cutting to length or cropping or emergency chopping.

. max. cutting capacity at 850 °C for steels having a cold tensile strength of 80 kg/mm^2: 1600 mm^2 sections

. speed of rolled stock: from 3.5 to 12 m/sec.

The shear is completed with:

a) 1 pinch roll at entry side of shear

b) 1 pneumatic-opening trough for discharge of chopped pieces.

ONE Cooling bed-run-in roller table fitted with a hydraulic device to brake the bars and to discharge them on the cooling bed.

Total length: 60 m divided as follows:

a) First portion, 6 m long fitted with six Ø 180 mm by 130 mm barrel length rollers and without lifting aprons;

b) Second portion, 48 m long fitted with 48 tapered rollers Ø 180 mm max. by 150 mm barrel length and with lifting aprons.

c) Third portion. 6 m long fitted with lifting aprons only. Roller table complete with chutes.

ONE Walking beam cooling bed

length: 40 m

width: 7 m

pitch of notches: 100 mm

The unit is completed with:

a) 35 multigrove lining-up rollers

b) 1 dampened fixed stop.

ONE Cooling bed run-out roller table fitted with liftable carriages for extraction of layers of bars and with a shain-type transfer for formation of bar layers.

length: 42 m

34 powered rollers dia. 185 mm by 700 mm barrel length.

ONE Reciprocating shear designed for cold cutting to length of layers of bars.

cutting force: 250 tons max.

cutting capacity for steel having a cold tensile strength of 80 kg, mm^2: 4200 mm^2 section max.

ONE Cutting to length device with liftable stop running on a beam.

Cut length: 6 to 12 m

ONE Roller table after the shear

length: 15 m

12 powered rollers dia. 185 mm by 700 mm barrel length.

The roller table is completed with:

. 1 chain-type bar extraction device

. 1 dampened fixed stop

. 2 bar retaining devices.

TWENTY Bar collecting pockets located at both sides of the roller table.

ONE Finishing group consisting of eight 2-high roll stands in continuous.

Total transmittable power	1100 kW
Service factor	1.75
Pinion centres	200 mm

Roll dia. 220/190 mm by 400 mm barrel length.

The group consists of:

. 9 couplings

8 gear boxes with built-in 2-high pinion stand

8 2-high roll stands designed for rolls mounted on roller bearings

. 16 universal spindles complete with coupling boxes and supports

. anchoring base plates for roll stands and pinion stands.

Mechanization of the 200 mm dia. train:

. 1 vertical looper before the 200 mm train: length: 5 m

. 1 set of conveying pipes: length: 22 mm approx.

ONE Wire rod-water cooling line at entry side of coiling unit; length: 10 m

Set of conveying pipes between the 200 mm train and the coiling unit.
length: 10 m approx.

ONE Cooling group featuring:

. coilable rounds: Ø 6 to 10 mm

. speed of rolled stock: 10.3 to 32 m/sec.

. coil weight: 300 kg max.

The group consists of:

a) 1 roller-type, dragging-conveying device placed at right angle at entry side of the turn-forming head

b) 1 rotary turn-forming head complete with turn retainer

c) group for turn collection and regular formation of coils

d) 1 hydraulic-coil ejector

d) 1 supporting anchoring frame for the dragging device and for the rotary head.

ONE Track conveyor at delivery side of the coiling group.

length: 8 m
width: 1400 mm

The track is completed with a pushing unit designed to put the coils on the aerial conveyor.

ONE Aerial conveyor with hooks, designed for coil transportation and cooling.

pitch of hooks: 1800 mm
total length: 150 mm approx.

The conveyor is completed with a pneumatic coil discharger.

ONE Capstan at the delivery side of the aerial conveyor.

number of collecting arms: 4

6.1.3.5.3.2. Lubrication and hydraulic system

THREE Central units for oil-forced librication of driving units of the 450 mm and 300 mm mill trains.
Deliver: 300 litres/minute approx.
Reservoir capacity: about 3000 litres

ONE Central unit for oil-forced lubrication of the coiling unit.
Delivery: 50 litres/minute approx.
Reservoir capacity: about 700 litres

ONE Oil-mist central unit for lubrication of rolling equipments of the 300 mm and 200 mm trains.

THREE Manual-type grease lubrication pumps with wheeled reservoir, complete with quick-fit couplings and hoses.

ONE Hydraulic central unit driving the lifting aprons.

ONE Hydraulic central unit driving the billet charger-pusher

6.1.3.5.3.3. Electrical equipment

The electrical equipment includes:

1.) Driving motors
2.) Electricals

Preliminary data

. Primary power supply	15 kW - 50 cycles
. Primary power for AC & DC auxiliary services	380 V - 50 cycles
. Remote control circuit voltage	220 V - 50 cycles

a.) Metal clad switchboard 15 kV - 50 cycles

The standard switchboard will consist of the following units:

. 1 incomer and measure unit equipped with 3-pole isolator with grounding knives, ammeters and voltmeters;

. 2 output units for control and protection of the two 1100 kW motors feeding the Ø 420 and 300 mm trains

Each unit will include one automatic, in-air 3-pole breaker, pull-out type, complete with powered control and maximum current indirect protection;

. 2 output units for control and protection of:

1st unit: 2 main slip ring motors rated 550 kW driving the Ø 200 mm train

2nd unit: 2 2000 kVA transformers feeding the main D.C. drives and the A.C. auxiliary drives.

b.) 380 V - 50 cycles power center swithchboard

Switchboard comprises:

. 2 line inputs with automatic, 3-pole, pull-out type breakers rated 3200 A

. 1 selt-closing switch with the fixed part only of a 3200 A breaker

. 9 outputs with automatic, pull-out type, 3-pole breakers rated 500 A

. 3 outputs with automatic, pull-out type, 3-pole breakers rated 800 A.

c.) Main transformers

. 2 transformers rated 2000 kWA, 15 kV ± 5 % 380 V - 50 Hz feeding the main D.C. drives and the D.G. and A.C. auxiliary drives.

d.) THREE 300 kW D.C. drives, each including:

. 1 300 kW D.C. - from 0 to 600/1200 RPM motor

. 1 fully controlled 3-phase feeder with thyristor unidirection bridge plus the equipments for control and regulation of speed at constant torgue from 0 to 600 RPM and at constant power from 600 to 1200 RPM. The above drives are fitted with three automatic loop regulators.

e.) A.C. & D.C, auxiliary services

A.C. & D.C. auxiliary services are as follows:

. 5 L.V. switchborads with the equipments for control, protection, semiautomation and speed regulation (for D.C. auxiliary motors) of all the machines.

. electronic systems for control and monitoring of the sequences of the machines hereunder.

. 1 system for shear and associated pinch roll

. 1 system for shear and associated pinch roll, roller table with lifting aprons and cooling bed.

. local control pulpits, standard design to be installed in the proximity of the following areas:

- pulpit P1 - Furnace charging area
- pulpit P2 - Furnace discharging area
- pulpit P3 - Rougher area

- pulpit P4 - Shear area
- pulpit P5 - Intermediate trains area
- pulpit P6 - Reciprocating shear area
- pulpit P7 - Ø 200 mm train, coiling and coil collection area

f.) A.C. 15.000 V - 50 cycles main motors

Motors for rolling mill heavy service, type rings asynchronous, 3-phase with frame size B3, each featuring:

- TWO 1100 kW motors at 750 RPM
- TWO 550 kW motors at 1500 RPM

6.1.3.5.3.4. Industrial water supply system

The industrial water system for lubricating the rolls and for cooling all parts of the machines is subjected to heating. It is a closes-loop system where water is recovered and losses are made up; it includes essentially;

a.) Direct cooling circuit with decanted water, consisting of:

. delivery circuit
. recovery circuit
. treatment circuit
. make-up circuit

The direct cooling circuit is dimensioned for a delivery of about 230 m^3/hour of water at the operating pressure of 5 and 12 kg/cm^2

b.) Indirect cooling circuit with filtered water, consisting of:

. delivery circuit
. recovery circuit

. treatment circuit

. make-up circuit

The direct cooling circuit is dimensioned for a delivery of about 120 m^3/hour of water at the operating pressure of 2 to 2.5 kg/cm^2.

c.) Circuit for washing the roll grooves of the 450 mm train with decanted water.

Closed-loop circuit with water delivered from the collecting pond to the consumers and back to the pond for recovery.

Decanted water is used (picked up and recirculated by the direct cooling circuit) in the quantity of about 50 m^3/hour.

The system includes all the required equipments, namely:

- 3 centrifugal electric pumps to handle dirty liquids; delivery of each pump 1.000 l/min.; head 30 m.
- 3 centrifugal electric pumps to handle clean liquids; delivery of pump 1.000 l/min.; head 30 m.
- 1 centrifugal electric pump to handle dirty water; delivery of the pump 900 l/min.; head 50 m.
- 2 centrifugal electric pumps to handle clean liquids; delivery of each pump 3.000 l/min.; head 120 m.
- Scale collecting baskets
- Distribution and collection pipes
- Gate valves, elbows, fittings and flexibles
- spray nozzles and pipes for groove washing
- Different securing brackets and clamps.

6.1.3.5.3.5. Auxiliary parts

The auxiliary parts include:

- 7 Buckets for collection of crop and chopped ends; on duty at the flying shears and at the reciprocating shear; buckets complete with changing devices.
- 7 Loop boxes
- 1 set of guards for the outside moving parts (couplings, shafts, etc.)
- 1 set of handrails, made of welded steel, for the bucket pits, the cooling bed run-in roller table, too.
- Set of checquered plates or grilles for covering pits, lubricating central units, cooling water pits, etc.
- 1 Set of walkways in welded steel in the area of the 450, 300, and 200 mm trains and at entry and exit side of cooling bed.
- 1 Welded steel structure supporting the water cooling line and the conveying pipes at entry side of the coiling unit, complete with inspection walkways and spillways.
- 1 Set of welded steel and rail subbases for crop and buckets, flying shears, pinch rolls.
- 4 Booths for control pulpits in welded steel, complete with glass panels, ladders and doors.
- 1 Set of anchor bolts and levelling shims.

Rolls and rolling equipment

These items are foreseen for the production of rounds Ø 6 mm in coils.

a) Rolls

- 6 steel rolls 450 mm x 1400 mm x 1400 mm, machined and grooved
- 14 special cast iron rolls 330 x 700 mm, machined and grooved
- 16 special cast iron rolls 220 mm x 400 mm, machined and grooved.

b) Rolling equipment

Including: 1 complete set of guides for rolling 6 mm rounds.

c) Two equipments to remove and install rolls

of 300 and 200 mm roll stands.

ONE Bridge crane

Lifting capacity	10 tons
Span	20,5 m

6.1.3.5.4. Electric energy supply

ONE 15 kV sub-station equipment, complete with feeding and tapping cells (for 27 MW simultaneous demand)

SIX Transformers of 15/6 kV and 15/0,4 kV, with transformer cells.

- Switch-gears for 6 and 0,4 kV
- Automatic system, relay protection

ONE Power-factor correcting capacitor for the electromotors.

- Cable network, earthing system
- Main power distribution equipment for the building's indoor lighting

TWO Emergency power generators of 2 x 100 kW capacity

6.1.3.5.5. Water supply

- Equipment for water technology (pumps, pressure boosters, de-ionization, tanks, cooling towers, water-tower of 200 m^3 capacity).
- Indoor piping (Nom Ø 40-400), fittings
- Indoor electric installations-instrumentation.

6.1.3.5.6. Compressed air supply

TWO Compressors with instrumentation and cooler (capacity 1300 Nm^3/hour each)

- Distribution system with fittings.

6.1.3.5.7. Quality control (Laboratories)

ONE Complete chemical laboratory, suitable to analyse the chemical composition of steel:
C, Si, Mn, P, S, as well as the percentage of any other usual alloying material.
The laboratory is also equipped with all necessary implements serving to the quick analysis of steel during this latter's production process.

ONE Complete chemical laboratory for water analysis with all necessary equipment for the analysis of cooling water.

ONE Mechanical laboratory with all necessary equipment serving to test mechanical properties of the product:

- tensile strength
- elongation
- yield point
- contraction
- Charpy (impact) value

6.1.3.5.8. <u>Maintenance shop</u>

EIGHTEEN Cutting machines (lathes, milling machines, planers)

SIX Welding machines

- Electricity equipments, battery chargers

ONE Compressed-air hammer

ONE Reheating furnace for forging purpose

- Hand-tools, small machineries

ONE Light travelling crane, 3 t/16.5 m

- Auxiliary equipments and cutting tools

6.1.3.5.9. <u>Storage of finished products</u>

ONE Bridge crane

. Load capacity	10 tons
. Span	20.5 m
. Lifting height	8 m

6.1.3.5.10. <u>Internal and general transportation</u>

THREE Lorries with 15-ton load capacity

FIVE Passanger motor cars

THREE Fork-lift trucks

. Load capacity 3 tons

. Lifting height 3.3 m

ONE Battery-driven platform truck

. Load capacity 5 tons

ONE Mobile loading machine

6.1.3.5.11. Office machines and furniture

ONE Telephone sub-centre with 30 extensions

ONE Teleprinter machine

SIX Typewriters

ONE Manifolding machine

NOTE: the investment costs of Chapter 6.1. are shown in the supplements 35, 36, 37, 38, 39.

6.2. Description of the various factory units and a short explanation of the technology suggested to the mini steel plant implementable in Pul-i-Charki

The technological line and the main processing units are basically quite similar to those described in point 6.1., although their sizes are smaller due to the volume of production. Besides this, the following significant difference is to be mentioned:

A continuous casting equipment is to be considered. As the volume of the production enables it, a horizontal casting equipment would be a competent, proper one. In the frame of this type the range varies from the fully automatized to the more simple versions. The volume of the production does not justify the choice of an automatized equipment, therefore we suggest a more simple and less operational costs demanding one.

The cost engineering of the rolling mill is not elaborated here as the connecting to the existing rolling mill is the most feasible solution. The reconstruction costs of this rolling mill is not taken into consideration in this Chapter.

6.2.1. General technical data

Production capacity

a) In the Steel Work:
2.400 t/year continuously cast carbon steel
in 90 x 90 x 4000 mm billets

b) In the Rolling Mill
20.000 t/year steel section

- angle	6.000 tons/year
- I sections	6.000 tons/year
- T sections	2.000 tons/year
- U sections	4.000 tons/year
- flats	2.000 tons/year
TOTAL:	20.000 tons/year

Electric power

- for the steel work	approx. 7,0 MW
- voltage levels:	15 kV, 50 Hz
	0,4 kV, 50 Hz

Water system

- in the steel work	approx. 125 m^3/hour
- refill-water requirement of the system	approx. 20 m^3/hour

6.2.2. Space requirement and architectural features

- scrap disassembling area	22 x 10 = 220 m^2
- furnace hall	22 x 24 = 528 m^2
- height of the crane rail	+ 8,0 m
- number of cranes	1 (one)
- max. crane load capacity	10,0 t
- billet storing hall area	22 x 24 = 528 m^2
- height of the crane rail	+ 8,0
- number of cranes	1 (one)
- max. crane load capacity	10,0 t

Technical data of electric arc furnace

- capacity	10,0 t
- diam. of the furnace shell	3.400 mm
- diam. of the graphite electrodes	300 mm
- electrode actuation	hydraulic
- door actuation	hydraulic
- rated capacity of furnace transformer	6,5 MVA
- max. capacity of furnace transformer	7,5 MVA
- secondary voltage	220-128 V

- capacity of the reactor	1.000 kVAr
- rating of auxiliary equipment	15 kW
- specific power consumption of melt down	450 kWO/t ± 7 %
- melt-down time (1520 °C)	55 min. ± 5 min.
- cooling water consumption	9 m^3/hour
- specific graphite electrode consumption	5-7 kg/t

List of machinery

- one mobile loading machine
- ten cutting torches
- ten acetylene generating equipment
- one cutting shear
- one scrap balling press
- one bridge scale of 2o tons
- one bridge crane of 10 tons
- two lifting magnet with power supply equipment
- two polyp crabs
- two bridge cranes 15 t
- one electric arc furnace
- one casting crane 25/15 t
- one one-strand horizontal continuous casting machine-complete
- six bottom-pouring ladles, 10 t
- one two-stand ladle-healting equipment
- one ladle-cooling equipment
- twelve containers for material transport
- one motor truck to transport the containers
- eight slag trays
- one stopper drying furnace
- two balances

NOTE: the investment costs of Chapter 6.2. are shown in the supplements 40, 41, 42, 43, 44.

7. PLANT ORGANIZATION AND OVERHEAD COSTS

The main production cost centers and the tendency of the general costs of the M.S.P. are fundamentally determined by the chosen technology of production, by the location and the inner organization of the factory and also by the correspondance of the firm with the external environment.

7.1.1. Production cost centers

- Preparation of scrap
- Steel production, casting
- Rolling.

7.1.2. Structure of the general costs

7.1.2.1. Operating general costs

The structure and the numerical value of the operating general costs were as follows for plant A and C:

Denomination	MSP in North basic data 10^6Afs	MSP in Pul-i-Charki basic data 10^6 Afs
Transportation costs	36,6	0,8
Duty on imported materials (generally)	25 % 92,9	25 % 28,6
Tool costs	26,7	11,1
Other costs (materials)	72,1	21,3
Other labour costs	7,2	2,5
TOTAL OPERATING GENERAL COSTS	235,5	64,3

7.1.2.2. Factory general costs

The structure and numerical values of the factory general costs are as follows for factory A and C:

Denomination	MSP in North basic data 10^6Afs		MSP in Pul-i-Charki basic data 10^6 Afs
Administration costs	$25x10^3$ Afs	2,5	0,5
Insurance costs		0,1	0,3
Communication costs		0,4	0,1
Administrative staff costs		1,0	0,2
Ground rent		1,5	0,3
Taxes (turnover tax)	2 %	43,2	2 % 12,7
Royalty	FAM	0,3	H FAM 0,5
Operating labour costs		4,3	1,6
TOTAL GENERAL COSTS (Adm.)		54,2	14,6
Sale costs (transportation)		28,5	8,3

7.2. Depreciation costs

The depreciation costs to be borne and already existing are as follows for factory A and C:

Denomination	MSP in North depr. %	10^6 Afs	MSP in Pul-i-Charki depreciation %	10^6 Afs
Buildings, structures	1,6	8,7	1,6	1,8
Machines, installations	8,5	124,8	8,5	19,3
Others	20,0	5,0	20,0	1,6
T O T A L		138,5		22,7

7.3. Financial, credit costs

The financial costs are basicaly interest costs and they form two main groups:

- Interests on short-term credits (credits to provide working assets)
- Interest on long-term, basicaly investment credits.

The interests of the short-term credits are not significant in case of a well-prospering factory and they are identical with the interest of the credits granted (commodity credits), so they can be neglected. The investment credits become important economic and economical factors in case of the establishment of a new plant or in case of significant expansion as far as there is not enough capital for the implementation that is why we introduce our suggestion in detail.

7.3.1. Trend of investment credits and their interests for the MSP in North

The costs of the implementation:

Fixed investment costs:

32.049×10^3 ∅ $= 1.602{,}5 \times 10^6$ Afs $+ 432{,}3 \times 10^6$ Afs $=$
$= 2.034{,}8 \times 10^6$ Afs

Preproduction capital:

4.629×10^3 ∅ $= 231{,}5 \times 10^6$ Afs $+ 92{,}19 \times 10^6$ Afs $=$
$= 323{,}6 \times 10^6$ Afs

TOTAL CAPITAL:

36.678×10^3 ∅ $= 1.833{,}9 \times 10^6$ Afs $+ 524{,}5 \times 10^6$ Afs $=$
$= 2.358{,}4 \times 10^6$ Afs

The use of the above sum takes three and a half years, so <u>673,8x 3,0 x 10^6 Afs</u> is the average use per year which sum would mean 88,o % of the own sources ([illegible],6 x 10^6 Afs) for industrial investments which is over the present possibilities of the Afghan national economy.

An international joint venture/associate should be formed with Afghan capital majority as form of the realization, with the following proposed capital share:

- Capital share of the foreign country (enterprise)

	49 %	=	1155,7 x 10^6 Afs
- Share of Afghan capital	51 %	=	12o2,8 x 10^6 Afs
- Own capital from it:	21 %	=	493,3 x 10^6 Afs
- Foreign capital credit:	3o %	=	7o9,4 x 10^6 Afs

The conditions of the foreign capital credits to be reached:

- total expiry period. [illegible]
- period of repayment: [illegible] years
- rate of interests: 9,5 %

Schedule and measure of borrowing (10^6 Afs)

	first year	second year	third year	3,5 year	T O T A L
Capital demand	11o1,8	759,3	466,9	3o,4	2,358,4
Foreign capital	539,9	372,1	228,8	14,9	1,155,7
Own capital	23o,5	158,8	97,7	6,3	493,3
Borrowing of investm. credit +	331,4	228,4	140,4	9,1	709,4
interests 9,5 %	15,7	42,3	59,9	33,5	151,4
Debt	347,1	270,7	200,[illegible]	42,6	860,8

Schedule of credit repayment, credit interests

	1/2 year 1371	1.year 1372	2.year 1373	3.year 1374	4.year 1375	5.year 1376	6.year 1377
Debt at beginning of the year	860,77	794,56	662,12	529,69	397,26	264,83	132,40
Repayment	66,21	132,43	132,43	132,43	132,43	132,43	132,40
Debt at beginning of the year	794,56	662,13	529,69	397,69	264,83	132,40	-
Yearly interest	40,89	75,48	62,90	50,32	37,74	25,16	12,58

7.3.2. The trend of the investment credits and their interests for the MSP in Pul-i-Charki

The costs of implementation:

- Fixed investment costs:

  5.438×10^3 \$ = $271,9 \times 10^6$ Afs + $89,6 \times 10^6$ Afs = $361,5 \times$
  $\times 10^6$ Afs

- Preproduction capital:

  903×10^3 \$ = $45,15 \times 10^6$ Afs + $29,98 \times 10^6$ Afs = $75,13 \times 10^6$ Afs

- TOTAL CAPITAL:

  6.340×10^3 \$ = $317,0 \times 10^6$ Afs + $119,6 \times 10^6$ Afs = $436,6 \times 10^6$ Afs

The plant is privately owned. About 126×10^6 Afs is the gross value of the existing stocks of the present plant, so the value of investment is more than double of the fix capital. Besides this the owners are burdened with the costs of renewal, amplification: about 20×10^6 Afs.

It means that they have probably not enough capital necessary for the investment. It seems advisable to reorganize the firm into a joint enterprise and to contribute to the development with state capital.

We suggest the following shares in capital:

- State capital investment: 58,5 % 329,2 x 10^6 Afs
- Existing private capital stocks: 22,4 % 126,0 x 10^6 Afs
- Capital credits: 19,1 % 107,3 x 10^6 Afs

Schedule and measure of borrowing (10^6 Afs)

	1.year 1368	2.year 1369	3.year 1370	3,5 year 1371	TOTAL
Capital demand	167,9	164,9	68,8	34,9	436,5
State capital investment	126,6	124,7	51,9	26,3	329,2
Borrowing of investment credits	41,3	40,5	16,9	8,6	107,30
+ interest 9,5 %	1,96	5,85	8,58	4,87	21,26
Credit debt	43,23	46,40	25,48	13,45	128,56

Schedule of repayment of credits, credit interest

	1/2 year 1371	1.year 1372	2.year 1373	3.year 1374	4.year 1375	5.year 1376	6.year 1377
Debt, opening	128,56	118,67	98,89	97,11	59,33	39,55	19,77
Repayment	9,89	19,78	19,78	19,78	19,78	19,78	19,77
Debt, closing	118,67	98,89	79,11	59,33	39,55	19,77	-
Yearly interests	6,11	11,27	9,39	7,52	5,64	3,76	1,88

8. MANPOWER

8.1. Manpower for MSP in North

The staff necessary for the total running-in is showed in Appendix 45, which consequences that 468 persons (100 %) are the total staff demand:

workers:	364 persons	77,8 %
employees:	79 persons	16,9 %
employers:	25 persons	5,3 %

Distribution of the total staff according to technology:

Steel production and casting	132 persons	28,2 %
Rolling mill	128 persons	27,3 %
Auxiliary workshops	50 persons	10,6 %
Maintenance	85 persons	18,1 %
General management	73 persons	15,8 %

The number of workers (364 persons) to be employed:

in first shift	206 persons	56,6 %
in second shift	80 persons	22,0 %
in third shift	78 persons	21,4 %

The number of employees (79 persons) to be employed:

in first shift	63 persons	79,8 %
in second shif	8 persons	10,1 %
in third shift	8 persons	10,1 %

8.1.1. Distribution of the workers according to qualifications and skills

- Workers in the scrap processing area (12persons)

4 persons	flame-welders	Grade 2
3 persons	semi-skilled tenters	Grade 6
2 person	crane operator	Grade 4
3 persons	unskilled workers	Grade 8

- Workers in furnace hall (55 persons)

15 persons	semi-skilled feeder	Grade 4
5 persons	solderer	Grade 1
5 persons	assistant solderer	Grade 3
5 persons	welder	Grade 2
5 persons	locksmith	Grade 4
2 person	blacksmith	Grade 3
8 persons	unskilled worker	Grade 8
10 persons	crane operator	Grade 4

- Auxiliary workshops (oxygen powder, copperworks) (40 persons)

10 persons	skilled worker	Grade 2
14 persons	pipe-fitter mechanic	Grade 3
6 persons	welder	Grade 2
10 persons	unskilled worker	Grade 9

- Central institutions (laboratory computer centre, directorate (29 persons)

5 persons	skilled worker	Grade 2
4 persons	electrician	Grade 2
2 persons	mechanic	Grade 1

8 persons driver Grade 3

4 persons tidier Grade 10

3 persons door-keeper Grade 7

3 persons unskilled worker Grade 9

The wages of workers according to ranging and allowances:

Ranging	Number of workers	Ranging wage Afs/month	Annual wage	Allowances 10^3 Afs	TOTAL Wages
Grade 1	3o	5.000	1.8oo	292	2.o92
Grade 2	11o	4.300	5.676	919	6.595
Grade 3	74	3.250	2.886	468	3.354
Grade 4	52	2.550	1.591	258	1.849
Grade 5	-	2.250	-	-	-
Grade 6	11	1.900	251	41	292
Grade 7	3	1.550	56	9	65
Grade 8	56	1.300	874	142	1.o16
Grade 9	24	1.250	36o	58	418
Grade 10	4	1.150	55	9	64
TOTAL	364	3.027	13.549	2.196	15.745

- Casting and ingot hall works (68 persons)

12 persons steel moulder Grade 2

6 persons welder Grade 2

12 persons tool setter Grade 2

8 persons crane operator Grade 4

3o persons unskilled worker Grade 8

- Workers in the rolling mill and in the finishing line (59 persons)

17 persons	rollerman	Grade 2
15 persons	assistant rollerman	Grade 3
4 persons	tool-setter	Grade 1
4 persons	tool mechanic	Grade 1
4 persons	semi-skilled tenter	Grade 6
8 persons	crane operator	Grade 4
3 persons	welder	Grade 2
4 persons	unskilled worker	Grade 9

- Ancillary works (31 persons)

11 persons	fitter	Grade 2
2 persons	turner	Grade 2
2 persons	miller	Grade 1
1 person	planer	Grade 2
4 persons	tenter	Grade 6
2 persons	crane operator	Grade 4
2 persons	motormechanic	Grade 3
7 persons	unskilled worker	Grade 9

- Maintenance units (70 persons)

3 perosns	inscriber	Grade 1
5 persons	turner	Grade 2
5 persons	miller	Grade 1
2 persons	planer	Grade 2
2 persons	grinder	Grade 1
15 persons	fitter	Grade 3
5 persons	electrician	Grade 3
5 persons	welder	Grade 2
3 persons	mechanic	Grade 1

2 persons	crane operator	Grade 4
4 persons	eng. works foreman	Grade 3
15 persons	unskilled worker	Grade 8
4 persons	pipe-fitter	Grade 3

The workers working in more shifts are entitled for 25 % allowance for the period spentin the second and 50 % allowance for the period spent in the third shift, i.e. the allowance calculated on the wage-categories:

$$\frac{2060,0+80x25+78x58}{364} = \frac{5900}{364} = 16,2\ \%$$

The wage of 225 workers is paid as direct wage-costs from the wages of the physical workers, i.e. the direct wage:

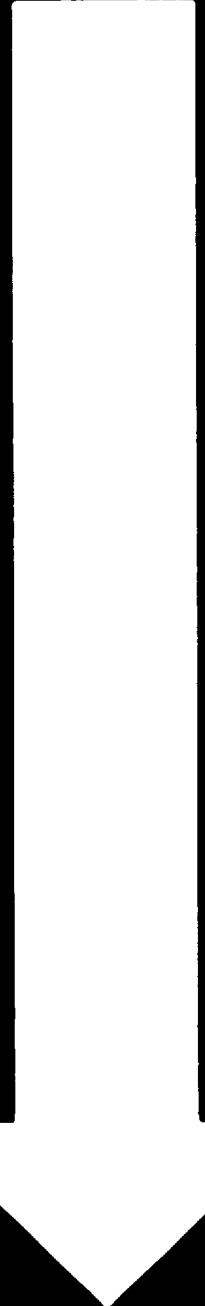
$$\frac{225}{364} \times 15.745 = \underline{9.732 \times 10^3 \text{ Afs/year}}$$

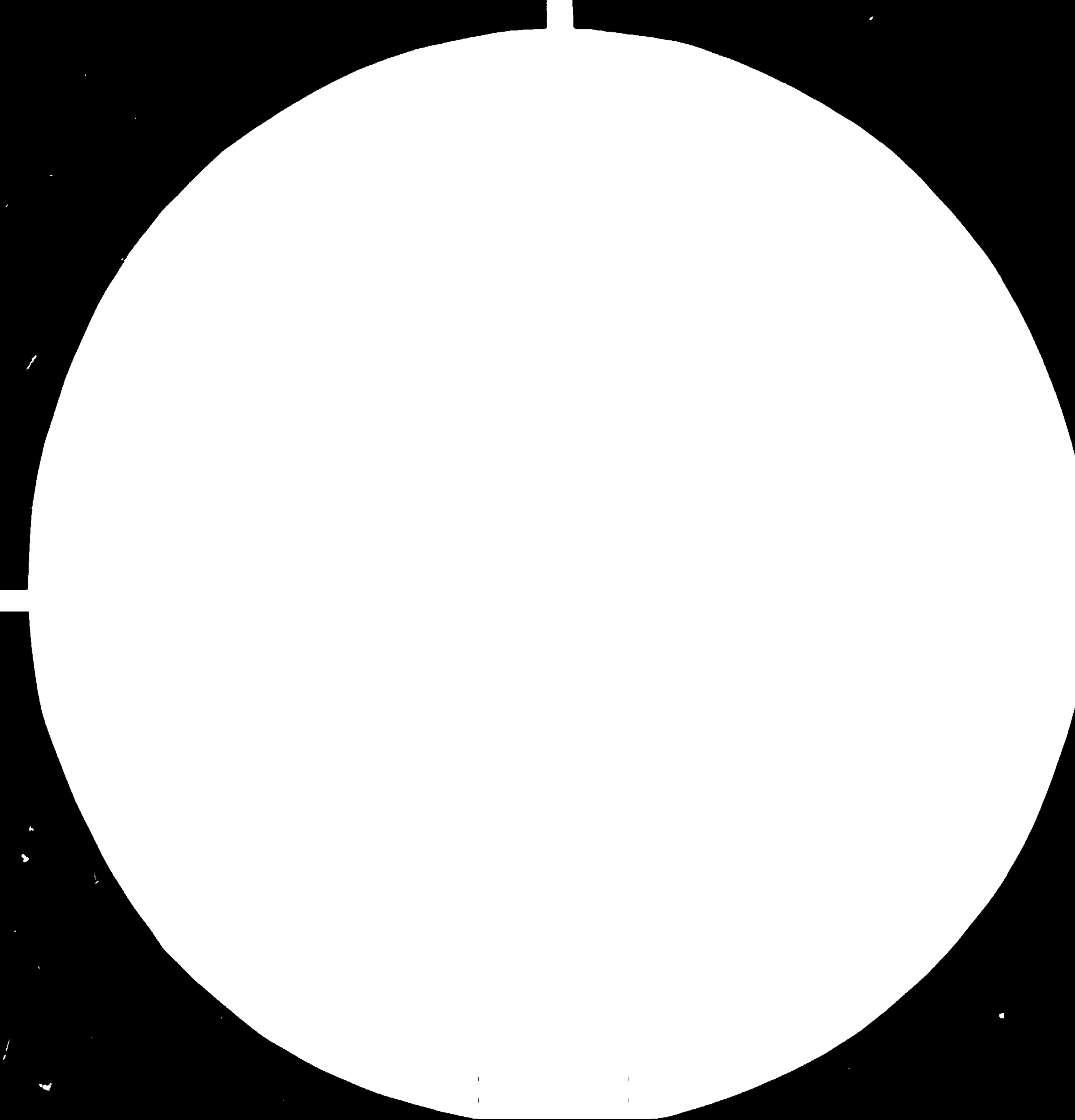
The wages of 110 workers are considered as operating general costs:

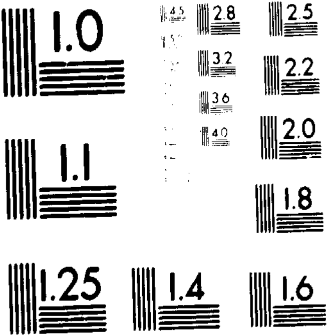
$$\frac{110}{364} \times 15.745 = \underline{4.758 \times 10^3 \text{ Afs}}$$

and the factory general costs are burdened with the wage of 29 workers:

$$\frac{29}{364} \times 15.745 = \underline{1.254 \times 10^3 \text{ Afs}}$$







MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

8.1.2. Distribution of the employees and engineers according to qualifications and rangins

Appendix 46 contains the distribution of the employees according to qualifications and field of activity of which the wage costs of employees are calculated as follows:

Ranging	Number of employees & engineers	Ranging Afs/month	Yearly wage 10^3 Afs	Premium (15%) 10^3 Afs	Total wage costs 10^3 Afs
Rank 1	1	7.500	90	14,0	1,04
Rank 2	2	6.300	151	23,0	174
Rank 3	4	5.300	254	38,0	292
Rank 4	12	4.300	619	93,0	712
Rank 5	23	3.000	938	141,0	1.079
Rank 6	32	3.100	1.190	179,0	1.369
Rank 7	10	2.700	324	49,0	373
Rank 8	6	2.400	173	26,0	199
Rank 9	7	2.200	185	28,0	213
Rank 10	7	2.000	168	25,0	193
T O T A L	104	3.279	4.092	616,0	4.708

The wages of the employees, engineers (35 persons) of the rolling mill and the steel production is charged to the <u>operating general costs,</u> i.e.:

$$\frac{35}{104} \times 4.708 = \underline{1.584 \times 10^3 \text{ Afs annually}}$$

The other employees' wages (69 persons) burden the factory general cost centers, i.e.:

$$\frac{69}{104} \times 4.708 = \underline{3.124 \times 10^3 \text{ Afs annually}}$$

8.2. Manpower for MSP in Pul-i-Charki

The total staff demand for the runnin-in period is showed in detail in Appendix 47 which consequences that 198 persons are the total staff demand of the factory of which:

155 persons workers	78,3 %
36 persons employees	18,2 %
7 persons engineers	3,5 %

Distribution of the workers (155 persons = 100 %) according to shifts:

86 persons work in one shift	55,5 %
36 persons work in two shifts	23,2 %
33 persons work in three shifts	21,3 %

8.2.1. Distribution of the workers according to qualifications and skills

The technology rates of Pul-i-Charki verticum are the same as that of the MSP in North, that is why the summary wage table (wages costs, ranging, allowance) can be made without the introduction of the details.

Ranging	Number of workers	Ranging wage Afs/month	Yearly wage 10^3 Afs	Allowances 10^3 Afs	TOTAL wage 10^3 Afs
Grade 1	15	5.000	900	146,0	1.046
Grade 2	46	4.300	2,374	385,0	2,759
Grade 3	35	3.250	1,365	221,0	1,586
Grade 4	17	2.550	520	84,0	604
Grade 5	-	2.250	-	-	-
Grade 6	4	1.900	91	15,0	106
Grade 7	2	1.550	37	6,0	43
Grade 8	21	1.300	328	53,0	381
Grade 9	12	1.250	180	29,0	209
Grade 10	3	1.150	41	7,0	48
T O T A L	155	3.145	5,836	946,0	6,782

The wages of 106 workers are paid as direct wages from the wages of the 155 physical workers, i.e.:

$$\frac{106}{155} \times 6.782 = \underline{4.638 \times 10^3 \text{ Afs annually}}$$

The wages of 35 persons are charged to the <u>operating general costs</u>, i.e.:

$$\frac{35}{155} \times 6.782 = \underline{1.531 \times 10^3 \text{ Afs annually}}$$

The wages of 14 persons are charged to the <u>factory general costs</u>, i.e.:

$$\frac{14}{155} \times 6.782 = \underline{612 \times 10^3 \text{ Afs annually}}$$

8.2.2. Distribution of employees and engineers according to qualifications and ranging in Pul-i-Charki

In connection with the trend of the wages the same procedure can be used as it was used in the preceding Chapter, i.e. the following table is to be drawn:

Ranging	Number of employees & engineers	Ranging wage Afs/month	Annual wage 10^3Afs	Premium (15%) 10^3 Afs	Total wage costs 10^3 Afs
Rank 1	1	7.500	90	14,0	104
Rank 2	2	6.300	151	23,0	174
Rank 3	3	5.300	191	29,0	220
Rank 4	5	4.300	258	39,0	297
Rank 5	10	3.400	408	61,0	469
Rank 6	10	3.100	372	56,0	428
Rank 7	4	2.700	130	19,0	149
Rank 8	2	2.400	58	9,0	67
Rank 9	3	2.200	79	12,0	91
Rank 10	3	2.000	72	11,0	83
T O T A L	43	3.506	1.809	273,0	2.082

The wages of 22 persons from the employees are charged to the operating general costs, i.e.:

$$\frac{22}{43} \times 2.082 = \underline{1.065 \times 10^3 \text{ Afs}}$$

The wages of the other employees are charged to the factory general costs, i.e.:

$$\frac{21}{43} \times 2.082 = \underline{1.017 \times 10^3 \text{ Afs/year}}$$

9. IMPELMENTATION SCHEDULING

The implementation of the investment needs the formation of a suitable investment administration, the accurate organization and harmonization of its work, the undisturbe joining of the work of the main contractor and the subcontractor acting in the investment.

For realizing the investment the O.S. and the TES having been finished - the following works should be done together with the formation of the investment organization:

- The offers and the Feasibility Study (FS) based on the technical preliminary plans should be made.
- The competent organs should decide the realization on the basis of the FS.
- The decision should start the formation of the investment organization(s), the way of securing the financial background and capital demand of the investment organization.

After establishing the investment organization the following tasks should be done:

1.) Issue of tenders for the realization (2 months)
2.) Invitation of the bidders (6 months)
3.) Selection of contractors, concluding the contracts (3 months)
4.) Contractual securing of bank-credits.
5.) Having the implementation detailed plans made (16 months)
6.) Settling the rights of ownership of the site.
7.) Making the relevant plans for training.
8.) Land preparation.

9.) Joining to public utilities networks (electric energy, water, gas, telephone, etc.)
10.) Carrying out the erection and fitting works (18 months)
11.) Delivery of equipment, machines, materials, (14 months)
12.) Fitting of machines, equipment on the spot.
13.) Purchase of materials for the operation (8-10 months)
14.) Cold operating tests (2 months)
15.) Charging the operating administration, nominations.
16.) Hot operating tests, trial operation.
17.) Transfer-taking over the investment projects to the operating enterprises(s).

The costs of the above listed activities are shown in Appendix 48 for MSP in North and in Appendix 49 for MSP in Pul-i-Charki.

The linear schedule of the implementation of the investment is illustrated in Appendix 50 for both MSP in North and MSP in Pul-i-Charki. This is valid in case of having financial sources available for the implementation should be made in form of reticulated schedule in the framework of preparing the FS in order to approach the reality of the time necessities.

10. FINANCIAL AND ECONOMIC EVALUATION

We examined three variations in respect of the MSP to be established in the northern area. The three variations differ from each other in respect of production volume, products structure and investment costs. On the basis of the examinations in the third Chapter variation 1 and 2 were rejected. This decision is supported by detailed rentability analysis. For proving this the break-even points are shwonw for the three variations.

$$\text{Break-even point} = \frac{\text{fixed production costs}}{\text{sales revenue/t - variable production costs/t}}$$

The summary of the necessary data are as follows:

(10^3 Afs)

I t e m	Variation 1	Variation 2	Variation 3
Fixed production cost	514.800	614.000	762.000
Sales revenue/t	30.800	28.900	31.600
Variable production cost/t	16.300	17.000	18.000
Break-even point (10^3 x t/year)	62,3	57,5	49,1
"0" balance production volume; lower limit of production volume	62,3 %	57,5 %	49,1 %

The above data prove spectacularly that variation 3 is the most profitable one, i.e. the MSP with 68,4 x 10^3 t/year production. The production - economic safety is much less favourable in the cases of variation 1 and 2 comparing with variation 3, so their rejection is justified.

10.1.1. Total investment costs

The total investment costs of the development chosen, their schedule are shown in Supplements 51, 52, 53, 54 and 57.

10.1.2. Project financing

Supplement 56 and 58 contain the financing plans of the investment. The detailed description of financing is introduced in Chapter 7.

10.1.3. Production costs

Supplement 55 contains the calculations and data of the total production costs. In the third Chapter we mentioned that we had analysed the trend of sales receipts at prognostic current prices that is why we considered the data, tendency of prices and stocks introduced in detail in the fourth Chapter when calculating the production costs.

10.1.4. Financial evaluation

The basic data are introduced in Supplement 59 and 60. The conclusions drawn from the tables are as follows:

- The average level of gross profit is 10,6 % during the first 10 years (3 years of investment, 10 years of production) as a result of the development which is a good result in case of metallurgical investment.

- There is no year with loss or financial deficit even at the beginning of the running-in period, moreover $354,8 \times 10^6$ Afs profit is accumulated by the end of the tenth year.

- The result makes possible the paying back of the credit in 6,5 years.

10.2. Financial and economic evaluation of MSP in Pul-i-Charki

The Jangalak development forming a variation of the Pul-i-Charki plant and having been also examined cannot be considered as a variation because of the reasons detailed in Chapter 3, that is why in this Chapter we do not deal with the analysis of this version. The rejection of variant 4 is reasoned in detail in Chapter 3.

The break-even point of Pul-i-Charki is as follows:

Fix costs	112.600×10^3 Afs
Variable costs	16.970 Afs/t
Sales receipts	3.140 Afs/t

$$\text{Break-even point} = \frac{112,6}{31,7 - 16,97} = \underline{7,6 \times 10^3 \text{ t}}$$

It means that the production can reach its rentability if the production volume decreases to its 38 %, i.e. in case of one shift production. It is more favourable than in the case of the MSP in North.

10.2.1. Total investment costs

Supplement 61, 62, 63, 64 and 68 introduce the costs necessary for the implementation of the investment, their annual schedule. We wish to emphasize that the costs of development and renovation of the rolling mills already existing are not included in the appendixes listed.

10.2.2. Project financing

The financing plan of the investment is introduced in Supplement 66 and 67. The financing proposal was introduced in detail in Chapter 7.

10.2.3. Production costs

Supplement 65 shows the calculation of the total production costs. The costs - just like the sales receipts - were calculated on prognostic current prices. The data, prices, stocks, used for the calculation of the costs were introduced in detail in Chapter 4.

10.2.4. Financial evaluation

Supplement 69 and 70 show the data and future tendency of the development in detail. The conclusions drawn are as follows:

- The average gross profit level is 22,3 % for the first 10 years.
- The average net profit level is 18,5 % for the first 10 years.

Both values are excellent!

- There is no year with loss or financial deficit in the period of the running-in, moreover $775,9 \times 10^6$ Afs is accumulated by the end of the tenth year.
- The result of the development secures the repayment of the credits in 6,5 years.

10.3. National economic evaluations

The two plants previously introduced are economic, profitable enterprises and they can consider suitable economic possibilities.

Though the implementation of the proposed two plants demand great investment, it will produce favourable conditions for the national economy of the Afghan People's Republic tha can be summarized as follows:

- It secures favourable raw material supply for the industry, first of all for the building industry.
- Significant import becomes unnecessary - $35\text{-}40 \times 10^6$ \$/year starting from the year of the running-in - which makes the increase and the development of the supply of other fields of the national economy possible.
- The supply from inner sources decreases the purchase costs of the rolled articles, first of all through decrease of the significant transportation costs.
- The development makes it possible that a significant quantity of steel and iron scrap without present use-value could get into the circulation of the national economy and could increase the income of the Afghan national economy.

In favour of promoting the favourable possibilities of the national economy listed above, the following are proposed:

a) The Pul-i-Charki development should represent the first stage of the implementation. This should be followed by the implementation of the northern plant, possibly even with the overlap of the implementation.

b) The processing of the steel and iron scrap in the south, south-west area is not economical because of its relatively small quantity and its great distance from the site of the processing. That is why it would be advisable to lift the export restrictions of the steel and iron scrap in this region (Herat, Forak, Nimróz, Hellend, Kandahar), moreover it is suggested to form a state organization for the promotion of the export of this territory.

List of Government officials contacted by UNIDO Experts in MSP for discussions concerning the development of the Metallurgical Industry in Afghanistan.

Date (1983)	Persons	Position	Ministry Dept. Establishment or Office
23/4	Mr.Ingolf Shultz Müller	Resident Representative	U N D P
24/4	Mr. M.Ekawa	President	MMI Design Dept.
25/4 and conti.	Mr.Nosir Ahmad Mr.G.M. Alifi Mr.A.G.Walesmal Mr.M.Y.Noor	Members of the Board	MMI Design Dept. Board of Technical & Economical Studies
4/5	Mr. Aziz Zoda	Techn. Director	Jangalak M.W.
5/5	Mr. Abdul Wahab Ghafuri	President	Pul-i-Charki Industrial Est.
7/5	Mr. Yari	Programm Offical	U N D P
8/5	Mr.Poyan Chouk Mr. Wais Miaden Mr. Salang Wat		Scrap depositing in Kabul city
9/5	Mr.G.Hussein Bayat	President	Ministry of Comm. Foreign Trade Department
9/5	Mr.K.M.Kosar Mr. Khaviullah Azizi	General Director President	Ministry of Commerce Foreign Department
10/5	Mr.Assadullah	President	Ministry of Finance Customs Department
11/5 12/5 19/6	Mr.Doud Soroush	General President	Central Authority for Buildings & Town Planning

Date (1983)	Persons	Position	Ministry Dept. Establishment or Office
12/5	Mr.Abdul Azim Ahmadzai	President	Ministry of Finance Income Dept.
14/5	Mr.M.Sh.Zadran	President	Ministry of Energy & Power Planning Department
16/5		President	Ministry of Agriculture Planning Department
16/5	Mr.Abdul Hamid Barna	Dpty.President	Kabul Municipality
17/5	Mr.Riaul Eger Alexandrovich	Expert	Topographic Inst.
18/5	~~Mr.Kawel~~ Ms - Kaiere	Dpty President Representative	U N D P
19/5	Mr.Surkhabi	President	Town Planning Comm. Private Investment Department
21/5	Mr.K.M. Kosar	General Director	Planning Committee Pul-i-Charki Rolling Mills
22/5	Mr. German R. Borisov	Economic Counsellor	USSR Embassy
23/5		President	Ministry of Transport Planning Dept.
24/5	Mr. Noori Abdul	Vice President	MMI Planning Dept.
24/5	Mr. Hagi Mohhamad Nawzadi	President	MMI Geological Dept.
25/5	Mr. Hamayan Tay	President	MMI Central Dept. of Coal
31/5	Mr. Khalil	President	Bitumen Works
15/6	Mr. Tahmas	President	Central Statistics Organization

Date (1983)	Persons	Position	Ministry Dept. Establishment or Office
15/5 16/5	Mr. Akrany	Vice President	Ministry of Energy & Tower Planning Department
18/8	Mr. Bonozai	Vice President	Jangalak Metal Works

Supplement 2/1

Details of Data requirement	Source of Information: Source of Data	Method ofobtaining dat.	Meeting Time	Data of Providing Data	Activities performed by Expert	Status
1. Steel scrap data in Kabul	-	-	4/5/83, 8/5/83	-	Personally visited Janga-lak, Salang Watt, Payan Chouk	O.K.
2. Steel/iron scrap data in Afghanistan	-	-		Around lo. July	Give the method of investigation and justification of quantity and quality to BTS on May 16	
3. Demand for rolled steel for mines and industries	M.M.I.			to 10 July	Questionaire given	
4. Demand for rolled steel for construction	M.of Public Works		13/5/83	21/5/83	Questionaire given	C.K.
5. Demand for rolled steel for energy industries	M.of Power		14/5/83	23/5/83	Questionaire given	
6. Demand for rolled steel in Agriculture	M.of Agric.		16/5/83	25/5/83	Questionaire given	
7. Demand for rolled steel for transportation	M.of Transp.		23/5/83	Around 7. Jun.	Questionaire given	
8. Demand for rolled steel for Defence Ministry	M.of Defence	Sending later	Send	2o.Jun.	Questionaire given	
9. Aims of Industrial Policies			9/5/83		Personal information and Analysis of information	O.K.
1o. Data for Steel import	M.of Commerce		8/5/83	6.Jun.	Questionaire has been given	
11. Financial and Economical Role	M.of Finance		12/5/83		Personal Information and Analysis of Information	O.K.

Supplement 2/1

	Details of Data requirement	Source of Information: Source of Data	Method ofobtain-ing dat.	Meeting Time	Data of Providing Data	Activities performed by Expert	Status
12.	Customs Tariff	M.of Finance		10/5/83		Personal Information	O.K.
13.	Master Plan of Kabul Cyti	Kabul Ministry		16/5/83	23/5/83	Personal Information	O.K.
14.	Road Map of Afghanistan	Cartographic Dep.			7.July		O.K
15.	Geological data for Pul-i-Charky and Janga-lak areas Map 1:2000				End of May		
16.	Possibilit of Electric Supply	M.of Power		14/5/83		Personal Information	O.K
17.	Possibility of gas, coal, water and oil supply	M.of Water M.of Cammerce M.M.I.		24-25-26 May	10.Jun.		O.K
18.	The basic cost of Const-ruction Work	M.of Public		13/5/83	21/5/83		O.K
19.	The pricelist of Indust-rial Products	H.C.C.			15.Jun.		n.d
20.	Data of iron ore deposit in Afghanistan	M.M.I.					O.K
21.	Data of Coal deposit	M.M.I.		24.May	5.Jun.		O.K
22.	Data of natural gas and oil of Afghanistan	M.M.I.		25.May	6.Jun.		O.K
23.	Official exhange rate of Afghanistan to US Dollars	DA Afghanistan Bank			End of		O.K

[illegible]

[illegible]

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[illegible]

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د کانو او صنایعو وزارت

د پلان ریاست

د تخنیکي او اقتصادي مطالعاتو لوی مدیریت

پرسشنامه درمورد نیازمندي به تولیدات فولادي جدول ذیل :

تفصیلات	سال ۱۳۶۰ (۱۹۸۱)		سال ۱۳۶۱ (۱۹۸۲)		سال ۱۳۶۶ (۱۹۸۷)		سال ۱۳۷۱ (۱۹۹۲)	
	قیمت به هزار افغانی	مقدار به تن	قیمت به هزار افغانی	مقدار به تن	قیمت به هزار افغانی	مقدار به تن	قیمت به هزار افغانی	مقدار به تن
میله های فلزي بقطر کمتر و بیشتر از (۲۰) ملی متر								
تخته های نازک فلزي								
تخته فلزي								
میله های چارریخ								
میله های شش رخ								
میله ها T بشکل								
میله ها I بشکل								
میله ها U بشکل								
انگل ایرن								
پیپ								
و پروفیل								
سایر تولیدات								

وزارت معادن و صنایع

ریاست پلان

مدیریت‌عمومی بورد مطالعات تخنیکی و اقتصادي

پرسشنامه‌ٔ جمع اوري داغمه جات

۱ ـ اسم و ادرس موسسه .....

۲ ـ موقعیت داغمه جات د رموسسه .....

۳ ـ مسافه‌ٔ محل داغمه جات از سرك قیر به کیلو متر .....

٤ ـ اندازه مساحه‌ٔ احتوا شده داغمه جات به مترمربع .....

٥ ـ ارتفاع وسطی داغمه جات به متر .....

٦ ـ ترکیب داغمه جات و تخمین فیصدي ان قرار تابلوي ذیل :

شماره	نو ع داغمه جات	تخمین فیصدي از لحاظ حجم
۱	براده ماشین خرادي	
۲	اجزاي کوچك داغمه جات	
۳	داغمه جات که وزن ان از ٤٠ کیلوگرام سنگین باشد	
٤	داغمه جات که وزن ان از ٤٠ کیلوگرام تجاوز نکند	
٥	داغمه جات ریخت شده که وزن ان از ٤٠ کیلو گرام سنگین باشد	
٦	داغمه جات ریخت شده که وزن ان از ٤٠ کیلو گرام تجاوزنکند	
۷	میله ها و داغمه جات غیر ریخت شده	
۸	اجزاي سنگین موتر پارچه شده	
۹	اجزاي موترپارچه شده که بصورت قطعات تخته باشد	
۱۰	موترکه به قطعات کوچك پارچه نگردیده باشد	
۱۱	انواع دیگر داغمه جات	

۷ ـ مجموع وزن تخمین به تن

۸ ـ عکس از موقعیت داغمه جات به زاویه‌ٔ °۹۰ در صورتیکه یکنفر د روسط داغمه جات استاده باشد .

۹ ـ توضیحات و عکس از محل که داغمه جات [illegible]

Some characteristic data on Democratic Republic of Afghanistan

Description	1357	1358	1359	1360	1361
Total population 10^6 p.	15,16	15,55	15,96	16,36	no data
Urban population 10^6 p.	1,89	1,98	2,07	2,17	no data
Rural population 10^6 p.	10,83	11,07	11,33	11,58	no data
Nomad population 10^6 p.	2,44	.2,50	2,55	2,61	no data
Territory of the country		652.225 km^2			
Population km^2/p.	19,5	20,0	20,6	21,0	no data
Manpower 10^6 p.	3,55	3,63	3,73	3,83	no data
Staff 10^6 p.	3,32	3,44	3,53	3,62	no data
National income 10^9 Afs	111,8	112,4	112,8	111,9	120,0
National income prod.	95,6	94,7	92,1	94,3	97,8
Industrial mines, energy	14,5	14,0	13,7	12,9	14,5
Agriculture, forestry	61,9	63,7	63,1	65,5	65,8
Construction	4,3	3,8	2,9	3,4	4,6
Transport	3,5	3,1	2,8	2,7	2,9
Trade	9,7	8,7	8,2	8,4	8,6
Other	1,7	1,4	-	-	-
Electricity 10^6 kWh	845,4	907,8	965,2	1018,3	1088,0

Description	1357	1358	1359	1360	1361
Natural gas $10^6 m^3$	2461,0	1327,0	2790,3	2674,6	2700,0
Coal 10^3 t	218,2	131,9	118,7	124,9	140,0
Cement 10^3 t	126,5	99,3	87,2	77,1	130,0
Ginned Cotton 10^3 t	41,5	29,4	23,0	14,0	27,0
Exports 10^6 USD	321,8	493,7	705,2	694,3	712,4
Imports 10^6 USD	407,8	425,5	551,7	622,4	675,3
Total industrial output	243	248	257	272	no data
Private	145	144	151	169	no data

Investment Cost Estimation

Preliminary studies and preparatory investigations

No.	Item Description	Foreign 10^3 USD	Local costs 10^6 Afs	T O T A L 10^6 Afs
1.	Preliminary studies			
1.1.	Opportunity studies	40	0,5	2,5
1.2.	Pre-feasibility studies	60	0,6	3,6
1.3.	Feasibility studies	250	2,5	15,0
1.4.	Partial studies	10	0,3	0,8
1.5.	Expert, consultant & engineering fees	-	0,8	0,8
2.	Preparatory investigations			
2.1.	Surveying, quantity tests	2	4,9	5,0
2.2.	Other investigations	5	0,2	0,5
3.	Others	3	-	0,2
	T O T A L	370,0	9,8	28,3

Supplement 10

Steel products imported by Democratic Republic of Afghanistan

10^3 t

Description	1344	1347	1348	1349	1353	1354	1355	1356	1357	1358	1359	1360	1361
	1965	1968	1969	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Steel import for investment	7,8	9,9	14,1	no data	n.d.	4,2	7,7	no data	n.d.	n.d.	n.d.	n.d.	n.d.
Steel import for production	7,7	8,0	9,0	9,8	8,9	12,0	11,0	20,9	17,0	13,6	16,7	32,7	38,2
Total steel import	15,5	17,9	23,1	9,8	8,9	16,2	18,7	20,9	17,0	13,6	16,7	32,7	38,2
Increasing rate of import connected with production as compared to 1344.th	1,00	1,038	1,169	1,273	1,156	1,558	1,428	2,714	2,208	1,766	2,169	4,247	4,96
Annual average increasing rate of five years		4,9	4,9	4,9	4,1	4,1	5,6	5,6	5,6	5,6	5,6	31,7	31,7

Compound of Steel products imported by DRA

Description	1347		1348		1353		1354		1355		1356		1358		1359		1360		1361	
	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%	10^3t	%
Total import	8,0	100,0	9,0	100,0	8,9	100,0	12,0	100,0	11,0	100,0	20,9	100,0	13,6	100,0	16,7	100,	32,7	100	38,2	100
Pig,cast iron	0,4	5,0	0,3	3,3	-	-	-	-	0,2	1,8	0,1	0,5	0,1	0,7	0,1	0,6	-	-	-	-
Steel sections	0,2	2,5	c,1	1,1	0,2	2,2	0,4	3,3	0,2	1,8	0,4	1,9	1,0	7,4	2,0	12,0	5,0	15,3	8,1	21,2
Rods, wires	3,3	41,2	3,4	37,9	0,6	6,7	0,8	6,7	0,4	3,6	0,1	0,5	3,5	25,7	5,0	29,9	17,0	52,0	18,7	[illegible]
Billet	-	-	-	-	4,6	51,7	5,3	44,2	-	-	7,1	34,0	0,5	3,7	1,0	6,0	3,0	9,1	3,3	8,6
Pipes	0,2	2,5	0,4	4,4	0,2	2,2	0,6	5,0	1,2	10,9	1,0	4,8	0,3	2,2	0,7	4,2	0,7	2,1	0,8	2,1
Seets	2,3	28,8	2,2	24,4	-	-	0,1	0,8	-	-	0,4	1,9	3,1	22,8	5,2	31,1	5,7	17,4	5,8	15,1
Nails bolts	1,1	13,8	1,1	12,2	-	-	0,1	0,8	0,1	1,8	0,1	0,5	0,1	0,7	0,2	1,2	0,2	0,6	0,2	0,5
Others	0,5	6,2	1,5	16,7	3,3	37,2	4,7	39,2	8,9	80,1	11,7	55,9	5,0	36,8	2,5	15,0	1,1	3,5	1,3	3,5
- Steel mat.	-	-	-	-	0,1	1,1	0,1	0,8	0,5	4,5	1,1	5,3	1,0	7,4	1,0	6,0	0,8	2,4	0,8	2,1
- Steel structures	-	-	-	-	-	-	-	-	-	-	0,3	1,4	0,4	10,3	0,2	1,2	0,2	0,6	0,2	0,5
- spare parts	-	-	-	-	3,2	35,9	4,3	35,8	4,6	41,8	10,0	47,8	1,5	11,0	0,9	5,4	0,1	0,3	0,1	0,3

Price-variation of imported steel by DRA

Description	1974		1975		1976		1977		1978		1979		1980		1981	
	1353		1354		1355		1356		1357		1358		1359		1360	
	$/t	%	$/t	%	$/t	%	$/t	%	$/t	%	$/t	%	$/t	%	$/t	%
Pig- Cast iron	-	-	-	-	64,9		143,4		269,0		395		520		-	-
Steel section	300,8	100	287,1	92,5	228,5	76,0	287,8	95,7	340,9	113,3	520,	172,8	416	138,3	450	149,6
Rods	442,5	100	284,1	64,2	206,9	46,8	450,1	101,7	313,9	70,9	384,0	86,8	454,1	102,6	459	103,7
Wire	487,6	100	412,7	84,6	-	-	-	-	397,6	81,5	425,9	87,3	454,1	93,1	455	93,3
Billet	289,4	100	287,9	99,5	-	-	250,5	86,6	260,0	89,8	579,4	200,0	474,3	163,9	485	167,5
Pipe	524,2	100,	493,2	94,1	557,1	106,3	358,4	68,4	516,5	98,5	841,4	160,5	609,7	151,5	750,1	143,1
Sheet	-	-	400,0	100,0	-	-	409,9	102,5	379,3	94,8	444,4	111,1	566,6	141,7	536,9	134,2
Nails, bolts	-	-	895,3	100,0	706,1	78,9	568,9	63,5	900,0	100,5	1350,0	150,8	1590,0	177,6	1646,1	183,9
Steel mat	-	-	395,5	100,0	409,0	101,4	429,6	108,6	465,9	117,8	502,3	127,0	538,6	136,2	526,0	133,0
Steel structure	104,0	100,0	-	-	144,0	138,5	257,4	247,5	355,0	341,3	452,5	435,1	550,0	528,8	555,4	534,0
Spare parts	400,3	100,0	344,2	86,0	354,3	88,5	430,3	107,5	901,0	225,1	1372,1	342,8	1843,4	460,5	1094,3	473,2
Total import average price	353,8	100,0	327,7	92,6	322,0	91,0	358,5	101,3	359,4	101,6	494,1	139,7	586,8	165,0	630,8	178,2
Total price 10^6 $	31,1	100,0	38,7	124,4	35,1	112,9	73,6	236,6								

Supplement 12

Supplement 13

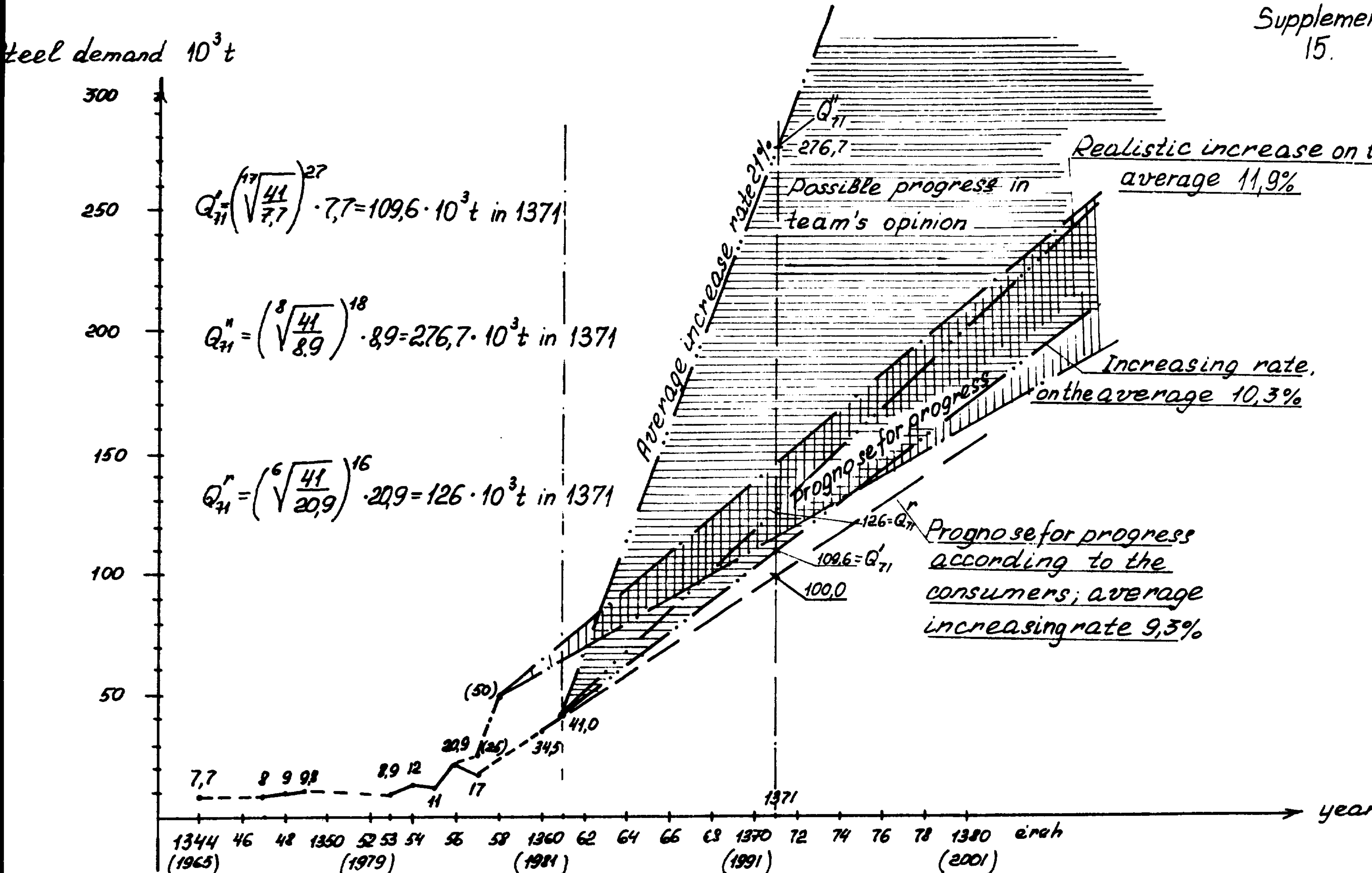
Demand of steel products for building construction on the basis of Shtapa' data

Description		1360 /1981/ Tonna	develop. %	1361/1982 Tonna	develop. %	1371/1982 Tonna	develop. %	Annual average %
Billet		3000	9,95	3300	110,0	8.400	280,0	9,8
Round bars:	Ø 20 mm	8000	26,53	9800		22.400		
	Ø 20 mm	7000	23,22	7700		19.600		
	twisted bars	2000	6,63	2200		5.600		
	Total	17000	56,38	18700	110,0	47.600	280,0	9,8
Sections:	angle	1500	4,98	2550		6.000		
	I	1500	4,98	2550		6.000		
	T	500	1,66	850		2.000		
	U	1000	3,32	1700		4.000		
	Flats	500	1,66	850		2.000		
	Total	5000	16,58	8500	170,0	20.000	400,0	13,4
Profiles :	open	1000	3,32	1200		3.500		
	closed	500	1,66	600		1.000		
	Total	1500	4,98	1800	120,0	4.500	300,0	
Steel pipe		150	0,5	200	133,3	500	333,3	11,6
Plate steel:	electro pl.flat	1400	4,64	1750		3.150		
	" corrugated	600	1,99	750		1.350		
	Total	2000	6,63	2500	125,0	4.500	225,0	7,6
Other		1500	4,98	1850	120,0	3.400	235,0	8,1
Grand Total		30150	100,00	36850	122,2	88.900	294,9	10,3

Demand on rolled steel of Jangalak Metal Works (upon personal information)

D e n o m i n a t i o n	1360 (1981) T	%	1361 (1982) T	%	1371 (1992) T	%	Annual average development %
Round steel							
Ø 1,6-6 mm	60		100		120		
Ø 6-20 mm	40		50		80		
Ø 20-50 mm	110		150		220		
Ø 50 mm	390		400		780		
T O T A L	600	32,4	700	31,8	1200	32,5	6,5
Sections							
angle	300		400		600		
U	250		350		500		
T O T A L	550	29,7	750	34,1	1100	29,7	6,5
Rolled bars	80	4,3	100	4,5	160	4,3	6,5
Plate							
thickness 1-4 mm	90		100		180		
thickness 4-25 mm	480		500		960		
T O T A L	570	30,8	600	27,3	1140	30,8	6,5
Other	50	2,8	50	2,3	100	2,7	6,5
GRAND TOTAL	1850	100,0	2200	100,0	3700	100,0	6,5

Supplement 15.



Supplement 16

Demand of rolled steel of DRA 10^3 t

Year / Description	1361 1982	1362 1983	1363 1984	1364 1985	1365 1986	1366 1987	1367 1988	1368 1989	1369 1990	1370 1991	1371 1992	Annual average development %
Billet:												
-utilization	3,3	3,6	3,9	4,4	4,8	5,3	5,8	6,3	7,0	7,7	8,4	9,8
-Pul-i charki Rolling Mill	-	-	-	-	-	0,8	1,9	3,4	4,4	5,6	7,1	24,4
Round bars												
-Ø 20 mm	9,0	10,2	11,6	13,2	14,9	17,0	19,2	21,9	24,8	28,2	32,0	13,5
-Ø 20 mm	11,4	12,6	13,9	15,4	17,1	18,7	20,8	22,9	25,2	27,8	30,7	10,4
Total	20,4	22,8	25,2	28,6	32,0	35,7	40,0	44,8	50,0	56,0	62,7	11,9
Section												
-flat steel	1,0	1,1	1,2	1,4	1,5	1,7	1,9	2,1	2,3	2,5	2,8	10,8
-angle steel	3,2	3,5	3,9	4,3	4,7	5,2	5,7	6,3	6,9	7,6	8,4	10,1
- I	2,6	2,9	3,2	3,6	4,0	4,4	4,9	5,5	6,1	6,8	7,6	11,3
- T	1,0	1,1	1,2	1,3	1,4	1,6	1,7	1,9	2,1	2,3	2,5	9,6
- U	1,9	2,1	2,4	2,6	3,0	3,3	3,7	4,2	4,6	5,2	5,7	11,6
Total	9,7	10,7	11,9	13,2	14,6	16,2	17,9	20,0	22,0	24,4	27,0	10,8
Profiles												
-open	1,3	1,5	1,7	1,9	2,1	2,4	2,7	3,1	3,5	4,0	4,5	13,2
-closed	0,6	0,6	0,7	0,8	0,9	0,9	1,0	1,0	1,1	1,2	1,3	8,0
Total	1,9	2,1	2,4	2,7	3,0	3,3	3,7	4,1	4,6	5,2	5,8	11,8
Steel pipe	0,2	0,2	0,3	0,3	0,3	0,3	0,4	0,4	0,5	0,5	0,6	11,6
Steel sheets												
-Electro plate	2,1	2,3	2,5	2,7	2,9	3,2	3,5	3,8	4,1	4,5	4,9	8,8
-black	1,2	1,3	1,4	1,5	1,6	1,7	1,8	1,9	2,1	2,2	2,3	6,7
Total	3,3	3,6	3,9	4,2	4,5	4,9	5,3	5,7	6,2	6,7	7,2	8,1
Nails, bolts	0,6	0,7	0,7	0,8	0,9	1,0	1,1	1,2	1,3	1,5	1,6	10,3
Other	1,6	2,1	2,7	3,2	4,1	4,1	4,1	4,1	4,1	5,0	5,6	13,3
Grand total	41,0	45,8	51,3	57,4	64,2	71,6	80,2	90,0	100,1	112,6	126,0	11,9

Estimation of the Production Cost

Sales and distribution costs 10^3 USD				
No.	Item description	Cost		
		Foreign	Local	Total
1.	Sales cost			
1.1.	Training of salesmen and merchants	4,5	18,0	22,5
1.2.	Advertising	-	12,0	12,0
1.3.	Travel expenses	-	10,8	10,8
1.4.	After sales services communication	-	9,6	9,6
2.	Distribution costs			
2.1.	Transport	-	735,5	735,5
2.2.	Commissions	-	5,2	5,2
	T O T A L	4,5	791,1	795,6
	T O T A L in 10^6 Afs	0,2	39,6	39,8

Transportation Costs

Item	10^3t	km	Afs/t.km	$/t.km	10^3 $
Shiberghan	15,0	220	2,5	0,05	165,0
Kabul	29,5	160	2,5	0,05	236,0
Kandahar	4,5	660	2,5	0,05	148,5
Herat	3,05	1240	2,5	0,05	186,0
T O T A L	52,0	-	2,5	0,05	735,5
T O T A L in 10^6 Afs					36,8

Considered variations to satisfy the demand for rolled steel in DRA 10^3 t

Description	Demand in 1371	Variation 1				Variation 2				Variation 3				Variation 4				
		A1	Co	Total home prod.	imp.	A2	C1	Total home prod.	imp.	A3	C2	Total home prod	imp.	A3	B1	C3	Tt h. prod	im
Billet	8,4	8,4	-	8,4	-	8,4	-	8,4	-	8,4	-	8,4	-	8,4	-	-	8,4	-
Round bars,wires	62,7	60,0	-	60,0	2,7	60,0	-	60,0	2,7	60,0	-	60,0	2,7	60,0	-	-	60,0	2,7
Section	27,0	20,0	6,3	26,3	0,7	-	18,9	18,9	8,1	-	20	20	7,0	-	-	6,3	6,3	20,7
Profiles,pipes	6,4	-	-	-	6,4	-	-	-	6,4	-	-	-	6,4	-	-	-	-	6,4
Sheet	7,2	-	-	-	7,2	-	-	-	7,2	-	-	-	7,2	-	-	-	-	7,2
Nails	1,2	-	-	-	1,2	-	-	-	1,2	-	-	-	1,2	-	-	-	-	1,2
Other	5,6	-	-	-	5,6	-	-	-	5,6	-	-	-	5,6	-	-	-	-	5,6
Total roll.prod.	118,5	88,4	6,3	94,7	23,8	68,4	18,9	87,3	31,2	68,4	20	88,4	30,1	68,4	-	6,3	74,7	43,8

Vertical relations

Description	A1	Co	A2	C1	A3	C2	A3	B1	C3
Vertical billet demand	+7,1	-7,1	+21,2	-21,2				+7,9	-7,9
Round steel or billet	67,2		67,2		67,2		67,2		
Section or billet	22,4	7,1		21,2		22,4			7,9
Finished prod.	8,4		8,4		8,4		8,4		
Total billet prod.	105,1	96,8	96,8		75,6		75,6		
						22,4		7,9	
Liquid steel prod.	111,0		102,6		80,1	23,7	80,1	9,0	

Programme of Sale of MSP products according to variations

Variation	Description of product.	Standard price		1st year /1368/			2nd year /1369/			3rd year /1370 /			4st year / 1371 /		
		Afs/t	$/t	10^3t	10^6Afs	$10^3$$	10^3t	10^6Afs	$10^3$$	10^3t	10^6Afs	$10^3$$	10^3t	10^6Afs	$10^3$$
A1	Cont.cast.billet	14500	290	4,8	8[illegible],6	1771,	5,6	106,9	2139	7,0	138,3	2767	7,1	145,2	2904
	Reroled billet	19250	385	6,3	154,3	3086	7,0	177,4	3549	7,7	202,0	4040	8,4	228,1	4562
	Round bar	22950	459	15,0	434,0	8760	20,0	604,4	12088	25,8	807,0	16140	28,5	922,6	18433
	wire	22750	455	15,0	434,2	8683	20,0	599,2	11983	27,0	837,2	16743	31,5	1010,9	20217
	Section bar	22500	450	13,9	397,[illegible]	7958	14,4	426,6	8533	18,5	567,3	11346	20,0	634,6	12695
	Total			55,0	151[illegible],0	30258	67,0	1914,5	38292	86,0	2551,8	51036	95,5	2941,6	58932
A2	Cont.cact billet	14500	290	8,7	160,5	3210	15,0	286,4	5728	19,5	385,4	7707	21,2	433,6	8672
	Rerolled billet	19250	385	6,3	154,3	3086	7,0	177,4	3549	7,7	202,0	4040,	8,4	228,1	458
	Round bar	22950	459	15,0	434,0	8760	20,0	604,4	12088	25,8	807,0	16140	28,5	922,6	18453
	wire	22750	455	15,0	434,2	8683	20,0	599,2	11983	27,0	837,2	16743	31,5	1010,9	20217
	section bar	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total			45,0	1187,0	23739	62,0	1167,4	33348	80,0	2231,6	44630	89,6	2595,2	51904
A3	Cont. cast, billet	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reroled billet	19250	385	6,3	154,3	3086	7,0	177,4	3549	7,7	202,0	4040	8,4	228,1	4562
	Round bar	22950	459	15,0	434,0	8760	20,0	604,4	12088	25,8	807,0	16140	28,5	922,6	18453
	wire	22750	455	15,0	434,2	8683	21,0	629,1	12582	28,5	837,2	16743	31,5	1010,9	20217
	Section bar	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	36,3	1026,5	20529	48,0	1410,9	28219	62,0	1846,2	36923	6[illegible],4	2161,6	43232

Note: increase rate is 3,5 % on the base of starting price in year 1361.

Programme of Sale of other small metallurgical plant which functions beside MSP

Symb.	Description of product.	Standard price		1.year /1368/			2.year /1369/			3.Year /1370/			4.year /1371/		
		Afs/t	\$/t	lo^3 t	lo^6 Afs	lo^3 \$	lo^3 t	lo^6 Afs	lo^3 \$	lo^3 t	lo^6 Afs	lo^3 \$	lo^3 t	lo^6 Afs	lo^3 \$
B1	Casted billet	1375o	275	5,4	94,5	1809	6,3	114,[illegible]	2281	7,8	146,2	2923	7,5	153,2	3065
Co=C3	Section bar	225oo	45o	4,3	123,1	2462	5,o	142,[illegible]	2963	6,2	19o,1	38o3	[illegible]	2oo,o	3999
C1	"	225oo	45o	7,8	223,3	4466	13,4	[illegible]	794o	17,4	533,6	1o672	[illegible]	599,9	11997
C2	"	225oo	45o	7,o	2oo,4	4oo8	13,3	394,[illegible]	7381	18,o	552,o	11o4o	2o,o	634,8	12695

Note: A1 = 111 x lo^3 ton yeary capacity plant } established at northern industrial plant of the country

A2 = 1o3 x lo^3 " } Pul-i-Khumuri or Mazari Sharif

A3 = 3o x lo^3 "

B1 = 8 x lo^3 "

Co = C3 = Renewed Rolling Mills in Pul -i -Khumry for one shift

C1 = " " " three shifts

C2 = " " " " and completed by a horisontal continous casting mach machine

Supplement 2o

Summary Programme of Sale for all Variations

Variation	Producing unit	1. Y /1368			2. Y /1369/			3. Y /1369/			4. Y /1371/		
		10^3 t	10^6 Afs	10^3 $	10^3 t	10^6 Afs	10^3 $	10^3 t	10^6 Afs	10^3 $	10^3 t	10^6 Afs	10^3 $
No.1	111×10^3 t/y ISP in north A1	55,o	1513,o	30257,9	67,o	1914,5	38291,	86,o	2551,8	51036,o	95,5	2941,6	58831,8
	Pul-i-Charky Co	4,3	123,1	2461,9	5,o	148,1	2962,8	6,2	190,1	38o2,5	6,3	200,o	3999,o
	Total	59,3	1636,1	32719,8	72,o	2062,6	41254,3	92,2	2741,9	54838,5	1o1,8	3141,6	6283o,8
No.2.	102×10^3 t/y ISP in north A2	45,o	1107,o	23738,8	62,o	1667,4	33348,2	8o,o	2231,6	4463o,4	89,6	2595,2	51903,4
	Pul-i-Charki C1	7,8	223,3	4465,7	13,4	397,o	794o,4	17,4	533,6	1o671,5	18,9	599,9	11997,2
	Total	52,8	141o,3	282o4,5	75,4	2o64,4	41288,6	97,4	2765,2	553o1,9	1o8,5	3195,1	639o1,5
No.3.	80×10^3 t/y ISP in north A3	36,3	1o26,5	2o528,8	48,o	141o,9	28219,2	62,o	1846,2	36923,2	68,4	2161,6	43232,o
	Pul-i-Charki C2	7,o	2oo,4	4oo7,7	13,3	394,1	7881,1	18,o	552,o	11o39,5	2o,o	634,8	12695,4
	Total	43,3	1226,9	24536,5	61,3	18o5,0	361oo,3	8o,o	2398,2	47962,7	88,4	2796,4	55927,4
No.4.	80×10^3 t/y ISP in north A3	36,3	1o26,5	2o528,8	48,o	141o,9	28219,2	62,o	1846,2	36923,2	68,4	2161,6	43232,o
	Jangalak M.V.D1	5,4	94,5	1889,3	6,3	114,1	2281,4	7,8	146,2	2923,4	7,9	153,2	3o64,5
	Pul-i-Charky C3	4,3	123,1	2461,9	5,o	143,1	2962,8	6,2	19o,1	38o2,5	6,3	2oo,o	3999,o
	Total	46,o	1244,1	2488o,o	59,3	1673,1	33463,4	76,o	2182,5	43649,1	82,6	2514,8	5o295,5

Supplement 21

Valuation of variations

Points of Valuation	Variation 1.		Variation 2.		Variation 3.		Variation 4.	
	Parameter	Position	Parameter	Position	Parameter	Position	Parameter	Position
Liquid steel consumption for one ton finished product kg/t	1172,1	1.	1175,2	3.	1174,2	2.	1192,8	4.
Billet for - " - - " -	1109,8	3.	1108,8	2.	1108,6	1.	1117,8	4.
Quantity of finished prod. 10^3t	101,8	2.	108,5	1.	88,4	3.	82,6	4.
Value of investment fund for one ton finished prod. 10^3Afs/t	25,2	4.	22,3	3.	22,1	2.	21,0	1.
Total investment 10^9 "	2,9	4.	2,51	3.	2,30	2.	1,95	1.
Production cost $/t	315/343	4.	314/311	3.	306/287	2.	306/260	1.
Import rate %	20,0	1.	26,3	3.	25,4	2.	36,9	4.
Transportation		4.		3.		2.		1.
Score and position of variations	23/4	4.	21	3.	17	1.	20	2.

Transportation cost of scrap and other materials regarding the different variations

Description	Specific weight t/m^3	Distance km	Cost Afs/kmt	Transportation cost 10^6 Afs A1 10^3t	A1 Afs	A2 10^3t	A2 Afs	A3 10^3t	A3 Afs
incompact scrap	o,6	15	6,25	5o,o	4,7	5o,o	4,7	5o,o	4,7
scrap	o,6	8o	6,25	41,o	2o,5	41,o	2o,5	4o,3	2o,2
light scrap	o,5	25o	7,5o	34,1	63,9	26,4	46,1	-	-
Total				125,1	89,1	115,6	71,3	9o,3	24,9
Refractories	1,o	5oo	3,8	5,5	1o,5	5,1	9,7	4,o	7,6
Other	1,5	15o	2,5	15,o	5,6	13,9	5,2	1o,8	4,1
Total other				2o,5	16,1	19,o	14,9	14,8	11,7

Note: The basic transportation cost is 2,5 Afs/km.t
When 15 tons capacity of the truck is spaced in 1o m^3 volume

The transportation cost of the refractory materials is counted from the country boarder

Supplement 24

Amortization cost of MSP in North regarding the different variations 10^6 Afs

Item	A1			A2			A3		
	B	M	Tt	B	M	Tt	B	M	Tt
Steel making fixed asset	225,o	428,2	653,2	206,3	396,5	602,8	191,o	300,o	491,o
Amortization	3,6	36,4	40,o	3,3	33,7	37,o	3,1	25,5	28,6
Conti.casting fixed asset	162,5	342,4	504,9	156,3	321,2	477,5	150,o	240,2	390,2
Amortization	2,6	29,1	31,7	2,5	27,3	29,8	2,4	20,4	22,8
Rolling of rods and wires fixed asset	200,5	540,2	740,7	200,5	540,2	740,7	200,5	540,2	740,7
Amortization	3,2	45,9	49,1	3,2	45,9	49,1	3,2	45,9	49,1
Rolling of steel section fixed asset	100,o	258,8	358,8	-	-	-	-	-	-
Amortization	1,6	22,o	23,6	-	-	-	-	-	-
MSP in North fixed asset	688,o	1569,6	2257,6	563,1	1257,9	1821,o	541,5	1080,4	1621,9
Amortization	11,o	133,4	144,4	9,o	106,9	115,9	8,7	91,8	100,5

Note : B = building amortization rate 1,6 %

M = machine, equipment -"- 8,6 %

<u>Amortization costs of small metallurgical plants in Pul-i-Charki operating beside Mini Steel Plant</u>

10^6 Afs

I t e m	Co = C1 = C3			C2		
	B	M	Total	B	M	Total
Steel making						
fixed asset	-	-	-	40,4	76,7	117,1
Amortization	-	-	-	0,7	6,5	7,2
Horizontal conti-nuous casting						
Fixed asset	-	-	-	40,4	49,0	89,4
Amortization	-	-	-	0,7	4,2	4,9
Steel section rolling mills						
fixed asset	25,0	101,2	126,2	25,0	101,2	126,2
Amortization						
1 shift	0,4	2,9	3,3	-	-	-
2 shift	0,4	8,6	9,0	0,4	8,6	9,0
Total in Pul-i-Charki						
fixed asset	25,0	101,2	126,2	105,8	226,9	332,7
Amortization						
1 shift	0,4	2,9	3,3	-	-	-
2 shift	0,4	8,6	9,0	1,8	19,3	21,1

JANGALAK

	B	M	Total
Steel making fixed asset	19,0	62,0	81,0
Amortization	0,3	5,3	

Note:

B = building,
amortization rate: 1,6 %

M = machine, equipment
amortization rate: 8,6 %

First-cost of liquid steel regarding different variations

	Description of cost	Parameter	Specific cost	Production cost A1 (10^6 Afs)	A2	A3
0	Volume of production	10^3 t		111,o	1o2,6	8o,1
1	Steel scrap	1,145 t/t	42oo A/t	533,8	493,4	385,2
2	Alloy materials	13 kg/t	3oooo "	45,3	4o,o	31,2
3	By pass	31 "	35oo "	12,o	11,1	8,7
4	Net metallic charge			565,1	522,3	4o7,7
5	Iron ore	53 "	8oo "	4,7	4,4	3,4
6	Lime-stone	3o "	1ooo "	3,3	3,1	2,4
7	Fluor spar	12 "	1ooo "	13,3	12,3	9,6
8	Coke powder	2o "	16ooo "	35,5	32,8	25,6
9	Total charge			621,9	574,9	448,7
1o	Electricity for melting	635 kWo/t	1,5 A/kWo	1o5,7	97,7	76,3
11	Elect. for other purp.	2o "	1,5 "	3,3	3,1	2,4
12	Gas	25 m^3/t	1,6 A/m^3	4,4	4,1	3,2
13	Total direct material			733,3	679,8	53o,6
14	Wages and expenses			5,6	5,2	4,3
15	Electrode consumption	7 kg/t	8oooo A/t	62,2	57,5	44,9
16	Transportation of raw materials			89,1	71,3	24,9
17	" other materials			16,1	14,9	11,7
18	Total direct cost			9o8,3	828,7	616,9
19	Miscellaneous:- lining material	25 kg/t	36ooo A/t	99,9	92,3	72,1
2o	- maintenance			65,3	6o,3	49,1
21	- overhead, w.			2,o	1,6	1,2
22	- amortization			4o,o	37,o	28,6
23	- other			1o,1	9,6	7,6
24	First-cost			1125,9	1o29,5	775,3
	S. first c. Afs/t $/t			1o143 2o2,9	1oo34 2oo,7	9682 193,6

First cost of Continously Casted billets regarding the different variations

	Description of cost	Parameter	Specific cost Afs/t	Production cost 10^6 Afs		
				A1	A2	A3
0	Volume of production	10^3 t		105,1	96,8	75,6
1	Liquid steel	1,06 t/t	10143	1125,9		
			10034		1029,5	
			9682			775,5
2	Cristalizator	1,2 kg/t	60000 A/t	7,6	7,0	5,4
3	Refractories	15 "	9000 "	14,2	13,1	10,2
4	By pass	50 "	4000 "	21,0	19,4	15,1
5	Net material cost			1126,7	1030,2	776,0
6	Energy cost	30 kWo/t	1,5 A/kWo	4,7	4,4	3,4
7	Direct wages			4,0	3,2	2,4
8	Total direct cost			1135,4	1037,8	781,8
9	Miscellaneous					
	- maintenance			50,5	47,8	39,0
10	- overhead			1,6	1,2	0,8
11	- amortization			31,7	29,8	22,8
12	-other			4,2	3,9	3,1
13	First cost			1223,4	1120,5	847,5
14	Specific first cost Afs/t			11640	11575	11219,0
	$/t			232,8	231,5	224,2

First cost of rods, wires and rerolled billets

	Desription of cost	Parameter	Specific cost	Production cost A1	A2	10^6 Afs A3
	Volume of production	10^3 t		68,4	68,4	68,4
1	Continously casted billet	1,1o5	1164o	88o,o		
			11575		875,1	
			1121o			847,5
2	By pass	1oo kg/t	4ooo A/t	27,4	27,4	27,4
3	Net materials cost	852,6			847,7	82o,1
4	Fuel oil	57 "	17ooo "	66,3	66,3	66,3
5	Electricity	115 kWo/t	1,5 A/kWo	11,8	11,8	11,8
6	Refractories	1,8 kg/t	85oo A/t	1,1	1,1	1,1
7	Rolls consumption	2,5 "	5oooo "	8,6	8,6	8,6
8	Casing joints	o,6 "	35ooo "	1,4	1,4	1,4
9	Total net.materials			941,8	936,9	9o9,3
1o	Direct wages and expenses			5,2	5,2	5,2
11	Total direct cost			947,o	942,1	914,5
12	Miscellaneous- maintenance			74,1	74,1	74,1
13	-overhead			2,o	2,o	2,o
14	-amortization			49,1	49,1	49,1
15	-other			6,3	6,3	6,3
16	First cost			1o78,5	1o73,6	1o46,o
17	Specific first cost Afs/t			15768	15696	15292
	$/t			315,3	313,9	3o5,8

First cost of steel sections
/raw material is Continously casted billets/

	Description of cost	Parameter	Specific Afs/t	Production cost A1	Co	C1	10^6 Afs C2
o	Volume of production	10^3t		20,o	6,3	18,9	20,o
1	Demand of con. casted billet	1,12t/t	1164o	260,7			
			1164o		82,1		
			11575			245,o	
			1o8o8				242,1
2	By pass	11o kg/t	4ooo	8,8	2,6	8,3	8,5
3	Net materials			251,9	79,3	236,7	233,5
4.	fuel oil	57	17ooo A/t	19,4			
		7o	"		7,5		
		6o				19,3	20,1
5.	Electricity	12o kWo/t	1,5 "	3,6	1,3	4,o	4,2
6.	Refractories	3/2,5 "	85oo A/t	o,5	o,2	o,4	o,4
7.	Rolls consumption	2,0 "	5oooo "	2,8	o,9	2,6,	2,8
8.	Casing joints	1,2 "	35ooo "	o,8	o,3	o,8	o,8
9.	Total materials cost			278,8	89,5	263,8	261,9
1o.	Direct wages and expenses			1,6	o,8	2,o	2,o
11.	Total direct cost			28o,4	9o,3	265,8	263,9
12.	Miscellaneous: - maintenance			35,9	3,5	1o,o	1o,o
13.	- overhead			o,8	o,4	o,8	o,8
14.	- amortization			23,6	3,o	9,o	9,o
15.	- other cost			3,o	1,o	3,o	3,o
16	First cost			343,7	98,2	288,6	286,7
	Spec. first cost Afs/t			17185,o	15587,o	1527o	14335
	$ /t			343,7	311,7	305,4	286,7

First cost of liquid steel at Jangalak Metal Works

	Description of cost	Parameter	Spec. cost	Production cost 10^6 Afs
0	Volume of production	10^3 t/y		7,9
1.	Scrap	1145 kg/t	4200 A/t	43,3
2.	Alloying	13 kg/t	30000 A/t	3,5
3.	By pass	161 kg/t	3500 A/t	5,1
4.	Net metal charge			41,7
5.	Iron ore	53 kg/t	800 A/t	0,4
6.	Limestone	30 kg/t	1000 A/t	0,3
7.	Fluor spar	12 kg/t	10000 A/t	1,1
8.	Coke powder	15 kg/t	16000 A/t	2,1
9.	Total charge			45,6
10.	Electricity for melting	650 kWh/t	1,5 A/kWh	8,8
11.	Electricity for other	5 kWh/t	1,5 A/kWh	0,1
12.	Gas consumption	10 Nm^3/t	1,6 A/kWh	0,1
13.	Electrodes consumption	10 kg/t	8000 A/kWh	7,2
14.	Mould and base plate	20 kg/t	6000 A/kWh	10,8
15.	Transportation			1,3
16.	Direct wages and expenses			1,0
17.	Total direct cost			74,9
18.	Miscellaneous-lining	10 kg/t	2000 A/kWh	2,3
19.	-maintenance			6,5
20.	-overhead			1,0
21.	-amortization			5,6
22.	- other			1,5
23.	First cost			90,9
24.	Spec. first cost Afs/t			11506,0
	$/t			230,1

First Cost of Pul-i-Charky Plant with Continuous Casting

Description	Parameter	Spec. cost Afs/T	Cost of cont. casting 10^6 Afs
Volume of production	10^3 t		22,4
Steel scrap	1,145 kg/t	4200 A/t	114,0
Alloying additions	13,0 kg/t	30000 A/t	9,2
By pass	31,0 kg/t	3500 A/t	2,6
Metal			120,6
Iron ore	53,0 kg/t	800 A/t	1,0
Limestone	30,0 kg/t	1000 A/t	0,7
Fluor spar	12,0 kg/t	1000 A/t	2,8
Coke powder	20,0 kg/t	16000 A/t	7,6
Total charge			132,7
Electricity for melting	640,0	1,5 A/t	22,7
Electricity for other	30,0	1,5 A/t	1,1
Fuel oil	12,0	17000	4,8
Electrodes consumption	8,0	80000	15,2
Refractories	25,0	36000	21,3
Crystalizator	5,0	600000	7,1
Direct wages	15,0	80000	1,2
Transportation of raw materials	25,0	6,0	0,8
Total direct cost			206,9
Miscellaneous-maintenance			20,7
-overhead		80000	0,8
-amortization			12,0
-other			1,7
First cost			242,1
Spec. first cost Afs/t			10808,0
USD/t			216,2

"[illegible]" plant, Program of scrap-storage, utilization and transportation

Month	Season	Specified store	Outlined store-changing	Net Consumption	Claim to transportation	Scrap price on base of 1361		Value of scrap-store	Cost of scrap buying on base 1361
						Afa/t	$/t.	10^6 Afs	10^6 Afs
I	spring	7650	-	6555,0	6555,0	4200	84,0	32,13	27,53
II	"	7650	-	6555,0	6555,0	4200	84,0	32,13	27,53
III	"	7650	-	6530,7	6530,7	4200	84,0	32,13	27,43
IV	summer	7650	-	6530,7	6530,7	4200	84,0	32,13	27,44
V	"	7650	-	6555,0	6555,0	4200	84,0	32,13	27,53
VI	"	7650	-	6555,0	6555,0	4200	84,0	32,13	27,53
VII	autumn	7650	-	6555,0	6555,0	4200	84,0	32,13	27,53
VIII	"	15300	+ 7650	6555,0	14205,0	4200	84,0	64,26	59,66
IX	"	22950	+ 7650	6555,0	14205,0	4200	84,0	96,39	59,66
X	winter	19750	- 3200	6555,0	3355,0	4200	84,0	82,95	14,09
XI	"	13195	- 6556	6555,0	-	4200	84,0	55,42	-
XII	"	7650	- 5545	6555,0	1010,0	4200	84,0	32,13	4,24
Total		132.395	-	78611,4	78611,4	4200	84,0	556,06	330,17
Average monthly	-	11032,9	-	6550,9	6550,9	4200	84,0	46,34	27,51

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Estimate of production cost.								
Material and inputs								
Project compoment No "A" Description MSP in North								
No.	Unit	Item desription	F.	L.	Unit cost	Cost		
						F 10^6 $	L 10^6 Afs	Total 10^6 Afs
1.		Raw materials						
1.1.	t.	Scrap	-	78611,4	4200	-	330,0	330,2
1.2.	t.	Ferro alloying	1041,3	-	500	624,8		31,2
1.3.	t.	Iron ore	4245,0	-	16	67,2	-	3,4
1.4.	t.	Lime-stone	-	2104	1000		24,0	24,0
1.5.	t.	Fluor spar	961,2	-	200	192,2	-	9,6
1.6.	t.	Coke powder	1602	-	320	512,6	-	25,6
1.7.	t.	Graphite electrode	560,7	-	1600	897,1	-	44,9
2.		Auxiliary materials	-	-	-	-	-	-
2.1.	t.	Refractories	3259,6	-	511,4	1667,0	-	83,4
2.2.	t.	Profiling tools	302,7	-	1019,4	308,6	-	15,4
3.	t.	Maintenance materials	1336	3435	850	1135,6	73,0	129,8
4.		Utilities						
4.1.	MWO	Electricity	62759,7	-	30	1882,8	-	94,0
4.2.		Natural gas		6619,5	1,6	-	10,6	10,6
4.3.	t.	Other				140,0	10,0	17,0
		Total	-	-	-	7428,6	426,2	797,6

Estimate of the production cost

Material and inputs

Project component No. "C" Description MSP in Pul-i-Charki

Description	F. (t)	L. (t)	Unit cost	Cost $F_{10^3\$}$	$L_{10^6 Afs}$	$T_{10^6 A}$
Raw materials						
Scrap	-	24189,9	4200	-	101,6	101,6
Ferro alloying	3080,1	-	600	184,9		9,2
Iron ore	1256,1	-	16	20,1		1,0
Limestone	-	711,0	1000	-	0,7	0,7
Fluor spar	284,4	-	200	56,9	-	2,8
Coke powder	474,0	-	310	151,7	-	7,6
Craphite electr.	189,6	-	1600	303,4	-	15,2
Auxiliary materials						
Refractories	642,5	-	675,5	434,0	-	21,7
Profiling tools	198,5	-	1078,1	214,0	-	10,7
Maint. materials	251,8	649,4	850,0	214,9	13,8	24,5
Utilities						
Electricity	6227,6	-	30,0	186,8	-	9,4
Fuel oil	1884,4	-	340	504,7	-	25,2
Other	-	-	-	20,0	3,7	4,7
T O T A L	-	-	-	2290,5	119,8	234,3

Estimate of technological cost of Mini Steel Plant in North, Lump - sum payments (incorporated fixed assests)

Technology	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Special technology for steel-making & steel-casting	250	-	12,5
Technology for rolling and operating	250	-	12,5
TOTAL	500	-	25,0

Equipment			
Project component			
Description	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Production equipment			
Scrap preparing and storage area	1500	-	75,0
Furnace hall and casting hall	6695	-	334,8
Billet storing hall	132	-	6,6
Rolling mill	9365	-	468,3
Auxiliary equipment			
Transport	300	1,3	16,3
Electric energy supply	1800	-	90,0
Water supply	2000	-	100,0
Gas supply	100	-	5,0
Oxygen supply	1700	-	85,0
Lime supply	876	-	43,8
Compressed air	190	-	9,5
Maintenance working	785	-	39 ,3
Laboratory	670	-	33,5
Storage	460	-	23,0
Intercommunication	232	-	11,6
Other	455	-	22,8
Service equipment			
Office equipment	63	-	3,2
Canteen	5	-	0,3
Medical service	25	-	1,3
Plant security	5	-	0,3

Cont.../d

Equipment			
Project component			
Description	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Plant yard cleaning and service	25	-	1,3
Staff welfare and residential buildings	6	-	0,3
Primary stock of spare parts, wear & tear parts, tools	1950	-	97,5
T O T A L	29339	1,3	1468,7

Summary sheet-investment cost of Mini Steel Plant in North

Equipment				
Project component		Cost		
No.	Denomination	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
1.	Producing equipment	17692	-	885,0
2.	Auxiliary equipment	9568	1,3	479,7
3.	Service equipment	129	-	6,5
4.	Primary stock of spare parts, wear & tear parts, tools	1950	-	97,5
	TOTAL	29339	1,3	1468,7

Estimate of investment cost of MSP in North

Civil engineering works			
Project component	Production Cost		
Description	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Site preparation & development			
Grading of ground	-	2,0	2,0
Utility connections from site to point of tie-in			
-electric power	-	25,0	25,0
-water	-	11,5	11,5
-communication	-	3,6	3,6
-other	-	1,5	1,5
Temporary work for plant construction	-	28,4	28,4
Buildings and special civil works			
Scrap preparing and storage area	-	37,2	37,2
Furnace hall and casting hall	-	44,6	44,6
Billet storing hall	-	31,9	31,8
Rolling mill hall	-	61,9	61,9
Steel structures for buildings	2210	-	110,5
Electric energy supply	-	30,0	30,0
Water supply	-	25,6	25,6
Maintenance works	-	35,0	35,0

Cont.../d

Civil engineering works			
Project component	Production Cost		
Description	Foreign 10^3 \$	Local 10^6 Afs	Total 10^6 Afs
Offices and welfare establishments	-	10,0	10,0
Storage	-	1,6	1,6
Oxygen supply	-	25,5	25,5
Lime supply	-	8,8	8,8
Outdoor works			
Road-system	-	27,6	27,6
Communication	-	1,3	1,3
Fencing in and supervision	-	4,4	4,4
Others	-	10,0	10,0
TOTAL	2210	427,0	537,5

Summary sheet investment cost of MSP in North

Civil engineering works				
Project component		Investment		
No.	Denomination	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
1.	Site preparation and development	-	72,0	72,0
2.	Building and special civil works	2210	311,8	442,3
3.	Outdoor works	-	43,3	43,3
	TOTAL	2210	427,0	537,5

Estimate of technological cost (MSP in Pul-i-Charki)

Lump-sum payments (incorporated fixed assets)			
Technology	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Special technology for steel-making and steel-casting	1000	-	50,0
T O T A L	1000	-	50,0

Estimate of Investment Cost of MSP in Pul-i-Charki

Equipment			
Project component	Cost		
Description	Foreign 10^3 $	Local 10^6Afs	Total 10^6Afs
Producing equipment			
Scrap preparing & storage area	50	1,3	8,8
Furnace hall & casting hall	4375	7,0	225,8
Auxiliary equipment			
Electric energy supply	200	0,5	10,5
Water supply	300	0,1	15,1
Other auxiliary equipment	100	-	5,0
Service equipment	10	-	0,5
Primary stock of spare parts wear & tear parts, tools	300	-	15,0
TOTAL	5435	8,9	280,7

Summary Sheet - Investment Cost of MSP in Pul-i-Charki

Equipment			
Project component	Investment Cost		
Description	Foreign 10^3 \$	Local 10^6Afs	Total 10^6Afs
Producing equipment	4525	8,3	234,6
Auxiliary equipment	600	0,6	30,6
Service equipment	10	-	0,5
Primary stock of spare parts, wear and tear parts tools	300	-	15,0
TOTAL	5435	8,9	280,7

Estimate of Investment Cost of MSP in Pul-i-Charki

Civil engineering works			
Project component	Investment Cost		
Description	Foreign 10^3 $	Local 10^6Afs	Total 10^6Afs
<u>Site preparation & development</u>			
Utility connection from site to point of tie-in:			
- electric power	-	10,0	10,0
- water	-	0,5	0,5
- other	-	0,1	0,1
Temporary work for plant construction	-	0,2	0,2
<u>Buildings & special civil works</u>			
Scrap preparing and storage area	-	2,0	2,0
Furnace hall & casting hall	-	36,7	36,7
Electric energy supply	-	18,8	18,8
Water supply	-	9,5	9,5
Other	-	2,0	2,0
Outdoor works	-	1,0	1,0
TOTAL	-	80,8	80,8

Summary Sheet-Investment Cost of MSP in Pul-i-Charki

Civil engineering works			
Project component	Investment Cost		
Description	Foreign 10^3 $	Local 10^6Afs	Total 10^6Afs
Site preparation and development	-	10,8	10,8
Buildings and special civil works	-	69,0	69,0
Outdoor works	-	1,0	1,0
TOTAL	-	80,8	80,8

HSP I North Planned total staff

Place of work	No. of workers				No. officials				No. engineer				Total
	No. of shift												
	1.	2.	3.	Sub Tt.	1.	2.	3.	Sub. Tt.	1.	2.	3.	Sub. Tt	
1. Steel making													
1.1 Scrap preparation	12	-	-	12	3	-	-	3	-	-	-	-	15
1.2. Furnace hall	15	10	10	35	3	1	1	5	2	-	-	2	42
1.3. Casting hall	28	20	20	68	3	1	1	5	2	-	-	2	75
Sub.Tt.	55	30	30	115	9	2	2	13	4	-	-	4	132
2. Rolling Mill													
2.1. Furnace hall	9	5	6	20	2	1	1	4	1	-	-	1	25
2.2. Rolling hall	20	15	12	47	2	1	1	4	2	-	-	2	53
2.3. Finishing "	5	3	4	12	1	1	1	3	-	-	-	-	15
2.4. Service	22	5	4	31	2	-	-	2	2	-	-	2	35
Sub.Tt.	56	28	26	110	7	3	3	13	5	-	-	5	128
3.1. Oxygen production	4	2	2	8	2	-	-	2	1	-	-	1	11
3.2. Lime productio	10	4	4	18	2	-	-	2	1	-	-	1	21
3.3. Energy	6	4	4	14	2	-	-	2	2	-	-	2	18
Sub.Tt	20	10	10	40	6	-	-	6	4	-	-	4	50
4. Maintenance	50	10	10	70	10	-	-	10	5	-	-	5	85
5.1. Central laboratory	3	1	1	5	3	1	1	5	1	-	-	1	11
5.2. Computer room	4	1	1	6	3	1	1	5	1	-	-	1	12
5.3. Management	18	-	-	18	25	1	1	27		-	-	5	
Sub T.	25	2	2	29	31	3	3	37		-	-	7	73
Total	206	80	78	364	63	8	8	79	25	-	-	25	468

Qualification of engineers and other staff

Qualification / Place of Work	Management	Computer center	Lab.	Maintenance	Service	Roll. Mill	Steel mak.	To.	1	2	3	4	5	6	7	8	9	10
Economic University	5	-	-	-	-	-	-	5	1	-	-	4	-	-	-	-	-	-
Metallurgical Engineer /metallurgist /	1	-	-	-	-	-	3	4	-	-	1	-	3	-	-	-	-	-
Metallurgical Engineer /technologist /	2	-	-	-	-	3	-	5	-	1	1	-	3	-	-	-	-	-
Electrical Engineer / heavy current /	1	-	-	1	1	1	-	4	-	-	1	1	2	-	-	-	-	-
Electrical Engineer / Weak-current /	-	1	-	1	-	-	-	2	-	-	-	1	1	-	-	-	-	-
Mechanical Engineer	1	-	-	3	1	1	1	7	-	1	1	3	2	-	-	-	-	-
Chemical Engineer	-	-	1	-	2	-	-	3	-	-	-	3	-	-	-	-	-	-
Metallurgical Technician	-	-	2	-	-	3	8	13	-	-	-	-	2	11	-	-	-	-
Mechanical Technician	-	-	-	5	1	5	3	14	-	-	-	-	5	7	2	-	-	-
Chemical Technician	-	-	3	-	3	-	-	6	-	-	-	-	1	3	2	-	-	-
Electrical -"-	-	-	-	5	2	5	2	14	-	-	-	-	3	10	1	-	-	-
Economical -"-	7	2	-	-	-	-	-	9	-	-	-	-	1	1	2	5	-	-
Maturity / for computer/	8	3	-	-	-	-	-	11	-	-	-	-	-	-	3	1	7	-
Primary school	7	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	7
Total	32	6	6	15	10	18	17	104	1	2	4	12	23	32	10	6	7	7

Planned total staff of MSP in Pul-i-Charky

No.	Place of Work	Number of Workers				Number of Employees				Number of Engineers				Total
		Number of Shift												
		1.	2.	3.	Sub Tt	1.	2.	3.	Sub Tt	1.	2.	3.	Sub Tt	
1.	Steel making													
1.1.	Scrap preparing	9	-	-	9	2	-	-	2	-	-	-	-	11
1.2.	Furnace hall	8	6	6	20	2	1	1	4	1	-	-	1	25
1.3.	Casting hall	12	10	10	32	2	1	1	4	1	-	-	1	37
	Sub.Tt	29	16	16	61	6	2	2	10	2	-	-	2	73
2.	Rolling Mill													
2.1.	Furnace hall	3	3	3	9	1	-	-	1	-	-	-	-	10
2.2.	Rolling hall	6	4	4	14	1	1	1	3	2	-	-	2	19
2.3.	Finishing "	3	3	3	9	1	1	1	3	-	-	-	-	12
2.4.	Service	8	4	1	13	1	-	-	1	-	-	-	-	14
	Sub.Tt	20	14	11	45	4	2	2	8	2	-	-	2	55
3.	Maintenance	25	5	5	35	3	-	-	3	1	-	-	1	39
4.1.	Laboratory	2	1	1	4	1	-	-	1	1	-	-	1	6
4.2	Management	10	-	-	10	12	1	1	14	1	-	-	1	25
	Sub.Tt	12	1	1	14	13	1	1	15	2	-	-	2	31
	Total	86	36	33	155	26	5	5	36	7	-	-	7	198

Estimate of Investment Cost of MSP in North

Project implementation			
Description	Cost Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Management of Project Implementation			
Salaries and wages of management	960	11,5	59,5
Rent & operation of offices	100	3,2	8,2
Travel & communication expenses	50	1,5	4,0
Duty and taxes during the implementation period	15	0,6	1,4
Detail Engineering, Tendering			
Salaries and wages of designers	2000	10,7	110,7
Rent and operation of offices	200	1,0	11,0
Travels, transportation, communication	100	1,0	6,0
Fees for various types of consultants	25	1,5	2,8
Site and laboratory tests	50	5,0	7,5
Supervision, Coordination, Test-run & Take-over of Civil Works Equipment and Plant			
Salaries & wages of site staff	20	1,5	2,5
Costs of foreign experts	30	-	1,5
Rents	10	-	0,5
Raw & auxiliary materials	-	2,4	2,4
Interests during construction	-	5,0	5,0
Others	-	2,0	2,0

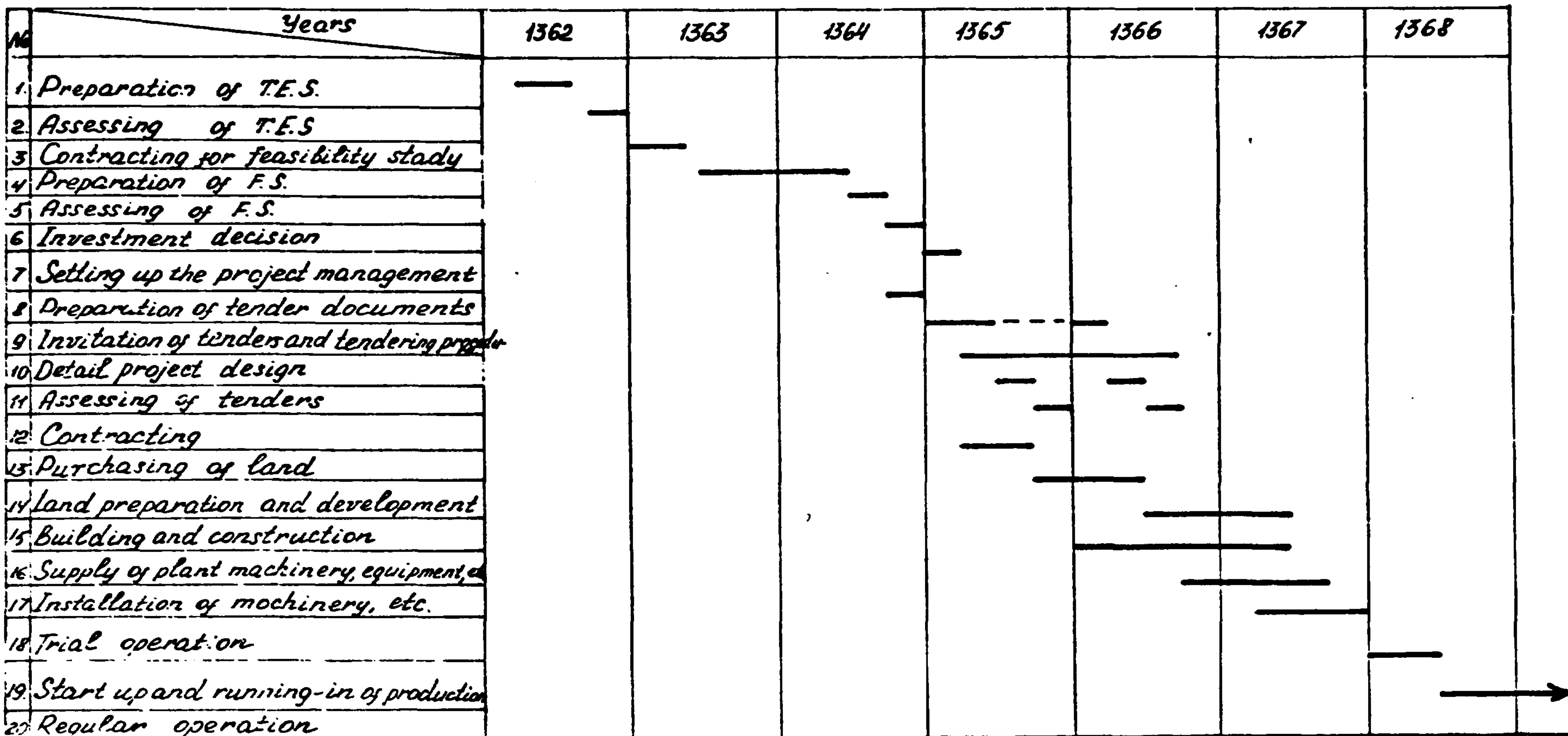
Estimate of Investment Cost of MSP in North

Project implementation	Cost		
Description	Foreign 10^3 $	Local 10^6 Afs	Total 10^6 Afs
Build-up of Administration Recruitment & Training of Staff and Labour			
Salaries and wages of administrative staff	-	2,4	2,4
Advertising costs related to recruiting personal	-	0,3	0,3
Salaries & wages of training staff	315	8,6	24,4
Training materials	-	1,0	1,0
Salaries and wages of recruited staff and labour	-	4,5	4,5
Rend and operation of offices training facilities motor, etc.	-	2,4	2,4
Arrangements for Supplies			
Salaries and wages of purchasing staff	-	2,9	2,9
Travel and other related expenses	-	2,0	2,0
Communication	-	0,5	0,5
Arrangements for marketing	-	0,5	0,5
Build-up of connections	-	0,1	0,1
Preliminary and capital issue expenses	-	1,0	1,0
Financial cost during construction	-	1,3	1,3
TOTAL	4259	82,4	295,3

Estimate of Investment Cost of MSP in Pul-i-Charki

Project implementation			
Description	Cost Foreign 10^3 $	 Local 10^6 Afs	 Total 10^6 Afs
Management of project implementation	150	6,0	13,5
Detail engineering, tender	200	10,0	20,0
Supervision coordination test-run and take-over of civil works, equipment and plant	150	5,0	12,5
Build-up of administration recruitment and training of staff and labour	200	5,0	15,0
Arrangements for supplies	-	5,0	15,0
Arrangements for marketing	-	0,1	0,1
Build up of connections	-	0,1	0,1
Preliminary and capital issue expenses	-	0,3	0,3
Financial cost during construction	-	0,4	0,4
TOTAL	700	27,8	62,8

Plant organization



Supplement 50.

Initial Fixed Investment Costs of MSP in North

Investment category	Foreign currency 10^3 $	Local currency 10^6 Afs	Total cost 10^6 Afs
Land	-	4,0	4,0
Site preparation and development	-	72,0	72,0
Structures and civil works			
a) Buildings and civil works	2210	311,8	422,3
b) Auxiliary and service facilities	-	43,3	43,3
Incorporated fixed assets	500	-	25,0
Plant machinery and equipment	29339	1,3	1468,7
Total initial fixed investment costs	32o49	432,3	2o35,3

Preproduction Capital Expenditures, by Category of MSP in North

Category	Foreign currency 10^3 \$	Local currency 10^6 Afs	Total cost 10^6 Afs
Preliminary studies	360	4,6	22,6
Preparatory investigations	10	5,3	5,8
Management of project implementation	1125	16,8	73,1
Detail planning, tendering	2375	19,2	137,9
Supervision, co-ordination test-run and take-over of civil works equipment & plant	444	18,9	41,1
Build-up of administration recruitment & training of staff and labour	315	19,2	34,9
Arrangements for supplies	-	5,4	5,4
Arrangements for marketing	-	0,4	0,4
Build-up of connection	-	0,1	0,1
Preliminary and capital issue expenditure	-	2,5	2,5
T O T A L	4629	92,2	323,6

Fixed investment costs of [illegible] plant in North

Period	Construction period /initial fixed investment/									Start-up and full capacity				Total		
Year	1365			1366			1367			1360						
Currency/FC = 10^3 $ LC, Tt = 10^6 Afs/	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt		FC	LC	Tt
Fixed investment costs	16493,5	107,6	932,3	9438	190,4	662,3	5867,5	134,3	427,7	250	-	12,5		32049	432,3	2034,8
1. Land	-	4,0	4,0	-	-	-	-	-	-	-	-	-		-	4,0	4,0
2. Site preparation and development	-	72,0	72,0	-	-	-	-	-	-	-	-	-		-	72,0	72,0
3. Structures and civil work	1574	31,2	109,9	636	190,0	221,8	-	133,9	133,9	-	-	-		2210	355,1	465,6
4. Incorporated fixed assets	250	-	12,5	-	-	-	-	-	-	250	-	12,5		500	-	25,0
5. Plant and machinery	14669,5	0,4	733,9	8802	0,4	440,5	5867,5	0,4	293,8	-	-	-		29339	1,3	1468,2

Preproduction capital expenditure,by year of MSP in North

Period	Construction						Start-up and full period						Total		
Year	1365			1366			1367			1368					
Currency /FC = 10^3 \$ LC, Tt = 10^6 Afs/	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt
Preproduction capital expenditure	2870	38,8	182,3	950	41,0	88,5	600	10,0	40	209	2,4	12,9	4629	92,2	323,6

Estimate of Production-cost of MSP in North

Period	Construction			Start-up			Full capacity			
Year	1365	1366	1367	1368	1369	137o	1371	1372	1373	1374
Product.programm %	0	0	0	53	7o	9o,6	1oo	1oo	1oo	1oo
Cost: 10^6 Afs										
Raw mat.:-scrap	-	-	-	222,5	298,4	4o7,6	465,6	481,9	498,8	516,2
-other	-	-	-	13,1	17,9	24,o	27,4	28,4	29,4	3o,4
-imp.mat.	-	-	-	77,3	1o5,7	141,5	161,7	167,4	173,2	179,3
Labour	-	-	-	6,5	8,9	12,o	13,8	14,4	14,9	15,5
Utilities	-	-	-	63,4	86,7	116,2	132,7	137,3	142,2	147,1
Repair	-	-	-	21,8	29,9	4o,o	45,7	47,3	49,o	5o,7
Maintenance spare p.	-	-	-	87,5	119,6	16o,2	183,o	189,4	196,o	2o2,9
Factory overhead	-	-	-	158,7	217,o	29o,7	332,1	343,7	355,8	368,2
Factory cost	-	-	-	65o,8	884,1	1192,2	1362,o	14o9,8	1459,3	151o,3
Administrative overhead cost	-	-	-	39,1	49,9	66,9	76,4	79,1	81,8	84,7
Sales cost	-	-	-	19,2	26,3	35,2	4o,2	41,6	43,1	44,6
Distribution cost	-	-	-	2,o	2,7	3,6	4,1	4,2	4,4	4,5
Operating cost	-	-	-	711,1	963,o	133o,3	1482,7	1534,7	1588,6	1644,1
Financial cost /int./	-	-	-	4o,9	75,5	62,9	5o,3	37,7	25,2	12,6
Depreciation	-	-	-	69,3	138,5	138,5	138,5	138,5	138,5	138,5
Total prod.or manufacturing cost	-	-	-	821,3	1177,o	1531,7	1671,5	171o,9	1752,3	1795,2

Working capital requirements /cash balance calk./ of MSP in North

Item	X	Y	Requirements /10^6 Afs/						
	Min. days cover.	coeffic. of turn-over	Start-up years			Full capacity years			
			1368	1369	1370	1371	1372	1373	1374
I Current assets									
A. Accounts receivable	30	12	59	80	108	123	127	132	136
B. Inventory									
a Row material - scrap	30	12	19	25	34	39	40	42	43
- other	30	12	1	1	2	2	2	3	3
- imp.mat.	90	4	19	26	35	40	42	43	45
b Spare parts	180	2	44	60	80	92	95	93	102
c Work-in-progress	10	36	18	24	33	38	39	40	42
d Finised products	15	24	29	39	52	60	62	64	66
C. Cash in hand	15	24	16	22	28	31	31	32	32
D. Current assets			205	277	372	425	438	454	469
II/A Accounts payable	30	12	-31	-42	-57	-66	-68	-70	-73
III/A Net.working capital			174	235	315	359	370	384	396
III/B Increase in work.c.			174	61	80	44	11	14	12
IV Total production cost			821,3	1177,0	1531,7	1671,5	1710,9	1752,3	1795,2
Less: Row material			312,9	422,6	573,1	654,7	677,8	701,4	725,9
Utility			65,4	86,7	116,2	132,7	137,3	142,2	147,1
Depreciation			69,3	138,5	138,5	138,5	138,5	138,5	138,5
	15	24	375,7	529,8	703,9	745,6	757,3	770,2	783,7
V. Required cash balance			16	22	29	31	32	32	33

Total investment cost of HSP in North

Period	Construction									Start-up								
Y e a r	1365			1366			1367			1368			1369			137o		
Currency: FC 1o^3 \$ LC, Tt = 1o^6 Afs	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	Fc	LC	Tt
1. Fixed inv.cost a initial f.i.c.	16493,5	1o7,6	932,3	9438	19o,5	662,3	5867,5	134,3	427,7	25o	-	12,5	-	-	-	-	-	-
2. Pre-production capital	287o	38,8	182,3	95o	41,o	88,5	6oo	1o,o	4o,o	2o9	2,4	12,9	-	-	-	-	-	-
3. Current assets inc	-	-	-	-	-	-	-	-	-	155	174,o	181,8	169	235,o	243,5	17o	315,o	323,5
Total inv.cost.	19363,5	146,4	1114,6	1o388	231,5	75o,8	6467,5	144,3	467,7	614	176,4	2o7,2	169	235,o	243,5	17o	315,o	323,5

Period	Full production												Total		
Year	1371			1372			1373			1374					
1.	-	-	-	-	-	-	-	-	-	-	-	-	32o49	432,3	2o34,8
2.	-	-	-	-	-	-	-	-	-	-	-	-	4629	92,2	323,7
3.	129	359,o	365,5	67,o	37o,o	373,4	-	384,o	384,o	-	396,o	396,o	69o	2233,o	2267,5
Total investment cost	129	359,o	365,5	67,o	37o,o	373,4	-	384,o	384,o	-	396,o	396,o	37368	2757,5	4626,o

Sources of initial funds of NSP in North

Period	Construction									Start-up					
Year	1365			1366			1367			1368			1369		
Currency: FC = 10^3 \$ LC, Tt = 10^6 Afs	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt
1. Equiti capital	12902	-	645,1	8544	-	427,2	5376	-	268,8	248	-	12,4	-	-	-
2. Preference capital	-	138,1	138,1	-	95,2	95,2	-	53,5	53,5	-	3,8	3,8	-	-	-
3. Suppliers' credits	6628	-	331,4	4568	-	228,4	2808	-	140,4	182	-	9,1	-	-	-
4. Courent liabilites	-	-	-	-	-	-	-	-	-	155	-	7,8	169	-	8,5
Total	19530	138,1	1114,6	13112	95,2	750,8	8184	53,5	467,7	585	3,8	33,1	169	-	8,5

Period	Start-up			Full capacity operation												Total		
Y.	1370			1371			1372			1373			1374					
1.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27070	-	1353,5
2.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	295,6	295,6
3.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14186	-	709,3
4.	170	-	8,5	[illegible]	-	6,4	67	-	3,3	-	-	-	-	-	-	690	-	34,5
T.	170	-	8,5	[illegible]	-	6,4	67	-	3,3	-	-	-	-	-	-	41946	295,6	2392,9

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Net income statement of MSP in North

Period	Construction			Start-up			Full capacity				Total
Year	1365	1366	1367	1368	1369	137o	1371	1372	1373	1374	
Production program	0 %	0 %	0 %	53 %	7o %	9o,6 %	loo %	loo %	loo %	loo %	
Cost 10^6 Afs											
1. Sales	-	-	-	1o26,5	1419,9	1846,2	2161,6	2237,3	2315,6	2396,6	13394,7
2. Production costs	-	-	-	821,3	1177,o	1531,7	1671,5	1710,9	1752,3	1795,2	10459,9
3. Gross or taxable prof.	-	-	-	2o5,2	233,9	314,5	490,1	526,4	563,3	601,4	2934,8
4. Tax. /21 %/	-	-	-	–	–	–	11,4	119,o	126,9	134,9	392,2
5. Net profit	-	-	-	2o5,2	233,9	314,5	478,4	4o7,4	438,4	466,5	2542,6
6. Undistributed profits	-	-	-	2o5,2	233,9	314,5	478,4	4o7,4	436,4	466,5	2542,6
7. Accumulated undist. prof.	-	-	-	2o5,2	439,1	753,6	1232,3	1639,7	2o76,1	2542,6	–
Ratios:											
Gross profit/sales %				8,1	8,6	1o,1	14,1	13,7	13,3	13,o	1o,6
Netprofit/sales %				8,1	8,6	1o,1	13,8	1o,6	1o,3	1o,1	9,1

Cash-flow of [illegible] in North

Period	Construction			Start-up			Full capacity					Total
Year	1365	1366	1367	1368	1369	137o	1371	1372	1373	1374		
Production programme	o %	o %	o %	53 %	7o %	9o,6 %	1oo %	1oo %	1oo %	1oo %		
Cost 10^6 Afs												
A. Cash inflow	1114,6	75o,8	467,7	1o59,6	1419,4	1854,7	2168,o	224o,6	2315,6	2396,6		15787,6
1. Financial res.t.	1114,6	75o,8	467,7	33,1	8,5	8,5	6,4	3,3	-	-		2392,9
2. Sales revenue	-	-	-	1o26,5	141o,9	1846,2	2161,6	2237,3	2315,6	2396,6		13394,7
B. Cash outflow	1114,6	75o,8	467,7	1o25,6	1414,4	1849,1	2o42,3	2197,2	2257,1	2314,o		15432,8
1.Total assets s.i.r.	1114,6	75o,8	467,7	2o7,2	243,5	323,5	365,5	373,4	384,o	396,o		462o,7
2.Operating cost	-	-	-	711,1	963,o	733o,3	1482,7	1534,7	1588,6	1644,1		9254,5
3.Debt service total												
a Interest	-	-	-	4o,9	75,5	62,9	5o,3	37,7	25,2	12,6		3o5,1
b Repayments	-	-	-	66,4	132,4							86o,8
4.Corporate tax.	-	-	-	-	-	-	11,4	119,o	126,9	134,9		492,2
C. Surplus/deficit	-	-	-	34,o	5,o	5,6	125,7	43,4	58,5	82,6		354,8
D. Cumulative cash balance	-	-	-	34,o	39,o	44,6	17o,3	213,7	272,2	354,8		-

Initial Fixed Investment Costs of MSP in Pul-i-Charki

Investment category	Foreign currency 10^3 $	Local currency 10^6 Afs	Total cost 10^6Afs
Land	-	-	-
Site preparation and development	-	10,8	10,8
Structures and civil works			
a) Buildings & civil works	-	69,0	69,0
b) Auxiliary and service facilities	-	1,0	1,0
Incorporated fixes assets	1000	-	50,0
Plant machinery and equipment	5435	8,9	280,7
Total initial fixed investment costs	6435	89,7	411,6

Fixed investment costs of MSP in Pul-i-Charky

Period	Construction									Start-up				Total		
Y e a r	1365			1366			1367			1368						
Currency / FC = 10^3 \$ LC, Tt = 10^6 Afs	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt		FC	LC	Tt
Fixed investment costs	2827	17,8	159,2	2328	50,2	166,7	780	21,6	60,6	500	-	25,0		6435	89,7	411,5
1. Land	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
2. Site preparation and development	-	10,8	10,8	-	-	-	-	-	-	-	-	-		-	10,8	10,8
3. Structures and civil work	-	7,0	7,0	-	44,1	44,1	-	18,9	18,9	-	-	-		-	70,0	70,0
4. Incorporated fixed assets	500	-	25,0	-	-	-	-	-	-	500	-	25,0		1000	-	50,0
5. Plant, equipment	2327	-	116,4	2328	6,2	122,6	780	2,7	41,7	-	-	-		5435	8,9	280,7

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Preproduction Capital Expenditures by Category of MSP in Pul-i-Charki

Category	Foreign currency 10^3 $	Local currency 10^6 Afs	Total cost 10^6 Afs
Preliminary	202	2,1	12,2
Preparatory investigations	1	0,5	0,5
Management of project implementation	150	6,0	13,5
Detail planning, tendering	200	10,0	20,0
Supervision, coordination test-run and take over of civil works, equipment & plant	150	5,0	15,0
Build-up of administration recruitment and training of staff and labour	200	5,0	15,0
Arrangements for supplies	-	1,0	1,0
Arrangements for marketing	-	0,1	0,1
Build-up of connections	-	0,1	0,1
Preliminary and capital issue expenditure	-	0,2	0,2
TOTAL	903	30,0	75,1

Preproduction capital expenditure, by year of [illegible]P in Pul-i-Charky

Period	Construction						Start-up and full production							Total		
Y e a r	1365			1366			1367			1368						
Currency /FC-10^5 $ LC, Tt = 10^6 Afs	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt		FC	LC	Tt
Preproduction capital expenditure	403	14,6	34,7	300	10,0	25,0	180	4,9	13,9	20,0	0,5	1,5		903	30,0	75,1

Estimate of Production-cost of MSP in Pul-i-Charky

Period	Construction			Start-up			Full capacity			
Year	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374
Production program	0 %	0 %	0 %	35 %	67 %	90 %	100 %	100 %	100 %	100 %
Cost: 10^6 Afs										
Raw material - scrap	-	-	-	45,1	89,4	124,3	143,5	148,3	153,5	158,9
- other	-	-	-	2,4	4,8	6,6	7,6	7,9	8,1	8,4
- imported material	-	-	-	16,0	31,6	44,0	50,6	52,4	54,2	56,1
Labor	-	-	-	2,3	4,1	5,7	6,6	6,9	7,1	7,4
Utilites	-	-	-	15,4	30,5	42,4	48,8	50,5	52,3	54,1
Repair	-	-	-	2,8	5,5	7,7	8,8	9,1	9,4	9,8
Maintenance-spare parts	-	-	-	10,9	24,5	30,1	34,6	35,8	37,1	38,4
Factory overhead	-	-	-	28,6	56,7	78,9	90,7	93,9	97,2	100,6
Factory cost	-	-	-	123,5	247,1	339,7	391,0	404,8	418,9	433,7
Aministrative overhead cost	-	-	-	8,5	12,9	17,9	20,6	21,3	22,1	22,8
Sales cost	-	-	-	3,7	7,3	10,2	11,7	12,1	12,5	13,0
Distribution cost	-	-	-	0,4	0,8	1,1	1,3	1,4	1,4	1,4
Operating cost.	-	-	-	131,6	268,1	368,9	424,6	439,6	458,9	470,9
Financial cost /interests/	-	-	-	6,1	11,3	9,4	7,5	5,6	3,8	1,9
Depreciation	-	-	-	11,4	22,7	22,7	22,7	22,7	22,7	22,7
Total prod.or manufacturing cost	-		-	153,6	302,1	401,0	454,8	467,9	481,4	495,5

Working capital requirements/cash balance calc/of HSP in Pul-i-Charkhi

Item	X	Y	Requirements /10^6 Afs						
	min. days of cov	coef. of turnover	Start-up years			Full capacity years			
			1368	1369	1370	[illegible]	1372	1373	1374
I. Current assets.									
A. Accounts receivable	30	12	11,3	22,2	30,5	35,2	36,4	37,7	39,0
B. Inventory									
a Raw material									
- scrap	15	24	1,9	3,7	5,2	6,0	6,2	6,4	6,6
- other	30	12	0,2	0,4	0,6	0,6	0,7	0,7	0,7
- imported mat.	90	4	4,0	7,9	11,0	12,7	13,1	13,6	14,0
b Spare parts	180	2	5,5	12,3	15,1	17,3	17,9	18,6	19,2
c Work-in progress	7	51	2,4	4,8	6,6	7,6	7,9	8,2	8,4
d Finished products	15	24	5,5	10,8	14,8	17,0	17,6	18,3	18,9
C. Cash in hand	15	24	2,6	5,0	6,6	7,5	7,6	7,8	8,0
D. Current assets			33,4	67,1	90,4	103,9	107,4	111,3	114,8
II/A Accounts payable	30	12	-6,5	-13,0	-18,1	-20,9	-21,6	-22,3	-23,1
III/A Net.working capital			26,9	54,1	72,3	83,0	85,8	89,0	91,7
III/B Increase in work.c.			26,9	27,2	18,2	10,7	2,8	3,2	2,7
IV. Total production cost			153,6	302,1	401,0	454,8	467,9	481,4	495,5
Less: Raw material			63,5	125,8	174,9	201,5	203,6	215,8	223,4
Utility			15,4	30,5	42,4	48,8	50,5	52,3	54,1
Depreciation			11,4	22,7	22,7	22,7	22,7	22,7	22,7
	15	24	63,3	123,1	161,0	181,8	186,7	190,6	195,3
V. Required cash balance			2,6	5,0	6,6	7,5	7,6	7,8	8,0

Supplement 66

Sources of initial funds of NSP in Pul-i-Charki

Period	Construction									Start-up								
Year	1365			1366			1367			1368			1369			1370		
Currency: FC=10^3, LC, Tt=10^6 Afs	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	Lc	Tt
1. Equiti capital	1328	86,2	152,6	1328	84,7	151,1	446	35,3	57,6	546	17,9	44,8	-	-	-	-	-	-
2. Suppliers' credits	826	-	41,3	812	-	40,6	338	-	16,9	172	-	8,6	-	-	-	-	-	-
3. Current liabilites	-	-	-	-	-	-	-	-	-	32	-	1,6	51	-	2,6	53	-	2,7
Total	2154	86,2	193,9	2140	84,7	191,7	784	35,3	74,5	750	17,9	55,0	51	-	2,6	53	-	2,7

Period	Full capacity operation													Total		
Year	1371			1372			1373			1374						
1.	-	-	-	-	-	-	-	-	-	-	-	-		3648	224,1	406,5
2.	-	-	-	-	-	-	-	-	-	-	-	-		2148	-	107,4
3.	41	-	2,1	21	-	1,1	-	-	-	-	-	-		198	-	10,1
Total	41	-	2,1	21	-	1,1	-	-	-	-	-	-		5994	224,1	524,0

Supplement 67

Total investment cost of HSP in Pul-i-Charki

Period	Construction									Start-up								
Year	1365			1366			1367			1368			1369			1370		
Currency FC in 10^3 \$, LC,Tt in 10^6 Afs	FC.	LC.	Tt.	FC.	LC.	Tt.	FC.	LC.	Tt.	FC.	LC.	Tt.	FC.	LC.	Tt.	FC.	LC.	Tt.
1. Fixed invest.cost initial f.i.c.	2827	17,8	158,2	2328	50,2	166,7	780	21,6	60,6	500	-	25,0	-	-	-	-	-	-
2. Pre-production cap.	403	14,6	34,7	300	10,0	25,0	180	4,9	13,9	20	0,5	1,5	-	-	-	-	-	-
3. Current assets i.	-	-	-	-	-	-	-	-	-	32	26,9	28,5	51	27,2	29,6	33	18,2	20,9
Total inv.cost.	3230	32,4	193,9	2628	60,2	191,7	960	26,5	74,5	552	27,4	55,0	51	27,2	29,8	33	18,2	20,9

Period	Full production												Total		
Year	1371			1372			1373			1374			Total		
1./ initial	-	-	-	-	-	-	-	-	-	-	-	-	6435	89,7	411,5
2./	-	-	-	-	-	-	-	-	-	-	-	-	903	30,0	75,0
3./	41	10,7	12,8	21	2,8	3,9	-	3,2	3,2	-	2,7	2,7	178	91,7	101,4
Total inv.cost	41	10,7	12,8	21	2,8	3,9	-	3,2	3,2	-	2,7	2,7	7536	211,4	587,5

Supplement 68

Net.income statement of [illegible]SP in Pul-i-Charki

Period	Construction				Start-up		Full capacity				Total
Year	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	
Production program	0 %	0 %	0 %	35 %	67 %	90 %	100 %	100 %	100 %	100 %	
Cost 10^6 Afs											
1./ Sales	-	-	-	200,4	394,1	552,0	634,8	657,0	680,0	703,8	3.822,1
2./ Production costs	-	-	-	153,6	302,1	401,0	454,8	467,9	481,4	495,5	2.756,3
3./ Gross or tax.profit	-	-	-	46,8	92,0	151,0	180,0	189,1	198,6	208,3	1065,8
4./ Tax. /21 %/	-	-	-	-	-	-	-38,4	-40,3	-42,3	-44,4	-165,4
5./ Net.profit	-	-	-	46,8	92,0	151,0	141,6	148,8	156,3	163,9	906,4
6./ Dividiends	-	-	-	-5,0	-5,0	-5,0	-5,0	-5,0	-5,0	-5,0	-35,0
7./ Undistributed profit	-	-	-	41,8	87,0	146,0	136,6	143,8	151,3	158,9	865,4
8./ Accumulated u.pr.	-	-	-	41,8	128,8	274,8	411,4	555,2	706,5	865,4	-
Ratios:											
Gross profit/sales %	-	-	-	9,1	16,9	26,7	31,2	32,5	33,8	35,5	22,3
Net.profit/sales %	-	-	-	9,1	16,9	26,7	24,5	25,6	26,7	27,9	18,5

Supplement 69

Cash-flow of MSP in Pul-i-Charki

Period	Construction			Start-up			Full capacity				Total
Year	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	
Production programme	0 %	0 %	0 %	35 %	67 %	90,0 %	100 %	100 %	100 %	100 %	
Cost: 10^6 Afs											
A. Cash inflow	193,9	191,7	74,5	223,5	396,5	554,7	636,9	658,1	680,0	703,8	4.318,6
1. Financial res.t.	193,9	191,7	74,5	28,1	2,6	2,7	2,1	1,1	-	-	496,7
2. Sales revenue	-	-	-	200,4	394,1	552,0	634,8	657,0	680,0	703,8	3.822,1
B. Cash outflow	193,9	191,7	74,5	207,5	334,0	424,0	508,1	514,2	533,0	561,8	3.542,7
1. Total assets a.i.r.	193,9	191,7	74,5	55,0	29,8	20,9	12,8	3,9	3,2	2,7	588,4
2. Operating cost	-	-	-	131,6	268,1	368,9	424,6	439,6	458,9	470,9	2.562,6
3. Debt service t.											
a. Interest	-	-	-	6,1	11,3	9,4	7,5	5,6	3,8	1,9	45,6
b. Repayments	-	-	-	9,8	19,8	19,8	19,8	19,8	19,8	19,8	128,6
4. Corpore tax.	-	-	-	-	-	-	38,4	40,3	42,3	44,4	165,4
5. Dividiends	-	-	-	5,0	5,0	5,0	5,0	5,0	5,0	5,0	35,0
C. Surplus/deficit	0	0	0	21,0	62,5	130,7	128,8	143,9	147,0	142,0	775,9
D. Cumulative cashbalance	-	-	-	21,0	83,5	214,2	343,0	486,9	633,9	775,9	-

Supplement 70.

The Mini Steel Plant / MSP / schould be located in the Kabul City area, or at the North Industrial area of the Country. In the Mazari-Sharif City's Industrial area or the near Fertilizer Factory x is the optimal location for the MSP. In the Kabul area should be located the Steel-melting Plant in Pul-i-Charky or Jangalak.
We kindly ask to declare your opinion about supply of Electricity acording to following shedule Which is that area where it possible to meet the requirements beside more favourable conditions and is there any financial effect of the new investment ?

INSTALLED POWER MW	x MAZARI-SHARIF MW	PUL-I-KHUMRI MW	JANGALAK MW	PUL-I-CHARKI MW	NOTE
IN 1985 / 1364 /	2	2	-	2	X See Drawing!
IN 1988 / 1367 /	16	16	3,5	5	
IN 1990 / 1369 /	9	9	-	-	
TOTAL	27	27	3,5	7	

K A B U L, 15. 06. 1983.

Ministry of Electrical Energy

Planning Departement

Ministry of Mines and Industries
Planning Departement
Board Techno-Economic Studies

Dear Sir,

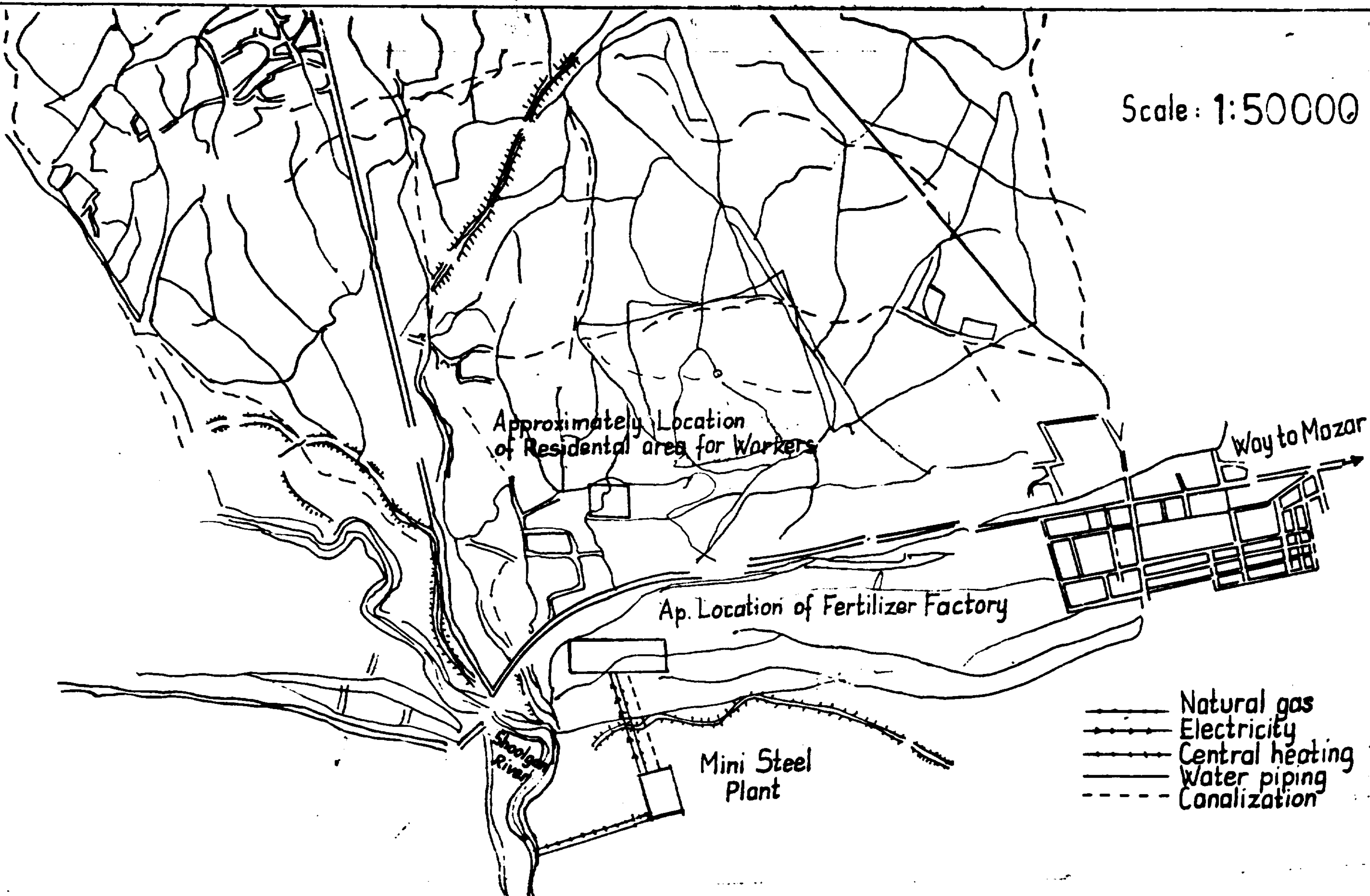
Replying your letter dated 15/6/83. concerning electrical energy requuirement for Mini Steel Plant / MSP /, it can be supply after completion of the extention line / 220 kV / USSR-Kholam-Pul-i-Khumri Kaboul.

1.- Establishing MSP in Pul-i-Charky we agreed, after completing the mentioned extention line we'll supply / 2 MW / electrical energy in the first stage and / 5 MW / in the final stage.

2.- Establishing / MSP / in Mazari-Sharif nearby Fertilizer factory and power producing factory we agree and we'll contact the related organization to supply the required amount of electrical energy but in Pul-i-Khumri according to the sharestage of electrical energy we don't agree, because import energy / extention line 220 kV USSR-Kholam-Pul-i-Khumri-Kaboul / is planned for the processing of Ainak Copper Mine.

3.- Considering the above mentioned items, instalation of power stations transformer, extention lines to MSP and other related expenses and designings are your responsibilities.

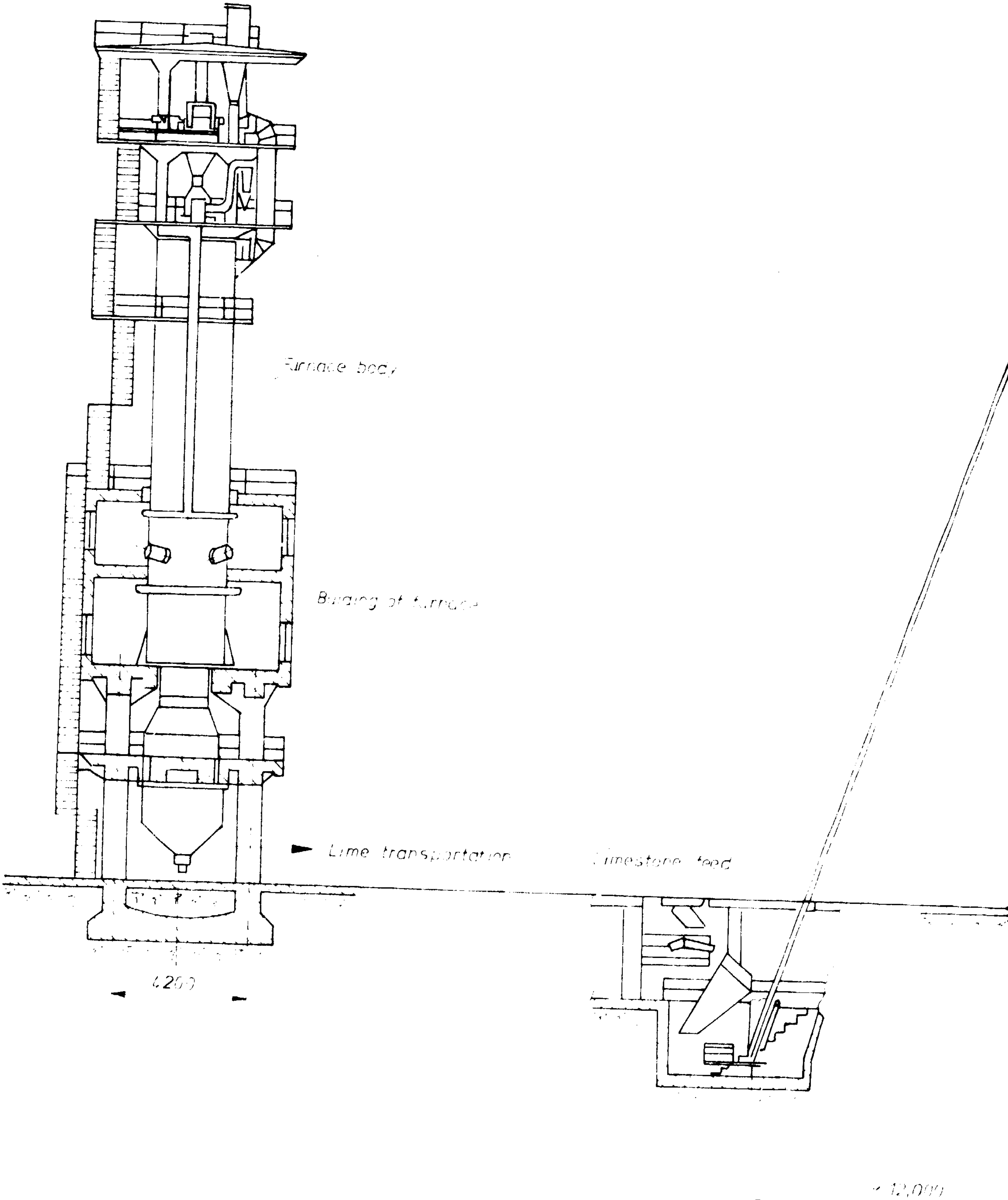
Thank You
Eng. M. Hashim
President Gen. for Elec.Energy



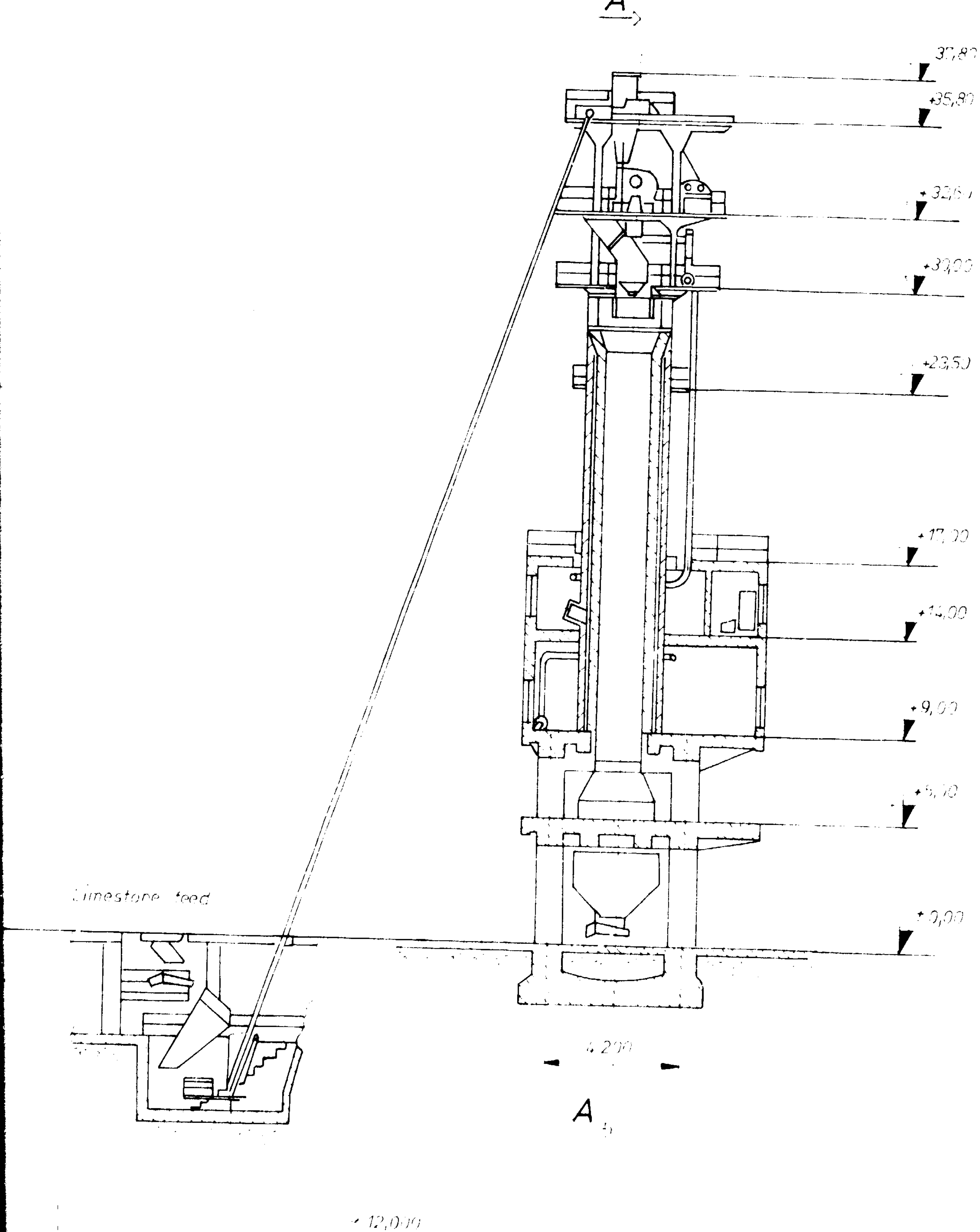
LOCATION OF THE MINI STEEL PLANT
IN MAZAR-E-SHARIF

DATE - 15 Th OF JULY 1983.

SECTION 1

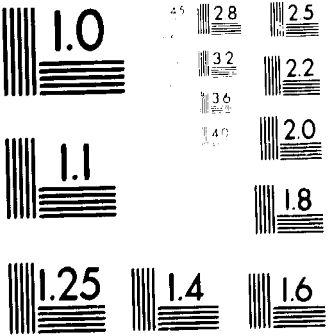

Furnace body
Burning of furnace
Lime transportation
Limestone feed
4200
12,000

SECTION 2

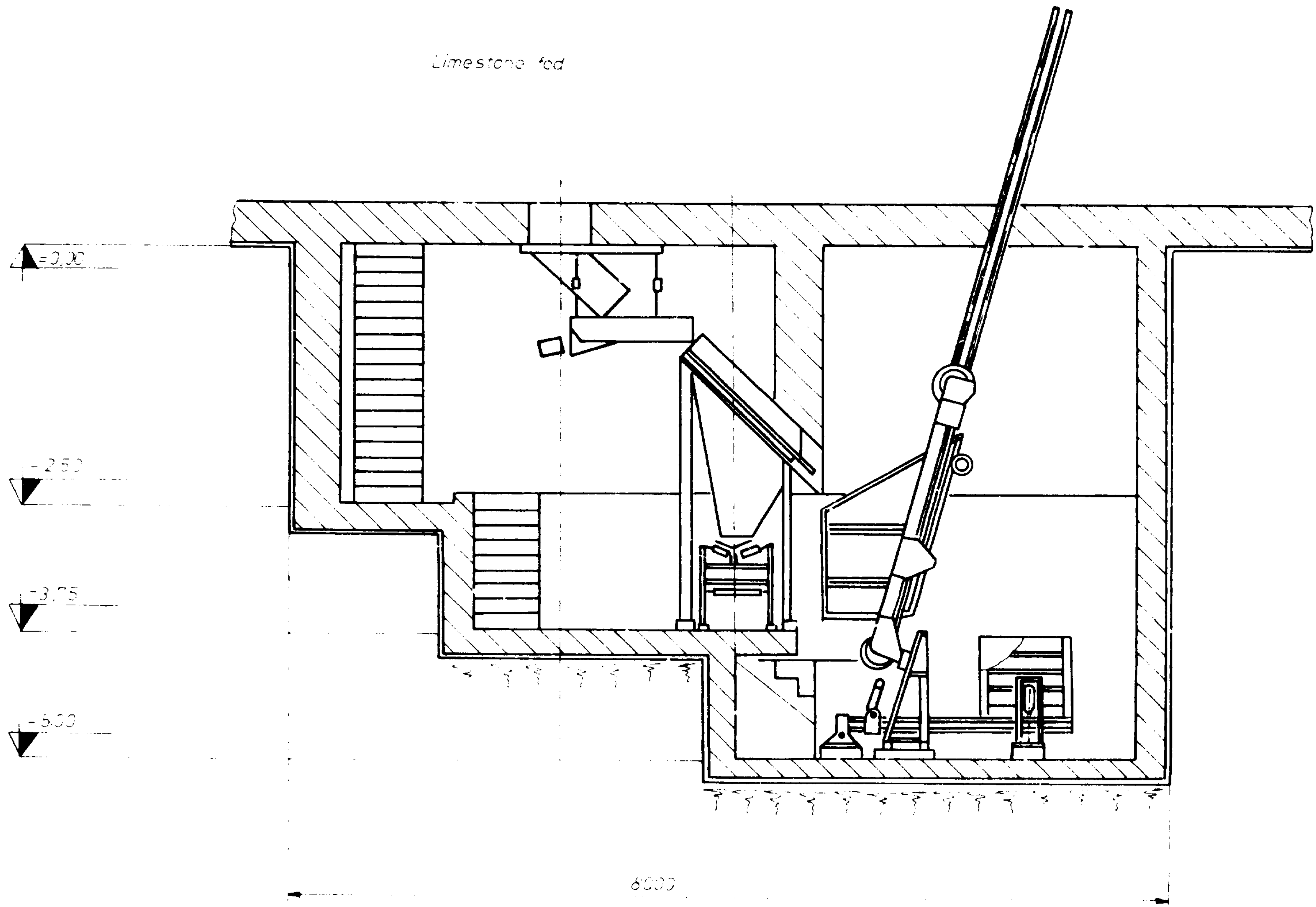


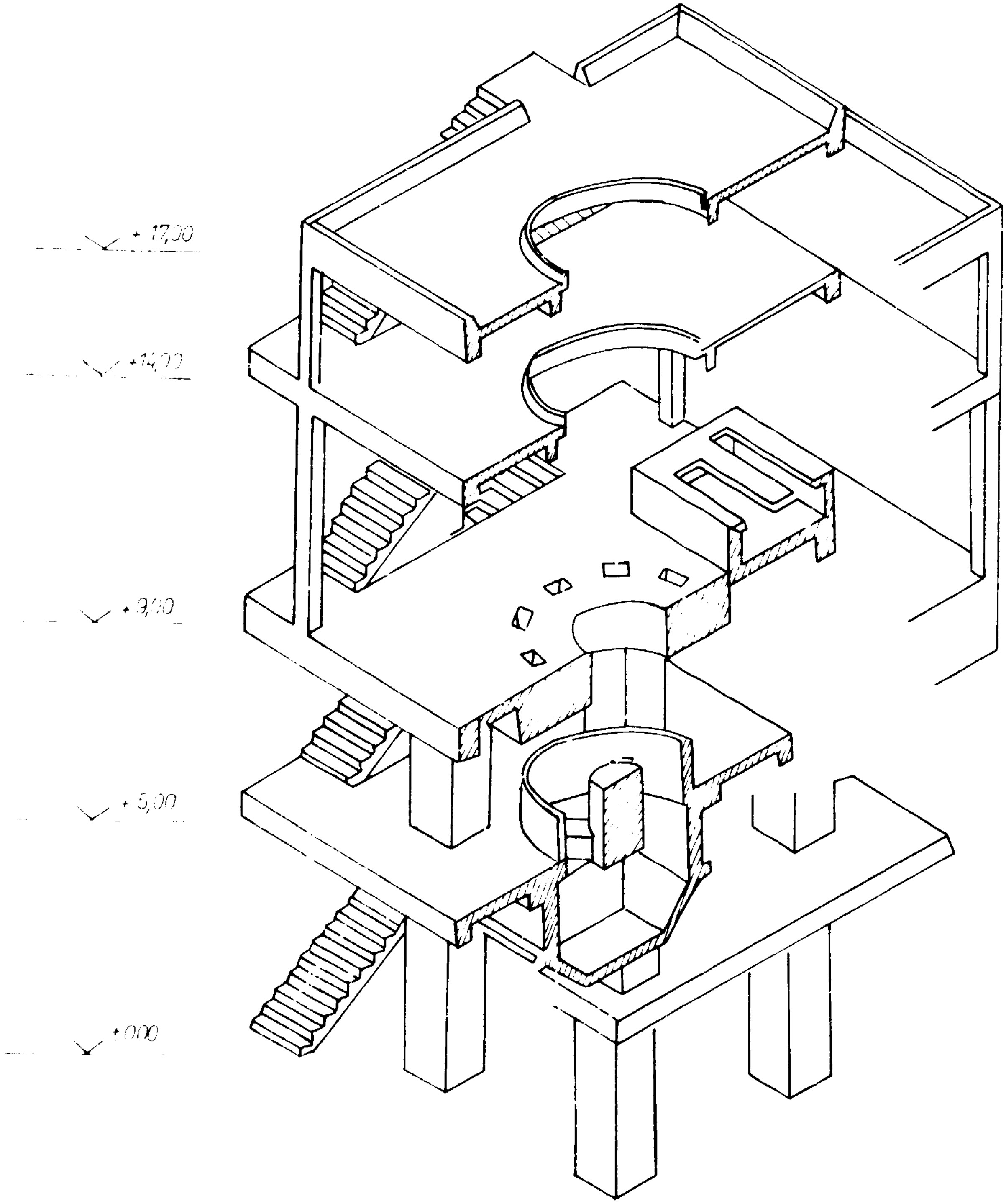
A
+35,80
+32,60
+30,00
+23,50
+17,00
+14,00
+9,00
+5,50
Limestone feed
±0,00
4 200
A
12,000

88 05 30
AD 89 01



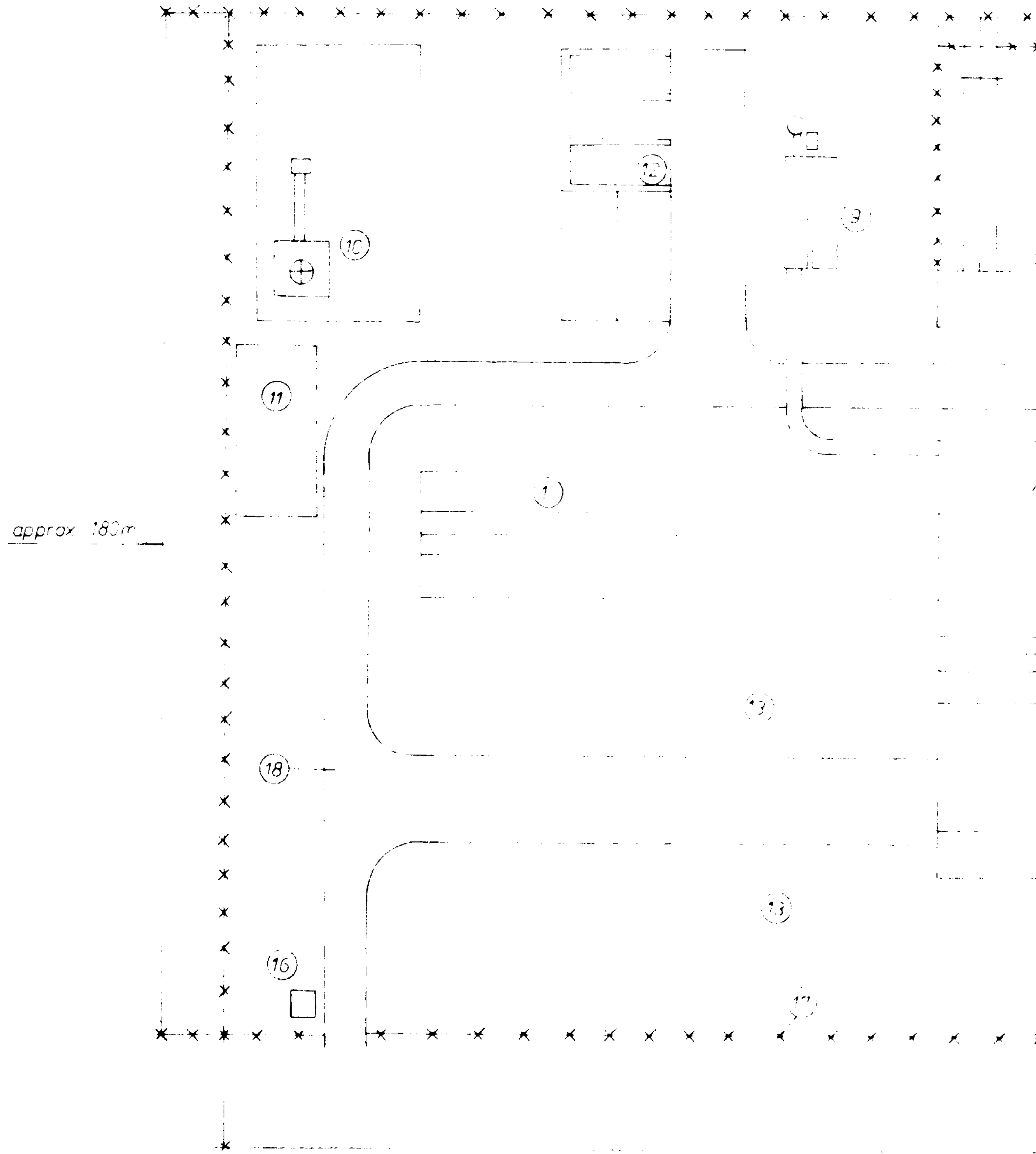
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)


Limestone fed
±0,00
-2,50
-3,75
-5,00
6000

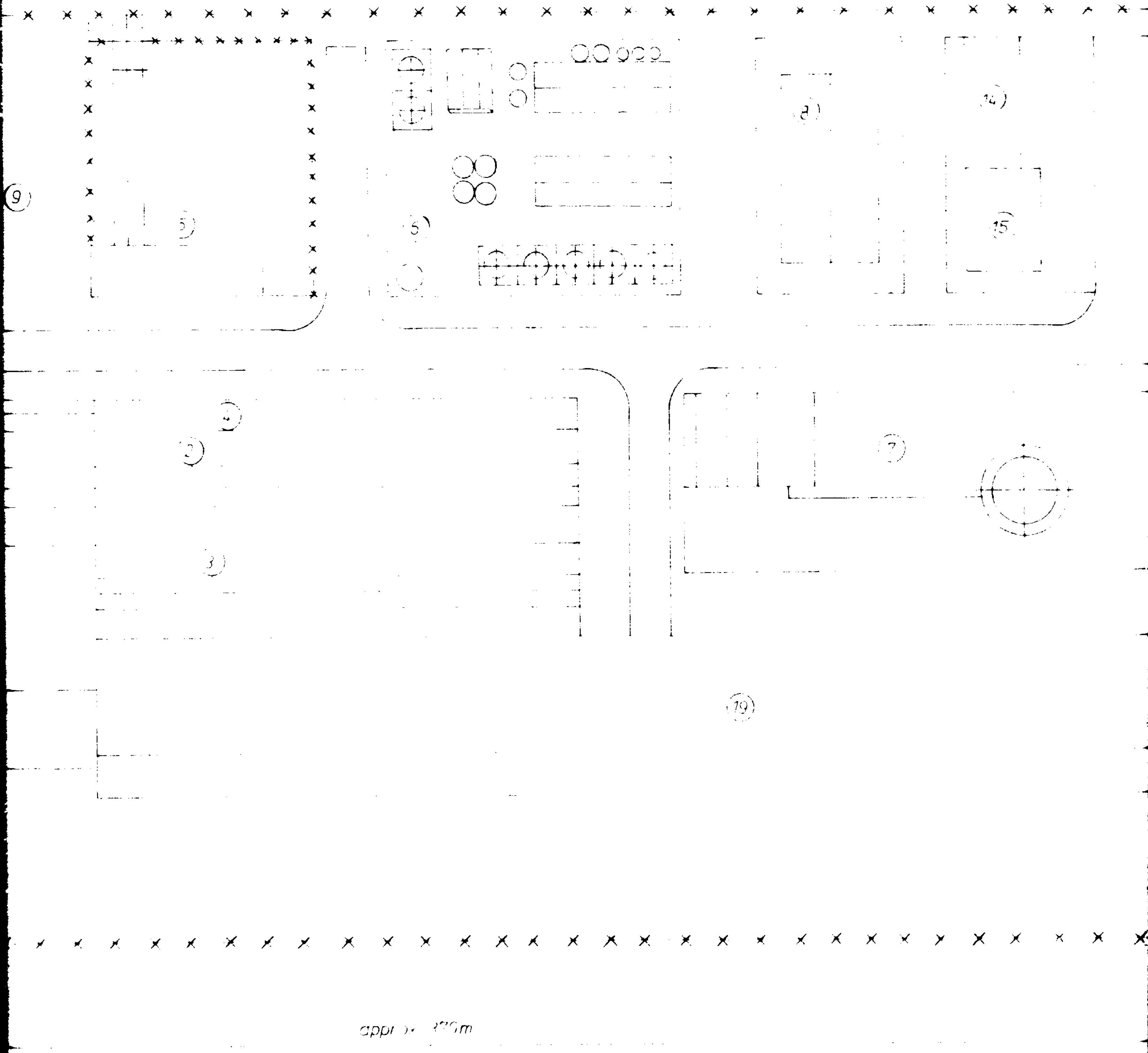


+ 17,00
+14,00
+ 9,00
+ 5,00
±0,00

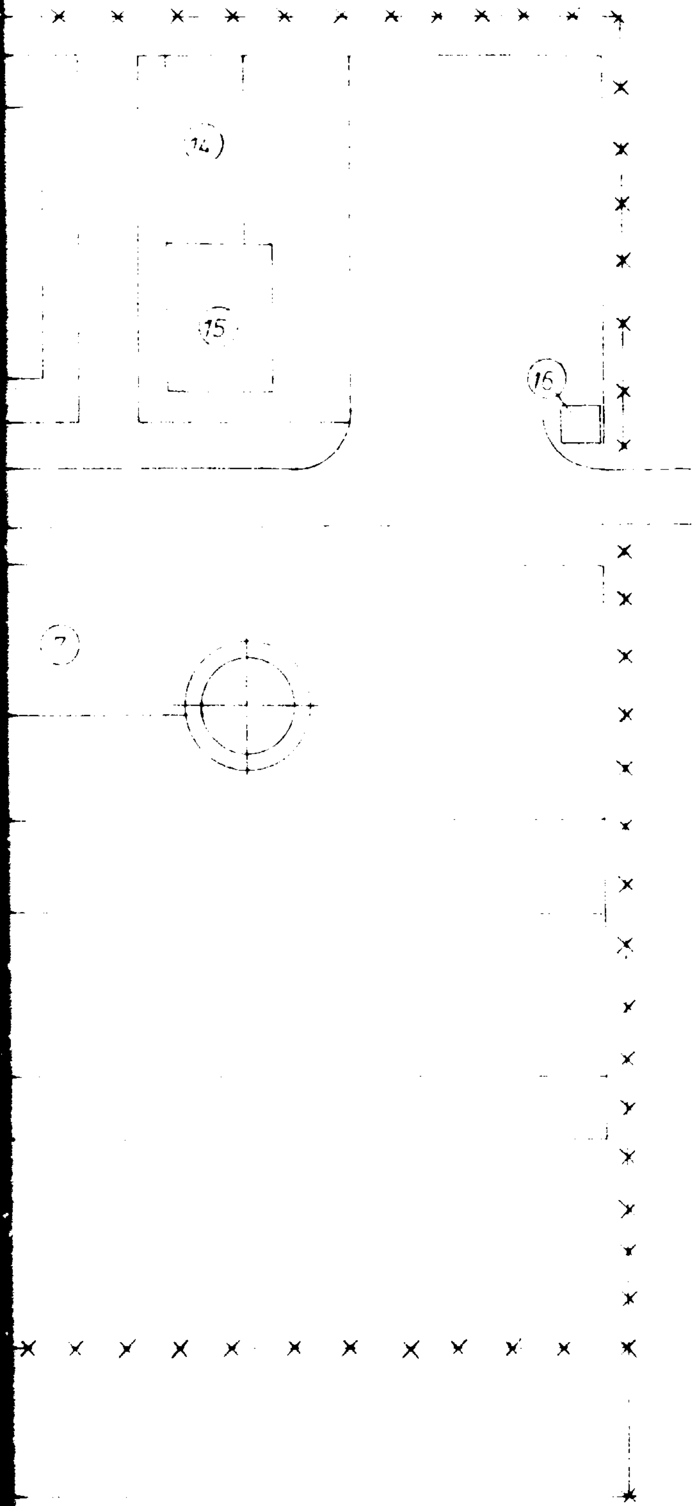
SECTION 1



SECTION 2



SECTION 3



1 SCRAP PREPARATION BAY
2 FURNACE AND CASTING HALL
3 INGOT STORAGE HALL
4 MAIN BUILDING
5 ELECTRIC ENERGY SUPPLY
6 WATER SUPPLY
7 OXYGEN SUPPLY
8 MAINTENANCE SHOP
9 DUST COLLECTION
10 LIME SUPPLY
11 GAS AND OIL SUPPLY
12 STORAGE AREA
13 SCRAP STORAGE AREA
14 WELFARE BLOCK
15 OFFICE BLOCK
16 PORTER
17 FENCING
18 ROAD
19 ROLLING MILL

M 1 : 1000

MINI STEEL PLANT PROPOSED LAYOUT