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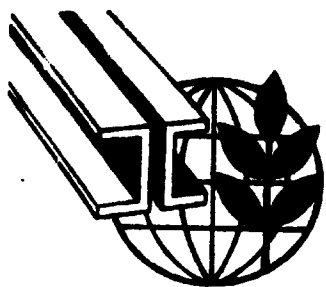
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Second Interregional Symposium  
on the Iron and Steel Industry

Moscow, USSR, 19 September - 9 October 1968

E - 9

DEVELOPMENT PLAN FOR THE IRON AND STEEL  
INDUSTRY IN ARGENTINA<sup>1/</sup>

by

F.E. Aldinio  
Argentina

<sup>1/</sup> The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. The document is presented as submitted by the author, without re-editing.

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by

**F. E. Aldinio, Argentina**

**SUMMARY**

The paper submitted deals with the Argentine Iron and Steel Plan. It begins with a series of geographical, economic, social, production and other data, affording a picture of the present position in Argentina, and thus aims to serve as a basis for the evaluation of existing possibilities for the determination of targets in iron and steel.

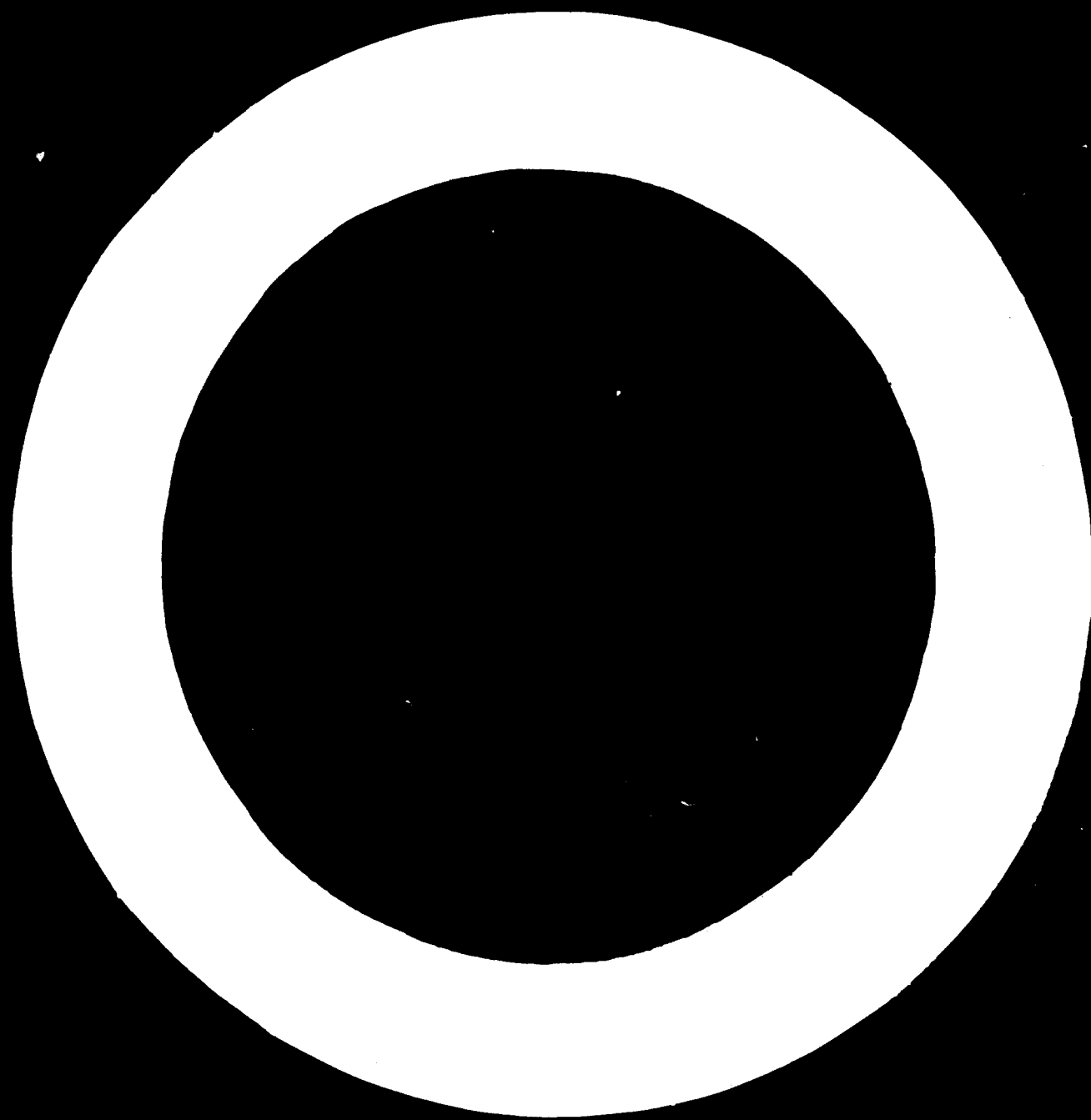
Each reader may draw his own conclusions from the facts and figures contained in this brief review. It has been stated that in this basic sector we are undertaking a colossal task of unrealistic proportions.

We hope to demonstrate that, with a gross per capita income of \$700, immense natural resources, a favourable balance of payments, a level of illiteracy lower than that in some developed countries, no racial or religious problems and with an acceptable degree of industrial development, it is in our power to achieve our destiny. Later on, the paper indicates the total demand for steel expected for 1974-1975 and bases it on the correlation that has been established between gross domestic product and the demand for steel. To be precise, in Argentina, it has been observed from a study of series covering the whole of this century, that a one per cent increase in gross domestic product corresponds to an increase in demand for steel between 2 and

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\* This is a summary of a paper issued under the same title as ID/WG.14/57.

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4 per cent. It is thus established that there is high income elasticity of demand: 2/4. As a minimum, it is estimated that the probable demand for steel in 1974-1975 will be 4 million tonnes a year. This figure constitutes a firm objective calculated in the light of Argentina's general situation, as already described, and attainable because the objective has been based on real possibilities. The target is therefore: to become self-sufficient in steel by 1974, with standards of efficiency and profitability comparable to those of the developed countries. With this objective in mind we have outlined a hypothetical situation, starting from zero, and a situation that could be achieved by 1974 on the basis of the existing industry, which has already accomplished so much and is making such a significant contribution to industrial and technological know-how.

In order to reach the proposed target the following projects have been approved:

- Sociedad Mixta Siderurgia Argentina (SOMISA) will extend its plant to produce 2,100,000 tonnes/year in 1973 (in execution)
- Industria Argentina de Aceros (ACINDAR) will integrate its existing plants to produce 800,000 tonnes/year in 1971 (in execution)
- PROPULSORA, will construct an integrated plant at Ensenada to produce 1,360,000 tonnes/year in 1974 (in execution).

In addition, plans are being made to re-model and modernize several semi-integrated plants.

The planned capital outlay under the Iron and Steel Plan is as follows:

SOMISA .....	195 million dollars
ACINDAR .....	155 million dollars
PROPULSORA .....	222 <sup>1</sup> / <sub>2</sub> million dollars
Other projects for semi-integrated plants .....	50 million dollars
Total .....	622 million dollars

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1/ Subject to alteration since the project has not yet been finalised.

The paper indicates the basic installations requiring such investment.

The 1974-1979 Argentine Iron and Steel Plan is already under consideration; when it has been implemented we should have an industry operating in virtually ideal conditions.

In order to ensure success, and because of the heavy investments entailed, much time is being taken over the project and the services of one of the world's foremost consulting firms have been enlisted.

Intensive geological and mining surveys are being carried out to ascertain the precise position with regard to raw material availabilities in our vast country. The most modern techniques are being applied. Up to now, the survey has resulted in promising findings of copper and molybdenum ores, the problem of raw materials for the iron and steel industry remaining unsolved.

Work has been begun on the Sierra Grande ore field, which will make available a million tonnes of pellets with a 68 per cent iron content. Thus far development plans for this field are limited to the first stage, comprising mining works and a beneficiation plant; the investment required for this stage is about 55 million dollars.

The level of customs duties has been adjusted to achieve the goal of an open economy, in accordance with our view that national industry should not be presented with too easy a market, while taking into account the need for sufficient protection, as we are faced with a world market eager to export at any price - a point we cannot ignore, at least in connexion with iron and steel.

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## I. INTRODUCTION

The Argentine Republic lies between 21° 46' and 55° 30' S and 73° and 53° W and, with the Republic of Chile, is one of the two most southerly countries in the Americas.

The mainland area is 2,776,655 km<sup>2</sup> and the area of the Antarctic territories, the Falkland Islands (Malvinas) and other islands in the South Atlantic is 1,249,000 km<sup>2</sup>, giving a total area of 4,025,655 km<sup>2</sup>.

The population, mainly of European descent (Spanish, Italian, British, French, etc.) numbers 22,691,000 (1966). The official language is Spanish and the predominating religion is Roman Catholicism, although there is full freedom of religious worship. The country has no racial or religious problems.

The rate of natural increase is low and does not exceed 1.5 per cent. It is estimated that the population will be about 35 million in the year 2000. Data covering agriculture and animal husbandry, mining, industry, services, commerce and cultural and artistic activities show that neither over-population nor unemployment are to be expected.

It has been calculated that 10 per cent of the area of the country is used for crops and 41 per cent as natural pasture. Agricultural products include:

Wheat	8 to 10 million tonnes a year
Maize	6 to 8 million tonnes a year
Flax	500,000 to 600,000 tonnes a year
Rye	300,000 tonnes a year
Barley	600,000 tonnes a year
Tobacco	45,000 tonnes a year
Tea	85,000 tonnes a year
Rice	200,000 tonnes a year

The country produces leguminous and other vegetables for the entire population; fruit such as pears, apples, grapes, citrus fruit, etc. is available in sufficient supply for the domestic market and constitutes an important export item.

The livestock resources consist mainly of:

Cattle	52 million head
Sheep	47 million head
Horses	3.8 million head
Pigs	3.4 million head

With these ample resources a large-scale freezing and export industry (366.6 million dollars) has been developed and 190,000 tonnes of wool and 4.6 million tonnes of milk are obtained each year; these products are industrially processed and partly exported, as is also the case with hides.

In 1965, industry accounted for 36 per cent of the gross domestic product at factor cost, which was 17,320 million dollars.

Of this 36 per cent, 33 per cent was taken up by manufacturing. Of the total gross domestic product mentioned above, 19 per cent was generated by agriculture, 14 per cent by commerce, 7 per cent by transport and communications, 4 per cent by construction and 30 per cent by animal husbandry and other activities.

According to the 1963 census, the total number of industrial establishments was 220,491, employing 1,527,467 persons. Manufacturing comprised 190,862 establishments employing 1,370,466 persons and producing 7,646.7 million dollars out of a total gross domestic product of 15,730 million dollars.

In commerce and services there are 593,665 establishments employing 1,465,103 persons.

Annual industrial production includes:

Passenger cars	140,000 units
Commercial vehicles	43,000 units
Tractors	11,000 units
Radio and television receivers	160,000 units
Non-cellulosic textile fibres	14,000 tonnes
Yarn and cotton	95,000 tonnes
Rayon and acetate	20,000 tonnes

Wine	22,000,000	hectolitres
Beer	2,500,000	hectolitres
Petroleum derivatives	17,755,000	m <sup>3</sup>
Gas and liquified gases (petroleum equivalent)	4,000,000	m <sup>3</sup>
Sulphuric acid	150,000	tonnes
Caustic soda	80,000	tonnes
Cement	3,500,000	tonnes
Tires (covers)	3,100,000	units
Sugar (restricted production)	800,000	tonnes
Paper	385,000	tonnes
Sawn wood	470,000	tonnes
Steel	1,347,700	tonnes

The value of external trade in 1966 was 1,124 million dollars for imports and 1,593 million dollars for exports.

The communication routes in the country are:

Railways	41,907 km
National roads	45,000 km
Provincial roads	92,000 km
Agricultural development roads	66,000 km

Large navigable rivers provide the coastal provinces with a cheap means of transport and an outlet to the sea.

Gas and other pipelines: 10,200 km

The country has a merchant marine of 189 ships with a total of 1,040,745 gross register tonnes.

It has many aerodromes for internal traffic and several international airports. The total distance flown by aircraft was 28,083,000 km in 1965, with 1,130,375,000 passenger/km.

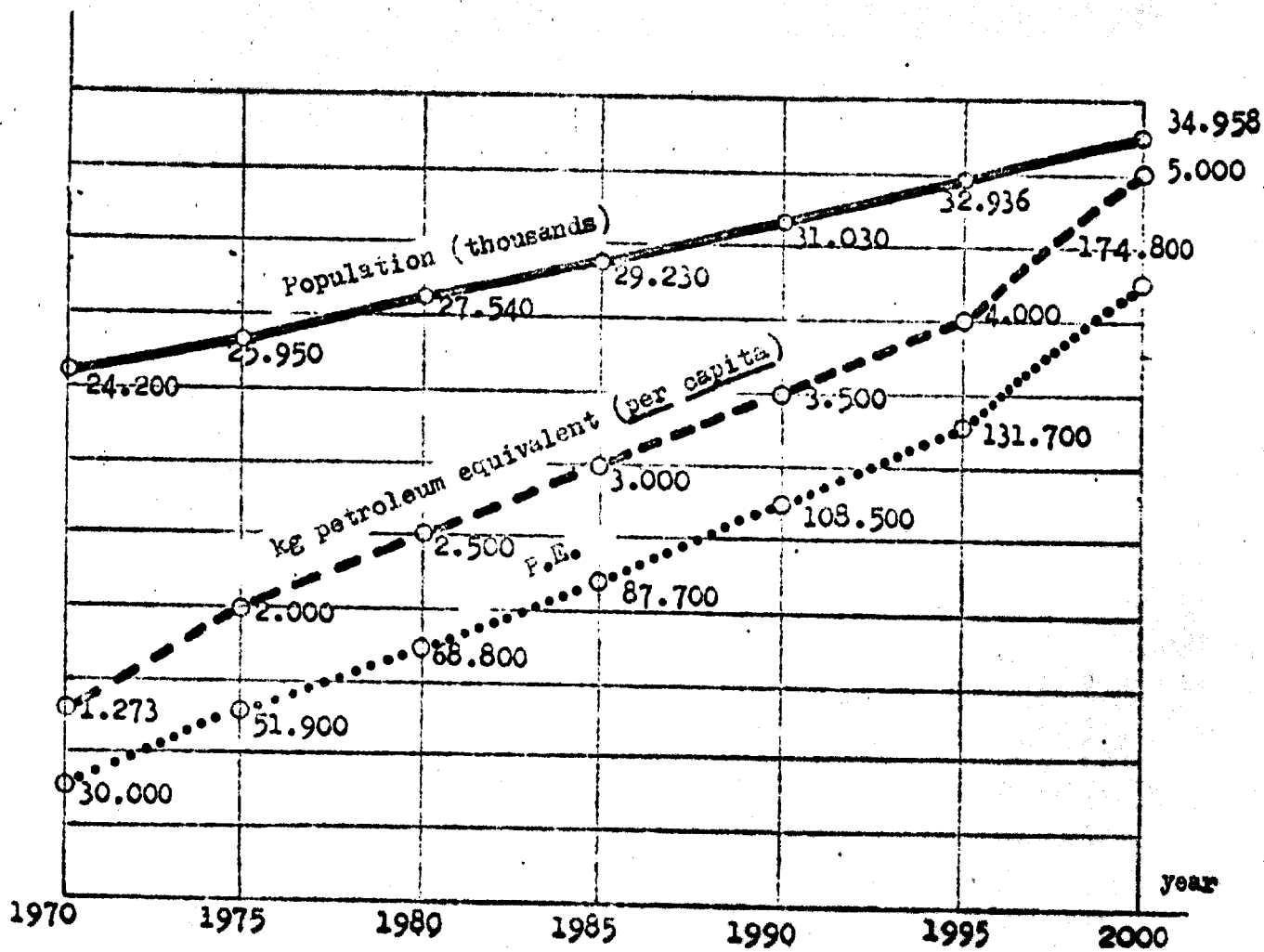
The fleet of motor vehicles comprises 1,819,700 units. There are 1,397,700 telephones, 2 million television receivers and 7 million radio receivers installed in the country, which also has 97 radio and 29 television broadcasting stations.

The country's energy reserves (hydroelectricity) amount to 44,000 million kWh/year. Known reserves of petroleum and gas represent 650 million m<sup>3</sup> petroleum equivalent and those of coal some 300 million. Prospecting now in progress has already shown much higher figures than those expressed above in petroleum equivalent.

The total production of electric energy was 12,000 million kWh, with an installed capacity of 5,091,000 kW. In 1967, the amount of petroleum produced was 18,241,604 m<sup>3</sup> and the amount of gas 3,915,000 m<sup>3</sup>, in petroleum equivalent. Coal production was less than 200,000 tonnes.

The petroleum refineries can process more than 20 million m<sup>3</sup> a year. Figure 1 shows the estimated population and the energy consumption in petroleum equivalent up to the year 2000.

Figure 1



Some educational statistics for the Argentine Republic are given below:

Pre-primary

Kindergartens	2,825
Pupils	154,606
Teaching staff	7,896

Primary

Schools	27,460
Pupils	3,449,226
Teaching staff	174,074

Secondary

Establishments	3,716
Pupils	823,257
Teachers	113,415

Higher

Establishments	424
Students	251,631
Teaching staff	16,102

Outside the regular system

Establishments	2,204
Pupils	309,199
Teachers	9,509

In the country there are nine national universities with 114 faculties; four provincial universities and thirteen private universities. State education is free at all three levels.

There are twelve academies of Sciences, Humanities and Fine Arts.

In 1966, 3,738 books were published, with a total of 22,301,634 copies.

Distributed throughout the territory of the Argentine Republic there are:

8,000 libraries for students

1,532 popular libraries

1,500 miscellaneous public libraries; foremost among all these is the national library, which possesses 700,000 volumes.

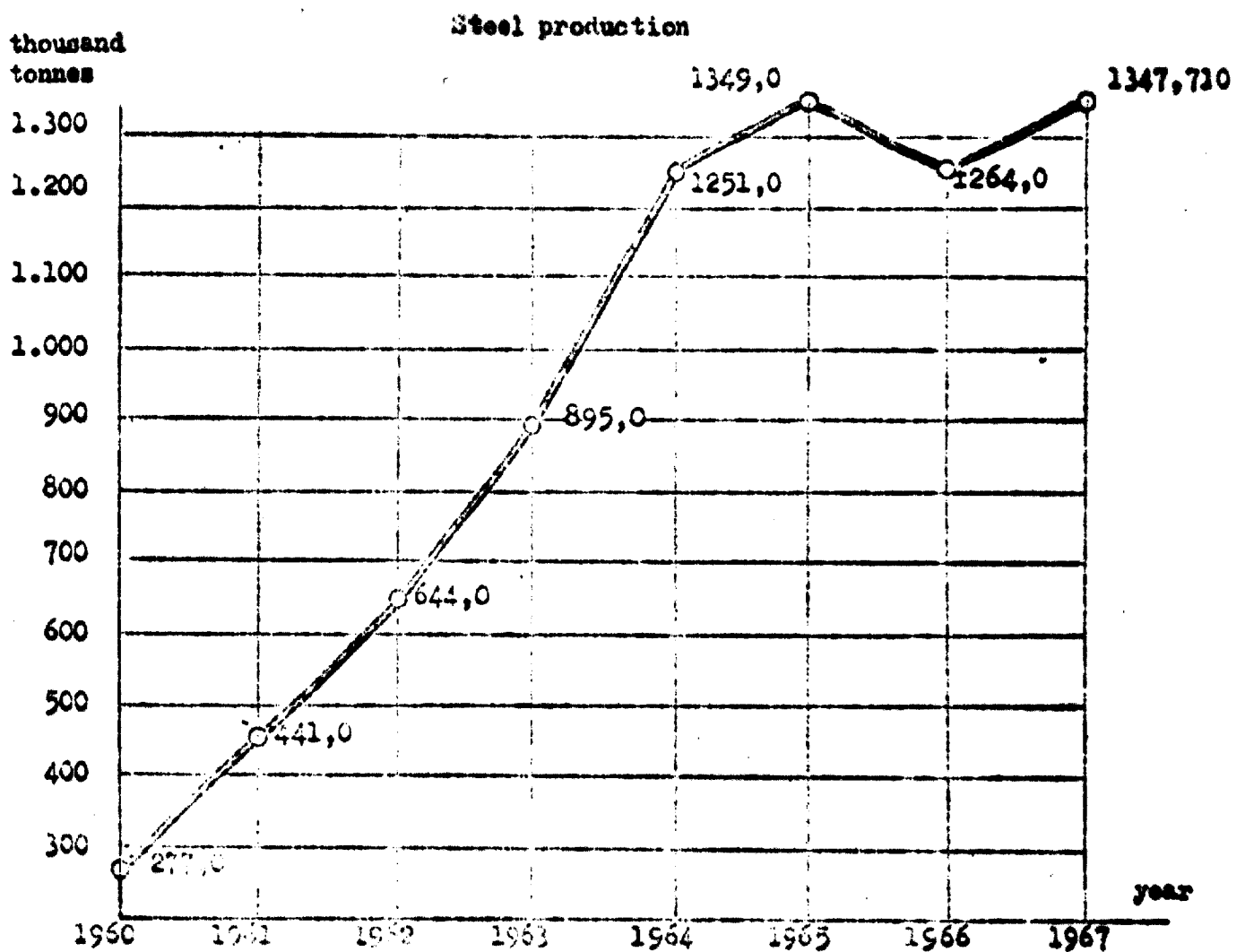
There are many cinemas and theatres throughout the nation; in the city of Buenos Aires alone there are 250 cinemas and thirty-four theatres.

The per capita gross domestic product is 700 dollars.

These data, which have been included in order to give a brief description of Argentina, provide a frame of reference that will facilitate the definition of realistic aims and objectives, based on the country's true potential.

## II. STEEL PRODUCTION AND INSTALLED CAPACITIES

Figure 2

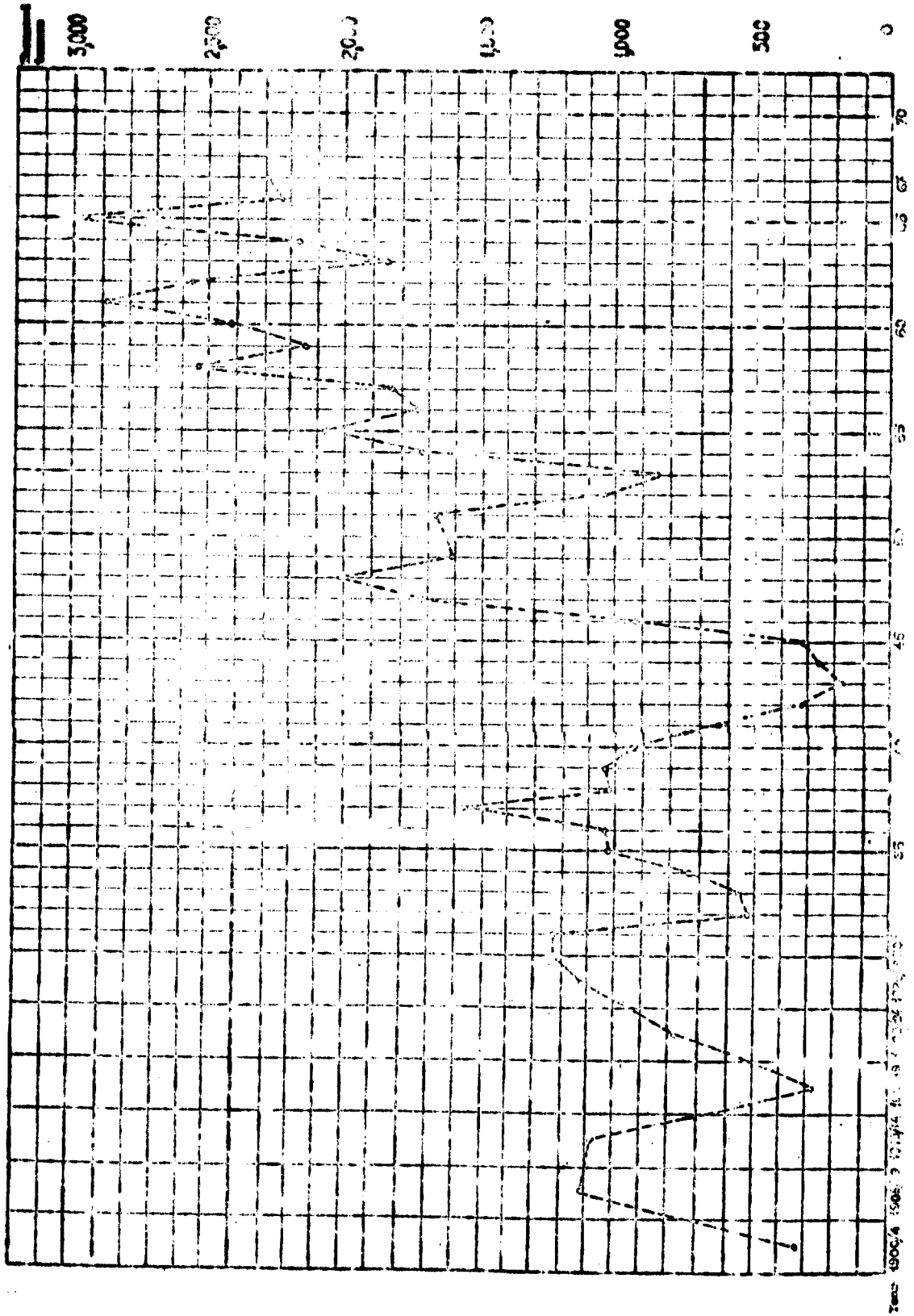


As can be seen from figure 2, steel production in 1967 reached the level of 1,347,710 tonnes, of which 828,095 tonnes were produced in integrated plants and the rest in the fourteen semi-integrated plants existing in the country, as shown in the following table.

<u>Iron and steel plant</u>	<u>Steel production/1967</u>	<u>Installed capacity</u>
SOMISA	745,955	850,000
A. H. Z.	82,140	153,000
ACINDAR	88,617	100,000
CURA HNOS.	313	25,000
DALMINE SIDERCA	163,114	205,000
F. M. ACEROS	28,164	50,000
LA CANTÁBRICA	57,014	65,000
MARATHON ARG.	9,774	15,000
SANTA ROSA	110,140	150,000
TAMET	39,902	55,000
Other plants:		
SEMI-INTEGRATED	22,577	160,000
<b>TOTAL</b>	<b>1,347,710</b>	<b>1,828,000 tonnes</b>

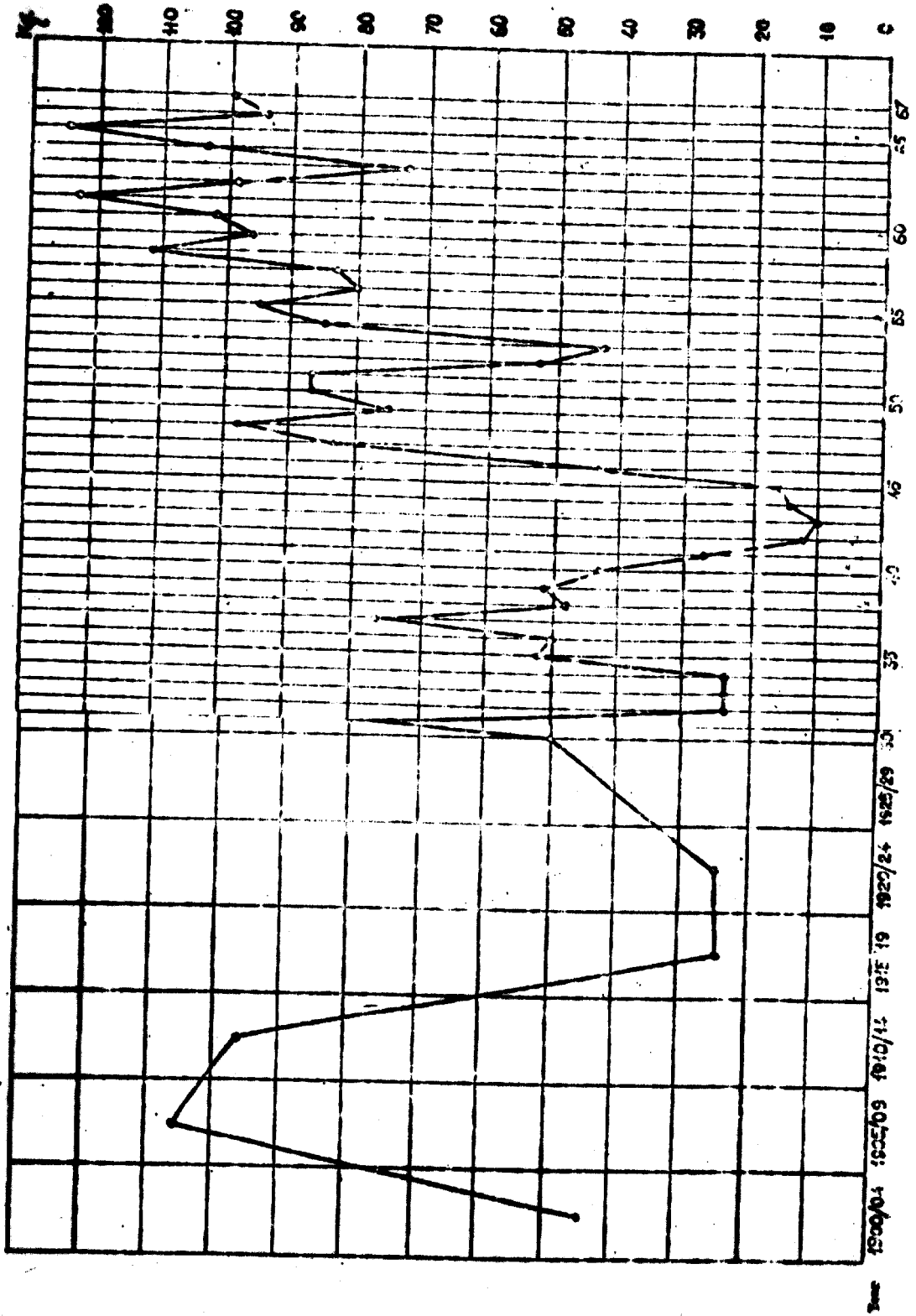
It will be noted that the rate of utilisation of installed capacity was low, the average figure being some 74 per cent.

Figure 2  
Apparent consumption of steel





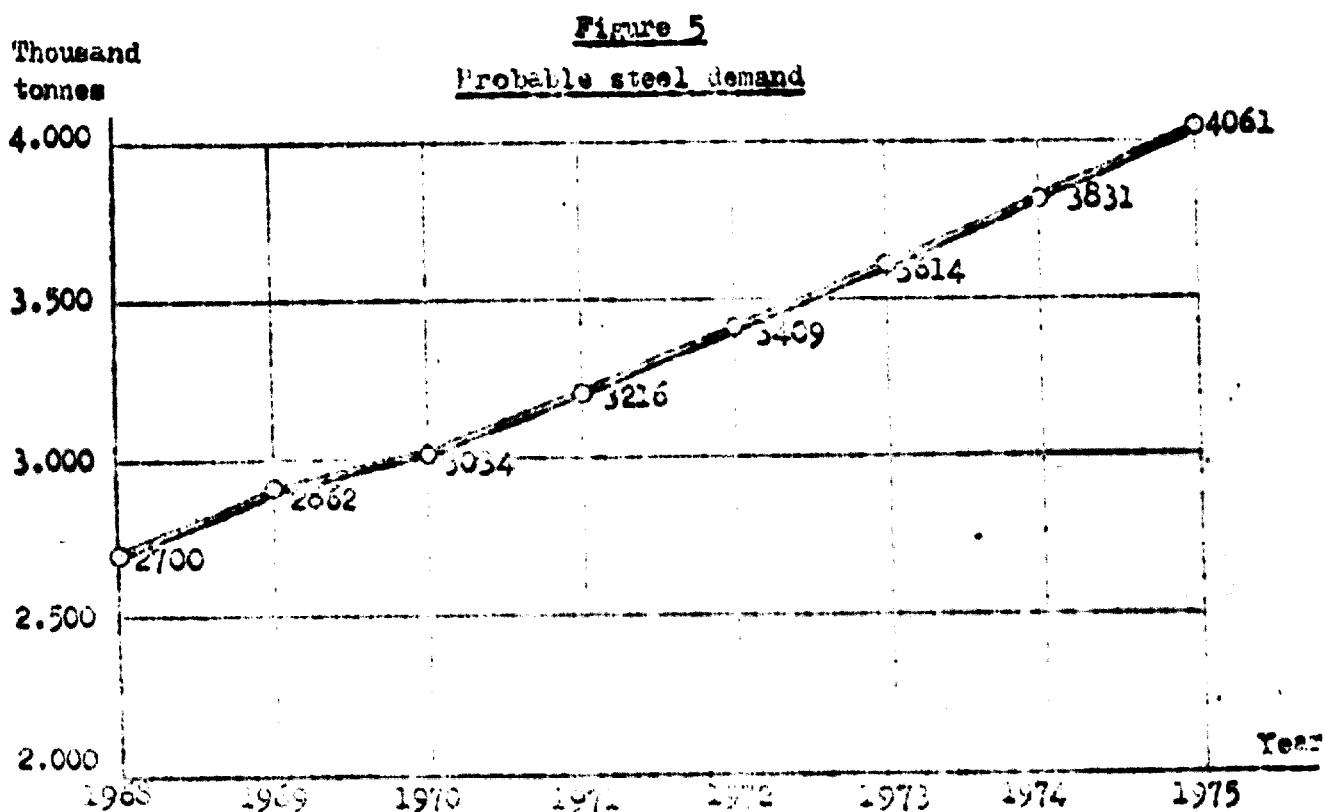
**Figure 4**  
**Per capita consumption of steel**



### III. STEEL CONSUMPTION AND PROJECTIONS OF OVERALL DEMAND

As can be seen from figures 3 and 4, demand for steel in Argentina has not been such as to permit any reliable projection for the immediate and fairly near future; certain methods that would have made it possible to determine probable steel consumption have thus had to be discarded. Careful analysis has revealed a high correlation between steel consumption and gross product. A study of series covering the whole of the present century will show that one per cent growth in gross product corresponded to an increase in steel consumption of between 2 and 4 per cent (income elasticity of demand 2-4). This high elasticity coefficient is the result of present inadequate consumption, which is below the world average. It must also be borne in mind that, for various reasons, in Argentina, where established practices play an important part, hardly any metal-frame buildings are constructed and cement is the material normally used.

In the light of a 3 per cent annual cumulative growth in the gross domestic product, it is considered that the minimum cumulative annual growth in total steel consumption will be 6 per cent. On this basis, it may be expected that by 1974-1975, when the first phase of the development of the iron and steel industry in Argentina will reach its climax, there will be a total demand for 4 million tonnes of steel in ingots (see figure 5).



On the assumption that 13 per cent of the total demand is for uncommon and special steel and that plants operate at 85 per cent of their capacity, it will be necessary to have an installed capacity of 4,100,000 tonnes per year of common steels and of 650,000 tonnes per year of uncommon and special steels.

To sum up:

Total demand for ingot steel ...	4,000,000 tonnes
Demand for common steels ...	3,480,000 tonnes
Demand for uncommon and special steels ...	520,000 tonnes
Installed capacity to meet the need for common steels at 85 per cent of capacity ...	4,100,000 tonnes
Installed capacity to meet the need for uncommon and special steels ...	650,000 tonnes

It should be borne in mind that this is reckoning from minimum requirements. If Argentina is to attain only the average steel consumption of countries with a similar economy, such as Australia, Canada and New Zealand, it would have to absorb rather more than 20 kg of crude steel per 100 dollars of national income. Per capita consumption would exceed 150 kg per annum and the short-term need would exceed the 3 million tonnes of actual steel production per annum. As can be seen from Figure 3, this amount has already been surpassed recently.

#### IV. TARGETS SET IN ARGENTINA'S IRON AND STEEL PLAN

It is clear that economic and technological advancement is linked to industrialization and likewise that the steel industry is at the basis of any industrial structure.

It is estimated that steel production and consumption will rise sharply during the remainder of this century. Argentina is determined not to lag behind in this process, but it will not have an efficient and competitive steel industry unless the country is sufficiently developed to absorb its output, and the country will not be developed unless it has a steel industry.

The dilemma is critical and action must be taken promptly. Success depends on a sound assessment of possibilities, on the definition of clear and precise targets and on the necessary determination to attain them.

A decisive and crucial aspect of potential development is the relating of production to internal and/or external demand. The degree of development and related factors in Argentina show, as previously stated, the need for a production capacity of 4,100,000 tonnes per year of common steels and 650,000 tonnes per year of uncommon and special steels. The possibility of large scale export should therefore not arise during the initial stages of steel expansion.

Our goal, therefore, emerges quite clearly: To become self-sufficient in steel by 1974, with standards of efficiency and profitability comparable to those of developed countries.

The plan to attain this goal by 1974 will have to provide for departures from the ideal course, because it is impossible to ignore the existing situation and actual possibilities. It should also be sufficiently flexible since, as has already been mentioned, there is a high elasticity coefficient in Argentina. As stated, this coefficient has an average value of 2-4 for the present country; but in some years, when the gross national product was exceptionally high or low, it amounted to 20. A recent example of this phenomenon occurred in 1966 when a 1-2 per cent decrease in the gross national product resulted in a drop in steel consumption of more than 20 per cent.

#### V. IDEAL PICTURE OF THE ARGENTINE STEEL INDUSTRY IN 1974 AND POSSIBILITIES OF ACHIEVING IT.

The ideal picture would be:

Theoretical annual capacity for production of common steels in integrated plants .....	4,100,000 tonnes
Theoretical annual capacity for production of uncommon and special steels in semi-integrated plants .....	650,000 tonnes
Theoretical annual capacity for rolling in integrated plants (80% of total) .....	4,560,000 tonnes

Theoretical annual capacity for rolling in semi-integrated plants (12% of total) .....	684,000 tonnes
Theoretical annual capacity for rolling in non-integrated rolling plants (8% of total) .....	456,000 tonnes
Total rolling capacity (120% of steel production capacity) .....	5,700,000 tonnes

Probable picture of the Argentine steel industry in 1974

Theoretical annual capacity for production of common steels in integrated plants .....	4,400,000 tonnes
Theoretical annual capacity for production of steels in semi-integrated plants .....	1,165,000 tonnes
Theoretical annual capacity for rolling in integrated rolling plants .....	4,812,000 tonnes
Theoretical annual capacity for rolling in semi-integrated plants .....	1,028,000 tonnes
Theoretical annual capacity for rolling in non-integrated plants .....	1,015,000 tonnes
Total rolling capacity .....	6,855,000 tonnes

As can be seen, existing circumstances are not conducive to the ideal development of the Argentine steel industry during the first stage, and it will be necessary to wait for the second stage, comprising the five-year period 1974-1979, to achieve the necessary adjustments. The second stage of the expansion is now being studied in consultation with the firm Akins and Partners, to prepare the necessary groundwork for appropriate action when the time comes.

The basic divergencies are:

Excess capacity for production of steel in semi-integrated plants .....	515,000 tonnes
Excess capacity for rolling of steels in semi-integrated plants .....	544,400 tonnes
Excess capacity for rolling in non-integrated plants .....	559,000 tonnes

The divergencies for the integrated plants are of little significance; moreover, as will be seen further on, the plan will have the necessary flexibility to solve any such problems and, to some extent, also the fundamental divergencies mentioned above.

#### VI. PLAN OF ACTION FOR ACHIEVING THE TARGET FIXED

The Dirección General de Fabricaciones Militares, an advisory body of the Executive in iron and steel matters, has, in conformity with article 4 of Act No. 12987/15801, proposed the necessary projects to the national Government, which in its turn has ratified the appropriate industrial promotion decrees; these projects consist mainly of:

The expansion of the Planta General Savio of the Sociedad Mixta Siderúrgica Argentina (SOMISA) to raise its capacity to..... 1,100,000 tonnes of steel a year

(First stage - in execution; will be completed by the end of 1968)

The expansion of SOMISA, to give a production capacity in 1973 of ..... 2,103,000 tonnes of steel a year

(Second stage - in execution)

The integration of ACINDA, Industria Argentina de Aceros, with a production capacity of ..... 800,000 tonnes of steel a year

(In execution - will be in operation by 1971)

The construction of the plant of Propulsora Siderúrgica S.A. at Ensenada, with a production of ..... 1,360,000 tonnes of steel a year

(In execution - will be integrated and in operation by 1974)

It should be added that some semi-integrated plants are in the process of carrying out or have already carried out certain reforms designed to fit them for the responsible role they must assume under the iron and steel plan; amongst such plants are Santa Rosa, Dalmine Siderca, Tamet, La Cantabrica, etc., which have been and still are making considerable efforts and investing large sums to meet the needs of the present day and promote efficiency and competitiveness.

The semi-integrated plants will be faced by serious problems in the near future because of their excess capacity. They will find it very difficult to compete with the integrated plants and, as they are already doing, will have to take up the production of uncommon and special steels and perhaps of certain types of common steels for which the integrated plants are unsuited.

Another project in the modernization and remodelling programme which deserves to be mentioned is that of Dalmine Siderca. This incorporates an "S" type continuous casting machine (curved mould type), with two or three strands, depending on the section desired, for billets from 75 mm square to 120 mm square, using ladles of 25 tonnes capacity. The project is at an advanced stage and the machine will be in operation in June this year.

It should perhaps be mentioned at this point that we have an integrated charcoal steel plant, Altos Hornos Zapala, with an annual capacity of 150,000 tonnes, which, despite its small output, is able to operate competitively owing to certain advantageous factors (geographical location, proximity of the mines, internal transport network, local coal production, etc). At this moment it deserves special consideration from the competent authorities; the high-quality steel produced by using charcoal would indicate that it should turn to production of uncommon and special steels. It has already started to produce some categories such as SAE 1045, 1080, 1112, 4150, 5160, 8620, 9260, etc.

A very interesting experiment has taken place at this plant in blast furnace No.3, using fuel-oil injection. The system was installed in May 1963.

This has proved a way of reducing charcoal consumption as well as a major factor in improving furnace control and increasing production.

The results indicate that with a fuel-oil injection of 66 kg per tonne of pig-iron, output was increased by over 10 per cent. Each kg of fuel oil replaced approximately 1.8 kg of charcoal. The process showed a saving of 4 per cent in the cost of pig-iron.

## VII. BRIEF DESCRIPTION OF THE MAIN PROJECTS APPROVED

### Sociedad Mixta Siderurgia Argentina (SOMISA)

The basic equipment and plant required to meet desired production and quality levels under the plan for expansion to 2,100,000 tonnes are as follows:

#### - Port and wharfs for unloading of raw materials

The expansion requires increased capacity for unloading and storage of raw materials and the introduction of efficient handling techniques. The following equipment will be installed:

- A third unloading crane.
- A connected system of belt-conveyors which will enable coal, ore and pellets to be unloaded at any point on the wharfs from boats moored at the wharf and from lighters.
- A system of coal recovery belts to feed the coke ovens.
- A system of belt-conveyors and a tippie for limestone.
- Coke-making facilities to supply the second blast furnace; two additional coke plants will be installed with a total of 119 ovens, and with recovery of ammonium sulphate, crude benzol, crude tar and hydrogen sulphide.
- Second blast furnace; with a hearth diameter of 9.15 metres and a nominal average production of 2,900 tonnes/day, which could be increased in the future.

There will be three stoves with a semi-automatic reversing system and provision for a fourth stove.

Hydro-carbon injection is planned. The storage and loading facilities for raw materials will be completely automated.

#### - Sinter plant

This will have a capacity of 1,600 tonnes/day with the possibility of doubling this capacity.

The plant will make it possible to recover ore and pellet fines, blast furnace dust and muds/slimes, and possibly LD converter dust, rolling-mill scale, Siemens-Martin residue and limestone and coke breeze.



- LD steel-making plant and degasification

The new steel-making plant will have 2 basic oxygen converters with a capacity of 120 tonnes and a potential capacity of 138 tonnes; provision will be made for the installation of a third converter.

- Continuous casting

A 6-strand continuous casting machine for 7" x 7" blooms and a 2-strand continuous casting machine for slabs 6 1/4" in thickness and with widths varying between 30" and 60" will be installed. Casting capacity will be 812,000 tonnes per annum.

- Oxygen plant

To feed the LD plant, an oxygen separating plant with a 426 tonnes/day capacity and recovery of nitrogen will be installed.

- Calcination plant

This will provide the high-quality calcined limestone required by the oxygen converters. It will also feed the Siemens-Martin furnaces. The plant will be equipped with two rotary furnaces and will have a capacity of 360 tonnes/day.

- Rolling of blooms and slabs

- (a) The system of raising work rollers will be modified to increase its speed, thereby reducing dead time in slab rolling.
- (b) Improvements will be made in the systems for evacuating residue and waste from blooms and slabs.

- Billet rolling

A continuous 150 tonne/hour furnace will be installed. There will be a wharf with storage facilities for blooms together with handling facilities for loading them into the reheating furnace.

- Hot-rolling mill for plate

The following additions or alterations will be made:

- A third continuous furnace for reheating slabs with a capacity of 100 tonnes/hour.

- Modernization of the de-scaling system, raising its precision to  $140 \text{ kg/cm}^2$  and thus reducing the defects caused by mill scale.
- Modernization of the system of cooling rollers to increase their working life.
- Intermediate system of leading off heavy plate before it passes to the finishing mill.
- Automatic control of thicknesses in the finishing mill by means of separation of rollers and radiation gauge.
- Two new coilers to increase the output, quality and availability of coiled products.
- Extension of the coil conveyor to improve handling.
- Installation of a new conveyor, tipple and mobile equipment for the dispatch of hot-rolled coils and their storage outside the mill.
- Equipment to speed up the changing of rollers and reduce delays.

- Cold rolling of sheet and plate

The following additions and modifications will take place:

- The coil handling system at the entry and exit of the mill will be modified and expanded, and the threading system will be improved so that it can handle 20-tonne coils.
- The sheet lubrication system and roller cooling system will be modified.
- A system of automatic control of thicknesses by tensionometers and radiation gauges and hydraulic adjustment of work rollers to produce cold-rolled sheet and plate with the thickness and shape tolerances required by the market.
- Extension of the electrolytic cleaning shop.
- Annealing of coils  
Nine single-pile furnaces and 27 stands and additional handling equipment will be installed.
- Tempering  
The entry and exit ends of the 1-stand and 2-stand tempering mills will be modified and the handling equipment extended to allow for the processing of 20-tonne coils.
- The speed of the 1-stand tempering mill will be increased.
- Hydraulic adjusting systems for rollers will be added in both mills.
- Tinplate  
An electrostatic lubricator will be installed.

Pump house and power facilities, etc. The following will be installed or constructed:

- A 26,500 KWA turbogenerator and ancillary equipment.
- Two boilers (227 tonnes/a steam, 63 kg/cm<sup>2</sup> pressure and 482°C).
- Extensions to the water treatment plant.
- Two 140,000 l/min. pumps to supply the condenser of the new turbogenerator.
- Ancillary electrical equipment and control room.
- Building extensions.
- A turbo-blower (4,250 m<sup>3</sup>/min. at 2.8 kg/cm<sup>2</sup> with a potential capacity of 4,750 m<sup>3</sup>/min. and 3.2 kg/cm<sup>2</sup>) for the second blast furnace.

System for preparing scrap:

A new press and ancillary equipment will be installed on the present wharf.

The cost of these extensions will be 195 million dollars.

ACINDAR, Industria Argentina de Aceros S.A.

The basic equipment and facilities in the project submitted by ACINDAR for the integration of its steel plant are the following:

- Unloading wharf for raw materials, approximately 380 m. in length.
- It will be constructed of steel and mounted on piles with wide flanges, sunk in the river bed. This structure will support the rails for unloaders and the belt-conveyor used in the unloading process.
- Storage wharfs for iron-ore, coke, coal and limestone.

These will be suitable for unloading and storing the raw materials brought by sea-going ships or river barges. Each unloading line will have a free unloading speed of 1,200 tonnes/hour. The unloading machines will be totally automated and driven by electric power, and will place the raw materials on belt-conveyors for transfer to the storage dumps. Recovery from these dumps will be effected by means of a bucket wheel which will again place the raw materials on belt-conveyors to be transferred to the blast furnace, pelletization and/or sinterization unit, etc. There will also be transportable bulldozers, front loaders and movable belt-conveyors.

- Blast furnace: This has been designed with a diameter of 29'6", with a nominal production capacity of 1,900 tonnes of pig-iron per day. It will include a system for injecting a liquid mixture of fine coke and fuel oil as an auxiliary fuel. Three forced-draught stoves 8 metres in diameter will be installed. Space will be left for a fourth stove.

Production will take place in the following manner:  
1,600 tonnes/day of hot metal for the steel-making plant;  
100 tonnes/day of pig-iron for the foundry to produce fine cast iron for sale.

- Steel-making plant: This will have two basic oxygen converters of 100 tonnes and all the necessary ancillary equipment. Its production capacity will be 1,750 tonnes per day. Equipment will be installed for degasification - a process which facilitates continuous casting.

The charge of the converters will consist of 70-80 per cent hot metal from the blast furnace and 20-30 per cent scrap.

- Oxygen plant: Its capacity will be 250 tonnes/day.

A possible alternative would be for oxygen to be supplied by a plant built and operated by one of the oxygen producing companies on a contract basis.

- Continuous casting and degasification installations

Partial quenching of the steel will be carried out by the degasification process according to the D.H. system (Dortmund-Hörder) or the R.H. system (Ruhrstuhl Heraeus), which would seem to be the most appropriate for ACFNDAR.

The steel will be continuously cast into billets and slabs, using two four-strand machines of the low-elevation type. The layout will allow for a third machine to be installed in the future.

Each machine will be able to cast the following cross-sections at the following speeds:

<u>CROSS-SECTION</u> (in mm)	<u>LENGTH OF BILLET</u> (in m)	<u>SPEED OF CASTING</u> (m/minutes)
177.8 x 177.8	0.915 m	34
139.7 x 177.8	0.915 m	68
139.7 x 228.6	0.915 m	59
139.7 x 304.8	0.915 m	55

Provision will be made for emergency casting in small ingot moulds, probably by bottom-casting. Further emergency equipment will be a set of cars with large ingot moulds (around 6 tonnes).

The billet mill will be a continuous mill composed of four vertical and four horizontal stands, each driven by individual electric motors with a total power of approximately 10,000 HP.

The continuous mill will easily produce more than 600,000 tonnes a year; it will have movable shears coupled with it for cutting the various sections produced and there will be two cooling stands at the end of the mill. Equipment will include 30 tonne cranes.

- Heating chamber for 150 tonnes/hour iron bars, 30 feet long. End-loading and unloading by rack-type feed and ejection.
- Projected steam and electricity plant. It will consist of two boilers, each with a capacity of 120 tonnes/hour, designed to burn blast furnace gas supplemented with natural gas and/or fuel oil.

The generating equipment will consist of a hydrogen-cooled turbine, of 25,000 Kw capacity.

- Pelletization and/or sinterization: A pelletization plant with a capacity of 500,000 tonnes/year is proposed for the preparation of ore agglomerates. This would depend on developments taking place in the plants situated in the mining areas.

It might be preferable to install sinterization plant for making use of coke and ore fines and iron oxides resulting from the rolling processes or the collection of dust residues from the blast furnace and LD converters in the steelworks.

It should be made clear that the above scheme may be subject to modification such as an increase in the capacity of the blast furnace and expansion consequential upon such an increase. The total investment entailed would be 155 million dollars.

PROFULEORA ARGENTINA S.A.

This project has been approved by Executive Decree and involves the installation of an integrated iron and steel plant with capacity for 1,360,000 tonnes of steel and 1,100,000 tonnes of rolled products.

The programme is for an integrated plant to be built in the Eisenada area, near La Plata, on the following lines:

- Raw material handling plant; port and internal transport facilities, etc.
- Coking plant using coal from Rio Turbio and imported coal; capacity 800,000 tonnes a year with recovery of by-products.
- Two blast furnaces each with a capacity of 1,330 tonnes a day.
- LD steel-making plant: two mixers and three oxygen-blown converters, capacity 75/85 tonnes a day with the possibility of 30 daily tappings. Total nominal capacity: 1,300,000 tonnes a year of molten steel.
- Continuous casting plant: the molten steel produced in the plant will be made into blooms and slabs by five continuous casting machines. Annual capacity will be 540,000/612,000 tonnes of flats and 310,000/318,000 tonnes of bar.
- Hot rolling: equipment for an annual capacity of 1,000,000 tonnes of hot-rolled sheet.
- Cold rolling: capacity for 350,000 tonnes a year comprising:
  - One pickling plant
  - One tandem train with five 66" cages
  - One tempering mill 66" wide
  - One longitudinal cutting line
  - One transversal cutting line

This project may undergo a certain amount of modification. It is now undergoing the first stage of execution, which includes the cold rolling, and definite plans have not yet been submitted for the subsequent processes. The total approximate investment will amount to some 222 million dollars.

It should be made clear that the later stages will go into effect as required by the real needs of the market and subject to evaluation carried out by the advisory body of the Executive, the Dirección General de Fabricaciones Militares. The flexibility of this project will enable production capacity to be adjusted to actual demand in determining which of the alternatives presented should be adopted. For this reason it may be called a "lung" project and calls for extreme care since, although the final objective is self-sufficiency in steel by 1974, it would not be desirable to have over-capacity. At present the iron and steel industry throughout the whole world is going through a very difficult period because of this very problem. Moreover, when production falls below a certain fairly strictly defined level with respect to installed capacity there can be a serious loss, and which, in view of the importance of this basic product, can be expected to affect the whole economy.

#### VIII. RAW MATERIALS

Substantial deposits of raw materials for iron and steel have still not been discovered in Argentina, apart from the Sierra Grande iron ore field in the province of Rio Negro, where neither the extent of the deposits or the iron content are such as to afford a complete solution for the problem regarding this raw material. These deposits are of sedimentary origin, are situated 30 km west of the Atlantic coast and have an average metallic content of 55 per cent. So far, surveys suggest the presence of some 50 million tonnes of ore; 15 million tonnes of proved reserves and 30 million tonnes estimated. The northern mines supplying iron ore to Altos Hornos Zapla and Altos Hornos Guemes do not altogether solve the problem either.

There is thus a shortage of iron ore; there is also a shortage of suitable metallurgical coal and a shortage of high-content manganese.

It is impossible to judge whether this problem can be solved in the future as the country's possibilities have not yet been thoroughly explored.

The Dirección General de Fabricaciones Militares, with the co-operation of the United Nations and the national and provincial mining institutes is undertaking with surveys to ascertain what possibilities there are for solving the problem. The Central Cordillera Plan is a geological-mining survey project covering a central sector of the Andes Cordillera in the provinces of Mendoza, Neuquén and San Juan, to locate likely areas for mineral deposits.

The considerations that led the Dirección General de Fabricaciones Militares to undertake a survey of this nature may be summed up as follows:

- The general picture presented by the national mining industry is one of stagnation; the rate and volume of extraction have declined and the mines will be paralysed by exhaustion of their reserves unless new deposits can be discovered.
- Meanwhile, industry is expanding more rapidly; as this industrial activity depends largely on the supply of mineral ores, the deficiency of mineral raw material was resulting in an increasing drain on the foreign currency needed for imports. Any action taken towards discovering new mineral reserves will help to improve this situation.
- There is a need to encourage private capital investment in mining, to see this type of undertaking through the costly and hazardous stage of prospecting and exploration, and ensure a reasonable margin of security for future investment.
- At the same time, opportunities will be afforded for the training of Argentine professional workers in the modern techniques used for ore-prospecting.

The headquarters of the Cordillera Plan is located in the city of Mendoza. The management of the project is the responsibility of the executing agency of the United Nations and the Dirección General de Fabricaciones



Militares, which plan and direct operations through the Project Director, who is selected and appointed jointly. The post of Project Director has been occupied in turn by the United Nations experts Jean S. Carman, from July 1963 to the end of 1964, and Pontus Ljunggren, from that date until the present time.

The area surveyed comprises 128,000 km<sup>2</sup>, and the most modern techniques were used in the execution of the works. The starting point of these techniques is aerial photography, the photographs being subsequently interpreted by experts. Promising areas were identified for subsequent intensive surface exploration.

From the aerial-photographic survey 233 map sheets on the scale of 1:50,000, each covering an area 15' latitude by 15' longitude, and 20 sheets on the scale 1:200,000, each covering 1° longitude by 1° latitude, were obtained.

Geological photo-interpretation, geochemical and geophysical prospecting followed next, and in 1964 drilling was begun.

The results are highly promising in respect of non-ferrous metals, but unfortunately have provided no solution to the problem of raw materials for iron and steel-making. However, the North Cordillera Plan is going ahead, with surveys covering an area of 265,000 km<sup>2</sup> in the north-eastern provinces. The aerial photography was completed last summer, and subsequently surveying will be extended to cover the whole country.

Sierra Grande, where initial development has already been begun, with mining works and a pelletization plant, will produce a million tonnes of agglomerates with an iron content of 68 per cent.

The only coal deposits which have been discovered and worked so far are in the Rio Turbio field; the type of coal produced can be used in blast furnaces only when mixed with imported coal, and then only in the proportion of 15 per cent.

The coal is of sub-bituminous "A" and high-volatility bituminous "C" as classified in the ASTM tables.

It is a young coal of the Tertiary era, with properties midway between old lignite and long-flame gas-rich coal and therefore its behaviour in low or high temperature distillation corresponds to its age; this means that it cannot be used in blast furnaces on its own or when employing the ordinary direct method for preparing metallurgical coke, as it forms crumbly and friable rather than compact coke.

The manganese deposit exploited is of poor quality with a manganese content below 40 per cent, so that it can only be used for ferrous alloys mixed with higher grade ore, mostly obtained from Brazil.

To sum up, the following will be the requirements in 1974:

Iron ore (content 63%)	6,350,000 tonnes
Coal	4,000,000 tonnes
Manganese ore (content 42%)	105,000 tonnes

This means that, if Argentina does not become self-sufficient, the shortage will have to be made good with imported raw materials; within the Latin American area and through close contacts with neighbouring countries, it should be possible to find solutions, which will greatly help in supplementing Argentina's supplies.

#### IX. PROMOTION AND ENCOURAGEMENT OF THE IRON AND STEEL INDUSTRY

We are well aware of the immense capital investment involved in the iron and steel industry, and realize that the profits are not high enough to attract many investors. At the same time we are quite convinced that self-sufficiency in steel is a vital priority for us to achieve fulfilment as a nation.

For this reason, legal provisions have been made for promotion of the iron and steel industry and have been brought into force.

The chief instrument of this kind is Act No.12987/15801, known as the Savio Act to commemorate its initiator, who is regarded by the Argentine people as the "father of the Argentine iron and steel industry".

The celebrated general Manuel N. Savio incorporated in this Act various provisions regarding promotion and encouragement, such as exemption from customs duties for the import of machinery, accessories, supplies, and raw materials intended for iron and steel plants, and laid down the fundamental guidelines for the elaboration of the Argentine iron and steel plan with the following objectives:

- (a) To produce steel in the country, using Argentine and foreign ores and fuels.
- (b) To supply the domestic conversion industries with finished high quality steel, at prices approximating to those in the major foreign producing centres.
- (c) To encourage the installation of plants for the transformation and finishing of steel items of the highest degree of technical perfection.
- (d) To ensure the development and guarantee the future stability of the Argentine iron and steel industry.

Subsequent legislation went further and in 1961 Decree No. 5038/61 laid down the efficiency and production standards necessary for iron and steel-producing units to qualify for the following benefits under the regulations:

- (a) Exemption from customs duties on the import of machinery, accessories, supplies and raw materials not produced in the country.
- (b) Deductions of 100 per cent in the case of integrated plants and of 80 per cent in the case of semi-integrated plants on the amount of capital investment for the assessment of income tax.
- (c) Exemption from income tax on payments for outside advisory services (5 years).

- (d) Accelerated amortization in tax balance-sheets.
- (e) Exemption from the tax in lieu of the duty on gifts.
- (f) Exemption from stamp duty.
- (g) Simplified entry formalities for foreign personnel.
- (h) Status of "enterprise in the national interest" for tax purposes.
- (i) Priority in the supply of raw materials, energy, fuel and transport for the benefit of State holdings and undertakings.
- (j) Backing and guarantees for foreign loans.

Later on, Decree No. 3113 provided the following benefits for the iron and steel industry:

- (a) Exemption from import duty on machinery, accessories, supplies, raw materials, fuels and materials imported for iron and steel plants, where not produced by domestic industry in sufficient quantity and quality at reasonable prices and with reasonable delivery dates.
- (b) For purposes of income tax and excess profit tax, permission to amortize two-thirds of the value of fixed assets during the first half of their working life.
- (c) Integrated iron and steel plants benefit to the extent of 100 per cent of the tax exemptions allowed; the proportion is 75 per cent in the case of semi-integrated plants.

Other privileges are:

- (1) Deferred payment of the tax in lieu of the duty on gifts.
- (2) Exemption from stamp duty.
- (3) Facilities for entry and permanent residence of foreign personnel.
- (4) Priority for equipment under Decree No. 5339/63.
- (5) Concessionary prices for gas, electricity and fuel.

The undertaking entitled to these benefits can, at its option, take partial advantage of the exemptions, to enable individual investors to benefit from the tax advantages granted.

For each particular project falling within the general framework of the legislation outlined above a special promotion decree is issued laying down in detail the benefits necessary to promote investment. ACINDAR and PROPULSORA, for example receive substantial State subsidies in respect of their share capital, guarantees for their foreign obligations and duty free allowances for 300,000 tonnes a year each of semi-finished goods over a period of three years to facilitate their capitalization, in addition to the exemptions mentioned under general legislation.

#### X. CUSTOMS POLICY

The years following the end of the Second World War were favourable to the development of the Latin American countries, when the primary products constituting the bulk of their exports met with a favourable reception on European markets, still suffering from the consequences of the war. However, a few years later, most of the industrial nations had organized their economies and with the help of appropriate measures and plans quickly regained their industrial and agricultural production levels. The prospects for increased exports from the Latin American countries began to fade and consequently the foreign exchange resources of these countries declined. The unfavourable changes in the relation between import and export prices also had a negative effect.

During the period 1954 to 1958 the terms of trade signified a loss of around 12 per cent of overall trade for the Latin American countries. To limit the volume of imports necessary for their growing development and to remedy the balance of payments, several such countries were obliged to alter their exchange systems and foreign trade regulations, principally by replacing the direct controls used up till the fifties by indirect procedures, placing the responsibility for regulating imports on the tariff structure. In this way a tariff system primarily designed as a monetary and fiscal instrument, and not as an aid to healthy industrial development, came into being.

Prior to 1 March 1967, the Argentine tariff system - although without general restrictions - was among the highest in the world. For a total of 6,707 products the duty rates were as follows:

- For 44.34 per cent of the products: less than 75 per cent.
- For 52.29 per cent of the products: rates ranging between 76 per cent and 225 per cent.
- For 3.15 per cent of the products: rates ranging between 226 per cent and 375 per cent.
- For 0.22 per cent of the products: rates ranging between 376 per cent and 625 per cent.

Since then Argentina has introduced, under Decree No.1410/67, substantially modified import regulations. This adjustment was an essential preliminary to harmonious overall development, ensuring a tariff system that would:

- (1) Serve to protect industry and act as a regulator to enable it, within a given period of time, to match its prices as closely as possible to those obtaining on the internal market of developed countries.
- (2) Enable the various duties to be grouped on a progressive scale for:
  - (a) Raw materials
  - (b) Semi-finished products
  - (c) Finished articles.

This system is now in operation; it is dynamic and oriented towards a specific policy to stimulate real and effective industrial development within an open market.

As regards the iron and steel sector, a very important advance has been achieved in the adaptation of duty levels, with a view to stimulating the growth of Argentine industry. By way of illustration, the previous and present duty levels for some of the more important products are shown as follows:

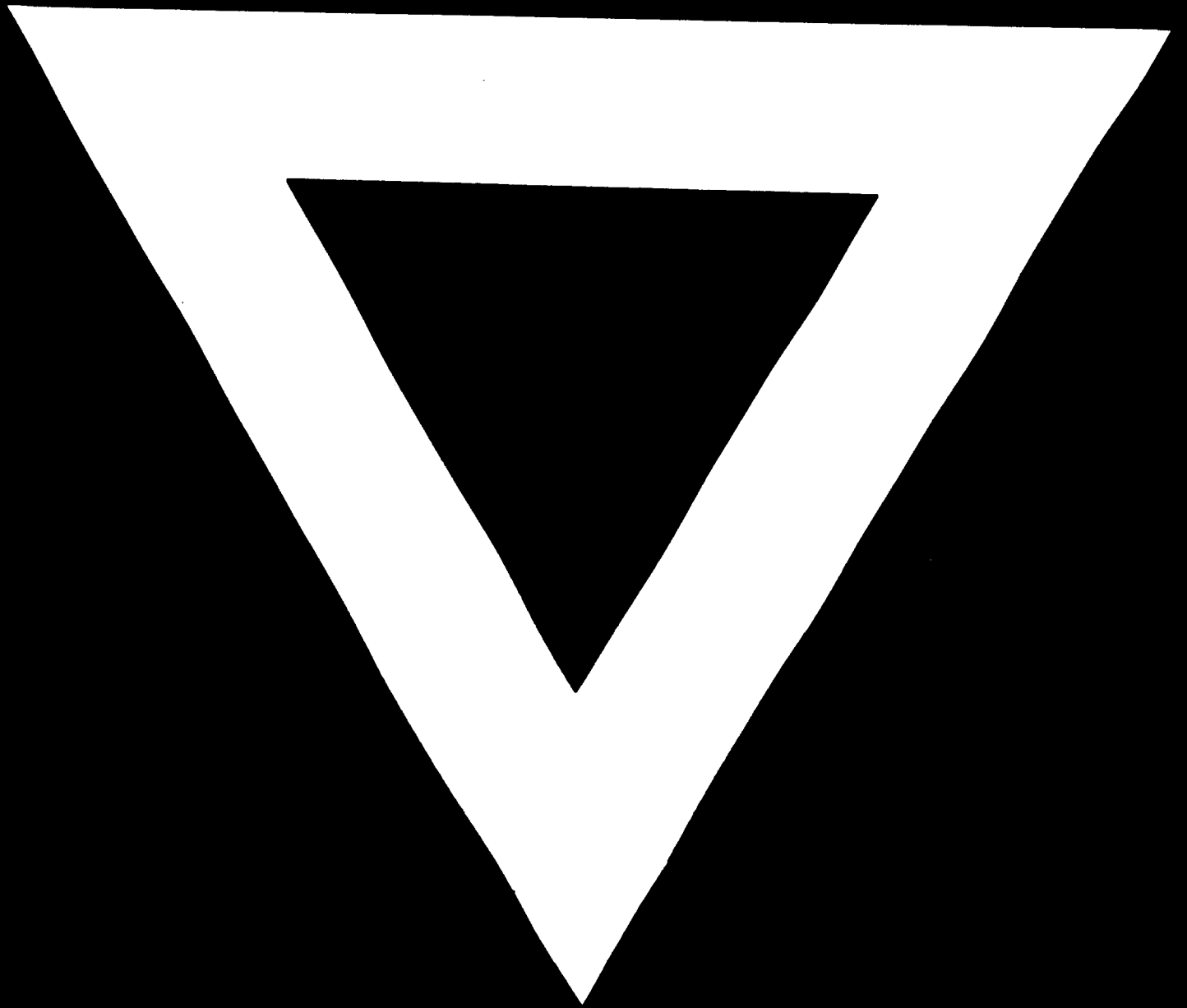
Customs heading	Product	Duties	
		Previous	Present
73.01.02.01	Pig iron (cast iron)	25	20
73.01.02.02	Hematite pig iron (cast iron)	25	20
73.02.01.00	Ferro-manganese	185	80
73.02.02.01	Ferro-silicon	185	80
73.02.02.02	Ferro-silicon-manganese	185	110
73.02.02.03	Ferro-molybdenum	130	20
73.03.00.00	Scrap and waste metal of iron or steel	50	20
73.05.02.00	Sponge iron or steel	50	20
73.06.02.01	Ingot of iron or steel containing less than 0.25% of C	40	30
73.06.02.02	Ingot of iron or steel containing more than 0.25% of C	80	50
73.07.01.01	Blooms and billets containing less than 0.25% of C	40	30
73.07.01.02	Blooms and billets containing more than 0.25% of C	80	50
73.07.03.00	Forged blooms	220	70
73.08.00.00	Coils	50	40
73.10.01.01	Wire rod	175	60
73.10.02.02	Heavy bars with a content of up to 0.25% of C, unworked	175	60
73.11.01.01	Shapes and sections of 80 mm or more with a carbon content of up to 0.25%, unworked	120	70
73.11.02.01	Shapes and sections of less than 80 mm with a carbon content of up to 0.25%, unworked	120	70
73.11.02.04	Shapes and sections for structural steelwork	175	70

Customs heading	Product	Duties	
		Previous	Present
73.12.00.90	Hoop and strip of iron or steel, hot-rolled or cold-rolled, unworked	120	60
73.13.01.00	Sheets and plates of iron or steel, not coated, more than 4.75 mm thick	50	40
73.13.02.01	As above, 3 to 4.75 mm thick	50	40
73.13.03.01	As above, less than 3 mm thick	50	40

The current levels take into account the necessity for protecting domestic production, since it is impossible to ignore the present trend to export iron and steel products at any price.







**74.10.15**