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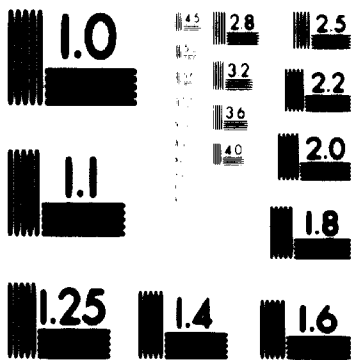
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report to dwell too subjectively on recounting the historical implementation of the duties as mentioned previously, duties which would have been carried out as a matter of course. Instead, after the briefest of treatments as to such implementation, catered for in the following Chapter 2, the report will endeavour to be objective as regards the capital goods programme overall, by presenting the conclusions and recommendations arrived at as a result of the Expert's own experience in Industrial Policy Planning, Industrial Engineering Administration, and Management Consultancy practices.

1.8 Summary of Conclusions and Recommendations.

The capital goods sub-sectors identified throughout the C.G. Project up to the present, are considered to be eminently comprehensive in the light of existing industrial circumstances and requirements in Mexico.

As regards general feasibility study, all such sub-sectors have been fully dealt with by their respective UNIDO experts or sub-contracted consultants during the assignment period of the Expert.

Nevertheless, in the course of his work it has occurred to the Expert that two areas of industrial activity, not specifically mentioned previously, are of particular interest to the C.G.

Project. These are Cold Rolled Section Forming and Welded Tubemaking which, although they can hardly be considered as constituting capital goods sub-sectors on their own, do nevertheless eminently qualify for special consideration within the Steel Industry Plant and Equipment sub-sector. Accordingly, these two industrial activities form the subject of the Expert's first two recommendations dealt with herein.

Remaining recommendations in the present report result from industrial operational deficiencies arising in Mexican industry which the Expert has had occasion to observe during the course of his assignment.

All conclusions and recommendations are dealt with in detail in Chapter 3, the summary of the recommendations themselves being as follows:

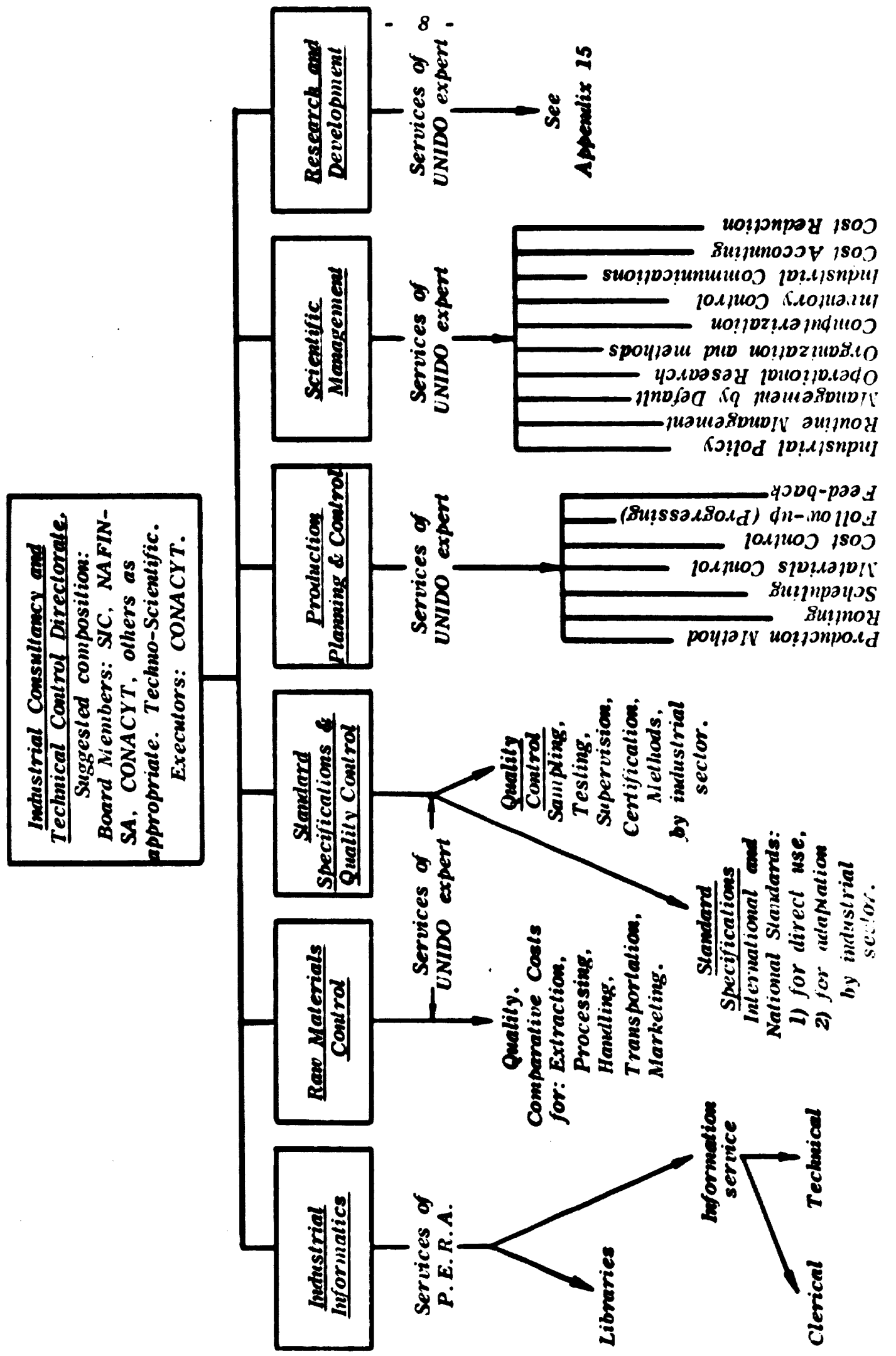
Recommendations.

- 1. Sponsor the creation of a Cold Rolled Section Forming Industry in Mexico.**
- 2. Sponsor the development of a suitable Welded Tubemaking Industry in Mexico, properly coordinated with the existing Seamless Tubemaking Industry.**
- 3. Establish a technically qualified official organization to administer Raw Material Control throughout the nation,**

under the overall direction of an Industrial Consultancy and Technical Control (IC & TC) Directorate (see suggested Organigrama in this respect appended to the present summary).

- 4. Establish a similar organization, under the same directorate, qualified to study, administer and execute the introduction of Standard Specifications and Quality Control practice nationwide.*
- 5. Obtain the services of a UNIDO expert in Raw Materials Control, Standard Specifications and Quality Control for industry.*
- 6. Establish a Production Planning and Control Division of the IC & TC Directorate proposed in 3 above.*
- 7. Obtain the services of a UNIDO expert in Production Planning and Control, including Productivity Incentive Planning.*
- 8. Establish a Scientific Management Division of the proposed IC & TC Directorate.*
- 9. Obtain the services of a UNIDO expert in Management and Industrial Consultancy.*
- 10. Establish a Research and Development Division of the proposed IC & TC Directorate.*
- 11. Obtain the services of a UNIDO expert in Research and Development (including Product Planning) for industry.*

Suggested Organigrama for Industrial Consultancy and Technical Control Authority.



CHAPTER 2

IMPLEMENTATION

2.1 Background briefing.

Apart from the local environmental information of a general nature, as regards the duty station for the Expert's assignment, obtained from UNIDO, all of the technical information on the C.G. Project's conception and initiation was obtained from the UNIDO Phase 1A and Phase 1B reports. Details of the investigational and promotional progress of the project, as well as its current status at the Expert's time of joining, were obtained from the UNIDO Project Manager and the UNIDO Industrial Economist.

Initial orientation as regards the industrial climate of Mexico was largely obtained from a study of Final Reports and individual industrial Visit Reports drawn up by past and present UNIDO experts on the C.G. Project.

2.2 Work Programme.

The Expert's Preliminary Report to UNIDO was completed in early May 1974, however, due to acute shortage of secretarial facilities at the time, this was not typed out until early June. Subsequently, an addendum in the form of a programme forecast for the Expert's future work was requested by the UNIDO substantive authority and this was sent off at the end of that

month, a copy of which is included herein as Appendix 4.

The foregoing future work programme attempted to set out very approximately the sort of timing which it was anticipated the Expert's assignment would follow in the general implementation of the duties as set out in the UNIDO Job Description.

One item of the work programme, however, which went well beyond the general scope forecast was that of the round trip planned to conduct a programme of introductory market surveys and investigations of local conditions and legislation abroad with respect to capital goods.

This programme was to be carried out by the UNIDO Project Manager, accompanied by the Expert, and was planned to take place around November of 1974. As it happened, the programme was not carried out due to the fact that the C.G. Project counterpart, NAFINSA, decided to take on responsibility for the investigation concerned and carry this out at a later stage. Also, NAFINSA had planned a series of development project promotional and negotiating visits to the U.S.A. in that same month, which it was particularly required that the UNIDO Project Manager should attend, while the Expert remained in Mexico as Deputy Project Manager.

Another item of the work programme which was also beyond the normal scope of the assignment, but which had been agreed early on in the C.G. Project, was the project in which the Expert would conduct a study of the supply and demand situation in Mexico for standard tooling aids and metalware production accessories. After having started the project, however, with a preliminary identification of the tooling items etc. to be studied, as shown in Appendix 5, NAFINSA again decided they would carry out the study themselves, independently of UNIDO.

2.3 Cooperation with C.G. Project's technical experts.

The UNIDO technical experts present during the Expert's period of assignment were those of Power Boilers, Power Transformers, Foundrywork, Machine Tools, Diesel Engines, Pumps and Compressors, Electrical Insulators, Gears/Speed-Changers/ Forgings, Heavy Rotary Electrical Plant and HRC Switchgear. Also present during the period were the Consultants of ICME/ CONDOR, the outside consultant organization appointed by UNIDO to study the Textile Machinery sector.

All technical and operational assistance required by the foregoing experts and consultants was furnished by the Expert on every possible occasion. Such assistance could include: arranging experts' meetings with Government officials and industrialists;

providing technical and linguistic liaison thereto; furnishing advance information pertaining to each expert's field, obtained previously, as regards relevant statistics, sources of information, industries concerned, etc.; drawing up glossaries of terms in English and in Spanish; editing and drafting expert's reports in English and Spanish; all experts were met and/or seen off at Mexico airport by the Expert and were helped with their accommodation arrangements (see Appendix 6, also circulated to UNDP/UNIDO).

2.4 Cooperation with NAFINSA and counterpart personnel.

As introduced in Chapter 1, the counterpart personnel of NAFINSA and associated entities directly concerned with the C.G. Project are shown in Appendix 2. In general, the type of cooperation furnished by the Expert in this respect was very similar to that furnished in the case of UNIDO experts. Most of the experts' industrial visits, in fact, would have been negotiated and arranged by counterpart personnel. However, in some cases where it was felt the "official" status of counterparts might be suspect to the company visited, it was useful to stress the UNIDO interest only. Where necessary industrial visits were carried out by the Expert as liaison consultant for NAFINSA (see Appendix 7, showing the standardized form of Visit/Interview Report prepared by the Expert for general use).

Other incidental services furnished by the Expert to the counterpart authority or staff thereto, in respect of the C.G. Project, could include: analyses and assessments of studies and reports made to counterparts outside the operations of the C.G. Project itself, but of particular interest thereto (e.g. see Appendix 8A and 8B); technolinguistic liaison in meetings, communication and correspondence between counterparts and prospective capital goods industrial development partners from abroad; training of counterpart staff in statistical analysis, and use of graphs and curves derived therefrom, for the identification of rationalized trends and the establishment of projections and forecasts; etc.

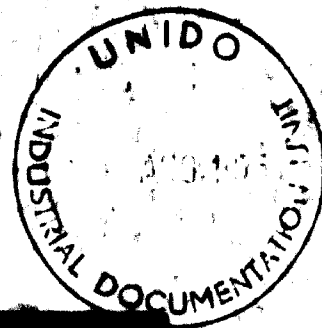
2.5 Additional commitments.

Instances would at times occur where the Expert was in a position to contribute his services in relatively non-technical matters, not necessarily connected with the C.G. Project, but of undoubted general value nevertheless.

Examples in this respect may be cited, such as: preparation of "investment profiles" and articles promoting the role of NAFINSA in the development of the capital goods manufacturing industries (e.g. see Appendix 9); attendance at conferences, conventions and lectures on subjects of some use to the C.G. Project or on behalf of some related organization not otherwise

able to be represented (e.g. representation of UNIDO's Chemicals, Pharmaceuticals and Building Materials Industries Section of ITD at the World Conference of Pharmaceuticals Manufacturers held in Mexico City in November 1974); meeting staff representatives or other experts from various national or international organizations and briefing these on the work and progress of the C.G. Project (e.g. Appendix 10); conducting Language Proficiency Oral Examinations for UNDP (see Appendix 11, prepared by the Expert for this purpose).

For a period of three months between December 1974 and March 1975 the Expert acted as Deputy Project Manager during the absence of Mr. Singh.



FINAL REPORT
of
H. Roy Hargreaves,
UNIDO Industrial Engineer.

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CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

3.1 Identified Capital Goods sub-sectors dealt with during the Expert's assignment.

During the course of the Phase 1B operation of the C. G. Project (see bar-chart of all phases, in Appendix 12) a number of C. G. product sub-sectors were identified as being of potential interest to Mexico for industrial development, in respect of, either, the expansion of existing industries, or, the launching of new industries. Phase II of the UNIDO participation was therefore to consist in the provision of individual experts, or outside consultants, who would conduct general feasibility studies for their corresponding sub-sector in order to establish the actual degree of such potential interest therein.

The ten sub-sectors so identified are those mentioned earlier in Chapter 2.3, every one of which has already been very thoroughly analysed and reported upon by the expert or outside consultants concerned, throughout 1974 and the early part of 1975. In view of the foregoing, it would not be useful to comment on these studies any further than to present the summary schedule of Appendix 13, prepared by the Expert,

showing, in convenient form, the C.G. manufactures, by sub-sector and by industrial concern, pertaining to Mexico.

3.2 Identified Capital Goods sub-sectors still to be dealt with.

In the case of the previously identified sub-sector for Steel Industry Plant and Equipment, the UNIDO expert, Mr. Chandi L. Sengupta, only arrived on 18th June 1975 and will be on the feasibility study in this respect for the next 6 months. In this very context, it would be appropriate to mention here that, in addition to being highly qualified in his own right, Mr. Sengupta has come fully equipped with a very complete library of up-to date technical and operational information on the entire steel industry and plant aspect, obtained from his own company in India and from other sources of similar national importance. The forthcoming extension phase of the C.G. Project allows for the further 6-months assignment of a UNIDO expert with regard to implementing the recommendations emanating from the present steel industry investigation. Since Mr. Sengupta would be available, quite exceptionally it may be said, to carry out the second assignment also, it is strongly recommended here that quick advantage be taken of this situation to enlist his further services in this respect, as an extension of his present assignment.

The two other sub-sectors not yet dealt with, as far as

feasibility study is concerned, are that of Chemical and Petrochemical Plant and Equipment and that of Hydraulic Turbines. Experts for these sub-sectors have already been appointed but it is feared that their assignment period will inevitably encroach upon the Extension Phase of the C.G. Project which, it was intended, should start as from September 1st, 1975.

3.3 Further Capital Goods sub-sectors for consideration.

During the course of his work in Mexico, the Expert has had occasion to develop a number of ideas as regards further potential industrial and trading activity developments which he feels would be particularly appropriate to the country's circumstances. Such ideas have originated from past industrial experience in general, from experience in other developing countries in particular, and from experience in New Product Research or Product Planning, Industrial Diversification, Specialization and Standardization.

Since two of such ideas are closely concerned with capital goods, either from the product point of view, or from the point of view of the production machinery, these will be dealt with in the present context, as follows.

3.3.1 Cold Rolled Section Forming.

This is the technique of continuously producing metal accessories whose dimensional emphasis is on length, but whose shape emphasis is on sectional sophistication. Before the advent and development of this technique in the industrialized nations, generally speaking during the 1930's, such sections were produced only by difficult folding methods, necessarily restricted in length.

With cold rolled section (c. r. s.) forming the starting material is metal strip, slit into appropriate widths, stored in coils, which can be of infinite length by the simple expedient of weld-jointing the end of one coil to the beginning of the next. The metal strip, which can be in any kind of malleable metal, metal alloys or metal laminates, is pulled between a series of inter-fitting roller pairs which gradually roll the strip into the final sectional shape required.

The rolling starts with the simplest U, V, or semi-circular sectional shape through the first roller pair, gradually producing a more and more sophisticated shape through subsequent roller pairs. The rolling can be continued until the side edges of the original flat strip not only are brought together in a variety of ways, but can even be curved around, in different directions if required, within the interior of the resulting

closed tubular section shape.

The Cold Rolled Section Forming type of machine appears to be almost unknown in Mexico, and yet there is ample evidence of the industrial need for such a production facility in the country. As a typical example of a machine requirement, the case may be cited of a DC motor/generator manufacturer in Monterrey purchasing a well worn, second hand, cold rolled section forming machine from the USA only to make the sector shaped copper strip used for commutator segments. Previously, this strip was being made piecemeal by pressing into sector shape precut lengths of rectangular section extracted copper strip; a costly time consuming and fairly inaccurate process.

The cold rolled section forming machine will enable the manufacturer to prepare a year's supply of high accuracy copper segment strips, in convenient coiled form, in a matter of hours. By itself, this would not be an economical use of such a machine from an industrial point of view, since its utilization factor might only be, say, 1%. Furthermore, the capability of the machine to produce very sophisticated rolled shapes would not be brought into play, since the sector shape of a commutator segment is very prosaic in comparison. The answer here, of course, is that there should exist in Mexico a semi-finished product industry providing a cold rolled section

forming service to all industries of the country, including capital goods industries, whereby the cold rolled section forming machines thereof could be maintained in continuous and highly economical use.

A further illustration of the need for a cold rolled section forming service to be instituted in Mexico comes from the high-cost-ridden automobile manufacturing industry. This industry uses very large quantities of light steel strip in a great variety of highly complex sectional shapes (chassis and bodywork members, stays, ties and stiffeners, door window frames, channels, etc. etc.). At present, it appears that such items are imported into Mexico from U.S.A.-based c.r.s. forming industrial services, or are laboriously press-folded locally at a very inadequately slow rate compared with the existing rate of demand.

In the U.K. alone, the total output of the entire cold rolled section forming service industry, comprising several hundred operators nationwide, is known to be about a quarter of a million tons per annum. The lead in this industry undoubtedly came from the U.S.A. where the corresponding output must be many times greater.

Thus, the Expert feels that the first recommendation he should make at this stage must be that the possibilities of creating an efficient cold rolled section forming industrial service in

Mexico, of sufficient capacity to meet the nation's needs, should be thoroughly investigated. This would entail a detailed survey of the c.r.s. formed semi-finished products used throughout the country's industries and of the types and numbers of c.r.s. forming machines required to satisfy such needs. Not only should this service industry be created but its c.r.s. forming machine needs, including replacement and servicing needs thereto, should, ideally, also be manufactured in Mexico under the present capital goods manufacturing development programme. The usual preliminary feasibility study in this respect might be carried out by the Steel Industry Plant and Equipment expert from UNIDO, Mr. Sengupta.

3.3.2 Welded Tubemaking.

As in the case of c.r.s. forming, the technique of Welded Tubemaking is also a fairly recent development of the industrial era generally and it is, in fact, a side development of the c.r.s. forming technique.

In its original form, that of longitudinal welded-seam tubing, a c.r.s. forming mill arrangement is used to fold round the metal strip into a tubular shape prior to effecting electrically a continuous longitudinal weld along the seam. Such tubing can also be produced by the hot rolling technique whereby the strip is first hot-rolled into shape and its edges are subsequently

jointed by hot fusion, either edge-to-edge, lap-jointed or hook-jointed. Hot rolled tubing, however, should not figure in the present context and has, in fact, been completely superceded by cold rolled and electrically welded tubing.

Fairly early on in his assignment, the Expert had prepared a brief report setting out the case for consideration of welded tubemaking as an appropriate additional sub-sector of the C.G. Project. This report is reproduced in Appendix 14. In essence, the arguments in favour of welded tubes are that they cost only about half as much as seamless tubes, their production time is only a fraction of that for seamless tubes, their mechanical strength under "load" loads (e.g. liquid or gas pressure) is equal to that of seamless tubes, and, with the latest welding and finishing techniques, the seam is indistinguishable from the rest of the tube's metal strip.

The only possible advantage seamless tubing may have over welded is that it is likely to be stronger under severe "live" or impact loading such as could occur in deep-well drilling since it is, in effect, a "forged" product and therefore of greater tempered hardness. The use of welded tubing in well casing is, however, perfectly acceptable.

In view of the factors as set out in the aforementioned brief report therefore, the Expert's second recommendation is that the subject of welded tubemaking should also be thoroughly investigated in conjunction with the investigation of the cold rolled section forming subject.

3.4 Extension and follow-up requirements on present C.G. Project.

The remainder of the Expert's conclusions and recommendations are concerned with the essential industrial services and administrative disciplines which should be available to industry in general, but which are all too often sadly lacking in Mexico. Now that a virile development programme in the capital goods sector is well under way on an official basis, advantage should be taken of the further availability of international aid in extensions of the C.G. Project to assist the country in setting up an Industrial Consultancy and Technical Control (IC & TC) Directorate for the launching of such facilities, first, into the capital goods manufacturing sector, secondly, into all other industries of the country.

The subject of Industrial Informatics is already being amply dealt with by CONACYT with the assistance of British PERA. This would constitute the first industrial service division of the proposed Directorate, whilst the remaining services and administrative or industrial disciplines contemplated by the Expert would be as follows.

3.4.1 Raw Materials Analysis and Control.

All industrial raw materials indigenous to Mexico should be carefully controlled on an official basis and subjected to detailed analysis in order to establish accurately their relative technical quality as well as their exploitation and marketing costs as compared with foreign sources of supply. Where costs for Mexican raw materials are found to be in excess of 25% above those of competing imports, like for like as to quality, investigations into the precise reasons therefor, and the remedial measures necessary, should be the responsibility of an official entity of the country.

This then forms the subject of the third recommendation of the present report, that a technically qualified official organization be established to administer Industrial Raw Materials control throughout the nation, which itself would be the second division of the IC & TC Directorate already mentioned.

3.4.2 Industrial Standard Specifications and Quality Control.

As in the case of raw materials, all capital goods products of the country, and eventually all industrial products as a whole, should be subject to strict official supervision and

Mexico. Capital goods project.

FINAL
REPORT

H. Roy Hargreaves

By
the UNIDO Industrial Engineer expert,
assigned as Industrial Project Planner
to the UNIDO/NAFINSA Capital Goods Project.

01921

June, 1975.

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control as to their quality and ability to compete successfully with corresponding products from traditional world suppliers, whether in home or in foreign markets.

In order to achieve this, it will be necessary to set up a third division of the proposed IC & TC Directorate whose first responsibility would be to study the adoption of appropriate Standard Specifications either of foreign or, eventually, of Mexican origin or adaptation. Its second responsibility would be to carry out surveillance of the Quality Control function nationwide, based on the Standard Specifications it had established.

Thus, the fourth recommendation in the present context covers the setting up of this Standard Specifications and Quality Control authority, which would be the third division of the IC & TC Directorate proposed.

The fifth recommendation is that a UNIDO expert in Raw Materials Control, Standard Specifications and Quality Control for industry, should be assigned to assist in the implementation of the third and fourth recommendations herein, under the auspices of the C. G. Project extension.

3.4.3 Production Planning and Control.

With the object of achieving the highest possible degree of operational efficiency from the start, any newly launched capital

goods manufacturing facilities should be assisted in the installing of effective Production Planning and Control (P.P.&C.) systems, based on the very latest procedures in such administrative techniques. Such P.P. & C. systems should be properly designed to cater separately for Production Method Engineering, Materials Inventory Control, Production Scheduling, Production Routing, Production Follow-Up or Progressing and Production Cost Accounting. Where manpower-intensive and lengthy in-process times are involved, Production Scheduling should include the use of network analysis by the Critical Path Method (CPM) or by the Programme Evaluation Review Technique (PERT).

Accordingly, by way of being the sixth recommendation herein, it is suggested that a fourth division of the aforementioned IC & TC Directorate be set up to take full responsibility for the development of efficient P.P. & C. systems throughout the country's industries, starting with those of the capital goods sector.

Here again, as seventh recommendation, it is proposed that a UNIDO expert in Production Planning and Control and in Productivity Incentive Planning, be assigned to assist in the implementation of the preceding recommendation.

3.4.4. Scientific Management.

As in the case of the need for effective P. P. & C. techniques to be installed in the country, there is a general need for modern scientific management methods to be injected into Mexican industry and corporate activity as a whole. Again, the very topicality of the capital goods development programme lends itself to the inception of such methods being undertaken first of all in the capital goods sector itself.

These methods would include, inter alia, planning practices such as:

- Routine Management for secondary executives;**
- Management by Default, based on Rationalized Decision-taking, for top executives;**
- Management Continuity and Replaceability through Training of Deputies and Delegation of Authority;**
- Industrial and Production Policy-making, as well as the devising of Marketing Methods, through analysis of detailed Market Research findings and through Dynamic Product Planning;**
- Cost Reduction and Control Effectiveness through rigid Materials Inventory Control, Production Planning and Control, Product Value Analysis and Value Engineering.**

The above therefore forms the basis of the Expert's eighth recommendation, i.e. that a fifth division of the aforementioned

IC & TC Directorate be set up to take full responsibility for the development and installation of modern, scientific management techniques, first in the capital goods sector, thence throughout Mexican industry.

It is also proposed, as ninth recommendation, that a UNIDO expert in Management and Industrial Consultancy be assigned to assist in implementing the above recommendation.

3.4.5. Research and Development

The basic stimulus for the instigation and perpetuation of dynamic change and growth in manufacturing industry can only be ensured through the maintenance of creative and responsible Research and Development (R. & D.) activities.

With judicious planning of objectives and precise delegation of duties amongst research staff, a well organized and generously endowed national R. & D. service is the only facility which can create and sustain industrial and product leadership in any field of endeavour. This does not mean that such leadership must apply on a universal basis. In the present case, it merely means that the leadership of Mexico should arise from, and apply in, the particular circumstances of this country, as well as in the similar circumstances of other countries which differ only in degree.

It is therefore suggested as a tenth recommendation that a sixth

division of the proposed IC & TC Directorate be set up to take full responsibility for officially promoting, coordinating and assisting R. & D. activities in Mexico, first in respect of capital goods manufacturing, thereafter in respect of the entire industrial scene.

As before, it is suggested as a final and eleventh recommendation, allied to the former, that a UNIDO expert in Research and Development organization, including the technique of Product Planning, be appointed to assist in the setting up of the R. & D. authority for Mexico.

The R. & D. authority could be constituted in accordance with the typical organigrama of such a service as encountered in major corporations and specialist institutions of the industrialized world. Such an organigrama is shown in Appendix 15, in which it will be seen that provision is made for a Product Planning function to be incorporated.

Product Planning is the function which has the specific responsibility of finding new products for a company to manufacture.

It does this by continuously reconciling the company's particular experience, its peculiar "differentiated assets", with the requirements and needs of the market.

On such a note of dynamic industrial continuity it seems perhaps most fitting to terminate the present report.

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NACIONES UNIDAS
PROGRAMA PARA EL DESARROLLO



UNITED NATIONS
DEVELOPMENT PROGRAMME

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

16 July 1973

PROJECT IN THE UNITED MEXICAN STATES

J o b D e s c r i p t i o n

DP/MEX/72/014/11-06/12

Post title **Industrial Project Planner (Industrial Engineer)**

Duration **Fifteen months.**

Date required **As soon as possible.**

Duty station **Mexico City, with travel within the country.**

Purpose of project **The expert will be a member of a three man team assigned to Nacional Financiera. The team will assist in the formulation, evaluation and implementation of industrial projects within the capital goods sector and in the preparation of a development programme for the sector.**

Duties **Under supervision of the team leader and in close co-operation with the other expert and with the staff of Nacional Financiera, the expert will be expected to:**

- 1. prepare investment projects on the basis of previously identified industrial opportunities within the capital goods sector;**
- 2. co-ordinate interrelated projects and co-ordinate the new projects with already existing similar and related industrial enterprises;**
- 3. identify and formulate additional industrial opportunities within the capital goods sector for later inclusion in the sector's development programme;**
- 4. assist in the technical appraisal of projects;**

5. assist in drawing up terms of reference for specific project studies to be carried out by consultants and evaluate the reports of these studies;

6. train counterpart personnel.

Qualifications Industrial engineer with extensive experience in the formulation and preparation of industrial investment projects, preferably in the capital goods industry sector.

Language Spanish; English an asset.

Background Information The Government of Mexico considers that the capital goods sector could play a significant role in the country's continued development efforts and in the endeavour to strive for increased export of manufactured goods. The Government's industrial development bank, Nacional Financiera S.A. is therefore systematically examining potentials for the development of the sector. In a first phase of UNIDO assistance to Nacional Financiera, a team of experts has carried out various basic techno-economic studies in order to identify new investment projects and expansions in those capital goods industries which appear most promising for long-term development. In the present phase II, a team of three experts (an industrial policies expert - team leader, an industrial project planner - industrial engineer, and an industrial project evaluator - industrial economist) will assist in formulating, evaluating and implementing specific industrial projects in the capital goods sector based on the identification and selection of potential growth industries carried out in the previous phase. A sub-contracting fund attached to the assistance will make possible the hiring of short-term experts and consulting firms for carrying out specific pre-investment studies and other detailed project studies.

COUNTERPART ORGANIZATION FOR THE
CAPITAL GOODS PROJECT:

INDUSTRIAL PROGRAMMING DIVISION OF NAFINSA

DIVISIONAL DIRECTORATE

<i>Director</i>	<i>Lic. David Ibarra Muñoz</i>
<i>General Manager</i>	<i>Lic. Carlos Bazdresch</i>
<i>Consultant</i>	<i>Lic. Bernardo Gómez Palacios</i>
<i>Consultant</i>	<i>Lic. Juventino Balderas Moreno</i>

DIVISIONAL EXECUTIVE

<i>Manager</i>	<i>Ing. Eduardo Colín Trejo</i>
<i>Sub-Manager</i>	<i>Ing. Pablo Cervantes Ruíz</i>

CAPITAL GOODS PROJECT
COUNTERPART STAFF

<i>Manager</i>	<i>Ing. Salvador Vélez García (Formerly Ing. Héctor Castro U.)</i>
<i>Deputy Manager</i>	<i>Ing. Rafael López Arce</i>
<i>Senior Mechanical Engineer</i>	<i>Ing. Carlos Guerrero Zapata</i>
<i>Senior Mechanical Engineer</i>	<i>Ing. José Antonio Velázquez G. (seconded from CONACYT)</i>
<i>Petroleum Engineer</i>	<i>Ing. Roberto Hernández Núñez (seconded from PEMEX)</i>
<i>Senior Electrical Engineer</i>	<i>Ing. Bernardo Fonseca</i>
<i>Mechanical Engineer</i>	<i>Ing. Guillermo Deschamps</i>
<i>Electrical Engineer</i>	<i>Ing. Sergio Meza Heredia</i>
<i>Legal Adviser</i>	<i>Lic. Manuel Vega (seconded from SIC)</i>
<i>Statistics Researcher</i>	<i>Lic. César Morton Garza</i>
<i>Statistics Researcher</i>	<i>Lic. Rodolfo de J. Haro G.</i>
<i>Planning Assistant</i>	<i>Sr. Andrés Terrones Juárez.</i>

**OTHER NATIONAL INSTITUTIONS AND ORGANIZATIONS
ASSOCIATED WITH THE CAPITAL GOODS PROJECT**

S.I.C. (Secretaría de Industria y Comercio)

Lic. Juan Guillermo Becker : **Sub Secretary of Industry**
Lic. Gabriel Zorrilla Martínez : **Director General of Industries**
Lic. Jaime Alvarez Soberani : **Director, Technology Registry**
Mr. Kan Mariwalla : **UNIDO expert, Technology Transfer**
Lic. Mauricio de María y Campos : **Director, Foreign Investments**

CONACYT (Comisión Nacional de Ciencia y Tecnología)

Lic. Gerardo Bueno Zirión : **Director General**
Ing. Guillermo Fernández : **Joint Director, Industrial**
de la Garza : **Support Services**

Banco de Mexico

Lic. Sergio Ghigliassi : **Manager, Economic Research Dept.**
(Successor to Lic. Manuel Uribe)

**FOMEX (Fondo Nacional para los productos Manufacturados de
Exportación)**

FONEI (Fondo Nacional de Equipamiento Industrial)

**FOGAIN (Fondo de Garantía y Fomento a la Industria Mediana
y Pequeña)**

IMCE (Instituto Mexicano de Comercio Exterior)

ACKNOWLEDGEMENTS

First of all, the Expert wishes to express his gratitude to Dr. Krishna Singh, a Project Manager with commendable qualities of leadership, for his constant and able guidance, encouragement and companionship throughout the assignment.

Thanks are also due to Dr. Maurice del Carril and UNDP staff, Mr. Herman Muegge and UNIDO staff, and to all the UNIDO experts present during the assignment, who undoubtedly formed the most congenial and effective team the Expert has been privileged to serve with.

The efficient collaboration and friendship of Ing. Salvador Vélez and all his counterpart staff have been greatly appreciated, not forgetting the ready assistance at all times afforded by the senior NAFINSA executives concerned.

Last but by no means least, appreciation must be expressed of the ever cheerful cooperation, stabilizing influence and unstinted support of the five, previously six, NAFINSA office lady typists and translator.

DISTRIBUTION.

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C. G.	
PROJECT:	Dr. Krishna D.N. Singh
	Mr. Chuni L. Sengupta
NAFINSA:	Dr. Lic. Carlos Bazdresch
	Ing. Eduardo Colín Trejo
	Ing. Salvador Vélez García

H.K. Hargreaves.

June 25, 1974.

Industrial Engineer Expert, Industrial Project Planning, UNIDO/NAFINSA Project, Capital Goods Manufacturing Development.

FUTURE WORK PROGRAMME

1. ***Before the departure of Mr. H. Muegge from Mexico, the Expert will be assembling, for Mr. Muegge to take with him, two "dossiers" of background information (statistics on national production, imports, exports, manufacturers, marketing conditions, etc. etc.), one relating to the Textile Industry, the other to the Diesel Engine Industry. The "dossiers" will serve as advance information for the CONDOR consultant organization, in the case of the Textile Industry, and for the Diesel Engineer Expert in the second case, prior to the start of their respective assignments to the Capital Goods Project here.***

2. ***By early July, the Expert intends to have familiarized himself with the feasibility study reports already drawn up under Phase II of the capital goods project, in respect of those capital goods so far identified as being appropriate for manufacture in Mexico. This will enable him to enter into technical discussions with all prospective parties interested in participating in any such new local manufacturing ventures in the future.***

3. ***Further visits to Mexican industries throughout the country will continue to be carried out in the company of individual experts and***

their counterparts, as appropriate. This will be for the purpose of identifying significantly repeated unsatisfied needs in capital plant and equipment, standard parts, or common semi-finished components and metalware, which do not necessarily fall within the immediate orbit of any individual expert. Such needs may arise either from the point of view of the manufacturer, or from that of the users, and in any type of industry. The example may be cited of the case of the Cold Rolled Section Forming type of machine, which is almost unknown in Mexico, but which has reached a peak of development and popularity, both in itself and in its products, in the highly industrialized nations within the last decade or so. In one instance, a manufacturer in Monterrey had purchased a well worn, second hand, cold rolled section forming machine, to form in continuous copper strip the sector shaped section, very prosaic for such a machine, required for DC motor/generator commutator segments. In another instance, an automobile manufacturer (i. e., a user) required large quantities of light steel strip of a highly complex sectional form, which is ideally and most efficiently made, especially on a bulk supply basis, by a sub contractor operating cold rolled section forming machines (as yet non-existent in Mexico), instead of by press-folding machines.

3.

It is anticipated that the Expert will probably be travelling away from Mexico City in the above context for periods usually of one week, perhaps once per month, and that such travels may continue for as long as there remains on the project a UNIDO technical expert to be accompanied, i.e. possibly into the early months of 1975.

4. *In the periods between provincial visits, the visit reports will be drawn up, as appropriate, the findings will be analysed and colated with other findings from other visits, and supporting data and statistics only available in the capital will be obtained and used in the analysis. Recommendations as to further capital goods manufacturing possibilities uncovered by the above procedure, will be put forward in individual report form, whilst parties potentially interested in contributing towards the exploitation of such possibilities, national or international, will be contacted.*

A further service in the above context which the Expert will provide will be to draw up summaries of visit information oriented towards each of the areas of interest of the technical experts still to come, so that each of these experts will have advance information as to which industries are of particular interest to his own field of activity.

4.

5. *As the final objective of Phase II of the capital goods project, the programme of introductory market surveys and investigations of local conditions and legislation abroad will be carried out by the UNIDO Project Manager and the Expert probably in November this year, subject to confirmation later on. The object of this programme will be to assess the export possibilities of capital goods projected to be manufactured in Mexico.*

In order to establish the relative importance of present export markets as far as Mexico is concerned, the figures of total export values to the various countries of interest, for 1971 and 1972, have been used as shown in columns (a) and (b) of the following table. Column (c) of the table shows the individual numbers of working days estimated to be required for the visit to each country. Column (d) shows the calendar period estimated to be necessary to survey each of the two groups of countries to be visited as well as the total trip period required.

5.

	(a) *	(b) *	(c)	(d)
<i>Country to be visited for Export Market Survey.</i>	<i>Exports from Mexico in Millions of U.S. \$ 1971</i>	<i>Exports from Mexico in Millions of U.S. \$ 1972</i>	<i>Work days on Survey</i>	<i>Calendar Period.</i>
LAFTA				
Chile	20.3	17.6	2	
Argentina	16.7	14.8	2	
Uruguay	1.9	2.0	0	
Paraguay	0.6	0.7	0	
Brasil	25.9	33.8	2	
Peru	11.5	12.1	1	2 1/2 weeks
Bolivia	0.4	0.4	0	
Ecuador	2.9	3.1	1	
Colombia	12.4	17.8	2	
Venezuela	24.6	38.5	2	
CACM				
Costa Rica	5.7	9.2	1	
El Salvador	4.0	5.8	1	
Guatemala	7.9	13.0	2	
Honduras	2.4	3.3	1	1 1/2 weeks
Nicaragua	3.2	4.2	1	
Panamá	8.7	10.1	1	
TOTAL CALENDAR PERIOD				4 weeks.

* Source of Information: Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos, 1972.

Proyecto ONUDI/NAFINSA de Bienes de Capital
Tooling Aids and Metalware Accessories Sub-sector
of the Capital Goods Project

UNIDO/NAFINSA CAPITAL GOODS PROJECT.

TOOLING AIDS & METALWARE ACCESSORIES SUBSECTOR.

STANDARD ITEMS.

Drills; taps and dies; standard punches; punching blocks; turning and grinding mandrels; bushing reamers; guide bushes; clamps; V-blocks; catch and ejector pins.

CUSTOM-MADE ITEMS.

Punch holder plates; match plates; plunger retainer plates; templets and stencils; heating elements.

STANDARD & CUSTOM-MADE ITEMS.

Jigs; tool and work fixtures; gauges; profile tools and cutters; matrix plates; index plates; pivots; mould and core cooler fittings; pattern and core box elements.

PROYECTO ONUDI/NAFINSA DE BIENES DE CAPITAL.

SUBSECTOR DE AUXILIARES HERRAMENTALES Y HERRAJES DE USO GENERAL.

PIEZAS CORRIENTES.

Taladros; machuelos y terrajas; punzones normales; bloques de punzar; mandriles de torno y de rectificadora; rinas de buje; bujes guía; sujetadores; bloques en V; pasadores de retención y expulsión.

PIEZAS ESPECIALES.

Placas porta punzones; placas de emparejar; placas retenes de buzos émbolos; templetes y plantillas; elementos calentadores.

PIEZAS CORRIENTES Y ESPECIALES.

Guías herramienta; porta herramientas y soportes de montaje; escantillones; herramientas perfiladoras y cortadoras; placas matriz; placas de índice; pivotes; dispositivos para enfriamiento de moldes y machos; elementos para cajas de molde y corazón.

PROJECT AND STAFF INFORMATION, UNIDO/NAFINSA CAPITAL GOODS PROJECT						TELEPHONE
	DESIGNATION	ARRIVED	LEAVING	ADDRESS		
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Project Office	Counterpart Premises			Nacional Financiera, S. A. (Programación) Venustiano Carranza 25, Piso 9, México 1, D. F. Río Guadaluquivir 76, Penthouse 2, México 5, D. F.	585-47-18 585-31-47 585-34-03	
Krishna D. N. Singh.	UNIDO Project Mgrt Indstl. Policy Advisor	17.3.72	## '75		511-87-88	
H. Roy Hargreaves	UNIDO Coordinating Indstl. Engineer.	18.4.74	JUL JAN '75 15.7.75	Calle J. Vázquez de Mella 319, Depto. 401, Lomas de Chapultepec México 10, D. F. Progreso 28, Chimalistac. San Angel. México 20, D. F.	557-00-20	
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John M. Shand.	UNIDO Expert, Foundrywork.	20.3.74	JAN'75 19.1.75	Río Hudson No. 11, Depto. 5 México 5, D. F.	511-77-13	
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Sven A. Björkenstam	UNIDO Expert, Diesel Engines	15.9.74	✓ 3.12.74	Hotel Genève, Londres 130, Room 127, México 6, D. F.	525-14-00	
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S. Swayambu	UNIDO Expert, Elec. Plant & Equipm.	30.9.74	MAY ## '75 24.5.75	21 Copérnico, Depto. 403, México 5, D. F.	250-00-00	
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Cronje Bäck.	UNIDO Expert, Forging & Gears	5.10.74	MAR'75 25.3.75		511-00-00	
Tristan Wichmann	UNIDO Expert, Elec. Insulators.	1.11.74	FEB'75 21.1.75	Hotel Geneva, Londres 130, Room A-25. México 6, D. F.	525-14-00	

Visit/Interview Report

Date: 15-8-74

<u>Concern visited:</u>	<u>I.E.M.</u>	<u>Activity or</u>	<u>Electrical Plant</u>
<u>Address:</u>	<u>Tlalnepanilla, Edo.</u>	<u>Industry:</u>	<u>& Equipment</u>
	<u>de Mexico</u>	<u>Telephone:</u>	<u>565-69-00</u>
<u>Visited by:</u>	<u>H.R. Fargreaves,</u>	<u>Accompanied by:</u>	<u>Sr. S. Galvan, Westinghouse</u>
	<u>UNIDO Industrial Eng.</u>		<u>Ing. D.E. Bartram,</u>
	<u>Ing. S. Vélez (NAFINSA)</u>		<u>Westinghouse</u>
	<u>Dr. J. Balderas (NAFINSA)</u>		
<u>Persons</u>	<u>Ing. Reynaldo Fresse</u>	<u>Designation:</u>	<u>Manager Electric Motors</u>
<u>contacted:</u>			<u>Engineering Dept. I.E.M.</u>
	<u>Ing. Luis Martín Cuellas</u>		<u>Manager Electric Motors</u>
			<u>Production Line, I.E.M.</u>

As Westinghouse de México are partners of IEM, Ing. Vélez had arranged for us to be taken to the IEM Works at Tlalnepanilla by his past colleague and friend, Sr. Galván, the District Manager, Power Systems, Westinghouse de Mexico, accompanied by Mr. Bartram, Contracts Management, Gas Turbine Systems Division of the same company.

In the joint interview between all the above persons, Ing. Vélez first of all introduced the NAFINSA-UNIDO Group's Capital Goods Project and its objectives, as well as the type of technical and market information which the Group was hoping to obtain through the enthusiastic and unstinted cooperation which the IEM directorate had promised to provide. In this context, the subjects of particular interest are the prospective manufacture in Mexico of large electric

.....

2.

motors, as well as possibly other rotating electric machines generally, and also of large extra high voltage, power transformers.

The writer then elaborated on the precise type of information which the C.G. Project group were seeking, in the form of basic examples as to the relationships between essential technical specifications, shipped weights and market values, both in the past and at present day levels, particularly as regards large and very large electric motors in the first instance. Such information would enable the C.G. Project group to convert the strictly customs oriented import statistics which exist profusely, into the highly meaningful import data of a technical, physical and market demand nature, which is so fundamentally necessary to the C.G. Project Group for the process of accurately forecasting the nation's needs thereto, in the future.

Ing. Fresse replied that IEM were indeed extremely interested in the C.G. Project Group's activities and would do everything in their power to facilitate the obtaining of the above requirements. He also reassured the meeting that from the facilities and the know-how points of view, IEM were eminently placed to provide such full cooperation now and as regards possible manufacturing developments eventually, and that the service which the C.G. Group were providing the nation in respect of the present investigation was a matter for which they were to be congratulated.

.....

3.

Ing. Fresse then went on to describe some of IEM's manufacturing operations in regard to large electric motors generally. The largest electric motor manufactured so far by IEM was of 1 600 H.P. in the 8-pole version, equivalent to 3 200 H.P. in a 4-pole version. There is no technical or physical difficulty whatsoever as regards IEM manufacturing even larger motors up to, say 10 000 H.P. if the market demand, which the C.G. Project Group is investigating, so prescribes. The main technical inconvenience in this respect concerns a point which fully endorses the findings of the C.G. Project Group's expert in foundrywork as to lack of top quality production of castings in Mexico. This refers to IEM's motors in the range no larger than some 400 H.P. whose casings are composed of cast iron segments bolted together. Because of the quality unreliability of these nationally produced castings, the very stringent Impulse Testing in accordance with NEMA and other worldwide standards cannot be safely applied to such cast-frame motors without serious risk of cracking some of the castings. Fortunately, as testimony to the very arduous nature of the Impulse Testing Standard, IEM have never experienced any such cracking as a result of actual operation in practice, for which reason the generally accepted Impulse Testing Standard is simply overlooked.

It will be appreciated, however, how much this fact will militate against the exportability of the motors concerned.

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4.

The visit was wound up by an inspection of the complete plant, under the guidance of Ing. Cuellar, Manager of the Electric Motors Production Line. Sight of the plant confirmed the advanced state of IEM's technology and manufacturing expertise, especially as regards the larger types of electric motors and power transformers where labour artisany in coil-winding and assembly particularly comes to the fore.

In this last respect, it was gratifying to note that the considerable area being taken up by the series production of small motors was due to be given up to provide more of such space so appropriate for the manufacture of the large units.

**SECRETARIAT OF THE NATIONAL PLAN FOR SCIENCE
AND TECHNOLOGY**

**Summary and commentary by H. R. Hargreaves, UNIDO Industrial
Engineer, on the Report of the Committee on Consumer
Durable Goods and Capital Goods.**
(June 5, 1975)

1. 12 working sessions were held by the Committee in Feb/Mar. 1975.
2. The objective was to study the Scientific and Technological involvement of the country in the manufacture of such goods.
3. Capital Goods were to be the main theme.
4. Definitions were given as follows:

Consumer Durable Goods:

Those which serve directly to satisfy necessities and whose consumption does not imply immediate destruction.

Capital Goods:

Those which are not directly or immediately applicable to the satisfying of a necessity, but which are used for the elaboration of other goods or services.

5. Capital Goods-29 subsectors of machinery and equipment (divided between "electrical" and "non-electrical", used by the productive systems of the country, were identified by the committee, but these only refer to imported goods.
6. After the foregoing, covered by only one page of introductory text and one page of text under Chapter I, some general statistics as to the progress of all the national industry, irrelevant in the present context, are given. Chapter I continues with a collection of graphs and tables showing the situation of the Domestic

Appliance manufacturing industry and consumption thereto in the country but no text of explanations or comments is given in this respect. The only reference to the situation of the Capital Goods industry deals with the projected imports thereof between 1976 and 1980. No survey of existing Capital Goods manufactures is made, neither are there any recommendations at this stage as to which new capital goods manufacturing industries should be established.

7. Chapter II plunges directly into a plea for encouragement in the establishment of proper Research and Development (R. & D.) facilities for the expansion of capital goods manufactures. It is stated that there is no progress in capital goods manufacture because there is no R. & D. thereto, also that there is no R. & D. activity because there is practically no capital goods manufacture. The inference is that only the establishment of R. & D. facilities will break this vicious circle. In point of fact, the contrary is the case: the establishment of more capital goods manufacturing industries will foster the growth of more and better R. & D. facilities in Mexico. It is, indeed, normal and appropriate that such new industries should in fact be launched and supported by already developed foreign technology in the first instance. Thereafter, it will be up to the local Applied R. & D. function alone to adapt such technologies and

ensuing products more precisely, not only to the particular needs and circumstances of Mexico, but also to those of the Latin American neighbours with whom Mexico, more than the distant developed countries, is well familiar.

8. Chapter III deals with the Information Services for industry existing in the country. Libraries for published information are too few and their material very inadequate. Also, there is no coordination or communication between such libraries. It is stated that the Information Services have certain characteristics which are specific to Mexico, i.e.:-

1. The greater part of the transfer of written knowledge is effected through the technologically specialised foreign partners to their associates, affiliates or licensees in Mexico. No doubt this is true but it is certainly not peculiar to Mexico only. Every developing country in the world is dependent industrially, at least initially, on its partners of the developed nations until it develops its own skills appropriate to itself, India being a notable example of this objective being successfully achieved.
2. In general, such sectoral information as is divulged is not up to the technical level which has been reached by the local industries of the particular sector. If this is the case, the local industries themselves are to blame in not taking the initiative to "go out" after the information they need,

themselves. This is akin to the situation of the unsuccessful salesman who sits back waiting for customers to come to him instead of going out into his market to find his customers himself, as does the successful salesman.

3. Given that the transference of knowledge is effected through technological partners, "mostly" (as quoted, instead of "entirely") foreign, nearly all existing publications are in foreign language, mainly in English. This is a particularly futile "bleat" since the situation referred to has existed worldwide ever since the "industrial revolution". Even the industrially advanced latin idiom countries such as France and Italy have always had this problem. The only constructive solutions are: (1) translate from English (or whatever) to the language required (2) learn English.

4. Technical studies published as a result of R. & D. carried out have little or no circulation in the industrial medium nor, for that matter, in the academic medium.

As for point 2 above, this is a question of the media concerned having to "go out" and obtain such technical studies themselves. It is stated that, in general (this expression occurs no less than 4 times in 2 1/2 pages of text), the transmission of information between industries of the same sector, between groups of investigators, or between these last and industry

as a whole, is almost non-existent. This is bravely attributed to 'our (Mexican nationals') own characteristic idiosyncrasy and to our existing level of development'.

Perspicacious as the foregoing observation may be, some consolation may be derived from the fact that, again, the attitude referred to is not solely peculiar to Mexico. In fact it applies most strongly in the whole of the Latin American continent, its three main manifestations being:-

- (a) Fear and suspicion of even innocent competition, this being invariably treated as a sly enemy instead of as a stimulating challenge.
- (b) By extension of the foregoing, acute insularity (isolationism) of individual industries, even amongst fellow members of the same trade or industrial association.
- (c) Averseness to taking and implementing decisions based either on calculated risk or on normal business risk.

9. CONACYT's present commitment in relation to Capital Goods is to publish (in June 1975) the second edition of the Collective Catalogue of Periodical Publications. In conclusion on this subject, it is stated that although there does exist information on Capital Goods in some libraries of the country, there does not exist any form of service actually communicating such information to industry. CONACYT is sponsoring a National Information System which will include various specialized information centres (presumably this is the main area of British PERA's cooperation

with CONACYT).

10. Chapter IV purports to deal with the transmission of knowledge. However, it states that there exists no organized system for identifying the technological requirements of industry. This appears to be irrelevant to the present context, since, presumably, industries should, and do, come forward with their own requirements in CONACYT's "question and answer" service. It is stated that there is no cooperation between the private and public sectors and that these do not participate in economic and industrial planning on a national scale.
Evidently, the previously mentioned insularity of individual industries is directed just as much against government authorities or national commissions as against all other industries. In effect, the report is promoting CONACYT as the techno-scientific coordinating entity in the foregoing respect, and in respect of the technical assessment of patents and their adaptation to national needs.
11. Chapter V attempts to establish the relationship of the capital goods sector with the economic system of the country. The value of such an exercise would appear to be of academic rather than practical value. A further classification of capital goods into two main groups, (a) "made to measure" goods (plants), (b) series produced goods, is put forward mainly, it appears, to differentiate between those goods (a) which normally require a high degree of foreign technology participation and those (b) which

may fall entirely within the existing technological capabilities of the country.

The apparent preoccupation of the report with the distastefulness of foreign technological participation is further stressed with the presentation of a somewhat random list of "national" products showing the degree of such participation each product requires, expressed as a percent value. This information is obviously of a somewhat arbitrary nature and therefore of dubious value. The main point here is that foreign technological participation per se is certainly not injurious to the country in the first instance, indeed it is an unavoidable prerequisite to the founding of a new industrial activity which has already reached an optimum stage of development elsewhere. Nevertheless, what can be injurious to the country in some measure is the unnecessary perpetuation of such technological dependence on foreign know-how. The remedy in this respect, however, obviously lies directly in the hands of the government controlling authority, the maintenance of whose complete initiative in such matters is absolutely inviolate. Undoubtedly, there is a national need for the intervention of an organization such as CONACYT to protect the country from any such technological exploitations, through its ability to practice scientific and technical surveillance as regards the optimum use of all national resources, whether technological or ecological.

12. "Anexo 3" is an interesting exposé, though again rather long

winded (17 pages), as regards the effects of existing institutions and government legislation on science and technology in the country.

Here, the deleterious effects of imports protectionism, fiscal franchises, decentralization incentives, Regla 14 of the General Tax on Imports, and the LISR scheme of accelerated depreciations, are identified in full, but again, no guidance is given in the way of spell-out recommendations as to how the situation should be remedied and by whom. On the other hand, the entirely beneficial effects of CONACYT and ATISA intervention in the country's science and technology interests are, understandably, played up with vigour.

13. Chapter VI purports to establish the relationship of the capital goods sector with the educational system of the country.

The case is forcibly made as regards the chronic scarcity of Mexican graduate engineers to supply the requirements of the country's industry as a whole, let alone that of the Capital Goods industry. It is pointed out that only 10% of university entrants actually succeed in graduating, this being due in equal measure either to abandonment of studies or to examination failure.

Furthermore, such as the supply is, the quality is not of high standard. In the UNAM, for example, out of 3 200 mechanical engineering students, only 20 are registered for Master's degree (0.6%) and a mere 5 for Doctorates (0.16%), whilst in electrical

engineering 30 are registered for Master's degree (1.5%) and none for a Doctorate.

The first comment to be made here is that, in view of this unhappy educational situation, the lament as regards the extent of technological "importation" seems to be somewhat misplaced.

Secondly, a further lament is made regarding the lack of cooperation between industry and the academic centres.

The comment in this case is that, apparently, neither industry nor the academic centres have much to cooperate with !

This subject of education, and its deficiencies, is spread out over no less than 45 pages of text, graphs, schedules and tables dealing with students' performances, professorial turnover, incidence of courses, etc. etc. etc.; in other words, a prime example of "labouring the point" !

14. *Chapter VII gives a summary of the results obtained from Capital Goods studies already carried out. The studies quoted are those of the UNIDO/NAFINSA Capital Goods Project and a follow-up study by ATISA based on the former. The ATISA study apparently establishes an order of priority in accordance with which it is said the Capital Goods sectors should be dealt with. The basis for such priority order is not stated, but it is assumed this is mainly according to decreasing values of imports. The next operation in this study was to establish an order of importance as to the involvement of technological industrial disciplines, as follows:*

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Foundrywork

Forging

Coining, or die-presswork

Machining

Welding

Heat treatment

At the same time, it is stated that the involvement of the techno-administrative discipline of Production Engineering (Planning and Control) is a necessity of prime importance common to all industrial activities. This is an incontestible fact and it is precisely in this area that the future role of CONACYT will come to the fore.

There also seems to be little to argue with as regards the technological order of priority adopted except to say that perhaps insufficient stress has been laid on facets of the industrial "image" particularly appropriate to Mexico, i.e. those of labour-intensiveness, heavy-product handling ability, and important manual-fabrication content. Bearing in mind such considerations, it is felt that the following order of priority should be more appropriate in the case of Mexico:-

Foundrywork

**{ Forging
Heat treatment**

Welding

Coining, or die-presswork

Machining

The foundrywork industry is said to be deficient in the number of foundry technicians, in the productivity of its operations and in the quality of its work. The Report estimates that the technician's shortfall amounts to 3800 men, whilst that of the engineers amounts to 450 men. The areas most affected are those of production equipment operation, selection and use of equipment and machinery, process control and quality control.

The production engineering functions in Mexico are said to be short of 2300 men in total. The Report estimates that the deficiencies in Engineers and Technicians in the most important functions, are as follows:-

<u>Function</u>	<u>Deficiency (approx)</u>
(a) Production (method) planning:	250 men
(b) Production equipment operation and supervision:	1100 men
(c) Production (scheduling), control (and follow-up):	280 men
	<u>1630 men</u>

REMARKS:

1. It is assumed that the functions shown in brackets above, were intended to be included.
2. It should be noted that function (c) is, essentially, of fairly non-technical commitment.
3. The above total of 1630 men in production administration leaves a balance of 2620 men out of the stated overall total of 4250 (3800 technicians + 450 engineers).

Presumably, this balance is to be employed in the functions of quality control, maintenance, design and sales engineering, etc. but it is felt that the figure is somewhat high for such "indirect" type of executive staff, as compared with the above figure for the more "direct" type of technical staff.

The forging industry in Mexico is said to be in a good state of development and is not unduly in need of outside technological aid. This is largely due to the fact that by far the greatest user of forgings is the automotive industry which has, of course, developed its own advanced methods and standards over a long period of time. The next largest use of forgings is in the making of impact and cutting tools where hardness and strength of steel are of paramount importance. In this case the technological content is minimal so that the industry is, in effect, quite self sufficient. In spite of the foregoing, the report states that the industry will have a requirement of 1961 average type technicians in the period 1975-1980. It will also need to have access to technological information concerning the following:-

*Equipment and tooling for cold forging
Automation of forging operations
Degasification of forging ingots
Tempering and heat treatment of large forged pieces*

In addition to furnishing the above information, any industrial consultancy institution established will need to furnish the following services in the future:

Selection and engineering of forging equipment
Operation of forging equipment
Tooling design work
Maintenance of forging equipment.

- 15. The report follows with a complete copy of ATISA's study report of 21 August 1974 on the establishment of a priority sequence for the giving of aid to the relevant sectors of the capital goods industries.**

This report is of a rather pedantic nature due to the fact that, although it utilizes a well recognised matrix method of making like-to-like comparisons, it does not press the method to the extent of arriving at a large number of "bi-nominal" or "yes-no" comparisons. The result is that a relatively small number of comparisons, as to the rating of capital goods sectors for priority treatment, are made through the use of a number of fairly arbitrarily selected "10-points" concepts. Further, as a probable result of having allocated ranges of "final points ratings" to the groups of capital goods sectors treated, the overall priority order arrived at shows the peculiar trait of having priorities 2 and 3 unfilled, i.e. there is a 1st priority and a 4th priority, on down to 10th priority only, but no 2nd and 3rd priorities !

As no less than 29 individual capital goods products have been considered for priority treatment, the priority position of each with respect to the others should have been indicated quite simply

by a number from 1 to 29, e.g. as in the case of Appendix 8A(2).

16. *The next section of the report is a 27-page study on the International Market for Capital Goods, extracted by CONACYT staff from a work by Fernando Fajnzylber. The author examines the dynamic position of the various capital goods supplier countries and organizations worldwide through the published statistics from the developed countries as to the movement of the supply and purchase of capital goods by each such country. Relative "supplier efficiency factors" are developed, based on the ratio of capital goods value supplied (i.e. exported) to that received (i.e. imported) and it is contended that such factors constitute a valid indication of the extent of overall technological capacity each developed country possesses.*
- Since the foregoing supplier efficiency factors are only based on trade statistics between developed countries, the report next endeavours to relate the value of each developed country's technological capacity to the requirements of under-developed countries. This has been done by comparing the percentages in which each industrialized country's capital goods export participate in the equipping of the under-developed countries. Examples in such respect are:- the U.S.A. participates in this way to the extent of 30% of the total capital goods imports value for all developing countries, whilst the equivalent proportion for each of West Germany, Japan and the U.K., is 15%. If*

the same participations of France and Italy are taken into account, then the total participation of these 6 countries alone is 90%.

Whilst the foregoing analysis appears to establish the four or six countries mentioned as the best suppliers of capital goods and technology thereto, to the underdeveloped countries, it also established that the main motivation for such supply capability appears to be the intertrade of capital goods supplies between those developed nations themselves.

It is thence concluded that the nature of the capital goods, and of the know-how thereto, available, also appears to be essentially appropriate to the conditions and circumstances of those same developed countries and not of the underdeveloped countries.

This is an over statement of the case since there are undoubtedly countless instances of technologies being specially "customized" to suit the conditions of the receiving country. Indeed, one of the strongest competitive attributes a supplier can display is his ability and willingness to adapt his technology and his plant supply to the very best advantage of his under developed client country.

It is further stated in the report that the basic technological effort towards this adaptation of technology must be provided by the interested under developed country. In practice this is not usually the case, but what does happen is that the under developed country can be the firm promoter of such effort on the part of the supplier, who is obviously, at least in the first instance.

far better equipped to produce the technological effort required than is the under developed country. However, this is not to say that the under developed country should not cooperate all the way with the supplier in this respect, to such an extent that, eventually, the under developed country will establish itself as the expert in its own adaptation of the technology.

The report goes on to say that it is more in the interest of a developing country that the purpose of an international supplier's affiliate in that developing country should be to supply export markets as well as the internal market. This is an obvious truism since the whole basis of setting up any industry anywhere should be to supply as many market needs as possible, including, of course, export markets.

The fundamental conclusion of this somewhat labouring treatise (25 pages) appears in the last half page thereto. It is that developing countries, Mexico included, must not "sit back and wait" for suitably adapted technologies to come to them but must go out and get them for themselves, following their own conducted systematic exploration of all the possibilities thereto.

17. The next individual report, included in the present CONACYT overall report, deals with the transference of technology in the automotive industry. This is a subject entirely on its own which is of no immediate interest to the capital goods programme

as presently conceived; therefore it will not be commented upon further at this stage.

18. The last section of the CONACYT report gives the ensuing Recommendations with which we are in general agreement except where commented upon otherwise. The Recommendations can be summarized as follows:-

1. Studies already carried out to be implemented.
2. Further detailed studies required (not specified which; to be carried out by "technological" participants?), involving assessment of:-
 - home market
 - present manufacturing capability and capacity
 - future manufacturing capability and capacity requirement
 - export markets
 - future technological requirements.

Comment: All such studies in sufficient detail for initial promotional purposes have already been carried out for Heavy Power Transformers and Switchgear, Heavy Boilers, Diesel Engines, Machine Tools, Heavy Sophisticated Foundrywork, Pumps and Compressors, Electrical Insulators, and Gears, Speed Changers and Forgings.

3. Create a centralized strategic planning organization for the capital goods sector, involving the establishment of incontrovertible priorities as to general treatment and supply of technological aid to the industries selected,

since all aid required cannot be supplied simultaneously.

Comment: The ATISA report on such priorities is very controversial.

4. The strategic planning should be in 5-year stages, to an overall extent of, say, 25 years, and taking into account such factors as, "amongst others":-

- exhaustibility of natural reserves
- the problem of pollution
- the geographic distribution of new capital goods producers.

Comment: Since the above factors apply to all industries with no exclusivity to capital goods, the following "amongst others" factors are the most important in the present context:-

- positive identification and utilization of particular national "differentiated assets" (e.g. climatological situation, geographic location for suitable exports, particular natural resources, economical labour availability, etc.).
- surveying and identification of specific activities, skills and experience forming part of the particular "national industrial image" (e.g. accent on "one-off" heavy fabrication space-requiring work, as opposed to smaller item series production factory work, involving heavy steel platework, skilled welding, acetylene cutting, etc. "yard" as opposed to "factory" constructional and erection work, generally "man-power-intensive". Also,

eventually, heavy sophisticated foundrywork.)

5. Create a permanent Interinstitutional Committee composed of representatives from Public Organizations, the Educational Sector, the Scientific and Technological (System) Organization and the (Private) Industrial Sector, to act as consultancy authority as regards technological and scientific policy-making for the Capital Goods Sector.

Comment: In our view, this should also deal with the overall development and national economic policymaking of the sector (otherwise, who else will do this?). The report suggests that sub-committees should deal only with overall development and national economic policymaking of the sector, but this is not feasible since these last are quite inseparable from the technological and scientific considerations.

6. Create a techno-scientific organization, which could be called a "Capital Goods Institute", capable of:-

(a) providing technical assistance in the transference and adaptation of technology;

(b) carrying out Applied Research into specified aspects of capital goods manufacturing developments;

(c) difusing technical information (repetition of (a) above) and "technological prospecting" on behalf of national producers (repetition of (b) above);

CHAPTER 1
INTRODUCTION

1.1 Purpose of the Assignment

According to the UNIDO Job Description, as reproduced in Appendix 1, the purpose of the Capital Goods (C.G.) Project is to formulate, evaluate and implement the setting up of new industrial manufactures within the capital goods sector and to prepare a development programme for the sector, in Mexico.

The assignment of the Industrial Project Planner, Industrial Engineer (hereinafter referred to as the Expert to differentiate him from the numerous other UNIDO experts) has been to ensure technical coordination between the various industrial subsectors dealt with and to examine the technical soundness of the feasibility studies undertaken by individual UNIDO experts and consultants.

At the same time, technical assistance in the work of counterparts and other authorities connected with capital goods, would be carried out as and when required.

The Expert's assignment began on 15th April 1974 when he travelled to Vienna for his briefing session. The present employment contract with UNIDO therefore terminates on 14th July 1975.

(d) coordination and execution of activities towards quality control and the establishment of nationally accepted standards in the manufacture of machinery and equipment generally and capital goods in particular.

Comment: Rather than create a separate "Institute" as recommended above, we suggest that a section of CONACYT could best be created to deal with these aspects.

7. Re-structure the existing fiscal measures in order to harmonize them with, and orient them towards, the expansion requirements of national industry as a whole.

8. Train engineers and technicians particularly in the field of capital goods technology and manufacture. In this respect, the priorities as to the correct sequence of treatment for capital goods sub-sectors should be strictly adhered to. Furthermore, any new educational institutions for such purpose should develop their own training curricula entirely in accordance with national industrial needs. They should not be made to slavishly follow the existing curricula of the UNAM or the IPN which are manifestly inadequate in the field of capital goods.

Postgraduate specialisation courses should be instituted and more fellowships abroad should be created.

9. Based on activities already in progress in the country

relating to metal-mechanical and machinery manufacturing industries, the committee recommends that the following programmes and organizations be supported as promoting the strengthening of the sector's technological infrastructure and the integration of such infrastructure with the user industries.

- (a) Support the CONACYT-UNIDO project as regards the investigational infrastructure and the technological services for the machinery and equipment manufacturing and capital goods sector.*
- (b) Support the development of ATISA as the entity qualified to provide, adapt and transfer technology for this sector, involving that entity in:-*
 - technical problem solving;*
 - development of production engineering methods most appropriate to the country's circumstances;*
 - acting as supervisory consultants in the setting up of capital goods manufacturing plants;*
 - establishing itself as the medium for the technological development of those other industrial sectors which contribute to the manufacture of capital goods.*
- (c) Support INFOTEC as the organization for the promulgation of information and industrial intelligence, so that in conjunction with the specialised centres associated with the capital goods industry, it can apply this service to*

the technological development of such industry and to the planning of an appropriate development strategy overall.

(d) Combine the efforts of the above mentioned three institutions into one directorate (could not CONACYT itself be the coordinating common directorate?).

(e) Make full use of the Public Sector's purchasing power as a promotional instrument for the development of the Capital Goods National Industry.

Final Summarised Comment

Very generally the report is somewhat subjective in that it dwells overmuch on all the circumstances inhibiting the development of capital goods industries without giving full objective and direct recommendations as to how such inhibitions should be remedied and by whom.

The report gives the impression of tending to promote the qualities and attributes which CONACYT, ATISA and INFOTEC should have, as well as their indispensability to the country. While this "commentator" entirely agrees that the stated functions of these entities are, indeed, indispensable to the development of Mexico's capital goods industry, it is felt that such a promotional slant should have been tempered by the injection of more constructive recommendations as regards the roles of other authorities and institutions.

CONSTITUTION OF THE
COMMITTEE ON CONSUMER DURABLE GOODS
AND CAPITAL GOODS

Coordinator:

Ing. Manuel Viejo Zubizaray.

Appointed members*

Ing. Jorge Arlansón

Ing. Pablo Barrueta

Lic. Luis Bravo Aguilera

Ing. José A. Esteva Maraboto

Ing. Juan Marysal

Ing. Luis Noriega

Ing. José Quevedo

Ing. Daniel Rivera Tayandir

Ing. Carlos Ruíz González

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Spokesman:

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Lic. Angel de la Vega

Investigador. El Colegio de México.

Dr. Miguel S. Wionczek

Director del Secretariado Técnico Plan Nacional de Ciencia y Tecnología.

• In alphabetical order.

ANALYSIS OF RELATIVE SIGNIFICANCE
IN VALUES OF CAPITAL GOODS IMPORTS
 (By H. R. Hargreaves, May 1974)

1. **Basic Rating** - Inverse of numerical position on table XI, Page 103 of UNDP / UNIDO Phase 1B Report

2. **Suitability Loadings**

Loading points	-3	-1	0	+1	+3
a) No. of specified outlets:	1	2	3	4	9
b) Degree of relative freight significance:	No Significance	Little Significance	Average Significance	Quite Significance	Very Significance
c) Distribution amongst specified outlets as % of whole:	0 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%

Capital Goods Categories	Pesos x1000M	1. Basic rating	2(a)	2(b)	2(c)	Total points	Loaded priority
A. Power gen. machinery (o.t. elec. machs. & eqipt)	9.05	26	+2	+2	+2	32	1
B. Machine tools (chip removing) & chipless forming	4.58	21	+2	+2	-1	24	6
C. Other metal-working machinery. (for welding, cutting, etc.)	0.56	2	+2	-1	0	5	21
D. Packaging, weighing, and spraying machinery	1.95	11	+2	+1	0	14	14
E. Heating & cooling eqipt.	3.86	18	+2	0	+1	21	8
F. Pumps, compressors & centrifuges	5.23	22	+2	0	+1	25	4
G. Lifting, loading, and conveying eqipt.	2.35	14	+2	+1	0	17	12
H. Other machinery	3.73	16	+2	+1	+1	20	10
I. Machinery parts & accessories	8.76	25	+2	-1	-1	25	3
J. Steel & non-ferrous metal production	1.93	10	0	+2	+2	14	15
K. Mining, construction & cement industries	4.29	19	-1	+1	+2	21	9
L. Paper & pulp manufacture	1.41	7	-2	+1	+2	8	19
M. Sugar & food production	1.13	5	-2	0	-2	1	24
N. Chemical production	0.32	1	0	0	-1	0	26
O. Textile machinery	8.09	24	-2	+1	+2	25	5
P. Agricultural machinery	2.73	15	-1	+2	-2	14	16
Q. Other equipment for specified industries	1.80	9	+2	+1	+2	14	17

<i>Capital Goods Categories</i>	<i>Pesos x1000M</i>	<i>1. Basic rating</i>	<i>2(a)</i>	<i>2(b)</i>	<i>2(c)</i>	<i>Total points</i>	<i>Loaded priority</i>
<i>R. Elec. generators & motors</i>	3.78	17	+1	+1	+2	21	7
<i>S. Transformers & circuit breakers</i>	5.44	23	+1	+2	+2	28	2
<i>T. Electrical insulating equipment</i>	0.77	4	-2	0	-2	0	25
<i>U. Telecommunications equipment</i>	2.00	12	-2	0	-2	8	20
<i>V. Elec. measuring & control insts.</i>	1.36	6	-2	-1	-2	1	23
<i>W. Electrical and other tools</i>	2.16	13	+2	-1	+2	16	13
<i>X. Electric furnaces, welding & cutting appar.</i>	0.57	3	-1	+1	-2	1	22
<i>Y. Other electrical equipt.</i>	1.48	8	+1	+1	+2	12	18
<i>Z. Capital goods not specifically identified</i>	4.32	20	0	0	-2	18	11

Mexico City, October 3rd. 1974.

TO: K.D.N. SINGH,
UNIDO Project Manager.
Capital Goods Project.

FROM: H.R. HARGREAVES,
UNIDO Industrial Engineering Consultant.

COMMENTARY ON THE STUDY
"FABRICACION DE EQUIPO SIDERURGICO" PHASE 1
CARRIED OUT BY CONSULTORES ASOCIADOS A.P., REPORT SUBMITTED MAY 1974.

This voluminous work purports to analyse the feasibility of manufacturing in Mexico the plant and equipment for steelmaking and processing in relation to the country's needs and its possible export markets in this field.

In fact, it is little more than a layman's statistical compendium and pseudo-technical reference manual pertaining to the steel industry and all its operations in general.

Contrary to normal expectations from such a consultancy work, covering a period of probably some 2 years duration, the report does not arrive at any really informative or useful conclusions as regards the possible industrial performance of any steel plant manufacturing operation which may be envisaged. Wherever that particular subject arises, reference is merely made to the pre-investment study which is supposed to follow and complement the present one.

All the international, inter-regional, and national statistics as to the markets, past, present and future, for iron and steel, basic metal and products thereof, are contained in the report, occupying nearly 200 pages of text and tables. Nevertheless, no attempt is made to enumerate or identify

precisely the types of steelmaking plants and equipment whose manufacture should be undertaken in Mexico, although much space (some 210 pages) has been devoted to what allegedly could feasibly be produced. In this last respect, estimates of possible "percentage integration" rates appear to have been somewhat arbitrarily arrived at, with no indication of the bases for such estimates.

In more specific terms regarding the lay-out and editing of the report, the following comments are relevant.

Under the heading "Basic information on the Project" the very first section of the report sets out a mixture of chronological facts concerning the participants in the project, its objectives, launching, and some of its requirements, the financial investment aspects of which are very cursorily and arbitrarily dealt with. The remainder of the first section, 45 pages no less, merely constitutes a legalistic record, illegible in many places, of all the meetings, negotiations and agreements arrived at between the parties concerned, as regards the setting up of the project.

The whole of the second section of the report is a sales promotional piece for the so called "second phase" of the consultancy project, i.e. the pre-investment study proper as regards the manufacture of iron and steelmaking equipment in Mexico. From the point of view of the consultant's customer, NAFINSA, this last is the only consultancy project required and relevant. It would be more appropriate to consider the "project report" being commented upon here as the "background information file" which consultants normally prepare for their own use as the basis of the legitimate pre-investment study. This pre-investment study itself is only now being put forward by Consultores Asociados, and for an entirely separate fee.

Some tables in the report are published without indication as to what units are referred to by the figures, i.e. whether these are "thousands of tons", "millions of Pesos", "thousands of Dollars", etc.

.....

1.2 Duties of the Expert.

Fundamentally in accordance with the terms of the UNIDO Job Description, the duties of the Expert were deemed to include the following:

- 1. Techno-economic assessment and up-dating of previously identified opportunities for industrial development projects, as regards the manufacture of capital goods in Mexico;**
- 2. coordination of interrelated projects, as well as coordinating new projects with already existing similar and related industrial enterprises;**
- 3. identification and formulation of further new opportunities for industrial development projects associated with the manufacture of capital goods and constituting suitable later inclusions into the sector's development programme;**
- 4. providing assistance in the technical appraisal of projects;**
- 5. providing assistance in drawing up the terms of reference for specific project studies to be carried out by later UNIDO experts or consultants, also further assistance in evaluating the reports ensuing from such studies;**
- 6. providing training for counterpart personnel.**

1.3 Comments on the Job Description.

The duties of the Expert were to be carried out in association with the other two intermediate term experts from UNIDO, the

For instance, Cuadro # 1 following page 13 of Section II fails to specify that its units are "thousands of tons". In at least one case (Section II page 4), the title of a table refers only to "growth rates for the period 1960 to 1971 "when, in fact, the figures shown are overall average annual growth rates within that period.

In the same vein, on page 7 of Section II, the average annual growth rate for the apparent national consumption of iron, steel and products thereof, has been wrongly calculated, from the table of annual consumption figures shown, as 7.4% per annum. The correct growth rate should have been expressed as 8.13% per annum, calculated from the generally accepted formula:

$$\text{Log } (1+x) = \frac{\text{Log } A_n - \text{Log } A_1}{n-1}$$

where: A_1 = 1st year figure.

= 1,812.2 million tons in this case.

A_n = n-th year figure.

= 12th. " " in this case.

= 4,276.4 million tons " "

x = Average Annual Growth Rate expressed as a decimal fraction (multiply by 100 to express as %).

$$\text{Thus, in this case } \text{Log } (1+x) = \frac{3.6311 - 3.2582}{11} = .0339$$

$$\text{or, } 1+x = 1.0813$$

$$\text{or, } x = 8.13\%$$

It is not known how the average annual growth rate of 7.4% was arrived at since even the erroneous calculation method of averaging the aggregate of the 11 individual annual growth rates gives a so called "average" of 9.1% per annum.

Consequent to the above observations, it is possible that the average annual growth rates (erroneously not so described, as said before) shown in the table on page 4 of this same Section II, have also been wrongly calculated. It follows that the statement at the top of page 8, to the effect that the steel industry's consumption growth rate is lower than that

of industrial production generally, may also be suspect.

In view of the foregoing, it may be considered surprising to find that the average annual growth rate for the Gross National Product, given as 7% in paragraph a) on the following page 9, has been correctly calculated from the 12 individual annual figures shown on page 8.

Nevertheless, the argument which follows regarding the choice of adopting a linear logarithmic or semilogarithmic formula for calculating consumption projections is not valid. The use of such a formula is considered to be cumbersome and unnecessary since the matter of industrial forecasting is only meant to involve the calculation of reasonable projections as to possible (not even probable) demand figures and cannot be expected to forecast actual annual figures or trends of any kind. The report itself confirms this by stating later, on page 23, that "extrapolation of the regression curve" gives a "very crude approximation" of projection conditions. Therefore, why go to so much trouble only to arrive at a "very crude approximation"?

By the same token, consideration of growth rates varying by as much as 1% above or below the correctly calculated GNP average annual growth rate, as has been done in pages 9 to 13 of Section II, is also believed to be uncalled for.

In conclusion, it is felt that the present report of Consultores Asociados is of little value to the client, NAFINSA. Certainly it is considered that, by itself, it is not worth any possibly high fee which may have been paid for it. In the writer's 14-years worldwide experience as an Industrial Engineering and Management Consultant with two of the world's most renowned international consultancy firms, one American the other European, he has never come across a case where the "working background file" has been submitted as a fee-paid consultancy report. The writer has been associated with many international studies of similar scope as the present one of Consultores Asociados and these have always included the full pre-investment study. Consultores Asociados are, in fact, treating the pre-investment study as a second consultancy project. In all cases known to the

writer, the type of content to be found in CA's present report has been assembled to serve the consultant's own purpose in executing the pre-investment study. Its cost is therefore invariably included in the overall cost of the entire pre-investment study. It is only the pre-investment study which is designed to give the client all the information and recommendations necessary to allow him to take the required decisions concerning the project subject.

January 23rd, 1975.

NAFINSA ARTICLE FOR PUBLICATION
IN "THE AMERICAN BANKER"

Before introducing the reader to the range of projects promoted by Nacional Financiera, S.A., which this article sets out to divulge, it would be appropriate to devote some words to the terms of reference and aims of this development bank.

Nacional Financiera, S.A., (NAFINSA) is a government controlled financial loan institution, whose function is to stimulate the economic development of Mexico by financing and promoting industry and other productive activities. The institution was created in 1934, and its legal constitution endows it with ample powers to carry out its work effectively. Currently, it is the bank which handles the largest volume of resources in Mexico, second only to the Central Bank. For the past 20 years, it has been the most important development bank in the whole of Latin America.

NAFINSA has provided financial resources to many forms of industrial activity and has also channelled an

important volume of funds towards the development of basic national economic infrastructure.

Within its purpose of acting as a development bank, NAFINSA seeks practical solutions and viable opportunities to formulate investment programs and projects. Since the last quarter of 1971, NAFINSA in collaboration with UNIDO, the industrial development branch of the United Nations, has embarked on the study and development promotion of the Mexican economy's capital goods manufacturing sector. In effect, the program constitutes the positive response of NAFINSA to the limited development that the capital goods sector has been experiencing until recently.

While there had been considerable growth as regards machinery manufacture in the past few years, the capital goods sector has continued to remain comparatively underdeveloped in terms of manufactured output. As a result, needless to say, export performance has of course been insignificant. In 1973 about 80 enterprises were principally engaged in the manufacture of capital goods items in Mexico. Last year's new entrants have not changed the picture substantially. These

enterprises cover a fairly wide field of machinery production but the level and range of sophistication is relatively low and the proportion of imported components is often high.

One of the reasons for slow growth of the Mexican capital goods sector has been the channelling of investment resources into consumer goods production. Limited internal demand and the expensive foreign know-how content of heavy machinery and precision equipment also deterred large scale investments in the capital goods sector. Furthermore, import substitution policies have failed to give any but very limited support for this sector. Consequently, what machinery manufacturers there are, have had to face strong foreign competition because of existing facilities for the importation of such machinery and the low tariffs on such imports.

In some cases, a low volume of production and higher charges for certain inputs have resulted in product prices being well above the international level. The development of exports has been hindered by this situation and by restrictive provisions, often included in the past, in licensing arrangements with foreign firms. Another problem has been the inadequate development in Mexico of facilities for design work, detail engineering and for technical services generally. None the less, it is NAFINSA's contention that the growing internal demand can serve as a firm foundation for the growth of the capital goods manufacturing industry

in the country, supported by a strongly export-oriented policy. Mexico's geographic location and infrastructural development, together with its general economic conditions and investment climate, are particularly well-suited in this last respect. Establishing facilities in the country provides a foreign firm with the opportunity to penetrate a dynamic and growing market which should prove to be a valuable asset for many years to come.

The main objective of NAFINSA's program in this sector is to promote the development of the capital goods through feasibility and preinvestment studies, negotiations with prospective technology supplying partners and other interested parties, and through all other activities that are necessary.

The program consists of two important parts, as follows:

(a) Programming of the investment decisions in the field in order to ensure the investment project's consistent development. Also, suggesting to the public agencies concerned, backed by previous studies and all relevant data, the types of general public policies that should be adopted, as well as other options and decisions of a more specific nature, to stimulate the commitment of public and private investment in this field.

(b) The second part constitutes the promotional activity that is directed towards the definitions and implementation of concrete investment projects.

Naturally, the two program parts are closely related to each other. Programming decisions depends on the feasibility of carrying out the projects. On the other hand, the projects themselves depend on accurate programming for their success. In fact, it would not be possible, or at least not desirable, to carry out the functions of the two parts separately.

To identify the principal gaps in capital goods manufacture, machinery and market requirements have been forecast for the period 1976-1980 by means of macro-projections of imports, domestic production and ensuing total demand. These macro-projections have been based primarily on the likely investments up to 1980 in 14 major industrial subsectors and on the capital goods requirements within such investments. The capital goods groups numbered 19 in all, and import projections for 1976-1980 have been made in each case. Thus, the major production gaps were identified taking into account various expansion proposals and new plant ventures currently under implementation. Finally, in accordance with the economic and technological circumstances surrounding each item, suggestions as to manufacturing possibilities were made and are being negotiated.

Since this article's main purpose is to describe the promotional activities of the capital goods development program, the remainder of its text will concentrate on this particular aspect.

1. - PROJECT PROMOTION

The general promotional considerations for the capital goods project are as follows:

(a) The efficient realization and operation of individual promotional projects invariably requires that the concern (usually foreign) offering the technology should enter the partnership through a substantial but necessarily minority participation in the equity stock of the new company or expanded operation.

(b) In order to ensure full cooperation of the foreign partner so that high standards of quality in the new products may be obtained, it is necessary that the new establishment be able to export a substantial part of its production, say 30 to 40% after a reasonable period of production time has elapsed. This ensures that the foreign partner has the right incentive to see to it that his own high quality of product also comes out of the Mexican producer.

(c) In many cases the execution of these projects requires very specialized training programs which entail some period of time before the company is fully established.

(d) In their first stage (mostly the initial year) the investment projects do not absorb a large amount of funds. They are oriented almost entirely towards the internal market with only very little required exports, and they initiate their operation mostly as assembly units. After a period of 4 or 5 years, the domestic integration coefficient increases up to the minimum of 65% that is required by the Ministry of Commerce.

(e) In many cases, it is necessary that the decision to carry out the type of project in question be agreed upon by various entities of the public sector. In these cases, the promotional activities imply the recruitment of working groups which include the participation of such entities.

(f) The main advantages the country obtains from the development of the capital goods sector are: (1) an increase in the general manufacturing capacity of Mexican industry in general (2) an increase in the national participation in the kind of growth enjoyed by the more dynamic sectors of the economy; and (3) higher value-added content of the national production.

These benefits more than compensate for the project promotional and other costs involved which, in this sector, are higher per peso invested than in other sectors such as, for example, the production of raw materials.

Project Manager (Policy Adviser) Krishna D.N. Singh, and the Industrial Economist (Project Evaluation) Per Blondell. The national counterpart of the C.G. Project is Nacional Financiera, S.A. (NAFINSA), which is the official financing institution of Mexico. The project is administered by NAFINSA's Industrial Programming Division and is staffed as shown in Appendix 2.

Executives of the national institutions and organizations concerned with the C.G. Project are shown in Appendix 3. With regard to the Expert's duties listed in section 2 above, all these were found to be very much in keeping with the running requirements of the project and did in fact occupy most of the Expert's time, working in very close collaboration with the UNIDO Project Manager, the UNIDO Industrial Economist, and each of the ten experts present during the Expert's assignment period.

Only in the case of the Foundrywork subsector was it found that there was, indeed, a certain amount of "interrelation" with all other subsectors, since cast iron parts are, of course, common to all such subsectors in some shape, form or size.

1.4 Scope of present report.

It has been deemed that it would not be useful for the present

NAFINSA's role in the program has been conceived to accelerate and actively participate in the development of each individual project. For this reason it is continuously seeking out and bringing together foreign and domestic partners interested in taking up the manufacture of any particular line of machinery. More precisely, NAFINSA contributes in the following way:

1. - It acquires a substantial share of the capital stock, as necessary, usually to the extent of obtaining the majority holding of the Mexican partnership.
2. - It can be an effective medium for obtaining long-term credit; alternatively, it can be the source of it.
3. - It can smooth out bureaucratic difficulties encountered in the gathering of data and other investment study preparatory work, as well as in the execution of the project itself. Much importance is attached to this particular effort.
4. - It gives considerable attention to the problem of diminishing the uncertainty of the future market. It invites prospective main purchasers to discussions in which precise user requirements are identified.
5. - It affords a consultancy service on tariff protection and submits applications in such respect to the Ministry of Commerce as and when appropriate.

In the following paragraphs, the different projects being dealt with are described.

2.- PRESENT STATE OF EXISTING PROJECTS

As regards concrete investment projects, the capital goods program is divided into three groups of equipment products: (a) Heavy electrical equipment, (b) Common - use mechanical equipment, and (c) Mechanical equipment for specific use.

(a) Heavy electrical equipment

This subsector includes high voltage power transformers, high voltage circuit breakers, high pressure boilers, heavy electric motors and generators, high voltage porcelain insulators, hydraulic turbines and equipment for the generation of electricity such as turbogenerators and parts for electric plants.

The establishment of these projects is being promoted jointly by NAFINSA and the "Comisión Federal de Electricidad" (the CFE, Mexico's national electricity supply corporation) except in the case of equipment not directly related to the generation and distribution of electricity, e.g. electric motors.

(b) Common - use mechanical equipment

This group consists of machine tools, steam turbines for industrial use, medium and heavy castings, gears and

precision forgings, pumps and compressors and heavy diesel engines.

(c) Mechanical equipment for specific use

This includes textile equipment, steel making plant and finishing equipment for chemical and allied plants, and equipment for the sugar, cement, paper and pulp industries.

3. - CONCLUSIONS

The realization of a program of such vast national concern naturally requires a prolonged effort before it can be completed successfully. In some instances, it will take time before many of the newly established enterprises are operating at full capacity in Mexico. However, the most intense part of the promotional activity is now in progress and a number of negotiated prospects, are well on their way to becoming realities in the near future. Up till now, the number of American firms involved in this important project has been relatively small. It is expected that very soon, a number of the important and more technically developed american companies will confirm their definite interest to participate in the program.

Finally it may be observed that in few years from now, Mexico should be able to count on having various important capital goods manufacturing industries which will prove to be good industrial examples of efficient operation and dynamic growth in a progressive country.

OCDE

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DE DÉVELOPPEMENT ÉCONOMIQUES

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DEVELOPMENT CENTRE

OECD

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

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4th March, 1975

Mr. H. Roy Hargreaves,
Assessor ONUDI,
Planeacion Industrial,
Nacional Financiera, S.A.,
Gerencia de Programacion Industrial,
V. Carranza 25-20 piso,
MEXICO 1, D.F.,
Mexico.

Dear Mr. Hargreaves,

It was a great pleasure to make your acquaintance when I was in Mexico. Your story about the Mexican entrepreneurship still stays deep in my mind. I am sending under separate cover a copy of the The Mexican Entrepreneur which I mentioned during our discussion. While this study is already some years old our own view has been that despite the rich case history material, there are no conclusions to be drawn from the policy standpoint. We should be grateful for any comments on this from you.

Please give my very best wishes to Mr. Blondell. Also please convey my regret to Mr. Singh, whom I had looked forward to seeing.

With kindest regards,

Yours sincerely,



Mikoto Usui, Head,
Technology and Industrialisation
Programme

LANGUAGE PROFICIENCY ORAL EXAMINATION

MARKING SHEET

CANDIDATES

	<u>Max. Marks</u>	_____	_____	_____	_____	_____
a) <u>FLUENCY</u>						
1. Smoothness	5					
2. Continuity	5					
3. Naturalness	5					
4. Pronunciation } Comprehensibility	5					
5. Intonation }	5					
	<u>25</u>	_____	_____	_____	_____	_____
b) <u>COMPREHENSION</u>						
1. Understanding of questions	5					
2. Response relevance	5					
3. Spontaneity	5					
4. Conversational initiative	5					
5. Boldness (unafraid of mistakes)	5					
	<u>25</u>	_____	_____	_____	_____	_____
c) <u>RANGE OF EXPRESSION</u>						
1. Range of vocabulary	5					
2. Variety of topics	5					
3. Originality (no "clichés")	5					
4. Use of current expressions and well known sayings	5					
5. Expression of complex ideas	5					
	<u>25</u>	_____	_____	_____	_____	_____
d) <u>CORRECTNESS</u>						
1. Use of verb forms and tenses	5					
2. Correct word order (especially the position of verbs)	5					
3. Use of prepositions	5					
4. Use of pronouns	5					
5. Listening response	5					
	<u>25</u>	_____	_____	_____	_____	_____
TOTAL	100	_____	_____	_____	_____	_____

**NUMBERED CODING BY SECTOR
FOR CAPITAL GOODS MANUFACTURES IN MEXICO**

A. Heavy steel platework manufactures and their accessories

1. Power Boilers
2. Industrial Boilers
3. Pressure parts for 300 MW boilers
4. Metal fabrications for large items of 1. & 2. above
5. Small industrial boilers
6. Boiler control equipment
7. Thermal insulated components
8. Pressure vessels, gas bottles
9. Heat exchangers
10. Industrial water heating
11. Water treatment plants
12. Desulphurization plants
13. Equipment and components for oil, steel, sugar, cement, pulp and paper industries.
14. Foundrywork
15. Low ferro-alloy manufactures.
16. Industrial electric furnaces (resistive)
17. Electric induction furnaces

B. Heavy static electrical equipment and accessories

1. Power transformers of 230 kV max: 3ph: up to 100MVA
1ph: " " 107MVA
2. Power transformers up to 5MVA, 69 kV
3. Power transformers up to 15MVA, 115 kV
4. Distribution transformers
5. Auto-transformers
6. Industrial regulating transformers
7. Rectifier transformers
8. Furnace transformers
9. Circuit Breakers, Switchgear and Contactors
10. Distribution panels
11. Current transformers
12. Potential transformers
13. Industrial Rectifiers
14. Power Factor Capacitors
15. Industrial Reactors
16. Industrial Accumulator Chargers
17. Integral substations
18. Phase-shift transformers
19. Instrument transformers
20. Equipment insulators

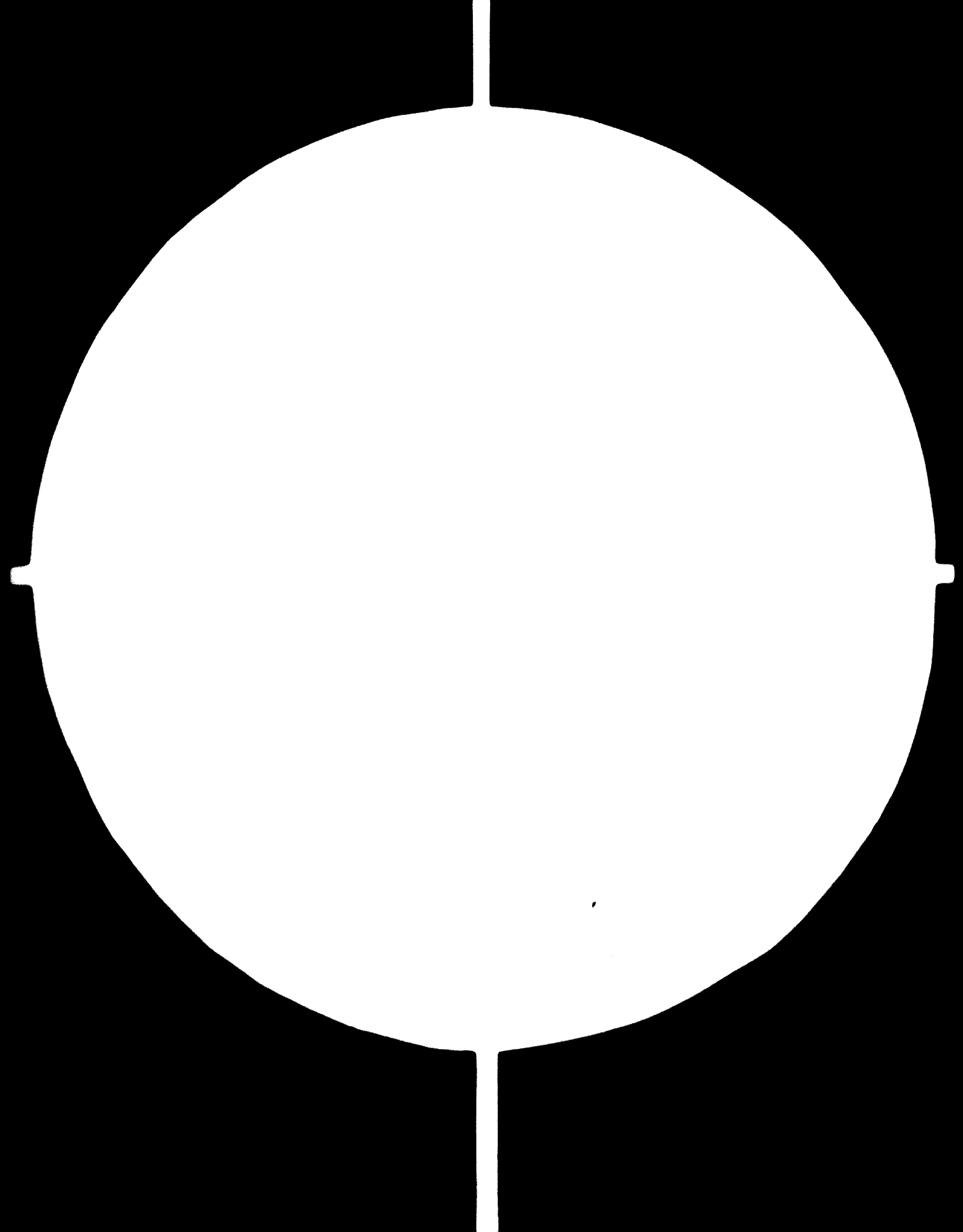
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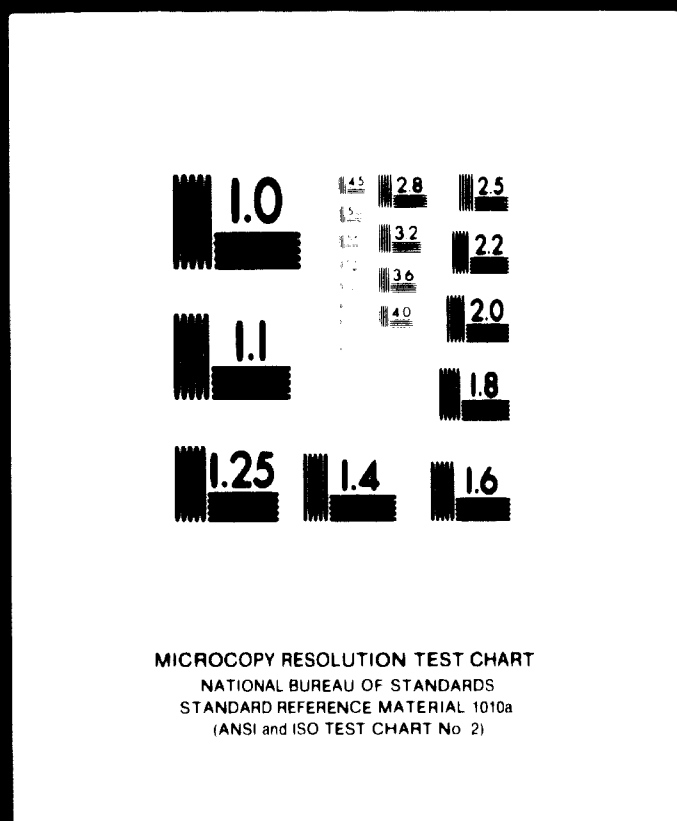
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2 OF 2



24 x F

From: H.R. Hargreaves
To: S. Vélez.

11 July, 1974.

WELDED TUBES IN RELATION TO THE
CAPITAL GOODS PROJECT

Based on statistics of the SIC's Dirección General de Estadística, the average rate of importation for Seamless Tubes from 1965 to 1972 was some 10,750 tons per annum. Over the past 5-year period the statistics in this respect do not reveal any great variation from year to year. Not only is this import quantity small compared with Mexico's present 185,000 tons p.a. home production of seamless tubing, but it is in any case more than offset by the country's 10-year average of some 50,000 tons p.a. exports of tube products generally (actually, 88,504 tons in 1971 and 73,783 tons in 1972). Consequently, the importation of seamless tubes, as it stands, is hardly of any significance to the Capital Goods Project.

In the case of seamed or welded tubing, however, the rate of importation increased markedly from 1965 to 1968, then decreased just as sharply from 1968 to 1971. In the year 1972, however, an enormous importation of welded tubes above 4 1/2" (115 mm.) diameter, amounting to almost 20,000 tons, suddenly occurred. This would seem to indicate that the country does not possess adequate facilities or sufficient production capacity in welded tubemaking, at least for tube sizes above 4 1/2" diameter.

In such diameter sizes the most appropriate type of welded

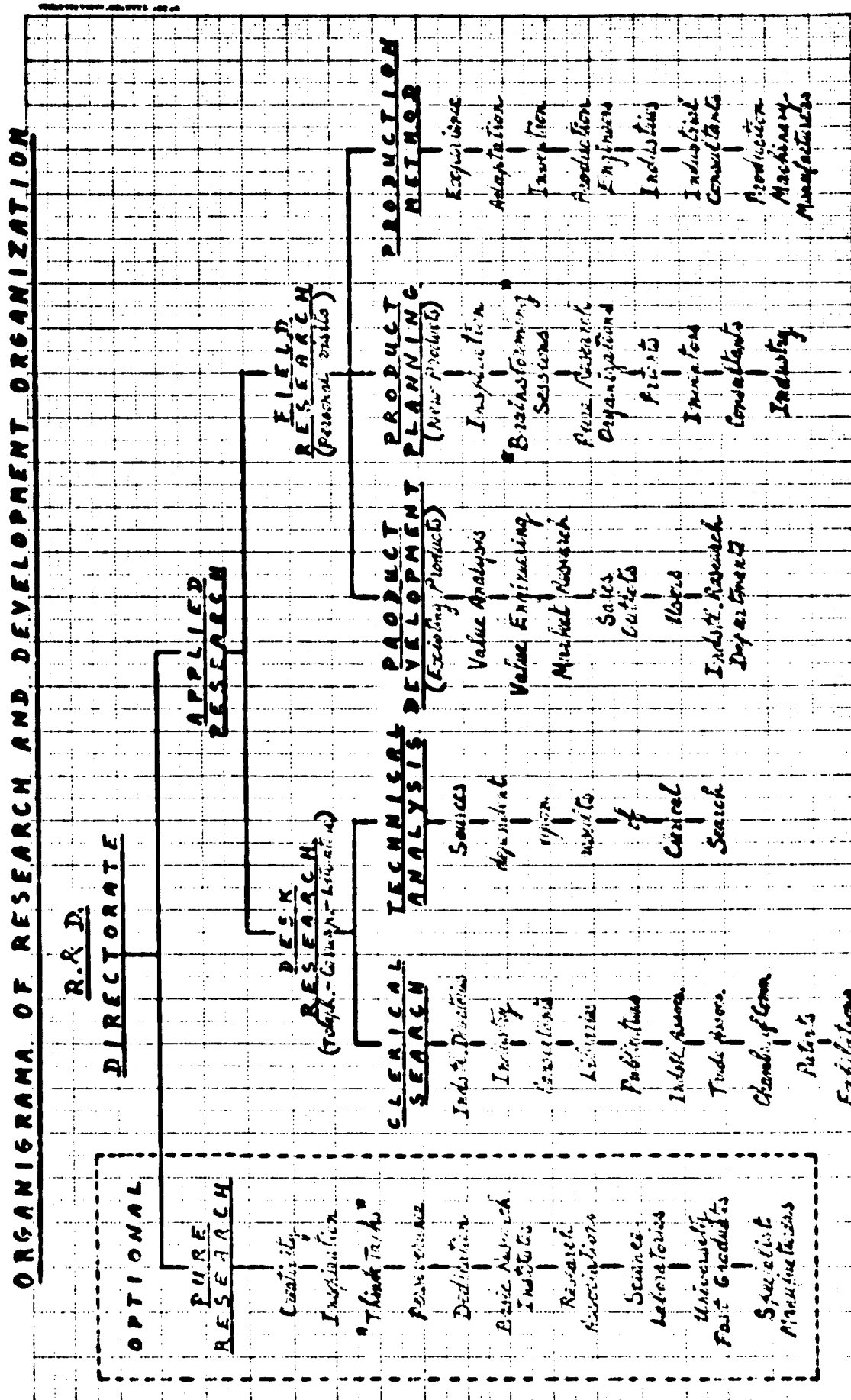
2.

tubemaking machine is the DRIAM type which is designed to manufacture continuous spiral, argon-arc welded tubing, from standard strip steel, in a wide range of wall thicknesses and diameters. Further, the compactness and flexibility of this type of machine is such that it can take the form of an entirely self-contained mobile unit (including its own electricity generating plant) which can produce continuous, integrally jointed, cross-country pipeline tubing while actually laying it along the ground or in a trench. It is considered that it would be of national interest to carry out a feasibility study for the setting up of such a welded tubemaking facility, or facilities, in Mexico and so create a substantial new item of import substitution. The impact of such an item on foreign exchange savings will be of greatly increasing importance with the development of the petroleum industry and its pipeline projects.

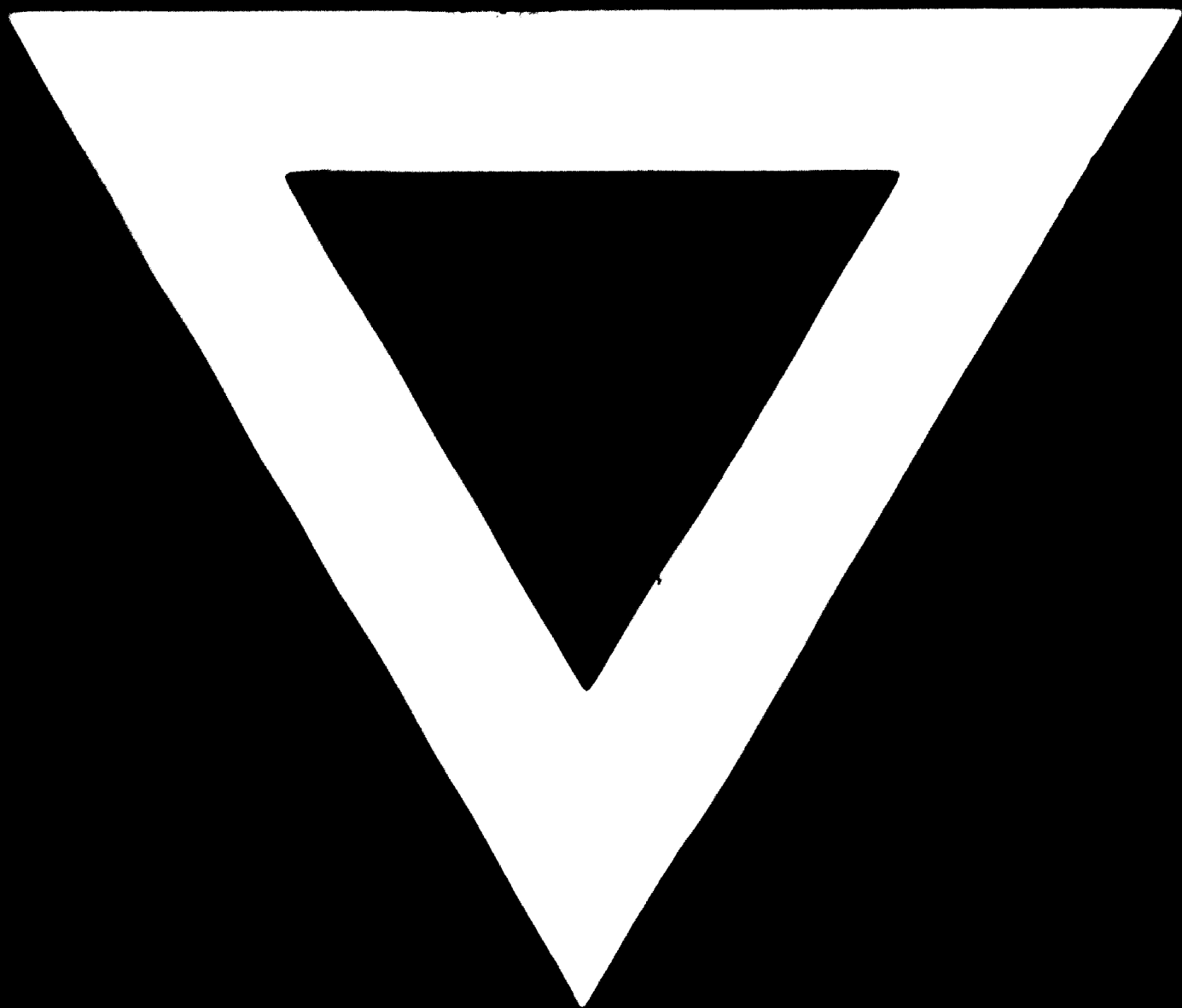
As regards welded tubes below and up to 4 1/2' diameter, it is considered that a market study should be undertaken to establish the extent and distribution of such tube usage in the country, past, present and future, as well as the sources of supply, whether from imports or from local manufacturers in the country. If the national demand for ordinary "commercial pipe" (water, gas & oil conveyance)

3.

is largely met either by imports or by the one and only seamless tube manufacturer TAMSA, then there is a strong case, on the one hand, for import substitution and, on the other hand, for releasing TAMSA production capacity in favour of more specialised and more remunerative types of tubes. In either case of these two inappropriate sources of supply for this particular type of piping, the desirable alternative is to manufacture the commercial piping locally on a cold strip rolling longitudinal welding tubemill. This is because, generally speaking, the manufacturing cost of longitudinally welded tubing can be as little as half that of seamless punch-extruded tubing in otherwise exactly similar commercial types.



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C. Heavy rotary electrical equipment and accessories

1. **Medium AC induction motors 200 to 1000 HP**
2. **Large AC " " 1000 to 3000 HP**
3. **Large AC " " up to 5000 HP (X)-prospective**
4. **Small to medium AC induction motors up to 200 HP L. T.**
5. **Explosion-proof motors up to 60 HP**
6. **Large AC synchronous motors up to 5000 HP**
7. **DC motors up to 1000 HP (drilling rigs)**
8. **Medium AC generators up to 250 HP**
9. **Large AC generators up to 3000 kW**
10. **Solid state equipment with thyristor convertor/invertor**

D. Diesel Engines

1. **Agricultural 7-30 HP**
2. **" 40-45 HP**
3. **" 50-130 HP**
4. **Marine 23-30 HP**
5. **" 140-210 HP**
6. **" 210-400 HP**
7. **Industrial 7-45 HP**
8. **" 50-130 HP**
9. **" 140-400 HP**
10. **Automotive 110-130 HP**

E. Machine Tools

1. **Light training lathes**
2. **Centre lathes (class B); 350-500mm. swing over bed; 1 to 2 m. bet. centres**
3. **Centre lathes (class B); up to 710mm. swing over bed; up to 4 m. bet. centres**
4. **Universal milling machines**
5. **Turret lathes**
6. **Surface grinding machines**
7. **Single-spindle automatic lathes**
8. **Boring machines**
9. **Universal grinders**
10. **Gear hobbing machines**
11. **Holding equipment for Precision Cutters**
12. **Bench/Pedestal light drilling machines**
13. **Column type drilling machines**
14. **Gang type drilling machines (multi-spindle)**
15. **Woodworking machinery**
16. **Bandsaw machines**
17. **Circular saw machines**
18. **Bench grinders**
19. **Mechanical presses up to 60 tons**

20. Mechanical presses up to 200 tons
21. Mechanical presses, double sided, up to 1600 tons
22. Plate shears
23. Press brakes up to 90 tons
24. Press brakes up to 400 tons
25. Hydraulic press brakes
26. Hydraulic shears
27. Punch presses
28. Roll-forming machines
29. Spot-welding machines

F. Heavy cast iron foundrywork

1. High quality castings below 3 tons weight
2. High quality castings of 3 tons weight and up to 15 tons at least
3. High quality castings of 3 tons weight and up to 10 tons only
4. Fair quality castings below 3 tons weight
5. Fair quality castings of 3 tons weight and up to 15 tons at least

G. Pumps and Compressors

1. Pipeline pumps
2. Process pumps
3. Deep well pumps
4. Sewage pumps, fixed rate type
5. Sewage pumps, adjustable rate type (6,500-220,000 GPM)
6. Pulp mill pumps
7. Boiler feed pumps
8. High pressure pumps
9. LPS pumps
10. Re-injection pumps
11. Reciprocating mud pumps
12. Submersible pumps
13. Vacuum pumps
14. Reciprocating compressors
15. Gas engine compressors
16. Centrifugal compressors

H. Electrical Insulators

1. Transmission line insulators up to 33.4 kV
2. Subtransmission and distribution line insulators up to 22 kV
3. Suspension type disc insulators for 66,110,230 and 400 kV lines-PORCELAIN
4. ALTERNATIVE to 3. As for 3. above but-GLASS

5. **Post insulators for busbar supports, air break, etc. as for 3. above-PORCELAIN**
6. **ALTERNATIVE to 5. As for 5. above but-GLASS**
7. **Transformer bushings, porcelain, enclosures only, to take condenser elements, also containers, porcelain, for current and potential transfrs. of 33 to 400 kV**
8. **Special porcelain enclosures for switchgear (min. oil, air-blast, and/or sulphur-hexafluoride types) in the voltage range 33 to 300 kV**
9. **Porcelain enclosures for lightning arrestors up to 400 kV**
10. **Complete lightning arresters up to 400 kV.**

SUMMARY OF CAPITAL GOODS MANUFACTURES IN MEXICO

Sector & Company	CAPITAL GOODS MANUFACTURED (CODED BY SECTOR)																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
<u>A. Heavy Steel Platework Manufactures</u>																															
B. & W. Mexico (Medidores Bailey for 6)	x	x	x	x	x	x	x	x	x	x	x																				
Ce-irey			x	x	x	x	x	x				x																			
Metalver					x		x	x					x																		
<u>B. Heavy Static Electrical Equipments</u>																															
IEM	x			x	x	x	x	x	x	x			x	x	x																
Industrial Eléctrica			x	x	x	x	x	x			x			x																	
Ingeniería Eléctrica Industrial			x	x	x	x	x	x			x			x																	
Electrónica Ballean												x						x	x												
Cía. Mfrera de Artefactos y Eléctricos	x			x	x					x		x																			
Maquinaria Continental Elec.		x		x	x					x		x																			
Central Electromecánica		x		x	x																										
Delta Mex.	x		x	x	x		x																								

SUMMARY OF CAPITAL GOODS MANUFACTURED IN MEXICO

Sector & Company	CAPITAL GOODS MANUFACTURED (CODED BY SECTOR)																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Electrocap													x																	
Electrotécnica, S.A.	x		x	x										x																
G. E. de Mexico		x	x	x					x	x	x																			
Inductomex																x														
Ingeniería Elec. Indstl.	x		x	x			x	x						x																
C. Heavy Rotary Electrical Equipments																														
ILEM																														
(M) = Intended future manufacture.																														
Motores U.S. de Mexico	(x)	(x)	(x)	x	x	(x)	(x)	(x)	(x)	(x)																				
Fairbanks Morse	x							x																						
D. Diesel Engines																														
Diesel Nal. (Dina-Cummins)					x																									
Motores Perkins	x	x						x																						
Internat. Harvester de Mex			x					x																						
Lister-Blackstone	x	x					x																							
Moto Equipos																														

SUMMARY OF CAPITAL GOODS MANUFACTURES IN MEXICO

Sector & Company	CAPITAL GOODS MANUFACTURED (CODED BY SECTOR)																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
<i>Siderúrgica Nacional</i>			x																												
<i>John Deere</i>			x																												
<i>Motores Volvo</i>						x																									
<i>E. Machine Tools</i>																															
<i>FAMASA</i>			x	(5)				(8)																							
<i>AHMSA</i>			(x)	(x)	(x)	(x)	(x)																								
<i>MECAMEX</i>			x							x																					
<i>ILSA</i>			x																												
<i>VINALERT DE MEXICO</i>			x								x	x																			
<i>TOSA</i>											x																				
<i>IASA</i>																															
<i>Maq. Occ. Mex.</i>																															
<i>Dreis & Krump</i>																															
<i>F. Heavy cast iron foundrywork</i>																															
<i>FUMOSA (Monclova)</i>			x																												

SUMMARY OF CAPITAL GOODS MANUFACTURES IN MEXICO

Sector & Company	CAPITAL GOODS MANUFACTURED (CODED BY SECTOR)																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
BAFSA (Monterrey)				x	x																										
FAMA (Monterrey)	x		x																												
<u>G. Pumps & Compressors</u>																															
Worlkington	x	x	x	x	(x)																										
Byron Jackson (Concentrate on large size pumps up to 10,000 HP.)	x	x	x	x			x																								
Bombas Goulds	(x)	x	x																												
Fairbanks Morse	x	x	x	x		x																									
TOSA																															
Ingersoll Rand (14. is air type)	x	x				x								x																	
Gardner Denver (Imports only)																															
Peerless		x	x																												
Bombas ITT	(x)	x	x					(x)																							
KSB		x	x																												

SUMMARY OF CAPITAL GOODS MANUFACTURED IN MEXICO

Sector & Company	CAPITAL GOODS MANUFACTURED (CODED BY SECTOR)																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Conjunto Manufacturero (<input type="checkbox"/> = Recommended future manufacture)										x			x		x																
EPNSA										<input checked="" type="checkbox"/>																					
Sulzer							x	x		x			<input checked="" type="checkbox"/>																		
Johnston Howe		x	x								x																				
H. Electrical Insulators																															
IUSA	x	x																													
PINCO	x	x																													
(Proposed new factory)			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																					