

6-4 Preliminary Design

The adoption of the Proposal II was decided in November - December 1985 when the Interim Report was submitted and full discussions between the Argentine counterpart personnel and this Study Team was held over the selection of the optimum plan.

In order to materialize the Workshop amplification plan, the preliminary design was worked out based on this Proposal II as a next step. The details are given in a separate preliminary design volume.

APPENDIX

APPENDIX 1 MINUTES OF MEETING

(1) PROGRESS REPORT

MINUTES OF MEETINGS
ON
PROGRESS REPORT
OF
THE FEASIBILITY STUDY AND PRELIMINARY DESIGN
FOR
THE AMPLIFICATION OF AN INSPECTION AND
REPAIRING WORKSHOP FOR ELECTRIC ROLLING STOCK


The Japanese Study Team, organized by Japan International Cooperation Agency (hereinafter referred to as JICA) headed by Mr. Shuichi SAWANO and the Argentine Railways (hereinafter referred to as F.A.) headed by Mr. Norberto CINAT, Managing Director, held a joint meeting for the above-mentioned study on the 19 April 1985 at the head office of Argentine Railways, Buenos Aires.

Attendants from both sides are attached in this Minutes.

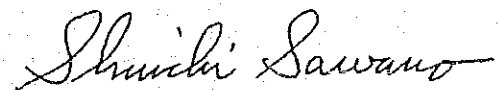
The Japanese Study Team submitted thirty (30) copies of the Progress Report on above-mentioned study of F.A. and made explanation on the Report, and both sides agreed upon a method to study the aforementioned amplification of the workshop.

The Progress Report was received by the Argentine Railways.

Buenos Aires, 19 April, 1985



Norberto CINAT
Director
Ferrocarriles Argentinos



Shuichi SAWANO
Leader
JICA Study Team

ATTENDANTS

JAPANESE STUDY TEAM

- 1 - Mr. Shuichi SAWANO - Leader.
- 2 - Mr. Susumu TSUMORI - Deputy Leader.
- 3 - Mr. Setsuo MORITA - Member.
- 4 - Mr. Toshimitsu IRIE - Member.
- 5 - Mr. Hiromi SHIMOKAWA - Member.
- 6 - Mr. Yoichi IKEDA - Member.
- 7 - Mr. Wahei AIDA - Member.
- 8 - Mr. Shinichi OHASHI - Member.
- 9 - Mr. Takao YOSHIIRI - Member.
- 10 - Mr. Kimiaki IJUIN - Member.

ARGENTINE RAILWAYS

- 1 - Mr. Norberto A. CINAT - Director F.A.

ARGENTINE COUNTERPARTS TEAM

- 1 - Mr. Diego FELIU BADALO - Director Team F.A.
- 2 - Mr. Daniel H. IGLESIAS - Member.
- 3 - Mr. Carlos Rodolfo RIOS - Member.
- 4 - Mr. Hugo A. ORTEGA - Member.
- 5 - Mr. Alberto TENGAN - Member.
- 6 - Mr. Juan P. CACCAGLIO - Member.
- 7 - Mr. Jorge BALGELLS - Member.
- 8 - Miss. Nora C. C. de EDO - Member.

S.S.



(2) INTERIM REPORT

MINUTES OF MEETING
ON THE INTERIM REPORT OF THE FEASIBILITY STUDY AND PRELIMINARY
DESIGN FOR THE AMPLIFICATION OF AN INSPECTION AND REPAIRING WORKSHOP
FOR ELECTRIC ROLLING STOCK

On the 22nd of November, 1985, in the Argentine Railways (hereafter F.A.) Headquarters, the Japanese Study Team organized by the Japan International Cooperation Agency (hereafter J.I.C.A), presided by Mr. Shuichi SAWANO, meets F.A.'s representatives, headed by Mr. Héctor ZANELLI, concerning the above mentioned study.

The lists of attendants from both parties are attached to this minute.

The J.I.C.A. Study Group submits thirty (30) copies of the above mentioned report and proceeds to its explanation.

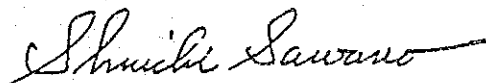
F.A. acquainted itself with the submitted feasibility study, which was accepted by F.A. under the Scope of Work, so that the Preliminary Design assignments will be continued in order to comply with the Scope of Work.

F.A. wishes to state its gratitude towards the J.I.C.A. Team for the present work, which will undoubtedly constitute an important landmark for future studies related to repair of electric rolling stock.

Buenos Aires, November 22nd, 1985.



Héctor ZANELLI
Vicepresident
FERROCARRILES ARGENTINOS



Shuichi SAWANO
Director
JICA STUDY TEAM

ATTENDANTS

JAPANESE ADVISORY COMMITTEE

- | | |
|------------------------|------------|
| 1- Mr. Tatsumi HONDA | - Chairman |
| 2- Mr. Tadashi IWASAKI | - Member |
| 3- Mr. Ken-ichi KOJIMA | - Member |

JAPANESE STUDY TEAM

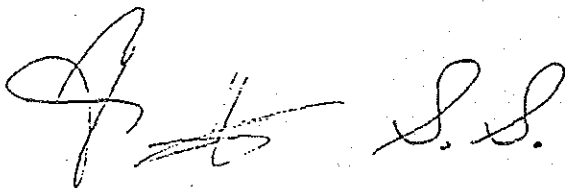
- | | |
|-------------------------|-----------------|
| 1- Mr. Shuichi SANANO | - Leader |
| 2- Mr. Susumu TSUMORI | - Deputy Leader |
| 3- Mr. Hiromi SHIMOKAWA | - Member |
| 4- Mr. Setsuo MORITA | - Member |
| 5- Mr. Yoichi IKEDA | - Member |
| 6- Mr. Wahei AIDA | - Member |
| 7- Mr. Shin-ichi CHASHI | - Member |
| 8- Mr. Takao YOSHITANI | - Member |
| 9- Mr. Kimiaki IJUIN | - Member |

EMBASSY OF JAPAN

- | | |
|-----------------------|--|
| 1- Mr. Yoshihiro MIWA | |
|-----------------------|--|

JICA

- | | |
|-------------------------|--|
| 1- Mr. Tadashi ISHIZUKA | |
|-------------------------|--|



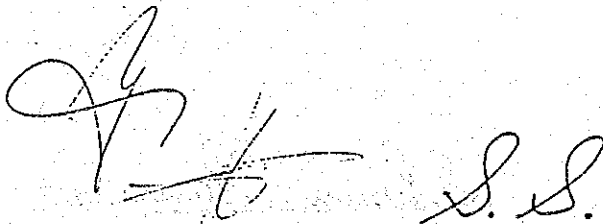
ATTENDANTS

ARGENTINE RAILWAYS

- 1- Mr. Héctor ZANELLI - Vice President. F.A.
- 2- Mr. Jorge BILOTTI - Manager of Electrification Coordination

ARGENTINE COUNTERPARTS TEAM

- 1- Mr. Diego FELIU BADALO - Director Team F.A.
- 2- Mr. Hugo A. ORTEGA - Member
- 3- Mr. Vigder SLETEAN - Member
- 4- Mrs. Nora C. de EDO - Member
- 5- Mr. Carlos R. RIOS - Member
- 6- Mr. Jorge BALCELLS - Member
- 7- Mr. Haroldo A. MALAVOLTA - Member
- 8- Mr. Alberto TENGAN - Member

A large, stylized handwritten signature is written in the lower-left quadrant of the page. To its right, the initials 'S.S.' are written in a similar cursive style.

MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
OF
THE FEASIBILITY STUDY AND PRELIMINARY DESIGN
FOR
THE AMPLIFICATION OF AN INSPECTION AND
REPAIRING WORKSHOP FOR ELECTRIC ROLLING STOCK

The Japanese Study Team, organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Shuichi SAWANO, assisted by the Advisory Committee headed by Mr. Tatsumi HONDA and the Argentine Railways (hereinafter referred to as "FA") headed by Mr. Héctor ZANELLI, Vice-president, held a series of meetings for the captioned study from the 14th to 20th May, 1986 at the head office of the FA, Buenos Aires.


The lists of attendants from both parties are attached to this minutes.

The JICA Study Team submitted thirty (30) copies of the above-mentioned report to FA and made explanation on the Report. The Draft Final Report was generally agreed to by FA.

In response to the earnest wishes of FA, JICA promises to translate the outline of this Report into Spanish language and FA contributes with the translation of the technical terms.

FA wished to state its gratitude towards the JICA team for the present work, which will undoubtedly constitute an important landmark for future studies related to repair of electric rolling stock.

Buenos Aires, 21 th May 1986



Héctor ZANELLI
Vice-president
FERROCARRILES ARGENTINOS



SHUICHI SAWANO
Leader
JICA STUDY TEAM

ATTENDANTS

JAPANESE ADVISORY COMMITTEE

- 1 - Mr. Tatsumi HONDA - Chairman
- 2 - Mr. Tadashi IWASAKI - Member
- 3 - Mr. Ken-ichi KOJIMA - Member

JAPANESE STUDY TEAM

- 1 - Mr. Shuichi SAWANO - Leader
- 2 - Mr. Susumu TSUMORI - Deputy Leader
- 3 - Mr. Hiromi SHIMOKAWA - Member
- 4 - Mr. Wahei AIDA - Member
- 5 - Mr. Takao YOSHIIRI - Member

EMBASSY OF JAPAN

- 1 - Mr. Namio TAKAGI

JICA ARGENTINE OFFICE

- 1 - Mr. Takashi ISHIZUKA

ATTENDANTS

ARGENTINE RAILWAYS

- 1 - Mr. Héctor ZANELLI - Vice President. F. A.
- 2 - Mr. Jorge BILOTTI - Manager of Electrification Coordination.

ARGENTINE COUNTERPARTS TEAM

- 1 - Mr. Diego FELIU BADALO - Director Team F.A.
- 2 - Mr. Hugo A. ORTEGA - Member
- 3 - Mr. Carlos R. RIOS - Member
- 4 - Mr. Jorge BALCELLS - Member
- 5 - Mr. Haroldo A. MALAVOLTA - Member
- 6 - Mr. Ricardo A. MARTINEZ - Member
- 7 - Mr. Rolando ROMANZI - Member

APPENDIX 2 OFFICERS OF WORKSHOPS AND DEPOTS VISITED BY STUDY TEAM

(1) GENERAL MITRE LINE

1) VICTORIA Workshop

Mr. VIGNOLO Deputy Director, Electrical Department
(GENERAL MITRE LINE)
Mr. FRAGA Workshop manager

(2) GENERAL BELGRANO LINE

1) CORDOBA Workshop

Mr. PASTELIS Workshop manager
Mr. BARIMBOIN Assistant manager and senior planning staff
Mr. CASELLA Senior production staff
Mr. MARTINEZ Senior technical staff

(3) GENERAL SAN MARTIN LINE

1) DIESEL MENDOZA Workshop

Mr. Vicentino PATTI Workshop manager
Mr. Paul TONEATTI Senior planning and maintenance study staff

2) DIESEL MENDOZA Depot

Mr. Antonio BONICELLI Depot manager
Mr. Jose FEMENIA Senior maintenance staff
Mr. Ricardo ALVAREZ Senior planning staff

(4) GENERAL ROCA LINE

(Companion)

Mr. TEMPERINI Representative of Machinery Department
(GENERAL ROCA LINE)

1) DIESEL ELECTRICOS SPURR Workshop (Bahia Blanca)

Mr. OLIVIERI Workshop manager
Mr. FANESI Senior planning staff
Mr. BISSET Senior maintenance study staff

2) CNEL. MALDONADO Workshop (Bahia Blanca)

Mr. Aniceto ARRIBAS Workshop manager

- 3) BAHIA BLANCA NOROESTE Workshop
- Mr. Mario DE SIMON Workshop manager
 - Mr. Antonio MARTINEZ Assistant manager and head officer
 - Mr. Rodolfo DIMATTEO Assistant technical manager
 - Mr. Paul A. RIAL Material coordination and personnel manager
- 4) REMEDIOS DE ESCALADA Workshop
- Mr. Oscar FONTANELLA Workshop manager
 - Mr. Rodolfo CARAFA Senior planning and production staff
 - Mr. José BONELLI Coordinator (Machinery Department)
- 5) LLAVALLOL Depot
- Mr. Juan P. CACCAGLIO Depot manager
- (5) D.F. SARMIENTO LINE
- 1) LINIERS Workshop
- Mr. GOMEZ Director, Machinery Department
(D.F. SARMIENTO LINE)
 - Mr. TARTAGIO Deputy Director, Machinery Department
(D.F. SARMIENTO LINE)
- (6) METROPOLITANA LINE
- 1) LYNCH Workshop
- Mr. STARGICH Director, Electrical Department
 - Mr. TROBIANI Workshop manager
 - Mr. CARABIO Assistant manager
- 2) VILLA LURO Workshop
- Mr. Juan CORTI Director, Electrical Department
(METROPOLITANA LINE)
 - Mr. RODRIGUEZ Workshop manager
 - Mr. POLTI Manager, Rolling Stock Section
 - Mr. VAZQUEZ Foreman
- 3) CASTELAR Depot
- Mr. VIOLA Depot manager
- (7) MATERFER Works (CORDOBA Province, MATERFER S.A. ARGENTINA)
- Mr. PORTA Director, Commercial Department
 - Mr. CASAS Staff, Production Department
- (8) FABRICACIONES MILITARES Works (FABRICACIONES DIRECCION GENERAL DE MILITARES)

APPENDIX 3 RESULTS OF THE SURVEY OF ROLLING STOCK INSPECTION/REPAIRING WORKSHOPS

In order to fully understand the actual situation of the Argentine Railways' rolling stock inspection/repairing workshops in carrying out this feasibility study, a total of nine inspection/repairing workshops including three electric railcar workshops were surveyed during the Study Team's stay in Argentina.

Generally speaking, the conditions of the Argentine Railways' rolling stock inspection/repairing workshops can be expressed as follows.

Most of the workshops surveyed were constructed at the turn of the century for steam locomotives, passenger cars and freight cars. Those workshops were improved in answer to the shift from steam locomotives to diesel locomotives and the partial electrification of suburban Buenos Aires sections.

That is, the track layout in the premises of the workshop, the relative position of the buildings, the buildings themselves and the inspection/repairing facilities are being used as they were in the olden days without hardly any improvements. This is giving rise to many problems at each workshop which are having a hard time in coping with them.

To be more specific, the situation is as follows.

- o Shops are not arranged functionally, and a considerable amount of wasted movement of rolling stock and their parts can be seen during the inspection/repairing process.
- o Since the investment was insufficient, old machinery is being used as it is, and there are problems with efficiency and safety. For example, steam locomotive cranes are used for indoor work such as disassembly of bogies. The same steam locomotive cranes are used for the outdoor work of taking car-body off its bogies and putting the car-body on temporary bogies at some workshops.

- o Although it does not concern facilities, there is a problem of late on the difficulty of purchasing parts for repairs, causing anxiety over the almost empty workshop storage shelves and big delays in the rolling stock repair process, resulting in heavy losses.
- o There are numerous problems such as an increased work burden due to antiquated rolling stock, a decrease in the number of workers, out-of-date and antiquated facilities and equipment, and the delayed improvement in the working environment, but these are being made up for by the workers' skill. In general, inspection/repairing work is being carried out in conformity with fundamentals, and the technical level can be said to be high.

Under the current situation of the Argentine Railways, large investments or fundamental improvements can not be expected for the time being. It is, however, hoped that when the modernization of operations on various routes is carried out in the future, a thorough review will be made of how rolling stock inspection/repairing system ought to be and an inspection/repairing workshop constructed.

Below are summaries of the survey of each workshop.

(1) VICTORIA Workshop

Division		GENERAL MITRE LINE Operating Division		
Assigned Rolling Stock		Electric Railcars (Japanese)	Electric Railcars (English)	Diesel Railcars
		110 cars	96 cars	53 cars
Inspection Period	D Inspection	600,000 km	520,000 km	600,000 km (overall)
	A,B,C Inspection	150,000	130,000	200,000 (Intermediary)
Inspection Process	D Inspection	45 days	75 days	(Overall)
	A,B,C Inspection	25 days	45 days	55 days (Intermediary)
1984 Inspection/Repairing Record	D Inspection	43 cars	13 cars	(Overall)
	A,B,C Inspection	44 cars	15 cars	16 cars (Intermediary)
Number of Personnel	Administration	19		
	Shop	341		
Total		360		
Land Area/Building Area		50,500 m ² /18,400 m ²		
Year Established		1890		

1) Summary

This workshop is adjacent to Victoria Station and the Victoria Rolling Stock Depot. It is primarily in charge of the General Mitre Line's electric railcar repairs, but it also repairs diesel cars.

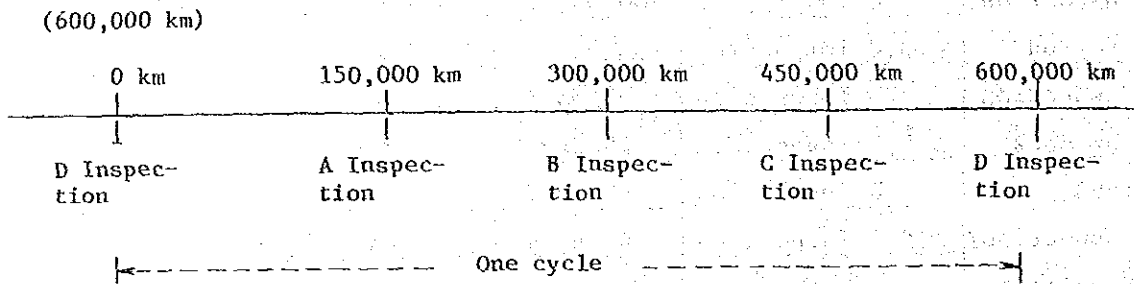
Shops are divided into three blocks; the Entrance/Leaving Inspection Shop (under construction), the Mounting Shop, and the Car-body Repair Shop all arranged in a row. The space between each block is 130-170 m, and railcars are moved between these blocks by a tractor.

Bogie repairs and car-body repairs (including painting) at this workshop are not carried out simultaneously in parallel but, instead, are carried out in succession making the whole process longer.

Fig. A.3.1 shows the workshop's organization, and Fig. A.3.2 shows the workshop's layout.

2) Inspection/repairing work

The electric railcar inspection periodicity is as follows.



. A Inspection

Traction motors and compressors are removed. Bogies are demounted. The car-body is cleaned and minor repairs are made. This inspection is the work of about 1,000 man hours (MH).

. B Inspection

Bogies are completely disassembled. Bogies are washed outdoors in a soda bath, and dye penetrant flaw detection is carried out. Equipments such as the main controller box and brake valves are demounted and inspected. This inspection is the work of about 3,000 MH.

. C Inspection

This is the same as the A Inspection.

. D Inspection

This is an overhaul. The B Inspection, complete car-body inspection and car-body painting are carried out. Since rolling stock in use at present has been in service for more than 20 years, there is much corrosion of floors and the lower part of side panels, and repairs take a great deal of time. This inspection is the work of about 4,000 MH.

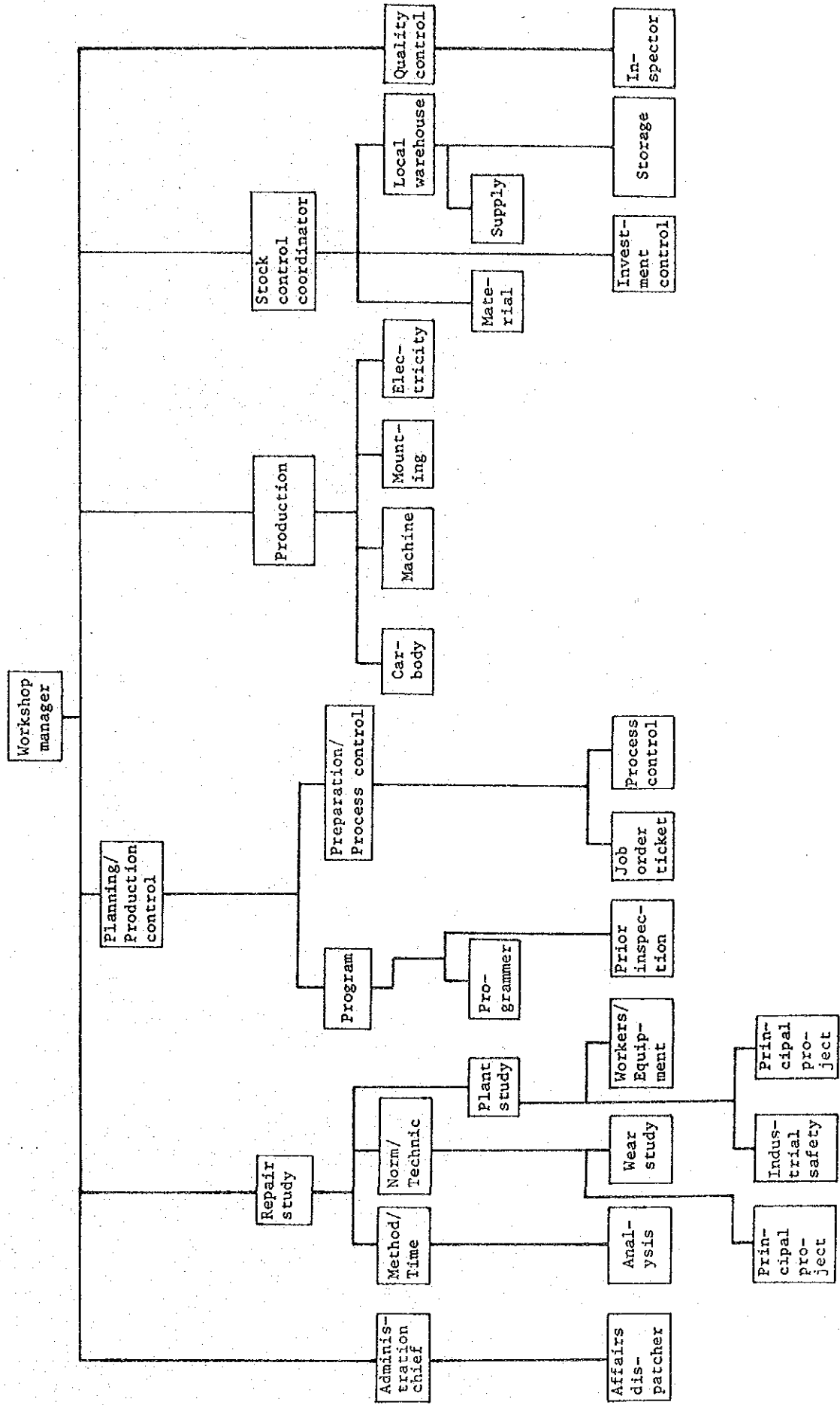
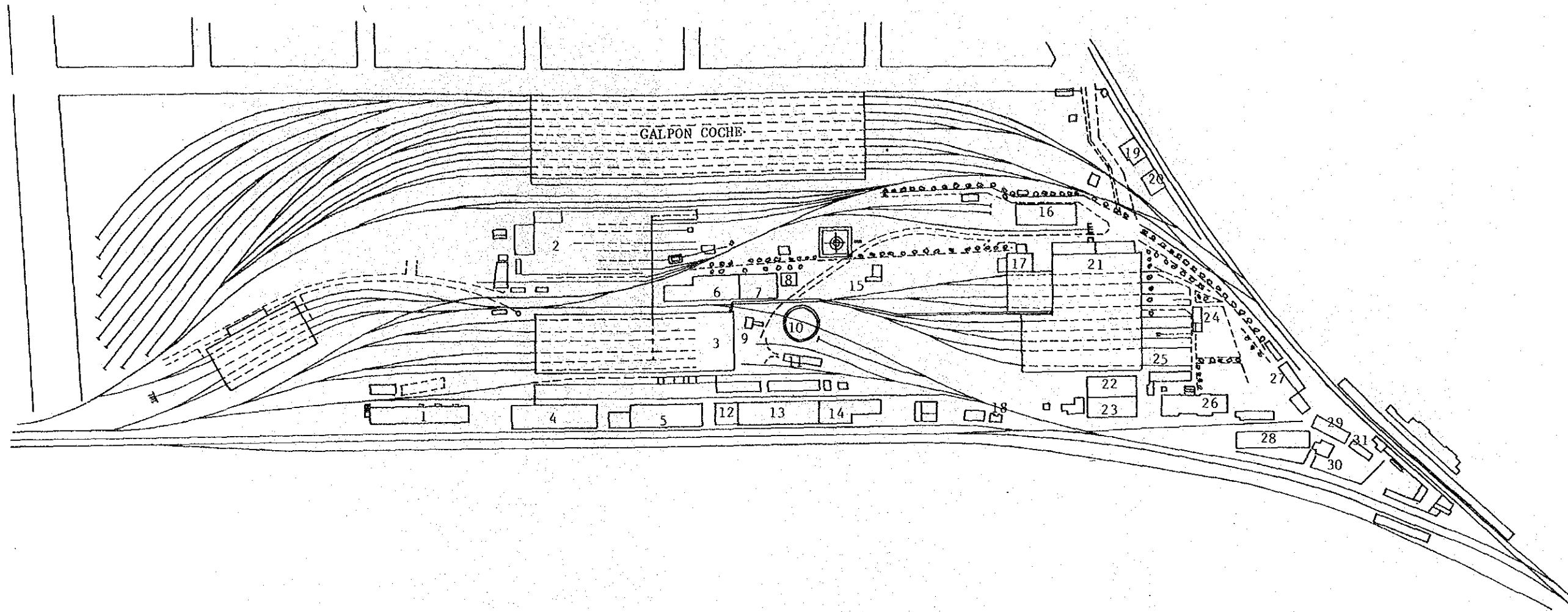


Fig. A.3.1 VICTORIA Workshop Organization Chart



- 1 DEPOSITO DE CABLES
- 2 TALLER MECANICO
- 3 TALLER MONTAJE
- 4 ALMACENES
- 5 DEPOSITO
- 6 TALLER ELECTRICO
- 7 DEPOSITO
- 8 VESTUARIO Y BAÑO DTO. ELECTRICO
- 9 TALLER AUTOS
- 10 MESA GIRATORIA

- 11 DEPOSITO
- 12 DEPOSITO
- 13 DEPOSITO ALMACENES
- 14 DEPOSITO
- 15 TALLER DE INSPECCION
- 16 NIQUELACION
- 17
- 18 SERENO
- 19 S/E TRANSFORMADOR
- 20 SUB-USINA

- 21 TALLER COCHES
- 22 DEPOSITO DE CABLES
- 23 DEPOSITO ALMACENES
- 24 DEPOSITO PINTURA
- 25 LABORATORIO
- 26 OFICINAS DEPOSITOS ELECTRICOS
- 27
- 28 DEPOSITO ALMACENES
- 29 ELECTRO MECANICA
- 30 O. MEDICA
- 31 O. SEÑALES

Fig. A.3.2. Layout of VICTORIA Workshop

3) Main equipments and facilities

Production Machines Bogie washing equipment, air hammer, punching/shearing machine, water purifying equipment, vacuum varnish immersion equipment, wheel press

Equipment Handling Forklift, overhead travelling crane

Mashines

Testing Machine Magnetic flaw detector

Motive Power Air compressor

Machine Tools Wheel lathe, upright drilling machine, radial drilling machine, shaper, buffing machine

(2) CORDOBA Workshop

Division		GENERAL BELGRANO LINE Operating Division
Assigned Rolling Stock		Diesel Electric Locomotives 355 cars
Inspection Period	Overall Inspection	800,000 km
	1st, 2nd, 3rd Inspection	200,000 km, 400,000 km, 600,000 km respectively
Inspection Process	Overall Inspection	50 days
	1st, 2nd, 3rd Inspection	35 days each
1984 Inspection/Repairing Record	Overall Inspection	28 cars
	1st, 2nd, 3rd Inspection	Total: 78 cars
	Temporary Inspection	65 cars
Number of Personnel	Administration	80
	Shop	1,018
	Total	1,098
Land Area/Building Area		223,000 m ² /72,400 m ²
Year Established		1909

1) Summary

This workshop has the largest scale of all workshops surveyed at this time, and it is the main workshop for the inspection/repairing of the Argentine Railways' diesel electric locomotives. Since this workshop was converted for diesel locomotives from a steam locomotive inspection/repairing workshop, the layout of the shops is not necessarily suitable, and efficiency in the work flow is sometimes poor. In all respects, though, this is a well-managed workshop. Research done on technical matters is being put into practical use, and traces of work improvement can be seen in various aspects.

The workshop's organization is shown in Fig. A.3.3 and the workshop's layout is shown in Fig. A.3.4.

2) Inspection/repairing work

The diesel electric locomotive inspection periodicity is as follows.

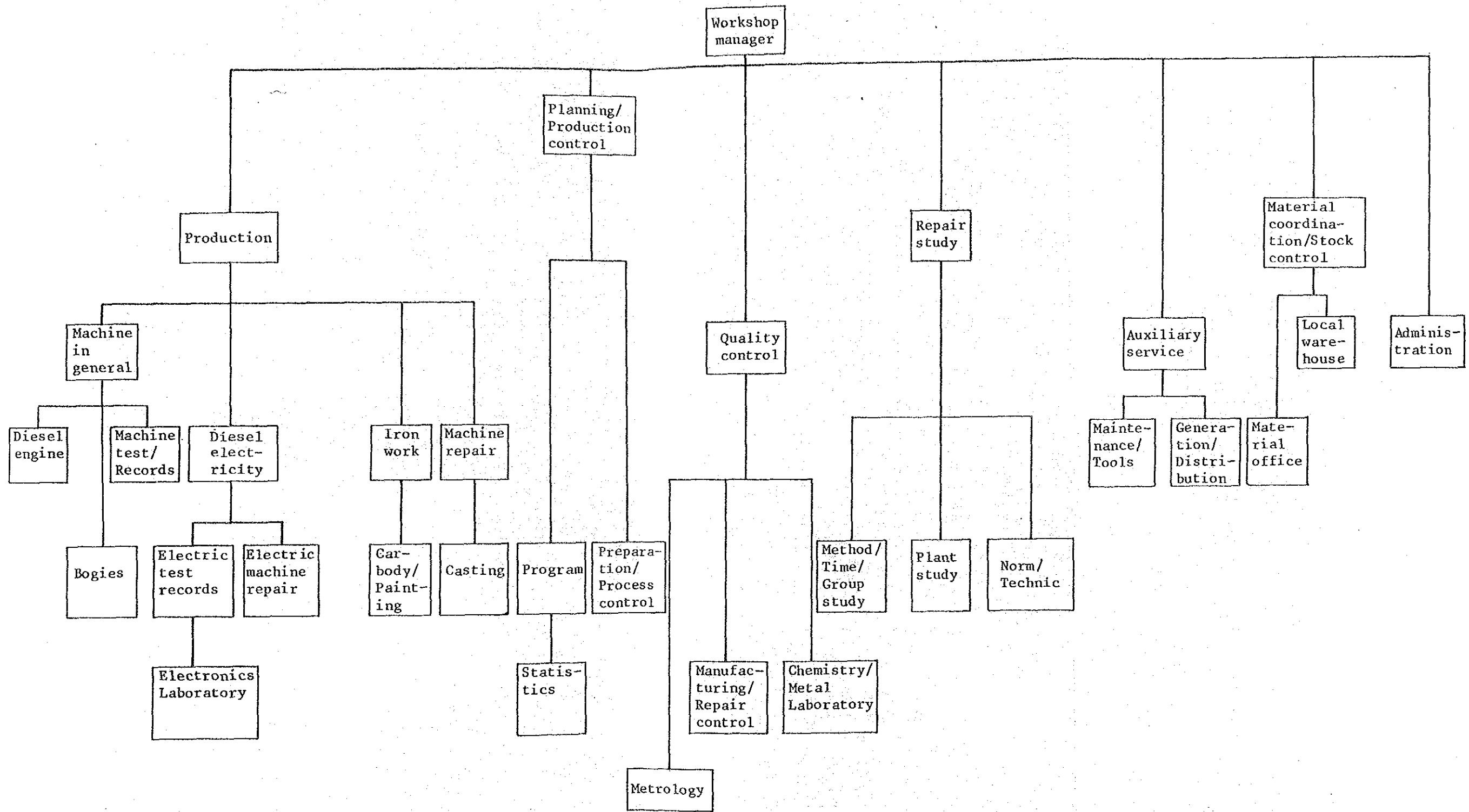
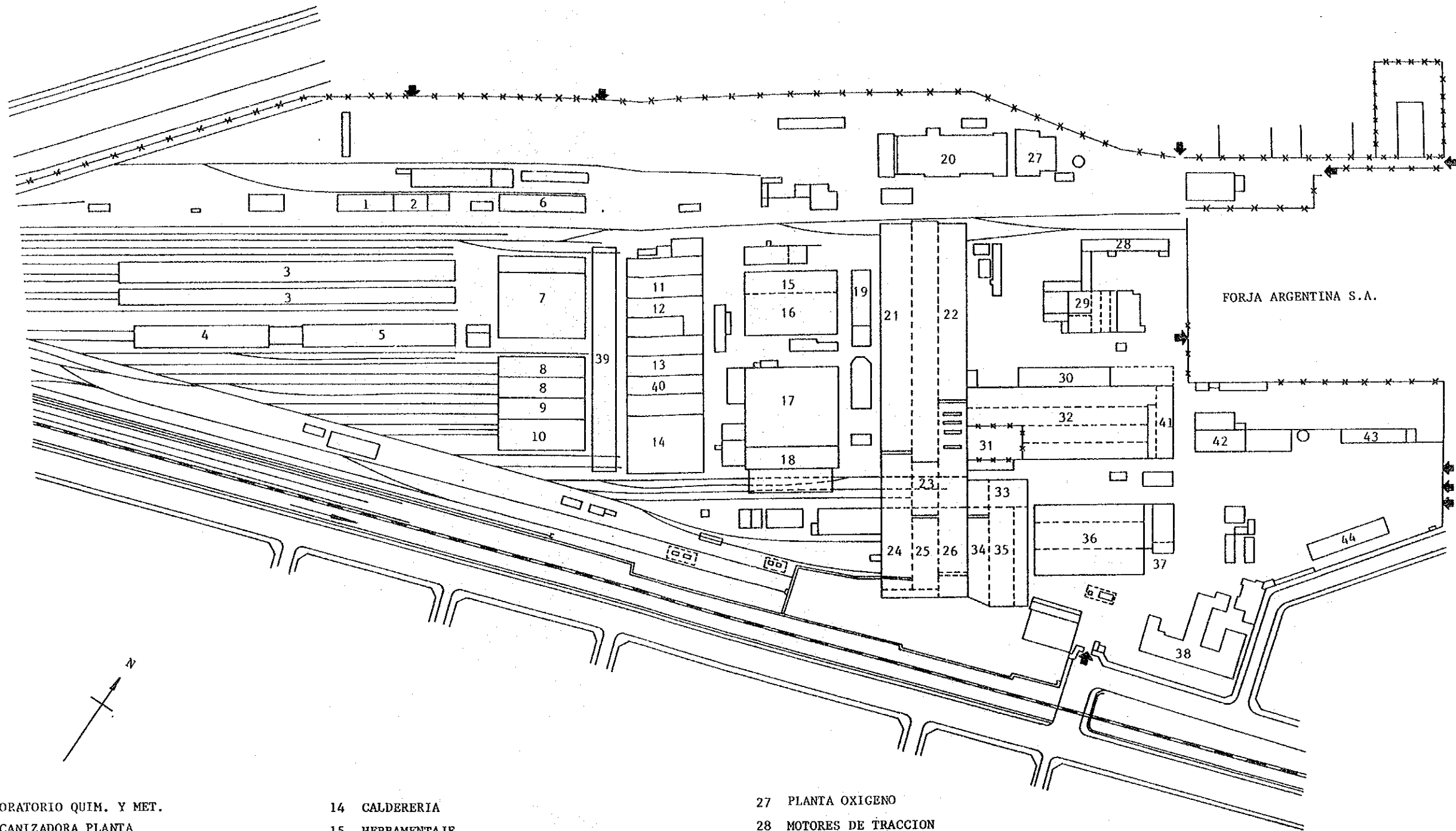


Fig. A.3.3. CORDOBA Workshop Organization Chart



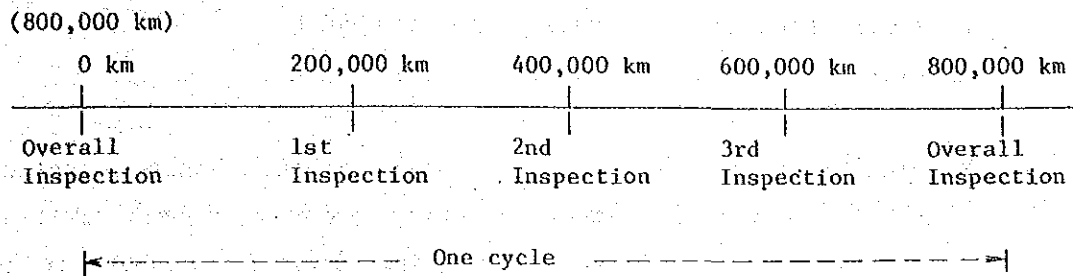
- 1 LABORATORIO QUIM. Y MET.
- 2 VULCANIZADORA PLANTA
- 3 ESTACIONAMIENTO DE LOCOMOTORAS
- 4 PINTURERIA
- 5 EX-TALLER DE OBRAS
- 6 GALVAN - CERRAJ. HOJAL-TAPICERIA
- 7 ELECTRICIDAD GRAL. Y BATERIAS
- 8 ALISTAMIENTO LOC.
- 9 DEP. MAQ. HERRAM.
- 10 CALDERERIA ANEXO
- 11 CARPINTERIA
- 12 ASERRADERO
- 13 ALMACEN

- 14 CALDERERIA
- 15 HERRAMENTAJE
- 16 INSTALACIONES
- 17 HERRERIA
- 18 ALMACEN LOCAL
- 19 COBRERIA
- 20 USINA ELECTRICA
- 21 REPARACION CARROCERIA Y MONTAJE LOCOMOTORAS
- 22 SECCION BOGUIES
- 23 DESARME DE CARROGER. TURBO
- 24 ARMADO DEL MOTOR DIESEL
- 25 REPAR. DE ELEM. DEL MOTOR DIESEL
- 26 DESARME GENERADOR PRINCIPAL

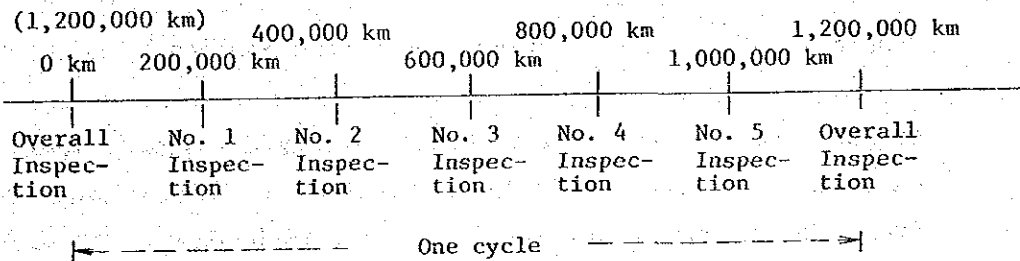
- 27 PLANTA OXIGENO
- 28 MOTORES DE TRACCION
- 29 ELECTRICIDAD DIESEL
- 30 ENLLANTADERO
- 31 FRENOS
- 32 TORNERIA
- 33 DESARME DE CARROCERIAS (FOTURA)
- 34 LAVADERO
- 35 DESARME MOTOR DIESEL
- 36 FUNDICION
- 37 P.A. LABORA. ELECTRONICO
- 38 OFICINAS CENTRALES

- 39 TRANSPORTADORA
- 40 INTERMEDIARIO
- 41 METROLOGIA INSPECCION VESTUARIOS
- 42 CISTERNA SUBTERRANEA NAFTA
- 43 SERV. BOMBA
- 44 COCHERA

Fig. A.3.4 Layout of CORDOBA Workshop



The above is the inspection/repairing periodicity for Guber Besser, GE, ALCO and FIAT railcars. The following cycle is used for GM locomotives.



Overall inspections take 8,800 MH and No. 1 - No. 5 inspections 5,000 - 7,000 MH.

The main building has shops for handling heavy equipment such as car bodies, bogies, diesel engines and generators, and for demounting work. In other buildings there are shops for repairing various types of equipment such as traction motors, electric equipment, axle bearings and brakes, and shops for manufacturing work of ironwork, machining, tire shrinkage fitting, plating, and heat treatment. In addition, this workshop also has an oxygen generating shop and a rubber vulcanizing shop.

3) Main equipment and facilities

Production Machines

Bogie washing machines, contra-rotating equipment, air blasting equipment, bind winding machine, vacuum varnish immersion equipment, soldering machine

Equipment Handling Machine	Battery powered car
Machine Tools	Lathe, milling machine, honing machine, horizontal boring machine, wheel lathe, crank shaft grinding machine, commutator grooving machine
Testing Machines	Brake testing machine, fuel injection valve tester, magnetic flaw detector, engine power tester, dynamic balancing machine, gauge test equipment
Others	Oxygen generating machine

As seen above, this workshop has a variety of machine tools from large ones to small ones and it has sufficient ability to manufacture parts from the standpoints of facilities and technology. At present, parts which are difficult to obtain due to the country's foreign currency situation and the Argentine Railways financial situation are manufactured at the workshop. Not only are these parts used at this workshop, but they are also supplied to other workshops. In the future, this workshop's role as a central parts manufacturer will probably become even more important.

(3) DIESEL MENDOZA Workshop

Division		GENERAL SAN MARTIN LINE Operating Division
Assigned Rolling Stock		Diesel Electric Locomotives 153 cars
Inspection Period	Overall Inspection	800,000 km
	Intermediary Inspection	200,000 km
Inspection Process	Overall Inspection	50 days
	Intermediary Inspection	38 days
1984 Inspection/ Repairing Record	Overall Inspection	12 cars
	Intermediary Inspection	40 cars
	Temporary Inspection	300 cars
Number of Personnel	Administration	43
	Shop	429
	Total	472
Land Area/Building Area		90,000 m ² /25,000 m ²
Year Established		1909

1) Summary

This workshop specializes in diesel electric locomotives. The workshop has three important buildings, the main building, the bogie inspection/repairing building, and the car-body painting building. Other buildings include those for ironwork, bogie washing, battery repair, etc.

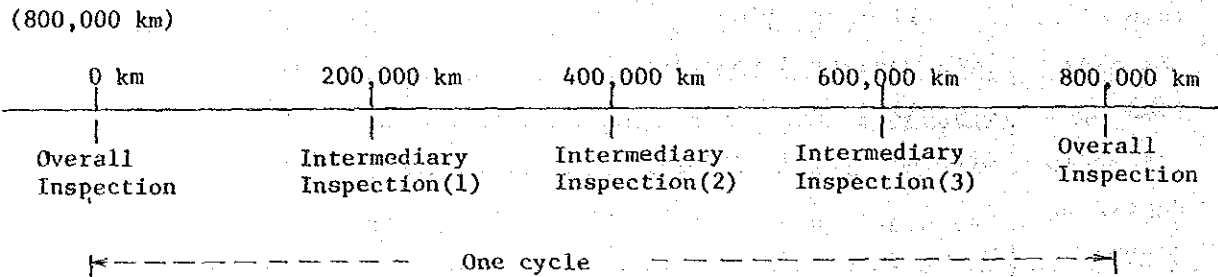
The main building has shops for mounting/demounting, engines, generators, brake equipments, electrical equipments, machines, and welding. The Bogies inspection/repairing building has shops for bogies, wheels and axles, and traction motors.

The space between the main building and the bogie inspection/repairing building or the car-body painting building is as much as 200 m giving rise to inefficiency in the movement of car bodies, bogies, and parts.

The workshop's organization is shown in Fig. A.3.5, and the workshop's layout is shown in Fig. A.3.6.

2) Inspection/repairing work

The diesel electric locomotive inspection periodicity is as follows.



The number of days needed for each of these inspections is overall inspections 38 days, Intermediary Inspection (2) 30 days, and Intermediary Inspections (1) and (3) 26-28 days. However, these are the standard numbers of days when all of the spare parts are available. In fact, there are many instances in which the shortage of spare parts is causing delays in the process.

The man-hours needed for each inspection are in the case of ALCO (1980 p.s.) planned at 7,800 MH (actual 8,500) for Overall Inspections and 7,200 MH (actual 7,200) for Intermediary Inspections (the average of (1) and (2)).

In addition, the renovation of locomotives has been carried out in the workshop, and wiring efficiency has been improved by using a special prewiring jig conceived by the workers themselves. Work has also been improved by using other self-devised tools such as an engine repair platform.

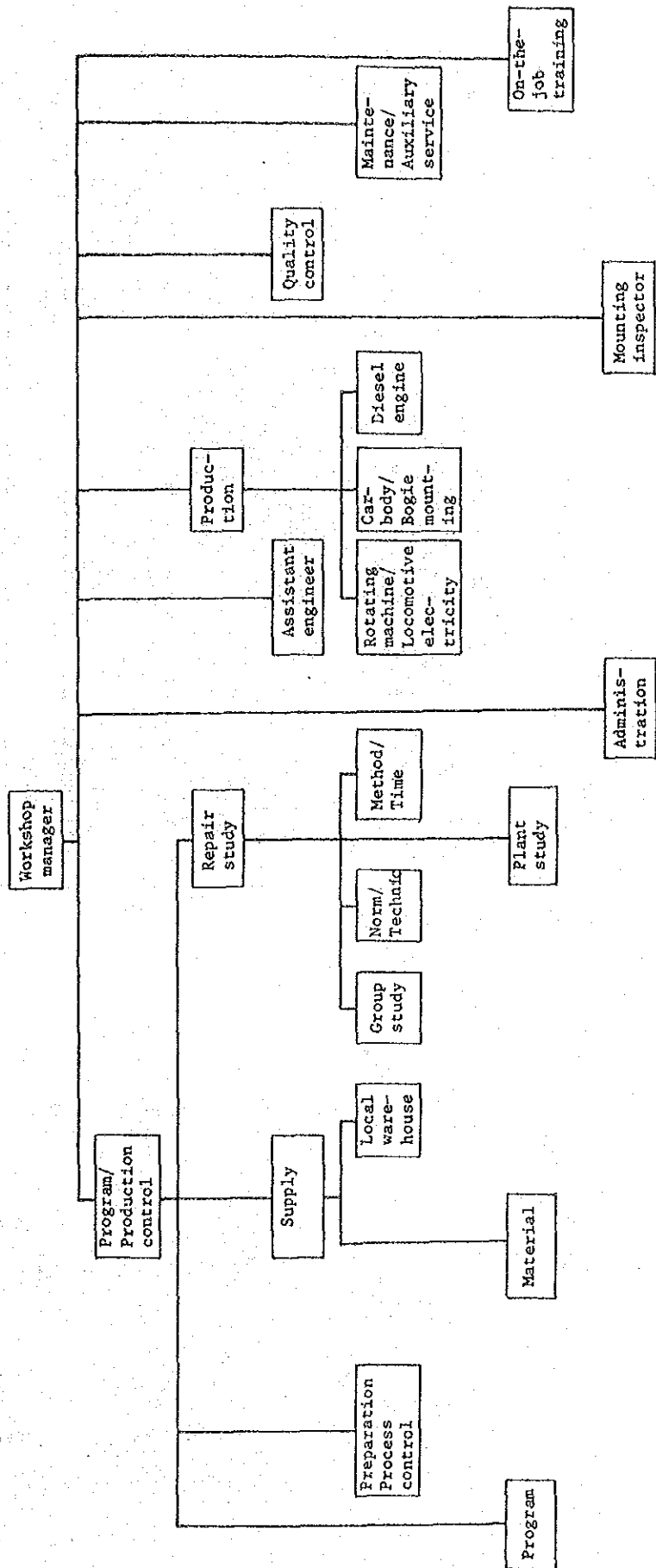
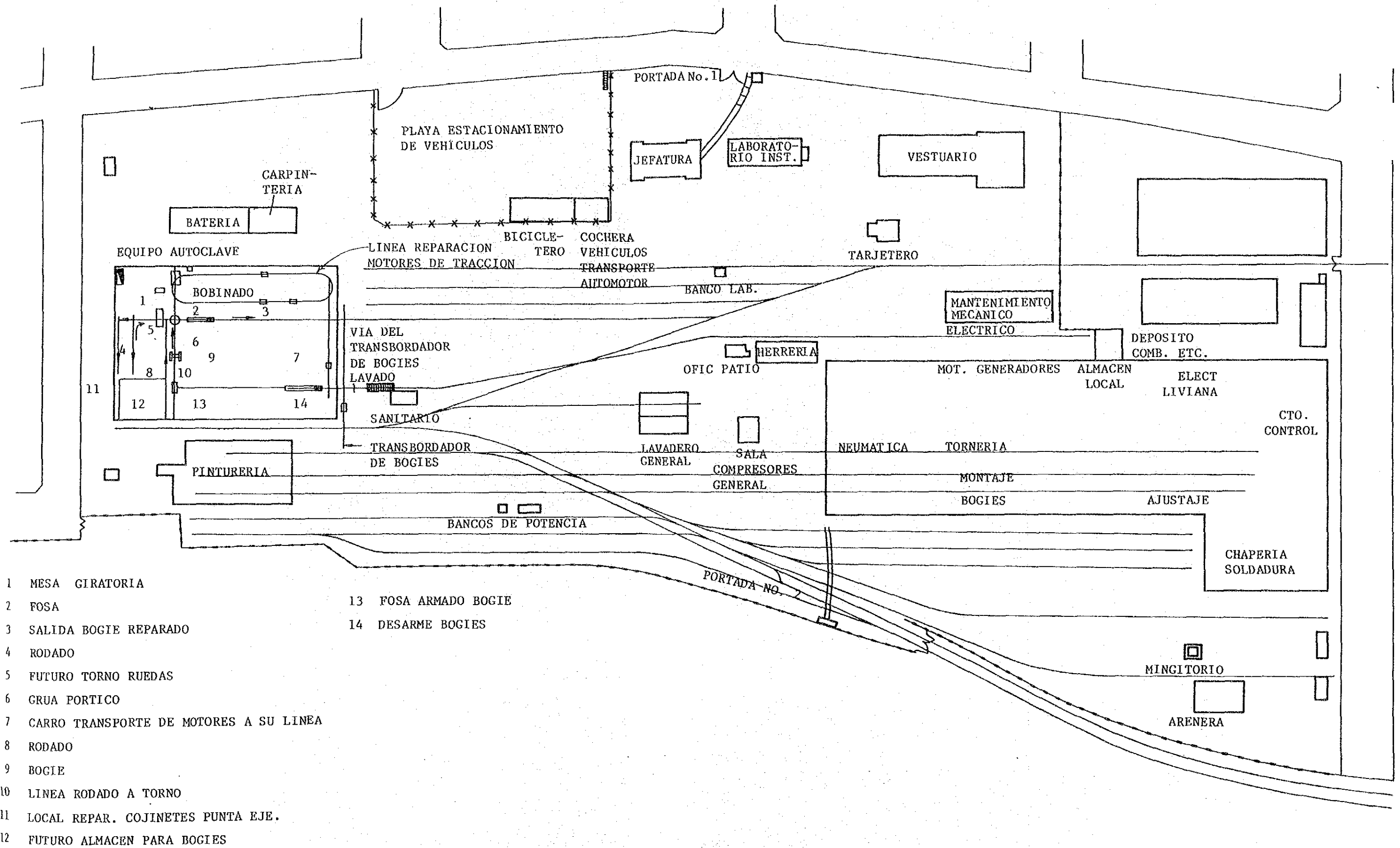


Fig. A.3.5 DIESEL MENDOZA Workshop Organization Chart



- 1 MESA GIRATORIA
- 2 FOSA
- 3 SALIDA BOGIE REPARADO
- 4 RODADO
- 5 FUTURO TORNO RUEDAS
- 6 GRUA PORTICO
- 7 CARRO TRANSPORTE DE MOTORES A SU LINEA
- 8 RODADO
- 9 BOGIE
- 10 LINEA RODADO A TORNO
- 11 LOCAL REPAR. COJINETES PUNTA EJE.
- 12 FUTURO ALMACEN PARA BOGIES
- 13 FOSA ARMADO BOGIE
- 14 DESARME BOGIES

Fig. A.3.6 Layout of DIESEL MENDOZA Workshop

3) Main equipment and facilities

Production Machines	Jet cleaning machine, soft blasting machine, engine contra-rotating equipment
Equipment Handling Machines	Overhead travelling crane, movable jib crane
Machine Tools	Fuel injection valve grinding machine, lathe, wheel lathe, vertical lathe
Testing Machines	Dynamic balancing machine, gauge test equipment, fuel injection valve tester, flatness tester, wiring tester, line breaker tester, magnetic flaw detector

Most of these machines are old, but there are signs of improvements having been made in testing machines.

(4) DIESEL ELECTRICOS SPURR Workshop

Division		GENERAL ROGA LINE Operating Division
Assigned Rolling Stock		Diesel Electric Locomotives 50 cars
Inspection	A2	150,000 km
Period	A1	50,000 km
Inspection	A2	67 days
Process	A1	45 days
1984	A2	25 cars
Inspection/Re-	A1	3 cars
pairing Record	Temporary Inspection	48 cars
Number	Administration	27
of	Shop	188
Personnel	Total	215
Land Area/Building Area		244,700 m ² /7,700 m ²
Year Established		1965

1) Summary

This workshop was established in 1965 for diesel electric locomotives, and though it is small, it is a well-arranged workshop. Almost all work is done in the main building, but wheel/axle inspection work is commissioned to another workshop.

All of the assigned locomotives have reached the end of their useful life, but since there is no investment for new ones, the workshop is unable to get them scrapped and is maintaining them with difficulty. Thus, because of economic reasons and the difficulty to get parts for the old locomotives, the situation is being met by cannibalizing parts from locomotives which have been in accidents, and other such measures.

The workshop's organization is shown in Fig. A.3.7, and the workshop's layout is shown in Fig. A.3.8.

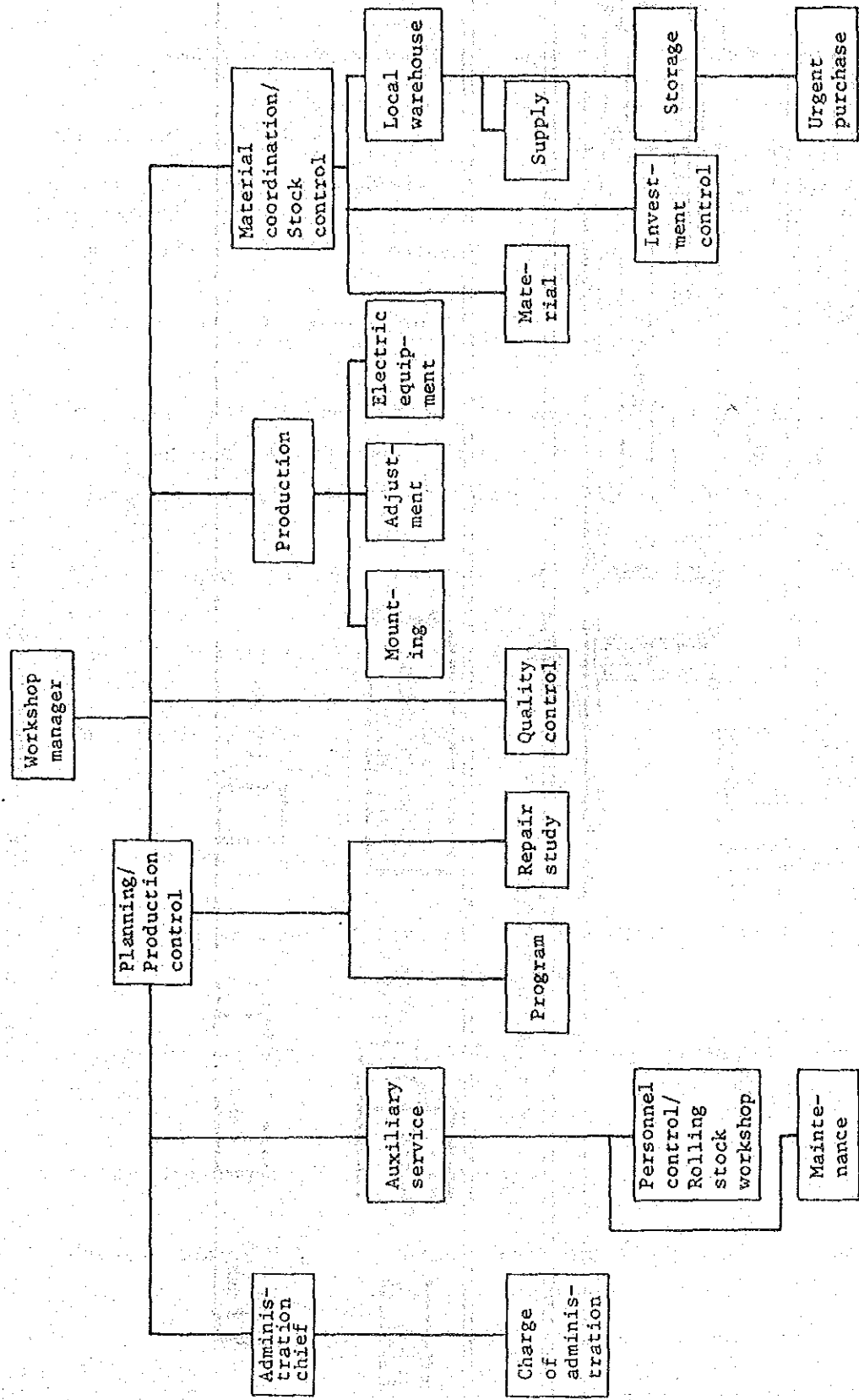


Fig. A.3.7 DIESEL ELECTRICOS SPURR Workshop Organization Chart

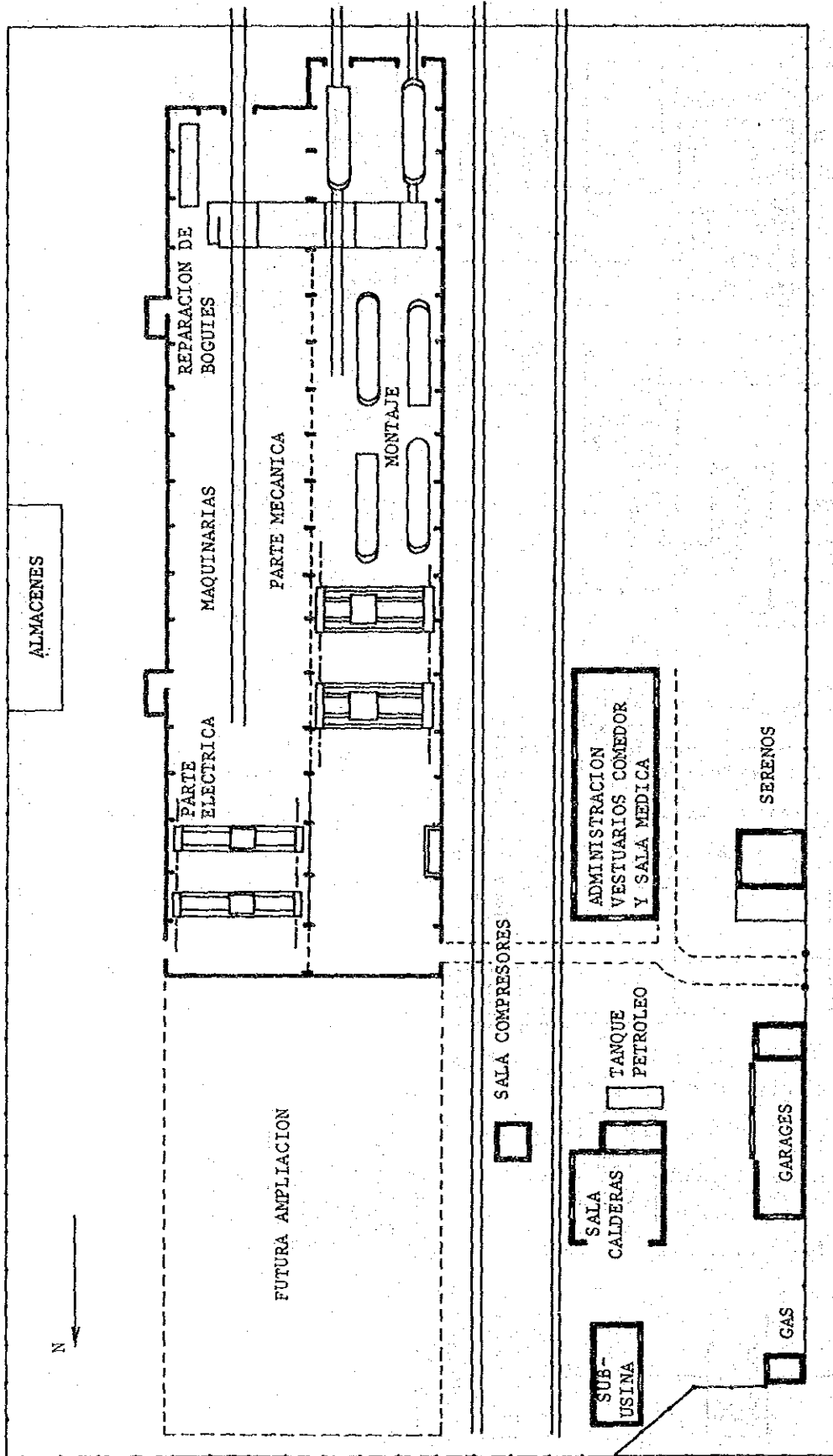
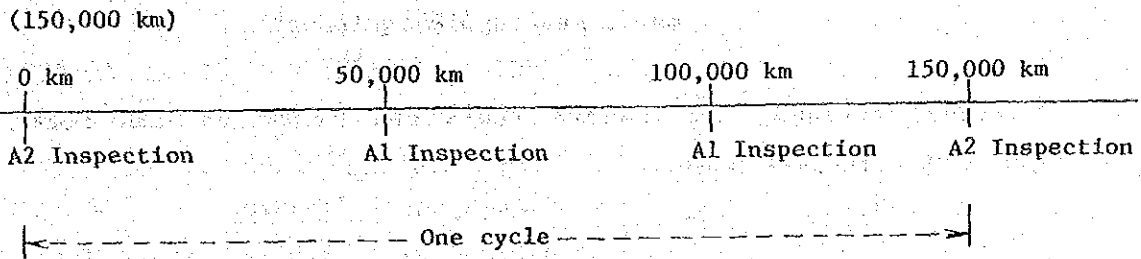


Fig. A.3.8 Layout of DIESEL ELECTRICOS SPURR Workshop

2) Inspection/repairing work

The workshop's inspection/repairing periodicity is as follows.



The workshop's layout is good considering its small size, and being equipped with washing equipment, bogies for hauling, and other equipment, the workshop work efficiency is being improved.

The detergent in the cleaning tank is heated using a gas burner and not steam. Thus, since there are no longer any machines using steam, the boiler will be removed in the near future.

In addition, warm water pumped from 750 m underground is being used for shops and baths.

3) Main equipment and facilities

Production Machines	Press, cleaning device, vacuum varnish immersion equipment, drying oven
Equipment Handling Machines	Forklift, battery powered car, overhead travelling crane (15 t. × 2, 35 t. × 2)
Motive Power	Air compressor
Machine Tools	Lathe, horizontal boring machine, slotting machine, shaper, milling machine, surface grinding machine, tool grinder, radial drilling machine, face lathe

Testing machine

Dynamic balancing machine

Others

Initial power receiving equipment, elevated tank, settling type effluent treatment equipment, gas supply equipment

Of these machines, the machine tools and vacuum varnish immersion equipment were left unused.

(5) BAHIA BLANCA NOROESTE Workshop

Division		GENERAL ROCA LINE Operating Division
Assigned Rolling Stock		Freight Cars 9,760 cars
Inspection Period	Overall Inspection	
	Intermediary Inspection	
Inspection Process	Overall Inspection	11 days
	Intermediary Inspection	6 days
1984 Inspection/Repairing Record	Overall Inspection	698 cars
	Intermediary Inspection	482 cars
	Temporary Inspection	166 cars
Number of Personnel	Administration	44
	Shop	354
	Total	398
Land Area/Building Area		92,400 m ² /15,000 m ²
Year Established		1890

1) Summary

This workshop was built for freight cars in 1890 making it the oldest of the Argentine Railways' workshops.

Located on the southeast portion on about half of the 160 m wide, 780 m long premises are the mounting shop, the lathe and sawing shop, the lubrication pad shop, and forging shop in four buildings with 30-60 m of space between each of them.

Conditions are not good because these buildings and facilities are old. In addition, some work must be carried out outdoors because of the small space inside the buildings.

Considering Argentine economic situation, large investments can not be expected for the time being, but this workshop should be thoroughly reexamined, and in time, improved.

This workshop's organization is shown in Fig. A.3.9, and the workshop's layout is shown in Fig. A.3.10.

2) Inspection/repairing work

Inspection/repairing machines installed in this workshop are all old and include machines which go back to the time of the workshop's establishment. For example, even now belt operated machines and steam locomotive cranes are used.

Furthermore, since shops are small and lack enough space, the passage at the mounting/demounting shop is used for disassembling and assembling bogies and changing bogies. The inspection/repairing of bogies and bearings, tire shrinkage fitting, and car-body painting are done outside.

Therefore, overall consideration and improvement is absolutely necessary to improve the quality of the inspection and repair of freight cars, improve work efficiency, and assure safety. A way must be found to do the present bogie work and wheel/axle work indoors. Workshop authorities are studying the means for carrying out car-body painting work indoors.

As for production control, a comparison of scheduled and actual man-hours is being made, and this is reflected in the following month's shop-in plan. Thus, efforts are already being made to improve efficiency and increase production.

3) Main equipment and facilities

Production Machines	Pneumatic power hammer, steam power hammer, spring furnace, radial drilling machine, shearing, punching/shearing machine
Equipment Handling Machines	Steam locomotive crane, overhead travelling crane, traverser

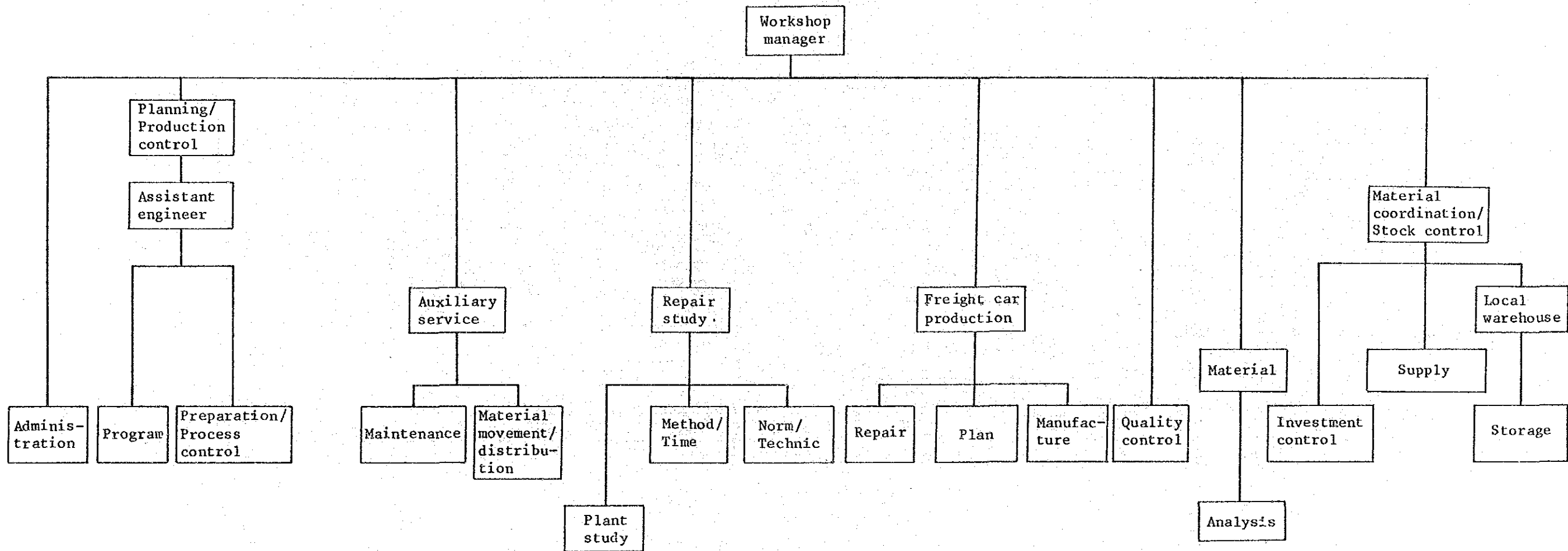
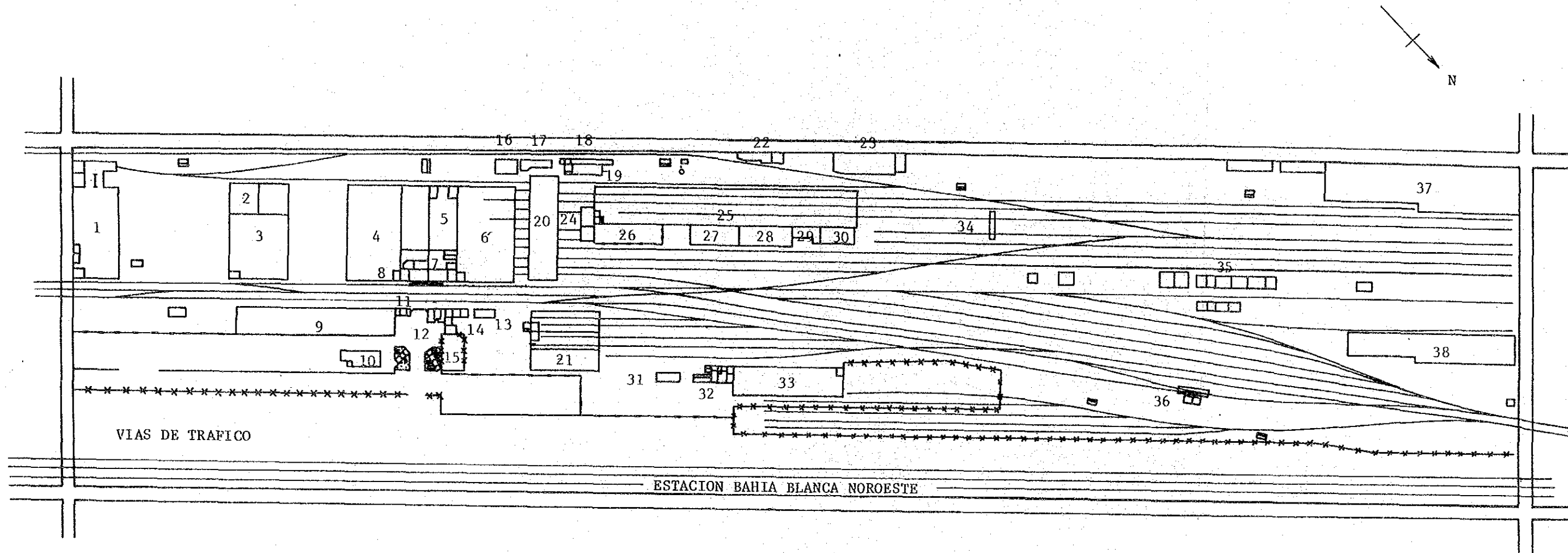


Fig. A.3.9 BAHIA BLANCA NOROESTE Workshop Organization Chart



- | | | |
|---------------------------------|----------------------|------------------------|
| 1 HERRERIA | 14 GARAJE | 27 TORNERIA RUEDA |
| 2 AUTOMOTORES | 15 BICICLETERO | 28 SOLDADORES |
| 3 PLANTEL DE ESTOPA | 16 METALADORES | 29 COMEDOR |
| 4 ASERRADERO | 17 COMPRESOR | 30 DEPOSITO |
| 5 AJUSTAJE | 18 BICICLETERO | 31 COMEDOR |
| 6 TORNERIA | 19 PRENSA | 32 LETRINA |
| 7 CUARTO HERRAMIENTAS | 20 MESA TRASLADADORA | 33 ALMACEN LOCAL |
| 8 OFICINAS | 21 CARPINTERIA | 34 ZANJA DE INSPECCION |
| 9 ADMINISTRACION CONTROL TRENES | 22 COMEDOR | 35 DEPOSITOS |
| 10 SALA MEDICA | 23 CALDERERIA | 36 BASCULA |
| 11 SERENO | 24 TORNO RUEDA | 37 VIVIENDAS |
| 12 OFICINA | 25 MONTAJE | 38 EX BODEGA |
| 13 SUB-USINA | 26 DEPOSITO | |

Fig. A.3.10 Layout of BAHIA BLANCA NOROESTE Workshop

Motive Power

Boiler, air compressor

Machine Tools

Lathe, wheel lathe

Others

Oxygen acetylene concentrated equipment, wood work machine

These machines are all old, and they are being used with incessant care.

(6) REMEDIOS DE ESCALADA Workshop

Division		GENERAL ROCA LINE Operating Division	
Assigned Rolling Stock		Diesel Electric Locomotive 166 cars	Passenger Coach 586 cars
Inspection Period	Overall Inspection	800,000 km	480,000 km
	Intermediary Inspection	200,000 km	240,000 km
Inspection Process	Overall Inspection	44 days	34 days
	Intermediary Inspection	15 days (check 1, 3) 26 days (check 2)	15 days
1984 Inspection/Re- pairing Record	Overall Inspection	1 car	16 cars
	Intermediary Inspection	38 cars	133 cars
	Temporary Inspection	645 cars	271 cars
Number of Personnel	Administration	66	
	Shop	983	
	Total	1,049	
Land Area/Building Area		214,000 m ² /62,200 m ²	
Year Established		1902	

1) Summary

This workshop formerly concentrated on steam locomotives and passenger cars. At present, besides being in charge of diesel electric locomotives and passenger cars, it is also a comprehensive workshop of the General Roca Line carrying out concentrated repairs for wheels and axles, brake valves, and so on. In the Golden Age of the steam locomotive it had about 5,000 workers but now there are about 1,000.

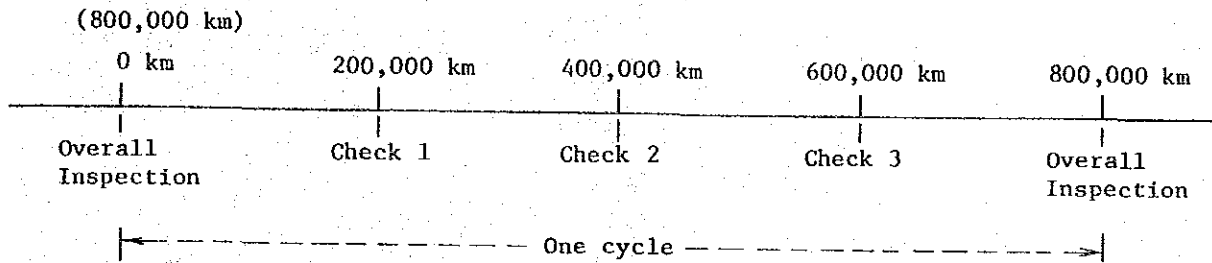
Since the premises are disorderly and old buildings and equipment are being used as is, the working environment is not good and work can not be said to be efficient.

The workshop is broadly divided into two sections, the diesel electric locomotive inspection/repairing section and the passenger car inspection/repairing section.

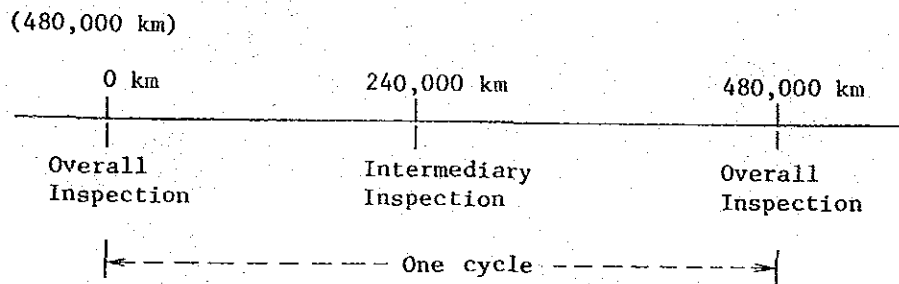
The workshop's organization is shown in Fig. A.3.11, and the workshop's layout is shown in Fig. A.3.12.

2) Inspection/repairing work

The workshop's diesel electric locomotive and passenger car inspection/repairing periodicities are as follows.



Diesel Electric Locomotive Inspection/Repairing Periodicity



Passenger Car Inspection/Repairing Periodicity

In addition to repairing diesel electric locomotives and passenger cars, this workshop has a large repair shop for the renovation of old rolling stock and the restoration of railcars involved in accidents. It also possesses a high degree of processing technology and repairs passenger car air conditioning equipment, and produces measuring equipment such as tire measuring gauges.

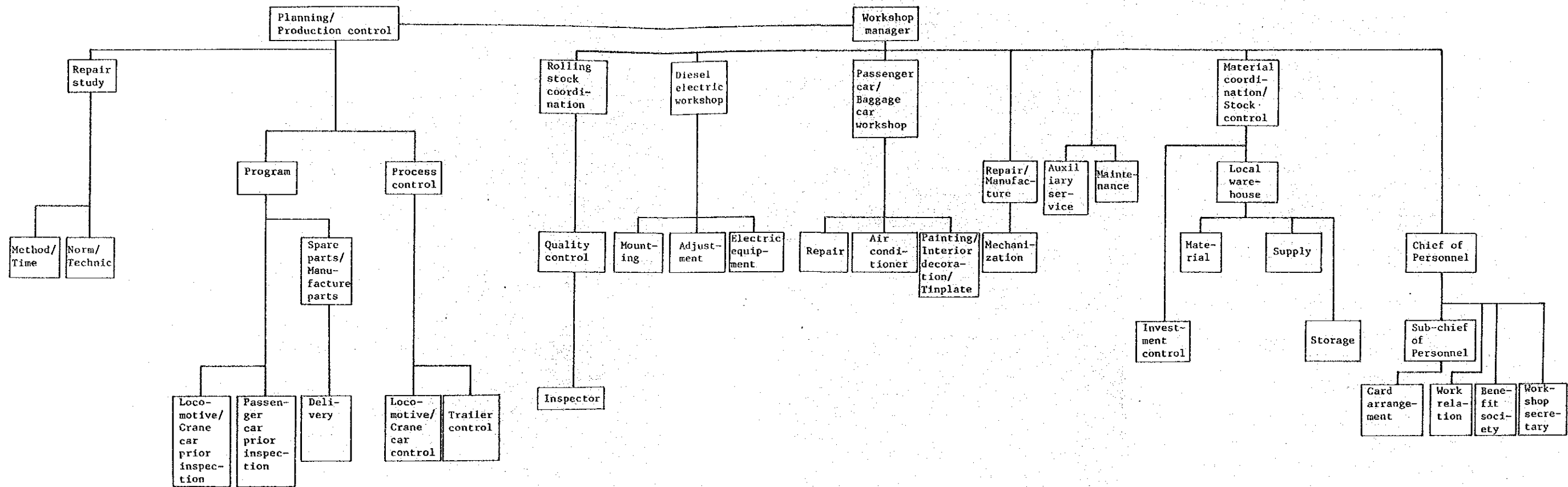


Fig. A.3.11 REMEDIOS DE ESCALADA Workshop Organization Chart

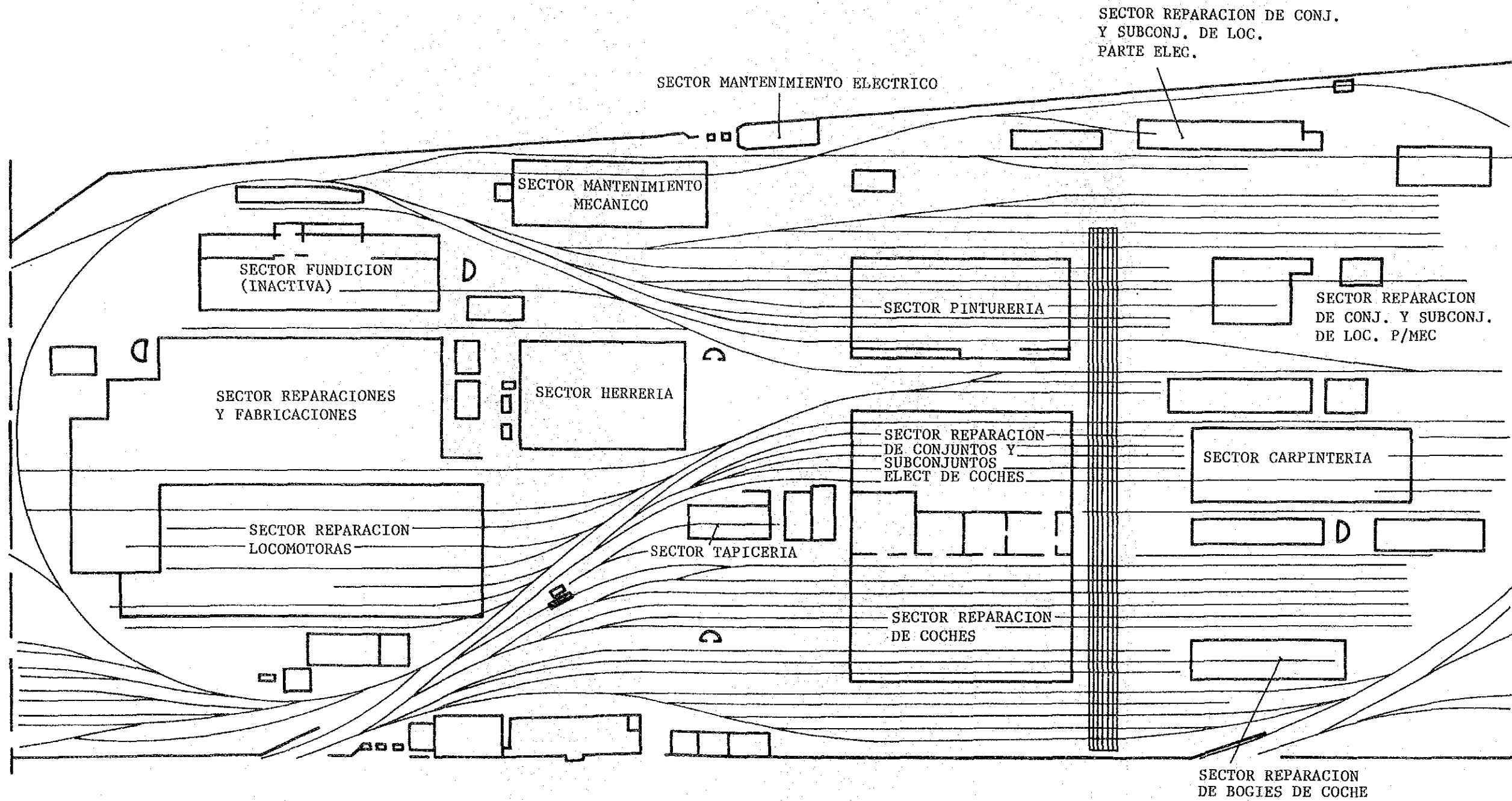


Fig. A.3.12 Layout of REMEDIOS DE ESCALADA Workshop

3) Main equipment and facilities

Production Machines	Bogie washing equipment, cylinder lathe, valve lathe, wheel press
Equipment Handling Machines	Overhead travelling crane (45 t, 30 t, 10 t, 5 t, etc.)
Motive Power	Boiler, air compressor
Machine Tools	Lathe, wheel lathe, drilling machine, shaper
Others	Oxygen and acetylene equipment

Along with other workshops, this one is also having a hard time in obtaining parts for rolling stock and its machines and equipment.

On one hand, this workshop is old, but since it has many well taken care of machine tools and sufficient production technology for parts and measuring equipment, it is recommended that it be organized to be able to service other workshops as a central manufacturer.

(7) VILLA LURO Workshop, LINIERS Workshop

Workshop		VILLA LURO Workshop	LINIERS Workshop
Division		METROPOLITANA LINE Operating Division	D.F. SARMIENTO LINE Operating Division
Assigned Rolling Stock		Electric Railcars 262 cars (Japanese make)	Diesel Electric Locomotive 111 cars
Inspection Period	Overall Inspection	600,000 km	800,000 km
	Intermediary Inspection	200,000 km	400,000 km
Inspection Process	Overall Inspection	(30 days) 108 days (78 days)	143 days
	Intermediary Inspection	(15 days) 60 days (45 days)	111 days
1984 Inspection/ Repairing Record	Overall Inspection	40 cars	7 cars
	Intermediary Inspection	75 cars	14 cars
	Temporary Inspection	159 cars	20 cars
Number of Personnel	Administration	15	68
	Shop	236	605
	Total	251	673
Land Area/Building Area		27,600 m ² /10,400 m ²	/
Year Established		1923	1903

1) Summary

The VILLA LURO Workshop which belongs to the METROPOLITANA LINE Operating Division and the LINIERS Workshop which belongs to the D.F. SARMIENTO LINE Operating Division are located next to each other with a fence separating them. Electrical inspection/repairing of electric railcars of the METROPOLITANA LINE Operating Division is taken care of at the VILLA LURO Workshop. The LINIERS Workshop takes care of the mechanical inspection/repairing (bogies and car-bodies) and diesel electric locomotive inspection/repairing for the D.F. SARMIENTO LINE Operating Division.

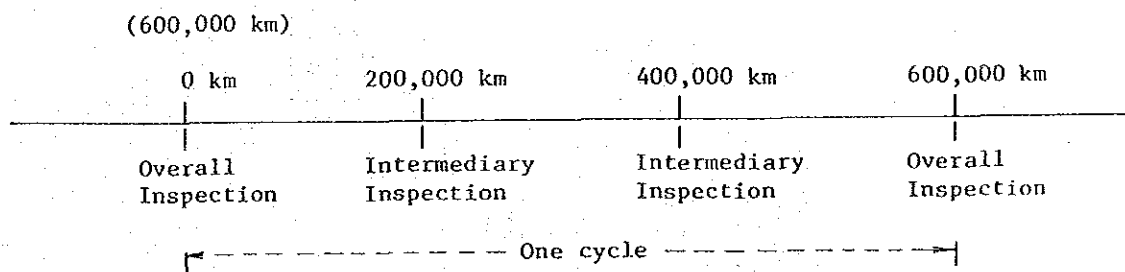
VILLA LURO is in charge of electric railcars. Electric railcars deadheaded from the CASTELAR Depot have their bogies demounted from the car-bodies at the VILLA LURO Workshop, and electrical equipment, traction motor and air brake parts are removed at the same workshop. The car-bodies put on temporary bogies and bogies are sent separately to the LINIERS Workshop next door for inspection/repairing. Once inspection/repairing is completed, car-bodies and bogie are sent back separately to the VILLA LURO Workshop where inspected and repaired electrical equipment, air brake equipment, and so on are mounted and the car-bodies are mounted back on the bogies. Afterwards, comprehensive tests are carried out and the cars are deadheaded back to the CASTELAR Depot.

As stated above, inspection/repairing work for one car is carried out divided between two workshops, and since these workshops belong to two different operating divisions, day-to-day management becomes more troublesome and the process takes longer.

It is necessary that workshop management, including the question of authority over the workshops, be thoroughly studied. The workshop's organization is shown in Fig. A.3.13, and the workshops layouts are shown in Fig. A.3.14 and A.3.15.

2) Inspection/repairing work

The inspection/repairing periodicities for electric railcars and diesel electric locomotives are as follows.



Electric Railcar Inspection/Repairing Periodicity

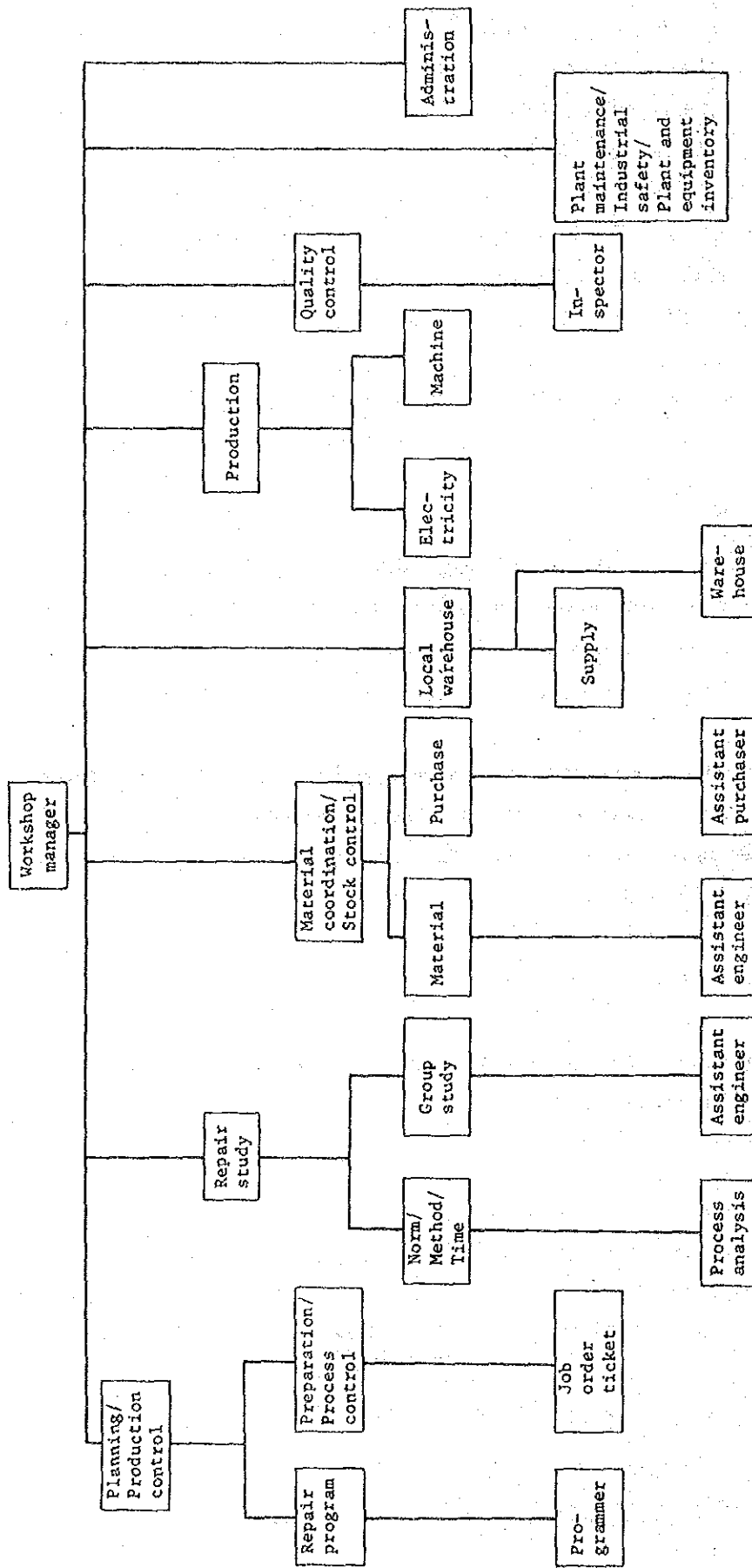
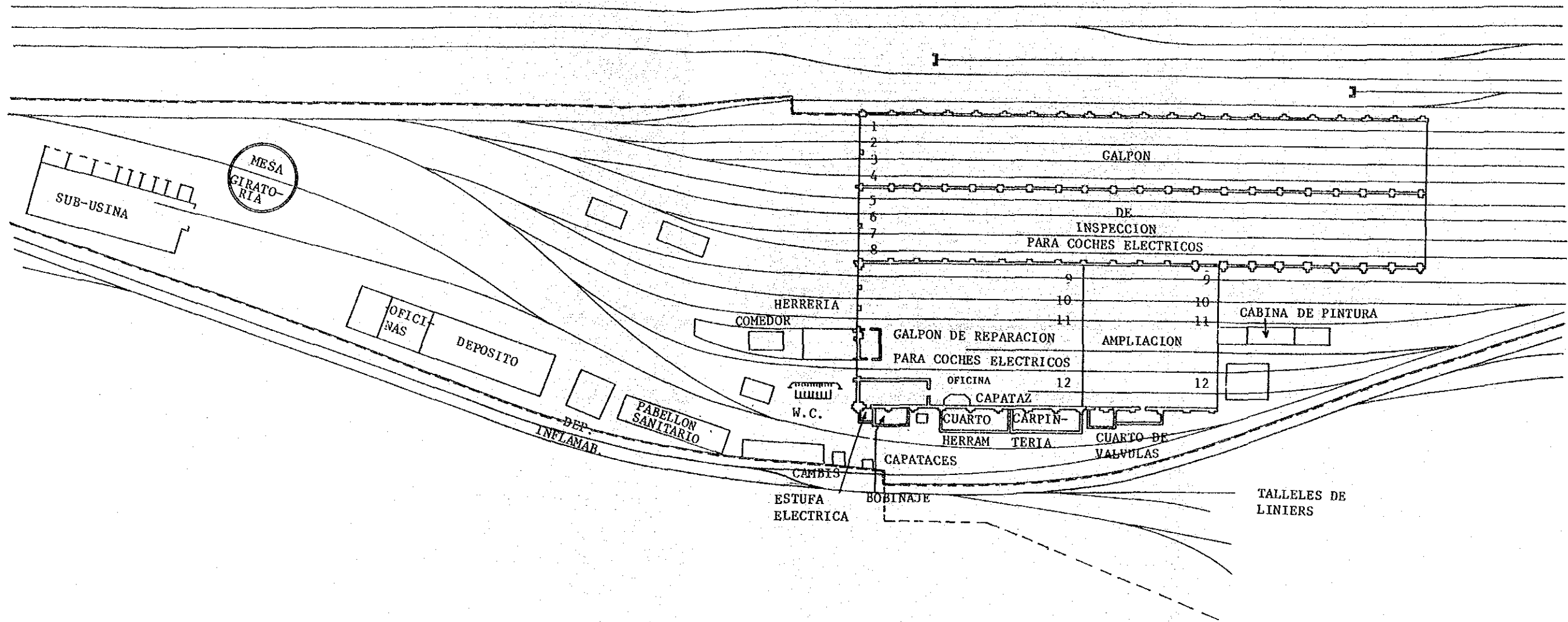
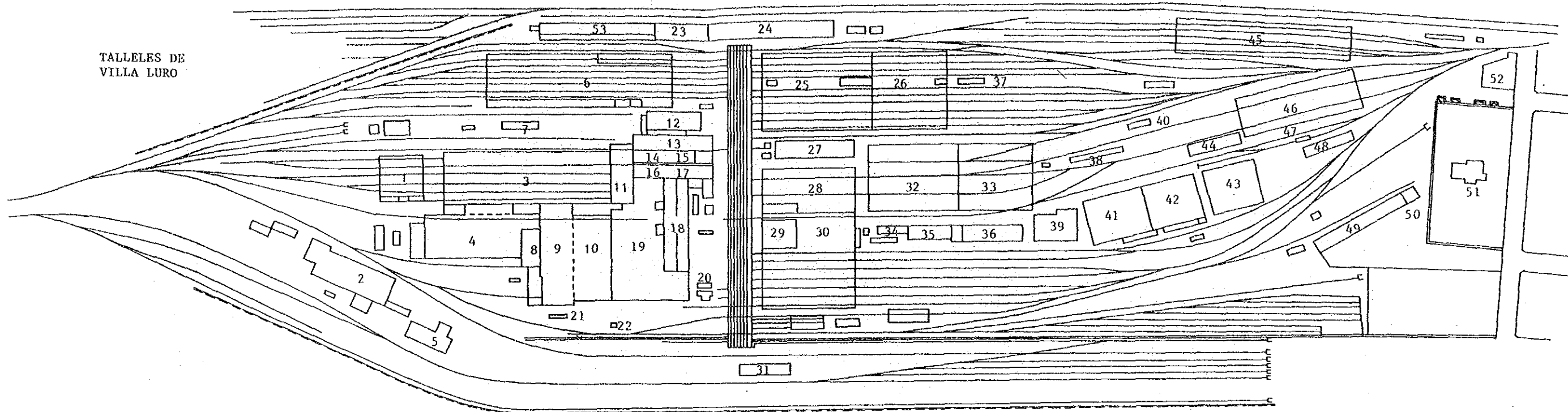


Fig. A.3.13 VILLA LURO Workshop Organization Chart



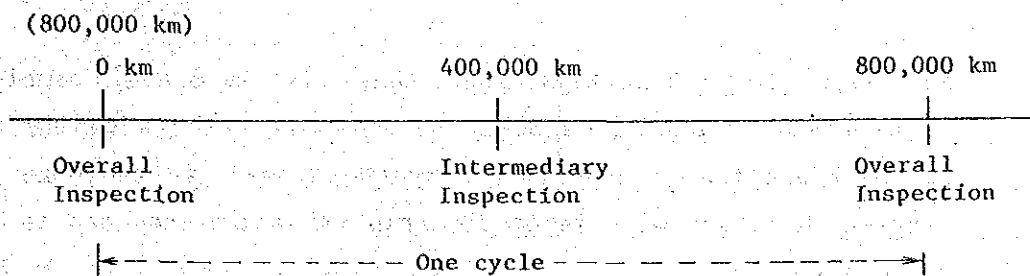
1	VIA AUXILIAR NO. 6	7	VIA AUXILIAR NO.18
2	" " NO. 8	8	" " NO.20
3	" " NO.10	9	" " NO.22
4	" " NO.12	10	" " NO.24
5	" " NO.14	11	" " NO.26
6	" " NO.16	12	" " NO.30

Fig. A.3.14 Layout of VILLA LURO Workshop



- | | | | | | |
|----|----------------------------------|----|--------------------------|----|-------------------------------|
| 1 | TINGLADO LAVADO MOTORES Y BOGUES | 18 | TORNERIA DE RUEDAS | 36 | DEP. DE HIERRO |
| 2 | TALLER DE ALUMBRADO | 19 | HERRERIA | 37 | COMEDOR |
| 3 | REPARACION GENERAL LOC'S DIESEL | 20 | SUB-USINA | 38 | COMEDOR |
| 4 | FUNDICION | 21 | COMEDOR | 39 | ALMACENES BODEGA "F" |
| 5 | DEP. PETROLEO | 22 | CASILLA | 40 | BAÑOS |
| 6 | PINTURERIA | 23 | SERENOS Y APUNTAD | 41 | ALMACENES BODEGA "A" |
| 7 | COMEDOR | 24 | OFICINAS DEPTO. MECANICA | 42 | GENERALES BODEGA "H" |
| 8 | CTO. HERRERIA | 25 | REPARACIONES DE COCHES | 43 | ALMACENES BODEGA "C" |
| 9 | LOCS. DIESEL | 26 | REPARACIONES DE COCHES | 44 | DEP. ELASTICOS BOD. "C" |
| 10 | TORNERIA GENERAL | 27 | RUEDAS | 45 | COCHERA |
| 11 | PARTE ELECT LOC.S.D.E. | 28 | CARPINTERIA | 46 | BODEGA "G" |
| 12 | REP. AUTOMOTOR | 29 | TAPICERIA | 47 | BASCULA |
| 13 | SOLDADURA COBRERIA | 30 | AJUSTE DE COCHES | 48 | BOD. "C" GALPON |
| 14 | AJUSTE ELEMENTOS ELECTRICOS | 31 | GALPON PEONES DE PATIO | 49 | BODEGA "E" |
| 15 | BAÑOS GALVANOPLASTIA | 32 | ASERRADERO | 50 | DEP. ACIDO MURIATICO |
| 16 | LOC. DIESEL ELECTRICA | 33 | DEPOSITO | 51 | POLICLINICO |
| 17 | COMPOSTURA MAQUINARIAS | 34 | COMEDOR | 52 | VIA Y OBRAS |
| | | 35 | DEP. 3A FIAT | 53 | OFICINAS DEPOSITOS ELECTRICOS |

Fig. A.3.15 Layout of LINIERS Workshop



Diesel Electric Locomotive Inspection/Repairing Periodicity

All electric railcars were manufactured in Japan. About 25 years have already passed since their introduction, and therefore, due to noticeable corrosion of the lower part of car bodies' outside panels and doors and of floors, major repairs are being carried out at this workshop or by outside consignment. Thus, measures are being taken to deal with the aging of car-bodies. As for electrical components on the other hand, the conditions are more favorable. Only a few traction motors out of a total of 400 have needed major repairs during the 25-year period.

A number of points were noted as follows for each of these workshops.

(VILLA LURO Workshop)

- . The lifting/lowering of car-bodies is carried out by lifting one end using an overhead travelling crane.
- . After traction motors are disassembled, they are cleaned by air blasting outdoors.
- . Since there is no vacuum varnish immersion equipment reimmersion in varnish is not carried out and only the surface is varnished and then dried in a drying oven.
- . After air compressors and motor generators are assembled, a rotation test is carried out.
- . A rotation test is not carried out on traction motors.

(LINIERS Workshop)

- . For bogie inspection/repairing, there is an actual sample of a bogie frame on display showing places where cracks easily develop in the bogie frame, and efforts are being made to thoroughly familiarize the staff with inspection/repairing know-how and to prevent accidents.
- . Most axle bearing inspections are carried out as installed.
- . Bogies are cleaned by air blasting outdoors. After disassembly, they are washed in a soda bath outdoors.
- . A locomotive crane is used both inside and outside the building.

3) Main equipment and facilities

(VILLA LURO Workshop)

Production Machines	Coiling machine, bogie setting equipment
Equipment Handling	Lifting jack, overhead travelling crane,
Machines	shunting locomotive
Machine Tools	Lathe, shaper
Testing Machines	Circuit breaker tester, MG tester, brake valve tester, dynamic balancing machine, air compressor rotation tester

(LINIERS Workshop)

Production Machines	Bogie washing tank, bearing washing tank
Equipment Handling	Steam locomotive crane, lifting jack, tra-
Machines	verser, overhead travelling crane
Testing Machine	Magnetic flaw detector
Machine Tools	Wheel lathe, driving wheel lathe, truck frame boring machine

(8) LYNCH Workshop

Division		METROPOLITANA LINE Operating Division
Assigned Rolling Stock		Electric Railcars 128 cars
Inspection Period	Overall Inspection	800,000 km
	Intermediary Inspection	200,000 km
Inspection Process	Overall Inspection	60 days
	Intermediary Inspection	45 days
1984 Inspection/Repairing Record	Overall Inspection	12 cars
	Intermediary Inspection	21 cars
	Temporary Inspection	3 cars
Number of Personnel	Administration	27
	Shop	111
	Total	138
Land Area/Building Area		10,200 m ² /6,900 m ²
Year Established		1908

1) Summary

This is a small workshop built long ago for steam locomotives, and since it was made an electric railcar workshop with practically no facilities improvement, work is inefficient and it can not be considered a very good workshop. Later improvements were not carried out since funds were cut off for economic reasons. Shops are clearly antiquated and small, and shop-in electric railcars can not be kept inside in two-car units. So, car-body and bogie work is partly done outdoors.

In addition, since there is no car-body and bogie washing equipment, this work must be done by hand. However, renovation work is carried out on cars damaged by fire, cars damaged by collision with car stoppers at station, and the technical ability is high.

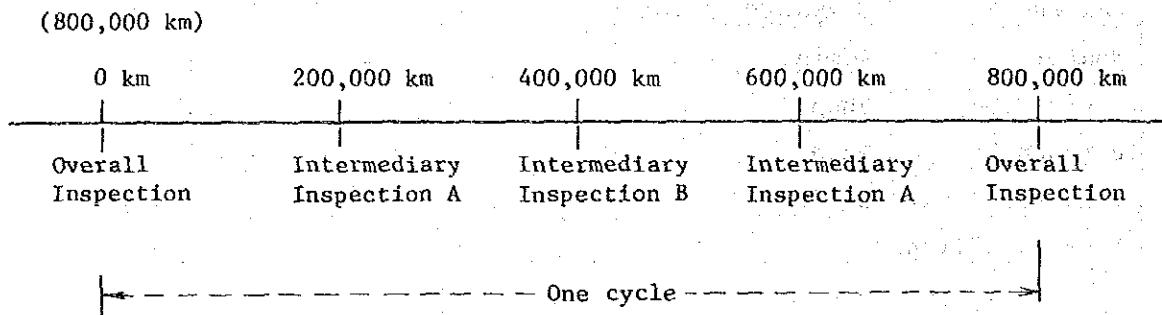
Lately, a painting shop and a car-body lifting/lowering shop are being newly constructed but these are no more than stopgap measures.

Rather than carrying out piecemeal improvement of this workshop, it is probably better that it be carried out comprehensively.

Fig. A.3.16 shows the workshop's organization, and Fig. A.3.17 shows its layout.

2) Inspection/repairing work

The electric railcar inspection/repairing periodicity is as follows.



Car-bodies are lifted using a simple lifting jack, but since the area inside the building is small, some electric railcar work is done outside using a steam locomotive crane. Furthermore, since there is no overhead travelling crane in the main building, antiquated equipment from the days of the inspection/repairing of steam locomotives is being put to use such as the utilization of a steam locomotive crane for bogie inspection/repairing work and the use of a beam jack for steam locomotive as a loading device for bogie demounting/mounting.

Originally, electric railcar Overall Inspections were carried out every 600,000 km, and Intermediary 150,000 km, period extensions were tried twice, and at present, Overall Inspections are carried out every 800,000 km and Intermediary are 200,000 km.

As for inspection/repairing supplies, purchases can not be made as desired due to the low budget, and storage shelves are practically empty which has a great effect on the inspection/repairing process.

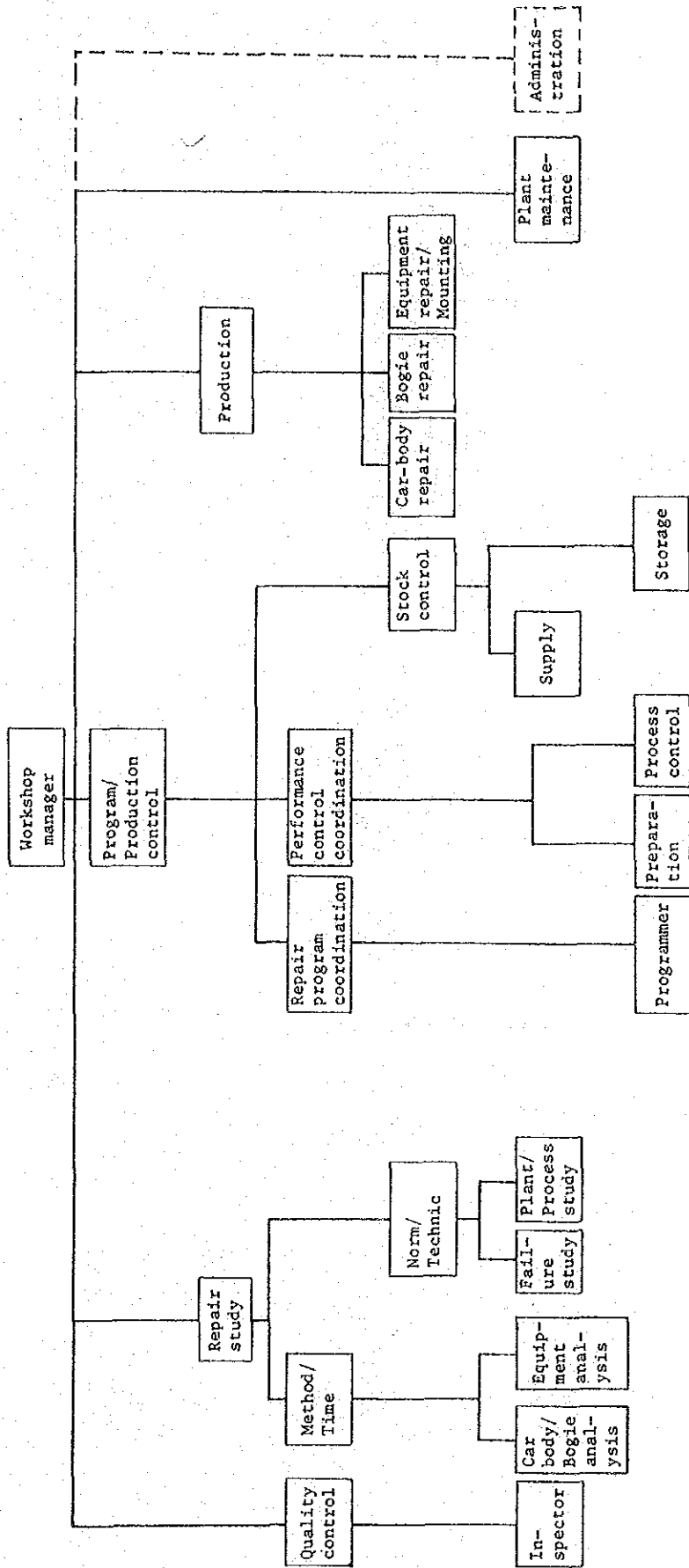
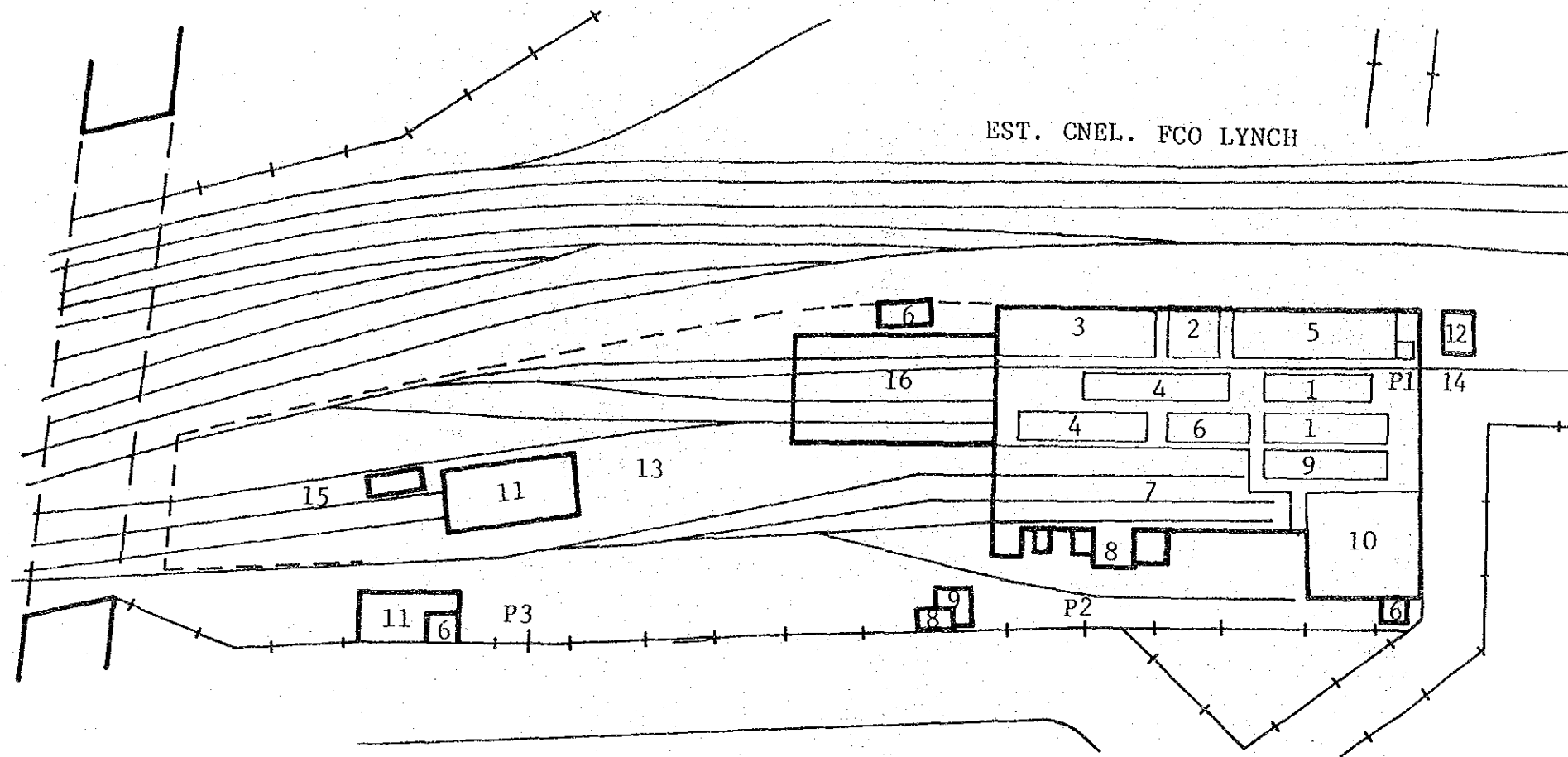


Fig. A.3.16 LYNCH Workshop Organization Chart



- 1 MECANICA
- 2 MAQ. HERRAMIENTAS
- 3 HERRERIA
- 4 CARP. METALICA Y SOLDADURA
- 5 CARPINTERIA
- 6 A.L. 6083 (BODEGAS)
- 7 BOGIES
- 8 CUARTO RODADOS C/ELECTR.

- 9 INSTALACIONES ELECTRICAS
- 10 MOTORES ELECTRICOS
- 11 PINTURERIA
- 12 JEFATURA TALLERES
- 13 AREA DE TRABAJOS DIVERSOS SECC.
- 14 PORTERIA (SERENOS)
- 15 PLATEA DE LAVADO BOGIES
- 16 AREA REPARAC. PROGRAMADAS

- P1 ACCESO AUXILIAR AL TALLER FERROVIARIO Y/O AUTOMOTOR
- P2-3 ACCESOS AUXILIARES AL TALLER DE AUTOMOTORES

Fig. A.3.17 Layout of LYNCH Workshop

3) Main equipment and facilities

Production Machines	Commutator grooving machine (with dust collecting device), heating device for drying paint
Equipment Handling Machines	Lifting jack, steam locomotive crane, mono-rail, simple type overhead travelling crane, shunting electric locomotive (with collector pole)
Machine Tools	Wheel lathe
Testing Machines	Dynamic balancing machine, air brake tester

APPENDIX 4 DEMOUNTING STANDARD OF ELECTRIC RAILCARS FOR THE GENERAL ROCA LINE

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
	Pantograph		1		Demount and disassemble
Pantograph-support insulator		4		Demount and inspect	Inspect as installed
Pantograph air supplying insulator		1		Inspect as installed	Inspect as installed
Emergency ground switch		1		Demount and disassemble	Inspect as installed
Vacuum circuit breaker		1		Demount and disassemble	Demount and disassemble
Lightning arrester		1		Demount and disassemble	Inspect as installed
Primary current transformer		1		Demount and inspect	Inspect as installed
Main transformer		1		Partly demount and disassemble	Inspect as installed
Main rectifier		1		Partly demount and inspect	Partly demount and inspect
Protection resistor box for main rectifier		1		Partly demount and disassemble	Inspect as installed
Main smoothing reactor		1		Demount and inspect	Demount and inspect
Line breaker box	1		1	Partly demount and disassemble	Partly demount and disassemble

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
	Traction motor	4		4	Demount and disassemble
Main controller	1		1	Partly demount and disassemble	Inspect as installed
Main resistor	1		1	Demount and disassemble	Inspect as installed
Field shunting resistor	1		1	Demount and disassemble	Inspect as installed
Motor alternator		1		Demount and disassemble	Demount and disassemble
Motor alternator control device		1		Partly demount and inspect	Partly demount and inspect
VCB relay box		1		Partly demount and inspect	Inspect as installed
Auxiliary control box	1	1	1	Partly demount and inspect	Partly demount and inspect
Battery box		1		Demount and inspect	Demount and inspect
Junction box (complete set)	1	1	1	Inspect as installed	Inspect as installed
ATS cab coil	1		1	Demount and inspect	Inspect as installed
ATS cab coil junction box	1		1	Inspect as installed	Inspect as installed
Pre-receiver	1		1	Demount and inspect	Demount and inspect
ATS receiver		1		Demount and inspect	Demount and inspect
ATS supervisor		1		Demount and inspect	Inspect as installed
ATS relay box		1		Demount and inspect	Inspect as installed
Master controller	1		1	Demount and disassemble	Inspect as installed
Speedometer	1		1	Demount and disassemble	Demount and disassemble
Voltmeter	3		3	Demount and disassemble	Demount and disassemble
ATS reset switch	1		1	Demount and disassemble	Inspect as installed
Pantograph switch	1		1	Demount and disassemble	Inspect as installed
Electric tight coupler cutout operating switch	1		1	Demount and disassemble	Inspect as installed

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
Driver's cab electric heater	1		1	Demount and disassemble	Inspect as installed
Driver's cab electric fan	1		1	Demount and disassemble	Inspect as installed
Driver's cab lamp	2		2	Inspect as installed	Inspect as installed
Pilot lamp for driver	1		1	Inspect as installed	Inspect as installed
Fault pilot lamp	1		1	Inspect as installed	Inspect as installed
Operation indication lamp	1		1	Inspect as installed	Inspect as installed
Signal buzzer	2		2	Inspect as installed	Inspect as installed
Emergency buzzer	1	1	1	Partly demount and disassemble	Inspect as installed
Door control switch for conductor	5	4	5	Demount and disassemble	Inspect as installed
Forward/reverse changeover switch	1		1	Inspect as installed	Inspect as installed
Headlight	2		2	Partly demount and disassemble	Inspect as installed
Position light	2		2	Partly demount and disassemble	Inspect as installed
Destination sign light	1		1	Demount and inspect	Inspect as installed
Fluorescent lamp (20 W)	2		2	Demount and disassemble	Inspect as installed
Distribution board	1	1	1	Inspect as installed	Inspect as installed
Fluorescent lamp (40 W)	20	22	20	Demount and disassemble	Inspect as installed
Ventilation fan for passengers' room	8	7	8	Demount and disassemble	Inspect as installed

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
Window and louver	27	28	27	Demount and inspect	Inspect as installed
Side sliding door	6	6	6	Demount and inspect	Inspect as installed
End sliding door	1	2	1	Demount and inspect	Inspect as installed
Hinged door	3		3	Inspect as installed	Inspect as installed
Seat	39	40	39	Demount and disassemble	Inspect as installed
Sliding door holder stop	14	16	14	Inspect as installed	Inspect as installed
Hinged door holder stop	3		3	Inspect as installed	Inspect as installed
Seat pedestal	39	40	39	Demount and disassemble	Inspect as installed
Driver's seat	1		1	Demount and disassemble	Inspect as installed
Gangway bellows	1		1	Demount and inspect	Inspect as installed
Track and track stand for sliding door (set)	1		1	Inspect as installed	Inspect as installed
Car-body and car-body parts	1	1	1	Partly demount and inspect	Inspect as installed
Electric automatic coupler	1		1	Inspect as installed	Inspect as installed
Control circuit coupler plug		2		Inspect as installed	Inspect as installed
Control circuit coupler receptacle	1		1	Inspect as installed	Inspect as installed
Dummy receptacle for control circuit coupler plug		2		Inspect as installed	Inspect as installed
Automatic coupler	1		1	Demount and disassemble	Demount and disassemble
Automatic coupler cutout device	1		1	Demount and disassemble	Demount and disassemble
Automatic coupling/uncoupling cylinder	1		1	Demount and inspect	Demount and inspect
Coupler cover	1		1	Demount and inspect	Demount and inspect

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
	Rod type coupler		2		Demount and inspect
Draft gear	2	2	2	Demount and inspect	Inspect as installed
Shank guide	2	2	2	Demount and inspect	Inspect as installed
York joint	2	2	2	Demount and inspect	Demount and inspect
Bogie frame	2	2	2	Demount and disassemble	Demount and disassemble
Axle spring	8	8	8	Demount and inspect	Demount and inspect
Swing bolster	2	2	2	Demount and disassemble	Demount and disassemble
Oil damper	4	4	4	Demount and disassemble	Demount and disassemble
Center plate	2	2	2	Demount and inspect	Demount and inspect
Wheel and axle	4	4	4	Demount and inspect	Demount and inspect
Axle box	8	8	8	Demount and disassemble	Partly demount and inspect
Earth brush device		4		Demount and disassemble	Demount and disassemble
Tachometer generator		1		Demount and disassemble	Demount and disassemble
Driving gear	4		4	Demount and disassemble	Demount and disassemble
Gear coupling	4		4	Demount and disassemble	Demount and disassemble
Foundation brake (brake block)	4		4	Demount and disassemble	Demount and inspect
Foundation brake (disk)		4		Demount and disassemble	Demount and inspect
Hand brake	1		1	Partly demount and inspect	Inspect as installed
Pressure regulating valve (NF-3)	1	1	1	Demount and inspect	Partly demount and inspect
Air hose	8	11	8	Demount and inspect	Inspect as installed
Brake valve (26-B-1)	1		1	Demount and disassemble	Demount and disassemble
Pressure gauge MR/ER BP/BC	2		2	Demount and disassemble	Demount and disassemble

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
Air reservoir	9	9	9	Inspect as installed	Inspect as installed
Strainer	3	2	3	Demount and disassemble	Demount and disassemble
Brake application valve P-2-A	1		1	Demount and disassemble	Demount and disassemble
Electromagnetic valve VM24-1	2		2	Demount and disassemble	Demount and disassemble
Whistle (S type)	1		1	Demount and disassemble	Demount and disassemble
Emergency brake valve (B-3-B)	2		2	Demount and disassemble	Partly demount and disassemble
Brake application valve (E-3)	1		1	Demount and disassemble	Demount and disassemble
Interface unit (EP-3)	1		1	Demount and disassemble	Demount and disassemble
Interface unit (Master controller)	1		1	Demount and inspect	Partly demount and inspect
Brake operating unit (CK4)	1	1	1	Demount and disassemble	Demount and disassemble
Actuator and air pressure switch box	1		1	Demount and disassemble	Demount and disassemble
Load detector valve	1	1	1	Demount and disassemble	Demount and disassemble
Strainer (Y-3/8-MR)	3	2	3	Partly demount and inspect	Partly demount and inspect
Vent valve (No.8)	1	1	1	Demount and disassemble	Demount and disassemble
Check valve	2	2	2	Demount and disassemble	Partly demount and inspect
Cutout cock with long handle	4	4	4	Demount and disassemble	Partly demount and inspect
Cutout cock	2	3	2	Partly demount and inspect	Partly demount and inspect

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
Drain cock	1	1	1	Partly demount and inspect	Inspect as installed
Whistle	1		1	Demount and disassemble	Demount and disassemble
Whistle valve	1		1	Demount and disassemble	Inspect as installed
Air-compressor		1		Demount and disassemble	Demount and disassemble
Air-compressor motor and condenser box	1		1	Demount and disassemble	Demount and disassemble
Air drier	1		1	Demount and disassemble	Demount and disassemble
Pressure governor (S-16-C)		1		Demount and disassemble	Demount and disassemble
Safety valve (Door)		1		Demount and disassemble	Demount and disassemble
Door engine	6	6	6	Demount and disassemble	Inspect as installed
Door close switch (SS 283 B)	6	6	6	Inspect as installed	Inspect as installed
Electromagnetic valve (M-42S)	6	6	6	Demount and inspect	Inspect as installed
Connecting plate	6	6	6	Inspect as installed	Inspect as installed
Cutout cock with side hole	9	9	9	Demount and inspect	Inspect as installed
Cutout cock	1	1	1	Demount and disassemble	Inspect as installed
Strainer	6	6	6	Partly demount and inspect	Partly demount and inspect
Electromagnetic relay	4	4	4	Demount and inspect	Demount and inspect
(Wiper)					
Wiper	1		1	Demount and disassemble	Inspect as installed
Wiper arm	1		1	Demount and disassemble	Inspect as installed
Wiper pilot valve	1		1	Demount and disassemble	Inspect as installed

Equipment	Equipment Set for Each Car			Demounting Classification	
	Mc	R	Mc	Overall Inspection	Intermediary Inspection
	Strainer (Y-3/8 MR)	1		1	Partly demount and inspect
(Auxiliary air compressor) Air-compressor		1		Demount and disassemble	Demount and disassemble
Air-compressor motor		1		Demount and disassemble	Demount and disassemble
Air reservoir		2		Inspect as installed	Inspect as installed
Drain cock (6 mm)		2		Partly demount and inspect	Inspect as installed
Air hose		1		Demount and disassemble	Inspect as installed
Safety valve		1		Demount and disassemble	Demount and disassemble
Pressure governor		1		Demount and disassemble	Demount and disassemble
Check valve		2		Demount and disassemble	Demount and disassemble
Pressure gauge		1		Demount and disassemble	Demount and disassemble
Strainer(V type)		1		Demount and disassemble	Demount and disassemble
Cutout cock		3		Demount and disassemble	Demount and disassemble
Electromagnetic valve		2		Demount and disassemble	Demount and disassemble
Air pressure switch		1		Demount and disassemble	Demount and disassemble

APPENDIX 5 INTERZONAL RAILWAY TRAFFIC VOLUME (A.D.2000)

Unit: persons per day

No.	1	2	3	4	5	6	7	8	9	10	11	Total
1	0	22,600	8,300	55,300	16,800	10,300	53,800	6,100	8,400	11,700	12,600	205,900
2		11,600	2,800	0	0	3,400	38,900	0	700	500	100	58,000
3			700	12,100	7,000	13,500	18,800	700	0	1,000	600	54,400
4				1,100	9,900	400	1,100	0	4,100	4,000	0	20,600
5					3,500	400	1,600	0	11,300	7,000	0	23,800
6						900	10,200	1,300	1,400	300	1,100	15,200
7							16,900	11,200	14,500	2,500	7,900	53,000
8								700	200	100	1,200	2,200
9									10,400	6,000	100	16,500
10										8,400	1,300	9,700
11											3,100	3,100
Total	0	34,200	11,800	68,500	37,200	28,900	141,300	20,000	51,000	41,500	28,000	462,400

APPENDIX 6 CROSS-SECTIONAL PASSENGER TRAFFIC VOLUME

Unit: persons, one way

	Name of Station	A.D. 2000	
		All Day	Peak
P. Constitución) Temperley) A. Korn	P. Constitución		
	Avellaneda	204,500	23,100
	Gerli	154,400	17,400
	Lanús	151,700	17,100
	R. de Escalada	146,800	16,600
	Banfield	145,200	16,400
	L. de Zamora	137,100	15,500
	Temperley	132,300	14,900
	Adrogué	57,000	6,400
	Bruzaco	52,400	5,900
	Longchamps	43,800	4,900
	Glew	33,200	3,800
	Guernica	24,900	2,800
	A. Korn	13,600	1,500
Temperley) Ezeiza	Temperley		
	Turdera	62,400	7,100
	Llavallol	65,600	7,400
	Luis Guillón	69,000	7,800
	Monte Grande	61,400	6,900
	El Jagüel	35,600	4,000
	Ezeiza	31,200	3,500

	Name of Station	A.D. 2000	
		All Day	Peak
Avellaneda) Quilmes) La Plata	Avellaneda		
	Sarandí	102,600	11,600
	Villa Domínico	102,900	11,600
	Wilde	102,300	11,600
	Don Bosco	104,800	11,800
	Bernal	101,200	11,400
	Quilmes	85,300	9,600
	Ezpeleta	62,600	7,100
	Berazategui	55,100	6,200
	Dr. R. Levene	27,500	3,100
	G.E.Hudson	25,800	2,900
	Pereyra	24,300	2,700
	Villa Elisa	23,400	2,600
	City Bell	26,200	3,000
	M.B.Gonnet	25,700	2,900
	Rinquelet	25,700	2,900
	Tolosa	25,600	2,900
	La Plata	25,100	2,800
Bosques) Berazategui	Bosques		
	S. T. Sourigues	11,900	1,300
	Ranelagh	11,500	1,300
	Villa España	12,200	1,400
	Berazategui	14,000	1,600

	Name of Station	A.D. 2000	
		All Day	Peak
Temperley } Bosques } Villa Elisa	Temperley		
	José Marmol	43,800	4,900
	R. Calzada	42,000	4,700
	Cláypole	38,100	4,300
	Ing. D. Ardigó	31,900	3,600
	F. Varela	28,900	3,300
	E. S. Zeballos	25,600	2,900
	Bosques	23,600	2,700
	J.M. Gutiérrez	11,000	1,200
	Juan Vucetich	5,000	600
	Villa Elisa	5,000	600

JICA