

In accordance with the same table, concerning housewives, the large percentage of them travel for family matters and personal business.

Business trips are mainly by persons between the ages of 30 and 59.

Table IV.7.6 Objective of Trip According to Occupation, Sex and Age (Figures are percentages)

Objective of trip		Sight-seeing	Business	Honey-moon	Study	Family matters or personal business	Other	Unknown
Character								
Sex	Male	11	55	1	11	20	3	1
	Female	16	27	3	10	43	3	3
Age	10 - 19	24	19	3	28	23	4	1
	20 - 29	17	38	2	18	24	2	1
	30 - 39	9	53	1	5	30	1	1
	40 - 49	10	53	1	1	30	5	2
	50 - 59	6	50	2	0	40	1	1
	60 - 69	10	38	1	2	46	3	2
	70 - 79	12	38	2		43		7
	80 - 89					80		20
Occupation	Professional	8	60	2	4	22	3	3
	Public employee	13	41	3	11	32	1	2
	Private employee	8	54	2	5	31	2	3
	Trader	3	87	1	1	9	0	
	Farmer	9	62	2	1	23	2	1
	Industrialist	3	73	3	6	12		3
	Student	22	10	2	44	20	3	1
	Housewife	18	20	2	3	54	2	3
	Pensioner	12	31	3	3	47	4	3

Note: The replies were made out in multiple answers.

Beyond this, within the objectives of trip, it is not possible to detect any features which are distinct when comparing the class of coach. However, a large proportion of Sal6n and Sleeper Coaches are used by persons travelling on

business and by professional people, whilst persons travelling for family matters or private business are concentrated in the First Class, according to analyses per class of coach.

In the case of tourists, no difference is noted between travelling by reserved seats and unreserved seats.

It is possible that these results are due to the fact that the survey took place during a period which is not within the higher frequency for that sort of travel. (Table IV.7.7).

Table IV.7.7 Objective of Trip According to Class of Coach
(Figures are percentages)

Objective of trip		Sight-seeing	Business	Honey-moon	Study	Family matter and personal business	Other	Unknown
Type of trains and characteristics of cars								
Trains	T 1023/1024	12	51	4	6	22	2	4
	T 9/10	15	45	2	7	30	4	2
	A 1001/1002	18	28	1	12	38	1	3
	A 1007/1008	12	55	2	5	27	1	0
	T 7/8	15	34	3	20	23	4	5
	T 5/6	7	35	1	15	38	5	0
	A 503/504	12	45	1	12	30	2	1
Classes	Second	17	40	3	11	25	3	5
	First	12	39	1	13	33	3	1
	Salón	13	49	4	6	25	2	3
	Super Salón	17	52	1	3	28	1	
	Sleeper	5	70	1	4	13	7	2
Reserved or not	Reserved	13	52	3	5	25	3	2
	Non-reserved	13	38	2	13	32	3	2

Among the objectives of trip, given as family matters or personal business, it can be observed that a relatively high

percentage of such trips are due to illness and for medical attention.

(4) Number of passengers accompanied

The average number of passengers forming a group travelling together was found to be 2.0 persons; and little differences were found according to classification by train, or by class of coach, or by age.

It was found that the number of passengers forming a group for sightseeing was slightly higher (Table IV.7.8).

It was found that the highest number of passengers forming one integrated group, was 12 persons from a students' group.

Table IV.7.8 Number of Passengers Forming Travel Groups According to Objective of Trip (Figures are percentages)

Objective of trip \ Number of companions	1	2	3	4	5	6	7-9	10-
Sightseeing	36	33	18	8	3	0		
Business	65	18	11	2	2	1		
Study	66	16	10	2	1	3	0	
Family matters or personal business	52	25	15	4	2	1	1	
Total	57	22	13	4	2	1	0	0

(5) Reason for travelling by railway

With regard to the reasons for using the rail services, the highest percentage—that is: 60% of the passengers surveyed—stated it was for reasons of "reliability/safety" followed by their reasons in the following order of priority:

"convenient departure and arrival times".... 46%; and "reasonable price".... 43%, although for "punctuality", only 19% responded to this.

Analyzing the motives for using the rail services, on the basis of distance, it is noted that in the case of those who mention safety reasons, the distances are greater, while in the case of those who mention that the fares are reasonable, the distances are shorter. With regard to to speed of the services, this relates to a much higher degree to those passengers travelling over medium distances [101 - 400 kms]. In the case of classification by train, the difference between electric-car and locomotive-hauled train is noted by the comfort and the speed.

Although it can be logically expected that opinion on the speed of sleeper cars should be unfavorable, the factor which calls attention is that the low charges have had considerable support (Fig. IV.7.4 to IV.7.6).

(6) Number of days of travel

Within the classification according to days of travel, those travels lasting from 2 ~ 7 days are seen to be in an absolutely dominant position, since these involve practically one half of the passengers surveyed. Study of the activity involving First and Second Class coaches and, taking into consideration objective of trip among those for business and professional, a high percentage of one-day trips in one day can be seen. (Table IV.7.9)

(7) Time of deciding the trip

With regard to the time of deciding to make the trip, 28% of passengers had decided the day before; 24%, between 2 ~ 7 days before; and 21% on the day of departure; and the number of passengers who had planned the trip more than one month in advance, amounted to only 5%. A study on the class of coach

shows that there is a tendency to plan farther ahead by those who are going to travel by the Salón, Super Salón and Sleeper classes; as can be verified from Table IV.7.10.

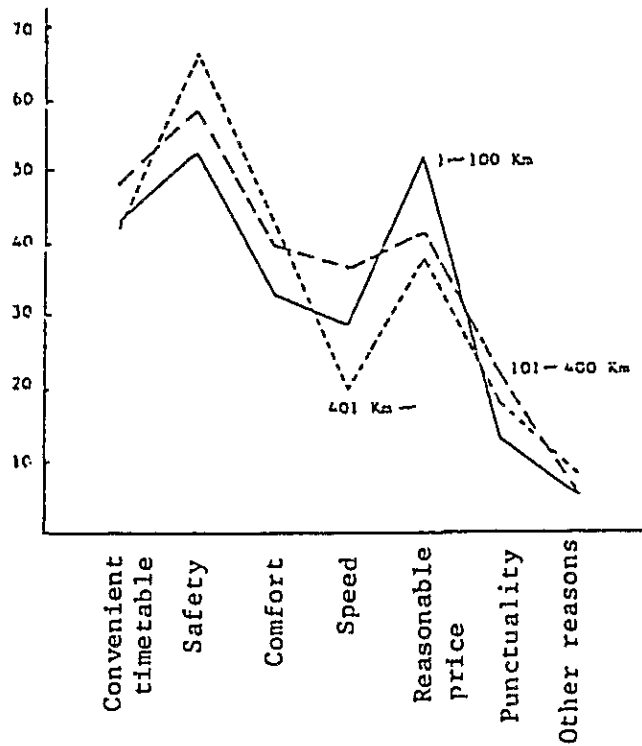


Fig. IV.7.4 Reasons for Travelling by Railway According to Travel Distance

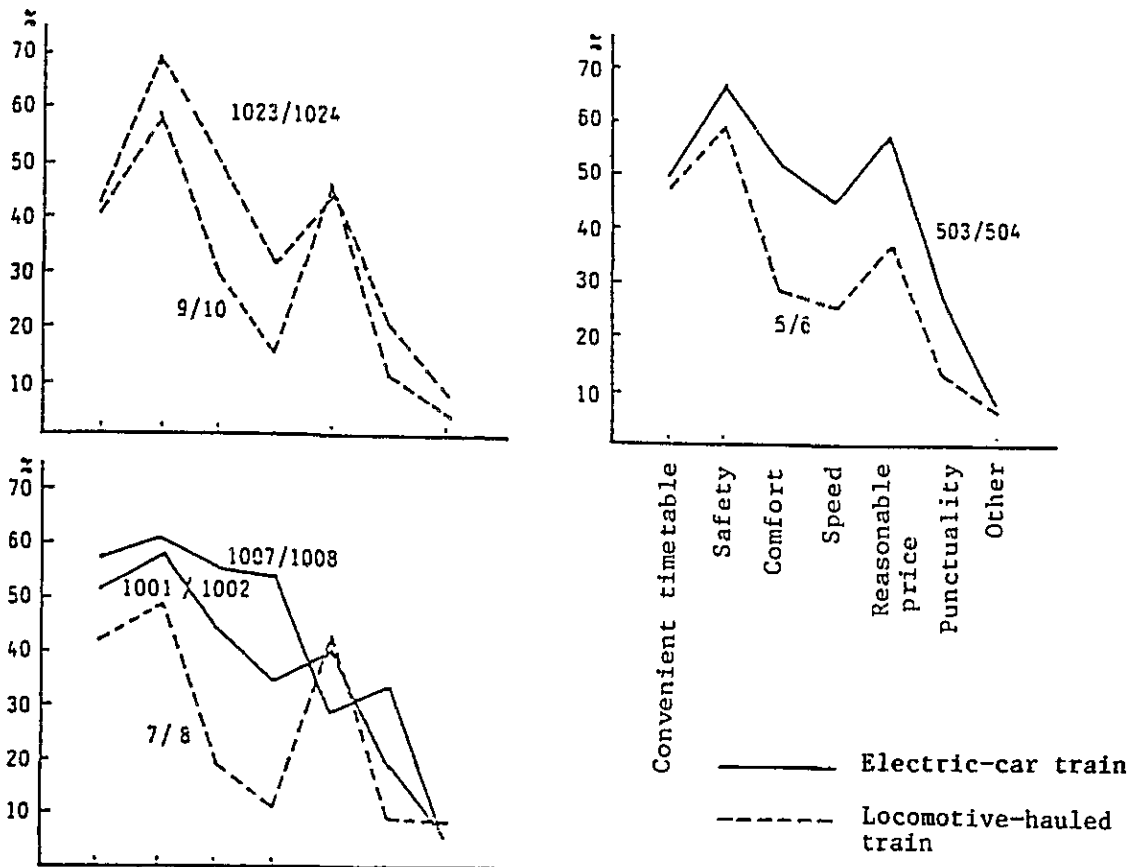


Fig. IV.7.5 Reasons for Travelling by Railway According to the Type of Train

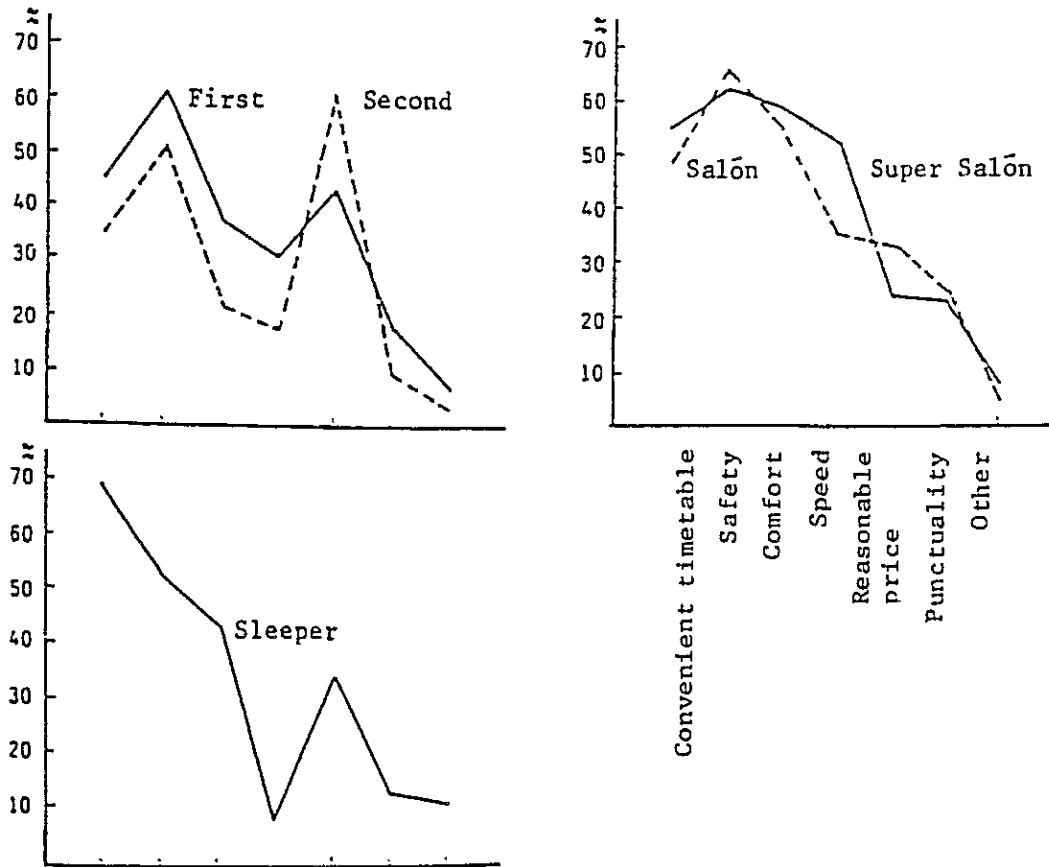


Fig. IV.7.6 Reasons for Travelling by Railway According to Class

Table IV.7.9 Number of Days of Travel (Figures are percentages)

Number of days		One-day	2 - 7 days	8 - 14 days	More than 15 days
Total		29	44	10	11
Class	Second	33	33	11	12
	First	34	40	10	11
	Salón	15	57	11	14
	Super Salón	17	66	9	5
	Sleeper		77	6	11
Objective of trip	Sightseeing	13	46	15	19
	Business and work	39	44	6	6
	Honeymoon	16	53	11	16
	Study	26	38	11	20
	Family matters and personal business	24	46	13	10
	Other	20	43	17	9

Table IV.7.10 Time of Deciding the Trip According to Class of Coach (Figures are percentages)

Class	Trip decision moment	Same day as departure	1 day preceding	2-7 days preceding	8-14 days preceding	15-30 days preceding	More than 30 days preceding
	Second		31	25	16	9	4
First		21	30	22	7	6	5
Salón		19	25	31	10	6	5
Super Salón		11	29	36	10	7	4
Sleeper		10	15	49	15	2	2

(8) Time of seat reservation

Of the total number of 1,941 persons questioned, 638 of them had taken reserved seat, of which number, approximately had made such reservations on the same day as the journey. It was found that no passenger had reserved more than 2 weeks in advance. It was noted that a high proportion of passengers had reserved in advance for the 7/8 trains, and it is assumed that this was so because of the sleepers on such trains. Study of the classification according to coaches, demonstrates that there was a higher proportion of advance reservation for accommodations in the sleeper coaches than for other facilities. (Table IV.7.11)

Table IV.7.11 Time of Reserving Reserved Seat
(Figures are percentages)

		Days in advance	Same day as departure	one day preceding	2-7 days preceding	8-14 days preceding	15-30 days preceding
Total			49	17	21	3	
Trains	T 1023/1024		49	13	19	5	
	T 9/10		43	18	30	3	
	T 7/8		25	13	44	6	
	A 1007/1008		53	21	20		
Classes	First		62	8	4		
	Salón		49	16	25	4	
	Super Salón		53	26	19		
	Sleeper		21	21	44	5	

Studying the relationship between the decision to travel and the time of making reservations of the reserved seat, some rather unpredictable cases do occur on a small scale, when reservations are made before the journey is decided, but in general, the predominant tendency is to make such reservations on the same day of the journey, and 2 ~ 7 days before the journey. (Table IV.7.12)

Table IV.7.12 Time of Deciding Trip and Time of Reserving Reserved Seat (Figures are percentages)

Moment of Reservation Trip de- cision Moment	Same day as departure	one day preceding	2-7 days preceding	8-14 days preceding	15-30 days preceding
Same day as departure	83	2	1		
one day preceding	66	25	1		
2-7 days preceding	34	20	40	0	
8-14 days preceding	19	22	38	16	
15-30 days preceding	36	24	33		
More than 30 days preceding	21	7	52	17	

- (9) Means of Transport which will be used for the return trip, or means used for the outward trip

The means to be used, or used for the return and outward trip, demonstrate figures of 80% for the trains, 9% for buses, and 4% for other means. Looking at the classification by train, we can see a high percentage of users of Trains 503/504, while there is an increase in passengers having recourse to the buses on Trains 7/8 and 9/10.

Looking at the classification according to class of coaches, there is a characteristic high proportion of 27% of passengers who use the sleeper coaches, but make the return trip-or the outward trip-by air. (Table IV.7.13)

- (10) Exterior appearance of coaches

On the point of exterior appearance of coaches, 68% thought it was normal; followed by 14% who thought it was bad, then 7% who thought it was elegant, with 5% who thought it was very bad.

The opinions given, according to train, and coach class, are set down in Figs. IV.7.7 and IV.7.8, respectively.

Table IV.7.13 Means of Transport to be Used for the Return Trip or Used for the Outward Trip (Figures are percentages)

Means of transportation	Train	Bus	Air-plane	Car	Ship	Other	not decided yet
Total	80	9	2	1	0	0	4
According to train							
T 1023/1024	80	8	5			0	4
T 9/10	76	13	3	1			6
A 1001/1002	83	10	2	1			2
A 1007/1008	83	4	2	6			4
T 7/8	73	18	2		0		5
T 5/6	84	8	0	2			4
A 503/504	86	4		0	0		5
According to class							
Second	81	12	0				3
First	81	10	1	1	0		4
Salón	84	7	1	3			5
Super Salón	84	4	2	6			4
Sleeper	58	1	27	1		1	7

Note: The replies were made in multiple answers.

Table IV.7.14 Means of Transport to be Used for the Return Trip or Used for the Outward Trip According to Distance of Trip and Objective of Trip (Figures are percentages)

Means of transportation to be used or used		Train	Bus	Air-plane	Car	Ship	Other	Not decided yet
Distance and purpose of trip	1 - 50 Km	75	13					4
	51 - 100 Km	80	14	0				4
	101 - 200 Km	80	11	1	1			3
	201 - 400 Km	83	8	1	2	0		4
	401 - 600 Km	80	8	3	4	0		4
	601 - 800 Km	78	7	6	1			8
	801 - 1000 Km	84	3	8	1			3
	1001 - Km -	73	14	2		2		6
Objective of trip	Sightseeing	80	10	2	3	0		4
	Business	80	8	3	1		0	6
	Honeymoon	79	3	5		3		8
	Study	76	18		1			5
	Family matters and personal business	85	9	1	1			3
	Other	69	17	6				7

Note: The replies were made in multiple answers.

(11) Interior appearance of coaches

On the question of interior appearance of coaches, 41% of those questionnaires felt it was regular; 39% that it was good; 10% felt it was excellent, and 9% that it was bad. The opinions about trains and coach classes are reflected in Figs. IV.7.7 and IV.7.8, respectively.

Even when the points average resulting from opinions on the interior appearance of the coaches are higher than points corresponding to the exterior appearance, it is impossible to make direct comparison, due to the fact that the phrasing of the questions differed. Study of the results related to exterior and interior appearances, shows that it is not always the superior classes of coach which are awarded the higher points, due to the fact that passengers expect the installations to be compatible with class in which they are travelling and, besides that, the questionnaires include the replies from passengers of all the classes.

(12) Service inside the train

On the question of train service, almost 20% of passengers reported that they do not avail themselves of the services and of those passengers who do call for the services, 60% of them are of the opinion that the service is good. Study of the results, according to train and class of coach, does not show any great differences (Table IV.7.15).

Although statements about what services are desired, cover numerous aspects, the most frequently voiced wish was that the tariff rates could be cheaper. The most representative opinions out of all of them were the following :

- Better cleaning up work should be done.
- Fresher dishes should be offered, and attempts made to improve the quality.
- Passengers should be attended to more conscientiously.

- The meals should be changed.
- There should be more variety of meals.
- Toilets/washrooms should be cleaned and looked after better.
- More care should be taken with the attendant's personal appearance.

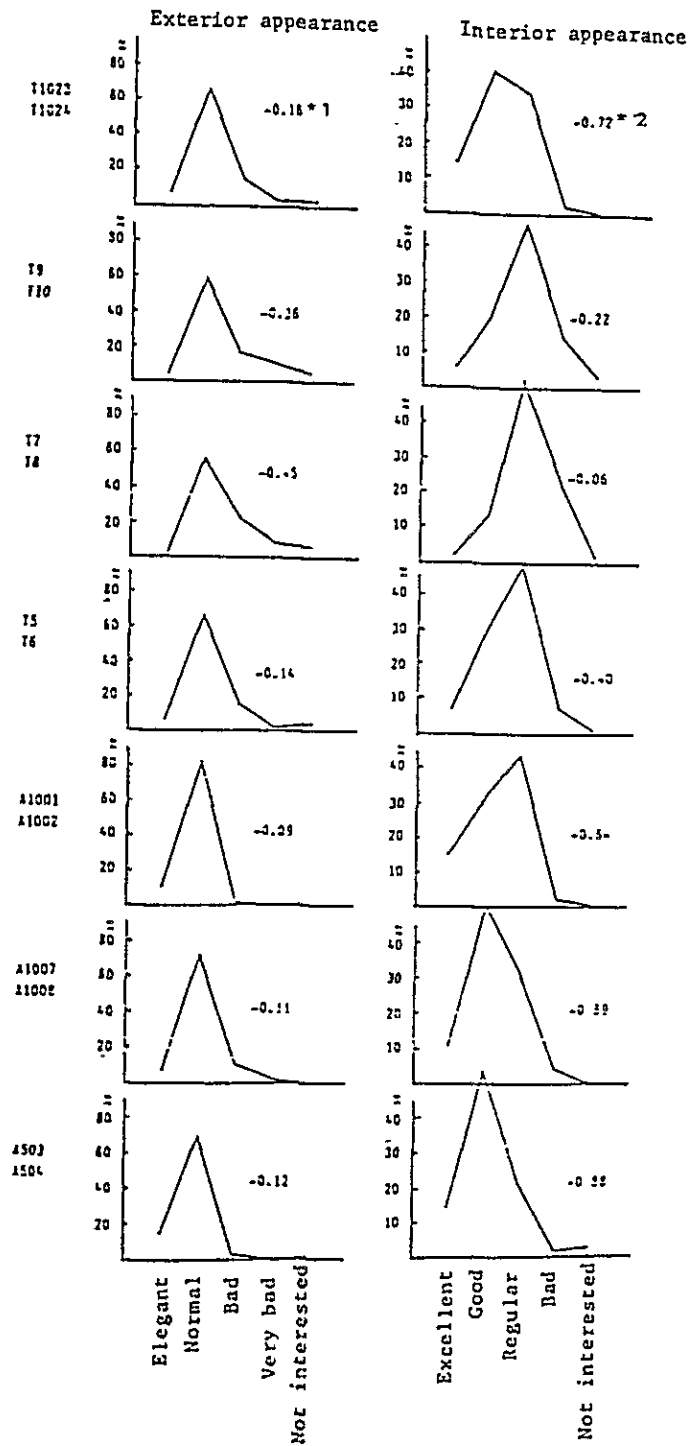
(13) Number of times of using railway during the year

In connection with travel frequency for the year, a considerably high average level of approximately 28 time is arrived at, due to the fact that among those surveyed, there is quite a number of passengers who normally use the trains for covering short distances.

Within the classification by sex, the frequency of the males is higher than in the case of females, the proportion of men to women being 1.5 times. Under the classification by age, the highest percentage is from the age range of 30 to 39 years, this being made up mainly of traders, public employees, professionals, and private employees. It can be noted that, in the case of housewives, the figures are relatively low.

In the case of classification by coach class, a higher proportion is noted in the First & Second Classes, which are more accessible, than in the Salon & Sleeper Classes which are more expensive.

Within the classification of objectives of travel, the frequency of sightseeing is very low, and the frequencies of travel for business, work & study is quite high. (Fig. IV.7.9)



Note: (1) Points Average calculated on the Basis of:
 +1 = Elegant, 0 = Normal, -1 = Bad and -2 = Very bad.

(2) Point Average calculated on the basis of:
 +2 = Excellent, +1 = Good, 0 = Regular and -1 = Bad.

Fig. IV.7.7 Impressions on Exterior and Interior Appearances According to Train

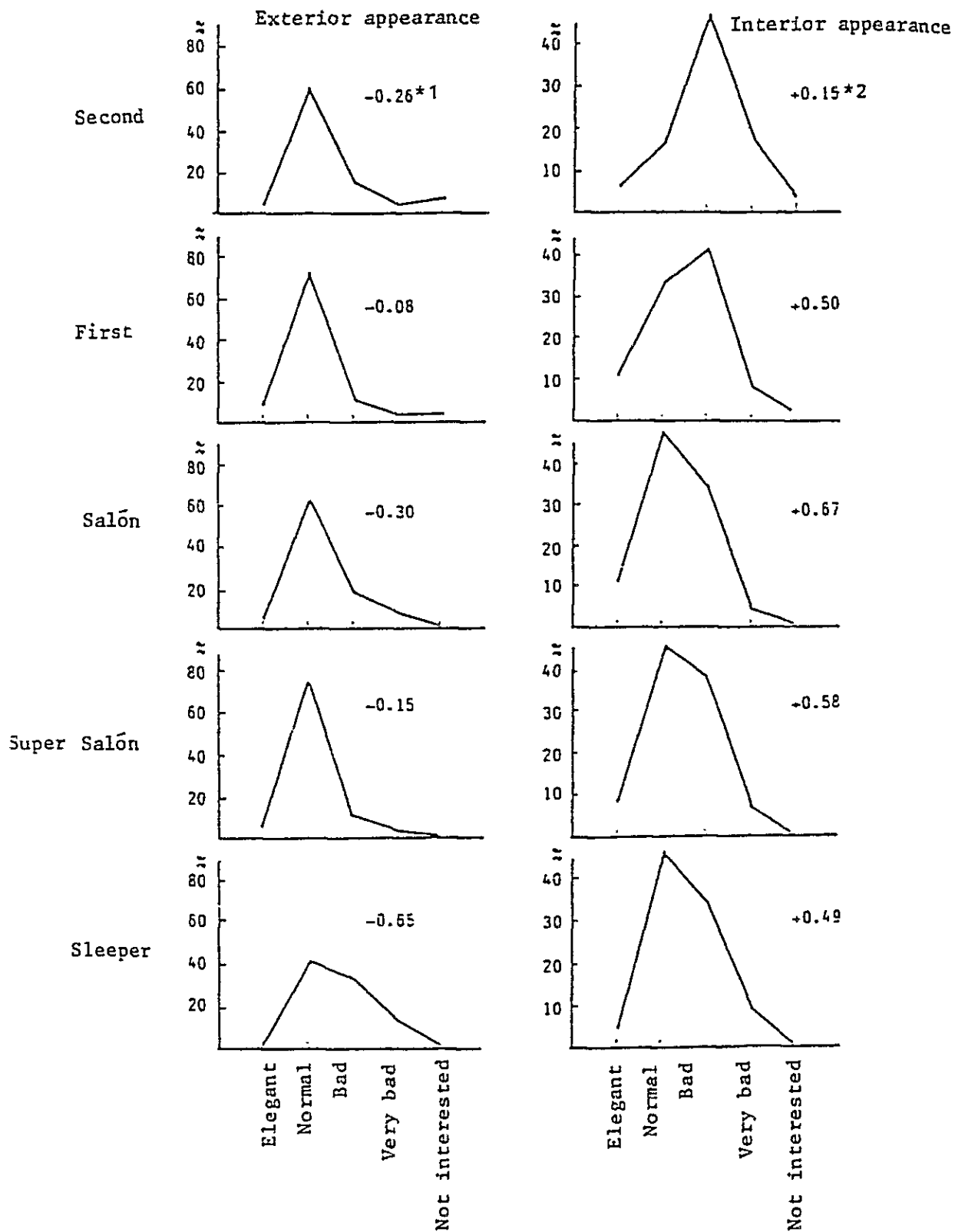


Fig. IV.7.8 Impressions on Exterior and Interior Appearances According to Class of Coach

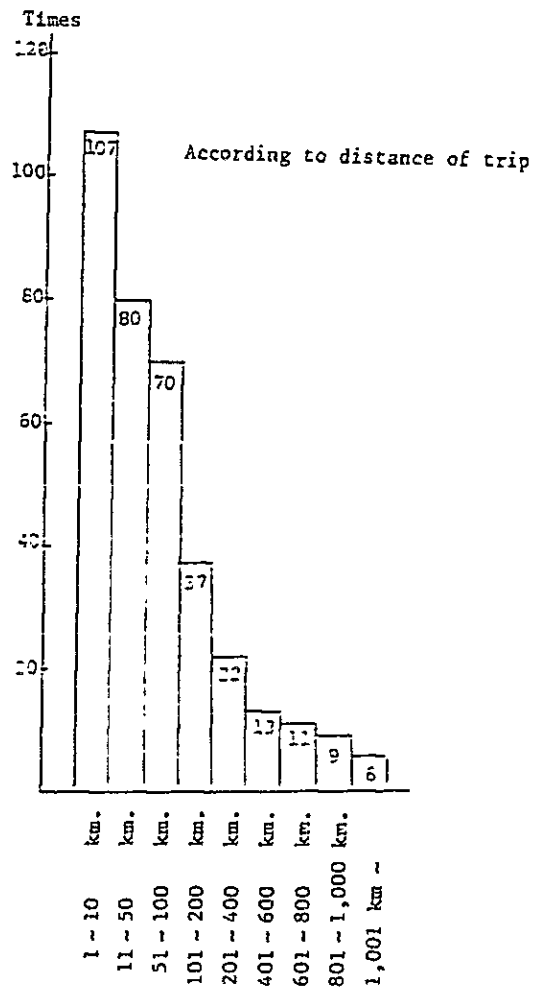
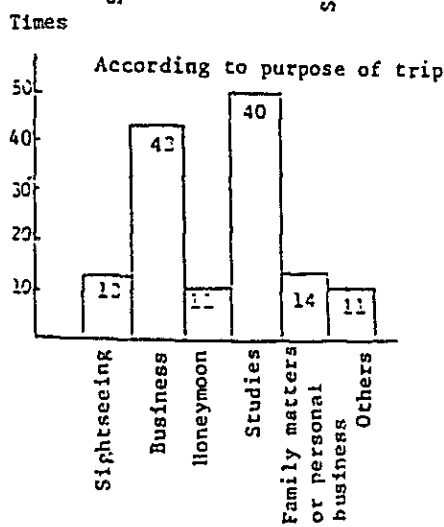
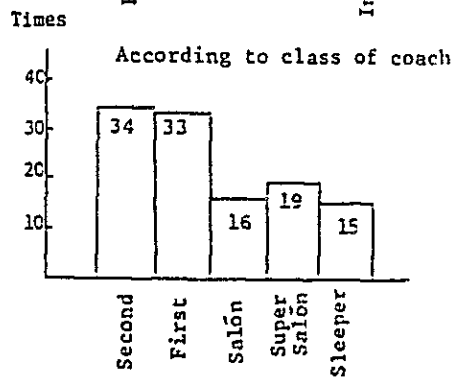
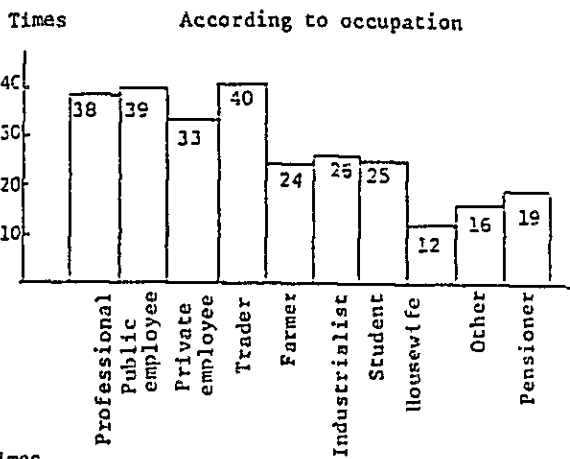
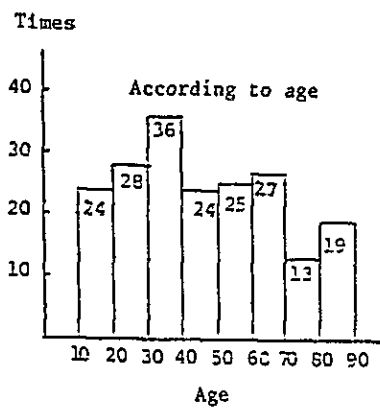
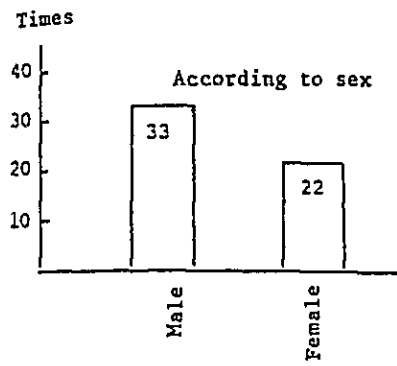


Fig. IV.7.9 Annual Frequency of Trips

Table IV.7.15 Opinions on the Services Offered Inside the Train

Qualification	Good (%)	Regular (%)	Bad (%)	Service not Available(%)	Average points
Total	44	25	4	18	+ 0.55
Train					
T 1023/1024	59	21	4	10	+ 0.65
T 9/10	45	24	4	18	+ 0.55
T 7/8	33	29	4	21	+ 0.43
A 1007/1008	48	26	6	14	+ 0.52
A 1001/1002	31	28	7	23	+ 0.36
T 5/6	38	28	2	22	+ 0.52
A 503/504	49	19	1	22	+ 0.70
Class					
Second	43	22	3	19	+ 0.58
First	42	25	3	21	+ 0.55
Salón	56	23	6	12	+ 0.59
Super Salón	46	28	7	11	+ 0.48
Sleeper	43	32	10	6	+ 0.39

Note: Points Average has been calculated on basis of:

+1 = Good, 0 = Regular and -1 = Bad.

(14) Possession of credit cards

Among the passengers, credit card holders are few, since only 144 out of the 1,941 passengers reported this; which makes a percentage of 7%. If we include such cases as were not able to declare possession, the percentage would be 9%. A count of the number of DINERS & VISA cards held, showed that these accounted for practically 40% of cards held by passengers respectively. Following on from this, were MASTER-CARD with 19% and AMERICAN EXPRESS with 3%.

Within the classification of occupations, the professional persons were seen to be the highest number of holders (leaving out those who did not specify) after which a figure of 26% for the industrial workers was detected, although this figure lacks reliability due to the small number of persons surveyed. For the other occupations, percentages were under 10%.

Within classification by age, the 40 ~ 49 years range reflected holdings of 14%, while those in the 30 ~ 39 years group with 13% of holdings, were the next highest.

(15) Passenger's free opinions

On this subject, 1,481 persons out of the 1,941 surveyed - which is a percentage of 73% - registered their opinions which on average covered 1.3 aspects. Out of the main opinions, the followings are mentioned : -

- Condition of washrooms (made by 36% of the persons giving the 1,418 replies):

- a) Hygiene of the washrooms
- b) Cleaning of washrooms
- c) Lack of water
- d) Supplies of toilet paper, towels, soap & mirror

- Improvement of coaches (29%):
 - a) Modernization of the coaches
 - b) Improving the interior and exterior appearances
 - c) Condition of the seats
 - d) Condition of windows and curtains
 - e) Improvement of interior lighting of the coaches
 - f) Condition of the doors

- State of heating and air conditioning (27%):
 - a) Installation and improvement of installations for heating & air conditioning, control of temperature and heating for the Second Class Coaches

- Improvements of train services (17%):
 - a) Background music broadcasting
 - b) Installation of television sets, ash trays and waste bins
 - c) Lower prices for meals
 - d) Reduce the number of vendors, and prevent them from shouting
 - e) Tableware hygiene
 - f) Facilities for babies
 - g) Designation of no-smoking coaches

- Punctuality of train departures and arrivals (14%):

- Improvement of sales system (9%):
 - a) Raising of discount rates for various classes
 - b) Abolition of penalty system
 - c) Discounts for regular users
 - d) Introduction of book of tickets
 - e) Introduction of computer
 - f) Improvement of tariff system for children
 - g) Sale of round trip tickets
 - h) Introduction of reservation by telephone

- Improvements in attendance to people and in giving information (8%)

- a) Display of station timetables inside the trains
- b) Information on delays
- c) Guidance about connections of trains and buses
- d) Announcement when train is to stop at a station
- e) Clear and rapid indicators for emergency situations
- f) Improvement in attention to passengers

- Opinions about the Timetable Diagram (6%):

- a) Higher frequency of services
- b) Completion of branch lines
- c) Re-Operation of the 31/32 train
- d) Implantation of the Concepcion--Puerto Montt service
- e) Increase in stops at stations
- f) Modifications to departure and arrival times

- Increasing the speed of the services (6%):

- a) Reduction of stopping time at stations
- b) Reduction in station stops

- Reduction in tariffs (5%):

Further to this, favorable opinions about the railways were received with kind replies from 5% of the passengers. Out of other opinions, the following can be mentioned:

- Make it possible to have hotel and other accommodations arranged.
- Continuation of restaurant service, but with higher quality.
- Checking in time for the Auto-Train, which at present commences two hours in advance, makes a long wait necessary until departure time.

- Increase the assignment of reserved seats for local stations.
- Prohibition of vendors from entering the train, without authorization.
- Completing the announcements of various classes, redecoration of the waiting rooms. Improvement to the ticket sales windows, and general improvement of the stations.
- More courteous treatment by personnel, and improvement of the interior and exterior appearance of the coaches, otherwise passengers will be lost because of small details.

IV.7.4.7 Opinions on the results of the survey

Some of the aspects which it has been possible to appreciate as the result of the investigation by survey, which on this occasion has been conducted with the collaboration of Southern Railway, will be described below.

(1) Design of Questionnaire Form

- 1) It is necessary to make the form clearer for those passengers who change trains during their trip; since it is not made clear which is to be stated; that is, whether or not it should be the very first station where they took the train and the final destination or else the boarding and alighting stations used for the particular train in which the questionnaire form had been received.
- 2) With the object of knowing the different journey flows, it would be desirable to investigate which are the departure and destination points of passengers, including those sections travelled by other means of transport.

- 3) Under reasons for travel, it has been possible to see many replies in the space labelled "Other Reasons", which mention family matters, private business, illness, medical consultations, work, etc. In this case, it would be more useful if the design of the form allowed for separation of the reasons, such as family matters, private business, work purposes, etc.

Although in the case of the spaces for Business and Work, this lacks a finer definition, these two could be combined into one section.

- 4) In the case of accompanying persons, it was not clear if the original person should, or should not be counted in, so that this ambiguity has caused some misleading replies. In almost all cases, it was not clear which quantities should be referred to, which has meant that this has been a hindrance in completion of the computations.
- 5) In connection with the reasons for using rail services, it was noted that many passengers marked 5 ~ 6 motives, but it would be helpful if they had been urged to denote the main objective of trip.
- 6) In connection with Questions 6, 7 and 8, it would have been more effective to divide the space marked "2 ~ 7 days" into more defined periods, such as: "2 days", "3 ~ 4 days" and "5 ~ 7 days". Some difficulties have arisen during study of the forms, due to the fact that questions have not been sufficiently detailed.
- 7) A low coefficient of valid replies has been found, in the cases of Questions 7 and 8, due the difficulty of understand them.
- 8) With Questions 10 and 11, it would have been advisable to unify the classifications into the following six

degrees, in to be able to make a comparison between the two questions:- "Very good", "Good", "Regular", "Bad", "Very bad" and "Not interested".

- 9) In the question connected with what aspects of train service should be improved, it has been found that passengers have made replies about items outside the scope of train service.
- 10) With regard to annual travel frequency, it would have been preferable for the replies to be answered on the basis of a complete outward and return journey. Consequently, the lack of clarity in the form gave rise to replies which did not make it clear if the journey in question was one-way only, or round trip, which condition made computation of the data difficult.
- 11) Among the replies concerning frequency of using the train services, lack of familiarization with regard to the replies was noted, producing some answers which proved impossible to assess quantitatively, such as : Some, Much, Several, Always, etc.
- 12) Some deficiencies in the classification of the occupations existed, and even if a specific section would have been applicable, many persons made their entry in a section for other occupations.
- 13) In order to facilitate computation of the data, it would have been desirable for all the questions to have been designated numbers.
- 14) Computation of the data has been made extremely difficult, due to the different ways in which passenger surveyed gave their answers. It would have been better to illustrate ways of answering, with examples given of such replies, which would make it clear where to put the marks.

(2) Other Comments

Normally in Japan, a section is established, upon which survey is done, and the data devolving from this are dealt with. However, the investigation executed by the questionnaire done on this occasion have proved very valuable, due to the fact that the survey was accomplished over the whole sector from the departure station to destination station of the train, by which numerous questionnaire forms were obtained with a very wide range of features.

Furthermore, of great assistance in the processing of the data, has been the fact that the surveyers have noted down data such as the date, train number, classes, coach numbers and the time the survey took place.

IV.7.4.8 Results of the analysis of the survey

(1) Improvement in the Services

Even though many users of the railways make use of the services by virtue of safety as the first aspect, and comfort as the second factor, this does not mean that they are satisfied with the service.

As to the human factor services, wishes have been expressed for improved issue of information (such as reports on delays, announcing stops at stations, etc.) and more courteous manners when attending to people (it is thought that the train services are run by railway personnel, etc.) whilst as to services of a material nature, opinions were expressed about betterment of the services, in an extremely detailed manner, which included the rolling stock equipment (improvements connected with washrooms, heating and airconditioning installations, etc.), installations in station buildings (improvements to the waiting rooms, etc.) and improvements to the tracks to increase train speeds.

In view of the fact that the improvements which can at present be made within railways, are those which depend on human factors, it would be advisable to carry out total studies, placing oneself once more in the position of the users, so as to be able to give the sort of service which will ensure greater comfort.

With regard to those improvements of a material nature, these will have to be carried out slowly, step by step, in line with annual programs, since it would be impossible to bring about such improvements in one attempt.

(2) Focus on future measures for increasing income

The sectors over which there are seen to be greater flows of users, have lengths of 200 to 400 kms., and these are the sections of Alameda --- Talca (249 kms.) and Alameda --- Chillan (398 kms.) This tendency was shown by the departures and arrivals of the trains in both directions during the year 1981.

Furthermore, the sections with the large flow of passengers during 1981 were the following, in order of importance:

Table IV.7.16 Sections with Large Passenger Movement in Order of Importance

	Stretch for downward train	Stretch for upward train
1	From Santiago to Talca (Approx. 250 kms.)	To Santiago from Talca
2	From Santiago to Chillán (Approx. 400 kms.)	To Santiago from Chillán
3	From Santiago to Curicó (Approx. 190 kms.)	To Santiago from Concepción
4	From Santiago to Concepción (Approx. 570 kms.)	To Santiago from Curicó
5	From Santiago to Linares (Approx. 300 kms.)	To Santiago from Linares
6	From Santiago to Rancagua (Approx. 80 kms.)	To Santiago from Temuco
7	From Santiago to Temuco (Approx. 700 kms.)	To Santiago from Rancagua

In addition to the aforementioned sections, passengers are numerous on the section between Concepción and Laja.

Within the tendencies to use rail services according to distance, it is noted that a high proportion of the users of First and Second Class are young people, up to a distance of about 200 kms. from Alameda.

In the case of distances around 400 kms. from Alameda, the trains with Salon, Super Salon, etc., are being used, but it is considered that conditions existing with the Southern Railway are such that the latter can compete with the bus services which cover the same route, from the point of view of safety, comfort, and also speed (electric-car).

In view of the fact that the services most appreciated by users are safety, punctuality, comfort and speed, it is necessary to think of a method of attracting bus users to the rail services, therefore the way of launching publicity campaigns must be thought out.

It would be possible, for example, to think about improving means of transport which would then improve communication with the surrounding zones of the main stations such as Talca, Chillan, Concepcion, etc., entering into transport contracts for interchange traffic, to establish overall transport conditions with the buses.

Further, it would be advisable to plan services directed towards the young groups, because already the proportion of young people among users is high. [About 55% of user passengers belong to the youthful 20 to 39 year group].

On the other hand, it is evident that the present situation is holding down the movement of those Chileans who like to get out and enjoy travelling, because of the severe recession affecting Chilean economy. Nevertheless, the desire which Chileans have for taking trips, continues to

urge strongly, so that it is felt that the flow of users could grow if schedules for accessible journeys were offered, which could serve as an incentive to those potential users.

Meanwhile, taking into account the numerous passengers who travel for business, services will have to be developed, to be directed at the businessman, to stimulate ideas for measures to increase income which bring about immediate effects by means of promotion centered in firms and various organizations.

IV.8 PUBLICITY ACTIVITIES

With the aim of increasing future demand for transport, a study must be made of the publicity activities, and the propagation it has been carrying on, and what methods can be conceived to draw users of other means of transport, so that it becomes necessary to make a study of the shape and form of future publicity campaigns and propagation by railways.

Out of the various methods of publicising, the following two can be mentioned : -

- 1) Publicity
- 2) Advertisements

When studying the criteria and basic ideas of the railroads, concerning this theme, it is possible to consider the following aspects:

IV.8.1 Publicity

As far as publicity is concerned, it is felt that the railways, in their way, are taking efficient use of the medium. That is to say, alterations to train timetables and changes in the tariffs are published gratuitously through the medium of the newspapers and, in the case of new facilities, such as meals service in the trains, press conferences are arranged, whose contents are made known to the public by the newspapers, which is a free form of publicity.

However, during the planning of new services no aggressive actions are undertaken, as can be seen in the case of Japan, where prior to new services being launched on the market, members of the press are invited to orientation meetings, or announcements are made in the press, while in the case of Chile, diffusion of such services, etc., is left only to those who have used the services to pass on the information by word of mouth.

This type of propagation through the comments of users is obviously an effective way of achieving such diffusion of information, but the risk is run that the true make up of the services may not be passed on with accuracy due to the subjectiveness existing among human beings.

Therefore it is necessary that the Southern Railway should make use of the publicity function so that the features of services, and planning of new services, get through to people, but in the correct way. In this way it is felt that diffusion via comments of users will have greater effect.

IV.8.2 Advertisements

Bound up with the basic criteria covering publicity, it is the policy to carry this out on the basis of annual budgets whose amounts are kept down, and do not actually suffice to support adequate publicity activities. Nevertheless, some campaigns are being got under way, to attract members of the public to the railways, by means of advertisements in the newspapers, and the designing and display of posters specifically for cases such as the following : -

- a) Peak passenger season (December -March).
- b) At the time when various kinds of commemoration celebrations are being organized (Independence Day, Armada Day, religious processions, etc.).
- c) Around the time for year end vacations

Due to set-up whereby the National Management of Tourism involves itself in the preparation of posters about tourist centers which have a close relationship with the operating of the railway passenger services, no ideas have been worked out at present as to undertake any activity which would be appropriate for the railways themselves.

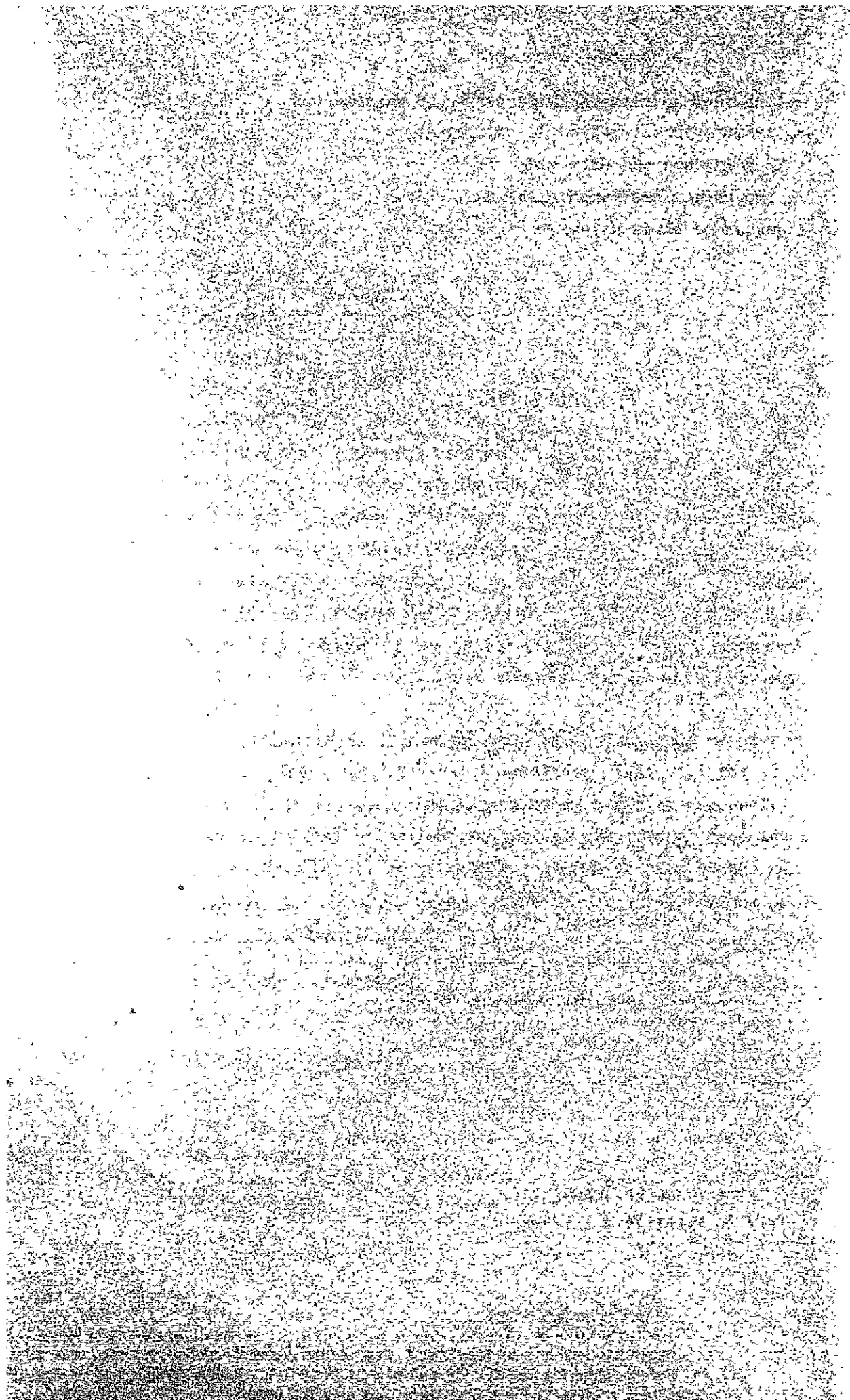
Regarding this, the Chilean State Railways must upgrade their promotions by integrated advertising with tourist centers, etc. The railways are responsible for preparation of all information concerning timetables, fares and sales details, and they distribute this through stations, etc. The opposition transportation system, namely the bus lines, provide pamphlets detailing the fares, timetables not only in the bus terminals but also in tourist centers, hotels, etc. This shows the enthusiasm and vigor of the bus promotions. Therefore the Chilean State Railways must reduce the per unit cost of advertising material by greatly increasing the number of items printed. Also such outlets as hotels and tourist centers must be utilized more fully.

In addition there is another more effective means of advertising, namely through travel agencies. This will change the emphasis of a travel agency from being a ticket purchasing office, to that of an advertising center. Travel agencies are generally found in prime locations in the center of the city's business and shopping areas. Therefore these locations provide the most valuable opportunity for displaying posters, etc.

From such connections with travel agencies, great benefits should result for Chilean State Railways.

Indeed, any action on such a matter would need an approach to Tourism be done to find measures which will indirectly stimulate use of the rail services, by going ahead with vigorous diffusion of informative matter which would have the effect of strengthening confidence in the railways, by such factors as safety, human factor services, comforts & facilities, etc.

V. TELECOMMUNICATION EQUIPMENT



V. TELECOMMUNICATION EQUIPMENT

V.1 GENERAL ASPECT

The actual state of telecommunication equipment were investigated.

Transmission equipment are of aerial open wire along railway track lines, and the operation rate and communication quality are very bad.

As shown in the daily failures of the communication line, the stability and quality of communication is generally in bad condition, and the grade of understanding and clearness is low.

Because of the importance of this private lines to effect directly on the train operation, it is important to improve the rate of operation of telecommunication line and the quality of communication. For the solution of these situation, improvement of telecommunication transfer system and utilization of public telephone line will be proposed.

With respect to the dispatching telephone, they are used for the communication between Control Center and Stations to control train operation and car distribution, but their age is overpassing 100 years, resulting in deteriorated and bad communication quality.

Dispatching telephone is used for the fundamental informations for train operation.

For that sake, they should be of high reliability and in good quality, and of easy manipulation.

It is necessary to introduce new equipment for precise transference of dispatching orders and for gathering informations.

These improvements designs are of outline, and for deciding the introduction, the other feasibility study should be executed for checking the possibility from the technical, political and economical viewpoints.

V.2 GENERAL DESCRIPTION OF THE INSTALLATIONS

The principal installations of telecommunication of the Southern Railway are mentioned in the following.

V.2.1 Equipment of Transmission

V.2.1.1 Aerial wire

Cable is used for the connection between installations, and in some sections, however open wire copper line is generally used. The copper line in use is of # 10 A.W.G.(American Wire Gauge) with a cross-section of 4.9 mm². In past time, iron line was used for the prevention of accidents by theft in an experimental way, but nowadays copper open wire is used in all places. As for the support of communication line, wooden or iron posts of single construction are used generally, but in some places posts with oblique support are used.

V.2.1.2 Wave carrier of telephone system

The communication transmission line is composed of the aerial open wire (# 10 A.W.G.) and open wire of wave carrier lines which run parallel with the railway track.

Until May, 1982, there existed two systems:

Santiago - Puerto (three channels), and
Santiago - Concepción (twelve channels).

Nowadays only the latter system is being used. The cities in which the telephone wave carrier is being assigned are Santiago, Talca, Chillán and Concepción.

Among these 12 channels, 6 channels are used actually as follows;

- Three channels are used for Talca (one channel is connected to Chillán), and
- The other three channels are for Concepción.

The band of frequency which is used for the transmission from Santiago to Concepción is 36 ~ 84 kHz, the band of frequency for the reverse direction (i.e. from Concepción to Santiago) is 92 ~ 143 kHz. Each telephone channel has a band of 4 kHz.

v.2.1.3 Radio communication system

Small network of radio systems of HF and VHF is used in local areas as follows:

(1) Transandino radio system (HF)

This local radio system is used in the region of Los Andes of Transandino Railway Line. This system is composed of the fixed stations in Los Andes, Juncal, Portillo and Caracoles. It is used for exchanging business information. The radio base is in Santiago also, and, if the command telephone is collapsed because of avalanche in winter time, the radio system will work like a supporting system of command service telephone to communicate with Los Andes.

The frequency used for this system belongs to HF band, the modulation system is SSB, and the transmission power is of 50 W.

The following four frequencies of F1 ~ F4 are used:

F1 = 3.293 MHZ
F2 = 4.9165 MHZ
F3 = 4.58 MHZ
F4 = 6.80 MHZ

Generally the F2 wave is used.

The equipments were made by a French company named Thomson CSF in 1965.

(2) Radio HF network of electric substations

This radio system is used for the communication among substations. The substations in Santiago and Bulnes are connected with special underground cable line, but for the mutual communications among other substations, equipments of radio system are used. The radio stations are inside the substations of Concepcion, Quilacoya, Laja, Monte Aquila and Curico.

The frequencies used for this system belong to the HF band. The modulation system is of SSB, and the transmission power is 50W.

Four frequencies in use are as follows :

F1 = 3.8325 MHZ

F2 = 6.78 MHZ

F3 = 9.105 MHZ

F4 = 11.645 MHZ

Usually F2 wave is used.

The equipments were made by a French Company named Thomson CSF in 1965.

(3) Movable radio system (VHF)

The movable radio system is used for information exchanging among important persons and personnel of security service in the Chilean State Railways. This radio system is composed of fixed stations and movable stations which are on the automobiles.

Fixed stations are in Head Office of the Chilean State Railways, in Alameda Message Center and in San Bernardo. The frequency used for this system is 168.87 MHZ. The equipment was made by an American company named WABCO in 1964.

v.2.2 Equipment of Exchanger

v.2.2.1 Telephone exchanger (central exchanger)

There are PBX exchangers with capacities of 20 - 200 lines, which are used for the mutual communication among organs in determined areas.

The communication inside a determined area can be connected directly by dial, but the communication to other areas should be served by operator of the exchanger board.

The installed condition of the telephone exchangers is shown in Table V.2.1.

Automatic exchangers are generally of XB type (crossbar type).

Table V.2.1 Location of Telephone Exchanger

Region	Place of Installation	Type
Baron	Inside of Baron station	PBX-100
Calera	Signal cabin of Calera station	PBX-35
Llay-llay	Signal cabin of Llay-llay station	PBX-30
Santiago	Central railway supervising office	UB-1200
Santiago	Head office	UH-200
Rancagua	Inside of Rancagua station	PBX-30
Curico	Inside of Curico station	PBX-30
Talca	Inside of Talca station	PBX-506B(2)
Linares	Inside of Linares station	PBX-20
Chillan	Inside of Chillan station	PBX-506A
Chillan	Inside of Chillan signalling office	PBX-506B
San Rosendo	Inside of San Rosendo station	PBX-20
Concepcion	Inside of Concepcion station	UB-200
Temuco	Inside of Temuco station	PBX-50
Valdivia	Inside of Valdivia station	PBX-50
Osorno	Inside of Osorno station	UH-60

V.2.2.2 Central telex exchanger

This is used for central telex exchanging system. For this exchanger is used an equipment of the type XB. The central telex exchanger is inside the Central Railway Division of Southern Railway in Alameda.

By using microwave of ENTEL (Chilean company of telecommunication), principal cities are connected with each other by teletype equipment.

By a contract with the telecommunication company, about 300,000 pesos are paid every month for borrowing 14 channels of telegraph. The telegraph channels can be used 24 hours of a day.

The principal specifications of the system are as follows:

Exchanging method:	circuit exchanging system
Calling method:	by internal code number
Connection method:	one phase connection
Velocity of transmission:	50 baud
Control signal:	begin + 20 mA stop - 20 mA
Communication current:	mark + 20 mA space - 20 mA
Electric power supply:	48 volts for control

Above equipment was made by Siemens Company. Capacity of terminal connection is 60 units.

V.2.3 Installations of Telephones

There are no railway telephone systems applicable for all over the country.

Principal telephone systems that are used actually are as follows:

v.2.3.1 Dispatcher telephone

The dispatcher telephone is used for the smooth execution of train operation control and dispatching service of freight cars, etc.

In this selector system, the central office equipment is connected with each station telephone directly in parallel by using a special line. Central equipment dispatcher can send their commands to each station individually or at the same time.

Each station can call dispatcher.

The telephone equipment of Chilean State Railways was made by Western Electric Company. By manipulating the selector key of central station, the impulse code are sent to the circuit through the path of selector box. Each selector of way stations are moved and the station corresponding to the code pulse will form the bell circuit to ring.

The selector circuits are of mechanical type and they are synchronized with the number of subscriber. The three impulse codes are fitted all to the ring type relay of a subscriber and then the bell circuit will be formed. The transmission electric power of dispatching station is 400 V (DC) and the power source of local circuit is 24 V (DC).

V.2.3.2 Magnetic type intercommunication telephone

This telephone is used inside the marshalling yards.

V.2.4 Telex

The purpose of Telex use is communication of business, transference of dispatching orders, and various reports. The total number of telex equipments in the Southern Railway is of 32. There are 2 units in the Northern Railway.

This telex network is formed through microwave network of ENTEL as mentioned before.

One of these 32 units of the Southern Railway is used specially for international telex service for exchanging informations concerning to transference of freight cars between Chile and Argentina, etc.

There are 10 typewriters with paper tape. The paper tape is the type of 5 units figures.

The disposition of telex typewriters is shown in Table V.2.2.

Table V.2.2 Disposition of Teletypewriters

Place located	Number	Type with paper-tape	ENTEL terminal station	Note
Santiago	20	8	Santiago	International 2
Concepción	2	1	Concepción	
Temuco	2		Temuco	
Osorno	1		Osorno	
Valdivia	1	1	Valdivia	
Chillán	1		Chillán	
Talca	1		Talca	
Barrancas	1		San Antonio	
Calera	1		Calera	
Puerto	1		Valparaíso	
Los Andes	1		San Felipe	
Coquimbo	1		La Serena	Northern Railway
Iquique	1		Iquique	Northern Railway
Total	34	10		

With respect to telexline, ENTEL circuit is used to connect, but for the connection among ENTEL terminal stations in cities, intermediate relay stations, and teleprinters use private circuit lines. The longest connecting line is in the case of teleprinter of Barrancas station of which the distance from terminal station of San Antonio is about 2 km.

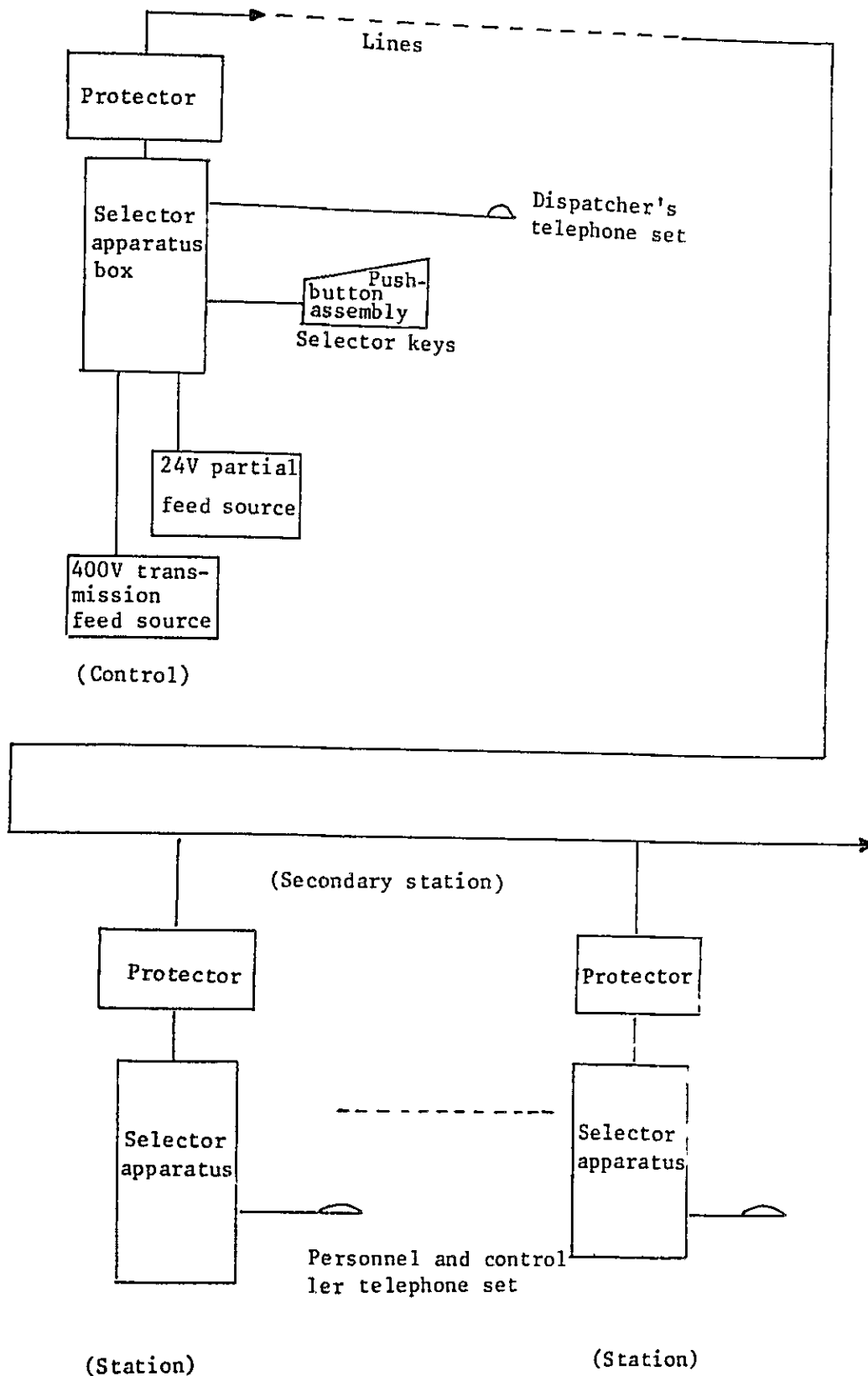


Fig. V.2.1 Outline of Equipment of Dispatcher Telephone

V.2.5 Electric Power Supply Equipment

As means of electric power supply equipment, there are batteries, current rectifiers, internal combustion engines, switches of exchanging of power supply source, etc.

V.2.6 Other Installations of Telecommunication

V.2.6.1 Equipment of amplifier

In major stations, 48 amplifiers are deposited for the guidance of passengers.

V.2.6.2 Interphones

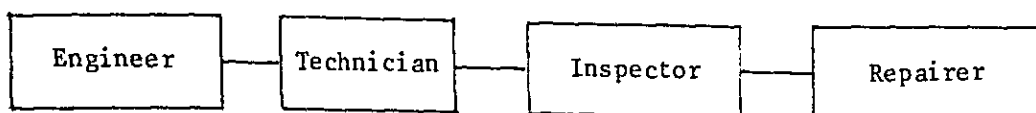
Interphones are used for calling secretaries.

V.3 ADMINISTRATION SYSTEM

V.3.1 Organization

The organization concerned to the control and operation of maintenance work of railway signal, posts and lines of communication is shown in Fig. V.3.1.

The installations of communication in and around Santiago city are maintained and repaired by the communication section of fixed installation department of the Southern Railway, but in other areas, facilities are responsible to the signal service sections of each Railway Divisions. The service depots of signal section are composed of signal dispatched section and inspection groups. The inspection group is engaged in the service work for recovering faults of installations of communication and signals in his area. The communication maintenance section of the installation department of the Southern Railway executes complicated recovering works of communication facilities which can not be achieved by signal inspection group. Principal organization of signal service depot is shown as follows.



The organization is changeable.

With respect to the telecommunication service depots, there are no independent depot in each Railway Division, and the works of telecommunication are belonging to the signal service depot. The communication section of fixed installation department of the Southern Railway is a part of administration, but actually is serving as an operating organ for the maintenance and repair work of the telecommunication equipment in and around Santiago City.

Fig. V.3.2 shows the organization and personnel of communication maintenance section.

V.3.2 Maintenance of Installations

Annual maintenance program is prepared concerning to each equipment. Generally the inspection works are executed periodically. The period of inspection of principal apparatus is shown in Table V.3.1.

Table V.3.1 Inspection Period of Major Installments of Telecommunication Equipment

Installation	Instrument	Inspection-cycle	Observation
Central communications instruments	Shelves	Every 6 months	29 shelves
	Rectifier	Every 6 months	
	Battery	Every 15 days	
	Selection dispatcher	Every 3 months	
	Lightning rods	Every 6 months	
	Circuit	Every 6 months	
Radio installations	Radio apparatus	Every 6 months	
Transmission installations	Transmitting Equipment	Every 6 months	
The instrument room is cleaned once each week			

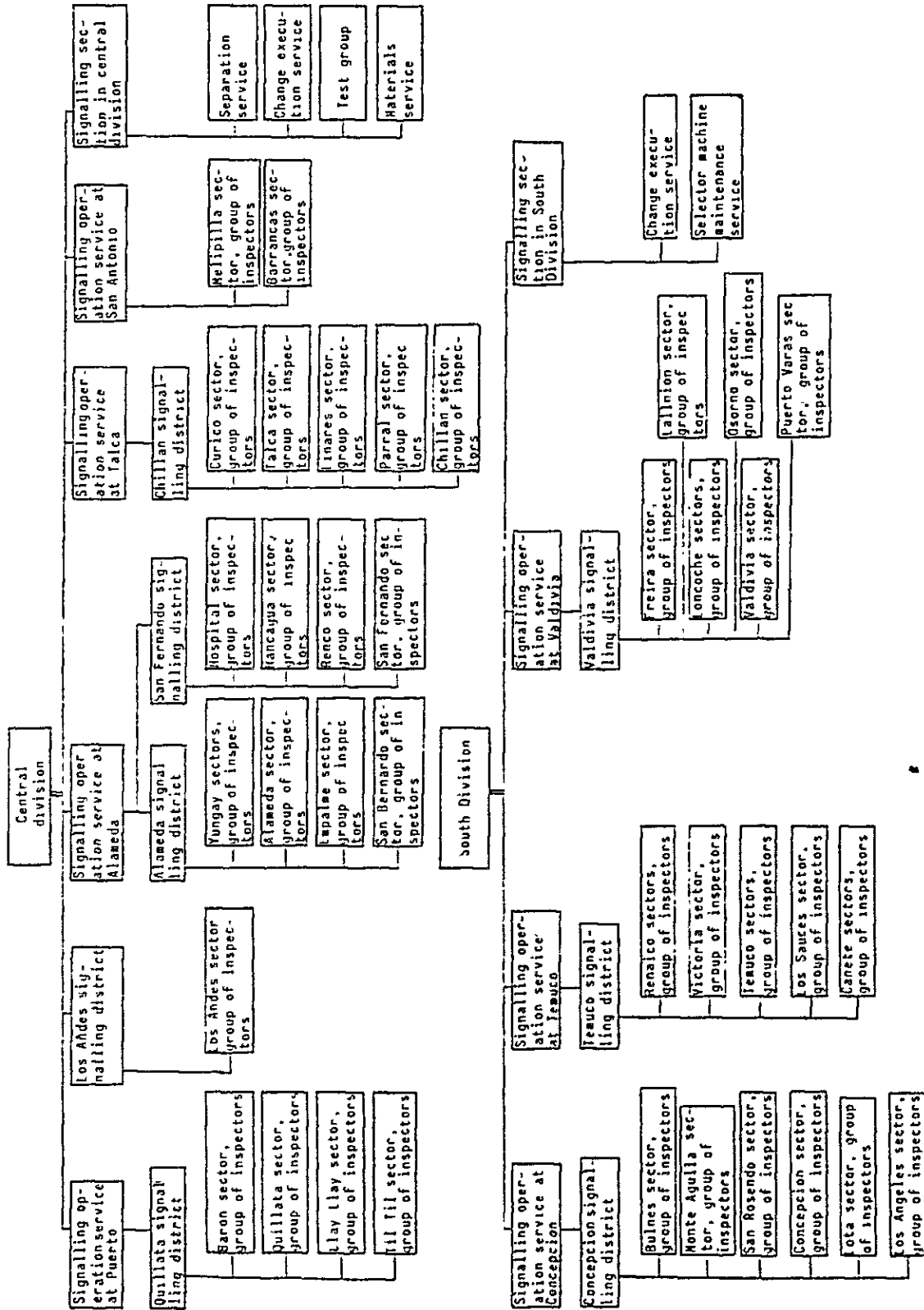
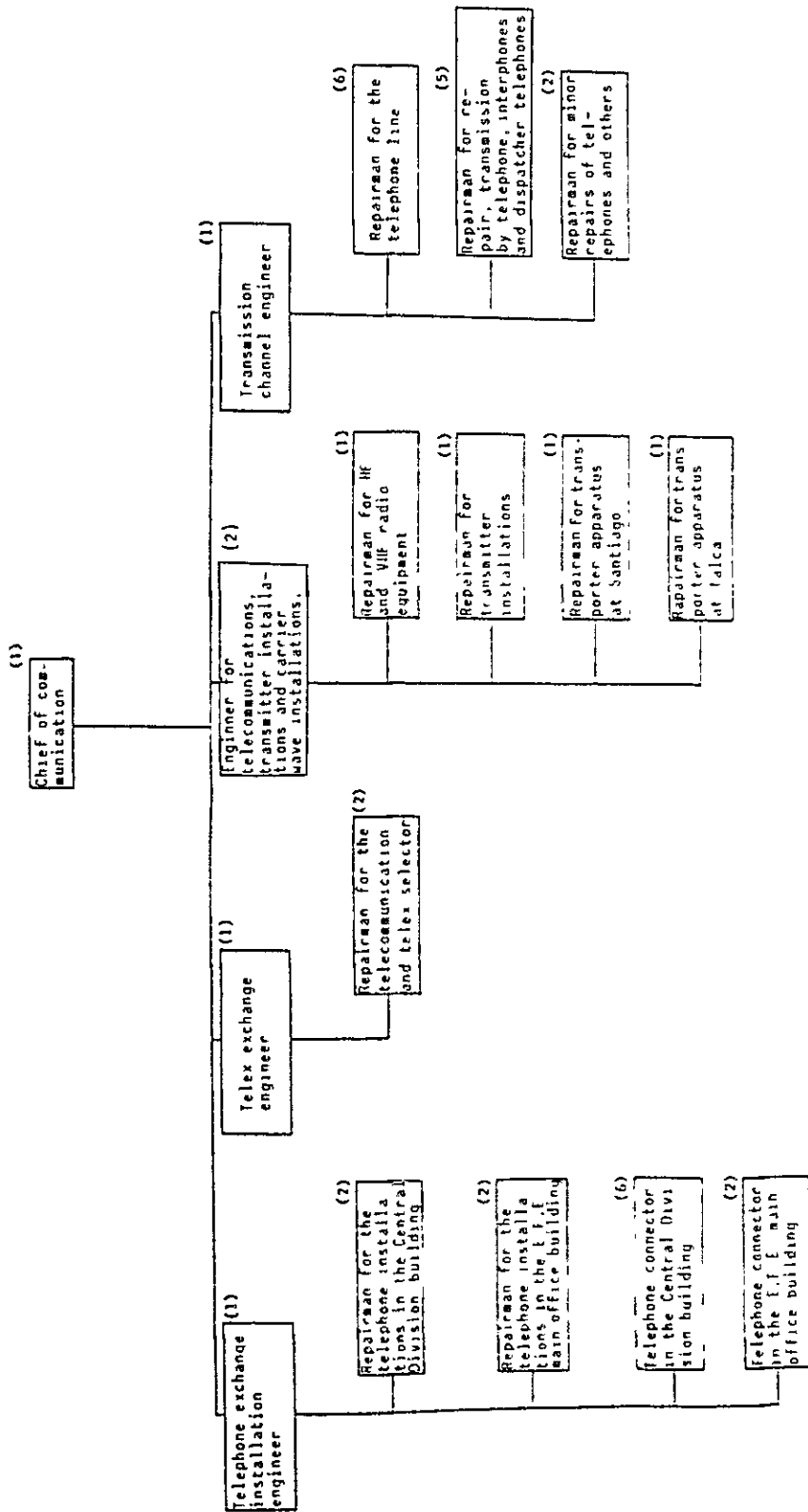


Fig. V.3.1 Organization of Supervising Telecommunication Equipment



Note The numbers within () indicate the number of persons

Fig. V.3.2 Organization of Telecommunication Section

V.4 PROBLEMS AND COUNTERMEASURES FOR IMPROVEMENT OF INSTALLATION

Based on the information acquired during on-site survey, the problems and countermeasures of improvement, concerning transmission equipment and dispatching telephone, are studied. Following measures are tentatively designed and, for that sake, feasibility study should be executed from the view points of economical and technical review more precisely.

V.4.1 Transmission Equipment

V.4.1.1 Problems

Aerial open wire is installed along the railway lines, and the operating rate of equipment and quality of communication are very low. As the failures of the communication lines are occurring daily, the stability of service is very bad. Only in and around Santiago city, the failures are occurring 5 ~ 6 times every day.

These failures are mainly caused of cut of line, short of circuit with earth or between lines.

About 80% of failures are related to theft of lines, fire alongside of railway line, or practical jokes. The place of thefts of line are limited.

The quality of communication lines are different depending on sections, but generally the degree of understanding and clearness are low.

V.4.1.2 Countermeasures of improvement

As this installation is very important to influence directly to the train operation and of exclusively owned private lines of the Southern Railway, it is necessary to elevate the index of operation rate and quality of communication lines.

As for countermeasures of above mentioned problems, improvement of communication transmission system and a way of borrowing the public communication lines are studied.

V.4.1.3 Improvement measures of communication transmission system

Without sufficient transmission equipment, telephones, teleprinters and others would not function well. But the cost of construction and maintenance of transmission equipments is fairly expensive. Therefore, improvement plans should be checked deliberately as shown in the following.

Generally cost of transmission equipment is proportional to the length of line, but not to the number of circuits.

This phenomenon is depending on the fact of the possibility of adopting duplication system and the outer treatment cost among the cable construction which is not proportional to the capacity of lines. Nowadays such communication transmission system is cultivated as to lower the cost per circuit according to the increase-ment of number of circuits.

The adoption of track line with necessitated capacity for the future modernization of the Chilean State Railways might be the most economical way of improvement ultimately.

(1) Telecommunication transmission system

The communication transmission system is classified to the short distance transmission system (shorter than 30 km) and to long distance system.

(2) Short distance transmission system

By this time the aerial open wire, aerial cable, and underground cable which use the core wire are cheap for construction. But in the case of open aerial wire system, the characteristic is influenced easily by atmosphere.

(3) Long distance transmission system

Multiple radio communication system and multiple communication system with line circuit are existing for long distance transmission.

1) Multiple radio communication system

Multiple radio communication system is to connect visible fixed stations with radio wave of 400 MHz, 800 MHz, 1,500 MHz and 6,000 MHz. By one radio wave there can be transmitted multiple telephone communication waves. The number of multiple circuits of each wave is approximately as follows ;

400 MHz	- - - - -	60 circuits
800 MHz	- - - - -	60 circuits
1,500 MHz	- - - - -	120 circuits
6,000 MHz	- - - - -	960 circuits

This radio system has a stable characteristic except of fading time and to be able to compete with actual line carrier system also in long distance.

In most cases the cost of radio system is cheaper than actual lined system, but this system requires cable lines in short distance communication. For that sake, it is necessary to compare economical priority. Furthermore, it is necessary to install intermediate radio stations in each 20 - 50 kms. Sometimes, the intermediate radio stations should be constructed on the top of mountains and it necessitates the construction of road, installment of power supply equipments of alternative current, etc. These factors demand precise investigations for the calculation of cost.

2) Multiple communication system by using line

Multiple communication system by line is classified as follows ;

- Open wire carrier system	-----	3 CH, 12 CH
- Cable carrier system	-----	12 CH/one system

- Coaxial cable carrier
system with thin wire ----- 300 CH, 600 CH, 960 CH
- Light fiber carrier
system ----- 30 CH, 120 CH, 480 CH

The application of above mentioned systems can be considered as follows approximately.

a) Open wire carrier system

This system can be used up to 12 circuits and for long distance sections, but there are defects that the group of open wire are limited for use of one system and the characteristic of carrier are changeable according to the variation of weather. Furthermore, maintenance of open wire is troublesome. This system should be considered as provisional one.

b) Cable carrier system

This system constructs 12 circuits by one core wire of communication cable. By increasing number of core wires, there can be created a great capacity of communication circuits. This system is very stable and suitable for the communication system within a few hundred kilometers.

But this system requires the installment of communication line, demanding fairly high cost. For that sake, for elevating up economical effects, communication cable are adopted the compound cable which connects short distance core wire and core wire for carrier use generally.

c) Carrier system by thin core wire cable

In the case more than 300 circuits, this system works economically, and the compound cable with core wire

for short distance use and core wire for carrier use with the same reason above mentioned.

d) Light fibre carrier system

Above mentioned 3 systems are of the frequency divided multiple system (FDM system).

This light fibre carrier system is of dividing time multiple system (PCM system). PCM system is suitable for the data transmission and has a high faculty of performance. For the future modernization of EFE, the utilization of computer system might be added.

By considering these situations, this PCM system is considered recommendable one. PCM system is classified as follows according to the adopted cable.

Normal cable system

Light fibre system

The latter system can provide longer distance section and is influenced little by noise disturbance of elec-trified railways. For that sake, light fibre carrier system is being adopted in many countries nowadays more and more.

(4) Cost comparison of each improvement measure

1) Model of improvement transmission system

The cost of transmission system varies according to the distance and number of circuits greatly, and it is necessary to compare the construction cost with determined model. Following models are prepared for comparison of cost performance.

a) The section between Alameda and Concepcion with a distance of 568 km.

- b) As minimum necessary number of circuits for railway service are considered following two systems.

Plan A - For dispatcher of traffic control, car distribution dispatcher, telex service, etc.
= 12 circuits

Plan B - Including 12 circuits of Plan A, for railway telephone circuits, and computer communication use circuits.
= 120 circuits.

- c) As for the stations to which the above mentioned circuits are applied, the following three types are prepared.

Plan X - Between Alameda and Concepcion, three stations of Talca, Chillan, and San Rocendo use the circuits (Every 100 ~ 200 km).
Open wire is used for the communication with other stations.

Plan Y - In the same section above mentioned, improved telecommunication lines will be applied to 15 stations with average distance of 40 km.
In this case, in the cable carrier system the cable circuit will be used for the communication with above stations and open wire circuit lines will be used with other stations.

Plan Z - In the same section, all stations use the improved communication line.

- d) Combination with A,B plans and X,Y,Z plans are shown as follows :

- Plan 1 - Plan A and plan X,
- Plan 2 - Plan A and plan Y,
- Plan 3 - Plan B and plan Z.

2) Various improving measures concerning Plan 1

a) α Plan

For realizing Plan 1, actual open wire is used for carrier system. The circuit composition of this case is shown in Fig. V.4.1 and open wire carrier installations will be equipped in the sections of Alameda-Talca, Talca-Chillán, Chillán-San Rosendo and San Rosendo-Concepción. In this system, it is necessary to exchange the actual dispatcher system into the type of calling system using audio frequency which can be transferred by carrier device.

By doing this exchanging, the communication will be done in good condition by using open wire as of carrier line which is shown in Fig. V.4.1.

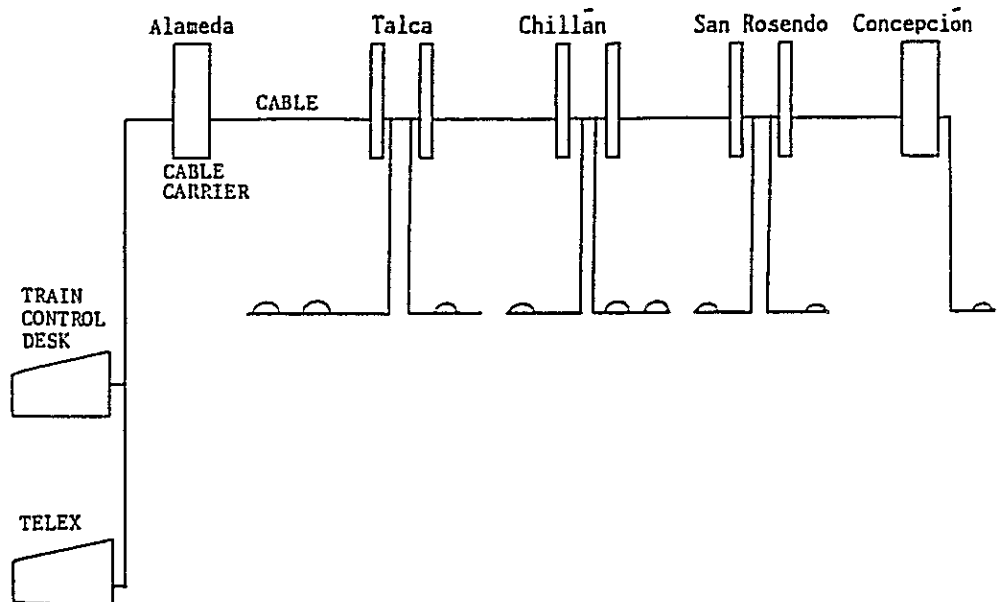


Fig. V.4.1 The Method of Using Open Wire for Carrier Circuit

b) β Plan

α Plan is using open wire for long section circuit and that system has a defect that the reliability is low. For that sake, by replacing the open wire by cable, similar system is realized as a plan. But for short distance circuit line, open wire should be kept to retain talk level. The problem of this case is the calculation of the number of core wire of the adopted cable. In Japan and in foreign countries 50 core lines telecommunication cable is used without trouble of replacing. Therefore, the 50 core wired and audio carrier compound cable is selected for this system. (See Fig. V.4.2)

c) γ Plan

When the multiple radio system is utilized for long distance circuit, the frequency band of 400 Mhz can be used if the capacity of communication is 12 CH and the average distance between radio stations is estimated about 30 Kms. for that sake, the number of radio stations becomes 21 stations. In this case, open wire is used also for short distance circuit. (See Fig. V.4.3)

d) Construction cost of Plan 1

Estimated construction costs of Plan 1 are shown in the following Table. Specially in the case of radio system, precise survey is required for actual decision. In the case of adoption of multiple radio system, the construction cost of road, iron tower, foundation work, etc. are not included. (This situation is similar in the Plans of 2 and 3.)

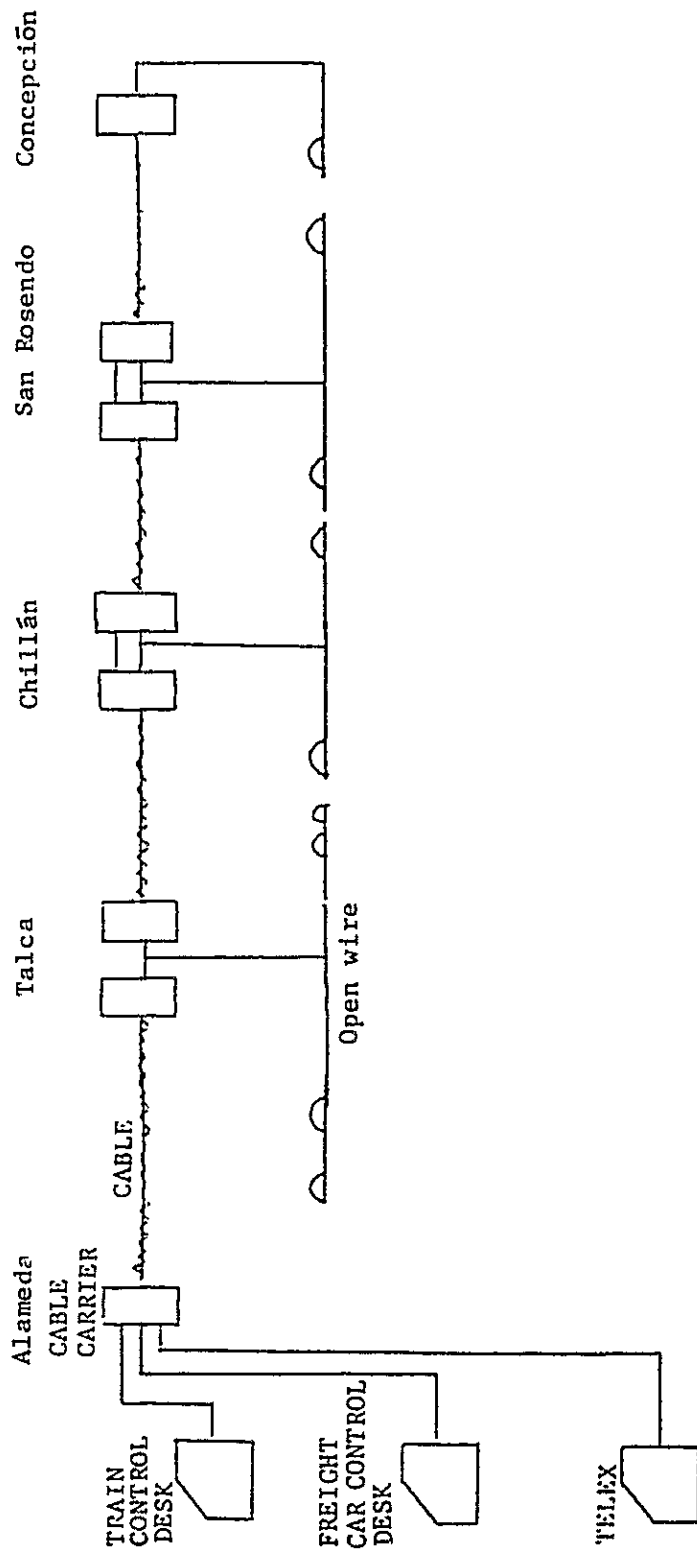


Fig. V.4.2 The Method of Using Cable for Carrier Circuit

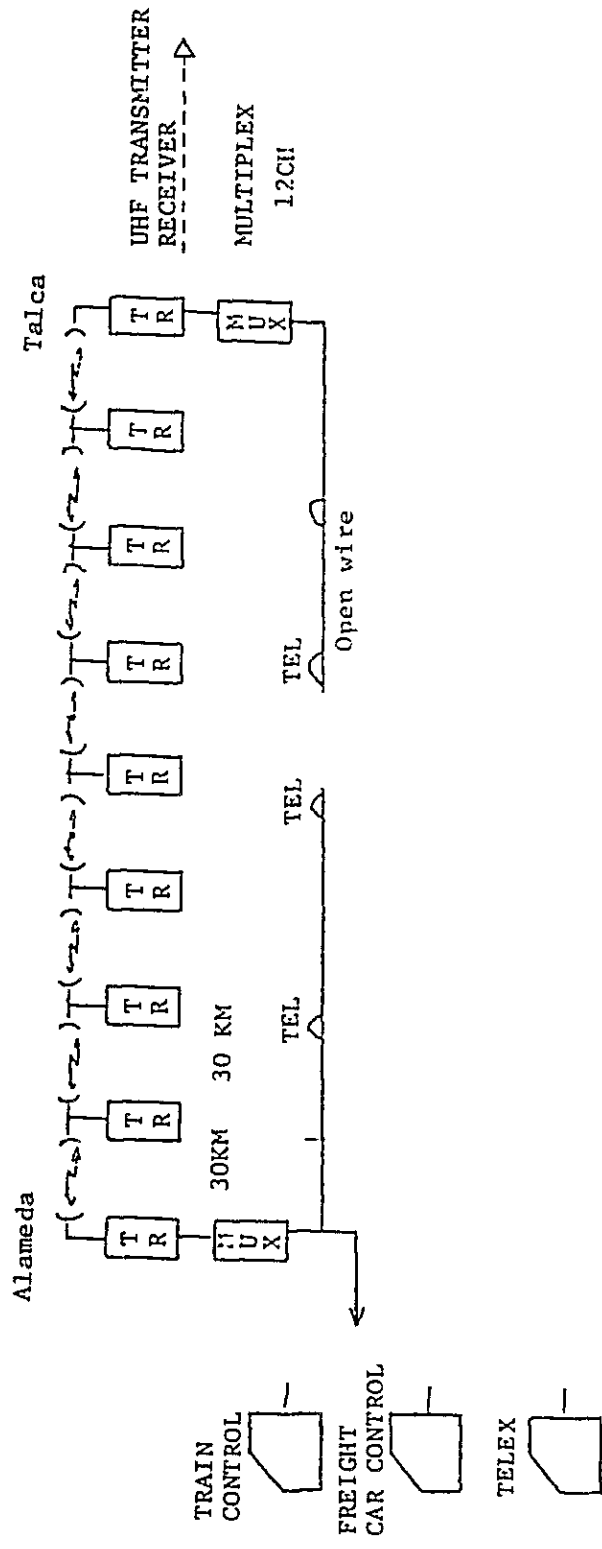


Fig. V.4.3 The Method of Using Multiple Radio System for Long Distance Circuit

Example of construction cost in Chile is also obscure and the examples of construction costs in other countries are adopted for the estimation calculation.

Plan	System	Cost Calculation (Estimated) (thousands of US\$)	Note
$\alpha - 1$	Carrier of open wire	600	Only carrier instruments
$\beta - 1$	Cable carrier	12,000	Including the 50 p cable.
$\gamma - 1$	Multiple radio	5,000	Including radio station and iron tower

Note: US\$ 1 = ¥ 245

3) Costs of various improvement measures of Plan 2

On the base of Plan 1 systems, the improvement plans of Plan 2 can be completed, by increasing the number of stations from 3 to 15. The calculation results of each α , β , γ Plans are shown in the following Table.

Plan	System	Cost Calculation (Estimated) (thousands of US\$)	Note
$\alpha - 2$	Carrier of open wire	2,500	
$\beta - 2$	Cable carrier	13,000	
$\gamma - 2$	Multiple radio	6,000	

Note: US\$ 1 = ¥ 245

4) Cost of various improvement measures of Plan 3

For the smooth communication with all stations, carrier terminal stations or radio stations should be installed every 40 Kms and from that stations telecommunication cable should be installed.

Furthermore, the circuit construction of 120 circuits should be determined for the design as a premise condition. For that sake, as a example, the circuit design is determined as shown in Fig. V.4.4 for cost estimation, in which all circuits are connected to Alameda.

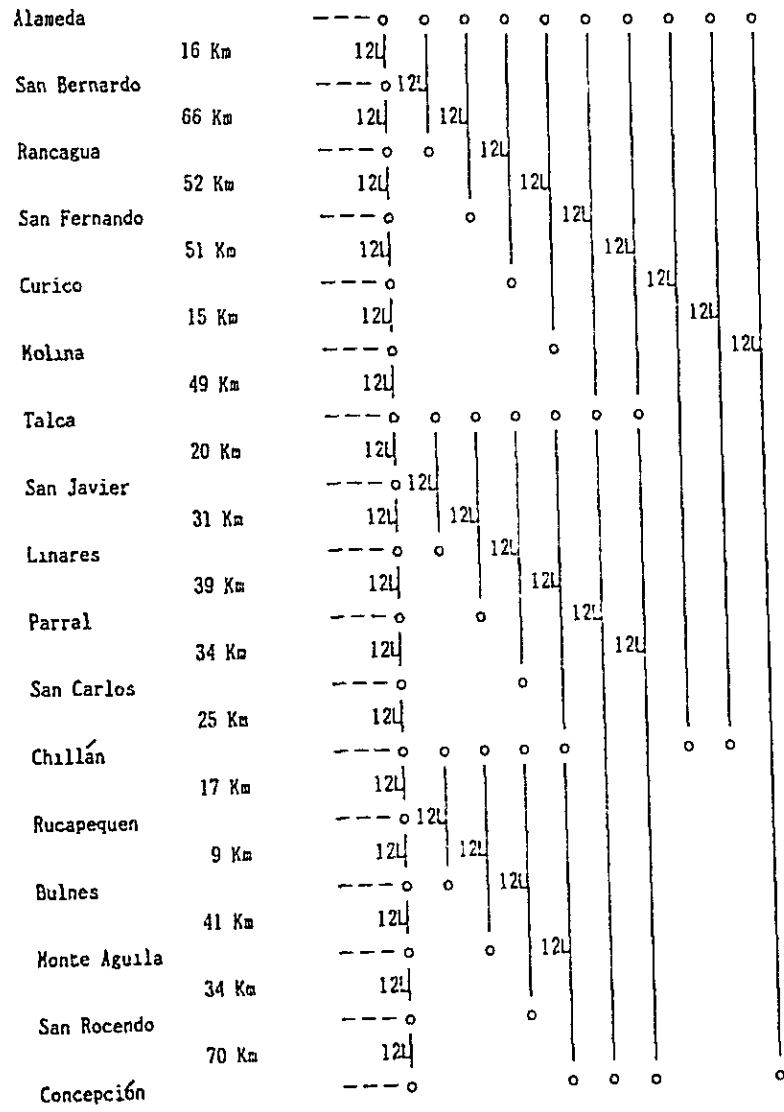


Fig. V.4.4 Example of Circuit Construction Among Stations (UHF Radio System)

This system can not be composed of the open wire system of Plan α , but two systems of the cable carrier system of Plan β or multiple radio system with local cable line can be applied. The estimated cost calculation of two systems are shown in the following Table.

Plan	System	Cost (Estimated) (thousands of US\$)	Note
$\beta - 3$	Cable carrier	18,000	
$\gamma - 3$	Multiple radio and local cable system	15,000	

5) Comparison of various plans

The results of various plans are shown in Table V.4.1. As shown in the Table, the cheapest plan per one circuit is $\alpha - 1$, with open wire system, but this system services only 4 stations. Furthermore actual open wire system does not act well for communication effectively.

The open wire carrier system of $\beta - 2$ has the faculty of communication up to 16 stations. But this system can not cover the defects of open wire system.

Cheap method in other plan per one circuit is the UHF radio system with 120 circuits. But the total construction cost is fairly high as of 15 millions of US dollars.

For that sake, the $\gamma - 1$ plan which can be reformed in future to the above mentioned system might be recommendable.

Because the construction cost of UHF system, as mentioned before, is variable according to the other conditions like geography, the presence of power source or not, etc., the actual construction cost should be determined by the execution of more precise study. The other systems, also, should be studied more precisely.

Table V.4.1 Comparison of Various Plans

Items	Plan							
	$\alpha - 1$	$\beta - 1$	$\gamma - 1$	$\alpha - 2$	$\beta - 2$	$\gamma - 2$	$\beta - 3$	$\gamma - 3$
System	OPEN WIRE CARRIER	CABLE CARRIER	UHF RADIO	OPEN WIRE CARRIER	CABLE CARRIER	UHF RADIO	CABLE CARRIER	UHF RADIO
Number of Circuit	12	12	12	12	12	12	120	120
Number of terminals	5	5	5	17	17	17	17	17
Cost (thousands of US\$)	600	12,000	5,000	2,500	13,000	6,000	18,000	15,000
Applicability for future	Impossible	possible	possible	Impossible	possible	possible	possible	possible
Cost/CH	50	1,000	410	200	1,100	500	150	125
Cost/Km	1.1	21.5	8.6	4.3	23.7	10.8	32.3	26.3
Cost/CH.Km	0.09	1.79	0.72	0.36	1.97	0.90	0.27	0.22

V.4.1.4 Utilization of public circuit line

This method is the utilization of public circuit line, by abolishing the privately owned circuit line of Railways.

According to the decrease of the facilities of railways, the rationalization of maintenance personnel can be expected.

But in case of circuit construction, generally the public communication lines are deposited in parallel with railway track, and the loss of distance and the loss of transmission become great.

Furthermore, the charge of use of public line will become higher and higher and it can not be expected to construct to call simultaneously all stations in case of emergency, etc.

V.4.2 Dispatcher Telephone

V.4.2.1 Problems

Dispatcher telephone is used for direct connection between dispatchers and stations. This telephone system is used for the communication for the train control, freight car distribution services, etc. Installations of this telephone are divided into 3 regions in the Southern Railway, and each area is completely separated. Therefore, intercommunication between each areas is impossible. The service area of each regions are as follows :

Santiago ---- Puerto - Talca and its branch lines
Concepción --- Talca - Temuco and its branch lines
Valdivia ---- Temuco - Puerto Montt and its branch lines

The problems of equipment are as follows :

The first problem is deterioration of equipment. The facilities are made about 100 years ago, and there are no spare parts.

When the parts are failed, they are repaired or substitute parts might be used. The same parts can be manufactured easily, because the structures are simple. The electric parts used are resistances, condensers, coils, relays, etc. As they are very simple, some parts can be replaced by others. However these methods are provisional and there exists limitation.

The second problem is the bad quality of communication. They are regulated by changing the voltage of telecommunication lines, but there exists also limitation of regulation by this way. Nowadays the limitatin of regulation is exceeded already.

The third problem is the discordance of the limits of installation and organization.

The limit station between Central and South Divisions is Chillán station but the boundary of equipments of telephone system of each

division is Talca station. For that sake, the section between Talca and Chillán should be controlled by Central Division from the view point of organization, but the organs in above mentioned area are supervised by orders of South Railway Division actually.

In fact, this section was connected experimentally, but attenuation was very great for the practical use. This phenomenon might be due to transmission circuit.

V.4.2.2 Improvement measures

Dispatching telephone is used for the transmission of the fundamental informations concerning train operation control or freight car distribution, etc. For that sake, not only high reliability and quality but also good characteristic of manipulation are required.

With respect to the maintenance of installations, the situations of using substitute parts should be considered abnormal condition.

Actually the supervising of equipment is done by a limited number of persons. In case of absence of these persons, recuperation of failures is sometimes impossible. All equipment should be maintained by any one using a standard manual.

From the above mentioned situations, introduction of new equipment is necessary.

V.4.2.3 Improvement of dispatching telephone

(1) Faculty required to the dispatching telephone

The faculties required to dispatcher telephone are as follows:

- 1) Personal use telephone which can serve at any time.
- 2) Clear understanding and short calling time for connection.

- 3) Dispatcher can call each station individually, and can talk to all stations at the same time. In the latter case, telephones should be able to transfer information in good understanding grade.
- 4) Some grouped stations should be able to be called at once.
- 5) Station master can call and talk to dispatcher.

(2) Telephone system which realize the required faculties

There is a telephone system which satisfies above mentioned faculties, named F1 system. This F1 system is constructed of cable carrier or multiple radio system for long distance transmission and of cable core wire for short distance transmission of information, for the security of calling and talking.

Amplifiers are deposited in the subscriber telephones for clear understanding and it is necessary to increase input impedance for the prevention of talk level loss in case of parallel connection of telephones to the cable core line. Calling signal should be of a system which use audio frequency for the transference by cable carrier or multiple radio circuit.

(3) Faculty and standard of F1 type dispatching phone

1) Faculty

- a. By pressing bottoms for stations, dispatcher can call all selected stations.
- b. Simultaneous talking should be possible.
- c. Station master can call dispatcher by using the telephone.

2) Standard

- a. Capacity of circuits ----- 8 circuits
- b. Capacity of connecting telephone
per circuit ----- 60 telephones
- c. Calling up system ----- Two time signal,
by audio frequency
- d. Frequencies for calling up ----- 600 ~ 800 Hz
- e. Duration time to send
calling signal ----- about 1.4 sec.
- f. Input impedance for subscriber
telephone ----- More than 40 K ohms

(4) One of proposed improvement plans

With a premise of completion of Y - 3 plan of telecommunication transference system, a plan of installing equipment are reviewed.

1) Traffic Control Office

Alameda and concepcion are considered as places of control center, and F1 telephone system are supposed to be installed.

2) Subscriber telephone

Necessary number of stations are estimated as of 50 for the calculation's sake.

3) Necessary costs are estimated as follows by approximated value.

- a. Central equipment ----- 2 sets = 1,370,000 pesos
- b. Subscriber telephones ----- 200 units = 330,000 pesos
- c. Total = 1,700,000 pesos

V.5 ORGANIZATION AND PROBLEMS OF SUPERVISING SYSTEM

V.5.1 Organization

Signal maintenance organization is systematized, and the staff and line work are separated.

But the situation of telecommunication is different. The maintenance work in and around Santiago city is executed by telecommunication section of the Southern Railway fixed installation department and the work of other places is done by signal service depots.

Telecommunication section of the Southern Railway should be separated from line actual work and be concentrated in the staff work and the line work should be transferred to both Central and South Divisions for executing efficient work.

The line work should be executed in actual system in which the works of signal and communication are combined for effective utilization of personnel.

V.5.2 Maintenance Planning

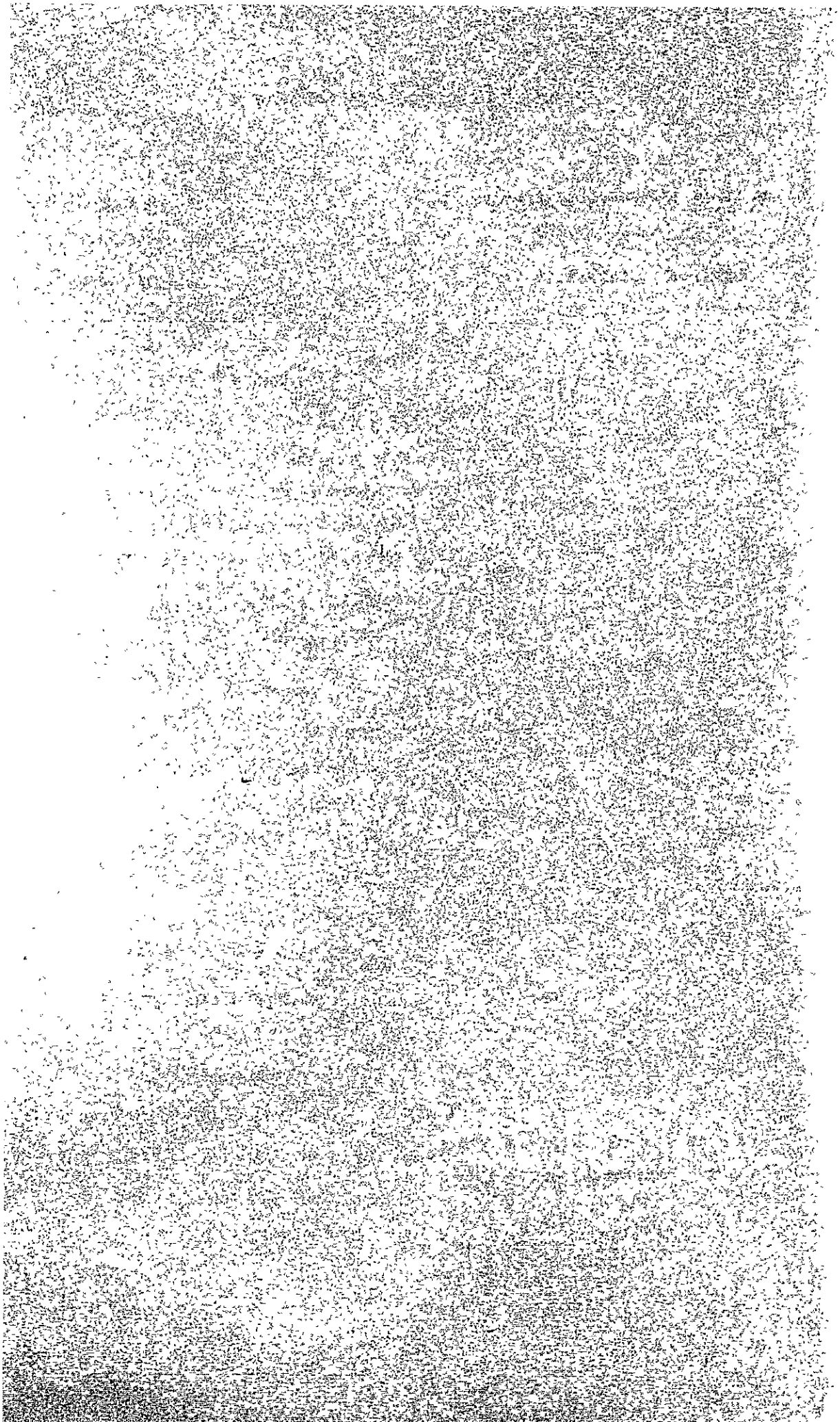
Actually maintenance is executed by "ex-post-facto" system. With respect to the exchanger, etc. the inspection is executed according to the maintenance plan, but the inspection level is of on-site-looking.

For the effective utilization of personnel, the inspection should be changed into the preventive inspection system.

For the introduction of this above mentioned system, the replacement of deteriorated equipments should be a premise.

By standardization of equipment and maintenance system, introduction of maintenance free system, centralized control system, etc. it becomes possible to acquire necessary parts, to execute effective utilization of personnel, etc. resulting the improvement of system operation rate and quality.

VI. REFERENCE MATERIALS



REFERENCE MATERIAL 1

Table VI.1.1.1 SCHEDULE OF OVERALL STUDY

Date	1 9 8 2							1 9 8 3				
	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Preparation work in Japan (1)	□											
Presentation of Inception report	△											
Field survey in Chile (1)	■											
Presentation of progress Report			△									
Analysis and preparation work in Japan (2)			□									
Field survey in Chile (2)					■							
Presentation of Interim Report						△						
Analysis and preparation work in Japan (3)							□					
Presentation of Draft Final Report in Chile									△			
Explanation of Draft Final Report in Chile									■			
Preparation work of Final Report in Japan											□	
Presentation of Final Report												△

Notes: ■ : Work in Chile, □ : Work in Japan, △ : Presentation of Report,

REFERENCE MATERIAL 2.

Table VI.2.1 COMPOSITION OF STUDY TEAM

Name	Responsible	
Kazuya Nakanishi	Director/General	JARTS, Executive Director
Chuji Suda	Sub-Director/ Freight Car Operation	JARTS, Director
Hiroshi Inoue	Freight Planning	Advisor to JARTS
Masakatsu Fukawa	Management Planning	Advisor to JARTS
Tadao Ishimori	Passenger Planning	JNR
Tadashi Miyawaki	Rolling Stock	Advisor to JARTS
Shigeyuki Aoi	Sales Planning, Sub- sidiary Enterprises	JNR
Toshio Nomura	Communications Sys- tem Analysis	JNR
Yasuo Watanabe	Competing Modes of Transport	JNR
Aiichiro Shimizu	Marketing Research, Advertising	Advisor to JARTS
Yorihiko Osuga	Business Planning	Advisor to JARTS
Haruhiko Mizukoshi	Data Analysis and Economics	JARTS
Kimihisa Sato	Overall Traffic Analysis	Advisor to JARTS
Kaoru Akagawa	Communications Sys- tems Design (1)	Advisor to JARTS
Yukio Takehana	Communications Sys- tems Design (2)	Advisor to JARTS
Hideo Serizawa	Totalling, Profit and Loss Analysis	JARTS

REFERENCE MATERIAL 3. THE CURRENT STATE OF THE CHILEAN ECONOMY

1. CURRENT CONDITIONS AND PROBLEMS

When the Chilean economy converted to free economic policies in 1974, 1975, there was a period of confusion. In 1974 the consumer price index recorded high inflation of 506% over the preceeding year. In 1975, as a result of policies of very tight money policies, such as the control of inflation and the acquisition of international revenue, the economic growth rate dropped to -12.4%, the inflation rate was 374%, unemployment was 20% and there was a large trade deficit. At that time, Chile faced the most severe economic crisis since the 1930's.

Since 1976, the Chilean economy has made a gradual recovery due to the free economic policies whose emphasis is on market mechanisms. The rate of economic growth for the years 1977 ~ 1979 attained a level of 8.8% per year. The effect of other policies including reductions of the inflation rate and the fiscal deficit and the maintenance of a fixed rate for the peso (since July, 1979) has made economic calm since about 1978.

International praise has grown for the Chilean economy and its policies which have conquered the high inflation. However, the Chilean economy has encountered further difficulties since the latter part of 1980.

The background to this has three elements:

- A slump in copper exports resulting from the depressed world economic conditions, the rise in the price of oil (a dependency rate on imported oil of 66%) and the increase in imports based on liberalization policies have all produced a growth in the trade deficit;

Table VI.3.1 Main Economic Indicators (1)

Year	GDP Billion Pesos	Growth Rate %	CPI 1975 = 100	Percentage Increase	Million Dollars		
					Exports(fob)	Imports(fob)	Trade Balance
70	43.23	3.7	0.36	33.3	1,113	- 832	281
71	46.47	7.5	0.43	19.4	1,000	- 892	108
72	46.47	0	0.77	79.1	851	- 1,001	- 150
73	44.76	- 3.7	3.48	351.9	1,316	- 1,326	- 10
74	47.42	5.9	21.09	506.0	2,244	- 1,821	423
75	42.09	-12.4	100.0	374.2	1,570	- 1,682	- 112
76	43.62	3.6	353.8	253.8	2,116	- 1,505	611
77	47.42	8.7	909.1	156.9	2,186	- 2,152	34
78	51.80	9.2	1,451.7	59.6	2,460	- 2,886	- 426
79	56.09	8.3	2,145.3	47.7	3,835	- 4,190	- 355
80	59.73	6.5	3,151.2	46.8	4,706	- 5,331	- 625
81			4,106.6	30.3	3,952	- 5,393	- 1,441

Note: The GDP uses 1975 prices as standard. The 1980 nominal GDP is 762.1 billion pesos, 10.54 billion dollars (1 dollar = 39 pesos); the equivalent of 1,776 dollars per person (population 11 million).

Sources: IMF "International Financial Statistics"

Table VI.3.2 Main Economic Indicators (2)

Year	Wholesale Prices		Wages 1975=100	Production Index		Exports (fob)	Imports (cif)	Export-Import Balance	Total Foreign Reserves	
	1975=100	Percentage Increase		Manufacturing Industries 1975=100	Mining Industries 1975=100				Million Dollars	Amount of Increase or decrease
	Million Dollars									
79	1,275.9	49.4	2,145.3	134	118	3,763	4,218	- 455	1,938.4	848.3
80	1,780.6	39.5	3,151.2	142	123	4,818	5,821	-1,003	3,123.2	1,184.8
81	1,942.4	9.1	4,106.6	142	129	3,952	5,393	-1,441	3,214.0	90.8
80.I	1,594.0	55.8	2,744.0	133	112	1,270	1,192	78	2,386.6	448.2
II	1,720.1	49.0	3,033.1	139	125	1,244	1,328	- 84	2,592.3	205.7
III	1,855.3	31.8	3,198.2	140	128	1,103	1,523	- 420	2,988.0	395.7
IV	1,952.9	28.5	3,629.2	153	131	1,209	1,761	- 552	3,123.2	135.2
81.I	1,969.5	23.3	3,775.7	138	126	1,111	1,591	- 480	3,188.4	65.2
II	1,954.9	13.7	3,949.2	149	118	944	1,970	-1,026	3,248.0	59.6
III	1,944.3	4.8	4,263.6	145	136	947	1,644	- 697	3,385.3	137.3
IV	1,900.8	-2.7	4,437.8	135	119	977	1,300	- 323	3,214.0	-171.3
82.I	1,859.1	-5.7	4,468.6	106	133	975	928	47	2,876.9	-387.1
II	1,832.6	-6.3	4,502.5	110	-	939	760	179	2,627.6	-199.3

Note: Gold not included.

- Worsening evidence of internal depression (particularly the growth in the number of bankrupt companies). This has been due to the deflationary effect of the automatic adjustment functions, the liberalization policies and the fixing of the peso under inflation higher than the international norm essentially terminated any exchange rate and produced a lowering of international competitiveness.
- Increasing pressure for repayments accompanying the growth in the foreign debt.

Then, in 1982 the government once again put the peso on a floating quotation, and inflation once again became a source of worry.

The most striking feature of the depressed situation up to now has been the increase in the number of companies going bankrupt. In 1980, some 415 such cases occurred. As a result in the drop in demand from the middle of 1981, bankruptcies have continued in the areas of sugar refiners, electrical appliance assembly makers, ceramics makers, cotton mills and so on. These effects have spread throughout all industries. The basic stance of the current government is the Friedman school of thought. That is,

Introduction of competitive principles - Expansion of exports - Increase in foreign revenue - Increased domestic liquidity, lower interest rates - Expansion of domestic investment - Increase of imports - Increased demand for foreign currency, Lowering of domestic liquidity - Higher interest rates - Withdrawal in demand for consumption and investment - Reduction of imports.

Following are the five major measures which constitute this free economic policy.

(1) Transfer of national enterprises to the private sector

The previous administration aimed to develop industry with state intervention. In addition to the large copper producing enterprises, 300 companies were managed under the auspices of the Chilean

Industrial Development Corporation. However, because this policy led to low productivity and delays in technological development, many of these companies inevitably ran at a loss. For these reasons, the present government has proceeded with sales of companies from CORFO (Industrial Development Corporation) to the private sector. Between 1974 and 1979, the number of companies sold reached approximately 450, a total of 723 million dollars.

Recent state-run enterprises include only the five large copper mines managed by the Copper Corporation, and others in the areas of steelmaking, telecommunications, transportation and energy.

(2) Abolition of prices controls

The previous administration placed many domestically produced and imported goods under prices controls, in order to restrain price increases of necessary daily items. This move not only destroyed the will of manufacturers to produce goods, but also expanded the government's financial burden due to the policy of financial assistance. For these reasons, the present government revived market principles and has striven to achieve an efficient distribution of manufacturing resources. Prices controls have been abolished for almost all commodities since 1973. The effect of the abolition of prices controls was to produce a momentary rise in the price of foodstuffs etc., but the increase in supply which accompanied the liberalization of imports has contributed, on the contrary, to the stabilization of prices.

(3) Policies for the liberalization of trade

The liberalization of trade has been promoted gradually by the cessation of import duties and the abolition of other obstacles apart from import duties.

Table VI.3.3 Trends in Import Duty Rates

Date of implementation	Average rate of duty	Maximum rate of duty
Dec. 31, 1973	94	500 or more
March 1, 1974	90	200
March 27, 1974	80	160
June 5, 1974	67	140
Jan. 16, 1975	52	120
Aug. 13 1975	44	90
Feb. 9, 1976	38	70
June 7, 1976	33	60
Dec. 22, 1976	27	60
Jan. 8, 1977	24	50
Apr. 30, 1977	22	50
Aug. 29, 1977	20	35
Dec. 1977	16	25
March 1978	15	20
June 1978	14	20
Dec. 1978	12	15
June 1979	10	10

(Source) Robert Zahler, "Monetary and real repercussions of financial opening-up to the exterior. The case of Chile, 1975 ~ 1978" P134 (U.N., ECLA, CEPAL Review April 1980)

As happened in 1981 and 1982, when there is a rapid rise in imports, restricted import policies such as a depletion of import usance, are utilized. However, such are merely short-term policies in response to business cycle in Chilean economy. The fundamental policy being advanced is that of liberalization.

(4) Development of exchange policies

When the new administration took office, Chile was operating with multiple exchange rates. This was because the general exchange

rate was slightly high as a result of domestic price increases, and the slump in the international price of copper which is Chile's major export. Government policies used multiple rates so that a favorable rate could be applied to the import of basic commodities, foodstuffs and so on, while that rate would be unfavorable to the import of finished items such as industrial products.

The first moves in getting out of this situation were to put an end to the exchange rates, and simplify the complex system of exchange quotations. More steps were made after that, until after July, 1979 up to the first half of 1982 the fixed rate of 1 dollar = 39 pesos was implemented. The reason behind the desire to prevent devaluation of the exchange rate was the prevention of imported inflation. However, since the latter half of 1982, domestic inflation is rising again and it has finally become impossible to maintain a fixed quotation. The exchange rate has been devaluated again, and inflation has begun to soar once more.

Table VI.3.4 Movements in Foreign Exchange

	U.S. Dollar Rate (end of period)	U.S. Dollar Rate (average)	SDR Rate (end of period)
1974	1.870	0.832	2.290
1975	8.500	4.911	9.951
1976	17.420	13.054	20.239
1977	27.960	21.529	33.963
1978	33.950	31.656	44.230
1979	39.000	37.246	51.376
1980	39.000	39.000	49.741
1981	39.000	39.000	45.394
82 I	39.000	39.000	43.411
82 II	43.020	40.020	46.988
82 III	63.040	55.013	67.600

Source: IFS

(5) Development of foreign capital policies

The positive introduction of foreign capital became necessary to make up for the shortage of domestic capital as the free economy progressed. With the enactment of the "Foreign Capital Law" (Directive No. 600) in July, 1974, policies were adopted for the wholesale introduction of foreign capital. As indicated in Table VI.3.5, the years 1977 ~ 1979 saw large scale growth, centered around investment in mining. In 1980 foreign investment in manufacturing and tertiary industries expanded. Since the development of these policies which favored foreign capital went against those policies of the Andes cooperative body (ANCOM) which limited foreign capital, Chile left ANCOM in October, 1976.

In July, 1977, a new foreign capital law (Directive No. 1748) was enacted to give a further boost to the introduction of foreign capital. This law represents one flank of the whole liberalization policy.

Not only has this law guaranteed equal treatment of foreign and domestic capital, the procedures for investing foreign capital have also been simplified. Such modifications to the system have brought much activity to foreign capital.

2. THE COMPOSITION OF THE CHILEAN ECONOMY AND ITS FUNDAMENTAL FEATURES

Chile has a population of 10,900,000, and its GNP per capita is 1,690 dollars (1979). The growth rate in the production by manufacturing industries is shown by the figures 5.5% in the 1960's and -1.0% in the 1970's. Since the beginning of the 1970's the effect of increased imports of raw materials such as oil has been to lower the growth of manufacturing industries. The 1970's show a minus figure for the growth in overall investment. Market potential has also been lowered.

Table VI.3.5 Flow of Foreign Capital into Chile (Based on approvals for investment) (August 5, 1974 ~ End of September, 1980)

		Number of Investment	Amount (million dollar)	Percentage
By year	1974	12	21.5	} 27.1
	1975	69	137.1	
	1976	57	150.1	
	1977	57	885.0	} 72.9
	1978	72	1,293.0	
	1979	122	1,726.6	
	1980	120	184.7	
By industry	Mining	21	3,742.4	85.1
	Manufacturing	189	379.3	8.6
	Services	213	210.7	4.8
	Construction	35	27.1	0.6
	Agriculture	37	14.8	0.3
	Transportation	10	11.1	0.3
	Forestry	2	11.0	0.3
	Energy	2	1.7	0.0
By major investing countries	U.S.A.	142	3,259.5	74.1
	Canada	10	607.9	13.8
	U.K.	35	113.1	2.6
	Panama	77	109.1	2.5
	West Germany	35	60.5	1.4
	Japan	16	54.9	1.2
	Spain	34	32.3	0.7
Total		509	4,398.1	100.0

(Source) Commercial Section, Chilean Embassy (JAPAN),
 "Information about the Chilean Economy", October, 1980.

A large discrepancy is seen between the percentages in GNP for 1979 of Chile at 16% and Japan at 30%. One bright spot is the high level of the weight of machinery in the supplementary value. Even though the 22% share of machinery in the import structure does not come up to that of Venezuela at 52%, it is rather high. Since a large portion of the machinery is constituted by electrical appliances and transportation machinery which are durable consumer commodities, this is a region which has rather good potential as a market for machinery, principally as durable consumer commodities.

Table VI.3.6 Basic Social and Economic Data about Chile

	Unit	Chile	Japan (for reference)
Total land area	1000 km ²	757	372
Population (1979)	million	10.9	115.7
GNP Per Capita (1979)	US\$	1,690	8,810
Economic Growth Rate Per Carita (1960 ~ 1979)	%	1.2	9.4
Average Yearly Inflation Rate 1960 ~ 1970	%	32.9	3.1
1970 ~ 1979		242.6	11.7
Production of Food Per Capita	69 - 71=100	95	98
Growth of Manufacturing In-			
dustries 1960 ~ 1970	%	5.5	11.0
1970 ~ 1979		-1.0	6.2
Overall Investment	%		
1960 ~ 1970		3.7	14.2
1970 ~ 1979		-2.0	3.2
Loan Repayments (against GNP)	%		
1970		3.1	-
1979		6.2	-

Source: U.N. Data

Table VI.3.7 Index Related to Industrialization

		Unit	Chile	Japan
Investment Ratio of GDP	1960	%	17	34
	1979		16	33
Supplementary Value	Food	%	19	9
	Machinery		3	33
	Chemistry		9	10
Energy Production	1960 ~ 1974	%	3.9	- 1.7
	1974 ~ 1979		0.1	3.4
Energy Consumption	1960 ~ 1974	%	6.1	9.7
	1974 ~ 1979		0.7	3.0
Energy Consumption per Capita (equivalent to coal)		kg		
	1960		824	1,333
	1979	1,193	4,260	
Machinery Share of the Imported Merchandise		%		
	1960		-	9
	1978	22	7	

Source: U.N. Data

3. TRADE MOVEMENTS AND INTERNATIONAL REVENUE AND EXPENDITURE

The composition of Chile's trade has the following special features.

- (1) Mineral, agricultural and fishery products and other primary produce occupies a large share of Chile's export structure. It is easily influenced by the condition of the international commodities market.
- (2) During the period 1975 ~ 1980, Chile's exports exhibited a three-fold growth from 1.59 billion dollars to 4.82 billion dollars. Against the 2.7-fold, 2.03 billion dollar growth in exports of traditional products (copper, molybdenite, fish meal, saltpeter, iron ore etc.), non-traditional products (fresh juices, lumber, copper products) grew 3.8-fold, an amount of 1.2 billion dollars. The fruits of efforts in the diversification of exports are beginning to become evident.

- (3) Imports in 1980 were 5.82 billion dollars, a 4.1 billion dollar growth compared to 1975. However, since the import restrictions for consumer commodities were lightened under the liberalization policies, the import of automobiles and electrical appliances has grown, and their share of overall imports has increased.
- (4) Although the weight occupied by copper among the export items shows a tendency to decline, variations in the price of copper continue to have a large influence on overall exports. In response to the lowering of copper prices in 1981, copper exports for the first and third quarters of that year showed a drop of 1.47 billion dollars, 16.6% down from the previous year. Chile's total exports for that period came to 3 billion dollars (13.3% down from previous year).

Table VI.3.8 Constituent Percentages of Exports and Imports according to Region

	(%)			
	Exports		Imports	
	1976	1980	1976	1980
Latin America	44.0	23.5	39.1	28.1
Argentina	13.1	5.8	13.0	4.2
Brazil	10.5	9.3	3.9	8.2
North America	11.5	13.6	24.7	28.9
United State	11.0	12.2	23.0	27.2
Western Europe	20.5	41.7	15.5	19.6
West Germany	7.8	12.3	5.7	5.4
U. K.	2.2	6.1	3.1	2.1
Asia	14.1	15.9	11.8	14.8
Japan	10.7	10.4	11.1	10.4
Middle East	0.4	1.0	2.9	0.8
Africa	9.5	4.3	6.0	7.8
Total	100.0	100.0	100.0	100.0

Source: Central Bank of Chile "Statistical Synthesis of Chile 1976 ~ 1980"

(5) As described above, actual data for 1981 shows that against exports (customs base) of 3.95 billion dollars (15% reduction), imports reached 5.39 billion dollars (9.3% increase) to produce an increased trade deficit. In recent years, the composition of Chile's international revenue and expenditure has been marked by an increasing deficit under the influence of such factors as growing interest repayments accompanying an increase foreign debt. Ordinary revenue and expenditure has also, since 1977, been subject to a continuous deficit, the size of which has kept growing.

Table VI.3.9 Balance of Payments of Chile

(Unit: Million Dollars)

	1975	1976	1977	1978	1979	1980
Trade Balance	70	643	35	- 426	- 355	- 626
Exports (FOB)	1,590	2,116	2,186	2,460	3,835	4,706
Imports	-1,520	-1,473	-2,151	-2,886	-4,190	-5,332
Services	28	- 518	- 657	- 732	- 915	-1,230
Exports	177	258	402	551	936	1,436
Imports	- 149	- 776	-1,059	-1,283	-1,851	-2,666
Transfers	12	24	70	70	80	70
Current Balance	110	149	- 552	-1,088	-1,190	-1,786
Capital	120	66	576	1,946	2,248	3,157
Direct Investment	50	- 1	16	177	233	194
Securities Investments	- 6	- 6	7	-	50	-
Long-term Capital	- 126	58	48	1,333	1,503	1,859
Short-term Capital	202	15	519	436	462	1,104
Overall Balance	- 285	- 450	15	654	1,049	1,244
Foreign Capital Reserves at End of Year 1)	111	462	484	1,149	2,378	4,087

Note: 1) Gold included.

4. GROWTH POTENTIAL AND STRUCTURAL CHANGES IN ECONOMIC AREAS

(1) Growth by sector and changes in economic structure

The composition of Chile's GDP by economic area is as follows.

	1970	1979
Agriculture	7.9%	8.5%
Mining	11.7%	12.5%
Manufacturing	27.2%	24.0%
Construction	4.2%	2.7%
Others	49.0%	52.3%

Although no major changes can be noticed, the decline in the share of the manufacturing sector stands out. When the growth rates by sector are considered, it is obvious that there have been large variations from year to year, and that the Chilean economy has been unstable.

If tertiary industries are excluded, at the center of Chile's economic structure are manufacturing industries. However, the mining sector must be considered as having the greatest potential as an earner of foreign capital.

(2) Copper production and direction of development planning

Chile is blessed with mineral resources. Silver at the last century was followed by saltpeter at the beginning of this century and then copper, as the country's representative exports and foreign currency earners. The production of copper in recent years has seen the reduction of 1975 followed by a growth of 21% over the previous year in 1976, to attain a level of 1 million tons. This reflected the revival of the economies of the advanced industrial nations in that year. Since then, the 1 million ton level has continued, though in 1981, with the slump in the world economy and the reduction in the demand for copper, there was a fall in production.

Table VI.3.10 Chile's Economic Growth Potential by Sector

a) Trade revenue and expenditure

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Agriculture	5.6	6.3	- 3.0	-15.0	16.0	3.3	1.2	15.0	- 2.5	7.7	2.4
Fisheries	22.6	17.1	-31.5	- 1.6	36.7	15.9	33.7	0.8	32.2	19.5	11.6
Mining	1.0	2.0	- 2.1	1.6	15.9	- 4.9	14.5	7.0	- 0.3	2.8	3.9
Manufacturing	1.3	13.7	2.8	- 6.5	- 0.9	-27.4	6.8	12.2	7.8	8.8	5.0
Construction	2.7	11.4	- 9.3	-11.8	20.0	-31.0	-18.8	3.5	2.5	25.8	17.6
Energy	3.9	13.3	14.3	2.9	12.4	1.4	3.6	4.8	6.6	7.6	6.4
Transportation	4.0	6.3	- 2.3	1.7	- 0.6	-10.5	5.1	8.7	5.7	7.9	7.2
Commercial	5.3	5.1	0.6	- 0.5	2.5	-15.2	1.2	17.9	14.6	9.3	9.5
Actual GDP Growth Rate (1964-70)	7.7	- 0.1	- 3.6	5.7							

(Unit: %)

b) Movements in components of GDP by sector

	1970	1973	1975	1977	1979
Agriculture, Forestry, Fisheries	7.9	6.1	8.9	8.9	8.5
Mining	11.7	11.7	14.0	13.9	12.5
Manufacturing	27.2	30.2	22.3	23.4	24.0
Construction	4.2	3.6	3.5	2.4	2.7
Commercial, Financial	17.2	48.4	16.3	18.1	52.3
Service	31.8		35.0	33.3	
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: Central Bank of Chile

The copper industry has for sometime been under the control of capital from the United States. A discussion continued over many years about whether or not to put this industry under government control. In 1971 with the period of the Allende administration, the five large copper mines were nationalized and placed under the control of CODELCO (Copper Corporation).

The current administration, in line with its promotion of liberalization policies, is returning parts of nationalized industry to the private sector. Progress has been made with the return to private hands of small and medium copper mines, but the four largest mines (of the five largest copper mines, Ecsotica has been merged with Chuquicamata since 1975) which have high productivity are still government-operated through COLDECO. (85% of the 1980 copper production was from these large-scale mines).

The Chilean copper industry is moving to increase the degree of on-the-spot processing and this has risen to 76% of the processed total in 1980 (56% in 1971). The government is looking on the current depressed situation as being due principally to the stagnant world economy. It is devising plans for strongly increased production in the medium- and long-term. President of CODELCO is proposing as a matter of urgency the development of new copper mines to offset the downturn in copper produce. It has been made clear that investment of about 4 billion dollars is necessary over the next 10 years, and that it is intended to use foreign capital for the development of these new copper mines. If this plan proceeds accordingly, it will be possible to increase production to a yearly level of 2 million tons in 10 years. Generally, in the case of Chile, further copper reserves are buried close to existing mines. This is seen as a favorable feature for the future, since it will be possible to use existing concentration and refining facilities, and save on investment in railways and ports.

In accordance with its policies of the positive introduction of foreign capital, the current administration has approved a total of 4.1 billion dollars in foreign investment over the period 1974 ~ 1980. Of that, 80% has been concentrated in areas related to the development of mining. In general, a time lag is likely to arise between the amount of investment approved and the amount actually invested, since the development of mining is a long-term project. In Chile's situation, only 1/10 of the investment amount approved has actually been implemented. It cannot be denied that behind this fact lie causes which are obstructing the realization of investment. In order to reorganize the investment environment, the government intends to enact a New Mines Law. A significant point of that will be the trend favoring nationalization and the balance of this trend with the will for development of the private sector.

In order that the Chilean economy develop, the mining industry must be modernized by establishing resources policies which are rational, practicable and integrated. The introduction of foreign capital should not merely be seen as an input of capital, but should include the absorption of the technology and know-how of the advanced industrial nations. It is also important that a balance be found between the necessity for the introduction of this foreign capital, and the necessity to keep the major segments of the mining industry under state control.

Table VI.3.11 GDP by Principal Sectors

(Million pesos, 1977 prices)

	1976	Consti-	1978	1980	Consti-
		tuent			tuent
Agriculture, Forestry, Fisheries	25,573	9.8	27,241	30,376	8.5
Mining	22,544	8.6	23,529	25,752	7.2
Manufacturing	57,681	22.0	68,374	76,776	21.4
Construction	11,809	4.5	12,651	18,294	5.1
Public Enterprises	6,124	2.3	6,913	7,856	2.2
Transportation, Communications	13,879	5.3	16,665	19,377	5.4
Commerce	35,934	13.7	53,820	64,305	17.9
Finance, Service and others	86,609	33.1	94,997	110,025	30.6
GDP	261,945	100.0	311,417	359,097	100.0

Note: Since some items have been excluded, the total of the sectors will not be 100.

Source: Central Bank of Chile

Table VI.3.12 Chile's Copper Production

(Unit: 1,000 tons)

	By Sector			By Product		
	Large-scale mines (1)	Medium and small-scale mines (2)	Total (3)	Refined products (4)	Blister (5)	Bulk (6)
1971	571.3	137.0	708.3	398.5	220.5	89.3
1972	592.6	124.2	716.8	461.4	169.2	86.2
1973	615.3	120.1	735.4	414.8	175.1	145.5
1974	762.9	139.2	902.1	538.1	186.2	177.8
1975	682.3	146.0	828.3	535.2	189.2	103.9
1976	846.8	158.4	1,005.2	632.0	224.3	148.9
1977	892.7	163.5	1,056.2	676.0	214.4	167.8
1978	876.5	159.0	1,035.5	749.1	178.3	108.1
1979	910.2	150.8	1,061.0	781.8	167.8	111.4
1980	904.5	163.2	1,067.7	810.7	142.4	114.6
1980 Jan. ~ July	506.6	97.7	604.3	460.4	76.9	67.0
1981 Jan. ~ July	504.7	99.0	603.7	444.0	82.1	77.6

Note: (1) Amount produced in Codelco - Chile's four regions (Chuquibambilla, El Salvador, Andina, El Teniente).

(2) ENAMI, Mantos Blancos, Disputada de Las Condes, etc.

(3) Production totals for large-scale and medium and small-scale mines.

(4) Including electrolytic copper, Concentrate of Copper, Scorios, Copper Minerals.

Source: Chilean Foreign Trade Report, November, 1981.

5. THE DEVELOPMENT OF THE CHILEAN ECONOMY DURING THE 1980's AND ITS BALANCE WITH FOREIGN COUNTRIES

Chile has effected the anti-inflation measures of Friedman and others to bring temporary stability to prices. Two problems have resulted from this, however.

- (1) The worsening of the foreign revenue and expenditure situation due to the rapid rise in imports, and
- (2) an increase in unemployment due to the slump in the domestic economy.

This is a period of trial and error aiming to strike a balance between the cure for inflation and the domestic economic conditions. On the side of international income and expenditure there are hopes for future recovery, since the price of primary produce can be considered to be at its worst point even when compared to other prices. The most significant questions regarding growth in the 1980's are, then, how to expand domestic employment and whether there are adequate employment opportunities in the mining and tertiary industries alone.

Table VI.3.13 shows the medium-term prospects for the Chilean economy from 1980 ~ 1985. It does seem possible that the actual rate of economic growth will attain the level of 6.5% (1980 prices). However, since the nominal GNP includes a deflator just at two figures, this must be expected at a level of 16%.

By industry, the mining, construction and electric power related industries will have a high growth. The growth in mining production will probably be a significant feature of any growth in GNP. The problem will be in the manufacturing industries. Under the current liberalization policies, very little expectations can be held for growth in domestic manufacturing. Since the employment increasing effects of industries is by far the highest for the manufacturing industry, if little growth is expected in this area, Chile's economy must face the danger of bankruptcy as a result of the unemployment problem.

Table VI.3.13 Estimates of Chile's Major Economic Indicators

	Unit	1979	1980	1985 (Estimated)	1980 - 1985 Yearly Rates	Remarks
GNP (Nominal)	Million Dollars	21,449.5	22,836.1	-	16.9	
Actual Economic Growth Rate	%	8.2	6.5	80 - 85	6.5	
Income per Capita	Dollar	1,964.6	2,056.4	2,489.9	3.9	
GNP (by industry)	Million Dollars					1980 prices
Agriculture		1,751 (7.8)	-	2,293 (7.0)	4.6	
Fishes		124 (0.6)	-	229 (0.7)	10.7	
Mining		1,547 (6.9)	-	2,358 (7.2)	7.3	
Manufacturing		4,651 (20.7)	-	6,879 (21.0)	6.7	
Electricity, Gas		470 (2.1)	-	818 (2.5)	9.7	
Construction		995 (4.4)	-	1,539 (4.7)	7.5	
Commerce		3,735 (16.6)	-	5,437 (16.6)	6.4	
Transportation, communications		1,150 (5.1)	-	1,703 (5.2)	6.7	
Finance		1,258 (5.6)	-	1,834 (5.6)	6.5	
Housing; I		1,327 (5.9)	-	1,932 (5.9)	6.5	
Educational, service		2,315 (10.3)	-	3,275 (10.0)	6.0	
Public Services		1,153 (5.1)	-	1,638 (5.0)	6.0	
Transfer a/c		842 (3.8)	-	1,244 (3.8)	-	
Customs Duties, IVA		1,318 (5.9)	-	1,933 (5.9)	6.6	
GNP Total		22,450 (100.0)	-	32,757 (100.0)	6.5	
Private consumption	Million Dollars	15,503	-	22,167	6.3	1980 prices
Investment	Million Dollars	2,439	-	3,701	7.2	

Source: ONEPLAN, Estimates by Mitsubichi Research Institute Inc.

Note: The figures in parentheses are constituent percentages.

Chile's future debt service is anticipated as:

1981	2482.5	(1 million dollars)
1982	2373.3	
1983	2040.4	
1984	1852.1	
1985	2185.9	(Only for amounts already borrowed)

Unless there are increases in copper prices, no high levels of growth can be hoped for.

6. CHILEAN ECONOMIC DEVELOPMENT PLANNING AND THE INFRASTRUCTURE

The Chilean economic planning agency (ODEPLAN) released a six-year plan for economic development from 1978 ~ 1983 in August 1978. The goal for economic growth rate was an annual average of 7%. The plan's major projects are at present being executed - copper mining, housing, roads, communications network, energy, education and health and hygiene.

In the manufacturing sector, the majority of the tasks have been left to the spontaneous efforts of the private sector. Therefore, the major plans are limited to the mining structure and the infrastructure.

One of the measures of major importance in Chile, is the development of electric power generation. The current state of power generation is as follows.

	<u>General Supply</u>	<u>Independent</u>
Thermal	1,349.9	2,188.1
Hydroelectric	5,993.3	828.4
Total	7,343.2	3,016.5

(Unit: MWH/Y)

Because the dependence on hydroelectricity is high, and hydroelectricity is still rather underdeveloped, ENDESA (Public Power Company) has become central in the promotion of the development of power generation.

Further, Table VI.3.16 shows the current conditions of and plans for the transport and communications-related infrastructure.

Table VI.3.14 Goals by Sector for the 6-year Social and Economic Development Plan

(Unit: Million Dollars)

	1978	1979	1980	1981	1982	1983	Total
Public Civil Engineering Works and Constructions	150	161	181	207	233	265	1,197
Public housing, civic development	125	125	115	210	100	100	675
Power generation	125	150	180	215	285	300	1,265
Oil, Gas, Coal	83	85	85	90	60	60	463
Large copper mines	150	140	140	140	140	140	850
Communications	46	58	55	62	65	80	358
Transportation	12	16	16	16	25	70	155
Education	39	42	45	45	50	50	271
Legal affairs	7	8	10	11	12	12	60
Insurance	15	18	20	20	25	25	123
Regional development	65	68	70	70	70	70	413
Manufacturing	23	25	32	48	46	46	215
Agriculture	17	17	15	15	15	15	94
Mining	17	15	15	15	15	15	92
Metropolitan water supply and sewage	11	8	6	6	8	8	47
Others	55	100	140	165	196	220	876
Total	940	1,038	1,125	1,235	1,340	1,476	7,154

Source: ODEPLAN

Table VI.3.15 Chile's Power Generation Development Projects

Type	Promoting Body	Site	Scale	Others
Thermal	CHILECTRA	Region 5	300,000 kw	
Geothermal	ENDESA	Northern region	30,000 kw	
Atomic	ENDESA	Northern region	600,000 kw	First atomic station
Hydroelectric (all ENDESA)	COLBUN-MACHICURA	Region 7	490,000 kw	Maule River Basin
	ANTUCO	Region 8	300,000 kw	Laja River Basin
	PEHUENCHE	Region 7	470,000 kw	Maule River Basin
	PANGUE	Region 8	640,000 kw	BioBio River Basin
	NELTUME	Region 10	400,000 kw	Lake Pihueico
Power transmission	ENDESA	Region 7		Colbun - Santiago Transmission and Transformation Plan

Source: ENDESA

Table VI.3.16 Infrastructure Facilities

(1) Major Port Facilities and Plans

(Facilities)

Port Name	Dock Cranes	Maximum Capacity	Movable Cranes	Maximum Capacity	Forklifts	Maximum Capacity
Arica	8	7t-13m	8	35t-3.5m	33	16,000 lbs.
Iquique	9	60t- 9m	5	19t-3 m	12	6,000 lbs.
Antofagasta	23	65t- 5m	8	27t-3.5m	50	6,000 lbs.
Coquimbo	8	5t-17m	5	15t-3.65m	7	6,000 lbs.
Valparaíso	34	10t-17m	14	60t-3.75m	121	16,000 lbs.
San Antonio	19	10t-17m	4	27t-3.5m	32	6,000 lbs.
Talcahuano San Vicente	10	9.5t-23m	5	19t-3 m	23	16,500 lbs.
Lirquen	-	-	-	-	23	13,000 lbs.
Puerto Montt	8	5t-18m	2	27t-3.5m	9	6,000 lbs.
Chacabuco	-	-	1	12t-3 m	3	6,000 lbs.
Punta Arenas	3	3t-13m	5	27t-3 m	9	6,000 lbs.

(Plans)

The total facilities investment in 1980 was 18 million dollars. The major plans included work on concrete protecting pier in Iquique Port, improvent works in the No. 4 area of Valparaíso Port, installation works for 6 x 12-ton cranes at Antofagasta Port.

(2) Airports

Number of Airports	International Airports and Names		Height above sea level (m)	Number of runways	Runway surface area	Surface		
	Position	Name						
12	Arica	Chacalluta	55	2	2170 x 45, 2160 x 30	Asphalt		
Investment amount and outline of plans.	Antofagasta	Cerro Moreno	140	1	2160 x 50	Asphalt		
	Santiago	Arturo	474	1	3200 x 55	Asphalt		
		Merino Benitez						
Investment amount (including Easter Island)	Concepción	Cerrillos	511	1	2342 x 45	Concrete		
		Carriel Sur	13	1	2300 x 45	Asphalt		
US\$ 5,720,000	Puerto Montt	El Tebual	90	1	2100 x 30	Concrete		
	Punta Arenas	Pdte. Ibañez	44	3	2960 x 60, 1816 x 45, 1677 x 45	Concrete		
(Year 1979)	Easter Island	Mataverí	68	1	2342 x 45	Asphalt		
	The 8 airports above.							
	Number of passengers (x 1000)			Amount of Freight (tons)				
	1975	414	1978	538	1975	18,146	1978	34,413
	1976	444	1979	627	1976	24,126	1979	36,047
	1977	565			1977	35,347		

At present, the plan for repair of the runways at Santiago's Pudahuel International Airport is underway. Millions of dollars are being invested to reinforce the runways. There are plans in the future to expand the facilities and runways at this airport which, together with the reinforcement mentioned above, will receive an estimated investment of more than 150 million dollars. There was recently an international tender for a F.S. for the reinforcement plan.

(3) Telecommunications Facilities

Telecommunication Facilities	Number of telephone circuits (past three years) 356,260 (of which 92.80% are automatic)	Telephone receivers (3 years) 534,300
	Number of telex circuits (domestic and international lines) (3 years)	
	Domestic 250	
	International 690	
Satellite communication earth station (Domestic, International)		
3 (Domestic, International)		
Construction is planned of one station at Coihaique in the South.		
Investment amount and Outline of plans (up to 1983)		
341 million dollars		
Breakdown:		
247 million dollars		Laying of new line
12 million dollars		Intracity call totalling equipment
82 million dollars		Service Improvements

Source: Ministry of Public Works

REFERENCE MATERIAL 4. PROPOSED PROJECT EVALUATION

1. OBJECTS OF EVALUATION

By considering the contents of the proposals for each project separately, and only looking at the items for which concrete improvements exist, it becomes obvious that there are items which can immediately be put into effect, and items where there is some problem with immediate execution. There are also items whose improvement is a matter of future direction. As well, there are many instances in which it would prove useful to combine multiple improvements. These decisions must be made in response to Chile's internal situation and the situation within the State Railways. For these reasons, it is difficult to grasp the economy of each project within the context of the project as a whole. Therefore, evaluation of investment must be carried out by limiting the scope to specific measures in the project. In this situation too, there are proposals which require no investment at all, and others which require investment but for which the cost cannot be readily gauged. At the same time, in determining the effectiveness of improvements which are undertaken, there are items whose effectiveness cannot be grasped at all, and many other items which, even if their effectiveness can be ascertained, it cannot possibly be expressed numerically. This fact is due to the combination of the lack of adequate amounts of various data within Chile, and the difficulty of measuring the effect of investment.

The three items following are limited to an analysis of the extent, within the scope of available data, to which the general aims can be grasped.

- Computerization of the freight car control (P1)
- Conversion of San Eugenio plant to repair depot (P1)
- Computerization of the sales of reserved seat tickets (P2-2)

2. EVALUATION METHODS

There are several methods for evaluating investment effectiveness. These include the method for evaluating the length of the period for the retrieval of investment, the method for calculating the internal rate of return, the method for comparing the net present value of cost and benefit, the method for obtaining the cost-benefit ratio and the method for comparing the amount of cost. The evaluation here will be according to the calculation of the internal rate of return.

In the internal rate of return, the total of the net present values over the period of the project life equals zero. That is, the discount rate must be such that the total of present values of costs equals the total of the present values of the benefits obtained by the implementation of the improvements. When expressed in the following formula, the "r" is the internal rate of return (IRR).

$$\sum_{t=1}^n \frac{C_t}{(1+r)^t} - \sum_{t=1}^n \frac{B_t}{(1+r)^t} = 0$$

C_t: Cost of year t

B_t: Benefit of year t

n : Project life

r : Discount rate

When this IRR is greater than the opportunity cost of capital in country, this means that the project is feasible.

In an economic evaluation, it is necessary to consider the costs and benefits of the project from the standpoint of the society as a whole. It is therefore usual in an evaluation to modify related data and to use it to meet these ends. That is, the data (price) is modified according to two standards:

- (a) Are the resources really used in that project? and,
- (b) Is it an expression of the real price?

Standard (a) excludes from the calculation of the market price such simply domestic transfer items as taxes and interest. Standard (b) uses as a shadow price such elements as labor, land and foreign exchange. However, this project is of a character which is difficult to place on the basis of an economic analysis. Since there were also facts and data which could not be adequately gathered, there were problems with conducting the analysis based on the thinking described above. The evaluation was therefore conducted according to the following method.

3. PRECONDITIONS TO EVALUATION

(1) Units of currency

The prices used in the calculations were in pesos. The following exchange rates were applied.

1 U.S. Dollar = 70 Pesos = 245 Yen

No shadow exchange rate was applied to the foreign exchanges.

(2) Acquisition of materials and labor

Apart from those particular items listed, the acquisition of materials and labor will be carried out on site.

(3) Breakdown of cost

Since no data was obtained which would allow the distribution of the majority of cost into commodities expenses and personnel expenses, that break-down is not indicated.

(4) Increases in transportation volume

The future growth in the volume of transportation have been estimated as 3.3% per year for freight transport and 2.2% for passenger transport. These estimates are based on the interrelation between the actual rates of economic growth and the variations in the amounts of transportation over the past few years. The basis used for the economic growth rates of the future was the aimed value (7%) of the average yearly economic growth rate. This

figure is in line with the social and economic development plan (Plan Nacional Indicativo de Desarrollo) published by the Chile Economic Planning Agency (ODEPLAN).

(5) Project life

This was calculated as a period of 30 years.

4. CALCULATION OF COST AND BENEFIT

(1) Computerization of the freight car control

The current set-up for freight car control reports the conditions of operation to the command personnel by command telephone. This information is sent to the Freight Car Control Office and entered in the freight car control ledgers. This proposal calls for the computerization of the duties of the Freight Car Control Office in order to increase the degree of accuracy, the completeness and the degree of use of data, and to increase the efficiency of freight car operations. In Chapter II, proposals are made in the categories short-term plans, medium-range plans and long-term plans. The short-term plans will be considered here.

1) Calculation of cost

As shown in Table VI.4.1, cost of computerization are calculated by dividing them into the initial costs for hardware, software and others, and operating costs. The system is to be replaced after 10 years. Other preconditions are stated in Chapter II. The employees in the current communications section are to be used as the personnel for the software control group. Any manpower shortages can be made up from such areas as the freight car control ledger personnel where labor savings will be made possible by the computerization.

Table VI.4.1 Cost of Computerization of Freight Car Control

(Unit: million pesos, Jan. 1983)

Item	Cost for short-term plan	Remarks
Hardware	5.7	
Software	22.9	General-use software
Other initial costs	4.9	Expenses for system consultation, installation and commissioning, training, transportation etc.
Operating costs	2.5	Maintenance, electricity charges, Communication expenses, etc.
Total	36.0	

2) Calculation of benefit

The reduction in personnel with this short-term plan will be 2 of the employees involved in the compilation of the freight car control ledgers. Since these 2 persons will be absorbed by the need for software control personnel, the direct effect will be only the reduction of printing costs for the control ledgers. This is very small amount of 120,000 pesos per year for 8,000 freight cars. Computerization will raise the efficiency of freight car operation. However, since at present there is an excess of freight car compared to the demand at the Chilean State Railways, freight car is available whenever it is necessary.

This means that almost no benefit can be expected from this improved efficiency of freight car operation.

The Chilean State Railways has more than 7,300 freight cars. In Chapter II, it is proposed that the future freight car be 4,300 cars, which would require rearrangements such as the

abolition of 3,000 cars. It is not possible to make an accurate determination of which freight car is necessary and which freight car is not necessary with a manual freight car operation control. This fact would prevent the implementation of a rational abolition program. On the other hand, to prevent the appearance in future of large numbers of cars which become temporarily unusable, periodic maintenance must be carried out. With the computer control of freight car, it will be possible to accurately gauge the number of cars required. This alone will make it possible to reduce freight car maintenance expenses. A difference in margin of error of up to 200 cars exists between a determination of the necessary freight car by manual means and by computer. Thus, the savings in maintenance cost is roughly estimated at 5.4 million pesos (note).

Accordingly, the total profit would be 5.5 million pesos, including the savings in freight car control ledgers.

(Note)

Maintenance expenses are calculated as follows;

Provisional inspections: For one car, expenses for one laborer, parts and materials - 8,000 pesos;

General inspections: For one car, expenses for five laborers, parts and materials - 80,000 pesos;

(2) Conversion of San Eugenio plant to repair depot

Since, at present, there is no large freight car repair yard in the Central, if cars come to require repairs there, they must be sent to either the Concepción plant or the Temuco repair yard. A rolling stock repair yard should be established at the San Eugenio plant in order to resolve this problem.

1) Calculation of cost

Costs accompanying a conversion of the plant might include the costs for the installation of various facilities and repairs and those costs attached to repair operations such as the slight increase in personnel necessary to carry out the repairs, and the costs of materials and electric power.

Of these, the materials and electric power costs are not included in the calculation of cost since the amount of these used at the San Eugenio plant will be saved at the other plants.

Table VI.4.2 shows data obtained from the Chilean State Railways regarding the costs for the installation and repair of various facilities.

As shown in Table VI.4.3 regarding the personnel necessary, the increase in personnel at the San Eugenio plant takes into consideration the decrease in personnel at the Patio freight car sector whose scale of operation will be reduced, and the reduction in personnel at the Concepción plant and the Temuco repair yard. The yearly salary for the extra necessary personnel was taken as 180,000 pesos.

Table VI.4.2 Cost of Reestablishment of the San Eugenio Plant

(Unit: thousand pesos, Jan. 1983)

Item	Cost
Installation of compressors	150
Repair of mobile gantry crane (2,500 kg)	40
Repair of mobile gantry crane (5,500 kg)	80
Construction of roof over mobile gantry crane (5,500 kg)	280
Establishment of steelmaking works plant	120
Welding machine parts and oxygen devices	120
Installation and assemble of machinery (lathes, working machines etc.)	120
Track-mobile repair	200
Total	1,110

Table VI.4.3 Increase in Personnel Necessary to Undertake Repairs at San Eugenio Plant

Yard	Existing	Revised	Increase
San Eugenio Plant	9	24	+15
Patio Freight Car Sector	15	8	- 7
Concepción Plant			- 4
Temuco Repair Yard			
Total			+ 4

2) Calculation of benefit

The benefit accompanying the execution of freight car repairs at the San Eugenio plant includes several elements.

These are the savings in expenses for sending freight car requiring repair from the Central Control Headquarters to the Concepción plant or the Temuco repair yard, savings in the expenses for returning repaired freight car, the improved freight car operating efficiency resulting from the reduction in number of inoperable cars and the solution of the problem of facilities in the deteriorated Patio freight car sector. Only the savings in freight car movement expenses will be calculated here.

The distance from the Central Control Headquarters to the southern plants is about 600 km. For a normal car to return over this distance would require 12 ~ 14 hours and about 3 ~ 4 times that time for a faulty car. During 1981, 164 cars requiring repair were returned from Alameda to the southern plants. Since the cost of return is 100 pesos per hour, per car, the total savings in these expenses can be calculated at 787,200 pesos per year.

(3) Computerization of the sales of reserved seat tickets

The sale of reserved seat tickets is being carried out with the system for tearing off half the ticket and using reserved seat

assignment registers. Computerization of these activities would modernize and simplify the reservation and sales of reserved seat tickets, make them more efficient, and improve services to passengers. Three proposals regarding the introduction of computers are made in Chapter IV. Second alternative and third alternative are considered here.

1) Calculation of cost

Costs for the introduction of the system might include those for the installation and commissioning of the hardware and software and maintenance and training expenses. The preconditions to these calculations are as follows.

- There will be no special modifications to the hardware
- System consultation will be conducted in Chile
- The system will be replaced after 10 years
- Documentation will all be in English
- Cost of interpreters is not included in estimate

Table VI.4.4 shows the calculation of the cost of computerization based on the above preconditions.

Table VI.4.4 Cost of Seat Reservation System

(Unit: million pesos, Jan. 1983)

Item	Second alternative	Third alternative	Remarks
One set of hardware	37.9	87.5	
Software	1.9	2.3	Excluding application programs.
Application programs	100.0	150.0	
System consultation	15.4	19.3	
Installation, commissioning costs	3.1	4.2	
Maintenance, training costs	10.0	10.0	
Transportation, insurance costs	4.3	5.7	
Spare parts, tools	11.4 (9.1)	26.3 (21.0)	Including dispatch of technicians. The amounts in parentheses are for the second year and thereafter.
Power supply, communication expenses	5.1	6.8	
Total	189.1	312.1	

2) Calculation of benefit

The benefit accruing from computerization of seat reservations has many aspects. The system allows for waste-free sales in which the reserved seats can be assigned between sections. The selling period can be extended. Additional preparations inside the cars in response to movements in passenger demand can be made promptly on the basis of accurate data. The reserved ticket for the return journey can also be easily secured. The effect of these features will be to improve services to passengers. The costs of printing the reserved seat assignment registers can be saved.

The scale of the printing plant for tickets can be reduced. If in addition to the computerization, plans are made to use travel agents, the sales network can be expanded, and an increase in the volume of transportation can be expected with the greater capacity for attracting passengers.

Computerization should also make it possible to reduce by 10 the staff at the central reservations center, principally from that staff responsible for the ticket windows, and also by 2 at Alameda Station. Since about 5 persons will be necessary for the operation and maintenance of the central computer, the net reduction in personnel possible will be 7.

Three elements from the above are totalled here as benefit. They are the reduction in printing costs of registers, the increase volume of transport owing to the use of travel agents and the reduction of personnel.

Registers are at present compiled for seat reservations in 60 cars. If the extra cars in the summer season are considered, each sales point requires a total of 184,000 sheets/year, and the cost is 2.8 million pesos per year.

Of the passenger income of the Japanese National Railways, 20% is sold by travel agents. Half of this can be considered as an increase due to the use of the agent. If the expected effect in Chile is half of that in Japan, the increase in transportation volume with the use of travel agents will be 5%. Since the expected income related to reserved seat tickets by the Chilean State Railways (for 1981) is 545 million pesos, the monetary equivalent of the increased volume is 27.25 million pesos.

(The commission fee taken by agents from the Railways is not calculated into the profit.)

The effect of personnel reductions becomes 1.3 million pesos when the yearly wage per person is 180,000 pesos. When the

above elements are totalled, the profit in the first year becomes 31.3 million pesos.

5. EVALUATION

(1) Computerization of the freight car control

Table VI.4.5 shows the IRR related to the computerization of the activities of the Freight Car Control Office. Although the indicated value of 7.3% is slightly low, this is due to the fact that those effects which are difficult to express numerically such as the improved accuracy of data, the greater degree of completion of data and the higher level of use of data, are not calculated into the profit.

Furthermore, when the long-term plans (a total system with a data base machine) are included, more accurate and more appropriate controls and directives will be possible. There is also the effect of being able to control even the operation of locomotives and crews, but this is not feasible at present since it would increase the initial investment costs.

(2) Conversion of San Eugenio plant

The calculation of the IRR for the reestablishment of the San Eugenio plant and the conduct of freight car repairs there, is as shown in Table VI.4.6. In this calculation, repairs has been increased accordingly with the growth in the transportation volume. The feasible value shown for the IRR is 20.1%. However, when other factors are taken into consideration, such as the slightly low estimate of the costs for refurbishing the plant and the fact that not all the profits are considered because of the difficulties in expressing them quantitatively, it is deemed necessary that further, more detailed investigations be undertaken.

(3) Computerization of the sales of reserved seat tickets

A roughly feasible value of 12.9% was obtained for the IRR with second alternative for the introduction of computers into the sales of reserved seat tickets for passenger trains on the Southern Railway.

It was not possible to calculate an IRR (less than 0%) for third alternative. This result was due to the fact that it is not possible to calculate into the benefit the great improvements in passenger services which are achieved with third alternative.

In the IRR calculation process, the benefit accruing from the use of the sales capacity of travel agents was calculated in. There are several elements in this matter. For instance, because wide-ranging personnel rationalizations have already been undertaken, there is almost no effect in reducing the number of necessary personnel by the introduction of the system. Further, many intangible benefits could not be quantitatively expressed. Finally, if no use were made of agents, the effect of the introduction of the system would be reduced by half.

6. FUTURE PROBLEMS

The calculation of IRR indicated that each of the improvements could produce generally feasible results. However, since it was not possible to undertake a full-fledged economic analysis within that calculation process, strong hopes are held that in the future, further detailed analyses will be carried out that include other means of evaluation. In particular with regard to the computerization of the freight car control and seat reservations, a detailed system design should be undertaken. Then, at the same time as the costs are carefully examined, determination should be made of the benefit based on adequate data, and the suitability of the introduction of the system investigated. A necessary precondition to the effectiveness of both systems is that the network of telecommunications circuits be reorganized. The first task to undertake is this organization of the telecommunications

network. Because the Chilean State Railways is carrying out extremely thorough rationalization of personnel, it was not possible to calculate a large effect for any of the improvements. Ideally in the future, analysis should be made after probes have been made of each type of improvement proposed in each Project to establish which improvement should be carried out in which form, how they can be best combined. To these ends, it is imperative that related data be immediately gathered and organized.

Table VI.4.5 Calculation of Internal Rate of Return
(Computerization of freight car control)

			(MILLION PESOS)						
			DISCOUNT RATE = 7%			DISCOUNT RATE = 8%			
YEAR	COST	BENE- FIT	DIS- COUNT FACTOR	COST	BENE- FIT	DIS- COUNT FACTOR	COST	BENE- FIT	
1	36.0	5.5	1.000	36.0	5.5	1.000	36.0	5.5	
2	2.5	5.5	.935	2.3	5.1	.926	2.3	5.1	
3	2.5	5.5	.873	2.2	4.8	.857	2.1	4.7	
4	2.5	5.5	.816	2.0	4.5	.794	2.0	4.4	
5	2.5	5.5	.763	1.9	4.2	.735	1.8	4.0	
6	2.5	5.5	.713	1.8	3.9	.681	1.7	3.7	
7	2.5	5.5	.666	1.7	3.7	.630	1.6	3.5	
8	2.5	5.5	.623	1.6	3.4	.583	1.5	3.2	
9	2.5	5.5	.582	1.5	3.2	.540	1.4	3.0	
10	2.5	5.5	.544	1.4	3.0	.500	1.3	2.8	
11	9.6	5.5	.508	4.9	2.8	.463	4.4	2.5	
12	2.5	5.5	.475	1.2	2.6	.429	1.1	2.4	
13	2.5	5.5	.444	1.1	2.4	.397	1.0	2.2	
14	2.5	5.5	.415	1.0	2.3	.366	.9	2.1	
15	2.5	5.5	.388	1.0	2.1	.340	.9	1.9	
16	2.5	5.5	.362	.9	2.0	.315	.8	1.7	
17	2.5	5.5	.339	.8	1.9	.292	.7	1.6	
18	2.5	5.5	.317	.8	1.7	.270	.7	1.5	
19	2.5	5.5	.296	.7	1.6	.250	.6	1.4	
20	2.5	5.5	.277	.7	1.5	.232	.6	1.3	
21	9.6	5.5	.258	2.5	1.4	.215	2.1	1.2	
22	2.5	5.5	.242	.6	1.3	.199	.5	1.1	
23	2.5	5.5	.226	.6	1.2	.184	.5	1.0	
24	2.5	5.5	.211	.5	1.2	.170	.4	.9	
25	2.5	5.5	.197	.5	1.1	.158	.4	.9	
26	2.5	5.5	.184	.5	1.0	.146	.4	.8	
27	2.5	5.5	.172	.4	.9	.135	.3	.7	
28	2.5	5.5	.161	.4	.9	.125	.3	.7	
29	2.5	5.5	.150	.4	.8	.116	.3	.6	
30	2.5	5.5	.141	.4	.8	.107	.3	.6	
-----				-----		-----			
TOTAL				72.1	73.0		63.7	66.9	
-----				-----		-----			
				NPV =	.9		NPV =	-1.3	
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$$IRR = 7 + \frac{0.9}{0.9 + 1.3} = 7.3 (\%)$$

Table VI.4.6 Calculation of Internal Rate of Return
(Reestablishment of the San Eugenio Plant)

(THOUSAND PESOS)

YEAR	COST	BENE- FIT	DISCOUNT RATE = 20%			DISCOUNT RATE = 21%		
			DIS- COUNT FACTOR	COST	BENE- FIT	DIS- COUNT FACTOR	COST	BENE- FIT
1	1830.0	787.2	1.000	1830.0	787.2	1.000	1830.0	787.2
2	743.8	813.2	.833	619.8	677.7	.826	614.7	672.1
3	768.3	840.0	.694	533.5	583.3	.683	524.8	573.7
4	793.7	867.7	.579	459.3	502.1	.564	448.0	489.8
5	819.3	890.4	.482	395.4	432.3	.467	382.4	418.2
6	846.9	925.9	.402	340.4	372.1	.386	326.5	357.0
7	874.9	950.5	.335	293.0	320.3	.319	273.8	304.8
8	903.7	988.1	.279	252.2	275.8	.263	238.0	260.2
9	933.5	1020.7	.233	217.1	237.4	.218	203.2	222.1
10	964.4	1054.4	.194	186.9	204.3	.180	173.5	189.6
11	995.2	1089.2	.162	160.9	175.9	.149	143.1	161.9
12	1027.0	1125.1	.135	133.5	151.4	.123	126.4	138.2
13	1063.0	1162.2	.112	119.2	130.3	.102	107.9	116.0
14	1098.1	1200.6	.093	102.8	112.2	.084	92.1	100.7
15	1134.0	1240.2	.078	88.3	98.6	.069	78.7	86.0
16	1171.0	1281.1	.065	76.1	83.2	.057	67.2	73.4
17	1210.4	1323.4	.054	65.5	71.0	.047	57.3	62.7
18	1251.0	1367.1	.045	56.4	61.0	.039	48.9	53.5
19	1291.0	1412.2	.038	48.5	53.0	.032	41.8	45.7
20	1334.3	1458.3	.031	41.3	45.7	.027	35.7	39.0
21	1376.3	1506.9	.026	36.0	39.3	.022	30.5	33.3
22	1423.3	1550.7	.022	30.9	33.8	.018	26.0	28.4
23	1470.3	1608.0	.018	26.6	29.1	.015	22.2	24.3
24	1519.3	1661.1	.015	22.9	25.1	.012	18.9	20.7
25	1569.4	1715.9	.013	19.7	21.6	.010	16.2	17.7
26	1621.2	1772.5	.010	17.0	18.6	.009	13.8	15.1
27	1674.7	1831.0	.009	14.6	16.0	.007	11.8	12.9
28	1730.0	1891.4	.007	12.6	13.8	.006	10.1	11.0
29	1787.1	1953.9	.006	10.8	11.9	.005	8.6	9.4
30	1840.0	2018.3	.005	9.3	10.2	.004	7.3	8.0
TOTAL				11172.8	11186.8		10758.6	10669.2
				NPV = 14.0			NPV = -89.3	

$$IRR = 20 + \frac{14.0}{14.0 + 89.3} = 20.1 (\%)$$

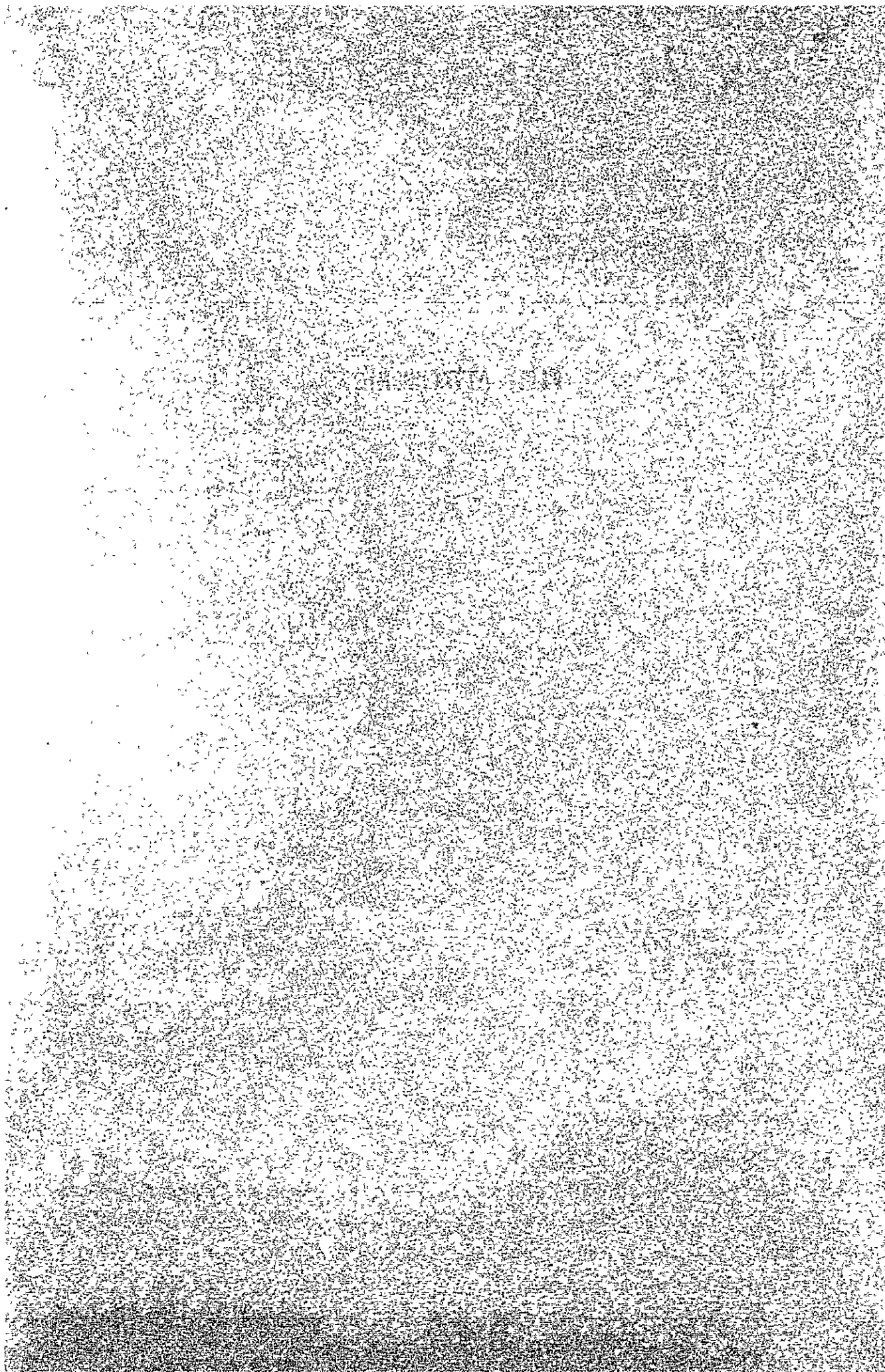
Table VI.4.7 Calculation of Internal Rate of Return
(Computerization of the sales of reserved seat
ticket)

(MILLION PESOS)

YEAR	COST	BENE- FIT	DISCOUNT RATE = 12%			DISCOUNT RATE = 13%		
			DIS- COUNT FACTOR	COST	BENE- FIT	DIS- COUNT FACTOR	COST	BENE- FIT
1	189.1	31.3	1.000	189.1	31.3	1.000	189.1	31.3
2	14.2	32.0	.893	12.7	28.6	.885	12.6	28.3
3	14.2	32.7	.797	11.3	26.1	.783	11.1	25.6
4	14.2	33.4	.712	10.1	23.8	.693	9.8	23.1
5	14.2	34.1	.636	9.0	21.7	.613	8.7	20.9
6	14.2	34.9	.567	8.1	19.8	.543	7.7	18.9
7	14.2	35.6	.507	7.2	18.0	.480	6.8	17.1
8	14.2	36.4	.452	6.4	16.5	.425	6.0	15.5
9	14.2	37.2	.404	5.7	15.0	.376	5.3	14.0
10	14.2	38.0	.361	5.1	13.7	.333	4.7	12.5
11	61.4	38.9	.322	19.8	12.5	.295	13.1	11.5
12	14.2	39.7	.287	4.1	11.4	.261	3.7	10.3
13	14.2	40.6	.257	3.6	10.4	.231	3.3	9.4
14	14.2	41.5	.229	3.3	9.5	.204	2.9	8.5
15	14.2	42.4	.205	2.9	8.7	.181	2.6	7.7
16	14.2	43.4	.183	2.6	7.9	.160	2.3	6.9
17	14.2	44.3	.163	2.3	7.2	.141	2.0	6.3
18	14.2	45.3	.146	2.1	6.6	.125	1.8	5.7
19	14.2	46.3	.130	1.8	6.0	.111	1.6	5.1
20	14.2	47.3	.116	1.6	5.5	.098	1.4	4.6
21	61.4	48.3	.104	6.4	5.0	.087	5.3	4.2
22	14.2	49.4	.093	1.3	4.6	.077	1.1	3.3
23	14.2	50.5	.083	1.2	4.2	.068	1.0	3.4
24	14.2	51.6	.074	1.0	3.8	.060	.9	3.1
25	14.2	52.7	.066	.9	3.5	.053	.8	2.8
26	14.2	53.9	.059	.8	3.2	.047	.7	2.5
27	14.2	55.1	.053	.7	2.9	.042	.6	2.3
28	14.2	56.3	.047	.7	2.6	.037	.5	2.1
29	14.2	57.5	.042	.6	2.4	.033	.5	1.9
30	14.2	58.8	.037	.5	2.2	.029	.4	1.7
TOTAL				323.1	334.6		313.2	311.2
				NPV =	11.5		NPV =	-2.0

$$IRR = 12 + \frac{11.5}{11.5 + 2.0} = 12.9 (\%)$$

VII. ATTACHMENTS



ATTACHMENT 4. Questionnaire Form on the Use of Trains for the
Transportation of Freight

QUESTIONNAIRE ON THE USE OF TRAINS FOR
THE TRANSPORTATION OF FREIGHT

The Railway Enterprise thanks you in anticipation for answering the following questionnaire the purpose of which is to improve the quality of the service offered.

Note:

1. Please use the reverse side of the sheet, if the space left to write your comments is not sufficient.
2. We hope you will be kind enough to return the completed questionnaire by _____ 1982.

Thanking you again,

CHILEAN STATE RAILWAYS

NOTE: Should you require additional information for your reply, please request it by telephoning Santiago 34205.
For provinces, the information can be requested from the commercial representative of the railways of your locality.

NAME OF YOUR ENTERPRISE

1. Regarding the use of railways, please place a circle or write your comments in the column of each item.

Name of main dispatch stations					
Does your enterprise have a siding?	Yes or no	Does you enterprise have private car?	Yes or no		
Existence of private Container	Yes or no	Use of siding by third parties	Yes or no		
Type of main freight					
Is there a transport enterprise that you usually use?	Yes or no	Is this transport enterprise of your own? Yes or no			
Transportation means Volume transported in 1981	Railways		Truck Thou- sands of tons	Ship	Total
	Complete car Thou- sands of tons	Container No. ..			
Transportation re- sult (1981) (Participation)	%	%	%	%	100%

2. Please explain the reason for choosing the means of transportation.

Put a mark in the column corresponding to the main reasons for your choice.

(In the diagram overleaf)

Reason for the choice \ Means of transportation	FFCCE	Truck	Ship
Transportation time			
Punctuality			
Movement flexibility			
Transportation distance			
Transportation cost (Tariff)			
Packing method			
Safety			
Transportation volume			
Other (.....)			

3. What do you think about the present tariff for merchandise applied by the State Railways?

Please give your comments, putting a circle in the corresponding number in the following alternatives.

- (1) The tariff of the State Railways are generally high for door-to-door transportation.
- (2) The rates of the State Railways are standard, but the values for loading, unloading and distribution to the warehouse are high and are necessary on a secondary basis.
- (3) The secondary cost is reasonable, but the rates of the Railways are high.

(4) Generally the cost level is standard.

(5) Others (.....)

4. If the Railways increase their rates (tariffs) what would your reaction be? Please put a mark in the number and then letter corresponding to your opinion.

(1) It is unavoidable. { a. It must be increased according to the
CPI.
(Nothing can b. It must increase after a certain period
be done.) of time by a certain amount, even though
it is high.
c. It must be proportionate to the improve-
ment of the system or service.
d. Others (.....)

(2) Opposition { a. Due to the economic
(Must be lowered). depression.
b. There is no other means of transpor-
tation
c. There is a tendency to lowering of the
price of other means of transportation.
d. Others (.....)

(3) Indifferent { a. There are other means of transportation.
b. I hardly use the Railways at all.
c. Others (.....)

5. If you have any suggestion to improve the dispatch formalities and marketing system, please indicate it briefly here:
.....
.....

6. In regard to the use of siding: Please draw a circle in the number and letter corresponding to your situation.

- (1) You have a siding: a. Not used enough
 b. Used little
 c. Not used

In case of b or c, please explain by placing another mark in the following letters as applicable.

- (a) Because the rates are high.
- (b) Because the cost for maintenance of the siding is high.
- (c) Because the place of destination was changed and the transportation has decreased.
- (d) Because truck is more convenient at present.
- (e) Others (.....)

- (2) You do not have a siding.

- a. Do you think to build it in future?
- b. You can't build even you need it.
- c. You have no intention to build.

In case b, please explain the reasons.

.....

7. If you have any suggestions about the quality of the railway equipment (cars) please indicate them briefly:

- (1) About the cars of the Railways:

.....

(2) Regarding private cars or private containers

- a. Do you know the systems of private cars or private containers that are being used in foreign countries?
- b. What advantages do you expect should you decide to use the private car or private container system?

8. Please state your desire for improvement of the freight-handling facilities, etc., placing a circle in the number that corresponds to your situation.

- (1) Paving of the site of loading and unloading.
- (2) Installation of the roof.
- (3) Change the platform from the high type to the low type or vice versa.
- (4) Arrangement of the place for treatment of the merchandise and storage facilities.
- (5) Others (.....)

9. What do you think about the commercial activities of the Railways?

Please indicate your opinion marking the corresponding number.

- (1) Satisfactory
- (2) Insufficient
- (3) Indifferent

Why?

(.....)
(.....)

10. What do you think about the payment system of Railways?

Do you have a checking account? Yes No

If you do not have a checking account, would you be interested by monthly payments? Yes No

Do you agree with the present form of payment? Yes No

What would you suggest as a method of payment?

.....
.....
.....
.....
.....
.....

11. Please indicate your opinion and desires in regard to the transportation of freight by railways.

ATTACHMENT 5. Questionnaire Form on the Use of Passenger Trains

COMMERCIAL ADMINISTRATION
DEPT: PASSENGER SECTION

S U R V E Y

MR. PASSENGER:

OUR COMPANY IS INTERESTED IN OFFERING THE SERVICE
THAT BEST ACCOMODATES ITS USERS.

WITH THIS IN MIND WE HAVE PREPARED THIS SURVEY WHICH
WE ASK YOU TO FILL OUT.

FOR YOUR COLLABORATION, BEFOREHAND, WE THANK YOU.

1.- What is your originating station?

Station

2.- What is your destination?

Station

Make an "X" in front of that which applies:

3.- What is the purpose of your trip?

- sightseeing
- Business
- Honeymoon
- Study
- Other purposes (What?)

4.- Number of persons traveling:

- Traveling alone? g alone?
- Traveling with someone (How many persons?)

5.- What is the reason for traveling by our services?

- The schedule of this train is accommodate
- Safety
- Comfort
- Fast
- The price of the ticket is within your means
- Punctuality of the schedule

6.- For how many days will you travel?

- Departure and return on the same day - More than one week
- Two to seven days - More than fifteen days

7.- When did you decide to travel?

- The day of departure
- The day before departure
- Two to seven days before departure
- More than one week before departure
- Fifteen to thirty days before departure
- More than thirty days before departure

8.- If you travel in reserved accomodations, when did you make reservations?

- The day of departure
- The day before departure
- Two to seven days before departure
- More than one week before departure
- Fifteen to thirty days before departure

9.- a) If you are departing, by what means do you plan to return?

b) If you are returning, by what means did you travel going? Circle a) or b) according to your situation.

- By train
- By bus
- By airplane
- By car
- By ship
- Still not decided

- 10.- How does the exterior appearance of this train seem?
 - Elegant - Normal
 - Bad - Very bad
 - Not interested
- 11.- How does the interior appearance of this train seem?
 - Excellent - Good
 - Regular - Bad
 - Not interested
- 12.- The Attention Service on this train (food, confections, drinks, etc.) is:
 Respond, if you think it necessary, to more than one alternative
 - Good
 - Regular
 - Bad
 - Service not available
 - What would you like to change?
- 13.- How many times do you use the train in year?
 trips
- 14.- Do you use some type of credit card? Example: DINERS, MASTER-CARD, VISA, AMERICAN EXPRESS.
 - Yes
 - No
 If you responded "Yes", which card do you use?
- 15.- Please indicate your sex.
 - Male - Female
- 16.- Your profession, work, job or occupation is:
 - Professional - Student
 - Public employee - Housewife
 - Private employee - Retired
 - Merchant - Pensioner
 - Farmer - Other:What?
 - Industrialist
- 17.- How old are you?
 Years
- 18.- In what city do you presently live?
 City
- 19.- What suggestions would you make to improve our Passenger services?

THANK YOU FOR YOUR ATTENTION

ATTACHMENT 6. Goods Flow in Southern Railway (March, July and December, 1981; 12 weeks)
(Unit: Tons)

	Ventana	Barrancas	Yungay (Various)	Maipū	Ñuñoa	Renca	Chuquicamata	Alameda	Talagante Calera Temuco	Pto. Aduana	Calera	Pto. Varas	Rengo	Los Andes	(Various)	Talcahuano Lirquen	Talcahu
Saladillo	43,080																
Rancagua	301	72,426					604										
Calera			11,430							1,230							
Polpaico				13,215													
Pto. Aduana			2,609					1,020			10,065	440		304			
Chagres		6,317															
Villa Alegre																	2,2
Talca																	3,6
Alameda		735															
Los Andes						300											
Barrancas			7,584		3,648			5,231	5,000						108,115		
Cocharcas						2,200											
Baron															2,880		
Talagante		2,771															
Malloco													1,656				
Laja																	34,359
(Various)																	
Carampangue																11,830	22,2
Colico																	18,1
Nacimiento																	4,200
Lebu																	
Curanilaque																	
Coronel															51,892		
Talcahuano								51,682							12,834	2,750	
Penco															33,040		
Temuco								2,388			2,718					1,709	
Valdivia																	
Osorno								2,640									
Lirquen															535		
Metrengo																	
Rapaco																	
Lanco																	
La Unión																	
Villarrica																	
Quepe																	
Gorbea																	
Total	43,381	82,249	21,623	13,215	3,648	2,500	604	62,961	5,000	1,230	12,783	440	1,656	304	209,296	54,848	48,

Pto. Aduana	Calera	Pto. Varas	Rengo	Los Andes	(Various)	Talcahuano Lirquen	Talcahuano	Laja	Laja Carampangue	Lautaro	Temuco	Rancagua	Linares Los Angeles	Los Angeles	Talca	Talagante	Chillán	Valdivia
1,230																		
	10,065	440		304														
							2,220											
							3,643											
					108,115													
					2,880													
			1,656															
						34,359												
								114,060										
						11,830	22,325											
							18,640											
						4,200												
					51,892													
					12,834	2,750		5,350	10,276	10,900	10,383	4,108						
	2,718				33,040								19,553					
						1,709												
					535													
														7,765				
								814										
								805										
																1,720	850	
1,230	12,783	440	1,656	304	209,296	54,848	48,447	119,410	10,276	10,900	10,383	4,108	19,553	7,765	350	1,720	850	120

Rengo	Los Andes	(Various)	Talcahuano Lirquen	Talcahuano	Laja	Laja Carampangue	Lautaro	Temuco	Rancagua	Linares Los Angeles	Los Angeles	Talca	Talagante	Chillán	Valdivia	Total	
																43,080	
																73,331	
																12,660	
																13,215	
																14,438	
	304															6,317	
				2,220												2,220	
				3,643												3,643	
																735	
																300	
																129,578	
		108,115														2,200	
																2,880	
		2,880														2,771	
																1,656	
1,656			34,359													34,359	
					114,060											114,060	
			11,830	22,325												34,155	
				18,640												18,640	
			4,200													4,200	
																51,892	
		51,892														108,285	
		12,834	2,750		5,350	10,275	10,900	10,383	4,108							52,593	
		33,040								19,553						6,815	
			1,709													2,640	
																535	
		535														7,765	
											7,765					814	
				814												170	
												170				805	
				805												180	
												180				2,570	
													1,720	850		120	
															120	120	
0	1,656	304	209,296	54,848	48,447	119,410	10,275	10,900	10,383	4,108	19,553	7,765	350	1,720	850	120	749,622

ATTACHMENT 7. OD Table of Passengers in Southern Railway (Year 1981)
(Unit: Number of Passengers)

Origin \ Destination	Puerto	Baron	Viña del Mar	Quilpue	Villa Alemana	Peña Blanca	Limache	Quillota	Calera Sur	Llay-Llay	Mapocho	Alameda	Cartagena	Sn. Bernardo	Rancagua	Rengo	Sn Fe
Puerto			40,086	120,386	101,061	35,871	17,809	22,660	15,465	10,942	19,865						
Baron	3		3,560	39,165	15,575	15,552	6,685	10,355	5,419	3,720	1,370						
Viña del Mar	19,085	163		226,081	78,335	23,766	58,132	54,331	14,291	14,192	13,846						
Quilpue	142,477	19,524	215,231		13,426	4,933	8,600	12,583	3,698	4,437	8,120						
Villa Alemana	106,130	4,913	58,290	11,231													
Peña Blanca	34,727	3,973	21,974	5,966	2,443												
Limache	30,319	1,436	55,103	14,121	8,429	59											
Quillota	24,216	616	37,536	16,228	11,445	11	9,356										
Calera Sur	20,225	178	7,330	3,850	3,697	677	2,244	4,933									
Llay-Llay	19,251	169	12,453	7,099	1,754		4,578	25,256	19,389								
Mapocho	43,355	49	6,714	11,753	2,977	15	13,354	16,496	28,297	59,248							
Alameda													41,357	29,898	74,620	29,200	
Cartagena												47,113					
Sn. Bernardo												19,645	18		31,247	10,294	
Rancagua												55,344	7	25,305		7,013	
Rengo												24,579		7,489	4,477		
Sn. Fernando												41,124		11,809	26,944	6,455	
Pichilemu												13,599		2,594	9,785	1,942	
Curicó												103,608		17,711	10,609	4,622	
Talca												208,046		17,460	23,610	4,970	
Constitution												333		7	44	15	
Linares												79,023		9,034	3,807	796	
Parral												30,841		2,583	2,273	239	
Sn. Carlos												33,067		3,636	2,659	62	
Chillán												113,657		5,241	5,724	661	
Coelemu												716		3	7		
Tome												36					
Sn. Rosendo												6,096		28	248	65	
Concepción												109,082	4	331	2,427	589	
Laja												8,566		25	66	1	
Los Angeles												5,082		7	78	6	
Angol												4,713		32	278		
Victoria												14,144		328	518	3	
Temuco												64,718		106	1,620	2	
Loncoche												6,057		5	93		
Valdivia												25,482		48	295	1	
Los Lagos												4,323		5	67		
Osorno												23,565		4	204		
P. Montt												12,593		50	152		
Other Stations	118,030	4,841	128,160	37,078	29,117	10,977	17,858	12,993	15,924	7,836	73,119	367,937	3,017	54,718	39,100	7,729	
Total	557,818	35,862	586,437	492,958	268,259	93,532	146,895	182,143	108,368	148,766	252,262	1,423,089	44,403	188,457	240,952	74,665	

Llay-Llay	Mapocho	Alameda	Cartagena	Sn. Bernardo	Rancagua	Rengo	Sn. Fernando	Pichilemu	Curicó	Talca	Constitution	Linares	Parral	Sn. Carlos	Chillán	Coelemu	Tome	Sn. Rosendo
10,942	19,865																	
3,720	1,370																	
14,192	13,846																	
4,437	8,120																	
3,934	9,963																	
310	48																	
3,744	11,130																	
19,914	18,728																	
20,489	28,857																	
	67,216																	
59,248																		
		41,357		29,898	74,620	29,200	55,372	17,515	120,595	217,360	165	95,205	33,459	30,709	122,855	310	12	14,382
	47,113																	466
	19,645	18			31,247	10,294	14,953	2,105	15,543	14,983	36	6,264	2,780	2,147	5,105	3		488
	55,344	7		25,305		7,013	33,494	12,370	13,937	25,955	86	4,587	2,468	2,566	7,099	2		100
	24,579			7,489	4,477		5,824	2,165	4,733	4,065	1	715	218	198	791			168
	41,124			11,809	26,944	6,455		12,670	17,300	15,411	8	1,984	540	355	2,355			1
	13,599			2,594	9,785	1,942	10,120		44	26		30						476
	103,608			17,711	10,609	4,622	17,772	105		17,706	26	4,882	1,705	778	4,382	32		1,187
	208,046			17,460	23,610	4,970	15,678	25	19,957		7,050	11,058	8,339	2,572	9,108		1	3
	333			7	44	15	3		69	5,127		3			11			460
	79,023			9,034	3,807	796	1,947	30	5,179	10,532	2		9,822	2,840	7,336		1	248
	30,841			2,583	2,273	239	500		1,672	10,447		14,010		5,916	8,044		1	273
	33,067			3,636	2,659	62	596		917	2,787	33	2,805	8,255		2,846	11		2,608
	113,657			5,241	5,724	661	2,345		4,206	9,624	6	7,029	7,765	4,379	18,536		3,497	1
	716			3	7				25				1	18	19,712		14,248	3
	36											14	10	1	3,751	15,232		460
	6,096			28	248	65	99		188	567	2	386	274	180	3,366	3		460
	109,082	4		331	2,427	589	1,286	5	2,101	6,078	14	2,683	1,456	538	3,847	17,012	1,798	37,298
	8,566			25	66	1	89	2	242	724		277	379	42	2,302			4,752
	5,082			7	78	6	21		43	179		54	2	7	35			15,331
	4,713			32	278		69		212	332		236	49	54	400		5	2,761
	14,144			328	518	3	292		276	522		337	387	211	772	2		941
	64,718			106	1,620	2	511		1,245	2,466	1	1,354	623	239	2,386			3,919
	6,057			5	93		31		32	232	2	75	15	1	273			159
	25,482			48	295	1	137		320	1,443	2	667	119	41	1,333	17	22	483
	4,323			5	67		11		62	225		27	55		239			67
	23,565			4	204		54	27	139	1,222		406	43	14	1,035			41
	12,593			50	152		132		235	659	2	297	40	5	602			24
7,836	73,119	367,937	3,017	54,718	39,100	7,729	28,532	17,084	28,031	55,370	21,163	19,036	10,979	8,432	51,174	29,311	26,605	75,819
148,766	252,262	1,423,089	44,403	188,457	240,952	74,665	189,868	64,103	237,303	404,022	28,599	174,421	89,783	62,243	261,159	80,471	46,190	162,456

los	Chillán	Coelemu	Tome	Sn. Rosendo	Concepción	Laja	Los Angeles	Angol	Victoria	Temuco	Loncoche	Valdivia	Los Lagos	Osorno	P. Montt	Other Stations	Total
																117,568	501,713
																25,291	126,695
																114,298	616,520
																14,298	447,327
																22,036	234,885
																18,772	93,233
																7,879	146,562
																12,438	151,109
																17,976	110,456
																6,006	163,171
																75,373	257,631
09	122,855	310	12	14,382	115,926	3,323	1,588	764	15,545	72,670	8,345	25,166	6,261	26,276	17,746	321,747	1,498,371
																1,403	48,516
47	5,105	3		466	2,114	32	157	438	890	2,385	652	607	123	312	187	45,067	178,553
66	7,099	2		488	3,839	40	64	157	835	2,043	106	506	11	255	194	27,376	226,147
98	791			100	614				4	18		3		1		4,617	60,612
55	2,355			168	1,364	18		5	364	666	9	163		107	169	16,199	156,187
				1	5					2				27		18,759	56,934
78	4,382	32		476	3,018	36	4	203	334	1,486	59	363	48	173	106	19,942	210,186
72	9,108		1	1,187	6,908	387	670	248	858	2,657	783	1,565	312	1,288	797	71,131	416,665
	11			3	10				1			2				32,468	38,096
40	7,336		1	460	3,651	36	23	228	443	1,926	310	821	72	393	414	14,458	153,584
16	8,044		1	248	1,610	69	24	179	486	785	24	111	49	41	52	13,356	93,560
	2,846	11		273	891	21	1	36	161	316	19	38	7	78	13	11,389	70,917
79		18,536	3,497	2,608	4,935	1,731	40	456	1,053	3,232	312	1,929	102	1,251	813	69,995	271,127
18	19,712		14,248	1	17,058	1									3	30,327	82,120
1	3,751	15,232			2,709											32,856	54,609
30	3,366	3			31,394	2,087	2,865	1,346	427	707	44	170				53,176	103,718
38	3,847	17,012	1,798	37,298	80,248	430	6,461	4,760	8,473	573	1,862	3	25	9	140,796	430,189	
42	2,302			4,752	76,353	12,359	6,372	2,044	3,362	116	599	30	170	77	56,495	175,444	
7	35			15,331	91	776	2	131	120	59	49		34		11,738	33,845	
54	400		5	2,761	3,505	722	6	3	31		16	1			12,319	25,744	
11	772	2		941	5,583	1,161	11		12,405	262	782	10	201	81	69,871	109,100	
39	2,386			3,919	8,285	372	2	26	11,386	15,972	5,910	2,826	2,189	1,339	101,116	228,593	
1	273			159	655	11	1		719	18,135	2,544	503	460	287	63,611	93,901	
41	1,333	17	22	483	1,551	65	32	17	574	3,892	1,876	8,230	706	507	121,032	168,892	
	239			67	14	7			94	2,624	1,028	7,406	1,714	517	22,484	40,969	
14	1,035			41	26	124	1	10	168	2,217	424	957	1,925	6,340	84,855	123,801	
5	602			24	37	17		99	83	1,069	234	654	512	6,591	29,109	53,196	
32	51,174	29,311	26,605	75,819	127,480	29,968	11,405	11,318	55,494	113,554	47,295	112,025	22,235	80,275	23,180	943,924	2,878,123
43	261,159	80,471	46,190	162,456	419,626	121,252	29,683	28,365	96,857	254,775	78,502	164,248	43,260	122,567	52,831	2,873,551	10,931,001

