CHAPTER 5 CONSTRUCTION COST

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As has been stated so far, this construction work is to amplify the functions of the KM 10 Workshop corresponding to the 1st Step Electrification for the 2nd Step Electrification.

Therefore, the construction work includes not only new construction of buildings and facilities but also partial removal of buildings and transfer of facilities of the KM 10 Workshop corresponding to the 1st Step Electrification, and the construction cost has been calculated by including all of them.

In calculating the construction cost, the following items have been taken into account.

(1) The construction cost has been calculated by the quantity used in the Preliminary Design.

(2) The classification of machines to be newly installed, whether to be domestic products or foreign products, has been made based on that of the 1st Step Workshop Amplification Construction Plan.

(3) In calculating each construction work cost, the price survey presented by the Argentine Railways in April, 1985 of the KM 10 Workshop for the 1st Step amplification works have been referred to.

(4) As for the prices of machines to be purchased for the workshop amplification, the Argentine Railways' price list, etc. have been referred to.

(5) The amount of money has been expressed in the U.S. dollar price in September, 1985. Therefore, in correcting those data made at different periods, at first, they were converted into the U.S. dollar price at each period, and then have been corrected to the price in September, 1985, applying the U.S. consumer price index (taking the prices in 1967 as 100).

The total construction cost thus calculated has amounted approximately to U.S.$21,000,000. Its details of construction cost is shown in Table 5.1.1 and Table 5.1.2.

However, it will be necessary for the Argentine Railways to restudy, calculate and integrate the amount shown in these tables when executing amplification of the KM 10 Workshop.

Table 5.1.1 Total Construction Cost

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
(1)	Civil Engineering (Track)	0	270	270
(2)	Building (No.1 Workshop Building, No.2 Workshop Building, Energy Cnter, Incidental Building)	0	7,982	7,982
(3)	Building (Administrative Building)	0	1,535	1,535
(4)	Facilities of building (No.1 Workshop Building, No.2 Workshop Building, Energy Center, Incidental Building)	0	2,321	2,321
(5)	Facilities of building (Administrative Building)		360	360
(6)	Power Distributing Facilities (Including Grounding)	0	1,766	1,766
(7)	Catenary System (for Traverser)	0	2	2
(8)	Communication Facilities	0	158	158
(9)	Machines to be Increased	2,118	3,289	5,407
(10)	Machine Transfer	0	942	942
(11)	Utility Facilities	0	237	237
Total		2,118	18,862	20,980

Table 5.1.2 Details of Construction Cost

(1) Civil Engineering (Track)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	breakup, removal	0	17	17
2	loading, trasport (removed objects)	0	45	45
3	loading, transport (track materials)	0	36	36
4	establishment, adjustment	0	34	34
5	drain ditch	0	30	30
6	preparatory works	0	108	108
Total		0	270	270

(2) Building (No.1 Workshop Building, No.2 Workshop Building, Energy Center, Incidental Building)

No.	Item	Foreign currency	Domestic currency	Total cost
1	temporary works	0	0	0
2	ground levelling works (earthwork) ground levelling	0	256	256
3	concrete foundation works	0	1,411	1,411
4	structural steel works	0	1,404	1,404
5	wall works	0	1,244	1,244
6	carpentering works	0	192	192
7	painting works	0	117	117
8	glassworks	0	22	22
9	miscellaneous works	0	331	331
10	incidental buildings	0	627	627
11	removing works	0	2,378	2,378
Total		0	7,982	7,982

(3) Building (Administrative Building)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
	incidental building (locker room, office cookroom, medical department, guards' surrounding hedge, fence or stone walls)			
1	temporary works	0	547	547
2	ground levelling (including temporary office)	0	24	24
3	concrete foundation works	0	150	150
4	structural steel works	0	0	0
5	wall works	0	214	214
6	carpentering works	0	61	61
7	painting works	0	19	19
8	glassworks	0	6	6
9	miscellaneous works	0	77	77
10	removing works	0	437	437
Total		0	1,535	1,535

(4) Facilities of Building (No.1 Workshop Building, No.2 Workshop Building, Energy Center, Incidental Building)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	plumbing facilities	0	498	498
2	effluent treatment facilities (included in (11))	0	0	0
3	natural gas supply facilities (included in (11))	0	0	0
4	lighting facilities	0	607	607
5	fire hydrant facilities	0	444	444
6	compressed air facilities (included in (11))	0	0	0
7	heating facilities	0	338	338
8	liquid fuel facilities (included in (11))	0	0	0
9	industrial water supply	0	62	62
10	steam supply facilities (included in (11))	0	0	0
11	ventilation facilities	0	174	174
12	industrial drainage	0	23	23
13	fire detection facilities	0	175	175
Total		0	2,321	2,321

(5) Facilities of Building (Administrative Building)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	plumbing facilities (included in (4))	0	0	0
2	natural gas supply facilities	0	51	51
3	lighting facilities (included in (4))	0	0	0
4	fire hydrant facilities (included in (4))	0	0	0
5	air conditioning facilities	0	309	309
6	elevator	0	0	0
Total		0	360	360

(6) Power Distributing Facilities (Including Grounding)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	high-tension switchboard (normal)	0	293	293
2	high-tension switchboard (emergency)	0	77	77
3	low-tension switchboard	0	269	269
4	low-tension panelboard	0	807	807
5	transformer (normal)	0	36	36
6	transformer (emergency)	0	8	8
7	aluminium bus duct	0	1	1
8	coated bus	0	18	18
9	inspection box	0	1	1
10	wiring	0	58	58
11	piping	0	38	38
12	various fixture	0	5	5
13	grounding system	0	155	155
Total		0	1,766	1,766

(7) Catenary System (for Traverser)

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	catenary system	0	2	2
Total		0	2	2

(8) Communication Facilities

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	telephone system	0	31	31
2	public-address system	0	3	3
3	electric clock	0	30	30
4	local cable wiring	0	42	42
5	truck cable wiring	0	33	33
6	engineering	0	17	17
7	adjustment, test	0	2	2
Total		0	158	158

(9) Machines to be Increased

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	A: workshop yard	0	220	220
2	B: entrance/leaving inspection shop	115	0	115
3	D: electric equipment shop	40	114	154
4	E: car-body equipment shop	0	44	44
5	F: air brake equipment shop	223	73	296
6	G: parts painting shop	0	24	24
7	H: seat and vestibule diaphragm shop	12	67	79
8	I: car-body shop	0	92	92
9	J: pipe works shop	0	42	42
10	K: car-body painting shop	0	711	711
11	L: bogie shop	0	40	40
12	M: wheel and axle shop	1,578	622	2,200
13	N: traction motor shop	0	92	92
14	O: rotating equipment shop	134	92	226
15	P: ironwork shop	16	110	126
16	Q: machine shop	0	387	387
17	R: tool room	0	16	16
18	S: temporary bogie shed	0	59	59
19	T: cooling unit shop	0	171	171
20	V: warehouse	0	177	177
21	W: energy center	0	107	107
22	branch circuit board	0	29	29
Total		2,118	3,289	5,407

(10) Machine Transfer

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	D: electric equipment shop	0	331	331
2	F: air brake equipment shop	0	9	9
3	H: seat and vestibule diaphragm shop	0	2	2
4	K: car-body painting shop	0	3	3
5	L: bogie shop	0	45	45
6	M: wheel and axle shop	0	184	184
7	N: traction motor shop	0	179	179
8	O: rotating equipment shop	0	161	161
9	P: ironwork shop	0	28	28
Total		0	942	942

(11) Utility Facilities

Unit 1,000 US$

No.	Item	Foreign currency	Domestic currency	Total cost
1	effluent treatment facilities	0	31	31
2	natural gas supply facilities	0	188	188
3	compressed air facilities	0	15	15
4	liquid fuel facilities	0	0	0
5	steam supply facilities	0	3	3
Total		0	237	237

CHAPTER 6 CONSTRUCTION WORK PROCESS

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The KM 10 Workshop amplification construction work will take 2 years and 6 months after starting the work at site.

This amplification construction work will be carried out while the inspection/repairing works of electric railcars are continued. Therefore, the amplification work should be conducted with close contact between the supervising body of the construction works and the Workshop authorities, not to mention the coordination among the construction working groups concerned.

The KM10 workshop amplification construction work process is shown Fig. 6.1.1.

NO.	Type of Works \ Schedule	1st Year												2nd Year												3rd Year											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Removing works	pulling down																						pulling down													
2	Temporary construction works			erection of frame work							scaffold erection															scaffold removal											
3	Earthworks				excavation			refilling																													
4	Foundation works				concrete subslab				floor concrete												floor finishing																
5	Steel skelton works					factory manufacture					steel skelton erection																										
6	Brick works																	exterior walls, concrete block																		
7	Metal works																	roofing																		
8	Fixture works																	manufacure		fitting																
9	Painting works																																				
10	Interior works														ground coat						painting															
11	Track works				foundation													partition						finishing													
12	Passages in the workshop	temporary works									track laying (outside)									track laying (inside)																	
13	Machine installing works (new installation)	arrangement			foundation									manufacture and transport									installation						finishing								
14	Machine installing works (transfer)				foundation																					installation			adjustment								
15	Industrial facilities					sleeve fixing			burying piping										piping				fittings equipment														
16	Electric works	temporary works																	wiring					fitting equipment				adjustment								
17	Contact wire for traverser				foundation				wiring																												
18	Communication facilities																						arrangement	installation		adjustment											
19	Plumbing facilities	temporary works				sleeve fixing			burying piping										piping					fitting equipment			adjustment										
20	Miscellaneous works																						arrangement	installation of furniture					surrounding , sweeping							
21																																					
22																																					
23																																					
24																																					
25																																					
26																																					
27																																					
28																																					
29																																					
30																																					

Notes (1) ▬ indicates actual construction work period at site.

(2) ▨ indicates indirect work period necessary for preparation work and manufacture in the workshop.

Fig. 6.1.1 KM 10 Workshop Amplification Construction Work Process

CHAPTER 7 ORGANIZATION AND PERSONNEL

CHAPTER 7 ORGANIZATION AND PERSONNEL

The organization and personnel arrangements for the workshop amplification were presumed to be studied in the Preliminary Design based on those of the 1st Step Workshop, but it has become impossible to do so because of the following reasons.

(1) KM10 Workshop (for the 1st Step Electrification) has not been constructed yet because of the delay in the plan.

(2) The organization of the Workshop and the arrangement of personnel for each shop have not been decided yet.

Because of the existing situation, the organization and personnel arrangement for the KM 10 Workshop amplification have been studied taking into consideration the present conditions of the workshops in general of the Argentine Railways and referring to those of electric railcar workshops of Japanese National Railways in the similar scale.

This proposition has been made as one of the ideas and therefore it is hoped for the Argentine Railways to fully study and decide the organization and the arrangement of personnel when executing amplification of the KM 10 Workshop.

7-1 Organization

Overall Inspection and Intermediary Inspection generally take 40 - 60 days in the Argentine Railways' electric railcar inspection/repairing workshop. In the 1st Step KM 10 Workshop, the Overall Inspection is to be carried out in 19 days and the Intermediary Inspection 14 days. The same process will apply to the 2nd Step KM 10 Workshop.

In order for the Workshop to carry out its mission, it is essential to observe this inspection/repairing process.

Therefore, when implementing KM 10 Workshop Amplification, its organization should be considered so that the process coordination, inspection/repairing data control and spare parts control can be adequately executed.

The organization chart based on the above ideas is shown in Fig. 7.1.1.

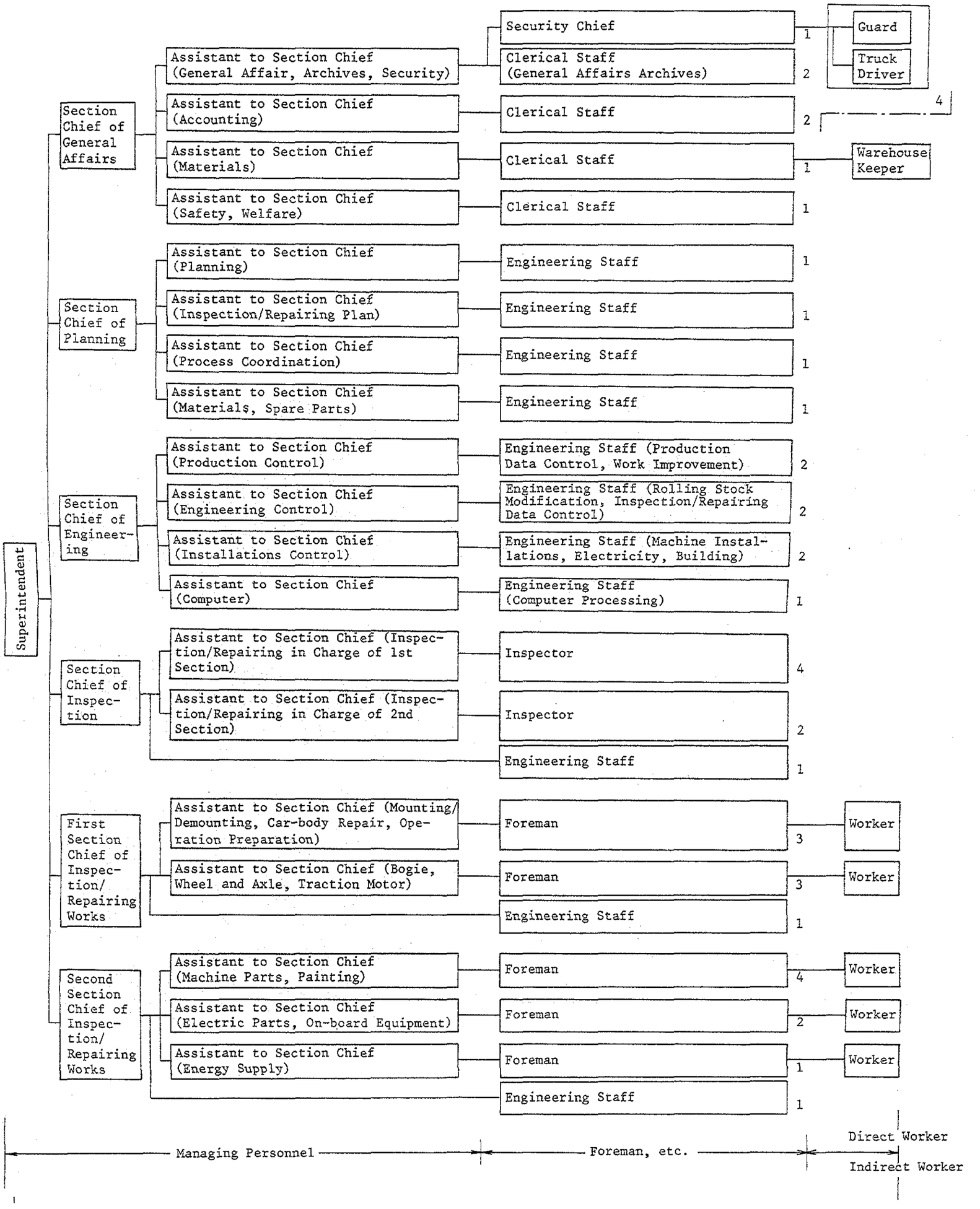

Fig. 7.1.1 Organization of KM 10 Workshop When Amplified

7-2 Personnel

The number of personnel of the KM 10 Workshop is calculated taking into consideration the organization shown in Fig. 7.1.1 and the number of railcars assigned, namely the amount of works, when it is amplified.

With this in view and by making comparison with the number of personnel of the 1st Step KM 10 Workshop presented by the Argentine Railways, the total number of personnel for the KM 10 Workshop when amplified has been calculated at 284 as shown in Table 7.2.1.

Table 7.2.1 Number of Personnel of KM 10 Workshop When Amplified

		At the Point of 1st Step Electrification*	When Amplified
Number of Railcars Assigned		156 railcars	318 railcars
Personnel	Direct Worker	105 persons	214 persons
	Indirect Worker	11 persons	
	Foreman, etc.	10 persons	Foreman 13 Inspector 6 Engineering staff 14 Clerical staff 6 Security chief, Guard, Truck driver 5 44 persons
	Managing Personnel	15 persons	26 persons
	Total	141 persons	284 persons

* Figures have been taken from the Feasibility Study Report.

In calculating these personnel, the following items have been taken into account.

(1) Direct Workers, Indirect Workers

The number of direct workers has been caluculated based on the number of 105 personnel in the 1st Step KM 10 Workshop, multiplying it by the ratio of the numbers of railcars assigned: between 156 railcars for the 1st Step KM 10 Workshop and 318 railcars when amplified. As a result 214 has been obtained. As far as the number of direct workers is concerned, a rough calculation can be made in proportion to the number of railcars assigned.

However, it will be necessary to take into account the labor practices, etc. in Argentina and the amount of work and the job classifications of respective shops when actually executing it.

Indirect workers jobs are considered to be running test of electric railcars, shunting operation in the yard, transport of equipments and materials by forklift, operation of traverser, control of Energy Room, driving of truck, etc.

When the scale of the Workshop is for 320 or so railcars assigned, the amount of these works is still small in volume, and therefore, it will be wasteful to arrange fixed indirect workers for each of these works.

So, instead of arranging indirect workers, direct workers are to engage in these works according to the necessity at respective shops, except that the Energy Room will have some indirect workers among the group and, Security Chief will have some of them under him for truck driving and guard duty for the purpose of flexible operations.

(2) Foreman, etc.

The number of Foremen, Inspectors, Engineering Staff, Clerical Staff and Guards (including truck drivers) are listed in the column of Foreman, etc. as shown in Table 7.2.1.

As the details of the organization and the arrangement of personnel in the 1st Step KM 10 Workshop are not clear and, therefore clear-cut observation is not possible to make. However, most of the Engineering Staff, Clerical

Staff, Guards, etc. as support of Assistant to Section Chief are seemed to be left out for the 1st Step KM 10 Workshop.

As has been stated in the item of 7-1 Organization, the planning work, engineering control work, supervisory work, spare parts control, etc. are very important sectors for the execution of inspection/repairing works according to the work processes. Consequently, the arrangement of personnel has been made to strengthen these sectors for the stage of the 2nd Step KM 10 Workshop as shown in Fig. 7.1.1.

The arrangement of foremen has been calculated as Table 7.2.2 taking into consideration the sectioning of work and the amount of work.

Table 7.2.2 Arrangement of Foreman

	Assignment to Assistant to Section Chief	Assignment to Foreman	Number
1st Inspection/ Repairing Section	Operation Preparation	Operation preparation	6 persons
	Mounting/Demounting	Mounting/demounting	
	Car-body Repair	Car-body repair	
	Bogie	Bogie	
	Wheel and Axle	Wheel and axle	
	Traction Motor	Traction motor	
2nd Inspection/ Repairing Section	Machine Parts Painting	Air brake equipment	7 persons
		Ironwork, pipe works, seat and vestibule diaphragm	
		Machines, tool control	
		Car-body painting	
	Electric Parts	Electric equipment, rotating equipment, railcar wiring	
	On-board Equipments	On-board equipments, cooling unit	
	Energy supply	Energy supply	
Total		13 persons	

The arrangement of inspectors has been calculated taking into consideration the sectioning of working groups shown in Table 7.2.2 and the amount of inspection work: 4 inspectors for the 1st Inspection/Repairing Section and 2 inspectors for the 2nd Inspection/ Repairing Section. However, Leaving Inspection is assumed to be carried out by cooperative work of all inspectors under the direction of Assistant to Section Chief.

(3) Managing Personnel

The number of managing personnel of the Superintendent, Section Chief and Assistant to Section Chief has been calculated in the process of studying the organization taking into consideration the amount of work and the substance of management of business. Details are as shown in Fig. 7.1.1.

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