4 – 1 Trial Calculation of Number of Trains and Hindrance Rate at the Principal Surface-crossing

1. Surface-crossing at Rampura signal station

At present, the hindrance rate at the surface-crossing in Rampura signal station is as follows:

(1) Number of trains pass through the surface-crossing

Table 4.1 Number of trains pass through the surface-crossing

Route	Passenger			Goods	Light Engine	Total
	Mail/EXP	Local	Total			
SSB→ PTNR	–	–	–	10	11	21
PTNR→ SSB	–	–	–	(9)	(11)	(20)
SSB→ DBSI	5	11	16	1	11	28
DBSI→ SSB	5	11	16	–	11	27
NDAZ→ DBSI	–	–	–	3	–	3
NDAZ→ PTNR	–	–	–	15	2	17
DBSI→ NDAZ	–	–	–	–	–	–
PTNR→ NDAZ	–	–	–	14	2	16
Total	10	22	32	(9) 43	(11) 37	(20) 112

Note: Figures in parentheses show number of trains which has no hindrance to the surface-crossing

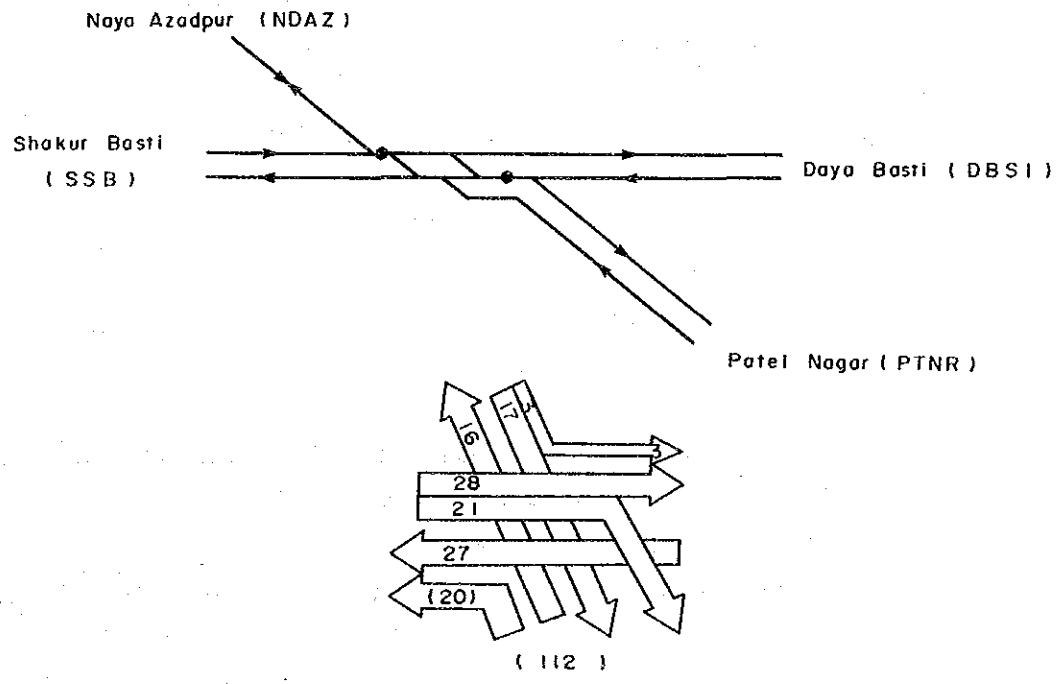


Fig. 4.1 Precondition for method of train operation

Total number of trains pass through the surface-crossing is 112.

(2) Precondition for facilities and method of train operation

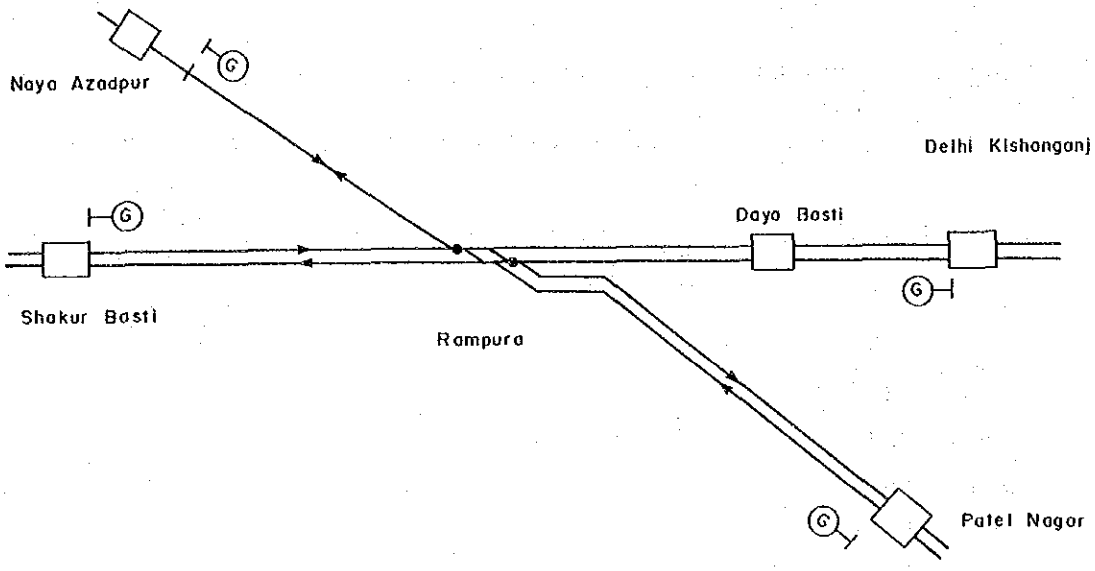


Fig.4.2 Precondition for facilities and method of train opoeration

1) Distance between a signal with G expression and a hindrance surface-crossing is approx. 3 km for each route.
Distance between Daya Basti and the hindrance surface-crossing is approx. 1 km.

2) Length of formation of trains are as follows:

①	Passenger train	530m
②	Goods train	650m
③	Light engine	20m

3) Operation speed of trains

(a) Passenger train

① Mail/Exp

It is presumed that all Mail/Exp stop over at Shakur Basti and the maximum operation speed is 85 k.p.h.

② Local passenger train

It is presumed that the said trains stop over at both Shakur

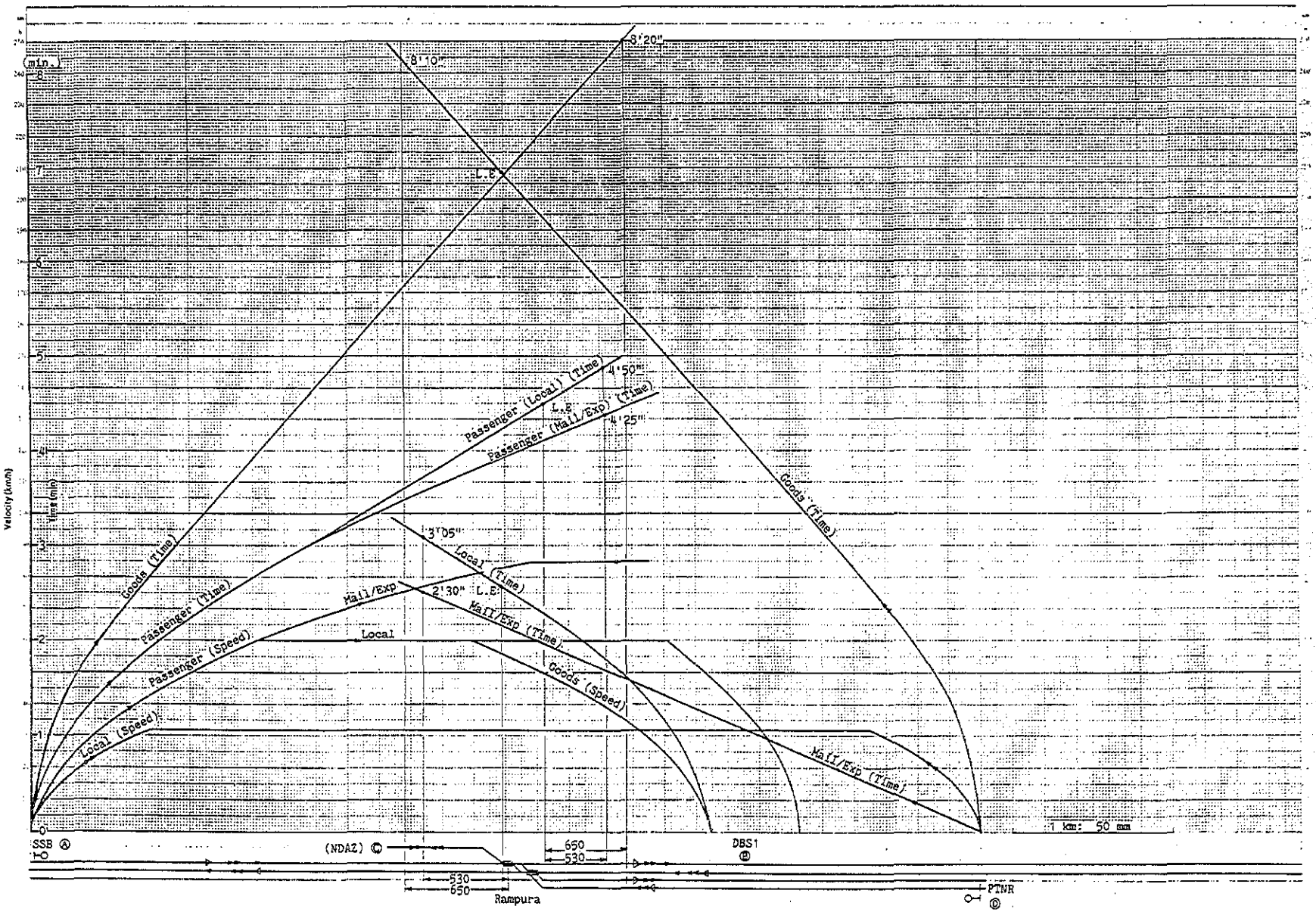


Fig.4.3 Train Operation Diagram at Rampura

Basti and Daya Basti and the max. operation speed is 60 k.p.h.

(b) Goods train

It is presumed that the max. operation speed is 30 k.p.h. for each route.

Train operation Diagram based on the above standards shown in Fig. 4.3.

(3) Trial calculation of occupied time at the surface-crossing

Occupied time at the surface-crossing based on (1) and (2) is shown in Table 4.2.

Occupied time per day is approx. 45%.

Table 4.2 Occupied time at the surface-crossing

Route	Train	Occupied time (min)	NOV. 1988	
			Number	Occupied time (min)
SSB→ PTNR	G. L.E total	8.5 4.5	10 11 21	85 49.5 134.5
PTNR→ SSB	G. L.E total		(9) (11) (20)	
SSB→ DBSI	M/E L G L.E total	4.5 5.0 8.5 4.5	5 11 1 11 28	22.5 55 8.5 49.5 135.5
DBSI→ SSB	M/E L G L.E total	2.5 3.5 8.5 7.5	5 11 – 11 27	12.5 38.5 – 27.5 78.5
NDAZ→ DBSI	G L.E total	8.5 2.5	3 – 3	25.5 – 25.5
NDAZ→ PTNR	G L.E total	8.5 4.5	15 2 17	127.5 9 136.5
DBSI→ NDAZ	G L.E total	– – –	– – –	– – –
PTNR→ NDAZ	G L.E total	8.5 7	14 2 16	119 14 133
Total			112	643.5

Note: M/E: Mail/Express

L : Local Passenger

G : Goods

L.E: Light Engine

2. GAL surface-crossing between Anand Vihar and Tilak Bridge

(1) Number of trains pass through the surface-crossing

Table 4.3 Number of trains pass through the surface-crossing

Route	Passenger			Goods	Light Engine	Total
	Mail/EXP	Local	total			
NZM→ ANVR ANVR→ TKJ	– 16	– 7	– 23	30 3	15 15	45 41
Total	16	7	23	33	30	86

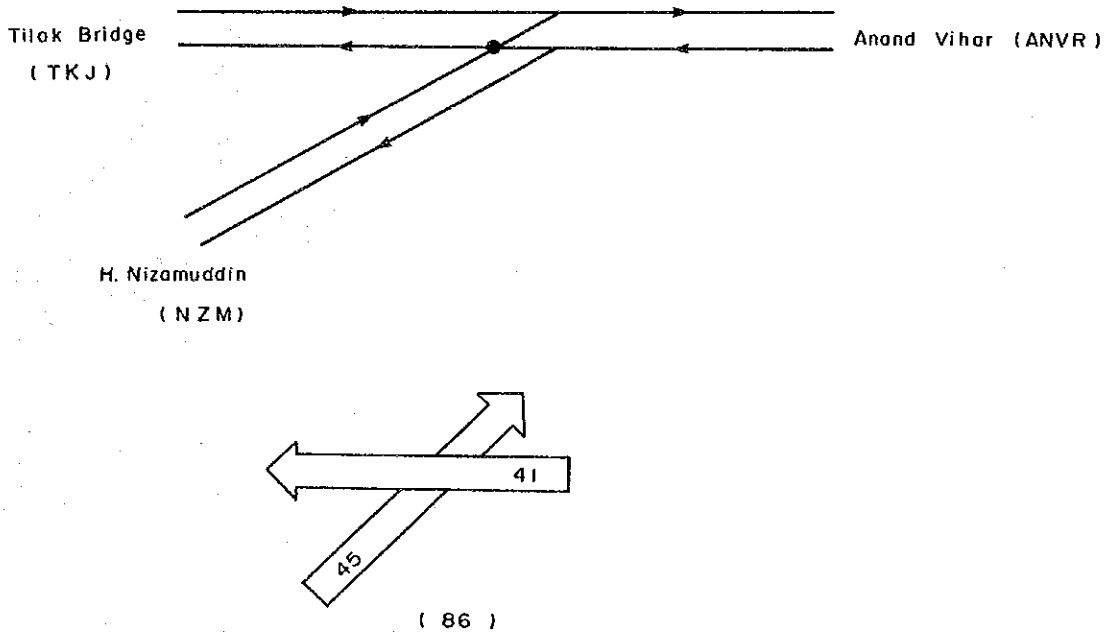


Fig.4.4 Precondition for method of train operation

Total number of trains pass through the said surface-crossing is 86.

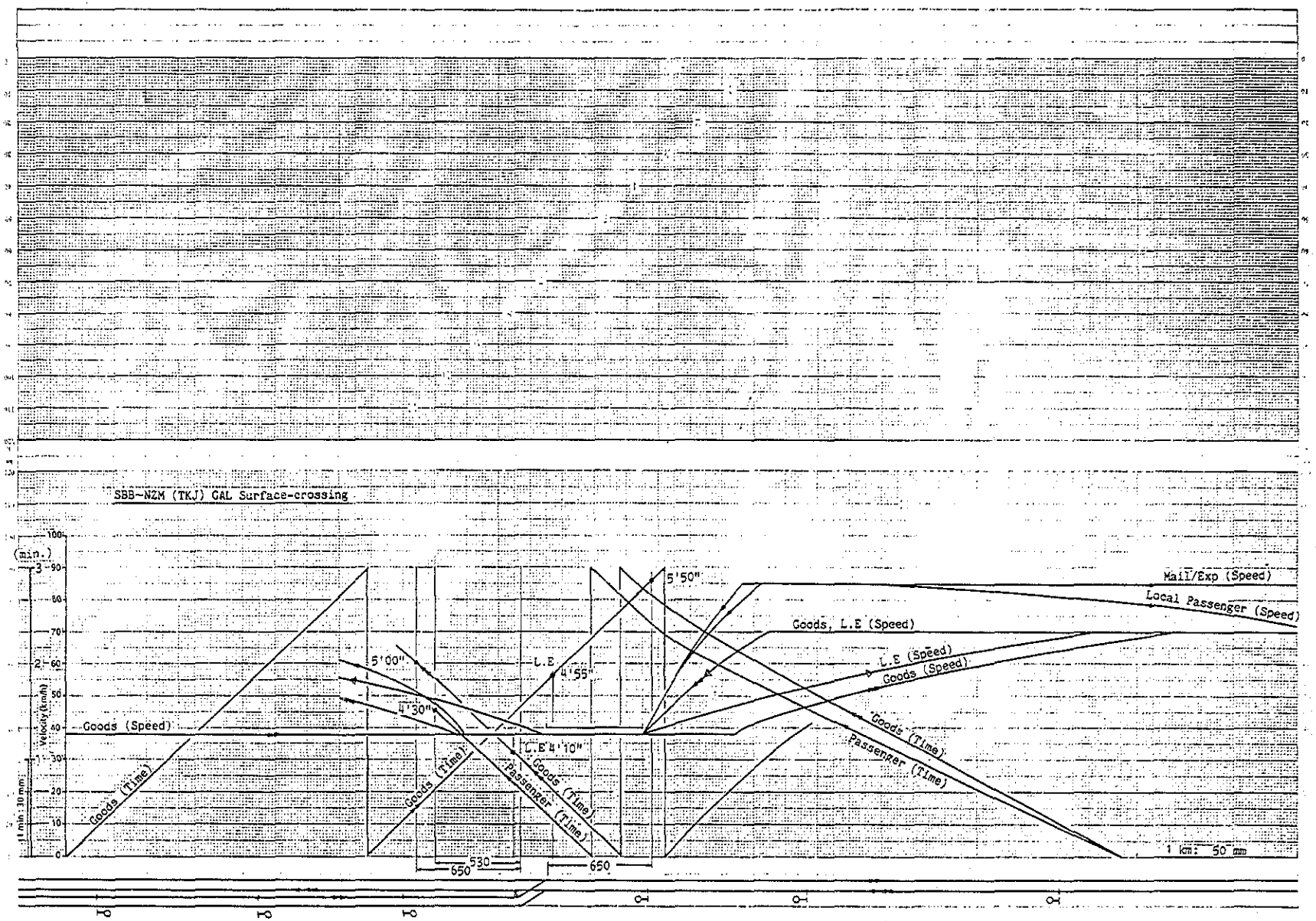


Fig.4.6 Train Operation Diagram on GAL

(2) Precondition for facilities and method of train operation

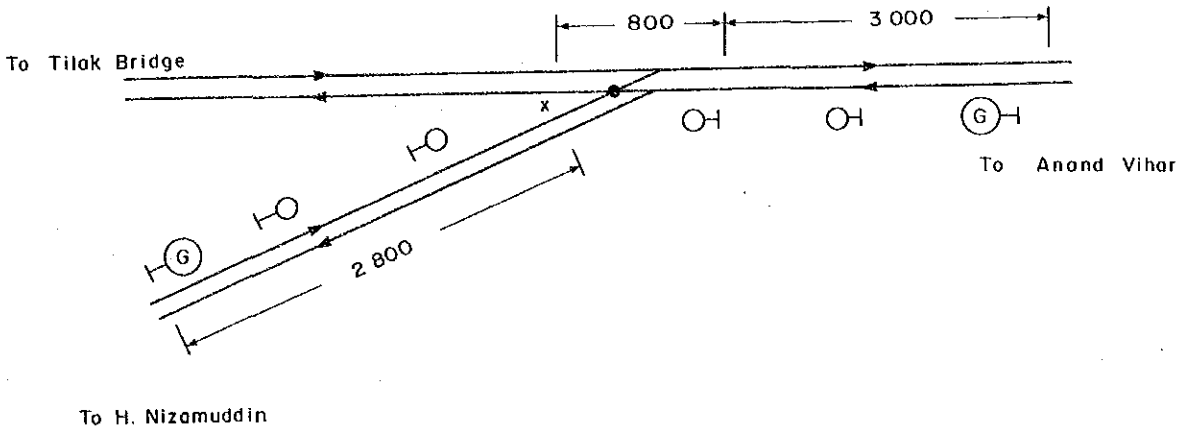


Fig.4.5 Distance between a signal with G expression and hindrance surface-crossing

1) Distance between a signal with G expression and a hindrance surface-crossing is approx. 2,800m～3,000m as shown in above figure.

2) Length of formation of trains are as follows:

①	Passenger train	530m
②	Goods train	650m
③	Light engine	20m

3) Operation speed of trains

It is presumed that operation speed of all trains in the course of passing through the Yamuna River Bridge is 40 k.p.h.

(a) Passenger train

It is presumed that max. speed is 85 k.p.h.

(b) Goods train and light engine

It is presumed that the max. speed is 75 k.p.h.

However, operation speed between H. Nizamuddin and the place just after the Yamuna River Bridge is 40 k.p.h.

Train Operation Diagram based on the above standards is shown in Fig. 4.6.

(3) Trial calculation of occupied time at the surface-crossing

Occupied time at the surface-crossing based on (1) and (2) is shown in Table 4.4.

Occupied time per day is approx. 31%.

Table 4.4 Occupied time at GAL surface-crossing

Route	Train	Occupied time (min)	NOV. 1988	
			Number	Occupied time (min)
NZM→ ANVR	G	6	30	180
	L.E	5	15	75
	total		45	255
ANVR→ NZM	M/E	4.5	16	72
	L	4.5	7	31.5
	G	5	3	15
	L.E	4.5	15	67.5
	total		41	186
Total			86	441

3. Ghaziabad Station Yard

As for Ghaziabad Station Yard, Moradabad, Saharanpur routes and Tundla route are crossing each other.

In case of crossing Main Route at the surface-crossing, because of the low running speed of 15 k.p.h., the occupied time is increasing.

(1) Number of trains pass through the surface-crossing

Table 4.5 Number of trains pass through the surface-crossing

Route	Passenger			Goods	Light Engine	Total
	Mail/EXP	Local	total			
GZB→ TDL	17	5	22	29	1	52
GZB ⇄ SRE / MB	13	10	23	15	2	40
SRE→ GZB	7	5	12	1	2	15
MB→ GZB	6	5	11	6	0	17
Total			68	51	5	124

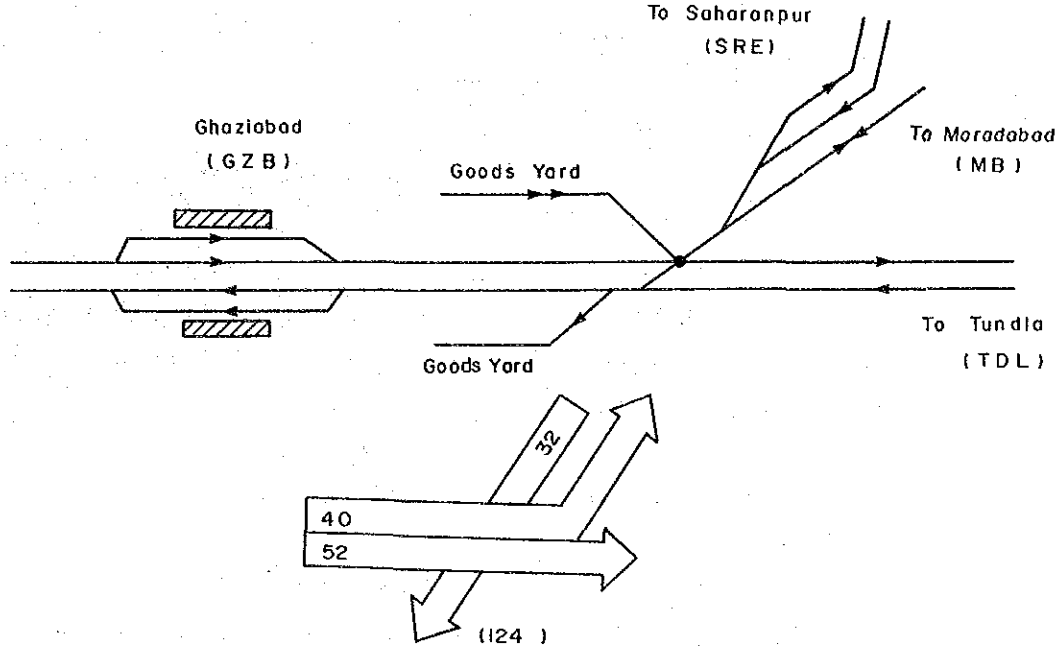


Fig.4.7 Precondition for facilities and method of train operation

(2) Precondition for facilities and method of train operation

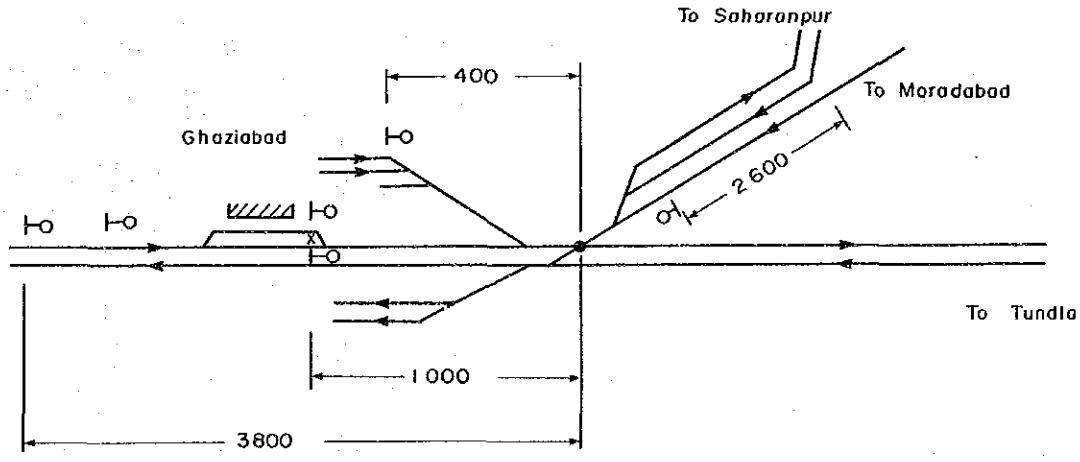


Fig.4.8 Distance from each route to the hindrance surface-crossing

1) Distance from each route to the hindrance surface-crossing is shown in above figure.

2) Length of formation of trains

① Passenger train 530m

② Goods train 650m (As for MB, SRE route, 530m)

③ Light engine 20m

3) Operation speed

It is presumed that operation speed of trains passing through the surface-crossing except for GZB ~ TDL route is 15 k.p.h.

(a) Passenger train

① GZB → TDL 98 k.p.h.

② GZB → MB and SRE 85 k.p.h.

(b) Goods train 60 k.p.h.

(c) Light engine 60 k.p.h.

Train Operataion Diagram based on the above standards is shown Fig. 4.9.

(3) Trial calculation of occupied time at the surface-crossing based on (1) and (2) is shown in Table 4.6.

Table 4.6 Occupied time at surface-crossing on Tundla side in Ghaziabad

Route	Train	Occupied time (min)	NOV. 1988	
			Number	Occupied time(min)
GZB→ TDL	M/E	3	17	51
	L	3	5	15
	G	5.5	29	159.5
	L.E	3	1	3
GZB→ SRE, MB.	M/E	5	13	65
	L	5	10	50
	G	5.5	15	82.5
	L.E	3	2	6
SRE→ GZB	M/E, L	5.5	12	66
	G	6	1	6
	L.E	4	2	8
MB→ GZB	M/E, L	5.5	11	60.5
	G	6	6	36
Total			124	608.5

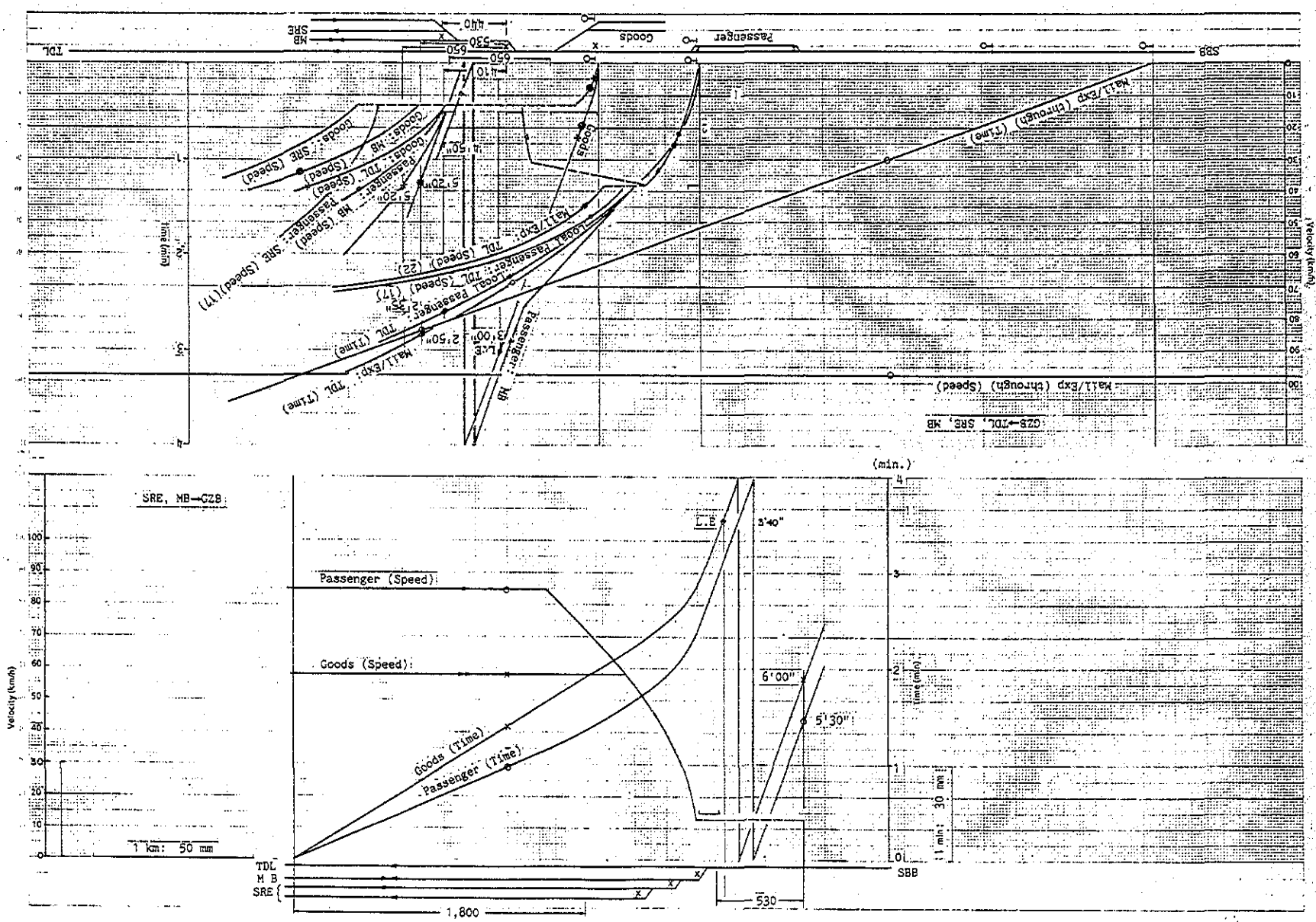


Fig.4.9 Train Operation Diagram at Tundla side in Ghaziabad

4. Surface-crossing at a delta area in both Delhi and New Delhi

(1) Surface-crossing of Broad gauge (B.G.) and Metre gauge (M.G.)

1) Number of trains pass through the surface-crossing

Table 4.7 Number of trains pass through the surface-crossing

Crossing point	Gauge	Route	Passenger			Goods	L.E	Total
			Mail/EXP	Local	Total			
Ⓐ	B.G	a → b	5	14	19	1	15	35
		b → a	5	13	18	1	15	34
		Sub total	10	27	37	2	30	69
	M.G	a → c	11	5	16	–	1	17
		c → a	11	5	16	–	1	17
		Sub total	22	10	22	–	32	34
	total		32	37	69	2	32	103
Ⓑ	B.G	b → c	4	8	12	1	–	13
		c → d	8	4	12	1	2	15
		Sub total	12	12	24	2	2	28
		c → b	4	8	12	1	–	13
		d → b	8	4	12	1	2	15
		Sub total	12	12	24	2	2	28
	total		24	24	48	4	4	56
	M.G	a → c	11	5	16	–	1	17
		c → a	11	5	16	–	1	17
		Sub total	22	10	32	–	2	34
	total		46	34	80	4	6	90
Total			78	71	149	6	38	193

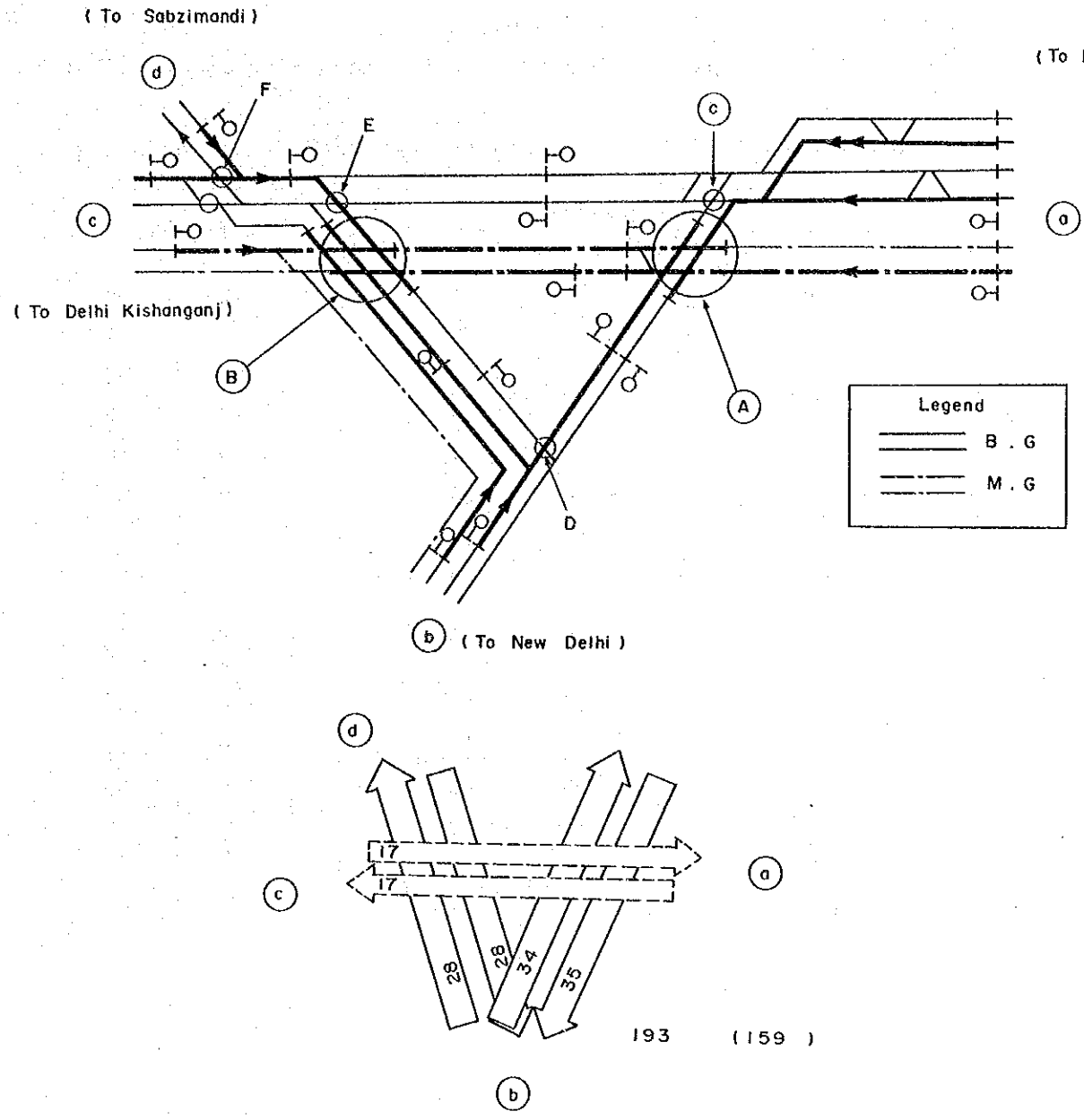


Fig.4.10 Precondition for facilities and method of train operation

Total number of trains pass through the surface-crossing is 159 (crossing number is 193, because M.G. route passes B.G. route twice).

(2) Surface-crossing of B.G. and B.G.

Number of trains pass through the surface-crossing is as follows:

Table 4.8 Number of trains pass through the surface-crossing

Crossing point	Route	Passenger			Goods	L.E	Total
		Mail/EXP	Local	total			
C	b → a	5	13	18	1	15	34
	a → c	1	10	11	1	} 6	} 25
	a → d	2	5	7	0		
	total	8	28	36	2	21	59
D	b → a	5	13	18	1	15	34
	c → b	4	8	12	1	—	13
	d → b	8	4	12	1	2	15
	total	17	25	42	3	17	62
E	a → c	1	10	11	1	} 6	25
	a → d	2	5	7	0		
	Sub total	3	5	18	1	6	25
	c → b	4	8	12	1	—	13
	d → b	8	4	12	1	2	15
	Sub total	12	12	24	2	2	28
	total	15	27	42	3	8	53
F	c → a	1	10	11	3	6	20
	c → b	4	8	12	1	—	13
	Sub total	5	18	23	4	6	33
	a → d	2	5	7	—	—	7
	b → d	8	4	12	1	2	15
	Sub total	10	9	19	1	2	22
	total	15	27	42	5	8	55

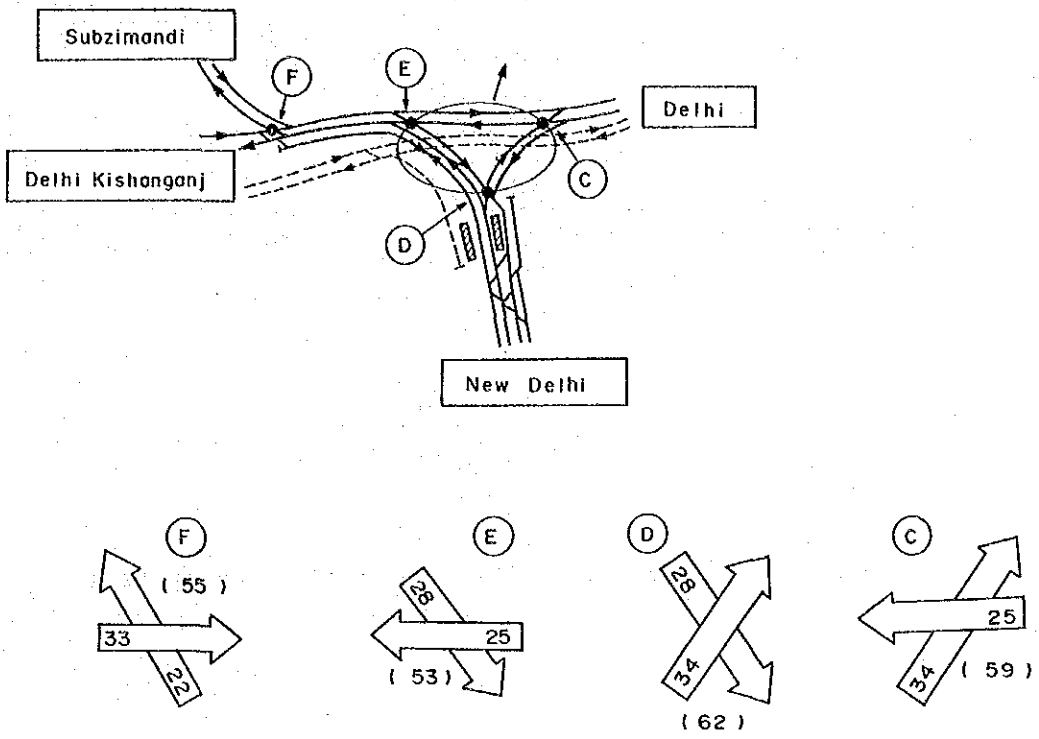


Fig.4.11

Some 53～62 trains pass through at each point.

5. Panel B

(1) Number of trains pass through the surface-crossing is shown in Table 4.9.

Table 4.9 Number of trains pass through the surface-crossing

Route	Passenger			Goods	L.E	Total
	Mail/EXP	Local	Total			
ANVR→ SBB	16	5	21	19	14	54
ANVR→ Panel<A>	–	–	–	–	2	2
Panel<A>→ ANVR	–	–	–	9	2	11
total	16	5	21	28	18	67

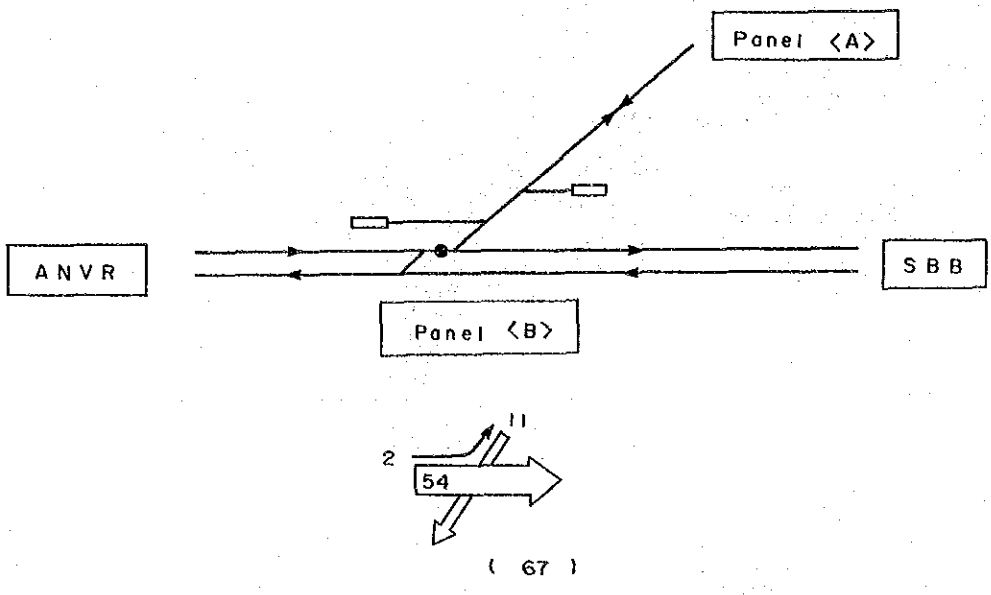


Fig.4.12 Precondition for method of train operation

6. Surface-crossing between Okhla and Lajpat Nagar (H. Nizamuddin)

Number of trains pass through the surface-crossing is shown in Table.4.10.

Table 4.10 Number of trains pass through the surface-crossing

Route	Goods	L.E	Total
OKA→ NZM LPJN→ OKA	22 16	8 8	30 24
Total	38	16	54

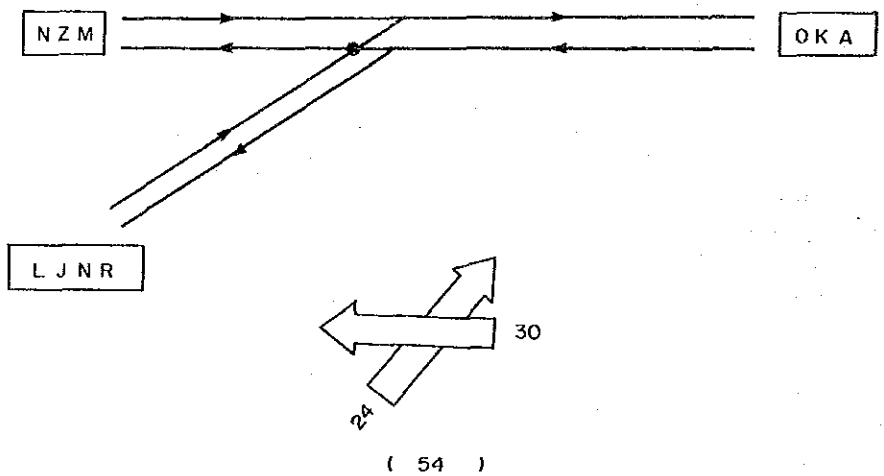
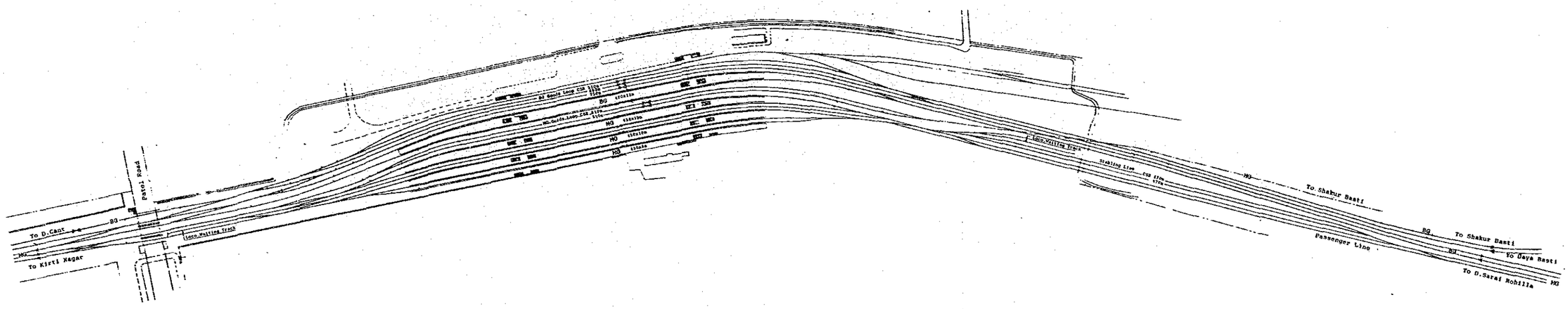


Fig.4.13 Precondition for method of train operation

4 – 2 Patel Nagar MG Terminal Plan

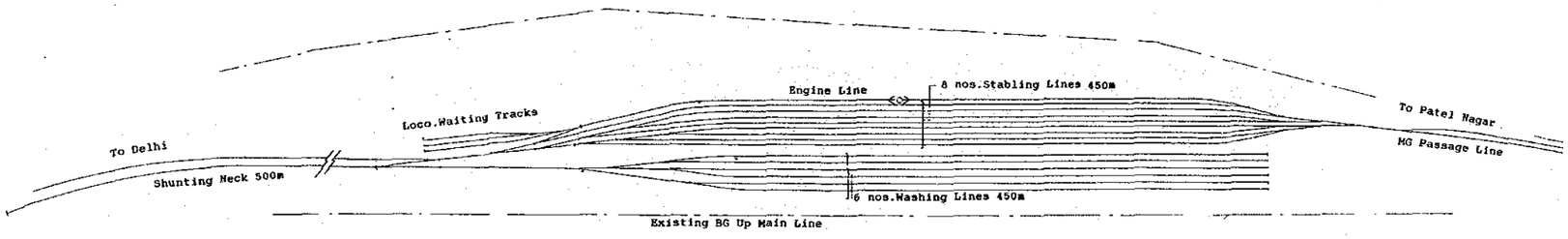
Patel Nagar MG Terminal Plan

Scale 1 : 5000



D.Sarai Rohilla MG Passenger Facilities

Scale 1 : 5000



5 - 1 Passenger Flow Survey

1) A decision was made to conduct a consisting of a passenger flow survey, OD volume survey, and traffic volume survey, as a result of several discussions of a sufficient nature with NR staff based on the survey plan in Table 5.1.1.

2) As for the execution of these surveys the following items were determined: A) NR employees would carry out the surveys; B) a demonstration of the passenger flow survey and OD volume survey would be carried out to find problems in advance; and C) none of the surveys would be carried out on the same day.

3) The schedules for the surveys were as shown below.

Demonstration	17:00-20:30 on Jan. 27th
Passenger Flow Survey	6:00 on Jan. 31st - 6:00 on Feb. 1st
OD Volume Survey	7:30-10:00 and 17:00-20:30 on Feb. 2nd
Traffic Volume Survey	7:30-10:30 and 17:00-20:00 on Feb. 7th

Table 5.1.1 Passenger Flow Survey at Naw Delhi Station

Item	Method	Location	Time
Passenger flow survey	The number of persons passing through the ticket windows, wickets, passageways, stairways, etc., are counted by direction and added up every 30 minutes.	a) Wickets (east and west entrances) b) Entrances at stairs leading to platforms c) Both ends of platform No. 1 d) Parcel entrance	24 hours
OD volume survey of passengers using survey cards	The place of distribution and numbers of survey cards are made clear, and the cards are collected and redistributed every 30 minutes via a color code. The collection of cards is to be discontinued 30 minutes after the last distribution.	Cards are to be distributed and collected at both the entrances and exits of overbridges and the entrances of stairways.	Peak hours in the morning and evening
Traffic volume survey around station	Traffic volume is classified by traffic type and direction and odded up every 30 minutes.	a) Road bridge (Ajmeri Gate Br.) b) Station plaza in front of the east entrance c) Station plaza in front of the west entrance	Peak hours in morning and evening

1. Passenger Flow Survey

* Fig.5.1.1 Survey Locations and Number of Staff Pasted

* Fig.5.1.2 Passenger Taffic Volume in Station

* Fig.5.1.3 to 5.1.11 Passenger Flow

(1) The total number of persons who entered and left the station (excluding passengers changing trains) on the day of the survey was 249,700.

(2) The number of persons who entered and left the overpass entrance on the Paharganj side (Location No. 1) was 13,656 and 19,701, respectively. The hourly peak occurred between 11:30 and 12:30, with the passenger traffic volume during that period being 3,445 persons/hour.

(3) The number of persons who entered and left the main entrance's wickets (Location Nos. 3,4,6,7) was 47,516 and 48,755 respectively. The hourly peak occurred between 18:30 and 19:30 with the passenger traffic volume during that period being 8,414 persons/hour.

(4) The number of persons who entered and left the overpass entrance on the Ajmeri Gate side (Location No. 1) was 34,479 and 34,736, respectively. The hourly peak occurred between 12:30 and 13:30 with the passenger traffic volume during that period being 9,866 persons/hour.

(5) The peak for traffic entering and leaving the station occurred three times a day: namely, in the morning, at noon, and in the evening. The morning peak occurred from 9:00 to 10:00 and has a traffic volume of about 16,000 persons/hour, of which 77% was departure traffic. The noon peak occurred from 11:30 to 12:30

and had a passenger traffic volume of about 20,000 persons/hour; the rate of concentration was about 10%. The evening peak was from 18:30 to 19:30 having a traffic volume of about 16,000 persons/hour, of which 70% was departure traffic. The rate of concentration was about 7%.

(6) The wickets on the Paharaganj side (Fig.5.1.3) have a many people leaving from them in the morning and many people entering them in the evening. This indicates what the characteristics of commuter flow are here.

(7) Arriving and departing traffic reach their peak during the 2 hours. Period (11:30 to 13:30) at the overpassage entrance on the Ajmeri Gate side. (Fig.5.1.7)

Location	Number of Staff	
	Day Shift 31/1 AM6:00 ~PM22:00	Night Shift 31/1 PM22:00 ~1/2 AM6:00
1	2	1
2	2	1
3	1	1
4	1	1
6	2	1
7	1	—
8	2	1
9	2	1
10	2	1
11	2	1
12	2	1
13	2	1
14	2	1
15	2	1
16	2	1
17	2	1
18	2	1
19	2	
20	2	1
21	2	1
22	2	—
23	1	—
24	1	—
25	1	—
26	2	—
27	2	—

Fig. 5.1.1 Survey Location and Number of Staff Pasted.

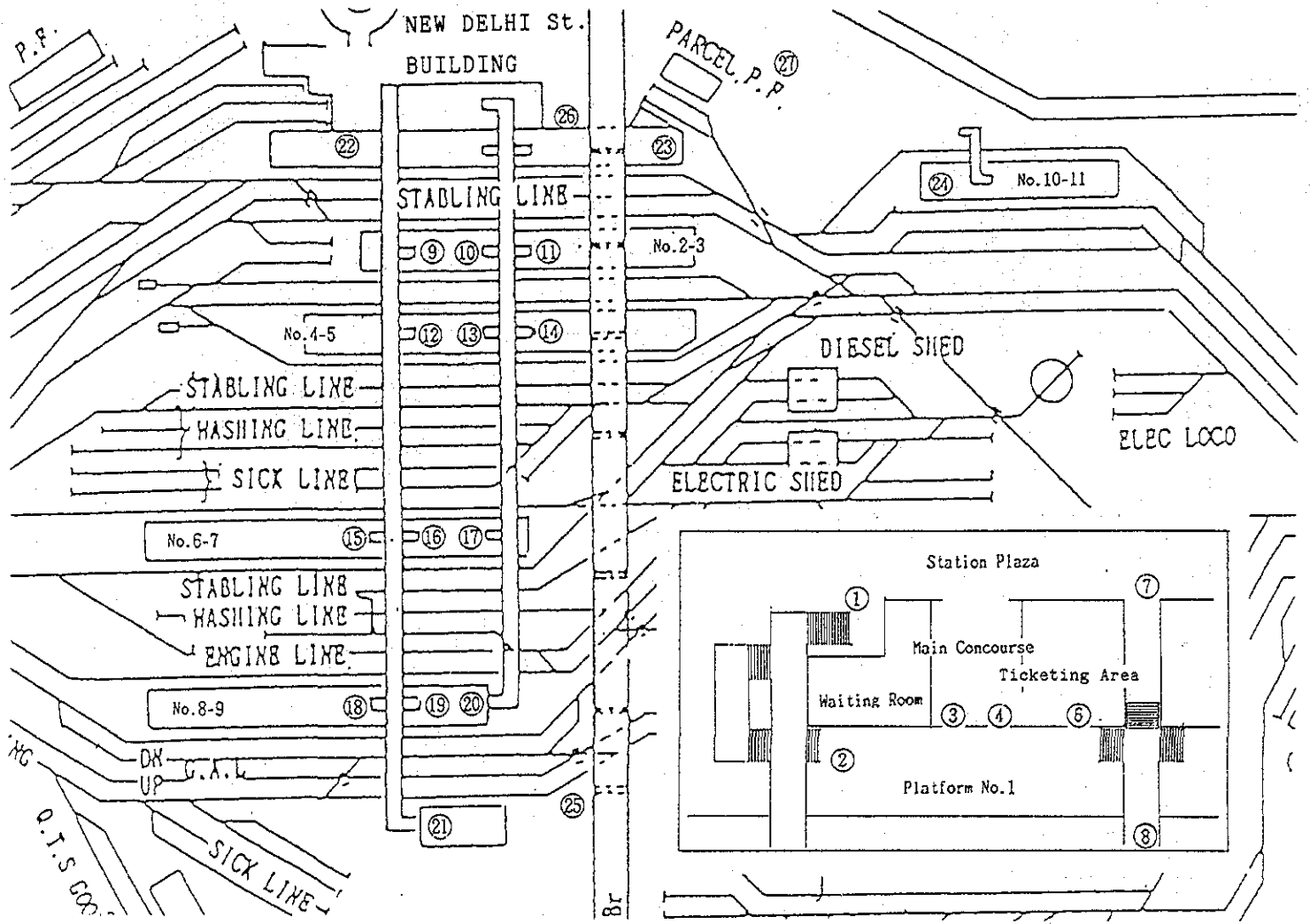


Fig.5.1.2 Passenger Traffic Volume in Station

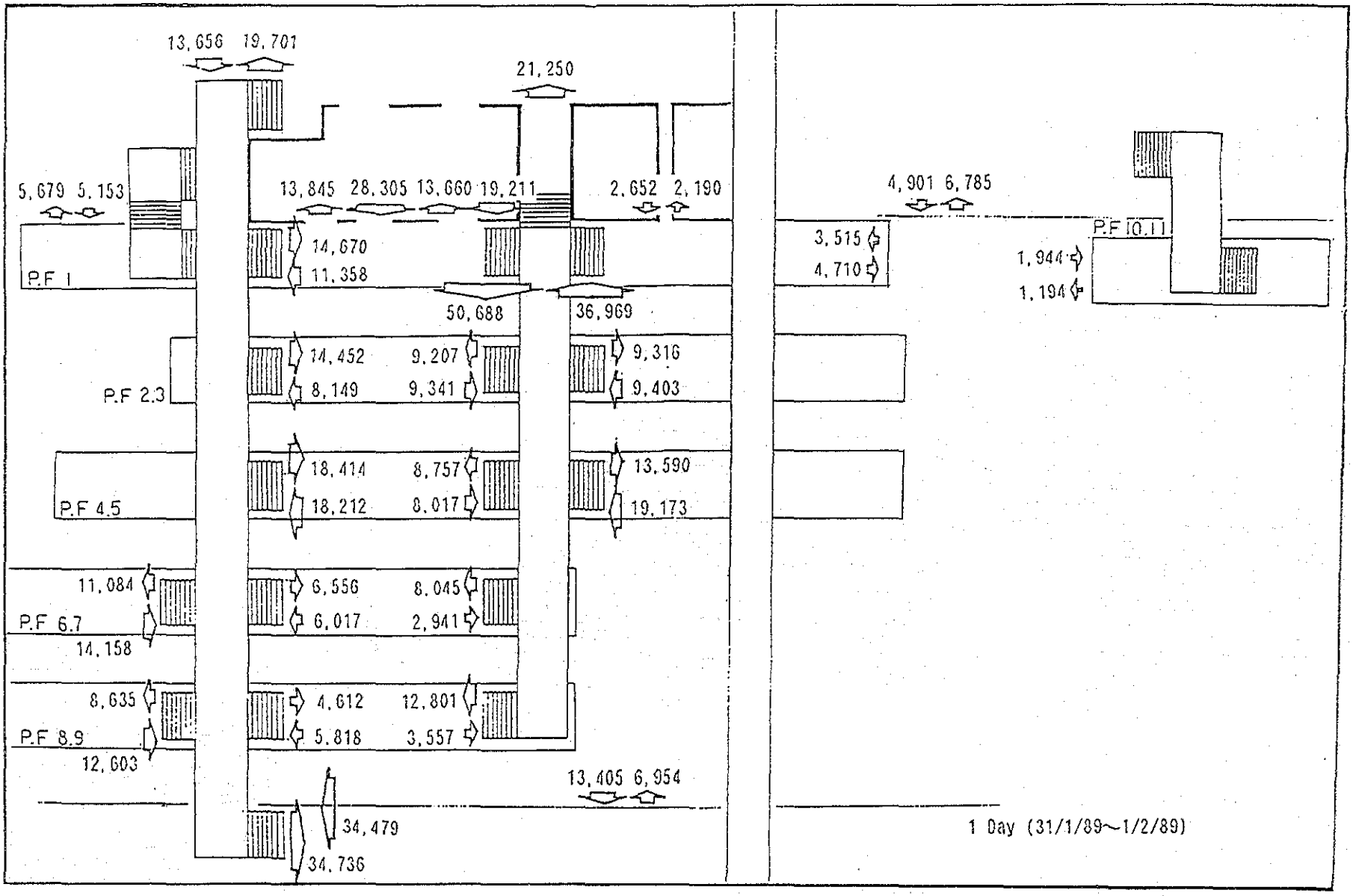


Fig.5.1.3 Passenger Flow

Location Paharganj Side

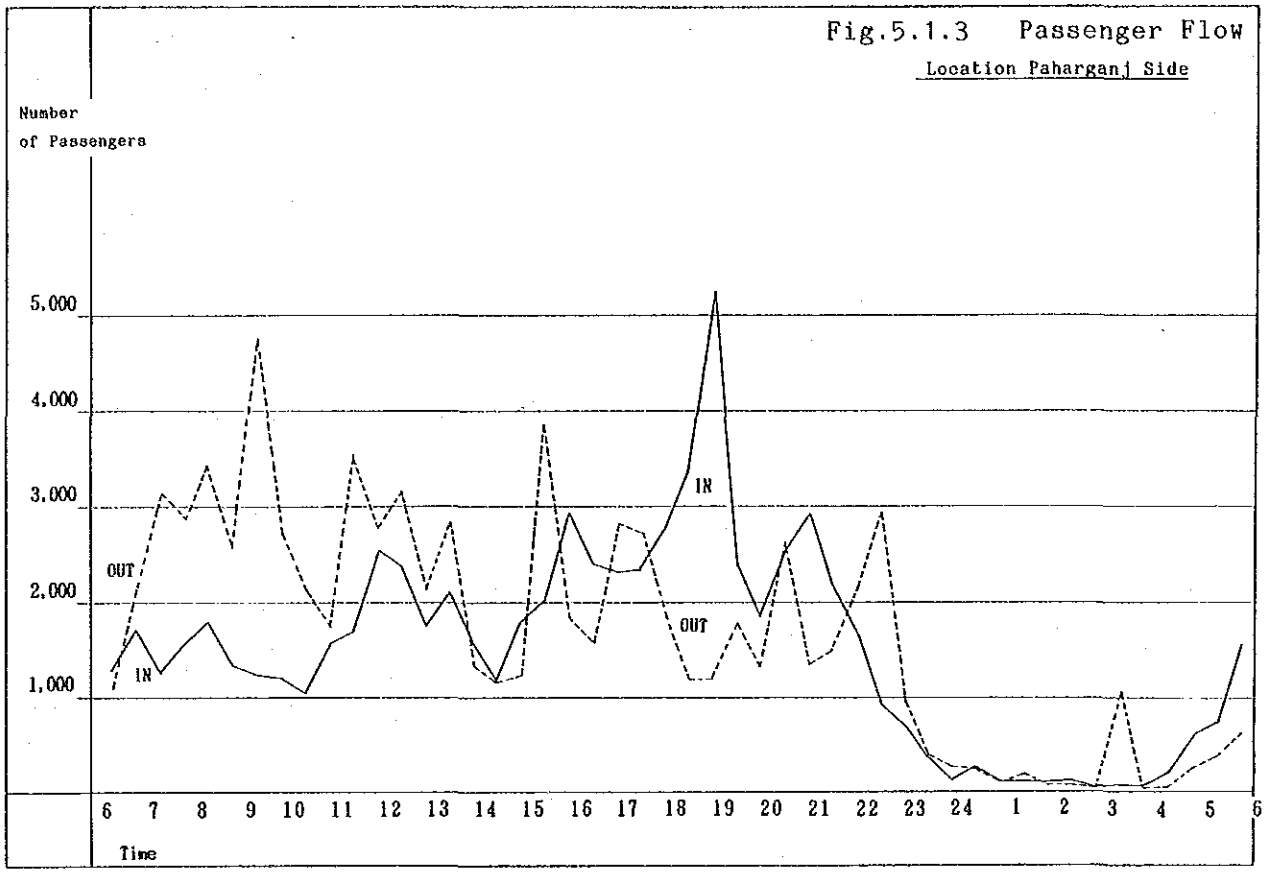
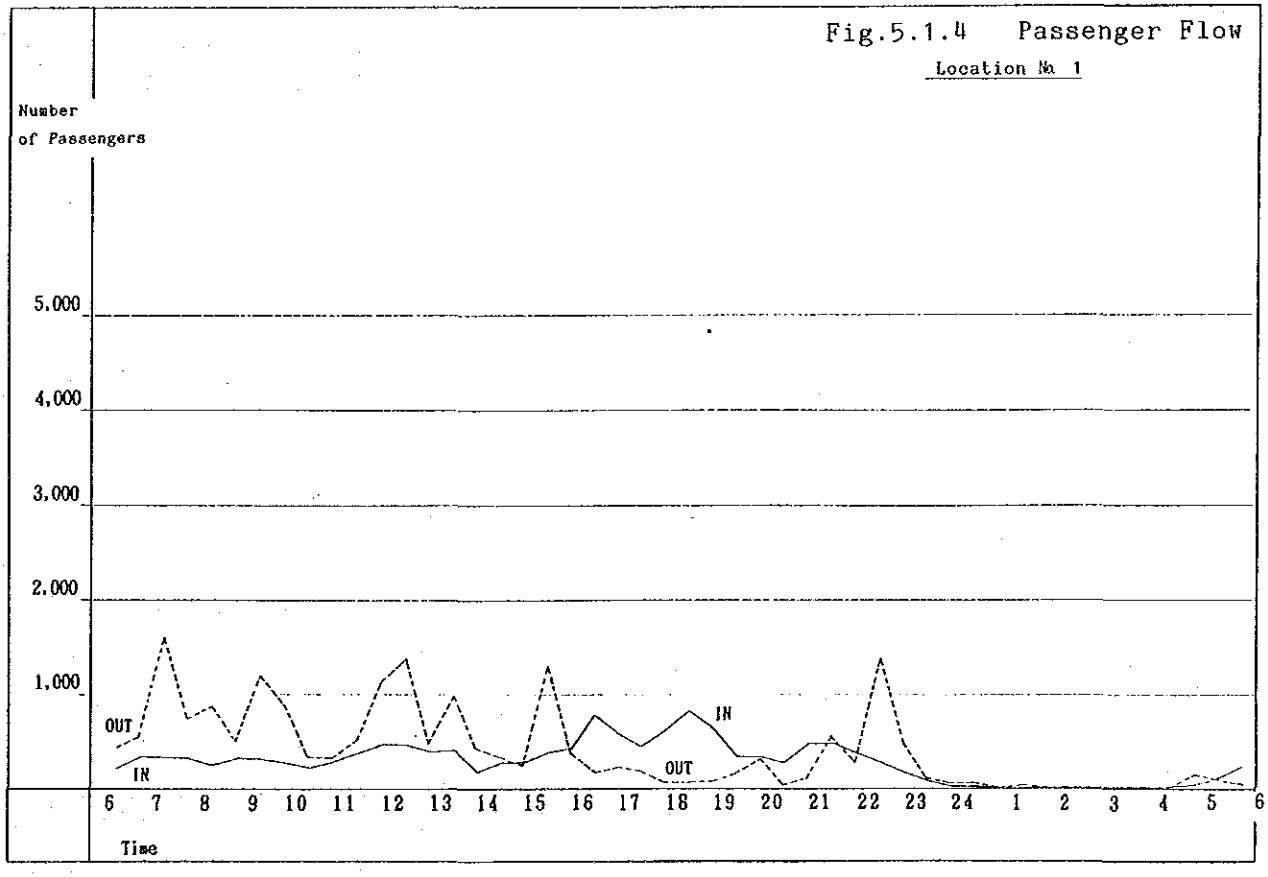


Fig.5.1.4 Passenger Flow

Location No 1



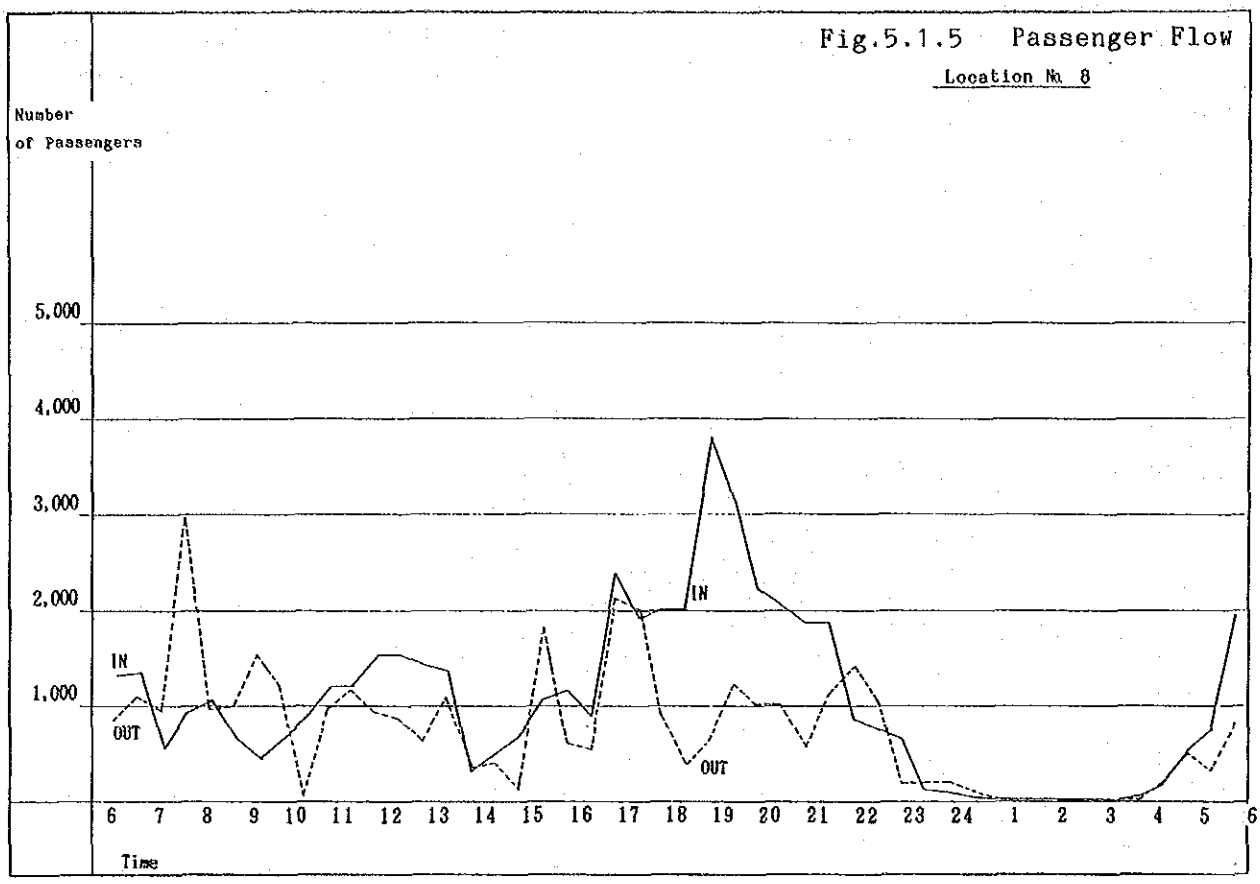


Fig.5.1.5 Passenger Flow
Location No. 8
Number
of Passengers
5,000
4,000
3,000
2,000
1,000
IN
OUT
IN
OUT
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 1 2 3 4 5 6
Time

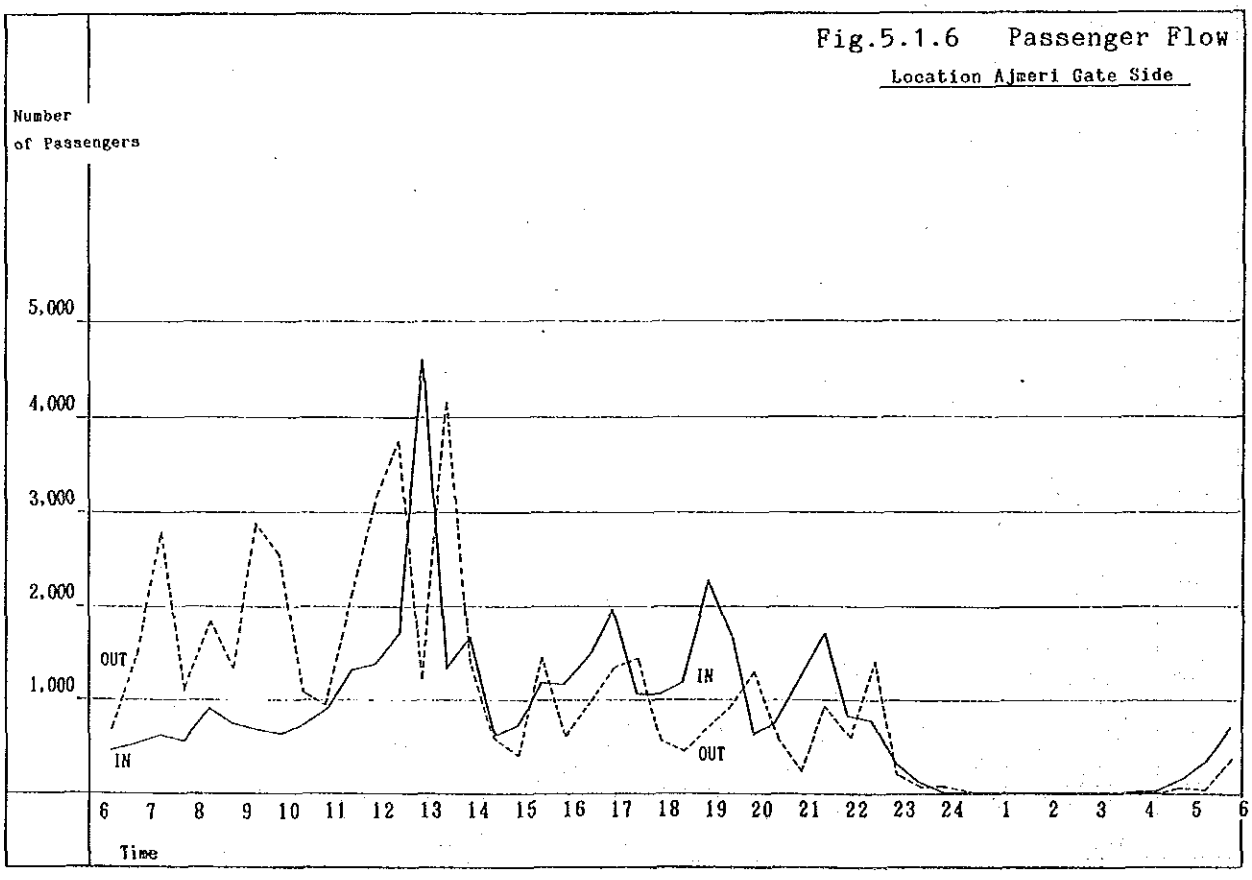


Fig.5.1.6 Passenger Flow
Location Ajmeri Gate Side
Number
of Passengers
5,000
4,000
3,000
2,000
1,000
OUT
IN
IN
OUT
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 1 2 3 4 5 6
Time

Fig.5.1.7 Passenger Flow

Location No. 21

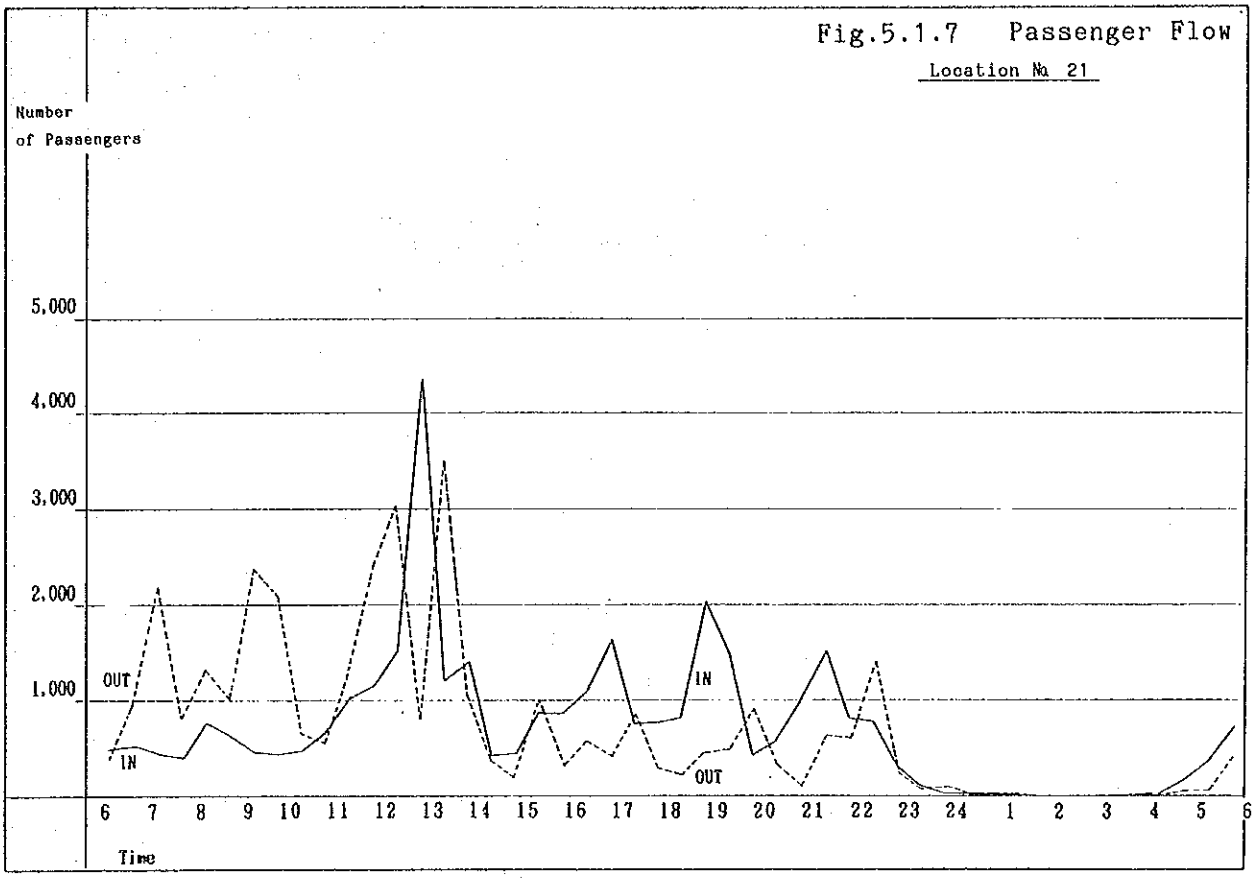


Fig.5.1.8 Passenger Flow

Location Platform No. 2・3

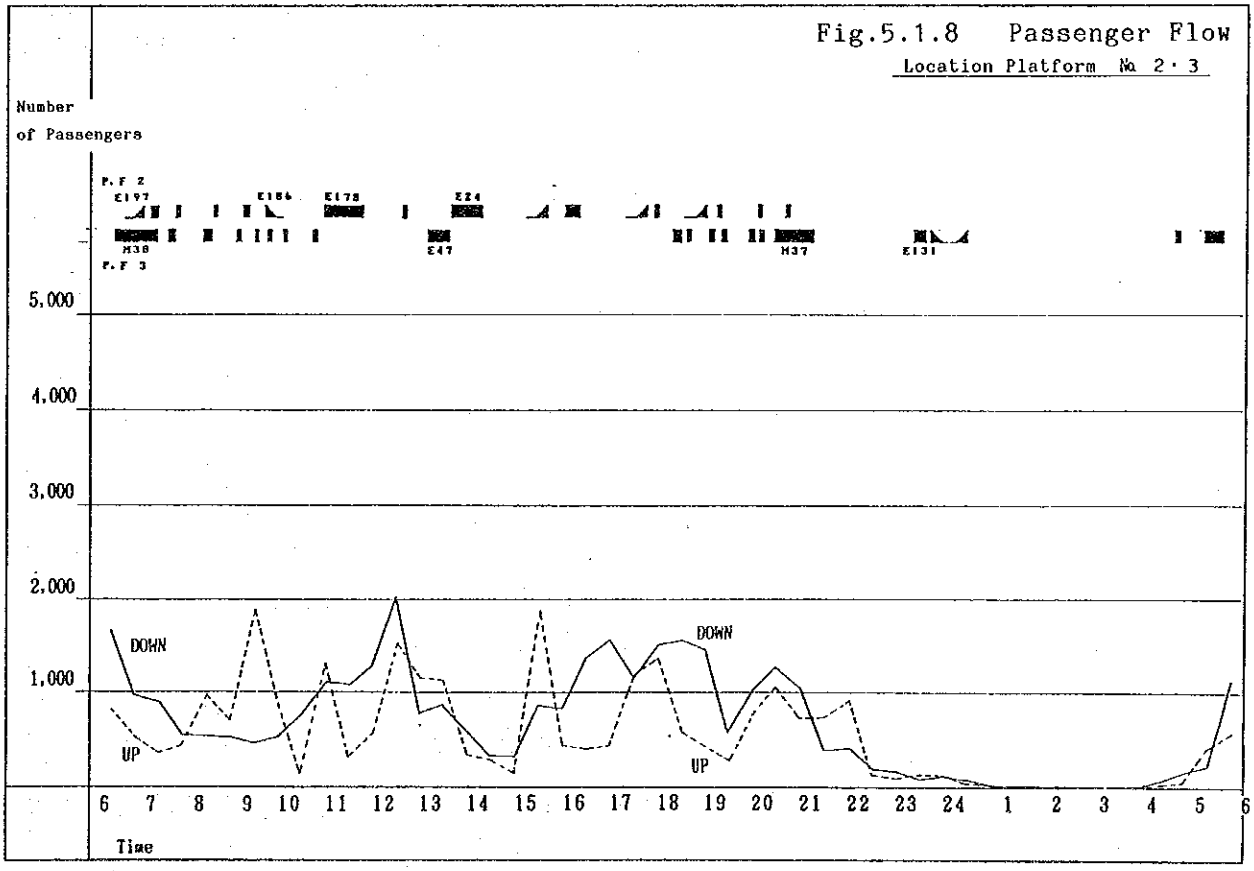


Fig.5.1.9 Passenger Flow

Location Platform № 4・5

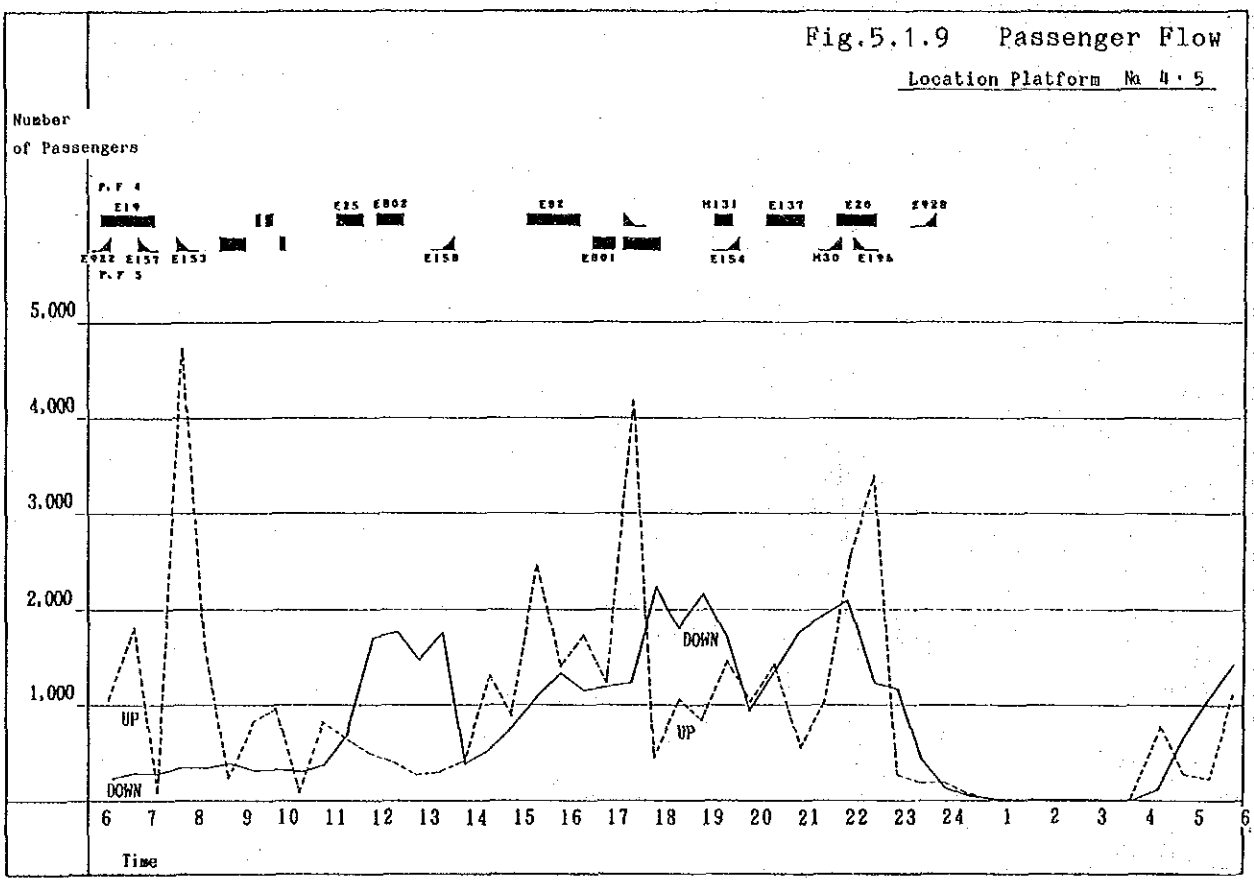


Fig.5.1.10 Passenger Flow

Location Platform № 6・7

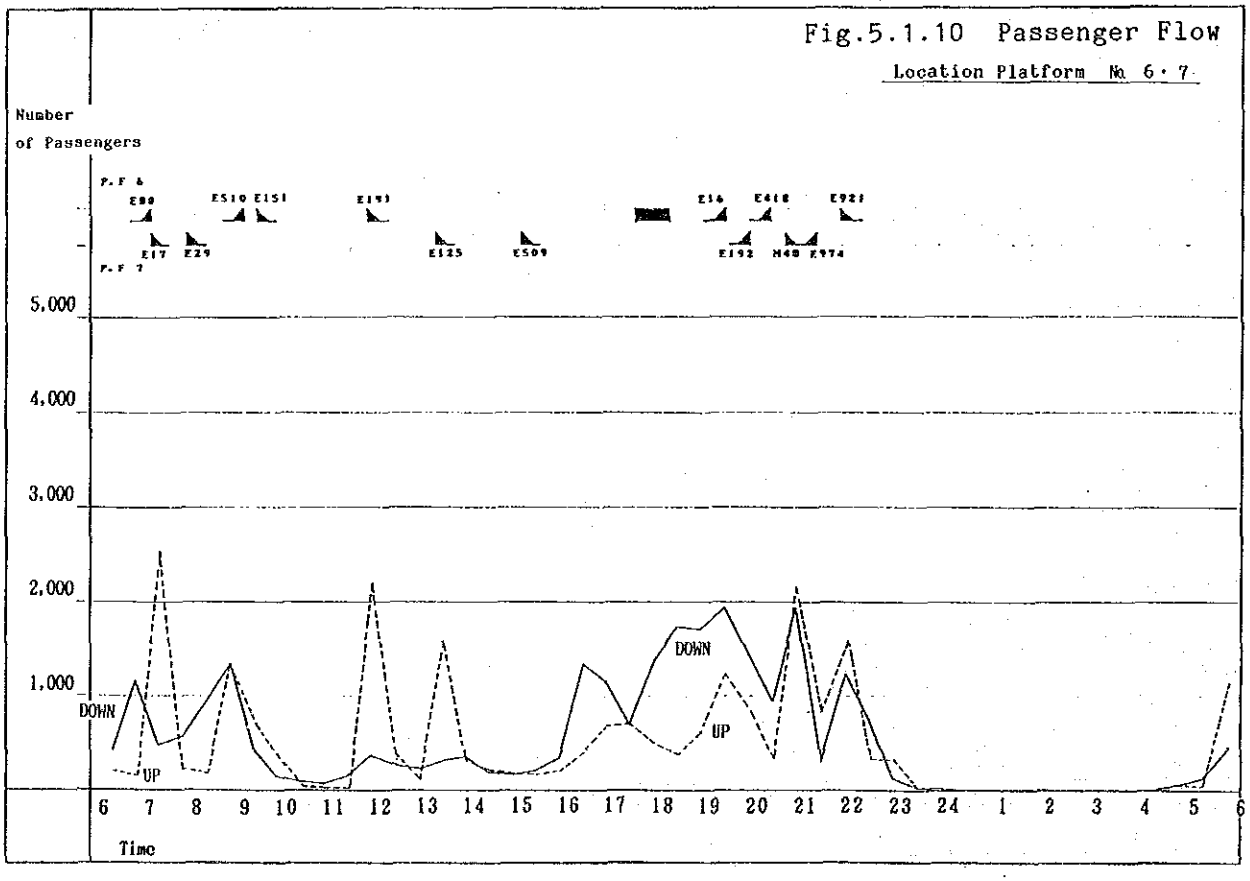
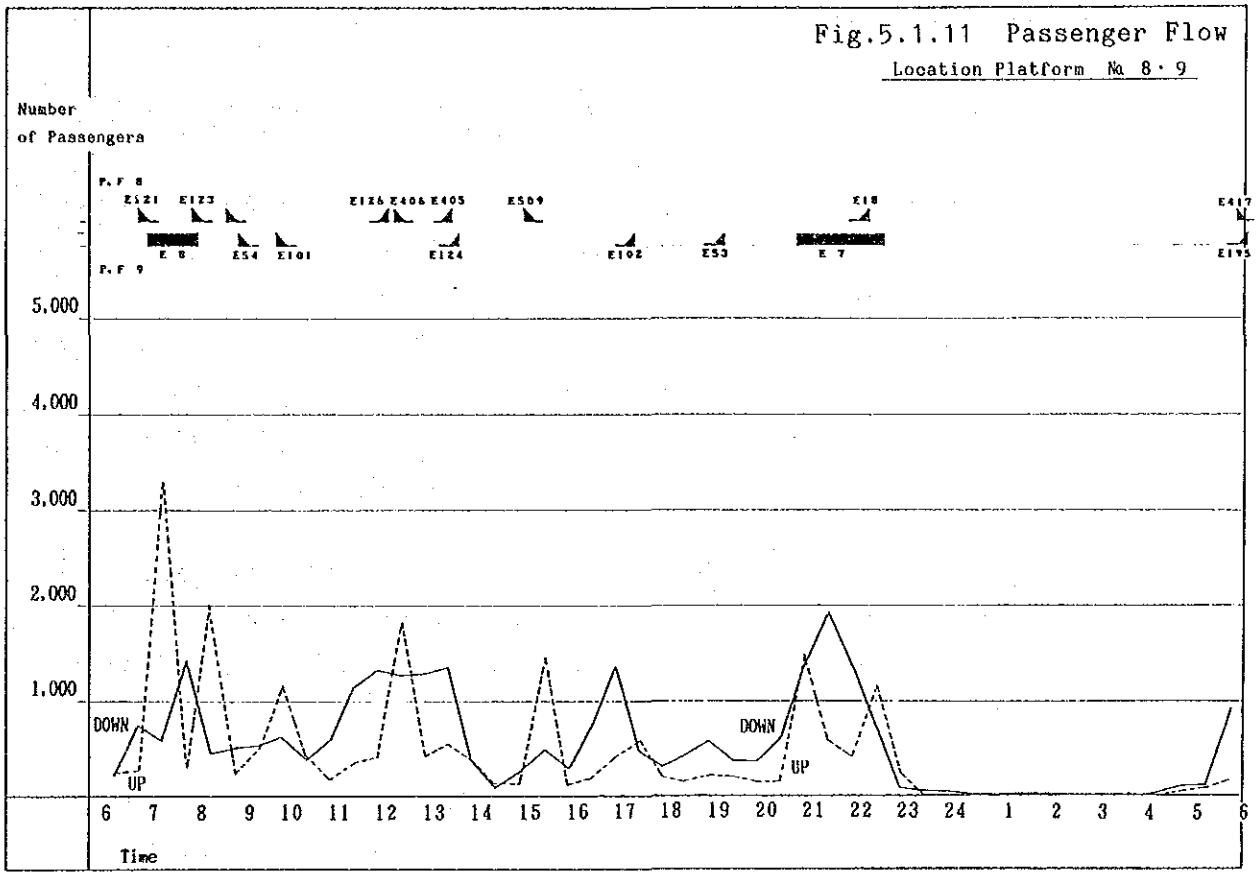


Fig.5.1.11 Passenger Flow

Location Platform № 8・9



2. Passenger OD Survey

* Fig.5.1.12 Survey Locations and Number of Staff Pasted

* Fig.5.1.13 to 5.1.18 Passenger Chart Flow in Relation to Locations for Card Distribution

(1) An evenly distributed flow of about 270 thousand persons per day use the Nizamuddin side overpass.
The OD Survey gives the estimate that slightly more than 10% of the users (about 30 thousand persons) pass through it.

(2) About 200,000 persons per day use the Delhi side overpass. As one approaches the east side the number of users decreases. This is probably because the east side is not directly connected to the station plaza.

(3) The charts flow from the platforms (Fig.5.1.13 to 18) lead to the estimate that 30% of total passenger traffic consists of those changing trains.

(4) Most of the distributed cards were collected within a fixed period of time. The method of their collection indicated that a fixed walking speed in the crowded station is securable.

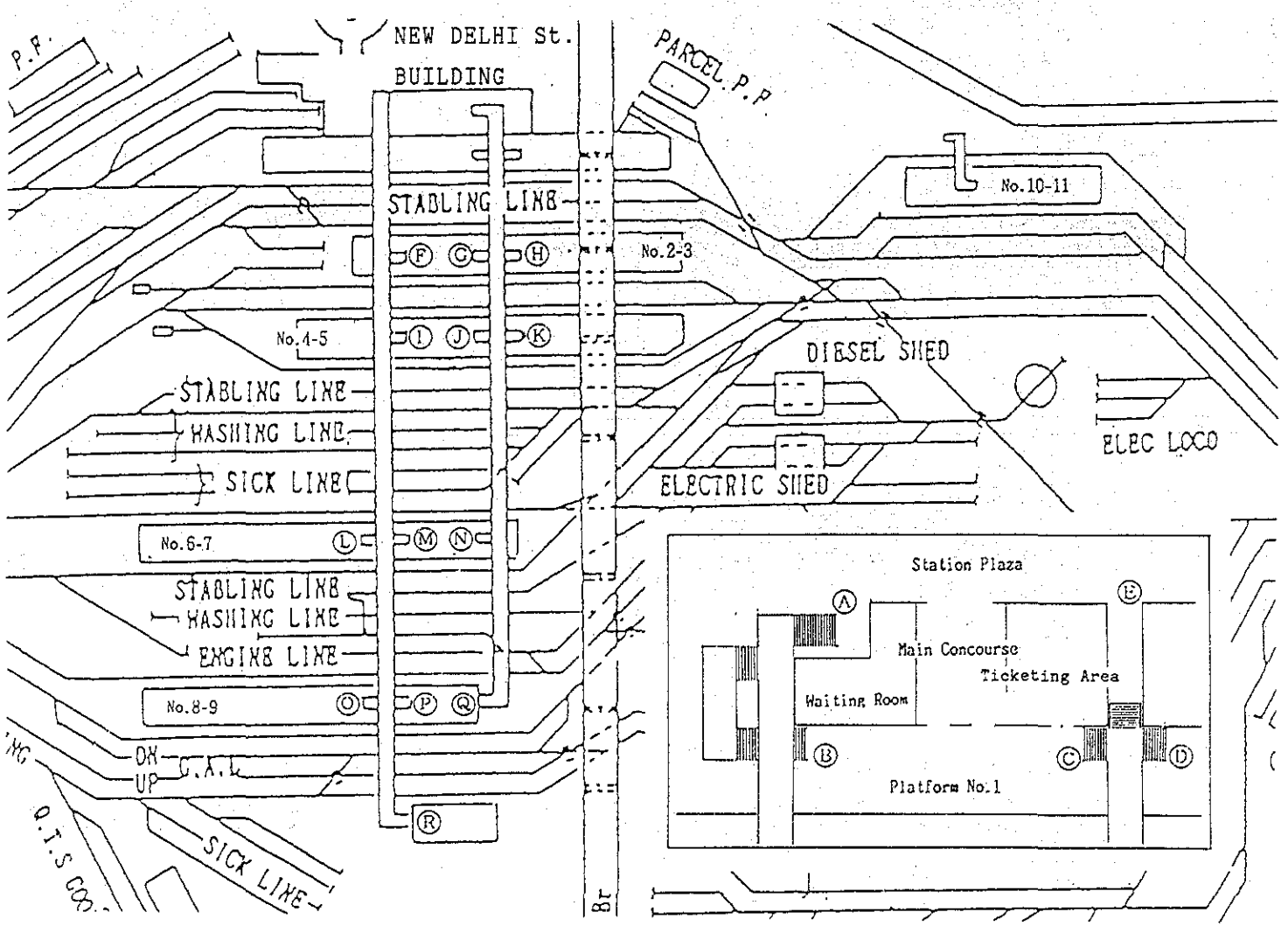
(5) The following percentages show the distribution of passengers among the platform stairs.

Platform	No. 1	30:60:10
	No. 2,3	40:30:30
	No. 4,5	45:20:35
	No. 6,7	60:20:20
	No. 8,9	45:25:30

The above figures can nearly be predicted from the layout of the platform stairs.

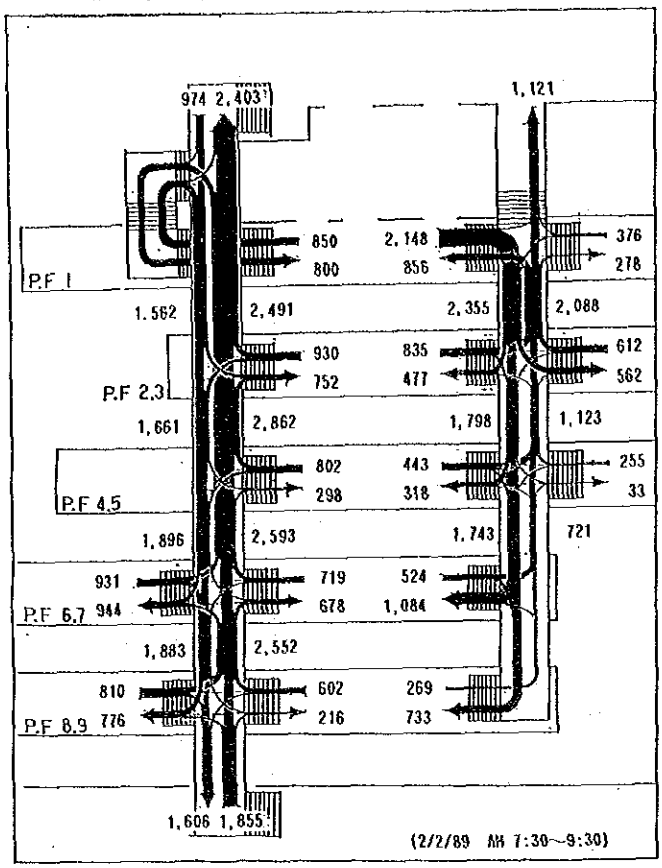
Fig. 5.1.12 Survey Locations and Number of Staff Pasted.

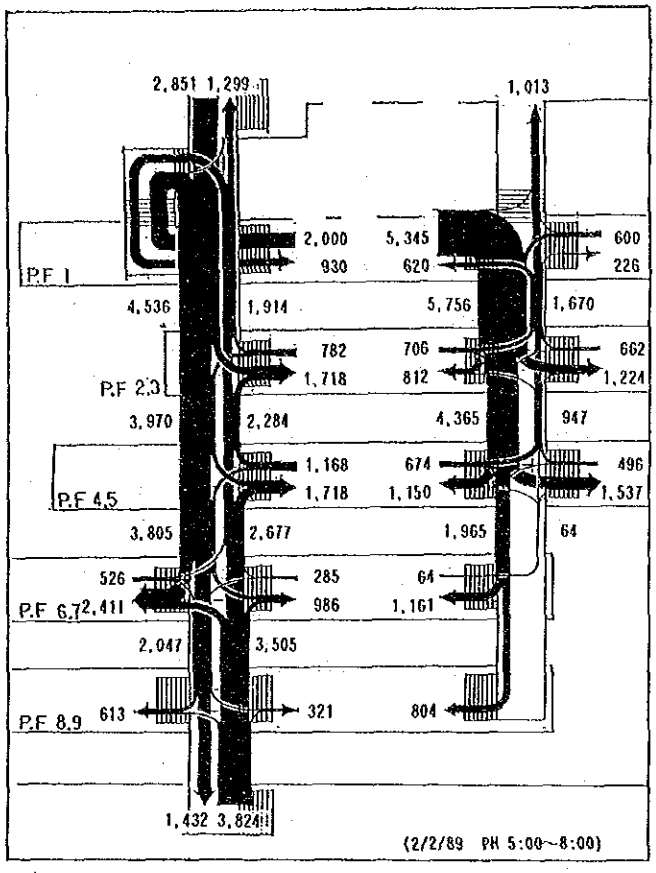
Location	Number of Staff			
	Distribute		Collect	
	AM	PM	AM	PM
A	2	2	2	2
B	1	1	1	1
C	2	2	2	2
D	1	1	1	1
E	—	—	1	1
F	1	1	1	1
G	1	1	1	1
H	1	1	1	1
I	1	1	1	1
J	1	1	1	1
K	1	1	1	1
L	1	1	1	1
M	1	1	1	1
N	1	1	1	1
O	1	—	1	1
P	1	—	1	1
Q	1	—	1	1
R	2	2	2	2



New Delhi St. O-D Volume

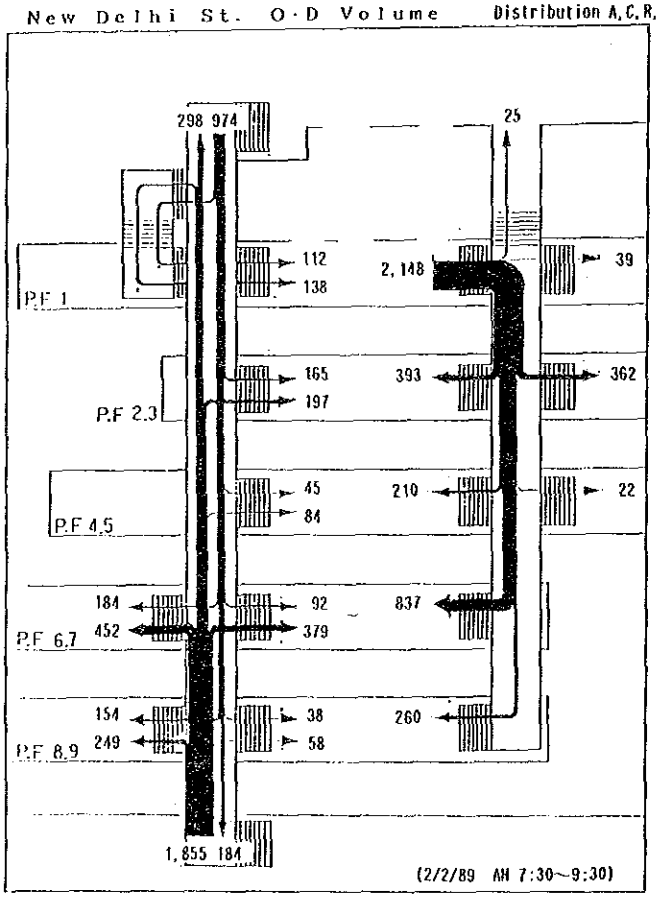
Fig.5.1.13 Passenger Flow Chart





New Delhi St. O-D Volume Distribution A,C,R,

Fig.5.1.14 Passenger Flow Chart



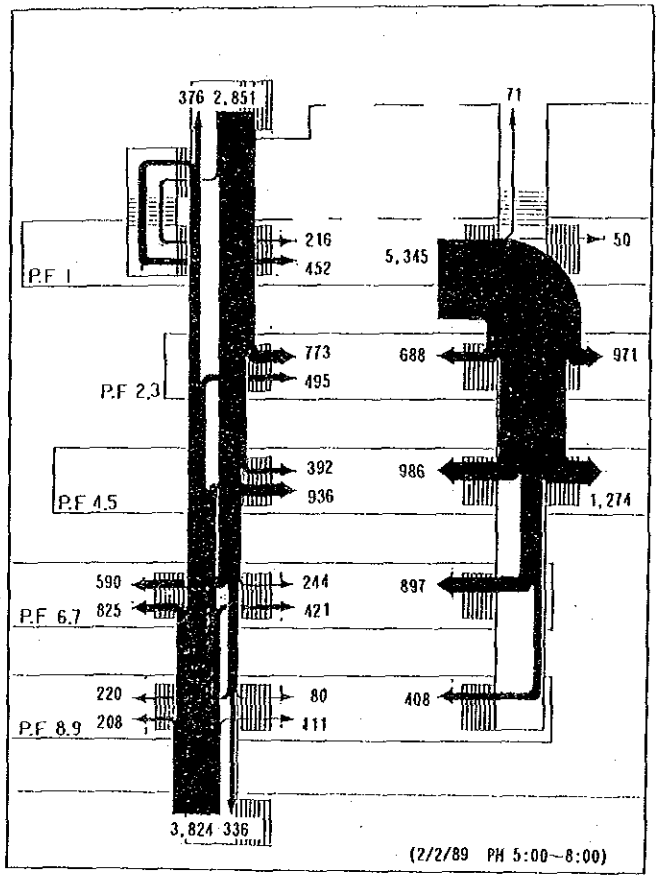


Fig.5.1.15 Passenger Flow Chart

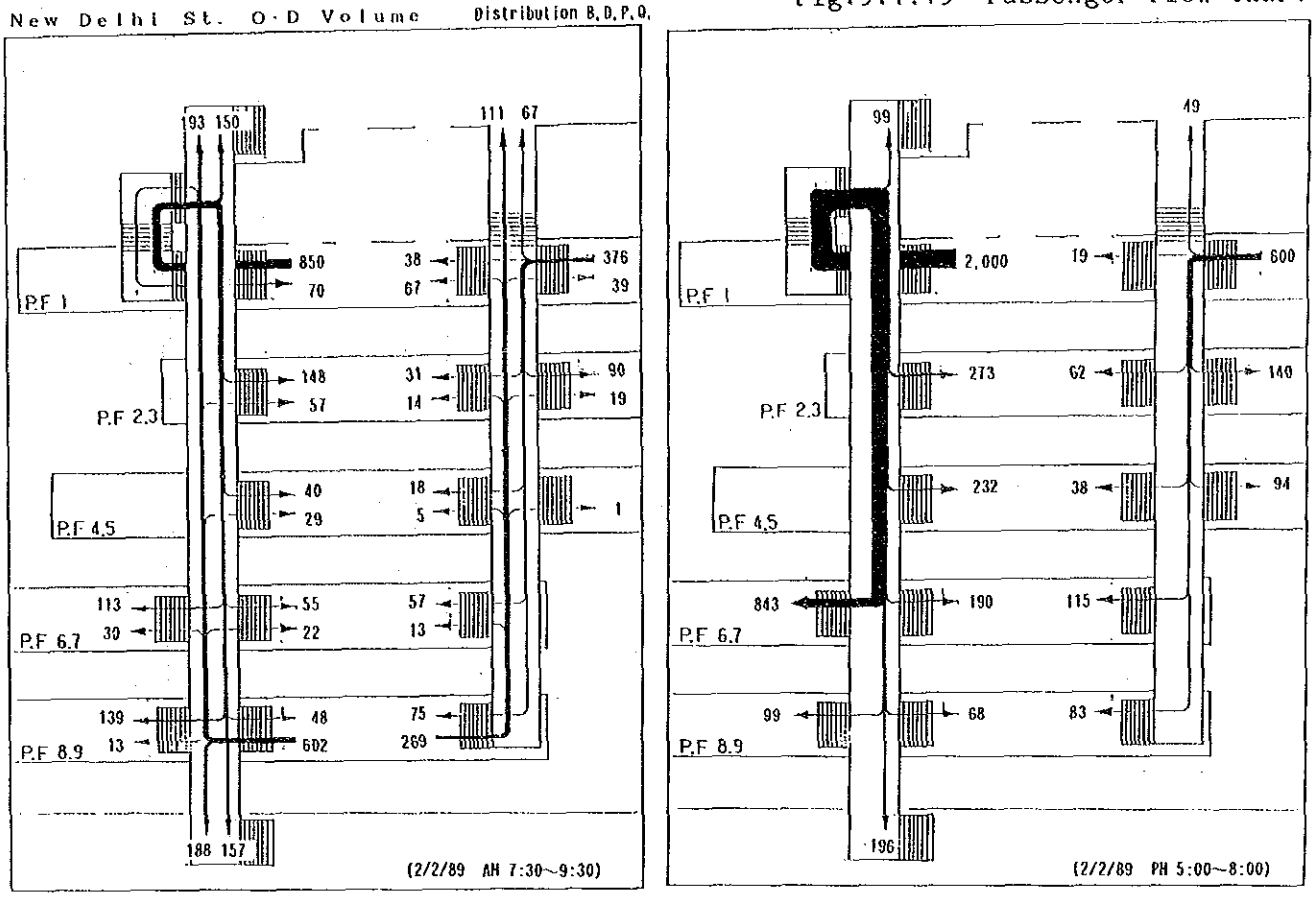


Fig.5.1.16 Passenger Flow Chart

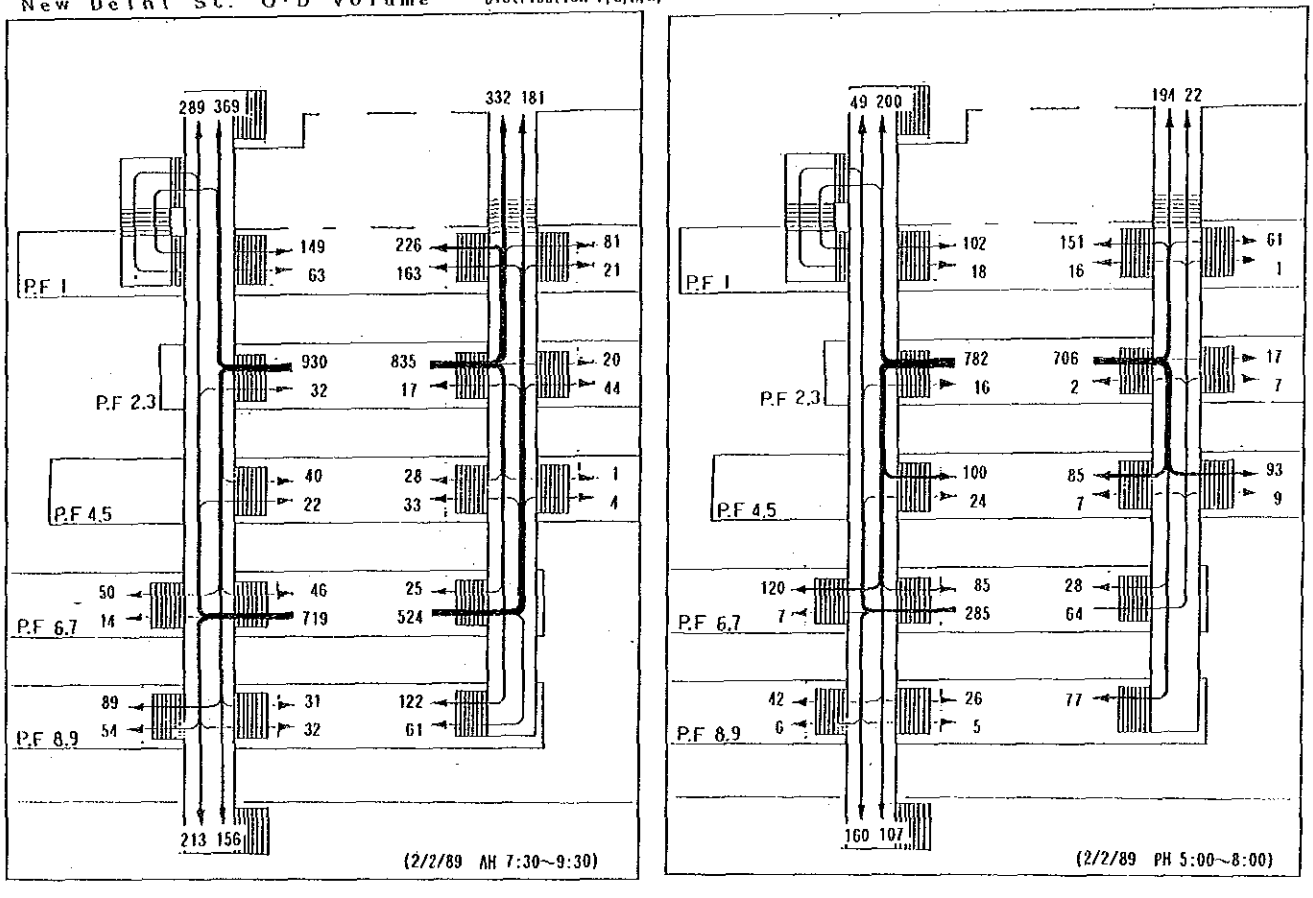
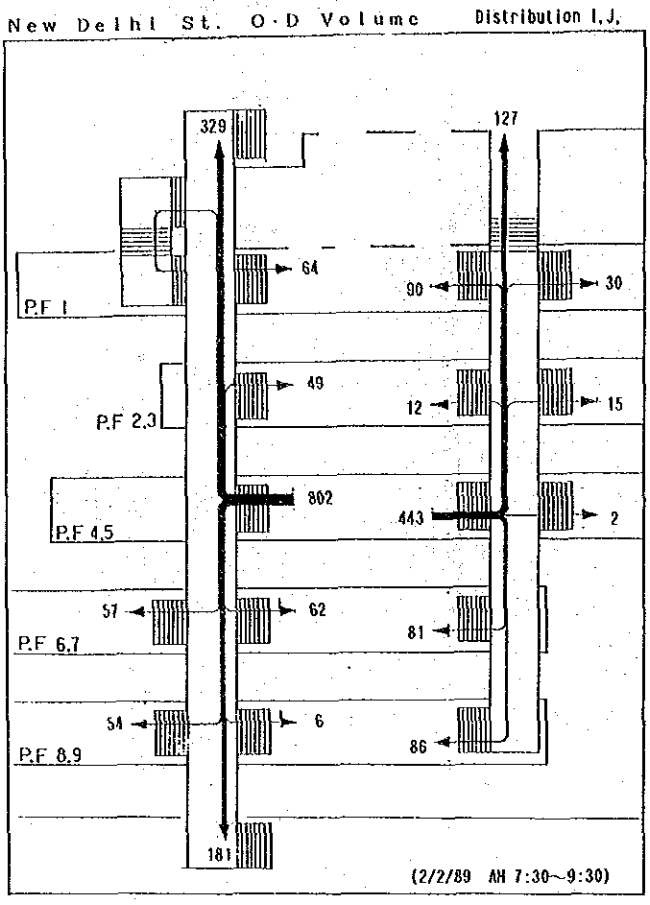


Fig.5.1.17 Passenger Flow Chart



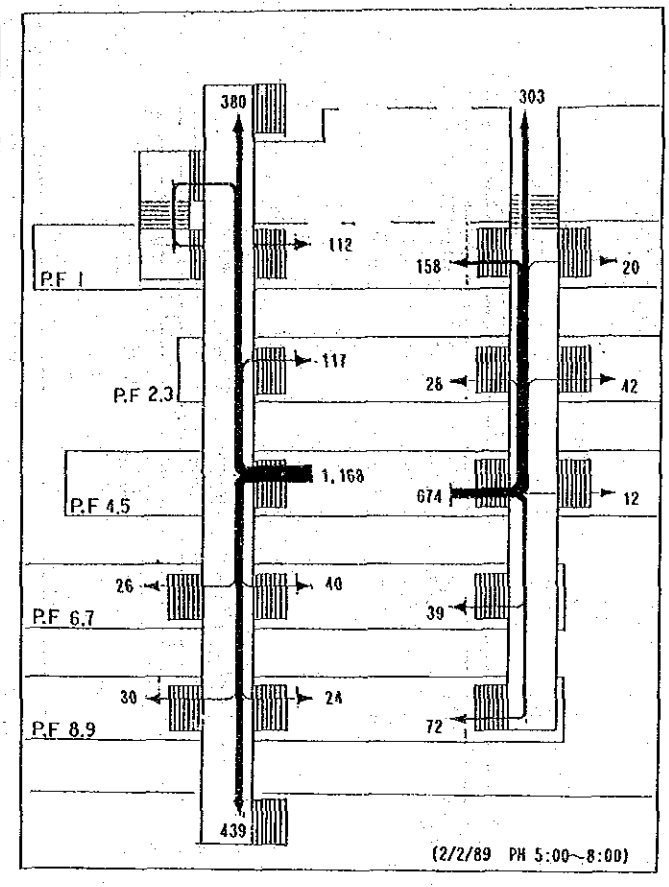
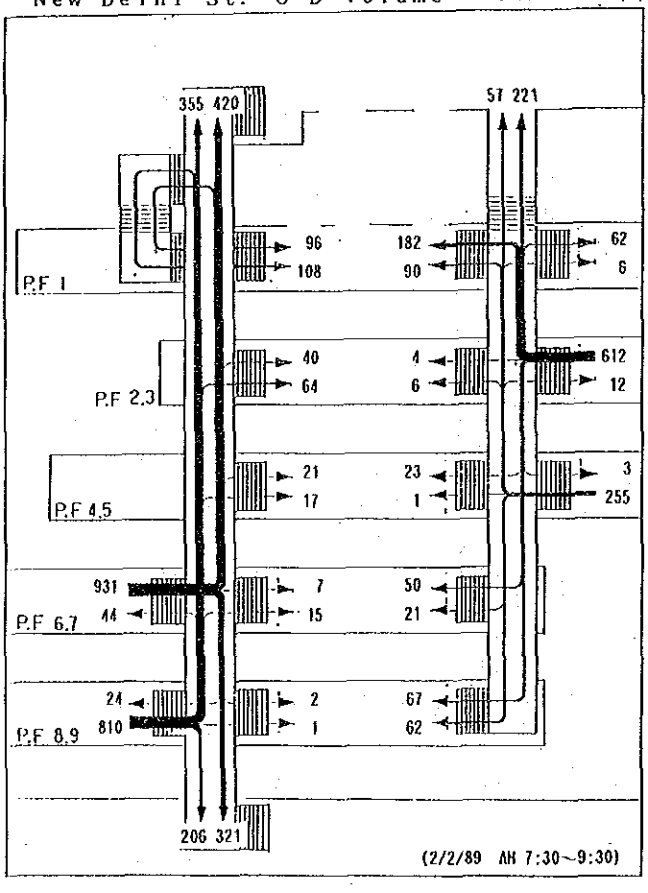
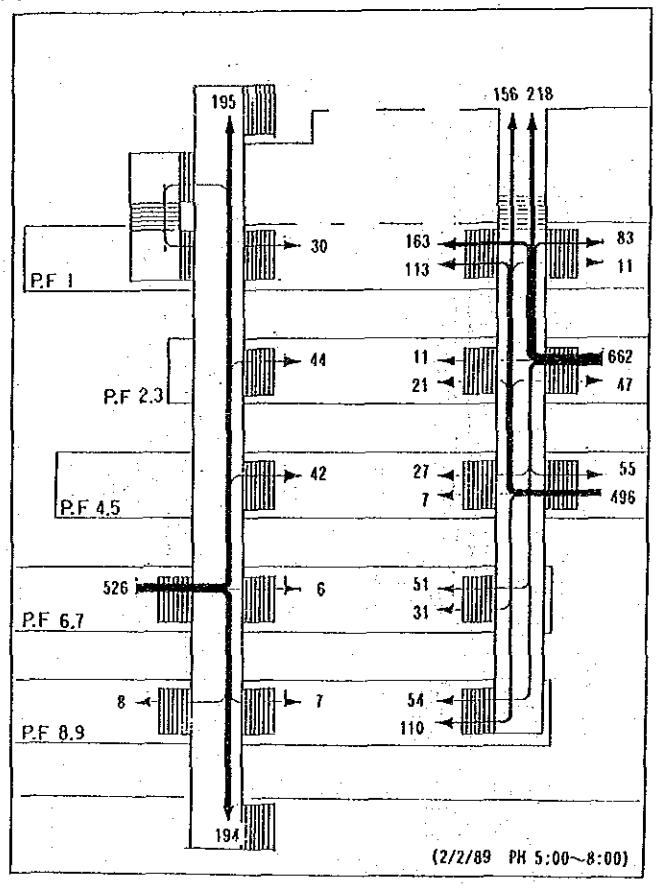


Fig.5.1.18 Passenger Flow Chart





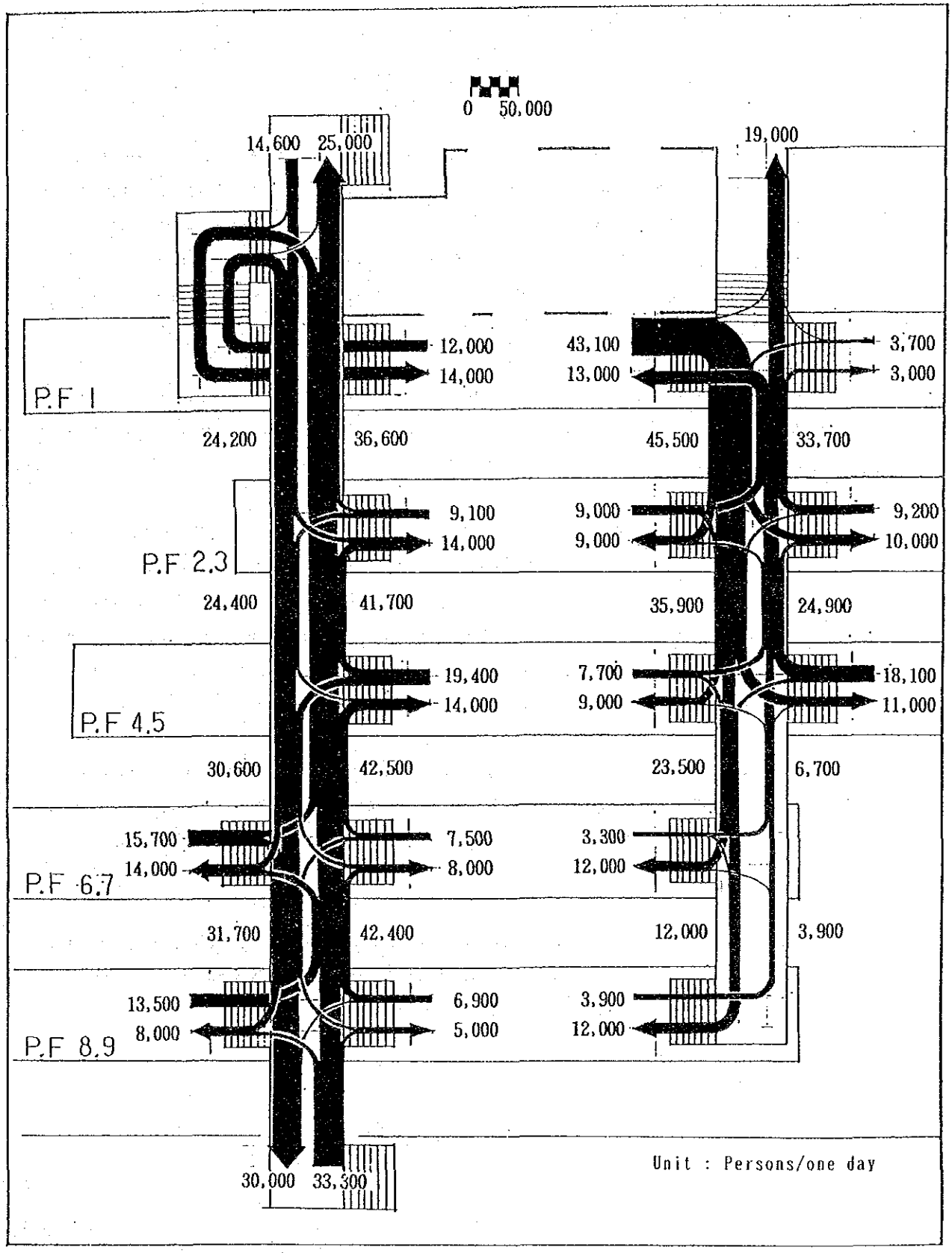


Fig. 5.1.19 Origin/Destination of Passenger Flow within New Delhi Station

3 . Traffic Volume Survey

* Fig.5.1.20 Survey Results

(1) When the total number of vehicles during the survey period at the east and west plazas are compared, the former is more heavily used than the latter. If only buses and cars are considered, the two are nearly the same. In other words, the east plaza had 1,437 motor vehicles and the west plaza 1,450 motor vehicles.

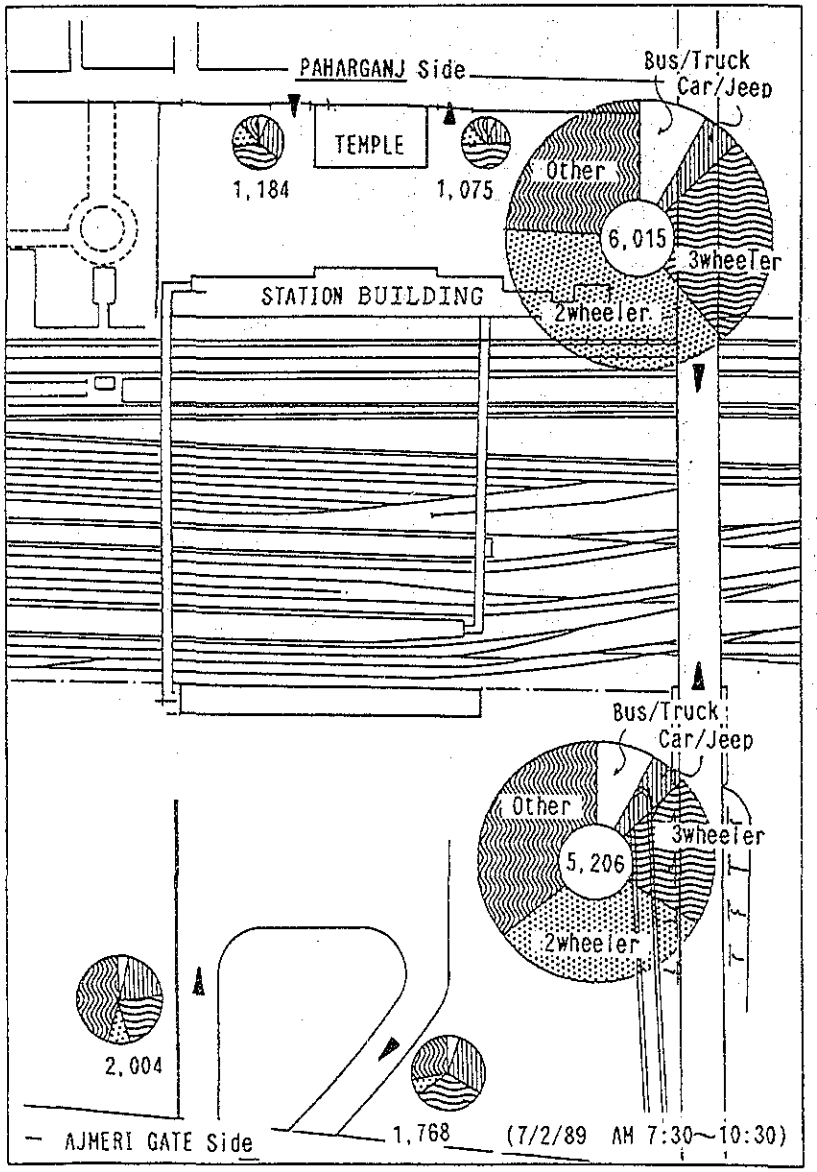
(2) In the west plaza, motorized three-wheelers accounted for about one-half of the total amount of traffic, While cars and buses accounted for only about 20% and 3%, respectively.

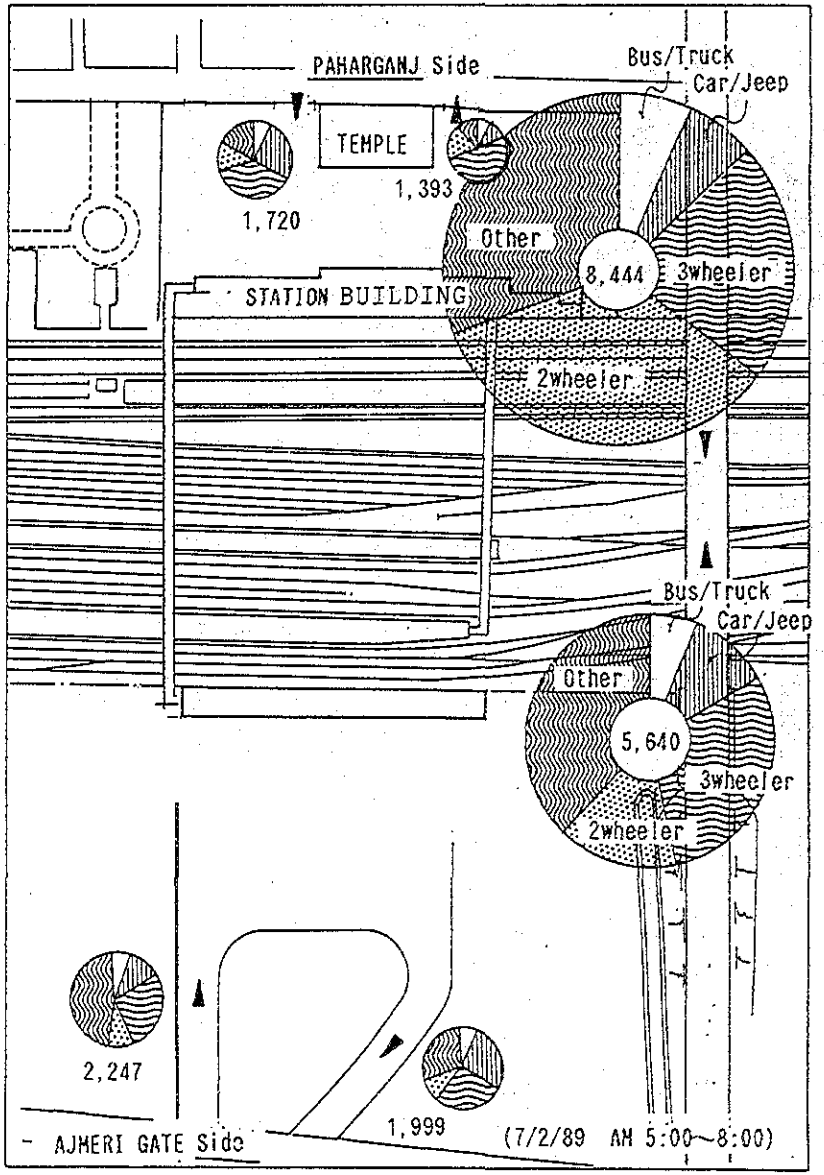
(3) In the east plaza, ox-carts and carriages accounted for about 40% of total traffic and motorized three-wheelers for about 30%. In other words, these low-speed modes of transport accounted for more than half of total traffic. While cars and buses, which are usually the principal means of urban transportation, accounted for only about 10% and about 5%, respectively.

(4) The traffic volume of cars and buses is small in both the east and the west plazas, but crowded with motorized three-wheelers, ox-carts and carriages. Therefore, the measures for the low-speed means of transportation are important.

(5) Ajmeri Gate Bridge is similar to the plazas; in other words, the traffic volume of the motorized three-wheelers, ox-carts and carriages is large, as well as that of two-wheelers.

Fig. 5.1.20 Traffic Volume Survey





5 - 2 Calculation of Required Area for Passenger Facilities

In order to secure smooth passenger flow now and in the future equations which are used in Japan for determining width and area were applied to India.

1. Width of Platform Stairs

If the current locations of platforms are not changed, there will be a large deviation between the planned position of the overpass concourse and the platform centers. This was considered in the passenger distribution on the stairs. Therefore, the maximum use ratio of one set of stairs was assumed to be 70% in the assessment below. Above-mentioned figure was evaluated by the present use ratio of the platform, 60% due to the result of passenger flows survey.

$$W = \frac{1}{N1} \times \left(\frac{S1}{T1} + \frac{S2}{T2} \right)$$

W = required width of platform stairs

N1 = flow coefficient of stairs = crowd density × crowd speed

Crowd density = the average number of passengers per 1 m^2 of platform stair. Although it is 2.6 person/m^2 (0.38 m^2/person) in Japan, it is assumed to be 1.7 persons/m^2 (0.6 m^2/person) in India due to passengers having a lot of baggage.

Crowd speed = the average walking speed of passengers on platform stairs. It is 0.6 m/sec in Japan, but is assumed to be 0.5 m/sec in India because of passenger baggage.

$= 1.7 \text{ persons/m}^2 \times 0.5 \text{ m/sec} \times 60 \text{ sec}$

$\fallingdotseq 50 \text{ persons/m/min}$

S1 = maximum number of alighting passengers per train using the stairs.

= 1,800 people × 0.7 (maximum usage percentage)

= 1,260 people.

S2 = number of entraining passengers using the stairs during alighting time = S1

T1 = time required to discharge alighting passengers from a train

= 5 minutes

T2 = time required to discharge all passengers from a train

= 10 minutes

$$W = \frac{1}{50} \times \left(\frac{1,260}{5} + \frac{1,260}{10} \right) = 7.56 \text{ m} \fallingdotseq 8.0 \text{ m}$$

The narrowest platform is 12:8 m at present. Therefore, even if stairs 8.0 m in width are constructed on this platform, a 2.0 m wide passage can still be secured on both sides. Therefore, standard platform width will be assumed to be 8.0 m.

2. Width of Concourse

W = P/N2

W = *concourse (free passageway) width*

P = volume of people on a normal day (including general public)

It is estimated that transportation capacity in 2010 will be approximately double that at present.

Therefore, it is assumed that the volume of people will also be approximately double in 2010.

(249,700 ≒ 250,000) × 2.0 = 500,000

The time fluctuation rate is assumed to be 25%, although it is currently about 10%.

500,000 persons/day = 500,000 persons/20hours
= 417 persons/minutes
417 persons/minutes × 1.25 ≒ 521 persons/minute

N2 = flow coefficient = Crowd density × Crowd speed
Crowd density = 1.5 persons/m² (2.3 persons/m² in Japan)
Crowd speed = 0.65 m/sec (0.75 m/sec in Japan)
1.5 persons/m² × 0.65m/sec × 60sec
= 55 persons/m/min

If the station is to have only one main concourse, its width must be as shown below.

W = 521 persons/min ÷ 55 persons/m/min = 9.47 m
A margin of 1.0 m is to be allowed for along the walls.
9.47 + 1.0 × 2 = 11.47 ≒ 12.00 m
Therefore, the main concourse width must be at least 12.00 m.

3. Width of Main Stairs

The number of persons using the main stairs is assumed as below from the volume of people in the concourse.

521 persons/min × 60 min ≒ 31,260 persons/hour

In Japan, 1 m is used by 3,000 persons/hour according to the simplex method. Since the flow coefficient (see N1 of the platform stairs calculation) is 55% of that in Japan, this difference is taken into consideration as shown below.

3,000 persons/hour × 0.55 = 1,650 persons/hour
31.260 persons/hour ÷ 1.650 persons/hour = 18.95 ≒ 19.00 m

Therefore, the width of the main stairs should be at least 19.00 m.

It is desirable for the concourse and main stairs to be of the same width from the standpoint of architectural designing, construction work, and passenger flow.

If the width of the concourse and main stairs are to be dependent upon the installation of elevators, the following assumption can be made.

If one upward escalator (transportation capacity = 9,000 persons/hour) and one downward escalator are installed, then :

31,260 persons/hour − 18,000 persons/hour = 13,260 persons/hour

Then, the width of the stairs is obtained as shown below.

13,260 persons/hour ÷ 1,650 persons/hour ≒ 8.00 m

Therefore, the required width of the main stairs will be :

8.0 m + 2.0 m (escalator width) × 2 = 12.0 m

Even if the concourse width is at its minimum (12.0 m), the main stairs can have the same width.

4. Public Spaces and Waiting Rooms

$A = U + T + S \times \alpha$

A = required area for public spaces and waiting rooms

U = area in front of booking office

= B1 × L1

B1 = the total width of booking windows

Present width of the booking window is about 55.0m and the obstruction witdh of it against improvement work is about 35.0m. And the required width due to the increase of passengers in the future is about 55.0m.

Therefore 35.0+55.0 = 90.0 m

L1 = depth of booking windows (The standard is 3 m in Japan.)

= 5.0 m

U = 90.0 × 5.0 = 450.0 m²

T = flow area

= B2 × L2

B2 = flow width

= (L3 × N) + B3

L3 = unit width of wicket = 1.3 m

N = number of wickets

(India does not have wickets like those in Japan. However, this should present no problem for calculating a wicket's basic area. Therefore, the following equation is used.)

$$N = \frac{1}{3,600} \times \left(\frac{n1}{P1} + \frac{n2}{P2} \right) + A$$

n1 = number of entraining passengers per hour during peak rush hours

= maximum measured value at present of 5,577 persons/hour × growth rate 2.0 (see P in the concourse width calculation.)

≒ 11,200 persons.

n2 = number of alighting passengers per hour during peak rush hours

= maximum measured value at present of

≒ 4,289 persons/hour × 2.0

≒ 8,600 persons

p1 = number of detraining passengers passing through a wicket per unit of time

= 0.6 persons/sec (0.7 persons/sec in Japan)

p2 = number of a lighting passengers passing a wicket per unit time

= 0.85 persons/sec (1.0 persons/sec in Japan)

A = margin

= 20%

$$N = \frac{1}{3,600} \times \left(\frac{11,200}{0.6} + \frac{8,600}{0.85} \right) \times 1.2$$

= 10

B3 = correction value of flow width

= 3.0 m (2.0 m in Japan)

B2 = 1.3× 10 + 3.0 = 16.0

L2 = depth in front of and behind wicket

depth in front of wicket = 3.0 m (standard)

depth behind wicket = 0.5 B2

≒ 8.0 m

= 8.0 +3.0

= 11 m

T = 16.0× 11.0 = 176.0≒ 180 m^2

S = Waiting area

= C× W

C = area per waiting person

= 1.0 m^2 (0.7 m^2 in Japan)

W = number of people waiting at one time

P× Q (r · t)

P = number of entraining passengers per hour during peak

= number of entraining passengers per day × hourly concentration rate during peak rush hours

〔The estimated volume of people was used in the present assessment.〕

= 500,000 × 10% = 50,000 persons/hour

Q (r・t) = simultaneous waiting coefficient

= from the attached diagram Fig.5.2.1

Passenger concentration rate = 10%

Number of trains = 175 trains ÷ 20 hours

≒ 9 trains

= about 10%

$S = 1.0\ m^2 \times 50,000 \times 0.10 = 5,000\ m^2$

α = coefficient

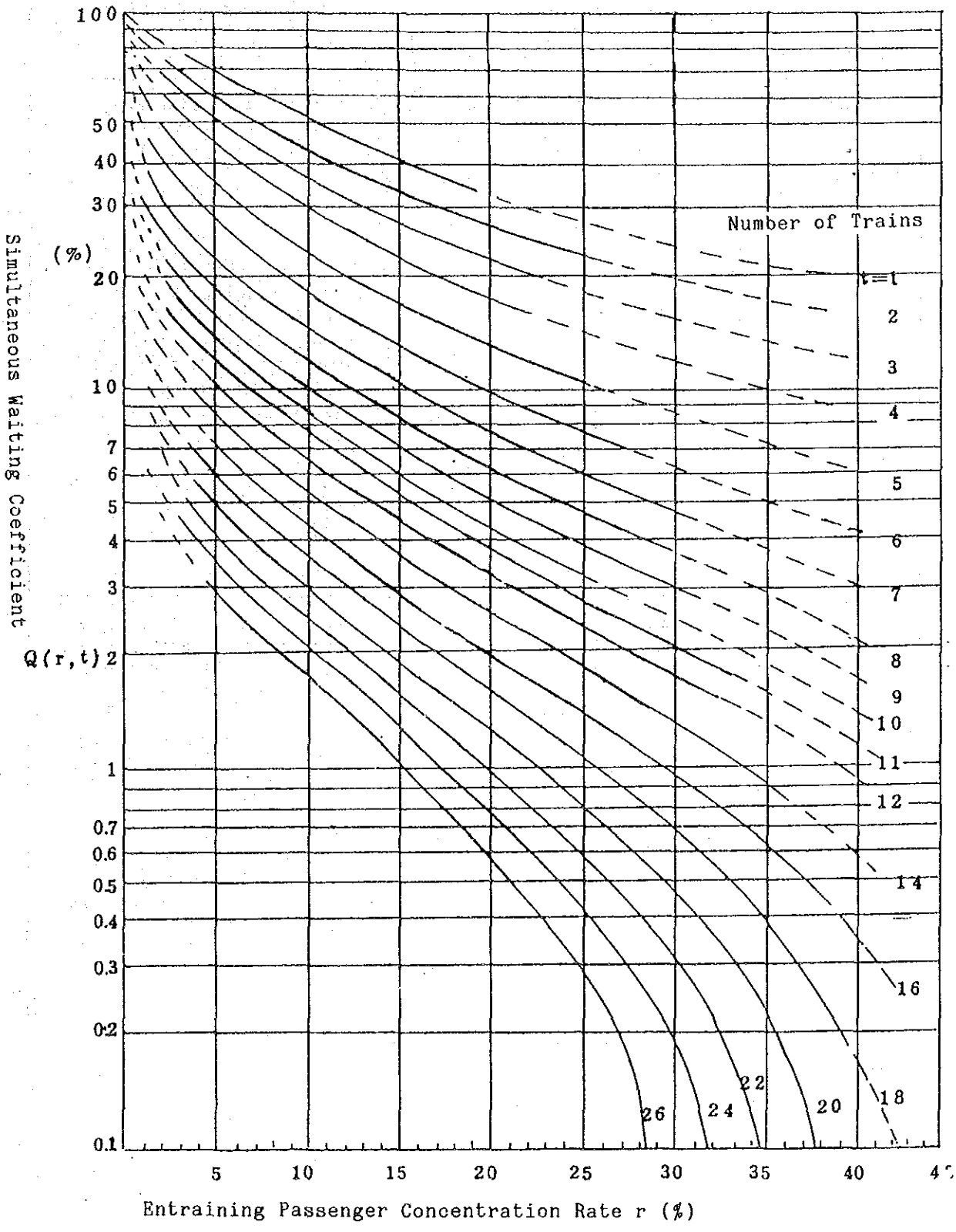
= Increase/decrease due to special reasons

(No increase/decrease is considered in the present assessment.)

Therefore, public spaces and waiting rooms must have at least the following area.

450 + 180 + 5,000 = 5,630 ≒ 6,000 m^2

Fig.5.2.1 Diagram for Calculating Simultaneous Waiting Coefficient Q (r・t)



5 – 3 Comparative Table of Passenger Facilities for Basic Layout Plans (Proposals)

Items Compared \ Proposal		A Fig. 5.3.1	B Fig. 5.3.2	C Fig. 5.3.3	Remarks on Evaluation
Floor Area	(m^2)	21,000	21,000	45,000	Area of improved & newly constructed locations
Construction & execution	Construction cost (millions of Rupees)	450	450	850	
	Difficulty of execution	◎	○	△	Proposal A has the main part of the overpass station on new platforms, and since construction is done usually while trains are not moving it is easier than Proposals B or C.
Passenger flow	Distinguishing passengers and the general public	×	○	○	In Proposal C wickets can be concentrated.
	Relation between free passageway and station building	○	○	◎	In Proposal C, smooth passenger flow is possible since the centers of the east and west sides are aligned with the free passageway.
Management & service	Level of facility development	○	○	◎	Proposal C plans for adequate facilities that are flexible to use.
Future measures		×	△	◎	In Proposals A & B future construction is necessary. At that time, B would be better than A from the viewpoint of layout.
Comprehensive evaluation		△	○	◎	

Legend: × = poor
△ = average
○ = good
◎ = excellent

Fig.5.3.1 Proposal A

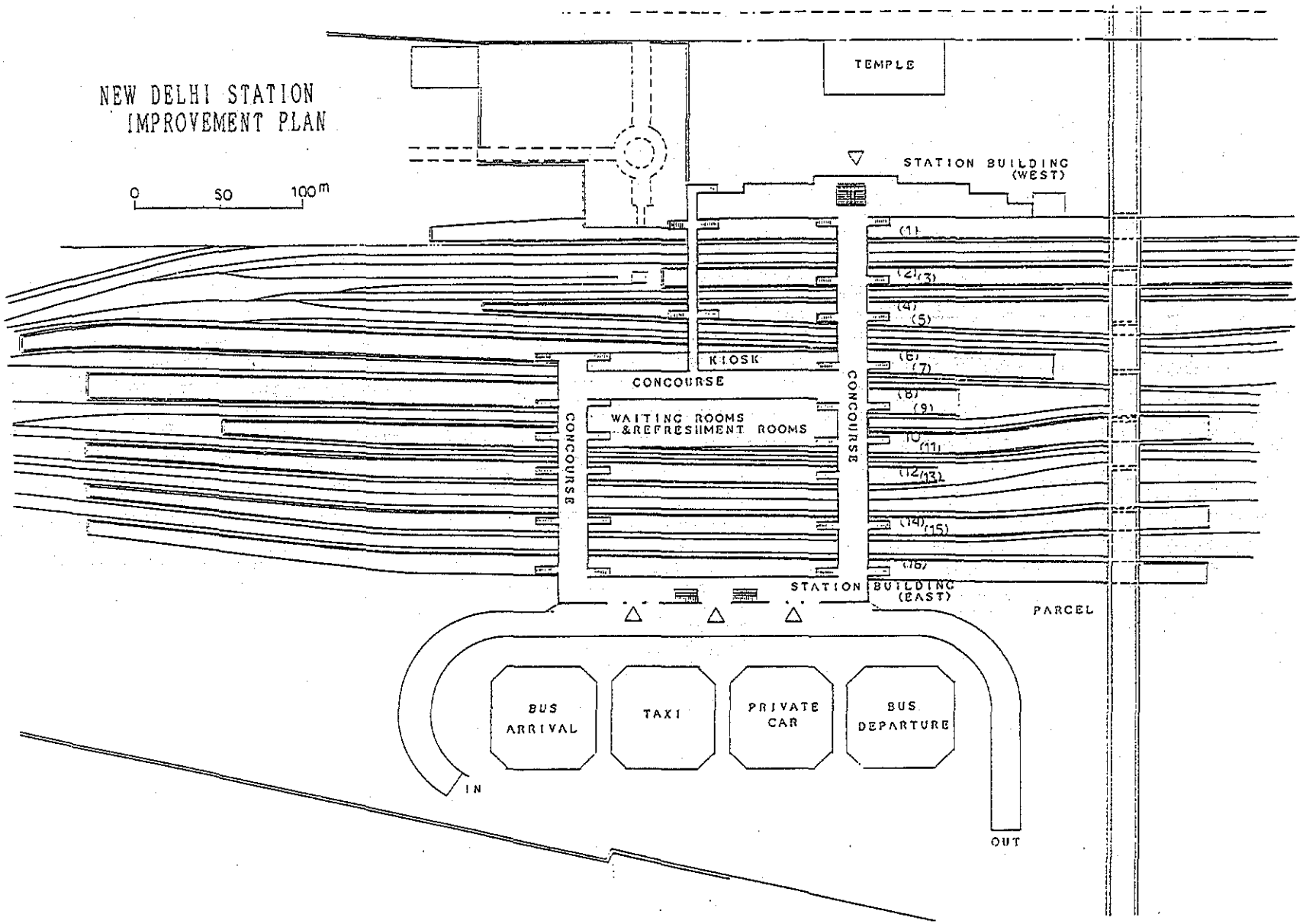


Fig.5.3.2 Proposal B

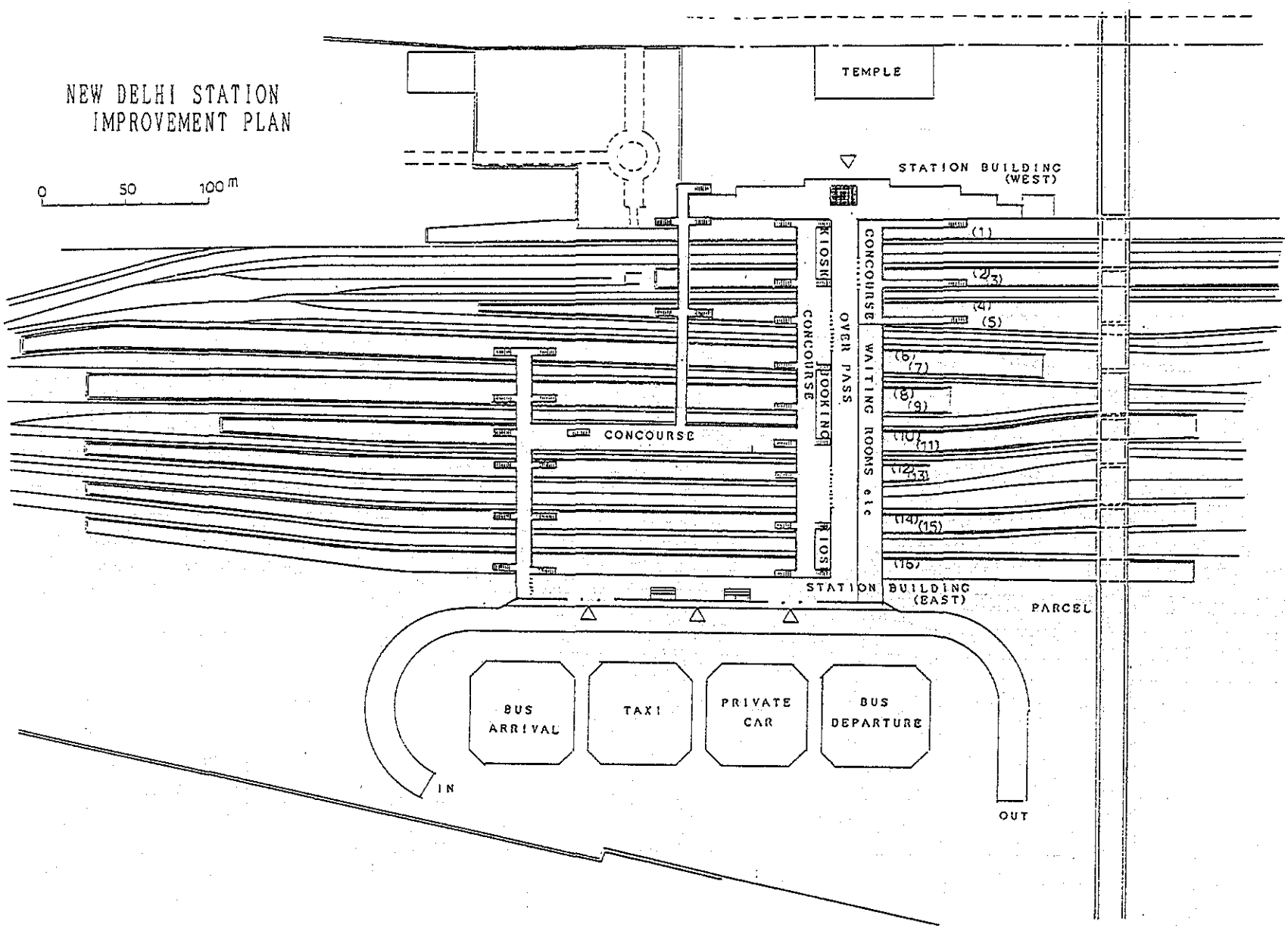
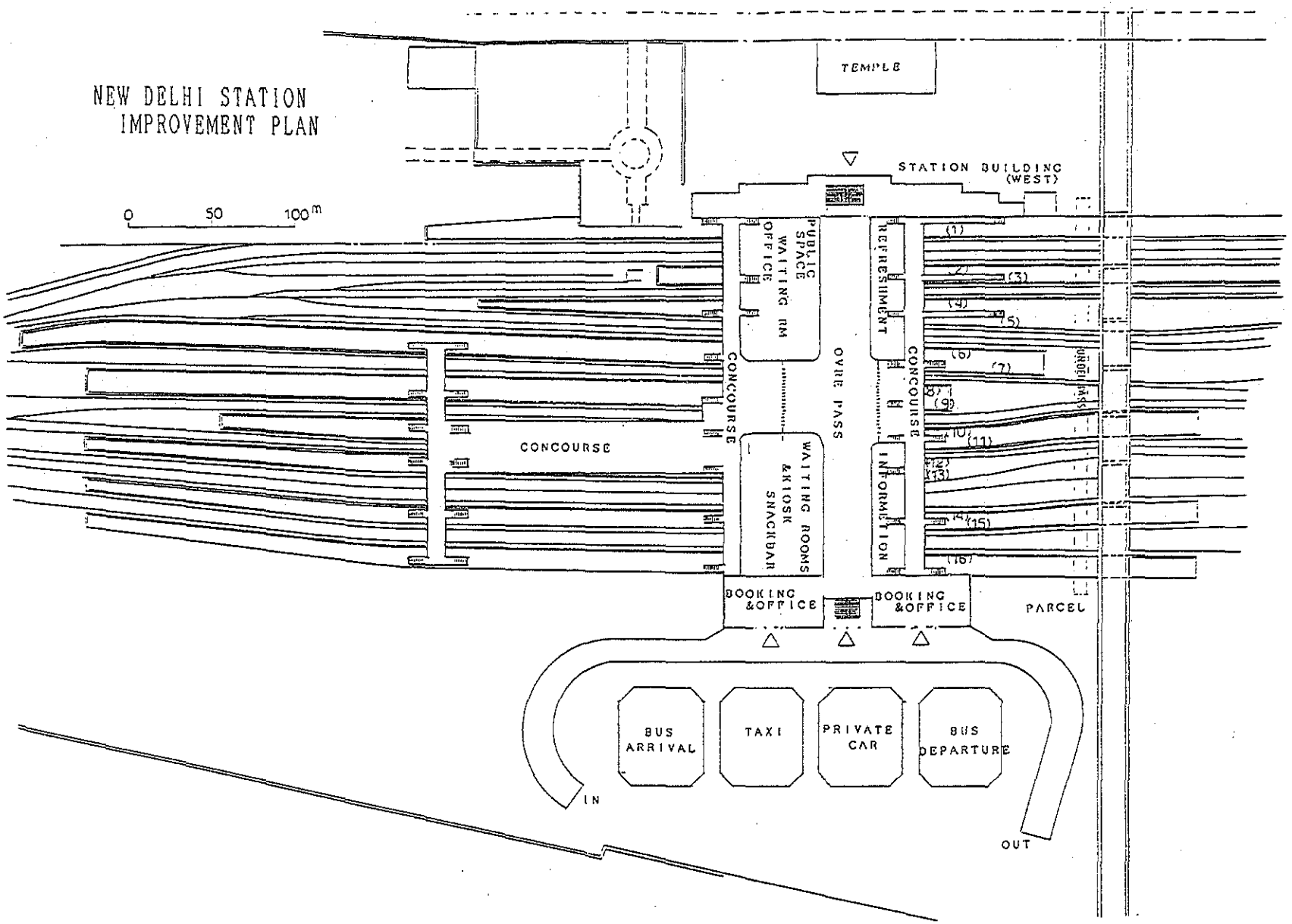
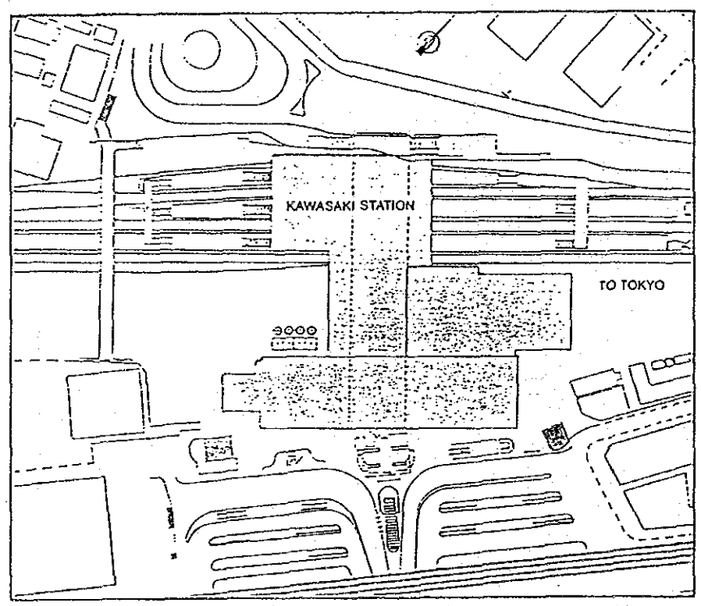


Fig.5.3.3 Proposal C

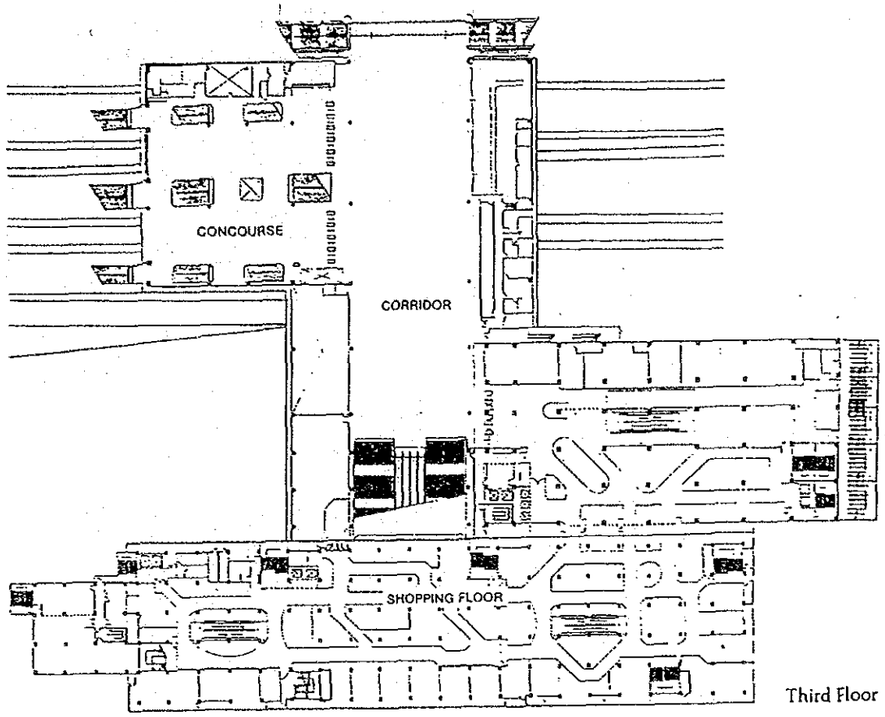


KAWASAKI STATION

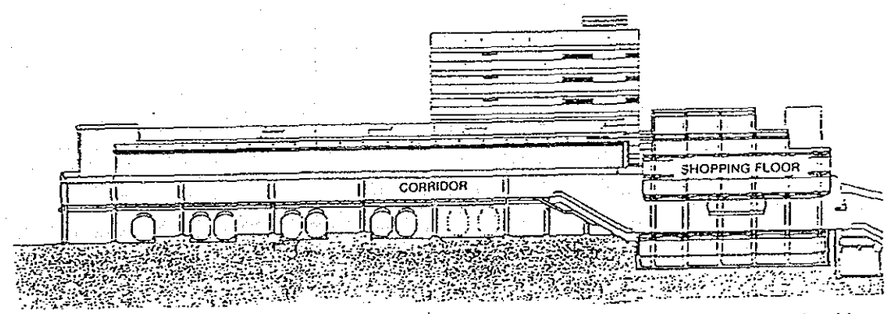
location	Kawasaki Kanagawa
population	1, 100, 000
passengers per day	300, 000
over track station building area	4, 100㎡
shopping building area	75, 000㎡



Plot plan

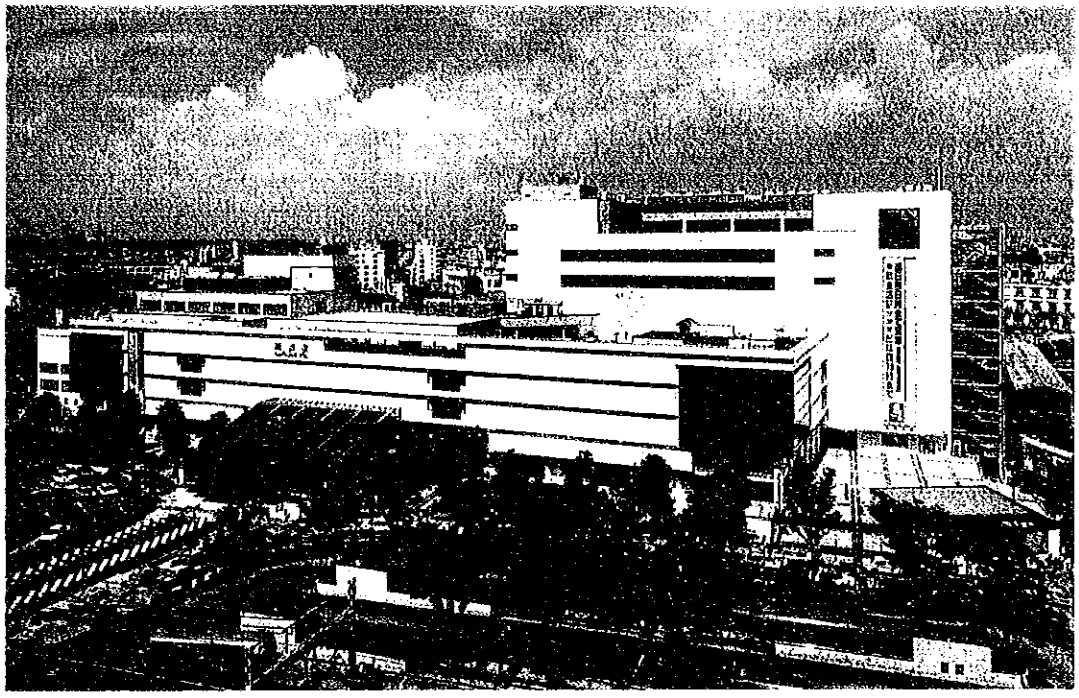


Third Floor



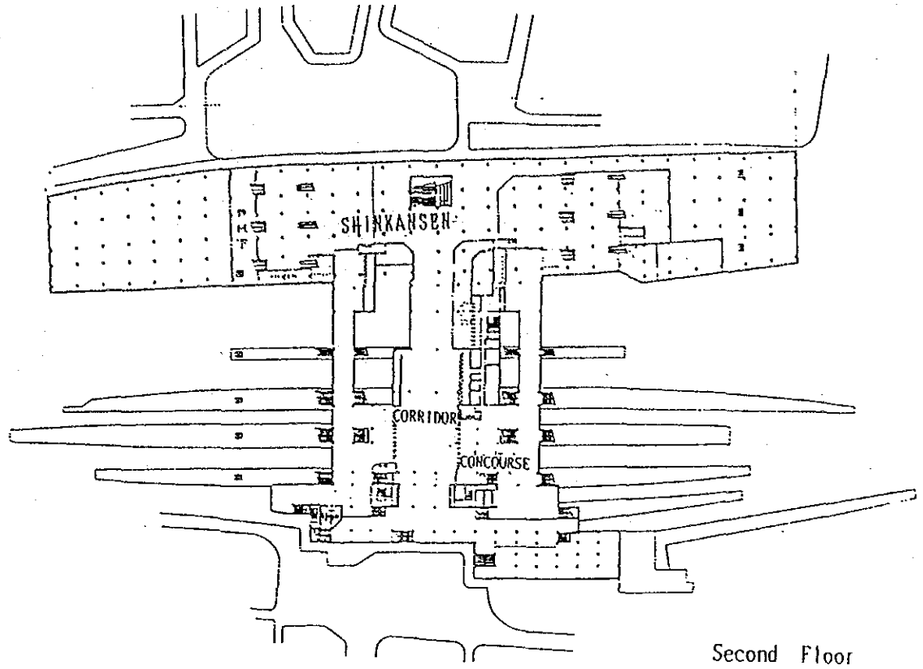
Section

KAWASAKI STATION

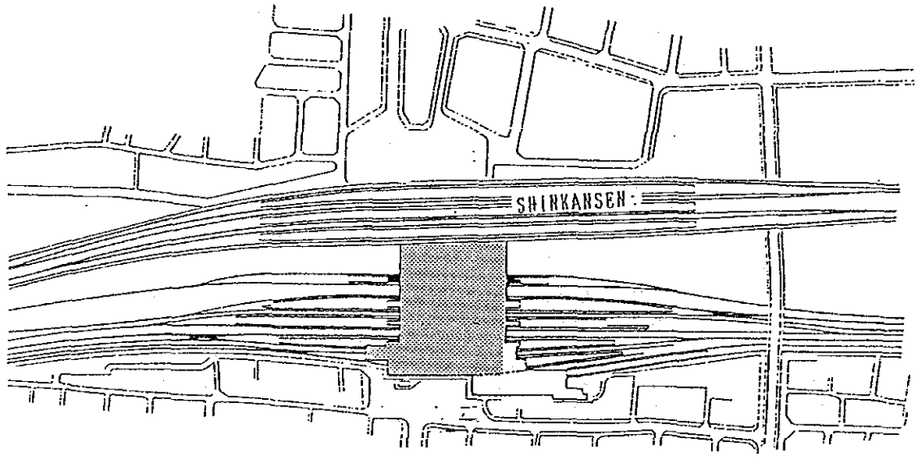


OMIYA STATION

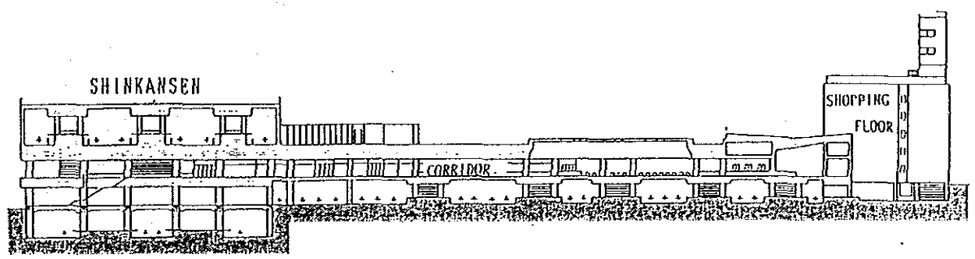
location	Omiya Saitama
population	380,000
passengers per day	340,000
over track station building area	8,600㎡



Second Floor

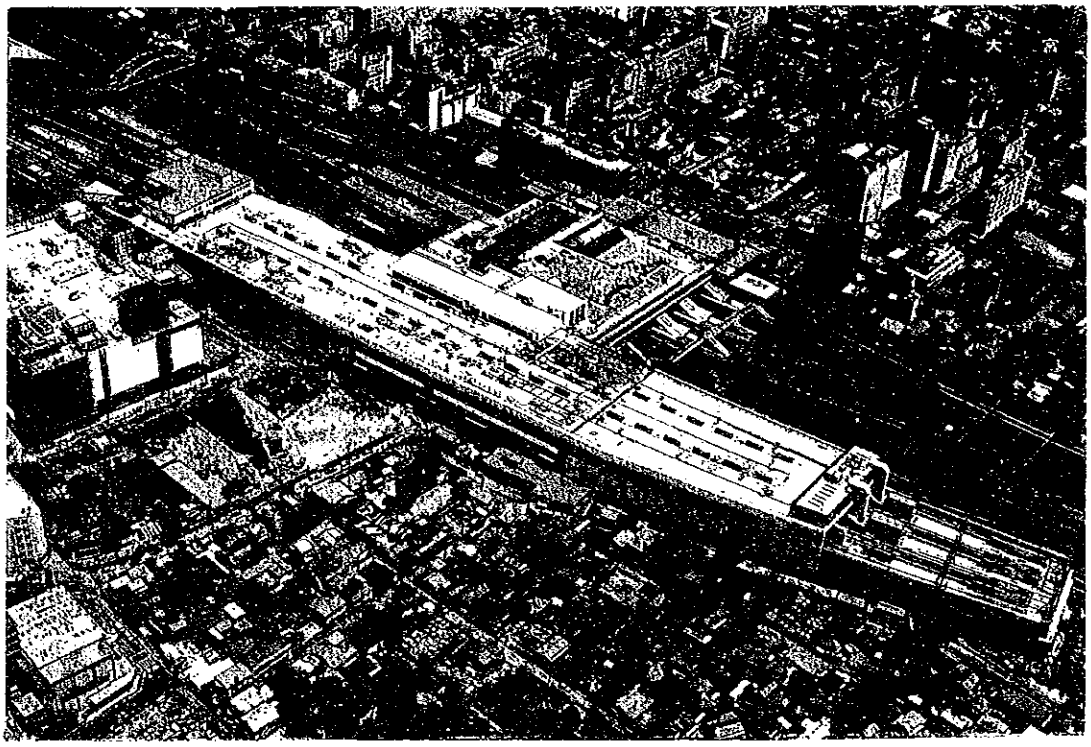


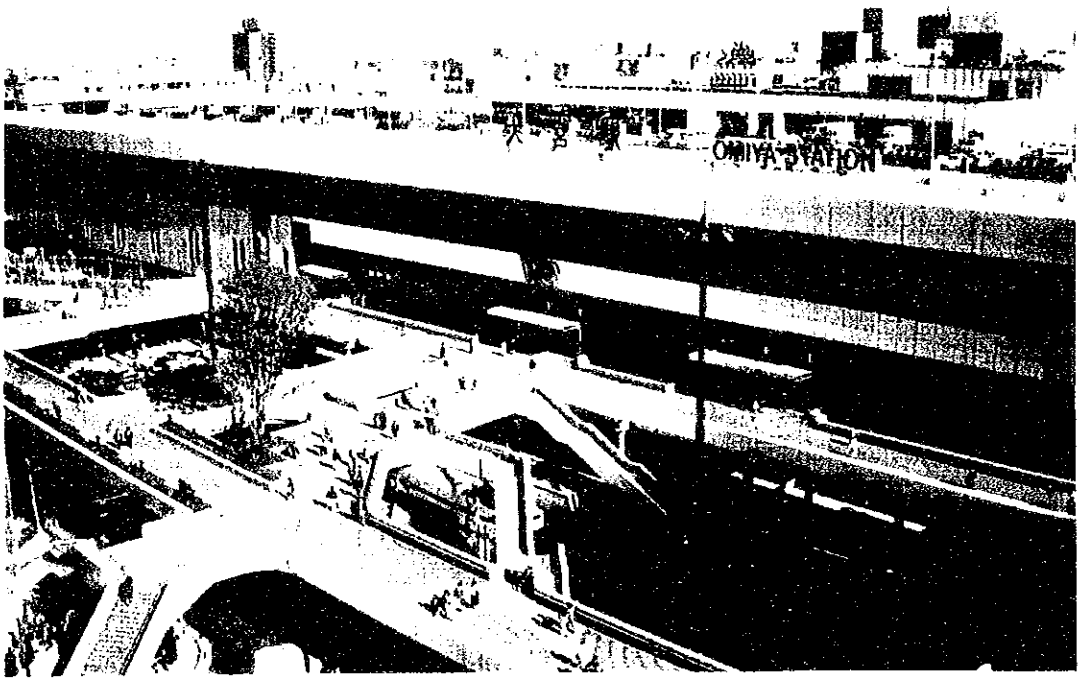
Plot plan



Section

OMIYA STATION





5 – 5 New Delhi Station Track Layout

1. Existing

NEW DELHI STATION YARD

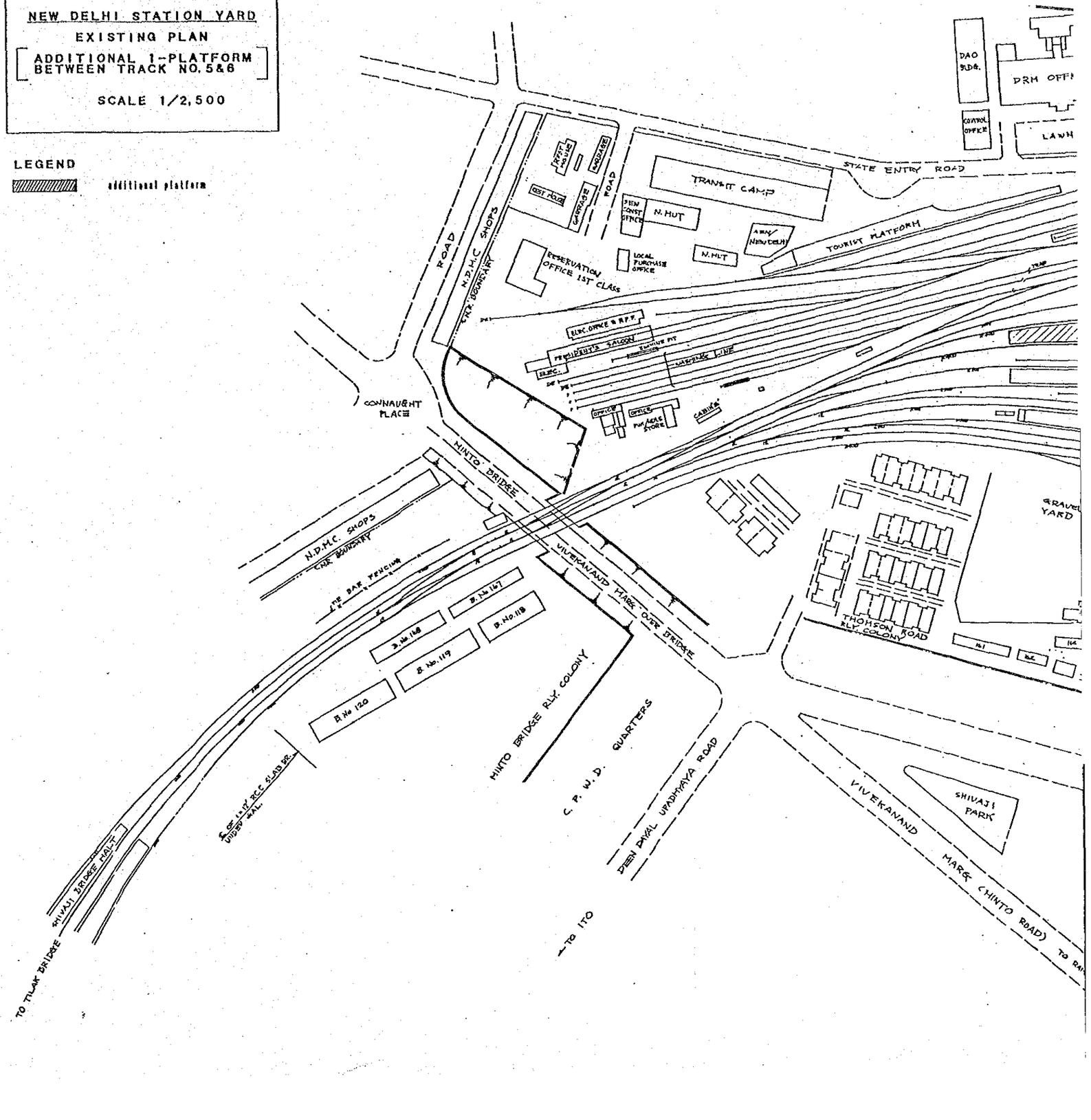
EXISTING PLAN

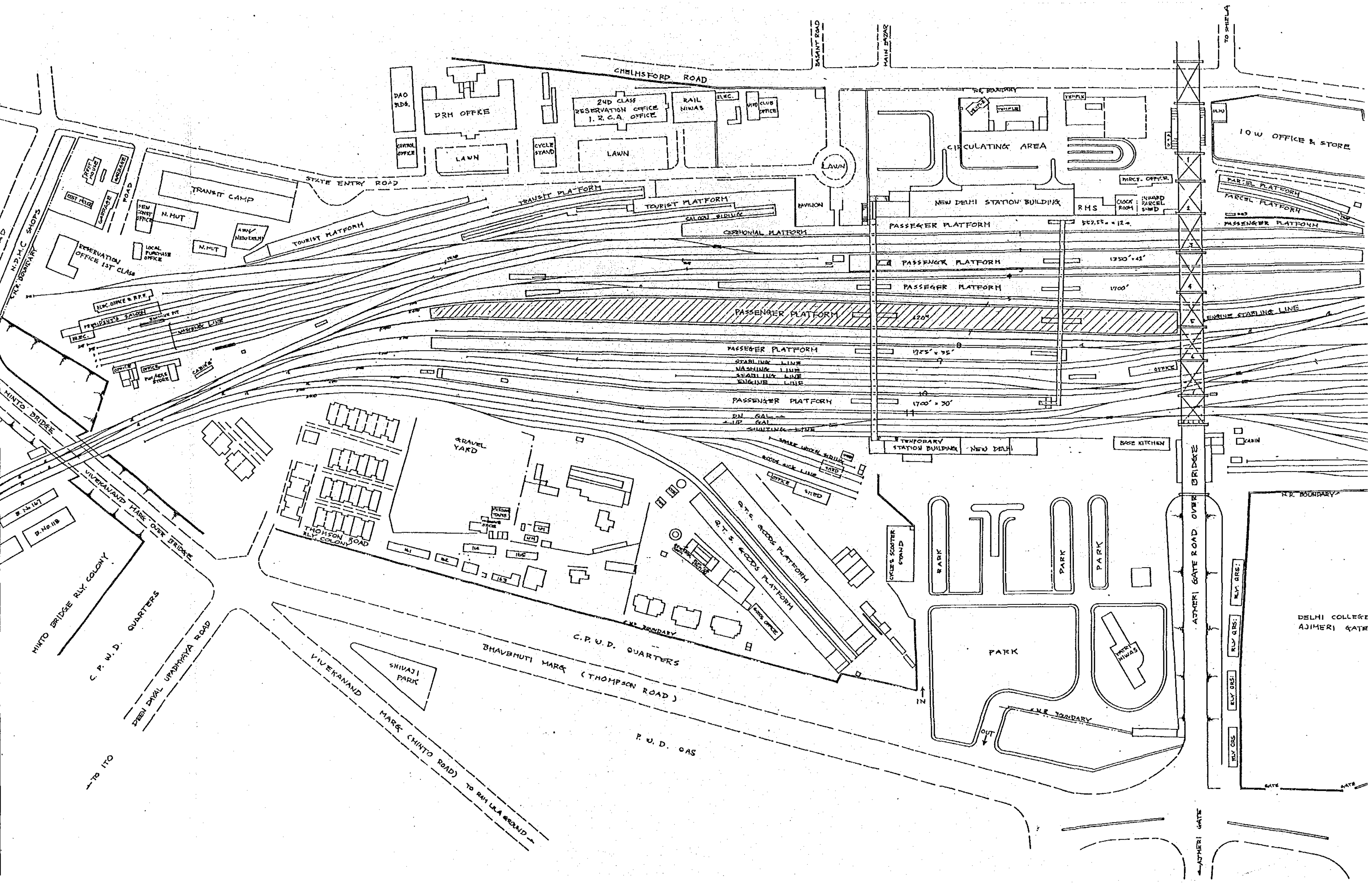
ADDITIONAL 1-PLATFORM BETWEEN TRACK NO. 5&6

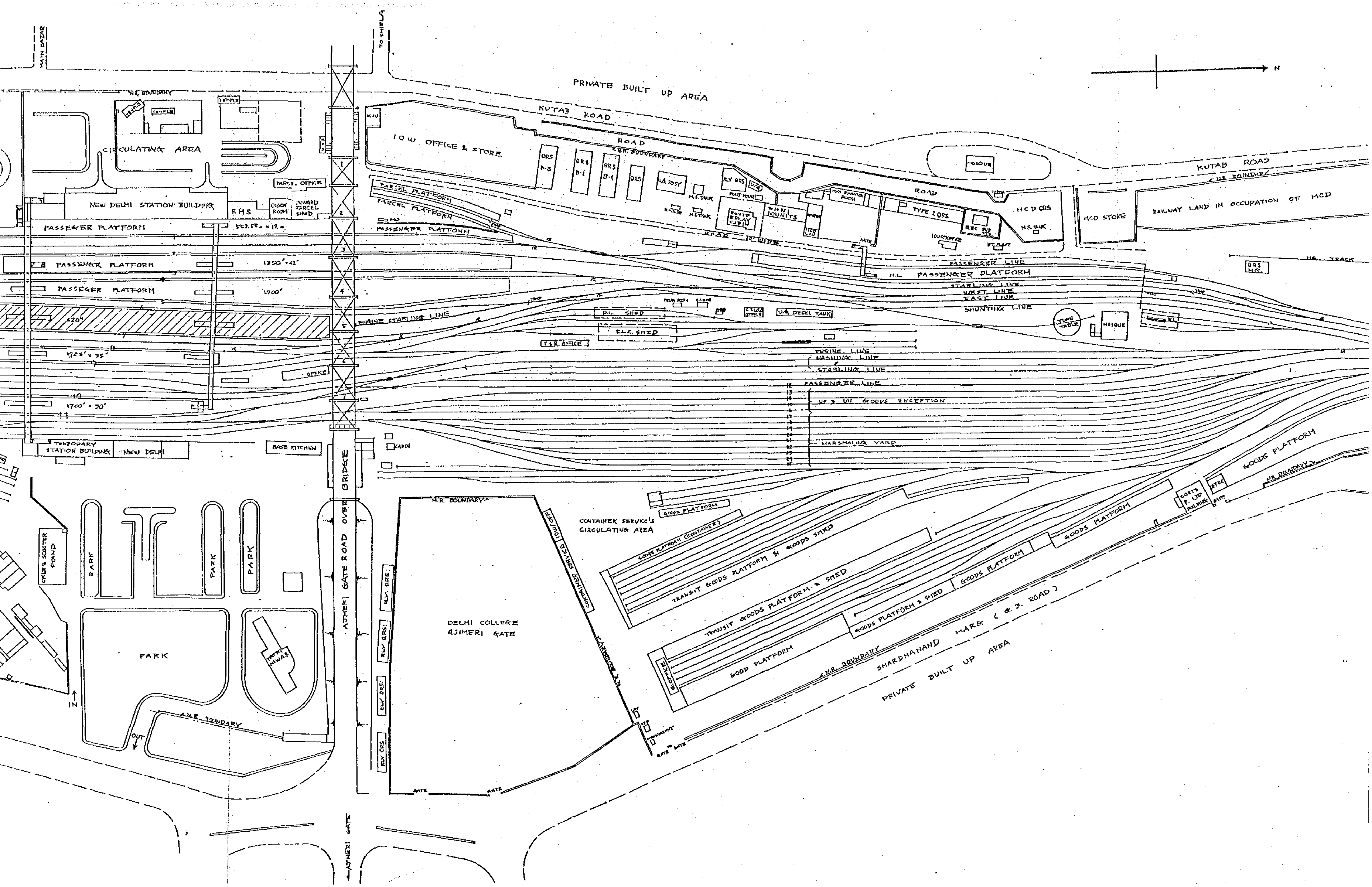
SCALE 1/2,500

LEGEND

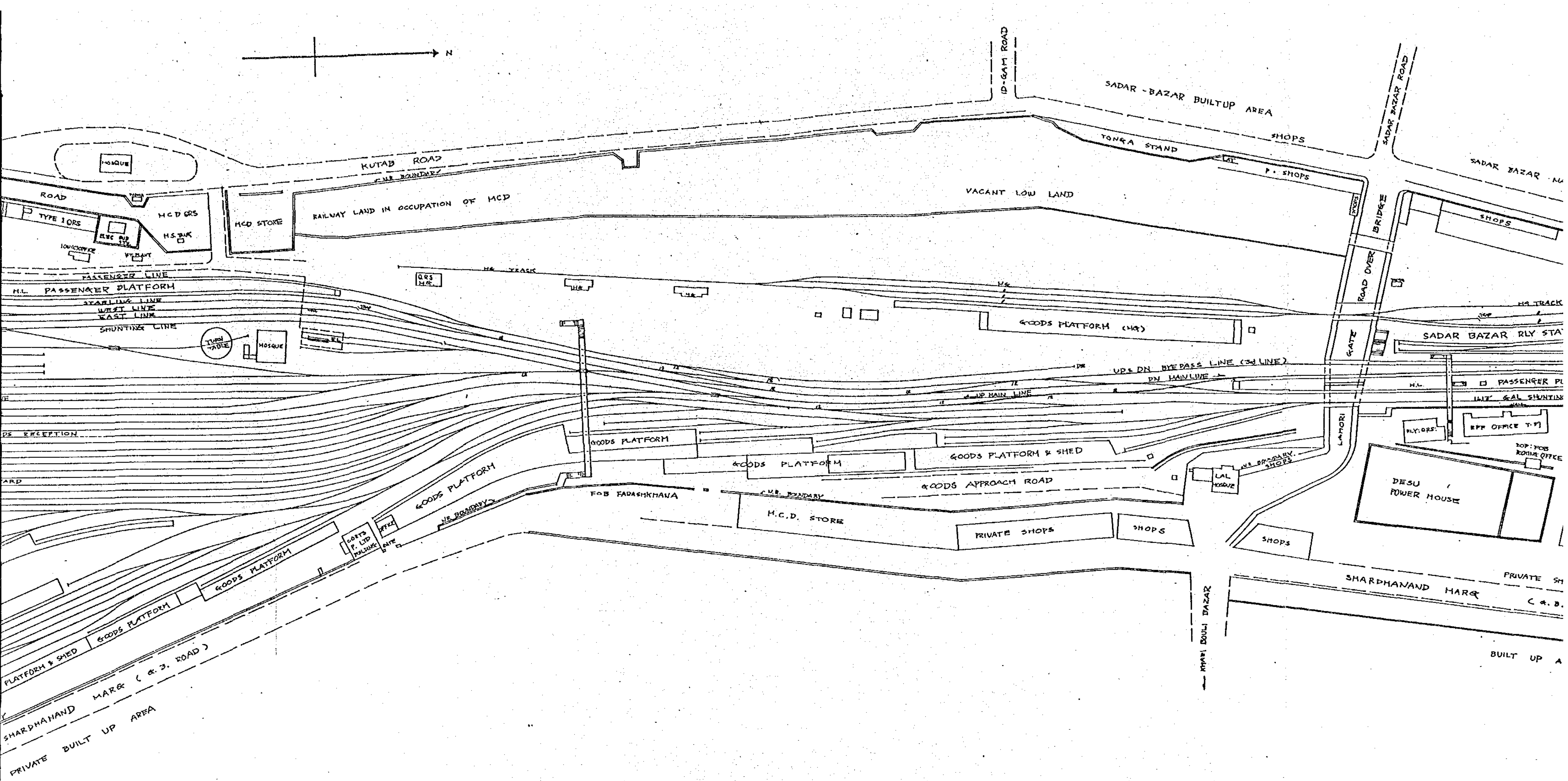
additional platform

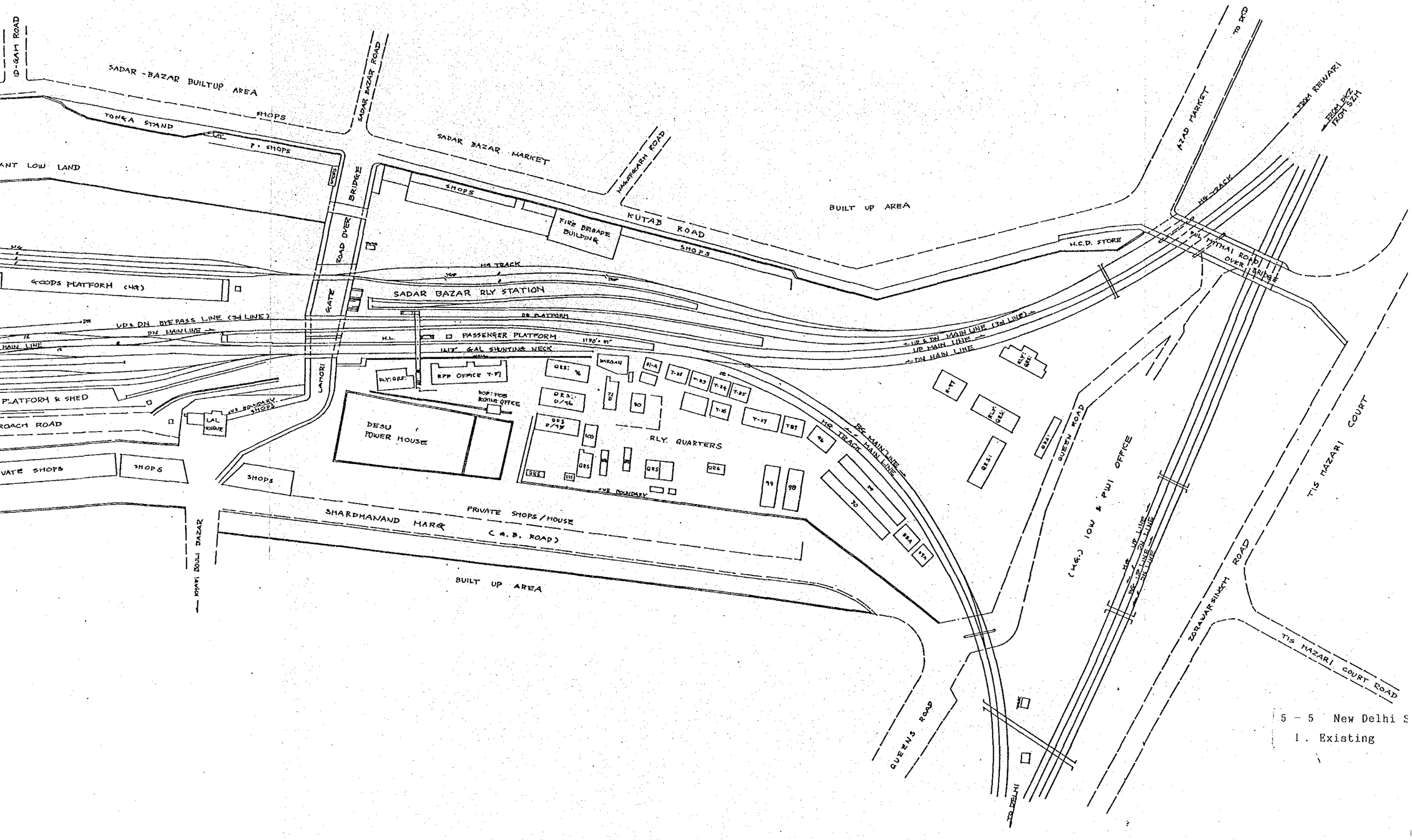



CHELMSFORD ROAD
BASANT ROAD
MAIN BAZAR
TO SHIELA
DAO BLDG.
DRM OFFICE
2ND CLASS RESERVATION OFFICE I.R.C.A. OFFICE
RAIL NIWAS
CONTROL OFFICE
LAWN
CYCLE STAND
LAWN
LAWN
CIRCULATING AREA
IOW OFFICE & STORE
STATE ENTRY ROAD
TRANSIT CAMP
TRANSIT PLATFORM
TOURIST PLATFORM
TOURIST PLATFORM
SALOON SIDING
CEREMONIAL PLATFORM
PAVILION
NEW DELHI STATION BUILDING
RHS
CLOCK ROOM
PARCEL PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
ENGINE STABLING LINE
STABLING LINE
WASHING LINE
STABLING LINE
ENGINE LINE
SHUNTING LINE
N. HUT
N. HUT
RESERVATION OFFICE 1ST CLASS
LOCAL PURCHASE OFFICE
N.D.M.C. SHOPS
MINTO BRIDGE
VIVEKANAND MARG OVER BRIDGE
MINTO BRIDGE RLY. COLONY
C.P.W.D. QUARTERS
DEEN DAYAL UPADHYAYA ROAD
TO ITO
VIVEKANAND MARG (MINTO ROAD)
TO RAM LILA GROUND
SHIVAJI PARK
GRAVEL YARD
THOMSON ROAD RLY. COLONY
C.P.W.D. QUARTERS
BHAVBHUTI MARG (THOMPSON ROAD)
P.W.D. QRS
Q.T.S. GOODS PLATFORM
Q.T.S. GOODS PLATFORM
GOODS OFFICE
TEMPORARY STATION BUILDING
NEW DELHI
BASE KITCHEN
CABIN
CYCLE SCOOTER STAND
PARK
PARK
PARK
PARK
YATRI NIWAS
IN
OUT
N.R. BOUNDARY
N.R. BOUNDARY
AJMERI GATE ROAD OVER BRIDGE
RLY. QRS.
DELHI COLLEGE AJMERI GATE
AJMERI GATE



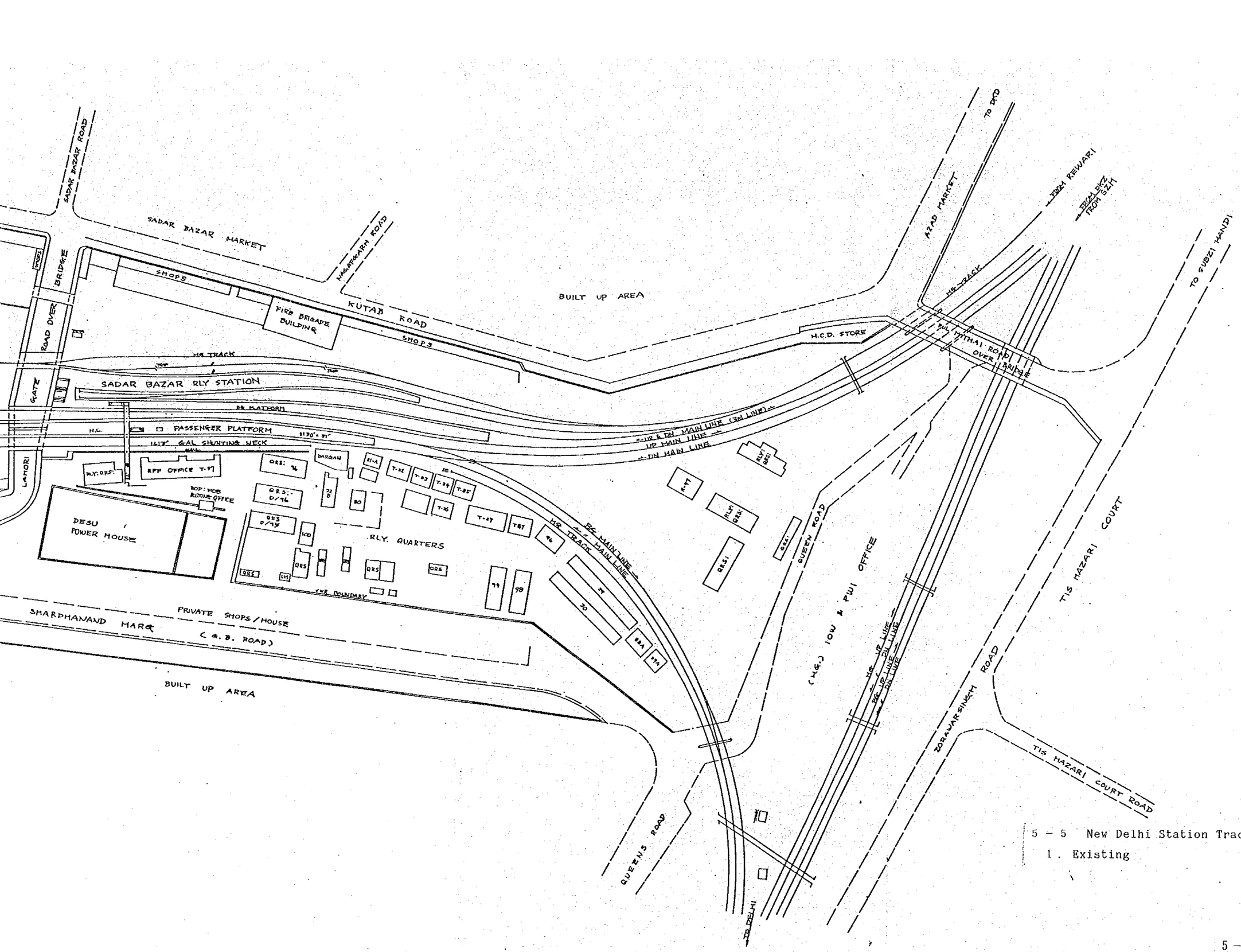
PRIVATE BUILT UP AREA
KUTAB ROAD
MAIN BAZAR
TO SHIELA
CIRCULATING AREA
NEW DELHI STATION BUILDING
PARCEL OFFICE
CLOCK ROOM
IOW OFFICE & STORE
PARCEL PLATFORM
PASSENGER PLATFORM
ENGINE STABLING LINE
D.L. SHED
ELC. SHED
UP DIESEL TANK
T&R OFFICE
TURN TABLE
MOSQUE
MCD STORE
MCD QRS
TYPE I QRS
RAILWAY LAND IN OCCUPATION OF MCD
PASSENGER LINE
M.L. PASSENGER PLATFORM
STABLING LINE
WEST LINE
EAST LINE
SHUNTING LINE
ENGINE LINE
WASHING LINE
PASSENGER LINE
UP & DN GOODS RECEPTION
MARSHALING YARD
TEMPORARY STATION BUILDING
NEW DELHI
BASE KITCHEN
CABIN
AJMERI GATE ROAD OVER BRIDGE
CYCLE & SCOOTER STAND
PARK
YATRI NIWAS
IN
OUT
N.R. BOUNDARY
RLY QRS.
DELHI COLLEGE AJMERI GATE
CONTAINER SERVICE'S CIRCULATING AREA
GOODS PLATFORM
GOODS PLATFORM (CONTAINER)
TRANSIT GOODS PLATFORM & GOODS SHED
TRANSIT GOODS PLATFORM & SHED
GOODS PLATFORM & SHED
GOOD PLATFORM
SHARDHANAND MARG (G. B. ROAD)
PRIVATE BUILT UP AREA
AJMERI GATE
GATE
N


N
ID-GAH ROAD
SADAR-BAZAR BUILTUP AREA
SADAR BAZAR ROAD
SHOPS
SADAR BAZAR
TONGA STAND
P. SHOPS
KUTAB ROAD
MOSQUE
ROAD
TYPE I QRS
MCD QRS
MCD STORE
RAILWAY LAND IN OCCUPATION OF MCD
VACANT LOW LAND
BRIDGE
ROAD OVER
GATE
PASSENGER LINE
H.L. PASSENGER PLATFORM
STABLING LINE
WEST LINE
EAST LINE
SHUNTING LINE
TURN TABLE
MOSQUE
GOODS PLATFORM (HQ)
SADAR BAZAR RLY STA
UP & DN BYEPASS LINE (3rd LINE)
DN MAIN LINE
UP MAIN LINE
PASSENGER PL
H.L.
RPF OFFICE
GOODS RECEPTION
GOODS PLATFORM
GOODS PLATFORM
GOODS PLATFORM & SHED
GOODS APPROACH ROAD
LAMORI
LAL MOSQUE
DESU POWER HOUSE
GOODS PLATFORM
FOB FARASHKHANA
H.C.D. STORE
PRIVATE SHOPS
SHOPS
SHOPS
GOODS PLATFORM
GOODS PLATFORM
PLATFORM & SHED
SHARDHANAND MARG (G.B. ROAD)
PRIVATE BUILT UP AREA
SHARDHANAND MARG
PRIVATE SH
BUILT UP A
KHARI BOULI BAZAR



5 – 5 New Delhi S

1. Existing



5 – 5 New Delhi Station Track Layout

1. Existing

5 – 5 New Delhi Station Track Layout

2 . Improvement

NEW DELHI STATION YARD

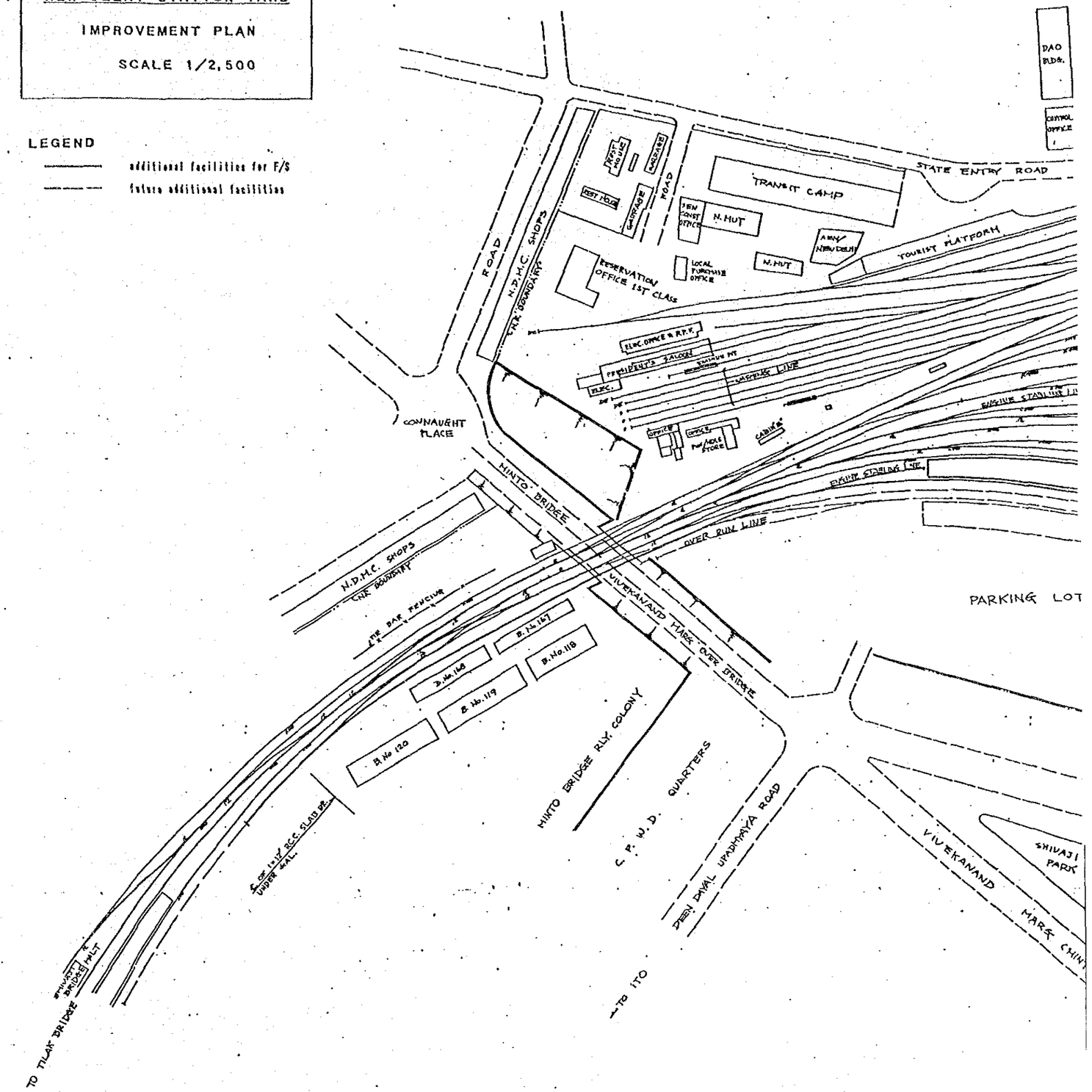
IMPROVEMENT PLAN

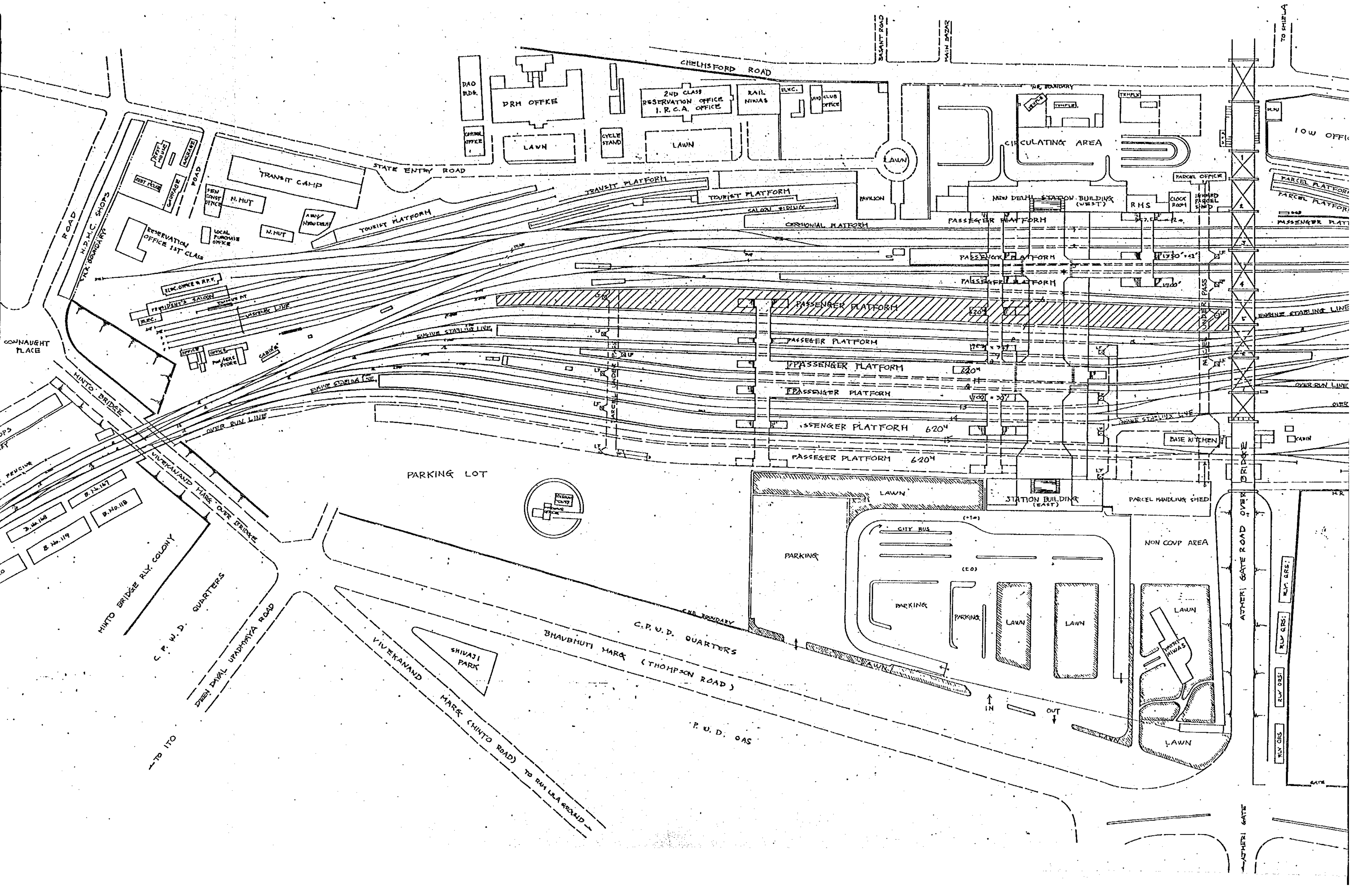
SCALE 1/2,500

LEGEND

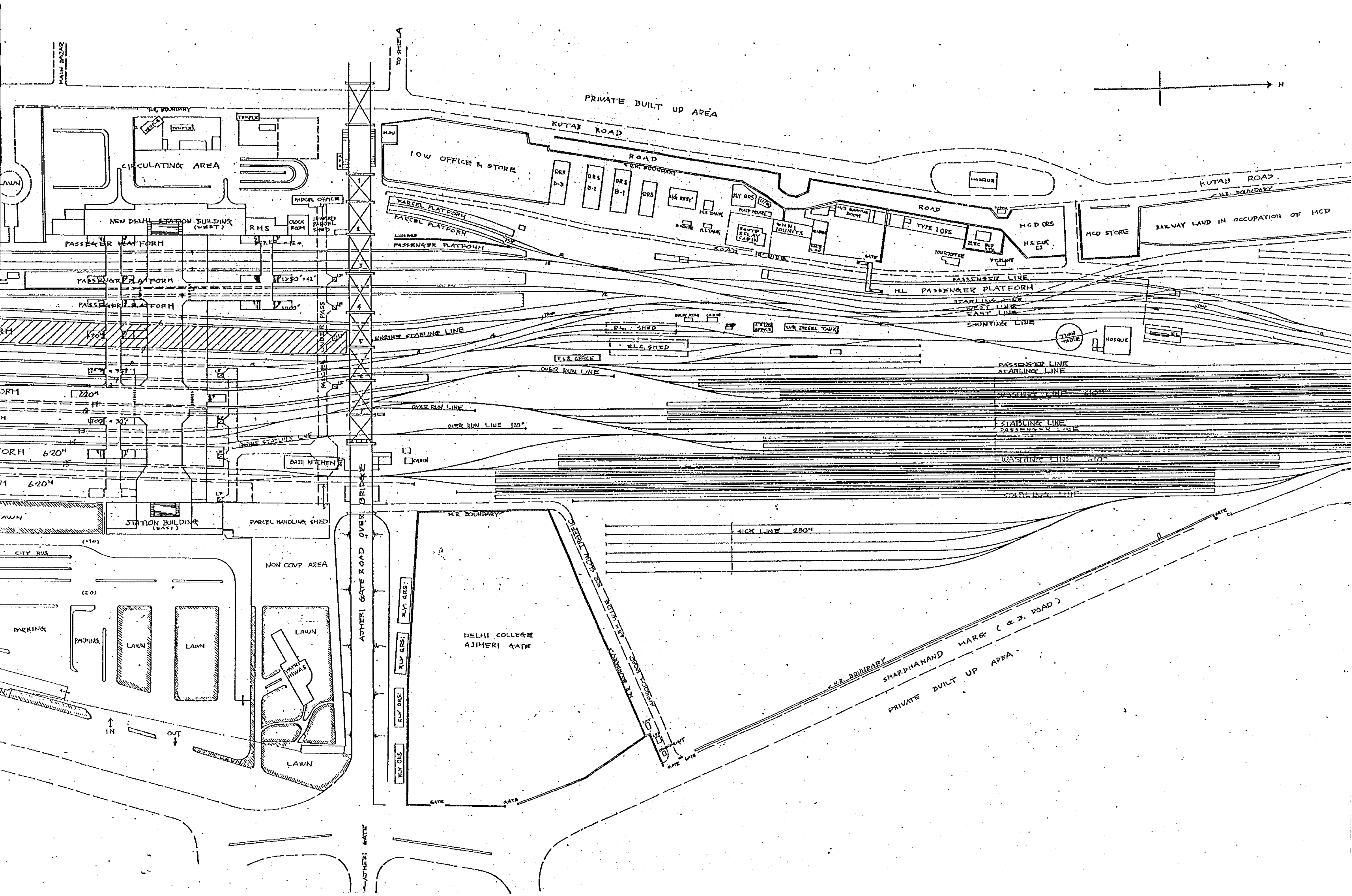
——— additional facilities for F/S

– – – – future additional facilities

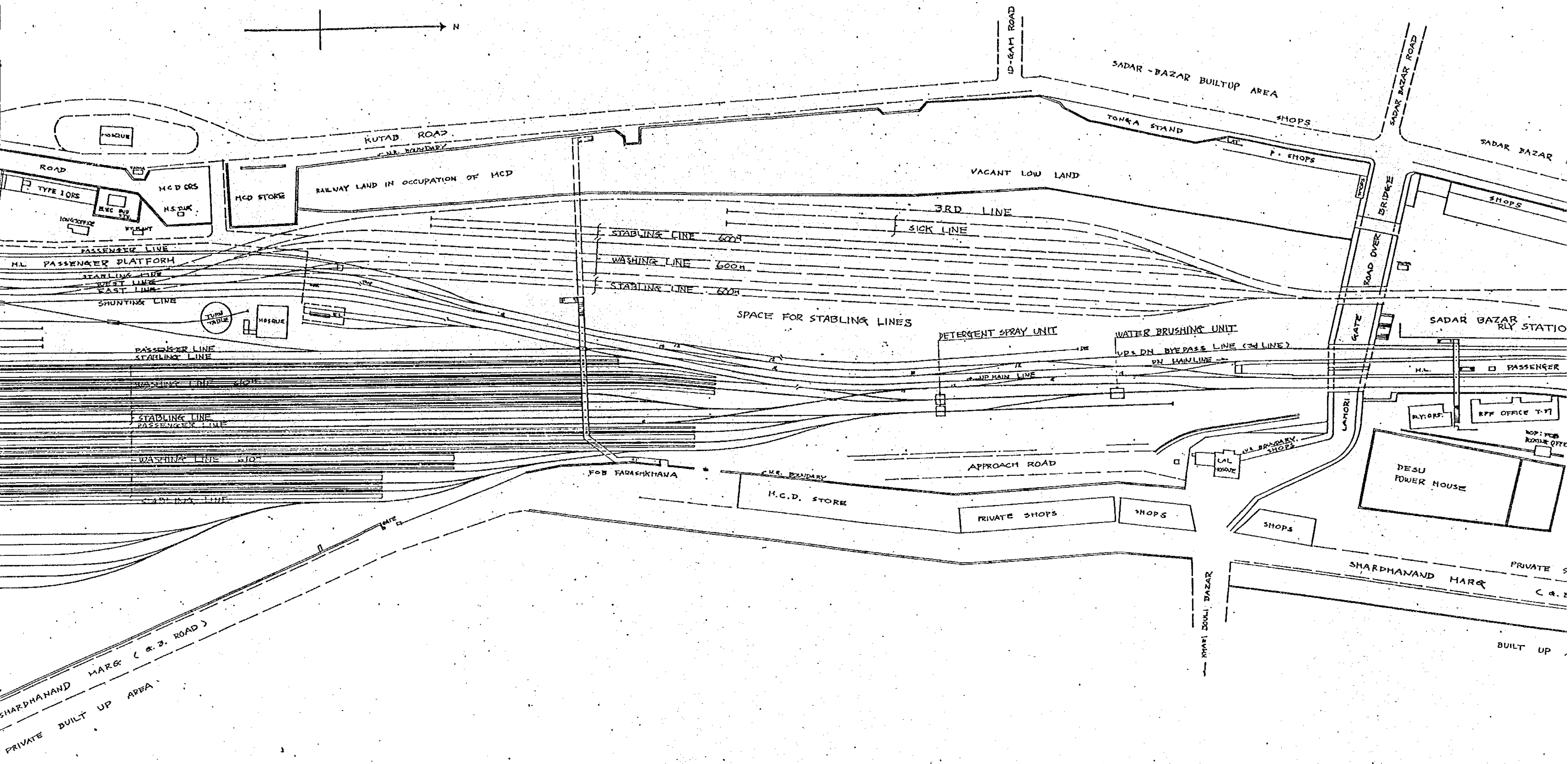


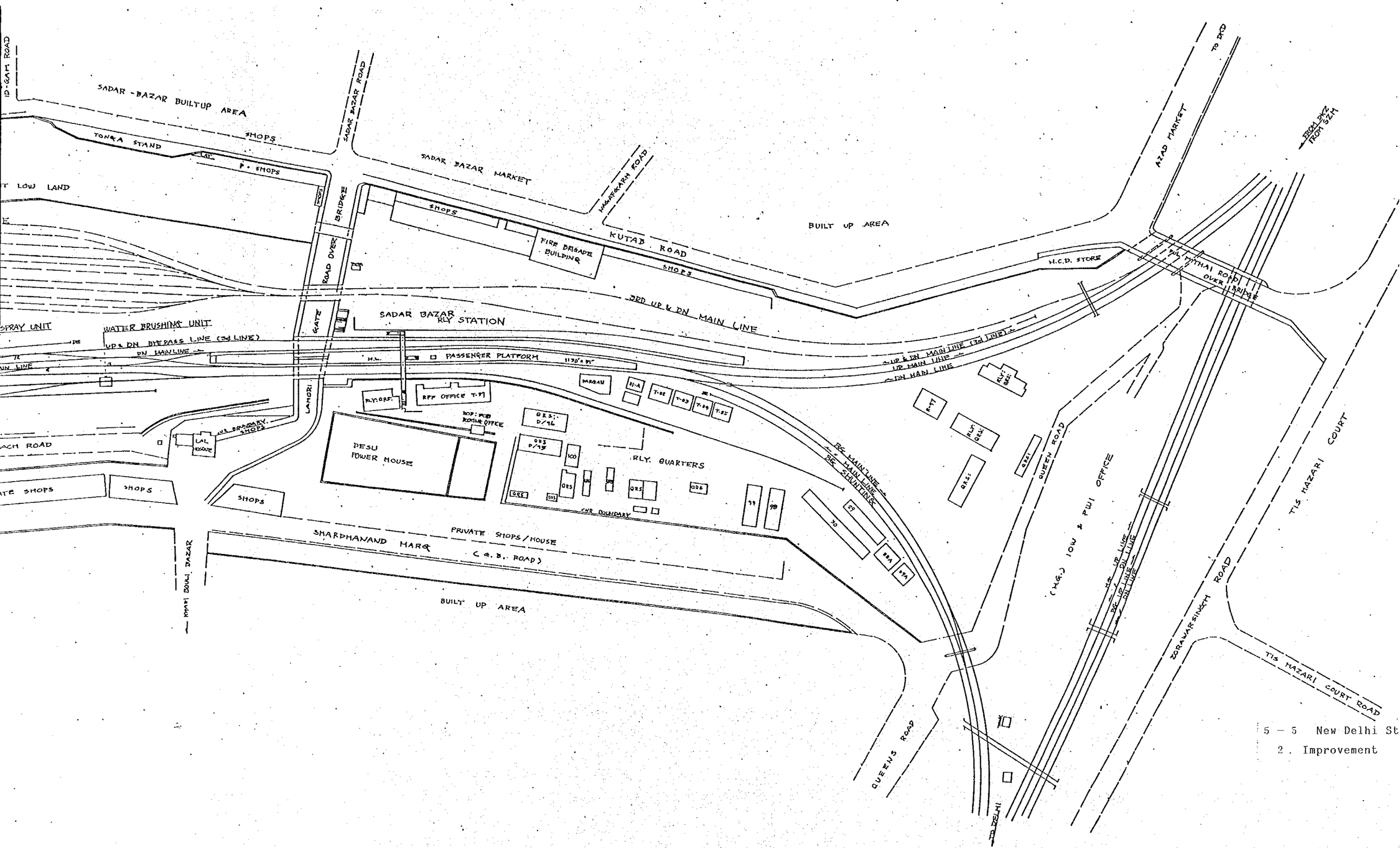


CHELMSFORD ROAD
BASANT ROAD
MAIN BAZAR
TO SHIELA
DAO BLDG.
DRM OFFICE
2ND CLASS RESERVATION OFFICE I.R.C.A. OFFICE
RAIL NIWAS
CLUB OFFICE
CONTROL OFFICE
LAWN
CYCLE STAND
LAWN
STATE ENTRY ROAD
LAWN
PAVILION
CIRCULATING AREA
TEMPLE
IOW OFFICE
NEW DELHI STATION BUILDING (WEST)
RMS
CLOCK ROOM
PARCEL OFFICE
PARCEL PLATFORM
PARCEL PLATFORM
PASSENGER PLATFORM
TRANSIT CAMP
TRANSIT PLATFORM
TOURIST PLATFORM
TOURIST PLATFORM
SALOON SIDING
CEREMONIAL PLATFORM
N.HUT
N.HUT
REST HOUSE
GARAGE
ROAD
LOCAL PURCHASE OFFICE
RESERVATION OFFICE 1ST CLASS
N.D.M.C. SHOPS
ROAD
PRESIDENT'S SALOON
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM
PASSENGER PLATFORM 620'
PASSENGER PLATFORM 620'
ENGINE STABLING LINE
ENGINE STABLING LINE
ENGINE STABLING LINE
OVER RUN LINE
OVER RUN LINE
PARCEL UNDER PASS
CABIN
CONNAUGHT PLACE
MINTO BRIDGE
VIVEKANAND MARG OVER BRIDGE
MINTO BRIDGE RLY. COLONY
C.P.W.D. QUARTERS
DEEN DAYAL UPADHYAYA ROAD
TO ITO
PARKING LOT
BASE KITCHEN
STATION BUILDING (EAST)
PARCEL HANDLING SHED
LAWN
PARKING
CITY BUS
NON COUP AREA
PARKING
PARKING
LAWN
LAWN
LAWN
LAWN
C.P.U.D. QUARTERS
BHAVBHUTI MARG (THOMPSON ROAD)
SHIVAJI PARK
VIVEKANAND MARG (MINTO ROAD) TO RAM LILA GROUND
P.U.D. QAS
IN
OUT
AJMERI GATE ROAD OVER BRIDGE
AJMERI GATE
RLY. QRS.



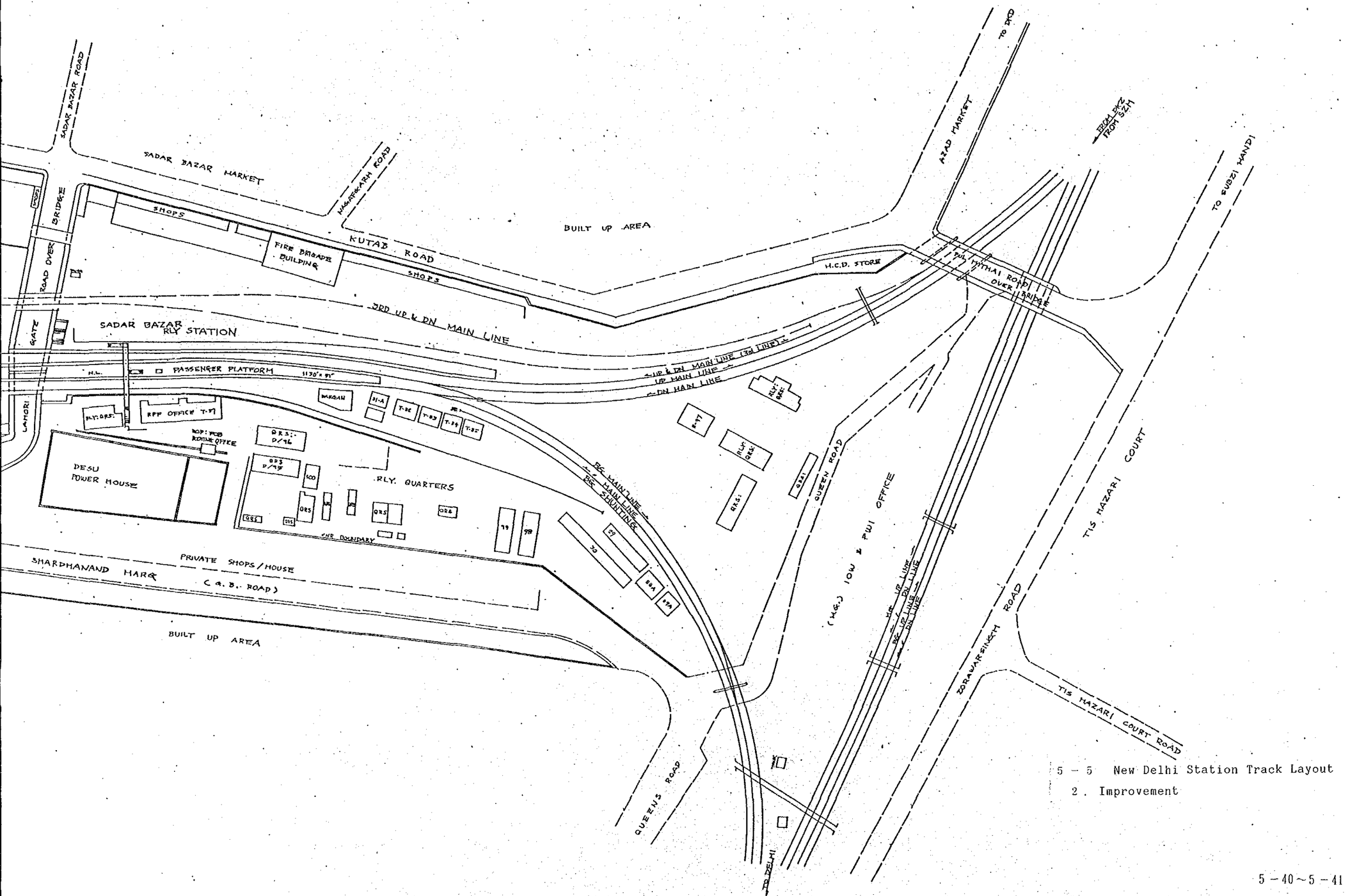
MAIN BAZAR
TO SHIMLA
PRIVATE BUILT UP AREA
KUTAB ROAD
ROAD
N
IOW OFFICE & STORE
CIRCULATING AREA
LAWN
PARCEL OFFICE
NEW DELHI STATION BUILDING (WEST)
RHS
CLOCK ROOM
PARCEL PLATFORM
PASSENGER PLATFORM
MOSQUE
KUTAB ROAD
ROAD
MCD QRS
MCD STORE
RAILWAY LAND IN OCCUPATION OF MCD
TYPE I QRS
PASSENGER LINE
H.L. PASSENGER PLATFORM
STABLING LINE
WEST LINE
EAST LINE
SHUNTING LINE
TURN TABLE
MOSQUE
ENGINE STABLING LINE
D.L. SHED
ELC. SHED
TSR OFFICE
OVER RUN LINE
PASSENGER LINE
STABLING LINE
WASHING LINE
OVER RUN LINE
STABLING LINE
PASSENGER LINE
WASHING LINE
BASE KITCHEN
CABIN
OVER BRIDGE
STATION BUILDING (EAST)
PARCEL HANDLING SHED
CITY BUS
NON COUP AREA
AJMERI GATE ROAD
SICK LINE 280M
PARKING
LAWN
YATRI NIWAS
RLY QRS
DELHI COLLEGE AJMERI GATE
IN
OUT
LAWN
GATE
SHARDHANAND MARG (G.B. ROAD)
PRIVATE BUILT UP AREA
AJMERI GATE


N
ID-GAH ROAD
SADAR-BAZAR BUILTUP AREA
SADAR BAZAR ROAD
SHOPS
SADAR BAZAR
TONGA STAND
KUTAB ROAD
C.N.R. BOUNDARY
MOSQUE
ROAD
TYPE I QRS
M C D QRS
MCD STORE
RAILWAY LAND IN OCCUPATION OF MCD
VACANT LOW LAND
P. SHOPS
3RD LINE
SICK LINE
STABLING LINE 600M
WASHING LINE 600M
STABLING LINE 600M
PASSENGER LINE
H.L. PASSENGER PLATFORM
STABLING LINE
WEST LINE
EAST LINE
SHUNTING LINE
TURN TABLE
MOSQUE
SPACE FOR STABLING LINES
DETERGENT SPRAY UNIT
WATER BRUSHING UNIT
UP & DN BYEPASS LINE (3rd LINE)
DN MAIN LINE
UP MAIN LINE
PASSENGER LINE
STABLING LINE
WASHING LINE
STABLING LINE
PASSENGER LINE
WASHING LINE
ROAD OVER BRIDGE
GATE
LAHORI
SADAR BAZAR RLY STATION
H.L.
PASSENGER
RLY QRS.
RPF OFFICE
DESU POWER HOUSE
FOB FARASHKHANA
C.N.R. BOUNDARY
APPROACH ROAD
LAL MOSQUE
SHOPS
M.C.D. STORE
PRIVATE SHOPS
SHOPS
SHOPS
GATE
SHARDHANAND MARG (G.B. ROAD)
PRIVATE BUILT UP AREA
SHARDHANAND MARG
PRIVATE
BUILT UP
KHARI BOULI BAZAR



5 – 5 New Delhi St

2 . Improvement



5 – 5 New Delhi Station Track Layout

2 . Improvement

6 - 1 Signalling System

(1) Existing Block system (ref. to Fig.6.1.1)

(2) Improved Block system (ref. to Fig.6.1.2,Table 6.1.1)

(3) Signals in Absolute Block Sections (ref. to Fig.6.1.3)

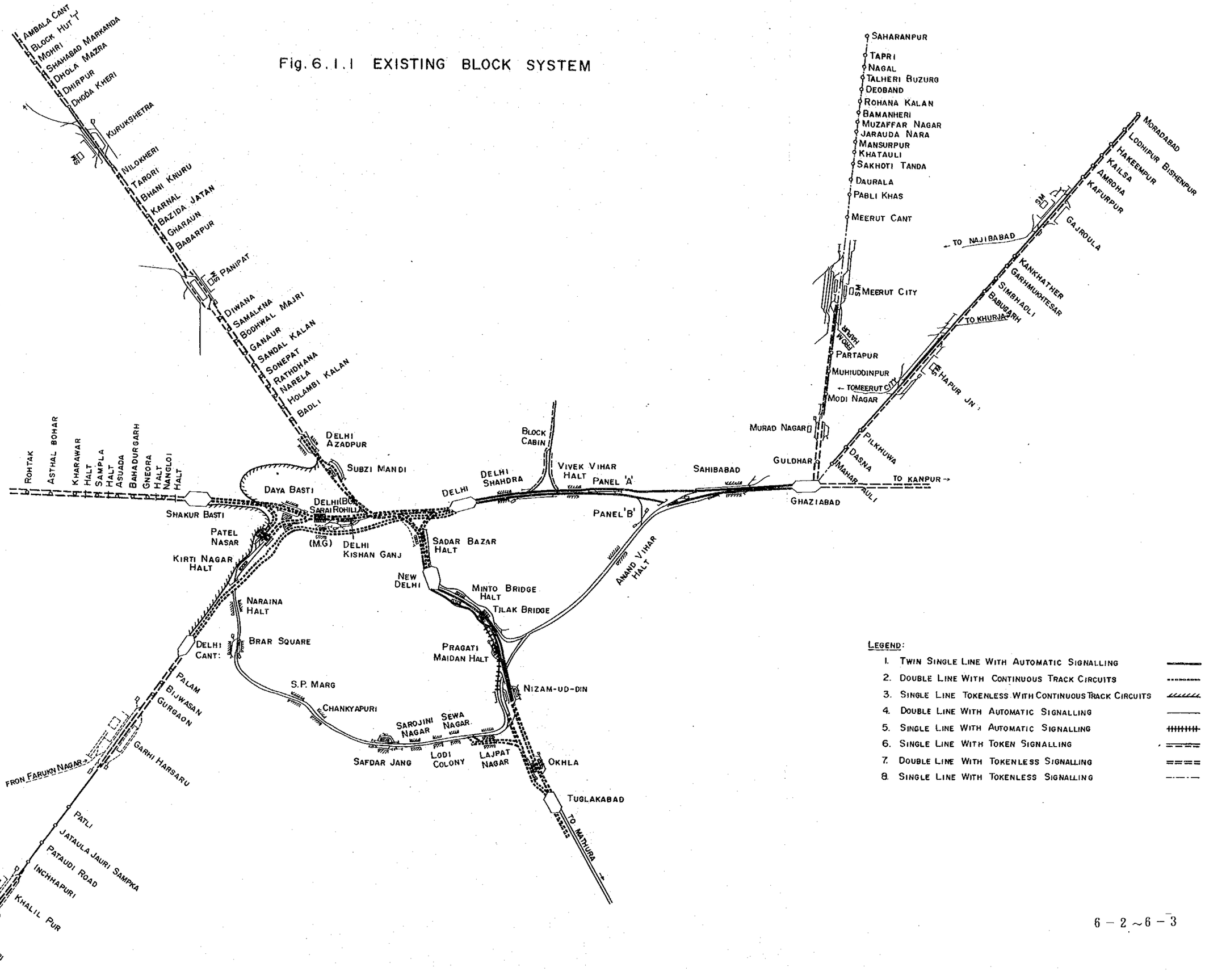
(4) Semaphore signal type (ref. to Fig.6.1.4)

(5) Type of interlocking Equipment at each station (ref. to Fig.6.1.5)

(6) Detail of level crossings on related section Connected to Delhi Area (ref.to Fig.6.1.6)

(7) Railway Diagram of the section on Delhi Area (ref. to Fig.6.1.7)

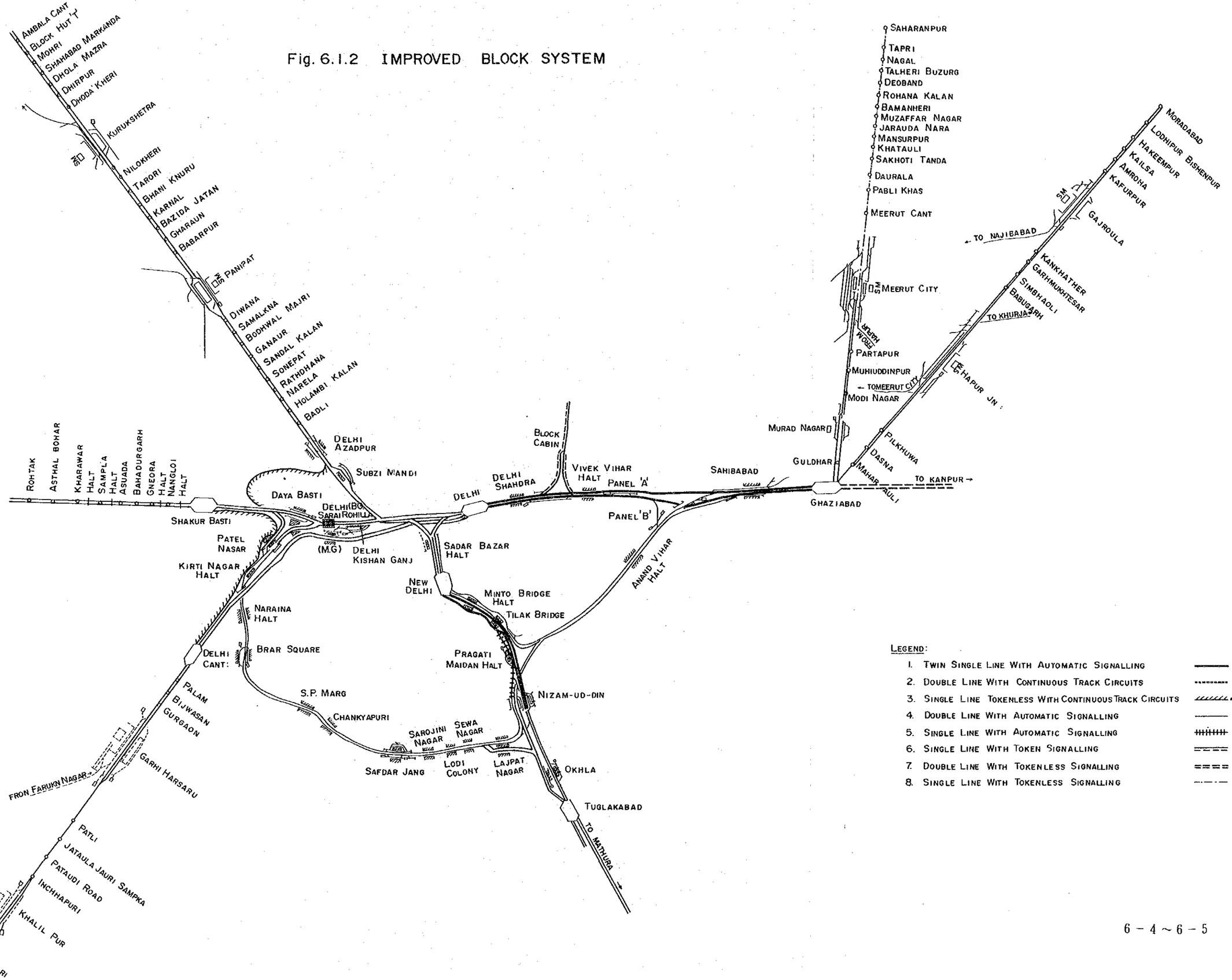
Fig. 6.1.1 EXISTING BLOCK SYSTEM



LEGEND:

1. TWIN SINGLE LINE WITH AUTOMATIC SIGNALLING
2. DOUBLE LINE WITH CONTINUOUS TRACK CIRCUITS
3. SINGLE LINE TOKENLESS WITH CONTINUOUS TRACK CIRCUITS
4. DOUBLE LINE WITH AUTOMATIC SIGNALLING
5. SINGLE LINE WITH AUTOMATIC SIGNALLING
6. SINGLE LINE WITH TOKEN SIGNALLING
7. DOUBLE LINE WITH TOKENLESS SIGNALLING
8. SINGLE LINE WITH TOKENLESS SIGNALLING

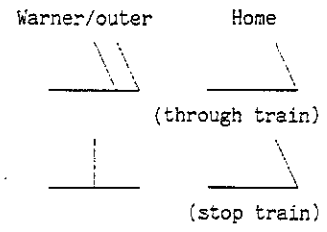
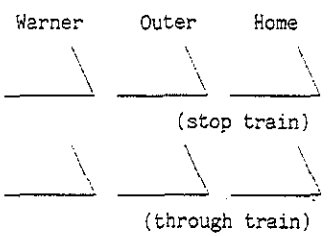
Fig. 6.1.2 IMPROVED BLOCK SYSTEM



LEGEND:

1. TWIN SINGLE LINE WITH AUTOMATIC SIGNALLING
2. DOUBLE LINE WITH CONTINUOUS TRACK CIRCUITS
3. SINGLE LINE TOKENLESS WITH CONTINUOUS TRACK CIRCUITS
4. DOUBLE LINE WITH AUTOMATIC SIGNALLING
5. SINGLE LINE WITH AUTOMATIC SIGNALLING
6. SINGLE LINE WITH TOKEN SIGNALLING
7. DOUBLE LINE WITH TOKENLESS SIGNALLING
8. SINGLE LINE WITH TOKENLESS SIGNALLING

Table 6.1.1 Signalling System of Typical Stations in Related Section

NAME OF Station	Section	Block system/instrument	Signal	Train Detection	Interlocking	Others
NANGOLOI	DLI ~ Rohtak Broad gauge	Absolute Block System (Double line Block instrument)	2 Aspect Semaphore (LQ System) Home & Advance starter can be released by short track circuit	(Sanctioned only) Axle counter (MAINLINE FM-FM) DC-Short-Circuit (Closed Circuit) Home & advance starter)	Mechanical with Slotting System (Check of occupation of trains)	Switch-Mechanical Warner-Outer-home starter-advance starter
BADLI	DLI ~ Ambala	Absolute Block System (Directional Double lines)	Color light Signal 4 Aspect: Gate Signal 3 Aspect: Home Signal 4 Aspect: distant, start, Last Stop	DC Track circuit (Home to advance) No track circuit between stations	Panel	4 Aspect R (gate) YY (Home Y) Y (Home R) G (Through) 3 Aspect G (through) Y (Stop train)
DASNA	GZB ~ Moradabad	Token type Block System (Single line)	2 Aspect Semaphore (LQS)	Neither track circuits or Axle counters	Mechanical with Slotting	
MURADNAGAR	GZB ~ Saharampur	Absolute Block System (to Delhi) Token type Block System (to Saharampur)	Color light Signal	Axle counter with DC Short track circuit	Panel	Electrical Switch
Bijwasan	DLI ~ JAIPUR	Absolute Block System (Double line/Tokenless type)	2 Aspect LQ Semaphore	DC Track circuit (FM to FM) Home Signal (Short open AC track circuti)	Mechanical with slotting System	

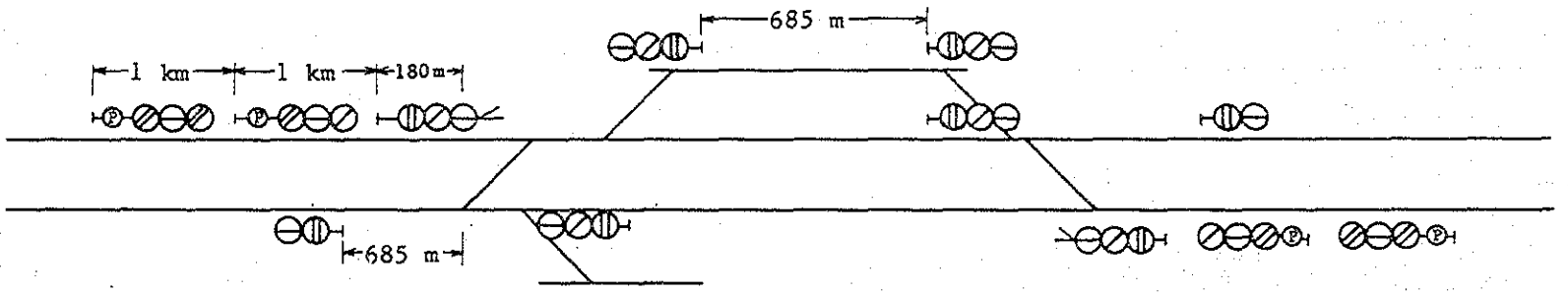
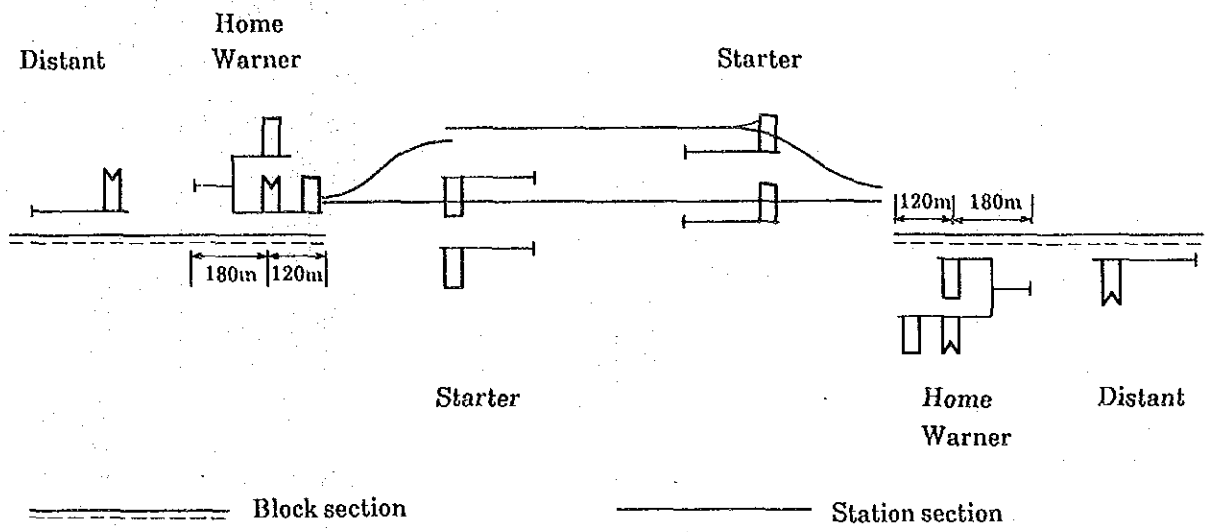


Fig.6.1.3 Signals in Absolute Block Sections

Fig.6.1.4 Semaphore Signal Type

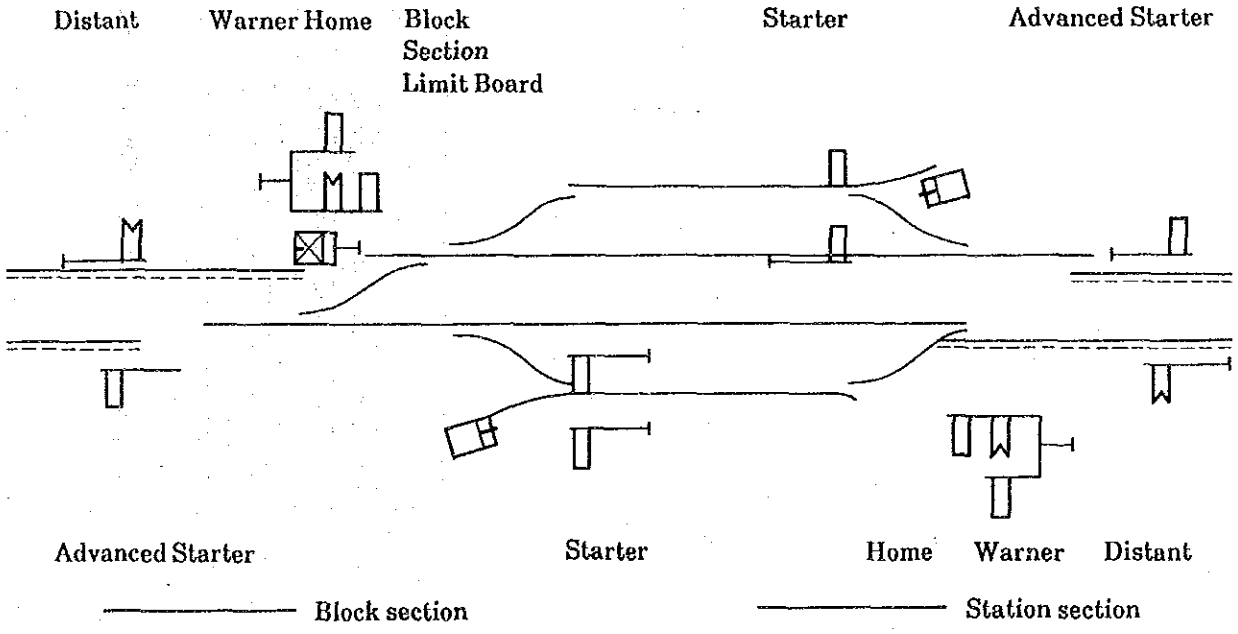
(1) Semaphore type Single line

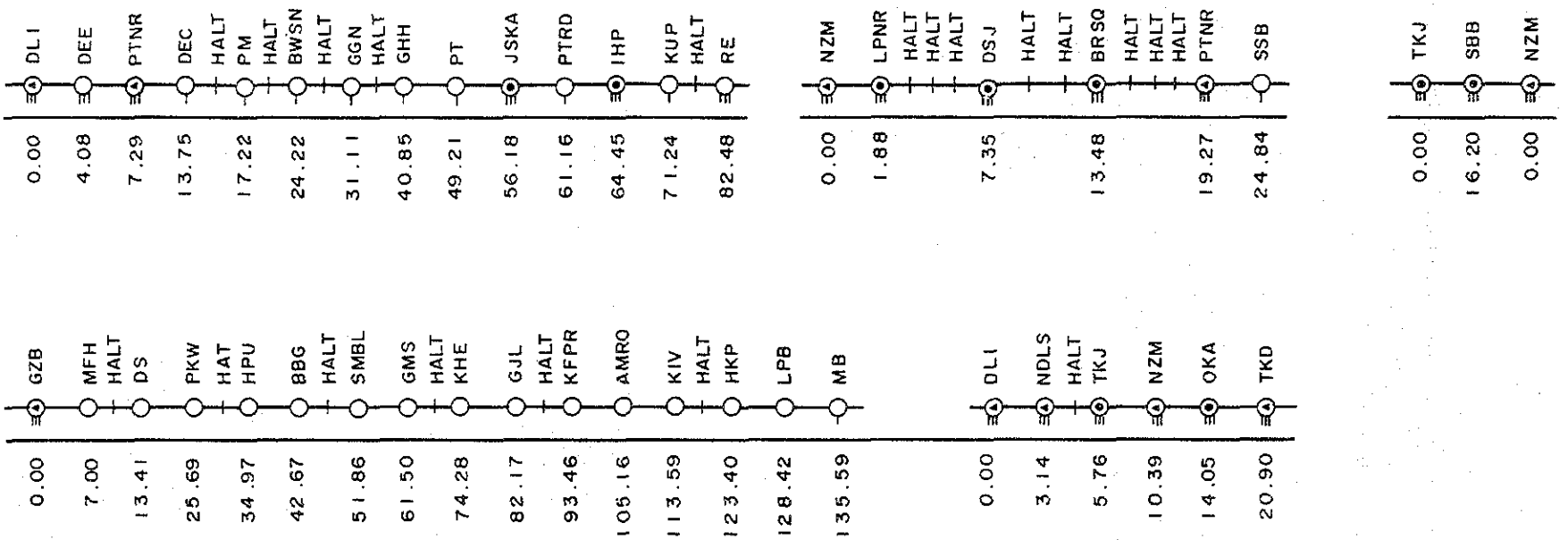
Single line station in modified lower quadrant signalling territory with Distant, Warner, Home and Starter signals
(Note to Rule 8.03 refers)



(2) Semaphore type Double line

Double line station in modified lower quadrant signalling territory with Distant, Warner, Home, Starter, Advanced Starter signals and Block Section Limit Board

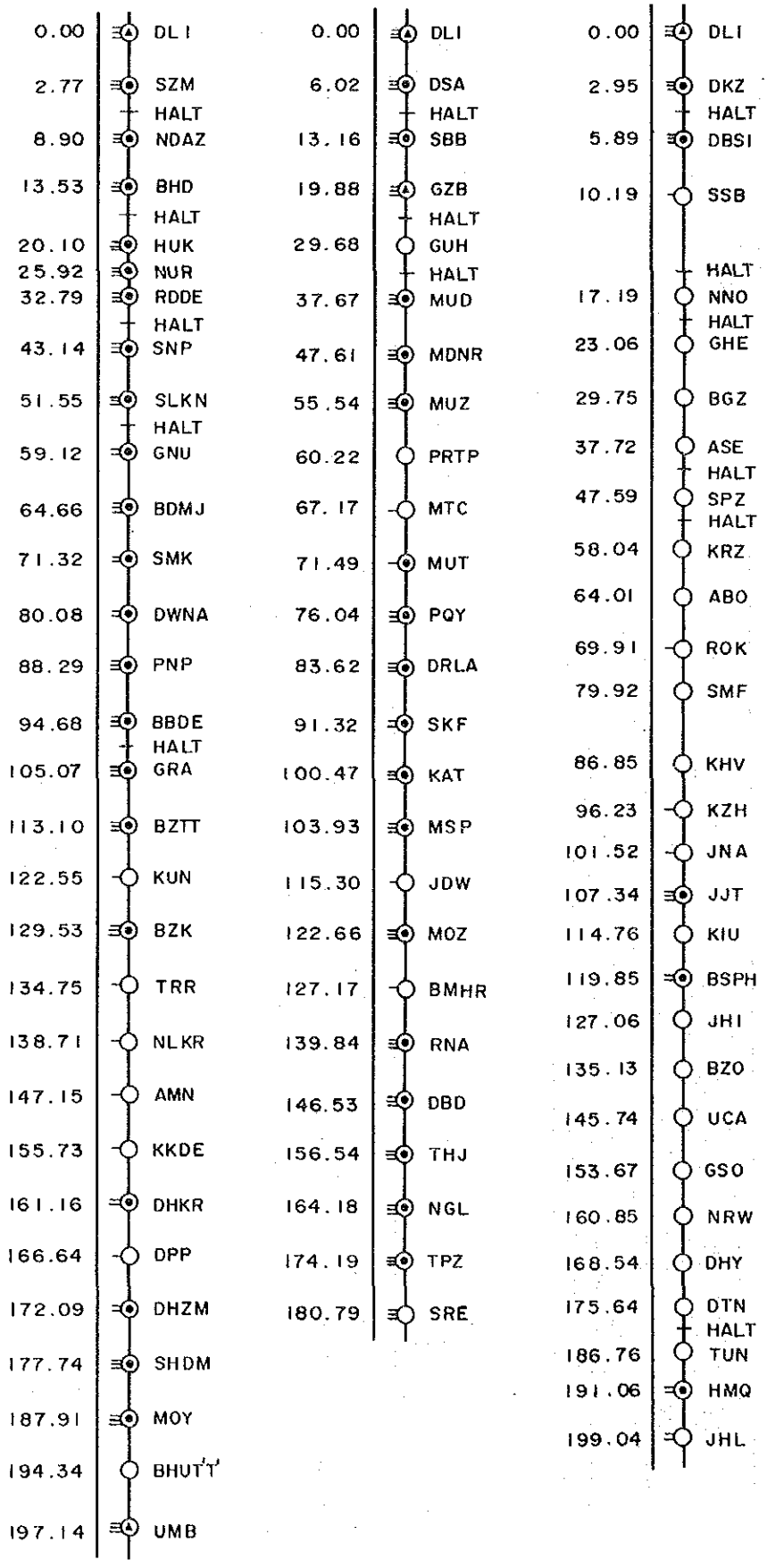


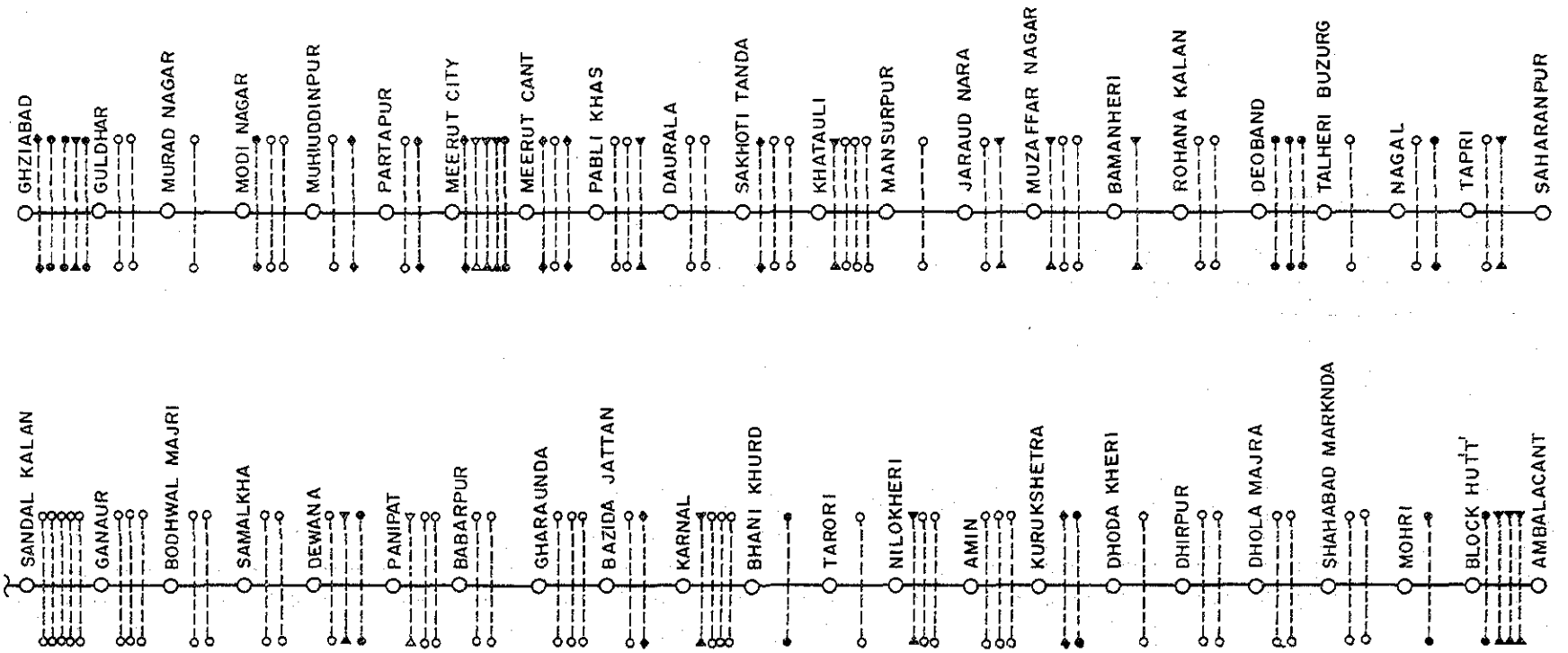


		NO. OF STATIOR			NO. OF STATIOR
◉	ROUTE RELAY INTERLOCKING	7	○	RUN THROUGH LINES ARE TRACK CIRCUITED FROM FM TOFM	22
◉	PANEL TYPE INTERLOCKING	50	○	MAIN LINE TRACK CIRCUITED FROM F.M TO B.S.L.	1
○	LEVER FRAME INTERLOCKING	36	○	TRCK CIRCUITED COMPLETLY.	3
				TOTAL	119

F.M. = FOULING MARK
B.S.L = BLOCK SECTION LIMIT

Fig. 6.1.5 TYPE OF INTERLOCKING EQUIPMENT AT EACH STATION


0.00 DLI
2.77 SZM
HALT
8.90 NDAZ
13.53 BHD
HALT
20.10 HUK
25.92 NUR
32.79 RDDE
HALT
43.14 SNP
51.55 SLKN
HALT
59.12 GNU
64.66 BDMJ
71.32 SMK
80.08 DWNA
88.29 PNP
94.68 BBDE
HALT
105.07 GRA
113.10 BZTT
122.55 KUN
129.53 BZK
134.75 TRR
138.71 NLKR
147.15 AMN
155.73 KKDE
161.16 DHKR
166.64 DPP
172.09 DHZM
177.74 SHDM
187.91 MOY
194.34 BHUTAN
197.14 UMB
0.00 DLI
6.02 DSA
HALT
13.16 SBB
19.88 GZB
HALT
29.68 GUH
HALT
37.67 MUD
47.61 MDNR
55.54 MUZ
60.22 PRTP
67.17 MTC
71.49 MUT
76.04 PQY
83.62 DRLA
91.32 SKF
100.47 KAT
103.93 MSP
115.30 JDW
122.66 MOZ
127.17 BMHR
139.84 RNA
146.53 DBD
156.54 THJ
164.18 NGL
174.19 TPZ
180.79 SRE
0.00 DLI
2.95 DKZ
HALT
5.89 DBSI
10.19 SSB
HALT
17.19 NNO
HALT
23.06 GHE
29.75 BGZ
37.72 ASE
HALT
47.59 SPZ
HALT
58.04 KRZ
64.01 ABO
69.91 ROK
79.92 SMF
86.85 KHV
96.23 KZH
101.52 JNA
107.34 JJT
114.76 KIU
119.85 BSPH
127.06 JHI
135.13 BZO
145.74 UCA
153.67 GSO
160.85 NRW
168.54 DHY
175.64 DTN
HALT
186.76 TUN
191.06 HMQ
199.04 JHL



CLASS X-ING \ LEVEL	BARRIER WITHOUT INTER LOCKING	NO. OF LEVEL-X-ING	BARRIER INTERLOCKED WITH GATE SIGNAL	NO. OF LEVEL-X-ING
A				16
B		3		32
C		205		58
			TOTAL	314

Fig.6.1.6 DETAIL OF LEVEL CROSSINGS

ON RELATED SECTION CONNECTED TO DELHI AREA (2)

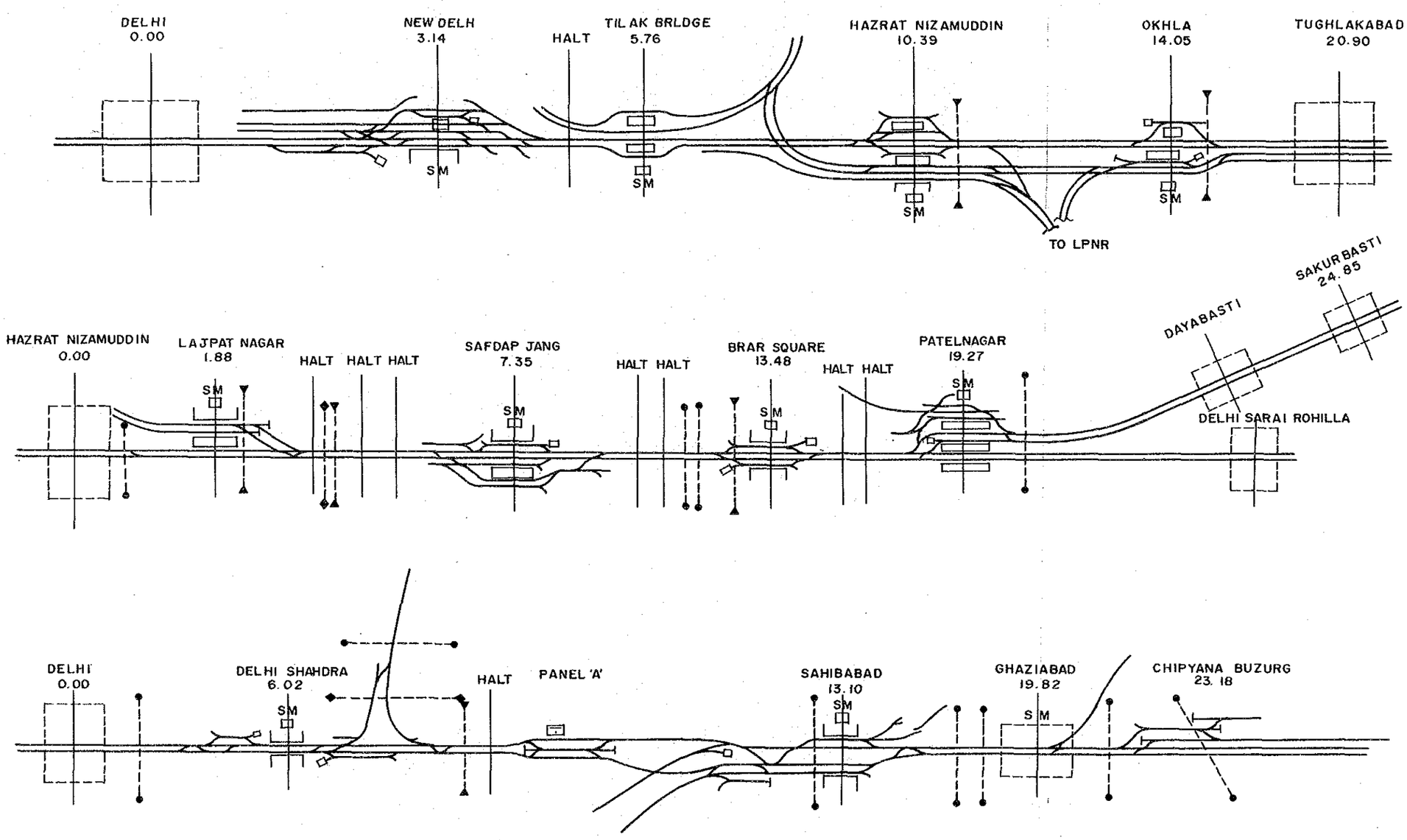
DETAIL OF LEVEL CROSSINGS
ON RELATED SECTION CONNECTED TO DELHI AREA (1)

Fig. 6.1.7 RAILWAY DIAGRAM OF THE SECTION (IN 1989) DELHI AREA

LEGEND

- - - - - -	PLANNED IN THE 7TH FIVE YEAR PLAN
S.M.	STATION MASTER ROOM
G.W.	GOODS WHARF
G.P	GOODS PLATFORM

LEVEL CLASS-X-ING	BARRIER WITHOUT INTERLOCKING	NO.	BARRIER INTERLOCKED WITH GATE SIGNAL	
A				3
B				9
C				23
			TOTAL	35



RAILWAY DIAGRAM OF THE SECTION (IN 1989) DELHI-AREA

LEGEND

----	PLANNED IN THE 7TH FIVE YEAR PLAN
S.M.	STATION MASTERS ROOM
G.W.	GOODS WHARF
G.P.	GOODS PLATFORM