



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF TRANSPORT
(COMMISSION OF RAILWAY SAFETY)

RAILWAY ACCIDENT INVESTIGATION REPORT

ON

**Collision of No 6 up Punjab Mail with
Stationary Goods Train No 747 Down
in Itarsi Station Yard on Central
Railway**

ON

20=10=80

SUMMARY

1. Date 20-10-1980.
2. Time 22.27 hours.
3. Railway Central.
4. Gauge Broad (1676 mm).
5. Location Near Itarsi 'B' Cabin.
6. Nature of Accident Head-on Collision.
7. Trains involved (i) No. 6 Up Punjab Mail.
(ii) No. 747 Down Bhopal Goods Train.
8. Consisting of (i) 6 Up.—18 coaches hauled by WDM-2 Diesel Locomotive No. 17605.
(ii) Goods Train—37 wagons hauled by WG Engine No. 9454.
9. Speed at the moment of impact (i) 6 Up.—About 30 Km/h.
(ii) Goods Train.—Stationary.
10. Operation Collision occurred within the extended station limits of Itarsi, a Special Class Station.
11. No. of tracks Double track Main Line, with entry/exit to the Goods Yard to the East.
12. Gradient 1 in 1000 falling.
13. Alignment Straight.
14. Weather Clear.
15. Visibility Normal for night-time.
16. Cost of damage Rs. 36,90,900.
17. Casualties Killed—22.
Injured—37 (22 Grievous and 15 simple).
18. Cause Due to 6 Up's Driver passing Signal No. S-7B at 'Danger'.
19. Responsibility Although Shri G.H. Patil, Driver of 6 Up, is held individually responsible, negligence on his part was not established in view of several other major factors that also contributed to this freakish accident.
20. Important Recommendations . (i) Measures to reduce the range of visibility of MACL Signals to be developed.
(ii) MACL Stop Signals to be pre-warned.
(iii) A proper syllabus and suitable modalities for training CASMs in charge of 'panel' working to be designed.
(iv) Station Working Orders of not only 'B' Cabin but also 'A' and 'C' Cabins to prohibit hazardous cross movements.
(v) Cabins to be constructed invariably at a raised elevation and also to provide the maximum visibility of the yard from within.
(vi) Positive steps to familiarise Drivers with any changes made in the Signalling to be evolved.
(vii) Due care to be exercised in imposing speed restrictions.
(viii) Non-torch-based equipment to be used in breakdown operations.

4. Passenger Occupation and Casualties

(a) According to the Railway's estimate, against the carrying capacity of 951 passengers in the 17 coaches (excluding the Mail Van), 731 passengers were actually travelling on that ill-fated 6 Up. In fact, it was quite providential that the 2 coaches marshalled immediately behind the engine had missed the previous day's 6 Up at Delhi owing to a mis-connection, causing most of the passengers to make alternative arrangements of travel rather than wait for one full day. It accordingly transpired that only 40 passengers were travelling in these 2 coaches (as against the combined carrying capacity of $2 \times 75 = 150$).

(b) I regret to report that, out of the 138 passengers travelling in the first 4 coaches behind the engine, 16 died on the spot, and 3 died later in the hospitals, besides 32 injured, 18 of whom grievously. Of these 16, 12 were recovered from the SLR Coach, marshalled the third from the engine.

(c) As regards the Train Crew of 6 Up, both its Driver and the Assistant Guard suffered grievous injuries, while the Assistant Driver suffered simple injuries. Of the 3 railway employees travelling with the Assistant Guard, one died on the spot while the other 2 sustained grievous injuries.

(d) As regards the Goods train, one Fireman died on the spot whereas the Driver, who sustained grievous injuries, succumbed finally a week later in the Bhopal Medical College Hospital.

(e) The situation in regard to casualties is summed up as below :—

Casualties	Deaths	Grievous injuries	Simple injuries
6 UP—			
Passengers	19	18	14
Train Crew . . . .	..	2	1
Railwaymen travelling in front Brake Van (SLR 6171-CR)	1	2	..
Goods Train—			
Train Crew	2	..	..
TOTAL	22	22	15

II. RELIEF MEASURE

5. Intimation

(a) The Collision having taken place near 'B' Cabin, the Itarsi Section Controller was advised of the mishap almost as soon as it happened and relief measures were thus activated straightaway. The Itarsi Break-down train reached the accident site on the Down Main Line at 23.50 hours, whereas the Bhusaval Break-down train arrived at 09.45 hours on the next day.

(b) Perchance, the Medical Superintendent of the Bhusaval Division and other Doctors were at Itarsi on that very day to inaugurate a newly purchased ambulance. These Doctors arrived by road

as close to the accident site as possible by 22.50 hours and immediately organised providing First Aid to the injured. The Accident Relief Medical Vans stabled at Itarsi and Bhusaval reached the accident site respectively at 23.30 hours that very night and 04.25 hours the next morning.

(c) Simultaneously, no time was lost by the In-door and Out-door Assistant Station Masters at Itarsi in immediately contacting all the local doctors, police, et al and also sending for the ambulance and medical assistance available with the local "Jansewa Rughalaya".

6. Medical Attention

(a) A major constraint with any railway yard of sizeable proportion and complexity of tracks is its own inherent weakness in finding road-access to its interior and, with poor night-time visibility a further handicap, reaching proper and speedy relief to the injured did throw up colossal difficulties. Yet, thanks in no small measure to the extra help by way of lighting arrangements which could be readily commandeered locally in the context of the on-going festive season, as also the very prompt appearance of local medical assistance and volunteer support, I am glad to report that passengers of 6 Up were not inconvenienced in receiving succour.

(b) With the third coach from the engine on 6 Up having buckled up badly and bent almost into a 'U' shape and its shell consequently totally collapsed and distorted before it climbed over the locomotive, coming to a rest with one end on top of the already capsized first coach, the extraction of the injured and the dead from the coach was a challenging task that called for the display of tremendous patience, carefulness, ingenuity and improvisation on the part of the Railway's rescue team. The last of the injured was spotted at 9.00 hours on 21-10-1980 in this coach and, as all other means of making an entry to gain access to this person proved inadequate, gas-cutting had inevitably to be resorted to, but with the safeguard of continuous hosing down of the target area of action with water jets so as to prevent the slightest of any likelihood of fire erupting within. A team of doctors and nurses then crawled inside to give a pain relieving injection and administer first aid, before extricating him, badly trapped as he was underneath a lot of metal and debris. Once outside, he was given intravenous Glucose and saline and other medication straightaway, before shifting him to the hospital.

(c) As regards the dead, it was noticed that on the afternoon of 21-10-1980, there were as yet 2 bodies still trapped deep within the wreckage of SLR 6171-CR and, as all other means at disposal were once again tried in vain, gas-cutting of the shell was undertaken with the same precautions as before. Because of the presence of a large quantity of newspaper bundles, tinder out of the structural composition of the collapsed coach itself and much of the other miscellaneous stuff in the luggage compartment that is fire-excitable, a fire eventually broke out that could not be put down, in spite of all the preventive and

fire fighting resources on hand. Regrettably, at this very crucial juncture, the V-belt drive of the fire engine snapped, which was a set-back. In the meantime, outside fire-fighting assistance was rushed to the coach with commendable alacrity and the fire put out, but only after it raged for some 2 hours. Nevertheless, the condition of the 2 bodies recovered immediately thereafter and of another (and the last) discovered and extricated during the forenoon of 22-10-1980 was not such as to preclude their identification.

(d) All the dead bodies recovered from the wreckage were properly shrouded and close liaison was established with the Police, who arrived promptly at the accident scene. As the sun rose in the sky on 21-10-1980, a tent was pitched up to provide shelter for the bodies. As decided by the District Magistrate, Hoshangabad, all the bodies (with the sole exception of that of a boy, who died in the Itarsi Railway Hospital on 21-10-1980) were sent to Hoshangabad, the town closest to Itarsi which also has mortuary facilities.

7. Clearance and Restoration

(a) The last 5 coaches of 6 Up, marshalled 14th to 18th from the engine, were first examined and found fit to run. Accordingly, these coaches were hauled back to Itarsi and cleared by 28 Up Varanasi Express of 21-10-1980. As the buffers of coaches marshalled 12th and 13th were found entangled and coach No. 11 in part derailed, necessary breakdown operations were then taken up, to enable the hauling back of these 3 coaches, along with 4 coaches marshalled 7th to 10th from the engine (which were all on rail and almost entirely unaffected by this accident), to Itarsi by 7.55 hours of 21-10-1980, whereafter the fit coaches were cleared for traffic and the damaged ones booked to Matunga Workshops for repair. Later, the coaches marshalled 5th and 6th, the leading trollies of both of which had derailed, were put back on the track by 13.20 hours and brought to Itarsi station, whereafter the damaged 5th coach was booked for repairs.

(b) Break-down operations on the first 4 coaches of 6 Up could be taken up only after the necessary clearance was accorded by the Police. In the meantime, Break-down operations were taken up to clear the Main line tracks of the 5 wagons blocking them so that the Up and Down Main lines could thus be cleared for traffic only by 04.30 hours on 22-10-1980.

(c) As a result, in addition to the expected 'en route' regulation of other trains of lesser importance, 2 Express trains as also 3 Passenger trains had to be cancelled, besides the short-of-destination termination of 2 more Express trains and 2 more Passenger trains.

(d) The 2 locomotives involved in the head-on collision were so badly entangled that another diesel engine had to be utilised to supply traction for separating them apart prior to their re-railing. The Goods Waiting Bay Line (South) was thus cleared for traffic at about 04.30 hours on 23-10-1980.

III. COMPOSITION OF TRAINS AND DAMAGE

8. Composition of 6 Up Punjab Mail

(a) Itarsi is a Loco/Crew changing station for 6 Up and WDM-2 diesel locomotive; No. 17605 of the following particulars was attached short-hood leading to this train on 20-10-1980:—

Place of Manufacture	Diesel Locomotive Works, Varanasi.
Year of commissioning	29-7-1976.
Length	16.85 m (56' -2").
Weight	112.8 tonnes.
Date of last POH (trien-nial)	12-4-1980.
Date of last IOH (half-yearly).	19-10-1980.

(b) Due to theft of non-ferrous components and lack of requisite spares, the WABCO Vigilance Control Device (VCD) provided on this engine was inoperative. Moreover, apprehending loco wheel skidding, the braking circuitry of Itarsi-based diesel locomotives was modified years ago, to isolate the proportionate braking mechanism. Although, at Railway Board's and RDSO's repeated insistence, proportionate braking is being gradually re-commissioned on a programmed basis at Itarsi and the necessary modifications already effected on 37 diesel locomotives so far, this particular locomotive was not yet attended to. In other words, air brakes on this locomotive work independently and not in appropriately synchronous conjunction with vacuum brakes. Excepting for these reservations, all the "Safety Items" from the Electrical and Mechanical considerations were functioning well.

(c) The standard train-consist of Punjab Mail has a minimum of 15 coaches and a maximum of 16 coaches on the Central Railway, with a 17th coach allowed on certain sections. 6 Up of 10-10-1980 was, however, run with 18 coaches, implying an overload of 2 coaches ex : Delhi itself. These 2 coaches, which had unfortunately missed the previous day's 6 Up due to a mis-connection, had to be cleared by 6 Up of 20-10-80 and were in fact marshalled immediately in rear of the engine.

(d) The train-consist, which remained unchanged from Delhi onwards, was a below, reckoning ad-seriatim from behind the engine:—

Sl. No.	Coach No.	Type	Year of build	Date of Carrying Return Capacity for POH.	Actual Capacity	
1	2	3	4	5	6	
1	*6693-CR	WGSYCN	1968	10/81	75	18
2	*9192-CR	WGSYCN	1978	9/81	75	22
3	6171-CR	SLR	1962	1/81	40	35
4	3834-CR	WGS	1969	6/81	80	63
5	9014-CR	WGSYCN	1975	10/81	75	69
6	9093-CR	WGSYCN	1975	10/81	75	69
7	773-NR	FC	1961	1/82	22	18
8	3056-CR	WFC	1971	3/81	22	21
9	3023-CR	WFC	1970	10/81	22	20

*Attached at Delhi, having earlier missed the 6 Up of the previous day, due to a mis-connection.

1	2	3	4	5	6
10	@2708-CR WAC	1953	4 81	14	14
11	2306-CR FCS	1963	5 81	50	30
12	@5184-CR SPPC	1958	5 81	..	..
13	£6361-CR WGSYCN	1962	1 81	80	56
14	£6517-CR GSCG	1967	7 81	81	66
15	9265-CR WGSYCN	1974	6 81	75	74
16	6336-CR WGSY	1960	9 81	75	55
17	8708-CR WGS	1971	9 81	80	68
18	7115-CR SYLR	1960	9 81	40	34

@An IRS non-Anti-Telescopic coach.

£A BEML Anti-Telescopic coach.

Excepting as otherwise indicated above, all coaches were of ICF manufacture and Anti-telescopic in construction. All the ICF coaches were all-coil (A/C) type, excepting for coaches at S. No. 3, 16 and 18, which were of laminated bearing (L/B) type.

(e) According to the standard rake-link for the Punjab Mail, it is the rake of 5 Dn left Bombay-VT on 17-10-1980 that would be on 6 Up leaving Delhi on 20-10-1980. A cross-check of the rakes of these trains (namely, 5 Dn which left Bombay-VT on 17-10-1980 and 6 Up which left Delhi on 20-10-80) revealed no discrepancy whatsoever, which proves that all the 16 coaches of the ill-fated 6 Up were indeed the standard composition of this train. Thus, there is no substance of truth in the allegations that appeared in a section of the Press (as, for instance, in column 1 of page 1, continued in column 3 of page 13 of "The Times of India", Bombay Edition of 24-10-1980, the relevant extract of which I reproduce hereunder):—

"It is learnt that the coach in which they were travelling and two other bogies had become 'sick' on the previous day at Agrā. After repairs they were attached to the ill-fated train immediately behind the engine instead of the normal position in which the 'Bhopal quota' sleeper coaches are attached. In the event, these sleeper coaches came to occupy the fifth, sixth and seventh positions from the engine and were spared from being smashed. Instead, the first three 'sick' coaches from Agra telescoped and most of their occupants were among the dead or injured."

(f) The total length of the coaches was 396 metres and the total weight 725 tonnes. As per the In-coming Vacuum Brake Certificate issued at Delhi and also according to the Continuity Certificate issued by TXR staff at Itarsi, this train had 100% effective brake cylinders, yielding a brake power of 234 tonnes.

9. Composition of the Goods train

(a) No. 747 Down Bhopal Goods train, a daily sectional shunting train between Itarsi and Bhopal, was ordered at 19.05 hours on 20-10-1980. The

out-going engine No. 9454-WG of the following particulars was taken on load at 20.00 hours:—

Place of Manufacture	. Chittaranjan Locomotive Works.
Put on the line in	. January, 1962.
Date of last POH	. 8-2-1979 at Dohad on Western Railway.
Date of Schedule IV	. 12-3-1980 at Bhusaval.
Date of Schedule II	. 3-10-1980.
Overall length	. 23.724 metres, including Tender.
Overall weight (in full load)	179.6 tonnes, including Tender.
Last Ultra-sonic Testing on	29-9-1980.

(b) The trailing load comprised 37 = 42½ Four wheelers = 1011 tonnes with an overall length of 329 metres and total brake force of 301 tonnes. As the full details of the load are not quite relevant to this accident, excepting in so far as pertaining to the damaged wagons, I give hereunder only a summary of the train-consist, reckoning ad seriatim behind the engine:—

Sl.No.	Type	Wagon No.	Year of Build	Return date	Remarks
1	BFR	41631-CR	1959	Obliterated	Empty*
2	C	27784-CR	1951	7/79	Empty*
3	C	15676-CR	1945	7/80	Empty*
4	C	60190-CR	1961	6/83	Loaded@
5	C	89816-ER	Invisible	7/79	Empty*
6	C	31494-NR	1965	10/80	Loaded
7	KC	81146-CR	1956	10/80	Empty*
8, 33 & 34 = 3	} BOX-T	..	..	..	. All loaded
9, 10 & 36 = 26						} Four-wheelers	..	..	All loaded.
37	Brake Van.				

* Booked to shops at Jhansi.

@ Loaded with 4 "smalls", which escaped damage, although the wagon got smashed up.

(c) The Vacuum Brake Certificate issued for the train shows that 6 (One cylinder of the BFR in rear of the Engine and the cylinder of four-wheelers marshalled 3rd, 5th, 9th, 12th and 21st) out of 41 brake cylinders were dummied, giving a figure of 85% for effective brake power. However, barely as the Goods train left the yard, it developed "vacuum trouble" and stopped on the Goods Waiting Bay (South) line.

10. Course of the Accident and the Damage

(a) The severity of the impact was so great that the front part of WDM-2 Diesel engine No. 17605, which was working 6 Up, had in fact mounted over the front buffers of the WG engine and was consequently very badly smashed up, with all the constituent units (the Nose compartment, the Driver's cab with its relays and control gear, the power pack, the Expressor compartment, the Radiator compartment as well as the the underframe and

traction motors) extensively damaged. All but Rs. One lakh of the cost of the damages sustained by this loco is attributed to the effect of the collision itself, whereas Rs. One lakh worth of damage occurred subsequently through the fire that broke out in SLR 6171-CR and which soon found access also into the diesel locomotive underneath it.

(b) Through the application of the well-known "Concertina Effect" associated with the buckling of transversely weak systems, and because the track on the Goods Waiting Bay (South) line was on a left-hand curve of 4° curvature, CR 6693 WGSYCN (the first coach of 6 Up behind the loco) veered to the right (in other words, towards the outside of the curve) by almost fully passing the loco to its right and capsizing clockwise before coming finally to rest on its right side, whereas CR 9192 WGSYCN (the second coach) got deflected to the left (or, towards the inside of the curve), shot past beyond the loco to its left and capsized anti-clockwise, coming finally to rest on its left side.

(c) CR 6693 had also borne the brunt of the impact before veering off to the right and its front "torpedo section" located in the lavatory portion collapsed in the predicted manner. CR 9192 didn't really have to absorb any impact and was thus not very badly damaged. With the snapping of all their couplings, both these coaches parted at the front as well as in the rear. Similarly, bodies of both these coaches separated from their trollies, which gathered behind the diesel loco up front.

(d) The third coach of 6 Up (SLR 6171-CR) was so marshalled that the Brakevan (Guard compartment) was leading, followed by the luggage compartment in the middle and the second class compartment at the trailing end. With the first 2 coaches gone off the track and the rear of the train as yet in motion, this coach got pushed against the already damaged rear of the diesel locomotive and it, too, separated from its trollies as the body pressed forward under the momentum of the 15 coaches in the rear part of the train which was still exerting considerable pressure. It is difficult to reconstruct clearly the type and magnitude of the forces, torques and moments brought into play as this coach separated from its own trollies, then rolled over the trollies that had previously separated from the 2 coaches ahead of it and got thrust against the immobilised diesel locomotive, but all that can be stated with confidence is that this coach did buckle upwards into an 'U' shape through the far-end doorways of the second class compartment, causing its shell to collapse in this process.

(e) Under the action of compressive forces, the maximum stresses are known to develop in the body around the middle of its length. The far-end doorways of SLR 6171-CR did constitute an unavoidable zone of weakness in the coach of the integral shell type of construction. This coach, of 1962 vintage and due its next 'POH' barely 3 months later, must have got weakened considerably at the middle of its length, which accommodates, besides the door-ways, also the lavatory portion, which is particularly known to be corrosion prone. As this coach yielded into

a shape convex upwards, the rear of the train continued to press forward until finally, this crookedly distorted body was forced to ride upon the 2 rolling stock units ahead, with its leading prong entangled over the trailing long hood of diesel loco straight ahead and the trailing prong slewed to the right and lodged atop of the first coach, which had previously capsized to the right of the diesel loco.

(f) CR 3834 WGS (the 4th coach of 6 Up) was found capsized with the front portion, which had severed from the bogie underneath, riding over all the trolleys of the 3 coaches ahead (which collected behind the engine) and finally resting over the rear of the loco. This coach had not, however, separated from its rear bogie. In the final configuration, the first coach (CR 6693) seemed to have slipped back slightly, with its left-side rear part lodged in the recess of the leading right-side door-way of this coach, which did not suffer substantial damage. The momentum of 6 Up trailing load having by now almost spent itself, the coaching stock further in rear suffered, but light damage or no damage at all.

(g) As regards the stationary goods train, its WG steam engine No. 9454 was likewise severely damaged, with the boiler smoke box collapsed, underframe/body of both the engine and the tender badly distorted, both its cylinders broken and the tender water tank smashed up, besides the expected damage to front-end buffers, cattle guard, etc.

(h) As regards the trailing load of the goods train, all its effective brakes were found in a fully applied condition, owing to the vacuum trouble experienced on this train (as already alluded to briefly in para 9(c) supra). In the postcollision situation, it was found that there was a gap of only 25 metres between the rear of the WG engine and the front of the rear string still on the track (comprising wagons marshalled the 6th to 37th), whereas the first 5 wagons and the tender would actually need a space of 59 metres to occupy. In other words, the engine of the goods train was driven back at least $59 - 25 = 34$ metres by the impact of 6 Up, causing the first 5 wagons (4 of which were empty and the other nearly so, having been loaded with Just 4 "Smalls") to be tossed off the track, with the rear 32 wagons serving as an anchor. Because of the left hand curve of 4° curvature of the track on the Goods Waiting Bay line (South) at this location as already referred to in para 10(b) supra, these 5 wagons were predictably thrown towards the double-track main line, situated on the outside of the curve.

(i) The Goods Waiting Bay line (South) was virtually destroyed for a distance of 77 metres, besides damage to another stretch of 58 metres. Due mainly to the impact of vehicles crashing over and fouling the Double Track Main Line, some damage was also sustained by the Main Line track near the 'B' Cabin. Besides the switch trailed through, the adjacent switches also sustained damage in the aftermath; likewise, 2 Point Machines and miscellaneous associated S&T components.

(j) The overall cost of damage was estimated at about Rs. 36,90,900, broken down into component elements as below :—

	Rs.
Permanent Way	1,36,400
Signalling	39,500
Steam Locomotive	4,95,000
Diesel Locomotive	22,54,000
Coaching Stock	6,77,000
Wagons	89,000
TOTAL	36,90,900

IV. LOCAL FEATURES

11. The Section and the Site

(a) Itarsi is one of the principal railway junctions on the Central Railway System, with lines going due North towards Delhi, Easterly towards Allahabad, South-Easterly towards Nagpur/Madras and South-Westerly towards Bombay. The jurisdiction of Bhusaval Division starts from Itarsi (inclusive) in the North and Itarsi Goods Yard, conceptually designed on the basis of unidirectional flow from reception through sorting to despatch in a roughly South-to-North orientation, is situated just to the South of Itarsi Station and due East of the Double Line Broad Gauge to Bombay.

(b) The kilometrages, as reckoned from Bombay-VI, are given below, in the direction of travel of 6 Up :—

	Kms.
Itarsi Station	745-13
Itarsi 'D' Cabin	744-46
Itarsi 'C' Cabin	743-08
Itarsi 'B' Cabin	740-17
Place of head-on collision	739-90
(i.e. where the engine of 6 Up finally came to halt, interlocked face-to-face with the engine of the Goods train).	
Itarsi 'A' Cabin	738-36
Dulariya Station	733-05

(c) To facilitate entry/exit to Up/Down Goods trains into/from this Goods Yard, the Block Section to Dulariya, the next station from Itarsi towards Bombay, had initially been split up by providing 3 additional Block Cabins 'A', 'B' and 'C', besides 'D' Cabin, which controls entry into and exit from the Itarsi Station towards Bombay. However, with progressive modernisation by way of continuous track-circuiting of the Main Line tracks, etc., and in consequence of alterations carried out with the prior sanctions of the Commission of Railway Safety, 'C' Cabin became a non-block Cabin on 5-10-1978 and 'B' Cabin became a non-block Cabin on 4-10-1980. In other words, the situation obtaining after 4-10-1980 has been that, in terms of SR 2-1, all the Cabins 'A', 'B', 'C' and 'D' operate together as parts of a Special Class Standard III Interlocked Station, Itarsi, with all Signals encountered on the Up Road after leaving Itarsi Station designated as Starters and all Signals encountered on the Down Road from 'A' Cabin onwards treated as Approach Signals.

(d) Trains are worked on the Absolute Block System and Daido Lock and Block Working exists between Itarsi 'A' Cabin and Dulariya Station. Continuous track-circuiting has been introduced between 'C' and 'A' Cabins, with partial track-circuiting and inter-slotting of Signals between 'D' and 'C' Cabins. 'D' and 'C' Cabins are provided with Orthodox 2-Aspect Semaphore Lower Quadrant mechanised signalling, while 'A' Cabin has Multiple-Aspect Colour Light Signalling operated from a mechanical lever frame. As regards 'B' Cabin, the new works, comprising panel Interlocking, motor-operated points and Multi-Aspect Colour Light Signals were commissioned but recently on 4-10-1980 and yet to be handed over to the Maintenance Organisation by the S&T Construction Branch.

(e) The Up and Down Goods Line extends from 'B' Cabin to beyond 'C' Cabin. Yet, because the Lever frame in 'C' Cabin is saturated, it had not been possible to provide for signalling any movement from this Up and Down Goods Line into the Down Main Line at 'C' Cabin. Thus, unless piloting (which is the very last measure adopted, usually only in exceptional circumstances) is resorted to at 'C' Cabin, north-bound goods trains meant for Bhopal and beyond are invariably required to enter the Down Main Line only at 'B' Cabin.

(f) Movement of Down Goods trains approaching the 'B' Cabin via the Goods Waiting Bay Line (South) is authorised by the exchange of Private Numbers between 'B' Cabin and Goods Cabin No. GC1 and inter-slotting of appropriate Signals between these two Cabins. As soon as the train passes the Signal controlled by GC1 Cabin, the automatic reverser enables the Signal to go to 'ON' aspect, and appropriate flashing light begins to appear on the 'B' Cabin's Panel, which draws the attention of the 'B' Cabinman to take further necessary action. As soon as the train enters on the approach track circuit behind Signal No. S-4, another indication appears on the 'B' Cabin's Panel.

(g) There is a continuous down gradient for the 'Up Road' commencing from Itarsi Station right upto the place of collision. For a stretch of about 4 kms. in rear of the place of collision, the 'Up Road' is on a falling grade of 1 in 1000. The Goods Waiting Bay Line (South) is, however, on a level and a short 4° left-hand curve enables this line deviate leftwards towards Goods Cabin No. GC-1.

(h) Cross-over No. 205 between the Up and Down Main Lines comprises 1 in 12 turnouts, whereas the cross-over No. 204 between the Up Main Line and the Up and Down Goods Line is composed of 1 in 8½ turnouts. Not being relevant to the context of this collision, particulars of track structure and other permanent way details are not being included in this Report.

12. The Route Relay Panel Interlocking introduced at 'B' Cabin

(a) Some of the safety features in-built into 'B' Cabin working in consequence of this sophisticated work are :—

(i) Every operation requires the manipulation of 2 buttons simultaneously, causing the

operator to use both his hands, thus obviating the possibility of accidental or inadvertent operation that may otherwise become feasible through the manipulation of a single button.

- (ii) The complete setting and locking of points is continuously proved by relays. A flashing light appears only within the limited duration that the points are operated but the flashing continues if anything is abnormal. The Panel indication appropriately shows whether a point is locked in its normal or reverse position.
- (iii) Adjacent track circuited sections are portrayed in different colours on the panel to bring into sharp focus their boundaries. To minimise fatigue to the operator, panel lighting levels can be adjusted to suit day/night conditions.
- (iv) Signal lamps are lit to different pre-set voltages by day and by night, so as to be really effective at all times.
- (v) "Cascading" has been provided for signal lamps, whereby the next restrictive aspect is lit automatically, if the bulb relating to any aspect cleared is not burning on account of its fusing or for any other reason. This safety measure extends to the RED aspect as well, for, if the RED bulb is malfunctioning, the track circuit in rear of that signal gets de-energised, thus throwing the signal immediately in rear to DANGER or RED. (In the case of Signal No. S-7, if it becomes 'blind' or if its RED lamp fuses, the protection is that the preceding Signal No. 23-C, controlled by 'C' Cabin, cannot be lowered or, if it is already lowered, it will automatically fly back to 'ON' position).
- (vi) Similarly, when a Signal bulb becomes defective, the indication corresponding to that Signal flashes on the Panel, where an audible Warning also sounds which can be acknowledged. In this manner, the Operator gets to know as to which particular Signal's bulb is malfunctioning, so that he may organise for the Maintenance Staff to do the needful.
- (vii) Before a set route can be cancelled in the usual manner by the passage of a train, the circuitry proves that the RED light of the concerned signal is burning. Likewise, the cancellation of a route also requires "a priori" that the track circuits on the route have been occupied and cleared in their proper sequence, whereby any out-of-sequence shorting of the track circuit(s) will cause the set route to remain locked.
- (viii) When, for reasons of operational convenience/necessity or in an emergency, a set route has to be cancelled, a certain given procedure is to be followed and this can-

cellation is recorded on the Emergency Route Cancellation Counter (there are indeed 3 other Counters, each covering certain unusual operation). Once the concerned signal is put back to 'ON' and Route Cancellation is initiated, the cancellation itself becomes effective only after the lapse of 2 minutes = 120 seconds, (during which time-interval a flashing white light appears above the signal indication), provided that the approach track circuit is already occupied. If, during this 2-minutes interval, the track ahead happens to be occupied, back-locking gets activated whereby the route cannot be cancelled. Of course, if the approach track is not occupied, route cancellation can be effected instantaneously. Thus, for signals without any approach track circuit, route cancellation can be achieved only after the time-delay of 2 minutes is attained. The Emergency Route Cancellation Counter records every such operation, irrespective of whether or not the time delay function was activated.

(b) The philosophy underlying the safeguard of this 2 minutes time-delay is that, should a signal be normalised after a train is already traversing the approach track-circuit, the driver of the train (whose duty it is to keep an effective "look-out") is expected to take note of the signal aspect now changed to RED and respond by controlling his train to stop short of the signal recently put back to 'ON'. One or the other of the 2 following contingencies can now occur within this 2-minutes time-span:—

- (i) the train has stopped short of the Signal, in which case it is quite safe to set another route, OR
- (ii) the train has overshot the Signal, in which case the back-locking comes into action, effectively preventing any alteration to the set route. (In this case, route cancellation becomes merely an attempt which could not materialise).

(c) As regards Signal No. S-7, as may be seen from Annexure II, the approach track extends to 2.277 metres in its rear. Yet, an additional feature has been incorporated in the logic of the circuitry for Signal No. S-7 such that its Long Arrival Approach Track is shown as occupied right from the moment that the preceding Signal (i.e. 'C' Cabin's S-23) is taken 'OFF'. In other words, provided that 'C' Cabin Signal No. S-23 is taken 'OFF', the 2-minutes time-delay has to elapse before Route Cancellation, even if the approach track may not in fact be physically occupied by a train.

(d) In regard to the Up Main Line, the significant changes made at the time of commissioning the new 'B' Cabin on 4-10-1980 were as follows:—

- (i) The provision of a single new Multiple Aspect Colour Light Starter Signal No. S-7, controlled by 'B' Cabin and located at

180 metres in rear of the cross-over* No. 205 between the Up and Down Main Lines, in replacement of the erstwhile Up Starter No. 29B@ and the Up Main Intermediate Starter No. 28B@;

- (ii) The deletion of the erstwhile Up Advanced Starter No. 10-B, controlled by 'B' Cabin; and
- (iii) The removal of the erstwhile Up Distant Signal† No. 29-A controlled by 'A' Cabin, which was reflected under phase IV of the Circular Notice No. BSL. T. 166/20/80 issued on 18-9-1980, prior to commissioning the works.

(e) Whereas the existing Warning Boards£ (provided long ago in the context of Block Working between 'B' and 'C' Cabins, and in rear of the 'First Stop Signal' in the Up direction) continued to be retained even after Block-Working between these 2 Cabins was discontinued in October, 1978, small notices were affixed under them in October, 1980, bearing the legend "Approaching CIS Territory".

13. Other Features relevant to this Accident

(a) Before the additions and alterations as also the new 'B' Cabin could be commissioned, the existing points had necessarily to be non-interlocked initially during the change-over period and duly clamped/padlocked. It was for this reason that a Caution Order, limiting the speed of trains to 10 Km/h between 'A' and 'B' Cabins on both the Up and Down Main Lines, was imposed on 3-10-80. In compliance with the Railway's Subsidiary Rule No. 28-1, which required that a Caution Order be issued for a 10-day period (in order that Drivers are allowed an adequate opportunity to familiarise themselves with any change(s) in signalling), this stringent speed restriction of 10 Km/h was continued for the stipulated 10-day period, even after the completion of the said new works and finally cancelled on 17-10-1980. However, as the "Cancellation Memo" was not addressed individually to the same Officials to whom the "Imposition Memo" was previously issued, it so transpired that this Caution Order of 10 Km/h continued to be issued to trains even after 17-10-80 by the Indoor ASM of Itarsi to all Up trains, including the ill-fated 6 Up of 20-10-1980.

(b) The Signals encountered by the Driver of 6 Up as he left Itarsi station from Platform No. 4 on 20-10-1980 were as follows :—

Signal	Aspect	Control	Remarks
1	2	3	4
S-11	Green	'D' Cabin	Platform Starter.
S-29	Green	'D' Cabin	Starter routing 6 Up to the Up Main Line

* This cross-over is negotiated by goods trains starting from the goods yard before they enter the Down Main Line at 'B' Cabin.

† Due to October 1978 these 2 signals were respectively designated as [No. 31 Up Outer and [No. 28 Up Home, as Block Working was in force at that stage between 'B' and 'C' Cabins.

‡ Due to Block Working between 'B' and 'A' Cabins having been dispensed with.

£ On account of the track spacing between the Up Main Line and the Up & Down Goods Line, the Warning Board in rear of Signal No. 3-7 had been kept deliberately sub-standard in width, so as not to constitute an infringement to the Schedule of Dimensions, and also re-positioned suitably.

‡ 1800 t, if Diesel-hauled.

1	2	3	4
S-21	Green 'D' Cabin	Up Main Advanced Starter with inter-Cabin control with 'C' Cabin, showing now that the line is clear upto S-42 plus the overlap.	
S-42	Green 'C' Cabin	Up Main Starter, showing that the line is clear upto S-23 plus the overlap.	
S-23	Green 'C' Cabin	Up Main Intermediate Starter showing that the line is clear upto S-7 plus the signal overlap of 180 metres beyond.	
S-7	Red* 'B' Cabin	Up Main Starter, showing that the line ahead is NOT clear.	

* The other aspect of this signal are as under :

Yellow	. Indicating that the line is clear upto the next Signal, 'A' Cabin's S-28 plus the overlap; also proves that S-28 is displaying 'RED' aspect.
Double Yellow	. Indicating that the next Signal, 'A' Cabin's S-28 is showing "YELLOW" aspect.
Green	. Indicating that the next Signal, 'A' Cabin's S-28 is showing "GREEN" aspect and that the line is clear upto Dulariya.

(c) As per Appendix V to Jhansi Division's Working Time Table, the maximum gross load for goods trains hauled by WG steam locomotives on the Itarsi-Bhopal Section is 1100§ tonnes, above which trains need to be banked on the Budni-Barkhera ghat section. Mainly for operational reasons relating to the paths for Mail and Express trains, which also require banking to negotiate this ghat section, the "Bhopal Board" does not, as a policy, accept from Itarsi beyond 22.30 hours any goods train requiring banking. This restriction does not, however, apply to loads not requiring banking.

(d) The joint observations of wagon-stock of the goods train made by the Railway's Senior Supervisors, who visited the site immediately after the accident, revealed, inter alia, that, other than the 5 which got smashed up vide para 10(h) supra, all the remainder 32 were quite safe on their wheels and intact on track in an undamaged state. Excepting for 3 cylinders found dummied, the position of which was in agreement with the data presented in para 9 (c) supra, the travel of piston strokes was throughout within the limits prescribed for 4-wheelers as well as bogie-stock.

(e) Similar joint observations of the coaching stock of 6 Up showed that, other than the 4 coaches damaged [vide paras 10(b), (c), (d) & (f)], the travel of piston strokes in the leading as well as the trailing cylinders of the rear string of 14 coaches were all within the prescribed limit. Excepting for the 2 IRS coaches, viz., the Postal Van (CR 5184

SPPC) and the Air-conditioned Coach (CR 2708 WAC), all the others were fitted with roller bearings; the details of repacking of boxes of these 2 coaches were as below :—

Coach	Marking	Station	Date
Postal Van	R	Wadi Bunder	22-8-80
Postal Van	O	Phirozepur	11-10-80
AC Coach	R	Wadi Bunder	9-10-80
AC Coach	O	Not yet due	—

(f) Joint Observation of the WDM-2 Diesel Loco No. 17605 [carried out by Shri T.N.G. Pillay, the Jhansi-based Senior Loco Inspector (Diesel); Shri D. D. Shukla, the Itarsi-based Movement Inspector; and Shri K. P. Kulhere, the Bhusaval-based Senior Inspector (Diesel)] revealed the following :—

Right Control Stand

- (i) A-9 Valve (Vacuum Brake) — Driver's application handle was in over-reduction zone; its air-pressure cut-out cock was in opened condition (whereas the similar cock of the left Control Stand was in the closed position);
- (ii) Selector Handle (Dynamic Brake) in braking zone up to 15 'B' (maximum position);
- (iii) SA-9 Valve (Loco Independent Brake) — handle was in released position (i.e. not applied);
- (iv) Reverser Handle was engaged in forward direction (Short Hood Leading);
- (v) Engine Speed Control handle (or, switch) was in "run" position; and
- (vi) All circuit breakers on this as well as other Control Stand, as also all those on the Control Panel, were found to be in the 'Off' position.

Elsewhere

- (vii) Hand Brake was in released position (i.e. not applied); this was on the Assistant's side;
- (viii) Emergency Vacuum Brake valve was in opened condition;
- (ix) WABCO-type Vigilance Control Device (VCD) was out of order;
- (x) Mechanical Speed Graph had its pointer stuck at 68 Km/h and its clock-work was in perfect working condition; and
- (xi) Ground Relay Switch was in operated condition.

(g) As mentioned in para 3(c) supra, there was no recording available on the speed chart, removed from 6 Up's locomotive. The reason given was that, while installing the recorder, the recording stylus inadvertently got stuck beneath the lower edge of the chart. The recording of the time was, however, found to be in order. The speed-chart referred to 3 Up and not 6 Up and the reason given was that this particular engine, which came out of its half-yearly IOH only on 19-10-1980 and which had thereafter

done just one round trip to Bhusaval working goods trains, was originally detailed to work 3 Up (requiring the fixing of a speed-recorder), but later re-planned to work 6 Up.

(h) As regards the 'B' Cabin's Panel, Shri B. R. Hanotiya, the Harda-based Transportation Inspector (who happened to be travelling by the ill-fated 6 Up) was the first to reach it immediately after the accident and he found all the seals on the Panel intact. Later, the Signal Inspector (Shri N. N. Kakkar) arrived and the seals of the Relay Room were jointly checked and found intact, whereupon the Relay Room was duly sealed, having taken care that the Panel keys as well as the Panel door keys were already kept inside the Relay Room. The indications available on the Panel were jointly recorded by these 2 officials as below :—

- (i) The Route was set for 747 Dn from S-4 to 407 T. The Route was correctly set and locked. The point No. 204 was set in 'Reverse' and having steady indication. Point No. 205 set and locked in 'R', but flashing continuously since burst;
- (ii) The engine and coaches of 6 Up trailed through Point No. 205 and negotiated cross-over No. 204 in reverse and occupied track circuit No. 562-T and 559-T and dashed against 747 Dn engine and wagons. Track Circuit No. 407 was occupied by ET Medical Van. Signal No. 7 and Signal No. 6 were showing Red Aspects; and
- (iii) Readings on the various counters provided on the Panel were :—

EWN	0126
EUUYN	01863
EUYN	01909
COGGN	0312.

(i) Although, because of continuous track circuiting between 'C' and 'A' Cabins, Block Working as such had been dispensed with, advance information on train movements is nevertheless communicated between 'C', 'B' and 'A' Cabins along with the exchange of Private Numbers, since it is essential that Cabin ASMs are made aware of the particulars of incoming trains in order that their onward movement is meaningfully planned and pursued. However, for the very reason that the conditions for taking off of signal are effectively proved 'in toto' by track-circuits as also the logic of the related circuitry, there is 'de facto' very little by way of Inter-Cabin Control between these 3 Cabins at Itarsi.

(j) As already mentioned in para 3(e) supra, the weather was clear and the night-time visibility was not impaired in any way.

V. SUMMARY OF EVIDENCE

14. Evidence of Shri S. N. Pandey, Indoor Assistant Station Master (ASM), Itarsi

He stated that 6 Up left Itarsi on right time (22.15 hours) and that he had issued a Caution Order of 10 km/h from 'B' Cabin to 'A' Cabin and of 30 Km/h between 'A' Cabin and Dulariya Station. During the ensuing cross-examination, he clarified

that he did not receive the Memo of 17-10-80 cancelling the 'Caution' between 'B' and 'A' Cabins. Queried about the precise time of 6 Up's departure, he admitted that he merely jotted down the timing given to him by the Outdoor ASM.

15. Evidence of Shri N. B. Gupta, Outdoor ASM, Itarsi

He stated that 6 Up left from platform No. 4 at 22.15 hours. As soon as he heard from the Control about the accident, he and the Indoor ASM took immediate steps to advise all concerned. He also sent his Pointsman on cycle to the local "Jansewa Rungalaya" to fetch medical assistance and ambulance.

16. Evidence of Shri P. L. Yadav, 'D' Cabin's ASM, Itarsi

(a) He said that he obtained 'line clear' from 'C' Cabin at 22.13 hours and that 6 Up left his Cabin at 22.18 hours. In reply to a query, he clarified that the Station Working Order for 'D' Cabin exempted him from exchanging signals with passing trains.

(b) During subsequent questioning, he revealed that the Train Engine came on load around 22.10 hours, whereafter he obtained the Controller's permission to get 'line clear' for 6 Up from 'C' Cabin. While he confirmed that the Section Controller (SCOR) did enquire at about 22.15 hours about 6 Up, he denied any such second enquiry having been made by the SCOR. He added that he did try to contact SCOR some 2 minutes after 6 Up ran past his Cabin, but the SCOR did not attend on the phone. He also clarified that he had correctly set his time with the SCOR but, when faced with the 'C' Cabin's record that 6 Up ran past that cabin at 22.25 hours, and the fact that 6 Up wouldn't take 7 minutes from 'D' Cabin to 'C' Cabin, he conceded the possibility of the 2 clocks being out-of-phase.

17. Evidence of Shri S. K. Yadav, 'C' Cabin's ASM, Itarsi

(a) He stated that he granted 'line clear' for 6 Up to 'D' Cabin at 22.16 hours and simultaneously obtained 'line clear' from 'B' Cabin. He then took immediate steps to have the Main Starter No. 42 and Intermediate Starter No. 23 lowered by his Leverman. He got the departure of 6 Up from 'D' Cabin at 22.20 hours. When 6 Up passed his Cabin, he tried to contact 'B' Cabin to give the departure time of 6 Up, but there was no response; accordingly, this information was passed on to the Section Controller. In the meantime, 'B' Cabin had also obtained line clear for the Goods train No. 747 at 22.25 hours from him. He had not taken any advance action in obtaining further line clear from 'D' Cabin for this goods train.

(b) During the cross-examination, he confirmed that he had set his time correctly with the Control at about 16.05 hours. He had also correctly exchanged signals with the Assistant Driver as well as the Guard of 6 Up, which was proceeding at a speed of about 30 Km/h at that stage. He added that he had no occasion to look towards 'A' Cabin and therefore he had no idea as to the aspect of the relevant Signals of 'B' Cabin and 'A' Cabin.

(c) As he added that 6 Up passed his Cabin at 22.25 hours, which was precisely the same time that 'B' Cabin sought line clear from him, he later clarified that, when he was on the phone to 'B' Cabin, 6 Up was in fact approaching his Cabin and that it was a minute or so before 6 Up cleared his Cabin. He also confirmed that, while he was on phone with 'B' Cabin with regard to line clear for the goods train, there was no reference made to 6 Up, by either of them.

18. Evidence of Shri K. K. Saxena, 'B' Cabin's ASM, Itarsi

(a) He stated that he granted 'line clear' for 6 Up to 'C' Cabin at 22.15 hours and obtained 'line clear' from 'A' Cabin at 22.16 hours. Earlier, he had already granted 'line clear' at 22.00 hours for Goods Train No. 747 to Goods Cabin No. GC-1. This goods train left GC-1 Cabin at 22.15 hours and arrived at his Cabin at 22.20 hours, as could be seen from the indication on his panel. Immediately, he sought instructions from the Section Controller who advised him to quickly clear it through, as 6 Up was still standing at Itarsi.

(b) He added that he immediately cancelled the 'line clear' for 6 Up from 'A' Cabin at 22.25 hours and also obtained 'line clear' from 'C' Cabin for the goods train to go through. He then took steps to cancel the route for 6 Up by putting back Signal S7 to Danger and simultaneously activating the route cancellation buttons. After the 2-minute interval, the flashing indication on the Panel stopped and he was able to set the route for the goods train and take off Signal S4. Right upto that time, he had no further information about the whereabouts of 6 Up. He then came out of his Cabin to take a peep at the goods train and found that it was not moving. He re-entered his Cabin and soon heard the sound of 6 Up and then the terrible sound of a crash.

(c) During the cross-examination, he confirmed that he had set his time correctly with the Section Controller at 16.05 hours and that the accident took place around 22.30 hours. Confronted with what was apparently a clear case of over-writing (the time first entered seemed to be 22.50) in his Train Register with reference to cancellation of 'line clear' for 6 Up with 'A' Cabin, he explained that he had initially entered the time wrongly as 2.25 and then corrected it to 22.25 and that what looked like "O" after 5 was in fact a "biggish" dot. Questioned about the over-writing with reference to the Private Number relating to the said cancellation in the Train Register of 'A' Cabin, he clarified that, whereas he had correctly read out the Private Number as 55, 'A' Cabin might have misheard it initially. Similarly, even when confronted with the curious coincidence of over-writing in the Train Register maintained at 'A' Cabin as well as at Dulariya in respect of the cancellation of 'line clear' previously granted to 6 Up, he maintained his stand that he himself cancelled it at 22.25 hours with 'A' Cabin. He had also admitted that he did not give any reason for the said cancellation, although Rule 4.18 of the Block Working Manual prescribed for circumstances for cancellation of the 'line clear' to be advised to the other Station.

(d) Further cross-examination brought out the following:—

- (i) He had been posted to 'B' Cabin only after Panel Interlocking was introduced; prior to that, he was working in the Junction Cabin. He had received 6 days of intensive on-the-job training in the 'B' Cabin, while someone else was actually in charge of the operations there and he felt quite satisfied and confident in regard to his own competence to be in charge of this Cabin.
- (ii) Clearance of this goods train was of particular importance, because it was an "interchange" train, which had to get past the Itarsi 'F' Cabin in order to be counted in the day's statistics. Otherwise, this goods train would be lost for that day; indeed, the Area Controller had already enquired twice about this train. (Later, when it transpired, however, that the Area Controller denied any such enquiry, he insisted that someone else must have contacted him then.)
- (iii) Visual indication was available on his panel that the goods train had left GC-1 Cabin, because 'S2/38' was flashing. It was, therefore, clear that this train would be arriving any time now at his Cabin; hence, he did not wait for its occupation on the approach track behind Signal S4. Indeed, goods trains often stopped quite short of this Signal. The time then was 22.20 hours.
- (iv) In view of the urgency to despatch the goods train, he straightaway contacted the Section Controller for instructions. He could not specifically recall whether or not he had apprised the Section Controller in so many words that Signal S7 had already been taken off for 6 Up; in view of the scheduled time of 6 Up ex: Itarsi, such must have obviously been the case. The Section Controller advised that he had understood from the 'D' Cabin that 6 Up was still on the platform and that the goods train should accordingly be quickly cleared. The time now was about 22.23 hours.
- (v) The indication on his panel was that the Up AR track displayed Red, meaning only that 'C' Cabin's Signal No. S23 had been taken off, as 6 Up could be nowhere near that Cabin as yet. There was, of course, no indication on track circuit No. 552T. He had first cancelled 'line clear' for 6 Up with 'A' Cabin, obtained 'line clear' for the goods train from 'C' Cabin, "put back" Signal No. S-7 (meant for 6 Up) to Danger and activated the Route cancellation mechanism. Setting the route for the goods train and taking off Signal S-4 to Yellow must have been accomplished by about 22.26 hours. As he was unaware that the 2-minute delay could be avoided if 'C' Cabin's Signal No. S-23 was also put back

to Danger (thus releasing the Up AR track) the thought of cancelling the 'line clear' for 6 Up with 'C' Cabin never occurred to him.

- (vi) When he had come out of his Cabin, he was unable to see 6 Up, because his view in that direction was obstructed by the structure of the old 'B' Cabin, nor did he look towards 'A' Cabin, as he had presumed that, 6 Up's line clear having been cancelled, the 'A' Cabin's Signals would have been put back to Danger. As regards the goods train, it was not moving; the headlight of its engine was off, but he could clearly see one "marker light" on.

(c) Perusal of the Cancellation Counter Register of 'B' Cabin showed that route cancellation was done twice on 15-10-80 and once on 16-10-80, whereas the Train Register did not reflect any corresponding cancellation of 'line clear' nor the exchange of Private Numbers, nor whether the concerned trains had been brought to a stop before the route-change was effected. In an attempt to explain this position, he clarified that getting in touch with the Goods Cabin and obtaining the slot invariably took considerable time as all the Cabins were extremely busy; hence, he did not actually cancel the 'line clear' earlier obtained. Questioned further as to why, against this given background, 'line clear' to 6 Up was cancelled on 20-10-80, he clarified that he thought that it was in the interests of safety that the Driver of 6 Up should not get misled by the 'Green' aspects of the signals controlled by 'A' Cabin. For want of time, however, he did not himself personally verify that the 'A' Cabin signals had actually been put back to Danger.

(f) Queried as to why the 'line clear' with 'C' Cabin was not cancelled for 6 Up, he reiterated that he was throughout labouring under the impression that 6 Up was as yet standing at Itarsi, in which case the Driver of 6 Up would in no way become aware of the fact that Signal No. S-7 had firstly been taken 'OFF' and later put back to 'Danger'. He explained further that, as a large number of Mail/Express trains left Itarsi in the Up direction during the early part of the night, when there was also the imperative need to push out all the ordered-and-ready goods trains in Down direction, split-second decisions had often to be made to push through the latter while maintaining the over-all fluidity of the former services.

(g) Queried in relation to the provisions of SR. 36-2(c), which enjoined that a Signal should not be put back to 'ON' until, inter alia, the train had been brought to a stand unless for the express purpose of preventing an accident, he reiterated that he was still under the impression that 6 Up was as yet at Itarsi Station. It was for this reason that he did not mention anything about 6 Up to 'C' Cabin, nor sought any information about 6 Up, while obtaining 'line clear' for the goods train at 22.25 hrs.

(h) Asked as to why he did not send the goods train on the 'Up and Down Goods Line' upto 'C' Cabin, he clarified that, because signalling facilities

did not exist at 'C' Cabin for such a move, goods trains meant for North entered the main-stream only at 'B' Cabin.

19. Evidence of Shri D. R. Kulkarni, 'A' Cabin's ASM, Itarsi

(a) He stated that he granted 'line clear' for 6 Up to 'B' Cabin at 22.16 hours and obtained line clear from Dulariya Station at 22.19 hours, whereupon he had also lowered the relevant Signals No. S-27 and S-28. However, at 22.25 hours 'B' Cabin had cancelled the 'line clear' for 6 Up and, after normalising the 2 Signals previously taken 'OFF' for 6 Up, in turn himself cancelled the 'line clear' for 6 Up with Dulariya at 22.26 hours.

(b) Explaining the over-writing relating to the said cancellation (both on the Private Number and on the timings) as reflected in his Train Register, he clarified that the Private Number given to him initially was 57 by 'B' Cabin, which was later on corrected to 55. As regards the timing, the over-writing was due to his pen not functioning properly. Queried as to whether he enquired of the reason for such cancellation from 'B' Cabin, he said that he was given no reason and that, before he could obtain clarification, 'B' Cabin had put his phone down; hence, he was unable to give any reason to Dulariya.

(c) Confronted later with the evidence of the Station Master of Dulariya that the line clear had in fact been cancelled at 22.32 hours, which was later corrected to 22.26 hours at 'A' Cabin's bidding, he denied this allegation. Similarly, even when confronted with the evidence of the Goods Train's Guard (that he happened to notice, after the collision, that the 'A' Cabin's Signals for the Up road were showing the Green aspect), he maintained that he did put back the Signals for 6 Up to Danger at 22.25 hours, the time acknowledged for the cancellation of the 'line clear'. He added that, if the collision took place earlier in fact to 22.25 hours, there would be no contradiction.

20. Evidence of Shri K. L. Rohalay, Station Master, Dulariya

(a) He stated that he had granted 'line clear' for 6 Up to Itarsi 'A' Cabin at 22.18 hours. At 22.32 hours, 'A' Cabin had cancelled the 'line clear' and he understood thereafter that there was a collision between 6 Up and a goods train near Itarsi 'B' Cabin.

(b) Queried as to the over-writing relating to the time for the cancellation of 'line clear', he clarified that he received the information at 22.32 hours, but was told to enter the timing as 22.26 hours; accordingly, he first entered the time as 22.26 hours. Later, he thought about the matter and decided to enter the correct time of 22.32 hours. He had indeed checked his time with the Control at about 16.00 hours.

21. Evidence of Shri V. D. Patil, GC-1 Cabin's ASM, Itarsi

(a) He stated that he was advised by the AYM on "talk-back" that the Goods Train was ready to depart at 21.55 hours. He had obtained 'line clear' from 'B' Cabin at 21.56 hours. The train passed his Cabin at 22.15 hours. Around 22.25 hours, he

heard a loud noise, much louder than what was commonly associated in the context of shunting operations, coming from the direction of GC-2 Cabin. Hence, he rang up GC-2 Cabin to find out about the mishap, information on which he at once passed on to the Controller.

(b) Queried about the vacuum trouble experienced by the Goods Train, he did not seem to be aware of that, since the speed of the train was in any case very slow; he himself heard nothing unusual on its run.

22. Evidence of Shri S. K. Verma, Section Controller, Itarsi

(a) He stated that, as 'B' Cabin came on phone at 22.15 hours seeking instructions about the Goods Train that had arrived at his Cabin, he got in touch with 'D' Cabin to be told that the headlight of 6 Up had not yet been switched on (implying that 6 Up was not yet ready to depart); so, he advised 'B' Cabin to clear the Goods Train and also instructed him to be in touch with 'C' Cabin regarding the whereabouts of 6 Up. He had again contacted 'D' Cabin at 22.20 hours and learnt that, although its headlight was now 'ON', 6 Up's engine had not yet whistled for departure.

(b) When he got 6 Up's departure particulars as 22.23 hours from 'D' Cabin and 22.25 hours from 'C' Cabin, he came out into the verandah of the Control Office to see the goods train still standing, whereas 6 Up was proceeding at speed towards 'B' Cabin, the Signal of which was showing 'Red' at that time. He, therefore, rushed back into the Control Office to enquire from 'B' Cabin about what was being done to let 6 Up proceed ahead, but 'B' Cabin did not respond. It was only at 22.30 hours that 'B' Cabin phoned to say that some bogies of 6 Up had derailed, whereupon he lost no time in taking further necessary action. It was perhaps after the lapse of an hour or so that he became aware that, in fact, there was a collision instead of merely a derailment.

(c) During the ensuing cross-examination, he provided the following clarifications:—

(i) The urgency for despatching this Goods Train arose because it was an inter-change train. Although the load was 1011 tonnes, it could be treated as a "banking load" and such loads were not accepted by the Bhopal Board beyond 22.30 hours. Because of a succession of Mail/Express trains in the Up direction during the early part of the night, there was always a tremendous pressure in Itarsi Yard with regard to despatching of Down goods trains towards Bhopal. Also, the extant policy was not to order any train beyond 20.05 hours towards Bhopal, if it was to be reckoned for the same day's statistics.

(ii) He was quite convinced in his own mind that it was 'B' Cabin which took the initiative in this matter by reporting to him that the Goods Train was waiting at the "exit point" and the distinct impression he got was that all that was needed in this context was his OK for this Goods Train to be quickly pushed through.

(iii) He merely gave his permission for the Goods Train to proceed, after having fully satisfied himself from 'D' Cabin that 6 Up was not yet ready to leave Itarsi Station. He, however, had no reason to go out of the Control Office, in order to personally verify whether or not the Goods Train had indeed arrived at the "exit point", i.e. short of 'B' Cabin's Signal No. S-4.

(d) In view of the disparity in the evidence tendered by him and that tendered by the 'B' and 'C' Cabins, he was confronted with the ASMs in charge of these 2 Cabins, one by one; yet, this measure did not produce any change in the testimony as each one maintained his own stand. In further amplification of his actions, the following sequence was submitted, commencing from the stage that 'B' Cabin rang him up about the Goods Train:—

- (i) Called 'D' Cabin to find out the position of 6 Up;
- (ii) Called 'D' Cabin again at 22.20 hours about 6 Up, to be told that it was not yet ready to depart;
- (iii) Instructed 'B' Cabin to despatch the Goods Train ahead of 6 Up;
- (iv) Received information from 'C' Cabin that 6 Up passed at 22.25 hours;
- (v) Contacted 'D' Cabin to be advised that 6 Up passed at 22.23 hours;
- (vi) Rushed out into the verandah to check up on the goods train;* and
- (vii) Rushed back into the Control Office to ring 'B' Cabin, but with no response.

(e) When his attention was drawn to Central Railway's SR-37(3) which enjoined that, "once definite instructions have been issued, these instructions must not be altered except in an emergency, as it must be realised that a sudden change of orders is apt to upset the working of trains", he admitted to be aware of this Rule. He also submitted that, in this particular instance, the urgency surrounding the despatch of the Goods Train was generally known to all and, furthermore, there was no question of "upsetting the working", once the initiative was taken by the Cabin itself. He also averred that the ASM at 'B' Cabin was in no way absolutely bound to obey his instructions, if they in any way jeopardised the safety aspect. Moreover, no one could really foresee that the Goods Train would itself be unable to move. He also denied that there was anything extraordinary about the decision to send the Goods Train ahead, as similar decisions had to be taken time and again in the past without any danger.

(f) As he admitted to be aware of the 'caution order' restricting the speed of 10 Km/h between 'B' and 'A' Cabins, he was asked as to whether any control was exercised at his level to ensure that this

restriction was in effect observed by Drivers and his reply was that, by and large, Drivers were pulled up only for loss of time. Furthermore, unless accurate information was provided firstly on the minimum running time and secondly on the extra time that must be taken in order to obey any given speed limit, it would be difficult to pull up any errant Driver. In this particular instance, he was not aware of how much extra time the Mail/Express trains should have taken between Itarsi and Dulariya, had they strictly observed the imposed stringent speed restriction.

23. Evidence of Shri G. S. Neelwarne, Area Controller, Itarsi

He stated that No. 747 was a sectional goods train and the Bhopal Controller would no doubt suitably regulate the attaching and detaching at way-side stations so as to avoid having to "bank" this train on the Budni-Barkhera ghat section. Against this background, he felt that this train would have been accepted by Bhopal Board even beyond 22.30 hours and he accordingly felt that there was no reason for any psychological pressure† for despatching this train. He also denied enquiring from 'B' Cabin, let alone twice, about the position of this goods train.

24. Evidence of Shri S. L. Kurele, Section Controller, Itarsi

He stated that, the principal purpose of operating a sectional goods train being to attach and detach wagons at way-side stations, the load on such a train should understandably vary over its run. That was why those trains, exiting from Itarsi even with less than 1100 tonnes but more than 1000 tonnes, could conceivably become "banking loads" subsequently. Accordingly, he was quite certain that this particular train (i.e. No. 747 of 20-10-80) would not have been accepted by Bhopal Board, unless it was pushed past the 'F' Cabin by 22.30 hours. Perusal of the Interchange Book maintained at Itarsi would substantiate his assertion, with only very few exceptions. He also added that, because of movements having to cross the Up Line, there have been occasions galore of Up trains being stopped at 'B' Cabin for departure of Down goods trains, or at 'A' Cabin for admission of Down goods trains. Similar was the case with the stoppage of Down trains at 'B' Cabin, so as to permit the despatch of Down goods trains via the Down Main Line. All this was quite unavoidable, being an in-built feature of the track lay-out.

25. Evidence of Shri G. H. Patil, Driver of 6 Up

(a) He stated that on 20-10-80 he signed off duty at 11.30 hours and after availing 9 hours of rest he signed on again at 20.30 hours. He took charge of WDM-2 diesel engine No. 17605 and brought it to the station area at 22.05 hours. He left Itarsi at 22.20 hours, having received a Caution Order to proceed at 10 Km/h from 'B' Cabin to 'A' Cabin.

* He added that, because of adequate yard-lighting, he was able to make out clearly one person (quite possibly, the Assistant Driver) with his back towards the yard, which was probably why the Assistant Driver might not have picked up the Red aspect of the Signal ahead much sooner.

† The evidence of Shri Asit Gupta, the Senior Divisional Operating Superintendent, Bhusaval, substantiated this view.

(b) All the signals operated by the 'D' and 'C' Cabins were taken off and he was also able to see from a considerable distance the 4 Colour Light Signals (1 operated by 'B' Cabin and the other 3 by 'A' Cabin) because of their long-range visibility. On his approach to 'B' Cabin, he was travelling at about 45 Km/h in view of the speed restriction ahead.

(c) However, he was perplexed to notice that the 'B' Cabin's Signal ahead of him suddenly displayed Red and he immediately applied the vacuum brake as well as the dynamic brake in order to quickly bring his train to a halt. All his efforts notwithstanding, he overshot the Signal and, as he entered the goods line on the left, he applied the dynamic brake to the 16th notch and the vacuum brake to the over-reduction position. A collision occurred and, as he sustained injuries, he lost consciousness.

(d) During the ensuing cross-examination he added that, of his 35 years of total service, he was working as a Mail Train Driver for the last 6 years and that he was quite familiar with the Itarsi-Bhusaval road. The headlight of his engine was working satisfactorily but, as the speedometer on the Driver's side was defective, he had to rely the information given to him by his Assistant.

(e) Further cross-examination brought forth the following clarifications:—

(i) He wore glasses and, when he reported for duty on 20-10-80, he had an extra pair of spectacles and also a watch; while the glasses worn by him got smashed in the accident, the latter two also got lost at that time, as they were not on him when he was taken to the hospital.

(ii) Before signing on, Drivers were expected to go through all the instructions kept in separate folders: 'O' for Operating, 'E' for Engineering and 'G' for General, and, as usual, he had gone through all the circulars and instructions.

(iii) He did recall going through the Circular Notice issued by the Division before the commissioning of the new 'B' Cabin. He pointed out, however, that very little in this Circular concerned Drivers as such and all that he could make out was that the existing signalling system at 'B' Cabin was being replaced by Colour Light Signals. To all intents and purposes, this Notice was apparently meant only for those concerned with the actual commissioning of the new 'B' Cabin, as neither the salient features of the new 'B' Cabin nor the important changes in the signalling (such as the revised location of new signals, deletion of existing signals, etc.) were highlighted. Thus, it was largely left to the Drivers themselves to find out all by themselves about the new signalling, regarding the knowledge of which he expressed confidence*.

(iv) There was no one in the Loco Shed who was entrusted with the specific responsibility of explaining these changes for the benefit of Drivers. By and large, in order to clear their doubts, Drivers were expected to seek clarification from the Assistant Loco Foreman in charge; this supervisors was, however, mostly tied up with his own "Shed work".

(v) Observance of this severe speed restriction of 10 Km/h right from 'B' Cabin upto 'A' Cabin would have resulted in a time-loss of 10 minutes, which was quite substantial in the context of the heavy emphasis that was placed on punctuality of Mail/Express trains. He confessed that this speed restriction was not observed by him even on his earlier trips within the past fortnight prior to the accident. The Caution Order itself merely stated the reason as "Colour Light Signalling", which gave the impression that this speed restriction was imposed because of some teething troubles associated with the 'B' Cabin working. In other words, it was not as if this was on account of track, etc., where safety was involved.

(vi) As regards the locomotive, although the VCD was dummied and the conjunction valve (for synchronisation between air and vacuum brakes) was inoperative, he had no complaint to make about the brake power either of the locomotive or of the load; nor had he any reservation about the visibility at the time of the accident.

(vii) It was the standard practice for 'line clear' to be taken well in advance for Mail/Express trains for them to run through without any hold-up at wayside stations; this was particularly so for Double Line Sections. 6 Up being a prestigious train of the Railway, the expectation was that all the signals for the Up Main Line would be displaying Green and, on that day also, all the signals, as far as he could see, were all Green, which was just as he expected. As to the time element, he had passed 'C' Cabin at about 22.25 hours.

(viii) He was perhaps 15 m. in rear of Signal No. S-7 when he became aware that it was showing 'Red'. Asked to express himself with reference to the time-frame, he felt that he must have become aware of this some 15 seconds or so before reaching Signal No. S-7. The engine headlight was bright and, unable to see any obstruction ahead on the track, he could not imagine any emergency that might have conceivably called for this Signal to be put back to 'Danger'. He accordingly reasoned that this Signal's 'Red' aspect was not genuine,

* In his replies, however he repeatedly referred to the 'A' Cabin's 3 Signals showing their Green aspect and, only when confronted with my observation (pursuant upon the visibility trials conducted by me), did he admit that there were probably only 2 signals for the Up Main Line controlled by 'A' Cabin. Thus, he was not really fully knowledgeable of the recent changes introduced in the signalling.

but caused instead by some teething troubles of the newly installed signalling system. Another major factor that contributed to this conviction was the fact that he could clearly see, right upto the time that he took the cross-over to the left, the 2 Signals ahead continuing to show 'Green'. It also occurred to him that Signal No. S-7 might have been put back to Red perhaps just to warn him of the Caution Order of 10 Km/h.

- (ix) Even though the headlight was bright, as his main attention was to locate any possible obstruction in his path, he failed to notice that the 'facing points' were actually set in the "reverse mode". In other words, it was only as 6 Up started negotiating the cross-over did he realise that there was something unusual and, even, then he couldn't simply resort to the full application of brakes abruptly, as that action would surely have caused a derailment on his train, with serious consequences.
- (x) The other engine on the Goods Waiting Bay (South) was standing some distance away from the Up & Dn Goods Line on a curved approach, whereby he was unable to notice it until 6 Up was some 2 TPs (Telegraph Poles) away from it. At that stage, he immediately took all possible steps to control his train and his Assistant lifted up the flap valve of the emergency vacuum brake, but it was too late to prevent a collision.
- (xi) According to his estimate, the speed of 6 Up at the moment of impact was around 25 Km/h. He explained the circumstance that the speedometer needle was stuck at a reading corresponding to 68 Km/h as possibly the result of the jerk caused by the collision. As regards the SA-9 valve, he asserted that he operated it fully, even though the position of the handle observed after the accident might indicate otherwise.

(f) Confronted with the 2-minute time-delay that is in-built into the approach locking circuitry and the logical inference that he must not have therefore kept Signal No. S-7 under continuous observation for almost 2 minutes, he maintained that he was keeping a sharp look-out ahead and denied having got busy with any miscellaneous but legitimate duties in the cab, after having satisfied himself, when he was probably very much in rear of this Signal, that it was then showing 'Green'. He felt that lack of familiarity with the newly introduced signalling system was probably the cause for the change in the aspect of Signal No. S-7 from Green to Red not having registered in his mind promptly. He did feel that, had this Signal been pre-warned by another one in rear of it, there would have been no scope for any guesswork or rationalisation on his part, particularly as the other Signal in rear would have displayed 'Yellow'.

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(g) Confronted with 'A' Cabin's evidence that 2 Signals for the Up road had been put back to 'Danger' he reiterated that, as he was indeed looking ahead for any possible obstruction, he kept these Signals in view and they both were 'Green', until the time that he got on to the goods Line and concentrated on braking his train.

26. Evidence of Shri Gurunath Sitharam, Assistant Driver of 6 Up

(a) He stated that his train left Itarsi 5 minutes late (i.e. at about 22.20 hours) and all the concerned Signals were taken off, as expected. He had picked out the 'Green' aspect of Signals and repeated the information to the Driver, who also confirmed the same, as per the usual practice. However, when the engine was hardly 3 m. in rear of 'B' Cabin's Signal, it suddenly changed to 'Red' and he immediately pointed this out to the Driver. Inasmuch as the 3 Signals ahead continued to display 'Green' aspect, the Driver was confused about this sudden development. Almost immediately, the train took the cross-over on the left side towards the Goods Yard and the Driver immediately took all measures to control the speed of the train.

(b) He felt that the speed was between 40 and 50 Km/h at the time of negotiating the turnout. Suddenly, in the 6 Up's headlight another engine was sighted ahead and he immediately lifted the flap valve of the emergency vacuum brake and this was all that he could do before the physical impact of the collision, which caused him to fall down unconscious in the cab.

(c) During the ensuing cross-examination, he stated that he had over 10 years of accident-free record of service on Mail/Express trains and added that he was only 50 feet (15 meters) from the engine ahead, when he noticed it. In his opinion, the speed at the moment of impact was under 30 Km/h.

(d) Queried about the aspect of the signals controlled by 'A' Cabin, he stated that these signals were displaying 'Green' until the time that he spotted the engine ahead, whereafter he was concentrating elsewhere, as stated.

(e) When confronted with the possibility that, from the left flank of the engine, he could not have spotted both the 'A' Cabin's Signals (as the view of the farther one was obstructed by the nearer one), he accepted this version. He, however, maintained that he picked up the 'B' Cabin's Signal from the "Sighting Board" and found it 'Green' at that time and, to the best of his recollection, this Signal changed to 'Red' when he was some 3 m. in rear of it.

27. Evidence of Shri P. N. Parashar, Guard of 6 Up

(a) He stated that 6 Up left Itarsi at 22.20 hours and the accident took place at 22.27 hours. During subsequent questioning, he added that the speed of the train was between 50 and 60 Km/h as it passed 'C' Cabin. He did not recall having sensed that the train was being braked.

(b) When questioned with reference to the Caution Order No. E 462048 in relation to 6 Up's speed, he made out that he applied the vacuum brake gradually until the reading in the gauge showed about 8 or 10 cm, as he also felt that the Driver might not be able to reduce the speed to 10 Km/h, while passing the 'B' Cabin.

28. Evidence of Shri Babulal Mulchand, Driver of the Goods Train

[This was recorded during the visit on 23-10-80 to the Bhopal Medical College Hospital, where he was admitted with serious injuries. Despite his obvious suffering, he willingly gave replies to questions and it is a matter of deep regret that he died in the hospital a few days later.]

He stated that, as the Goods Train was ordered at 19.05 hours, he had reported for duty alongwith his 2 Firemen at 16.30 hours, after all of them had availed adequate rest. In the event, however, the Goods Train was ready to depart only at 21.40 hours and finally left the yard from line No. 4 at about 22.10 hours, arriving short of 'B' Cabin by 22.15 hours. At that stage, Signal No. 4 was showing Red but, although it soon changed to Yellow, he was unable to re-start because of some vacuum trouble. He therefore, had to depute his 2nd Fireman, Shri Ram Prasad, to examine the load and find out what was wrong but, within a few minutes, a diesel engine driven train rammed into his engine making it to skid and roll back. He was thrown out of the engine and lost consciousness. Queried as to why he had stopped as far back as about 280 metres in rear of Signal No. 4, he replied that he did experience some difficulty on account of vacuum trouble even on the short run from the yard.

29. Evidence of Shri Ram Prasad, the Goods Train's 2nd Fireman

(a) He stated that, after it left Goods Cabin No. GC-1, his train halted near Goods Cabin No. GC-2 and he was instructed to examine the load for vacuum trouble. Accordingly, he got down on the left side of the train and walked along the cess checking the train pipe. After about 5 minutes, he heard a loud thundering noise and his train suffered a big jolt and he at once rushed back towards the engine but it was only after about half an hour that it became safe to approach the engine. Shri Bhandari, the 1st Fireman, was found dead, whereas the Driver had to be carried away in an unconscious state.

(b) During cross-examination, he admitted that there was some vacuum trouble while on the run from the yard but, during the 5 minutes or so that he examined the load, he was unable to detect any defect. When his train stopped, the Signal No. S-4 ahead was showing Red; afterwards, he had no occasion to look at it again. He had no knowledge of the aspects shown by the 'A' Cabin's Signals for the Up Main Line.

30. Evidence of Shri M. D. Sharma, Guard of the Goods Train

(a) He stated that his train started from line No. 4 at 22.10 hours, arriving short of 'B' Cabin at 22.22 hours. At that time, Signal No. S-4 was

showing 'Red' and the 'A' Cabin's Signals were showing 'Green' for the Up Main Line. Within 5 minutes, he experienced a big jolt and was thrown about in the brakevan; seconds later, he experienced another jolt. The time was then 22.28 hours and, perplexed at this development, he got down on the right side and walked towards the front of the train, but did not find any engine attached to the front. Later, when he found the wreckage, part of which was blocking the Main Lines, he rushed to Goods Cabin No. GC-2 to raise alarm.

(b) Questioned as to the aspect of Signal No. S-4 at the time of the accident, he explained that, as 'A' Cabin's Signals for the Up Main Line continued to show Green, he presumed that there would be no change in the aspect of Signal No. S-4.

31. Evidence of Shri T.N.G. Pillay, Senior Loco Inspector (Diesel), Itarsi

(a) Questioned regarding the measures adopted for familiarising Drivers of changes made in the Signalling System, he clarified that, other than the issue of Caution Orders and posting of the Circular Notice in the Loco Shed, there were no special steps taken in this respect, as it was not possible to collect all the Drivers together to organise a special session for this purpose. He, however, felt that, in future, Safety Counsellors (Loco) could be associated with such work, in order to make out a brief note in the local language, which could explain in simple terms any changes effected and their noteworthy features.

(b) He frequently accompanied Drivers on the footplate, and he felt that this particular accident occurred because the Driver was clearly unable to correctly interpret the change in the aspect of Signal No. S-7; the Driver might have possibly likened it to the "Bobbing of Signals" on the Automatic Signalling Territory. To add to this confusion, the Driver would have received two severe jolts in quick succession as 6 Up's engine negotiated the sharp curvature of the 1 in 8½ cross-over at high speed. By the time he recovered and then taken all possible steps to control his train, it was probably too late to avoid the collision.

(c) With reference to the joint observation of the condition of equipment in the diesel locomotive's cab [para 13(f)], he clarified that no mention was made of the position of the throttle because, unless it was in the idle position, the dynamic brake could not be applied. As regards the SA-9 valve (the handle of which was in the released position after the accident), he felt that, as the handle would be locked in that position if it were fully operated, the Driver was most probably holding on to this particular handle at the moment of impact when, alongwith the forward movement of his body, the handle also must have been pushed forward in that very instant of impact.

(d) As regards the speed, he reckoned that it could have been around 30 Km/h at the time of impact and further that credence need not be placed on the circumstance that the speedometer needle was stuck at a reading showing 68 Km/h, particularly because 6 Up would certainly have failed to negotiate the 1 in 8½ cross-over without derailment, had the terminal speed at the moment of impact been as much as 68 Km/h.

32. Evidence of Shri N. N. Kakkar, Signal Inspector (Route Relay Interlocking), Itarsi

(a) He stated that the Caution Order of 10 Km/h was imposed in compliance with SR 28/1 but it was issued, even after its cancellation, on 20-10-80. After coming to know of the accident, he attended the 'B' Cabin, which was promptly sealed for the purpose of preservation of clues. He then found that the left-hand tongue-rail of Point No. 205 on the Up Main Line was bent, having got trailed through. The roddings of the point machine were also badly bent, with other parts (such as, friction clutch, bearings, etc.) damaged, too. The roddings were then disconnected and the tongue-rail got jim-crowed by the Permanent Way Inspector, in order to facilitate the use of this cross-over for the sake of accident relief measures.

(b) During the ensuing cross-examination, he clarified that, on the first day, a 10 Km/h restriction was necessary because the points were initially non-interlocked during the actual phase of commissioning the new 'B' Cabin and that the same speed restriction was maintained for the sake of continuity. He added that, so long as he was in the 'B' Cabin, all Drivers were observing this speed restriction. For the sake of brevity, the Caution Order mentioned the reason as "Colour Light Signalling" and it was not the practice to refer to changes in signalling locations, etc., in the Caution Order.

(c) As regards on-the-job training imparted to Cabin ASMs in 'B' Cabin, there was no specific procedure prescribed as such. Shri Saxena was given this training for 6 days, watching closely and carefully at day and night the actual working of the Panel, how to operate it, the Calling-On Signals, Route Cancellation, etc. The procedures to be adopted under abnormal conditions were also explained, such as the use of the crank handle, action to be taken when a track circuit was 'down', etc. However, that a Signal, once taken Off for a train, should not be put back to Danger unless in an emergency was not told to him, as this was a well-known concept covered by extant Rules and also mentioned as such in the Station Working Order for this Cabin.

33. Evidence of Shri C. J. Jiandani, Asst. S & T Engineer (Construction), Bhusaval

In reply to questions put to him, the following clarifications were provided :—

(a) Special dispensation was obtained from the Commission of Railway Safety, vide Section No. 464 of 3-4-78, for treating the 'B' Cabin also as a non-Block Cabin of the Special Class Station, Itarsi, with Standard III Interlocking.

(b) As regards movements on the Main Lines, the conditions precedent to granting "Line Clear" were actually proved with the aid of the relevant track circuits and associated relays and circuitry by the Cabin in the rear, thereby obviating the need for any ICC (Inter-cabin control). However, the

Up and Dn Goods Line functioned as a Single Line and ICC by way of inter-slotting had been expressly provided to ensure safety to movements on this line.

(c) As Block-Working 'per se' had been dispensed with, the question of issuing any fresh Block Competency Certificates did not arise after the commissioning of the new 'B' Cabin and it was sufficient that Cabin-ASMs were rendered competent by imparting training to them in adequate measure.

(d) The approach-locking concept incorporated here was the standard feature which provided a certain in-built safety principle that was just not available in the past, when a set route could be altered immediately after throwing back the concerned Signal to Danger. However, the hazard was still there, if the Driver did not keep a sharp look-out ahead and continued to be in motion even after the lapse of the 2-minute time-delay upon the Stop Signal displaying 'Danger', with consequent failure to stop clear of that Signal afterwards.

34. Evidence of Shri M. Krishnaswamy, Senior S & T Engineer, Bombay

In reply to questions put to him, he provided the following clarifications :—

(a) With reference to Multiple Aspect Colour Light (MACL) Signals, para 119(e)(i)* of the Signal Engineering Manual (SEM) applied generally to MACL Signalling Territory, but not in such cases where the Signal in rear was of orthodox 2-aspect Lower Quadrant (LQ) type, the 'Green' aspect of which implied, in terms of GR-7 (c), that a Driver could proceed ahead duly prepared to find the next Signal either 'Green' or 'Red'. It was, in fact, in view of this immediately preceding LQ Signal ('C' Cabin's Signal No. S-23) that a signal overlap of 180 metres was provided as adequate distance beyond 'B' Cabin's MACL Signal No. S-7.

(b) It was unusual to provide a Distant-type Permissive Signal within Station Limits, because it tended to create confusion in the minds of Drivers. For instance, in the case of a 'no light' condition, the 'Permissive Signal' could be passed by a Driver without any special authority, which was not the case with Stop Signals.

(c) Whereas SEM para 109 stipulated the provision of a Warning Board when changing from the Multiple Aspect Signalling Territory to a 2-Aspect Signalling Territory (because the 'Green' aspect of the latter system was more restrictive than the 'Green' aspect of the former) the erstwhile Warning Board (provided in the past in the context of Block Working between 'C' and 'D'

* Aspects generally : (i) When a signal is displaying the Danger aspect the Signal next in rear must not display a less restrictive aspect than caution.

Cabins) was retained (excepting for re-siting) to serve as a reminder to a Driver that he was approaching Colour Light Signalling Territory. This Warning Board would be removed after the new Central Cabin was commissioned with route relay interlocking to replace all the existing Cabins at Itarsi, other than 'A' and 'B' Cabins.

- (d) In the future arrangement after commissioning the new Central Cabin, the erstwhile 'C' Cabin Signal No. S-23 would be replaced by a 4-aspect Starter and it would be impractical* to provide more Signals in yards, even when they were not warranted from line capacity considerations, just to keep the inter-signal distance to about a kilometer.

35. Evidence relating to the outbreak of fire in SLR 6171 CR during the afternoon of 21-10-80

(a) Shri R. S. Bhatnagar (Carriage and Wagon Superintendent, Itarsi) stated that gas-cutting was resorted to on that morning also. In fact, the only alternative means available comprised hack-saws or hammers and chisels which proved totally ineffective to cope with the situation. Since the recovery of bodies could not be delayed, recourse to gas-cutting became unavoidable and 12 Nos. of portable hand-held fire extinguishers were kept on hand, while fall within the Coach. He added that it was unfortunate were used to douse the red hot molten metal as it fell within the Coach. He added that it was unfortunate that, despite these precautions, fire did break out and all the more regrettable that the 'V' belt of the fire engine had snapped at the crucial juncture, thus allowing the fire to gain control. He felt that a trailer pump ought to form an integral part of the Break-down train's tools and plant and, as a possible alternative to gas-cutting, heavy-duty high-speed cutting equipment should be provided.

(b) Shri Anil Kumar Pillay (Skilled Rivetter/Boiler-Maker of Itarsi Loco Shed), who worked continuously right from 23.10 hours of 20-10-80 upto 13.30 hours of 22-10-80, corroborated the above and added that, as the lights in the SLR had got extinguished in this accident, the rescue squad had to use battery-operated hand-torches and further that, initially hammers and chisels were used to break into this Coach and make access-ways very carefully in order to preclude even the least possibility for any further injury to be caused to persons trapped within. In this manner, 3 'alive' persons were extricated besides 11 dead bodies. He also clarified that the fire (which, alas, broke out in the SLR) managed to spread into the Diesel Loco as also Coach No. CR 6693 WGSYCN (both of which were mounted over

by the ill-fated SLR), because the Police Authorities at the site did not accord their clearance for any breakdown operations as such, until all the bodies were extricated from this SLR Coach.

(c) Dr. D. R. Bapat (Medical Superintendent, Bhusaval) added that any allegation that this fire might have been caused deliberately was simply malicious and held that the 3 bodies recovered subsequently were not charred beyond recognition or identifiability. He added that, when 2 bodies were recovered at 17.30 hours on 21-10-80, every one (including the Government Railway Police) felt certain, after having thoroughly searched the wreckage of this SLR, that no more dead bodies remained in it. On the next day, however, it was at his personal insistence that a thorough search was once again organised (the position of the SLR having in the meantime been shifted by the previous evening's breakdown operations), with the result that one more body was recovered.

36. Evidence on the areas needing improvements

(a) Dr. D. R. Bapat, the Railway's Bhusaval-based Medical Superintendent, felt that—

- (i) Pathways should be provided across yards at suitable intervals, so as to facilitate movement generally and, more so, particularly when stretchers bearing patients are to be carried across the yard. In this case, the progress was necessarily hampered in having to take care that the rescue teams conveying the injured did not themselves trip over the rails, etc;
- (ii) The emergency lighting equipment was never adequate to deal with major accidents of this magnitude; in this case, providentially, it was possible to commandeer extra lighting as the "visarjan" of the Durga image at the culmination of the Dassera festivities was proceeding in procession just at that time; and
- (iii) There was a need to plan for a volunteer force of the St. John's Ambulance Brigade (SJAB)—type which could be pressed into service along with the ARME Van and its paraphernalia. In this case, whereas as many as 15 stretchers could be mustered which required, for their full utilization, at least 60 persons for conveyance, the absence of a formalised arrangement to organise such a body of men (and, that, too, at night time) was acutely felt.

(b) Shri B. P. Singh, the Itarsi-based Sr. Divisional Mechanical Engineer (Diesel) felt the dire need for a new kind of equipment (for cutting

*However, the Railway has since contemplated the provision of an additional Starter mid-way between the 2, in compliance with the recent directive from the Railway Board (vide letter No. 76/W3/SG/G/9 of 1-11-80) calling for a review of inconvenient locations, and the provision of additional signals wherever considered necessary in order to curtail the inter-signal distance. In this instance the object is to restrict the length over which a movement will last if the Calling-On Signal operated.

NOTE : Shri Pannabh (Head Rayshak and Trailer Pump Operator, Itarsi) and Shri Raghavendra Pandey (RPF Rakshak Itarsi New Yard) generally substantiated the above statement.

NOTE : Shri B. P. Singh (Sr. Divisional Mechanical Engineer (Diesel), Itarsi) corroborated Shri Pillay's evidence and added that the Police did not authorize break down operations on the SLR Coach until the evening of 21-10-80, probably in order to avoid any possibility of avoidable mutilation of the bodies trapped inside.

through the coach-work's metallic shell) that was not torch-based, but which was small and yet powerful enough to satisfy the desideratum of speedy operating capability in narrow and confined spaces.

(c) Shri R. S. Bhatnagar, the Carriage & Wagon Superintendent, Itarsi, felt that, to meet the fire-fighting contingency, a trailer pump should be provided on the Breakdown Train itself.

VI. TESTS AND OBSERVATIONS

37. Inspection of the Accident Site on 22-10-1980

(a) Recovery of the last dead body (as confirmed later on) was being effected from the wreckage of SLR 6171-CR. The body was immediately shrouded properly and handed over to the Police.

(b) As mentioned in para 2(a), the 2 Main Line tracks had already been restored for traffic prior to my visit to the site. Work on the Up-and-Down Goods Waiting Bay (South) was on hand, but as yet the 2 locomotives had not been touched, excepting for removal of the speed-recorder for safe custody. The damaged rolling stock was inspected, and the damage was as narrated in para 10.

(c) The cab of the damaged WDM-2 Diesel Loco No. 17605 was then inspected and, besides confirming the observations (i) through (v) and (viii) of para 13(f) supra, the handle of the throttle was observed in the 'idle' position. Since most of the equipment in the Driver's cab was completely destroyed by the fire on the afternoon of 21-10-80 [para 10(a) supra], no recovery was possible of either its A-9 vacuum brake valve, or its SA-9 air brake valve, thus precluding any possibility of conducting braking distance trials with this equipment, in order to rationally and independently assess the effectiveness of the braking system of the ill-fated locomotive.

(d) The Inter-Signal Distances relating to Signals encountered by 6 Up were measured as below:—

D Cabin's	S-14	275 m. from centre-line of Itarsi Station.
"	S-20	319 m. from S-14
"	S-21	408 m. from S-20
C Cabin's	S-42	462 m. from S-21
"	S-23	347 m. from S-42
B Cabin's	S-7	2,708 m. from S-23
A Cabin's	S-28	1,132 m. from S-7
"	S-27	524 m. from S-28.

The Warning Board [see para 12(e) supra] was found to be located 1,422 metres in rear of Signal No. S-7.

(e) The distances travelled by 6 Up after having passed the 'B' Cabin Signal No. S-7 at DANGER were as below:—

287 metres	before bursting/tralling through the Points of Cross-over No. 205.
313.5 metres	before negotiating the 1 in 8½ cross over No. 204.
419.5 metres	before entering the Goods Line.
716 metres	before coming to a halt after colliding head-on with the Goods train.

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38. Inspection of 'B' Cabin on 22-10-1980

(a) It was seen on the Panel (and also verified from the site) that Signal No. S-7 was exhibiting its 'Red' aspect and that the route was set from the Goods Waiting Bay (South) to the Down Main Line. The white lights for the route on Cross-over No. 204 were lit, with the locking indication for the points displayed. Track-circuit Nos. 559T and 562T were showing 'Red' (i.e. occupied), the former because of the presence of the 2 engines and the latter because the track was yet to be restored fully. The reverse indication for Cross-Over No. 205 was flashing continuously in the "slits", whereas the white route lights on either side of the cross-over were missing (the crank handle having been used several times, subsequent to the accident, for passing the ARME Van, Breakdown Train, etc.); the locking indication for the points did, however, appear on the Panel.

(b) The seal of the Relay Room was got broken and the inside inspected with respect to the various seals and the last-operated position of relays, which would remain unaltered as the Panel itself was not touched after the accident, with all subsequent movements accomplished only by crank-handling of points and 'T-32.B Paper Authority'. My observations were as under:—

- (i) The seals of all the relays, including those for all the AJTRS (and, in particular, that for Signal No. S-7) were found intact;
- (ii) The non-correspondence Yellow lights were seen flashing on point group Nos. 201, 203, 204 and 205, because of crank-handling of points for operational reasons, with 'B' Cabin working having been temporarily suspended;
- (iii) In regard to Point Group Nos. 204 and 205, the RWLR-1, RWLR-2 and RWLR-3 latch relays as well as the W(R)LR relay were all found operated (i.e. picked up), which proved that these 2 point groups (cross-overs) were set and locked in the reverse position at the time of the accident;
- (iv) In regard to Point group Nos. 202 and 203, the NWLR-1, NWLR-2 and NWLR-3 latch relays as well as the W(N)LR relay were all picked up, proving thereby that all the related points were set and locked in their normal position. However, Point group No. 201 was in normal position, but not locked;
- (v) As regards Signal Groups for Signal Nos. S-1, S-2, S-4, S-5, S-6 and S-7, the red indications were lit corresponding to the 'RED' aspect of these Signals. (All these Signals were indeed showing 'RED' at the site);
- (vi) The Route groups for 202 A/B and 205 A/B were showing both the red light and yellow light, the red light thereby indicating that the route was set and locked, with U(R)LR relays duly picked up; by reference to the U(R)S relays in the upper tier, it was noted that 202 was in normal mode and 205 in reverse; and

(vii) The clockwork timing device, of SIEMENS make (Type Rs Sk 30/0052) with a positive drive, permitted the time-delay mechanism to be pre-set upto 5 minutes on a dial-gauge. For this Signal No. S-7, the setting corresponded to 2 minutes.

(c) With reference to Annexure III, the route locking for Point group Nos. 202A, 205, 203 and 204 was got released in my presence by the use of EUYN push-button. The route for S-7 to 558T (i.e. for the Up Main Line) was initiated and Signal S-7 cleared, before actuating the route cancellation mechanism by operating the EUUYN push-button. The flashing light indication lasted fully 2 minutes but, as the track in that region was broken and/or occupied by the 2 engines, there was no response to the move made to initiate the route from Signal No. S-4 to 407T. Similarly, the route holding of Signal No. S-7 by the occupation of the Track Circuit 553-T ahead of it was also verified.

(d) Having got further repeated trials of similar nature performed in the 'B' Cabin, I was entirely satisfied that, once a route was set, the wrong operation of several combinations of buttons did not have any effect whatsoever, thereby proving the structural integrity of the route-relay-interlocking circuitry installed here.

(e) With efficient and speedy manipulation of the buttons provided on the Panel, it was found possible to alter a set route within a matter of 24 minutes (135 seconds) as follows, after Signal No. S-7 was put back to 'Danger'.

Task	Time (Seconds)
Activating route cancellation	5
Time delay for release of approach-locking	120
Setting the new route (pushing proper buttons)	5
Motor operation of Points & Signal taken 'Off'	5
Total	135

(f) 'B' Cabin was provided with 5 telephone instruments as below :—

- (i) Control Telephone, connected to the Itarsi-Khandwa Board;
- (ii) Control Telephone, linked to Area Control;
- (iii) Group Telephone, to 'C' Cabin (2 rings), and 'D' Cabin (1 ring);
- (iv) Group Telephone, to 'A' Cabin (1 ring), GC-1 Cabin (2 rings) and GC-4 Cabin (4 rings); and
- (v) Auto Telephone with dialing facilities, connected to all the Cabins and the Station.

(g) Contrary to the conditions prescribed for fulfilment, vide the Railway's Joint Operating and Signalling Circular No. W. 828/BN/Policy of 14-4-78, before Panel Interlocking is commissioned at stations, it was observed at the site that the operating panel of this new 'B' Cabin was not so located as to

afford the Cabin-ASM as wide a view of the station yard as possible, nor was the panel so installed as to ensure that the Cabin-ASM ordinarily faced towards the yard. During the ensuing discussions, however, an opposite view was preferred by Officials of the S&T Department that, once all the physical characteristics of the track lay-out, the signal aspects and the track occupation were very carefully and faithfully reproduced on the panel itself, there was really no cause to think in terms of the Cabin-ASM having to look out for the situation obtaining outside; it was added that the field and depth of vision were anyhow limited by physiological factors as well as various structures which tended to obstruct the view.

(h) All Signal-lamps are double-filament type for the Colour Light Signalling, with the main consuming 25 Watts and the auxiliary of 8 Watts.

39. Trials to test the visibility of Signals and effectiveness of approach-locking and back-locking for Signal No. S-7—

(a) The general descriptive details were as under :—

Date/Time : 02.30 to 3.00 hrs. on 24-10-1980.
 Test Engine No. : WDM-2 Diesel Locomotive No. 18459, driven by Shri Mohan Singh with short hood leading.
 Officials present : Shri F. J. Correya [Dy. CRS (Optg.) on the test engine besides myself], S. Anantharaman [Sr. DSTE], T.N.G. Pillay [Sr. Loco Inspector], V. K. Sarode [Safety Counsellor]
 Official position- Shri A.P. Srivastava [ADRM] ed in 'B' Cabin. J. Bhattacharjee [Dy. CRS (S&T)], U. Nagnath [DSO].

(b) The 'modus operandi' of the trial was to pick up a speed of about 70 Km/h, with 'B' Cabin's Signal No. S-7 and 'A' Cabin's Signal Nos. S-28 and S-27 all displaying 'GREEN' for the run through movement on the Up Main Line such that, upon a red HS lamp shown towards the 'B' Cabin from the engine as it reached the Warning Board situated at a distance of 1.422 Km. in rear of Signal No. S-7, S-7 would at once be put back by the 'B' Cabin to RED, with the route cancellation mechanism set into motion immediately thereafter. The object was to check up whether the route could be altered, and, if so when and also if the conflicting Signal No. S-4 could be taken 'OFF' or if any part of the set track lay-out could be disturbed. In the test, run, the engine overshot Signal No. S-7 after a time-lapse of 65 seconds of this Signal displaying 'RED' but came to a halt just past the 'B' Cabin on the Up road itself, i.e. the route did not alter. In the 'B' Cabin, it was reported that various attempts were made, all in vain, to locate any defect in the integrity of the approach-locking for route-cancellation.

(c) The test engine was taken back (long-hood leading) on the Up Main Line and Signal No. S-7 was cleared for entry into the Goods yard, after obtaining the slot from Goods Cabin No. GC-1. As expected, S-7 displayed its 'YELLOW' aspect, with the direction-type route indicator on the left side lit up. In other words, the 'GREEN' aspect of Signal No. S-7 would clearly establish that the route was set beyond this Signal for only the Up Main Line.

(d) Visibility of Signals were tested on the way back into Itarsi station, as it was necessary to replicate the short-hood leading condition of the locomotive. The results were as follows:—

**B' Cabin's Signal
No. S-7**

Because of straight track and the relatively bright luminosity of Colour Light Signals, the aspect of this Signal could be picked up clearly from 'D' Cabin itself (i.e. from a distance of 3.85 Km. and right from the moment the engine came on the Up Main Line proper).

At the moment of passing the last Signal in its rear (i.e. S-23 of 'C' Cabin), this Signal was so conspicuously visible that it would be virtually impossible to miss it provided that one was looking towards the track ahead.

From the Warning Board provided at a distance of 1.42 Km. in rear of it, this Signal was visible jewel-bright in its Green, Yellow and Red aspects, all of which were observed from this vantage point during the trials.

There was no scope for confusing or mistaking this particular Signal for another, especially after passing 'C' Cabin's Signal No. S-23, i.e. from a distance of 2.71 Km.

**'A' Cabin's Signal
No. S-28**

The Signal was barely visible above the horizon from 'D' Cabin itself, but it could be misleading and certainly pointless to take any cognizance of it from almost 5 Km. away.

At the moment of passing 'C' Cabin's Signal No. S-23, the aspect of this Signal could be distinctly made out both from the Driver's side as well as from the Assistant Driver's side. The visual of this particular signal from the closer Signal No. S-7 of 'B' Cabin was quite unmistakable at the time of passing the Warning Board erected in rear of the latter.

At the time of passing 'B' Cabin's Signal No. S-7 this signal was distinctly visible "jewel-bright" from the Driver's side, the Green aspect of 'A' Cabin's farther Signal No. S-27 could barely be discerned as a separate entity whereas, from the Assistant Driver's side, the view of the farther Signal was still eclipsed by the nearer Signal.

From a point on the Up Main Line opposite of the new 'B' Cabin, the Green aspect of the farther Signal No. S-27 could be clearly picked out from the Green aspect of the near signal No. S-28 from both the flanks of the locomotive.

40. Observations relating to the cross-movements at 'B' Cabin

(a) The work of providing Panel Interlocking at Itarsi 'B' Cabin and additional facilities to reduce cross-movements in the Yard Complex was sanctioned by me under Sanction No. BSL/10/80-81 dated 22-9-80, in response to an application submitted by the General Manager (S&T), Bombay, under his letter No. N-107/S/ET/RRI/IV dated 9th September 80. As regards infringements, an extract from this application is reproduced below in verbatim:—

"(2) Permanent Works:—

- | | |
|--|------|
| (c) List of infringements to Schedule of Dimensions | NIL. |
| (d) List of deviations from the Manuals of Instructions for Signalling and Interlocking and Block Signalling | NIL. |
| (e) List of deviations from General and Subsidiary Rules | NIL. |
| (f) Restrictions | NIL. |
| " | " |

(b) The situation obtaining at 'B' Cabin is conceptually similar to Single Line Sections, about which the Railway Board's letter No. 69/Safety/28/8 of 16-6-69 not only laid down the directive principle that, where simultaneous reception was envisaged, physical isolation should invariably be provided at way/road-side stations, but also enjoined that this principle be followed to the extent possible even at other stations, without involving large-scale alterations to existing lay-outs.

(c) A change in this stance was, however, evident under Railway Board's letter No. 77/Safety (A&R)/29/2 of 2-5-77, wherein it was decided as follows in regard to, *inter alia*, the situation obtaining at Itarsi 'A' Cabin (which is similar to what exists now at 'B' Cabin) in respect of simultaneous reception on a Double Line involving the movement across a Main Line:—

"Simultaneous movements, of the type envisaged at stations falling on a double line section are permissible, provided the conditions laid down for adequate distance, in GR-38 for reception of trains are satisfied."

(d) On the subject of decisions by Controllers for arranging crossings and precedences, the Railway Board had accepted under their letter No. 63-Safety/1/18 dated 10-3-69 the following recommendation, in respect of busy suburban sections where there were well-defined periods of passenger 'blocks' and where stations were located in very close proximity:—

"Instructions should be issued to all Control Offices to avoid interference with the set pattern of running of important Mail and Express trains and particularly cross movements which may affect the path of approaching run-through trains. If unavoidable, the train should be stopped at the station in rear to keep a safe margin and not take the risk of allowing it to come up to the signals of the station."

(e) The situation currently prevalent in the sections controlled by 'D', 'C', 'B' and 'A' Cabins at Itarsi is closely akin to what is generally described as an 'Open Block System', under which no co-operation is necessary from the Official in charge of the adjacent section, with conditions for granting the 'Permission to Approach' automatically determined by the various track circuits and other sophisticated circuitry and relays. The exchange of information in verbal form can under such circumstances often play a vital role in correct decision-making.

(f) For recording the Cancellation Counter Readings, a new Register was opened on 22-10-80, the current one having been sealed on 20-10-80 after the accident and Cabin-Working having been suspended upto the time of my inspection on 22-10-80. This Register was scrutinised on 5-1-81 and it was discovered that during the intervening period (i.e. 75 days) the route cancellation mechanism was operated no less than 350 times, the counter having moved from 1865 to 2115 on 150 different occasions. As such large-scale use of this route-cancellation facility, even in the face of the most distressing experience by way of the subject accident (which ought to have had a 'sobering effect' on the ASMs manning the 'B' Cabin) the reasons thereto were got probed into and classified cause-wise as below:—

Reason	Frequency
Planning of train movements	39
Failure of power supply	45
Failure, for other reasons	45
Testing etc., by S&T staff	15
Training of the new Cabin-ASM	6
TOTAL	150

(g) The Railway Board had indeed been periodically emphasising the imperative need for educating the staff to develop a balanced outlook regarding safety vis-a-vis detention to trains; an extract of Railway Board's letter No. 77/Safety (A&R)/29/14 dated 6-6-1977 is reproduced in verbatim below:—

"There have been accidents in past also in which it came to light that the fear of punishment in cases of detentions to trains compelled the staff to ignore safety precautions which led to accidents. In this connection attention is invited to this office letter No. 75/Safety (A&R)/1/17 dated 16-2-1976, wherein it was emphasized that the railways should gear up their safety organisations to inculcate amongst the staff a balanced outlook and respect for the observance of safety rules and procedures vis-a-vis detentions to trains. It appears that these instructions have not so far percolated to the staff properly. The Board, therefore, once again wish to reiterate that safety counsellors should, during their personal contacts, impress upon the staff connected with the running of trains that at no cost should the safety precautions be ignored or short-cut methods adopted."

41. Observations on the speed restriction imposed in the context of changes in signalling at the 'B' Cabin—

(a) The speed chart of 28 Up that left Itarsi on 8-10-80 (an earlier train worked by Shri Patil, the Driver of the ill-fated 6 Up, during the period that the speed restriction of 10 Km/h was actually in force as required, was inspected and it was found that the speed after leaving Itarsi never dropped to less than 35 Km/h.

(b) Observance of this 10 Km/h restriction between 'B' and 'A' Cabins (or, a distance of just over 1.8 Km) would entail an extra running time of some 12 minutes for Mail/Express trains, giving due

allowance for the necessary acceleration/deceleration. Hence, the Control Charts for the period 4-10-80 to 20-10-85 were examined to find out the extra time taken by Up Mail/Express trains between Itarsi and Dulariya and, with this as a criterion, it did appear that in almost all cases this crippling speed restriction of 10 Km/h was conspicuous only in its breach. In the balance of cases where extra time did happen to be taken between Itarsi and Dulariya, it was possible to establish by reference to the Train Register maintained at 'B' Cabin that the concerned trains were in fact detained short of Signal No. S-7 for some reason.

(c) Anyone familiar with Railway operations in India would be aware of the phenomenal resistance from the Operating Department to the execution of any works entailing speed-restrictions and consequently loss-of-time; this feature is, of course, only appropriate because the principal "raison de etre" of any railway system is to run trains on time. In this instance, although, as mentioned in sub-para (c) above, the time-loss was of the order of 12 minutes for Mail/Express trains, it appeared that neither was the Operating Department approached for clearing this severe restriction nor was any approval accorded. Neither, indeed, was any special reason mooted out during the Inquiry in justification of limiting the speed to as low a figure as 10 Km/h, nor was there any follow-up to ensure that this speed-limit was obeyed. All of which does raise a fundamental doubt, if at all the imposed speed restriction was really meant for sincere observance by Drivers.

(d) Because of the changes introduced in the signalling in the context of panel interlocking provided in the new 'B' Cabin, a speed restriction of 15 Km/h was imposed subsequent to this accident (vide Bhusaval Division's message No. BSL/T/149 dated 25-10-80) for all Up trains to be observed day and night between Itarsi 'C' and 'B' Cabins. Subsequently, under Bhusaval Division's letter No. BSL/T/149 dated 16-4-81, it is clarified that Up trains could pick up speed immediately after passing the 'B' Cabin's "Up Home Signal".

42. Observations relating to the 2 trains involved—

(a) To probe further into the acceptance or otherwise by the Bhopal Board of "banking loads" beyond 22.30 hours, the Interchange Register of Itarsi was perused with particular reference to the despatch, beyond 22.30 hours, of goods trains requiring banking (i.e. exceeding 1100 tonnes with WG engine or 1800 tonnes with WDM-2 loco) and following were the observations:—

Period	Remarks
3-8-80 to 31-8-80	13 trains (12 with Diesel and only 1 with Steam) were despatched towards Bhopal. Indeed, only 1 other Steam-hauled goods train was despatched beyond 22.30 hours but that was not a "banking load".
1-9-80 to 30-9-80	No Steam hauled goods train left after 22.30 hours towards Bhopal; there was, therefore, no question whether the load required banking or not. On 11 days, 12 Diesel/Goods trains requiring banking were despatched towards Bhopal.

Period	Remarks
1-10-80 to 20-10-80	No Steam hauled goods train left after 22-30 hours towards Bhopal; there was, therefore, no question whether the load required banking or not. On 7 days, 8 Diesel Goods trains requiring banking were despatched towards Bhopal.

(b) The Goods Train had 85% effective brake power [para 9(c)] and, as per the Vacuum Certificate which bore the signature of both the Driver and the Guard of the Goods train, the vacuum readings were 45 cm on the engine and 38 cm in the brakevan. Similarly, neither the joint observation of this train's wagon stock [para 3(d)] covering the last 32 wagons, nor the efforts of the 2nd Fireman [para 29(b)] whose examination must have covered several others behind the first 5 wagons, succeeded in locating the source of any leakage or problem. Thus, the vacuum trouble experienced by the goods train, barely as it commenced its journey from the Goods Yard, remains somewhat of a mystery.

(c) Vide their letter No. M. 224.RL.79A dated 14-11-1980, the Railway had advised the following emergency braking distances, computed on the basis of para 8.2.1 of RDSO's Mechanical Engineering Report No. M.276 for a train of 18 coaches (with 94.5% operative cylinders) and hauled by a WDM-2 locomotive, assuming 545 mm of average vacuum level and treating the 1 in 1000 down gradient as equivalent to level tangent track for all practical purposes :—

Speed	Emergency braking distance
30 Km/h	31.5 Metres
40 "	102.4 "
50 "	193.5 "
60 "	304.2 "
70 "	436.7 "
80 "	590.0 "
90 "	764.0 "

(d) The Driver of 6 Up, Shri Ganesh Hari Patil, had an Accident Index of 194, with the last punishment having been a censure imposed in the context of the yard derailment of an engine on 12-12-1966. In other words, he had well over a dozen years of continuous accident-free record since that last occasion for punishment. He tendered his evidence in a cool, composed and confident manner, evincing neither the belligerent bravado of a cornered person nor the studied arrogance of a man who had scant respect for Rules or discipline. His even tenor in replying to questions bespoke of a keen and rational mind. His curriculum vitae (CV) is as follows :—

Date of Birth	24-3-1924
Date of Appointment— As Fireman 'B'	7-7-1945
As Driver 'B' (AC)	23-6-1978
As Driver 'A' (Spl)	24-6-1978
As Driver 'A' (AC)	2-7-1979
As Driver 'A' (Spl) Steam	3-7-1979

Last Safety Camp attended	22-9-1973 (No. 116)
Last Refresher Course (Steam)	18-8-1978
Last Refresher Course (Diesel)	26-8-1979
Last Periodical Medical Examination.	7-11-1979*

*Declared fit in Category A1, with glasses, vide Certificate No. 32.

43. Miscellaneous Observations—

(a) Advantage was taken of the visit to the Railway Hospital, Itarsi, on 22-8-80 to record the evidence of 2 public witnesses, as they were likely to be discharged later on that day itself. Shri Jainath Singh Satyanarayan had sustained a grievous injury and was first admitted to the local Civil Hospital before getting transferred to the Railway Hospital, whereas Shri Ramesh Kumar Prabhati Lal had been admitted to the Railway Hospital with simple injuries. Both were satisfied with the medical attention bestowed upon them.

(b) By commissioning the Panel Interlocking works at the new 'B' Cabin, the nett change in the signalling in the vicinity of this Cabin for the Up Main Line was "minus 3 signals", with all the 4 old Signals (the 2 erstwhile "Starters" at 'B' Cabin, its Advanced Starter and 'A' Cabin's Outer) deleted and just one new Signal ('B' Cabin's S-7) installed. The remarkable extent by which this change affects the Drivers simply beggars description. Yet, other than being expected to pick through a Circular Notice prepared and distributed in this context, the Drivers were largely left to themselves to discover this change. To demonstrate that this Circular Notice was scarcely meant to be the proper medium for transmission of any information to Drivers, it is reproduced in full as Annexure I. A touch of poignancy was perhaps added by the fact that the printing on that particular copy of this Circular Notice, which was provided in the Itarsi Loco Shed for the benefit of the Drivers, was found to be "faint" for the most part, with occasional blank patches, due in all probability to poor quality of paper used and/or poor workmanship in cyclostyling or "Roneo-ing". A clear copy was specially arranged later on for my use.

(c) Vide Railway Board's letter No. 66/W3/SG/M/1 of 21-8-67, the minimum visibility prescribed for all multiple aspect signals was 200 metres.

(d) With reference to the cancellation of 'line clear' for 6 Up, perusal of the Private Number Sheets in use at 'A' and 'B' Cabins revealed the following :—

Cabin	P.N.	Given to	Time	Reason
'B'	55	'A' Cabin	22-25	Cancel 6 Up's 'Line Clear'.
'B'	57	'C' Cabin	23-10*	'Line Clear' for AR-ME Van.
'A'	19	Dulariya	22-26	Cancel 6 Up's 'Line Clear'.
'A'	61	Dulariya	02-08* of 21-8-80	'Line Clear' for 115 Dn.

* These latter timings constituted an "upper-bound" for the cancellation of 6 Up's Line Clear.

(e) The hazard of fire-outbreak is inherent in any torch-based modality for cutting through the metal-work of coaches. The only available alternative of using hand-held hack-saws or hammers and chisels is not only anachronistic in the present times but also inconsistent with the notable technological progress made by the Railways in other spheres. The International Airport Authority of India has, for instance, been using at the Bombay Airport for some time now, as a part of their equipment housed in their Air-field Rescue Tenders, imported petrol-operated power-saws capable of quickly cutting through even steel and stone using special abrasive wheels. This saw measures 810 mm × 320 mm × 320 mm at the outside and weighs but 10.7 kg., including its petrol engine. Similar sheet-metal rippers and cutters with special fatigue-proof steel-alloy tools of foreign make are also being marketed in India by local firms. This Rescue Tender's equipment additionally comprises, inter-alia, the following :—

- (i) Specially hardened "crash axes" with capability of slicing through metal;
- (ii) Portable electric drills and other tools, for which the power is supplied by a light-weight 230 V generator in addition to the vehicle's own alternator; and
- (iii) Special masks to enable the rescue squad to breath pure air and also special overalls for protection against fire.

44. Observation of the Dy. CRS (S&T), Calcutta

Shri J. Bhattacharjee, the Calcutta-based Deputy Commissioner of Railway Safety (Signalling & Telecommunications), who assisted this Inquiry [para 2 (c)] as a Technical Adviser, had observed, inter alia, as under vide his D.O. No. 1198 of 31-10-1980 :—

"(i) Multi-aspect colour light signal No. 7 of 'B' Cabin for Up main line, situated 180 metres in rear of cross over No. 205, is not prewarned, resulting in the Driver facing a Red signal after crossing the 2-aspect semaphore Green signal No. 23 of 'C' Cabin.

The condition was worse for the Driver of 6 Up who, while approaching signal 23 of 'C' Cabin could clearly see signal 7 of 'B' Cabin and signal 28 of 'A' Cabin and could also see the Green aspect of signal 27 of 'A' Cabin while coming near to signal No. 7 of 'B' Cabin. Having seen all the signals in rear and advance Green, the Driver misjudged the change of aspect of signal No. 7 from Green to Red as a case of signal failure and crossed the same without controlling the speed and met with the accident. Would the signalling be correctly provided with a Distant for signal No. 7 of 'B' Cabin, the Driver would have got a Yellow and a Red signal; thus being prewarned, the signalling would have probably cleared any confusion in his mind.

In view of the above, it is certain that the deficiency of signalling has denied the Driver to judge the aspect of signalling correctly and confused his ideas which has contributed greatly

to the cause of the serious head-on collision. Under para 119(c)(i)&(ii) of the Signal Engineering Manual, it is explained that when a multi-aspect signal displays danger aspect, the signal in rear must not display less restrictive aspect than caution. In view of this rule, I am of the firm opinion that multi-aspect colour light signalling provided at 'B' Cabin is incorrect and unsafe for train working.

(ii) Movement of Down trains from Goods Cabin-1 crosses the Up and Down main lines when cross-overs 204 and 205 are reversed and signal 4 of 'B' Cabin is taken off. No restriction has been imposed for such cross movements over the main line in the SWR and signal interlocking allows this movement while Up main line signal 23 of 'C' Cabin is cleared.

(iii) The Assistant Station Master operating the panel was not examined and issued a 'competency certificate' after the 'B' Cabin was brought into commission."

VII. DISCUSSION

45. As to the urgency for despatching the Goods train

(a) The 'B' Cabin ASM had admitted [para 18 (b)] to having put back Signal No. S-7, which had previously been taken off, to Danger and activated the route cancellation mechanism in order to set the route for the Goods train and take off Signal No. S-4 instead. The Section Controller, too, admitted his involvement [para 22(c)(iii)] in the decision. To all accounts, therefore, there is little doubt that despatch of the Goods train with the utmost promptitude and expedition was considered to be of sufficient urgency as to hold back, if necessary, even such an important and prestigious train as 6 Up.

(b) Indeed, as explained in para 18(d)(iii), the 'B' Cabin's ASM took the initiative in obtaining the SCOR's instructions in this connection, even before the Goods train had arrived on the approach track behind Signal No. S-4. This advance action, which proved in the event somewhat premature, because of the vacuum trouble [para 9(c)] developed on the goods train, adduces further proof of the said urgency.

(c) A careful consideration of paras 23, 24 and 42(a) would show that, at least in so far as the minds of the SCOR and the 'B' Cabin ASM were concerned, the quick despatch of the Goods train was of crucial importance, whether or not this train could be classified as a banking load and irrespective of whether or not the real cause underlying this urgency related to the "movement statistics" for the day, by way of yard balances and number of trains pushed out. For, this pressing immediacy could hardly be just a figment of imagination on the part of these 2 officials and there is no other interpretation or motivation that is even remotely plausible, which can serve to satisfactorily explain the sense of urgency with which the movement of the Goods train was attempted to be carried through. It is a pity that, human nature being what it is in professing non-involvement in matters implicating accountability, the

active role of the other official(s) whose responsibility it was to see to the movement of goods trains, did not reveal itself at the Inquiry.

(d) In any case, with the in-built 2-minute time-delay [para 12(b)] serving as an adequate safeguard, there is nothing either unsafe or repugnant in the idea 'per se' to despatch the Goods train ahead of 6 Up, provided that it was understood by all concerned at the time of the decision-making that 6 Up was at that juncture not yet ready to leave Itarsi Station.

46. As to the role of the Section Controller (SCOR)

(a) The SCOR did concede [para 22(c)(iii)] his involvement in the decision to push out of the yard the Goods train ahead of the passage of 6 Up past 'B' Cabin. Crucial to this decision were three important factors :—

- (i) His understanding from 'D' Cabin that 6 Up was not yet ready to leave Itarsi station;
- (ii) His belief that the Goods train was ready and waiting to get across the 'B' Cabin on to the Down Main line, as soon as the appropriate signal was taken off for it; and
- (iii) Experience had shown that a Goods train could get across and clear the Up Main line well within the 5 minutes or thereabouts that 6 Up would need to arrive near 'B' Cabin.

(b) Unfortunately, there were two opposing versions, as to whether or not the SCOR enquired from 'D' Cabin a second time at about 22.20 hours about the readiness of 6 Up to start [paras 16(b), 22(a) and 22(d)]. Moreover, from paras 16(b) and 22(d)(v), it will be seen that these 2 officials deposed differently, with regard to whether and when 6 Up's time of departure past 'D' Cabin was advised to the SCOR. Whereas it might be naturally to be expected of the SCOR to reassure himself once again about the position of 6 Up by contacting the 'D' Cabin the second time, there does not seem to be 'prima facie', any special motive for 'D' Cabin ASM to tender misleading evidence on this matter, unless he was trying to protect himself by supporting the timings actually recorded by him in his train register to the effect that 6 Up left his Cabin at 22.18 hours because, if such were the case, 'D' Cabin's ASM could hardly own up to any dialogue implicating himself as advising that 6 Up was still on the platform at about 22.20 hours (i.e. even some 2 minutes later to the actual departure time recorded).

(c) Particularly in reference to those trains the punctuality of which is closely monitored, experience has shown that wrong entries are often deliberately won't to be made in Train Registers by station staff, who resort to recording only the scheduled timings as long as the delay was within about 15 minutes. Thus, despite the total incompatibility of the evidence tendered by the 'D' Cabin ASM and the SCOR on this issue, I hold it on the balance of probabilities much more likely that the SCOR did enquire the second time at about 22.20 hours from 'D' Cabin about 6 Up, at which time it was probably on the point of leaving Itarsi Station.

(d) The observation made under para 40(f) strengthens the conclusion that the yard lay-out at Itarsi is such that the 'B' Cabin's route cancellation facility has necessarily to be made use of quite frequently. In other words, this is one of those instances where an undesirable feature had become a practical necessity. Thus, it would be correct to deduce from the complexity of the existing entry/exit facilities as well as the exigencies of railway operations that the SCOR is often compelled to re-plan/re-order the 'inter-se' priorities in train movements (some or all of which might involve recourse to this route cancellation facility), in order that yard operations as also main line movements are rendered as fluid as possible, without causing any undue overall detention to traffic.

(e) All things considered therefore, and keeping also in view of what has been presented in paras 22 (e) and 40(g) above. I do not hold the SCOR negligent of violating the spirit of any General and Subsidiary Rules.

(f) Nevertheless, the wisdom of stopping a train at a safe margin in rear [para 40(d)] and not take the risk of allowing it to come up to a stop Signal on a "run through" line, unless at a controlled speed, cannot be overemphasised. It would accordingly be worthwhile to extend the scope of Railway Board's instructions hitherto meant for only Suburban Sections, as contained in their letter No. 63-Safety/1/18 of 10-3-69, to also all busy yards and junctions which envision such cross-movements intersecting the paths of through running lines as an integral feature of their working unless the other alternative (i.e. approach at a controlled speed) can be achieved through the provision of "calling-on" facility at the preceding Signal.

47. As to the disposition of the track lay-out and signalling at the time of the accident

(a) From the facts that point No. 205 was burst through on the Up Main Line [para 10(i)] and that the entire train negotiated the cross-over No. 204 leading to the Up and Down Goods Waiting Bay (South), it is clear that both the cross-overs No. 204 and 205 were set and locked in the reverse mode.

(b) At the time of the accident, Signal No. S-4 was taken off and was showing Yellow aspect (para 28) and Signal No. S-7 was showing its Red aspect [para 13(h)] and none disputed this version. However, some time earlier, the route had been set for the Main line for the passage of 6 Up and 'B' Cabin's Signal No. S-7 as well as Signal Nos. S-28 and S-27 of 'A' Cabin had all been displaying the Green aspect. Having regard to para 38(c), the time interval of at least 2.25 minutes must have elapsed after Signal No. S-7 was normalised and before Signal No. S-4 was taken off.

48. As to the time of cancellation of 6 Up's "Line Clear"

(a) That the timings in the Train Registers maintained by Itarsi 'A' and 'B' Cabins and by Dulariya station [paras 18(c), 19(b) and 20(b)] should all reflect overwritings with reference to the time of cancellation of 6 Up's "line clear" is too

much of a coincidence to be regarded as 'bona fide' or genuine. The version of Dulariya Station Master (para 20) bears not only a ring of truth but also becomes irrational to explain if it were not the truth. Accordingly, I hold that 6 Up's "line clear" was cancelled by 'A' Cabin at 22.32 hours and by 'B' Cabin, in all probability, a minute or so earlier. These timings fall within the "upper bounds" mentioned in para 43(d).

(b) Two inferences logically stem now from the foregoing :—

- (i) that, 6 Up's "line clear" not yet having been cancelled, 'A' Cabin's signals already taken 'Off' for the Up Main line must have continued to display their 'GREEN' aspect until after a few minutes of the accident, as corroborated by the Guard of the Goods train [para 30(b)]; and
- (ii) that Shri K. K. Saxena ('B' Cabin ASM) and Shri D. R. Kulkarni ('A' Cabin ASM) joined hands in compounding a lie in altering the train timings in their Train Registers and generally trying to mislead the Commission on this matter.

49. As to the time of the accident

(a) Irrespective of the timings entered in the Train Registers maintained at Itarsi station and the 'D' Cabin, I place more credence on the SCOR's evidence as discussed in para 46(b) as well as that of 6 Up's Driver [para 25(a)], duly supported by his Assistant Driver [para 26(a)] and the Guard [para 27(a)], and hence hold that 6 Up left Itarsi station at 22.20 hours or a few seconds thereafter.

(b) According to 6 Up's Guard [para 27(a)], the accident took place at 22.27 hours. According to the Goods train's Guard [para 30(a)], it was at 22.28 hours when he experienced a second jolt. In all probability, the first jolt was caused by the shock of the impact as conveyed by the compression of the buffers, with the second jolt caused by the de-compression of the buffers as 5 wagons in the front got flung off the track. I, therefore, hold that the collision as such had occurred at 22.27 hours.

50. As to when Signal No. S-7 was put back to 'Danger' and Signal No. S-4 taken 'Off'

(a) The 'B' Cabin ASM [para 18(d)(iv)] stated that he obtained the clearance at 22.23 hours for pushing the Goods train through. This may be taken as the earliest time for the event of Signal No. S-7 being put back to 'Danger'.

(b) According to the Driver of the Goods train (para 28), Signal No. S-4 was taken Off but he was not able to start. Since the time of the accident has been taken as 22.27 hours [para 49(b)], Signal No. S-4 must have been taken Off at least a few seconds sooner than this. According to 'B' Cabin ASM [para 18(d)(v)] this was at about 22.26 hours, which may be accepted as correct. In consideration of the time interval of 24 minutes [after putting back Signal S-7 to Danger and before S-4 can be taken Off, as per para 38(e)], the latest time for the event of putting back Signal S-7 to 'Danger' would thus be 4 of a minute earlier than 22.24 hours.

(c) All things considered, therefore, it would be logical to infer that Signal S-7 was normalised at 22.23½, which time is reflected in Annexure II, which portrays the progress of 6 Up from the time it left Itarsi Station up to its collision with the Goods train.

(d) Since it is clear that Signal S-7 could not have been put back to Danger after 22.25 hours, the establishment of the time for normalisation of Signal No. S-7 as above falsifies the *sequence* of events narrated by the 'B' Cabin ASM in para 18(d)(v), because the time for obtaining "line clear" for the Goods train tallies at 22.25 hours as deposed by both the 'B' Cabin [para 18(b)] and 'C' Cabin [para 17(a)]. This issue will again be considered while discussing the 'B' Cabin ASM's role.

51. As to the damage caused by the Collision and the instantaneous value of 6 Up's speed at the moment of impact

(a) Unfortunately, as in the case of the famous Naini collision of 10-10-77, here, too, the Goods train had experienced vacuum trouble, with all its effective brakes in the applied position. It was this immobilised state of the Goods train that had led to the damage described in para 10. For, had the Goods train's brakes been otherwise (i.e. in a released or non-applied position), it would have been pushed back by the impact, yielded in this process some valuable space over which the forward momentum of 6 Up could be destroyed.

(b) The circumstance that it was, besides the engine tender, only the first 5 wagons of the Goods train that had been thrown off the track can possibly be best explained by the two under-noted features :—

- (i) That the first 3 wagons as well as the 5th were empty (para 19), while the 4th was nearly so having been but lightly loaded; and
- (ii) Most of the wagons with the ineffective brake-rigging were located at the front [para 9(c)].

(c) As already brought out in para 8(e), the allegation that appeared in certain sections of the Press (viz. that much of the damage was due to the fact that the 3 "sick" coaches attached at Agra had telescoped) was entirely without any basis.

(d) With reference to paras 3(c) and 13(g), it is most unfortunate that there was no recording available on the speed chart due to an inadvertent deficiency while installing the speed chart on 6 Up's locomotive. As regards the mechanical speedometer, the needle/pointer of which was found stuck at a reading of 68 Km/h [para 13(f)(x)], I am in agreement with the Senior Loco Inspector's view [para 31(d)] that the impact of the collision must have caused the pointer to jerk into some position or the other, which bore no relation to the actual speed immediately prior to the impact of the collision. Also, from a careful consideration of the nature and extent of damage caused by this accident, I am in agreement with his assessment of 6 Up's terminal speed and hold that the instantaneous speed of the already braking 6 Up was about 30 Km/h at the moment of impact.

52. As to the braking efforts of 6 after it passed Signal No. S-7 B at 'ON'

(a) As mentioned in para 8(b), the proportionate braking mechanism of 6 Up's WDM2 engine No. 1/605 had long been isolated. However, as brought out in para 13(c), nothing adverse was discovered at the time of the joint inspection carried out by Senior Subordinates on the brake rigging of 6 Up's trailing load, excepting the badly damaged front 4 coaches. Although 6 Up's Driver had but little opportunity to test the braking characteristics of the train, according to his own evidence [para 25(e)(vi)], he was quite satisfied with the brake power on his train and further that the night time visibility did not cause any undue handicap.

(b) As explained in para 37(c), no recovery was possible of the A-9 and SA-9 valves from 6 Up's Diesel locomotive, which were extensively damaged also by fire. In the absence of any evidence about mechanical mal-functioning or defects in 6 Up's braking system, it would be appropriate to surmise that the braking capability of the ill-fated 6 Up was about equal to the EBDs mentioned in para 42(c).

(c) A rather simplistic consideration of these EBDs would show that the distance traversed while braking from an initial speed of 60 Km/h down to a terminal speed of 30 Km/h would be 272.7 m (304.2 m less 31.5 m) or thereabouts.

(d) The joint observation [para 13(f)] made immediately by the Railway Officials after the accident showed that the Driver did take appropriate action in trying to control the speed of his train by applying the A-9 valve to the overreduction zone and the dynamic brake to its maximum extent. As regards the position of SA-9 valve in which it was found immediately after the accident, the hypothesis of the Sr. Loco Inspector (Diesel) [para 31(c)] is reasonable enough and it is accordingly accepted that the Driver had in fact applied the locomotive independent brake. As regards the hand brake [para 13(f)(vii)] which had not been applied, this was the responsibility of the Assistant Driver, who deposed as having had barely enough time [para 26(b)] to lift the flap valve of the emergency vacuum brake.

(e) Having regard to the fact that 6 Up did not derail on cross-over No. 204 (composed of 1 in 8½ turnouts with straight switches), it would be difficult to visualise its speed as high as 60 Km/h. On the other hand, after negotiating this cross-over, 6 Up's engine did travel a distance of no less than 338 metres and, that, too, with a terminal speed of 30 Km/h. The distance actually covered certainly indicates that 6 Up's speed could not possibly be much less than 60 Km/h, having due regard to what has been stated in sub-para (c) above, for, 6 Up would have otherwise come to a halt quite easily without colliding with the stationary Goods train.

(f) In analysing this situation, due allowance must also be given for its Driver who, as postulated in para 31(b), must have felt 2 severe jolts or knocks in quick succession (as the engine negotiated first the left-hand lead curve and then the right-hand lead

curve of the cross-over) to recover his wits and he might have taken, say, 4 seconds of reaction time before getting into action.

(g) Because of the 1 in 1000 down gradient in this region this speed of 60 Km/h may be reckoned to have been maintained right through 6 Up's passage over the cross-over and during the reaction time of 4 seconds. At 60 Km/h, 4 seconds would entail 67 m. of forward movement which, taken together with 273 m. of sub-para (c) above, adds up to 340 m., which tallies almost precisely with the distance actually traversed (i.e. 338 m.). All things considered, therefore, it would be reasonable to surmise that the speed of 6 Up was around 60 Km/h, as it negotiated the cross-over No. 204.

(h) The Secretary's Note for Item No. 696 (discussed at the 51st Track Standards Committee Meeting held in March 1975) on "Permissible speed on Turnouts" referred to tests carried out on, inter alia, 1 in 8½ turnouts with straight switches upto a speed of only 40 Km/h. The maximum instantaneous value of the lateral guiding force 'Y' under a WDM-2 loco at 40 Km/h was as much as 19.2 t. By extrapolation, the lateral force exerted at a speed of 60 Km/h would be even more substantially severe and it would appear, prima facie, fanciful to entertain even a conjecture about the safe negotiation of a train at such a fast speed over a 1 in 8½ turnout in the facing direction. However, this lateral force 'Y' does, of course, vary with the nature of the precise path taken by the locomotive within the gauge-clearance available and, amazing as it does seem, 6 Up did proceed at a speed of the order of 60 Km/h as deduced in sub-para (g) above. This experience only serves to demonstrate what indeed the speed-potential of our turnouts can be, provided that track and rolling stock are both in good fettle.

(i) from the foregoing it may be concluded that no serious effort was made by 6 Up's Driver to control his train until just after the engine had negotiated the cross-over No. 204. No other explanation would fit in with the available evidence relating to satisfactory brake power on 6 Up, the EBD values for an 18-coach train, hauled by a WDM2 Diesel locomotive, the distances actually covered and finally the terminal speed at which the collision took place. Indeed, the Driver himself admitted [para 25(e)(ix)] that he did not resort to full application of brakes while negotiating the cross-over.

53. As to 6 Up's likely speed-profile and progress after leaving Itarsi Station

6 Up's journey from Itarsi Station to the accident site may be analysed in 4 distinct phases as below :—

- | | |
|---------|--|
| Stage 1 | . The initial controlled speed phase, which lasted until the entire train had cleared the 'D' Cabin, upto which a large number of turnouts had to be negotiated; |
| Stage 2 | . 'D' Cabin to 'C' Cabin, marked by acceleration; |
| Stage 3 | . From clearing 'C' Cabin upto the stage when its locomotive was in line with Signal No. S-7B; and |
| Stage 4 | . The final phase, covering a distance of 716 m. (0=72 Km) traversed after it has passed Signal No. S-7B at 'Danger'. |

(i) Bracketted Platform Starter Nos. 14 and 15 are located at a distance of 275 m. from the centre line of Itarsi station. From a consideration of the normal position of stoppage of 6 Up's locomotive on Platform No. 4, it might be inferred that the front of 6 Up's engine was 240 m. or 0.24 Km. from the centre line of Itarsi station.

(ii) From the information provided in paras 8(a) and 8(f), the overall length of the train, including the engine, may be derived as 0.41 Km. As 'D' Cabin is situated at a distance of 0.67 Km. from the centre line of Itarsi station, the Stage-1 distance may now be computed as $0.67 - 0.24 + 0.41 = 0.84$ Km.

(iii) Stage-2 distance remains the same as that between the 'D' and 'C' Cabins, or 1.38 Km. Signal No. S-7B being located at 2.47 Kms. from 'C' Cabin, the Stage-3 distance may be computed as $2.47 - 0.41$ (the train length) = 2.06 Kms.

If the following evidence tendered in regard to the speed profile is to be believed, the stage-wise timings can be computed as below :—

Para 17(b)	30 Km/h while passing 'C Cabin;
(As per CASM)	
Para 25(b)	45 Km/h while approaching 'B Cabin;
(As per Driver)	
Para 25 (e) (xi)	25 Km/h at the moment of impact;
(As per Driver)	

Stage	Distance	Speed in Km/h.			Time in minutes
		Initial	Final	Average	
1	0.84	00	15 ^(a)	12.5*	4.03
2	1.38	15	30	22.5	3.68
3	2.06	30	45	37.5	3.30
4	0.72	45	25	35.0	1.23
TOTAL					12.24

^(a) The initial speed of 15 Km/h had to be observed because of having to negotiate the turnouts.

* Not simply the arithmetic mean, but using weightage

Against the total duration of about 12 minutes as above, the fact that 6 Up's Driver travelled for only 7 minutes [paras 49(a)(b)] before colliding with the Goods train clearly proves that 6 Up's speed profile was grossly under-estimated in the items of evidence considered in the above analysis.

(d) Once the unreliable evidence is discarded, the speed-profile of 6 Up can be analysed best by considering the events backwards from the point of collision, because 2 external features are available to provide sufficient guidelines: firstly, the fact that while 6 Up was not proceeding too fast to negotiate the 1 in 8½ cross-over No. 204 without derailing, it nevertheless failed to stop short of the other train (para 52), and secondly, the extent of damage as a result of the collision (para 51).

(e) As regards the maximum speed attained on the run upto Signal No. S-7B, a wide range of assumptions are possible in the absence of the speed-chart. However, keeping in view the Driver's own awareness of the "caution order" although he did

not intentionally observe it, and the overall time-frame of 7 minutes (para 49), it would be quite rational to surmise that 6 Up had in all probability not attained a speed in excess of 80 Km/h. Because the Driver had not yet resorted [para 25(e)(ix)] to full application of brakes during this part of journey, the speed would have dropped from 80 Km/h or so at Signal No. S-7B to perhaps only 60 Km/h at the beginning of cross-over No. 204. As regards Stage-1, because of the various turnouts to be negotiated in this phase, 6 Up could well have quickly attained and then maintained a speed of 20 Km/h with an average of, say, 18 Km/h. As regards Stages-2, keeping once again the "caution order" in view, 6 Up may not have picked up a speed in excess of 60 Km/h and it is now possible to project the likely progress of 6 Up as tabulated below, with the final stage split up further for the sake of convenience into the following components :—

Stage 4(a)	From Signal No. S-7B to the beginning of cross-over No. 204.
.. 4(b)	Cross-over No. 204
.. 4(c)	Reaction time [para 52(f)].
.. 4(d)	The Remainder.

Stage	Distance	Speed in Km/h.			Time in minutes
		Initial	Final	Average	
1	0.84	00	20	18	2.80
2	1.38	20	60	40	2.07
3	2.06	60	80	70	1.18
4(a)	0.31	80	60	70	0.27
4(b)		60	60	60	0.07
4(c)	0.07	60	60	60	0.07*
4(d)		60	30	45	0.36
TOTAL =					6.82

* 0.07 minutes = 4 seconds.

(or, say, 7 minutes)

(f) Now that the hypothesis for the speed profile postulated in sub-paras (d) and (e) above has been validated via the accord of the overall time taken with the duration of 6 Up's travel (para 49). For ease in understanding this situation as well as to round off the decimals, 6 Up's progress has been charted as below :—

20.20	Departure from Itarsi Station.
22.23	Cleared 'D' Cabin.
22.25	Cleared 'C' Cabin.
22.26 1/4	6 Up's engine in line with Signal No. S-7B.
22.27	Collision.

54. 'Time Slice' analysis of the events leading to the accident—

(a) In the 'time slice' approach to investigation, any set of events changing over a given span of time-continuum is viewed at specific points of time, when the panorama is "sliced" as it were, in order to gain a proper appreciation of the overall situation. The various happenings occurring at any given 'time slice' are discussed rather in the present tense, in

order to reconstruct the situation. On the basis of the available evidence and of the foregoing discussions, the following situation unfolds itself.

(b) 22.20 hours :

- (i) 'Line clear' having been granted for 6 Up's passage upto Dulariya, all the relevant signals have already been taken 'Off' previously.
- (ii) 6 Up is still on platform No. 4 and almost ready to depart.
- (iii) The Goods train is on the move on the Goods Waiting Bay (South) and, alerted by the light flashing on his panel at S-2/38 [para 18(d)(iii)], the 'B' Cabin ASM seeks SCOR's instructions for sending it onwards.
- (iv) 'D' Cabin advises the SCOR, in reply to the latter's query, that 6 Up is as yet on the platform, whereupon the SCOR is possibly caught up in attending to the needs of the various Stations on his 'Board'.

(c) 22.23 hours :

- (i) 6 Up has passed 'D' Cabin but 'D' Cabin is unable to convey this information to the SCOR [para 16(b)], who did not attend the phone.
- (ii) Busy upto now as he was attending to his 'Board', it is only now [para 18(d)(iv)] that the SCOR is able to advise 'B' Cabin of what he had learnt earlier about 6 Up's whereabouts. He also 'OKays' the pushing through of the Goods train past 'B' Cabin on to the Down Main line.

(d) 22.23½ hours :

- (i) Signal No. S-7B has been put back to danger [para 50(c)] and the necessary sequence of operations needed to take off Signal No. S-4 for the Goods train is set in motion.
- (ii) 6 Up's Driver, who had been sighting it at its 'Green' aspect ever since 22.21½ hours, fails to immediately register this change in the aspect of Signal No. S-7B. Indeed, from 22.24 hours onwards, he is also able to perceive the 'Green' aspect of the farther Signal No. S-28A and he has conceivably mistaken one for the other because, at 22.24 hours (when he is at Signal No. S-23C) Signals No. S-7B and S-28A are respectively at 2.71 Km. and 3.84 Km. distance away, with both of them presenting to the Driver a very narrow "visual angle".

(e) 22.25 hours :

- (i) It is just a few seconds earlier that 'B' Cabin seeks and obtains "line clear" for the Goods train from 'C' Cabin. In the absence of any kind of inter-cabin control between these 2 cabins for movements on the Main lines and with train-control akin to the so-called 'Open Block System' [paras 13(i) and 40(e)], it is rather a pity that neither does the 'B' Cabin explain the background

nor does 'C' Cabin seek any explanatory clarification, whereas at this precise moment 6 Up is almost at 'C' Cabin.

- (ii) At 22.25 hours, 6 Up clears 'C' Cabin but 'C' Cabin is unable to transmit this information to 'B' Cabin [para 17(a)], there being no response from the latter. A point of note is that, as yet the 2-minute time-delay, which was activated at 22.23½ hours [sub-para (d)(i) above] is still in progress. In other words, had 'C' Cabin been at all aware of the manoeuvre planned by 'B' Cabin he would have straightaway seen to the abandonment at least after 6 Up's departure past his Cabin, had he not already done so earlier, when approached by 'B' Cabin for 'line clear' to the Goods train.
- (iii) 'C' Cabin advises the SCOR of 6 Up's departure. Shocked by this revelation, the SCOR obtains confirmation from 'D' Cabin that 6 Up had indeed left that region at 22.23 hours [para 22(d)]. He then rushes out on to the balcony to find out about the Goods train's whereabouts but he sees only the speeding 6 Up. The SCOR then rushes back into his office to contact 'B' Cabin, who fails to respond, etc.

(f) 22.26 hours :

- (i) Totally oblivious of the speedily approaching 6 Up and the route having been released duly after the expiry of the 2-minute period, 'B' Cabin now sets the route for the Goods train [para 18(d)(v)] and takes 'Off' Signal No. S-4.
- (ii) Precisely at this juncture the speeding 6 Up happens to react at last to the situation confronting him: viz. Signal No. S-7B glaring 'Red'. The Driver, no doubt thoroughly confused by this shocking development, while trying to rationalise and think about it, concentrates particularly on the track ahead [para 25(e)(viii)] to find out if there is any obstruction or any danger ahead. He also in the meantime eases off the throttle [para 13(f)(v)] and probably notes, too, that there is in fact no other train on the parallel Up-and-Down Goods Line to his left for which the 'A' Cabin's Signal No. 28A might have been taken 'Off'.

55. As to the effect of the vacuum trouble on the Goods train

As brought out in para 42(b), the reason for the vacuum trouble experienced by the Goods train remains unexplained. However, as postulated in para 54(c), 6 Up had reached Signal No. S-7B at a time when Signal No. S-4 was taken 'Off' for the Goods train. Thus, if the Goods train did not "stall" as it did, it would have been on the move on the Up-and-Down Goods Line. This circumstance might not have unduly perturbed the already confused Driver of 6 Up and thus, with both the trains on the

move and consequently with very much larger momentum and kinetic energy to be dissipated through the collision, the outcome would have been far more ghastly, grisly and disastrous.

56. As to the speed restriction imposed from 'B' Cabin to 'A' Cabin

(a) Paras 32(b) and 41(c) show that the extremely severe speed restriction of 10 Km/h imposed by the Signalling Department happens to be one of the peculiar features. It is noteworthy that GR 89 (b) does require a Driver to observe all temporary speed restrictions and ordinarily no violation of an imposed speed restriction should be condoned, simply on the grounds that such a violation had been practiced on an extensive scale over a continued period. In this case, however, no special justification existed for imposing this stringent speed limit. Moreover, it would be clear from para 41(b) that not a single train actually observed this speed restriction; in other words, drivers could grossly exceed this speed restriction entirely with impunity.

(b) It would also appear that no machinery existed to exercise check on the observance of this speed restriction and the overall general impression created was that, in the absence of any proper justification for limiting the speed to 10 Km/h (as distinct from, say, 30 Km/h, for instance) no one in the various echelons of the Railway Administration seriously or sincerely intended that the speed limit actually imposed should be complied with rigorously. It is no wonder, then that there was no check or post-audit on whether the said speed restriction was in reality observed at all. Indeed, this very Driver had on an earlier occasion [para 41(a)] failed to comply with it while on 20 Up on 8-10-1980, and no one pulled him up, of course.

(c) It was thus a great pity that the 10 Km/h speed restriction, imposed *prima facie* only as a mere formality just so as to meet a provision of SR 28/1, was immediately recognised as an operational myth by all the Drivers without exception. Under the prevailing circumstances, therefore, I am inclined to hold that the principles of natural justice would deem it a "non-sequitur" to regard 6 Up's Driver accountable for not having observed this speed restriction on the ill-fated trip.

57. As to the adequacy of the existing machinery to educate Drivers on the changes in Signalling

(a) The basic object underlying the provision that Drivers must be given adequate opportunity to learn the road is to ensure that he is properly acquainted with the section over which he has to operate. Thus, a thorough familiarity with the section is a *'sine qua non'* for a Driver to be deemed to be qualified to work on any section of the Railway. Critical to the appreciation of the extent of this thoroughness is GR 82(a), which enjoins that, if there is no Fixed Signal at a place where a Fixed Signal is ordinarily shown, the Driver shall act as if the non-existent Signal were showing its most restrictive aspect. In other words, Drivers must know the precise location of all the Signals in their territory.

(b) It is only a natural corollary to the above that SR 28/1 requires not only that the attention of Drivers shall be focussed upon changes that might have been effected in the signalling at any location, but also that a caution order should be issued for a period of 10 days to enable the Driver to familiarise himself with the changes effected. Yet, a reference to paras 31(a), 43(b) which, at least from the Driver's view-point, was something of an imbroglio — would clearly prove that no such effort was made in this case, in spite of phenomenal changes effected in the signalling layout, to educate the Drivers on this score. Thus, in the absence, be it witting or unwitting, of a proper machinery to assist and guide the Drivers towards a proper appreciation of the changes effected in the signalling layout, there is no doubt that the Drivers were denied an opportunity to gain knowledge of the changes involved and thereby placed at an extreme disadvantage.

(c) No doubt, GR 118 does call upon a Driver, who is not acquainted with any section of the line, to obtain the services and assistance of a qualified Railway servant who is acquainted with it, but it would be neither correct nor fair to infer that this GR places the onus entirely upon the Driver. The correct interpretation would be that if, despite even all the efforts on the part of the Administration, a Driver does not feel confident of his knowledge, he shall then obtain the services of a "qualified" person. For, it shall always be deemed to be the duty and responsibility of an Administration to ensure an intelligent database for its employees, as is evidenced by the contents of SR 118-1. It should accordingly be deemed unacceptable as well as unsafe that hardships and obstacles should be faced by Drivers, with the hopeful serendipity that these will somehow be overcome by Drivers' own sheer initiative.

(d) In this case, as is evident from para 25(e) (iii), the Driver was hardly aware of the number of signals that he was to encounter at 'B' and 'A' Cabins and, *ipso facto*, he could not be knowing of their precise location. Accordingly, for no fault of his own and unbeknownst to himself, he suddenly found himself, after the accident, to be virtually unqualified to drive on the Up Main Line from Itarsi.

(e) One would have expected that, with the considerable attention focussed on the changes in the signalling lay-out made at 'B' Cabin because of this serious accident, all concerned would have become aware of the actual signalling lay-out. It is, therefore, particularly amazing that the latest message of Bhusaval Division [para 41(d)], which sought to modify the speed restriction of 15 Km/h that was imposed as a post-accident precautionary measure, referred to Signal No. S-7B as 'B' Cabin's Up Home Signal! Indeed, Block Working between 'B' and 'C' Cabins had been dispensed with as far back as in October 1978 [paras 11(c) and 37(a)]. Yet, that such a state of confusion could still persist even for over 2 years (and that, too, at the Divisional Headquarter's Transportation Department), only serves to emphasise the utter need for all-round education for all the personnel dealing with train-operations about the changes effected in the signalling and more particularly about all the finer implications resulting

thereby. As regards the category of Drivers, paras 25(c)(iii) & (vi) and 31(a) bring out the inadequacy of the existing machinery in this respect.

58. As to the hazard-proneness of the entry/exit facilities provided for the Goods yard

(a) The track lay-out was such that cross movements across the Up Main line are an in-built weakness, which can only be overcome by the future provision of fly-overs. In the absence of such grade-separation works or, at the very least, physical isolation, the situation is patently fraught with danger, whenever a movement across the Up Main line is planned in the face of an approaching train, even though the latter may be signalled to stop on the Up Main line and its Driver overshoots the Stop Signal even beyond the "adequate distance". This is so for the very simple reason that no distance may really be regarded as "adequate", when a Driver overshoots a stop signal.

(b) In the subject case, however, physical isolation as such is not a feasible proposition and, although the desirability of physical isolation has been appreciated [para 40(b)], the Railway Board have nevertheless approved of such lay-outs [para 40(c)], provided that the requirement in respect of the adequate distance as stipulated in GR 38 was satisfied. In this instance, it was keeping in view the type of Signal No. S-23C, which is an Orthodox 2-Aspect Lower Quadrant Signal, that an overlap of 180 m. [para 34(a)] was provided by the Railway.

(c) Fundamental to the design of any viable signalling system is the assumption that the signal aspects will always be truly obeyed by Drivers. Moreover, opposing movements without physical isolation are an inherent feature of Railway operation as typified by shunting operations upto the Advanced Starter (or, the Shunting Limit Board) in the face of an approaching train. Thus, I cannot hold that the facilities at present provided for entry into and exit from Itarsi Goods yard are in any way deficient as far as Permanent Way is concerned.

(d) Having regard to the information provided in paras 12(a) and 12(b), there is also no question but that the route relay interlocking system was designed to the acceptable standards of safety. Furthermore, having regard to the information presented in para 38, based upon my inspection of the 'B' Cabin, there is no question but that the structural integrity of the signalling system as provided has been proved beyond all doubt.

(e) The question nevertheless remains as to whether, in view of what has been deposed as per the concluding part of para 25(f) supra, the provision of Signal No. S-7B as an un-pre-warned MAACL stop signal constituted an unsafe act/measure. In spite of the Railway's evidence [para 34] and despite the Railway's own belief in this regard, as apparent from its application to the Commission [para 40(a)] requesting sanction for this work, that Signal No. S-7B not being pre-warned did not constitute a violation of any existing Rule, it does appear quite clear that Signal Engineering Manual's para 119(e)(i) has been infringed because, when the MAACL Signal No.

S-7B was displaying its RED aspect, the Signal next in rear (viz., 'C' Cabin's Signal No. S-23) did display the GREEN aspect, which was indeed less restrictive than the caution aspect.

(f) Had signalling been provided correctly in compliance with the Signal Engineering Manual's provisions, (by providing, for example, a Permissive Signal in rear of Signal No. S-7B), the Driver would have been adequately fore-warned well ahead of approaching the Signal No. S-7B, as stated by the Driver himself [para 25(f)]. The observation made by the Dy. CRS (S&T) [para 44] is lucid enough on this point, in respect of both the violation of the stated para of the Signal Engineering Manual and the consequent development of an unsafe situation. Contrary to the Railway's contention [para 34(b)], I would regard that provision of a Permissive Signal within the 'station limits' will be no more unusual or confusing than the existing provision of a Warning Board within the said 'Station Limits'.

59. As to the role of 6 Up's Driver

(a) The non-observance of the speed restriction has already been dealt with in para 56(c) supra.

(b) His own ratiocination upon leaving Itarsi platform No. 4 has been reflected in para 25(e)(viii) and cannot be faulted as such but, for an experienced Driver not to perceive the 'Red' Signal ahead until he was perhaps 15 m. in rear of it [para 25(e)(viii)] and then not react to it immediately [paras 25(e)(ix) & (x)] are utterly uncharacteristic.

(c) GR 76(a) enjoins the Driver to obey every Signal, whether or not he is aware of the cause, whereas GR 76(b) exhorts him not to merely trust to the Signal aspects exhibited but always show such additional vigilance and presence of mind as to go by any other factor that might render further movement unsafe. At first sight, a curious ambivalence emerges for, whereas GR 76(a) does not require a Driver to think or question or use his intelligence but merely implicitly obey the Signal ahead, GR 76(b) requires of him to make use of all his faculties, intelligence, discretion and caution in order to avoid an accident, although the Signal ahead might permit him to pass it. However, further reflection would reveal there is really no ambiguity at all; a Driver is not expected to think but stop under all circumstances when facing a Signal at 'ON', but he should be alert and cautious even if the Signal is taken 'OFF'.

(d) Central Railway's SR 76-2(b) further requires a Driver to *keep* under observation, while approaching or leaving a Station, the aspect of Signals as are applicable to his train *until* he passes them. However, such a continuous vigil is impracticable as the Driver has not only several important duties to perform within the cab as he has to keep gauges under observation and operate/actuate levers, etc., but GR 123 also requires of him to look back *frequently* to see if the train is following safely.

(e) Having sighted all the Signals ahead showing Green as expected, the Driver of this prestigious 6 Up must doubtless have felt absolutely confident of the road ahead and, busying himself with his tasks

within the cab, he failed to keep a sharp look out ahead, with the result that he suddenly came across the Signal No. S-7B at 'ON'. However, although this view was discounted by the Driver himself [para 25 (f)], one cannot ignore the SCOR's deposition [note under para 22(d)] that he could clearly make out one person — almost certainly the Assistant Driver — with his back towards the yard which, while suggesting the possibility that the Assistant Driver could have been receiving some instructions 'vis-a-vis' from the Driver, explains also how both the engine crew (busy as they were with their duties in the cab) could not look ahead. All said and done, it must be recognised that busying themselves in the cab is but a normal as well as essential part of the duty of the Driver and the Assistant Driver. But, for them not to look ahead for as long as 2½ minutes [para 54(d)(ii)] is unimaginable; so, it must be accepted that the Driver did look ahead 'off and on' but failed to register in his mind the changed aspect of Signal No. S-7B.

(f) Having availed of proper rest [para 25(a)], the Driver had just come on duty. Hence, there is no question of any mental fatigue affecting his faculties. He is a sober person and of a mature and well-balanced disposition as evident [para 42(d)] from the manner he tendered his evidence. Yet, he could not perceive the change in the aspect of Signal No. S-7B for as long as 2½ minutes, for which failure a logical explanation could be the combination of the following two factors:—

- (i) Prevailing complete ignorance as to the signalling lay-out newly introduced [para 57(e)], whereby both the Driver and his Assistant neither knew [note under para 25(e)(iii) and para 26(e)] the number nor the position of Signals to be faced on the Up road after 'C' Cabin Signal No. 23C; and
- (ii) What we expect to perceive or are "set" to perceive often influences our perception; this effect, called "perceptual constancy", is illusory in its nature and quite distinct from delusions or hallucinations, which require an abnormal mental acuity. In other words, this is a common enough phenomenon when the perceiver, mainly due to prior knowledge via past experiences, unconsciously adjusts his perception to suit his pre-conceived notion. No doubt, Drivers are expected to and do possess "depth perception" but, for this capability to function, the imagery facing him should include, in this case, Signal lamps all of equal size and of equal brightness, which was not so at Itarsi with an Up train which faced MAFL Signals only from Signal No. S-7B onwards. Indeed, as he could see at 22.24 hours, [para 54(d)(ii)] both the Signals S-7B and S-28A from a fairly long distance, 6 Up's Driver could have mistaken one for the other. In other words, it is entirely understandable that the mind of a Driver (who was not thoroughly aware of either the number or the location of the Signals ahead and who could not hence register the fact that Signal No. S-7B, showing hitherto its 'GREEN' aspect, had

subsequently altered to 'RED', simply because the 'GREEN' aspect of the farther Signal No. S-28A was also clearly visible simultaneously) could conceivably misinterpret the situation through this "perceptual constancy" effect.

(g) The point to note in this context is that such a cognitive misjudgement could occur only if the Driver was inadequately knowledgeable of the road ahead. The inadequacy of the existing machinery to familiarise Drivers with the changes in the Signalling lay-out and the braking of 6 Up have already been dealt with in paras 57 and 52 supra. The crucial question thus relates to the *quality* of thinking exhibited by the Driver as under:

- (i) The train, authorised to run at 100 Km/h had already started 5 minutes late and the psychological pressure imposed by the understandable stress on punctuality of important trains must have induced him to play not too safe and ignore the 10 Km/h speed limit, which he knew [para 25(c)(v)] bore no relation to track-vehicle dynamics, rather than be called to explain later on about the loss in punctuality.
- (ii) When 'Green' aspect was displayed by all the Signals for the Up Main Line as far as the eye could see, it was but natural for the Driver to take it for granted that the Section ahead was absolutely clear for his train upto at least as far as Dulariya. When he came to sight the 'A' Cabin's Signal No. S-28A and found it also displaying Green as expected, he felt so unreservedly confident of being able to run through that any thought that a Signal ahead could have been put back to 'ON' would understandably be the farthest from his mind. There is no doubt that no one could reasonably expect the Driver to entertain the least bit of doubt that this most prestigious train of his would be stopped in between Stations almost immediately after departing from Itarsi. Thus, besides what has been stated in sub-para (f) above, such indeed must have been the working of the mind of Driver Shri G. H. Patil, before he found himself suddenly encountering Signal No. S-7B at 'ON' about 15 metres away.
- (iii) When he did perceive Signal No. S-7B at 'ON', he really had no option but to brake hard but, handicapped as he was by having to take notice of the 'Green' aspect of the farther Signal(s) ahead, and reckoning that either this Signal was "bobbing" [para 31 (b)] because of the fail-safe principle on which all signalling was based, or the newly introduced signalling [para 25(e)(viii)] was probably experiencing teething trouble or perhaps that this Signal was probably put back to 'Danger' to remind him of the 'caution order', he accordingly concentrated [para 25(e)(ix)] on the track ahead to locate any possible obstruction and finding none he probably only eased off the throttle, [para 54(I)(ii)].

(h) All things considered, and taking due cognizance of the consequences [paras 4(e) and 10(j)] of this accident but without being unduly influenced by the same, and also whereas there is no question but that it was the human failure on the part of 6 Up's Driver which caused this accident, it would be patently unjust not to consider the following numerous adverse factors that had combined together to most severely handicap the judgement of the Driver :

- (i) That he had not been explained about the crucial changes made in the Signalling layout [paras 57(b) & (d)], which lead to the regrettable situation that he was not even aware of the newly installed signalling layout with the expected degree of thoroughness;
- (ii) That the MACL Signal No. S-7B was not pre-warned [para 58(f)], which deprived him of the vital forewarning; and
- (iii) That MACL Signals have a long range visibility particularly on tangent track, which contributed to the confusion [para 44(i)], because a Driver can't be expected to selectively ignore a part of the visible array pertaining to Signals [SR 76-2(a)] applicable to his train.

60. As to the Role of the Assistant Driver

(a) One of the primary duties of an Assistant Driver is to provide back-up support to the Driver in his look-out duties, which would not, however, absolve the latter of his own responsibilities indicated in paras 59(c) & (d) above. SR 122-1 requires the Assistant Driver to call out the aspects displayed by a Signal from where it can be sighted whereupon and, after personal verification of the correctness of the aspect, the Driver shall repeat the same. No evidence came up at the Inquiry by way of any contributing factor(s) that might have possibly served to distract both the Driver and his Assistant at the critical period and thus incapacitate them from sighting Signal No. Signal No. S-7B.

(b) In this instance, his failure to detect the Red aspect of Signal No. S-7B has been equally greatly influenced by the handicaps mentioned in para 59(h).

(c) He must have been quite shocked out of his wits at the rapid turn of developments to be able to merely operate the emergency vacuum brake and not apply the hand-brake which was also on his side in the cab.

61. As to the need for restrictions to be imposed in the Station Working Orders of 'A', 'B' and 'C' Cabins on cross movements across the Main Lines

(a) If the signalling and interlocking does not in itself prohibit such cross movements, even then the desirability cannot be denied for such restrictions to be placed through Station Working Orders, in order to cater to the contingency of Drivers overshooting Signals. However, as already brought out in para 44 (ii), no such restriction exists at present in the Station Working Orders for either 'A', 'B' or 'C' Cabins. Such cross movements can be broadly classified in 2 categories :

- (i) Trains overshooting from the yard to foul the Main Line; and
- (ii) Trains overshooting a Stop Signal on the Main Line and fouling the path of a cross movement.

Both these cases are discussed below :

(b) As regards the first category, goods trains cannot leave the yard unless the concerned departure Signals are duly taken 'Off' for this express purpose and this contingency is effectively prevented by the interlocking provided. However, in respect of the track-layout at 'B' Cabin, even if a goods train overshoots the Up and Down Goods Waiting Bays at the North as well as the South ends, the setting of the cross-overs in their *normal* position for the Main Line movement will ensure that the Main Line is never fouled. Hence, the feared situation can never occur.

(c) As regards the second category, there can be several reasons necessitating the cross passage of goods trains with through trains brought to a halt on the Main Line, with the inherent hazard if the Main Line train does overshoot the Stop Signal. In respect of 'B' Cabin, the following examples will serve to highlight the situation :—

<i>Hazard</i>	<i>Remedy</i>
(i) Stoppage of an Up through train at Signal No. S-7B. Goods Train via the Down Main Line (as did happen in the subject accident);	Stoppage of train at Signal No. S-23C, after which this Signal may be lowered; 'A' Cabin's signals not to be taken 'OFF' until after Signal No. S-7B is taken 'OFF'.
or, to despatch an Up Goods Train via either Signal No. S-5B from the North Up and Down Goods Waiting Bay or Signal No. S-6B from the Up and Down Goods Line ;	When the new Itarsi 'Central' Route Relay Cabin is commissioned, an Up through train can be stopped at the Signal immediately in rear of Signal No. S-7B and then allowed to proceed further by its 'Calling-On' Signal.
or, to receive a Down Goods Train either on the Up and Down Goods Line or on the North Up and Down Goods Waiting Bay (as Signal No. S-2B has two 'played' route-indicators for this purpose)	
(ii) Stoppage of a Down through train at Signal No. S-2B, to facilitate the despatch of a Down goods train via the Down Main line.	The Up train to be first stopped at Signal No. S-1B and then allowed to proceed further, by taking 'OFF' the Calling-On Signal No. O-1 unto Signal No. S-2 at 'ON'.

(d) Anyone familiar with yard operations will not deny the pressing necessity that arises from time to time to keep the yard fluid and make space in the departure yard by pushing out goods trains even ahead of Mail/Express trains. At 'A' and 'C' Cabins also similar cross movements do occur and the imperative need for making due allowance for Main Line Drivers of through trains overshooting Signals at Danger has already been brought out in para 46(e):

62. As to the 'B' Cabin ASM's Role—

(a) He had just been posted to the new 'B' Cabin [para 18(d)(i)] and received 6 days of intensive on-the-job training [para 32(c)]. However, as brought out towards the end of para 18(d)(v), he was unaware of the finer points of the route cancellation mechanism. As regards the issue of a Competency Certificate to him, the usual practice in such cases is that, after the actual completion of 6 days training on panel working, a certificate is given by the CSI declaring the Cabin ASM attending such panel training course as passed. This certificate is sent to the Divisional Safety Office, where a fresh certificate is issued to the Cabin ASM under the signatures of DSTE and DSO declaring him fit for panel working. In this case, however, such a Competency Certificate was not issued [para 44(iii)] and the reason mentioned in para 33(c) is unacceptable. The Division had subsequently clarified that, in verity, the issue of the Competency Certificate was actually under process at the Divisional Office at the time of the accident.

(b) The Station Working Orders did contain an injunction that "as far as possible" a Signal once taken 'OFF' must not be put back to "ON" except in an emergency. But, with the large number of Mail/Express trains scheduled to leave Itarsi during the early part of the night [para 18(f)] and the subsequent experience gained even after the accident [para 40(f)], it must be accepted that in the interest of railway operations, it does become necessary for Signals to be put back to Danger for operational convenience and not necessarily in an "emergency", by which is meant an imminent accident or potential hazard that must be avoided.

(c) No doubt SR-36-2(c) also places a restriction on putting back a signal to 'ON' until the train, for which it had been taken 'OFF', had been brought to a halt. In this case, however, the Cabin ASM's explanation [para 18(g)] is acceptable, in that the question of stopping a train could hardly arise if, within his knowledge, the train had not even started from Itarsi. Moreover, this Subsidiary Rule is actually meant to safeguard the Driver of a train, against a Signal already taken 'OFF' for him being put back to 'Danger' suddenly and instantaneously and the route also altered simultaneously. In this instance, however, such was not the case because of the 2-minute time-delay mechanism, the concept underlying which has been clarified in para 12(b).

(d) Had he been thoroughly conversant with the significant nuances of the working of his Panel (or, conversely, had he been properly trained in the finer points of the route relay interlocking system installed there), he would have at once realised that he could avoid the "wastage" of the vital 2 minutes, provided that 'C' Cabin's Signal No. 23-C was put back to 'ON'. Had he attempted to get in touch with 'C' Cabin to achieve this end the fact that 6 Up was already on the move would have been made known to him and the question of putting back Signal No. S-7B to Danger would never have arisen; else, Signal No. S-23C would have been put back to 'ON' and 6 Up would have come to a halt, as it is inconceivable that it would have passed 2 successive Signals at 'Danger'.

(e) The matter of over-writings in the Train Registers maintained by the Cabin ASMs of 'A' and 'B' Cabins and by the Station Master of Dulariya and the attempt initiated by the 'B' Cabin's ASM to compound a fabrication with the co-operation of the 'A' Cabin's ASM has already been brought out in para 48(b)(ii). What has been stated at the end of para 19(b) lends further credence to this conclusion.

(f) Another error, relating to the precise sequence of events narrated by the 'B' Cabin ASM [para 18(d)(v)], was probably caused by the confusion created by aftermath of the accident, which must have doubtless come as a rude shock to him. What actually happened was that, while the 2-minute time release was in progress [para 50(d)], he must have obtained 'line clear' for the Goods Train from 'C' Cabin.

(g) As regards the ground floor structure of the new 'B' Cabin, it becomes easily self-evident that, had the Cabin been provided at a raised elevation and provided with all-round glazing on the sides facing the yard, the 'B' Cabin ASM could not have failed to detect the approach of 6 Up, particularly because of the straight track. In that event, despite his earlier dependence on the SCOR's word regarding the whereabouts of 6 Up, he would have stopped himself in time [para 54(f)] from re-setting the route and this accident would not have happened. In this context, however, the conditions prescribed by the Railway itself [para 38(g)] were not followed, thus denying an opportunity for the CASM to make a better evaluation of the situation by supplementing the knowledge gained from the Panel with his own perception.

(h) The effect of lack of inter-cabin-control and inter-slotting has already been brought out in para 54(e)(ii). Indeed, from the view-point of the 'B' Cabin's ASM, had not 6 Up's Driver been unable to detect the change in the aspect of Signal No. S-7B for as long as 2½ minutes, 6 Up would have certainly stopped short of any collision. All things considered, therefore, I do not hold that the 'B' Cabin ASM is to be regarded even partially culpable for this accident.

63. As to negligence and individual responsibility for this accident

(a) Several factors which combined to contribute to this accident may now be summed up as follows:—

- (i) The long range of visibility of MAFL Signals as against the minimum 200 metres [para 43(c)], which no doubt impelled 6 Up's Driver to give due consideration to the Green aspect of 'A' Cabin's Signal(s);
- (ii) Putting back Signal No. S-7B to Danger and altering of the set route in the absence of any real emergency as such; and
- (iii) The Driver passing that Signal at Danger.

(b) The various coincidences that had a preponderant influence on the latter 2 factors have already been dealt with in paras 62(d), (e) & (h) and 59(h) respectively and individual or administrative responsibility, if any, is discussed hereunder:—

- (i) Confusion to some extent or the other must prevail when a large number of bright

colour light signals become visible to an approaching Driver. The need for limiting the visibility is thus of critical importance in the interests of safety. While several possibilities suggest themselves such as dipping the Signal unit slightly downwards, lengthening the hood, etc; there is no question of any responsibility involved here; the approach is to render the system in future less amenable to confusion and hence safer.

- (ii) For the unsafe circumstance [para 44(i)] of Signal No. S-7B not being pre-warned, which did violate SEM para 119(e)(i), the Railway's Signal & Telecommunication Department has to bear the responsibility. However, for this deficiency [para 58(e)] in the design of the Signalling System, no individual responsibility can be assigned, particularly as the Railway's own expertise on S & T matters regarded this issue as a moot point.
- (iii) With regard to the 'B' Cabin ASM's inadequate grasp of the working of his panel, it is difficult to hold the Chief Signal Inspector, who had imparted 6 days on-the-job training to him, individually responsible for any specific lapse, in the absence of any non-verbal stipulation as to the curriculum for the said training. Hence, the need for laying down the syllabus and itemising a check-list against which the sufficiency of the imparted training may be gauged, can hardly be overemphasized. Moreover, institutionalised formal training at the Zonal Training School needs to be insisted upon, prior to exposure to such on-the-job training, particularly in the case of the younger employees. Also, a catechism should be developed to quiz and question such staff thoroughly as well as extensively not only in regard to all the various features of the panel but also in so far as these features relate to the General and Subsidiary Rules in respect of train-passing duties.
- (iv) There is nothing unsafe 'per se' in the 'Open Block System' but, in the absence of inter-slotting or adequate inter-cabin-control, the Station Working Orders must hereafter explicitly ensure the exchange of vital information at the stage of seeking 'line clear' which, purely viewed in a technical context, is now a mere formality inasmuch as the conditions required for the taking 'Off' of a Signal are detected and proved through track-circuits, relays and circuitry. A "seasoned" or experienced Cabin ASM, incurred as he is to co-operate and co-ordinate with his colleagues in the adjacent Cabins, would have explained to the 'C' Cabin the planned movement of the Goods Train ahead of 6 Up, thereby setting up an entirely different event-chain.
- (v) Likewise, in the absence of any firm directive on such a policy matter as this, no individual responsibility can be fixed for the circumstance [paras 46(e) and 61(c)] that

the Station Working Orders for 'B' Cabin do not prohibit movements across (or, fouling) the Main Lines, when through trains on the move on the Main Line are to be brought right upto the last Stop Signal.

- (vi) Similarly, no individual responsibility can be fixed for the failure of the Station Working Orders of 'B' Cabin to explicitly specify that, unless another train is already on the move on the Up Main Line requiring 'A' Cabin's Signal(s) to be taken 'Off', the said Signal(s) shall not be taken 'Off' [para 61(c)(i)] for a through train moving from Itarsi on the Up Main Line, until after Signal No. S-7B is itself taken 'Off'.
- (vii) Irrespective of whatever the merit may be of the technological inputs that go into the design of a sophisticated route-relay-interlocking system, the usefulness of providing the wherewithal for enabling the maximum visibility all-around in an elevated Cabin cannot be denied. However, for the new 'B' Cabin to have constructed as it was at Itarsi, its "plan" must have obviously been signed by all the concerned Divisional Officers in token of their approval. Therefore, no blame can be attached to any individual for having disregarded [para 38(g)] the desiderata laid down by the Administration in this context.
- (viii) That the existing procedure as followed at present to familiarise Drivers with the changes in signalling is wanting in the extreme has already been established in para 57. The Railway Administration, which has not only prescribed under SR 28-1 that the attention of Drivers be drawn to the changes effected in the signalling but also positioned Safety Counsellors (Loco) besides arranging for the Circular Notice to be posted in the Loco Shed, cannot be held guilty for not having established any further machinery. Rather the true position is that this "machinery" has through the years lost its purpose to some extent and thus proved ineffective in this particular case, for which failure, however, no individual can be held responsible. Thus, it now becomes imperative for the Administration to re-iterate forcefully the necessary guide-lines for achieving the desired object.

(c) Whereas the collision took place mainly because 6 Up's Driver had overshot a Signal at Danger, it cannot be denied that the overall situation suffered an overwhelming impact by the simultaneous co-existence of the adverse combination of the above 8 factors, some of which totally confounded his decision-making skills. The logical inference to be drawn from the foregoing is that the 6 Up's Driver, instead of being the culprit, was in fact an unfortunate victim of circumstances, most of which were entirely beyond his control. Accordingly, by giving him the benefit of all these mitigating and extenuating features and keeping in view the observations made in para 42(d) supra, I am unable to hold that negligence as such on his part has been established beyond reasonable doubt.

(d) It also becomes readily apparent that this accident, which could have easily been averted on several accounts, is somewhat of a freak.

64. As to the adequacy of relief measures—

(a) With regard to medical attention and care, on the basis of para 43(a) and my own visits to the various hospitals where the persons injured in this accident were being treated, I was entirely satisfied on this account, as already mentioned in para 2(c).

(b) The only disconcerting feature of the relief operations was the outbreak of fire alluded to in para 6(c) and which caused an additional damage estimated at Rs. 1 lakh [para 10(a)]. That the outbreak of fire was almost unavoidable is acceptable, as it occurred despite the precautions mentioned in para 35(a). Speed is of essence in wreckage clearance and emphasis should rightly be on both safety and the time factor; yet, curiously, ancient tooling continues to be in use in breakdown operations. The need for setting up improved facilities of the type already being used in India by the International Airport Authority of India cannot, therefore, be over-emphasised and, if adverse criticism [para 35(c)] is to be avoided in the future, procurement of special tools and miniaturised machinery must be planned with the utmost expedition.

VIII. CONCLUSIONS

65. (a) Upon full consideration of the factual, material and circumstantial evidence at my disposal, I conclude that the head-on collision of 6 Up Punjab Mail with a stationary Goods Train near Itarsi 'B' Cabin on the Central Railway's Bhusaval Division at 22.27 hours on 20-10-1980 was the result of 6 Up's Driver passing an un-prewarned MACL Signal No. S-7B at Danger. I also conclude that the said Driver was indeed a victim of a combination of several adverse circumstances, some of which had sorely handicapped his sense of judgement and, but for the simultaneous co-existence of which, this accident would not have happened.

(b) This accident is accordingly classified under the category "Failure of Railway Staff".

66. Responsibility—

(a) Individual responsibility as such for this collision can only devolve on Shri G.H. Patil, the Driver of 6 Up, whose bio-data has been given in para 42(d). Nevertheless, for reasons brought out in para 63(c), I cannot with logic hold him guilty of negligence or culpable for this freakish accident which had in effect resulted from the cumulative effect of, besides the unsafe design and installation of the Signalling System that left MACL Signal No. S-7B un-prewarned, also a variety of human failures on the part of several others.

(b) And, for the same reasons, I do not hold Shri Gurunath Seetharam, the Assistant Driver of 6 Up, culpable for this accident.

(c) For the said unsafe design/installation of the Signaling System at 'B' Cabin, whereas the Railway's Signal & Telecommunication Department has to shoulder the responsibility, no individual official is held blame-worthy.

(d) For reasons elucidated in para 63(b), I do not also hold any single individual responsible for the various failures of the human element.

(e) Infractions relating to what has been brought out in para 62(c), etc., have been separately referred to the Railway Administration for appropriate action.

67. Relief Measures—

With reference to para 64(a), I was entirely satisfied with the quality of medical attention provided to the injured.

IX. REMARKS AND RECOMMENDATIONS

68. Development of measures to reduce the range of visibility of MACL Signals—

As it is eminently desirable to eliminate the possibility of any confusion likely to be caused to the Driver through sighting too many signals within the field of his vision, it is recommended that the Railway Board may direct the RDSO to develop suitable measures aimed at curtailing the visibility of MACL Signals to about 500 m. or thereabouts, such as, tilting the 'signal unit' slightly downwards and lengthening the hood, etc.

69. Pre-warning of MACL Stop Signals—

In an age characterised by the direction of inputs of technological growth towards providing an improved information system for Drivers, it is only proper that the Railway should, hereafter at least, ensure strict and unexceptional compliance with SEM para 119(e)(i) in this respect, even if the introduction of Colour Light Signals has to be progressively "phased" in the case of large yards like Itarsi. Whereas it is understood that this proviso will be met when the new route-relay-interlocking installation of the Itarsi Central Cabin is commissioned, it is suggested that the Railway should review the situation obtaining at present in the various other large marshalling yards so as to check up whether or not the un-prewarned condition of the said Signal No. S-7B was an isolated instance and take such appropriate action as necessary to comply with the relevant SEM stipulation.

70. Design of a proper syllabus and suitable modalities for training CASMs in charge of 'Panel' working—

(a) At present, it is largely left to the Chief Signal Inspector's own initiative to devise his own methodology for training CASMs responsible for operating route-relay-interlocking 'panels'. While on the one hand the easy push-button operation does seem, prima facie, elementary to master, there is no denying the fact that such installations are conceptually extremely sophisticated, requiring a thorough grasp of the various intricacies involved. It is accordingly recommended that the Railway should standardise the syllabus as well as modalities for imparting training to such CASMs and also evolve an exhaustive catechism to enable the extensive quizzing of CASMs as to their proficiency.

(b) It is also recommended that CASMs—particularly those with a short service and hence limited experience — be deputed to undergo an institutionalised short-duration training programme on panel working at the Zonal Training School, in order that they are fully equipped with all the requisite knowhow as also the basic background that is so vital for gaining in-depth appreciation of the ensuing on-the-job training. It is further recommended that, as a pre-requisite to the issue of the Competency Certificate, such CASMs shall be re-tested on their knowledgeability in the General and Subsidiary Rules in respect of train passing duties. With some advance planning, it should be quite easy to fulfil these requirements.

71. Station Working Orders of not only 'B' Cabin but also 'A' and 'C' Cabins to prohibit hazardous cross movements—

(a) In the interests of safety, it becomes essential to display prudence and caution by inserting suitable instructions in the Station Working Orders for these Cabins prohibiting any cross movement across/over the Main Lines in the face of 'line clear' granted for a through train, in order to cater to the possibility of this latter train overshooting a Signal at 'Danger'.

(b) Similarly, in the event that such cross-movement becomes inescapable, suitable instructions should also be incorporated in the Station Working Orders to ensure that the said through train is stopped, rather than take the risk of allowing it to come upto the last possible Stop Signal on the run-through line, at a safe margin in rear, with any further movement enabled by the use of 'Calling-on' Signal. Since the Main Line trains will have to stop anyhow, it would be pertinent to note in this context that the wording of SR 42-1. "If, however, Calling-on Signal has been taken 'Off' before the train has arrived at that Signal—", would facilitate the use of a Calling-on-Signal without loss of time, even where the CASM positioned in a large RRI Cabin has no direct view of the entire yard.

(c) Whenever an otherwise run-through train has to be stopped on the Main Line thus, it is further recommended that the Station Working Orders should expressly stipulate that, wherever practicable, the farther Signals applicable to the relevant Main Line shall not be taken 'Off' unless and until the Stop Signal immediately ahead of the stopped train is itself taken 'Off'.

72. Cabins to be constructed invariably at a raised elevation and also to provide the maximum visibility of the yard from within

In this case, the Relay Room could have been positioned at the ground floor level with the Cabin located above, which is almost a standard practice all over. It is recommended that the construction of future Cabins should invariably be so planned as to provide the Panel Room at the highest possible elevation that may be commensurate with the actual requirements. Such Cabins should also provide for the widest possible range of over-view of the yard to enable the CASM to profit by using his perceptive

knowledge of the movements taking place to supplement the information already indicated on the Panel. To the extent possible, it is desirable that this facility be provided via all-round glazing which obviates any need for the CASM to go outside the Panel Room as, for instance, he would have to, if instead a balcony is provided skirting around it.

73. Positive steps to familiarise Drivers with any changes made in the Signalling

Drivers, who are required to be knowledgeable about the section ahead and who must implicitly obey Signals at all times, have the right to be explained unambiguously about any Signalling changes that are contemplated/installed. The Administration should thus regard it as one of its sacred duties to educate the loco crew in simple and lucid terms regarding any change(s) in the existing signalling lay-out. It is accordingly recommended that the Railway should quickly evolve suitable procedures to fulfil this requirement and identify, from amongst the existing categories of personnel, upon whom this responsibility would devolve, as also those whose duty it will be to exercise a check on the task as performed.

74. Exercise of due care in imposing speed restrictions

There is no gain-saying the fact that any and every speed-restriction per se is counter-productive to train-running. Hence, any overly restrictive speed restriction imposed merely for the sake of a formality, would only serve in the end as a provocation for the Drivers to disregard it, particularly when the accent is rightly on punctuality, higher average speeds, etc. As the development of such an anomalous situation is against the interests of safety, it is recommended that any speed restriction on account of change(s) in the signalling should hereafter be imposed only with due care aforethought, depending upon the needs of the actual circumstances obtaining; necessary instructions may be issued to all concerned.

75. Use of non-torch-based equipment in Breakdown operations

It is lamentable enough to incur a serious accident but it would appear unforgivable that the pathos of the situation should be aggravated by further damage through fire erupting during breakdown operations. The present-day technology has already made available, for example, at the airports in India, miniature high-power cutting tools capable of attaining very high speeds in wreckage clearance operations. It is, therefore, recommended that the Indian Railways should likewise procure similar light-weight, high-speed non-torch-based equipment for use at all depots meant to handle rescue operations.

Yours faithfully,

Sd/-

(N. P. VITHAL)

Commissioner of Railway Safety,
Central Circle, Bombay.

BOMBAY,

Dated 23rd July 1981.

ANNEXURE-I

CIRCULAR NOTICE

SUB : *Itarsi*—Provision of Route Relay Interlocking at 'B' Cabin.

On a date and time to be notified by DRM Bhusaval, the above work will be carried out in the following phases by SI(Const) RRI Itarsi.

PHASE I. *Disconnection at 'B' Cabin Lever Frame*

All the points, signals and slot levers will be disconnected from respective levers and will be non-interlocked by SI(Const) RRI ET under disconnection memo for a period of 3 days.

During the phase work—

(1) Signal 2B, 4B, 7B, 24B, 26B, 28B and 29B will be worked from the existing lever frame with respective levers without detection of points. These signals should be taken 'Off' after ensuring that the correct route is set and the points in the route are clamped and padlocked by Operating staff on special duty only and train has come to a stop at the Outer Signal of Up and Down Main Lines and Starter signals of Up and Down goods waiting bay lines.

(2) First day, points will be operated by crow bar. Second day the points will be operated by crank handle and third day the points will be operated from the new installed panel.

(3) Since slots are disconnected and cabins should pass the Traffic according to GR.56 and SR. thereunder. TI(RRI)BSL with three special duty Guards and 6 Pointsmen will be required round the clock. TI(RRI)BSL will be overall incharge and one Guard and two Pointsmen will work in 8 hrs. shift. Necessary caution order will be issued to all concerned.

PHASE II. *Block instruments between 'A' and 'B' Cabins will be disconnected and removed.*

PHASE III. *Transferring of Telephones.*

All the group and control phones and other Electric Instruments provided in the existing 'B' Cabin will be transferred to the panel room by TCI ET.

After the above phase work—

Mechanical signal arms will be disconnected and the colour light signals, motor operated points and track circuits will be commissioned and operated from the newly installed panel after carrying out the necessary tests. Necessary working order No. 192/B dt. 22-8-80 will be introduced by TI.

PHASE IV. *Removal of control on Green Aspects of signals locking alteration and circuit alteration in 'A' Cabin and removal of signal No. 5-A and Up Distant signal.*

A cabin will be made non-interlocked for a period of 24 hrs. under disconnection Memo by Signal Inspector (Const) RRI ET for carrying out the neces-

sary locking alteration and circuit alteration. Signal No. 5-A and Up Distant will be disconnected and removed. Removal of controls of green aspects of signals by lever No. 1-A, 2-A, 29-B will be done and levers made spare.

During the phase work—

TI(RRI) BSL with 3 special duty Guards and Six Pointsmen are required round the clock to pass the traffic, as per GR.54 and 56 and SR. thereunder.

Temporary working instructions as per Annexure attached will be observed.

After the Phase work—

Pre-laid track circuits, 3-T, 3-AT, 3-BT, 28-AT, 28-BT and 28-CT will be commissioned. Cabin will be made interlocked after carrying out the necessary locking and circuit testing. Necessary correction slip No. 192/A/4 dt. 22-8-80 to the existing SWO will be introduced by TI.

PHASE V. *Locking alteration and circuit alteration in 'C' Cabin.*

'C' Cabin will be made non-interlocked for a period of 24 hrs. under disconnection memo by Signal Inspector (Const) RRI ET for carrying out the necessary locking and circuit alterations.

During the Phase work—

TI RRI BSL with 3 guards on special duty and 6 Pointsmen are required round the clock to pass the traffic as per GR.54 and 56 and SR. thereunder.

Temporary working instructions as per Annexure attached will be observed.

After the Phase work—

Cabin will be made interlocked after carrying out the necessary locking and circuit testing. Necessary correction slip No. 192/C/1 dt. 22-8-80 to the existing SWO will be introduced.

PHASE VI. *Circuit alteration at GC-1.*

Necessary circuit alteration will be carried out at GC-1 under disconnection memo as per the approved circuits and the signal Nos. 2, 38, 59 and 21 will be kept at 'On' for a period of 8 hours by Signal Inspector (Const) RRI ET.

During this period Traffic should be passed as per GR.56. After the work is over, necessary correction slip No. 192/GC-1/B dt. 22-8-80 to the existing SWO will be introduced.

PHASE VII. Circuit alteration at GC-4.

Necessary circuit alteration will be carried out at GC(4)/B under disconnection Memo as per the approved circuits and the signal Nos. 35 and 49 will be kept at 'On' for a period of 8 hours by Signal Inspector (Const.) RRI ET. During the period, the traffic should be passed as per GR.56.

After the work is over, necessary correction slip No. 192/GC-4 dt. 22-8-80 to the existing SWO will be introduced.

PHASE VIII. Dismantling of existing 'B' Cabin lever frame and outside gears, such as signals and points.**NOTES :**

- (1) After the completion of Phase I, II and III, S & T staff will remain round-the-clock at 'B' Cabin panel room as long as smooth working is resumed.
- (2) Caution order is to be issued for Colour light signals at 'B' Cabin panel for a period of 10 days as per SR. 28-1.

General

1. Before commencement of work in each Phase SI (Const) RRI ET will take written permission of AO/Yard Master ET.
2. During the progress of work caution orders will be issued to drivers of all Up and Down trains passing through the affected area to whistle freely, keep a sharp look out for guy ropes, observe hand signals and be prepared to stop if necessary.
3. Whenever any signal is shifted or any new signal brought into use, caution orders as per SR.28-1 will be issued to all drivers of the concerned trains for a period of ten days to observe the signal/signals in its/their new location.

4. Sighting committee consisting of TI Harda, LI ET and SI ET will be formed by TI Harda as per SR.28-2 to check the visibility of all shifted signals and all new signals as early as possible immediately after the signal is brought into use in its new location, and submit sighting certificate to all concerned.

5. Caution orders as per Appendix 'E' to G&S Rule book will be issued during the progress of work in each Phase and the site of the work will be protected in accordance with GR.215 and SR.215-1.

6. TI RRI BSL will be present throughout the progress of the work at 'A', 'B' and 'C' Cabins in all Phases to co-ordinate the work and to ensure safe and quick movement of traffic.

7. During the period of non-interlocking, special duty guards and Pointsmen in each shift shall be present round the clock to ensure safe movement of traffic. TI(RRI)BSL will arrange sufficient clamps and padlocks to enable the special duty staff to clamp and padlock all the affected points.

8. On completion of work SI (Const) RRI ET will issue safety certificate to the Transportation Representative to the effect that the work is complete and safe for traffic. The latter will then advise all concerned.

9. All concerned message will be addressed to the following : GM(O) GM(S&T) BB DEN(N) Sr. DOS DSO DSTE(Wks) Sr. DSTE CHC BSL SM TI HD SM KNW DKI AO YM LF SI (Const) RRI SS DYC ET

C. RLY.

No. BSL.T.166/20/80.

Divisional Office, BSL.

Date : 18-9-80.

RAILWAY BOARD'S VIEWS ON THE RECOMMENDATION

Para 65 : The cause of the accident as given by CRS is prima facie accepted. It is mentioned however that the accident resulted directly from the failure of the Driver to obey a signal and in his passing it in the 'On' position. It is also mentioned that pre-warning of signal No. S-7B of 'B' Cabin which the Driver of 6 Up passed at danger was not a codal necessity, as has already been pointed by the Railway.

Para 66 : It is noted that CCRS considers the Driver of 6 Up responsible for causing the accident and it is prima facie accepted. Regarding provision of signals, signal No. 23-C preceding signal No. 7-B was a two aspect signal. On passing the signal No. 23-C, the Driver was expected to necessarily keep a look out for the next signal which in this case was signal No. 7-B presuming it to be at danger unless seen by him otherwise. The Driver was obviously still travelling in 2 aspect signalling territory and considering the layout and scheme of working in the yard, it was not a codal necessity to pre-warn this signal. The signalling arrangement provided were quite adequate from safety point of view and hence there is no question of Signal & Telecommunication department of the Railway shouldering the responsibility.

Para 68 : *Development of measures to reduce the range of visibility of MACL signals.*

The railway is already aware of this problem. Due to inherent feature of this system there is a wide variation in the range of visibility of Colour Light Signals at night and during the day. Any attempt to restrict the visibility at night affects the range of visibility during the day also. Knowledge of the road for the drivers is therefore an essential requirement.

Para 69 : *Pre-Warning of MACL stop signals.*

As indicated against views in para No. 66(C) it would not be correct to interpret as a case of unpre-warned stop signal in multiple aspect signalling territory. There is, therefore, no need to issue any instructions from the Board arising out of this.

Para 70(a) : *Design of proper syllabus for training CASMs.*

The Railway has been asked to standardise the syllabus and modalities for imparting training to staff.

Para 70(b) : *Panel training.*

The Railway Administration has advised that panel training is to be included as a part of initial training of freshly recruited Cabin ASMs/ASMs at zonal training school at Bhusaval. As far as training in the in-service Cabin ASMs on panel is concerned, the same is being organised by the Railway Administration on the Division. In addition, the refresher course is also being modified to include panel training.

Other Railways are also being suitably advised, as suggested by CCRS.

GIPN—S1—423 CRS Luck/85—21-8-86—500.

Para 71(a) & (b) : *Station working orders of not only B Cabin but also A & C Cabins to prevent hazardous cross movement.*

The Railway Administration has accepted the recommendations and incorporated necessary provision in the station working order of Itarsi station. This has been noted by CCRS. Instructions are being issued to other Railways to take similar action.

Para 71(c) : *Aspect of signal ahead.*

CCRS has appreciated the difficulty in implementing CRS's recommendations in this respect. However as desired by him necessary directives are being issued to Railways that in case any signal is put back to 'On' in an emergency the signals ahead should also be put back to 'On' immediately thereafter.

Para 72 : *Cabins to be constructed at raised elevation to provide maximum visibility.*

The Railway Administration has accepted the recommendations for implementation in future cases. Other Railways have also been advised in this regard under Board's letter No. 83/WDO/EV/1 dated 28-12-83 (copy enclosed).

Para 73 : *positive steps to familiarise drivers with any changes made in the signalling.*

The recommendation that the drivers should be acquainted with any changes made in the signalling is being implemented by the Railway Administration. CCRS has noted this. Other railways are also being advised in the matter.

Para 74 : *Exercise of due care in imposing speed restriction.*

Speed restrictions are imposed where it is inescapable for safety running of trains. The speed restriction under consideration was imposed by the Railway Administration on account of changes in Signalling. The restriction was lifted when no longer required and was not current at the time of the accident "but wrongly issued". CCRS has noted this.

Para 75 : *Use of non-torch based equipment in breakdown portions.*

The Railway Administration has advised that cold cutting equipment has since been provided in all the A. class breakdown trains on Central Railway. It has been noted by CCRS. Other railways have been asked to do likewise as desired.

Para 76 : *CCRS's additional remarks : Check on repeated contravention of speed restriction.*

Instructions have been issued to intensify supervision to ensure safe running of trains including implementation of speed restrictions etc.

Price : (Inland) Rs. 18.00 (Foreign) £ 2.10 or \$ 6.48 Cents.