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Government of India-Ministry of Railways
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TECHNICAL CIRUCLAR NO. 18

Ramesh Chandra,
Executive Director Stds / Electrical

D.O. No.No. El/3.1.39/1 Dt.27.2.98

Dear Shri Garg/ Goel/Sen/ Bansal / Prasad / Punnuswami / Nagpal / Aggarwal / Jain / Adhikari

Sub: Selection of locomotives on busy traffic routes.

In the past and even now, the capability of the locomotive to haul various loads is taken based on the starting tractive effort only. As a tradition a locomotive which gives higher starting tractive effort is branded as superior in railway jargon. While starting capabilities are important: for day to day running it is more important as to how fast the locomotive is able to clear the section i.e. the acceleration and the time taken in attaining balancing speeds.These parameters have a big bearing in deciding the throughput of the section and higher utilisation of assets (loco and wagons). Unfortunately this view has never been projected. Through the write up below, an analysis has been made and is placed for your information.

The decision generallly taken is based on the ruling gradient of a particular section of operation. Practically in all cases these gradients fall in open routes where there are no signals and trains do not stop. The locomotives with higher HP can run through without having the need to start on such gradients. Example is one WAG7 cannot start 4700t load on 1 in 200 Up gradient but can run through at a reasonably good speed (35 kmph).

The decision of deployment of locomotive, therefore based on solely starting capabilities is misleading. For faster clearance of traffic, particularly on high density routes the time, taken by the train in clearing the critical block section is of utmost importance,This depends entirely on the final balancing speed achievable, time taken to attain it and the time taken to attain full speed after passing a speed restriction. It is here, that higher H.P. plays a vital role.

Some exercise has been done for varius types of locomotives. In case of haulage of 58 BOXN (4700t) on level the acceleration curves for various class of locomotivs are shown in Annexure I.As would be seen that all electric locomotives, viz , single WAG5, single WAG7, single WAG9, attain a speed of 75 kmph in less than 1000 seconds. (Traditionally taken as the time for attaining the maximum speed in the section). All diesel locomotives do not attain a service speed of 75 kmph at all. Even single WAG5 gives a better performance than GM loco. (anticipated performance). Similar exercise has been done for 58 BOXN (4700t) load for haulage on 1 in 400 gradients. These curves are enclosed as Annexure II.

From the curves at Annexure I.it would also be seen that to attain a speed of 75Kmph form a speed restriction of 30kmph the time taken for GM loco is 16 1/2 mins while WAG9 takes 5.6 mins., WAG7 takes 8 minutes and WAG5 takes 10 1/2 mins. For a balancing speed of 80 Kmph the difference rises sharply. This analysis is ample proof of the loss in line capacity that would be affected if we deploy low HP locomotive especially on gradients. Looking in another way, this is the real merit of electric locomotives, which matters in day to day operations.

Computer simulations have been done for running 58 BOXN (4700t) from MGS to Ghaziabad with normal speed restriction and assuming one halt at every 50 Km for precedence etc. The summary of the timings taken by various locomotives is shown in Annexure III enclosed.

As would be evident from Annexure-III, the time taken by single WAG7 is 1% less compared to GM locomotive and 11% less compared to WDG2. In other words this means the increase in line capacity to that extent and improvement and unilistion of rolling stock by the same percentages. In the case of WAG9, these figures are higher at 3.7% & 14.5%.

These benefits need to be projected in the right perspective, particularly the gains on every busy sections, working to near saturation traffic levels where even a couple of minutes reduction in running time on critical block section means a lot in terms of generation line capacity. This point needs to be emphasised in every forum and the operations Manager at various levels convinced on these lines, for ultimate gain to Indian Railways.

With regards,

Your sincerely,

Encl. As above

(Ramesh Chandra)

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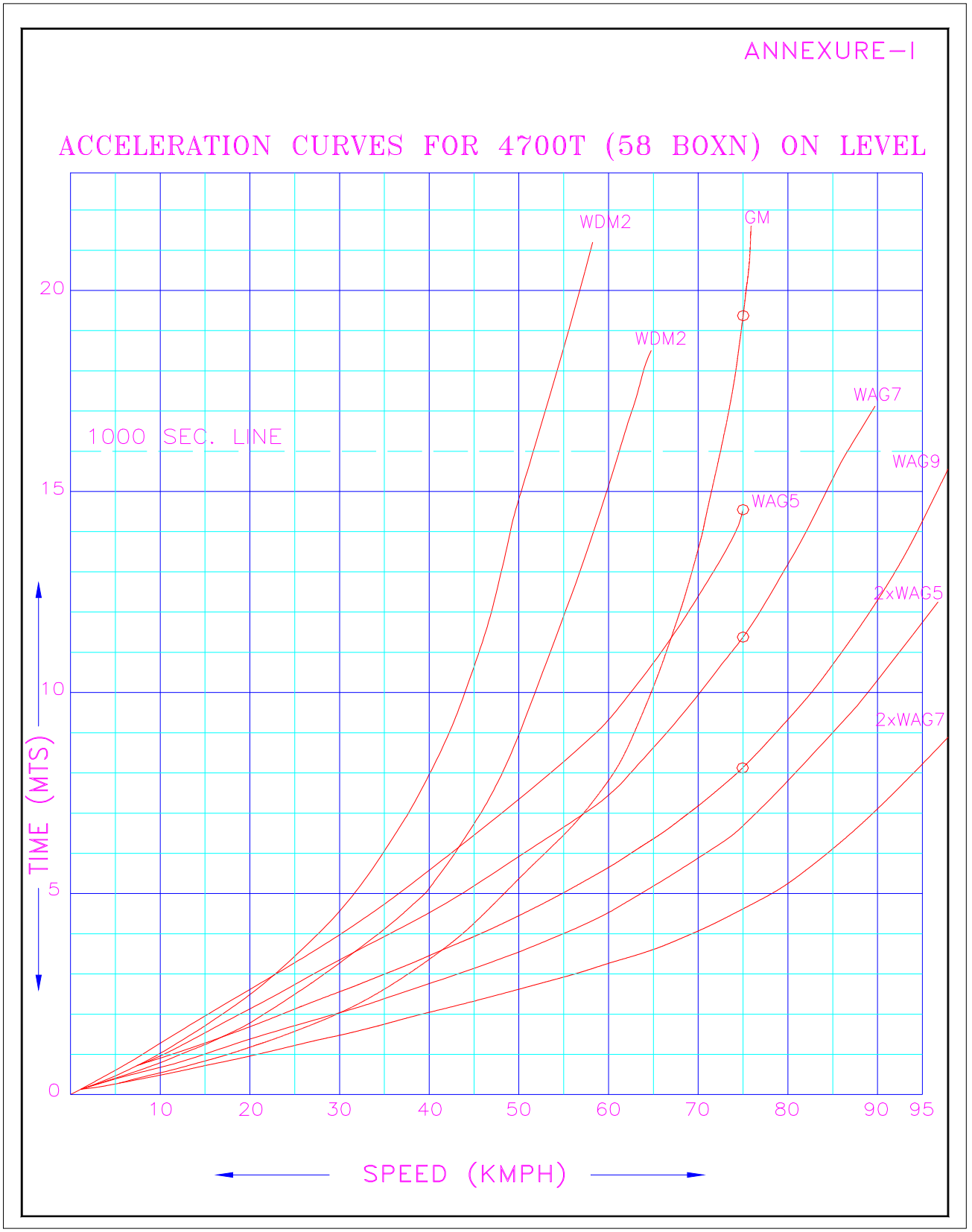
Encl : As above

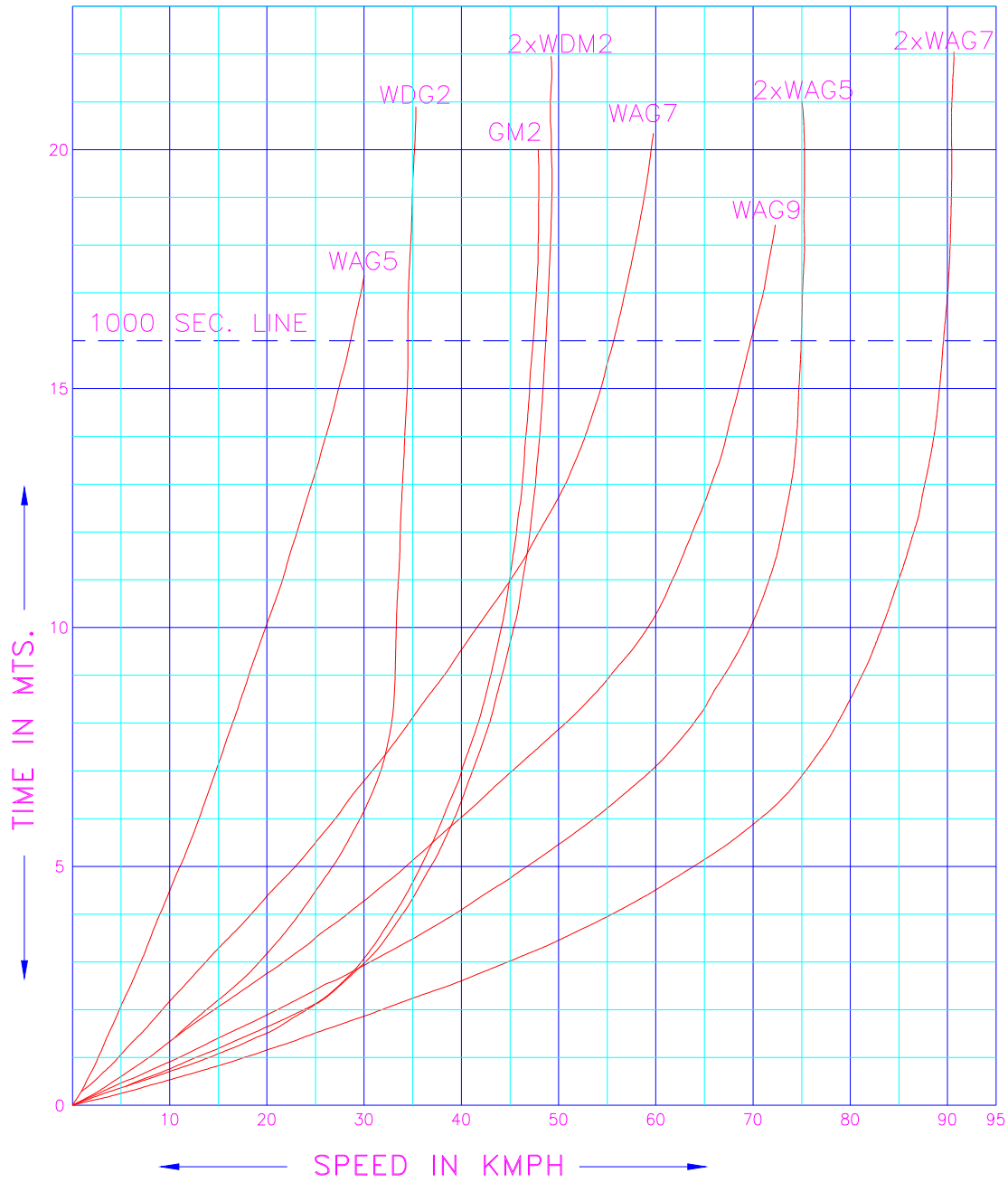
(Ramesh Chandra)
for Director General/Elect.

ANNEXURE–I


ACCELERATION CURVES FOR 4700T (58 BOXN) ON LEVEL
WDM2
GM
WDM2
WAG7
1000 SEC. LINE
WAG9
WAG5
2xWAG5
2xWAG7
20
15
10
5
0
TIME (MTS)
10
20
30
40
50
60
70
80
90
95
SPEED (KMPH)

ANNEXURE II

ACCELERATION CURVES FOR 4700T (58BOXN) ON 1:400



ANNEXURE - III

S.No.	Loco Type	Running Time in minutes	% Saving with	
			WAG 9	**WAG 7**
1.	WDM2	922	27	23.8
2.	WDG2	829	14.5	11.0
3.	GM	751 (anticipated)	3.7	1.0
4.	WAG5	786	7.4	4.2
5.	WAG7	745	2.7	-
6.	WAG9	724	-	-
7.	2xWAG7	696.37	3.8	6.8