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अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226011
Government of India - Ministry of
Railways
**Research, Designs & Standards
Organization, LUCKNOW - 226011**

EL/3.1.39/1

Date: 29.06.2009

Chief Electrical Engineer

- 1- Central Railway, Mumbai CST - 400001
- 2- Northern Railway, Baroda House, New Delhi - 110001
- 3- Eastern Railway, Fairlie Palace, Kolkata- 700001
- 4- Southern Railway, Park , Chennai -600003
- 5- South Central Railway, Rail Nilayam, Secunderabad -500071
- 6- Western Railway, Church Gate, Mumbai - 400020
- 7- South Eastern Railway, Garden Reach, Kolkata - 700043
- 8- East Central Railway, Hazipur, Bihar - 844101
- 9- West Central Railway, Jabalpur - 482001
- 10- South East Central Railway, Bilaspur- 495004
- 11- East Coast Railway, Bhubneshwar- 751016
- 12- North Central Railway, Subedarganj, Allahabad- 211033

Technical Circular No: RDSO/2009/EL/TC/0100 (Rev '0')**Sub: Haulage capacity of WAG9 Freight AC Three phase locomotive in run through conditions on different gradients.**

Lengths of negotiable stretches of rising gradients in run through conditions for various loads and locos at different attacking speeds were advised to Railways from time to time through Technical circulars TC-22, TC-23, TC-24, TC-26, TC-86, TC-87, TC-88, TC-89, TC-95, TC-97 and TC-99.

However, Railways also desired lengths of negotiable stretches of 1/125, 1/80 and 1/62 rising gradients also for various train load and locos at different attacking speeds. Computer simulations have been done at RDSO for following combinations to arrive at the lengths of stretches which can be negotiated in run through conditions at various attacking speeds. Simulation results are given in table No. 1 to 38 at Annexure-I for Single WAG9 Loco.

Loads	Grade		
	1:125	1:80	1:62
40BCN, 3300T	Loco can start and achieve speed of 46 kmph in 36.3 min. & 18.1 km.	Table-11	Table-25
40BCN (CC+6), 3491T	Loco can start and achieve speed of 25 kmph in 36.8 min. & 11.0 km.	Table-12	Table-26
40BCN (CC+6+2), 3571T	Loco can start and achieve speed of 17 kmph in 41.2 min. & 9.3 km.	Table-13	Table-27
41BCN+1BV (CC+6), 3593T	Loco can start and achieve speed of 15 kmph in 46.5 min. & 9.8 km.	Table-14	Table-28
41BCN+1BV (CC+6+2), 3675T	Table-1	Table-15	Table-29
41BCN+1BV (CC+10), 3757T	Table-2	Table-16	Table-30
48BTPN (CC), 4000T	Table-3	Table-17	Table-31
58BOXXN (CC), 4714T	Table-4	Table-18	Table-32
58BOXXN (CC+6), 5062T	Table-5	Table-19	Table-33
58BOXXN (CC+6+2), 5178T	Table-6	Table-20	Table-34
58BOXXN (CC+10), 5294T	Table-7	Table-21	Table-35
59BOXXN+1BV (CC+6), 5164T	Table-8	Table-22	Table-36
59BOXXN+1BV (CC+6+2), 5282	Table-9	Table-23	Table-37
59BOXXN+1BV (CC+10), 5400T	Table-10	Table-24	Table-38

Railways are requested to conduct field trials on the above guidelines in different sections. Based on such trials, you may issue guidelines to Loco pilots to enable them negotiate such stretches successfully without causing stalling and overloading of electrical equipments. RDSO may be kept apprised of the developments.

(Ishaq Khan)
For Director General/Elec.

Encl: Annexure - I

Distribution: As per standard mailing list no. EL/M/0019 Amendment-3.

(Ishaq Khan)
For Director General/Elec.

Annexure-I**Negotiable length of stretches on various rising gradients with single WAG9 loco**

TABLE-1		
Grade: 1: 125 Compensated Load: 41BCN+1BV (CC+6+2), 3675T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	3.0	18.0
30	5.5	23.0
40	7.5	29.0
50	9.5	36.0
60	11.0	38.0
70	12.5	39.0

TABLE-2		
Grade: 1: 125 Compensated Load: 41BCN+1BV (CC+10), 3757T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	2.5	15.5
30	4.5	20.0
40	6.5	26.5
50	8.5	32.5
60	10.0	35.0
70	11.5	36.0

TABLE-3		
Grade: 1: 125 Compensated Load: 48BTPN (CC), 4000T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	1.5	12.0
30	3.0	16.5
40	5.0	19.0
50	7.0	24.0
60	8.5	27.0
70	10.0	28.0

TABLE-4		
Grade: 1: 125 Compensated Load: 58BOXN (CC), 4714T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	0.5	14.0
30	1.5	14.0
40	2.5	18.0
50	4.0	18.0
60	5.0	22.0
70	6.0	25.0

TABLE-5		
Grade: 1: 125 Compensated Load: 58BOXN (CC+6), 5062T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	0.5	12.0
30	1.0	18.0
40	2.0	19.0
50	3.0	23.0
60	4.0	26.0
70	5.0	27.0

TABLE-6		
Grade: 1: 125 Compensated Load: 58BOXN (CC+6+2), 5178T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	21.0
40	1.5	25.0
50	2.5	28.0
60	3.5	30.0
70	4.5	31.0

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-7		
Grade: 1: 125 Compensated Load: 58BOXN (CC+10), 5294T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	20.5
40	1.5	24.0
50	2.5	26.0
60	3.5	28.0
70	4.5	29.0

TABLE-8		
Grade: 1: 125 Compensated Load: 59BOXN+1BV (CC+6), 5164T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	21.0
40	1.5	25.0
50	2.5	28.0
60	3.5	30.0
70	4.5	31.0

TABLE-9		
Grade: 1: 125 Compensated Load: 59BOXN+1BV (CC+6+2), 5282T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	20.5
40	1.5	24.0
50	2.5	26.0
60	3.5	28.0
70	4.5	29.0

TABLE-10		
Grade: 1: 125 Compensated Load: 59BOXN+1BV (CC+10), 5400T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	20.0
40	1.5	23.0
50	2.5	24.0
60	3.5	26.0
70	4.5	27.0

TABLE-11		
Grade: 1: 80 Compensated Load: 40BCN , 3300T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	17.0
40	1.0	27.0
50	2.0	25.0
60	2.5	31.0
70	3.0	35.0

TABLE-12		
Grade: 1: 80 Compensated Load: 40BCN (CC+6), 3491T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	14.0
40	1.0	24.5
50	2.0	19.5
60	2.5	26.5
70	3.0	31.0

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-13		
Grade: 1: 80 Compensated Load: 40BCN (CC+6+2), 3571T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	13.0
40	1.0	23.5
50	2.0	17.5
60	2.5	24.5
70	3.0	29.5

TABLE-14		
Grade: 1: 80 Compensated Load: 41BCN+1BV (CC+6), 3593T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.75	12.0
40	1.0	23.0
50	2.0	17.0
60	2.5	24.0
70	3.0	29.0

TABLE-15		
Grade: 1: 80 Compensated Load: 41BCN+1BV (CC+6+2), 3675T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.5	20.0
40	1.0	22.0
50	1.5	27.0
60	2.0	32.0
70	2.5	36.0

TABLE-16		
Grade: 1: 80 Compensated Load: 41BCN+1BV (CC+10), 3757T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.5	19.0
40	1.0	21.0
50	1.5	26.0
60	2.0	31.0
70	2.5	35.0

TABLE-17		
Grade: 1: 80 Compensated Load: 48BTPN (CC), 4000T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.5	18.0
40	1.0	18.0
50	1.5	23.0
60	2.0	27.5
70	2.5	31.5

TABLE-18		
Grade: 1: 80 Compensated Load: 58BOXN (CC), 4714T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	0.5	13.0
40	0.75	21.0
50	1.0	30.0
60	1.5	32.5
70	2.0	35.0

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-19		
Grade: 1: 80 Compensated Load: 58BOXN (CC+6), 5062T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	19.0
50	1.0	28.25
60	1.5	30.0
70	2.0	32.0

TABLE-20		
Grade: 1: 80 Compensated Load: 58BOXN (CC+6+2), 5178T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	18.5
50	1.0	27.75
60	1.5	29.0
70	2.0	31.0

TABLE-21		
Grade: 1: 80 Compensated Load: 58BOXN (CC+10), 5294T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	18.0
50	1.0	27.25
60	1.5	28.5
70	2.0	30.5

TABLE-22		
Grade: 1: 80 Compensated Load: 59BOXN+1BV (CC+6), 5164T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	18.5
50	1.0	27.75
60	1.5	29.0
70	2.0	31.0

TABLE-23		
Grade: 1: 80 Compensated Load: 59BOXN+1BV (CC+6+2), 5282T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	18.0
50	1.0	27.25
60	1.5	28.5
70	2.0	30.5

TABLE-24		
Grade: 1: 80 Compensated Load: 59BOXN+1BV (CC+10), 5400T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	17.25
50	1.0	26.5
60	1.5	27.75
70	2.0	29.75

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-25		
Grade: 1: 62 Compensated Load: 40BCN , 3300T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	17.5
50	1.0	27.5
60	1.5	27.5
70	2.0	28.0

TABLE-26		
Grade: 1: 62 Compensated Load: 40BCN (CC+6), 3491T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	15.5
50	1.0	25.0
60	1.5	24.5
70	2.0	24.5

TABLE-27		
Grade: 1: 62 Compensated Load: 40BCN (CC+6+2), 3571T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	14.5
50	1.0	24.0
60	1.5	23.0
70	2.0	22.5

TABLE-28		
Grade: 1: 62 Compensated Load: 41BCN+1BV (CC+6), 3593T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	14.0
50	1.0	23.5
60	1.5	22.5
70	2.0	22.0

TABLE-29		
Grade: 1: 62 Compensated Load: 41BCN+1BV (CC+6+2), 3675T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.75	12.5
50	1.0	22.5
60	1.5	21.0
70	2.0	20.5

TABLE-30		
Grade: 1: 62 Compensated Load: 41BCN+1BV (CC+10), 3757T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	25.0
50	1.0	21.5
60	1.5	19.5
70	2.0	18.5

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-31		
Grade: 1: 62 Compensated Load: 48BTPN (CC), 4000T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	24.0
50	1.0	19.0
60	1.0	36.0
70	1.5	35.0

TABLE-32		
Grade: 1: 62 Compensated Load: 58BOXN (CC), 4714T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	21.0
50	0.75	26.0
60	1.0	33.0
70	1.5	29.0

TABLE-33		
Grade: 1: 62 Compensated Load: 58BOXN (CC+6), 5062T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	20.0
50	0.75	24.5
60	1.0	31.0
70	1.5	26.5

TABLE-34		
Grade: 1: 62 Compensated Load: 58BOXN (CC+6+2), 5178T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	19.5
50	0.75	24.0
60	1.0	30.5
70	1.5	26.0

TABLE-35		
Grade: 1: 62 Compensated Load: 58BOXN (CC+10), 5294T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	19.0
50	0.75	23.5
60	1.0	30.0
70	1.5	25.5

TABLE-36		
Grade: 1: 62 Compensated Load: 59BOXN+1BV (CC+6), 5164T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--
30	NR*	--
40	0.5	19.5
50	0.75	24.0
60	1.0	30.5
70	1.5	26.0

*NR means "Not Recommended"

Negotiable length of stretches on various rising gradients with single WAG9 loco

TABLE-37			TABLE-38		
Grade: 1: 62 Compensated Load: 59BOXN+1BV (CC+6+2), 5282T			Grade: 1: 62 Compensated Load: 59BOXN+1BV (CC+10), 5400T		
Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)	Attacking Speed (KMPH)	Max.length which can be negotiated (Km.)	Exit Speed (KMPH)
20	NR*	--	20	NR*	--
30	NR*	--	30	NR*	--
40	0.5	19.0	40	0.5	18.5
50	0.75	23.5	50	0.75	23.0
60	1.0	30.0	60	1.0	29.5
70	1.5	25.5	70	1.5	25.0

*NR means "Not Recommended"