

---

# **Evaluation of the Low-speed Offtracking of Extended Length B-trains**

---

Prepared for



**Canadian Trucking Alliance**  
**555 Dixon Road**  
**Rexdale Ontario M9W 1H8**

by

**John R. Billing**  
**31 La Peer Blvd**  
**Agincourt Ontario M1W 2H3**  
**Phone (416)-499-3202**  
**Fax (416)-499-2295**  
**[jrbilling@sympatico.ca](mailto:jrbilling@sympatico.ca)**  
**10 October 2013**



## TABLE OF CONTENTS

1.	Introduction .....	1
2.	B-train Configurations .....	2
2.1	Scope .....	2
2.2	Tractors .....	2
2.3	B-trains.....	2
3.	Computer Simulation .....	4
3.1	Simulation Procedure.....	4
3.2	Results .....	4
4.	Discussion of Results .....	5
4.1	Baseline Low-speed Performance Standard.....	5
4.2	Low-speed Offtracking of B-trains .....	5
5.	Conclusions .....	8
	References .....	9
	Appendix .....	10

## LIST OF FIGURES

Figure 1: Tridem-tandem B-train Van Configuration.....	2
--	---

## LIST OF TABLES

Table 1: B-train Wheelbase Combinations .....	3
Table 2: Low-speed Offtracking for 6.80 m (268 in) Wheelbase Tractor .....	5
Table 3: Low-speed Offtracking for Tractors with Longest Lead Semitrailer and 17.00 m (669 in) Sum of Semitrailer Wheelbases .....	6
Table 4: Maximum Sum of Semitrailer Wheelbases to Meet Low-speed Offtracking Performance Standard .....	7
Table 5: Low-speed Offtracking for 5.28 m (208 in) Wheelbase Tractor .....	10
Table 6: Low-speed Offtracking for 5.60 m (220 in) Wheelbase Tractor .....	11
Table 7: Low-speed Offtracking for 5.90 m (232 in) Wheelbase Tractor .....	12
Table 8: Low-speed Offtracking for 6.20 m (244 in) Wheelbase Tractor .....	13
Table 9: Low-speed Offtracking for 6.30 m (248 in) Wheelbase Tractor .....	14
Table 10: Low-speed Offtracking for 6.40 m (252 in) Wheelbase Tractor .....	15
Table 11: Low-speed Offtracking for 6.50 m (256 in) Wheelbase Tractor .....	16
Table 12: Low-speed Offtracking for 6.60 m (260 in) Wheelbase Tractor .....	17
Table 13: Low-speed Offtracking for 6.70 m (264 in) Wheelbase Tractor .....	18
Table 14: Low-speed Offtracking for 6.80 m (268 in) Wheelbase Tractor .....	19
Table 15: Low-speed Offtracking for 6.90 m (272 in) Wheelbase Tractor .....	20
Table 16: Low-speed Offtracking for 7.00 m (276 in) Wheelbase Tractor .....	21
Table 17: Low-speed Offtracking for 7.10 m (280 in) Wheelbase Tractor .....	22
Table 18: Low-speed Offtracking for 7.20 m (283 in) Wheelbase Tractor .....	23

## 1. INTRODUCTION

The 8-axle B-train became the principal heavy haul truck configuration when all provinces adopted the Memorandum of Understanding on Interprovincial Weights and Dimensions (“the M.o.U.”) in 1989 [1]. The M.o.U. allows a box length up to 20 m (65 ft 7 in) for double trailer combinations, but restricts the overall length to 25 m (82 ft) [1]. The M.o.U. allows a tractor wheelbase up to 6.20 m (244 in), but the 20 m (65 ft 7 in) box length within 25 m (82 ft) overall length restricts the tractor pulling a double trailer combination to a maximum wheelbase of about 5.28 m (208 in), though a for a B-train with a box length less than 20 m (65 ft 7 in). The front axle setback of particular tractor models, the need for a sleeper berth, environmental control equipment, longer fuel tanks for natural gas, or a moose bumper, further restricts the choice of tractor model and wheelbase, or B-train, for carriers who run B-trains.

The Canadian Trucking Alliance (CTA) sponsored a study to assess the dynamic performance of B-train configurations whose trailers met the M.o.U. specifications but were pulled by a tractor with a wheelbase up to 7.16 m (282 in) [2]. This work found that the high-speed performance measures were not greatly affected by tractor wheelbase, but that low-speed offtracking exceeded the performance standard by a small amount for tractors with a wheelbase over 6.20 m (244 in) when pulling a tridem-tandem B-train with a lead semitrailer more than 9.75 m (32 ft) long. The tandem-tridem B-train met the low-speed offtracking performance standard for all tractors considered.

Ontario regulations [3], and the regulations of some other provinces, now allow a tractor with a wheelbase from 6.20 to 7.20 m (244 to 283 in) to pull a semitrailer, provided the semitrailer wheelbase is appropriately reduced below 12.50 m (492 in).

The M.o.U. and the regulations of all provinces provide a minimum wheelbase of 6.25 m (246 in) for both the lead and rear semitrailer of a B-train, with no upper limit. However, the upper limit on the wheelbase for each semitrailer is effectively restricted by the maximum box length of 20.00 m (787 in), the limit on the sum of the wheelbases of the two semitrailers of 17.00 m (669 in), and practical concerns of configuring a B-train for proper axle weight distribution.

The purpose of this work was to determine reasonable restrictions on the wheelbase of the longest B-trains so that they could meet the low-speed offtracking performance standard with tractors with a wheelbase from 6.20 to 7.20 m (244 to 283 in).

## 2. B-TRAIN CONFIGURATIONS

### 2.1 Scope

This work examined the low-speed offtracking performance of tridem-tandem M.o.U. B-trains pulled by a tractor with a wheelbase from 5.28 to 7.20 m (208 to 283 in), with an overall length up to 27.5 m (90 ft 3 in).

### 2.2 Tractors

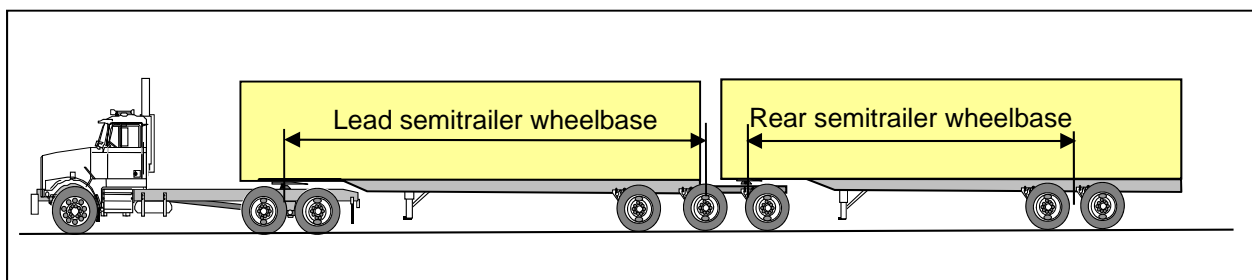
The principal factor in this work was the effect of tractor wheelbase on the low-speed offtracking of B-trains within the practical box length from about 18 m (59 ft) to 20 m (65 ft 7 in). The tractor was considered with a wheelbase of 5.28, 5.60, 5.90, 6.20, 6.30, 6.40, 6.50, 6.60, 6.70, 6.80, 6.90, 7.00, 7.10 or 7.20 m (208, 220, 232, 244, 248, 252, 256, 260, 264, 268, 272, 276, 280 and 283 in). The tractor fifth wheel was placed 0.25 m (10 in) forward of the centre of the drive tandem for all tractor wheelbases.

All other tractor properties were as described in the previous work [2].

### 2.3 B-trains

The only issues that arose with low-speed offtracking in the previous work were for the longest lead semitrailer and the shortest rear semitrailer [2]. This work considered the same generic dry van tridem-tandem B-train used in the previous work [2], as shown schematically in Figure 1. The dimensions shown are the variables considered in this analysis. This B-train was pulled by a generic tandem tractor, as described in Section 2.2 above. All B-train semitrailer properties, other than the wheelbases, were as described in the previous work [2].

**Figure 1: Tridem-tandem B-train Van Configuration**



The lead semitrailer had a wheelbase between 9.75 and 10.75 m (384 to 423 in). The rear semitrailer had a wheelbase that when combined with the lead semitrailer resulted in a sum of semitrailer wheelbases between 16.00 and 17.00 m (630 to 669 in). Table 1 shows the lead and rear semitrailer wheelbases considered. The blank cells would have a rear semitrailer wheelbase less than the minimum of 6.25 m (246 in).

Table 1: B-train Wheelbase Combinations

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	6.25										
10.65	6.35	6.25									
10.55	6.45	6.35	6.25								
10.45	6.55	6.45	6.35	6.25							
10.35	6.65	6.55	6.45	6.35	6.25						
10.25	6.75	6.65	6.55	6.45	6.35	6.25					
10.15	6.85	6.75	6.65	6.55	6.45	6.35	6.25				
10.05	6.95	6.85	6.75	6.65	6.55	6.45	6.35	6.25			
9.95	7.05	6.95	6.85	6.75	6.65	6.55	6.45	6.35	6.25		
9.85	7.15	7.05	6.95	6.85	6.75	6.65	6.55	6.45	6.35	6.25	
9.75	7.25	7.15	7.05	6.95	6.85	6.75	6.65	6.55	6.45	6.35	6.25
9.65	7.35	7.25	7.15	7.05	6.95	6.85	6.75	6.65	6.55	6.45	6.35
9.55	7.45	7.35	7.25	7.15	7.05	6.95	6.85	6.75	6.65	6.55	6.45
9.45	7.55	7.45	7.35	7.25	7.15	7.05	6.95	6.85	6.75	6.65	6.55
9.35	7.65	7.55	7.45	7.35	7.25	7.15	7.05	6.95	6.85	6.75	6.65
9.25	7.75	7.65	7.55	7.45	7.35	7.25	7.15	7.05	6.95	6.85	6.75

The B-trains were configured without regard to whether the load could be distributed properly, or whether the box length would be within 20 m (787 in), for any particular body style. In practice, getting the box length within 20 m (787 in) might require a bit of squeezing at 17.00 m (669 in) sum of wheelbases, but it should not be impossible.

### 3. COMPUTER SIMULATION

#### 3.1 Simulation Procedure

This work evaluated the low-speed offtracking performance measure at 8.8 km/h (5 mi/h).

The earlier work presented offtracking results with the B-trains fully loaded [2]. However, because this work used a full simulation including tire and suspension forces, the offtracking empty was about 0.03 m (1 in) greater when empty than when loaded, principally due to differences in tire forces between the empty and loaded conditions. This work was therefore done with the B-train empty.

#### 3.2 Results

The results for each tractor with all B-train combinations shown in Table 1 are presented in Table 5 through Table 18 in the Appendix. Each table presents the low-speed offtracking for a tractor with a specific wheelbase for lead semitrailer wheelbases from 9.25 to 10.75 m (364 to 423 in) for the sum of semitrailer wheelbases from 16.00 to 17.00 m (630 to 669 in). Blank cells in these tables represent cases where the rear semitrailer wheelbase would be less than 6.25 m (246 in), the minimum specified in the M.o.U. Cells highlighted in bold exceed the performance standard. The bottom row in each table contains the average of the values in the column above.

The results are discussed in the next chapter.



## 4. DISCUSSION OF RESULTS

### 4.1 Baseline Low-speed Performance Standard

The nominal performance standard for low-speed offtracking is 5.60 m (220 in), for a tractor with 6.20 m (244 in) wheelbase pulling a semitrailer with 12.50 m (492 in) wheelbase. However, the actual low-speed offtracking computed in a full simulation for this configuration, with zero tractor fifth wheel offset, and empty, was 5.682 m (223 in). This value was used as the performance standard for this work.

### 4.2 Low-speed Offtracking of B-trains

Table 2 presents, as an example, the low-speed offtracking for a 6.80 m (268 in) wheelbase tractor for lead semitrailer wheelbases from 9.25 to 10.75 m (364 to 423 in) for the sum of semitrailer wheelbases from 16.00 to 17.00 m (630 to 669 in). Blank cells represent cases where the rear semitrailer wheelbase would be less than 6.25 m (246 in), the minimum specified in the M.o.U. Cells highlighted in bold exceeded the performance standard of 5.682 m (223 in). The bottom row in Table 2 contains the

**Table 2: Low-speed Offtracking for 6.80 m (268 in) Wheelbase Tractor**

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	<b>5.981</b>										
10.65	<b>5.967</b>	<b>5.933</b>									
10.55	<b>5.953</b>	<b>5.919</b>	<b>5.884</b>								
10.45	<b>5.941</b>	<b>5.906</b>	<b>5.870</b>	<b>5.836</b>							
10.35	<b>5.929</b>	<b>5.893</b>	<b>5.857</b>	<b>5.822</b>	<b>5.787</b>						
10.25	<b>5.930</b>	<b>5.893</b>	<b>5.857</b>	<b>5.822</b>	<b>5.786</b>	<b>5.752</b>					
10.15	<b>5.919</b>	<b>5.882</b>	<b>5.846</b>	<b>5.810</b>	<b>5.774</b>	<b>5.739</b>	<b>5.701</b>				
10.05	<b>5.906</b>	<b>5.869</b>	<b>5.832</b>	<b>5.796</b>	<b>5.760</b>	<b>5.725</b>	<b>5.690</b>	5.655			
9.95	<b>5.897</b>	<b>5.859</b>	<b>5.822</b>	<b>5.786</b>	<b>5.749</b>	<b>5.713</b>	5.678	5.642	5.608		
9.85	<b>5.879</b>	<b>5.851</b>	<b>5.813</b>	<b>5.776</b>	<b>5.739</b>	<b>5.703</b>	5.667	5.631	5.596	5.561	
9.75	<b>5.870</b>	<b>5.832</b>	<b>5.804</b>	<b>5.767</b>	<b>5.729</b>	<b>5.692</b>	5.656	5.620	5.584	5.549	5.514
9.65	<b>5.864</b>	<b>5.825</b>	<b>5.787</b>	<b>5.759</b>	<b>5.721</b>	<b>5.684</b>	5.647	5.610	5.574	5.539	5.503
9.55	<b>5.857</b>	<b>5.818</b>	<b>5.780</b>	<b>5.742</b>	<b>5.713</b>	<b>5.675</b>	5.638	5.601	5.564	5.528	5.492
9.45	<b>5.851</b>	<b>5.812</b>	<b>5.773</b>	<b>5.735</b>	<b>5.696</b>	<b>5.667</b>	5.630	5.592	5.555	5.519	5.482
9.35	<b>5.846</b>	<b>5.806</b>	<b>5.767</b>	<b>5.728</b>	<b>5.689</b>	<b>5.651</b>	5.622	5.585	5.547	5.510	5.473
9.25	<b>5.841</b>	<b>5.802</b>	<b>5.762</b>	<b>5.722</b>	<b>5.683</b>	<b>5.644</b>	5.606	5.577	5.539	5.502	5.465
<b>Avg</b>	<b>5.902</b>	<b>5.860</b>	<b>5.818</b>	<b>5.777</b>	<b>5.736</b>	<b>5.695</b>	5.654	5.613	5.571	5.530	5.488

average of all the values in the column above.

Table 3 presents the low-speed offtracking for each tractor with a lead semitrailer wheelbase of 10.75 m (423 in) and a sum of semitrailer wheelbases of 17.00 m (669 in), from the top cell in the first column of Table 5 through Table 18. This is the critical case for each tractor. Cells highlighted in bold exceeded the performance standard of 5.682 m (223 in).

**Table 3: Low-speed Offtracking for Tractors with Longest Lead Semitrailer and 17.00 m (669 in) Sum of Semitrailer Wheelbases**

Tractor Wheelbase (m)	Low-speed offtracking (m)
5.28	5.550
5.60	5.627
5.90	<b>5.706</b>
6.20	<b>5.793</b>
6.30	<b>5.822</b>
6.40	<b>5.854</b>
6.50	<b>5.884</b>
6.60	<b>5.914</b>
6.70	<b>5.945</b>
6.80	<b>5.981</b>
6.90	<b>6.014</b>
7.00	<b>6.045</b>
7.10	<b>6.077</b>
7.20	<b>6.104</b>

Inspection of the values in the columns of Table 5 through Table 18 revealed that low-speed offtracking increased between about 0.09 to 0.10 m/m of increase in lead semitrailer wheelbase. Inspection of the values in the rows of Table 5 through Table 18 revealed that low-speed offtracking increased between about 0.34 to 0.43 m/m of increase in the sum of semitrailer wheelbases. Inspection of the values in Table 3 revealed that low-speed offtracking increased at about 0.30 m/m of increase in tractor wheelbase. The sum of semitrailer wheelbases was a much stronger driver of low-speed offtracking than lead semitrailer wheelbase alone. Roughly speaking, each 0.1 m increase in tractor wheelbase increased low-speed offtracking by 0.03 m, so the sum of semitrailer wheelbases should be reduced by  $0.1 \times 0.03 / 0.038 = 0.08$  m for there to be no net increase in low-speed offtracking.

From Table 5 through Table 8 in the Appendix, any tractor with a wheelbase up to 6.20 m (244 in) meets the performance standard for any B-train with a sum of semitrailer wheelbases up to the maximum of 17.00 m (669 in). For tractor wheelbases beyond 6.20 m (244 in), it is possible to construct a table that restricts the sum of semitrailer wheelbases in a similar manner to that for tractor-semitrailers with tractor wheelbases beyond 6.20 m (244 in) in Schedule 1 of Ontario Regulation 413/05 [3]. Table 4 shows two such tables, determined by different methods. The second column was obtained by interpolating the average offtracking in the bottom row of each of Table 5 through Table 18 to determine the sum of semitrailer wheelbases that would correspond to the performance standard of 5.682 m (224 in). The third column was obtained by finding the value at the top of a column that was closest to but lower than the performance standard of 5.682 m (224 in), then interpolating between that value and the one in the column to the immediate left to determine the sum of semitrailer wheelbases that would correspond to the performance standard of 5.682 m (224 in). There may be other ways to devise wheelbase limits from the results presented in Table 5 through Table 18. The values in Table 4 reflect the rough estimate above of 0.08 m reduction in sum of semitrailer wheelbases necessary to negate an 0.1 m increase in tractor wheelbase.

The B-train wheelbase restriction ranged from 0.85 to 0.92 m (33 to 36 in) in Table 4, which is slightly more than the restriction of 0.63 m (25 in) for the same range of tractor wheelbase for tractor-semitrailers in Schedule 1 of Ontario Regulation 413/05 [3].

**Table 4: Maximum Sum of Semitrailer Wheelbases to Meet Low-speed Offtracking Performance Standard**

<b>Tractor Wheelbase (m)</b>	<b>From Average Values</b>	<b>From Maximum Values</b>
5.90 m or less	17.00 m	17.00 m
> 5.90 m to 6.20 m	17.00 m	16.80 m
> 6.20 m to 6.30 m	16.85 m	16.72 m
> 6.30 m to 6.40 m	16.77 m	16.66 m
> 6.40 m to 6.50 m	16.70 m	16.59 m
> 6.50 m to 6.60 m	16.62 m	16.49 m
> 6.60 m to 6.70 m	16.55 m	16.44 m
> 6.70 m to 6.80 m	16.47 m	16.38 m
> 6.80 m to 6.90 m	16.38 m	16.33 m
> 6.90 m to 7.00 m	16.30 m	16.21 m
> 7.00 m to 7.10 m	16.22 m	16.15 m
> 7.10 m to 7.20 m	16.15 m	16.08 m

## 5. CONCLUSIONS

This work has evaluated the low-speed offtracking of tridem-tandem B-trains pulled by tractors with a wheelbase from 5.28 to 7.16 m (160 to 282 in), to determine how the wheelbase of B-train semitrailers should be limited if tractors of such wheelbase would be allowed to pull a B-train with a box length up to 20.00 m (787 in) within an overall length of 27.50 m (90 ft 3 in).

The sum of semitrailer wheelbases was found to be a much stronger driver of low-speed offtracking than lead semitrailer wheelbase alone. Roughly speaking, each 0.1 m increase in tractor wheelbase increased low-speed offtracking by 0.03 m, so the sum of semitrailer wheelbases must be reduced by about 0.08 m for there to be no net increase in low-speed offtracking.

A set of reductions in the sum of B-train semitrailer wheelbases has been identified for the same tractor wheelbases beyond 6.20 m (244 in) that are addressed in Ontario regulations by the reduction of semitrailer wheelbase.

## REFERENCES

- [1] “Heavy Truck Weight and Dimension Limits for Interprovincial Operations in Canada”, Task Force on Vehicle Weights and Dimensions Policy, December 2011,  
<http://www.comt.ca/english/programs/trucking/MOU%202011.pdf> .
- [2] Billing J.R., “Evaluation of the Dynamic Performance of Extended Length B-trains”, Report for Canadian Trucking Alliance, 1 April 2013.
- [3] “Vehicle Weights and Dimensions — For Safe, Productive and Infrastructure-Friendly Vehicles”, Ontario Ministry of Transportation, Regulation 413/05,  
[http://www.e-laws.gov.on.ca/html/regs/english/elaws\\_regs\\_050413\\_e.htm](http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_050413_e.htm) .

## APPENDIX

**Table 5: Low-speed Offtracking for 5.28 m (208 in) Wheelbase Tractor**

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.550										
10.65	5.536	5.500									
10.55	5.523	5.487	5.450								
10.45	5.509	5.472	5.436	5.400							
10.35	5.497	5.460	5.423	5.386	5.350						
10.25	5.498	5.460	5.423	5.386	5.349	5.313					
10.15	5.488	5.450	5.411	5.374	5.337	5.300	5.264				
10.05	5.478	5.439	5.401	5.363	5.325	5.288	5.251	5.215			
9.95	5.469	5.430	5.391	5.352	5.314	5.277	5.240	5.203	5.167		
9.85	5.450	5.420	5.381	5.342	5.304	5.266	5.229	5.191	5.154	5.119	
9.75	5.442	5.402	5.372	5.333	5.294	5.256	5.218	5.180	5.143	5.106	5.070
9.65	5.435	5.395	5.355	5.325	5.286	5.247	5.209	5.171	5.133	5.096	5.059
9.55	5.428	5.388	5.348	5.307	5.278	5.239	5.200	5.161	5.123	5.086	5.048
9.45	5.423	5.382	5.341	5.301	5.261	5.231	5.192	5.153	5.114	5.076	5.038
9.35	5.418	5.376	5.336	5.295	5.254	5.214	5.184	5.145	5.106	5.068	5.030
9.25	5.413	5.371	5.330	5.289	5.248	5.208	5.168	5.138	5.098	5.059	5.021
<b>Avg</b>	5.472	5.429	5.386	5.343	5.300	5.258	5.216	5.173	5.130	5.087	5.044

Table 6: Low-speed Offtracking for 5.60 m (220 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.627										
10.65	5.613	5.578									
10.55	5.600	5.564	5.528								
10.45	5.587	5.551	5.515	5.479							
10.35	5.575	5.539	5.502	5.466	5.430						
10.25	5.576	5.539	5.502	5.465	5.429	5.393					
10.15	5.566	5.526	5.489	5.452	5.415	5.379	5.343				
10.05	5.555	5.516	5.478	5.440	5.403	5.367	5.330	5.295			
9.95	5.546	5.507	5.468	5.430	5.393	5.356	5.319	5.282	5.247		
9.85	5.527	5.498	5.459	5.421	5.382	5.345	5.307	5.271	5.234	5.198	
9.75	5.519	5.479	5.450	5.411	5.373	5.335	5.297	5.260	5.223	5.186	5.150
9.65	5.512	5.472	5.433	5.403	5.364	5.326	5.288	5.250	5.213	5.176	5.139
9.55	5.506	5.465	5.425	5.386	5.356	5.317	5.279	5.241	5.203	5.165	5.129
9.45	5.500	5.459	5.419	5.379	5.339	5.310	5.271	5.232	5.194	5.156	5.119
9.35	5.495	5.454	5.413	5.373	5.332	5.293	5.263	5.224	5.186	5.147	5.109
9.25	5.490	5.449	5.408	5.368	5.327	5.287	5.247	5.218	5.178	5.140	5.101
<b>Avg</b>	5.550	5.506	5.464	5.421	5.379	5.337	5.294	5.253	5.210	5.167	5.125

Table 7: Low-speed Offtracking for 5.90 m (232 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	<b>5.706</b>										
10.65	<b>5.692</b>	5.656									
10.55	5.679	5.643	5.608								
10.45	5.666	5.630	5.594	5.559							
10.35	5.655	5.618	5.581	5.546	5.510						
10.25	5.656	5.619	5.582	5.546	5.510	5.474					
10.15	5.646	5.608	5.571	5.534	5.497	5.462	5.426				
10.05	5.636	5.598	5.560	5.523	5.486	5.450	5.414	5.378			
9.95	5.627	5.588	5.550	5.513	5.475	5.438	5.402	5.366	5.330		
9.85	5.608	5.579	5.541	5.503	5.465	5.428	5.391	5.354	5.318	5.282	
9.75	5.600	5.561	5.532	5.493	5.455	5.418	5.380	5.343	5.306	5.270	5.234
9.65	5.593	5.554	5.515	5.485	5.447	5.409	5.371	5.333	5.297	5.260	5.224
9.55	5.587	5.547	5.508	5.468	5.439	5.400	5.362	5.324	5.287	5.250	5.213
9.45	5.581	5.541	5.501	5.461	5.422	5.393	5.354	5.315	5.278	5.240	5.203
9.35	5.576	5.535	5.495	5.455	5.415	5.376	5.346	5.308	5.269	5.231	5.194
9.25	5.571	5.531	5.490	5.449	5.409	5.369	5.330	5.300	5.262	5.223	5.185
<b>Avg</b>	5.630	5.587	5.545	5.503	5.461	5.420	5.378	5.336	5.293	5.251	5.209



Table 8: Low-speed Offtracking for 6.20 m (244 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	<b>5.793</b>										
10.65	<b>5.779</b>	<b>5.744</b>									
10.55	<b>5.766</b>	<b>5.731</b>	<b>5.695</b>								
10.45	<b>5.753</b>	<b>5.717</b>	5.682	5.647							
10.35	<b>5.742</b>	<b>5.705</b>	5.669	5.634	5.599						
10.25	<b>5.743</b>	<b>5.706</b>	5.669	5.633	5.598	5.562					
10.15	<b>5.732</b>	<b>5.695</b>	5.658	5.621	5.585	5.550	5.514				
10.05	<b>5.722</b>	<b>5.685</b>	5.647	5.610	5.574	5.538	5.502	5.467			
9.95	<b>5.713</b>	5.675	5.637	5.600	5.563	5.526	5.490	5.455	5.419		
9.85	<b>5.695</b>	5.666	5.628	5.590	5.553	5.516	5.479	5.443	5.407	5.372	
9.75	<b>5.687</b>	5.648	5.619	5.581	5.543	5.506	5.469	5.432	5.396	5.360	5.324
9.65	5.680	5.641	5.602	5.573	5.535	5.497	5.460	5.422	5.386	5.349	5.313
9.55	5.674	5.634	5.595	5.556	5.527	5.489	5.450	5.413	5.376	5.339	5.303
9.45	5.668	5.628	5.588	5.549	5.510	5.481	5.442	5.404	5.367	5.329	5.293
9.35	5.663	5.622	5.582	5.542	5.503	5.464	5.435	5.396	5.358	5.320	5.283
9.25	5.658	5.617	5.577	5.537	5.497	5.457	5.418	5.389	5.350	5.313	5.275
<b>Avg</b>	5.717	5.674	5.632	5.590	5.549	5.508	5.466	5.425	5.382	5.340	5.299

Table 9: Low-speed Offtracking for 6.30 m (248 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	<b>5.822</b>										
10.65	<b>5.808</b>	<b>5.773</b>									
10.55	<b>5.795</b>	<b>5.760</b>	<b>5.724</b>								
10.45	<b>5.782</b>	<b>5.746</b>	<b>5.711</b>	5.676							
10.35	<b>5.770</b>	<b>5.734</b>	<b>5.699</b>	5.663	5.628						
10.25	<b>5.771</b>	<b>5.735</b>	<b>5.698</b>	5.662	5.627	5.592					
10.15	<b>5.761</b>	<b>5.724</b>	<b>5.687</b>	5.651	5.615	5.579	5.544				
10.05	<b>5.751</b>	<b>5.713</b>	5.676	5.639	5.603	5.567	5.532	5.496			
9.95	<b>5.742</b>	<b>5.704</b>	5.666	5.629	5.592	5.556	5.520	5.484	5.449		
9.85	<b>5.724</b>	<b>5.695</b>	5.657	5.619	5.582	5.545	5.509	5.472	5.437	5.402	
9.75	<b>5.716</b>	5.677	5.648	5.610	5.572	5.535	5.498	5.461	5.425	5.389	5.354
9.65	<b>5.709</b>	5.670	5.631	5.602	5.564	5.526	5.489	5.452	5.415	5.379	5.343
9.55	<b>5.703</b>	5.663	5.624	5.585	5.556	5.517	5.480	5.442	5.405	5.368	5.332
9.45	<b>5.696</b>	5.656	5.617	5.578	5.539	5.510	5.472	5.434	5.397	5.360	5.323
9.35	<b>5.692</b>	5.652	5.612	5.572	5.533	5.494	5.465	5.426	5.389	5.351	5.314
9.25	<b>5.687</b>	5.647	5.606	5.566	5.527	5.487	5.448	5.419	5.381	5.343	5.305
<b>Avg</b>	<b>5.746</b>	5.703	5.661	5.619	5.578	5.537	5.496	5.454	5.412	5.370	5.329

Table 10: Low-speed Offtracking for 6.40 m (252 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	<b>5.854</b>										
10.65	<b>5.840</b>	<b>5.805</b>									
10.55	<b>5.828</b>	<b>5.792</b>	<b>5.757</b>								
10.45	<b>5.815</b>	<b>5.779</b>	<b>5.744</b>	<b>5.709</b>							
10.35	<b>5.803</b>	<b>5.767</b>	<b>5.731</b>	<b>5.696</b>	5.660						
10.25	<b>5.804</b>	<b>5.767</b>	<b>5.731</b>	<b>5.695</b>	5.660	5.624					
10.15	<b>5.793</b>	<b>5.756</b>	<b>5.720</b>	<b>5.683</b>	5.647	5.612	5.577				
10.05	<b>5.784</b>	<b>5.746</b>	<b>5.709</b>	5.672	5.636	5.599	5.564	5.529			
9.95	<b>5.774</b>	<b>5.736</b>	<b>5.699</b>	5.662	5.625	5.589	5.552	5.517	5.481		
9.85	<b>5.756</b>	<b>5.727</b>	<b>5.689</b>	5.652	5.615	5.578	5.541	5.505	5.469	5.434	
9.75	<b>5.748</b>	<b>5.709</b>	5.681	5.642	5.605	5.567	5.530	5.494	5.458	5.422	5.386
9.65	<b>5.741</b>	<b>5.702</b>	5.663	5.635	5.596	5.559	5.521	5.484	5.447	5.411	5.375
9.55	<b>5.735</b>	<b>5.695</b>	5.656	5.617	5.588	5.550	5.510	5.473	5.435	5.399	5.363
9.45	<b>5.727</b>	<b>5.687</b>	5.647	5.608	5.569	5.540	5.502	5.464	5.427	5.389	5.353
9.35	<b>5.722</b>	<b>5.682</b>	5.642	5.602	5.562	5.523	5.494	5.456	5.418	5.381	5.344
9.25	<b>5.717</b>	<b>5.677</b>	5.636	5.596	5.556	5.517	5.478	5.449	5.411	5.373	5.335
<b>Avg</b>	<b>5.778</b>	<b>5.735</b>	<b>5.693</b>	5.651	5.610	5.569	5.527	5.486	5.443	5.401	5.359

Table 11: Low-speed Offtracking for 6.50 m (256 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.884										
10.65	5.871	5.836									
10.55	5.857	5.822	5.787								
10.45	5.845	5.809	5.774	5.739							
10.35	5.833	5.797	5.761	5.726	5.691						
10.25	5.834	5.797	5.761	5.725	5.690	5.655					
10.15	5.823	5.786	5.749	5.713	5.678	5.642	5.607				
10.05	5.813	5.776	5.739	5.702	5.666	5.630	5.595	5.560			
9.95	5.804	5.766	5.729	5.692	5.655	5.619	5.583	5.548	5.512		
9.85	5.786	5.757	5.720	5.682	5.645	5.608	5.572	5.536	5.500	5.465	
9.75	5.777	5.739	5.710	5.673	5.635	5.598	5.561	5.525	5.489	5.453	5.418
9.65	5.771	5.732	5.693	5.665	5.627	5.589	5.552	5.515	5.478	5.443	5.407
9.55	5.764	5.725	5.686	5.647	5.619	5.581	5.544	5.506	5.469	5.433	5.397
9.45	5.759	5.719	5.680	5.641	5.602	5.573	5.535	5.498	5.460	5.423	5.387
9.35	5.754	5.714	5.674	5.635	5.595	5.557	5.528	5.490	5.452	5.415	5.378
9.25	5.749	5.709	5.669	5.629	5.589	5.550	5.511	5.482	5.444	5.406	5.369
<b>Avg</b>	<b>5.808</b>	<b>5.766</b>	<b>5.724</b>	5.682	5.641	5.600	5.559	5.518	5.476	5.434	5.393

Table 12: Low-speed Offtracking for 6.60 m (260 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.914										
10.65	5.900	5.866									
10.55	5.888	5.852	5.818								
10.45	5.875	5.839	5.805	5.770							
10.35	5.863	5.827	5.792	5.757	5.722						
10.25	5.864	5.828	5.792	5.756	5.721	5.686					
10.15	5.853	5.816	5.780	5.744	5.709	5.673	5.638				
10.05	5.844	5.806	5.770	5.733	5.697	5.661	5.626	5.591			
9.95	5.834	5.797	5.760	5.723	5.686	5.650	5.614	5.579	5.544		
9.85	5.816	5.788	5.750	5.713	5.676	5.640	5.603	5.567	5.532	5.497	
9.75	5.808	5.770	5.742	5.704	5.666	5.629	5.592	5.557	5.520	5.485	5.450
9.65	5.802	5.763	5.724	5.696	5.658	5.621	5.583	5.547	5.511	5.475	5.439
9.55	5.795	5.756	5.717	5.679	5.650	5.612	5.575	5.538	5.501	5.464	5.428
9.45	5.789	5.750	5.711	5.672	5.633	5.605	5.567	5.529	5.492	5.455	5.419
9.35	5.784	5.745	5.705	5.666	5.626	5.588	5.559	5.521	5.484	5.446	5.409
9.25	5.779	5.739	5.699	5.660	5.621	5.581	5.542	5.514	5.476	5.438	5.401
<b>Avg</b>	<b>5.838</b>	<b>5.796</b>	<b>5.755</b>	<b>5.713</b>	<b>5.672</b>	<b>5.631</b>	<b>5.590</b>	<b>5.549</b>	<b>5.508</b>	<b>5.466</b>	<b>5.424</b>

Table 13: Low-speed Offtracking for 6.70 m (264 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.945										
10.65	5.931	5.896									
10.55	5.918	5.883	5.849								
10.45	5.906	5.870	5.835	5.801							
10.35	5.894	5.858	5.823	5.787	5.752						
10.25	5.894	5.858	5.822	5.787	5.752	5.717					
10.15	5.884	5.847	5.811	5.775	5.739	5.704	5.670				
10.05	5.874	5.837	5.800	5.764	5.728	5.693	5.658	5.623			
9.95	5.866	5.828	5.791	5.754	5.717	5.681	5.646	5.611	5.576		
9.85	5.848	5.819	5.781	5.744	5.707	5.671	5.635	5.599	5.564	5.529	
9.75	5.839	5.801	5.773	5.735	5.698	5.660	5.624	5.588	5.552	5.517	5.482
9.65	5.833	5.794	5.756	5.727	5.689	5.652	5.615	5.578	5.542	5.507	5.471
9.55	5.826	5.787	5.748	5.710	5.681	5.643	5.606	5.569	5.532	5.496	5.460
9.45	5.820	5.781	5.742	5.703	5.664	5.636	5.598	5.560	5.523	5.487	5.450
9.35	5.815	5.775	5.735	5.696	5.657	5.619	5.590	5.553	5.515	5.478	5.442
9.25	5.810	5.770	5.731	5.691	5.652	5.613	5.574	5.546	5.508	5.470	5.433
<b>Avg</b>	<b>5.869</b>	<b>5.827</b>	<b>5.786</b>	<b>5.744</b>	<b>5.703</b>	5.663	5.622	5.581	5.539	5.498	5.456

Table 14: Low-speed Offtracking for 6.80 m (268 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	5.981										
10.65	5.967	5.933									
10.55	5.953	5.919	5.884								
10.45	5.941	5.906	5.870	5.836							
10.35	5.929	5.893	5.857	5.822	5.787						
10.25	5.930	5.893	5.857	5.822	5.786	5.752					
10.15	5.919	5.882	5.846	5.810	5.774	5.739	5.701				
10.05	5.906	5.869	5.832	5.796	5.760	5.725	5.690	5.655			
9.95	5.897	5.859	5.822	5.786	5.749	5.713	5.678	5.642	5.608		
9.85	5.879	5.851	5.813	5.776	5.739	5.703	5.667	5.631	5.596	5.561	
9.75	5.870	5.832	5.804	5.767	5.729	5.692	5.656	5.620	5.584	5.549	5.514
9.65	5.864	5.825	5.787	5.759	5.721	5.684	5.647	5.610	5.574	5.539	5.503
9.55	5.857	5.818	5.780	5.742	5.713	5.675	5.638	5.601	5.564	5.528	5.492
9.45	5.851	5.812	5.773	5.735	5.696	5.667	5.630	5.592	5.555	5.519	5.482
9.35	5.846	5.806	5.767	5.728	5.689	5.651	5.622	5.585	5.547	5.510	5.473
9.25	5.841	5.802	5.762	5.722	5.683	5.644	5.606	5.577	5.539	5.502	5.465
<b>Avg</b>	<b>5.902</b>	<b>5.860</b>	<b>5.818</b>	<b>5.777</b>	<b>5.736</b>	<b>5.695</b>	5.654	5.613	5.571	5.530	5.488

Table 15: Low-speed Offtracking for 6.90 m (272 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	6.014										
10.65	5.999	5.965									
10.55	5.986	5.951	5.917								
10.45	5.973	5.938	5.903	5.869							
10.35	5.962	5.926	5.890	5.856	5.821						
10.25	5.962	5.926	5.890	5.855	5.820	5.785					
10.15	5.952	5.915	5.879	5.843	5.808	5.772	5.738				
10.05	5.942	5.905	5.868	5.832	5.796	5.760	5.725	5.690			
9.95	5.933	5.895	5.858	5.821	5.785	5.749	5.713	5.678	5.643		
9.85	5.915	5.886	5.849	5.811	5.775	5.738	5.702	5.667	5.631	5.596	
9.75	5.906	5.868	5.839	5.802	5.765	5.728	5.691	5.655	5.619	5.584	5.549
9.65	5.899	5.861	5.823	5.794	5.756	5.719	5.682	5.646	5.610	5.574	5.539
9.55	5.893	5.854	5.815	5.777	5.748	5.711	5.673	5.636	5.599	5.564	5.528
9.45	5.887	5.848	5.809	5.770	5.731	5.703	5.665	5.628	5.591	5.554	5.518
9.35	5.882	5.842	5.802	5.763	5.724	5.686	5.657	5.620	5.582	5.545	5.508
9.25	5.877	5.837	5.797	5.758	5.718	5.679	5.641	5.612	5.574	5.537	5.500
<b>Avg</b>	<b>5.936</b>	<b>5.894</b>	<b>5.853</b>	<b>5.812</b>	<b>5.771</b>	<b>5.730</b>	<b>5.689</b>	<b>5.648</b>	<b>5.606</b>	<b>5.565</b>	<b>5.524</b>



Table 16: Low-speed Offtracking for 7.00 m (276 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	6.045										
10.65	6.031	5.997									
10.55	6.018	5.984	5.949								
10.45	6.005	5.970	5.935	5.901							
10.35	5.994	5.958	5.923	5.888	5.853						
10.25	5.994	5.958	5.922	5.887	5.852	5.818					
10.15	5.984	5.948	5.912	5.876	5.841	5.806	5.771				
10.05	5.974	5.938	5.901	5.865	5.829	5.794	5.759	5.724			
9.95	5.965	5.928	5.891	5.854	5.818	5.782	5.747	5.712	5.677		
9.85	5.947	5.919	5.881	5.845	5.808	5.772	5.736	5.700	5.665	5.631	
9.75	5.939	5.901	5.872	5.835	5.798	5.761	5.725	5.689	5.653	5.618	5.583
9.65	5.932	5.894	5.856	5.827	5.790	5.752	5.716	5.679	5.643	5.608	5.573
9.55	5.925	5.887	5.848	5.810	5.781	5.744	5.707	5.670	5.634	5.598	5.562
9.45	5.920	5.881	5.841	5.803	5.765	5.736	5.699	5.661	5.624	5.588	5.552
9.35	5.914	5.875	5.835	5.797	5.758	5.720	5.691	5.653	5.616	5.579	5.542
9.25	5.910	5.870	5.830	5.791	5.752	5.713	5.674	5.646	5.608	5.571	5.534
<b>Avg</b>	<b>5.969</b>	<b>5.927</b>	<b>5.885</b>	<b>5.845</b>	<b>5.804</b>	<b>5.763</b>	<b>5.723</b>	<b>5.682</b>	<b>5.640</b>	<b>5.599</b>	<b>5.558</b>

Table 17: Low-speed Offtracking for 7.10 m (280 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	6.077										
10.65	6.063	6.029									
10.55	6.050	6.016	5.981								
10.45	6.037	6.002	5.968	5.934							
10.35	6.026	5.990	5.955	5.920	5.886						
10.25	6.027	5.991	5.955	5.920	5.885	5.850					
10.15	6.016	5.980	5.944	5.908	5.873	5.838	5.804				
10.05	6.006	5.969	5.933	5.898	5.862	5.827	5.792	5.757			
9.95	5.998	5.960	5.923	5.887	5.851	5.816	5.780	5.745	5.710		
9.85	5.980	5.952	5.914	5.877	5.841	5.805	5.769	5.734	5.699	5.664	
9.75	5.971	5.934	5.905	5.868	5.831	5.794	5.758	5.722	5.687	5.652	5.617
9.65	5.965	5.926	5.888	5.860	5.823	5.785	5.749	5.713	5.677	5.641	5.606
9.55	5.958	5.920	5.881	5.843	5.814	5.777	5.740	5.703	5.667	5.631	5.596
9.45	5.952	5.913	5.874	5.836	5.798	5.769	5.731	5.695	5.658	5.621	5.585
9.35	5.947	5.908	5.868	5.829	5.791	5.752	5.724	5.686	5.649	5.613	5.576
9.25	5.942	5.903	5.863	5.824	5.785	5.746	5.708	5.679	5.642	5.605	5.568
<b>Avg</b>	<b>6.001</b>	<b>5.960</b>	<b>5.918</b>	<b>5.877</b>	<b>5.837</b>	<b>5.796</b>	<b>5.756</b>	<b>5.715</b>	5.674	5.632	5.591

Table 18: Low-speed Offtracking for 7.20 m (283 in) Wheelbase Tractor

Lead WB	Sum of Semitrailer Wheelbases (m)										
	17.00	16.90	16.80	16.70	16.60	16.50	16.40	16.30	16.20	16.10	16.00
10.75	6.104										
10.65	6.090	6.056									
10.55	6.077	6.042	6.008								
10.45	6.064	6.029	5.994	5.959							
10.35	6.052	6.016	5.981	5.946	5.911						
10.25	6.052	6.016	5.980	5.945	5.910	5.876					
10.15	6.042	6.005	5.969	5.933	5.898	5.863	5.829				
10.05	6.031	5.994	5.958	5.922	5.886	5.851	5.816	5.782			
9.95	6.022	5.985	5.948	5.912	5.876	5.840	5.805	5.770	5.735		
9.85	6.004	5.976	5.938	5.902	5.865	5.829	5.793	5.758	5.723	5.689	
9.75	5.995	5.958	5.929	5.892	5.855	5.819	5.783	5.747	5.711	5.676	5.642
9.65	5.989	5.950	5.913	5.884	5.847	5.810	5.774	5.737	5.702	5.666	5.631
9.55	5.982	5.943	5.905	5.867	5.839	5.802	5.764	5.728	5.692	5.656	5.620
9.45	5.977	5.938	5.899	5.860	5.822	5.794	5.756	5.719	5.683	5.646	5.610
9.35	5.971	5.932	5.893	5.854	5.816	5.777	5.749	5.711	5.674	5.637	5.601
9.25	5.966	5.927	5.887								
<b>Avg</b>	<b>6.026</b>	<b>5.984</b>	<b>5.943</b>	<b>5.906</b>	<b>5.866</b>	<b>5.826</b>	<b>5.785</b>	<b>5.744</b>	<b>5.703</b>	5.662	5.621

Note: The cells for a lead semitrailer wheelbase of 9.25 m are blank because the runs were not completed.

