Comment Letter O069 Continued

numéro de train		6640	91400	6700	6784	39760	6754	91402	91980	91404	91404
notes à consulter		1	2	3	4	5	6		7	8	9
		TGV		TGV	TGV		TGV				
Lyon-Perrache	Dép.	05.17								05.25	05.34
Lyon-Part-Dieu	Dép.	05.30								05.36	
Lyon-Saint-Exupery-Tgv	Dép.										
Villefranche-sur-Saône	Dép.					05.27				05.56	05.56
Mâcon-Ville	Dép.								05.52	06.16	06.16
Mâcon-Loché-TGV	Dép.					06.12					
Tournus	Dép.								06.15	06.32	06.32
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.		05.26		06.05			06.16	06.35	06.48	06.48
Chagny	Dép.		05.40					06.32		07.02	07.02
Beaune	Dép.		05.50		06.25			06.46		07.13	07.13
Dijon-Ville	Arr.		06.15	06.22	06.43		06.55	07.21		07.36	07.36
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	07.26		08.05	08.40		08.40				

numéro de train		6602	6642	6786	6756	91406	39762	6788	91982	39764	930632
notes à consulter		4	3	10	4	2	5	11	2	12	13
		TGV	TGV	TGV	TGV			TGV			
Lyon-Perrache	Dép.	05.46	06.17								
Lyon-Part-Dieu	Dép.	06.00	06.30								
Lyon-Saint-Exupery-Tgv	Dép.										
Villefranche-sur-Saône	Dép.						06.42			06.54	
Mâcon-Ville	Dép.								06.50		
Mâcon-Loché-TGV	Dép.	06.27					07.30			07.42	
Tournus	Dép.								07.15		
Le Creusot-TGV	Dép.	06.47									
Chalon-sur-Saône	Dép.			07.06		07.15		07.31	07.33		
Chagny	Dép.					07.31					
Beaune	Dép.			07.28		07.42		07.51			07.53
Dijon-Ville	Arr.			07.47	07.52	08.09		08.11			08.15
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	08.08	08.28	09.36	09.38			10.00			

numéro de train		6758	91408	4306/7	6560	4306/7	6192	6604	5356/7	6691/0	6960/1
notes à consulter		14	15	16	4	17	4	18	19	20	6
		TGV			TGV		TGV	TGV	TGV	TGV	TGV
Lyon-Perrache	Dép.		06.31	06.38		06.38		06.42			
Lyon-Part-Dieu	Dép.			06.49		06.49		07.00	06.56	07.00	
Lyon-Saint-Exupery-Tgv	Dép.						06.49				07.07
Villefranche-sur-Saône	Dép.		06.57								
Mâcon-Ville	Dép.		07.32	07.28		07.50					
Mâcon-Loché-TGV	Dép.				07.45						
Tournus	Dép.		07.51								
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.		08.07	07.56		08.20					
Chagny	Dép.		08.19								
Beaune	Dép.		08.30								
Dijon-Ville	Arr.	08.18	08.56	08.33		08.53					
Massy-TGV	Arr.								08.54		
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	10.00			09.22		08.44	09.00		09.00	09.06

numéro de train		6644	6648	6902	6646	930594	9260	930676	6710	758045	4151
notes à consulter		21	22	23	24	25	26	27	28	15	29
		TGV	TGV	TGV	TGV		TGV		TGV		
Lyon-Perrache	Dép.	07.02	07.17		07.17						
Lyon-Part-Dieu	Dép.	07.15	07.30		07.30						
Lyon-Saint-Exupery-Tgv	Dép.			07.50							
Villefranche-sur-Saône	Dép.										
Mâcon-Ville	Dép.										07.5
Mâcon-Loché-TGV	Dép.				07.58						08.0
Tournus	Dép.										
Le Creusot-TGV	Dép.				08.18						
Chalon-sur-Saône	Dép.										10.0
Chagny	Dép.									09.33	
Beaune	Dép.					08.40		09.06		09.45	
Dijon-Ville	Arr.					09.00	09.21	09.28	10.02	10.10	
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	09.16	09.27	09.41	09.42		11.01		11.43		

Bar ou vente ambulante
Restauration
Voir conditions dans le guide Train + vélo
Place(s) handicapés

Trains circulant tous les jours (fond coloré)

TGV Réservation obligatoire
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JOURS DE CIRCULATION ET SERVICES DISPONIBLES

1. les 14, 21, 28 juin et 5 juil ; à partir du 30 août : les lun sauf le 1er nov ; le 2 nov.
2. tous les jours sauf les dim et fêtes.
3. jusqu'au 12 juil : tous les jours sauf les sam et dim ; du 19 juil au 30 août : les lun ; à partir du 31 août : tous les jours sauf les sam, dim et fêtes et sauf le 12 nov.
4. tous les jours sauf les sam, dim et fêtes ; le 14 juil.
5. tous les jours sauf les sam, dim et fêtes- 2e CL- AUTOCAR.
6. tous les jours sauf les dim et sauf le 1er nov.
7. tous les jours sauf les sam, dim et fêtes et sauf le 27 sept.
8. jusqu'au 10 sept et à partir du 30 sept : tous les jours sauf les sam, dim et fêtes et sauf les 12, 13, 14, 15, 19, 20, 21 et 22 oct.
9. du 13 au 29 sept : tous les jours sauf les sam et dim ; du 12 au 22 oct : les mar, mer, jeu et ven.
10. les sam et le 11 nov.
11. du 11 juil au 29 août : les dim.
12. les sam, dim et fêtes- 2e CL- AUTOCAR.
13. tous les jours sauf les sam, dim et fêtes- 2e CL.
14. jusqu'au 4 juil et à partir du 5 sept : tous les jours sauf les sam, dim et fêtes et sauf les 31 oct et 11 nov.
15. tous les jours sauf les sam, dim et fêtes.
16. jusqu'au 19 juin : tous les jours ; du 21 juin au 17 juil : tous les jours sauf les dim ; du 18 juil au 4 sept : tous les jours ; du 5 sept au 2 oct : tous les jours sauf les dim ; à partir du 3 oct : tous les jours sauf le 24 oct.
17. les 20, 27 juin, 4, 11 juil, 5, 12, 19, 26 sept et 24 oct.
18. tous les jours sauf les dim et sauf les 1er et 12 nov.
19. tous les jours sauf les dim et fêtes ; les 14 juil et 11 nov.
20. jusqu'au 14 juil et à partir du 28 août : tous les jours sauf [cut]
21. jusqu'au 8 juil et à partir du 30 août : les lun, mar, mer et je[cut] nov.
22. jusqu'au 9 juil et à partir du 30 août : tous les jours sauf [cut] sauf le 12 nov.
23. jusqu'au 1er juil : les lun, mar, mer et jeu.

numéro de train		6606	5360/1	5360/1	6904	6610	6852	6693/2	91412	91474	91414
notes à consulter			31	10	6			32	33	34	35
		TGV	TGV	TGV	TGV	TGV		TGV			
Lyon-Perrache	Dép.	07.47	08.30			08.40				09.15	09.15
Lyon-Part-Dieu	Dép.	08.00	08.45	08.45		09.00	08.51	09.00		09.26	09.26
Lyon-Saint-Exupery-Tgv	Dép.				09.00						
Villefranche-sur-Saône	Dép.										09.47
Mâcon-Ville	Dép.						09.21		09.28		10.10
Mâcon-Loché-TGV	Dép.										
Tournus	Dép.								09.45		10.25
Le Creusot-TGV	Dép.	08.45									
Chalon-sur-Saône	Dép.						09.54		10.00		10.41
Chagny	Dép.								10.10		10.53
Beaune	Dép.								10.21		11.02
Dijon-Ville	Arr.						10.30		10.46	11.22	11.24
Massy-TGV	Arr.		10.44	10.44							
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	10.06			10.53	11.00		11.00			

numéro de train		91474	6612	6194	6762	39766	9284	6714	756089	6614	6068/9
notes à consulter		17				29	26	36	37		
			TGV	TGV	TGV		TGV	TGV		TGV	TGV
Lyon-Perrache	Dép.		09.47							10.47	
Lyon-Part-Dieu	Dép.	09.26	10.00							11.00	
Lyon-Saint-Exupery-Tgv	Dép.			10.29							
Villefranche-sur-Saône	Dép.					10.51					
Mâcon-Ville	Dép.										
Mâcon-Loché-TGV	Dép.					11.36					11.51
Tournus	Dép.										
Le Creusot-TGV	Dép.									11.41	
Chalon-sur-Saône	Dép.										
Chagny	Dép.								11.39		
Beaune	Dép.								11.52		
Dijon-Ville	Arr.	11.22			11.32		11.43	12.06	12.16		
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.		11.57	12.25	13.14		13.21	13.54		13.02	13.29

numéro de train		6908	91416	930680	6718	5171/0	5171/0	6616	6792	9268	91478
notes à consulter			38	39	40	41	42		43	26	44
		TGV			TGV	TGV	TGV	TGV	TGV	TGV	
Lyon-Perrache	Dép.							11.47			11.54
Lyon-Part-Dieu	Dép.					11.55	11.55	12.00			12.05
Lyon-Saint-Exupery-Tgv	Dép.	11.44									
Villefranche-sur-Saône	Dép.										
Mâcon-Ville	Dép.					12.24	12.24				
Mâcon-Loché-TGV	Dép.										
Tournus	Dép.										
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.		12.31			12.56	13.05		13.22		
Chagny	Dép.		12.48								
Beaune	Dép.		13.00	13.18					13.41		
Dijon-Ville	Arr.		13.24	13.40	14.08	13.32	13.45		14.01	15.24	14.09
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	13.39			15.49			14.01	15.49	17.01	

numéro de train		91418	93610	41517	4340/1	5366/7	6618	91422	31916	6658	9142
notes à consulter		45		29	46	47		48	49	50	51
						TGV	TGV			TGV	
Lyon-Perrache	Dép.	11.54				12.35	12.47			13.17	
Lyon-Part-Dieu	Dép.	12.05			12.36	12.49	13.00			13.30	
Lyon-Saint-Exupery-Tgv	Dép.										
Villefranche-sur-Saône	Dép.	12.25									
Mâcon-Ville	Dép.	12.52		13.00	13.13			13.20	13.20		13.3
Mâcon-Loché-TGV	Dép.			13.12							
Tournus	Dép.	13.15						13.40	13.50		13.5
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.	13.31		15.06	13.52			13.56	14.20		14.1
Chagny	Dép.	13.40						14.09	14.40		14.2
Beaune	Dép.	13.51	14.56					14.19	15.00		14.3
Dijon-Ville	Arr.	14.12	15.18		14.24			14.43	16.00		14.5
Massy-TGV	Arr.					14.58					
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.						14.58			15.26	

24. les sam, dim et fêtes sauf le 14 juil.
25. jusqu'au 9 juil et à partir du 30 août : tous les jours sauf les sam, dim et fêtes.
26. 1ère CL.
27. les sam, dim et fêtes- 2e CL.
28. jusqu'au 12 juil : tous les jours sauf les dim ; du 16 juil au 30 août : les lun, ven et sam ; à partir du 31 août : tous les jours sauf les dim et sauf le 1er nov.
29. 2e CL- AUTOCAR.
30. du 5 au 15 juil : les lun, mar, mer et jeu ; du 16 juil au 2 sept : tous les jours sauf les sam et dim ; à partir du 3 sept : les lun, mar, mer et jeu sauf les 1er, 10 et 11 nov.
31. jusqu'au 25 juin : tous les jours sauf les ven et dim ; du 27 juin au 3 sept : tous les jours sauf les sam ; à partir du 6 sept : tous les jours sauf les sam, dim et fêtes.
32. jusqu'au 14 juil et à partir du 28 août : tous les jours sauf les dim et sauf le 1er nov.
33. tous les jours sauf les 5, 13, 20 et 26 juil.
34. du 20 sept au 10 nov : tous les jours sauf les sam, dim et fêtes.
35. Circulation périodique.
36. - assuré certains jours.
37. les sam, dim et fêtes.
38. tous les jours sauf les sam, dim et fêtes et sauf les 15 et 16 nov.
39. tous les jours sauf les dim et fêtes et sauf les 15 et 16 nov- 2e CL.
40. tous les jours sauf le 31 oct.
41. jusqu'au 20 juin : tous les jours ; du 26 juin au 25 juil : les sam, dim et fêtes ; à partir du 29 juil : tous les jours sauf les 3, 4, 5 et 6 août.
42. du 21 juin au 6 août : tous les jours sauf les sam, dim et fêtes et sauf les 26, 30 juil et 2 août.
43. tous les jours sauf les sam, dim et fêtes et sauf les 15 et 16 nov ; le 14 juil.
44. les 28, 29 et 30 juin ; du 12 au 20 juil : les lun, mar, jeu et ven ; les 21 et 22 juil ; du 25 oct au 10 nov : tous les jours sauf les sam, dim et fêtes ; les 15, 16, 25, 29 et 30 nov.
45. jusqu'au 11 juil et du 25 juil au 24 oct : tous les jours ; du 14 au 18 juil et du 30 oct au 11 nov : les sam, dim et fêtes ; à partir du 12 nov : tous les jours sauf les 15, 16, 25, 29 et 30 nov.
46. jusqu'au 25 juil, du 29 juil au 2 août et du 6 août au 26 sept : tous les jours.
47. les sam et le 11 nov.
48. les 15, 16, 17 et 18 juin ; à partir du 30 août : tous les jours sauf les fêtes et sauf les 15, 16, 25 et 26 nov.
49. les 14 juin, 15 et 16 nov- 2e CL- AUTOCAR.
50. les 18, 25 juin, 2, 9 juil et 10 nov.
51. du 21 juin au 9 juil : tous les jours sauf les sam et dim.
52. tous les jours sauf le 13 nov.

numéro de train		5198/9	6695/4	6572	6722	91424	91424	6196	6118	6622	91030
notes à consulter			1		2	3	4				
		TGV	TGV	TGV	TGV			TGV	TGV	TGV	
Lyon-Perrache	Dép.					13.56	14.07			14.46	
Lyon-Part-Dieu	Dép.	13.53	14.00			14.09				14.59	
Lyon-Saint-Exupery-Tgv	Dép.							14.09	14.56		
Villefranche-sur-Saône	Dép.					14.30	14.30				
Mâcon-Ville	Dép.	14.23				14.54	14.54				
Mâcon-Loché-TGV	Dép.			14.50							
Tournus	Dép.					15.20	15.10				
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.	14.58				15.35	15.26				
Chagny	Dép.					15.45	15.37				
Beaune	Dép.					15.56	15.48				
Dijon-Ville	Arr.	15.28			16.13	16.18	16.15				16.40
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.		15.58	16.27	17.51			16.04	16.48	16.57	19.37

numéro de train		91426	6624	6726	938632	91428	91428	931154	6794	91430	91432
notes à consulter		5	6	7	8	9	10	11	12	13	14
			TGV	TGV					TGV		
Lyon-Perrache	Dép.		15.47								
Lyon-Part-Dieu	Dép.		16.00								
Lyon-Saint-Exupery-Tgv	Dép.										
Villefranche-sur-Saône	Dép.										
Mâcon-Ville	Dép.	15.45				16.25					17.28
Mâcon-Loché-TGV	Dép.										
Tournus	Dép.	16.09				16.44					17.51
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.	16.24				17.02	17.02		17.28	17.58	18.14
Chagny	Dép.	16.40				17.13	17.13			18.10	18.32
Beaune	Dép.	16.50			17.01	17.23	17.23	17.46	17.49	18.21	18.42
Dijon-Ville	Arr.	17.12		17.19	17.21	17.47	17.47	18.13	18.09	18.46	19.05
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.		17.59	18.59					20.04		

numéro de train		6776	41521	39772	6576	39774	6734	6580	6980	6980	91034
notes à consulter		15	16	16		17	12	18	19	20	
		TGV			TGV		TGV	TGV	TGV	TGV	
Lyon-Perrache	Dép.										15.57
Lyon-Part-Dieu	Dép.										16.12
Lyon-Saint-Exupery-Tgv	Dép.								19.43	19.44	
Villefranche-sur-Saône	Dép.			17.36		18.53					16.32
Mâcon-Ville	Dép.		17.29								16.56
Mâcon-Loché-TGV	Dép.		17.41	18.31	18.46	19.41		19.56			
Tournus	Dép.										17.17
Le Creusot-TGV	Dép.										
Chalon-sur-Saône	Dép.		19.32								17.32
Chagny	Dép.										17.45
Beaune	Dép.										17.56
Dijon-Ville	Arr.	19.18					19.45				18.17
Massy-TGV	Arr.										
Massy-Palaiseau	Arr.										
Paris-Gare-de-Lyon	Arr.	21.01			20.23		21.28	21.33	21.35	21.39	21.40

numéro de train		6664	6626	5378/9	6668	5376/7	4338/9	91434	9272	6770	9306
notes à consulter		21			22				23	24	8
		TGV	TGV	TGV	TGV	TGV			TGV	TGV	
Lyon-Perrache	Dép.	16.17	16.47		17.17			17.17			
Lyon-Part-Dieu	Dép.	16.30	17.00	16.56	17.30	17.44	17.48				
Lyon-Saint-Exupery-Tgv	Dép.										
Villefranche-sur-Saône	Dép.							17.47			
Mâcon-Ville	Dép.						18.24	18.28			
Mâcon-Loché-TGV	Dép.										
Tournus	Dép.							18.53			
Le Creusot-TGV	Dép.	17.10	17.42								
Chalon-sur-Saône	Dép.						18.54	19.17			
Chagny	Dép.							19.27			
Beaune	Dép.							19.37			21.0
Dijon-Ville	Arr.						19.28	20.02	20.10	21.20	21.2
Massy-TGV	Arr.			18.58							
Massy-Palaiseau	Arr.					19.51					
Paris-Gare-de-Lyon	Arr.	18.32	19.09		19.26				21.52	23.00	

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Trains circulant tous les jours (fond coloré)

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JOURS DE CIRCULATION ET SERVICES DISPONIBLES

1. jusqu'au 14 juil et à partir du 28 août : tous les jours sauf le 13 nov.
2. tous les jours sauf les sam, dim et fêtes ; le 14 juil.
3. jusqu'au 14 nov et à partir du 6 déc : tous les jours ; du 20 nov au 5 déc : les sam et dim.
4. du 15 nov au 3 déc : tous les jours sauf les sam et dim.
5. tous les jours sauf les 21, 28 juin, 12, 15 et 19 juil.
6. jusqu'au 11 juil : tous les jours ; du 15 juil au 29 août : les jeu, ven, sam et dim ; à partir du 30 août : tous les jours.
7. jusqu'au 11 juil : tous les jours ; du 16 juil au 29 août : les ven, sam et dim ; à partir du 30 août : tous les jours.
8. 2e CL.
9. le 14 juin ; du 18 juin au 31 juil : tous les jours sauf les lun, dim et fêtes et sauf les 29, 30 juin, 13, 15, 16, 20, 21 et 22 juil ; à partir du 2 août : tous les jours sauf les dim et fêtes et sauf les 22 et 23 nov.
10. les 15, 16, 17, 21, 28, 29 et 30 juin ; du 12 au 22 juil : les l[cut] 21 juil.
11. les ven et les 13 juil et 10 nov.
12. les dim sauf le 31 oct ; le 1er nov.
13. tous les jours sauf les sam, dim et fêtes.
14. jusqu'au 10 juil et à partir du 30 août : tous les jours.
15. tous les jours sauf les sam et sauf le 11 nov.
16. 2e CL- AUTOCAR.
17. tous les jours sauf les sam, dim et fêtes- 2e CL- AUTOC[cut]

numéro de train		5387	9248	17710	17710	6630	6699/8	6632	6674	5390/1	6634	9274	6876	39776	6676	6588	91442	4300/1
notes à consulter				27	13	28	29		12	30	31	32		33	34	34		34
		TGV	TGV			TGV	TGV	TGV	TGV	TGV	TGV	TGV	TGV		TGV	TGV		
Lyon-Perrache	Dép.					18.42		19.47	20.17		20.47				21.17		21.39	
Lyon-Part-Dieu	Dép.	18.40		18.45	18.45	19.00	19.00	20.00	20.30	20.30	21.00		21.04		21.30		21.50	23.52
Lyon-Saint-Exupery-Tgv	Dép.		21.00															
Villefranche-sur-Saône	Dép.			19.06	19.06									21.20			22.09	
Mâcon-Ville	Dép.			19.30	19.30								21.36				22.31	00.36
Mâcon-Loché-TGV	Dép.													22.11		22.26		
Tournus	Dép.			19.47	19.47												22.49	
Le Creusot-TGV	Dép.					19.41	19.41				21.41				22.11			
Chalon-sur-Saône	Dép.			20.02	20.02								22.06				23.03	01.07
Chagny	Dép.			20.13	20.13												23.13	
Beaune	Dép.			20.23	20.23												23.23	
Dijon-Ville	Arr.			20.49	20.49							21.51	22.42				23.47	01.50
Massy-TGV	Arr.	20.44								22.33								
Massy-Palaiseau	Arr.																	
Paris-Gare-de-Lyon	Arr.		22.53	23.37		21.05	21.05	21.58	22.29		23.05	23.29			23.33	00.03		

18. tous les jours sauf les sam, dim et fêtes ; le 14 juil.
19. jusqu'au 4 juil : tous les jours sauf les 26 juin et 3 juil.
20. du 5 juil au 3 sept : tous les jours sauf les sam ; à partir du 4 sept : tous les jours.
21. les ven sauf le 12 nov ; le 10 nov.
22. jusqu'au 9 juil : tous les jours sauf les sam et dim ; du 16 juil au 27 août : les ven ; à partir du 30 août : tous les jours sauf les sam, dim et fêtes.
23. jusqu'au 4 juil et à partir du 5 sept : tous les jours sauf les sam ; du 5 juil au 3 sept : tous les jours- 1ère CL.
24. les dim et fêtes sauf les 31 oct et 11 nov.
25. les sam.
26. jusqu'au 11 juil : tous les jours sauf les sam ; du 18 juil au 29 août : les dim ; à partir du 30 août : tous les jours sauf les sam et sauf le 11 nov.
27. les dim et fêtes sauf le 31 oct.
28. jusqu'au 11 juil : tous les jours sauf les sam ; du 15 juil au 26 août : tous les jours ; à partir du 29 août : tous les jours sauf les sam et sauf le 11 nov.
29. jusqu'au 14 juil et à partir du 27 août : tous les jours.
30. les ven et le 10 nov.
31. tous les jours sauf les sam et sauf le 11 nov.
32. jusqu'au 9 juil : les ven, sam et dim ; du 11 juil au 3 sept : les ven et dim ; à partir du 4 sept : les ven, sam et dim- 1ère CL.
33. les dim et fêtes sauf le 1er nov- 2e CL- AUTOCAR.
34. les dim sauf le 31 oct ; le 1er nov.

Comment Letter O069 Continued

Attachment B

Example of train splitting on Thalys line

Train leaves Paris, splits at Brussels (second line of schedules), with one half continuing to Cologne and the other to Amsterdam. The split takes five minutes for the Amsterdam-bound train and eight minutes for the train to Cologne.

THALYS

FR | EN | NL | DE ▢ Timetables ▢ Fares ▢ Ticket purchase ▢ Destinations ▢ Partners ▢ Travel guide ▢ Contact

TIMETABLES : Paris-Nord > Köln Deutz FROM APRIL 1, 2004 TO DECEMBER 11, 2004

THALYS		9409	9417	9429	9433	9441	9445	9453
Paris-Nord	D	06:55	08:55	11:55	12:55	14:55	15:55	17:55
Bruxelles-Midi/Brussel-Zuid	A	08:20	10:20	13:20	14:20	16:20	17:20	19:20
	D	08:28	10:28	13:28	14:28	16:28	17:28	19:28
Liège-Guillemins	A	09:20	11:20	14:20	15:20	17:20	18:20	20:20
Aachen Hbf	A	10:06	12:06	15:06	16:06	18:06	-	21:06
Köln Hbf	A	10:49	12:49	15:49	16:49	18:49	-	21:49
Köln Deutz	A	11:01	13:01	16:01	17:01	19:01	-	22:01
Monday to Friday		+	+	+	+	+	+	+
Saturday		+	+	+	+	+	-	+
Sunday		+	+	+	+	+	+	+

+ running - not running

Return timetables ›

Billet imprimé® : Print your ticket
Comfort 1 : Services
Lys : 50 % at any time
TCP : Corporate program
Avis : Rent a car
Accor : Book your hotel

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SEARCH AND BOOK Help

1 France
2 Departure station
3 Arrival station
4 1 adult(s) Comfort 2
5 31-08-2004 morning
6 Return on --
7 schedules booking

OK

Travel with children, TCP, Lys, ...
DETAILED search and booking

France

OK

| General conditions of use |

Comment Letter O069 Continued

THALYS

FR | EN | NL | DE ☐ Timetables ☐ Fares ☐ Ticket purchase ☐ Destinations ☐ Partners ☐ Travel guide ☐ Contact

TIMETABLES : Paris-Nord > Amsterdam Centraal FROM DECEMBER 14, 2003 TO NE 12, 2004

THALYS		9309	9313	9313	9321	9329	9333	9341	9345	9349	9353	9357
Paris-Nord	D	06:55	07:55	07:55	09:55	11:55	12:55	14:55	15:55	16:55	17:55	18:55
Bruxelles-Midi / Brussel-Zuid	A	08:20	09:20	09:20	11:20	13:20	14:20	16:20	17:20	18:20	19:20	20:20
	D	08:25	09:25	09:25	11:25	13:25	14:25	16:25	17:25	18:25	19:25	20:25
Ant erpen-Berchem	A	09:03	10:03	10:03	12:03	14:03	15:03	17:03	18:03	19:03	20:03	21:03
Rotterdam Centraal	A	10:08	11:08	11:08	13:08	15:08	16:08	18:08	19:08	20:08	21:08	22:08
Den Haag HS	A	10:27	11:27	11:27	13:27	15:27	16:27	18:27	19:27	20:27	21:27	22:27
Schiphol	A	10:49	11:49	11:49	13:49	15:49	16:49	18:49	19:50	20:49	21:49	22:49
Amsterdam Centraal	A	11:06	12:06	12:06	14:06	16:06	17:06	19:06	20:06	21:06	22:06	23:06
onday to Thursday			-			-		-		-	-	
Friday			-	-		-		-		-		
Saturday				-		-		-		-	-	
Sunday		-	-	-							-	
		(1)	(2)	(3)		(4)		(5)		( )		

+ running **- not running**

Return timetables ›

(1) does not run on 12 4, 20 and 31 5
(2) runs also 12 4, 20 and 31 5
(3) runs from 28 until 30 8
(4) runs on 20 5 and from 2 until 2 8
(5) runs also on 12 4 and 31 5
( ) runs also on 10 11

Connections

At Rotterdam to Delft, trecht and ilversum
At Den aag to Leiden and aarlem
At Amsterdam to Alkmaar and Den elder.

Billet imprimé® : Print your ticket
Comfort 1 : Services
Lys : 50 % at any time
TCP : Corporate program
Avis : Rent a car

SEARCH AND BOOK Help

1 France
2 Departure station
3 Arrival station
5 31-08-2004 morning
6 Return on --
7 schedules booking

Travel with children, TCP, Lys, ...
DETAILED search and booking

France

OK

Attachment C

Eurostar

TGVweb > TGV Trainsets > Eurostar *Serve this page from:* *California, USA* / *Pisa, Italy*

Eurostar is an international high speed service between Paris, London and Brussels, through the 50 km (31 mi) long Channel Tunnel, using TGV-derived trains. It is jointly operated by British Rail (European Passenger Services), SNCF (the French national railways) and SNCB (the Belgian national railways). Eurostar trainsets can operate at speeds of 300 km/h (186 mph) on the Nord-Europe line in northern France. To see where this is, take a look at the map. The photograph (from La Vie du Rail) shows a Eurostar rounding the Tonbridge curve in Britain. At left is an old Class 411 EMU.

In this article:

A Brief History

Eurostar owes its existence to the Channel Tunnel project, which fostered cooperation between France and Britain to establish rail service between Paris and London. Early on in the development of the tunnel project, BR and SNCF agreed with tunnel promoters to make use of a certain fraction of the tunnel's capacity. Belgium joined in with France and Britain, and the International Project Group (IPG) for Trans Manche Super Trains was formed in 1987. The group was put in charge of defining the requirements for an international high speed rail service. Fairly quickly, it became clear that TGV technology was well-suited for this purpose. The IPG was a model of international cooperation, as staff from three countries shared a single office, a common secreterial

Comment Letter O069 Continued

staff and filing system.

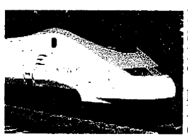
The specifications of the new train were drastic, since they had to conform not only to the requirements of three different rail networks, but also to special issues of tunnel safety. Final specifications were settled upon in November 1988. A firm order to build 30 trainsets was placed with GEC-Alsthom in December 1989; a further 8 were later added to this order.

Eurostar's debut was delayed by the controversy surrounding the time and budget overruns encountered during construction of the tunnel. Perhaps this was providential, since technical problems were encountered while the new trainsets were being tested on British rails. The archaic 750V third rail power supply that Eurostar uses in Britain caused electrical interference problems with the sensitive signalling system, causing the train shut itself down unexpectedly. The delay in the tunnel opening was used to fix these problems (described in more detail below), and in the summer of 1993 the first Eurostar trainset was run through the tunnel... at reduced speed, pulled by a diesel locomotive. This was a major milestone, since until then Eurostar had used the boat and the road to get to Britain for testing.

Eurostar service was officially inaugurated on 14 November 1994, and service has since been expanded incrementally to many destinations.

The Eurostar Trainset

The Eurostar TGV was arguably the most complicated and sophisticated train ever to ride the rails when it was introduced. From the outside, the trainset looks distinctly different from other TGVs, but retains a subtle air of familiarity. Quoted from the TGV Spotter's Guide, some basic specifications:



Build Dates: 1993-1995
Territory: LGV Nord-Europe and points north
Top Speed: 300 km/h (186 mph)
Number in Service: 31 (see fleet list for numbering)
Supply Voltages: 25kV 50Hz AC, 3kV DC, 750V DC third rail (1.5kV DC for some)
Traction: 12 3-phase AC asynchronous motors, total power 12200 kW (16300 hp) under 25kV supply
Length and Weight: 394 m / 752 tonnes
Configuration: 1 power car + 18 trailers + 1 power car, 794 seats (see formations)
Performance Metrics: 16 kW/tonne / 0.98 tonnes/seat / 15.90 kW/seat
Pressure Sealed: Yes
Spotting Features: yellow duckbill nose, low profile.
Images: [TGVweb] [ERS Picture Gallery]
Special Notes: International (40/40/20) cooperation between France, Britain and Belgium.

Eurostar trainsets come in two kinds: long and short. 31 trainsets are long, with 18 trailers between two power units. The remaining 7 are short, with only 14 trailers. The short trainsets are for service north of London, to destinations such as Manchester and Glasgow, where platform lengths are insufficient to accomodate longer trains.

Tunnel Issues

For safety reasons, the trainset is divided into two symmetrical halves. Trailers R9 and R10 do not ride on a common truck; instead, they are coupled (not articulated) using an automatic coupler. This allows the trainset to be split in the middle in under two minutes, should there be a serious emergency in the Tunnel. This operation can also be performed at the level of the power cars, so that the train can be split in a total of three different places. In any case, no external intervention is required; the procedure is performed from inside the train.

Tunnel operations dictated the installation of a sophisticated fire detection and extinguishing system, incorporated in the traction compartments. Fire resistant materials are used wherever possible, and the passenger compartment end doors and floors are 30 minute fire resistant. (The fire doors between cars are closed only while the train is in the tunnel.)

Should a trainset become stranded in the tunnel due to a power failure, the couplers at each end of the Eurostar trainset are compatible with Eurotunnel's diesel electric locomotives, as are the brake and service connections.

Eurostar's nose is computer-optimized for running in the Channel Tunnel, where pressure waves can affect passenger comfort. The tunnel itself is passed at a reduced speed of 160 km/h (99 mph), and TVM 430 cab signal is used as on the high speed lines, but with non-permissive blocks.

Traction Equipment

One of the main differences between Eurostar and its TGV brethren is the introduction of a British-designed asynchronous AC drive, as opposed to the

Comment Letter O069 Continued

synchronous drive used until then in TGV technology. A Eurostar trainset has twelve 1020 kW (1370 hp) traction motors. Eight of them are in the power units (frame mounted, as in TGV practice); the remaining four are in trailers R1 and R18 and equip the trucks immediately adjacent to the power units, just like for the TGV Sud-Est trainsets. The reason for this is the great length (and hence weight) of the trainset; more powered axles are needed to provide acceptable acceleration. Eurostar's power to weight ratio is still the worst in the TGV family.

Each power unit is equipped with two pantographs: one suited for high speeds and 25 kV AC, and the other for running to Belgium under 3 kV DC. On high speed lines, both 25 kV pantographs (one on each end of the trainset) are used. This breaks with the earlier practice in TGV technology of feeding the front power unit from the rear through a 25 kV power cable running the length of the trainset's roof. The great distance between the two pantographs (compared to other TGV types) eliminates the need for this, since the disturbance caused in the catenary by the leading pantograph has enough time to damp out while the train passes underneath. Advantages are lower currents, and simplicity.

The third rail pickup shoes, for 750 V operations on British soil, are found on each side of every powered truck. They number 12 total, and they retract when not needed to fit the UIC loading gauge. A design challenge was to mount them on the truck sideframes (instead of on the journal boxes, which allows a constant height to be maintained) in order to reduce unsprung mass.

Problems with the Third Rail

The former Southern Railway's third rail electrification, which Eurostar uses in Britain, uses a 50 Hz track circuit. The return traction current from the Eurostar trainsets also travels through the rails, so it is of the essence to avoid any dangerous interference between traction and signalling. The variable-frequency supplies used to run Eurostar's 3-phase AC asynchronous motors are liable to produce this frequency. This was recognized early, and Eurostar power units were built with an Interference Current Monitoring Unit (ICMU) which automatically opens the main circuit breaker as soon as the 50 Hz component is detected. In principle, this was to take care of the problem without excessively frequent circuit breaker trips.

In practice, things turned out differently. As soon as Eurostar trainsets started testing in Britain, the ICMU's began tripping much more often than expected. Every time the ICMU cut power, it took approximately thirty seconds to restore it. This became a serious problem since the trips occured at intervals on the order of thirty seconds. Eurostar is already woefully underpowered when it uses third rail (it has about one quarter of its full power available, in order to limit current pickup to about 750 Amps per shoe) so frequent tripping made it impossible to keep an already slow schedule. Why were there so many ICMU trips?

As it turns out, arcing between the pickup shoes and the rail was the problem. Eurostar's third rail pickup shoes are not linked through a 750 V power cable running the length of the train, so that when a break in contact occurs, the load cannot be taken over by as many other pickups. This results in bigger sparks, which can generate noise with a 50 Hz component detected by the ICMU. The solution to this problem was twofold: First, the modification of over 1000 track circuit relays to increase their response time, and then the modification of the ICMU's so that they only cut power when the 50 Hz component was detected for longer than 1 second. These modifications took care of the problem, but delayed the testing program and made a stink in the press.

Eurostar Operations

Eurostar is operated as a seamless service, which is something of a challenge because three countries, each with their own language, are served. In many ways, a trip on Eurostar will feel more like an airplane trip than a conventional train trip. There are airport-like check-in procedures; the staff wears specially designed uniforms and speaks several languages, and on-board announcements are made in up to four languages: French, English, German and Dutch. The language of the country in which the train finds itself is used first.

Like the cabin staff, the driver is also required to speak several languages. Drivers can use their native tongue to communicate on the train's radio link to the dispatcher. Eurostar's information system is trilingual, so that the computer displays in the cab can be set to the driver's preference.

Eurostar can acheive very high speeds, but only on the continent. The tracks in Britain are limited to 161 km/h (100 mph) because of the third rail supply and tight curves. This leads to a rather embarrassing disparity in average speeds on either side of the Channel: in a run from Paris to London, the average speed on the French side is a full 160 km/h (100 mph) faster than on the British side! The high speed rail link from the tunnel to London, the Union Railway, is planned to open in 2002, and will make the run significantly faster.

Eurostar in Numbers

DIMENSIONS AND WEIGHT

- **Length:** 393.72 m (1291' 8")
- **Width:** 2.81 m (9' 4")
- **Power unit truck pivot spacing:** 14.00 m (45' 11")
- **Trailer truck pivot spacing:** 18.70 m (61' 4")
- **Truck wheelbase:** 3.00 m (9' 10")
- **Wheel diameter:** 0.92 m (36")
- **Empty weight:** 752,400 kg (1,658,000 lbs)

Comment Letter O069 Continued

Operating weight: 816,000 kg (1,798,000 lbs)
Adhesive weight: 204,000 kg (450,000 lbs)

POWER (at the rail)

Under 25 kV 50 Hz: 12200 kW (16400 hp)
Under 3 kV DC: 5700 kW (7640 hp)
Under 750 V DC third rail: 3400 kW (4560 hp)

COST (per trainset)

210 million FF (1988) This works out to approximately $40,000 per seat, possibly another world record for a train. (For comparison, a typical new airliner costs about $250,000 per seat.) The design lifetime of Eurostar is 30 years.

Trip Reports

These were written by people who actually rode Eurostar.

- Jeff Lunden
- Jishnu Mukerji
- David Bunny

Pictures

...of Eurostar can be found here in the TGVweb, or in the Mercurio Picture Gallery.

Eurostar Travel Information

See Eurostar's official website.

Sources: La Vie du Rail, Railway Magazine, Eurostar Special (on-board magazine), and others. Thanks to Andrea Zana for suggesting some of these sources.

TGVweb > TGV Trainsets > Eurostar Back to Top

Attachment D

MARK A. KETCHUM, PH.D., P.E.
2029 Delaware Street, Berkeley, California 94709 Tel 510 486 1521 Email mark@ketchum.org

August 31, 2004

Stuart Flashman
Attorney for Train Riders Association of California
5626 Ocean View Drive
Oakland, CA 94618

Reference: Comments on Appendix 2-J: Cost Estimate for San Francisco Bay Crossing

Dear Mr. Flashman:

I have briefly reviewed the referenced Appendix to the California High-Speed Train Program EIR/EIS, downloaded from the http://www.cahighspeedrail.ca.gov/ web site. I offer the following observations of the assumptions and findings reported in this Appendix:

1. The assumption was made that the existing Dumbarton Rail bridge and Newark Slough bridge structures and approaches would remain for other uses. While it is accepted that the existing structures may be unsuitable for HST use, it could be feasible and economical to build the new crossing on the existing alignment. This solution could reduce both construction costs and mitigation costs. Construction costs could be reduced by using the existing structures for construction staging of the new crossing. Mitigation costs could be reduced by using a pre-existing encroachment on the wetlands instead of building a new encroachment.

2. To accommodate construction for 125 mph trains with HST tolerances/standards, a 15 to 20% factor was added to unit costs [for conventional rail bridge]. While HST does require a relatively rigid guideway for full speed operation, high speed trains in use around the world (ICE, Shinkansen, TGV) are significantly lighter in weight than conventional heavy rail. And for the part-speed operation presumed, the rigidity requirements could be relaxed. Therefore this 15 to 20% factor may be excessive.

3. The contingency and project delivery allowances appear to be at standard rates for this stage of this type of project. These cover cost growth due to ancillary requirements (contingency) and cost of design and construction supervision (project delivery).

4. Costs for the main channel bridge are not well documented, but appear high compared with costs for recent highway bridge projects in the region. Somewhat higher costs can be expected for HST as compared with highway bridges, because of the special requirements of HST. But the escalation factor in the Bay Area should be lower than in other parts of the world, because the seismic component, which is not as subject to HST escalation, is such a great contributor to construction cost.

   For example: Estimated unit prices appear high. Where unit prices are defined as $ per unit deck area: The San Mateo Trestle was recently completed for just over half the unit

Comment Letter O069 Continued

MARK A. KETCHUM

Stuart Flashman
August 31, 2004
Page 2

price estimated for the "Trestle over Water". The Carquinez (Zampa Memorial) Bridge - with significantly longer span - was recently completed for about one fifth the unit price estimated for the "Main Span over Navigation Channel". The new Benicia Martinez Bridge is currently estimated for completion at about one quarter the unit price estimated for the "Main Span over Navigation Channel". With the "High Speed Factor" and "Contingency Factor" included, these comparisons get about 50% worse.

In summary, the basis for the estimated crossing costs are not well documented, but this comparison of tabulated estimated costs in Appendix 2-J with actual or current estimated costs of recent local highway projects, adjusted for differences between highway and HST bridges, suggests that the estimated construction costs for the Dumbarton Crossing may be several times higher than justified.

My brief review suggests that the cost estimate reported in Appendix 2-J may be realistically reduced to reflect recent local and world-wide bridge design and construction experience.

Sincerely,

Mark A. Ketchum

Mark A. Ketchum, Ph.D., P.E.

Mark A. Ketchum, *Ph.D., P.E.*

Title: Vice President, OPAC Consulting Engineers, Inc.
Experience: 27 Years

EXPERTISE

Dr. Ketchum's professional career has included structural design, construction support, research, development, investigation, and rehabilitation of bridges, buildings, and industrial structures. He is known for taking on unusual design challenges and for addressing challenging technical evaluations. Execution of these projects prompted his development and/or implementation of technologies for nonlinear seismic performance evaluation, construction sequence evaluation for deformations and loads, nonlinear collapse analysis, and dynamic wind response evaluation.

EDUCATIONAL AND PROFESSIONAL STATUS

Ph.D., Civil Engineering (University of California, Berkeley), 1986
M.S., Civil Engineering (University of California, Berkeley), 1977
B.S., Civil Engineering (Worcester Polytechnic Institute), 1975

Registered Professional Engineer, California
Member, American Society of Civil Engineers
Member, American Concrete Institute
Member, International Association for Bridge and Structural Engineering

PROFESSIONAL EMPLOYMENT RECORD

OPAC Consulting Engineers	Vice President	1992-present
T.Y. Lin International	Principal Engineer Engineer	1988-1992 1977-1981
Wiss, Janney, Elstner Assoc.	Senior Engineer	1986-1988
University of California	Teaching / Research Associate & Assistant Appointments	1981-1986 1975-1977

PROJECT EXPERIENCE (Chronological Listing)

Route 237-880 HOV Connector Separation (California)
Engineering Consultant *(2004)* Providing engineering analysis to support resolution of construction cracking issues in a curved, ten-span post tensioned concrete box girder bridge in Santa Clara County. Services include detailed three-dimensional Finite Strip analysis of the bridge.

Clearwater Causeway Bridge (Florida)
Engineering Consultant *(2004)* Providing engineering consultation in support of resolution of construction issues on a nine-span segmentally erected concrete box girder bridge. Services include review of design and construction documentation, and complete independent check calculation of the bridge both as-designed and as-built. Performed three-dimensional service-load analyses and stage-by-stage segmental erection sequence analyses as components of the independent check.