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”LOS ANGELES-BOSTON: 20h on High Speed”

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Abstract

This paper describes a Spanish proposal of possible collaboration with the Federal Railway Administration of the USA Transport Department for the operating in a term of 15 years of the HSR way Los Angeles (CA)-Boston (MA), 3.626 mile (5.834 km) length, that vertebrate the USA High Speed Railway System “USHSRS”, 17.000 mile (more of 27.000 km) length, launched in 2009 by the President Obama, and to date, only in execution some sections of the CHSRA (California High–Speed Railway Authority), 200 km hardly, in the Californian Central Valley, around Fresno. In the construction of these sections take part Spanish companies of high level in wined bids provided the Spain’s privileged international consideration for the development and high technology of its high-speed railway network (AVE), the second in the world by length, after China.

This itinerary is integrated by the Structural Units: “Ia:- Pacific Coastal Corridor”, “II: Intercoasts Way” and “Ib:– Atlantic Coastal Corridor”, as collect in the Table “Taking off & Summary” about Characteristic figures: morphological, structural and budgetary, from predesigned HSR Lines by the authors of this paper in the “Farwest”, “Canevar”, “Nevut”, “Utconmar”, “Interplains”, “Ohio-Potomac” and “Chesa-Hudsanan-Charles” Projects. The Construction Budget is 112.175 M$, with an unit cost of 19,30 M$/km.

Finally is summarized an operation study of this itinerary with fourteen stations and the two Terminals, from which would depart trains each forty minutes (18h/day) by direction, respectively, with twenty carriages (eleven sitting cars and nine sleeping cars) in a similar composition to the used in the Berlin-Moscow express railway since 2016 December 17. In a graph is summarized also the distances between stations, times of travel (with stops between) and foreseen ticket rates with loans at 6% for a total investment financing (infrastructure, superstructure, equipments, signaling and rolling stock).

Keywords: High-Speed Railway, USHSRS, Los Angeles-Boston Itinerary, ...

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1. Introduction

The news in the press in December 2016: "Opening of the new Moscow-Berlin night train service", a few days before the announcement of the International High Speed Congress in Ciudad Real (October 2017), motivated the proposal of this Conference with The "abstract" sent at the end of January 2017.

The authors of this paper have pre-designed a large part of the US High Speed Network "USHSRS" in Preprojects registered at the Colegio de Ingenieros de Caminos of Madrid, and described in articles published in the "Vía Libre" and "Alta Velocidad" of the Fundación de los Ferrocarriles Españoles, "Ingeniería Civil" and "Fomento" of the Ministerio de Fomento and "Revista de Obras Públicas""ROP" of the Colegio de Ingenieros de Caminos.

At the 1st International Congress of Civil Engineering, held at the Colegio de Ingenieros de Caminos in Madrid on March 2 and 3, 2016, under the motto "Routes joining the world", the authors presented a communication, based on the positioning of Spain as a world reference in the field of High Speed Rail, so that it could serve as the starting point for a possible coordinated collaboration between the governments of Spain and the United States. Figure 1 reproduces the planning presented for the development of the Plan, considering eight structural units. For the purposes of the present paper, we focus on units I, II and VI.

Unit I, "Coastal Corridors", consists of the Pacific Coast Corridor (I1) and the Atlantic Coast Corridor (I2). This unit is the one with the greatest profitability foreseeable in its exploitation, when communicating large urban conglomerates: (I1: Los Angeles-San Francisco Bay) and (I2: Washington D.C.-New York-Boston).

Unit II, "Intercoasts Way: San Francisco-Washington DC", communicates the two corridors of the first Unit and vertebra the network, allowing its execution a progressive advance of the communication between the different States of the country, taking into account the difference Time between the two coasts and the possibility of taking advantage of the night time for the trips, favors a progressive, comfortable, flexible and efficient exchange of relations between the most important centers of activity of the nation, in a similar way, although on a much larger scale, to the service of the night train Moscow-Berlin, inspiring of the Conference.

Unit VI, "Missouri-Illinois-Indiana-Ohio Connection (VI 1-3)". This connection: Saint LouisSpringfield-Chicago / Gary-Indianapolis-Cincinnati allows, alternatively, in a part of sub-unit II3 "Saint Louis-Louisville-Cincinnati Route, to realize it" via Chicago "or" via Louisville ", giving So high-speed access to the third urban agglomeration of the United States.

2. State of the art (Exposition)

The proposed commissioning of the Los Angeles (CA) -Boston (MA) itinerary requires at least the construction of 5,876 km (5834 + 42 km state of the branch to Carson (NV)), and an investment of 112,175 M $, with itinerary integrated only by Structural Units I and II, connecting a population of 32.5 Mhab. in every sense.

If in this itinerary, the Saint Louis-Cincinnati route "via Louisville" is replaced by "Chicago route", the total length to be built is 6,170 km (5979 + 191 km state) of the branches to Carson (NV), Jefferson (MO) and Mount Vernon (TN)), with an investment of 116,917 M $ and a connected population of 36,5 Mhab. in every sense.

This second option has the objective advantage that, with a 4% increase in investment, the population connected to a large distance is increased by 14%, with no appreciable difference in travel times. References to the Los Angeles-Boston route, are made considering it "via Chicago".

This itinerary, which is part of the United States High Speed Network "USHSRS", can be carried out, according to the Approach planned for its development in four five-year (20 years) stages, by the USHSRS Association, within fifteen years, taking the initial proposal of the authors (Ref. 11), to construct the more than 27,000 km of estimated total length of the network from ten major poles of action, dedicating six of them for the direction and coordination of the execution of this itinerary (San Francisco, Denver, Chicago, Pittsburgh, New York and Boston).

The other four large poles would occupy in this same period of construction of the "injection" to the vertebral route of the network, another 20 Mhab. In each direction: 2.5 Mhab. from the Seattle Polo (Salt Lake City Connection); 8.0 Mhab. from the Dallas Pole (Kansas City Connection); 3.0 Mhab from Atlanta´s Polo (Connection Saint Louis) and 6.5 Mhab. from the Miami Polo (Washington DC Connection)

In the following five years, from the ten poles, the planned network could be completed, but with more than 50% of the urban working population already connected with traveling times of less than 20 hours, with an investment of less than 25%, overall.

2.1 LA-BO Itinerary Description

A detailed description of the route with the HSR lines that form it is found in the preliminary projects whose characteristic, morphometric, constructive and budgetary figures are summarized in the attached Tables

The following is a summary of the length of each line, the number of LT "Long Tunnels", the longest and total length of them, as well as the number of SB "Suspension Bridges" and their total length .

		LT			SB	
Line	**L (km)**	**nb**	**ΣL(km)**	**Lmax (km)**	**nb**	**ΣL(km)**
1: LA-SF	598	5	95,7	27,5	1	1,6
2: SF-Sac	167	1	14,0	14,0	8	12,8
3: Sac-Reno	162	4	56,5	16,0	1	1,6
4: Reno-SLC	680	2	70,0	35,0	7	11,2
5: SLC-Denver	660	18	204,5	22,0	3	4,8
6: Denver-KsC	896	0	0,0	---	4	6,4
7: KsC-SL	415	0	0,0	---	2	3,2
8: SL-Chicago/G	420	0	0,0	---	2	3,2
9: Chicago/G-Cin	450	1	6,0	6,0	1	1,6
10: Cin/H-Colum	60	0	0,0	---	2	3,2
11: Colum-Pittsb	253	0	0,0	---	2	3,2
12: Pittsb-Wash	371	2	17,0	10,0	3	4,8
13: Wash-NY	460	2	12,0	6,0	5	8,0
14: NY-BO	387	0	0,0	---	5	8,0
1-14: LA-BO	**5.979**	**35**	**475,0**	**35,0**	**46**	**73,6**

2.2 Summary of the previous exploitation study of the LA-BO itinerary

The Sustainable Approach to the California High Speed Network (CHSRS) (Ref.15) was premised on its functional integration into the United States federal grid, as anticipated by the USHSRS Network Phasing Plan) which includes, among others:

- Direct communication between the city of San Francisco and the capital of the State of California, Sacramento, crossing the Bay of San Francisco
- Direct communication of the "Central Valley" with downtown Los Angeles through "Tehachapi Mountains"
- The North HSR connection of the States of California and Nevada by the "Tahoe Line"

From a general point of view, the planning of the construction and operation of the network as a whole is based on the criterion of "prompt profitability" of the operation, linked to competitive rates with other means of transport (car, airplane) An operating income that allows the self-financing of the construction and operation of the same, providing its cashflow, from an initial funding contribution of approximately 20% of the total investment, an internal rate of return similar to Interest rate of the financial market for long-term operations (≈ 6%).

As a summary of the economic-financial analysis carried out for the LA-BO itinerary, some data are highlighted in the following sections.

a) Operating revenue

The average occupancy of the itinerary, of 5,979 km, is 8.83 Mp / y, which means an average operating revenue of 13,990 M $ / y.

At the age of ten it could be in service from Los Angeles (CA) to Reno / Carson (NV) (927 km with demand of 18.6 Mp / y), on the other hand, from Denver (CO) to Columbus (OH) (via Chicago / Gary) (2,241 km with 5.4 Mp/y) and on the other hand, from Washington DC To Boston (MA) (847 km with 14.9 Mp / y). That is, 3,715 km, with an average operating revenue of 11,125 M $ / y.

b) Rolling stock required for the operation

The following mobile material (for circulation and minimum reserve), both for service (TAV), and for assistance and rescue (VAL), is foreseen:

- Years 9 to 14: 50 TAV of 540 seats (348 seats and 192 beds / berths) and 26 VAL
- Years 15 to 50: 80 TAV of 540 seats (348 seats and 192 beds / berths) and 84 VAL

c) Operating costs

Annual operating costs are the sum of hourly costs (ch), linked to driving hours and kilometer costs, multiplied by a factor (F) of annual hours of service.

The unit costs, updated to 2017, of the US Bureau of Labor Statistics, are: cu h = 37 $ / h and cekm = 2.57 $ / km F = 365 * (15 or 21). n = number of trains

Operating costs will therefore be:

≈ 300 M$/y (years 9 to 14)

≈ 765 M&/y (years15 to 50)

d) Construction Budgets

Los Angeles-San Francisco	15.312 M$	Preliminary design Farwest
San Francisco-Sacramento	6.910 M$	Preliminary design Farwest
Sacramento-Reno/Carson	6.806 M$	Preliminary design Canevar
Reno-Salt Lake City	13.686 M$	Preliminary design Nevut
Salt Lake City-Denver	19.905 M$	Preliminary design Utconmar
Denver-Kansas City	8.825 M$	Preliminary design Interplains
Kansas City-Jefferson/Saint Louis	4.345 M$	Preliminary design Interplains
Saint Louis-Springfield-Chicago/Gary	6.183 M$	Preliminary design Misilinoh
Chicago/Gary-Indianapolis-Cincinnati/H	5.088 M$	Preliminary design Misilinoh
Cincinnati/Hamilton-Columbus	1.957 M$	Prelimin. design Ohio/Potomac
Columbus-Pittsburgh	2.429 M$	Prelimin. design Ohio/Potomac
Pittsburgh-Washington D.C.	5.587 M$	Prelimin. design Ohio/Potomac
Washington/Dulles-New York	10.510 M$	Prelimin. design ChesananCharles
New York-Boston	9.374 M$	Prelimin. design ChesananCharles
Itinerary Los Angeles-Boston	**116.917 M$**	**(Chicago way)**

Tabla 2 (Desglose y Resumen)

USHSRS :LOS ANGELES-SAN FRANCISCO+ INTERCOASTS WAY (TRAYECTO INTERCOSTAS SAN FRANCISCO-WASHINGTON (Via Chicago)) + WASHINGTON-NEW YORK-BOSTON

	PACIFIC SIDE	CENTRAL SIDE	APPALACHIAN SIDE Chicago Connection	PACIFIC COASTAL CORRIDOR	ATLANTIC COASTAL CORRIDOR	LOS ANGELES-BOSTON
Líneas	FARWEST/CANEVAR/NEVUT PROJECTS USHSRS: INTERCOASTS I (San Francisco-Salt Lake City)	UTCONMAR/INTERPLAINS I y II PROJECTS USHSRS: INTERCOASTS II (Salt Lake City-Saint Louis)	OHIO/POTOMAC PROJECT & MISILINOH PROJECT USHSRS: INTERCOASTS III (Saint Louis-Washington via Chicago)	FARWEST PROJECT CHSRS: MISSIONS TRAIL HSL (Los Angeles-San Francisco)	CHESA/HUDSANAN/CHARLES PROJECT USHSRS: LIBERTY&TRIMOUNTAINE HSLs (Washington-New York-Boston)	FARWEST/CANEVAR/NEVUT/UTCONMAR/INTERPLAINS I y II /OHIO POTOMAC/MISILINOH/CHESAHUDSANANCHARLES PROJECTS USHSRS:INTERCOASTS+CORREDORS(Los Angeles Boston)
Longitud Total (km, miles)	1052,0 (654mile)	1971,0 (1220mile)	1703,0 (1059mile)	507,0 (321mile)	547,0 (327mile)	5.170 (3.212mile)
Desmontes / áreas de relleno (km) (%)	795,0 (75,57%)	1682,0 (85,31%)	1601,0 (94,02%)	359,0 (69,14%)	770,0 (91,83%)	5.315 (84,52%)
Longitud Total de Túneles (km)	194,0 (18,44%)	216,5 (11,14%)	65,8 (3,29%)	169,0 (33,33%)	32,6 (3,84%)	700,0 (11,36%)
Longitud Total de Viaductos (km)	63,0 (5,99%)	70,0 (3,55%)	46,4 (2,72%)	39,0 (8,53%)	36,5 (4,21%)	255,0 (4,13%)
Estaciones Principales	VALLEJO-RENO/CARSON-EONNEVILLE	Dutheve-Meeker-DENVER-Goodland-Salina-TOPEKA-KANSAS CITY-Marshall-COLUMBIA/JEFFERSON CITY	SPRINGFIELD-BLOOMINGTON-JOLIET/CHICAGO/GARY-WEST LAFAYETTE-INCIANAPOLIS-FUSHVILLE-CINCINNATI/HAMILTON-COLUMBUS-Wheering-PITTSBURGH-HAGERSTOWN-LEESBURG-WASHINGTON Dulles Airport-CENTREVILLE	LOS ANGELES-BAKERSFIELD-FRESNO-GILROY-SAN JOSE-SAN FRANCISCO	WASHINGTON D.C.-BALTIMORE-PHILADELPHIA-TRENTON-NEW YORK-NEW HAVEN-HARTFORD-PROVIDENCE-BOSTON	LOS ANGELES-SAN FRANCISCO-SACRAMENTO-RENO-CARSON-SALT LAKE CITY-DENVER-KANSAS/TOPEKA-SAINT LOUIS/JEFFERSON-SPRINGFIELD-CHICAGO-GARY-INDIANAPOLIS-CINCINNATI-HAMILTON-COLUMBUS-PITTSBURGH-WASHINGTON-BALTIMORE-PHILADELPHIA-TRENTON-NEW YORK-PROVIDENCE-BOSTON
TSAP's/PAET's número (Lines+Estaciones)	22 (17+5)	31 (20+6)	45 (23+18)	17 (9+8)	31 (21+10)	142 (91+51)
Velocidad media (km/h)	300	310	306	281	322	308
Total Movimiento de Tierras (Mm³)	886,36	980,23	245,40	126,99	303,42	1965,31
Túneles Largos (20 Km) (ud. Km Totales)	10 (151,24)	12 (168,80)	5 (36,70)	14 (181,10)	3 (22,20)	44 (553,14)
Viaductos principales (>400 m luz) (ud ; Km Totales)	5 25,68	14 26,40	14 22,40	3 8,20	10 16,00	46 37,40
Presupuesto (A+B+C+D+E+F) (M$)	27.402	33.075	21.344	15.312	19.838	116.971
Movimiento de Tierras (a) (M$)	3916	2351	4661	1757	3024	12.470
Túneles (b) (M$)	7060	7239	1553	7322	1103	24.376
Estructuras (c) (M$)	4068	3719	9405	1979	3469	43.240
A - Infraestructura (a+b+c) (M$)	21244	18003	4979	10958	13996	71.330
B - Superestructura (M$)	2854	5246	5348	1329	2943	17.721
C - Equipamiento (M$)	2991	3939	4457	1731	1754	15.022
D - Protección ambiental (M$)	453	553	386	177	348	1.917
E - Proyecto,Garantía de Calidad y Dirección de obra (M$)	661	796	511	344	519	2.834
F - Suplemento por Estaciones y PAETs (M$)	759	498	540	504	454	2.922
Coste Unitario (incluidas Estaciones) (M$/km)	25,59 (25,05)	16,90 (17,05)	12,13 (12,48)	25,39 (25,55)	22,99 (23,48)	18,49 (18,95)
Inversión prevista de los Estados (M$)	10.200 CALIFORNIA 12.875 NEVADA 4.327 UTAH	8.595 UTAH 13.605 COLORADO 8.530 KANSAS 4.345 MISSOURI	8.601 ILLINOIS 3.802 INDIANA 294 MISSOURI 4.200 OHIO 4.139 PENNSYLVANIA 736 MARYLAND 1.190 VIRGINIA	15.312 CALIFORNIA	300 VIRGINIA 4.505 MARYLAND 1.599 PENNSYLVANIA 3.200 NEW JERSEY 2.201 NEW YORK 5.259 CONNECTICUT 920 RHODE ISLAND 1.954 MASSACHUSSETS	25.512 CALIFORNIA 12.875 NEVADA 12.922 UTAH 13.605 COLORADO 8.530 KANSAS 4.639 MISSOURI 8.601 ILLINOIS 3.802 INDIANA 4.200 OHIO 5.724 PENNSYLVANIA 5.243 MARYLAND 1.599 VIRGINIA 3.224 NEW JERSEY 2.201 NEW YORK 5.259 CONNECTICUT 920 RHODE ISLAND 1.954 MASSACHUSSETS

e) Estimation of the number of passengers/year (Demand)

The total demand initially envisaged in the LA-BO route, once put into service within 15 years, according to the attached list, is 128.70 Mp / y (passenger / year), and 143 Mp/y when the connections with the Poles of Seattle (in Salt Lake City), Dallas (in Kansas City), Atlanta (in Saint Louis) and Miami (in Washington DC) were put into service.

Section (HSL)	Population (Mhab)	Passenger/y(1) (Mp/y)	Travel time	Operation term (years)
LA-SF	8,111	22,25	2h 28'	8
SF-Sac	4,385	20,43	0h 36'	8
Sac-Ren	0,700	3,31	0h 34'	7
Ren-SLC	1,500	*2,87	2h 10'	15
SLC-Denv	2,500	**3,92	1h 57'	15
Denv-Ks.C	2,500	***1,62	2h 56'	9
Ks.C-SL	3,750	2,23	1h 19'	6
SL-Chic/G	7,330	8,02	1h 22'	10
Chic/G-Cin-Col	6,160	12,26	1h 43'	10
Col-Pittsb	3,100	10,76	0h 48'	15
Pittsb-Wash	5,400	9,94	1h 19'	15
Wash-NY	12,777	7,78	1h 24'	10
NY-Boston	**14,401**	**23,31**	**1h 14'**	**10**
LA-BO	**72,614**	**8,83**	**19h 50'**	**15**

(1): z=(20,000-0,039682L) (0,34854 P)

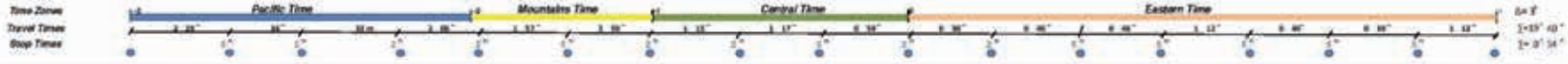
*: Lv=(200/315)L

**: Lv=(200/338)L

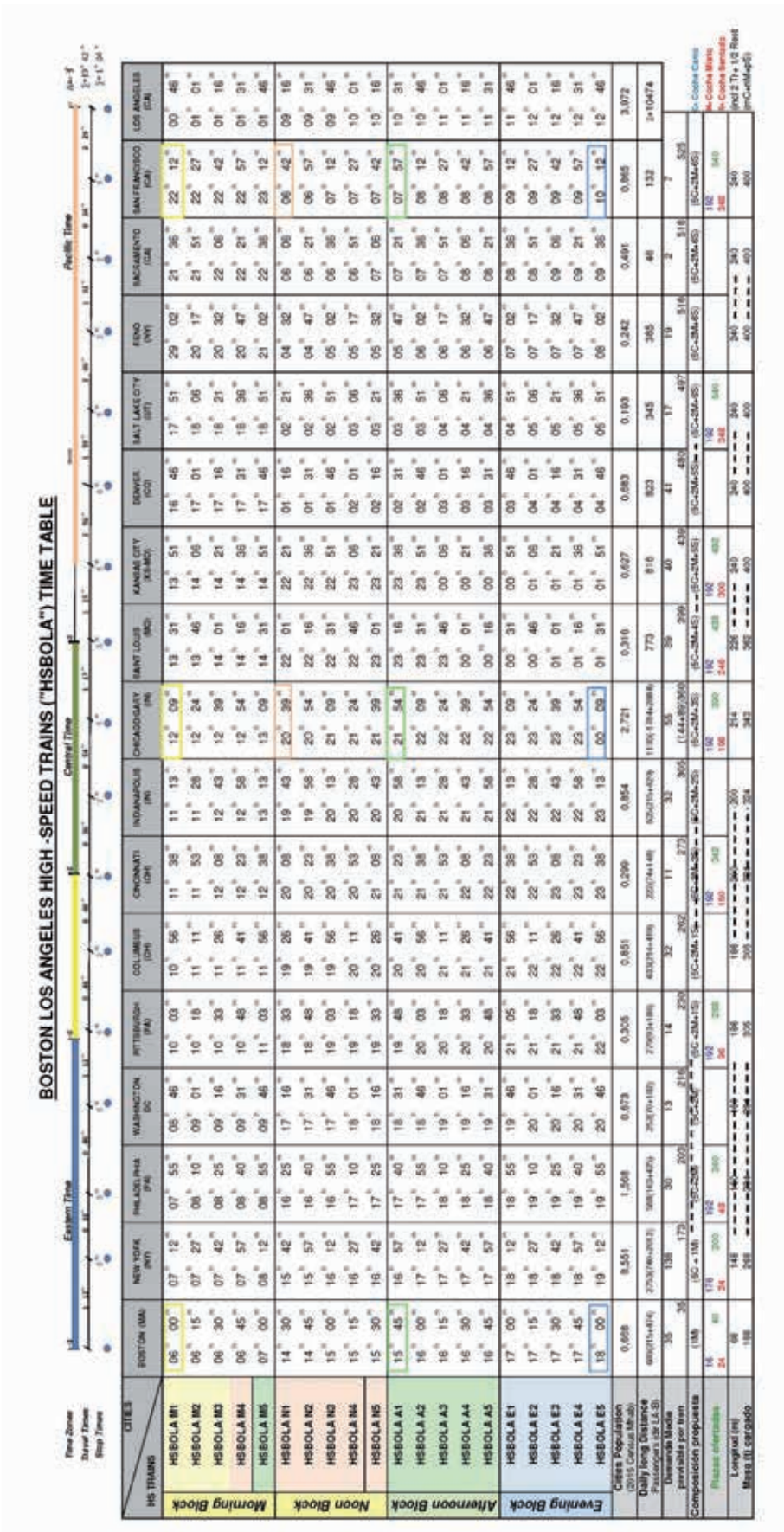
***: Lv=(200/350)L

Average daily occupation: 8.83 * 106/2/365 = 12096 p / d ->≈20 daily compositions of 600 passengers, distributed in seated places, berths and beds, as specified in the attached tables by routes and directions: HST LABO And HST BOLA

LOS ANGELES -BOSTON HIGH -SPEED TRAINS ("HS LABO") TIME TABLE



	HS TRAINS \ CITIES	LOS ANGELES (CA)	SAN FRANCISCO (CA)	SACRAMENTO (CA)	RENO (NV)	SALT LAKE CITY (UT)	DENVER (CO)	KANSAS CITY (KS+MO)	SAINT LOUIS (MO)	CHICAGO GARY (IN)	INDIANAPOLIS (IN)	CINCINNATI (OH)	COLUMBUS (OH)	PITTSBURGH (PA)	WASHINGTON D.C.	PHILADELPHIA (PA)	NEW YORK (NY)	BOSTON (MA)
Morning Block	HSLABO M1	09 00	11 29	12 08	12 42	15 50	17 49	21 44	23 01	00 20	02 19	02 51	03 33	04 26	05 45	06 34	07 17	08 34
	HSLABO M2	09 15	11 44	12 23	12 56	16 05	18 04	21 59	23 16	00 35	02 34	03 06	03 48	04 41	05 58	06 49	07 32	08 49
	HSLABO M3	09 30	11 59	12 38	13 11	16 20	18 19	22 14	23 31	00 50	02 49	03 21	04 03	04 56	06 13	07 04	07 47	09 04
	HSLABO M4	09 45	12 14	12 53	13 26	16 35	18 34	22 29	23 46	01 05	03 04	03 36	04 18	05 11	06 28	07 19	08 02	09 19
	HSLABO M5	10 00	12 29	13 08	13 42	16 50	18 49	22 44	00 00	01 20	03 19	03 50	04 33	05 26	06 43	07 34	08 17	09 34
Noon Block	HSLABO N1	15 00	17 29	18 08	18 42	21 50	23 49	03 44	05 00	06 20	08 19	08 50	09 33	10 26	11 43	12 34	13 17	14 34
	HSLABO N2	15 15	17 44	18 23	18 56	22 05	00 04	03 59	05 16	06 35	08 34	09 06	09 48	10 41	11 58	12 49	13 32	14 49
	HSLABO N3	15 30	17 59	18 38	19 11	22 20	00 19	04 14	05 31	06 50	08 49	09 21	10 03	10 56	12 13	13 04	13 47	15 04
	HSLABO N4	15 45	18 14	18 53	19 26	22 35	00 34	04 29	05 46	07 05	09 04	09 36	10 18	11 11	12 28	13 19	14 02	15 19
	HSLABO N5	16 00	18 29	19 08	19 41	22 50	00 49	05 44	06 01	07 20	09 19	09 51	10 33	11 26	12 43	13 34	14 17	15 34
Afternoon Block	HSLABO A1	16 15	18 04	19 23	19 56	23 05	01 04	05 59	06 16	07 35	09 34	10 06	10 48	11 41	12 58	13 49	14 32	15 49
	HSLABO A2	16 30	18 59	19 38	20 11	23 20	01 19	06 14	06 31	07 50	09 49	10 21	11 03	11 56	13 13	14 04	14 47	16 04
	HSLABO A3	16 45	19 14	19 53	20 26	23 35	01 34	06 29	06 46	08 05	10 04	10 36	11 18	12 11	13 28	14 19	15 02	16 19
	HSLABO A4	17 00	19 29	20 08	20 41	23 50	01 49	06 44	07 01	08 20	10 19	10 51	11 33	12 26	13 43	14 34	15 17	16 34
	HSLABO A5	17 15	19 44	20 23	20 56	00 05	02 04	06 59	07 16	08 35	10 34	11 06	11 48	12 41	13 58	14 49	15 52	16 49
Evening Block	HSLABO E1	17 30	19 59	20 38	21 11	00 20	02 19	07 14	07 31	08 50	10 49	11 21	12 03	12 56	14 13	16 04	15 47	17 04
	HSLABO E2	17 45	20 14	20 53	21 26	00 35	02 34	07 29	07 46	09 05	11 04	11 36	12 18	13 11	14 28	15 19	16 02	17 19
	HSLABO E3	18 00	20 29	21 08	21 41	00 50	02 49	07 44	08 01	09 20	11 19	11 51	12 33	13 26	14 43	15 34	16 17	17 34
	HSLABO E4	18 15	20 44	21 23	21 56	01 05	03 04	07 49	08 16	09 35	11 34	12 06	12 48	13 41	14 58	15 49	16 32	17 49
	HSLABO E5	18 30	20 59	21 38	22 11	01 20	03 19	08 04	08 31	09 50	11 49	12 21	13 03	13 56	15 13	16 04	16 47	18 04
	Cities Population	3,972	0,865	0,491	0,242	0,193	0,683	0,627	0,316	2,721	0,854	0,299	0,851	0,305	0,673	1,568	8,551	0,658
	Daily long Distance Passengers (dir LA-B)	2488	542	307	151	121	427	392	197	1942	608	240	567	319	1408	1304	965	1>11978
	Demande Media previsible por tren	124 124	27 151	15 166	8 174	6 180	21 201	20 221	10 231	50 (97-47) 281	30 311	10 321	30 351	16 367	46 (70-24) 413	24 (65-41) 437	84 (113-29) 521	
	Composición propuesta	(4C)	(5C + 1M)			(5C + 1M)	(5C+2M)			(5C+2M+1S)	(5C+2M+2S)		(5C+2M+3S)		(5C+2M+4S)	(5C+2M+4S)	(5C+2M+6S)	S= Coche Cama M= Coche Micio S= Coche Sentado (incl 2 Tr+ 1/2 Rest) (nC+rM+pS)
	Plazas ofertadas	128 128	176 24 200	200	200	200	192 48 240	240	240	192 96 288	192 144 336	336	192 192 384	384	192 246 438	438	192 342 534	
	Longitud (m) Masa (t) cargado	108 219	134 254			134 254	174 286			174 286	188 305	200 324		214 342		226 362	240 400	


BOSTON LOS ANGELES HIGH -SPEED TRAINS ("HSBOLA") TIME TABLE
Eastern Time
Central Time
Pacific Time
Time Zones
Travel Times
Stop Times
Morning Block
Noon Block
Afternoon Block
Evening Block
HS TRAINS
CITIES
BOSTON (MA)
NEW YORK (NY)
PHILADELPHIA (PA)
WASHINGTON DC
PITTSBURGH (PA)
COLUMBUS (OH)
CINCINNATI (OH)
INDIANAPOLIS (IN)
CHICAGO/GARY (IN)
SAINT LOUIS (MO)
KANSAS CITY (KS-MO)
DENVER (CO)
SALT LAKE CITY (UT)
RENO (NV)
SACRAMENTO (CA)
SAN FERNANDO (CA)
LOS ANGELES (CA)
HSBOLA M1
HSBOLA M2
HSBOLA M3
HSBOLA M4
HSBOLA M5
HSBOLA N1
HSBOLA N2
HSBOLA N3
HSBOLA N4
HSBOLA N5
HSBOLA A1
HSBOLA A2
HSBOLA A3
HSBOLA A4
HSBOLA A5
HSBOLA E1
HSBOLA E2
HSBOLA E3
HSBOLA E4
HSBOLA E5
Cities Population (2015 Census Mhab)
Daily long Distance Passengers (dir LA-B)
Demanda Media prevista por tren
Composición propuesta
Plazas ofertadas
Longitud (m)
Masa (t) cargado
Cocha Cama
Cocha Mixta
Cocha Sentada
(incl 2 TV+ 1/2 Rest)

	LOS ANGELES (CA)	SAN FRANCISCO (CA)	SACRAMENTO (CA)	RENO (NV)	SALT LAKE CITY (UT)	DENVER (CO)	KANSAS CITY (KS/MO)	SAINT LOUIS (MO)	CHICAGO/GARY (IN)	CINCINNATI/ HAMILTON (OH)	COLUMBUS (OH)	PITTSBURGH (PA)	WASHINGTON (Dulles Int'l Airport) (VA)	PHILADELPHIA (PA)	NEW YORK/JFK Int'l Airport (NY)	BOSTON/Suffolk (MA)
LOS ANGELES (CA)		588 *113* 2 h 42 m	765 *1 stop* *145* 2 h 21 m	927 *2 stops* *175* 3 h 06 m	1607 *3 stops* *304* 4 h 11 m	2267 *4 stops* *429* 4 h 11 m	3103 *5 stops* *598* 11 h 16 m	3578 *6 stops* *676* 12 h 32 m	3996 *8 stops* *755* 10 h 09 m	4446 *10 stops* *840* 10 h 13 m	4619 *11 stops* *873* 10 h 46 m	4872 *12 stops* *925* 14 h 20 m	5198 *13 stops* *982* 17 h 24 m	5449 *14 stops* *1038* 16 h 24 m	5631 *15 stops* *1064* 16 h 56 m	5979 *17 stops* *1130* 20 h 14 m
SAN FRANCISCO (CA)	588 *113* 2 h 42 m		167 *32* 0 h 39 m	329 *1 stops* *62* 0 h 15 m	1000 *2 stops* *191* 3 h 26 m	1689 *3 stops* *315* 3 h 26 m	2565 *4 stops* *485* 8 h 25 m	2988 *5 stops* *563* 8 h 47 m	3400 *7 stops* *643* 11 h 13 m	3850 *8 stops* *728* 12 h 51 m	4021 *10 stops* *760* 10 h 4 m	4274 *11 stops* *808* 13 h 30 m	4600 *12 stops* *869* 14 h 37 m	4851 *13 stops* *917* 15 h 42 m	5033 *14 stops* *951* 16 h 16 m	5381 *16 stops* *1017* 17 h 32 m
SACRAMENTO (CA)	765 *1 stop* *145* 2 h 21 m	167 *32* 0 h 39 m		162 *31* 0 h 24 m	842 *1 stop* *159* 2 h 47 m	1502 *2 stops* *284* 4 h 47 m	2598 *3 stops* *453* 7 h 46 m	2613 *4 stops* *552* 8 h 3 m	3235 *6 stops* *611* 10 h 34 m	3683 *8 stops* *696* 11 h 22 m	3854 *9 stops* *728* 12 h 28 m	4107 *10 stops* *776* 12 h 11 m	4433 *11 stops* *838* 14 h 18 m	4684 *12 stops* *885* 15 h 3 m	4866 *13 stops* *920* 15 h 37 m	5214 *15 stops* *985* 16 h 53 m
RENO (NV)	927 *2 stop* *175* 3 h 06 m	329 *1 stop* *62* 1 h 15 m	162 *31* 0 h 24 m		680 *110* 2 h 09 m	1340 *1 stop* *253* 3 h 47 m	2236 *2 stops* *423* 7 h 3 m	2651 *3 stops* *501* 8 h 3 m	3071 *5 stops* *580* 9 h 27 m	3521 *7 stops* *665* 11 h 15 m	3692 *8 stops* *698* 11 h 46 m	3945 *9 stops* *746* 12 h 24 m	4271 *10 stops* *807* 13 h 31 m	4522 *11 stops* *855* 14 h 5 m	4704 *12 stops* *889* 14 h 39 m	5052 *14 stops* *955* 15 h 55 m
SALT LAKE CITY (UT)	1607 *3 stop* *304* 4 h 11 m	1000 *2 stop* *191* 3 h 26 m	842 *1 stop* *159* 2 h 47 m	680 *110* 2 h 09 m		660 *125* 1 h 37 m	1556 *1 stop* *294* 4 h 34 m	1971 *2 stop* *379* 5 h 33 m	2391 *4 stop* *452* 7 h 44 m	2841 *6 stop* *537* 8 h 2 m	3012 *7 stop* *569* 8 h 30 m	3265 *8 stop* *617* 10 h 21 m	3591 *9 stop* *679* 11 h 28 m	3842 *10 stop* *726* 12 h 12 m	4024 *11 stop* *761* 12 h 47 m	4372 *13 stop* *826* 14 h 3 m
DENVER (CO)	2267 *4 stop* *429* 4 h 10 m	1689 *3 stop* *315* 3 h 26 m	1502 *2 stop* *284* 4 h 47 m	1340 *1 stop* *253* 3 h 47 m	660 *125* 1 h 37 m		896 *169* 2 h 36 m	1311 *1 stop* *248* 3 h 33 m	1731 *3 stop* *327* 5 h 40 m	2181 *5 stop* *412* 6 h 58 m	2352 *6 stop* *443* 7 h 21 m	2605 *7 stop* *492* 8 h 17 m	2931 *8 stop* *554* 9 h 4 m	3182 *9 stop* *601* 10 h 9 m	3364 *10 stop* *636* 10 h 55 m	3712 *12 stop* *702* 12 h 11 m
KANSAS CITY (KS/MO)	3103 *5 stop* *598* 11 h 16 m	2565 *4 stop* *485* 8 h 25 m	2598 *3 stop* *453* 7 h 46 m	2236 *2 stop* *425* 7 h 3 m	1556 *1 stop* *294* 4 h 34 m	896 *169* 2 h 36 m		415 *78* 1 h 18 m	835 *2 stop* *158* 2 h 40 m	1285 *4 stop* *243* 4 h 8 m	1456 *5 stop* *275* 4 h 36 m	1709 *6 stop* *323* 5 h 22 m	2035 *7 stop* *385* 6 h 28 m	2286 *8 stop* *432* 7 h 14 m	2468 *9 stop* *466* 7 h 48 m	2816 *11 stop* *532* 8 h 4 m
SAINT LOUIS (MO)	3578 *6 stop* *676* 12 h 32 m	2988 *5 stop* *563* 8 h 47 m	2613 *4 stop* *532* 8 h 3 m	2651 *3 stop* *501* 8 h 3 m	1971 *2 stop* *373* 5 h 33 m	1311 *1 stop* *248* 3 h 33 m	415 *78* 1 h 18 m		420 *1 stop* *79* 1 h 23 m	870 *3 stop* *164* 2 h 41 m	1041 *4 stop* *197* 3 h 19 m	1294 *5 stop* *245* 4 h 9 m	1620 *6 stop* *306* 5 h 23 m	1871 *7 stop* *354* 6 h 22 m	2053 *8 stop* *388* 6 h 56 m	2401 *10 stop* *454* 7 h 42 m
CHICAGO/GARY (IN)	3996 *8 stop* *755* 10 h 09 m	3400 *7 stop* *643* 11 h 13 m	3235 *6 stop* *611* 10 h 34 m	3071 *5 stop* *580* 9 h 27 m	2391 *4 stop* *452* 7 h 44 m	1731 *3 stop* *327* 5 h 40 m	835 *2 stop* *158* 2 h 40 m	420 *1 stop* *79* 1 h 23 m		450 *1 stop* *85* 1 h 18 m	621 *2 stop* *117* 1 h 51 m	874 *3 stop* *165* 2 h 37 m	1200 *4 stop* *227* 3 h 44 m	1451 *5 stop* *274* 4 h 29 m	1633 *6 stop* *309* 5 h 3 m	1981 *8 stop* *374* 6 h 16 m
CINCINNATI/ HAMILTON (OH)	4446 *10 stop* *840* 10 h 13 m	3850 *8 stop* *728* 12 h 51 m	3683 *9 stop* *696* 11 h 22 m	3521 *7 stop* *665* 11 h 15 m	2841 *6 stop* *537* 9 h 2 m	2181 *5 stop* *412* 6 h 58 m	1285 *4 stop* *243* 4 h 8 m	870 *3 stop* *164* 2 h 41 m	450 *1 stop* *85* 1 h 18 m		171 *32* 0 h 33 m	424 *1 stop* *80* 1 h 15 m	750 *2 stop* *142* 2 h 24 m	1001 *3 stop* *189* 3 h 11 m	1185 *4 stop* *224* 3 h 48 m	1531 *6 stop* *289* 4 h 1 m
COLUMBUS (OH)	4619 *11 stop* *873* 10 h 46 m	4021 *10 stop* *760* 13 h 4 m	3854 *9 stop* *728* 12 h 28 m	3692 *8 stop* *698* 11 h 46 m	3012 *7 stop* *569* 9 h 30 m	2352 *6 stop* *443* 7 h 21 m	1456 *5 stop* *275* 4 h 36 m	1041 *4 stop* *197* 3 h 19 m	621 *2 stop* *117* 1 h 51 m	171 *32* 0 h 33 m		253 *48* 0 h 46 m	579 *1 stop* *109* 1 h 54 m	830 *2 stop* *157* 2 h 39 m	1012 *3 stop* *191* 3 h 14 m	1360 *5 stop* *257* 4 h 30 m
PITTSBURGH (PA)	4872 *12 stop* *925* 14 h 20 m	4274 *11 stop* *808* 13 h 30 m	4107 *10 stop* *776* 12 h 11 m	3945 *9 stop* *746* 12 h 24 m	3265 *8 stop* *617* 10 h 21 m	2605 *7 stop* *492* 8 h 17 m	1709 *6 stop* *323* 5 h 22 m	1294 *5 stop* *245* 4 h 9 m	874 *3 stop* *165* 2 h 37 m	424 *1 stop* *80* 1 h 15 m	253 *48* 0 h 46 m		326 *62* 1 h 7 m	577 *1 stop* *109* 1 h 52 m	759 *2 stop* *143* 2 h 26 m	1107 *4 stop* *209* 3 h 40 m
WASHINGTON (Dulles Int'l Airport) (VA)	5198 *13 stop* *982* 17 h 24 m	4600 *12 stop* *869* 14 h 37 m	4433 *11 stop* *838* 14 h 18 m	4271 *10 stop* *807* 13 h 31 m	3591 *9 stop* *679* 11 h 28 m	2931 *8 stop* *554* 9 h 4 m	2035 *7 stop* *385* 6 h 28 m	1620 *6 stop* *306* 5 h 23 m	1200 *4 stop* *227* 3 h 44 m	750 *2 stop* *142* 2 h 24 m	579 *1 stop* *109* 1 h 54 m	371 *70* 1 h 19 m		254 *47* 0 h 48 m	430 *1 stop* *82* 1 h 16 m	781 *2 stop* *148* 2 h 34 m
PHILADELPHIA (PA)	5449 *14 stop* *1038* 16 h 24 m	4851 *13 stop* *917* 15 h 42 m	4684 *12 stop* *885* 15 h 3 m	4522 *11 stop* *855* 14 h 5 m	3842 *10 stop* *726* 12 h 12 m	3182 *9 stop* *601* 10 h 9 m	2286 *8 stop* *432* 7 h 14 m	1871 *7 stop* *354* 6 h 22 m	1451 *5 stop* *274* 4 h 29 m	1001 *3 stop* *189* 3 h 11 m	830 *2 stop* *157* 2 h 39 m	577 *1 stop* *109* 1 h 52 m	254 *47* 0 h 48 m		182 *34* 0 h 34 m	530 *2 stop* *100* 1 h 30 m
NEW YORK/JFK Int'l Airport (NY)	5631 *15 stop* *1064* 16 h 56 m	5033 *14 stop* *951* 16 h 16 m	4866 *13 stop* *920* 15 h 37 m	4704 *12 stop* *889* 14 h 39 m	4024 *11 stop* *761* 12 h 47 m	3364 *10 stop* *636* 10 h 55 m	2468 *8 stop* *466* 7 h 48 m	2053 *8 stop* *388* 6 h 56 m	1633 *6 stop* *309* 5 h 3 m	1185 *4 stop* *224* 3 h 48 m	1012 *3 stop* *191* 3 h 14 m	759 *2 stop* *143* 2 h 26 m	433 *1 stop* *82* 1 h 16 m	182 *34* 0 h 34 m		348 *1 stop* *66* 1 h 16 m
BOSTON/Suffolk (MA)	5979 *17 stop* *1130* 20 h 14 m	5381 *16 stop* *1017* 17 h 32 m	5214 *15 stop* *985* 16 h 53 m	5052 *14 stop* *955* 16 h 55 m	4372 *13 stop* *826* 14 h 3 m	3712 *12 stop* *702* 12 h 11 m	2816 *11 stop* *532* 8 h 4 m	2401 *10 stop* *454* 7 h 42 m	1981 *8 stop* *374* 6 h 16 m	1531 *8 stop* *289* 5 h 1 m	1360 *5 stop* *257* 4 h 30 m	1107 *4 stop* *209* 3 h 40 m	781 *3 stop* *148* 2 h 34 m	530 *2 stop* *100* 1 h 30 m	348 *1 stop* *66* 1 h 16 m	

LEYENDA SENTIDO 1 (Los Ángeles - Boston)

3267	Distancia en Km
4 stops	Número de paradas
428	Tarifa billeto $
8 h 11 m	Tiempo en **horas y minutos**

LEYENDA SENTIDO 2 (Boston - Los Ángeles)

3267	Distancia en Km
3 stops	Número de paradas
428	Tarifa billete $
8 h 15 m	Tiempo en **horas y minutos**

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