Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte

Band: 74 (1996)

Artikel: Railway traffic actions and combinations with other variable actions

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DOI: https://doi.org/10.5169/seals-56074

Railway traffic actions and combinations with other variable actions

Einwirkungen aus Eisenbahnverkehr und ihre Kombinationen mit Einwirkungen, die nicht bahnspezifisch sind

Actions de circulation ferroviaire et combinaisons avec les actions autres que de circulation ferroviaire

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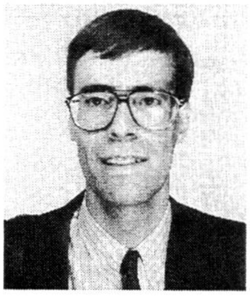

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SOMMAIRE

Cet article présente la partie 6 "actions ferroviaires et autres actions spécifiques aux ponts-rail" de l'ENV 1.3. Il décrit les charges élémentaires et groupes de charges, leurs combinaisons, ainsi que certains "backgrounds" liés aux états-limites de service ferroviaires.

ZUSAMMENFASSUNG

Der vorliegende Artikel stellt den Teil 6 "Einwirkungen aus Eisenbahnverkehr und andere spezifische Einwirkungen für Eisenbahnbrücken" der ENV 1.3 vor. Er beschreibt die elementaren Lasten und die Lastgruppen, ihre Kombinationen, sowie gewisse "Backgrounds" zu den Gebrauchsgrenzzuständen.

SUMMARY

This article presents part 6 "Railway actions and other actions specific to railway bridges" contained in ENV 1.3. It describes elementary loads, groups of loads and their combinations, together with the background to the serviceability limit states.

1. Introduction

This article contains a presentation of the current thoughts of European railway companies about the contents of ENV 1991.3 standard "Traffic loads on bridges" - Part 6 which is called "rail traffic actions and other actions specifically for railway bridges" (EC 1.3, Part 6). This provisional draft for the Eurocode has been made by 6 railway experts from a number of European railway undertakings, who incidentally are members of the Bridge Sub-committee of the International Union of Railways (UIC).

ENV 1991-3 (EC1-3 part 6) needs to be completed and tested before it is put to the vote as an EN. Groups of loads and combinations of actions, among other things, are still being discussed by European railway administrations. Therefore, the following should be considered as initial thoughts which is slightly different from the ENV prescriptions and application rules, taking into account the early observations raised by BANVERKET (Sweden), DB-AG (Germany) and S.N.C.F. (France).

This part of the Eurocode is essential for the railway administrations which will be involved in the future European High-Speed Rail System.

As a matter of fact, in conjunction with the Eurocode development, Engineers have been given a two-year timescale to produce a common technical response to the E.U. directive on interoperability of the European High-Speed Rail System. The purpose of this directive is to enable the operation of any type of train, whether existing or yet to be developed, for speeds of 250 km/h and above, on the totality of the network.

To achieve this goal, an organization was set up consisting of representatives from UIC (railway companies) and UNIFE (railway manufacturers) and is supported by editorial groups in charge of technical specifications on interoperability (STI). This specification will be mandatory for designers and suppliers of high speed sub-systems (infrastructure, rolling stock, power supply systems, command/control systems). The organisation is further supported by a coordination group addressing interfaces between these various sub-systems. So far as bridges are concerned, STI will refer to the Eurocode.

The interoperability parameters applicable to bridges are the following :

* for railway actions : vertical loads, horizontal static loads (in particular, braking and traction forces, slip-stream effects, load combinations) (see § 6.3 to 6.7).
* for traffic safety criteria : permissible girder vertical accelerations, twists, rotations and horizontal deformations (see § 3.1.2 in appendix G).

It should be noted that the operating comfort and durability of structures are not assumed as essential interoperability requirements for bridges.

The parameters relating to rolling stock which have an impact on bridge interoperability are as follows : axle load, axle spacing, operating speed, vertical suspension characteristics (or transfer function) braking and traction forces, train aerodynamic drag coefficient. The range of characteristics required for future high-speed trains will have to be validated by the coordination and interface group.

2. Vertical load models

To design railway bridges, various vertical load models must be taken into account, as follows :

Vertical load models	UIC 71 + SW/0	SW/2	Unloaded train	Actual trains for dynamic calculation	Train types for fatigue
Approach	Deterministic (characteristic = nominal values).	Deterministic (characteristic = nominal values).	Deterministic (characteristic = nominal values).	Actual trains, especially present high speed trains all over the world.	Collection of trains representative of traffic.
Description	Normal traffic : see load model below.	Heavy load traffic : see load model below.	a 12.5kN/m uniformly distributed force.	For instance, AVE, ETR, EUROSTAR, ICE,TGV SHINKANSEN.	* 12 train types, * standard traffic mix, * heavy traffic mix.
Static assessment	Yes, multiplied by a factor α if specified.	If specified.	Yes.	No.	No
Dynamic assessment	Dynamic effect is taken into account by a multiplying factor Φ, within a field of application.	Dynamic effect is taken into account by a multiplying factor Φ, within a field of application.	No.	To be used for dynamic calculation, outside of the field of application of the dynamic factor Φ.	No.
Fatigue assessment	Normal traffic mix is taken into account by UIC 71 (including the dynamic factor Φ) multiplied by a factor λ.	No.	No.	No.	If specified : standard traffic mix, or, heavy traffic mix with 250kN axles, or, special traffic mix as a combination of train types.

Table 1

(1) European Rail Research Institute (ERRI), Union Internationale des Chemins de fer (UIC).

Fig. 1: UIC71 LOAD MODEL :

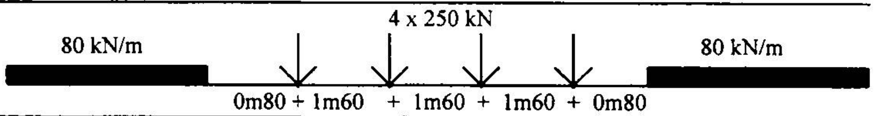


Fig. 2: SW/0 AND SW/2 LOAD MODELS :

Load model	q_{vk} (kN/m)	a (m)	c (m)
SW/0	133	15,0	5,3
SW/2	150	25,0	7,0

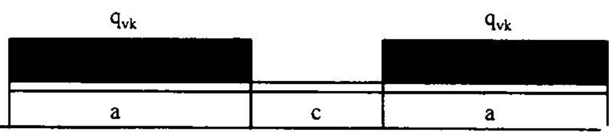


Fig. 3: TGV AXLE LOADS (as an example) :

V = 350 km/h
L = 237,60 m
q = 21,5 kN/m
ΣQ = 5100 kN

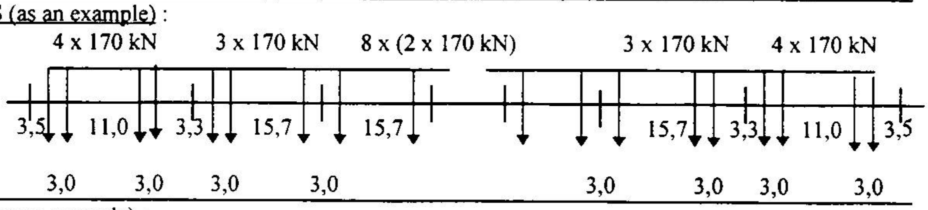
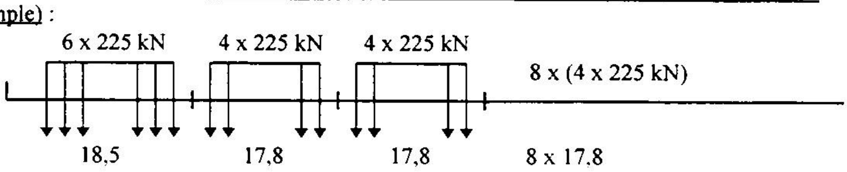


Fig. 4: TRAIN TYPE N°7 (as an example) :

ΣQ = 10350 kN
V = 120 km/h
L = 196,50
q = 52,7 kN/m



3. Groups of loads, combinations of actions and specific railway assessments

3.1 Horizontal forces

Together with vertical loads, some horizontal forces due to rail traffic must be taken into account :

- **traction and braking** forces (see ENV 1991-3, §6.5.3 and §6.5.4) act at the top of the rails in the longitudinal direction of the track; when the track is continuous at one or both ends of the bridge, only a proportion of these forces is transferred through the deck to the bearings, the remainder of the forces are transmitted through the track where it is resisted behind the abutments. This is called « interaction between the track and the bridge due to traction and braking » ;
- **centrifugal** forces (see ENV 1991-3, §6.5.1) are considered fully transmitted through the deck to the bearings ;
- **nosing** forces having generally only local effects.

3.2 Groups of loads and rail traffic action

The simultaneous effects of the various vertical and horizontal forces due to the railway traffic is taken into account by considering the groups of loads, as follows (boxed values) :

Groups of loads			Vertical forces			Horizontal forces		
Nb of loaded tracks	Group n°	Loaded track n°	LM71= UIC71+ SW/0	SW/2	Unloaded train	Traction and braking	Centrifugal force	Nosing force
One track	11	T1	[1,0]	[0]	[0]	[1,0]	[0,5]	[0]
	12	T1	[1,0]	[0]	[0]	[0,5]	[1,0]	[0]
	13	T1	[1,0]	[0]	[0]	[1,0]	[0,5]	[1,0]
	14	T1	[0]	[1,0]	[0]	[1,0]	[0,5]	[0]
	15	T1	[0]	[0]	[1,0]	[0]	[1,0]	[0]
Two tracks	21	T1	[1,0]	[0]	[0]	[1,0]	[0,5]	[0]
		T2	[1,0]	[0]	[0]	[1,0]	[0,5]	[0]
	22	T1	[1,0]	[0]	[0]	[0,5]	[1,0]	[0]
		T2	[1,0]	[0]	[0]	[0,5]	[1,0]	[0]
	23	T1	[1,0]	[0]	[0]	[1,0]	[0,5]	[1,0]
		T2	[1,0]	[0]	[0]	[1,0]	[0,5]	[1,0]
	24	T1	[1,0]	[0]	[0]	[0,75]	[0,5]	[0]
		T2	[0]	[1,0]	[0]	[0,75]	[0,5]	[0]
Three tracks or more	31	T1	[0,75]	[0]	[0]	[0,5]	[0,75]	[0]
		T2	[0,75]	[0]	[0]	[0,5]	[0,75]	[0]
		T3	[0,75]	[0]	[0]	[0]	[0,75]	[0]
	32	T1	[0,75]	[0]	[0]	[1,0]	[0,375]	[0]
		T2	[0,75]	[0]	[0]	[1,0]	[0,375]	[0]
		T3	[0,75]	[0]	[0]	[0]	[0,375]	[0]
	33	T1	[0,75]	[0]	[0]	[1,0]	[0,375]	[1,0]
		T2	[0,75]	[0]	[0]	[1,0]	[0,375]	[1,0]
		T3	[0,75]	[0]	[0]	[0]	[0,375]	[1,0]

table 2

to be considered in designing a structure supporting one track.
to be considered in designing a structure supporting two tracks ; that means all the groups from 11 to 24.
to be considered in designing a structure supporting three tracks or more ; that means all the groups from 11to33.

The multicomponent action due to railway traffic from the groups of loads above should be chosen in order to determine the most unfavourable effect for each assessment. Embankment loading can be added, when relevant.

3.3 Other variable actions

Some other actions must be taken into account. For instance :

- aerodynamic effects (slipstream due to railway traffic, see ENV 1991 -3, §6.6), should be considered as a separate variable action,
- non public footpaths loads (see ENV 1991-3, §6.3.6.1)),
- wind forces (see ENV 1991 -2-4),
- temperature effects (see ENV 1991-2-5), including interaction between track and deck of bridges (see ENV 1991 -3, §6.5.4).

3.4 Representative values of the rail traffic action

Each traffic action, as defined in ENV 1991-3, part 6, must be considered as a characteristic value, for combination with non-traffic actions.
The other representative values are defined by multiplying by factors Ψ_1' (infrequent values), Ψ_1 (frequent values) and Ψ_2 (quasi-permanent) : see table 3 below (boxed values).

3.5 Combinations of actions

In order to use « Basis of Design » format, see combination factors Ψ_0 and partial safety factors γ_Q in table 3 below (boxed values).

Variable actions		γ_Q	ψ_0	ψ'_1	ψ_1	ψ_2
Main traffic action (Groups of loads)	Gr. n° 11	[1,45]	[0,80]	[1,00]	[0,80]	[0]
	Gr. n° 12	[1,45]	[0,80]	[1,00]	[0,80]	[0]
	Gr. n° 13	[1,45]	[0,80]	[1,00]	[0,80]	[0]
	Gr. n° 14	[1,20]	[0,80]	[1,00]	[0,80]	[0]
	Gr. n° 15	[1,00] (3)	[0,80]	[1,00]	[0,80]	[0]
	Gr. n° 21	[1,45]	[0,80]	[1,00]	[0,60]	[0]
	Gr. n° 22	[1,45]	[0,80]	[1,00]	[0,60]	[0]
	Gr. n° 23	[1,45]	[0,80]	[1,00]	[0,60]	[0]
	Gr. n° 24	[1,20]	[0,80]	[1,00]	[0,60]	[0]
	Gr. n° 31	[1,45]	[0,80]	[1,00]	[0,40]	[0]
	Gr. n° 32	[1,45]	[0,80]	[1,00]	[0,40]	[0]
	Gr. n° 33	[1,45]	[0,80]	[1,00]	[0,40]	[0]
Other traffic actions	aerodynamic effects	[1,50]	[0,80]	[1,00]	[0,50]	[0]
	non public footpaths	[1,50]	[0,80]	[0,80]	[0,50]	[0]
Wind forces	F_{wk} or F_{wn} (1)	[1,50]	[0,60]	[0,60]	[0,50]	[0]
	F_w^{**} (1)	[1,50]	[1,00]	[0]	[0]	[0]
Temperature effects	T_k (2)	[1,50]	[0,60]	[0,80]	[0,60]	[0,50]

Table 3

(1) Whenever wind action is required to be considered with traffic, the wind action $\psi_0 F_{wk}$ or $\psi_0 F_{wn}$ should be taken as no greater F_w^{**} : see ENV 1991-2.4.

(2) see ENV 1991-2.5.

(3) generally [1,00], to be combined with wind forces, for transversal static equilibrium or lateral internal forces.

3.6 Design situations and combinations of actions

Design situations and combinations of actions are summarized in the following next two pages table 4 (boxed values).

Table 4 (1/2)

SITUATIONS			PERSISTENT AND TRANSIENT											
LIMIT STATES			Ultimate (3) static equilibrium		resistance		Service infrequent		frequent		quasi permanent		fatigue	
COMBINATIONS			fundamental		fundamental		infrequent		frequent		quasi permanent		fatigue	
PERMANENT ACTIONS			G1 G2		G. Max. G. Min.		G. Max. G. Min.		G. Max. G. Min.		G. Max. G. Min.		G. Max. G. Min.	
direct actions	Self weight Earth pressure and weight	Fav.	0.9 (2)		1		1		1		1		1	
		Unfav.	1.1 (2)		1.35		1		1		1		1	
	Movable loads	Fav.	0.9 (2)		1		1		1		1		1	
		Unfav.	1.1x1.3 (2)		1.35x1.3		1.3		1.3		1.3		1.3	
indirect actions	Settlements	Fav.	0		0		0		0		0		0	
		Unfav.	1.1 (2)		1.35		1		1		1		1	
	Prestressing, shrinkage and creep	Fav.	/		1		1		1		1		1	
		Unfav.	/		1.35		1		1		1		1	
Variable actions			d.	a.	d.	a.	d.	a.	d.	a.	d.	a.	d.	a.
Traffic actions	Gr11		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.8	/	/	/	/	/
	Gr12		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.8	/	/	/	/	/
	Gr13		1.45	1.45x1	1.45	1.45x1	1	1	0.8	/	/	/	/	/
	Gr14		1.2	/	1.2	/	1	/	0.8	/	/	/	/	/
	Gr15		1	1x1	1	1x1	1	1	/	/	/	/	/	/
	Gr21		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.6	/	/	/	/	/
	Gr22		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.6	/	/	/	/	/
	Gr23		1.45	1.45x1.0	1.45	1.45x1.0	1	1	0.6	/	/	/	/	/
	Gr24		1.35	/	1.35	/	1	/	0.6	/	/	/	/	/
	Gr31		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.4	/	/	/	/	/
	Gr32		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.4	/	/	/	/	/
	Gr33		1.45	1.45x1	1.45	1.45x1	1	1	0.4	/	/	/	/	/
	Embankment loads		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	(1)	/	/	/	/	/
	Other traffic actions (actual trains, specific actions)		1.45	1.45x0.8	1.45	1.45x0.8	1	0.8	0.8	/	/	/	/	/
	Fatigue traffic actions		/	/	/	/	/	/	/	/	/	/	1	/
	Other traffic actions		1.5	1.5x0.8	1.5	1.5x0.8	1	0.8	0.5	/	/	/	/	/
Other variable actions	Natural actions Wind		1.5	1.5x0.6	1.5	1.5x0.6	1	0.6	0.5	/	/	/	/	/
	Thermal		1.5	1.5x0.6	1.5	1.5x0.6	1	0.6	0.6	0.5	/	0.5	/	0.6
	Seismic actions		/		/				/		/		/	
	Accidental actions		/		/		/		/		/		/	

(1) 0.8 / 0.6 / 0.4 for 1, 2 or 3 tracks.
(2) 0,85 and 1,15 instead of 0,9 and 1,1 when people safety is involved.
(3) General equilibrium of earthworks is not included in this table.
« d. » = dominant
« a. » = accompanying

Table 4 (2/2)

SITUATIONS			ACCIDENTAL				SEISMIC					
LIMIT STATES			**Ultimate** **static equilibrium**		**Ultimate** **resistance**		**Ultimate** **static equilibrium**		**Ultimate** **resistance**		**Service**	
COMBINATIONS			accidental		accidental		seismic		seismic		infrequent	
PERMANENT ACTIONS			G1 G2		G. Max. G. Min.		G. Max. G. Min.		G. Max. G. Min.		G. Max. G. Min.	
Direct actions	Self weight Earth pressure and weight	Fav.	(1)		[1]		[1]		[1]		[1]	
		Unfav.	(1)		[1]		[1]		[1]		[1]	
	Movable loads	Fav.	[1]		[1]		[1]		[1]		[1]	
		Unfav.	[1.3]		[1.3]		[1.3]		[1.3]		[1.3]	
Indirect actions	Settlements	Fav.	[0]		[0]		[0]		[0]		[0]	
		Unfav.	(1)		[1]		[1]		[1]		[1]	
	Prestressing, shrinkage and creep	Fav.	/		[1]		/		[1]		[1]	
		Unfav.	/		[1]		/		[1]		[1]	
Variable actions			d.	a.	d.	a.	d.	a.	d.	a.	d.	a.
Traffic actions	Gr11		[0,8]	/	[0,8]	/						
	Gr12		[0,8]	/	[0,8]	/						
	Gr13		[0,8]	/	[0,8]	/						
	Gr14		[0,8]	/	[0,8]	/						
	Gr15		/	/	/	/						
	Gr21		[0,6]	/	[0,6]	/						
	Gr22		[0,6]	/	[0,6]	/						
	Gr23		[0,6]	/	[0,6]	/						
	Gr24		[0,6]	/	[0,6]	/						
	Gr31		[0,4]	/	[0,4]	/						
	Gr32		[0,4]	/	[0,4]	/	**R E**	**S E**	**R**	**V**	**E**	**D**
	Gr33		[0,4]	/	[0,4]	/						
	Embankment loads		(1)	/	(1)	/						
	Other traffic actions (actual trains, specific actions)		[0,8]	/	[0,8]	/						
	Fatigue traffic actions		/	/	/	/						
	Other traffic actions		[0.5]	/	[0,5]	/						
Other variables actions	Natural actions Wind		[0.5]	/	[0,5]	/						
	Temperature		[0,6]	[0,5]	[0,6]	[0,5]						
	Seismic actions		/		/		[1]		[1]		[1]	
	Accidental actions		[1]		[1]		/		/		/	

(1) 0.8 / 0.6 / 0.4 for 1, 2 or 3 tracks.
« d. » = dominant
« a. » = accompanying

3.7 Specific railway assessments

Besides assessments related to structures and materials, there are some specific railway criteria to be checked (see ENV 1991-3, annex G3).

	Criteria	Safety of traffic due to bridge		Durability of bridge		Safety of traffic due to track			Comfort
Situations	Limit states of bridge	Static equilibrium	Resistance	Durability of bridge	Fatigue of bridge	Track geometry	Stress in rail	Ballast compacity	Deflection
Normal traffic (persistent and transient situations)	ULS static equilibrium	X							
	ULS resistance		X						
	SLS infrequent			X		X	X	X	X
	other SLS			X					
	Fatigue LS				X				
Earthquake	ULS static equilibrium	X							
	ULS resistance		X						
	SLS infrequent			X		X	X	X	
Accidental situations (derail- -ments and collisions)	ULS static equilibrium	X							
	ULS resistance		X						
	SLS infrequent			X		X	X	X	

4 Current research topics

Up to now, research which was conducted with a view to setting up common directives specific to the development of a European High Speed Rail System, has highlighted two main problems raised concerning track safety, they are the dynamic behaviour of bridge girders under traffic action, and the problems related to the interaction between continuous track and structure.

4.1 Dynamic behaviour under traffic actions (background)

Safety and comfort are two major requirements determining the deformability limits of rail bridges.

The safety of train operations is conditional upon the strict observance of certain criteria concerning the permanent way. It is first important to make sure that the wheel/rail contact is still maintained despite the oscillations of the structure and the train dynamic trajectory. As a result, the ascending vertical acceleration onto axles and the track twist due to the girder torsional movements have to be restricted. Secondly, it is also necessary to check that the girders' dynamic oscillations do not cause a reduction in track stability or loss of track geometry (in the case of the ballasted track, this can give a lateral stability defect).

To prevent any discomfort when a train is crossing a bridge, passengers should not be subject to excessive levels of vertical acceleration. These accelerations are generated, on the one hand, by bridge oscillations and, on the other, by the damping from vehicle body suspensions.

The deformability criteria that should be assumed for specific checks on the serviceability limit state of the railway bridges are shown in appendix G 3. The limitations on the natural frequency are shown in item 6.4.3. Such limitations should guarantee that the dynamic stresses due to actual trains at speeds smaller than or equal to 220 km/h, remain smaller than the stresses calculated with the UIC loading scheme, including the dynamic factor. In the 70's UIC developed a dynamic increment factor from a statistical survey on existing bridges' stiffnesses. Therefore, new design bridges should not be made more flexible than existing bridges. At very high speeds (in excess of 220 km/h), this check has to be supplemented by dynamic calculations under actual traffic as shown in appendix H, in order to cover any resonance or excessive vibration of the girder.

The calculations and measurements made by the various UIC members on the permanent way, girders and vehicles have led to the determination of the following limits for high speeds : the vertical acceleration of the girder is limited to 0,35 g (wheel/rail contact criteria and ballast loosening), twist to 0,4 mm/m (wheel/rail contact criterion), rotations at girder ends to a level usually comprised between 0,5 10^{-3} and 10^{-3} rd under an actual train (rail breakage criterion -due to excessive tensile strength or to track buckling resulting from excessive compressive load- and ballast looseness criterion), the vertical accelerations on vehicle bodies to a level between 0,1 and 0,2 g (depending on the level of comfort required).

Detailed investigations into the dynamic behaviour of structures should be made by calculations appropriate to the structures to solve the equation of the dynamic movement of bending beams using the finite element method. This equation is the following :

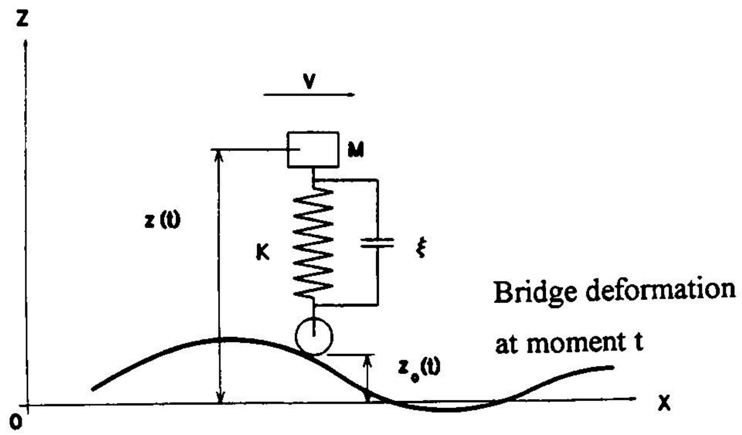
$$m(x)\frac{d^2y(t,x)}{dt^2} + c\frac{dy(t,x)}{dt} + \frac{d^2}{dx^2}EI(x)\frac{d^2y(t,x)}{dx^2} = p(t,x)$$

The finite element method consists of determining successive vibration modes on the structure and then in calculating the structural response by model superimposition, with the selection of train speeds likely to result in resonance situations (so called "critical" speeds) .

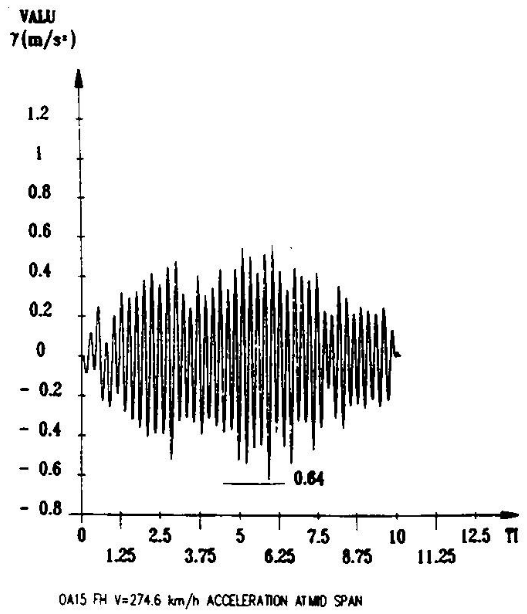
The study on the train dynamic behaviour is carried out on the basis of calculations determining the Za(t) displacement at the level of a bogie and the vertical acceleration onto the body including bogie suspension characteristics which are obtained by the integration of the z(t) differential equation where :

$$\frac{d2z}{dt2} + 2\xi\omega n\left(\frac{dz}{dt} - \frac{dza}{dt}\right) + \omega_n^2(z(t) - za(t)) = 0$$

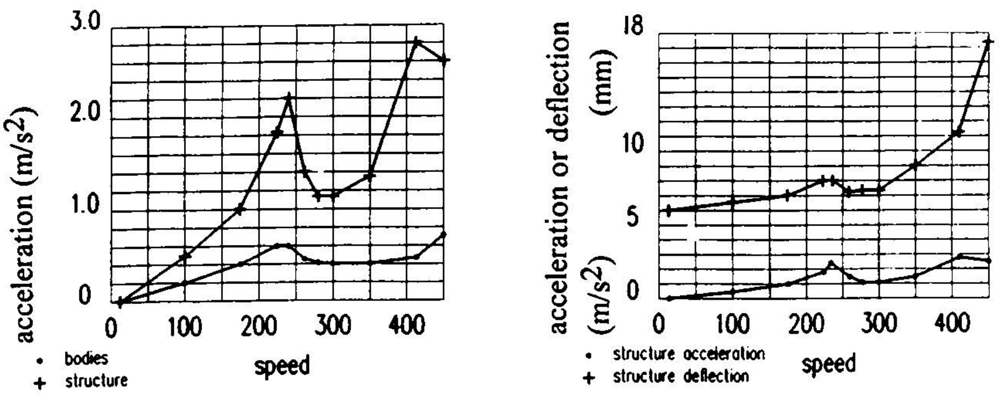
ωn: is vibration of the body/bogie assembly.
and ξ: is the damping/critical damping ratio.



Trajectory of bodies - modelling



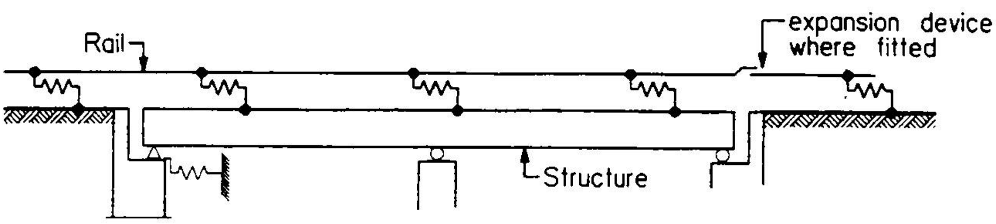
Midspan of continuous bridge acceleration at resonance



Example of complete analysis of vibratory behaviour

4.2 Track structure interaction (background)

When a track is continuous at least at one end of the bridge, the longitudinal forces generated by the track are distributed as a result of the interaction between track and structure. The longitudinal force components transmitted to each element (bridge and track) depend on track resistance to longitudinal displacement in relation to the adjacent structure or substructure, and on the girder resistance to longitudinal displacement, hence on the stiffness of bearings (bearing devices, piers, foundations). The additional forces exerted on the track will have to be withstood by the track ; the force components affecting the bridge will have to be taken into consideration for the design of the structure.



Model of structure for interaction

The loading cases likely to generate additional horizontal forces are essentially : thermal expansion, horizontal traction and braking loads, angular rotation of the structure at the bearings.

For each of these determinant factors, item 6.5.4 gives values for the design of structures under the interaction effects from a ballasted continuous track and takes into account the variations of permissible stress increment factors in long-welded rails. These interaction effects are essentially : the girder maximum expansion lengths, the permissible girder longitudinal displacement under braking and traction forces, permissible bending rotations at the level of bearings, the bearing reactions due to thermal loads, the bearing reactions due to braking and traction.

However, it should be noted that the design assumptions of the ENV relating to the interaction only reflect the case of ballasted structures with either isostatic girder and a fixed bearing at one end, or continuous girder and fixed end or intermediate bearing, and with track equipped with UIC 60 rails, providing for a standard track behaviour law on its bearing and that they are only valid for certain temperature ranges of the rail and of the structure.

The other cases (different track equipment, direct fastened track, sequence of isostatic or continuous girders, etc.) are subject to specific requirements in each railway. A UIC committee of experts has been set up to conduct modellings, tests and measurements, so as to achieve a joint specification by the end of 1997, this deadline being both applicable to EC1 and STI.