Stretto di Messina

Concessionaria per la progettazione, realizzazione e gestione del collegamento stabile tra la Sicilia e il Continente Organismo di Diritto Pubblico
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EurolinK

PONTE SULLO STRETTO DI MESSINA

PROGETTO DEFINITIVO

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INDICE

1 Introduction

This report contains the fatigue assessment carried out for the roadway, railway and cross girder as well as hanger anchorages. For a thorough description of the calculation approach and extend of analyses carried out, reference is made to “Tech Design Report - Suspended Deck” and “General Design Principles for Suspended Deck” design reports.

According to the Design Basis, the railway fatigue load has been based on the standard traffic mix whose composition may be found in EN 1991-2, Table D.1; it includes 67 number of train transits expected per day per track with a traffic volume of 24.95 million tonnes per year. The roadway fatigue load comprises of 2 million transits per year of heavy roadway vehicles for each direction fulfilling the traffic category 1 defined in EN 1991-2 section 4.6.1. During the 200 years design life of the bridge the total number of transits for the railway girder hence becomes 4.89 million for each track and 400 million for the roadway girder in each direction (slow lane).

The "unlimited life method" and the damage accumulation method (Palmgren-Miners summation of damage) have both been used for the fatigue assessment of the main structural components subjected to direct man generated loads. In addition the wind induced fatigue degradation has been accounted for in the damage accumulation method by a damage of 0.05; this implies that the verification is fulfilled when the damage from traffic loads is lower then 0.95.

2 Basis for Fatigue Verification

2.1 Application of Loads

In the fatigue verification of the roadway girders, all the vehicles have been considered driving in the slow lane and the roadway girders are loaded with one vehicle at a time. The analysis includes 8 different fatigue trains indicated in Annex D of EN 1991-2. The train always passes the bridge in the track towards the loaded roadway girder in order to achieve the most unfavourable load combination.

For the fatigue loads the following assumptions have been made:

- Railway traffic: 67 trains per day giving a total of 4.89 million in 200 years per track
- Roadway traffic: 2 million heavy vehicles per year, i.e. 400 million in the 200 year design life

- Speed of trains: maximum speed of trains
- Dynamic factors have been calculated in accordance with EN 1991-2, Annex D “Basis for the fatigue assessment of the railway structure”
- The likelihood of two train meeting at any given point on the bridge is 12%

According to the "Safe Life" assessment method in EN1993-1-9, Section 3 and the recommendation given in the RFI44/F the following partial factors have been used: γ_m =1.15 has been applied to local details of the orthotropic roadway deck, while a safety factor of γ_m =1.35 has been applied to all other details.

2.2 Assessment Method

2.2.1 Unlimited life method

The fatigue verification for "unlimited life method" has been based on the most onerous fatigue train in one track in combination with fatigue Load Model 2 (LM2) applied on the roadway girder closest to the train. No other fatigue loading is considered for the unlimited life method.

The most onerous fatigue train is found to be the EN5 for which the results are given for in the following. LM2 is utilised for analysis of global traffic load effects for the roadway, railway and cross girder including dynamic effects. The LM2 is furthermore used for verification of local load effects of the orthotropic steel deck including dynamic effects. Transverse position of the load has been varied to identify the most critical load position.

In the following the results are only presented for fatigue train type EN5 in combination with vehicle no. 3 of LM2 (refer to document General Design Principles for Suspended Deck) as this combination has been found to give the most adverse effects. Exception is provided for the verification of point F (Figure 5-1) of the roadway deck plate at the cross girder web. For this location, the unlimited life method has been verified including two EN5 meeting on the bridge together with LM2. By this approach the unlimited life has been verified for the maximum stress range and therefore the damage accumulation method is not relevant, refer to Section 9.17.

2.2.2 Damage accumulation method

For the "damage accumulation method" (Palmgren-Miners summation of damage) the fatigue contribution is based on the passing of all 8 fatigue trains in combination with roadway fatigue Load Model 3 (LM3) applied on the roadway girder closest to the train. Fatigue loading from mean wind as well as buffeting have also been included in the damage evaluation by a damage factor of 0.05 which lower the damage limit due to traffic loads to 0.95.

The following combinations of roadway fatigue loading and railway fatigue loading applies for the verification:

- No trains + 1 roadway vehicle + wind
- 1 train + 1 roadway vehicle + wind
- 2 trains + 1 roadway vehicle + wind

LM3 is utilised for analysis of global and local traffic load effects of the girder including dynamic effects. The transverse position of the local vehicle load has been varied to identify the most critical position depending on the considered detail.

One cycle per train has been taken into consideration as the second relevant cycle has nearly always been found to be lower than the cut-off limit of the actual detail. In the few cases where the second cycle has been above the cut-off limit the first stress range has been increased to consider only a single cycle event thus maintaining the same induced damage.

2.2.3 Combination of global and local loads

The combination of effects from local wheel loads and global traffic loads shall be considered and applied according to EN 1993:2, Annex E. The most severe of $\sigma_{design} = \sigma_{local} + \psi * \sigma_{global}$ and $\sigma_{design} = \psi * \sigma_{local} + \sigma_{global}$ has to be considered where ψ is the combination factor and varies between ψ = 0.85 for span length of 30 m (i.e. when applied to the global effects) and ψ = 1 for span length of 3.75 m (i.e. when applied to the local effect). Due to the low influence of the global stress in the roadway girder compared to the local stress, the combination factor has not been accounted for in the calculations and the factor of ψ = 1 has therefore been used.

2.2.4 Local load effect

A detailed local IBDAS FE-model of the roadway and railway deck has been developed for examination of local stress distributions ("General Design Principles for Suspended Deck").

2.3 Stress Range Determination

2.3.1 Screening of Main Span

2.3.1.1 Investigated Sections of the Main Span

The highlighted sections in Figure 2-1 (Span 7, 12, 19, 26, 32, 38, 45, 52, 59) are analysed in order to evaluate and select the worst spans for the fatigue assessment within the main span.

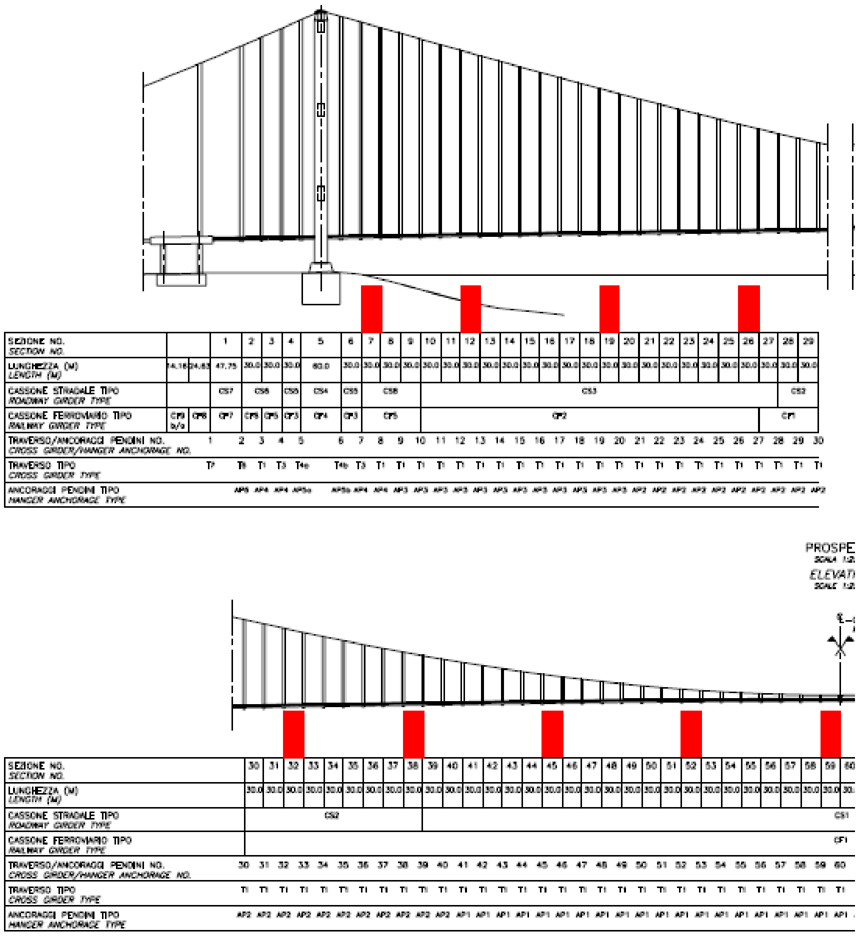


Figure 2-1 Investigated sections of the main span

The roadway fatigue load LM2 (vehicle 3) and the RFI 5 fatigue train have been run over the bridge and the stress histories have been calculated in each of the above 9 sections.

The following locations marked in red have been screened within a 30 m section of the 9 selected locations of the roadway and railway girders.

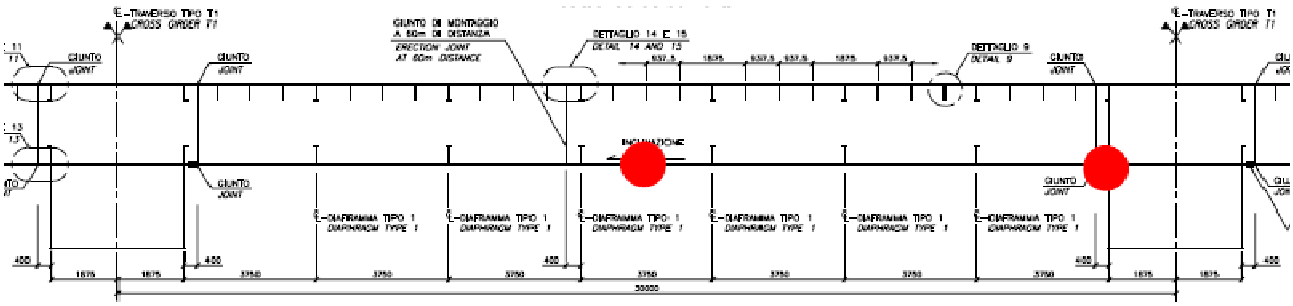


Figure 2-2 Roadway and railway girder - locations being screened

The following locations marked in red have been investigated within the 9 selected cross girders.

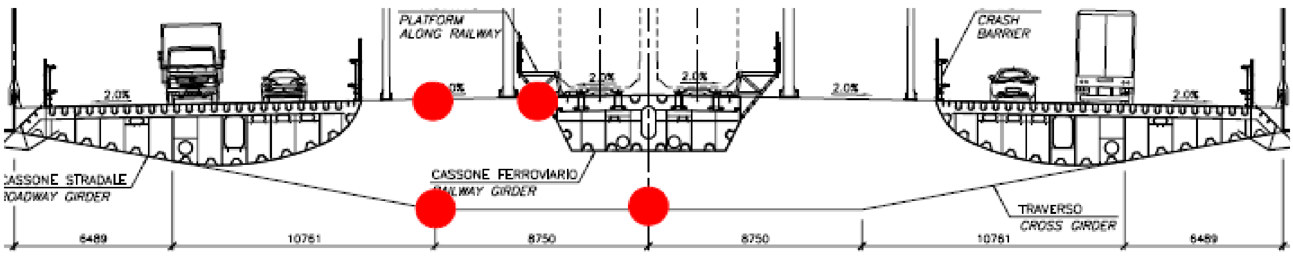


Figure 2-3 Cross girder - locations being screened

It must be noted that at when the screening was performed the train used as reference was the RFI5 which is no longer used in accordance to the train mix mentioned in the Design Basis. This is anyway still relevant for the screening in the main span as the RFI 5 induces stress ranges of a similar magnitude to the EN5.

2.3.1.2 Screening of Roadway Girders

The Table 2-1 below shows the maximum stress ranges within the 9 selected roadway girders. It is seen that the stress ranges are highest at the bottom flange and tend to increase towards the tower.

Table 2-1 Screened roadway sections - stresses in top and bottom flange for LM2 (vehicle 3) and RFI 5 fatigue train

			LM2-3						RFI 5	
			top			bottom			top	bottom
span	IBDAS	location	max	min	Δσ	max	min	Δσ	envelope	
7	37	centre	1.0	5.8	6.8	13.0	2.5	15.5	12.0	36.0
	38	end	0.8	4.8	5.6	10.5	2.0	12.5	12.0	33.0
12	39	centre	0.7	5.7	6.4	15.5	2.0	17.5	15.0	36.0
	40	end	1.0	4.7	5.7	12.5	3.0	15.5	20.0	37.0
19	41	centre	0.7	5.5	6.2	17.5	2.0	19.5	20.0	35.0
	42	end	1.0	4.7	5.7	13.0	3.0	16.0	20.0	36.0
26	43	centre	0.5	5.3	5.8	13.5	2.0	15.5	20.0	32.0
	44	end	0.8	4.0	4.8	11.0	3.0	14.0	21.0	31.0
32	45	centre	0.5	5.2	5.7	14.0	1.8	15.8	21.0	28.0
	46	end	0.8	3.8	4.6	10.0	2.5	12.5	21.0	27.0
38	47	centre	0.4	5.0	5.4	13.5	1.8	15.3	19.0	23.0
	48	end	0.7	3.4	4.1	9.0	2.2	11.2	19.0	22.0
45	49	centre	0.3	5.6	5.9	16.0	1.7	17.7	15.5	20.0
	50	end	0.5	3.4	3.9	9.5	2.2	11.7	15.5	23.0
52	51	centre	0.2	4.7	4.9	13.0	1.7	14.7	14.0	19.0
	52	end	0.4	2.8	3.2	7.5	2.0	9.5	13.5	23.0
59	53	centre	0.2	5.3	5.5	15.5	1.5	17.0	10.0	18.0
	54	end	0.3	3.0	3.3	8.0	2.0	10.0	9.5	22.0

Based on the above screening, span 12 will be utilised in the fatigue verification of the roadway girder. Additional spans have also been calculated as mentioned in Section 2.3.3.

2.3.1.3 Screening of Railway Girders

Table *2-2* shows the maximum stress ranges within the 9 selected railway girders. It is seen that the stress ranges are highest in the bottom flange at the centre betweens the cross girders and tend to increase towards the tower.

Table 2-2 Screened railway sections - stresses in bottom flange given by LM2 (vehicle 3) and RFI 5 fatigue train

span	IBDAS	location	Δσ bottom LM2-3	Δσ bottom RFI 5
7	37	centre	7.5	49
	38	end	7.5	31
12	39	centre	7.5	43
	40	end	7.5	[illegible]
19	41	centre	7.5	47
	42	end	7.5	21
26	43	centre	7.5	40
	44	end	7.5	22
32	45	centre	7.5	37
	46	end	7.5	22
38	47	centre	7.5	34
	48	end	7.5	21
45	49	centre	7.5	35
	50	end	7.5	21
52	51	centre	7.5	(34)
	52	end	7.5	(21)
59	53	centre	7.5	(34)
	54	end	7.5	(30)

Based on the above screening, span 19 has been initially chosen as representative for the main span and therefore verified. Additional spans have also been calculated as mentioned in Section 2.3.3.

2.3.1.4 Screening of Cross Girders

The Table 2-3 below shows the maximum stress ranges within the 9 selected cross girders. It is seen that the stress ranges are almost constant along the bridge.

Table 2-3 Screened cross girder sections - stresses in bottom flange given by RFI5

	y = -1.247									
IBDAS numbering	3	8	15	22	28	34	41	48	55	
Cross girder number	8	13	20	27	33	39	46	53	60	
top Δσ =	48	50	51	51	51	50	50	51	51	N/mm^2
bottom Δσ =	51	53	54	54	54	53	53	54	54	N/mm^2
					y = -8.75					
top Δσ =	36	37	37	37	37	37	36	36	36	N/mm^2
bottom Δσ =	40	41	41	40	40	40	40	40	40	N/mm^2

Based on the above screening, cross girder number 27 (IBDAS no. 22) is selected and will be utilised in the fatigue verification of the cross girder.

2.3.2 Verification points

2.3.2.1 Stress history plots

In order to determine the stress ranges produced by a given load situation "loaded influence lines"/"stress histories" calculated by IBDAS are considered. An example of a stress history plot is given in Figure 2-4, where the stress induced by the passage of the EN5 train in the considered section (marked by an arrow) is shown.

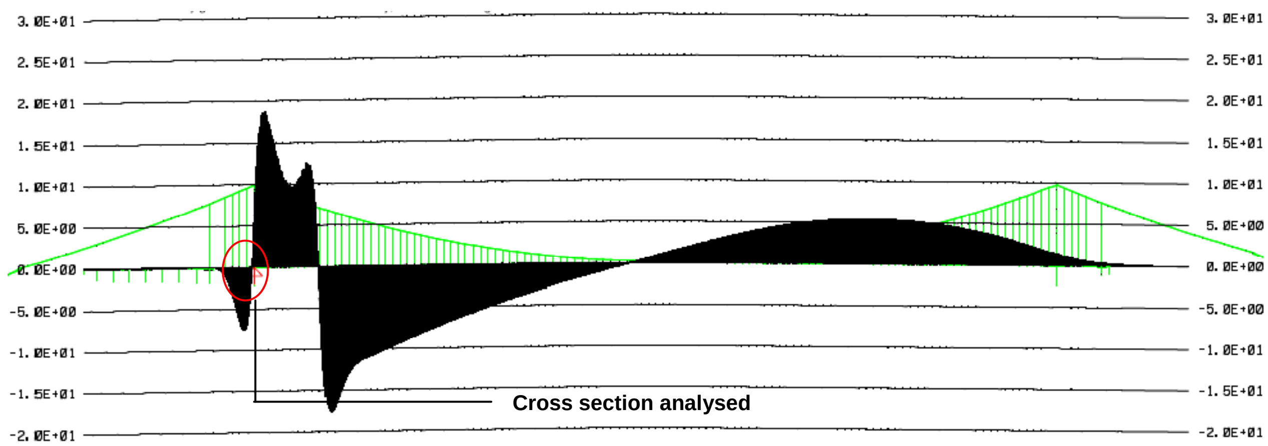


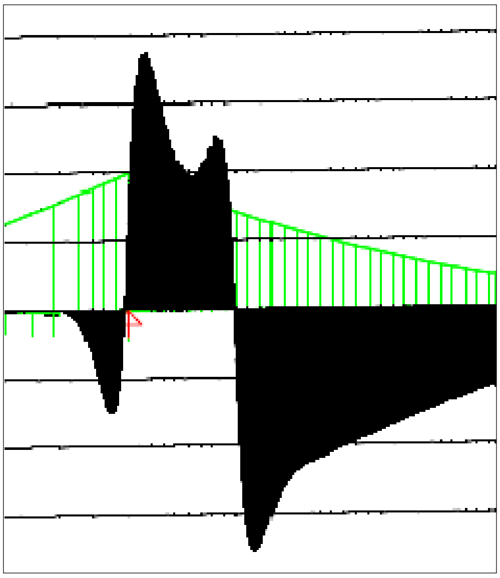
Figure 2-4 Stress history plot, railway girder. EN5 train used for illustration

An "influence line" in IBDAS is determined based on the actual influence surfaces of the structure. This means that it is possible to determine "influence lines" that are connected to a given system of lanes, tracks or individual lanes/tracks such as the (-y) track on the railway girder (i.e. the track 2.0m to the east of the bridge centre line). The analysis type for calculating the influence lines is a 1st order p-delta analysis with the reference condition as p-delta effects. This means that the results from our traffic loads are very close to the results coming from a 2nd order analysis because the dead load is dominating.

IBDAS loads an "influence line" in a given cross section (s-coordinate) using e.g. a train modelled with the actual configuration of axles, wheels and length as defined in EN 1991-2 Annex D Section

D.3. The train is then stepped through the structure with steps of a fixed distance. This is denoted a "loaded influence line" or a “stress history”, as the one illustrated in Figure 2-4.

The arrow on the influence line plot indicates the section considered, and for which the stress variation occurs when the load passes the bridge. The stress history plots illustrate the stress variation in this point only for varying locations of the load, as aforesaid. The stresses are associated with the location of the "end" of the train/vehicle, running from the right towards the left on the plot, see also Figure 2-5.



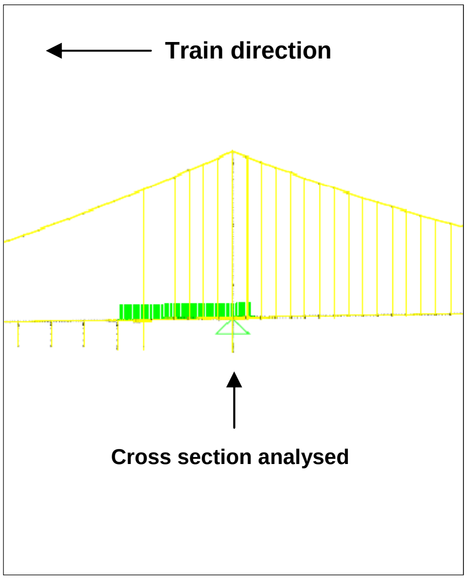


Figure 2-5 Location of the train and associated stress history in the region around the investigated section (marked with an arrow). Longitudinal stresses due to the EN5 train used in the illustration. Train direction for track 1 indicated

The stress history can be recorded for the considered section e.g. in the railway girder associated with the location of the load as follows, refer to Figure 2-6.

- Train in track 1 (+y), track 2 (-y) or in both tracks
- Vehicle on the roadway girder located to either the direction of (+y) or (-y)

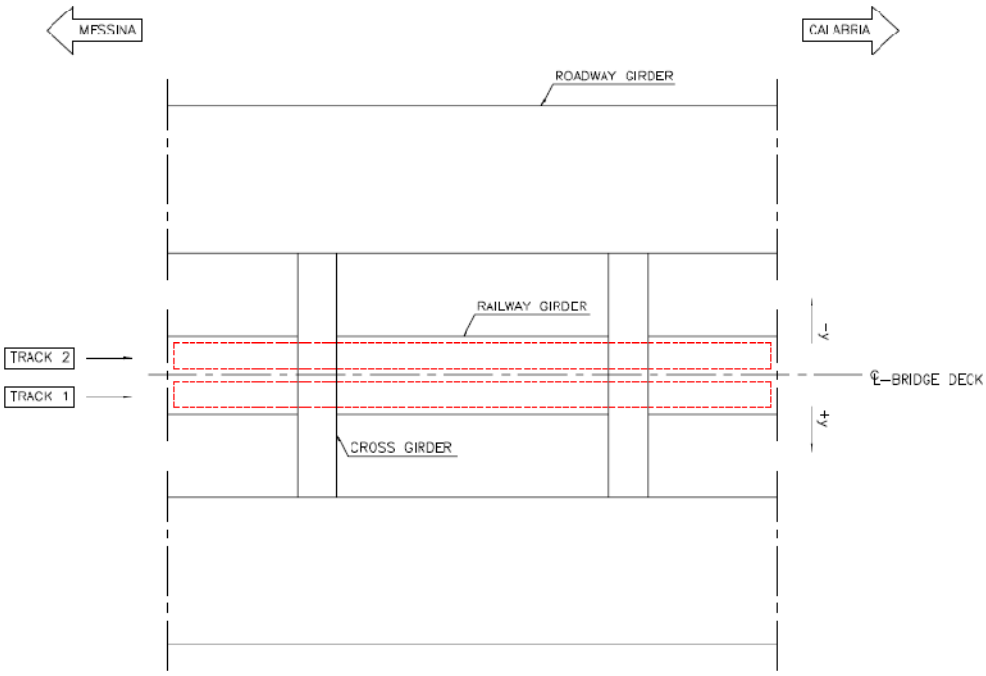


Figure 2-6 Illustration of bridge deck with indication of track location

2.3.2.2 Verification points

Stress-history plots for each of the 8 trains as well as the LM2 and the LM3 roadway fatigue loads have been calculated using the IBDAS global model and can be found in Appendix A, B and C.

Appendix A, B and C refer to a stress point in the bottom plate for a typical cross section in the main span for the roadway, railway and cross girder. The stress history plots of the longitudinal girders are given in two points, the first is in the centre between two cross girders, the second is located 400mm from the cross girder web. The stress-history plots for the cross girder are given for all of the analyzed sections. The location of the stress-history plots for roadway, railway and cross girder can be seen on Figure 2-7.

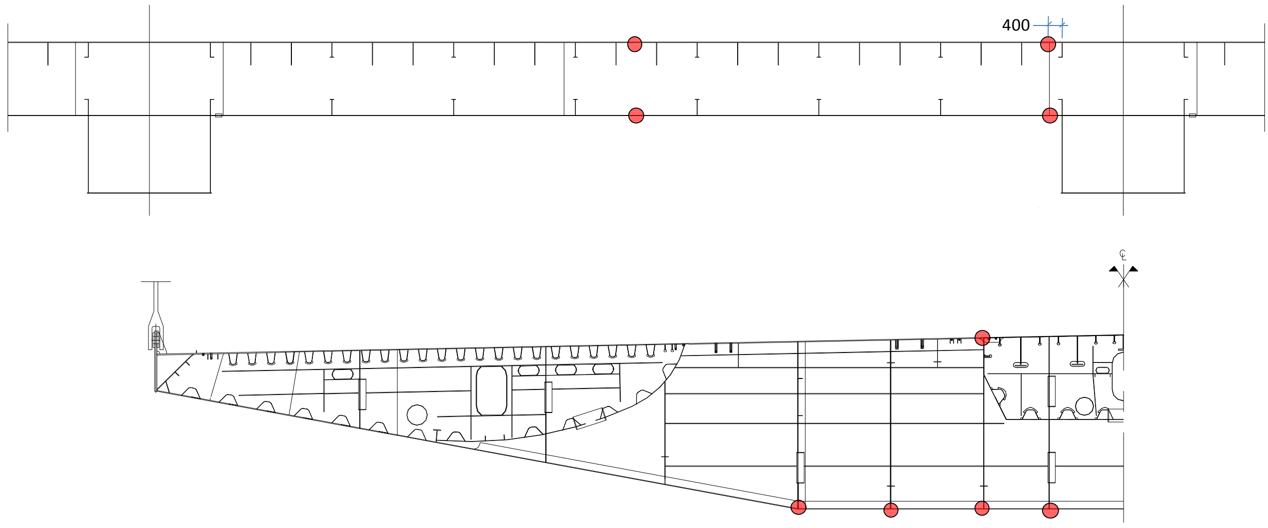


Figure 2-7 Stress-history plots location for roadway, railway and cross girder

Stress-history plots and relative stress range spectrum have been calculated in several locations in the girders. For the longitudinal girders the stress spectrum for location 1 and 2 are based on the global effects derived from the stress given in the mid span.

In Figure 2-8 the sections used for the verification of the roadway girder are shown and a description of the location is given:

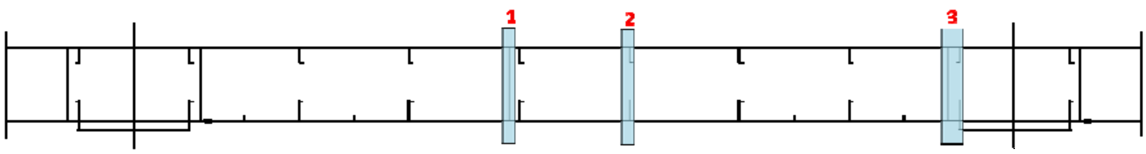


Figure 2-8 Roadway girder - locations verified

- Location 1: At the erection joint. The verification focus on both the top and the bottom plate trough splice. Due to the variation of the local effects, the top plate trough have been verified at any trough splice section at 200 mm, 500 mm and 700 mm from the closest diaphragm. Other orthotropic deck detail such as the trough to diaphragm at the cope hole corner have also been verified at this location.
- Location 2: Diaphragm to plate welds for both top and bottom plate.
- Location 3: At the shop joint and at the cross girder web. The verification focus on the trough splice of both the top and the bottom plate in correspondence of the shop joint. Due to the

variation of the local effects, the top plate trough have been verified at any trough splice section, namely at 300 mm, 700 mm and 900 mm from cross girder web. Additionally due to different cross section geometry and a different detail category also the full penetration butt weld of the bottom plate to the cross girder web has been verified. Other orthotropic deck detail such as the trough to diaphragm at the cope hole corner have been verified at this location.

In Figure 2-9 the sections used for the verification of the railway girder are shown and a description of the location is given:

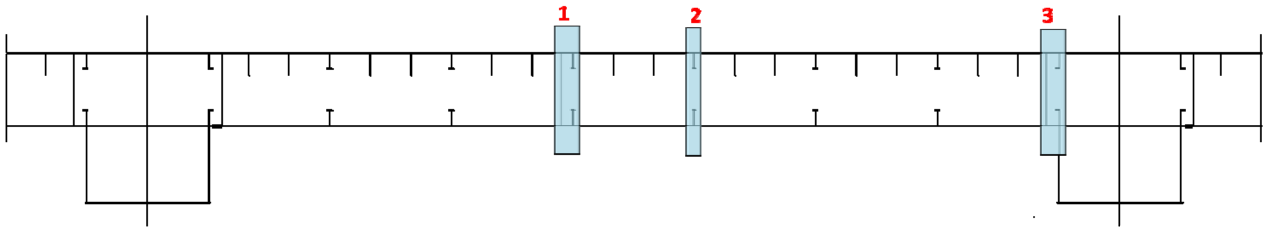


Figure 2-9 Railway girder - locations verified

- Location 1: At the erection joint. At the bottom plate the verification focus on the trough splice. At the top plate the details of interest are diaphragm to top of T-stiffener connection. Moreover also the T-stiffener bottom plate longitudinal fillet weld with cope holes has been verified.
- Location 2: Diaphragm to plate welds for both top and bottom plate.
- Location 3: At the shop joint. The verification focus on the trough splice of the bottom plate in correspondence of the shop joint. Additionally in correspondence of the cross girder web the T-stiffener top to web of cross girder has been verified.

For the verification of the locations 1 and 2 the same set of global stress ranges have been used (taken at the girder mid span).

In Figure 2-10 the sections used for the verification of the cross girder are shown and a description of the locations is given:

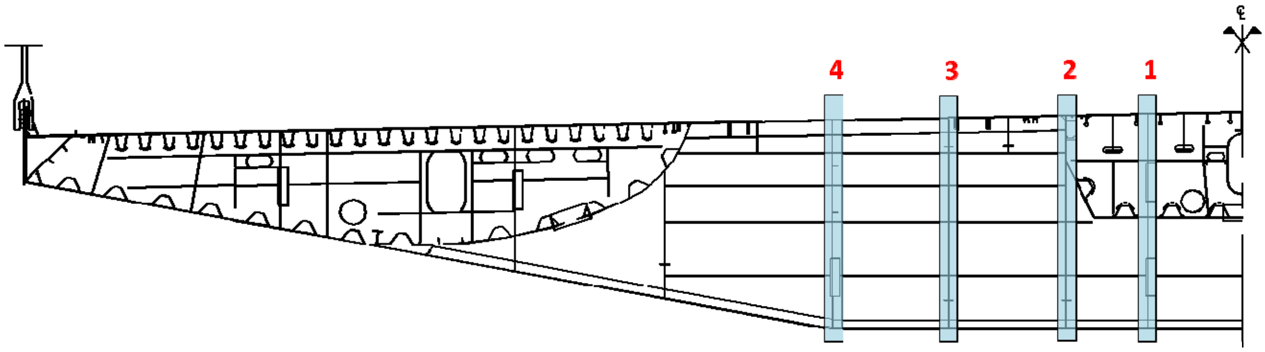


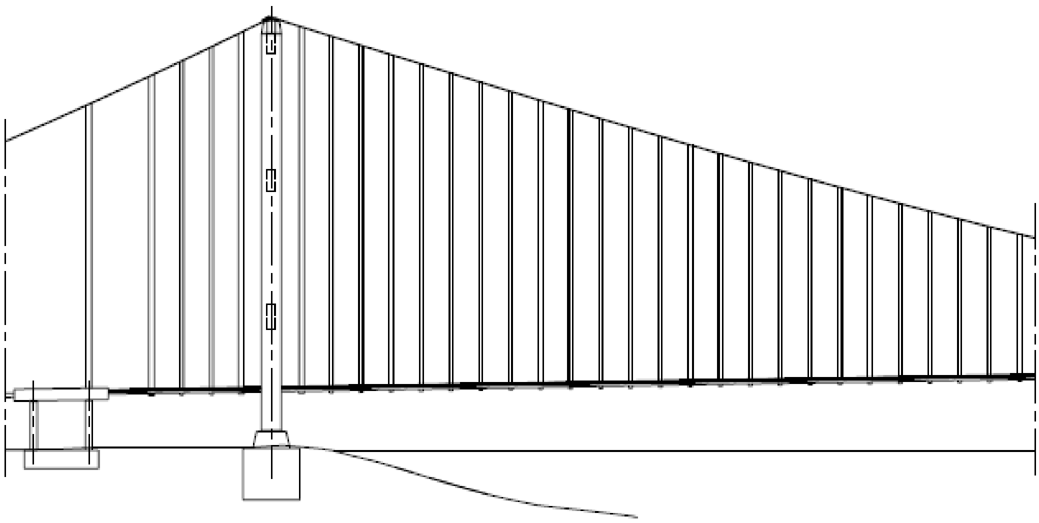
Figure 2-10 Cross girder - locations verified

- Location 1: Diaphragm to bottom plate weld, at 2 m from the cross girder mid span.
- Location 2: Top and bottom plate to diaphragm weld connection, at 3.75 m from the mid span.
- Location 3: Diaphragm to bottom plate weld, at 6.25 m from the mid span.
- Location 4: Diaphragm to bottom plate weld, at 8.75 m from the mid span.

2.3.3 Structural elements verified

The fatigue evaluation has been carried out in various locations along the bridge in order to cover the elements most prone to fatigue.

An overview of the girder elements analysed and verified is provided in Figure 2-11 where main span, tower location and side span elements are shown.



SEZIONE NO. *SECTION NO.*			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
LUNGHEZZA (M) *LENGTH (M)*	14.66	24.63	47.75	30.0	30.0	30.0	60.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
CASSONE STRADALE TIPO *ROADWAY GIRDER TYPE*			CS7	CS6	CS5		CS4	CS5		CS8			CS6							CS3										CS2	
CASSONE FERROVIARIO TIPO *RAILWAY GIRDER TYPE*	CF9 b/a	CF8	CF7	CF6		CF3	CF4	CF3	CF6		CF5							CF2												CF1	

TRAVERSO/ANCORAGGI PENDINI NO. *CROSS GIRDER/HANGER ANCHORAGE NO.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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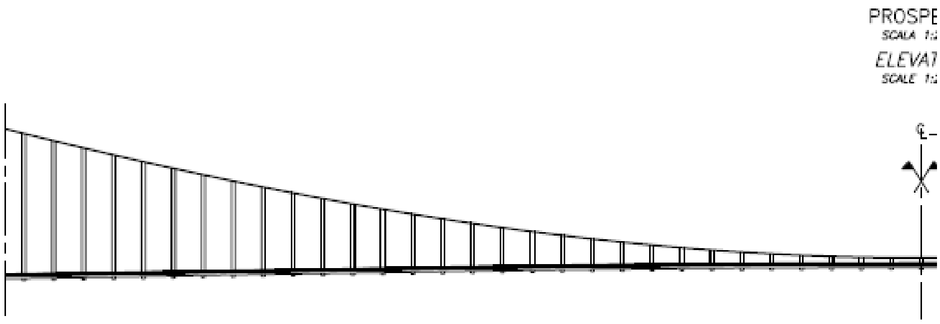
ANCORAGGI PENDINI TIPO *HANGER ANCHORAGE TYPE*		AP6	AP4	AP4	AP5a	AP5b	AP4	AP4	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP3	AP2	AP2	AP2	AP2	AP2	AP2	AP2	AP2	AP2	AP2



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LUNGHEZZA (M) *LENGTH (M)*	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30
CASSONE STRADALE TIPO *ROADWAY GIRDER TYPE*					CS2																										CS1
CASSONE FERROVIARIO TIPO *RAILWAY GIRDER TYPE*																															CF1

TRAVERSO/ANCORAGGI PENDINI NO. *CROSS GIRDER/HANGER ANCHORAGE NO.*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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Figure 2-11 Girders verified to fatigue: light blue for roadway girder, yellow for railway girder and

green for cross girder

Main Span

- Roadway and railway girder: In the main span the choice of the most representative girders has been based on the stress ranges along the span. This has been performed by the stress screening described in Section 2.3.1 and girder 12 (CS3) has been selected for the roadway and girder 19 (CF2) for the railway. Moreover two girders have been selected based on the location where the transition of the girder type takes place namely span number 28 (CS2, CF1) and 39 (CS1, CF1). Additionally also the railway girders towards the tower from span 12 to 6 have been analysed.
- Cross girder: The representative cross girder has been chosen to be the number 27 (T1), see Section 2.3.1.4. Additionally also the girders towards the tower (section 6 and 7) have been investigated.

Tower location

- Roadway and railway girder: Both roadway and railway girder span 5 have been verified (CS4 and CF4)
- Cross girder: Both T4a and T4b have been verified.

Side spans

- Roadway and railway girders: All the side spans have been verified.
- Cross girders: All cross girders in the side spans have been verified.

2.3.4 Fatigue Strength

Each detail category is characterised by the following values:

- $\Delta\sigma_C$ fatigue strength at 2 million cycles.
- $\Delta\sigma_D$ is the constant amplitude fatigue limit $\Delta\sigma_D = 0.737 * \Delta\sigma_C$
- $\Delta\sigma_L$ is the cut off limit $\Delta\sigma_L = 0.549 * \Delta\sigma_D$

- k_s is the size effect due to thickness or other dimensional effects, hence $\Delta\sigma_{C,red} = k_s \cdot \Delta\sigma_C$. The size effect is only utilised when explicit specified within the used fatigue detail category.

2.3.5 Unlimited Life Method

For the unlimited life method the following equation has been used:

$$\Delta\sigma_{rail+road}=(\Delta\sigma_{LM2}+\Delta\sigma_{EN5}{}^{*}\ \varphi_{real,1}\ )^{*}\ \gamma_{MF} < \Delta\sigma_D, \text{ where:}$$

- $\Delta\sigma_{LM2}$ is the maximum stress range given by the algebraic difference between the two extremes of the stress history plot of the fatigue load model 2 for the given detail

- $\Delta\sigma_{EN5}$ is the maximum stress range given by the algebraic difference between the two extremes of the stress history plot of train type 5 running in one track for the given detail

- $\gamma_{MF} = \gamma_f * \gamma_m$ is the partial factor for fatigue strength (fatigue partial factor * resistance partial factor) equal to 1.15 for local details of the roadway orthotropic deck plate and 1.35 for all the others components

- $\varphi_{real,i}$ is the dynamic factor where the index i refers to the loaded track. Depending to the detail to be verified and to the determinant length L_Φ a distinction between local and global dynamic factors is needed: dynamic factors for local effects have been accounted for by assuming L_Φ=3 times the span of deck element and for global effects by assuming L_Φ=1,5 times the span of the main girder spanning between cross girders. Considering the maximum design speed the real dynamic factors are summarised in Table 2-4.

Table 2-4 Real dynamic factors

		speed	local effects	global effects
Fatigue trains EN 1991-2: 2003	EN 1	200	1.300	1.165
	EN 2	160	1.230	1.125
	EN 3	250	1.400	1.224
	EN 4	250	1.400	1.224
	EN 5	80	1.181	1.056
	EN 6	100	1.190	1.071
	EN 7	120	1.200	1.088

	EN 8	100	1.190	1.071

Bottom Plate details of roadway, railway and cross girder:

- $\Delta\sigma = (\Delta\sigma_{LM2,\ glob} + \Delta\sigma_{EN5,glob} * \varphi_{glob}) * \gamma_{MF} < \Delta\sigma_D$

Deck plate details of railway girder:

- $\Delta\sigma = (\Delta\sigma_{LM2\ ,glob} + \Delta\sigma_{EN5,glob} * \varphi_{glob} + \Delta\sigma_{EN5,loc} * \varphi_{loc}) * \gamma_{MF} < \Delta\sigma_D$

Deck plate details of roadway girder:

- $\Delta\sigma = (\Delta\sigma_{LM2\ ,glob} + \Delta\sigma_{LM2\ ,loc} + \Delta\sigma_{EN5,glob} * \varphi_{glob,1}) * \gamma_{MF} < \Delta\sigma_D$

Structural details have been distinguished between bottom plate elements for which local effects have not been accounted for and deck plate elements which include local loading effects. Based on said division different damage contributions apply as shown in the following.

2.3.6 Damage Accumulation Method

When the combination of roadway and railway loads has been considered for the fatigue assessment in general terms, the following equation has been used:

$$\Delta\sigma_{rail+road} = ((\Delta\sigma_1 * \varphi_{real,1}) + (\Delta\sigma_2 * \varphi_{real,2}) + \Delta\sigma_{LM3}) * \gamma_{MF}\text{ , where:}$$

- $\Delta\sigma_1$ is the maximum stress range given by the algebraic difference between the two extremes (max, min) of a particular stress cycle derived from a stress history diagram by one of the 8 trains on track 1. $\Delta\sigma_1$ is zero if no trains are present

- $\Delta\sigma_2$ is the maximum stress range given by the algebraic difference between the two extremes (max, min) of a particular stress cycle derived from a stress history diagram by one of the 8 trains on track 2. $\Delta\sigma_2$ is zero if only one train is present

- $\Delta\sigma_{LM3}$ is the maximum stress range given by the algebraic difference between the two extremes of a particular stress cycle derived from a stress history diagram using load model 3 (LM3)

- $\gamma_{MF} = \gamma_f * \gamma_m$ (fatigue partial factor * resistance partial factor) equal to 1.15 for local details of the orthotropic roadway deck and 1.35 for all the others components

- $\varphi_{real,i}$ is the dynamic factor. Due to the determinant length it is necessary to distinguish in local and global dynamic factors. Considering the maximum of real train speed the real dynamic factors are summarised in Table 2-4.

- For the damage accumulation calculations the damage sum has to be below 0.95 to take account of the wind contribution to fatigue (refer to Section 4), hence:

- $\Sigma\, n_i / N_i <= 0.95$, where N_i is the endurance (in cycles) obtained from the $\Delta\sigma_C$ - N_R curve for a stress range of $\Delta\sigma_{i,d}$, n_i is the number of cycles associated with the stress range $\Delta\sigma_{i,d}$ for band *i* in the factored spectrum. This number for the railway loads has been carried out on the basis of the traffic mix defined in the Design Basis described in Table 2-5.

Table 2-5 Total number of trains in 200 years per track (normal traffic mix)

		Trains/day	1 year	200 years	Ni for train meeting (12%)	Ni for train alone (88%)
fatigue trains - EN 1991-2: 2003	EN 1	12	4380	876000	105120	770880
	EN 2	12	4380	876000	105120	770880
	EN 3	5	1825	365000	43800	321200
	EN 4	5	1825	365000	43800	321200
	EN 5	7	2555	511000	61320	449680
	EN 6	12	4380	876000	105120	770880
	EN 7	8	2920	584000	70080	513920
	EN 8	6	2190	438000	52560	385440

The number of events, n_i, for each of the 8 x 8 different combination is summarised in Table 2-6.

Table 2-6 Number of train intersections in 200 years (normal traffic mix)

	EN 1	EN 2	EN 3	EN 4	EN 5	EN 6	EN 7	EN 8
EN 1	18827	18827	7845	7845	10983	18827	12552	9414
EN 2	18827	18827	7845	7845	10983	18827	12552	9414
EN 3	7845	7845	3269	3269	4576	7845	5230	3922
EN 4	7845	7845	3269	3269	4576	7845	5230	3922
EN 5	10983	10983	4576	4576	6407	10983	7322	5491
EN 6	18827	18827	7845	7845	10983	18827	12552	9414
EN 7	12552	12552	5230	5230	7322	12552	8368	6276
EN 8	9414	9414	3922	3922	5491	9414	6276	4707

Structural details have been distinguished between bottom plate elements for which local effects have not been accounted for and deck plate elements which include local loading effects. Following load combinations have been checked:

Bottom Plate details of roadway, railway and cross girder:

- Train on track 1 + LM3
- Train on track 2 + LM3
- Train on track 1 + train on track 2 + LM3

Deck plate details of railway girder:

- Train on track 1 + LM3 + local of train on track 1
- Train on track 2 + LM3
- Train on track 1 + train on track 2 + local of train on track 1 + LM3
- LM3 only

Deck plate details of roadway girder:

- Train on track 1 + LM3 + local LM3
- Train on track 2 + LM3 + local LM3
- Train on track 1 + train on track 2 + LM3
- LM3 + local LM3

It must be noted that when the roadway girder deck plate is analysed for the life time of the bridge of 200 years, it is affected by $4.0x10^8$ global load cycles and even more local load cycles. Thus the maximum stress amplitude given by a single event multiplied by γ_{MF} must be less than $\Delta\sigma_L$ to prevent failure. This is valid when looking at both the bottom flange (i.e. without local effects) and at the trough (i.e. including local effects). For the latter element it has been verified that the stiffener is capable to limit the stress due to the effect of the local load, below the cut off limit for the detail category 71 representative of the trough splice at the structural joint. Local thickening of the trough has been introduced at the location of the trough splice at the structural joints.

3 Fatigue due to Nature Loads

The following describes estimates of the accumulated fatigue damage (Miner's sum) of the roadway and railway girders due to wind, temperature and seismic loadings respectively. The following has been considered:

- Wind during the design life of 200 years.
- +/- 10˚C uniform variation daily during the design life of 200 years.
- SLS1 earthquake 4 times, 5 minutes per event (i.e. total of 20 minutes)

The individual contribution of temperature and seismic load effects are considered separately and not combined with man generated load effects. Wind is considered in a separate chapter taking man generated loads into account. The accumulative damage is calculated according to the Palmgren-Miner's accumulative damage summation method.

The IBDAS s-coordinates for the section analysed for temperature and seismic loads are shown on Figure 3-1:

- Roadway Girder: S = -1473, S=-1005, S=-735 and S = -447 from mid span
- Railway Girder: S = -1650, S = -1473, S=-1005 and S=-735 from mid span

Figure 3-1 Location of the sections analysed

3.1 Temperature Load

The fatigue damage of the railway and roadway girders due to temperature effects is estimated by analysing the following loading event:

- +/- 10°C uniform variation daily during design life of 200 years.

The stress ranges in railway and roadway girders are found for different locations and it is checked that the stress ranges found are below the cut-off limit ($\Delta\sigma_L$) and do not contribute to the calculated cumulative damage.

All stresses are calculated based on sectional forces from the global IBDAS model using ADVERS. The stress ranges for the most critical point in the girders is considered.

The expansions joints located on both sides of the tower sections (CS4) allows the roadway girders to accommodate the movements due to temperature loading and the stresses in the roadway girders at the tower locations are therefore negligible.

The maximum stress range found in the roadway girder is 22 MPa (main span, CS1) and 25 MPa for the railway girder (Tower locations, CS4).

The given numbers of cycles during the 200 year design life are 200x365 =73000.

The calculated damage for details of category 80 and 56 are calculated for roadway at S=-447 and Railway at S=-1650. It can be seen that the calculated Miner's sum is close to zero, hence no fatigue problems will occur due to the temperature variations considered isolated. Effect due to combination with man generated loads is not accounted for. The stress level and calculated damage for roadway (S=-447) and railway (S=-1650) for detail of category 80 and 56 is shown on Figure 3-2.

Category 56

S=-447	Temperature		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma^*\gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
+/- 10 deg	22.0	29.7	29.7	2.59E+07	2.82E-03
				Σ	0.0028

S=-1650	Temperature		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma^*\gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
+/- 10 deg	25.0	33.8	33.8	1.37E+07	5.35E-03
				Σ	0.0053

Category 80

S=-447	Temperature		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma^*\gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
+/- 10 deg	22.0	29.7	0.0	NA	0.00E+00
				Σ	0.0000

S=-1650	Temperature		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma^*\gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
+/- 10 deg	25.0	33.8	33.8	8.12E+07	8.98E-04
				Σ	0.0009

Figure 3-2 Stress level and calculated damage for roadway (S=-447) and railway (S=-1650) for detail of category 80 and 56

3.2 Seismic Load

The fatigue damage of the railway and roadway girders due to seismic action is checked by analysing the following loading event:

- SLS1 earthquake 4 times, 5 minutes per event (i.e. total of 20 minutes)

The maximum stress range found in the roadway girder is 34 MPa (main span, CS1) and 24 MPa for the railway girder (main span, CF1).

In order to calculate accumulated fatigue damage due to the seismic response, it was assumed that SLS1 earthquake occurs 4 times during the design life of 200 years. It is further assumed that the duration of each event is 5 minutes and we made a preliminary assumption that there will be one cycle per second. Then the total number of cycles is:

4 x 5min x 60 sek = 1200 number of cycles.

It should be further noted that maximum and minimum stresses for the roadway girder are +/- 17 MPa giving a stress range of 34 MPa. These stresses are peak stresses and will therefore not occur all the time. The response will consist of both oscillations of peak values and lower values where the stress range is below cut-off limit for the most critical detail category 56 (ΔσL=22.7).

The calculated damage for details of category 80 and 56 are calculated at S=-1473. It can be seen that the calculated Miner's sum is close to zero, hence no fatigue problems will occur due to the seismic variations considered isolated. Effect due to combination with man generated loads is not accounted for.

S=-1473	Seismic		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d} = \Delta\sigma^* \gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
Roadway	34.0	45.9	45.9	1.75E+07	6.87E-05
				Σ	0.0000
S=-1473	Seismic		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d} = \Delta\sigma^* \gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
Railway	24.0	32.4	32.4	9.96E+07	1.20E-05
				Σ	0.0000

Figure 3-3 Stress level and calculated damage for roadway and railway (S=-1473) for detail of category 80

S=-1473	Seismic		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d} = \Delta\sigma^* \gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
Roadway	34.0	45.9	45.9	3.63E+06	3.30E-04
				Σ	0.0000
S=-1473	Seismic		$\Delta\sigma_1 > \Delta\sigma_L$		
	$\Delta\sigma$	$\Delta\sigma_{i,d} = \Delta\sigma^* \gamma_{MF}$	$\Delta\sigma_1 > \Delta\sigma_L$	N_i	n_i / N_i
Railway	24.0	32.4	32.4	1.67E+07	7.17E-05
				Σ	0.0000

Figure 3-4 Stress level and calculated damage for roadway and railway (S=-1473) for detail of category 56

4 Wind loading

Wind load due to natural turbulent wind can be considered as the sum of a static mean wind and a stochastic fluctuating wind load known as buffeting. The response of the bridge structure can thus be divided into response to mean wind (static contribution) and response due to buffeting (dynamic response). The analysis carried out in the following is based on wind time history analysis.

For design verification according to the unlimited life approach it is not required to include the effect of wind loading, however for design verification according to the damage accumulation approach the effect from man-generated loads shall be combined with the effects from wind loading. The following describes estimates of the accumulated fatigue damage (Miner's sum) of the roadway and railway girders of the Messina Strait Bridge due to wind buffeting during the design life of 200 years.

In the following the considered stress ranges due to wind and man-generated loads are all calculated based on the global IBDAS model. The stress ranges for the most critical point in the girders is considered. The IBDAS s-coordinates for the section analysed are, see Figure 4-1.

- Roadway Girder: S = -1005, S = -885 from mid span
- Railway Girder: S = -1650, S = -1425 from mid span

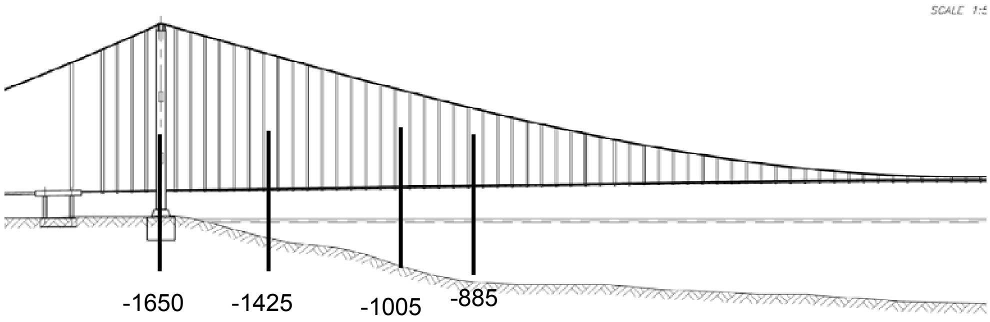


Figure 4-1 Location of the sections analysed

These points are selected for verification due to:

- -1650: Centre of 60m span. Here the angular rotation of the railway girder will be large and result in large stresses.
- -1425: Location used to illustrate effect on railway girder in main span.

- -1005: Location close to 1/4-span of the bridge.
- -885: Location close to 1/3-span of the bridge.

4.1 Wind data

Data regarding the wind direction speed and occurrence is based on measurements from the wind station of Reggio Calabria (airport), ref. report by SdM (DT.ISP.V.E.R1.001 Valutazione del Vento di Progetto). According to this report the wind data has been recalculated fitting the data to the girder height of the bridge and corresponding to the topography at the bridge location.

A wind rose illustrating the direction and distribution of the wind can be seen in Figure 4-2 along with a Weibull distribution of the wind speed. The Weibull distribution defines the probable density of a certain wind velocity defined for all directions. The data for the wind speeds is based on a 10min mean wind ref. report by SdM (DT.ISP.V.E.R1.001 Valutazione del Vento di Progetto).

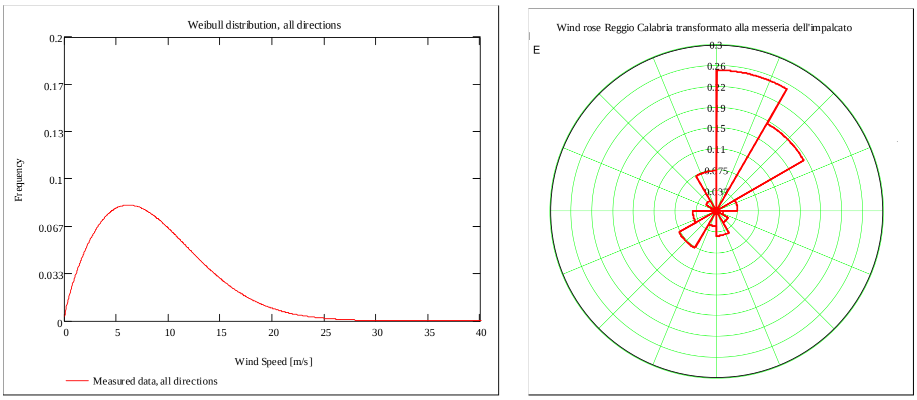


Figure 4-2 Distribution of wind speed and direction

The wind speed and directions shown in the wind roses has been recalculated to components blowing perpendicular to the bridge girder. In the analysis 8 wind speed intervals are used, where the wind speed listed is valid for the location of the bridge deck at mid span (70m reference height). The wind speed intervals are (in m/s): [0;5], [5;10], [10;15], [15;20], [20;25], [25;30], [30;35] and [35;39].

The buffeting response for each interval is calculated for the maximum wind speed in that interval. Thus, it is conservatively assumed that all load cycles for a given wind speed interval have stresses as calculated for the maximum wind speed in that interval.

4.1.1 Load determination

In order to determine the loads affecting the fatigue life of the bridge structure the stress range and number of cycles of each fluctuation during buffeting are of importance. It has been found that overall only the first 3 mode shapes (horizontal movement) during buffeting contributes with more than 99% to the displacement and thus the stress range. The period of each mode shape is calculated to:

- 1st mode: 0.03015 Hz => period T = 33.2 s
- 2nd mode 0.05488 Hz => period T = 18.2 s
- 3rd mode 0.07949 Hz => period T = 12.6 s

The 3 modes are identified by plotting the displacements due to each frequency, see Figure 4-3. Peak displacements from a ULS load case is used.

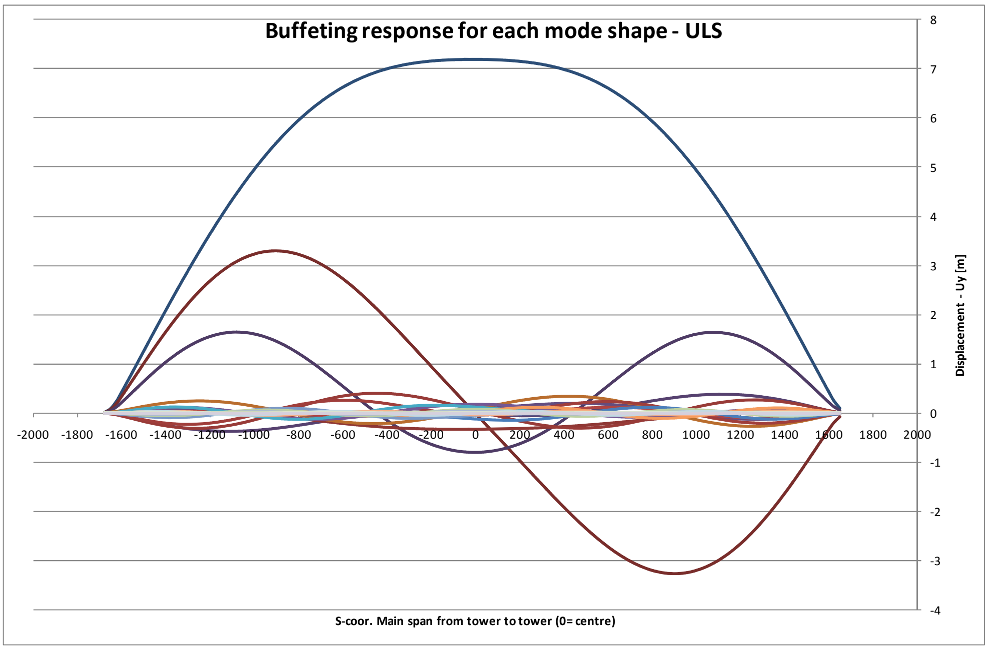


Figure 4-3 Buffeting response for ULS. Three dominating modes identified

The fatigue damage is calculated according to the Palmgren-Miner's damage summation, where the total allowable accumulated fatigue damage ratio must be below 1.00 for the design life of 200 years. All stress ranges above the cut off value contribute to the accumulated fatigue damage.

The effect of the wind is calculated in two different locations of the bridge for both the road and the railway girders. The IBDAS s-coordinates for the section analysed are:

- Roadway Girder: S = -1005, and S = -885 from mid span
- Railway Girder: S = -1650 and S=-1425 from mid span

The S-coordinate -1650 is located at the towers where the angular rotation of the railway girder is largest and hence large stresses occur. The roadway girder is not considered at this location since it is in the centre of the 60m drop-in span, hence no forces due to wind will affect the roadway girder at this location.

4.2 Wind Load - Mean Wind

4.2.1 Synthetic storm event

The mean wind component of the wind field is varying fairly slowly – as compared to the turbulent fluctuations of the wind and in order to illustrate the effect of such a component on the stress range distribution a synthetic wind history is considered, which displays the main features of a storm.

A storm period shaped as half a sinusoid is postulated – with a maximum wind effect of 90 MPa. During this storm sinusoidal turbulent wind fluctuations are superseded and these fluctuations are scaled such that the response amplitude is proportional to the mean wind component thus reaching a maximum of 10 MPa. The postulated mean wind load effect and the load effects from wind fluctuations are illustrated separately in Figure 4-4, while the combined effect is illustrated in Figure 4-5.

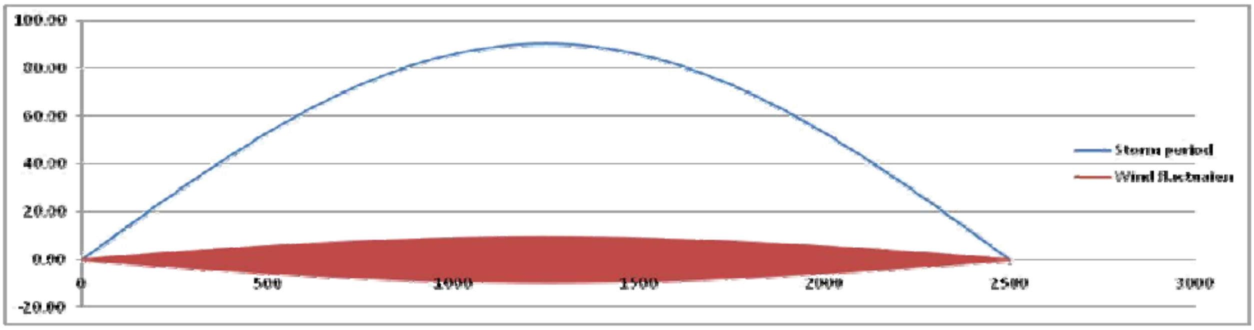


Figure 4-4 Synthetic mean wind response – blue curve. Synthetic fluctuating wind response - red curve (high frequency sinusoidal component cannot be discerned)

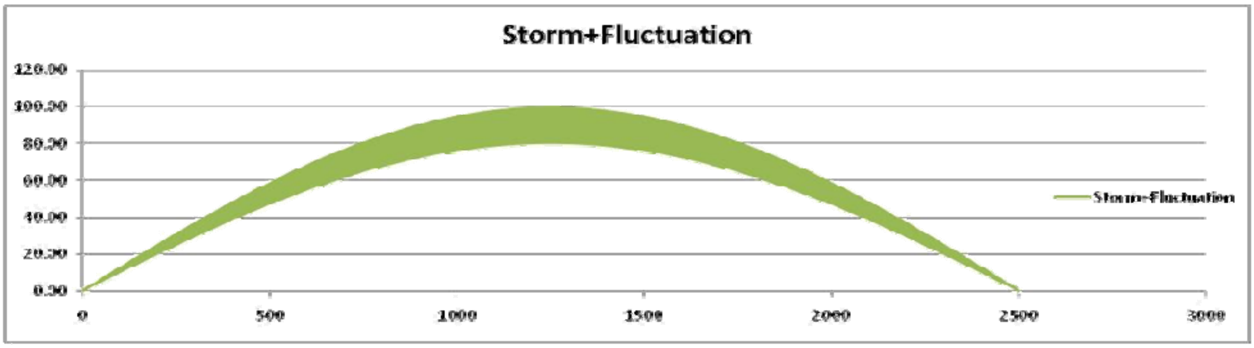


Figure 4-5 Combined synthetic mean wind response and fluctuating response

When a rain flow counting of such a synthetic storm is carried out the result is that one cycle count is registered corresponding to the maximum stress (100 MPa) while all other stress ranges fall in the range 0-20 MPa.

Hence for storm events one stress range cycle is generated that corresponds to the maximum stress range encountered during the entire storm, while all other stress ranges can be determined corresponding to the fluctuating part of the response. The influence of wind loads on the structure can be split into determination of the:

- contributions from storm events
- contributions from the combined effect of man-generated load effects and the effects from the wind fluctuations (short term considerations)

4.2.2 Damage contribution

In the analysis of static wind response 6 wind speed intervals are identified giving stress ranges above the cut-off value of the lowest fatigue detail category (Category 56). The wind speed listed is valid for the location of the bridge deck at mid span (70m reference height). The wind speed intervals are (in m/s): [21;24], [25;27], [28;30], [31;33], [34;36] and [37;39]. Wind speed of 21m/s result in a stress range of 17.5MPa.

The response for each interval is calculated for the maximum wind speed in that interval. Thus, it is conservatively assumed that all load cycles for a given wind speed interval have stresses as calculated for the maximum wind speed in that interval.

The output of the static wind analysis carried out with the global IBDAS model comprises expected root mean square (RMS) values of section forces. To the calculated stress range from the static response the stress contribution from buffeting has been added giving the correct peak value.

During meteorological storm events the maximum mean wind speed encountered during the storm is registered (10 min average / hourly average). This value is applied for extreme wind statistics – as also carried out for the Messina Strait project. As only one maximum value is used the extreme wind statistics is well suited as a basis for assessing the contribution to the fatigue damage during the entire life of the structures from the mean wind component. From Figure 4-6 the return period corresponding to different extreem wind speeds are given ref. report by SdM (DT.ISP.V.E.R1.001 Valutazione del Vento di Progetto, Allegato F). It can be seen that V=19 m/s corresponds to a return period of 1 year.

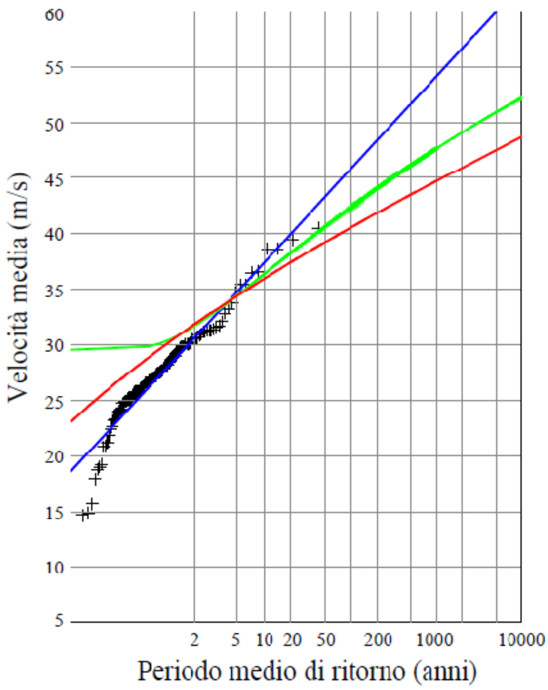


Figure 4-6 Wind velocities and corresponding return period. The blue line used as basis for wind data

The return period corresponding to the lowest wind speed in each interval has been used and multiplied with the number of wind speeds within the interval, see Figure 4-7.

Cycles			
V intervals	No.	cycles pr. V	Total Cycles
21-24 m/s	4	200	800
25-27 m/s	3	134	402
28-30 m/s	3	112	336
31-33 m/s	3	100	300
34-36 m/s	3	50	150
37-39 m/s	3	5	15

Figure 4-7 Correlation between wind speed intervals (V) and number of cycles

The calculated damages for details of category 56 are calculated for roadway at S=-1005 and Railway at S=-1650, see Figure 4-8. It can be seen that the calculated Miner's sum is close to zero, hence no fatigue problems will occur due to the static wind variations considered isolated. Hence the more important part of the influence of wind seems to be the effect from the fluctuating load effects in combination with the man-generated load effects. Therefore in the following damage due to mean wind effects will be neglected.

S=-1005		Roadway		$\Delta\sigma_1>\Delta\sigma_L$		
		$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma*\gamma_{MF}$	$\Delta\sigma_1>\Delta\sigma_L$	N_i	n_i / N_i
Wind intervals	21-24 m/s	22.7	30.7	30.7	2.20E+07	3.64E-05
	25-27 m/s	28.6	38.7	38.7	6.92E+06	5.81E-05
	28-30 m/s	35.2	47.5	47.5	3.27E+06	1.03E-04
	31-33 m/s	42.5	57.3	57.3	1.86E+06	1.61E-04
	34-36 m/s	50.4	68.0	68.0	1.12E+06	1.34E-04
	37-39 m/s	59.0	79.6	79.6	6.96E+05	2.15E-05
					Σ	0.001

S=-1650		Railway		$\Delta\sigma_1>\Delta\sigma_L$		
		$\Delta\sigma$	$\Delta\sigma_{i,d}=\Delta\sigma*\gamma_{MF}$	$\Delta\sigma_1>\Delta\sigma_L$	N_i	n_i / N_i
Wind intervals	21-24 m/s	37.1	50.1	50.1	2.79E+06	2.87E-04
	25-27 m/s	46.7	63.1	63.1	1.40E+06	2.88E-04
	28-30 m/s	57.4	77.5	77.5	7.54E+05	4.46E-04
	31-33 m/s	69.2	93.4	93.4	4.31E+05	6.96E-04
	34-36 m/s	82.0	110.8	110.8	2.59E+05	5.80E-04
	37-39 m/s	95.9	129.5	129.5	1.62E+05	9.28E-05
					Σ	0.002

Figure 4-8 Stress level and calculated damage for roadway (S=-1005) and railway (S=-1650) for detail of category 56.

4.3 Damage due to combining man-generated loads and wind

The accumulated damage is calculated for the following combinations in order to estimate the effect of wind on the total damage:

Roadway girder:

- LM3 vehicle (global and local load effects) + 1 train (EN5) on both tracks (no train meetings)
- LM3 vehicle (global and local load effects) + 1 train (EN5) on both tracks (no train meetings) + wind

Railway girder:

- 1 train (EN5) on both tracks (global and local loads, no train meetings)
- 1 train (EN5) on both tracks (global and local loads, no train meetings) + wind

In order to assess the effects of wind, time series of wind fluctuations at a mean wind speed of 35 m/s perpendicular to the bridge alignment are used. The wind time series are scaled to a series of different mean wind speeds considered in the analyses (5, 10, 15, 20, 25, 30, 35 and 39 m/s) by a power law. All calculations in the following is based on a fatigue detail category 80 as basis.

4.3.1 Roadway

The following locations is considered for the roadway girder, see Figure 4-9.

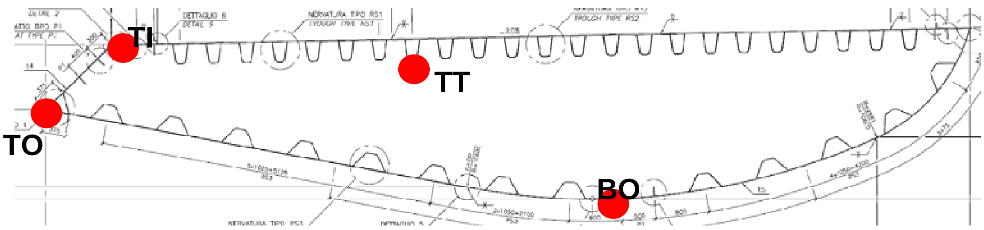


Figure 4-9 Points selected for fatigue damage calculation

The following loads have been considered:

- BO: Global effect of train on one track, global effect of LM3 vehicle and wind buffeting.
- TO: Global effect of train on one track, global effect of LM3 vehicle and wind buffeting.
- TI: Global effect of train on one track, global effect of LM3 vehicle and wind buffeting.
- TT: Global effect of train on one track, global and local effects of LM3 vehicle and wind buffeting.

The results for the most adverse location of the roadway girder in the bridge when considering wind loading have been given in the following:

- IBDAS s-coordinate s=-885 from bridge centre

A full set of results are given for point TT in the following in order to illustrate individual effects and show the calculation method. Results of the remaining points are summarised in a table.

4.3.1.1 Point TT

TRAIN LOAD

The effect of global train load is calculated using IBDAS and can be seen in the figure below. The values shown in the figure are unfactored - however for the calculations a dynamic factor of 1.056 has been used on the calculated stress ranges.

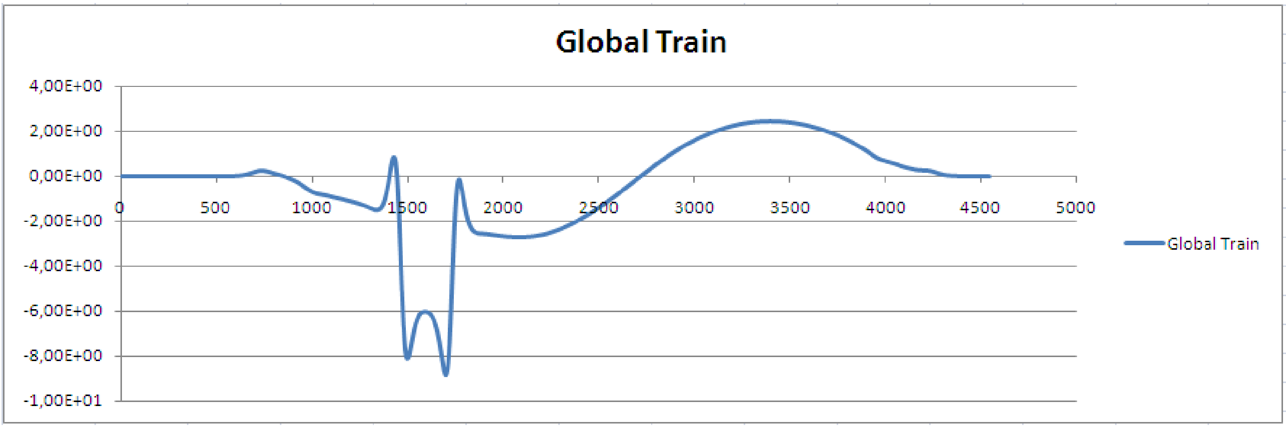


Figure 4-10 Stress range due to global train load

VEHICLE LOAD

The effect of global and local vehicle load is shown below together with the combined effect. The local effect is taken from a local IBDAS model of the orthotropic deck.

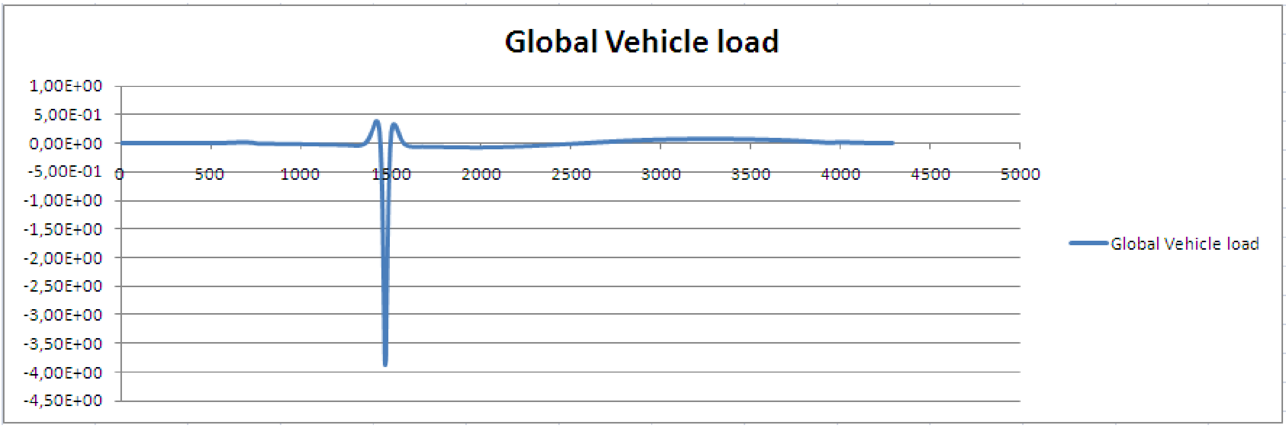


Figure 4-11 Stress range due to global vehicle load

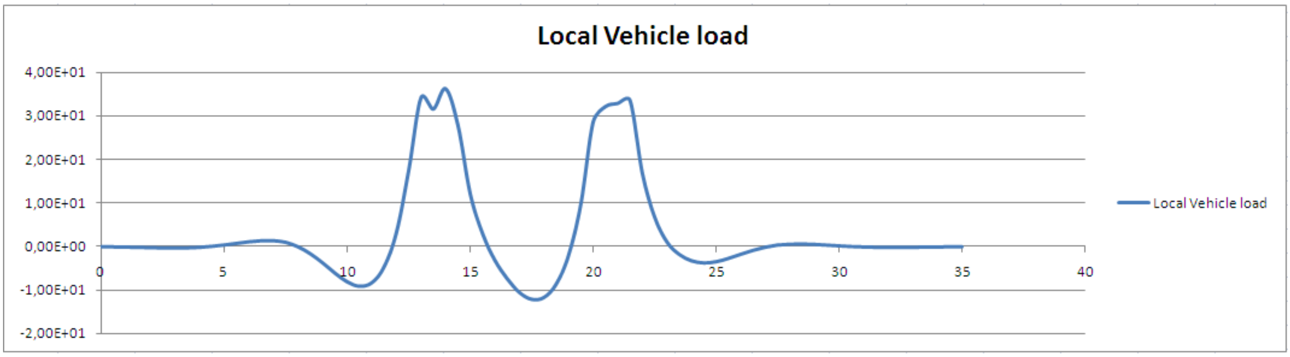


Figure 4-12 Stress range due to local vehicle load

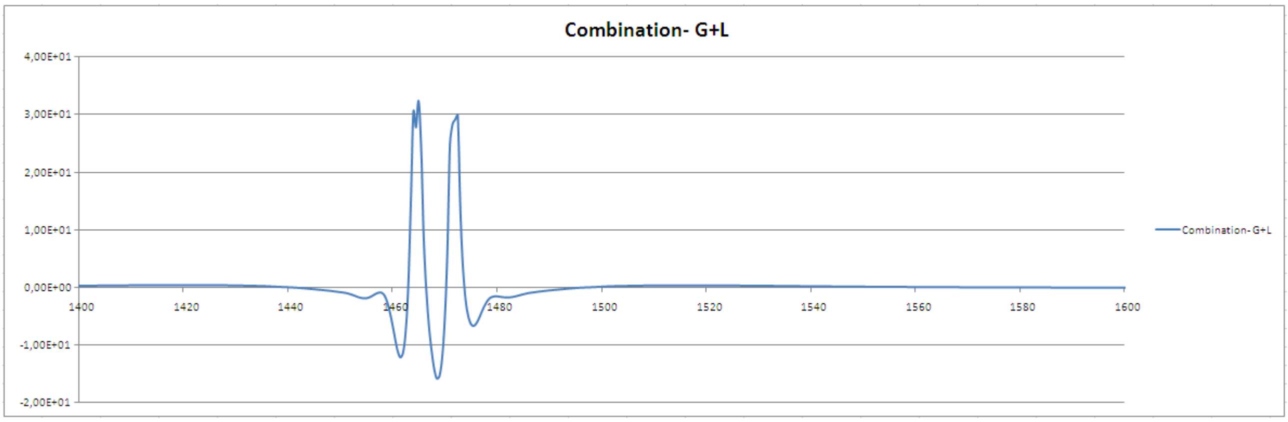


Figure 4-13 Stress range due to combined effect of global and local vehicle load

From the combination of loads it can be seen that the global effect is small compared to the local.

WIND

The wind load is shown for a wind of 35m/s - illustrating the time history of wind buffeting.

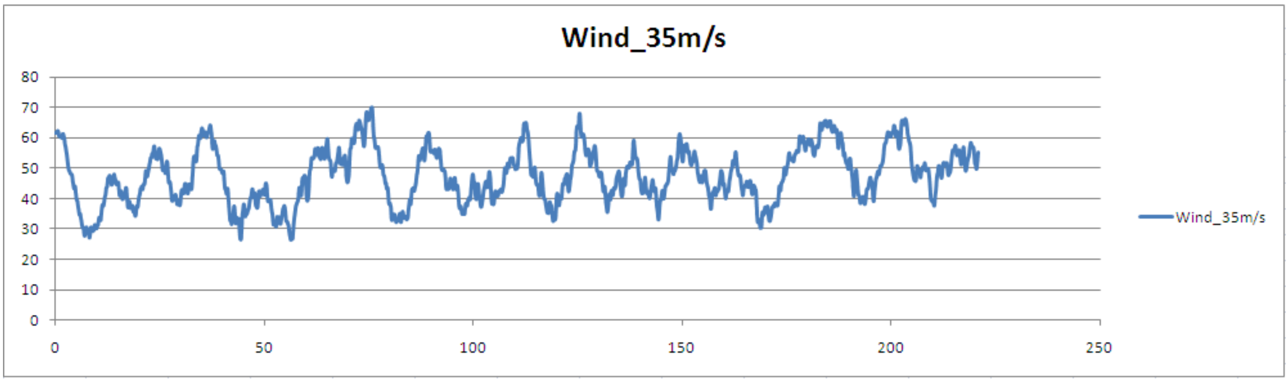


Figure 4-14 Stress ranges due to wind buffeting - based on a time history wind series of 35m/s

ACCUMULATED DAMAGE

From the above given stress range curves from the individual loads a maximum stress ranges of approximately 42 MPa for wind buffeting (35m/s) and a total of 98MPa can be expected to occur. However the damage obtained for each of the considered interval of wind speed is weighted by the distribution of wind speeds perpendicular to the bridge girder to obtain the accumulated damage from the combination of man-generated loads and wind.

The accumulated damage due to traffic load combined with wind loading in each considered wind speed interval is given in Table 4-1 along with the occurrence of the wind interval during the design life. From the table it can be seen that despite an increasing damage with wind speed is expected, the occurrence of high wind speeds is so rare that - when the results are weighted by the wind speed distribution - the resulting increases in the accumulated damage is rather limited.

Table 4-1 Damage contribution based on wind speed interval and occurrence of wind

Wind interval	"calm"	5 m/s	10 m/s	15 m/s	20 m/s	25 m/s	30 m/s	35 m/s	39 m/s
Occurrence	0.1906	0.4618	0.2753	0.0604	0.0104	0.0013	0.0002	3.165E-05	2.123E-06
Damage contribution	0.087	0.211	0.125	0.027	0.005	0.001	0.0001	2.55E-05	3.27E-06

The total accumulated damage of combined traffic load and traffic load + wind can be seen in Table 4-2.

Table 4-2 Accumulated damage due to effect of traffic and traffic + wind load

Traffic		
$\Delta\sigma_{C,red}$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**59.0**	**32.4**
Stress factor		1.35
Total damage		**0.45682**

Traffic + Wind		
$\Delta\sigma_{C,red}$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**59.0**	**32.4**
Stress factor		1.35
Total damage		**0.45763**

The difference between the results is (effect from wind): **0.18%**

The result for the remaining points considered and locations for the roadway girder are summarised in Table 4-3. For location s=-1005 only the points BO and TT are considered, since these are the most adverse points in the girder.

Table 4-3 Comparison of accumulated damage of points in roadway girder

Structural detail	Stationing	Train alone EN5	Train + Wind fluctuations	Percentage increase
BO	885	0.019524	0.019759	+1.21%
TO	885	NA	4.61E-5	NA
TI	885	NA	5.57E-5	NA
TT	885	0.45682	0.45763	+0.18%
BO	1005	0.024185	0.024804	+2.56%
TT	1005	0.468657	0.471574	+0.62%

Where "NA" is shown in the table is due to the stress ranges obtained from traffic loading alone is below the cut-off limit and no direct comparison is possible. The small effect from traffic is mainly due to the location close to the neutral axis.

An investigation considering 12% train meetings of the EN5 train during the design life combined with global effect of LM3 vehicle and wind has been calculated for the point BO. Point BO is chosen since the effect of an additional train will be less visible for point TT due to large effect of local vehicle loads, thus this is not included here. The calculated damage is:

Structural detail	Stationing	Train alone EN5	Train + Wind fluctuations	Percentage increase
BO	885	0.025106	0.025475	+1.46%

As expected it can bee seen that the additional increase in damage due to the contribution of wind is very small.

4.3.2 Railway

The following points are considered in the railway girder, see Figure 4-15, in order to illustrate the characteristics of the combined effect from wind and man-generated train and road load effects.

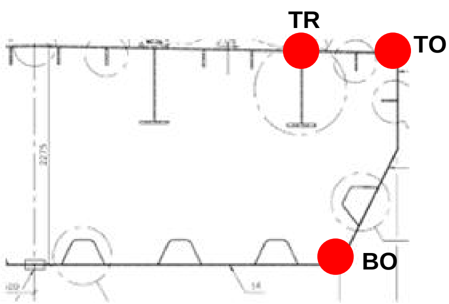


Figure 4-15 Points selected for fatigue damage calculation

The following loads have been considered:

- BO: Global effect of train on one track, global effect of LM3 vehicle and wind buffeting.
- TO: Global effect of train on one track, global effect of LM3 vehicle and wind buffeting.
- TR: Global and local effect of train on one track, global effects of LM3 vehicle and wind buffeting.

The results for the most adverse location of the roadway girder in the bridge when considering wind loading have been given in the following:

- IBDAS s-coordinate s=-1650 from bridge centre

A full set of results are given for point TR in the following in order to illustrate individual effects and show the calculation method. Results of the remaining points are summarised in a table.

4.3.2.1 Point TR

TRAIN LOAD

The effect of global train load is calculated using IBDAS and can be seen in the figure below. The values shown on the figure are unfactored - however for the calculations a dynamic factor of 1.056 has been used on the calculated stress ranges.

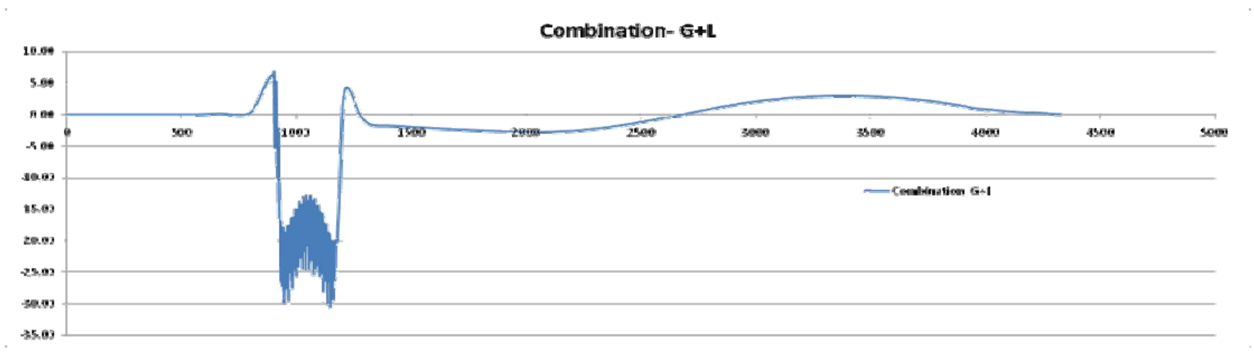


Figure 4-16 Variation of combined global and local stresses from EN5 train plotted as a function of the location of the front of the train on the railway girder in point TR.

It can be noted that the general global effect seems to be similar to the previous example as shown for the road, while the local effects induces a stronger variation of stresses as the boogies and wheels pass the location under consideration (stress variation between the two “low points” in Figure 4-16).

WIND

The wind load is shown for a wind of 35m/s - illustrating the time history of wind buffeting.

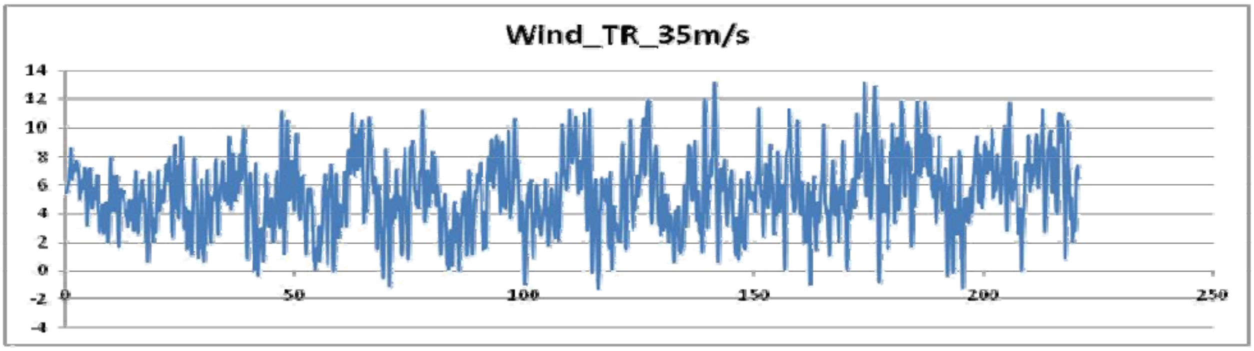


Figure 4-17 Variation of load effects from wind plotted as a function of time.

ACCUMULATED DAMAGE

The accumulated damage due to traffic load combined with wind loading in each considered wind speed interval is given in Table 4-4 along with the occurrence of the wind interval during the design life. A detail category 80 is used as basis for the calculations. From the table it is seen that despite an increasing damage with wind speed is expected, the occurrence of high wind speeds is so rare that - when the results are weighted by the wind speed distribution - the resulting increases in the accumulated damages are rather limited.

Table 4-4 Damage contribution based on wind speed interval and occurrence of wind

Wind Interval	"calm"	5 m/s	10 m/s	15 m/s	20 m/s	25 m/s	30 m/s	35 m/s	39 m/s
Occurrence	0.1906	0.4618	0.2753	0.0604	0.0104	0.0013	0.0002	3.165E-05	2.123E-06
Damage contribution	0.024	0.056	0.034	0.007	0.0014	0.0002	5.29E-05	1.8E-05	2.92E-06

The total accumulated damage for combined traffic load and traffic load + wind can be seen in Table 4-5 for points in the railway girder selected at the most severely exposed locations in the girder.

Table 4-5 Comparison of accumulated damage of points in railway girder

Structural detail	Stationing	Train alone EN5	Train + Wind fluctuations	Percentage increase
TO	1425	0.062759	0. 062809	+0.1%
TR	1425	0.083127	0.084488	+1.6%
BO	1425	0.015851	0.016540	+4.4%
TO	1650	0.024211	0.024505	+1.2%
TR	1650	0.122338	0. 122507	-0.7%
BO	1650	0.024211	0.024345	+0.6%

Investigations using 12% train meetings will have an increase in the damage obtained by trains alone and only a minor increase in the effect of wind in percentage of the total damage. Thus these are not included here.

4.3.3 Conclusion

The points selected for the analyses in the illustrative examples have been selected where the effect of wind stresses have been expected to be significant. The described approach is extensive and will be time consuming if applied to all points selected for fatigue verification. It is hence of interest to establish an approach that can be considered robust and at the same time easy to use.

The results given in the preceding chapters all indicate a modest increase in fatigue damage when wind is also applied. The percentage increase is for all selected points below 5 %. It is hence suggested simply to subtract 5% from the allowable damage in the verification inequality and then limit the verification to the fatigue damage from trains and road traffic.

The assessment of damage is consequently performed following the formula of Palmgren-Miner, checking that the following result is obtained

$$D=\sum_i \frac{n_i(rail+road)}{N_i} \leq 1.0-0.05=0.95$$

5 Fatigue Detail Categories

All fatigue categories have been taken from the EN 1993-1-9:2005 table 8.1 to table 8.10, EN 1993-2:2006.

5.1.1 Roadway general plate details

The fatigue analysis of the most critical locations in the roadway girder is analysed using the sectional forces of the global IBDAS model.

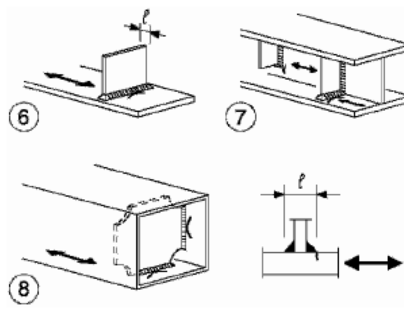
The fatigue assessment concerns the following construction details:

- Full penetration butt weld between top plate of the road- railway girder and top plate of the cross girder. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.3, detail no.11.
- Full penetration butt weld between bottom plate of the girder and web of the cross girder. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.5, detail no.1.
- Full penetration longitudinal butt weld between plates of top and bottom plates of the girder at mid and end span. The weld corresponds to detail category 90, see EN1993-1-9 Table 8.2, detail no.10.
- Fillet weld between the web and the top and bottom plate at mid and at end span. The weld corresponds to detail category 100, see EN1993-1-9 Table 8.2, detail no.6.
- Welded connection of the girder diaphragm to the plate or the web. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.4, detail no.8.
- Transverse full penetration welds between the plates crossed by continuous longitudinal weld of stiffener. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.3, detail no.9.
- Transverse joint in troughs with full penetration butt weld with steel backing plate. The bottom plate trough splices occurs at both the erection joint and the shop joint. The weld corresponds to detail category 71, see EN1993-1-9 Table 8.8, detail no.4.

In the following calculations only the most critical detail for the fatigue verification have been considered, namely:

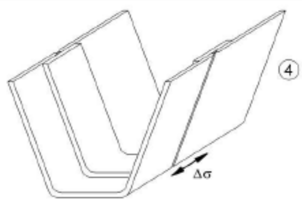
1. The connection of the diaphragm to bottom plate. The weld corresponds to detail category 80 (EN1993-1-9 Table 8.4, detail no.8)

80	ℓ≤50mm
71	50<ℓ≤80mm



2. The bottom plate trough splices in correspondence of the erection joint and the shop joint (EN1993-1-9 Table 8.8, detail no.4).

71



All other details are of same or higher category or capable of improvement up to a higher class and thus indirectly covered in the calculation.

5.1.2 Roadway deck plate details

The fatigue analyses of the local actions in points A, B, C, D, E, F in Figure 5-1 has been performed using a local IBDAS model of the orthotropic steel deck, refer to General Design Principles for Suspended Deck section 10.9.2 for more detailed description.

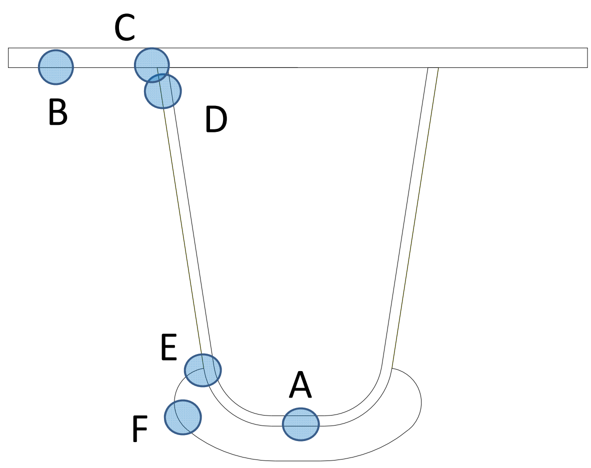
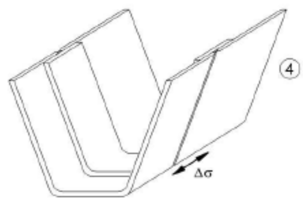


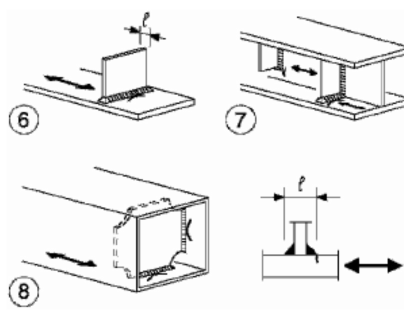
Figure 5-1 Roadway orthotropic deck details

The fatigue assessment concerns the following details:

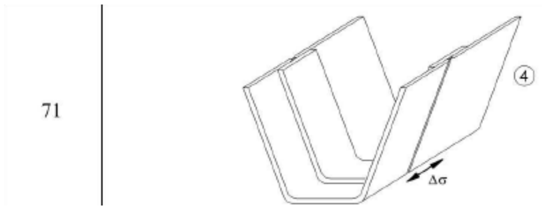
1. **Point A** represents the full penetration butt weld in trough with steel backing plate. The weld corresponds to detail category 71, see EN1993-1-9 Table 8.8, detail no.4.

71	

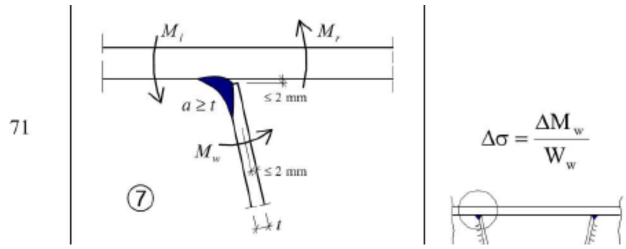
2. **Point B** represents the deck connected to the diaphragm. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.4, detail no.8.

80	ℓ≤50mm	
71	50<ℓ≤80mm	

3. **Point C** represents the continuation in the plate limited by the trough splice; this is thus taking place only at the structural joints (erection and shop). The detail category must then fulfil the same limitation as for point A. External to the structural joints it represents also the sections where the longitudinal fillet weld of the trough intersects a transverse full penetration butt weld splice of the deck plate and here a fatigue detail 80 is prescribed, see EN1993-1-9 Table 8.3, detail no.9. In the latest configuration being a shop weld the category might be increased to 112 MPa thus becoming less critical then detail B and therefore it has never been considered.

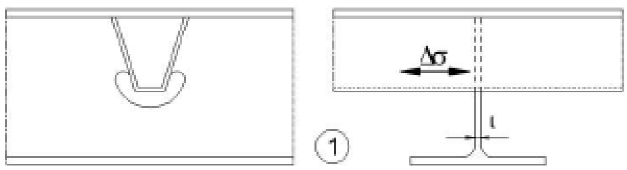


4. **Point D** represents the weld connecting deck plate to trough web. Being a partial penetration weld, an additional parasite bending moment becomes present due to the compression in the web of the trough and the eccentricity of the weld. This detail is only subjected to local effects. The weld corresponds to a detail category 71, see EN1993-1-9 Table 8.8, detail no.7.



5. **Point E** represents the connection between the trough and the cut out in the diaphragm. As the diaphragm thickness is 15mm the weld corresponds to detail category 71, see EN1993-1-9 Table 8.8, detail no.1.

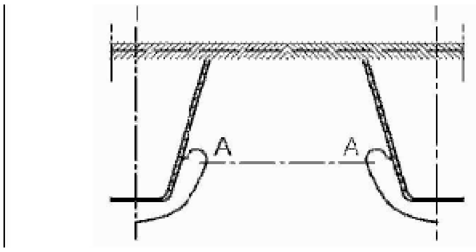
80	t≤12mm
71	t>12mm



6. **Point F** represents one end of the critical section in the diaphragm due to cut outs. The tooth plate at the diaphragm is only subject to stresses due to local roadway loads and not being

affected by other global effects such as the railway girder load. Thus they are verified according to the unlimited life method. The same detail has been verified at the cross girder web and the verification also includes the combined effects of the local wheel load and the global railway load. The description of the analysis of point F can be found in Section 9.17.

71



6

Points A and D have been checked at specific points between two diaphragms. The results at point A have then been used to optimise the trough splice location whereas point D must be fulfilled at any location between diaphragms; for more information see the local roadway FE-model in the document General Design Principles for Suspended Deck, section 10.9.2. Points B, E and F have only been checked at the location of the diaphragms.

5.1.3 Railway general plate details

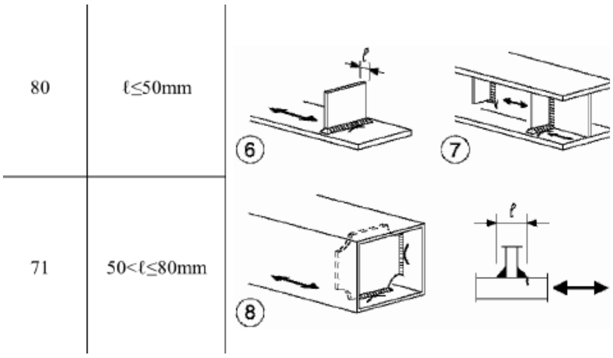
The fatigue analysis of the most critical locations in the railway girder is performed using stress history plots determined from the global IBDAS model of the bridge. The fatigue assessment concerns the following construction details:

- Full penetration butt weld between top plate of the girder and top plate of the cross girder. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.3, detail no.11.
- Full penetration butt weld between bottom plate of the girder and web of the cross girder. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.5, detail no.1.
- Full penetration longitudinal butt weld between top and bottom plates of the girder at mid and at end span. The weld corresponds to detail category 90, see EN1993-1-9 Table 8.2, detail no.10.
- Automatic fillet weld carried out from both sides between the web and the top plate at mid and at end span. The weld corresponds to detail category 100, see EN1993-1-9 Table 8.2, detail no.5.

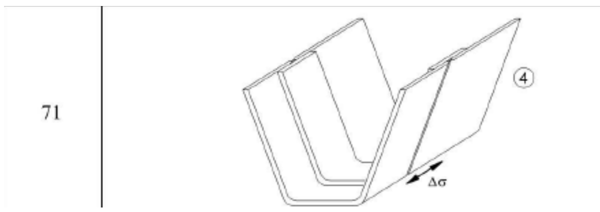
- Welded connection of the girder diaphragm to the deck plate, bottom plate or the web. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.4, detail no.8.
- Transverse full penetration welds between the plates crossed by continuous longitudinal weld of stiffener. The weld corresponds to a detail category 80, see EN1993-1-9 Table 8.3, detail no.9.

In the following calculations only the most onerous for the fatigue verification have been considered, namely:

1. The connection of the diaphragm to bottom plate (EN1993-1-9 Table 8.4, detail no.8)



2. The bottom plate trough splices in correspondence of the erection joint and the shop joint (EN1993-1-9 Table 8.8, detail no.4).



All other details are of same or higher category or capable of improvement up to a higher class and thus indirectly covered in the calculation.

5.1.4 Railway deck plate details

The fatigue analyses of the local actions of points WA and WB has been performed using a local IBDAS model of the T stiffener including the effective top plate, refer to General Design Principles for Suspended Deck 10.9.4.

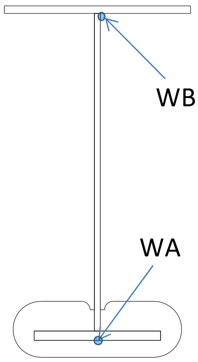
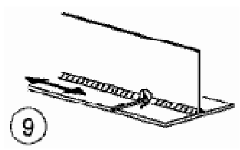


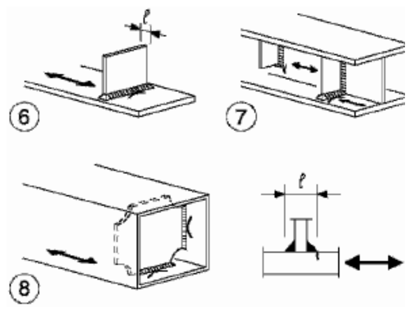
Figure 5-2 Railway orthotropic deck details

The fatigue assessment concerns the following details in proximity of the structural joints:

1. **Point WA** represents the longitudinal fillet weld with a cope hole height not grater than 60 mm. The weld corresponds to detail category 71, see (EN1993-1-9 Table 8.2, detail no.9).

71	

2. **Point WB** represents the top of the stiffener web connected to the either the main diaphragms or the intermediate diaphragms. Detail category 80, see EN1993-1-9 Table 8.4, detail no.8.

80	ℓ≤50mm	
71	50<ℓ≤80mm	

5.1.5 Cross Girder Details

The fatigue analysis of the most critical locations in the cross girder is performed using the sectional forces of the global IBDAS model. For the top and bottom plate the fatigue details have been checked at plate connections.

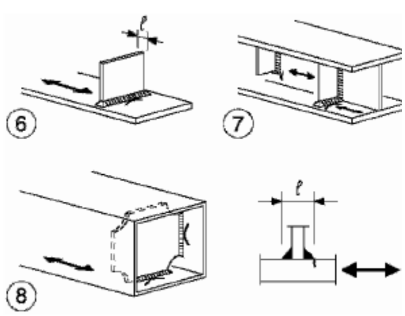
The fatigue assessment concerns the following construction details:

- Full penetration butt weld between top plate and bottom plate. The weld corresponds to detail category 112, see EN1993-1-9 Table 8.3, detail no.1.
- Fillet weld between the web and the top and bottom plate at mid span. The weld corresponds to detail category 100, see EN1993-1-9 Table 8.2, detail no.6.
- Transverse full penetration welds between the plates crossed by continuous longitudinal weld of stiffener. The weld corresponds to detail category 112, see EN1993-1-9 Table 8.3, detail no.2.
- Welded connection of the girder diaphragm to the top plate, bottom plate or the web. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.4, detail no.8.

In the following calculations the fatigue verification have only been carried out for the most onerous details, namely:

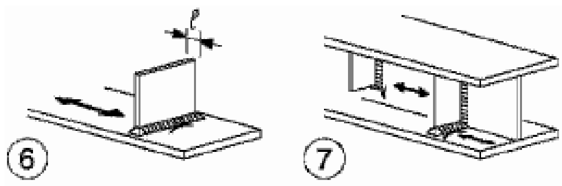
1. Welded connection of the girder diaphragm to the top plate, bottom plate or the web. The weld corresponds to detail category 80, see EN1993-1-9 Table 8.4, detail no.8).

80	ℓ≤50mm
71	50<ℓ≤80mm

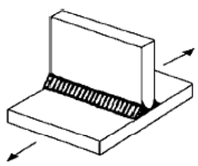


5.2 Weld Improvement

Verification of the road, rail and cross girders requires that some of the weld connections shall be improved by grinding the toe smooth. The connections of the girder diaphragm to the top plate, bottom plate or the web correspond to detail category 80 according to EN1993-1-9 Table 8.4, detail no.8.

80	ℓ≤50mm	

This weld can however be improved by grinding the toe smooth and thereby get an increased detail category of 100 according to "Recommendations for Fatigue Design of Welded Joints and Components", International Institute of Welding (IIW), doc. XIII-2151-07/XV-1254-07, May 2007.

511		Transverse non-load-carrying attachment, not thicker than main plate K-butt weld, toe ground Two sided fillets, toe ground Fillet weld(s), as welded thicker than main plate	 100 100- 80 71

6 Stress Concentration Factor (SCF)

6.1 Points investigated

The calculation of stress ranges used for the fatigue verification is based on the global IBDAS beam model. Further a semi local shell model has been developed in IBDAS in order to verify the stress flow over the span and therefore to evaluate the stress concentration occurring in the plate edges in correspondence of the diaphragms and the shear lag effects at the web of the cross girder. In this section the difference in stress ranges between using the semi-local shell model and the IBDAS global beam model is shown and stress concentration factor to be added to the fatigue stress are presented. The investigation involves span 12 which has been chosen to be representative of all main spans. Its results have been also been adopted for all the side spans where the global effects (given by the train located far away from the section investigated) may lead to lower stress concentrations.

Stress ranges are considered in the following locations of the two models, see Figure 6-1. Two points respectively at 165 mm from the plate edge in the loaded side and at 165 mm from the axis of the plate are distributed over the bottom plate at the following locations along the railway span 12: at mid span (s=-1425.0 m), at the third diaphragm from cross girder 13 (s=-1423.13 m) at the second diaphragm from cross girder 13 (s=-1419.38 m), at 1 m from the cross girder web (s=-1412.88 m), at 0.4 m from the cross girder web (s=-1412.28 m), at 0.2 m from the cross girder web (s=-1412.08 m) and right in correspondence of the cross girder web (s=-141.88 m). The point at 0.2 m has been also investigated at the transversal location of the trough splice approximately at 0.4 m from the bottom plate edge.

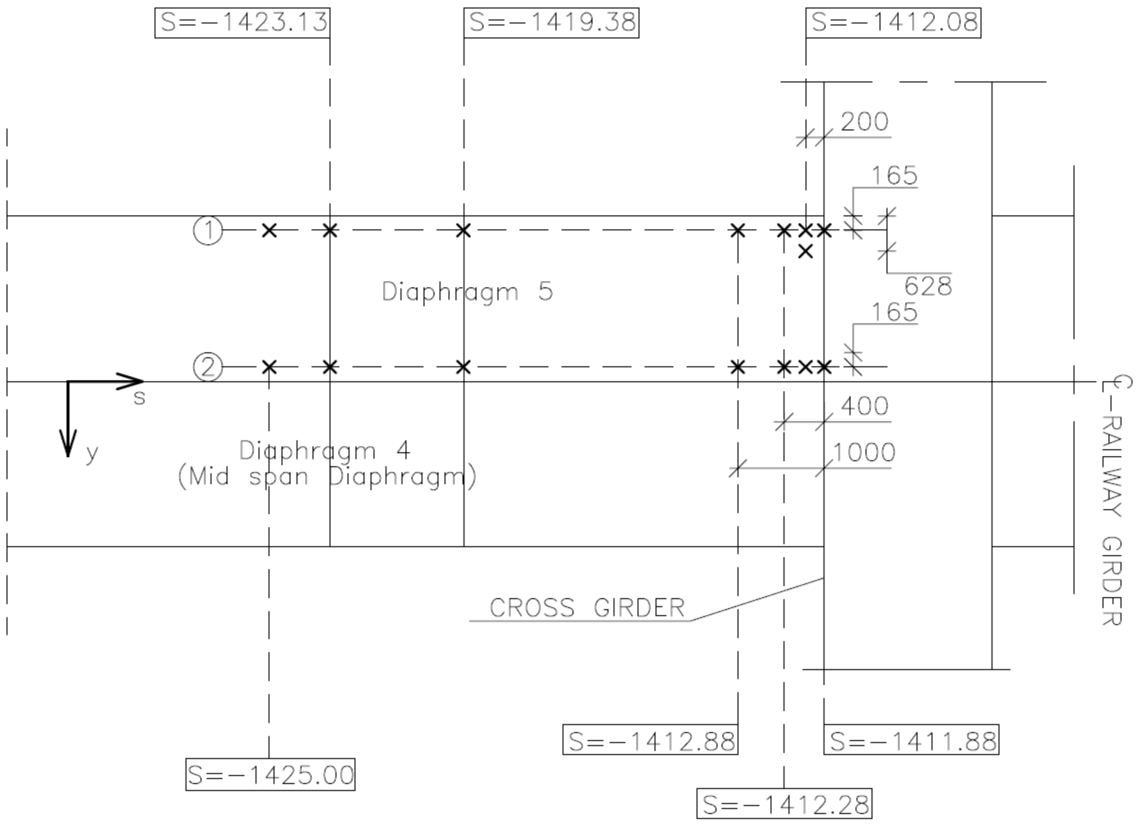


Figure 6-1 Span 12 bottom plate - Location of points selected for verification

In Figure 6-2 the Gauss point positions and the dimensions of a typical shell element are shown. The values in flush to the diaphragm have been extrapolated along the gauss points and therefore at 165 mm from the plate edge. The type of the shell elements are parabolic and further information can be found in the document "Semi-local IBDAS Model, Suspended Deck".

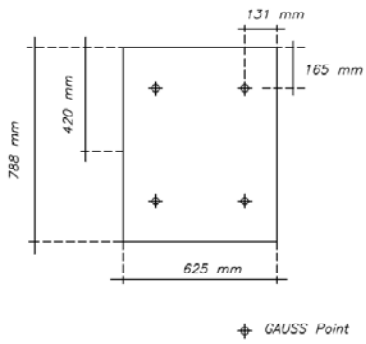


Figure 6-2 Mesh element geometry

6.2 Stress range determination and SCF results

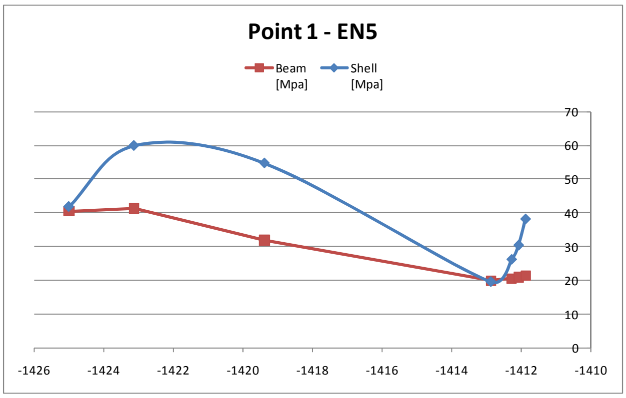
The stress ranges are calculated for the EN5 train passing in the track located in the negative part of the y axis namely along line 1 of Figure 6-1. Additionally the effects of LM2 vehicle 3 transiting in the roadway girder located in y negative has been investigated and added.

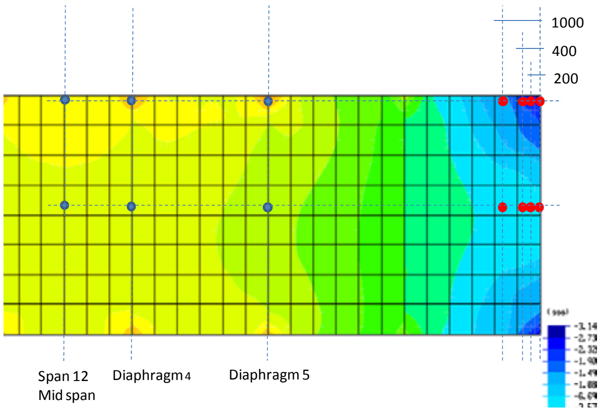
The stress ranges obtained running the EN5 train over the bridge using the IBDAS global beam model and the semi local shell model is presented in Table 6-1. The stress ranges are calculated for each of the considered points in both models. In the table the coMParison between the results of the two models are coMPared, and the difference in stress range is calculated. It can be seen that for the mid span the stress ranges are coMParable whereas at the diaphragm locations large variation in stress ranges occurs due a combination of detailing shear lag and torsion due to the unsymmetrical load condition. Since no stress concentrations are experienced using the beam model, a stress concentration factor has been applied for each location.

Table 6-1 Stress ranges calculated for EN5 train, IBDAS global beam model and sheel local model

Type	Shell [Mpa]	Beam [Mpa]	Deviation [%]
	EN5		
Location	s=-1425		
Point 1	41.9	40.5	**3.44%**
Point 2	39.4	40.4	**-2.55%**
Location	s=-1423.13		
Point 1	59.9	41.3	**45.05%**
Point 2	38.4	41.2	**-6.79%**
Location	s=-1419.38		
Point 1	54.7	31.9	**71.52%**
Point 2	33.8	31.8	**6.27%**
Location	s=-1412.88		
Point 1	19.7	20.0	**-1.43%**
Point 2	18.0	19.9	**-9.26%**
Location	s=-1412.28		
Point 1	26.3	20.6	**27.50%**
Point 2	16.8	20.5	**-18.05%**
Location	s=-1412.08		
Point 1	30.5	21.0	**45.37%**
Point 2	16.5	20.9	**-20.98%**
Location	s=-1411.88		
Point 1	38.2	21.3	**78.92%**
Point 2	16.3	21.2	**-23.45%**

Location	s=-1412.08		
Extra point	25.9	21.0	**23.38%**





As an example the stress history plot of the point along line one in correspondence of diaphragm 4 in the shell local model is given in Figure 6-3 and a stress range of approximately 60 MPa is shown.

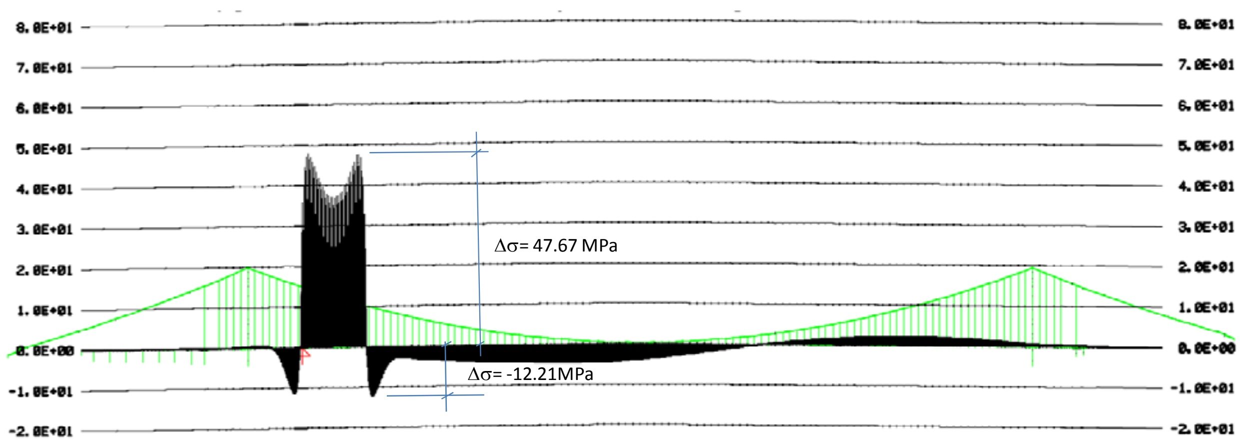


Figure 6-3 Stress time history plot for the point along line 1 on diaphragm 4 – EN5 train

As an example of the stress flow, the bottom plate of shell model for the load configuration maximizing the positive stress in correspondence of diaphragm 4 can be seen in Figure 6-4.

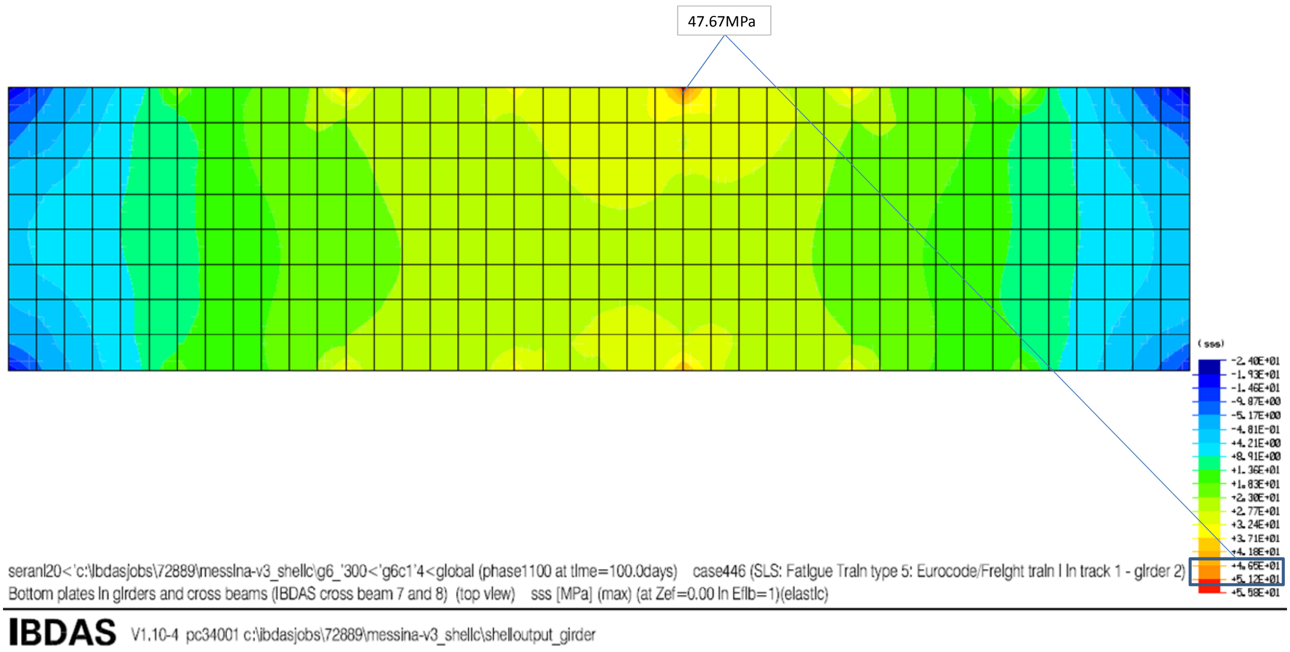
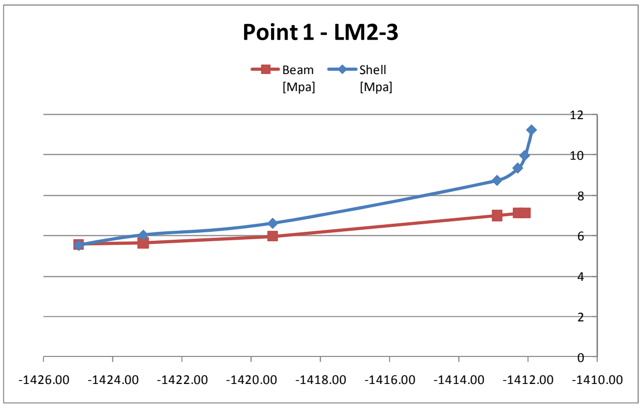


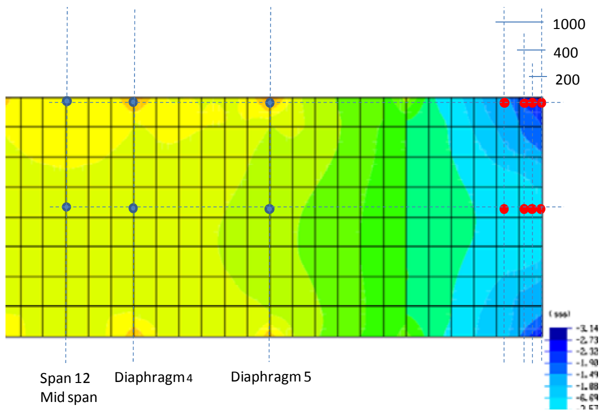
Figure 6-4 Stress flow (sss) in the bottom plates of the semi-local IBDAS model

In the same manner the results from the two models are compared considering LM2 vehicle 3, and the difference in stress range is calculated, see Table 6-2.

Table 6-2 Comparison of stress ranges between the beam and the shell model running LM2 vehicle 3. Railway girder bottom plate considered

	LM2		
Type	Shell [Mpa]	Beam [Mpa]	Deviation [%]
Location	s=-1425		
Point 1	5.5	5.6	**-0.87%**
Point 2	5.7	5.4	**6.29%**
Location	s=-1423.13		
Point 1	6.0	5.6	**6.87%**
Point 2	5.8	5.4	**5.72%**
Location	s=-1419.38		
Point 1	6.6	6.0	**10.65%**
Point 2	6.3	5.8	**9.19%**
Location	s=-1412.88		
Point 1	8.7	7.0	**24.68%**
Point 2	7.0	6.9	**1.37%**
Location	s=-1412.28		
Point 1	9.3	7.1	**31.11%**
Point 2	6.8	7.0	**-2.86%**
Location	s=-1412.08		
Point 1	10.0	7.2	**39.01%**
Point 2	6.8	7.1	**-4.08%**
Location	s=-1411.88		
Point 1	11.2	7.2	**55.72%**
Point 2	6.8	7.1	**-4.23%**





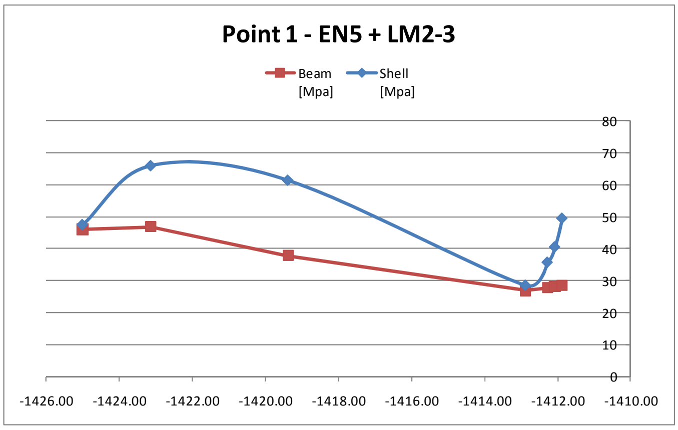
Location	s=-1412.08		
Point 1	9.2	7.2	**27.89%**

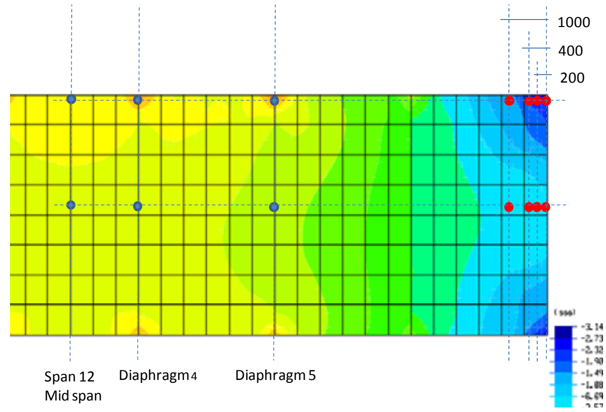
The stress ranges for the two load situations have been then summed up and the following total deviation is found, see Table 6-3.

Table 6-3 Comparison of stress ranges between the beam and the shell model considering LM2 vehicle 3 and EN5 train. Railway girder bottom plate considered

	EN5 + LM2		
Type	Shell [Mpa]	Beam [Mpa]	Deviation [%]
Location	s=-1425		
Point 1	47.4	46.1	**2.92%**
Point 2	45.1	45.8	**-1.51%**
Location	s=-1423.13		
Point 1	65.9	46.9	**40.47%**
Point 2	44.1	46.6	**-5.33%**
Location	s=-1419.38		
Point 1	61.3	37.9	**61.93%**
Point 2	40.1	37.6	**6.72%**
Location	s=-1412.88		
Point 1	28.4	27.0	**5.35%**
Point 2	25.0	26.8	**-6.52%**
Location	s=-1412.28		
Point 1	35.6	27.7	**28.43%**
Point 2	23.6	27.5	**-14.16%**
Location	s=-1412.08		
Point 1	40.4	28.1	**43.75%**
Point 2	23.3	27.9	**-16.69%**
Location	s=-1411.88		
Point 1	49.4	28.6	**73.06%**
Point 2	23.0	28.3	**-18.65%**

Location	s=-1412.08		
Point 1	35.0	28.1	**24.53%**





Based on the results shown the charts representing the actual stress concentration factors at the various locations investigated are shown in Figure 6-5 where the detail next to the web and those next to the mid span are shown.

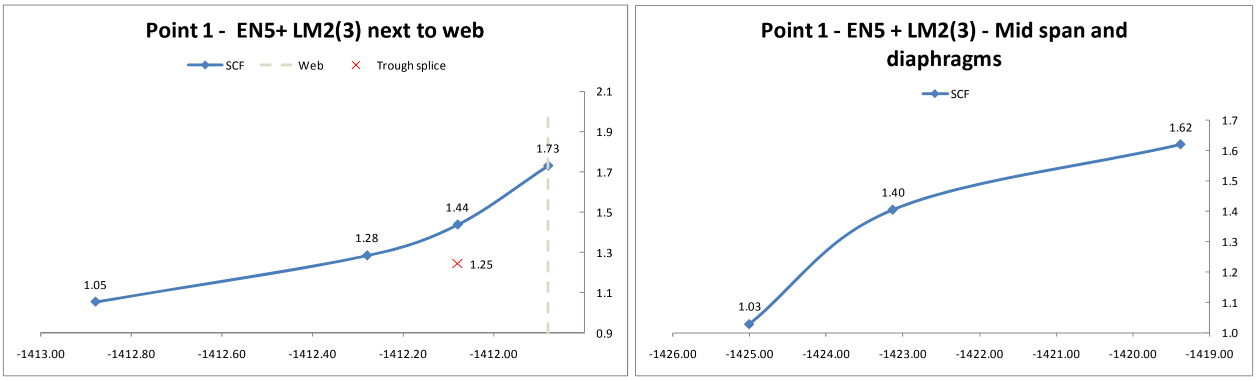


Figure 6-5 Stress concentration factors (SCF)

In the charts above it can be noticed that the trough splice detail has a SCF=1.25. This has been worked out as an average between the results in the upper gauss point and the lower one in order to match the trough splice location. The detail of the location of the trough splice in relation to the mesh element as well as the mesh dimension can be seen in the figure below.

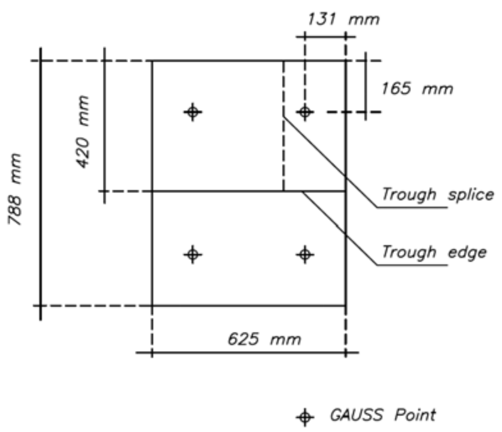


Figure 6-6 Shell elements, Gauss points location and their position relative to the trough splice

Further adjustments to the SCF have been performed in order to account for the position where the fatigue stresses are extrapolated in the global beam model. The fatigue verification of the various spans has been carried out using the stresses in the mid span and at 0.4 m from the cross girder web. This implies that the shell model stresses must be scaled against the beam stress at the said locations. Moreover the details where the stress concentration occurs are the ones in correspondence of the diaphragms next to the mid span and at the cross girder web. The structural details where the stress concentration factor has been taken into account are listed below:

- Bottom plate to diaphragm weld at the section in correspondence of the diaphragm next to the girder mid span
- Bottom plate to diaphragm weld at the section at the cross girder web
- Trough splice next to the plate edge at the shop joint

In Figure 6-7 the SCF scaled against the global beam stresses used in the fatigue verification (at the relevant location) are shown.

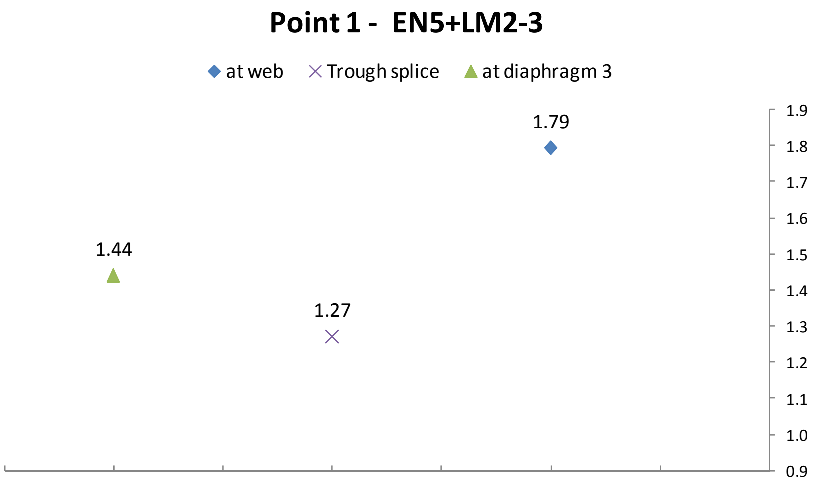


Figure 6-7 Stress concentration factors (SCF) at the location of the fatigue verification

Furthermore the SCF shown above will be lowered by the introduction of a local strengthening at the kink between the bottom plate and the inclined web.

For those girders where the strengthening at the cross girder is not necessary the trough splice detail presents utilization ratios which are always lower than the web to bottom plate detail throughout the bridge as the latter detail has been kept without weld improvement and therefore as class 80 MPa. Furthermore as it can be seen in Figure 6-13 and Figure 6-15 in section 6.3 where the strengthening is required the SCF at the trough splice is lower than one. Therefore in the chapter relative to the railway verification the trough splice details are omitted. The spans where local strengthening is not necessary have been found out to be spans 4 to 6, all the spans between 12 and 107 included, 113, 114 and 115. For these spans fatigue verification has been performed increasing the stress values by 1.79 at the cross girder web and 1.27 at the trough splice.

In Appendix D the stress history plots and the bottom plate contour plots of longitudinal stresses for the load condition maximizing and minimizing the stress in the considered point are presented. Results are presented for those locations which affect the railway girder fatigue verification as shown in Figure 6-8.

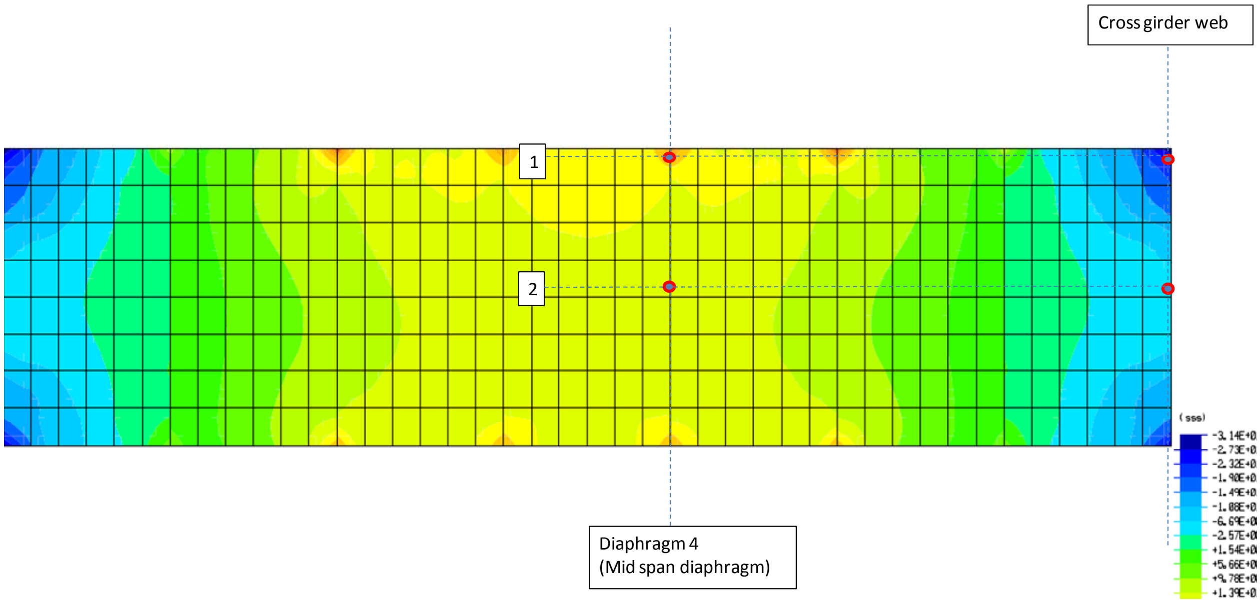


Figure 6-8 Locations where stress history plots and stress contour are presented in Appendix D

6.3 Determination of the strengthening thickness – ROBOT model

In order to fulfil the fatigue verification including the stress concentration a local strengthening has been implemented in the girder geometry. This comprises of a local thickening of a portion of bottom plate and inclined web for a width in longitudinal direction of 80 mm on each side of the diaphragm. The strengthening occurs in correspondence of the mid span diaphragms as well as at the cross girder web. The thickening considered varies between the main span girders and the side span and in general terms a thickening of 5 mm for bottom plates of 10 mm (which include the girder types CF1 and CF2) and 6 mm for bottom plates of 20 mm has been applied. The influence in the stress level due to the introduction of the local strengthening has been accounted for by a detail factor which has been determined by means of a ROBOT model that can be seen in Figure 6-9. The model comprises of 4 diaphragms and it takes account of global effects with boundary conditions applied to beam elements placed at the sides of the shell elements and connected to them by rigid links. The model is representative of span 12 and has been developed to compare the stress concentrations for a load situation where the EN5 train locomotive is positioned at s=-1300. The aim of the model is to determine the stress variation from the unreinforced cross section to the strengthened one by means of a detailed model with fine meshing. As for the IBDAS semi local shell model also for the ROBOT model the stress points have been located right on the diaphragm/web and 165 mm away from the plate edge in the loaded side.

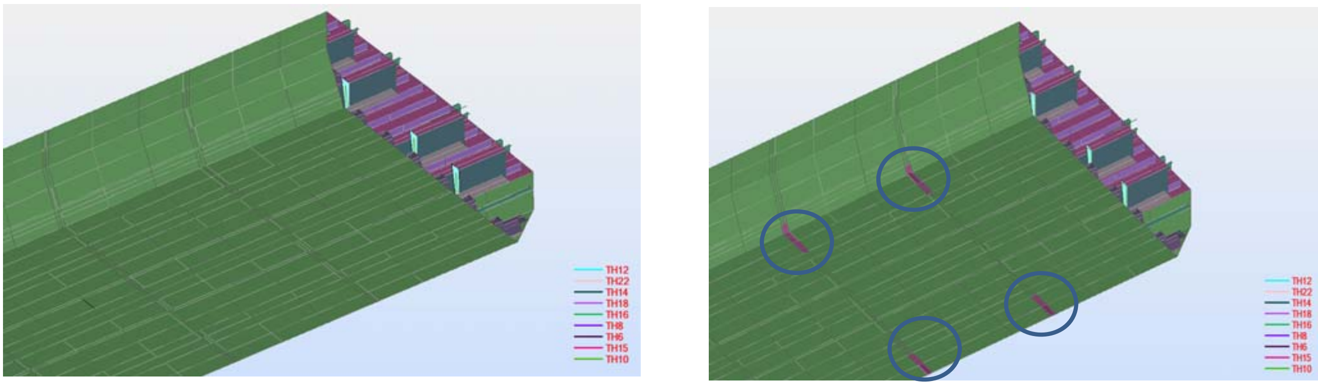


Figure 6-9 Robot model of span 12 – The figure to the right shows the locations of the strengthening

The longitudinal stress distribution used to determine the stress concentration with the reinforcement has been obtained by panel cuts as shown in Figure 6-10.

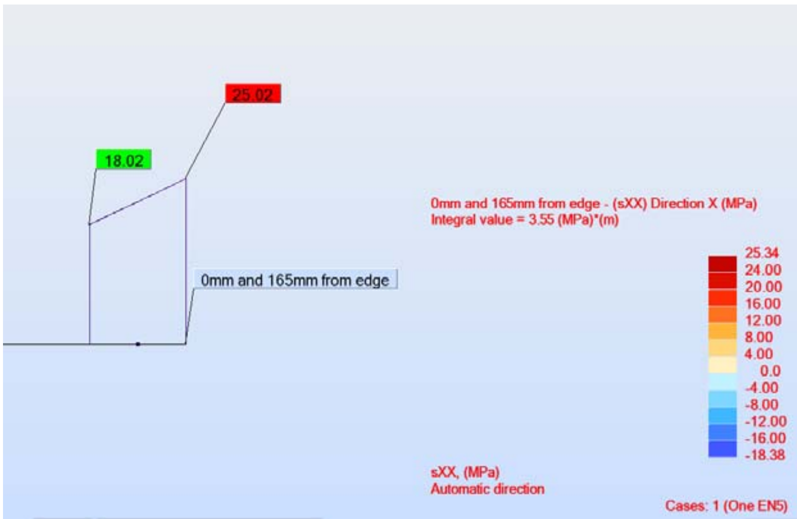


Figure 6-10 Stress distribution within the strengthening in the bottom plate – strengthened geometry

As seen in figure above the stress at 165mm from the edge is σ_{reinf} = 18.02MPa. Stresses are shown for the middle element layer and are presented as smoothed within the panel. To determine the detail factor for this reinforcement, the stress at the same locations is found for the unreinforced geometry. The longitudinal stresses distribution used to determine the stress concentration in the reference condition is shown in the figure below.

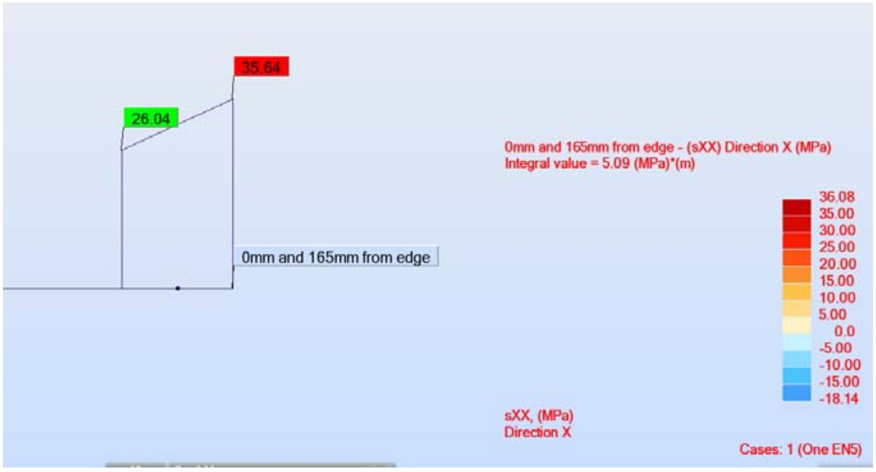


Figure 6-11 Stress distribution within the strengthening in the bottom plate – reference geometry

As seen in the figure above the stress 165mm from the edge is σ_{ref} = 26.04MPa. The detail factor is hereby determined to:

$$DF = \frac{\sigma_{ref}}{\sigma_{reinf}} = \frac{26.04}{18.02} = 1.45$$

In the same manner the assessment has been performed also for other thickening namely for 2 and 8 mm. The results can be seen in Figure 6-12.

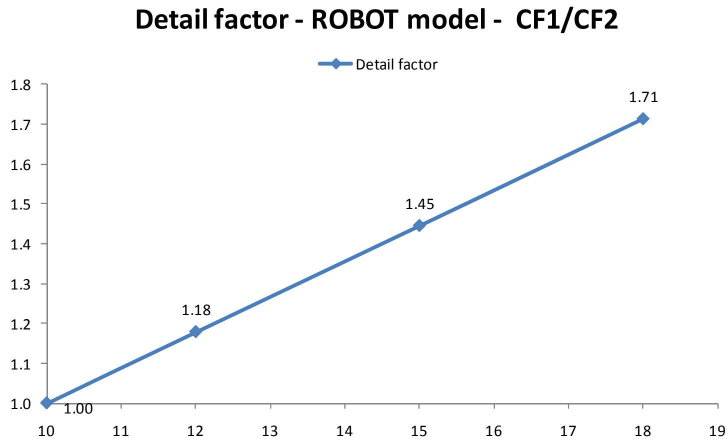


Figure 6-12 Detail factor to thickness relation. The reference condition is a 10 mm bottom plate as for CF1/CF2

Adopting 5 mm thickening of a 10 mm bottom plate the following SCF have been derived taking the SCF values from Figure 6-7 divided by the detail factor shown in Figure 6-12.

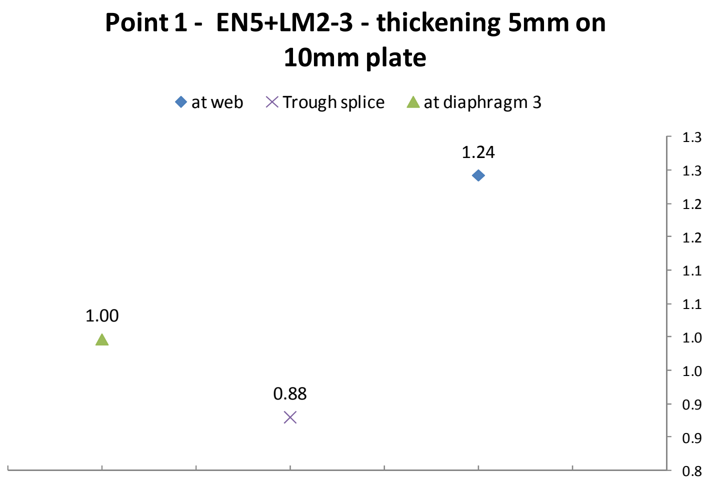


Figure 6-13 Stress concentration factor SCF used for the CF1 and CF2 girders

Similarly the same evaluation has been done for the bottom plate of 20 mm representative of the railway girder type CF6 whose utilisation ratio was the highest in the side span. The relation between the thickening and the detail factor can be found in the figure below.

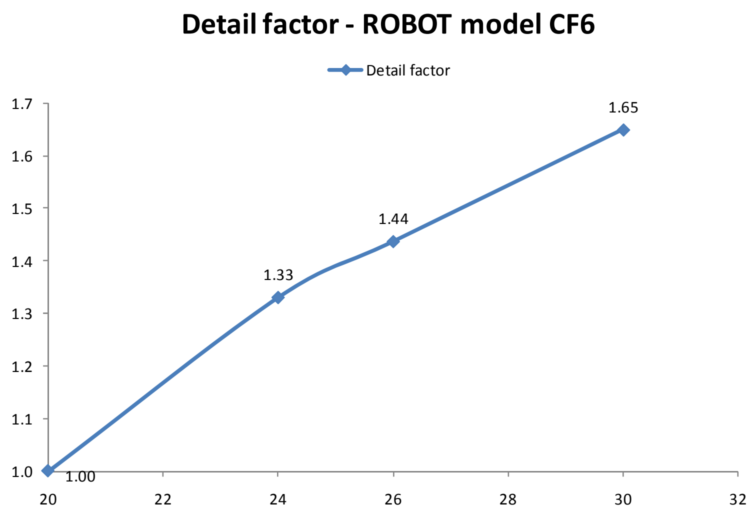


Figure 6-14 Detail factor to thickness relation The reference condition is a 10 mm bottom plate as for CF6

Adopting 6 mm thickening of a 20 mm bottom plate the following SCF have been derived taking the SCF values from Figure 6-7 divided by the detail factor shown in Figure 6-14.

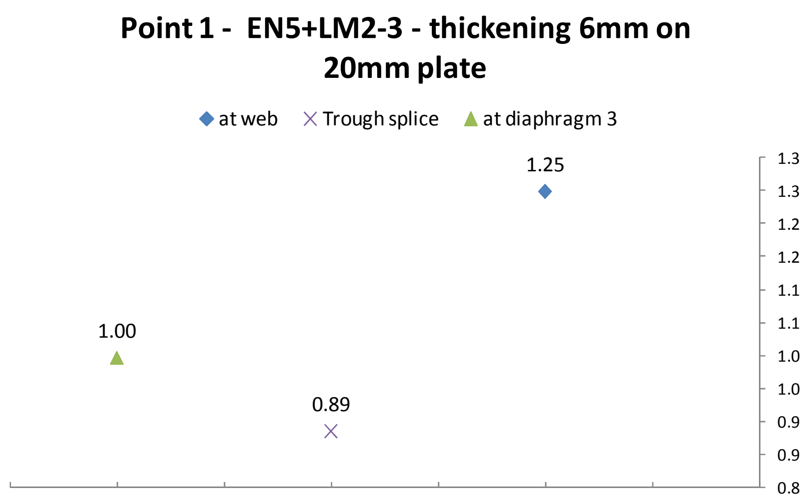


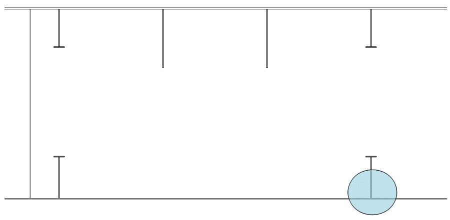
Figure 6-15 Stress concentration factor SCF used for the CF6 girder

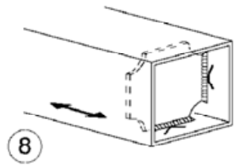
The spans where local strengthening is necessary the fatigue verification has been performed increasing the stress values by 1.25 only at the cross girder web to bottom plate connection as the other details presents SCF's lower or equal to one. No factor has been applied to the 60 m spans as the SCF decreases with the increase of the plate thickness as well as the safety is guaranteed by the high margin of the utilisation ratios: at the shop joint it is equal to 0.61 with class improved to 100 MPa giving allowance for a SCF=1/0.61=1.63 and similarly at the mid span diaphragm the allowance becomes 1/0.67=1.49 yet considering the improvement of the weld.

6.4 Conclusions

Through the FE analysis of the railway box girder it has been found which stress concentration factors are to be applied to the stresses for the fatigue verification, which is based of the IBDAS beam model. In the following a description of the details affected by the SCF is presented.

BOTTOM PLATE TO DIAPHRAGM WELD – LOCATION 2

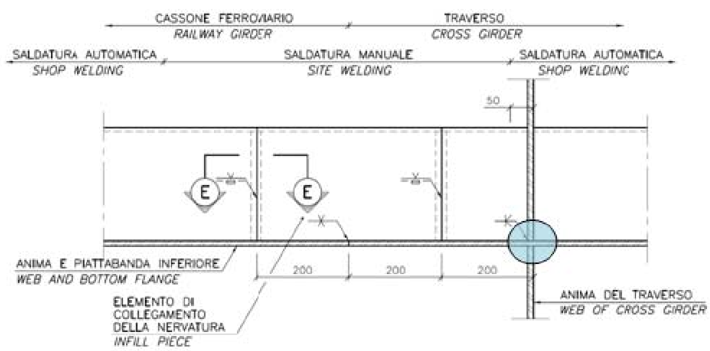


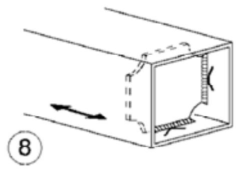


$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

SHOP JOINT – CROSS GIRDER WEB TO BOTTOM PLATE WELD - LOCATION 3





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

The SCF of first detail “Bottom plate to diaphragm weld – location 2” equal to 1.44 has led to a local thickening of 5-6 mm along the whole bridge at exception of the 60 m spans. As a consequence the SCF of the same detail has lowered to 1.00.

The second and the third details, with a SCF of 1.27 and 1.79 respectively, do not require any improvement in the main span (12 to 107 included) as well as in the tower area (spans 4, 5, 6, 113, 114 and 115).

For all the other spans a local improvement has been developed leading to a reduction of the SCF to 0.89 - 1.00 for the trough splice detail and 1.24-1.25 for the cross girder web to bottom plate weld.

7 Investigation of span 12 for a fixed EN5 position

A fixed load condition aiming to determine the bending moment distribution and the stress flow of the railway girder plates has been investigated and a sketch of the load position can be found in Figure 7-1. The load is defined by the locomotive of the EN5 train located at s= -1300m.

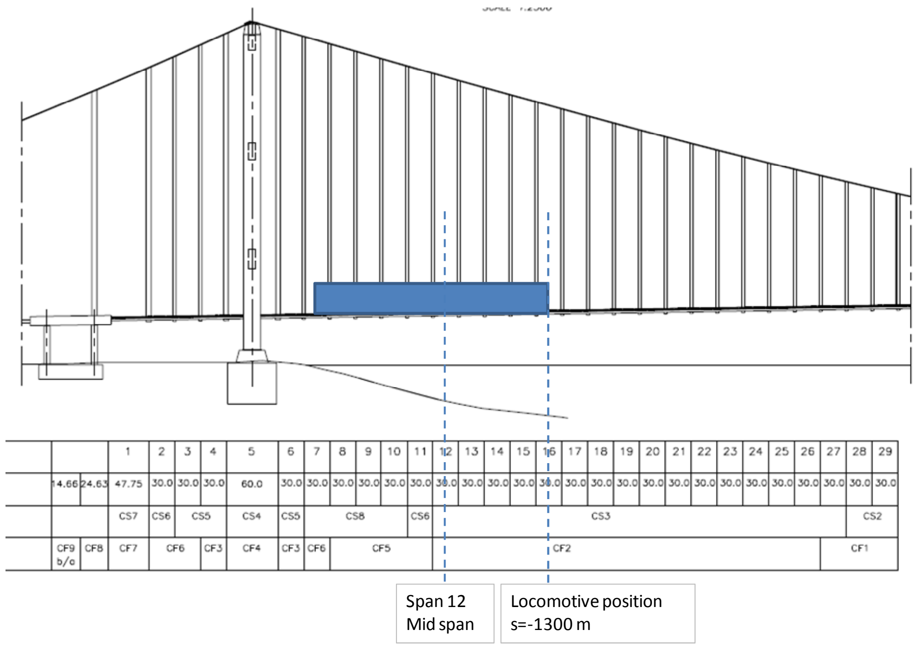


Figure 7-1 My Fixed load condition – Position of the train

7.1 Bending moment My distribution

The bending moment diagram My has been generated for the given load configuration and two plots are presented in the following. Figure 7-2 shows the bending moment along the relevant part of the bridge and the absolute extremes are My(-)= -22.2 MN*m and My(+)= 8.4 MN*m. Figure 7-3 shows the bending moment in span 12 with vertical dotted line showing the location of the cross girder web: the local extremes can be found as My(-)= -4.1MN*m My(+)= -4.5 MN*m.

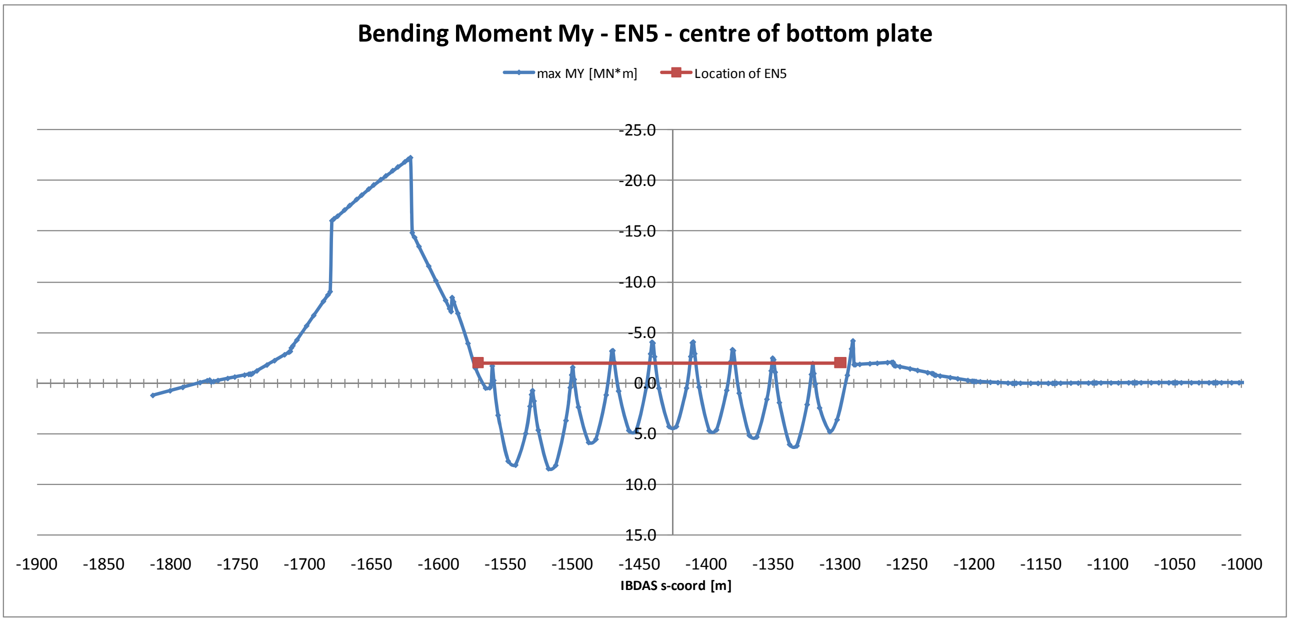


Figure 7-2 My in the bridge for the fixed position of the train

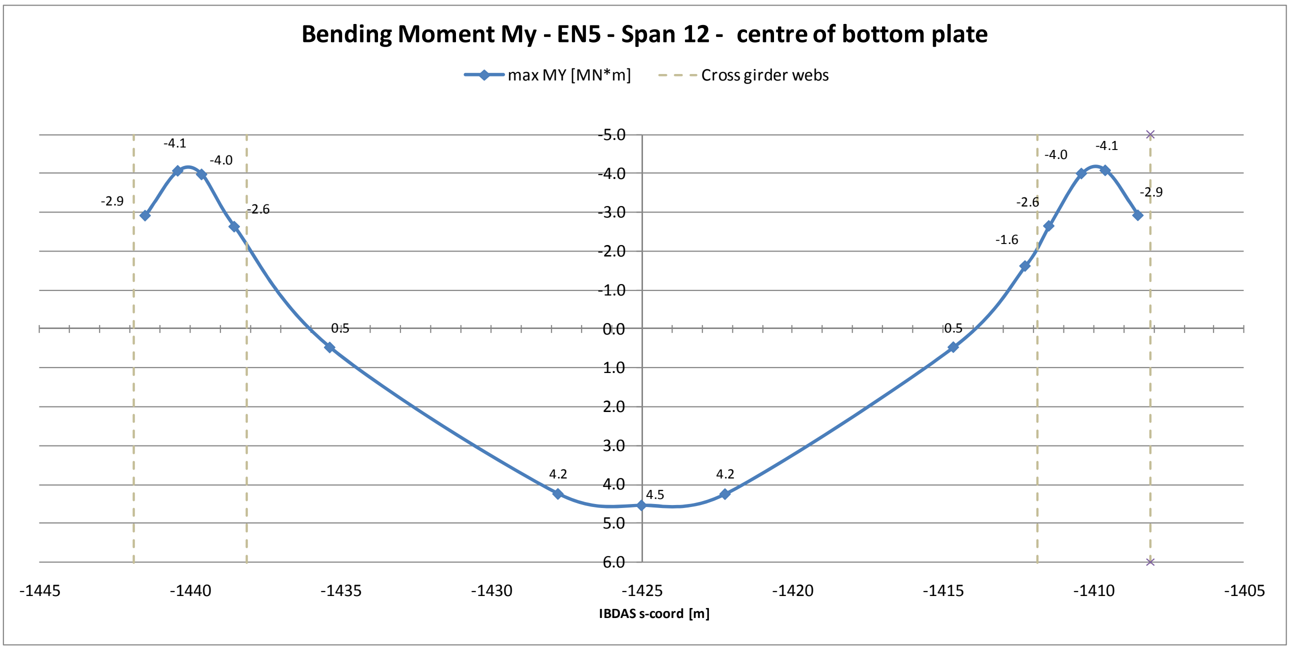


Figure 7-3 My in railway girder span 12 for the fixed position of the train

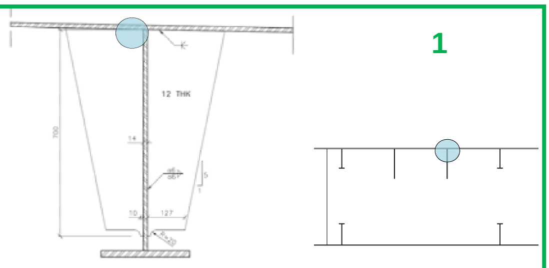
The load condition has been investigated also by means of the local shell model and a full description of the stress flow for the main structural elements can be seen in Appendix E.

8 Presentation of Results

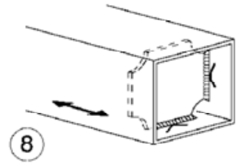
The fatigue stress-history plots of nominal stresses are carried out by the global IBDAS model at specific locations along the bridge considering each fatigue train running in one track and the roadway fatigue loads running on the slow lane of the roadway girder.

The results of the fatigue verification are presented for both the “unlimited life method” and the “damage accumulation method”. Aiming to explain their contents, a sample result of the connection of the intermediate diaphragm to top plate of the railway girder type CF1 in span 39 is shown in the following.

1



2



$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

3

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.4	1.056	8.3	1.181	2.3	1.35	**51.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.868**

4

DAMAGE ACCUMULATION METHOD

5 7

N/mm^2	global	local
EN 1	17.6	5.9
EN 2	12.9	6.0
EN 3	11.9	5.2
EN 4	10.8	4.0
EN 5	24.4	8.3
EN 6	18.4	7.3
EN 7	19.4	6.8
EN 8	18.5	6.6
LM3	1.8	

6

8

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.118**		
train on track 2 + LM3 =	**0.009**		
local effects =	**0.000**		
train meetings + LM3 =	**0.154**		
tot =	**0.282**	<	**0.950**

9

10

A brief explanation of each column is given in the following:

1. Figure showing the verification detail
2. Construction detail in the top and the fatigue strengths underneath: reference value of the fatigue strength $\Delta\sigma_C$, fatigue limit for constant amplitude stress range $\Delta\sigma_D$ and the cut-off limit $\Delta\sigma_L$
3. Stress range contributions for the unlimited life verification divided in roadway and railway effects including global, local dynamic factors and the partial factor for fatigue strength γ_{MF}:

   $\Delta\sigma = (\Delta\sigma_{LM2\ ,glob} + \Delta\sigma_{EN5,glob}{}^{*}\ \varphi_{glob} + \Delta\sigma_{EN5,loc}{}^{*}\ \varphi_{loc})\ ^{*}\ \gamma_{MF} < \Delta\sigma_D$
4. Utilisation ratio calculated as $\Delta\sigma_{x\ tot}$ / $\Delta\sigma_D$
5. Maximum stress range values of the trains from the IBDAS global model at the location where the detail is verified
6. Maximum stress range values of the fatigue load model 3 from the IBDAS global model at the location where the detail is verified
7. Maximum stress range values from the IBDAS local model of the T-stiffener at the location where the detail is verified
8. Train meeting percentage according to the Design Basis
9. Contributions to the damage by the various loads
10. Miner’s sum limited to 0,95 to include wind effects

9 Roadway Girder – Fatigue Verification

Construction details have been checked for the following roadway girders with the corresponding s-coordinates.

Table 9-1 Selected girders for verification and associated s-coordinates

		s-coordinate	
Girder type	**Span no.**	**mid span**	**end**
CS1	39	615.0	627.6
CS2	28	945.0	957.6
CS3	19	1215.0	1202.3
CS3	12	1425.0	1412.3
CS6	11	1455.0	1467.5
CS8	10	1485.0	1497.5
CS8	9	1515.0	1527.5
CS8	8	1545.0	1557.6
CS8	7	1575.0	1587.6
CS5	6	1605.0	1616.5
CS4	5	1650.0	
CS5	4	1695.0	1707.6
CS6	3	1725.0	1737.6
CS6	2	1755.0	1766.5
CS7	1	1795.4	1815.9

The simultaneous applications of roadway and railway loads have also been considered when the detail is loaded by two trains meeting on the bridge. With the aim of giving a general overview of the fatigue calculations the results are summarised in Table 9-2. References to sections no. are given for the fatigue details found to me most critical. The numbering of the spans is shown on Figure 2-11 and the analysed locations are shown on Figure 2-8.

The Points C, A, E are shown on Figure 9-1.

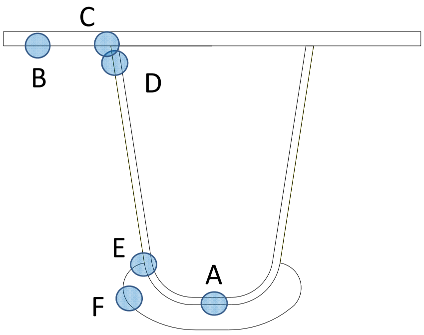


Figure 9-1 Roadway orthotropic deck details

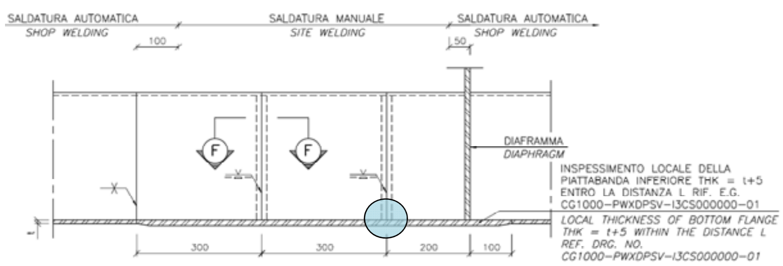
Table 9-2 Summarisation of fatigue verification, roadway girder

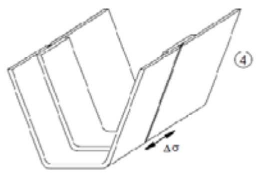
		Bottom plate			Top plate		
	detail	Erection joint	At diaphragm	Shop joint	Point C	Point A	Point E
Main - spans 39, 28, 19, 12, 11, 10, 9, 8, 7 and 6	location	1	2	3	1 & 2	3	1 & 2
	span / ref	11/7.5.1.1	12/7.4.1.2	12/7.4.1.3	09/7.7.2.2	09/7.7.2.11	09/7.7.2.6
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.986	0.970	0.994	0.777	0.772	0.826
	$\Sigma n_i/N_i + 0.05$	0.420	0.417	0.526	0.065	0.188	0.096
tower - span 5	location	NA	2	NA	NA	NA	NA
	ref		7.11				
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$		0.572				
	$\Sigma n_i/N_i + 0.05$		0.050				
side - spans 1, 2 , 3 and 4	location	1	2	3	3	3	3
	span / ref	02/7.14.1.1	04/7.12.1.2	02/7.14.1.3	02/7.14.2.8	01\7.15.2.11	01/7.15.2.12
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.974	0.959	0.998	0.812	0.792	0.841
	$\Sigma n_i/N_i + 0.05$	0.342	0.317	0.403	0.073	0.194	0.100

9.1 Span 39 – Main span

9.1.1 Bottom plate (Span 39)

9.1.1.1 Erection joint – location 1 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	16.8	1.056	12.9	1.35	**41.4**	<	**52.3**

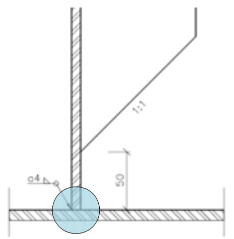
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.791**

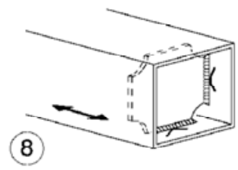
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	9.4
EN 2	6.6
EN 3	6.4
EN 4	5.8
EN 5	16.8
EN 6	11.0
EN 7	12.0
EN 8	11.5
LM3	9.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.038**		
train on track 2 + LM3 =	**0.038**		
train on track 1 + train on track 2 + LM3 =	**0.053**		
tot =	**0.128**	<	**0.950**

9.1.1.2 Bottom plate to diaphragm weld – location 2 (Span 39)





$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.1	1.056	18.4	1.35	**59.2**	<	**73.7**

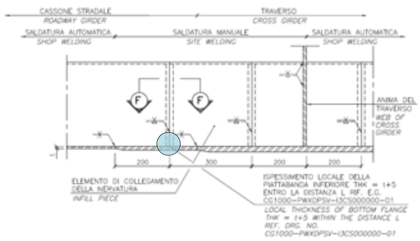
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.804**

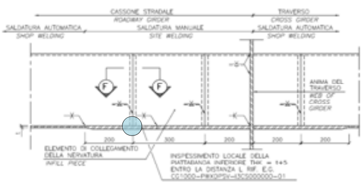
DAMAGE ACCUMULATION METHOD

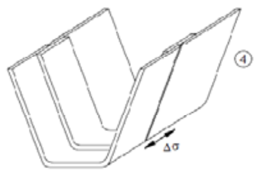
	N/mm^2
EN 1	13.4
EN 2	9.5
EN 3	9.2
EN 4	8.3
EN 5	24.1
EN 6	15.7
EN 7	17.2
EN 8	16.5
LM3	14.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.041**		
train on track 2 + LM3 =	**0.041**		
train on track 1 + train on track 2 + LM3 =	**0.057**		
tot =	**0.138**	<	**0.950**

9.1.1.3 Shop joint – location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	18.8	1.056	9.0	1.35	**38.9**	<	**52.3**

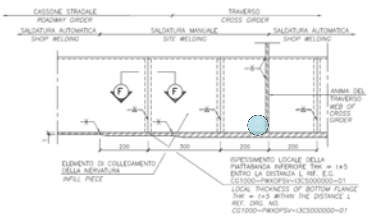
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.744**

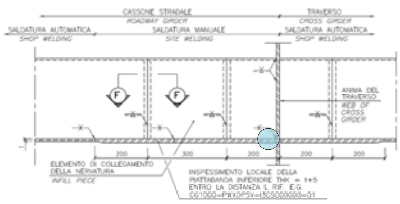
DAMAGE ACCUMULATION METHOD

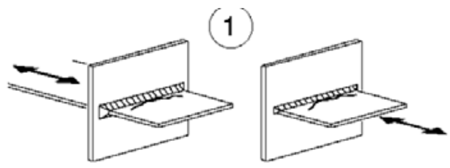
	N/mm^2
EN 1	11.5
EN 2	8.2
EN 3	8.0
EN 4	7.1
EN 5	18.8
EN 6	13.2
EN 7	13.9
EN 8	13.4
LM3	7.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.025**		
train on track 2 + LM3 =	**0.025**		
train on track 1 + train on track 2 + LM3 =	**0.063**		
tot =	**0.113**	<	**0.950**

9.1.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	17.6	1.056	8.4	1.35	**36.3**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.616**

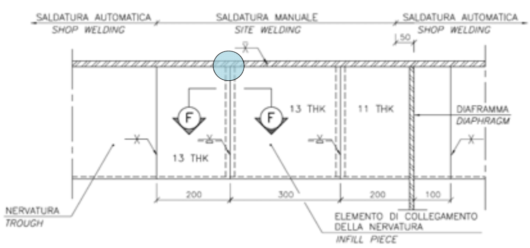
DAMAGE ACCUMULATION METHOD

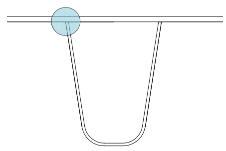
	N/mm^2
EN 1	10.8
EN 2	7.6
EN 3	7.5
EN 4	6.7
EN 5	17.6
EN 6	12.3
EN 7	13.0
EN 8	12.5
LM3	6.5

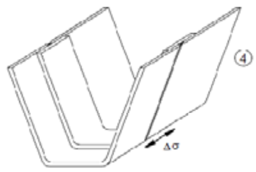
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.006**		
train on track 2 + LM3 =	**0.006**		
train on track 1 + train on track 2 + LM3 =	**0.025**		
tot =	**0.037**	<	**0.950**

9.1.2 Top plate (Span 39)

9.1.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.5	1.056	5.9	10.6	1.35	**34.4**	<	**52.3**

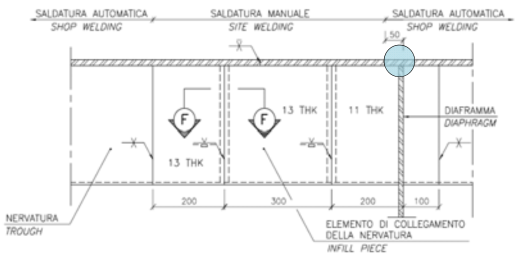
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.657**

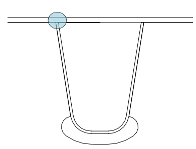
DAMAGE ACCUMULATION METHOD

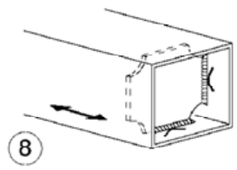
	N/mm^2
EN 1	4.2
EN 2	3.0
EN 3	3.3
EN 4	2.7
EN 5	8.5
EN 6	5.3
EN 7	5.5
EN 8	5.3
LM3	4.5
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.1.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.5	1.056	5.9	16.8	1.35	**42.7**	<	**58.9**

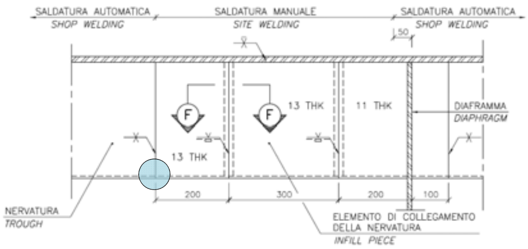
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.724**

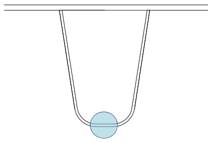
DAMAGE ACCUMULATION METHOD

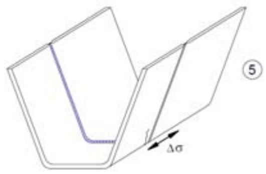
	N/mm^2
EN 1	4.2
EN 2	3.0
EN 3	3.3
EN 4	2.7
EN 5	8.5
EN 6	5.3
EN 7	5.5
EN 8	5.3
LM3	4.5
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.005**		
train on track 2 + LM3 $_{global + local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.010**	<	0.950

9.1.2.3 Point A - Erection joint at 700m from diaphragm - 9to13mm – location 1 (Span 39)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.0	41.2	1.15	**50.2**	<	**82.5**

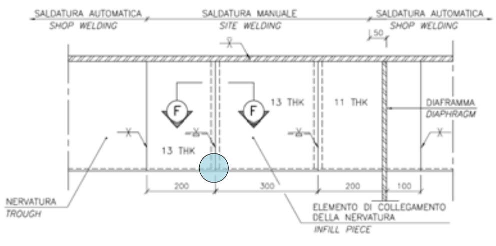
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.608**

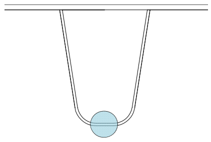
DAMAGE ACCUMULATION METHOD

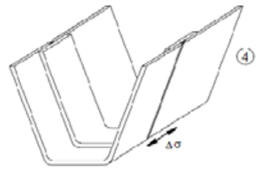
	N/mm^2
EN 1	0.7
EN 2	0.5
EN 3	0.6
EN 4	0.5
EN 5	1.4
EN 6	0.9
EN 7	0.9
EN 8	0.9
LM3	0.8
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.051**		
train on track 2 + LM3 $_{global+local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.102**	<	**0.950**

9.1.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.0	27.4	1.15	**34.3**	<	**52.3**

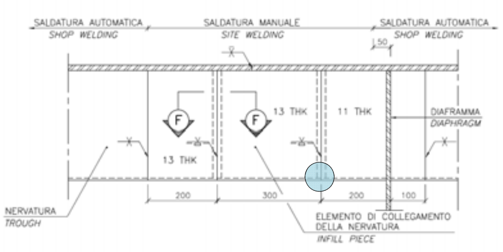
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.656**

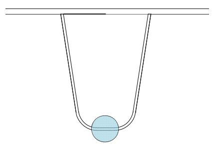
DAMAGE ACCUMULATION METHOD

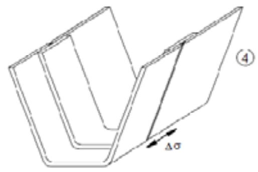
	N/mm^2
EN 1	0.7
EN 2	0.5
EN 3	0.6
EN 4	0.4
EN 5	1.4
EN 6	0.9
EN 7	0.9
EN 8	0.9
LM3	0.8
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.048**		
train on track 2 + LM3 $_{global+local}$ =	**0.048**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.096**	<	**0.950**

9.1.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.0	28.7	1.15	**35.8**	<	**52.3**

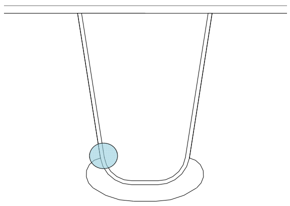
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.685**

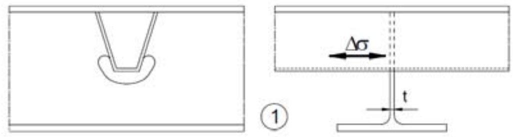
Damage accumulation method

	N/mm^2
EN 1	0.7
EN 2	0.5
EN 3	0.6
EN 4	0.4
EN 5	1.4
EN 6	0.9
EN 7	0.9
EN 8	0.9
LM3	0.8
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.051**		
train on track 2 + LM3 $_{global+local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.102**	<	**0.950**

9.1.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.1	32.7	1.15	**41.0**	<	**52.3**

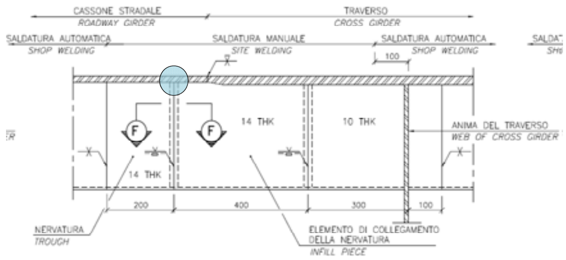
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.783**

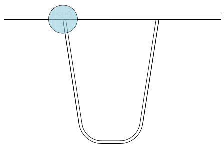
DAMAGE ACCUMULATION METHOD

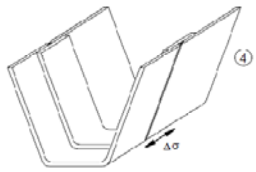
	N/mm²
EN 1	0.8
EN 2	0.6
EN 3	0.7
EN 4	0.5
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.0
LM3	0.9
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.1.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.9	1.056	3.8	10.5	1.35	**32.0**	<	**52.3**

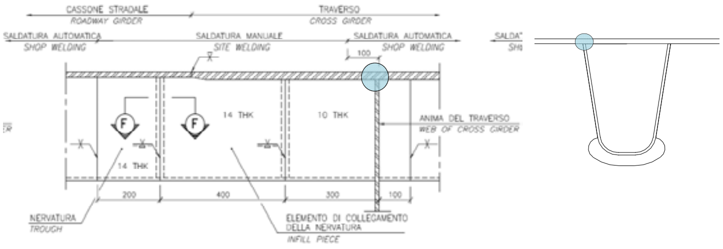
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.611**

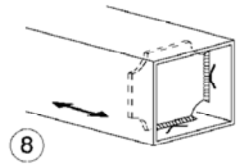
Damage Accumulation Method

	N/mm^2
EN 1	5.0
EN 2	3.6
EN 3	3.7
EN 4	3.1
EN 5	8.9
EN 6	6.0
EN 7	6.1
EN 8	5.9
LM3	3.0
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.1.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.9	1.056	3.8	16.8	1.35	**40.4**	<	**58.9**

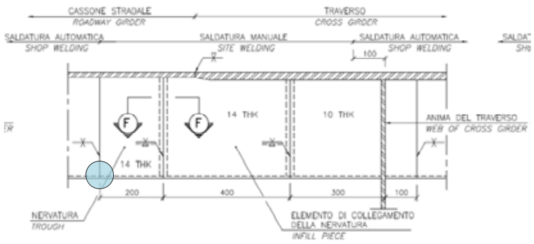
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.686**

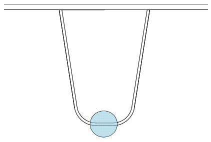
DAMAGE ACCUMULATION METHOD

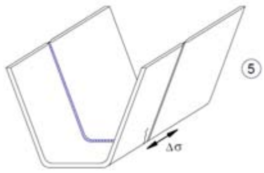
	N/mm^2
EN 1	5.0
EN 2	3.6
EN 3	3.7
EN 4	3.1
EN 5	8.9
EN 6	6.0
EN 7	6.1
EN 8	5.9
LM3	3.0
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.1.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 39)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	0.6	40.6	1.15	**49.3**	<	**82.5**

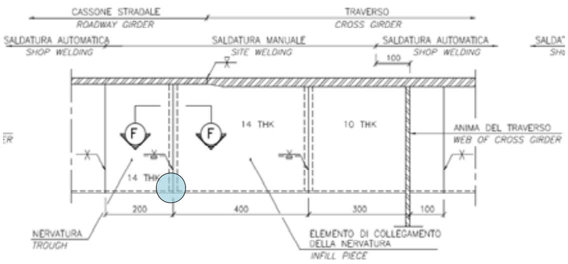
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.597**

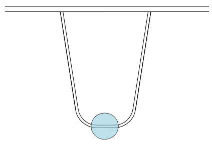
DAMAGE ACCUMULATION METHOD

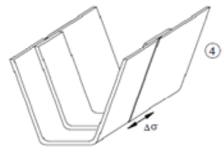
	N/mm^2
EN 1	0.8
EN 2	0.6
EN 3	0.6
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	1.0
LM3	0.5
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.049**		
train on track 2 + LM3 $_{global+local}$ =	**0.049**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.098**	<	**0.950**

9.1.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	0.6	26.8	1.15	**33.4**	<	**52.3**

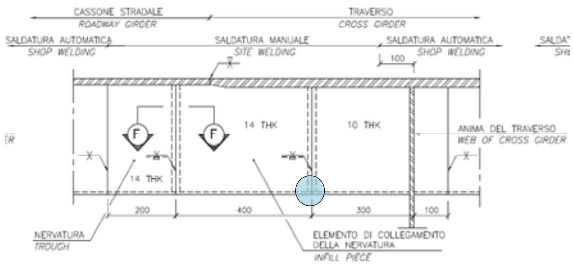
$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.638**

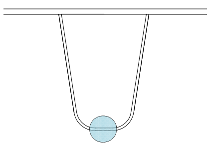
DAMAGE ACCUMULATION METHOD

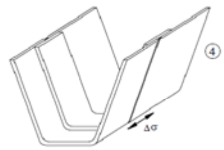
	N/mm²
EN 1	0.8
EN 2	0.6
EN 3	0.6
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	1.0
LM3	0.5
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.055**		
train on track 2 + LM3 $_{global + local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.1.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	0.6	31.1	1.15	**38.3**	<	**52.3**

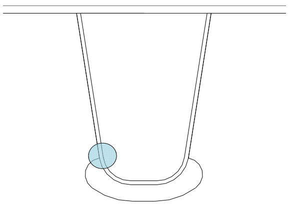
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.732**

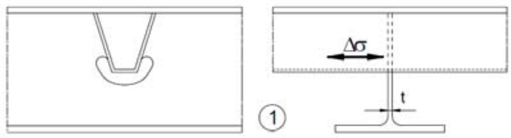
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.8
EN 2	0.6
EN 3	0.6
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	1.0
LM3	0.5
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.055**		
train on track 2 + LM3 $_{global+local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.1.2.12 Point E – trough to diaphragm weld – location 3 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	0.7	32.7	1.15	**40.6**	<	**52.3**

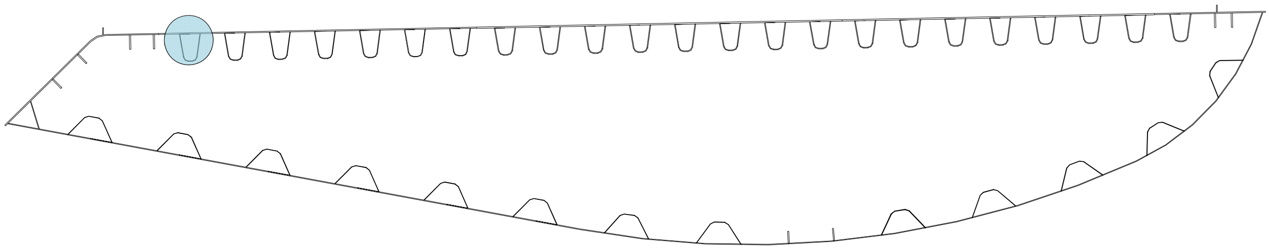
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.776**

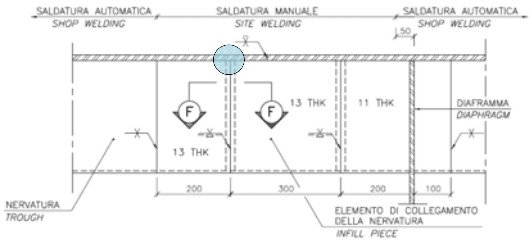
DAMAGE ACCUMULATION METHOD

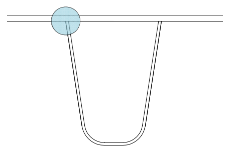
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.6
LM3 local	21.8

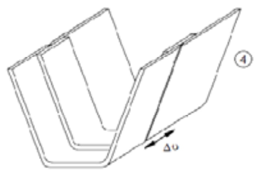
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.1.2.13 Point C – Erection joint – location 1 – only global actions (Span 39)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.5	1.056	5.9	0.0	1.35	**20.0**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.383**

DAMAGE ACCUMULATION METHOD

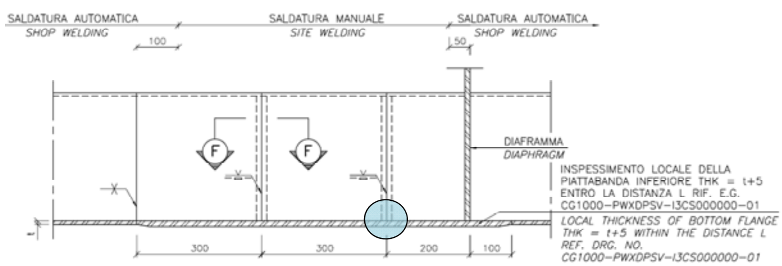
	N/mm^2
EN 1	4.2
EN 2	3.0
EN 3	3.3
EN 4	2.7
EN 5	8.5
EN 6	5.3
EN 7	5.5
EN 8	5.3
LM3	4.5
LM3 local	0.0

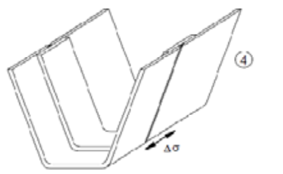
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.2 Span 28 – Main span

9.2.1 Bottom plate (Span 28)

9.2.1.1 Erection joint – location 1 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	19.6	1.056	11.3	1.35	**43.2**	<	**52.3**

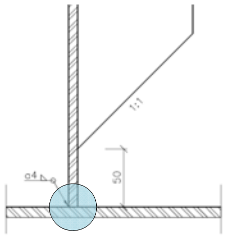
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.826**

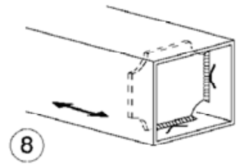
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	10.7
EN 2	7.6
EN 3	7.4
EN 4	6.7
EN 5	19.6
EN 6	12.6
EN 7	13.9
EN 8	13.3
LM3	8.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.047**		
train on track 2 + LM3 =	**0.047**		
train on track 1 + train on track 2 + LM3 =	**0.072**		
tot =	**0.165**	<	**0.950**

9.2.1.2 Bottom plate to diaphragm weld – location 2 (Span 28)





$\Delta\sigma_{C WI}$	$\Delta\sigma_{D WI}$	$\Delta\sigma_{L WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.5	1.056	15.8	1.35	**60.4**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.820**

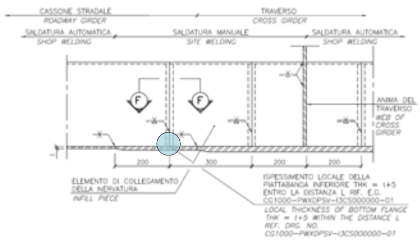
DAMAGE ACCUMULATION METHOD

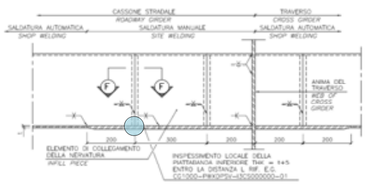
	N/mm^2
EN 1	15.0
EN 2	10.6
EN 3	10.3
EN 4	9.4
EN 5	27.5
EN 6	17.6
EN 7	19.4
EN 8	18.6
LM3	12.1

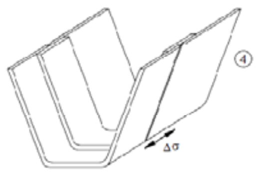
Train meeting percentage: 12.0

Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.045**		
train on track 2 + LM3 =	**0.045**		
train on track 1 + train on track 2 + LM3 =	**0.069**		
tot =	**0.159**	<	**0.950**

9.2.1.3 Shop joint – location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.7	1.056	9.3	1.35	**43.5**	<	**52.3**

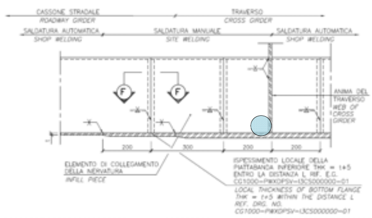
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.832**

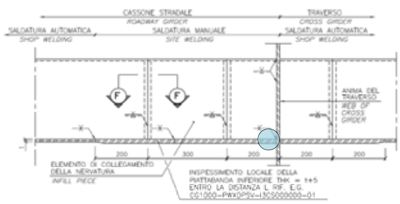
DAMAGE ACCUMULATION METHOD

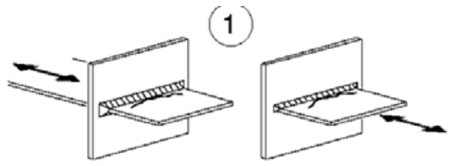
	N/mm^2
EN 1	13.0
EN 2	9.1
EN 3	9.0
EN 4	8.1
EN 5	21.7
EN 6	14.8
EN 7	15.8
EN 8	15.3
LM3	7.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.063**		
train on track 2 + LM3 =	**0.063**		
train on track 1 + train on track 2 + LM3 =	**0.098**		
tot =	**0.223**	<	**0.950**

9.2.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.8	1.056	8.9	1.35	**41.8**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.709**

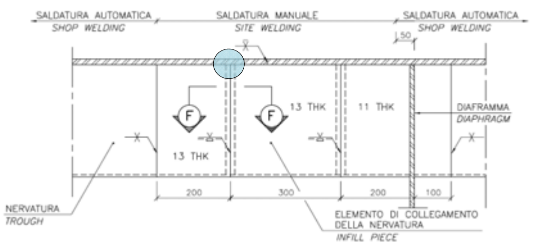
DAMAGE ACCUMULATION METHOD

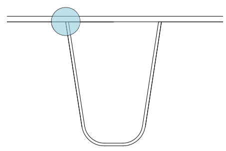
	N/mm^2
EN 1	12.4
EN 2	8.8
EN 3	8.6
EN 4	7.7
EN 5	20.8
EN 6	14.2
EN 7	15.1
EN 8	14.7
LM3	6.9

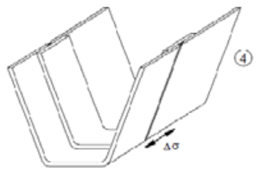
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.011**		
train on track 2 + LM3 =	**0.011**		
train on track 1 + train on track 2 + LM3 =	**0.049**		
tot =	**0.072**	<	**0.950**

9.2.2 Top plate (Span 28)

9.2.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.1	1.056	5.2	10.6	1.35	**34.4**	<	**52.3**

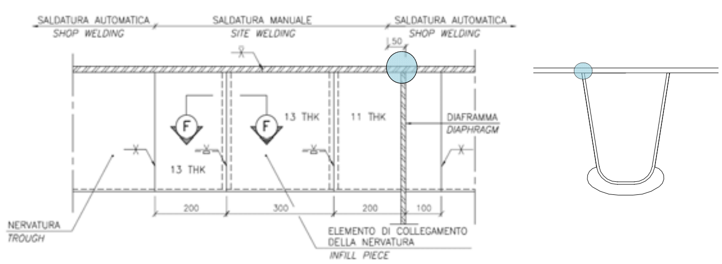
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.657**

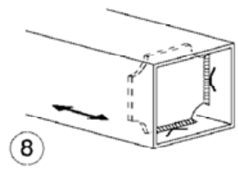
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	4.7
EN 2	3.3
EN 3	3.6
EN 4	3.0
EN 5	9.1
EN 6	5.5
EN 7	6.0
EN 8	5.8
LM3	4.0
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.005**		
train on track 2 + LM3 $_{global + local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.2.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.5	1.056	5.9	16.8	1.35	**42.7**	<	**58.9**

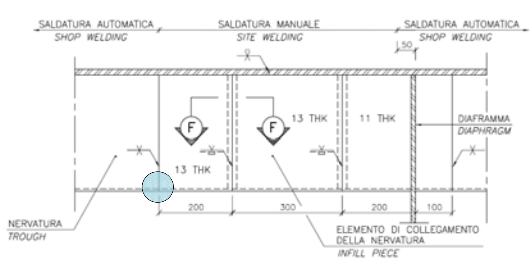
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.724**

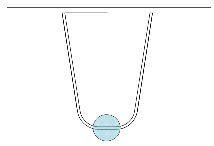
DAMAGE ACCUMULATION METHOD

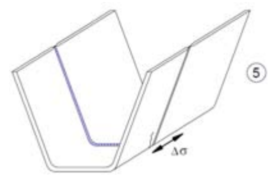
	N/mm^2
EN 1	4.2
EN 2	3.0
EN 3	3.3
EN 4	2.7
EN 5	8.5
EN 6	5.3
EN 7	5.5
EN 8	5.3
LM3	4.5
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.2.2.3 Point A - Shop joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 28)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.0	41.2	1.15	**50.6**	<	**82.5**

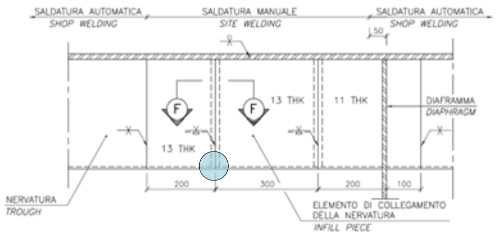
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.613**

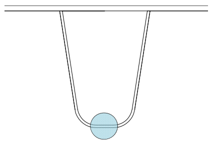
DAMAGE ACCUMULATION METHOD

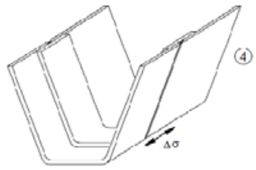
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.1
EN 7	1.1
EN 8	1.1
LM3	0.8
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.052**		
train on track 2 + LM3 $_{global+local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.105**	<	**0.950**

9.2.2.4 Point A - Shop joint at 500m from diaphragm - 13mm – location 1 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.0	27.4	1.15	**34.7**	<	**52.3**

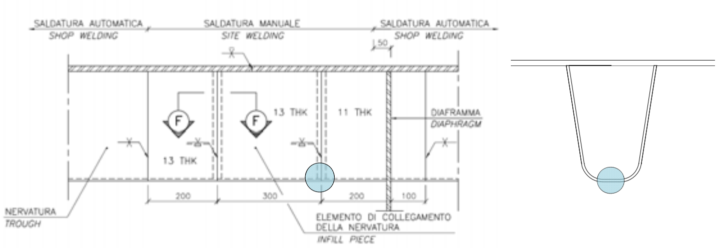
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.663**

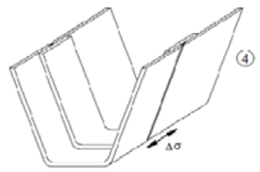
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.1
LM3	0.8
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.050**		
train on track 2 + LM3 $_{global+local}$ =	**0.050**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.100**	<	**0.950**

9.2.2.5 Point A - Shop joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.0	28.7	1.15	**36.2**	<	**52.3**

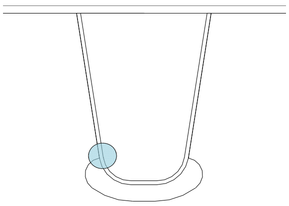
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.692**

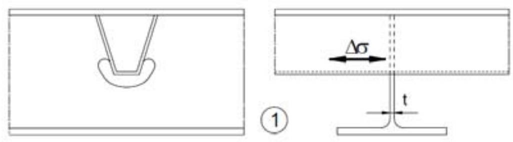
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.1
LM3	0.8
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.106**	<	**0.950**

9.2.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.1	32.7	1.15	**41.3**	<	**52.3**

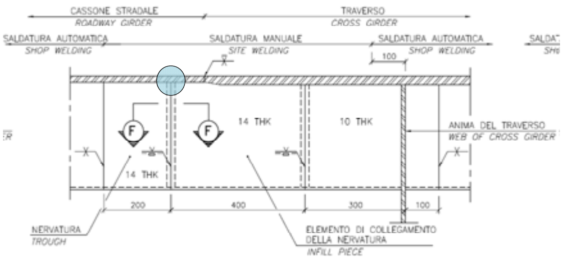
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.790**

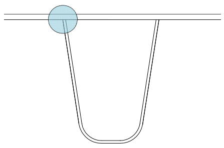
DAMAGE ACCUMULATION METHOD

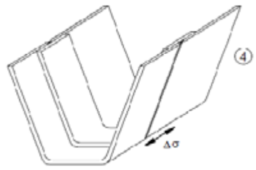
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.8
EN 4	0.6
EN 5	2.0
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	0.9
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.2.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.6	1.056	4.0	10.5	1.35	**33.2**	<	**52.3**

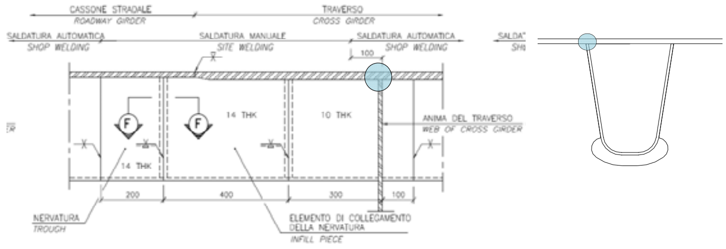
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.635**

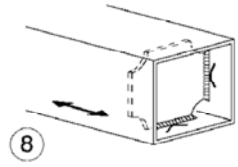
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	5.6
EN 2	4.0
EN 3	4.0
EN 4	3.5
EN 5	9.6
EN 6	6.4
EN 7	6.6
EN 8	6.5
LM3	3.1
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	0.950

9.2.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.6	1.056	4.0	16.8	1.35	**41.6**	<	**58.9**

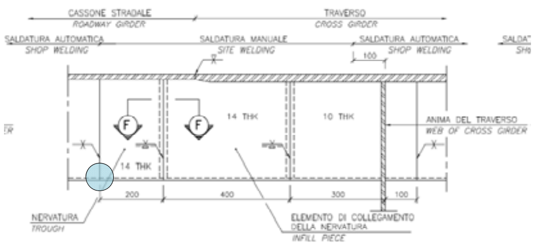
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.706**

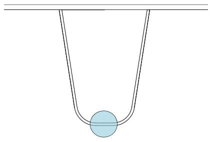
DAMAGE ACCUMULATION METHOD

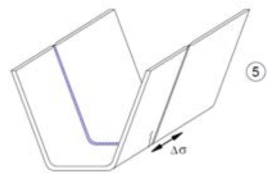
	N/mm^2
EN 1	5.6
EN 2	4.0
EN 3	4.0
EN 4	3.5
EN 5	9.6
EN 6	6.4
EN 7	6.6
EN 8	6.5
LM3	3.1
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global + local}$ =	**0.005**		
train on track 2 + LM3 $_{global + local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.009**	<	**0.950**

9.2.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 28)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.8	40.6	1.15	**49.8**	<	**82.5**

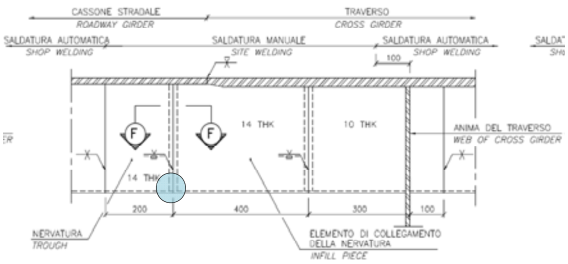
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.603**

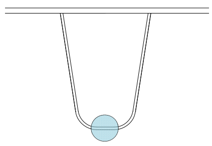
DAMAGE ACCUMULATION METHOD

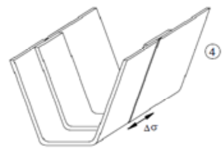
	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.8
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.6
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.051**		
train on track 2 + LM3 $_{global + local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.102**	<	**0.950**

9.2.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.7	26.8	1.15	**33.9**	<	**52.3**

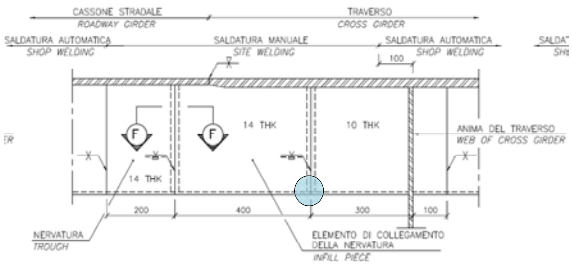
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.648**

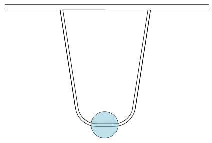
DAMAGE ACCUMULATION METHOD

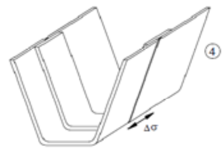
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.7
EN 4	0.6
EN 5	1.8
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.6
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.058**		
train on track 2 + LM3 $_{global + local}$ =	**0.058**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.116**	<	**0.950**

9.2.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.8	31.1	1.15	**38.8**	<	**52.3**

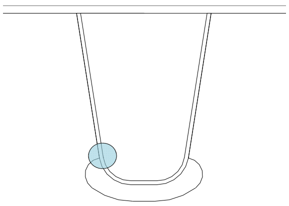
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.741**

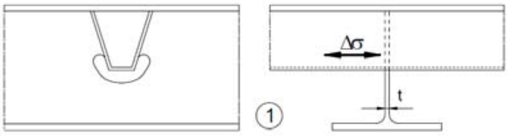
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.8
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.6
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.058**		
train on track 2 + LM3 $_{global+local}$ =	**0.058**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.116**	<	**0.950**

9.2.2.12 Point E – trough to diaphragm weld – location 3 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	$\Delta\sigma_{x\ local}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	2.1	1.056	0.9	32.7	1.15	**41.1**	<	**52.3**

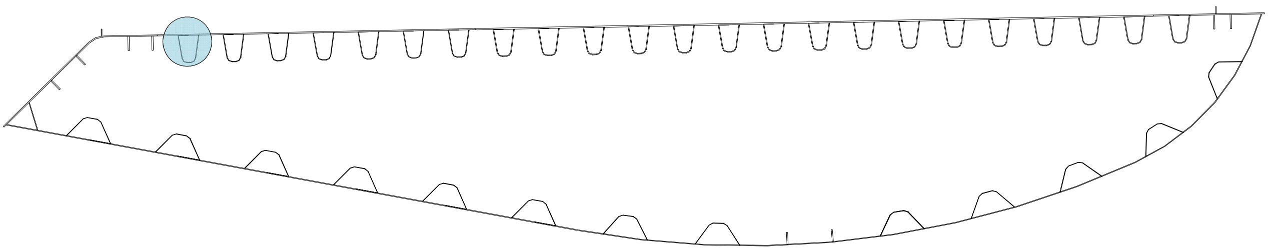
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.787**

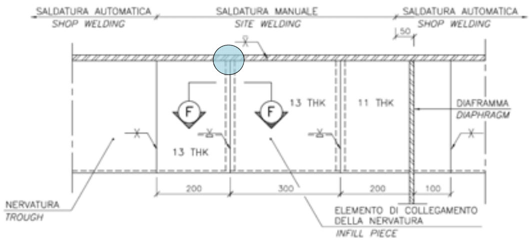
DAMAGE ACCUMULATION METHOD

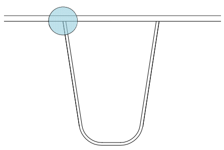
	N/mm^2
EN 1	1.2
EN 2	0.9
EN 3	0.9
EN 4	0.7
EN 5	2.1
EN 6	1.4
EN 7	1.4
EN 8	1.4
LM3	0.7
LM3 local	21.8

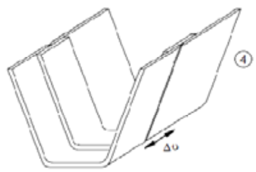
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.2.2.13 Point C – Erection joint – location 1 – only global actions (Span 28)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.1	1.056	5.2	0.0	1.35	**20.1**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.383**

DAMAGE ACCUMULATION METHOD

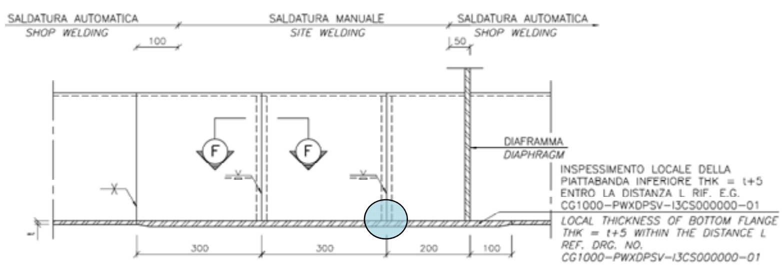
	N/mm^2
EN 1	4.7
EN 2	3.3
EN 3	3.6
EN 4	3.0
EN 5	9.1
EN 6	5.5
EN 7	6.0
EN 8	5.8
LM3	4.0
LM3 local	0.0

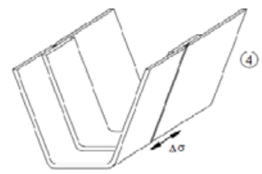
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.3 Span 19 – Main span

9.3.1 Bottom plate (Span 19)

9.3.1.1 Erection joint – location 1 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.9	1.056	13.7	1.35	**49.6**	<	**52.3**

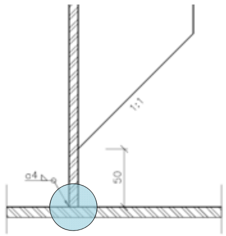
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.949**

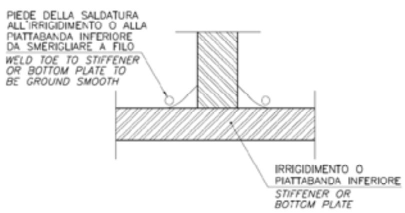
DAMAGE ACCUMULATION METHOD

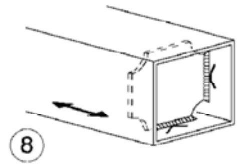
	N/mm²
EN 1	11.8
EN 2	8.3
EN 3	8.3
EN 4	7.4
EN 5	21.9
EN 6	13.8
EN 7	15.3
EN 8	14.7
LM3	10.6

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.108**		
train on track 2 + LM3 =	**0.108**		
train on track 1 + train on track 2 + LM3 =	**0.117**		
tot =	**0.334**	<	**0.950**

9.3.1.2 Bottom plate to diaphragm weld – location 2 (Span 19)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	30.5	1.056	19.1	1.35	**69.4**	<	**73.7**

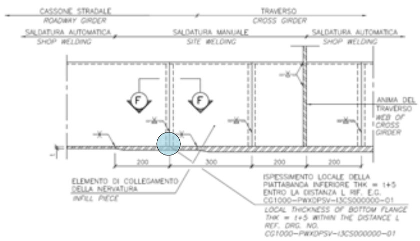
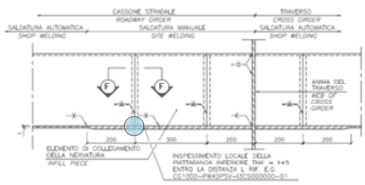
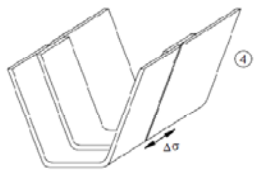
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.941**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	16.5
EN 2	11.6
EN 3	11.6
EN 4	10.3
EN 5	30.5
EN 6	19.4
EN 7	21.4
EN 8	20.6
LM3	14.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.104**		
train on track 2 + LM3 =	**0.104**		
train on track 1 + train on track 2 + LM3 =	**0.114**		
tot =	**0.323**	<	**0.950**

9.3.1.3 Shop joint – location 3 (Span 19)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.4	1.056	11.0	1.35	**48.2**	<	**52.3**

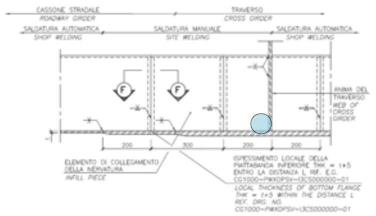
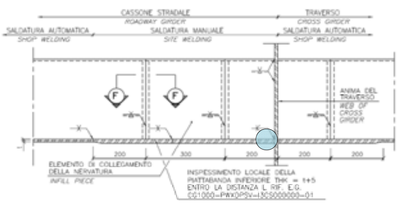
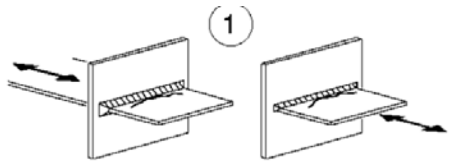
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.921**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	14.4
EN 2	10.1
EN 3	9.4
EN 4	8.8
EN 5	23.4
EN 6	16.2
EN 7	17.2
EN 8	16.7
LM3	8.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.109**		
train on track 2 + LM3 =	**0.109**		
train on track 1 + train on track 2 + LM3 =	**0.142**		
tot =	**0.359**	<	**0.950**

9.3.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 19)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.5	1.056	10.5	1.35	**46.3**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.785**

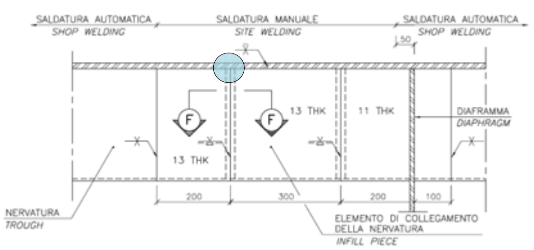
DAMAGE ACCUMULATION METHOD

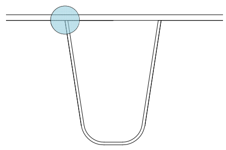
	N/mm^2
EN 1	13.8
EN 2	9.7
EN 3	9.1
EN 4	8.4
EN 5	22.5
EN 6	15.5
EN 7	16.5
EN 8	16.0
LM3	8.1

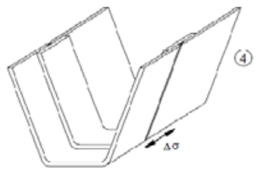
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.049**		
train on track 2 + LM3 =	**0.049**		
train on track 1 + train on track 2 + LM3 =	**0.078**		
tot =	**0.176**	<	**0.950**

9.3.2 Top plate (Span 19)

9.3.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.0	1.056	6.4	10.6	1.35	**35.8**	<	**52.3**

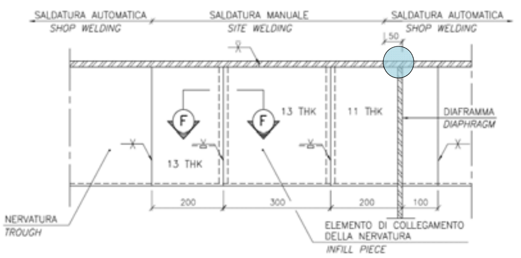
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.684**

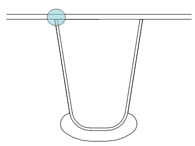
DAMAGE ACCUMULATION METHOD

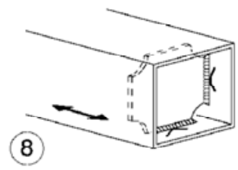
	N/mm^2
EN 1	4.8
EN 2	3.4
EN 3	3.5
EN 4	3.0
EN 5	9.0
EN 6	5.5
EN 7	6.0
EN 8	5.8
LM3	5.0
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.3.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.0	1.056	6.4	16.8	1.35	**44.1**	<	**58.9**

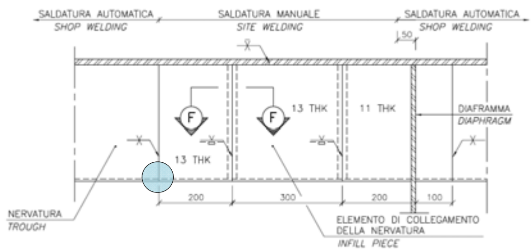
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.748**

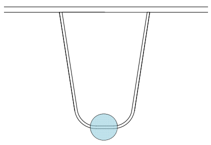
DAMAGE ACCUMULATION METHOD

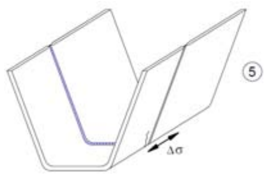
	N/mm^2
EN 1	4.8
EN 2	3.4
EN 3	3.5
EN 4	3.0
EN 5	9.0
EN 6	5.5
EN 7	6.0
EN 8	5.8
LM3	5.0
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.3.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 19)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.2	41.2	1.15	**50.8**	<	**82.5**

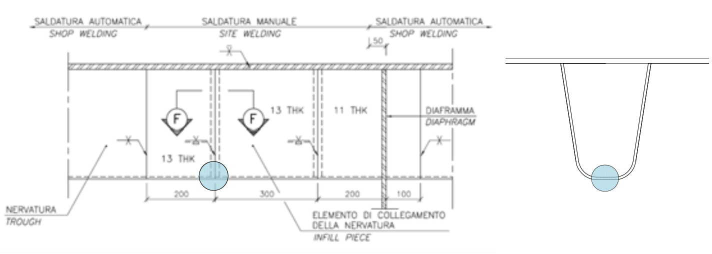
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.615**

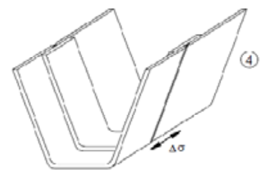
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.1
LM3	0.9
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.107**	<	0.950

9.3.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.2	27.4	1.15	**34.9**	<	**52.3**

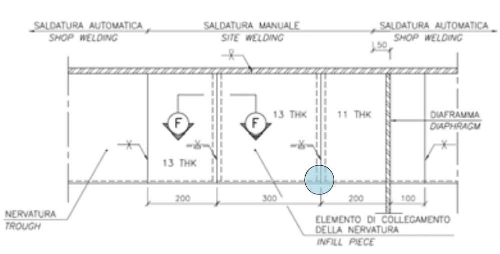
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.667**

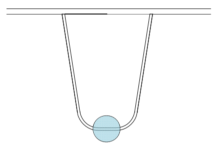
DAMAGE ACCUMULATION METHOD

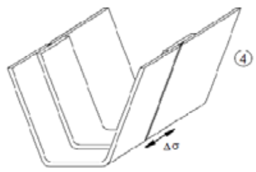
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.1
LM3	0.9
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.052**		
train on track 2 + LM3 $_{global + local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.103**	<	**0.950**

9.3.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.2	28.7	1.15	**36.4**	<	**52.3**

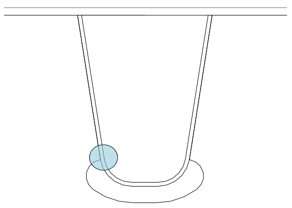
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.696**

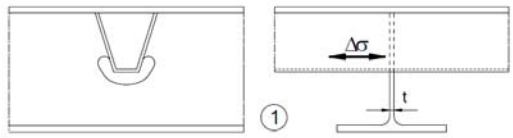
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.7
EN 4	0.6
EN 5	1.7
EN 6	1.0
EN 7	1.1
EN 8	1.1
LM3	0.9
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.055**		
train on track 2 + LM3 $_{global+local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.3.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.4	32.7	1.15	**41.6**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.795**

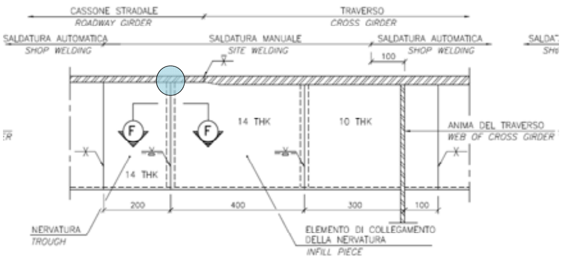
DAMAGE ACCUMULATION METHOD

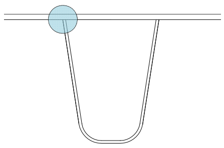
	N/mm²
EN 1	1.0
EN 2	0.7
EN 3	0.8
EN 4	0.6
EN 5	2.0
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	1.1
LM3 local	21.8

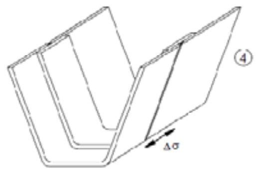
Train meeting percentage	12.0

Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.3.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.6	1.056	4.7	10.5	1.35	**34.2**	<	**52.3**

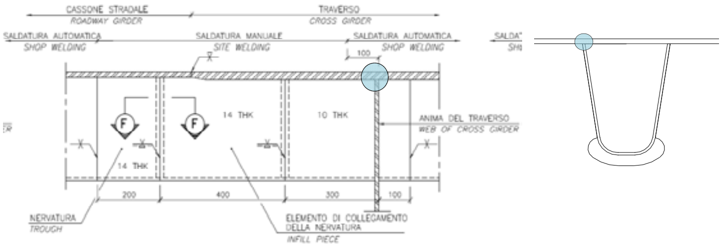
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.655**

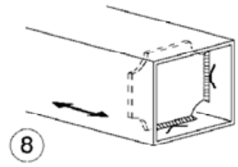
Damage Accumulation Method

	N/mm²
EN 1	5.9
EN 2	4.2
EN 3	4.2
EN 4	3.6
EN 5	9.6
EN 6	6.4
EN 7	6.7
EN 8	6.6
LM3	3.6
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.007**		
train on track 2 + LM3 $_{global + local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.014**	<	**0.950**

9.3.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.6	1.056	4.7	16.8	1.35	**42.7**	<	**58.9**

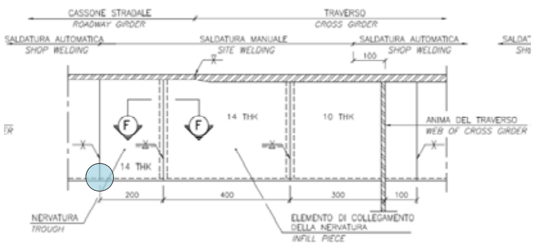
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.724**

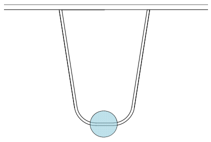
DAMAGE ACCUMULATION METHOD

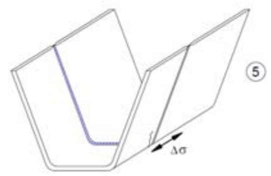
	N/mm^2
EN 1	5.9
EN 2	4.2
EN 3	4.2
EN 4	3.6
EN 5	9.6
EN 6	6.4
EN 7	6.7
EN 8	6.6
LM3	3.6
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.3.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 19)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.9	40.6	1.15	**50.0**	<	**82.5**

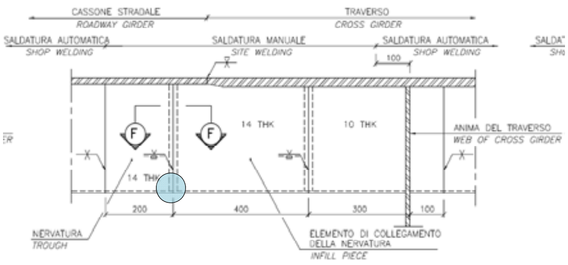
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.605**

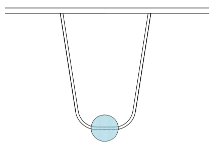
DAMAGE ACCUMULATION METHOD

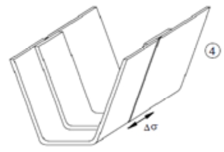
	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.8
EN 6	1.2
EN 7	1.3
EN 8	1.2
LM3	0.7
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.052**		
train on track 2 + LM3 $_{global+local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.103**	<	**0.950**

9.3.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.9	26.8	1.15	**34.1**	<	**52.3**

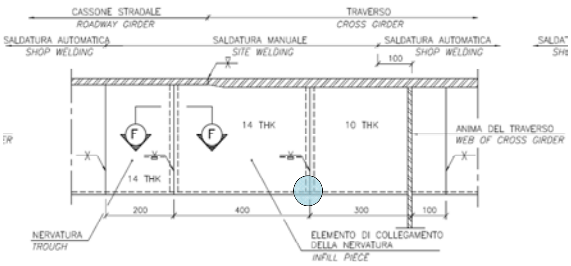
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.651**

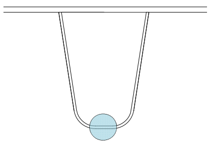
Damage Accumulation Method

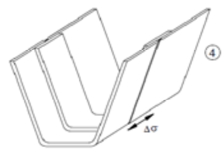
	N/mm²
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.8
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.060**		
train on track 2 + LM3 $_{global + local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.119**	<	**0.950**

9.3.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	0.9	31.1	1.15	**39.0**	<	**52.3**

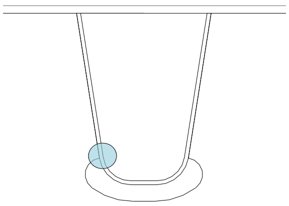
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.745**

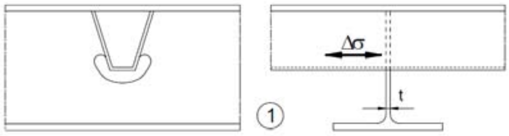
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.8
EN 6	1.2
EN 7	1.3
EN 8	1.2
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.060**		
train on track 2 + LM3 $_{global+local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.119**	<	**0.950**

9.3.2.12 Point E – trough to diaphragm weld – location 3 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.1	1.056	1.0	32.7	1.15	**41.3**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.790**

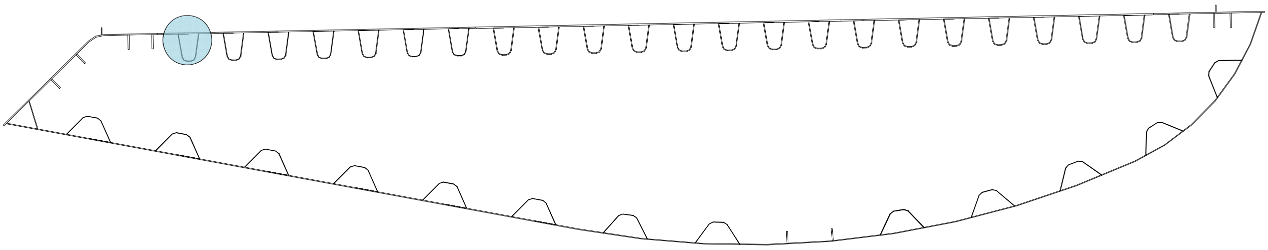
DAMAGE ACCUMULATION METHOD

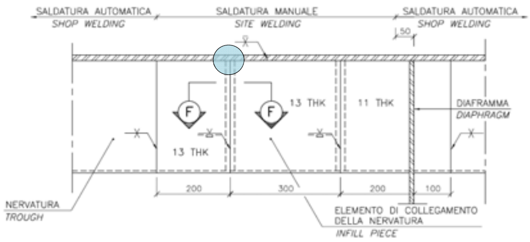
	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.1
EN 6	1.4
EN 7	1.4
EN 8	1.4
LM3	0.8
LM3 local	21.8

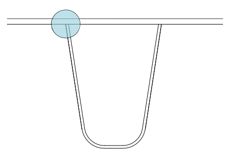
Train meeting percentage	12.0

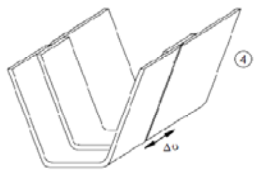
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.3.2.13 Point C – Erection joint – location 1 – only global actions (Span 19)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.0	1.056	6.4	0.0	1.35	**21.4**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.410**

DAMAGE ACCUMULATION METHOD

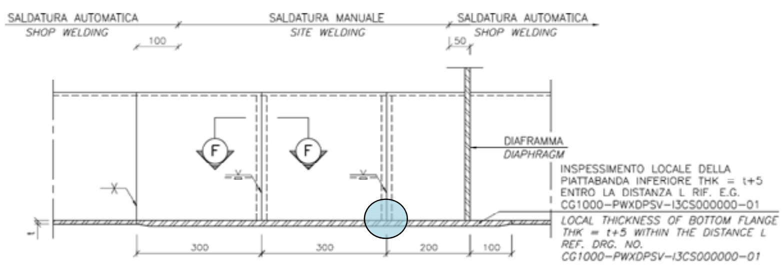
	N/mm^2
EN 1	4.8
EN 2	3.4
EN 3	3.5
EN 4	3.0
EN 5	9.0
EN 6	5.5
EN 7	6.0
EN 8	5.8
LM3	5.0
LM3 local	0.0

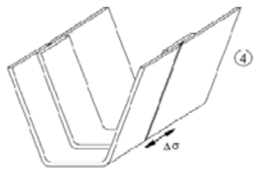
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.4 Span 12 – Main span

9.4.1 Bottom plate (Span 12)

9.4.1.1 Erection joint – location 1 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.1	1.056	12.4	1.35	**51.1**	<	**52.3**

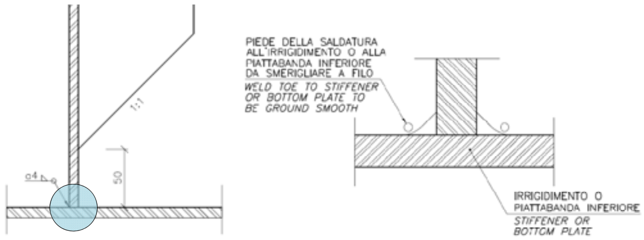
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.977**

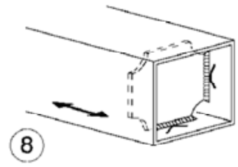
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	12.8
EN 2	9.0
EN 3	9.0
EN 4	8.1
EN 5	24.1
EN 6	15.1
EN 7	16.8
EN 8	16.1
LM3	9.6

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.122**		
train on track 2 + LM3 =	**0.122**		
train on track 1 + train on track 2 + LM3 =	**0.136**		
tot =	**0.380**	<	**0.950**

9.4.1.2 Bottom plate to diaphragm weld – location 2 (Span 12)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	33.7	1.056	17.3	1.35	**71.4**	<	**73.7**

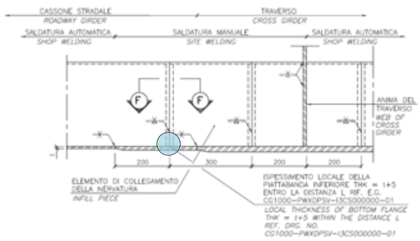
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.970**

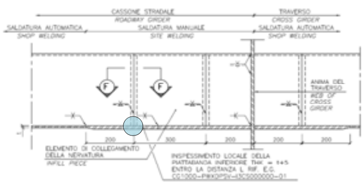
DAMAGE ACCUMULATION METHOD

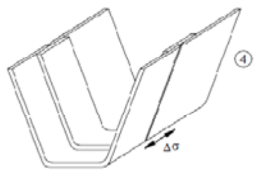
	N/mm^2
EN 1	17.9
EN 2	12.6
EN 3	12.6
EN 4	11.3
EN 5	33.7
EN 6	21.2
EN 7	23.5
EN 8	22.6
LM3	13.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.117**		
train on track 2 + LM3 =	**0.117**		
train on track 1 + train on track 2 + LM3 =	**0.132**		
tot =	**0.367**	<	**0.950**

9.4.1.3 Shop joint – location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.1	1.056	10.9	1.35	**52.0**	<	**52.3**

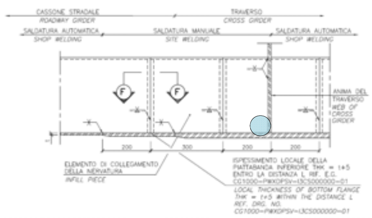
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.994**

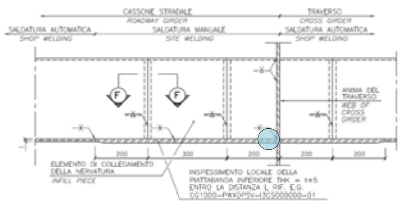
DAMAGE ACCUMULATION METHOD

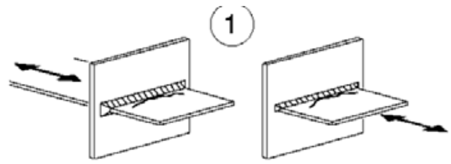
	N/mm^2
EN 1	15.6
EN 2	10.9
EN 3	10.3
EN 4	9.6
EN 5	26.1
EN 6	17.7
EN 7	18.8
EN 8	18.2
LM3	8.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.149**		
train on track 2 + LM3 =	**0.149**		
train on track 1 + train on track 2 + LM3 =	**0.178**		
tot =	**0.476**	<	**0.950**

9.4.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.1	1.056	10.5	1.35	**49.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.847**

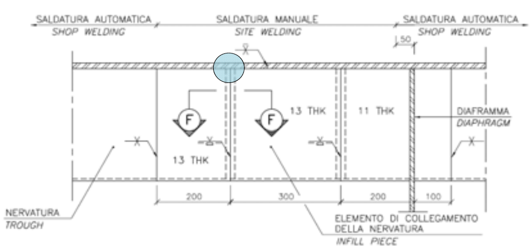
DAMAGE ACCUMULATION METHOD

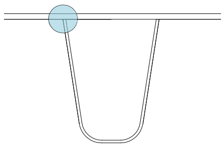
	N/mm^2
EN 1	14.9
EN 2	10.5
EN 3	9.9
EN 4	9.2
EN 5	25.1
EN 6	17.0
EN 7	18.0
EN 8	17.5
LM3	8.0

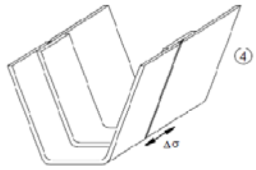
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.067**		
train on track 2 + LM3 =	**0.067**		
train on track 1 + train on track 2 + LM3 =	**0.103**		
tot =	**0.236**	<	**0.950**

9.4.2 Top plate (Span 12)

9.4.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.7	10.6	1.35	**35.3**	<	**52.3**

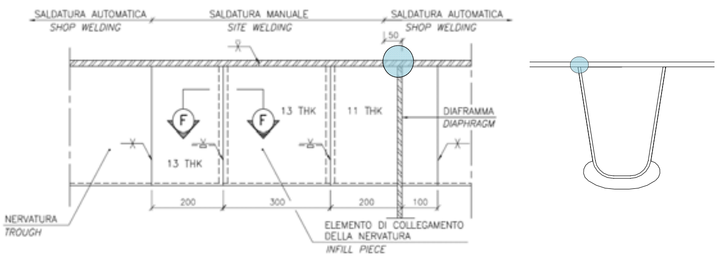
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.675**

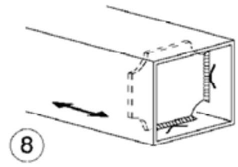
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.1
EN 5	9.3
EN 6	5.3
EN 7	6.3
EN 8	6.1
LM3	4.4
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.4.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.7	16.8	1.35	**43.6**	<	**58.9**

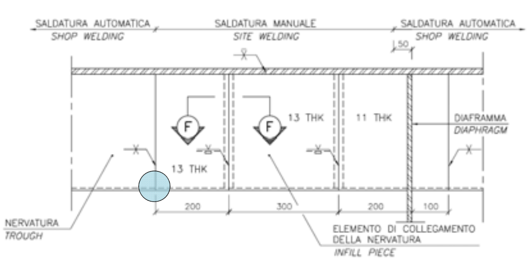
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.740**

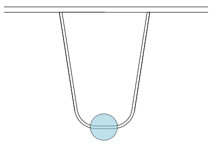
DAMAGE ACCUMULATION METHOD

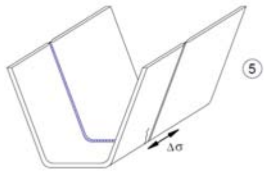
	N/mm^2
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.1
EN 5	9.3
EN 6	5.3
EN 7	6.3
EN 8	6.1
LM3	4.4
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.4.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 12)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	1.1	41.2	1.15	**50.7**	<	**82.5**

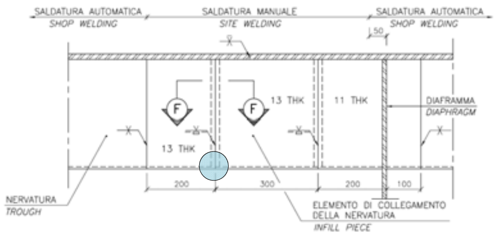
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.614**

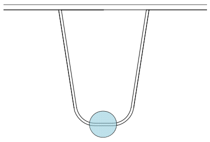
DAMAGE ACCUMULATION METHOD

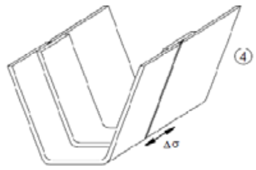
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.7
EN 4	0.6
EN 5	1.8
EN 6	1.0
EN 7	1.2
EN 8	1.2
LM3	0.8
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.106**	<	0.950

9.4.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	1.1	27.4	1.15	**34.8**	<	**52.3**

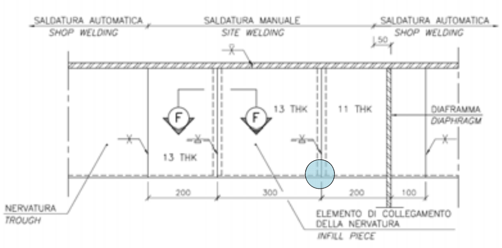
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.666**

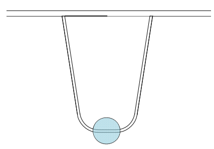
DAMAGE ACCUMULATION METHOD

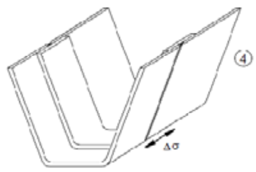
	N/mm^2
EN 1	0.9
EN 2	0.7
EN 3	0.7
EN 4	0.6
EN 5	1.8
EN 6	1.0
EN 7	1.2
EN 8	1.1
LM3	0.8
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.051**		
train on track 2 + LM3 $_{global+local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.102**	<	**0.950**

9.4.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	1.1	28.7	1.15	**36.3**	<	**52.3**

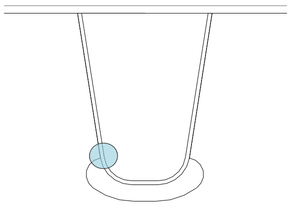
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.695**

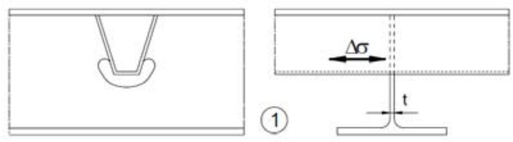
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.9
EN 2	0.7
EN 3	0.7
EN 4	0.6
EN 5	1.8
EN 6	1.0
EN 7	1.2
EN 8	1.1
LM3	0.8
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.054**		
train on track 2 + LM3 $_{global+local}$ =	**0.054**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.108**	<	**0.950**

9.4.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.2	32.7	1.15	**41.5**	<	**52.3**

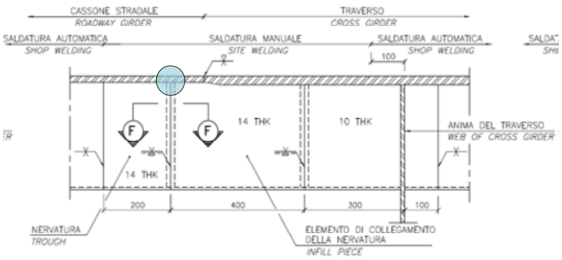
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.794**

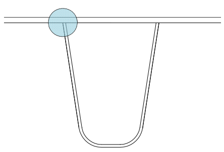
DAMAGE ACCUMULATION METHOD

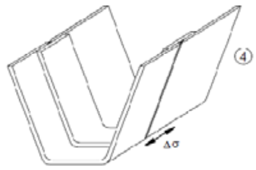
	N/mm²
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	2.0
EN 6	1.2
EN 7	1.4
EN 8	1.3
LM3	0.9
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.4.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.1	1.056	4.6	10.5	1.35	**34.9**	<	**52.3**

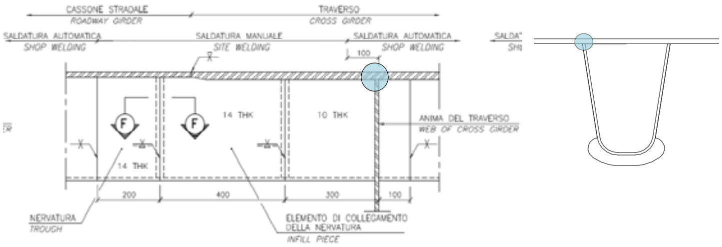
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.667**

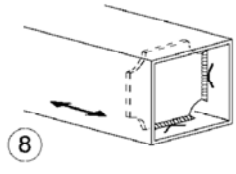
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	6.3
EN 2	4.4
EN 3	4.4
EN 4	3.8
EN 5	10.1
EN 6	6.3
EN 7	7.1
EN 8	7.0
LM3	3.5
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.007**		
train on track 2 + LM3 $_{global+local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.015**	<	**0.950**

9.4.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.1	1.056	4.6	16.8	1.35	**43.4**	<	**58.9**

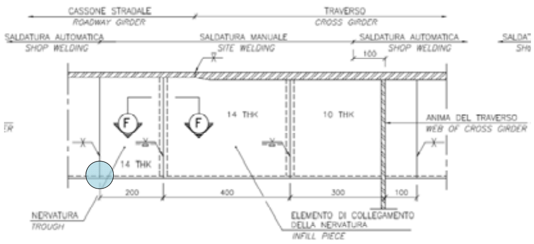
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.735**

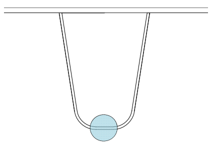
DAMAGE ACCUMULATION METHOD

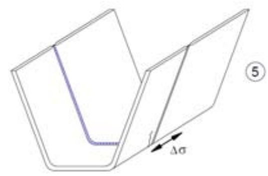
	N/mm^2
EN 1	6.3
EN 2	4.4
EN 3	4.4
EN 4	3.8
EN 5	10.1
EN 6	6.3
EN 7	7.1
EN 8	7.0
LM3	3.5
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.4.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 12)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.9	1.056	0.9	40.6	1.15	**50.1**	<	**82.5**

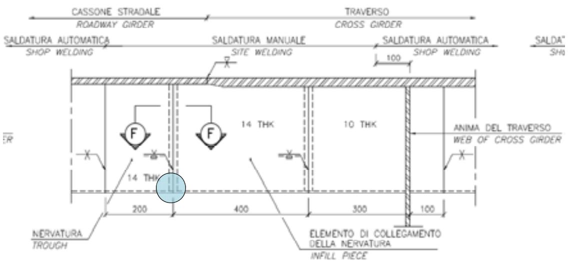
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.607**

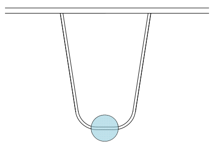
DAMAGE ACCUMULATION METHOD

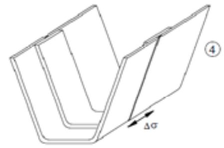
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.9
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	0.7
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.052**		
train on track 2 + LM3 $_{global+local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.104**	<	**0.950**

9.4.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.9	1.056	0.9	26.8	1.15	**34.2**	<	**52.3**

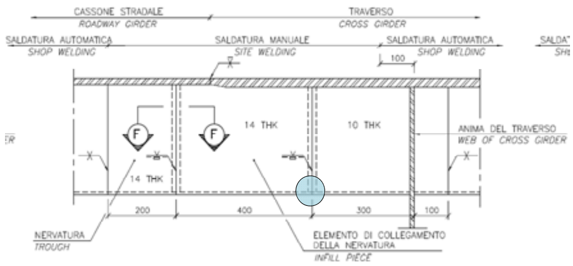
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.653**

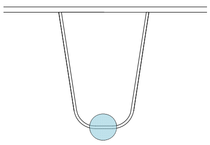
DAMAGE ACCUMULATION METHOD

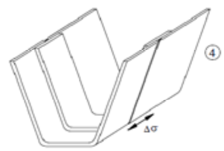
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.9
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.060**		
train on track 2 + LM3 $_{global + local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.120**	<	**0.950**

9.4.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.9	1.056	0.9	31.1	1.15	**39.1**	<	**52.3**

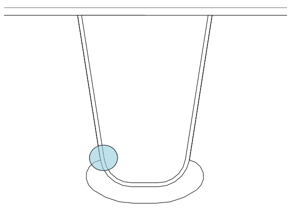
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.747**

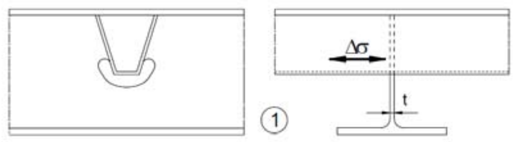
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	1.9
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.060**		
train on track 2 + LM3 $_{global+local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.120**	<	0.950

9.4.2.12 Point E – trough to diaphragm weld – location 3 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	$\Delta\sigma_{x\ local}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	2.2	1.056	1.0	32.7	1.15	**41.5**	<	**52.3**

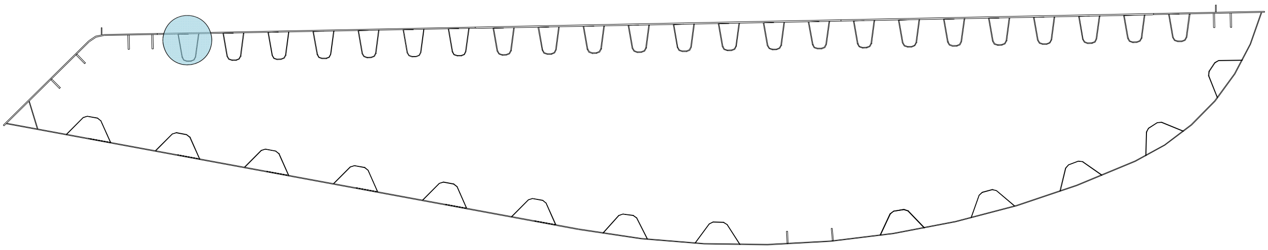
$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.793**

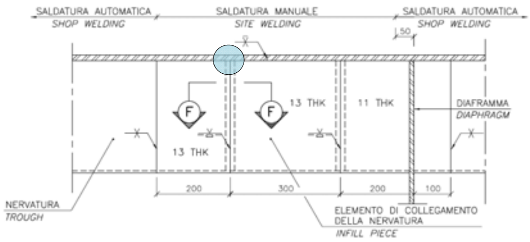
DAMAGE ACCUMULATION METHOD

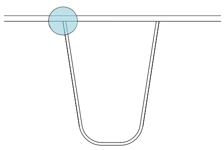
	N/mm^2
EN 1	1.4
EN 2	1.0
EN 3	0.9
EN 4	0.8
EN 5	2.2
EN 6	1.4
EN 7	1.5
EN 8	1.5
LM3	0.8
LM3 local	21.8

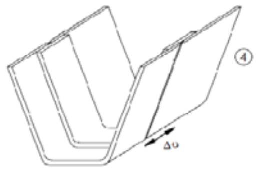
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.4.2.13 Point C – Erection joint – location 1 – only global actions (Span 12)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.7	0.0	1.35	**21.0**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.401**

DAMAGE ACCUMULATION METHOD

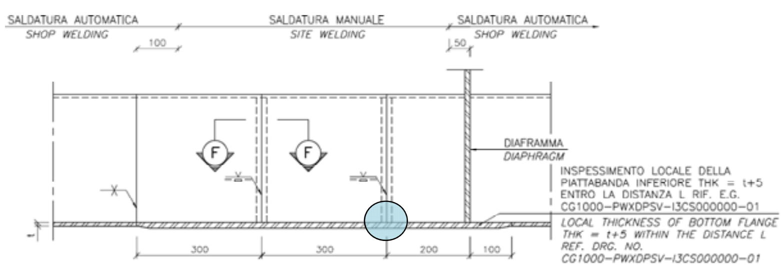
	N/mm^2
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.1
EN 5	9.3
EN 6	5.3
EN 7	6.3
EN 8	6.1
LM3	4.4
LM3 local	0.0

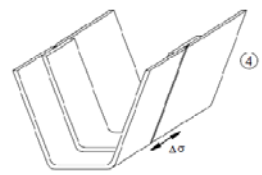
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.5 Span 11 – Main span

9.5.1 Bottom plate (Span 11)

9.5.1.1 Erection joint – location 1 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.6	1.056	13.3	1.35	**51.6**	<	**52.3**

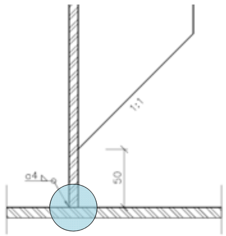
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.986**

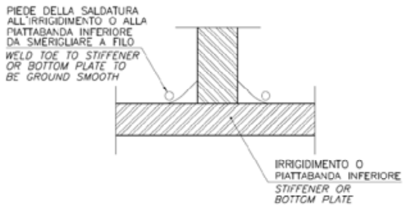
DAMAGE ACCUMULATION METHOD

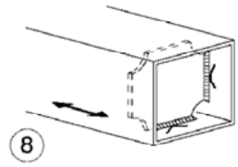
	N/mm^2
EN 1	12.0
EN 2	8.5
EN 3	8.8
EN 4	7.8
EN 5	23.6
EN 6	14.7
EN 7	15.8
EN 8	15.2
LM3	10.3

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.121**		
train on track 2 + LM3 =	**0.121**		
train on track 1 + train on track 2 + LM3 =	**0.128**		
tot =	**0.370**	<	**0.950**

9.5.1.2 Bottom plate to diaphragm weld – location 2 (Span 11)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.8	1.056	18.0	1.35	**69.6**	<	**73.7**

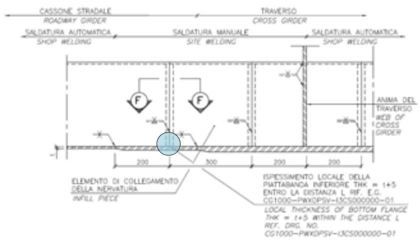
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.945**

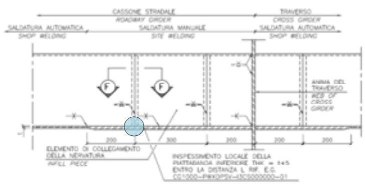
DAMAGE ACCUMULATION METHOD

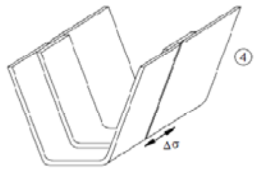
	N/mm^2
EN 1	16.2
EN 2	11.4
EN 3	11.9
EN 4	10.5
EN 5	31.8
EN 6	19.9
EN 7	21.3
EN 8	20.5
LM3	13.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.098**		
train on track 2 + LM3 =	**0.098**		
train on track 1 + train on track 2 + LM3 =	**0.110**		
tot =	**0.306**	<	**0.950**

9.5.1.3 Shop joint – location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.3	1.056	10.3	1.35	**49.9**	<	**52.3**

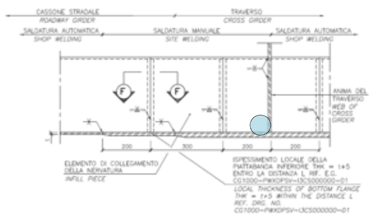
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.955**

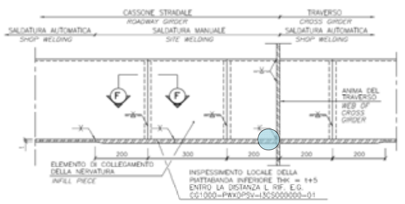
DAMAGE ACCUMULATION METHOD

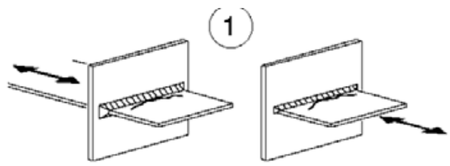
	N/mm^2
EN 1	13.6
EN 2	9.6
EN 3	10.1
EN 4	9.0
EN 5	25.3
EN 6	16.7
EN 7	16.7
EN 8	16.2
LM3	8.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.110**		
train on track 2 + LM3 =	**0.110**		
train on track 1 + train on track 2 + LM3 =	**0.138**		
tot =	**0.358**	<	**0.950**

9.5.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.8	1.056	10.5	1.35	**51.0**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.866**

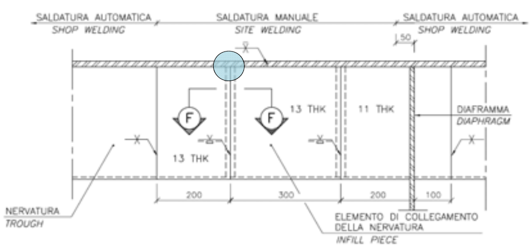
DAMAGE ACCUMULATION METHOD

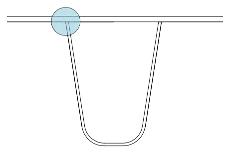
	N/mm^2
EN 1	13.9
EN 2	9.8
EN 3	10.3
EN 4	9.2
EN 5	25.8
EN 6	17.1
EN 7	17.1
EN 8	16.6
LM3	8.2

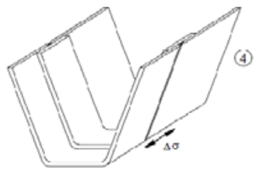
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.068**		
train on track 2 + LM3 =	**0.068**		
train on track 1 + train on track 2 + LM3 =	**0.097**		
tot =	**0.233**	<	**0.950**

9.5.2 Top plate (Span 11)

9.5.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.1	1.056	6.5	10.6	1.35	**36.0**	<	**52.3**

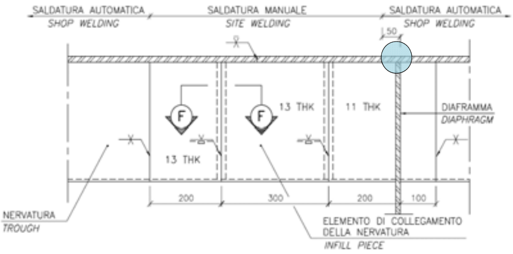
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.689**

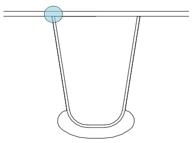
DAMAGE ACCUMULATION METHOD

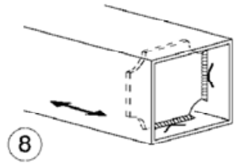
	N/mm^2
EN 1	4.9
EN 2	3.5
EN 3	3.5
EN 4	3.0
EN 5	9.1
EN 6	5.5
EN 7	6.1
EN 8	5.9
LM3	5.0
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.006**		
train on track 2 + LM3 $_{global + local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.013**	<	**0.950**

9.5.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.1	1.056	6.5	16.8	1.35	**44.4**	<	**58.9**

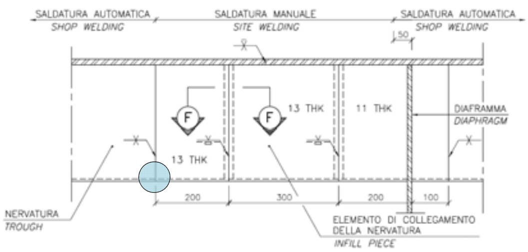
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.753**

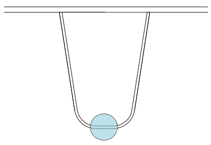
DAMAGE ACCUMULATION METHOD

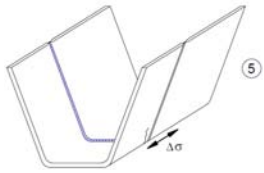
	N/mm^2
EN 1	4.9
EN 2	3.5
EN 3	3.5
EN 4	3.0
EN 5	9.1
EN 6	5.5
EN 7	6.1
EN 8	5.9
LM3	5.0
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	0.950

9.5.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 11)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.4	41.2	1.15	**51.3**	<	**82.5**

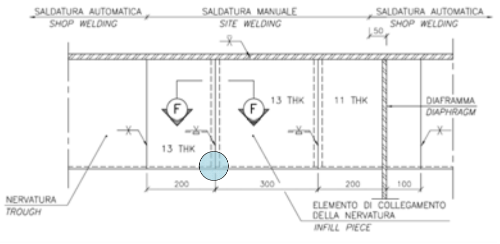
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.622**

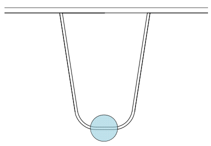
DAMAGE ACCUMULATION METHOD

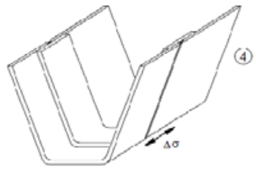
	N/mm²
EN 1	1.1
EN 2	0.7
EN 3	0.8
EN 4	0.7
EN 5	2.0
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	1.1
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.111**	<	0.950

9.5.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.9	1.056	1.4	27.4	1.15	**35.5**	<	**52.3**

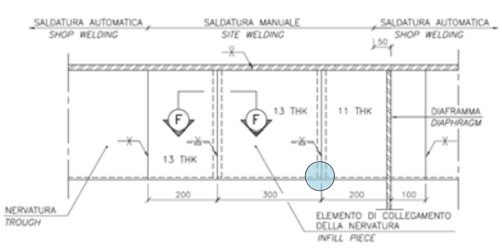
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.678**

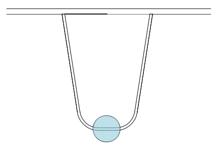
DAMAGE ACCUMULATION METHOD

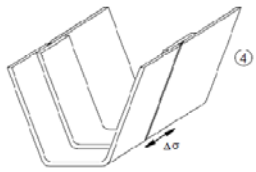
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.8
EN 4	0.7
EN 5	1.9
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	1.1
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.055**		
train on track 2 + LM3 $_{global+local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.5.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.4	28.7	1.15	**37.0**	<	**52.3**

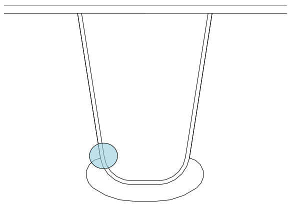
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.707**

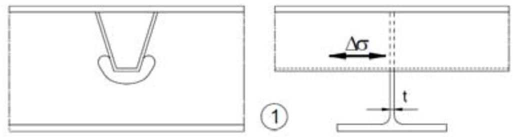
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.1
EN 2	0.7
EN 3	0.8
EN 4	0.7
EN 5	2.0
EN 6	1.2
EN 7	1.3
EN 8	1.3
LM3	1.1
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.058**		
train on track 2 + LM3 $_{global + local}$ =	**0.058**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.117**	<	**0.950**

9.5.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.2	1.056	1.6	32.7	1.15	**42.2**	<	**52.3**

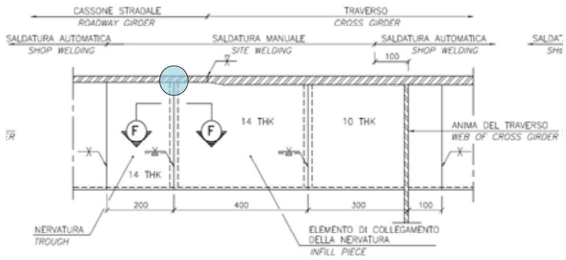
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.806**

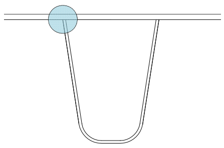
DAMAGE ACCUMULATION METHOD

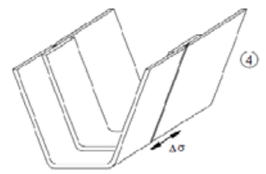
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.9
EN 4	0.7
EN 5	2.2
EN 6	1.3
EN 7	1.5
EN 8	1.4
LM3	1.2
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	0.950

9.5.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.4	1.056	4.8	10.5	1.35	**34.1**	<	**52.3**

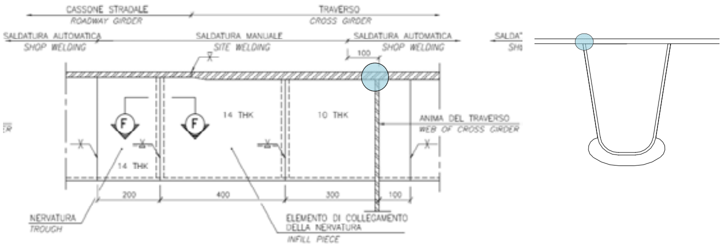
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.651**

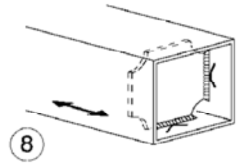
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	5.8
EN 2	4.1
EN 3	3.9
EN 4	3.5
EN 5	9.4
EN 6	6.5
EN 7	6.6
EN 8	6.4
LM3	3.7
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.007**		
train on track 2 + LM3 $_{global+local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.013**	<	**0.950**

9.5.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.4	1.056	4.8	16.8	1.35	**42.5**	<	**58.9**

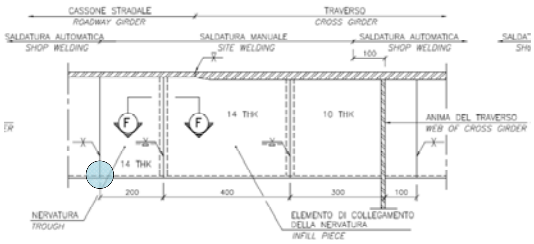
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.721**

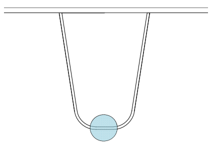
DAMAGE ACCUMULATION METHOD

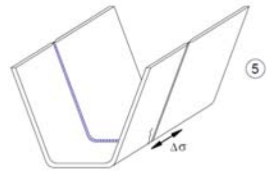
	N/mm^2
EN 1	5.8
EN 2	4.1
EN 3	3.9
EN 4	3.5
EN 5	9.4
EN 6	6.5
EN 7	6.6
EN 8	6.4
LM3	3.7
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.5.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 11)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.0	40.6	1.15	**50.4**	<	**82.5**

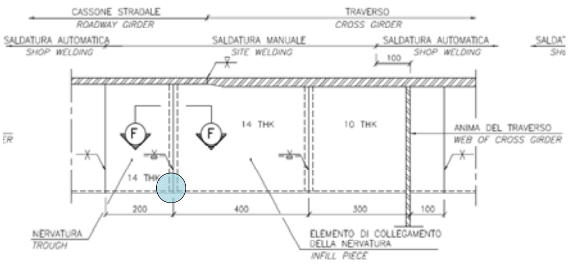
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.611**

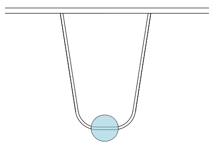
DAMAGE ACCUMULATION METHOD

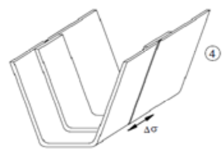
	N/mm²
EN 1	1.3
EN 2	0.9
EN 3	0.8
EN 4	0.8
EN 5	2.0
EN 6	1.4
EN 7	1.4
EN 8	1.4
LM3	0.8
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.054**		
train on track 2 + LM3 $_{global + local}$ =	**0.054**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.107**	<	**0.950**

9.5.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.0	26.8	1.15	**34.5**	<	**52.3**

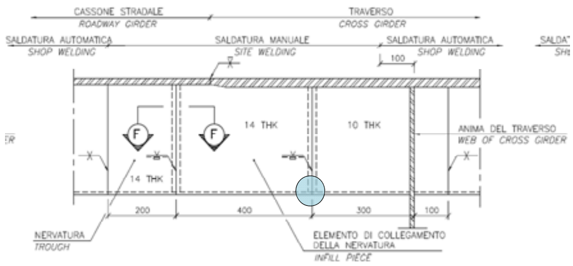
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.659**

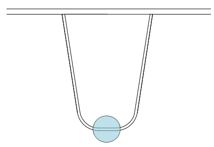
DAMAGE ACCUMULATION METHOD

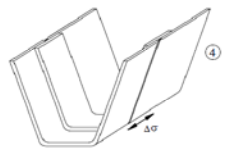
	N/mm^2
EN 1	1.2
EN 2	0.9
EN 3	0.8
EN 4	0.8
EN 5	2.0
EN 6	1.4
EN 7	1.4
EN 8	1.4
LM3	0.8
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.063**		
train on track 2 + LM3 $_{global + local}$ =	**0.063**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.126**	<	**0.950**

9.5.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.0	1.056	1.0	31.1	1.15	**39.4**	<	**52.3**

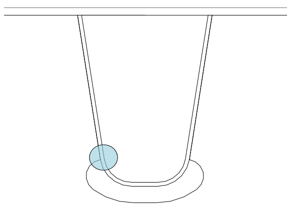
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.753**

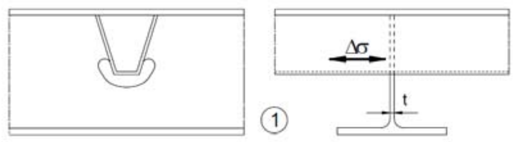
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	1.3
EN 2	0.9
EN 3	0.8
EN 4	0.8
EN 5	2.0
EN 6	1.4
EN 7	1.4
EN 8	1.4
LM3	0.8
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.063**		
train on track 2 + LM3 $_{global+local}$ =	**0.063**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.126**	<	0.950

9.5.2.12 Point E – trough to diaphragm weld – location 3 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.3	1.056	1.2	32.7	1.15	**41.8**	<	**52.3**

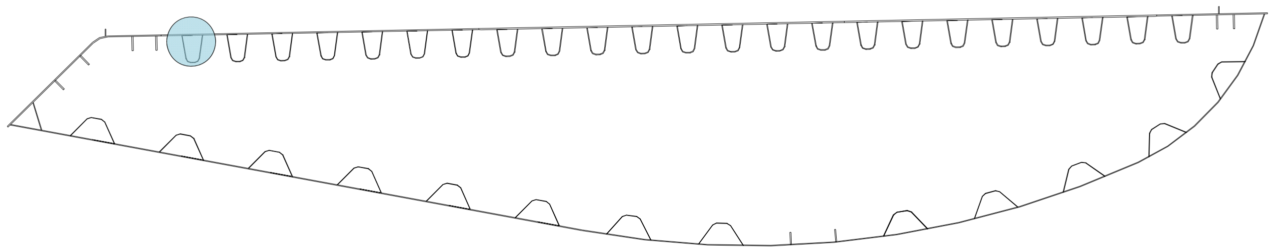
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.799**

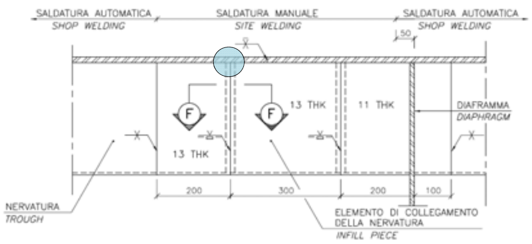
DAMAGE ACCUMULATION METHOD

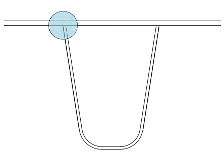
	N/mm^2
EN 1	1.4
EN 2	1.0
EN 3	0.9
EN 4	0.9
EN 5	2.3
EN 6	1.6
EN 7	1.6
EN 8	1.6
LM3	0.9
LM3 local	21.8

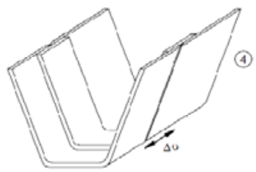
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.009**	<	**0.950**

9.5.2.13 Point C – Erection joint – location 1 – only global actions (Span 11)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.1	1.056	6.5	0.0	1.35	**21.7**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.415**

Damage accumulation method

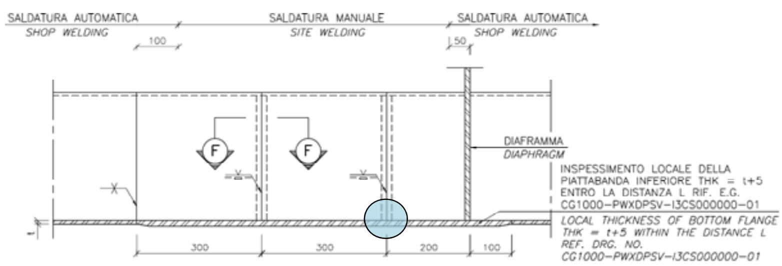
	N/mm²
EN 1	4.9
EN 2	3.5
EN 3	3.5
EN 4	3.0
EN 5	9.1
EN 6	5.5
EN 7	6.1
EN 8	5.9
LM3	5.0
LM3 local	0.0

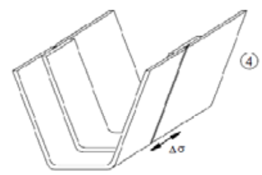
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.6 Span 10 – Main span

9.6.1 Bottom plate (Span 10)

9.6.1.1 Erection joint – location 1 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.0	1.056	10.3	1.35	**46.7**	<	**52.3**

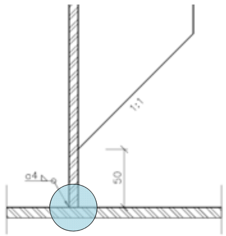
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.893**

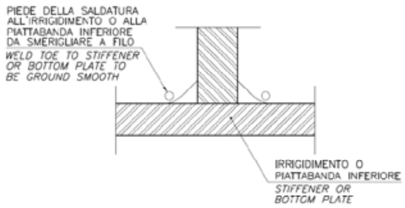
DAMAGE ACCUMULATION METHOD

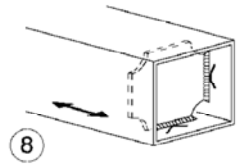
	N/mm²
EN 1	10.8
EN 2	7.6
EN 3	8.4
EN 4	7.4
EN 5	23.0
EN 6	14.1
EN 7	14.5
EN 8	13.8
LM3	7.8

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.060**		
train on track 2 + LM3 =	**0.060**		
train on track 1 + train on track 2 + LM3 =	**0.084**		
tot =	**0.204**	<	**0.950**

9.6.1.2 Bottom plate to diaphragm weld – location 2 (Span 10)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.5	1.056	14.1	1.35	**63.9**	<	**73.7**

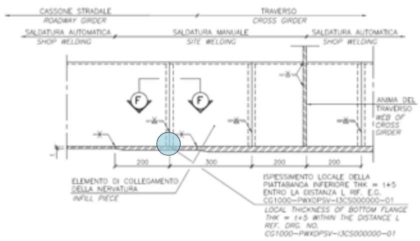
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.868**

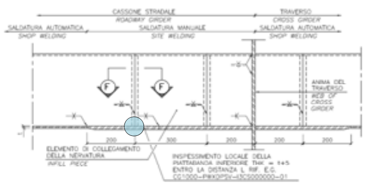
DAMAGE ACCUMULATION METHOD

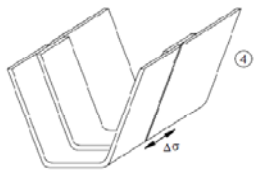
	N/mm^2
EN 1	14.8
EN 2	10.4
EN 3	11.5
EN 4	10.1
EN 5	31.5
EN 6	19.3
EN 7	19.8
EN 8	18.8
LM3	10.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.052**		
train on track 2 + LM3 =	**0.052**		
train on track 1 + train on track 2 + LM3 =	**0.075**		
tot =	**0.179**	<	**0.950**

9.6.1.3 Shop joint – location 3 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.4	1.056	9.4	1.35	**50.2**	<	**52.3**

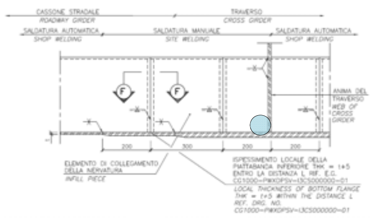
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.961**

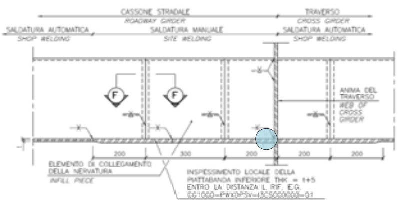
DAMAGE ACCUMULATION METHOD

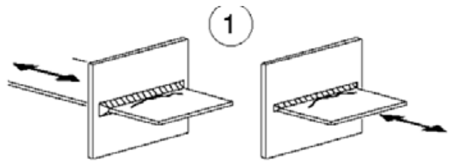
	N/mm²
EN 1	13.1
EN 2	9.2
EN 3	10.3
EN 4	9.1
EN 5	26.4
EN 6	16.9
EN 7	16.6
EN 8	15.7
LM3	7.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.100**		
train on track 2 + LM3 =	**0.100**		
train on track 1 + train on track 2 + LM3 =	**0.128**		
tot =	**0.327**	<	**0.950**

9.6.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.6	1.056	9.8	1.35	**52.5**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.890**

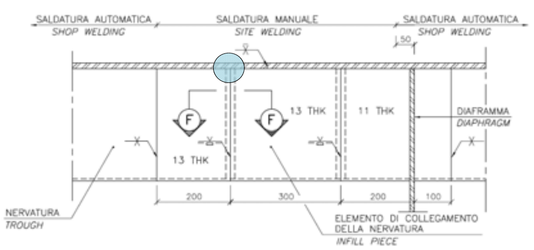
DAMAGE ACCUMULATION METHOD

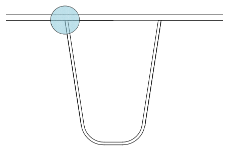
	N/mm^2
EN 1	13.7
EN 2	9.6
EN 3	10.8
EN 4	9.5
EN 5	27.6
EN 6	17.7
EN 7	17.3
EN 8	16.4
LM3	7.4

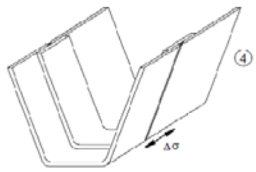
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.062**		
train on track 2 + LM3 =	**0.062**		
train on track 1 + train on track 2 + LM3 =	**0.097**		
tot =	**0.220**	<	**0.950**

9.6.2 Top plate (Span 10)

9.6.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.5	10.6	1.35	**35.1**	<	**52.3**

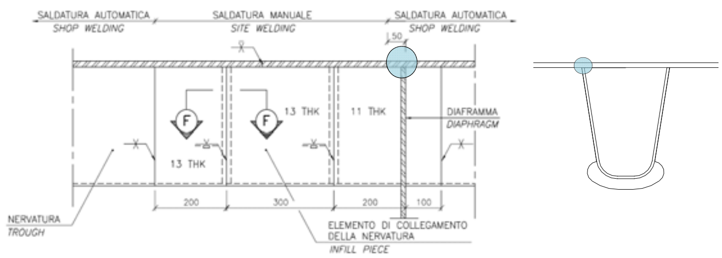
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.671**

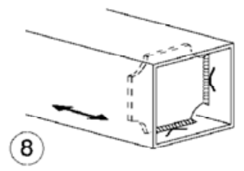
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	4.9
EN 2	3.4
EN 3	3.5
EN 4	3.1
EN 5	9.3
EN 6	6.0
EN 7	6.1
EN 8	5.9
LM3	4.2
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.006**		
train on track 2 + LM3 $_{global + local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.6.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.5	16.8	1.35	**43.4**	<	**58.9**

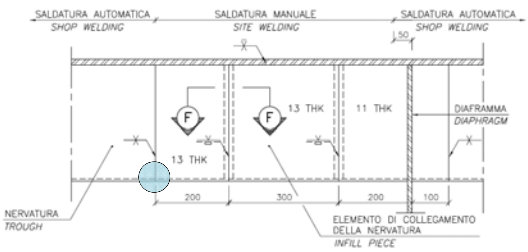
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.737**

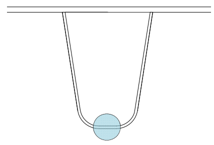
DAMAGE ACCUMULATION METHOD

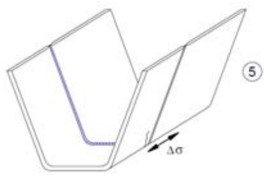
	N/mm^2
EN 1	4.9
EN 2	3.4
EN 3	3.5
EN 4	3.1
EN 5	9.3
EN 6	6.0
EN 7	6.1
EN 8	5.9
LM3	4.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.6.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 10)







$\Delta\sigma_{C WI}$	$\Delta\sigma_{D WI}$	$\Delta\sigma_{L WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.4	1.056	1.4	41.2	1.15	**51.8**	<	**82.5**

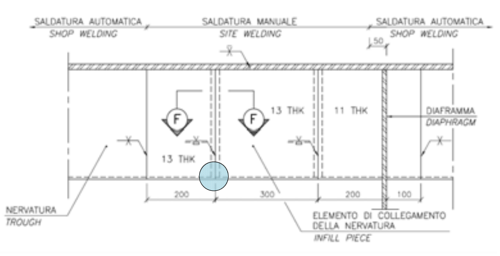
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.628**

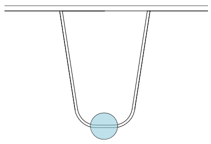
DAMAGE ACCUMULATION METHOD

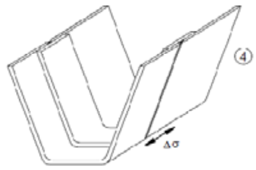
	N/mm²
EN 1	1.2
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.4
EN 6	1.5
EN 7	1.6
EN 8	1.5
LM3	1.1
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.057**		
train on track 2 + LM3 $_{global + local}$ =	**0.057**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.114**	<	0.950

9.6.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.3	1.056	1.4	27.4	1.15	**35.9**	<	**52.3**

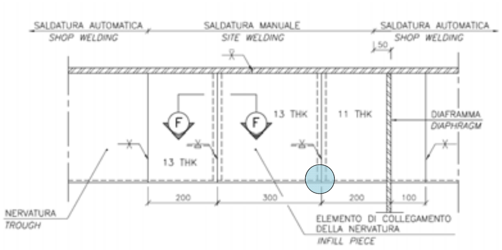
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.687**

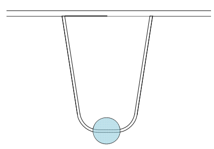
DAMAGE ACCUMULATION METHOD

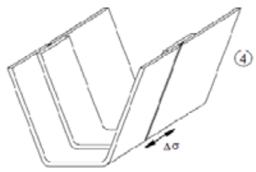
	N/mm^2
EN 1	1.2
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.3
EN 6	1.5
EN 7	1.5
EN 8	1.5
LM3	1.1
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.057**		
train on track 2 + LM3 $_{global+local}$ =	**0.057**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.115**	<	0.950

9.6.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.4	1.056	1.4	28.7	1.15	**37.4**	<	**52.3**

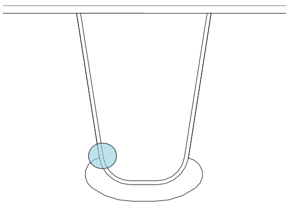
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.716**

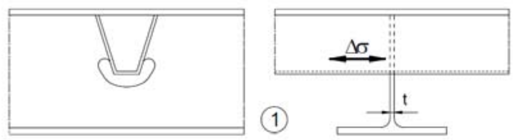
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.2
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.4
EN 6	1.5
EN 7	1.5
EN 8	1.5
LM3	1.1
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.061**		
train on track 2 + LM3 $_{global + local}$ =	**0.061**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.122**	<	**0.950**

9.6.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.6	32.7	1.15	**42.6**	<	**52.3**

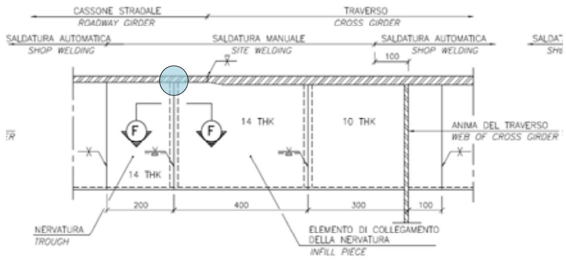
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.815**

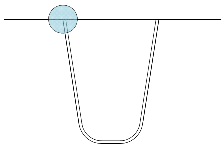
DAMAGE ACCUMULATION METHOD

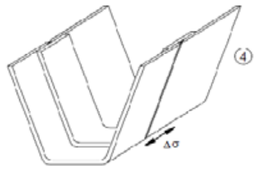
	N/mm^2
EN 1	1.4
EN 2	1.0
EN 3	1.0
EN 4	0.9
EN 5	2.6
EN 6	1.7
EN 7	1.7
EN 8	1.7
LM3	1.2
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	0.950

9.6.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.3	1.056	4.5	10.5	1.35	**35.0**	<	**52.3**

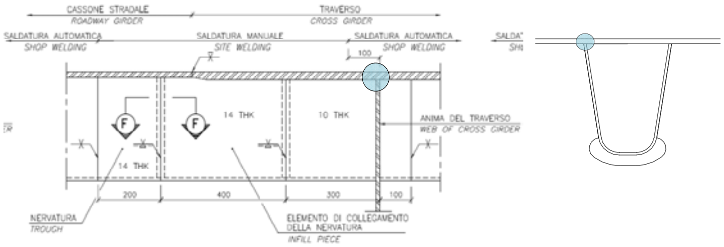
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.669**

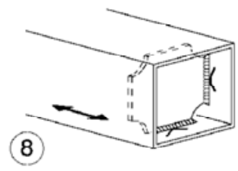
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	5.9
EN 2	4.1
EN 3	4.1
EN 4	3.8
EN 5	10.3
EN 6	7.1
EN 7	6.7
EN 8	6.5
LM3	3.4
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.007**		
train on track 2 + LM3 $_{global + local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.016**	<	**0.950**

9.6.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.3	1.056	4.5	16.8	1.35	**43.4**	<	**58.9**

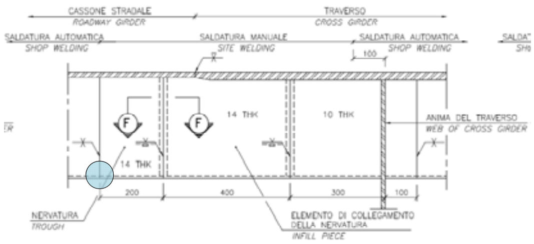
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.737**

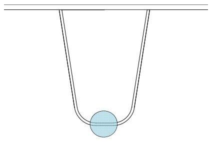
DAMAGE ACCUMULATION METHOD

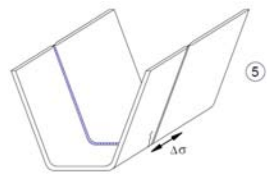
	N/mm^2
EN 1	5.9
EN 2	4.1
EN 3	4.1
EN 4	3.8
EN 5	10.3
EN 6	7.1
EN 7	6.7
EN 8	6.5
LM3	3.4
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.012**	<	**0.950**

9.6.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 10)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.1	40.6	1.15	**51.2**	<	**82.5**

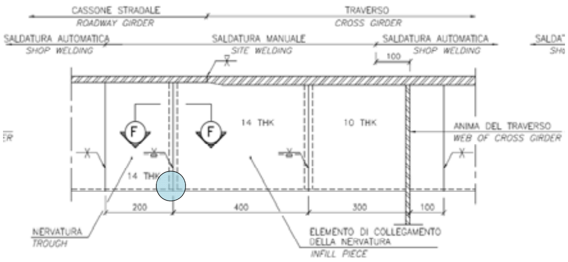
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.621**

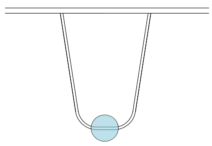
DAMAGE ACCUMULATION METHOD

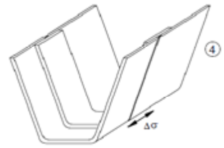
	N/mm^2
EN 1	1.5
EN 2	1.0
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.7
EN 8	1.7
LM3	0.9
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.112**	<	0.950

9.6.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.1	26.8	1.15	**35.3**	<	**52.3**

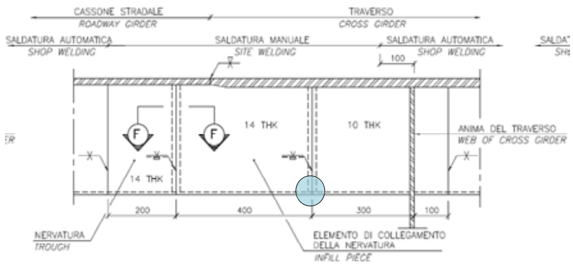
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.675**

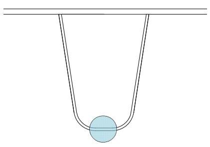
DAMAGE ACCUMULATION METHOD

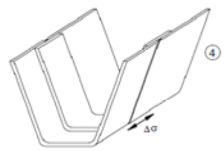
	N/mm^2
EN 1	1.5
EN 2	1.0
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.7
EN 8	1.6
LM3	0.9
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.067**		
train on track 2 + LM3 $_{global+local}$ =	**0.067**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.135**	<	**0.950**

9.6.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.1	31.1	1.15	**40.2**	<	**52.3**

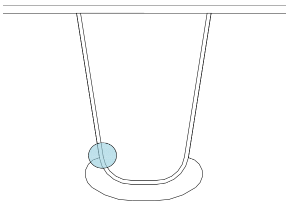
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.769**

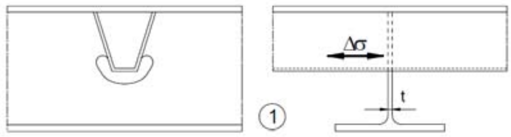
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.5
EN 2	1.0
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.7
EN 8	1.7
LM3	0.9
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.067**		
train on track 2 + LM3 $_{global+local}$ =	**0.067**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.135**	<	0.950

9.6.2.12 Point E – trough to diaphragm weld – location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.9	1.056	1.3	32.7	1.15	**42.6**	<	**52.3**

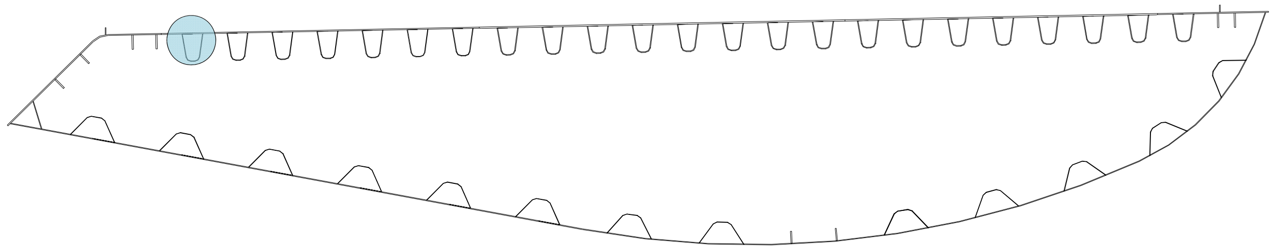
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.815**

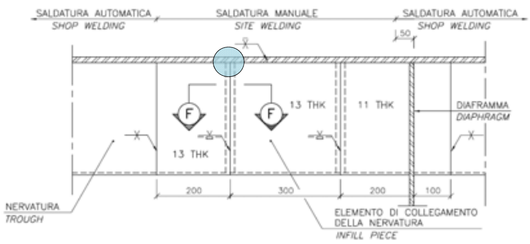
DAMAGE ACCUMULATION METHOD

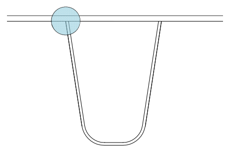
	N/mm^2
EN 1	1.7
EN 2	1.2
EN 3	1.2
EN 4	1.1
EN 5	2.9
EN 6	2.0
EN 7	1.9
EN 8	1.8
LM3	1.0
LM3 local	21.8

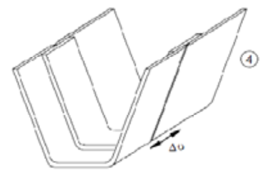
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	0.950

9.6.2.13 Point C – Erection joint – location 1 – only global actions (Span 10)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.3	1.056	5.5	0.0	1.35	**20.8**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.397**

DAMAGE ACCUMULATION METHOD

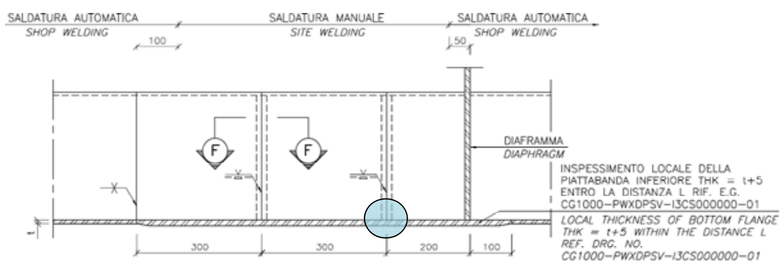
	N/mm^2
EN 1	4.9
EN 2	3.4
EN 3	3.5
EN 4	3.1
EN 5	9.3
EN 6	6.0
EN 7	6.1
EN 8	5.9
LM3	4.2
LM3 local	0.0

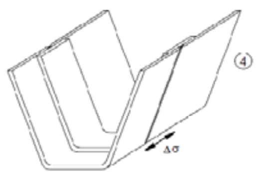
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.7 Span 9 – Main span

9.7.1 Bottom plate (Span 9)

9.7.1.1 Erection joint – location 1 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.9	1.056	12.1	1.35	**50.4**	<	**52.3**

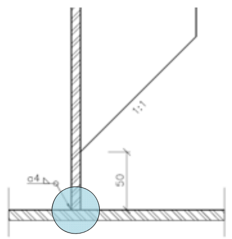
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.963**

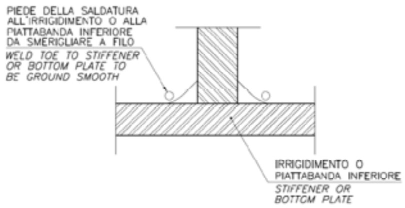
DAMAGE ACCUMULATION METHOD

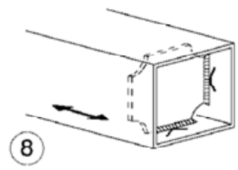
	N/mm^2
EN 1	10.9
EN 2	7.6
EN 3	8.6
EN 4	7.6
EN 5	23.9
EN 6	14.4
EN 7	15.1
EN 8	14.2
LM3	9.4

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.098**		
train on track 2 + LM3 =	**0.098**		
train on track 1 + train on track 2 + LM3 =	**0.106**		
tot =	**0.302**	<	**0.950**

9.7.1.2 Bottom plate to diaphragm weld – location 2 (Span 9)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.7	1.056	16.5	1.35	**68.9**	<	**73.7**

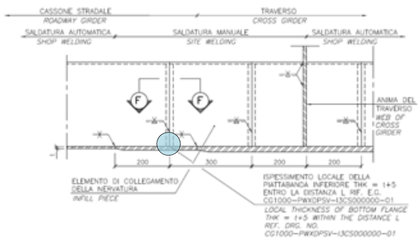
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.936**

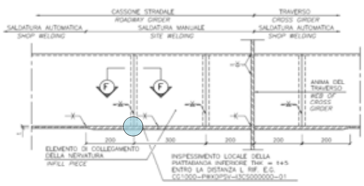
DAMAGE ACCUMULATION METHOD

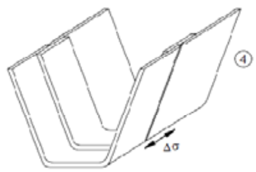
	N/mm^2
EN 1	14.9
EN 2	10.5
EN 3	11.8
EN 4	10.4
EN 5	32.7
EN 6	19.7
EN 7	20.7
EN 8	19.4
LM3	12.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.085**		
train on track 2 + LM3 =	**0.085**		
train on track 1 + train on track 2 + LM3 =	**0.095**		
tot =	**0.265**	<	**0.950**

9.7.1.3 Shop joint – location 3 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	26.2	1.056	9.9	1.35	**50.7**	<	**52.3**

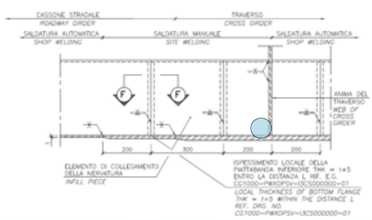
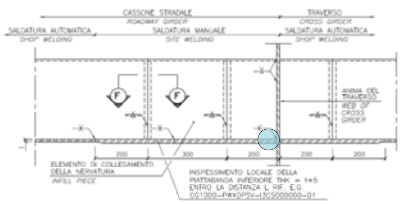
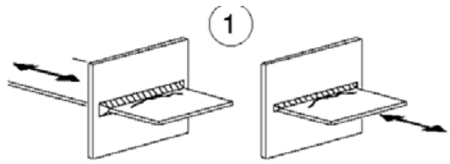
$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.968**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	12.9
EN 2	9.0
EN 3	10.0
EN 4	8.9
EN 5	26.2
EN 6	16.6
EN 7	16.5
EN 8	15.7
LM3	7.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.108**		
train on track 2 + LM3 =	**0.108**		
train on track 1 + train on track 2 + LM3 =	**0.130**		
tot =	**0.345**	<	**0.950**

9.7.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 9)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.3	1.056	10.4	1.35	**52.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.898**

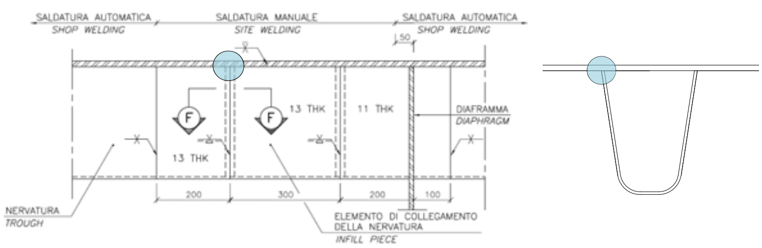
DAMAGE ACCUMULATION METHOD

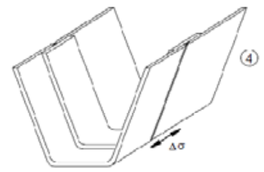
	N/mm^2
EN 1	13.5
EN 2	9.4
EN 3	10.5
EN 4	9.3
EN 5	27.3
EN 6	17.4
EN 7	17.3
EN 8	16.4
LM3	8.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.066**		
train on track 2 + LM3 =	**0.066**		
train on track 1 + train on track 2 + LM3 =	**0.099**		
tot =	**0.232**	<	**0.950**

9.7.2 Top plate (Span 9)

9.7.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.0	1.056	6.6	10.6	1.35	**37.5**	<	**52.3**

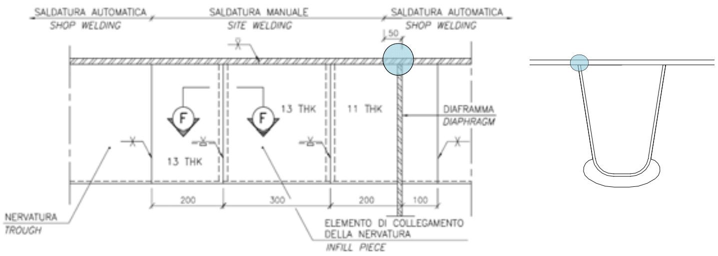
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.716**

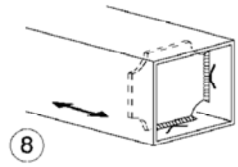
Damage Accumulation Method

	N/mm^2
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.3
EN 5	10.0
EN 6	6.3
EN 7	6.5
EN 8	6.3
LM3	5.2
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.008**		
train on track 2 + LM3 $_{global+local}$ =	**0.008**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.017**	<	**0.950**

9.7.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.0	1.056	6.6	16.8	1.35	**45.8**	<	**58.9**

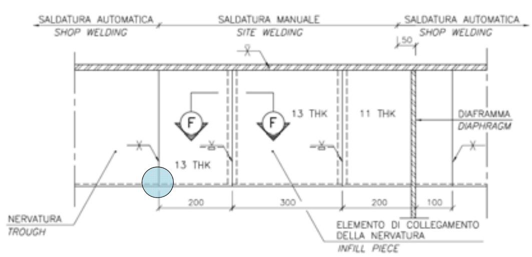
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.777**

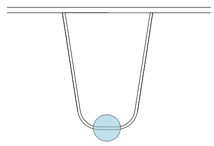
DAMAGE ACCUMULATION METHOD

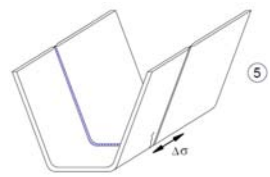
	N/mm²
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.3
EN 5	10.0
EN 6	6.3
EN 7	6.5
EN 8	6.3
LM3	5.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.008**		
train on track 2 + LM3 $_{global+local}$ =	**0.008**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.015**	<	**0.950**

9.7.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 9)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	1.7	41.2	1.15	**52.3**	<	**82.5**

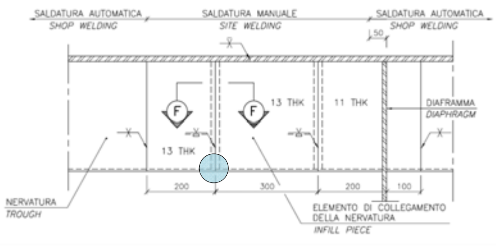
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.634**

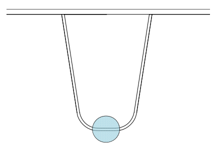
DAMAGE ACCUMULATION METHOD

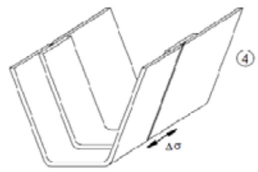
	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.5
EN 6	1.6
EN 7	1.6
EN 8	1.6
LM3	1.3
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.059**		
train on track 2 + LM3 $_{global + local}$ =	**0.059**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.119**	<	**0.950**

9.7.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	1.7	27.4	1.15	**36.4**	<	**52.3**

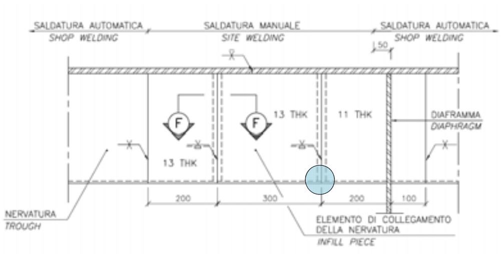
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.697**

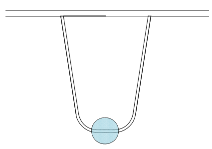
DAMAGE ACCUMULATION METHOD

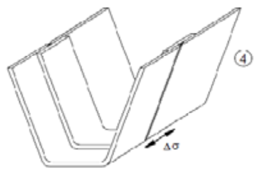
	N/mm²
EN 1	1.3
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.5
EN 6	1.6
EN 7	1.6
EN 8	1.6
LM3	1.3
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.061**		
train on track 2 + LM3 $_{global+local}$ =	**0.061**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.122**	<	**0.950**

9.7.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	1.7	28.7	1.15	**38.0**	<	**52.3**

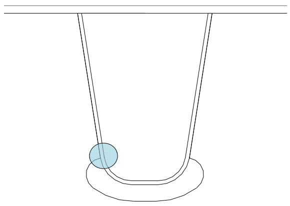
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.726**

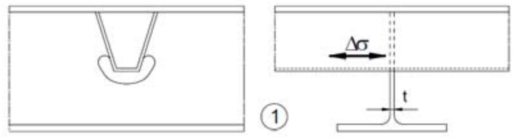
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.5
EN 6	1.6
EN 7	1.6
EN 8	1.6
LM3	1.3
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.065**		
train on track 2 + LM3 $_{global + local}$ =	**0.065**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.129**	<	**0.950**

9.7.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.8	1.056	1.9	32.7	1.15	**43.2**	<	**52.3**

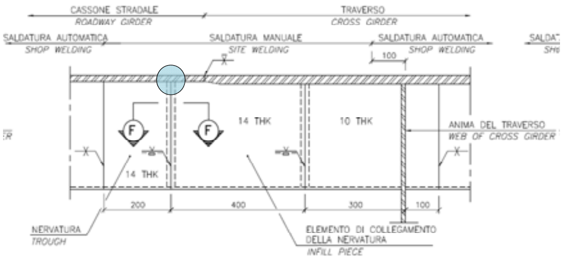
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.826**

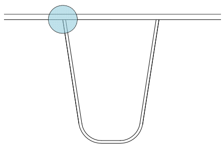
DAMAGE ACCUMULATION METHOD

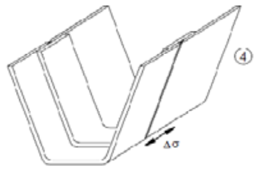
	N/mm^2
EN 1	1.4
EN 2	1.0
EN 3	1.0
EN 4	0.9
EN 5	2.8
EN 6	1.8
EN 7	1.8
EN 8	1.8
LM3	1.5
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.023**		
train on track 2 + LM3 $_{global+local}$ =	**0.023**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.046**	<	0.950

9.7.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.5	1.056	5.0	10.5	1.35	**35.9**	<	**52.3**

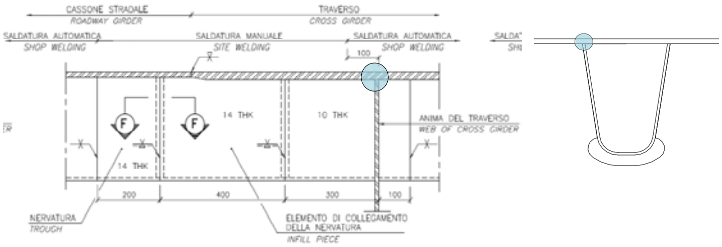
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.686**

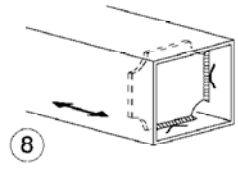
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	6.0
EN 2	4.2
EN 3	4.1
EN 4	3.8
EN 5	10.5
EN 6	7.2
EN 7	6.9
EN 8	6.8
LM3	3.9
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.009**		
train on track 2 + LM3 $_{global + local}$ =	**0.009**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.018**	<	**0.950**

9.7.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.5	1.056	5.0	16.8	1.35	**44.3**	<	**58.9**

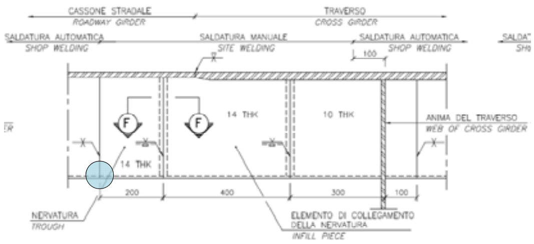
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.752**

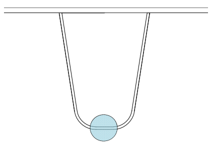
DAMAGE ACCUMULATION METHOD

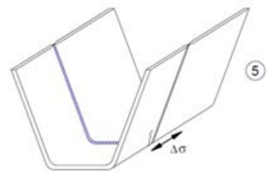
	N/mm^2
EN 1	6.0
EN 2	4.2
EN 3	4.1
EN 4	3.8
EN 5	10.5
EN 6	7.2
EN 7	6.9
EN 8	6.8
LM3	3.9
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.007**		
train on track 2 + LM3 $_{global+local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.013**	<	0.950

9.7.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 9)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.3	40.6	1.15	**51.4**	<	**82.5**

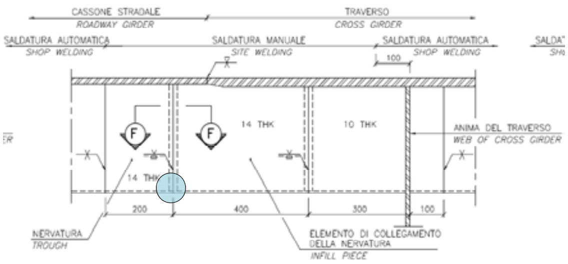
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.623**

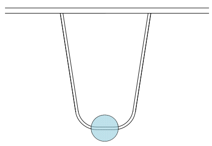
DAMAGE ACCUMULATION METHOD

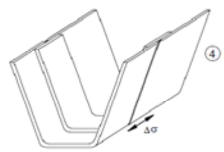
	N/mm^2
EN 1	1.5
EN 2	1.1
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.8
EN 8	1.7
LM3	1.0
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.057**		
train on track 2 + LM3 $_{global + local}$ =	**0.057**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.114**	<	**0.950**

9.7.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.3	26.8	1.15	**35.5**	<	**52.3**

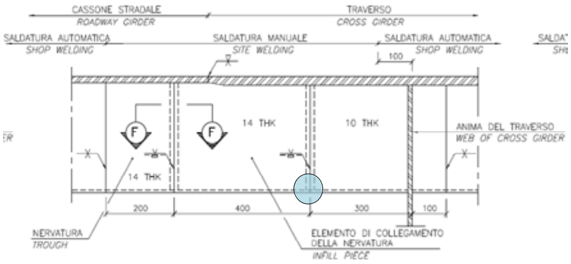
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.679**

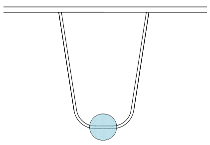
DAMAGE ACCUMULATION METHOD

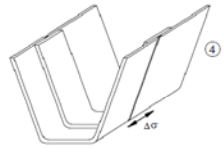
	N/mm^2
EN 1	1.5
EN 2	1.0
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.7
EN 8	1.7
LM3	1.0
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.069**		
train on track 2 + LM3 $_{global + local}$ =	**0.069**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.139**	<	**0.950**

9.7.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	1.3	31.1	1.15	**40.4**	<	**52.3**

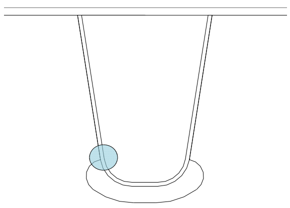
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.772**

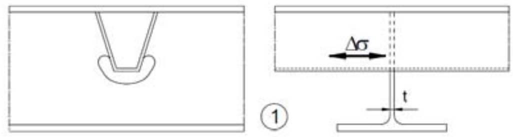
Damage Accumulation Method

	N/mm²
EN 1	1.5
EN 2	1.1
EN 3	1.0
EN 4	1.0
EN 5	2.6
EN 6	1.8
EN 7	1.8
EN 8	1.7
LM3	1.0
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.069**		
train on track 2 + LM3 $_{global+local}$ =	**0.069**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.138**	<	0.950

9.7.2.12 Point E – trough to diaphragm weld – location 3 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	$\Delta\sigma_{x\ local}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	3.0	1.056	1.4	32.7	1.15	**42.9**	<	**52.3**

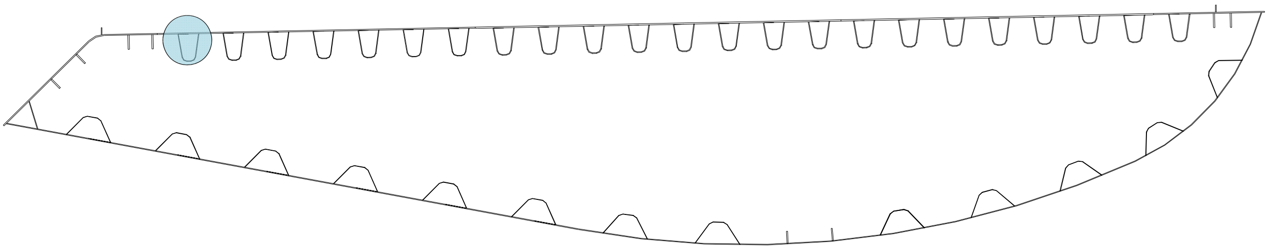
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.819**

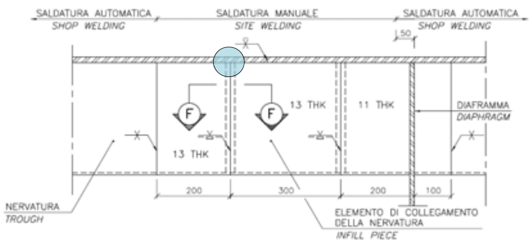
DAMAGE ACCUMULATION METHOD

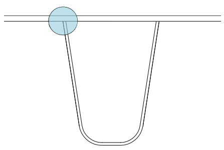
	N/mm²
EN 1	1.7
EN 2	1.2
EN 3	1.2
EN 4	1.1
EN 5	3.0
EN 6	2.0
EN 7	2.0
EN 8	1.9
LM3	1.1
LM3 local	21.8

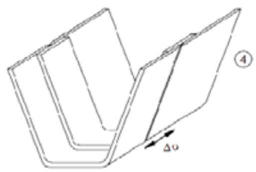
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.018**		
train on track 2 + LM3 $_{global + local}$ =	**0.018**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.037**	<	0.950

9.7.2.13 Point C – Erection joint – location 1 – only global actions (Span 9)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.0	1.056	6.6	0.0	1.35	23.1	<	52.3

$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.442

DAMAGE ACCUMULATION METHOD

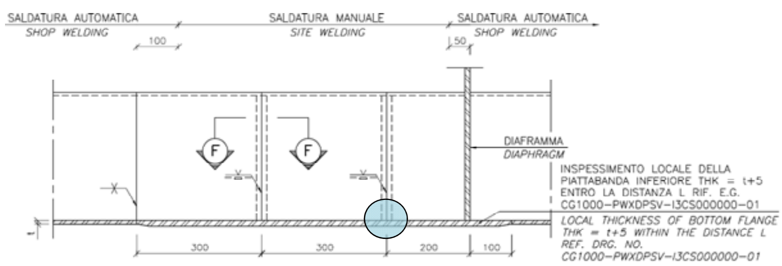
	N/mm²
EN 1	5.0
EN 2	3.5
EN 3	3.6
EN 4	3.3
EN 5	10.0
EN 6	6.3
EN 7	6.5
EN 8	6.3
LM3	5.2
LM3 local	0.0

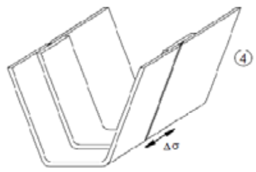
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	0.000		
train on track 2 + LM3 $_{global+local}$ =	0.000		
train on track 1 + train on track 2 + LM3 $_{global}$ =	0.001		
LM3 $_{global+local}$ =	0.000		
tot =	0.001	<	0.950

9.8 Span 8 – Main span

9.8.1 Bottom plate (Span 8)

9.8.1.1 Erection joint – location 1 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.7	1.056	10.4	1.35	**44.9**	<	**52.3**

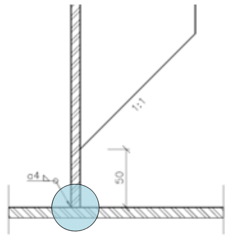
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.858**

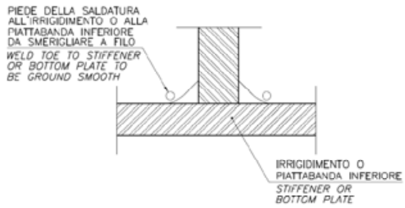
DAMAGE ACCUMULATION METHOD

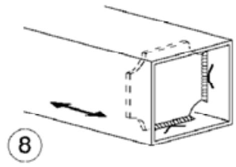
	N/mm^2
EN 1	10.4
EN 2	7.3
EN 3	8.0
EN 4	7.0
EN 5	21.7
EN 6	13.2
EN 7	13.8
EN 8	13.3
LM3	7.9

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.050**		
train on track 2 + LM3 =	**0.050**		
train on track 1 + train on track 2 + LM3 =	**0.072**		
tot =	**0.171**	<	**0.950**

9.8.1.2 Bottom plate to diaphragm weld – location 2 (Span 8)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.6	1.056	14.2	1.35	**61.4**	<	**73.7**

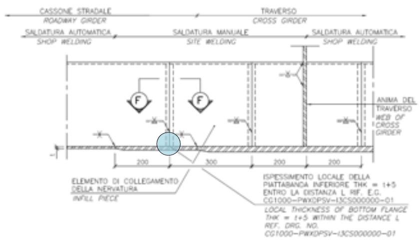
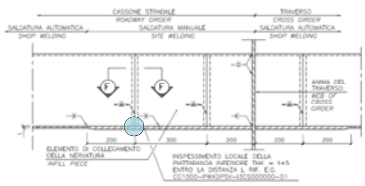
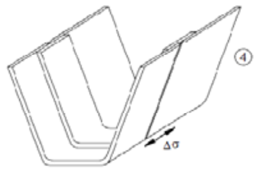
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.834**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	14.2
EN 2	10.0
EN 3	11.0
EN 4	9.6
EN 5	29.6
EN 6	18.1
EN 7	18.9
EN 8	18.1
LM3	10.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.043**		
train on track 2 + LM3 =	**0.043**		
train on track 1 + train on track 2 + LM3 =	**0.063**		
tot =	**0.150**	<	**0.950**

9.8.1.3 Shop joint – location 3 (Span 8)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.5	1.056	8.7	1.35	**42.4**	<	**52.3**

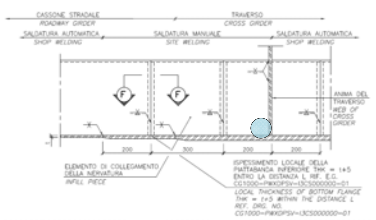
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.811**

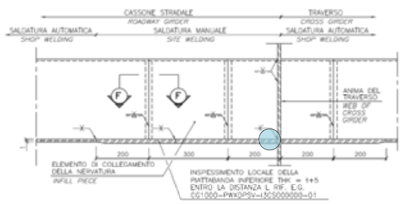
Damage accumulation method

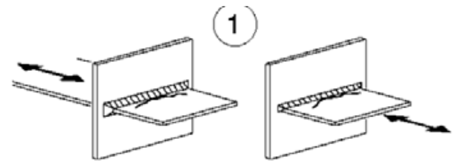
	N/mm^2
EN 1	11.4
EN 2	7.9
EN 3	8.8
EN 4	7.6
EN 5	21.5
EN 6	14.1
EN 7	13.8
EN 8	13.3
LM3	6.6

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.037**		
train on track 2 + LM3 =	**0.037**		
train on track 1 + train on track 2 + LM3 =	**0.070**		
tot =	**0.143**	<	**0.950**

9.8.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.5	1.056	9.1	1.35	**44.3**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.752**

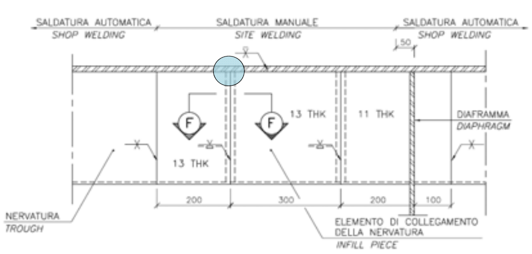
DAMAGE ACCUMULATION METHOD

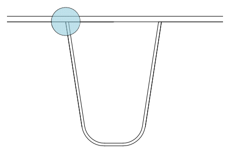
	N/mm^2
EN 1	11.9
EN 2	8.3
EN 3	9.1
EN 4	7.9
EN 5	22.5
EN 6	14.7
EN 7	14.4
EN 8	13.9
LM3	6.9

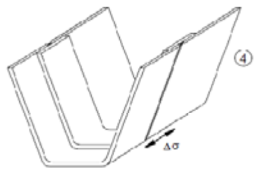
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.015**		
train on track 2 + LM3 =	**0.015**		
train on track 1 + train on track 2 + LM3 =	**0.051**		
tot =	**0.081**	<	**0.950**

9.8.2 Top plate (Span 8)

9.8.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.3	1.056	5.6	10.6	1.35	**33.7**	<	**52.3**

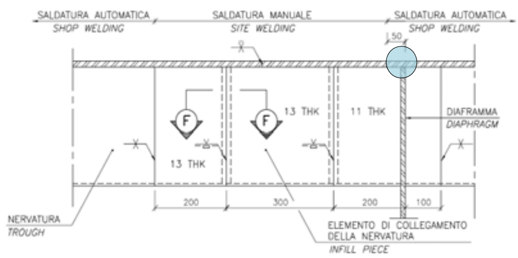
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.645**

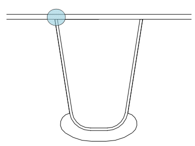
DAMAGE ACCUMULATION METHOD

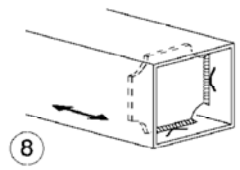
	N/mm^2
EN 1	4.5
EN 2	3.2
EN 3	3.1
EN 4	2.8
EN 5	8.3
EN 6	5.0
EN 7	5.6
EN 8	5.4
LM3	4.3
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.8.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.3	1.056	5.6	16.8	1.35	**42.1**	<	**58.9**

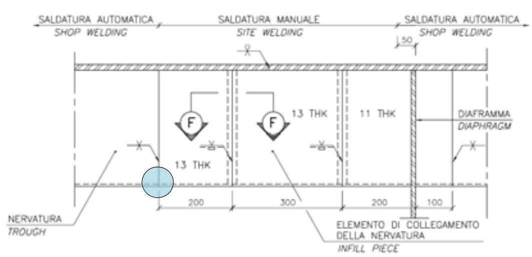
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.714**

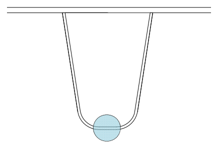
DAMAGE ACCUMULATION METHOD

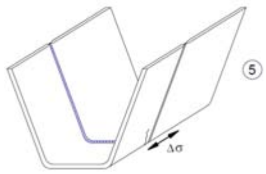
	N/mm^2
EN 1	4.5
EN 2	3.2
EN 3	3.1
EN 4	2.8
EN 5	8.3
EN 6	5.0
EN 7	5.6
EN 8	5.4
LM3	4.3
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.009**	<	**0.950**

9.8.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 8)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.1	1.056	1.4	41.2	1.15	**51.5**	<	**82.5**

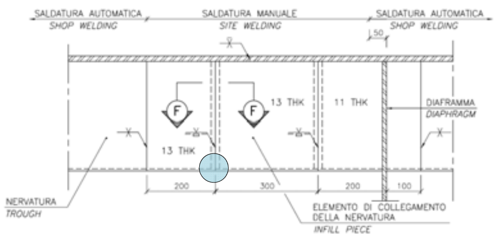
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.624**

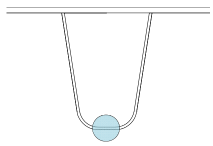
DAMAGE ACCUMULATION METHOD

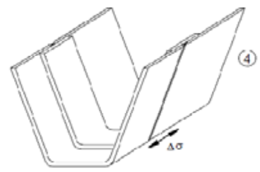
	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	2.1
EN 6	1.3
EN 7	1.4
EN 8	1.4
LM3	1.1
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.112**	<	**0.950**

9.8.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.1	1.056	1.4	27.4	1.15	**35.7**	<	**52.3**

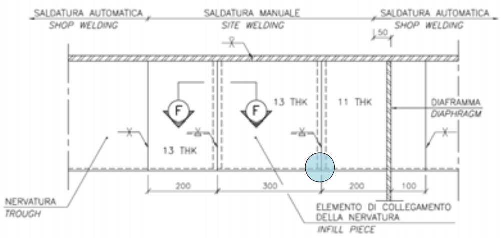
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.681**

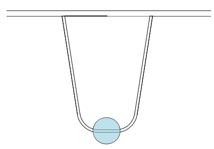
DAMAGE ACCUMULATION METHOD

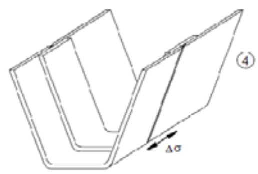
	N/mm²
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	2.1
EN 6	1.3
EN 7	1.4
EN 8	1.4
LM3	1.1
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.112**	<	**0.950**

9.8.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.1	1.056	1.4	28.7	1.15	**37.2**	<	**52.3**

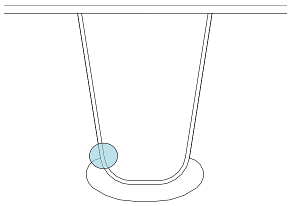
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.710**

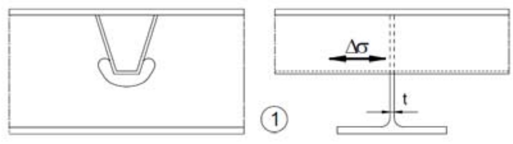
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	0.8
EN 4	0.7
EN 5	2.1
EN 6	1.3
EN 7	1.4
EN 8	1.4
LM3	1.1
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.059**		
train on track 2 + LM3 $_{global+local}$ =	**0.059**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.119**	<	**0.950**

9.8.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.3	1.056	1.6	32.7	1.15	**42.3**	<	**52.3**

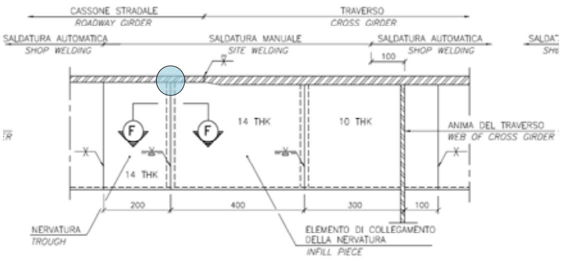
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.809**

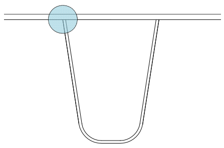
DAMAGE ACCUMULATION METHOD

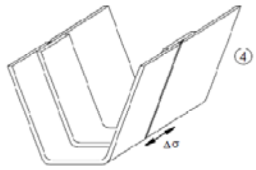
	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	0.9
EN 4	0.8
EN 5	2.3
EN 6	1.4
EN 7	1.6
EN 8	1.5
LM3	1.2
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.005**		
train on track 2 + LM3 $_{global + local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.010**	<	**0.950**

9.8.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	6.3	1.056	4.1	10.5	1.35	**28.8**	<	**52.3**

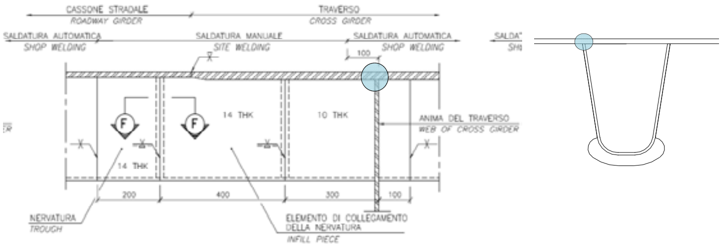
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.551**

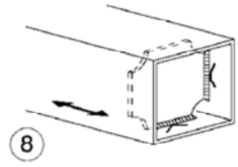
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	4.6
EN 2	3.2
EN 3	2.7
EN 4	2.7
EN 5	6.3
EN 6	4.6
EN 7	4.7
EN 8	4.6
LM3	3.2
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.8.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	6.3	1.056	4.1	16.8	1.35	**37.2**	<	**58.9**

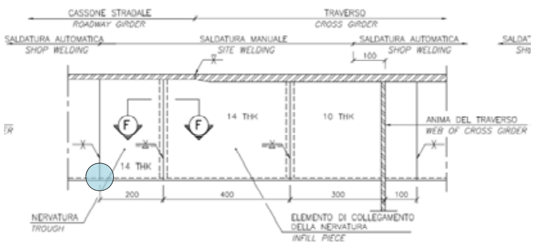
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.632**

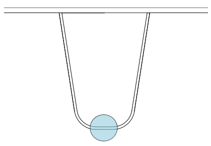
DAMAGE ACCUMULATION METHOD

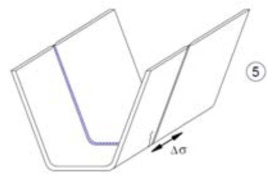
	N/mm^2
EN 1	4.6
EN 2	3.2
EN 3	2.7
EN 4	2.7
EN 5	6.3
EN 6	4.6
EN 7	4.7
EN 8	4.6
LM3	3.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.8.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 8)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.6	1.056	1.1	40.6	1.15	**49.9**	<	**82.5**

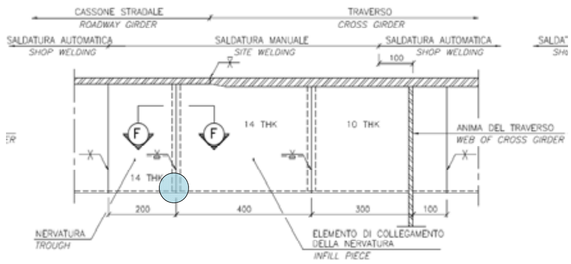
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.604**

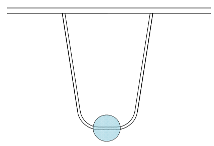
DAMAGE ACCUMULATION METHOD

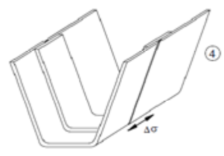
	N/mm²
EN 1	1.2
EN 2	0.8
EN 3	0.7
EN 4	0.7
EN 5	1.6
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.8
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.052**		
train on track 2 + LM3 $_{global + local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.104**	<	0.950

9.8.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.6	1.056	1.0	26.8	1.15	**34.0**	<	**52.3**

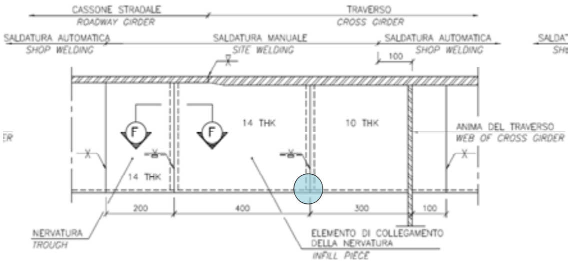
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.650**

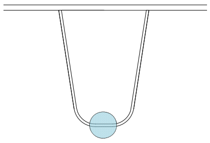
DAMAGE ACCUMULATION METHOD

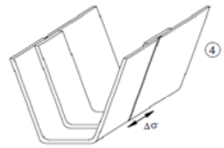
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.7
EN 4	0.7
EN 5	1.6
EN 6	1.1
EN 7	1.2
EN 8	1.2
LM3	0.8
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.060**		
train on track 2 + LM3 $_{global+local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.121**	<	**0.950**

9.8.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.6	1.056	1.1	31.1	1.15	**38.9**	<	**52.3**

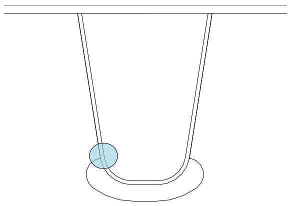
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.743**

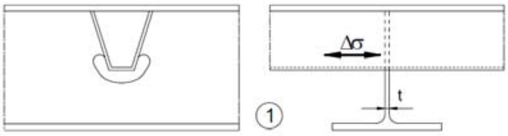
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	0.7
EN 4	0.7
EN 5	1.6
EN 6	1.2
EN 7	1.2
EN 8	1.2
LM3	0.8
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.060**		
train on track 2 + LM3 $_{global+local}$ =	**0.060**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.121**	<	0.950

9.8.2.12 Point E – trough to diaphragm weld – location 3 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	1.2	32.7	1.15	**41.2**	<	**52.3**

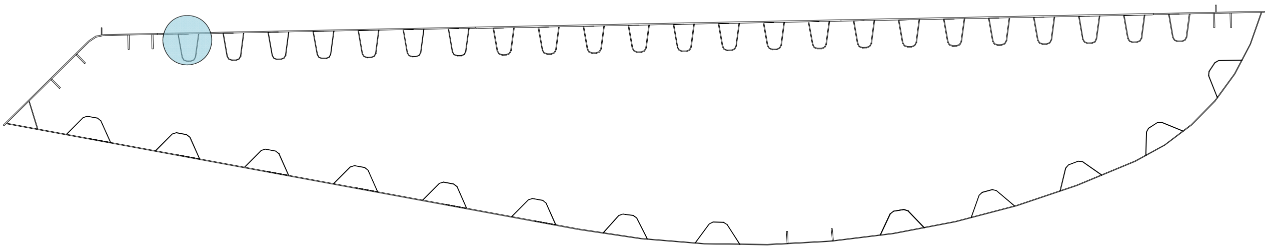
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.787**

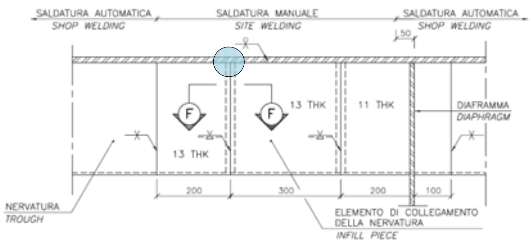
DAMAGE ACCUMULATION METHOD

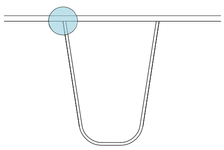
	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	0.8
EN 4	0.8
EN 5	1.8
EN 6	1.3
EN 7	1.3
EN 8	1.3
LM3	0.9
LM3 local	21.8

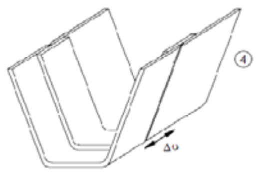
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.8.2.13 Point C – Erection joint – location 1 – only global actions (Span 8)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	8.3	1.056	5.6	0.0	1.35	**19.4**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.371**

DAMAGE ACCUMULATION METHOD

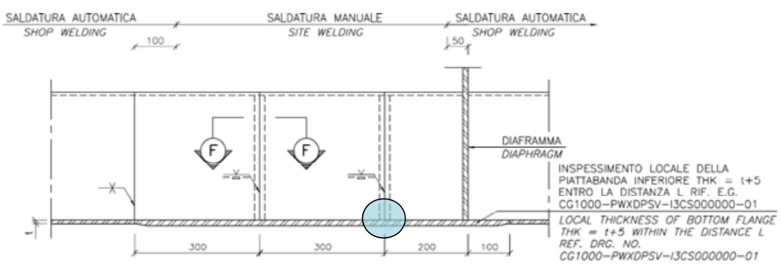
	N/mm^2
EN 1	4.5
EN 2	3.2
EN 3	3.1
EN 4	2.8
EN 5	8.3
EN 6	5.0
EN 7	5.6
EN 8	5.4
LM3	4.3
LM3 local	0.0

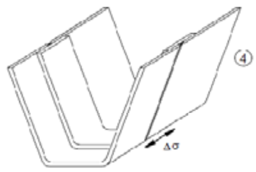
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9 Span 7 – Main span

9.9.1 Bottom plate (Span 7)

9.9.1.1 Erection joint – location 1 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.8	1.056	11.1	1.35	**44.6**	<	**52.3**

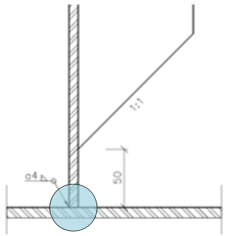
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.853**

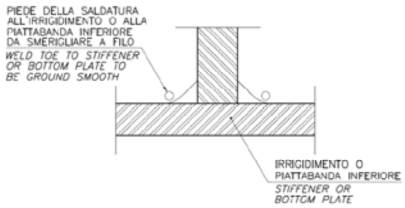
DAMAGE ACCUMULATION METHOD

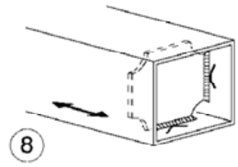
	N/mm^2
EN 1	9.3
EN 2	6.6
EN 3	8.2
EN 4	6.6
EN 5	20.8
EN 6	13.2
EN 7	12.8
EN 8	12.1
LM3	8.6

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.049**		
train on track 2 + LM3 =	**0.049**		
train on track 1 + train on track 2 + LM3 =	**0.066**		
tot =	**0.164**	<	**0.950**

9.9.1.2 Bottom plate to diaphragm weld – location 2 (Span 7)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.4	1.056	15.2	1.35	**61.1**	<	**73.7**

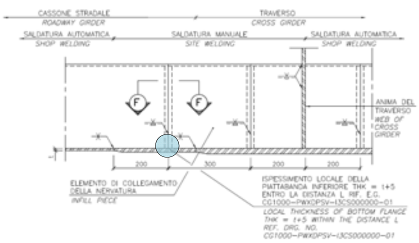
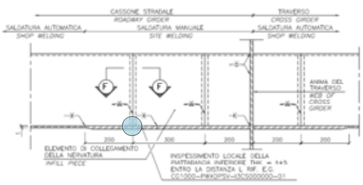
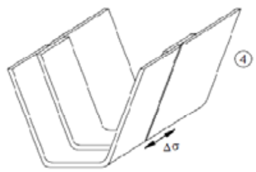
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.829**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	12.8
EN 2	9.0
EN 3	11.2
EN 4	9.1
EN 5	28.4
EN 6	18.0
EN 7	17.6
EN 8	16.5
LM3	11.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.039**		
train on track 2 + LM3 =	**0.039**		
train on track 1 + train on track 2 + LM3 =	**0.058**		
tot =	**0.136**	<	**0.950**

9.9.1.3 Shop joint – location 3 (Span 7)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.0	1.056	9.0	1.35	**47.8**	<	**52.3**

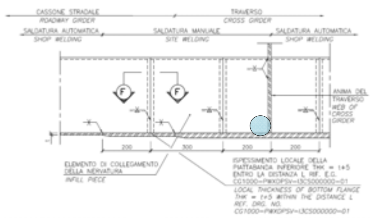
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.913**

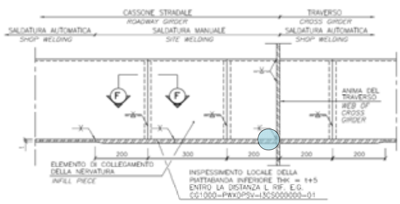
DAMAGE ACCUMULATION METHOD

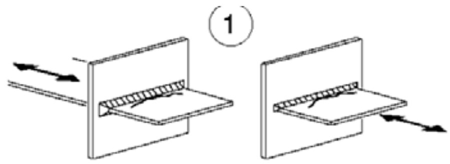
	N/mm^2
EN 1	11.3
EN 2	7.9
EN 3	10.5
EN 4	8.4
EN 5	25.0
EN 6	16.6
EN 7	15.0
EN 8	14.2
LM3	7.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.071**		
train on track 2 + LM3 =	**0.071**		
train on track 1 + train on track 2 + LM3 =	**0.101**		
tot =	**0.244**	<	**0.950**

9.9.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.1	1.056	9.4	1.35	**49.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.847**

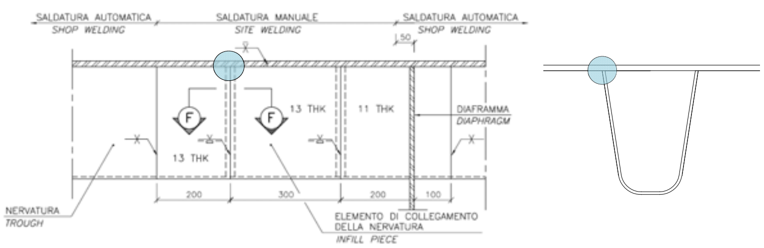
DAMAGE ACCUMULATION METHOD

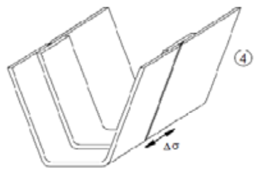
	N/mm²
EN 1	11.8
EN 2	8.3
EN 3	11.0
EN 4	8.8
EN 5	26.1
EN 6	17.3
EN 7	15.7
EN 8	14.8
LM3	7.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.046**		
train on track 2 + LM3 =	**0.046**		
train on track 1 + train on track 2 + LM3 =	**0.075**		
tot =	**0.167**	<	**0.950**

9.9.2 Top plate (Span 7)

9.9.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.1	1.056	5.9	10.6	1.35	**28.1**	<	**52.3**

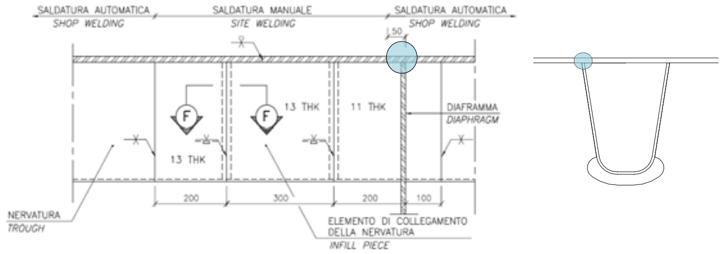
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.537**

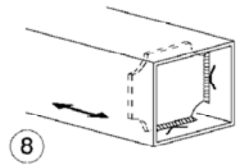
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	3.2
EN 2	2.1
EN 3	1.8
EN 4	1.8
EN 5	4.1
EN 6	3.1
EN 7	3.2
EN 8	3.1
LM3	4.6
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.1	1.056	5.9	16.8	1.35	**36.4**	<	**58.9**

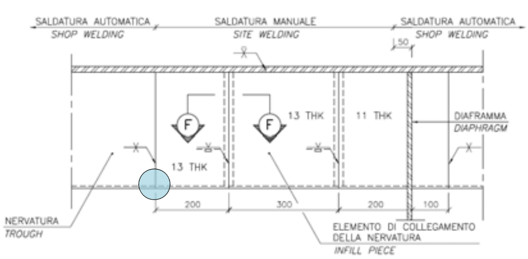
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.618**

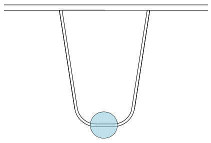
DAMAGE ACCUMULATION METHOD

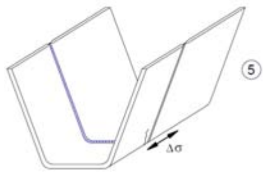
	N/mm^2
EN 1	3.2
EN 2	2.1
EN 3	1.8
EN 4	1.8
EN 5	4.1
EN 6	3.1
EN 7	3.2
EN 8	3.1
LM3	4.6
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 7)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.5	41.2	1.15	**50.3**	<	**82.5**

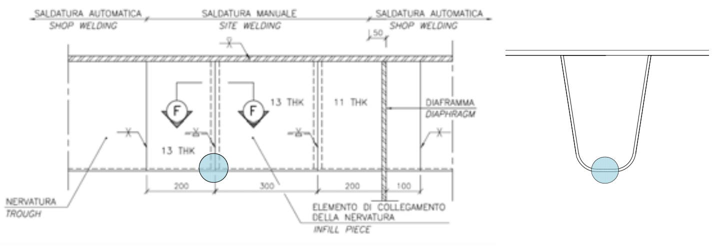
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.610**

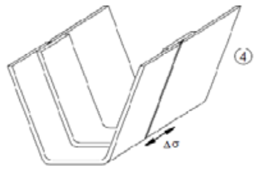
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.8
EN 2	0.5
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.8
EN 7	0.8
EN 8	0.8
LM3	1.2
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.106**	<	0.950

9.9.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.5	27.4	1.15	**34.4**	<	**52.3**

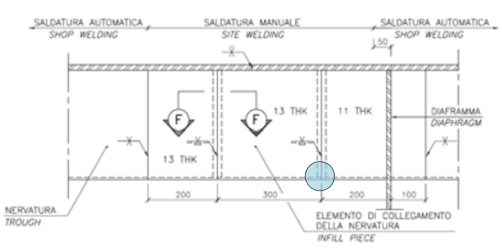
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.658**

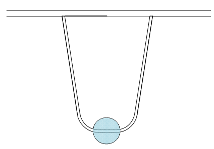
DAMAGE ACCUMULATION METHOD

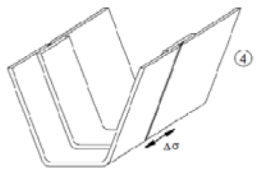
	N/mm^2
EN 1	0.8
EN 2	0.5
EN 3	0.4
EN 4	0.4
EN 5	1.0
EN 6	0.8
EN 7	0.8
EN 8	0.8
LM3	1.1
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.051**		
train on track 2 + LM3 $_{global+local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.102**	<	**0.950**

9.9.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.5	28.7	1.15	**35.9**	<	**52.3**

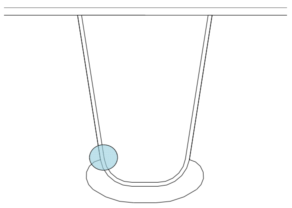
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.687**

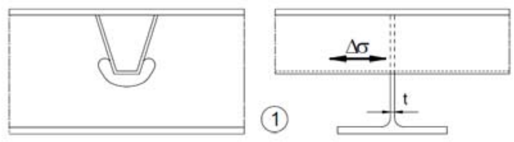
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.8
EN 2	0.5
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.8
EN 7	0.8
EN 8	0.8
LM3	1.2
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.054**		
train on track 2 + LM3 $_{global+local}$ =	**0.054**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.109**	<	0.950

9.9.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.2	1.056	1.7	32.7	1.15	**41.0**	<	**52.3**

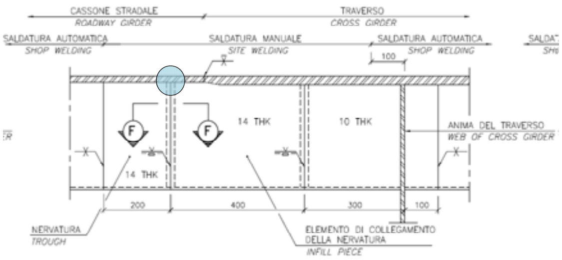
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.783**

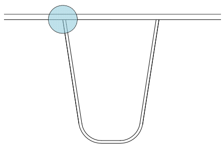
DAMAGE ACCUMULATION METHOD

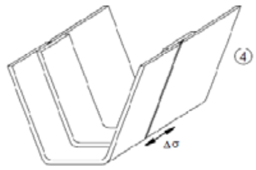
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.5
EN 4	0.5
EN 5	1.2
EN 6	0.9
EN 7	0.9
EN 8	0.9
LM3	1.3
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.9	1.056	4.0	10.5	1.35	**25.2**	<	**52.3**

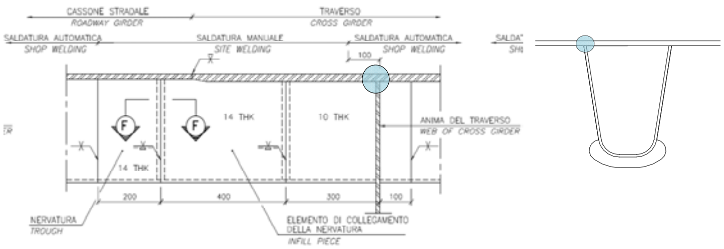
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.482**

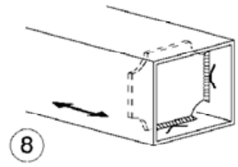
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	3.6
EN 2	2.3
EN 3	2.2
EN 4	2.2
EN 5	3.9
EN 6	3.6
EN 7	3.0
EN 8	2.9
LM3	3.1
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.9.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.9	1.056	4.0	16.8	1.35	**33.6**	<	**58.9**

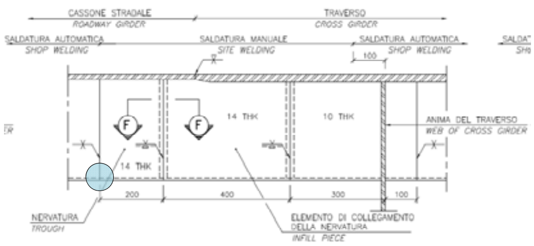
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.571**

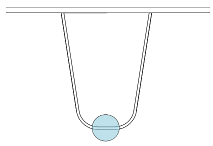
DAMAGE ACCUMULATION METHOD

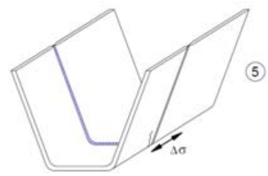
	N/mm^2
EN 1	3.6
EN 2	2.3
EN 3	2.2
EN 4	2.2
EN 5	3.9
EN 6	3.6
EN 7	3.0
EN 8	2.9
LM3	3.1
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 7)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.0	40.6	1.15	**49.1**	<	**82.5**

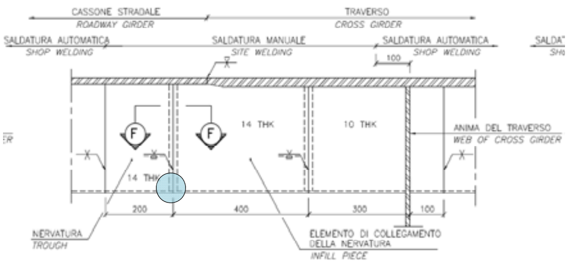
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.595**

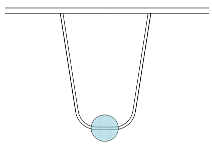
DAMAGE ACCUMULATION METHOD

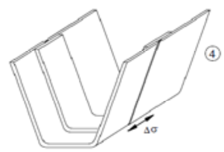
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.5
EN 4	0.6
EN 5	1.0
EN 6	0.9
EN 7	0.7
EN 8	0.7
LM3	0.8
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.050**		
train on track 2 + LM3 $_{global+local}$ =	**0.050**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.100**	<	**0.950**

9.9.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.0	26.8	1.15	**33.2**	<	**52.3**

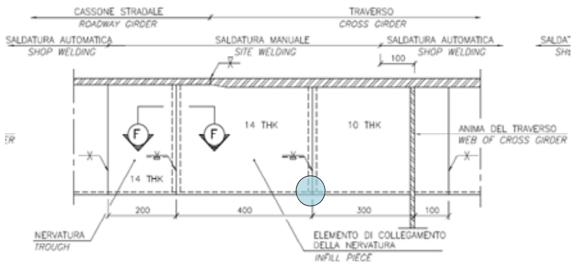
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.635**

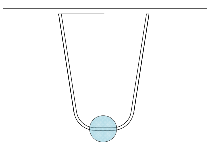
DAMAGE ACCUMULATION METHOD

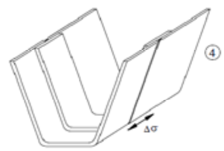
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.9
EN 7	0.7
EN 8	0.7
LM3	0.8
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.057**		
train on track 2 + LM3 $_{global + local}$ =	**0.057**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.113**	<	**0.950**

9.9.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.0	31.1	1.15	**38.1**	<	**52.3**

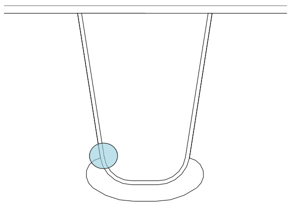
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.728**

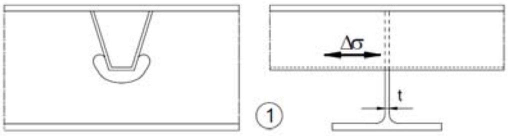
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.9
EN 2	0.6
EN 3	0.5
EN 4	0.6
EN 5	1.0
EN 6	0.9
EN 7	0.7
EN 8	0.7
LM3	0.8
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.113**	<	0.950

9.9.2.12 Point E – trough to diaphragm weld – location 3 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.1	1.056	1.1	32.7	1.15	**40.3**	<	**52.3**

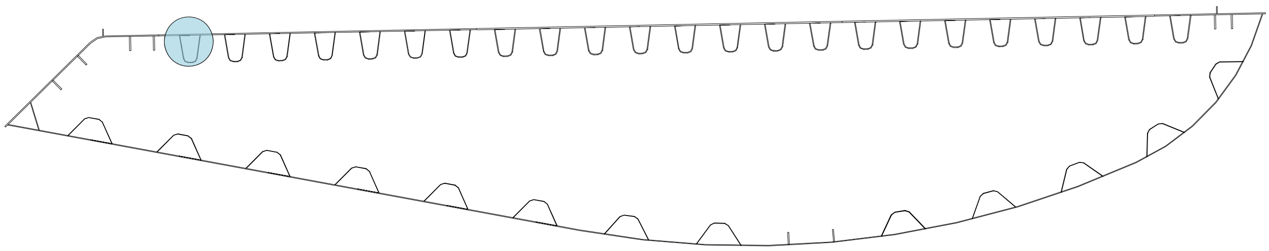
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.770**

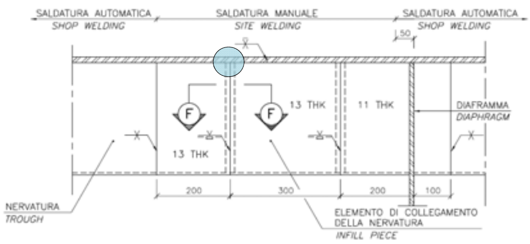
DAMAGE ACCUMULATION METHOD

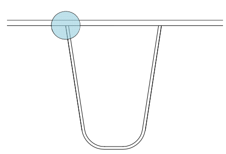
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.6
EN 4	0.6
EN 5	1.1
EN 6	1.0
EN 7	0.8
EN 8	0.8
LM3	0.9
LM3 local	21.8

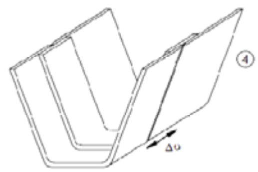
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.9.2.13 Point C – Erection joint – location 1 – only global actions (Span 7)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.1	1.056	5.9	0.0	1.35	**13.8**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.263**

DAMAGE ACCUMULATION METHOD

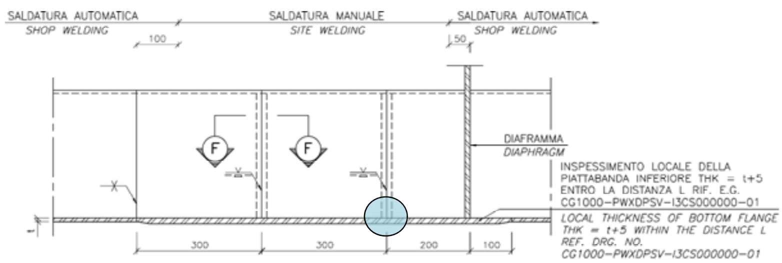
	N/mm²
EN 1	3.2
EN 2	2.1
EN 3	1.8
EN 4	1.8
EN 5	4.1
EN 6	3.1
EN 7	3.2
EN 8	3.1
LM3	4.6
LM3 local	0.0

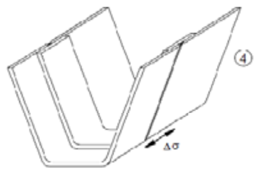
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.10 Span 6 – Main span

9.10.1 Bottom plate (Span 6)

9.10.1.1 Erection joint – location 1 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.0	1.056	9.2	1.35	**46.6**	<	**52.3**

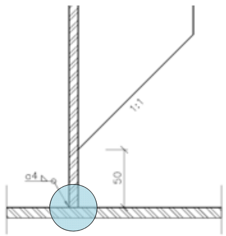
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.890**

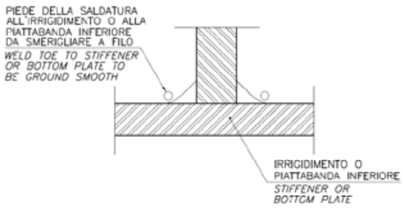
DAMAGE ACCUMULATION METHOD

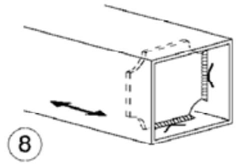
	N/mm^2
EN 1	8.4
EN 2	6.1
EN 3	9.6
EN 4	7.2
EN 5	24.0
EN 6	15.3
EN 7	14.0
EN 8	13.3
LM3	7.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.060**		
train on track 2 + LM3 =	**0.060**		
train on track 1 + train on track 2 + LM3 =	**0.074**		
tot =	**0.194**	<	**0.950**

9.10.1.2 Bottom plate to diaphragm weld – location 2 (Span 6)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.6	1.056	12.1	1.35	**61.3**	<	**73.7**

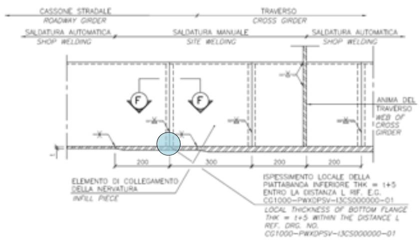
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.832**

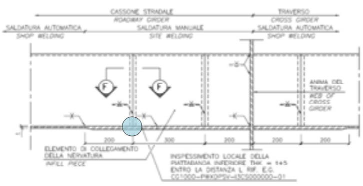
DAMAGE ACCUMULATION METHOD

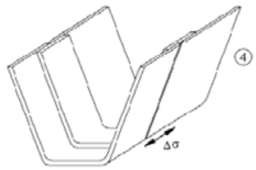
	N/mm^2
EN 1	11.0
EN 2	8.0
EN 3	12.6
EN 4	9.5
EN 5	31.6
EN 6	20.1
EN 7	18.5
EN 8	17.5
LM3	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.035**		
train on track 2 + LM3 =	**0.035**		
train on track 1 + train on track 2 + LM3 =	**0.056**		
tot =	**0.126**	<	**0.950**

9.10.1.3 Shop joint – location 3 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.9	1.056	7.3	1.35	**49.6**	<	**52.3**

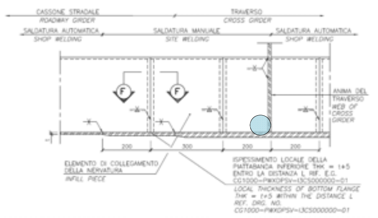
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.949**

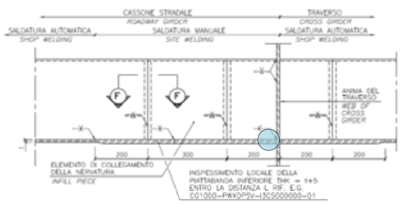
DAMAGE ACCUMULATION METHOD

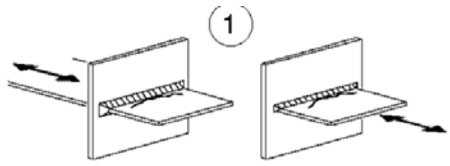
	N/mm^2
EN 1	9.2
EN 2	7.0
EN 3	11.5
EN 4	8.5
EN 5	27.9
EN 6	18.0
EN 7	15.9
EN 8	15.2
LM3	5.5

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.082**		
train on track 2 + LM3 =	**0.082**		
train on track 1 + train on track 2 + LM3 =	**0.100**		
tot =	**0.265**	<	**0.950**

9.10.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	30.9	1.056	8.1	1.35	**54.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.931**

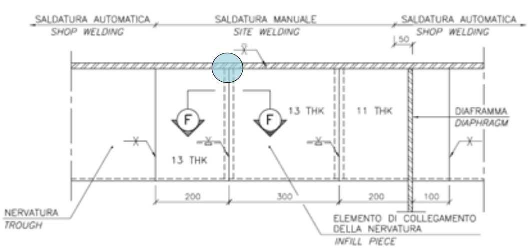
DAMAGE ACCUMULATION METHOD

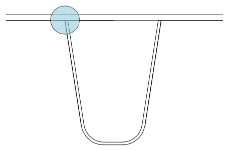
	N/mm²
EN 1	10.2
EN 2	7.7
EN 3	12.7
EN 4	9.4
EN 5	30.9
EN 6	19.9
EN 7	17.6
EN 8	16.8
LM3	6.1

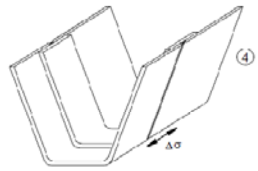
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.075**		
train on track 2 + LM3 =	**0.075**		
train on track 1 + train on track 2 + LM3 =	**0.094**		
tot =	**0.244**	<	**0.950**

9.10.2 Top plate (Span 6)

9.10.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.4	1.056	5.0	10.6	1.35	**25.9**	<	**52.3**

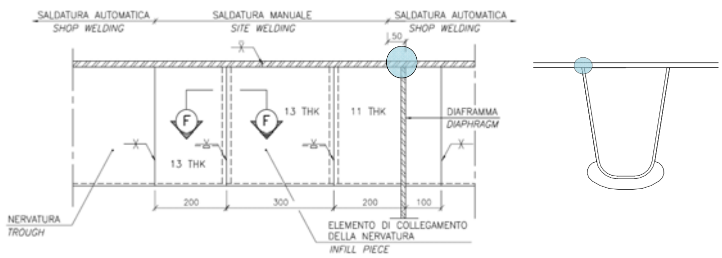
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.495**

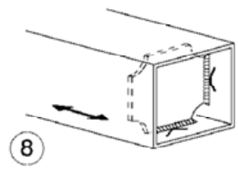
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	1.8
EN 2	1.1
EN 3	1.6
EN 4	1.6
EN 5	3.4
EN 6	2.8
EN 7	2.2
EN 8	2.0
LM3	3.9
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.10.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.4	1.056	5.0	16.8	1.35	**34.2**	<	**58.9**

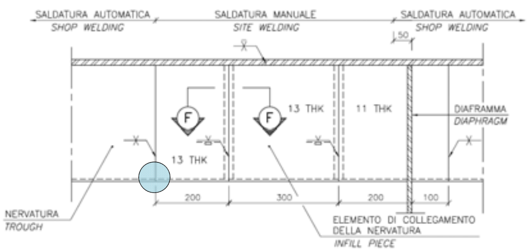
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.580**

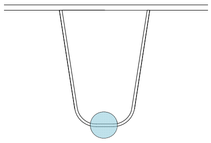
DAMAGE ACCUMULATION METHOD

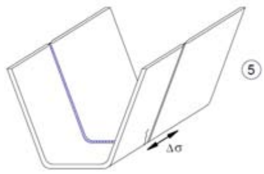
	N/mm^2
EN 1	1.8
EN 2	1.1
EN 3	1.6
EN 4	1.6
EN 5	3.4
EN 6	2.8
EN 7	2.2
EN 8	2.0
LM3	3.9
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.10.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 6)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_{D}$
EN5 + LM2	1.0	1.056	1.5	41.2	1.15	**50.3**	<	**58.9**

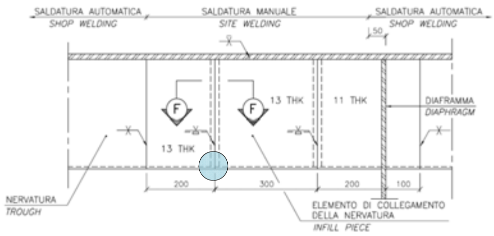
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.853**

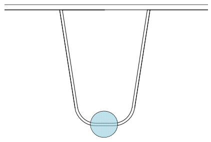
DAMAGE ACCUMULATION METHOD

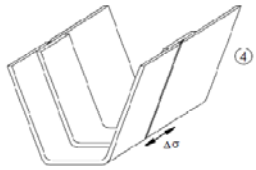
	N/mm²
EN 1	0.6
EN 2	0.3
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.8
EN 7	0.7
EN 8	0.6
LM3	1.2
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.282**		
train on track 2 + LM3 $_{global + local}$ =	**0.282**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**4.000**		
tot =	**4.564**	>	**0.950**

9.10.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.5	27.4	1.15	**34.4**	<	**52.3**

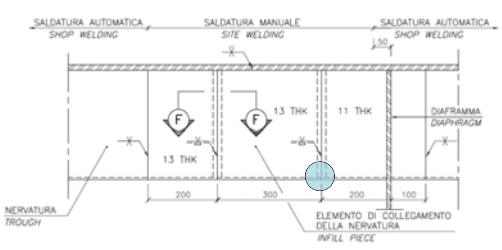
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.658**

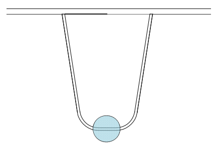
DAMAGE ACCUMULATION METHOD

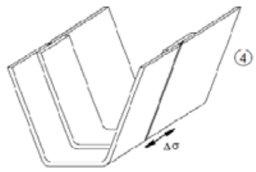
	N/mm²
EN 1	0.6
EN 2	0.3
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.8
EN 7	0.7
EN 8	0.6
LM3	1.2
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.050**		
train on track 2 + LM3 $_{global+local}$ =	**0.050**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.100**	<	**0.950**

9.10.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.0	1.056	1.5	28.7	1.15	**35.9**	<	**52.3**

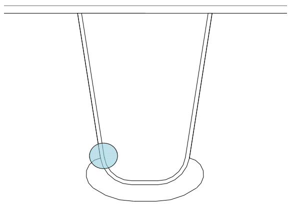
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.687**

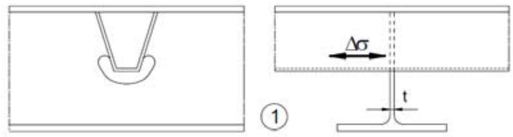
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.6
EN 2	0.3
EN 3	0.5
EN 4	0.5
EN 5	1.0
EN 6	0.8
EN 7	0.7
EN 8	0.6
LM3	1.2
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.106**	<	0.950

9.10.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.1	1.056	1.7	32.7	1.15	**40.9**	<	**52.3**

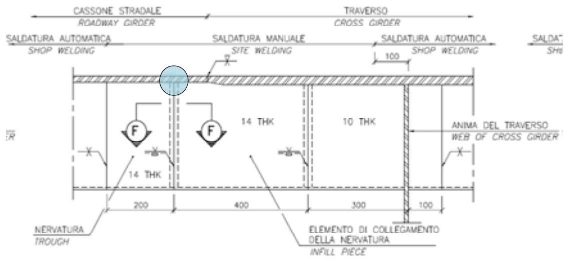
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.782**

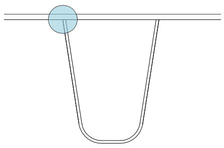
DAMAGE ACCUMULATION METHOD

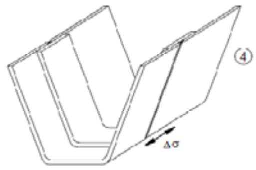
	N/mm^2
EN 1	0.6
EN 2	0.4
EN 3	0.5
EN 4	0.5
EN 5	1.1
EN 6	0.9
EN 7	0.7
EN 8	0.7
LM3	1.3
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.10.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.5	1.056	3.1	10.5	1.35	**24.9**	<	**52.3**

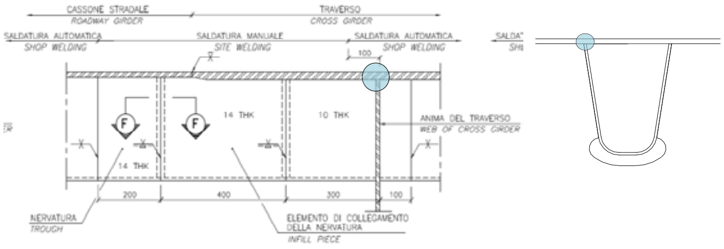
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.476**

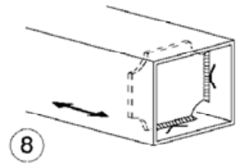
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.9
EN 2	1.1
EN 3	2.2
EN 4	2.1
EN 5	4.5
EN 6	3.6
EN 7	2.9
EN 8	2.6
LM3	2.3
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.10.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.5	1.056	3.1	16.8	1.35	**33.3**	<	**58.9**

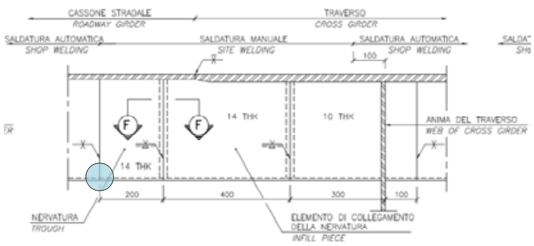
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.565**

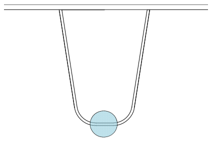
DAMAGE ACCUMULATION METHOD

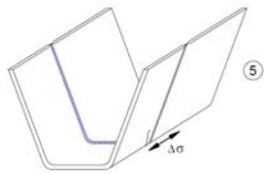
	N/mm²
EN 1	1.9
EN 2	1.1
EN 3	2.2
EN 4	2.1
EN 5	4.5
EN 6	3.6
EN 7	2.9
EN 8	2.6
LM3	2.3
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.10.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 6)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	0.9	40.6	1.15	**49.5**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.839**

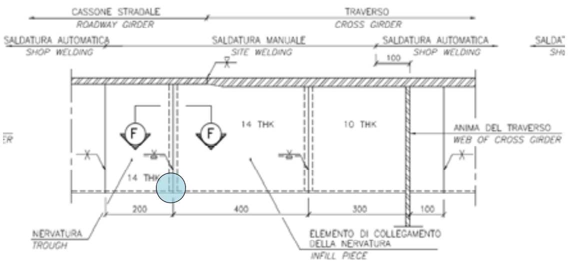
DAMAGE ACCUMULATION METHOD

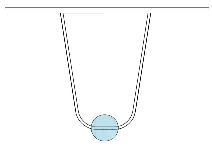
	N/mm^2
EN 1	0.6
EN 2	0.3
EN 3	0.7
EN 4	0.6
EN 5	1.4
EN 6	1.1
EN 7	0.9
EN 8	0.8
LM3	0.7
LM3 local	39.0

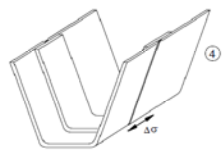
Train meeting percentage	12.0

Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.266**		
train on track 2 + LM3 $_{global+local}$ =	**0.266**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**4.000**		
tot =	**4.531**	>	**0.950**

9.10.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.3	1.056	0.9	26.8	1.15	**33.6**	<	**52.3**

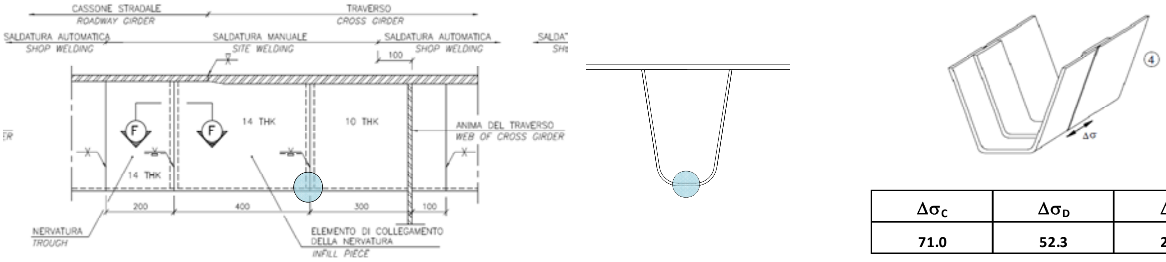
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.642**

DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.6
EN 2	0.3
EN 3	0.7
EN 4	0.6
EN 5	1.3
EN 6	1.1
EN 7	0.9
EN 8	0.8
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.111**	<	**0.950**

9.10.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 6)



$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	0.9	31.1	1.15	**38.5**	<	**52.3**

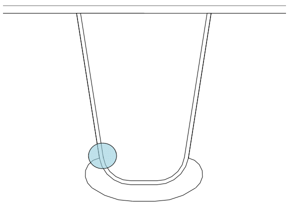
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.735**

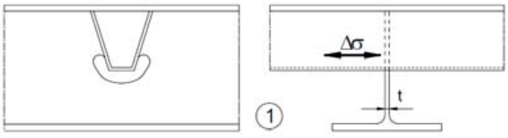
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.6
EN 2	0.3
EN 3	0.7
EN 4	0.6
EN 5	1.4
EN 6	1.1
EN 7	0.9
EN 8	0.8
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.055**		
train on track 2 + LM3 $_{global + local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.111**	<	**0.950**

9.10.2.12 Point E – trough to diaphragm weld – location 3 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	1.0	32.7	1.15	**40.7**	<	**52.3**

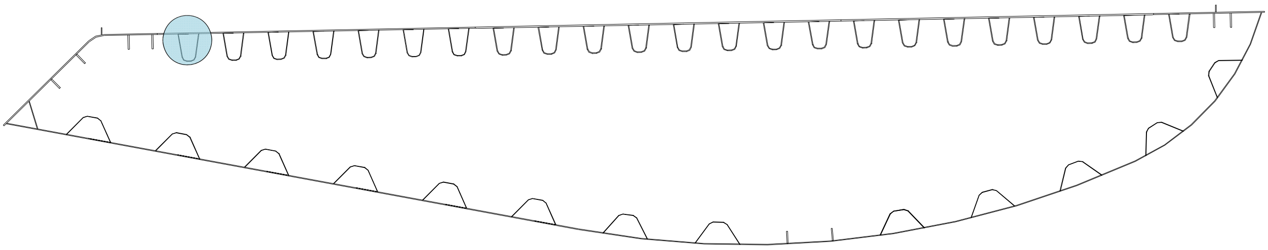
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.777**

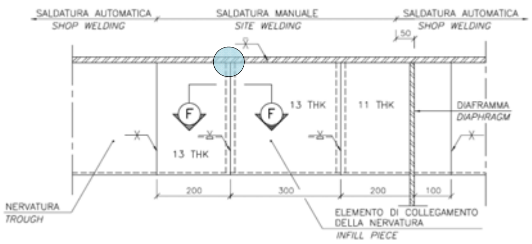
DAMAGE ACCUMULATION METHOD

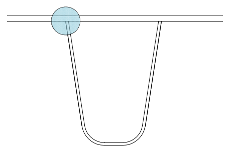
	N/mm²
EN 1	0.6
EN 2	0.4
EN 3	0.7
EN 4	0.7
EN 5	1.5
EN 6	1.2
EN 7	1.0
EN 8	0.9
LM3	0.8
LM3 local	21.8

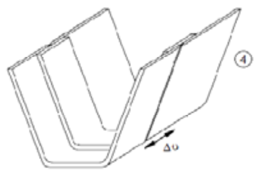
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.10.2.13 Point C – Erection joint – location 1 – only global actions (Span 6)









$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.4	1.056	5.0	0.0	1.35	**11.6**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.221**

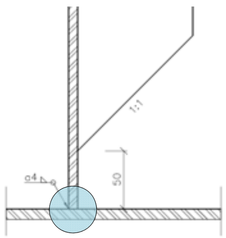
DAMAGE ACCUMULATION METHOD

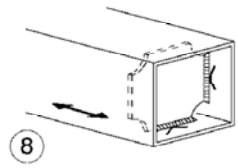
	N/mm²
EN 1	1.8
EN 2	1.1
EN 3	1.6
EN 4	1.6
EN 5	3.4
EN 6	2.8
EN 7	2.2
EN 8	2.0
LM3	3.9
LM3 local	0.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

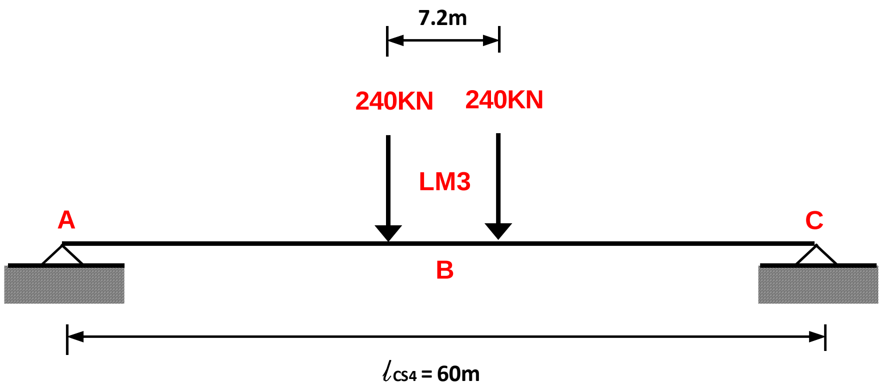
9.11 Span 5 – Tower location

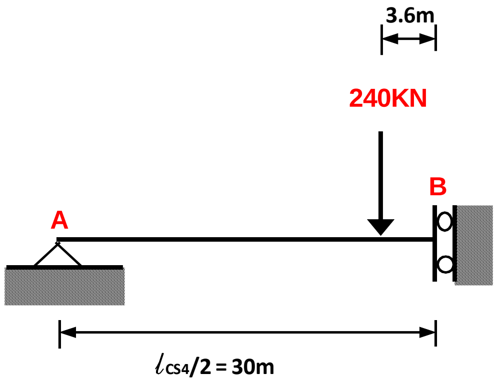
9.11.1 Bottom plate to diaphragm weld – centre span - (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4





$$240KN \times 30m - 240KN \times \frac{7.2m}{2} = 6336KNm$$

$$J_y = 5.27E + 12mm^4$$

$$W_{bottom} = \frac{J_y}{y_{bottom}} = \frac{5.27E12mm^4}{1717mm} = 3.070E8mm^3$$

$$\Delta\sigma = \frac{6336E6Nmm}{3.07E8mm^3} * 1.35 = 27.8N/mm^2 < 32.4N/mm^2 = 80 \cdot 0.737 \cdot 0.549$$

9.11.2 Corbel for support of the 60 m drop in span (Span 5)

The following describes the fatigue verification of the support corbels for the 60m drop-in span at the towers. The cantilevered corbels are the main support structure for bearing no. A3 and A4, and transfers the reaction, from the 60m drop-in span to the cross girders T4a and T4b, in each end of the span. The plate thicknesses for the corbel support structure at the two cross girders, are the same, but the corbel at T4b is longer, whereas it has the highest section forces. The critical section, section A-A, is show in Figure 9-2.

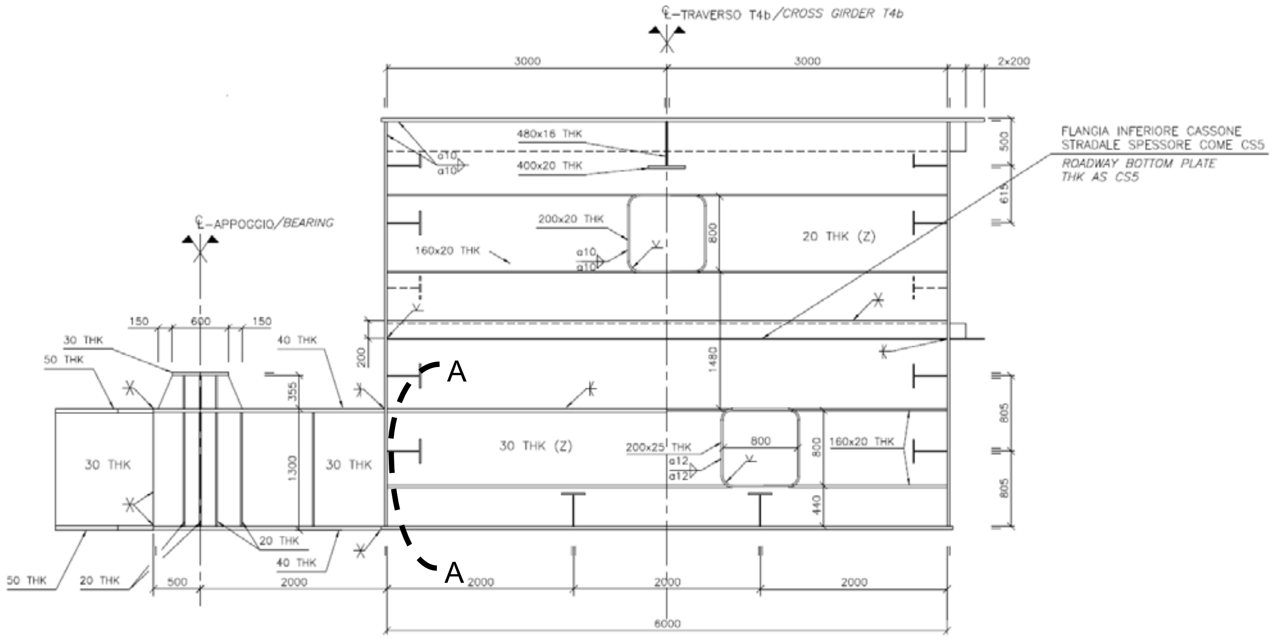


Figure 9-2   Section A-A at corbel in cross girder T4b

The vertical bearing reaction on the corbel, at R_B from a passage of LM3 vehicle, is determined to (see *Figure 9-3*):

$$R_B = \frac{60 - a}{60} \cdot P = 446kN$$

Due to the support conditions of the drop-in span, no fatigue stresses from the railway girder and only a negligible wind contribution is transferred to section A-A.

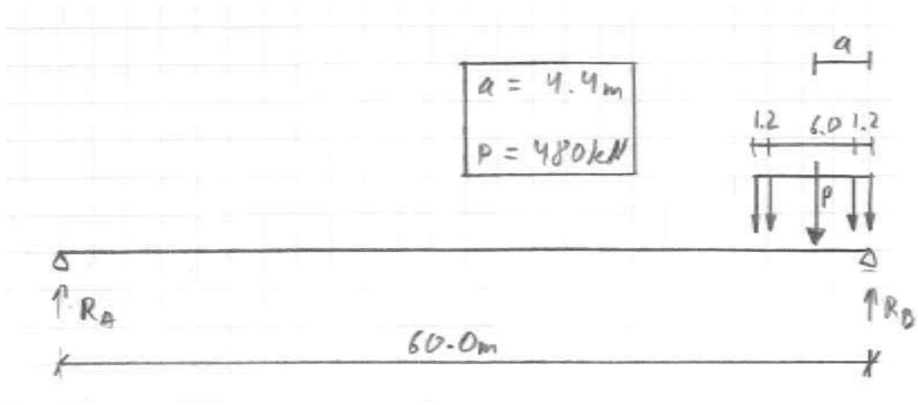


Figure 9-3 Maximum reaction on corbel from drop-in span for LM3 vehicle

The bending moment in the corbel is determined to:

$$BM = b \cdot R_B = 937kNm$$

As shown in Figure 9-4, the full reaction is considered on one corbel, which is on the safe side.

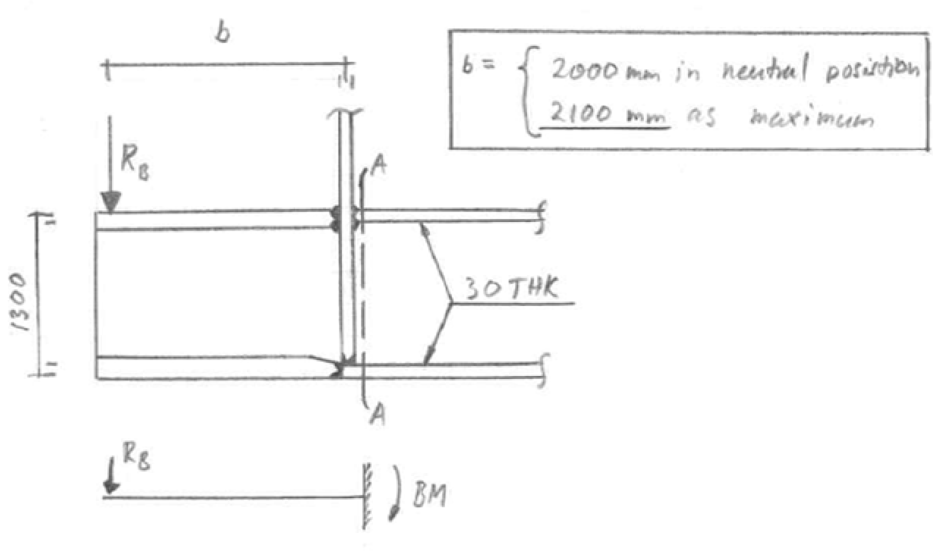


Figure 9-4 Maximum bending moment in support structure for LM3 vehicle

For this verification, the web in the corbel is transferring shear, where as only the top and bottom flange in the corbel acts as resistance of the bending moment. The equivalent flange width is shown in Figure 9-5, for a linear stress distribution.

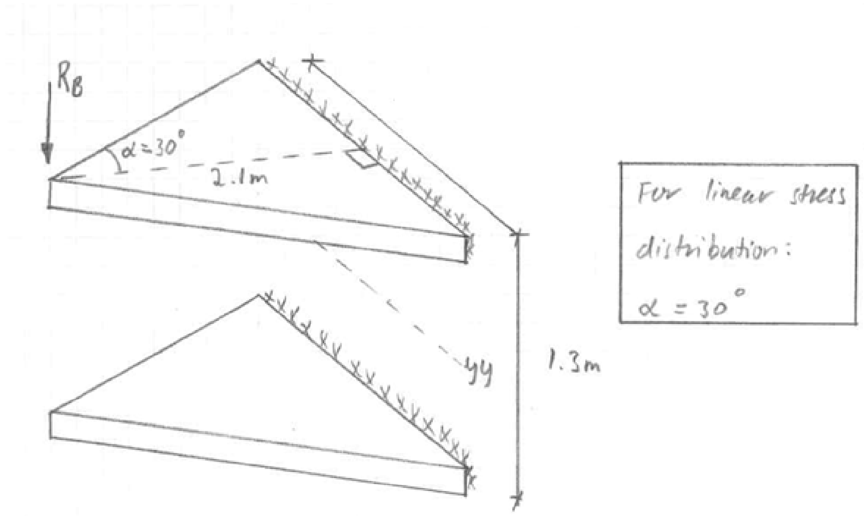


Figure 9-5 Equivalent flange width in corbel for a linear stress distribution

The equivalent flange width is therefore:

$$l = 2 \cdot 2.1 \cdot \tan(\alpha) = 2.42m$$

Section properties for the equivalent bottom and top plate in section A-A, are:

$$I_{yy} = \left[\frac{2420 \cdot 30^3}{12} + 2420 \cdot 30 \cdot \left(\frac{1300 - 30}{2}\right)^2\right] \cdot 2 = 58.6 \cdot 10^9 mm^4$$

$$W_{yy} = \frac{I_{yy} \cdot 2}{1300 - 30} = 92.3 \cdot 10^6 mm^3$$

According to figure Figure 9-6 the fatigue detail category for this stress is 80, which corresponds to a cut-off limit ($\Delta\sigma_L$) of 32.4MPa.

Detail category	Constructional detail	
80	ℓ<50 mm	all t [mm]
71	50<ℓ≤80	all t
63	80<ℓ≤100	all t
56	100<ℓ≤120	all t
56	ℓ>120	t≤20
50	120<ℓ≤200 ℓ>200	t>20 20<t≤30
45	200<ℓ≤300 ℓ>300	t>30 30<t≤50
40	ℓ>300	t>50

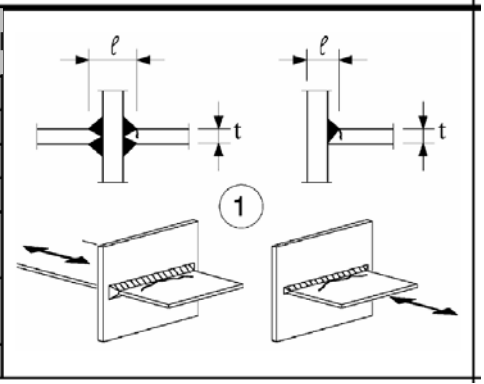


Figure 9-6 Fatigue detail category for a full penetration butt weld

According to Eurocode, the amplification factor for the expansion joint is set to 1.3.

The fatigue stress in section A-A is determined to:

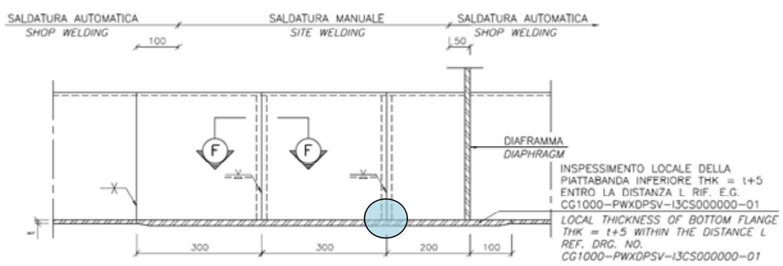
$$\sigma = \frac{BM}{W_{yy}} \cdot \gamma_{MF} \cdot \Delta\varphi_{fat} = \frac{937 \cdot 10^6}{92.3 \cdot 10^6} \cdot 1.35 \cdot 1.3 = 17.8MPa$$

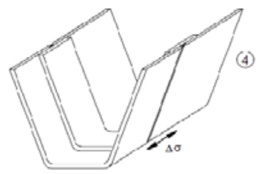
$$\leq 80 \cdot 0.737 \cdot 0.549 = 32.4MPa$$

9.12 Span 4 – Side span

9.12.1 Bottom plate (Span 4)

9.12.1.1 Erection joint – location 1 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.2	1.056	7.4	1.35	**42.9**	<	**52.3**

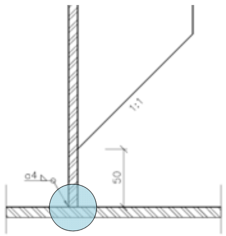
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.821**

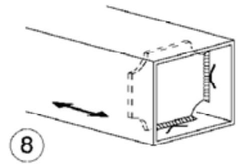
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	7.4
EN 2	5.6
EN 3	9.1
EN 4	6.8
EN 5	23.2
EN 6	14.6
EN 7	13.3
EN 8	12.7
LM3	5.6

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.033**		
train on track 2 + LM3 =	**0.033**		
train on track 1 + train on track 2 + LM3 =	**0.053**		
tot =	**0.119**	<	**0.950**

9.12.1.2 Bottom plate to diaphragm weld – location 2 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	30.5	1.056	9.7	1.35	**56.5**	<	**58.9**

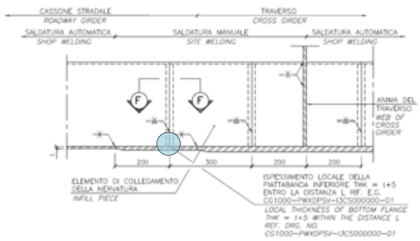
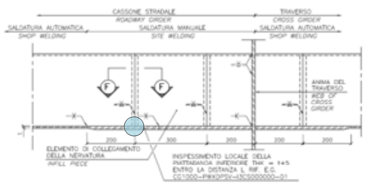
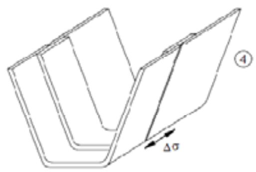
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.959**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	9.7
EN 2	7.4
EN 3	12.0
EN 4	8.9
EN 5	30.5
EN 6	19.3
EN 7	17.5
EN 8	16.8
LM3	7.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.085**		
train on track 2 + LM3 =	**0.085**		
train on track 1 + train on track 2 + LM3 =	**0.097**		
tot =	**0.267**	<	**0.950**

9.12.1.3 Shop joint – location 3 (Span 4)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.7	1.056	6.2	1.35	**45.0**	<	**52.3**

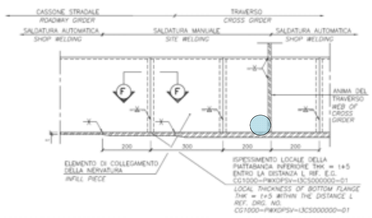
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.860**

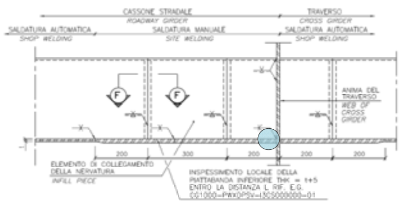
DAMAGE ACCUMULATION METHOD

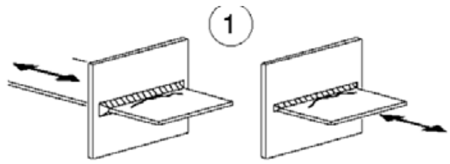
	N/mm²
EN 1	8.4
EN 2	6.5
EN 3	10.1
EN 4	6.3
EN 5	25.7
EN 6	15.7
EN 7	13.7
EN 8	13.4
LM3	4.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.043**		
train on track 2 + LM3 =	**0.043**		
train on track 1 + train on track 2 + LM3 =	**0.065**		
tot =	**0.152**	<	**0.950**

9.12.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.4	1.056	6.9	1.35	**49.8**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.844**

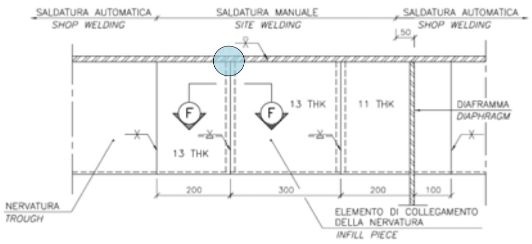
DAMAGE ACCUMULATION METHOD

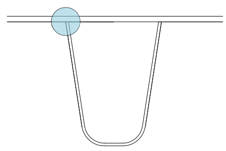
	N/mm^2
EN 1	9.3
EN 2	7.2
EN 3	11.2
EN 4	7.0
EN 5	28.4
EN 6	17.3
EN 7	15.1
EN 8	14.8
LM3	5.5

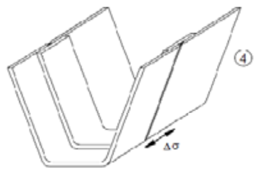
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.039**		
train on track 2 + LM3 =	**0.039**		
train on track 1 + train on track 2 + LM3 =	**0.060**		
tot =	**0.139**	<	**0.950**

9.12.2 Top plate (Span 4)

9.12.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.8	1.056	4.2	10.6	1.35	**26.8**	<	**52.3**

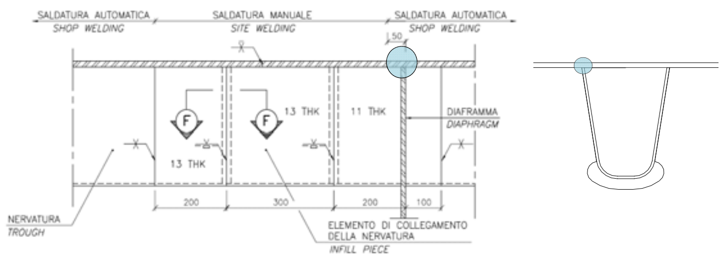
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.513**

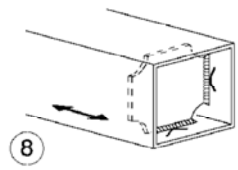
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.3
EN 2	1.0
EN 3	2.0
EN 4	1.9
EN 5	4.8
EN 6	3.4
EN 7	3.0
EN 8	2.8
LM3	3.2
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.12.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.8	1.056	4.2	16.8	1.35	**35.2**	<	**58.9**

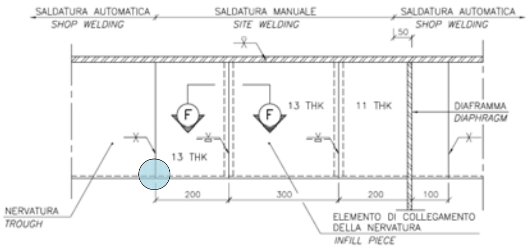
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.597**

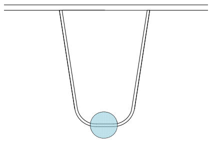
DAMAGE ACCUMULATION METHOD

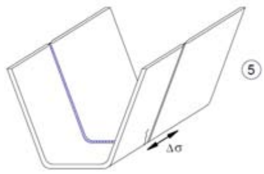
	N/mm^2
EN 1	1.3
EN 2	1.0
EN 3	2.0
EN 4	1.9
EN 5	4.8
EN 6	3.4
EN 7	3.0
EN 8	2.8
LM3	3.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.12.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 4)







$\Delta\sigma_{C WI}$	$\Delta\sigma_{D WI}$	$\Delta\sigma_{L WI}$
112.0	82.5	45.3

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.3	41.2	1.15	**50.5**	<	**82.5**

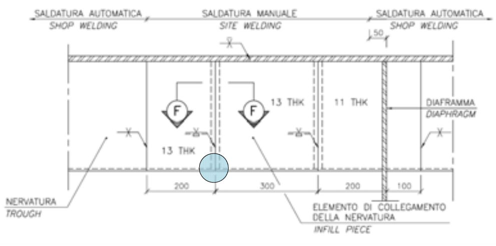
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.612**

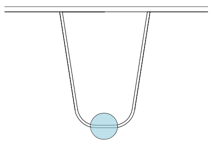
Damage Accumulation Method

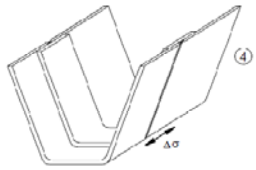
	N/mm²
EN 1	0.4
EN 2	0.3
EN 3	0.6
EN 4	0.6
EN 5	1.4
EN 6	1.0
EN 7	0.9
EN 8	0.8
LM3	1.0
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.052**		
train on track 2 + LM3 $_{global+local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.104**	<	**0.950**

9.12.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.3	27.4	1.15	**34.7**	<	**52.3**

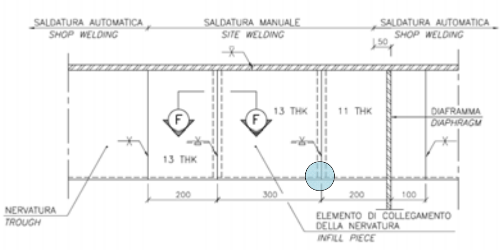
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.663**

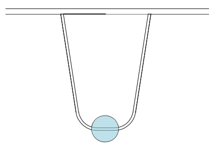
DAMAGE ACCUMULATION METHOD

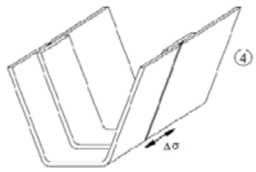
	N/mm^2
EN 1	0.4
EN 2	0.3
EN 3	0.6
EN 4	0.6
EN 5	1.4
EN 6	1.0
EN 7	0.9
EN 8	0.8
LM3	1.0
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.049**		
train on track 2 + LM3 $_{global + local}$ =	**0.049**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.099**	<	**0.950**

9.12.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	1.3	28.7	1.15	**36.2**	<	**52.3**

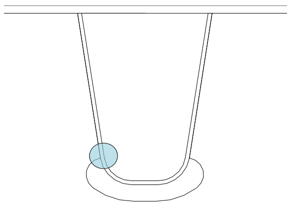
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.692**

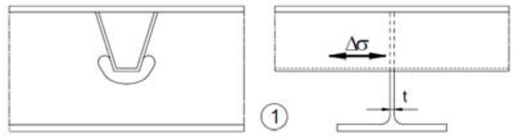
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.4
EN 2	0.3
EN 3	0.6
EN 4	0.6
EN 5	1.4
EN 6	1.0
EN 7	0.9
EN 8	0.8
LM3	1.0
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.052**		
train on track 2 + LM3 $_{global+local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.105**	<	**0.950**

9.12.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.6	1.056	1.4	32.7	1.15	**41.2**	<	**52.3**

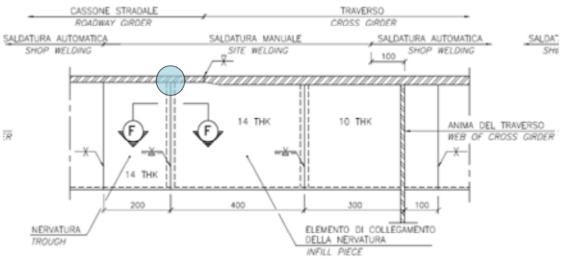
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.787**

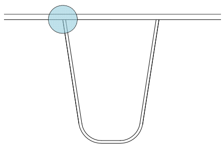
DAMAGE ACCUMULATION METHOD

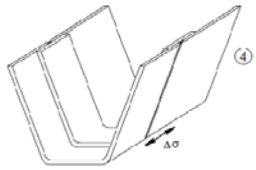
	N/mm^2
EN 1	0.4
EN 2	0.3
EN 3	0.7
EN 4	0.6
EN 5	1.6
EN 6	1.1
EN 7	1.0
EN 8	0.9
LM3	1.1
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.12.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.8	1.056	2.3	10.5	1.35	**22.7**	<	**52.3**

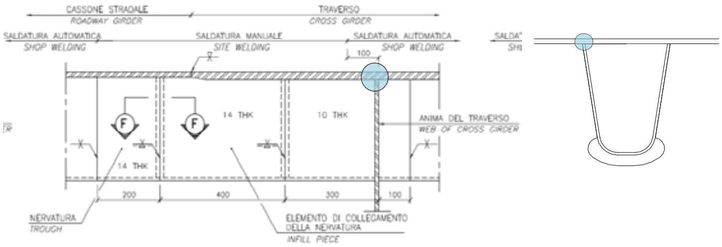
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.433**

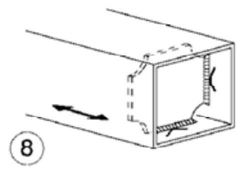
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	1.2
EN 2	0.9
EN 3	1.6
EN 4	1.0
EN 5	3.8
EN 6	2.5
EN 7	1.8
EN 8	1.8
LM3	1.8
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.12.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.8	1.056	2.3	16.8	1.35	**31.1**	<	**58.9**

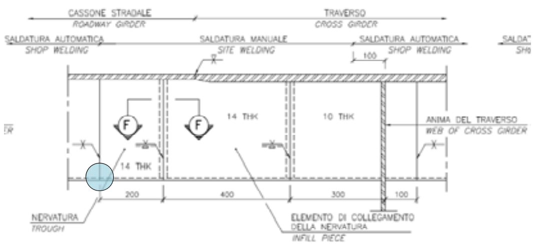
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.528**

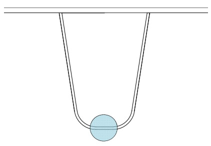
DAMAGE ACCUMULATION METHOD

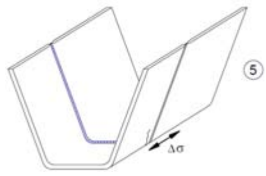
	N/mm²
EN 1	1.2
EN 2	0.9
EN 3	1.6
EN 4	1.0
EN 5	3.8
EN 6	2.5
EN 7	1.8
EN 8	1.8
LM3	1.8
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.12.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 4)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.1	1.056	0.7	40.6	1.15	**48.9**	<	**82.5**

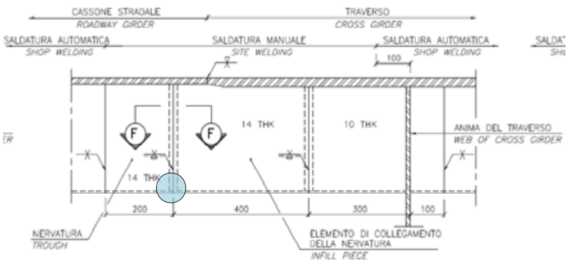
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.593**

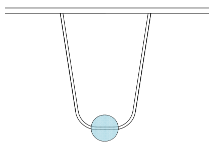
DAMAGE ACCUMULATION METHOD

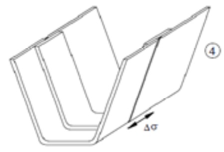
	N/mm²
EN 1	0.4
EN 2	0.3
EN 3	0.5
EN 4	0.3
EN 5	1.1
EN 6	0.8
EN 7	0.6
EN 8	0.6
LM3	0.5
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.047**		
train on track 2 + LM3 $_{global + local}$ =	**0.047**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.094**	<	**0.950**

9.12.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.1	1.056	0.7	26.8	1.15	**33.0**	<	**52.3**

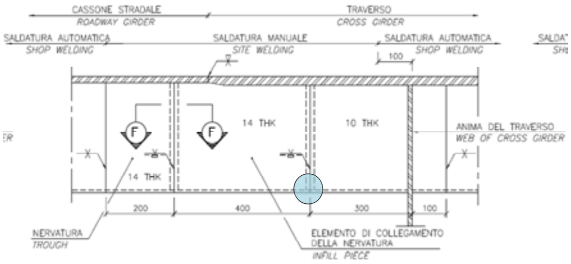
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.631**

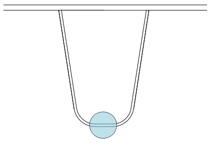
DAMAGE ACCUMULATION METHOD

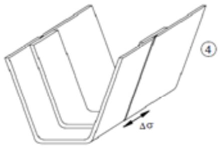
	N/mm^2
EN 1	0.3
EN 2	0.3
EN 3	0.5
EN 4	0.3
EN 5	1.1
EN 6	0.7
EN 7	0.5
EN 8	0.5
LM3	0.5
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global + local}$ =	**0.052**		
train on track 2 + LM3 $_{global + local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.103**	<	**0.950**

9.12.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.1	1.056	0.7	31.1	1.15	**37.9**	<	**52.3**

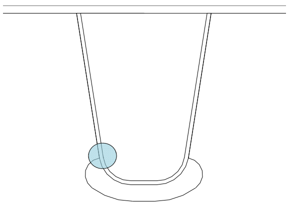
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.724**

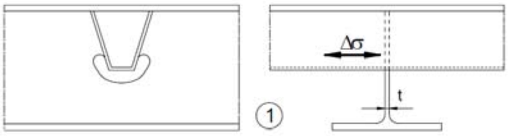
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.4
EN 2	0.3
EN 3	0.5
EN 4	0.3
EN 5	1.1
EN 6	0.8
EN 7	0.6
EN 8	0.6
LM3	0.5
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.051**		
train on track 2 + LM3 $_{global+local}$ =	**0.051**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.103**	<	**0.950**

9.12.2.12 Point E – trough to diaphragm weld – location 3 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.3	1.056	0.7	32.7	1.15	**40.0**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.765**

DAMAGE ACCUMULATION METHOD

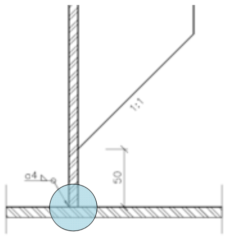
	N/mm²
EN 1	0.4
EN 2	0.3
EN 3	0.5
EN 4	0.3
EN 5	1.3
EN 6	0.8
EN 7	0.6
EN 8	0.6
LM3	0.6
LM3 local	21.8

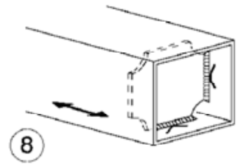
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.000**		
train on track 2 + LM3 $_{global + local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.13 Span 3 – Side span

9.13.1 Bottom plate (Span 3)

9.13.1.1 Bottom plate to diaphragm weld – location 2 (Span 3)





$\Delta\sigma_{C\,Wl}$	$\Delta\sigma_{D\,Wl}$	$\Delta\sigma_{L\,Wl}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	35.6	1.056	11.5	1.35	**66.3**	<	**73.7**

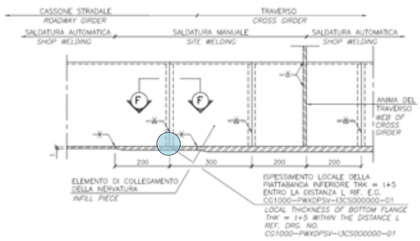
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.900**

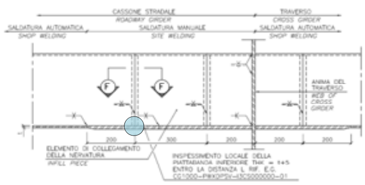
DAMAGE ACCUMULATION METHOD

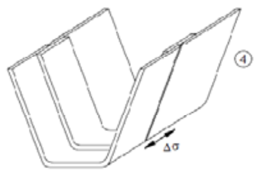
	N/mm²
EN 1	12.5
EN 2	8.8
EN 3	12.6
EN 4	10.4
EN 5	35.6
EN 6	21.3
EN 7	21.9
EN 8	20.5
LM3	8.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.062**		
train on track 2 + LM3 =	**0.062**		
train on track 1 + train on track 2 + LM3 =	**0.078**		
tot =	**0.201**	<	**0.950**

9.13.1.2 Shop joint – location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.0	1.056	7.2	1.35	**50.9**	<	**52.3**

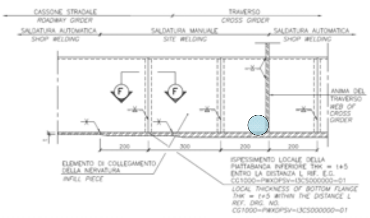
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.974**

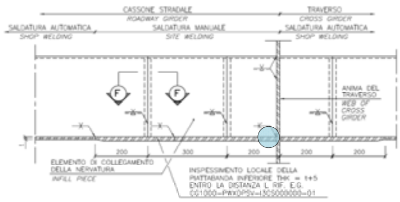
DAMAGE ACCUMULATION METHOD

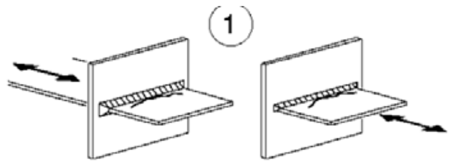
	N/mm^2
EN 1	11.2
EN 2	7.8
EN 3	10.8
EN 4	9.0
EN 5	29.0
EN 6	18.3
EN 7	17.7
EN 8	16.6
LM3	5.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.098**		
train on track 2 + LM3 =	**0.098**		
train on track 1 + train on track 2 + LM3 =	**0.121**		
tot =	**0.316**	<	**0.950**

9.13.1.3 Shop joint – bottom flange to cross girder web weld - location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.5	1.056	7.0	1.35	**50.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.851**

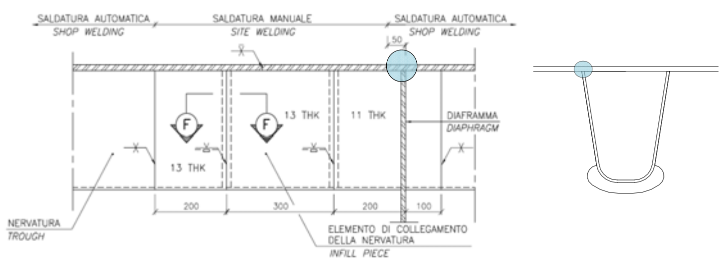
DAMAGE ACCUMULATION METHOD

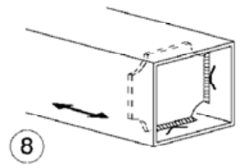
	N/mm^2
EN 1	11.0
EN 2	7.7
EN 3	10.6
EN 4	8.8
EN 5	28.5
EN 6	18.0
EN 7	17.4
EN 8	16.3
LM3	5.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.047**		
train on track 2 + LM3 =	**0.047**		
train on track 1 + train on track 2 + LM3 =	**0.074**		
tot =	**0.168**	<	**0.950**

9.13.2 Top plate (Span 3)

9.13.2.1 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	12.2	1.056	5.5	16.8	1.35	**47.4**	<	**58.9**

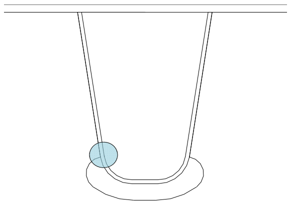
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.803**

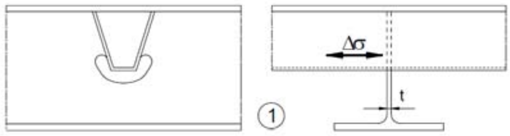
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	3.9
EN 2	2.6
EN 3	4.1
EN 4	3.7
EN 5	12.2
EN 6	7.4
EN 7	7.7
EN 8	7.1
LM3	4.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.010**		
train on track 2 + LM3 $_{global+local}$ =	**0.010**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.020**	<	0.950

9.13.2.2 Point E – trough to diaphragm weld – location 1 or 2 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.0	1.056	1.3	32.7	1.15	**42.8**	<	**52.3**

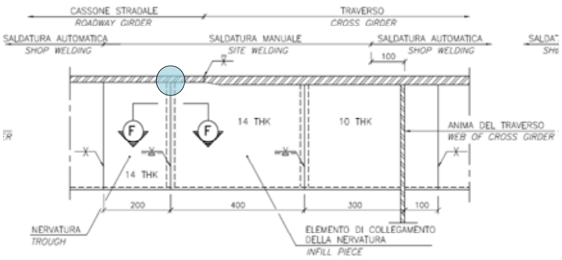
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.818**

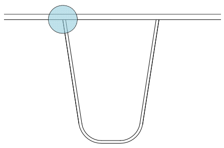
DAMAGE ACCUMULATION METHOD

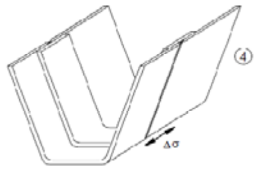
	N/mm^2
EN 1	1.0
EN 2	0.6
EN 3	1.0
EN 4	0.9
EN 5	3.0
EN 6	1.8
EN 7	1.9
EN 8	1.7
LM3	1.0
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.13.2.3 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.5	1.056	4.1	10.5	1.35	**36.2**	<	**52.3**

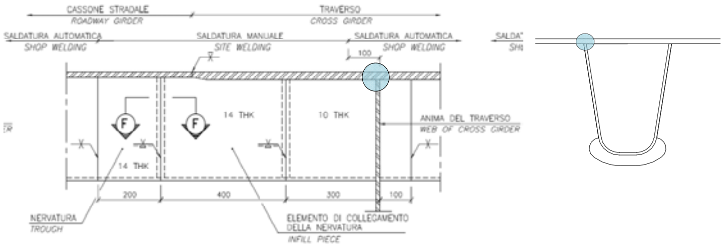
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.692**

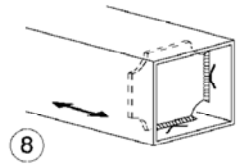
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	4.3
EN 2	2.9
EN 3	4.3
EN 4	4.0
EN 5	11.5
EN 6	7.7
EN 7	7.3
EN 8	6.7
LM3	3.2
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.009**		
train on track 2 + LM3 $_{global+local}$ =	**0.009**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.020**	<	**0.950**

9.13.2.4 Point C – Top plate to web of cross girder weld – location 3 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.5	1.056	4.1	16.8	1.35	**44.7**	<	**58.9**

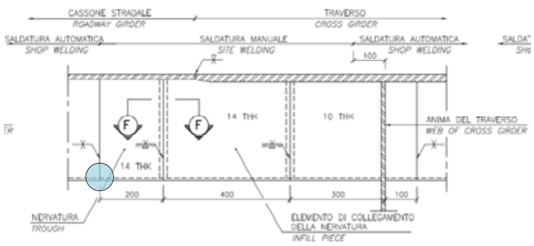
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.758**

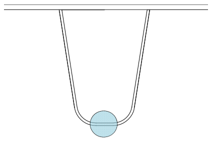
DAMAGE ACCUMULATION METHOD

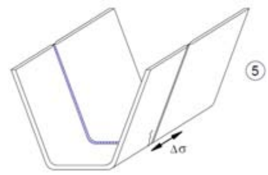
	N/mm^2
EN 1	4.3
EN 2	2.9
EN 3	4.3
EN 4	4.0
EN 5	11.5
EN 6	7.7
EN 7	7.3
EN 8	6.7
LM3	3.2
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global+local}$ =	**0.007**		
train on track 2 + LM3 $_{global+local}$ =	**0.007**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.014**	<	**0.950**

9.13.2.5 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 3)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

Unlimited Life Method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	0.9	40.6	1.15	**50.8**	<	**82.5**

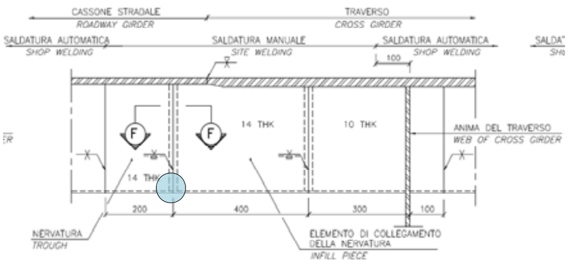
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.615**

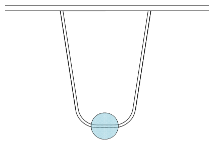
Damage Accumulation Method

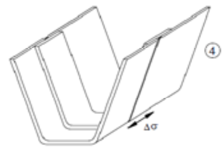
	N/mm^2
EN 1	0.9
EN 2	0.6
EN 3	0.9
EN 4	0.9
EN 5	2.5
EN 6	1.7
EN 7	1.6
EN 8	1.4
LM3	0.7
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.053**		
train on track 2 + LM3 $_{global+local}$ =	**0.053**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.106**	<	**0.950**

9.13.2.6 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	0.9	26.8	1.15	**34.9**	<	**52.3**

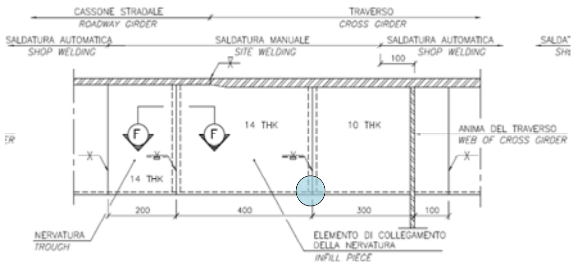
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.667**

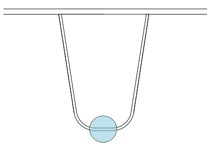
DAMAGE ACCUMULATION METHOD

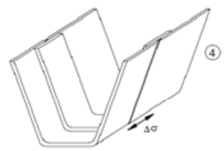
	N/mm²
EN 1	0.9
EN 2	0.6
EN 3	0.9
EN 4	0.9
EN 5	2.5
EN 6	1.7
EN 7	1.6
EN 8	1.4
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.062**		
train on track 2 + LM3 $_{global+local}$ =	**0.062**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.124**	<	**0.950**

9.13.2.7 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.5	1.056	0.9	31.1	1.15	**39.8**	<	**52.3**

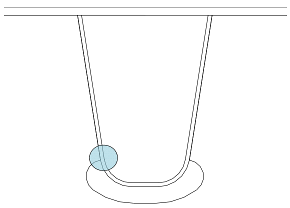
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.760**

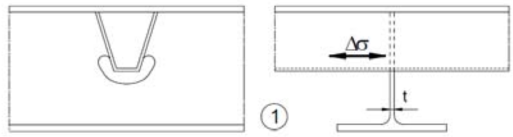
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	0.9
EN 2	0.6
EN 3	0.9
EN 4	0.9
EN 5	2.5
EN 6	1.7
EN 7	1.6
EN 8	1.4
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.062**		
train on track 2 + LM3 $_{global+local}$ =	**0.062**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.123**	<	**0.950**

9.13.2.8 Point E – trough to diaphragm weld – location 3 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.8	1.056	1.0	32.7	1.15	**42.2**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.807**

DAMAGE ACCUMULATION METHOD

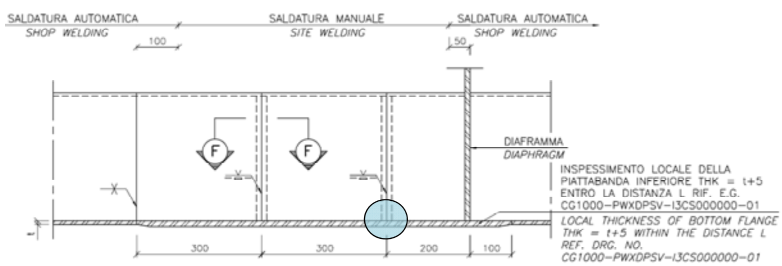
	N/mm²
EN 1	1.1
EN 2	0.7
EN 3	1.0
EN 4	1.0
EN 5	2.8
EN 6	1.9
EN 7	1.8
EN 8	1.6
LM3	0.8
LM3 local	21.8

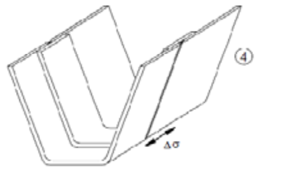
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.010**	<	0.950

9.14 Span 2 – Side span

9.14.1 Bottom plate (Span 2)

9.14.1.1 Erection joint – location 1 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.5	1.056	9.8	1.35	**51.0**	<	**52.3**

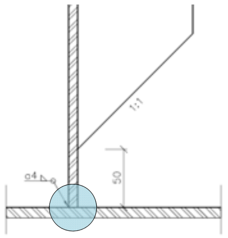
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.974**

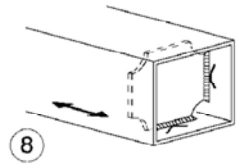
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	10.3
EN 2	7.3
EN 3	9.0
EN 4	7.8
EN 5	26.5
EN 6	15.8
EN 7	16.8
EN 8	15.5
LM3	7.4

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.093**		
train on track 2 + LM3 =	**0.093**		
train on track 1 + train on track 2 + LM3 =	**0.106**		
tot =	**0.292**	<	**0.950**

9.14.1.2 Bottom plate to diaphragm weld – location 2 (Span 2)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	35.8	1.056	13.2	1.35	**68.8**	<	**73.7**

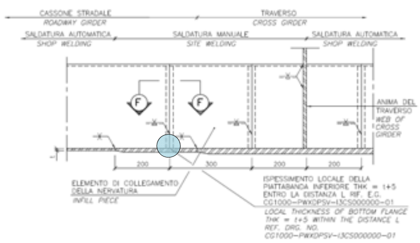
$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.934**

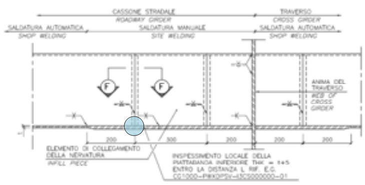
DAMAGE ACCUMULATION METHOD

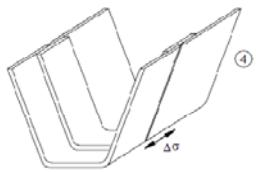
	N/mm^2
EN 1	13.8
EN 2	9.8
EN 3	12.2
EN 4	10.5
EN 5	35.8
EN 6	21.3
EN 7	22.7
EN 8	20.9
LM3	10.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.075**		
train on track 2 + LM3 =	**0.075**		
train on track 1 + train on track 2 + LM3 =	**0.091**		
tot =	**0.241**	<	**0.950**

9.14.1.3 Shop joint – location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.7	1.056	8.3	1.35	**52.2**	<	**52.3**

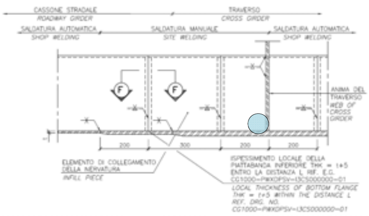
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.998**

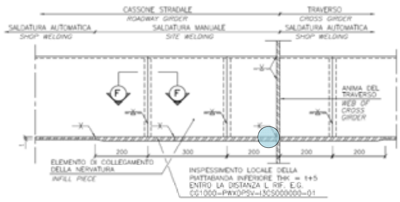
DAMAGE ACCUMULATION METHOD

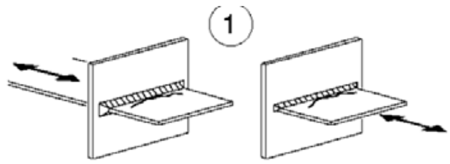
	N/mm^2
EN 1	12.1
EN 2	8.5
EN 3	10.2
EN 4	9.0
EN 5	28.7
EN 6	17.9
EN 7	18.2
EN 8	16.8
LM3	6.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.110**		
train on track 2 + LM3 =	**0.110**		
train on track 1 + train on track 2 + LM3 =	**0.134**		
tot =	**0.353**	<	**0.950**

9.14.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.4	1.056	8.5	1.35	**53.4**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.906**

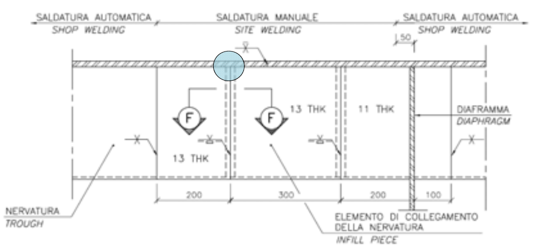
DAMAGE ACCUMULATION METHOD

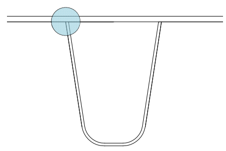
	N/mm^2
EN 1	12.4
EN 2	8.7
EN 3	10.5
EN 4	9.2
EN 5	29.4
EN 6	18.2
EN 7	18.6
EN 8	17.2
LM3	6.5

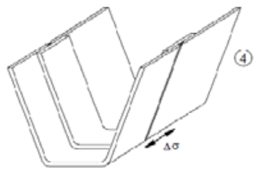
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.067**		
train on track 2 + LM3 =	**0.067**		
train on track 1 + train on track 2 + LM3 =	**0.094**		
tot =	**0.229**	<	**0.950**

9.14.2 Top plate (Span 2)

9.14.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	12.7	1.056	5.0	10.6	1.35	**39.1**	<	**52.3**

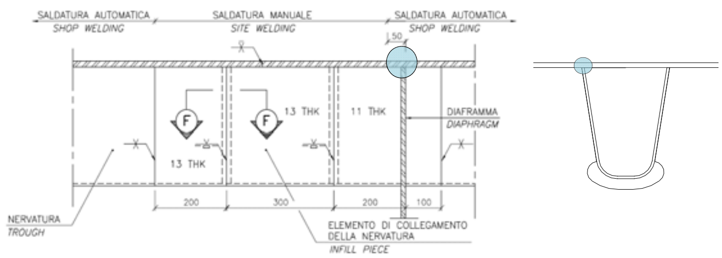
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.747**

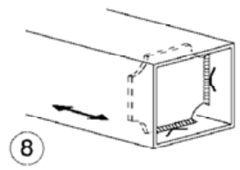
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	4.6
EN 2	3.3
EN 3	4.2
EN 4	3.7
EN 5	12.7
EN 6	7.5
EN 7	8.0
EN 8	7.3
LM3	3.8
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.011**		
train on track 2 + LM3 $_{global+local}$ =	**0.011**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.002**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.023**	<	0.950

9.14.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	12.7	1.056	5.0	16.8	1.35	**47.4**	<	**58.9**

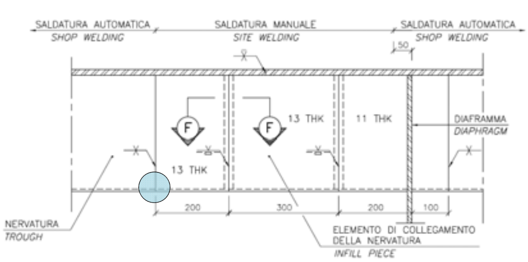
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.804**

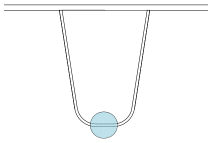
DAMAGE ACCUMULATION METHOD

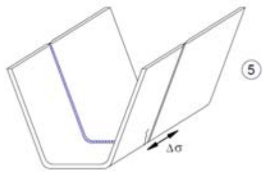
	N/mm^2
EN 1	4.6
EN 2	3.3
EN 3	4.2
EN 4	3.7
EN 5	12.7
EN 6	7.5
EN 7	8.0
EN 8	7.3
LM3	3.8
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.010**		
train on track 2 + LM3 $_{global+local}$ =	**0.010**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.021**	<	0.950

9.14.2.3 Point A - Erection joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 2)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.7	1.056	1.1	41.2	1.15	**51.9**	<	**82.5**

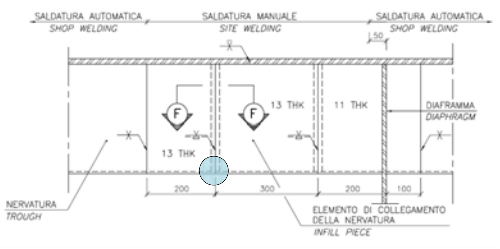
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.629**

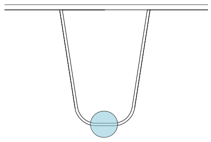
DAMAGE ACCUMULATION METHOD

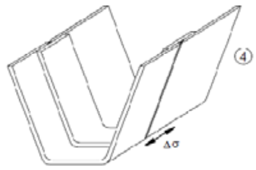
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.9
EN 4	0.8
EN 5	2.7
EN 6	1.6
EN 7	1.7
EN 8	1.6
LM3	0.8
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.111**	<	0.950

9.14.2.4 Point A - Erection joint at 500m from diaphragm - 13mm – location 1 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.7	1.056	1.1	27.4	1.15	**36.0**	<	**52.3**

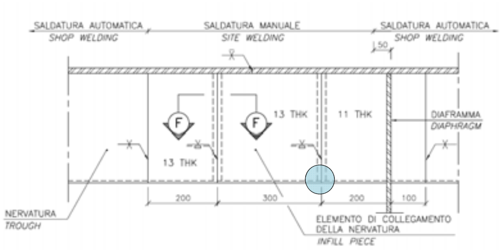
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.688**

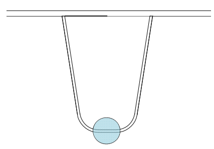
DAMAGE ACCUMULATION METHOD

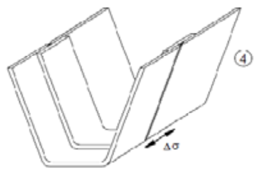
	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.9
EN 4	0.8
EN 5	2.7
EN 6	1.6
EN 7	1.7
EN 8	1.6
LM3	0.8
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.055**		
train on track 2 + LM3 $_{global+local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.14.2.5 Point A - Erection joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.7	1.056	1.1	28.7	1.15	37.5	<	52.3

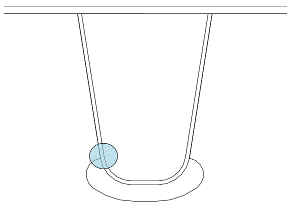
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.717

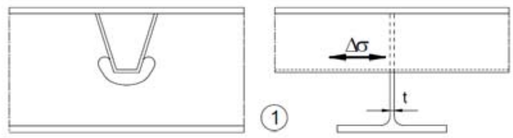
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.0
EN 2	0.7
EN 3	0.9
EN 4	0.8
EN 5	2.7
EN 6	1.6
EN 7	1.7
EN 8	1.6
LM3	0.8
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	0.058		
train on track 2 + LM3 $_{global+local}$ =	0.058		
train on track 1 + train on track 2 + LM3 $_{global}$ =	0.000		
LM3 $_{global+local}$ =	0.000		
tot =	0.117	<	0.950

9.14.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.1	1.056	1.2	32.7	1.15	**42.8**	<	**52.3**

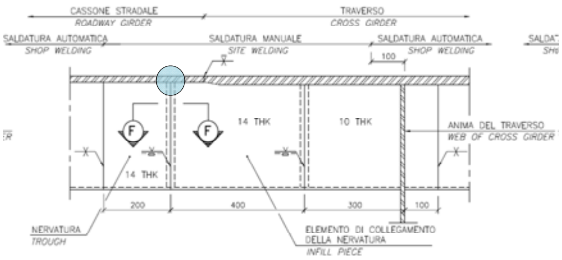
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.818**

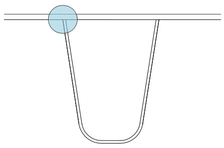
DAMAGE ACCUMULATION METHOD

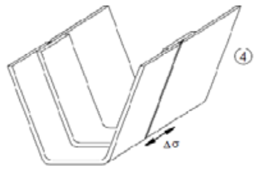
	N/mm^2
EN 1	1.1
EN 2	0.8
EN 3	1.0
EN 4	0.9
EN 5	3.1
EN 6	1.8
EN 7	2.0
EN 8	1.8
LM3	0.9
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.005**		
train on track 2 + LM3 $_{global+local}$ =	**0.005**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.14.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.4	1.056	4.5	10.5	1.35	**39.4**	<	**52.3**

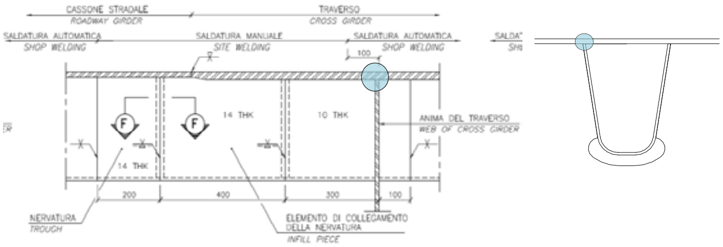
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.753**

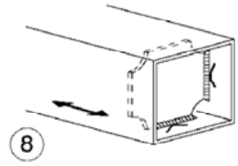
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	5.5
EN 2	3.8
EN 3	4.7
EN 4	4.3
EN 5	13.4
EN 6	8.5
EN 7	8.5
EN 8	7.8
LM3	3.5
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.029**		
train on track 2 + LM3 $_{global+local}$ =	**0.029**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.003**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.062**	<	0.950

9.14.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.4	1.056	4.5	16.8	1.35	**47.8**	<	**58.9**

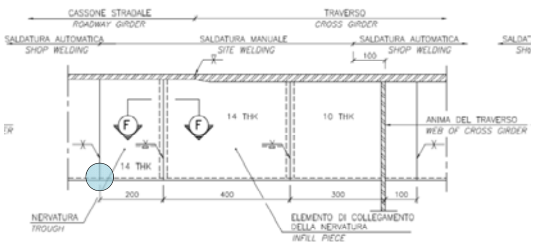
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.812**

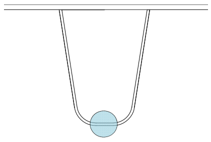
DAMAGE ACCUMULATION METHOD

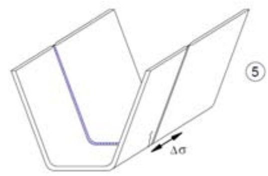
	N/mm^2
EN 1	5.5
EN 2	3.8
EN 3	4.7
EN 4	4.3
EN 5	13.4
EN 6	8.5
EN 7	8.5
EN 8	7.8
LM3	3.5
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 $_{global + local}$ =	**0.011**		
train on track 2 + LM3 $_{global + local}$ =	**0.011**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.023**	<	**0.950**

9.14.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 2)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.9	1.056	1.0	40.6	1.15	**51.4**	<	**82.5**

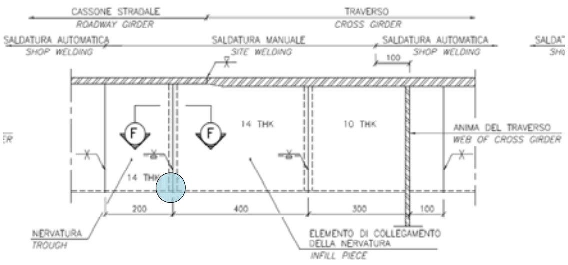
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.623**

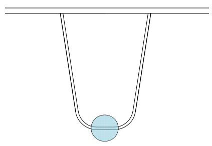
DAMAGE ACCUMULATION METHOD

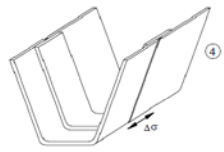
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	1.0
EN 4	0.9
EN 5	2.9
EN 6	1.8
EN 7	1.8
EN 8	1.7
LM3	0.7
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.055**		
train on track 2 + LM3 $_{global+local}$ =	**0.055**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.110**	<	**0.950**

9.14.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.9	1.056	1.0	26.8	1.15	**35.5**	<	**52.3**

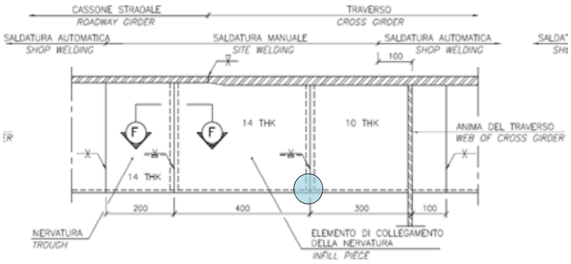
$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.678**

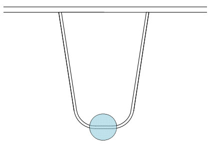
DAMAGE ACCUMULATION METHOD

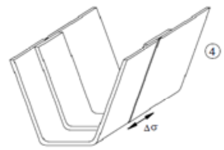
	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	1.0
EN 4	0.9
EN 5	2.9
EN 6	1.8
EN 7	1.8
EN 8	1.7
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.065**		
train on track 2 + LM3 $_{global + local}$ =	**0.065**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.131**	<	**0.950**

9.14.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.9	1.056	1.0	31.1	1.15	**40.4**	<	**52.3**

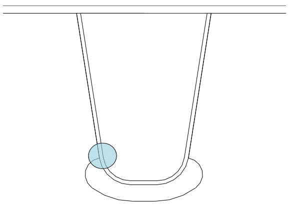
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.772**

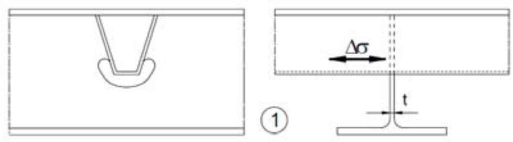
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.2
EN 2	0.8
EN 3	1.0
EN 4	0.9
EN 5	2.9
EN 6	1.8
EN 7	1.8
EN 8	1.7
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.065**		
train on track 2 + LM3 $_{global+local}$ =	**0.065**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.131**	<	0.950

9.14.2.12 Point E – trough to diaphragm weld – location 3 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.3	1.056	1.1	32.7	1.15	**42.9**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.820**

DAMAGE ACCUMULATION METHOD

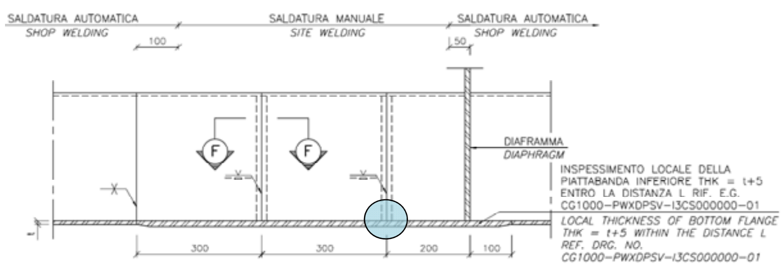
	N/mm^2
EN 1	1.3
EN 2	0.9
EN 3	1.1
EN 4	1.0
EN 5	3.3
EN 6	2.1
EN 7	2.1
EN 8	1.9
LM3	0.8
LM3 local	21.8

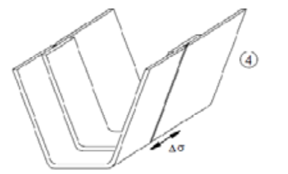
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.006**		
train on track 2 + LM3 $_{global+local}$ =	**0.006**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.011**	<	**0.950**

9.15 Span 1 – Side span

9.15.1 Bottom plate (Span 1)

9.15.1.1 Erection joint – location 1 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.4	1.056	10.2	1.35	**32.9**	<	**52.3**

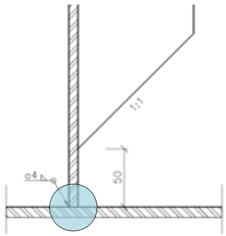
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.628**

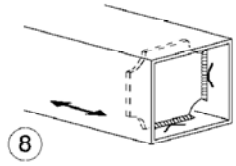
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	5.1
EN 2	3.6
EN 3	4.7
EN 4	4.2
EN 5	13.4
EN 6	7.9
EN 7	8.9
EN 8	8.2
LM3	7.9

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.005**		
train on track 2 + LM3 =	**0.005**		
train on track 1 + train on track 2 + LM3 =	**0.011**		
tot =	**0.021**	<	**0.950**

9.15.1.2 Bottom plate to diaphragm weld – location 2 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	17.3	1.056	13.1	1.35	**42.4**	<	**58.9**

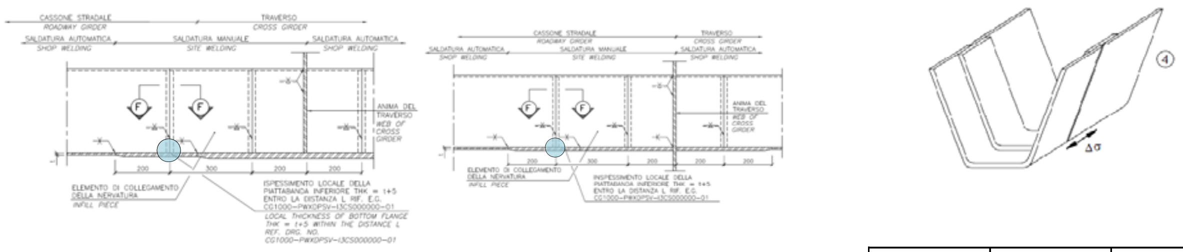
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.719**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	6.6
EN 2	4.6
EN 3	6.1
EN 4	5.5
EN 5	17.3
EN 6	10.2
EN 7	11.4
EN 8	10.6
LM3	10.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.010**		
train on track 2 + LM3 =	**0.010**		
train on track 1 + train on track 2 + LM3 =	**0.022**		
tot =	**0.043**	<	**0.950**

9.15.1.3 Shop joint – location 3 (Span 1)



$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.6	1.056	9.2	1.35	**51.7**	<	**52.3**

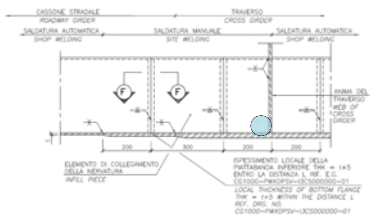
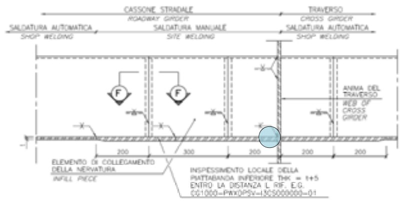
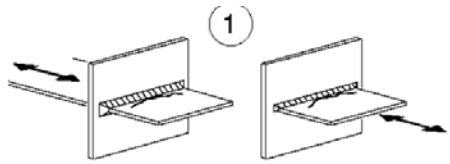
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.989**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	11.4
EN 2	8.1
EN 3	9.9
EN 4	8.3
EN 5	27.6
EN 6	17.3
EN 7	17.4
EN 8	16.0
LM3	7.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.107**		
train on track 2 + LM3 =	**0.107**		
train on track 1 + train on track 2 + LM3 =	**0.126**		
tot =	**0.339**	<	**0.950**

9.15.1.4 Shop joint – bottom flange to cross girder web weld - location 3 (Span 1)

$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.9	1.056	9.3	1.35	**52.4**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.889**

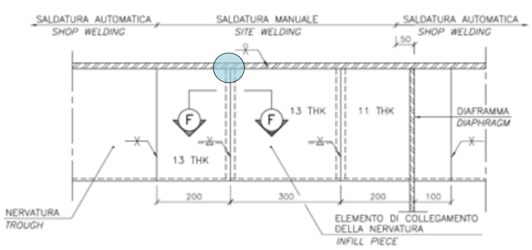
DAMAGE ACCUMULATION METHOD

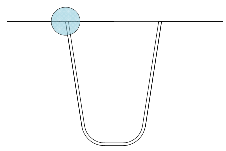
	N/mm^2
EN 1	11.6
EN 2	8.2
EN 3	10.0
EN 4	8.4
EN 5	27.9
EN 6	17.5
EN 7	17.6
EN 8	16.2
LM3	7.3

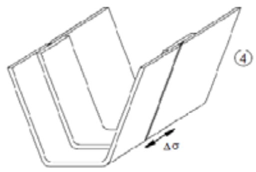
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.063**		
train on track 2 + LM3 =	**0.063**		
train on track 1 + train on track 2 + LM3 =	**0.085**		
tot =	**0.211**	<	**0.950**

9.15.2 Top plate (Span 1)

9.15.2.1 Point C – Erection joint at 500mm from diaphragm – location 1 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	5.6	1.056	5.8	10.6	1.35	**30.2**	<	**52.3**

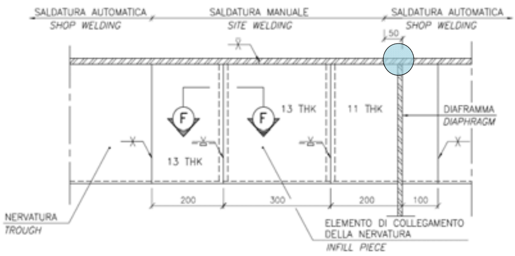
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.576**

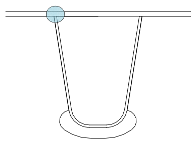
Damage accumulation method

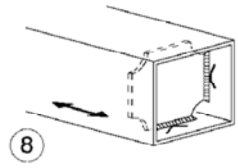
	N/mm^2
EN 1	1.9
EN 2	1.3
EN 3	2.0
EN 4	1.8
EN 5	5.6
EN 6	3.6
EN 7	3.6
EN 8	3.3
LM3	4.5
LM3 local	8.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	0.950

9.15.2.2 Point C – Top plate to diaphragm weld – location 1 or 2 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	5.6	1.056	5.8	16.8	1.35	**38.5**	<	**58.9**

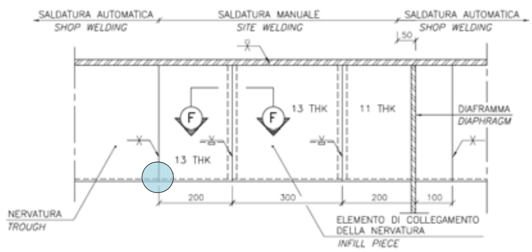
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.653**

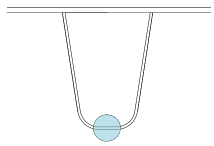
DAMAGE ACCUMULATION METHOD

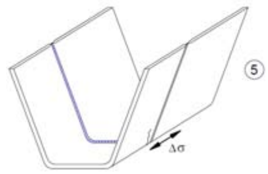
	N/mm^2
EN 1	1.9
EN 2	1.3
EN 3	2.0
EN 4	1.8
EN 5	5.6
EN 6	3.6
EN 7	3.6
EN 8	3.3
LM3	4.5
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.15.2.3 Point A - Shop joint at 700m from diaphragm - 9 to 13mm – location 1 (Span 1)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	1.6	41.2	1.15	**51.0**	<	**82.5**

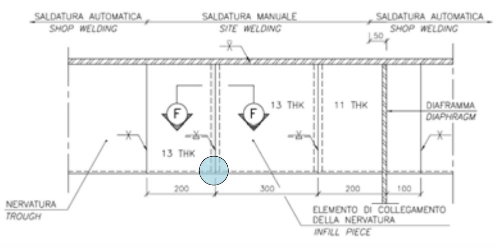
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.618**

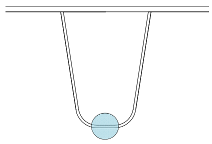
DAMAGE ACCUMULATION METHOD

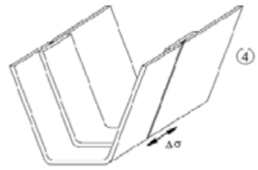
	N/mm^2
EN 1	0.5
EN 2	0.4
EN 3	0.6
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	0.9
LM3	1.2
LM3 local	39.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.054**		
train on track 2 + LM3 $_{global + local}$ =	**0.054**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.108**	<	**0.950**

9.15.2.4 Point A - Shop joint at 500m from diaphragm - 13mm – location 1 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	1.6	27.4	1.15	**35.1**	<	**52.3**

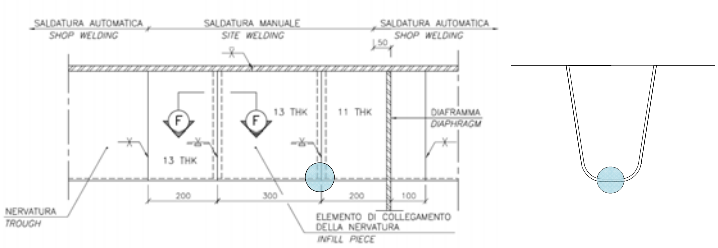
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.672**

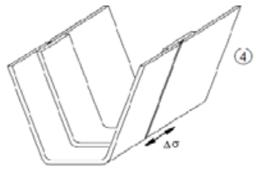
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.5
EN 2	0.4
EN 3	0.5
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	0.9
LM3	1.2
LM3 local	23.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.052**		
train on track 2 + LM3 $_{global + local}$ =	**0.052**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.105**	<	0.950

9.15.2.5 Point A - Shop joint at 200m from diaphragm - 11 to 13mm – location 1 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	1.6	28.7	1.15	**36.6**	<	**52.3**

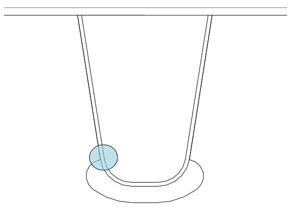
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.700**

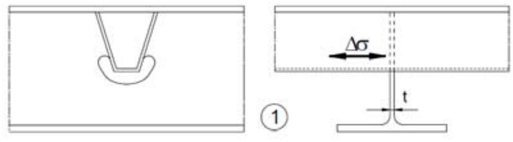
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	0.5
EN 2	0.4
EN 3	0.6
EN 4	0.5
EN 5	1.5
EN 6	1.0
EN 7	1.0
EN 8	0.9
LM3	1.2
LM3 local	24.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.056**		
train on track 2 + LM3 $_{global+local}$ =	**0.056**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.111**	<	**0.950**

9.15.2.6 Point E – trough to diaphragm weld – location 1 or 2 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.7	1.056	1.7	32.7	1.15	**41.7**	<	**52.3**

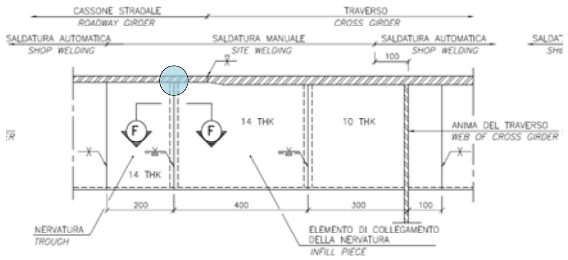
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.797**

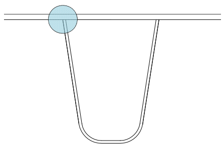
DAMAGE ACCUMULATION METHOD

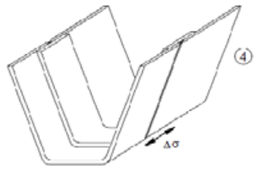
	N/mm^2
EN 1	0.6
EN 2	0.4
EN 3	0.6
EN 4	0.5
EN 5	1.7
EN 6	1.1
EN 7	1.1
EN 8	1.0
LM3	1.4
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.000**		
train on track 2 + LM3 $_{global+local}$ =	**0.000**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.000**	<	**0.950**

9.15.2.7 Point C – Shop joint at 700mm from cross girder web – location 3 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.1	1.056	3.3	10.5	1.35	**38.9**	<	**52.3**

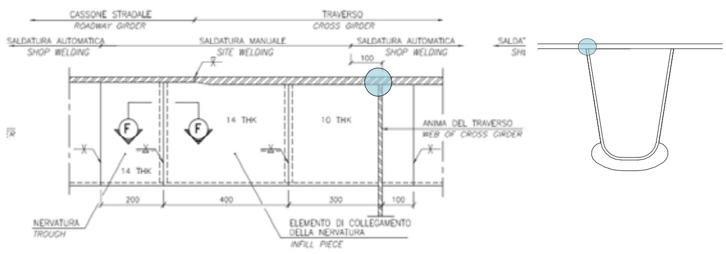
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.744**

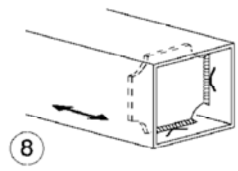
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	5.8
EN 2	4.1
EN 3	4.9
EN 4	4.3
EN 5	14.1
EN 6	8.7
EN 7	9.0
EN 8	8.2
LM3	2.7
LM3 local	9.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.028**		
train on track 2 + LM3 $_{global+local}$ =	**0.028**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.004**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.059**	<	0.950

9.15.2.8 Point C – Top plate to web of cross girder weld – location 3 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.1	1.056	3.3	16.8	1.35	**47.3**	<	**58.9**

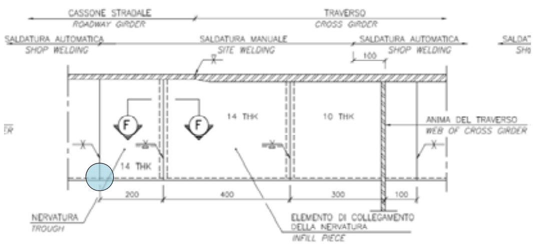
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.803**

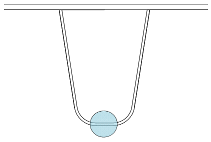
DAMAGE ACCUMULATION METHOD

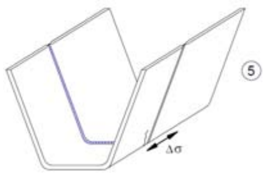
	N/mm^2
EN 1	5.8
EN 2	4.1
EN 3	4.9
EN 4	4.3
EN 5	14.1
EN 6	8.7
EN 7	9.0
EN 8	8.2
LM3	2.7
LM3 local	11.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global + local}$ =	**0.011**		
train on track 2 + LM3 $_{global + local}$ =	**0.011**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.001**		
LM3 $_{global + local}$ =	**0.000**		
tot =	**0.023**	<	0.950

9.15.2.9 Point A - Shop joint at 900m from cross girder web - 10 to 14mm – location 3 (Span 1)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
112.0	82.5	45.3

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.9	1.056	0.9	40.6	1.15	**52.5**	<	**82.5**

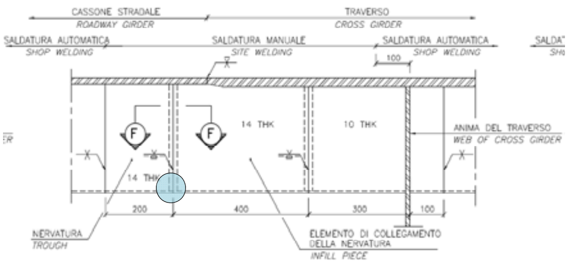
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.636**

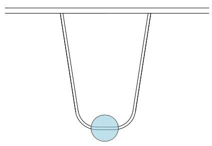
DAMAGE ACCUMULATION METHOD

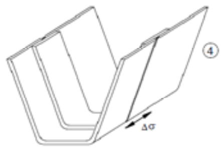
	N/mm²
EN 1	1.6
EN 2	1.1
EN 3	1.3
EN 4	1.2
EN 5	3.9
EN 6	2.4
EN 7	2.4
EN 8	2.2
LM3	0.7
LM3 local	39.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.058**		
train on track 2 + LM3 $_{global+local}$ =	**0.058**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.117**	<	**0.950**

9.15.2.10 Point A - Shop joint at 700m from cross girder web - 14mm – location 3 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.8	1.056	0.9	26.8	1.15	**36.5**	<	**52.3**

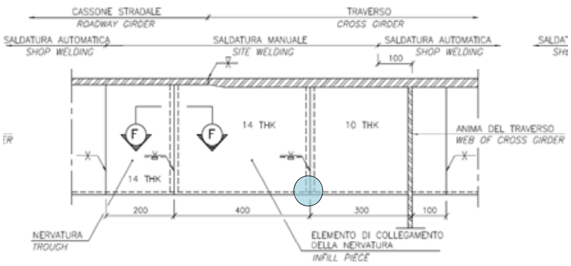
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.699**

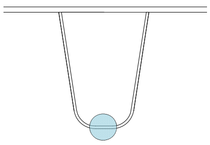
DAMAGE ACCUMULATION METHOD

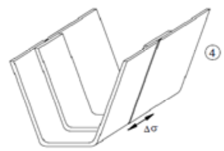
	N/mm^2
EN 1	1.6
EN 2	1.1
EN 3	1.3
EN 4	1.2
EN 5	3.8
EN 6	2.4
EN 7	2.4
EN 8	2.2
LM3	0.7
LM3 local	24.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.072**		
train on track 2 + LM3 $_{global+local}$ =	**0.072**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.144**	<	**0.950**

9.15.2.11 Point A - Shop joint at 300m from cross girder web - 10 to 14mm – location 3 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.9	1.056	0.9	31.1	1.15	**41.5**	<	**52.3**

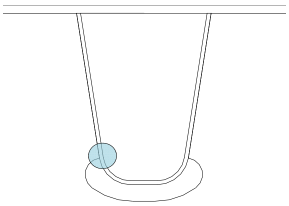
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.792**

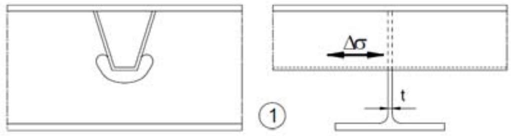
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.6
EN 2	1.1
EN 3	1.3
EN 4	1.2
EN 5	3.9
EN 6	2.4
EN 7	2.4
EN 8	2.2
LM3	0.7
LM3 local	24.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.072**		
train on track 2 + LM3 $_{global+local}$ =	**0.072**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.144**	<	**0.950**

9.15.2.12 Point E – trough to diaphragm weld – location 3 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2					
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	$\Delta\sigma_{x\,local}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	4.3	1.056	1.0	32.7	1.15	**44.0**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.841**

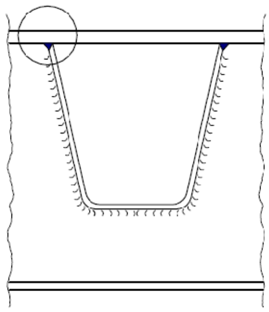
DAMAGE ACCUMULATION METHOD

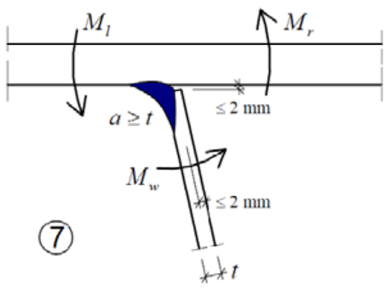
	N/mm^2
EN 1	1.8
EN 2	1.2
EN 3	1.5
EN 4	1.3
EN 5	4.3
EN 6	2.6
EN 7	2.7
EN 8	2.5
LM3	0.8
LM3 local	21.8

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 $_{global+local}$ =	**0.025**		
train on track 2 + LM3 $_{global+local}$ =	**0.025**		
train on track 1 + train on track 2 + LM3 $_{global}$ =	**0.000**		
LM3 $_{global+local}$ =	**0.000**		
tot =	**0.050**	<	0.950

9.16 Stress point D

$$\Delta\sigma = \frac{\Delta M_w}{W_w}$$



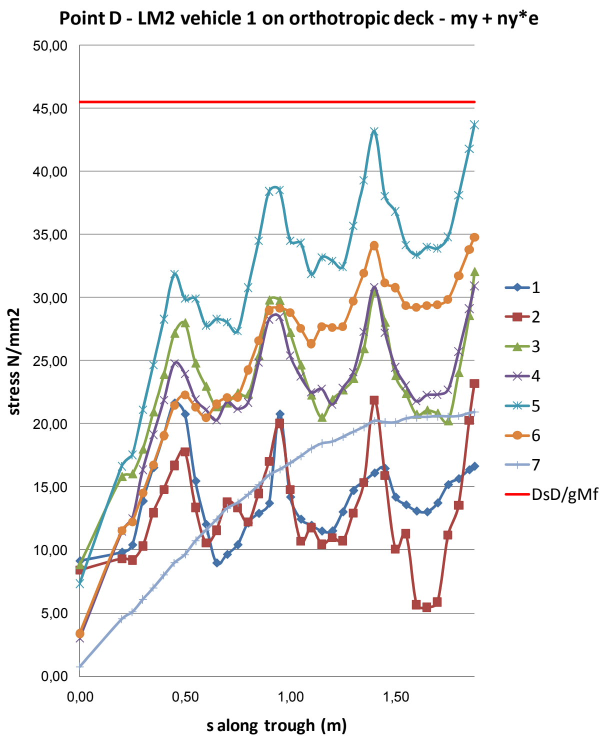


$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

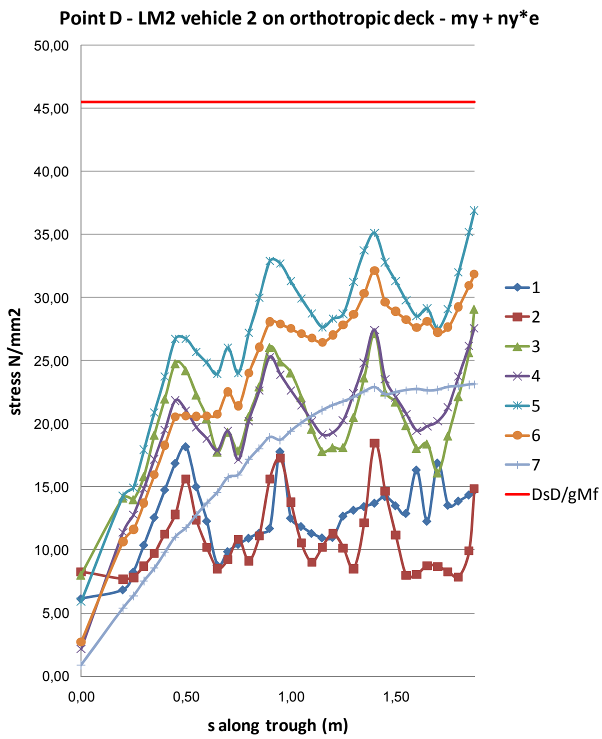
The fatigue detail for a partial penetration weld subject to a transverse bending moment with an additional parasite bending moment due to compression in the web of the trough caused by the eccentricity of the weld is 71 MPa according to EN1993-1-9 Table 8.8, detail no.7.

The stress range calculation has been performed considering each of the five vehicles running straight in seven different transverse offsets positions from the centre. The governing results include the additional bending moment given by the effect of a non full penetration weld (max 0.2 x t) and it is shown below:

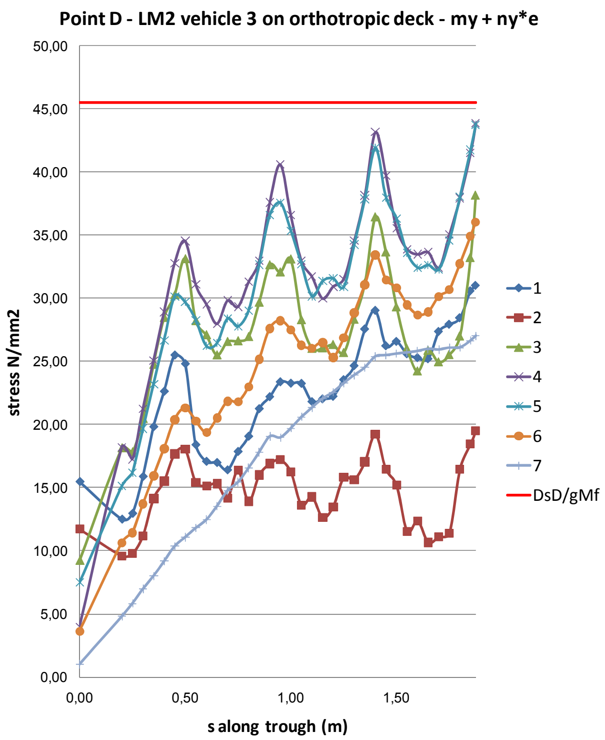
$\Delta\sigma_{my}$	$\Delta\sigma_{ny*e/W}$	$\Delta\sigma_{my+ny*e/W}$		$\Delta\sigma_D$ / γ_{MF}
-34.37	-6.68	45.09	<	45.48 = 52.3 / 1.15
3.78	0.26			



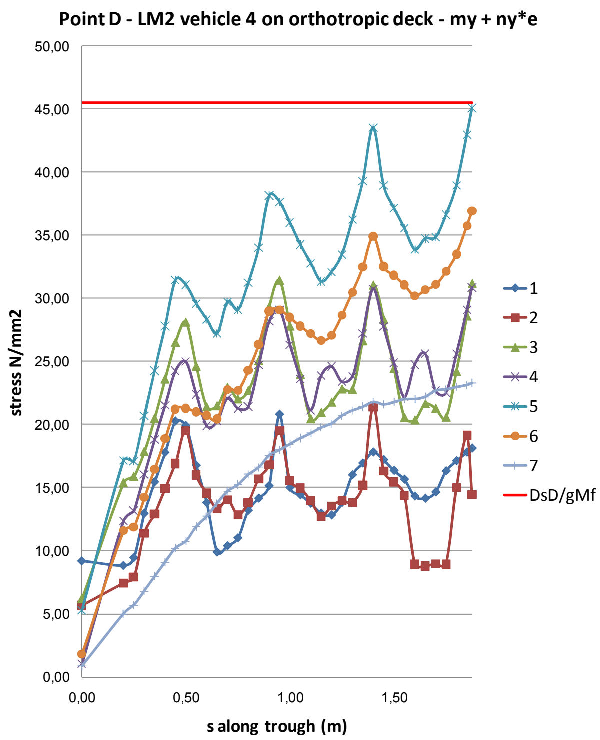
Point D - LM2 vehicle 1 on orthotropic deck - my + ny*e
stress N/mm2
s along trough (m)
1
2
3
4
5
6
7
DsD/gMf



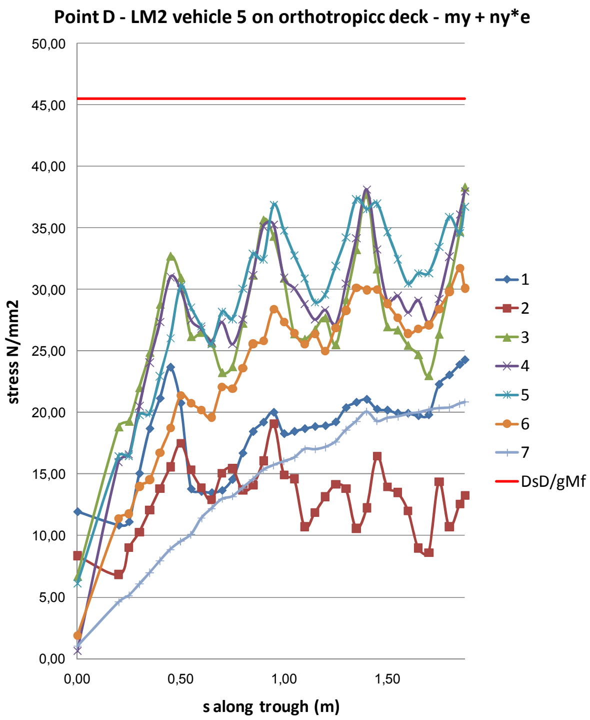
Point D - LM2 vehicle 2 on orthotropic deck - my + ny*e
stress N/mm2
s along trough (m)
1
2
3
4
5
6
7
DsD/gMf

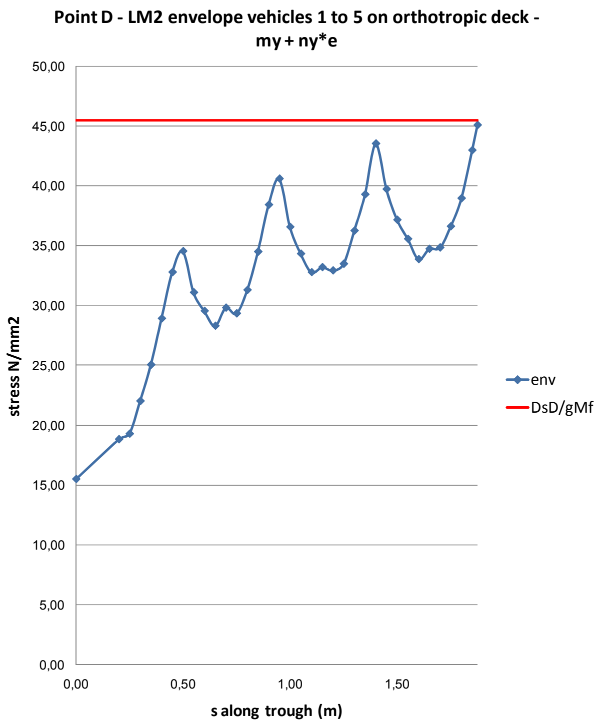


Point D - LM2 vehicle 3 on orthotropic deck - my + ny*e
stress N/mm2
s along trough (m)
1
2
3
4
5
6
7
DsD/gMf



Point D - LM2 vehicle 4 on orthotropic deck - my + ny*e
stress N/mm2
s along trough (m)
1
2
3
4
5
6
7
DsD/gMf





9.17 Stress point F

9.17.1 Diaphragm

The free edge of the cut-out in the diaphragm at the stiffeners is a non-welded detail, refer to point F in Figure 5-1.

The fatigue detail category is 71 (EN1993-1-9 Table 8.8, detail no.6) for verification based on nominal stresses and 112 for geometric stresses. The present analysis is based on geometric stresses at Section A-A shown in the figure below calculated by means of the local IBDAS model. Consequently, detail category 112 is adopted.

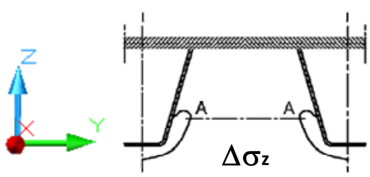


Figure 5-1 Roadway orthotropic deck details

According to EN1993-1-9 Clause 7.2.1 (2) the effective stress range for a non-welded detail may be calculated by adding the tensile portion of the stress range and 60% of the magnitude of the compressive portion of the stress range.

The diaphragm plate directly underneath the roadway deck is only subject to stresses due to concentrated wheel loads from the road traffic and is not influenced by other effects. Consequently, the verification is carried out according to the unlimited life method applying LM2.

The stress range is determined at the nearest gauss point which is located 3mm from the edge of the cut-out. The mesh is considered sufficiently fine (element size 5mm x 14mm corresponding to 0.3t x t, where t=15mm) and the gauss point sufficiently close to the edge of the cut-out (equivalent to 20% of the plate thickness) to render extrapolation of stresses to the plate edge unnecessary.

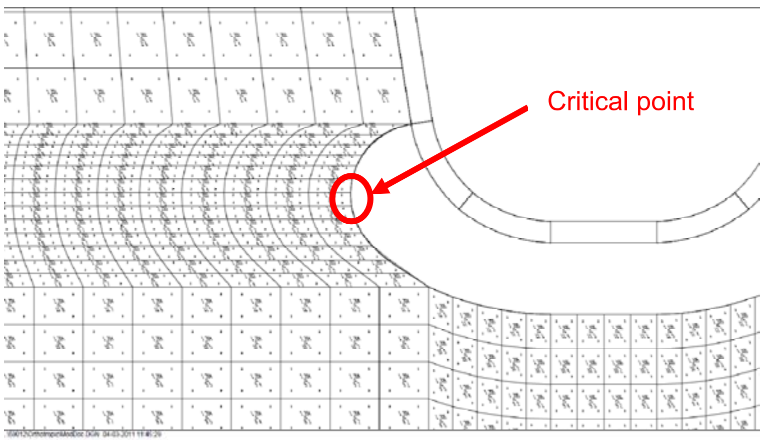


Figure 9-7 Mesh at cut-out

The governing stress component at the critical point at the edge of the cut-out is the normal stress in the vertical direction.

The local IBDAS model is used to find the worst transverse position of the load and the governing of the five vehicles defined in LM2. This is vehicle 3 and the stress range is calculated as follows:

$$\Delta\sigma = 1.15*(3.922\text{MPa}-0.6*(-96.69\text{MPa})) = 71.2\text{MPa} < 82.5\text{MPa} = \Delta\sigma_D$$

Since the largest stress range is below the constant amplitude fatigue limit no further analysis is required.

The governing influence line is shown below.

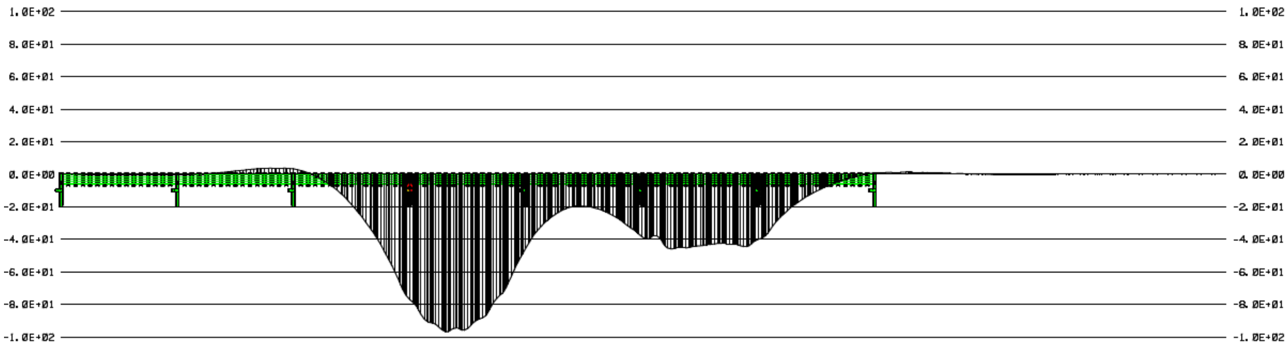


Figure 9-8 Influence line for normal stress [MPa] in the vertical direction at cut-out. LM2 - vehicle 3.

9.17.2 Cross girder

The cross girder webs underneath the roadway deck are subject to both local stresses due to concentrated wheel loads and global stresses from transverse bending of the cross girder due to rail and road traffic. The stresses are combined using the formulae given in section 2.2.3.

The web plate thickness is 20-25mm under the emergency lane and 16mm in the remaining part of the cross girder with a strip of 25mm under the roadway deck. The following check is based on 25mm plate thickness in the tooth plates between trough stiffeners.

The local stress range is based on the assessment above scaled by the relative plate thicknesses:

$$\Delta\sigma_{local} = 71.2\text{MPa} * 15\text{mm}/25\text{mm} = 42.7\text{MPa}$$

For global effect in the cross girder the maximum effect under unlimited life is obtained for two crossing freight trains EN5 + road traffic LM2.

The semi-local IBDAS model does not include cut-outs at the trough stiffeners and is consequently not detailed enough to assess stresses in the tooth plates. Instead, the Bridge deck local FE-model (refer to General Design Principles for Suspended Deck, section 9.3) is calibrated against the global IBDAS model in terms of global bending stresses in the cross girder. A vertical load of 1MN is applied to the Robot model at the centre of the railway girder and the normal stress in the cross girder is calibrated resulting in a scaling factor of 5.1 on stresses in the Robot model.

The vertical normal stress at the edge of the cut-outs is shown below.

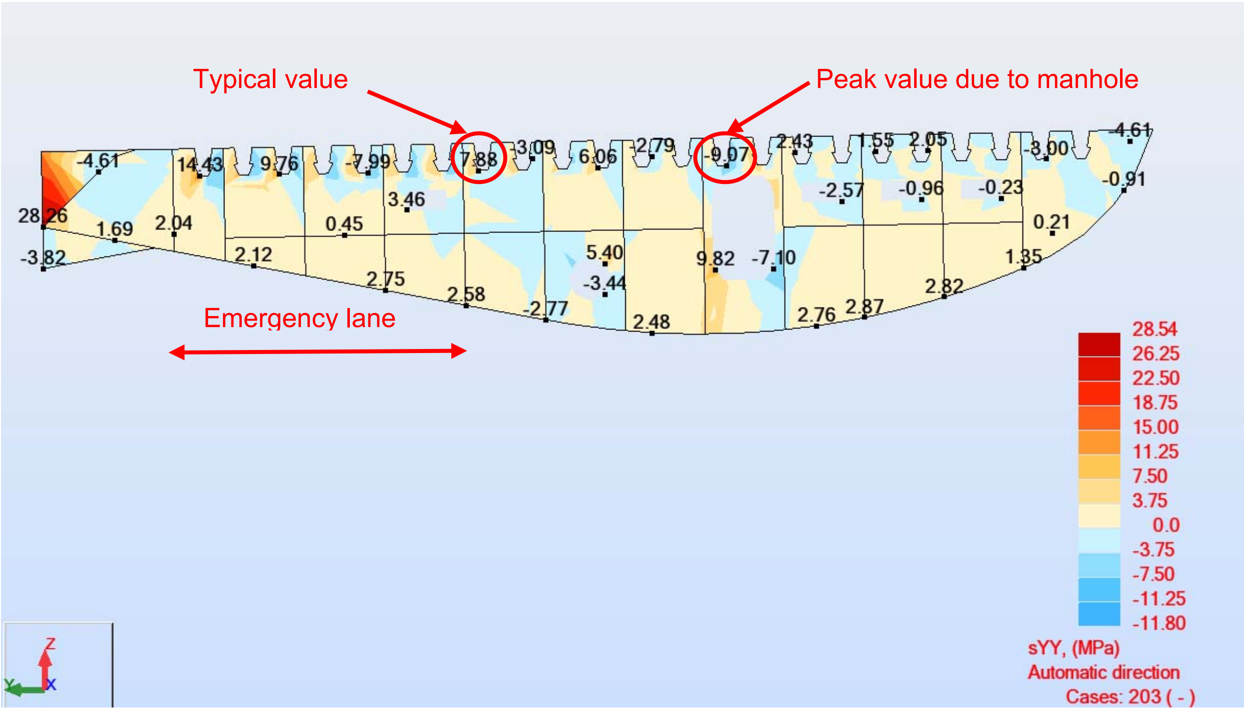


Figure 9-9 Vertical normal stress at the edge of the cut-outs calculated in Robot.

The maximum stress under the traffic lanes is found to be 9.07MPa for the unit load of 1MN applied in the Robot model. This peak value is to some extent influenced by the combined effect of the manhole and the trough cut-out. A more typical and representative value is 7.88MPa as seen from Figure 9-9. Consequently, the global stress for the combined effect of global rail and road load is:

$$\text{Typical:} \quad \Delta\sigma_{global} = 5.1 * 7.88\text{MPa} = 40.2\text{MPa}$$

$$\text{Peak:} \quad \Delta\sigma_{global} = 5.1 * 9.07\text{MPa} = 46.3\text{MPa}$$

The combined local and global stress is the maximum of the following two expressions:

$$\Delta\sigma_{design} = \Psi^*\Delta\sigma_{local} + \Delta\sigma_{global}, \text{ with } \Psi = 1.0 \text{ for the orthotropic deck (L=3.75m)}$$

$$\Delta\sigma_{design} = \Delta\sigma_{local} + \Psi^*\Delta\sigma_{global}, \text{ with } \Psi = 0.7 \text{ for the cross girders (L=52m)}$$

Combined stress at typical cut-out:

$$\Delta\sigma_{design} = \Psi^*\Delta\sigma_{local} + \Delta\sigma_{global} = 1.0^*42.7MPa + 40.2MPa = 82.9MPa \approx \Delta\sigma_D = 82.5MPa$$

$$\Delta\sigma_{design} = \Delta\sigma_{local} + \Psi^*\Delta\sigma_{global} = 42.7MPa + 0.7^*40.2MPa = 70.8MPa < \Delta\sigma_D = 82.5MPa$$

Combined stress at manhole (peak value):

$$\Delta\sigma_{design} = \Psi^*\Delta\sigma_{local} + \Delta\sigma_{global} = 1.0^*42.7MPa + 46.3MPa = 89.0MPa > \Delta\sigma_D = 82.5MPa$$

$$\Delta\sigma_{design} = \Delta\sigma_{local} + \Psi^*\Delta\sigma_{global} = 42.7MPa + 0.7^*46.3MPa = 75.1MPa < \Delta\sigma_D = 82.5MPa$$

From this assessment it is concluded that the fatigue performance of the typical cut-outs under the normal traffic lanes is acceptable. The slight over-utilization at the cut-out above the manhole may to some degree be due to model effects related to the level of detail in the Robot model. It is considered feasible to improve the fatigue performance of the detail by refined detailing and/or strengthening of the tooth plate above the manhole.

10 Railway Girder - Fatigue Verification

Fatigue details have been checked for the following railway girders with the associated s-coordinates, see Table 10-1:

Table 10-1 Selected girders for verification and associated s-coordinates

		s-coordinate		
Girder type	Span no.	mid span	end 1	end 2
CF1	39	615.0	627.6	
CF1	28	945.0	957.6	
CF2	19	1215.0	1202.3	
CF2	12	1425.0	1412.3	
CF2	11	1455.0	1467.5	
CF2	10	1485.0	1497.5	
CF5	9	1515.0	1527.5	
CF5	8	1545.0	1557.6	
CF6	7	1575.0	1587.6	
CF3	6	1605.0	1616.5	
CF4	5	1650.0	1623.5	1676.5
CF3	4	1695.0	1683.5	1707.6
CF6	3	1725.0	1712.4	1737.6
CF6	2	1755	1742.4	1766.5
CF7	1	1795.4	1773.5	1815.9
CF8		1830.7	1819.6	1841.9
CF9a		1848.2	1842.8	
CF9b			1856.5	

The simultaneous applications of roadway and railway loads have been considered also when the detail is loaded by two trains meeting on the bridge. With the aim of giving a general overview of the fatigue calculation the results are summarised in Table 10-2. References to sections no. are given for the fatigue details found to me most critical. The numbering of the spans is shown on Figure 2-11 and the analysed locations are shown on Figure 2-9.

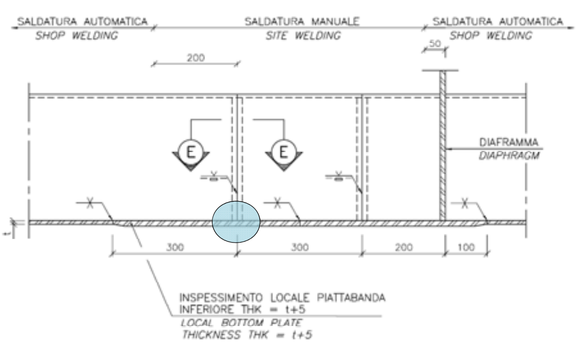
Table 10-2 Summarisation of fatigue verification, railway girder

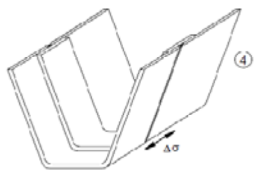
		Bottom plate			Top Plate		
	detail	Erection joint	At diaphragm	Shop joint	At diaphragm	Between diaphragm	Bottom of T beam
Main - spans 39, 28, 19, 12, 11, 10, 9, 8, 7 and 6	location	1	2	3	1 or 2	1 & 2	1
	span / ref	09/8.7.1.1	19/8.3.1.2	09/8.7.1.3	06/8.10.2.1	06/8.10.2.2	06/8.10.2.3
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.991	0.962	0.987	0.980	0.996	0.868
	$\Sigma n_i/N_i + 0.05$	0.579	0.671	0.542	0.370	0.357	0.245
Tower - span 5	location	1	2	3	3	3	1
	ref	05/8.11.1.1	05/8.11.1.2	05/8.11.1.3	05/8.11.2.4	05/8.11.2.5	05/8.11.2.3
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.761	0.840	0.765	0.838	0.877	0.710
	$\Sigma n_i/N_i + 0.05$	0.150	0.230	0.137	0.167	0.183	0.112
Side - spans 0, 1, 2 , 3 and 4	location	1	2	3	1 or 2	3	3
	span / ref	02/8.14.1.1	03/8.13.1.1	02/8.14.1.3	01/8.15.2.1	00/8.16.2.4	00/8.16.2.5
	$\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.988	0.959	0.880	0.991	0.995	0.909
	$\Sigma n_i/N_i + 0.05$	0.454	0.390	0.277	0.395	0.335	0.261

10.1 Span 39 – Main span

10.1.1 Bottom plate (Span 39)

10.1.1.1 Erection joint – location 1 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	30.2	1.056	3.0	1.35	**47.1**	<	**52.3**

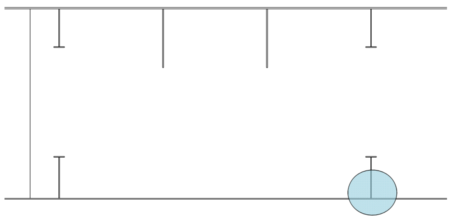
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.900**

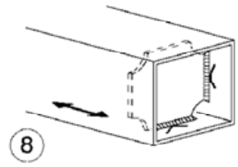
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	21.7
EN 2	15.9
EN 3	14.6
EN 4	13.4
EN 5	30.2
EN 6	22.6
EN 7	24.0
EN 8	22.9
LM3	2.3

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.134**		
train on track 2 + LM3 =	**0.134**		
train on track 1 + train on track 2 + LM3 =	**0.247**		
tot =	**0.515**	<	**0.950**

10.1.1.2 Bottom plate to diaphragm weld – location 2 (Span 39)





$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	40.6	1.056	4.1	1.35	**63.3**	<	**73.7**

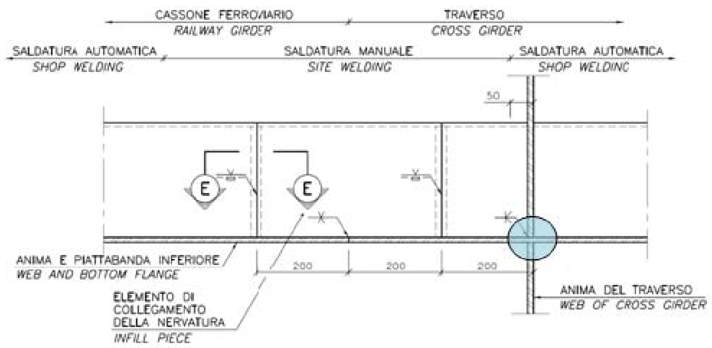
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.859**

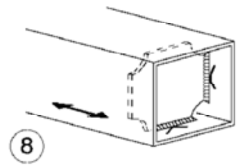
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	29.2
EN 2	21.4
EN 3	19.6
EN 4	18.0
EN 5	40.6
EN 6	30.4
EN 7	32.3
EN 8	30.8
LM3	3.1

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.106**		
train on track 2 + LM3 =	**0.106**		
train on track 1 + train on track 2 + LM3 =	**0.214**		
tot =	**0.427**	<	**0.950**

10.1.1.3 Shop joint – location 3 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	35.4	1.056	5.6	1.35	**57.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.983**

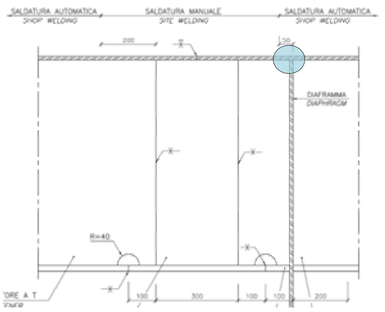
DAMAGE ACCUMULATION METHOD

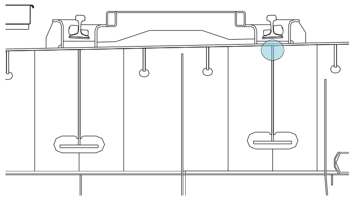
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	26.9
EN 2	20.3
EN 3	17.6
EN 4	15.6
EN 5	35.4
EN 6	29.1
EN 7	27.4
EN 8	24.6
LM3	4.3

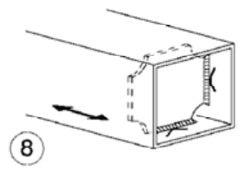
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.244**		
train on track 2 + LM3 =	**0.244**		
train on track 1 + train on track 2 + LM3 =	**0.328**		
tot =	**0.816**	<	**0.950**

10.1.2 Top plate (Span 39)

10.1.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.2	1.056	6.8	1.181	2.5	1.35	**50.1**	<	**58.9**

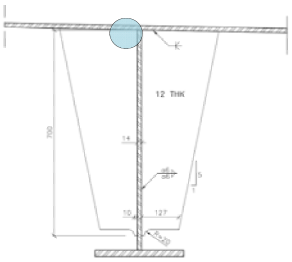
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.850**

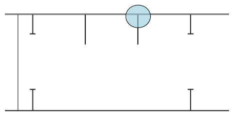
DAMAGE ACCUMULATION METHOD

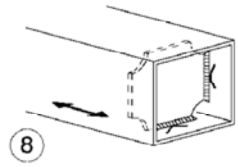
N/mm^2	global	local
EN 1	17.7	6.2
EN 2	13.0	5.4
EN 3	12.0	5.2
EN 4	10.9	4.4
EN 5	25.2	6.8
EN 6	19.2	6.9
EN 7	19.5	7.0
EN 8	18.7	6.4
LM3	1.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.120**		
train on track 2 + LM3 =	**0.011**		
local effects =	**0.000**		
train meetings + LM3 =	**0.160**		
tot =	**0.291**	<	**0.950**

10.1.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.2	1.056	8.3	1.181	2.5	1.35	**52.4**	<	**58.9**

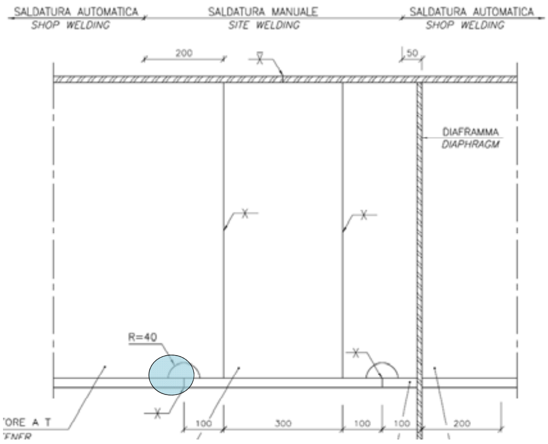
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.889**

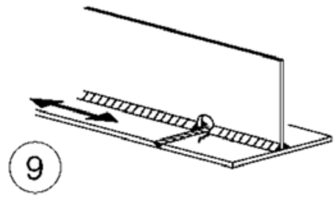
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	17.7	5.9
EN 2	13.0	6.0
EN 3	12.0	5.2
EN 4	10.9	4.0
EN 5	25.2	8.3
EN 6	19.2	7.3
EN 7	19.5	6.8
EN 8	18.7	6.6
LM3	1.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.130**		
train on track 2 + LM3 =	**0.011**		
local effects =	**0.000**		
train meetings + LM3 =	**0.163**		
tot =	**0.304**	<	**0.950**

10.1.2.3 Bottom of T beam – Erection joint – location 1 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.8	1.056	10.9	1.181	0.2	1.35	**21.8**	<	**52.3**

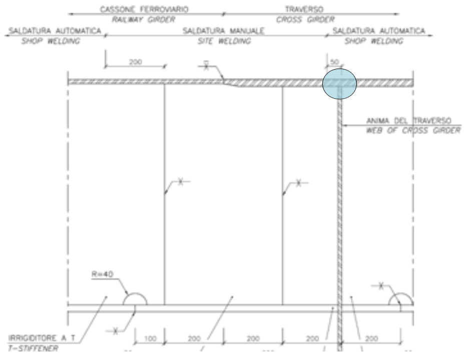
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.416**

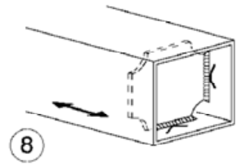
Damage accumulation method

N/mm²	global	local
EN 1	2.0	9.2
EN 2	1.5	9.5
EN 3	1.4	8.2
EN 4	1.3	6.5
EN 5	2.8	10.9
EN 6	2.1	11.4
EN 7	2.3	10.9
EN 8	2.2	10.1
LM3	0.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.1.2.4 Top plate to web of cross girder weld – location 3 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.0	1.056	6.8	1.181	3.4	1.35	**31.2**	<	**58.9**

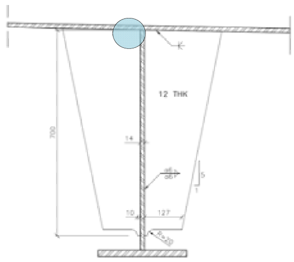
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.530**

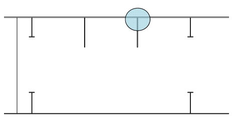
DAMAGE ACCUMULATION METHOD

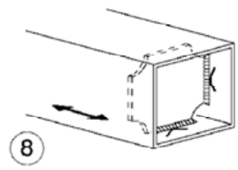
N/mm²	global	local
EN 1	8.9	6.2
EN 2	6.6	5.4
EN 3	5.8	5.2
EN 4	5.3	4.4
EN 5	11.0	6.8
EN 6	9.8	6.9
EN 7	9.2	7.0
EN 8	8.2	6.4
LM3	2.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.016**		
tot =	**0.016**	<	**0.950**

10.1.2.5 Top plate to diaphragm weld – section close to location 3 (Span 39)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.0	1.056	8.3	1.181	3.4	1.35	33.5	<	58.9

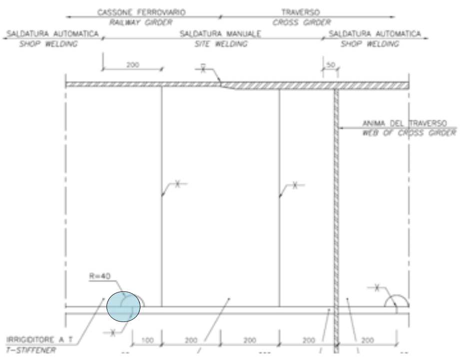
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.569

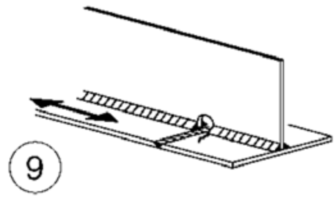
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.9	5.9
EN 2	6.6	6.0
EN 3	5.8	5.2
EN 4	5.3	4.0
EN 5	11.0	8.3
EN 6	9.8	7.3
EN 7	9.2	6.8
EN 8	8.2	6.6
LM3	2.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.005		
train on track 2 + LM3 =	0.000		
local effects =	0.000		
train meetings + LM3 =	0.017		
tot =	0.021	<	0.950

10.1.2.6 Bottom of T beam – Shop joint – location 3 (Span 39)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.4	1.056	10.9	1.181	0.3	1.35	**19.8**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.378**

DAMAGE ACCUMULATION METHOD

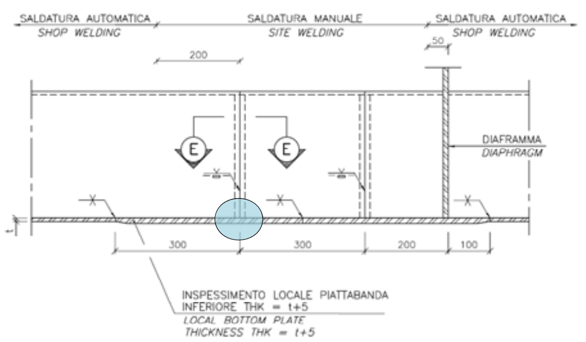
N/mm^2	global	local
EN 1	1.1	9.2
EN 2	0.8	9.5
EN 3	0.7	8.2
EN 4	0.6	6.5
EN 5	1.4	10.9
EN 6	1.1	11.4
EN 7	1.1	10.9
EN 8	1.0	10.1
LM3	0.3	

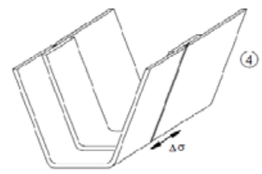
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.2 Span 28 – Main span

10.2.1 Bottom plate (Span 28)

10.2.1.1 Erection joint – location 1 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.6	1.056	3.4	1.35	**43.9**	<	**52.3**

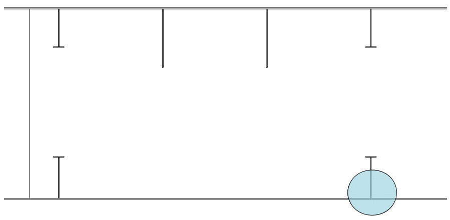
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.839**

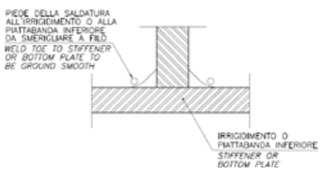
DAMAGE ACCUMULATION METHOD

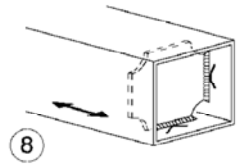
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	19.2
EN 2	14.0
EN 3	12.6
EN 4	11.5
EN 5	27.6
EN 6	20.1
EN 7	21.8
EN 8	20.8
LM3	2.6

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.088**		
train on track 2 + LM3 =	**0.088**		
train on track 1 + train on track 2 + LM3 =	**0.182**		
tot =	**0.359**	<	**0.950**

10.2.1.2 Bottom plate to diaphragm weld – location 2 (Span 28)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.1	1.056	4.6	1.35	**59.1**	<	**73.7**

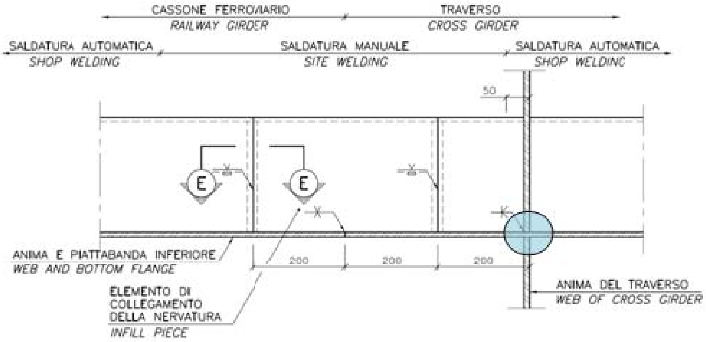
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.802**

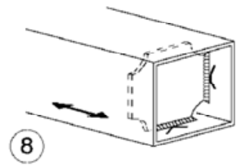
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	25.9
EN 2	18.8
EN 3	17.0
EN 4	15.5
EN 5	37.1
EN 6	27.0
EN 7	29.3
EN 8	27.9
LM3	3.6

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.070**		
train on track 2 + LM3 =	**0.070**		
train on track 1 + train on track 2 + LM3 =	**0.157**		
tot =	**0.297**	<	**0.950**

10.2.1.3 Shop joint – location 3 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	33.3	1.056	6.1	1.35	**55.7**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.945**

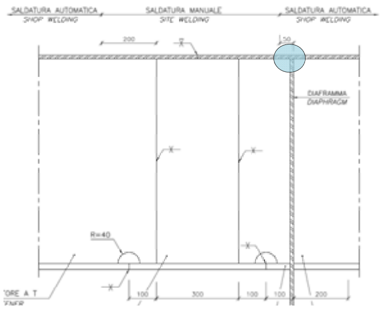
DAMAGE ACCUMULATION METHOD

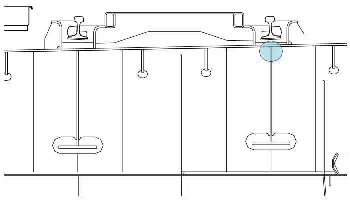
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	26.3
EN 2	19.6
EN 3	17.3
EN 4	15.9
EN 5	33.3
EN 6	28.8
EN 7	27.0
EN 8	23.8
LM3	4.7

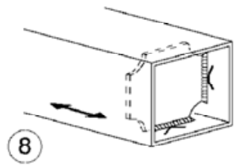
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.230**		
train on track 2 + LM3 =	**0.230**		
train on track 1 + train on track 2 + LM3 =	**0.311**		
tot =	**0.772**	<	**0.950**

10.2.2 Top plate (Span 28)

10.2.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.6	1.056	6.8	1.181	2.8	1.35	**48.4**	<	**58.9**

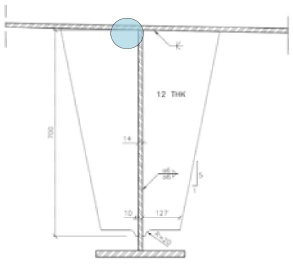
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.820**

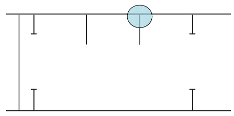
DAMAGE ACCUMULATION METHOD

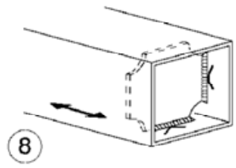
N/mm²	global	local
EN 1	15.8	6.2
EN 2	11.4	5.4
EN 3	10.8	5.2
EN 4	9.7	4.4
EN 5	23.6	6.8
EN 6	16.7	6.9
EN 7	18.2	7.0
EN 8	17.3	6.4
LM3	2.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.092**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.123**		
tot =	**0.223**	<	**0.950**

10.2.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.6	1.056	8.3	1.181	2.8	1.35	**50.7**	<	**58.9**

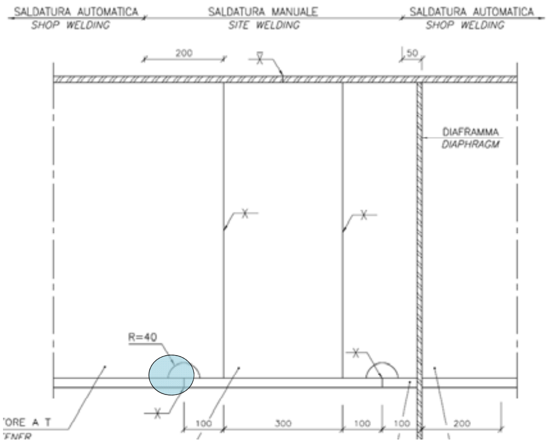
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.859**

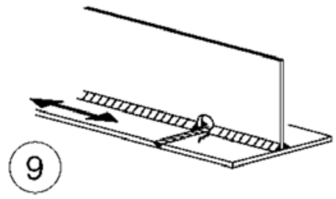
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	15.8	5.9
EN 2	11.4	6.0
EN 3	10.8	5.2
EN 4	9.7	4.0
EN 5	23.6	8.3
EN 6	16.7	7.3
EN 7	18.2	6.8
EN 8	17.3	6.6
LM3	2.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.100**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.126**		
tot =	**0.234**	<	**0.950**

10.2.2.3 Bottom of T beam – Erection joint – location 1 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.6	1.056	10.9	1.181	0.3	1.35	**21.5**	<	**52.3**

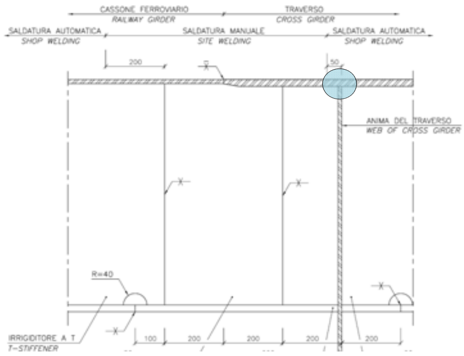
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.410**

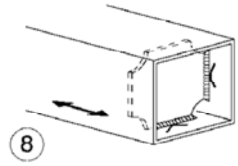
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	1.8	9.2
EN 2	1.3	9.5
EN 3	1.2	8.2
EN 4	1.1	6.5
EN 5	2.6	10.9
EN 6	1.9	11.4
EN 7	2.1	10.9
EN 8	2.0	10.1
LM3	0.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.2.2.4 Top plate to web of cross girder weld – location 3 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.9	1.056	6.8	1.181	3.7	1.35	**30.1**	<	**58.9**

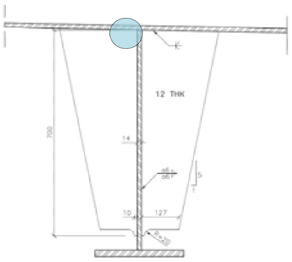
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.510**

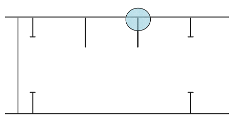
DAMAGE ACCUMULATION METHOD

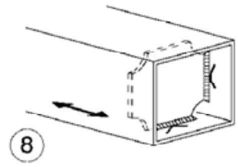
N/mm^2	global	local
EN 1	8.7	6.2
EN 2	6.4	5.4
EN 3	5.7	5.2
EN 4	5.3	4.4
EN 5	9.9	6.8
EN 6	9.8	6.9
EN 7	9.0	7.0
EN 8	8.0	6.4
LM3	2.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.015**		
tot =	**0.015**	<	**0.950**

10.2.2.5 Top plate to diaphragm weld – section close to location 3 (Span 28)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.9	1.056	8.3	1.181	3.7	1.35	**32.4**	<	**58.9**

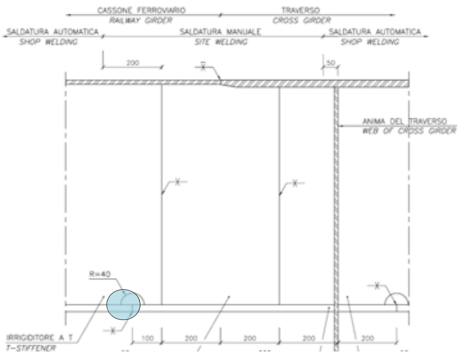
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.549**

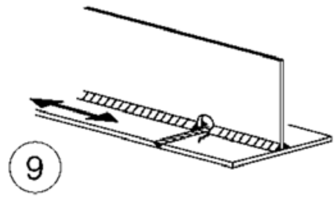
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.7	5.9
EN 2	6.4	6.0
EN 3	5.7	5.2
EN 4	5.3	4.0
EN 5	9.9	8.3
EN 6	9.8	7.3
EN 7	9.0	6.8
EN 8	8.0	6.6
LM3	2.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.016**		
tot =	**0.016**	<	**0.950**

10.2.2.6 Bottom of T beam – Shop joint – location 3 (Span 28)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.3	1.056	10.9	1.181	0.3	1.35	**19.7**	<	**52.3**

$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.377**

DAMAGE ACCUMULATION METHOD

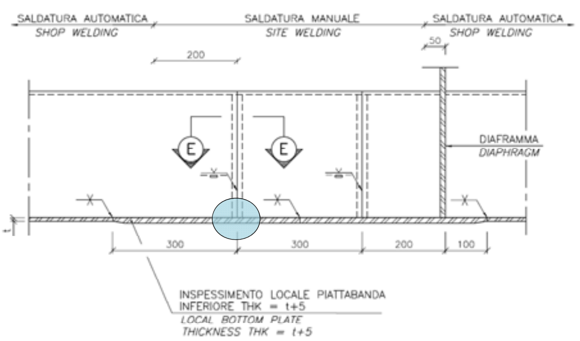
N/mm^2	global	local
EN 1	1.0	9.2
EN 2	0.8	9.5
EN 3	0.7	8.2
EN 4	0.6	6.5
EN 5	1.3	10.9
EN 6	1.1	11.4
EN 7	1.1	10.9
EN 8	0.9	10.1
LM3	0.3	

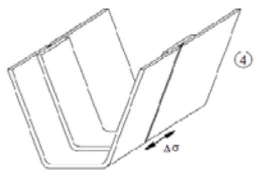
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.3 Span 19 – Main span

10.3.1 Bottom plate (Span 19)

10.3.1.1 Erection joint – location 1 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.8	1.056	3.6	1.35	**50.1**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.959**

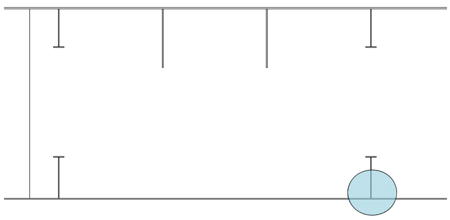
DAMAGE ACCUMULATION METHOD

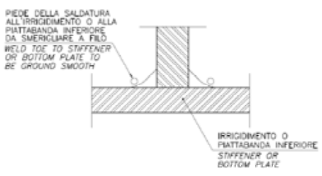
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	21.9
EN 2	16.0
EN 3	14.7
EN 4	13.6
EN 5	31.8
EN 6	23.0
EN 7	25.2
EN 8	23.6
LM3	2.8

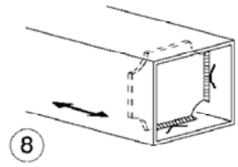
Stress Concentration factor = f_{SC} =	1.00
Train meeting percentage	12.0

contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.169**		
train on track 2 + LM3 =	**0.169**		
train on track 1 + train on track 2 + LM3 =	**0.273**		
tot =	**0.611**	<	**0.950**

10.3.1.2 Bottom plate to diaphragm weld – location 2 (Span 19)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	44.9	1.056	5.1	1.35	**70.9**	<	**73.7**

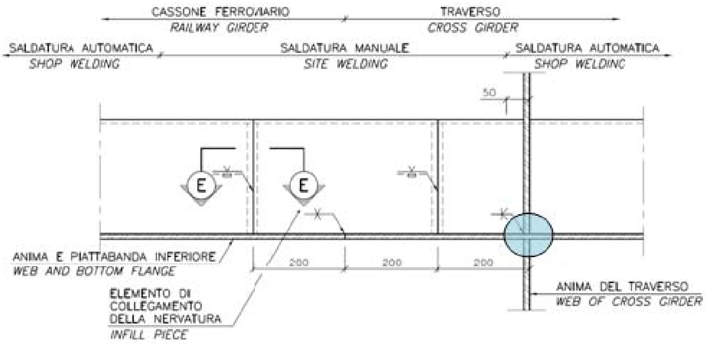
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.962**

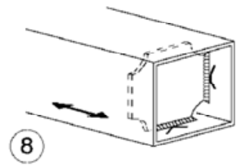
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	31.0
EN 2	22.6
EN 3	20.8
EN 4	19.3
EN 5	44.9
EN 6	32.5
EN 7	35.6
EN 8	33.4
LM3	3.9

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.172**		
train on track 2 + LM3 =	**0.172**		
train on track 1 + train on track 2 + LM3 =	**0.277**		
tot =	**0.621**	<	**0.950**

10.3.1.3 Shop joint – location 3 (Span 19)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.0	1.056	6.7	1.35	**64.6**	<	**73.7**

$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.877**

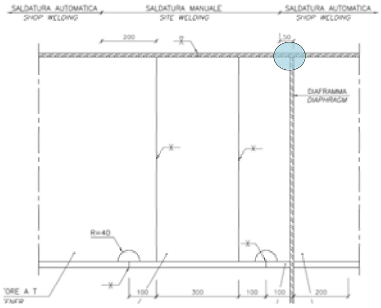
DAMAGE ACCUMULATION METHOD

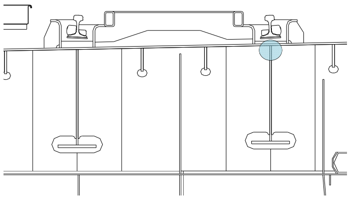
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	25.7
EN 2	20.6
EN 3	18.9
EN 4	17.1
EN 5	39.0
EN 6	32.5
EN 7	29.8
EN 8	29.0
LM3	5.2

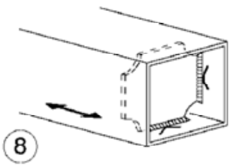
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.115**		
train on track 2 + LM3 =	**0.115**		
train on track 1 + train on track 2 + LM3 =	**0.209**		
tot =	**0.439**	<	**0.950**

10.3.2 Top plate (Span 19)

10.3.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 19)







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$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.1	1.056	6.8	1.181	3.1	1.35	**55.2**	<	**58.9**

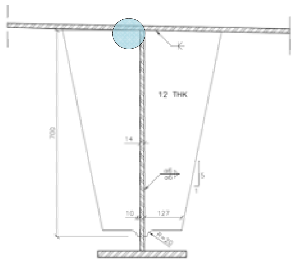
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.936**

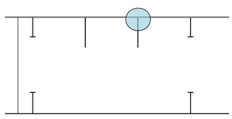
DAMAGE ACCUMULATION METHOD

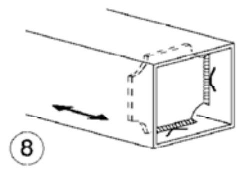
N/mm²	global	local
EN 1	18.8	6.2
EN 2	13.7	5.4
EN 3	13.1	5.2
EN 4	11.9	4.4
EN 5	28.1	6.8
EN 6	19.9	6.9
EN 7	21.9	7.0
EN 8	20.5	6.4
LM3	2.4	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.186**		
train on track 2 + LM3 =	**0.039**		
local effects =	**0.000**		
train meetings + LM3 =	**0.200**		
tot =	**0.426**	<	**0.950**

10.3.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.1	1.056	8.3	1.181	3.1	1.35	**57.5**	<	**58.9**

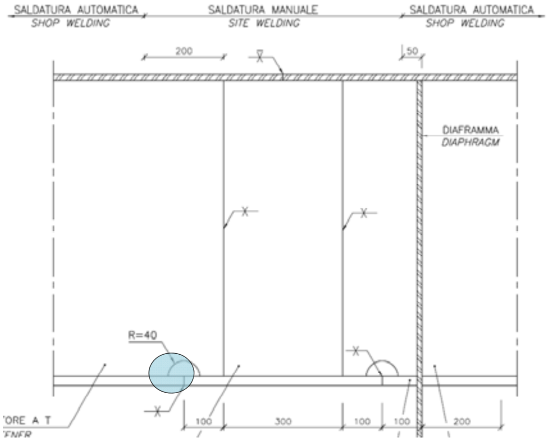
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.975**

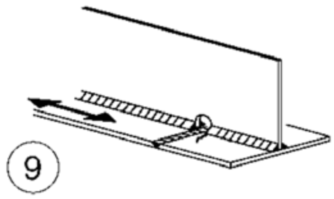
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	18.8	5.9
EN 2	13.7	6.0
EN 3	13.1	5.2
EN 4	11.9	4.0
EN 5	28.1	8.3
EN 6	19.9	7.3
EN 7	21.9	6.8
EN 8	20.5	6.6
LM3	2.4	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.202**		
train on track 2 + LM3 =	**0.039**		
local effects =	**0.000**		
train meetings + LM3 =	**0.204**		
tot =	**0.445**	<	**0.950**

10.3.2.3 Bottom of T beam – Erection joint – location 1 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.2	1.056	10.9	1.181	0.3	1.35	**22.3**	<	**52.3**

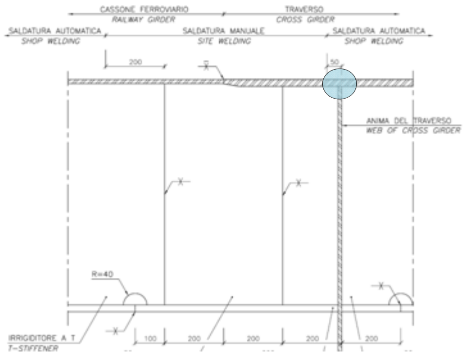
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.426**

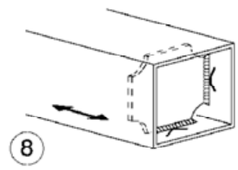
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	2.2	9.2
EN 2	1.6	9.5
EN 3	1.5	8.2
EN 4	1.4	6.5
EN 5	3.2	10.9
EN 6	2.3	11.4
EN 7	2.5	10.9
EN 8	2.3	10.1
LM3	0.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.3.2.4 Top plate to web of cross girder weld – location 3 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.1	1.056	6.8	1.181	4.1	1.35	**36.6**	<	**58.9**

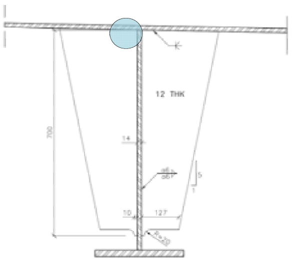
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.620**

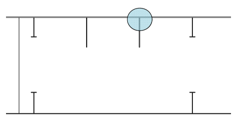
DAMAGE ACCUMULATION METHOD

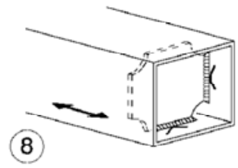
N/mm^2	global	local
EN 1	8.9	6.2
EN 2	7.0	5.4
EN 3	6.5	5.2
EN 4	5.8	4.4
EN 5	14.1	6.8
EN 6	11.3	6.9
EN 7	10.5	7.0
EN 8	10.2	6.4
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.007**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.027**		
tot =	**0.034**	<	**0.950**

10.3.2.5 Top plate to diaphragm weld – section close to location 3 (Span 19)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.1	1.056	8.3	1.181	4.1	1.35	**38.9**	<	**58.9**

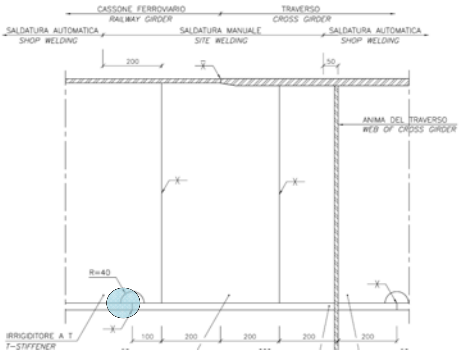
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.659**

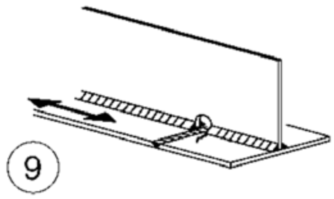
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	8.9	5.9
EN 2	7.0	6.0
EN 3	6.5	5.2
EN 4	5.8	4.0
EN 5	14.1	8.3
EN 6	11.3	7.3
EN 7	10.5	6.8
EN 8	10.2	6.6
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.009**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.028**		
tot =	**0.038**	<	**0.950**

10.3.2.6 Bottom of T beam – Shop joint – location 3 (Span 19)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	10.9	1.181	0.4	1.35	**20.1**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.384**

DAMAGE ACCUMULATION METHOD

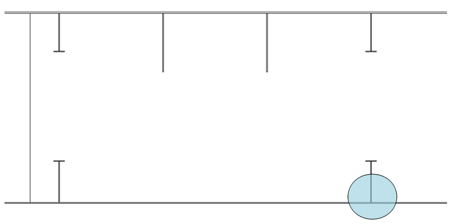
N/mm^2	global	local
EN 1	1.0	9.2
EN 2	0.8	9.5
EN 3	0.7	8.2
EN 4	0.7	6.5
EN 5	1.5	10.9
EN 6	1.3	11.4
EN 7	1.2	10.9
EN 8	1.1	10.1
LM3	0.4	

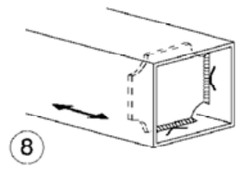
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.4 Span 12 – Main span

10.4.1 Bottom plate (Span 12)

10.4.1.1 Bottom plate to diaphragm weld – location 2 (Span 12)





$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	40.9	1.056	5.5	1.35	**65.7**	<	**73.7**

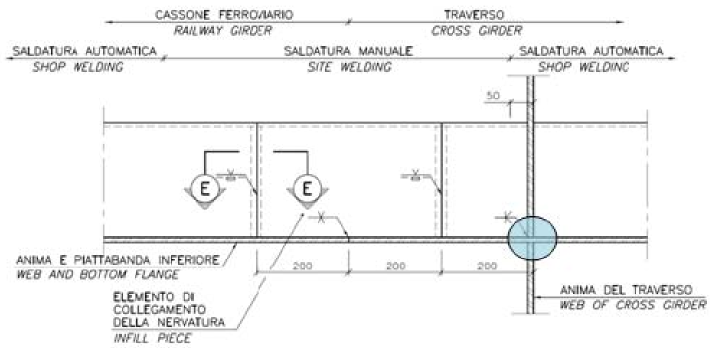
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.892**

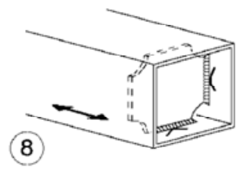
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	27.6
EN 2	20.0
EN 3	18.5
EN 4	16.7
EN 5	40.9
EN 6	29.4
EN 7	31.6
EN 8	30.1
LM3	4.2

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.112**		
train on track 2 + LM3 =	**0.112**		
train on track 1 + train on track 2 + LM3 =	**0.204**		
tot =	**0.427**	<	**0.950**

10.4.1.2 Shop joint – location 3 (Span 12)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.7	1.056	7.2	1.35	**63.5**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.862**

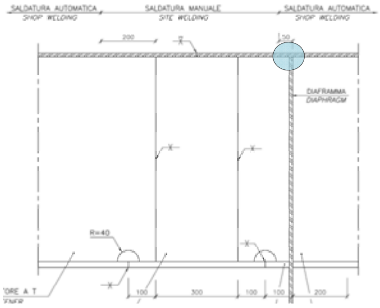
DAMAGE ACCUMULATION METHOD

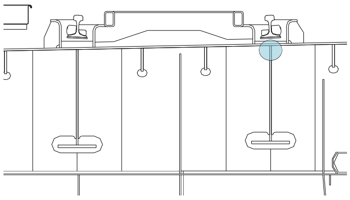
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	25.9
EN 2	19.9
EN 3	18.8
EN 4	17.3
EN 5	37.7
EN 6	33.0
EN 7	29.5
EN 8	27.9
LM3	5.5

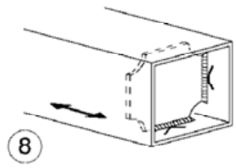
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.115**		
train on track 2 + LM3 =	**0.115**		
train on track 1 + train on track 2 + LM3 =	**0.206**		
tot =	**0.437**	<	**0.950**

10.4.2 Top plate (Span 12)

10.4.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.6	1.056	6.8	1.181	3.3	1.35	**53.3**	<	**58.9**

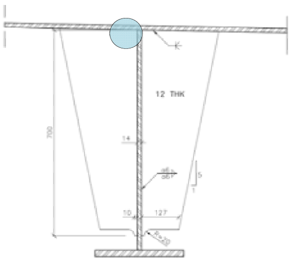
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.905**

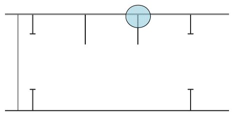
DAMAGE ACCUMULATION METHOD

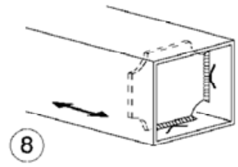
N/mm²	global	local
EN 1	16.8	6.2
EN 2	12.2	5.4
EN 3	11.8	5.2
EN 4	10.5	4.4
EN 5	26.6	6.8
EN 6	18.2	6.9
EN 7	19.9	7.0
EN 8	18.9	6.4
LM3	2.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.138**		
train on track 2 + LM3 =	**0.021**		
local effects =	**0.000**		
train meetings + LM3 =	**0.160**		
tot =	**0.319**	<	**0.950**

10.4.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.6	1.056	8.3	1.181	3.3	1.35	55.6	<	58.9

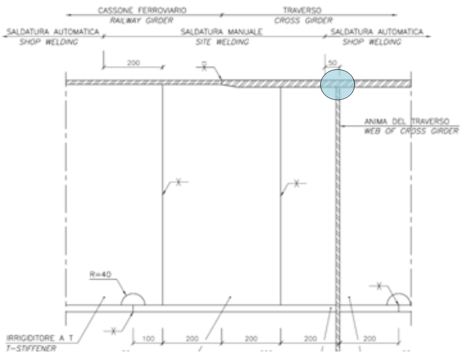
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.944

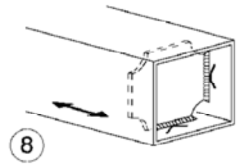
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	16.8	5.9
EN 2	12.2	6.0
EN 3	11.8	5.2
EN 4	10.5	4.0
EN 5	26.6	8.3
EN 6	18.2	7.3
EN 7	19.9	6.8
EN 8	18.9	6.6
LM3	2.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.150**		
train on track 2 + LM3 =	**0.021**		
local effects =	**0.000**		
train meetings + LM3 =	**0.164**		
tot =	**0.335**	<	**0.950**

10.4.2.3 Top plate to web of cross girder weld – location 3 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.2	1.056	6.8	1.181	4.4	1.35	**37.1**	<	**58.9**

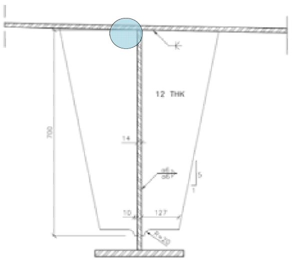
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.629**

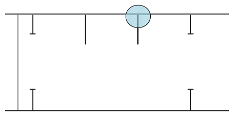
DAMAGE ACCUMULATION METHOD

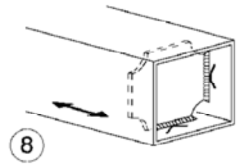
N/mm^2	global	local
EN 1	8.8	6.2
EN 2	6.7	5.4
EN 3	6.6	5.2
EN 4	6.0	4.4
EN 5	14.2	6.8
EN 6	11.5	6.9
EN 7	10.5	7.0
EN 8	10.0	6.4
LM3	3.4	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.007**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.028**		
tot =	**0.035**	<	**0.950**

10.4.2.4 Top plate to diaphragm weld – section close to location 3 (Span 12)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.2	1.056	8.3	1.181	4.4	1.35	**39.4**	<	**58.9**

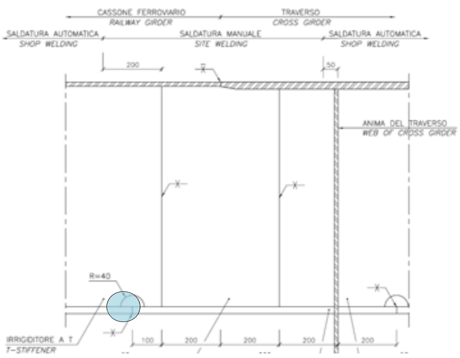
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.668**

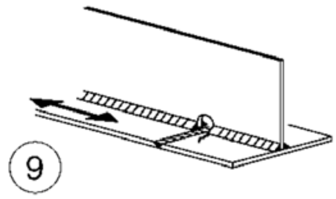
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.8	5.9
EN 2	6.7	6.0
EN 3	6.6	5.2
EN 4	6.0	4.0
EN 5	14.2	8.3
EN 6	11.5	7.3
EN 7	10.5	6.8
EN 8	10.0	6.6
LM3	3.4	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.018**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.029**		
tot =	**0.048**	<	**0.950**

10.4.2.5 Bottom of T beam – Shop joint – location 3 (Span 12)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.5	1.056	10.9	1.181	0.4	1.35	**20.1**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.383**

DAMAGE ACCUMULATION METHOD

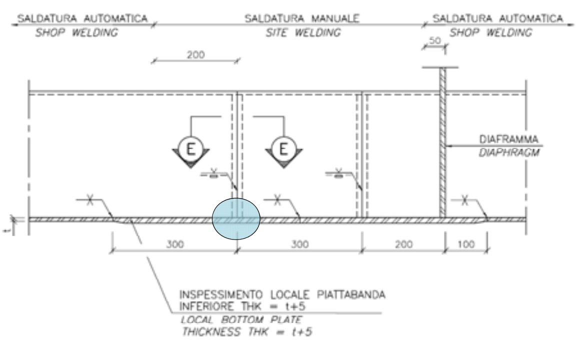
N/mm^2	global	local
EN 1	1.0	9.2
EN 2	0.8	9.5
EN 3	0.7	8.2
EN 4	0.7	6.5
EN 5	1.5	10.9
EN 6	1.3	11.4
EN 7	1.2	10.9
EN 8	1.1	10.1
LM3	0.4	

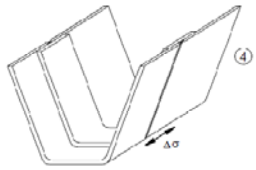
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.5 Span 11 – Main span

10.5.1 Bottom plate (Span 11)

10.5.1.1 Erection joint – location 1 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.4	1.056	2.8	1.35	**38.6**	<	**52.3**

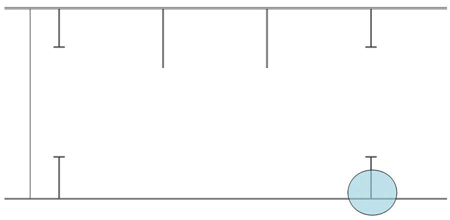
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.737**

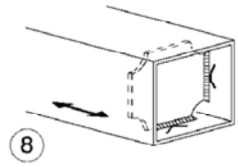
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	16.2
EN 2	11.8
EN 3	11.3
EN 4	10.2
EN 5	24.4
EN 6	17.6
EN 7	18.3
EN 8	17.4
LM3	2.1

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.024**		
train on track 2 + LM3 =	**0.024**		
train on track 1 + train on track 2 + LM3 =	**0.107**		
tot =	**0.154**	<	**0.950**

10.5.1.2 Bottom plate to diaphragm weld – location 2 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	31.1	1.056	3.5	1.35	**49.0**	<	**58.9**

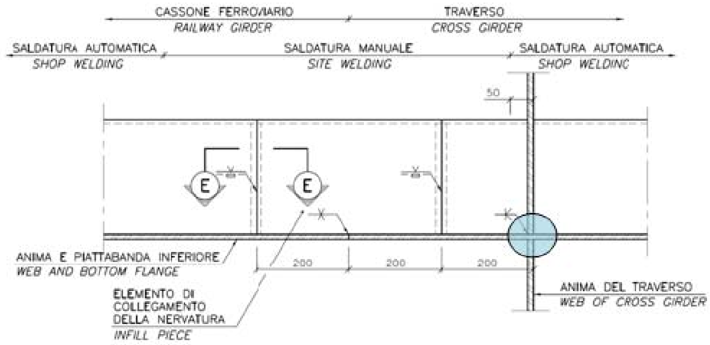
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.831**

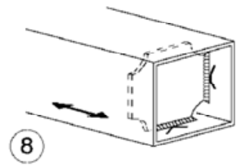
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	20.5
EN 2	15.0
EN 3	14.3
EN 4	13.0
EN 5	31.1
EN 6	22.4
EN 7	23.3
EN 8	22.1
LM3	2.7

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.075**		
train on track 2 + LM3 =	**0.075**		
train on track 1 + train on track 2 + LM3 =	**0.163**		
tot =	**0.313**	<	**0.950**

10.5.1.3 Shop joint – location 3 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.3	1.056	4.6	1.35	**35.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.597**

DAMAGE ACCUMULATION METHOD

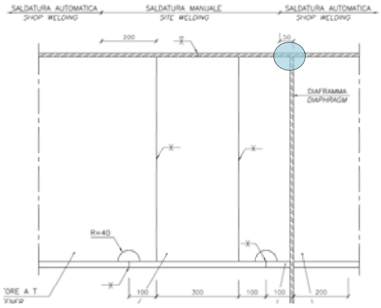
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	13.2
EN 2	9.8
EN 3	9.4
EN 4	8.2
EN 5	20.3
EN 6	14.6
EN 7	14.1
EN 8	12.8
LM3	3.5

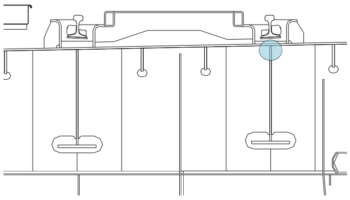
Stress Concentration factor = f_{SC} =	1.24
Train meeting percentage	12.0

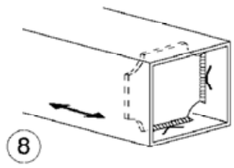
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.006**		
train on track 2 + LM3 =	**0.006**		
train on track 1 + train on track 2 + LM3 =	**0.032**		
tot =	**0.043**	<	**0.950**

10.5.2 Top plate (Span 11)

10.5.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.4	1.056	6.8	1.181	3.3	1.35	**57.3**	<	**58.9**

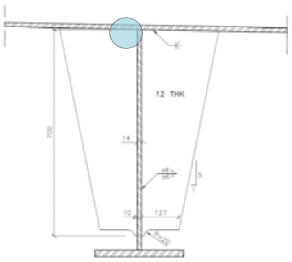
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.972**

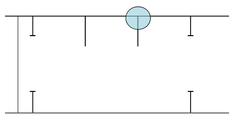
DAMAGE ACCUMULATION METHOD

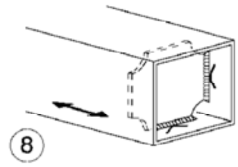
N/mm^2	global	local
EN 1	19.5	6.2
EN 2	14.2	5.4
EN 3	13.1	5.2
EN 4	12.2	4.4
EN 5	29.4	6.8
EN 6	21.1	6.9
EN 7	22.3	7.0
EN 8	21.2	6.4
LM3	2.5	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.219**		
train on track 2 + LM3 =	**0.058**		
local effects =	**0.000**		
train meetings + LM3 =	**0.221**		
tot =	**0.497**	<	**0.950**

10.5.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 11)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.4	1.056	8.3	1.181	3.3	1.35	**59.6**	<	**73.7**

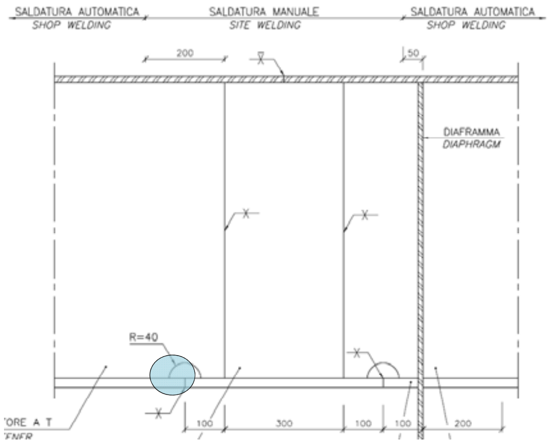
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.809**

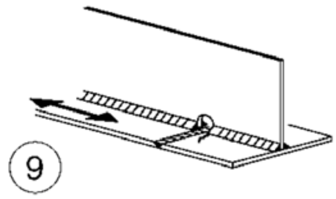
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	19.5	5.9
EN 2	14.2	6.0
EN 3	13.1	5.2
EN 4	12.2	4.0
EN 5	29.4	8.3
EN 6	21.1	7.3
EN 7	22.3	6.8
EN 8	21.2	6.6
LM3	2.5	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.072**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.107**		
tot =	**0.187**	<	**0.950**

10.5.2.3 Bottom of T beam – Erection joint – location 1 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	3.4	1.056	10.9	1.181	0.3	1.35	**22.6**	<	**52.3**

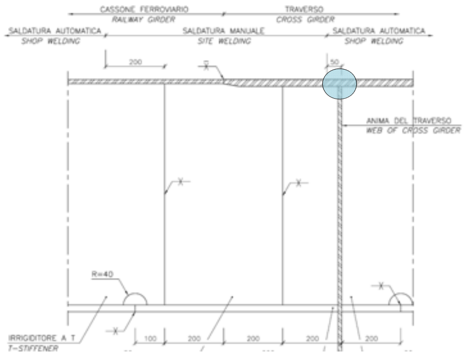
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.433**

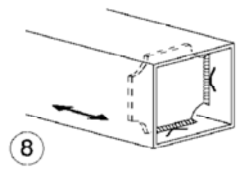
Damage accumulation method

N/mm^2	global	local
EN 1	2.2	9.2
EN 2	1.6	9.5
EN 3	1.6	8.2
EN 4	1.4	6.5
EN 5	3.4	10.9
EN 6	2.4	11.4
EN 7	2.5	10.9
EN 8	2.4	10.1
LM3	0.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.5.2.4 Top plate to web of cross girder weld – location 3 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.1	1.056	6.8	1.181	4.3	1.35	**35.5**	<	**58.9**

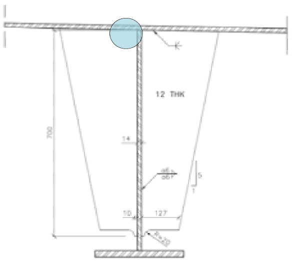
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.602**

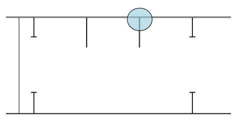
DAMAGE ACCUMULATION METHOD

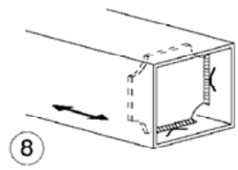
N/mm^2	global	local
EN 1	9.9	6.2
EN 2	7.3	5.4
EN 3	6.7	5.2
EN 4	6.1	4.4
EN 5	13.1	6.8
EN 6	10.8	6.9
EN 7	10.8	7.0
EN 8	9.8	6.4
LM3	3.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.006**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.028**		
tot =	**0.034**	<	**0.950**

10.5.2.5 Top plate to diaphragm weld – section close to location 3 (Span 11)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.1	1.056	8.3	1.181	4.3	1.35	**37.8**	<	**58.9**

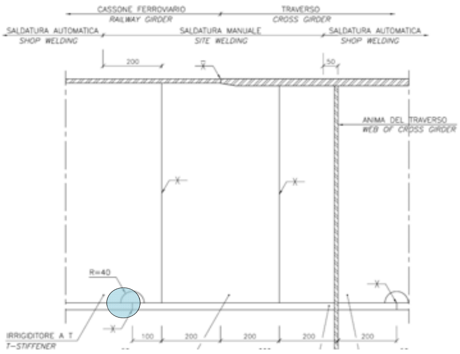
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.641**

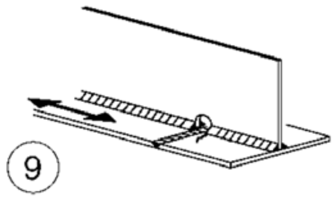
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	9.9	5.9
EN 2	7.3	6.0
EN 3	6.7	5.2
EN 4	6.1	4.0
EN 5	13.1	8.3
EN 6	10.8	7.3
EN 7	10.8	6.8
EN 8	9.8	6.6
LM3	3.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.008**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.029**		
tot =	**0.038**	<	**0.950**

10.5.2.6 Bottom of T beam – Shop joint – location 3 (Span 11)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ loc}$	φ_{loc}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	10.9	1.181	0.4	1.35	**20.5**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.392**

DAMAGE ACCUMULATION METHOD

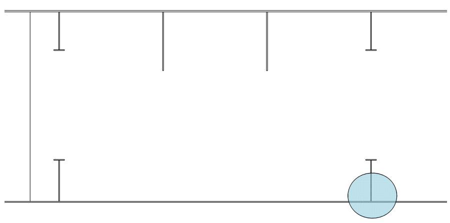
N/mm^2	global	local
EN 1	1.2	9.2
EN 2	0.9	9.5
EN 3	0.8	8.2
EN 4	0.7	6.5
EN 5	1.8	10.9
EN 6	1.3	11.4
EN 7	1.2	10.9
EN 8	1.1	10.1
LM3	0.4	

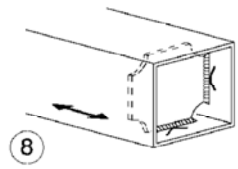
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.6 Span 10 – Main span

10.6.1 Bottom plate (Span 10)

10.6.1.1 Bottom plate to diaphragm weld – location 2 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	30.3	1.056	3.7	1.35	**48.2**	<	**58.9**

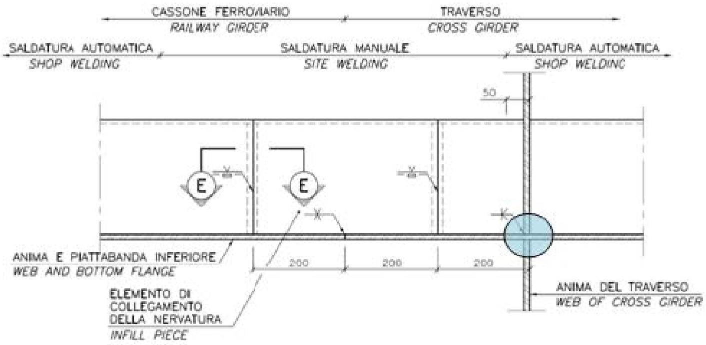
$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.817**

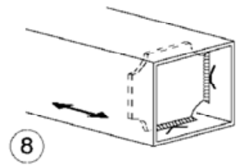
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	18.0
EN 2	13.0
EN 3	13.2
EN 4	11.6
EN 5	30.3
EN 6	20.8
EN 7	20.4
EN 8	19.6
LM3	2.8

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.045**		
train on track 2 + LM3 =	**0.045**		
train on track 1 + train on track 2 + LM3 =	**0.120**		
tot =	**0.210**	<	**0.950**

10.6.1.2 Shop joint – location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	24.8	1.056	5.1	1.35	**42.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.715**

DAMAGE ACCUMULATION METHOD

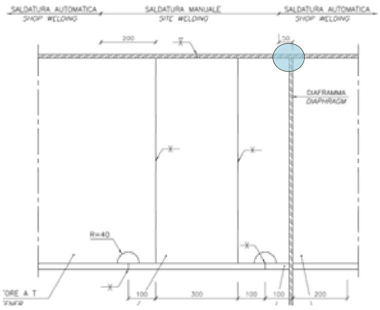
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	14.5
EN 2	10.5
EN 3	11.1
EN 4	9.3
EN 5	24.8
EN 6	17.7
EN 7	16.8
EN 8	15.3
LM3	3.9

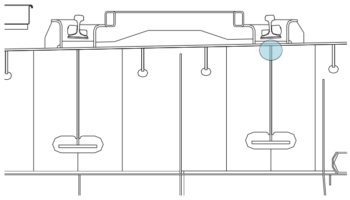
Stress Concentration factor = f_{SC} =	1.24
Train meeting percentage	12.0

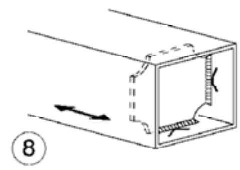
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.014**		
train on track 2 + LM3 =	**0.014**		
train on track 1 + train on track 2 + LM3 =	**0.065**		
tot =	**0.093**	<	**0.950**

10.6.2 Top plate (Span 10)

10.6.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.7	1.056	6.8	1.181	3.5	1.35	**53.6**	<	**58.9**

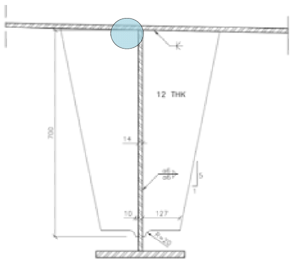
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	0.910

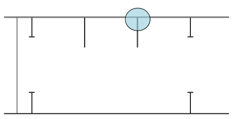
DAMAGE ACCUMULATION METHOD

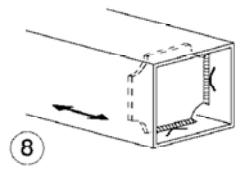
N/mm^2	global	local
EN 1	17.2	6.2
EN 2	12.4	5.4
EN 3	11.5	5.2
EN 4	10.6	4.4
EN 5	26.7	6.8
EN 6	18.8	6.9
EN 7	19.5	7.0
EN 8	18.7	6.4
LM3	2.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.143**		
train on track 2 + LM3 =	**0.016**		
local effects =	**0.000**		
train meetings + LM3 =	**0.165**		
tot =	**0.323**	<	**0.950**

10.6.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 10)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.7	1.056	8.3	1.181	3.5	1.35	**55.9**	<	**58.9**

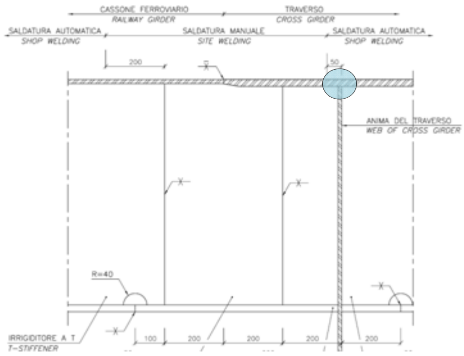
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.949**

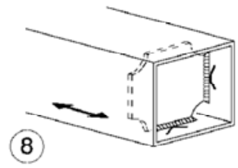
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	17.2	5.9
EN 2	12.4	6.0
EN 3	11.5	5.2
EN 4	10.6	4.0
EN 5	26.7	8.3
EN 6	18.8	7.3
EN 7	19.5	6.8
EN 8	18.7	6.6
LM3	2.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.163**		
train on track 2 + LM3 =	**0.016**		
local effects =	**0.000**		
train meetings + LM3 =	**0.168**		
tot =	**0.347**	<	**0.950**

10.6.2.3 Top plate to web of cross girder weld – location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	15.8	1.056	6.8	1.181	4.8	1.35	**39.9**	<	**58.9**

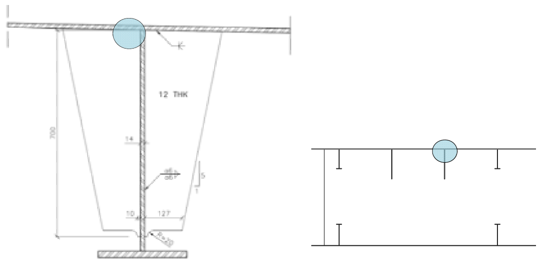
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.677**

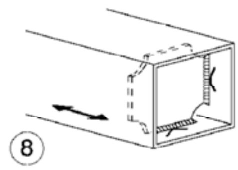
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	10.6	6.2
EN 2	7.6	5.4
EN 3	7.1	5.2
EN 4	6.6	4.4
EN 5	15.8	6.8
EN 6	11.4	6.9
EN 7	11.4	7.0
EN 8	10.3	6.4
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.032**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.039**		
tot =	**0.071**	<	**0.950**

10.6.2.4 Top plate to diaphragm weld – section close to location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	15.8	1.056	8.3	1.181	4.8	1.35	**42.2**	<	**58.9**

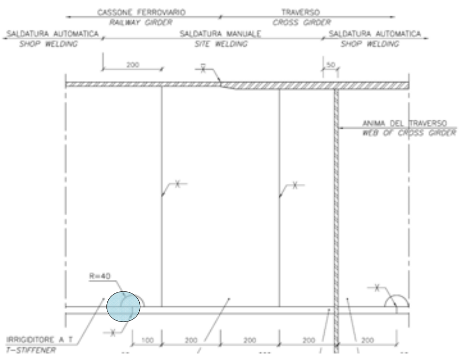
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.716**

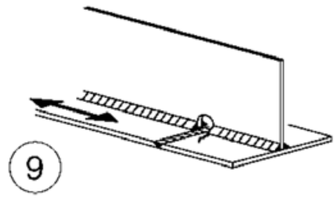
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	10.6	5.9
EN 2	7.6	6.0
EN 3	7.1	5.2
EN 4	6.6	4.0
EN 5	15.8	8.3
EN 6	11.4	7.3
EN 7	11.4	6.8
EN 8	10.3	6.6
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.028**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.041**		
tot =	**0.069**	<	**0.950**

10.6.2.5 Bottom of T beam – Shop joint – location 3 (Span 10)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	2.2	1.056	10.9	1.181	0.4	1.35	**21.1**	<	**52.3**

$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.403**

DAMAGE ACCUMULATION METHOD

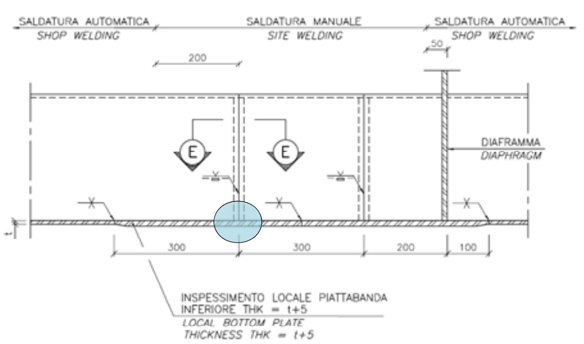
N/mm^2	global	local
EN 1	1.3	9.2
EN 2	0.9	9.5
EN 3	1.0	8.2
EN 4	0.8	6.5
EN 5	2.2	10.9
EN 6	1.6	11.4
EN 7	1.5	10.9
EN 8	1.3	10.1
LM3	0.4	

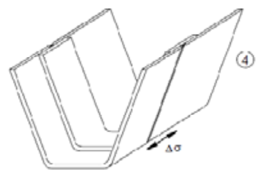
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.7 Span 9 – Main span

10.7.1 Bottom plate (Span 9)

10.7.1.1 Erection joint – location 1 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.6	1.056	3.9	1.35	**51.8**	<	**52.3**

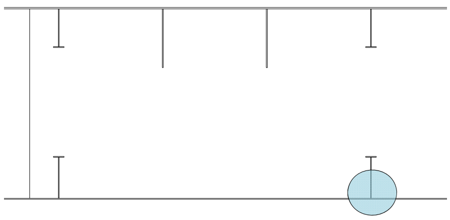
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.991**

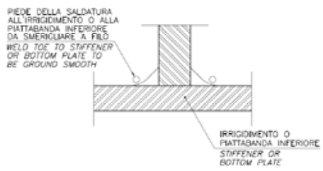
DAMAGE ACCUMULATION METHOD

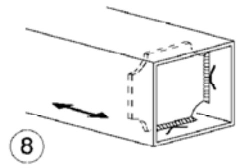
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	19.5
EN 2	14.0
EN 3	13.8
EN 4	12.6
EN 5	32.6
EN 6	22.5
EN 7	22.3
EN 8	21.2
LM3	3.0

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.150**		
train on track 2 + LM3 =	**0.150**		
train on track 1 + train on track 2 + LM3 =	**0.230**		
tot =	**0.529**	<	**0.950**

10.7.1.2 Bottom plate to diaphragm weld – location 2 (Span 9)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	43.2	1.056	5.2	1.35	**68.7**	<	**73.7**

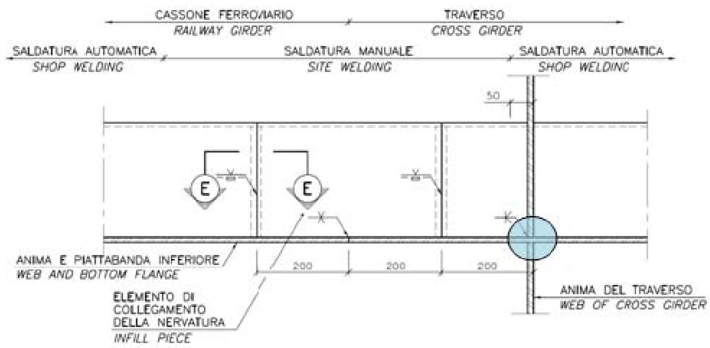
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.932**

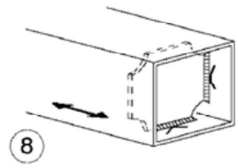
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	25.8
EN 2	18.6
EN 3	18.3
EN 4	16.7
EN 5	43.2
EN 6	29.8
EN 7	29.6
EN 8	28.0
LM3	4.0

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.110**		
train on track 2 + LM3 =	**0.110**		
train on track 1 + train on track 2 + LM3 =	**0.190**		
tot =	**0.410**	<	**0.950**

10.7.1.3 Shop joint – location 3 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	34.3	1.056	6.9	1.35	**58.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.987**

DAMAGE ACCUMULATION METHOD

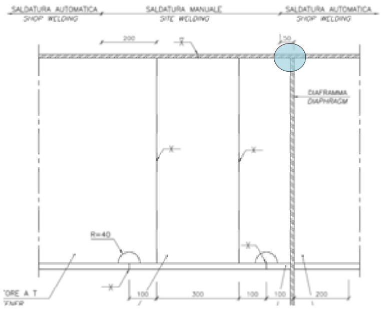
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	20.9
EN 2	15.2
EN 3	15.1
EN 4	13.6
EN 5	34.3
EN 6	23.4
EN 7	22.6
EN 8	21.3
LM3	5.3

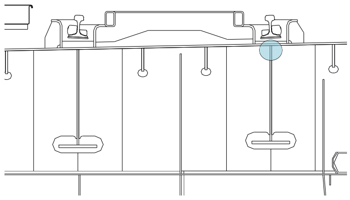
Stress Concentration factor = f_{SC} =	1.24
Train meeting percentage	12.0

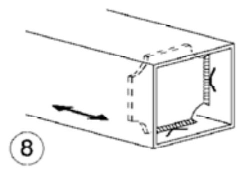
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.141**		
train on track 2 + LM3 =	**0.141**		
train on track 1 + train on track 2 + LM3 =	**0.209**		
tot =	**0.492**	<	**0.950**

10.7.2 Top plate (Span 9)

10.7.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.6	1.056	6.8	1.181	3.7	1.35	**55.3**	<	**58.9**

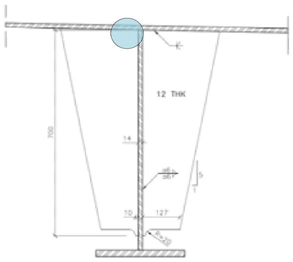
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.938**

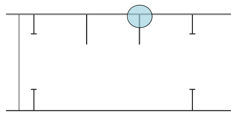
DAMAGE ACCUMULATION METHOD

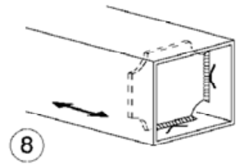
N/mm^2	global	local
EN 1	17.8	6.2
EN 2	12.8	5.4
EN 3	11.9	5.2
EN 4	11.1	4.4
EN 5	27.6	6.8
EN 6	19.4	6.9
EN 7	20.4	7.0
EN 8	19.4	6.4
LM3	2.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.166**		
train on track 2 + LM3 =	**0.025**		
local effects =	**0.000**		
train meetings + LM3 =	**0.182**		
tot =	**0.373**	<	**0.950**

10.7.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.6	1.056	8.3	1.181	3.7	1.35	**57.6**	<	**58.9**

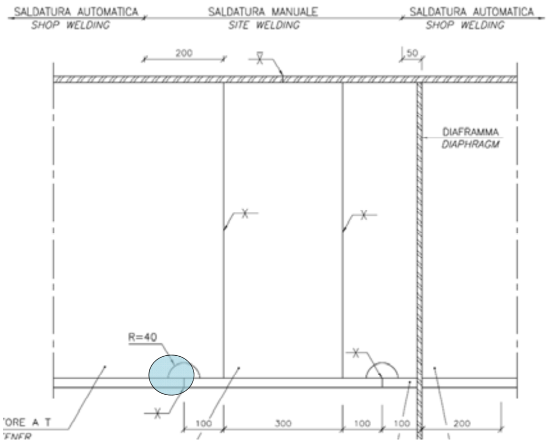
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.977**

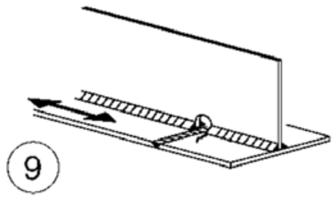
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	17.8	5.9
EN 2	12.8	6.0
EN 3	11.9	5.2
EN 4	11.1	4.0
EN 5	27.6	8.3
EN 6	19.4	7.3
EN 7	20.4	6.8
EN 8	19.4	6.6
LM3	2.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.189**		
train on track 2 + LM3 =	**0.025**		
local effects =	**0.000**		
train meetings + LM3 =	**0.186**		
tot =	**0.400**	<	**0.950**

10.7.2.3 Bottom of T beam – Erection joint – location 1 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.5	1.056	10.9	1.181	1.2	1.35	**34.0**	<	**52.3**

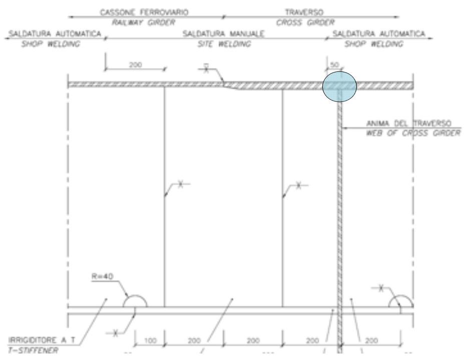
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.649**

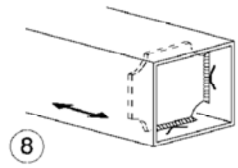
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	6.3	9.2
EN 2	4.5	9.5
EN 3	4.4	8.2
EN 4	4.0	6.5
EN 5	10.5	10.9
EN 6	7.2	11.4
EN 7	7.2	10.9
EN 8	6.8	10.1
LM3	1.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.026**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.023**		
tot =	**0.049**	<	**0.950**

10.7.2.4 Top plate to web of cross girder weld – location 3 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	16.6	1.056	6.8	1.181	4.9	1.35	**41.2**	<	**58.9**

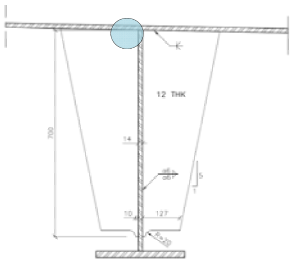
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.699**

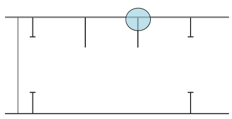
DAMAGE ACCUMULATION METHOD

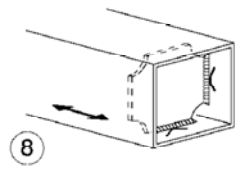
N/mm^2	global	local
EN 1	11.4	6.2
EN 2	8.2	5.4
EN 3	7.4	5.2
EN 4	7.0	4.4
EN 5	16.6	6.8
EN 6	11.6	6.9
EN 7	12.4	7.0
EN 8	11.6	6.4
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.037**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.048**		
tot =	**0.085**	<	**0.950**

10.7.2.5 Top plate to diaphragm weld – section close to location 3 (Span 9)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	16.6	1.056	8.3	1.181	4.9	1.35	**43.5**	<	**58.9**

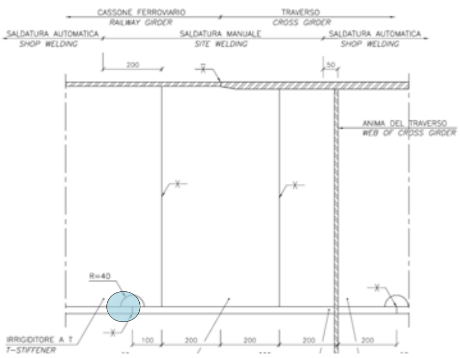
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.738**

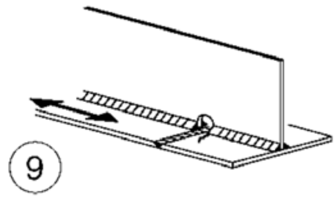
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	11.4	5.9
EN 2	8.2	6.0
EN 3	7.4	5.2
EN 4	7.0	4.0
EN 5	16.6	8.3
EN 6	11.6	7.3
EN 7	12.4	6.8
EN 8	11.6	6.6
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.045**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.050**		
tot =	**0.095**	<	**0.950**

10.7.2.6 Bottom of T beam – Shop joint – location 3 (Span 9)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	6.7	1.056	10.9	1.181	1.6	1.35	**29.1**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.556**

DAMAGE ACCUMULATION METHOD

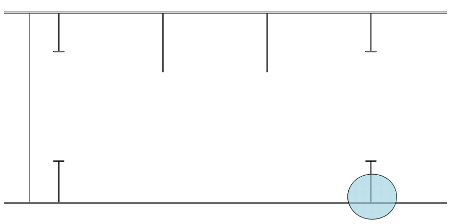
N/mm^2	global	local
EN 1	4.1	9.2
EN 2	3.0	9.5
EN 3	2.9	8.2
EN 4	2.7	6.5
EN 5	6.7	10.9
EN 6	4.6	11.4
EN 7	4.4	10.9
EN 8	4.2	10.1
LM3	1.3	

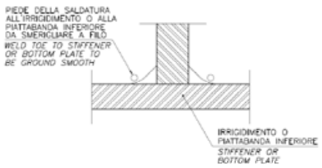
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.007**		
tot =	**0.007**	<	**0.950**

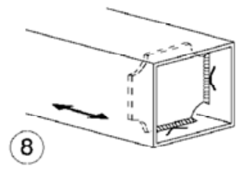
10.8 Span 8 – Main span

10.8.1 Bottom plate (Span 8)

10.8.1.1 Bottom plate to diaphragm weld – location 2 (Span 8)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.4	1.056	5.5	1.35	**63.5**	<	**73.7**

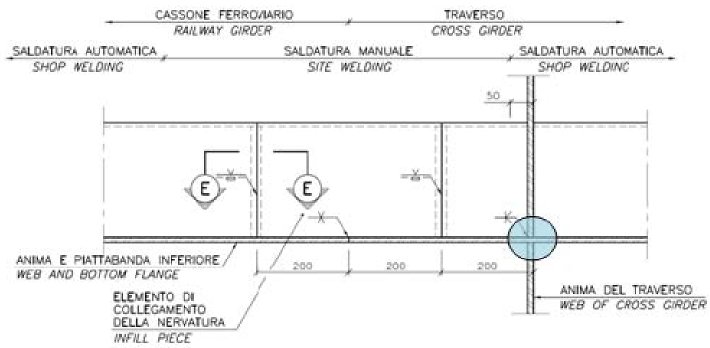
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.862**

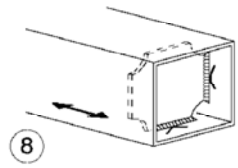
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	23.5
EN 2	16.8
EN 3	16.7
EN 4	14.9
EN 5	39.4
EN 6	26.8
EN 7	26.9
EN 8	25.9
LM3	4.2

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.073**		
train on track 2 + LM3 =	**0.073**		
train on track 1 + train on track 2 + LM3 =	**0.142**		
tot =	**0.288**	<	**0.950**

10.8.1.2 Shop joint – location 3 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.1	1.056	6.7	1.35	**50.6**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.858**

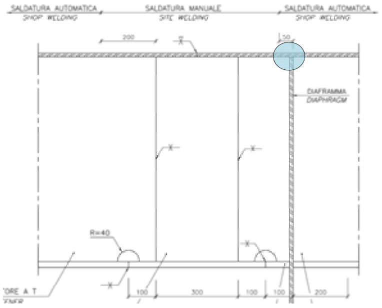
DAMAGE ACCUMULATION METHOD

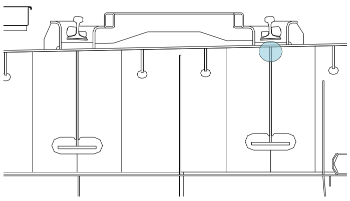
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	18.7
EN 2	13.4
EN 3	13.2
EN 4	12.0
EN 5	29.1
EN 6	21.1
EN 7	19.9
EN 8	18.4
LM3	5.1

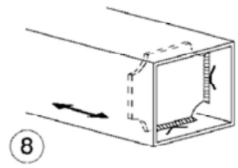
Stress Concentration factor = f_{SC} =	1.24		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.077**		
train on track 2 + LM3 =	**0.077**		
train on track 1 + train on track 2 + LM3 =	**0.142**		
tot =	**0.296**	<	**0.950**

10.8.2 Top plate (Span 8)

10.8.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.1	1.056	6.8	1.181	3.9	1.35	**52.0**	<	**58.9**

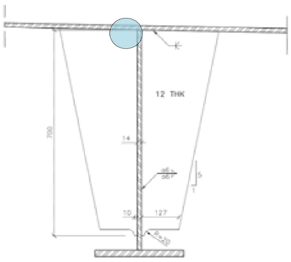
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.881**

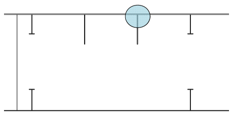
DAMAGE ACCUMULATION METHOD

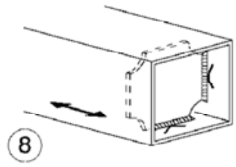
N/mm^2	global	local
EN 1	15.9	6.2
EN 2	11.4	5.4
EN 3	10.6	5.2
EN 4	9.8	4.4
EN 5	25.1	6.8
EN 6	17.4	6.9
EN 7	18.2	7.0
EN 8	17.5	6.4
LM3	2.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.117**		
train on track 2 + LM3 =	**0.013**		
local effects =	**0.000**		
train meetings + LM3 =	**0.139**		
tot =	**0.268**	<	**0.950**

10.8.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.1	1.056	8.3	1.181	3.9	1.35	**54.2**	<	**58.9**

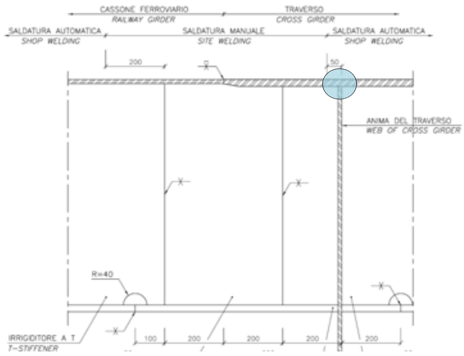
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.920**

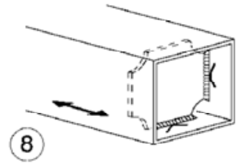
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	15.9	5.9
EN 2	11.4	6.0
EN 3	10.6	5.2
EN 4	9.8	4.0
EN 5	25.1	8.3
EN 6	17.4	7.3
EN 7	18.2	6.8
EN 8	17.5	6.6
LM3	2.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.128**		
train on track 2 + LM3 =	**0.013**		
local effects =	**0.000**		
train meetings + LM3 =	**0.142**		
tot =	**0.282**	<	**0.950**

10.8.2.3 Top plate to web of cross girder weld – location 3 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ loc}$	φ_{loc}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	14.6	1.056	6.8	1.181	4.7	1.35	**38.1**	<	**58.9**

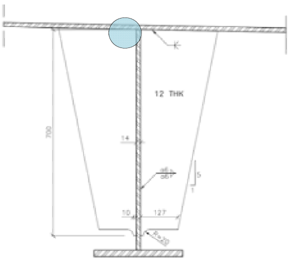
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.646**

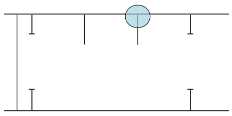
DAMAGE ACCUMULATION METHOD

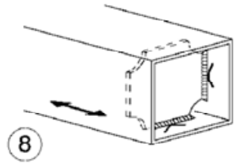
N/mm^2	global	local
EN 1	10.0	6.2
EN 2	7.2	5.4
EN 3	6.5	5.2
EN 4	6.3	4.4
EN 5	14.6	6.8
EN 6	11.0	6.9
EN 7	10.7	7.0
EN 8	9.8	6.4
LM3	3.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.008**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.032**		
tot =	**0.040**	<	**0.950**

10.8.2.4 Top plate to diaphragm weld – section close to location 3 (Span 8)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.6	1.056	8.3	1.181	4.7	1.35	40.4	<	58.9

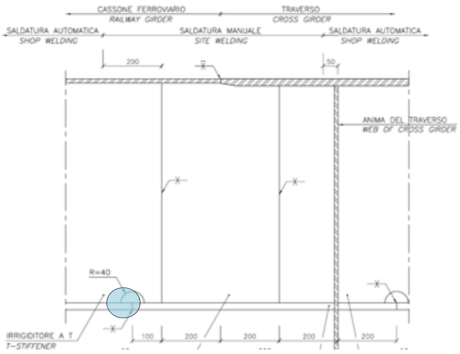
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	0.685

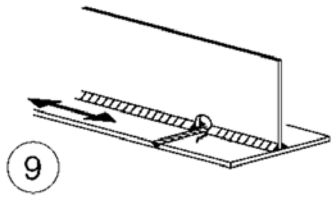
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	10.0	5.9
EN 2	7.2	6.0
EN 3	6.5	5.2
EN 4	6.3	4.0
EN 5	14.6	8.3
EN 6	11.0	7.3
EN 7	10.7	6.8
EN 8	9.8	6.6
LM3	3.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.019		
train on track 2 + LM3 =	0.000		
local effects =	0.000		
train meetings + LM3 =	0.033		
tot =	0.052	<	0.950

10.8.2.5 Bottom of T beam – Shop joint – location 3 (Span 8)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	5.7	1.056	10.9	1.181	1.5	1.35	**27.6**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.528**

DAMAGE ACCUMULATION METHOD

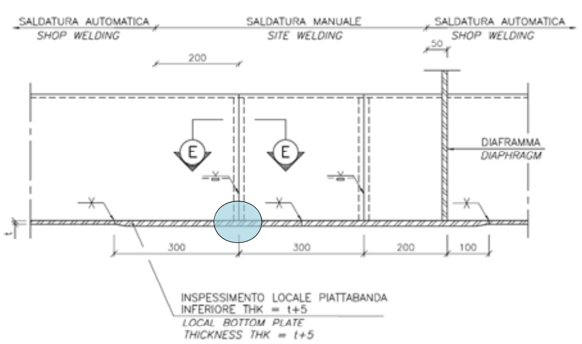
N/mm^2	global	local
EN 1	3.7	9.2
EN 2	2.6	9.5
EN 3	2.6	8.2
EN 4	2.3	6.5
EN 5	5.7	10.9
EN 6	4.1	11.4
EN 7	3.9	10.9
EN 8	3.6	10.1
LM3	1.2	

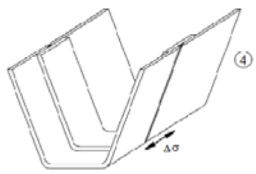
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.005**		
tot =	**0.005**	<	**0.950**

10.9 Span 7 – Main span

10.9.1 Bottom plate (Span 7)

10.9.1.1 Erection joint – location 1 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	29.0	1.056	3.9	1.35	**46.6**	<	**52.3**

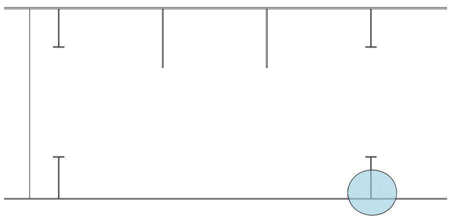
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.892**

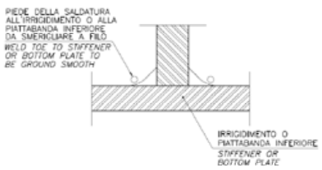
DAMAGE ACCUMULATION METHOD

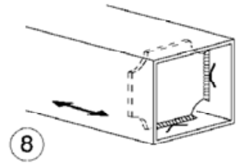
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	17.0
EN 2	12.3
EN 3	12.7
EN 4	11.2
EN 5	29.0
EN 6	20.1
EN 7	19.6
EN 8	18.6
LM3	3.0

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.086**		
train on track 2 + LM3 =	**0.086**		
train on track 1 + train on track 2 + LM3 =	**0.159**		
tot =	**0.332**	<	**0.950**

10.9.1.2 Bottom plate to diaphragm weld – location 2 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	35.0	1.056	4.7	1.35	**56.2**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.953**

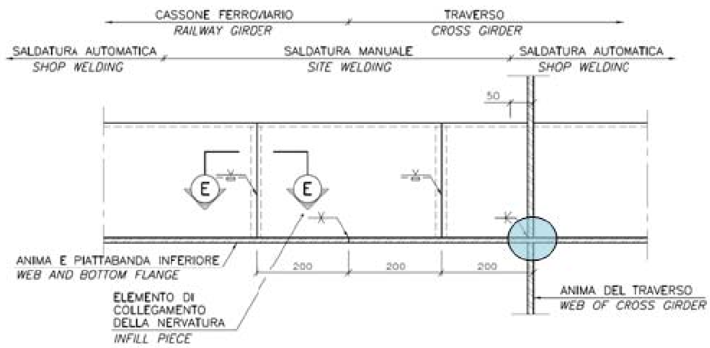
DAMAGE ACCUMULATION METHOD

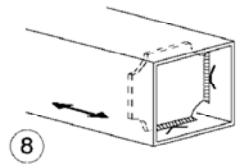
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	20.5
EN 2	14.8
EN 3	15.3
EN 4	13.5
EN 5	35.0
EN 6	24.2
EN 7	23.6
EN 8	22.4
LM3	3.6

Stress Concentration factor = f_{SC} =	1.00
Train meeting percentage	12.0

contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.120**		
train on track 2 + LM3 =	**0.120**		
train on track 1 + train on track 2 + LM3 =	**0.198**		
tot =	**0.438**	<	**0.950**

10.9.1.3 Shop joint – location 3 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.7	1.056	6.0	1.35	**54.8**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.929**

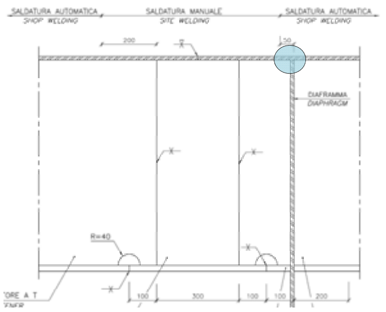
DAMAGE ACCUMULATION METHOD

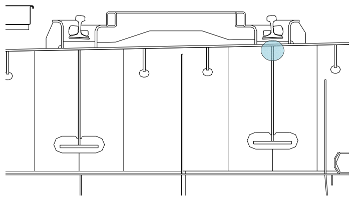
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	15.9
EN 2	11.4
EN 3	13.5
EN 4	10.8
EN 5	32.7
EN 6	20.6
EN 7	18.6
EN 8	17.8
LM3	4.6

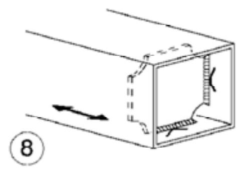
Stress Concentration factor = f_{SC} =	1.25		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.072**		
train on track 2 + LM3 =	**0.072**		
train on track 1 + train on track 2 + LM3 =	**0.123**		
tot =	**0.266**	<	**0.950**

10.9.2 Top plate (Span 7)

10.9.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.7	1.056	6.8	1.181	4.1	1.35	**57.3**	<	**58.9**

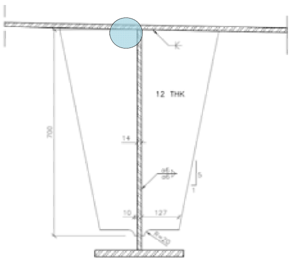
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.973**

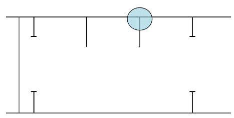
DAMAGE ACCUMULATION METHOD

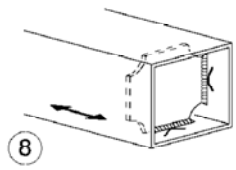
N/mm²	global	local
EN 1	16.8	6.2
EN 2	12.1	5.4
EN 3	12.3	5.2
EN 4	11.1	4.4
EN 5	28.7	6.8
EN 6	19.7	6.9
EN 7	19.1	7.0
EN 8	18.1	6.4
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.170**		
train on track 2 + LM3 =	**0.032**		
local effects =	**0.000**		
train meetings + LM3 =	**0.177**		
tot =	**0.379**	<	**0.950**

10.9.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 7)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.7	1.056	8.3	1.181	4.1	1.35	**59.6**	<	**73.7**

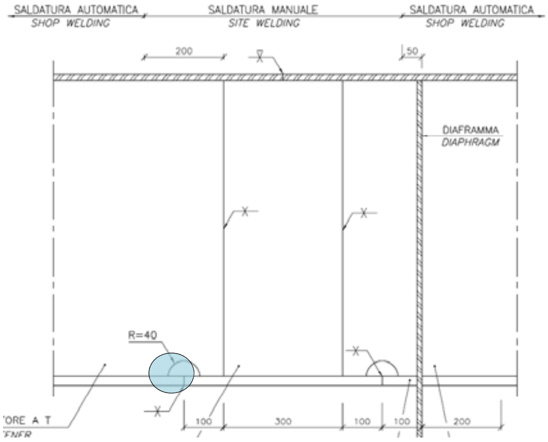
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.809**

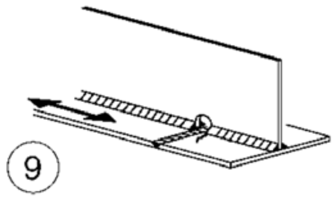
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	16.8	5.9
EN 2	12.1	6.0
EN 3	12.3	5.2
EN 4	11.1	4.0
EN 5	28.7	8.3
EN 6	19.7	7.3
EN 7	19.1	6.8
EN 8	18.1	6.6
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.060**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.081**		
tot =	**0.148**	<	**0.950**

10.9.2.3 Bottom of T beam – Erection joint – location 1 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	12.5	1.056	10.9	1.181	1.6	1.35	**37.4**	<	**52.3**

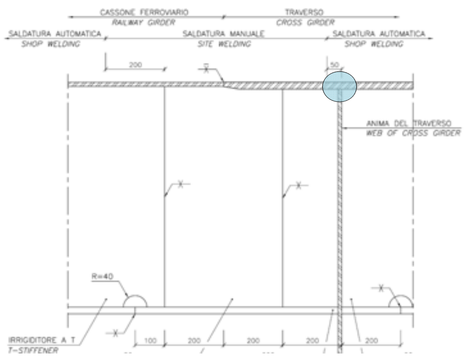
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.715**

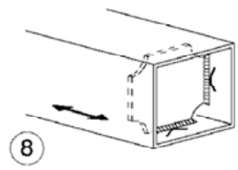
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	7.3	9.2
EN 2	5.3	9.5
EN 3	5.5	8.2
EN 4	4.8	6.5
EN 5	12.5	10.9
EN 6	8.6	11.4
EN 7	8.4	10.9
EN 8	8.0	10.1
LM3	1.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.052**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.040**		
tot =	**0.092**	<	**0.950**

10.9.2.4 Top plate to web of cross girder weld – location 3 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.6	1.056	6.8	1.181	5.2	1.35	**47.3**	<	**58.9**

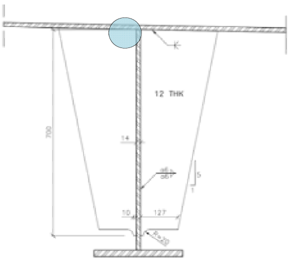
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.802**

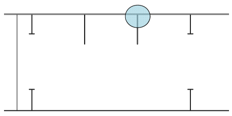
DAMAGE ACCUMULATION METHOD

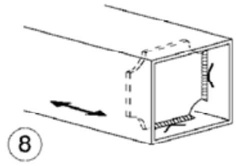
N/mm²	global	local
EN 1	10.2	6.2
EN 2	7.4	5.4
EN 3	9.0	5.2
EN 4	7.3	4.4
EN 5	20.6	6.8
EN 6	13.7	6.9
EN 7	13.2	7.0
EN 8	11.9	6.4
LM3	4.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.052**		
train on track 2 + LM3 =	**0.006**		
local effects =	**0.000**		
train meetings + LM3 =	**0.063**		
tot =	**0.122**	<	**0.950**

10.9.2.5 Top plate to diaphragm weld – section close to location 3 (Span 7)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.6	1.056	8.3	1.181	5.2	1.35	**49.6**	<	**58.9**

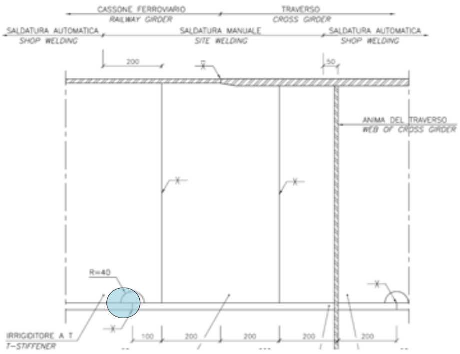
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.841**

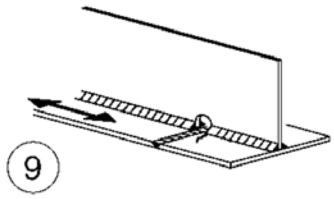
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	10.2	5.9
EN 2	7.4	6.0
EN 3	9.0	5.2
EN 4	7.3	4.0
EN 5	20.6	8.3
EN 6	13.7	7.3
EN 7	13.2	6.8
EN 8	11.9	6.6
LM3	4.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.060**		
train on track 2 + LM3 =	**0.006**		
local effects =	**0.000**		
train meetings + LM3 =	**0.066**		
tot =	**0.132**	<	**0.950**

10.9.2.6 Bottom of T beam – Shop joint – location 3 (Span 7)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.4	1.056	10.9	1.181	2.1	1.35	**33.7**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.643**

DAMAGE ACCUMULATION METHOD

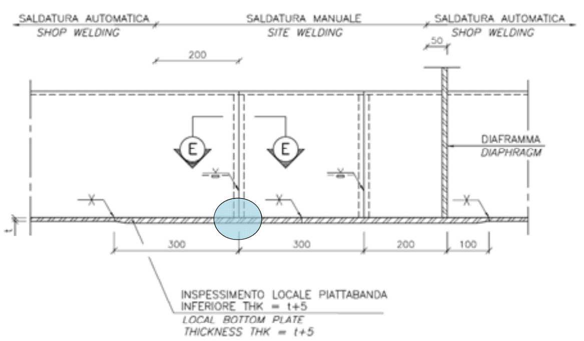
N/mm²	global	local
EN 1	4.6	9.2
EN 2	3.3	9.5
EN 3	3.9	8.2
EN 4	3.1	6.5
EN 5	9.4	10.9
EN 6	5.9	11.4
EN 7	5.4	10.9
EN 8	5.1	10.1
LM3	1.7	

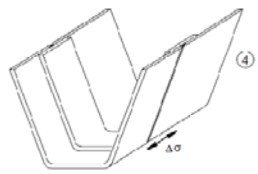
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.017**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.015**		
tot =	**0.033**	<	**0.950**

10.10 Span 6 – Main span

10.10.1 Bottom plate (Span 6)

10.10.1.1 Erection joint – location 1 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	28.1	1.056	3.7	1.35	**45.0**	<	**52.3**

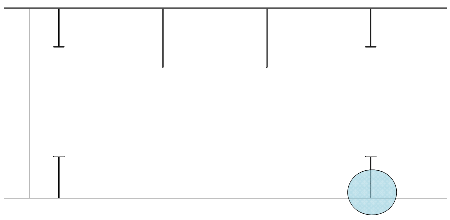
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.860**

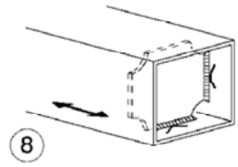
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	13.4
EN 2	9.6
EN 3	12.3
EN 4	10.0
EN 5	28.1
EN 6	18.9
EN 7	17.1
EN 8	15.6
LM3	2.8

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.054**		
train on track 2 + LM3 =	**0.054**		
train on track 1 + train on track 2 + LM3 =	**0.107**		
tot =	**0.215**	<	**0.950**

10.10.1.2 Bottom plate to diaphragm weld – location 2 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.1	1.056	4.2	1.35	**51.5**	<	**58.9**

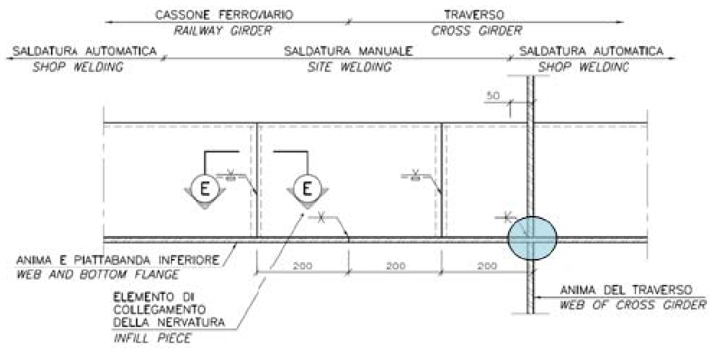
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.874**

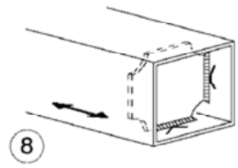
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	15.3
EN 2	11.0
EN 3	14.1
EN 4	11.4
EN 5	32.1
EN 6	21.6
EN 7	19.6
EN 8	17.9
LM3	3.2

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.059**		
train on track 2 + LM3 =	**0.059**		
train on track 1 + train on track 2 + LM3 =	**0.113**		
tot =	**0.230**	<	**0.950**

10.10.1.3 Shop joint – location 3 (Span 6)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	41.2	1.056	4.0	1.35	**64.1**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.869**

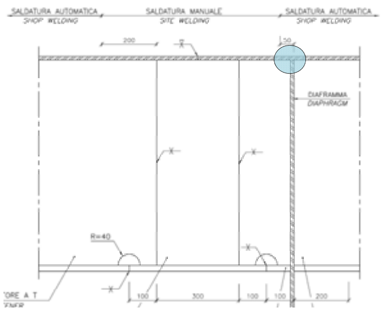
DAMAGE ACCUMULATION METHOD

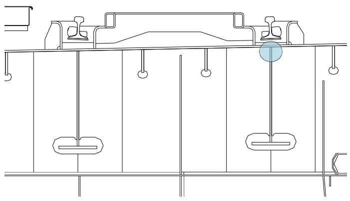
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	14.9
EN 2	10.7
EN 3	16.1
EN 4	11.7
EN 5	41.2
EN 6	24.7
EN 7	22.5
EN 8	21.9
LM3	3.0

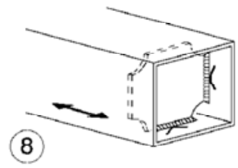
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.041**		
train on track 2 + LM3 =	**0.041**		
train on track 1 + train on track 2 + LM3 =	**0.080**		
tot =	**0.161**	<	**0.950**

10.10.2 Top plate (Span 6)

10.10.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 6)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.5	1.056	6.8	1.181	4.7	1.35	**72.2**	<	**73.7**

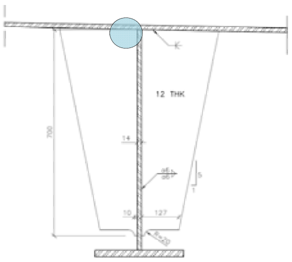
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.980**

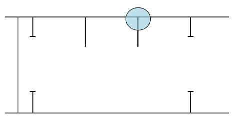
DAMAGE ACCUMULATION METHOD

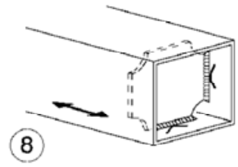
N/mm^2	global	local
EN 1	16.8	6.2
EN 2	12.0	5.4
EN 3	16.3	5.2
EN 4	13.4	4.4
EN 5	38.5	6.8
EN 6	25.0	6.9
EN 7	23.7	7.0
EN 8	21.8	6.4
LM3	3.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.138**		
train on track 2 + LM3 =	**0.040**		
local effects =	**0.000**		
train meetings + LM3 =	**0.142**		
tot =	**0.320**	<	**0.950**

10.10.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 6)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.7	1.056	8.3	1.181	4.7	1.35	**73.4**	<	**73.7**

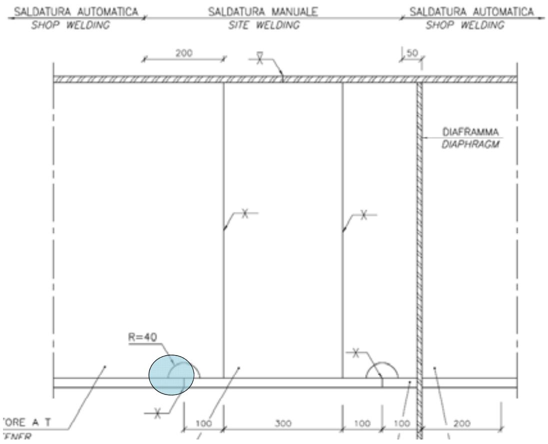
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.996**

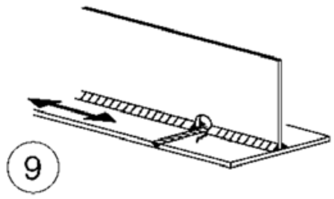
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	16.5	5.9
EN 2	11.7	6.0
EN 3	16.0	5.2
EN 4	13.1	4.0
EN 5	37.7	8.3
EN 6	24.5	7.3
EN 7	23.2	6.8
EN 8	21.3	6.6
LM3	3.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.141**		
train on track 2 + LM3 =	**0.029**		
local effects =	**0.000**		
train meetings + LM3 =	**0.137**		
tot =	**0.307**	<	**0.950**

10.10.2.3 Bottom of T beam – Erection joint – location 1 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	17.5	1.056	10.9	1.181	2.2	1.35	**45.4**	<	**52.3**

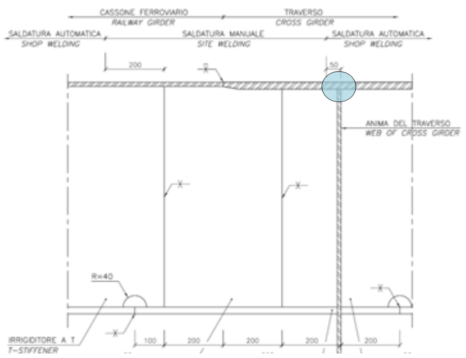
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.868**

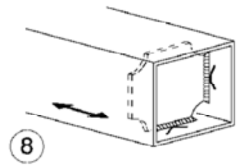
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.3	9.2
EN 2	6.0	9.5
EN 3	7.7	8.2
EN 4	6.2	6.5
EN 5	17.5	10.9
EN 6	11.8	11.4
EN 7	10.7	10.9
EN 8	9.7	10.1
LM3	1.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.112**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.083**		
tot =	**0.195**	<	**0.950**

10.10.2.4 Top plate to web of cross girder weld – location 3 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.3	1.056	6.8	1.181	2.2	1.35	**44.2**	<	**58.9**

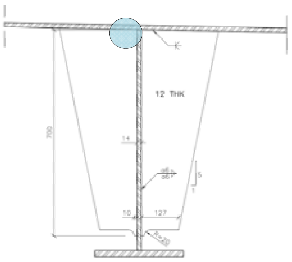
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.749**

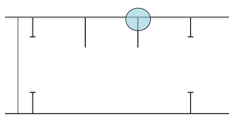
DAMAGE ACCUMULATION METHOD

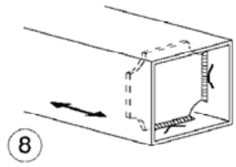
N/mm^2	global	local
EN 1	8.3	6.2
EN 2	5.9	5.4
EN 3	8.9	5.2
EN 4	6.8	4.4
EN 5	21.3	6.8
EN 6	14.1	6.9
EN 7	12.8	7.0
EN 8	11.8	6.4
LM3	1.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.029**		
train on track 2 + LM3 =	**0.005**		
local effects =	**0.000**		
train meetings + LM3 =	**0.044**		
tot =	**0.078**	<	**0.950**

10.10.2.5 Top plate to diaphragm weld – section close to location 3 (Span 6)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.3	1.056	8.3	1.181	2.2	1.35	**46.5**	<	**58.9**

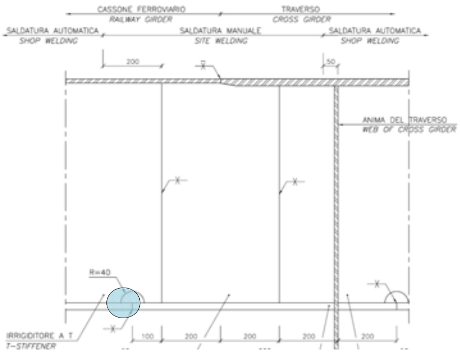
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.788**

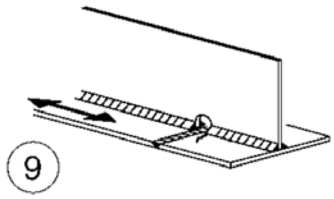
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.3	5.9
EN 2	5.9	6.0
EN 3	8.9	5.2
EN 4	6.8	4.0
EN 5	21.3	8.3
EN 6	14.1	7.3
EN 7	12.8	6.8
EN 8	11.8	6.6
LM3	1.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.036**		
train on track 2 + LM3 =	**0.005**		
local effects =	**0.000**		
train meetings + LM3 =	**0.046**		
tot =	**0.087**	<	**0.950**

10.10.2.6 Bottom of T beam – Shop joint – location 3 (Span 6)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.7	1.056	10.9	1.181	0.9	1.35	32.4	<	52.3

$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.620

DAMAGE ACCUMULATION METHOD

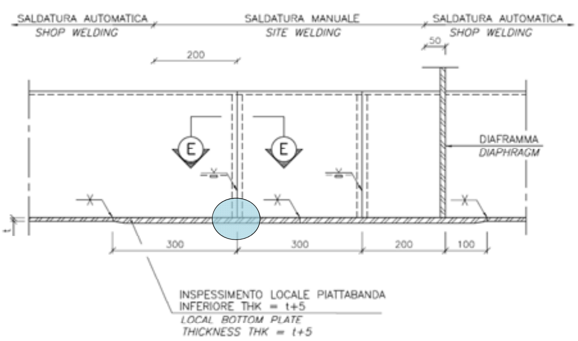
N/mm^2	global	local
EN 1	3.5	9.2
EN 2	2.5	9.5
EN 3	3.8	8.2
EN 4	2.8	6.5
EN 5	9.7	10.9
EN 6	5.8	11.4
EN 7	5.3	10.9
EN 8	5.1	10.1
LM3	0.7	

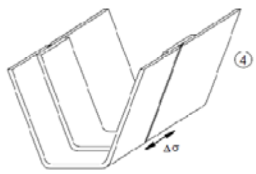
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.008		
train on track 2 + LM3 =	0.000		
local effects =	0.000		
train meetings + LM3 =	0.010		
tot =	0.018	<	0.950

10.11 Span 05 – Tower location

10.11.1 Bottom plate (Span 5)

10.11.1.1 Erection joint – location 1 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Note 1: Thickening of 15mm instead of 5mm.

Note 2: Stress value at the erection joint location s=-1636.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.4	1.056	2.7	1.35	**39.8**	<	**52.3**

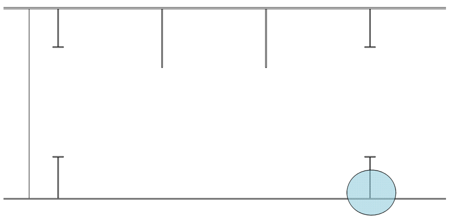
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.761**

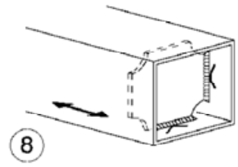
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	10.8
EN 2	7.6
EN 3	9.9
EN 4	8.1
EN 5	25.4
EN 6	16.3
EN 7	15.3
EN 8	14.2
LM3	2.1

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.021**		
train on track 2 + LM3 =	**0.021**		
train on track 1 + train on track 2 + LM3 =	**0.058**		
tot =	**0.100**	<	**0.950**

10.11.1.2 Bottom plate to diaphragm weld – location 2 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	32.8	1.056	2.0	1.35	**49.5**	<	**58.9**

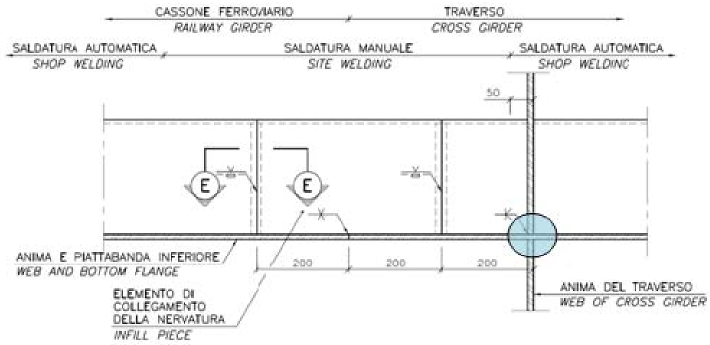
$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.840**

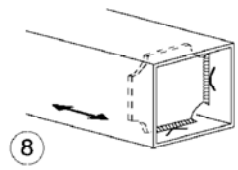
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	14.2
EN 2	10.1
EN 3	12.8
EN 4	10.5
EN 5	32.8
EN 6	21.5
EN 7	19.7
EN 8	18.3
LM3	1.5

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.044**		
train on track 2 + LM3 =	**0.044**		
train on track 1 + train on track 2 + LM3 =	**0.093**		
tot =	**0.180**	<	**0.950**

10.11.1.3 Shop joint – location 3 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	27.8	1.056	4.1	1.35	**45.1**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.765**

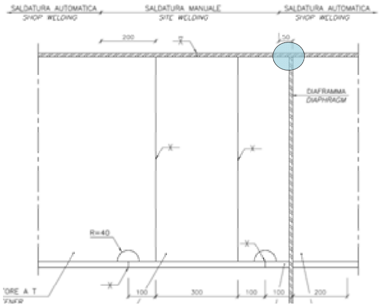
DAMAGE ACCUMULATION METHOD

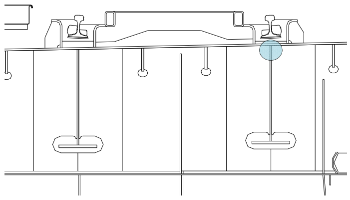
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	10.1
EN 2	7.6
EN 3	10.7
EN 4	7.3
EN 5	27.8
EN 6	16.3
EN 7	15.8
EN 8	15.3
LM3	3.2

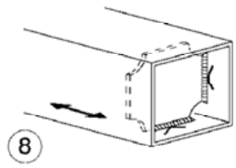
Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.021**		
train on track 2 + LM3 =	**0.021**		
train on track 1 + train on track 2 + LM3 =	**0.046**		
tot =	**0.087**	<	**0.950**

10.11.2 Top plate (Span 5)

10.11.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 5)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	33.2	1.056	6.8	1.181	1.7	1.35	**60.6**	<	**73.7**

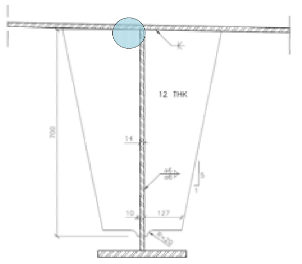
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.822**

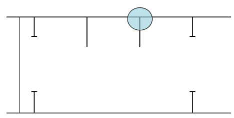
DAMAGE ACCUMULATION METHOD

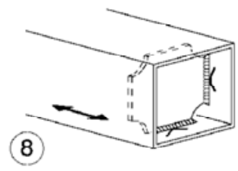
N/mm^2	global	local
EN 1	14.1	6.2
EN 2	10.0	5.4
EN 3	12.5	5.2
EN 4	10.4	4.4
EN 5	33.2	6.8
EN 6	21.1	6.9
EN 7	20.0	7.0
EN 8	18.6	6.4
LM3	1.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.050**		
train on track 2 + LM3 =	**0.012**		
local effects =	**0.000**		
train meetings + LM3 =	**0.073**		
tot =	**0.134**	<	**0.950**

10.11.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 5)







$\Delta\sigma_{C\,Wl}$	$\Delta\sigma_{D\,Wl}$	$\Delta\sigma_{L\,Wl}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	33.2	1.056	8.3	1.181	1.7	1.35	**62.9**	<	**73.7**

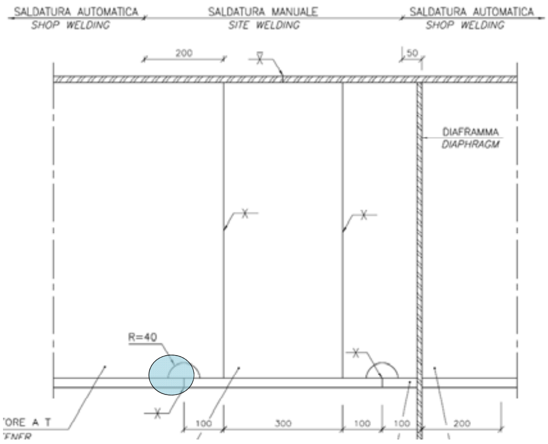
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.853**

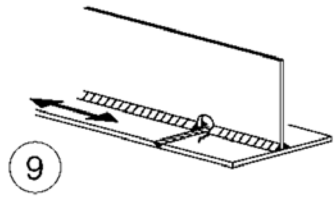
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	14.1	5.9
EN 2	10.0	6.0
EN 3	12.5	5.2
EN 4	10.4	4.0
EN 5	33.2	8.3
EN 6	21.1	7.3
EN 7	20.0	6.8
EN 8	18.6	6.6
LM3	1.3	

Train meeting percentage	12.0		
contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + local + LM3 =	**0.057**		
train on track 2 + LM3 =	**0.012**		
local effects =	**0.000**		
train meetings + LM3 =	**0.075**		
tot =	**0.144**	<	**0.950**

10.11.2.3 Bottom of T beam – Erection joint – location 1 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited Life Method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	12.6	1.056	10.9	1.181	1.3	1.35	**37.1**	<	**52.3**

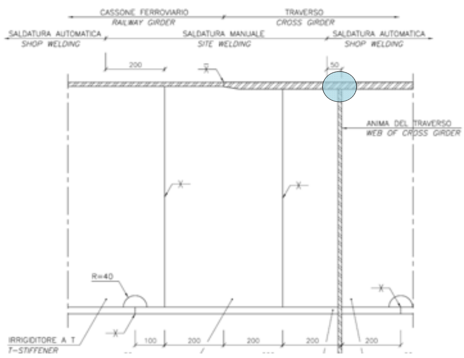
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.710**

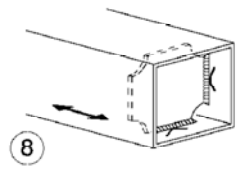
Damage Accumulation Method

N/mm^2	global	local
EN 1	5.3	9.2
EN 2	3.8	9.5
EN 3	4.9	8.2
EN 4	4.0	6.5
EN 5	12.6	10.9
EN 6	8.1	11.4
EN 7	7.6	10.9
EN 8	7.0	10.1
LM3	1.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.034**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.028**		
tot =	**0.062**	<	**0.950**

10.11.2.4 Top plate to web of cross girder weld – location 3 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

Unlimited life method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.7	1.056	6.8	1.181	3.5	1.35	**49.4**	<	**58.9**

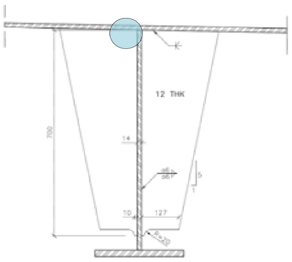
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.838**

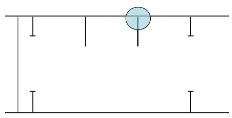
Damage accumulation method

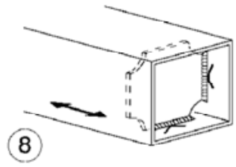
N/mm^2	global	local
EN 1	8.0	6.2
EN 2	6.2	5.4
EN 3	9.1	5.2
EN 4	6.0	4.4
EN 5	23.7	6.8
EN 6	14.2	6.9
EN 7	13.0	7.0
EN 8	12.7	6.4
LM3	2.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.052**		
train on track 2 + LM3 =	**0.009**		
local effects =	**0.000**		
train meetings + LM3 =	**0.056**		
tot =	**0.117**	<	**0.950**

10.11.2.5 Top plate to diaphragm weld – section close to location 3 (Span 5)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	23.7	1.056	8.3	1.181	3.5	1.35	**51.7**	<	**58.9**

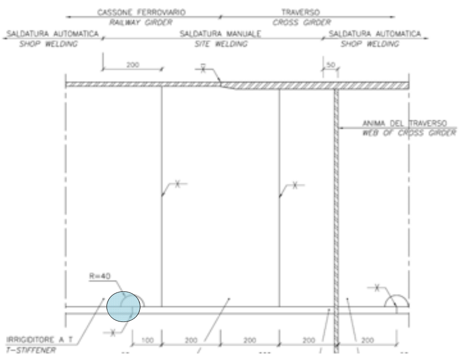
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.877**

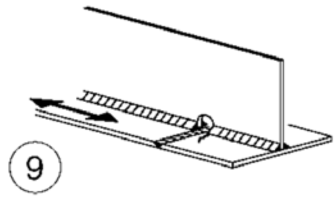
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	8.0	5.9
EN 2	6.2	6.0
EN 3	9.1	5.2
EN 4	6.0	4.0
EN 5	23.7	8.3
EN 6	14.2	7.3
EN 7	13.0	6.8
EN 8	12.7	6.6
LM3	2.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.065**		
train on track 2 + LM3 =	**0.009**		
local effects =	**0.000**		
train meetings + LM3 =	**0.059**		
tot =	**0.133**	<	**0.950**

10.11.2.6 Bottom of T beam – Shop joint – location 3 (Span 5)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.8	1.056	10.9	1.181	1.5	1.35	**34.9**	<	**52.3**

$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.667**

DAMAGE ACCUMULATION METHOD

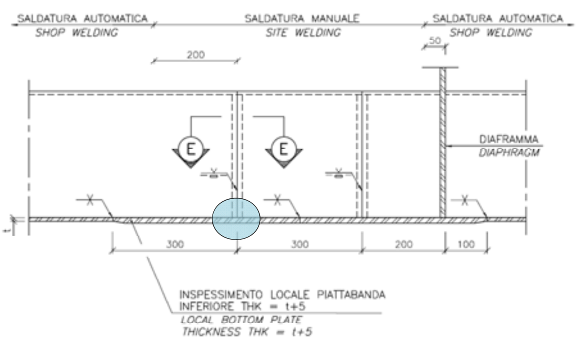
N/mm^2	global	local
EN 1	3.9	9.2
EN 2	3.0	9.5
EN 3	4.2	8.2
EN 4	2.8	6.5
EN 5	10.8	10.9
EN 6	6.3	11.4
EN 7	6.2	10.9
EN 8	6.0	10.1
LM3	1.2	

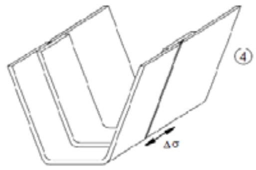
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.020**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.016**		
tot =	**0.036**	<	**0.950**

10.12 Span 04 – Side span

10.12.1 Bottom plate (Span 4)

10.12.1.1 Erection joint – location 1 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.6	1.056	3.2	1.35	**46.5**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.889**

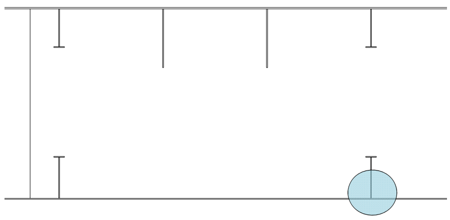
DAMAGE ACCUMULATION METHOD

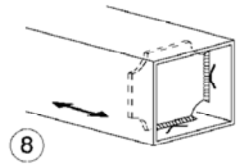
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	11.6
EN 2	8.3
EN 3	12.4
EN 4	9.8
EN 5	29.6
EN 6	19.3
EN 7	17.6
EN 8	16.6
LM3	2.5

Stress Concentration factor = f_{SC} =	1.00
Train meeting percentage	12.0

contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.062**		
train on track 2 + LM3 =	**0.062**		
train on track 1 + train on track 2 + LM3 =	**0.104**		
tot =	**0.229**	<	**0.950**

10.12.1.2 Bottom plate to diaphragm weld – location 2 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	33.9	1.056	3.7	1.35	**53.3**	<	**58.9**

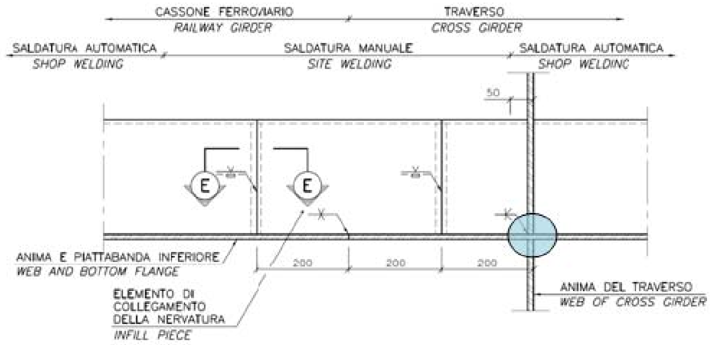
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.904**

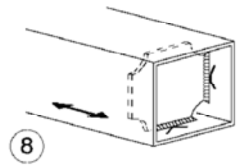
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	13.3
EN 2	9.5
EN 3	14.2
EN 4	11.2
EN 5	33.9
EN 6	22.1
EN 7	20.1
EN 8	19.1
LM3	2.8

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.067**		
train on track 2 + LM3 =	**0.067**		
train on track 1 + train on track 2 + LM3 =	**0.111**		
tot =	**0.245**	<	**0.950**

10.12.1.3 Shop joint – location 3 (Span 4)





$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	40.3	1.056	2.9	1.35	**61.3**	<	**73.7**

$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.832**

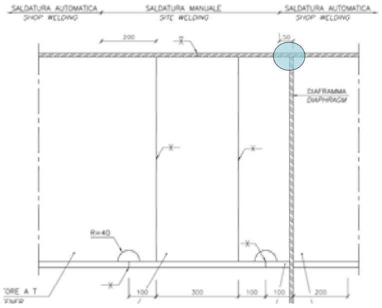
DAMAGE ACCUMULATION METHOD

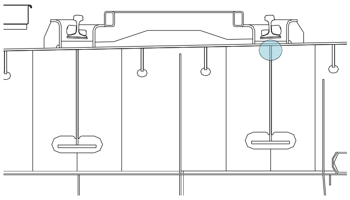
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	13.7
EN 2	10.5
EN 3	15.8
EN 4	10.2
EN 5	40.3
EN 6	24.3
EN 7	22.0
EN 8	21.4
LM3	2.3

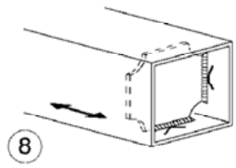
Stress Concentration factor = f_{SC} =	1.79		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.033**		
train on track 2 + LM3 =	**0.033**		
train on track 1 + train on track 2 + LM3 =	**0.069**		
tot =	**0.135**	<	**0.950**

10.12.2 Top plate (Span 4)

10.12.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 4)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.4	1.056	6.8	1.181	4.2	1.35	61.3	<	73.7

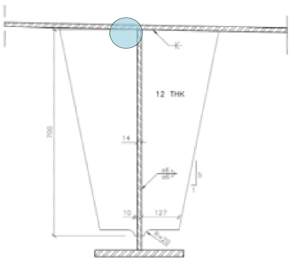
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	0.833

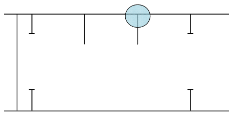
DAMAGE ACCUMULATION METHOD

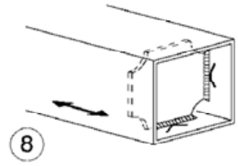
N/mm^2	global	local
EN 1	13.7	6.2
EN 2	9.9	5.4
EN 3	13.2	5.2
EN 4	10.6	4.4
EN 5	31.4	6.8
EN 6	21.2	6.9
EN 7	18.5	7.0
EN 8	17.4	6.4
LM3	3.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.054		
train on track 2 + LM3 =	0.012		
local effects =	0.000		
train meetings + LM3 =	0.076		
tot =	0.141	<	0.950

10.12.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 4)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.4	1.056	8.3	1.181	4.2	1.35	**63.6**	<	**73.7**

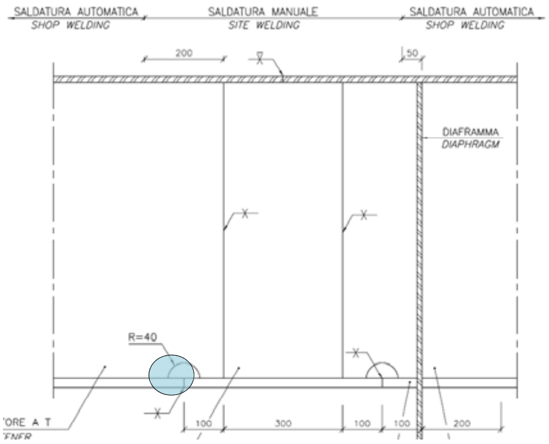
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.864**

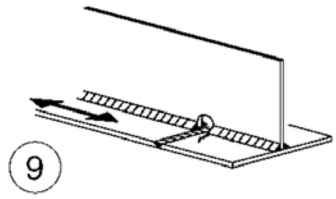
DAMAGE ACCUMULATION METHOD

N/mm²	global	local
EN 1	13.7	5.9
EN 2	9.9	6.0
EN 3	13.2	5.2
EN 4	10.6	4.0
EN 5	31.4	8.3
EN 6	21.2	7.3
EN 7	18.5	6.8
EN 8	17.4	6.6
LM3	3.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.061**		
train on track 2 + LM3 =	**0.012**		
local effects =	**0.000**		
train meetings + LM3 =	**0.078**		
tot =	**0.151**	<	**0.950**

10.12.2.3 Bottom of T beam – Erection joint – location 1 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	18.5	1.056	10.9	1.181	2.0	1.35	**46.4**	<	**52.3**

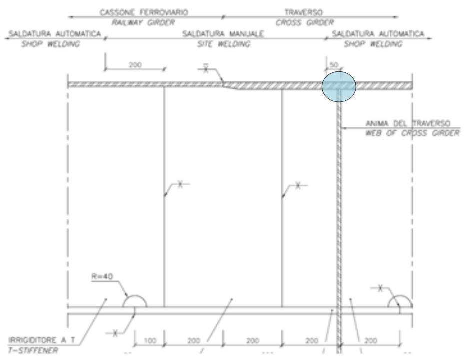
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.886**

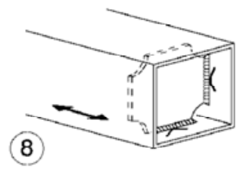
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	7.3	9.2
EN 2	5.2	9.5
EN 3	7.7	8.2
EN 4	6.1	6.5
EN 5	18.5	10.9
EN 6	12.1	11.4
EN 7	11.0	10.9
EN 8	10.4	10.1
LM3	1.6	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.114**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.081**		
tot =	**0.196**	<	**0.950**

10.12.2.4 Top plate to web of cross girder weld – location 3 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	18.6	1.056	6.8	1.181	1.6	1.35	**39.6**	<	**58.9**

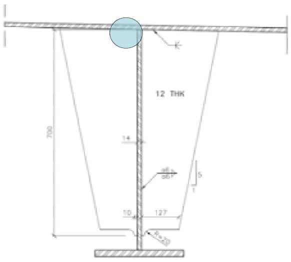
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.672**

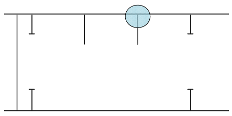
DAMAGE ACCUMULATION METHOD

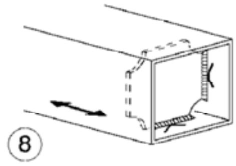
N/mm^2	global	local
EN 1	6.1	6.2
EN 2	4.8	5.4
EN 3	7.4	5.2
EN 4	4.6	4.4
EN 5	18.6	6.8
EN 6	11.4	6.9
EN 7	10.1	7.0
EN 8	9.8	6.4
LM3	1.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.012**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.021**		
tot =	**0.032**	<	**0.950**

10.12.2.5 Top plate to diaphragm weld – section close to location 3 (Span 4)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

Unlimited Life Method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	18.6	1.056	8.3	1.181	1.6	1.35	**41.9**	<	**58.9**

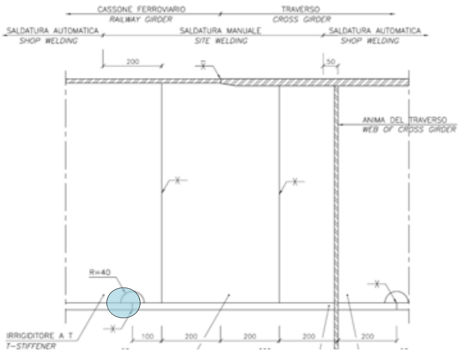
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.711**

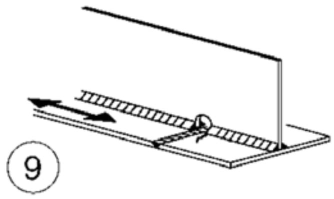
Damage Accumulation Method

N/mm^2	global	local
EN 1	6.1	5.9
EN 2	4.8	6.0
EN 3	7.4	5.2
EN 4	4.6	4.0
EN 5	18.6	8.3
EN 6	11.4	7.3
EN 7	10.1	6.8
EN 8	9.8	6.6
LM3	1.2	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.015**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.023**		
tot =	**0.038**	<	**0.950**

10.12.2.6 Bottom of T beam – Shop joint – location 3 (Span 4)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	**52.3**	**28.7**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	9.4	1.056	10.9	1.181	0.7	1.35	**31.8**	<	**52.3**

$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.608**

DAMAGE ACCUMULATION METHOD

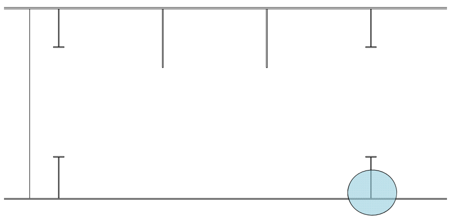
N/mm²	global	local
EN 1	3.2	9.2
EN 2	2.5	9.5
EN 3	3.7	8.2
EN 4	2.4	6.5
EN 5	9.4	10.9
EN 6	5.7	11.4
EN 7	5.2	10.9
EN 8	5.0	10.1
LM3	0.5	

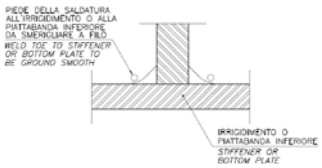
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.007**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.009**		
tot =	**0.016**	<	**0.950**

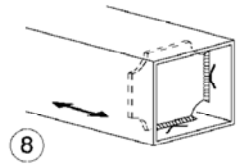
10.13 Span 3 – Side span

10.13.1 Bottom plate (Span 3)

10.13.1.1 Bottom plate to diaphragm weld – location 2 (Span 3)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	45.2	1.056	4.7	1.35	**70.6**	<	**73.7**

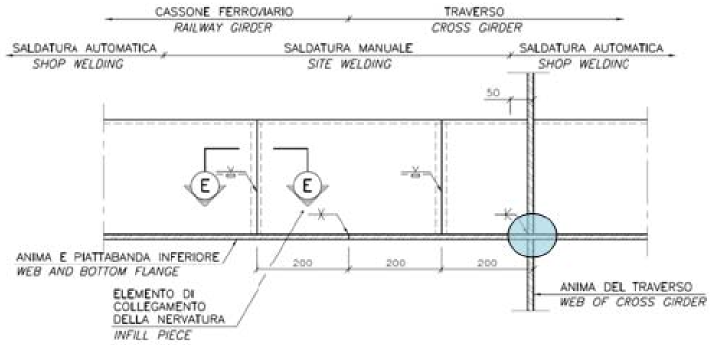
$\Delta\sigma x_{\ tot} / \Delta\sigma_D$	**0.959**

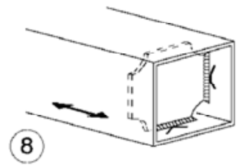
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	20.0
EN 2	14.3
EN 3	17.5
EN 4	15.0
EN 5	45.2
EN 6	29.0
EN 7	28.2
EN 8	26.1
LM3	3.6

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.097**		
train on track 2 + LM3 =	**0.097**		
train on track 1 + train on track 2 + LM3 =	**0.147**		
tot =	**0.340**	<	**0.950**

10.13.1.2 Shop joint – location 3 (Span 3)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	41.2	1.056	5.6	1.35	**66.3**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.900**

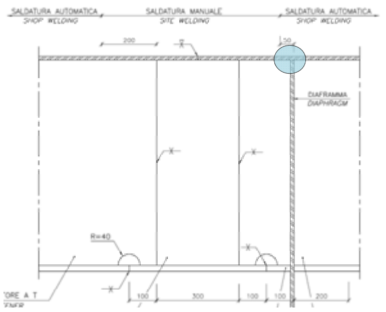
DAMAGE ACCUMULATION METHOD

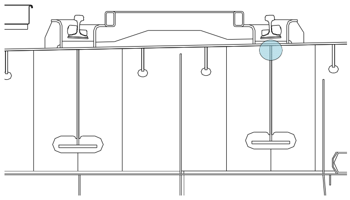
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	18.3
EN 2	13.2
EN 3	15.5
EN 4	14.0
EN 5	41.2
EN 6	25.9
EN 7	27.0
EN 8	23.8
LM3	4.3

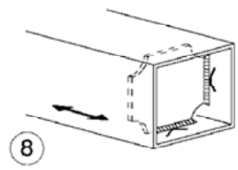
Stress Concentration factor = f_{SC} =	1.25		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.066**		
train on track 2 + LM3 =	**0.066**		
train on track 1 + train on track 2 + LM3 =	**0.115**		
tot =	**0.248**	<	**0.950**

10.13.2 Top plate (Span 3)

10.13.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 3)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.2	1.056	6.8	1.181	4.0	1.35	**62.3**	<	**73.7**

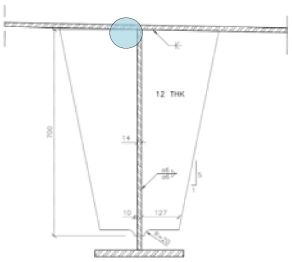
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.845**

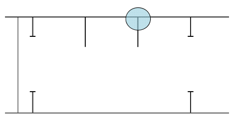
DAMAGE ACCUMULATION METHOD

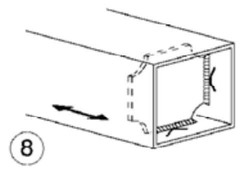
N/mm²	global	local
EN 1	15.6	6.2
EN 2	11.3	5.4
EN 3	12.8	5.2
EN 4	11.0	4.4
EN 5	32.2	6.8
EN 6	21.5	6.9
EN 7	20.0	7.0
EN 8	18.5	6.4
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.063**		
train on track 2 + LM3 =	**0.013**		
local effects =	**0.000**		
train meetings + LM3 =	**0.088**		
tot =	**0.164**	<	**0.950**

10.13.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 3)







$\Delta\sigma_{CWI}$	$\Delta\sigma_{DWI}$	$\Delta\sigma_{LWI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.2	1.056	8.3	1.181	4.0	1.35	**64.6**	<	**73.7**

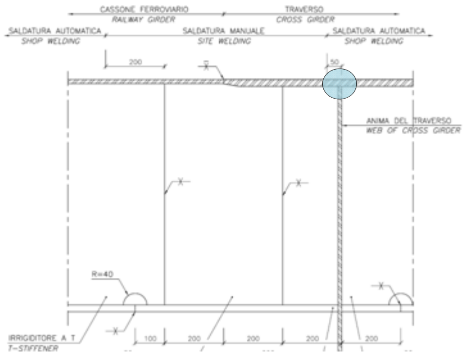
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.876**

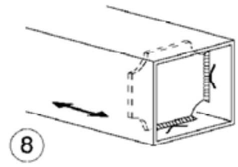
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	15.6	5.9
EN 2	11.3	6.0
EN 3	12.8	5.2
EN 4	11.0	4.0
EN 5	32.2	8.3
EN 6	21.5	7.3
EN 7	20.0	6.8
EN 8	18.5	6.6
LM3	3.1	

Train meeting percentage	12.0		
contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + local + LM3 =	**0.071**		
train on track 2 + LM3 =	**0.013**		
local effects =	**0.000**		
train meetings + LM3 =	**0.091**		
tot =	**0.174**	<	**0.950**

10.13.2.3 Top plate to web of cross girder weld – location 3 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	**58.9**	**32.4**

UNLIMITED LIFE METHOD¨

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.5	1.056	6.8	1.181	4.8	1.35	**49.5**	<	**58.9**

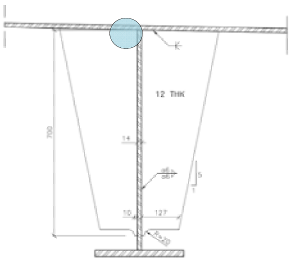
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.841**

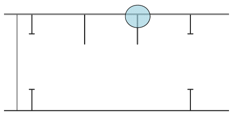
DAMAGE ACCUMULATION METHOD

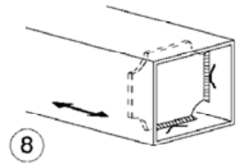
N/mm^2	global	local
EN 1	11.2	6.2
EN 2	8.1	5.4
EN 3	8.8	5.2
EN 4	8.1	4.4
EN 5	22.5	6.8
EN 6	14.9	6.9
EN 7	14.8	7.0
EN 8	12.9	6.4
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.074**		
train on track 2 + LM3 =	**0.009**		
local effects =	**0.000**		
train meetings + LM3 =	**0.080**		
tot =	**0.163**	<	**0.950**

10.13.2.4 Top plate to diaphragm weld – section close to location 3 (Span 3)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.5	1.056	8.3	1.181	4.8	1.35	51.8	<	58.9

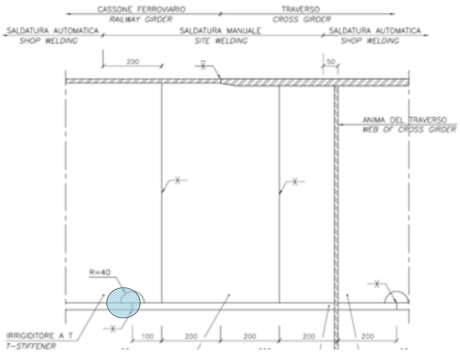
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.880

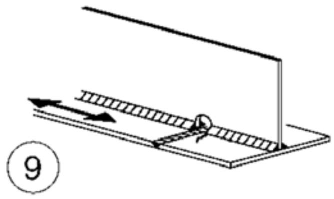
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	11.2	5.9
EN 2	8.1	6.0
EN 3	8.8	5.2
EN 4	8.1	4.0
EN 5	22.5	8.3
EN 6	14.9	7.3
EN 7	14.8	6.8
EN 8	12.9	6.6
LM3	3.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.084		
train on track 2 + LM3 =	0.009		
local effects =	0.000		
train meetings + LM3 =	0.083		
tot =	**0.175**	<	0.950

10.13.2.5 Bottom of T beam – Shop joint – location 3 (Span 3)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.9	1.056	10.9	1.181	1.9	1.35	**36.9**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.706**

DAMAGE ACCUMULATION METHOD

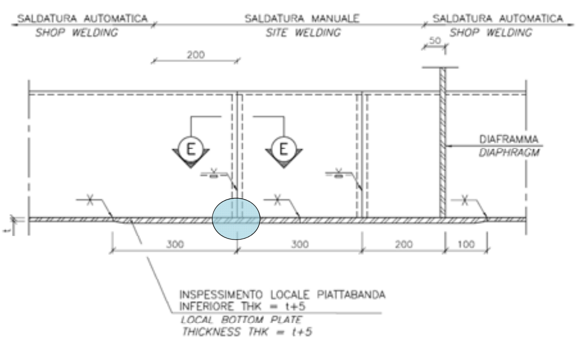
N/mm^2	global	local
EN 1	5.3	9.2
EN 2	3.8	9.5
EN 3	4.5	8.2
EN 4	4.0	6.5
EN 5	11.9	10.9
EN 6	7.5	11.4
EN 7	7.8	10.9
EN 8	6.9	10.1
LM3	1.5	

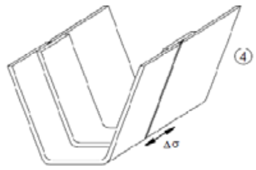
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.034**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.027**		
tot =	**0.062**	<	**0.950**

10.14 Span 2 – Side span

10.14.1 Bottom plate (Span 2)

10.14.1.1 Erection joint – location 1 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.6	1.056	3.9	1.35	**51.7**	<	**52.3**

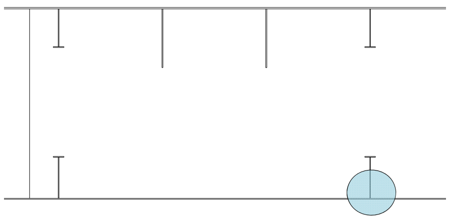
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.988**

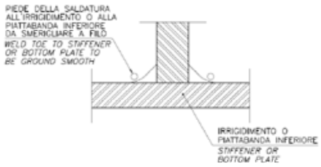
DAMAGE ACCUMULATION METHOD

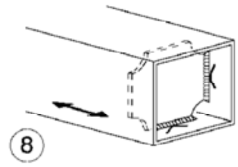
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	15.6
EN 2	11.2
EN 3	12.9
EN 4	11.0
EN 5	32.6
EN 6	21.6
EN 7	20.6
EN 8	18.9
LM3	3.0

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.115**		
train on track 2 + LM3 =	**0.115**		
train on track 1 + train on track 2 + LM3 =	**0.175**		
tot =	**0.404**	<	**0.950**

10.14.1.2 Bottom plate to diaphragm weld – location 2 (Span 2)







$\Delta\sigma_{C WI}$	$\Delta\sigma_{D WI}$	$\Delta\sigma_{L WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.2	1.056	4.7	1.35	**62.2**	<	**73.7**

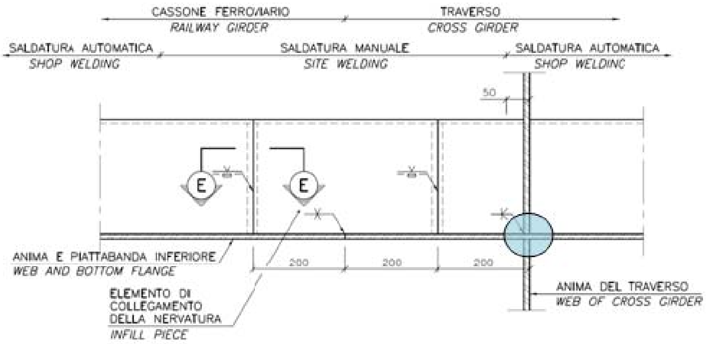
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.844**

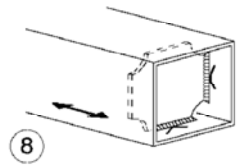
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	18.8
EN 2	13.5
EN 3	15.5
EN 4	13.3
EN 5	39.2
EN 6	26.1
EN 7	24.8
EN 8	22.7
LM3	3.6

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.050**		
train on track 2 + LM3 =	**0.050**		
train on track 1 + train on track 2 + LM3 =	**0.101**		
tot =	**0.200**	<	**0.950**

10.14.1.3 Shop joint – location 3 (Span 2)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	40.1	1.056	5.7	1.35	**64.8**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.880**

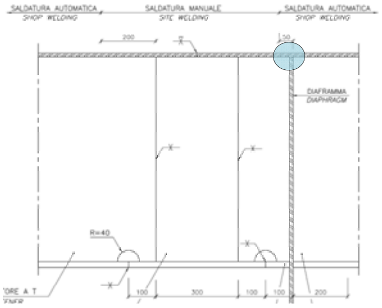
DAMAGE ACCUMULATION METHOD

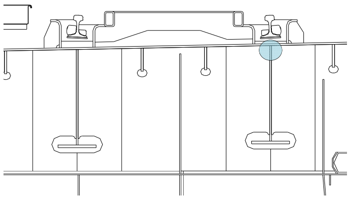
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	17.6
EN 2	12.9
EN 3	15.9
EN 4	14.0
EN 5	40.1
EN 6	25.6
EN 7	26.2
EN 8	23.2
LM3	4.4

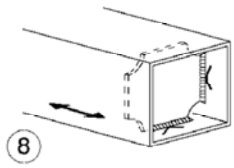
Stress Concentration factor = f_{SC} =	1.25		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.060**		
train on track 2 + LM3 =	**0.060**		
train on track 1 + train on track 2 + LM3 =	**0.107**		
tot =	**0.227**	<	**0.950**

10.14.2 Top plate (Span 2)

10.14.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.8	1.056	6.8	1.181	4.0	1.35	**57.4**	<	**58.9**

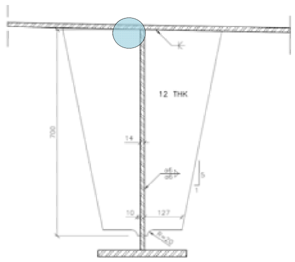
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.974**

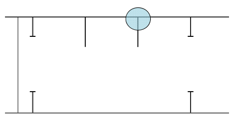
DAMAGE ACCUMULATION METHOD

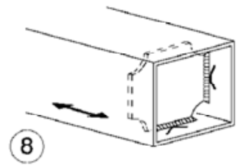
N/mm^2	global	local
EN 1	15.1	6.2
EN 2	10.9	5.4
EN 3	11.7	5.2
EN 4	10.3	4.4
EN 5	28.8	6.8
EN 6	19.5	6.9
EN 7	18.4	7.0
EN 8	17.4	6.4
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.157**		
train on track 2 + LM3 =	**0.024**		
local effects =	**0.000**		
train meetings + LM3 =	**0.158**		
tot =	**0.339**	<	**0.950**

10.14.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 2)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.8	1.056	8.3	1.181	4.0	1.35	**59.7**	<	**73.7**

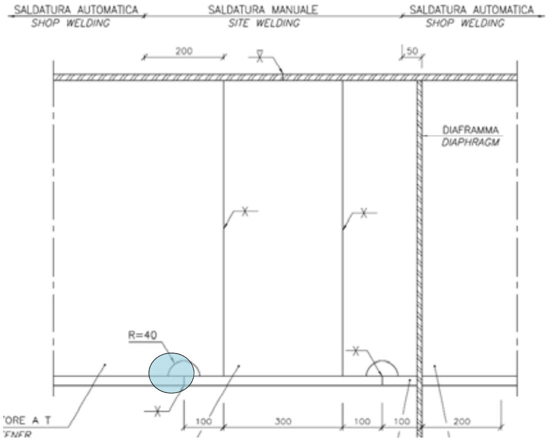
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.811**

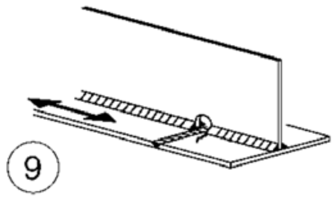
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	15.1	5.9
EN 2	10.9	6.0
EN 3	11.7	5.2
EN 4	10.3	4.0
EN 5	28.8	8.3
EN 6	19.5	7.3
EN 7	18.4	6.8
EN 8	17.4	6.6
LM3	3.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.046**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.070**		
tot =	**0.125**	<	**0.950**

10.14.2.3 Bottom of T beam – Erection joint – location 1 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	14.0	1.056	10.9	1.181	1.6	1.35	39.6	<	52.3

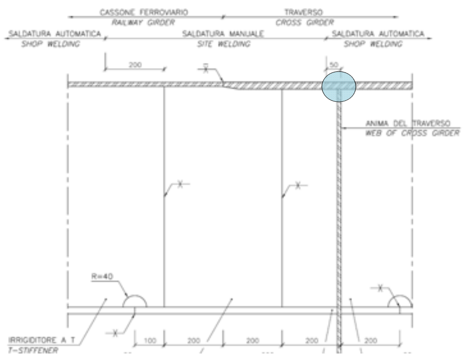
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.756

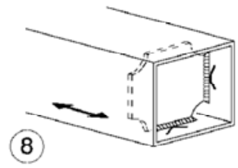
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	6.7	9.2
EN 2	4.8	9.5
EN 3	5.6	8.2
EN 4	4.7	6.5
EN 5	14.0	10.9
EN 6	9.3	11.4
EN 7	8.9	10.9
EN 8	8.1	10.1
LM3	1.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	0.052		
train on track 2 + LM3 =	0.000		
local effects =	0.000		
train meetings + LM3 =	0.044		
tot =	0.096	<	0.950

10.14.2.4 Top plate to web of cross girder weld – location 3 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.2	1.056	6.8	1.181	4.9	1.35	**49.1**	<	**58.9**

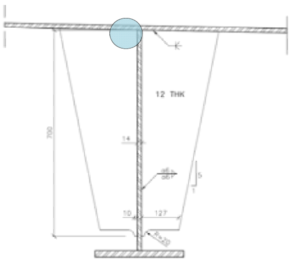
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.833**

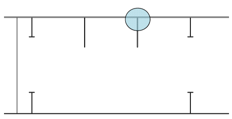
DAMAGE ACCUMULATION METHOD

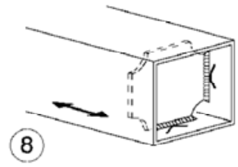
N/mm^2	global	local
EN 1	10.9	6.2
EN 2	8.1	5.4
EN 3	9.2	5.2
EN 4	8.2	4.4
EN 5	22.2	6.8
EN 6	14.8	6.9
EN 7	14.7	7.0
EN 8	12.8	6.4
LM3	3.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.072**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.078**		
tot =	**0.159**	<	**0.950**

10.14.2.5 Top plate to diaphragm weld – section close to location 3 (Span 2)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	22.2	1.056	8.3	1.181	4.9	1.35	**51.4**	<	**58.9**

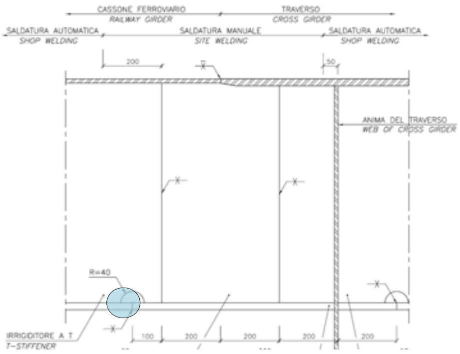
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.872**

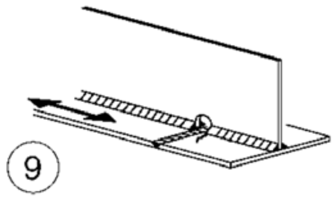
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	10.9	5.9
EN 2	8.1	6.0
EN 3	9.2	5.2
EN 4	8.2	4.0
EN 5	22.2	8.3
EN 6	14.8	7.3
EN 7	14.7	6.8
EN 8	12.8	6.6
LM3	3.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.081**		
train on track 2 + LM3 =	**0.008**		
local effects =	**0.000**		
train meetings + LM3 =	**0.081**		
tot =	**0.170**	<	**0.950**

10.14.2.6 Bottom of T beam – Shop joint – location 3 (Span 2)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

Unlimited life method

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	11.6	1.056	10.9	1.181	1.9	1.35	**36.5**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.698**

Damage accumulation method

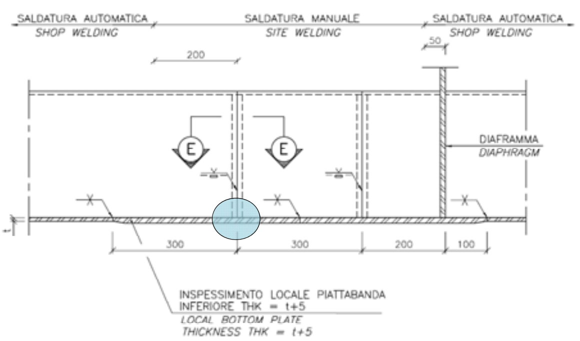
N/mm²	global	local
EN 1	5.1	9.2
EN 2	3.7	9.5
EN 3	4.6	8.2
EN 4	4.0	6.5
EN 5	11.6	10.9
EN 6	7.4	11.4
EN 7	7.6	10.9
EN 8	6.7	10.1
LM3	1.6	

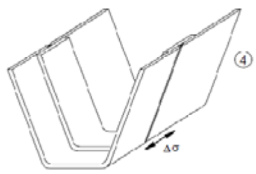
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.033**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.026**		
tot =	**0.059**	<	**0.950**

10.15 Span 01 – Side span

10.15.1 Bottom plate (Span 1)

10.15.1.1 Erection joint – location 1 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.3	1.056	1.9	1.35	**38.6**	<	**52.3**

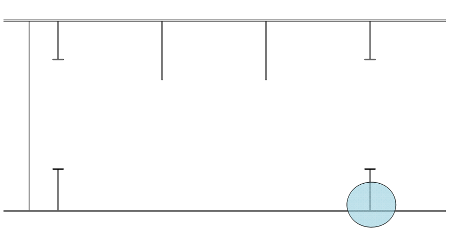
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.739**

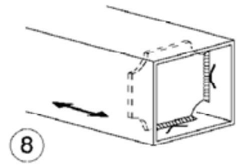
DAMAGE ACCUMULATION METHOD

	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	11.3
EN 2	8.0
EN 3	9.5
EN 4	8.6
EN 5	25.3
EN 6	16.2
EN 7	16.7
EN 8	15.3
LM3	1.4

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.018**		
train on track 2 + LM3 =	**0.018**		
train on track 1 + train on track 2 + LM3 =	**0.061**		
tot =	**0.097**	<	**0.950**

10.15.1.2 Bottom plate to diaphragm weld – location 2 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.6	1.056	2.1	1.35	**43.5**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.739**

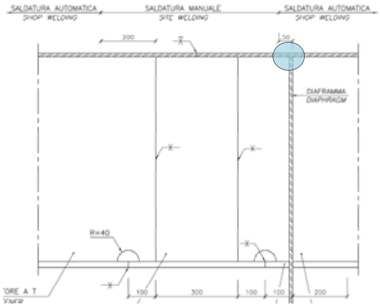
DAMAGE ACCUMULATION METHOD

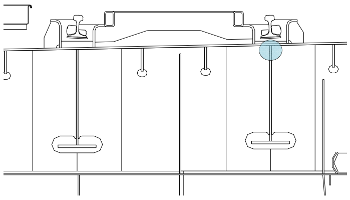
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	12.7
EN 2	9.0
EN 3	10.8
EN 4	9.7
EN 5	28.6
EN 6	18.3
EN 7	18.8
EN 8	17.3
LM3	1.6

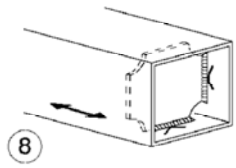
Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.018**		
train on track 2 + LM3 =	**0.018**		
train on track 1 + train on track 2 + LM3 =	**0.060**		
tot =	**0.097**	<	**0.950**

10.15.2 Top plate (Span 1)

10.15.2.1 Top plate to diaphragm weld – location 1 or 2 (Span 1)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.0	1.056	6.8	1.181	2.4	1.35	**58.4**	<	**58.9**

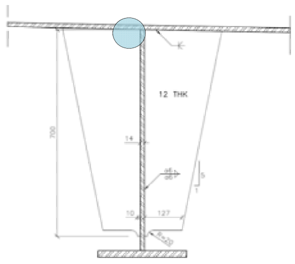
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.991**

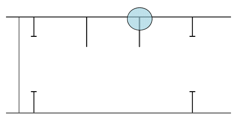
DAMAGE ACCUMULATION METHOD

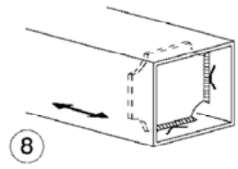
N/mm^2	global	local
EN 1	14.0	6.2
EN 2	9.9	5.4
EN 3	11.8	5.2
EN 4	10.7	4.4
EN 5	31.0	6.8
EN 6	19.9	6.9
EN 7	20.4	7.0
EN 8	18.8	6.4
LM3	1.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.156**		
train on track 2 + LM3 =	**0.033**		
local effects =	**0.000**		
train meetings + LM3 =	**0.156**		
tot =	**0.345**	<	**0.950**

10.15.2.2 Top plate to diaphragm weld – location between 1 and 2 (Span 1)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.0	1.056	8.3	1.181	2.4	1.35	**60.7**	<	**73.7**

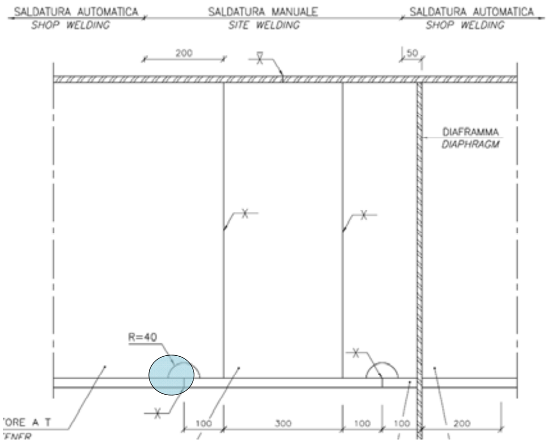
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.824**

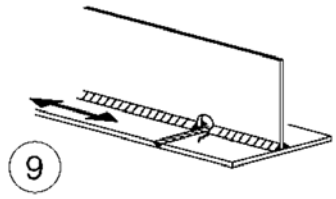
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	14.0	5.9
EN 2	9.9	6.0
EN 3	11.8	5.2
EN 4	10.7	4.0
EN 5	31.0	8.3
EN 6	19.9	7.3
EN 7	20.4	6.8
EN 8	18.8	6.6
LM3	1.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.050**		
train on track 2 + LM3 =	**0.009**		
local effects =	**0.000**		
train meetings + LM3 =	**0.071**		
tot =	**0.130**	<	**0.950**

10.15.2.3 Bottom of T beam – Erection joint – location 1 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	15.9	1.056	10.9	1.181	1.1	1.35	**41.6**	<	**52.3**

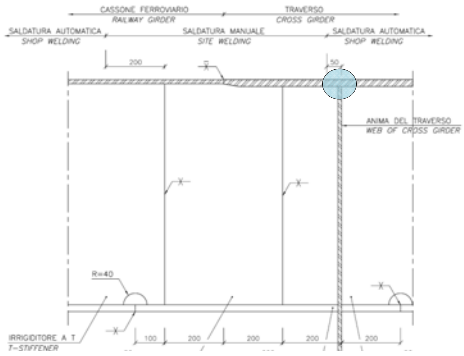
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.796**

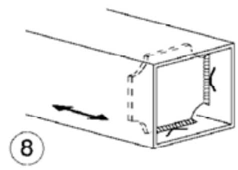
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	7.1	9.2
EN 2	5.0	9.5
EN 3	6.0	8.2
EN 4	5.4	6.5
EN 5	15.9	10.9
EN 6	10.2	11.4
EN 7	10.5	10.9
EN 8	9.6	10.1
LM3	0.9	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.065**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.056**		
tot =	**0.121**	<	**0.950**

10.15.2.4 Top plate to web of cross girder weld – location 3 (Span 1)





$\Delta\sigma_{C WI}$	$\Delta\sigma_{D WI}$	$\Delta\sigma_{L WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.9	1.056	6.8	1.181	2.3	1.35	**69.5**	<	**73.7**

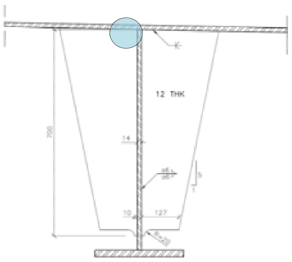
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.943**

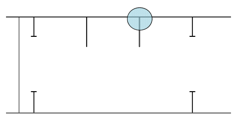
DAMAGE ACCUMULATION METHOD

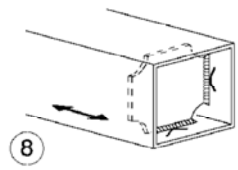
N/mm^2	global	local
EN 1	16.0	6.2
EN 2	11.7	5.4
EN 3	13.3	5.2
EN 4	10.9	4.4
EN 5	38.9	6.8
EN 6	23.1	6.9
EN 7	26.0	7.0
EN 8	24.5	6.4
LM3	1.8	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.107**		
train on track 2 + LM3 =	**0.032**		
local effects =	**0.000**		
train meetings + LM3 =	**0.123**		
tot =	**0.262**	<	**0.950**

10.15.2.5 Top plate to diaphragm weld – section close to location 3 (Span 1)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.9	1.056	8.3	1.181	2.3	1.35	**71.8**	<	**73.7**

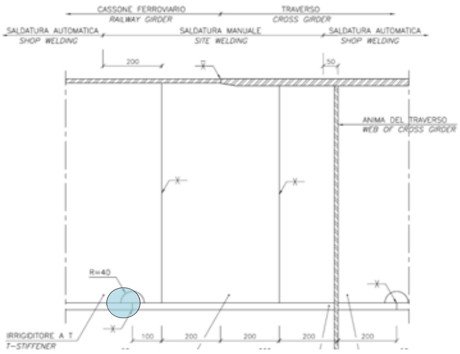
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.974**

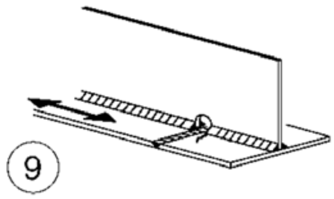
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	16.0	5.9
EN 2	11.7	6.0
EN 3	13.3	5.2
EN 4	10.9	4.0
EN 5	38.9	8.3
EN 6	23.1	7.3
EN 7	26.0	6.8
EN 8	24.5	6.6
LM3	1.8	

Train meeting percentage	12.0		
contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + local + LM3 =	**0.119**		
train on track 2 + LM3 =	**0.032**		
local effects =	**0.000**		
train meetings + LM3 =	**0.126**		
tot =	**0.277**	<	**0.950**

10.15.2.6 Bottom of T beam – Shop joint – location 3 (Span 1)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	17.5	1.056	10.9	1.181	1.0	1.35	**43.7**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.836**

DAMAGE ACCUMULATION METHOD

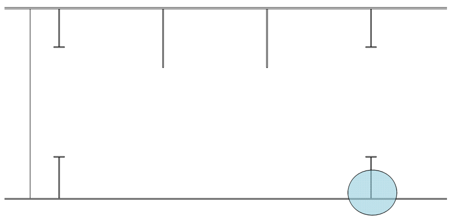
N/mm^2	global	local
EN 1	7.2	9.2
EN 2	5.3	9.5
EN 3	6.0	8.2
EN 4	4.9	6.5
EN 5	17.5	10.9
EN 6	10.3	11.4
EN 7	11.7	10.9
EN 8	11.0	10.1
LM3	0.8	

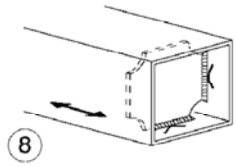
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.078**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.066**		
tot =	**0.144**	<	**0.950**

10.16 CF8 – Side span

10.16.1 Bottom plate (CF8 side span)

10.16.1.1 Bottom plate to diaphragm weld – location 2 (CF8 side span)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.3	1.056	2.3	1.35	**49.1**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.833**

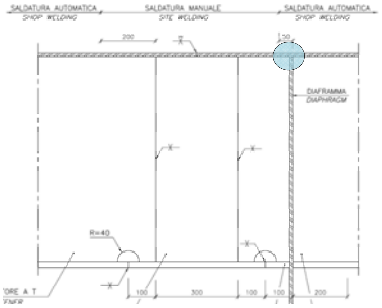
DAMAGE ACCUMULATION METHOD

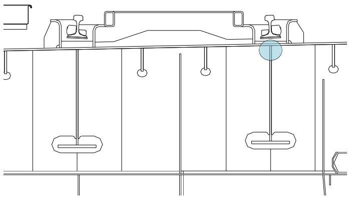
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	12.1
EN 2	9.0
EN 3	11.7
EN 4	10.3
EN 5	32.3
EN 6	17.2
EN 7	22.0
EN 8	20.1
LM3	1.8

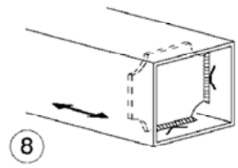
Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.041**		
train on track 2 + LM3 =	**0.041**		
train on track 1 + train on track 2 + LM3 =	**0.079**		
tot =	**0.161**	<	**0.950**

10.16.2 Top plate (CF8 side span)

10.16.2.1 Top plate to diaphragm weld – location 1 or 2 (CF8 side span)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.6	1.056	6.8	1.181	2.2	1.35	**56.1**	<	**58.9**

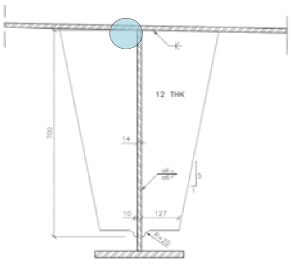
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.953**

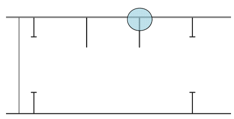
DAMAGE ACCUMULATION METHOD

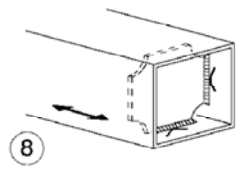
N/mm^2	global	local
EN 1	11.1	6.2
EN 2	8.2	5.4
EN 3	10.8	5.2
EN 4	9.5	4.4
EN 5	29.6	6.8
EN 6	15.8	6.9
EN 7	20.2	7.0
EN 8	18.5	6.4
LM3	1.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.112**		
train on track 2 + LM3 =	**0.022**		
local effects =	**0.000**		
train meetings + LM3 =	**0.114**		
tot =	**0.247**	<	**0.950**

10.16.2.2 Top plate to diaphragm weld – location between 1 and 2 (CF8 side span)







$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.6	1.056	8.3	1.181	2.2	1.35	58.4	<	58.9

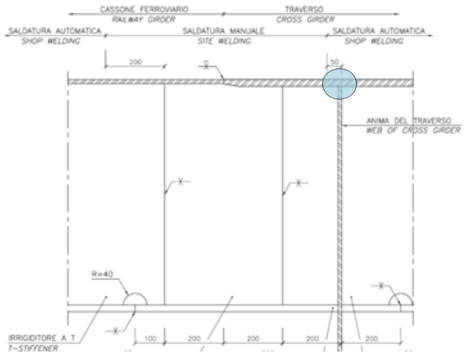
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.992

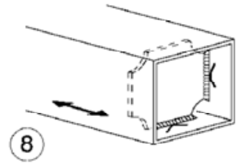
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	11.1	5.9
EN 2	8.2	6.0
EN 3	10.8	5.2
EN 4	9.5	4.0
EN 5	29.6	8.3
EN 6	15.8	7.3
EN 7	20.2	6.8
EN 8	18.5	6.6
LM3	1.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.127**		
train on track 2 + LM3 =	**0.022**		
local effects =	**0.000**		
train meetings + LM3 =	**0.117**		
tot =	**0.266**	<	**0.950**

10.16.2.3 Top plate to web of cross girder weld – location 3 (CF8 side span)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	40.0	1.056	6.8	1.181	2.7	1.35	**71.6**	<	**73.7**

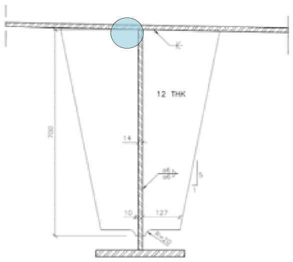
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.971**

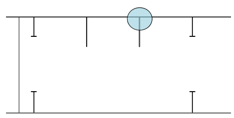
DAMAGE ACCUMULATION METHOD

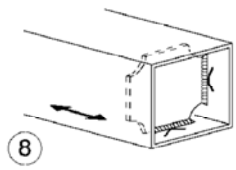
N/mm^2	global	local
EN 1	15.2	6.2
EN 2	11.1	5.4
EN 3	13.3	5.2
EN 4	10.9	4.4
EN 5	40.0	6.8
EN 6	22.7	6.9
EN 7	26.1	7.0
EN 8	24.6	6.4
LM3	2.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.118**		
train on track 2 + LM3 =	**0.037**		
local effects =	**0.000**		
train meetings + LM3 =	**0.124**		
tot =	**0.279**	<	**0.950**

10.16.2.4 Top plate to diaphragm weld – section close to location 3 (CF8 side span)







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.6	1.056	8.3	1.181	2.7	1.35	**73.3**	<	**73.7**

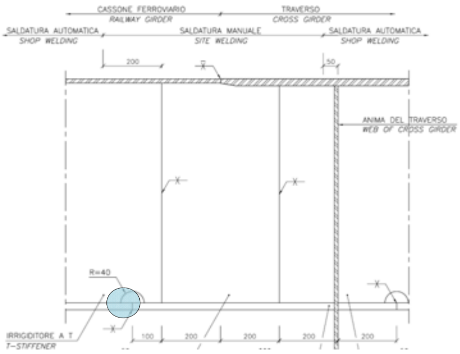
$\Delta\sigma_{x\,tot} / \Delta\sigma_D$	**0.995**

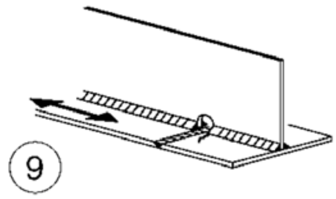
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	15.0	5.9
EN 2	11.0	6.0
EN 3	13.1	5.2
EN 4	10.8	4.0
EN 5	39.6	8.3
EN 6	22.5	7.3
EN 7	25.9	6.8
EN 8	24.4	6.6
LM3	2.1	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.126**		
train on track 2 + LM3 =	**0.036**		
local effects =	**0.000**		
train meetings + LM3 =	**0.123**		
tot =	**0.285**	<	**0.950**

10.16.2.5 Bottom of T beam – Shop joint – location 3 (CF8 side span)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
71.0	52.3	28.7

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	20.0	1.056	10.9	1.181	1.2	1.35	**47.6**	<	**52.3**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.909**

DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	7.6	9.2
EN 2	5.6	9.5
EN 3	6.6	8.2
EN 4	5.5	6.5
EN 5	20.0	10.9
EN 6	11.3	11.4
EN 7	13.1	10.9
EN 8	12.3	10.1
LM3	1.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.119**		
train on track 2 + LM3 =	**0.005**		
local effects =	**0.000**		
train meetings + LM3 =	**0.087**		
tot =	**0.211**	<	**0.950**

10.17 CF9 a centre – Side span

10.17.1 Bottom plate (CF9a side span)

10.17.1.1 Bottom plate centre (CF9a side span)

Conservatively in the bottom flange has been checked the lowest detail category possible.

$\Delta\sigma_{C,red}$	$\Delta\sigma_D$	$\Delta\sigma_L$
36.0	**26.5**	**14.6**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	7.6	1.056	0.8	1.35	**11.9**	<	**26.5**

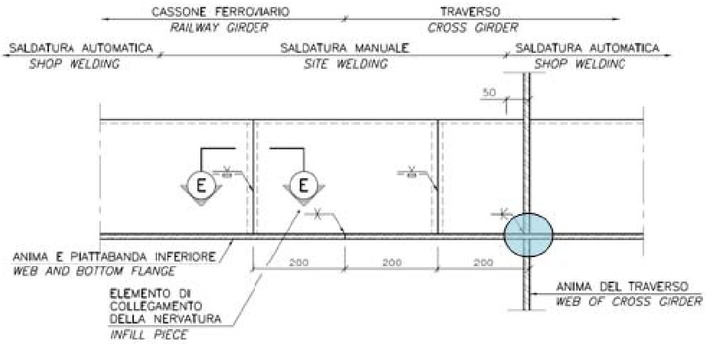
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.448**

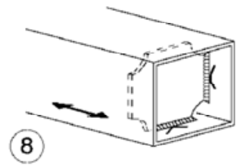
DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	7.6
EN 2	5.6
EN 3	6.2
EN 4	5.7
EN 5	7.6
EN 6	9.8
EN 7	8.3
EN 8	6.3
LM3	0.6

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.009**		
train on track 2 + LM3 =	**0.009**		
train on track 1 + train on track 2 + LM3 =	**0.065**		
tot =	**0.083**	<	**0.950**

10.17.1.2 Bottom plate end towards tower (CF9a side span)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.5	1.056	0.8	1.35	**31.7**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.538**

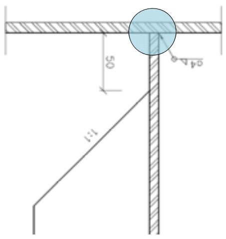
DAMAGE ACCUMULATION METHOD

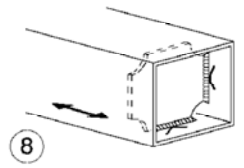
	$\Delta\sigma \bullet f_{SC}$ N/mm^2
EN 1	10.7
EN 2	7.7
EN 3	7.5
EN 4	6.9
EN 5	21.5
EN 6	13.2
EN 7	14.5
EN 8	13.5
LM3	0.7

Stress Concentration factor = f_{SC} =	1.00		
Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3 =	**0.015**		
tot =	**0.015**	<	**0.950**

10.17.2 Top plate (CF9a side span)

10.17.2.1 Top plate to diaphragm weld – centre (CF9a side span)





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	10.7	1.056	18.0	1.181	0.3	1.35	**44.3**	<	**58.9**

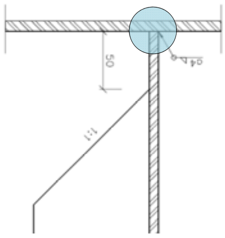
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.751**

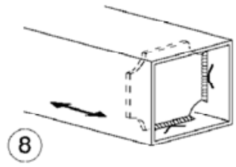
DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	6.0	0.0
EN 2	4.4	0.0
EN 3	5.1	0.0
EN 4	4.3	0.0
EN 5	10.7	18.0
EN 6	7.0	0.0
EN 7	8.1	0.0
EN 8	7.3	0.0
LM3	0.3	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.021**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.008**		
tot =	**0.029**	<	**0.950**

10.17.2.2 Top plate to diaphragm weld – end towards tower (CF9a side span)





$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.5	1.056	19.3	1.181	0.8	1.35	**62.4**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.847**

DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	10.7	0.0
EN 2	7.7	0.0
EN 3	7.5	0.0
EN 4	6.9	0.0
EN 5	21.5	19.3
EN 6	13.2	0.0
EN 7	14.4	0.0
EN 8	13.4	0.0
LM3	0.7	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.039**		
train on track 2 + LM3 =	**0.000**		
local effects =	**0.000**		
train meetings + LM3 =	**0.018**		
tot =	**0.057**	<	**0.950**

10.18 CF9 b end – side span

10.18.1 Bottom plate (CF9b side span)

Conservatively in the bottom flange has been checked the lowest detail category possible.

$\Delta\sigma_{C,red}$	$\Delta\sigma_D$	$\Delta\sigma_L$
36.0	**26.5**	**14.6**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	1.6	1.056	0.1	1.35	**2.4**	<	**26.5**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.090**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	1.5
EN 2	1.1
EN 3	1.1
EN 4	1.0
EN 5	1.6
EN 6	1.7
EN 7	1.6
EN 8	1.4
LM3	0.0

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3 =	**0.000**		
tot =	**0.000**	<	**0.950**

10.18.2 Top plate (CF9b side span)

Conservatively in the top flange has been checked the lowest detail category possible.

$\Delta\sigma_{C,red}$	$\Delta\sigma_D$	$\Delta\sigma_L$
36.0	**26.5**	**14.6**

UNLIMITED LIFE METHOD

	EN5				LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,loc}$	φ_{loc}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	1.8	1.056	10.9	1.181	0.1	1.35	**20.0**	<	**26.5**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.754**

DAMAGE ACCUMULATION METHOD

N/mm^2	global	local
EN 1	1.6	9.2
EN 2	1.2	9.5
EN 3	1.2	8.2
EN 4	1.1	6.5
EN 5	1.8	10.9
EN 6	1.8	11.4
EN 7	1.7	10.9
EN 8	1.6	10.1
LM3	0.0	

Train meeting percentage	12.0		
contributions:	$\Sigma n_i/N_i$		
train on track 1 + local + LM3 =	**0.165**		
train on track 2 + LM3 =	**0.000**		
local effects =	**1.604**		
train meetings + LM3 =	**0.040**		
tot =	**1.809**	>	**0.950**

10.19 Local FE-model of support of T-beams in the railway girder

A local FE-model is constructed with the purpose of verifying the fatigue stresses in the support of T-beams in the railway girder. The model consists of one T-beam along with a part of the deck plate and diaphragm. Furthermore angle profiles for the railway fastening system are modelled.

The FE-model is supported as shown in Figure 10-1 and the plate thicknesses are indicated by varying colours.

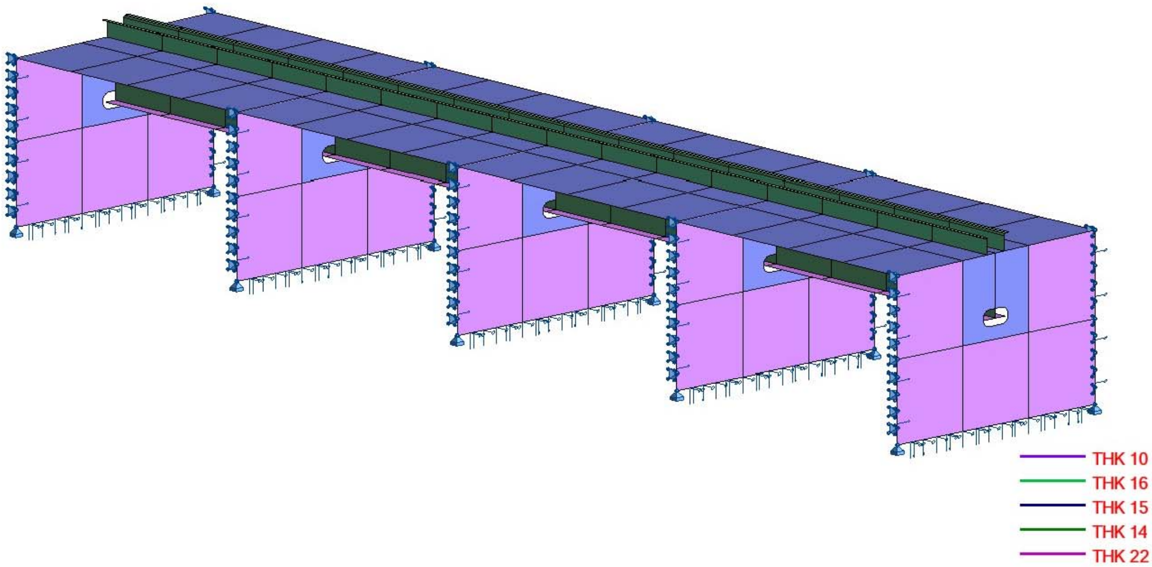


Figure 10-1 Sketch from Robot showing support conditions and plate thicknesses

The FE-model is supported along the vertical edges and horizontal bottom edge of the diaphragms. The vertical edges are fixed for translation in the transverse direction and free in the other directions. The edges are free to rotate. The horizontal bottom edges of the diaphragms are fixed for translation in the vertical direction and longitudinal direction of the bridge. The supports are free to rotate.

The applied load is shown for three load cases in Figure 10-2 to Figure 10-4. A bogie load from train EN5 is applied over the full width of 262mm between the angle profiles in the railway fastening system and over a length of 400mm in the longitudinal direction of the bridge. There is 1.8m between the axles. The applied load is then:

$$\frac{0.225MN \cdot 0{,}5}{(0.262 \cdot 0.400)m^2} \cdot 1.181 \cdot 1.35 = 1.71MN/m^2$$

where $\varphi = 1.181$ is the dynamic load factor and γ_M=1.35 is the partial safety factor.

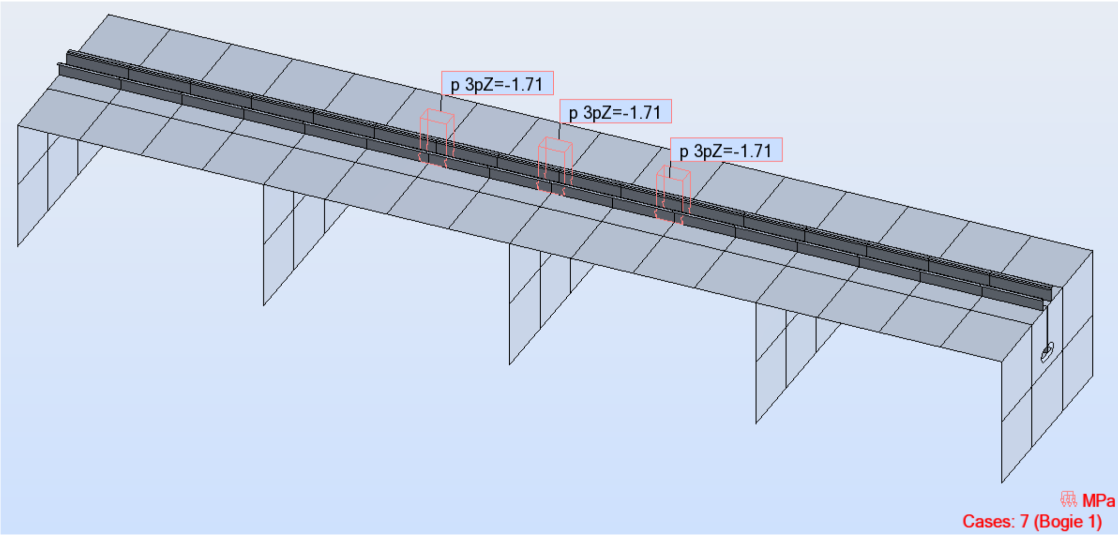


Figure 10-2 Load case bogie 1 - the centre axle is placed directly over the diaphragm

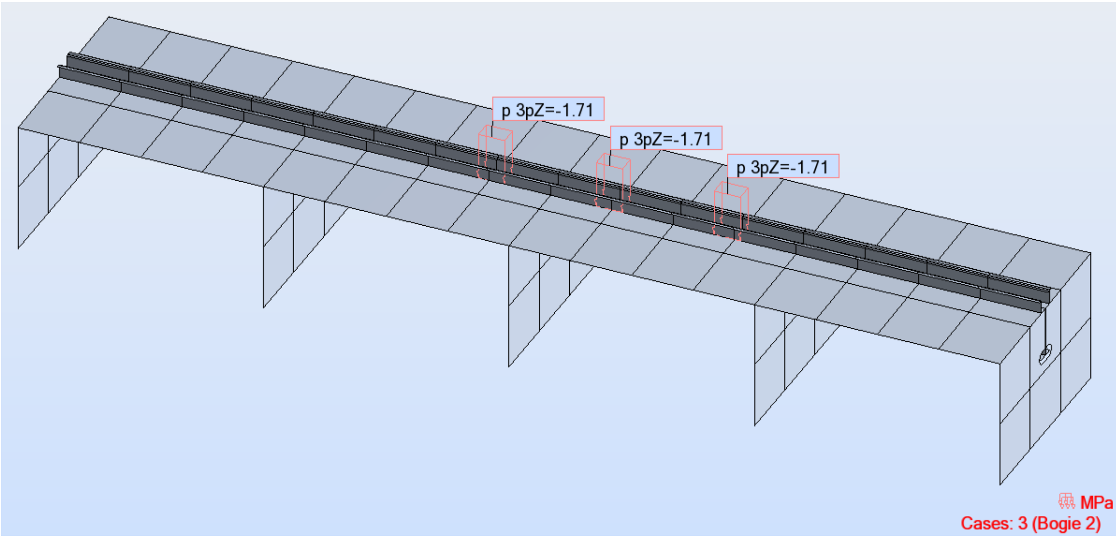


Figure 10-3 Load case bogie 2 - two axles are placed on each side of the diaphragm

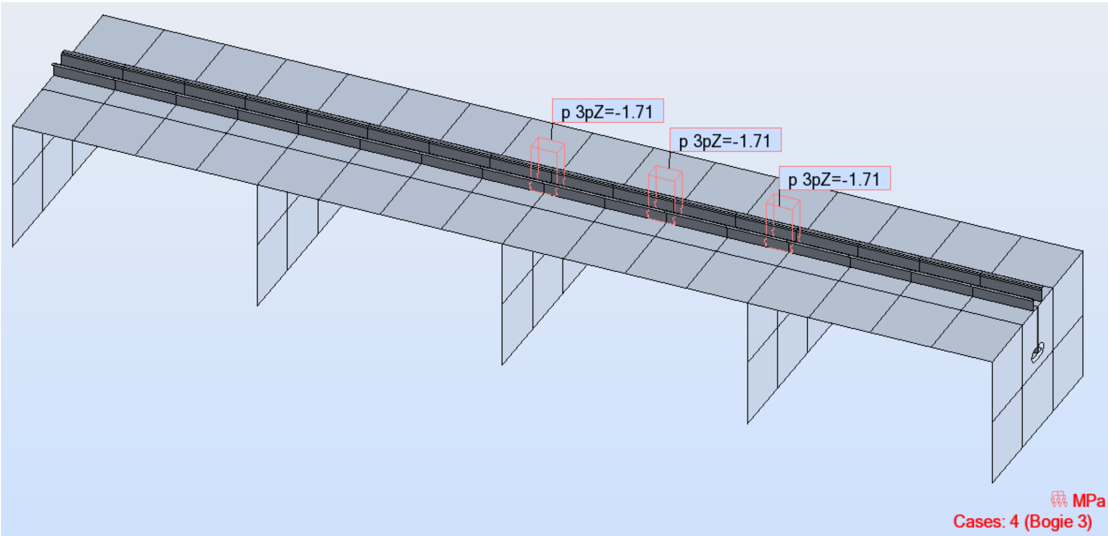


Figure 10-4 Load case bogie 3 - one axle is placed directly over the diaphragm and one approximately between two diaphragms

In Figure 10-2 load case bogie 1 is applied with one axle directly on the centre diaphragm and two axles symmetrically on each side thereby obtaining the largest stress level in the diaphragm. Figure 10-3 shows load case bogie 2 with two axles placed symmetrically on each side of the diaphragm. Finally load case bogie 3 is shown in Figure 10-4 with one axle placed directly over the diaphragm and one approximately between two diaphragms.

A part of the diaphragm is shown in Figure 10-5 with the cut out for the T-beam. The radius in the cut out is 100mm improving the distribution of the stresses along the edge of the cut out. A mesh refinement is made around the cut out to obtain a correct stress level, see Figure 10-5.

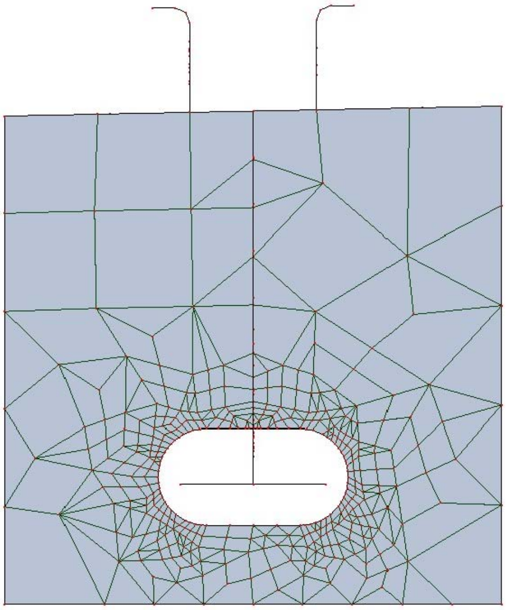


Figure 10-5 Mesh refinement around cut out in the diaphragm for the T-beam

Stress plots for the three load combinations are shown in Figure 10-6 to Figure 10-17 for normal stresses σ_X, σ_Y and von Mises stresses, respectively. Each figure shows the diaphragm in a front view together with an isometric view of a selected part of the centre diaphragm in the FE-model. For the front view the direction of the stresses is defined according to the coordinate system shown in the figures. For the isometric view the x-direction for the longitudinal steel is defined in the longitudinal bridge direction and the y-direction is vertical.

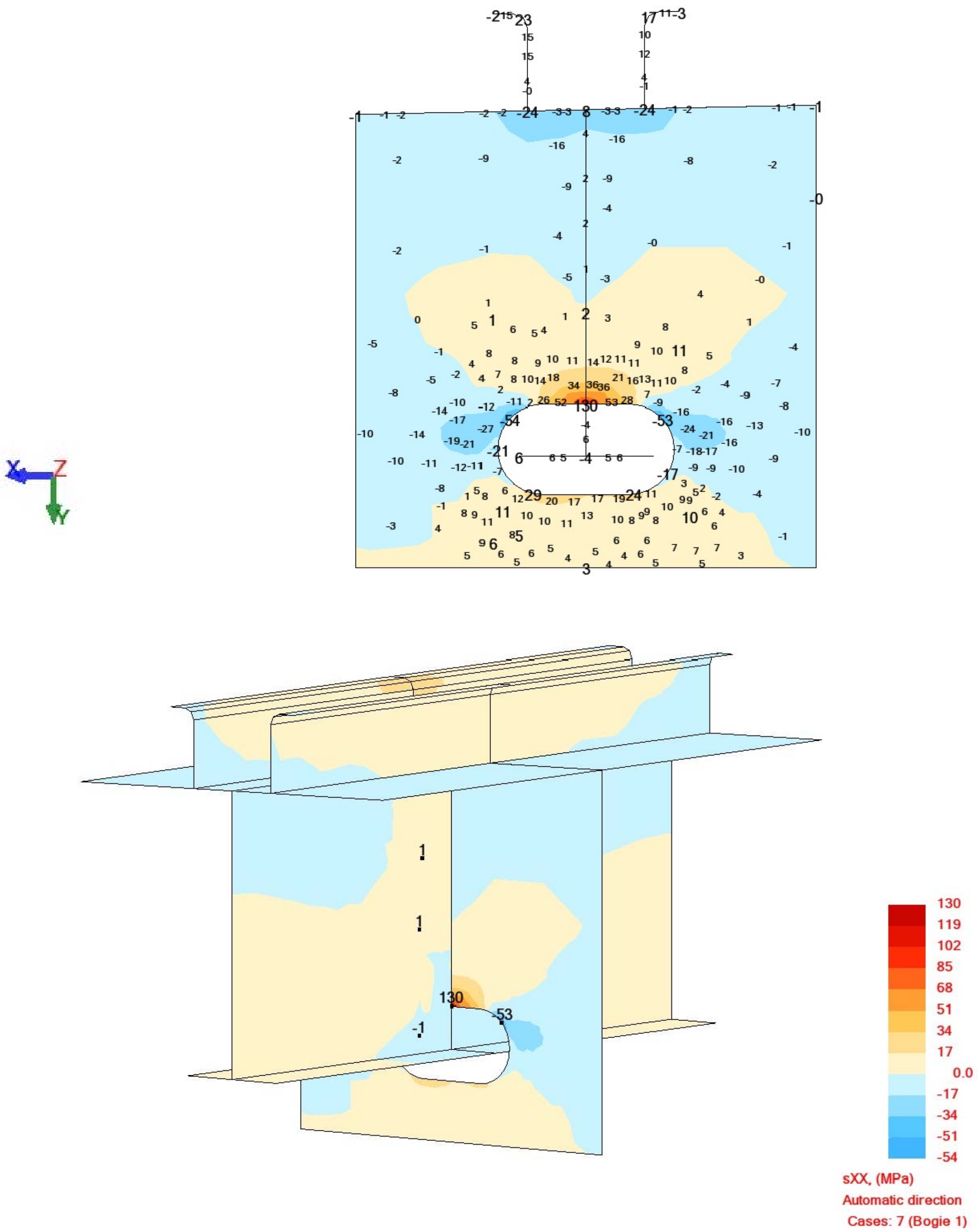


Figure 10-6 Bogie 1 - normal stresses, σ_X, according to the x-axis

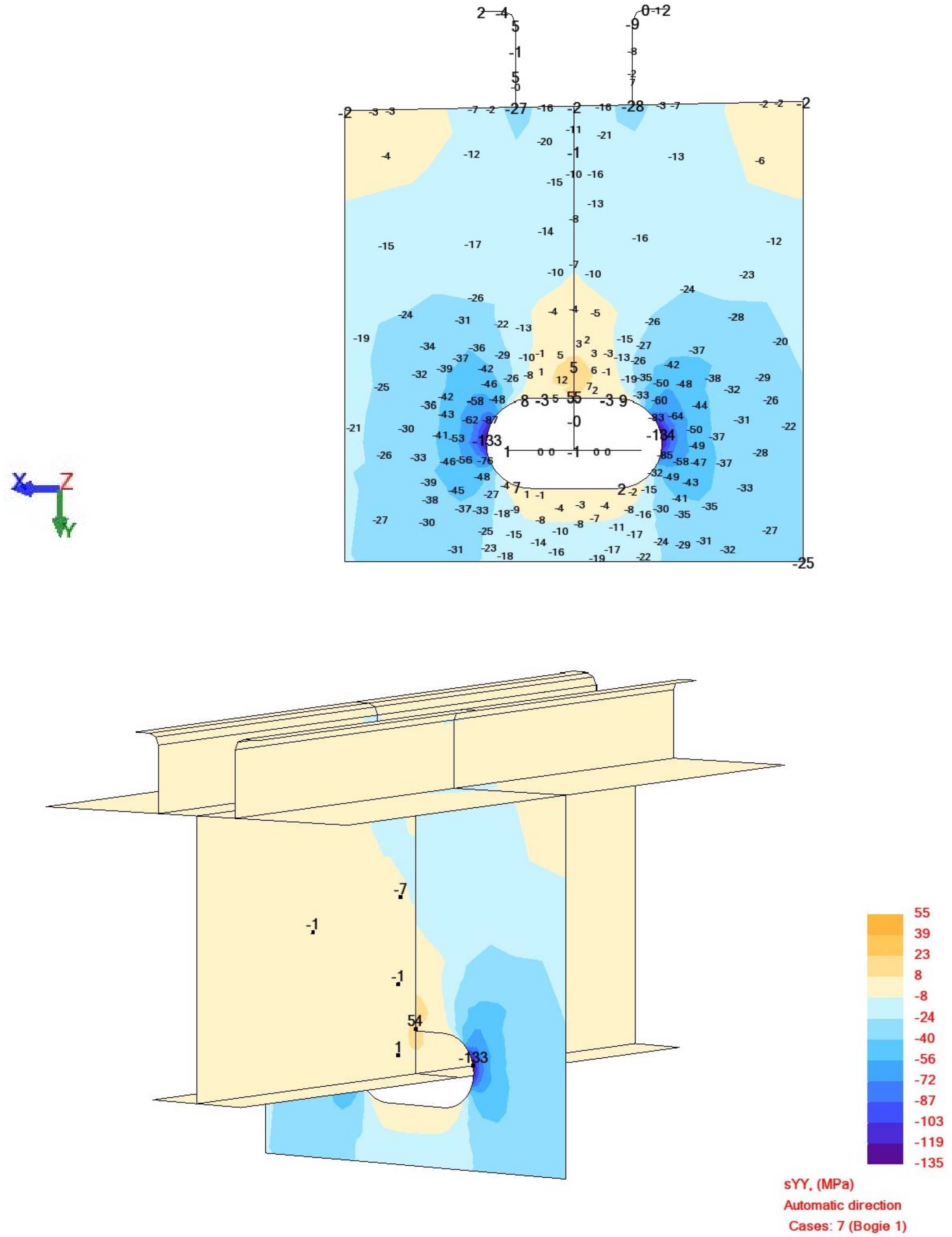


Figure 10-7 Bogie 1 - normal stresses, σ_Y, according to the y-axis

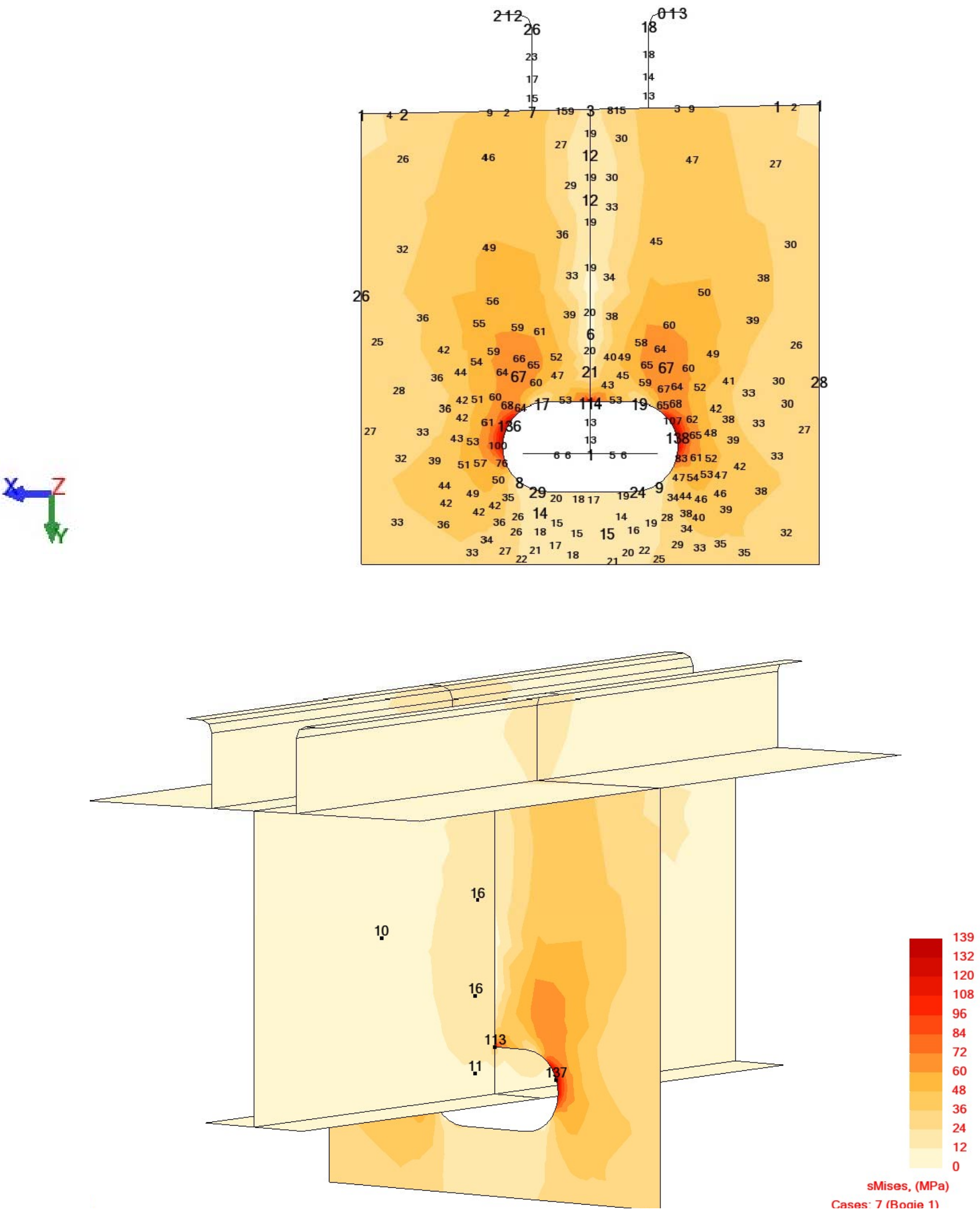


Figure 10-8 Bogie 1 - von Mises stresses, σ_{VM}

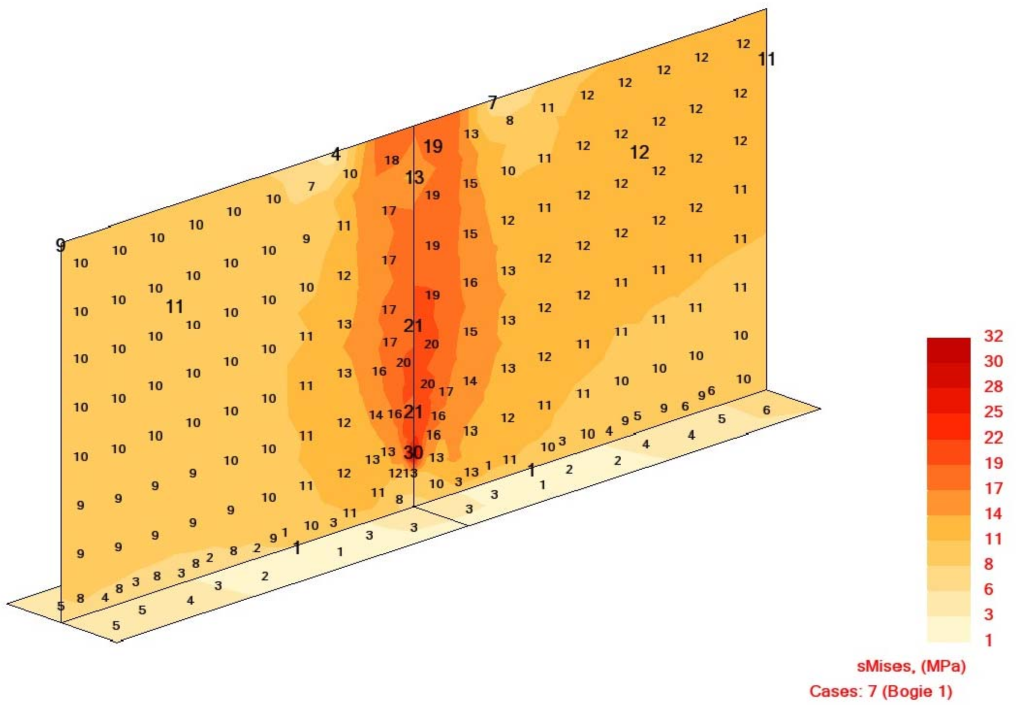


Figure 10-9 Bogie 1 - plot of the von Mises stresses for the T-beam

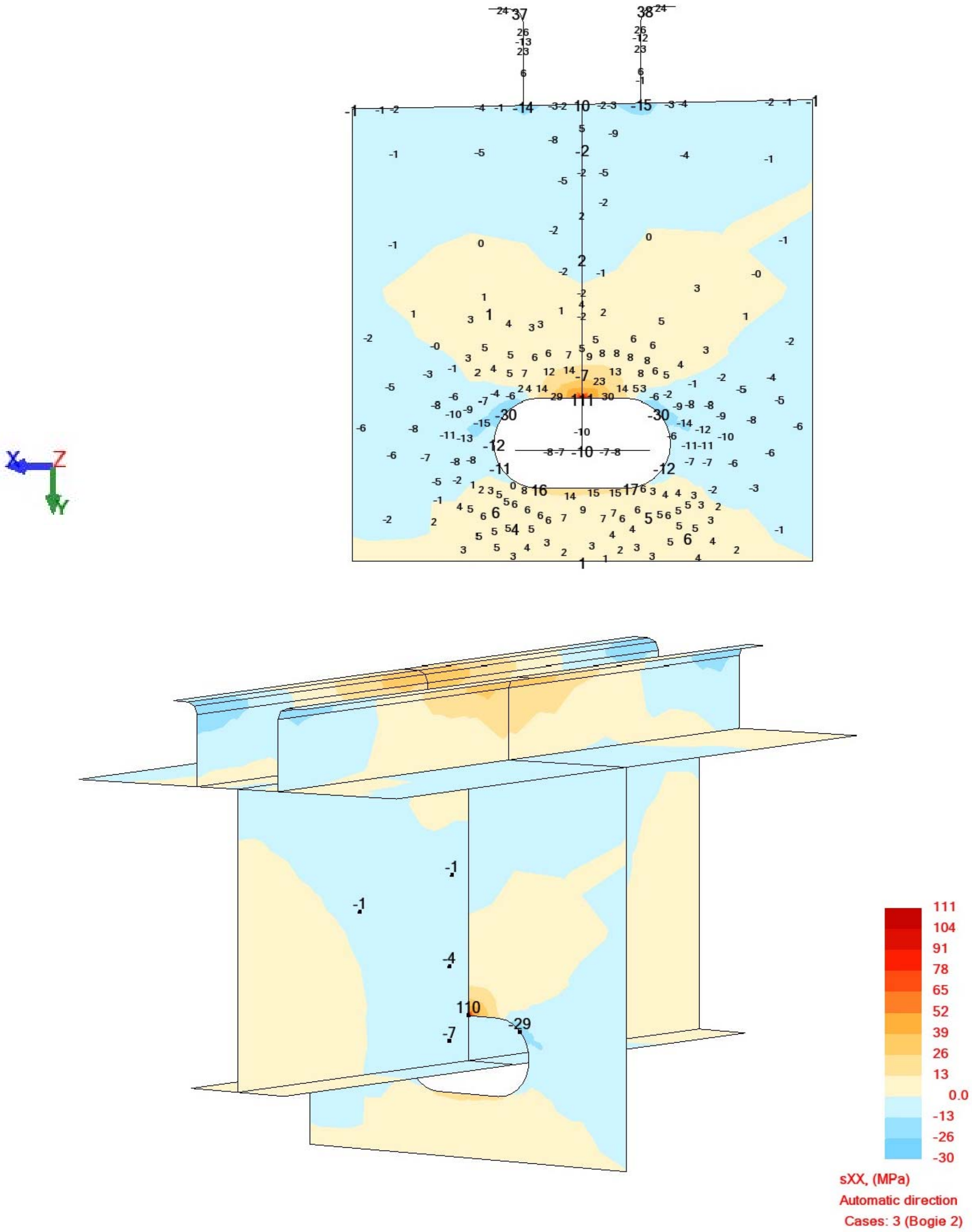


Figure 10-10 Bogie 2 - normal stresses, σ_x, according to the x-axis

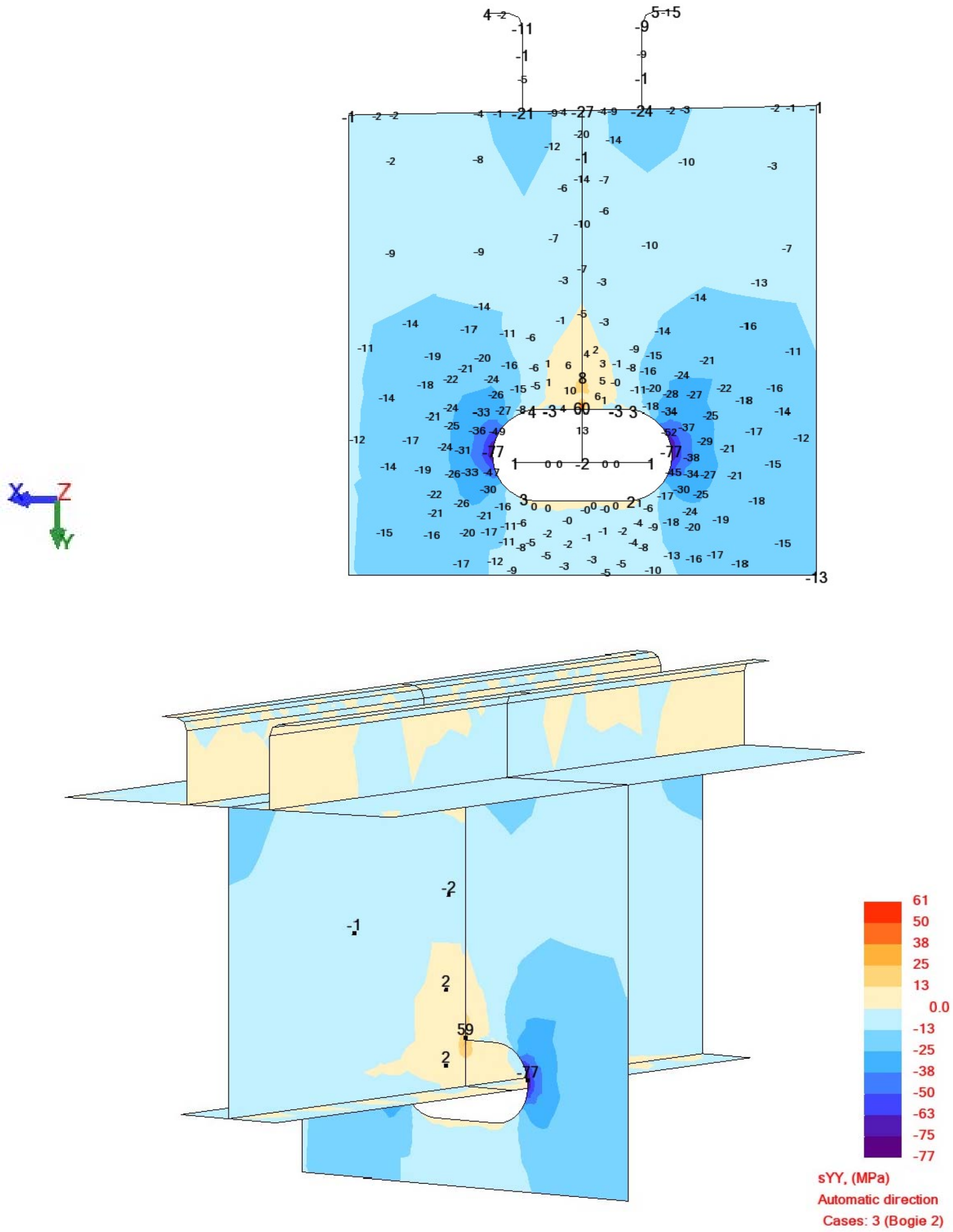


Figure 10-11 Bogie 2 - normal stresses, σ_Y, according to the y-axis

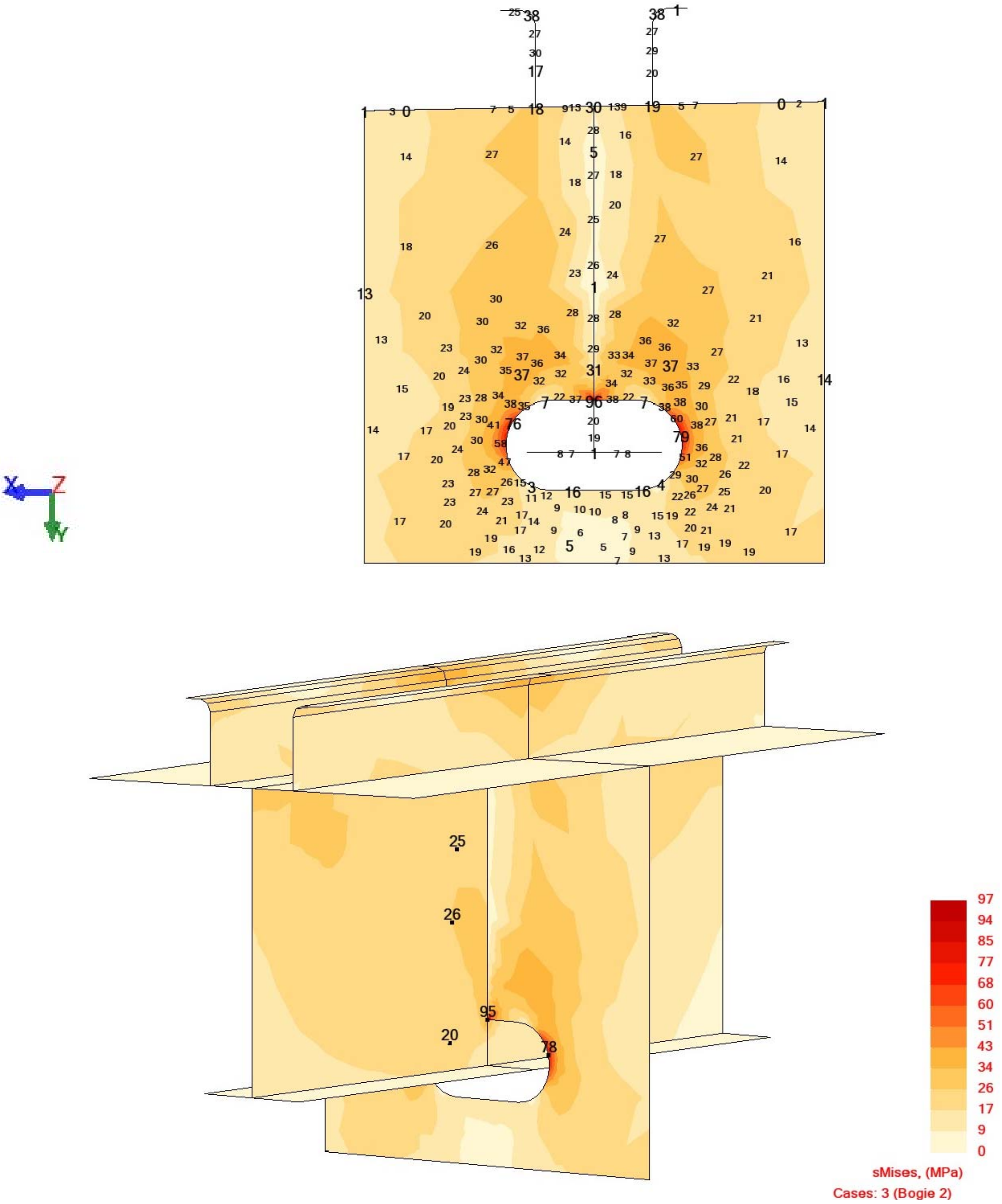


Figure 10-12   Bogie 2 - von Mises stresses, σ_{vM}

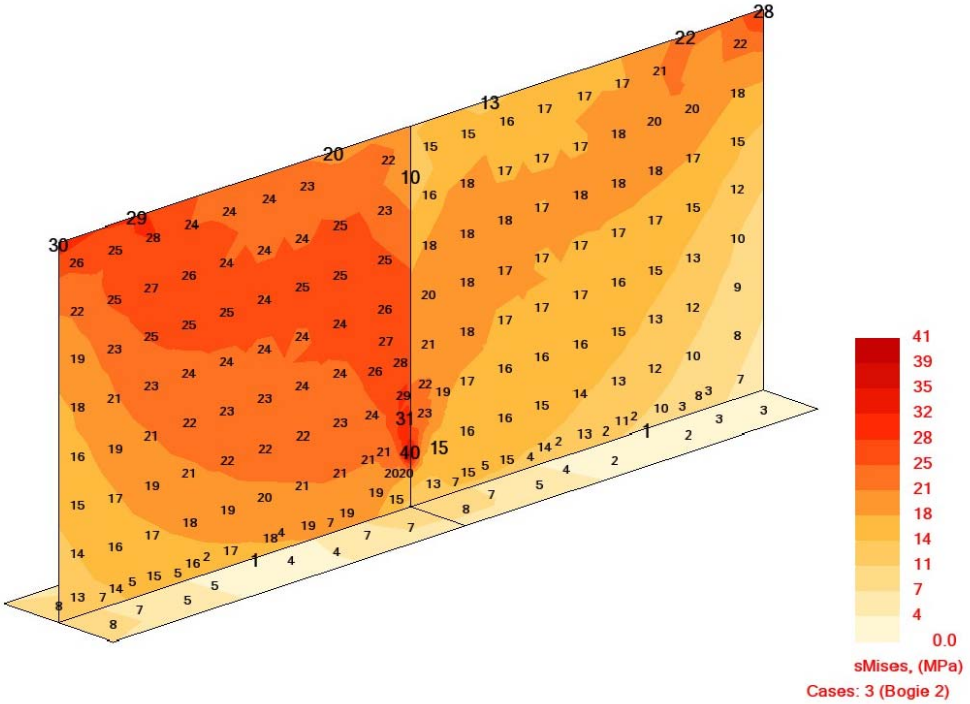


Figure 10-13 Bogie 2 - plot of the von Mises stresses for the T-beam

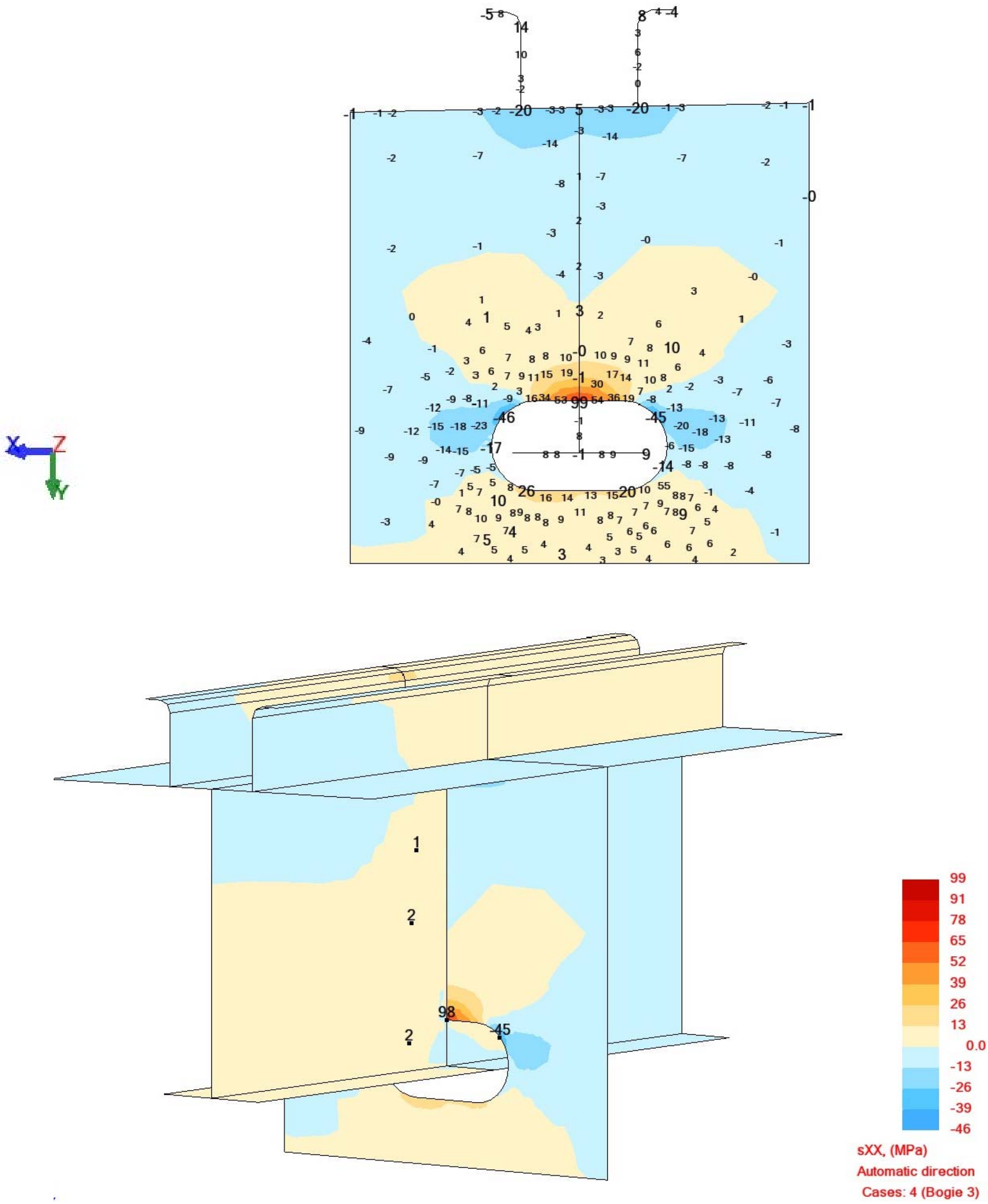


Figure 10-14 Bogie 3 - normal stresses, σ_X, according to the x-axis

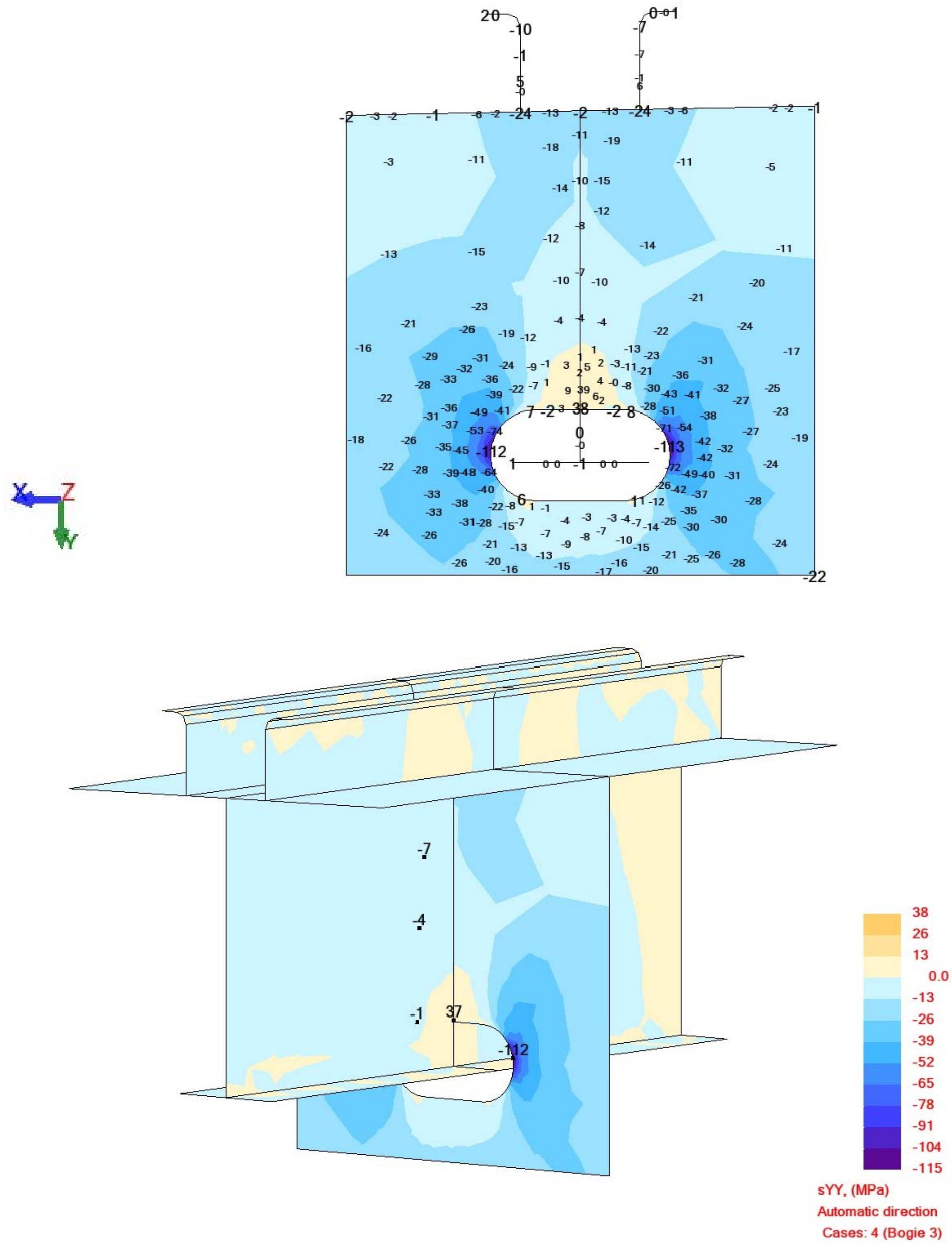


Figure 10-15   Bogie 3 - normal stresses, σ_Y, according to the y-axis

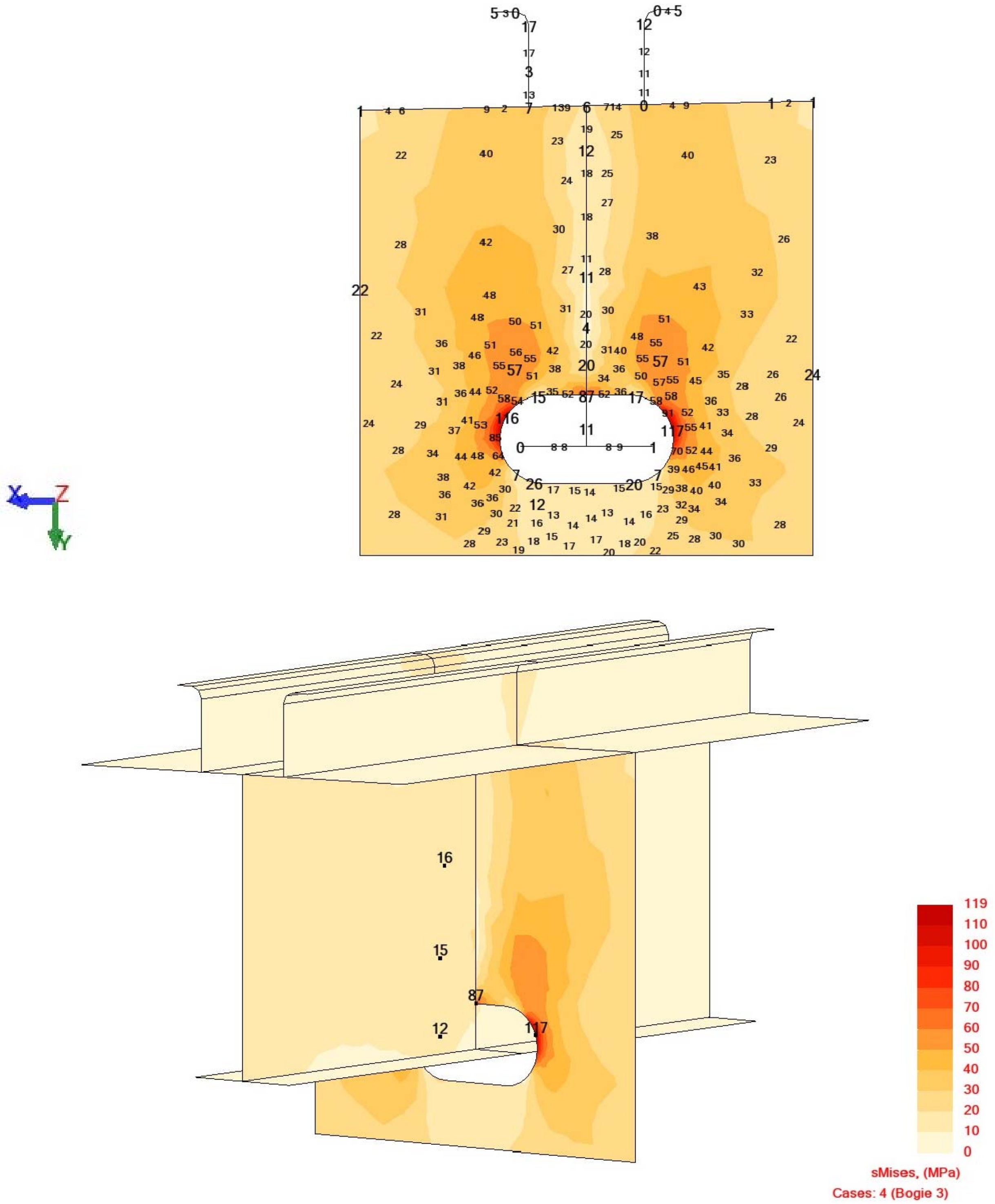


Figure 10-16 Bogie 3 - von Mises stresses, σ_{vM}

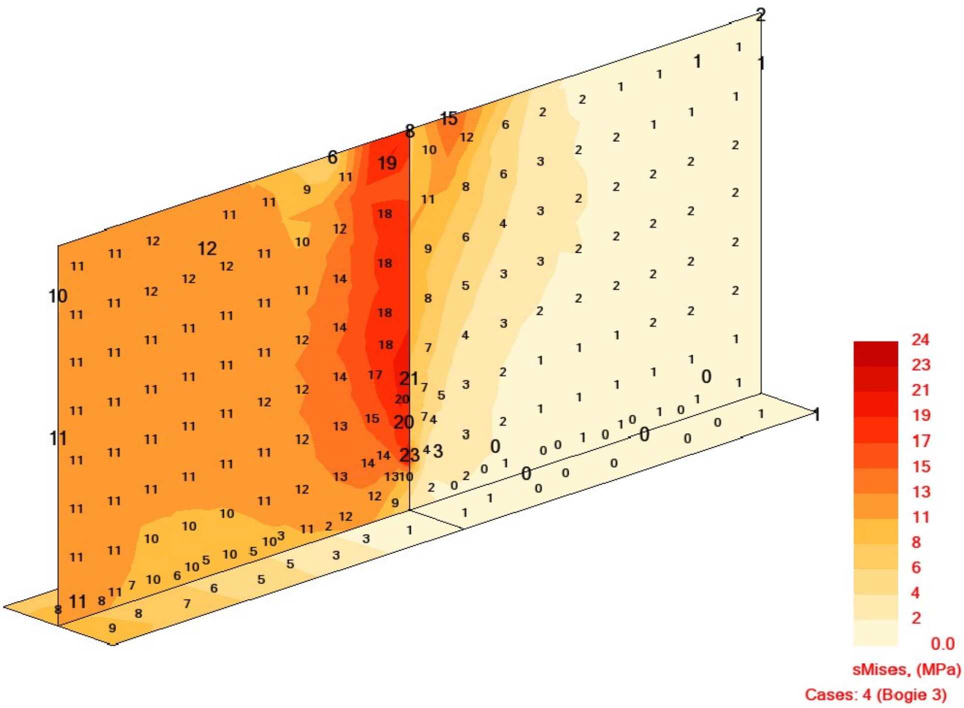


Figure 10-17 Bogie 3 - plot of the von Mises stresses for the T-beam

The stress plots show that load case bogie 1 gives the highest stress level in the diaphragm. In Figure 10-6 the normal stresses in transverse direction, σ_X, are shown. It can be seen that the stress level reaches a maximum value of 130MPa. Due to the geometry a very local stress concentration occurs with the peak stress located where the diaphragm is connected to the web of the T-beam. This point corresponds to fatigue detail category 80, and the construction detail is shown in Figure 10-18.

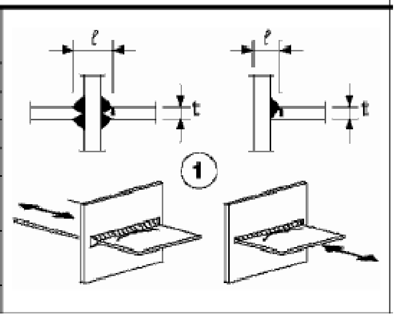
Detail category	Constructional detail		
80	ℓ<50 mm	all t [mm]	
71	50<ℓ≤80	all t	
63	80<ℓ≤100	all t	
56	100<ℓ≤120	all t	
56	ℓ>120	t≤20	
50	120<ℓ≤200 ℓ>200	t>20 20<t≤30	
45	200<ℓ≤300 ℓ>300	t>30 30<t≤50	
40	ℓ>300	t>50	

Figure 10-18 Construction detail for point 1 corresponding to fatigue detail category 80

The constant amplitude fatigue limit, $\Delta\sigma_D$, is calculated according to EN 1993-1-9 clause 7:

$$\Delta\sigma_D = 0.737 \cdot 80MPa = 59MPa$$

The layout of the detail will be further investigated in Progetto Esecutivo where also fatigue tests will be carried out for the detail.

Figure 10-7 shows that the maximum normal stress in the vertical direction is σ_y = -134MPa. The rounding in the cut out in the diaphragm corresponds to detail category 125. The construction detail is shown in Figure 10-19.

125	

Figure 10-19 Construction detail for point 2 corresponding to fatigue detail category 125

The constant amplitude fatigue limit, $\Delta\sigma_D$, is calculated according to EN 1993-1-9 clause 7:

$$\Delta\sigma_D = 0.737 \cdot 125MPa = 92MPa$$

A reduction of the stresses can be made according to EN 1993-1-9. Clause 7.2 describes that a fatigue strength modification can be made for non-welded details in compression. In non-welded details the mean stress influence on the fatigue strength may be taken into account by determining a reduced effective stress range in the fatigue assessment when part or all of the stress cycle is compressive. The effective stress range may be calculated by adding the tensile portion of the stress range and 60% of the magnitude of the compressive portion of the stress range. The tensile portion is approximately zero and the compression stress will be reduced to 80MPa.

Since the tensile stress is approximately zero the stress range of 80MPa is acceptable according to the constant amplitude fatigue limit. With reduction in the compression stress range, the utilisation ratio becomes:

$$UR = \frac{0.60 \cdot 134}{92} MPa = 0.87$$

11 Cross Girder - Fatigue Verification

Fatigue details have been checked for the following cross girders with the associated type and s-coordinates (the zero is assumed in the bridge mid span), see Table 11-1:

Table 11-1 Selected cross girders

Section	s-coord (IBDAS)	Type
27	-990	T1
8	-1560	T1
7	-1590	T3
6	-1620	T4b
5	-1680	T4a
4	-1710	T3
3	-1740	T1
2	-1770	T6
1	-1817.75	T7

The simultaneous applications of roadway and railway loads have been considered also when the detail is loaded by two trains meeting on the bridge.

With the aim of giving a general overview of the fatigue calculation the results are summarised in Table 11-2. The table shows the highest utilization ratios in top and bottom plate for each cross girder and the associated damage according to the Miner's sum. The numbering of the spans is shown on Figure 2-11 and the analysed locations are shown on Figure 2-10. Location 1 is found to be most critical for the bottom plate and location 2 for the top plate.

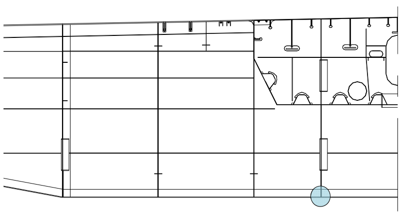
Table 11-2 Summary of critical utilization ratios, cross girders

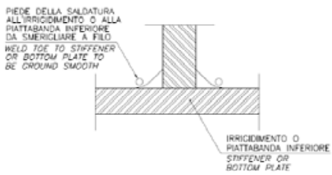
Section	s-coord (IBDAS)	Type	Method	Botttom plate	Top plate
27	-990	T1	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.998	0.971
			Miner: $\Sigma n_i/N_i+0.05$	0.322	0.258
8	-1560	T1	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.990	0.978
			Miner: $\Sigma n_i/N_i+0.05$	0.299	0.262
7	-1590	T3	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.888	0.852
			Miner: $\Sigma n_i/N_i+0.05$	0.188	0.154
6	-1620	T4b	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.789	0.708
			Miner: $\Sigma n_i/N_i+0.05$	0.119	0.093
5	-1680	T4a	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.766	0.610
			Miner: $\Sigma n_i/N_i+0.05$	0.113	0.067
4	-1710	T3	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.870	0.757
			Miner: $\Sigma n_i/N_i+0.05$	0.172	0.110
3	-1740	T1	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.860	0.742
			Miner: $\Sigma n_i/N_i+0.05$	0.168	0.105
2	-1770	T6	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.585	0.694
			Miner: $\Sigma n_i/N_i+0.05$	0.066	0.082
1	-1817.75	T7	U.L.: $\Delta\sigma^*\gamma_{MF}/\Delta\sigma_D$	0.995	0.962
			Miner: $\Sigma n_i/N_i+0.05$	0.289	0.252

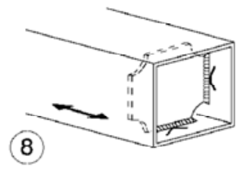
11.1 Cross Girder Section 27 - Type T1

11.1.1 Bottom plate

11.1.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	49.7	1.056	2.0	1.35	**73.5**	<	**73.7**

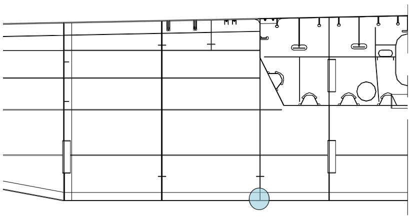
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.998**

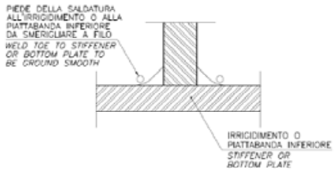
DAMAGE ACCUMULATION METHOD

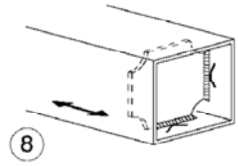
	N/mm^2
EN 1	20.6
EN 2	14.7
EN 3	15.5
EN 4	13.9
EN 5	49.7
EN 6	28.5
EN 7	31.7
EN 8	29.0
LM3	1.7

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.116**		
train on track 2 + LM3 =	**0.046**		
train on track 1 + train on track 2 + LM3=	**0.110**		
tot =	**0.272**	<	**0.950**

11.1.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	48.8	1.056	1.9	1.35	**72.1**	<	**73.7**

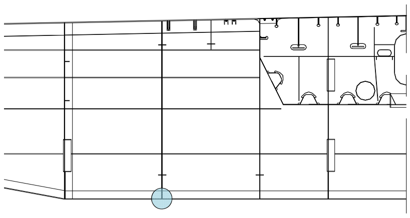
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.979**

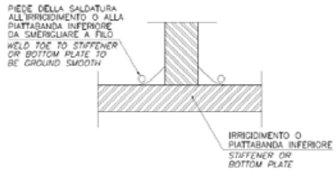
DAMAGE ACCUMULATION METHOD

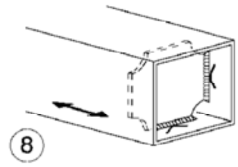
	N/mm^2
EN 1	19.5
EN 2	13.9
EN 3	14.8
EN 4	13.3
EN 5	48.8
EN 6	27.6
EN 7	31.2
EN 8	28.6
LM3	1.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.104**		
train on track 2 + LM3 =	**0.025**		
train on track 1 + train on track 2 + LM3=	**0.088**		
tot =	**0.217**	<	**0.950**

11.1.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_{D}$
EN5 + LM2	46.7	1.056	2.2	1.35	**69.6**	<	**73.7**

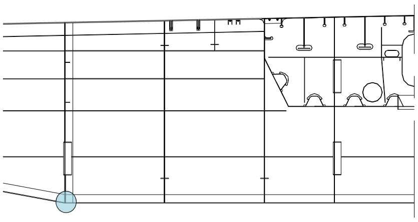
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.944**

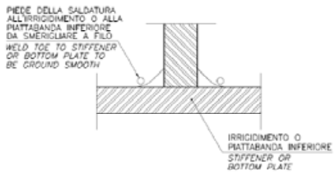
DAMAGE ACCUMULATION METHOD

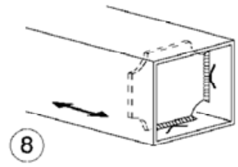
	N/mm^2
EN 1	18.5
EN 2	13.2
EN 3	14.0
EN 4	12.6
EN 5	46.7
EN 6	26.4
EN 7	29.9
EN 8	27.4
LM3	1.8

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.087**		
train on track 2 + LM3 =	**0.012**		
train on track 1 + train on track 2 + LM3=	**0.062**		
tot =	**0.161**	<	**0.950**

11.1.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	42.2	1.056	2.9	1.35	**64.1**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.870**

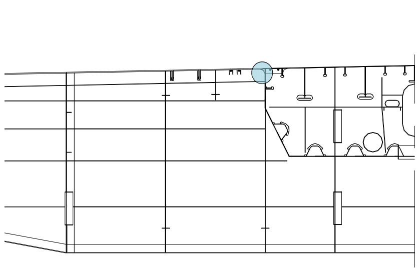
DAMAGE ACCUMULATION METHOD

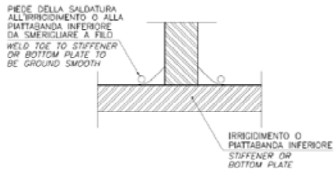
	N/mm^2
EN 1	16.3
EN 2	11.6
EN 3	12.5
EN 4	11.1
EN 5	42.2
EN 6	23.6
EN 7	26.9
EN 8	24.7
LM3	2.4

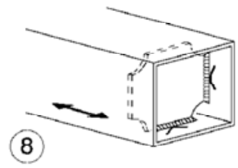
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.049**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.033**		
tot =	**0.081**	<	**0.950**

11.1.2 Top plate

11.1.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	48.4	1.056	1.9	1.35	**71.5**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.971**

DAMAGE ACCUMULATION METHOD

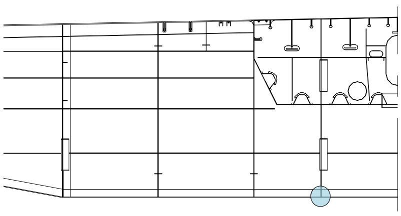
	N/mm^2
EN 1	19.2
EN 2	13.6
EN 3	14.4
EN 4	12.9
EN 5	48.4
EN 6	27.0
EN 7	30.9
EN 8	28.3
LM3	1.5

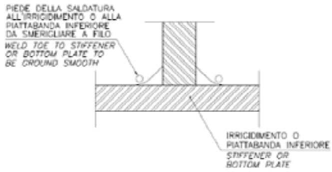
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.100**		
train on track 2 + LM3 =	**0.024**		
train on track 1 + train on track 2 + LM3=	**0.084**		
tot =	**0.208**	<	**0.950**

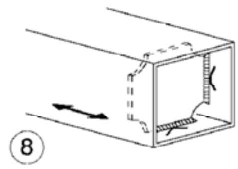
11.2 Cross Girder Section 8 - Type T1

11.2.1 Bottom plate

11.2.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	48.3	1.056	3.1	1.35	**72.9**	<	**73.7**

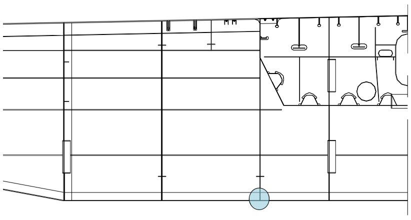
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.990**

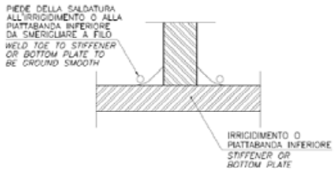
DAMAGE ACCUMULATION METHOD

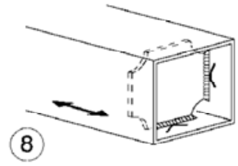
	N/mm^2
EN 1	19.0
EN 2	13.5
EN 3	14.5
EN 4	12.8
EN 5	48.3
EN 6	27.1
EN 7	31.0
EN 8	28.4
LM3	2.4

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.110**		
train on track 2 + LM3 =	**0.044**		
train on track 1 + train on track 2 + LM3=	**0.095**		
tot =	**0.249**	<	**0.950**

11.2.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	47.8	1.056	1.9	1.35	**70.6**	<	**73.7**

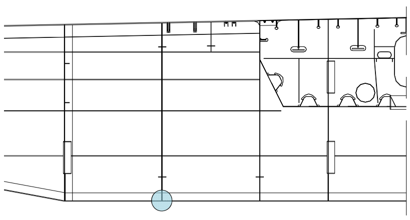
$\Delta\sigma x_{\,tot}$ / $\Delta\sigma_D$	**0.958**

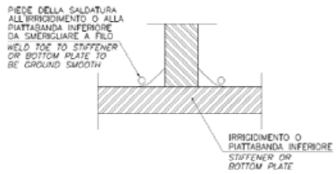
DAMAGE ACCUMULATION METHOD

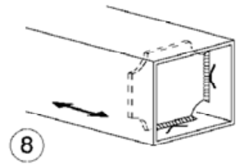
	N/mm^2
EN 1	18.0
EN 2	12.9
EN 3	13.9
EN 4	12.3
EN 5	47.8
EN 6	26.5
EN 7	30.7
EN 8	28.2
LM3	1.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.086**		
train on track 2 + LM3 =	**0.022**		
train on track 1 + train on track 2 + LM3=	**0.078**		
tot =	**0.186**	<	**0.950**

11.2.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	45.3	1.056	1.9	1.35	**67.0**	<	**73.7**

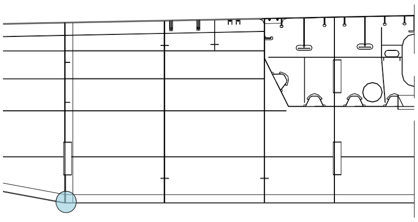
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.910**

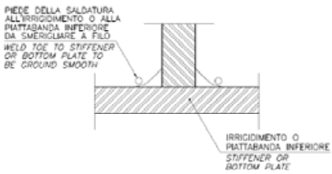
DAMAGE ACCUMULATION METHOD

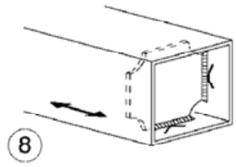
	N/mm^2
EN 1	16.9
EN 2	12.1
EN 3	13.2
EN 4	11.6
EN 5	45.3
EN 6	25.0
EN 7	29.1
EN 8	26.6
LM3	1.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.066**		
train on track 2 + LM3 =	**0.010**		
train on track 1 + train on track 2 + LM3=	**0.052**		
tot =	**0.128**	<	**0.950**

11.2.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	40.9	1.056	2.2	1.35	**61.2**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.831**

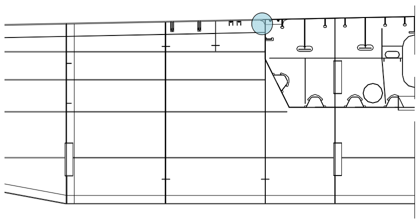
DAMAGE ACCUMULATION METHOD

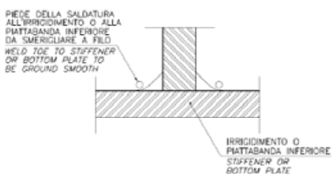
	N/mm^2
EN 1	14.8
EN 2	10.6
EN 3	11.9
EN 4	10.2
EN 5	40.9
EN 6	22.2
EN 7	26.1
EN 8	24.0
LM3	1.8

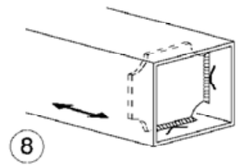
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.039**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.027**		
tot =	**0.066**	<	**0.950**

11.2.2 Top plate

11.2.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	49.1	1.056	1.5	1.35	**72.1**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.978**

DAMAGE ACCUMULATION METHOD

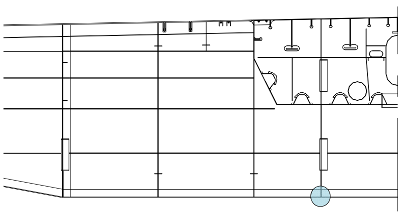
	N/mm^2
EN 1	18.3
EN 2	13.1
EN 3	14.3
EN 4	12.5
EN 5	49.1
EN 6	27.0
EN 7	31.0
EN 8	28.6
LM3	1.2

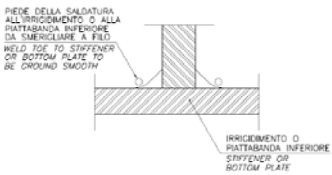
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.103**		
train on track 2 + LM3 =	**0.025**		
train on track 1 + train on track 2 + LM3=	**0.084**		
tot =	**0.212**	<	**0.950**

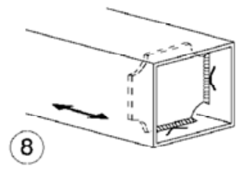
11.3 Cross Girder Section 7 - Type T3

11.3.1 Bottom plate

11.3.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

Unlimited Life Method

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	43.2	1.056	2.9	1.35	**65.5**	<	**73.7**

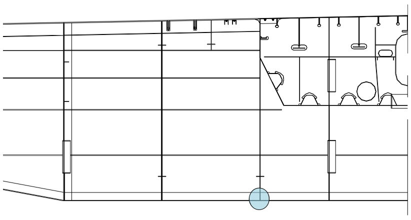
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.888**

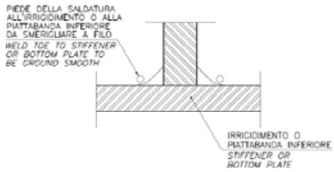
Damage Accumulation Method

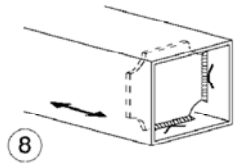
	N/mm^2
EN 1	16.9
EN 2	12.1
EN 3	13.3
EN 4	11.6
EN 5	43.2
EN 6	24.2
EN 7	27.3
EN 8	25.1
LM3	2.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.054**		
train on track 2 + LM3 =	**0.022**		
train on track 1 + train on track 2 + LM3=	**0.062**		
tot =	**0.138**	<	**0.950**

11.3.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	41.0	1.056	1.8	1.35	**60.8**	<	**73.7**

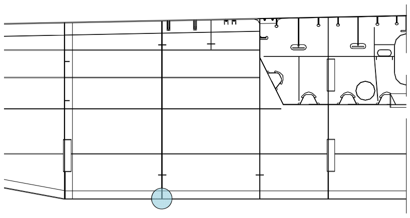
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.825**

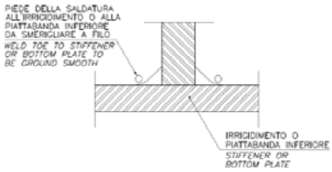
DAMAGE ACCUMULATION METHOD

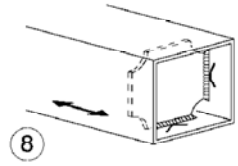
	N/mm^2
EN 1	15.3
EN 2	10.9
EN 3	12.2
EN 4	10.6
EN 5	41.0
EN 6	22.6
EN 7	26.0
EN 8	23.9
LM3	1.5

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.033**		
train on track 2 + LM3 =	**0.011**		
train on track 1 + train on track 2 + LM3=	**0.042**		
tot =	**0.086**	<	**0.950**

11.3.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.0	1.056	1.8	1.35	**58.1**	<	**73.7**

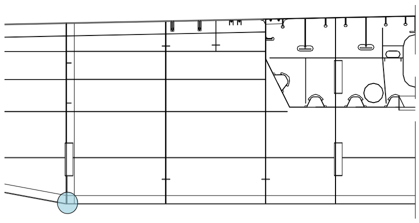
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.789**

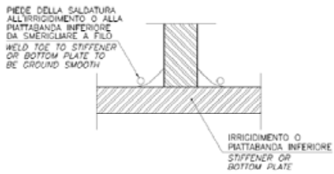
DAMAGE ACCUMULATION METHOD

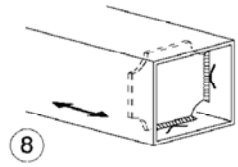
	N/mm^2
EN 1	14.3
EN 2	10.2
EN 3	11.4
EN 4	10.0
EN 5	39.0
EN 6	21.4
EN 7	24.9
EN 8	22.8
LM3	1.5

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.026**		
train on track 2 + LM3 =	**0.005**		
train on track 1 + train on track 2 + LM3=	**0.027**		
tot =	**0.059**	<	**0.950**

11.3.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	36.8	1.056	1.8	1.35	**54.9**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.744**

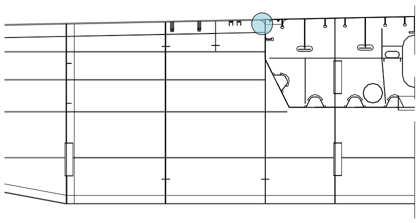
DAMAGE ACCUMULATION METHOD

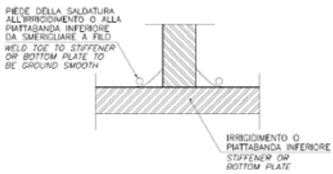
	N/mm^2
EN 1	12.8
EN 2	9.2
EN 3	10.7
EN 4	9.0
EN 5	36.8
EN 6	19.9
EN 7	23.6
EN 8	21.6
LM3	1.5

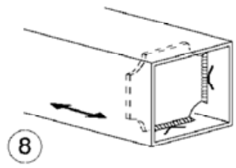
Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.020**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.016**		
tot =	**0.036**	<	**0.950**

11.3.2 Top plate

11.3.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	42.5	1.056	1.6	1.35	**62.8**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.852**

DAMAGE ACCUMULATION METHOD

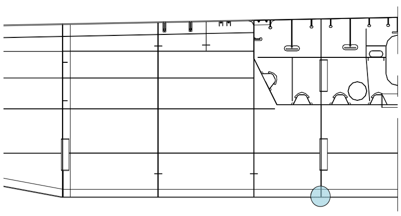
	N/mm^2
EN 1	14.6
EN 2	10.5
EN 3	12.3
EN 4	10.6
EN 5	42.5
EN 6	23.3
EN 7	27.0
EN 8	24.8
LM3	1.3

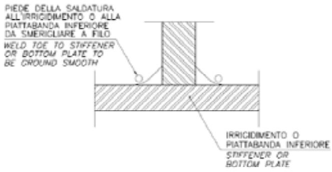
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.045**		
train on track 2 + LM3 =	**0.012**		
train on track 1 + train on track 2 + LM3=	**0.047**		
tot =	**0.104**	<	**0.950**

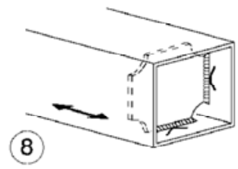
11.4 Cross Girder Section 6 - Type T4b

11.4.1 Bottom plate

11.4.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.0	1.056	2.9	1.35	**58.1**	<	**73.7**

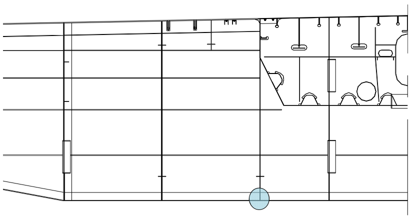
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.789**

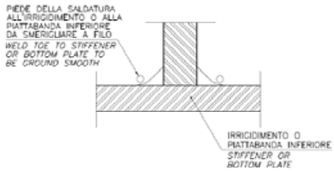
DAMAGE ACCUMULATION METHOD

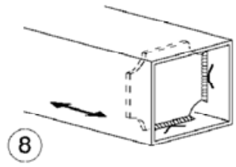
	N/mm^2
EN 1	12.3
EN 2	9.1
EN 3	12.4
EN 4	9.0
EN 5	38.0
EN 6	21.4
EN 7	21.8
EN 8	20.7
LM3	2.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.025**		
train on track 2 + LM3 =	**0.012**		
train on track 1 + train on track 2 + LM3=	**0.031**		
tot =	**0.069**	<	**0.950**

11.4.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	29.0	1.056	1.7	1.35	**43.5**	<	**73.7**

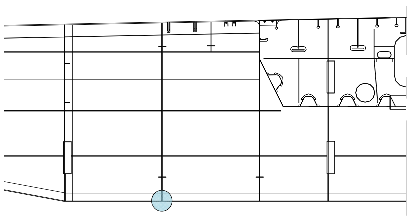
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.590**

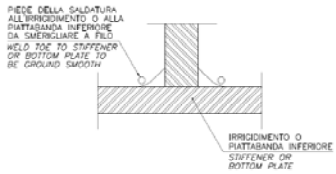
DAMAGE ACCUMULATION METHOD

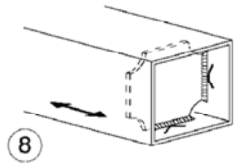
	N/mm^2
EN 1	9.4
EN 2	6.9
EN 3	9.4
EN 4	6.8
EN 5	29.0
EN 6	16.3
EN 7	16.7
EN 8	15.8
LM3	1.3

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.006**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.007**		
tot =	**0.013**	<	**0.950**

11.4.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	25.9	1.056	1.5	1.35	**38.8**	<	**73.7**

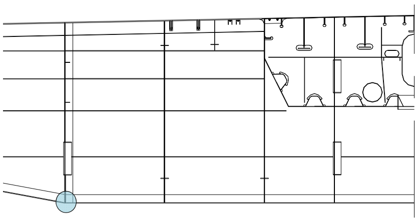
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.527**

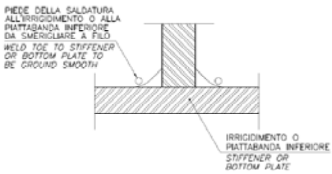
DAMAGE ACCUMULATION METHOD

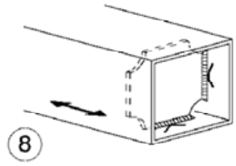
	N/mm^2
EN 1	8.4
EN 2	6.2
EN 3	8.2
EN 4	6.1
EN 5	25.9
EN 6	14.4
EN 7	15.2
EN 8	14.3
LM3	1.2

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.003**		
tot =	**0.003**	<	**0.950**

11.4.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,Wl}$	$\Delta\sigma_{D\,Wl}$	$\Delta\sigma_{L\,Wl}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.0	1.056	1.3	1.35	**38.9**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.527**

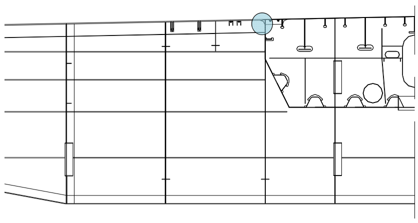
DAMAGE ACCUMULATION METHOD

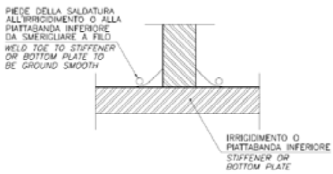
	N/mm²
EN 1	8.4
EN 2	6.2
EN 3	8.1
EN 4	6.2
EN 5	26.0
EN 6	14.4
EN 7	15.5
EN 8	14.6
LM3	1.1

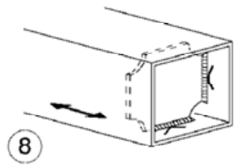
Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.002**		
tot =	**0.002**	<	**0.950**

11.4.2 Top plate

11.4.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	35.8	1.056	0.8	1.35	**52.1**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.708**

DAMAGE ACCUMULATION METHOD

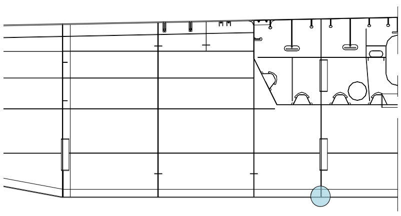
	N/mm^2
EN 1	11.1
EN 2	8.0
EN 3	10.4
EN 4	8.1
EN 5	35.8
EN 6	19.8
EN 7	23.4
EN 8	21.2
LM3	0.8

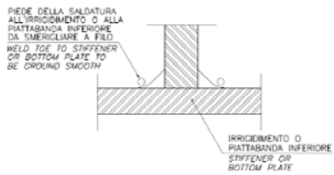
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.016**		
train on track 2 + LM3 =	**0.005**		
train on track 1 + train on track 2 + LM3=	**0.022**		
tot =	**0.043**	<	**0.950**

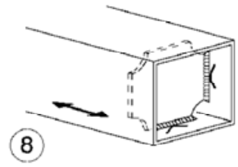
11.5 Cross Girder Section 5 - Type T4a

11.5.1 Bottom plate

11.5.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.2	1.056	2.6	1.35	**56.4**	<	**73.7**

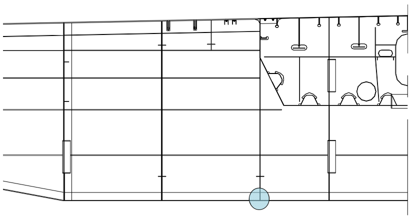
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.766**

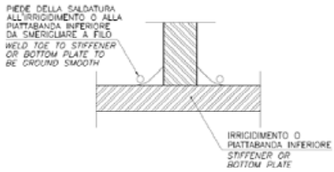
DAMAGE ACCUMULATION METHOD

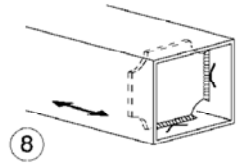
	N/mm^2
EN 1	12.8
EN 2	9.4
EN 3	12.0
EN 4	9.2
EN 5	37.2
EN 6	20.9
EN 7	22.7
EN 8	21.1
LM3	2.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.022**		
train on track 2 + LM3 =	**0.010**		
train on track 1 + train on track 2 + LM3=	**0.031**		
tot =	**0.063**	<	**0.950**

11.5.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	34.4	1.056	1.5	1.35	**51.2**	<	**73.7**

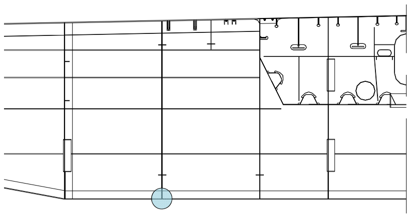
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.694**

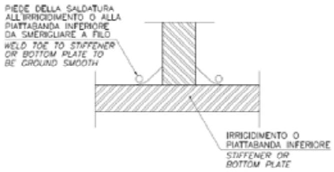
DAMAGE ACCUMULATION METHOD

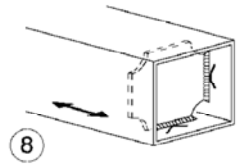
	N/mm^2
EN 1	11.5
EN 2	8.5
EN 3	10.8
EN 4	8.4
EN 5	34.4
EN 6	19.2
EN 7	21.0
EN 8	19.5
LM3	1.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.014**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.018**		
tot =	**0.032**	<	**0.950**

11.5.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	31.3	1.056	1.7	1.35	**47.0**	<	**73.7**

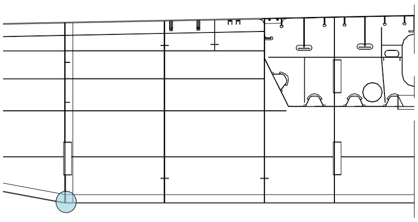
$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.638**

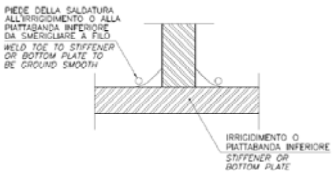
DAMAGE ACCUMULATION METHOD

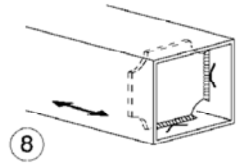
	N/mm^2
EN 1	10.6
EN 2	7.8
EN 3	10.1
EN 4	7.7
EN 5	31.3
EN 6	17.7
EN 7	19.1
EN 8	17.8
LM3	1.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.009**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.009**		
tot =	**0.018**	<	**0.950**

11.5.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.1	1.056	1.6	1.35	**42.2**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.572**

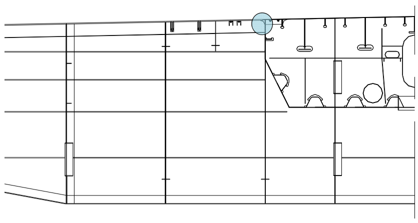
DAMAGE ACCUMULATION METHOD

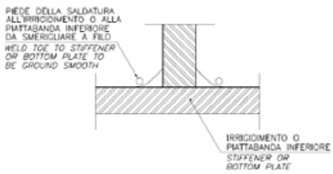
	N/mm^2
EN 1	9.4
EN 2	7.0
EN 3	9.1
EN 4	6.8
EN 5	28.1
EN 6	15.9
EN 7	17.1
EN 8	15.9
LM3	1.3

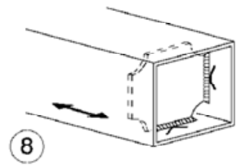
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.005**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.003**		
tot =	**0.009**	<	**0.950**

11.5.2 Top plate

11.5.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

Unlimited life method

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	30.5	1.056	1.1	1.35	**45.0**	<	**73.7**

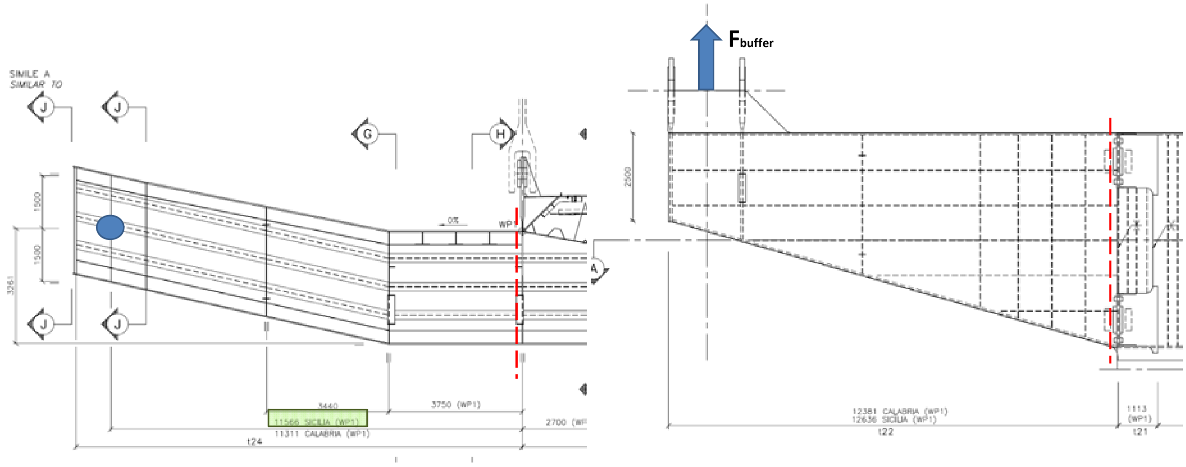
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.610**

Damage accumulation method

	N/mm^2
EN 1	10.1
EN 2	7.4
EN 3	9.6
EN 4	7.1
EN 5	30.5
EN 6	17.1
EN 7	18.8
EN 8	17.4
LM3	0.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.007**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.010**		
tot =	**0.017**	<	**0.950**

11.5.3 T4a – buffer fatigue verification



The fatigue verification of the extension of T4a has been made in correspondence of the hanger's diaphragm. Conservatively in the calculation has been taken the bending moment M_z due to the buffers force F summed to M_x effect due to the vertical displacement of the girder due to the train passage. The vertical displacement, in order to simplify the calculation, has been assumed as the maximum displacement in the SLS2 equal to 1,55m for all the trains and roadway vehicles.

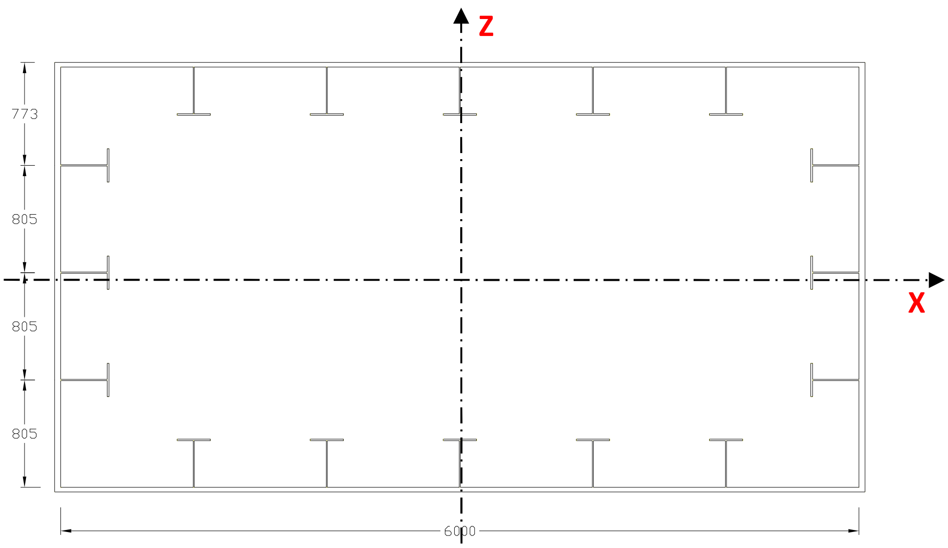


Figure 11-1 Section verified

Following is explained the calculation for the stress given by the EN5 train, all the others are similar.

In the IBDAS model is possible to get the total force applied to the buffers at the two end of the T4a. In the Figure 11-2 is shown the variation of the force in the whole system of buffers due to the train EN5.

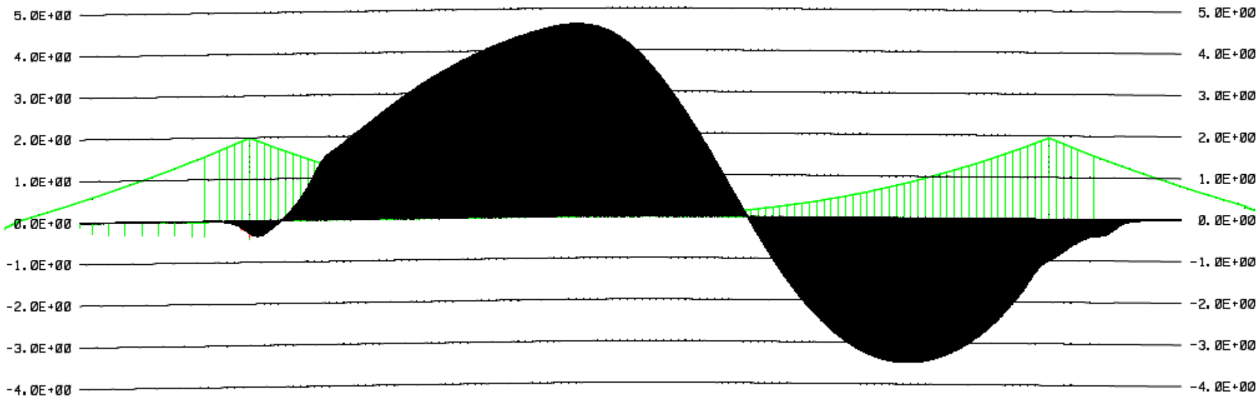


Figure 11-2 total variation of force in the buffers due to train EN5

The total variation of the force given by the EN5 is:

3.478 + 4.623 = 8.101MN

To work out the bending moment acting on one side of the T4a is necessary to divide by 2 this number:

F = 8.101 / 2 = 4.05MN

The bending moment M_z is given by:

$$M_z = F \cdot b = 4.05 \cdot 11.566 = 46.8MNm$$

$$\sigma_z = {M_z}/{W_z} = {46.8MNm}/{1.45E+09m^3} = 32.3\,{N}/{mm^2}$$

The bending moment M_x is given by:

$$M_x = F_v \cdot b = 0.391 \cdot 11.566 = 4.5MNm$$

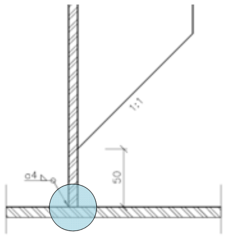
$$\sigma_z = {M_x}/{W_x} = {4.5MNm}/{9.11E+08m^3} = 5.0\,{N}/{mm^2}$$

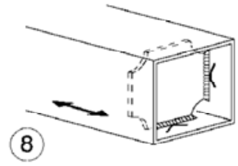
Where:

$$F_v = F \sin\alpha = 4.05 \cdot arctg\left({1.55}/{16}\right) = 0.391MN$$

Thereby in one corner of the section there will be a total stress of:

$$\sigma_{ztot} = 32.3 + 5.0 = 37.3\,{N}/{mm^2}$$





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.3	1.056	1.1	1.35	**54.7**	<	**58.9**

DAMAGE ACCUMULATION METHOD

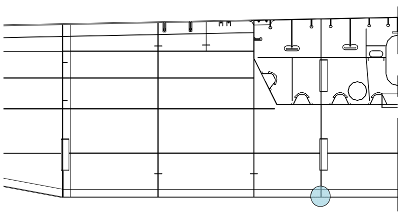
	N/mm^2
EN 1	11.4
EN 2	9.1
EN 3	16.0
EN 4	8.8
EN 5	37.3
EN 6	24.6
EN 7	18.0
EN 8	18.0
LM3	0.8

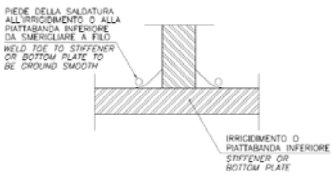
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.074**		
train on track 2 + LM3 =	**0.074**		
train on track 1 + train on track 2 + LM3 =	**0.104**		
tot =	**0.252**	<	**0.950**

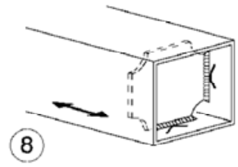
11.6 Cross Girder Section 4 - Type T3

11.6.1 Bottom plate

11.6.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	42.3	1.056	2.8	1.35	64.1	<	73.7

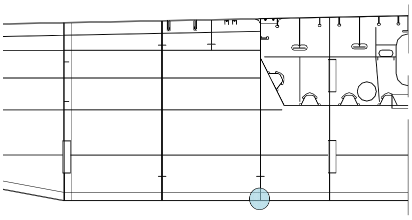
$\Delta\sigma x_{tot} / \Delta\sigma_D$	0.870

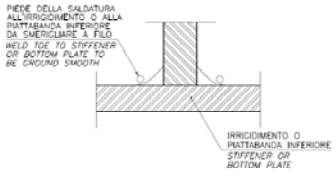
DAMAGE ACCUMULATION METHOD

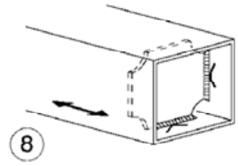
	N/mm^2
EN 1	15.6
EN 2	11.1
EN 3	12.7
EN 4	10.7
EN 5	42.3
EN 6	23.6
EN 7	26.5
EN 8	24.3
LM3	2.2

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	0.048		
train on track 2 + LM3 =	0.020		
train on track 1 + train on track 2 + LM3=	0.054		
tot =	0.122	<	0.950

11.6.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.1	1.056	1.7	1.35	**58.1**	<	**73.7**

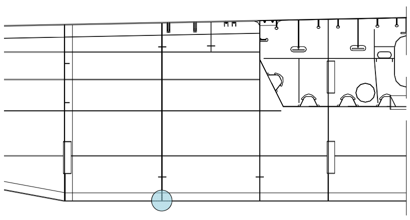
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.789**

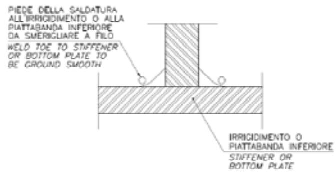
DAMAGE ACCUMULATION METHOD

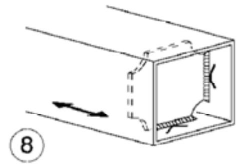
	N/mm^2
EN 1	13.9
EN 2	9.9
EN 3	11.7
EN 4	9.6
EN 5	39.1
EN 6	21.6
EN 7	24.5
EN 8	22.5
LM3	1.4

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.026**		
train on track 2 + LM3 =	**0.009**		
train on track 1 + train on track 2 + LM3=	**0.034**		
tot =	**0.069**	<	**0.950**

11.6.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	36.1	1.056	1.7	1.35	**53.7**	<	**73.7**

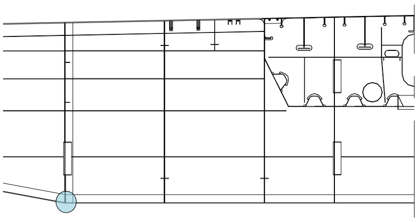
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.729**

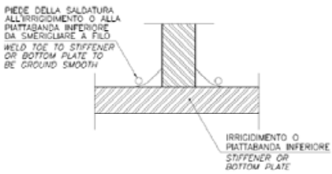
DAMAGE ACCUMULATION METHOD

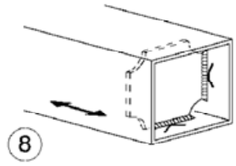
	N/mm²
EN 1	13.1
EN 2	9.3
EN 3	10.7
EN 4	9.0
EN 5	36.1
EN 6	19.8
EN 7	22.9
EN 8	21.0
LM3	1.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.018**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.019**		
tot =	**0.037**	<	**0.950**

11.6.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.8	1.056	1.4	1.35	**48.7**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.661**

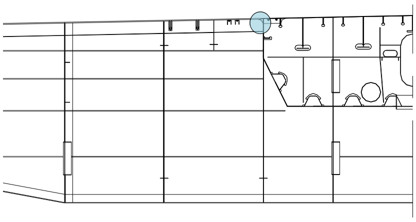
DAMAGE ACCUMULATION METHOD

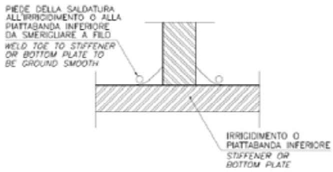
	N/mm^2
EN 1	11.7
EN 2	8.4
EN 3	9.6
EN 4	8.1
EN 5	32.8
EN 6	17.8
EN 7	20.8
EN 8	19.1
LM3	1.2

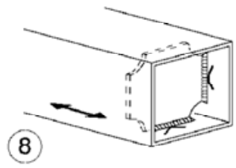
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.011**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.009**		
tot =	**0.020**	<	**0.950**

11.6.2 Top plate

11.6.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.1	1.056	1.1	1.35	**55.8**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.757**

DAMAGE ACCUMULATION METHOD

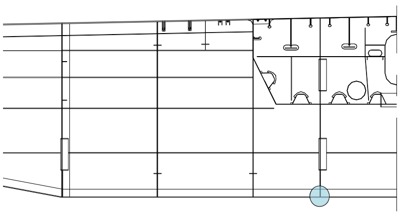
	N/mm²
EN 1	14.7
EN 2	10.4
EN 3	11.5
EN 4	10.6
EN 5	38.1
EN 6	21.3
EN 7	23.6
EN 8	21.7
LM3	1.0

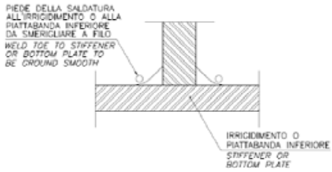
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.022**		
train on track 2 + LM3 =	**0.007**		
train on track 1 + train on track 2 + LM3=	**0.031**		
tot =	**0.060**	<	**0.950**

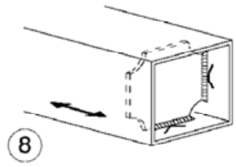
11.7 Cross Girder Section 3 - Type T1

11.7.1 Bottom plate

11.7.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	41.3	1.056	3.3	1.35	**63.4**	<	**73.7**

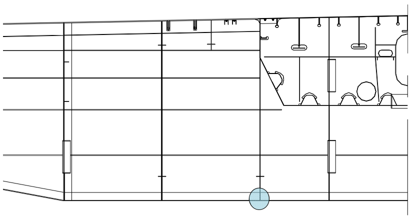
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.860**

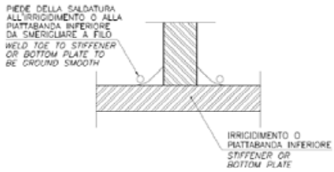
DAMAGE ACCUMULATION METHOD

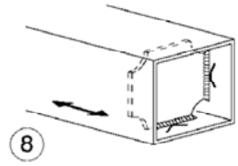
	N/mm^2
EN 1	16.7
EN 2	11.8
EN 3	12.7
EN 4	11.4
EN 5	41.3
EN 6	23.3
EN 7	26.4
EN 8	24.2
LM3	2.6

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.046**		
train on track 2 + LM3 =	**0.019**		
train on track 1 + train on track 2 + LM3=	**0.053**		
tot =	**0.118**	<	**0.950**

11.7.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	39.8	1.056	1.9	1.35	**59.3**	<	**73.7**

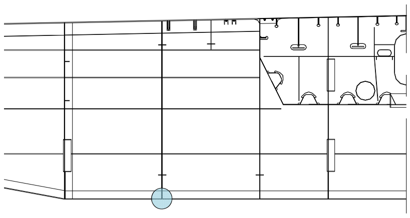
$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.805**

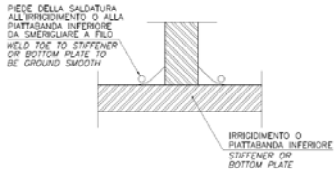
DAMAGE ACCUMULATION METHOD

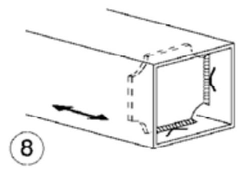
	N/mm^2
EN 1	15.4
EN 2	10.9
EN 3	12.0
EN 4	10.7
EN 5	39.8
EN 6	22.1
EN 7	25.3
EN 8	23.2
LM3	1.6

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.029**		
train on track 2 + LM3 =	**0.009**		
train on track 1 + train on track 2 + LM3=	**0.038**		
tot =	**0.077**	<	**0.950**

11.7.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.8	1.056	2.0	1.35	**56.6**	<	**73.7**

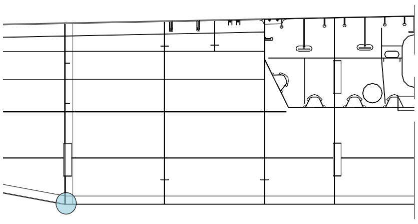
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.768**

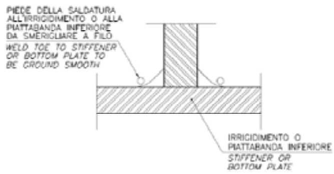
DAMAGE ACCUMULATION METHOD

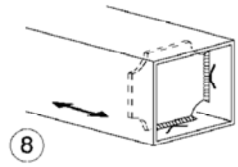
	N/mm^2
EN 1	14.6
EN 2	10.4
EN 3	11.4
EN 4	10.1
EN 5	37.8
EN 6	21.0
EN 7	24.0
EN 8	22.0
LM3	1.7

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.023**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.025**		
tot =	**0.048**	<	**0.95**

11.7.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	33.6	1.056	1.7	1.35	**50.2**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.681**

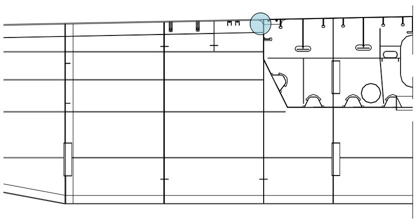
DAMAGE ACCUMULATION METHOD

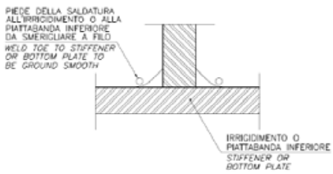
	N/mm^2
EN 1	12.6
EN 2	9.0
EN 3	9.9
EN 4	8.8
EN 5	33.6
EN 6	18.5
EN 7	21.2
EN 8	19.4
LM3	1.4

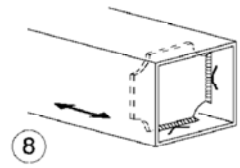
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.013**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.010**		
tot =	**0.023**	<	**0.95**

11.7.2 Top plate

11.7.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	37.2	1.056	1.2	1.35	**54.7**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.742**

DAMAGE ACCUMULATION METHOD

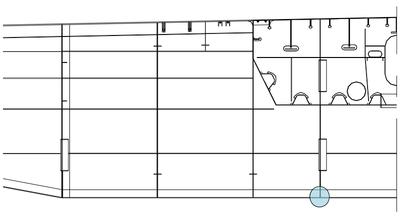
	N/mm^2
EN 1	14.7
EN 2	10.5
EN 3	11.5
EN 4	10.1
EN 5	37.2
EN 6	20.6
EN 7	23.3
EN 8	21.3
LM3	1.0

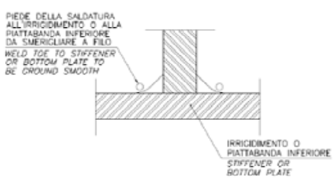
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.020**		
train on track 2 + LM3 =	**0.006**		
train on track 1 + train on track 2 + LM3=	**0.029**		
tot =	**0.055**	<	**0.95**

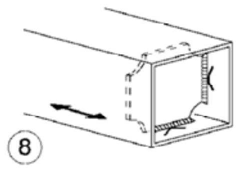
11.8 Cross Girder Section 2 - Type T6

11.8.1 Bottom plate

11.8.1.1 Bottom plate to diaphragm weld – location 1







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.6	1.056	1.7	1.35	**43.1**	<	**73.7**

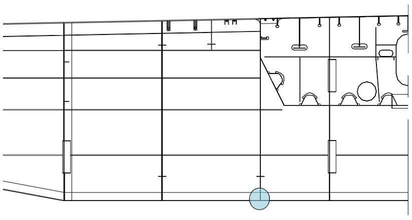
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.585**

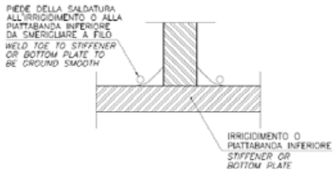
DAMAGE ACCUMULATION METHOD

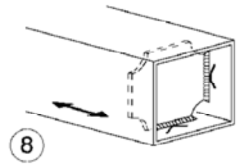
	N/mm^2
EN 1	11.6
EN 2	8.2
EN 3	8.9
EN 4	7.9
EN 5	28.6
EN 6	15.9
EN 7	18.9
EN 8	17.7
LM3	1.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.006**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.010**		
tot =	**0.016**	<	0.95

11.8.1.2 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	28.6	1.056	1.1	1.35	**42.3**	<	**73.7**

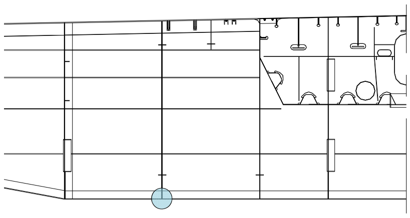
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.574**

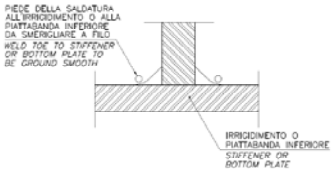
DAMAGE ACCUMULATION METHOD

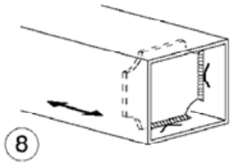
	N/mm^2
EN 1	11.2
EN 2	8.0
EN 3	8.8
EN 4	7.7
EN 5	28.6
EN 6	15.7
EN 7	18.6
EN 8	17.4
LM3	1.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.005**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.008**		
tot =	**0.013**	<	**0.95**

11.8.1.3 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.3	1.056	1.1	1.35	**38.9**	<	**73.7**

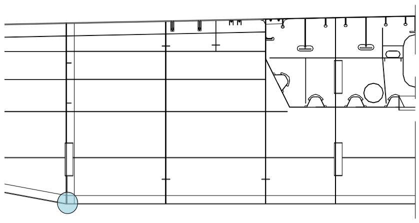
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.529**

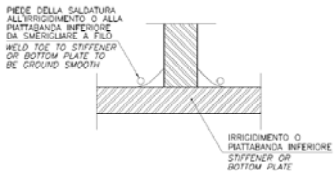
DAMAGE ACCUMULATION METHOD

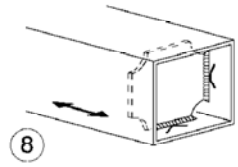
	N/mm²
EN 1	10.2
EN 2	7.3
EN 3	7.9
EN 4	7.0
EN 5	26.3
EN 6	14.3
EN 7	16.9
EN 8	15.8
LM3	1.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.003**		
tot =	**0.003**	<	**0.95**

11.8.1.4 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	26.7	1.056	1.6	1.35	**40.1**	<	**73.7**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.545**

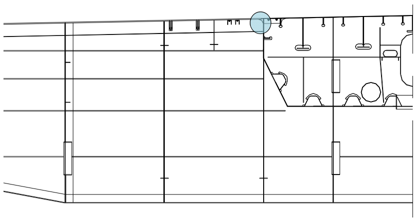
DAMAGE ACCUMULATION METHOD

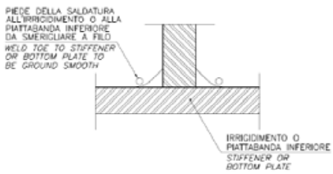
	N/mm^2
EN 1	10.1
EN 2	7.2
EN 3	8.0
EN 4	7.0
EN 5	26.7
EN 6	14.3
EN 7	17.0
EN 8	15.8
LM3	1.3

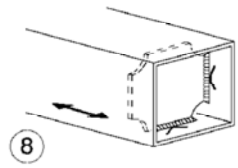
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.003**		
tot =	**0.003**	<	**0.95**

11.8.2 Top plate

11.8.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	34.5	1.056	1.5	1.35	**51.2**	<	**73.7**

$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.694**

DAMAGE ACCUMULATION METHOD

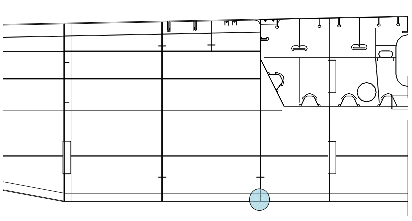
	N/mm^2
EN 1	12.3
EN 2	9.2
EN 3	10.0
EN 4	8.8
EN 5	34.5
EN 6	17.8
EN 7	21.2
EN 8	19.7
LM3	1.2

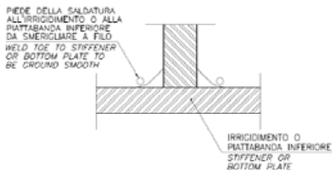
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.014**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.018**		
tot =	**0.032**	<	0.95

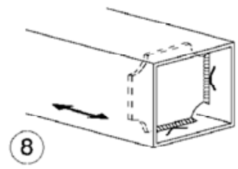
11.9 Cross Girder Section 1 - Type T7

11.9.1 Bottom plate

11.9.1.1 Bottom plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	48.1	1.056	3.6	1.35	**73.3**	<	**73.7**

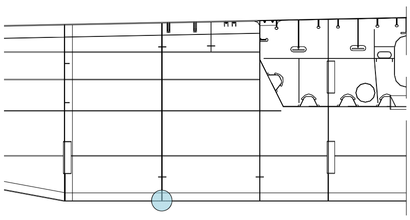
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.995**

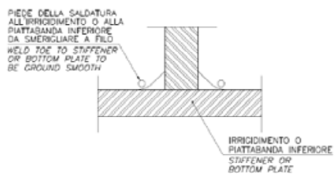
DAMAGE ACCUMULATION METHOD

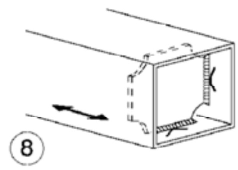
	N/mm^2
EN 1	19.2
EN 2	14.0
EN 3	15.8
EN 4	13.5
EN 5	48.1
EN 6	27.0
EN 7	31.7
EN 8	29.9
LM3	3.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.118**		
train on track 2 + LM3 =	**0.033**		
train on track 1 + train on track 2 + LM3=	**0.089**		
tot =	**0.239**	<	**0.95**

11.9.1.2 Bottom plate to diaphragm weld – location 3







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	**73.7**	**40.5**

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	38.8	1.056	3.4	1.35	**59.9**	<	**73.7**

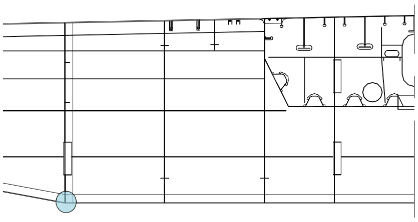
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.813**

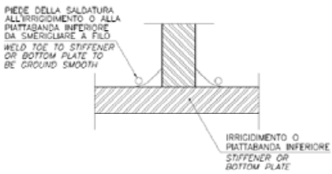
DAMAGE ACCUMULATION METHOD

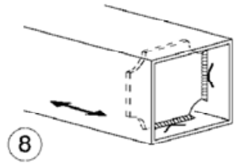
	N/mm^2
EN 1	15.5
EN 2	11.3
EN 3	12.7
EN 4	10.9
EN 5	38.8
EN 6	21.8
EN 7	25.7
EN 8	24.2
LM3	2.9

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.036**		
train on track 2 + LM3 =	**0.006**		
train on track 1 + train on track 2 + LM3=	**0.031**		
tot =	**0.073**	<	**0.95**

11.9.1.3 Bottom plate to diaphragm weld – location 4







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	43.2	1.056	4.6	1.35	**67.8**	<	**73.7**

$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.921**

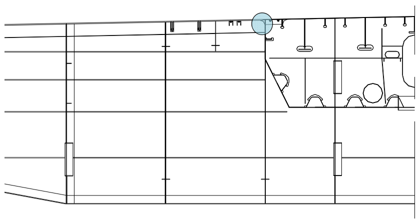
DAMAGE ACCUMULATION METHOD

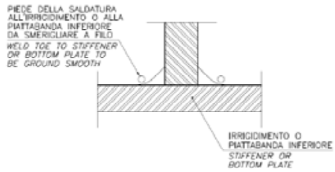
	N/mm^2
EN 1	17.3
EN 2	12.6
EN 3	14.1
EN 4	12.1
EN 5	43.2
EN 6	24.3
EN 7	28.7
EN 8	27.0
LM3	4.0

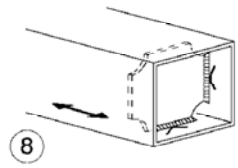
Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.074**		
train on track 2 + LM3 =	**0.006**		
train on track 1 + train on track 2 + LM3=	**0.040**		
tot =	**0.119**	<	**0.95**

11.9.2 Top plate

11.9.2.1 Top plate to diaphragm weld – location 2







$\Delta\sigma_{C\,WI}$	$\Delta\sigma_{D\,WI}$	$\Delta\sigma_{L\,WI}$
100.0	73.7	40.5

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	46.3	1.056	3.7	1.35	**70.9**	<	**73.7**

$\Delta\sigma x_{\,tot} / \Delta\sigma_D$	**0.962**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	18.6
EN 2	13.5
EN 3	15.2
EN 4	12.9
EN 5	46.3
EN 6	26.1
EN 7	30.8
EN 8	28.9
LM3	3.1

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.100**		
train on track 2 + LM3 =	**0.023**		
train on track 1 + train on track 2 + LM3=	**0.078**		
tot =	**0.202**	<	**0.95**

12 Hanger Anchorage - Fatigue Verification

The most representative hanger anchorage throughout the length of the bridge is hanger anchorage type AP2 (84 out of 476 throughout the length of the bridge). The maximum hanger reaction at type AP2 is hanger no. 40. The load considered in this investigation is a passage of one EN5 train in the track closest to the considered hanger anchorage. Load and rotations applied to the hanger anchorage are obtained from the global IBDAS beam model. The variation in S-axis angle rotation of the end node at cross girder beam element is shown in Figure 12-1 for an EN5 passage and the hanger force in Figure 12-2.

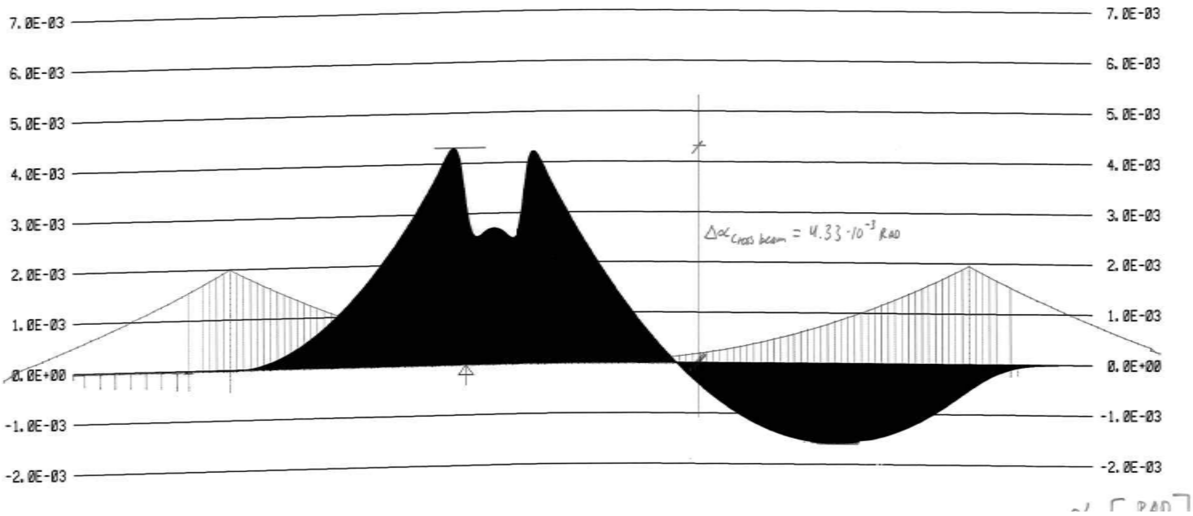


Figure 12-1 Variation in rotation (rad) of end node around S-axis at cross girder beam element for an EN5 passage

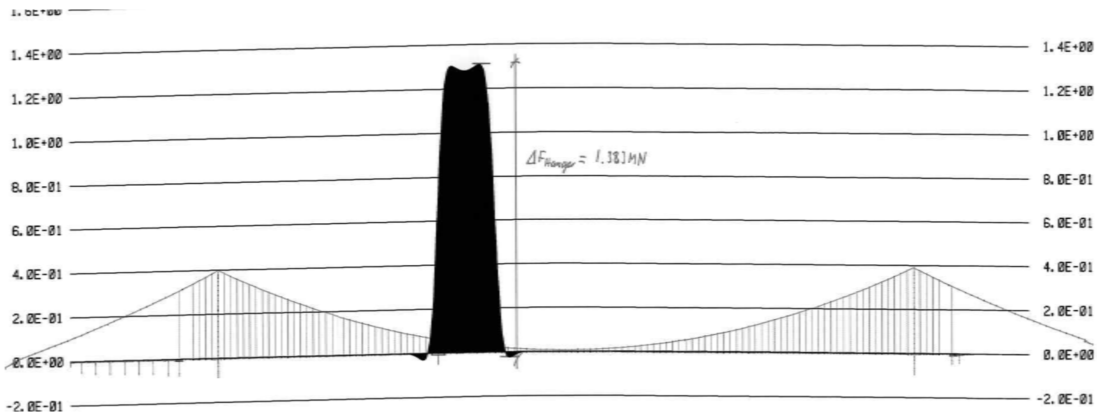


Figure 12-2 Variation in hanger force (MN) for an EN5 passage

In the global IBDAS beam model the hangers are modelled as one hanger at each end of the cross girder. The variation in hanger force from IBDAS is determinant to 1.38MN which is 0.69MN per hanger. Due to the higher rigidity from two hangers relatively to one, this support will have a higher force than the half of the IBDAS result. This extra contribution is taken into account by increasing the hanger force range with 10%.

The contribution to the force range from road traffic for load model 2, vehicle 3, is 0.11MN for one hanger.

The rotation range of 4.33 x 10^{-3} rad is only related directly to the passage of the EN5 train. To include the contribution due to wind, the rotation is increased to 34.9 x 10^{-3} rad or 2.00 deg. With a dynamic factor of 1.056 and a safety factor of 1.35, the total hanger force is:

$$\Delta F_{Hanger} = 1.1 \times 1.35 \times (1.056 \times 0.69 + 0.11) = 1.25 \text{ MN}$$

To determine the linear stress concentrations a local FE-model is made. Relatively to the model of the hanger anchorage used for the ULS verification, the mesh has been refined for the fatigue limit state, as shown in Figure 12-3.

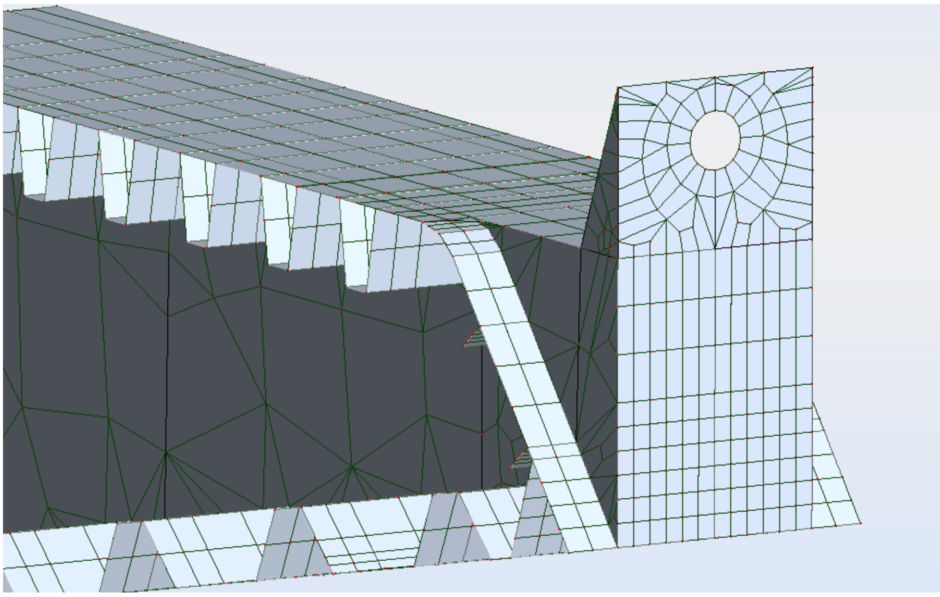


Figure 12-3 Mesh in local FE-model of hanger anchorage

The hanger reaction of 1.25MN in the 2.00 deg angle is converted and applied to local FE-model according to Table 12-1 and Figure 12-4.

Table 12-1 Applied load to pinhole in the local FE-model

Rotation angle	3.49E-02	RAD
Hanger force	1250	kN
Vertical reaction (+X-direction)	1249	kN
Transverse reaction (+Y-direction)	43.6	kN

	X [kN]	Y [kN]
Middle node (50%)	625	21.8
Adjacent node (25%)	312	10.9

The hanger reaction is applied to the model in the middle and the adjacent nodes in the pinhole, as shown in Figure 12-4.

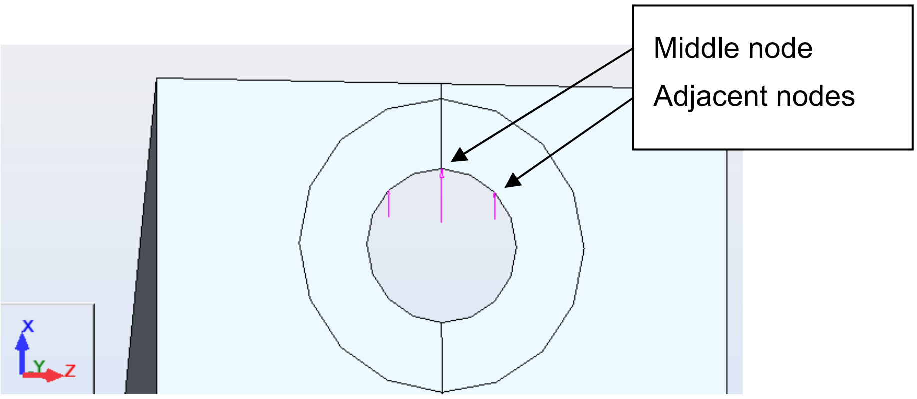


Figure 12-4 Applied load to pinhole in the local FE-model

The two essential plates of the hanger anchorages are the anchor and side plate, shown in Figure 12-5.

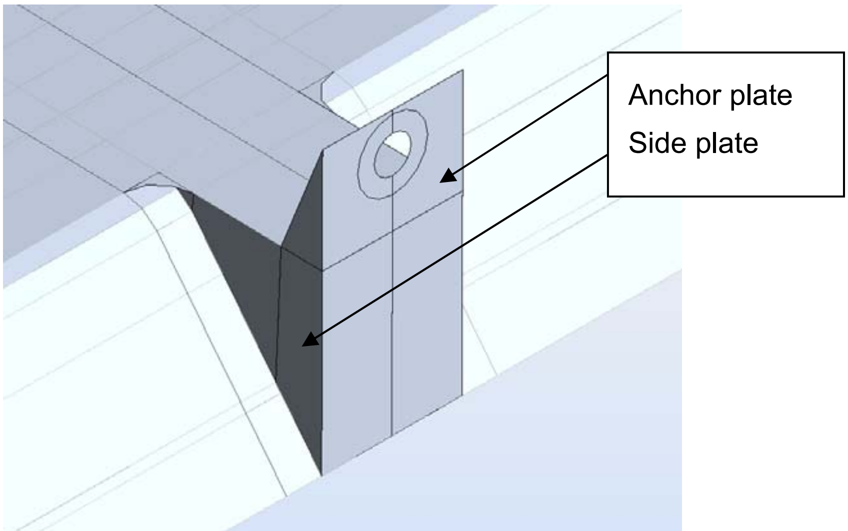


Figure 12-5 Isometric view showing the anchor and side plate

The critical stress points in the anchor plate due to fatigue stresses are shown in Figure 12-6.

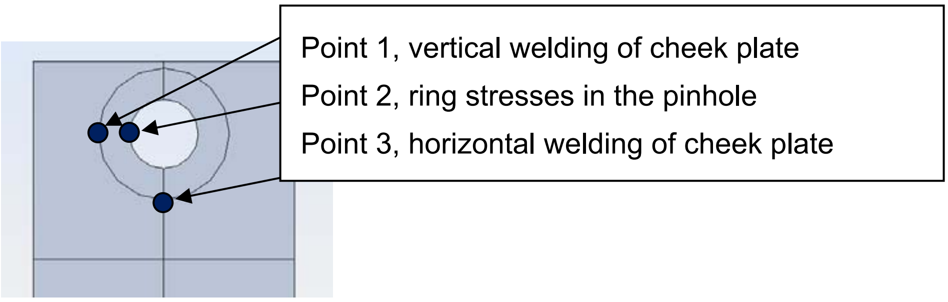
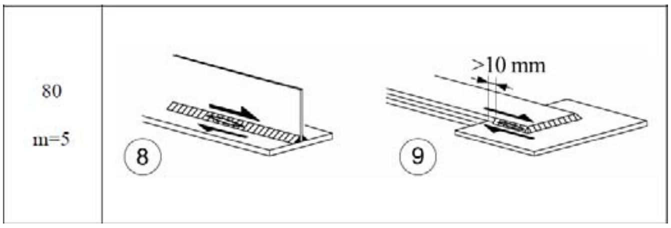


Figure 12-6 Stress points investigated in the anchor plate

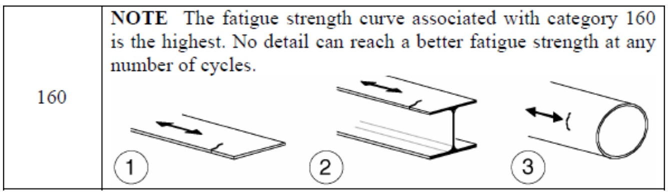
The cut off limit of the detail category for the vertical welding of cheek plate in point 1 is shown in Figure 12-7.



$\Delta\tau_L$ = 80 x 0.457 = 36.56MPa

Figure 12-7 Cut off limit for shear stresses in point 1

The cut off limit of the detail category for the ring stresses in the pinhole in point 1 is shown in Figure 12-8.

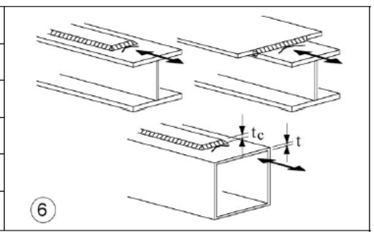


$\Delta\sigma_D$ = 160 x 0.737 = 117.9MPa

Figure 12-8 Cut off limit for axial stresses in vertical direction in point 2

The cut off limit of the detail category for the horizontal welding of cheek plate in point 3 is shown in Figure 12-9.

	$t_c<t$	$t_c\geq t$
56*	t≤20	-
50	20<t≤30	t≤20
45	30<t≤50	20<t≤30
40	t>50	30<t≤50
36	-	t>50



$\Delta\sigma_D$ = 40 x 0.737 = 29.48MPa

Figure 12-9 Cut off limit for axial stresses in vertical direction in point 3

To evaluate the stresses in point 1, the plot of shear stresses in the anchor plate is shown in Figure 12-11.

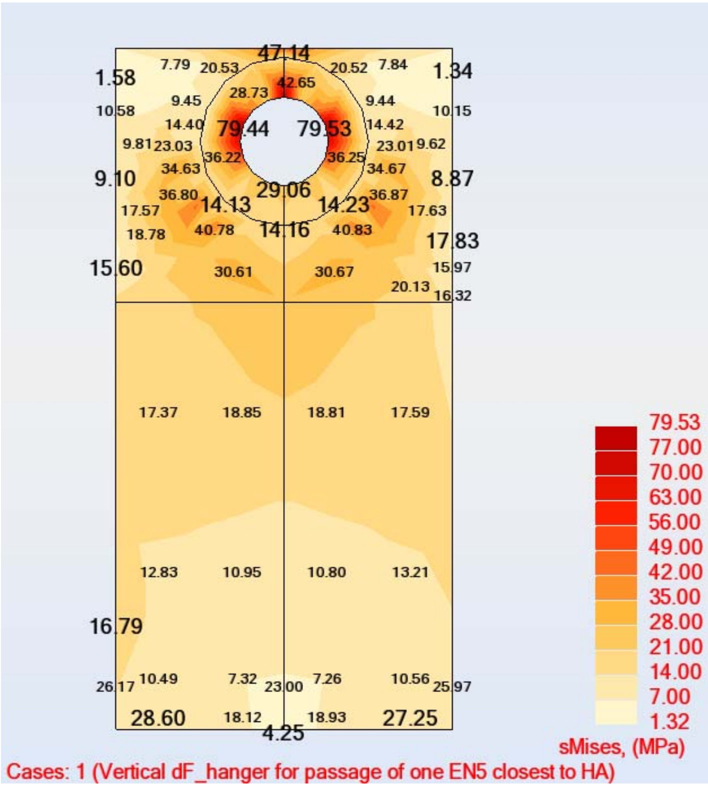


Figure 12-10 von Mises stresses in anchor plate, centre layer

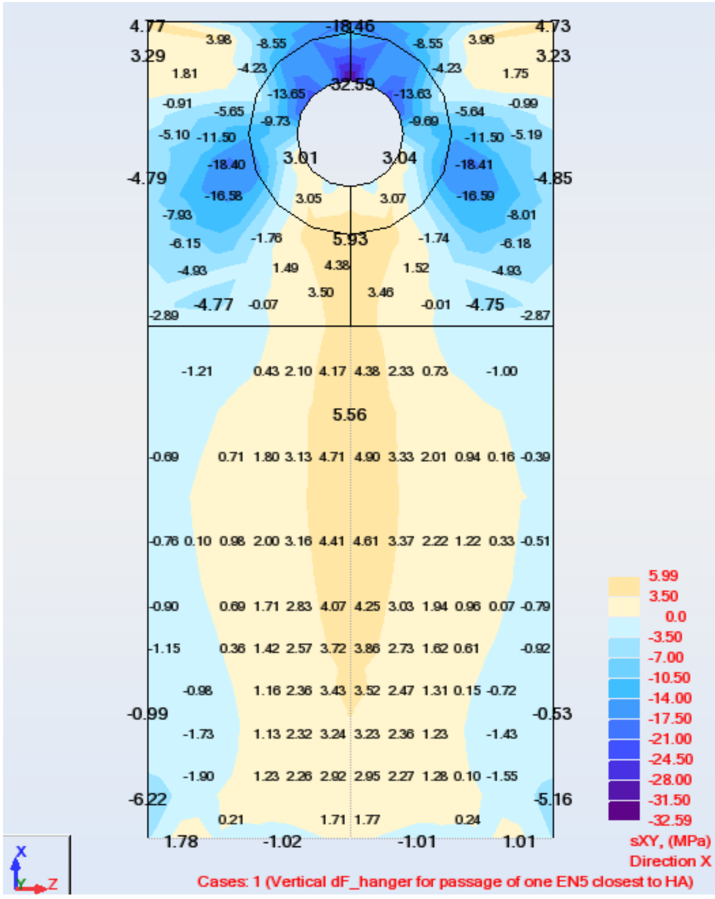


Figure 12-11   Shear stresses in anchor plate, centre layer

As shown in Figure 12-11 the shear stress in point 1 is well below the cut off limit according to Figure 12-7.

To evaluate the stresses in point 2 and 3, vertical axial stresses in the anchor plate is shown in Figure 12-12.

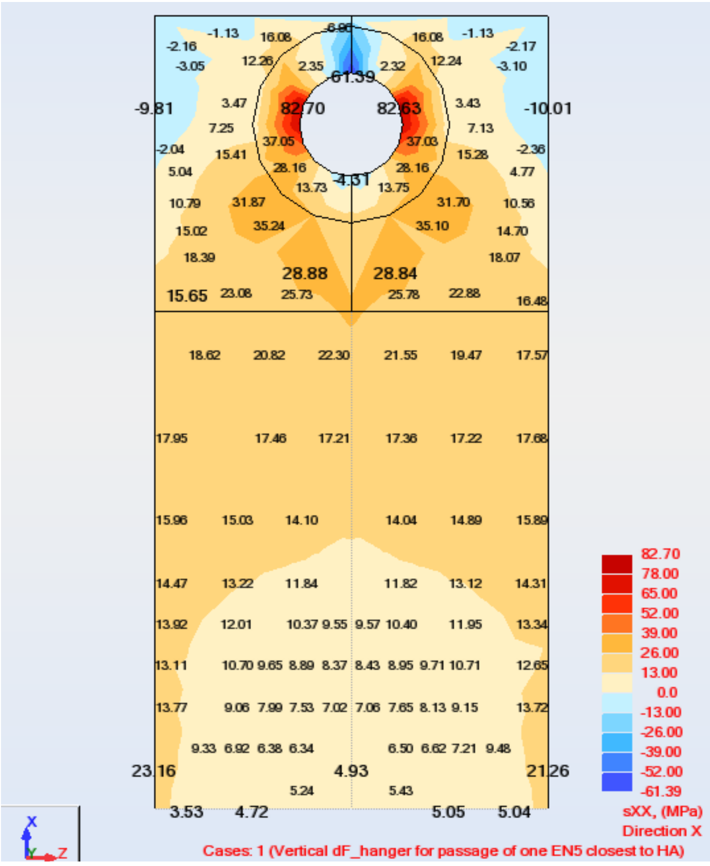


Figure 12-12 Axial stresses in vertical direction for anchor plate, centre layer

As shown in Figure 12-12 the vertical axial stresses in point 2 are well within the allowable cut off limit according to Figure 12-8. Further more the stresses in point 3 are relatively close to the allowable cut off limit according to Figure 12-9. To improve this detail the weld toe could be ground smooth, or alternatively the anchor and cheek plates could be combined into one 120thk plate, with a full penetration weld to the surrounding anchor plate. This optimisation will be further investigated together with the manufacturing procedure of the hanger anchorages in progetto esecutivo.

The critical stress point in the side plate due to fatigue stresses is shown in Figure 12-13.

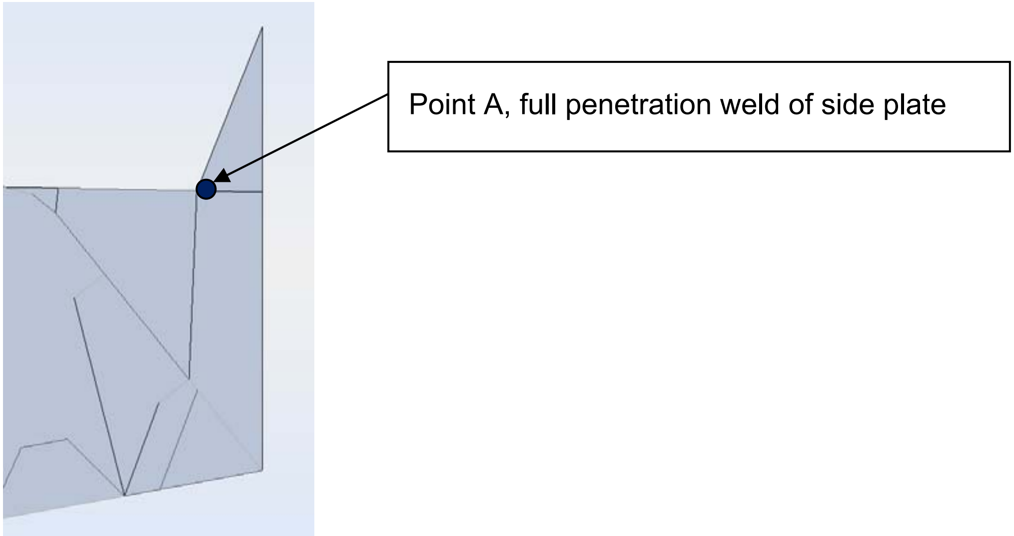
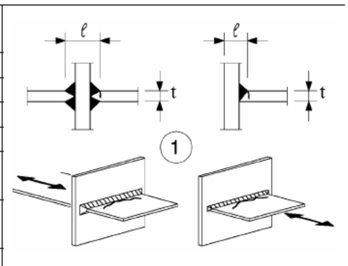


Figure 12-13 Stress point investigated in the side plate

The cut off limit of the detail category for welding of the side plate in point A is shown in Figure 12-14.

80	ℓ<50 mm	all t [mm]
71	50<ℓ≤80	all t
63	80<ℓ≤100	all t
56	100<ℓ≤120	all t
56	ℓ>120	t≤20
50	120<ℓ≤200 ℓ>200	t>20 20<t≤30
45	200<ℓ≤300 ℓ>300	t>30 30<t≤50
40	ℓ>300	t>50



$\Delta\sigma_D$ = 56 x 0.737 = 41.27MPa

Figure 12-14 Cut off limit for axial stresses in vertical direction in point A

To evaluate stresses in point A the plot for vertical axial stresses in the side plate is shown in Figure 12-16.

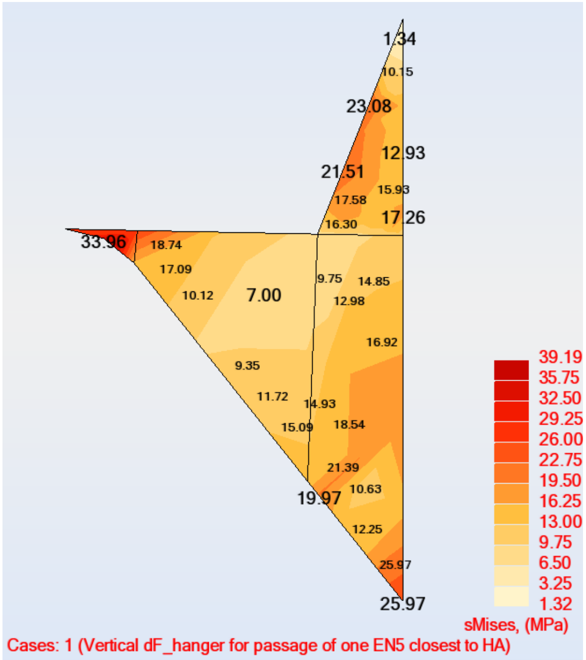


Figure 12-15 von Mises stresses in side plate, centre layer

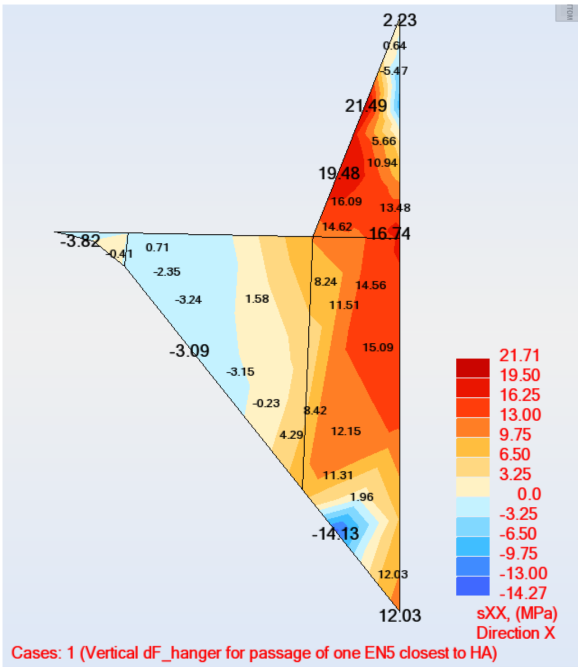
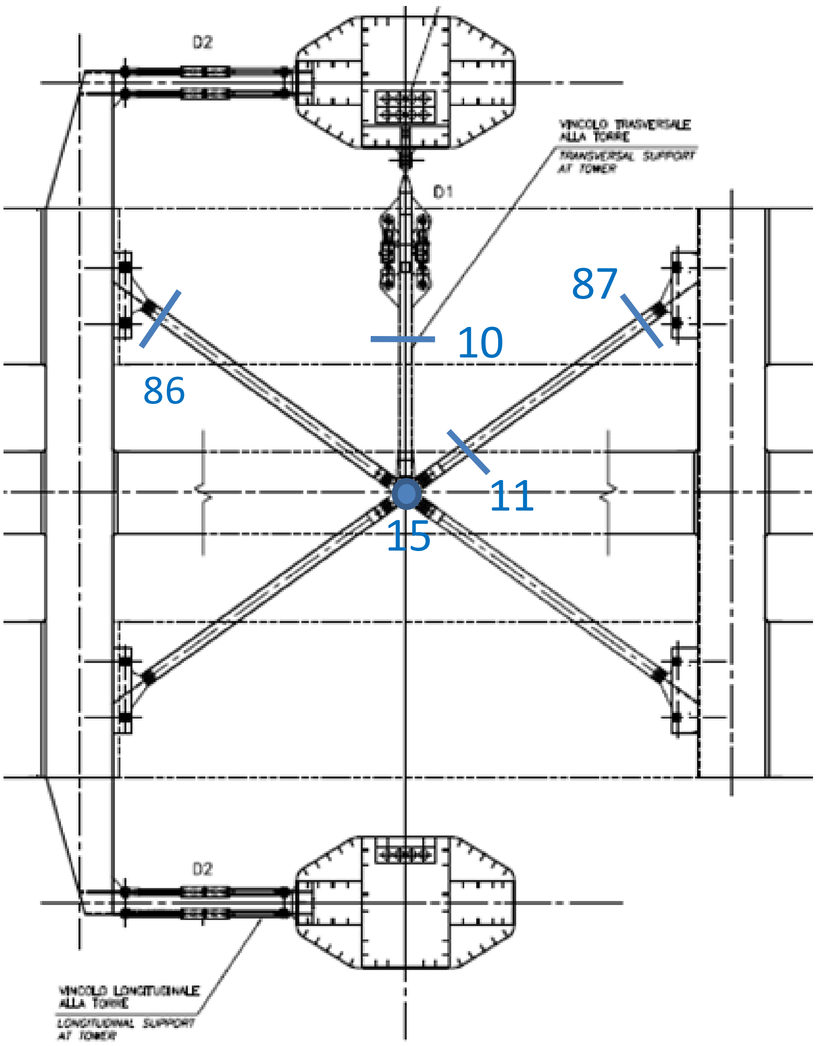


Figure 12-16 Axial stresses in vertical direction for side plate, centre layer

As shown in Figure 12-16 the vertical axial stresses in point A are well within the allowable cut off limit according to Figure 12-14.

13 Articulation system: X-Structure

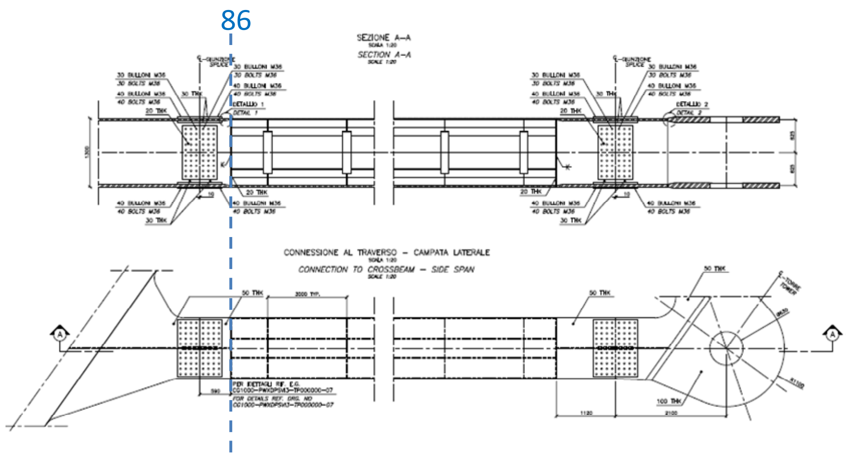
Various sections of the X-structure have been verified: they comprise all the struts/ties forming the support arrangement at tower as shown in the figure below. The main scope of the structure is to limit the large longitudinal and transversal deformation of the bridge mainly due to non-man generated actions.

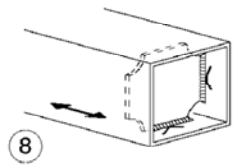


In the following results according to the unlimited life for all the points are presented. The Miner summation of damage as well as wind induced effects of point 9 and 10 are being investigated.

13.1 Point 86

The articulation system has been modelled as fixed end towards the cross girders and due to the capacity to resist bending moment the section next to the joint has been investigated for fatigue. The fatigue detail checked is the diaphragm to bottom plate ($\Delta\sigma_C$=80MPa) with a constant amplitude fatigue strength of 58,9MPa as the surrounding details including the bolted joint present an higher resistance to fatigue.





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

Unlimited Life Method

	EN5		LM2				
	$\Delta\sigma_{x\ glob}$	φ_{glob}	$\Delta\sigma_{x\ glob}$	γ_{MF}	$\Delta\sigma_{x\ tot}$		$\Delta\sigma_D$
EN5 + LM2	26.3	1.056	1.6	1.35	**39.6**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.671**

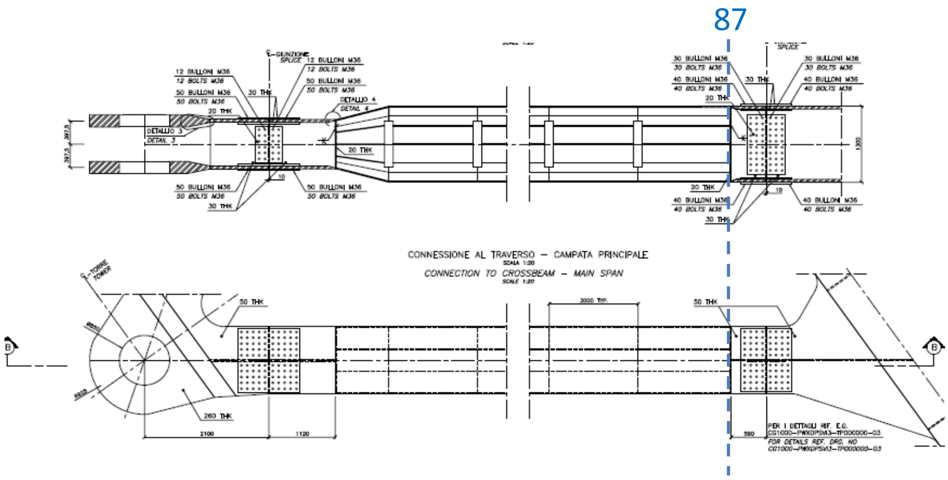
Damage Accumulation Method

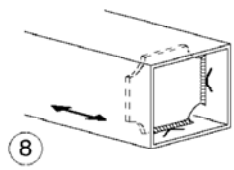
	N/mm²
EN 1	9.4
EN 2	6.9
EN 3	10.1
EN 4	7.5
EN 5	26.3
EN 6	15.7
EN 7	15.1
EN 8	14.5
LM3	1.2

Train meeting percentage	12.0		
Contributions:	**$\Sigma n_i/N_i$**		
train on track 1 + LM3 =	**0.012**		
train on track 2 + LM3 =	**0.005**		
train on track 1 + train on track 2 + LM3=	**0.018**		
tot =	**0.035**	<	**0.95**

13.2 Point 87

Similarly to point 86 the section next to the fixed end has been analysed for the strut towards the main span cross girder.





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	21.8	1.056	0.5	1.35	**31.7**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.538**

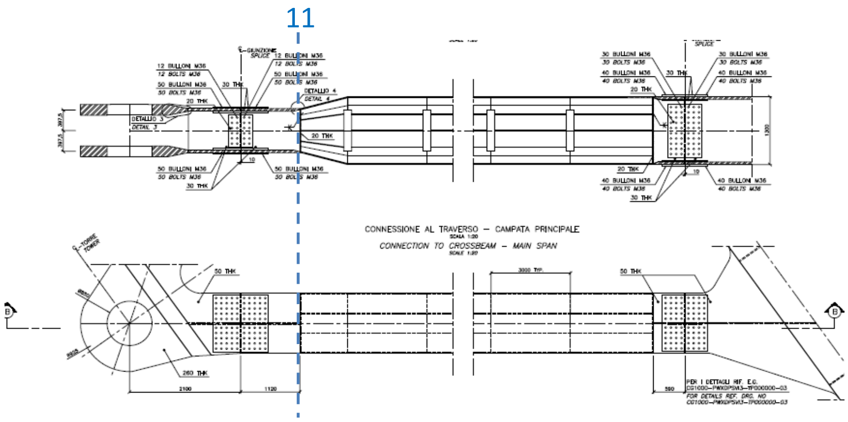
DAMAGE ACCUMULATION METHOD

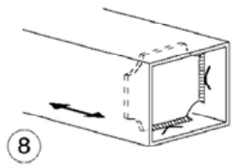
	N/mm^2
EN 1	8.6
EN 2	6.2
EN 3	8.6
EN 4	6.5
EN 5	21.8
EN 6	13.9
EN 7	13.1
EN 8	12.5
LM3	0.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.006**		
tot =	**0.006**	<	**0.95**

13.3 Point 11

Due to a reduction of the cross section height point 11 has also been analysed.





$\Delta\sigma_C$	$\Delta\sigma_D$	$\Delta\sigma_L$
80.0	58.9	32.4

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	32.5	1.056	0.5	1.35	**46.9**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.796**

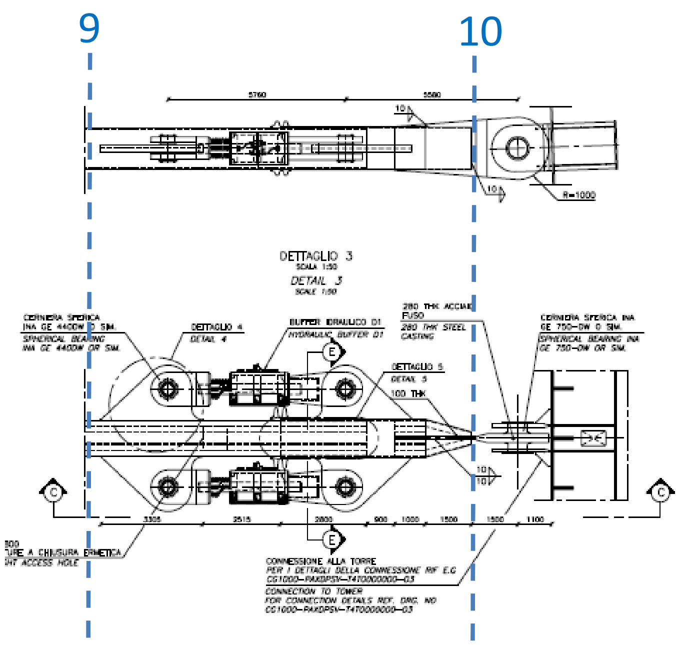
DAMAGE ACCUMULATION METHOD

	N/mm²
EN 1	12.5
EN 2	9.0
EN 3	12.1
EN 4	9.4
EN 5	32.5
EN 6	20.0
EN 7	19.5
EN 8	18.6
LM3	0.4

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.028**		
train on track 2 + LM3 =	**0.005**		
train on track 1 + train on track 2 + LM3=	**0.036**		
tot =	**0.070**	<	0.95

13.4 Point 10

The transverse support at tower is at the present time being investigated under wind loading. The train load gives a negligible contribution to fatigue.



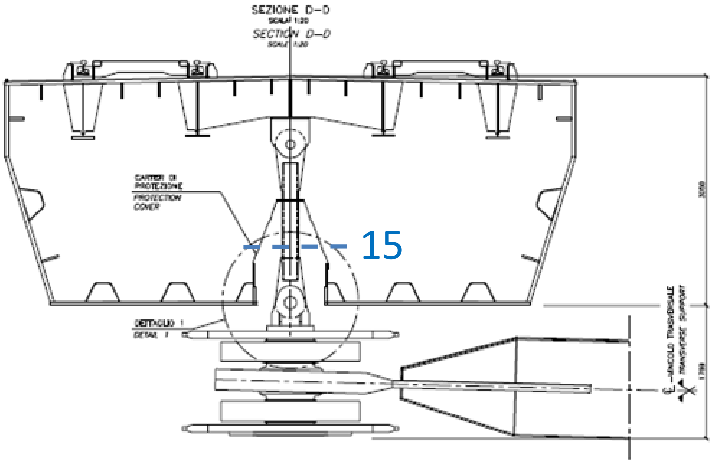
UNLIMITED LIFE METHOD

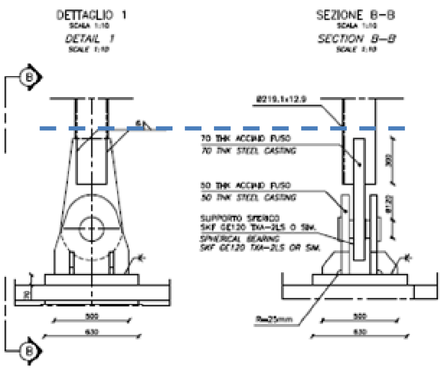
	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	0.1	1.056	0.0	1.35	**0.1**	<	**58.9**

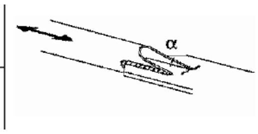
$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.002**

13.5 Point 15

The vertical tie underneath the railway girder CF4 is primarily loaded by the articulation system self weight. Additionally it is loaded by the cyclic effect of the train passing on the bridge. It is in fact subjected to the force induced by the relative deflection between the articulation itself and the railway girder and thus it supports part of the train load also when not directly loaded. Due to uncertainty of the actual detail in consideration the lowest between the details 1, 2 of Table 8.6 (EN1993-1-9) has been chosen and correspond to a detail category of 63Mpa with $\Delta\sigma_D$=46,4MPa.





71	α≤45°	
63	α>45°	

UNLIMITED LIFE METHOD

	EN5		LM2				
	$\Delta\sigma_{x\,glob}$	φ_{glob}	$\Delta\sigma_{x\,glob}$	γ_{MF}	$\Delta\sigma_{x\,tot}$		$\Delta\sigma_D$
EN5 + LM2	13.9	1.056	0.0	1.35	**19.8**	<	**58.9**

$\Delta\sigma x_{tot} / \Delta\sigma_D$	**0.336**

DAMAGE ACCUMULATION METHOD

	N/mm^2
EN 1	6.6
EN 2	4.8
EN 3	5.3
EN 4	4.3
EN 5	13.9
EN 6	8.7
EN 7	9.0
EN 8	8.6
LM3	0.0

Train meeting percentage	12.0		
Contributions:	$\Sigma n_i/N_i$		
train on track 1 + LM3 =	**0.000**		
train on track 2 + LM3 =	**0.000**		
train on track 1 + train on track 2 + LM3=	**0.000**		
tot =	**0.000**	<	**0.95**

14 APPENDIX A Roadway Girder - Influence Lines from Road/ Rail Traffic

stress history at:
mid of 30m span number 12, s=-1425m from centre
end of 30m span number 12, s=-1412.3m from centre

page	Load	location of point	type
545	EN 1	mid span - bottom plate	direct
546	EN 1	end span - bottom plate	direct
547	EN 2	mid span - bottom plate	direct
548	EN 2	end span - bottom plate	direct
549	EN 3	mid span - bottom plate	direct
550	EN 3	end span - bottom plate	direct
551	EN 4	mid span - bottom plate	direct
552	EN 4	end span - bottom plate	direct
553	EN 5	mid span - bottom plate	direct
554	EN 5	end span - bottom plate	direct
555	EN 6	mid span - bottom plate	direct
556	EN 6	end span - bottom plate	direct
557	EN 7	mid span - bottom plate	direct
558	EN 7	end span - bottom plate	direct
559	EN 8	mid span - bottom plate	direct
560	EN 8	end span - bottom plate	direct
561	LM3	mid span - bottom plate	Max
562	LM3	end span - bottom plate	Max
563	LM3	mid span - bottom plate	Min
564	LM3	end span - bottom plate	Min
565	LM2-3	mid span - bottom plate	Max
566	LM2-3	end span - bottom plate	Max
567	LM2-3	mid span - bottom plate	Min
568	LM2-3	end span - bottom plate	Min

15 APPENDIX B Railway Girder - Influence Lines from Road/ Rail Traffic

stress history at:
mid of 30m span number 12, s=-1425m from centre
end of 30m span number 12, s=-1412.3m from centre

page	Load	location of point	type
570	EN 1	mid span - bottom plate	direct
571	EN 1	end span - bottom plate	direct
572	EN 2	mid span - bottom plate	direct
573	EN 2	end span - bottom plate	direct
574	EN 3	mid span - bottom plate	direct
575	EN 3	end span - bottom plate	direct
576	EN 4	mid span - bottom plate	direct
577	EN 4	end span - bottom plate	direct
578	EN 5	mid span - bottom plate	direct
579	EN 5	end span - bottom plate	direct
580	EN 6	mid span - bottom plate	direct
581	EN 6	end span - bottom plate	direct
582	EN 7	mid span - bottom plate	direct
583	EN 7	end span - bottom plate	direct
584	EN 8	mid span - bottom plate	direct
585	EN 8	end span - bottom plate	direct
586	LM3	mid span - bottom plate	Max
587	LM3	end span - bottom plate	Max
588	LM3	mid span - bottom plate	Min
589	LM3	end span - bottom plate	Min
590	LM2-3	mid span - bottom plate	Max
591	LM2-3	end span - bottom plate	Max
592	LM2-3	mid span - bottom plate	Min
593	LM2-3	end span - bottom plate	Min

16 APPENDIX C Cross Girder - Influence Lines from Road/ Rail Traffic

stress history at:
-1.247m from mid span of cross girder number 22

page	Load	location of point	type
595	EN 1	mid span - bottom plate	direct
596	EN 1	mid span - top plate	direct
597	EN 2	mid span - bottom plate	direct
598	EN 2	mid span - top plate	direct
599	EN 3	mid span - bottom plate	direct
600	EN 3	mid span - top plate	direct
601	EN 4	mid span - bottom plate	direct
602	EN 4	mid span - top plate	direct
603	EN 5	mid span - bottom plate	direct
604	EN 5	mid span - top plate	direct
605	EN 6	mid span - bottom plate	direct
606	EN 6	mid span - top plate	direct
607	EN 7	mid span - bottom plate	direct
608	EN 7	mid span - top plate	direct
609	EN 8	mid span - bottom plate	direct
610	EN 8	mid span - top plate	direct
611	LM3	mid span - top plate	Max
612	LM3	mid span - bottom plate	Max
613	LM3	mid span - top plate	Min
614	LM3	mid span - bottom plate	Min
615	LM2-3	mid span - bottom plate	Max
616	LM2-3	mid span - top plate	Max
617	LM2-3	end span - bottom plate	Min
618	LM2-3	end span - top plate	Min

17 APPENDIX D Stress concentration factor - Bottom plate of Railway Girder span 12

plots of railway span 12

page	Load	Description	location of point	type
620	EN5	Stress history plot	Diaphragm 4 - plate edge	direct
621	LM2-3	Stress history plot	Diaphragm 4 - plate edge	direct
622	EN5	Bottom plate contour Plot	Diaphragm 4 - plate edge	Max
623	EN5	Bottom plate contour Plot	Diaphragm 4 - plate edge	Min
624	EN5	Stress history plot	Diaphragm 4 - plate centre	direct
625	LM2-3	Stress history plot	Diaphragm 4 - plate centre	direct
626	EN5	Stress history plot	Cross girder web - plate edge	direct
627	LM2-3	Stress history plot	Cross girder web - plate edge	direct
628	EN5	Bottom plate contour Plot	Cross girder web - plate edge	Max
629	EN5	Bottom plate contour Plot	Cross girder web - plate edge	Min
630	EN5	Stress history plot	Cross girder web - plate centre	direct
631	LM2-3	Stress history plot	Cross girder web - plate centre	direct

18 APPENDIX E Fixed load condition - Suspended deck span 12

plots of structural element stresses in span 12

page	Load	Description	stress
633	EN5 fixed	Full top view	sss
634	EN5 fixed	Full top view	syy
635	EN5 fixed	Full top view	Mises
636	EN5 fixed	Full bottom view	sss
637	EN5 fixed	Full bottom view	syy
638	EN5 fixed	Full bottom view	Mises
639	EN5 fixed	Rail top view	sss
640	EN5 fixed	Rail top view	syy
641	EN5 fixed	Rail top view	Mises
642	EN5 fixed	Rail bottom view	sss
643	EN5 fixed	Rail bottom view	syy
644	EN5 fixed	Rail bottom view	Mises
645	EN5 fixed	Rail web view	sss
646	EN5 fixed	Rail web view	syy
647	EN5 fixed	Rail web view	Mises
648	EN5 fixed	Cross girder web view	sss
649	EN5 fixed	Cross girder web view	syy
650	EN5 fixed	Cross girder web view	Mises