Concessionaria per la progettazione, realizzazione e gestione del collegamento stabile tra la Sicilia e il Continente Organismo di Diritto Pubblico
(Legge n° 1158 del 17 dicembre 1971, modificata dal D.Lgs. n°114 del 24 aprile 2003)

PONTE SULLO STRETTO DI MESSINA

PROGETTO DEFINITIVO

EUROLINK S.C.p.A.

IMPREGILO S.p.A. (MANDATARIA)
SOCIETÀ ITALIANA PER CONDOTTE D'ACQUA S.p.A. (MANDANTE)
COOPERATIVA MURATORI E CEMENTISTI - C.M.C. DI RAVENNA SOC. COOP. A.R.L. (MANDANTE)
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Unità Funzionale	OPERA DI ATTRAVERSAMENTO	PS0003_F0
Tipo di sistema	SOVRASTRUTTURE	
Raggruppamento di opere/attività	ELEMENTI DA CARATTERE GENERALE	
Opera - tratto d'opera - parte d'opera	Generale	
Titolo del documento	Modello Semi-Locale IBDAS, impalcato sospeso	

CODICE: C G 1 0 0 0 P R G D P S V 0 0 0 0 0 0 0 0 0 0 0 2 F0

REV	DATA	DESCRIZIONE	REDATTO	VERIFICATO	APPROVATO
F0	20-06-2011	EMISSIONE FINALE	LADI	KLO	KLO / LSJ

NOME DEL FILE: PS0003_F0_ITA.docx

INDICE

1 Introduzione

1.1 Scopo

La presente relazione ha lo scopo di presentare e descrivere il modello semi-locale preparato per il Progetto Definitivo dell'impalcato sospeso.

1.2 Struttura della relazione

La presente relazione si compone dei seguenti capitoli:

- Il Cap. 1 comprende l'introduzione ed elenca i riferimenti incluse le specifiche e le norme di progetto
- Il Cap. 2 descrive il modello IBDAS Globale
- Il Cap. 3 descrive la rigidità degli Elementi ed i pesi aggiunti al modello di analisi
- Il Cap. 4 indica i risultati selezionati

1.3 Riferimenti

Lo stesso modello semi-locale fa parte del modello di analisi globale.

La presente relazione fornirà esclusivamente le informazioni supplementari necessarie per il modello semi-locale. Per informazioni dettagliate sul modello di analisi globale fare riferimento alla relazione preparata per la relazione di analisi IBDAS Globale, “CG1000-P-RG-D-P-SV-00-00-00-00-00-01”, del 23 marzo 2011.

1.3.1 Specifiche di progetto

[1] CG1000-P-RG-D-P-GE-00-00-00-00-00-02 “Manuale applicativo riferito ai fondamenti progettuali”.

2 Descrizione del modello Semi-Locale dei Cassoni

Il presente capitolo descrive il modello FEM usato per l'analisi Semi Locale dell'impalcato sospeso.

Il modello semi-locale è incluso nel modello di analisi globale nel senso che per la maggior parte del ponte viene usato il modello globale (travi), mentre per alcune parti selezionate viene usata una modellazione più dettagliata dove è prevista una combinazione di elementi shell and beam. Questo sistema garantisce delle condizioni a margine corrette per il modello dettagliato. Il modello shell comprende i cassoni, i traversi ed i diaframmi.

Il termine “semi locale” al posto del termine “locale” viene usato per richiamare l'attenzione sul fatto che alcuni dettagli potrebbero non essere modellati con precisione.

Di seguito verrà chiarito il livello di dettaglio del modello shell semi-locale.

2.1 Geometria

Viene descritto qui di seguito il modello semi-locale della geometria dei cassoni e dei traversi.

Il modello semi-locale dell'impalcato sospeso considera una sezione di 60 m posizionata nella campata principale tra i pendini 32 e 33.

I seguenti elementi strutturali sono inclusi nel modello semi-locale dei cassoni del Ponte di Messina:

- Impalcato sospeso costituito da 2 cassoni stradali e da un cassone ferroviario.
- 2 cassoni trasversali.

I diaframmi e gli elementi di irrigidimento longitudinali sono inclusi sia nei cassoni sia nei traversi.

La Figura 2.1 mostra un diagramma del modello geometrico IBDAS globale

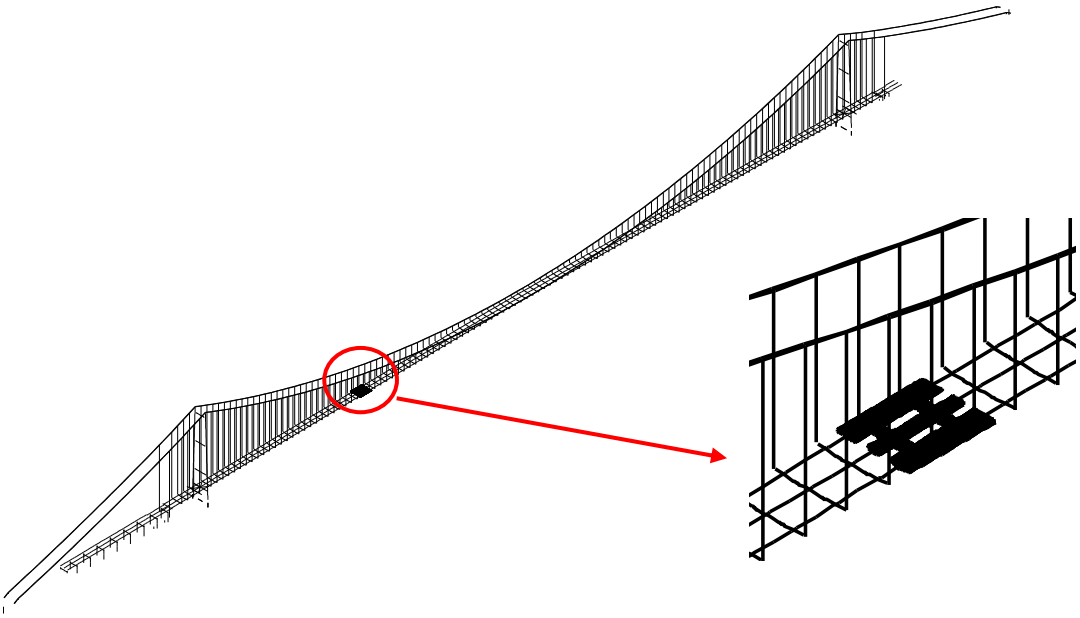


Figura 2.1: Ponte di Messina, modello della geometria (vista isometrica)

I diversi elementi strutturali vengono esplicitati con maggior dettaglio nella figura che segue, che mostra delle immagini prese dal modello stabilito nella fase di progettazione del Progetto Definitivo.

L'impalcato sospeso è costituito da 3 cassoni longitudinali singoli collegati per mezzo di traversi. La figura che segue mostra una riproduzione del modello.

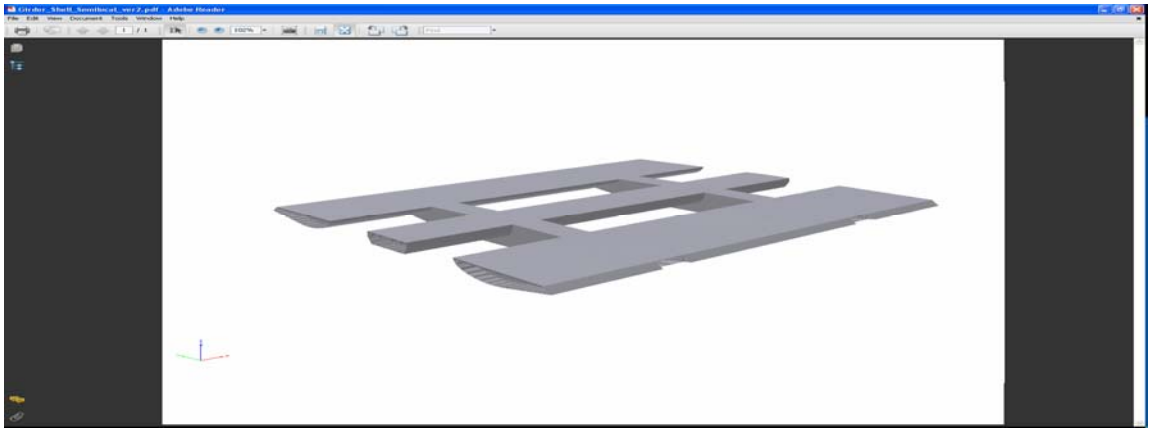


Figura 2.2: Riproduzione del modello semi-locale dell'impalcato sospeso.

L'intera superficie in acciaio longitudinale dei cassoni compresi gli irrigidimenti è modellata nel rispetto esatto della sua geometria e dello spessore delle lamiere. I diaframmi sono modellati usando uno spessore equivalente uniforme dove si tiene conto dell'area degli irrigidimenti dei diaframmi in modo da ottenere il peso corretto dei diaframmi stessi.

Elementi locali quali irrigidimenti supplementari e lamiere vicino agli ancoraggi dei pendini non sono inclusi nel modello, al quale però viene aggiunto il peso. Il peso delle verniciature e delle saldature viene incluso sotto forma di peso uniformemente distribuito lungo i cassoni.

I traversi dei pendini sono modellati nel rispetto esatto della geometria esterna e degli irrigidimenti longitudinali. I diaframmi sono inseriti usando uno spessore equivalente uniforme dove si tiene conto dei passi d'uomo e degli irrigidimenti in modo da ottenere una corretta distribuzione del peso.

I traversi sono modellati in 10 sezioni, la qual cosa consente di modellarli usando degli spessori di lamiera pressocchè corretti lungo i cassoni, vedi da Figura 2.3 a Figura 2.5.

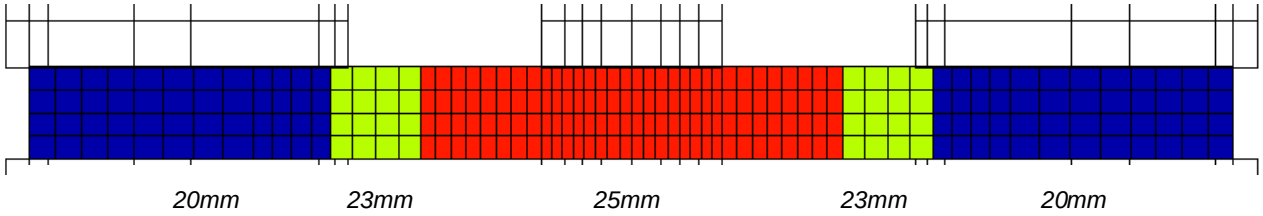


Figura 2.3: Spessore della flangia superiore del traverso.

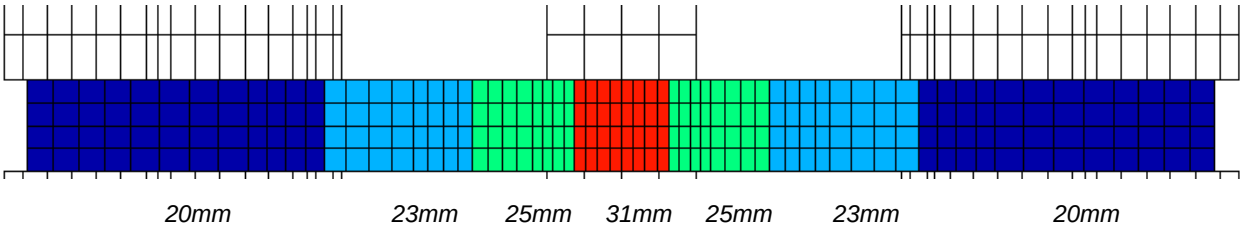


Figura 2.4: Spessore della flangia inferiore del traverso.

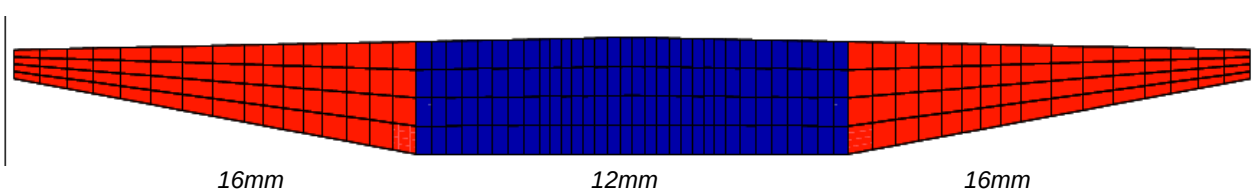


Figura 2.5: Spessore dell'anima del traverso .

I diagrammi dei cassoni metallici longitudinali e dei traversi sono riportati nella Figura 2.6 fino alla Figura 2.8. Il diagramma mostra il profilo usato da IBDAS per il calcolo delle caratteristiche degli elementi (rigidità, massa ecc.).

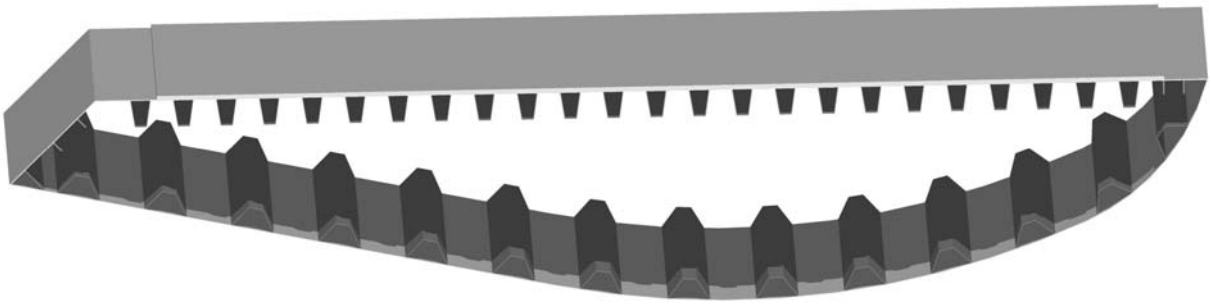


Figura 2.6: Sezione trasversale tipica dell'impalcato sospeso (stradale).

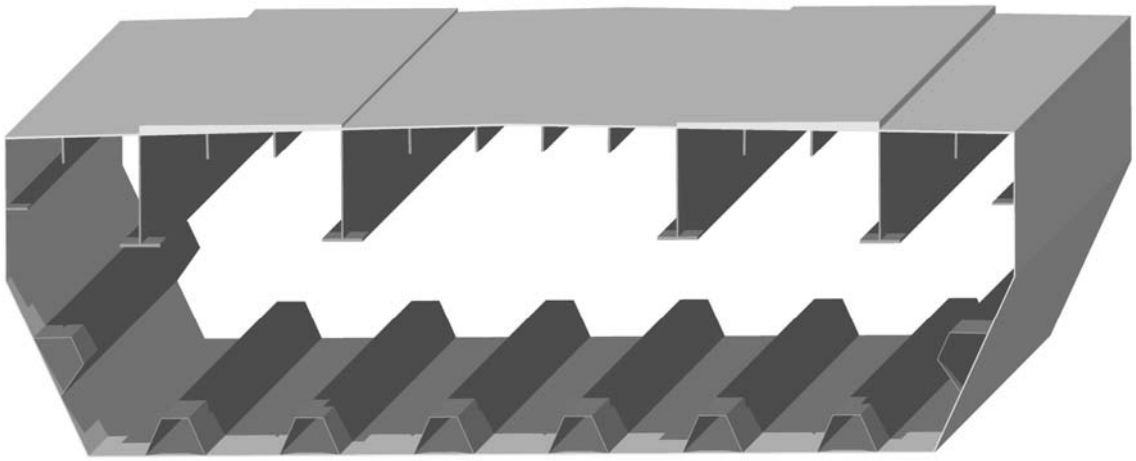


Figura 2.7: Sezione trasversale tipica dell'impalcato sospeso (ferroviario).

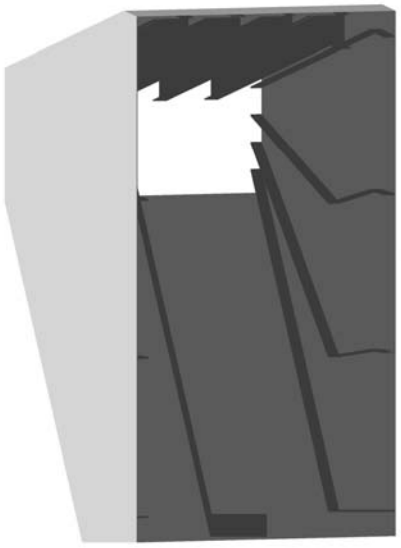


Figura 2.8: Sezione trasversale tipica del traverso del pendino.

I cassoni proseguono attraverso i traversi. Lo spessore delle lamiere superiori nel cassone stradale e ferroviario e lo spessore della lamiera inferiore inclinata nei cassoni stradali viene ridotto a 0,2 mm onde evitare doppie lamiere nel modello semi locale.

2.2 Sistemi di coordinate

2.2.1 Sistema globale delle coordinate

Nel modello sono stati definiti parecchi sistemi di coordinate. Il sistema globale delle coordinale usato per indicare ad esempio spostamenti e reazioni è un sistema sinistrorso così definito:

- l'asse **S** (1^ asse) si estende lungo la linea di mezzeria del ponte, positiva verso la Calabria, s=0 si trova al centro della campata principale.
- l'asse **Y** (2^ asse) è ortogonale rispetto all'asse **S** e all'asse **Z** formando un sistema di coordinate sinistrorso. L'asse Y si estende quindi in orizzontale trasversalmente alla linea di mezzeria del ponte.
- l'asse **Z** (3^ asse) è verticale e si estende positiva verso l'alto, zero ad un'elevazione 0,00 secondo i disegni di progetto.

Il sistema globale delle coordinate è indicato in Figura 2.9.

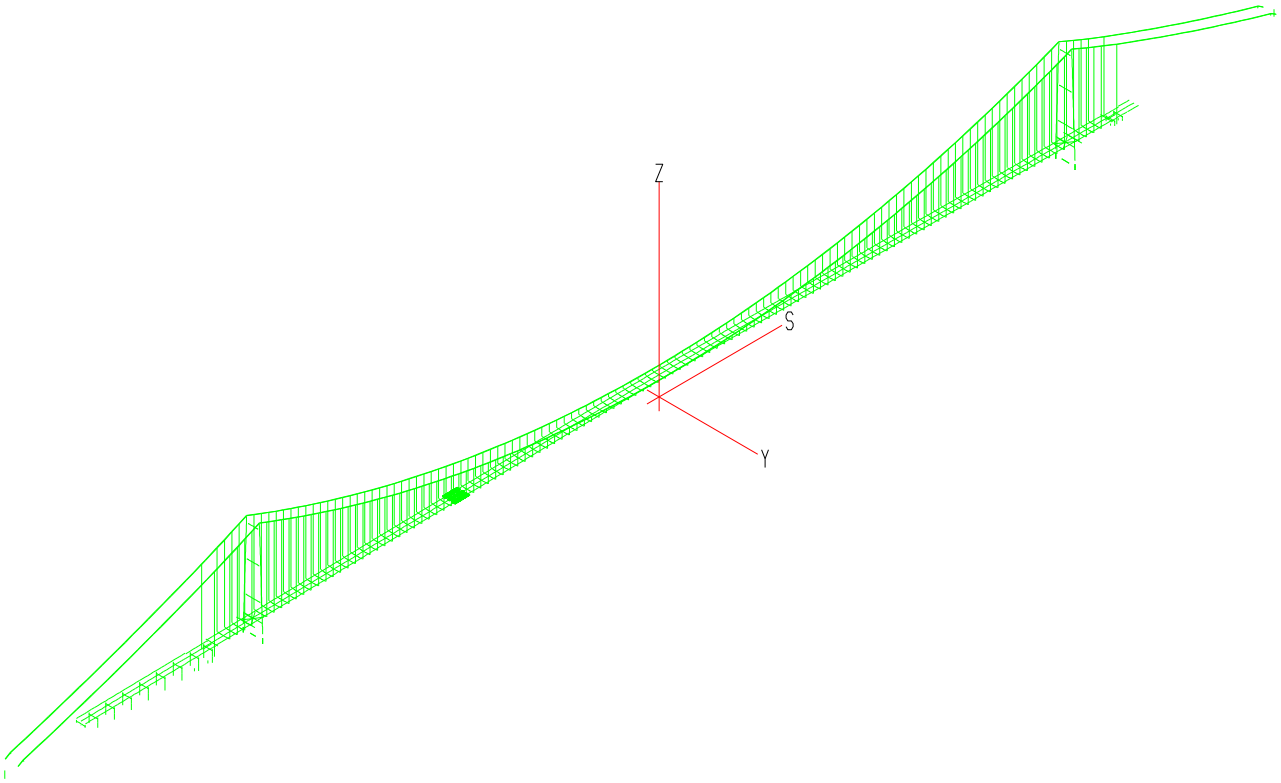


Figura 2.9: Sistema globale sinistrorso delle coordinate usato nel modello IBDAS. Il disegno mostra anche l'intero modello FEM ed il modello semi locale selezionato in corrispondenza dell'impalcato della campata principale.

2.2.2 Sistemi delle coordinate degli elementi

I disegni che seguono mostrano i sistemi di coordinate solo per gli elementi shell del modello semi locale. I sistemi delle coordinate sono tutti sistemi sinistrorsi. Tali sistemi vengono usati per indicare le azioni degli elementi quali le sollecitazioni generalizzate (forze delle sezioni).

Le sezioni dei cassoni seguono l'intera asse s, mentre i traversi hanno l'asse s lungo l'intera asse y. L'asse y degli elementi è trasversale rispetto all'asse s sul piano dell'elemento e l'asse z è ortogonale rispetto all'elemento.

I sistemi delle coordinate sono illustrati nella figura seguente.

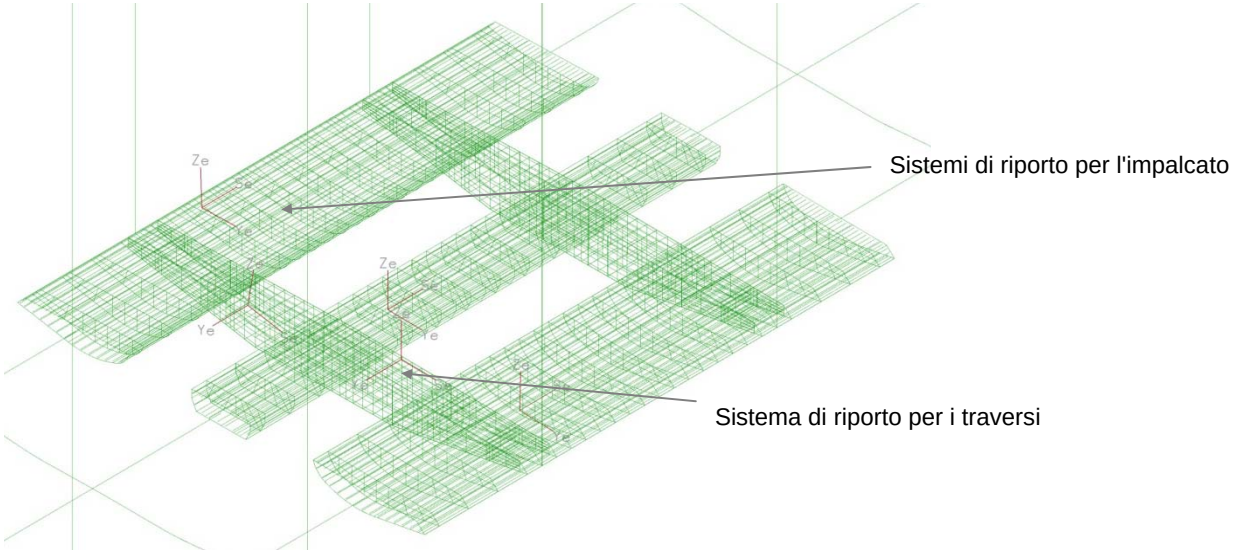


Figura 2.10: Sistemi di riporto (sinistrorsi) in corrispondenza dell'impalcato sospeso.

2.3 Elementi

Gli elementi IBDAS usati nel modello globale sono tutti elementi 3D isoparametrici di travi o tralicci. Gli elementi shell vengono usati nel modello semi locale.

Generalmente, tutti gli elementi in acciaio strutturali vengono modellati usando elementi di trave parabolici a tre nodi (IBDAS BEAM18) con 6 gradi di libertà in ciascun nodo, dove si tiene conto delle deformazioni di taglio.

I cavi dei pendini ed i cavi principali vengono modellati con elementi di traliccio a due nodi (IBDAS TRUSS6) con 3 gradi di libertà in ciascun nodo.

Gli elementi shell inseriti nel modello semi locale usano elementi shell a 8 nodi (IBDAS SHELL48) con 8 gradi di libertà in ciascun nodo, dove si tiene conto delle deformazioni di taglio fuori piano.

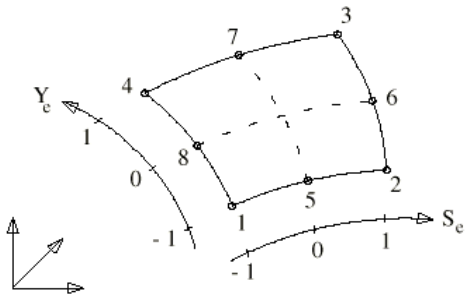


Figura 2.11: Elemento IBDAS Shell48.

Gli irrigidimenti vengono modellati con elementi di trave.

2.4 Condizioni di supporto

Le condizioni di supporto del ponte sono uguali a quelle descritte per il modello di analisi globale.

3 Rigidità, Masse e Pesi

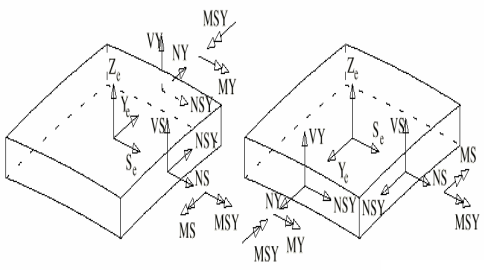
3.1 Masse e Pesi

La diversa gestione dei pesi tra il modello globale ed il modello semi locale consiste nel fatto che i diaframmi vengono modellati nel modello semi locale senza quindi aggiunta del peso per i diaframmi in corrispondenza della parte modellata con elementi shell.

3.2 Segni convenzionali

I segni delle forze usati nell'IBDAS sono indicati più sotto .

I segni delle risultanti delle sollecitazioni in un elemento infinitesimale attorno ad un punto gaussiano di un elemento shell sono indicati nella figura seguente . Il modello di analisi e quindi i risultati si basano sul sistema di coordinate sinistrorso. E' tuttavia da notare che esso si applica in generale e che un momento positivo attorno ad un'asse trasversale genera compressione sul lato superiore del guscio.



Sistema di coordinate sinistrorso

Figura 3.1: Risultati nel punto di sollecitazione per l'elemento shell spaziale. Viene mostrato un elemento infinitesimale attorno ad un punto di sollecitazione.

4 Risultati ottenuti dal modello semi locale

I risultati dettagliati ottenuti dal modello semi locale verranno, ove possibile, presentati nelle varie relazioni di progetto. La presente relazione contiene solo risultati selezionati .

Onde evitare effetti terminali vicino alla transizione tra le sezioni di beam e le sezioni di shell, i risultati sono validi solo ad una certa distanza dalla transizione, vale a dire a distanza di un diaframma.

Vengono così ottenuti diagrammi di profilo e diagrammi dei valori di sollecitazione.

Il numero dei casi di carico tracciati è molto limitato in modo da limitare il numero di diagrammi forniti ai gruppi di progettazione.

Sono stati scelti i seguenti casi di carico:

- Caso 1 (Carico permanente totale) - condizione di riferimento del ponte
- Caso 6500 (involucro ULS)
- Caso 6550 (involucro QL-ULS)

4.1 Diagrammi di profilo

I risultati di questo tipo ricavati dal modello semi locale e riportati al gruppo di progettazione vengono forniti sotto forma di diagrammi che indicano:

- diagrammi di profilo delle sollecitazioni sss, syy e ssy
- diagrammi di profilo delle sollecitazioni Von Mises

In genere, i tipi di diagrammi sopra citati vengono generati per 7 diverse posizioni:

1) Flange superiori in cassoni e traversi
2) Flange inferiori in cassoni e traversi

3) anima Y del cassone ferroviario

4) anima Y+ del cassone ferroviario

5) Diaframmi, fila 3 tra traversi

6) anima del traverso S+ (traverso s-)

7) anima del traverso S- (traverso s-)

La *Figura 4.1* mostra il diagramma di profilo delle sollecitazioni normali massime nel caso 1 (Condizione di Riferimento). Il diagramma viene indicato come un esempio delle informazioni che possono essere ottenute usando il modello semi locale.

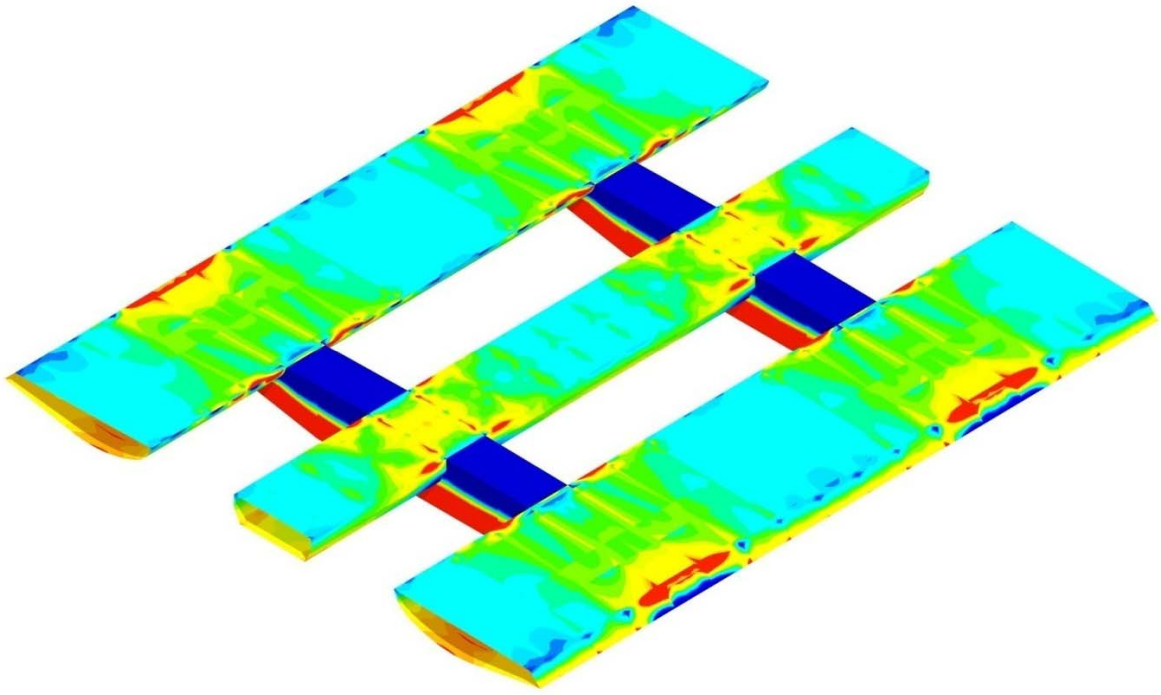


Figura 4.1: Diagramma di profilo - sollecitazioni normali massime (sss) nel caso 1 (Condizione di Riferimento).

L'Appendice A contiene i risultati relativi al Caso 1 (Condizione di Riferimento), al Caso 6500 (involucro ULS) ed al caso 6550 (involucro QL-ULS).

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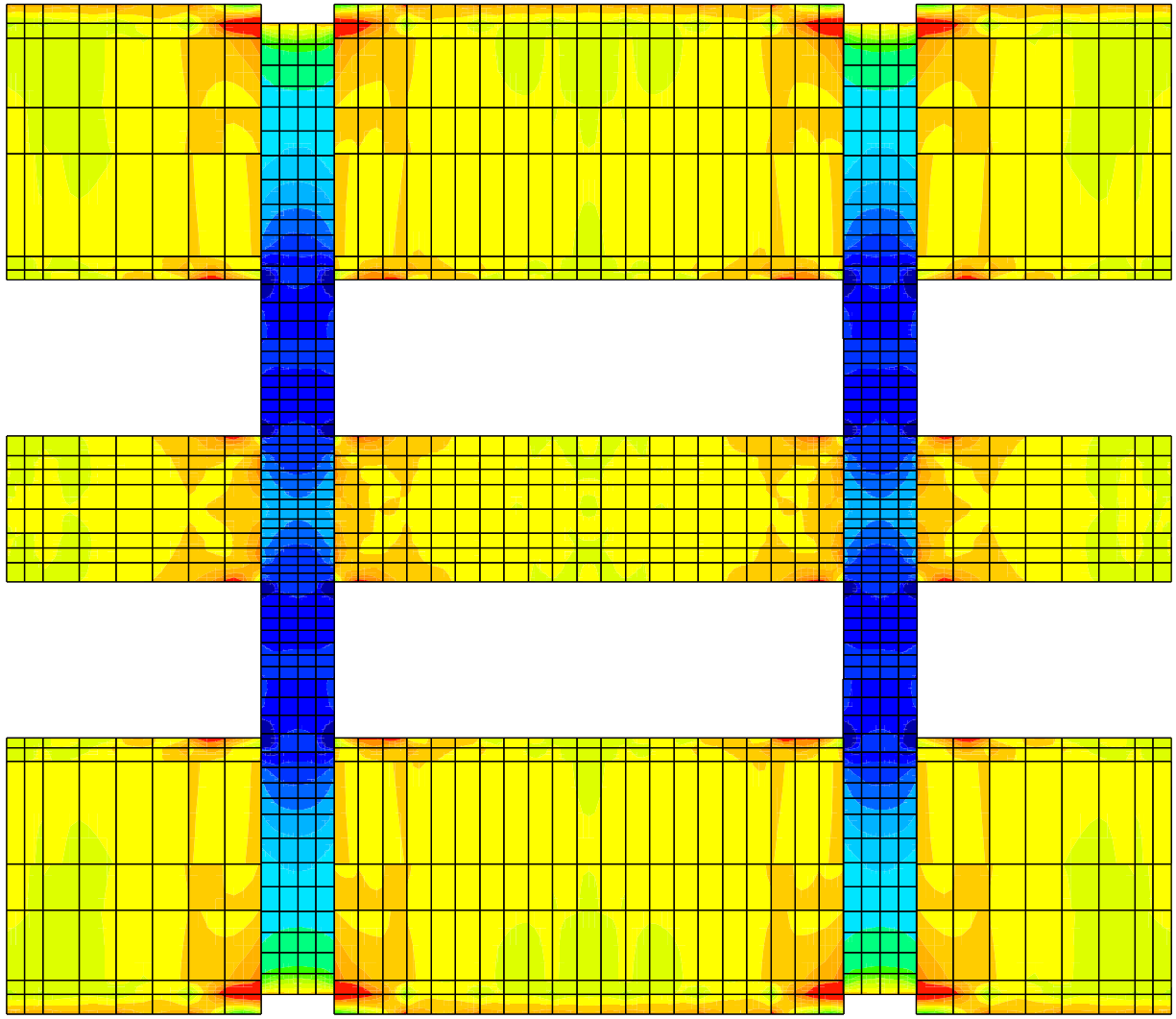

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Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

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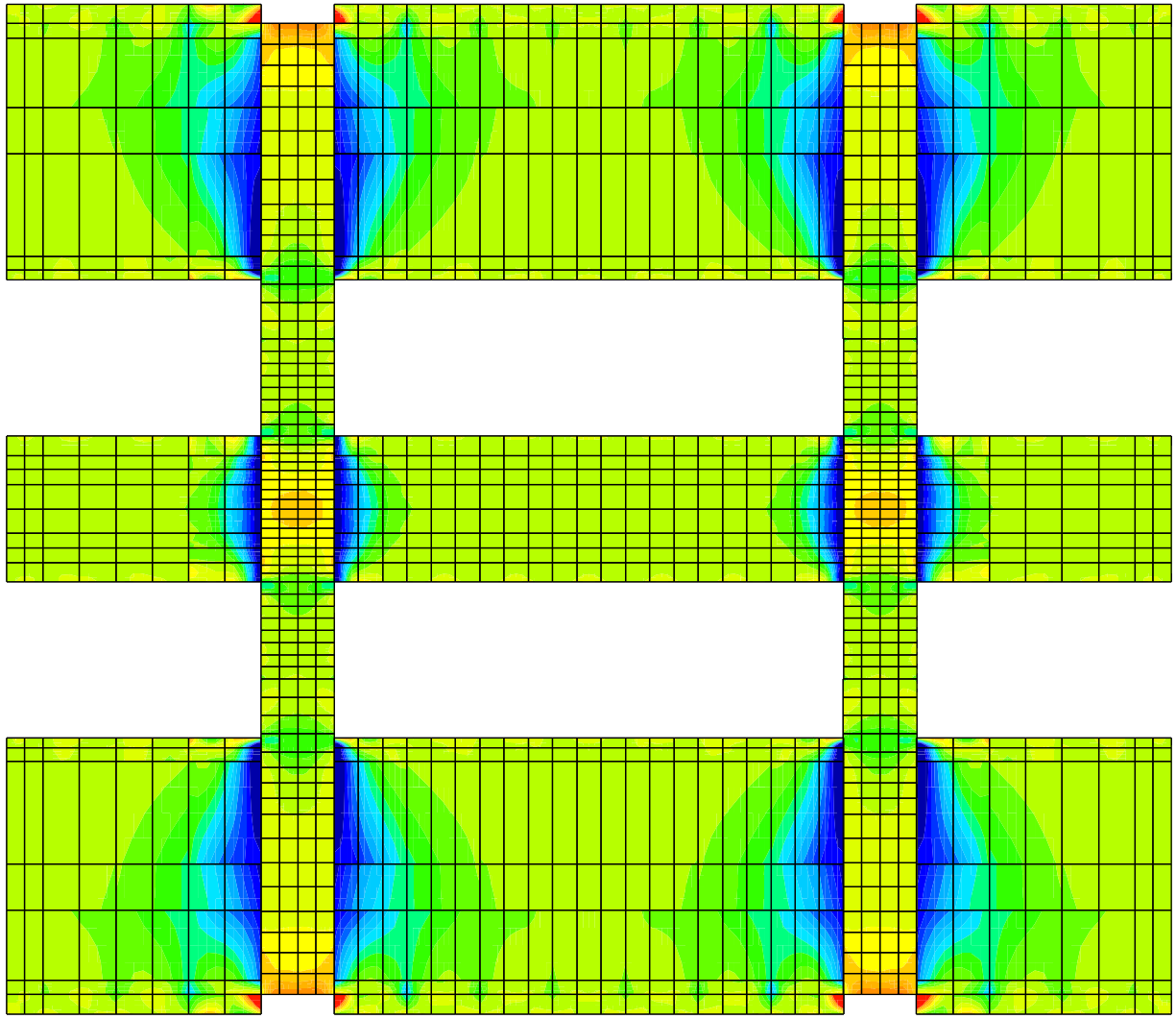

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Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

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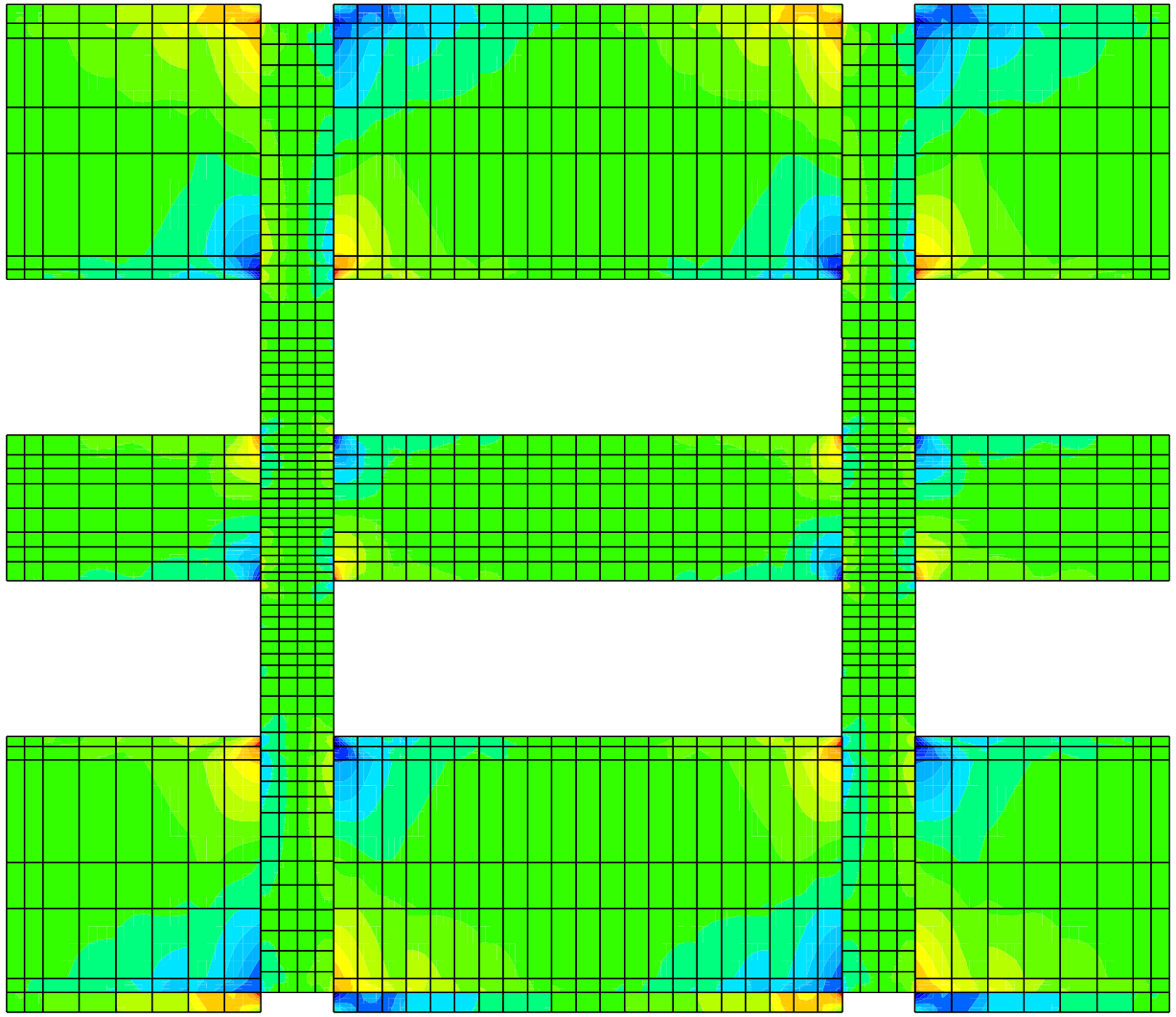

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Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

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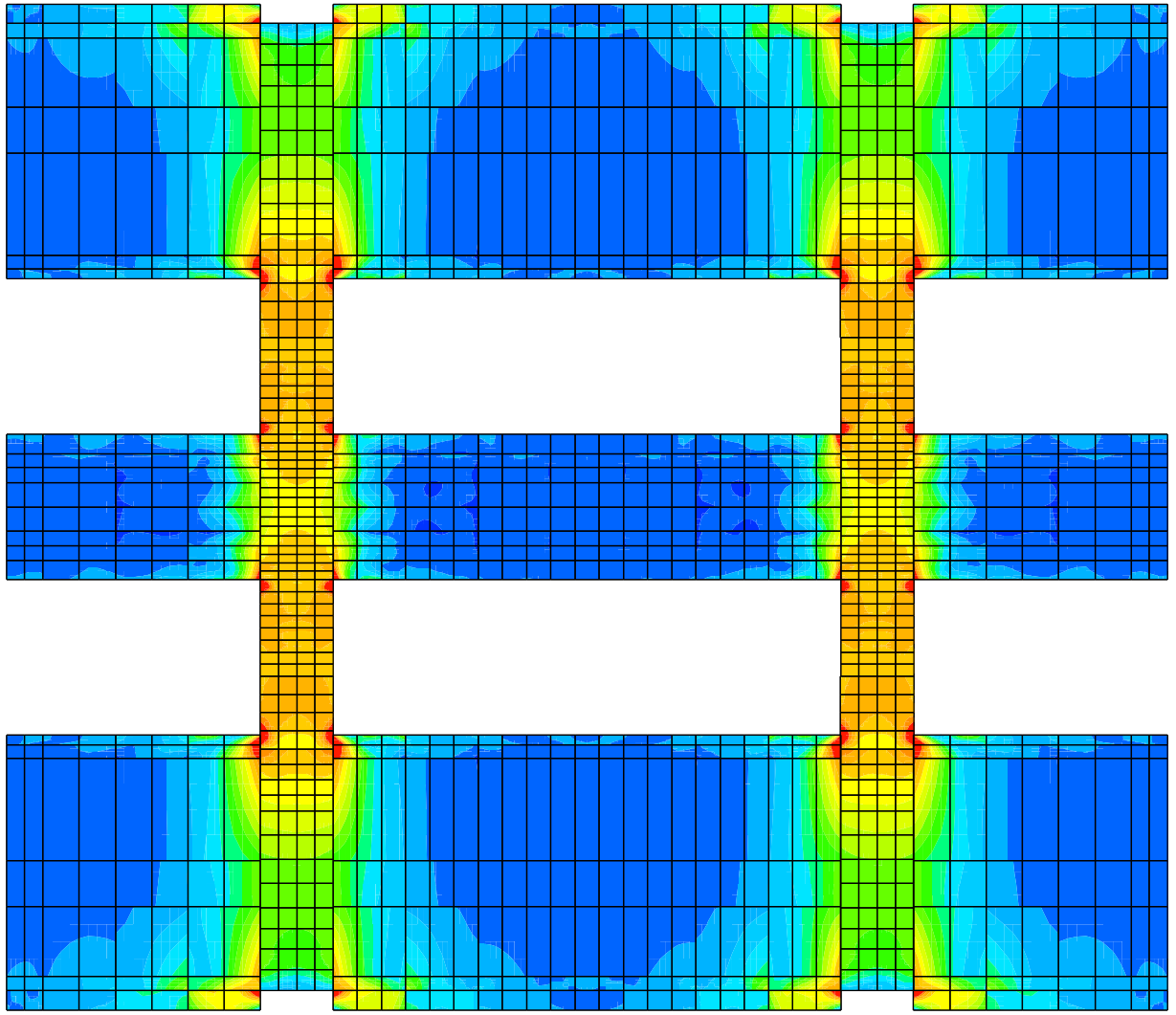

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Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

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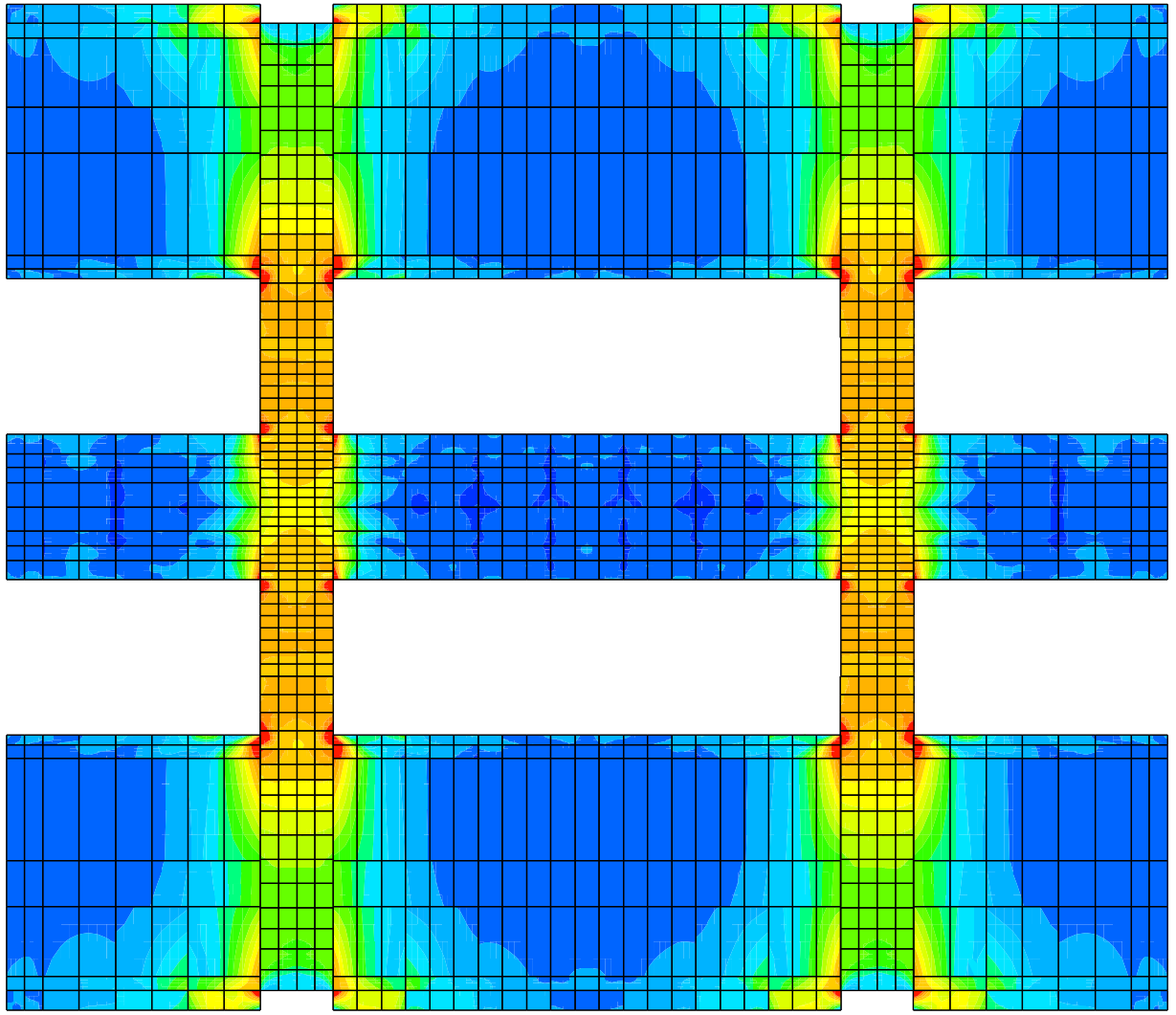

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Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

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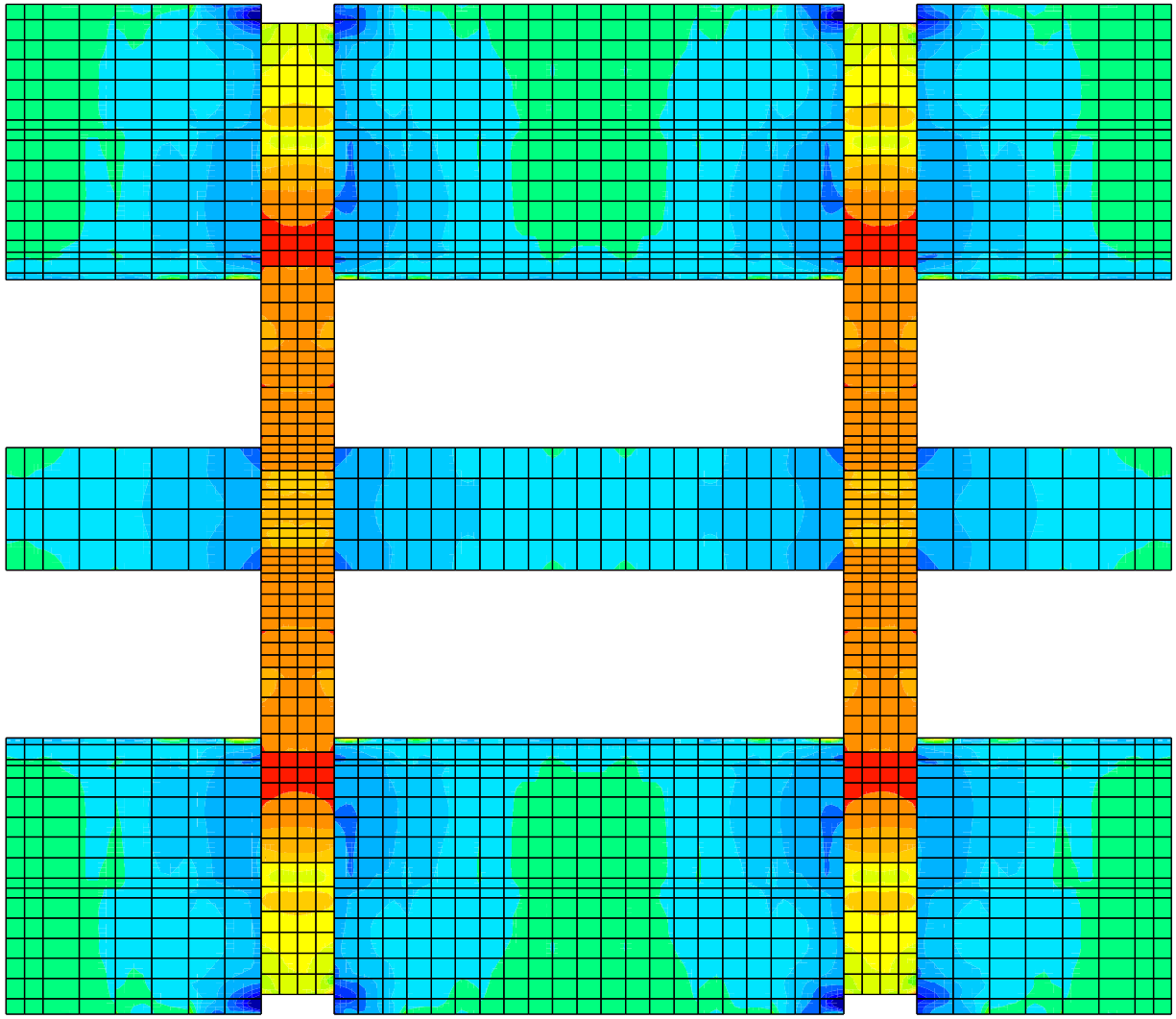

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Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

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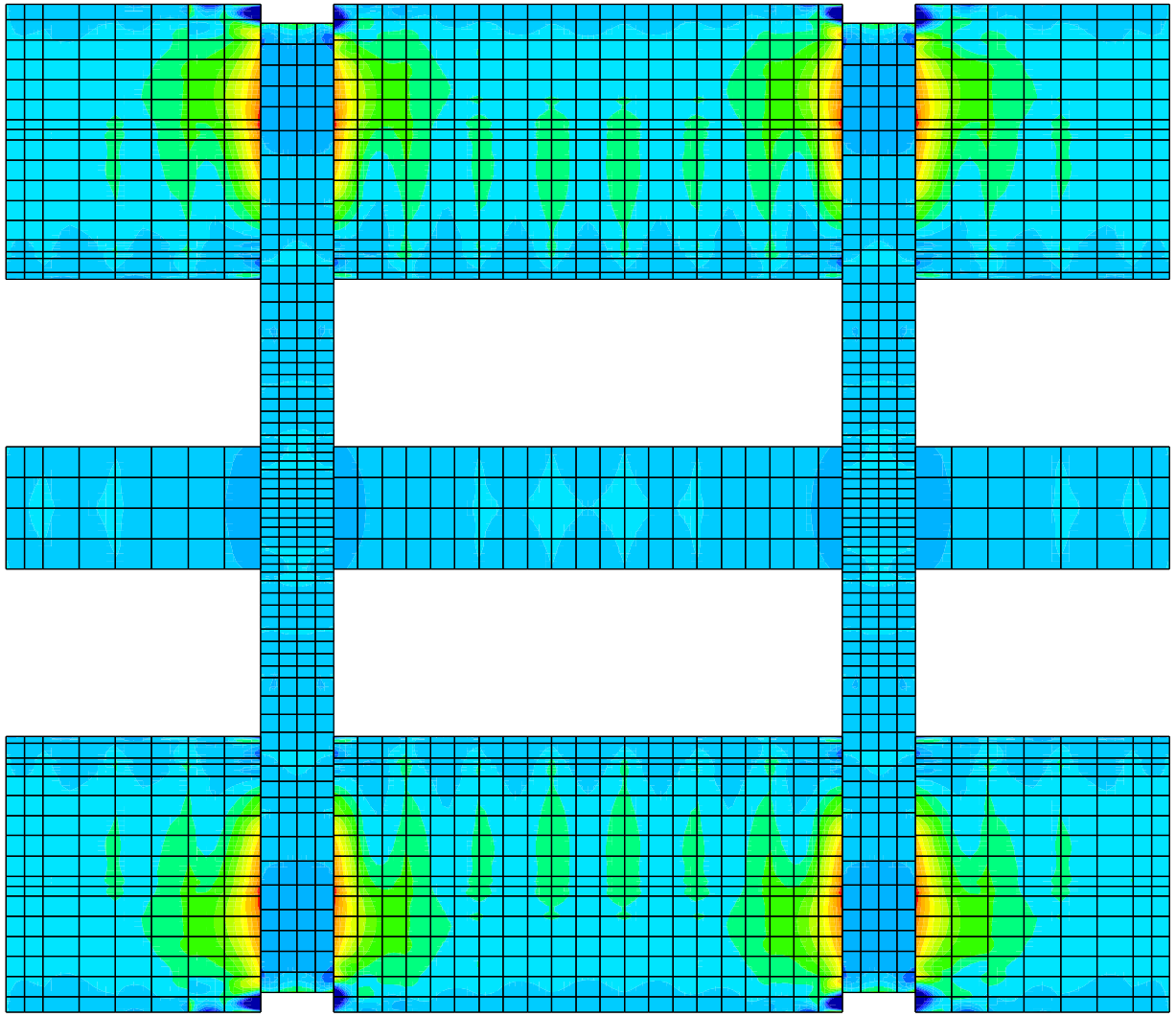

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Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

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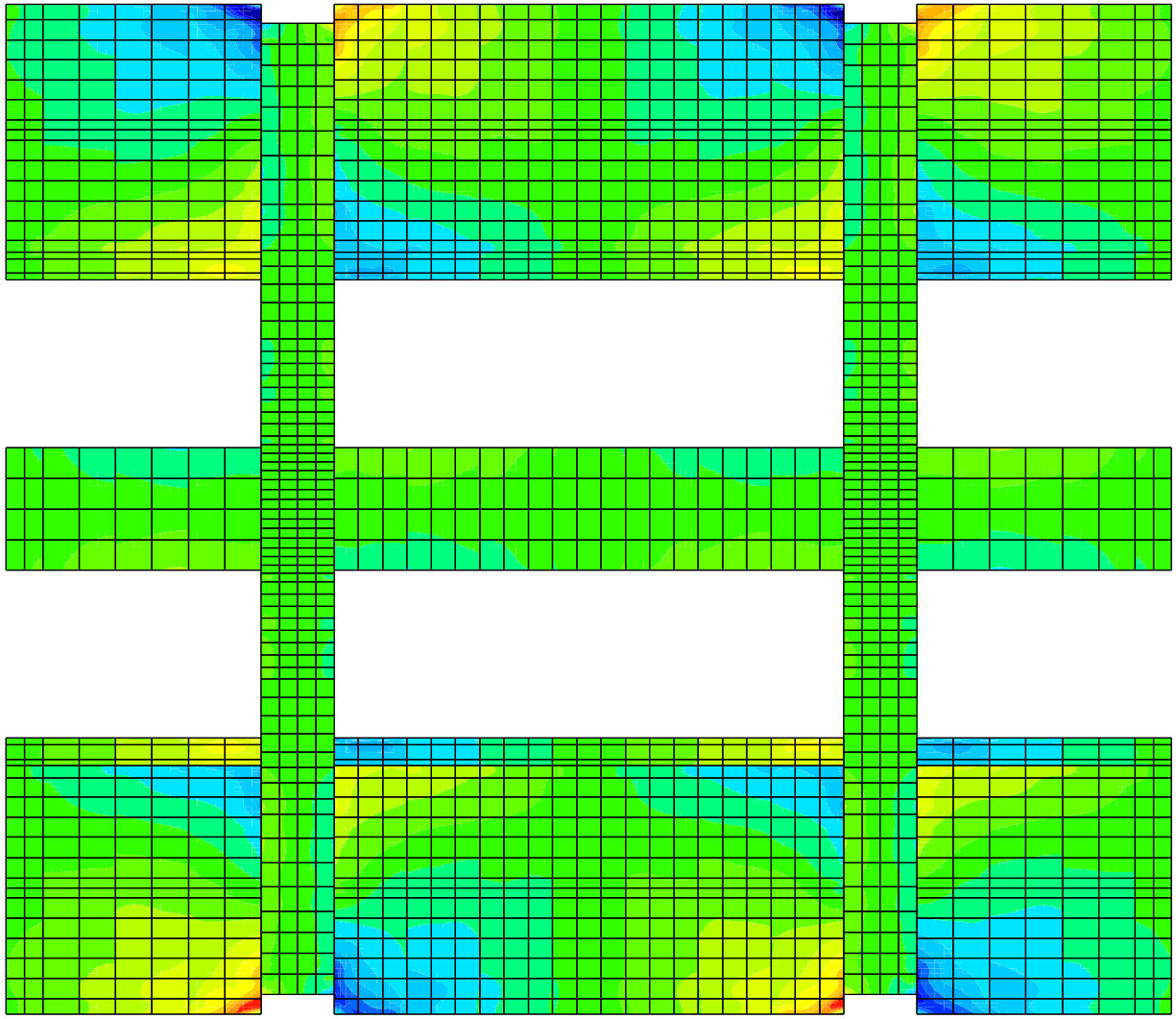

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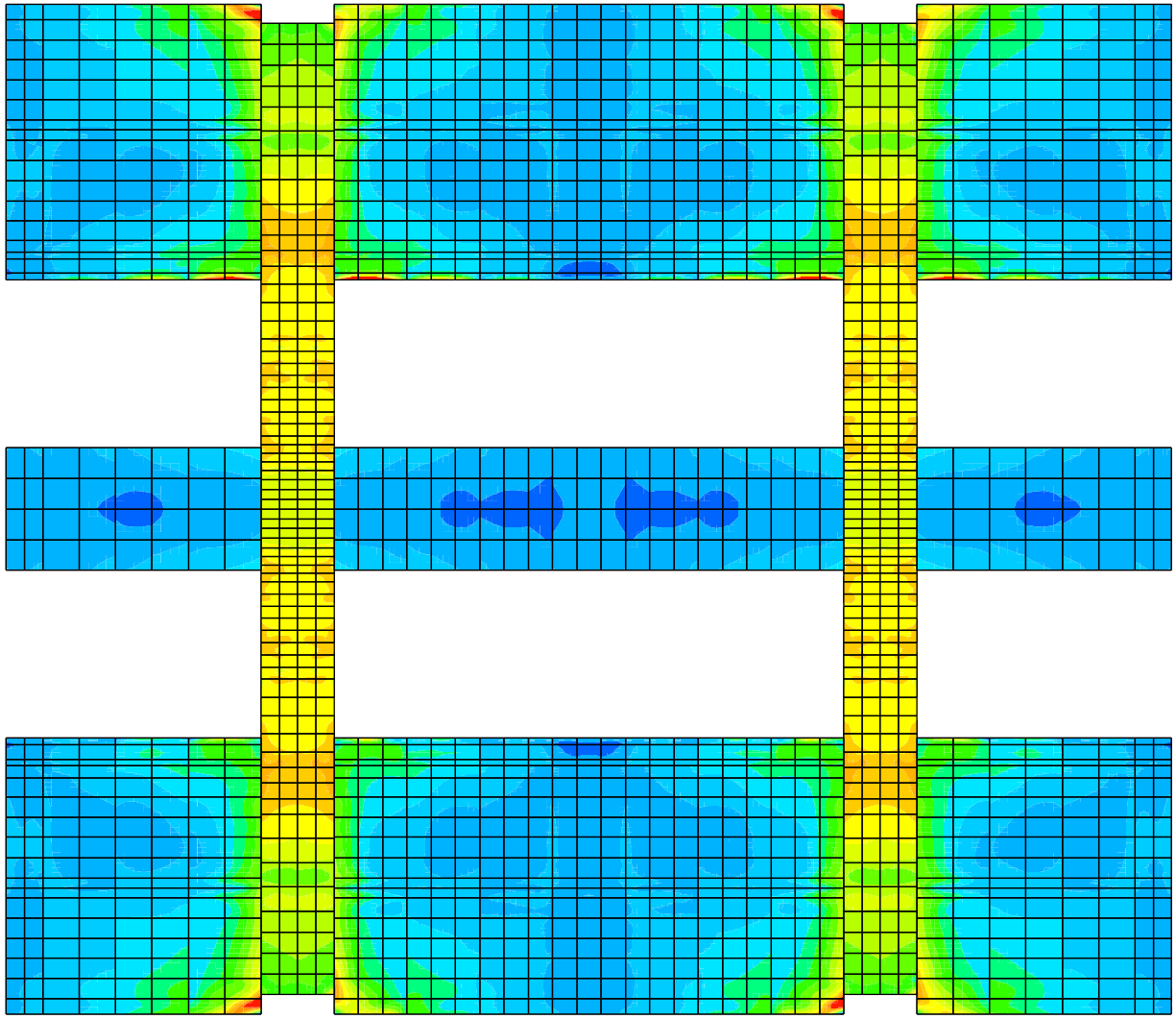
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 16:50	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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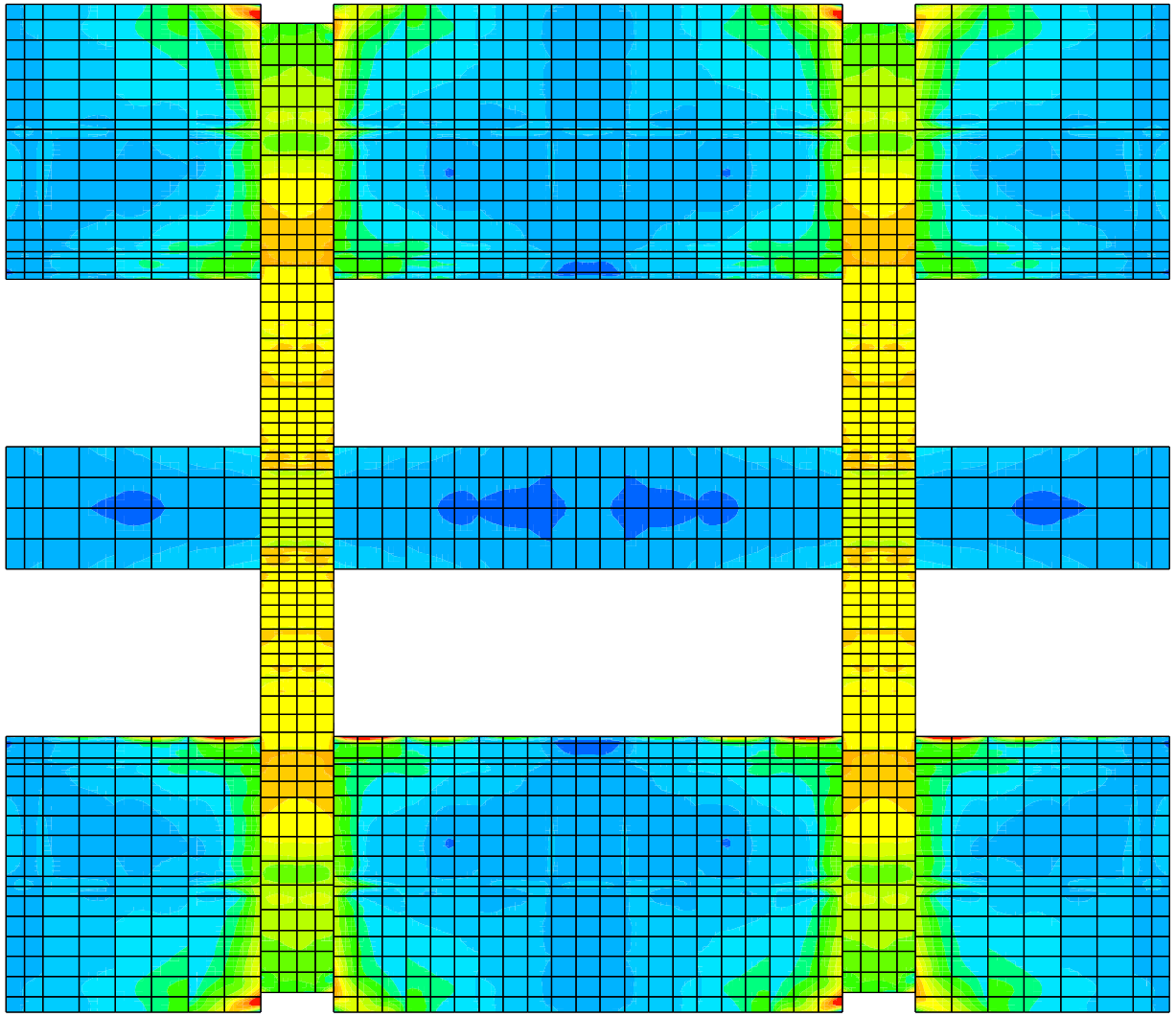
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 16:50	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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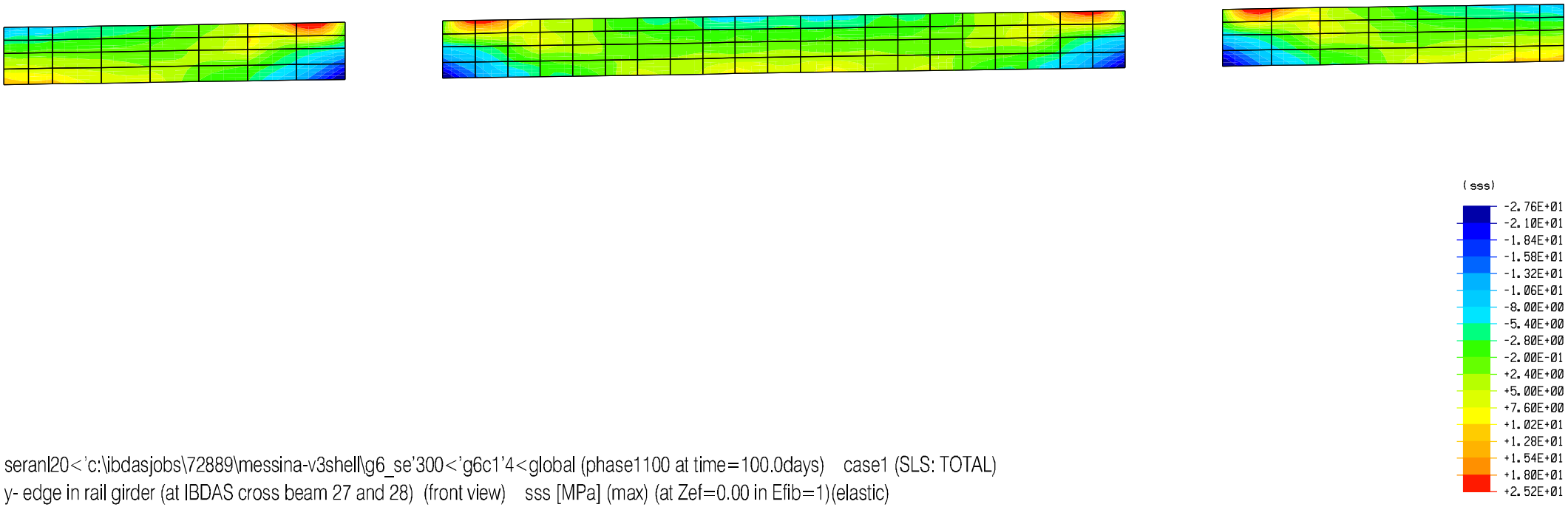
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 17:27	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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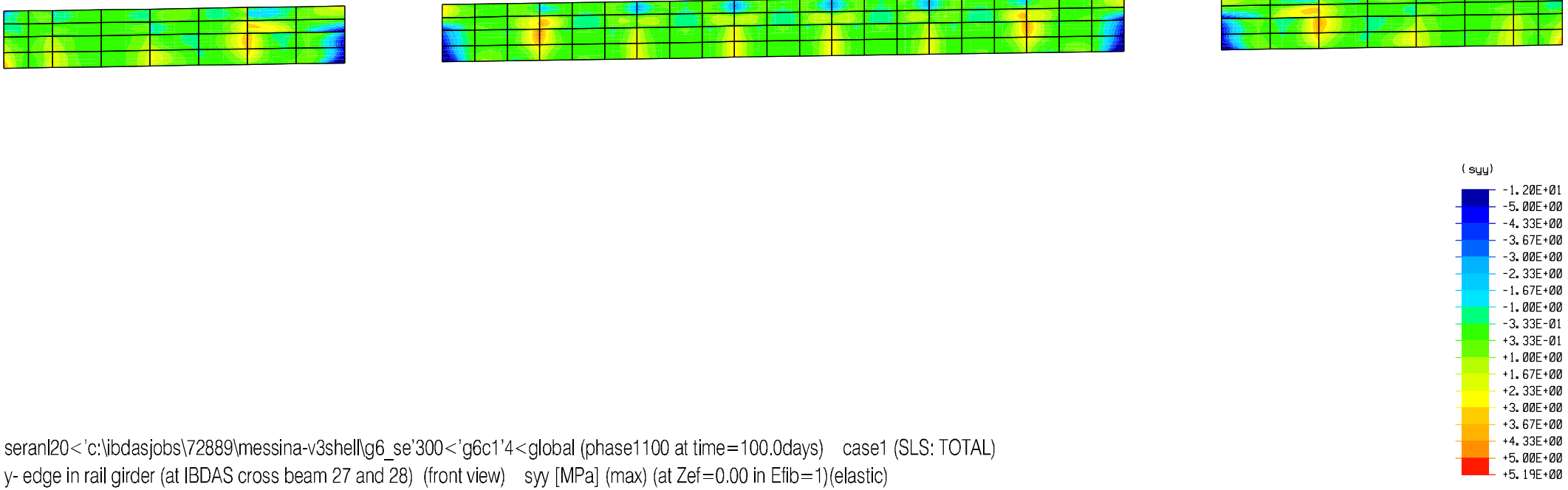
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:27	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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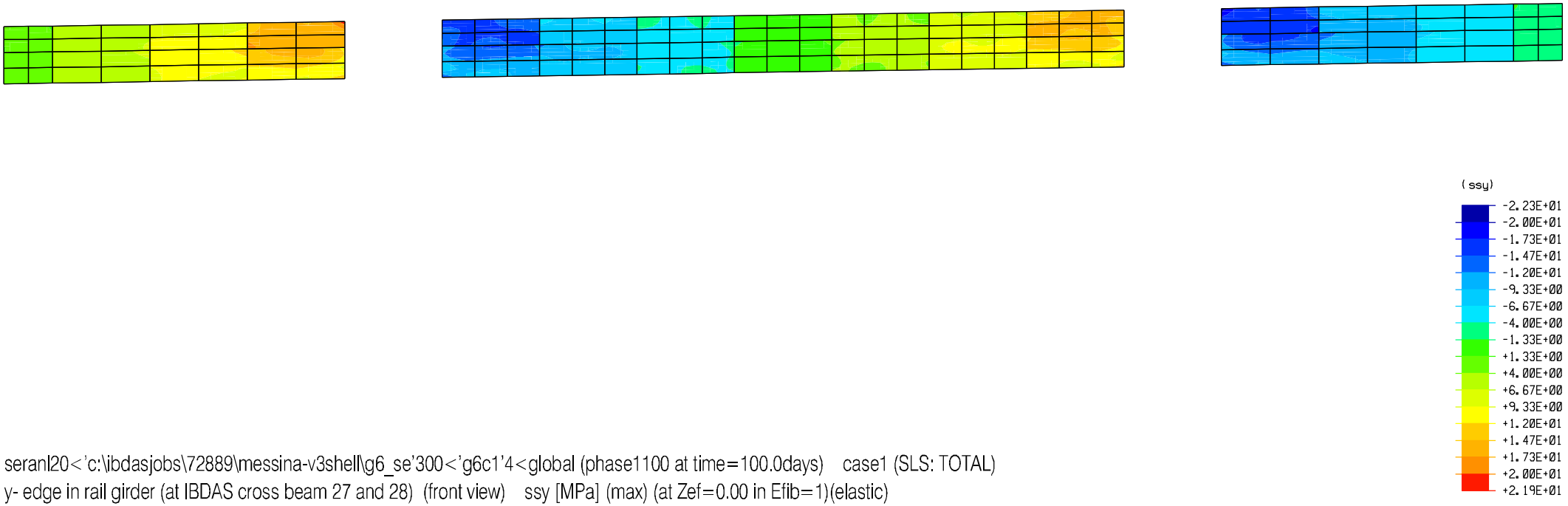
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:27	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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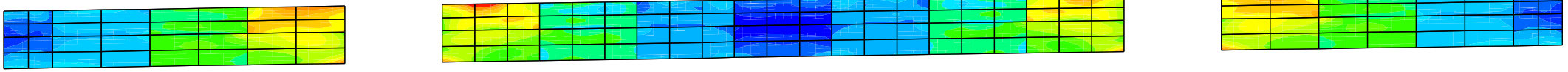
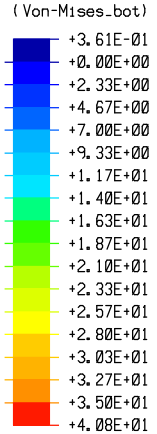
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:27	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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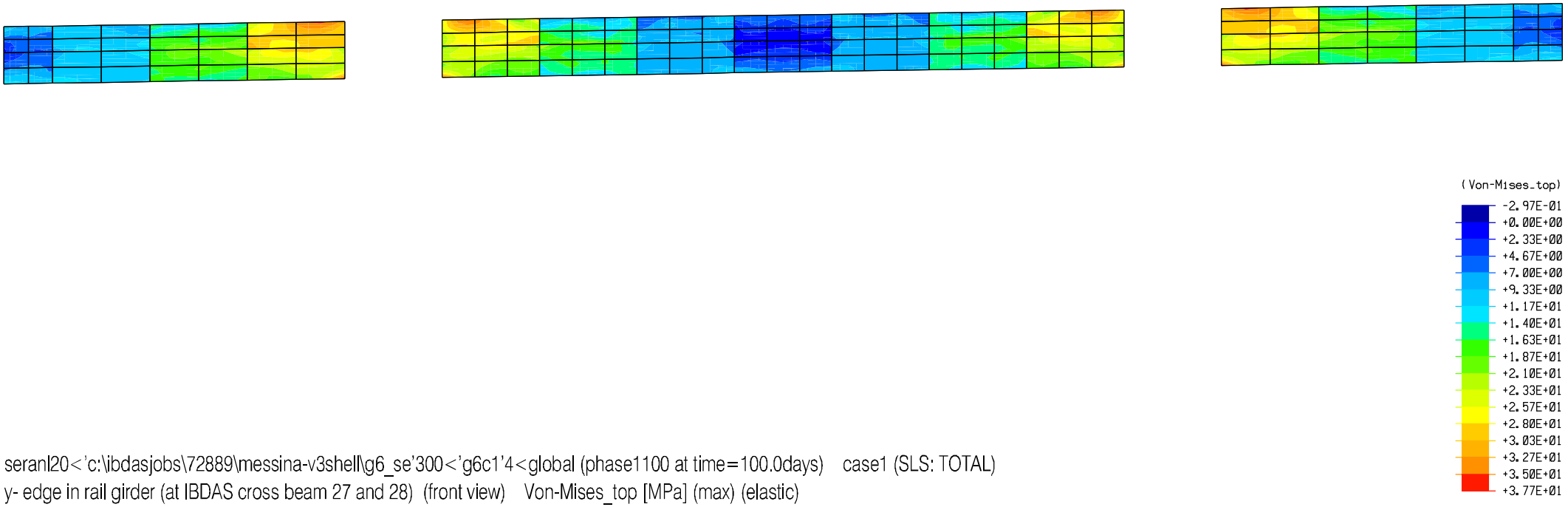
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 17:27	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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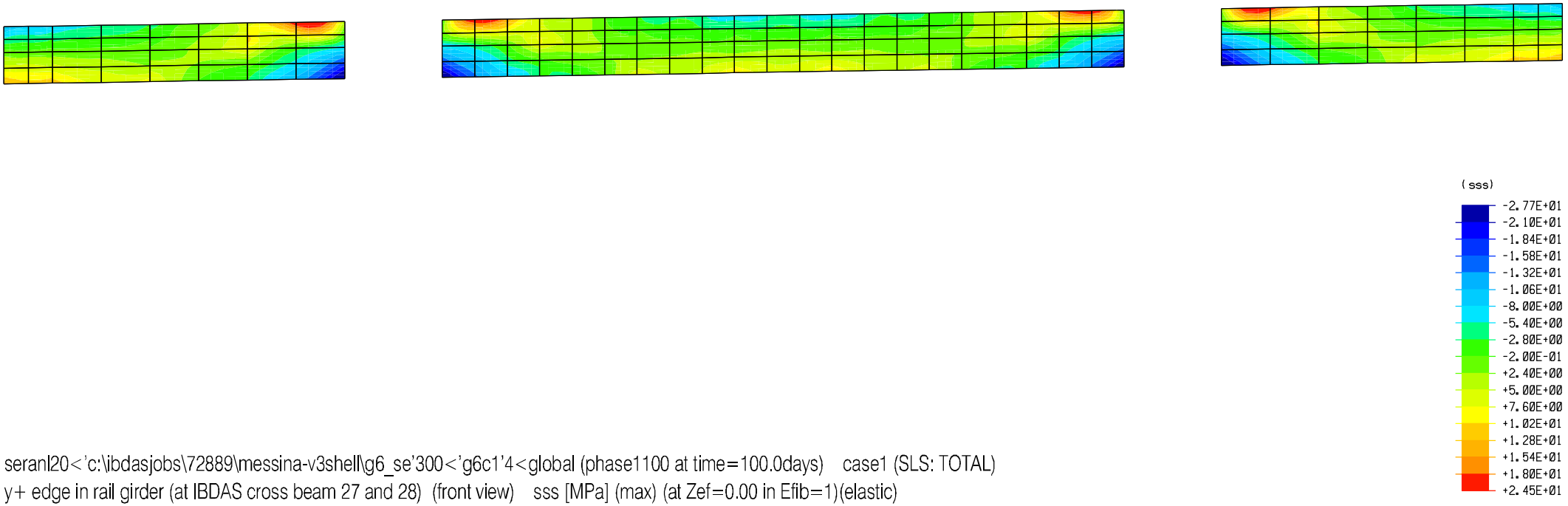
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 17:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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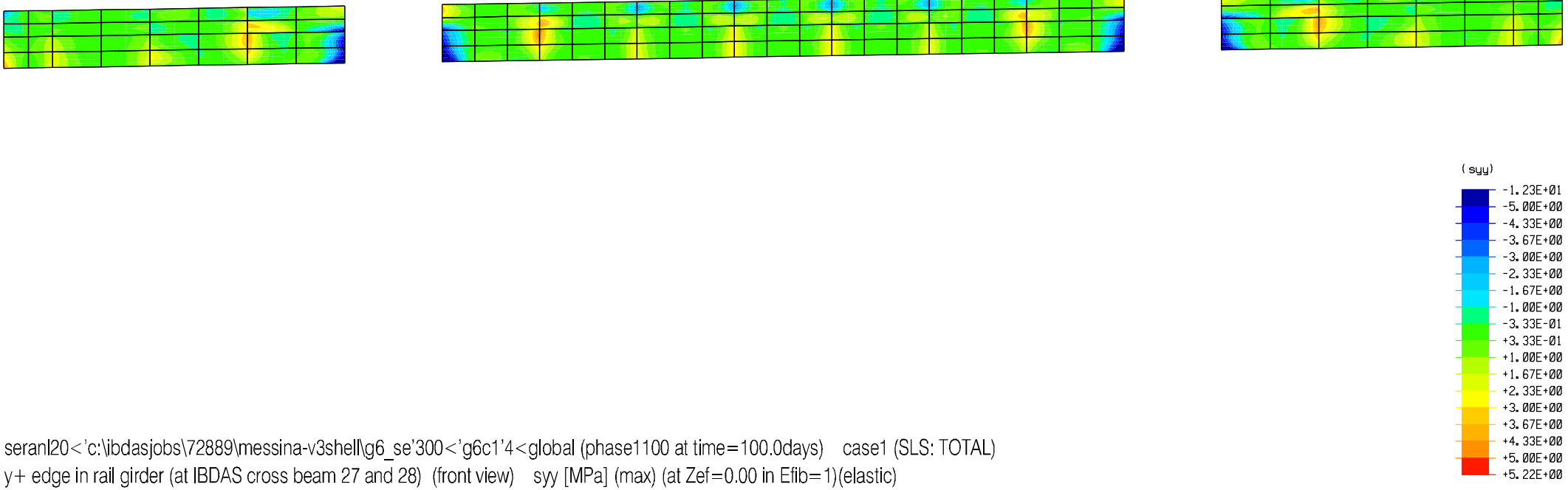
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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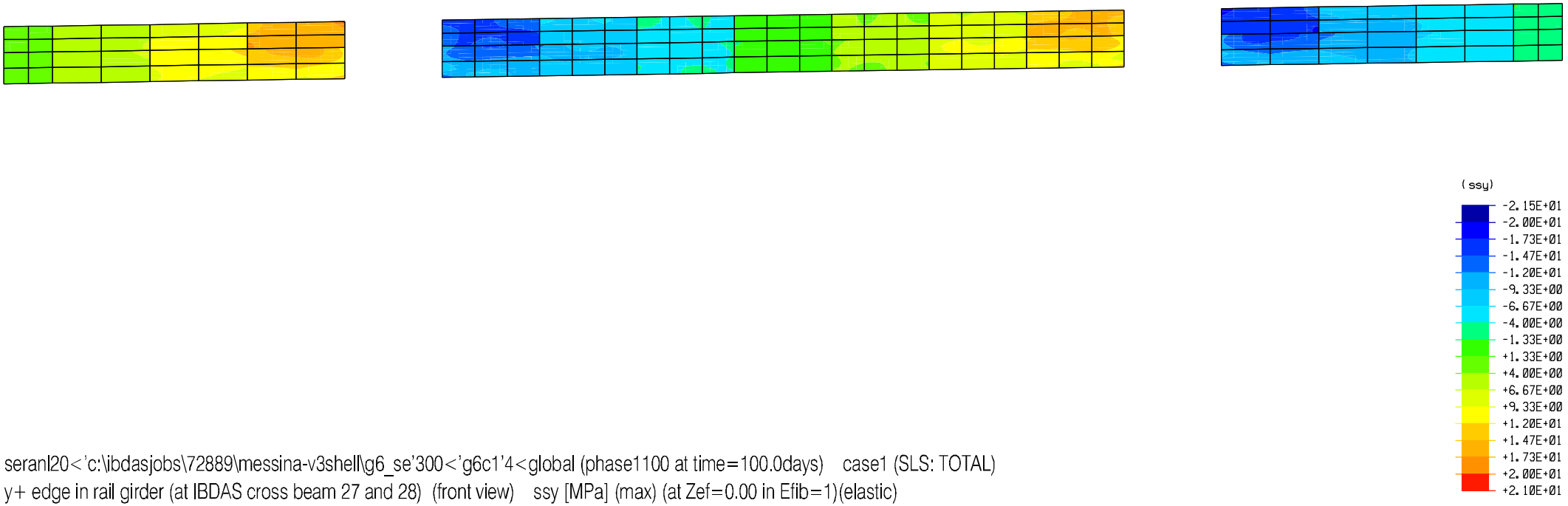
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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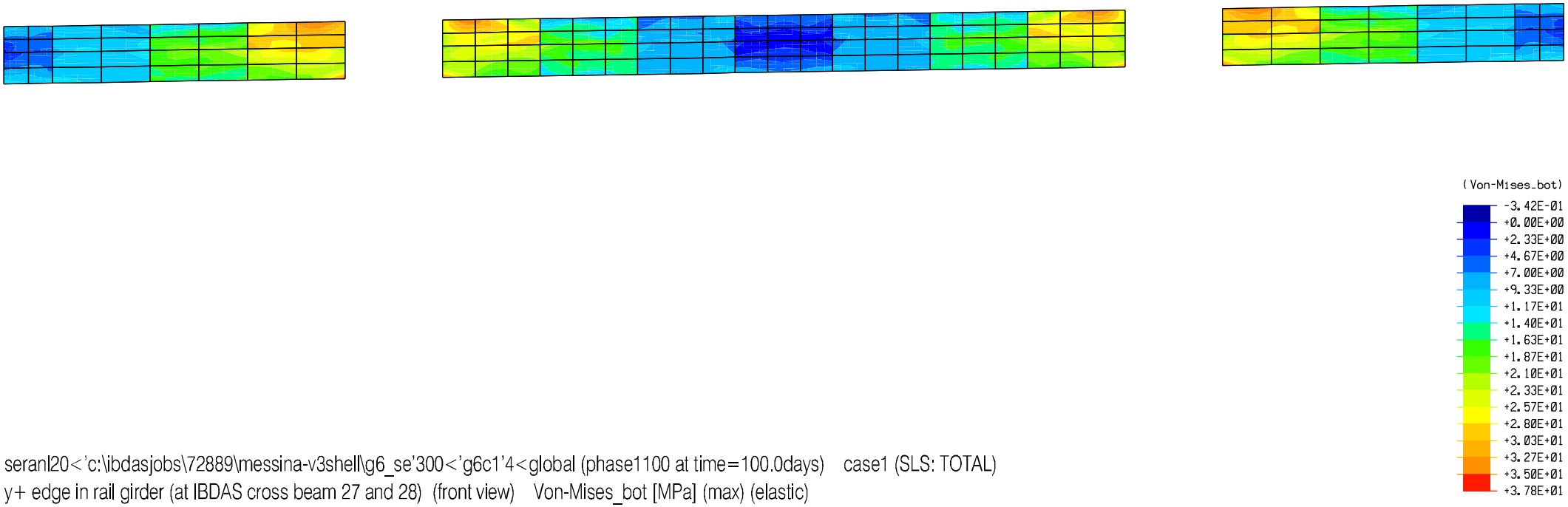
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 17:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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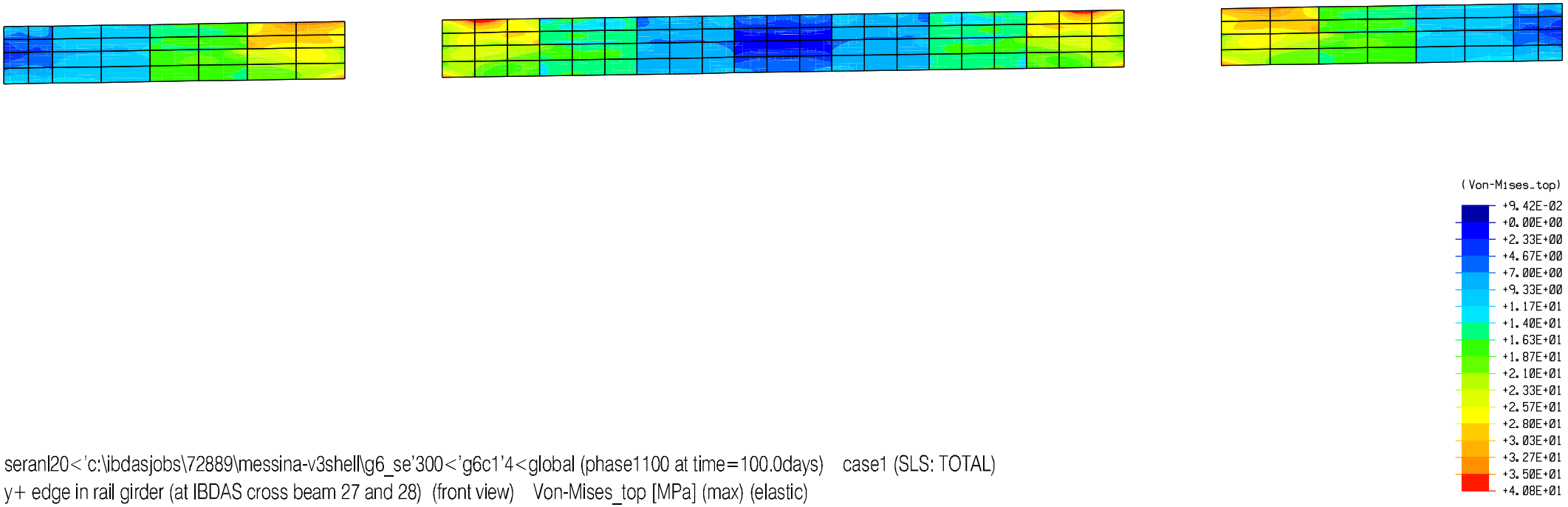
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 17:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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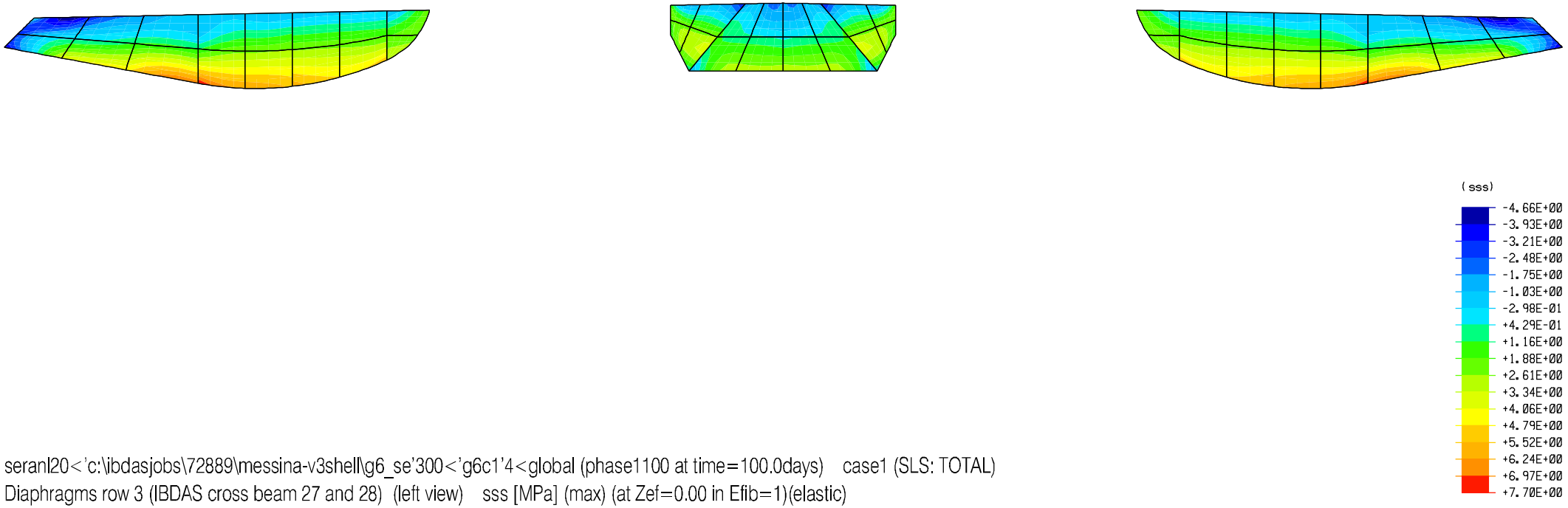
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 18:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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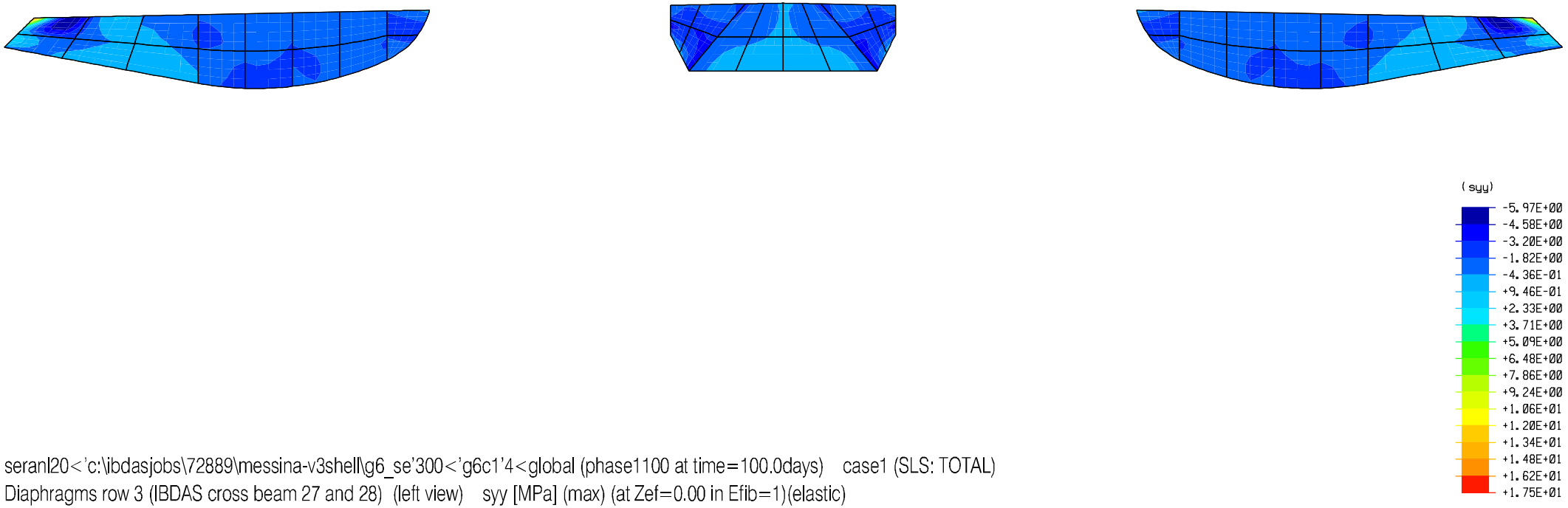
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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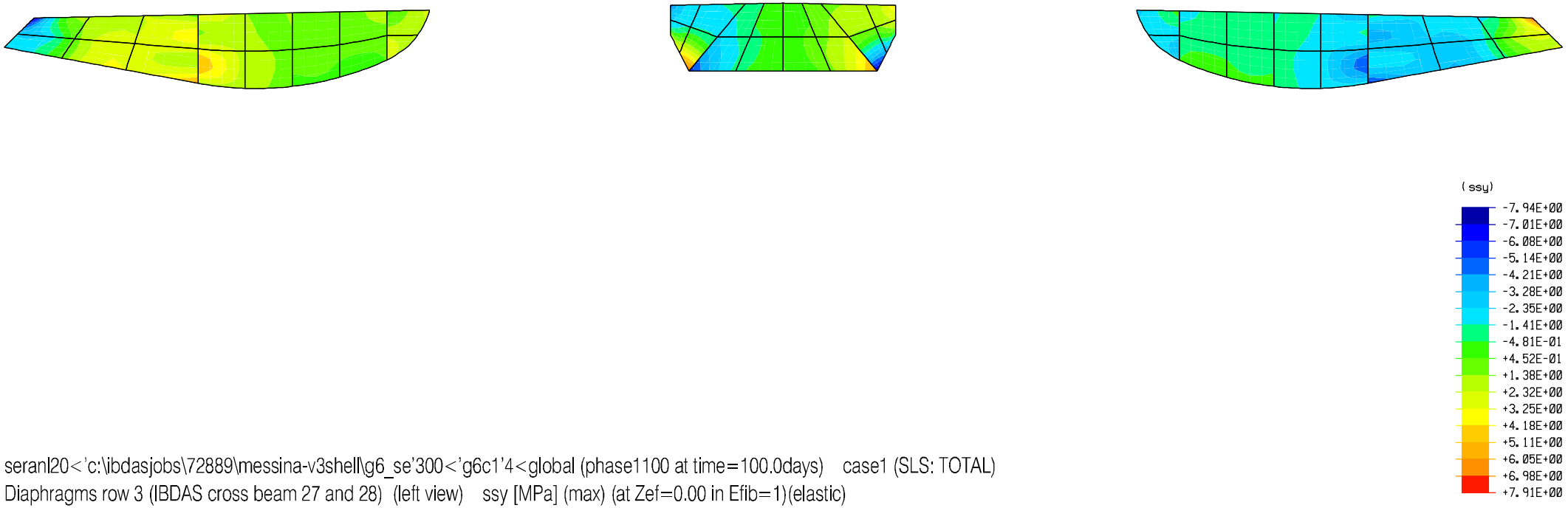
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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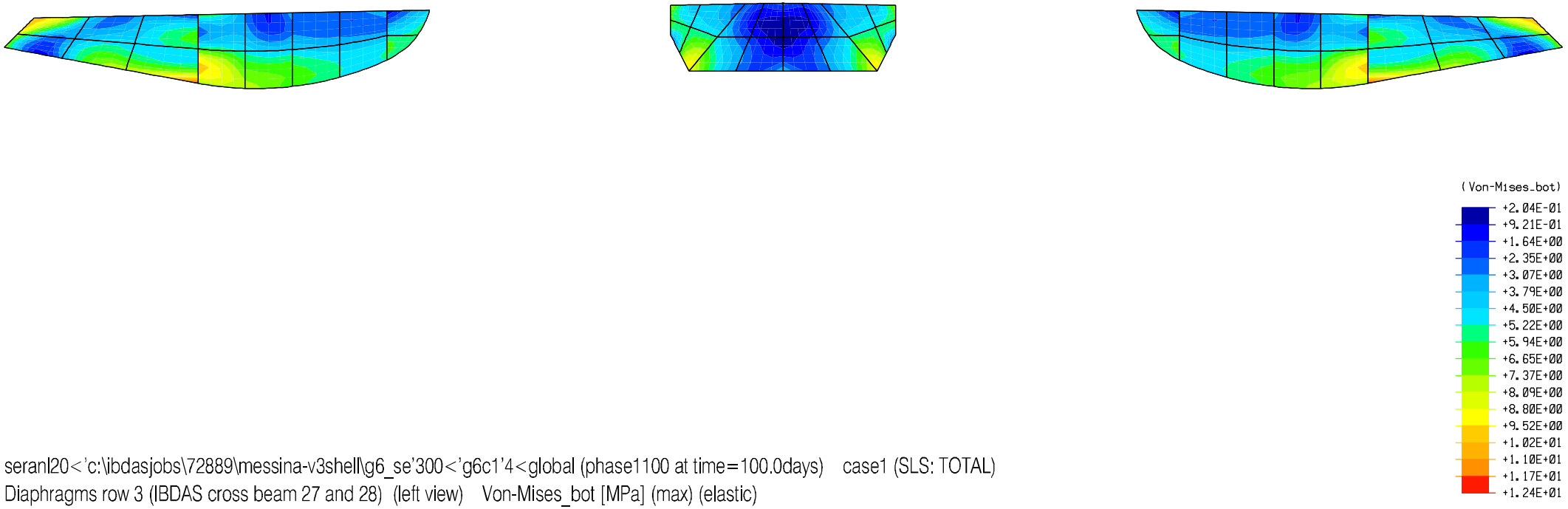
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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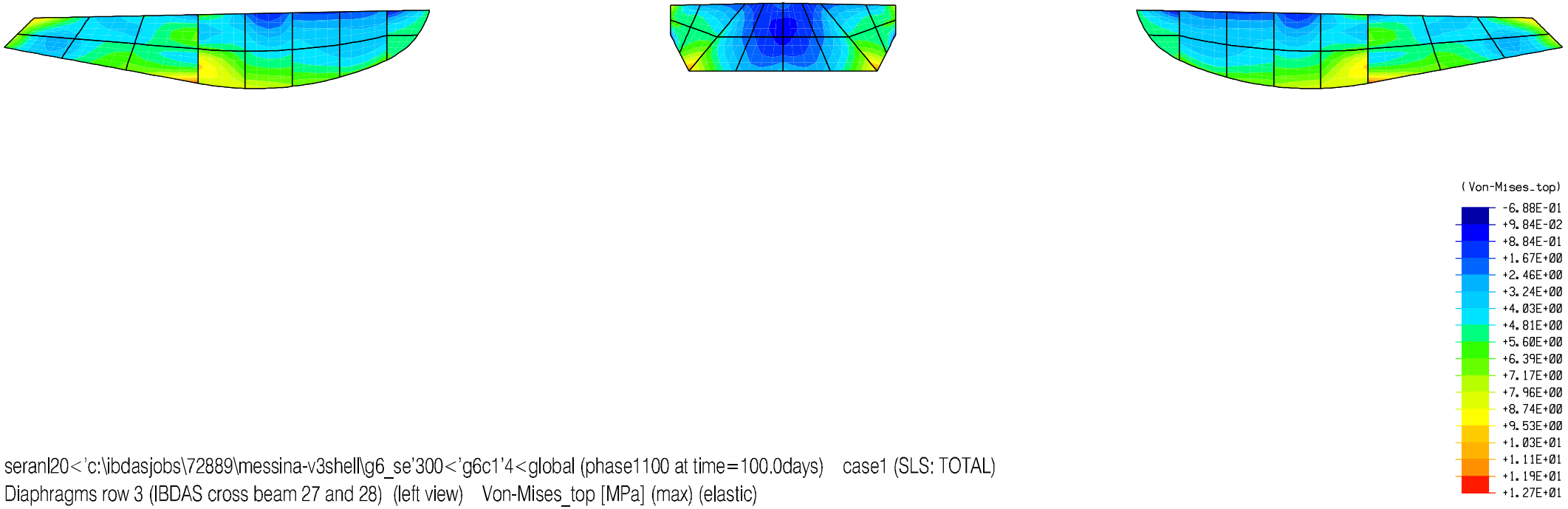
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_bot [MPa] (max) (elastic)



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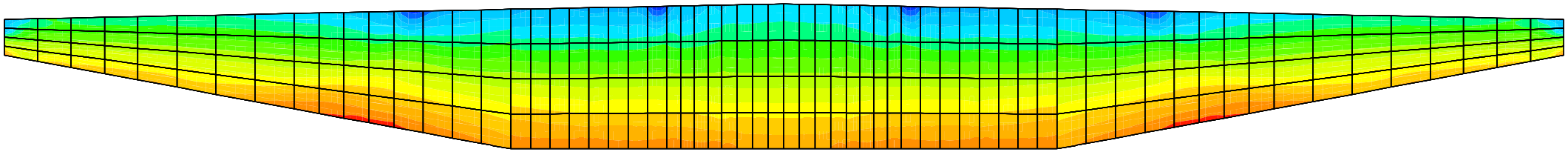
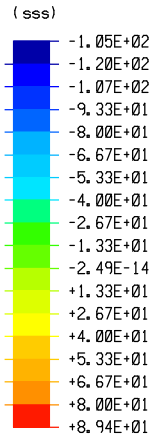
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 18:41	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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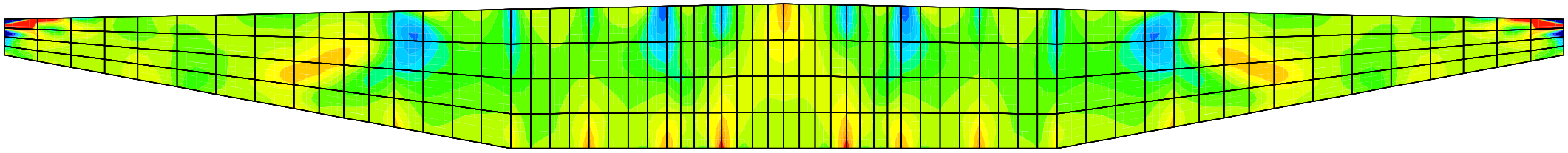
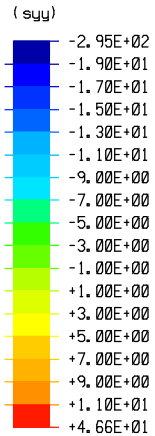
s+ cross beam edge (IBDAS cross beam 27) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:41	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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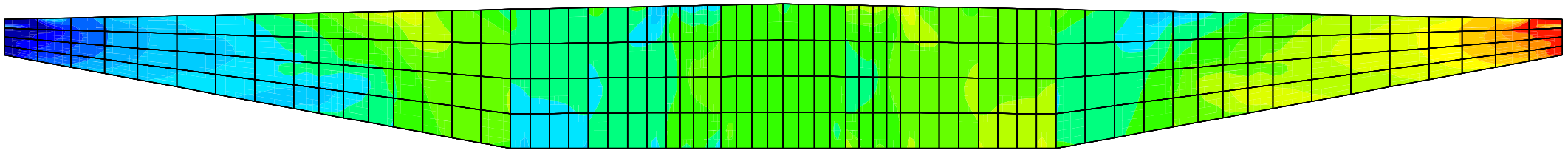
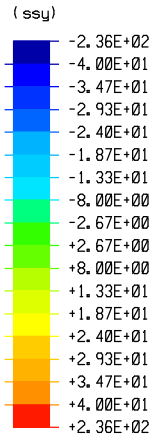
s+ cross beam edge (IBDAS cross beam 27) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:41	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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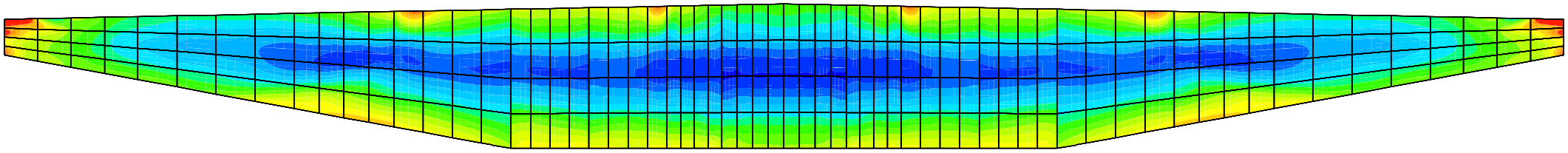
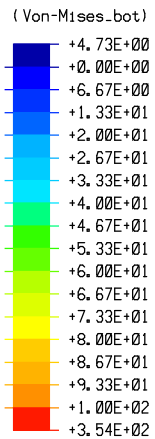
s+ cross beam edge (IBDAS cross beam 27) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 13-mar-11 18:41	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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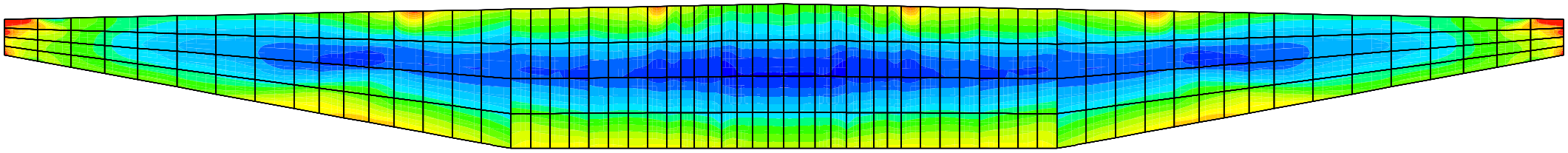
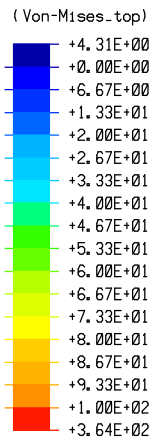
s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 13-mar-11 18:41	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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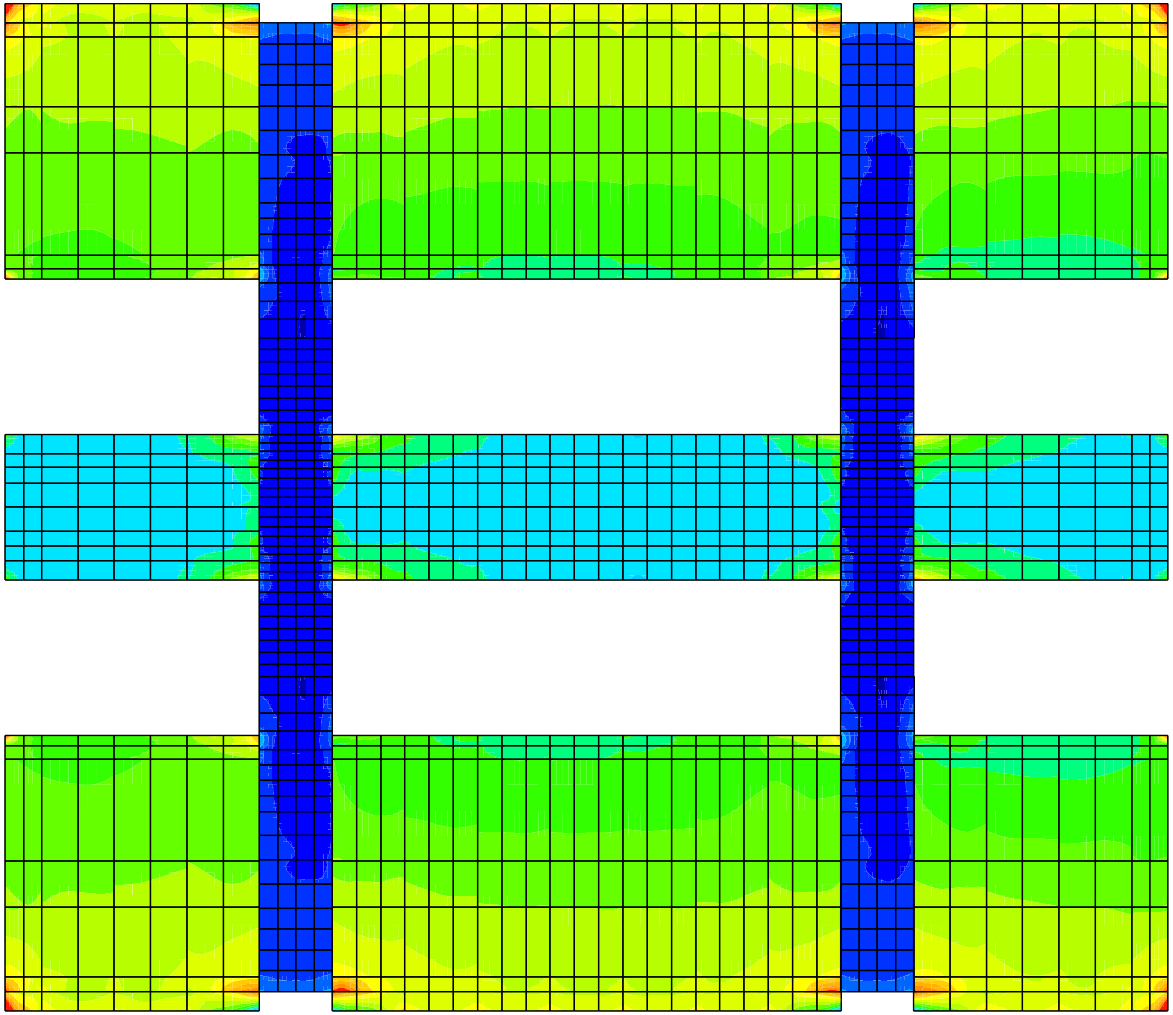
s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 15:36	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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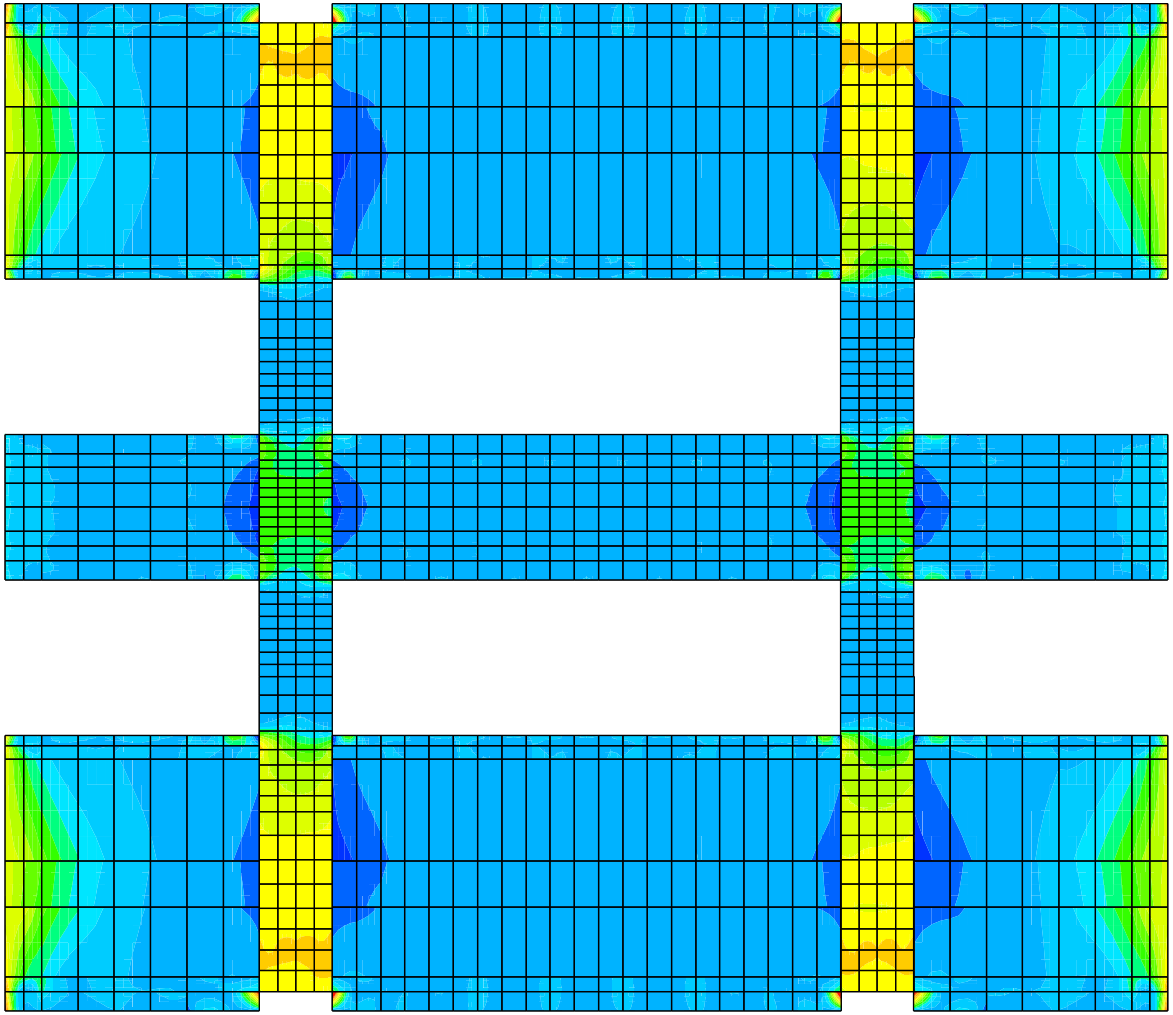
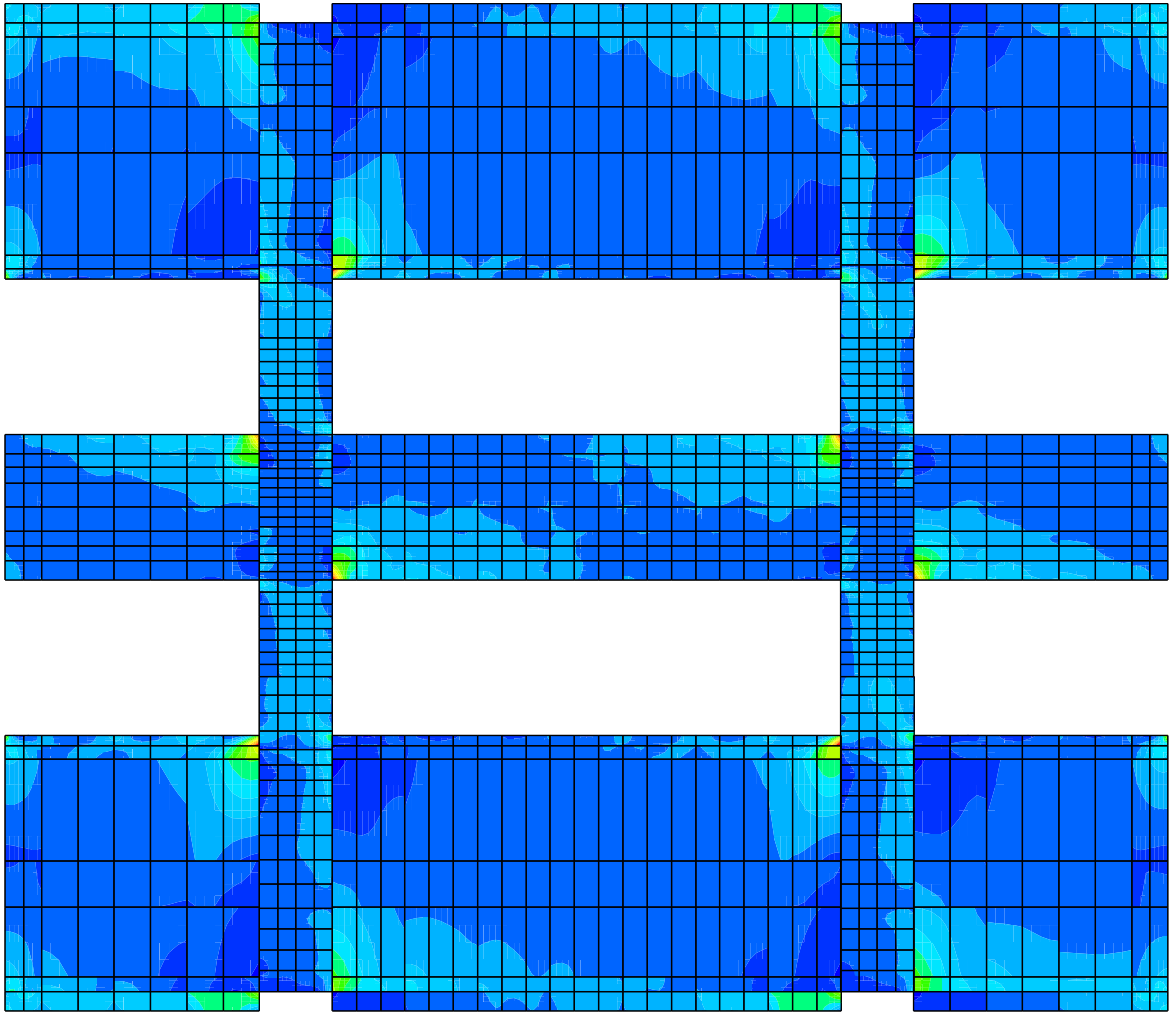
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:36	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



seranl20<'c:\ibdasjobs\72889\messina-v3shell\g6_se'300<'g6c1'4<global (phase1100 at time=100.0days) case6500 (ULS: ULS load finished bridge (envelope w. static loads) (Design Basis Soléil 2.1E Surf=40mm)
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:36	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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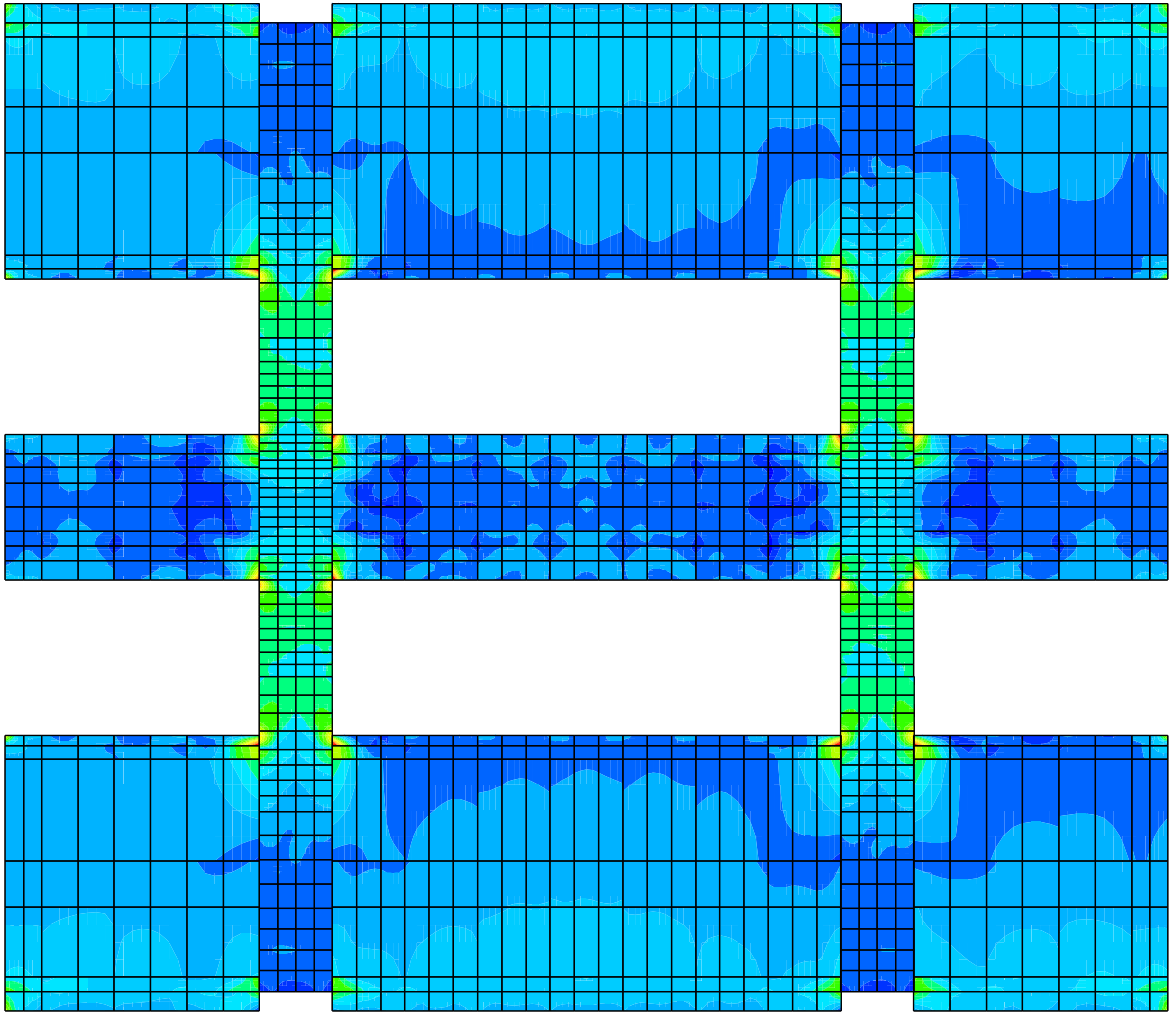
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:36	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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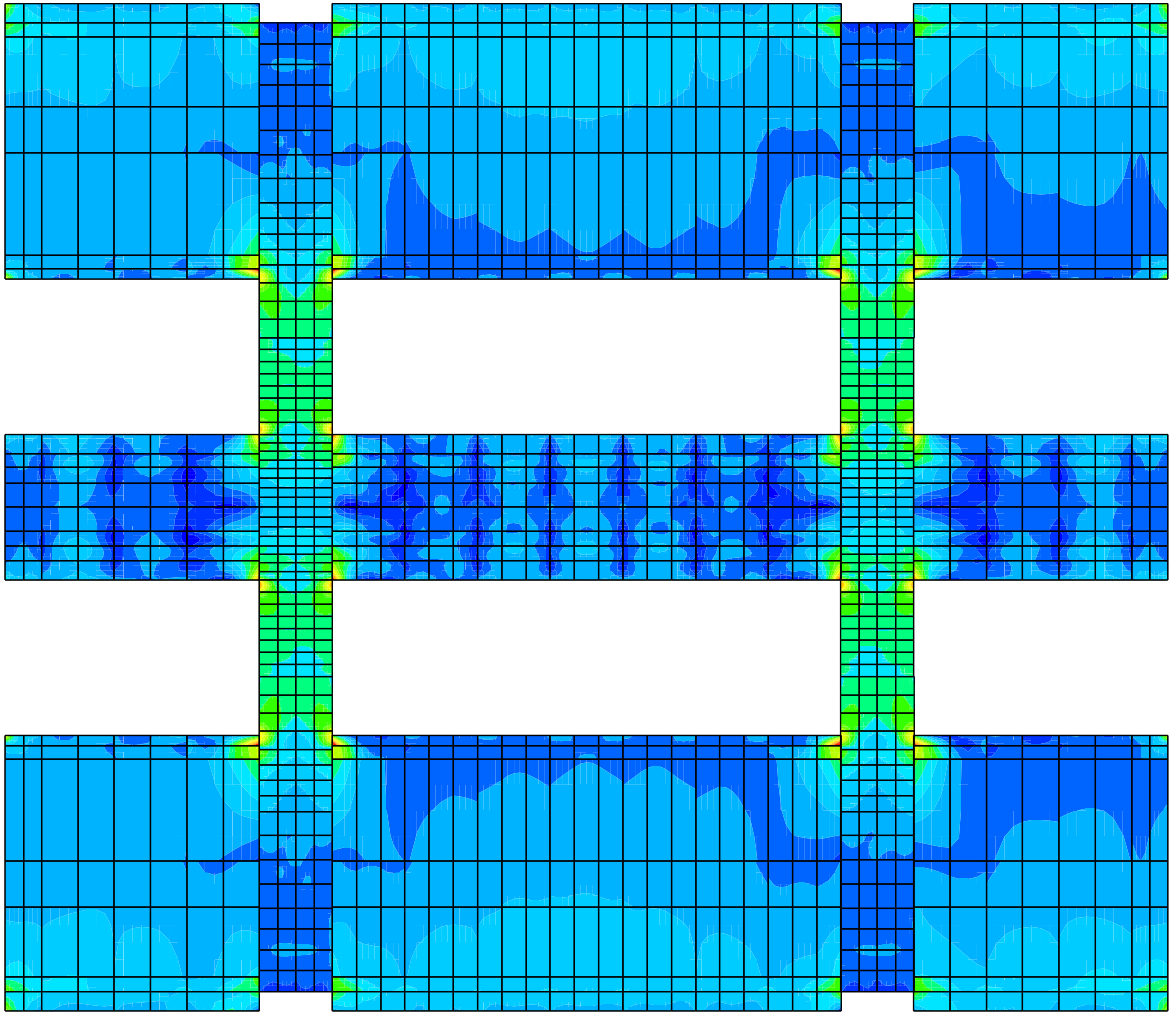
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 15:36	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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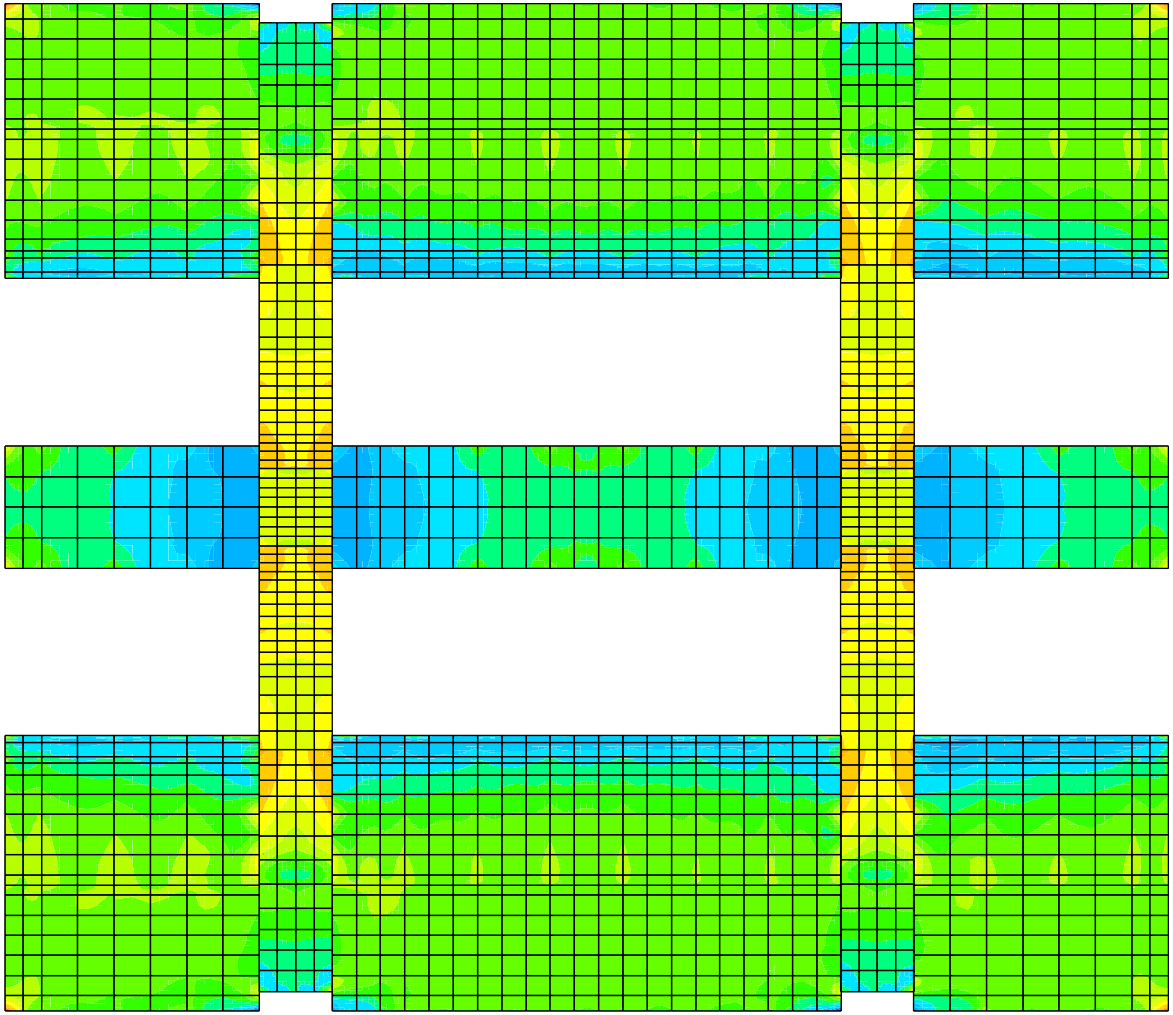
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 15:58	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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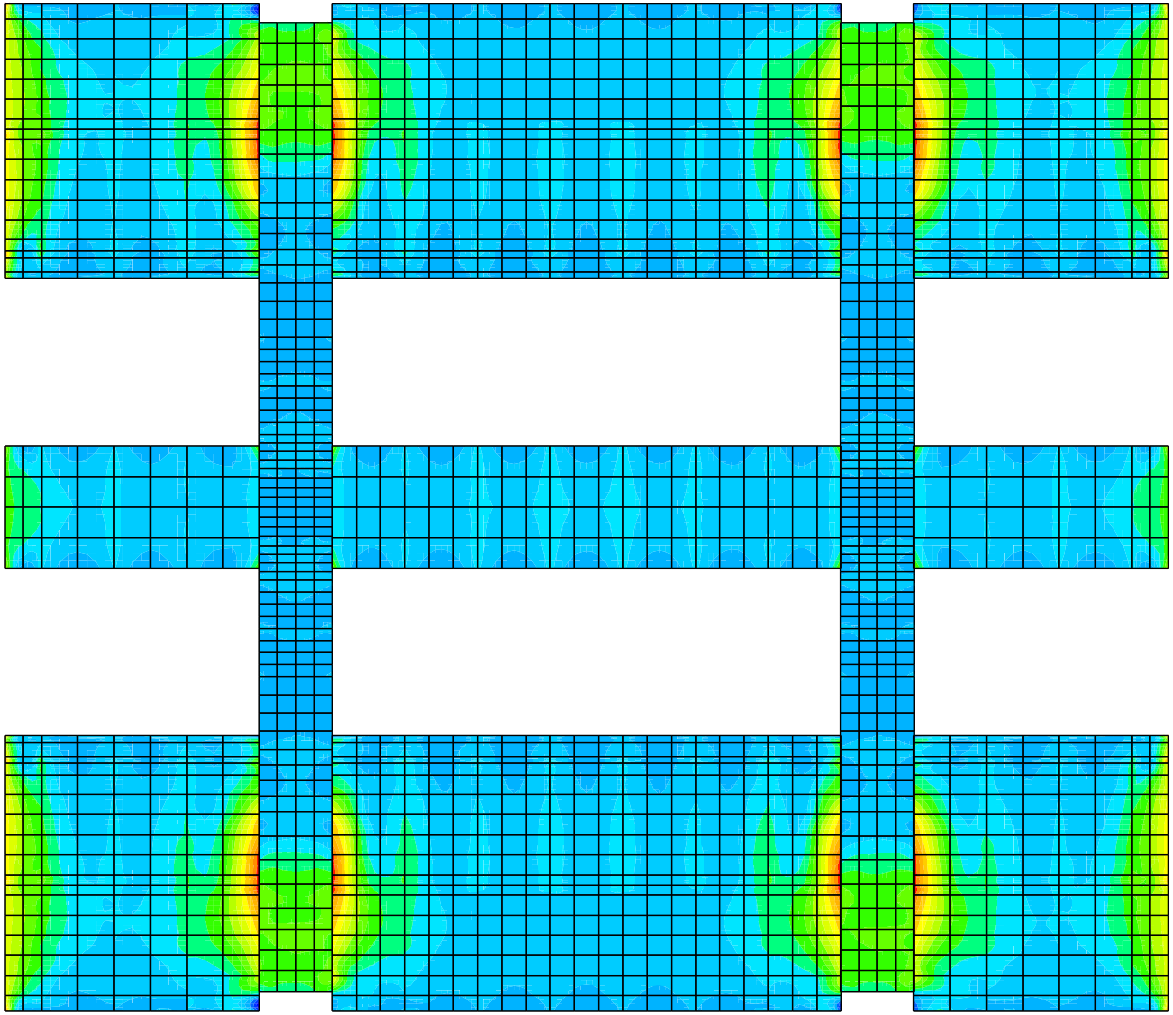
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:58	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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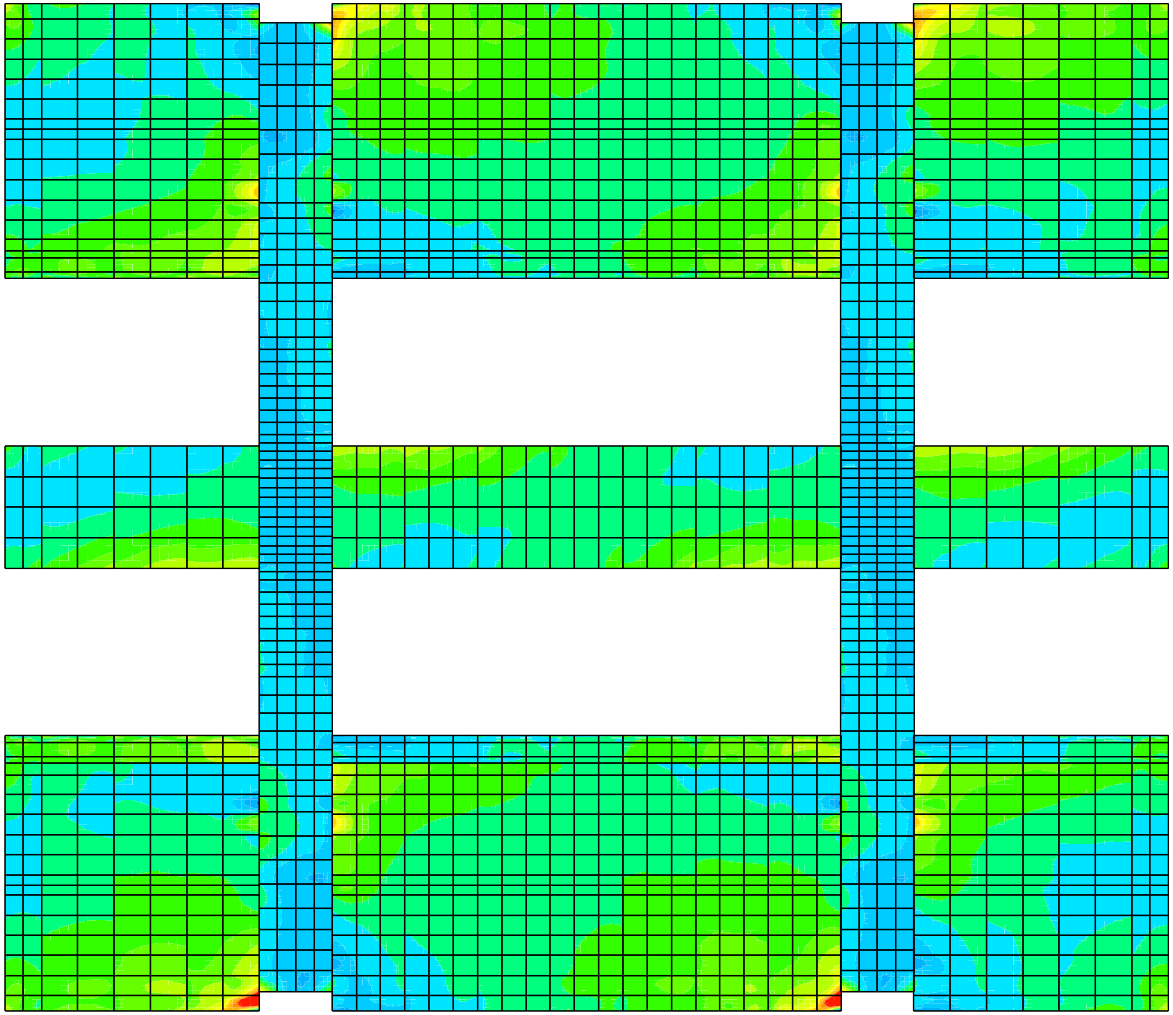
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:58	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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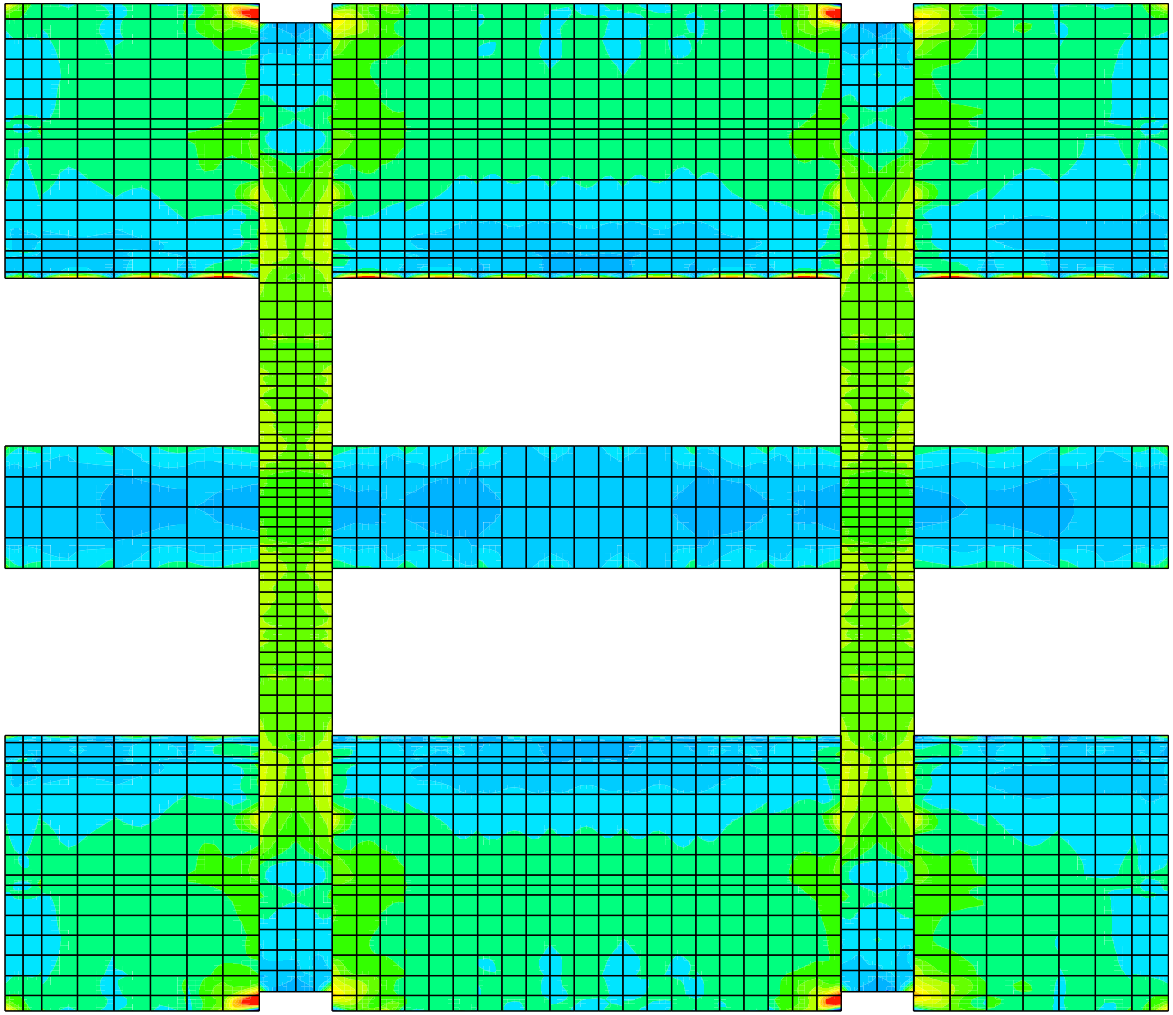
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 15:58	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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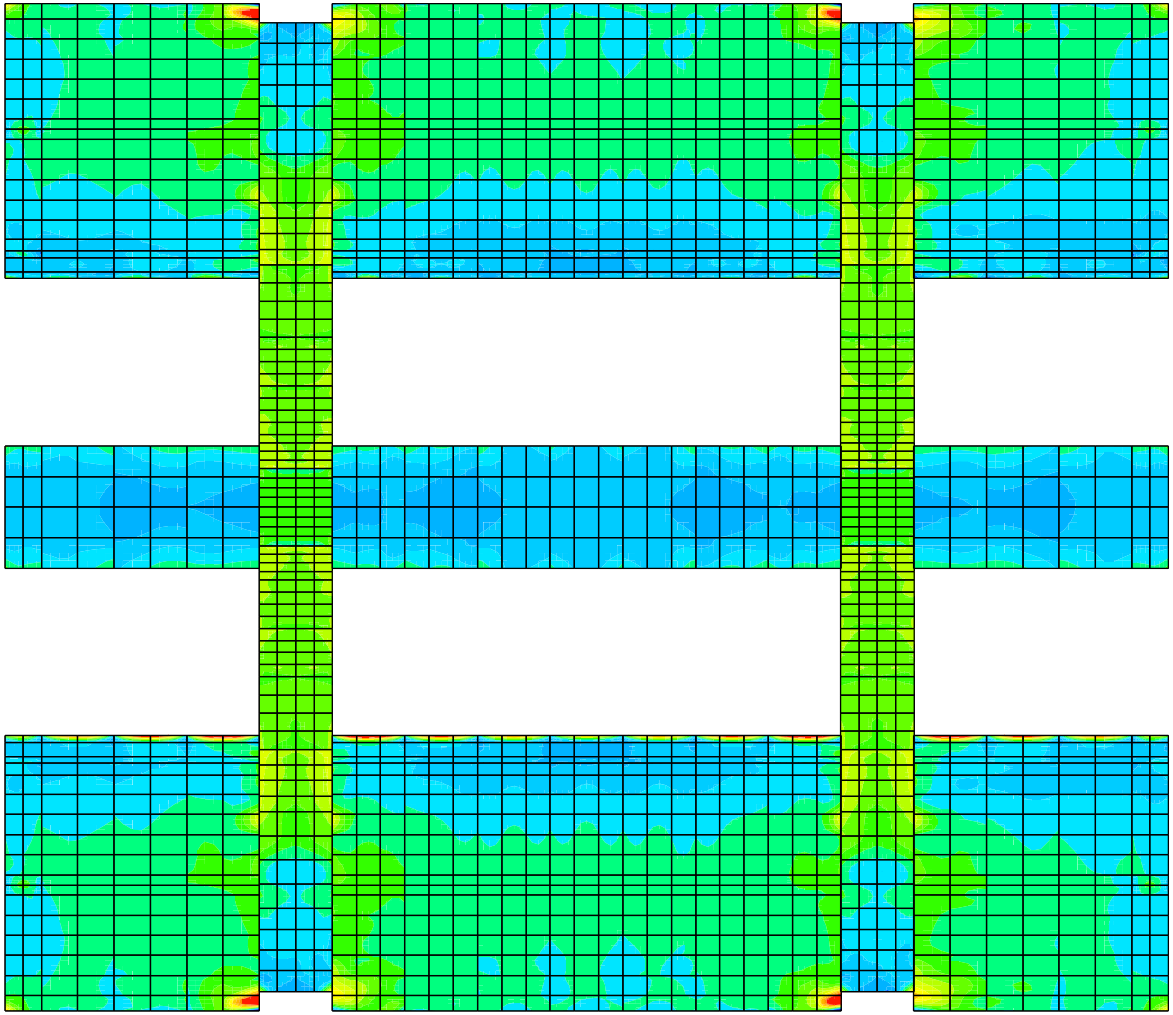
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 15:58	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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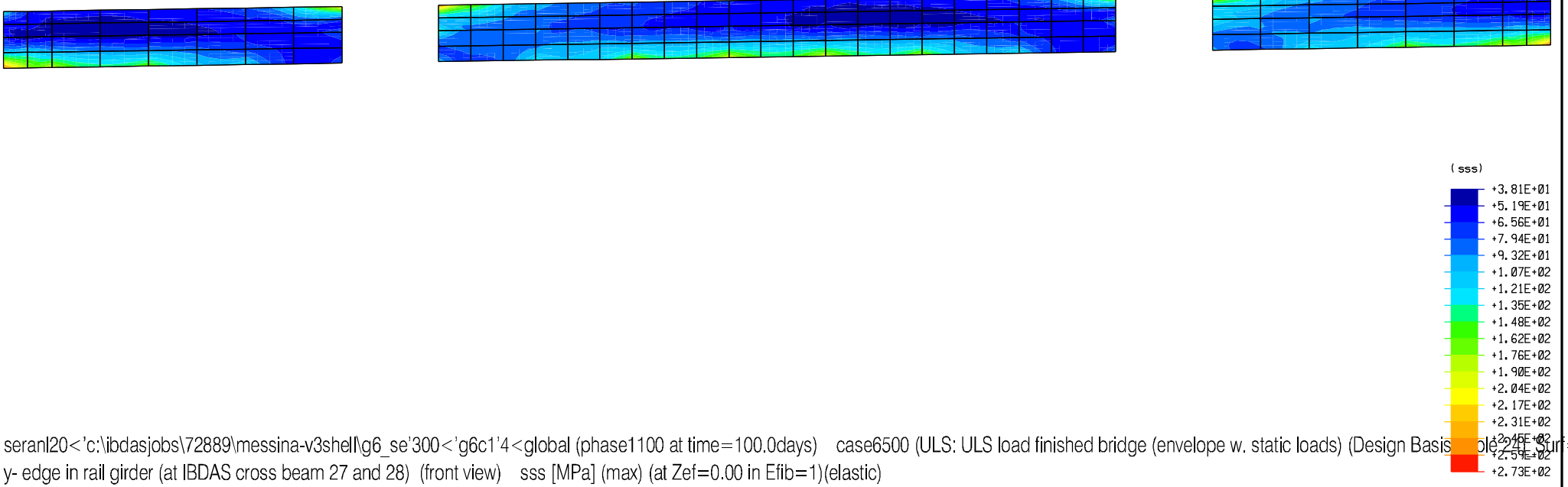
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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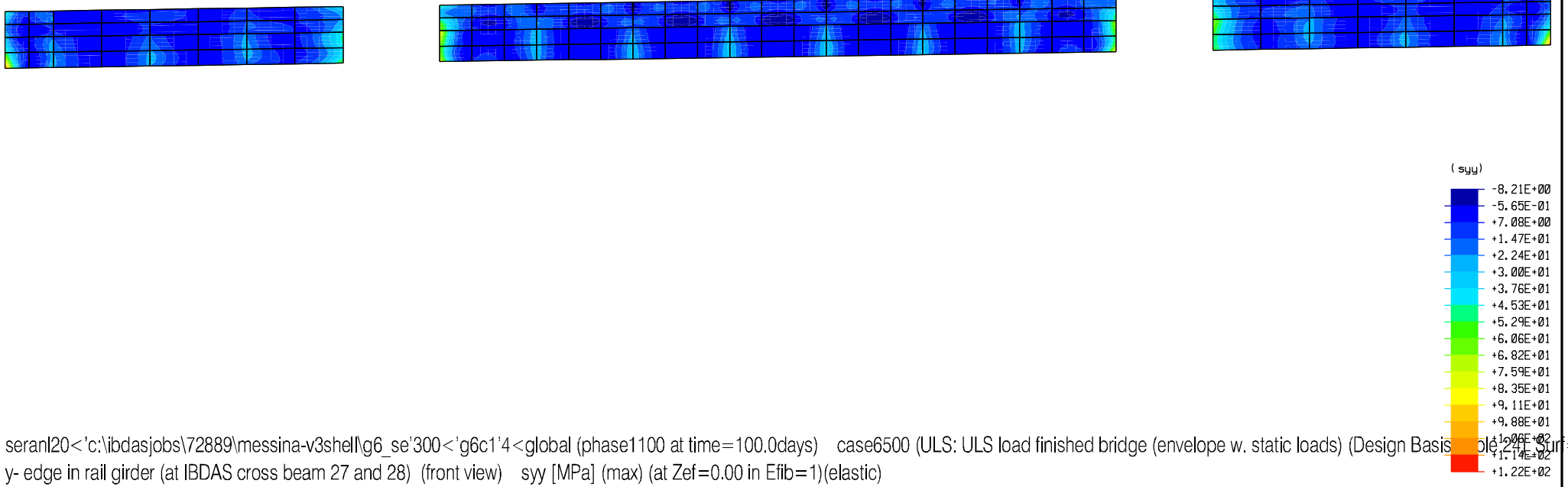
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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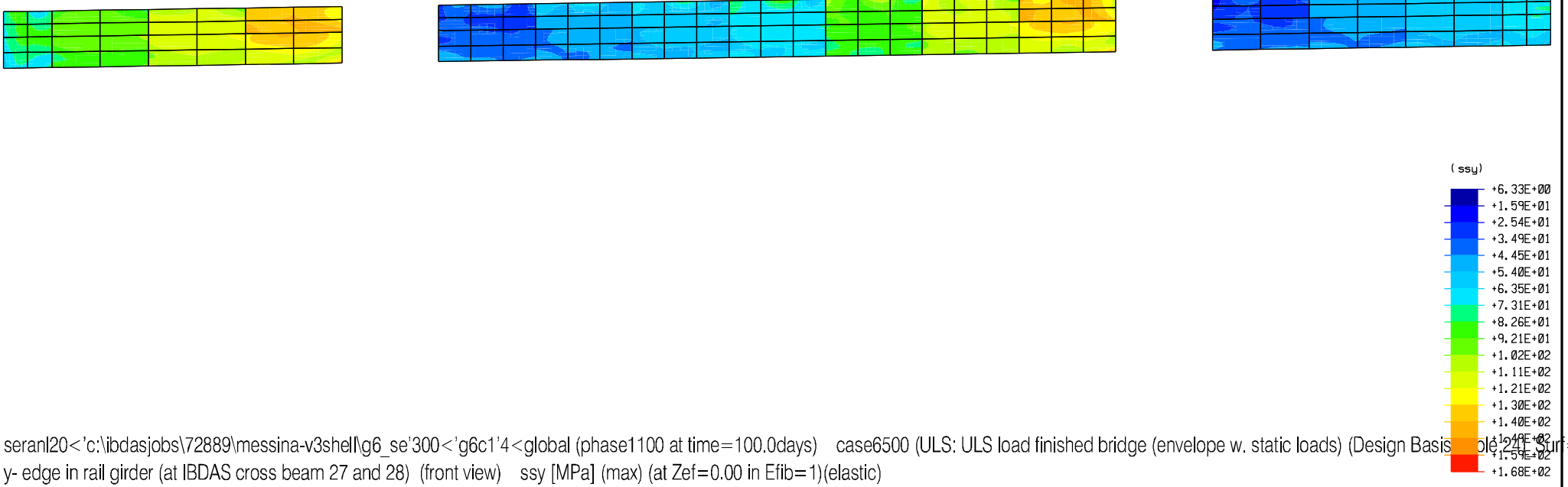
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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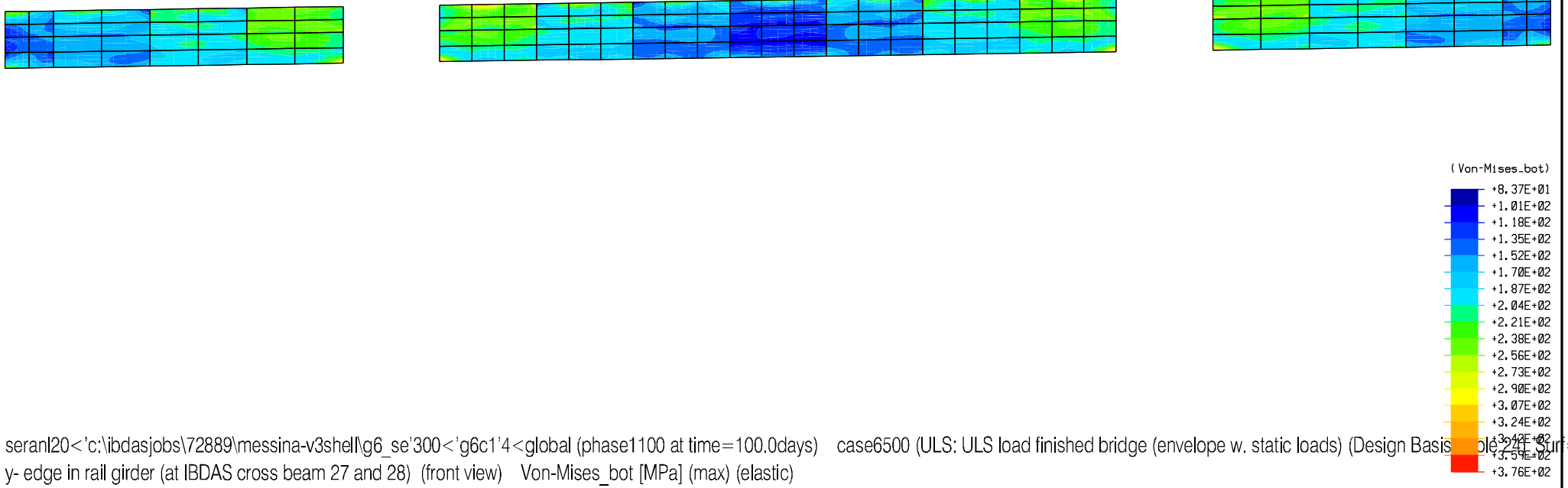
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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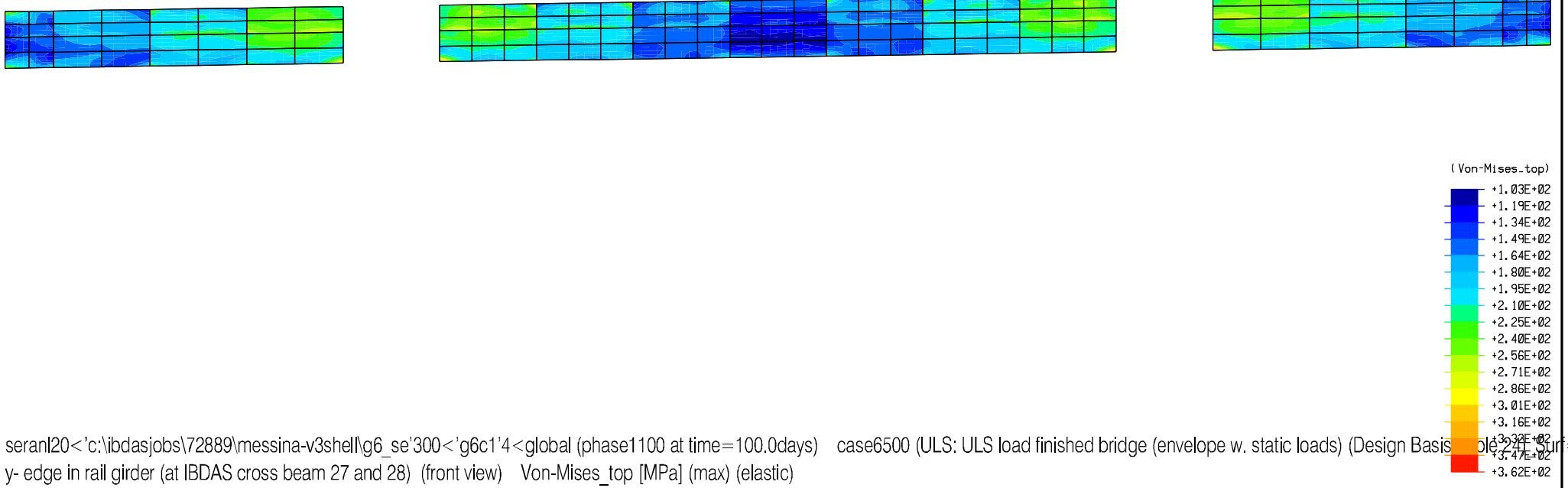
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:16	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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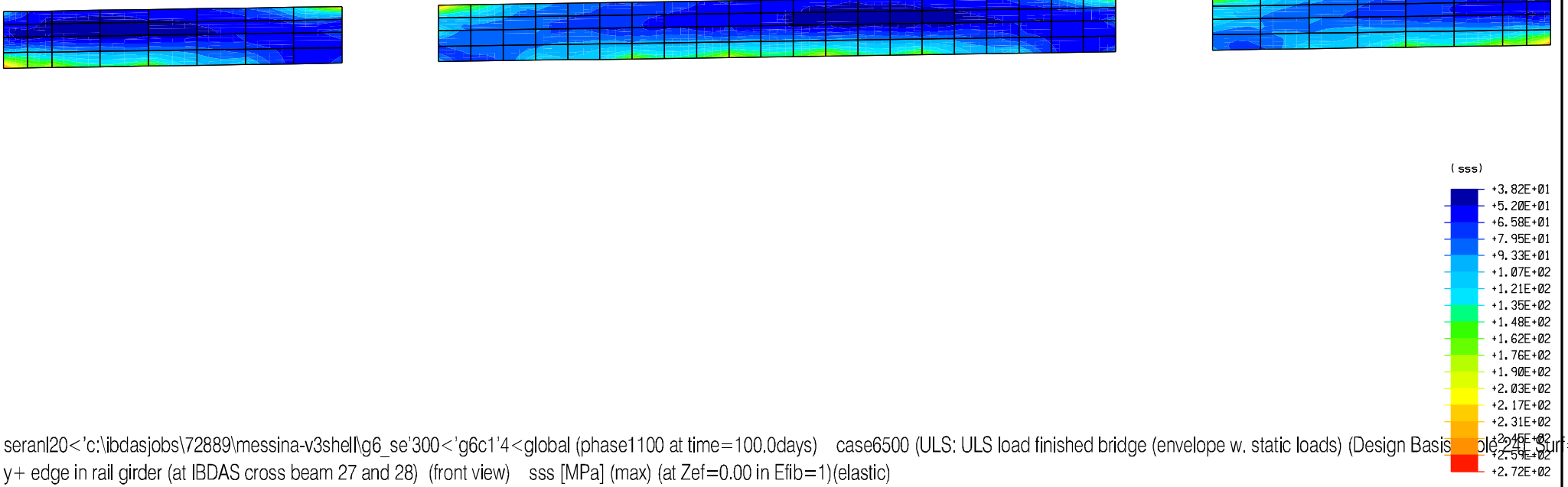
y- edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:33	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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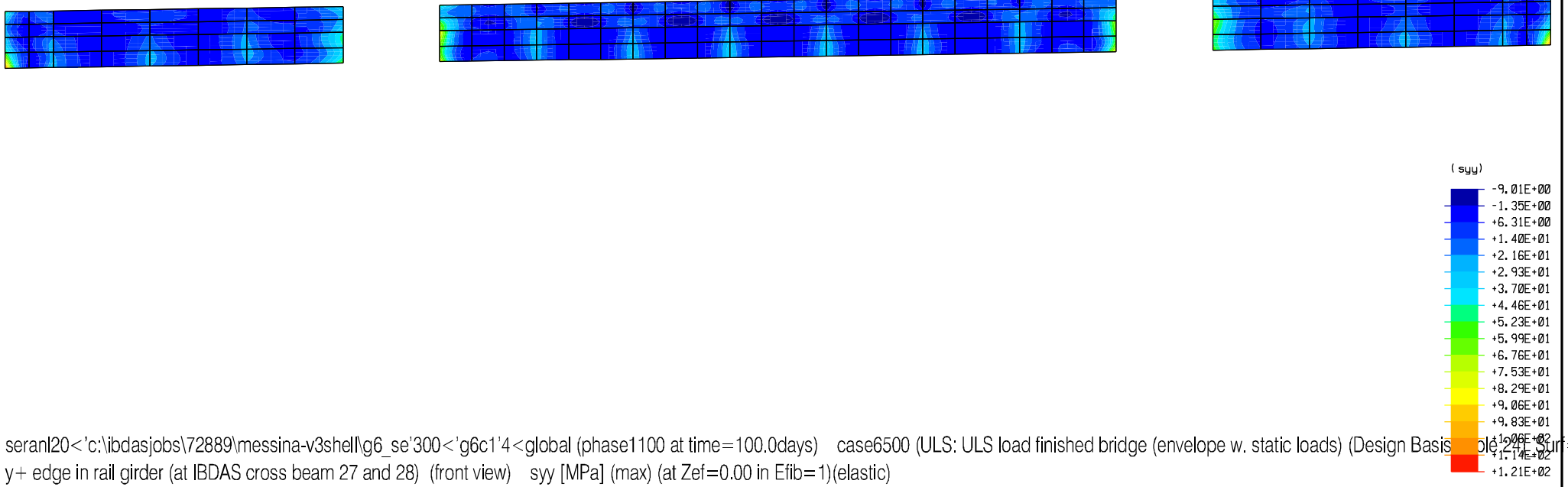
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:33	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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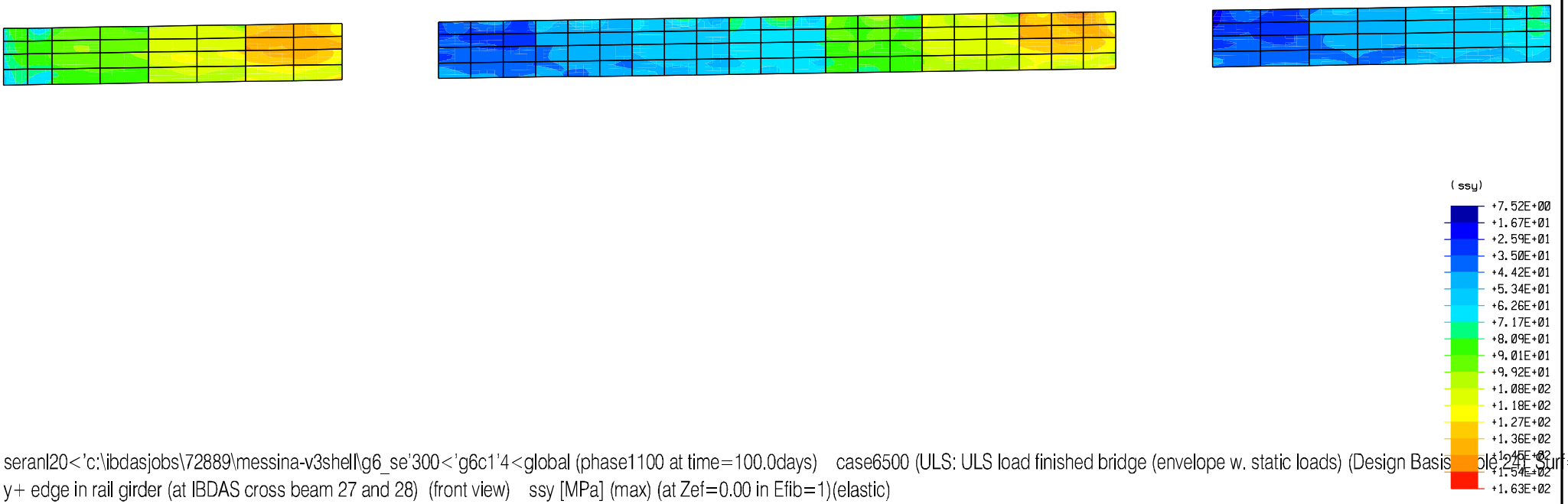
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:33	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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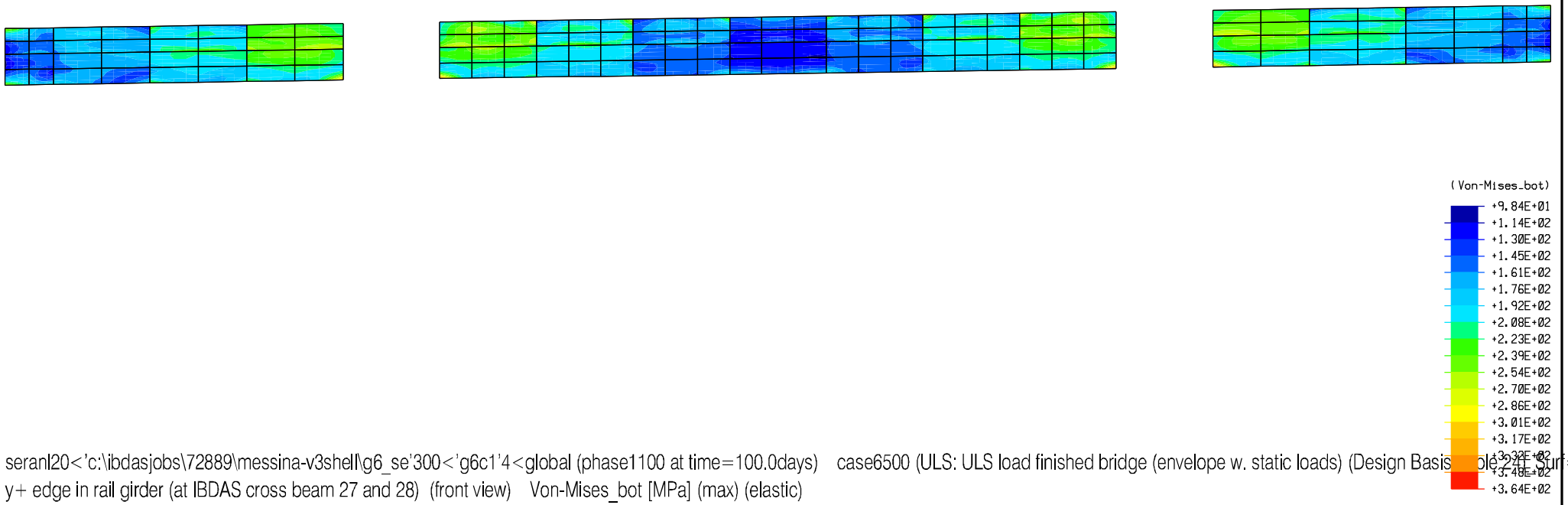
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:33	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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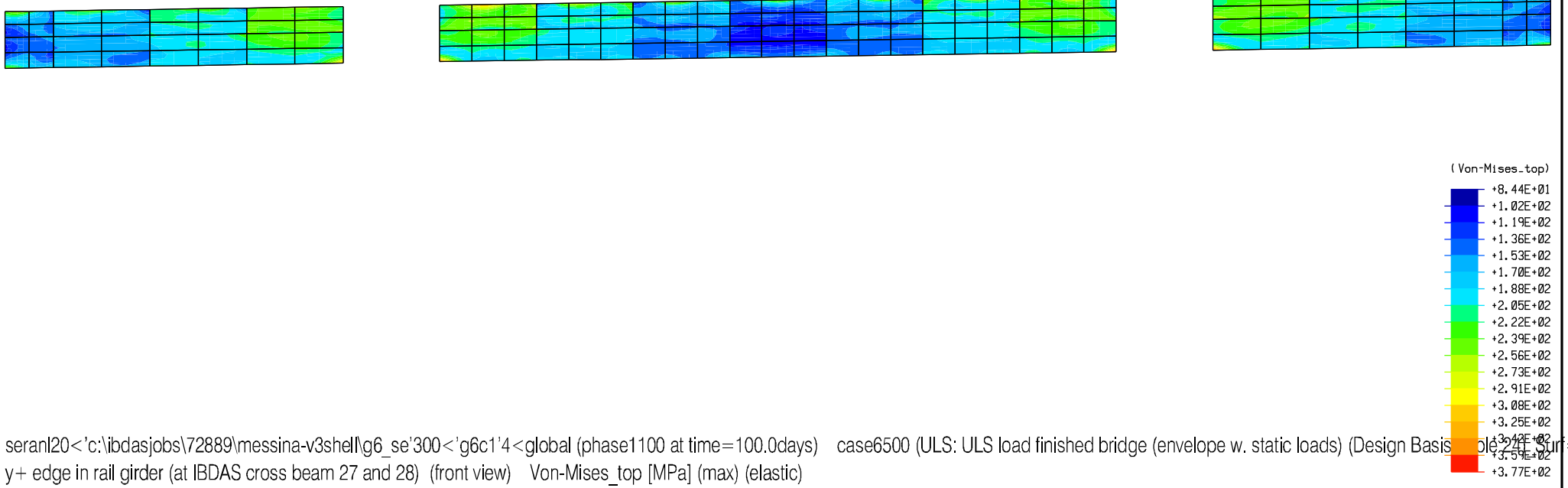
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:33	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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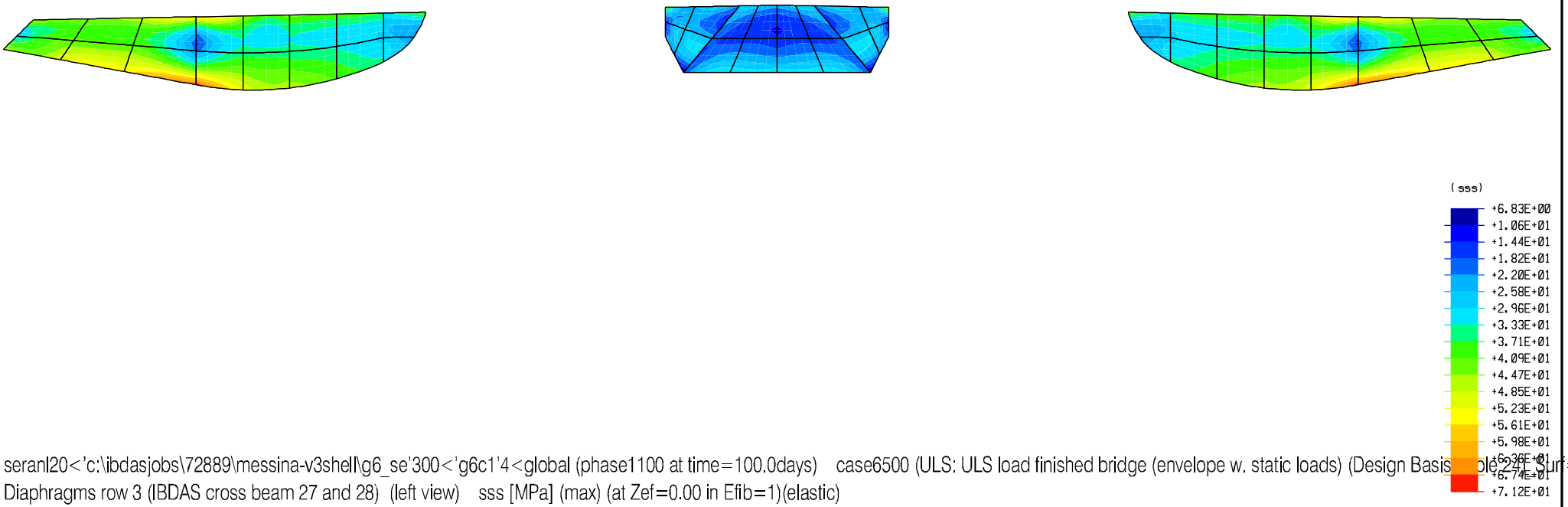
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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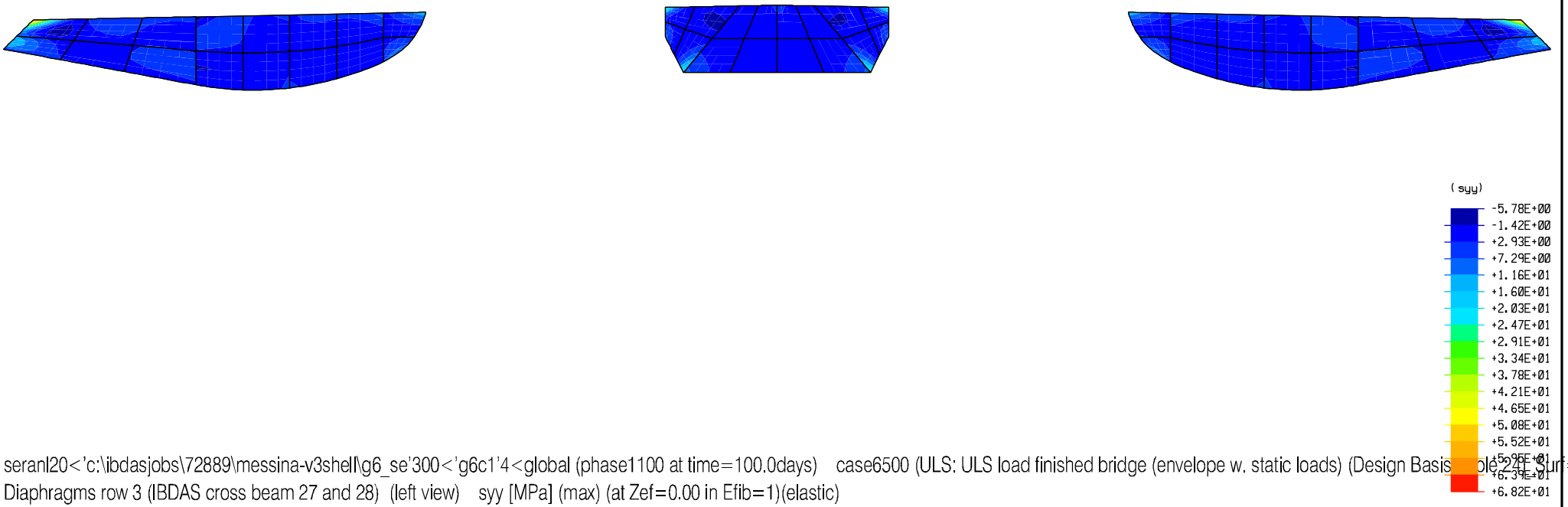
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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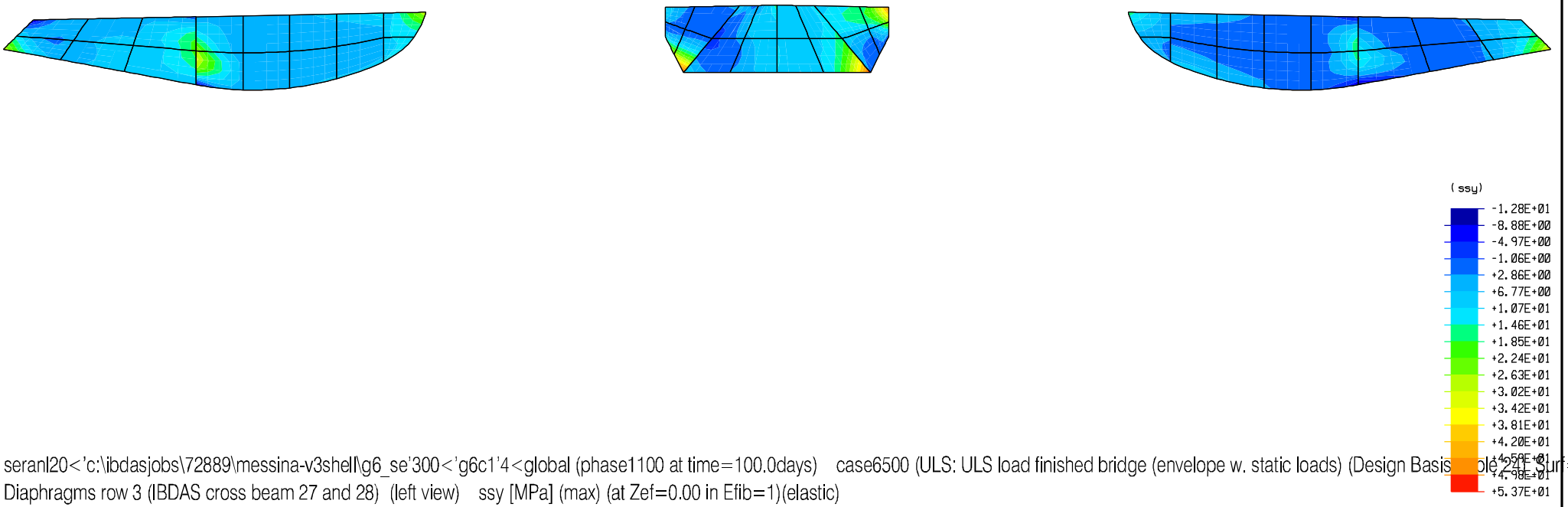
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 16:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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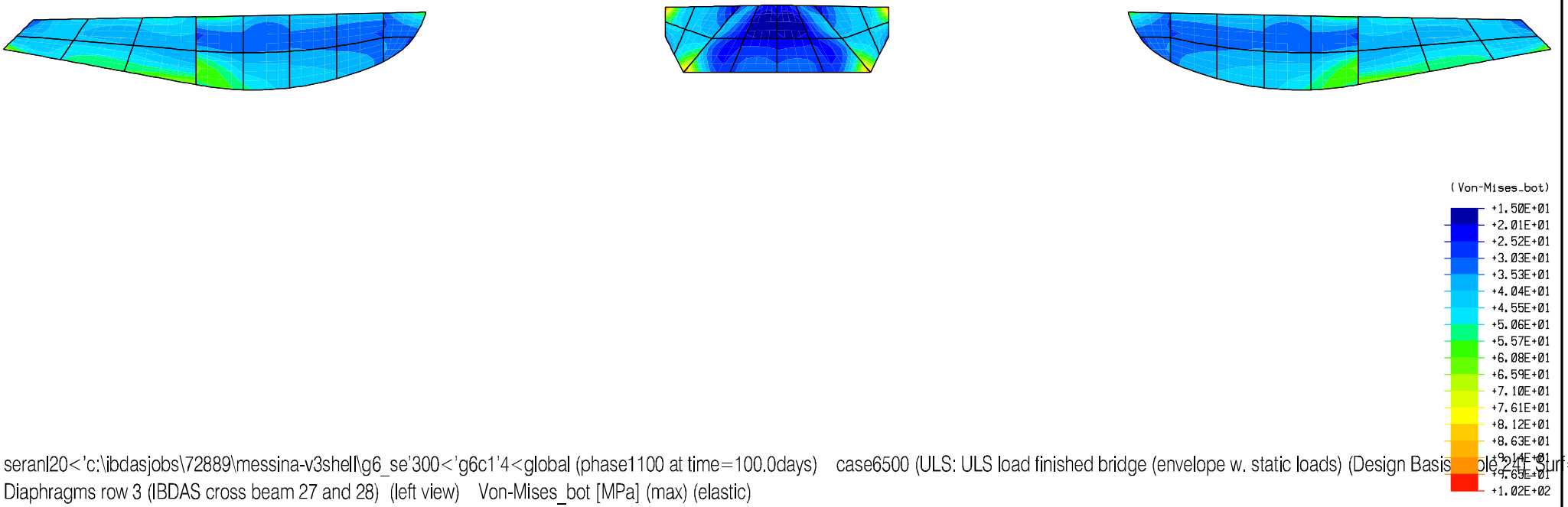
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)



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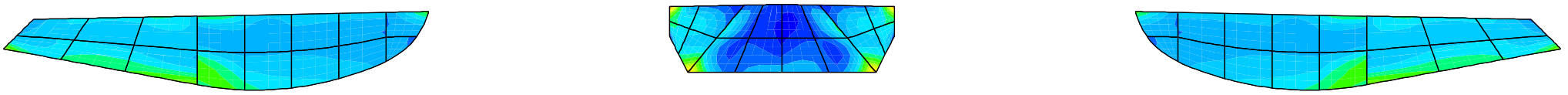
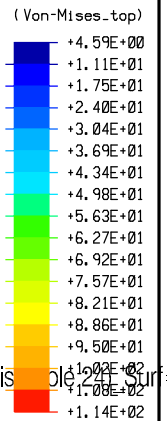
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 16:51	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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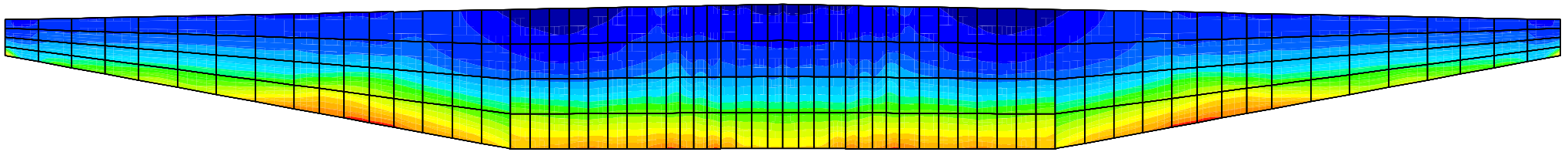
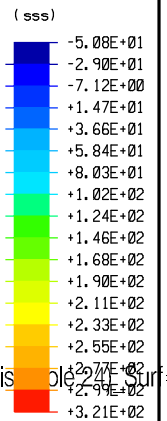
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:08	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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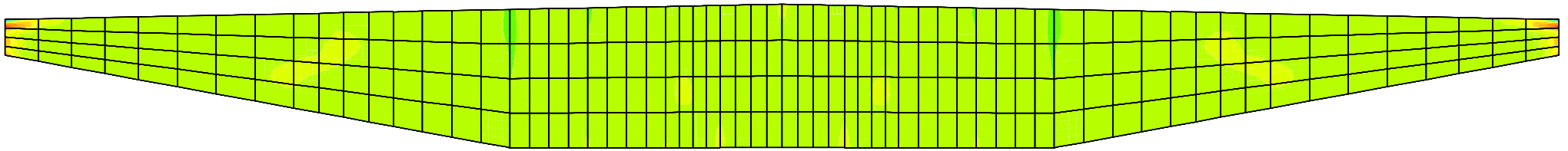
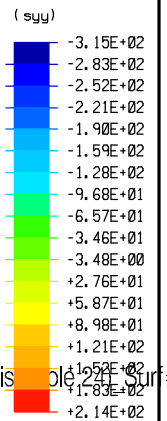
s+ cross beam edge (IBDAS cross beam 27) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

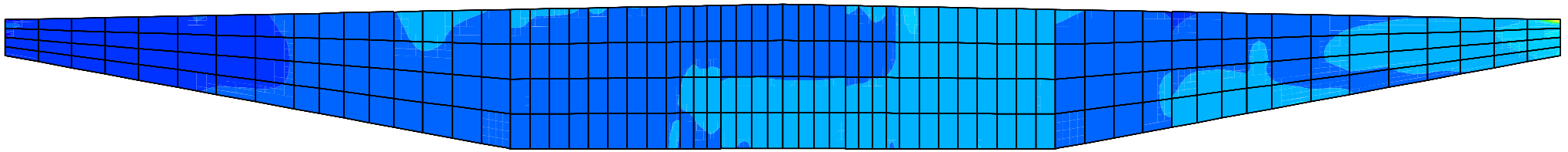
COWI Author: ladi Date: 15-mar-11 17:08	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:

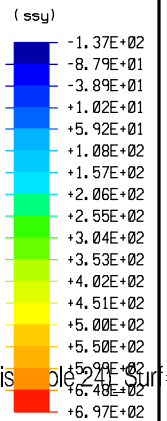




seranl20<'c:\ibdasjobs\72889\messina-v3shell\g6_se'300<'g6c1'4<global (phase1100 at time=100.0days) case6500 (ULS: ULS load finished bridge (envelope w. static loads) (Design Basis, Sole 24L Surf=40mm)
s+ cross beam edge (IBDAS cross beam 27) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:08	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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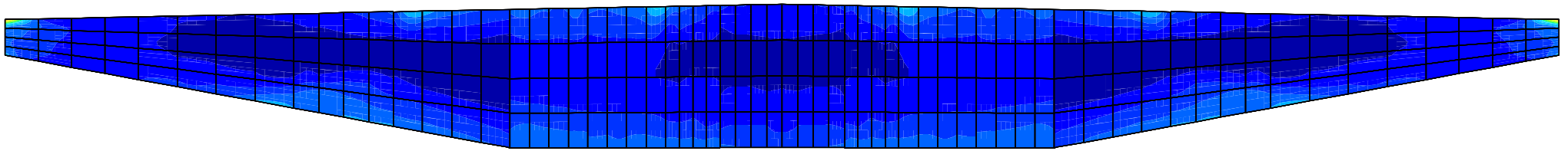
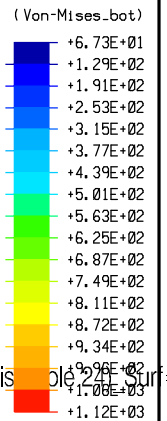
s+ cross beam edge (IBDAS cross beam 27) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:08	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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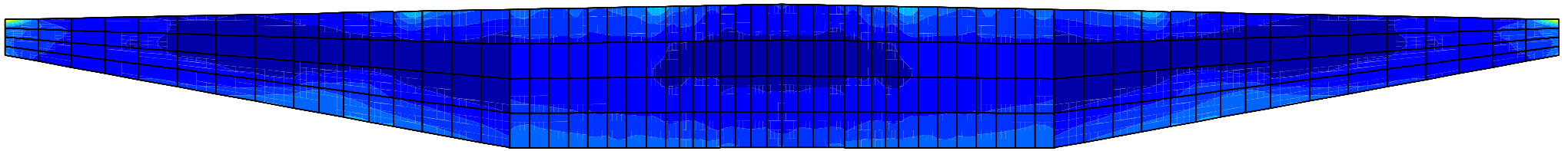
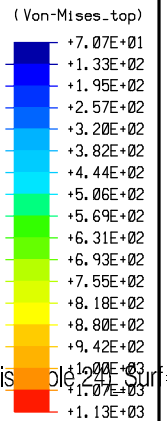
s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:08	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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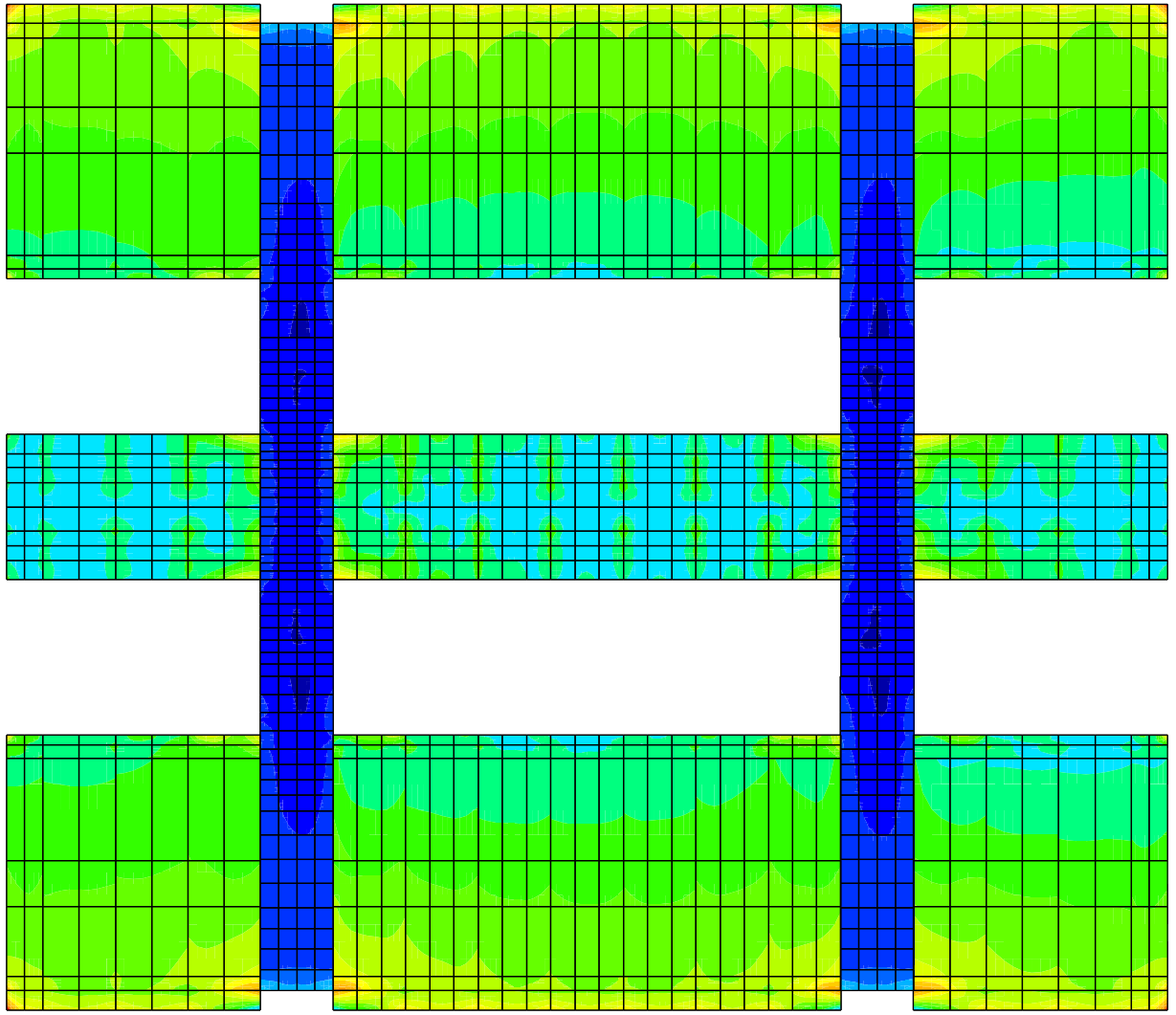
s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:25	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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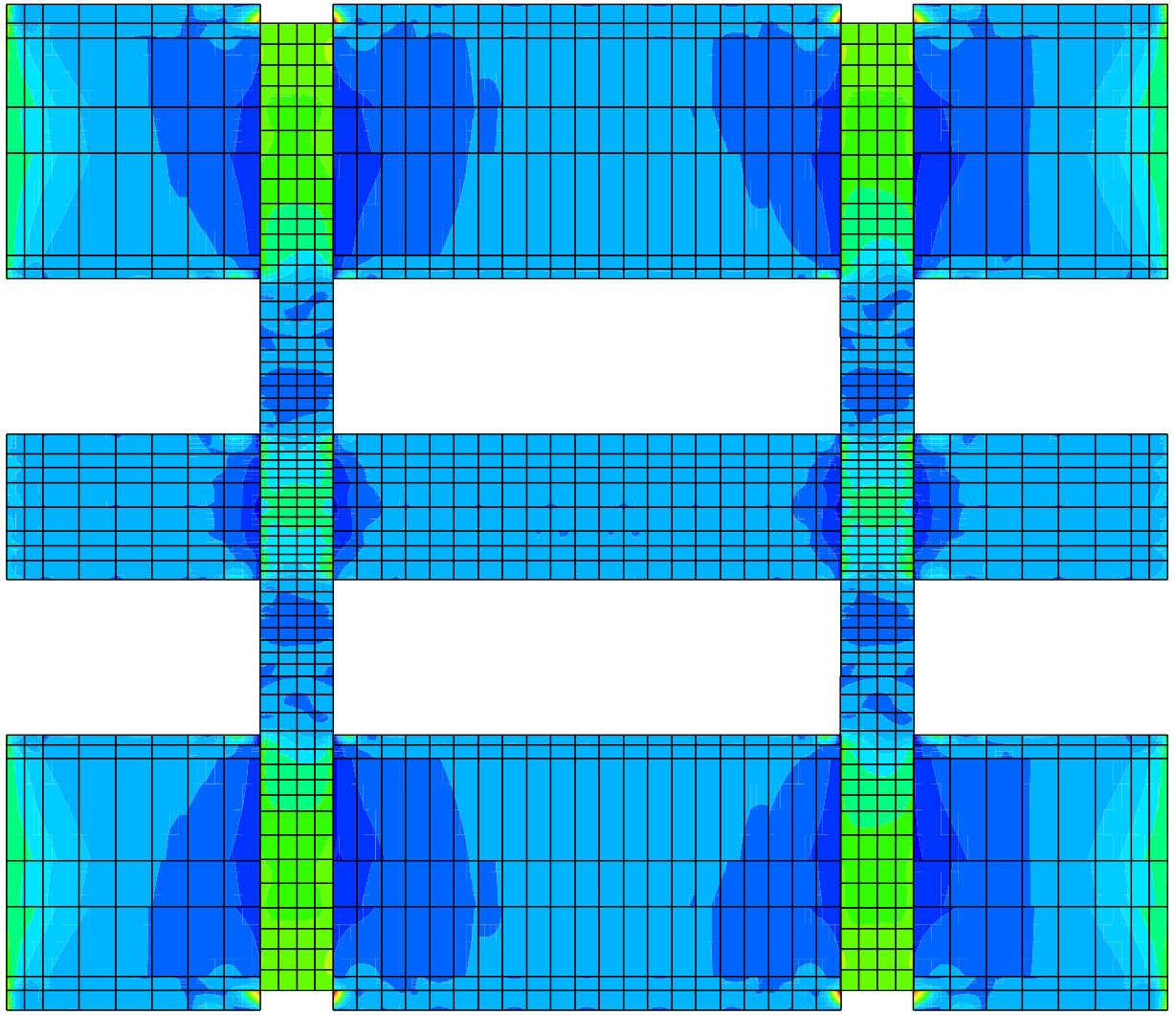
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:25	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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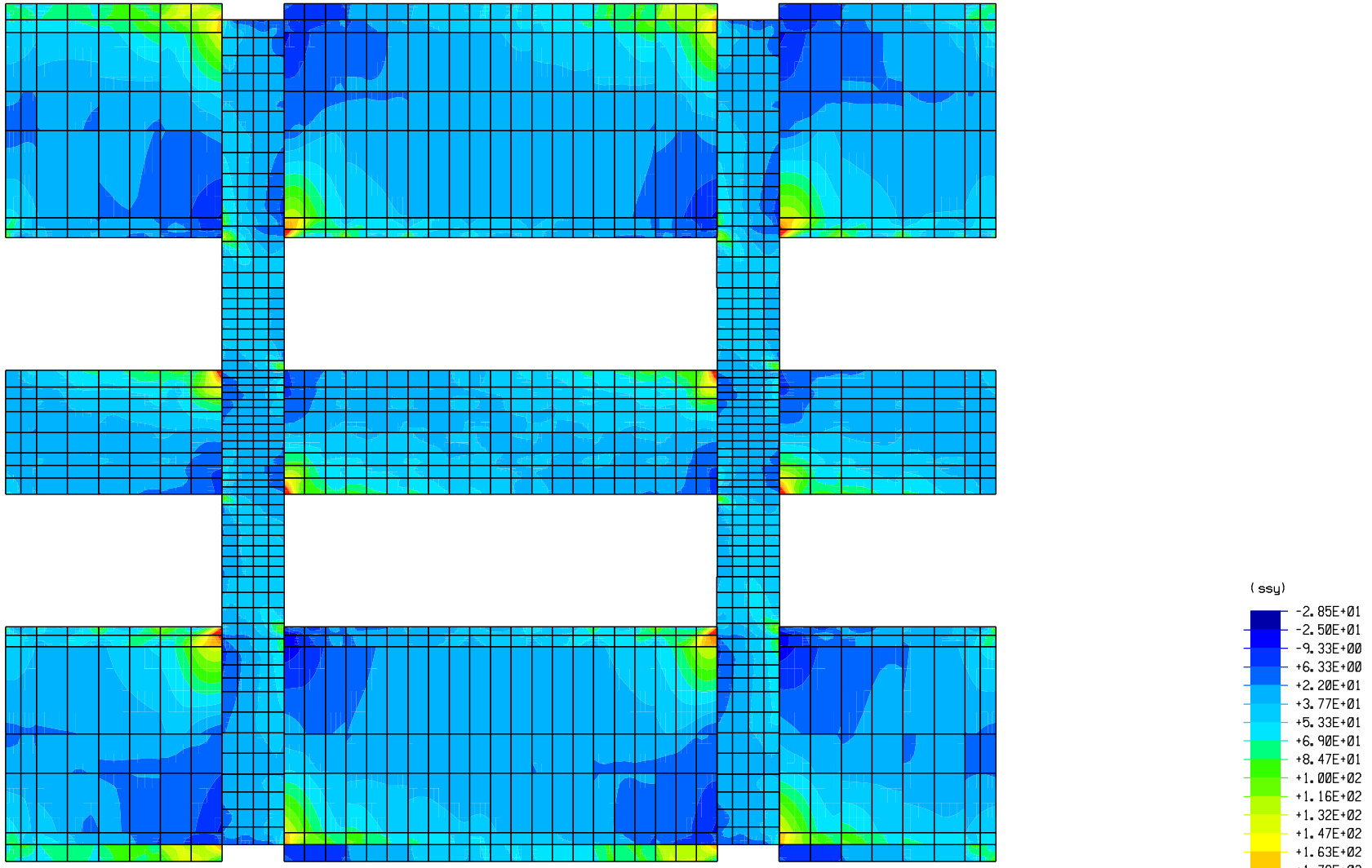
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:25	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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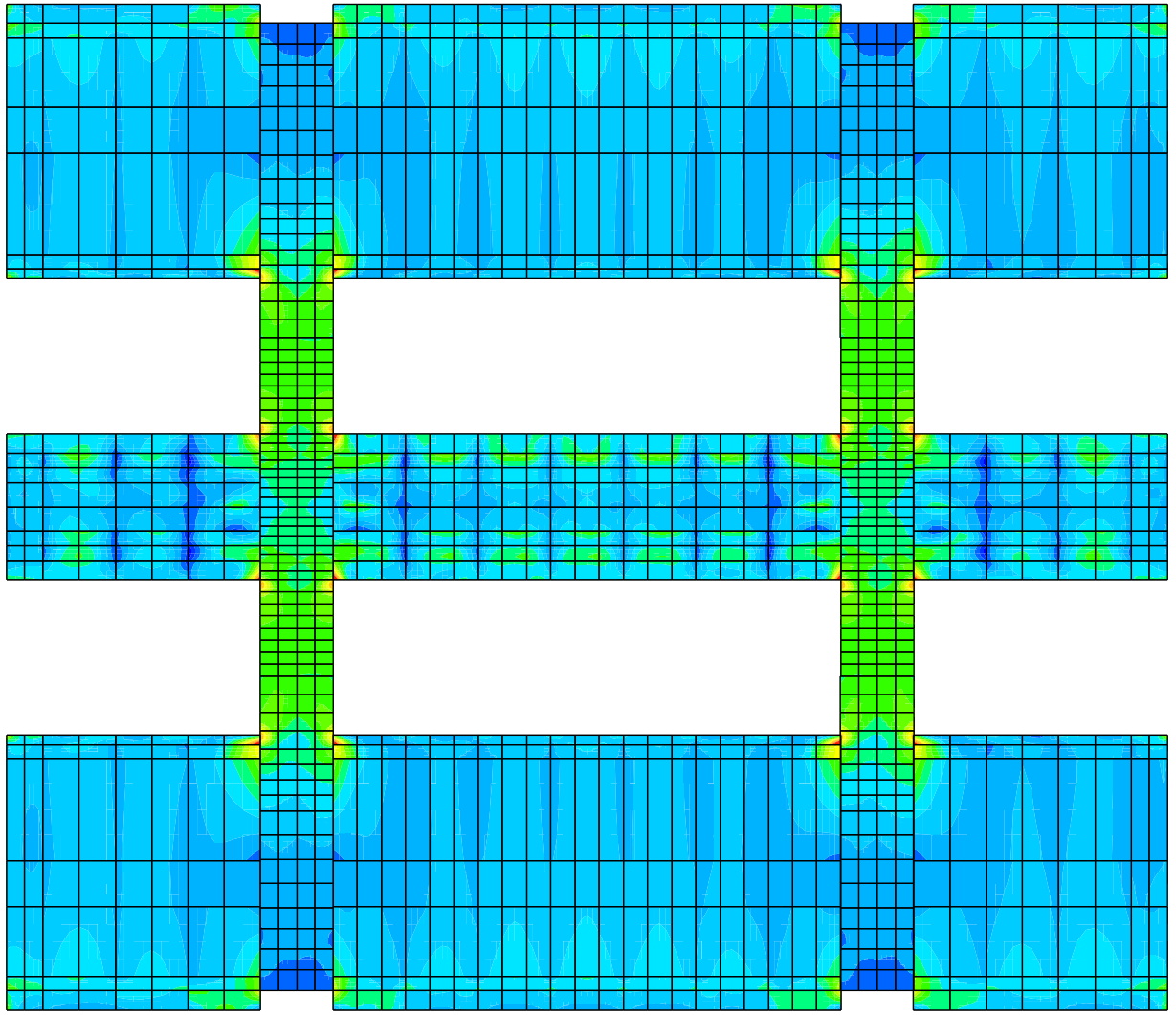
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:25	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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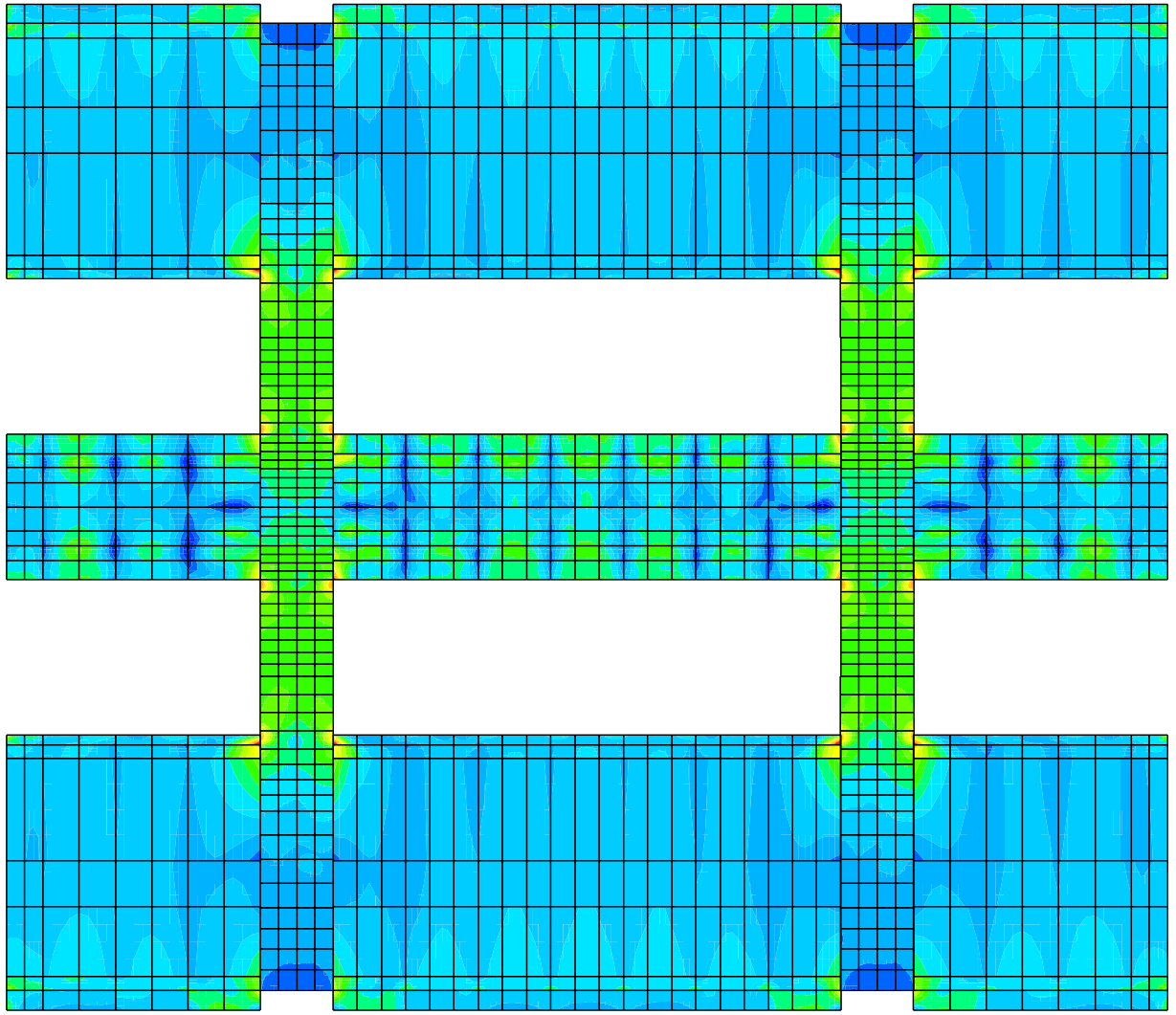
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:25	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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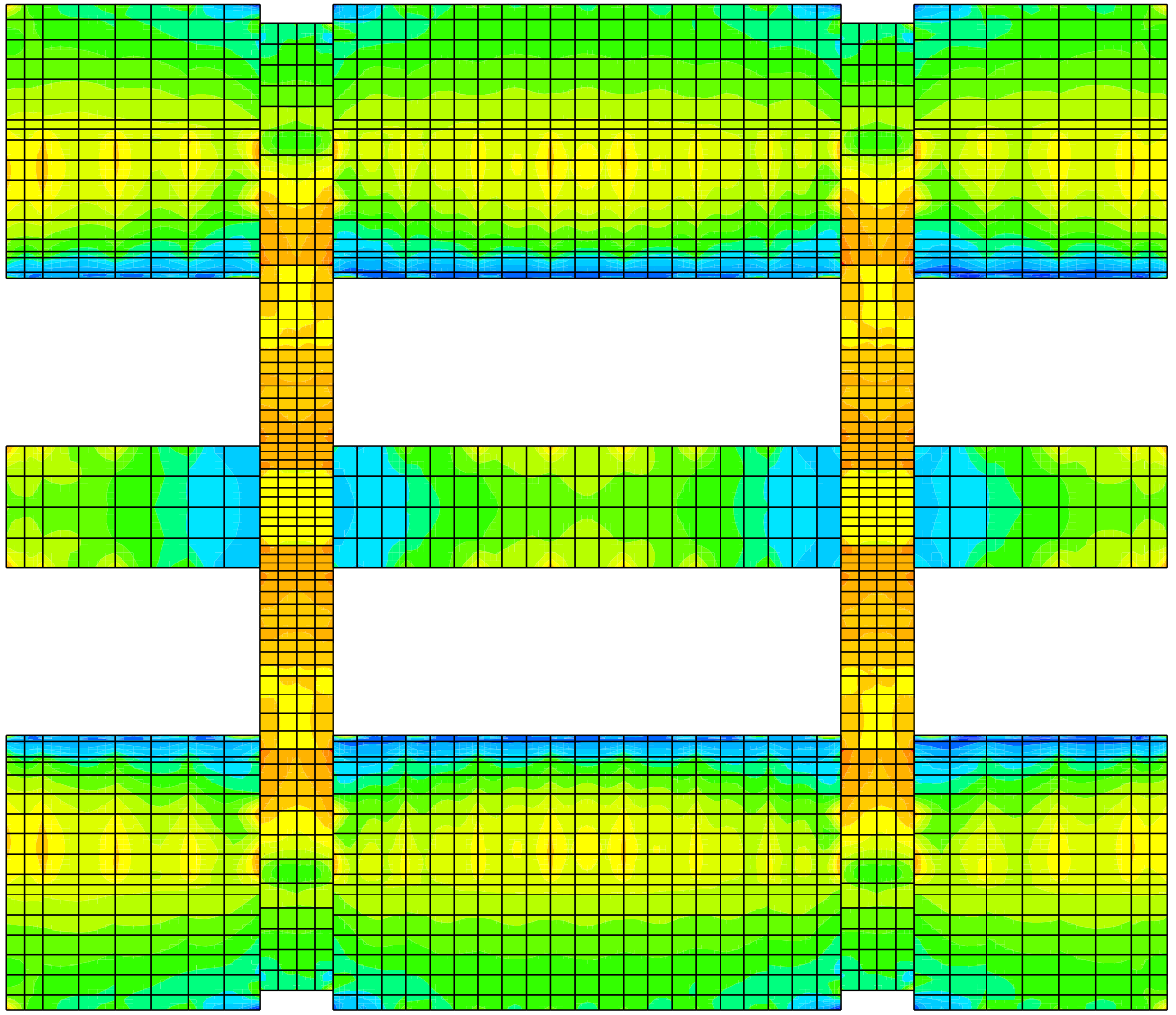
Top plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:43	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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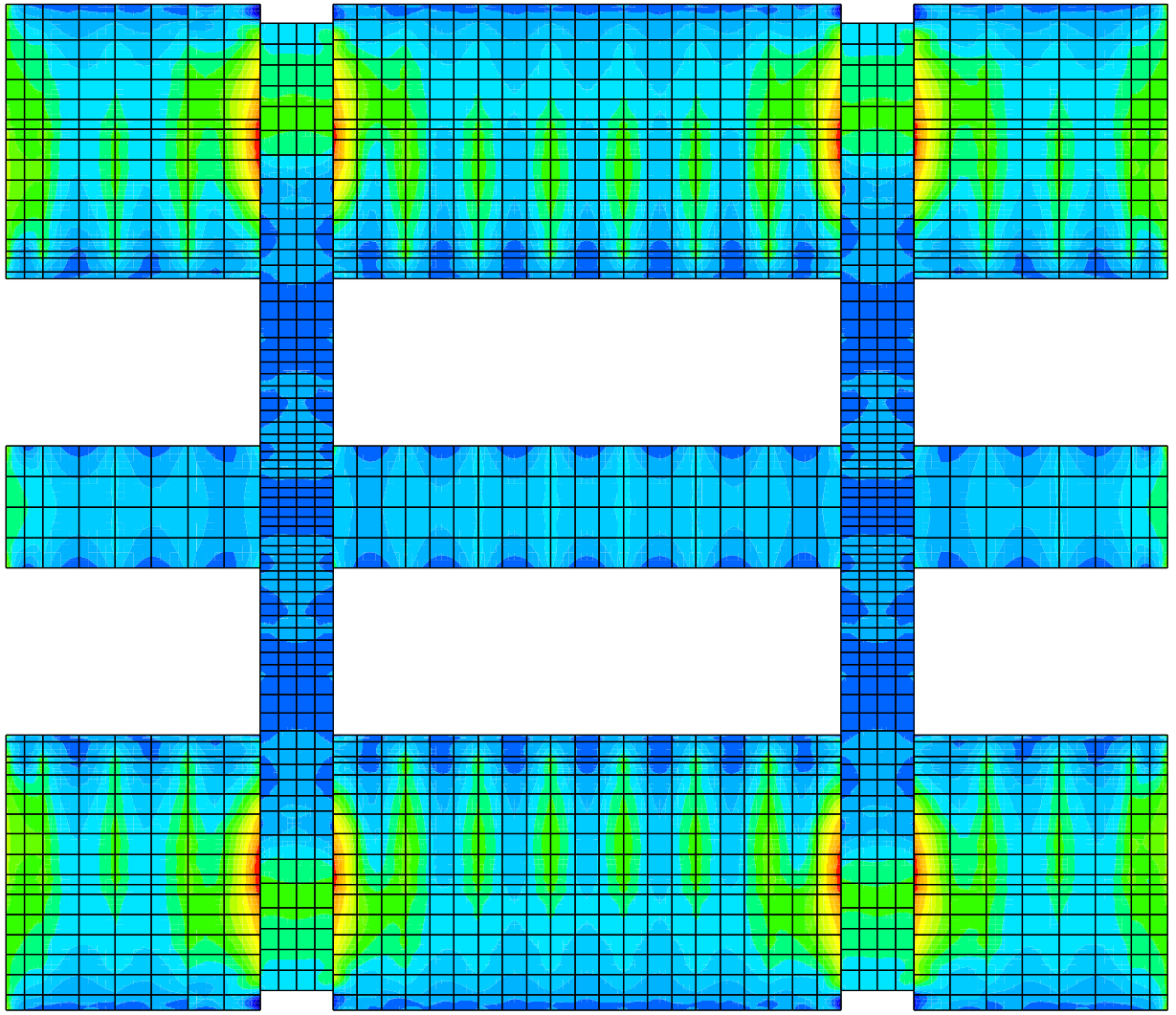
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:43	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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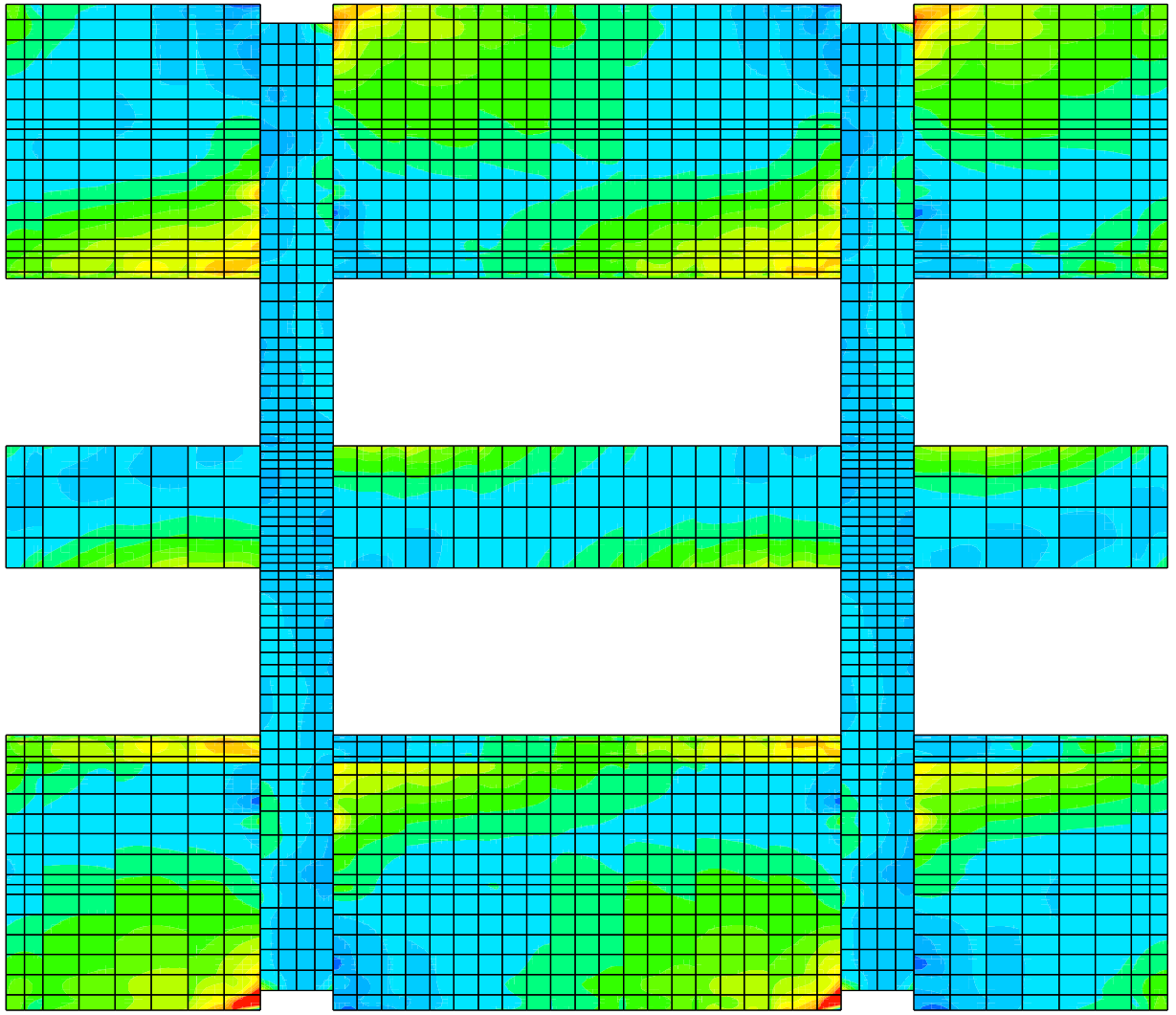
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:43	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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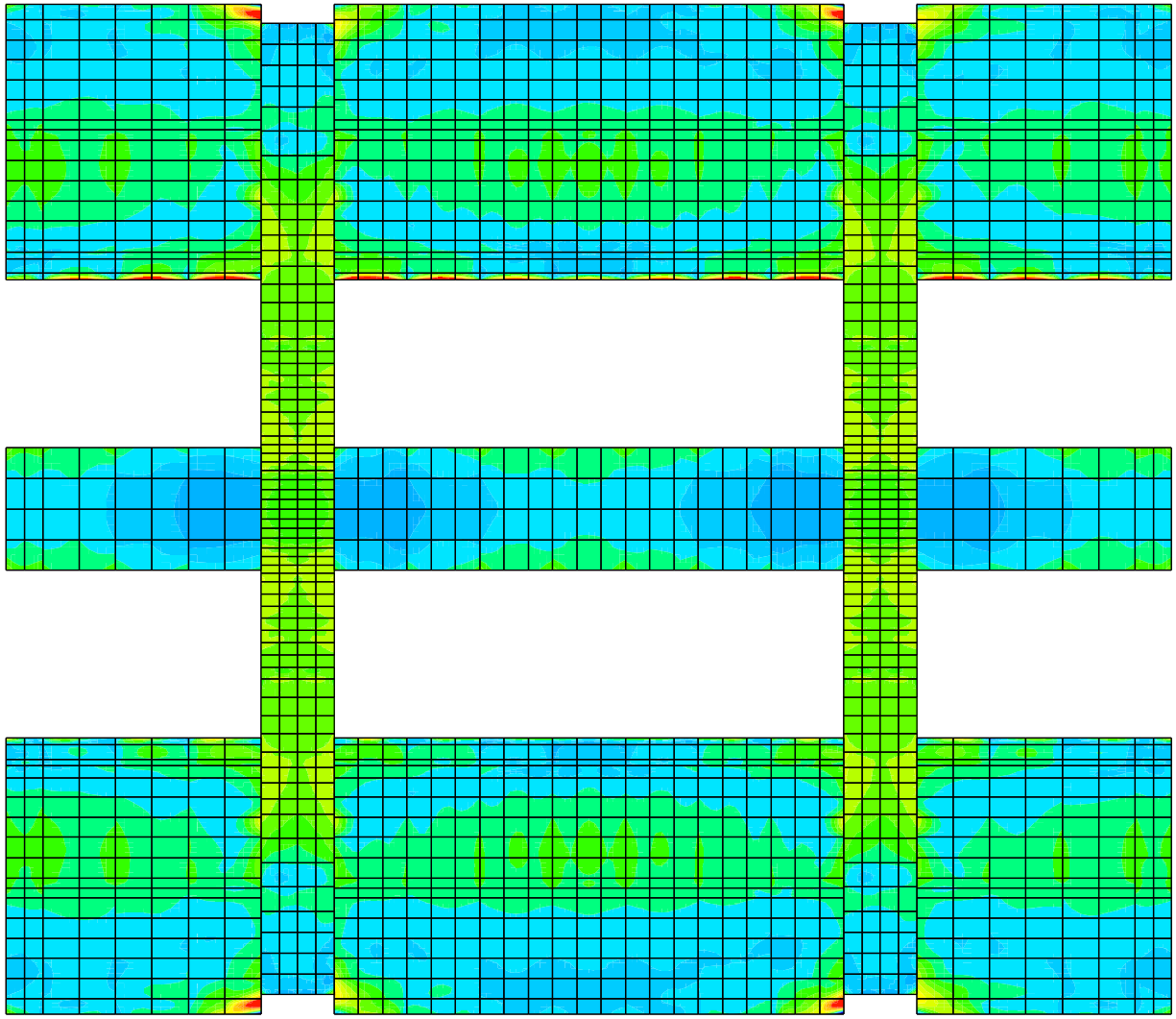
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 17:43	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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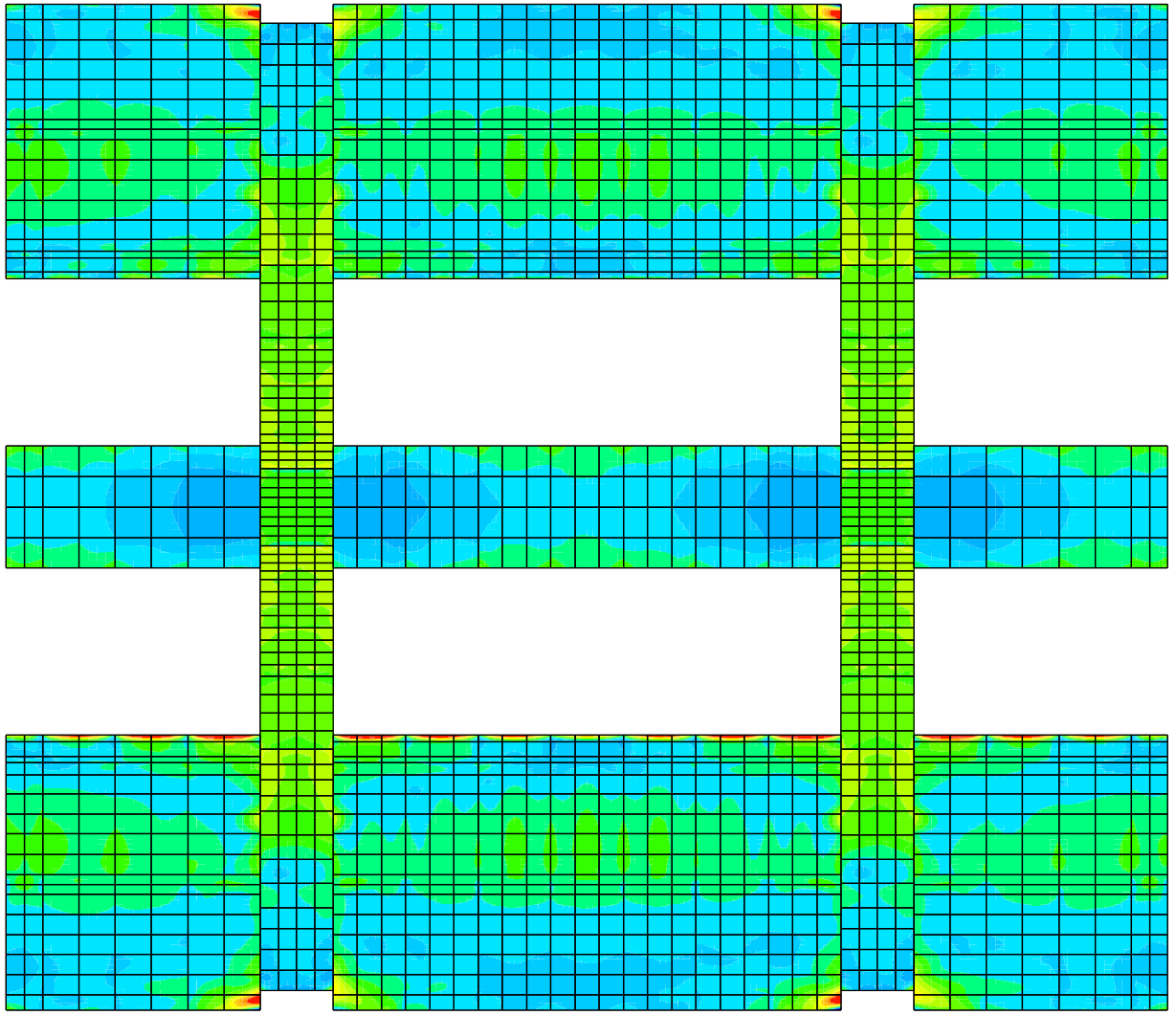
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 17:43	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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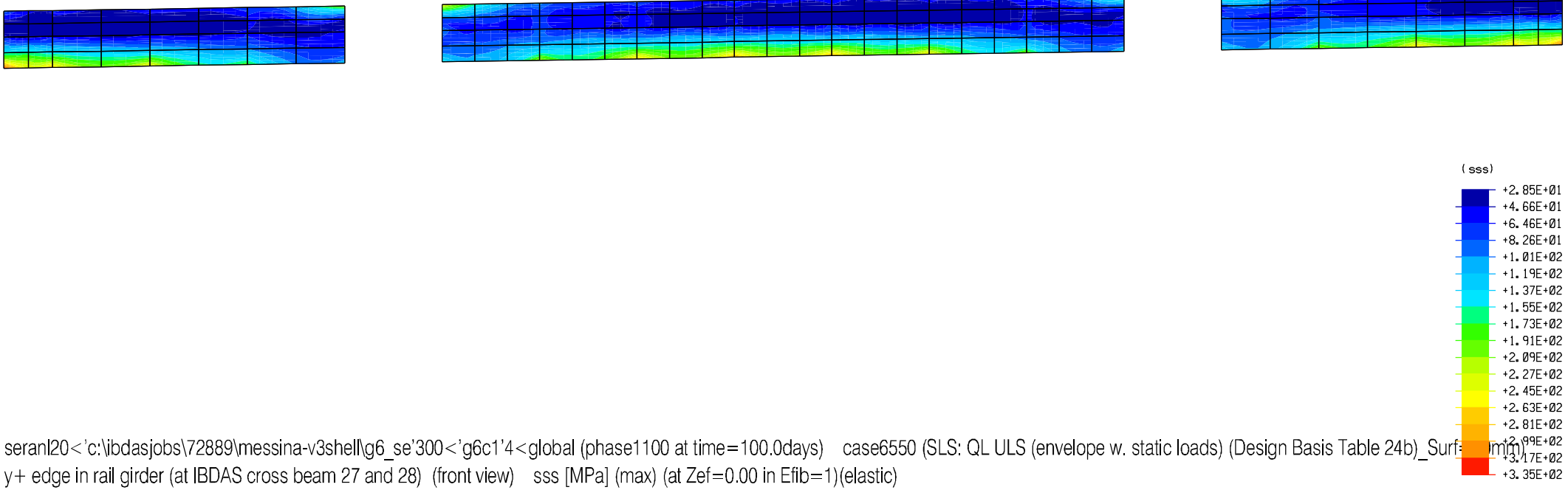
Bottom plates in girders and cross beams (IBDAS cross beam 27 and 28) (top view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:18	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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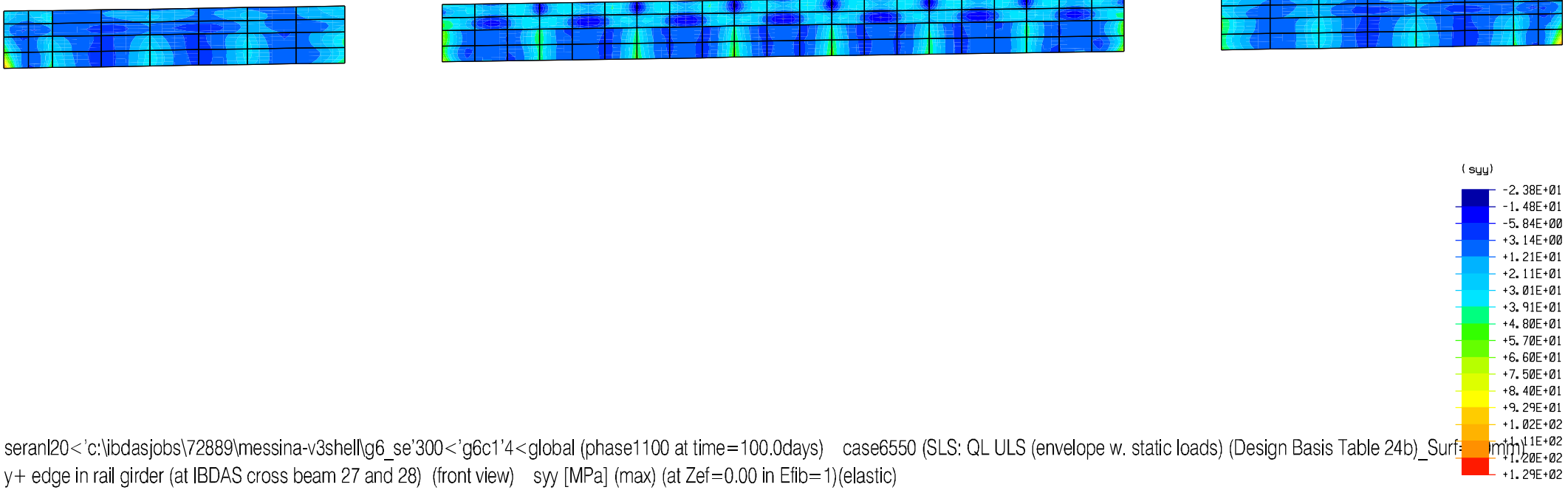
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:18	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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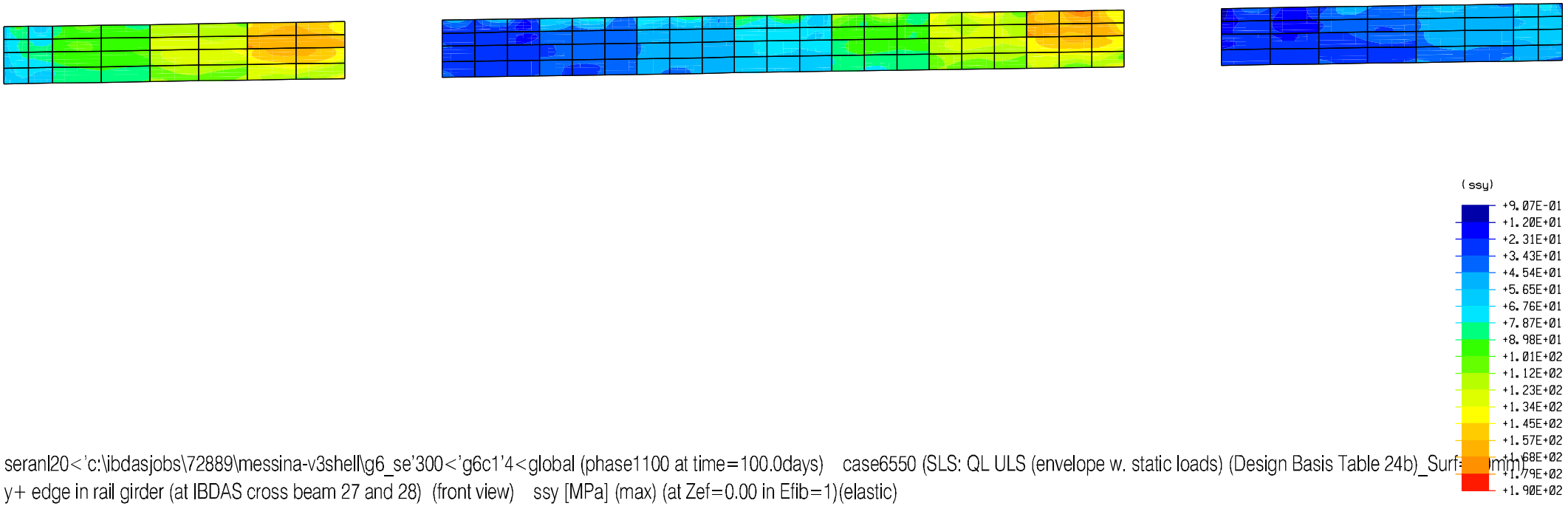
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:18	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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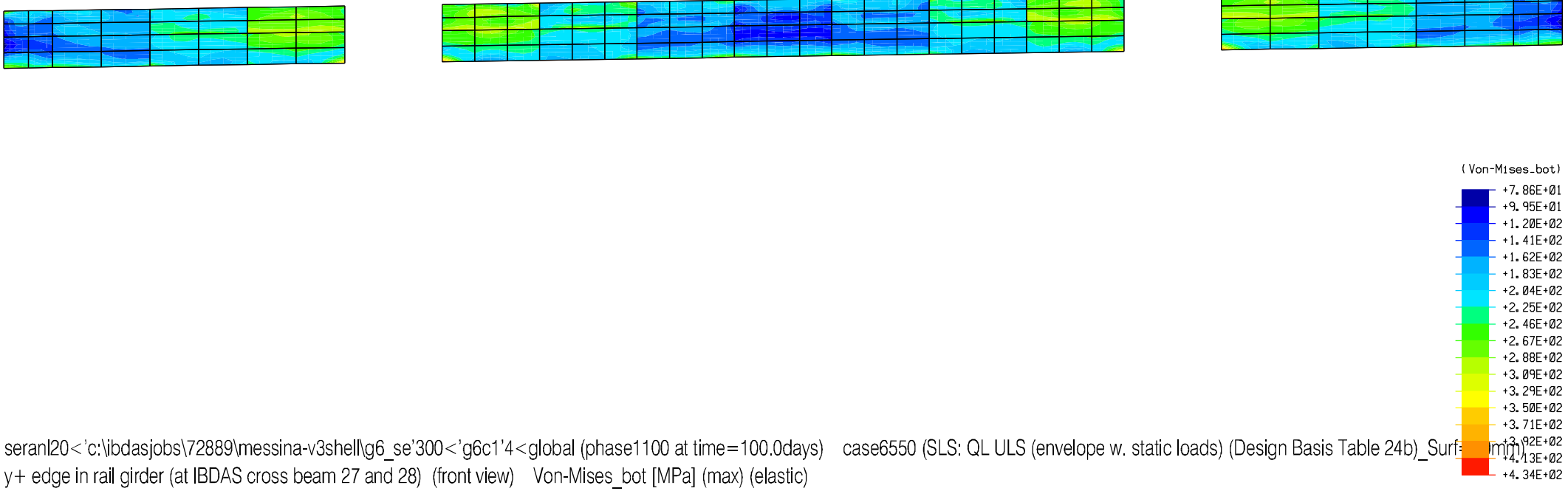
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:18	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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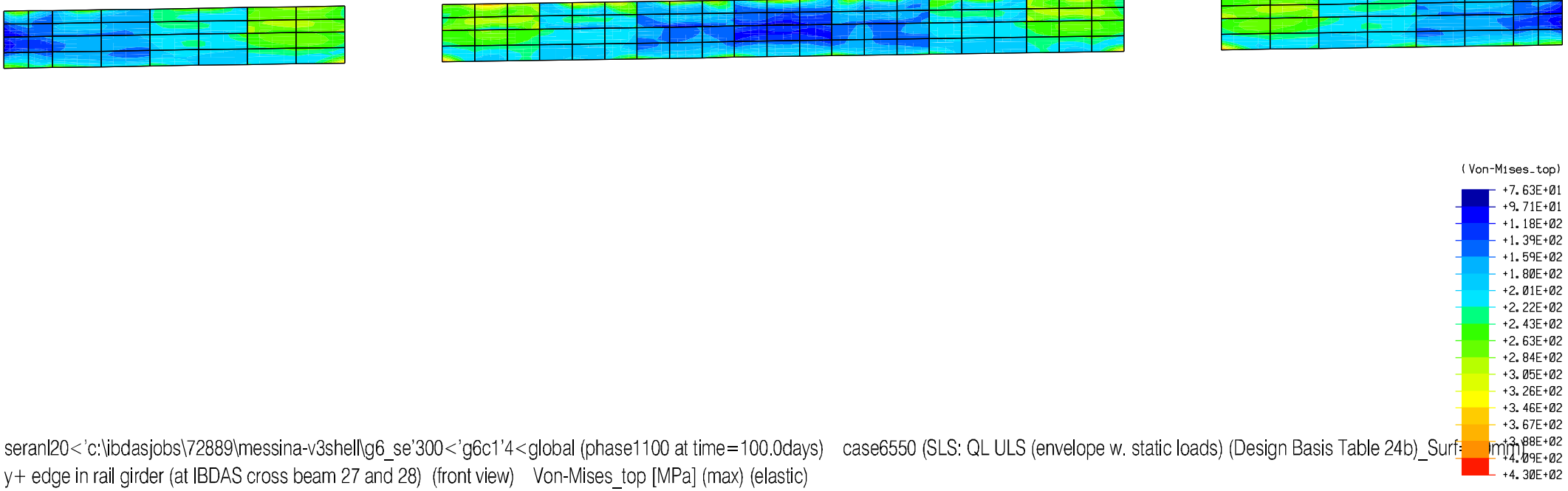
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:18	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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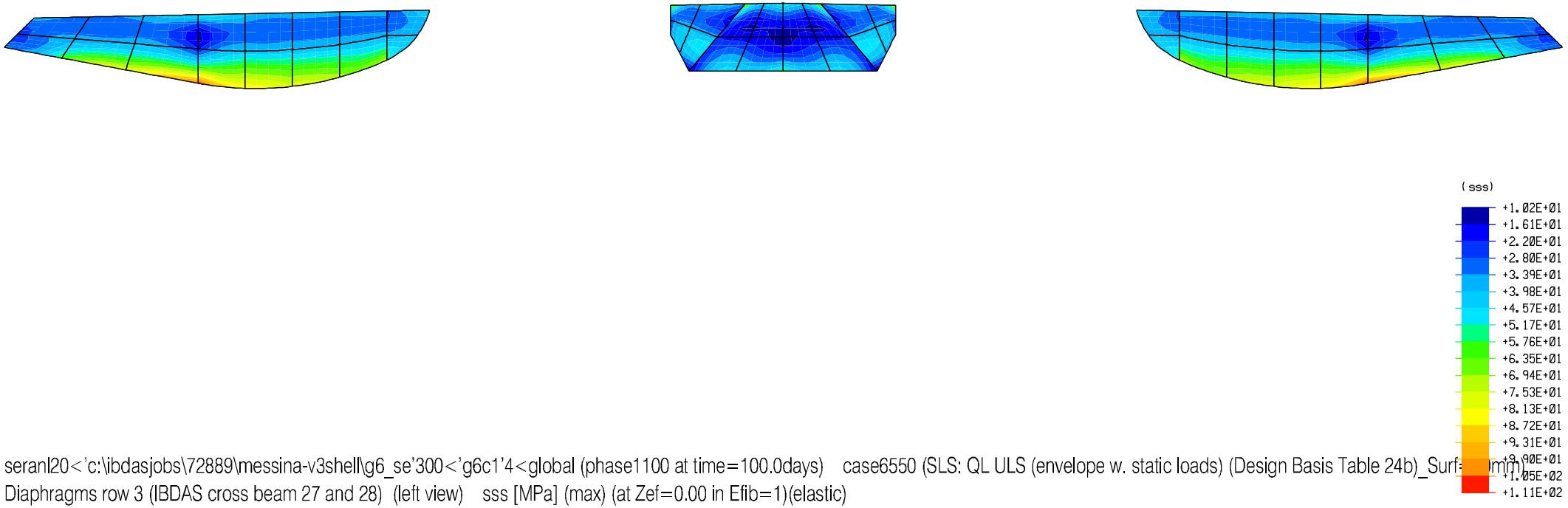
y+ edge in rail girder (at IBDAS cross beam 27 and 28) (front view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:35	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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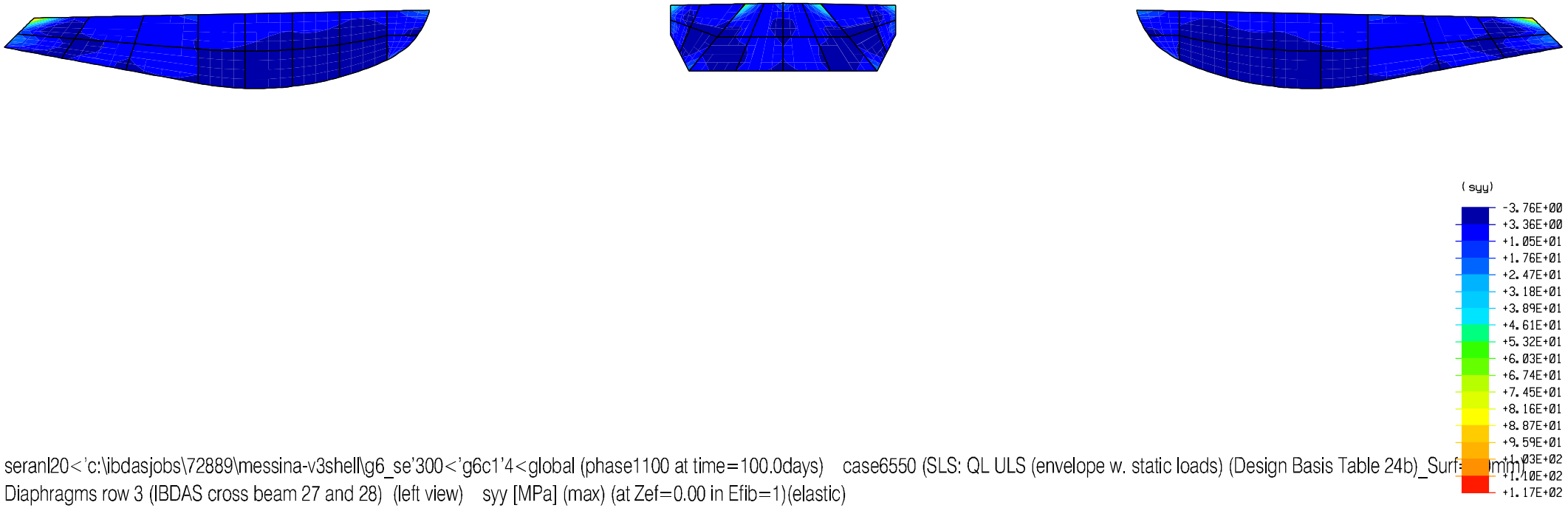
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:35	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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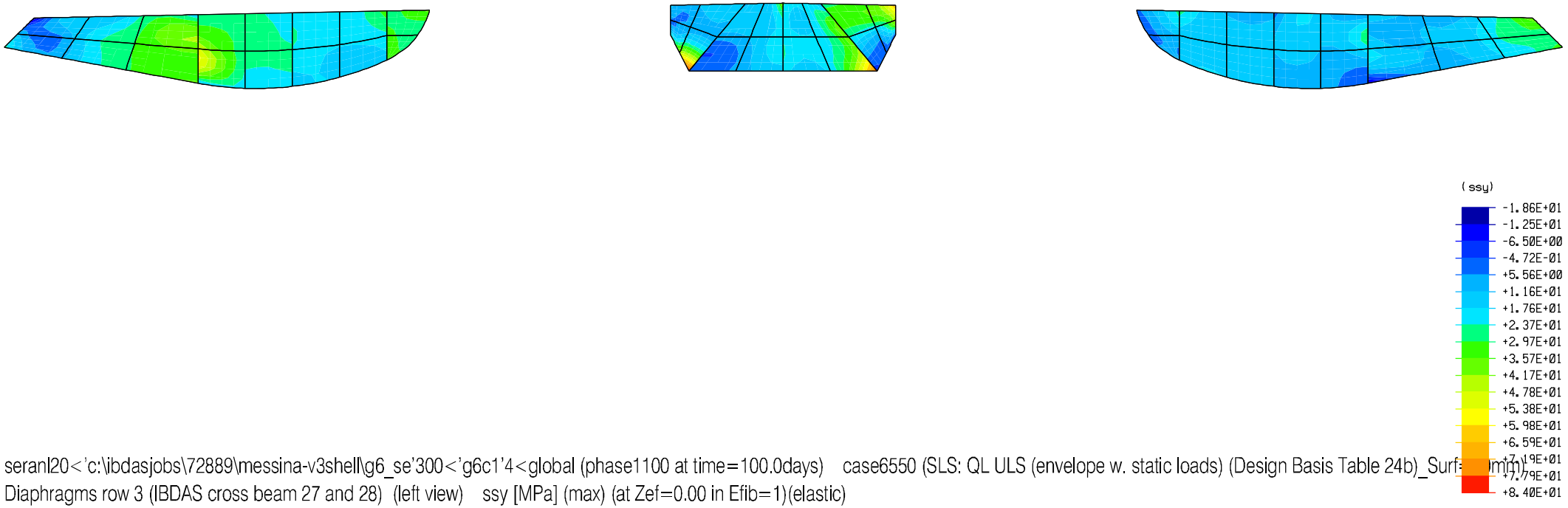
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:35	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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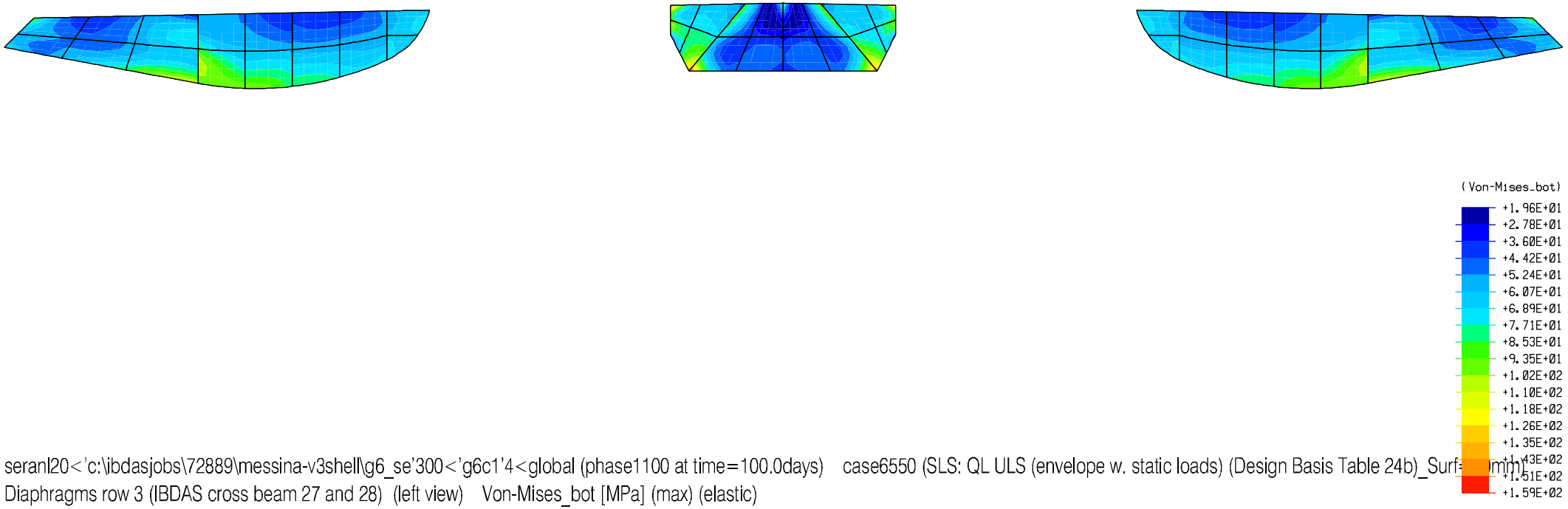
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:35	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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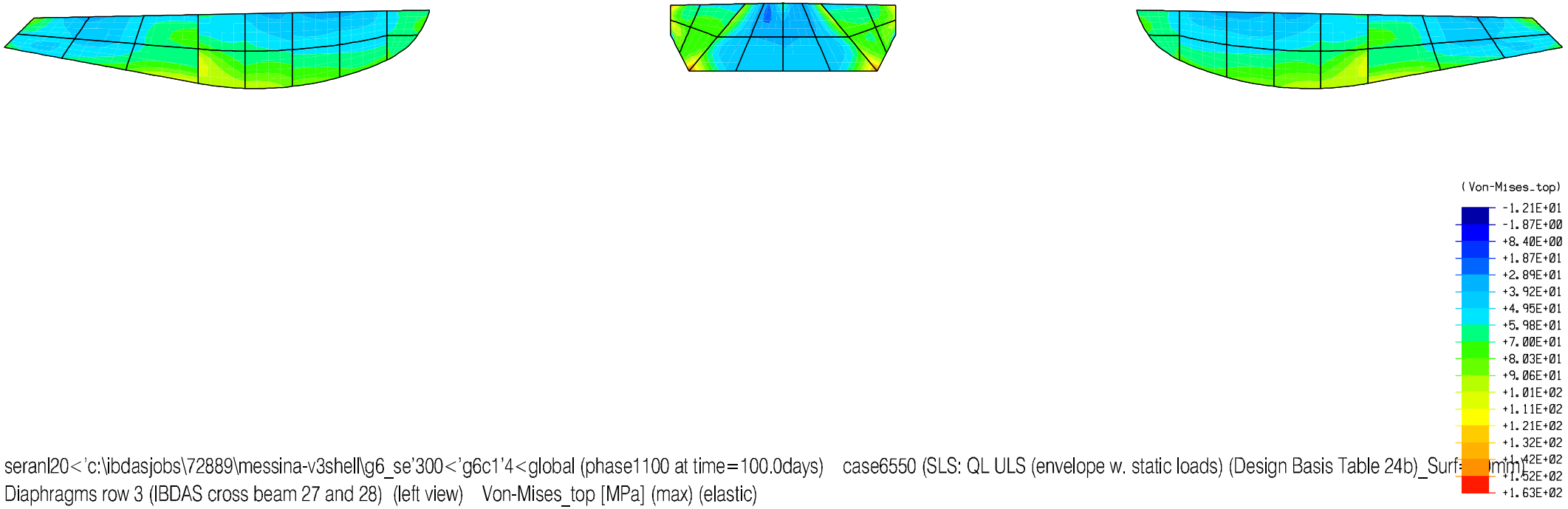
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:35	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:



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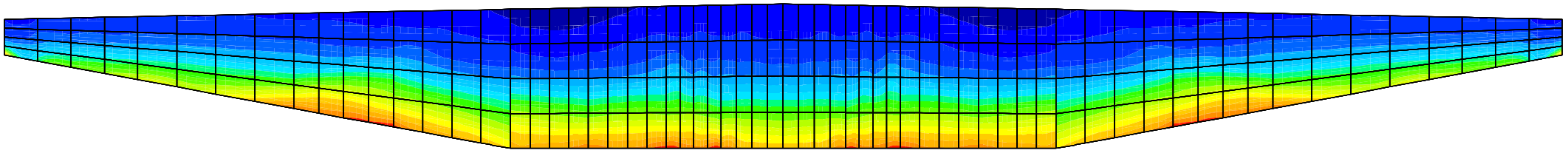
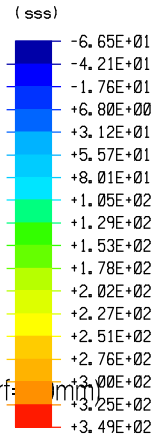
Diaphragms row 3 (IBDAS cross beam 27 and 28) (left view) Von-Mises_top [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:52	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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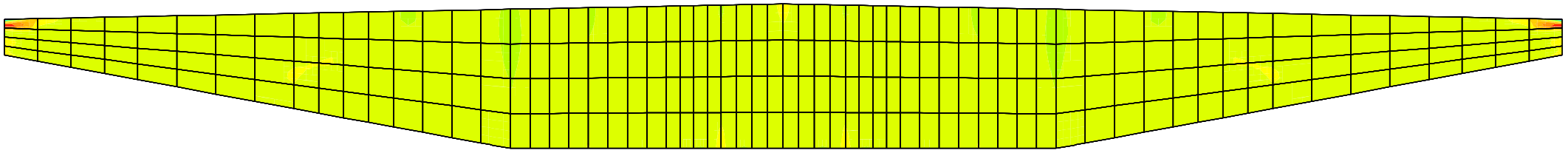
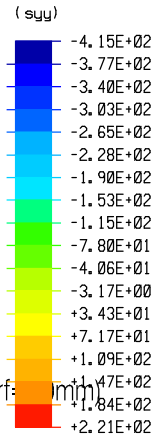
s+ cross beam edge (IBDAS cross beam 27) (left view) sss [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:52	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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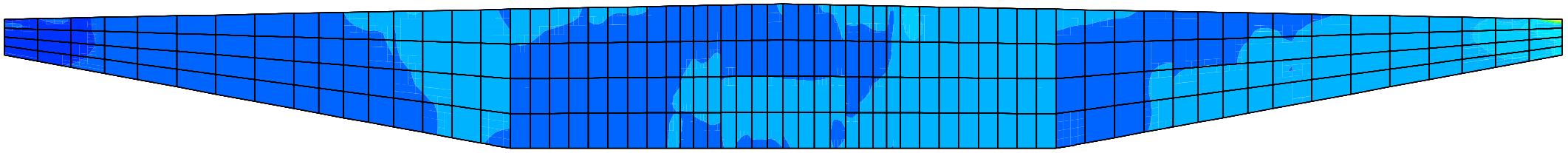
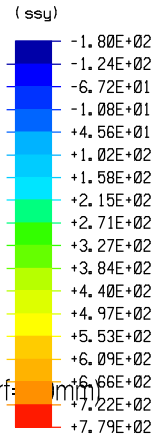
s+ cross beam edge (IBDAS cross beam 27) (left view) syy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

COWI Author: ladi Date: 15-mar-11 18:52	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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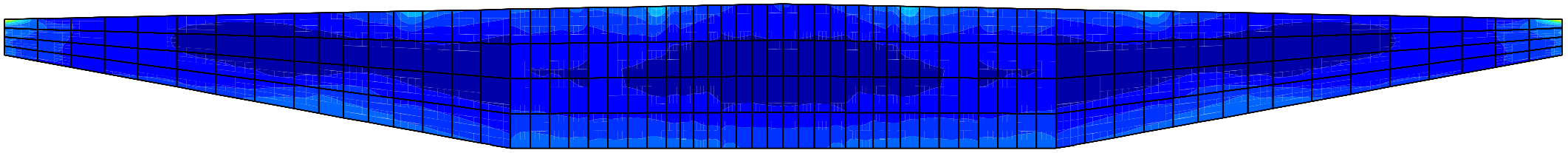
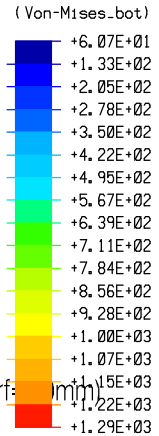
s+ cross beam edge (IBDAS cross beam 27) (left view) ssy [MPa] (max) (at Zef=0.00 in Efib=1)(elastic)

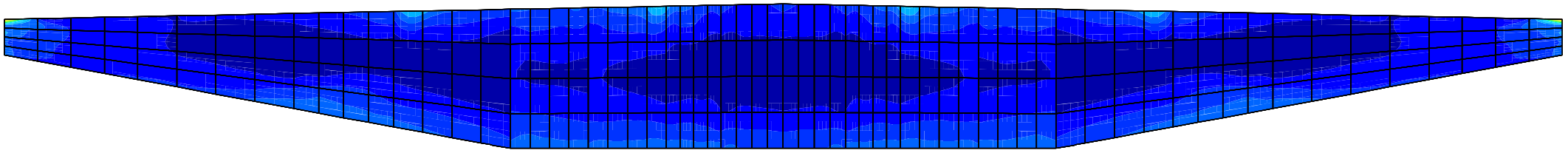
COWI Author: ladi Date: 15-mar-11 18:52	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:

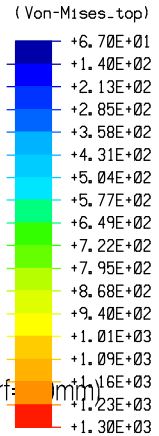




seranl20<'c:\ibdasjobs\72889\messina-v3shell\g6_se'300<'g6c1'4<global (phase1100 at time=100.0days) case6550 (SLS: QL ULS (envelope w. static loads) (Design Basis Table 24b)_Surf=[illegible]mm)
s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_bot [MPa] (max) (elastic)

COWI Author: ladi Date: 15-mar-11 18:52	Job no: 72889-a	Bridge across Strait of Messina Progetto Definitivo. Model ver. 3.3f	Page:





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s+ cross beam edge (IBDAS cross beam 27) (left view) Von-Mises_top [MPa] (max) (elastic)