

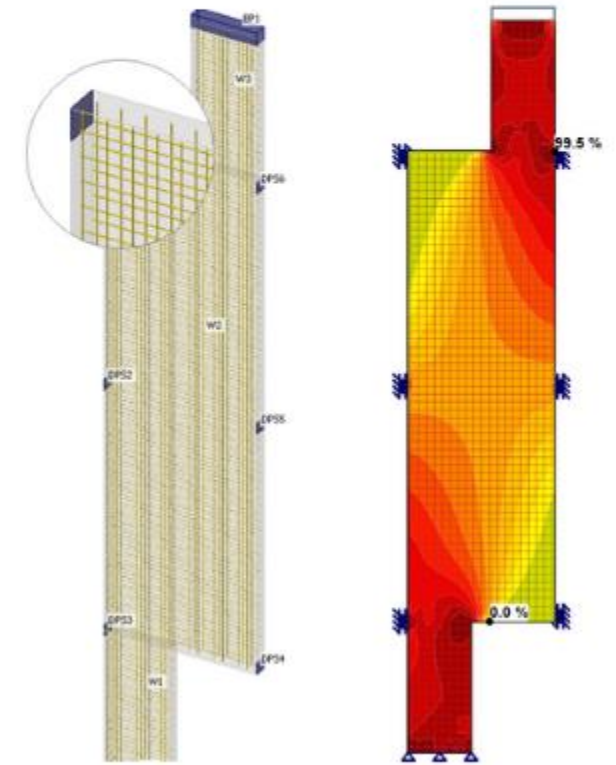
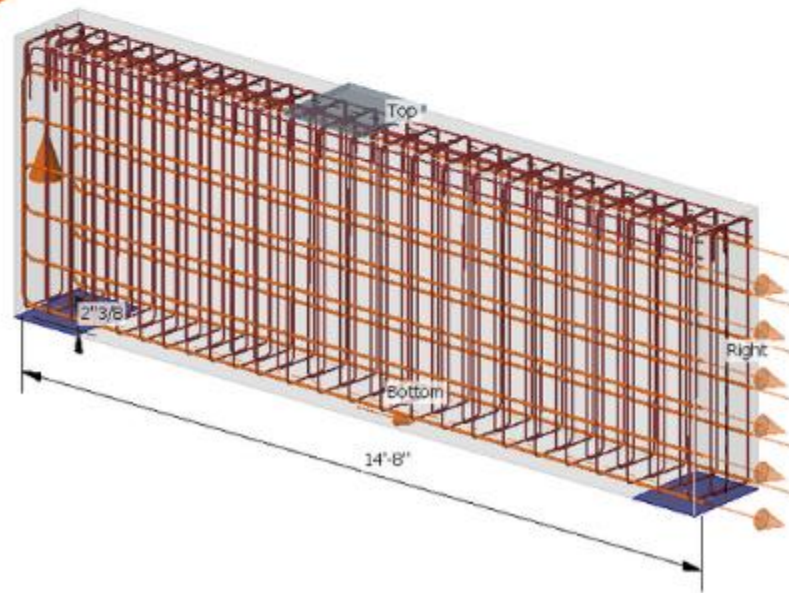
US Webinar

Concrete transfer beams and walking columns: model, analysis and design

September 27,
2023

IDEA StatiCa[®]

Calculate yesterday's estimates

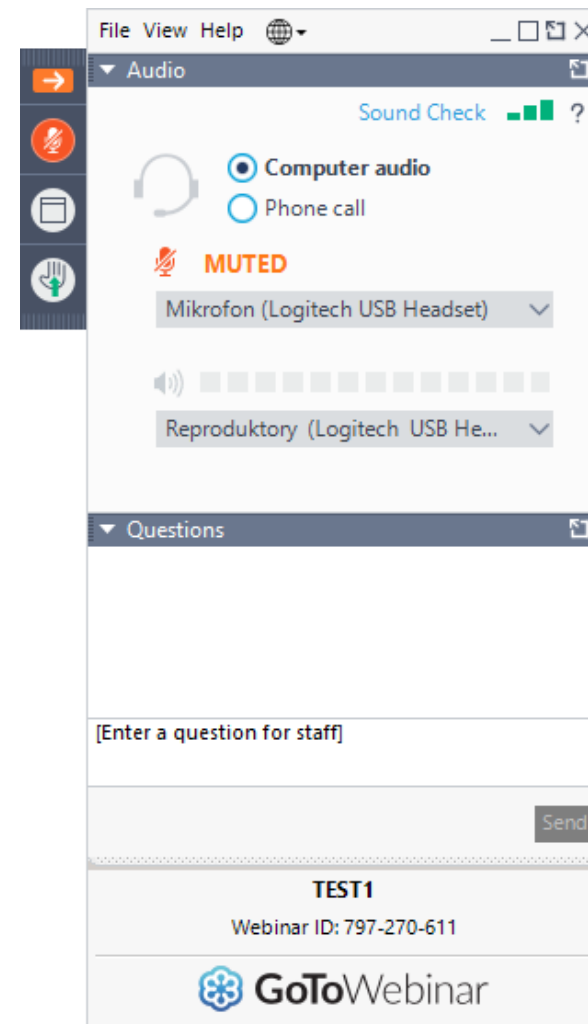


Control Panel

When you first join a session, the Control Panel appears on the right side of your screen. Use the Control Panel to manage your session. To free up space on your desktop, you can collapse the Control Panel and use the Grab Tab to continue to manage your session.

- **Grab Tab:** From the Grab Tab, you can hide the Control Panel, mute yourself (if you have been unmuted by the organizer), view the webinar in full screen and raise your hand.
- **Audio Pane:** Use the Audio pane to switch between Telephone and Mic & Speakers.
- **Questions Pane:** Ask questions for the staff.

QUESTIONS



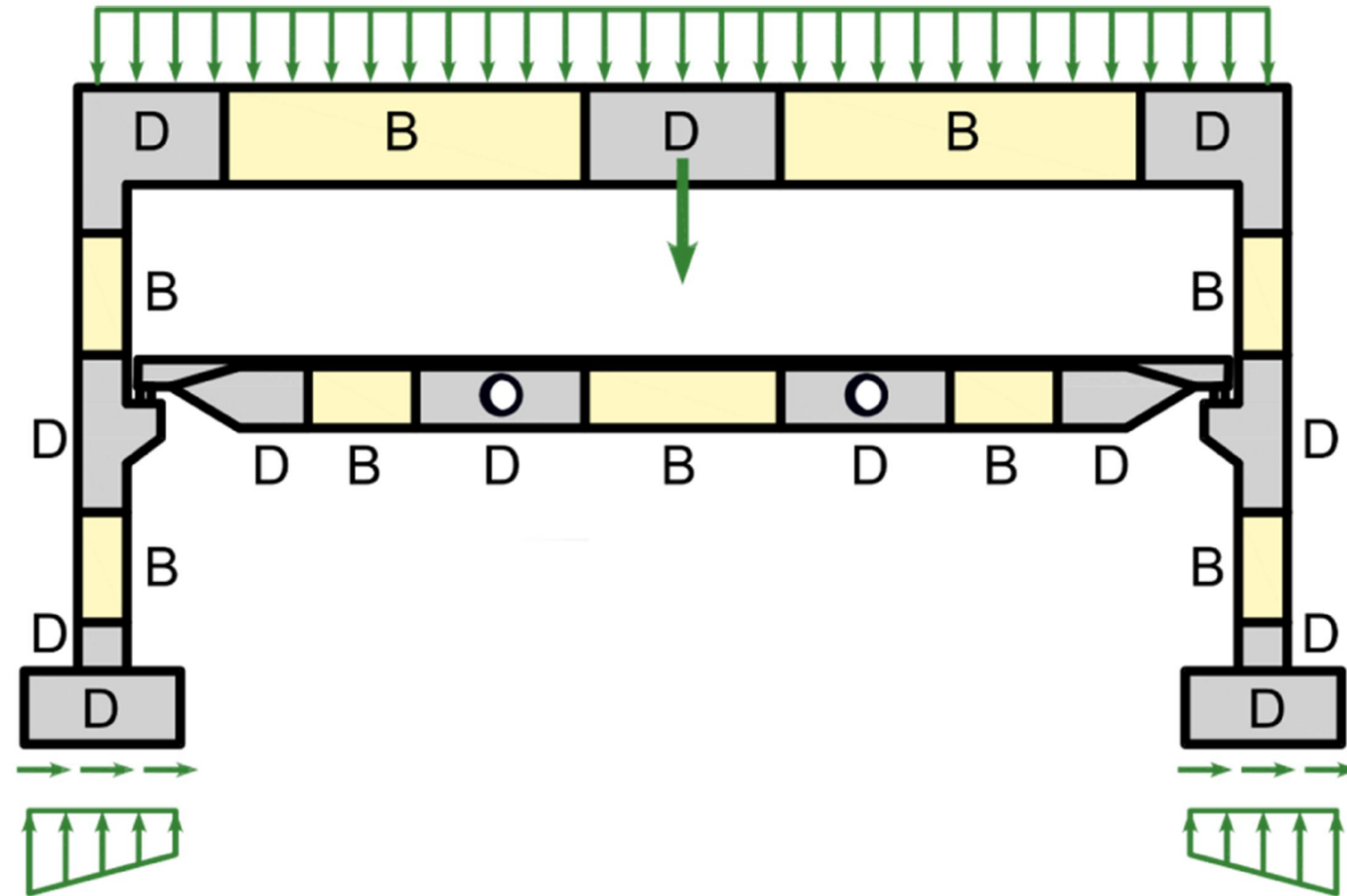
Agenda

- Why Detail?
- Live demo:
 - Transfer beam
 - Walking column
- Where to learn about it?



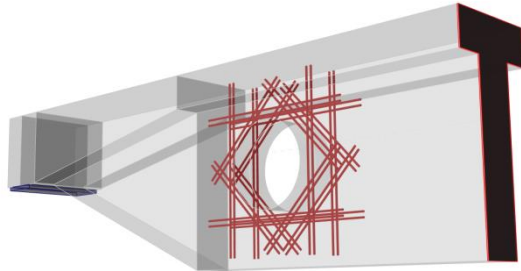
<https://www.imegcorp.com/insights/blog/walking-columns-the-structural-solution-for-the-tallest-residential-building-in-philadelphia/>

Why Detail?

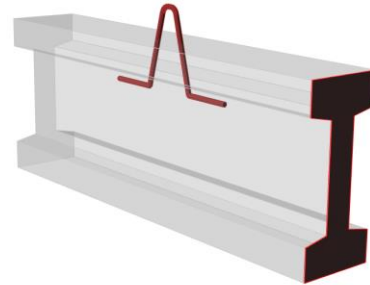


IDEA STATICA DETAIL

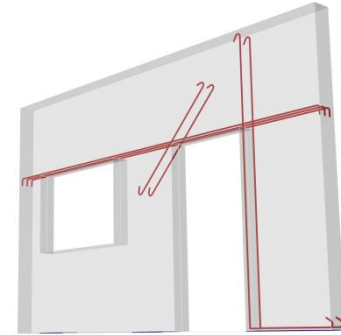
Dapped ends



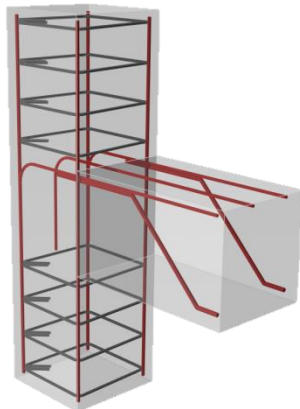
Hangings



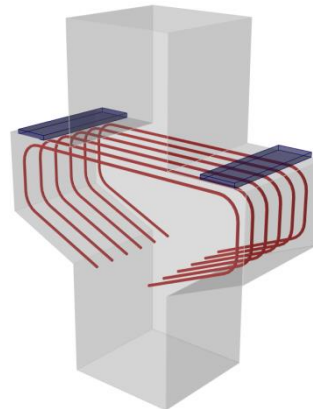
Walls



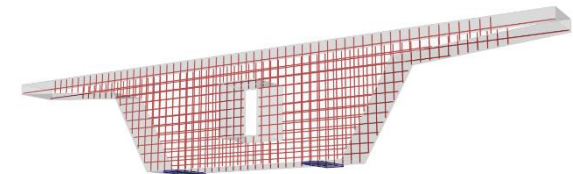
Frame joints



Corbels / Brackets

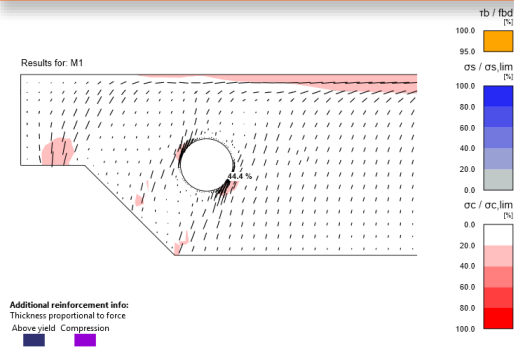


Diaphragms

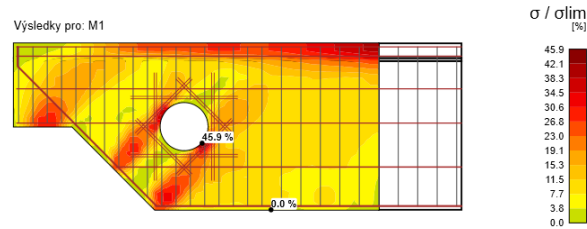


DESIGN AND CODE-CHECK

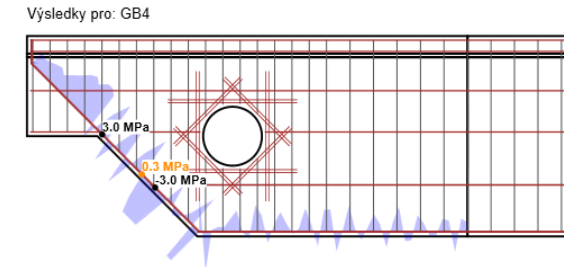
Overall check



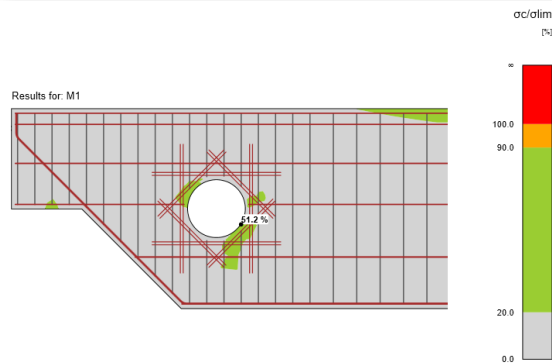
Strength



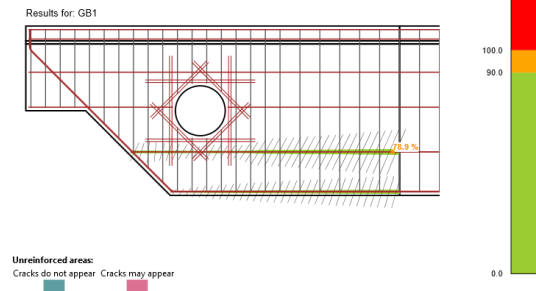
Anchorage



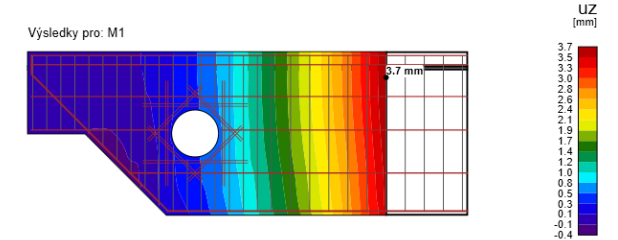
Stress



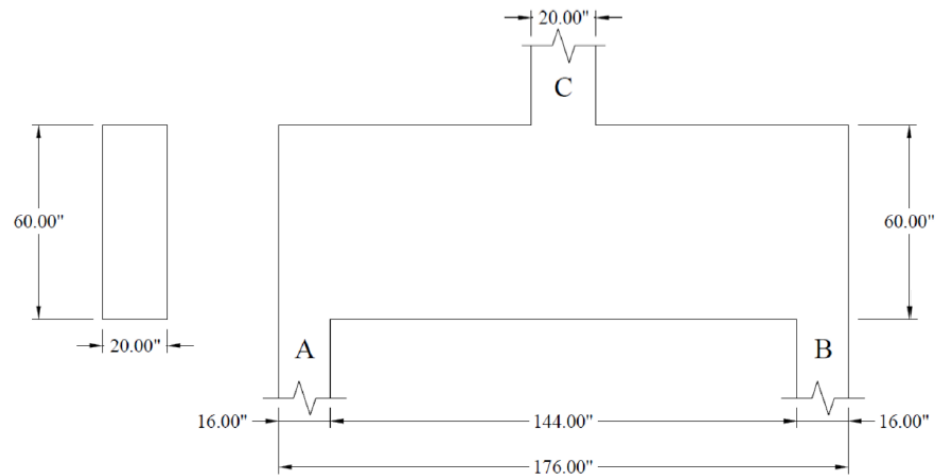
Cracks



Deflection

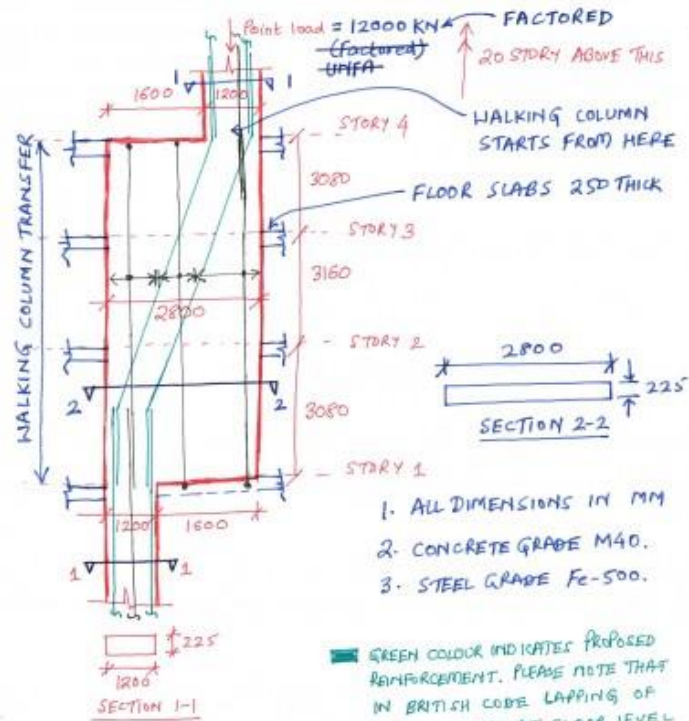


Live demo



- Design data:
- $f_c' = 4000$ psi normal weight concrete
- $f_y = 60000$ psi
- The single column at midspan subjects the girder to:
- DL = 180 kips
- LL = 250 kips

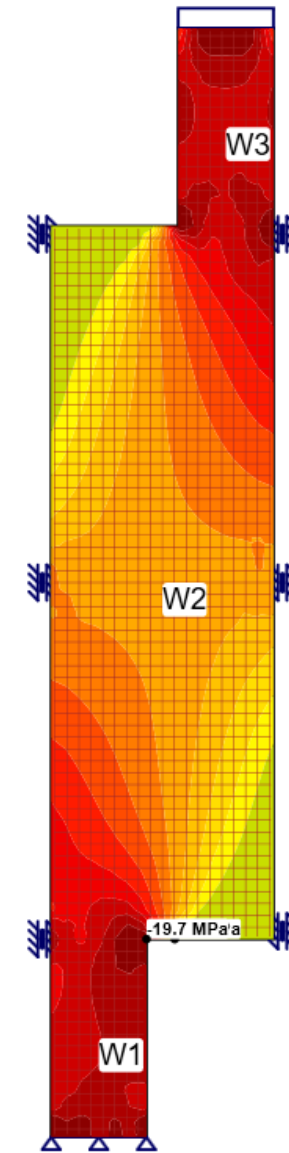
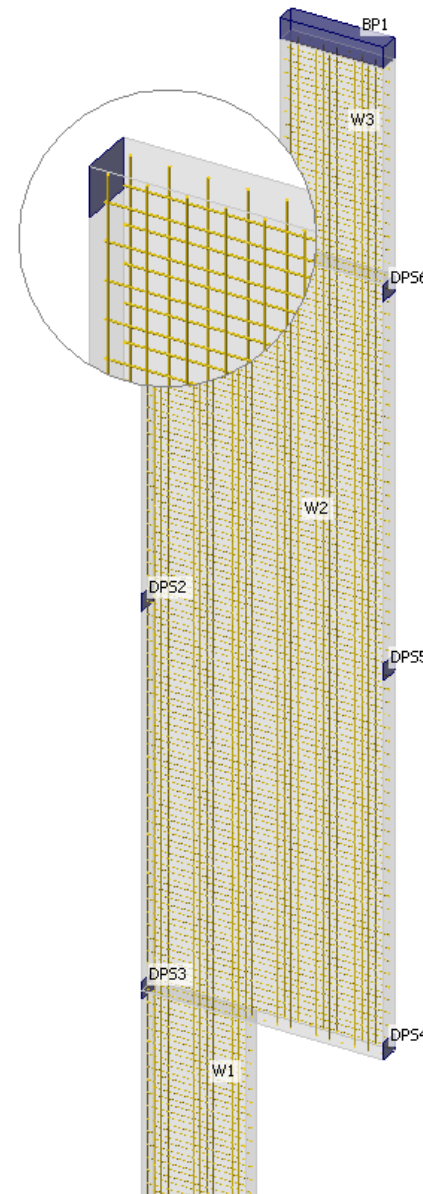
WALKING COLUMN



1. ALL DIMENSIONS IN MM
2. CONCRETE GRADE M40.
3. STEEL GRADE Fe-500.

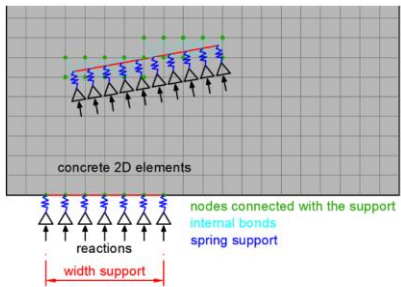
GREEN COLOUR INDICATES PROPOSED REINFORCEMENT. PLEASE NOTE THAT IN BRITISH CODE LAPPING OF BARS OCCURS AT FLOOR LEVEL AS SHOWN.

BLACK LINE ALSO INDICATES A PROPOSED TYPE OF REINFORCEMENT ARRANGEMENT



Support type

• scheme

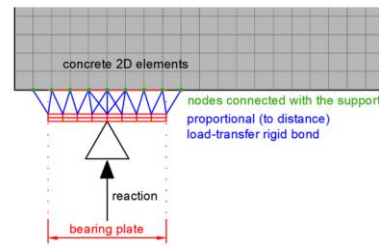


• reality



Line support

• scheme

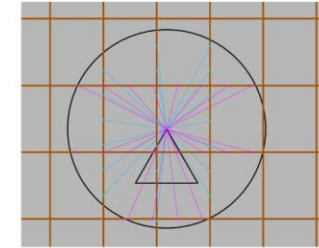


• reality

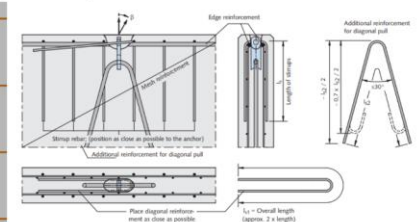


Bearing plate support

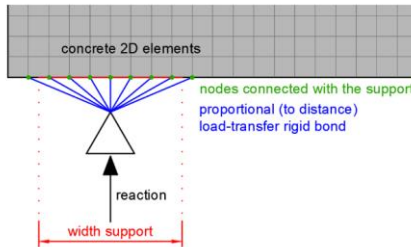
• scheme



• reality

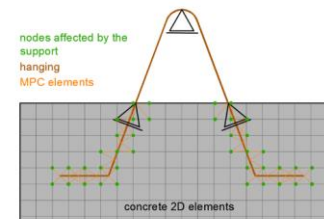


Patch support

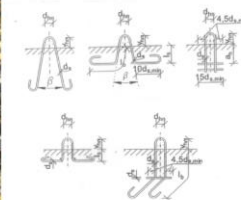


Point distributed support

• scheme

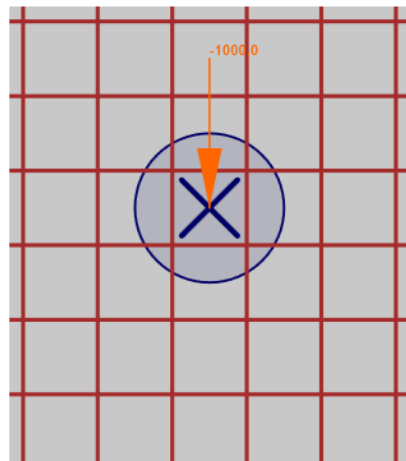
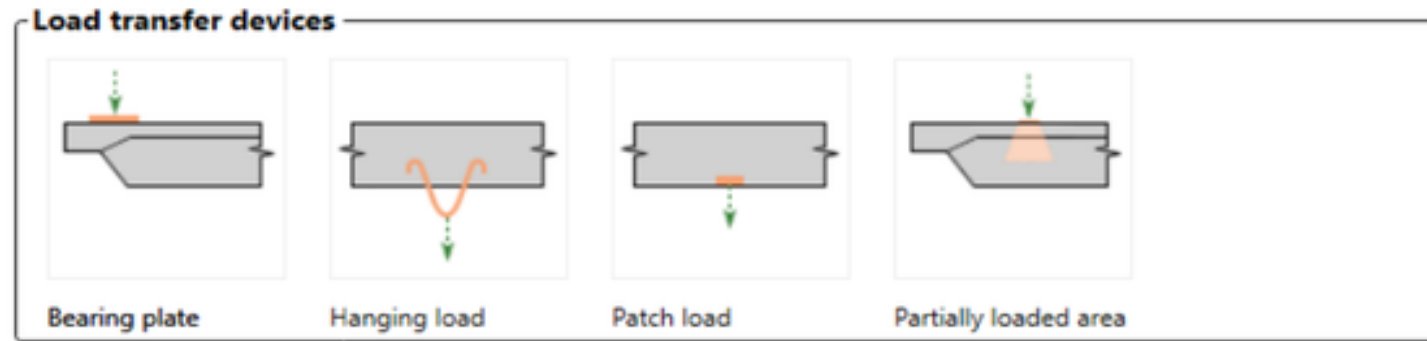


• reality

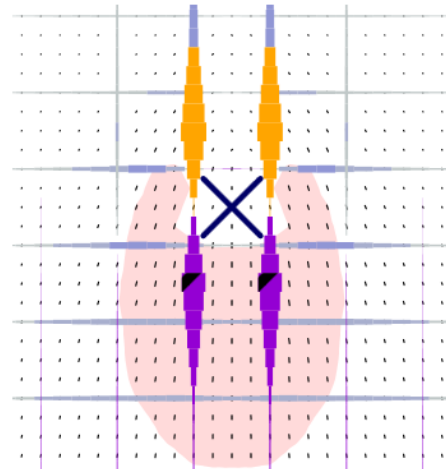


Hanging support

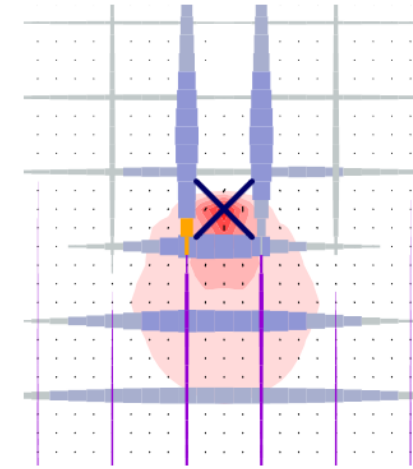
Load transfer devices



(a)



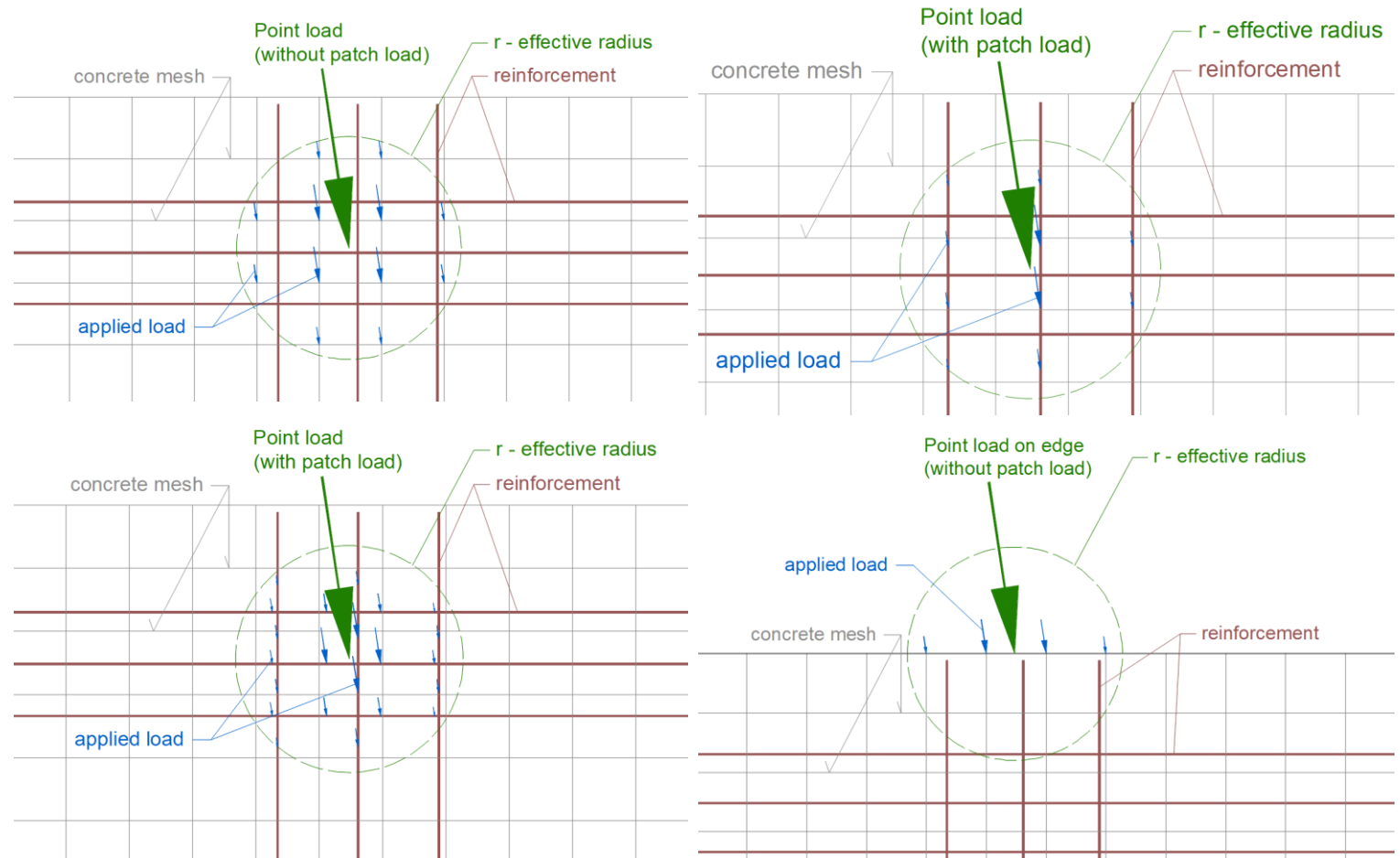
(b)



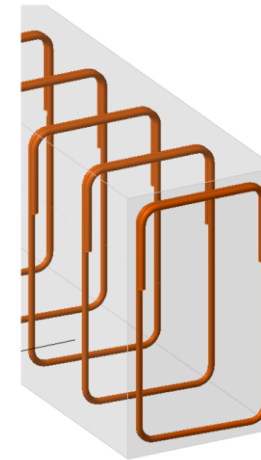
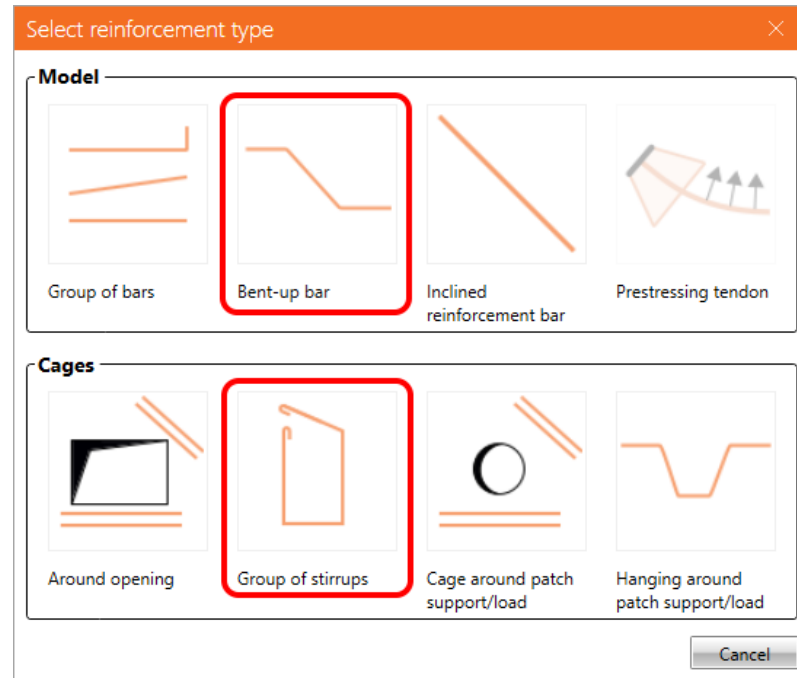
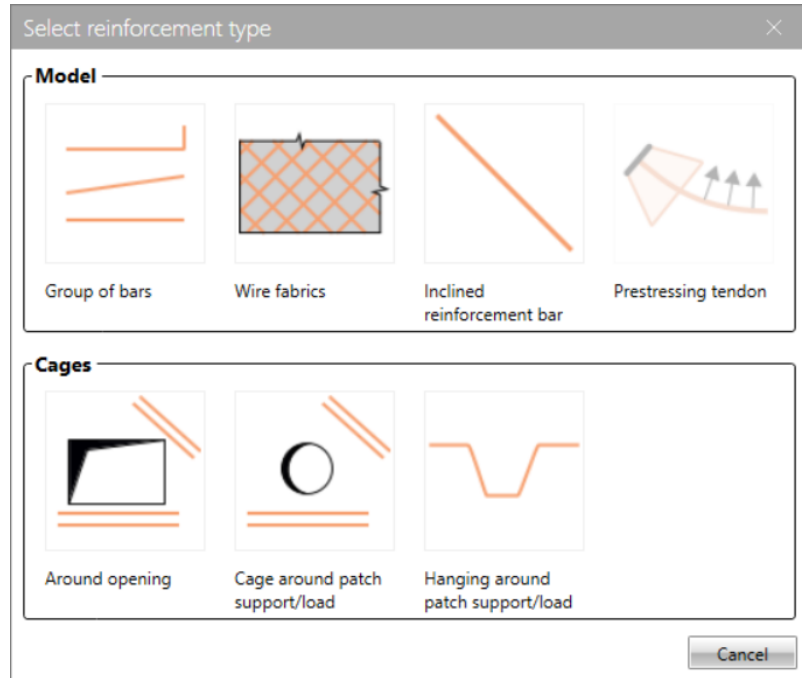
(c)

(a) load application; (b) load transferred through rebars, (c) load transferred through concrete

Load impulses

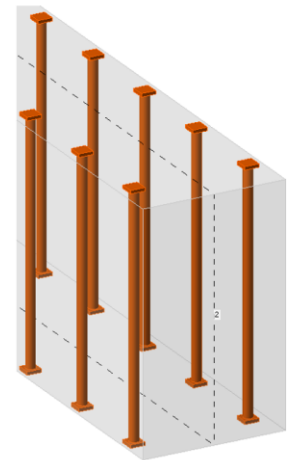


Reinforcement



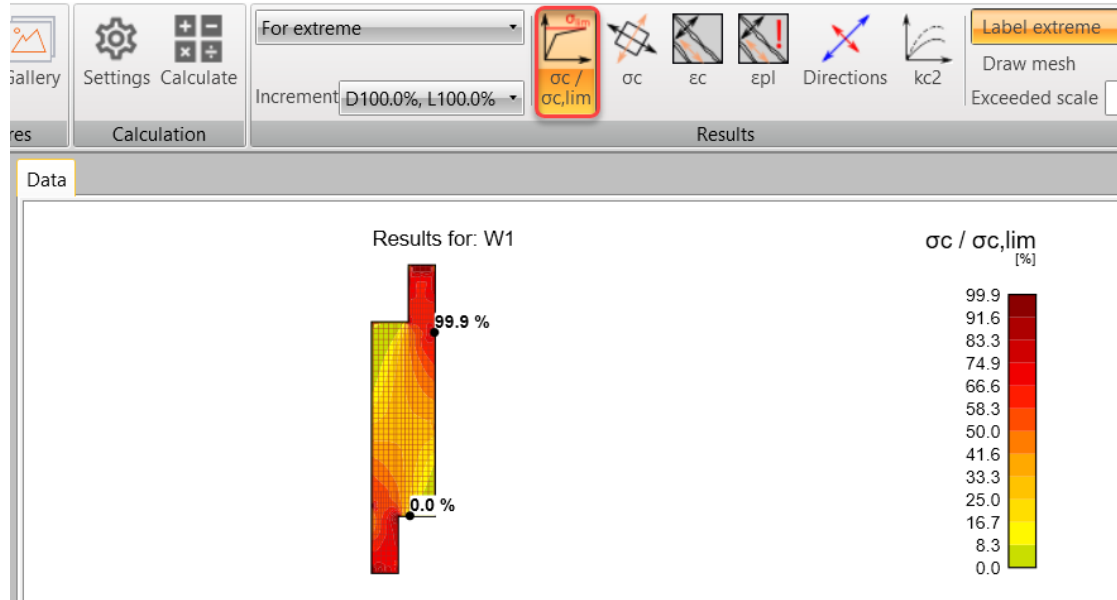
Beam with stirrups

=

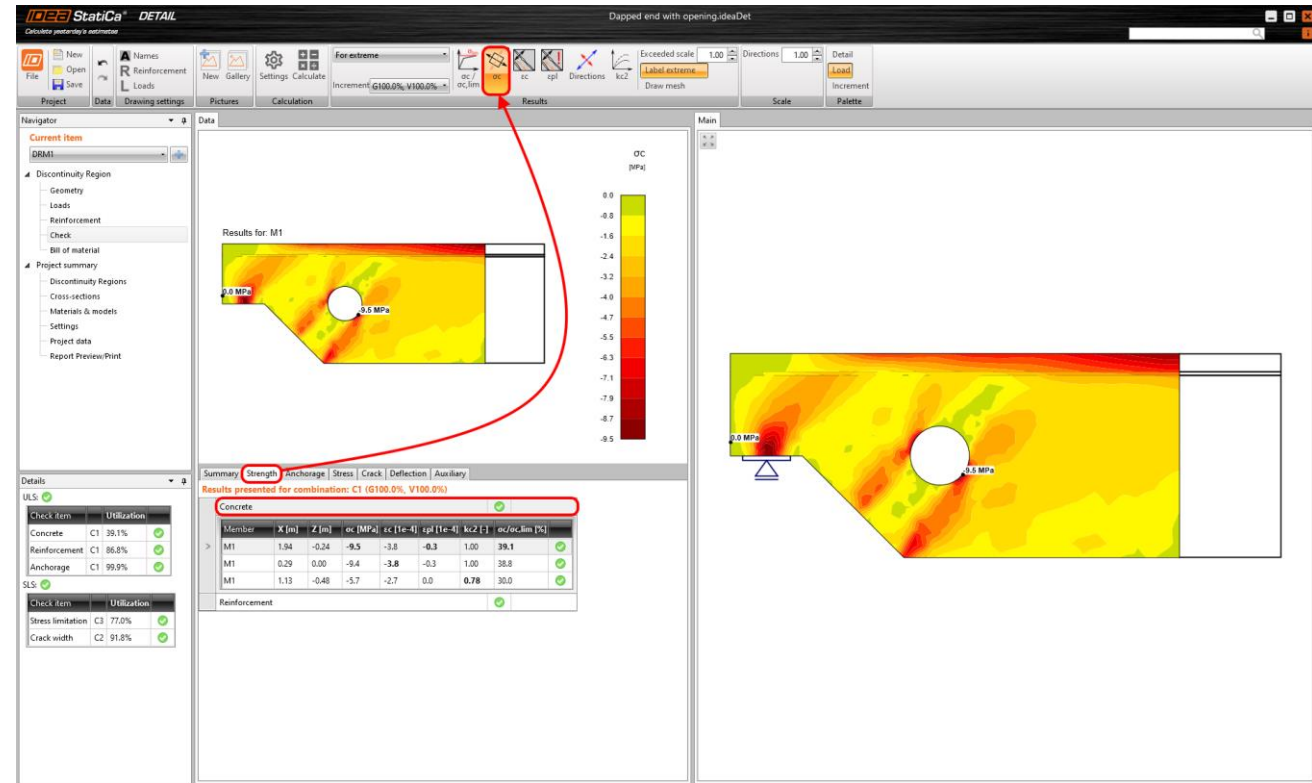


Wall with perfectly bonded bars

Design strength concrete results



Concrete utilization ratio



Concrete stress

Reinforcement utilization

IDEA StatiCa® DETAIL Test DXF TRANSFER BEAM.ideaDet

For extreme: $\sigma_s / \sigma_{s,lim}$ (highlighted)

Reinforcement: 1.00

Scale: 1.00

Current item: DRM1

Discontinuity Region: Geometry, Loads, Reinforcement, Check, Bill of material

Project summary: Discontinuity Regions, Cross-sections, Materials & models, Settings, Project data, Report Preview/Print

Details: ULS: SLS:

Check item	Utilization	Status
Concrete	C1 99.9%	✓
Reinforcement	C1 92.4%	✓
Anchorage	C1 100.1%	✓
Crack width	C3 82.1%	✓

Results for: GB6

$\sigma_s / \sigma_{s,lim}$ [%]

92.4
80.8
69.3
57.7
46.2
34.6
23.1
11.5
0.0

Summary | Strength | Anchorage | Crack | Deflection | Auxiliary

Results presented for combination: C1 (D100.0%, L100.0%)

Reinforcement	X [in]	Z [in]	σ_s [ksi]	ϵ_s [1e-4]	$\sigma_s / \sigma_{s,lim}$ [%]	$\sigma_s / \sigma_{s,yield}$ [%]	$\epsilon_s / \epsilon_{s,lim}$ [%]	Status
GB6	57'-1"3/4	54'-2"1/8	49.9	12.7	92.4	92.4	1.3	✓
GB6	57'-1"3/4	55'-0"1/8	44.2	12.8	81.9	81.9	1.3	✓
GB2	52'-9"3/4	14'-10"11/16	-39.5	-13.6	73.2	73.2	1.4	✓
GB7	49'-5"5/16	46'-0"1/8	37.3	10.4	69.0	69.0	1.0	✓
GB5	58'-7"3/4	44'-6"	-36.3	-12.5	67.2	67.2	1.3	✓
GB1	52'-4"3/4	15'-3"15/16	-32.8	-11.3	60.8	60.8	1.1	✓
GB4	54'-10"3/4	51'-9"1/4	-27.5	-9.5	50.9	50.9	0.9	✓
GB8	49'-0"3/4	6'-8"7/8	20.1	4.5	37.3	37.3	0.5	✓
GB3	52'-9"5/8	17'-1"5/8	-14.1	-4.9	26.1	26.1	0.5	✓

Deflection

StatiCa® DETAIL Test DXF TRANSFER BEAM.ideaDet

Calculata ymerzdrydy's wozimawo

File New Open Save Reinforcement Loads Drawing settings Pictures Calculation Deflection check Results Deformation 1.00 Scale

For extreme Increment D100.0%, L100.0%

Results: u_z , $u_{z,lim}$, u , Deformed shape, $u_{z,st}$, $u_{z,lt}$, Δu_z , $u_{z,tot}$, Exceeded scale 1.00

Navigator: Current item DRM1

- Discontinuity Region
 - Geometry
 - Loads
 - Reinforcement
 - Check
 - Bill of material
- Project summary
 - Discontinuity Regions
 - Cross-sections
 - Materials & models
 - Settings
 - Project data
 - Report Preview/Print

Details: ULS: SLS:

Check item	Utilization	
Concrete	C1 99.9%	<input checked="" type="checkbox"/>
Reinforcement	C1 92.4%	<input checked="" type="checkbox"/>
Anchorage	C1 100.1%	<input checked="" type="checkbox"/>

Check item	Utilization	
Crack width	C3 82.1%	<input checked="" type="checkbox"/>

Data: Results for: W1 -0.0553 in

Summary | Strength | Anchorage | Crack | Deflection | Auxiliary

Results presented for: C2 (D100.0%, L100.0%)

Member	X [in]	Z [in]	uz,st [in]	uz,lt [in]	Δu_z [in]	uz [in]
> W1	56'-9"1/4	55'-2"	-0.1932	-0.3803	-0.0553	-0.4356

Main: 3D visualization of the beam showing deflection contours and a maximum deflection of -0.0553 in.

Cracks width

StatiCa® DETAIL Test DXF TRANSFER BEAM.ideaDet

Crack width: 0.01 in

For extreme: D100.0%, L100.0%

Crack width: 1.00

Scale: 1.00

Results for: GB6
0.0097 in

W [in] color scale: 0.0000 to 0.0097

Results presented for: C3 (D100.0%, L100.0%)

Reinforcement	X [in]	Z [in]	w [in]	sr [in]	w / wlim [%]
GB6	57'-1"3/4	54'-2"1/8	0.0097	1'-4"5/16	82.1
GB7	49'-9"13/16	46'-0"1/8	0.0074	8"1/16	63.0
GB8	49'-0"3/4	6'-8"7/8	0.0033	8"1/16	28.2
GB1	49'-10"3/4	46'-2"	0.0026	2'-6"3/8	21.7
GB4	54'-10"3/4	54'-9"1/2	0.0014	11"1/2	11.8
GB3	54'-1"3/8	16'-8"15/16	0.0009	2'-1"5/8	7.4
GB5	55'-3"3/4	15'-7"	0.0008	2'-2"3/16	6.4

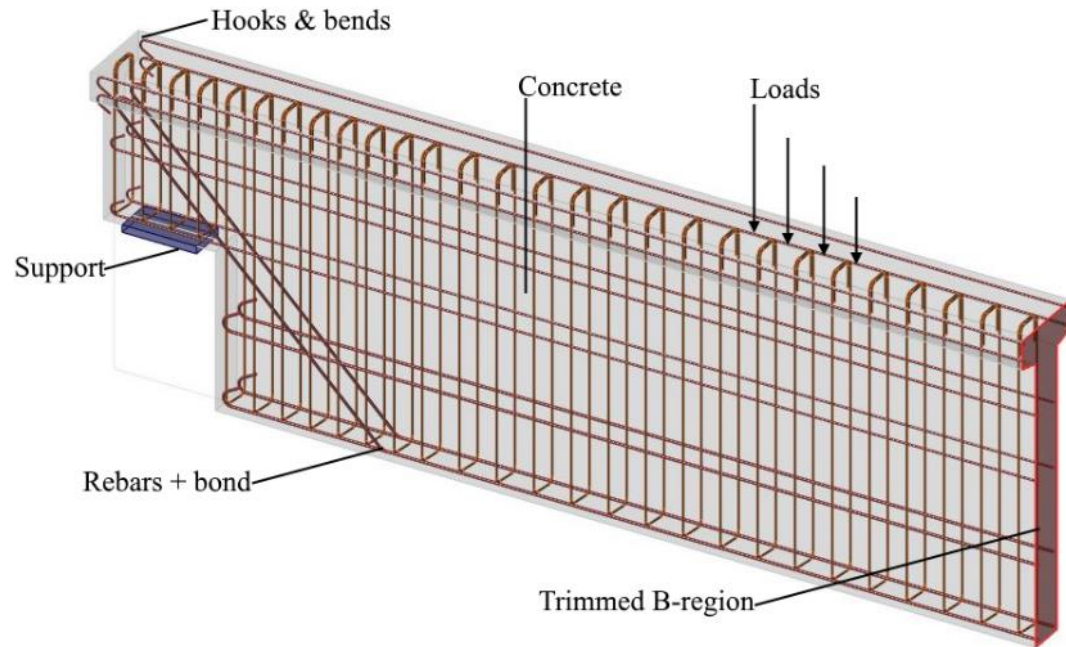
Check item Utilization

Check item	Utilization	Status
Concrete	C1 99.9%	✓
Reinforcement	C1 92.4%	✓
Anchorage	C1 100.1%	✓

Crack width C3 82.1% ✓

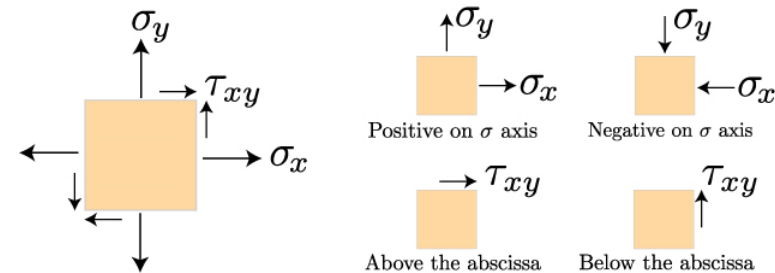
The crack width is checked in the vicinity of the reinforcement only. No control of cracking is performed in non-reinforced zones.
The presentation of crack spacing is schematic only. It does not represent the crack spacing computed for the calculations.

CSFM



- Plane stress shell elements (2D FEA)

- 'Rod' elements representing the reinforcement (1D finite elements)



New project

Design code: Name:

Concrete: Author:

Reinforcement: Description:

Concrete cover: in

New entities:

Templates

Beams Frame joints Walls

General input

General shape

Beams

End support Dapped end, one css Dapped end, two css Haunched dapped end Internal support end

Opening

Walls

Wall with window and door openings Wall with window

Frame joints

Knee joint Cross joint - prismatic column Column with bracket Column with brackets

IDEA StatiCa Campus

The screenshot shows the IDEA StatiCa Campus website interface. At the top, there is a navigation bar with the logo on the left and menu items: STEEL, CONCRETE, BIM, SUPPORT & LEARNING, PRICING, and COMPANY. On the right side of the navigation bar, there are icons for user profile, search, and a flag (USA), along with a 14-DAY TRIAL button. The main content area is titled "SELECT YOUR CONCRETE COURSE" with the subtitle "Choose the course you are interested in". Below this, there is a grid of course cards. The first card is titled "STRUCTURAL DESIGN OF RC ELEMENTS WITH DISCONTINUITY REGIONS" and includes a description, application details, and a "START THE COURSE" button. The second card is titled "STRUCTURAL DESIGN OF REINFORCED CONCRETE SECTIONS" and has a dropdown arrow. A small circular icon with the number 9 is visible in the bottom left corner of the screenshot.

IDEA StatiCa® STEEL ▾ CONCRETE ▾ BIM ▾ SUPPORT & LEARNING ▾ PRICING ▾ COMPANY ▾

14-DAY TRIAL

SELECT YOUR CONCRETE COURSE

Choose the course you are interested in

STRUCTURAL DESIGN OF RC ELEMENTS WITH DISCONTINUITY REGIONS

In this course, you will learn the principles of the Compatible Stress Field Method (CSFM), basic workflow in the Detail application, and proper results interpretation.

- Application: IDEA StatiCa Detail
- Duration of study: 12 hours

START THE COURSE →

STRUCTURAL DESIGN OF REINFORCED CONCRETE SECTIONS ▾

<https://www.ideastatica.com/campus-course/structural-design-of-rc-elements-with-discontinuity-regions>

Q&A



What's next?

Next webinar

Complex modeling in Connection

- Wed., Nov. 1st at noon ET

Live events

- SEA of Texas 9/28-29
- SDS2 User Summit 10/11-12
- Trimble Dimensions 11/6-8
- NCSEA Summit 11/8-10