A short history

Research on the developing of a “Guideline for non-linear analysis of concrete girders” was initiated by Rijkswaterstaat. Feenstra has written the earliest version which was based on the *fib* Model Code 1990. In 2010, reference was made to the draft version of the Model Code 2010.

The guideline covers topics on the simulations of reinforced girders, prestressed girders and reinforced slabs. The first approved version of the guideline was published in May 2012.

Today both the *fib* Model Code 2010 and the Eurocode2 allow to check the design capacity of concrete members by nonlinear analysis with so-called safety formats. Validation of the guideline was done by simulations of existing and newly published experiments to verify the effect of the choices of parameters made by the users and the software codes. Several researchers from Delft University of Technology and the University of Parma were involved in this project. Two commercially available software packages were used. The Guideline has been used for re-assessments of existing concrete structures in the Netherlands and abroad.

In 2014, a contest was organized with the aim of: further improving the practical use of the guideline and promote the guideline to a larger group of international end-users and other software packages. In the contest, the users were asked to make a prediction on the behaviour of T-shaped prestressed girders, based on the guideline.

The four, almost similar, precast prestressed girders were tested by Ensink in the autumn of 2014 in the Stevin Laboratory of Delft University of Technology.

A Workshop at the University of Parma, organised by Belletti and others with more than 20 participants using 7 different software packages concluded the Contest.

Now, a new Contest is organized, again including a Workshop. This new Shear Prediction Workshop, with contributions from the participants, using different software codes, is planned on 22-23 May, 2019 at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway.

At this venue the Diana Users Association will celebrate its 35 year anniversary. The NTNU has always been strongly involved in developments of Concrete Mechanics and validation of NLFEAs. In close cooperation with the current staff members of this university, we are now organizing this workshop.

At the end of the Workshop, there will be a Winner!

Winner Contest: € 500,-

Contest Participation form

First name
…………………………………………………...

Last name
…………………………………………………..

Company/University
…………………………………………………..

Address
…………………………………………………..

Country
…………………………………………………..

Email
…………………………………………………..

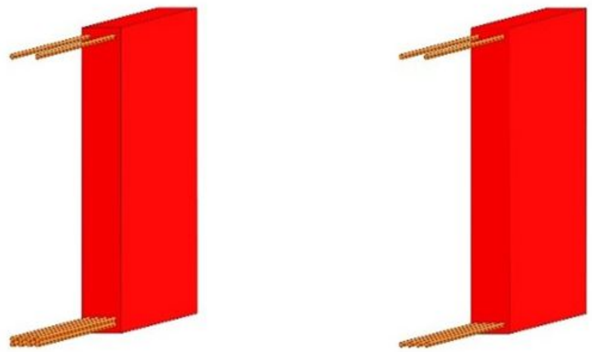
Software package
…………………………………………………..

to be sent to the secretariat **a.s.a.p.**

Final submission prediction: 1 May 2019

INTERNATIONAL CONTEST

SHEAR CAPACITY OF TWO SIMPLE POORLY REINFORCED DEEP CONCRETE BEAMS



A Workshop with Analytical and Numerical ULS Predictions Compared to Experimental Results

Norwegian University of Science and Technology, Trondheim, 22-23 May 2019

Initiative

Yuguang Yang, Delft University of Technology, The Netherlands
Cor van der Veen, Delft University of Technology, The Netherlands
Max Hendriks, Delft University of Technology, The Netherlands & NTNU, Norway
Ane de Boer, DIANA USERS ASSOCIATION, The Netherlands

Secretariat
Email: info@dianausers.nl
Further Info Contest website: www.dianausers.nl

Test setup

The boundary conditions and the reinforcement lay-out of the two tests: H352 and H123 are given in the figure below:

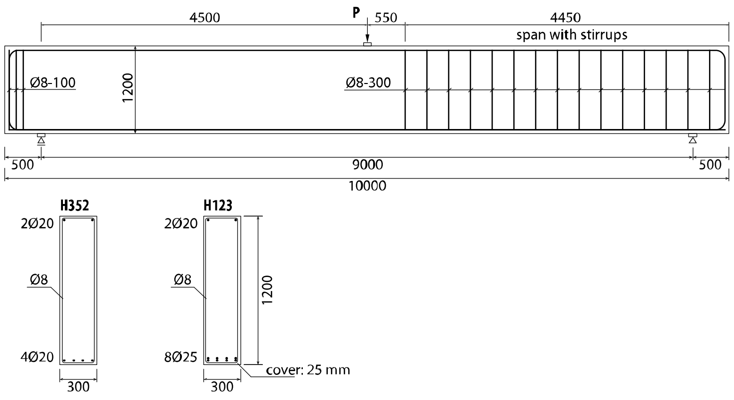


Figure 1. Configurations of test specimen: H352 and H123

The specimens are simply supported and loaded by a single point load at 4500 mm from the support, thus in the middle of the span. The point load was applied by a hydraulic actuator with displacement control. Steel plates with the dimension of 300 × 100 × 10 mm were used to introduce the force at the supports and the a point load. A felt layer was included between the TOP surface of the beam and the steel plate, to evenly distribute the load to the rough concrete surface, see the figure 2, right.

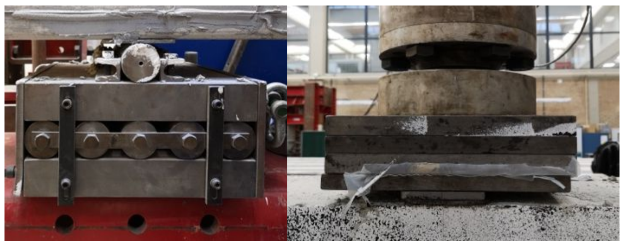


Figure 2. Details of the loading (right) and supporting (left) conditions

The longitudinal reinforcement of the two specimens are H352: 4Ø20 and H123: 8Ø25.

The concrete cover of both specimens is 25 mm for the longitudinal reinforcement.

All the rebars are standard ribbed bars with the average yielding strength of around 580 MPa. The stirrups are Ø8 ribbed bars. They are placed to make sure shear failure occurs at the instrumented side and confine the tensile reinforcement at the anchorage zone, see figure 1 for more detail.

Material properties

A standard commercial concrete mixture has been used, ordered from the local concrete plant. The physical properties of the concrete, reinforcement are given in table 1.

Table 1. Mean value of the parameters of concrete used in the two specimens

Parameter		Value	Units
Concrete strength (from 150 mm cube tests)	$f_{c,cube}$	86.9	MPa
Concrete tensile strength (from splitting tests of 150 mm cubes)	$f_{ct,split}$	5.7	MPa
Maximum aggregate size	d_a	16	mm
Concrete cover	c	25	mm
Density of concrete	ρ_c	23.9	kN/m^3
Yield stress reinforcements	f_{yk}	583.9	MPa
Ultimate stress reinforcements	f_{tk}	683.9	MPa
Modulus of elasticity of steel	E_s	200	GPa

Guidelines Nonlinear Analysis

Preferably, you are using a solution strategy based on the NLFEA Guidelines by Rijkswaterstaat, which can be downloaded from the website of the Users Association.
If you would like to use a (partly) different solution strategy or if you make specific choices, you are asked to describe this.

Expected output

An analytical and a numerical analysis is asked. The analytical solution should be based on the Eurocode or on the ModelCode2010.

As a qualified input of the Contest, we expect the following information:

1. Your name, affiliation;
2. The approach or software package that you adopt in the calculation, including references if appropriate;
3. Optional: the calculation details or the input of your model;
4. The ULS load level of both tests in kN;
5. Optional: an estimate of the standard deviation of the uncertainty distribution of your ULS load level prediction in kN;
6. The failure mode of both test and explanation
7. Load–deflection curve [kN-mm] or a maximum ULS deflection[mm] of both tests;
8. Crack pattern of the specimens just before and after failure;
9. Crack width [mm] at the load level of 175kN, just before and after ULS failure.