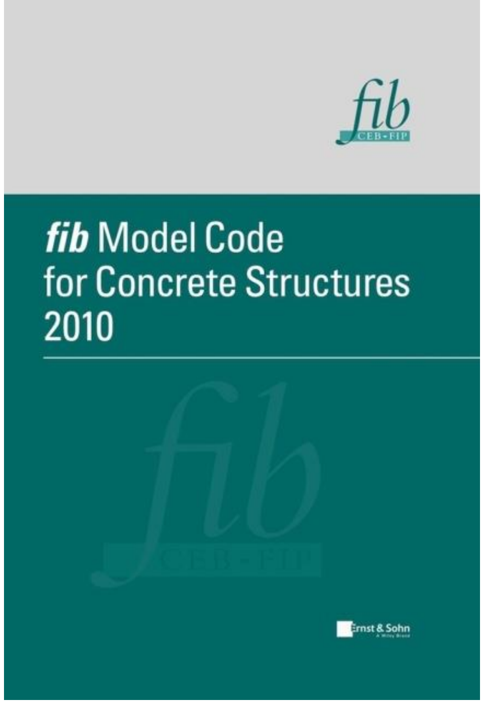
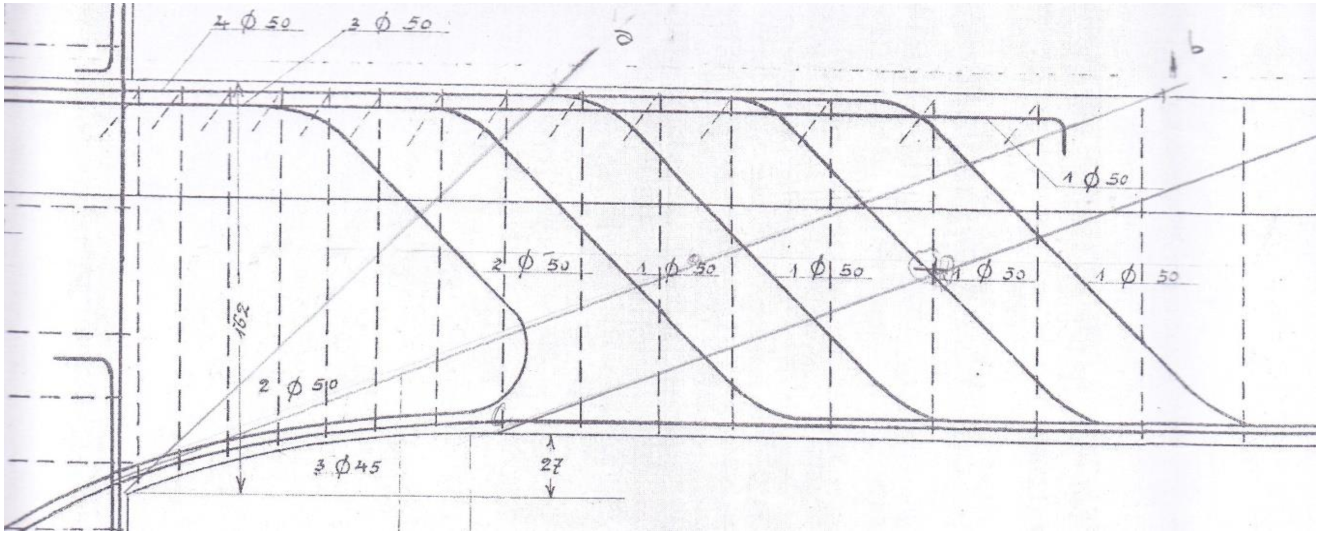
Worked examples based on fib MC 2010

- The examples illustrate the use of new methods offered by *fib* MC 2010
- They refer to practical situations which could not be treated adequately well up to now and structural applications or solutions which were not possible before.



Shear capacity of old beam

The picture shows a detail of a beam-column connection in an old structure. The question is which is the shear capacity of the beam.



Shear capacity of old beam

<u>Verification with LoA III</u>

Step 1: Assume a the uniformly distributed load q_{Ed} on the beam
Step 2: Calculate M_{ed} from q_{Ed}
Step 3: Calculate V_{ed} from q_{Ed}
Step 4: Calculate ε_x from (7.3-16)
Step 5: Calculate ε_1 from (7.3-41)
Step 6: Calculate k_ε from (7.3-40)
Step 7: Calculate η_{fc} from (7.3-28)
Step 8: Calculate k_c from (7.3-27)
Step 9: Calculate $V_{Rd,max}$ from (7.3-26)
Step 10: Calculate k_v from (7.3-43)
Step 11: Calculate $V_{Rd,c}$ from (7.3-30)
Step 12: Calcultate $V_{Rd,s}$ from (7.3-29)
Step 13: Calculate V_{Rd} from (7.3-23)
Step 14: Calculate q_{Ed} from step 13
Step 15: Compare q_{Ed} from step 14 with q_{Ed} from step 1

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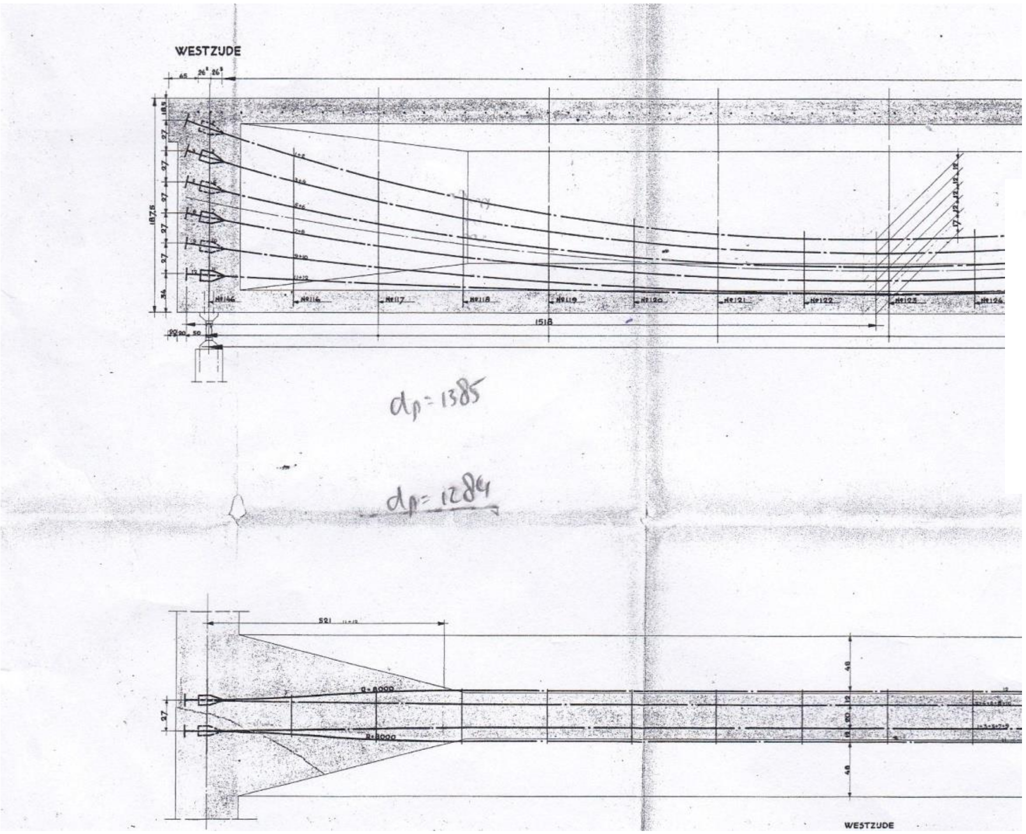
Shear capacity of old beam

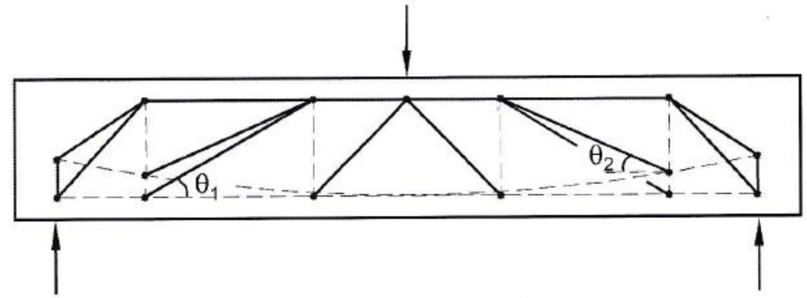
Schritt	Grösse	Rechengang 1	Rechengang 2	Rechengang 3
1	q_{Ed} (angenommen)	150 kN/m	228 kN/m	211 kN/m
2	M_{Ed}	3030 kNM	4606 kNm	4262 kNm
3	V_{Ed}	1215 kN	1847 kN	1707 kN
4	ε_x	0,00084	0,0013	0,0012
5	ε_1	0,0037	0,0046	0,0044
6	k_ε	0,65	0,65	0,65
7	η_{fc}	1	1	1
8	k_c	0,65	0,65	0,65
9	$V_{Rd,max}$	5363 kN	5363 kN	5363 kN
10	k_v	0,137	0,089	0,0937
11	V_{Rdc}	413 kN	268 kN	282 kN
12	V_{Rds}	1438 kN	1438 kN	1438 kN
13	V_{Rd}	1851 kN	1705 kN	1720 kN
14	q_{Ed} (Ergebnis)	228 kN/m	211 kN/m	212 kN/m

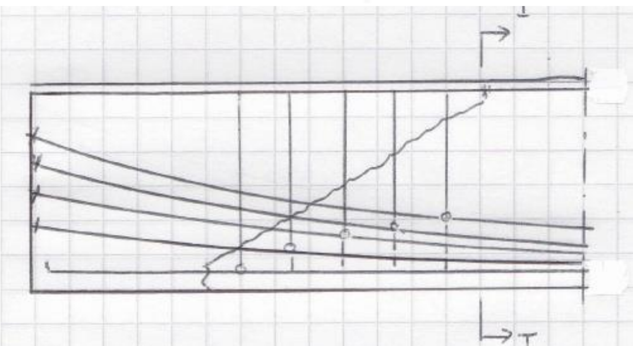
Shear capacity of old bridge with sloped prestressing tendons in combination with reinforcing steel



Question 1

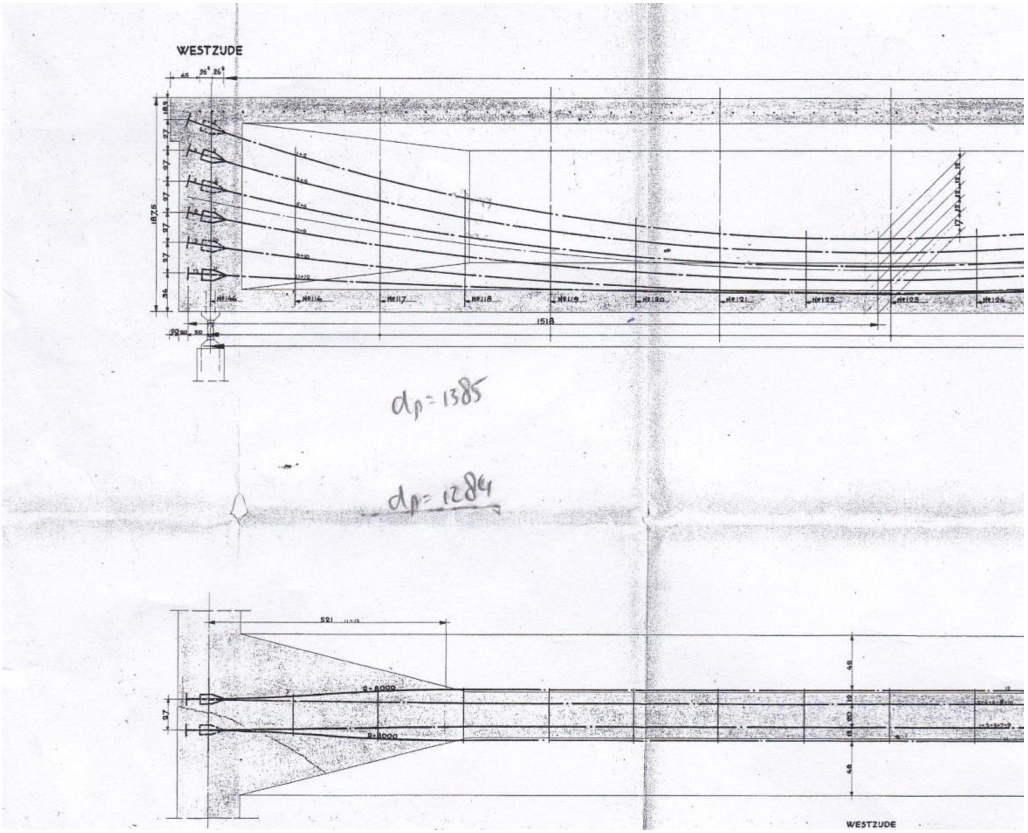
- Effective depth of truss?
- How many stirrups can be mobilized for shear





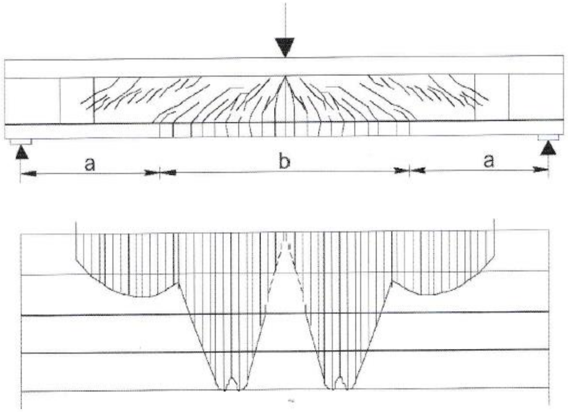
Equilibrium considerations

Shear capacity of old bridge with sloped prestressing tendons in combination with reinforcing steel



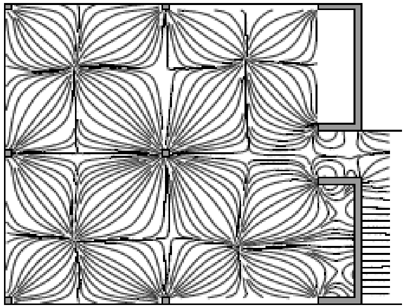
Question 2

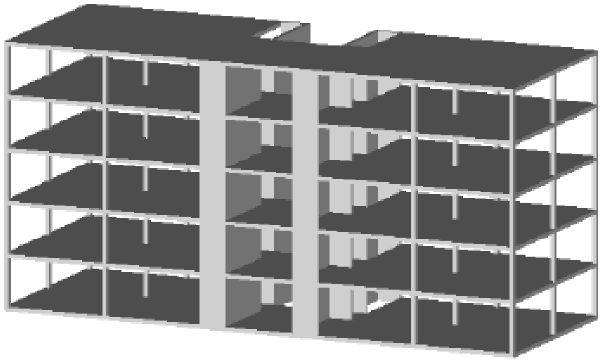
Shear capacity of members with uncracked flanges



Calculation of shear resistance with MC 2010 Cl. 7.3.3.2

Punching shear capacity





Punching of flat slabs: Design example

Stefan Lips, Aurelio Muttoni, Miguel Fernández Ruiz
Ecole Polytechnique Fédérale de Lausanne, Switzerland,
18.07.2011

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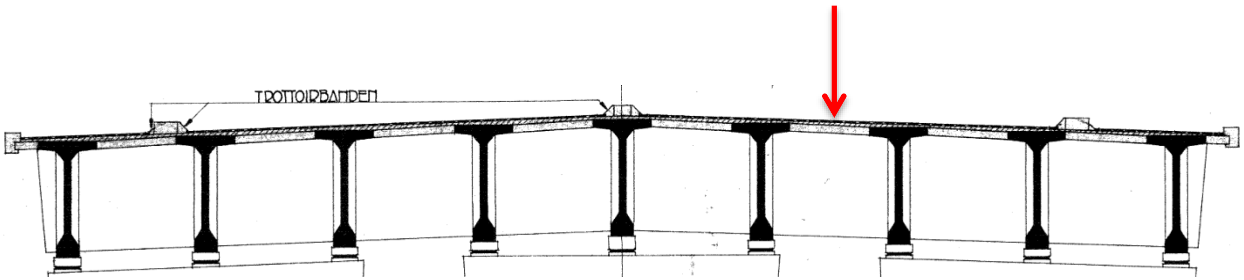
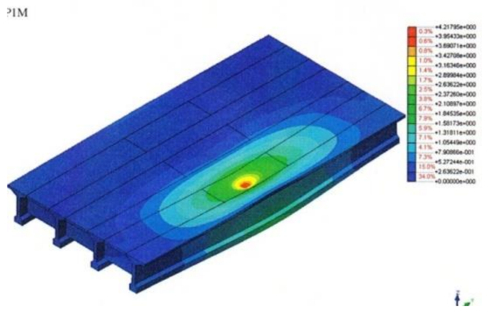
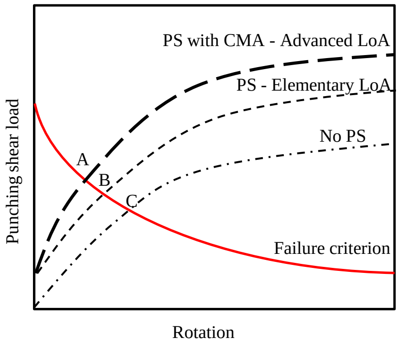
Punching shear in thin bridge decks including compressive membrane action



Using the principles of design for punching shear in Cl. 7.3.5.4
- Using NLFEM
- Using FLFEM with the CSCT - Method





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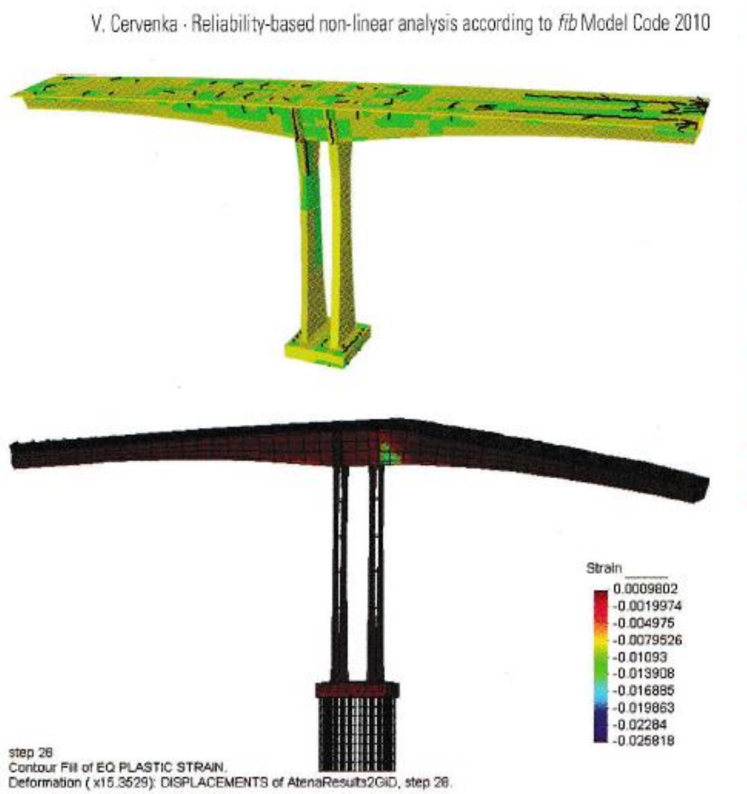
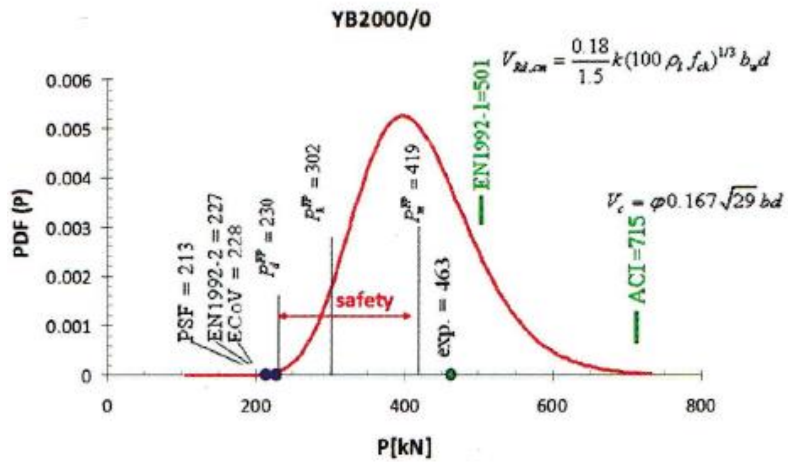
NLFEM analysis

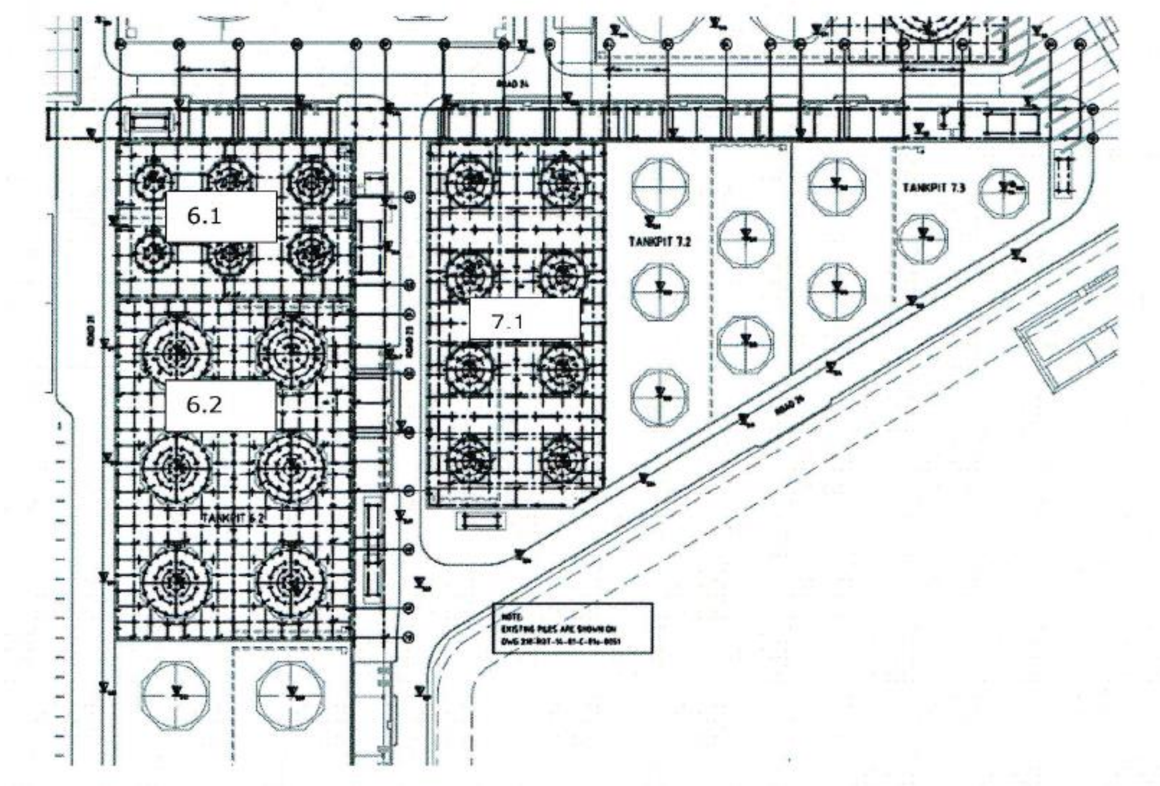
Illustration of level I, II, III approximation for specific case



Analysis of bridge over river Berounka



Design of a fiber reinforced concrete floor slab based on piles



The floor supports a number of containment vessels for chemical fluids. It functions as a safety barrier for the case that one of the vessels fails. The fluid is catched by the tub-floor in order to protect the environment.
The fiber reinforced floor is designed for tightness ($w \leq 0{,}15mm$) and for punching shear resistance)

Task Group on Worked Examples for fib MC 2010

- Members
- Inventarisation of practical applications which are available already
- Examples of applications to be worked out
- Terms of Reference to be worked out
- Time schedule
- Way of publication (Bulletin or Journal Issue)
- Seminar (Already invitation from Vienna)