
ANNEX A

Flexural Test Data

FLEXURAL TEST DATA

A.1. Experimental Details

Three point bending (3PB) tests were carried out using 150×150×600 mm notched prismatic beams. The tests configuration can be seen in Figure A.1, the setup is similar to that proposed by RILEM (2000a) recommendations; the only difference is that a 450 mm span was used instead of 500 mm. The test was controlled by means of the crack mouth opening displacement (CMOD) through a clip gage extensometer (± 2.5 mm span and 10 mm gauge length) and the deflection measured by an LVDT mounted on a rigid frame (Figure A.1).

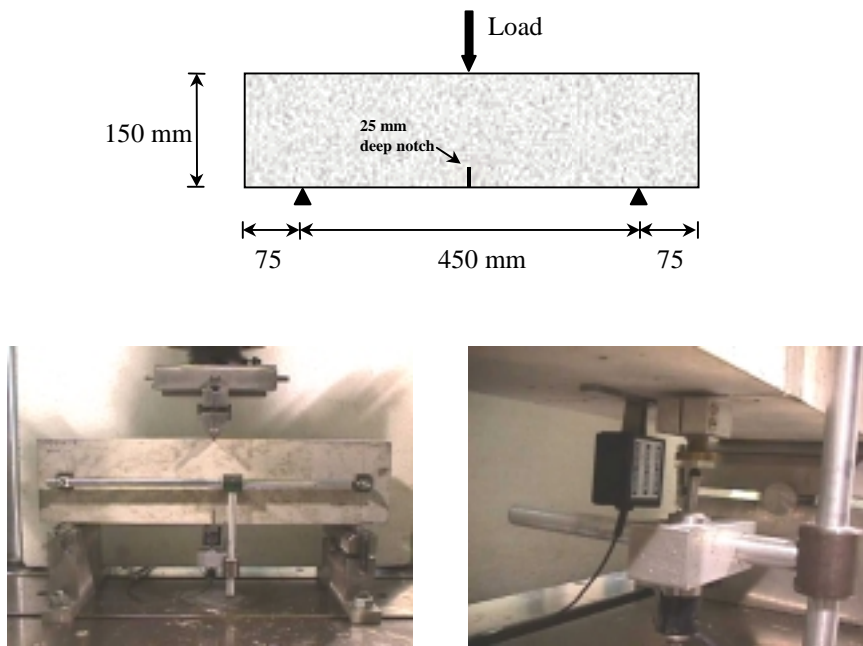


Figure A.1. Three point bending test configuration

The notation used in the study is presented in Table A.1 and is in accordance with the following designation:

N1, N2 = Mix notations

3PB-P = Three point bending test on a plain concrete 150×150×600 mm beam with a 25 mm deep notch.

3PB-20= Three point bending test on a 150×150×600 mm SFRC beam with a 25 mm deep notch. The concrete had 20 kg/m³ of steel fibres.

3PB-40= Three point bending test on a 150×150×600 mm SFRC beam with a 25 mm deep notch. The concrete had 40 kg/m³ of steel fibres.

The last number in the specimen notation denotes the trial.

Table A.1. Specimen notation for 3PB tests

Test series	Fibre dosage (kg/m ³)	Specimen notation
N1 (NSC)	0	N1-3PB-P 1~3
	20	N1-3PB -20 1~3
	40	N1-3PB -40 1~3
N2 (HSC)	0	N2-3PB -P 1~3
	20	N2-3PB -20 1~3
	40	N2-3PB -40 1~3

A.2. Test Results

In total, 18 beams were tested under three point bending. All tests were stable along the entire pre- and post-peak response. A typical state of the crack after the test can be seen in Figure A.2 for the 150 case of a HSC beam with 20 kg/m³ of steel fibres.

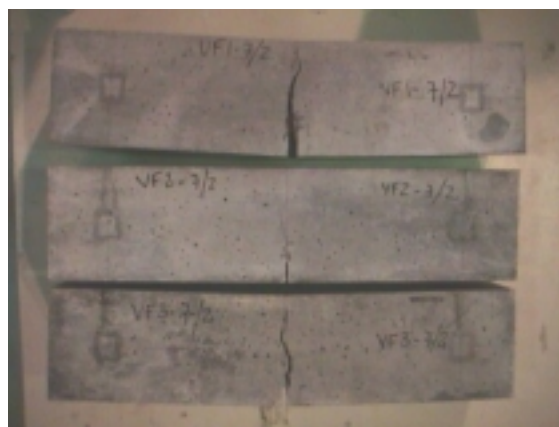


Figure A.2. Crack pattern observed in the 3PB tests

Annex A

The following figures present the load-deflection and load-CMOD responses for all the specimens tested. The responses are plotted up to 3000 μm and the inset presents the initial response up to 250 μm . For each specimen, the relation between deflection and CMOD is also plotted. Tables summarise the mean values of the parameters calculated from the flexure test. The limit of proportionality, $f_{ct,fl}$, is obtained as:

$$f_{ct,fl} = \frac{3.F_u.L}{2.b.h_{sp}^2}$$

where F_u = load at the limit of proportionality

L = span of the specimen

b = width of the specimen

h_{sp} = net height

The crack mouth opening displacement at the limit of proportionality has been denoted as $\text{CMOD}_{\text{peak}}$.

NSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 1.

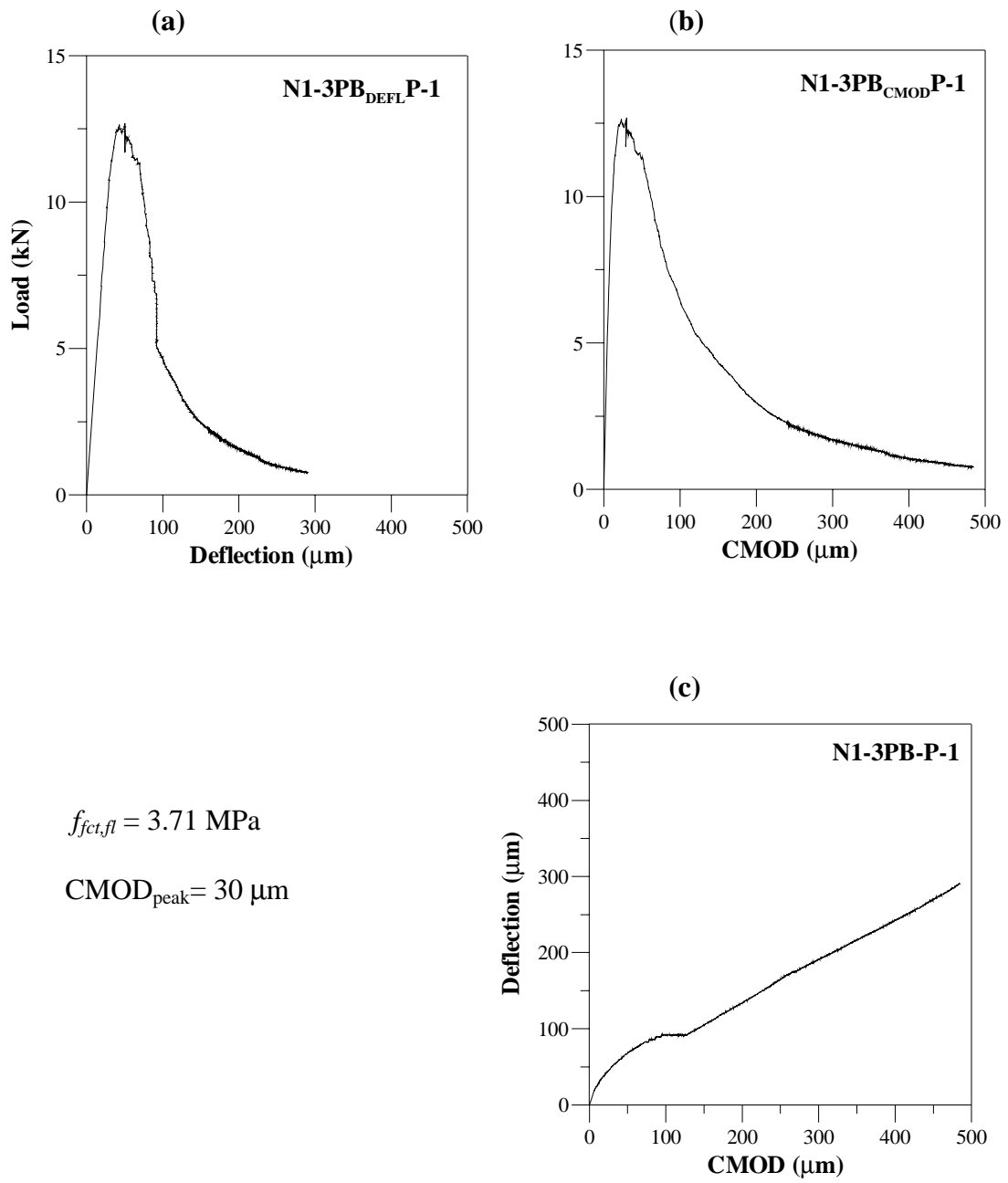


Figure A.3. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 2.

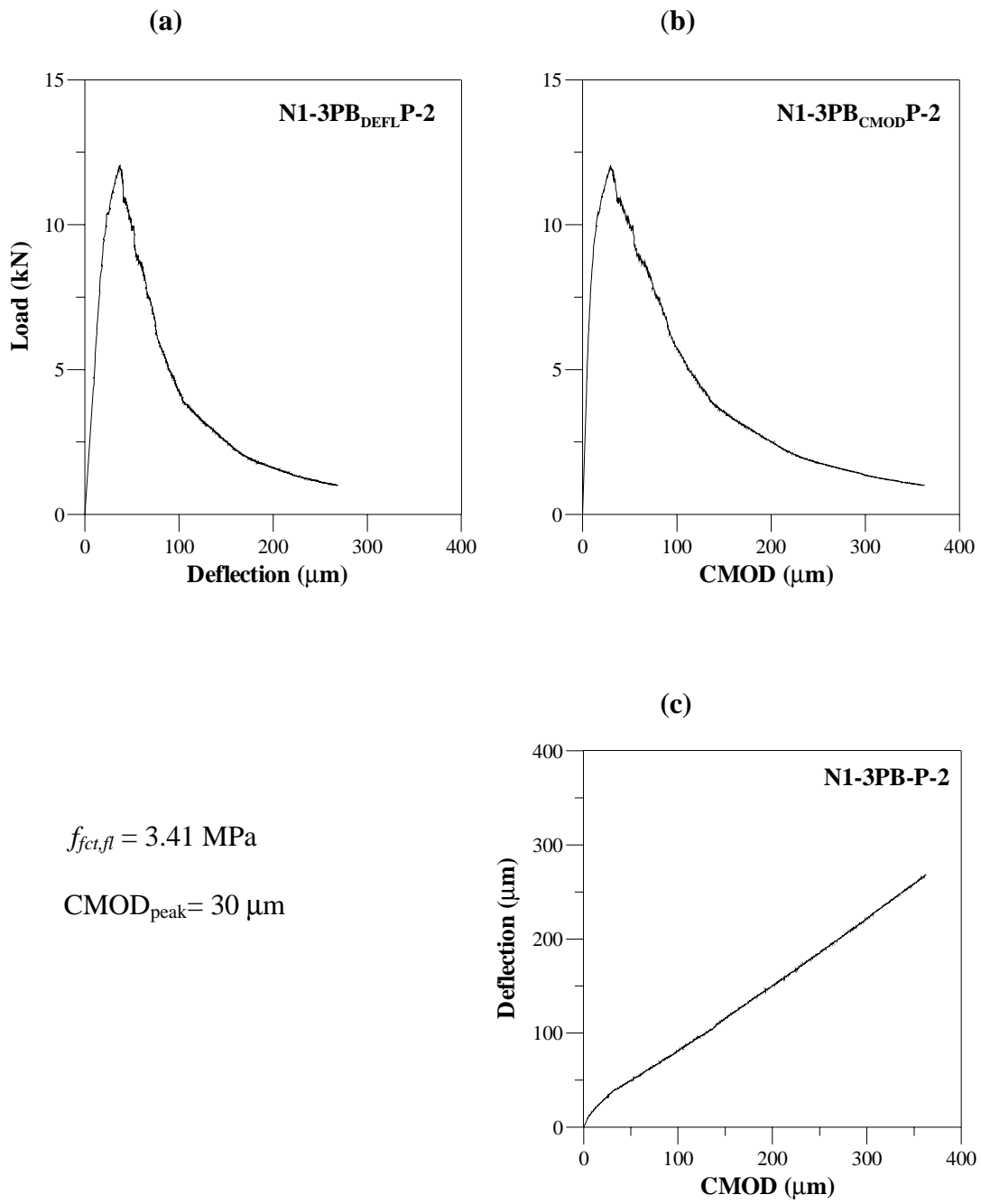


Figure A.4. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 3.

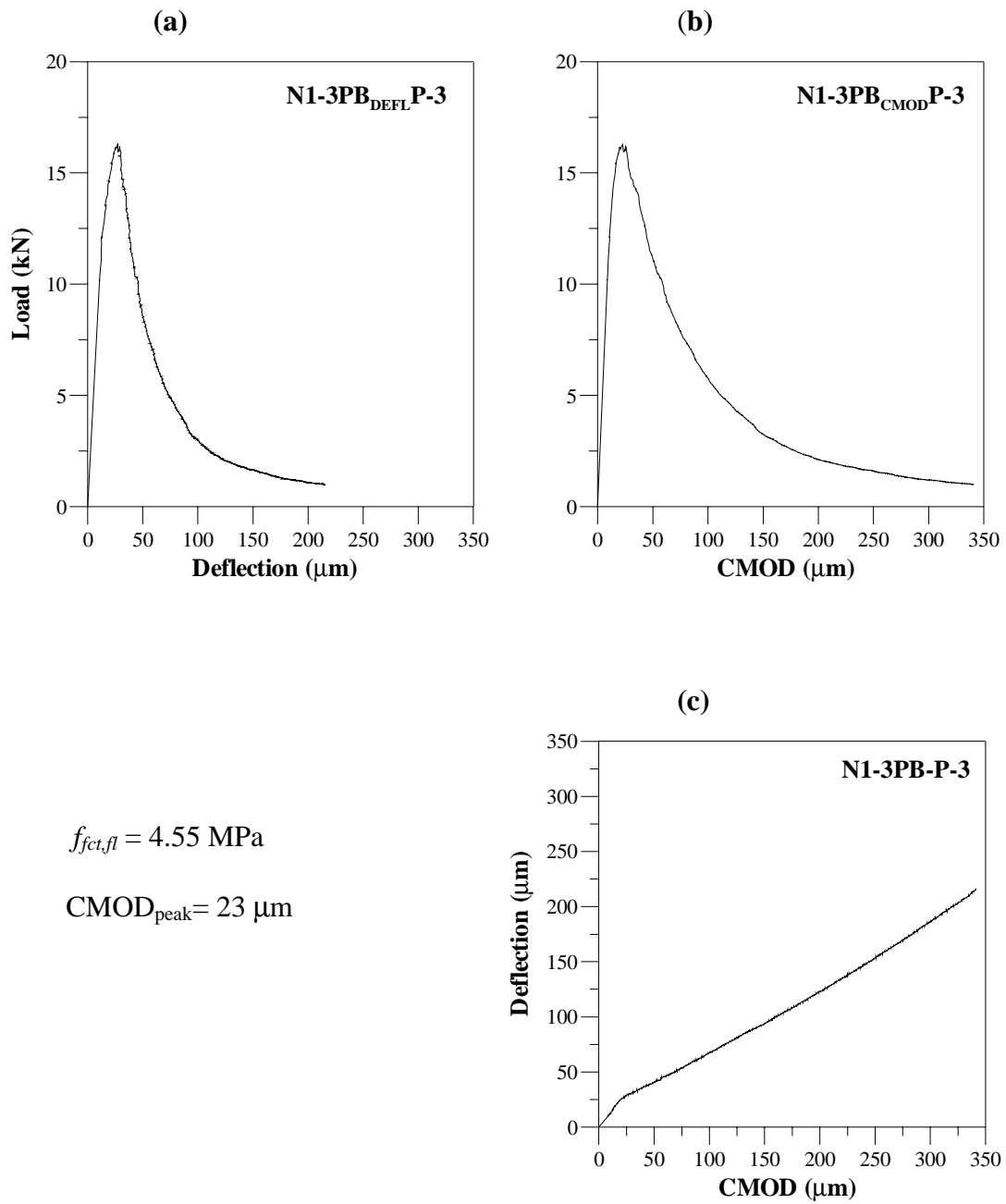


Figure A.5. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 1.

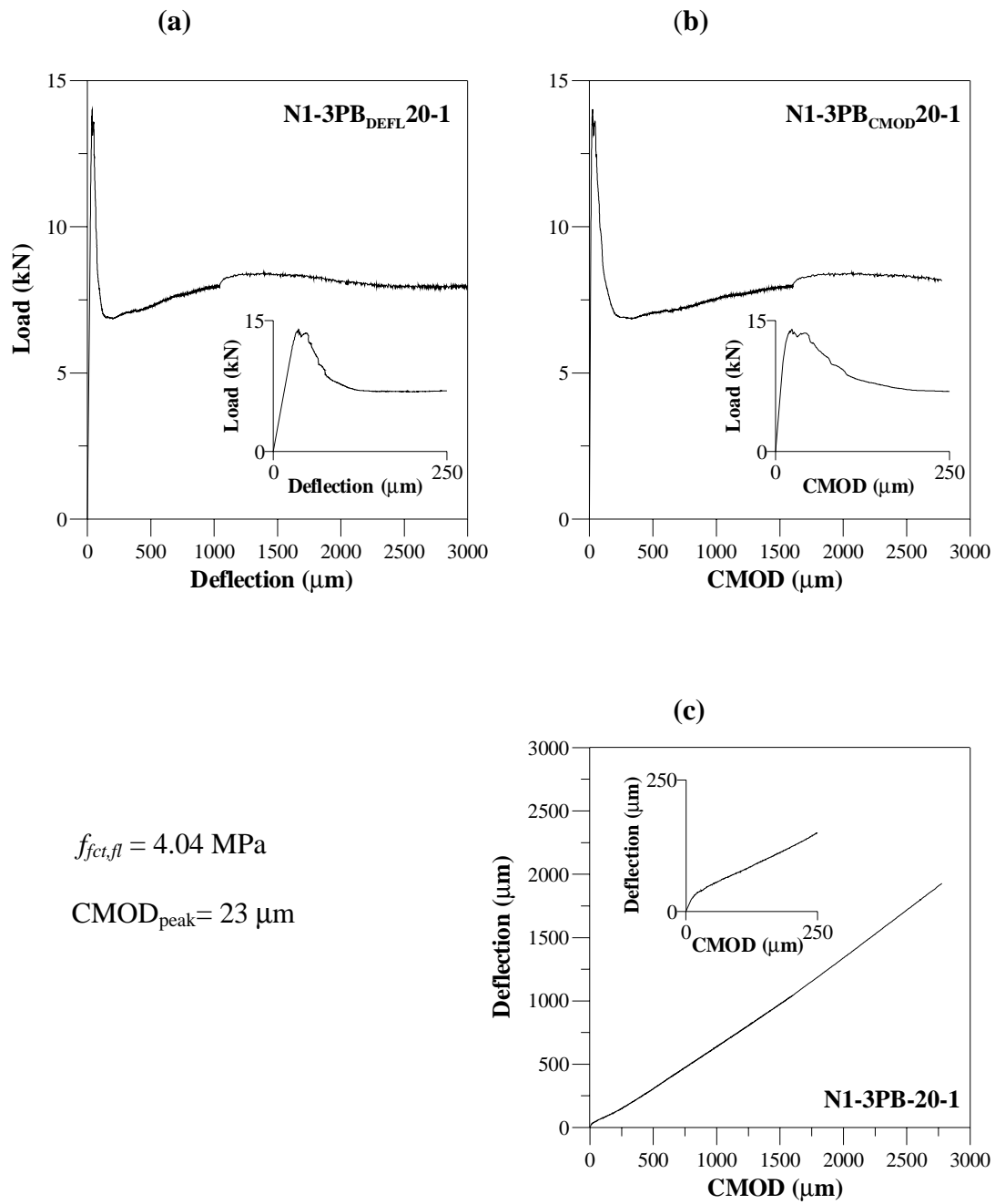


Figure A.6. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 2.

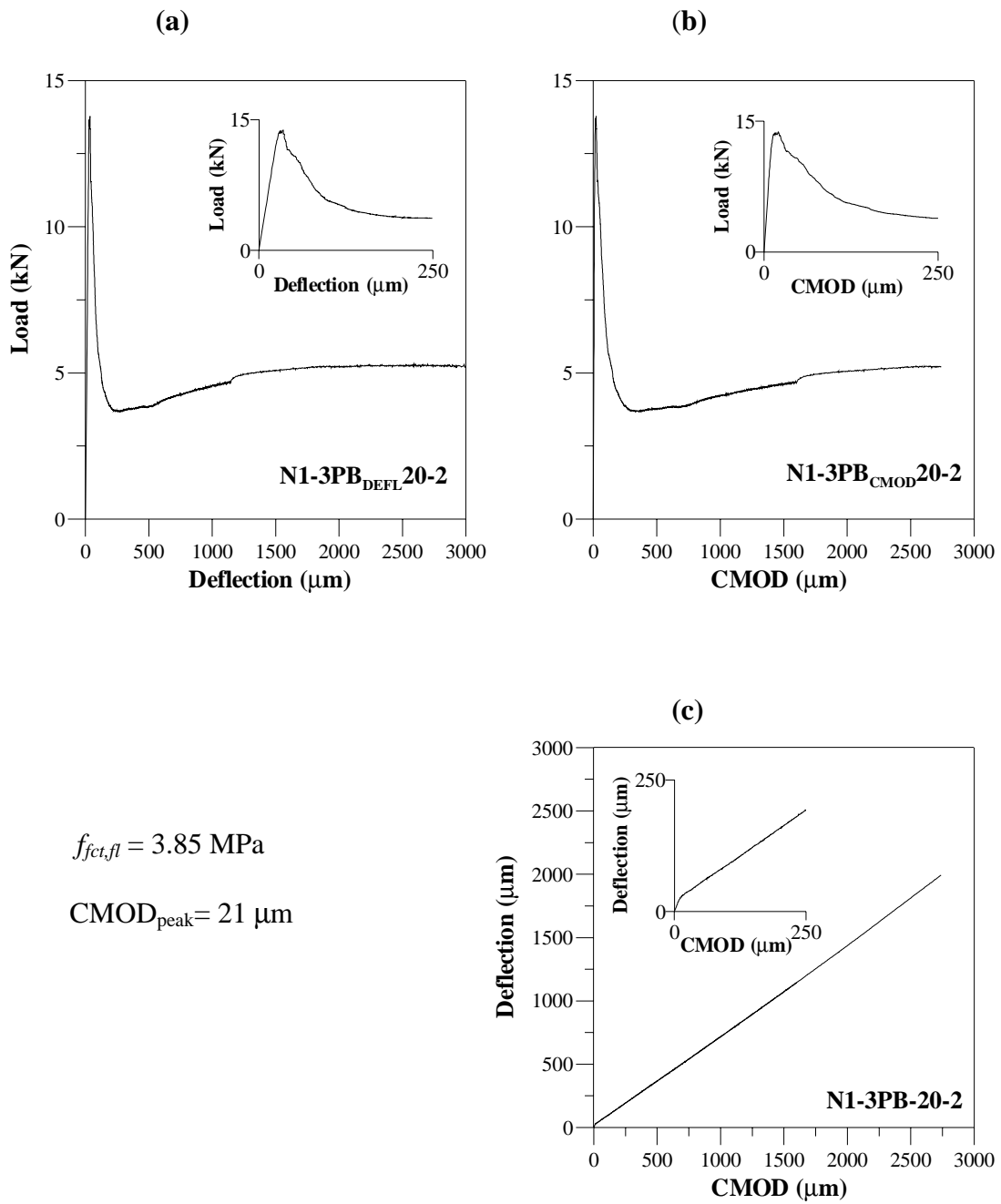


Figure A.7. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 3.

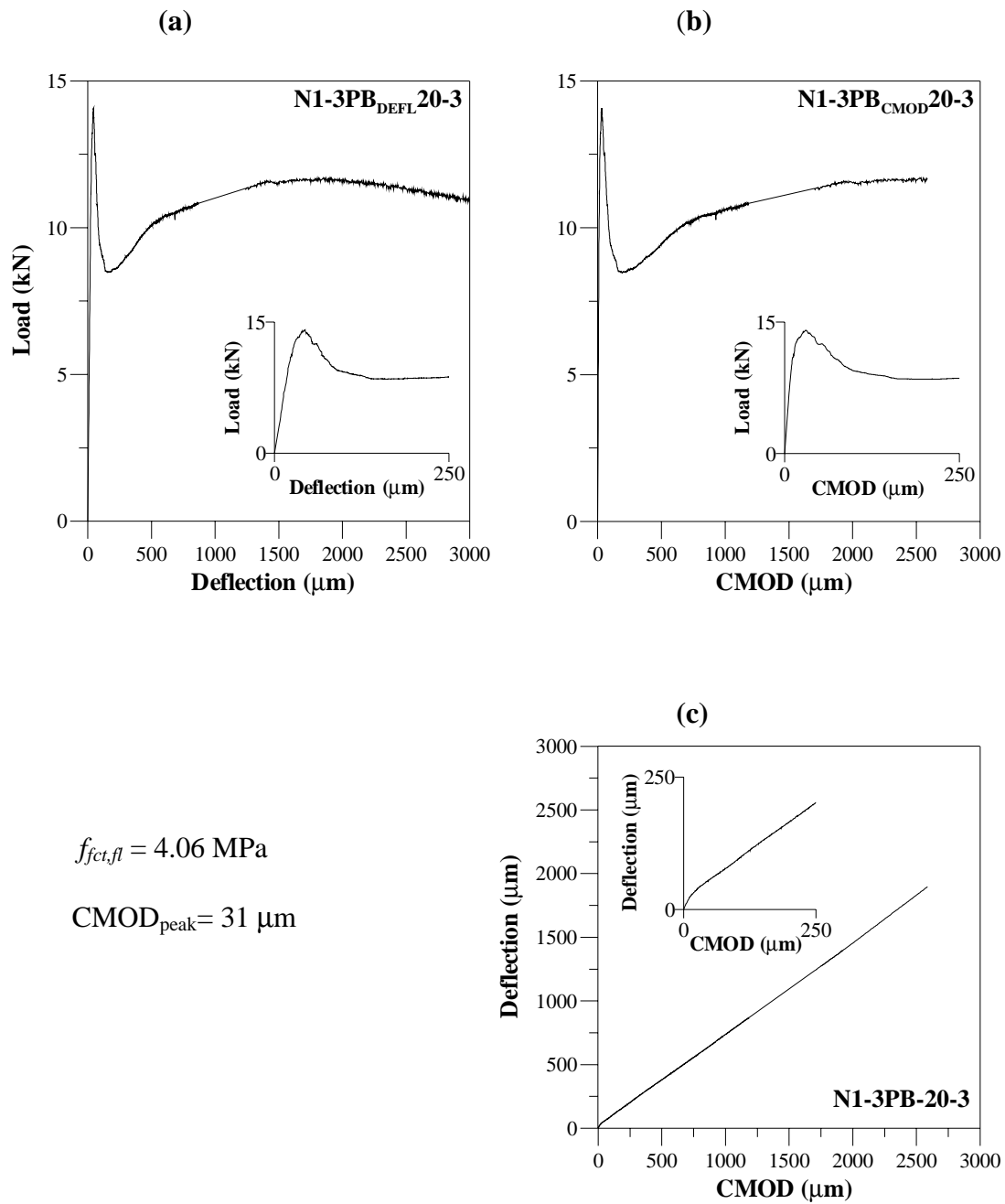


Figure A.8. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, 40 kg/m³ OF STEEL FIBERS. SPECIMEN 1.

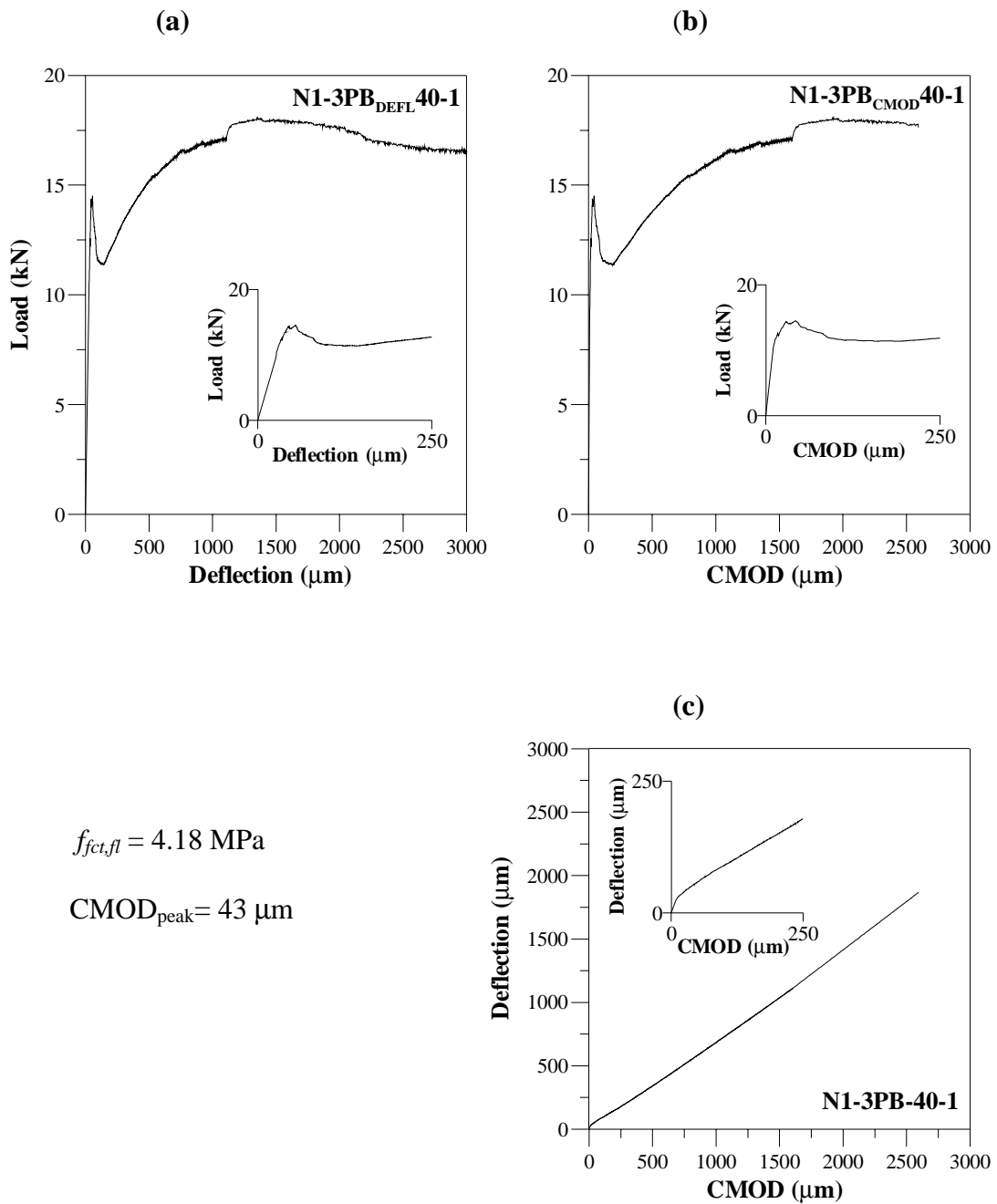


Figure A.9. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

NSC, 3PB TEST, 40 kg/m³ OF STEEL FIBERS. SPECIMEN 2.

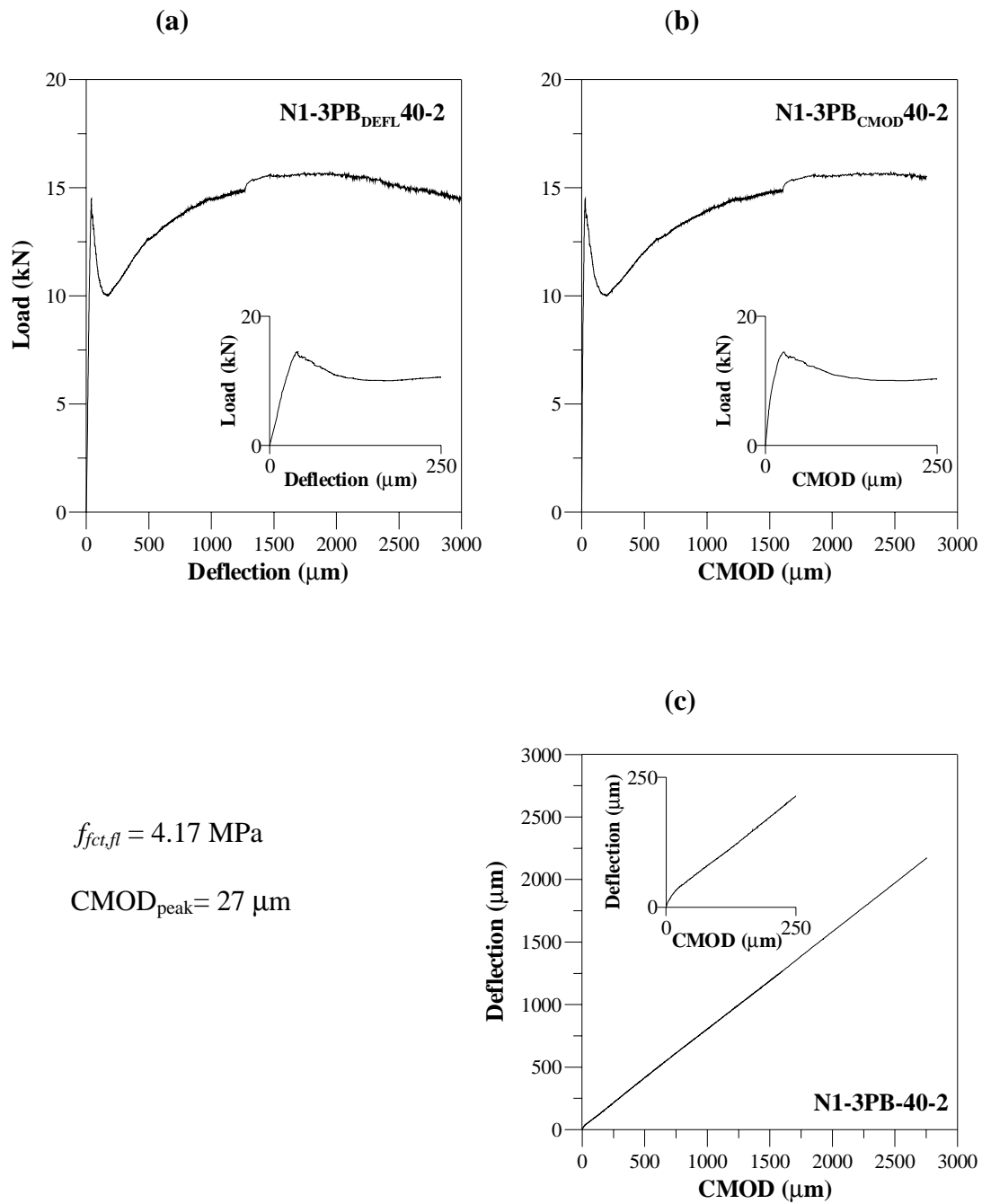


Figure A.10. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 1.

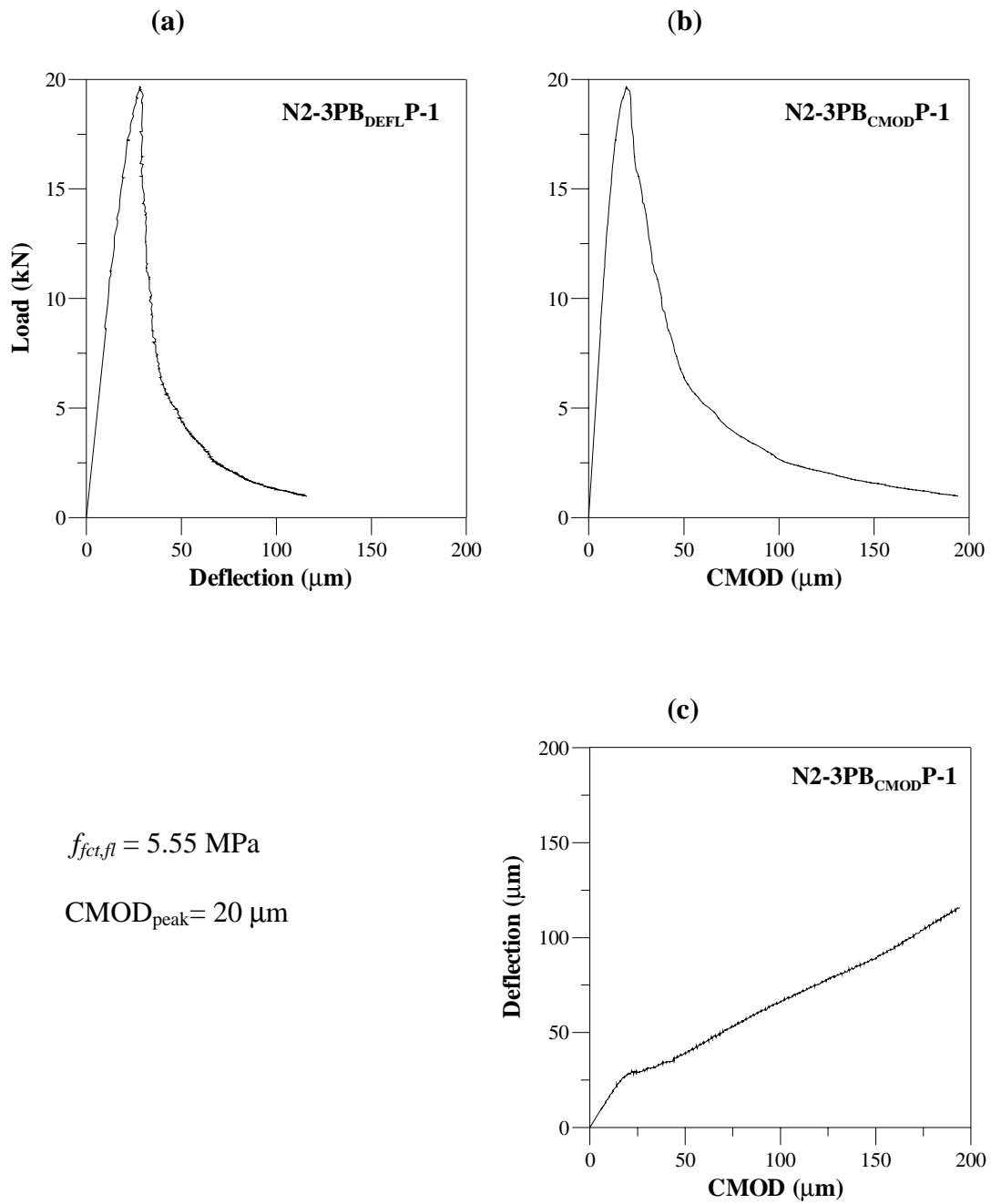


Figure A.11. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 2.

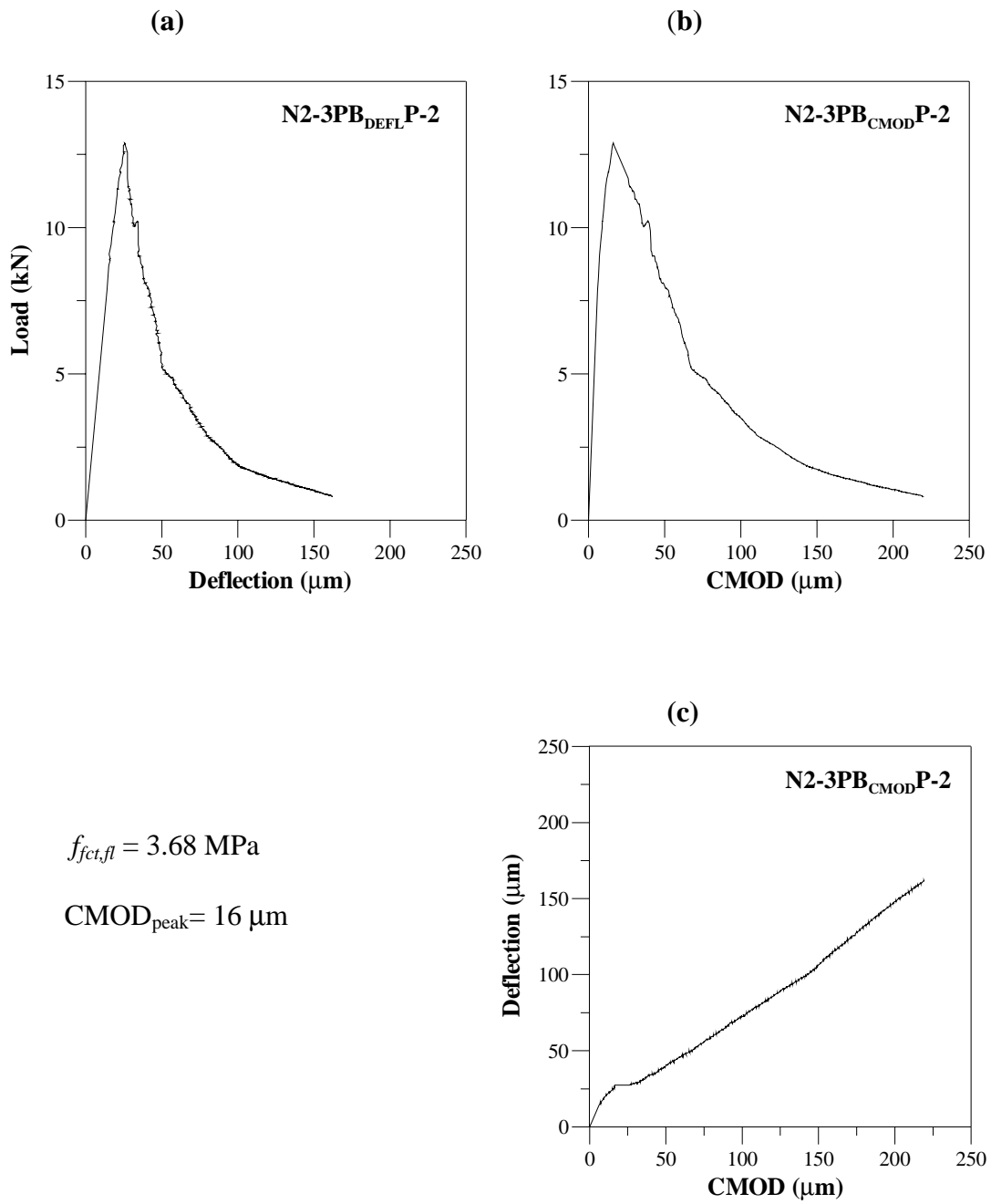


Figure A.12. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, PLAIN CONCRETE. SPECIMEN 3.

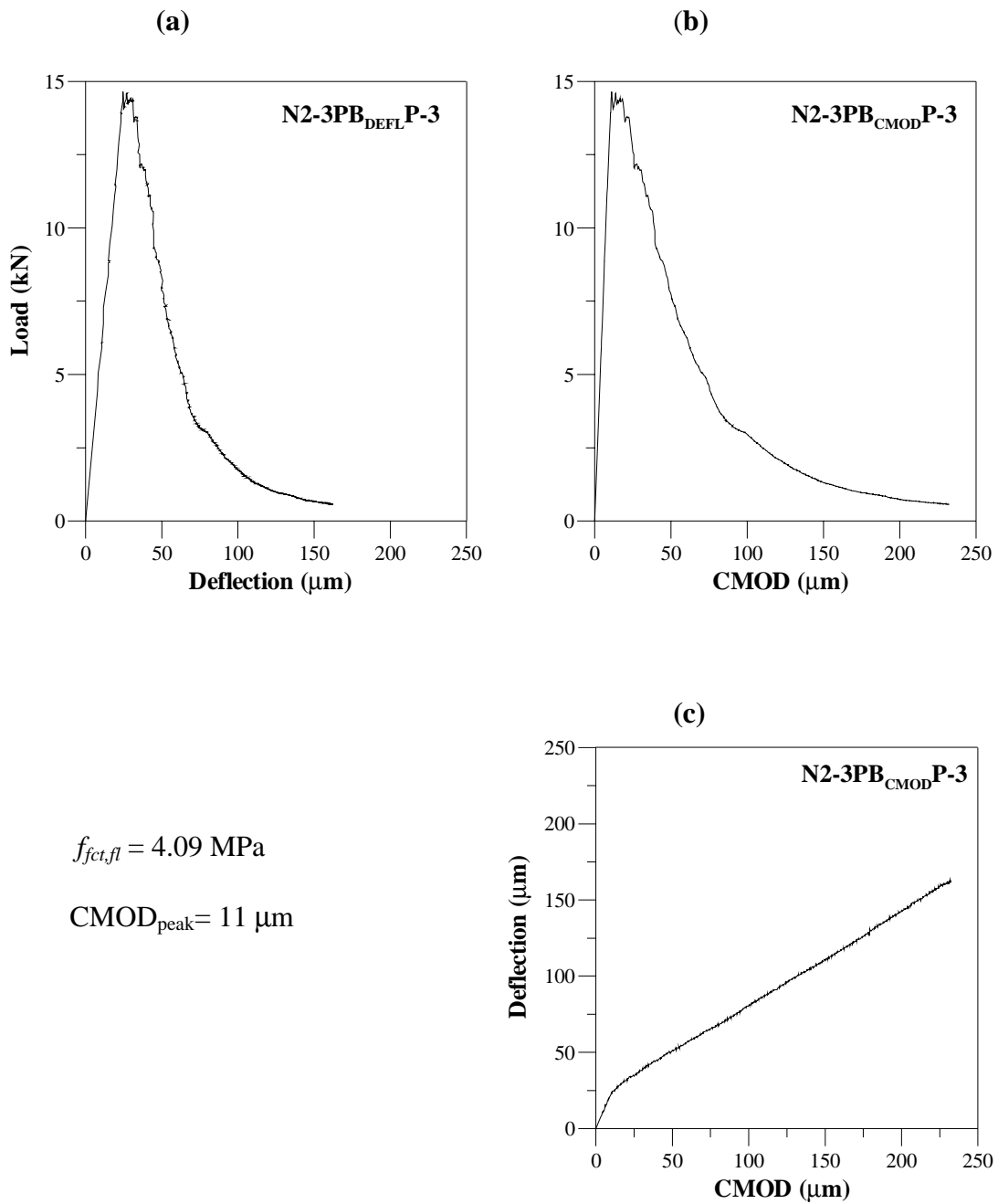


Figure A.13. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 1.

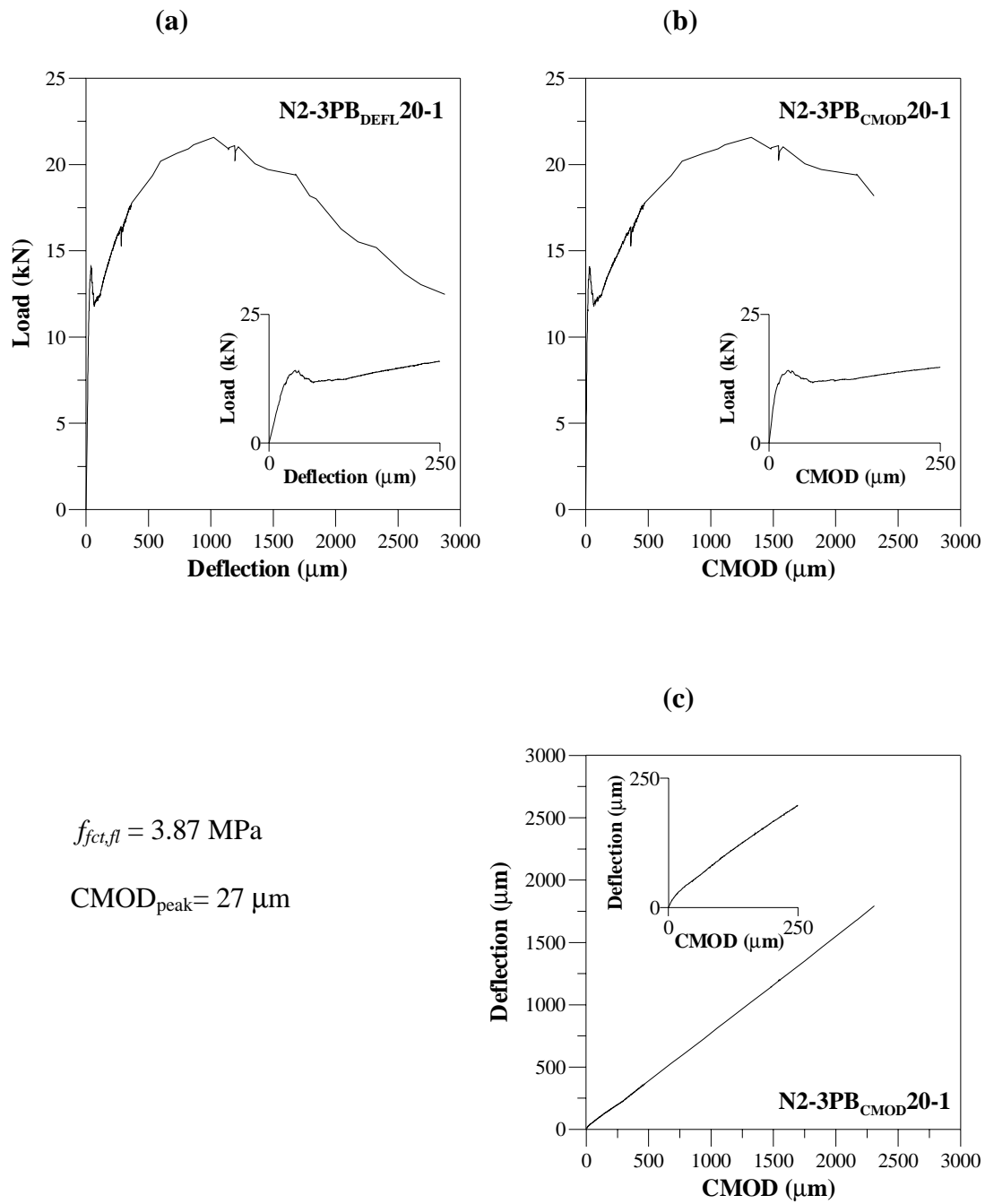


Figure A.14. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

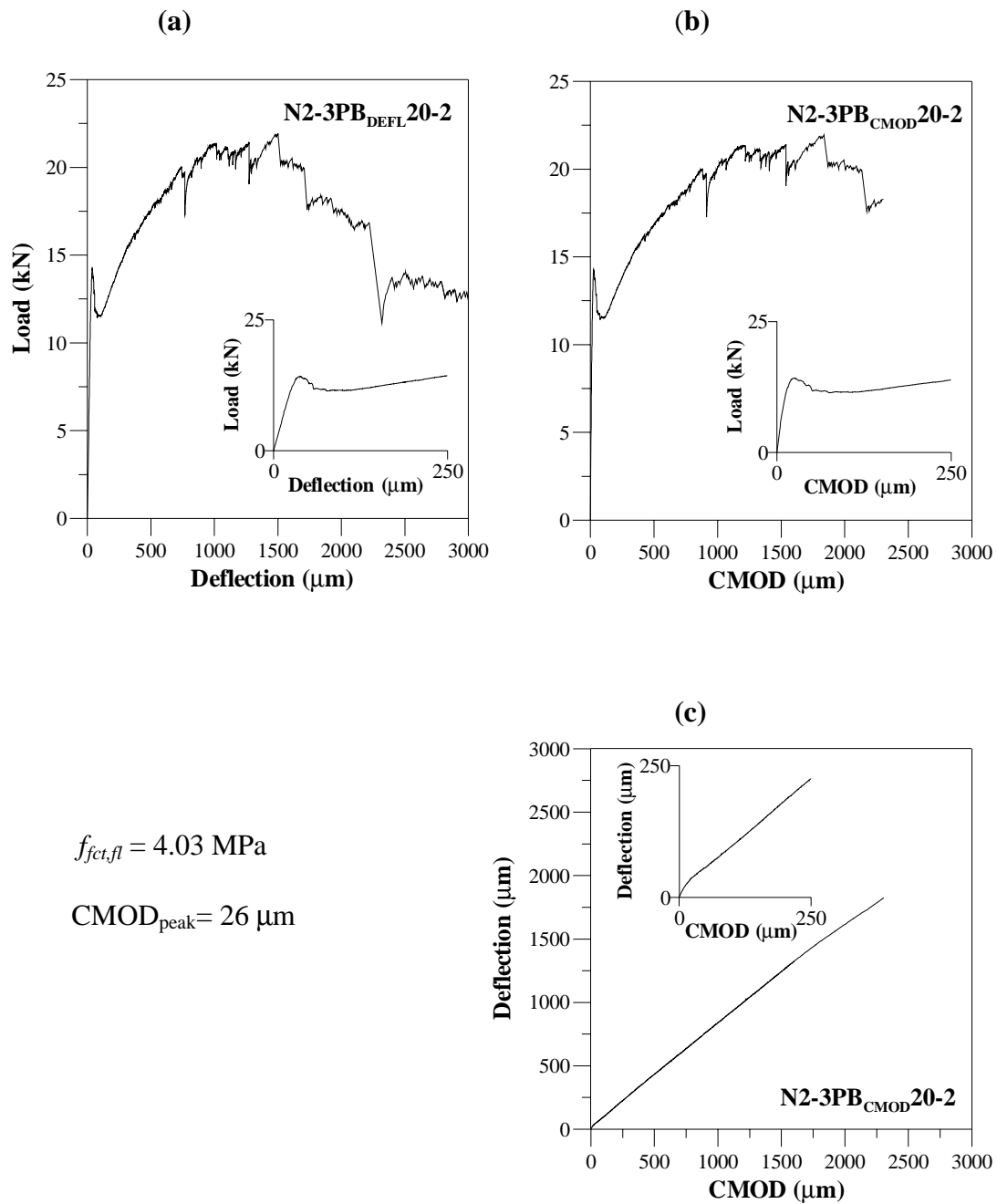
HSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 2.

Figure A.15. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, 20 kg/m³ OF STEEL FIBERS. SPECIMEN 3.

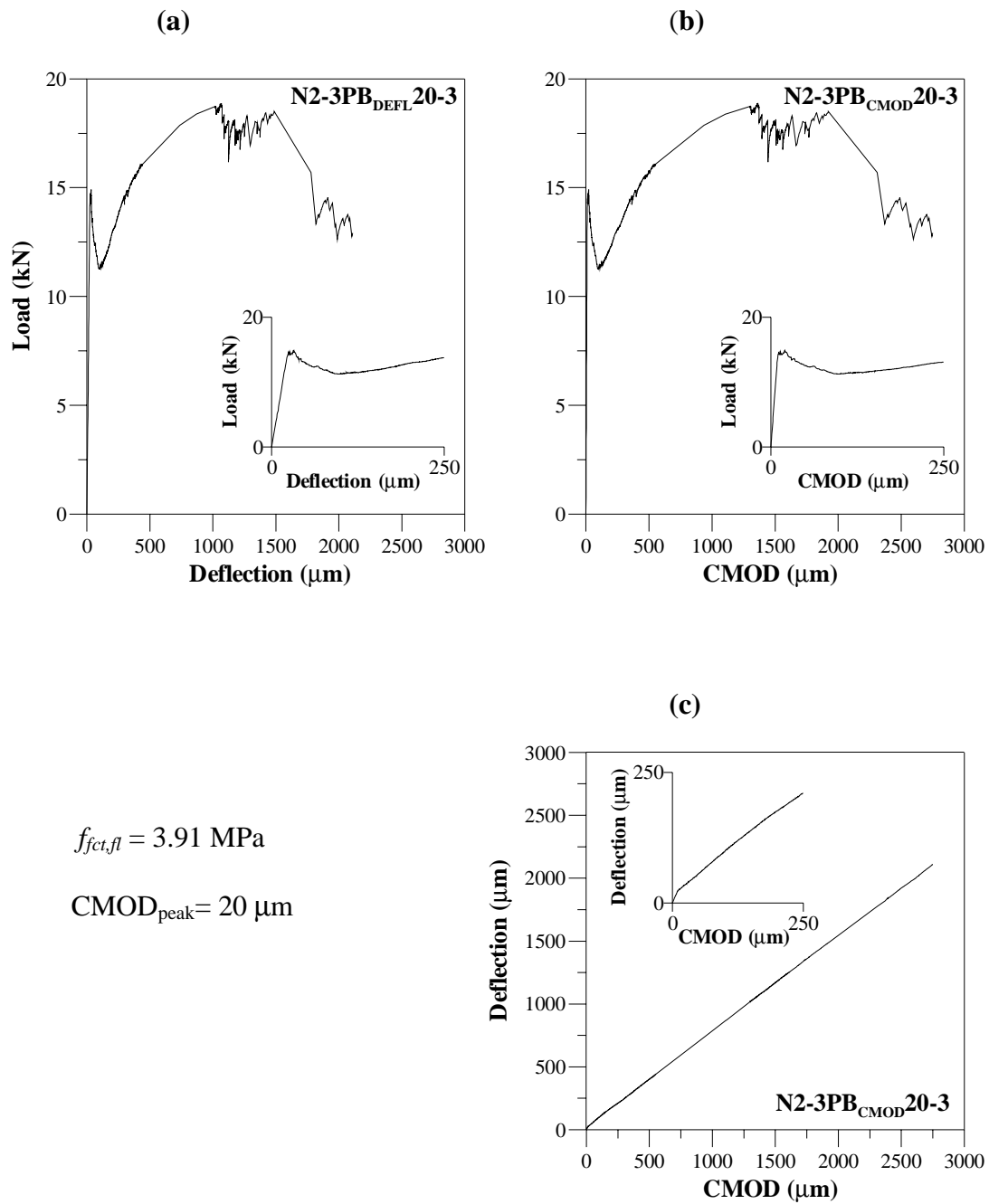


Figure A.16. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, 40 kg/m³ OF STEEL FIBERS. SPECIMEN 1.

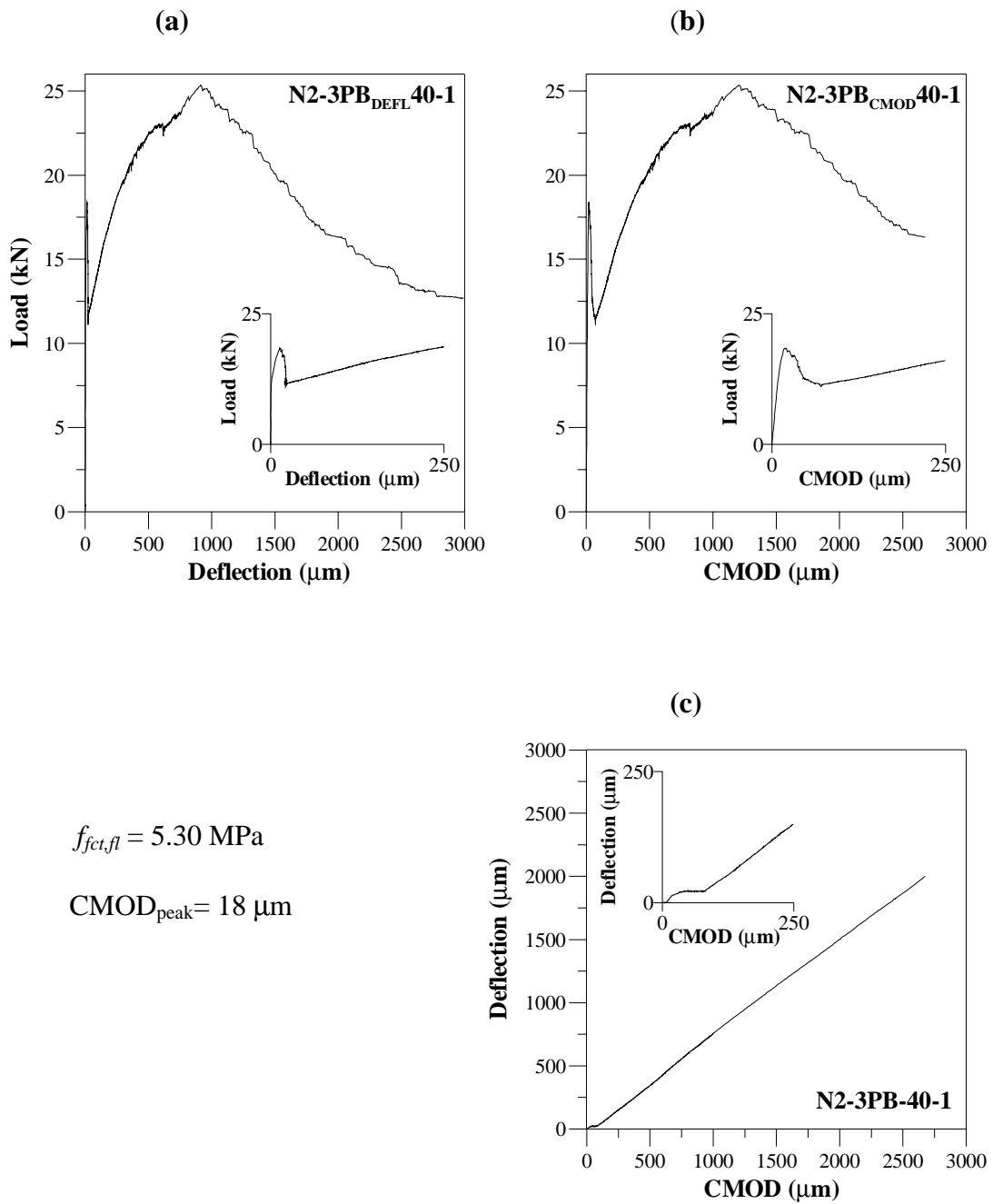


Figure A.17. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, 40 kg/m³ OF STEEL FIBERS. SPECIMEN 2.

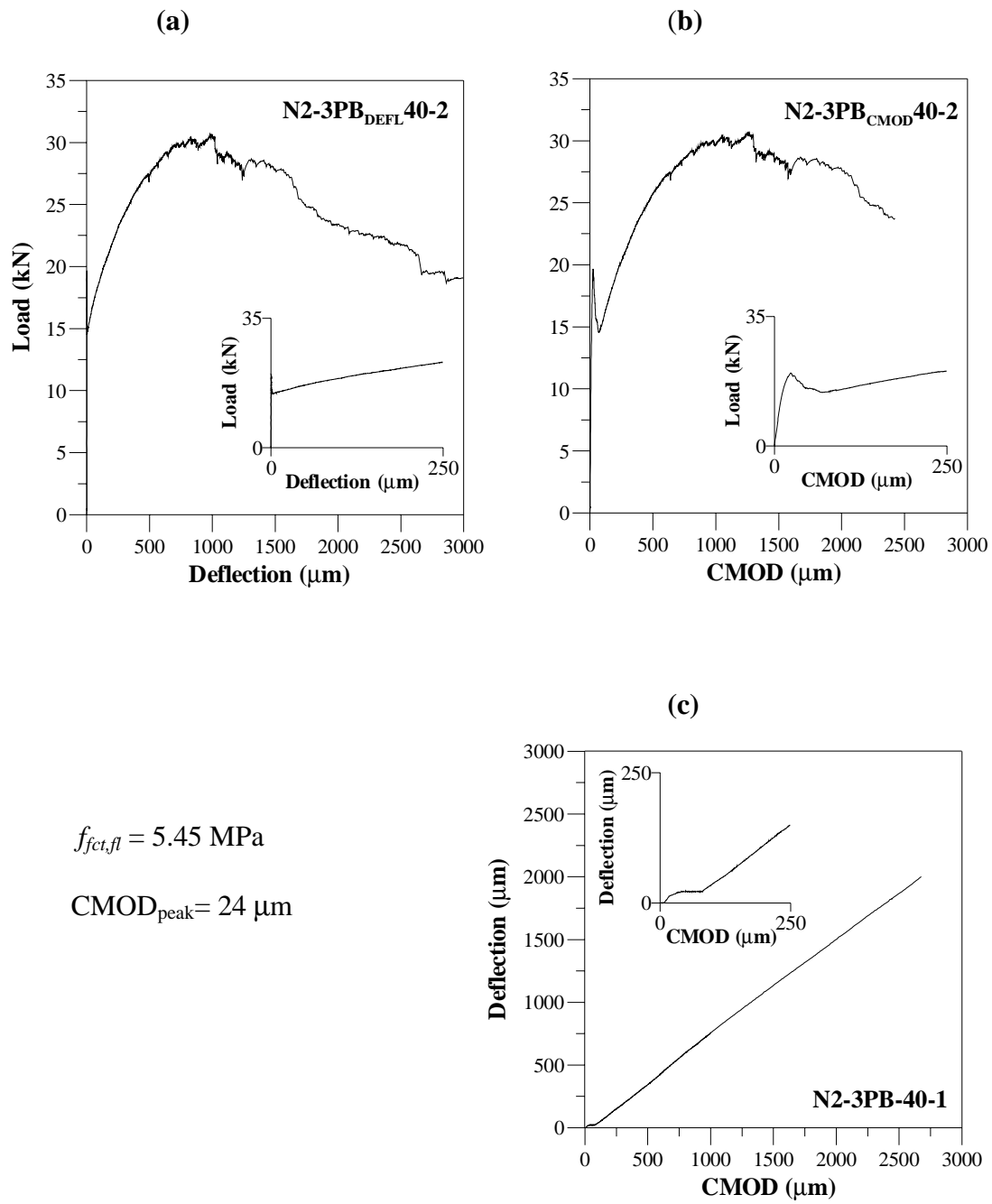


Figure A.18. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves

HSC, 3PB TEST, 40 kg/m³ OF STEEL FIBERS. SPECIMEN 3.

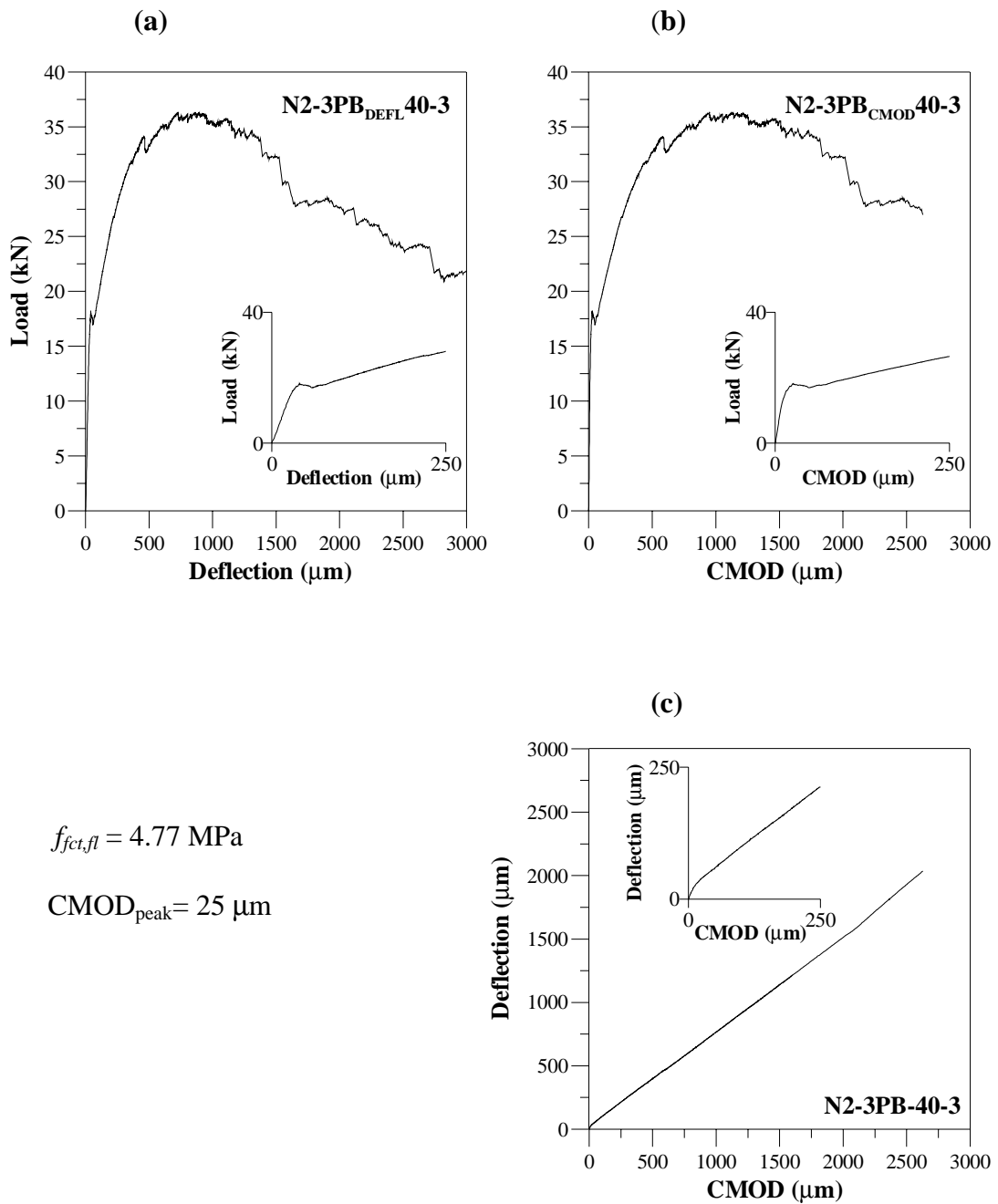


Figure A.19. (a) Load-deflection, (b) load-CMOD responses and (c) deflection-CMOD curves