

Invited Paper

## Calibration of the CDP model parameters in Abaqus

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### ABSTRACT

The modeling of reinforced concrete structures can be performed using Abaqus software. Authors of this paper decided to use of the concrete damaged plasticity model (CDP) which is implemented in this program. Some parameters of CDP are decisive to obtain proper and realistic results. These parameters are: the viscosity parameter, the dilation angle in p-q plane, the flow potential eccentricity, the ratio of initial biaxial compressive yield stress to initial uniaxial compressive yield stress. Another open issue is a definition of a proper fracture energy of concrete

Authors of this paper perform numerical simulations concerning uniaxial and biaxial compression and uniaxial tension of a sample concrete specimen. The results are compared with experimental tests. After this comparison all mentioned above parameters are determined in a rational way.

### 1. INTRODUCTION

Authors of the paper have recently examined reinforced concrete corners under opening bending moment in Abaqus (Szczecina and Winnicki 2014, 2015) using CDP model. They have noticed that gained results strongly depend on a choice of some CDP parameters, especially on the dilation angle and the viscosity parameter. Hence arose the need to perform a calibration of these parameters. Some sample results of authors' research are presented in the Figures 1 and 2. The first figure presents a relation between a displacement of a node of the corner and a load parameter. The second one shows a map of equivalent plastic strains in tension (PEEQT) for analyzed corner.

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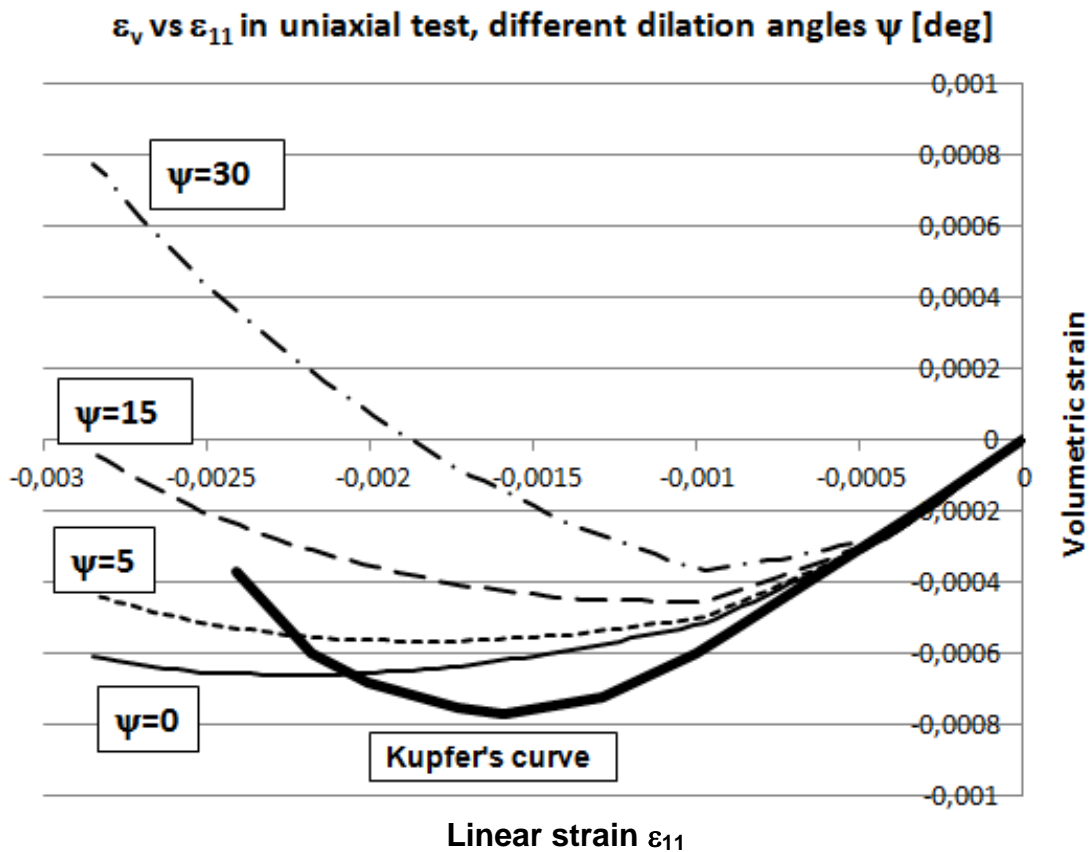


Fig. 14. Volumetric strain in uniaxial compression test

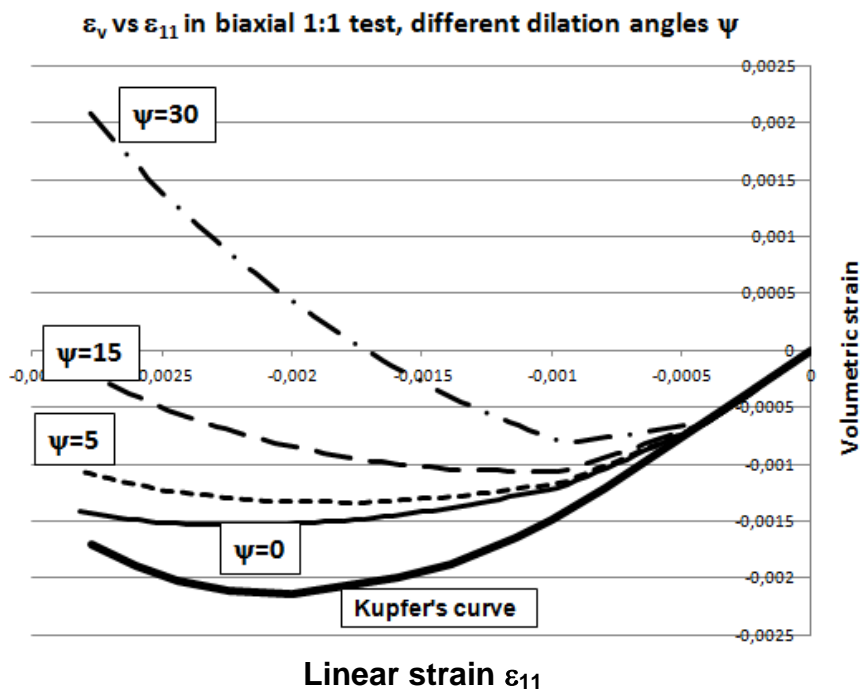


Fig. 15. Volumetric strain in biaxial 1:1 compression test

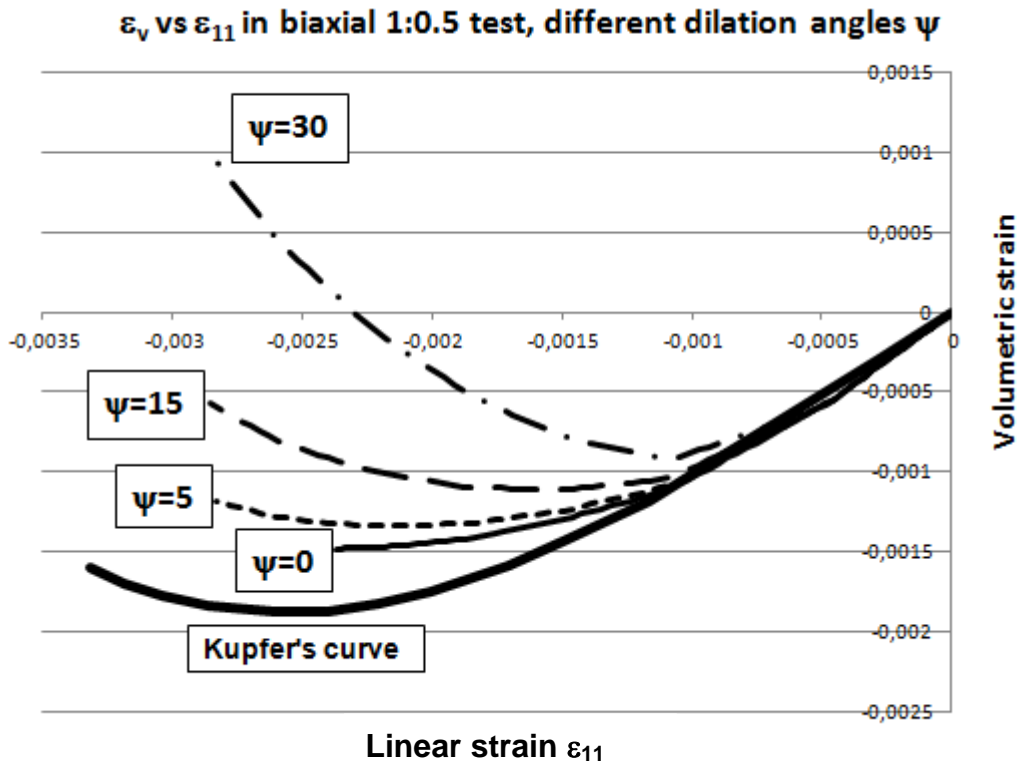


Fig. 16. Volumetric strain in biaxial 1:0.5 compression test

## 5. CONCLUSIONS

The presented results of numerical tests show that a proper choice of CDP model parameters should be done very carefully, possibly examining the assumed values performing numerical tests at the material point level compared with the available experimental results. This stage of modeling of reinforced concrete structures seems to be the most important and crucial for obtaining realistic results. Authors of the paper recommend the following values of parameters:

- viscosity parameter as 0.0001,
- dilation angle 5 degrees.

When applying higher values of viscosity parameter it is almost sure that the damage zone spreads to many finite elements leading to diffuse pattern of cracking and limiting crack propagation, whereas the higher values of dilation angle may lead to positive volumetric strains in compression zone causing artificial increase of bearing capacity in the case of confinement.

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