

---

## BOOK REVIEW

---

### **Fracture Mechanics of Concrete: Applications of Fracture Mechanics to Concrete, Rock, and Other Quasi-Brittle Materials**

*Reviewed by W. L. Fourney, University of Maryland, 1137 Engineering Classroom Bldg., College Park, MD 20742.*

**REFERENCE:** Shah, S., Swartz, S. E., and Qiyang, C., *Fracture Mechanics of Concrete: Applications of Fracture Mechanics to Concrete, Rock, and Other Quasi-Brittle Materials*, John Wiley and Sons, New York, 1995, 552 pages, \$69.95, ISBN 0-471-30311-9.

The purpose of *Fracture Mechanics of Concrete*, is to demonstrate the use of fracture mechanics in describing structural behavior leading to failure of quasi-brittle materials. It is intended as a textbook for a graduate course in civil engineering, engineering mechanics, or allied disciplines. It could be used as a supplementary text for courses in advanced concrete theory and as a reference text for the practicing engineer. It draws upon the research finding of the authors and others over the last two decades in the applications of fracture mechanics as applied to cracking, damage, and fracture of plain and reinforced concrete structures and rock masses.

The book contains 12 chapters. The first eight are devoted to fundamentals of fracture mechanics as applied to concrete and rock. The last four cover applications of these fundamentals to

cases of interest. The chapters and topics covered are: 1. Failure of Structures; 2. Principles of Linear Elastic Fracture Mechanics; 3. Principles of Nonlinear Fracture Mechanics; 4. Structure and Fracture Process of Concrete; 5. Nonlinear Fracture Mechanics for Mode I Quasi-Brittle Fracture; 6. Test Methods to Determine Mode I Fracture Properties for Concrete and Rock; 7. Fracture Resistance Curves for Quasi-Brittle Materials; 8. Fracture Mechanics for Other Deformation Modes; 9. Applications of Fracture Mechanics to Concrete Structures; 10. Fracture Mechanics and Compressive Failure; 11. Damage Mechanics and Fracture Mechanics; 12. Other Areas in Application of Fracture Mechanics.

The book provides a good description of how fracture mechanics can and should be applied to the failure of concrete and rock and why these materials need to be treated differently than metals in applying these techniques. It does a very good job of comparing models of behavior by different investigators with one another on a point-by-point basis and connects nicely the physics of the mechanism of what is happening within the concrete or rock structure to the empirical laws used to describe the behavior. It is very well illustrated with regard to making this connection. The chapter on test methods is very comprehensive and would be of assistance to those interested in proposed and accepted test methods for concrete and rock. The last four chapters cover topics that are currently being investigated by the research community and should prove to be of value to faculty and students engaged in research activities. The number of problems for assignments and examples within the test is somewhat limited.