

# **SOLUTION MINING RESEARCH INSTITUTE**

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**MEETING  
PAPER**



## **DESIGN PRINCIPLES AND METHODOLOGY APPLIED TO SOLUTION MINED SALT CAVERNS**

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*"Design is to the '90s what finance was to the '80s and marketing to the '70s; it is the corporate buzzword of the new decade, as over 70% of the life cycle of a product or a structure is determined during design."*

**Business Week, Sept. 4, 1990**

## ABSTRACT

This paper discusses the principles of engineering design specifically developed for applications to design and construction of excavations in geologic media. In the field of rock engineering, including excavations in salt, only limited attention has been paid to the design process. Other fields of engineering utilize methodical design processes and principles extensively, such as '*design for manufacturing*' or '*concurrent engineering*' leading to optimization of the design methodology itself. It is believed that design of solution mined salt caverns could be significantly improved if the wealth of data already available on salt properties, design heuristics, rules of thumb, and case history experience could be integrated into a systematic design methodology for caverns in salt, thus maximizing our knowledge base and improving design economy and safety.

Accordingly, the principles of engineering design for excavations in geologic media are described and the methodology of the design process is formulated and termed the Systems Design Methodology (SDM). From problem formulation, through analysis and synthesis, to evaluation and optimization, the SDM design process is seen as the use of design principles within a systematic design methodology, leading to innovative problem solving. The potential of these principles and methodology is demonstrated with respect to design and construction issues involving solution mined salt caverns. Recommendations are made for research needs, feasible for a one-year project, which would enable the Systems Design Methodology for rock engineering to be utilized effectively to meet the specific design issues pertinent to solution mined salt caverns, leading to the improved economy and safety of these structures.