INNOVATIVE SHOTCRETE TECHNOLOGIES FOR DURABLE RAPID UNDERGROUND DEVELOPMENT AND INFRASTRUCTURE REPAIRS EXPOSED TO SEVERE CONDITIONS

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Among the techniques used for ground support in underground applications and infrastructure repairs, shotcrete or sprayed concrete has been used very successfully for many years due to the flexibility, efficiency and robustness offered by the shotcrete process. In parallel, major advancements have been made to improve the mechanical performance, ease of application and durability of shotcrete materials over the past two decades. The advancements in shotcrete materials and processes to be covered in this paper include the durability properties of shotcrete materials used in North America to build and repair concrete structures exposed to severe freeze and thaw cycling and high volumes of aggressive agents such as chloride ions due to the use of de-icing salts. In addition, the paper also covers the mechanical characteristics of ultra-rapid strength gain shotcrete materials using an alternative cement technology for rapid ground support installation and emergency repairs of critical infrastructure. An overview of each shotcrete technology and practice will be provided including a brief state of the art summary, recent research completed on the topic and any applicable case studies to show how the advancement is currently being used in the industry. The intent of this paper is to inspire innovations in underground development and infrastructure repairs through shotcrete by providing the reader with an overview of the latest technologies available to the industry.