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## Gas ground risks and geological investigations for TBM tunneling in Iran

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### ABSTRACT

Natural gases are a potential hazard in construction of underground excavations. Encountering with gases usually result in costly delays. Gases occur in a wide variety of geological conditions, so predict the occurrence of potentially hazardous concentrations of gases needs a good understanding of geological conditions. Understanding gas grounds will enable investigators to assess the risk associated with gas prior to excavation. This article outlines the findings of post inundation desk study and specialized geological investigations carried out to verify the gas ground risks. Some practical mitigation measures and recommendations for gas ground investigation are also presented.

### KEYWORDS

Gas ground, geological hazards, TBM tunneling, geological investigations

## 1. INTRODUCTION

Construction of underground excavations such as rock tunnels is among the most problematic civil engineering works. Rock masses (as a nature product) surrounding a tunnel show special behavior with any changes in geological conditions. According to Zhao, et. al (2007), suitability of a tunneling system to the encountered geological conditions is a key factor for a successful project construction.

Gassy grounds as an adverse geological condition have always been the most hazardous environments in underground excavation projects and gas inflow can accordingly disrupt normal work activities. Gases from the ground may mix with air in the excavation to generate an explosive, toxic, or asphyxiating atmosphere. It can threaten personnel health and project safety as it detect, in excess of allowable limits, in an excavation atmosphere. Doyle, 2001, denoted that most accidents and financial losses attributed to gas are a consequence of errors made in developing and maintaining control measures, originating from a lack of awareness of the nature of gases underground. Therefore, understanding of the nature of gas is an essential task and enables to make

excavations safer, by making control measures more reliable. Nowadays, more long tunnels are being driven in gassy grounds in mountain ranges of Iran which gas-related hazards have relatively reported in all of them. It has become the most important challenge in construction of long tunnels for Iranian participants. Table 1 presents some of recent tunneling projects in Iran in gassy grounds along with related hazards and selected mitigation measures. It shows that tunneling in gassy grounds is almost subjected to an increase in construction time and cost of every project.

However, few case studies have been reported to describe gas-related hazards in these kinds of tunneling projects. Ghiasvand (2009), describe some problems related to gas emission in Long Zagros (Lot. 2) tunnel. Shahriar et.al. (2008), presents high gas emission accidents and practical mitigation measures in the construction of Zagros tunnel. Wenner and Wannenmacher (2009), have shown that gas emission is the main extraordinary difficulties encountered during the excavation of Alborz service tunnel. They discussed the possible source of methane, hydrogen sulfide and Carbone monoxide and presented effective countermeasure to reduce gas emission hazards.