

Quick-Erect Stopping System (QESS) for Miners to Prevent High Radon Exposures

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Abstract. A new Quick-Erect Stopping System (QESS) for miners was developed to reduce the radon exposures of miners employed in remediation work at old mining sites in Germany. The QESS is a light-weight, modular, and reusable construction kit consisting of interlocking telescopic aluminum tubes, radon-proof foil, and expanding foam to shut off radon-rich parts of galleries of any width within only a few minutes. Moreover, the reflecting foil of the color-coding of the tubes can be clearly seen in the light of miners' lamps. Setting up the QESS takes two miners 15 to 30 minutes. The QESS can be dismantled in less than five minutes. The QESS is reusable except for the foil and the foam and can be re-erected, for example, after a blasting operation at the same location or reused at another location. The QESS was tested in the Reiche-Zeche Research and Teaching Mine of the Technical University Bergakademie Freiberg, in the Edgar Experimental Mine of the Colorado School of Mines and at some small underground construction sites of old mining in the Ore Mountain (Erzgebirge).

KEYWORDS: *radon, mining, ventilation.*

1 INTRODUCTION

Mining in the Ore Mountains (Erzgebirge) and Vogtland mountains began in the 12th century and continues to this day. Both mountains are low-mountain ranges in the East German state of Saxony. The mining has left numerous galleries and shafts that cause occasional surface damage. To protect people, buildings and infrastructure, around 250 miners from eight companies are permanently engaged in remediation work at up to 40 smaller and frequently changing construction sites in an average year. The high radon potential in the two mountain ranges is significant for radiation protection of miners during remediation work. It is not unusual to find radon activity concentrations of 100,000 Bq/m³ in mine air currents under natural ventilation [1, 2]. Miners usually erect mine stoppings with the help of wood, foil and expanding foam. Erecting such stoppings is time-consuming (Fig. 1). The goal of this project was to develop a new reusable stopping with a quick assembly time to reduce the working time of miners in mine air currents with high radon activity concentrations.

2 QUICK-ERECT STOPPING SYSTEM (QESS)

The QESS is a lightweight, modular and reusable construction kit consisting of interlocking telescopic aluminum tubes, radon-proof foil and expanding foam able to seal off radon-rich parts of galleries of any width within minutes [3].

The construction kit contains 15 two-piece, extendable telescopic tubes in four different lengths. All tubes have regularly placed slots on both sides from top to bottom. The tubes have tips made of hard plastic at both ends. The tube tips can be inserted into the slots of other tubes.

The QESS comes boxed for transport over ground and includes two bags for transportation underground (Fig. 2). The QESS can be extended by more kits. Setting up the QESS takes two miners 15 to 30 minutes. The QESS can be dismantled in less than five minutes. It is reusable except for the foil and the foam. To erect the QESS, no tools or electricity are required. There is no need to measure the gallery to be sealed off. Moreover, the reflecting foil of the color-coding of the tubes can be clearly seen in the light of miners' lamps (Fig. 3).

Figure 1: Conventional stopping made of wood in the gallerie Querschlag 24 in Schneeberg



Figure 2: Quick-Erect Stopping System (QESS) in its transportation box



Figure 3: Quick-Erect Stopping System (QESS) in the Edgar Mine, Idaho Springs, Colorado



3 CONCLUSION

The QESS protects miners from radon (Fig. 4). Compared with conventional stoppings, the QESS reduces the radon exposure of miners due to its significantly shorter assembly time. For mine rescue operations, the QESS can be used as ventilation predams to slow down fires and to protect against smoke and dust (Fig. 5). The QESS has also proven useful in ventilation experiments (Fig. 6).

Figure 4: Quick-Erect Stopping System (QESS) in the crosscut Querschlag 60 to protect the construction site in the Markus Semmler gallery at the section Fleischer Morgengang in Schneeberg



Figure 5: Setup of the Quick-Erect Stopping System (QESS) by a troop of the Student Mine Rescue of the Technical University Mining Academy of Freiberg in the gallery section Wilhelm Stehender in the Teaching and Research Mine Reiche Zeche. Image: Detlev Müller/Technical University Bergakademie Freiberg



Figure 6: Ventilation experiment in the gallery Silberstrecke with Quick-Erect Stopping System (QESS) set up in the visitor mine Frisch Glück Glöckl in Johanngeorgenstadt [3]



4 REFERENCES

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