

Penelitian ini dibuat berdasarkan adanya rencana pembangunan Terowongan Pengelak Bendungan Pelosika Provinsi Sulawesi Tenggara. Pada lokasi tersebut diperlukan adanya investigasi geologi dan geologi teknik yang lebih detail. Berdasarkan kondisi geologinya, lokasi penelitian berada pada litologi satuan filit muskovit kuarsa, endapan fluvial dan endapan aluvial. Terdapat struktur geologi berupa kekar pada batuan metamorf (filit muskovit kuarsa) serta adanya sesar yang diperkirakan. Kondisi geologi teknik permukaan memiliki kualitas massa batuan sangat buruk sampai baik dengan tingkat pelapukan sangat tinggi hingga rendah. Kondisi geologi teknik bawah permukaan dengan metode GSI dan RMR menghasilkan kualitas batuan yang buruk (*poor rock*) sementara menggunakan metode *Q-System* menghasilkan nilai *extremely poor* dan *very poor rock*.

Metode penggalian terowongan yang dianalisis berdasarkan Pettifer-Fookes menghasilkan metode penggalian *easy ripping* dan *hard ripping* sementara menggunakan metode GSI menghasilkan metode penggalian *digging*. Metode penggalian berdasarkan metode RMR dengan kualitas massa batuan yang buruk (*poor rock*) menghasilkan metode penggalian *top heading* dan *bench*. Nilai *stand-up time* terowongan dengan *roof span* 2,6 m memiliki nilai 42-240 menit. Sistem penyangga terowongan setelah dilakukan penggalian berdasarkan metode RMR menggunakan kombinasi perkuatan *shotcrete*, *rock bolt*, *grouting* dan *steel sets*. Sementara itu sistem penyangga terowongan berdasarkan metode *Q-System* dengan *roof span* 2,6 m menggunakan perkuatan *fiber reinforced shotcrete* dan *rock bolt*. Stabilitas lereng portal terowongan dianalisis menggunakan *Limit Equilibrium Method* (LEM) berdasarkan metode Bishop dan Morgenstern Price pada bagian *inlet* dan *outlet* terowongan dengan kemiringan lereng 45° menghasilkan nilai di bawah angka aman sehingga perlu didesain ulang. Desain ulang lereng portal dilakukan dengan melandaikan lereng *inlet* dan *outlet* terowongan pengelak. Pada *inlet* terowongan pengelak dibuat dengan kemiringan 40° serta ditambah *berm* pada bagian atas agar lereng tidak curam. Pada bagian *outlet* terowongan dibuat dengan kemiringan 35° sehingga lereng lebih landai. Hasil analisis menunjukkan nilai angka aman melebihi standar angka aman (SoF) berdasarkan standar SNI 8460:2017 pada geometri lereng portal yang baru.

**Kata kunci:** Geologi teknik, terowongan pengelak, kualitas massa batuan, metode penggalian, sistem penyangga terowongan, stabilitas lereng portal

## ABSTRACT

This research was made based on the planned construction of the Pelosika Dam Diversion Tunnel in Southeast Sulawesi Province. At that location a more detailed geological and engineering geology investigation is required so that the construction of the diversion tunnel goes more smoothly. Based on the geological conditions, the research location is in the lithology of muscovite quartz phyllite units, fluvial deposits and alluvial deposits. There is a geological structure in the form of joints in metamorphic rocks (muscovite quartz phyllite) and indications of faults. Surface engineering geological conditions have rock mass quality with very poor to good quality and very high to low weathering levels. Subsurface engineering geological conditions using the GSI and RMR methods produce poor rock quality while using the Q-System method produces extremely poor and very poor rock values.

The tunnel excavation method analyzed based on Pettifer-Fookes produces easy ripping and hard ripping methods while using the GSI method produces digging excavation methods. The excavation method based on the RMR method with poor rock mass quality results in top heading and bench excavation methods. The value of the stand-up time for a tunnel with a roof span of 2.6 m has a value of 42-240 minutes. The tunnel support system after excavation is based on the RMR method using a combination of shotcrete reinforcement, rock bolts, grouting and steel sets. Meanwhile the tunnel support system is based on the Q-System method with a roof span of 2.6 m using fibre reinforced shotcrete and rock bolts. The stability of the tunnel portal slope was analyzed using the Limit Equilibrium Method (LEM) based on the Bishop and Morgenstern Price method on the inlet and outlet sections of the tunnel with a slope of 45° resulting in values below the safe number, so it needs to be redesigned. Portal slope redesign was carried out by sloping the inlet and outlet slopes of the diversion tunnel. At the inlet, the diversion tunnel is made with a slope of 40° and a berm is added at the top so that the slope is not steep. At the outlet of the tunnel is made with a slope of 35° so that the slope is gentler. The results of the analysis show that the safety score exceeds the standard of safety factor (SoF) according to SNI 8460:2017 standard on the new portal slope geometry.

**Keywords:** Engineering geology, diversion tunnel, rock mass quality, excavation method, tunnel support system, portal slope stability