

INTISARI

Penelitian ini dilakukan pada lokasi rencana terowongan pengelak Bendungan Krekeh yang terletak di Desa Krekeh, Kabupaten Sumbawa, Provinsi Nusa Tenggara Barat. Penyelidikan terdahulu (2013 – 2020) belum menyajikan penilaian kualitas massa batuan secara rinci dan tidak mempertimbangkan keberadaan Sesar Trans Sumbawa (diperkirakan) yang berjarak ± 150 m dari trase terowongan. Oleh karena itu, diperlukan evaluasi geologi teknik yang lebih komprehensif untuk menentukan metode penggalian dan sistem penyangga terowongan, serta desain lereng portal yang aman. Penelitian ini mencakup pemetaan geologi teknik, analisis data pemboran, uji laboratorium, penilaian kualitas massa batuan, penentuan metode penggalian dan sistem penyangga secara empiris menggunakan klasifikasi RMR dan JSCE, serta analisis stabilitas lereng portal *outlet* dengan metode *limit equilibrium*. Lokasi penelitian tersusun atas tiga satuan geomorfologi, yaitu perbukitan vulkanik berlereng agak curam–curam Selang B, lembah sinklin berlereng landai–miring, dan perbukitan vulkanik berlereng agak curam–curam Selang A. Lokasi penelitian terdiri atas satuan batupasir tufan sisipan batulanau dan breksi andesit. Struktur geologi yang berkembang meliputi sinklin, sesar naik minor, sesar geser sinistral, dan kekar. Trase terowongan berada di bawah elevasi muka airtanah dengan kondisi kering hingga lembab. Analisis stabilitas lereng portal menggunakan koefisien seismik horizontal sebesar 0,16 g. Kualitas massa batuan pada trase terowongan dikategorikan kelas sedang (RMR 46–55) dan diklasifikasikan sebagai kelas CI pada bagian *inlet* dan *outlet*, sedangkan bagian tengah terowongan tergolong buruk (RMR 29) dan termasuk kelas DI. Metode penggalian yang direkomendasikan adalah *heading and bench*. Sistem penyangga pada *inlet* dan *outlet* berupa *rock bolt* sepanjang 4 m dengan spasi 1,2 m (transversal) dan 1,5 m (longitudinal) serta *shotcrete* setebal 150 mm. Pada bagian tengah terowongan diperlukan *rock bolt* panjang 6 m dengan spasi 1,1 m, *shotcrete* setebal 200 mm, dan *steel set* H-150 dengan jarak 1 m. Analisis stabilitas menunjukkan desain awal lereng portal *outlet* berada dalam kondisi tidak stabil. Setelah modifikasi geometri berupa pelebaran *bench* dan penambahan *safety berm*, faktor keamanan meningkat menjadi 1,44 dan 1,43 pada kondisi statis serta 1,14 dan 1,12 pada kondisi pseudostatis, sehingga memenuhi persyaratan keamanan.

Kata Kunci: Bendungan Krekeh, geologi teknik, kualitas massa batuan, metode penggalian, sistem penyangga, stabilitas lereng portal *outlet*

ABSTRACT

This study was conducted at the planned diversion tunnel of the Krekeh Dam, located in Krekeh Village, Sumbawa Regency, West Nusa Tenggara Province, Indonesia. Previous investigations carried out between 2013 and 2020 did not provide a detailed assessment of rock mass quality and did not consider the presence of the (inferred) Trans Sumbawa Fault, which is located approximately ± 150 m from the tunnel alignment. Therefore, a more comprehensive engineering geological evaluation is required to determine appropriate excavation methods, tunnel support systems, and a safe portal slope design. This study includes engineering geological mapping, borehole data analysis, laboratory testing, rock mass quality assessment, empirical determination of excavation methods and support systems using the RMR and JSCE classifications, and outlet portal slope stability analysis using the limit equilibrium method. The study area consists of three geomorphological units, namely moderately steep to steep volcanic hills of Selang B, a gently sloping to inclined synclinal valley, and moderately steep to steep volcanic hills of Selang A. The lithological units comprise tuffaceous sandstone intercalated with siltstone and andesite breccia. Geological structures identified in the study area include a syncline, minor reverse faults, sinistral strike-slip faults, and joints. The tunnel alignment is located below the groundwater table, with dry to damp conditions. Portal slope stability analysis was performed using a horizontal seismic coefficient of 0.16 g. The rock mass quality along the tunnel alignment is classified as fair (RMR 46–55) and categorized as Class CI at the inlet and outlet sections, while the central section of the tunnel is classified as poor (RMR 29) and categorized as Class DI. The recommended excavation method is heading and bench. The support system for the inlet and outlet sections consists of 4 m long rock bolts with spacing of 1.2 m (transverse) and 1.5 m (longitudinal), combined with 150 mm thick shotcrete. In the central section of the tunnel, a support system consisting of 6 m long rock bolts with 1.1 m spacing, 200 mm thick shotcrete, and H-150 steel sets at 1 m spacing is required. Stability analysis indicates that the initial design of the outlet portal slope is unstable. After geometric modifications in the form of bench widening and the addition of a safety berm, the factor of safety increased to 1.44 and 1.43 under static conditions and to 1.14 and 1.12 under pseudostatic conditions, thereby satisfying the safety requirements.

Keywords: *Krekeh Dam, engineering geology, rock mass quality, excavation method, support system, outlet portal slope stability*