Sub-model stress analysis for construction process of a metro crossing passage tunnel with shield machine

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Abstract: This paper aims to simulate and optimize the structure stress during construction process of a metro crossing passage tunnel with the shield machine. Taking the world first metro crossing passage tunnel with shield method at Ningbo Metro Line 3 as an example, a finite element model is established to simulate the construction process. Sub-model approach is applied for this analysis, and the simulation result matches with the strain test monitoring data of the concrete segments. The results also show that the maximum stress occurs at the T-joint of the starting and receiving sections during the construction process. With the progress of the construction, the stress at the T-joint of the starting section is gradually reduced, while the stress at the T-joint of the receiving section is gradually increased. Consequently, an authentic, reliable and advanced simulation process is established, and it can provide technique support for the optimization of the construction process of metro crossing passage tunnel.

Keywords: shield method; metro crossing passage tunnel; sub-model; test data; stress analysis