

Natural Boundary Element Method for Stress Field of Rock Surrounding Roadway with Local Short Supporting

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Summary

Roadway with local short supporting is not only a common phenomenon in engineering, but also short of in-depth theoretical study. Existing literature on underground stress field theory of surrounding rock, generally gives the analytical solution of stress for the surrounding rock of roadway with uniform supporting or no supporting, but doesn't give a corresponding stress solution for local supporting or local short supporting. Based on the circular roadway local short supporting mechanical model, according to the boundary element method of bi-harmonic boundary value problem of exterior circular domain, the boundary integral formula of Airy stress function is deduced for the local short supporting roadway. Using boundary surface force of the roadway to calculate the boundary stress function and its normal derivative and substituting them into the integral formula, the concrete expression of stress function is derived under various supporting resistance. Furthermore, we have given the distribution laws of the stress and the strain of the surrounding rock for the roadway with different short supporting area and supporting resistances. By the integral formula, the analytical stress solutions can be directly obtained for the surrounding rock of roadway with uniform support or with no support and the solutions are exactly the same as those given in the literature.

