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Numerical study on heat transfer and flow of natural convection in a square enclosure with two vertically aligned cylinders YONG GAP PARK, MAN YEONG HA, School of Mechanical Engineering, Pusan National University, Jang Jeon 2-Dong, Geum Jeong Gu, Busan 609-735, Korea, HYUN SIK YOON, Global core research center for ships and offshore plants, Pusan National University, Jang Jeon 2-Dong, Geum Jeong Gu, Busan 609-735, Korea — This study investigates natural convection in a square enclosure with two hot inner cylinders induced by a temperature difference between a cold outer enclosure and two hot inner circular cylinders. The centers of two equidiameter cylinders are placed at those of the lower and upper half of the enclosure, respectively. The immersed boundary method (IBM) to model the inner circular cylinders based on the finite volume method is used to study a two-dimensional natural convection for different Rayleigh numbers varying from 10^3 to 10^6. The effect of the distance between two inner cylinders in an enclosure on heat transfer and fluid flow at different Rayleigh numbers has been examined. The distance between two inner cylinders is changed from 0.1 to 0.5. The natural convection bifurcates from steady to unsteady depending on Ra and the distance between two inner cylinders . The flow and thermal fields eventually reach steady state regardless of the distance between two inner cylinders in the range of Rayleigh numbers from 10^3 to 10^5. However, for Ra = 10^6, there exist unsteady regions depend on the distance between two inner cylinders.

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