

## Flooding Data Measured in Annular Narrow Gaps with Large Diameter of Curvature

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### Abstract

An experimental study on counter-current flow limitation phenomena in narrow annular passages was carried out. The gap sizes examined were 1, 2, 3 and 5 mm. This is very small compared with the outer diameter of the annular passage, 500 mm. It was visually observed that a CCFL might occur in some part of the periphery while the other part is remained at a counter current flow regime. That is, non-uniform behaviours of fluids due to a 2-dimensional effect appear in a large diameter facility. Because of this non-uniformity, a CCFL is defined in the present work as the situation where net water accumulation is sustained. No amount of provided water should be allowed to penetrate the gap and should accumulate over the gap at CCFL criterion. The measured data are presented in the form of Wallis' type correlation. The data fit well when the average circumference is used as the characteristic length scale of the Wallis parameter. It was found that the effects of gap size diminishes when the radius of curvature of the annular passage become large.

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### Non-uniform Flow Characteristics in the Steam Generator U-Tubes During Natural Circulation

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### Abstract

A one-dimensional, integrated flow model is formulated to analyze single- and two-phase flow characteristics in the primary side of vertical, inverted U-tube steam generators. It is shown that flow excursion instability can exist in the flow inside the U-tubes under certain low-flow conditions. A stability criterion for the flow excursion is derived and its physical interpretation is given. Heterogeneous flow behaviors in multiple U-tubes are also discussed.