The present work studies the relationship between target and sidewall surfaces of a multi-row, narrow impingement channel at various jet heights with one impingement hole per row. Temperature sensitive paint and constant flux heaters are used to gather heat transfer data on the target and side walls. Jet-to-target distance is set to 1, 2, 3, 5, 7 and 9 jet diameters. The channel width is 4 jet diameters and the jet stream wise spacing is 5 jet diameters. All cases were run at Reynolds numbers ranging from 7500 to 30000. Pressure data is also gathered and used to calculate the channel mass flux profiles, used to better understand the flow characteristics of the impingement channel. While target plate heat transfer profiles have been thoroughly studied in the literature, side wall data has only recently begun to be studied. The present work shows the significant impact the side walls provide to the overall heat transfer capabilities of the impingement channel. A channel height of three diameters was found to be the optimum height in order to achieve the largest heat transfer rates out of all channels. In order to further investigate the cause of the cooling performance of the channel height of three diameter case, a computational model was setup. Flow fields results of the computational model support the Nusselt number profile of the experimental results.

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The public is welcome to attend.