The present investigation dealt with experimental study of three-phase direct-contact heat exchanger, for water-R11 system. Whereas water was the continuous phase (liquid) and R11 (liquid-gas) was the dispersed phase. The test section consisted of a cylindrical Perspex column with inner diameter 8 cm and 1.2 m long, in which, water was to be confined. Liquid R11 drops were injected into the hot water filled column, through a special design of distributors at the bottom of the column. The liquid R11 drops rose on their way up and evaporated into two-phase bubbles at atmospheric pressure.

The study was devoted to express the effect of process variables (column height, initial temperature of water, and inlet average temperature and mass flow rate of R11) on the percentage holdup, heat transfer rate, volumetric heat transfer coefficient and effectiveness, the experimental work was designed for this purpose in the following experimental ranges:

- Column height (H) (5 - 40) cm.
- Initial temperature of water (Tci) (35 - 55) °C.
- Inlet temperature of R11 (Td1) (10 °C /1.15 bar - 20 °C /4 bar).
- Mass flow rate of R11 (m_d) (1.8 - 5.4) kg/hr.
- Distributor geometry (Dh = 0.7, 1, 1.5 mm / Nh = 7, 19, 36).

The obtained experimental data showed that the average percentage holdup increased with increasing in the process variables. Its maximum increase was 130% when the column height increased from 5 to 40 cm at Nh = 36. The heat transfer rate increased clearly two times (200%) with increasing in mass flow rate of R11 from 1.8 to 5.4 kg/hr. While, it increased slightly (3%) with increasing the other process variables.

The volumetric heat transfer coefficient was found to decrease with increasing in column height and initial temperature of water while it was increased with increasing in mass flow rate and inlet temperature of R11. Its maximum value (57.61 W/m3.°C) would be at lower column height and higher mass flow rate. The effectiveness was found to increase (maximum 99%) with increasing in column height and inlet temperature of R11 and decreasing in the mass flow rate of R11 and initial temperature of water.

Effect of distributor geometry was appearing clearly on the average percentage holdup and effectiveness. Where the increase in hole diameter or holes number in the distributor led to increasing in the average percentage holdup and effectiveness but it decreased the volumetric heat transfer coefficient. While, this
effect caused very little (3%) raise in the value of heat rate.