Dosimetry measurements and theoretical calculations of liquid- and gas-filled balloon intravascular brachytherapy sources in tissue-equivalent A-150 plastic are presented. The investigated sources include ^{90}Y, ^{188}Re, ^{99m}Tc liquid-filled, and ^{133}Xe gas-filled balloon catheters. The balloon is a 0.025-mm thick nylon with dimensions of 20-mm in length and 3-mm in diameter. The dosimetry measurements in cGy/s were obtained using NIST-calibrated GAFChromic dye film. To determine the contained activity (GBq) just before each film irradiation, each source was measured using a calibrated ionization chamber (dose calibrator). The films were irradiated at distances between 1 and 5 mm from the balloon axis in A-150 plastic, and read out with a high-resolution scanning densitometer. Theoretical dosimetry calculations of the catheter-based balloon system for all radionuclides investigated were obtained from Monte Carlo simulations using MCNP4B, and point dose kernel calculations. The results of both measurements and calculations are expressed in absorbed-dose rate per unit of contained activity (cGy/s/GBq). Comparisons indicate that the measurements and calculated dosimetry are in reasonable agreement (<10%) within the relevant treatment distance 4-mm). Theoretical radial dose comparisons among the different radionuclides investigated will also be presented. This work will lead to the development of improved calibration methods for liquid- and gas-filled balloon catheters.