THE INTENSITY OF RAINFALL AT MANILA

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Introduction.—In order to prevent the flooding of streets and to preserve the property stored in basements, the water that falls during a storm should be removed as rapidly as possible. The factors, upon which the quantity of storm-water to be cared for, depend, are four: the rate of rainfall, the area to be drained, the character of the ground and the slope of the surface.[1] In any given locality and for a considerable number of years, the last three quantities are not variable and can be accurately determined once for all. Except in cases of a very fast expansion of a city, the drainage area and the slope of the surface are constant. The character of the surface, namely its relative porosity or imperviousness, changes with modifications of city parts, residential districts, industrial sections, even with house roofings and street paving. It is usually assumed that asphalt pavements will give nearly 100 per cent run-off, after the surfaces have become thoroughly wet, while parks, gardens and lawns will give between 5 and 25 per cent run-off, depending on the surface slope and character of the subsoil. The variety of roofings in Manila is very great and heterogeneous, from the impervious galvanized iron sheets of the comfortable residences, through the porous tiles of the old city, to the shaky nipas of the poorest huts. Surveyors and geologists may be called upon to furnish the information necessary to know the topographic and geologic characteristics of the drainage area. Meteorology may contribute to the solution of the drainage and sewer problem, by giving the data necessary for the determination of the most variable and delicate element of the problem, namely the rate of rainfall. The rainfall observations taken daily 8 hours apart cannot be used for the study of the rate of precipitation. A fair determination of the intensity of rainfall requires a recording instrument of continuous registration, a fast movement of the revolving drum in order to obtain a sufficiently large scale of time and a suitable device to insure sufficient capacity to register small amounts of rain. Automatic raingauges are used only when they can be often inspected, as they are liable to derangement. Long series of observations are necessary to serve as a basis for any deduction as to the intensity of rainfall and for the derivation of any intensity-curve. For this reason, this report refers to Manila only, where automatic raingauges have been in operation for several years. The period of operation of one of the raingauges has been considered sufficiently long to warrant the examination and publication of its records, for the benefit of scientists, specially of hydraulic engineers.

Volume of the Manila rainfall.—Knowing the area of Manila and the average depth of its rainfall, it is easy to compute the average annual total of water that descends upon the entire city. The average annual rainfall of Manila, as derived from the 61 years (1865–1926), is 1875.7 mm. According to the best maps of Manila, the surface of the city is 13.72 square miles or 35.67 square kilometers. The total volume of water represented by an annual rainfall is 0.06 cubic kilometer at least. The same computation can be extended to the entire Philippines and the volume of water can be computed that falls on land only, excluding water-surfaces. The land surface is 114,400 square miles or 297,440 square kilometers approximately; the average annual rainfall for the Philippines, as derived from 70 stations scattered throughout the Ar-

[1] Babbitt, Sewerage and Sewage Treatment, (1925), No. 28, p. 35.