

ENGINEERING

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ABSTRACTS

New Direction in Environmental Systems Planning: Experience of the Maumee River Basin Level-B Planning. PRASANTA DAS, School of Civil Engineering, Purdue University, West Lafayette, IN. 47907.—The “principles and standards” for water and related land resources planning prepared by Water Resources Council and adopted by Congress on September 10, 1973, identify two major objectives in such planning: (i) enhancement of national economic development by increasing the value of the nation’s output of goods and services, and improving national economic efficiency; (ii) enhancement of the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural resources and ecological systems. The Maumee River Basin Level-B study is structured under this new approach in order to identify and evaluate all the major water and related land resources problems. A systems methodology is utilized in formulating and evaluating the impact of this planning on to the economic development and environmental qualities of the Basin. In particular, multiple objectives related to the above two goals are treated in noncommensurable terms for trade-off analysis between economic efficiency and environmental qualities.

Bose-Einstein Statistics and Short Time-Increment Rainfall Process. A. RAMACHANDRA RAO, School of Civil Engineering, Purdue University, West Lafayette, IN. 47907.—Models of short time-increment rainfall process are needed in urban drainage design. Rainfall depths measured at time intervals of an hour or less constitute the short time-increment rainfall process. Although several models exist for characterizing the total rainfall, very few of these deal with the statistics of the rainfall distribution within the storm. The present paper deals with a model for the distribution of rainfall within the storm as well as the total rainfall.

The model is applied to the 5 min. rainfall data from Chicago. Rainfall data from 194 storms measured during the period 1913-1947 were used in the analysis. The parameter estimation and the validation of the model are discussed. The model is demonstrated to be a valid and accurate model to characterize the statistics of short time increment rainfall process.

The Laminar Two-Dimensional Plume in a Horizontal Magnetic Field. DONALD D. GRAY, School of Civil Engineering, Purdue University, West

Lafayette, IN. 47907.—The dynamics of a buoyant plume rising above a horizontal line heat source in a transverse, horizontal magnetic field is investigated. Similarity is shown to occur when the magnetic field strength varies as the $-2/5$ power of vertical distance from the source. The plume depends on two parameters—the Prandtl number (Pr) and the Lykoudis number (Z_L). Families of exact closed form solutions are derived for $Pr = 5/9$ and $Pr \geq 2$. A family of numerical integrations for $Pr = 0.01$ (typical of liquid metals) is also reported. An approximate closed form solution valid for low Pr and high Z_L is presented. Possible experimental tests of the theory are proposed.

From Ferris Wheel to Bridge. ALDO GIORGINI, Purdue University, West Lafayette, IN. 47907.—The 1893 World's Columbian Exhibition in Chicago, commemorating the fourth centenary of the discovery of America, should have featured a "proctor steel tower" which should have stood 111 feet taller than the Eiffel Tower in Paris. Mainly for political reasons, the tower was never built, but in its place its designer, the young American engineer George W. Gale Ferris (1859-1896) built the first Ferris Wheel, a 250 feet diameter wheel with 36 cars of 60 people capacity per car. The Ferris Wheel was featured again in the 1904 World's Exhibition in St. Louis. After that it was sold as scrap metal. Mr. Dunn, of Dunnville (now Dunns), Indiana, bought the metal to build a bridge (now Dunns Bridge) across the Kankakee River. The bridge is still extant, in sound shape, but no longer in use.