CHAPTER 1

GENERAL

1-1. Purpose and scope.

This manual provides information, instructions, procedures and criteria for the design of gravity sanitary and industrial wastewater collection systems for fixed Army and Air Force installations, and any applicable special projects.

1-2. Design objectives.

The design of a gravity wastewater collection system must provide an engineered system of sewers, complete with all appurtenant facilities, sufficient in size, slope and capacity to collect and convey the required wastewater flows to an acceptable point of discharge. The system must be practicable, economically feasible, and must be located to minimize the costs of installation, operation and maintenance. Sewers and appurtenances must be structurally sound, and must protect the environment from pollution caused by leakage at pipe joints or manhole structures. Extraneous flows that hydraulically overload the system and produce flooding at sewer manholes and lift stations must be excluded. Elimination of excessive infiltration and inflow is essential in avoiding increased costs of sewer maintenance, wastewater pumping and treatment. Even more important in this regard is the necessity to maintain design wastewater treatment efficiencies, and thus assure that effluent discharge requirements are met. Contributing waste flows which are harmful to sewer pipe materials and appurtenant structures, toxic to biological and other waste treatment systems, or create fire and explosion hazards, must be identified and evaluated early during predesign, so that suitable materials and/or procedures for their disposal can be included.

1-3. Limitations on use.

To protect sewers, pumping stations and treatment facilities from unwanted pollutants and extraneous flows that result in excessive operation and maintenance, fire and explosion hazards, or reduced wastewater treatment efficiencies, limitations must be placed on the use of the sewer system. Wastewaters from fuel loading and dispensing systems, grease and oil from vehicle wash racks, aircraft washing and garage or shop floor drains, must be directed through oil/water separators to prevent such wastes from entering the sewers. Combined sewers will not be permitted, and collection of storm drainage of any kind must be avoided. All types of industrial wastes must be analyzed to determine if any substance is detrimental to sewer pipe materials, waste treatment processes, or creates a safety hazard to personnel. The general guidelines cited in Water Pollution Control Federation (WPCF) Manual of Practice No. 3 for identifying wastes not admissable to sewers will be followed closely. Chapters 3 and 8 of TM 5-814-8 provide a description of the various types of industrial wastes generated at military installations, and give criteria governing discharge to sanitary or industrial waste sewers.

1-4. Alternatives to gravity sewers.

a. Wastewater pumping. There may be areas in which the topography is not well suited for construction of a gravity sewer system. In such areas, the installation of a gravity system would require deep and expensive trench excavation, jacking, boring, tunnelling, or construction of long sewer lines to avoid unfavorable terrain. In cases like these, the existing topography and subsurface conditions at the site will be studied to determine if a pump or ejector station would be more feasible. Depths of gravity sewers greater than 15 to 20 feet are usually uneconomical. However, the operation and maintenance costs of a pumping station when capitalized, may offset or exceed the construction costs of a deep gravity sewer system. When it is not readily apparent which solution would be more economical, the decision to use one or the other will be based on a life cycle cost analysis. Initial capital and construction costs for pumps, ejectors, structures, force mains, etc., plus operation and maintenance costs, will be compared with the costs of deep trench excavation, or other special construction methods required for a gravity system. Generally, a gravity sewer system will be justified until its cost exceeds the cost of a pumped system by 10 percent. TM 5-814-8 contains criteria for economic evaluation of wastewater pumping. TM 5-814-2/AFM 88-11, Chapter 2 provides criteria for engineering and design of sanitary and industrial wastewater pumping facilities.

b. Grinder pumps and vacuum systems. Some areas under consideration may be further limited by high groundwater, unstable soil, shallow rock, or extremely adverse topography, and neither gravity sewers nor pump or ejector stations will be suitable. To overcome these difficulties, grinder pumps with small diameter (less than 4-inch) pressure sewers may be utilized. In a typical installation, wastewater from individual buildings will be discharged to a holding tank, and then periodically transferred by grinder pump through small diameter pipe, into either a central pressure main, conventional gravity sewer, pumping station, or

wastewater treatment facility. Vacuum systems offer an alternative to pressure sewers and may be used under similar circumstances. Both of these systems are relatively new and are continuously being improved. Manufacturers' literature should be carefully reviewed along with operating data from existing installations before deciding to use either system. Design criteria for these types of installations are contained in TM 5-814-2/AFM 88-11, Chapter 2.