

2.3 AIRPORT DRAINAGE

An adequate drainage system for the removal of surface and subsurface water is vital for the safety of aircraft and for the long service life of the pavements. Improper drainage results in the formation of puddles on the pavement surface which can be hazardous to aircraft taking off and landing poor drainage can also results in the early deterioration of pavements.

Purpose of drainage

The functions of an airport drainage system are as follows;

- Intercepting and diversion of surface and ground water flow originating from lands adjacent to the airport.
- Removal of surface run off from the airport
- Removal of subsurface flow from the airport

Design storm for surface run off

Federal aviation administration recommends that for civil airports the drainage system be designed for a storm whose probability of occurrence is once in 5 years. The designs should, however be checked with a storm of lesser frequency (10 to 15 years). Drainage system for military airfields is based on a 2-years storm frequency. Rainfall intensity is expressed in inches per hour for various durations of a particular storm. The FAA adopts the following formula for the calculation of amount of runoff.

$$Q = CIA \quad Q =$$

Runoff from the drainage basin (ft/sec)

C = ratio of runoff to rainfall (coefficient of runoff) I =

Rainfall intensity (inch /hour)

A = Drainage area in acres

For drainage basins consisting of several types of surfaces with different infiltration characteristics, the weighted run off coefficient should be computed as

$$C = \frac{A_1C_1 + A_2C_2 + A_3C_3}{A_1 + A_2 + A_3}$$

Having calculated the discharge to be handled, the pipes diameter is determined. Pipes used are of perforated metal, concrete on vitrified clay. Pipes are of usually 6" diameter with a minimum recommended slope of 0.15%. a minimum thickness of 6" of filter material should surround the drain and filter material must be many times more pervious than the protected soil. For cleaning and inspection, manholes and risers are often installed along the drains. The crops of engineers recommend that manhole be placed at intervals not more than 1000 ft with one riser midway between the manholes. Some time one combined drain is provided both for surface and subsurface drainage (combined system).

Surface drainage

Water from a discharge area is collected into the storm drain by means of inlets. The inlets structures consists of a concrete box, whose top is covered with a grating made of cast iron, cast steel or reinforced concrete a cover is designed to takes aircraft wheel loads. The inlets are spaced from 200 – 400 ft. Support locations of inlets depend on the configuration of the airport and on the grading plan.

Normally drains are placed near the edge of the runway pavement or at the toe of the slope of the graded area. The grades of the storm drain should be such as to maintain a minimum velocity of 2.5 ft/sec self cleaning velocity. The diameter of surface drains should not be less than 12". The design should be such that entire quantity of surface run off should be removed in 1 to 2 hours following the rain storm.

Ponding

If the airport area is subjected to high rainfall intensities and calculations gives very large diameter of drains required to remove water from the land area. So ponding of water is done to accumulate water for some time and then allow it to enter the drains, thus reducing size of drains. Water is collected in catch basin and carried away by storm sewer.

Sub surface drainage

Functions of subsurface drainage are to

- Remove water from a base course
- Remove water from the sub grade beneath a pavement and
- Intercept, collect and remove water flowing from springs and previous strata.

Base drainage is usually required;

- Where frost action occurs in the sub-grade beneath a pavement
- Where the ground water is expected to rise to the level of base course.
- Where the pavement is subjected to frequent inundation and the sub-grade is highly impervious and sub surface waters from adjacent areas are seeping towards the airport pavements.

Methods for draining sub-surface water

Base course are usually drained by installing sub-surface drains adjacent to and parallel to the edge of pavement. The pervious material in the trench should extend to the bottom of base course and center line of the drain pipe should be placed a minimum of 1 ft below the bottom of the base course. Sub grade is drained by pipes installed along the edge of the pavement and the center line of the drain should be placed at edge.

