



CE 442

CONSTRUCTION AND MAINTENANCE OF HIGHWAYS AND AIRPORTS

HW No. 8

Design the following drainage structures for Jubail expressway:

1- Drainage channel (2 ft base and 2:1 side slopes) to collect and drain an area of 700 acres rolling barren land away from the highway (40 % of the water is expected to be drained). The channel will be lined with concrete. The channel slope will be 0.4 % and the distance to the farthest point is 300 feet with an average slope of 0.65 %. Determine the discharge and the required channel depth if the water level is expected not to exceed 70 % of the channel depth. Design for 50 years storm cycle.

2- Design concrete Box culvert 200 ft long flowing under inlet control and maintain a maximum water head of 5 feet. The culvert will drain an area of 700 acres rolling barren land (50 % of the water is expected to be drained). The distance to the farthest point is 500 feet with an average slope of 0.75 %. Determine the design discharge rate for 50 years storm cycle. What is the required dimension of the culvert box if 70° wing wall will be used?

3- A perforated drainage pipe will be installed below the highway subbase to collect and drain water from rising water table. Design the required soil filter if the pipe openings are 5mm and subgrade soil has gradation similar to that in the following Table.

Sieve Size	% Passing
3/4"	100
1/2"	90
3/8"	80
# 4	66
# 10	50
# 40	35
# 80	28
# 200	21