Assignment 7: Airport Geometric Design Standards

Date Due: March 24, 2016
Instructor: Trani

Problem 1

An airport is designing a new overflow ramp area to accommodate two Boeing 787-8 passenger planes simultaneously. The airport authority needs to know the dimensions (A through G and also radii R1 and R2) of the apron area shown in Figure 1. In your solution consider the maneuvering envelopes of the Boeing 787-8 using the Boeing technical data. The design is such that aircraft are expected use their own engine **power to move** out of the two positions (i.e., no need for a tow truck). **Design and draw to scale** (**no hand sketches will be accepted**) your solution assuming no more than 60 degrees of **steering angle** available to the pilot. Provide at least 30 feet if clearance between a maneuvering aircraft and the wingtip of the adjacent vehicle. Clearly state all the dimensions in your drawing.

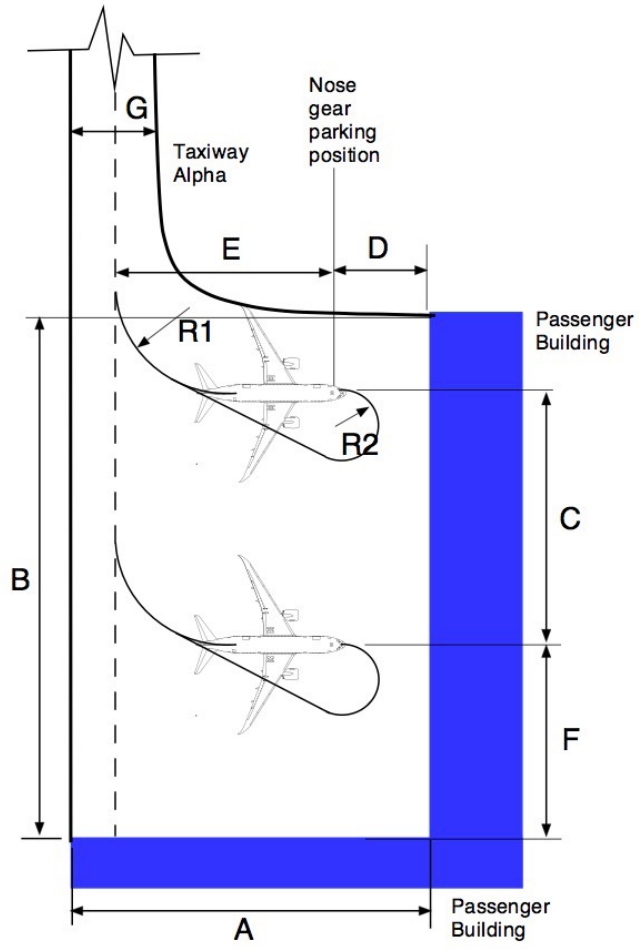

Figure 1. Proposed Airport Terminal Extension at the end of Taxiway "Alpha".

Problem 2

Using the FAA taxiway design method, design a new taxiway-taxiway intersection between taxiways “Alpha” and “Bravo” as shown in Figure 2. The critical aircraft is the Boeing 787-8. The taxiway-taxiway angle is 150 degrees as shown. Note that solving this problem is not about just copying and pasting the solution stated by the Boeing airport compatibility document.

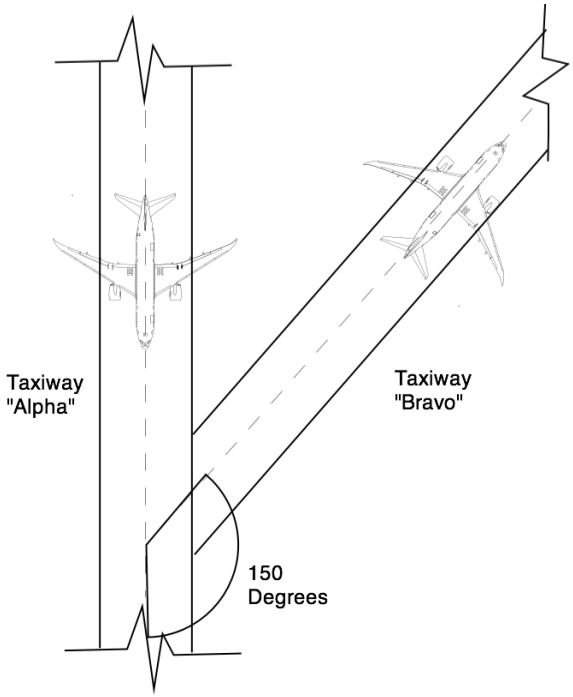

Figure 2. Taxiway Design for Problem 2.

a) State all the required dimensions (according to the FAA design procedure) in your taxiway-taxiway design. Indicate the Taxiway Design Group used in the analysis.

b) Find the recommended taxiway width for the critical design vehicle. Also find the shoulder width of the taxiway. Check if the Boeing 787-8 engines are contained within the taxiway shoulder dimension.

c) Draw your solution (**no hand sketches are acceptable**) and compare the values obtained with those suggested by the aircraft manufacturer. State any differences and similarities.

Problem 3

A 3,050 meter long runway at an airport has three longitudinal grades (**from left to right**): 0.65%, -0.70% and 0.55% with the points of intersection located at metric stations 845 and 2,020 from the left threshold. Assume the left threshold is station 0 +00 (metric). The airport, located 1,200 feet above sea level, is designed to serve aircraft such as the Boeing 787-8 shown in Figure 3.

Figure 3. Japan Airlines Boeing 787-8 at Tokyo Narita International Airport (A. Trani).

a) Test the suitability of this runway to be used in commercial operations. State all your checks.

b) Design the first transition curve for this runway using a symmetric parabola. Specify the elevations (10-20 meters - your choice) as a function of the station (in meters). Refer to the formulas in the handout Geometric Design to create a symmetrical parabola. Use Excel or Matlab to simplify your work. You are allowed to use the Matlab script provided in
c) class.

d) State the typical grade of the shoulders for allow maximum drainage.

Problem 4

Before solving this problem, read carefully paragraph 407 in the FAA Advisory Circular 150/5300-13A.

a) Specify (**do not draw**) the dimensions of a crossover taxiway shown in Figure 4 using the FAA taxiway design methods contained in Chapter 4 of the Advisory Circular 5300-13A. The critical aircraft is the Boeing 787-8. Specify all dimensions shown in Figure 4 considering the critical aircraft operating at the airport.

b) Briefly contrast the dimensional standards used in this design and those used in Problem 2.

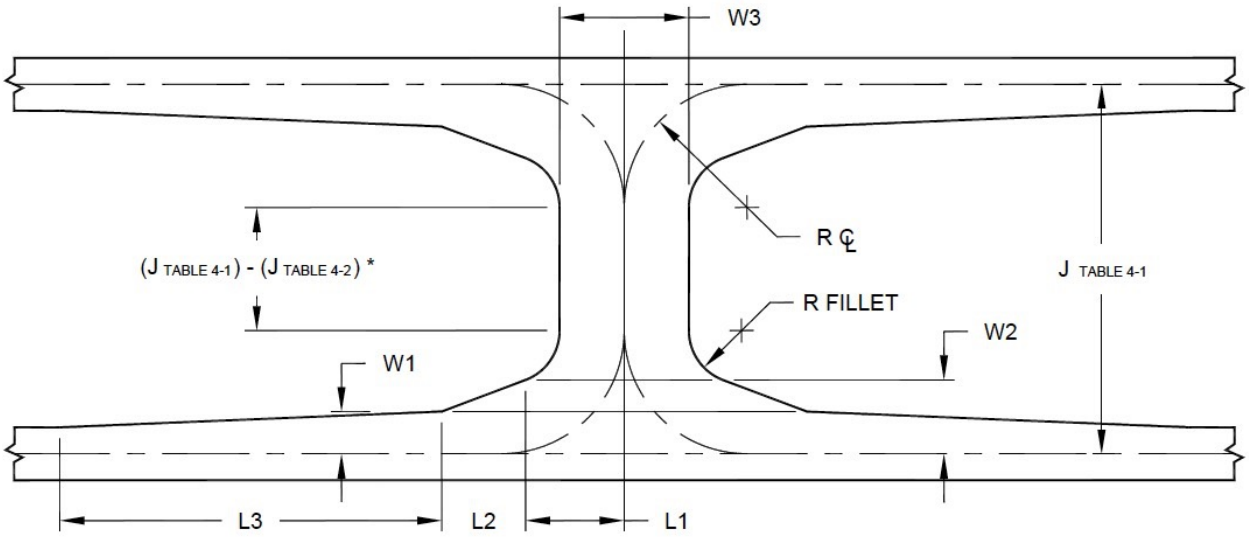

Figure 4. General Layout of a Crossover Taxiway (source: FAA AC 150/5300-13A Figure 4-16).