

Assignment 7: Airport Geometric Design Standards

Solution

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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 787-9 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 of clearance between a maneuvering aircraft and the wingtip of the adjacent vehicle. Clearly state all the dimensions in your drawing.

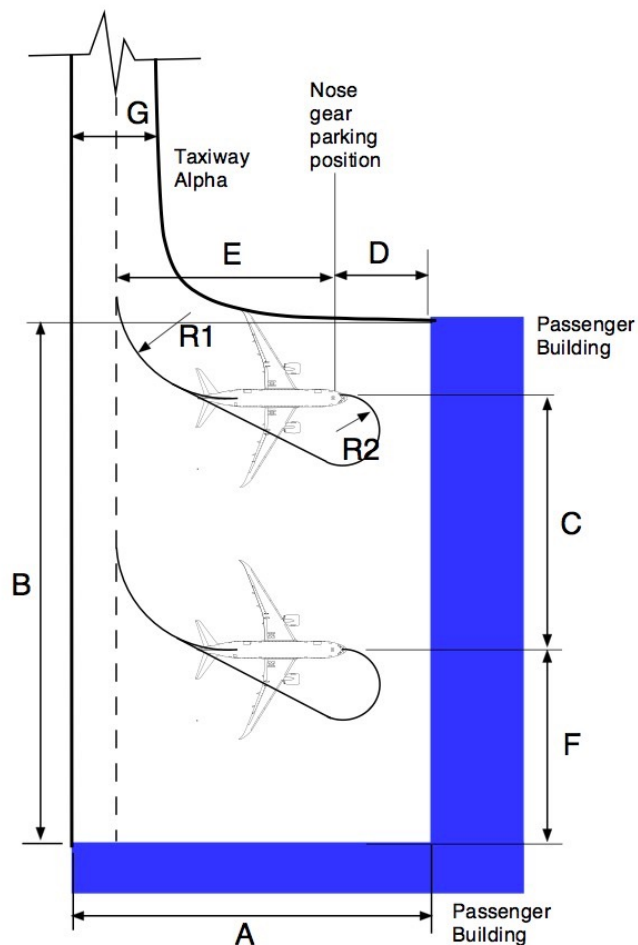


Figure 1. Proposed Airport Terminal Extension at the end of Taxiway "Alpha".

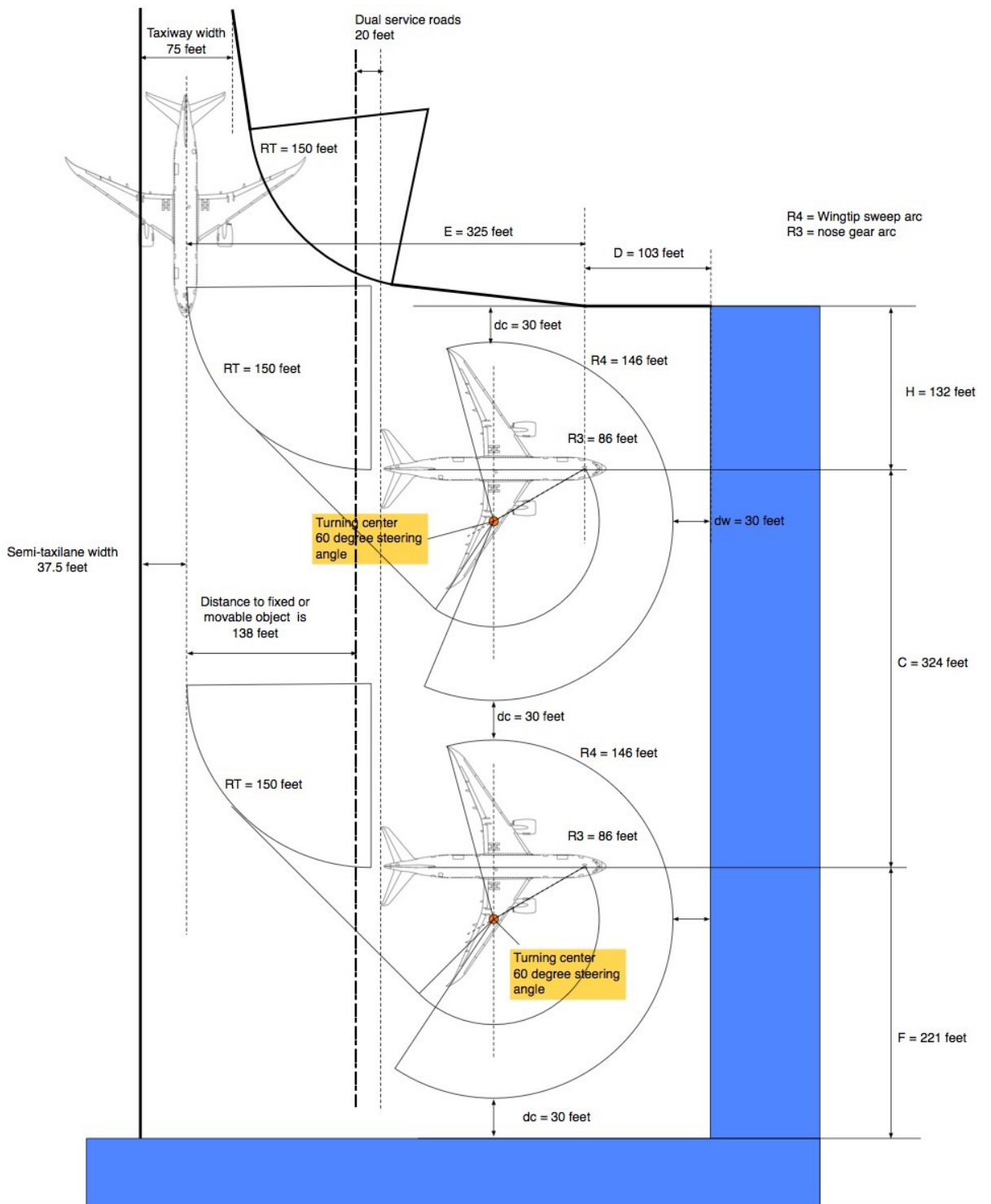


Figure 1.1 Geometric Design Solution to the Apron Ramp Problem.

Table 1. Summary of Minimum Dimensions for Problem 2.

Dimension	feet	meters
A	465	142
B	677	206
C	324	99
D	103	31
E	325	99
F	221	67
G	75	23

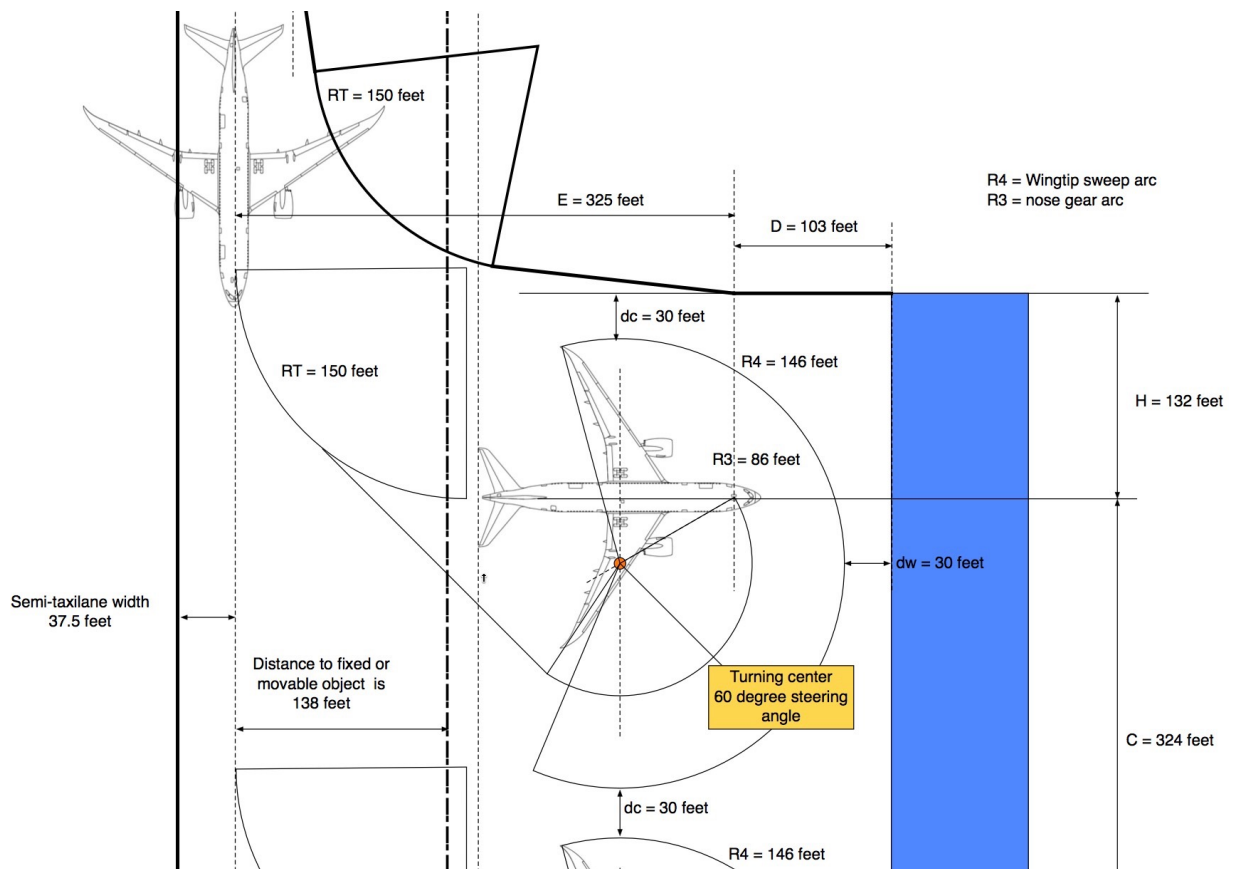


Figure 1.2 Detail of the Geometric Design for Problem 2.

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.

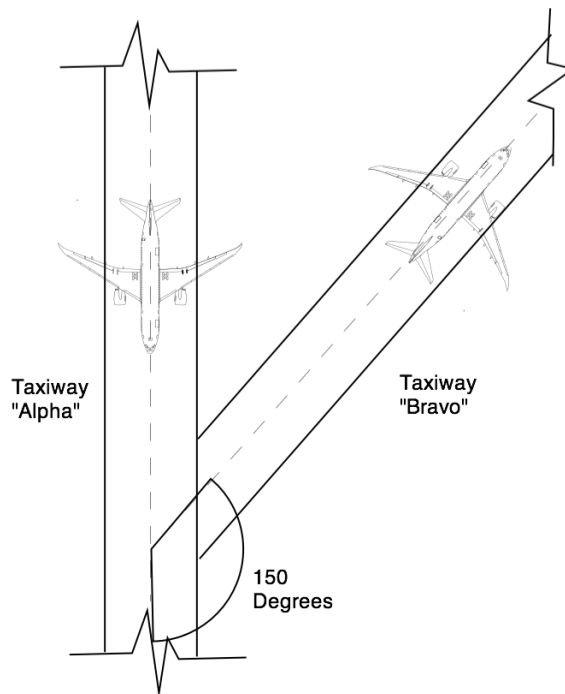


Figure 2. Taxiway Design for Problem 2.

- 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.
- 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.
- 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

The Boeing 787-8 belongs to TDG group 5. The graphical solution is presented in Figure 2.2. The dimensions are presented in the table below.

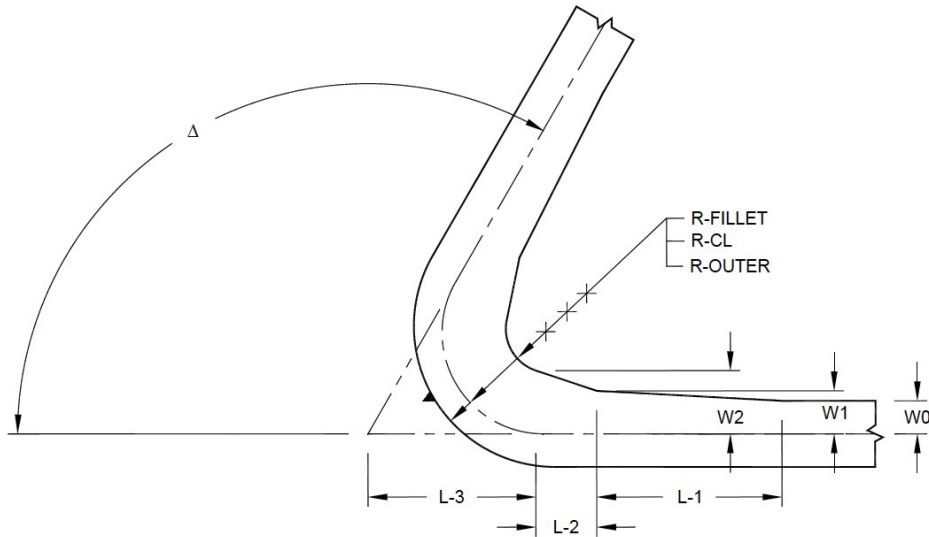


Figure 2.1. Taxiway-taxiway Junction (source: FAA).

Table 1. Summary of Minimum Dimensions for Problem 2. Use the Values for 150 degree turn.

TDG 5							
Dimension (See Figure 4-13, Figure 4-14, and Figure 4-15)							
Δ (degrees)	30	45	60	90	120	135	150
W-0 (ft)	37.5	37.5	37.5	37.5	37.5	37.5	37.5
W-1 (ft)	44	47	48	49	50	50	50
W-2 (ft)	55	63	71	82	75	76	76
L-1 (ft)	254	287	300	310	317	321	320
L-2 (ft)	100	100	110	125	100	100	100
L-3 (ft)	15	26	41	82	201	289	451
R-Fillet (ft)	0	0	0	0	50	50	50
R-CL (ft)	110	110	110	95	115	120	120
R-Outer (ft)	350	285	195	162	160	165	160

Note: Values in the table are rounded to the nearest foot. 1 foot = 0.305 meters.

Source: FAA AC 150-5300-13A

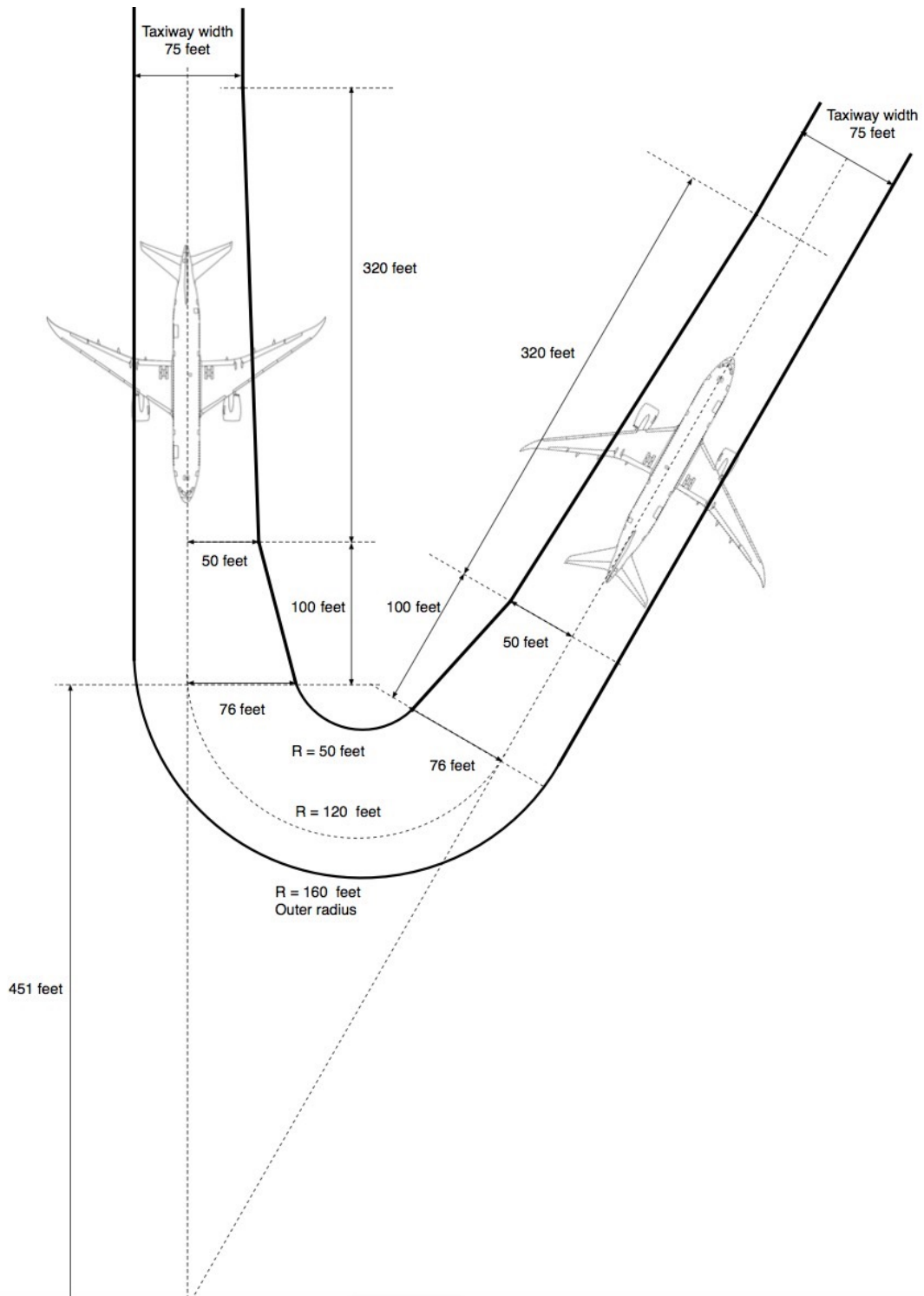


Figure 2.2 Taxiway-Taxiway Design Solution for Problem 2.

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 is designed to serve aircraft such as the Boeing 787-8.

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

First quarter of each runway end meets specification (< 0.8%)
Maximum grade change meets maximum permissible (< 1.5%)
Maximum grade is < 1.5. OK.
Distance between points of intersection (PIs) is acceptable.

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.

Using Tables 4-1 and 4-14 we find that the recommended taxiway-taxiway distances are: a) **240 feet based on TDG** criteria and b) **267 feet based on ADG** criteria. This mean the ADG criteria is adopted here as its offers more flexibility.

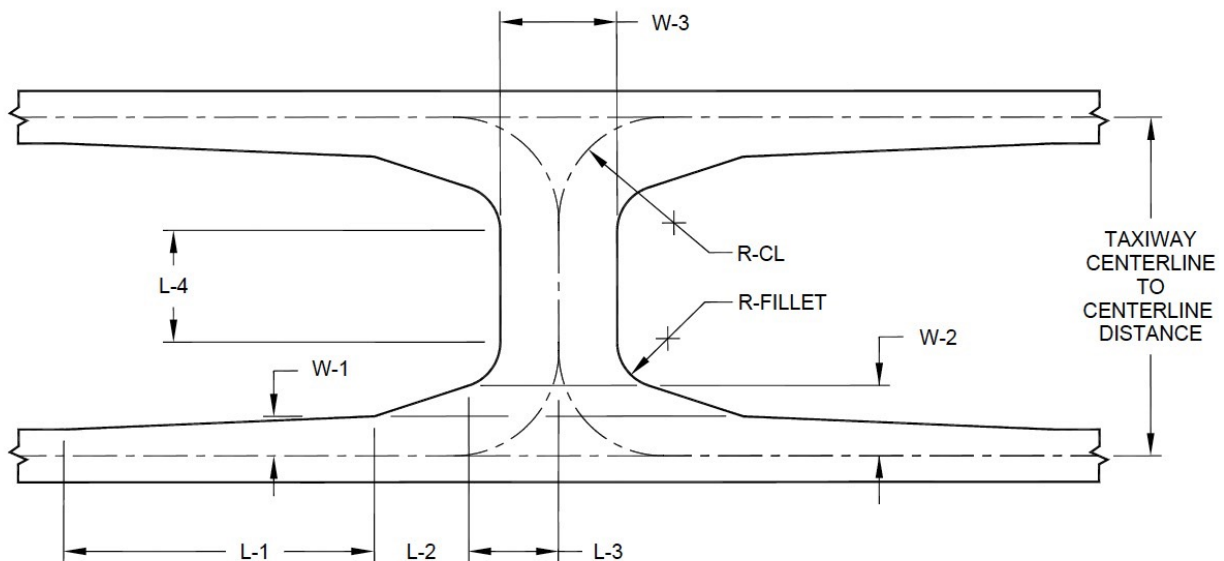


Figure 4. General Layout of a Crossover Taxiway (source: FAA AC 150/5300-13A Figure 4-16).

The general dimensions for the design are shown in the table below. These are reproduced from Table 4-15 in the FAA Advisory Circular. The distance from taxiway to taxiway is 267 feet.

Dimension	feet
L-1	347
L-2	90
L-3	103
L-4	27
W1	54
W2	86
W3	141
W0	37.5
R centerline	120
R fillet	50