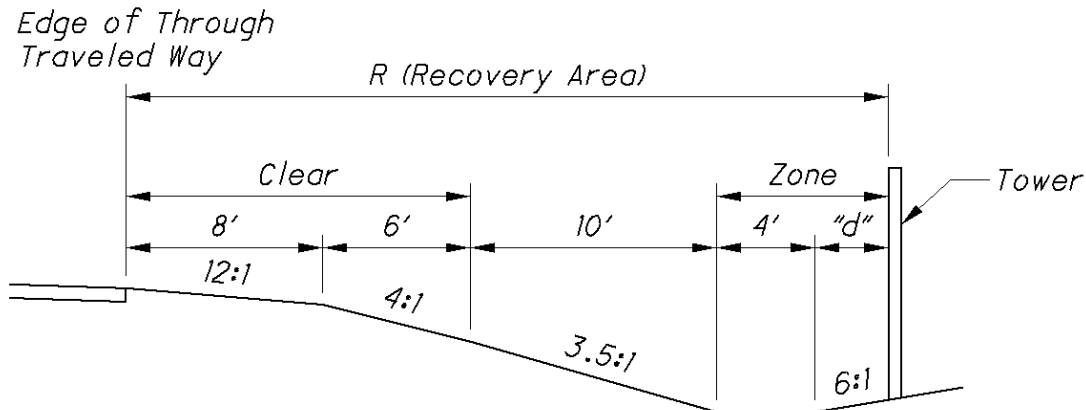


SAMPLE CALCULATIONS

Ex. 600-1

Clear Zone Measurement Using
Slope Averaging (Traversable Ditch)

Problem 1: Compute the safe distance from the edge of traveled way to locate a tower for lighting. The project has a design speed of 55 mph, a design year traffic volume of 3,400 ADT, and the following cross section in the area where the tower is to be located:



Solution 1: **Step 1** - Check the foreslope from the edge of traveled way to the backslope to determine if all intermediate foreslopes are either recoverable or non-recoverable. (See **Figure 600-2**).

Since the foreslope has intermediate slopes that are recoverable (12:1 & 4:1) and non-recoverable (3.5:1), the clear zone may extend into the backslope if necessary.

Step 2 - Determine the weighted average of the foreslope. For sections flatter than or equal to 10:1, use a 10:1 slope. (The 12:1 shoulder is typically ignored; however, for this example it is included for illustrative purposes.) Decimal results of 0.5 or greater should be rounded up to the next whole numbered slope while decimal results less than 0.5 should be rounded down to the next whole numbered slope.

First, multiply the width of each slope by the rate of the slope to obtain the weighted average rise for the foreslope. Include half of the ditch bottom in the foreslope.

$$8' (1/10) + 6' (1/4) + (0^*) + 4'/2 (1/10) = 2.5'$$

*Since the 3.5:1 foreslope is non-recoverable, it is not included.

SAMPLE CALCULATIONS

Ex. 600-1

Clear Zone Measurement Using
Slope Averaging (Traversable Ditch)

(continued)

Next, add the width of each foreslope used above.

$$8' + 6' + 4'/2 = 16'$$

Then, divide the total recoverable width by the weighted average rise to obtain the weighted average of the foreslopes.

$$16' / 2.5' = 6.4 \text{ (Rounded to 6:1 slope)}$$

Now, use **Figure 600-1** (for 6:1 foreslopes, 55 mph Design Speed and 1,501 < ADT < 6,000) to determine that the required clear zone distance is 21 feet.

Since the required clear zone is 21 feet and only 16 feet of recoverable clear zone exists, additional width must be considered from the backslope.

Step 3 - Determine if the ditch section is traversable.

Using **Figure 307-11**, a ditch with a 3.5:1 foreslope and 6:1 backslope is traversable.

If a non-traversable ditch section had been provided then the designer would have to consider other site conditions to determine whether or not the ditch should be used within the clear zone or if guardrail should be installed. (Ex. 3:1 foreslope)

Step 4 - Determine the clear zone using the back slope.

Determine how much of the backslope should be included in the clear zone.

$$\text{“d”} = 21' - 8' - 6' - 4' = 3'$$

Therefore, the clear zone must extend 3 feet into the backslope.

The “Recovery Area” includes the clear zone width plus any intermediate widths where the slopes are traversable, but not recoverable.