Design Loads
Seismic
Example 1

Determine SDS, SD1, and Seismic Design Category for the following building:
- Children's Hospital located at 100 Mario Capecchi Drive, SLC, UT 84113
- Soils Report shows
    - Site Class D
    - Ss = 1.281
    - S1 = 0.474

STEP #1: DETERMINE RISK CATEGORY

    HOSPITAL $\longrightarrow$ RISK CATEGORY $\underline{IV}$

STEP #2: DETERMINE SHORT-PERIOD SITE COEFFICIENT, F_a

    USE TABLE 11.4-1
    SITE CLASS D
    $S_S = 1.281$

    INTERPOLATE TO FIND F_a:

        $S_{S_1} = 1.25$ $F_{a_1} = 1.0$

        $S_{S_2} = 1.5$

                   $F_{a_2} = 1.0$

          $\therefore F_a = 1.0$

STEP #3: DETERMINE S_{MS}

    EQUATION 11.4-1 $\longrightarrow$ $S_{MS} = F_a S_S$

                            $= 1.0(1.281)$

STEP #4: DETERMINE F_v $= 1.281$ $\underline{S_{MS} = 1.281}$
    USE TABLE 11.4-2
    SITE CLASS D
    $S_1 = 0.474$

    INTERPOLATE TO FIND F_v
        $S_{1_1} = 0.4$ $F_{v_1} = 1.9$

        $S_{1_2} = 0.5$ $F_{v_2} = 1.8$

$$F_v = F_{v_1} + \left[\left(\frac{S_1 - S_{1_1}}{S_{1_2} - S_{1_1}} \right) (F_{v_2} - F_{v_1}) \right]$$

$$= 1.9 + \left[\left(\frac{0.474 - 0.4}{0.5 - 0.4} \right) (1.8 - 1.9) \right]$$

    $= 1.826$ $\underline{F_v = 1.826}$

STEP #5: DETERMINE S_{M1}
    EQUATION 11.4-2 $\longrightarrow$ $S_{M1} = F_v S_1$

$$= 1.826(0.474)$$
$$= 0.866$$

$$\underline{S_{M1} = 0.866}$$

STEP #6 : DETERMINE S_{DS} & S_{D1}

EQUATION 11.4-3 → $S_{DS} = \frac{2}{3} S_{MS}$

$$= \frac{2}{3}(1.281)$$

$$= 0.854$$

EQUATION 11.4-4 → $S_{D1} = \frac{2}{3} S_{M1}$

$$= \frac{2}{3}(0.866)$$

$$= 0.577$$

$$\boxed{\begin{array}{l} S_{DS} = 0.854 \\ S_{D1} = 0.577 \end{array}}$$

STEP #7 : DETERMINE SEISMIC DESIGN CATEGORY

SECTION 11.6

TABLE 11.6-1 ⟶ S_{DS} → D

TABLE 11.6-2 ⟶ S_{D1} → D

∴ $\boxed{\text{SEISMIC DESIGN CATEGORY D}}$