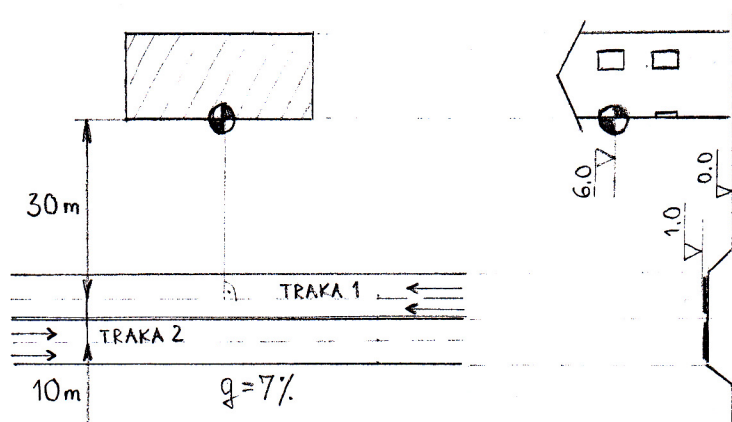


1. Izračunati merodavni nivo buke drumskog saobraćaja na poziciji stambenog objekta u toku dnevnog i noćnog perioda merenja. Stambeni objekat je udaljen 30 [m] od dvosmerne saobraćajnice nagiba 7%. Širina saobraćajnih traka u jednom pravcu iznosi 10 [m]. Visina prijemne tačke iznosi 6 [m], a visina emisione tačke 1 [m]. Karakteristike saobraćajnog toka date su u tabeli za oba smera. Maksimalno dozvoljena brzina automobila iznosi 100 [km/h], a kamiona 80 [km/h].



	TRAKA 1		TRAKA 2	
	dan	noć	dan	noć
H [m]	6,0			
h _e [m]	1,0			
s [m]	30		40	
N [voz/h]	500	200	500	200
p [%]	10	20	10	20

RLS 90 :

$$L_m = 10 \log [10^{0,1 L_{m1}} + 10^{0,1 L_{m2}}]$$

$$L_{m1,2} = L_0 + C_D + C_G + C_B^{\nearrow 0} + C_Z^{\nearrow 0} + C_R^{\nearrow 0}$$

$$1) L_0 = 10 \log [10^{0,1 L_{0,A}} + 10^{0,1 L_{0,K}}] + C_{NP} + C_{PP}^{\nearrow 0}$$

$$L_{0,A} = 27,7 + 10 \log N_A + 10 \log [1 + (0,02 \cdot v_A)^3]$$

$$L_{0,K} = 23,1 + 10 \log N_K + 12,5 \log v_K$$

$$N_A = N \frac{100-p}{100} ; N_{A1,2}^{\text{dan}} = 450 [\text{aut/h}], N_{A1,2}^{\text{noć}} = 160 [\text{aut/h}]$$

$$N_K = N \frac{p}{100} ; N_{K1,2}^{\text{dan}} = 50 [\text{kam/h}], N_{K1,2}^{\text{noć}} = 40 [\text{kam/h}]$$

$$\left. \begin{aligned} L_{0,A1,2}^{\text{dan}} &= 27,7 + 10 \log 450 + 10 \log [1 + (0,02 \cdot 100)^3] = 63,77 [\text{dB(A)}] \\ L_{0,K1,2}^{\text{dan}} &= 23,1 + 10 \log 50 + 12,5 \log 80 = 63,88 [\text{dB(A)}] \end{aligned} \right\}$$

$$\left. \begin{aligned} L_{0,A1,2}^{\text{noć}} &= 27,7 + 10 \log 160 + 10 \log [1 + (0,02 \cdot 100)^3] = 59,28 [\text{dB(A)}] \\ L_{0,K1,2}^{\text{noć}} &= 23,1 + 10 \log 40 + 12,5 \log 80 = 62,91 [\text{dB(A)}] \end{aligned} \right\}$$

$$C_{NP} = 0,6 \cdot |g| - 3$$

$$C_{NP} = 0,6 \cdot 7 - 3 ; C_{NP} = 1,2 \text{ [dB(A)]}$$

$$L_{0,2}^{dan} = 10 \log [10^{0,1 L_{0,A,2}^{dan}} + 10^{0,1 L_{0,K,2}^{dan}}] + C_{NP} = 10 \log [10^{6,377} + 10^{6,388}] + 1,2 = 68,04 \text{ [dB(A)]}$$

$$L_{0,2}^{noc} = 10 \log [10^{0,1 L_{0,A,2}^{noc}} + 10^{0,1 L_{0,K,2}^{noc}}] + C_{NP} = 10 \log [10^{5,928} + 10^{6,291}] + 1,2 = 65,67 \text{ [dB(A)]}$$

$$2) C_D = 15,8 - 10 \log S_{\perp} - 0,0142 \cdot S_{\perp}^{0,9}$$

$$S_{\perp} = \sqrt{6^2 + (H-h_0)^2} ; S_{\perp 1} = \sqrt{S_1^2 + (H-h_0)^2} = \sqrt{30^2 + (6-1)^2} = 30,41 \text{ [m]}$$

$$S_{\perp 2} = \sqrt{S_2^2 + (H-h_0)^2} = \sqrt{40^2 + (6-1)^2} = 40,31 \text{ [m]}$$

$$C_{D1} = 15,8 - 10 \log 30,41 - 0,0142 \cdot 30,41^{0,9} = 0,67 \text{ [dB(A)]}$$

$$C_{D2} = 15,8 - 10 \log 40,31 - 0,0142 \cdot 40,31^{0,9} = -0,65 \text{ [dB(A)]}$$

$$3) C_G = -4,8 \cdot 10^{-\frac{1}{2,3} \left[\frac{h_m}{S_{\perp}} \left(8,5 + \frac{100}{S_{\perp}} \right) \right]^{1,3}}$$

$$h_m = \frac{H+h_0}{2} = 3,5 \text{ [m]}$$

$$C_{G1} = -4,8 \cdot 10^{-\frac{1}{2,3} \left[\frac{3,5}{30,41} \left(8,5 + \frac{100}{30,41} \right) \right]^{1,3}} = -1,08 \text{ [dB(A)]}$$

$$C_{G2} = -4,8 \cdot 10^{-\frac{1}{2,3} \left[\frac{3,5}{40,31} \left(8,5 + \frac{100}{40,31} \right) \right]^{1,3}} = -1,87 \text{ [dB(A)]}$$

$$L_{m1}^{dan} = L_{01}^{dan} + C_{D1} + C_{G1} = 68,04 + 0,67 - 1,08 = 67,63 \text{ [dB(A)]} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\}$$

$$L_{m2}^{dan} = L_{02}^{dan} + C_{D2} + C_{G2} = 68,04 - 0,65 - 1,87 = 65,52 \text{ [dB(A)]} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\}$$

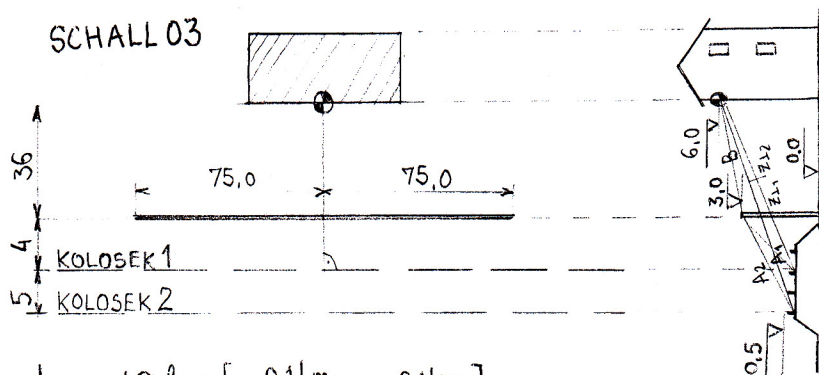
$$L_m^{dan} = 10 \log [10^{0,1 L_{m1}^{dan}} + 10^{0,1 L_{m2}^{dan}}] = 10 \log [10^{6,763} + 10^{6,552}] = \underline{69,71 \text{ [dB(A)]}}$$

$$L_{m1}^{noc} = L_{01}^{noc} + C_{D1} + C_{G1} = 65,67 + 0,67 - 1,08 = 65,26 \text{ [dB(A)]} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\}$$

$$L_{m2}^{noc} = L_{02}^{noc} + C_{D2} + C_{G2} = 65,67 - 0,65 - 1,87 = 63,15 \text{ [dB(A)]} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\}$$

$$L_m^{noc} = 10 \log [10^{0,1 L_{m1}^{noc}} + 10^{0,1 L_{m2}^{noc}}] = 10 \log [10^{6,526} + 10^{6,315}] = \underline{67,34 \text{ [dB(A)]}}$$

2. Izračunati merodavni nivo buke železničkog saobraćaja na poziciji stambenog objekta u toku noćnog perioda merenja. Stambeni objekat je od dvokolosečne pruge udaljen 40 [m]. Medusobno rastojanje koloseka iznosi 5 [m]. Visina prijemne tačke iznosi 6 [m], a emisione tačke 0,5 [m]. Karakteristike saobraćajnog toka date su u tabeli. Na rastojanju 4 [m] od bližeg koloseka postavljena je barijera visine 3 [m] i širine 150 [m].



	KOL. 1		KOL. 2	
TIP VOZA	A	B	C	B
H [m]	6			
h ₀ [m]	0,5			
s [m]	40		45	
n [voz/h]	10	6	2	9
p [%]	40	0	93,5	40
L [m]	250	350	250	350
v [km/h]	160	90	160	90

$$L_m = 10 \log [10^{0,1 L_{m1}} + 10^{0,1 L_{m2}}]$$

$$L_{m1,2} = 10 \log \left[\sum_{i=1}^k 10^{0,1 L_{0,E,i}} \right] + C_{TP}^0 + C_D^0 + C_G^0 + C_B^0 + C_Z^0 + S + C_R^0$$

$$1) C_D = 15,8 - 10 \log S_{\perp} - 0,0142 \cdot S_{\perp}^{0,9}$$

$$S_{\perp} = \sqrt{s^2 + (H - h_0)^2}; \quad S_{\perp 1} = \sqrt{s_1^2 + (H - h_0)^2} = \sqrt{40^2 + 5,5^2} = 40,38 \text{ [m]}$$

$$S_{\perp 2} = \sqrt{s_2^2 + (H - h_0)^2} = \sqrt{45^2 + 5,5^2} = 45,33 \text{ [m]}$$

$$C_{D,1} = 15,8 - 10 \log 40,38 - 0,0142 \cdot 40,38^{0,9} = -0,66 \text{ [dB]}$$

$$C_{D,2} = 15,8 - 10 \log 45,33 - 0,0142 \cdot 45,33^{0,9} = -1,20 \text{ [dB]}$$

$$2) C_B = -7 \log \left[5 + \left(\frac{70 + 0,25 \cdot S_{\perp}}{1 + 0,25 \cdot Z_{\perp}} \right) \cdot Z_{\perp} \cdot K_{W_{\perp}}^2 \right]$$

$$Z_{\perp} = A_{\perp} + B_{\perp} + C_{\perp}^0 - S_{\perp}$$

$$K_{W_{\perp}} = e^{-\frac{1}{2000} \sqrt{\frac{A_{\perp} \cdot B_{\perp} \cdot S_{\perp}}{2 \cdot Z_{\perp}}}}$$

$$A_{\perp 1} = \sqrt{4^2 + (3 - 0,5)^2} = 4,72 \text{ [m]}$$

$$B_{\perp} = \sqrt{(40 - 4)^2 + (6 - 3)^2} = 36,12 \text{ [m]}$$

$$Z_{\perp 1} = A_{\perp 1} + B_{\perp} - S_{\perp 1} = 4,72 + 36,12 - 40,38 = 0,46 \text{ [m]}$$

$$K_{W_{\perp 1}} = e^{-\frac{1}{2000} \sqrt{\frac{4,72 \cdot 36,12 \cdot 40,38}{2 \cdot 0,46}}} = 0,96$$

$$C_{B,1} = -7 \log \left[5 + \left(\frac{70 + 0,25 \cdot 40,38}{1 + 0,25 \cdot 0,46} \right) \cdot 0,46 \cdot 0,96^2 \right] = -10,85 \text{ [dB]}$$

$$A_{\perp 2} = \sqrt{(4+5)^2 + (6-3)^2} = 9,49 \text{ [m]}$$

$$B_{\perp} = 36,12 \text{ [m]}$$

$$Z_{\perp 2} = A_{\perp 2} + B_{\perp} - S_{\perp 2} = 9,49 + 36,12 - 45,33 = 0,28 \text{ [m]}$$

$$K_{W\perp 2} = e^{-\frac{1}{2000} \sqrt{\frac{9,49 \cdot 36,12 \cdot 45,33}{2 \cdot 0,28}}} = 0,92$$

$$C_{B,2} = -7 \log \left[5 + \left(\frac{70 + 0,25 \cdot 45,33}{1 + 0,25 \cdot 0,28} \right) \cdot 0,28 \cdot 0,92^2 \right] = -9,53 \text{ [dB]}$$

$$3) S = -5 \text{ [dB]}$$

$$4) L_{0,i} = 51 + C_{TV}^0 + C_P + C_N + C_L + C_v$$

$$4.1) C_P = 10 \log (5 - 0,04 p) ; C_{P,A} = 10 \log (5 - 0,04 \cdot 40) = 5,31 \text{ [dB]}$$

$$C_{P,B} = 10 \log (5 - 0,04 \cdot 0) = 6,99 \text{ [dB]}$$

$$C_{P,C} = 10 \log (5 - 0,04 \cdot 93,5) = 1 \text{ [dB]}$$

$$4.2) C_N = 10 \log N = 10 \log \frac{n}{8} ; C_{N,1,A} = 0,97 \text{ [dB]}$$

$$C_{N,1,B} = -1,25 \text{ [dB]}$$

$$C_{N,2,C} = -6,02 \text{ [dB]}$$

$$C_{N,2,A} = 0,51 \text{ [dB]}$$

$$C_{N,2,B} = -2,04 \text{ [dB]}$$

$$4.3) C_L = 10 \log (0,01 \cdot L) ;$$

$$C_{L,1,A} = 10 \log 2,5 = 3,98 \text{ [dB]}$$

$$C_{L,1,B} = 10 \log 3,5 = 5,44 \text{ [dB]}$$

$$C_{L,2,C} = 10 \log 2,5 = 3,98 \text{ [dB]}$$

$$C_{L,2,A} = 10 \log 2,5 = 3,98 \text{ [dB]}$$

$$C_{L,2,B} = 10 \log 3,5 = 5,44 \text{ [dB]}$$

$$4.4) C_v = 20 \log (0,01 \cdot v) ;$$

$$C_{v,1,A} = 20 \log 1,6 = 4,08 \text{ [dB]}$$

$$C_{v,1,B} = 20 \log 0,9 = -0,91 \text{ [dB]}$$

$$C_{v,2,C} = 20 \log 1,6 = 4,08 \text{ [dB]}$$

$$C_{v,2,A} = 20 \log 1,6 = 4,08 \text{ [dB]}$$

$$C_{v,2,B} = 20 \log 0,9 = -0,91 \text{ [dB]}$$

$$\left. \begin{aligned} L_{0,A,1} &= 51 + 5,31 + 0,97 + 3,98 + 4,08 = 65,34 \text{ [dB]} \\ L_{0,B,1} &= 51 + 6,99 - 1,25 + 5,44 - 0,91 = 61,27 \text{ [dB]} \end{aligned} \right\} \Rightarrow L_{0,1}$$

$$\left. \begin{aligned} L_{0,C,2} &= 51 + 1 - 6,02 + 3,98 + 4,08 = 54,04 \text{ [dB]} \\ L_{0,A,2} &= 51 + 5,31 + 0,51 + 3,98 + 4,08 = 64,88 \text{ [dB]} \\ L_{0,B,2} &= 51 + 6,99 - 2,04 + 5,44 - 0,91 = 60,48 \text{ [dB]} \end{aligned} \right\} \Rightarrow L_{0,2}$$

$$L_{0,1} = 10 \log [10^{0,1 L_{0,A,1}} + 10^{0,1 L_{0,B,1}}] = 10 \log [10^{6,534} + 10^{6,127}] = 66,77 \text{ [dB]}$$

$$L_{0,2} = 10 \log [10^{0,1 L_{0,C,2}} + 10^{0,1 L_{0,A,2}} + 10^{0,1 L_{0,B,2}}] = 10 \log [10^{5,404} + 10^{6,488} + 10^{6,048}] = 66,48 \text{ [dB]}$$

$$\left. \begin{aligned} L_{m,1} &= L_{0,1} + C_{D,1} + C_{B,1} + S = 66,77 - 0,66 - 10,85 - 5 = 50,26 \text{ [dB]} \\ L_{m,2} &= L_{0,2} + C_{D,2} + C_{B,2} + S = 66,48 - 1,2 - 9,53 - 5 = 50,75 \text{ [dB]} \end{aligned} \right\} \Rightarrow L_m$$

$$L_m = 10 \log [10^{5,026} + 10^{5,075}] = \underline{\underline{53,52 \text{ [dB]}}}$$