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CONCRETE SLEEPERS SYDNEY

Maximum wall height is 2200mm for 80mm thick sleeper and 2000mm length

Sleeper Length =		2000	mm
Sleeper Width =		200	mm
Height of Wall =		2200	mm
Thickness of Sleeper =		80	mm
d=		44	mm
Number of bars=		2	
Steel Bras type		N12	

Parameters

Compressive strength of concrete	f'c =	65	Mpa.
	Ec =	37892.61142	Mpa.
Yield strength of steel Reos (N Grade)	fsy =	500	Mpa.
Elastic Modulus steel	Es =	200000	Mpa.
b	b=	200	mm
Friction Angle of Soil	Ø=	26.1°	
Ka=tan(45-Ø/2)²	Ka=	0.39	
Bulk Unit Weight of Backfill Soil	Ys=	18	KN/m³
Surcharge	Q=	5	Kpa.
ηo=	KaQ=	1.95	Kpa.
η1=	KaYsH-KaYs(b/2)	15.59844	Kpa.
Wo=		0.39	KN/m
W1=		3.119688	KN/m

Design Actions

W*=1.25G+1.5Q	1.25W1 + 1.5Wo	4.48461	KN/m
M*=W*L²/8	M*=	2.242305	KN.m
V*=W*L/2	V*=	4.48461	KN

FLEXURAL STRENGTH OF SLEEPER

CAPACITY REDUCTION FACTOR BENDING	AS 3600 (TABLE2.2.2)	Ø=0.8		0.8
$A_{st,\ req}$=	$f'_c \cdot b/1.2f_{sy} \cdot (d-\sqrt{(d^2-2.4M^*/(Ø_b f'_c \cdot b)}$		238.3104485	mm²
Number of Bars		2		
use N12				
Area of 1 bar	πr^2		113	mm²
area of total 2 bars			226	mm²
$ØMu=Øf_{sy}A_{st}d(1-(0.6A_{st}f_{sy}/(bdf'_c))$		0.197552448	0.802447552 3.191815385	
DUCTILITY CHECK	Ku=(Ast x fsy)/(0.85 x 0.65 x b x d x f'c)		0.357560991 <0.4	it is ok
	M* < Øm u, Therefore okay in bending			

Shear Strength of Sleeper

Capacity reduction factor	Ø	0.7	
AS3600-Clause 8.2.4.1	K_v	0.1	
$V_{uc}=K_v b_v d_v \cdot sqrt(f_c)$		7.094786819	
fV_{uc}		4.966350773	
	V* < fVuc		
	V* < Øvuc , Therefore no shear reos required.		

Maximum wall height is 1600mm for 80mm thick sleeper and 2400mm length

Sleeper Length =		2400	mm
Sleeper Width =		200	mm
Height of Wall =		1600	mm
Thickness of Sleeper =		80	mm
d=		44	mm
Number of bars=		2	
Steel Bras type		N12	

Parameters

Compressive strength of concrete	f'c =		65	Mpa.
	Ec =		37892.61142	Mpa.
Yield strength of steel Reos (N Grade)	fsy =		500	Mpa.
Elastic Modulus steel	Es =		200000	Mpa.
b	b=		200	mm
Friction Angle of Soil	Ø=	26.1°		
Ka=tan(45-Ø/2)²	Ka=		0.39	
Bulk Unit Weight of Backfill Soil	Ɣs=		18	KN/m³
Surcharge	Q=		5	Kpa.
ηo=	KaQ=		1.95	Kpa.
η1=	KaƔsH-KaƔs(b/2)		11.34432	Kpa.
Wo=			0.39	KN/m
W1=			2.268864	KN/m

Design Actions

W*=1.25G+1.5Q	1.25W1 + 1.5Wo		3.42108	KN/m
M*=W*L²/8		M*=	2.4631776	KN.m
V*=W*L/2		V*=	4.105296	KN

FLEXURAL STRENGTH OF SLEEPER

CAPACITY REDUCTION FACTOR BENDING	AS 3600 (TABLE2.2.2)	Ø=0.8		0.8
$A_{st,\ req}$=	$f'_c*b/1.2f_{sy}*(d-\sqrt{(d^2-2.4M^*/(Øbf'_c*b)})$		238.3104517	mm²
Number of Bars		2		
use N12				
Area of 1 bar	πr²		113	mm²
area of total 2 bars			226	mm²
		0.197552448	0.802447552	
$ØMu=Øf_{sy}A_{st}d(1-(0.6A_{st}f_{sy}/(bdf'_c))$			3.191815385	
DUCTILITY CHECK	Ku=(Ast x fsy)/(0.85 x 0.65 x b x d x f'c)		0.357560991	<0.4 it is ok
	M* < Ømu, Therefore okay in bending			

Shear Strength of Sleeper

Capacity reduction factor	Ø		0.7
AS3600-Clause 8.2.4.1	Kv		0.1
$V_{uc}=K_v b_v d_v*\sqrt{f_c}$			7.094786819
fV_{uc}			4.966350773
	V* < fVuc		
	V* < Øvuc , Therefore no shear reos required.		