Design of Bearing Pad

Given

	Max. Dead Load	=		1025	kN
	f_{ck}	=		30	
	Thickness	=		75	mm
	Live load	=	365+75	440	kN
	Horizontal force due to live load	=		80	kN
	Assumed Size of bearing pad				
	Breadth of pad(bp)	=		550	mm
	Length of pad(Lp)	=		950	mm
	Side cover(Sc)	=		6	mm
	Thickness of steel	=		10	mm
Step 1-					
	Thickness should be between		b/10 to b/5	55 to 110	
					OK
Step 2-	Live load	=		440	kN
	Loaded area	=	(bp*Lp)-(2(bp+Lp)*Sc)	504500	mm^2
	Total load (Nmax)	=	DL+LL	1465	kN
		~		1500	
	Nmin	=		1025	kN
	A1			4	
	A2			2	
	A1/A2			2	
Step 3-	Grade Provided M30 :-				
	Allowable contact pressure	=	.25*fck*(A1/A2)^2	10.61	MPa
	Effective area of bearing required	=		141376	mm^2
	σ_m	=	Total load/loaded area	2.973	MPa
Step 4-	Thickness of individual Elastomer layer				
	hi	=		15	mm
	No.	=		5	
	Thickness of steel Laminates	=		10	mm
	Overall thickness of bearing	=		75	mm
	Side cover	=		6	mm
	Total thickness of elastomer (t)	=		55	mm
	Shear modules assumed\	=		1	N/mm^2
	Shear strain due to creep, shrinkage, temperature (L)	=		0.0005	
	?			41000	
	Shear strain per bearing due to creep, shrinkage, temperature	=	(L*K)/2t	0.186	
	Shear strain due to longitudinal force	=	?	0.1586	
	Shear strain due to translation	=	B/loaded area	0.345	Safe
Step 5-	Calculation of rotation,				
	σmin	=	$.5\sigma_m*h_i/bs^2$		
	N			538	?
	O			938	?
				15	
(I)	Shape factor (s)	=	Loaded area/$(2(N+O)h_i)$	11.393	safe
(ii)	Assume, σ_m,max.	=		10	MPa

	αb_i , max.	=	(.5*(σm,max)*hi)/(N*s^2)	0.00107	radians
	P			2.93	
	β	=	P/10	0.293	MPa
	Permissible rotation	=	β*n*αbi	0.00157	MPa
Step 6-	Friction				
	Shear strain(Z)	=		0.345	MPa
	Check:-				
			$0.2+0.1*\sigma_m$	0.4973	safe
	Check		where 2MPa<σm<10MPa		ok
Step 7-	Total Shear Stress				
	Shear stress due to compression(X)	=	(1.5*σm)/s	0.3914	MPa
	Shear Stess due to Horizonal deformation(Y)	=	$.5(b/h_i)^2 *\alpha b_i$	0.688	
	Shear Stess due to Horizonal rotation	=	X+Y+Z	1.4244	MPa
					safe