9(b) Employ N & mm units – hence stresses in MPa.
First select size then deduce corresponding A and I.

(i) size ≡ A , so $I = 0.15A^2$

(ii) size ≡ wall thickness, t
Let D = outside diameter = τt
where τ is constant = 15
then $A = \frac{\pi}{4}[D^2 - (D-2t)^2] = \pi(\tau-1)t^2 = 14\pi t^2$
$I = \frac{\pi}{64}[D^4 - (D-2t)^4] = \frac{\pi}{8}(\tau-1)(\tau^2-2\tau+2)t^4$
$= 132.9\frac{\pi}{4}t^4$

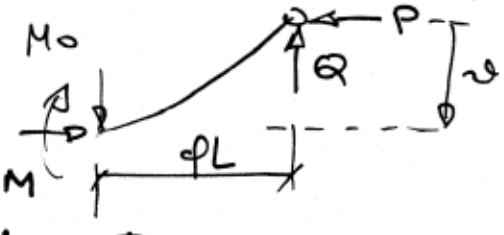
(iii) size ≡ tabulated dimensions
A and I (note $\bar{I}$) from tables.

Then proceed as follows:
$\sigma_c = E(\pi/\rho)^2 = E(\pi/L)^2 I/A$
$= 207\times10^3(\pi/2400)^2 I/A$ MPa.

Hence solve (3), with $S = 250$, $\sigma_\eta = 60$ MPa, for $\bar{\sigma}$.
So $n = A\bar{\sigma}/F$ (where $F = 3\times10^5$ N) and compare n with specified value of 2.

	A mm²	I mm⁴	σ_c MPa	$\bar{\sigma}$ MPa	n	
(i)						
	4000	2.400×10^6	213	138	1.84	
	4200	2.646 "	223	143	2.00	⇦
	4400	2.904 "	234	148	2.16	
(ii)						
t = 7	2155	2.600 "	428	198	1.42	
8	2814	4.436 "	559	213	2.00	⇦
9	3562	7.106 "	707	222	2.64	
(iii)						
229×76	3320	1.587 "	170	117	1.29	
89	4173	2.850 "	242	151	2.10	⇦
254×76	3603	1.626 "	160	112	1.34	
89	4542	3.024 "	236	148	2.25	

10. Take RH free body to eliminate central Mo.



$M = Pv + Q.qL$
& $= -EI\,d^2v/dx^2$
$= -EI/L^2 \cdot d^2v/d\phi^2$

So following analysis steps of notes:-
$d^2v/d\phi^2 + \pi^2\eta\, v = -\frac{QL}{P}.\pi^2\eta.\phi$
which has solution:
$v = A\sin\pi\sqrt{\eta}.\phi + B\cos\pi\sqrt{\eta}.\phi - \frac{QL}{P}\phi$ cont'd