Telecentric Petzval Lens

$f_1 = f_2$

$t = 75$ mm

$f = 100$ mm

Object: 250 mm to the left of L1

$h = 20$ mm

First, design the Petzval Lens (P' between the elements)

$$\phi = \frac{1}{f} = .01/\text{mm} = \phi_1 + \phi_2 - \phi_1 \phi_2 t$$

$$\phi_1 = \phi_2 \qquad t = 75$$

$$.01/\text{mm} = 2\phi_1 - 75\phi_1^2$$

$$\phi_1 = .02/\text{mm} \quad \text{or} \quad .00667/\text{mm}$$

$$f_1 = 50 \text{ mm} \quad \text{or} \quad 150 \text{ mm}$$

but f_1 must be greater than t for a Petzval

$$f_1 = f_2 = 150 \text{ mm}$$

Locate P: $d = \frac{\phi_2}{\phi} t = 50$ mm (from Lens 1)

Locate F: $FFD = f_F + d = -f + d$

$FFD = -50$ mm (from Lens 1)

To be telecentric in image space the stop is located at F → 50 mm to the left of the first element.

For aperture sizes, trace marginal and chief rays

	Object	Stop	L1	L2	Image
$-\phi$		–	-.006667	-.006667	
t/n	200	50	75	100	
y	0	10	12.5	10.0	0
nu					
u	.05	.05	-.0333	-.100	
$\bar{y}$	20	0	-5.0	-10.0	-10.0
$n\bar{u}$					
$\bar{u}$	-.10	-.10	-.0666	0	

Note: - $\bar{u}$ in image space is zero → telecentric
- image size/location not required.

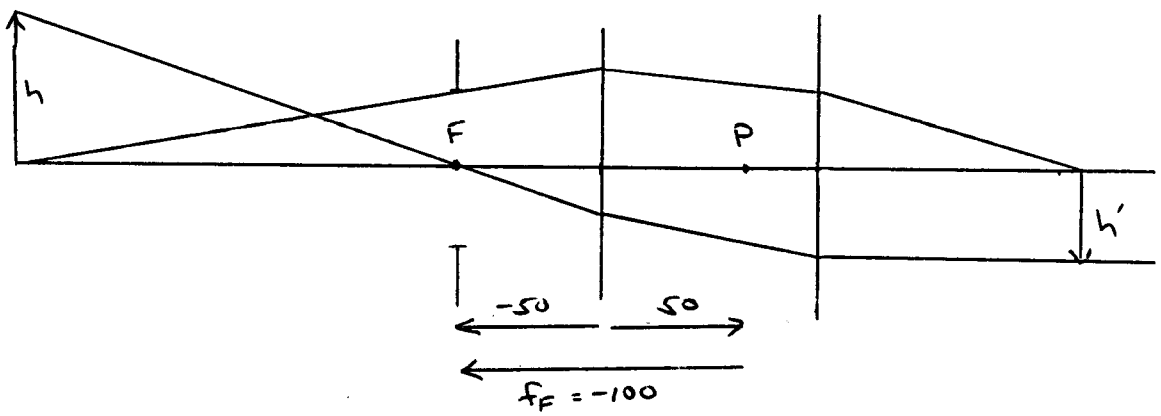
No vignetting $a_i \geq |y_i| + |\bar{y}_i|$

L1: $a_1 \geq |12.5| + |-5.0| = 17.5$ mm

$D1 = 35$ mm

L2: $a_2 \geq |10.0| + |-10.0| = 20.0$ mm

$D2 = 40$ mm



Stop	L1	L2
D=20	$f_1 = 150$	$f_2 = 150$
	D1 = 35	D2 = 40