Fresnel's Distance $(D = Z_F)$

The minimum distance a beam of light can travel before its deviation from straight line path due to diffraction becomes equal to the width of the slit, is known as 'Fresnel's Distance'.

    i.e, for $(D = Z_F)$ or $y_1' = a$

                         or $\lambda Z_F/d = a$

                         or $\mathbf{Z_F = a^2/\lambda}$

Spreading of light due to diffraction may cause significant deviation from the results we get in Ray optics (because ray optics works of the presumption that light travels in straight line in a given medium). So, for results of ray optics to be valid it is necessary that the distances in consideration should be lesser than or equal to 'Fresnel's Distance'.

'Fresnel's Distance' is considered as the distance for which the ray optics is a good approximation.