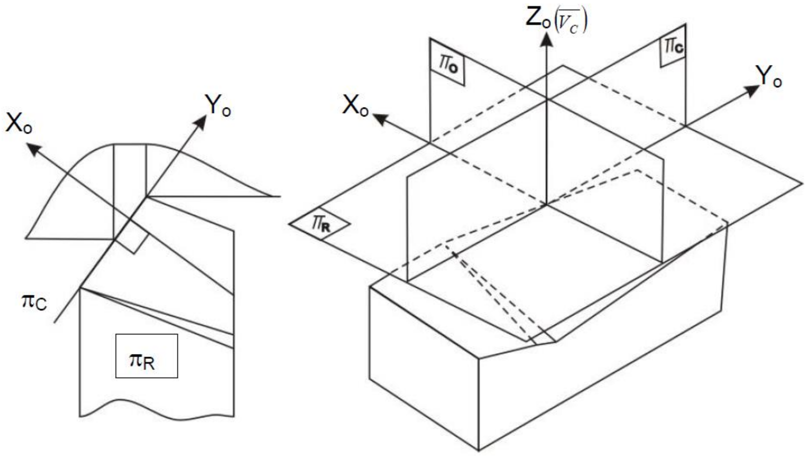
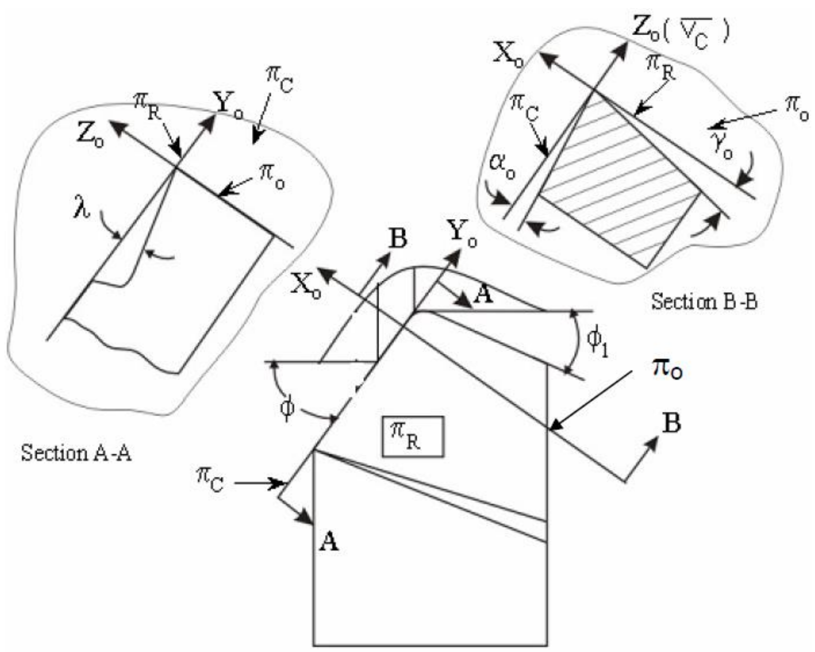
Design of Tool Geometry

2.2.2.2 Designation of tool geometry in the orthogonal rake system(ORS)

This system is also known as ISO – old. The planes of reference and the co-ordinate axes used for expressing the tool angles in ORS are: πR - πC - πO and Xo - Yo - Zo which are taken in respect of the tool configuration as indicated in Fig



where, πR = Refernce plane perpendicular to the cutting velocity vector, VC πC = cutting plane; plane perpendicular to πR and taken along the principal cutting edge πO = Orthogonal plane; plane perpendicular to both πR and πC and the axes; Xo = along the line of intersection of πR and πO Yo = along the line of intersection of πR and πC Zo = along the velocity vector, i.e., normal to both Xo and Yo axes. The main geometrical angles used to express tool geometry in Orthogonal Rake System (ORS) and their definitions will be clear from Fig



1.Rake angle

Rake angles [Fig. 3.7] in ORS

γo = orthogonal rake: angle of inclination of the rake surface from Reference plane, πR and measured on the orthogonal plane, πo

λ = inclination angle; angle between πC from the direction of assumed longitudinal feed [πX] and measured on πC

2.clearance angle

αo = orthogonal clearance of the principal flank: angle of inclination of the principal flank from πC and measured on πo αo' = auxiliary orthogonal clearance: angle of inclination of the auxiliary flank from auxiliary cutting plane, πC' and measured on auxiliary orthogonal plane, πo

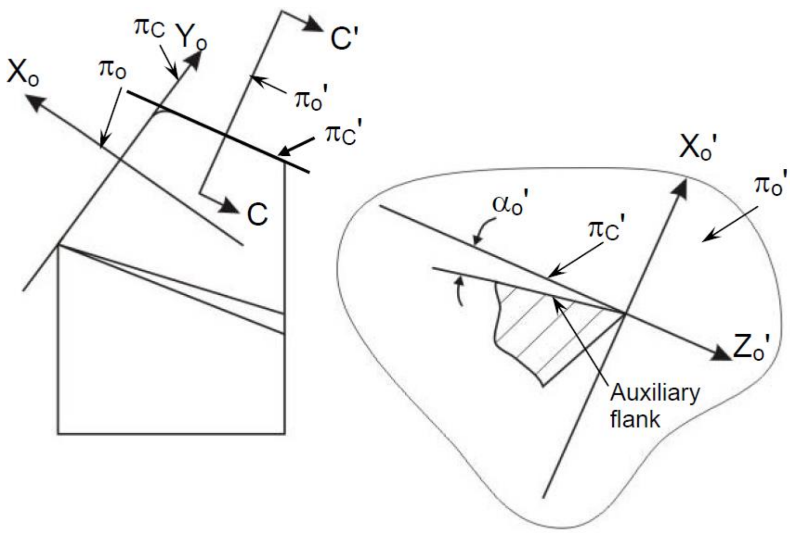
3.Cutting angles

fi= principal cutting edge angle: angle between πC and the direction of assumed longitudinal feed or πX and measured on πR

φ1 = auxiliary cutting angle: angle between πC' and πX and measured on πR

4. Nose radius

r (mm) r = radius of curvature of tool tip



2.2.2.3 Designation of tool geometry in the normal rake system(NRS)

This system is also known as ISO – new. ASA system has limited advantage and use like convenience of inspection. But ORS is advantageously used for analysis and research in machining and tool performance. But ORS does not reveal the true picture of the tool geometry when the cutting edges are inclined from the reference plane, i.e., λ≠0. Besides, sharpening or re sharpening, if necessary, of the tool by grinding in ORS requires some additional calculations for correction of angles.

These two limitations of ORS are overcome by using NRS for description and use of tool geometry. The basic difference between ORS and NRS is the fact that in ORS, rake and clearance angles are visualized in the orthogonal plane, πo, whereas in NRS those angles are visualized in another plane called Normal plane, πN. The orthogonal plane, πo is simply normal to πR and πC irrespective of the inclination of the cutting edges, i.e., λ, but πN (and $\pi N'$ for auxiliary cutting edge) is always normal to the cutting edge. The differences between ORS and NRS have been depicted in Fig. The planes of reference and the coordinates used in NRS are: πRN - πC - πN and Xn – Yn – Zn where, πRN = normal reference plane πN = Normal plane: plane normal to the cutting edge and Xn = Xo Yn = cutting edge Zn = normal to Xn and Yn It is to be noted that when $\lambda = 0$, NRS and ORS become same, i.e. $\pi o \cong \pi N$, $YN \cong Yo$ and $Zn \cong Zo$

1.Rake angle

γn = normal rake: angle of inclination angle of the rake surface from πR and measured on normal plane, πN αn = normal clearance: angle of inclination of the principal flank from πC and measured on πN $\alpha n'$= auxiliary clearance angle: normal clearance of the auxiliary flank (measured on $\pi N'$ – plane normal to the auxiliary cutting edge. The cutting angles, φ and $\varphi 1$ and nose radius, r (mm) are same in ORS and NRS.