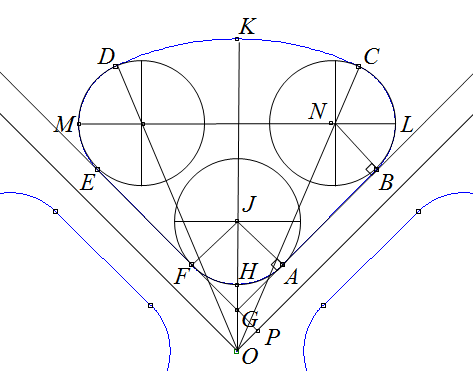
# Sector cable geometry



## Conductor geometry

The sector conductor geometry defines:

Number of sectors

Back radius

Sector depth

Sector width

Corner radius

Conductor angle

Sector angle

Relating these lengths to the diagram above:

An angle is defined as angle AJG as:

The rounding at the corner nearest the centre is defined as length between points G and H:

Without yet allowing for the thickness of the conductor insulation, the intersection point of the straight edges and the origin for the main sector arc is:

The rounded corner near the centre of the cable intersects a straight edge at points *A* and *F*, with co-ordinates:

Where the rounded corners on the sides intersect the main sector arc at points C and D, it is assumed that the tangential directions to both the arc and the rounding circle are equal. Therefore the line CN normal to the rounding circle is on the same line as CO. The distance from point O to point N, denoted as , is then:

The rounded corner has radius of curvature about point *N*, for which the co-ordinates are and such that:

The co-ordinates of points B and E are defined as and such that:

Also:

Therefore:

where

The above can be solved as a quadratic formula.

The sector width can then be defined by:

This can be checked for consistency with:

The co-ordinates of the points C and D are given by scaling the radial distances:

The arc *FHA* is drawn with angle *FJA* given by .

The rounded corners at the sides (arcs *BLC* and *DME*)are drawn with angle given by the sum of angles and where is angle *LNB* and is angle *CNL*:

Finally, the main arc *CKD* can be drawn with angle γ given by *COD*:

## Consistency checks

The calculated value of sector width can be compared to the value defined in the standards.

Secondly, the standards define the total area of the sector conductor, which can be compared to the resulting area of the sector shape constructed according to the method described here.

## Cable geometry

BS 3988:1970 defines a single conductor, but does not define how this is assembled into the cable. For some cable types, the minimum insulation thickness TI is defined in BS 7870:2001 has been found to be larger than the length between points G and P. This indicates that the origin for the sector shape of the conductor, point O, is not the centre of the cable. As a correction, the y-axis values defined above are adjusted by an offset for the insulation given by:

In practice, the cable manufacturers typically apply a thicker insulation layer so as to ensure that manufacturing tolerances do not leave the conductor with less than the minimum thickness as seen in a measured sample. Prysmian have advised that production tolerances have improved over the years and so cables in the ground are likely to have greater insulation thickness than those produced at present.

The concentric neutral is defined in terms of the number of strands and their diameter in BS 7870:2001. The cable has outer diameter and an insulating sheath of thickness . The neutral strands therefore form a ring of circles their centres at radius from the cable centre: