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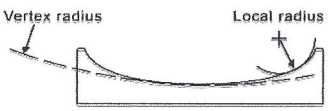
Aspheric Design Guide

Definition:
Aspheric optical surfaces are those who's shapes are not constrained to be spherical (or flat). In optical systems, the most commonly used aspheric surfaces are rotationally symmetric and defined by this equation (or a variation).

Size:
- 15 to 150mm diameter preferred
- 5 to 200mm with limitations

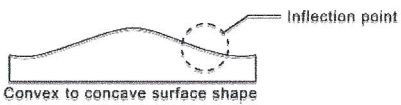
(If an aspheric shape is such that it can be processed out to a 15mm diameter, it may then be edged down to the desired final diameter)

Shape:
Departure from best fit sphere: in general, any departure from the best fit sphere up to 1 or even 2mm does not cause significant difficulty, with these considerations being more important.

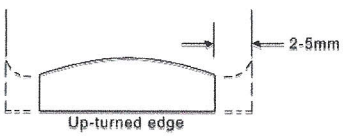


Radius:
- Minimum 10mm local radius preferred
- Concave: Minimum 20mm local radius preferred.

Convex to Concave Surface Shape: Shapes going through an inflection point make form correction more difficult.

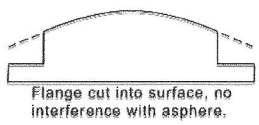


The processing diameter of an aspheric lens can be 4 – 10mm larger than the finished lens; therefore, it is desirable for the aspheric shape to be "well behaved" in this regard.

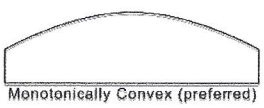


Upturned Edge: An up-turned edge can significantly interfere with processing.

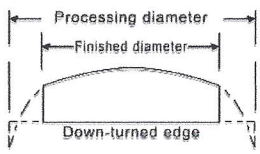
Flange Cut: Flange cut into a surface is okay (but adds a manufacturing step).



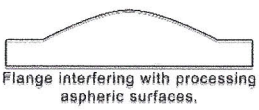
Monotonically Convex:
Maximum sag height (either convex or concave) of 22mm preferred
Monotonically convex surfaces are easiest to process.



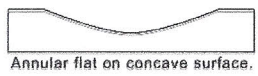
Down-Turned Edge: A down-turned edge can cause minor difficulty.



Flange Interference: Flange interfering with a convex surface is bad.



Annular Flats: Annular flats on concave surfaces are routine.



Surface Definition: In general, use an even polynomial and avoid higher order terms than necessary.

Surface Design Tips:
- Surfaces using only a conic constant are always "well behaved"
- Avoid odd polynomials (these can be processed, but require finding a best fit, even polynomial for generating)
- Avoid using the X2 term. This is redundant with base radius anyway.