CLAIMS

1. A method for designing a soft contact lens with a semi-customized back surface, comprising:

determining axial radius data for a plurality of eyes of a specific population;

fitting the axial radius data using equations that define an aspheric surface as a change in axial radius for an apical radius and a conic constant;

creating a base curve library from the fitted data wherein said base curve library comprises a plurality of base curves each comprising:

an inner region for providing vision correction;

an outer region for providing stability of the contact lens on eye; and

an intermediate region between the inner region and the outer region.

wherein a number of base curves is selected based on clinical evaluation criteria selected from the group consisting of vision, wearing comfort, fit, handling, minimization of lens wrapping, and any combination thereof and wherein a number of base curves provide a grid of regularly-spaced apical radius and conic constant values,

determining apical radius and conic constant values for an individual subject;

selecting a subset of base curves from a base curve library based on the corneal topography data for the plurality of eyes of a specific population and the individual subject's apical radius and conic constant values; and

selecting a final base curve from said subset of base curves that fits the individual subject's needs based on one or more selection criteria;

wherein the one or more selection criteria comprises minimization of lens wrapping and wherein the selecting steps only consider the candidate base curves from which the selections are made.

2. The method according to Claim 1, wherein said axial radius data for the specific population are measured or calculated from corneal topography data.

3. The method according to Claim 1, wherein said fitting comprises calculating an apical radius R_0 and a conic constant k using the following Equation:

$$R_S^2 = R_0^2 + (-k).y^2$$

wherein R_0 is the apical radius and R_S is the axial radius at a distance y from the corneal apex.

4. The method according to Claim 1, wherein said specific population comprises subjects having a high order eye aberration.

5. The method according to Claim 1, wherein said specific population comprises normal subjects having less than 0.25 μm of a high order aberration within a 5.00 mm pupil size.

6. The method according to Claim 1, wherein a number of base curves is selected to cover a percentage of the specific population.

7. The method according to Claim 6, wherein a number of base curves is selected to cover greater than 90% of the specific population.

8. The method according to Claim 1, wherein said selecting a subset of base curves comprises selecting multiple base curves in said base curve library based on apical radius and conic constant ranges that overlap with the apical radius and conic constant for the individual subject.

9. The method according to Claim 1, wherein said selecting a subset of base curves comprises applying a default pattern to said base curve library based on at least one of the individual subject's apical radius or conic constant.

10. The method according to Claim 1, wherein said selecting a subset of base curves comprises selecting a base curve from said base curve library within a minimum

distance of the individual subject's apical radius and conic constant according to the following equation (2):

$$D = \sqrt{(R_0 - R_{0B})^2 + (k - k_B)^2} \qquad (2)$$

wherein R_{0B} and k_B represent the apical radius and conic constant of the base curve, and D represents a minimum distance D that is adjusted based on an eye aberration of the individual subject.

11. The method according to Claim 1, further comprising adjusting a range of equivalent base curves across the base curve library in order to match an equivalent back surface radius within the inner region or optical zone to a subset of apical radius and conic constant values.

12. The method according to Claim 1, wherein the one or more selection criteria comprises at least one of vision, wearing comfort, fit, or handling.

13. The method according to Claim 1, wherein the individual subject has a low order eye aberration or vision defect selected from the group consisting of myopia, hyperopia, astigmatism, and presbyopia.

14. The method according to Claim 1, wherein the individual subject has a substantial high order eye aberration.

15. The method according to Claim 1, further comprising selecting an outer region using two or more different base curve libraries.

16. The method according to Claim 15, selecting the outer region based on an equivalent base curve of the eye; to balance corneal / scleral pressure; to be an extension of an inner region or optical zone to give a single conic surface; or any combination thereof.