Precision Lighting Elements
Light Guides for LEDs

General Description
3M™ Precision Lighting Elements (PLEs) are solid, rod-shaped light guides that deliver light to a target area. The precise optical surfaces that project into the core redirect light rays in a predetermined pattern.

Technical Details
- Numeric Aperture: 1 (No cladding, outside media is air)
- Thermal Expansion Coefficient: 1.26% (of Standard PU)
- Light Loss/ft: 4%
- Shore D: 20
- Tensile Strength: 50 N
- Breaking Elongation: Approx. 81%
- Scratch Resistance (4 N Erichsen): Passed

Passed Temperature Stability Tests:
- -30°C to +85°C no optical changes
- 10 cycles: 2h 95°C, 2h RT, 2h –30°C
- 7 days 90°C
- 30 days 95°C
- 7 days 55°C, 98% humidity
- 96 hours Salt Spray Test

Flammability acc. To FMVSS 302
UV-Stability 1.000 h: no visible changes

Design Parameters
PLEs can be designed according to the lighting needs of the application. Notches with optical surfaces are positioned along the length of the light guide to deliver light to the target. The notch angle and the number of notch rows control the angular distribution of the light. Specify the target area size and distance from the target for determining the PLE design.
Illumination
For those applications that illuminate a surface, the notch spacing down the length may vary as they get farther from the light source(s).

Signal
In applications where the light guide is the signaling device that one views, the notch spacing is typically constant. This constant, closely spaced notch pattern looks like an even glow to the human eye.

Viewing Angle
In all applications, we control the viewing angle by the number of notch rows around the diameter. The greater the notch coverage, the larger the viewing angle. The light emitting angle can vary from $10^\circ$ up to $100^\circ$. 
### Capabilities
Diameters can be molded from 2mm to 12mm. Maximum length is currently 1m.

Other shapes can be molded, but the control of the optics is less than with the symmetry offered by the round cross section. Subject to design review.

LED coupling and orientation features are possible, subject to design review. Single-ended or double-ended LED injection is possible.

Parts are currently made from thermosetting, flexible polyurethane designed to be extremely clear and resistant to aging.

### Prototypes
3M has a number of various prototypes available for first evaluations.

### Available References


### U.S. Patents
5,432,876; 5,845,038; 6,367,941

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