ZEISS Officelens:

Uncompromising Performance for Demanding Vision

By Darryl Meister, ABOM

Office work and computer use often place significant visual demands upon eyeglass wearers. Ordinary, general-purpose progressive lenses, however, are not designed to offer optimal visual utility in an office environment or at a computer workstation, leaving many wearers to suffer from reduced visual performance, vision problems, and even musculoskeletal discomfort. With the introduction of ZEISS Officelens, a new series of customized, free-form progressive lenses that are designed specifically for office work and computer use, eyecare professionals can now custom-tailor the perfect optical solution for presbyopes working in visually demanding environments.

Vision in the Office Environment

Office work and similar near-oriented activities place significant demands upon the visual system. In particular, sustained vision at mid-range and up-close working distances requires constant effort from the mechanisms of accommodation and convergence. Clear, comfortable vision over a wide range of viewing distances is required for extended periods of time. Many of the viewing tasks in an office or similar work environment also require a sufficiently wide field of clear mid-range and reading vision. In addition to various reading tasks, office work inevitably involves extensive computer use. In fact, according to estimates by the US Census Bureau, over 56% of Americans use a computer at work.

The incidence of computer-related vision problems has increased along with our reliance upon computers and other digital display devices in the workplace. Every year, millions of patients seek care to relieve computer-related vision problems. According to the US Occupational Safety and Health Administration, eye strain is one of the most frequent complaints among computer users. Various studies have shown that up to 75% or more of computer users may experience vision-related symptoms, including eye strain, headache, eye irritation, blur, and neck or back pain possibly associated with viewing-related postural adjustments.[1,2]

Blurred vision and slowness of focus are common symptoms associated with office work and computer use. Additionally, the ciliary and extraocular muscles of the eyes must work constantly to maintain proper focus and alignment during prolonged periods of near vision. Like repetitive strain injury, frequent eye movements combined with continual fluctuations in accommodation and convergence may eventually lead to *asthenopia* or eye strain. Tension in the musculature of the face during strenuous visual activities may lead to headache. Uncorrected vision problems or poorly designed eyewear that does not provide the proper optical correction can increase the stress on the visual system, exacerbating these symptoms.

Moreover, because "the eyes lead the body," the body will often position the eyes so as to allow them to work comfortably and efficiently when performing a visually intensive task. Often, the design of the vision correction for presbyopes will be unsuitable for the layout of the workstation or the viewing distances involved, causing the wearer to bend the neck forward or backward—and to lower or raise the chin—in order to locate the area of proper focus in the lens. The wearer must then assume an awkward posture for extended periods of time in order to see clearly, which may cause tonic stress in the musculature and, ultimately, musculoskeletal symptoms such as neck and back pain.[3]

The term *computer vision syndrome* (CVS) has been coined by the American Optometric Association to encompass the complex of eye and vision problems that are experienced during or related to computer use and associated near work.[4] Computer vision syndrome is characterized by a variety of symptoms that result when the visual demands of a viewing task exceed the capabilities of the visual system to perform the task comfortably (Table 1).[5]

Table 1. A variety of symptoms are associated with computer vision syndrome.

Category	Symptoms	Contributing Factors
Asthenopic	Eye strain Tired or sore eyes Headache	Binocular vision problem Accommodative
Musculoskeletal	Neck pain Back pain Shoulder pain	Presbyopic correction Spectacle lens design Monitor placement
Visual	Blurred vision Slowness of focus Double vision	Refractive error Accommodative Binocular vision problem

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Lens Options for Office Work and Computer Use

The *depth of field* of a spectacle lens represents the extent of the range of viewing distances over which the wearer can see clearly through the lens. For presbyopes, who require additional plus power for clear vision at reading distances, the depth of field is limited to the focal length of the addition power. Clear vision at *mid-range* viewing distances, from 60 to 120 cm, is therefore not possible with reading lenses, leaving objects such as a computer monitor out of focus. With bifocal lenses, objects at mid-range distances are too close to be seen clearly through the distance portion and too far to be seen clearly through the bifocal segment without uncomfortable postural adjustments (Figure 1). The bifocal segment line may also interfere with mid-range vision.

General-purpose progressive lenses provide an unlimited depth of field, with clear vision at every viewing distance, but these lenses must utilize comparatively small intermediate and near zones in order to provide a sufficiently large distance zone. The relatively narrow intermediate and near zones of progressive lenses can restrict the wearer's *field of view*, or the lateral extent of clear vision through the lens, forcing the wearer to make additional head movements while reading in order to keep images in focus.[6] The placement of the correct amount of addition power for optimal mid-range vision may also be too low. Eye movements and gaze stabilization take longer with progressive lenses, since wearers have more difficulty finding the areas of optimal focus.[7]

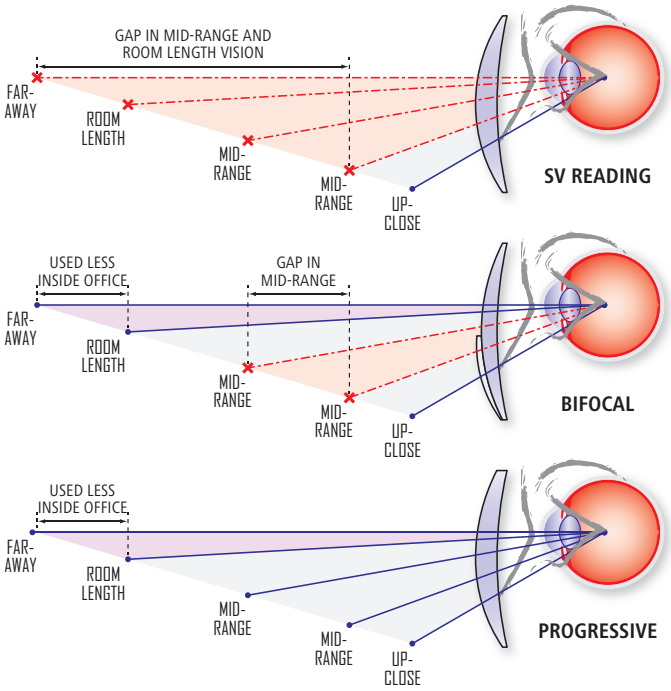

Figure 1. Unlike progressive lenses, traditional bifocal and single-vision reading lenses will not provide adequate visual utility at mid-range viewing distances for advanced presbyopes with little or no accommodation.

Computer use, in particular, relies on clear, comfortable mid-range vision. Although printed text has well-defined edges that the visual system responds favorably to when focusing, text produced by the pixels of computer displays often exhibits less contrast and sharpness, resulting in "fuzzier" images that may require more effort to read. Moreover, the eye frequently fails to exert the full focusing effort required for perfectly clear vision at a computer, or may drift back to the resting point of accommodation, resulting in a *lag of accommodation*. However, because the intermediate zone of general-purpose progressive lenses is comparatively small, and positioned relatively low, these lenses often do not provide optimal mid-range utility for extended periods of computer use.[8]

Occupational or *task-specific* progressive lenses, on the other hand, are progressive lenses that have been specifically designed for office work and computer use. Viewing tasks at a desk or computer workstation are routinely sedentary, involving prolonged periods of sustained vision at relatively short viewing distances. Vision in an office or similar work environment is often confined to room-length distances, with minimal reliance upon clear far vision. Thus, occupational lenses can take advantage of the fact that a dedicated distance zone with a full range in addition power from distance to near is not necessary for these visual tasks.

The absence of a distance zone allows the intermediate and near zones of an occupational progressive lens design to be distributed over more of the available lens area, thereby increasing the size of the intermediate and near zones. Additionally, the progressive change in addition power between the near and intermediate zones is reduced, which decreases the unwanted surface astigmatism associated with the rate of change in power. For presbyopes frequently engaged in viewing tasks inside an office or similar environment, occupational lens designs offer a superior balance of optics compared to general-purpose designs (Figure 2).

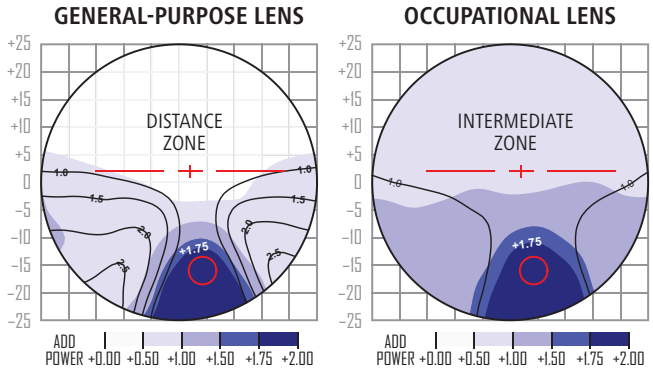

Figure 2. Compared to general-purpose progressive lens designs, occupational lens designs eliminate the distance zone in order to distribute the intermediate and near zones over more of the available lens area.

Occupational Lens Solutions to Suit Every Wearer

ZEISS Officelens is a new series of customized, free-form lenses that have been specifically designed or "purpose-built" for office work and computer use. Officelens is an occupational progressive lens design that has been engineered with the intermediate and near zones distributed over the entire lens area in order to provide exceptionally large fields of clear, comfortable mid-range and reading vision. The combination of soft viewing zone boundaries with a carefully controlled progression of power has allowed lens designers at Carl Zeiss Vision to achieve large intermediate and near zones, while maintaining low levels of peripheral blur and distortion. Further, ZEISS Officelens is available in three different lens design options that allow eyecare professionals to select the optimal solution for the specific vision requirements of each wearer: Officelens Room, Officelens Desk, or Officelens Book.

The intermediate addition power through the upper zone of the lens varies as a function of the specified Officelens design. The difference in addition power between the upper (intermediate) and lower (near) zones of the lens design dictates the rate of change in addition power between these two zones. Consequently, each Officelens design option offers a different optical balance between the maximum extent of vision and the width of the viewing zones:

- The maximum extent of vision—or *depth of field*—decreases as the intermediate addition power increases, and vice versa, due to the shorter focal distance through the upper zone of the lens.
- The width of the viewing zones—or *field of view*—increases as the intermediate addition power increases, and vice versa, due to a more gradual change in addition power along the corridor.

ZEISS Officelens Room: Intermediate addition power of +0.25 D

Officelens Room is designed with a maximum range of vision through the upper intermediate zone of 400 cm or 14 ft (Figure 3). This lens is intended for wearers with intensive visual demands at reading distances, mid-range distances, and room-length distances out to 4 meters. Room lenses will provide wearers with wide zones of clear mid-range and reading vision. Room lenses will allow most wearers to walk around the office comfortably. Officelens Room lenses are also ideal for wearers previously satisfied with ZEISS Gradal RD.

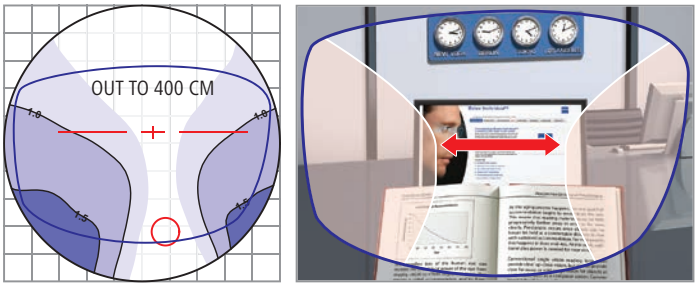

Figure 3. ZEISS Officelens Room provides wide zones of clear vision.

ZEISS Officelens Desk: Intermediate addition power of +0.50 D

Officelens Desk is designed with a maximum range of vision through the upper intermediate zone of 200 cm or 7 ft (Figure 4). This lens is intended for wearers with intensive visual demands at reading distances and mid-range distances out to the length of a cubicle or computer workstation. Desk lenses will provide wearers with wider zones of clear vision than Room lenses. However, Desk lenses may need to be removed for walking. Officelens Desk lenses are also ideal for wearers previously satisfied with ZEISS Business.

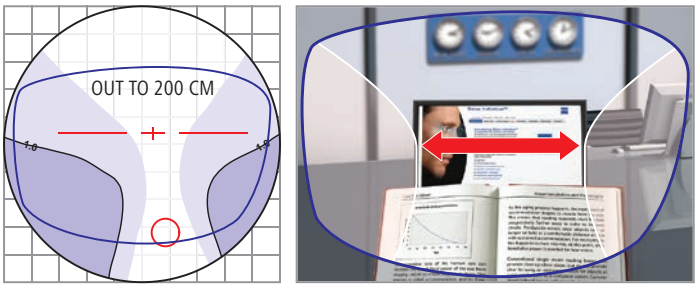

Figure 4. ZEISS Officelens Desk provides wider zones of clear vision than Room.

ZEISS Officelens Book: Intermediate addition power of +1.00 D

Officelens Book is designed with a maximum range of vision through the upper intermediate zone of 100 cm or 3 ft (Figure 5). This lens is intended for wearers with visual demands primarily at reading distances and limited mid-range distances out to 100 cm. Book lenses will provide wearers with the widest zones of clear mid-range and reading vision. Book lenses will need to be removed for walking. For wearers who would appreciate mobility around the workplace, Officelens Desk or Officelens Room should be considered.

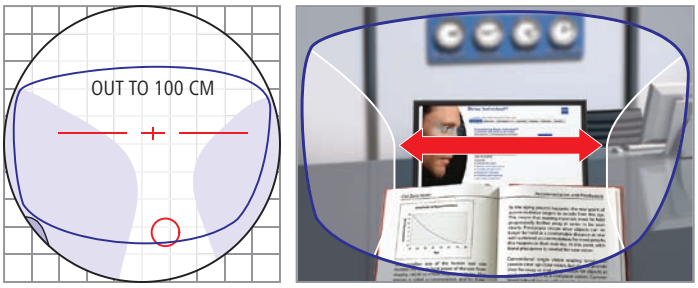

Figure 5. ZEISS Officelens Book provides the widest zones of clear vision.

Wider, Higher Field of Clear Vision

The unwanted astigmatism to either side of the intermediate and near zones of a progressive lens is proportional to the rate of change in addition power along the progressive corridor. General-purpose progressive lenses must rely on a rapid change in power that starts relatively low on the lens in order to provide a sufficiently large distance zone. The width of the intermediate and near zones of the lens is therefore restricted, while significant levels of blur and distortion occur in the lens periphery. The height of the intermediate zone is also limited, because the progressive corridor is confined to a shorter area of the lens. Consequently, the wearer must rely on more head movement while working. This increases demand on the musculature of the neck, while also reducing reading efficiency and visual performance (Figure 6).

ZEISS Officelens, on the other hand, has the intermediate and near zones distributed over a larger area of the lens in order to provide larger fields of clear mid-range and reading vision compared to general-purpose progressive lenses. Officelens also relies on a more gradual change in addition power along the corridor that starts higher on the lens, as dictated by the chosen Officelens design (Figure 7). The width of the intermediate and near zones of the lens is therefore increased considerably, while the levels of blur and distortion in the lens periphery are decreased. Further, the intermediate zone is extended vertically, resulting in more optimally placed mid-range vision. Hence, Officelens requires significantly less horizontal and vertical head movement, while also allowing the wearer to maintain a more comfortable posture (Figure 8).

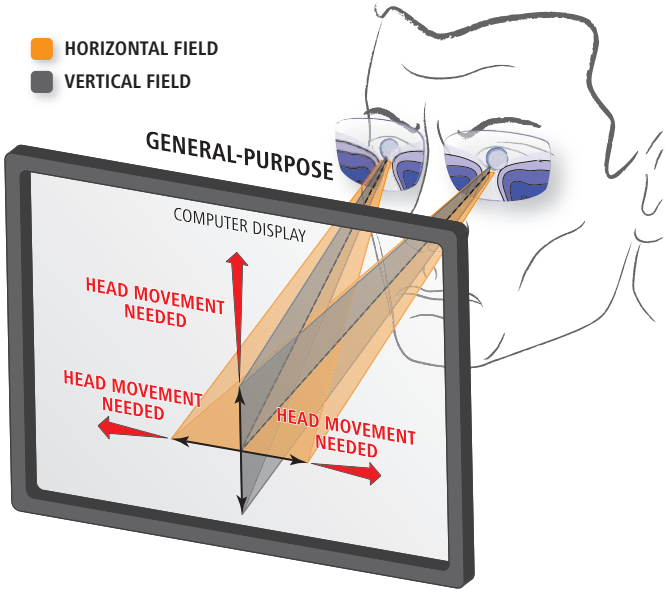

Figure 6. Because of the relatively rapid change in addition power and the presence of a large distance zone, general-purpose progressive lenses produce relatively short and narrow fields of clear mid-range and reading vision that require more vertical and horizontal head movement.

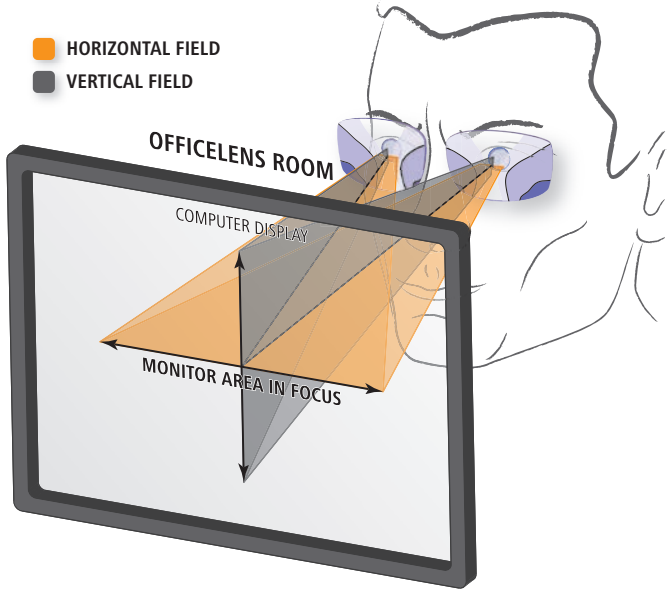

Figure 8. By combining a more gradual change in addition power with intermediate and near zones distributed over a larger area of the lens, Officelens produces taller, wider fields of clear mid-range and reading vision that require less vertical and horizontal head movement.

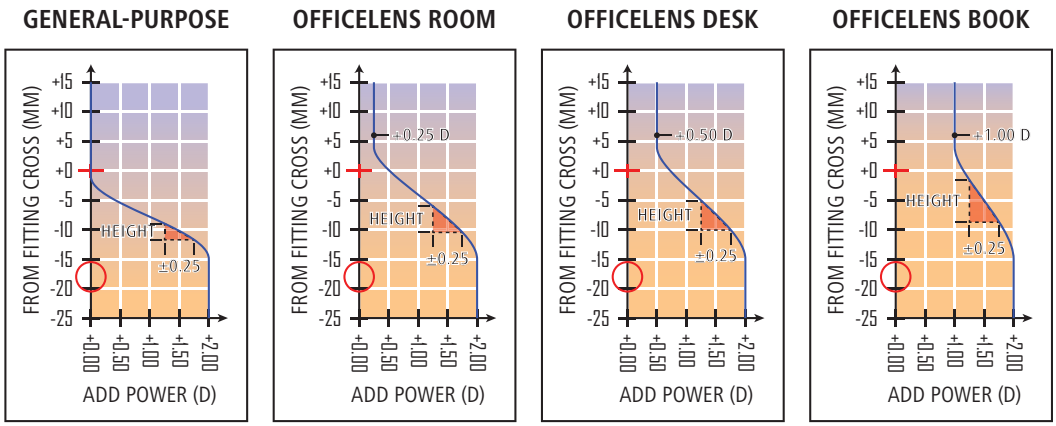

Figure 7. Plots of the change in add power along the progressive corridor of different lenses with the same add power of +2.00 D demonstrate that the length of the intermediate zone that provides the desired power—for a given combination of dioptric demand (or viewing distance) and depth of focus (e.g., ±0.25 D)—is longer with Officelens designs due to a more gradual change in power along the corridor, resulting in a taller field of mid-range vision that also starts higher on the lens.

Improving the Visual Experience at Work

General-purpose progressive lenses are not well-suited for the strenuous visual demands of office work and computer use. On the other hand, clinical studies have proven the efficacy of progressive lenses *specifically designed* for computer use in relieving many of the symptoms associated with computer vision syndrome, including eye strain, blurred mid-range vision, and neck/shoulder ache.[9] These studies have also demonstrated that occupational progressive lenses are preferred by wearers over conventional forms of vision correction for computer use.[10] Clearly, occupational progressive lenses represent a superior alternative for maximizing visual performance and for minimizing both ocular and musculoskeletal discomfort while performing near-oriented viewing tasks.

However, ordinary occupational progressive lenses suffer from drawbacks that may limit the utility of these lenses for many wearers. Ordinary occupational lenses are frequently available in only two or three "degression" powers that are based strictly on the specified addition power. This results in inconsistent mid-range utility, because the intermediate power is not independent of the near power. In higher addition powers, wearers are also restricted to a relatively short range of vision (or depth of field) because the intermediate power of the lens is typically too high for room-length vision. Further, many "enhanced single vision" or "computer" lenses rely on lens design choices that compromise optical performance, such as the use of a single lens design for both eyes.

ZEISS Officelens, on the other hand, combines a superior lens design with more flexible prescribing choices. The three different Officelens design options allow eyecare professionals to choose the ideal balance between the width of the fields of clear vision and the maximum extent of vision away from the wearer, independent of the specified addition power (Figure 9). Moreover, Officelens utilizes separate right- and left-eye lens designs that are optically balanced using patented *horizontal symmetry* technology.* Horizontal symmetry maximizes the binocular field of view and improves binocular fusion by reducing differences in power, prism, and magnification between corresponding points across the right and left lenses.

An internal wearer trial was conducted by vision scientists at Carl Zeiss Vision to evaluate the effectiveness of ZEISS Officelens. A total of 94 presbyopic subjects who spent at least five hours per day using a computer in an office environment were evaluated. Wearers were overwhelmingly satisfied with the visual performance of Officelens in the key categories associated with office work and computer use (Figure 10). The majority of those wearers who presented with symptoms of musculoskeletal discomfort, such as neck or shoulder pain, also reported a reduction in or cessation of symptoms. Furthermore, 97% of wearers adapted to their new lenses within 3 days. These remarkable results confirm the efficacy of Officelens for treating computer vision syndrome and similar vision problems.[11]

The usefulness of occupational progressive lenses such as ZEISS Officelens is not limited only to office work and computer use. Presbyopes engaged in other vocational or recreational activities that involve extended periods of sustained vision at mid-range and reading distances, including fine detail work and many common hobbies, may benefit from appropriately selected occupational progressive lenses. With three different lens design configurations to suit virtually any application, ZEISS Officelens represents the perfect optical solution for any wearer engaged in visually demanding tasks in environments that do not require far vision.

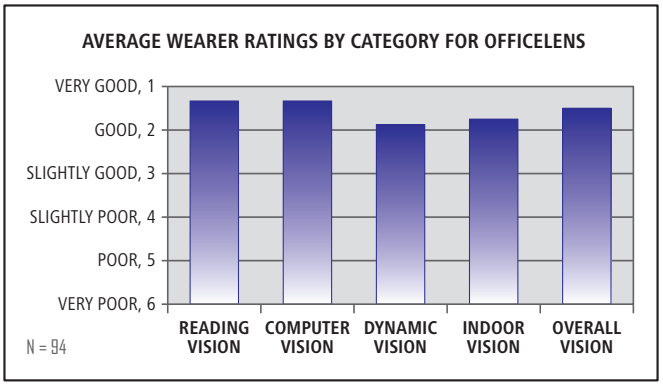

Figure 10. During a recent internal wearer trial conducted by vision scientists at Carl Zeiss Vision to evaluate the efficacy of ZEISS Officelens, subjects rated Officelens exceptionally high in each of the key vision categories associated with office work and computer use (n = 94).

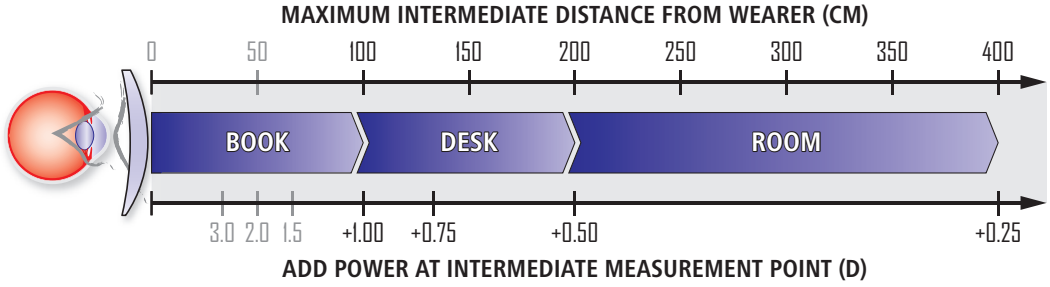

Figure 9. The maximum viewing distance through the intermediate zone of Officelens is selected by the eyecare professional in order to provide the wearer with the best balance between the extent of the range of clear viewing distances and the size of the fields of clear mid-range and reading vision.

** US Patent 4 606 622*

Precision Optics for Maximum Visual Performance

Ordinary progressive lenses are subject to optical aberrations produced by the oblique angles of view that result when the wearer uses different regions of the lens. *Oblique astigmatism* from oblique refraction interacts with the unwanted astigmatism over the progressive lens surface, resulting in optical interactions that can reduce the clarity of the lens, shrink the width of the viewing zones, and disrupt comfortable binocular fusion. Consequently, the optical aberrations produced by ordinary occupational lenses can exacerbate the symptoms associated with computer vision syndrome.

However, every Officelens is customized for the wearer's specific prescription using real-time optical optimization combined with patented free-form technology. By fine-tuning the optical design of the lens for the exact prescription, residual optical aberrations that can distort the shape of the viewing zones of the lens and blur vision are virtually eliminated, resulting in wider, more symmetrical fields of clear vision compared to ordinary lenses. Wearers will therefore enjoy the widest fields of clear, comfortable binocular vision possible, regardless of prescription (Figure 11).

Moreover, adequate reading utility is essential for office work and for mobile device use, such as smart phone. ZEISS Officelens offers a variable progressive corridor length in order to maintain consistent reading utility, even in small frame sizes. The corridor length of Officelens is automatically sized to the fitting height in order to maximize the viewing zones of the lens for the available lens area inside the frame. This ensures that the wearer will enjoy the widest viewing zones possible in every frame, without compromising reading utility, down to a minimum fitting height of 13 mm (Figure 12).

Due to the visually demanding nature of computer use and similar critical viewing tasks, even small uncorrected refractive errors and binocular vision problems can impact visual comfort and performance.[12] By relying upon proven ZEISS technology that integrates patented back-side optics, real-time optical optimization, and precision free-form manufacturing, every ZEISS Officelens will preserve the intended optics of the lens design. The result is unparalleled visual performance and comfort for the wearer, even during the most visually demanding applications.

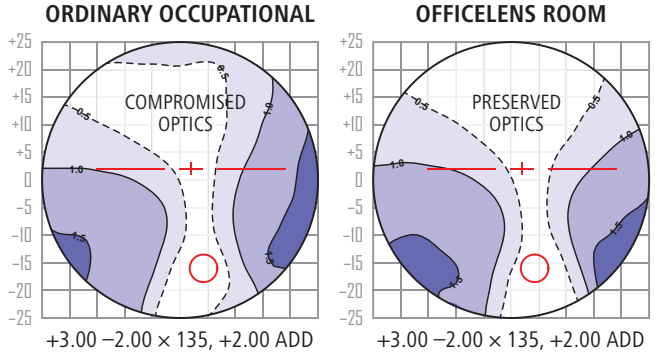

Figure 11. Unlike ordinary occupational lenses, which suffer from optical aberrations that can shrink and distort the field of clear vision in many prescriptions, every ZEISS Officelens is optically optimized for the exact prescription of each wearer, resulting in consistently excellent vision.

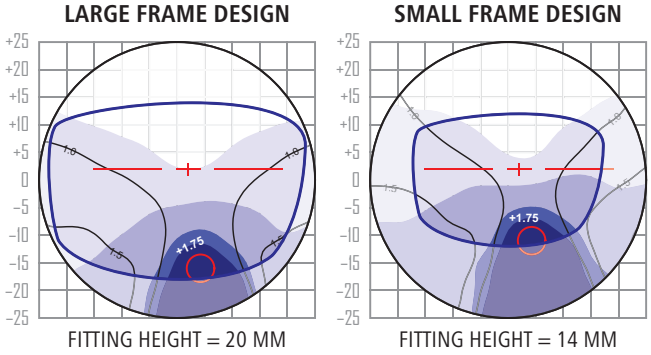

Figure 12. As these plots of add power demonstrate, ZEISS Officelens offers a variable corridor length that is automatically sized to the fitting height of the frame in order to maximize the size of the viewing zones for the available lens area, while maintaining sufficient reading utility inside virtually any frame.

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