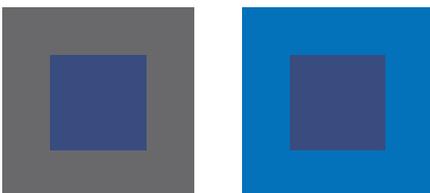
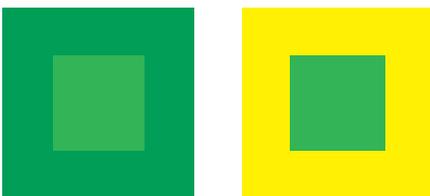


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Warm Colors vs. Cool Colors*Simultaneous Contrast*

OPTICAL EFFECTS

A room painted in a light color will seem larger than that same room painted in a dark color. This is because light colors tend to recede while dark colors advance. Warm colors seem closer while cool colors seem farther away. A long narrow room will seem more in proportion if its far wall is dark and its side walls are light. A room with a low ceiling painted white will seem higher than a ceiling painted dark.

Colors are often said to be warm or cool in temperature and thus all colors are classified in one of these two families that create strong and different impressions.

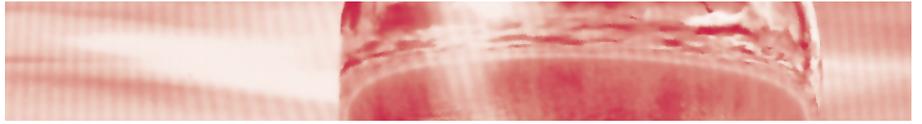
Warm colors such as red, orange, and yellow, are associated with sun and fire, and therefore create a sensation that a space is several degrees warmer than actuality. Warm colors appear to advance toward its viewer as well as excite and cause a sense of aggression.

Cool colors such as blue, violet and green, are associated with air, sky and water, and thus, are naturally cool and soothing. Cool colors tend to recede in a space and can create feelings of passiveness and calmness.

Note that there can be cool shades of red and warm shades of blue that are determined by mixtures of hues. In addition, the quality of warmth and coolness in a color may be altered by its neighboring hues. For example, when a warm hue is in contrast with a cool hue, the warm hue appears warmer and the cool hue appears cooler.

The rule of Simultaneous Contrast is the effect of one hue upon another. Whenever two different hues come into direct contact, the contrast intensifies their differences. The greatest contrast occurs with complementary colors. For example, red seems brightest next to green, as green seems brightest when seen with red. There is an effect with closely related colors, for example, a yellow-green surrounded by green appears yellowish, but surrounded by yellow, the yellow-green seems more noticeably green.

The contrast can be in value or intensity as well as in hue. A gray-blue looks brighter when placed against a gray background; however, the same gray-blue neutralizes when placed against a bright blue background. These are just a few examples of the tricks colors play and why it can be difficult applying color.



The Three Dimensions of Color



Hue and the Color Wheel

BASIC COLOR THEORY

Successful color selection in interior design is a combination of experience, schooling and talent. Developing the ability to properly apply color begins with studying the basic principles of color theory.

The properties of color are based on three dimensions; *hue*, *value* and *intensity*.

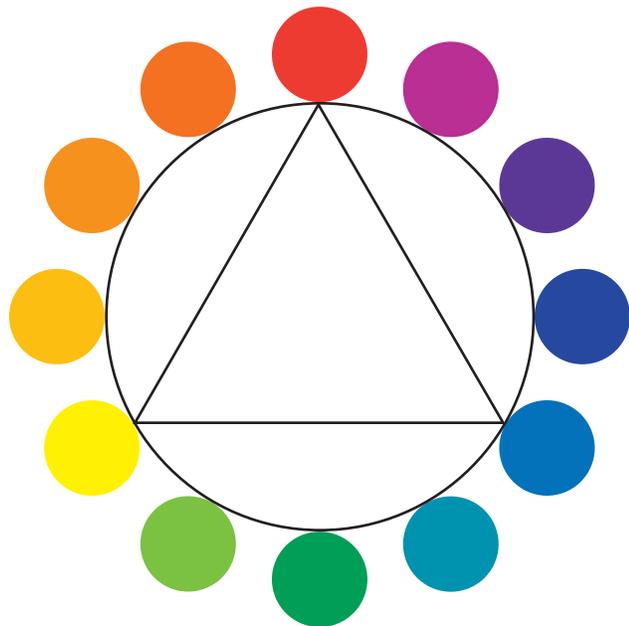
Hue is the name of a color, such as red, blue and yellow.

Value is the lightness or darkness of a color that indicates the quantity of light reflected.

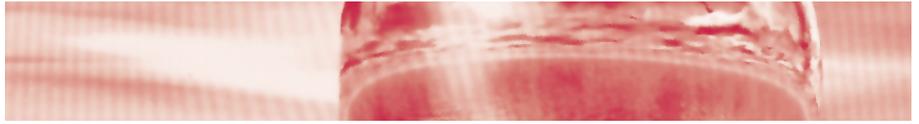
Intensity is the saturation or strength of a color determined by the quality of light reflected from it. A vivid color is of high intensity; a dull or muted color, of low intensity.

Hues are defined and organized by the *color wheel* which is made up of the following twelve colors, each at their full intensity:

Primary Colors: Red, Yellow, Blue
 Secondary Colors: Orange, Green, Violet
 Tertiary Colors: Red-orange, Orange-yellow, Yellow-green
 Green-blue, Blue-violet, Violet-red



The Color Wheel



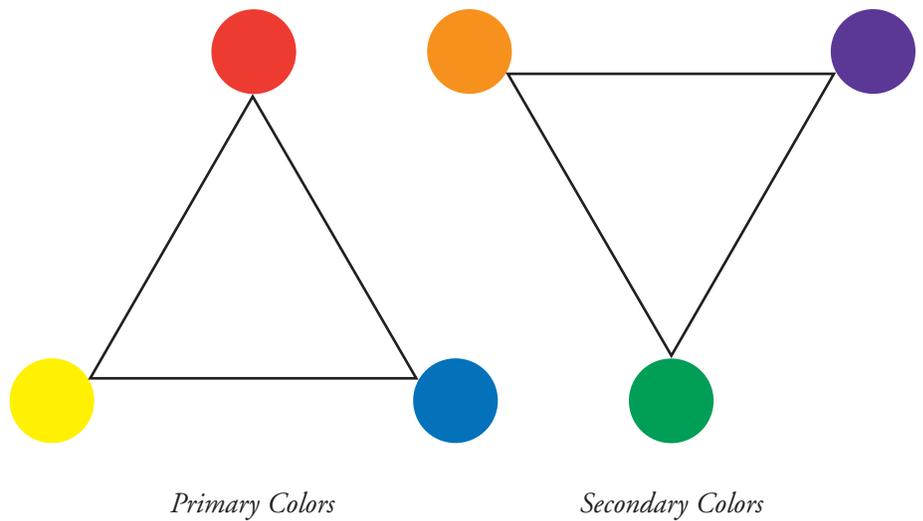
The *primary colors* are red, blue, and yellow. When the three primaries are mixed in pairs, or all together in equal or unequal amounts, all possible colors can be produced

Secondary colors are created by combining two primary colors:

Red + Yellow = Orange

Red + Blue = Violet

Blue + Yellow = Green

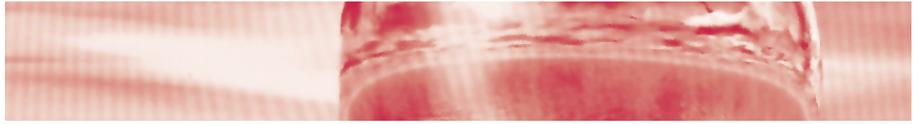


Value

Value is the relative lightness or darkness of a color that is determined by the amount of black or white present in a color.

A “*tint*” is created when white is added to lighten a color. This also gives a color a high value.

A “*shade*” is created when black is added to darken a color. This also gives a color a low value.



The value of color is graded on the *gray value scale* with white as the highest value, black as the lowest value, and several *tints* and *shades* of gray in between. If a black and white photograph were taken of a room full of colors, their equal values could be compared with the *gray value scale*. Note: Black and white printers and black and white copiers do not give the same effect as black and white photography.



Color Value Scale

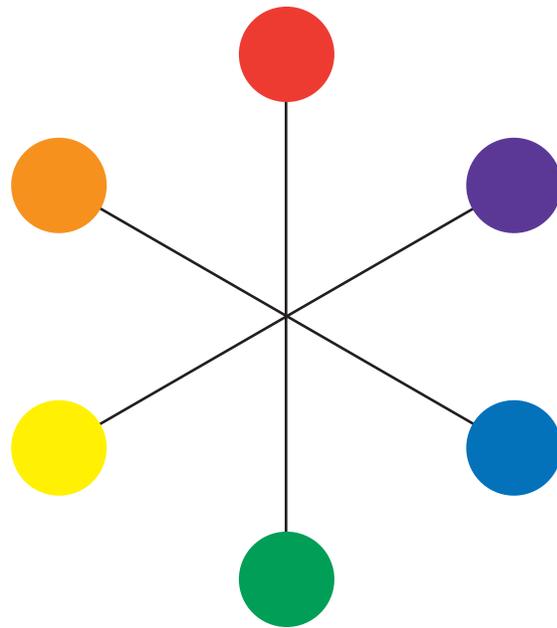
Intensity

Intensity, or the saturation of color, is determined by the amount of gray added to a color. The “*pure*” color of red will have a strong intensity while a muted color of red will have a low intensity.



Color Relationships

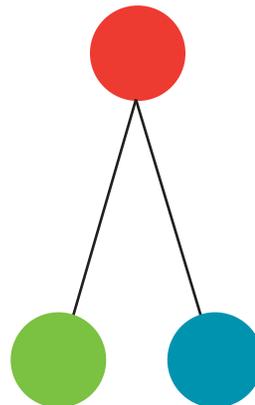
The successful use of color is dependent upon a clear understanding of color relationships. A single color retains a certain character, but adding other colors to its surrounding may change its characteristics. Colors may be closely related or in contrast. The greatest contrast occurs with *complementary colors*, two colors that appear directly opposite each other on the color wheel. For example, red and green are complementary colors just as violet and yellow, and blue and orange are complementary colors.



Complementary Colors (extreme contrast)

Split Complementary Colors

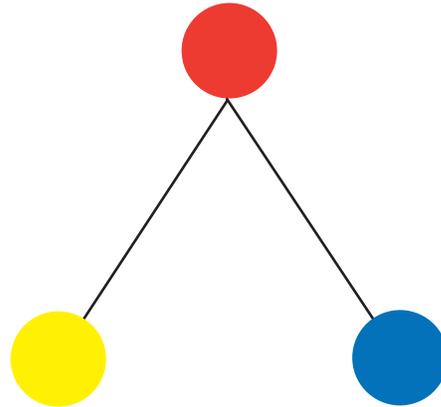
A split complementary system involves a color with two colors on either side of its complement. This results in a variation that has less contrast because of the short interval between colors on the color wheel.



Split Complementary Colors

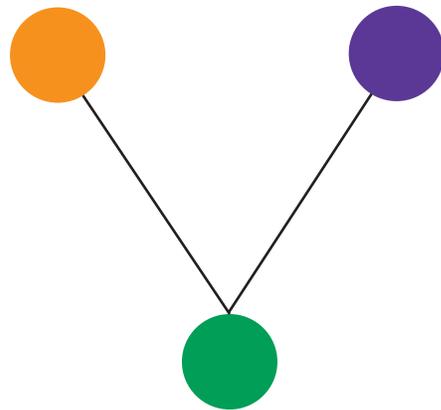


There is less contrast when three colors are spaced equally apart on the color wheel and used together. The first group is called the primary triad which consists of red, yellow and blue. This triad provides the most striking contrast.

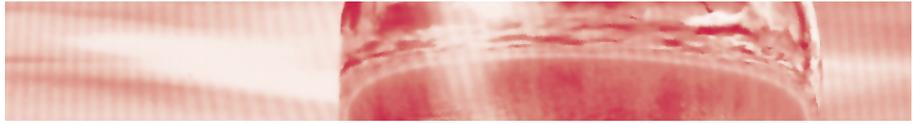


Primary Triad (vibrant contrast)

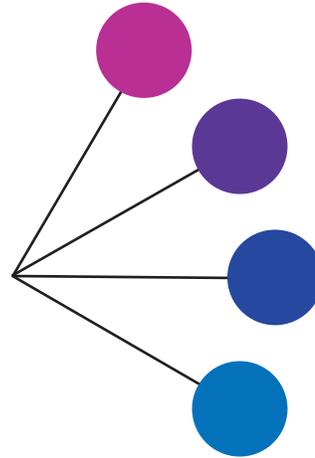
The secondary triad, composed of orange, green and violet, has the same interval between hues, yet gives a softer contrast.



Secondary Triad (soft contrast)



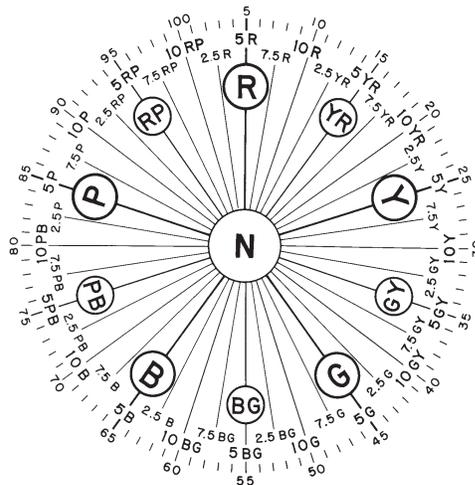
Analogous colors appear next to each other on the color wheel, and because they have the shortest interval between them, they have the most harmonious relationship.



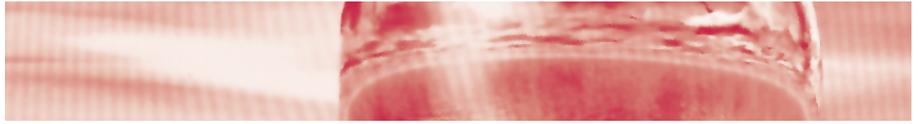
Analogous Colors (Close relationships)

The Munsell System

Our fascination with color has resulted in the development of a number of color systems. The most widely used system for identifying color was developed in the early 1900's by the American artist, Albert Munsell. Munsell's system shows the relationships between color, tints and shades. The system was used to give names to the many varieties of hues that result from mixing different colors with each other or mixed with the neutral colors black and white. In 1943, American industry adopted the Munsell system as its standard for naming colors. The United States Bureau of Standards in Washington, D.C. also adopted this system.



Munsell Color Wheel



The Munsell system has five basic colors: red, yellow, green, blue and purple (violet). *Intermediate colors* are created by the mixture of any two of the basic colors that are adjacent on the color wheel. For example, the mixture of red and yellow is the intermediate color red-yellow. Other intermediate hues include green-yellow, blue-green, purple-blue, and red-purple.

Munsell devised a three-dimensional color system that classifies the variations of colors according to the qualities of hue, value, and intensity.

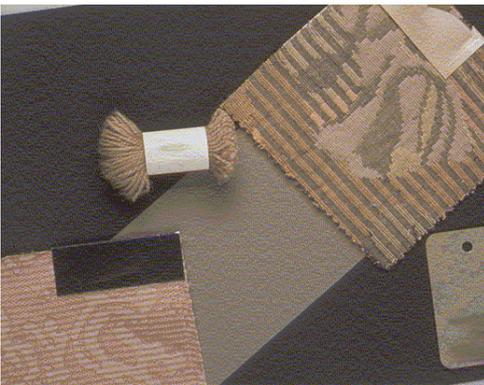
Each hue is indicated by the notation found on the inner circle of the color wheel – R for red, Y for yellow, G for green, B for blue, and P for purple. The intermediate or tertiary colors are described with two letters such as RP for red-purple. The value number of a color follows the hue designation. For example, YG/7 is a yellow-green with a value matching step 7 of the gray scale. The intensity number comes last; thus, YG/7/4 indicates a yellow-green hue at a value of 7 and intensity of 4.

COLOR SCHEMES

There are several color schemes; some simple while others are very complex. As expected, the more complex a color scheme the more skill is required to achieve a successful design. The concept of harmony lies behind the development of each color scheme.

Neutral (monotone) Color Schemes

A neutral or monotone color scheme consists of various tints and shades of a neutral color such as black, white, gray, beige, tan or taupe. A neutral scheme is easily composed by selecting a neutral then building upon several values of that neutral. This scheme is often used as a backdrop for a striking accent color or for non-competing backgrounds when an important element is displayed, such as artwork. Neutral color schemes can become monotonous if not accented properly; however, a successful scheme can be considered sophisticated, elegant, and refined. They are used when a soft but formal space is desired, such as a hotel, bank or museum.



Neutrals



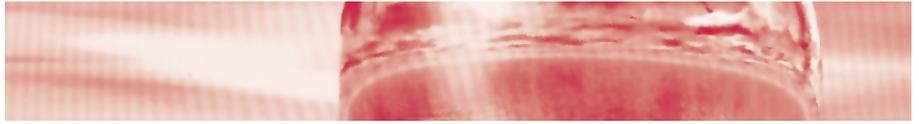
Monochromatic Color Scheme



Analogous Color Scheme



Complementary Color Schemes



Monochromatic Color Schemes

The monochromatic color scheme consists of one chosen hue with several values and intensities of that hue used to create depth and interest. Spaces with a single color can look dramatic, but this scheme may create monotony. The monochromatic color scheme works well in spaces where we don't spend a great deal of time, for example, a private hotel suite or an upscale retail store.

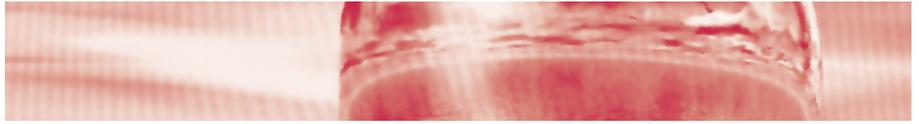
Analogous Color Schemes

Using colors that are adjacent on the color wheel have close relationships and create analogous color schemes. Blue-green, blue, and blue-violet make up an analogous scheme. This scheme easily creates harmony, is usually vibrant, and works well in spaces that encourage high energy such as daycare centers and sports facilities.

Complementary Color Schemes

Colors that are located across from each other on the color wheel are complementary and thus make up a complementary color scheme. For example, red and green, yellow and purple, and blue and orange are complements. Complements have the greatest intensity when seen together and can be extremely pleasing. When designed correctly, the scheme brings feelings of energy and cheerfulness. However, it can be difficult to succeed at this scheme for it can become too bright or garish if the colors are not properly balanced.

Fast food restaurants often use complementary color schemes. The result is an interior that exudes high energy, but also does not make the customer too comfortable. The effect is that many are attracted, but at the same time there is the high turnover necessary to achieve profit.



Yellow-Green



Red



Blue-Green

Split Complementary Color Schemes

The split complementary color scheme consists of one hue with the two hues adjacent to its complement. The two adjacent hues are harmonious while the complement adds a vibrant contrast. When used together, the palettes of yellow-green, red, and blue-green, will create a split complementary color scheme.



Child Development Center
Hanscom Air Force Base, Massachusetts



Gossick Leadership Center Renovation
Arnold Air Force Base, Tennessee



Typical Office

Triad Color Scheme

The triad color scheme incorporates three hues that are equally spaced on the color wheel. The most common triad scheme is used with the primary colors - red, yellow and blue in energetic spaces such as schools, sports arenas, and movie theaters. Varying the values of triad hues can create a sophisticated look, but this is difficult to master without creating harshness and confusion within a space.

Tetrad Color Schemes

The tetrad color scheme incorporates four hues that are equally spaced on the color wheel. Vivid tones give a lively feeling, while muted tones bring a subtler mood. Tetrad color schemes are rare and difficult to produce since they often create harsh and confusing spaces.

APPLYING COLOR IN FACILITIES

The basics of incorporating color apply to every type of interior space. Yet, many variables interact with color (e.g., location, the size of the space, and natural and artificial lighting). The Federal Standard 595B color fandeck may be used as a reference when selecting colors. The fandeck may be ordered from the General Services Administration (GSA) catalogue, stock #7690-01-162-2210.

The following generalizations are suggested for each space type.

Offices – General

The objective for designing an office is to create an environment that promotes productivity for the many users who work long hours. Color plays an important role in stimulating productivity without creating distraction. Bright warm colors work best in areas where physical tasks take place, and calmer, cooler colors work best where visual and mental tasks are performed. Livelier colors should be applied in limited areas with related quiet tones in larger spaces. In multi-floor or large offices, each floor or department can possess an identifying color tonality, with strong colors in lobbies, corridors, and entrance points, while related softer hues are used in the general office areas.

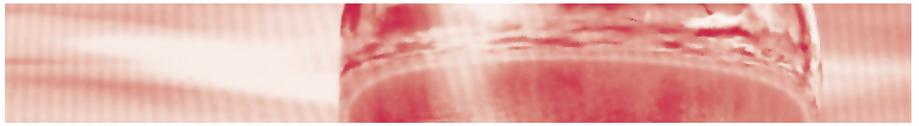
- Desks and work surfaces – light toned neutral desks and work surfaces are good choices since neutrals are not distracting, and their low brightness contrast (glare) minimizes eye fatigue. Light gray, tan, beige, taupe and ivory are soft colors that work well and have a light reflectance of approximately 30%.
- Flooring – medium to light toned floor surfaces are suggested to reduce brightness contrast between the floor color and tasks or work surfaces. The light reflectance range should be 20% – 50%. The color of soil in a given geographical region plays a part in the color selection of flooring so as to camouflage soil.



Building 32 Rehabilitation
Wright-Patterson Air Force Base, Ohio



Air Mobility Command Design Center
Scott Air Force Base, Illinois



- Walls and panels – a light reflectance range of 40% - 60% is suggested for walls and panels. An accent wall, in a soft hue, can be added for interest and to relieve monotony. Deep colors may be used behind a desk, or in frontal view, but should not be used on a window wall due to the high contrast.
- Ceilings – bright ceilings of white are functional for good light reflectance.
- Corridors – bright, bold, and contrasting colors may be added to corridors for visual stimulation.
- Doors – various colors for doors can be used anywhere.
- Private offices and conference rooms – variations of colors may be used in private offices and conference rooms. Avoid use of dark colors in spaces with low light levels. However, dark hues, when balanced with lighter hues, complement spaces that have an abundance of natural and artificial light.

Industrial Plants

Color is important in the industrial setting to reduce fatigue, annoyance, and to promote efficiency and safety. Certain colors in these settings also reduce absenteeism, and improve labor morale.

Colors may offset problem areas, for example, the use of cool blues and greens are desirable in a space with excessive heat. Conversely, reds and oranges warm a cold space or can compensate for the lack of natural light. Incorporating soft hues, especially tints of green, may calm noisy spaces.

- General surfaces – brightness contrasts are to be considered; glossy surfaces that produce glare should be avoided.
- Walls – colors should be in light hues; however, a tinted accent hue with a reflectance of 25% - 40% may be used on an end wall to reduce monotony and lessen eye fatigue.
- Upper walls – should have a light reflectance between 50% - 70%.
- Ceilings – white should be used on ceilings to provide maximum light reflectance.



Child Development Center
United States Air Force Academy, Colorado



*Air Force Senior Commissioned
Officer Academy*
Gunter Annex,
Maxwell Air Force Base, Alabama



Health and Wellness Center
Elgin Air Force Base, Florida

- Colors and safety – various colors have been adopted for safety purposes in industrial settings. Green is the choice color for machinery and equipment. Yellow marks potential hazard areas while red indicates fire-safety equipment, containers of dangerous materials, and control switches and buttons on machinery. Blue indicates electrical controls and repair areas, and white indicates trash containers, drinking fountains, and food-service locations. Black striping indicates traffic areas, aisles, and stairways.

Schools

Studies have shown that the proper use of color in schools plays an important role in the performance of students. This is especially true in the early years of children. A warm brighter, color scheme not only offers positive affects on the academics of students, but their behavior as well.

One of the most important interior elements in schools is illumination. A goal of effectively controlling illumination with color is to keep eyestrain and glare to a minimum. The way to accomplish this is to keep the brightness ratios somewhat consistent.

Walls, floors, furniture and equipment - these areas should be painted in mild color schemes with a 50-60% light reflectance. A stronger color painted end wall can add interest. Gray or green chalkboards can seem less drab when surrounded by contrasting colors.

- Ceilings – white or off-white ceilings should be installed for maximum light reflectance.
- Auditorium – several hues of warm tones are suggested, including tints of green.
- Shops, and art rooms – light hues are appropriate and work well in these spaces.
- Gymnasium – luminous tones work well in gyms, while colors that reflect flattering light, such as coral, work best in locker and dressing rooms.
- School facilities such as libraries, offices and teachers lounges, should be designed with subdued tones.
- Corridors and stairways – bolder colors may be used to offer stimulation in these transition spaces.



Hotels

A hotel design should present a welcome, pleasant experience for its guests. The climate and customs of the region can add to the characteristics of the chosen color schemes and style. For example, brightly colored tiles and fabrics combined with white walls may suggest a tropical location.

- Lobby and lounge – the front lobby and reception desk can accept strong use of color that creates lasting impressions. Warm colors in lobbies and lounges provide comfort for people who will occupy these spaces for long periods. Dark woods and marbles suggest solidity and tradition, whereas bright saturated colors imply a casual and playful atmosphere.
- Guestrooms – colors may vary, as suggested above, to reflect climate and region. However, the chosen color scheme should promote comfort and relaxation.
- Corridors - a lively color scheme is suggested for the corridors, incorporating a dark color at one end to give interest when walking down a long hallway.



Area Dental Lab

Peterson Air Force Base, Colorado

Medical and Healthcare Facilities

The interest of the patient is the primary concern when designing medical and healthcare facilities. Research studies suggest that the environmental ambience plays a significant role in the rate of patient recovery. Visual contact with the out-of-doors, natural materials such as wood, and warm colors contribute to a faster rate of recovery. Warmer colors in hospital rooms flatter users' skin tones when reflected in mirrors.

Cooler colors offer a calming ambience and are appropriate for intensive care units. Bluish-green is a standard for operating rooms because it provides visual relief of personnel from the red tones of blood and tissue. Cooler colors, which calm, are appropriate for examination rooms, while warmer tones are used in areas such as dermatology and obstetrics. However, color should be restrained to avoid the possibility of environmental color reflection interfering with patient diagnosis.

Food Service

Many studies have been provided by the food service industry regarding color and the physiological responses to food and its atmosphere. For example, the color red was found to stimulate the appetite.

In general, warm tones are comforting in restaurant settings. Colors to avoid include black, dark gray, cold gray, strong tones of blue and violet, and yellow-green.

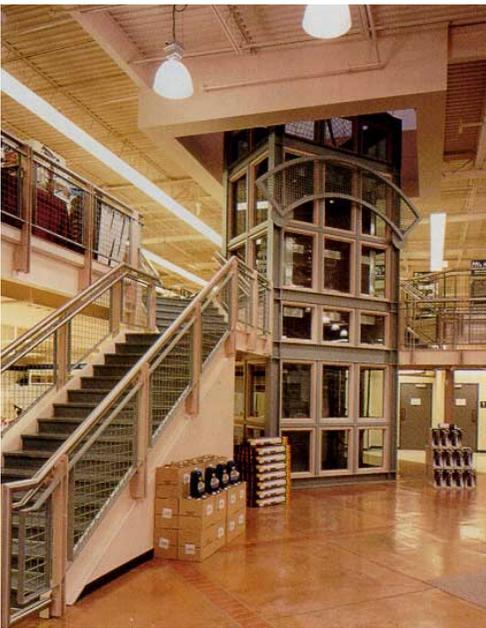


Iditarod Dining Facility

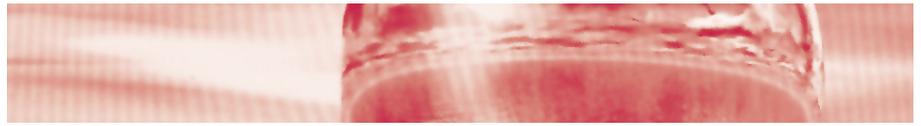
Elmendorf Air Force Base, Alaska



*Air Force Senior Commissioned
Officer Academy
Gunter Annex,
Maxwell Air Force Base, Alabama*



*BXTRA Open Air Mall
Hickam Air Force Base, Hawaii*



The style of each food service area should be taken into consideration when applying color. Fast food establishments and cafeterias incorporate bright colors to promote a faster pace. Fine restaurants and traditional eating establishments are typically designed in subdued colors to promote leisurely dining. In each case, the color of floor coverings should be selected to conceal soiling. The color scheme should be versatile with bright lighting at lunchtime and softer lighting at dinner.

Traditional associations of color are appropriate when serving various styles of cuisine. Mexican, Indian and Spanish foods are associated with bright cheerful colors, Greek with blue and white, and Italian with red, green and white. Colors of table settings should complement the food to be served. Care must be taken so that the space does not become a cliché.

Supermarkets apply bright colors in various areas; however, white is preferred in the dairy section, and lighter blues and blue greens are used at the meat counter to complement red meats. Colorful cans and other merchandise are nicely displayed when seen against a neutral background.

Retail Outlets

Retail outlets display their merchandise in the most attractive setting to achieve high sales volumes. Color has a strong impact on consumer reactions to products including impulse buying.

The general rule of thumb is to use bright colors in low cost, rapid turnover shops, and more subtle sophisticated color schemes in higher priced and leisure shops. Discount stores often use bright colors to stimulate customers; however, a low-end rack outlet may use white walls and gray floors to give the effect of a discount image.

Men's clothing shops tend to have natural wood and brown tones to promote a club-like atmosphere. Women's shops usually retain soft, warm tones, possibly pastels. Bright colors used with metallic, white, black, or gray, tend to promote electronics and other high tech products. Avoid strong color on display backdrops and shelves that may distract from the merchandise. Light grays and tans are good choices. Expensive jewelry and small gift items sparkle against conservative colors.

CONCLUSION

Along with man's sensitivity to time and space is sensitivity to color. Color can affect perception of size just as it can affect mood. It is important to wisely and carefully incorporate color into all interior projects using it to heighten awareness of the appearance and mood of space.