

The Randolph-Sheppard Business Enterprise Program: Illumination and Color Contrast

Monograph 3: Studies of the Randolph-Sheppard Program

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March, 1992

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Development of this document was supported by the Rehabilitation Research and Training Center Grant G0086C3502 from the National Institute on Disability and Rehabilitation Research, Department of Education, Washington, D.C. Opinions expressed in this document are not necessarily those of the granting agency.

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THE RANDOLPH-SHEPPARD BUSINESS ENTERPRISE PROGRAM: ILLUMINATION AND COLOR CONTRAST

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ABSTRACT: In this study, researchers sought to determine whether or not snack bars operating under the Randolph-Sheppard Business Enterprise Program meet recommended illumination standards and use color schemes to achieve proper mood and maximum production when applicable. The demonstrated impact of color and illumination on perception, mood, emotion, appetite, and customer satisfaction in dining facilities strongly suggests that these factors should be considered in the design of BEP facilities. Through measurement and observation, the researchers sought to establish lighting and color guidelines for BEP dining facilities.

Fifty-one snack bars operated under the Randolph-Sheppard BEP were visited in the states of Alabama, Arkansas, Mississippi, and Tennessee. Segments of the Work Environment Visual Demands Protocol which measure light and color were used to secure measurements in food service areas, food preparation areas, dining areas, operator work areas, and storage areas. Only dining and storage areas were found to meet or surpass recommended illumination levels. None of the snack bars surveyed used the recommended colors in their dining areas.

Results of this study suggest that a review and possible improvement of light and color in existing facilities might enhance sales and profits for blind entrepreneurs. If an appropriation of funds for remodeling and renovating existing facilities is sought, lighting and color considerations could be included. State Licensing Agency personnel can include understandings regarding lighting and color in proposed facilities under negotiation. Information regarding the use of light and color shared with the Elected Committee of Vendors could ensure their understanding of its importance in optimizing sales and profit.

INTRODUCTION

The purpose of this study was to determine if the existing illumination levels in snack bars operating under the Randolph-Sheppard Business Enterprise Program (BEP) meet recommended lighting standards (Illumination Engineering Society of North America, 1981) and if these dining facilities utilize color schemes suggested by researchers in psychology and/or the food service industry to achieve proper mood and maximum production when applicable.

The passage of the Randolph-Sheppard Act in June, 1936 (P.L. 74-732) and its subsequent amendments was designed to provide business opportunities for blind and visually impaired Americans. The 1936 Act and its amendments

delineated a Vending Facility Program (now commonly referred to as the Business Enterprise Program) which provided a priority for persons who are legally blind in the establishment of businesses in federal property locations. Today many states have locations in state, local, and private facilities in addition to the federal sites. Most of the state-federal rehabilitation agencies which serve persons who are blind or visually impaired administer a Randolph-Sheppard Business Enterprise Program. There are more than 3,200 sites located in local, county, state, and private facilities.

The program has provided employment for more than 20,000 individuals with visual impairments. The Business Enterprise Program ranks among the 50 largest food corporations in

America (Rehabilitation Services Administration, 1988).

Administration of the BEP in each state is located in the state-federal rehabilitation agency, which is designated as the State Licensing Agency (SLA). The state may, under contract, designate a nominee organization to provide daily supervision, although the responsibility for the program operation remains with the SLA. As established by the 1974 amendments to the Randolph-Sheppard Act, an elected Committee of Vendors (operators) advises the SLA on program operations including promotion, assignment of locations, training, and various other program operations (Weston & Spann, 1985).

In most states a BEP director, who is responsible to the SLA director, and a staff of BEP counselors (job titles vary by state) work directly with blind and visually impaired business operators in the daily operation of the program. The BEP staff have on-going contact with the business operators and provide technical assistance and consultation, provide training, develop and implement new business locations, and coordinate financial reporting.

Since its passage, the Randolph-Sheppard program has operated without a program appropriation from the federal government. Funds for program operations in most states are derived from a portion of the federal vocational rehabilitation funds (section 110 funds), from a "set-aside" fund levied against the net profits of the individual business operators, or from a combination of funds from these and other sources. Therefore, there is a historic paucity of funds available for the establishment of new BEP facilities, purchase of new equipment, repair and/or replacement of existing equipment, and for remodeling of existing business locations.

Review of the Literature

Most patrons and employees of food establishments rarely give consideration to the

lighting levels and color configurations of the establishment. Often designers have spent a great deal of time and effort through research and planning to ensure that the lighting and color of food areas elicit the proper mood and arouse the appetite.

Although there has been no agreement as to whether a great deal of light, a moderate amount of light, or minimal light is preferred, there are ample data to support all three arguments. As early as the 1920's and 30's, studies conducted at the Hawthorne Works of Western Electric Company concluded that as illumination levels approach natural illumination levels people are more positively stimulated, resulting in an elevation in mood and greater productivity (Roethlisberger & Dickson, 1947).

Similarly, Hughes & McNelis (1978) concluded that among normally sighted clerical workers, increased illumination levels resulted in greater productivity as well as higher acceptability ratings, especially by older workers. Boyce (1973) observed that older workers are notably more vulnerable to imperfections in lighting conditions, such as glare. According to Miles, Cook, Huertas, and Lyon (1984), in studies including visually impaired people, most fully and partially sighted people benefit from increased illumination levels.

Given that the average age of the American worker is increasing and older workers are shown statistically to be inclined toward some degree of visual impairment (Sekuler, Kline, & Dismukes, 1982), observations concerning older workers take on greater significance. The possible ramifications of proper illumination levels in the work environment warrant further study. In the present study of illumination and color contrast at Business Enterprise Program locations, the mean age of the BEP operators was 47.6 years.

A related psychological malady which is drawing interest from researchers is Seasonal Affective Disorder (SAD), which is directly related to the amount of light in a person's environment. Studies conducted recently on low or shortened

periods of daylight or artificial daylight support theories that the length and level of light in the environment can lead to Seasonal Affective Disorder in some persons, as indicated by symptoms of depression, decreased energy, hypersomnia, increased appetite, and carbohydrate cravings (Lam, Buchanan, & Remick, 1989). These symptoms usually become evident during the winter and go into remission during the summer. According to Winton, Corn, Huson, & Franey (1989), McIntyre, Armstrong, Norman, & Burrows, (1989), and Lam (1989), SAD symptoms are reduced significantly by exposing individuals to increased levels of artificial daylight for as little as two hours per day. The research concludes that providing proper levels of full spectrum lighting (or artificial daylight) in the work environment can minimize the likelihood of employees developing SAD.

Generally, an esthetics approach has dominated the application of color by architects and interior designers (Biren, 1972a). According to Mahnke & Mahnke (1987), appetite depends on the sense of sight just as greatly as it does on smell. In their psychological studies on sensory perception, which included the effects of color on appetite, they concluded that warm reds such as flamingo and coral, certain oranges such as peach and pumpkin, warm and light yellows, and clear greens are true appetite stimulating colors (see Color Plate 1). Negative enhancement colors are also shown on Color Plate 1.

Studies into the effects of white and gray in the environment yield some interesting results. According to Mahnke & Mahnke (1987), white colors create a sterile environment and thus cause the restaurant patron to be uncomfortable during the dining experience. They offer an example of a new restaurant where the walls were light gray accented with shades of bluish-gray and the tablecloths and upholstery were snow white; the customers felt cold and unstimulated and the business failed. The gray made the meats appear gray, dark, and

unappetizing.

Biren (1979) proposed that white is emotionally negative and rates last or near-last in any color preference test. In an early article (1972a) he postulates that, at high levels of illumination, trendy/modern walls that lack color other than white may actually cause eye damage. White glare (caused by the reflection of bright light off of white walls and ceilings) can provoke a form of artificial snow blindness.

Biren (1972b) also reports that exposing an organism to a monotonous sensory environment can cause disorganization of brain function similar to, and in some respects as great as, that produced by drugs or lesions. Additionally, Gregory (cited in Biren, 1972b) states that in the absence of sensory stimulation the brain can produce fantasies which parallel hallucinations. Biren (1972b, 1982) reports that when surrounded by blank walls, research subjects have even been observed to emit behavior similar to that of schizophrenics.

Other studies have shown how color in the environment can have negative effects on people. According to Goldstein (1942), words written in red lettering perceptually indicate different sizes and distances between letters than do other colors, such as green. People who suffer from micropsia and macropsia (visual distortions of shape and size), while under conditions of either red lighting or red print, reported more errors of judgement in size and distance than did people suffering from the same affliction under conditions of green lighting or green print.

A report in the Los Angeles Times demonstrated how improper color selection can destroy one's appetite (Dreyfuss, cited in Allen, 1977). A meat market in Chicago which was painted bright yellow lost business. The owner was told that the yellow walls left a blue after-image, causing the meats to appear purplish, old, and spoiled. By repainting the walls bluish-green, a red after-image was created which enhanced the color of the meat. Sales increased. This after-image

phenomenon is due to iconic memory and should be addressed when color schemes are designed.

In his studies of color contrast, Crouch (1967) concluded that, when dark on dark relationships exist which emit low reflectance as well as low contrast, the relationship of dark colors elicits a much higher level of illumination for the perception of visual stimuli than a contrasting relationship such as black words on a white background.

Providing lighting that is neither too bright nor too dark is the first rule of good lighting ambience in eating establishments, according to Mahnke and Mahnke (1987). Bright lights do not elicit an intimate setting; dim lights do not permit the patron's appetite to be enhanced through visual stimulation. Bright yellows, yellow-orange, yellow-green, purple-violet, purplish-reds, gray tones, and whites decrease appetite and should be avoided (see Color Plate 1). Snack bars are not restaurants nor cafeterias and may not necessarily follow the same rules for lighting and color. They may be a bit brighter, but should still follow the same color schemes to enhance the working and dining environment.

Given the impact of color and illumination on perception, mood, emotion, appetite, and customer satisfaction in dining facilities, BEP food facilities should reflect consideration of these factors in their designs. Through measurement and observation of illumination levels and color schemes in BEP facilities and by comparing these data against lighting standards and suggested color configurations, this study purports to establish lighting and color standards which BEP operators can use to enhance their dining facilities.

METHOD

Subjects

With the cooperation of the State Licensing Agency BEP directors, staff, and the Elected Committee of Vendors, site visits were made during a four month period to snack bars operated under

the Randolph-Sheppard BEP. Sites visited were in the states of Alabama, Arkansas, Mississippi, and Tennessee. Fifty-one sites were visited; participation in the research study by the operators was voluntary. All of the dining facilities were operated in either city/county, state, federal, or private locations. Data from two sites was unusable.

Instrument

The Work Environment Visual Demands Protocol or WEVD (Graves, Maxson, & McCaa, 1987), an instrument designed to gather information on the workplace, was adapted for use in this study. Sections of the WEVD which measure light and color were used to secure measurements in five discrete areas: food service area, food preparation area, dining area, operator work area, and storage areas. The instrument was also adapted to gather information about the blind business person and the location of the snack bar enterprise.

Pilot Study

Prior to utilization of the instrument at the locations selected, the modified WEVD protocol was field tested at a snack bar location in Jackson, Mississippi and the results were reviewed with the business operator and the director of the BEP of Mississippi Vocational Rehabilitation for the Blind. The observations and recommendations of these individuals resulted in some modification of the instrument.

Data Analysis

The lighting data in this study are reported under one of the five categories, food service area, food preparation area, dining area, operator work area, and storage area, for purposes of comparison. Using SPSS-PC+, the data were tabulated in frequency tables and means in an effort to determine tendencies and describe composite findings.

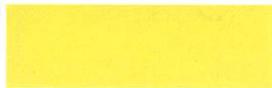
RESULTS

Forty percent of the sample population was from Arkansas, 38% from Tennessee, 16% from Alabama, and 6% from Mississippi. The sample business locations included 23 state sites (46%), 10 city/county (20%), 9 federal (18%), and 7 private (14%). The visual impairments reported by the BEP operators/owners are listed in Table 1.

Sixty-eight percent of the operators were legally blind with some usable vision, 22% of the operators had no light perception, and 6% of the operators could see hand movement only. Four percent of the operators were not available for the site visit and data for those individuals is not included in the statistics on reported visual impairment.

Positive Enhancement Colors			
Coral		Flamingo	
Peach		Pumpkin	
Light Yellow		Warm Yellow	
Clear Greens			

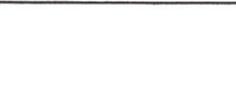
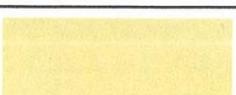
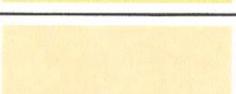
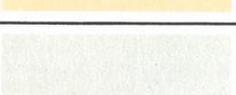
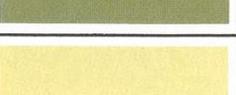
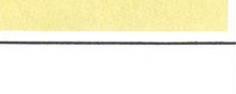
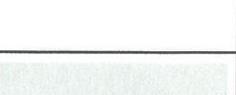
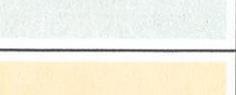
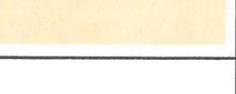
The above color samples appear courtesy of The Glidden Company (Coral Reef & Colonial Peach) and Benjamin Moore & Co. These samples are reproductions and not true color samples.

Negative Enhancement Colors		
Bright Yellows		
Yellow Oranges		
Yellow Greens		
Purple Violet		
Purplish Reds		
Grayed Tones		
Whites		

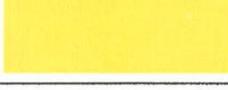
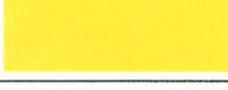
The above color samples appear courtesy of Benjamin Moore & Co. These samples are reproductions and not true color samples.

COLOR PLATE 1

Leading colors in BEP snack bar locations

Leading colors found by item: (first and second most frequent)				
Items	Munsell Notation	Munsell Color Sample	Frequency	Percentage
Tables	5YR9/2		15	30
	N9.5/		4	8
Chairs	5YR4/2		10	20
	5B3/6		3	6
Walls	5Y9/2		21	42
	5YR9/2		5	10
	N9/		5	10
Floors	5YR7/2		7	14
	5Y8/2		5	10
	5Y7/2		5	10
Ceiling	5Y9/2		19	38
	N9.5/		19	38
	N9/		5	10
Counters	5YR9/2		14	28
	N9.5/		7	14

COLOR PLATE 2

Recommended colors that maintain or enhance "appetite"	
Munsell Notation	Munsell Color Sample
5R7/8	
7.5R5/12	
10R8/4	
5YR7/8	
5YR8/4	
5Y9/4	
5Y9/6	
10GY9/2	

Recommended wall colors that maintain or enhance "mood/appetite"	
Munsell Notation	Munsell Color Sample
5R7/8	
5YR7/8	
5YR8/6	

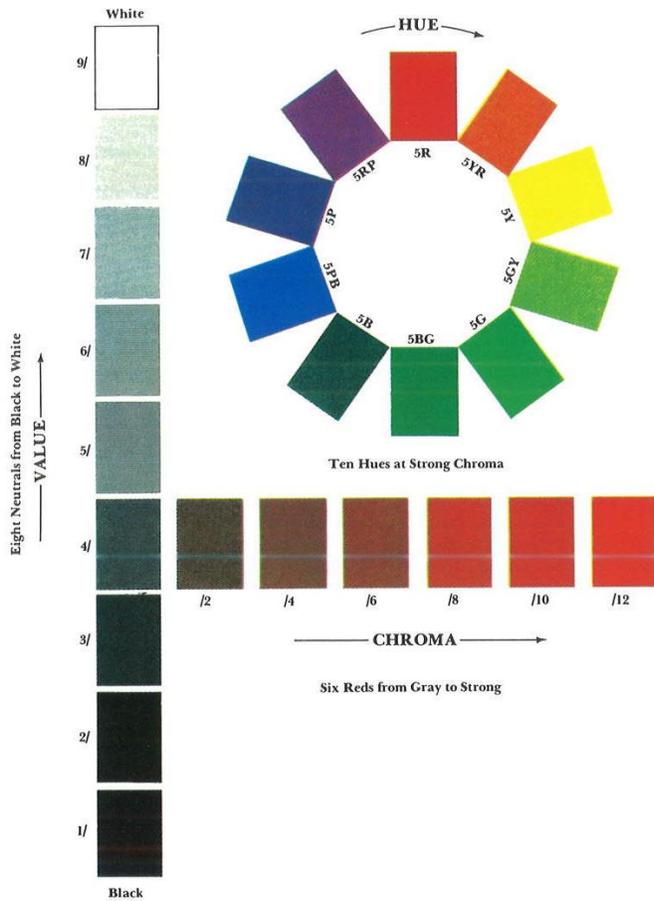
Recommended accent colors that maintain or enhance "mood/appetite"	
Munsell Notation	Munsell Color Sample
7.5B6/6	
5BG7/4	

Colors recommended by literature review

The above recommended color samples are the results of studies conducted by Mahnke & Mahnke (1987).

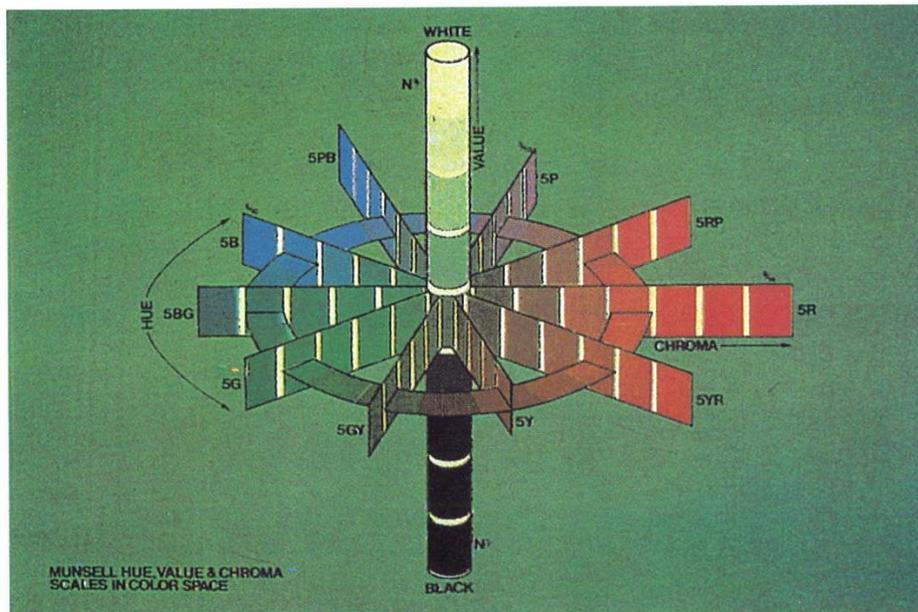
All Munsell color samples are reproductions and not actual Munsell standards. Used by permission.

COLOR PLATE 3



MUNSELL COLOR SYSTEM

Left: Hue, value, and chroma relationships. The circular band represents the hues in their proper sequences. The upright, center axis is the scale of value. The paths pointing outward from the center show the steps of chroma increasing in strength, as indicated by the numerals. Below: Hue, value, and chroma scales in color space. *Courtesy of Munsell Color Co., Inc.*



COLOR PLATE 4

Table 1
Visual impairments reported by BEP operators

Percentage	Visual impairment
16%	Retinitis pigmentosa
16%	Glaucoma
8%	Unknown
6%	Retinal detachment
6%	Retrolental fibroplasia
6%	Optic nerve problems
6%	Nystagmus
4%	Diabetic retinopathy
4%	Macular degeneration (senile), unspecified
4%	Other dystrophies primarily involving the sensory retina
4%	Congenital cataract, unspecified
4%	Artificial eyes
16%	Other

The areas that were evaluated for illumination and color in each snack bar were:

- (1) Food Service Area: service line, counters, machine banks;
- (2) Dining Area: tables, chairs;
- (3) Operator Work Area: cash register, separate offices;
- (4) Food Preparation Area: kitchen or food preparation counter;
- (5) Storage Area: A separate room or area from the food service or preparation area, not including under counter or cabinet storage.

Evaluation of Lighting in the Snack Bars

The percentages of sites that met the recommended illumination levels in each area are graphically represented in Figure 1.

Food service areas. As a group, the sites failed to meet the recommended lighting standards by 28% (thus the areas were too dark). Individually, 10% met the recommended levels at city sites, 9%

at state, 14% at private, and none at federal sites.

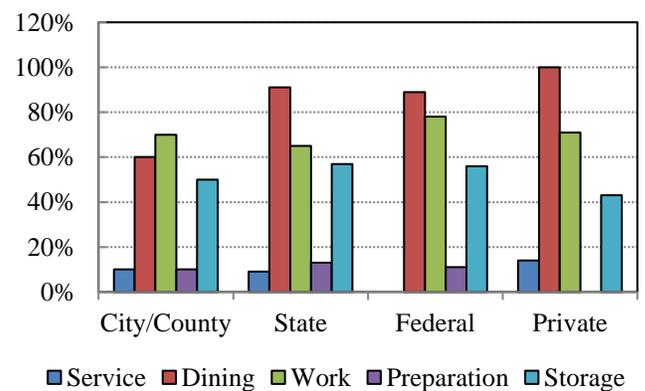
Dining areas. As a group, the sites exceeded the recommended lighting standards by 72% (thus the areas were too bright). Individually, 60% met the recommended levels at city sites, 91% at state, 89% at federal, and 100% at private sites.

Work areas. As a group, the sites failed to meet the recommended lighting standards by only 6% (thus the areas were close to the proper lighting level). Individually, 70% met the recommended levels at city sites, 65% at state, 78% at federal, and 71% at private sites.

Food preparation areas. As a group, the sites failed to meet the recommended lighting standards by 15% (thus the areas were a little on the dark side). Individually, 10% met the recommended levels at city sites, 13% at state, 11% at federal, and none at private sites.

Storage areas. As a group, the sites exceeded the recommended lighting standards by 10% (thus the areas were a little on the bright side). Individually, 50% met the recommended levels at city sites, 57% at state, 56% at federal, and 43% at private sites.

Figure 1: Percentage of Food Ares that Recommend Illumination Standards



Group Means: Service=10, Dining=86, Work=70, Preparation=10, Storage=50

Color

Because color is a three dimensional phenomenon, Albert H. Munsell described color through numbers for clarification and classification. According to Allen (1977), the Munsell System of Color Notation (1976) is a scientific concept of describing color in terms of these dimensions: Hue, value, and chroma (see Color Plate 4).

Munsell notations thus appear as "H v/c". Hue is indicated by the capital letter(s), i.e., R = red and YR = yellow-red. Hue is the circular band or color wheel shown in Color Plate 4. Value is indicated by increments of one along the central vertical axis, where black is #1, gray is #5, and white is #9. Chroma is indicated by the horizontal axis extending away from the central axis and denotes the degree of hue.

Frequencies and percentages of leading colors found in existing BEP snack bar locations are listed in Table 2. The leading colors are shown in Color Plate 2. Colors recommended by Mahnke and Mahnke (1987) to maintain or enhance mood and appetite are shown in Color Plate 3 for comparison.

Conclusions

Lighting and color play an important role in the dining environment. Too much or too little light can affect the color perception of the patron. Certain warm colors can enhance the mood and appetite and certain bright colors can diminish the mood and appetite. Combinations of bright light and white colors can cause headaches and nausea (Biren, 1979).

Of the five areas where light levels were measured in BEP locations, only dining and storage areas met or surpassed the recommended illumination levels within the facilities. Because customers most often select their food items in serving lines in snack bars, the food service areas should meet the lighting recommendations.

Improper lighting and color could very well affect the quantity purchased by the snack bars' patrons. In this survey, lighting in the dining areas was

Table 2
Leading colors found in snack bar locations*

Item	Munsell Notation	Frequency	Percentage
Tables	5YR9/2	15	30%
	N9.5/	4	8%
Chairs	5YR4/2	10	20%
	5B3/6	3	6%
Walls	5Y9/2	21	42%
	5YR9/2	5	10%
	N9/	5	10%
Floors	5YR7/2	7	14%
	5Y8/2	5	10%
	5Y7/2	5	10%
Ceiling	5Y9/2	19	38%
	N9.5/	19	38%
	N9/	5	10%
Counters	5YR9/2	14	28%
	N9.5/	7	14%

*Colors recommended that maintain or enhance appetite: 5R7/8, 5YR7/8, 5Y9/4, 10GY9/2, 7.5R5/12, 5YR8/4, 5Y9/6, 10R8/4.

Wall colors recommended that maintain or enhance mood and/or appetite: 5R7/8, 5YR7/8, 5YR8/6.

Accent colors recommended that maintain or enhance mood and/or appetite: 7.5B6/6, 5BG7/4.

found to be quite bright. Given the choice of colors provided for the operators, the blind business men/women may find that customer purchases could be affected. It should be noted that the bright dining areas were, in several instances, the result of large window areas which permitted natural light. None of the snack bars surveyed met the

recommended colors for the dining area. This could result in dissatisfied customers and a business with lower profits. The lowered lighting in the work and food preparation areas should be noted. As a result, production may decrease, while the possibility of injury increases with lower lighting levels in these areas.

The survey did ask the blind business men/women operating the snack bars if they would change anything in their location should they have the opportunity to do so. Ninety percent of the respondents indicated that they did not perceive the need to change anything in their existing location. In one of the states surveyed, the SLA is proactive in remodeling of existing locations and the results of this program are dramatic because the BEP staff and blind entrepreneurs work cooperatively.

As anticipated, the SLA and the blind business men/women are seldom consulted prior to its availability for bid on either the configuration of the snack bar area or for recommendations regarding color and illumination. Most often, the property manager will designate a location and, in some instances, delineate the color scheme and lighting. This, of course, inhibits the considerations which might be given by the BE Program staff and blind entrepreneurs to issues of color and lighting. Conflict between property managers and BEP operators regarding constraints needs some resolution or flexibility. Taking these constraints into consideration, along with limited availability of funds for program operations, considerations of light and color in the BE Program are most appropriate in remodeling and renovation of existing facilities.

Recommendations

The results of this study suggest several recommendations related to policy or development of in-state programs.

(1) Review use of light and color in existing food

service locations. Improvement, if necessary, could enhance sales and profits for blind entrepreneurs.

- (2) Consider consultation from the faculty of a local university with a Department of Architecture to review the utilization of light and color in existing food service operations. The SLA could also consider a review of similar private food service operations in their states which have demonstrated success to determine the use of light and color in the business.
- (3) Consider seeking an appropriation of funds for remodeling and renovation of existing facilities, and in such renovations include light and color upgrading as necessary.
- (4) In negotiation for new locations, SLA personnel should be sure to include understandings regarding light and color in the proposed facilities. Negotiation of these issues with the building managers prior to operation by the blind vendor could improve the opportunity for profit.
- (5) Share the information regarding use of light and color with the Elected Committee of Vendors to ensure their understanding of its importance in optimizing sales and profit.

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