A STUDY OF LEGIBILITY FACTORS FOR STATEMENTS OF CONTENTS ON CONSUMER GOODS FOOD PACKAGES

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ABSTRACT

A STUDY OF LEGIBILITY FACTORS
FOR STATEMENTS OF CONTENTS ON CONSUMER
GOODS FOOD PACKAGES

by Neil I. Gilbert

Prompted by such ambiguous regulatory terms of the Fair Packaging and Labeling Act as "conspicuous" and "easily legible" for statements of contents on consumer commodity package labels, the author compiled a list of legibility factors which contains specific recommendations for improving the legibility of printed material. The list, a compilation of results of many earlier studies in the area of typeface legibility, contains some factors which are supported by only one study or investigator, but contains many factors given support by several different investigations or investigators.

Next is presented a discussion of the Fair Packaging and Labeling Act and the Federal Food, Drug, and Cosmetic Act proposed modifications affecting net weight statements on consumer food packages. The two areas of concern were: (1) the required size of type in relation to the area of the package principal display panel, and (2) the required placement of the net weight statement in the lower twenty per cent of the principal display panel area. Were these requirements fair and just to not only the consumer but also to the manufacturer of a product?

Through a process of visually analyzing seven pack-

age display panels, determining the time required for subjects to locate and orally read the net weight statements on each, it was concluded that the above-mentioned regulations did not create significant differences in the ease with which a consumer could "obtain accurate information as to the quantity of contents." Therefore, it was concluded that the regulations were fair to both consumer and manufacturer.

Also included, as Appendix II, is a list of sixty-six sources pertaining to studies conducted in the area of visual analysis of typographic material. It was felt these sources would prove useful to someone interested in this work.

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By

Neil I. Gilbert

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INTRODUCTION

Mrs. Esther Peterson, a past Advisor to the President on Consumer Affairs, referred to 1966 as the "Year of the Consumer."[1] Mrs. Peterson's statement was undoubtedly prompted by the then-current boom in consumer protection legislation. The most recent examples were the National Traffic and Motor Vehicle Act--the first federal law to order compulsory safety standards for new and used automobiles and for automobile tires, and the Fair Packaging and Labeling Act--designed to protect the shopper from deceptive packaging practices such as hard-to-find net weight statements, and such misleading and often meaningless terms as "jumbo pound."

The Fair Packaging and Labeling Act, signed into law November 3, 1966, was the culmination of proposals and hearings before the Congress which began in 1961. The Act requires that consumer products in interstate commerce be honestly and informatively labeled, to enable a shopper to easily and quickly determine the best value for her money.

Fair Packaging and Labeling Act
Declaration of Policy

Sec. 2. Informed consumers are essential to the

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[1] "Consumer: King or Vassal of the Economy?" Senior Scholastic, February 10, 1967, p. 13.

> fair and efficient functioning of a free market economy. Packages and their labels should enable consumers to obtain accurate information as to the quantity of the contents and should facilitate value comparisons. Therefore, it is hereby declared to be the policy of the Congress to assist consumers and manufacturers in reaching these goals in the marketing of consumer goods.[2]

Briefly, what the Act requires on a consumer product package is the following:

1. Product identification.
2. Name and place of the manufacturer or distributor.
3. Net quantity of contents in terms of weight, measure, or numerical count.
4. Net quantity of each serving if the label indicates a particular number of servings is contained.

The Fair Packaging and Labeling Act is administered by two governmental agencies: the Secretary of Health, Education, and Welfare--regarding foods, drugs, and cosmetics; and the Federal Trade Commission--regarding other consumer products. Each has the authority to promulgate additional regulations--according to Sec. 5 of the Fair Packaging and Labeling Act--with respect to the consumer products over which it has regulatory authority. Such regulations will take the form of modifications of existing regulations covering the

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[2]U.S., Congress, Fair Packaging and Labeling Act, Public Law 89-755, 89th. Cong., S. 985, 1966, p. 1.

affected products; for the Act is not intended to repeal, invalidate, or supersede:

1. The Federal Trade Commission Act or any statute defined therein as an antitrust Act.
2. The Federal Food, Drug, and Cosmetic Act.
3. The Federal Hazardous Substances Labeling Act.[3]

The scope of this thesis shall be restricted to a study of net weight statements on packages--classified as consumer food packages--for the following reasons:

1. A very large percentage of the consumer products affected by the Fair Packaging and Labeling Act are food products.
2. In today's giant impersonal supermarket--as much or more than in any other type of retail outlet--the shopper must rely almost totally on the package to give him the basic product information he once received from the salesman.
3. Price-value relationships are becoming apparently more important to the grocery shopper, who is quite frankly often confused by the barrage of advertising claims for a given product category.

First, a brief discussion of typography, specifically a discussion of factors that contribute to the legibility of

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[3] Ibid., Sec. 11.

printed matter is presented. This is done in the hope of making a meaningful contribution to those in the packaging industry directly concerned with the Fair Packaging and Labeling Act and subsequent regulations, and who are faced with such ambiguous regulatory labeling terms as "conspicuous" and "easily legible."

Next is presented a discussion of the Fair Packaging and Labeling Act regulations and the Federal Food, Drug, and Cosmetic Act proposed modifications affecting net weight statements on consumer food packages. The two areas of concern were: (1) the required size of type in relation to the area of the package principal display panel, and (2) the required placement of the net weight statement in the lower 20% of the principal display panel area. The question to be answered was whether these regulations were fair and just to not only the consumer but also the manufacturer of a product. The approach taken to answer this question was not that of personal opinion nor sentiment, but rather a process of factual investigation and visual testing.

I. LEGIBILITY OF PRINTED MATTER

Typography's Role in Package Design

"Typography" is defined by Webster's New International Dictionary as the "act or art of expressing by types or symbols; emblematic representation."[4] Clearly therefore, the typographer's main goal is communication.[5] This communication should be clear with as little interference as possible. The medium for conveying the message is the printed matter--the type. Therefore, type becomes an integral part of the message; and every attempt should be made to employ legible type.

Prompted by such statement of contents regulatory terms as "easily legible" and "in distinct contrast," the author felt that some form of guidelines should be established to assist the package label designer in determining what indeed does constitute "legible" type and "distinct contrast" of printed material.

The Federal Food, Drug, and Cosmetic Act proposed modifications list several requirements which must be met in or-

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[4] "Typography," Webster's New International Dictionary (Springfield, Mass.: G. & C. Merriam Co., 1957), p. 2751.

[5] John Lewis, Typography: Basic Principals - Influences and Trends Since the 19th. Century (New York: Reinhold Publishing Corporation, 1964), p. 42.

der for the net weight statement to qualify as "conspicuous" and "legible" in the legal sense. Not included in this list, however, is a discussion of type face characteristics which enhance the legibility of the type, nor any mention of what brightness gradient differentials between the symbol and the background are necessary to produce "distinct contrast." Therefore, a list of legibility factors was compiled from a study of many reports of earlier investigators in the field of visual analysis of typographic matter. These factors are intended to aid the package designer in developing a label which will clearly communicate all mandatory printed information.

Legibility Factors and Requirements of Each For Legible Printed Material

"Legibility" was defined by one investigator as "the total amount of characteristics of symbols which determine the visual ability to recognize and read them correctly."[6] The specific means for measuring type face legibility are dictated by the particular study involved. Burtt and Basch[7] listed five general methods for measuring legibility of type

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[6]Curt Berger, "Some Experiments on the Width of Symbols as Determinant of Legibility," Acta Ophthalmologia, XXVI (1948), pp. 517-550.

[7]Harold E. Burtt and Coryne Basch, "The Legibility of Bodoni, Baskerville Roman, and Cheltenham Type Faces," Journal of Applied Psychology, VII (1923), pp. 237-245.

face:

1. Maximum distance at which the type can be read.
2. Time taken to read a passage.
3. Number of letters read in a tachistoscope or minimum exposure at which they can be seen.
4. Minimum illumination under which type can be seen.
5. Extent to which letters can be thrown out of focus and still be legible.

Regardless of the specific method employed, the conclusions of the various investigators studied were in general agreement.

Most of the legibility factors listed below were supported by more than one investigation, and therefore shall not be individually footnoted. A few, however, were conclusions of only one study or one investigator. These are individually credited.

I. The FORM or CONFIGURATION of the letter.

There is a distinct difference in the legibility of printed material printed in different type faces, and between different characters of the same type face. Suggestions for contributing to more legible form are:

A. Simple outlines should be employed whenever possible.

B. The use of a type face having few hairlines is

recommended.[8]

C. Characteristic parts of each symbol should be emphasized in the type face design.

D. Regular letter width rather than condensed letter width should be utilized whenever possible. (Breadth of the character is more important than character height because breadth allows for greater visibility of the letter's internal spaces.)[9]

E. The use of caps and lower case letters in combination (first letter of each word capitalized) is better than the use of all upper case letters for tasks such as headline reading. (Visually grasping the net weight statement on a package principal display panel is similar to the headline reading task.)

F. A symbol width-to-height ratio of 3:5 is recommended.[10]

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[8] Miles A. Tinker, "The Relative Legibility of the Letters, the Digits, and of Certain Mathematical Signs," Journal of General Psychology, I (1928), pp. 472-496.

[9] E.C. Sanford, "The Relative Legibility of the Small Letters," American Journal of Psychology, I (1888), pp. 402-435.

[10] Charles A. Baker and Walter F. Grether, "Visual Presentation of Information," WADC Technical Report 54-160 United States Air Force, Wright Air Development Center, August, 1954, p. 57.

II. The SIZE of the letter.

A. When the printed matter is about 28 inches from the observer's eye, the recommended minimum letter height is 0.10 inches when the level of illumination is above one foot-candle.[11]

B. Legibility of printed matter improves with increasing chararacter size, other factors remaining constant.

C. Distance recognition is better for capitals than for lower case letters. (This is due to the apparent larger size of an upper case character.)

III. The STROKE WIDTH of the letter.

A. Light strokes are poor.

B. There is generally an increase in the legibility of printed matter with increased stroke width.

C. The stroke width should be uniform.

D. The stroke width should be approximately 25% of the mean letter width.[12]

E. The optimum height to stroke-width ratio appeared to vary with the particular type face involved,

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[11] Ibid., p. 57.

[12] Mason N. Crook, J.A. Hanson, and A. Weisz, "The Legibility of Type as Determined by the Combined Effects of Typographical Variables and Reflectance of Background," WADC Technical Report 53-441 United States Air Force, Wright Air Development Center, March, 1954, p. 12.

and differed slightly from upper to lower case characters. The height to stroke-width ratios discovered ranged from 4.6:1 to 8.0:1, with the majority about 5:1.

IV. The SPACING between characters.

Optimum spacing appeared to be about 50% of mean letter width.[13]

V. The SIZE of the CRITICAL DETAIL.

As mentioned earlier, the critical detail can be improved by expanding the letters. Such increased breadth gives more visibility to the internal spaces of the characters.

VI. The CONTRAST between FIGURE and BACKGROUND.

Concerning the relative legibility of black characters on a white background versus white characters on a black background, differing conclusions were discovered:

A. Three studies indicated that black printing on a white background proved more legible.

B. Two studies reported no apparent difference in the legibility of the two combinations.

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[13] M.N. Crook, J.A. Hanson, and A. Weisz, "The Legibility of Type as a Function of Stroke Width, Letter Width, and Letter Spacing Under Low Illumination," WADC Technical Report 53-440 United States Air Force, Wright Air Development Center (Submitted to Aero Medical Laboratory, March, 1954), p. 19.

C. Only one study indicated that--under high illumination--white printing on a black background was more legible than black printing on a white background.[14]

VII. The BRIGHTNESS CONTRAST between SYMBOL AREA and BACKGROUND. The studies agreed generally that the greater the brightness contrast between symbol area and background the greater is the legibility of the material. Specifically, one study reported the relative legibility of several color combinations.[15] The following list, taken from that study, is in descending order of legibility.

GOOD	FAIR	POOR
Blue on White	Green on Red	Orange on Black
Black on Yellow	Red on Yellow	Black on Purple
Green on White	Red on White	Orange on White
Black on White		Red on Green

These combinations are but a few of the possible combinations of color employed in package label design;

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[14] K. Dunlap, Report of the Highway Research Board (National Research Council, Division Office, 1932), Appendix E, Article 4, p. 3.

[15] Katherine Preston, Howard P. Schwankl, and Miles A. Tinker, "The Effect of Variations in Color of Print and Background on Legibility," Journal of General Psychology, VI (1932), pp. 459-461.

and there is room for question concerning what value of each hue the researchers employed. The list does provide, however, a point from which to start when considering what color combinations could be employed to create the desired design effect and still be considered "in distinct contrast."

The most unfavorable combination of the above-listed factors of legibility is: (1) condensed letters, (2) close-spaced, with (3) narrow strokes. The reader should bear in mind, however, that what may be optimally legible in one instance may prove much less so in another. Frederic W. Goudy, designer of more type faces than any other type creator in history, was quoted as saying, "I feel that too few (designers) realize that a type amply legible for one purpose may not prove so for another--there is no universal type--there is no universal quality of legibility for types of all purposes."[16]

However, if a package designer considers the above-mentioned legibility factors when planning the printed message on his package, and employs combinations yielding what is generally accepted as legible print in contrasting colors, he should encounter little difficulty in developing copy

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[16]Earl English, "Study of Readability of Four Newspaper Headline Types," Journalism Quarterly, XXI (1944), pp. 217-229.

which will be considered "legible" and "in distinct contrast" by the governmental regulatory bodies.

II. CONSUMER PACKAGE LABELING LEGISLATION

General Discussion

The legislation applicable to the area of net weight statements for food packages and herein discussed is the Fair Packaging and Labeling Act, and 21 CFR Part 1 of the Federal Food, Drug, and Cosmetic Act as proposed ammended by the Commissioner of Food and Drugs.

Section 201 (f) of the Federal Food, Drug, and Cosmetic Act defines "food" as "(1) articles used for food or drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article." Such items account for a very large percentage of the products found on supermarket shelves--those commodities purchased for household consumption or expenditure.

There are a few product categories which the reader might normally consider to be a "food" product but which are exempt from the Fair Packaging and Labeling Act. These include meat and meat products, and poultry and poultry products. These items are subject to regulations under other laws, and the exemptions are in accord with those of the Federal Food, Drug, and Cosmetic Act.

Fair Packaging and Labeling Act
(Net Weight Statement Labeling Requirements)

The Fair Packaging and Labeling Act requires that the net quantity of contents be expressed:

1. In a uniform location upon the principal display panel of the label.
2. In ounces (with identification as to avoirdupois) and, if applicable, in pounds, with any remainder in terms of ounces or common or decimal fractions of the pound, if the product weighs less than four pounds.
3. In ounces (with identification as to fluid) and, if applicable, in the largest whole unit (quarts, quarts and pints, or pints, as appropriate) with any remainder in terms of fluid ounces or common or decimal fractions of the pint or quart, if the product is less than one gallon.
4. In inches and the largest whole unit (yards, yards and feet, or feet, as appropriate) with any remainder in terms of inches or common or decimal fractions of the foot or yard for a package labeled in terms of linear measure.
5. In square inches and the largest whole square unit (square yards, square yards and square feet, or square feet, as appropriate) with any remain-

der in terms of square inches or common or decimal fractions of the square foot or square yard for packages labeled in terms of measure of area.

5. In conspicuous and easily legible type in distinct contrast (by typography, layout, color, embossing, or molding) with other matter on the package.
6. In letters or numerals in a type size which shall be (a) established in relationship to the area of the principal display panel of the package, and (b) uniform for all packages of substantially the same size.
7. In lines parallel to the base on which the package rests as it is designed to be displayed.

Federal Food, Drug, and Cosmetic Act
(Net Weight Statement Labeling Requirements)

The Federal Food, Drug, and Cosmetic Act - 21 CFR Part 1 (as proposed ammended by the Commissioner of Food and Drugs) lists the following labeling requirements for the net weight statements:

1. The declaration shall be located on the principal display panel of the label, and with respect to packages bearing alternate principal panels, it shall be duplicated on each principal display

panel.

2. The declaration shall appear as a distinct item on the principal display panel, separated (by a space at least equal to the height of the lettering used in the declaration) from other printed matter appearing above the declaration, and shall be void of any qualifying words or phrases. It shall be placed on the principal display panel within the bottom twenty percent of the area of the panel in lines generally parallel to the base on which the package rests as it is designed to be displayed. No label information shall appear below or to either side of the declaration on the principal display panel.
3. The declaration shall accurately reveal the quantity of food that may be delivered from the package exclusive of wrappers, propellants, and other material packed therewith.
4. The declaration shall appear in conspicuous and easily legible boldface type in distinct contrast (by typography, layout, color, embossing, or molding) to other matter on the package. Requirements of conspicuousness and legibility shall include the following specifications:

   A. No decorative or ornamental letters shall be

used. (This is in accord with the first element of good form--simplicity of typeface.)

B. The ratio of height to width (of the letter) shall not exceed a differential of 3 units to 1 unit. (This will prohibit the use of extremely condensed letters, which were reported to be less legible than regular width letters.)

C. Letter heights pertain to upper case (capital) letters. When upper and lower case or all lower case letters are used, it is the lower case "x" or its equivalent that should meet the minimum standards.

D. When fractions are used, each component numeral shall meet the minimum height standards. (This will increase the legibility, other factors remaining constant.)

5. The declaration shall be in letters and numerals in a type size established in relationship to the area of the principal display panel of the package[17] and shall be uniform for all packages

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[17]The Federal Food, Drug, and Cosmetic Act proposed modifications define "area of the principal display panel" as the area of the side or surface that bears the principal display panel, which area shall be:

(1) In the case of a rectangular package where one entire side properly can be considered to be the principal display panel side, the product of the height times the width

of substantially the same size complying with the following type specifications:

A. Not less than 1/16 inch in height on packages the principal display panel of which has an area of 5 square inches or less.

B. Not less than 1/8 inch in height on packages the principal display panel of which has an area of more than 5 but not more than 15 square inches.

C. Not less than 3/16 inch in height on packages the principal display panel of which has an area of more than 15 but not more than 75 square inches.

D. Not less than 1/4 inch in height on packages the principal display panel of which has an area of more than 75 square inches, except not less than 1/2 inch in height if the area is more than 400 square inches.

The Federal Food, Drug, and Cosmetic Act 21 CFR Part 1 (as proposed modified), contains additional labeling regu-

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of that side.

(2) In the case of a cylindrical or nearly cylindrical container, 40 percent of the product of the height of the container times the circumference.

(3) In the case of any other shaped container, the total actual area of the surface of the principal display panel.

lations for net weight statements; but these are, in main, merely a repetition of the Fair Packaging and Labeling Act regulations concerning methods of expressing the net weight, including the units of measure to be allowed and accepted abbreviations for different quantities. Therefore, further explanation of them is not here in order.

Summary and Comparison of the Acts

Below in brief outline form is shown what the above-discussed legislation requires for net weight statements on consumer food packages. Also exhibited is the relationship of the Federal Food, Drug, and Cosmetic Act statement of contents labeling requirements (as proposed ammended) to those of the Fair Packaging and Labeling Act.

Fair Packaging and Labeling Act	Federal Food, Drug, and Cosmetic Act
1. Statement must appear in a uniform location on the display panel.	1. Statement must appear in the lower 20% of the display panel area.
2. Measurement units to be used.	2. Same (somewhat more explicit).
3. Statement must appear in "conspicuous and easily legible type..."	3. Same (four requirements of conspicuousness and legibility).
4. Type size established in relation to panel area.	4. Explicitly lists five groupings of panel areas and related minimum re-

	quired type size.
5. "In lines parallel to the base...."	5. Same.

The requirements of items (2) and (5) of the above list do not materially affect the legibility of the net weight statement; and shall therefore not be further discussed. Items (1), (3), and (4) do, however, relate very closely to the legibility of the net weight statement. The requirements of item (3) were discussed at some length earlier in this paper. Therefore, the net weight statement labeling requirements of items (1) and (4) constitute the basis for the remainder of this work.

III. PRINCIPAL DISPLAY PANEL VISUAL ANALYSIS

Introduction

The first area of concern was the Food and Drug Administration proposed minimum type size requirements for the net weight statement in relation to the area of the package principal display panel. It appeared unreasonable, for example, to require a package having a principal display panel area of 15.01 square inches to have the net weight statement minimum type size equal to the net weight statement minimum type size on a package the principal display panel of which had an area of 75.00 square inches. This reasoning involved the apparent disproportionate type size relationship between the net weight statement and other typographic matter on the 15.01 square inch panel and the net weight statement and other typographic matter on the 75.00 square inch panel.

The second area in question was the Food and Drug Administration proposed regulations requiring the net weight statement to appear in the lower 20% of the principal display panel area. Was this requirement based on an already established pattern? And could the consumer locate the statement quicker if positioned in the lower 20% of the panel area than if positioned elsewhere on the panel? It was felt these

two questions needed answering.

In-Store Study

Before any visual testing was performed, an in-store investigation was made to determine:

1. What was the general height to width ratio for existing package primary display panels; and which dimension was parallel to the base on which the package normally rested when displayed for sale?
2. Based on the location of the net weight statements, what percentage of the food packages investigated would conform to the F&DA proposed regulations regarding placement of the statement in the lower 20% of the principal display panel area?
3. Based on the type size of the net weight statements, what percentage of the food packages studied would conform to the F&DA proposed regulations regarding the required minimum type size in relation to the area of the primary display panel?
4. Which of the five ranges of display panel area (and accompanying minimum required statements of contents type size) merited investigation? The ranges, with respectively required minimum type

size for the net weight statements (as found on page (19) of this paper) are:

a) Five or less square inches . . . .1/16" type.

b) Over five to fifteen sq. in. . . . 1/8" type.

c) Over fifteen to seventy-five square inches. . . . . .3/16" type.

d) Over seventy-five to four hundred square inches. . . . . 1/4" type.

e) Over four hundred square inches. . 1/2" type.

The results of this study were:

1. The average height to width ratio for the packages analyzed was 1.55:1. There was about a 2:1 ratio of packages having the short display panel dimension parallel to the base of the package to those having the longer dimension parallel to the base of the package.
2. On 65.5% of the packages inspected, the net weight statement was found in the lower portion of the primary display panel. (This wasn't necessarily within the lower 20% of the panel area, for the distance each statement was from the bottom of the panel was not measured; but it would have been very close to the lower 20% of the panel area if not within it.)
3. Only 31.2% of the packages inspected would con-

form to the F&DA proposed regulations regarding the required minimum type size in relation to the area of the principal display panel.

The results of (2) and (3) for each range are illustrated in TABLE 1.

TABLE 1

NET WEIGHT STATEMENT COMPLIANCE WITH THE FEDERAL FOOD, DRUG, AND COSMETIC ACT PROPOSED MODIFICATIONS

MINIMUM TYPE SIZE AND PLACEMENT

Group	No. of Packages Inspected	Per Cent Compliance	
		Min. Type Size	Placement
a)	2	100.0	50.0
b)	21	19.0	71.4
c)	34	20.5	64.6
d)	6	100.0	50.0
e)	1	100.0[a]	100.0

[a]The digit type size was well in excess of the minimum standards, but the words "Net Wt." were less than the proposed minimum allowed type size.

Because of the 100% compliance with the regulations for minimum type size within groups (a) and (d), and because only one package could be found in the store having an area greater than 400 in.^{2}--Group (e)--it was decided to investigate further only packages of which the size of the display panel would fall within Groups (b) and (c). Further support

for this decision was the fact that packages having a primary display panel area of between five and seventy-five square inches account for by far the great majority of all consumer food packages normally displayed on supermarket shelves. And, as indicated in TABLE 1, there was only about 20% compliance with the F&DA proposed modified net weight minimum required type sizes for packages within these groups.

Size of Net Weight Statement Type in Relation to the Area of the Package Principal Display Panel

Testing Procedure

The first step in the visual testing was to evaluate several package display panels the areas of which were within the limits of Groups (b) and (c). The purpose was to test in one way the "fairness" of the Federal Food, Drug, and Cosmetic Act proposed modifications concerning the required minimum type size for the statement of contents in relation to the area of the package principal display panel.

The test specimens consisted of six package display panels, the areas of which corresponded to the lower and upper limits of each of the two groups investigated, with one panel in each size group having an area equal to the mean panel area of the packages analyzed in the supermarket falling within each of the respective groups.

The ratio of the height to width of each panel tested

was 1.55:1. This ratio was based on the packages evaluated in the supermarket (See page 24). The size of the panels tested with the corresponding net weight type size can be seen in TABLE 2.

TABLE 2

SPECIFICATIONS OF DISPLAY PANELS ANALYZED
PANEL SIZE AND "NET WT." TYPE SIZE

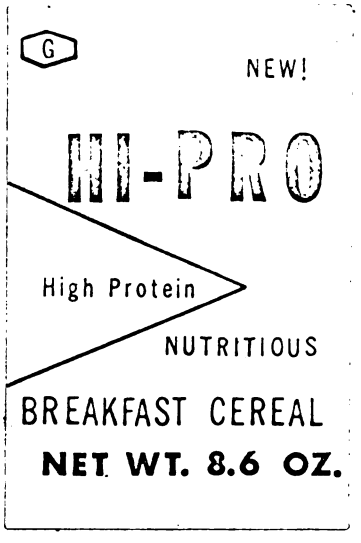
Group	Panel Area	Statement of Contents Type Size	
		Inches	Points
b)	5.01 $in.^2$	1/8	9
b)	9.20 $in.^2$	"	"
b)	15.00 $in.^2$	"	"
c)	15.01 $in.^2$	3/16	14
c)	40.80 $in.^2$	"	"
c)	75.00 $in.^2$	"	"

The panels were made of white clay-coated bending board stock; and the printing was accomplished by use of transfer lettering. (TRANS-ARTYPE manufactured by Artype, Inc. of Crystal Lake, Ill. was employed.) The typographic material--design, layout, and type face--of each panel was identical and in direct size proportion to the height of each panel. The type size of the net weight statements, however,

was the same for the three panels within each group. An exact replica--with specifications--of each package display panel visually analyzed is found on the following pages.

FIGURE 1

PANEL A



SPECIFICATIONS

1. PANEL SIZE: 5.01 in.^{2}

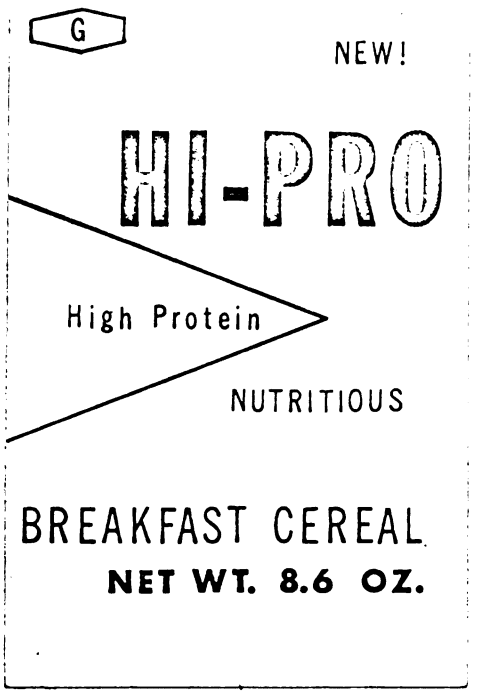
2. TYPE SPECIFICATIONS:

	Points[18]	Style
HI-PRO	36	Franklin Gothic Extra Condensed
G	10	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	14	"
NET WEIGHT 8.6 OZ.	14	Futura Bold

[18]Because of a problem in securing the same type face for the elements on each of the six different panels, it was not always possible to obtain a type size which was exactly in direct proportion to the height of the corresponding panel height. Any discrepancies, however, were very slight, and would not affect the results of the study. A "point" is 1/72 of an inch.

FIGURE 2

PANEL B



SPECIFICATIONS

1. PANEL SIZE: 9.20 $in.^2$

2. TYPE SPECIFICATIONS:

	Points	Style
HI-PRO	48	Franklin Gothic Extra Condensed
G	12	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	18	"
NET WT. 8.6 OZ.	14	Futura Bold

FIGURE 3

PANEL C

SPECIFICATIONS

1. PANEL SIZE: 15.00 $in.^2$

2. TYPE SPECIFICATIONS:

	Points	Style
HI-PRO	60	Franklin Gothic Extra Condensed
G	14	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	24	"
NET WT. 8.6 OZ.	14	Futura Bold

FIGURE 3

PANEL C

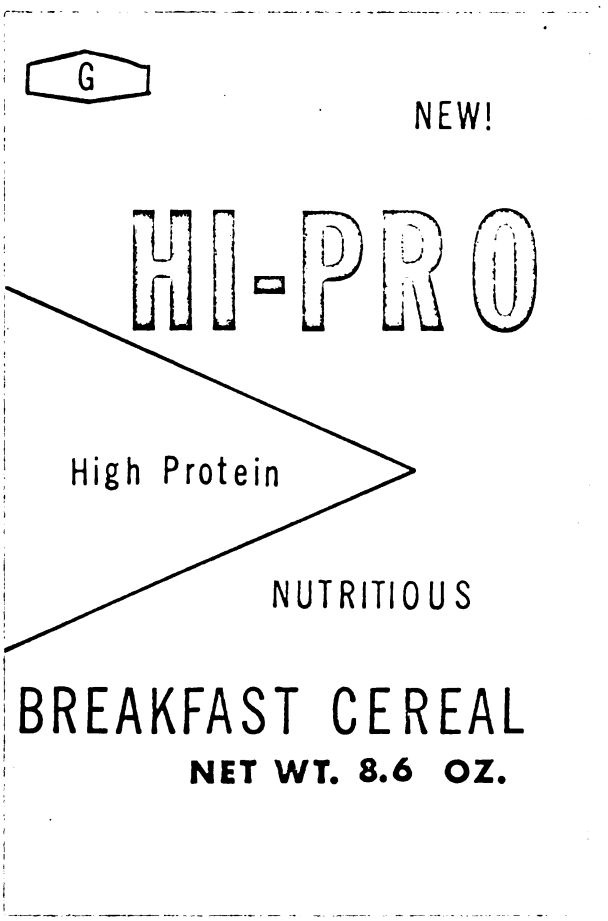


FIGURE 3

PANEL C

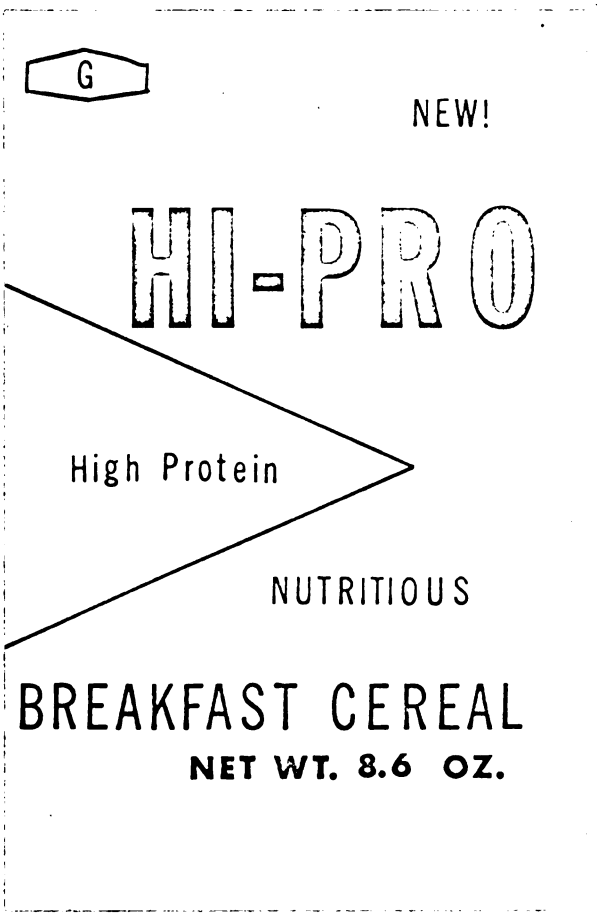


FIGURE 4

PANEL D

SPECIFICATIONS

1. PANEL SIZE: 15.01 $in.^2$

2. TYPE SPECIFICATIONS:

	Points	Style
HI-PRO	60	Franklin Gothic Extra Condensed
G	14	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	24	"
NET WT. 8.6 OZ.	24	Futura Bold

FIGURE 4

PANEL D

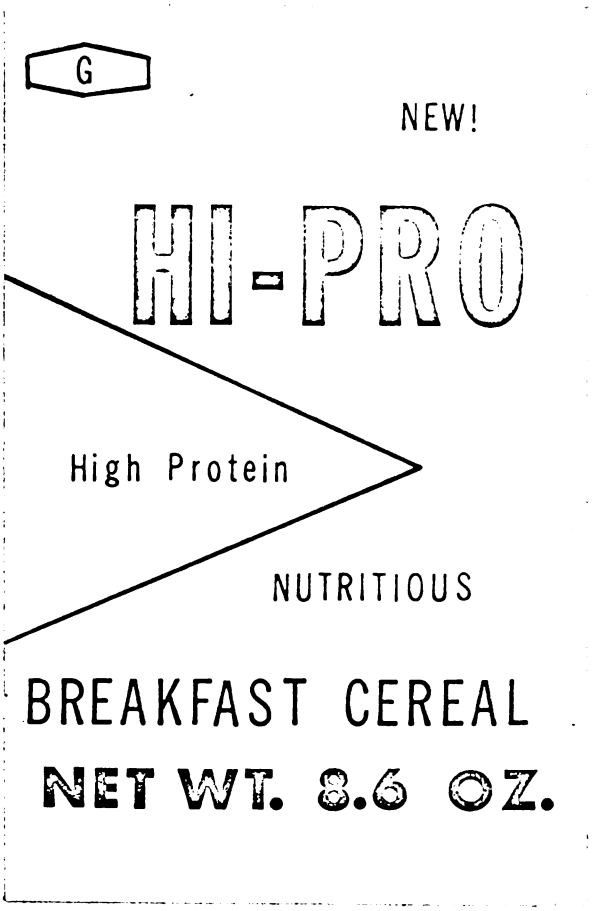


FIGURE 5

PANEL E

SPECIFICATIONS

1. PANEL SIZE: 40.80 In.^{2}

2. TYPE SPECIFICATIONS:

	Points	Style
HI-PRO	96	Franklin Gothic Extra Condensed
G	24	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	48	"
NET WT. 8.6 OZ.	24	Futura Bold

FIGURE 5

PANEL E

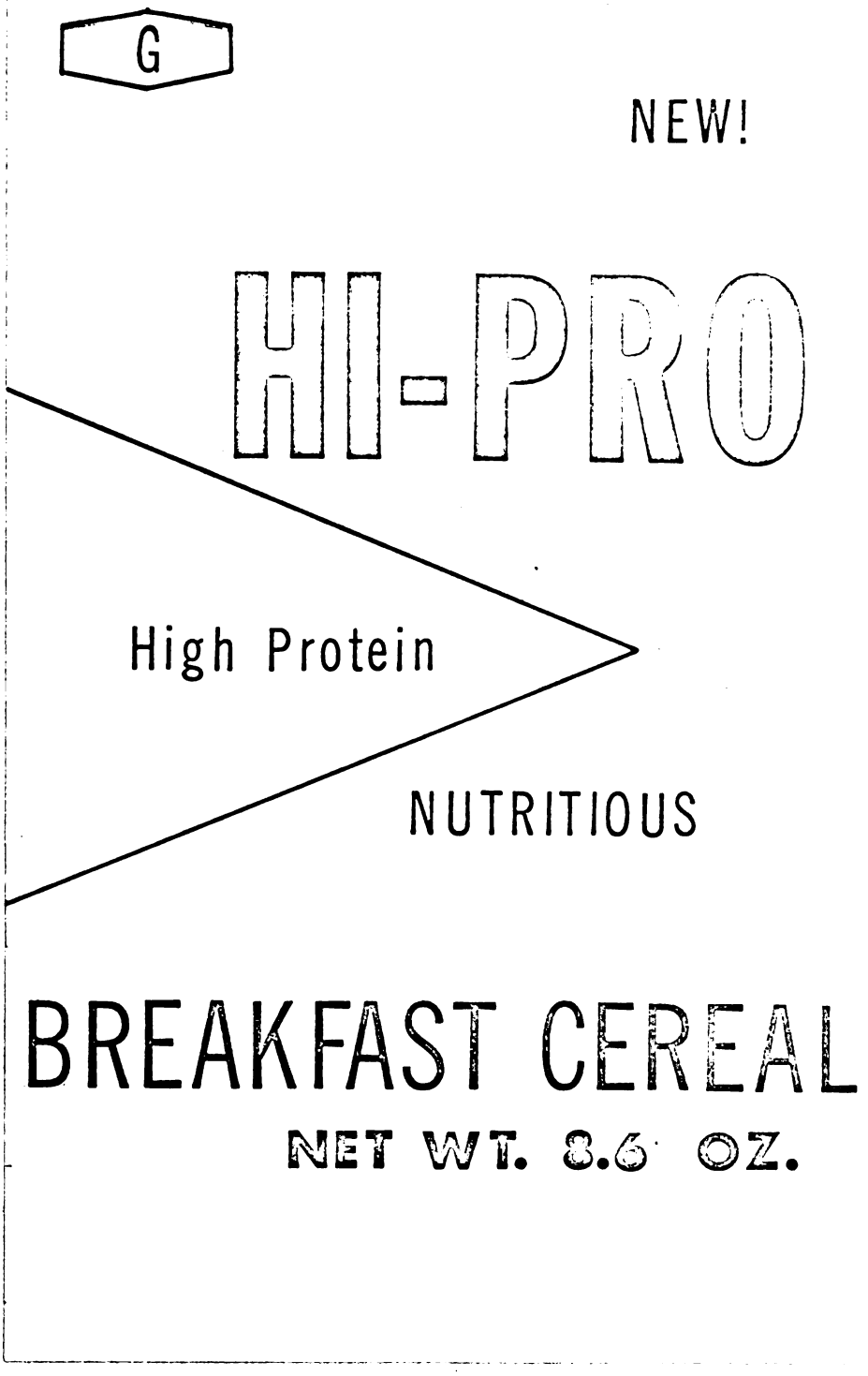


FIGURE 6

PANEL F

SPECIFICATIONS

1. PANEL SIZE: 75.00 $in.^2$

2. TYPE SPECIFICATIONS:

	Points	Style
HI-PRO	120	Franklin Gothic Extra Condensed
G	36	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	60	"
NET WT. 8.6 OZ.	24	Futura Bold

Each panel was positioned in a vertical plane 30 inches from the observers' eyes, with the flat-grey area surrounding the display panel void of any distracting elements. Three General Electric 40-watt Cool White fluorescent bulbs provided an illumination level of 200 foot-candles for the area surrounding the panel (measured on a horizontal plane directly in front of the panel). Although most supermarkets' illumination levels are below 200 foot-candles, this is the level recommended by the Illuminating Engineering Society for self-service stores--such as today's supermarket.[19]

The subjects were college students with normal vision or corrected-to-normal vision with glasses. Fifteen different students viewed each display panel. Each student viewed only one panel. The subjects were told the study consisted of an evaluation of legibility factors for net weight statements on package primary display panels. They were informed they would be looking at a display panel of a package. They were further informed that the panel they would be viewing had no color nor illustration, but did have some design and the words one would normally expect to find on a package primary display panel.

The observers were positioned behind a shield with a slide opening, measuring 5" x 2", through which they were in-

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[19]"Recommended Practice for Lighting Merchandising Areas," Reprinted from Illuminating Engineering, June, 1963, p. 14.

structed to view the panel. The slide opening was operated manually by the experimenter. With the subject positioned in front of the shield with his eyes directly in front of the slide opening, the slide was opened; and the subject was shown a blank panel the exact size of the display panel and positioned exactly where the display panel under study would be positioned when he viewed it. The subject was instructed to adjust his line of vision to enable him to look directly at the panel when the slide was next opened. This pre-exposure was intended to reduce the subject's uncertainty of: (1) the size of the panel he would be viewing, and (2) the location of the panel behind the shield.

The subjects were instructed to locate and to immediately read aloud the net contents statement exactly as it appeared on the panel. For example, on the packages studied this statement appeared as "NET WT. 8.6 OZ." The subjects were instructed to read this as "Net weight eight point six ounces," or "Net weight eight and six-tenths ounces." If the subject omitted the words "Net Weight," the time was not recorded.

The subjects were asked to locate and read the statement as rapidly as possible when the slide was drawn away from the opening in the shield. When the experimenter drew back the slide with one hand, he started the timer with the other; and immediately upon the verbal completion of the net

contents statement by the subject, the experimenter stopped the timer.[20] This time (in minutes) for each subject for the respective panels is shown on the following pages.

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[20] A GraLab micro-timer, manufactured by the Meylan Stopwatch Co. of New York City, was employed. The timer was accurate to the nearest one-thousandth of a minute. The timer switch was a two-way switch, which the experimenter held in his hand when operating the instrument.

TABLE 3

TIMES REQUIRED FOR SUBJECTS TO LOCATE AND READ THE NET WEIGHT STATEMENTS ON THE VARIOUS DISPLAY PANELS

Panel A		Panel B		Panel C	
Subject	Time	Subject	Time	Subject	Time
1	.041 (min)	16	.047 (min)	31	.048 (min)
2	.036	17	.073	32	.054
3	.042	18	.046	33	.061
4	.054	19	.064	34	.039
5	.034	20	.046	35	.062
6	.033	21	.050	36	.056
7	.060	22	.052	37	.059
8	.058	23	.043	38	.045
9	.054	24	.045	39	.047
10	.042	25	.058	40	.063
11	.041	26	.046	41	.058
12	.061	27	.044	42	.060
13	.039	28	.044	43	.060
14	.060	29	.047	44	.073
15	.056	30	.056	45	.064

TABLE 3--Continued

Panel D		Panel E		Panel F	
Subject	Time	Subject	Time	Subject	Time
46	.064 (min)	61	.038 (min)	76	.042 (min)
47	.056	62	.055	77	.041
48	.044	63	.048	78	.059
49	.055	64	.055	79	.058
50	.048	65	.046	80	.050
51	.050	66	.055	81	.047
52	.055	67	.039	82	.060
53	.047	68	.053	83	.043
54	.037	69	.045	84	.051
55	.055	70	.047	85	.053
56	.049	71	.047	86	.047
57	.048	72	.047	87	.048
58	.044	73	.049	88	.051
59	.046	74	.047	89	.038
60	.046	75	.041	90	.041

A summarization of these data is shown in TABLE 4. The times are the means of the fifteen subjects' times for each panel.

TABLE 4

MEAN TIMES REQUIRED FOR SUBJECTS TO LOCATE AND READ THE NET WEIGHT STATEMENTS ON THE VARIOUS DISPLAY PANELS

Panel	Panel Area ($In.^2$)	Time (Min.)	Type Size[a] (In.)
A	5.01	.047	1/8
B	9.20	.051	1/8
C	15.00	.057	1/8
D	15.01	.050	3/16
E	40.80	.047	3/16
F	75.00	.049	3/16

[a]Net Weight Statement.

Discussion of Results

The reader will note that for the three display panels having 1/8" net weight statement type the time required to locate and read aloud the net weight statement increased from Panel A to Panel C. This was as expected because as all the other typographic matter became larger, it appeared reasonable that more effort would be required to find the relatively "smaller" net contents statement.

It is interesting to note, however, when examining the times required to locate and read the net contents statement on each of the three panel sizes having 3/16" net weight statement type, that this pattern does not exist.

Rather the shortest mean required time was for Panel E (40.80 $in.^2$). The second shortest time was for Panel F (75.00 $in.^2$); and the longest time was for Panel D (15.01 $in.^2$).

The reason for this partial reversal of expected results can probably be attributed to the difference in type size contrast between the net contents statement and the adjacent words "BREAKFAST CEREAL." Because of the greater type size contrast the net weight statement probably appeared more conspicuously, and thus was recognized sooner on the two larger panels.

The greatest time difference recorded within one group was between Panel A and Panel C. Between these two panel sizes there was a mean time difference of 0.01 minutes or 0.60 seconds. The remainder of the panel sizes, when contrasted against other panels within their respective groups (i.e. 1/8" OR 3/16" type) or even against panels of the other group (where there existed a statement of contents type size difference), all yielded results within 0.004 minutes (0.24 sec.) of each other.

Employing the statistical t-test[21] to determine if these time differences were statistically significant at the 0.05 level of significance, the results shown in TABLE 5 were

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[21] John E. Freund and Frank J. Williams, Modern Business Statistics (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1958), pp. 240-241.

obtained.

TABLE 5

T-TEST RESULTS BETWEEN MEAN TIMES
FOR EACH PANEL STUDIED

Panels	A	B	C	D	E
B	Not sig.[a] t=1.51				
C	Sig. t=3.33	Sig. t=2.50			
D			Sig. t=3.18		
E				Sig. t=2.30	
F				Not sig. t=0.06	Not sig. t=1.08

[a]"Significant."

Four of the seven relationships did yield a statistically significant time difference. The question which remained, however, was how significant were these absolute time differences in the practical sense. Based on the foregoing results, even when considering the statistically significant time differences between four of the panels, there was very little absolute difference in the time required for persons to locate and orally read the net weight statement on typographically identical display panels of varying scale, each having the same size type for the statement of contents.

For it is most unlikely that a shopper would be consciously aware of a time difference no greater than 0.60 seconds when searching for a packaged food product's net weight.

Therefore, it was concluded that the Federal Food, Drug, and Cosmetic Act regulations (as proposed modified) regarding required statement of contents type size in relation to the area of the package principal display panel are fair and just to not only the consumer but also to the manufacturer of a product. It was clearly shown, in this instance, that the required type size-panel area relationships did not create significant differences in the ease with which a consumer could "obtain accurate information as to the quantity of contents" to enable him to easily and quickly determine the best price-value relationship for his money. Because no such difference existed, it was concluded that the regulations were indeed fair and just.

Placement of Contents Statement in Lower Twenty Per Cent of Display Panel Area

General Discussion

The second area of concern regarding the Fair Packaging and Labeling Act regulations and the Federal Food, Drug, and Cosmetic Act proposed modifications affecting net weight statements on consumer food packages was the required placement of the statement of contents in the lower 20% of the principal display panel area. Two questions were in need of an answer: (1) was this requirement based on an already established pattern, and (2) could a person locate the statement quicker if it were positioned in the lower 20% of the panel area than if positioned elsewhere on the panel?

The results of the in-store investigation (see pp. 24-25) indicated that there was a 1.9:1 ratio of packages having the statement in the lower portion of the panel (although not necessarily within the lower 20% of the panel area--see p. 24) to those having it elsewhere on the panel. This indicated that the F&DA regulation was based, at least to some extent, on an already established consumer food package labeling pattern.

Testing Procedure

To more firmly substantiate this position, however, it was decided to perform additional visual testing. The pro-

cedure was identical to that employed in the analysis of Panels A-F. Fifteen students were used, none of whom had had previous exposure to the study or to the other display panels. Panel G was identical in copy elements and size to Panel E. The differences were the use of "4.3 OZ." instead of "8.6 OZ." in the net weight statement, and the placement of the elements. The "4.3" difference was due only to a problem of type supply.

An exact replica--with specifications--of the panel is found in FIGURE 7. The principal difference between Panel G and Panel E was that the typographic elements of Panel E were lowered a respective distance to enable placement of the net contents statement in the upper 20% of the "new" panel. The words "BREAKFAST CEREAL" were moved to the upper portion of this panel to provide the same type size contrast with the net weight statement as existed on Panel E. The only other significant typographic difference was that on Panel G the trademark remained in the 20% of the panel area with the net weight statement. The trademark was not moved in order to more realistically represent a package display panel than if it had been repositioned in the lower area of the panel. It was felt that the proximity of the trademark alone would not affect the legibility of the net contents statement.

The time required for each subject to locate and read aloud the statement of contents can be seen in TABLE 6.

FIGURE 7

PANEL G

SPECIFICATIONS

1. Panel Size: 40.80 $in.^2$

2. Type Specifications:

	Points	Style
HI-PRO	96	Franklin Gothic Extra Condensed
G	24	News Gothic Condensed
NEW!	"	"
High Protein	"	"
NUTRITIOUS	"	"
BREAKFAST CEREAL	48	"
NET WT. 4.3 OZ.	24	Futura Bold

FIGURE 7

PANEL G

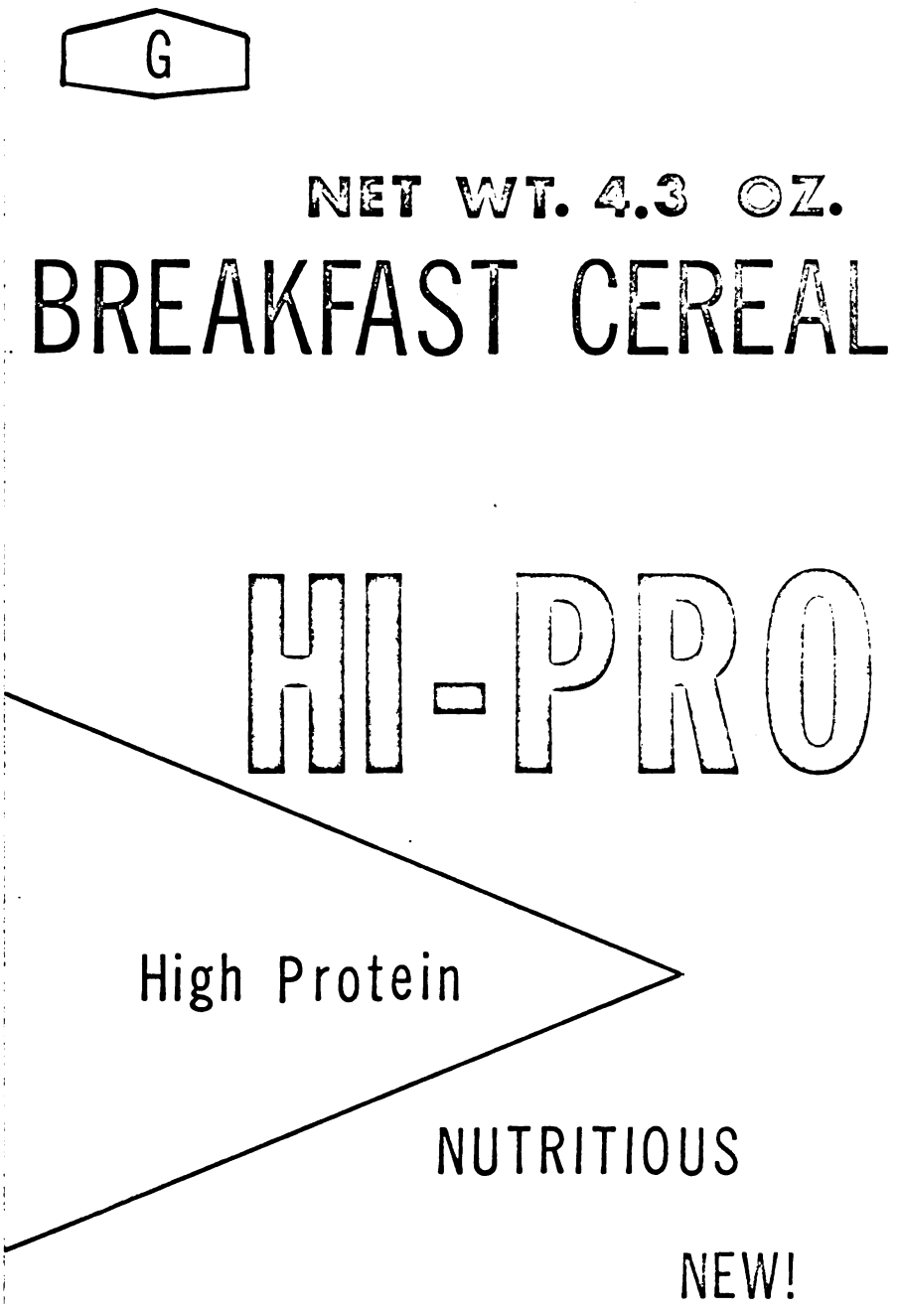

TABLE 6

TIMES REQUIRED FOR SUBJECTS TO LOCATE AND READ THE NET WEIGHT STATEMENT ON PANEL G

Subject	Time
1	.047 (min.)
2	.059
3	.058
4	.047
5	.043
6	.047
7	.044
8	.061
9	.060
10	.054
11	.041
12	.058
13	.044
14	.040
15	.049

Discussion of Results

The mean time for the fifteen subjects was 0.050 minutes. Employing the t-test earlier mentioned there was indicated a statistically significant time difference (t=2.3) between Panel G and Panel E. However, the absolute required

time was 0.003 minutes (0.18 sec.) longer than the time required for subjects to locate and read the statement on Panel E. This appeared to substantiate the position that there was a slight tendency on the part of the viewer to look near the bottom of the display panel area when searching for the statement of contents.

Again the question arose as to whether this absolute time difference was significant when considering the consumer in the market place. It is most unlikely that a shopper would be consciously aware of a time difference no greater than 0.18 seconds when searching for a packaged food product. However, when considering the intent of the legislation--to enable a shopper to easily and quickly determine the best price-value for her money--and the existing consumer food package labeling pattern of placing the statement in the lower portion of the panel (see p. 24), it was concluded that this requirement of the legislation was also fair and just to not only the consumer but also to the manufacturer.

These conclusions do not tend to support the sentiments of Mr. Harry Schroeter, National Biscuit Company's vice president for packaging. Mr. Schroeter was quoted as having said--regarding some of the type regulations--"The public may think we have a new brand called 'Net Weight'."[22]

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[22]"Packagers Wait for the New Rules," Business Week, May 13, 1967, p. 180.

IV. CONCLUSIONS AND RECOMMENDATIONS

It was not the intent of this author to consider the appropriateness or the need for the packaging legislation herein discussed. Rather than assume a position on one side of this issue and attempt to gather all possible information to shore-up that position, the author attempted to determine the "fairness" of the legislation to not only the consumer but also to the manufacturer of a product.

As discussed earlier, the two areas investigated were: (1) the minimum required type size for the statement of contents in relation to the area of the package principal display panel, and (2) the required placement of the statement in the lower 20% of the display panel area. Through a process of visually analyzing seven package display panels, it was concluded that:

I. Although there existed a statistically significant time difference for persons to locate and read the net weight statement on packages of different surface area (i.e. 15.01 sq. in. panel area vs. 75.00 sq. in. panel area), this time difference was not significant when considering a shopper in a supermarket looking for the net weight of a packaged product. This indicated that, all other factors remaining constant (elements, layout, color, and size of type in relation to pan-

el area), a consumer should find it no more difficult to locate the net weight statement on the larger panel than on the smaller one within a respective group. Which conclusion tends to dilute the import of Mr. Schroeter's statement that "The public may think we have a new brand called 'Net Weight'." For on none of the panels studied did the statement of contents attract initial attention due to exaggerated type size in relation to other elements on the panel.

II. Placement of the contents statement in the lower 20% of the panel area proved to yield faster recognition by the subjects than when the statement was placed in the upper 20% of the panel area. Again the time difference was slight; but nonetheless the results did tend to support the In-Store Investigation finding that there was a greater percentage of packages on the supermarket shelves today with the statement of contents positioned in the lower portion of the principal display panel than in the upper portion (approx. 2:1). Therefore, it does not appear unreasonable to establish this requirement to assist the shopper to "easily and quickly determine the best price-value relationship for his money."

The discussion of legibility factors for printed material was presented to give the label designer some guidance in developing or utilizing type which by all evidence to date would be considered "legible." There still exists, however, the need to more precisely define the ambiguous area of

typographic legibility. One of the specific needs in this area is to determine what brightness gradient differentials between the symbol and background constitute "distinct contrast." Perhaps a minimum brightness gradient differential yielding "legible type" in "distinct contrast" could be established.

More ideally, would be the establishing of a means to analyze any package primary display panel graphic layout to determine if--in this case the net weight statement--was "legible," regardless of the colors employed, the size of the type utilized, or the location of the statement on the panel. One such means to accomplish this would be to assemble a great variety of packages that meet the present (and proposed) labeling requirements, and determine the ease with which a consumer could "obtain accurate information as to the quantity of the contents" (possibly based on a time factor similar to that utilized in this study). Such analysis would yield a range of times (effort) required to locate and read the statement. Using the minimum time value as a standard, a manufacturer could subject any display panel layout, regardless of color, type size, or placement of the elements to analysis; and if it met the established minimum standard, the package would be acceptable.

This is only one possible approach to the problem, and it obviously has some drawbacks, the major one being the means

whereby the government could effectively assure adherence to the minimum standard. The point to be made, however, is that there is more than one approach to regulating "deceptive packaging practices;" and investigation of alternative approaches should not be overlooked.

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LIST OF REFERENCES

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APPENDIXES

APPENDIX I

DEFINITION OF TERMS

For purposes of clarification of some of the terms in this paper the following list of definitions is provided:

1. BOLDFACE TYPE: type having a heavy face.

2. CAPS (UPPER CASE): capital letters (A,B,C, etc.).

3. CONSUMER PRODUCTS (COMMODITY): any food, drug, device, or cosmetic (as those terms are defined by the Federal Food, Drug, and Cosmetic Act), and any other article, product, or commodity of any kind or class which is customarily produced or distributed for sale through retail sales agencies or instrumentalities for consumption by individuals or use by individuals for purposes of personal care or in the performance of services ordinarily rendered within the household, and which usually is consumed or expended in the course of such consumption or use. (Fair Packaging and Labeling Act p. 5).

4. FOOT-CANDLE: unit of illumination.

5. LOWER CASE: non-capital letters (a,b,c, etc.).

6. PRINCIPAL DISPLAY PANEL: that part of a label that is most likely to be displayed, presented, shown or examined under normal and customary conditions of display for retail sale. (Fair Packaging and Labeling Act p. 6).

7. TACHISTOSCOPE: an instrument which presents an image in brief flashes of equal or increasing duration. After each flash the respondent describes what was seen.

8. TYPEFACE: the complete dimensional and configurational characteristics of a set of letters or digits as specified by the original designer. Some of the details might vary among different point sizes.

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