5-1-1993

Prepress selection of typeface styles and sizes for gravure printing

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Master's Thesis

This is to certify that the Master's Thesis of

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With a major in Graphic Arts Publishing
has been approved by the Thesis Committee as satisfactory
for the thesis requirement for the Master of Science degree
at the convocation of

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Prepress Selection of Typeface Styles and Sizes for Gravure Printing

by

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A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
School of Printing Management and Sciences in the College
of Imaging Arts and Sciences of the
Rochester Institute of Technology

May 1993

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Acknowledgements

This project would not have been possible
without the contributions of the following people:

Project Advisors

Archie Provan, Project Advisor, RIT Professor, Typography
Marie Freckleton, Student Advisor, RIT Assistant Professor, Design
Miles Southworth, Director, RIT School of Printing Management and Sciences
Eberhard Braun, Project Technical Advisor, Arcata Graphics, Buffalo, NY
David Dombrowski, Technical Associate in Printing, RIT
Charles Layne, Project Statistics Advisor, RIT Adjunct Professor,
Statistical Inference

Special recognition to Walter Horne, former Professor, Gravure Printing, RIT School of Printing Management and Sciences who was consulted extensively in this project

Funding and Assistance

Special recognition to the Gravure Education Foundation for granting a fellowship award to make this study possible

Cheryl Kasunich, Director of the Gravure Education Foundation,
Gravure Association of America
Greg Tyszka, Vice President, Technical Services, Gravure Association of America
Jim Tubay, R.R. Donnelley & Sons, Standards Committee Chairman,
Gravure Association of America

Special recognition to Arcata Graphics, Buffalo, NY, for their technical assistance

Steve Schonour, Engraving Department, Arcata Graphics
Greg Birke, Engraving Department, Arcata Graphics

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Abstract

The hypothesis of this study supposes that it is possible to design a more accurate prepress, "user friendly" method of type selection for gravure printing than the system used today.The experimental methods chosen for this project were based on the suggestions made by the Gravure Association of America, the professors at Rochester Institute of Technology, and the technical staff at Arcata Graphics, Buffalo, NY. The purpose of these methods was to gather technical information about how the gravure printing process generates type images. More specifically, this meant investigating the effects of the gravure screen on type.

To accomplish this, line and circle patterns of various widths and a variety of typefaces, styles, and sizes were printed by gravure at Arcata Graphics in four different engraving settings most commonly used for publication printing. The printed samples were measured and analyzed, both visually and with magnification equipment. The typeface samples of different styles and sizes were subjected to a panel review by five gravure printing professionals through the Gravure Association of America for their acceptablility or unacceptability for gravure reproduction. The results of the panel review were subjected to statistical analysis and correlations were drawn to the results of the visual observation and measurement of the samples.

The results of this study suggest that a wider range of typefaces and typeface styles are suitable for gravure printing than those identified by the system of type selection used today. The existing guidelines discourage the use of several typefaces and typeface styles that registered favorable responses from the Gravure Association of America's panel review in this study. Garamond Light, a typeface characterized by fine serifs and thick and thin strokes, and traditionally thought as unsuitable for gravure printing was found to be acceptable at seven point size type.

Statistical analysis of the Gravure Association of America's panel review revealed that only one of the four engraving settings tested (60-0), registered a high percentage of statistically significant responses. In engraving setting 60-0, it was possible to

determine the cutoff point between acceptable and unacceptable type sizes for sixteen of the nineteen typeface styles tested. The majority of typeface styles were found to have lower acceptable type size limits at seven and eight point size type. The italic or oblique styles registered higher lower limits, at least one type size higher than the normal style of the same typeface. This can be attributed to the distortion of the line image caused by the gravure screen referred to as "jaggies" and observed to be more pronounced in italic and oblique styles as compared to normal styles. The visual observation of the "jaggies" in the line and circle patterns supports this conclusion.

It appeared unusual that the statistical analysis of the GAA panel review recorded a high percentage of statistically significant findings for only one engraving setting. The GAA judges' responses appeared to follow the same pattern for all the engraving settings except that the finer screen settings recorded more favorable responses in smaller type sizes. Statistical tests were run on the original experimental data assuming that if type sizes two and three had been included in the type sample review, the judges would have found them unacceptable for gravure printing. The results of these tests recorded one hundred percent statistically significant findings for all four engraving settings. The finer screen settings recorded lower type size preferences which can be attributed to the sharper and finer rendering of smaller type sizes in these settings. It is recommended that the Gravure Association of America examine these findings and decide on their significance.

The primary conclusion of the study is that the hypothesis is true. It is possible to design a more accurate prepress, "user-friendly" system of type selection for gravure printing than the system used today. This study explores the possibility of using a mechanical means of measuring typefaces for suitability for gravure printing. The results show that it is not possible to predict the suitability of a particular typeface, type style, or type size by mechanical means alone. However, a tool to measure typefaces may be a very effective way to eliminate a large number of typefaces, styles, and sizes from consideration. Two models of practical or "user-friendly" methods of type measurement may be useful tools to develop. One method involves measuring type from type sample books, the other using computer software programs.

Chapter 1

Introduction

The purpose of this study is to determine whether it is possible to develop a more accurate "user friendly" method of typeface and typeface style selection for gravure printing than the system being used in the gravure industry today.

The latest book printed by the Gravure Association of America classifies type into two categories, "Good Gravure Types" and "Poor Gravure Types". Thirty-eight typefaces are listed as good typefaces recommended for gravure reproduction, twenty-one as poor typefaces not recommended for gravure reproduction.[1] These recommendations are for body text sizes and normal weights. Body text sizes refer to type below size fourteen type. Type sizes fourteen point and higher are considered display type.

The problems still encountered in type selection are primarily limited to selection of correct typefaces, sizes, and styles for body text sizes. With the established guidelines it is not completely clear what is recommended as the lowest point size for good gravure types. The Gravure Association of America guidelines suggest six point type may be suitable for some but not all recommended typefaces.[2] The guidelines do not establish which of the recommended typefaces may not be suitable in six point type. There are no clear criterion for selecting italic versions for body text sizes. Most light versions of typefaces are classified as "Poor Gravure Types", but there are no specific guidelines for which light versions are acceptable or not acceptable.[3] There are no recommendations for screen size or angles.

It is known that the optimum typefaces for gravure reproduction in body text sizes are "monoweight" typefaces that have strokes of uniform weight. Typefaces that may cause problems are characterized by thick and thin strokes or lightweight typefaces with fine serifs.[4] In many circumstances, professionals in the gravure industry find these guidelines

sufficient. However, problems still result in the reproduction of body text size type that is less than ideal and at times unacceptable.

When I contacted the Gravure Association of America in January of 1992, I found that type selection had already been targeted for further study and improvement. I have worked closely with Cheryl Kasunich, Director of the Gravure Education Foundation and Greg Tyszka, Vice President of Technical Services, and have relied on their guidance throughout the study. In the early stages of the project, Greg Tyszka contacted Jim Tubay of R.R. Donnelley & Sons, Chairman of the Gravure Association of America's Standards Committee for his input into the project. He suggested that the study include developing a "user friendly" method of type selection. This means that guidelines need to be practical and easily used by designers, art directors, and type directors in the Gravure Industry.

In March of 1992 I had the opportunity to meet with Mr. Tubay, Walter Horne, former Rochester Institute of Technology professor in gravure, and David Dombrowski, Technical Associate in printing at R.I.T. and discuss at length their ideas about the project's design. It was decided that it was important to conduct more in depth research of the effects of the gravure screen on type images. The screening process in gravure places mechanical limitations on the reproduction of type. It interferes with the readability of type because the "screen tends to break up the uniformity and continuity of line work and type." [5]

All type in gravure is screened. The type image is created by engraving cells in a gravure cylinder that release ink onto the paper at the time of impression. In gravure, the term "screen" refers to the pattern of cells engraved on the cylinder. The screen size refers to the number of rows of cells per inch. The screen angle is determined by the angles of the individual diamond shaped cells. In electromechanical engraving, a helio-klishograph is used to engrave cylinders with a diamond stylus. Screen size and angles are set at the beginning of the engraving process. For example, a setting of 60-0 is commonly used in publication printing for gravure. This is equivalent to a 150 line screen with a screen angle of thirty degrees. Current guidelines of type selection are based on the recommendations of experienced designers, not scientific experimentation. One of the primary objectives of this study was to gather technical information about the gravure screen using scientific research methods with the prospect of improving current methods of type selection.

Technical assistance was provided by the staff at Arcata Graphics in Buffalo, New York. Steve Schonour, Greg Birke and Eberhard Braun of the engraving department at Arcata were consulted in many stages of production and arranged a press run to test sample fonts, line, and circle patterns to be used for analysis.

The intent of this project was to assist the Gravure Education Foundation who granted me a fellowship to explore the possibility of improving methods of "user friendly" type selection for gravure. A more accurate and practical method of type selection might benefit the gravure industry in the following manner: 1) Improve the appearance of final printed products; 2) Aide design departments by saving time in making decisions about type selection especially newly introduced typeface and typeface styles; and, 3) Progress toward the development of type standards. My academic goal in conducting this project was to work on a contemporary issue in the printing industry which involved the application of the most current technology. As a student in Graphic Arts Publishing, I am interested in the fundamental considerations of typography and design. This project also satisfied my desire to gain experience working directly with the printing industry.

1.1 Delimitations of the Study (scope of the project)

1) Study pertains only to gravure publication printing
2) Electromechanical engraving : helio-klishograph
3) Optical input to helio-klishograph

1.2 Limitations of the Study

1) Limited number of test patterns and typeface samples included in the study because of limited resources (financial, technical assistance, press time)
2) Limited time period to conduct testing
3) Study limited to solid typefaces
4) Limited number of experts (five) to review type samples
5) The term "legibility" in this study refers to the perception of the physical appearance of the type image. To avoid any misinterpretation of the term "legibility" in conducting experimental testing, the Gravure Association of America panel of judges was asked if type samples were "acceptable" or "not acceptable"

6) The hypothesis states that a prototype of a "user friendly" system of typeface selection may be developed. Time limitations prevent the development of a time tested model of type selection being developed.

7) Limitations based on specific conditions chosen for the study: Test Patterns, Typefaces, Electromechanical Engraving, Optical Input, Press Conditions, Paper, Ink

Endnotes for Chapter 1

[1]Gravure Education Foundation, Gravure Association of America, *Gravure Process and Technology* (Rochester: 1991), 382.

[2]Ibid., 382.

[3]Ibid., 382.

[4]Ibid., 382.

[5]Ibid., 382.

Chapter 2

Hypothesis

It is possible to develop a more accurate prepress "user friendly" system of selecting type styles and sizes for gravure reproduction than is presently being used. To actually develop a new time tested system of type selection is outside the scope of this project. Therefore this goal is limited to the methods proposed in this study. However, the study may involve making a prototype or suggested model to be used.

Chapter 3

Methodology

3.1 Study Design

This study has two components designed to test the effect of the gravure screen on type. The first component is a subjective evaluation of type samples by a panel of five judges selected by the Gravure Association of America. The second component is the observation and measurement of test patterns and typeface test samples. In the Results of the Study and Conclusion sections both components will be examined and correlations between the two discussed.

3.2 Study Format & Rationale

The format for the study is outlined below.

1) Design of test images and fonts to be used in the study
2) Image assembly
3) Electromechanical engraving
4) Press run
5) Design of test sample evaluation
6) Test sample evaluation - Gravure Association of America
7) Statistical review of experimental results
8) Observations and measurements of test patterns and typeface samples

Further description of each step follows:

1) Design of test images and fonts used in the study

Test Patterns

Line Pattern: 4 sets of 10 lines arranged at 4 different orientations: 0, 45, 90, 135 degrees; line widths range from .05 points to .5 points in .05 point increments

Circle Pattern: 12 circles 1 1/4" diameter; line widths range from .05 points to .6 points in .05 point increments

Typefaces: 19 styles, 4-9 points - San Serif, Serif, Script, Light, Bold, Italic: Courier, Courier Oblique, New Century Schoolbook, New Century Schoolbook Italic, Optima, Optima Oblique, Garamond Light, Garamond Light Italic, Zapf Chancery, Helvetica Bold, Helvetica Bold Oblique, Times Roman, Times Roman Italic, Palatino, Palatino Italic, Helvetica Regular, Helvetica Oblique, Helvetica Light, Helvetica Light Oblique

Line Screen / Angle: All lines, circles, and fonts, engraved at 4 different settings

1) 60-0 (30 degree screen / equivalent to 150 line screen / compressed cell format)
2) 60-4 (45 degree screen / equivalent to 220 line screen / fine cell format)
3) 70-0 (30 degree screen / equivalent to 175 line screen / compressed cell format)
4) 70-4 (45 degree screen / equivalent to 250 line screen / fine cell format)

Rationale:

The purpose of the line and circle patterns of various line widths is to examine more closely the effect of the gravure screen on type. The building blocks of type images are lines of different widths arranged and connected at various angles. These test patterns were suggested by Jim Tubay and Walter Horne. Eberhard Braun, engraver at Arcata Graphics in Buffalo, NY and technical advisor of the study, recommended that the line patterns be arranged at 45 degree and 135 degree angles as well as 0 degrees and 90 degrees because the "stepping" or "jaggies" in line images caused by the gravure screen is most noticeable at these angles. The circle test patterns tests line reproduction at all angles, from 0 to 360 degrees. The rationale of these patterns is to isolate at what line widths and angles are gravure cells unable to reproduce a line image satisfactorily. It was predicted by gravure experts that at some point in the reduction of line widths that the line image would start to break up.

The nineteen different typeface styles included in the study are representational of a variety of commonly used typefaces including serif, san serif, script, light, and italic styles. The purpose of the typeface selection was not to test a wide variety of typefaces

with exclusive purpose of developing a booklet of typefaces and styles as a reference for gravure printing. The purpose of the typefaces included in the study was to include a sufficient number of fonts to study the effects of the gravure screen on type.

Mr. Braun recommended that four different engraving settings commonly used in publication printing be included in the study to compare how the gravure screen performed in line and type reproduction at each of the settings. Each engraving setting has a unique pattern of engraved cells with a distinct line screen ruling and screen angle.

2) Image Assembly

Input into the helio-klishograph was optical. The films were generated by the author of the study at Rochester Institute of Technology facilities using the following equipment:

a) MacIntosh Computer - IIx
b) Line and Circle patterns generated in Adobe Illustrator software
c) Type generated in Quark Express software
d) Film - Kodak Imagelight HNU
e) Imagesetter used to produce type image on film: Agfa 9600, resolution 2400 dots per inch

3) Electromechanical Engraving

Films produced at Rochester Institute of Technology were taken to Arcata Graphics, Buffalo NY and prepared for engraving:

a) Bromides were made from the films in Arcata Graphics pre-press division
b) Helio-klishograph K-201 - engraved a full size cylinder from optical reading of bromides

4) Press Run

Conducted on full-size gravure publication press at Arcata Graphics.

a) Press: Reader's Digest 210
b) Press Conditions: Running Press; Press Speed: 1800 ft. per minute
c) Paper: Champion 35 lb. coated stock
d) Ink: Group #6 Black Ink for publication printing

5) Design of Typeface Test Sample Evaluation

The test was set up as follows:

1) Individual cards were made up with one type sample of one type size

2) The cards contained no visibly identifying information that could be recognized by the subject, but cards were coded so that the font and point size could be identified for later gathering of test data.

3) Subjects were asked to sort the cards into two piles — one pile for typeface samples that were acceptable for gravure printing and another pile for typeface samples that were not acceptable for gravure printing (See Appendix H for examples of typeface sample cards).

6) Typeface Sample Evaluation

The Gravure Association of America submitted type samples to a panel of six judges, five of whom elected to participate, to review the typeface sample cards. See Appendix H for a copy of the instructions that were sent to each panel member with a stack of typeface sample cards. Each judge reviewed all nineteen typefaces at point sizes 4-9 points at all four engraving settings for a total of 456 cards. The judges who reviewed the type sample cards were:

1) Al Hegedus, Ringier America

2) Jim Tubay, R.R. Donnelley & Sons, Standards Committee, Gravure Association of America

3) Gregory Tyszka, Vice President, Technical Services, Gravure Association of America

4) Gustavo Vergara, Reader's Digest

5) Roy Zucca, Young & Rubicam

7) Statistical Review of Experimental Results

Charles Layne, Adjunct Professor of Statistical Inference at Rochester Institute of Technology is the study's advisor in the statistical analysis of experimental results. The following statistical tests were applied to the experimental data:

a) chi squared "Goodness of Fit" (alpha level .10, df=5)

b) statistical probability that M of 5 viewers agree (M=1-5)

c) chi squared "For Independence" (alpha level .10, df=15)

8) Observations and measurements of test patterns and typeface samples
    1) Visual assessment with the unaided eye
    2) Visual assessment with magnification: 5x glass, 30x Micronta glass, 200x Videomet

Chapter 4

The Results

4.1 Analysis of Typeface Sample Review by the Gravure Association of America Panel of Five Expert Judges

Analysis consisted of applying the following statistical tests: chi squared "Goodness of Fit" alpha level .10, df=5, chi squared "For Independence" alpha level .10, df=15, probability that M of five viewers agree (M=1-5); See Table A and Figures A1.1-A1.5 in Appendix A, of the Appendices. Five printing professionals reviewed 456 typeface samples [point sizes 4-9 points of 19 typefaces (114 type sample cards at each of four engraving settings: 60-0, 60-4, 70-0, 70-4)]. Each type sample was judged to be either acceptable or unacceptable for gravure printing.

Table A entitled "Results of the Gravure Association of America Panel Review of Typeface Samples" records the results of the typeface sample review in worksheet format. Typefaces are listed in rows 4-22 on the y-axis. Engraving settings are listed as column headings B, C, D, E. Entries of a point size in a box indicate a statistically significant finding. A point size entry indicates the lower acceptable type size limit for a specific typeface and engraving setting (intersection of row and column). All body text sizes above the lower acceptable limit are acceptable for gravure printing. Four of the type size entries have an asterisk mark. Asterisks indicate there was some inconsistency in the judges review of the typeface indicated. The statistical test of probability (from M of 5 viewers agree) was used to establish cutoff points between acceptable and unacceptable type sizes. For the type entries with an asterisk the probability that the cutoff point is accurate is slightly less than ninety five percent. All other type size entries listed as cutoff points are accurate at ninety five percent probability (from M of 5 viewers agree; chi squared "Goodness of Fit" alpha level .10, df=5).

It is notable that some inconsistency in the judges responses is registered in italic or oblique typeface styles in all four cases. See Figures A1.1-A1.4 entitled "Graphic

Illustration of Table A Lower Acceptable Type Size Limits" for graphic illustration of Table A.

For the boxes (typeface vs. engraving setting) that are blank, statistical analysis of the judges' responses indicate no significant preference. A logical but false analysis of a blank entry is that the judges responses to the particular typeface were so variable as not to register a statistically significant finding. The blank entries are directly related to the study design as will be discussed more fully in the Discussion section found in Section 4.4 of Chapter 4.

Analysis of the lower acceptable typesize limits in engraving settings 60-4, 70-0, and 70-4 is limited because less than fifty percent of the typefaces reviewed in each of these settings register a significant finding. In engraving settings 60-4, 70-0, and 70-4, in columns C, D, and E respectively, there are 8 of 19 typefaces, 7/19, and 4/19 significant data entries of lower acceptable type size limits. It can be observed that each of the entries in columns C, D, and E is equal to or lower than the lower point size limits in the 60-0 (column A) engraving setting, however there is not enough data to make any significant comparisons between engraving settings. The statistical test chi squared "For Independence" (alpha level .10, df=15), when applied to the experimental data, finds no significant difference between engraving settings and preference for point size.

In column A of Table A, engraving setting 60-0 records 16 of 19 or 84 % significant lower acceptable type size entries. Several observations can be made about these entries found in column A. These are as follows:

1) The range of lower acceptable type size limits is from 6 points (Times Roman) to 9 points (Garamond Light Italic).
2) The distribution of typefaces with a significant entry at this setting from the lowest to the highest type size are as follows:

6 points(Times Roman); 7 points (Courier, Garamond Light, Helvetica Bold, Times Roman Italic, Palatino, Helvetica Oblique, Helvetica Light Oblique), 8 points (Courier Oblique, New Century Schoolbook Italic, Optima Oblique, Helvetica Bold Oblique, Palatino Italic, Helvetica Light), 9 points (Garamond Light Italic), all unacceptable type sizes 4-9 points (Zapf Chancery).

Refer to Figure A1.4 for a bar chart entitled, "Distribution of Lower Acceptable Type Size Limits - 60-0", (y axis: number of typefaces; x axis: point size) for graphic illustration. As can be seen from the chart, the majority of typefaces have a lower acceptable type size limit of 7 and 8 points.

3) A pattern can be observed in five of the six lower type size limits of italic or oblique typeface styles compared to the same typeface of normal style. All but one of the italic or oblique styles have a lower acceptable type size limit at least one point size higher than the normal style. Helvetica Light and Helvetica Light Oblique are exceptions where the pattern is reversed.

Refer to Figure A1.5 for a line chart entitled, "Comparison of Normal vs. Italic Styles - (60-0) Actual GAA Panel Review Preferences" for graphic illustration. This chart shows that the italic or oblique styles are at least one point size higher than the normal style of the same typeface 83% of the time in the 60-0 setting.

4) The average lower acceptable type size limits for engraving setting 60-0 is 7.1 compared to 6.1 for 60-4, 6.7 for 70-0, and 6.8 for 70-4 (located in Row 23, Table A). These averages cannot be compared because of the lack of sufficient entries in engraving settings 60-4, 70-0, and 70-4.

4.2 Visual Observation of Test Patterns and Typeface Samples

1) General Observations

a) Engraving settings 60-0 and 60-4 have more contrast to the paper (darker in appearance) to 70-0 and 70-4.

b) There was no complete break up of line images in the line and circle test patterns.

2) Observations of Line Patterns

Distortion of line patterns described in the gravure industry as "jaggies" is greater at 45 degree and 135 degree angles as compared to 0 degree and 90 degree angles, as predicted. The "jaggies" are most pronounced at the 60-0 setting, less pronounced at the 60-4 and 70-0 settings, and least pronounced at the 70-4 engraving setting.

Distortion of the line patterns is present at 0 degrees and 90 degrees and when viewed under 30x appears to alternately narrow and widen and appears to the eye as a "waviness" in the line. The "waviness" observed follows the same pattern as the "jaggies"— most pronounced at the 60-0 setting, less pronounced at the 60-4 and 70-0 settings, and least pronounced at the 70-4 engraving setting. Overall line width is wider in 60-0 and 60-4 settings compared to the 70-0 and 70-4 settings.

3) Observations of Circle Patterns

"Jaggies" appear in the circle test patterns verses engraving settings in the same fashion as in the Line Patterns — most pronounced at the 60-0 setting, less pronounced at the 60-4 and 70-0 setting and least pronounced at the 70-4 setting.

4) Observations of Typefaces

a) Contrast: Type images have greater to lesser contrast (darkest to lightest in appearance) in sequence from 60-0 to 60-4 to 70-0 to 70-4

b) "Jaggies" appear as a "fuzziness" of type in visual appearance to the eye. This phenomena is observed to be greater in the 60-0 engraving setting, less in the 60-4 and 70-0 settings, and least in the 70-4 setting. The "fuzziness" of italic or oblique styles is more pronounced than in normal styles.

4.3 Measurements of Test Patterns and Typeface Samples

1) Measurements of Line Patterns

Measurement Tool: Videomet II (K. Walter, Munchen) Magnification 200x
Measurements of line widths were taken of each line in the set of 10 lines at a 90 degree orientation (vertical on the page). Measurements were taken at this orientation as opposed to 0, 45, or 135 degrees because the 90 degree orientation more closely resembles the stem orientation of typefaces on a page. All actual measurements were taken in microns and converted to thousands of an inch.

The purpose of taking these measurements was twofold:

1) To monitor how the width of the line image varied at different stages of production. There were three basic stages of production as follows: a) The "original"

line width defined by Adobe Illustrator software, measurements in point sizes (.05 line width to .5 line width); b) line image on film; c) final line image printed on paper in four different engraving settings.

2) To compare the line widths in the four different engraving settings.

Table B in Appendix B records the width of the line in the production sequence. It is worth noting the following:

a) There was no complete break up of line images, the narrowest line width measured .05 points in Adobe Illustrator, 62 microns or .0025" on film.

b) The average difference in the line width from the "original" (software) to the line width on film for all ten lines was .002 inch (from the first to second stage of production).

c) The average difference for all ten lines in the line width from film to paper in each of the engraving settings follows: .008 (60-0), .007 (60-4), .007 (70-0), and .006 (70-4). Table C, "Average Increase in Line Width of Line Patterns in Three Basic Production Stages" and Figure C1.1, "Graphic Illustration of Table C - Average Increases in Line Width by Engraving Setting in Thousands of an Inch" (see Appendix C) record and illustrate the average difference in line width in the three basic stages of production for each of the engraving settings. It is worth noting that the line width measurements in Adobe Illustrator, measured in points, gained on the average .002" in line width when the line image was recorded on film. The total average increase is recorded in column E and is the average increase in line width from the first to last stage of production.

2) Measurements of Circle Patterns

The measurements of circle patterns were taken for the same purpose and with the same procedure used in measurements of line patterns. The results were similar to those found in the line patterns. There was no complete break up of the circular line image at any of the line widths tested. The narrowest line width measured 60 microns or .0024" on film. The summary of the average increase in line widths for all 12 circles in the production sequence is recorded in Table D, "Average Increase in Line Width of Circle Patterns in Three Basic Production Stages" (see Appendix D). The only difference between the line and circle patterns worth noting is that the average increases in line widths in the circle patterns is slightly less than the line widths of the line patterns.

3) Measurement of Typefaces

Measurement Tool: Videomet II (K. Walter, Munchen) 200x

Measurements were taken from film of the narrowest character width of each typeface at the lower acceptable type size limit and of the type size just below the lower acceptable limit. In other words, the narrowest character widths of each typeface were measured on either side of the cut off point between acceptable and unacceptable type sizes as determined by the Gravure Association of America panel review. For example, for the Courier typeface in engraving setting 60-0, the narrowest width of the lower acceptable type size of 7 points. (in this case the width of the lower case "i") is 130 microns. For the type size below this, type size 6 points, found to be unacceptable, the lower case "i" measured 116 microns. The purpose of taking these measurements was to gather more information to see if the variable of a typeface's narrowest character width is related to the acceptability or unacceptability of a particular typeface sample size.

Table E, "Measurements of Narrowest Character Widths of Lower Acceptable Type Sizes and One Type Size Below Cutoff Point" (see Appendix E) records these measurements. On this chart, for each significant typeface entry (filled box), there are two measurement entries set off by parenthesis and divided by a slash mark as follows: (/). The first measurement to the left of the slash mark is the narrowest character width of the lower acceptable type size limit of the typeface in Column A. The second measurement to the right of the slash mark is the narrowest character width of the type size just below the lower acceptable limit. For example, the entry for Courier in engraving setting 60-0 is "7/6pts (130/116)".

The following observations can be made from Table E:

a) The narrowest character widths of all typefaces of the lower acceptable type size limits in microns are located in Row 25; Row 27 records the same values converted to ten thousands of an inch.

b) The range of narrowest character widths in microns of lower acceptable type sizes for all typefaces are located in Row 29; the range of narrowest character widths of type sizes just below the lower acceptable limits are located in Row 32.

c) From this data, it can be seen that there is not a direct relationship between the variable of narrowest character width of a particular type and size and whether it is acceptable or unacceptable for gravure printing. For example, in setting 60-0, the narrowest character width of all 19 typefaces at the lower acceptable type size limit was Garamond Light 7 points at 80 microns. Helvetica Bold at 6 points was found to be unacceptable at 332 microns.

d) From this data, it can be stated that the narrowest character widths of lower acceptable type size limits found in this study are 80 microns (.0032") for engraving setting 60-0, 74 microns (.0030") for setting 60-4, 74 microns (.0030") for setting 70-0, and 72 microns (.0029") for setting 70-4.

4.4 Discussion

In the Section 4.1 it was noted in Table A that the 60-0 engraving setting had the most entries recording significant findings. In looking at the data recorded in this chart, there are many blank boxes with no type size entries. These statistical findings did not appear to accurately reflect the pattern of responses by the judges in the raw data recording their preferences. In fact, the pattern of responses by the judges was virtually identical in all four engraving settings, except that in engraving settings 60-4, 70-0, and 70-4, the judges found type samples acceptable at lower point sizes. This raised the question of whether the study design might possibly account for the difference in statistical findings between the engraving settings.

To test this hypothesis, the chi squared test was run for "Goodness of Fit" (alpha level .10, df=5) making the assumption that the following was true: "Type sizes of point size 2 and 3 would have been found to be unacceptable by all five judges for every typeface reviewed." There is strong evidence that type sizes two and three are unacceptable given that in all the type samples reviewed at 4 point type, 83% were found unacceptable by all five judges (See Appendix I for examples of printed samples of typefaces in point sizes of two and three points.) If it is assumed type sizes two and three are unacceptable, the statistical findings would be very different. These are recorded in Table F, "Projected Results of Panel Review of Typeface Samples Including Type Sizes Two and Three" (see Appendix F) in worksheet format. In this chart, all boxes (the intersection of typeface and engraving setting) record significant findings of lower acceptable type size limits. Compare

this to Table A where 42 of the 76 boxes are blank. Figures F1.1-F1.4 are bar charts graphically illustrating the findings shown in Table F entitled, "Graphic Illustration of Table F Lower Acceptable Type Size Limits". In examining Table F, several observations can be made:

a) Compared to the findings of Table A, two additional lower acceptable type size limits have an asterisk indicating some inconsistency in the judges responses. These are Courier in the 60-4 setting registering *7 points and Helvetica Bold in the 70-4 setting registering *7 points. This inconsistency has already been noted in four Italic or oblique typeface styles in the 60-0 setting in the actual experimental findings recorded in Table A.

b) The predominant pattern observed in Table A of italic or oblique type style versions recording a lower limit of at least one point size higher than normal styles in the 60-0 setting also appears in Table F in New Century Schoolbook (6 pts.) and New Century Schoolbook Italic (8 pts.), Optima (5 pts.) and Optima Oblique (8 pts.), and Helvetica (5 pts.) and Helvetica Oblique (7 pts.). See Figure F1.5, "Comparison of Normal vs. Italic Styles Projected Results if Panel Review Included Type Sizes Two and Three Points" for a line graph illustrating this relationship.

c) The average lower acceptable type size limits for each typeface are recorded in Table F in the far right hand column. See Figure F1.6 , "Average Type Size by Typeface - All Engraving Settings" for the recording of this data in a bar graph. From this graph, it can be observed that Helvetica has the lowest average at 5 points, followed by Optima and Helvetica Light Oblique at 5.3 points, etc.

d) The average lower acceptable type size limits of all typefaces for each engraving setting are recorded at the bottom of Table F in Row 23 and graphically illustrated in Figure F1.7 "Average Type Size by Engraving Setting - All Typefaces" in bar chart format. It can be seen from Figure F1.7 that the average lower acceptable type size limit is highest in engraving setting 60-0 at 7.1, followed by 70-0 at 5.9, followed by 60-4 at 5.8, and 70-4 at 5.6.

Chapter 5

Summary and Conclusions

The Discussion section 4.4 included an analysis of the project's experimental design and what the results of the Gravure Association panel review of type samples would have been if type sizes of two and three points were included in the review and assumed to be unacceptable for gravure printing. For purposes of accuracy, the conclusion section of this study will pertain only to the results of the actual panel review that are recorded in Table A and Figures A1.1-1.5. Reference to projected experimental results given the assumption type sizes two and three points are unacceptable are included in the section, Suggestions for Further Study.

The primary conclusion of this study is that it is possible to develop a more accurate prepress "user friendly" system of selecting type styles and sizes for gravure reproduction than is presently being used. However, this study reveals that there may be limitations in developing more accurate "user friendly" methods. The conclusion section will also include suggested models of type selection to be used. As stated in the hypothesis, to actually develop a time tested system of type selection is outside the scope of this project.

In section 4.1 of Chapter 4 The Results, a statistical analysis of the Gravure Association of America type sample review found there were too few significant findings in engraving settings 60-4, 70-0, and 70-4 to make any strong conclusions about those settings. But in engraving setting 60-0, 84% of the typefaces reviewed had significant findings of lower acceptable type size entries. Therefore, the discussion in this section will primarily refer to the findings for engraving setting 60-0. Before stating the conclusions more fully, a summary of the most important points from Chapter 4 or the analysis section follow:

1) In the 60-0 engraving setting the majority of typefaces were found to have lower acceptable type size limits at 7 and 8 points type sizes.
(See Table A, Figures A1.1-1.4)

2) The italic or oblique styles were found to be at least one type size higher than the normal style of the same typeface (See Table A, Figure A1.5). From the visual observation of typefaces, the "jaggies" or fuzzy appearance of italic or oblique styles is more pronounced than in normal styles. This may help explain the judges' preference for larger type sizes of italic or oblique styles.

3) The average lower acceptable type size limit was found to be 7.1 point type.

4) The narrowest character width of lower acceptable type size limits of the typefaces tested and that had statistically significant findings in 60-0 was 80 microns (.0032"), (See Table E, Row 25 and 27).

5) There is not a direct relationship between the variable of narrowest character width of a particular typeface and size and whether it is acceptable or unacceptable for gravure printing (See Table E).

A valid conclusion of this study that could be easily overlooked is that a panel review of type samples by gravure professionals is a successful method of establishing cutoff points between acceptable and unacceptable type sizes for gravure printing. It could have been predicted that there would have been enough agreement among judges to establish significant findings, but this study shows using scientific research methods that a panel review with a minimum of five judges is a valid method producing valid results. In fact, for engraving setting 60-0, it appears to be an essential part of any new future system of type selection. Since there is not a direct relationship between the variable of narrowest character width and acceptability of a particular type and size for gravure in setting 60-0, it is not possible to use a mechanical method alone in predicting which type sizes will be acceptable. In the panel review, there are variables other than character width influencing the judges' decision making. It is not in the realm of this study to make any definite conclusions about which variables are accounting for the judges' decisions. However, other variables known to effect the legibility of type in general, are overall type design, size of x-height of type characters, and openness of counters.

Though it is not possible to use a mechanical method alone in predicting type acceptability, it is possible that the narrowest character width of the lower acceptable type sizes of typefaces tested in this study could be used to establish a minimum character width for any typeface in body text sizes (this would be true for display type sizes as well). The narrowest character width found was 80 microns (.0032") in Garamond Light at 7 point type. Once a typeface or typeface style met the criterion of minimum character width in body text sizes, the type could be categorized as acceptable for gravure printing. However, a panel review would be the next step to evaluate the cutoff point between acceptable and unacceptable type sizes.

Several methods that are "user friendly" could be developed as ways to measure minimum character widths of any typeface in the prepress area. The first suggested model to explore is a mechanical means of measurement involving film and a printer's glass. For evaluating type for engraving setting 60-0, a film with a positive or negative line image of 80 microns or .0032" or slightly wider, could be placed over the narrowest portion of a type character. If the character width is wider than the minimum, then the typeface would be found to be acceptable. If a normal printer's glass of 5x magnification is not sufficient to perform the measurement, hand held magnifiers to 30x are readily available and could be used for this purpose. The one used in this study was a Micronta 30x available at Radio Shack for ten dollars.

It is important to take into consideration at what step in the production sequence the minimum character width is measured. The results of this study show that the character widths of type images increase at successive stages of the production sequence. For example, for setting 60-0, the average increase of the line images used from the film stage to the same line images on paper, was .008 inches. For an accurate standard measurement tool to be developed, it must be decided, at what point in the production sequence the measurement will be applied.

The most ideal step of the production sequence to apply the minimum character width would be prior to making films, from either type sample books or from computer page displays.This would give the advantage of easily evaluating typefaces for acceptability before investing time and money in making films. However, if the measurements were made from typeface sample books, it would have to be established that character widths of

a typeface in a sample book are the same as the character widths that would be produced on film. If for example, it is found that there is some margin of error between the two stages, it would be important to take this into account because of the high degree of accuracy that is required in making such small measurements in thousands of an inch.

The second suggested model is to measure minimum character widths of prospective typefaces on computer displays. This could be easily accomplished by importing the typeface to be measured into any of the font design programs such as Font Studio or Fontographer. These programs have the capability of taking very fine measurements. Of the two suggested models, measurements taken at the computer stage of production would be more accurate.

A large number of representative typefaces of different typeface classifications could be assembled into a reference booklet or into a software program. Typefaces that do not meet the minimum character widths could be listed as typefaces to avoid. Procedures that explain how to evaluate unlisted or new typefaces could be included with a "user friendly" type gauge in the case that measurements would be taken with a printer's glass, or in a software program if measurements are to be made on the computer display.

The results of this study suggest very strongly that a wider range of typefaces and styles may be acceptable for gravure printing in setting 60-0 than the present Gravure Association of America guidelines identify. This statement is supported by the findings of two typefaces and their oblique / italic styles. The Gravure Association of America guidelines list these as "Poor Gravure Types", but in this study the panel review found body text sizes of these acceptable. Most notable are the findings for Garamond Light and Garamond Light Italic, a typeface characterized by fine serifs and thick and thin strokes. Garamond Light was found to have a lower acceptable type size limit at seven points, Garamond Light Italic at nine point type. Helvetica Light is the other typeface the present Gravure Association of America guidelines suggest avoiding, but was found acceptable in this study (Helvetica Light at seven point type, Helvetica Light Oblique at eight point type).

The present Gravure Association of America guidelines state most typefaces considered as good gravure types are acceptable at a lower limit of six point type. The findings of this

study for setting 60-0 vary from these recommendations with the cutoff point for the majority of typefaces of normal style at seven points and eight or nine points for italic or oblique styles. The visual observation that "jaggies" are more pronounced in italic and oblique styles (also more noticeable at 45 degrees than 90 degrees in the line patterns) than normal styles and appears as "fuzziness" of the type image is evidence that the effects of the gravure screen accounts for the judges' preferences of higher type size limits for italic or oblique type styles.

Chapter 6

Suggestions for Further Study

It is recommended that the Gravure Association of America Standards Committee review the experimental design used in this study and decide whether it is possible to rule out point sizes two and three as unacceptable for gravure printing. If this conclusion can be reached, then the Standards Committee can consider the additional information in this study as valid as outlined in the Discussion section 4.4 and illustrated in Table F and Figures F1.1-1.7. If the Standards Committee decides that it is not possible to judge these type sizes as unacceptable without conducting further testing, then the additional information should be considered with whatever weight they see fit.

The additional conclusions that can be drawn if type sizes two and three can be ruled as unacceptable or are found to be unacceptable by other means decided by the Gravure Association of America are as follows:

a) The pattern observed in the 60-0 setting of italic / oblique type styles having a lower limit at least one point size higher than normal styles is also observed in three more typeface pairs. This lends more weight to the conclusion that italic and oblique styles in the 60-0 setting have a lower acceptable limit of at least one type size higher than normal styles (the majority at 8 points).

b) Comparison of the four different engraving settings is possible. These comparisons are not based on chi squared statistical analysis but on statistical calculations of average point size per engraving setting, point size average of lower acceptable type size limits per typeface, and range and distribution of significant type size entries.

The average point size per engraving setting reveals that the 60-0 setting has an average lower type size limit of 7.1 points, settings 60-4 and 70-0 are close to each other at 5.8 and 5.9 points respectively, and 70-4 registers the lowest at 5.6 points.

The choices of the judges are quite different for engraving setting 60-0 than for the other three settings. In addition to having a higher average at 7.1 points, the distribution of the majority of lower type size limits is at 7 and 8 point type. For settings 60-4, 70-0, and 70-4, the distribution of the majority of lower limits is at type sizes of 5 and 6 points.

It is also true that the pattern observed in engraving setting 60-0 of italic / oblique styles recording higher acceptable lower limits compared to normal styles is not observed in settings 60-4, 70-0, and 70-4 with the same frequency of occurrence. The lower limits are more likely to be the same for normal and italic styles in these settings.

The observation and measurement of the line and circle patterns, and typefaces also records differences in the physical appearance and dimensions between the samples of the four engraving settings that provides additional information that helps explain the differences in the judges' preferences in the Gravure Association of America panel review. In the observation of line patterns, the distortion of the line caused by the gravure screen called "jaggies" is greater at the 45 degree angle compared to the 0 degree and 90 degree angles, the same phenomena that was observed when looking at the sample typefaces. The "jaggies" were more pronounced in the italic / oblique styles compared to the normal styles. And in comparing the four engraving settings, the "jaggies" are more pronounced in the 60-0 setting, less in the 60-4 and 70-0 settings, and least in the 70-4 setting. In the visual observation of "jaggies" in the typefaces, this distortion appears as stated earlier as a "fuzziness" of the type image. It is very possible that this physical distortion caused by the gravure screen helps account for the differences in the judges of lower type size limits for settings 60-4, 70-0, and 70-4 compared to setting 60-0.

The measurement of line samples also reveals information that helps account for the judges' preferences. From film to printed line image on paper, there was an increase in line width for all four engraving settings. The greatest increase in line width was recorded for setting 60-0 at .008", 60-4 and 70-0 at .007" and, 70-4 at .006 inches. In smaller type sizes the finer line rendered by settings 60-4, 70-0, and 70-4 creates a sharper image of the type characters especially in the counters of individual characters. The combination of a finer line and less presence of "jaggies" in settings 60-4, 70-0, and 70-4 may account for the lack of difference in type size preference for normal vs. italic / oblique styles in these settings.

The minimum character widths found for each of the engraving settings could be considered in creating a more accurate prepress "user friendly" device for eliminating prospective typefaces for gravure printing. These are recorded in Table E for all four engraving settings as follows: 60-0 (80 microns; .0032"), 60-4 (74 microns; .003"), 70-0 (74 microns; .003), and 70-4 (72 microns; .0029").

In the overall comparison of engraving settings, the finer screen setting of 70-4 records the lowest type size preferences. Settings of 60-4 and 70-0 have similar performances in the ability to produce acceptable type images in lower point sizes. And setting 60-0 performs the least well in producing acceptable type images in smaller type sizes compared to the other three settings. In observing lower acceptable type size averages of all four engraving settings per typeface, the monoweight typefaces recorded the lowest type sizes as expected. Helvetica had the lowest average at 5 points, followed by Optima at 5.3 points. The other type size averages are recorded in Table F in Column F.

In creating "user friendly" tools to measure typefaces in the prepress area, it may be possible to design a measuring device that has several different settings that can be applied to type for different engraving settings. Printed material that requires the use of small type sizes could be printed at the finer engraving settings with more pleasing results.

It should be noted that the script typeface of Zapf Chancery recorded significant but unacceptable findings for the type sample review of type sizes 4-9 points for engraving settings 60-0, 60-4, and 70-0. This is an example of a typeface that in these three settings have body text sizes (in the 4 - 9 point type sizes tested) that meet the minimum character widths on film, but the panel review found unacceptable for gravure printing. It is unknown whether Zapf Chancery would have been found acceptable at body text sizes higher than 9 points in settings 60-0, 60-4, and 70-0. In engraving setting 70-4 the lower acceptable type size limit is 9 point type. It is recommended that the Gravure Association of America Standards Committee reviews this data, and decide to either establish lower acceptable type size limits for script typefaces for engraving settings 60-0, 60-4, and 70-0 at ten or twelve point type or recommend to avoid script typefaces in these settings.

The overall assessment of this study is that substantial progress was made toward furthering the knowledge of the effects of gravure screen on type with the potentially positive contribution of establishing new guidelines of type selection that are more accurate and "user friendly" for the gravure industry. The findings of this study can also be applied to new studies to establish guidelines of type selection for reverse type.

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Appendices

Appendix A

Results of Gravure Association of America Panel Review of Typeface Samples

Table A

	A	B	C	D	E
1	Table A Experimental Results of GAA Panel Review of Typeface Samples				
2					
3		60-0	60-4	70-0	70-4
4	Courier	7			
5	Courier Oblique	8	7		
6	New Century School Book			6	
7	New Century School Book It.	*8	6	7	
8	Optima				
9	Optima Oblique	*8			
10	Garamond Light	7		7	
11	Garamond Light Italic	*9	6	8	6
12	Zapf Chancery	all unacceptable 4-9pts.			9
13	Helvetica Bold	7			
14	Helvetica Bold Oblique	*8			
15	Times Roman	6	6		
16	Times Roman Italic	7	6	6	6
17	Palatino	7	6		
18	Palatino Italic	8	6	6	6
19	Helvetica				
20	Helvetica Oblique	7			
21	Helvetica Light	8			
22	Helvetica Light Oblique	7			
23	Average Typesize	7.1	6.1	6.7	6.8

Figure A1.1 Graphic Illustration of Table A - Part 1
Lower Acceptable Type Size Limits

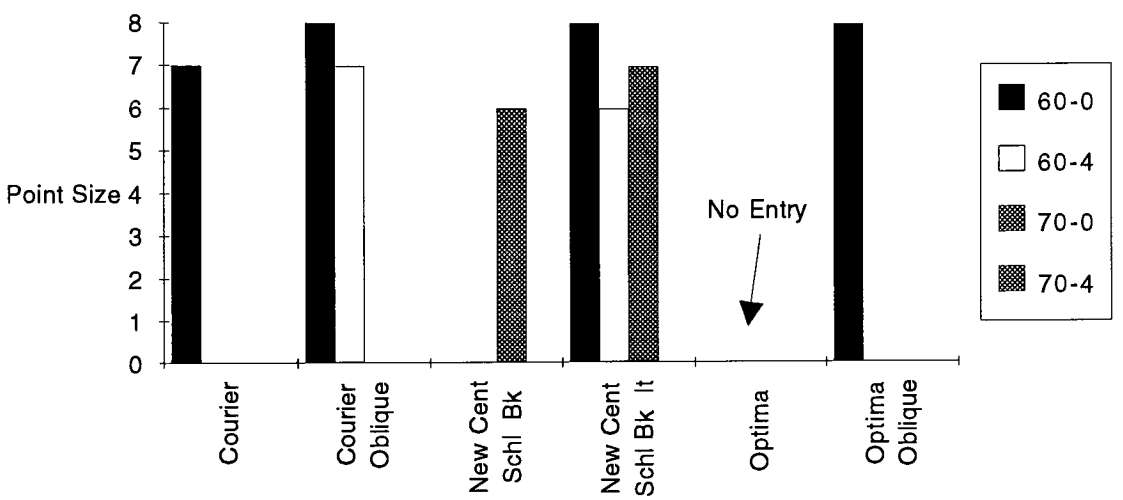


Figure A1.2 Graphic Illustration of Table A - Part 2
Lower Acceptable Type Size Limits

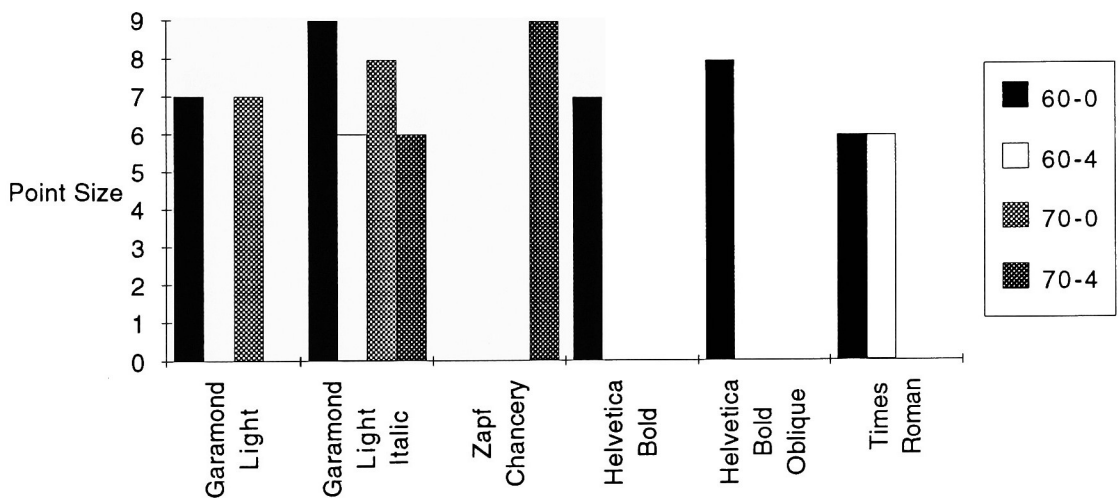


Figure A1.3

Figure A1.3 Graphic Illustration of Table A - Part 3
Lower Acceptable Type Size Limits

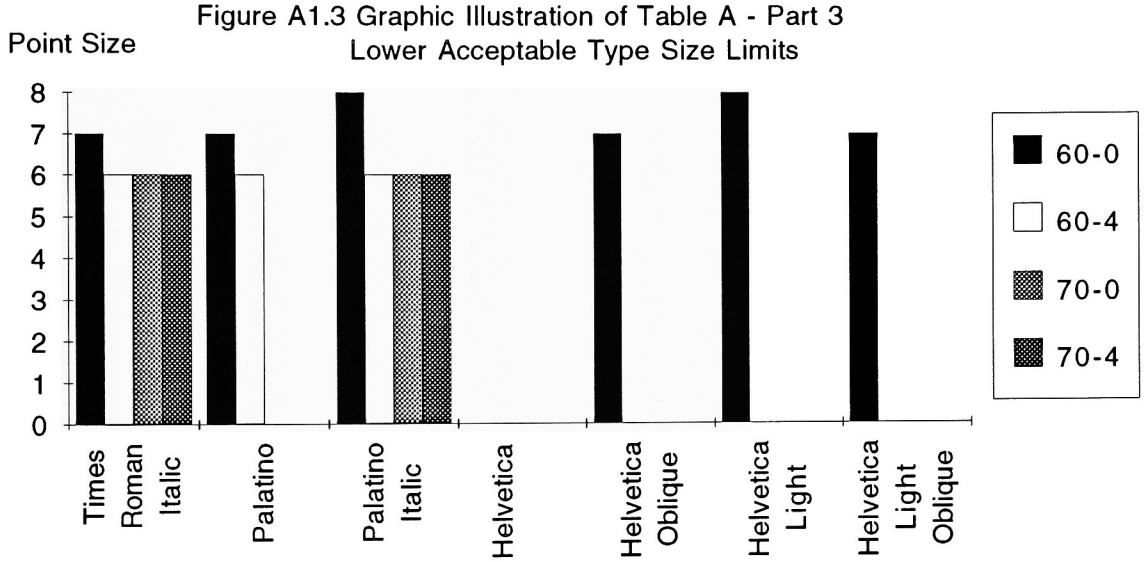


Figure A1.4

Figure A1.4 Distribution of Lower Acceptable Type Size Limits - (60-0)

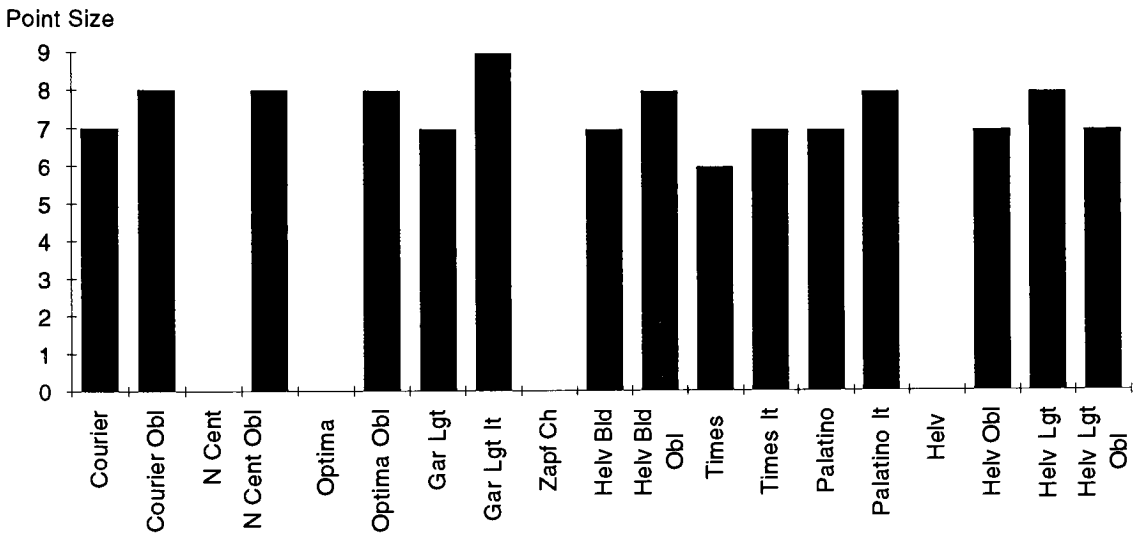
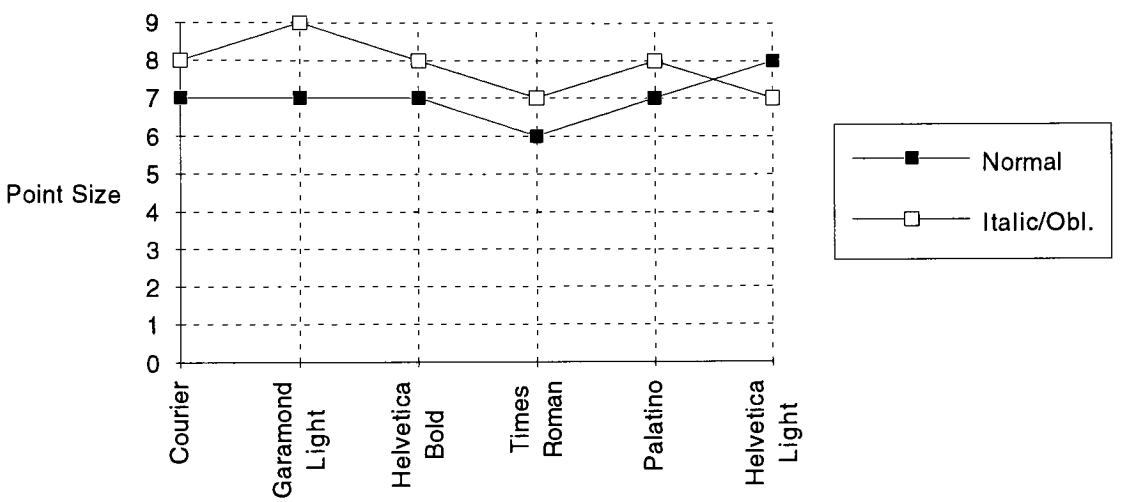


Figure A1.5

Figure A1.5 Comparison of Normal vs. Italic Styles - (60-0)
Actual GAA Panel Review Preferences



Appendix B

Line Widths at Stages of Production

Table B

	A	B	C	D	E	F	G
1		Table B Line Widths at Stages of Production					
2							
3	"original"	"original"	2nd stage	3rd stage	(width of line on printed page)		
4	(width of line	(width of line	(width of line				
5	in Adobe Illustrator	in Adobe Illustrator	on film in 0.000")	60-0	60-4	70-0	70-4
6	in points)	converted to 0.000")					
7							
8	0.05	0.001	0.002	0.01	0.01	0.01	0.008
9	0.1	0.001	0.003	0.011	0.011	0.011	0.008
10	0.15	0.002	0.004	0.012	0.012	0.012	0.01
11	0.2	0.003	0.004	0.013	0.012	0.012	0.011
12	0.25	0.003	0.005	0.014	0.012	0.013	0.011
13	0.3	0.004	0.006	0.015	0.013	0.014	0.012
14	0.35	0.005	0.007	0.015	0.014	0.014	0.012
15	0.4	0.005	0.008	0.015	0.014	0.014	0.012
16	0.45	0.006	0.008	0.016	0.014	0.014	0.013
17	0.5	0.007	0.009	0.017	0.015	0.015	0.013

Appendix C

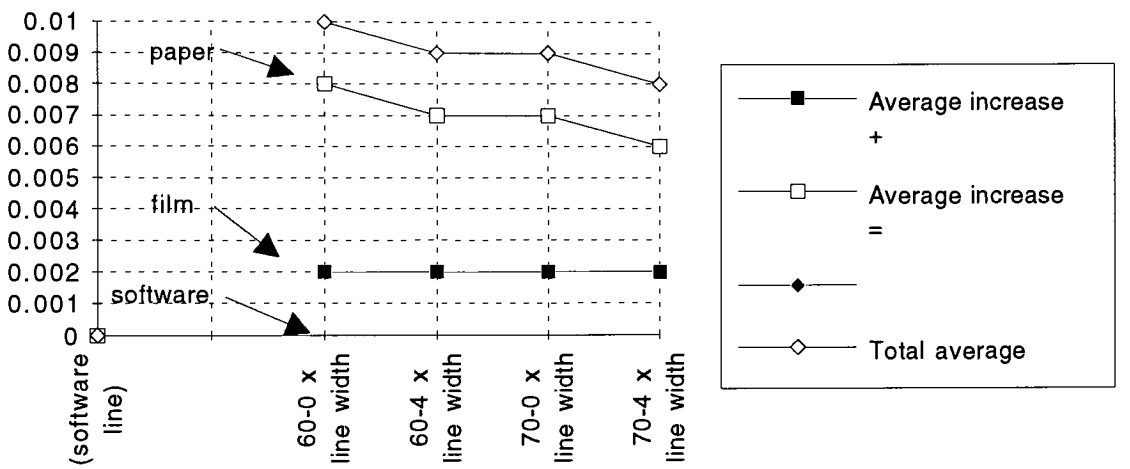
Average Increase in Line Width of Line Patterns in Three Basic Production Stages

Table C

	A	B	C	E
1	Table C Average Increase in Line Width of Line Patterns in Three Basic Production Stages			
2				
3	"original" +	Average increase +	Average increase =	Total average
4	(software line)	from "original" to film	from film to printed line	increase in line width
5				
6	60-0 x line width	0.002	0.008	0.01
7	60-4 x line width	0.002	0.007	0.009
8	70-0 x line width	0.002	0.007	0.009
9	70-4 x line width	0.002	0.006	0.008

Figure C1.1

Figure C1.1 Graphic Illustration of Table C - Average Increases in Line Width by Engraving Setting in Thousands of an Inch



Appendix D

Average Increase in Line Width of Circle Patterns in Three Basic Production Stages

Table D

	A	B	C	E
1	Table D Average Increase in Line Width of Circle Patterns in Three Basic Production Stages			
2				
3				
4	"original" +	Average increase +	Average increase =	Total average
5	(software line)	from "original" to film	from film to printed line	increase in line width
6				
7	60-0 x line width	0.002	0.007	0.009
8	60-4 x line width	0.002	0.005	0.007
9	70-0 x line width	0.002	0.005	0.007
10	70-4 x line width	0.002	0.004	0.006

Appendix E

Measurements of Narrowest Character Widths of Lower Acceptable Type Sizes and One Type Size Below Cutoff Point

Table E

	A	B	C	D	E
1	Table E Measurements of Narrowest Character Widths of Lower Acceptable Type Sizes and				
2	and One Type Size below Cutoff Point				
3	(Each entry indicates cutoff point between acceptable and unacceptable type sizes in microns)				
4		60-0	60-4	70-0	70-4
5	Courier	7/6pts (130/116)			
6	Courier Oblique	8/7pts (140/128)	7/6 (128/110)		
7	N. Cent. Schl. Bk.			6/5 (100/78)	
8	N. Cent. Schl. Bk. It.	*8/7pts (120/118)	6/5 (106/103)	7/6 (118/106)	
9	Optima				
10	Optima Oblique	*8/7pts (106/104)			
11	Garamond Light	7/6pts (80/74)		7/6 (80/74)	
12	Garamond Light It.	*9/8pts (92/82)	6/5 (72/68)	8/7 (82/80)	6/5 (72/68)
13	Zapf Chancery	all unacceptable 4-9pts.			9/8 (114/108)
14	Helvetica Bold	7/6 pts (380/332)			
15	Helvetica Bold Ob.	*8/7 (402/364)			
16	Times Roman	6/5pts (82/80)	6/5 (82/80)		
17	Times Roman Italic	7/6pts (86/74)	6/5 (74/64)	6/5 (74/64)	6/5 (74/64)
18	Palatino	7/6pts (98/84)	6/5 (84/78)		
19	Palatino Italic	8/7pts (86/82)	6/5 (74/70)	6/5 (74/70)	6/5 (74/70)
20	Helvetica				
21	Helvetica Oblique	7/6pts (222/156)			
22	Helvetica Light	8/7pts (205/180)			
23	Helvetica Light Ob.	7/6pts (186/156)			
24					
25	Narrowest Character	80	74	74	72
26	Width of All Typfcs.				
27	(in 0.0000")	0.0032	0.003	0.003	0.0029
28					
29	Range of Acceptable	80-402	72-128	74-118	72-114
30	Widths (microns)				
31					
32	Range of Unacceptable	74-364	64-110	64-106	64-108
33	Type Sizes one below				
34	cutoff point				

Appendix F

Projected Results of Panel Review of Typeface Samples
Including Type Sizes Two and Three

Table F

	A	B	C	D	E	F
1	Table F Projected Results of Panel Review of Typeface Samples Including Type Sizes Two and Three					
2						
3		60-0	60-4	70-0	70-4	Pt. Avg./Typfc
4	Courier	7	*7	5	5	6
5	Courier Oblique	8	7	6	6	6.8
6	New Century School Book	6	6	6	6	6
7	New Century School Book Italic	*8	6	7	6	6.8
8	Optima	5	6	5	5	5.3
9	Optima Oblique	*8	5	6	5	6
10	Garamond Light	7	6	7	5	6.3
11	Garamond Light Italic	*9	6	8	6	7.3
12	Zapf Chancery	all unacceptable 4-9pts.			9	no data
13	Helvetica Bold	7	6	6	*7	6.5
14	Helvetica Bold Oblique	*8	6	5	5	6
15	Times Roman	6	6	6	6	6
16	Times Roman Italic	7	6	6	6	6.3
17	Palatino	7	6	5	5	5.8
18	Palatino Italic	8	6	6	6	5.5
19	Helvetica	5	5	5	5	5
20	Helvetica Oblique	7	5	6	5	5.8
21	Helvetica Light	8	5	6	6	6.3
22	Helvetica Light Oblique	7	5	5	6	5.3
23	Average Pt. Size/ Engr. Setting	7.1	5.8	5.9	5.6	

Figure F1.1

Figure F1.1 Graphic Illustration of Table F - Part 1
Lower Acceptable Type Size Limits

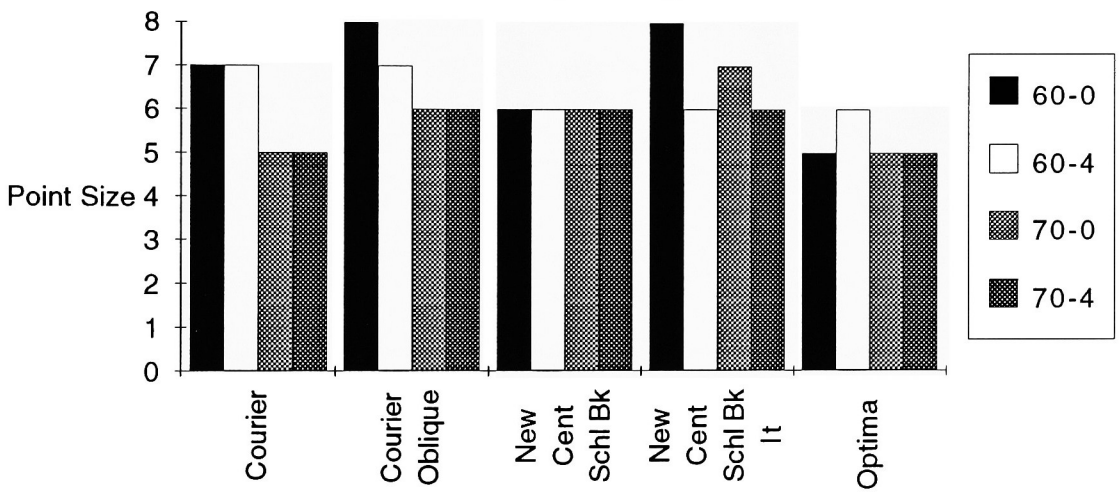


Figure F1.2

Figure F1.2 Graphic Illustration of Table F - Part 2
Lower Acceptable Type Size Limits

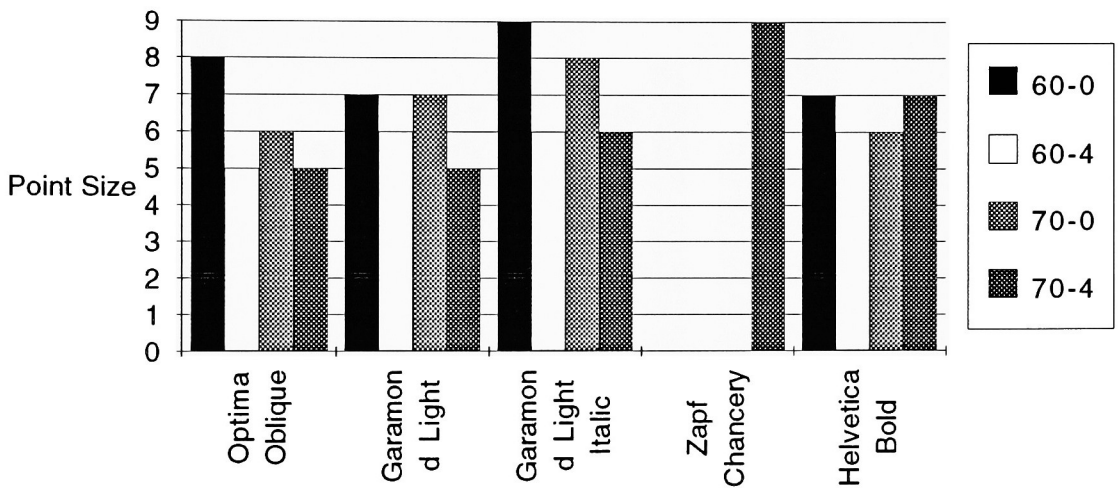


Figure F1.3

Figure F1.3 Graphic Illustration of Table F - Part 3
Lower Acceptable Type Size Limits

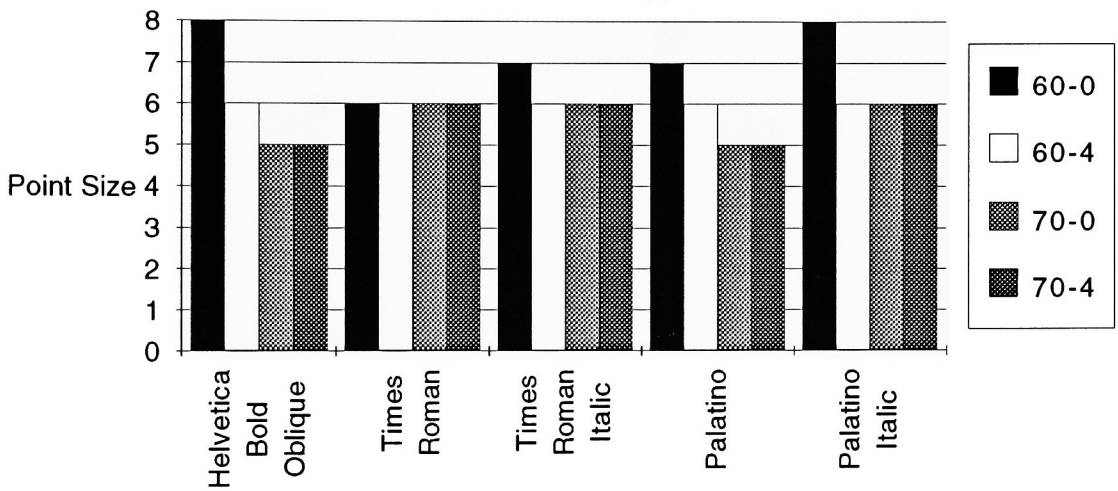
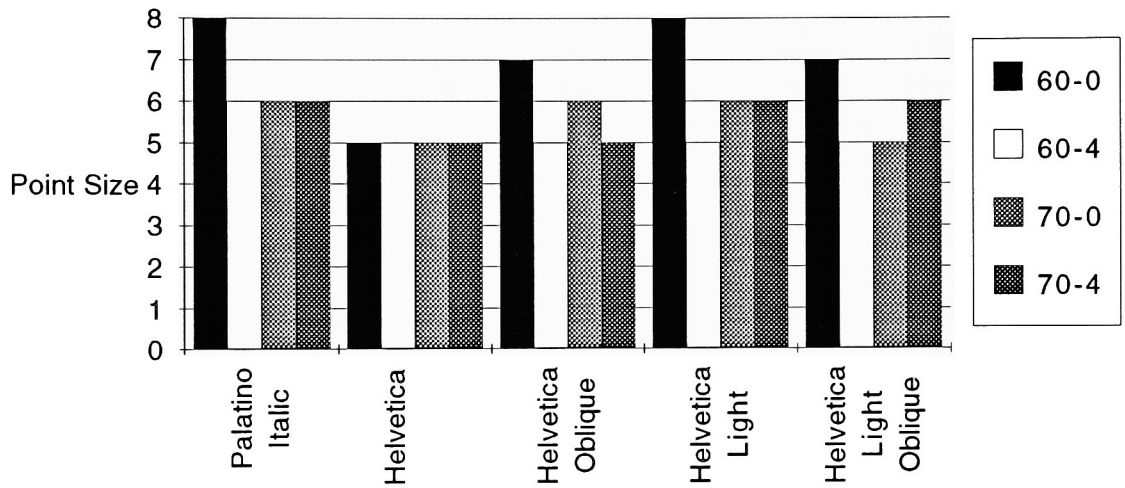


Figure F1.4

Figure F1.4 Graphic Illustration of Table F - Part 4

Lower Acceptable Type Size Limits



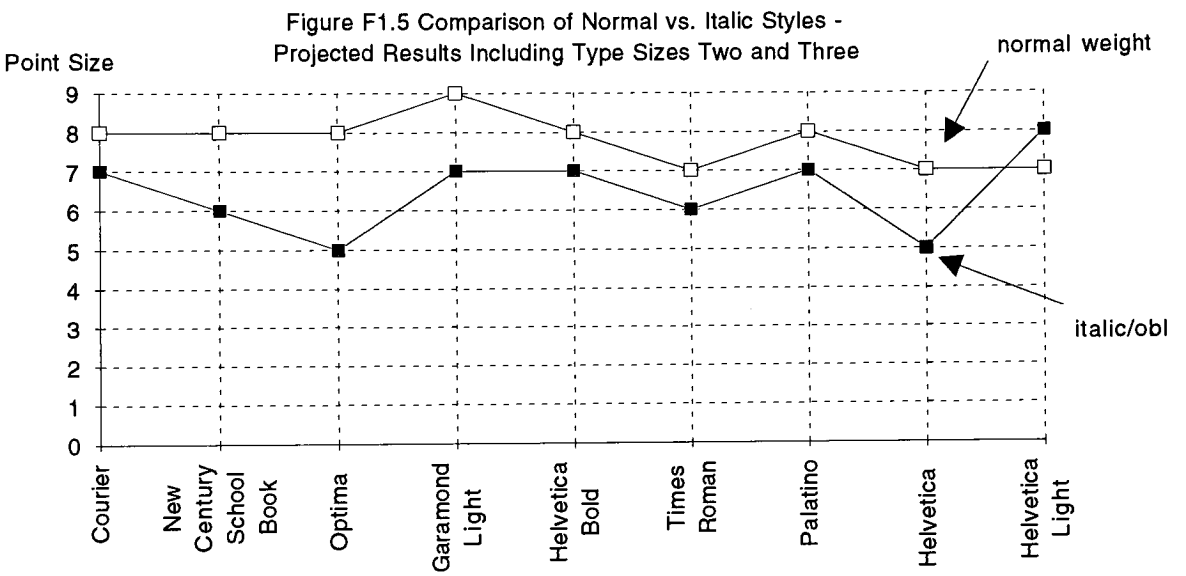


Figure F1.5 Comparison of Normal vs. Italic Styles -
Projected Results Including Type Sizes Two and Three
Point Size
normal weight
italic/obl
9
8
7
6
5
4
3
2
1
0
Courier
New Century School Book
Optima
Garamond Light
Helvetica Bold
Times Roman
Palatino
Helvetica
Helvetica Light

Figure F1.6

Figure F1.6 Average Type Size by Typeface - All Engraving Settings

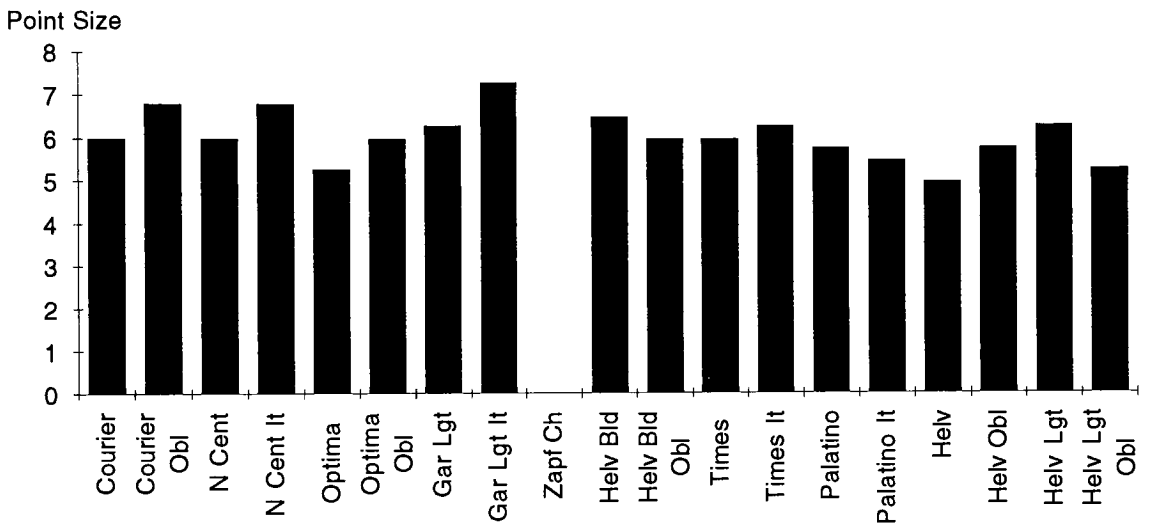
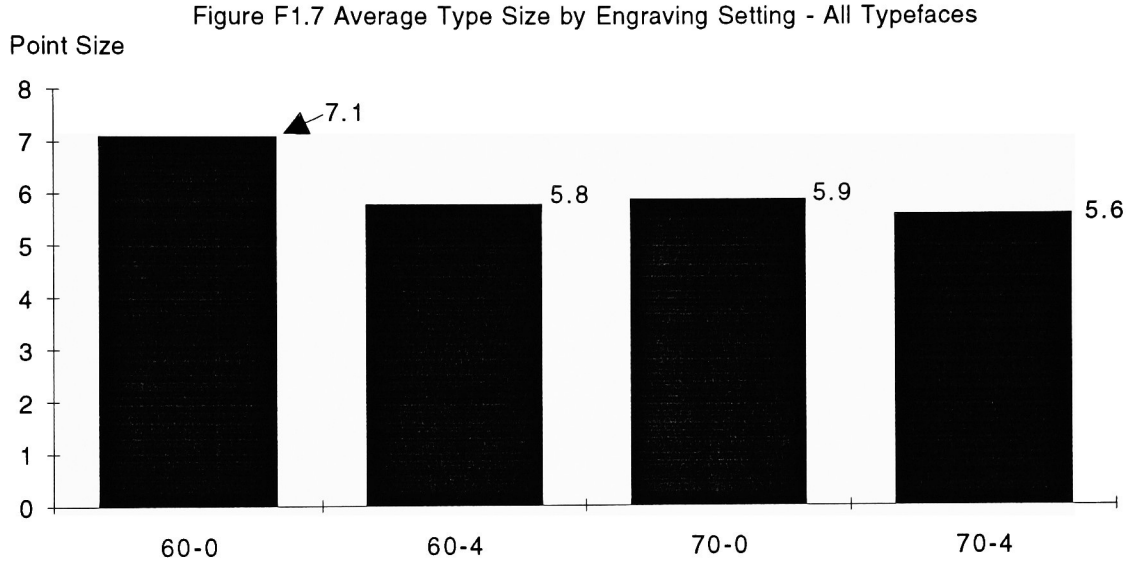


Figure F1.7

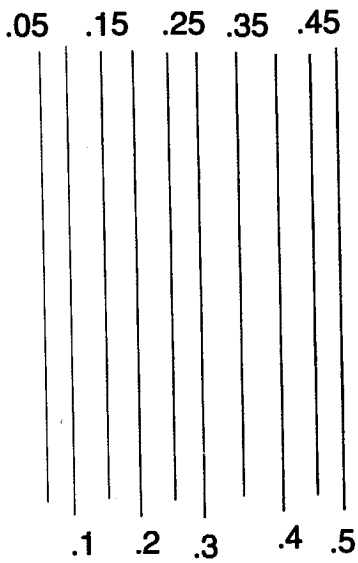
Figure F1.7 Average Type Size by Engraving Setting - All Typefaces

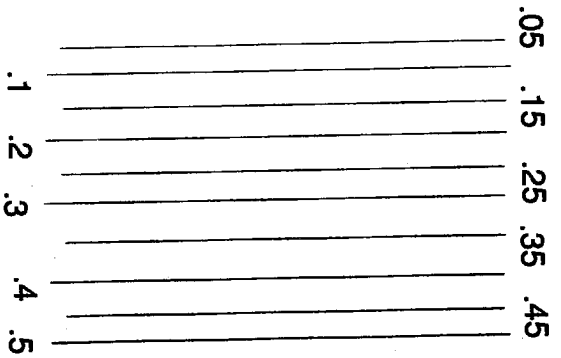


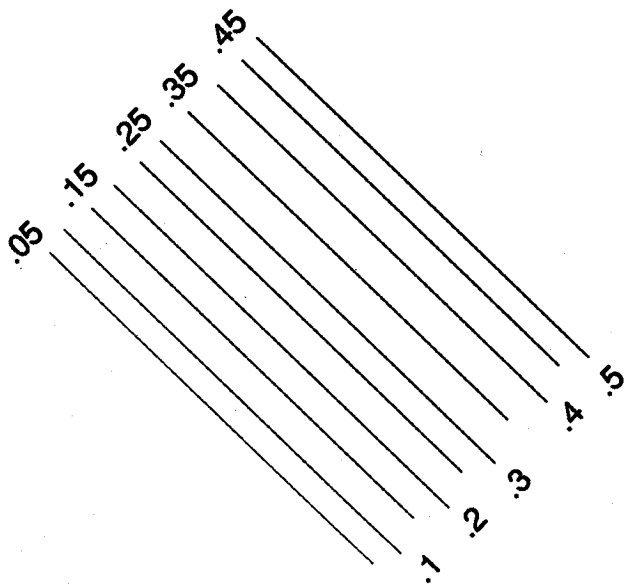
Appendix G

Press Sheets of Line and Circle Patterns

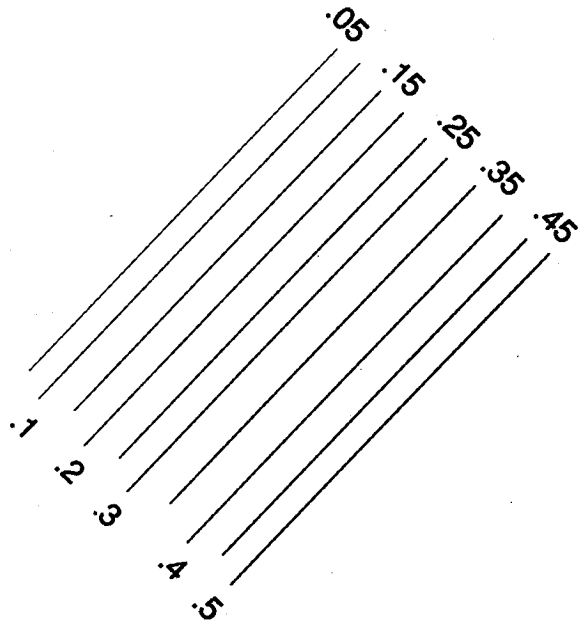
All measurements in fractions of a point. Created in Illustrator 6/5/92





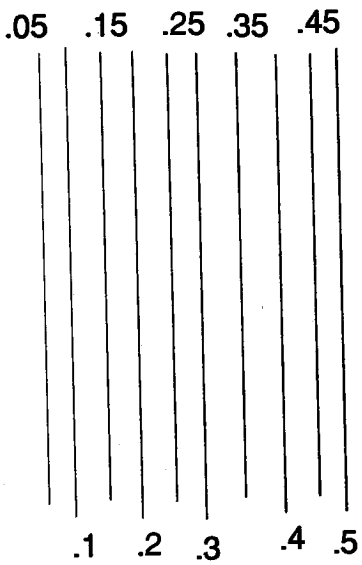


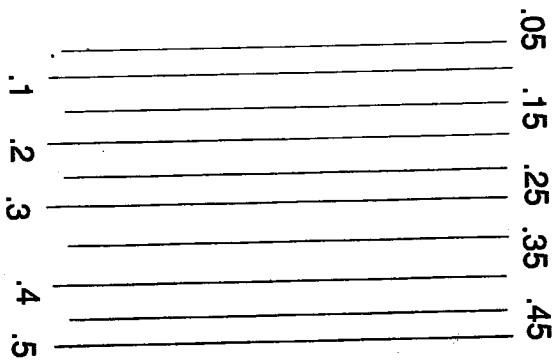
45 degrees

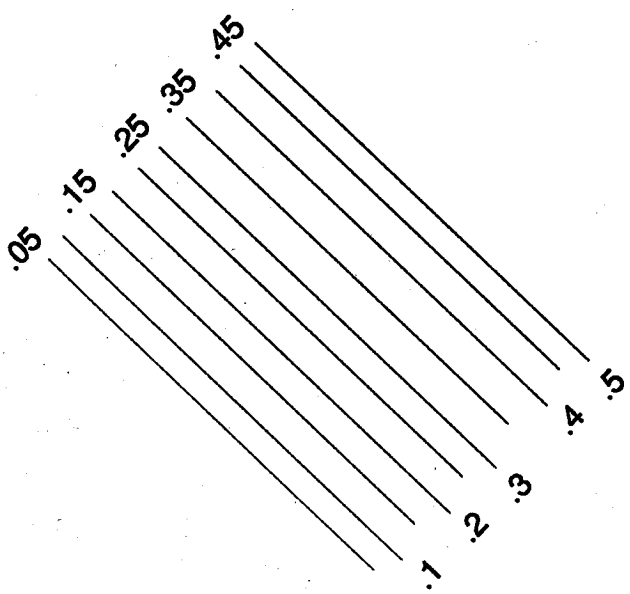


45 degrees

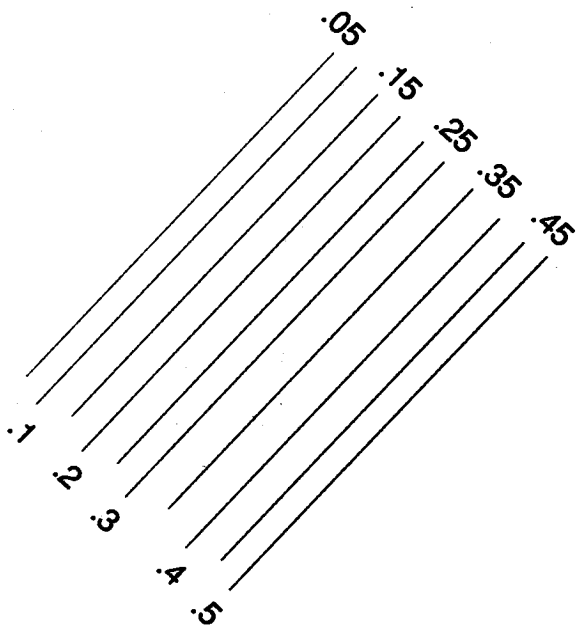
All measurements in fractions of a point. Created in Illustrator 6/5/92



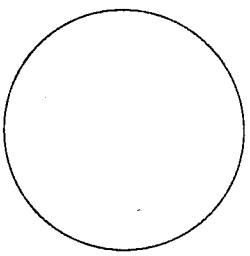




45 degrees



45 degrees



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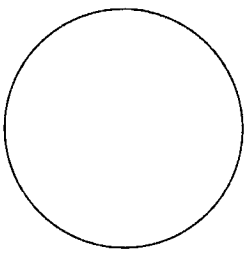

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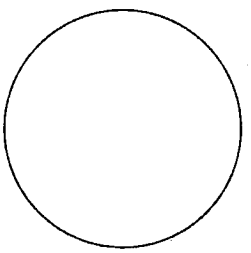

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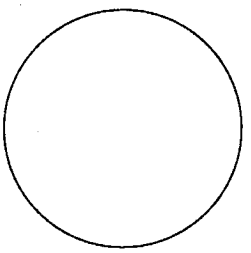

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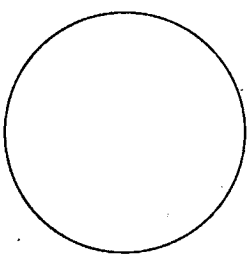

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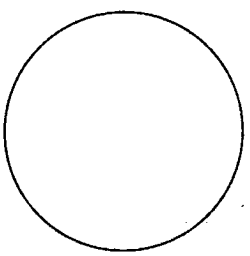

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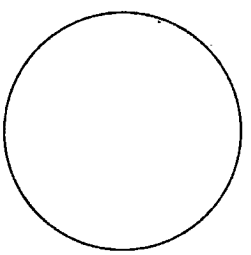

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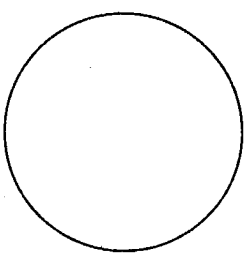

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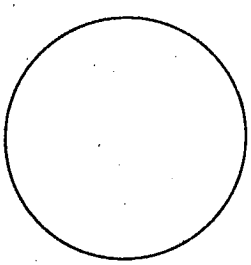

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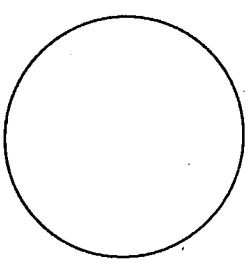

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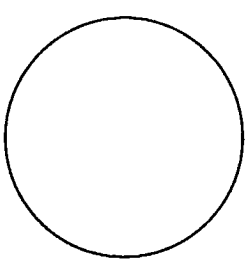

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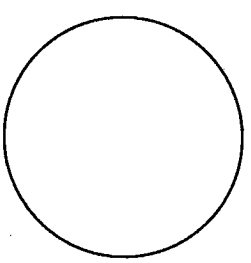

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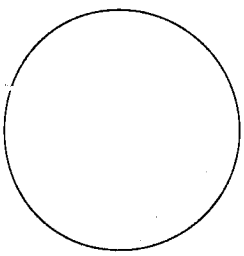
All measurements in fractions of a point. Created in Illustrator 6/5/92.



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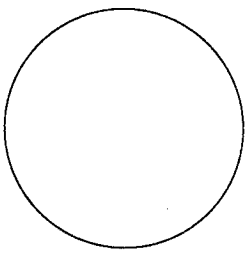

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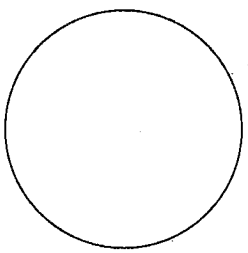

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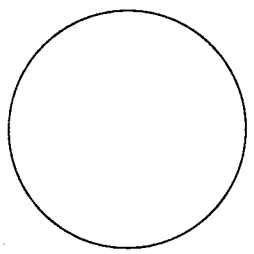

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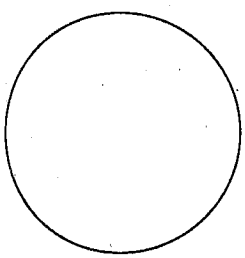

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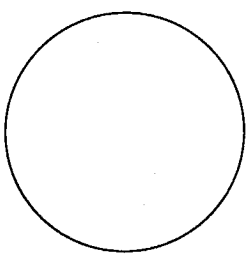

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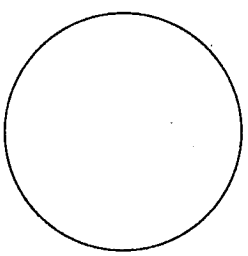
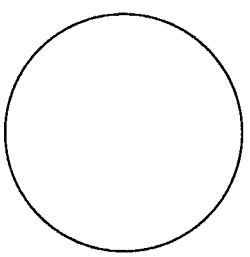


.35 pt.



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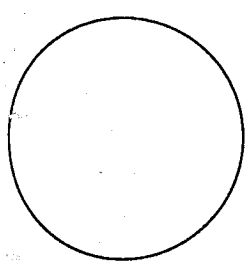
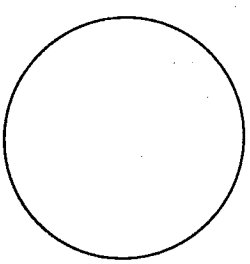


.45 pt



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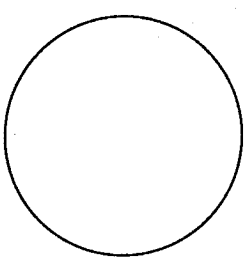

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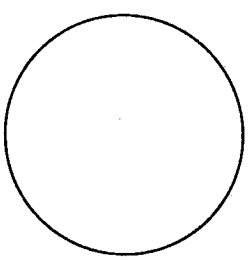

.60 pt

All measurements in fractions of a point. Created in Illustrator 6/5/92.

Appendix H

Instructions and Examples of Type Sample Cards used in the Gravure Association of America Panel Review

GAA

November __, 1992

Dear _____,

The packet of materials you have just received is part of an experimental study conducted by Rochester Institute of Technology graduate student Eric Henty under a Gravure Fellowship from the Gravure Association of America.

The general purpose of the study is to improve the print quality of typefaces and typeface styles for gravure reproduction.

We are asking your participation as an advertiser because you have the most critical eye in determining what the consumer will accept or reject in print quality. In short, we are soliciting your expertise so the project will have valid results.

Your time is valuable. The experiment is designed to be clear and simple and should take approximately one half hour.

We ask that you go through the experiment in the next 2-3 days and return the packet to the Gravure Association of America immediately. A summary of the project results will be sent to you automatically at the project's completion.

Enclosed you will find an instruction sheet, type samples, and packaging materials to return the samples to the Gravure Association of America.

Thank you for your help to improve type quality for gravure printing!

Sincerely,

Eric Henty and GAA

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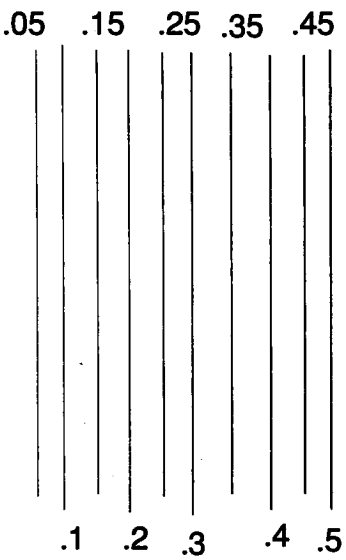
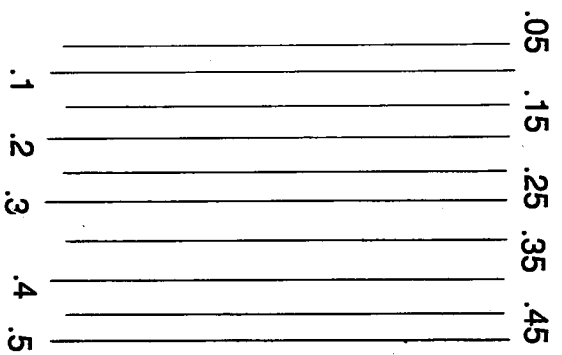
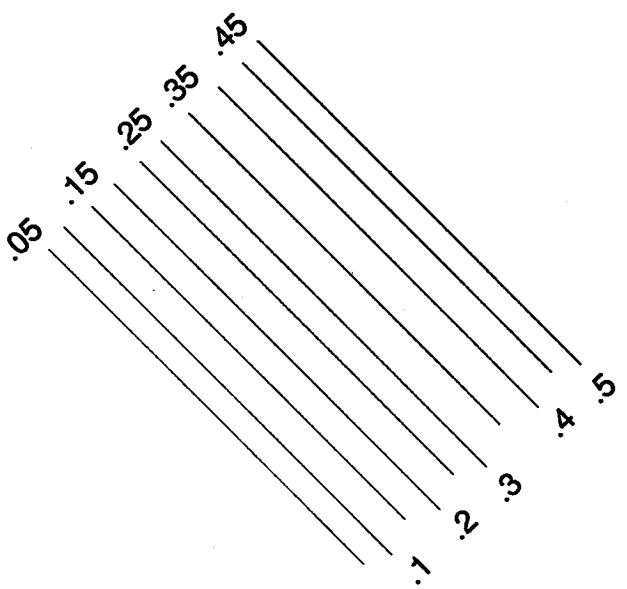
All measurements in fractions of a point. Created in Illustrator 6/5/92







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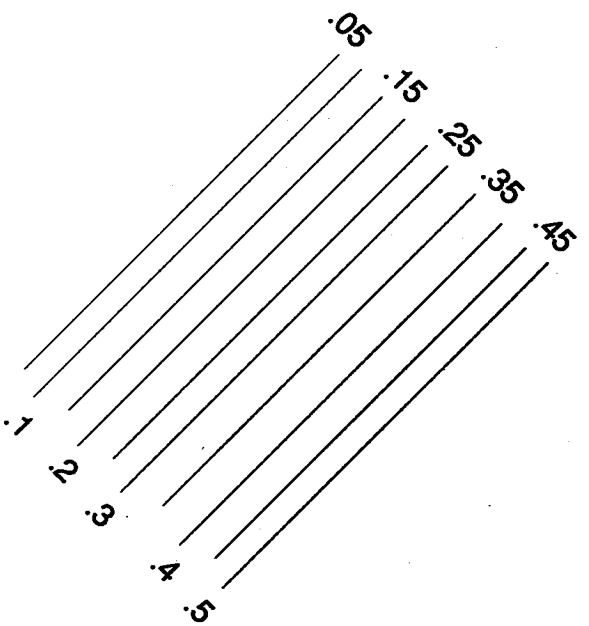
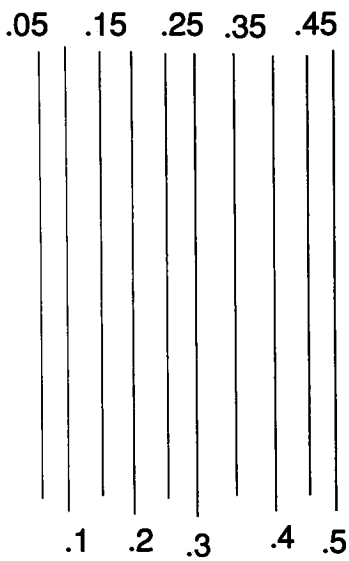


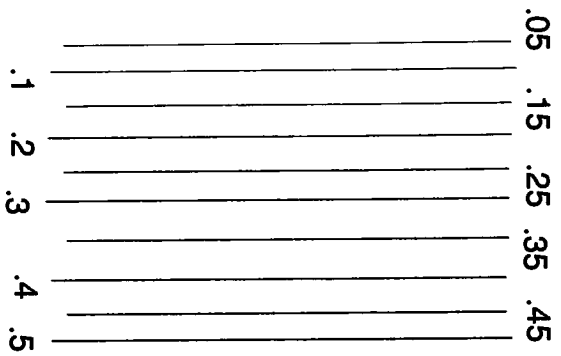
45 degrees

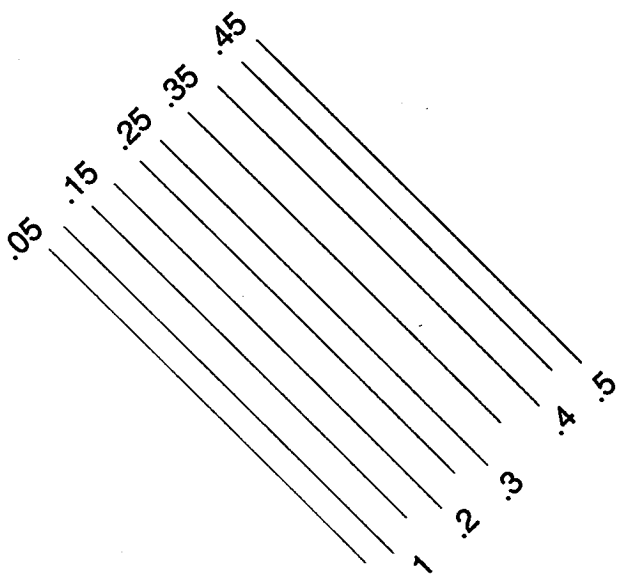
Appendix I

Samples of Type Sizes of Two and Three Points

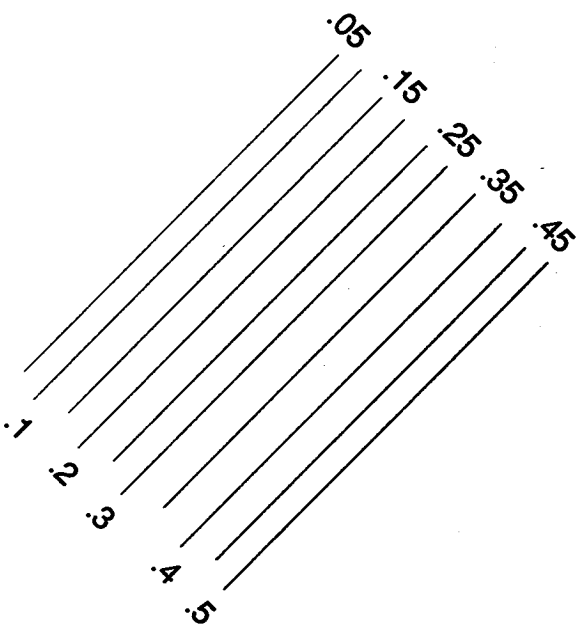
All measurements in fractions of a point. Created in Illustrator 6/5/92







45 degrees



45 degrees

Helvetica Regular

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abcdefghijklmnopqrstuvwxyz
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7 pt.
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4 pt.
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0123456789.,;:?!''&———_/#$¢£
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3 pt.
ABCDEFGHIJKLMNOPQRSTUVWXYZ
[illegible]

2 pt.
[illegible]

Helvetica Oblique

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abcdefghijklmnopqrstuvwxyz
0123456789.,;:?!''&———_/#$¢£
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(repeated at 8 pt., 7 pt., 6 pt., 5 pt., 4 pt., 3 pt. and 2 pt.)

Helvetica Light

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789.,;:?!''&———_/#$¢£
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(repeated at 8 pt., 7 pt., 6 pt., 5 pt., 4 pt., 3 pt. and 2 pt.)

Helvetica Light Oblique

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789.,;:?!''&———_/#$¢£
%†‡[]{}() fi fl æ œ Æ Œ Â Ê Á Ë È*
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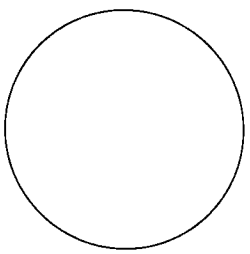
(repeated at 8 pt., 7 pt., 6 pt., 5 pt., 4 pt., 3 pt. and 2 pt.)



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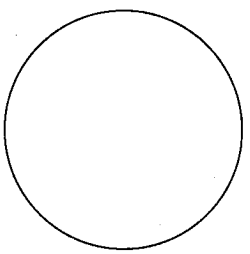

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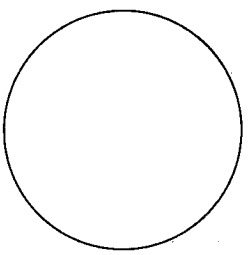

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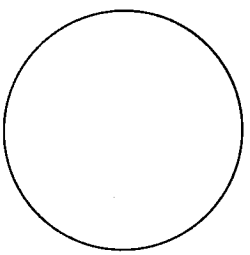

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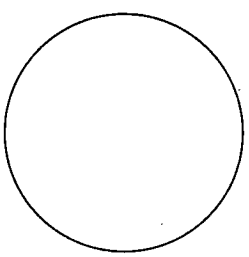

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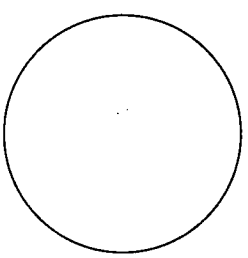

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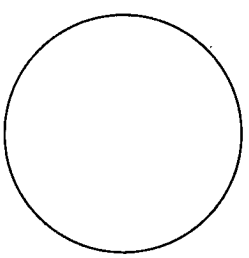

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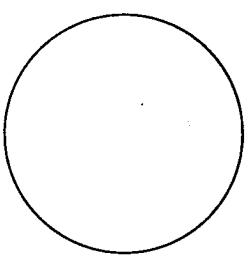

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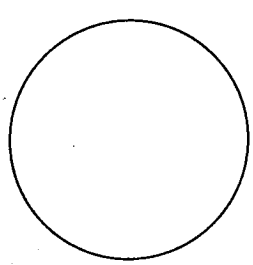

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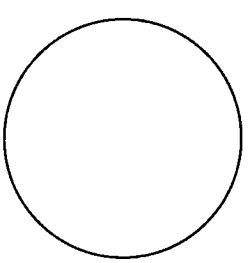

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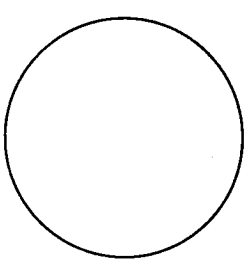

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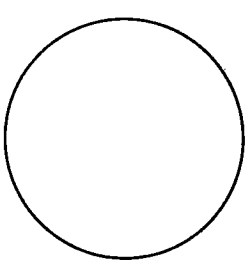

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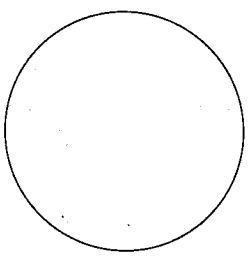
All measurements in fractions of a point. Created in Illustrator 6/5/92.



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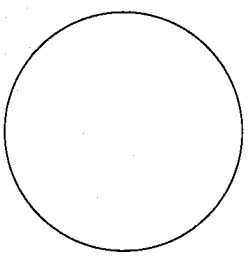

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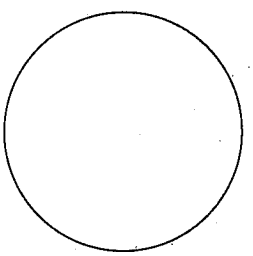

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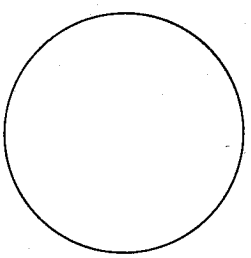

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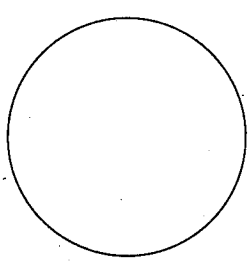

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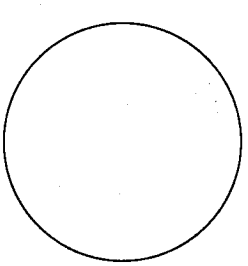

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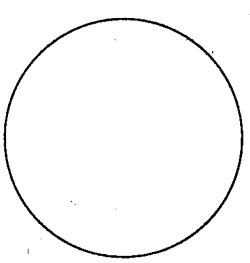

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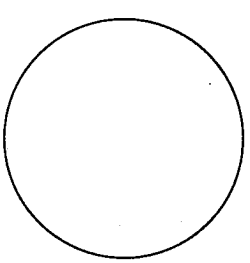

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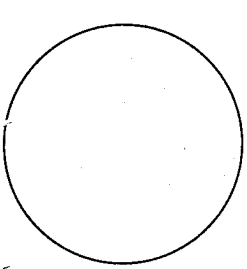

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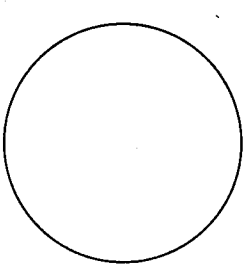

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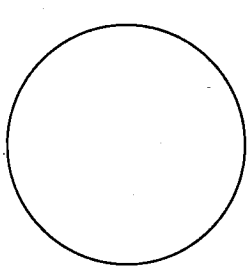

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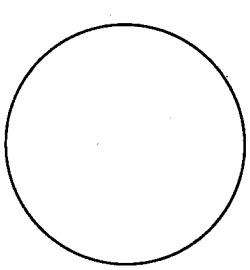

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All measurements in fractions of a point. Created in Illustrator 6/5/92.

Instruction Sheet

Background Information

The type samples you are about to view were printed on a publication press on 35# coated paper stock with #6 inks. Please be careful with the samples. They represent 1,000 man hours of work and $5,000 investment.

Materials Enclosed

1) Total of 456 white typeface (3"x5") cards
2) 1 blue card labeled "NOT ACCEPTABLE"
3) 1 yellow card labeled "ACCEPTABLE"
4) 2 rubber bands
5) Return packaging material addressed to the Gravure Association of America

Viewing Conditions to be observed

1) View the cards in a well lighted area as close to standard viewing conditions as possible (5,000 degrees Kelvin).
2) Please hold the cards at a sufficient angle to the light source to avoid glare.
3) Please view the cards at a normal reading distance for you with the unaided eye (with glasses if you wear glasses). Please do not use magnification equipment.

Procedure

1) Place the stack of typeface cards in front of you. On top of the stack you will find one yellow card labeled "ACCEPTABLE" and a blue card labeled "NOT ACCEPTABLE". Take these off the stack and place them in front of you where they are easily visible.

2) Take each white typeface card off the stack one at a time and view it for no longer than 5 seconds under viewing conditions stated above.

3) In your professional judgement, decide if each sample of typeface is acceptable or not acceptable for publication printing on coated stock by gravure.

4) Place the typeface card next to the correct colored card.

5) When you are finished viewing all of the white typeface cards you will have two piles of cards.

6) Place the yellow "ACCEPTABLE" and blue "NOT ACCEPTABLE" cards on their respective piles and bind with a rubber band.

7) Place both bound piles into the enclosed packaging materials addressed to the Gravure Association of America and mail promptly.

THANK YOU! A SUMMARY OF THE PROJECT'S CONCLUSIONS WILL BE SENT TO YOU ON COMPLETION.

New CenturySchoolbook

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