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STUDY OF THE WINDOWS OF WINDOW ENVELOPES FOR THE PURPOSE OF DEVELOPING STANDARD SPECIFICATIONS

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STUDY OF THE WINDOWS OF WINDOW ENVELOPES FOR THE PURPOSE OF DEVELOPING STANDARD SPECIFICATIONS

By R. E. Lofton

ABSTRACT

This paper gives an idea of the extent of the use of window envelopes, and also the importance of this matter to postal employees, especially mail clerks, since windows of poor transparency and high gloss would cause serious eyestrain and loss of time in distributing the mails.

For the purpose of getting data upon which specifications for transparency and gloss might be based, glassine papers, one-piece and two-piece windows, and a few semitransparent materials were tested. One-piece envelopes are those made from a single sheet of paper in which the window is made by impregnating that part of the envelope pattern through which the address is to be read with a suitable oil or varnish. Two-piece envelopes are those made from two pieces of paper. The envelope pattern is cut from an opaque sheet of paper; the window is then cut out, and subsequently covered with glassine paper.

For permanency of transparency, the glassine paper windows were better than the one-piece windows. Tests indicated, however, that one-piece windows would keep for a year or more with negligible loss of transparency if they were stored in a dry, cool, dark place.

The paper gives suggested specifications for the two types of windows, methods for sampling and testing, and regulations of the Post Office Department relating to window envelopes.

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I. INTRODUCTION

The purpose of this investigation and of the suggested specifications is to assist in establishing standards of quality for window envelopes and to aid manufacturers by indicating the lines along which efforts to improve the quality of window envelopes may be profitably directed.

The address of a letter can not be seen as easily through the window of an envelope, except one of the open-panel type, as it can when typed on the windowless envelope. In this respect, therefore, the highest possible quality of window envelope is at a disadvantage, as compared with the windowless envelope. This does not indicate that the window envelope is inferior to the windowless envelope; on the contrary, the former has certain features which make its use for business correspondence advantageous. Because of the nature of the product, however, it is necessary that the manufacturers of window envelopes constantly endeavor to maintain the visibility through the windows at the highest standard and, where practicable, to improve methods and processes with the view to obtaining greater visibility.

The widespread use of window envelopes is a matter of considerable importance to postal authorities and employees, because the use of window envelopes of inferior visibility and high gloss [1] would result in excessive eyestrain among the employees and loss of time in distributing the mails. The United States Government is a large user of window envelopes, approximately 65,000,000 being the estimated number required by the various departments during the fiscal year 1925–26. Many millions are used annually by other agencies.

The reason for the great popularity of the window envelope is certainly economic—the saving of time and labor, as compared with that required in using the windowless envelope. Although the cost to the consumer of the window envelope is probably somewhat greater than that of the old-style envelope, nevertheless the net saving effected by the use of the former is sufficient to cause it to be used extensively for business correspondence.

Owing to the greater effort required to read the address through the covering of the window envelope, as compared with that required to read the address typed on the windowless envelope, complaints regarding the poor visibility through the former type are sometimes heard; and the Bureau of Standards has from time to time received requests for information on the subject. For these reasons it was thought advisable that the paper laboratory undertake an investigation of the properties of the windows of window envelopes with a view to drawing up standard specifications for quality.

[1] In this paper the term "gloss" is used as referring to the objective aspect, or the stimulus, while the terms "glossy" and "glossiness" are used as referring to the subjective aspect, or the resulting sensation.

II. TYPES OF WINDOW ENVELOPES

There are three types of window envelopes in use—the open-panel envelope, the one-piece envelope, and the two-piece envelope. Only the last two types, of course, are considered in this investigation. The two-piece envelope has been in use longer than the one-piece envelope, the latter being a comparatively recent development.

1. ONE-PIECE WINDOW ENVELOPES

The one-piece window envelope is so designated because it is made from a single sheet of paper. The window is made by impregnating that portion of the envelope pattern through which the address is to be read with a suitable oil or similar material. If the impregnating material is of nearly the same index of refraction as the material composing the paper, the window becomes more or less transparent, because the solution drives out and replaces the air inclosed in the web of paper, and thus allows the rays of light to pass through with less scattering.[2]

2. TWO-PIECE WINDOW ENVELOPES

The two-piece window envelope is so called because it is made of two pieces of paper. The envelope pattern is cut from an opaque, or nearly opaque, sheet of paper. An oblong window of such form and area as to permit the address on inclosed correspondence to be plainly seen is cut from the portion of the pattern which is to be the face of the envelope. After being cut out the window is closed in the process of manufacture by cementing over it, on the surface which is to be inside the sealed envelope, a piece of glassine paper or other nearly transparent material.

The base of glassine[3] paper is usually bleached sulphite wood pulp. The beater treatment of the pulp, especially if the resulting paper is to be used in the manufacture of window envelopes, is such as to cause the maximum hydration of the pulp, since this is necessary in obtaining the maximum transparency of the paper, and this can be accomplished best by a slow brushing or squeezing action with blunt beater roll and bedplate knives. After the stock has been run over the paper machine and the paper is well dried, it is sprayed with 25 or 30 per cent of its weight of water or steam and allowed to stand in rolls a sufficient length of time for the moisture to become equally distributed through the paper.

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[2] Bancroft, W. D., Applied Colloid Chem., p. 198–199. McGraw-Hill Book Co., New York, 1921.

[3] Glassine and Greaseproof Papers, Paper Tr. J., **73**, No. 25 (Dec. 22, 1921), p. 23. See also "Glassine" and "Greaseproof wrapping," Paper Tr. J., **78**, No. 6 (Feb. 7, 1924), p. 56; or Classification and definitions of papers, pp. 41–42, published by the Lockwood Tr. J. Co., 10 East Thirty-ninth Street, New York, N. Y.; 1924. Parchment and imitation parchment, Paper, **32**, No. 10 (June 27, 1923), pp. 11–12. Technical Association Pulp and Paper Industry, The Manufacture of Pulp and Paper, **3**, sec. 4, p. 82; also **5**, sec. 3, p. 35. Le Papier Cristal et sa Fabrication, La Papeterie **46**, No. 24 (Dec. 25, 1924), pp. 1157–1160.

The moistened paper is passed between steam-heated calendar rolls under high pressure, by which means a smooth finish is imparted to the surface of the paper due to the ironing out of most of the felt and wire marks and other irregularities. The calendering process also greatly increases the transparency of the paper by forcing nearly all the inclosed air from inside the web and by pressing the fiber mass into a more homogeneous sheet. Unfortunately, the calendering tends to give the paper considerable gloss which, as has been mentioned, is undesirable.

Transparent materials other than glassine paper may be used as a window covering in the manufacture of the two-piece envelope if they have the necessary strength and flexibility.

There is on the market a product in sheet form made from viscose, the cellulose compound from which a large amount of rayon is made, which is an excellent material in some respects for the window covering of two-piece envelopes.

The one-piece envelope has several advantages over the two-piece envelope: (1) The correspondence can be placed in this type of envelope more easily than in the two-piece type, since there are no obstructing projections of the window. (2) Tests made here show that the rate of change of area of the body and the window of one-piece envelopes, due to ordinary changes in the relative humidity of the atmosphere, is so nearly the same that distortion and wrinkling at the window does not take place; this is not always true of the two-piece envelope. (3) Since the window is a continuation of the body of the envelope, the envelope can not be entered through the window without detection. Because of the character of the surface of glassine paper it is difficult to make an adhesive which will bind with sufficient firmness the glassine covering of the window to the body of the two-piece envelope. The Post Office Department has found that it is taking too much risk to register matter mailed for foreign destination inside the two-piece envelope, since at various times in the past a portion of the window has been unsealed, the valuable portion of the contents removed, and the opening resealed in such a manner that one could not determine, even by a careful examination, that the package had been tampered with. For this reason the Post Office Department has ruled[4] that matter for foreign destination inclosed within a two-piece envelope is not eligible to registry, and that domestic matter inclosed within a two-piece envelope should not be accepted for registry.

The greatest obstacle in the manufacture and use of the one-piece envelope is the difficulty experienced in making the window sufficiently transparent and at the same time keeping the body of the envelope sufficiently opaque.

[4] See Appendix for postal regulations relating to window envelopes.

III. TEST METHODS

Following are brief descriptions of the principles involved and of the methods used in determining transparency and gloss:

The usual method of determining the transparency of paper is to place the sample over a printed page, or over any black and white surface, and to observe the reduction in the contrast between the black and the white surface as seen through the paper. If the contrast is only slightly reduced, the paper is said to be quite transparent; if, on the other hand, the contrast is very much reduced, or is not perceptible, the paper is said to be nearly opaque, or completely opaque, as the case may be.

This is the principle upon which the apparatus [5] used by the Bureau of Standards for determining transparency is constructed. The sample is placed simultaneously over a standard white and a standard black surface, and then diffusely illuminated. The relative amounts of light coming from the standard black and the standard white surface are measured by means of a Martens photometer.

The results are expressed in terms of the "contrast ratio," which is the ratio of the brightness of the light from the black surface to that from the white surface. A perfectly opaque paper tested by this method would have a contrast ratio of one, while a perfectly transparent paper would have a contrast ratio of zero.

The scale settings on this instrument can be repeated with a very good degree of accuracy. A careful observer can, after a little experience, duplicate the scale settings for any two given areas on the test specimen to about two-tenths of 1°, which corresponds to a contrast ratio of 0.004 for windows of window envelopes.

The practicability of this method of determining transparency has been demonstrated, as results obtained by it have been found in accord with experience. A great variety of printing papers has been tested for transparency by this method since it has been in use here, and the printing results have agreed, other things being equal, with the transparency results; that is, the papers giving the lower contrast ratios allowed the printing to show through most conspicuously, while those giving the higher contrast ratios were the more nearly opaque from the printer's point of view.

Nearly all the white envelopes used by the Government departments and nearly all the uncoated printing paper used by the Government Printing Office are purchased under specifications for finish and opacity.

The Government Printing Office's specifications for white envelopes states that deliveries must conform to the standard sample in opacity.

[5] The details of the method and of the apparatus are given in Bureau of Standards Circular No. 63, Government Printing Office, Washington, D. C., 1917. Price, 5 cents per copy. See also Paper-testing methods, Tech. Assoc. Pulp and Paper Indus., New York, 1924.

The specifications for uncoated printing papers require that deliveries conform to the standard sample in finish and opacity.

The specifications of the Post Office Department for envelopes for the Government departments states: "The paper used in the 'window' of window envelopes must meet a test for transparency and gloss which will be satisfactory to the Post Office Department." The specifications for white stamped envelopes of standard and extra quality require that these envelopes shall meet a definite minimum requirement for opacity.

The glarimeter [6] is used by the paper section at the Bureau of Standards for measuring the gloss of paper.

One of the most obvious differences in papers is in the character of their surfaces. Some have a somewhat irregular, dull surface, while others have a smoother, more shiny surface. Of the light reflected by those papers having a dull appearance, practically all is reflected in various directions and, for this reason is called scattered or diffused reflection. Those papers which appear glossy, however, reflect less scattered light, the degree of glossiness being inversely proportional to the relative amount of light diffusely reflected. For example, of the light reflected by blotting paper, which has little or no gloss, practically all is diffusely reflected; coated and supercalendered book paper, however, reflects very little scattered light, and is said, therefore, to have a high gloss.

The glarimeter is designed to give the ratio of the amount of polarized light reflected at an angle of about 57½° to the total amount reflected at this angle, this ratio being taken as a measure of the gloss of the paper. A surface which would not reflect any light diffusely would give a reading of 100 per cent gloss with this instrument; therefore the lower the reading the less the gloss.

Results obtained on the glarimeter can be repeated with a fair degree of accuracy. After a little experience, one can make a series of scale settings which do not vary more than the variations in gloss at different points on the surface of the paper. The average of 10 scale settings can be duplicated usually within considerably less than a degree (1° equals about 2 per cent of gloss).

This method of determining finish is specified by the United States Treasury Department in its definition of newsprint paper for collection of import duty, and has given satisfactory results in grading this paper. It is in use in several paper mills for assisting in the control of finish.

In making the tests on glassine papers and windows of one-piece envelopes, several sheets of the sample should be placed one upon another in the instrument in order to prevent any light from the

[6] A more detailed description of the glarimeter and of the test procedure recommended will be found in the article, "The glarimeter and the measurement of the finish of paper," by R. E. Lofton; Paper Tr. J., 80, No. 7 (Feb. 12, 1925), p. 47. See also "Paper testing methods," Tech. Assoc. Pulp and Paper Indus., New York, p. 28, 1922.

holder being reflected into the photometer, since such a condition would tend to cause incorrect results. In this investigation such a number of sheets of each sample was used in each case that the use of additional sheets did not affect the scale settings on the glarimeter.

In studying Table 1, the reader should not get the impression that the results, or more especially the opacity and gloss results, given therein are entirely applicable to glassine papers used in the manufacture of window envelopes. A large part of the glassine papers made in this country is used for wrapping purposes, and in this case the degree of transparency is not a consideration. It is the writer's impression that only the more transparent grades are used in the manufacture of the two-piece window envelope.

Since the specifications given below were prepared, a limited number of windows from two-piece envelopes has been tested for opacity and gloss. The results of these tests were as follows: Opacity, average 0.138; maximum, 0.159; minimum, 0.121. Gloss, average, 74.9 per cent; maximum, 78.7 per cent; and minimum, 62.4 per cent.

The reader should not attempt to compare the gloss values given for glassine papers or windows with the gloss values given for the one-piece windows. The glarimeter is not well adapted for measuring differences in gloss of surfaces produced by different methods or surfaces differing much in color. The inventor of the glarimeter recognizes these limitations of the instrument.[7] It is believed, however, that the glarimeter will grade in the proper sequence the gloss values of a series of papers of about the same color and whose surface characteristics have been produced by the same process. The glarimeter had to be used for this investigation because it is the only instrument commercially available for measuring the gloss of paper.

IV. TEST DATA

1. GLASSINE PAPERS

Table 1 gives the results of various tests on 17 samples of glassine papers. The collection is representative, since it includes samples from practically every manufacturer of glassine papers in this country. For the purpose of getting information as to the general quality of papers of this class, several tests were made on each sample. Tests of such properties as might be influenced by slight changes in the moisture content of the material were made under standard atmospheric conditions—65 per cent relative humidity and 70° F. temperature. Tensile tests were made on a Schopper instrument which was driven by water power and which has a capacity of 50 kg. Folding tests were made on the Schopper folder. Bursting strength tests were made on the Mullen tester.

[7] R. L. Ingersoll, The glarimeter: An instrument for measuring the gloss of paper, J. Op. Soc. Am., **5**, p. 217; May, 1921.

TABLE 1.—*Summary of tests on 17 glassine papers*

	Weight of 500 sheets		Bursting strength	Thickness	Ratio bursting strength to weight of 500 sheets 25 by 40 inches
	25 by 40 inches	24 by 36 inches			
	Pounds	*Pounds*	*Points*	*Inch*	*Per cent*
Range	8.2	7.1	4.7	0.0001	15.6
Maximum	30.6	26.5	18.5	.0010	72.8
Minimum	22.4	19.4	13.8	.0009	57.2
Average of all 17 papers	26.0	22.5	16.5	.0010	63.1

	Folding endurance		Breaking strength per inch width		Ash	Gloss	Opacity
	Machine	Cross	Machine	Cross			
	Double folds	*Double folds*	*Pounds*	*Pounds*	*Per cent*	*Per cent*	*Contrast ratio*
Range	113	34	6.0	2.2	0.79	11.7	0.135
Maximum	120	37	19.8	8.9	1.06	80.1	.247
Minimum	7	3	13.8	6.7	.27	68.4	.112
Average of all 17 papers	27	13	16.3	7.8	.54	75.3	.186

The results show that, in general, glassine papers compare quite favorably in strength with other all-sulphite papers. The average ratio of the bursting strength to the weight of the glassine papers tested is considerably above this ratio for most sulphite writings and bonds. The folding endurance is probably about as good as that for sulphite writings and bonds of the same weight. The tensile strength is no doubt better than that of sulphite writings and bonds of about the same weight.

2. MISCELLANEOUS MATERIALS

Table 2 gives the results of tests on five materials similar to glassine papers; they are, therefore, of interest in connection with this investigation.

TABLE 2.—*Tests on materials similar to glassine papers*

Sample	Weight of 500 sheets		Bursting strength	Thickness	Ratio bursting strength to weight of 500 sheets 25 by 40 inches
	25 by 40 inches	24 by 36 inches			
	Pounds	*Pounds*	*Points*	*Inch*	*Per cent*
Bleached grease proof	26.0	22.5	15.6	0.0017	59.3
Sheet viscose, embossed	23.2	20.1	20.2	.0018	91.3
Sheet viscose, plain	21.3	18.4	25.1	.0009	117.8
Treated glassine	25.6	22.1	15.0	.0009	58.6
Impregnated white tissue	36.9	31.9	13.0	.0017	35.2

TABLE 2.—*Tests on materials similar to glassine papers*—Continued

Sample	Folding endurance		Breaking strength per inch width		Ash	Gloss	Opacity
	Machine	Cross	Machine	Cross			
	Double folds	*Double folds*	*Pounds*	*Pounds*	*Per cent*	*Per cent*	*Contrast ratio*
Bleached grease proof	51	14	15.7	8.6	0.74	26.5	0.391
Sheet viscose, embossed	----------	----------	7.5	3.0	.80	25.0	.070
Sheet viscose, plain	----------	----------	----------	----------	----------	70.5	.070
Treated glassine	317	32	17.5	6.0	.41	65.8	.083
Impregnated white tissue	183	18	17.6	7.5	.32	69.9	.104

The high opacity of the bleached grease-proof paper precludes the possibility of its being used in the manufacture of window envelopes. The sample is from a maker of glassine papers, and was included in the series for comparison with the other materials investigated.

The two samples of sheet viscose referred to above are included because they are almost ideal, in respect to transparency, for the covering of the aperture of the two-piece window envelope. The most noticeable difference between these two samples is that one has ribbed or embossed surfaces, whereas the other has plane surfaces. It will be noted, by referring to Table 2, that the embossing has produced a remarkable change in the character of the reflection. While more than 70 per cent of the light reflected from the plane surface was polarized, this value has been reduced to 25 per cent by embossing. The transparency of the material has not been changed appreciably, however, by the embossing process. From the standpoints of transparency and gloss, therefore, the embossed sample is an excellent material for covering the aperture of two-piece window envelopes; its present relatively high cost, however, hinders extensive use for this purpose.

The sample of glassine paper has been given some sort of after treatment, resulting in a higher transparency than are characteristic of the ordinary glassine papers.

The sample of impregnated white tissue was made by treating white tissue paper with a solution like, or similar to, those used in making the windows of one-piece window envelopes. As compared with the average glassine paper, it is somewhat heavier and thicker. This is no doubt due to the clarifying solution with which the paper was treated. In other respects, however, this material compares favorably with glassine papers.

3. ONE-PIECE ENVELOPES

In Table 3 is given a summary of tests on one-piece window envelopes. The given weights per ream refer to the untreated paper from the envelopes, and not to the transparent portion forming the windows.

The gloss determinations were made on both the untreated and the treated portions of the envelopes, because it seemed probable that the amount of polarized light reflected by the windows was dependent to a considerable degree upon that reflected by the untreated parts of the envelopes.

TABLE 3.—*Summary of tests on one-piece window envelopes*

	Weight per 500 sheets		Gloss		Opacity of window	Transparency per pound 25 by 40, 500 by 100
	25 by 40 inches	17 by 22 inches	Paper	Window		
	Pounds	*Pounds*	*Per cent*	*Per cent*	*Contrast ratio*	
Range	33.9	12.6	11.8	10.2	0.088	0.76
Maximum	84.6	31.6	78.3	87.7	.229	1.67
Minimum	50.7	19.0	66.5	77.5	.141	.91
Average	64.3	24.1	73.1	84.1	.183	1.30

4. PERMANENCE

Table 4 gives an indication of the permanence of the transparency of the windows of one-piece and two-piece window envelopes under different conditions of exposure. The results reported are the averages. The column marked "First determination" contains results of tests made on the material when first received. The next column gives results on the same samples after 600 hours exposure in diffused daylight, about 15 feet from a south and an east window. The last column contains the results of opacity tests after about 50 hours exposure to direct sunlight through window glass.

TABLE 4.—*Increase in opacity of windows with exposure and age*

Type of window	First determination	600 hours diffused light	50 hours sunlight
Two-piece	0.125	0.132	0.139
One-piece	.187	.197	.222

It will be noted from these results that considerable change in the opacity of the samples has taken place. There was an increase in the opacity of the glassine samples of 11.2 per cent and in that of the one-piece samples of 18.7 per cent. The cause of the increase in opacity of both materials is probably largely, if not wholly, due to oxidation. There is little doubt that chemical changes, such as oxidation, take place more rapidly in the materials constituting the one-piece windows than in glassine papers.

TABLE 5.—*Effect of storage on one-piece windows*

Sample No.	Opacity (contrast ratio)					
1	Dec.[1] 1=0.196	Jan. 16=0.207	Feb. 16=0.208	Mar. 16=0.208	Apr. 17=0.209	Sept. 13=0.206
2	Dec. 1= .188	Jan. 16= .199	Feb. 16= .197	Mar. 16= .195	Apr. 17= .197	Sept. 13= .203
3	Nov. 1= .141	Jan. 16= .154	Feb. 16= .152	Mar. 16= .150	Apr. 17= .154	Sept. 13= .149

[1] The dates refer to the month and day the tests were made.

The effect of storage for several months on the opacity of one-piece windows is shown in Table 5. The samples were stored in a cool, dry room, and were kept in total darkness except when taken out into a dimly lighted room for testing.

The results indicate that there was a small decrease in transparency during the first month or two after manufacture, and that following this the windows remained practically constant in this respect during the remainder of the period indicated. The results also indicate that there will usually be no serious reduction in the transparency of one-piece windows over a period of several months, perhaps of a year or more, if the envelopes are stored in a cool, dry room to which only dim light, or no light at all, has access.

The same series of tests were made on samples of glassine papers stored under the same conditions, but there was no appreciable change in their opacity during the period covered.

5. WEIGHT

Other things being equal, the opacity of the windows of one-piece window envelopes increases with increase in the weight of the paper used in their manufacture. For only two or three of the samples tested was the difference in weight not reflected by a corresponding difference in opacity. These exceptions to the general rule occur because one manufacturer can sometimes get better transparency from a paper of a given weight than can his competitors from a paper of the same weight.

In the present state of the art, the manufacturer of one-piece window envelopes is limited, in some respects, as compared with the manufacturer of two-piece window envelopes. The former may not be able to meet the demand of his customer for a stronger envelope, because the use of a heavier paper may prevent him getting the necessary transparency of windows. At the other extreme, in attempting to get the maximum transparency of the windows, he is prevented from using paper of too lightweight, since in that case the body of the envelope would not be sufficiently strong nor sufficiently opaque to prevent the contents from being seen or read through the envelope.

V. QUALITY SPECIFICATIONS RECOMMENDED FOR WINDOWS OF WINDOW ENVELOPES

There are two reasons why it is impractical to draft one specification to include both the one-piece type and the two-piece type of envelope. In the first place, the windows of the two types are made of different materials, and the glarimeter is not well adapted for measuring the comparative gloss of the surfaces of different materials, as has already been pointed out. In the second place, the two types of windows were found to differ considerably in transparency. A specification for transparency suitable for the two-piece type would exclude the one-piece type; and a specification for transparency suitable for one-piece type would permit the use of two-piece windows much inferior to those being used to-day. In order, therefore, to give specifications that would, if generally adopted, maintain the present quality of both types of windows, it was necessary to write a different specification for each type.

As already stated, the suggested specifications are meant to serve as a guide to the manufacturer in his efforts to produce window envelopes of satisfactory quality. The following specifications are merely suggestions, and nothing contained in this article shall be interpreted as interfering in any way with the authority of the Post Office Department to deal as it sees fit with any problem relating to the use of window envelopes in the mails, as this is a function of that office alone.

The suggested specifications follow:

1. REQUIREMENTS

ONE-PIECE ENVELOPES

Opacity.—The contrast ratio shall be not more than 0.25. Opacity shall be determined on windows that are not less than five days old.

Gloss.—The gloss shall be not more than 90 per cent.

Bursting strength.—Shall be not less than that of the body of the envelope.

Impregnating material.—Shall not spread excessively after application.

TWO-PIECE ENVELOPES

Opacity.—The contrast ratio shall be not more than 0.20.

Gloss.—The gloss shall be not more than 80 per cent.

Bursting strength.—Shall average not less than 12 points.

Adhesion.—The window must adhere firmly and uniformly to the body of the envelope under the ordinary conditions of usage.

2. SAMPLING AND TESTING

The test samples shall consist of at least 20 envelopes so selected as to be representative of the entire lot. They shall be kept flat and free from folds, wrinkles, dirt, etc., during transmission to the testing laboratory.

Opacity tests shall be made by means of the apparatus described in Bureau of Standards Circular No. 63. Tests shall be made upon six individual windows, and the average results computed to "contrast ratio," as described in Circular No. 63. The time clause respecting this determination is to insure reasonable permanence of transparency.

Gloss tests shall be made with the glarimeter. All tests shall be made on that surface of the window which is part of the outside surface of the finished envelope. In making the tests, a sufficient number of the windows shall be stacked one upon another, with outside surfaces up, to prevent any light from passing through the stack and reaching the holder of the glarimeter. For this purpose, it will be sufficient to take twice the number of windows required to make invisible heavy black printing on a white surface when the windows are stacked over the printing. Tests shall be made on not less than 10 separate windows, and the average shall be reported as per cent gloss.

Bursting strength tests shall be made by the official method of the Technical Association of the Pulp and Paper Industry.

APPENDIX: POSTAL REGULATIONS RELATING TO WINDOW ENVELOPES

1. WINDOW ENVELOPES

THIRD ASSISTANT POSTMASTER GENERAL,
Washington, January 27, 1923.

Notwithstanding the objections to window envelopes from a postal standpoint, they are advantageous to mailers, and there is a widespread demand for their use. In view of this their acceptance for mailing is permitted, provided they comply with certain prescribed conditions. These have been made as liberal as is consistent with the easy and expeditious reading of the addresses and the proper handling of the mails.

A campaign of education has been conducted for a number of years to induce users of window envelopes to obtain envelopes having windows of the highest possible degree of transparency; to use therein inclosures only of such character and color as will permit of clear and legible addresses, and also to place on the envelopes a proper and complete return card, all of these things being necessary for the handling of the matter in the mails without the expenditure of unnecessary time and labor.

Manufacturers of window envelopes have been fully informed as to the requirements, and in view of the publicity given the subject and the efforts that have been made along these lines, there is no good reason why manufacturers should make window envelopes which do not fully meet the conditions governing their use and also why they should not, when customers ask to have window envelopes printed in such manner that they do not conform to the conditions, adivse them as to the postal requirements and refuse to supply envelopes not conforming to such requirements.

In view of the foregoing, postmasters are again requested to inform patrons who use window envelopes as well as manufacturers of such envelopes in their cities that window envelopes not conforming in all respects to the conditions prescribed therefor are not mailable.

Manufacturers should not, therefore, furnish to their customers envelopes which they know do not meet the postal requirements, thus causing annoyance not only to the Postal Service but to the customers and themselves. Under no circumstances will window envelopes not meeting the postal requirements furnished by manufacturers after this date be accepted for mailing. This notice is given in order that manufacturers may not cause loss to their customers as well as themselves by furnishing window envelopes which are not mailable.

The conditions governing the use of window envelopes, briefly stated, are as follows:

1. The window must be parallel with the length of the envelope, properly located, and as transparent and free from glaze as possible.

2. The envelopes must bear a complete and proper return card in the upper left corner of the address side, including a street address or post-office box number when the post office is one having letter-carrier service.

3. No printing of advertising or of sentences or words of any kind around the "window" of window envelopes is permissible, nor on any part of such envelopes where it will interfere with a distinct postmark, rating indorsements, forwarding address, etc., but a plain narrow border not exceeding approximately five thirty-seconds of an inch in width around the window or outer edges is not objectionable.

4. The stationery used in window envelopes, or at least that portion upon which the address appears, must be white, or, if colored, of a very light tint or shade. The use of dark-colored stationery is not permissible.

5. The inclosures used must be so folded that nothing but the name and address of the addressee will be exposed through the window and so that they will not shift around in the envelopes and thus obscure the address in whole or in part.

6. The address must be written clearly and boldly, preferably in typewriting, but in any case with ink of a dense black or other strongly contrasting color. Changes in address must not be made on the window.

W. Irving Glover,
Third Assistant Postmaster General.

2. REGISTRATION OF LETTERS CONTAINED IN WINDOW ENVELOPES, INTERNATIONAL AND DOMESTIC

Third Assistant Postmaster General,
Washington, November 24, 1923.

In connection with the registration of letters contained in window envelopes, attention is directed to the information concerning window envelopes printed on pages 20 and 21 of the July, 1923, Postal Guide.

Registered letters for foreign destination inclosed in window envelopes should not be accepted for registration unless, in addition to complying with the requirements set forth on pages 20 and 21 of the July, 1923, Postal Guide, they conform to the provisions of Article XI, section 2, of the Detailed Regulations for the Execution of the Universal Postal Convention of Madrid, reading as follows:

"2. Articles in envelopes entirely transparent or in envelopes with an open panel are not admitted.

"The following conditions apply to articles in envelopes with a transparent panel:

"(*a*) The transparent panel must form an integral part of the envelope and must be parallel to the longest side, so that the address of the addressee appears in the same direction; it must be placed so as not to interfere with the application of the date stamp.

"(*b*) The panel must be sufficiently transparent for the address to be perfectly legible, even in artificial light, and must take writing.

"Articles forwarded in envelopes with a transparent panel may be registered."

Domestic letters inclosed in window envelopes and containing any matter of intrinsic value should not be accepted for registration unless the transparent panel of the envelope constitutes an integral part of the envelope as distinguished from a window envelope which has no covering over the opening or has the covering over the opening simply pasted or glued to the envelope. Even though the transparent panel is an integral part of the envelope, the letter should not be accepted for registration if it is apparent that it is not strong enough to safely carry the inclosure or its use results in the nature of the contents being unduly exposed.

Letters for domestic destinations inclosed within window envelopes may be accepted for registration even though the cover of the opening is not an integral part of the envelope, *provided the letter contains nothing of intrinsic value and the envelope is sufficiently strong to carry the inclosure. However, no indemnity will be paid for the loss or rifling of registered matter inclosed in such envelopes.*

W. Irving Glover,
Third Assistant Postmaster General.

Washington, October 11, 1926.