

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL HOUSING ADMINISTRATION

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USE OF MATERIALS
BULLETIN NO. 58a

TO: AREA OFFICE DIRECTORS
INSURING OFFICE DIRECTORS

Date

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SUBJECT: ACRYLIC PLASTIC SHEETS FOR GLAZING

Members of the HUD Staff processing cases and inspecting construction shall use this information in determining acceptability of the subject material for the uses indicated.

This bulletin should be filed with Bulletins on Special Methods of Construction and Materials as required by prescribed procedures. Additional copies may be requisitioned by the field offices.

The technical description, requirements and limitations expressed herein do not constitute an endorsement, approval or acceptance by the Federal Housing Administration of the subject matter, and any statement or representation, however made, indicating approval or endorsement by the Federal Housing Administration is unauthorized and false, and will be considered a violation of the United States Criminal Code 18, U.S.C. 709.

Any reproduction of this bulletin must be in its entirety and any use in sales promotion or advertising is not authorized.

Subject to good workmanship, compliance with local codes, and the methods of application listed herein, the materials described in the bulletin may be considered suitable for FHA mortgage Insurance or Low Rent Public Housing Programs.

The eligibility of a property under these Programs is determined on the property as an entity and involves the consideration of underwriting and other factors not indicated herein. Thus, compliance with this bulletin should not be construed as qualifying the property as a whole, or any part thereof, as to its eligibility.

The methods of application for the materials listed herein are to be considered as part of the FHA Minimum Property Standards and shall remain effective until this bulletin is cancelled or superseded.

Section I - Scope

- A. This bulletin sets forth the specifications and conditions for the use of acrylic plastic sheets as lightweight, weather resistant, safety glazing material. These specifications shall apply whether the acrylic sheets have colorless or colored, smooth or patterned surfaces.
- B. Acrylic plastic materials must be used with an appreciation for the fact that they are combustible materials. In general, the same fire precautions that are observed in connection with the handling and use of any ordinary combustible materials should be observed when handling, storing, or using acrylic plastic materials. The fire hazard of uses of acrylic plastics can be kept at an acceptable level by complying with building codes and fire safety codes and observing established principles of fire safety.
- C. The information contained herein may be used as a guide by architects, engineers and builders seeking HUD acceptance of their specified materials and methods of installation. Where local building codes are more stringent than HUD Standards, then the local codes shall apply.

Section II - Applicable Documents

- ASTM Specification D702 (As it applies to cast methacrylate plastic sheets)
- ANSI Z97.1 (Performance Specifications and Methods of Test for Transparent Safety Glazing Material Used in Buildings)
- ASTM Test D635 (Standard Method of Test for Flammability of Self-Supporting Plastics)
- Federal Standard No. 102 (Preservation and Packaging)
- ASTM Test D1929 (Standard Test for Ignition Properties of Plastics)
- ASTM Test D2843 (Standard Test for Measuring the Density of Smoke from the Burning or Decomposition of Plastics)
- Fed. Spec. L-P-391 (As it applies to cast methacrylate plastic sheets)
- HUD Minimum Property Standards (Single Family - Vol. 1, Multi-Family - Vol. 2, and Care-Type Housing - Vol. 3 and Manual of Acceptable Practices - Vol. 4 - Requirements for Glazing).

Section III - Materials

- A. Acrylic plastic for glazing shall be fabricated from methacrylate plastic sheets as specified under Federal Specification L-P-391 or American Society for Testing and Materials (ASTM) Specification D-702. The acrylic plastic also shall meet the safety requirements for glazing materials as specified by the American National Standards Institute (ANSI) Standard Z97.1.
- B. Sealants - Only those sealants recommended by the plastics supplier as compatible with acrylic shall be used. Associated materials, which include sealant backer, sealant primer, glazing points and shims, as recommended by the sealants manufacturers shall be used.
- C. Sash - Wood, metal, plastic coated and rigid plastics such as PVC may be used. Ferrous sashes shall have a protective finish.

Section IV - Uses

The material is appropriate for use wherever a light weight weather resistance safety glazing material is needed and may be used in locations such as: storm doors, skylights, shower door and tub enclosures, storm window and sidelight glazing, windows, sunscreens, greenhouses and bathroom and vanity type mirrors.

Locations where acrylic is not recommended include: splash guards around stoves, near heater units, kitchen counter tops, load bearing partitions and interior finish applications due to combustibility characteristics of acrylic.

Section V - Handling and Storage

- A. In new construction, acrylic plastic glazing should be regarded as a finishing operation and scheduled as one of the last steps in the completion of the structure. The masking paper should be removed either before installation or as soon after installation as practical but not exceeding 24 hours. Acrylics may be purchased with a weatherable polyethylene masking film which may be left in place to protect them during the construction period. This film should of course, be removed from the edges which will be covered by the glazing frames and sealants before setting the glazing.

- B. Acrylic plastic shall be handled in such a manner as to prevent contact with materials common to the building trades that may produce deterioration of the plastic. Acrylic plastic shall be protected from liquid or gaseous fuels, sharp objects or instruments, paint (including synthetic compounds), acid solder, plaster and tar splashes. Any acrylic plastic in contact with these materials will not be acceptable for use.
- C. Copies of a product information sheet shall be furnished by the producer, with each shipment, describing any characteristics or limitations of the material which may impair its serviceability. Product information sheets shall further describe maintenance and cleaning of acrylic plastics. The installer shall furnish each mortgagee with a maintenance pamphlet or sheet on the care and/or cleaning of acrylic plastic.

Section VI - Preservation and Packaging

- A. Preservation and packaging shall be in accordance with Federal Standards No. 102 and as described under preparation for delivery in Federal Specification L-P-391.

Section VII - Installation

- A. General - All installations shall conform to recommendations of the supplier of the acrylic sheet, unless otherwise specified herein, or by the responsible design engineer.
- B. Storm Doors, Storm Windows, Windows, Side Lights - Standard mounting methods may be used including use of an edge gasket mounted in a standard frame. Unframed sheets may be used if the thickness is compatible with the mounting channel and if edges are smooth. Thickness should be selected from one of the following:
 - 1. Flat Glass Jobbers Marketing Association Glazing Manual, 1972 Edition.
 - 2. Acrylic supplier's recommendations.
 - 3. Responsible engineer's design.

For large area glazing acrylic sheet (between 6 and 14 linear feet) shall be in custom sash. The sheet may be flat or formed. Thickness and reinforcing, if any, shall be based on accepted methods of analysis using material properties recommended by the manufacturer. Typical properties are:

Tensile strength, psi.....	9 to 11,000
Compressive strength (ASTM D-695-63T), psi....	16,000 to 18,000
Modulus of elasticity, psi.....	450,000
Specific gravity (ASTM D-792).....	1.18 to 1.19
Flexural strength, psi.....	14,000 to 16,000
Smoke density (ASTM D-2843-70).....	4 to 10% (1/4" Thick)
Thermal transmission (U factor) 1/4" BTU/Hr./S.F./°F (15 mph-0°F outside, 70°F, inside).....	.958 (1/4" Thick)
Coefficient of linear thermal expansion in/in/°F x 10 ⁵	3.5 to 4.5
Izod notched impact strength, ft. - lbs/in of notch (ASTM D-256).....	.3 to .4
Sound transmission (ASTM E90-70/E413) (36" x 84") 1/4", db.....	31
Shading coefficient (vertical) tinted .050% light74
Weight per foot, 1/4" thick	1.55 lbs.
U.V. Transmission 385 nanometers.....	92%
U.V. Transmission 400 nanometers.....	92%
Heat resistance	180 to 200 °F
Thermal Conductivity(k).....	1.3 BTU/hr. Ft ² F° in.

Acrylic plastics are not affected by many chemicals including mineral acids, strong alkalies, kerosene or white gasoline. Leaded or ethyl gasolines and such solvents as concentrated alcohol, benzene, acetone, lacquer thinners, carbon tetrachloride and many window cleaning spray compounds should not be used on acrylic plastics.

Some design criteria are:

The maximum recommended deflection is 3" or 5% of the shorter side, whichever is smaller. The selected sealant must be proportioned according to the manufacturer's recommendation to withstand the expected sheet expansion and contractions. The rabbet depth must be large enough to maintain engagement at maximum sheet expansion. Expansion and contraction of large size sheets may cause edge gaskets to pump out the frame. (Install large size sheets - 6 to 14 linear feet in custom frames.)

C. Skylights - Skylights shall meet the requirements of building codes in a given jurisdiction in addition to the following requirements:

1. A complete unit shall withstand a live load of 40 lbs. per sq. ft.
2. Edges of the plastic shall be encased in a noncombustible frame, of materials such as aluminum, copper, or stainless steel, and of adequate strength.
3. The skylight shall be mounted on a metal curb or a curb clad with a non-combustible material rising at least four inches (4") above roof plane.

Exception:

If the slope of the roof is at least four inches (4") in twelve inches (12"), the unit may be mounted in the plane of the roof.

4. Dome shaped units shall rise above the mounting flange a minimum distance equal to ten percent (10%) of its maximum span, but the rise shall be not less than five inches (5").
5. Flat or corrugated units shall slope at least four inches (4") in twelve inches (12") and corrugations shall be parallel to the inclined plane.

6. Each skylight unit shall be marked with a suitable label, decal or marking which shows compliance with this regulation and gives the manufacturer's identification of the acrylic plastic.
7. A condensate gutter shall be placed on the inside around the periphery, and gaskets shall be placed to drain the condensate to the outside while preventing penetration by rain or snow. The gutter may be integral with the frame.

D. Shower doors and tub enclosures:

1. The relationship of panel thickness to panel size shall be:

<u>Panel Width</u>	<u>Minimum Thickness</u>
Up to 27"	1/8" (.125")
27" and up to 48"	3/16" (.187")

2. All edges of the plastic shall be smooth without nicks, chips or notches. There shall be no holes in the sheet.
3. Metal channel for mounting shall be a minimum of 3/4" deep.
4. For sliding doors, it is desirable that the back surface of the outer panel shall be a minimum of 5/8" from the outer surface of the inner frame.
5. Sheets shall be cut shorter in each dimension by 1/4".
6. Standard metal (aluminum, chrome plated brass, or stainless steel) frames shall be used to mount the acrylic plastic panels. The frame shall have a minimum wall thickness of 1/16", frame width of 1/2" and frame height of 3/4".
7. A gasket material of durometer A hardness of 40-60 or a foam gasket shall be provided to protect the edges and retain the plastic sheet in the frame.

- E. Sunscreens - Sunscreens can be supported by 2, 3 or 4 edges according to manufacturer's recommendations. Edge engagement need not be weathertight if the sunscreen is separate from the window. Thickness and size shall be specified by the responsible engineer. Transmittance through tinted sheet shall remain essentially constant in 10 years.