SPECIFICATION FOR 12 MIL CLEAR GARWARE SAFETY FILM

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes properties of an abrasion resistant safety window film applied to the interior surface of window glass to impart safety and solar control performance for solar heat, UV reduction, glare reduction, impact performance and other characteristics. The film is called 12 MIL clear Garware safety film.

1.02 DEFINITIONS

A. Visible light transmittance :-: It is the ratio of visible solar energy (380 to 750 nm) that passes through a glazing system to the total visible solar energy falling on the system..

B. Visible light reflectance :- It is the total percentage of visible light reflected by a glazing system that can be seen visually.

C. Ultraviolet light transmittance :- This is the ratio of solar ultraviolet energy (300 nm to 380 nm) that is transmitted by the glazing system to the total solar ultraviolet energy falling on the glazing system.

D. Solar Energy Transmitted:- It is the ratio of the total solar energy passing through a glazing system to the amount of total solar energy falling on that glazing system.

E. Solar Energy Reflected:- This is the ratio of total solar energy directly reflected by the glazing system to the amount of total solar energy falling on that glazing system.

F. Solar Energy Absorbed :- The ratio of total solar energy directly absorbed by the glazing system to the amount of total solar energy falling on that glazing system.

G. Total Solar Energy Rejected :-: It is the sum of incident solar energy rejected by a glazing system (solar energy reflectance and part of solar absorption which is re-radiated outward)

H. Shading Coefficient:- Shading Coefficient is the ratio of solar heat gain through a given glazing system to that of a standard plane glass. (1/8 inch or 3mm thickness) under the same test conditions Lower the shading coefficient value better is the sun control capability.

I. U factor :- U factor is a measure of the rate of heat conductivity of a glazing system, and it is independent of solar radiation. When multiplied by the difference between indoor and outdoor temperature in Fahrenheit, it gives the amount of heat in BTUs/hours/square foot of glazing.

J. Emissivity: The ability of a surface to absorb far-infrared heat and to reflect it. The lower the emissivity, the lower the far-infrared heat absorption and the greater the far-infrared heat reflectance.

K. Luminous Efficacy: Ratio of visible light transmission to shading coefficient for a glazing system

L. Solar Heat Gain Coefficient: The fraction of incident solar radiation that actually passes through that window, including solar energy that is both directly transmitted and that which is absorbed and subsequently released inwardly by re-radiation and conduction. SHGC is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits. This number is the mathematical complement of the TSER value: The sum of the TSER (Total Solar Energy Rejection, in decimal form) of a glazing system and its SHGC value is 1; therefore, 1 - TSER = SHGC

1.03 REFERENCES

A. Section makes references to the following:

1. ASTM E-903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres

2. BS EN 410 Determination of Luminous and Solar characteristics of Glazing.

3. ASTM D-1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test)

4. ASTM G-26 Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight

5. ASTM E-84 Standard Method of Test for Surface Burning Characteristics of Building Materials

6. Window 7.8 , a Computer Tool for Analyzing Window Thermal Performance, Lawrence Berkeley Laboratory.

7. ASTM D-882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting

8. ASTM D-3330 Standard Method of Test for Peel adhesion of pressure sensitive adhesive tapes.

9. ASTM D 6988 Standard Method of Test for determination of thickness of plastic film.

1.04 PERFORMANCE REQUIREMENTS

A. Thermal and Optical Performance Properties: Provide glazing films with performance properties specified (on 1/8 inch clear glass) based on manufacturer's published test data, as determined according to procedures indicated in ASHRAE,ASTM & AIMCOL Standards

Product Name : 12 MIL CLEAR SAFETY FILM

1.	Thickness (Mil) :	12.0	
2.	Visible Light Transmittance :	88%	
3.	Visible Light Transmittance Tolerance :		89 ± 2.0
4.	Visible Light Reflectance Exterior :	10 %	
5.	Visible Light Reflectance Interor :	9 %	
6.	Solar Transmittance :	80 %	
7.	Solar Reflectance :	9%	
8.	Solar Absorptance :	11 %	
9.	Ultraviolet Transmission :	<1%	
10.	Total Solar Energy Rejected :	17 %	
11.	Shading Coefficient :	0.96	
12	Emissivity :	0.89	
13.	U Value (Day Winter) :	1.12	
14.	Solar Heat Gain Coefficient :	0.84	
15.	Luminous Efficacy :	0.92	
16.	Glare Reduction :	3	

B. Provide films with UV absorbing materials that limit the weighted UV Transmission to less than 1 percent when measured in accordance with BS EN 410.

C. Scratch Resistance: Provide films that shall have surface coating that is resistant to abrasion such that less than 5.0 percent increase in haze when tested as per ASTM D 1044, using 100 revolutions, CS-10F wheel and 500 g weights

D. Surface Burning Characteristics: Provide films that shall meet the requirements of Class A interior finish for Building materials for both Flame spread index and Smoke development values as per ASTM E 84.

E. Mechanical Performance Properties: Provide glazing films with mechanical performance properties specified based on manufacturer's published test data, as determined according to procedures indicated in ASTM Standards

Product Name : 12 MIL CLEAR SAFETY FILM

1.	Thickness (Mil) :	12.0
2.	No of layers :	Two
3.	Tensile Strength in PSI :	28446
4.	Break Strength in Lbs/in :	340
5.	% Elongation at break :	160
6.	Peel Strength in Gram/in :	2000
7.	Abrasion Resistance :	5% Haze increase

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing systems similar to those indicated for this Project and meeting the standards of the International Standards Organization (ISO), ISO 9001 Quality Assurance in Production

The manufacturer will insure proper quality control during production, shipping and inventory clearly identify and label each film core with the product designation and run number.

B. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.

C. Mockups: Apply glazing films in locations as directed to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Obtain approval of field samples before continuing with remainder of installation.
2. Maintain field samples during remainder of installation in an undisturbed condition as a standard for judging the completed Work.
3. Approved field samples may become part of the completed Work.

D. Pre-installation Conference: Before installing glazing films, conduct conference at Project site. Conduct pre-installation conference in conjunction with installation of mockup.
1. Meet with Owner, Architect, glazing film Installer and glazing film manufacturer's representative.
2. Review methods and procedures related to installation, including manufacturer's written instructions.
3. Examine substrate conditions for compliance with requirements.
4. Review temporary protection measures required during and after installation.

5. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing films according to manufacturer's written instructions and as needed to prevent damage condensation, temperature changes, direct exposure to sun, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with film installation when ambient and substrate temperature conditions are outside limits permitted by manufacturer and when glass substrates are wet from frost, condensation, or other causes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS/PRODUCTS

A. Provide one of the products:
12 MIL Clear Garware Safety film.

Color : Clear

2.02 GLAZING FILM ACCESSORIES

A. General: Provide products complying with requirements of glazing film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Adhesive: optically clear, Pressure sensitive adhesive system that forms a molecular bond between film and glass.

C. Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine glass and surrounding adjacent surfaces for conditions affecting installation.

1.Report conditions that may adversely effect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

C. Protect window frames and surrounding conditions from damage during installation.

3.03 INSTALLATION

A. General: Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
1. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.
a. If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.
2. Do not remove release liner from film until just before each piece of film is cut and ready for installation.
3. Install film with mounting solution and custom cut to the glass with neat, square comers and edges to within 1/8 inch of the window frame.
4. Remove air bubbles, wrinkles, blisters, and other defects.
5. Upon completion, the film may have a dimpled appearance from residual moisture. Said moisture shall, under reasonable weather conditions, dry flat with no moisture dimples within a period of 30 calendar days when viewed under normal viewing conditions
6. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

C. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots, pinholes and other optical defects.

1. If installed film does not meet this criteria, remove and replace with new film.

3.04 CLEANING

A. The film may be cleaned using common window cleaning solutions, 30 days after application. Abrasive type cleaning agents and bristle brushes which could scratch the film must not be used. Synthetic sponges or soft cloths are recommended.

B. Use cleaning methods recommended by glazing film manufacturer.
Replace films that cannot be cleaned.

For Garware Hi-Tech Films Limited

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