

Architectural
Information
Binder

**Architectural
Information
Binder**

FAX REGISTRATION CARD

In order to assure updating of this binder, please fill out or tape a business card below, date and fax to: **650 967-0182**



**Southwall
Technologies**

1029 Corporation Way
Palo Alto, CA 94303

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(800) 365-8794

(650) 962-9111

FAX: (650) 967-0182

Date: _____

Name: _____

Title: _____

Company: _____

Address: _____

City: _____

State: _____ **Zip:** _____

Phone: _____

Fax: _____

E-mail: _____

Please Check One:

Architect _____

Consulting Engineer _____

General Contractor _____

Other _____

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IMPACT OF THE GLASS DECISION

The choice of the right glass is one of the most important, critical, and far-reaching decisions that you will make on a building, whether it be residential, commercial or institutional. The type of glass used has more spin-off impacts than virtually any other construction material.

The glass decision impacts:

DESIGN

HUMAN COMFORT

ENERGY EFFICIENCY

HVAC DESIGN & SIZE

CONDENSATION CONTROL

EMPLOYEE PRODUCTIVITY

ULTRA-VIOLET FADING

SOUND CONTROL

DAYLIGHTING



HEAT MIRROR® - OUR SUSTAINABLE FUTURE

GREEN ARCHITECTURE

SUSTAINABLE DESIGN

SUSTAINABLE ARCHITECTURE

We have all heard these terms but what do they really mean?

Sustainability means meeting the needs of the current generation without compromising the ability of future generations to meet their own needs. A sustainable society restores, preserves, and enhances nature and culture for the benefit of all life present and future; a diverse and healthy environment is intrinsically valuable and essential to a healthy society; today's society is seriously degrading the environment and is not sustainable.¹

When a new office building is conceived today, tacit expectations of “environmentally correct” design hover. The movement toward green buildings is finding its way into site selection, building materials, construction practices, interior design, and architecture. Theories of sustainability and life cycle costing are undoubtedly becoming more mainstream.

Any sustainable design should include the use of high-performance glass. Heat Mirror is endorsed by many as the best, most versatile, high-performance glass solution available today. This technology was developed by M.I.T. scientists in the mid 1970's and brought to market in 1980 by Southwall Technologies. It was the very first “low-e” product ever developed and is still today among the highest in performance and certainly the most versatile glazing product in the market place. Since **Heat Mirror's** inception, Southwall has continued to develop and refine the **Heat Mirror** family of wavelength-selective products available to the architectural and engineering community. The use of **Heat Mirror** enables the architect to positively address all of the impacts associated with the glass decision. As more and more of America's architects and builders adopt the **Heat Mirror** technology, buildings will move from part of the environmental problem to part of its solution.

Company Profile



COMPANY PROFILE

- FOUNDED:** 1979
- EMPLOYEES:** 300?
- LOCATION:** Palo Alto, California
San Francisco Bay Area
- TECHNOLOGY:** Southwall Technologies Inc., produces state-of-the-art thin-film coatings that selectively absorb, reflect, or transmit certain types of electromagnetic radiation. The Company's proprietary method of "sputtering" produces thin-film coatings that have a distinct advantage over competing products in the architectural, automotive, and electronic/aerospace markets.
- MISSION:** Our goal is to provide superior solutions to our customers' needs, create significant returns for our investors, and offer a rewarding environment for our workplace through a philosophy of responsible management, continuous improvement, and commitment to our community.
- HISTORY:** Southwall Technologies Inc. was formed in 1979 to commercialize Heat Mirror™ transparent insulation, a thin-film coating developed by researchers at the Massachusetts Institute of Technology.
- Heat Mirror with XUV® fading protection was introduced in 1989 and named "Technology of the Year" by the Association of Industrial Metalizers, Coaters, and Laminators.
- The Superglass® System, introduced in 1990, was named "Best Home Technology" by *Popular Science* magazine; and *Architecture* magazine featured Southwall for its innovations in window technology.
- In 1991, Southwall gained recognition for contributing to energy conservation by receiving the Diamond Crystal Industry Achievement Award for Product Design and Manufacture from *Door & Window Business* magazine. Southwall was also recognized for energy conservation on ABC-TV, Cable News Network, and The National Audubon Society.
- In 1992, Southwall introduced California Series® laminated glass. California Series combines significant solar control with high light transmittance and low visible reflectivity.
- In 1994, three new products were introduced: Heat Mirror TC88, Heat Mirror SC75, and Solis® Clear Heat Control film for windows.

In 1995, Heat Mirror TC88 was awarded the “Best of What’s New” by *Popular Science* magazine. Heat Mirror TC88 (or Twin Coated 88) is specifically structured to be used when maximum insulation is desired.

Solis, a transparent polyester film that is applied directly to windows, was introduced in 1995. This combination of film and coating blocks approximately half of the sun’s heat and virtually all of the damaging ultraviolet radiation.

Also in 1995 Southwall Technologies was ISO 9002 certified to manufacture Heat Mirror film, Heat Mirror XIR film, and Solis window film.

In 1996 Audi and Renault first to commercialize XIR® infrared reflecting film into auto glass.

In 1999 *Popular Science* magazine chooses Heat Mirror™ coated film as one of the 100 greatest inventions of the millenium.

In 2000 Southwall Europe GmbH begins XIR production at its new plant in Dresden, Germany.



HEAT MIRROR® INSULATING GLASS
COMMERCIAL ARCHITECTURAL SOURCES - U.S.

Fabricator

Contact

ACI GLASS DISTRIBUTION

9120 S. Norwalk Blvd.
 Santa Fe Springs, CA 90670
 800 606-9828, 562 345-1252 Fax: 800 694-4224
 www.aci-distribution.com

Mike Grossman

ACI GLASS DISTRIBUTION

12900 Nicholson Road
 Farmers Branch, TX 75234
 800 284-4527, 972 484-3691 Fax: 972 620-7530
 www.aci-distribution.com

Tina Lee

ACI GLASS PRODUCTS

3225 116th Street, Suite 133
 Seattle, WA 98168
 800 334-8176, 206 244-0727 Fax: 206 244-3351

Gary Meigs
 (Gas-filled Units)

ALPEN, INC.

5400 Spine Road
 Boulder, CO 80301
 800 882-4466, 303 530-1150 Fax: 800 321.1753, 303 530-1753
 www.alpeninc.com

Rob Livingston
 Robert Clarke
 (Source for Silicone-sealed Units)

CAPITOL ALUMINUM & GLASS

1276 West Main St. - U.S. 20
 Bellevue, OH 44811
 800 331-8268, 419 483-7050 Fax: 419 483-7830

Dave Panyard

HGP INDUSTRIES

1900 Midland Street
 Rock Hill, SC 29731
 800 845-9486, 803 366-5167 Fax: 800 637-8091

Mark Costner
 (Gas-filled Units)



COMMERCIAL HEAT MIRROR® ARCHITECTURAL SOURCES
NORTH AMERICA

Fabricator

Contact

MULTIVER

436 Rue Berube
Ville Vanier, QUE G1M 1C8
Canada
418 687-0770 Fax: 418 687-0784

Dennis Cormier
(Gas-filled units)

HIGH PERFORMANCE GLASS LTD.

460 Fraserview Place
Annalis Business Park
New Westminster, BC V3M 6H4
Canada
604 526-7620 Fax: 604 522-4377

Ted Roosen
(Source for Silicone-sealed Units)
(Gas-filled units)

SUNLITE INSULATING GLASS LTD.

1416 Bonhill Road
Mississauga, ONT L5T 1L3
Canada
905 564-8235 Fax: 905 564-1814

Dieter Gollnow
Sandy MacKay
(Gas-filled units)



HEAT MIRROR® LAMINATED GLASS – NORTH AMERICA

Fabricator

Contact

GLASPRO INC.

15500 S. Cornet Avenue
 Santa Fe Springs, CA 90670
 800 776-2368
 562 946-7722 Fax: 562 946-2764

Joe Green

DLUBAK CORPORATION

Route 22 & Dixon Street
 P.O. Box 510
 Blairsville, PA 15717
 800 336-0562
 724 459-9540 Fax: 724 459-0868 Fax

Mark Kearns

HGP & AFFILIATES

5115 E. Hartford Street
 Tampa, FL 33619
 800 282-7291 (Florida Only)
 813 247-3184 Fax: 813 248-1861 Fax

Scott Reynolds

CRISTACURVA

Calle 9 No. 114 Col Seattle
 Zapopan, Jalisco C.P. 45150
 Mexico
 52 3 656-1222, 52 3 633-4337 Fax: 52 3 633-6144

Gabriela Ortega
 Javier Sanchez-Gil Alarcon

U.S. DISTRIBUTOR - SOLIS APPLIED FILM PRODUCTS

Distributor

Contact

V-KOOL, INC.

17356B Northwest Freeway
 Houston, TX 77040
 800 217-7046
 713 856-8333 Fax: 713 856-8998 Fax
 www.v-kool.com

Tyler Fairbanks



HEAT MIRROR® INSULATING GLASS
COMMERCIAL ARCHITECTURAL SOURCES - U.S.

Fabricator

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1900 Midland Street
 Rock Hill, SC 29731
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Mark Costner
 (Gas-filled Units)



HEAT MIRROR®
COMMERCIAL ARCHITECTURAL SOURCES - U.S.

Fabricator

Contact

Heat Mirror Insulating Glass Units Only:

ACI GLASS DISTRIBUTION

9120 S. Norwalk Blvd.
 Santa Fe Springs, CA 90670
 800 606-9828, 562 345-1252 Fax: 800 694-4224
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1900 Midland Street
 Rock Hill, SC 29731
 800 845-9486, 803 366-5167 Fax: 800 637-8091

Mark Costner
 (Gas-filled Units)

Heat Mirror Commercial Windows and Doors:

EFCO Corporation

County Road & Bridle Lane
 Monett, MO 65708
 800 221-4169, 417 235-3193 Fax: 417 235-7313

John Fuldner
 (Source for commercial windows)

Heat Mirror Commercial Windows and Doors (Continued):**TRACO**

71 Progress Avenue
Cranberry Twp., PA 16066
724 776-7000
800 837-7002, Fax: 724 776-7088
www.traco.com

(Source for Commercial windows)

TRACO Skytech Systems, Inc.

7030 N. Berwich Highway
Bloomsburg, PA 17815-8630
717 752-1111
800 800 477-4938, Fax: 717 752-3535
www.traco.com

(Source for commercial windows, doors
skylights, and solariums.)

Product Description



COMFORT & PRODUCTIVITY

*The single biggest investment that a business owner makes is not in his building, facility, product, or process but in his **EMPLOYEES!***

Individuals rarely put a dollar premium on comfort until only after they have been uncomfortable. Although the issue of comfort is fairly subjective, one should note that the single biggest investment that any employer makes is in his people.

To whatever extent employees can be made more comfortable in their workplace the employer will reap the rewards of increased productivity.

Conversely, if the workplace is uncomfortable, productivity suffers quite dramatically.

Since the use of **Heat Mirror®** greatly enhances the daylighting and interior comfort levels of the building. . .

employee productivity

is yet another by-product

of this high-performance glass decision!



PRODUCT DESCRIPTION

HEAT MIRROR® INSULATING GLASS

Heat Mirror is a low-emissivity coated-film product suspended inside an insulating glass unit. **The result is a triple unit with two air spaces, without the weight of triple insulating glass and with far superior insulating and shading performance.** There are nine different Heat Mirror coatings: HM TC88, SC75, 88, 77, 66, 55, 44, 33, and 22. These range from the low-reflectance, high-light transmittance performance of Heat Mirror 88 through the maximum shading performance of Heat Mirror 22.

All Heat Mirror products can be used with virtually any type of glass—clear, heat-absorbing, reflective, heat-strengthened, tempered, laminated—to achieve superior performance in a wide range of aesthetics.

HEAT MIRROR® LAMINATED GLASS

The most recent glazing product added by Southwall is Heat Mirror Laminated **solar-control** glass. Heat Mirror Laminated consists of a wavelength selective Heat Mirror XIR® coated film sandwiched between two layers of PVB and glass. Its unique **low visible reflectance** meets external daytime as well as internal nighttime visual requirements.

Like All Heat Mirror glass products, HM Laminated blocks 99.5% of ultraviolet radiation which accounts for 60% of fading damage. It can be used to meet safety, security, and sound abatement requirements. Other applications include insulating glass, bent glass, structural glazing, and sloped glazing.

SOLIS® CLEAR & GRAY HEAT CONTROL FOR WINDOWS

Solis is a **retrofit film product** that is applied directly to existing windows. The combination of film and coating **blocks nearly half of the sun's heat** and virtually all of the damaging ultraviolet radiation, **while maintaining a clear appearance**. Solis will not alter the view—looking in or out, day or night. There is no mirror appearance. Where glare is a problem, Solis Select, a gray tinted film, is also available.



PRODUCT APPLICATION GUIDE

(What to Use - Where)

Heat Mirror®

The coated suspended-film, insulating glass product to use when these are needed in combination:

- *Excellent winter insulation*
- *Interior condensation control*
- *Varying amounts of solar control*
- *Sound attenuation*
- *Ultraviolet control and fading reduction*
- *Enhanced interior comfort*
- *Daylighting and solar control*
- *Increased employee productivity*
- *Makes any insulating glass combination more energy efficient.*

Where and When to Use Each Heat Mirror Product

All Heat Mirror products block 99.5% of the ultraviolet radiation to slow the rate of fading.

Heat Mirror 88:

- *Substantially improved insulation* over standard, double-pane insulating glass.
- *Low reflectance; highest light transmittance* (north and east side of structures).
- *Passive solar structures* where solar heat gain is desired (south and west side of structures).

Examples:

1. Residential projects where insulation is the primary concern and for "view" homes.
2. Smaller commercial or institutional projects where low reflectivity is desirable

Heat Mirror TC88:

- *High insulation* - (Coating on both sides of film) U-Value = .21 vs. .26 over HM 88. (1/8" glass, air filled, 1" overall).
- *Greatest transparency* - less reflective than HM 88.
- *High light-transmittance.*
- *Color neutral.*

Examples:

1. Residential - improved insulation over HM 88 with or without gas filling.
2. Commercial - any project needing improved insulation and minimum reflectance such as retail storefronts, restaurants, airports, schools, hospitals, museums, historic renovations.

Heat Mirror 77:

- ***Improved Solar Control*** with minimal reflectance and high light transmittance.
- ***Less Reflectance*** than HM 66.

Examples:

1. Residential - view homes with a south or west orientation.
2. Commercial - any project needing additional control of heat gain with minimal reflectance.

Heat Mirror SC75:

- ***Excellent Solar Control*** with minimal reflectance and high light transmittance.
- ***Less Reflective*** than HM 66 but with similar shading performance.

Examples:

1. Residential - view homes with strong need for control of heat gain and good insulation.
2. Commercial - all types of projects where a reflective glass appearance is undesirable but solar control is necessary.

Heat Mirror 66:

- ***Stronger solar control*** but non-reflective enough to meet City of San Francisco code requirements.
- Residential or commercial product needing ***solar control and insulation WITH low reflectance.***

Examples:

1. Residential projects with south or west-facing glass.
2. All types of applications with strong need for clear solar control but minimal reflectance such as: schools, hospitals, museums, libraries, vertical portions of solariums and conservatories, smaller skylights.

Heat Mirror 55:

- ***Moderately reflective,*** high light transmittance.
- Vertical and sloped glazing for commercial projects ***needing stronger solar control without losing visible light.***

Examples:

1. Office buildings needing clear glass.
2. Sloped glazing needing good light transmittance (solariums).
3. Small to moderate-sized skylights.

Heat Mirror 44:

- *Reflective*, but with high light transmittance.
- Sloped glazing or commercial projects where reflectivity is not an issue but *needing stronger solar control*.

Examples:

1. Sloped glazing for skylights, atriums, or conservatories needing a favorable light to heat ratio.
2. Projects needing a very high light transmittance versus solar control.
3. Often used with tinted glass for vertical applications.

Heat Mirror 33:

- *Reflective*, high light transmittance where maximum solar control is needed.
- Sloped glazing or commercial projects where *reflectivity is not an issue but control of glare is desired*.
- Can be combined with tinted glass for *excellent solar performance and daylighting*.

Examples:

Large commercial skylights and all types of overhead glazing needing strong solar control and glare reduction.

Heat Mirror 22:

- *Highly reflective exterior appearance* - **maximum solar control**.
- *Sloped glazing projects where reflectivity is not an issue*.

Examples:

1. Wide use in solariums for maximum solar control and insulation in sloped glazing.
2. Large skylights



Heat Mirror® Laminated (California Series®)

A laminated glass product used monolithically or in insulating glass unit form.

Where and When to Use XIR® Architectural

- Monolithic applications where ***maximum transparency (low reflectivity)*** is needed **with** superior ***solar control***.
- ***Meets code*** for laminated applications where ***solar control*** and ***safety*** are important in *hurricane_areas*.
- ***Sound and security*** laminated applications where ***solar control*** is important.
- ***Ultraviolet control*** and ***fading reduction*** applications.
- Retrofit applications ***replacing existing clear or reflective single-pane*** where ***solar control*** and ***daylighting*** are needed.
- Retrofit applications ***replacing existing tinted, reflective single-pane*** where ***solar control*** and natural ***daylighting*** are needed.

Examples:

1. Restaurants - (transparency and comfort near windows)
2. Retail - (transparency and fading reduction)
3. Banks and financial institutions - (transparency and security)
4. Conservatories and botanical gardens - (daylighting for plants and low thermal stress)
5. Museums and libraries - (comfort, security, and fading reduction)
6. Historical renovations - (energy efficiency but maintain "look" of the original)
7. Airport control towers - (high transparency and energy efficiency)
8. Guard and sentry posts - (security, transparency, and energy efficiency)
9. Day care facilities
10. Skylights and sloped glazing where outside reflectance must be minimized.
11. Areas subject to hurricanes and typhoons.



Solis®

A professionally-applied film product for existing windows or glazing.

Where and When to Use Solis

- Interior surface of existing single or double-pane glass ***to cut heat gain*** approximately 50%.
- ***Crystal-clear*** appearance.
- ***Ultraviolet control*** and ***fading reduction***.
- ***10-year warranty*** for ***commercial*** projects. (Applied by professional window tinter.)

Examples:

1. To control heat gain on any existing windows where replacement of glass is ***not*** desirable.



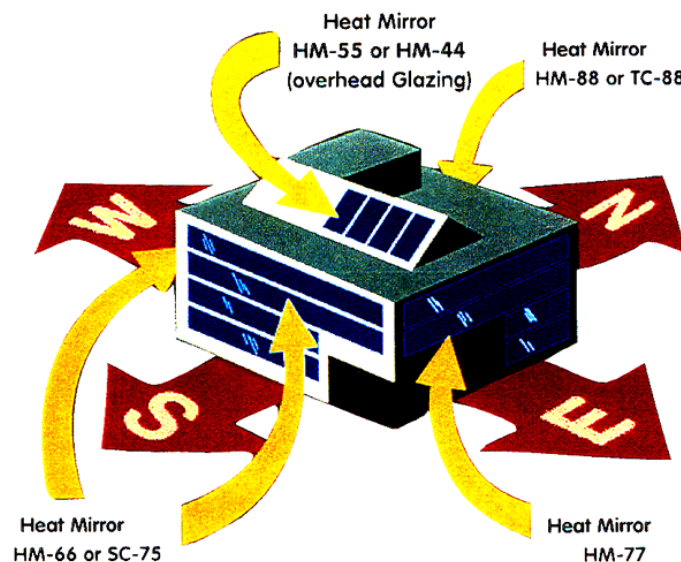
“TUNING”

Today architects have some extremely difficult decisions and choices to make, not the least of them is the right choice of glazing material. The choice of the right glass is one of the most important, critical, and far-reaching decisions that you will ever make on a building, for this decision has more spin-off impacts than virtually any other construction material. *The glass decision impacts the overall*

- *Aesthetics & Design*
- *Energy Efficiency*
- *Mechanical HVAC design and loads*
- *Daylighting*
- *Sound Control*
- *Condensation Control*
- *Ultraviolet Fading*
- *Human Comfort & Productivity*

In today’s architectural design community the concept of “*Green Architecture*”, “*Sustainable Design*”, “*Sustainable Architecture*” has moved into the forefront in choosing the right materials for the job. The Heat Mirror® family of high performance products enables the architect to actually environmentally “tune” a building by using different wavelength-selective films for different building elevations. For example, as depicted in the diagram below, on South and West elevations, one might use HM-66 or SC-75, East elevation, HM-77, North Elevation - HM-88 or TC-88 and for overhead, skylight glass HM-55 or HM-44. Tuning allows one to optimize by elevation daylight transmittance and address solar gain concerns at the same time. This concept of using multiple Heat Mirror types to meet specific design criteria is recognized as one of the most powerful uses of this technology and makes for a truly “*Green Building*” and may provide you and your firm with the “*architectural signature*” you may be looking for.

Tuned by Orientation



Myth #5: *All “low-e” glass provides protection from solar heat gain.*

Fact: Most varieties of low-e insulating glass are **designed to improve winter insulation**. To effectively limit solar heat gain in summer, most low-e manufacturers have to use tinted or reflective glass, which blocks light along with the solar heat. Within the Heat Mirror family of wavelength-selective, suspended coated films, **one can choose a product which provides a low shading coefficient to control heat gain while still effectively controlling heat loss as well**. Combined with clear glass, this product appears visually clear and neutral in color.

Myth #6: *All “low-e” glass looks clear and colorless, like ordinary insulating glass.*

Fact: Many low-e coatings give the glass a slight purple, blue, brown, or yellow tint—especially noticeable in reflection. Heat Mirror is specifically designed to be clear and colorless. People interested in low-e windows should compare the color of low-e glass types by looking at actual, full-size window samples.

Myth #7: *“Low-e” glass is more durable than Heat Mirror.*

Fact: **Sputtered low-e coatings, whether on glass or polyester, last as long as the seal in the insulating glass unit**. If the seal fails, the unit will fail regardless of whether the unit is a low-e unit, a Heat Mirror unit, or a standard insulating glass unit. Heat Mirror insulating glass is regularly tested for durability at independent test laboratories using industry standard test procedures, and **repeatedly passes at the highest possible levels**.

Heat Mirror insulating glass units are manufactured according to IGCC (Insulating Glass Certification Council) CBA “A” Level Certification and SIGMA (Sealed Insulating Glass Manufacturers Association) CBA “A” Level Certification.

Myth #8: *All “low-e” glass eliminates fading.*

Fact: **No low-e product completely eliminates fading** because both ultraviolet (UV) radiation *and* visible light cause fading.

The Heat Mirror products block most of the damaging ultraviolet, offering more fading protection than any other glass—coated, tinted, or reflective. The Heat Mirror products effectively block 99.5% of harmful UV radiation.

Myth #9: "I can't afford Heat Mirror."

Fact:

The choice of the right glass is one of the most important, critical, and far-reaching decisions that one will make on a building. The type of glass used has more spin-off impact than virtually any other construction material. The glass decision impacts:

**DESIGN
HUMAN COMFORT
ENERGY EFFICIENCY
HVAC DESIGN & SIZING
CONDENSATION CONTROL
EMPLOYEE PRODUCTIVITY
ULTRAVIOLET FADING
SOUND CONTROL
DAYLIGHTING**

The glazing of any job consists of three components: Glass, Metal, and Labor. It is generally accepted that each accounts for 1/3 of the glazing cost. As a worst case scenario, let's compare Heat Mirror to standard clear, insulating glass in a simple storefront system. Heat Mirror may double the glass cost, however, [this addition will represent only a 25% increase of the total installed glazing cost](#). Should the metal system be more complicated and costly, increasing labor, the resulting percentage increase that Heat Mirror adds to the job actually becomes less.

	<u>Standard IG</u>	<u>Heat Mirror</u>
GLASS	\$100,000	\$200,000
METAL	\$100,000	\$100,000
LABOR	<u>\$100,000</u>	<u>\$100,000</u>
	\$300,000	\$400,000

The "real" premium for Heat Mirror is the dollar difference between glass types divided by the job total cost ($\$100,000/\$400,000 = 25\%$). This nominal increase should result in either an immediate or near-term payback because Heat Mirror insulating glass often enables the mechanical engineer to:

- ◆ **DOWNSIZE THE HVAC DESIGN & SIZE**
- ◆ **SAVE ON ANNUAL OPERATING COSTS**
- ◆ **REDUCE USE OF ARTIFICIAL LIGHTING**

Viewed in terms of overall building cost, Heat Mirror's marginal investment is likely to be small, yet return to owners and occupants many times this initial cost in both energy savings and comfort. No one ever puts a premium on comfort until after he has been uncomfortable! We now have all of the unquantifiable benefits associated with the Heat Mirror product:

- **Excellent Daylighting**
 - **Almost Total Ultraviolet Blockage**
 - **Enhanced Interior Comfort Levels**
 - **Elimination or Reduction of Condensation**
 - **More Usable Interior Space**
 - **Quieter Building**

1029 Corporation Way
Palo Alto, CA 94303
Phone: 650 962-9111
Fax: 650 967-0182

In reality, you can't afford NOT to use Heat Mirror!



KEY TERMS

DAYLIGHT TRANSMITTANCE (Tvis): The percentage of visible light that a glazing transmits through glass.

EFFICACY FACTOR: The ratio of Tvis to SC: $K = \frac{T_{vis}}{SC}$

A simple ratio of Light to Heat. The higher the number, the more light per amount of heat. A low number means that either it is a dark glass or a lot of heat gets through. A superior, spectrally-selective glass will have a $K > 1.0$. This may also be called Light to Heat Ratio (LHR) or Coolness Factor.

HEAT MIRROR®: A high performance soft-coat low-e sputtered directly on an optically clear substrate then suspended within the airspace of an insulated glass unit.

HEAT MIRROR® LAMINATED: A high performance soft-coat low-e coated film encapsulated between two layers of PVB laminated between two layers of glass. When used monolithically, it reduces solar heat gain while maintaining its transparency.

LOW EMISSIVITY COATINGS: Coatings applied which allow short-wave energy to be transmitted through glass, but reflect long wave infrared radiation. The lower the emissivity, the lower the resultant U-value.

PYROLYTIC LOW-E: Glass with a coating, either visually reflective or low emissivity, applied at high temperatures and fired into the glass surface during float glass production.

R-VALUE: Measures the insulation effectiveness of the window. The R-value equals one divided by the U-value ($R=1/U$). The higher the R-value, the better the insulating performance.

RELATIVE HEAT GAIN (RHG): A number which represents the amount of heat entering a building due to both solar radiation and conductive/connective heat gain. The total heat flow through the glass for a specific set of conditions. This value considers indoor/outdoor temperature differences and the effect of solar radiation (Btu's/hr./ft²).

SHADING COEFFICIENT (SC): Measures the total solar heat gain through the glazing compared to 1/8" clear glass under the same conditions. It includes both the solar energy transmitted directly plus any absorbed solar radiation that is re-radiated as heat into the interior. The number ranges from 0.0 to 1.0. Standard insulating glass has a SC of .81. The lower the shading coefficient, the lower the solar heat gain.

SOFT-COAT LOW-E: Glass with a coating applied in a secondary process at ambient temperature within a vacuum chamber.

SOLAR HEAT GAIN COEFFICIENT(SHGC): The percentage of Solar Energy either directly transmitted or absorbed and then re-radiated into the building.

SOLIS®: An optically clear solar control film applied to the room side of existing glass to reduce heat gain through the glass.

U-VALUE: Measures the heat loss or gain due to differences between indoor and outdoor air temperatures (Btu's/hr./ft²). The U-value equals one divided by the R-value ($U=1/R$). The lower the U-value, the better the insulating performance.



INTERIOR CONDENSATION RESISTANCE

Based on LBL WINDOW Center Method

Indoor Temp: 70° F

Temperatures (°F) at Which

Interior Surface Condensation Occurs

INDOOR RELATIVE HUMIDITY

50%

60%

70% Outside

Outdoor Temperatures

	VALUE	R-VALUE	°F	°F	°F
Monolithic 1/4" Glass	1.09	0.92	46	52	58
Standard IG 1" OA	0.49	2.0	15	30	42
Heat Mirror® 1" OA (88,77,75,66,55,44,33,22)	0.31	3.2	-17	7	26
Heat Mirror TC88 1" OA	0.27	3.7	-30	-3	20
Heat Mirror 1 1/2" OA	0.22	4.5	-52	-19	-9
Heat Mirror TC88 1 1/2" OA	0.18	5.6	-79	-39	-5



HEAT MIRROR® & PLANT GROWTH

Interior plant growth depends upon both the quantity and quality of natural light transmittance. The quantity of photosynthetically active light is measured by the PAR (Photosynthetically Active Radiation). The primary PAR response occurs well within Heat Mirror's visible transmittance curve. Because of this high PAR transmittance, **Heat Mirror glazing applications promote thriving plant growth.**

Light quality depends on the ability to selectively transmit useful radiation (visible light and PAR) while controlling thermal stress and damaging radiation (infrared thermal burn, ultraviolet radiation). Heat Mirror's wavelength-selective coatings provide the means for improving light quality. The exact choice of Heat Mirror type depends on building type, orientation and climate.

Heat Mirrors 88 and TC88 provide the maximum PAR transmission for northern, cold-climate applications where thermal burn problems are not anticipated. Heat Mirrors 77, 66, TC88 and SC75 render the best PAR vs. IR-UV ratio for optimal light quality and growth rates; use HM 77 and TC88 in northern climates and HM 66 and SC75 in the southern climates or anywhere excess heat gain is a problem. Heat Mirrors 55 and 44 have slightly lower PAR curves yet still provide much higher growth than commercial reflective glazings. In general, use clear glass with HM 88, 77, 66, and SC75 in vertical applications while reserving HM 55 and 44 for sloped usage with either clear or tinted glass.

A few plants species (about 2%) have "far-red photomorphogenesis" requirements in the area of 700+ nm (these wavelengths are in the boundary region between visible light and near infrared). **Such plants types generally do not grow well behind any glass unless supplemented with artificial light sources.** Incandescent (not fluorescent) lights may be used to promote development for these plant varieties.

We often receive questions regarding plant sensitivity to ultraviolet light (below 380 nm). According to the Denver Botanical Garden's¹ Horticulture Department and published reference materials, no ultraviolet light requirements have been documented for plant growth. High intensity artificial UV light is occasionally used by the Denver Botanical Gardens to sterilize soil and plant samples prior to planting.

In summary, clear Heat Mirror units promote optimal plant growth by transmitting photosynthetically active radiation and controlling excessive temperature swings and thermal stress.

¹ Denver Botanical Garden, 909 York Street, Denver, CO 80206; phone 303 331-4000.



WHY USE HEAT MIRROR® HIGH-PERFORMANCE GLAZING IN SLOPED GLAZING & SKYLIGHTS?

The purpose of a skylight is to add natural daylight and enhance the aesthetics of the interior of a building.

- (1) Heat Mirror provides ***the highest daylight to solar control ratio of any product on the market.*** Heat Mirror has seven shading products that can control heat gain without the use of dark or reflective glass. These products are so effective, that tinted glass is combined with them mainly to reduce glare, as Heat Mirror with clear glass, will dramatically control heat gain.
- (2) ***Minimum deterioration of insulation value between vertical and sloped applications.*** When insulating glass is tilted, it becomes a solar collector. The U-value then deteriorates because of increased convection within the air space. Since the Heat Mirror technology creates two small air spaces instead of one large one, this convection loop is short circuited; and the U-value remains close to that of the vertical glass (see following pages).
- (3) On new construction, the use of Heat Mirror should enable the Mechanical Engineer to ***downsize the mechanical HVAC system*** thus offsetting the cost of using energy-efficient glass. Some utility companies also offer ***up-front rebates*** that off-set cost of the glass.
- (4) ***Lower the cost for energy used to heat and cool*** the building. Due to the use of Heat Mirror total performance glass, owners should realize significant savings in energy costs..
- (5) Since Heat Mirror provides a high level of natural daylight while providing a stable climate under the skylights, ***plant growth is promoted.*** This is significant whether specimen plants are used for botanical gardens or merely to provide a pleasant atmosphere within the building.
- (6) The use of Heat Mirror results in a ***significant reduction or total elimination of harmful interior condensation.*** Since Heat Mirror provides outstanding winter insulation, a much higher level of humidity can be tolerated within the building before condensation forms.
- (7) All Heat Mirror architectural products ***block more harmful ultraviolet than any other similar products*** on the market. It is a significant factor in reducing the rate of fading and controlling damage due to ultraviolet radiation.
- (8) Heat Mirror glazing is ***compatible with all commercial skylight systems.*** Heat Mirror is basically double insulating glass with a suspended, coated film in the middle. The standard polyurethane-sealed units are used in four-sided capture window systems. If the job is to be ***butt or structurally glazed,*** this fact must be noted on the specification in order that the proper silicone sealant will be used in fabrication.
- (9) When a monolithic glazing system is required and/or when a good ***U-value/R-value is not critical,*** the use of Southwall's ***California Series® laminated*** product would be appropriate.



SLOPED U-VALUE DEGRADATION

Skylight Type	U-Value Vertical	U-Value 27% Slope	Performance Degradation Due to Sloping
Single Pane	1.11	1.22	10%
Double Pane	0.49	0.57	17%
Pyrolitic Low-e	0.35	0.45	28%
Sputtered Low-e	0.33	0.43	29%
Low-e ²	0.31	0.41	31%
Heat Mirror® 66	0.25	0.27	6%

Featured Benefits



WHY USE HEAT MIRROR® HIGH-PERFORMANCE GLAZING IN HOSPITALS & MEDICAL OFFICE BUILDINGS?

Hospitals must provide an environment conducive to the efficient function of staff and the comfort and recovery of patients.

- (1) ***No HVAC "Night Setback" required.*** Hospitals cannot vary nighttime or weekend HVAC demands as they operate on a 24-hour, 7-day week schedule. As a result, the savings are greatly enhanced by using a higher performance glass over that of a standard IG.
- (2) With the use of Heat Mirror, ***clear glass can be used*** vs. tinted to control heat gain where required and thereby giving a more ***pleasing natural light*** rather than a gloomy light sometimes cast by the use of tinted glass.
- (3) ***Higher Sound Transmission Class (STC)*** with Heat Mirror (especially with 1 1/2" system) keeps outside noise outside, making for a less disturbing atmosphere for patient recovery.
- (4) Significant increased perimeter ***comfort of patients near windows***. Minimum reliance or complete elimination of perimeter heating systems.
- (5) ***Comfortable Atriums***. Standard commercial atriums might get away much greater temperature swings, as people run fully clothed through these areas. However, hospital atriums for patient transportation are much more sensitive to ***round-the-dock comfort***.
- (6) ***Lessen Client concern for ongoing operating costs***. Due to the use of higher performance glass, the Hospital owner would realize far greater savings over the life of the facility by a significant reduction in HVAC operating costs.
- (7) On new construction, the use of Heat Mirror should enable the Mechanical Engineer to ***downsize the mechanical HVAC system***, thus saving front end money.
- (8) Heat Mirror glazing is ***compatible with existing hospital window systems***.
- (9) ***The ability to "tune" the building*** by using different "wavelength-selective" suspended Heat Mirror in different building elevations. This would alleviate dramatic temperature swings in different areas of the building and dramatically increase patient comfort.
- (10) Heat Mirror is ***complementary to other specialty glass requirements*** - i.e., strong, "safety glass" or laminated glass for psychiatric wards.



WHY USE HEAT MIRROR® HIGH-PERFORMANCE GLAZING IN LIBRARIES, MUSEUMS, AND ART GALLERIES?

Libraries, museums, and art galleries all have similar concerns: to protect their collections from deterioration due to fading and in some cases excess humidity.

- (1) All of our architectural products **block more harmful ultraviolet radiation than any other similar products** on the market. Therefore our products eliminate, what is believed by many scientists to account for, over half of the cause of fading. Other factors also contribute to fading such as: visible light (both natural and artificial); temperature and humidity; and the types of materials or dyes used. All of these affect the rate of fading and deterioration.
- (2) **Natural daylight can be used for ambient lighting**, where desirable, without the deterioration due to ultraviolet.
- (3) **Deterioration due to excess solar gain can be eliminated**. Heat Mirror not only offers superior insulation, but has eight different clear coatings that control heat gain through the glass, thereby protecting exhibits near the glass. Where insulating glass is not required, California Series laminated glass can provide clear solar control with very low visible reflectance.
- (4) By providing outstanding insulation Heat Mirror architectural glazing products **control or eliminate condensation** from skylights, and vertical glazing. This condensation can cause damage to exhibits as well as to window sash and walls.
- (5) **The ability to "tune" the building** by using different "wavelength-selective" products for different building elevations. Southwall has *nine different Heat Mirror insulation products* as well as *California Series, solar-control laminated glass*. These alleviate dramatic temperature swings in different areas of the building.
- (6) **Higher Sound Transmission Class (STC)** with Heat Mirror (especially with a 1 1/2" system) helps control outside noise making a more agreeable atmosphere for appreciation and learning.
- (7) On new construction, the use of Heat Mirror should enable the Mechanical Engineer *to downsize the mechanical HVAC system*, thus **saving initial cost** with continuing **operating cost savings** over time and all of the other benefits associated with Heat Mirror.

HEAT MIRROR® FOR OTHER COMMERCIAL BUILDINGS BY TYPE

RESTAURANT AND FAST FOOD

- Optical clarity from outside
- Enhance interior perimeter comfort (day, night, summer, winter)
- Ability to obtain "clear shading"*
- Best appearance of food is obtained with clear glass and natural daylighting
- Reduce energy costs
- Noise Reduction
- Reduce/elimination of condensation

AUTO DEALERSHIPS, BANKS, BOOK STORES, AND RETAIL

- Optical clarity from outside - high visibility, merchandise enhancement, and security concerns
- Reduce HVAC loads and operating costs - "clear shading"*
- Enhance interior perimeter comfort levels
- Ultraviolet fading concerns
- Reduce/eliminate condensation
- Enhance daylighting
- Noise reduction

RECREATION CENTERS, CONSERVATORIES, HIGH-HUMIDITY ENVIRONMENTS

- Excellent daylighting
- "Clear shading"*
- Lower HVAC design and sizing
- Lower operating costs
- Reduce/eliminate condensation
- Reduce large temperature swings
- Create excellent plant growth environment

OFFICE BUILDINGS WITH "VISION GLASS" ON 50% OR MORE OF THE BUILDING SKIN

- Enhance interior comfort levels
- Increase employee productivity
- Excellent daylighting
- "Clear shading"*
- Reduce initial HVAC costs
- Reduce annual operating costs
- Immediate payback or within 5 years
- Noise reduction
- Ultraviolet protection

* **Clear Shading** refers to the ability to have optical clarity in conjunction with solar control without having to go to a reflective or tinted glass type. Solar control is enhanced when tinted or reflective glasses are used with Heat Mirror products--however, at the expense of daylight and optical clarity. The overall architectural design, functionality, and aesthetics should come into play in choosing the right product to fit the needs of the client. Consult Southwall during design stage before HVAC system is designed.

WHY USE HEAT MIRROR® HIGH-PERFORMANCE GLAZING IN SCHOOLS, COLLEGES, & UNIVERSITIES?

Schools have a dual function: to provide a comfortable environment for learning and to minimize daily operational costs due to energy use.

- (1) Heat Mirror provides ***comfort near the windows in both winter and summer*** by eliminating the cold air chill in winter and excess solar radiation in the summer. Therefore students and teachers can concentrate on the business of learning.
- (2) Since all Heat Mirrors provide ***clear*** insulation and solar control, ***natural daylight can be used for ambient*** This further impacts first costs in ***reduced need for artificial lighting*** within the building..
- (3) With the use of Heat Mirror, ***clear glass can be used if desired*** instead of tinted to control heat gain, thereby giving a more pleasing natural daylight.
- (4) On new construction, the use of Heat Mirror should enable the Mechanical Engineer to ***downsize the mechanical HVAC system***, thus offsetting the cost of using energy-efficient glass. Some utility companies also offer ***up-front rebates*** that off-set cost of the glass.
- (5) ***Lower the cost for energy used to heat and cool*** the building. In this time of reduced budgets for school districts, the daily cost of heating and air-conditioning is a significant factor. Due to the use of Heat Mirror total performance glass, the owners should realize significant savings in energy costs..
- (6) Heat Mirror glazing is ***compatible with all commercial window systems***. Heat Mirror is basically double insulating glass with a suspended, coated film in the middle. The standard polyurethane-sealed units are used in four-sided capture window systems. If the job is to be butt or structurally glazed, this fact must be noted on the specification in order that the proper silicone sealant will be used in fabrication.
- (7) ***Higher Sound Transmission Class (STC)*** with Heat Mirror (especially with a 1 1/2" system) helps control outside noise making a more agreeable atmosphere for learning.
- (8) The use of Heat Mirror results in a ***significant reduction or total elimination*** of harmful ***interior condensation***.
- (9) All the Heat Mirror architectural products ***block more harmful ultraviolet than any other similar products*** on the market. It is a significant factor in reducing the rate of fading and controlling damage due to ultraviolet radiation.
- (10) The ***ability to "tune" the building*** by using different "wavelength-selective" products for different building elevations. The amount of solar control and insulation is tailored to the orientation of the building.

Handling & Installation



HEAT MIRROR®

INSULATING GLASS PRODUCTS DESIGN AND INSTALLATION GUIDELINES

To maximize the serviceable life of the perimeter edge sealant on hermetically-sealed insulating glass units, it is imperative that the following guidelines be adhered to:

1. Heat-Strengthening or Tempering.

Heat-strengthening or tempering is recommended for the outboard lite of a tinted unit when high thermal stress is likely. High thermal stress situations include circumstances where glass may be subjected to re-radiated solar heat, irregular shadow patterns, and excessive glass coverage..

2. Flush or structurally glazed Heat Mirror® units must be sealed with approved silicone sealant.

If Heat Mirror units are to be flush or structurally glazed, this fact **must** be indicated when ordering to insure that the proper Southwall-approved silicone sealant will be used in the fabrication of the units. Polyurethane perimeter edge sealant and spacers must **not** be exposed to sunlight, even during storage. Polyurethane-sealed Heat Mirror installations **must** provide a full perimeter cap or four-sided capture system to cover the unit sealant edge and spacer assembly with at least 9/16" edge sight-line coverage. Exposed exterior flush or structural glazing joints are not permissible for polyurethane-sealed units and will cause premature sealant failure.²

3. Compatible Glazing and Sealant Materials.

Heat Mirror insulating glass units must be installed with glazing materials and sealants compatible with Bostik 3190HM or 3199HM or Courtaulds PRC 4429HM polyurethane sealants, or with Dow Corning® 3-0117 silicone insulating glass sealant. For Bostik please call 800 523-2678 or 215 674-5600 for compatibility information; for Courtaulds please call 818 549-7530, and for Dow Corning please call 770 751-7979 or 517 496-7770.

4. Adequate Water Drainage.

Adequate perimeter moisture barriers and condensate weepage must be provided by the framing system. Insulating glass unit perimeter edges must **not** be exposed to water immersion or prolonged moisture exposure. Weep systems must provide for drainage of water at a faster rate that it enters the glazing channel.

5. Breather Tube Instructions.

If the Heat Mirror units contain breather tubes, **DO NOT** twist or pull the tubes out of the units. The breather tubes **must** be completely closed upon arrival by crimping twice with pliers and trimming the end with a diagonal cutter.

6. Heat Mirror Transparent Film.

The exterior side of each Heat Mirror unit is clearly marked and must be glazed accordingly to maintain warranty coverage.

7. Glazing Installation Procedures.

In addition to the foregoing provisions Heat Mirror units must be handled, stored, and installed in compliance with GANA¹, SIGMA², and AAMA³ standards and procedures. Setting blocks and/or glazing gaskets must fully support the monolithic or insulating glass unit and isolate it from contact with metal framing systems or components.



HEAT MIRROR® **INSULATING GLASS DESIGN AND INSTALLATION GUIDELINES** **FOR SKYLIGHTS AND SLOPED GLAZING**

Skylight installations using Heat Mirror® insulating glass units require close adherence to industry (AAMA, GANA, and SIGMA) standard design procedures and Heat Mirror specific installation guidelines. The following skylight installation checklist includes the most important design features. Further details are available in the standards publications shown in parentheses.

1. Skylight and Sloped Glazing Installations.

Skylight and sloped glazing installations require particularly close attention to glazing design and installation guidelines. Exterior perimeter frame caps should cover the insulating glass unit spacer/sealant assembly plus at least 3/16" of the visible area perimeter. Primary and secondary weepage systems should be provided. Special structural load analysis and laminated safety glass provisions may be required.

2. Flush or structurally glazed Heat Mirror units must be sealed with approved silicone sealant.

If Heat Mirror units are to be flush or structurally glazed, this fact must be indicated when ordering to insure that the proper Southwall-approved silicone sealant will be used in the fabrication of the units. Polyurethane perimeter edge sealant and spacers must not be exposed to sunlight, even during storage. Polyurethane-sealed Heat Mirror installations must provide a full perimeter cap or four-sided capture system to cover the unit sealant edge and spacer assembly with at least 3/16" intrusion into sight-line coverage. Exposed exterior flush or structural glazing joints are not permissible for polyurethane-sealed units and will cause premature sealant failure.²

3. Compatible Glazing and Sealant Materials.

Heat Mirror insulating glass units must be installed with glazing materials and sealants compatible with Bostik 3190HM or 3199HM or Courtaulds PRC 4429HM polyurethane sealants, or with Dow Corning® 3-0117 silicone insulating glass sealant. For Bostik please call 800 523-2678 or 215 674-5600 for compatibility information; for Courtaulds please call 818 549-7530, and for Dow Corning please call 770 751-7979 or 517 496-7770.

4. Minimum Slope.

In order to optimize drainage, Heat Mirror units should be installed in a slope of more than 14° or at least a 3 ft. rise for every 12 lateral ft. pitched roof.

5. SealGuard® Tape.

It is recommended that SealGuard tape, available from Southwall Technologies, be used in applications where high levels of solar exposure could result in seal deterioration for polyurethane-sealed units. This tape is to be applied to the glass adjacent to the capture or cap system for sloped-glazed applications. For further information and sourcing contact Southwall Technologies Product Service, 800 365-8794.

6. Adequate Water Drainage and Weep Systems (SIGMA²).

Adequate perimeter moisture barriers and condensate weepage must be provided by the framing system. Insulating glass unit perimeter edges must not be exposed to water immersion or prolonged moisture exposure. Weep systems must provide for drainage of water at a faster rate that it enters the glazing channel. Skylights must include weepage systems specifically designed for sloped applications of 14° to 60°. Drainage must be provided for both the unit surface weather seal and internal channels.

7. Framing Deflection (AAMA³)

Frame unit openings must be square within 1/8".

Maximum frame deflection at full design load

$$D_{max} = 0.4 (L_g/100)^2$$

where: L_g = Glass edge length (inches)

Example: Unit with a 60" edge span has a maximum deflection of 0.14" (1/8" at 40 psf design load. Framing deflection under passive load (approx. 12 psf) must not exceed 0.05" (3/64").

8. Glazing Structural Loading (AAMA)

Maximum unit size for sloped glazing with laminated inboard lite. See AAMA Table 2-7 or Monsanto Loads software program for exact design requirements. Note these are maximums!

up to 12 sq. ft. = 1/4" annealed laminate inboard

up to 18 sq. ft. = 3/8" annealed laminate inboard

up to 24 sq. ft. = 5/16" heat-strengthened laminate inboard

up to 36 sq. ft. = 7/16" heat-strengthened laminate inboard

up to 40 sq. ft. = 9/16" heat-strengthened laminate (run Loads program over 40 sq. ft.)

9. Perimeter Support Gasket (SIGMA, AAMA)

Skylight glazing unit inboard surface must be fully supported by a perimeter structural channel gasket capable of evenly distributing load stress during maximum design conditions. Note that glazing tapes applied directly to the metal frame (commonly used in small residential skylights) do not meet guidelines and should not be used on commercial installations or large units.

10. Setting and Anti-Walk Blocks (GANA¹)

Setting blocks should be 85±5 Shore A durometer neoprene, 4" length, width equal to glass thickness, placed at quarter points of the glazing unit base. Anti-walk (edge) blocks should be 55-65 durometer neoprene with at least 1/16" clearance between block and glass.



HEAT MIRROR® SPECIFIC GLAZING INSTRUCTIONS

[Failure to follow these instructions will void the warranty and may cause the unit to fail.]

Heat Mirror must be handled, stored and installed in strict accordance with approved insulating glass procedures as detailed in the GANA Glazing Manual: Available from:

GANA
2945 SW Wanamaker Dr., Suite A
Topeka, KS 66614-5321
785 271-0208 Fax: 785 271-0166
www.glasswebsite.com

1. Size Limitations:

Southwall Technologies' wavelength-selective film has a coating width of 72 inches and, as a result, Heat Mirror units must have one dimension which is 72 inches or less. Unit lengths can be as long as 175 inches.

2. Breather Tube Instructions:

Some Heat Mirror units are equipped with pressure equalizing breather tubes. **DO NOT TWIST, PULL OR CUT** this tube or pull out from unit. This breather tube must be completely closed upon arrival by crimping twice with pliers. If possible, units should be installed with the breather tube in an upper corner position, pointing downward.

3. Flush or Structural Glazing:

In the event that the project dictates the **use of butt-glazed or structurally-glazed product, this must be disclosed and written into the specification prior to the project bid.** Heat Mirror fabricators must be apprised of this condition in advance of quoting or fabrication.

4. Polyurethane-Sealed Units:

Standard Heat Mirror units are fabricated with a polyurethane sealant which **must not be exposed to sunlight.** The glass unit edge, spacers, and sealant must be completely covered (captured) by the framing system (9/16" minimum sight line coverage). These organically-sealed units **DO NOT** lend themselves to two-sided or structurally-glazed applications.

5. Glazing Materials:

Heat Mirror insulating glass units must be installed with glazing materials and sealants compatible with Bostik 3190HM or 3199HM, Courtaulds PRC 4429HM polyurethane sealants, or with Dow Corning® 3-0117 silicone insulating glass sealant. It is the glazier/installer's responsibility to verify framing design compliance and glazing material compatibility prior to installation. For compatibility information please call:

Bostik: 800 523-2678 or 215 674-5600
Courtaulds: 818 549-7530
Dow Corning: 770 751-7979 or 517 496-7770

6. Heat Mirror Transparent Film:

The exterior side of each Heat Mirror unit is clearly marked, and must be glazed accordingly to maintain warranty coverage.

7. Heat Mirror Transparent Film:

The exterior side of each Heat Mirror unit is clearly marked, and must be glazed accordingly to maintain warranty coverage.

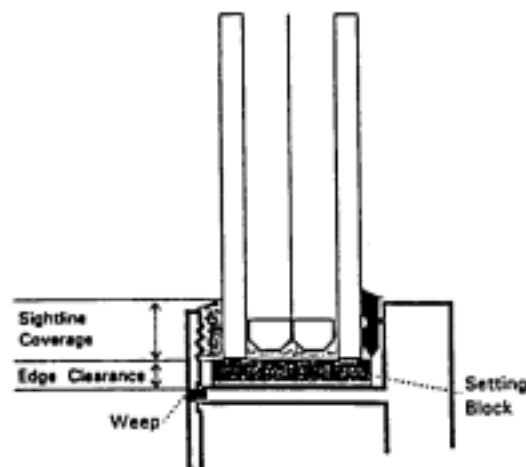
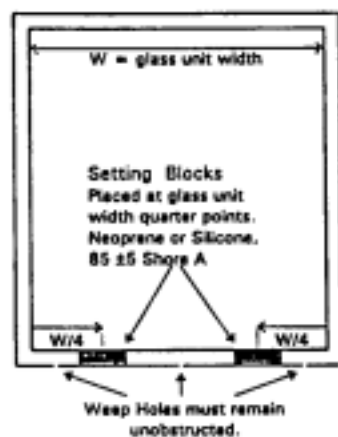
8. Storage Requirements:

Heat Mirror insulating glass units should be installed promptly. If required, storage facilities **must** be at moderate temperature, dry, and covered. Breather tubes **must** be closed upon arrival. Units **must** be covered or shielded from sunlight exposure.

GENERAL GLAZING INSTRUCTIONS:

- (1) **Glazing Materials:** Neoprene gaskets or non-hardening, non-corrosive glazing tapes or sealants must be applied in such manner as to effect and maintain a watertight, weatherproof seal for a period of time equal to the Heat Mirror warranty. All glazing materials must be compatible with polyurethane for Heat Mirror units sealed with this material.
- (2) **Setting Blocks:** Neoprene or silicone blocks must be placed at unit "quarter points" and equally support insulating glass unit inner and outer lites. Setting blocks should be 4" to 6" long and 1/8" wider than the thickness of the unit as indicated in the GANA Glazing Manual.
- (3) **Edge Clearance:** Unit must be centered in the opening so that minimum spacing (1/4") exists between edge of glass and frame (1/8" on small units). No wood or metal shall contact the glass at any point in the frame. Face and edge clearances shall comply with GANA Glazing Manual, Chapter IX minimum recommendations.
- (4) **Weep (Condensate) System:** Insulating glass units must not be exposed to moisture accumulation or high humidity dew points. The glazing system design and installation must provide a positive weather seal and unobstructed weep drainage.
- (5) **Sight Line Coverage (Bite):** Frame and gasket materials must provide a least 9/16" sight line coverage (bite). Insulating glass sealants and spacers must be completely covered by the framing system.
- (6) **Framing:** Openings must be square, in plane, and free of obstructions. Sash and frames must be structurally adequate to support weight of unit and prevent twisting stresses. Frame deflection must not exceed L/175 or less, depending upon size (AAMA).

Setting Block & Weep Hole Locations



Testing & Qualifications



HEAT MIRROR®

PRODUCT TESTING AND QUALIFICATION

Southwall Technologies has over 100 million square feet of Heat Mirror insulating glass in buildings throughout the world. Much of this glass has been installed since 1981, providing a history of proven reliability. Southwall supplements this experience with accelerated testing using industry standard methods.

TEST	OBJECTIVE	CONDITION	RESULT
Thermal Aging and Ultraviolet Exposure	To determine the long-term adverse effects of accelerated thermal and oxidative aging on Heat Mirror insulating glass units.	UVA-351 fluorescent bulbs for 5000 hours ¹	Complies. (Test report available.)
Thermal Stress and Wet Environment	To determine the long-term adverse effects of extreme temperature cycling and moisture on Heat Mirror insulating glass units.	Temperature cycling - 20°F (-30°C) to 135°F (+57°C) plus water spray in six-hour cycles for 1512 hours ²	Passed CBA level. (Test report available.)
Canadian Ultraviolet Fogging	To determine whether extreme temperatures could cause chemical outgassing to condense inside the insulating glass unit.	Temperature 140°F (+60°C) for 164 hours ³	No chemical condensation visible. (Test report available.)

PRODUCT RATINGS: IGCC (Insulating Glass Certification Council) CBA "A" Level Certification; SIGMA (Sealed Insulating Glass Manufacturers Association) CBA "A" Level Certification.

WARRANTY: Heat Mirror insulating glass units are available directly from licensed Heat Mirror insulating glass manufacturers and warranted by them for a minimum of ten (10) years in vertical applications and five (5) years in sloped applications, provided shop drawings have been submitted to and approved by the Heat Mirror manufacturer.

¹Per ASTM (American Society for Testing and Material E773-88, #77--88

²Per NRCC (National Research Council of Canada) CAN2-12.8-M76

³Per ASTM (American Society for Testing and Materials) D-882, G-53



HEAT MIRROR® LAMINATED PRODUCT TESTING AND QUALIFICATION

There are tens of thousands of square feet of laminated glass using Southwall's XIR® film. Southwall supplements this experience with broad-based testing.

Heat Mirror Laminated film must pass tests for visible and solar transmittance, emissivity, adhesive corrosion resistance, reflected or transmitted color, and overall optical quality.

The materials approved and the process specified for the production of Heat Mirror Laminated are the result of years of extensive Southwall testing. Only Southwall-approved materials are allowed to be used in the manufacture of Heat Mirror Laminated units. In this way, Southwall assures that every component of HM Lami. glass works together.

TEST	OBJECTIVE	CONDITION	RESULT
Salt Spray Testing	To determine the long-term effects of a corrosive environment on XIR coating and adhesion.	Five percent (5%) salt solution in water at 95°F for 1,500 hours. ¹	Less than 1/8" edge defect and no delamination.
Impact Strength Testing	To determine ability of product to withstand accidental impacts.	400 ft. lb. Impact. ²	Complies.

PRODUCT RATINGS:

CPSC Consumer Product Safety Commission: Safety Glazing 16 CFR 1201 Cat. II
ANSI American National Standards Institute: Z97.1 Safety Glazing
FRA Federal Railroad Administration: Safety Glazing 49 CFR 223-sidefacing

WARRANTY:

Southwall warrants the quality, performance, and durability of Heat Mirror Laminated glass for five (5) years provided shop drawings from the glass contractor have been submitted and approved by Southwall.

¹Per ASTM (American Society for Testing and Materials) B117

²Per CPSC (Consumer Products Safety Commission) 16CFR 1201 Cat. II

Specifications



SAMPLES & SPECIFICATIONS

Project-specific [samples](#) and [specifications](#) are available from

Southwall Technologies' Product Services by calling:

800 365-8794

or

650 962-9111

1029 Corporation Way
Palo Alto, CA 94303
Phone: 650 962-9111
Fax: 650 967-0182



GLAZING SPECIFICATION
HEAT MIRROR® INSULATING GLASS

DIVISION 8**GLASS & GLAZING****SECTION 08800****PART 1: GENERAL****1.01 Description**

- A. Work included: Type of glass and location as shown on drawings.
- B. Related work: (Spec Sections).

1.02 Quality Assurance

- A. Heat Mirror insulating glass shall be manufactured by commercial fabricators licensed by Southwall Technologies, 1029 Corporation Way, Palo Alto, CA 94303 (800 365-8794; Fax 650 967-0182). These commercial fabricators shall maintain an Insulating Glass Certification Council (IGCC) CBA certification for insulating glass with suspended coated film.
- B. Standards and Code Compliance: (Consult per job).

1.03 Submittals

Submit in accordance with Section _____ as follows:

- A. Manufacturer's data: Submit manufacturer's specification, product literature, and performance data.
- B. Samples: Provide one sample 8 1/2" x 11" of each configuration and type of Heat Mirror insulating glass required.
- C. Certificates of Compliance: (1) Fabricator shall provide a letter of compliance for Section 08800 2.01A. Letter shall mention performance values and confirm they are based on AHSRAE standard conditions.

1.4 Product Handling

- A. Protection: Use all means necessary to protect the products of this section before, during, and after installation, and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage or breakage, immediately make all repairs and replacements necessary; this work shall be done at no expense to the owner.

PART 2: PRODUCTS**2.01 Manufacturer**

Units shall be Heat Mirror insulating glass as manufactured by a Heat Mirror fabricator source approved and licensed by Southwall Technologies (800 365-8794) and IGCC approved for Suspended Coated Films (SCF).

- A. Unit Configuration: Heat Mirror insulating glass units shall be configured as follows by group/type.

Type 1:

Outboard Lite: (glass thickness) _____ (color/name) _____

Type (float or laminated) _____

(annealed, heat-strengthened, or tempered) PER CODE & PLANS

Spacer Thickness & Color : (MINIMUM of 2)

Heat Mirror Type: (HM-88,77,66,55,44, 33, 22, SC-75, or TC-88) HM-

Inboard Lite: (glass thickness) _____ (color/name) _____

Type: (float or laminated) _____

(annealed, heat-strengthened, or tempered) PER CODE & PLANS

Overall unit thickness: _____

Type 2: (If any, same format as above)

- B. Performance:** All performance data shall be calculated according to ASHRAE standard procedures and verified using the LBL "WINDOWS" program.

Type 1:

- (1). Glass shall have a winter nighttime U-Value of: _____ (Btu/Hr./Sq.Ft./F.)
- (2). Glass shall have a summer daytime U-Value of : _____ (Btu/Hr./Sq.Ft./F.)
- (3). Shading Coefficient shall be: _____
- (4). Solar Heat Gain Coefficient shall be: _____
- (5). Daylight Transmittance shall be: _____%.
- (6). Ultraviolet blockage shall be at least 99.5%

Type 2: (If any, same format as above)

- C. Glazing:** (Varies based upon window system employed) Glaze using standard industry (GANA, SIGMA, and AAMA) recommendations for insulating glass, with approved Heat Mirror sealant. For example, the glazing system must include compatible glazing caulks, proper drainage, adequate support, and clearance for both lites, and protection of Heat Mirror unit sealant from direct ultraviolet exposure through the glass.

PART 3: EXECUTION

3.01 Surface Conditions

- A.** Prior to installation carefully inspect installed work of other trades and verify work is completed to the point where the work of this section may proceed.
- B.** Verify that the glass is installed in accordance with original design and in accordance with all pertinent codes and regulations.

3.02 Installation

- A.** Comply with skylight, window, storefront or curtain wall manufacturer guidelines for glazing Heat Mirror in their framing systems.
- B.** Setting blocks should be 85 Shore A durometer neoprene, 4" length, width equal to glass thickness and placed at the quarter points of the glazing unit base. Anti-walk (edge) blocks should be 55-65 durometer neoprene with at least 1/16" clearance between block and glass.
- C.** Be sure exterior of the lite is set toward the building exterior.
- D.** Skylights should include a weep system specifically designed for sloped applications of 15 to 60 degrees. Drainage must be provided for both the unit surface weather seal and internal channels.
- E.** Heat Mirror units cannot be butt or flush glazed unless they were fabricated using Southwall-approved silicone sealant. The polyurethane sealant normally used undergoes ultraviolet degradation when exposed to sunlight. All units sealed with polyurethane must be either fully captured or have a 'cap' which protects the sealant from direct sunlight. All polyurethane units in the field, if stored in an open area, must be covered/tarped to shield from exposure to sunlight until glazed.
- F.** One dimension must to be 72" or less, as Heat Mirror is manufactured in rolls that are 72" in width.
- G.** If units are equipped with breather/capillary tubes, they can be trimmed back to within three inches of entry point and double crimped with a pair of dikes in order to seal the unit.



GLAZING SPECIFICATION
HEAT MIRROR® LAMINATED GLASS

DIVISION 8**GLASS & GLAZING****SECTION 08800****PART 1: GENERAL****1.01 Description**

- A. Work included: Type of glass and location as shown on drawings.
- B. Related work: (Spec Sections).

1.02 Quality Assurance

- A. Heat Mirror laminated glass shall be supplied by a glass laminator licensed by Southwall Technologies Inc., 1029 Corporation Way, Palo Alto, CA 94303 (800 365-8794; Fax 650 967-0182).
- B. Standards and Code Compliance: (Consult per job).

1.03 Submittals

Submit in accordance with Section _____ as follows:

- A. Manufacturer's data: Submit manufacturer's specification, product literature, and performance data.
- B. Samples: Provide one sample 8 1/2" x 11" of each configuration and type of XIR Architectural laminated glass unit as required.
- C. Certificates of Compliance: Fabricator shall provide a letter of compliance for Section 08800 2.01.A. Letter shall mention performance values and confirm they are based on ASHRAE standard conditions.

PART 2: PRODUCTS**2.01 Materials**

- A. Performance: All performance data shall be based upon standard ASHRAE calculations and conditions.

Group 1:

- (1). Daylight transmittance shall be _____ % or better
- (2). Exterior daylight reflectance shall be _____ % or better
- (3). Interior daylight reflectance shall be _____ % or better
- (5). Shading coefficient shall be _____ or better
- (6). Solar heat gain coefficient shall be _____ or better
- (7). Ultraviolet blockage shall be _____ 99.5% or better

Group 2: (As above).

- B. Manufacturer: Units shall be Heat Mirror Laminated as supplied by a glass laminator licensed by Southwall Technologies Inc., 1029 Corporation Way, Palo Alto, CA 94303 (800 365-8794; Fax 650 967-0182).

C. Unit Configuration:

XIR Architectural laminated glass units shall be configured as follows by group:

Group 1:

Outside glass layer: (glass thickness) _____ (color/name) _____
(Annealed, heat-strengthened, or tempered) _____
XIR® encapsulated inner layer
Inside glass layer: (glass thickness) _____ (color/name) _____
(Annealed, heat-strengthened, or tempered) _____

Group 2: (As above).

- D. Glazing: (Varies—based on window system employed.) Glaze using standard industry (GANA, SIGMA, and AAMA) recommendations for monolithic glass, with approved XIR Architectural sealants. *For example, the glazing system must include compatible glazing caulks, proper drainage, adequate support, and clearance for the glass.*¹

PART 3: EXECUTION

3.01 Surface Conditions

- A. Prior to installation, carefully inspect installed work of other trades and verify work is completed to the point where the work of this section may proceed.
- B. Verify that the glass is installed in accordance with original design and in accordance with all pertinent codes and regulations.

3.02 Product Handling

- A. Protection: Use all means necessary to protect the products of this section before, during, and after installation, and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage or breakage, immediately make all repairs and replacements necessary; this work shall be done at no expense to the owner.

3.03 Installation

- A. Comply with skylight, window, storefront, or curtain wall manufacturer guidelines for glazing in their product.
- B. Setting blocks should be a minimum 85±5 Shore A durometer neoprene, 4" length, width equal to glass thickness, placed at quarter points of the glazing unit base. Anti-walk (edge) blocks should be 55-65 durometer neoprene with at least 1/16" clearance between block and glass.
- C. Be sure solar side of lite is set toward building exterior.
- D. Skylights must include weepage systems specifically designed for sloped applications of 15° to 60°. Drainage must be provided for both unit surface weather seal and internal channels.

¹**Note:** All the above are standard industry procedures. Glazing Guidelines are available from Southwall Technologies, 1-800 365-8794.

Installations



REPRESENTATIVE PROJECT LIST

AIRPORTS:

Baltimore Washington Int. Airport Architect: Cesar Pelli & Assoc.	Linthicum, MD New Haven, CT	Heat Mirror® & CS/ CGY IG; 88/Gray
Hong Kong Airport Control Tower Architect: Hong Kong Government	Hong Kong Hong Kong	XIR® Arch. Sierra Green Conventional lami spandrel areas
McAllen-Miller Int. Airport Architect: O'Dell Associates, Richmond	McAllen, TX Richmond, VA	Heat Mirror 66/Clear
Patrick Henry Int. Airport Architect: O'Dell Associates Richmond	Newport News, VA Richmond, VA	Heat Mirror 66/Clear
People Mover Stations Main & Remote Newark Airport Architect: Port Authority of NY & NJ	Newark, NJ New York, NY	Heat Mirror 77, 55/Green
Pullman Moscow Regional Airport Architect: Manual Babayan	Pullman, WA Pullman, WA	Heat Mirrors 66, 44/Bronze

CONVENTION CENTERS:

Broward Co. Convention Center Architect: Cannon	Fort Lauderdale, FL New York, NY	Heat Mirrors 55/Green; 66/Clear
Indianapolis Convention Center Architect: Plus Four Architects	Indianapolis, IN Indianapolis, IN	Heat Mirror 77/Clear
San Jose Convention Center Architect: M.G.A. Partners	San Jose, CA Philadelphia, PA	Heat Mirror 66/Green

CORPORATE HEADQUARTERS:

Audubon Society Building Architect: Croxton Collaborative Architects	New York, NY New York, NY	Heat Mirrors 77, 66, 55/Clear
Blue Cross, Blue Shield Building Architect: Plus Four Architects	Cambridge, MA Indianapolis, IN	Heat Mirrors 77/Gray; 88/Clear
Campbell Estate Corp. Headquarters Architect: Kober Hanssen Mitchell Architects	Honolulu, HI Kapolea, HI	Heat Mirror 77/Clear
Dudley Products Architect: J. Hyatt Hammond	Kernersville, NC Greensboro, NC	Superglass®/Green
Hershey Corporate Headquarters Architect: The Ballinger Co.	Hershey, PA Philadelphia, PA	Heat Mirrors 77, 66/Green
Unisys Headquarters Building Architect: V.V.K.R., Inc.	Eagan, MN Alexandria, VA	Heat Mirrors 55, 66/Blue
Whole Foods Corporate Headquarters Architect: Tom Hatch Architects	Austin, TX Austin, TX	Heat Mirrors 77, 66, 88, 33/Clear

CORRECTIONAL FACILITY:

Eagle County Justice Center Architect: W. C. Muchow & Partners	Eagle, CO Denver, CO	Heat Mirror 55/Green
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COURTHOUSES:

Barrow Courthouse Architect: Allen & Peterson	Barrow, AK Anchorage, AK	Heat Mirror 88/Clear
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Bend Courthouse Architect: Unknown	Bend, OR	Heat Mirror 66/Bronze
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Henderson Justice Facility Architect: H.C.A. Architects	Henderson, NV Las Vegas, NV	Heat Mirror 66/Gray
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Jefferson County Government Center Architect: Fentress Bradburn	Golden, CO	Heat Mirrors 66, 55, 44/Clear & Bronze
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Ogden Regional Government Center Architect: Unknown	Ogden, UT	Heat Mirrors 77, 55/Bronze
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U.S. Federal Courthouse Architect: Wilson Darnell Associates	Wichita, KS Wichita, KS	Heat Mirror 88/Gray
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FINANCIAL:

American Savings Architect: McCullah Leggett Manning	Waco, TX Dallas, TX	Heat Mirror 44/Bronze
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Bank of Edwardsville Architect: F.G.M. Architects	Edwardsville, IL Belleville, IL	Heat Mirror 66/Bronze
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Bank of Levy Architect: Rossetti Associates	Ventura, CA Santa Monica, CA	Heat Mirror 66/Clear
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Barnett Bank Architect: Kenneth H. Woolf Architect	Gulf Breeze, FL Pensacola, FL	Heat Mirrors 77, 55, Bronze
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First Bank Architect: Davis Partnership	Denver, CO Denver, CO	Heat Mirrors 77, 75, 55/Clear
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First Hawaiian Bank Center Architect: Ro Architects	Honolulu, HI Miami, FL	XIR Architectural Low-e Sea Foam Clear
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Southeast Bank Architect: Ro Architects	Coral Springs, FL Miami, FL	Heat Mirror 66/Gray
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Southeast Bank Architect: Ro Architects	Miami, FL Miami, FL	Heat Mirror 66/Gray
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United Bank of Alaska Architect: Scott Bohne Wirum & Cash	Fairbanks, AK Anchorage, AK	Heat Mirror 55/Bronze
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Western Savings Architect: Ted Howard Associates	Waco, TX Dallas, TX	Heat Mirror 55/Gray
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World Savings & Loan Association
Architect: James Alcorn & Assoc.

Rancho San Diego
La Jolla, CA

Heat Mirror SC75/Clear

Zapp Bank
Architect: Korunsky Krank & Erikson Architects

St. Cloud, MN
Minneapolis, MN

Heat Mirrors 66, 55/Blue

HISTORIC:

One Arsenal Place
Architect: Larry B. Spencer Associates

Columbus, GA
Decatur, GA

Heat Mirror 55/Clear

Tobacco Row, Philip Morris Tobacco Bldg.
Architect: Unknown

Richmond, VA

Heat Mirror 88/Clear

HOTELS:

Bangkok Peninsula Hotel
Architect: RMJM

Bangkok, Thailand
Bangkok, Thailand

Heat Mirror 66/Green

Embassy Suites Hotel
Architect: Unknown

Anaheim CA

Heat Mirrors 55, 66, 44/Clear

Flushing World Towers
Architect: Daniel Pang Associates

Flushing Meadow, NY
New York NY

Heat Mirrors 77, 44/Pink

Hilton International
Architect: Unknown

Dorval, QUE, Canada

Heat Mirror 88/Clear

Hyatt Regency-Palm Terrace
Architect: Glumac & Associates

San Francisco, CA
San Francisco, CA

Heat Mirror 77/Bronze

Mariott
Architect: K.S.L.W. Architects

Palm Desert, CA
Long Beach, CA

Heat Mirror 55/Bronze

Tropicana Hotel II Addition
Architect: Morris & Brown Architects Ltd.

Las Vegas, NV
Reno, NV

Heat Mirror 55/Bronze

Westin Hotel
Architect: Vlastimil Koubek Architect

Washington, DC
Washington, DC

Heat Mirror 88/Gray; 66/Clear

LABORATORIES:

Bell Northern Research Center-Lab. 5
Architect: C.R.S.S.

Ottawa, ONT, Canada
Houston, TX

Heat Mirrors 77, 66, 55/Green; 66/Clear

Bio Tech. Lab. Bldg., U. of Pittsburgh
Architect: Bohlin Powell Larkin Cywinski

Pittsburgh, PA
Pittsburgh, PA

Heat Mirrors 77, 55/Green; 55/Blue

Bristol-Meyers Research Center
Architect: The Stubbins Associates, Inc.

Wallingford CT
Cambridge, MA

Heat Mirror 55/Clear

Burroughs Welcome, Div. Headquarters
Architect: O'Brien Atkins Associates

Research Triangle Pk, NC
Research Triangle Pk, NC

Heat Mirror 66/Green

Eli Lilly Research Lab Bldg 48
Architect: CUH2A

Indianapolis, IN
Princeton, NJ

Heat Mirror 66/Gray

Health Sciences Lab., U. of Maryland
Architect: Ayers Saint Gross Architects

Baltimore, MD
Baltimore, MD

HM 77/Clear

M.I.T. Lincoln Laboratories
Architect: Anderson Debartolo Pan, Inc.

Lexington, MA
Tucson, AZ

Heat Mirror 66/Clear

Yale Center for Molecular Medicine
Architect: Cesar Pelli & Associates

New Haven, CT
New Haven, CT

Heat Mirror 66/Clear

LIBRARIES:

Boulder Public Library
Architect: Midyette Seieroe & Associates

Boulder, CO
Boulder, CO

Heat Mirrors 77, 66/Clear, 66/SCGray

C. J. Loussac Library
Architect: Environmental Concern, Inc.

Anchorage, AK
Spokane, WA

Heat Mirror 55/Clear

City of Mountain View Main Library
Architect: Esheick Homsey Dodge and Davis

Mountain View, CA
San Francisco, CA

Heat Mirrors TC88, SC75/Clear

Clayton Library
Architect: S.M.W.M.

Clayton, CA
San Francisco, CA

Heat Mirror 66/EverGreen

Culver Military Academy Library
Architect: CRSS

Culver, IN
Houston, TX

Heat Mirrors 55, 66, 88/Clear

Danville Library and Community Center
Architect: Bull Stockwell Allen & Ripley

Danville, CA
San Francisco, CA

XIR Architectural Carmel Gray

Humbolt Co. Public Library
Architect: Robert J. Gianelli Architects

Eureka, CA
Benicia, CA

Heat Mirror 88/Clear

I. D. Weeks Library
Architect: Herbert Lewis Kruse Blundk

Vermillion, SD
Des Moines, IA

Heat Mirrors 77/Clear

M.I.T. Rotch Library Addition
Architect: Schwartz Silver Architects

Cambridge, MA
Boston, MA

Heat Mirror 55/Green

Mt. Holyoke College Library
Architect: Graham Gund Associates

S. Hadley, MA
Cambridge, MA

Heat Mirror 66/Clear

Newport Beach Library
Architect: S.M.W.M.

Newport Beach, CA
San Francisco, CA

Heat Mirror 66/Green

Peter J. Shields Library Addition, UC Davis
Architect: S.M.W.M.

Davis, CA
San Francisco, CA

Heat Mirror 66/Green

Research & Tech. Center, Gonzaga U.
Architect: Unknown

Spokane, WA

Heat Mirror 66/EverGreen

Science Library, UC Santa Cruz
Architect: Esheick Homsey Dodge and Davis

Santa Cruz, CA
San Francisco, CA

Heat Mirror 77/Clear

South Chula Vista Library
Architect: Leason Pomeroy Associates

Chula Vista, CA
San Diego, CA

XIR Architectural Low-e Sea Foam Clear

Thomas Jefferson Library, U. of MO
Architect: Ittner & Bowersox, Inc.

St. Louis, MO
St. Louis, MO

Heat Mirror 66/Green

MEDICAL:

Angel Community Hospital Architect: Nix Mann Viehman Architects	Franklin, NC Atlanta, GA	Heat Mirrors 77, 66/Clear
Ben Taub Hospital Architect: C.R.S.S.	Houston, TX Houston, TX	Heat Mirror 66/Gray; 66/GYSP
Brigham & Women's Hospital Architect: Kaplan McLaughlin Diaz	Boston, MA San Francisco, CA	Heat Mirror 55/Clear
Crittenton Hospital Architect: Harley Ellington Pierce Yee & Assoc.	Rochester, MI	Heat Mirror 55/Gray
Deaconess Hospital Addition Architect: Kaplan McLaughlin Diaz	Spokane, WA San Francisco, CA	Heat Mirror 77/Bronze
Harvard Medical School Skylight Architect: Davis Brody & Assoc.	Cambridge, MA New York, NY	Heat Mirror 77/Clear
Lucile Salter Packard Children's Hospital Architect: Anshen & Allen Architects	Stanford, CA San Francisco, CA	Heat Mirror 55/Green
Thomas Jefferson University Hospital Architect: Mirick Pearson & Bachelor	Philadelphia, PA Philadelphia, PA	Heat Mirrors 66, 44/Green
Veterans Administration Hospital Architect: Unknown	Wichita, KS Philadelphia, PA	Heat Mirror 88/Clear

MILITARY:

Buckley Naval Reserve Training Architect: Glove-Grow Consulting	Aurora, CO Aurora, CO	Heat Mirror 55/Clear
Buckley Air National Guard Base Architect: Unknown	Aurora, CO	Heat Mirror 77/Clear
Ordinance Damage Control Architect: U.S. Coast Guard Fac. Des & Constr.	Yorktown, VA Norfolk, VA	Heat Mirror 77/Bronze
U.S. Coast Guard Facility Architect: Unknown	Prudhoe Bay, AK New York, NY	Heat Mirror 88
U.S. Naval Academy Visitors' Center Architect: Cochran Stephenson & Donkervoiert	Annapolis, MD Baltimore, MD	Heat Mirror 66/Clear

MUNICIPAL BUILDINGS :

Barrow Courthouse Architect: Allen & Peterson	Barrow, AK Anchorage, AK	Heat Mirror 88/Clear
Bend Courthouse Architect: Unknown	Bend, OR	Heat Mirror 66/Bronze
Jefferson Co. Courthouse Architect: Unknown	Golden, CO	Heat Mirrors 66, 44/Clear; 55/SCGray
Loveland Civic Center Architect: Midyette Seieroe & Assoc.	Loveland, CO Boulder, CO	Heat Mirrors 66, 55, 44/Clear

Ogden Regional Government Center
Architect: Unknown

Ogden, UT

Heat Mirrors 77, 55, Bronze

Police School
Architect: Unknown

Andorra, Spain

XIR Architectural Sea Foam Clear

Spokane City Hall
Architect: Northwest Architectural

Spokane, WA
Seattle, WA

Heat Mirror 88/Gray

U.S. Federal Courthouse
Architect: Wilson Darnell Assoc.

Wichita, KS
Wichita, KS

Heat Mirror 88/Clear

Westminster City Hall
Architect: Unknown

Westminster, CO

Heat Mirror 55/Clear

MUSEUMS:

Air & Space Museum
Architect: Mitchell/Giurgola

Hampton, VA
New York, NY

Heat Mirrors 66, 55/Green

Alaska State Museum
Architect: Minch Ritter Voelcker Architects

Juneau, AK
Juneau, AK

Heat Mirror 77/Clear

Amon Carter Museum
Architect: Art Preservation Services

Fort Worth, TX
New York, NY

XIR Architectural Custom Mojave Bronze

Anchorage Hist. & Fine Arts Museum
Architect: Maynard & Patch

Anchorage, AK
Anchorage, AK

Heat Mirror 88/Clear

Boeing Museum of Flight
Architect: Ibsen Nelsen & Assoc.

Seattle, WA
Vashon, Ireland

Heat Mirror 55/Green; 55, 66/Clear

Center for the Arts, Yerba Buena Center
Architect: Fumihiko Maki Architect

San Francisco, CA
Tokyo, Japan

Heat Mirror 88/Clear

Freer Gallery
Architect: Cole & Denny, Inc.

Washington, DC

Heat Mirror 44/Clear (Frit)

Joslyn Art Museum
Architect: Norman Foster & Partners

Omaha, NE
London, England, UK

Heat Mirror 66/Clear+

Knoxville Museum of Art
Architect: Unknown

Knoxville, TN

HM 66/Pattern Glass

Minnesota History Center
Architect: Hammel Green & Abrahamson, Inc.

St. Paul, MN
Minneapolis, MN

Heat Mirror 66/Clear

Oglethorpe University, Lowry Hall Skylight
Architect: Cherry Roberts & Assoc.

Atlanta, GA
Norcross, GA

Heat Mirror 44/Clear

Salvador Dali Museum
Architect: Unknown

Spain

XIR Architectural Sea Foam Clear

OFFICE BUILDINGS:

Auraria Replacement Facility Architect: Hoover Berg Desmond	Denver, CO Denver, CO	Heat Mirror 55/Gray; 66, 77/Clear
B. C. Cellular Architect: Unknown	Burnaby, BC, Canada	Heat Mirror 66/Blue
Edifice Professional Architect: Unknown	Montreal, QUE, Canada	Heat Mirror 55/SC Bronze
I.B.M. Office Building Architect: C.R.S.S.	Austin, TX Houston, TX	Heat Mirror 44/Gray
Immeubles Polaris Ltee. Architect: Ibsen Nelsen & Assoc.	Montreal QUE Canada Vashon, Ireland	Heat Mirror 55/Gray
Center for the Arts, Yerba Buena Center Architect: Fumihiko Maki Architect	San Francisco, CA Tokyo, Japan	Heat Mirror 88/Clear
Kuala Lumpur Stock Exchange Architect: Unknown	Kuala Lumpur, Malaysia	Cal Series Mojave Bronze
Lawrence National Laboratory Architect: ED2, Int.	Livermore, CA San Francisco, CA	Heat Mirrors 55, 33/Green
Liberty Hall Corporate Center Architect: Wallace Roberts & Todd	Union Township, NJ Philadelphia, PA	Heat Mirrors 55, 44/Clear
Linden Building Architect: Croxton Collaborative Architects	Wilmington, DE New York, NY	Heat Mirrors 77, 66/Gray; 77/Clear
Nat. Wildlife Federation Building Architect: Keyes Condon & Florance	Washington, DC Washington, DC	Heat Mirror 88/Gray
Nerco Mineral Office Building Architect: Northwest Design Group	Fairbanks, AK Seattle, WA	Heat Mirror 88/Bronze
N.R.D.C. Headquarters Architect: Croxton Collaborative Architects	New York, NY New York, NY	Heat Mirrors 77, 66, 55/Clear
One & Two Newport Architect: Roderick Parr & Assoc.	Bellevue, WA Bellevue, WA	Heat Mirror 88/Blue
Tour Balexert Architect: Favre & Guth	Geneva, Switzerland Geneva, Switzerland	Heat Mirror 77/Clear

RECREATION FACILITIES:

Florida Aquarium Architect: H.O.K.	Tampa, FL Tampa, FL	XIR Architectural Sea Foam Clear
Hyatt Regency Health Club Architect: Graham Gund Assoc.	Cambridge, MA Cambridge, MA	Heat Mirror 77/Clear
McDonald's Playlands Architect: Various	Various U.S.	Heat Mirror TC88, 77, SC75/Clear

Montgomery Co. Regional Swim Center

Architect: Sasaki Assoc

Rockville, MD

Heat Mirror 66/Clear

National Tennis Centre

Architect: Peddle Thorp & Walker

Melbourne, Australia
Sydney, Australia

XIR Architectural Sea Foam Clear?

Westminster Recreation Center

Architect: Barker Rinker Seacat & Partners

Westminster, CO

Heat Mirrors 77/Clear; 55/Gray

RESTAURANTS:**Hardee's Restaurants**

Architect: Hardee's Food Systems, Inc.

Various U.S.
Cambridge, MA

Heat Mirror 66/Bronze

Luby's Cafeterias

Architect: Luby's Corporate

Southern U.S.

Heat Mirrors 77/Clear; 66, 44/Gray

McDonald's

Architect: Various

Various U.S.

Heat Mirror TC88, 77, SC75/Clear

Wendy's

Architect: Various

Various U.S.

Heat Mirrors 66/Clear; 55/Bronze

SCHOOLS:**A. B. Anderson Hall, U. of MN**

Architect: Helstrom Architects, Inc.

Duluth, MN
Duluth, MN

Heat Mirror 77/Clear

Anderson Elementary School

Architect: Unknown

Redding, CA

Heat Mirror 55/Clear

Annenberg School of Communication

Architect: M.G.A. Partners

Philadelphia, PA

Heat Mirror 77/Green

Breakthrough Youth Campus

Architect: Freeman Chan

Hong Kong
Hong Kong

XIR Architectural Moss Green

Bus. Adm. Bldg., Kennesaw College

Architect: Lord Aeck & Sargent

Marietta, GA

Heat Mirror 66/Clear

College of Architecture, U. of NE

Architect: Unknown

Lincoln, NE

Heat Mirror 55/Clear & Bronze

A. B. Anderson Hall, U. of MN

Architect: Helstrom Architects, Inc.

Duluth, MN
Duluth, MN

Heat Mirror 77/Clear

Anderson Elementary School

Architect: Unknown

Redding, CA

Heat Mirror 55/Clear

Annenberg School of Communication

Architect: M.G.A. Partners

Philadelphia, PA
Philadelphia, PA

Heat Mirror 77/Green

Breakthrough Youth Campus

Architect: Freeman Chan

Hong Kong
Hong Kong

XIR Architectural Moss Green

Bus. Adm. Bldg., Kennesaw College

Architect: Lord Aeck & Sargent

Marietta, GA
Atlanta, GA

Heat Mirror 66/Clear

College of Architecture, U. of NE Architect: Unknown	Lincoln, NE	Heat Mirror 55/Clear & Bronze
College 9 Academic, UC Santa Cruz Architect: Esherick Homesy Dodge & Davis	Santa Cruz, CA San Francisco, CA	Heat Mirror 77/Clear
Collis Hall, Dartmouth College Architect: Facilities, Dartmouth College	Hanover, NH Hanover, NH	Heat Mirror 88/Clear
East Canton High School Architect: Unknown	E. Canton, OH	Heat Mirror 77/Clear
Economics Building, Stanford U. Architect: Anshen & Allen Architects	Stanford, CA San Francisco, CA	Heat Mirror 77/Green
Foard Elementary School Architect: W. C. Johnston & Assoc.	Katona, NC High Point, NC	Heat Mirror 66/Clear
Fort Wainwright Elementary School Architect: Unknown	Fairbanks, AK	Heat Mirror 88/Clear
Fremont Ross High School Architect: Unknown	Fremont, OH	Heat Mirror 77/Clear
Garfield School Architect: Mount Vernon Group	Revere, MA Winchester, MA	Heat Mirrors 77, 66/Clear; 77, 66/Gray
Gonzaga U. Engineering Building Architect: Adkison Leigh Sims Cuppage	Spokane, WA Spokane, WA	Heat Mirror 55, 88/Clear
Harvard Medical School Skylight Architect: Davis Brody & Assoc.	Cambridge, MA Cambridge, MA	Heat Mirror 77/Clear
Jacksonville High School Architect: W. C. Johnston & Assoc.	Jacksonville, NC High Point, NC	Heat Mirror 66/Gray
Kankakee Schools - 3 Architect: Unknown	Kankakee, IL	Heat Mirror 88/Clear
Kettle Falls High School Architect: Northwest Architectural	Kettle Falls, WA Spokane, WA	Heat Mirror 88/Clear & Bronze
Malloy College Architect: Beatty Bede & Harvey	Rockville Center, NY New York, NY	Heat Mirrors 66/Clear & Bronze
Matherly Hall, U. of FL Architect: Skinner & Assoc.	Gainesville, FL Gainesville, FL	Heat Mirror 66/Clear
McIntosh & Nurland Halls Architect: Wellenstein Architects, Inc.	Fairbanks, AK Anchorage, AK	Heat Mirror 88/Clear
Memorial Union, UC Davis Architect: SMWM	Davis, CA San Francisco, CA	Heat Mirror 77/Clear
Michigan State Engineering Building Architect: Albert Kahn Assoc.	E. Lansing, MI High Point, NC	Heat Mirror 66/Clear
Minnesota History Center Architect: Hammel Green & Abrahamson, Inc.	St. Paul, MN Minneapolis, MN	Heat Mirror 66/Clear

North Pole High School Architect: Design Alaska, Inc.	North Pole, AK	Heat Mirror 55/Clear
Oak Creek Elementary Architect: BOORA Architects	Lake Oswego, OR Portland, OR	Heat Mirror 88/Clear
Open Learning Institute Architect: Percy Thomas & Partners	Hong Kong Hong Kong	XIR Architectural Sierra Green
Pavillon Notre Dame Architect: Denis Berthiaume Architects	St. Therese, QUE, Canada QUE, Canada	Heat Mirror 66/Clear
Principia School, 5 Bldgs. Architect: Principia School	Elsah, IL Elsah, IL	Heat Mirror 66/Clear
Roosevelt Junior High School Architect: Jeffrey Stubbs Architect	Zanesville, OH	Heat Mirror 88/Clear
Sinsheimer Science Building, UC Santa Cruz Architect: Ed2, Int.	Santa Cruz, CA San Francisco, CA	Heat Mirror 66/Green
Spokane Community College Architect: Unknown	Spokane, WA Cambridge, MA	Heat Mirror 66/Clear
Student Union, Washington State U. Architect: Washington State U.	Pullman, WA Pullman, WA	Heat Mirror 88/Bronze
Swanton High School Architect: Swanton School District	Swanton, OH	Heat Mirror 88/Clear
Troutman Elementary Architect: W. C. Johnston & Assoc.	Troutman, NC Highpoint, NC	Heat Mirror 66/Clear
UC Santa Cruz Student Center Architect: Fernau & Hartman	Santa Cruz, CA Berkeley, CA	Heat Mirror 66/Clear
Washington Elementary Architect: Baker Vilar Architects	Berkeley, CA Berkeley, CA	Heat Mirror 66, 88/Clear
SHOPPING CENTERS & MALLS:		
Bay Fair Mall Architect: Westfield, Inc.	San Leandro, CA W. Los Angeles, CA	Heat Mirror 55/Gray
Megastore Architect: Patrick Genhard Architect	Andorra, Spain Spain	XIR Architectural Sea Foam Clear
North Town Mall Renovation & Addn. Architect: Unknown	Spokane, WA	Heat Mirror 55/Clear
Oltorff Market Architect: Unknown	Austin, TX	Heat Mirror 77/Clear
South Coast Plaza Architect: Unknown	Costa Mesa, CA	Heat Mirrors 55, 44/Clear
SALMYA Shopping Complex Architect: SSH Salen Al-Marsouk/Sabel Abi Hane	Kuwait City, Kuwait	Heat Mirror HPR 18/Pink Rosa

Tala Center

Architect: A; Kazeerah

Kuwait City, Kuwait
Unknown

High Mirror HPR 38/Green

Westside Pavillion

Architect: Jerde Partnership, Inc.

West Los Angeles, CA

Heat Mirror 55/Gray

THEATERS:**Cineplex Odeon Theater**

Architect: John K. Perttula, AIA

Universal City, CA
Long Beach, CA

Heat Mirror 77/Gray

Harbin Entertainment Palace

Architect: Harbin City Government

Harbin, P.R.C.
Peoples Rep. of China

Heat Mirror HPR 28/Clear

TRANSPORTATION:**KCRC Kowloon Station**

Architect: Foster Asia

Hong Kong, P.R.C.
Hong Kong, P.R.C.

XIR Architectural Sierra Green

VISITORS' CENTERS:**Coldwater Johnson Visitors' Center**

Architect: Spencer Assoc.

Mt. St. Helens, WA
Palo Alto, CA

Heat Mirror 66, 44/Azurlite; 66/Clear

Hoover Dam Visitors' Center

Architect: Spencer Assoc.

Las Vegas, NV
Palo Alto, CA

Heat Mirror 77/Pink Rosa

Mt. Rushmore Concessions Bldg.

Architect: Anderson Mason Dale

Keystone, SD
Denver, CO

Heat Mirror 77/Clear

Spotsylvania Co. Visitors' Center

Architect: Spotsylvania Co.

Spotsylvania, VA
Peoples Rep. of China

Heat Mirror 44/Gray

U.S. Naval Academy Visitors' Center

Architect: Cochran Stephenson & Donkervoet

Annapolis, MD
Baltimore, MD

Heat Mirror 66/Clear

Visitors' Center Addition

Architect: Derthick Henley Wilkerson

Chicamauga, GA
Chattanooga, TN

Heat Mirrors 77, 66, 44/Gray

Visitors' Center, Cascades National Park

Architect: Unknown

Winthrop, WA
Baltimore, MD

Heat Mirrors 88, 55/Clear

Visitors' Center, Red Butte Canyon Arboretum, U. of Utah

Architect: Brixen & Christopher Architects

Salt Lake City, UT
Salt Lake City, UT

Heat Mirror 77/Clear

Case Studies