

TIPS FOR INSULATING YOUR HOME AGAINST AIRCRAFT NOISE



Provided by
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INTRODUCTION

The Purpose of This Guide

This guide has been developed in response to numerous requests from homeowners asking for information about methods the Metropolitan Airports Commission (MAC) has successfully implemented to reduce interior noise levels in homes. This guide is intended as a means to share information with homeowners about sound transmission and explains the elements of the MAC's Residential Sound Mitigation Program within the federally recognized 65 DNL contour area. *It is not intended for use as a "how to" manual.*

Who May Find This Guide Useful

- Homeowners/Homebuyers
- Builders
- Cities
- Realtors

Disclaimers

- This pamphlet is intended to be used as an informational guide. It is not intended for use as a "How To" manual.
- Insulating a home for noise reduction tends to tighten a home. Homeowners should have their homes tested for indoor air quality before and after home modifications.
- Homeowners should consult with professional contractors for their home's individual needs (HVAC, windows and doors, etc.).
- The Metropolitan Airports Commission claims no responsibility for decisions homeowners make based on the information contained in this pamphlet.
- The Metropolitan Airports Commission takes no responsibility for decisions homeowners' may make based on any of the recommended reading and/or reference materials contained in this pamphlet.
- Any modifications completed by homeowners are the sole responsibility of the homeowner.

NOISE CONTROL BASICS

How Outside Noise Gets Inside a Home

Sound travels from the exterior to the interior of a home in two ways: through solid structural elements and through the air.

Although sound energy in the form of vibrations can be deflected by solid structural elements (walls) of a home, some of those vibrations can make it through the walls and into a home.

Openings in a home, such as space around windows and doors, mail slots and vents, allow air to travel directly from the exterior to the interior of a home.

Wherever air can infiltrate a home, so also can sound.

Noise Level Reduction

A home's Noise Level Reduction (NLR) is the number of decibels a home attenuates from its exterior to interior when all openings (windows and doors) are closed.

Homes constructed in cold climates like Minnesota typically provide a NLR of between 27 and 30 decibels without the additional measures to insulate against outside noise. (eg. A single aircraft overflight that produces 75 decibels of sound on the ground would be reduced to 45 decibels inside a home if the home attenuates 30 decibels.)

Reducing Sound Transmission Into a Home

Some primary approaches for reducing sound transmission into a home are:

1. Elimination of openings.
2. Using higher rated Sound Transmission Class (STC) windows and doors.
3. Adding mass to walls or ceilings.
4. Adding absorptive materials between the studs or joists in a wall.

The STC rating is a measure of a material's ability to insulate against sound; the higher the STC rating, the better insulating properties it will have. ***The MAC's sound insulation program uses a standard of 40 STC.***

Windows generally allow more noise inside a home than do walls. Because of this, the more space windows take up on a wall the more the overall noise protection decreases. Using acoustical windows typically does more to improve the sound insulation performance than any other design modification.

THE MAC'S PROGRAM

The MAC's Residential Sound Mitigation Program within the federally recognized 65 DNL noise contour was very successful in reducing interior noise levels for homes within the most noise-impacted areas. According to homeowner surveys, the program has increased homeowners' enjoyment of their homes by making it easier to watch TV, talk on the phone and to sleep at night.

Below are the methods typically used to reduce transmission of exterior noise into a home, all of which the MAC program has employed to one degree or another:

- Reconditioning or replacement of prime windows/doors
- Installing acoustical storm windows/doors
- Addition of wall and attic insulation
- Baffling of roof and attic vents
- Installing central air conditioning (if not existing)
- Ventilation modifications (when necessary for health and safety reasons)

Windows and Doors

A home's interior noise level can be reduced through differing degrees of treatment. For instance, some homes may only need their windows or doors *reconditioned*, while others may need all new windows or a combination of the two.

To ensure the tightness necessary to achieve an STC 40 rating, homeowners may be able to recondition their home's existing prime windows or doors by:

- Re-glazing panes that are loose
- Replacing cracked panes
- Installing weather stripping (to both windows and doors)
- Adding insulation to weight cavities
- Installing vinyl jamb liners
- Trimming sides of existing sashes to fit with new jamb liners

In more severe cases, complete replacement of window sashes or the entire window or door may be necessary.

MAC's research showed that adding an operable acoustic storm window to a tight-fitting prime window results in a Sound Transmission Class (STC) of 40. (A typical window with storm can provide an STC rating between 27 and 30.)

New acoustic products are superior, but are also more expensive. Acoustical storm windows and doors are significantly different from regular storms. They may have

thicker glass and a higher grade of aluminum, which act to prevent sound from entering a home, and are also very effective at reducing air infiltration. (These products are not available through the standard building supply stores.) When acoustical storm windows and doors are installed, two inches of dead air space is created between the prime window or door and the storm. This dead air space acts to prevent noise from entering a home.

Casement windows alone do not provide a high STC rating and acoustical storm windows cannot be installed outside the crank-out windows. Some options for casement windows include:

- Replace windows with custom, acoustically rated casement windows with extra thick glass
- Replace with a new slider or double hung window with an acoustical storm.
- Add an interior glazing panel to the existing casement window at the screen location (not recommended for bedroom windows for safety and code reasons)

Insulate Sidewalls

- Sidewall cavities should be insulated to capacity. (This does not apply to homes with brick, stucco or stone exterior siding.)
- Insulate attic areas to capacity, or up to 14 inches, whichever is applicable.
- Consult a home insulation contractor.

Baffle Roof Vents

Baffle roof vents in attic spaces to minimize noise transmission while still allowing airflow. A baffle can be as simple as installing insulation board under the roof vent, while leaving both ends open to allow the vent to operate normally.

- Vent Baffling
 - Attic vent baffling
 - Roof vent baffling
 - Chimney treatment (if required)
 - Mail slot sealing
- Sealing Attic Bypasses (This is more a treatment to improve indoor air quality and to keep the warm, moist air from migrating to the attic spaces, helping to reduce ice dams during the winter.)

Install Central Air Conditioning

Installing central air conditioning or another type of cooling system allows people inside the home to be comfortable during the warmer months without the need to open windows and doors for a breeze.

Through-the-wall air conditioning units are not recommended, as they allow air, and thus noise, to infiltrate the home.

The method and cost of adding central air conditioning depends on a home's heating system. It is relatively easy, in most cases, to add a central air conditioning system to homes with a forced air heating system. It becomes more difficult and costly with hydronic (boiler heat) or gravity (large "octopus" furnace) systems.

Consult a certified HVAC contractor for the best solution for your home.

A Word About House "Tightness" and Maintaining Proper Ventilation

Acoustic modifications tend to make houses "tighter." For health and safety purposes, the following is suggested:

- Have your indoor air quality tested by a qualified professional.
- Have your home's furnace/boiler, water heater, and other gas combustion appliances checked by a professional.
- Correct any problems with venting or carbon monoxide production.
- Ensure adequate fresh airflow through the house by installing a quiet, low volume exhaust fan or a balanced ventilation system if necessary.
- Have your home checked for tightness after acoustical retrofits are completed.

TIPS ON CHOOSING CONSULTANTS AND CONTRACTORS

Prior to signing a contract with a contractor, know in advance what treatments or improvements you are planning to have completed.

- Invite multiple contractors to visit the home and provide cost estimates on an identical scope of work.
- Determine whether the contractor has experience with acoustic products or installation of acoustically rated storm windows or doors.
- Determine whether any of the work will be sub-contracted. If so, investigate the subcontractor(s) to the same degree as the primary contractor.
- Ensure the contractor is licensed, bonded and insured. Verify that their license is current.
- Ask for references.
- Contact the Better Business Bureau to find out if the contractor has any outstanding, un-resolved complaints.


ADDITIONAL RESOURCES

Wyle Laboratories


 Web Site - www.wyleacoustics.com

 **“New Construction Acoustical Design Guide”**

Federal Aviation Administration

 **“FAA Guidelines for the Sound Insulation of Residences Exposed to Aircraft Noise”** prepared by Wyle Labs, October 1992 (can be found on www.wyleacoustics.com web site)

United States Environmental Protection Agency

 **“A Do-It-Yourself Guide to Energy Star Home Sealing: Sealing Air Leaks and Adding Attic Insulation”** Office of Air and Radiation (6202J) EPA 430-F-04-024, November 2004.

 Web site: www.energystar.gov

 Phone: **1-888-782-7937**

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Appendix A

Products Installed by the Metropolitan Airports Commission Residential Sound Mitigation Program

Products Installed by the Metropolitan Airports Commission Residential Sound Mitigation Program

STORM PRODUCT MANUFACTURERS' CONTACT INFORMATION

A. Harvey Windows 43 Emerson Rd. (800) 225-6183,
Waltham, MA 02154-4689 Ext. 7718

B. Hess Manufacturing P.O. Box 127 (800) 541-6666
Quincy, PA 17247

C. Mon-Ray, Inc. 801 Boone Ave. N. (763) 546-8625
Golden Valley, MN 55427

D. Republic Windows and Doors, Inc. 930 West Evergreen Ave., (800) 248-1775,
Chicago, IL 60622 Ext. 8302

E. Sound Control Systems (SCS) 2333 Eastbrook Drive (952) 940-0197,
Brookings, SD 57006 (800)-238-9681, Ext. 6831. Appendix B

MANUFACTURERS AND PRODUCTS

GLASS UNIT MASONRY

A. Glass Block

1. Fidenza Vetraria Spa.
2. Innovative Building Products, Inc.
3. Pittsburgh Corning Corporation.
4. Saint-Gobain.
5. Weck, Glashaus Division.
6. Westerwald A.G.

BUILDING INSULATION

A. Vapor Retarders:

1. Reinforced Polyethylene:
 - a. DURA-SKRIM 6WW; Raven Industries, Inc.
 - b. Griffolyn T-65; Reef Industries, Inc., Griffolyn Div.
2. Fire-Retardant, Reinforced Polyethylene:
 - a. DURA-SKRIM 2FR; Raven Industries, Inc.
 - b. Griffolyn T-55 FR; Reef Industries, Inc., Griffolyn Div.
3. Foil Polyester Film:
 - a. Alumiseal Zero Perm; Alumiseal Corporation.
 - b. Air Infiltration Barriers:
4. Tyvek HomeWrap (spunbonded polyethylene).
5. Amoco Amowrap (woven polypropylene).
6. Schuller Performance Seal HouseWrap (spunbonded polyethylene).
7. Rufco-Wrap (laminated polyethylene).

SEALANTS

A. Single component Nonsag Polyurethane Sealant:

1. Approved sealants:
 - a. Chem-Caulk 900, Bostik.
 - b. Vulkem 116, Mameco.
 - c. 77-A, Manus Bond.
 - d. Sikaflex, Dika Corp.
 - e. NP1, Sonolastic.
 - f. Dymonic, Tremco.
 - g. Flexiprene 1000, Polymeric Systems, Inc.

B. Single component non-sag siliconized acrylic:

1. Approved sealants:
 - a. Alex Plus, DAP.
 - b. Glidden Paint Co.
 - c. 67-A, Manus Bond.
 - d. Sololax, Sonneborn Building Products Division, ChemRex, Inc.
 - e. Tremco, Tremflex 834.

C. Mildew-Resistant Silicone Sealant:

1. Approved sealants:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. Sanitary 1700; GE Silicones.
 - c. NuFlex 302; NUCO Industries, Inc.
 - d. 898 Silicone Sanitary Sealant; Pecora Corporation.
 - e. PSI-601; Polymeric Systems, Inc.
 - f. Omniplus, Sonneborn Building Products Division, ChemRex, Inc.
 - g. Tremsil 600 White; Tremco.

STEEL DOORS

A. The following steel door manufactures have been approved by MAC. Only products supplied by them shall be bid.

1. Castlegate "Steel" Series.
2. Castlegate "Premium Grade Wood Edge" Series, Insulated Steel Door by Premdor Entry Systems (Lites, if provided, shall have wood frames).
3. CelcoPro.
4. Peachtree, Inc. "Avanti" Series. At fire rated doors – Firenze Series.
5. Stanley "Sta-Tru" Series Entry Door System.
6. Stanley "Weather-Wise" Entry Door Slab (prefinished Steel) Prehung with wood frame.
7. Taylor "Uni-Door" standard and fire rated doors.
8. Therma-Tru "Premium Steel."
9. "WeatherSeal" by J.B. O'Meara Company, standard and fire rated doors.

B. The following Steel Terrace models have been approved (see the Project Manager's designations PR-P3 and PR-P4):

1. Peachtree "Pradio" Patio Doors.
2. Stanley "PS" Series Patio Doors.
3. Taylor Patio Doors.

4. Therma-Tru “Premium Steel” Patio Doors.

WOOD DOORS AND FRAMES

A. The following manufactures, subject to compliance with this Specification and Sound Insulation requirements, are approved:

1. Wood Solid Core Doors:
 - a) Doorcraft Doors.
 - b) Eggers Industries.
 - c) Graham Manufacturing.
 - d) Mohawk Doors.
 - e) Lynden Flush Door.
 - f) Illinois Flush Door.
 - g) Young Door Company.
2. Wood Panel Doors:
 - a) Buffelen Doors.
 - b) Morgan Doors.
 - c) Nicolai Doors.
 - d) Simpson Doors.
3. Wood Swinging Patio Doors (Designation PR-E12, PR-13, PR-E14, PR-C5):
 - a) Buffelen “Thermal” B-5001; B-5510; B-5515.
 - b) Marvin “Wood Inswing French Door.”
 - c) Morgan “Marquis” Exterior French Doors.
 - d) Morgan “Marquis” Exterior Swing Set Patio Doors.
 - e) Nicolai “Marquis” Insulated Exterior French Doors “E6000” Series.
 - f) Park-Vue Swinging Patio Doors.
 - g) Simpson “Mastermark” Exterior French Doors.
4. Wood Sliding Patio Doors (Designation PR-E11):
 - a) Marvin “Wood Safe-T Plus” Patio Door.
 - b) Marvin “ Wood Trimline” Patio Door.
 - c) Park-Vue Patio Door.
5. Stave Appearance Doors:
 - a) Pinecrest.

B. Approved Manufacturers of Acoustical Storm Panels for prime door applications.

1. New acoustical storm panel (D6), 1/4" laminated class: Mon-Ray 603-DP and Sound Control Systems (SCS) S703-D.

Note: The above products may be used with thicker glass than specified, at the manufacturer’s discretion. All glazing mounted on doors shall meet the Uniform Building Code requirements for safety glass and be clearly labeled.

FIBERGLASS DOORS

A. The following prime door manufacturers, subject to compliance with this Specification and Sound Insulation requirements, are approved:

1. Castlegate “Harmony.”
2. Peachtree “Newport.”
3. Peachtree “Newport Vintage.”
4. Stanley “Prodigy” Entrance Door.

5. Therma-Tru “Fiber Classic” Embossed Series.

B. The following terrace door manufacturers (Designated PR-P3 and PR-P4), subject to compliance with this Specification and Sound Insulation requirements, are approved:

1. Stanley “Prodigy: Patio Door System.
2. Therma-Tru “Fiber Classic” Patio Door System.

SLIDING GLASS STORM DOORS

Door # Mon-Ray, Inc. Sound Control Systems (SCS)

Colors White, Tan, Brown White, Tan, Brown

ST-S1 805-PSD with 1/8" tempered glass SCS Series 300 w/ 3/16" tempered glass

Note: The above products may be used with thicker glass than specified, at the manufacturer’s discretion. All glazing in sliding glass storm doors shall meet the Uniform Building Code requirements for safety glass and be clearly labeled.

STORM DOORS

Door Code	Mon-Ray, Inc.	Sound Control Systems (SCS)	Hess Manufacturing
Colors	White, Tan, Brown, Green	White, Tan, Brown, Green	White, Brown, Green
ST-F1	802-L with 3/16" glass	SCS 720-04 with 3/16" glass --	
ST-F2	803-S with 1/8" glass	SCS 730-04 with 3/16" glass	FL with 1/8" glass
ST-F2G	803-SG with 1/8" glass --		FL-G with 1/8" glass
ST-F3	803-H with 1/8" glass	SCS 730-37 with 3/16" glass	WT with 1/8" glass
ST-F3G	803-HG with 1/8" glass	SCS 730-41 with 3/16" glass	WT-G with 1/8" glass
ST-F4	803-P with 1/8" glass	SCS 730-36 with 3/16" glass	CLA with 1/8" glass
ST-F4G	803-PG with 1/8" glass	SCS 730-42 with 3/16" glass	CLA-G with 1/8" glass
ST-F5	803-X with 1/8" glass	SCS 730-35 with 3/16" glass	CB with 1/8" glass
ST-F5G	803-XG with 1/8" glass	SCS 730-43 with 3/16" glass	CB-G with 1/8" glass
ST-F6	803-M with 1/8" glass	SCS 730-36 NP with 3/16" glass	HL with 1/8" glass
ST-F6G	803-MG with 1/8" glass	SCS 730-42 NP with 3/16" glass	HL-G with 1/8" glass
ST-F7	803-T with 1/8" glass	SCS 730-35 SPL with 3/16" glass	JT with 1/8" glass
ST-F7G	803-TG with 1/8" glass	SCS 730-43 SPL with 3/16" glass	JT-G with 1/8" glass
ST-C1	804-S with 1/8" glass	SCS 720-33 with 3/16" glass --	
ST-C2	804-L with 1/8" glass at inserts and 1/4" laminated glass at kickpanel.	inserts and 1/4" laminated glass at kickpanel	
ST-C3	804-H with 1/8" glass	SCS 720-34 with 3/16" glass at	--
ST-C3G	804-HG with 1/8" glass	SCS 730-07 with 3/16" glass	--
ST-C4	804-P with 1/8" glass	SCS 730-41 with 3/16" glass	--
ST-C4G	804-PG with 1/8" glass	SCS 730-03 with 3/16" glass	--
ST-C5	804-X with 1/8" glass	SCS 730-42 with 3/16" glass	--
ST-C5G	804-XG with 1/8" glass	SCS 730-06 with 3/16" glass	--
ST-C6	804-M with 1/8" glass	SCS 730-06 with 3/16" glass	--
ST-C6G	804-MG with 1/8" glass	SCS 730-03 NP with 3/16" glass	--
ST-C7	804-T with 1/8" glass	SCS 730-42 NP with 3/16" glass	--
ST-C7G	804-TG with 1/8" glass	SCS 730-03 SPL with 3/16" glass	--
Acoustical panel at security door		SCS 730-42 SPL with 3/16" glass	--

P-150 with 1/4" laminated
glass
SCS S744-D with 1/4" laminated
glass
--

Note: The above products may be used with thicker glass than specified, at the manufacturer's discretion. All glazing in storm doors shall meet the Uniform Building Code requirements for safety glass and be clearly labeled.

VINYL WINDOWS AND PATIO DOORS

A. Vinyl Windows. Only the following non-acoustically rated vinyl window models from respective manufacturers shall be used:

1. Thermal Line Windows, in conjunction with acoustically rated storm windows as indicated on window schedule:
 - a. Model 620, Sideload Double Hung (without vinyl storm).
 - b. Model 635 and 655, Slider (without vinyl storm).
2. Tru-View by Lindsay Sash, Inc.:
 - a. Model 710 Double Hung.
 - b. Model 730 Slider.
 - c. Model 840 Casement, Fixed.
3. Heartland:
 - a. Model 600 Double Hung.
 - b. Model 610 Slider.
 - c. Model 620 Fixed.

B. Vinyl Sliding Patio Doors. Only the following non-acoustically rated vinyl, sliding patio doors shall be used:

1. Heartland patio doors, for use with existing or new wood blindstops and brickmolds.

VINYL WINDOWS WITH INTEGRAL STORM WINDOWS

A. Approved Manufacturers:

1. Republic Windows and Doors, Inc.
404300 Series
VC-2 DH 1/8" DS glass, 1/2" air, 1/4" glass min. 1/8" DS glass
VC-2 Slider 1/8" DS glass, 1/2" air, 1/4" glass min. 1/8" DS glass
2. Harvey Windows
VC-2 DH 1/8" glass, 5/8" air, 3/32" glass min. 1/8" glass
VC-2 Slider 1/8" glass, 5/8" air, 3/32" glass min. 1/8" glass
3. Mon-Ray Inc.
VC-1 DH (8400) 1/8" glass, 9/16" air, 1/8" glass min. 1/8" glass
VC-1 Slider (8500) 1/8" glass, 1/2" air, 1/8" glass min. 1/8" glass
VC-2 DH (7400) 1/8" glass, 9/16" air, 1/8" glass min. 1/8" glass
VC-2 Slider (7500) 1/8" glass, 7/16" air, 3/16" glass min. 1/8" glass

B. The above products may be used with thicker glass than specified, at the manufacturer's discretion. All glazing in storm windows shall meet the Uniform Building Code requirements for safety glass and be clearly labeled. Refer to Section 01410 – Acoustical Testing for fixed window situations in connection with operable units.

STORM WINDOWS

<u>Wdw Style</u>	<u>Window type</u>	<u>Mon-Ray, Inc.</u>	<u>Sound Control Systems (SCS)</u>
ST-1	DH Recessed	604 w/ min. 3/16" glass and 1/8" spacer at single glazed PR-1, or w/ min. 1/8" glass and 1/8" spacer at thermal glazed PR-1, or w/ min. 1/8" glass at PR-2	S203 w/ min. 3/16" glass at PR-1 or PR-2
ST-2	DH Flush	504 w/ min. 3/16" glass at single glazed PR-1, or w/ min. 1/8" glass at thermal glazed PR-1, or w/ min. 1/8" glass at PR-2	S204 w/ min. 3/16" glass at PR-1 or PR-2
ST-3	DH Overlap	404 w/ min. 3/16" glass at single glazed PR-1, or w/ min. 1/8" glass at thermal glazed PR-1, or w/ min. 1/8" glass at PR-2	--
ST-4	DH Overlap	604 w/ min. 1/8" glass at PR-1 or PR-2	S203 OL w/ min. 3/16" glass at PR-1 or PR-2
ST-1	Slider Recessed	605 w/ min. 1/4" glass	S603 w/ min. 1/4" laminated glass
ST-2	Slider Flush	505 w/ min. 3/16" glass	S604 w/ min. 3/16" glass
ST-3	Slider Overlap	405 w/ min. 1/4" glass	--
ST-4	Slider Overlap	605 w/ min. 1/4" glass	S603 OL w/ min. 1/4" lam. glass
ST-1	Fixed Recessed	603 w/ min. 3/16" glass	S503 w/ min. 3/16" glass
ST-2	Fixed Flush	503 w/ min. 3/16" glass	S504 w/ min. 3/16" glass
ST-3	Fixed Overlap	402 or 403 w/ min. 3/16" glass	--
ST-4	Fixed Overlap	603 w/ min. 3/16" glass	S503 OL w/ min. 3/16" glass
ST-5	Fixed Min. Frame P-170	w/ min. 3/16" glass	--
ST-6	Fixed Min. Frame P-170-PL	w/ min. 3/16" glass	S703 w/ min. 3/16" glass
ST-7	Exterior storm panel at inswing sash		S703 w/ min. 3/16" glass
IP-1	Interior Glazing Panel	P-150 w/ min. 3/16" tempered glass P-150 w/ V-seal, min. 1/4" lam. glass P-150 w/ adjustable stop, min. 3/16" tempered glass	--
IP-2	Interior Glazing Panel	503-PL w/ min. 3/16" tempered glass 603-PL w/ min. 3/16" tempered glass	--
IP-3	Interior Glazing Panel	P-130 w/ min. 3/16" tempered glass	S744 w/ min. 3/16" safety glass
SKO-1	Operable Skylight Glazing Panel	503-POS w/ 1/4" laminated glass	S734 O w/ min. 3/16" laminated glass
SKF-1	Fixed Skylight Glazing Panel	503-PFS w/ 1/4" laminated glass	S734 S w/ min. 3/16" laminated glass

Metal Prime Window Slider	1500 w/ 1/8" DSB glass	--
Metal Prime Window DH	1400 w/ 1/8" DSB glass	--

Note: The above products may be used with thicker glass than specified, at the manufacturer's discretion. All glazing in storm windows shall meet the Uniform Building Code requirements for safety glass and be clearly labeled.

WOOD WINDOWS

A. Fixed acoustical window units listed below may be of any sash construction type as long as the sash frame and glazing type match the unit that was tested and approved. Only the following wood window manufacturers and models shall be used:

1. Marvin Windows: Double hung, slider and fixed windows. Acoustical casement, acoustical awning and acoustical fixed windows.
2. Vetter Windows: Fixed windows.
3. Windsor Windows: Fixed windows.
4. A-Craft Windows: Double hung and fixed windows. Acoustical fixed window.
5. Loewen Windows: Acoustical casement, awning and fixed windows. Double hung and fixed windows.
6. H-Window Company: Acoustical pivot awning and fixed windows.
7. For Cottage/ Inswing windows:
 - a. Sashes: A & A Millwork, Marvin, A-Craft, Kampmann Sash & Door Inc.
 - b. Frames: A & A Millwork, Shaw Lumber, A-Craft, Kampmann Sash and Door Inc. and Lamperts.
8. Accessory for double hung sash removal: Jamb-Spreader by Window Tools, Inc.
9. Kolbe & Kolbe: Double hung and fixed windows. Only non-clad units are approved.
10. Semco Windows: Double hung and fixed windows.

B. The styles for the true divided lite option for prime windows shall be classified as follows:

1. TDL-1 Marvin Windows.
2. TDL-2 A-Craft Windows, Lindsay Windows, Semco Windows.

C. The styles for wood prime double hung, including fixed windows of double hung sash construction, shall be classified as follows:

1. PR-1 Wood finish jambs Marvin Windows, Loewen Windows
2. PR-2 Vinyl jamb liners A-Craft Windows, Kolbe & Kolbe, Lindsay Windows, Semco Windows.

PRIME WINDOW RECONDITIONING AND SASH REPLACEMENT

A. Only the following replacement wood sashes/ jamb liner kits from respective manufacturers shall be used: A-Craft Windows, Marvin Windows, Lindsay Windows Semco Windows, Loewen Windows or Kolbe & Kolbe.

B. Only the following jamb liner assemblies shall be used for reconditioning existing double hung wood sashes: A-Craft Windows, J.W. Window Components, Marvin Windows, or Lindsay Windows.

- C. The styles for the true divided light option for prime windows shall be classified as follows:
1. TDL-1 Marvin Windows.
 2. TDL-2 A-Craft Windows, Lindsay Window.

DOOR HARDWARE

- A. Products specified acceptable
- Butt Hinges Hager Stanley, Lawrence
 - Prime Door
 - Locks and Latches Schlage Sargent, Yale, Corbin, Russwin
 - Closers LCN Norton, Sargent
 - Wall Stops Ives Prior approved
 - Thresholds, Sweeps National Guard Prod. Pemko, Reese
 - Weatherstrips, Gaskets Q-Ion Pro-seal, Macklanburg, Duncal, Randall
 - Door Viewers Ives Prior approved equal
 - Dead Bolts Schlage Sargent, Yale, Corbin, Bigon

GLASS AND GLAZING

- A. Only glazing materials from the following manufacturers shall be used:
1. Glass Products:
 - a. Falconer Glass Industries.
 - b. Ford Glass Division.
 - c. Guardian Industries Corporation.
 - d. PPG Industries, Inc.
 - e. Viracon, Inc.

ACRYLIC GLAZING PANELS

- A. Only acrylic glazing panels from the following manufacturers shall be used:
1. Scratch-resistant Acrylic Glazing Products:
 - a. DuPont Lucite S.A.R.
 2. Acrylic Glazing Products:
 - a. Acrylite by Cyro Industries.
 - b. DuPont Lucite.
 - c. Plexiglass by Rohm-Haas.
 - d. KSH.

LATH AND PLASTER

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to:
1. Dale/Incor - Dale Industries.
 2. Fry Reglet Corporation.
 3. Georgia - Pacific Corporation.
 4. Keene Products.
 5. National Gypsum.
 6. Thoroseal Plaster Mix - Harris Specialty Chemicals, Inc.
 7. Uni-Mast Incorporation.
 8. US. Gypsum Company.
 9. Western Metal Lath Company.

GYPSUM DRYWALL

A. Approved manufacturers for gypsum board and related products:

1. Georgia-Pacific Corporation.
2. Gold Bond Building Products Division, National Gypsum Company.
3. United States Gypsum Company.

DOMESTIC WATER HEATER

A. Residential gas-fired water heaters: Subject to compliance with requirements, provide residential gas-fired water heaters of one of the following: A.O. Smith, Bradford White, Rheem, or State.

B. Residential electric -fired water heaters: Subject to compliance with requirements, provide residential electric water heaters of one of the following: A. O. Smith, Rheem/ Ruud, State and Bradford White.

AIR CONDITIONING AND FURNACE COMPONENTS

A. Gas-fired furnaces and sealed combustion gas-fired furnaces: Armstrong, Gibson, Nordyn, Trane, Lennox, Carrier, Bryant, Arcoaire, RUUD, Heil, Tempstar, Amana, Luxaire, Comfortmaker, Janitrol by Goodman Manufacturing, Evcon, York.

B. Residential air-cooled condensing units: Trane, Lennox, Carrier, Bryant, Arcoaire, RUUD, Heil, Tempstar, Luxaire, Comfortmaker, Janitrol by Goodman Manufacturing, Villager ACS Series, Evcon, York, Gibson, Nordyne, Philco.

C. Ductless air conditioning units: Sanyo, Mitsubishi, Bryant, Carrier, Goodman and Samsung.

D. Humidifiers: Emerson Moist Air 6000 (1400 sq. ft.), 7002 (1750 sq. ft.) or 1300W (3000 sq. ft.); Bemis Model 8268 (2000 sq. ft.) or 4968 (3000 sq. ft.), Holmes HM3650 (1700 sq. ft.), and Sears Kenmore.

COMBUSTION AIR/ VENTILATION SYSTEMS

A. Balanced Ventilation Systems. Only the following models from their respective manufacturers shall be used:

1. Ventmax air exchanger by Nutech Energy Systems.
2. Freshvent balanced ventilation system by Nutech Energy Systems.
3. Broan Buardian System II.
4. Van EE Econo Air Exchanger.

B. Heat Recovery Ventilators. Only the following models from their respective manufacturers shall be used:

1. Broan Guardian HRV 100H and HRV 200H.
2. Carrier Models VA3AAB015, VA3AAB020, VB5AAB015, VB5AAB020, VC5AAB015, VC5AAB020.
3. Honeywell Models HR150, HR200, HR205.
4. Lennox Models HRV-1015SDPRNC2, HRV1-200SDPRNC, HRV2-95SRP, HRV2-150SDP, HRV2-195DDP, HRV2-200SDP, HRV2-300DDP, HRV2-200SRPTOP.
5. Nutech Energy Systems Inc. (Lifebreath) Models 155MAX, 195 DCS, 200MAX, 300DCS, MAXTOP.
6. Venmar Ventilation, Inc. Models vanEE 10 Constructo, vanEE 20 Constructo, vanEE 1000

HE, vanEE 1000 Solo, vanEE 2000 HE, vanEE 2000 Solo.

7. Summeraire Models SHRV405D, SHRV125SD, SHRV185SD, SHRV240SD and SV35.

C. Ceiling Exhaust Fans. Only the following models from their respective manufacturers shall be used:

1. Panasonic model FV-05VQ.
2. Panasonic model FV-07VQ, or, if light is required, Panasonic FV-07VQL.
3. Panasonic model FV-08VQ or Broan model S80UE or, if light is required, Panasonic FV-08VQL, or Broan model S80LU.
4. Panasonic model FV-11VQ or Broan model S110UE or, if light is required, Broan model S110LUE or Panasonic FV-11VQL.

D. In-Line Remote Exhaust Fans. Only the following models from their respective manufacturers shall be used:

1. For kitchen applications: Fantech FX4, FX5, FX6, RE6 (roof mount); or Continental AXC 100A, or AXC-125A.
2. For non-kitchen applications: Fantech FR 100, FR 150, or FR225; Kanalflakt K4, K5, K6, K8, or K10.

E. Exterior Mount Through-Wall Exhaust Fans. Only the following models from their respective manufacturers shall be used:

1. Fantech RVF-4, RVF6.
2. Preventilator-5 (75cfm @ .1 wg); Preventilator-D (75 cfm @ .25 wg).
3. Panasonic FV-08WQ1.

F. Electronic Control Devices. Only the following models from their respective manufacturers shall be used:

1. Fan Speed Controller allowing continuous low speed operation and continuous high speed manual override.
 - a. Tamarack Airetrak and Tamarack Airetrak CD.
2. Duty Cyclor for Furnace.
 - a. Grasslin mil 72A and mil 72E.
 - b. Lipedex Air Cyclor model FR.
3. Timer.
 - a. Intermatic Inc. E1020.
 - b. Aube T1033.

G. Roof Vents with Operable Louvers for Use with Exhaust Fans. Only the following models from their respective manufacturers shall be used:

1. Broan 634; 636.
2. Vent-air RCV6.
3. Aldes: 22 043 (4"), 22 044 (5"), and 22 046 (6").

H. Exterior Wall Exhaust Hoods with Dampers. Only the following models from their respective manufacturers shall be used:

1. Famco 783; 831.
2. Broan 642 (4"); (6").
3. Van EE vent hood kit.
4. Broan Model 641.

I. Airflow Control Devices. Only the following models from their respective manufacturers shall be used:

1. Aldes Constant Air Regulators: 3", 4", 5", and 6" diameter or equal.

J. Ceiling Grille. Only the following models from their respective manufacturers shall be used:

1. Aldes 4", 5", 6" adjustable grille.
2. Fantech 4", 5", 6" round adjustable grille.
3. Venmar 4", 5", 6" adjustable Whispergrille.
4. Hart & Cooley 4", 5", 6" Professional's Choice non-adjustable Ceiling Diffuser.

K. Exterior Mounted Draft Inducer. Only the following models from their respective manufacturers shall be used:

1. Fan: Exhausto RS 9.
2. Draft Proving Switch: Dwyer 1638-0.
3. Variable Speed Controller: Tamarack Airetrak CD.

ELECTRICAL REQUIREMENTS

A. Light Fixtures – Recessed:

1. Halo.
2. Juno.
3. Thomas.

B. Light Fixtures – Surface Mounted:

1. Thomas.
2. Tropical.
3. Progress.
4. International.
5. ICON.
6. Kichler.
7. Good Earth.
8. Lumax.
9. Sea Gull.

C. Smoke Detectors:

1. Battery Operated:
 - a. Dicon #300B.
 - b. First Alert 83R.
 - c. Family Guard 888D.
 - d. American Sensors 308.
2. Hard wired:
 - a. Firex #0406.
 - b. First Alert.
 - c. American Sensors SA379.
3. Hard wired with strobe: Gentex 7109CS.

D. Carbon Monoxide (CO) Detector

1. Standard Units

- a. Nighthawk model 6000.
- b. Nighthawk model 2000.
- c. American Sensors CO920.

2. Carbon Monoxide (CO) Detector with strobes or transmitter:

- a. Lifesaver Model No. FY-col (1-800-825-6758).
- b. Macord Model No. SC-14A896L (with strobe) or Model No. SC-14A896T (with transmitter)(1-800-825-6758).
- c. First Alert No. FA-SA1005.
- d. Silent Call Model No. "Shakeup" SC-34350011.

E. Electric Baseboard Heaters

1. Markel – 2900 S series.
2. Berko – BKO series.
3. Q'mark – QMK 2500 series.

F. Fan Forced Wall Heaters

1. Berko FRA Series.
2. Markel 3320 Series.
3. Q'mark AWH4000 Series.