PHOENIX SKY HARBOR
INTERNATIONAL AIRPORT

Appendix D
SOUND ATTENUATION STANDARDS

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This appendix depicts the Maricopa County sound attenuation standards for jurisdictions within the 65 DNL noise contours for Luke Air Force Base. These standards are incorporated into their Building Codes for use around military airports in which the day-night average sound level is 65 decibels of higher. The objective is to achieve a maximum interior noise level of forty-five decibels.

MARICOPA ASSOCIATION OF GOVERNMENTS
SOUND ATTENUATION STANDARDS

BACKGROUND

In April 1995, the Arizona Legislature passed Senate Bill 1062, which required that political subdivisions having territory in the vicinity of a military airport in which the day-night average sound level (DNL) is 65 decibels or higher, incorporate sound attenuation standards into their building code. The objective of the law is to achieve a maximum interior noise level of forty-five decibels. The law also required that political subdivisions adopt ordinances incorporating these sound attenuation standards by July 1, 1996.

This law is applicable to the following seven jurisdictions that have territory within the 65 DNL noise contours of Luke Air Force Base: Maricopa County, Glendale, Surprise, El Mirage, Goodyear, Buckeye, and Youngtown. The law defines the noise levels for Luke Air Force Base using the noise contours developed in the 1988 MAG Westside Joint Land Use Study.

The enclosed set of standards have been drawn from the King County Ordinance for the Seattle-Tacoma International Airport, and the Luke Air Installation Compatible Use Zone (AICUZ) Study.

It is important to emphasize that many of the sound attenuation standards are similar to the thermal insulation standards recommended by Arizona Public Service Company and Salt River Project. These standards are used to develop more energy efficient homes and help the consumer realize savings in utility charges.

SOUND TRANSMISSION CONTROL

Adopted by MAG Building Codes Committee on April 17, 1996.

Note: These sound attenuation standards have been drawn from the King County ordinance for the Seattle-Tacoma International Airport, and the Luke Air Force Base Air Installation Compatible Use Zone (AICUZ) Study.

SECTION 1215. DEFINITIONS

In this ordinance, unless the context otherwise requires:

"ASTM (American Society for Testing and Materials)" means an organization which develops and publishes recommended practices and standards for a broad range of testing and material properties issues.

"A-WEIGHTED SOUND LEVEL" means a quantity, in decibels, read from a standard sound level meter which discriminates against the lower frequencies to which the ear is less sensitive. The A-weighted scale attempts to approximate the auditory sensitivity of the human ear.

"DAY-NIGHT AVERAGE SOUND LEVEL (DNL)" means the A-weighted equivalent continuous sound exposure for a 24-hour period with a 10 dB adjustment added to sound levels occurring during nighttime hours (10 p.m. to 7 a.m.)

"INTERIOR NOISE LEVEL" means the sound level of noise in any habitable room with windows and doors closed.

"NOISE CONTOURS" mean lines which connect points subject to equal noise levels expressed in terms of average daily noise over a 24-hour period.

"R-VALUE" means insulation properties of an assembly. Insulation properties are further defined as the ability to reduce the factor of heat transmission or loss.

"SOUND TRANSMISSION CLASS (STC)" means a single-number rating for describing sound transmission loss of a wall, roof, floor, window, door, partition, or other individual building components or assemblies.

SECTION 1217. APPLICATION TO NEW BUILDINGS

The criteria of this ordinance establish the minimum requirements for acoustic design of the exterior envelope of buildings and for through-the-wall ventilation (HVAC) units and their parts. These requirements shall apply to all new buildings and alterations for first occupancy after October 1, 1996 that are located on property on which the average sound level is sixty-five decibels or greater. This noise level is defined by the noise contours for Luke Air Force Base prepared as a part of the 1988 Maricopa Association of Governments Westside Joint Land Use Study. The criteria of this ordinance do not apply to ancillary buildings used in agricultural land use.

SECTION 1219. APPLICATION TO EXISTING BUILDINGS

A. Additions may be made to existing buildings without making the entire building comply with all the requirements of this ordinance for new construction.

B. If the gross floor area of a building is expanded by less than fifty percent, the requirements of this section apply only to the area of expansion. If the gross floor area of a non-residential building is expanded by fifty percent or more, the requirements of this section apply to the entire building.

C. Any change in occupancy or use of a building shall not be permitted unless the building or portion of the building complies with this ordinance.

SECTION 1221. PLANS AND SPECIFICATIONS

The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems, as herein governed, including, but not limited to: exterior envelope component materials; STC ratings of applicable component assemblies; R-values of applicable insulation materials; size and type of apparatus and equipment; equipment and system controls and other pertinent data to indicate conformance with the requirements herein.

SECTION 1223. ALTERNATE MATERIALS AND METHODS OF CONSTRUCTION

A. The provisions of this ordinance are not intended to prevent the use of any material or method of construction not specifically prescribed by this ordinance, provided any alternative has been approved and its use authorized by the building official.

B. The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this ordinance and that the material or method of construction is, for the purpose intended, at least the equivalent of that prescribed in this ordinance in noise level reduction.

C. The building official shall require that sufficient evidence or proof be submitted by a licensed architect or engineer to substantiate any claims that may be made regarding the use of alternative materials and methods. The details of any action granting approval of an alternate shall be recorded and entered in the files of the county, city, or town.

SECTION 1225. BUILDING REQUIREMENTS FOR A NOISE LEVEL REDUCTION OF 25 dB

Compliance with Section 1231 through Section 1239 in Appendix A shall be deemed to meet requirements for a minimum noise level reduction (NLR) of 25 decibels. This noise level reduction is required within the 65-70 DNL noise contours.

SECTION 1227. BUILDING REQUIREMENTS FOR A NOISE LEVEL REDUCTION OF 30 dB

Compliance with Section 1241 through Section 1249 in Appendix A shall be deemed to meet requirements for a minimum noise level reduction (NLR) of 30 decibels. This noise level reduction is required within the 70-75 DNL noise contours.

SECTION 1229. BUILDING REQUIREMENTS FOR A NOISE LEVEL REDUCTION OF 35 dB

Compliance with Section 1251 through Section 1259 in Appendix A shall be deemed to meet requirements for a minimum noise level reduction (NLR) of 35 decibels. This noise level reduction is required within the 75-80 DNL noise contours.

SOUND ATTENUATION STANDARDS April 17, 1996			
	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
General	Section 1231 a. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.	Section 1241 a. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.	Section 1251 a. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.
	b. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar.	b. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar.	b. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar.
	c. Window and/or through-the-wall ventilation units (HVAC) shall not be used.	c. Window and/or through-the-wall ventilation (HVAC) units shall not be used.	c. Window and/or through-the-wall ventilation units shall not be used.
	d. Through-the-wall/door mail boxes shall not be used.	d. Through-the-wall/door mail boxes shall not be used.	d. Through-the-wall/door mail boxes shall not be used.
	e. All sleeping spaces shall be provided with a sound-absorbing ceiling system and carpeted floors.	e. All sleeping spaces shall be provided with a sound-absorbing ceiling system and a carpeted floor.	e. All sleeping spaces shall be provided with a sound-absorbing ceiling system and a carpeted floor.
		f. Operational vented fireplaces shall not be used.	f. Operational vented fireplaces shall not be used.
			g. No glass or plastic skylights shall be used.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Exterior Walls	Section 1233 a. Exterior walls, other than as described in this section, shall have a laboratory sound transmission class rating of at least STC 39;	Section 1243 a. Exterior walls, other than as described in this section, shall have laboratory sound transmission class rating of at least STC 44;	Section 1253 a. Exterior walls, other than as described in this section shall have a laboratory sound transmission class rating of at least STC 49;
	b. Masonry walls having a weight of at least 25 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.	b. Masonry walls having a weight of at least 40 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.	b. Masonry walls having a weight of at least 75 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.
	c. Stud walls shall be at least 4 inches in nominal depth and shall be finished on the outside with solid sheathing under an approved exterior wall finish; siding-on-sheathing, stucco or brick veneer.	c. Stud walls shall be at least 4 inches in nominal depth and shall be finished on the outside with solid sheathing under an approved exterior wall finish: siding-on-sheathing, stucco or brick veneer.	c. Stud walls shall be at least 4 inches in nominal depth and shall be finished on the outside with solid sheathing under an approved exterior wall finish: siding-on-sheathing, stucco, or brick veneer.
	1. Interior surface of the exterior walls shall be of gypsum board or plaster at least ½ inch thick, installed on the studs.	1. Interior surface of the exterior walls shall be of gypsum board or plaster at least ½ inch thick, installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.	1. Interior surface of the exterior walls shall be of gypsum board or plaster at least 5/8 inch thick installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs or double thickness must be used.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Exterior Walls (Cont'd)	2. Continuous composition board, plywood, or gypsum board sheathing at least ½ inch thick shall cover the exterior side of the wall studs behind wood or metal siding. Asphaltic or wood shake shingles are acceptable in lieu of siding.	2. Continuous composition board, plywood, or gypsum board sheathing at least 3/4 inch thick shall cover the exterior side of the wall studs behind wood or metal siding. The sheathing and facing shall weigh at least 4 pounds per square foot.	2. Continuous composition board, plywood, or gypsum board sheathing at least 1 inch thick shall cover the exterior side of the wall studs. The sheathing and facing shall weigh at least 4 pounds per square foot.
	3. Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.	3. Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.	3. Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.
	4. Insulation material at least R-11 shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.	4. Insulation material at least R-15 shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.	4. Insulation material at least R-19 shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.
Exterior Windows	Section 1234 a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28;	Section 1244 a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33;	Section 1254 a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-38;
	b. Glass shall be at least 3/16 inch thick, double glazed.	b. Windows shall be double glazed with panes at least 3/16 inch thick. Panes of glass shall be separated by a minimum ½ inch airspace.	b. Glass of double glazed windows shall be at least 3/16 inch thick. Panes of glass shall be separated by a minimum ½ inch airspace and shall not be equal in thickness.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Exterior Windows (Cont'd)	c. All operable windows shall be weatherstripped and airtight when closed so as to conform to an air infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.	c. Double-glazed windows shall employ fixed sash or efficiently weather-stripped, operable sash. The sash shall be rigid and weatherstripped with material that is compressed airtight when the window is closed so as to conform to an infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.	c. Double-glazed windows shall employ fixed sash or efficiently weatherstripped, operable sash. The sash shall be rigid and weather-stripped with material that is compressed airtight when the window is closed so as to conform to an infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.
	d. Glass of fixed sash windows shall be sealed in an airtight manner with a nonhardening sealant or a soft elastomer gasket or glazing tape.	d. Glass of fixed sash windows shall be sealed in an airtight manner with a nonhardening sealant or a soft elastomer gasket or gasket tape.	d. Glass of windows shall be sealed in an airtight manner with nonhardening sealant or a soft elastomer or glazing tape.
	e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal specifications: TT-S-00227, TT-S-00230, or TT-S-00153.	e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal specifications: TT-S-0027, TT-S-00230, or TT-S-00153.	e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal specifications: TT-S-00227, TT-S-00230, or TT-S-00153.
	f. The total area of glass in both windows and doors in sleeping spaces shall not exceed 20% of the floor area.	f. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.	f. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.
Exterior Doors	Section 1235 a. Doors other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28.	Section 1245 a. Doors other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33.	Section 1255 a. Doors other than as described in this section shall have a laboratory sound transmission class rating of at least STC 38.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Exterior Doors (Cont'd)	b. All exterior side-hinged doors shall be solid core wood or insulated hollow metal at least 1-3/4 inches thick and shall be fully weatherstripped.	b. Double door construction is required for all door openings to the exterior. Openings fitted with side-hinged doors shall have one solid core wood or insulated hollow metal door at least 1-3/4 inches thick separated by an airspace of at least 4 inches from another door, which can be a storm door. Both doors shall be tightly fitted and weatherstripped.	b. Double door construction is required for all door openings to the exterior. The doors shall be side-hinged and shall be solid core wood or insulated hollow metal door at least 1-3/4 inches thick, separated by a vestibule or enclosed porch at least 3 feet in length. Both doors shall be tightly fitted and weather-stripped.
	c. Exterior sliding doors shall be weather-stripped with an efficient airtight gasket system with performance as specified in Section 1234 (c). The glass in the sliding doors shall be at least 3/16 inch thick.	c. The glass of double glazed sliding doors shall be separated by a minimum ½ inch airspace. Each sliding frame shall be provided with an efficiently airtight weatherstripping material as specified in Section 1244 (c).	c. The glass of double glazed sliding doors shall be separated by a minimum ½ inch airspace. Each sliding frame shall be provided with an efficiently airtight weather-stripping material as specified in Section 1254 (c).
	d. Glass in doors shall be sealed in an airtight nonhardening sealant or in a soft elastomer gasket or glazing tape.	d. Glass in all doors shall be at least 3/16 inch thick. Glass in double sliding doors shall not be equal in thickness.	d. Glass of all doors shall be at least 3/16 inch thick. Glass in double sliding doors shall not be equal in thickness.
	e. The perimeter of door frames shall be sealed airtight to the exterior wall construction (framing) as described in Section 1234 (e).	e. The perimeter of door frames shall be sealed airtight to the exterior wall construction (framing) as indicated in Section 1244 (e).	e. The perimeter of door frames shall be sealed airtight to the exterior wall construction (framing) as indicated in Section 1254 (e).
		f. Glass in doors shall be sealed in an airtight nonhardening sealant or in a soft elastomer gasket or glazing tape.	f. Glass in doors shall be sealed in an airtight nonhardening sealant or in a soft elastomer gasket or glazing tape.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Roofs	Section 1236 a. Combined roof and ceiling construction other than described in this section and Section 1237 shall have a laboratory sound transmission class rating of at least STC-39.	Section 1246 a. Combined roof and ceiling construction other than described in this section and Section 1247 shall have a laboratory sound transmission class rating of at least STC-44.	Section 1256 a. Combined roof and ceiling construction other than described in this section and Section 1257 shall have a laboratory sound transmission class rating of at least STC-49.
	b. With an attic or rafter space at least 6 inches deep, and with a ceiling below, the roof shall consist of ½ inch composition board, plywood, or gypsum board sheathing topped by roofing as required.	b. With an attic or rafter space at least 6 inches deep, and with a ceiling below, the roof shall consist of 3/4 inch closely butted composition board, plywood, or gypsum board sheathing topped by roofing as required.	b. With an attic or rafter space at least 6 inches deep, and with a ceiling below, the roof shall consist of 1 inch composition board, plywood, or gypsum board sheathing topped by roofing as required.
	c. Open beam roof construction shall follow the energy insulation standard method for batt insulation.	c. Open beam roof construction shall follow the energy insulation standard method for batt insulation, except use 1 inch plywood decking with shakes or other suitable roofing material.	c. Open beam roof construction shall follow the energy insulation standard method for batt insulation, except use 1 inch plywood decking with concrete or clay tiles as roofing material.
	d. If the underside of the roof is exposed, or if the attic or rafter space is less than 6 inches, the roof construction shall have a surface weight of at least 6 pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculation.	d. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6 inches, the roof construction shall have a surface weight of at least 9 pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculations.	d. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6 inches, the roof construction shall have a surface weight of 9 pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculation.
	e. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-28.	e. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-33.	

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Ceiling	Section 1237 a. Gypsum board or plaster ceilings at least ½ inch thick shall be provided where required by Section 1236 (b). Ceilings shall be substantially airtight with a minimum of penetrations.	Section 1247 a. Gypsum board or plaster ceilings at least 5/8 inch thick shall be provided where required by Section 1246 (b), above. Ceilings shall be substantially airtight with a minimum of penetrations.	Section 1257 a. Gypsum board or plaster ceilings at least 5/8 inch thick shall be provided where required by Section 1256, above. Ceilings shall be substantially airtight with a minimum of penetrations. The ceiling panels shall be mounted on resilient clips or channels.
	b. Glass fiber or mineral wool insulation at least R-19 shall be provided above the ceiling between joists.	b. Glass fiber or mineral wool insulation at least R-25 shall be provided above the ceiling between joists.	b. Glass fiber or mineral wool insulation at least R-30 shall be provided above the ceiling between joists.
Floors	Section 1238 Openings to any crawl spaces below the floor of the lowest occupied rooms shall not exceed 2% of the floor area of the occupied rooms.	Section 1248 The floor of the lowest occupied rooms shall be slab on fill, below grade, or over a fully enclosed basement or crawl space. All door and window openings in the fully enclosed basement shall be tightly fitted. Crawl space ventilation shall comply with Section 1238.	Section 1258 a. The floor of the lowest occupied rooms shall be slab on fill or below grade.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Ventilation	Section 1239 a. A ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior. The inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1 inch thick coated glass fiber, and shall be at least 5 feet long with one 90 degree bend.	Section 1249 a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior. The inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1 inch thick coated glass fiber, and shall be at least 5 feet long with one 90 degree bend.	Section 1259 a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior. The inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1 inch thick coated glass fiber, and shall be at least 10 feet long with one 90 degree bend.
	b. Gravity vent openings in attics shall not exceed code minimum in number and size, as practical.	b. Gravity vent openings in attics shall not exceed code minimum in number and size, as practical. The openings shall be fitted with transfer ducts at least 3 feet in length containing internal 1 inch thick coated fiberglass sound-absorbing duct lining. Each duct shall have a lined 90 degree bend in the duct such that there is no direct line-of-sight from the exterior through the duct into the attic.	b. Gravity vent openings in attics shall be as close to code minimum in number and size, as practical. The openings shall be fitted with transfer ducts at least 6 feet in length containing internal 1 inch thick coated fiberglass sound-absorbing duct lining. Each duct shall have a lined 90 degree bend in the duct such that there is no direct line-of-sight from the exterior through the duct into the attic.

	25 dB Reduction (Required Within 65-70 DNL Noise Contours)	30 dB Reduction (Required within 70-75 DNL Noise Contours)	35 dB Reduction (Required within 75-80 DNL Noise Contours)
Ventilation (Cont'd)	c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with coated glass fiber 1 inch thick, and shall be at least 5 ft. long with one 90 degree bend.	c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with coated glass fiber 1 inch thick, and shall be at least 5 ft. long with one 90 degree bend.	c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1 inch thick coated glass fiber, and shall be at least 10 ft. long with one 90 degree bend.
	d. All other vent ducts connecting the interior space to the outdoors, shall contain at least a 5-foot length of internal sound-absorbing duct lining. Each duct shall be provided with a bend in the duct such that there is no direct line-of-sight through the duct from the venting cross-section to the room-opening cross-section. Duct lining shall be coated glass fiber duct liner at least 1 inch thick approved and suitable for the intended use.	d. All other vent ducts connecting the interior space to the outdoors, shall contain at least a 10-foot length of internal sound-absorbing duct lining. Each duct shall be provided with a lined 90 degree bend in the duct such that there is no direct line-of-sight through the duct from the venting cross-section to the room opening cross-section. Duct lining shall be coated glass fiber duct liner at least 1 inch thick approved and suitable for intended use.	d. All other vent ducts connecting the interior space to the outdoors, shall contain at least a 10-foot length of internal sound-absorbing duct lining. Each duct shall be provided with a lined 90 degree bend in the duct such that there is no direct line-of-sight through the duct from the venting cross-section to the room-opening cross-section. Duct lining shall be coated glass fiber duct liner at least 1 inch thick approved and suitable for intended use.