

Project 02-24

Guidelines for Airport Sound Insulation Programs

Final Contractor Report

Prepared for

Airport Cooperative Research Program (ACRP)

Transportation Research Board

of

The National Academies

Michael K. Payne, AIA, et al.

The Jones Payne Group, Inc.

Boston, MA.

April 2012

ACKNOWLEDGMENT OF SPONSORSHIP

This work was sponsored by one or more of the following as noted:

- American Association of State Highway and Transportation Officials, in cooperation with the Federal Highway Administration, and was conducted in the **National Cooperative Highway Research Program,**
- Federal Transit Administration and was conducted in the **Transit Cooperative Research Program,**
- American Association of State Highway and Transportation Officials, in cooperation with the Federal Motor Carriers Safety Administration, and was conducted in the **Commercial Truck and Bus Safety Synthesis Program,**
- Federal Aviation Administration and was conducted in the **Airports Cooperative Research Program,** which is administered by the Transportation Research Board of the National Academies.

DISCLAIMER

This is an uncorrected final report as submitted by the research agency. The opinions and conclusions expressed or implied in the report are those of the research agency. They are not necessarily those of the Transportation Research Board, the National Academies, or the program sponsors.

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Acknowledgements

Research Team

The proposal submitted by The Jones Payne Group (JPG) recognized the experience required to update the Guidelines would not reside in a single individual or firm. As such, JPG proposed it would be necessary to assemble a research team of individuals who are experts in key areas of sound insulation programs. JPG assembled a team comprised of individuals from several firms who have expertise in their assigned areas of inquiry, as well as a broad perspective and experience in sound insulation programs. Team members comprising JPG’s team are:

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We were assisted in our efforts by professional colleagues providing peer review of certain sections of the report. We thank Alan Hass of Landrum & Brown and Tariq Hussein of PBS Engineers for their assistance. We also thank our editor, Donna L. Cook, for her expertise.

Advisory Panel and Management

JPG’s research efforts have benefitted greatly from the feedback of our review panel and the management provided by staff of the TRB. We gratefully acknowledge the following individuals:

TRB: Ms. Theresia Schatz, Senior Program Manager

Advisory Panel Members:

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Abstract

The product of the research was updated guidelines for sound insulation of residential and other noise sensitive buildings for potential use by airport and non-airport sponsors to develop and effectively manage their aircraft noise insulation projects. Noise sensitive buildings are defined as "residences (single family and multi-family), schools, hospitals, churches, and other non-compatible structures identified in a sponsor's Noise Compatibility Program (NCP) or Environmental Impact Statement (EIS) and approved by the FAA.

The research recognized the experience required to update the Guidelines would not reside in a single individual or firm. As such, Jones Payne assembled a research team of experts with a broad perspective and experience in key areas of sound insulation programs. The research effort included surveys, review of related documents, review of the two previous versions of the guidelines, and the direct experience of the team members.

Chapters include information on program development, acoustics, community outreach, architectural and historic treatments, sustainability practices, HVAC design, fenestration product development, construction contracting, program costs and funding and project reporting. Included in the appendices are sample documents used at various stages of projects and further information on products.

Executive Summary

The objective of this research is to develop updated guidelines for sound insulation of residential and other noise sensitive buildings for potential use by airport and non-airport sponsors to develop and effectively manage their aircraft noise insulation projects. Noise sensitive buildings are defined as ‘residences (single family and multi-family), schools, hospitals, churches, and other non-compatible structures identified in the sponsor’s Noise Compatibility Program (NCP) and approved by the FAA as a project in the NCP,’ as defined in AIP Handbook FAA Order 5100.38C Chapter 8, paragraph 812.A.

The research has brought to light many issues relevant to sound insulation programs and the Part 150 process. It was intended that the team’s research efforts would first and foremost update the Guidelines as a research undertaking for the Transportation Research Board (TRB); and second, that the Guidelines might be referenced or adopted by the FAA, in whole, or in part to provide policy clarifications for sound insulation programs. While the updated Guidelines will reference FAA documents, it is important to understand that the updated Guidelines are not an FAA document.

The new Guidelines provide broad information relevant to program sponsors on the many issues that comprise the management and implementation of a sound insulation program. The research contained in the Guidelines is relevant to professional consultants who provide design, engineering, construction and project management services. The Guidelines do not replace the services of industry professionals. Some of the information contained in the Guidelines is technical and may appear more oriented to consultants than to program sponsors. However, they have been written, as much as possible, to be accessible to a broad audience of interested parties.

CHAPTER ONE

1. Background

1.1 Problem Statement and Research Objective

There are aspects of the two previous versions of the Guidelines that need to be either revised or added to in order to create a document that reflects current standards for design, construction, and regulatory compliance. For example, cost data is now out-of-date and too generalized; industry surveys have shown that program costs vary widely depending on program offerings, housing stock, and local and regional bidding factors. Heating, ventilating, and air conditioning (HVAC) treatments and air quality is briefly mentioned in previous Guidelines, but only in the context of being required to ensure that the effectiveness of the sound insulation treatments are not compromised by needing to open windows and doors for fresh air. Thermal efficiency and energy performance is not mentioned at all, but absolutely needs further consideration to reflect advances in healthy building and modern ventilation requirements. Sustainability, hazardous materials, recycling green building products, homeowner outreach, historic buildings, and project structure and management are likewise not addressed but need to be included in the Guidelines. This helps programs develop holistic solutions to not just noise, but to other environmental and community concerns that inevitably factor into formulation of sound insulation treatments.

At a time when sound insulation was first being undertaken, and with the publication of Guidelines in 1992 and 2005, the Guidelines provided the acoustic guidance necessary to develop treatment performance standards. The research team reviewed the two previous versions of the Guidelines for their continuing applicability and embedded knowledge in order to retain valuable information, while taking into account the broader range of concerns that must be considered when formulating successful sound insulation programs.

1.2 Sound Insulation History

While the federal government has no jurisdiction over local or state land use decisions (i.e., zoning), the FAA can and does influence compatible land use planning. Under the Aviation Safety and Noise Abatement Act of 1979 (ANSA), the FAA was directed to define compatible and non-compatible land uses in and around the nation's airports. Towards this end, in 1985 Federal Aviation Regulation (FAR) Part 150 was adopted and established. The Part 150 process created a uniform system of assessing noise impacts around individual airports. It also identifies land use compatibility criteria and measures necessary to enhance compatibility, for example a Noise Compatibility Plan (NCP).

As part of the NCP, measures to achieve compatibility are proposed and typically characterized as either: "noise abatement measures," such as aircraft flight procedures that reduce noise or redirect it to less populated areas; or, "land use measures," such as property acquisition or sound insulation of noise sensitive properties.

After the airport authority submits an NCP, the FAA responds with a Record of Approval (ROA) stating which measures are approved or not approved, and eligible or ineligible for funding under its Airport Improvement Program (AIP). Since 1992, approximately \$1.9 billion in AIP funding has been provided to sound insulation programs nationally. Additionally, \$1.1 billion in Passenger Facility Charges (PFC) funds have been provided since 1992. This combined investment of more than \$3 billion for sound insulation is an indication of the importance of achieving compatibility between communities and airport operations. Without such efforts, aircraft noise will continue to be the primary constraint on the improvement of the nation's aviation infrastructure.¹

1.3 The “Guidelines”: Previous Versions

There are two previous versions of the Guidelines, both authored by Wyle Laboratories. The first was written in 1992 at the behest of the Naval Facilities Engineering Command and the Federal Aviation Administration’s Office of Environment and Energy, and Office of Airport Planning and Programming. Wyle Laboratories was charged with creating “... a report containing guidelines for the sound insulation of residences exposed to aircraft operations. The report provides a project management handbook for studying, initiating, and implementing residential sound insulation programs in neighborhoods around military and civilian airports.”²

A second updated version of the Guidelines was created for the U.S. Navy in 2005, and expanded the Guidelines to provide information on how to build new sound-insulated residential structures versus sound insulating existing structures. A computer program provided with the updated Guidelines made it possible for a non-technical person to determine acoustical performance specifications for new construction based upon input of basic construction information.

Topics covered in the versions of the Guidelines included:

- Basic concepts of noise and acoustics
- Noise reduction requirements
- Sound insulating new and existing homes
- Costs and code issues

Both documents are essentially technical “how to” descriptions of designing acoustical treatments for existing and new residential structures. Both documents were sole sourced documents commissioned by the US Navy for the Navy’s specific use, but subsequently endorsed by the FAA for AIP programs. As such, they were not intended to address the full range of issues typically encountered in AIP sound insulation programs.

¹ Jawad Rachimi & Joanna Norris, “A Synergistic Green Approach to Conducting Federal Aviation Administration (FAA) and Department of Energy (DOE) Residential Retrofit Programs,” Wyle Laboratories, July 25, 2008.

² Department of the Navy, Naval Facilities Engineering Command, *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations*, 1992.

CHAPTER TWO

2. Research Approach

Per the Request for Proposals published by the Transportation Research Board on February 24, 2010, the intent of ACRP 02-24 is to:

“... develop updated guidelines for sound insulation of residential and other noise sensitive buildings for potential use by airport and non-airport sponsors to develop and effectively manage their aircraft noise insulation projects. Noise sensitive buildings are defined as ‘residences (single family and multi-family), schools, hospitals, churches, and other non-compatible structures identified in the sponsor’s Noise Compatibility Program (NCP) and approved by the FAA as a project in the NCP,’ as defined in AIP Handbook FAA Order 5100.38C Chapter 8, paragraph 812.A.”

To accomplish these goals, The Jones Payne Group, Inc. developed an approach predicated on two core concepts.

- Build upon the two previous versions by maintaining that which is useful and relevant, while updating and expanding the Guidelines in key areas not covered in previous versions; and,
- Assemble a research team from various consultant sources rather than relying on the experience of a single firm or entity.

2.1 Work Plan

It is important to note that the team does not consider any particular aspect of its research to be more significant than another. The results of the research is a synthesis of information obtained from multiple sources and activities. Each research activity is, and was, of equal importance in arriving at the team’s insights and recommendations.

Task 1: Review relevant literature on sound insulation programs and other information, such as FAA directives relating to sound insulation and the 1992 and 2005 Guidelines.

Task 2A: Part one of this task was completed in the preparation of a preliminary survey of attitudes towards the existing Guidelines that was conducted at the Airport Noise Mitigation Symposium in San Francisco on October 3, 2010.

Part two of this task was a full “Best Practices” survey sent between December 5, 2010 and February 4, 2011 to stakeholders in the sound insulation industry, categorized into eight industry groups with customized surveys addressed to each group. Participants included: FAA officials, airport sponsors, program managers/design consultants, aviation planners, contractors, manufacturers, HVAC engineers, and acoustical consultants. The survey was conducted throughout January and extended into early February to elicit as many participants as possible without affecting the schedule. The Interim Report included data from this survey.

All survey responses were collected using a web-enabled software package that has export to Excel spreadsheet capability. This database was used to report data to each of the team members regarding the questions they posed or the industry group of their research concern.

Task 2B: Team members provided the principal investigator with a synopsis of the industry developments that apply and the reasoning for their relevance to sound insulation. Following the principal investigator’s ongoing review and concurrence on relevance, the research team completed their individual research and contributed to the Interim Report chapter on the impact of relevant industry developments.

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Task 3: Each member of the research team evaluated and summarized the information gained in their area of expertise from the three activities of: reviewing existing documents, surveying to determine existing program practices, and determining pending industry developments. Complete results were submitted in an Interim Report. As part of the evaluation of data, each team member assembled observations on the most widely used practices for inclusion in their recommendations. The data analysis is included in Appendix A.

Task 4: The team conducted an evaluation of the existing Guidelines and developed a preliminary outline of recommended revisions and expansions. This recommended outline was distributed amongst the research team for review and comment and then submitted with the Interim Report. Since most members of the team have broad scope interest in sound insulation, their feedback was sought on revisions to the entire Guideline rather than just their single designated area of expertise.

Task 5: The team prepared an interim report that synthesized the information from tasks 1 – 4 as the basis of recommended revisions and expansions to the Guidelines. This report documented the research progress and results. The report included a copy of the data that was collected and organized for review.

Task 6: The team prepared extended outlines followed by their chapters, for submission on August 29, 2011. The draft Guidelines were a progress submittal for panel review.

Task 7: The team responded to the progress review comments and suggestions and submitted a final complete draft of the Guidelines in February 2011.

2.2 Methodology

2.2.1 Summary

The research team consists of selected members of professions that have helped develop some of the practices contributing to successful sound insulation programs across the country. The team consisted of individuals from nine different companies who brought a wide spectrum of knowledge to the updating and revision of the sound insulation Guidelines.

The team's research approach was predicated on individual team member expertise in their assigned areas of investigation to determine "best practices" and trends that currently or in the future will impact sound insulation programs (SIPs). While each team member had specific topics to investigate, all members were invited to contribute to any other area of research where they felt their expertise would lend value. Each member of the research team has experience in multiple aspects of sound insulation, not just in their declared research area. The result was an experienced, versatile team that was able to collaborate and provide a dynamic research dialogue.

In order to determine existing practices in sound insulation that would inform revisions to the Guidelines, the research team surveyed various parties involved in sound insulation. Surveys were prepared that allowed for targeted inquiries relevant to the respondent's role, such as program sponsors, consultants, vendors and contractors.

The team conducted two surveys as a means of getting insight into the use of the existing Guidelines as well as collecting "Best Practice" information from key stakeholders in SIPs. A preliminary survey conducted at the 10th Annual AAAE Noise Mitigation Symposium held in San Francisco on October 4, 2010 ascertained key stakeholder awareness and use of the Guidelines, to establish if users were in favor of expanding the Guidelines to new topic areas.

The main, more extensive survey was released to a first group of participants on December 2, 2010 with subsequent groups receiving invitations to the survey during the next two weeks. That survey closed in mid-

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February 2011. The main survey sought to identify practices, policies, and preferences by key stakeholders in core service areas of sound insulation programs.

2.2.2 Main Survey

This main survey was more extensive in terms of the number of people invited and the number of questions asked. The survey explored practices and attitudes towards a wide range of topics: regulatory policy, program funding, construction costs, bidding methodologies, products, program policies and procedures, design, and noise reduction criteria.

The goals of the survey were to:

1. Identify differences between airport sponsors and the FAA in the interpretation of policy.
2. Provide an industry-wide opportunity to seek clarification on current practices.
3. Identify where clear, consistent program policy guidance may be most needed.

A. Target Audience

Leveraging team members' contacts and industry knowledge, an invitation list was developed to identify as wide a range of potential participants as possible. The list contained 213 contacts that were sent invitations to participate.

B. Assignment of Questions

Each member of the team submitted survey questions specific to their area of research and expertise. In collaboration, many team members contributed questions outside of their immediate area of interest. Questions were assembled into common themes and assigned to participant groups.

2.2.3 Execution of the Survey

A. Technology – Formsite

After an evaluation of existing web-based survey applications, the research team chose Formsite for its ability to handle a complex cross-matrix assignment of the questions. There were eight sub-surveys organized within the framework of a master survey. Formsite also provided respondents the ability to complete the survey in single or multiple sittings. This was desirable since some of the participant groups had many questions to address in the sub-surveys.

B. Securing Survey Responses

Invitations to participate in the survey were emailed to the first user group on December 5, 2010. By December 21st, all eight user groups had received email invitations to participate. Follow-up reminders were sent during January and February, 2011.

To insure a strong response from important user groups, such as airport and FAA staff, the team undertook person-to-person phone calls to encourage greater participation. In addition, some panel members assisted with and were instrumental in securing a higher level of participation. In order to accommodate the extra effort to “turn out the vote” the team extended the close-out date to February 11th.

2.2.4 Participation

There were 213 questions addressed to the eight different stakeholder groups that are typically involved in SIPs. These groups are indicated in the left hand column of the table below.

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No single group was given all 213 questions. The team reviewed each question and assigned questions to the appropriate group.

The following table indicates the number of questions assigned to each group as well as the number of surveys sent to each group and response statistics for each.

Participant Groups	# Questions	# Surveys Sent	# Completed Surveys	% Participation
FAA Officials	40	21	14	67%
Aviation Planners	10	21	9	43%
Airport Program Sponsors	160	65	29	45%
Manufacturers	32	23	14	61%
Contractors	91	24	7	29%
Acoustical Consultants	43	12	12	100%
PM/Designers	197	43	31	72%
HVAC & Energy Experts	32	14	9	64%
Totals	213	223	125	56%

CHAPTER THREE

3. Findings and Applications

“Those who anticipate a complete Federal solution to the aircraft noise problem misunderstand the need for federal, local and private interaction....The primary obligation to address the airport noise problem always has been and remains a local responsibility.” Introduction to the FAA’s 1976 Aviation Noise Abatement Policy

3.1 Determining Interior Noise Impact

The impending issuance of a new Program Guidance Letter (PGL) from the FAA on the topic of interior noise thresholds for sound insulation program eligibility has been a delicate issue to balance during the research activities. The following defines the positions taken in the discussion between program sponsors and the FAA. The research team used existing documents as the basis for all research.

As of the publication of these Guidelines the FAA is considering more uniform application of a minimum standard of eligibility for retrofit sound insulation treatment within the 65 DNL contour. Specifically, they are contemplating not qualifying those homes for treatment where the existing interior DNL noise exposure is below 45 dB. Common practice in programs has been to offer treatment to all homes within the noise impacted contours. Previous AIP direction allowed for the inclusion of an “incidental” number of homes that might not qualify individually:

AIP 5100.38c 812 a.(3) “Where noise insulation is being proposed as a single project for a large number of structures, and where a standard package of noise insulation improvements will be included, the qualifying criteria need not be so restrictively applied that it would prevent an incidental number of homes within the project area from receiving the standard package of improvements. For example, if acoustical windows are to be installed in a preponderant number of homes within the project area, eligibility may be extended to an incidental number of homes within the project area, even though they would not qualify for window installation if considered individually.”

The anticipated PGL is scheduled to draw more heavily on the AIP Handbook’s language of providing an alternate level of treatment for neighborhood equity as described below.

AIP 5100.38c 812 b (1) “...The project design should be based on exterior DNL and the existing NLR in the structure. ***The existing construction must provide less than the needed noise level reduction for the noise exposure level at the location of the residence.*** For purposes of equity in a neighborhood where noise insulation has taken place, the following example may be considered as a guide. A house having 30 dB noise level reduction is located at the DNL 68 dB. It is already compatible because the interior noise level would be approximately equivalent to 38 dB, well below the target 45 dB. Although such a dwelling is compatible under the Federal guidelines of part 150, some lesser level of noise insulation (replacement of depreciated windows, storm doors, caulking and weather stripping, etc.) may be provided to assure conformity of improvements and perceived equity of application in the project neighborhood.”

The emphasis on the interior noise level as a threshold qualification would require an assessment of the existing interior DNL for each residence prior to its acceptance into or rejection from the SIP. This assessment may be affected by either 1) composite transmission loss (CTL) computation of the existing NLR performance of the residence, or 2) measurement of the NLR performance. Further, the actual qualification requirements require further definition. Specifically a policy must be established for residences where some but not all rooms currently meet an interior DNL of 45 dB. Also, a tolerance or margin of error exists with any measurement, or analytical assessment, and particularly the measurement or computation of interior DNL throughout a home. A policy is required to account for measurement tolerances.

3.2 Main Survey Data Analysis

The 213 questions contained in the survey were divided into sub-groups and the responses were analyzed by the various team members for their potential contribution of information to understanding current practices in sound insulation and determining best practices. Appendix A contains the analysis generated by each of the team members organized by question and subject area. More than one person analyzed some questions when it applied to multiple subject areas. The individual subject area sections contain the questions, the survey responses and the team member's analysis.

3.3 Sustainability Practices by Program

The central lesson of the science of ecology is the interrelationship of systems and processes. If a building envelope is made airtight for sound attenuation reasons, mechanical ventilation will be required in order to ensure indoor air quality. If mechanical ventilation is added to a building's systems, heating and air conditioning are required to ensure indoor conditions remain tenable. If mechanical equipment is mandated for air quality reasons, it should be efficient with beneficial life-cycle prospects, both for economic and environmental reasons. Also, the process of construction generates energy and material use. A project can contribute to sustainability in the conduct of design and contracting.

This section identifies sustainability practices currently used in SIPs across the country. Not all programs use all practices. Chapter 8 of the Guidelines documents practices that are used or recommended, but did not elaborate on the findings of the percentage of use. Table 3.1 chronicles the results of a survey to determine current program practices.

The findings from that survey show that:

1. The majority of programs and consultants use some method to reduce paper waste in the administration of bid documents.
2. Over a third of programs recycle or reuse construction materials or removed building products.
3. Greater than two-thirds of programs use high SEER equipment with multi-speed blowers and programmable thermostats.
4. However, only 17% of programs use blower door testing and only 42% use duct leakage testing to determine existing conditions. If those programs are not replacing or resealing the duct systems, any potential energy savings from high SEER equipment could be lost to air leakage. Currently, 20-40% of American homes lose energy to leaky ducts and building infiltration.
5. Close to 60% of programs use some level of environmentally safe products. This mostly involves the use of low VOC paints and sealants, though as the comments show, some programs are complying with building codes as opposed to specifying these items as a voluntary standard.
6. While there was no explicit question about indoor air quality, only two programs mention providing outdoor air as part of their treatments. While this is not currently a code requirement for most single family residential systems, the Guidelines recommend compliance with ASHRAE standards, which do require the introduction of outdoor air.

In Section 4 of this final report we recommend further research into energy efficiency and sustainability practices for sound insulation programs.

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Table 3.1 - Current Sustainability Practices by Sound Insulation Programs or Consultants

PROGRAMS	Baton Rouge	Bayswater - MPA	Boston Logan-MPA	Bradley	Burbank - Bob Hope Airport RATP	CDC - LA County	C. Kell-Smith	CRAA	C & S Engineers Programs	El Segundo	Fresno	Ft. Lauderdale	Inglewood	KCIA	Ontario Quiet Home	Pease	Philadelphia	Phoenix - CSDA	San Diego	Sound Transit	Wyle - Lehigh Valley	Milwaukee	LA - Los Angeles	Great Falls, MT	TOTALS	PERCENT %	
SUSTAINABLE PRACTICES																											
Project Administration																											
a	Electronic bid documents		1	1	1		1		1		1	1	1				1	1	1	1	1	1	1	1	1	16	67%
	Comments				A				B		C		D		E				F	G		H	H	H	H		
b	Re-cycle paper products.				1		1		1		1		1	1	1		1			1	1	1	1	1	1	14	58%
	Comments				A				B				B	C	B			D	E	C							
Project Design																											
c	Blower door testing to identify and treat air leaks.							1	1									1				1			4	17%	
	Comments						A	B										C									
d	Pressure-test ducts to identify and repair air leaks.				1		1	1	1	1			1		1	1	1	1							10	42%	
	Comments						A	B										C									
e	Energy efficient mechanical systems.				1		1		1	1			1		1		1		1						8	33%	
	Comments				A			B	B,C	D			B		B												
f	High SEER rated equipment.	1	1	1	1	1	1		1	1		1	1		1		1	1	1	1		1			16	67%	
	Comments	A			A			B	B		C		B		B			D		E							
g	Multi-speed blowers.	1			1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1			16	67%	
	Comments	A					B							C		D				E							
h	Programmable thermostats.	1	1	1	1	1	1		1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	21	88%
	Comments																			A		B	B	B			
i	Energy efficient windows & doors.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24	100%
	Comments				A									B						B							
j	Specify insulation made from recycled materials.				1	1			1				1	1											5	21%	
	Comments				A		C						B	D					E								

*Comments are included in a table after this chart

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PROGRAMS	Baton Rouge	Bayswater - MPA	Boston Logan-MPA	Bradley	Burbank - Bob Hope Airport RATP	CDC - LA County	C. Keil-Smith	CRAA	C & S Engineers Programs	El Segundo	Fresno	Ft. Lauderdale	Inglewood	KCIA	Ontario Quiet Home	Pease	Philadelphia	Phoenix - CSDA	San Diego	Sound Transit	Wyle - Lehigh Valley	Milwaukee	LA - Los Angeles	Great Falls, MT	TOTALS	PERCENT %	
SUSTAINABLE PRACTICES																											
Project Execution																											
k	Salvage and reuse of building materials (eg., windows & doors).		1				1			1		1	1	1	1		1			1						9	38%
	Comments				A				B	C	D	E	C	F	G				H	I	J						
l	Recycling of construction materials.		1				1			1		1	1	1	1		1			1						9	38%
	Comments				A				B	C	D		D	F	E					G							
m	Use of environmentally safe products.		1	1	1				1	1	1	1	1	1	1		1	1	1	1	1					14	58%
	Comments				A		B			C	D	E	F	F	F				G	F	H						
n	Add insulation: Walls								1								1				1	1				4	17%
	Comments																					A					
o	Add insulation: Crawl spaces						1		1			1										1				4	17%
	Comments											A															
p	Add insulation: Attics	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	21	88%
	Comments				A					B	C								D			E	E	E	E		
q	Add insulation: Window/Door Jamb		1	1	1											1	1									5	21%
Other																											
r	Acoustic Baffles w/ rigid insulation.				1																					1	4%
s	Provide operation/ maintenance manual(s) plus instructions.					1							1													2	8%
t	Protect equipment and ducts during construction from debris					1							1													2	8%
u	Indoor air quality.					1							1													2	8%
	Comments					A							A														
v	Environmental Comfort Design.					1					1		1													3	13%
	Comments					A				B			A														
w	Specify low to no Formaldehyde material.												1													1	4%
	Comments												A														
x	Economizers with CO@ sensors.																									1	4%
y	Ceiling fans.																									1	4%

*Comments are included in a table after this chart

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Comments to Table 3.1	
a	Electronic bid documents
A	Bid docs and Photos are PDF docs online for all bidders and sub-contractors to view.
B	They have both prints and CDs for the bid documents. Addendums are electronic.
C	But city is reviewing several providers.
D	Available, although paper bids were also provided.
E	But OHA is planning on using Planet Bid in the coming Phases: 10 and 11.
F	QHP Publishes. We provide 1 hard copy as well with a CD of all the contents.
G	E-bid systems only.
H	The contractors have an option to receive the construction document electronically.
b	Recycle paper products.
A	Two hard copies of Bid docs are printed on recycled paper for the program sponsor. All other office waste is recycled.
B	For unused bid sets.
C	Office protocols in place.
D	Not specified but used voluntarily.
E	QHP - I believe they do
c	Blower door testing to identify and treat air leaks.
A	Only if requested.
B	Not in all programs.
C	Systems are balanced but balancing is not specifically performed for air leaks.
d	Pressure-test ducts to identify and repair air leaks.
A	Only if requested.
B	HERS rating for HVAC and California Title 24 Energy Compliant.
C	Pressure test to air balance.
D	Testing commenced in Phase 8.
e	Energy efficient mechanical systems.
A	Meet or exceeds state minimum requirement.
B	90% efficiency
C	Recent policy revisions have deleted new central HVAC systems in their entirety. Energy efficiencies noted were for systems installed prior to new policy changes. Program is only providing fresh air intake.
D	No mechanical work.
f	High SEER rated equipment.
A	13 or higher
B	14 SEER
C	Qualified for the Florida Light and Power rebate.
D	Commercial uses EER but we use good units. RSMS used higher SEER rated units.
E	When new HVAC is specified.

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g	Multi-speed blowers.
A	3 speed
B	Multi-speed yes, low, med, high. Not variable speed that would be electronically controlled depending on the heating and cooling load.
C	Fresh air induction system (Aldes).
D	Are used but unsure if it's a requirement.
E	Multi-port fresh air systems (Aldes).
h	Programmable thermostats.
A	When new HVAC is specified.
B	Being used in all of the programs (LAWA, GF, NMP).
I	Energy efficient windows and doors.
A	1. Milgard and Graham STC 40 windows. 2. Vancouver and Eggers Prime Doors. 3. Monray and Whisperlike Secondary Doors.
B	Windows - Compliant to NFRC 100.
j	Specify insulation made from recycled materials.
A	Minimum 20% post consumer recycled content with low or no formaldehyde emissions.
B	But city is looking at "greener" products in subsequent bid packages.
C	Sometimes
D	Cellulose
E	Not a requirement in the Spec. QHP does not do cellulosic. I believe most insulation MF have some % of recycled materials in their product depending upon the material.
k	Salvage and reuse of building materials (eg., windows and doors).
A	Nor required by program sponsor.
B	Lead Paint/ Asbestos contamination.
C	Doors only.
D	About 40% of doors salvaged and returned to Homeowner plus any other items per owner's request.
E	Contractor to provide waste management plan with salvage and recycling of demoed products.
F	Homeowners are provided local Habitat information when they opt to retain products.
G	Mostly by Homeowners who now have taken on the responsibility of salvaging on their initiative.
H	Not specified. Contractors often turn in the aluminum or steel if they are pulling old single glazed aluminum or steel products.
I	Extracted products offered to local habitat organizations (where feasible).
J	Homeowners have the right to salvage materials.
I	Recycling of construction materials.
A	Nor required by program sponsor, however, general contractors usually recycle most metals removed from homes.
B	Contractors typically will recycle the aluminum.
C	Lead Paint/ Asbestos contamination.
D	Metal and glass, along with old AC units, swamp coolers.
E	Metal and glass, along with old AC units, swamp coolers <i>by the property owners.</i>

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F	Contractor required to recycle salvaged metal products.
G	Past Bid Groups (nothing current).
m	Use of environmentally safe products.
A	Meet SCAQMD requirements of VOC.
B	Sometimes.
C	City is revising specs to include "greener" construction products.
D	To some extent.
E	To meet code for low-voc paint etc. but nothing above and beyond code.
F	Low VOC caulks and paints.
G	Strict CA Coastal VOC requirements.
H	To clarify, we do not specify products must be "environmentally safe".
n	Add insulation to: Walls
A	Being specified in the Milwaukee Program (NMP).
o	Add insulation to: Crawl Spaces
A	Insulation would be added if condition found.
p	Add insulation to: Attics
A	R-30 required.
B	Insulation level is typically increased to a level of R-30 minimum from an average of about R-15.
C	Qualified for the Florida Light and Power rebate.
D	Only if accessible (if < 24" in height we stay out of).
E	Being used in all of the programs (LAWA, GF, NMP).
u	Indoor air quality.
A	By introducing fresh air to all homes through mechanical system(s).
v	Environmental Comfort Design.
A	By reducing the exterior noise transmissions. By the proper duct system sizing and equipment selection through mechanical engineering.
B	By reducing the exterior noise transmissions.
w	Specify low to no Formaldehyde material.
A	For insulation and composite wood.

CHAPTER FOUR

4. Conclusions and Suggested Research

4.1 Conclusions

The FAA is currently developing a Policy Guidance Letter (PGL) that is anticipated to clarify that structures within a DNL 65dB contour with interior noise levels of less than DNL 45dB would not be eligible for sound insulation. The impact of this clarification will likely exclude the sound insulation of many structures that would have previously been treated by most sound insulation programs that understood FAA policy to allow for sound insulation of most noise-sensitive structures within a DNL 65dB contour.

The team has discussed the anticipated PGL with ACRP. The updated guidelines are not intended to interpret ambiguities in existing FAA policy or anticipate clarification that may be provided in future guidance. Once clarifications to FAA standards are issued, and if the team is authorized to do so under its contract with ACRP, updates can be made to the Guidelines.

Should the PGL clarifications be as anticipated, numerous community, policy and technical issues will need to be addressed. There are three technical issues that the team feels could be addressed by future ACRP research. Two of those address the questions of how to accurately test and measure existing noise levels in structures in noise-impacted areas. A third issue is how sound insulation programs can simultaneously achieve noise reduction and meet national goals for higher levels of energy efficiency and better indoor environmental quality.

1. Acoustical Evaluation Methods - While the ASTM standard ASTM E 966, *Guide for Field Measurement of Airborne Sound Insulation of Building Façades and Façade Elements*, sets guidelines for testing it allows variety in methods. Consultants use a number of methods for testing and research would help determine if one method is preferable or more accurate.
2. Determining 45dB DNL Interior Exposure - With the FAA's anticipated clarification of eligibility regulations, research is needed into methods for determining interior noise levels beyond testing 100% of structures.
3. Energy Efficiency and Sound Insulation Treatments - Further research into the potential energy savings from adhering to model energy standards and the relevant costs or rebates would assist the FAA in adopting policies to promote energy efficiency in sound programs.

4.2 Suggested Research

4.2.1 Assessment of Acoustical Evaluation Methods for Sound Insulation Programs

This research would investigate the accuracy and reliability of methods for determining interior DNL noise exposure, in order to identify procedures to ensure results that are more consistent. This will be critical to maintaining the integrity of the PGL proposal for excluding homes from programs.

The following research idea was submitted to the ACRP for consideration to be included in next year's program. This proposal deals only with the methods for reliably determining interior DNL, and does not address any construction techniques or building material issues.

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A. Research Problem Statement

Per the FAA's anticipated Policy Guidance Letter (PGL) treatment eligibility of noise-impacted structures around airports will be clarified. Future eligibility for each structure will likely be based on interior noise exposure in addition to location within eligible DNL 65 dB noise contour. Specifically, if interior DNL noise levels are less than 45 dB, the structure would not be eligible for acoustical treatments typically provided by sound insulation programs (SIPs) funded under the FAA's Airport Improvement Program (AIP).

Currently SIPs measure and/or compute the noise level reduction (NLR) of selected rooms within the impacted structures using one of several methods. However, these methods provide no assessment of measurement accuracy or reliability, and no comparison of measurement results among the various methods employed. The absence of such information would make it impossible to determine definitively whether a structure is eligible for acoustical treatment.

Owners of impacted structures deemed ineligible may be expected to challenge the acoustical measurement techniques and results used to determine eligibility. Acoustical testing methods require a degree of standardization, and an assessment of their accuracy and reliability for qualification eligibility measurement to be used on future SIPs.

B. Objective

The proposed research program has the following objectives:

1. Description and evaluation of
 - a. acoustical testing using an exterior loudspeaker sound source,
 - b. acoustical testing using aircraft flyovers for the noise source, and
 - c. computation of NLR from composite transmission loss and interior acoustical absorption calculations.
2. Quantitative assessment of the repeatability of acoustical testing and computational methods for determining NLR. This will be presented statistically relating the tolerance in NLR measurement results.
3. Establishment of acoustical testing guidelines to improve consistency of NLR results.

C. Research Proposed

The research project will select two rooms in each of one hundred noise-impacted structures for assessment of the NLR by

1. acoustical testing using an exterior loudspeaker sound source,
 2. acoustical testing using aircraft flyovers for the noise source, and
 3. computation of NLR from composite transmission loss and interior acoustical absorption calculations.
- The results of the three assessments will be compared statistically along with construction type.

Results will be evaluated and compared statistically to quantify the consistency of NLR results by the three methods. Additionally, modifications to measurement techniques will be made to determine if certain methods render more consistent and uniform results.

D. Urgency And Payoff Potential

Due to the importance of acoustical treatments, ineligible property owners may be expected to launch legal challenges based upon the techniques used to assess the NLR for their disqualification. This would result in legal expense and additional costs from program delays. Additionally, adverse publicity from disparaged assessment programs may be expected to further homeowner dissatisfaction with airports, the FAA, and others involved in the nationwide SIP effort.

4.2.2 Establishment of Methodology for Determining 45dB DNL Interior Exposure

The FAA Policy Guidance Letter (PGL) currently being developed will likely clarify that residences and other noise-impacted structures with an interior DNL of less than 45 dB will not be eligible for sound insulation. Currently, there is no standardization of methods for determining the interior DNL. This research would investigate the accuracy and reliability of methods for determining interior DNL noise exposure, and will recommend procedures to ensure more consistent results. This will be critical to maintaining program integrity for excluding homes from sound treatments. The most reliable method for determining interior noise exposure is to test 100% of the structures that are potentially eligible. The research would evaluate whether establishment of a methodology for projecting interior DNL based on structure typology or other scientifically defensible method is possible.

4.2.3 Energy Efficiency, Ventilation and Sound Insulation Treatments

As a federal program, Energy Star and HERS constitute the most widely available and consistent system used to evaluate home energy performance. It is also the base standard for determining qualification for many of the energy rebates available today. As such, it is a best practice recommendation of the updated Guidelines that SIPs create policies and procedures for products and installations that meet ASHRAE 90.2 *Energy-Efficient Design of Low-Rise Residential Buildings* using Energy Star performance criteria. Energy Star homes are typically 15 percent more energy efficient than average minimum energy codes.

Treatments eligible for reimbursement from the FAA are those that contribute to meeting FAA acoustical goals and providing ventilation; however, meeting those goals with Energy Star practices and products can maximize the achievement of federal goals for energy efficiency. Further research into the potential energy savings from adhering to Energy Star, HERS, ICC-700, California Green Building Standards Code and ASHRAE Energy standards and the relevant costs or rebates would assist the FAA in adopting policies to promote energy efficiency in sound programs.

Additionally, indoor environmental quality is a key issue. As SIPs tighten the exterior envelope of homes to prevent the intrusion of noise, mechanical systems become a necessity rather than a program extra. Furthermore, as demand for conformity to efficiency standards becomes more stringent, houses become less permeable and forced ventilation becomes more commonplace. Although it may seem counter intuitive to bring in outdoor air after sealing infiltration points, standards for indoor air quality must be maintained. Chapter 7 of the Guidelines has specific recommendations about providing and tempering outdoor air. As a component of researching the determination of an SIP energy standard, it would be useful to research the methods used by programs to provide and condition outside ventilation air. Since standard residential mechanical systems do not have outdoor air provision without customization, it would be important to review the recommendations in the Guidelines for their inclusion into program practices.

Appendix A

Data Analysis

CHAPTER 1

ANALYSIS OF SURVEY RESULTS — PROGRAM DEVELOPMENT

1.1 QUESTIONS & INTEREST GROUP

The ACRP 02-24 research team conducted an on-line survey of current practices in sound insulation. The survey included:

<u>Group</u>	<u>Number of Responses</u>
1. FAA	14
2. Airport Officials (Program Sponsors)	29
3. Acoustical Consultants	12
4. Aviation Planners	9
5. Contractors	7
6. HVAC / Energy Engineers	9
7. Manufacturers	14
8. Program Managers / Design Consultants	31

1.2 ANALYSIS

The following sections will describe the results of the survey that are applicable to Program Development.

1.2.1 Project Eligibility

The AIP Handbook lists the following mechanisms through which a Sound Insulation Program may be eligible for AIP or PFC funding: (1) noise compatibility program implementation projects, (2) noise mitigation projects approved in an environmental record of decision, or (3) noise mitigation projects qualified under Title 49, U.S.C., Section 47504.

Question #5 asks respondents what type of actions initiated Sound Insulation Programs. Voluntary Part 150 Studies was by far the most common response, followed by Environmental Impact Studies for Airport Development. Somewhat surprising were the number of respondents that indicated either Legal Actions from Communities or Community Relations Initiatives had prompted Sound Insulation Programs.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 5.- What actions have initiated SI programs in your region? (Select all that apply)				
	Legal actions from communities	Voluntary Part 150 studies	Environmental Impact Studies for airport changes	Community relations initiatives prior to Part 150 regulation	Other
Acoustical Consultant	0	0	0	0	0
Airport Official (Program Sponsors)	6	21	7	6	1
Aviation Planner	0	0	0	0	0
Contractor	0	0	0	0	0
FAA	3	11	8	4	0
HVAC / Energy Engineer	0	0	0	0	0
Manufacturer	0	0	0	0	0
Program Manager / Design Consultant	0	0	0	0	0

1.2.2 Program Development

Obtaining an accurate count of the number and type of structures included in a Sound Insulation Program is important for numerous reasons, including project planning and cost estimating. The Survey Team was interested in the methodology used in Part 150 Studies to identify impacted properties. The results of Question #6 suggest there is not a clear FAA-required methodology, and it appears that there are a number of methodologies being utilized, probably in combination with one another.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 6.- In preparing Part 150 studies, does the FAA require specific methodology for verifying number of impacted properties. (Select all that apply)				
	Yes, GIS data gathered from municipalities	Yes, aerial photography	Yes, field based confirmation	Yes, all of the above	No specific methodology required
Acoustical Consultant	0	0	0	0	0
Airport Official (Program Sponsors)	7	2	7	8	6
Aviation Planner	1	0	2	1	6
Contractor	0	0	0	0	0
FAA	1	2	1	4	5
HVAC / Energy Engineer	0	0	0	0	0
Manufacturer	0	0	0	0	0
Program Manager / Design Consultant	0	0	0	0	0

1.2.3 Program Boundaries

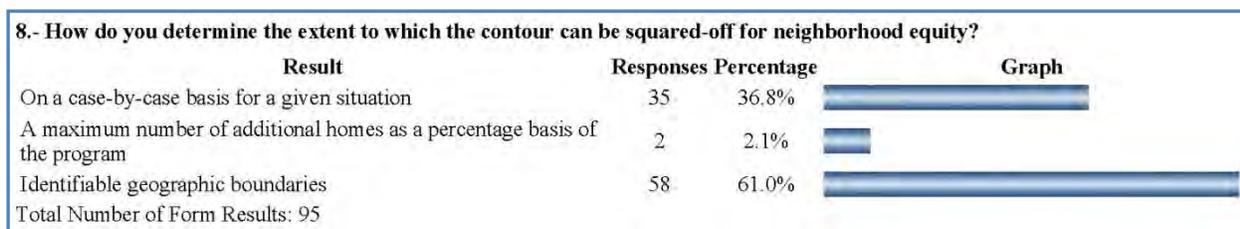
Traditionally, eligibility for participation in an FAA-funded sound insulation program has been based on a noise-sensitive structure’s location within the DNL 65DB or greater noise contour or within the FAA-approved program boundary that has been established to achieve equity in the neighborhood. The basis for these eligibility criteria is drawn from Section 810.b. of the *AIP Handbook* (FAA Order 5100.38C, Chapter 8), which states,

Noise compatibility projects usually are located in areas where aircraft noise exposure is significant, as measured in day-night average sound level (DNL) of 65 decibels (dB) or greater. However, projects may also be approved and made eligible in area of less noise exposure...In addition, projects within DNL 65DB may be expanded beyond the DNL 65 dB contour to include a reasonable additional number of otherwise ineligible parcels contiguous to the project area, if necessary to achieve equity in the neighborhood. Neighborhood or street boundary lines may help determine what is reasonable, in addition to numbers of properties.

Question #7 asks respondents what type of information should be included in the sponsor’s NCP to make it easier to implement the approved sound insulation program. “Identification of the program boundary” received 56 votes, which was the response that received the most votes.

The research team was interested in the methodology utilized to determine the program boundary. Question #8 pertained directly to determination of the program boundary. The survey results indicated that identifiable geographic boundaries are the primary method 61% used to determine the program boundary. A significant number (36.8%) determine the extent to which the contour can be squared-off for neighborhood equity on a case-by-case basis for a given

situation. An insignificant number (2.1%) reported they allow a certain number of additional homes, which is a set percentage of the total number of homes in the contour (e.g. if the contour includes 100 homes they allow an additional 10 homes if the percentage is 10%).



In conclusion, it is noted that the decision regarding the extent to which the contour can be squared-off for neighborhood equity is an important decision that should be vetted during the Part 150 process. It should be based on identifiable geographic boundaries that are selected on a case-by-case basis for a given situation. No definitive guidance is available, rather, it is expected that professional judgment will be utilized to ensure that the number of additional homes is reasonable, not excessive.

1.2.4 Phasing

Phasing refers to prioritizing homes for participation in a Residential Sound Insulation Program (RSIP), as well as pre-determining the number of homes that will participate at one time. It could be based upon a number of factors such as noise level, location, anticipated funding level, and/or manageability. Additionally, some programs conduct a “Pilot Phase,” which generally involves fewer homes, but often attempts to include a representative sample of the various construction types found throughout the program area.

The research team was interested in the methodology utilized to determine the number of houses that should be included in each phase, and when those phases should be identified. There were three questions on the survey that provided insight regarding these questions.

The survey results for Question #7 indicated that specifically identifying the phases in the sponsor’s Noise Compatibility Program (NCP) did not make it easier to implement the approved Sound Insulation Program. Only 17 of the respondents indicated this information would be helpful.

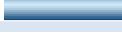
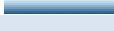
However, the survey results for Question #7 indicated that identifying the priority for participation (e.g., single-family before multifamily highest noise level first regardless of structure type, owner-occupied before tenant occupied, etc.) would make it easier to implement the approved Sound Insulation Program. Forty-four respondents indicated this information would be helpful.

The survey results for Question #171 were very revealing when it came to identifying the ideal number of houses/units that should be included in each phase/bid package. From the Contractor’s and Supplier’s point of view it was clear that very small bid packages (five units or less) clearly increased the cost. Bid packages containing between 25 and 50 units seemed to be ideal, where an equal number of respondents indicated the cost would increase or decrease or there would be no impact on the cost. From the Contractor’s and Supplier’s point of view it was clear that large-bid packages (100 units or more) definitely decreased the cost.

Another question (Question #173) that was answered by the Contractors and Suppliers indicated that the bid package size had a significant impact on the cost. Of the 13 items listed, bid package size was the one that had the most significant impact.

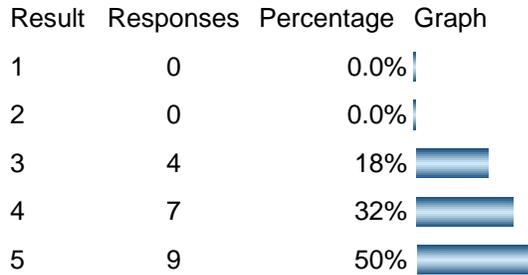
So if phases are assumed to be bid packages then it appears that the ideal size is probably around 50 units, in order to efficiently utilize available funding. It may or may not be of benefit to conduct a “Pilot Phase,” but if it is done, be aware that it will most likely be more costly (on a unit basis) than the larger phases that will follow.

171. From a Contractor's and Supplier's perspective what is the impact of bid package size on construction cost:

5 Unit Bid Package or less			
Result	Responses	Percentage	Graph
Increases cost	18	95%	
Decreases cost	0	0.0%	
No impact	1	5%	
25 Unit Bid Package			
Increases cost	5	26%	
Decreases cost	4	21%	
No impact	10	58%	
50 Unit Bid Package			
Increases cost	2	11%	
Decreases cost	8	42%	
No impact	9	49%	
100 Unit Bid Package			
Increases cost	0	0.0%	
Decreases cost	15	79%	
No impact	4	21%	

173. From a Contractor's and Supplier's perspective what items below have the greatest impact on cost*Rate each item 1 thru 5, 1 being no impact and 5 significant impact

Bid Package Size



1.2.5 Eligibility

The survey was completed prior to learning of the FAA’s potential position regarding eligibility. Therefore, this analysis will be based solely on the results of the survey, as if we were not aware of the relevant industry development that has surfaced since the survey was completed.

We will start with the assumption that we are referring to homes that are inside the program boundary described in Item A. above.

Question #7 asks respondents what type of information should be included in the sponsor’s NCP to make it easier to implement the approved sound insulation program. The following items both received a significant number of votes:

- Type of structures that are included (e.g., detached single-family, attached single-family, multifamily, school, church, etc.)
- Type of structure that are excluded (e.g., structures built after a certain date, mobile homes, structures that are in very poor condition, etc.)

The response to Question #49 indicates that schools are most frequently treated, followed by places of worship. A number of other community facilities (e.g. hospitals, community centers, libraries) are not uncommon.

49. Do you treat buildings other than residential? If so, what types of buildings? (Select all that apply)

Result	Responses	Percentage	Graph
Schools (elementary thru high school)	54	58.0%	
Schools (early education, daycare)	34	36.5%	
Schools (college, professional, trade)	15	16.1%	
Places of Worship (churches, temples, mosques, etc.)	38	40.8%	
Hospitals, nursing facilities	17	18.2%	
Community Centers	14	15.0%	
Libraries	8	8.6%	
Museums	3	3.2%	
Other	4	4.3%	
Total Number of Form Results	83		

Question #9 asks whether interior noise levels within structures must be tested as a basis for eligibility (if the structure is within the DNL 65DB contour). Forty-eight respondents said no, 26 said yes, and nine said only under unusual circumstances. It is interesting to note that this is the breakdown is for all groups who responded to this question.

If we look at the responses by group, we see a significant inconsistency between the FAA and the other groups. The FAA and the Acoustical Consultants are at opposite ends of the spectrum. The FAA indicated 10 to one that measurements of interior noise levels were required as a basis for eligibility (three indicated they were required only under unusual circumstances). The Acoustical Consultants (who presumably are the ones doing the measurements) indicated 11 to one that measurements of interior noise levels were not required to establish eligibility. Program Managers and Airport Officials tended to side with the Acoustical Consultants with 65% and 62% respectively indicating that measurements of interior noise levels were not required to establish eligibility, except under unusual circumstances.

9. Do you require interior noise levels within structure to be tested as a basis for eligibility (if the structure is within the DNL 65 dB contour)?

Result	Responses	Percentage	Graph
Yes	26	31%	
No	48	58%	
Only under unusual circumstances	9	11%	
Total Number of Form Results	83		

Question #10 asks respondents if they disqualify structures that test at DNL 45DB or less. Responses to Question #10 were consistent with the responses to Question #9. For all groups, 45 respondents said no, 22 said yes, and 11 said only under unusual circumstances.

10. Do you disqualify structures that test at DNL 45 dB or less?

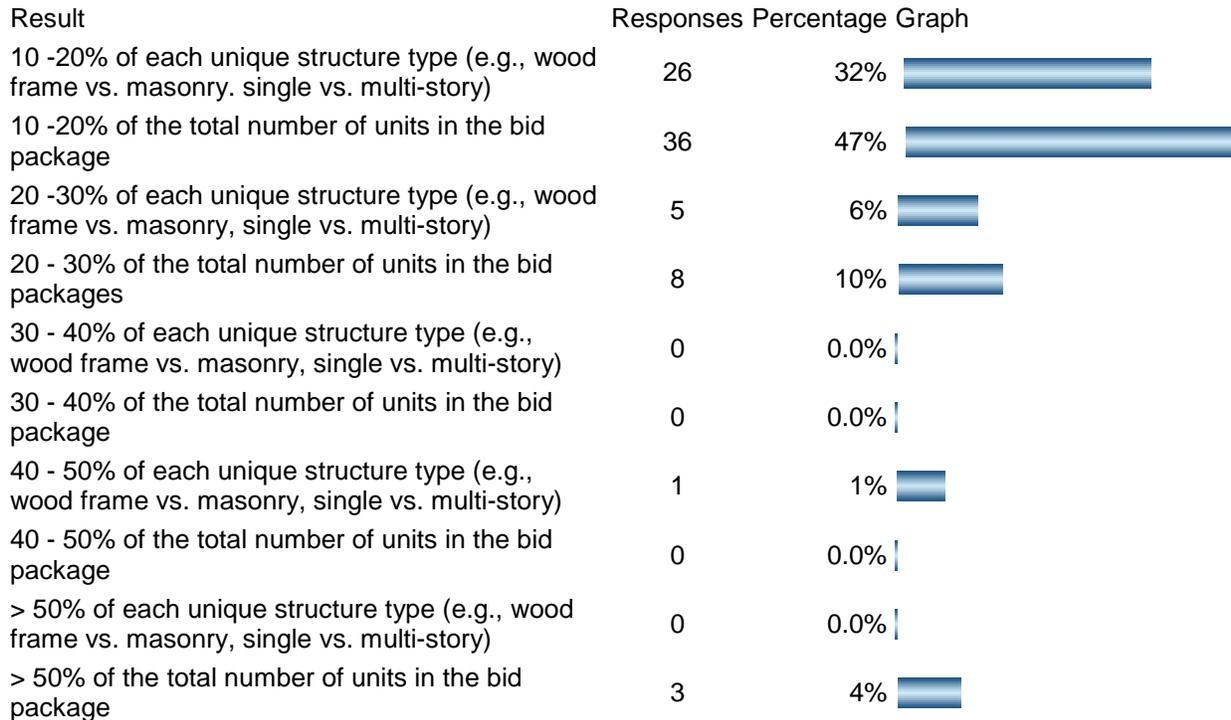
Result	Responses	Percentage	Graph
Yes	23	20%	
No	45	58%	
Only under unusual circumstances	11	14%	
Total Number of Form Results	78		

If we look at the responses by group, we see a significant inconsistency between the FAA and the other groups. The FAA and the Acoustical Consultants are at opposite ends of the spectrum. The FAA indicated eleven 11 to zero that they disqualify structures that test at DNL 45dB or less (two indicated they disqualify only under unusual circumstances). The Acoustical Consultants indicated nine to one that they do not disqualify structures that test at DNL45 dB or less (two indicated they disqualify only under unusual circumstances). Program Managers and Airport Officials tended to side with the Acoustical Consultants with 64% and 72% respectively indicating that they do not disqualify structures that test at DNL 45dB or less, except under unusual circumstances.

Eligibility criteria for public buildings appear to be somewhat different than for residential structures. The overall results indicate that while over 50% of respondents remain consistent in the application of interior noise level based on DNL, a significant number (>20% each) utilize interior noise level based on either speech interference or Lmax during time of use. Over 70% of the FAA respondents indicated eligibility criteria should be interior noise level based on DNL. Again, the FAA and the Acoustical Consultants are at opposite ends of the spectrum. Acoustical Consultants were more evenly divided between all three criteria, with approximately 43% indicating interior noise level based on DNL and an equal number (29% each) indicating either speech interference or Lmax during time of use.

We are going to report on the results of Question #11, even though it does not strictly qualify as Program Development. Question #11 asks respondents *who do not require all structures to be tested to determine their eligibility*, what percentage of residential structures do you want to see tested before and after modification to document the effectiveness of the program? In light of their responses to Questions #9 and #10, described above, it is interesting to note that 12 FAA responded to this question. If we understand the questions correctly, only four FAA representatives should have answered this question. The survey results are revealing because the majority of the responses indicated they would like to see only between 10% and 20% of each unique structure type or total number of units in the bid package. The same trend is observed in the overall results.

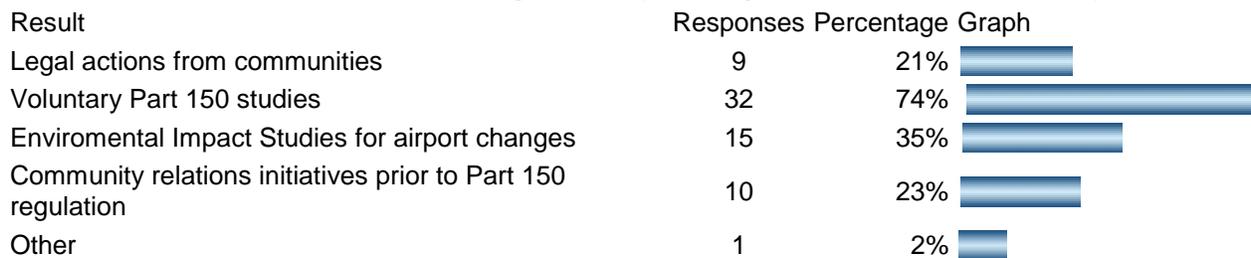
11. If you do not require all structures to be tested to determine their eligibility, what percentage of residential structure do you want to see tested before and after modification to document the effectiveness of the program?



Total Number of Form Results: 79

There is an important message here — there appears to be a major misunderstanding not only between the FAA and everyone else, but ultimately within the FAA itself, regarding eligibility for participation in sound Insulation programs. The policy interpretation varies widely amongst the participants. This is a red flag that should not be ignored. ACRP 02-24 should strive to clarify policy regarding eligibility for participation in sound insulation programs.

5. What actions have initiated SI programs in your region? (Select all that apply)



Total Number of Form Results: 43

As expected, Voluntary Part 150 Studies are the most common process for initiating sound insulation programs, followed by environmental impact studies. Surprisingly, community relations initiatives and legal action were not uncommon.

1.2.6 Costs

Sound insulation programs are costly to implement, second only to land acquisition with relocation assistance in terms of unit cost.

21. Should there be a cap on the amount of money that is spent to insulate a residential structure?

Result	Responses	Percentage	Graph
Yes, as a percentage of the structure's value	19	25%	
Yes, based on Part 150 forecasts	2	3%	
No, insulation is dependent on program policies, standards and housing stock.	56	72%	

Total Number of Form Results: 77

Question #21 asked respondents if there should be a cap on the amount of money that is spent to insulate a residential structure. The overwhelming majority (> 70%) said there should not be a cap; rather, insulation is dependent on program policies and housing stock. Most of the other respondents said yes, as a percentage of the structure's value.

Looking at the results by group painted a slightly different picture. The FAA was split approximately in half, between "Yes, as a percentage of the structure's value," and "No, insulation is dependent on program policies and housing stock." Program Sponsors, Aviation Planners, and Program Managers/Design Consultants were much more heavily weighted toward "No, insulation is dependent on program policies and housing stock."

Question #153 asked if anticipated costs (including in-house, professional, and construction) were estimated prior to the establishment of the program. Over 90% of the respondents indicated that these costs were estimated.

153. Were anticipated Sponsor(in-house), professional, and construction costs estimated prior to establishment of your Program?

Result	Responses	Percentage	Graph
Yes	42	91%	
No	4	9%	

Total Number of Form Results: 46

Question #154 asked when program costs including construction costs were first estimated. The majority were first estimated during the planning process, whether it be the Part 150 Study, Master Plan, or Five-Year Plan. It was surprising to see that some were not estimated until the time of grant application, during contract document production, or during the Pilot Phase of the program.

154. At what phase were program costs including construction costs first estimated:

Result	Responses	Percentage	Graph
Part of Master Plan	4	10%	
Part of 5-Year Plan	2	5%	
Time of grant application	6	14%	
During Part 150 Study	11	26%	
During Pilot Phase of program	9	21%	
During contract document production	7	17%	
Other	3	7%	

Total Number of Form Results: 42

Program costs were refined to include detailed construction cost estimates primarily during contract document production, but also at the time of grant application, as well as during the Pilot Phase of the program, according to the results of Question #155.

155. At what phase were program costs refined to include detailed construction cost estimated:

Result	Responses	Percentage	Graph
Part of Master Plan	1	2%	
Part of 5-Year Plan	1	2%	
Time of grant application	12	29%	
Part 150 Study	0	0.0%	
Pilot Phase of program	11	27%	
During contract document production	16	39%	
Other	0	0.0%	

Total Number of Form Results: 41

Seventy-five percent of respondents indicated that estimated per home sound insulation costs were an important consideration in initial establishment of their program, according to the results of Question #156.

156. Were estimated per home sound insulation costs an important consideration in initial establishment of your program.

Result	Responses	Percentage	Graph
Yes	30	75%	
No	10	25%	

Total Number of Form Results: 40

Less than 50% of the respondents indicated they established cost goals prior to initiating their program, according to the results of Question #157.

157. Did you establish any cost goals prior to initiating your program?

Result	Responses	Percentage	Graph
Yes	17	45%	
No	21	55%	

Total Number of Form Results: 38

Question #158 addressed cost considerations, and how they may have affected SIP decisions. Treatment offerings and policy and procedures were named as the two most effected decisions, followed by product selections and delivery system approach.

158. Were any of the following SIP decisions impacted by cost considerations: (Select all that apply)

Result	Responses	Percentage	Graph
Sound insulation treatment offerings	24	40.0%	
Product selections	12	20.0%	
Policy and procedures	22	36.6%	
Delivery system approach	11	18.3%	

Total Number of Form Results: 60

Construction cost estimates were primarily prepared by project consultants, although a significant number were prepared by in-house staff, according to the results of Question #159.

159. Who prepared your construction cost estimates:

Result	Responses	Percentage	Graph
In-house Staff	13	28%	
Project Consultants	31	67%	
Third Party Estimators	0	0.0%	
Other	2	5%	

Total Number of Form Results: 46

Over 70% of initial estimates were within 10% of the actual cost per house, while 26% were within 30% of actual costs. Very few were off by more than 50%, according to the results of Question #161.

161. How accurate were your initial estimates of per home cost for SIP:

Result	Responses	Percentage	Graph
Within 10% of estimated	28	72%	
Within 30% of estimated	10	26%	
Within 50% of estimated	1	2%	
More than 50% above estimated	0	0.0%	

Total Number of Form Results: 39

Very few respondents indicated that actual SIP costs resulting from completion of an initial phase caused them to alter their approach. Of the few that did, sound insulation treatment offerings were most prevalent, according to the results of Question #162.

Most of the respondents were completely satisfied with the cost estimates prepared throughout establishment of their program, but there were a significant number who were only somewhat satisfied. Only a few were not satisfied, according to the results of Question #163.

163. Are you satisfied with the cost estimates prepared throughout establishment of your program?

Result	Responses	Percentage	Graph
Completely satisfied	24	63%	
Somewhat satisfied	12	32%	
Not satisfied	2	5%	

Total Number of Form Results: 38

1.2.7 Program Documents

The Policies & Procedures Manual typically addresses the documents that stakeholders are required to sign prior to their participation in a sound insulation program. Question #104 addressed typical program documents. Program Sponsors and Program Managers/Design Consultants responded to this question, as shown below. Typically, the Policies & Procedures Manual would include examples of each of these documents in appendices.

104. What documents were stakeholders required to complete prior to participation? (Select all that apply)

Result	Responses	Percentage	Graph
Application	44	80.0%	
Avigation and Noise Easement	34	61.8%	
Participation Agreement	42	76.3%	
Photo release	3	5.4%	
Scope of Work sign-off	35	63.6%	
Pre-Construction sign-off	20	36.3%	
Other, please specify	7	12.7%	

Total Number of Form Results: 60

Respondents indicated in Question #7 that it would be beneficial if the sponsor’s Part 150 NCP indicated whether or not an avigation easement is required in exchange for participation. The content of the avigation easement may or may not have been addressed in the Part 150 NCP. If not, it will need to be addressed in the Policies & Procedures Manual.

Question #104a addressed the content of an avigation easement. The results suggest that most avigation easements are broad in their coverage of all types of aircraft emissions and other effects that may be inherent in the operations of an aircraft.

104a. What aircraft emissions along with noise are granted in the Avigation and Noise Easement? (Select all that apply)

Result	Responses	Percentage	Graph
Lights	6	10.9%	
Electromagnetic emissions	3	5.4%	
Vibrations	16	29.0%	
Fumes	16	29.0%	
Fuel particles	13	23.6%	
Dust	18	32.7%	
All other effects as may be inherent	13	23.6%	

Total Number of Form Results: 60

1.2.8 Program Policies

Question #104b goes on to ask if the noise mitigation program offers purchase of an avigation easement as a separate option. The results are interesting in that most (78%) of the noise mitigation programs do not. Of the ones that do, most (90%) do so only if the homeowner is not interested in other mitigation measures. Only 10% of the programs that offer purchase of an avigation easement as a separate option do so only if the homeowner is not eligible for other mitigation measures.

104b. Does your noise mitigation program offer the purchase of avigation easement as a separate option to homeowners?

Result	Responses	Percentage	Graph
Yes, if the homeowner is not interested in other mitigation measures	9	19%	
Yes, only if the homeowner is not eligible for other mitigation measures	1	3%	
No	37	78%	

Total Number of Form Results: 47

Question #104c addresses the compensation paid for an avigation easement. Most paid exactly \$2,500, which is the nominal value identified in the AIP Handbook. A few paid between \$2,500 and \$5,000, which suggests that the nominal value might be able to be increased somewhat.

104c. If yes, what is the compensation value of the avigation easement?

Result	Responses	Percentage	Graph
Less than \$2,500.00	0	0.0%	
Exactly \$2,500.00	6	67%	
Greater than \$2,500.00, but less than \$5,000.00	3	33%	
Greater than \$5,000.00, but less than \$10,000.00	0	0.0%	
Greater than \$10,000	0	0.0%	
Give a percent based of the fair market value	0	0.0%	

Total Number of Form Results: 9

Question #13 deals with allowing waivers for certain elements of program standard treatment, which could potentially impact the ability to meet certain portions of the 5DB reduction goal.

The responses were heavily weighted toward allowing such waivers, for a variety of reasons, such as for historic properties only, or to keep homeowners from dropping out of the program. Only 23% indicated they do not allow waivers for any reason. A significant number indicated they were allowed if approved by the program sponsor or allowed in the Program Manual. It is clear that a policy regarding waivers should be established and documented in the Policies & Procedures Manual.

13. Are programs in your experience allowed to utilize waivers for elements of program standard treatments, potentially impacting the ability to meet a portion of the 5dB reduction goal? (Select all that apply)

Result	Responses	Percentage	Graph
Yes, for historic properties only	19	19%	
Yes, as approved by the program sponsor	32	34%	
Yes, after approval of the acoustical consultant	15	16%	
Yes, when necessary to keep homeowners from dropping out of the program	14	14%	
Yes, per policies in an approved Program Manual	25	27%	
No	29	31%	

Total Number of Form Results: 94

1.2.9 Program Identity

Identification of historic structures is another issue that should be addressed during program development. The Part 150 Study or EIS should have identified any historic structures located within the DNL 65+ noise contours. The results of Question #14 indicate that over 60% of respondents require a study to identify and document structures that are listed or eligible for listing on the National Register of Historic Places, prior to inclusion of those structures in a program.

14. For programs that include structures approaching or exceeding 50 years old within the program boundary, do you require a study to identify and document potential National Register of Historic Properties eligible structures prior to inclusion of those structures in a program?

Result	Responses	Percentage	Graph
Yes	44	61%	
No	27	39%	

Total Number of Form Results: 71

Over 50% of respondents indicated that their program conducts its own survey to determine if there are historic or potentially historic structures that are eligible for acoustical treatment, according the results of Question #77.

77. Does your program conduct its own surveys to determine if there are historic or potentially historic structures that are eligible for acoustical treatment?

Result	Responses	Percentage	Graph
Yes	22	59%	
No	15	41%	

Total Number of Form Results: 37

If the program conducts its own survey, over 60% hire a preservation consultant to perform the survey, according to the results of Question #78.

78. If yes, then does your program hire a preservation consultant to perform the surveys?

Result	Responses	Percentage	Graph
Yes	18	62%	
No	11	38%	

Total Number of Form Results: 29

If a preservation consultant is not involved, it appears that a variety of officials might potentially make the determination of whether the structure is historic or potentially historic, according to the results of Question #79.

79. If a preservation consultant is not involved, then who makes the determination of whether structures are historic or potentially historic?

Result	Responses	Percentage	Graph
State Historic Preservation Office	8	35%	
Local historic preservation commission	7	30%	
Local building or planning officials	7	30%	
Other	1	5%	

Total number of Form Results: 23

CHAPTER 2

DATA ANALYSIS — ACOUSTICS

2.1 QUESTIONS AND INTEREST GROUP

Eleven consultants responded to this survey. Two each were from the four top acoustical consulting firms (collectively comprising more than 90% of all FAA RSIP projects), one was among the authors of this report, and two had lesser experience with RSIP's. We are pleased with the balanced response and believe it to fairly represent the consensus of those actively involved with the program.

2.2 ANALYSIS

7. What information should be included in the sponsor's Part 150 NCP to make it easier to implement the approved Sound Insulation Program? (Select all that apply)

Acoustical consultants cited type of structures and program boundaries as most important; most others also included homeowner participation as a priority. The FAA and managers also included the issue of an avigation easement.

8. How do you determine the extent to which the contour can be squared-off for neighborhood equity?

Nearly all respondents agreed that eligibility boundaries should be decided case-by-case.

9. Do you require interior noise levels within structure to be tested as a basis for eligibility (if the structure is within the DNL 65dB contour)?

The acoustical consultants were almost unanimous in stating that noise levels within the structure are not tested for eligibility. Surprisingly, nearly half the Airport Officials and nearly all of the FAA believed that they are being tested.

Acoustical: 92% No.
Airports: 38% Yes.
FAA: 71% YES.

10. Do you disqualify structures that test at DNL 45 dB or less?

Three fourths of the acoustical consultants agreed that homes are not disqualified when they test an interior DNL of 45dB or less.

Acoustical: 75% No.

11. If you do not require all structures to be tested to determine their eligibility, what percentage of identical structure do you want to see tested before and after modification to document the effectiveness of the program?

Most respondents agreed that 10%-20% of the structures are tested for eligibility.

12. Regarding before and after testing results, do you expect a reduction of at least 5dB in each room that is tested, or an average of at least 5dB for the entire structure?

A third of the acoustical consultants expect an NLR of at least 5dB average for the structure, almost have find an average for the project, and the remainder find no such performance requirement. Most other respondents expect a 5dB NLR for the entire structure.

It should be noted that achievement of a 5dB NLR is not entirely a policy issue. When an existing structure has high noise reduction performance initially, it may not be possible to improve the NLR by a full 5dB without wall modifications, which are generally not allowed in most programs. Likewise, if there is only a single small window available for retrofit in a bounded room, there may not be sufficient surface area available for treatment to enable a 5dB NLR improvement.

13. Are programs in your experience allowed to utilize waivers for elements of program standard treatments, potentially impacting the ability to meet a portion of the 5dB reduction goal? (Select all that apply)

Most acoustical consultants agreed that waivers are accepted with Sponsor approval or when specified in the Program Manual. Similar responses were made by others. This Program Manual policy may include reasons such as Sponsor approval, compliance with historic preservation requirements, or simply to keep homeowners from opting out of the program for aesthetic reasons.

This question, however, did not ask whether the acoustical consultant agrees with policies for waivers. For some programs the local FAA may hold the acoustical consultant directly responsible for a high level of compliance with the FAA acoustical performance criteria, thereby conflicting the acoustical consultant with the FAA.

15. Do you believe that all parties have a clear understanding of their roles and responsibilities throughout program (i.e., FAA, airport, city, homeowners, architect, acoustical consultant, contractor and vendors)?

The responses to this question varied considerably among respondents. 67% of the acoustical consultants believed that all parties had a clear understanding as did 86% of Contractors, 83% of Managers and 78% of HVAC Engineers. However, 78% of Planners and 64% of Manufacturers answered “no” indicating that that they felt roles were not well understood.

25. Does the final project report require the endorsement of a Registered Professional Engineer experienced acoustics?

Results were split exactly 50-50 for the acoustical consultants (not surprisingly between those respondents holding a PE license and those without). 71% of airport respondents agreed, as did 33% of FAA and 41% of Managers.

The term ‘Acoustical Consultant’ is extremely broad and applies to those in underwater warfare acoustics, bioacoustics (hearing studies), etc. (no engineering experience necessary). RSIPs need those experienced in building design and construction acoustics. The only U.S. certifications for this experience are 1) a PE experienced in acoustics, and 2) a Board-Certified Member of the Institute of Noise Control Engineering, USA. As with all engineering, not all

those working on a project need such accreditation — only the person responsible for the work. The issue of unqualified consultants has diminished dramatically since the earliest stages of the RSIP's.

26. In your opinion, should an acoustical consultant be retained directly by the FAA instead of a part of the project team to maintain an oversight role?

Nearly all respondents (about 90 percent) believe that the FAA should not directly retain the acoustical consultant.

The acoustical consultants have formed alliances with architectural teams, and one of the four major RSIP teams is an Acoustical/Architectural firm; so it's not surprising that they wouldn't favor this. As noted above, the FAA and Management do not fully realize the conflicts arising within the project team. Specifically, it is often difficult to reconcile the opposing objectives of maximizing homeowner satisfaction (minimizing neighbor conflict with the airport) and maintaining the technical objectives of the project. Sponsors are uncomfortable explaining to applicants why their home is ineligible while their neighbors' homes are accepted. Specific responses below.

Acoustical: 92% No.
Airport: 88% No.
FAA: 83% No.
Managers: 90% No.

31. Should FAA policy recognize the goal of energy reduction as well as noise reduction in SI programs?

Almost two thirds of all respondents agreed that energy reduction should be incorporated into the RSIP's; not surprisingly, all HVAC respondents agreed.

Most: ~60% Yes.
HVAC: 100% Yes.

32. If there is an additional cost to achieve energy reduction beyond the cost necessary to meet noise reduction goals, should this additional cost be eligible for reimbursement?

All respondents were split about 50-50 on the issue of funding for energy costs. This question might also have asked who should do the funding, and whether it should be included as a part of their charter of services. Specific responses below.

All together: ~50%/50%

33. What types of residential properties does your program (region) treat?

Nearly all respondents gave a similar response to this question. This is not surprising since they all tend to work on the same projects and all are knowledgeable about the properties in their programs. Below is a breakdown for all respondents.

SF detached	27%
SF attached	23%
Condos	23%
MF (apts)	18%
Assisted living	6%
Other	4%

34. Does your program (region) provide different treatments within different noise contours?

The acoustical consultants were split 50-50 on whether treatments varied for different noise contours. However, eighty percent of managers believe that treatments are not changed among various noise environments, and others varied widely in their responses. It would seem logical to rely most strongly on the responses of the acoustical consultant since they are most intimately involved with this issue. Specific responses below.

Acoustical: 50%/50%
 Managers: 80% No.
 Others: 25% - 79% No.

36. What are some of the special treatments in your program to meet these special issues?

There was a relatively even spread of usage of the special treatments mentioned with wall treatments being the least used. This indicates approximately 25% of the respondent programs use special treatments.

A) Please select the category that best describes your involvement in sound insulation programs:	36. What are some of the special treatments in your program to meet these special issues? (Select all that apply)				
	High STC windows in bedrooms	Ceiling treatments in higher DNL (CNEL) contours	Wall treatments	Special HVAC systems	Other
Acoustical Consultant	6	5	4	5	3
Airport Official (Program Sponsors)	4	4	2	5	5
HVAC / Energy Engineer	2	2	2	3	0
Program Manager / Design Consultant	7	8	7	8	4
Total	19	19	15	21	12

37. Do Homeowners have options in their selection of treatments? Choose all that apply:

Of 71 respondents to this question, 5 indicated that their program offered no options for Homeowner selections. The other 66 respondents indicated at least options for prefinished color choices. The least available option was any selection of brands or size for mechanical systems.

Please select the category that best describes your involvement in sound insulation programs:	37. Do Homeowners have options in their selection of treatments? (Select all that apply)					
	Materials like vinyl or wood	Colors of prefinished products	Styles of doors or windows	Options for upgrades@ homeowner cost	Mechanical system size or brand	No choices
Acoustical Consultant	8	10	9	5	0	2
Airport Official (Program Sponsors)	11	22	20	5	1	3
HVAC / Energy Engr.	2	6	6	2	1	1
Program Manager / Design Consultant	17	28	27	8	2	0
Total	38	66	62	20	4	6

38. What acoustic performance criteria do you use in selecting treatment products?

Acoustical consultants favored the Sound Transmission Class (STC) criteria by a wide margin, followed by Outdoor-Indoor Transmission Class (OITC) and then Noise Level Reduction (NLR). The question may be slightly ambiguous since NLR relates to the overall noise reduction of the composite room; STC and OITC are metrics used for each room element to compute NLR. Managers also largely favored STC, with slightly different results for the other criteria as shown below. Sones are not an RSIP criterion; they are used only to rate the sound power of fans.

Acousticals and Managers responded. Results:

	<u>STC</u>	<u>OITC</u>	<u>NLR</u>	<u>Air infil</u>	<u>Field tst</u>	<u>Sones</u>
Acousticals	12	6	5	2	6	0
Managers	28	3	6	11	9	5

43. In addition to windows and doors, do you treat any of the following noise pathways into the home?

Acoustical consultants, Airports and Managers agreed closely on the noise paths treated. It is reasonable to expect that the acoustical consultants may best address this question. Attic baffles, attic hatch and ceiling treatments are the most common special treatments. Below are totals for all respondents:

Ceilings	35	17%
Walls	27	13%
Added insul	10	5%
None	9	4%

Fireplace doors	34	17%
Attic baffles	48	24%
Attic hatch	41	20%

49. Do you treat buildings other than residential? If so, what types of buildings?

Most respondents reported similar experience in the type of non-residential structures treated in their experience. Below is a tabulation of the percent of respondents with experience in sound insulation for various building types:

Elementary schools	30%
Mid schools & daycare	18%
Colleges & trade schools	8%
Places of worship	21%
Hospitals/healthcare	9%
Community centers	7%
Libraries	4%
Museums	1%
Other	2%

50. What acoustical criteria do you use to determine if a public building is eligible for treatment?

The respondents seem to show quite a variation in acoustical criteria used for sound insulation eligibility. In fact, most programs may not have any criteria for eligibility beyond any residence within the DNL 65 dB contour. This may explain, in part, the disparity in responses below:

	<u>All respondents</u>	<u>Acousticals</u>
Interior noise wrt speech	23%	29%
Interior DNL	55%	43%
Interior L	22%	29%

51. From your experience, what margin of error do you estimate the best 90% of acoustical tests achieve (i.e., that is the certainty interval at the 90% probability level?) for each of the following test methods? [That is "90% of the tests are within +/- dB".]

The acoustical consultants reported ± 2 dB at the 90 percent probability level for the flyover methods, and ± 4 dB for the external loudspeaker methods. Managers, however, believe that there is negligible margin of error for the flyover method and ± 1 dB for the external speaker test method. It is reasonable to assume that the acoustical consultants performing the testing would have the best knowledge on this subject, and that the managers are somewhat optimistic about the accuracy and reliability of both testing methods. The flyover methods allows for statistical sampling and computation of confidence intervals due to sampling multiple tests, whereas the external speaker does not since only a single test is typically made.

Only two acoustical consultants addressed the interior test method, both from the same company (and the only company employing the method). Since no standards exist to address the method and the procedure is proprietary and unpublished, there is a degree of skepticism about the method. The firm employing the method has touted it to the non-technical clients and tends to defend it vigorously. The ± 1 dB confidence interval given below, with all results, is solely from the method users and proponents and not the acoustical consulting community. Specific responses below.

	<u>Flyover</u>	<u>External Speaker</u>	<u>Interior Speaker</u>	<u>Other</u>
Acousticals	±2	±4	±1	±5
Managers	±0	±1	±1	±0

	<u>Program Manager</u>	<u>Acoustical Consultant</u>
The aircraft flyover method.	0	2
The external loudspeaker method?	1	4
The indoor-outdoor loudspeaker method?	1	1
Other	0	5
Totals	2	12

52. When possible, which method of acoustical testing do you recommend?

The test method favored by acoustical consultants, airports and managers is summarized below. The reasons for favoring one test method over another apparently do not reflect the accuracy and reliability of results from the question above. Speculation as to why one method may be favored from each of the parties includes ease of testing, cost of testing, disruption to neighbors, and/or support for current program(s).

It is not clear why the airport or managers should be involved in selection of acoustical methods. The results of the testing are the sole responsibility of the acoustical consultant who should, therefore, have sole responsibility for selecting and executing the acoustical testing.

	<u>Program Manager</u>	<u>Acoustical Consultant</u>
The aircraft flyover method.	9	3
The external loudspeaker method?	16	5
The indoor-outdoor loudspeaker method?	4	2
Other	0	2
Totals	29	12

	<u>Flyover</u>	<u>External Speaker</u>	<u>Interior Speaker</u>	<u>Other</u>
Acousticals	3	5	2	2
Airport	1	0	0	0
Managers	9	16	4	0

53. For what percent of your past projects have your testing recommendations been accepted by the program?

Acoustical consultants were almost unanimous in having their testing recommendations accepted by the program. It would appear that have only been there a few isolated instances

where they were not accepted. It would be interesting to learn the basis for such non-acceptance.

	Program Manager	Acoustical Consultant
100%	17	7
95%	0	1
90%	0	1
50%	0	1
25%	1	0
10%	4	0
5%	0	0
Totals	22	10

54. Regarding the AIP Handbook criteria for a maximum interior DNL of 45dB and a minimum interior improvement of 5dB, what percentage of tested homes (all rooms averaged) met both criteria:

Acoustical consultants, airports and managers all showed similar results where 90 to 100 percent of homes met both FAA criteria. There are relatively few instances where substandard performance was reported. Since the acoustical consultants make the measurements and report the results in the final project report, the only source of this information for airports and managers is those reports. So the later are not reading the reports, not recalling it correctly or relying on some other source of information.

The table below gives the results.

	<u>Below 60%</u>	<u>60% - 70%</u>	<u>70% - 80%</u>	<u>80% - 90%</u>	<u>90% - 100%</u>
Acousticals	0	0	2	2	7
Airports	1	0	0	1	18
Managers	1	0	4	1	18

	Program Manager	Airport Official	Acoustical Consultant
Below 60%	1	1	0
60% to 70%	0	0	0
70% to 80%	4	0	2
80% to 90%	1	1	2
90% to 100%	18	18	7
Totals			

55. In your total experience with RSIP's, about what percentage of rooms fail to meet one or both criteria?

92% of Program Managers and 91% of Acoustical Consultants indicated that between zero and twenty percent of homes fail to meet both FAA criteria.

	Program Manager	Acoustical Consultant
0% to 20%	22	10
21% to 40%	1	0
41% to 60%	1	0
61% to 80%	0	1
81% to 100%	0	0
Totals	24	11

56. In your experience with RSIP's, about what percent of homes have one or more rooms that fail to meet one or both criteria?

92% of Program Managers and 82% of Acoustical Consultants indicated that between zero and twenty percent of rooms fail to meet both FAA criteria.

	Program Manager	Acoustical Consultant
0% to 20%	21	9
21% to 40%	0	1
41% to 60%	1	0
61% to 80%	1	1
81% to 100%	0	0
Totals	23	11

57. Do you believe that the AIP Handbook criteria should be applied:

To each room tested in the program

As an average for each home tested in the program

As an average of all tests conducted on all homes in the program

Respondents gave varying responses to how the FAA criteria should be applied to RSIP's, though 'as an average for the home' seems to be the strongest recommendation. The table below summarizes the results.

It should be noted that the objectives for compliance with the FAA criteria may not always be possible to meet in every case without excessive sound insulation such as modification of walls. Therefore, a potential conflict may exist between what the program seeks to achieve and what is technically possible.

	Program Manager	Airport Official	Acoustical Consultant
To each room tested in the program?	5	5	2
As an average for each home tested in the program?	15	14	4
As an average of all tests conducted on all homes in the program?	7	6	5
Totals	27	25	11

	<u>Each room tested</u>	<u>Average for home</u>	<u>Average: all homes</u>
Acousticals	2 / 18%	4 / 36%	5 / 45%
Airports	5 / 21%	13 / 54%	6 / 25%
Managers	5 / 19%	15 / 56%	7 / 26%

58. Are you able to predict prior to pre-construction acoustical testing whether a home is likely to meet both criteria after treatment?

Acoustical consultants indicated that they may reliably predict whether a home will comply with the FAA criteria prior to design and retrofit. One technical uncertainty in pre-design and construction prediction is the extent of flanking, or acoustical leaks from poor seals. Flanking paths may be difficult to recognize prior to construction and may therefore affect the degree of NLR improvement after retrofit. Specific responses below.

Acousticals: Generally – 82%; Occasionally – 18%; Never – 0%.

	Program Manager	Acoustical Consultant
Generally	2	9
Occasionally	0	2
Never	0	0
Totals	2	11

59. Should homes be disqualified from the program if they are unlikely to meet both criteria after retrofit?

About eighty percent of acoustical consultants and managers favored allowing homes to remain in the program even though they would likely fail one or both FAA criteria. Airports, on the other hand, generally declined to respond to the question, but those that did felt the same.

It would have been interesting to also get the opinion of the FAA whose criteria is the subject of the question. Motivation for keeping such homes in the project may be to minimize potential dissatisfaction from homeowners eliminated from the program. Specific responses below.

	Yes	No
Acousticals	2 / 18%	9 / 82%
Airports	7 / 29%	17 / 71%
Managers	3 / 12%	23 / 88%

	Program Manager	Airport Official	Acoustical Consultant
Yes	3	7	2
No	23	18	9
Totals	26	25	11

60. Under what conditions are homes most likely to fail?

More than a third of the acoustical consultants found that good existing construction did not permit a full 5-dB NLR improvement under the retrofit program. Secondly, about one fifth each was due to few windows and poor construction not enabling noise reduction to the 45 DNL level. The managers' responses were similar. This serves to point out the dichotomy in achieving both FAA criteria: if it's too good to start you'll never get the $\Delta NLR \geq 5dB$; if it's too bad to start you'll never get the $DNL \leq 45dB$. Below is the breakdown.

	Good existing	Few windows	Poor existing	Poor constr	Other
Acousticals	10 / 20%	5 / 10%	3 / 6%	6 / 12%	3 / 6%
Managers	16 / 33%	10 / 20%	7 / 14%	16 / 33%	0

	Program Manager	Acoustical Consultant
Very good pre-treatment exterior envelope	16	10
Few windows and no program provision for improvement of exterior envelope	10	5
Poor pre-treatment exterior envelope and no program provision for improvement of exterior envelope	7	3
Poor construction, poor building materials and/or poor maintenance even with program provision for improvement of exterior envelope	16	6
Other	0	3
Totals	49	27

61. Does the FAA provide comments on your final RSIP reports?

The acoustical consultants note that the FAA seldom reviews the reports. This, of course, varies among the individual FAA Airport District offices conducting the review. Manager also generally noted that reports are seldom viewed, though they report about twice the reviews of the acoustical consultants. This would indicate that the managers may not be advising the acoustical consultants of the reviews or that they have a more optimistic view of the review process. Below is the breakdown.

	<u>Always</u>	<u>Generally</u>	<u>Occasionally</u>	<u>Never</u>
Acousticals	0	1 / 9%	2 / 18%	8 / 73%
Managers	1 / 5%	3 / 14%	9 / 43%	8 / 38%

	<u>Program Manager</u>	<u>Airport Official</u>	<u>Acoustical Consultant</u>
<u>Always</u>	1	0	0
<u>Generally</u>	3	0	1
<u>Occasionally</u>	9	0	2
<u>Never</u>	8	1	8
Totals	21	1	11

62. Do project sponsors provide input on approval of building materials or selection of homes for testing?

Nearly half of both acoustical consultants and managers reported that project sponsors generally provide input on approval of building materials or selection of homes. Below is the breakdown.

	<u>Always</u>	<u>Generally</u>	<u>Occasionally</u>	<u>Never</u>
Acousticals	2 / 18%	5 / 45%	4 / 36%	0
Managers	3 / 11%	11 / 41%	7 / 26%	6 / 22%

	<u>Program Manager</u>	<u>Airport Official</u>	<u>Acoustical Consultant</u>
<u>Always</u>	3	0	2
<u>Generally</u>	11	0	5
<u>Occasionally</u>	7	1	4
<u>Never</u>	6	0	0
Totals	27	1	11

63. Should the OITC metric replace STC in future material specifications for RSIP's?

Slightly more than a third of acoustical consultants and managers believe that OITC should replace STC in future material specification. One issue with replacement of the current STC

metric is that it would require new testing for all materials, including those long-accepted and in use in the programs. Below is the breakdown.

	<u>Yes</u>	<u>No</u>
Acousticals	4 / 36%	7 / 64%
Managers	8 / 36%	14 / 64%

	Program Manager	Airport Official	Acoustical Consultant
Yes	8	0	4
No	14	1	7
Totals	22	1	11

64. How often should products be retested for acoustical performance?

About one third of acoustical consultants and contractors recommend new testing every ten years; two thirds recommend new testing for design and/or manufacturing changes. Manufacturers were nearly split 50-50 on retesting on a ten-year cycle and only for changes, with one recommending no retesting requirement. One consideration is the identification and extent of design or manufacturing changes; the manufacturers paying and waiting for the testing may consider some changes too small to warrant retesting while others may believe that it is warranted. Below is the breakdown.

General consensus between Acousticals, Contractors:

Every 10 years ~30%; only w/ design or manufacturing changes ~70%

Manufacturers:

Every 10 years 43%; only w/ design or manufacturing changes 43%; Never 14%

Project Managers:

Every 10 years 38%; only w/ design or manufacturing changes 58%; Never 4%

	Program Manager	Airport Official	Contractors	Acoustical Consultant	Manufacturer
Every ten years with or without any change in the product's design	9	1	2	3	6
Only when design or manufacturing changes	14	0	5	7	6
Retesting is not required because it is not as important as field performance based on modeled results	1	0	0	0	2
Totals	24	1	7	10	14

65. Rate acoustical consultant qualifications in order of importance (1 = highest; 9 = lowest).

Acoustical consultants were asked to rank their own qualifications in order of importance, from 1 to 9. Below is a summary of all results from averaging the numerical rating by each acoustical consultant for each qualification, in their rank order. SIP experience is clearly the favored qualification. There was considerable variation in results for several questions, particularly those involving PE licensing and INCE certification where the answer may be expected to be heavily biased by whether or not the respondent holds the particular credential.

SIP experience:	AVG = 1.7
References:	AVG = 2.7
Proposal:	AVG = 3.9
Part 150 experience:	AVG = 5.8
PE Registration:	AVG = 5.6
INCE Certification:	AVG = 6.4
Paper/pres/mtgs:	AVG = 7.2
Minority/EEO:	AVG = 7.5

Experience with other SIP's

Ranking	Responses	Percentage	Graph
1	35	42.1%	
2	9	10.8%	
3	6	7.2%	
4	3	3.6%	
5	3	3.6%	
6	2	2.4%	
7	0	0.0%	
8	0	0.0%	
9	0	0.0%	

References from other Airports and/or colleagues

Ranking	Responses	Percentage	Graph
1	6	7.2%	
2	21	25.3%	
3	13	15.6%	
4	8	9.6%	
5	6	7.2%	
6	0	0.0%	
7	2	2.4%	
8	1	1.2%	
9	1	1.2%	

Proposal

Ranking	Responses	Percentage	Graph
1	6	7.2%	
2	9	10.8%	
3	6	7.2%	
4	14	16.8%	
5	6	7.2%	
6	5	6.0%	
7	6	7.2%	
8	4	4.8%	
9	2	2.4%	

Experience with this Airport's Part 150 program

Ranking	Responses	Percentage	Graph
1	6	7.2%	
2	13	15.6%	
3	15	18.0%	
4	4	4.8%	
5	4	4.8%	
6	2	2.4%	
7	5	6.0%	
8	6	7.2%	
9	3	3.6%	

Professional Engineer registration

Ranking	Responses	Percentage	Graph
1	4	4.8%	
2	2	2.4%	
3	5	6.0%	
4	11	13.2%	
5	8	9.6%	
6	10	12.0%	
7	8	9.6%	
8	7	8.4%	
9	3	3.6%	

Board Certification from the Institute of Noise Control Engineering

Ranking	Responses	Percentage	Graph
1	0	0.0%	
2	1	1.2%	
3	3	3.6%	
4	3	3.6%	
5	10	12.0%	
6	12	14.4%	
7	7	8.4%	
8	12	14.4%	
9	10	12.0%	

Papers and/or presentations at meetings and conferences

Ranking	Responses	Percentage	Graph
1	0	0.0%	
2	1	1.2%	
3	0	0.0%	
4	0	0.0%	
5	5	6.0%	
6	5	6.0%	
7	10	12.0%	
8	10	12.0%	
9	27	32.5%	

Thoroughness in acoustical assessment and specification

Ranking	Responses	Percentage	Graph
1	4	4.8%	
2	17	20.4%	
3	12	14.4%	
4	15	18.0%	
5	4	4.8%	
6	5	6.0%	
7	0	0.0%	

Communication skills (oral and written) in explaining rationale for decisions

Ranking	Responses	Percentage	Graph
1	1	1.2%	
2	9	10.8%	
3	6	7.2%	
4	7	8.4%	
5	12	14.4%	
6	12	14.4%	
7	10	12.0%	

Ability to explain rationale for project mandates, decisions and standards

Ranking	Responses	Percentage	Graph
1	1	1.2%	
2	3	3.6%	
3	15	18.0%	
4	9	10.8%	
5	18	21.6%	
6	6	7.2%	
7	5	6.0%	

Ability to modify noise reduction criteria to accommodate other project needs

Ranking	Responses	Percentage	Graph
1	0	0.0%	
2	7	8.4%	
3	5	6.0%	
4	6	7.2%	
5	8	9.6%	
6	12	14.4%	
7	19	22.8%	

Guidance in the assessment of building materials and systems

Ranking	Responses	Percentage	Graph
1	1	1.2%	
2	5	6.0%	
3	4	4.8%	
4	13	15.6%	
5	9	10.8%	
6	11	13.2%	
7	14	16.8%	

67. Should the acoustical consultant? (Select all that apply)

- Have absolute approval and disapproval authority over all project designs, materials and systems
- Modify acoustical criteria in order to accommodate the historical, cost and/or aesthetic objectives of the program
- Select homes for pre and post-construction acoustical testing
- Have the authority to eliminate homes from the program that may not meet both
- AIP Handbook criteria (i.e., maximum interior 45 DNL and 5dB NLR

This question on acoustical consultant responsibility and authority presented some interesting and unexpected results. The issue is whether the acoustical consultants have absolute QA/QC responsibility for compliance with FAA criteria, or whether they are one of several important inputs in the project design. It appears that the airports and managers believe that the acoustical consultants should have more responsibility than the consultants do. Perhaps the acoustical consultants are uncomfortable with potential conflicts within the project team, or don't want full responsibility for project success or shortfall with meeting the FAA criteria. This may be a reflection of the general passive nature of engineers. Below are the specific results.

	Acousticals	Airport	Managers
Absolute approval: designs, materials	2	5	7
Modify criteria	8	12	12
Select homes for acoustical testing	7	14	15
Eliminate homes	4	3	2
Acousticals methods & reporting	4	4	5

	Program Manager	Airport Official	Acoustical Consultant
Have absolute approval and disapproval authority over all project designs, materials and systems	7	5	2
Modify acoustical criteria in order to accommodate the historical, cost and/or aesthetic objectives of the program	12	12	8
Select homes for pre and post-construction acoustical testing	15	14	7
Have the authority to eliminate homes from the program that may not meet both AIP Handbook criteria (i.e., maximum interior 45 DNL and 5 dB NLR improvement)	2	3	4
Have sole authority over acoustical testing methods and reporting	5	4	4
Totals	41	38	25

68. Do you believe that the acoustical consultant should be involved in the following project activities? (Select that apply)

- Contractor qual/select
- Material selection
- Material inspection

- Modeling of design options
- Pre-construction inspection
- Post-construction inspection
- Community outreach
- Other

Acoustical consultants were pretty unanimous on involvement with material selection, material inspection, modeling and community outreach; but only about 50 percent were committed to pre and post-construction inspection. Airports and Managers were pretty unanimous in recommending acoustical consultant involvement in all aspects of the project. Below are the specific results.

	<u>Acousticals</u>	<u>Airport</u>	<u>Managers</u>
Contractor qual/select	1	6	6
Material selection	9	19	23
Material inspection	8	13	10
Modeling of design options	11	14	20
Pre-construction inspection	6	16	12
Post-construction inspection	5	14	11
Community outreach	10	15	15
Other	4	4	3

	<u>Program Manager</u>	<u>Airport Official</u>	<u>Acoustical Consultant</u>	<u>FAA</u>	<u>Manufacturer</u>
Contractor qualification and selection	6	6	1		
Material selection	23	19	9		
Material inspection	10	13	8		
Modeling of design options	20	14	11		
Pre-construction home inspection	12	16	6		
Post-construction home inspection	11	14	5		
Community outreach and/or homeowner meetings	15	15	10		
Other activities	3	4	4		
Totals	100	101	54		
Acoustical Consultant Other:	RFI responses (as applicable)				
	Pre/post inspection on a percentage of homes				
	Policies & Procedures Manual				
Airport Official	Work with inspectors on finding acoustical deficiencies				
	construction oversight				
	pre and post interior noise tests				
	specification and bid review				
	Review of design				
Program Manager	homeowner plan review				
	Be available and on site during construction.				
	FAA funding/good neighbor treatment policy				

69. In your experience, is the acoustical consultant doing a good job of insuring that the FAA noise reduction criteria are met?

The acoustical consultants themselves and managers believe that they are doing a good job of insuring compliance with the FAA criteria. The airports and FAA are only slightly more skeptical. Below are the specific results.

	Yes	No
Acousticals	11 / 100%	0
Airports	24 / 96%	1 / 4%
FAA	10 / 83%	2 / 17%
Managers	6 / 100%	0

	Program Manager	Airport Official	Acoustical Consultant	FAA
Generally	26	24	11	10
Occasionally	0	1	0	2
Never	0	0	0	0
Totals	26	25	11	12

70. Does the acoustical consultant, as the quality control representative to the FAA, have a conflict of interest in being a member of the program team?

Only about one in six acoustical consultants identified a potential conflict of interest with FAA QA/QC responsibilities and being a member of the project team. This would seem to indicate that only a small percentage of programs encounter such conflicts. Below are the specific results.

17% -- yes
 75% -- no
 8% -- no response

	Program Manager	Airport Official	Acoustical Consultant	FAA
Yes	3	1	2	1
No	23	23	9	11
Totals	26	24	11	12

72. In your experience, if conflicts arise among program participants over acoustical issues they are usually resolved:

- By a majority consensus of the members of the program team
- By the FAA
- By the acoustical consultant
- By the program sponsor

- By the program manager / design consultant

Acoustical consultants see most decisions split between themselves and the sponsor with some input from the majority and the manager. Airports see themselves as the primary acoustical decision makers with major input from the manager and little from the acoustical consultant. Likewise the managers see themselves as the major decision makers with little regard for technical input from the acoustical consultants. Below are the specific results.

	<u>Acousticals</u>	<u>Airport</u>	<u>Managers</u>
Team majority	3	3	5
FAA	0	1	1
Acoustical consultant	4	1	6
Airports/Sponsors	5	15	6
Manager/ Design consultant	3	11	20

	<u>Program Manager</u>	<u>Airport Official</u>	<u>Acoustical Consultant</u>
By a majority consensus of the members of the program team	5	3	3
By the FAA	1	1	0
By the acoustical consultant?	6	1	4
By the program sponsor?	6	15	5
By the project manager / design consultant	20	11	3
Totals	38	31	15

74. Criteria for historic structures?

Airport Officials and Managers are nearly equally unanimous on eligibility if listed on national, state or local registers.

82. Are acoustical products for historic properties readily available?

Approximately half of acoustical consultants, contractors and managers believe that acoustical products for historic properties readily available; three fourths of the airports believe they are readily available. This appears to depend on the specific program and specific products required. Below are the specific results.

	<u>Yes</u>	<u>No</u>
Acousticals	4 / 40%	6 / 60%
Airports	11 / 73%	4 / 27%
Contractor	4 / 57%	3 / 43%
Managers	8 / 44%	10 / 56%

CHAPTER 3

DATA ANALYSIS — COMMUNITY OUTREACH

3.1 ANALYSIS

The following sections will describe the results of the survey that are applicable to Community Outreach.

3.1.1 Program Participants

Before you begin community outreach efforts for a sound insulation program, each program needs to know who they are reaching out to in order to determine the methods that will produce the best results. Therefore, the ACRP 02-24 research team believes, as a general rule of thumb, it is a good idea to identify the ethnic and economic make-up of the affected noise impacted communities. Questions #85 and #86 were included in the survey to accomplish this task.

With respect to question #85, the majority of respondents (70%) indicated the ethnic make-up of their noise impacted neighborhoods was White, followed closely by Hispanic and then African American.

85. The ethnic make-up of your noise-impacted neighborhoods is predominately:
(Select all that apply)

Result	Responses	Percentage	Graph
White	39	70%	
African American	20	36%	
Hispanic	26	46%	
Native American	4	7%	
Asian	9	16%	
Other, please specify	1	2%	

With respect to question #86, the majority of respondents indicated the average income of families living within their noise impacted neighborhoods ranges from middle class to working class to working poor or impoverished. Working class received the most votes (71%).

86. The average income of families living within the noise-impacted neighborhoods is predominately: *Please enter just numbers equaling 100%

Result	Responses	Percentage	Graph
% Wealthy	19	34%	
% Upper middle class	24	43%	
% Middle class	33	59%	
% Working Class	40	71%	
% Working Poor or Impoverished	24	43%	

3.1.2 Collateral

The ACRP 02-24 research team was interested in learning about the types of collateral sound insulation programs produce. To this end, questions #87, #88, #89, #90, #91, #95, and #104 were included in the survey.

Question #87 asks respondents if their program services a multi-lingual community. Sixty-four percent of Airport respondents and 68% of Program Managers said they do service a multi-lingual community.

Question #88 only applies to respondents who answered yes to question #87. The results from question #88 indicate that a significant number of programs develop multi-lingual collateral materials (32%), offer translation services at public/community meetings (28%), and provide a bi-lingual homeowner representative (30%). Additionally, it should be noted that while it's an insignificant number, (just 5%), there are programs that even go a step further to service multi-lingual communities by providing website information in a language other than English.

88. If “Yes”, do you provide program information in a language other than English? (Select all that apply)

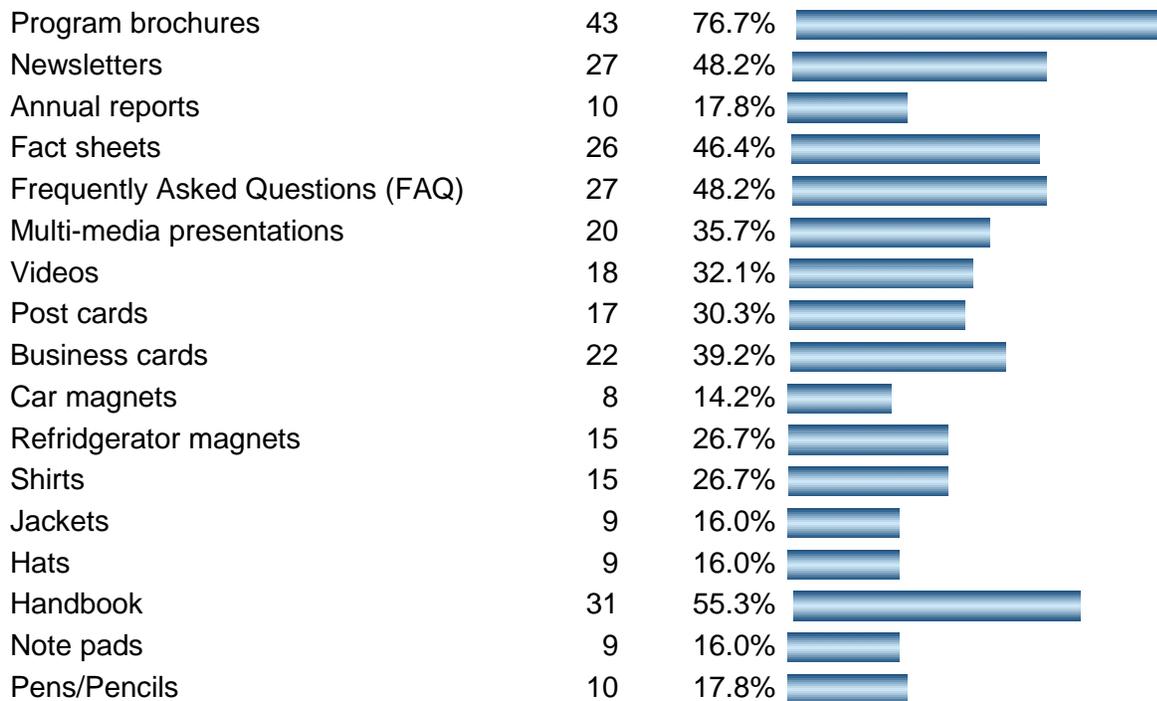
Result	Responses	Percentage	Graph
Printed materials developed in a language other than English	18	32.0%	
Website information created in a language other than English	3	5.0%	
Translation services are provided at community meetings	16	28%	
Homeowner Liaisons are bi-lingual and can communicate in a language other than English	17	30%	
Other	3	5%	

The responses to questions #87 and #88 indicate that a majority of sound insulation programs are sensitive to language issues/barriers and, as a result, offer multi-lingual collateral materials. It should be noted that this is contrary to the participant data collected in question #85, which indicated that Whites make up 39% of the ethnic make-up in noise impacted communities. It can be assumed from the answers received, that the need for multi-lingual collateral materials is not a policy issue, but should be determined on a project-by-project basis.

Question #95 asks respondents to list what collateral materials were developed for the program. The collateral items that were selected most by respondents (in order of most responses) include letters, program brochures, handbooks, fact sheets, newsletters, frequently asked questions. From the data collected, it appears that Program Managers rate the smaller items including car & refrigerator magnets, shirts and jackets, higher in importance than Airport Officials, but Airport Officials still produce these items for most programs. It can be assumed from the answers received, that most sound insulation programs create and distribute a variety of collateral items. It doesn't appear that this should be a policy issue. Rather, it should be determined on a project-by-project basis.

95. What type of collateral materials were developed for the program? (Select all that apply)

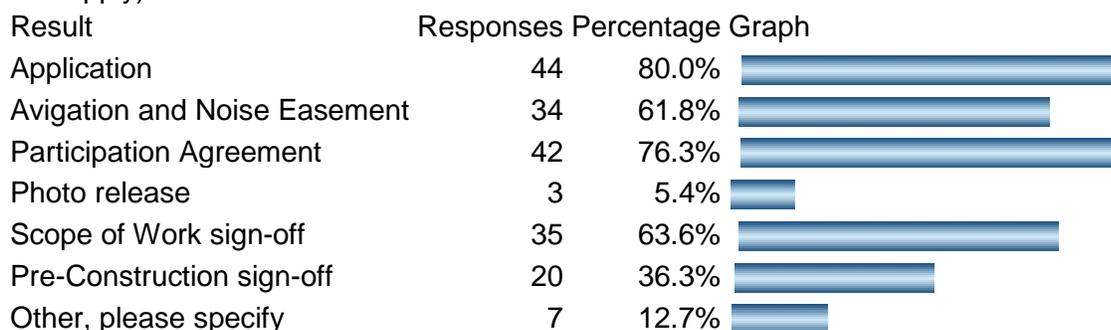
Result	Responses	Percentage	Graph
Letters	42	75.0%	



Question #104 addresses required program documentation. The ACRP 02-24 research team was interested in learning what documents sound insulation programs require that participants complete prior to participation. As assumed by our team, the top 4 items that received the most votes (in order of votes received) were:

1. Application
2. Participation Agreement
3. Scope of Work sign-off
4. Avigation and Noise Easement

104. What documents were stakeholders required to complete prior to participation? (Select all that apply)



Question #89 asks respondents to indicate if they created a program website. More than 67% of respondents (both Airport Officials and Program Managers) said they provide a program website. Not every program provides a website so this may not be a matter of policy, rather it should be decided on a project-by- project basis.

Question #90 asks respondents to list what information they provided on the website. Of those who provide a website, the items that received the most votes include:

- Program overview/information – 55%
- Boundary Map – 52%
- Contact Information – 29%
- General noise information – 43%

What was revealing to our team is that Program Managers placed a higher importance on including program updates (46.4%) and community information (42.8%) on the website than Airport Officials – (program updates - 28.5%) and (community information -14.2%). This is interesting to note because there appears to be a slight disconnect between Program Managers and Airport Officials on communication with homeowners via the website, how often to communicate and what to communicate to them, etc.

Airport Official Response:

90. What information was included on the website? (Select all that apply)

Result	Responses	Percentage	Graph
General noise information	12	42.8%	
Program information/program overview	16	57.1%	
Program boundary map	14	50.0%	
Abatement procedures	10	35.7%	
Program updates	8	28.5%	
Community information	4	14.2%	
Links to view/download developed program collateral i.e., program brochure, newsletter, annual reports, fact sheets, frequently asked questions, etc.	6	21.4%	
Program-related photographs	7	25.0%	
Contact information	12	42.8%	
Links to other related sites	4	14.2%	
Other	0	0.0%	

Program Manager Response:

90. What information was included on the website? (Select all that apply)

Result	Responses	Percentage	Graph
General noise information	12	42.8%	
Program information/program overview	15	53.5%	
Program boundary map	15	53.5%	
Abatement procedures	8	28.5%	
Program updates	13	46.4%	
Community information	12	42.8%	
Links to view/download developed program collateral i.e., program brochure, newsletter, annual reports, fact sheets, frequently asked questions, etc.	10	35.7%	
Program-related photographs	8	28.5%	
Contact information	14	50.0%	
Links to other related sites	4	14.2%	
Other	0	0.0%	

Question #91 asks respondents to state which elements of the website they would want to improve or see differently. The answers were revealing to our team because it indicated that Airport Officials would like to see more improvements to their current website than Program Managers. The answers divided by each group are below:

Airport Official Response:

91. Which elements of the website would you do differently or want to see improve? Please specify

We update on a quarterly basis and include information in our Noise newsletter. We are satisfied with our outreach efforts.

Testimonials from program participants

Would like to include start to finish process with timeline information.

Homeowner testimonials added

More information on insulation boundaries

Site location in relation to Noise Monitor reporting (i.e. single noise events) and program eligible contours

Program Manager Response:

91. Which elements of the website would you do differently or want to see improve? Please specify

Result

Website was part of Airport's website. Functioned all right.

Updates

Pictures of the products used in the program as well as the product literature

Would like to add a general noise information page

None

Nothing Yet.

3.1.3 Communication

Communication is an important element in the outreach process. The ACRP 02-24 research team was interested in learning how sound insulation programs communicate with participants. Questions #92, #93, #94, #97 and #105 address the issue of communication.

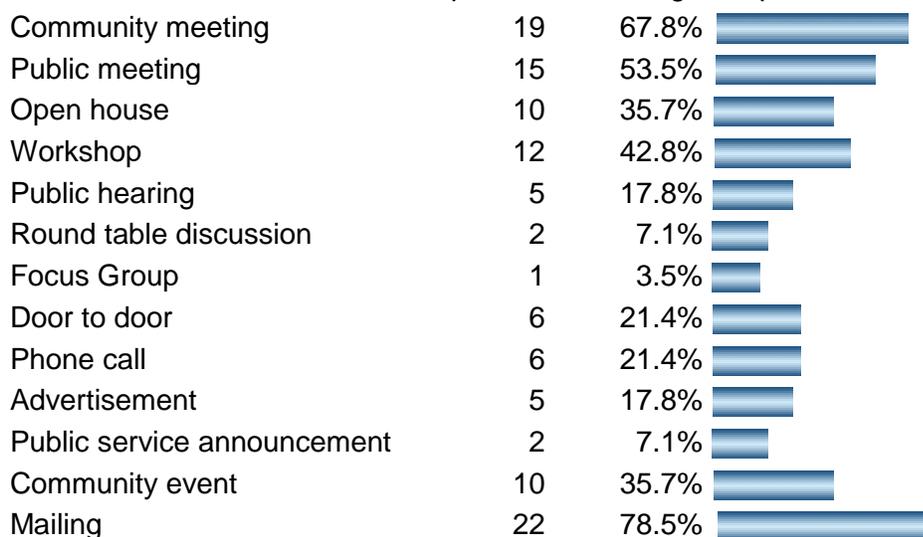
Question #92 asks how the public was notified of the program's existence. The response from Airport Officials and Program Managers was varied but the majority of respondents selected mailings as their first preference followed closely by community and public meetings. The answers indicate that a variety of outreach methods are employed with respect to reaching potential participants. What was of interest to the team is that Airport Officials ranked workshops (42.8%) and community events (35.7%) much higher than Program Managers did – workshops (32.1%) and community events (17.8%).

Airport Official response:

92. How was the public notified of the program's existence? (Select all that apply)

Result

Responses Percentage Graph

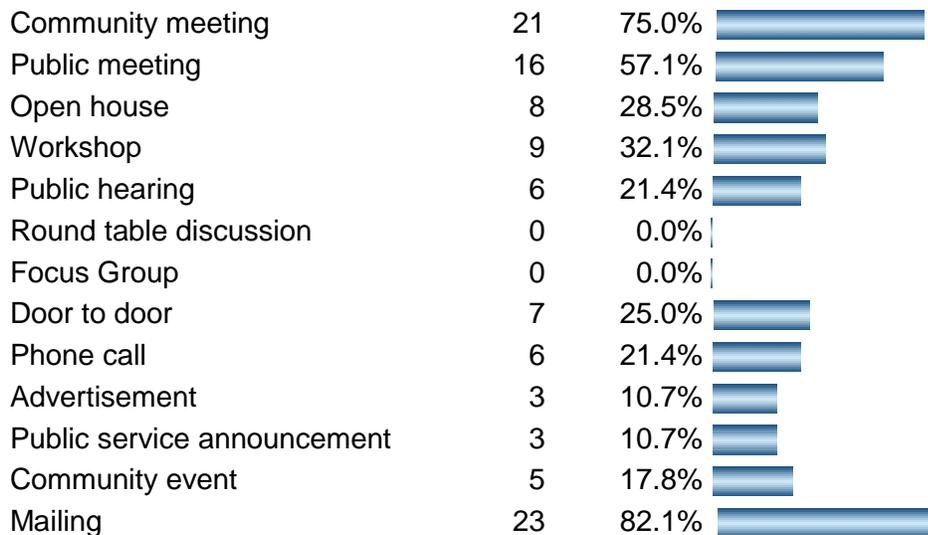


Program Manager response:

92. How was the public notified of the program's existence? (Select all that apply)

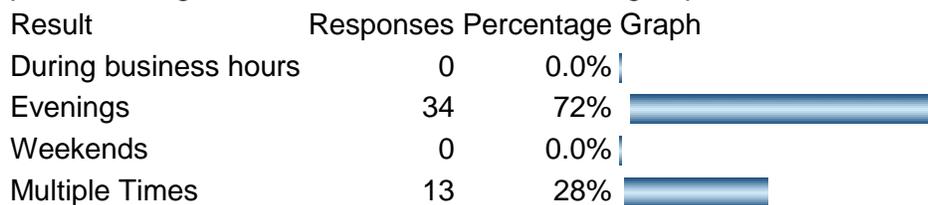
Result

Responses Percentage Graph



Question #93 addresses community and public meetings. More than 70% of respondents indicated they hold community/public meetings either in the evenings, which indicates that sound insulation programs are sensitive to the schedules of potential participants.

93. If the public was notified of the program via community meeting, open house, workshop, public hearing, round table discussion, or focus group, when were these meetings held?



Question #97 asked if the sound insulation program sponsored some sort of community service or fun event within the program boundary. Of the responses provided, only 2 individuals answered no. This is revealing because it indicates that many sound insulation programs place some sort of priority not only on community outreach but community service. This is not necessarily a policy issue; rather it just illustrates that (on a case by case basis) sound insulation programs should consider the possibility of hosting community events in order to publicize their program and/or demonstrate their level of service and commitment.

Question #105 asks respondents to check how homeowner liaisons communicated with program participants. An overwhelming majority indicated phone calls (74.5%) was the primary communication tool followed closely by face to face communication (65.4%). While this is not surprising, a significant number (45.4%) of respondents indicated that they communicate to program participants via email. This illustrates the growing need for sound insulation programs to keep pace with technology in an effort to improve communication.

105. How did Homeowner Liasons communicate with program participants? (Select all that apply)

Result	Responses	Percentage	Graph
Phone call	41	74.5%	
Email	25	45.4%	
Fax	7	12.7%	
Text	1	1.8%	
Social media site notification	1	1.8%	
Face to face communication	36	65.4%	
Other, please specify	9	16.3%	

3.1.4 Success/Satisfaction

Satisfaction rates are extremely important to most sound insulation programs. Success is achieved if program participants remain happy and involved throughout the duration of the program, from initial outreach efforts through construction completion. The ACRP 02-24 research team was interested in learning about the success/satisfaction rates of sound insulation programs. Questions #98, #99, #100, #101, #106, #107, #108, #109 and #112 address the issue of satisfaction.

Question #98 asks if public perception of your program is positive. More than 80% of respondents said public perception of their program is mostly favorable to wholly favorable.

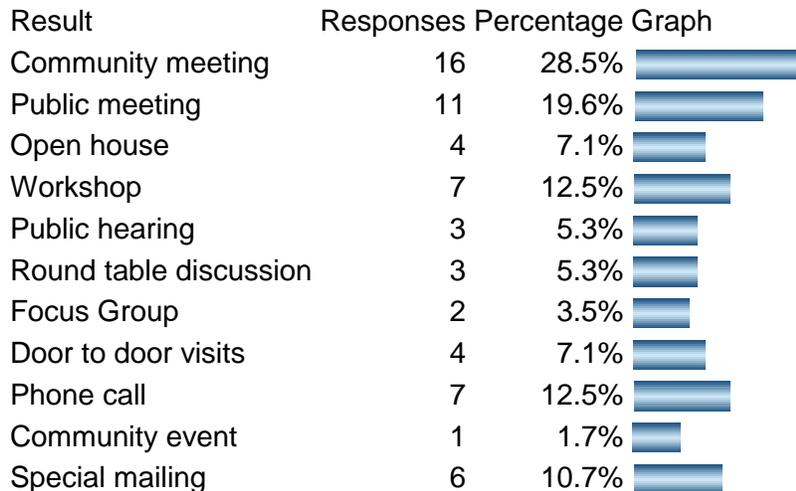
98. Is public perception of your program positive?

Result	Responses	Percentage	Graph
Yes, wholly	15	35%	
Yes, mostly	30	59%	
50/50	3	6%	
No	0	0.0%	

Questions #99-#101 address the issue of community groups. Both Program Managers and Airport Officials agree that in most locations there are active community groups. A majority of Program Managers and Airport Officials (40%) said that most of the community groups are favorable of their programs. A slightly smaller number (31%) reported that the community groups are split, ½ favorable and ½ unfavorable of program. Program Managers and Airport officials seem to disagree when asked if those groups who are *not* favorable of the program are vocal about it. Airport officials seem to think they aren't vocal but a majority of program managers say they are, which indicates there might be a slight disconnect in information.

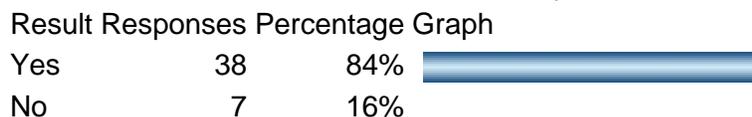
Question #101 asks if people are *not* in favor of the program, what steps are taken to remedy the situation. Most respondents indicated that community meetings (28.5%) and public meetings (19.6%) are the best routes to take, followed closely by a special mailing, workshop and then an open house.

101. If they are not in favor of the program, what steps have you taken to remedy the situation? (Select all that apply)



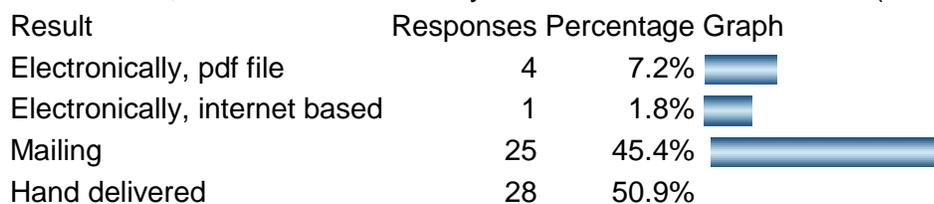
Questions #106-#107 discuss Satisfaction Surveys. Based on the answers, 69% of respondents utilize a Satisfaction Survey.

106. Were Homeowner Satisfaction Surveys created?



The answers to question #107 are revealing to the research team. While technology is embraced within other parts of the outreach process, most of the respondents indicated that Satisfaction Surveys are usually hand delivered. This indicates that sometimes, face to face communication is more appropriate.

107. If “Yes”, how were those surveys distributed to homeowners? (Select all that apply)



Over half of the respondents said that satisfaction survey respondents indicated that the goals and the steps of the program were clearly explained.

Of great interest to the research team is question #109: ‘In your opinion, what major factors contributed to successful stakeholder involvement’. The majority of respondents listed *availability of good contractors* (58.1%) as the number one contributing factor to successful stakeholder involvement followed in order by:

- Encouraging homeowner interaction
- Follow-up on warranty issues
- Consistent funding
- Good range of product selection
- Well targeted collateral materials

- Improved bidding process

109. In your opinion, what major program factors contributed to successful stakeholder involvement? (Select all that apply)

Result	Responses	Percentage	Graph
Well targeted collateral materials	18	32.7%	
Encouraging homeowner interaction	26	47.2%	
Improved bidding process	8	14.5%	
Availability of good contractors	32	58.1%	
Consistent funding	25	45.4%	
Good range of product selections	22	40.0%	
Follow-up on warranty issues	29	52.7%	

Question #112 asks if you would be willing to provide a sample of a Satisfaction Survey and/or results. An overwhelming majority of program managers (46.4%) indicated they would be willing to do this. Response from Airport Officials however was mixed.

Response from Program Managers:

112. Are you willing to provide a sample of a satisfaction survey and/or results? This will be kept confidential and will only be used for comparison purposes and not for distribution.

Result	Responses	Percentage	Graph
Yes	13	76%	
No	4	24%	

Response from Airport Officials:

112. Are you willing to provide a sample of a satisfaction survey and/or results? This will be kept confidential and will only be used for comparison purposes and not for distribution.

Result	Responses	Percentage	Graph
Yes	9	47%	
No	10	53%	

Question #110 asked what elements of your program do you deem key to program success. Both Airport Officials and Program Managers overwhelmingly referred to the outreach process, including consistent, transparent communication, more informational meetings with groups of homeowners, more one on one meetings with individual homeowners, assigning a direct liaison with each homeowner, communication with community leaders about program and participation, and bi-lingual materials and team members. The second most noted comment was an experienced, dedicated program consultant. Other elements that were mentioned included good products, a good design process and weekly construction progress meetings to address issues.

Response from Airport Officials:

110. Which elements of your program work particularly well and have been key to its success?
(Please List)

- Result
- Consistency with consultants, contractors and program staff. The public know who to call and who to expect when it's time to participate in the program.
- Community Outreach and defined goals based on front end technical and regulatory assessment of the target areas.
- One-on-one meetings to explain the program. Taking the extra effort keep the community leaders in the loop as to who was participating. Immediate (24-hour) follow up to problems and quick response time to homeowner questions.
- Program transparency, bilingual capabilities, steady funding, architectural/engineering team, dedicated program staff.
- Standardized program steps and communication with homeowner on what to expect. Weekly progress meetings during construction to address any issues/problems and not let them linger.
- Informational meetings with entire groups of homeowners. One-on-one meetings with homeowners to review their floor plans and expectations. Availability of staff for questions throughout the process.
- Property representatives were direct liaison with owners. Step-by-step guidebook given to owners. Lots of communication about process
- Experience and expertise of consultants and construction contractors.
- Air conditioning and electrical panel upgrades
- Good Products
- having a good program consultant
- The design process - meeting with the homeowners, explaining what will be done to their homes and their signature on the plans. All parties (homeowner, design consultant and the airport program representative) all have a copy of floor plan and a clear understanding of the scope of work.
- Clear and consistent communication. Follow-through in construction.
- Aviation authority staff did construction management and paid for each house as work was signed off on by the homeowner and construction manager. limited the number of houses that could be worked on in the community to avoid truck traffic and staging impacts.
- Communication, workmanship, inspection and NLR success.

Response from Program Managers:

110. Which elements of your program work particularly well and have been key to its success? (Please List)

- Result
- Constant oversight, problem anticipation and resolution, well defined goals.
- Service
- Being consistent in treatments
- Individual attention of the single parcel method. Homeowner involvement in selecting products and the selection of local contractors to bid on their home.
- Personal interaction with staff and prompt response to warranty issues.
- Quality design and effective construction management; smooth and efficient construction process
- Having one point of contact, a well educated participant and participant testimonials.
- The well organized and defined process used from initial design visit to the close-out of the residence.
- Assigning a homeowner agent to each homeowner/property owner to see them through each step of the program. Continuous interaction with homeowner/property owner.
- Homeowner Outreach
- Knock and talk
- Interaction with homeowners from the beginning of the selection process to close-out of the group.
- A well working team
- Responsiveness to homeowner inquiries

When asked as to the lessons learned to improve stakeholder involvement, comments included the need for more outreach, the need to gain the trust of homeowners and the need to be forthright with homeowners — to explain what is and what is not eligible for treatment.

3.1.5 Publicity

Questions #102 and #103 address the issue of publicity. A majority of respondents (both Airport Officials and Program Managers) said their programs do not actively engage the media. But when asked, a slight majority said that media attention enhances their program.

102. Does your program actively engage the media?

Result Responses Percentage Graph

Yes	18	39%	
No	28	61%	

103. Do you believe media attention enhanced or improved your program?

Result Responses Percentage Graph

Yes	21	54%	
No	18	46%	

The answers to questions #102 and #103 illustrate that media attention while not solicited, can be an important outreach tool.

CHAPTER 4

DATA ANALYSIS — DESIGN TREATMENTS-HISTORIC

4.1 QUESTIONS AND INTEREST GROUP

Twelve questions were developed and included in the Best Practice survey to elicit information specific to the programmatic issues involved in sound insulation of historic or potentially historic structures.* These twelve questions primarily targeted two user groups — Airport Officials and Program Managers/Design Consultants — the two user groups that are most involved in the program elements that deal with historic structures. Five of the questions were also put to the following user groups: Acoustical Consultants, Contractors and the FAA — with these groups having tangential involvement in historic structures issues.

4.2 ANALYSIS

What follows is an analysis of the answer(s) to each question with comments that are largely focused on how the information from the questions is applicable to updating the guidelines or suggestions for further review.

*NOTE: There are other questions in the survey that focus on the particulars of products that are used for treatment of historic structures. These questions are not analyzed here.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 73.- Does your program provide acoustical treatments to historic or potentially historic structures?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	12	12
Aviation Planner	0	0
Contractor	0	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	18	7

COMMENT: Given that any building 50 years or older is potentially eligible for National Register listing, it is surprising that half of Airport Officials report that their programs do not treat historic structures.

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A) Please select the category that best describes your involvement in sound insulation programs:	B) 74.- Does your program consider structures historic or potentially historic in which of the following circumstances: (Select all that apply)		
	if they are national register listed or eligible for listing	if they are listed or eligible for listing on your state's register	if they are listed or eligible for listing on a local register
Acoustical Consultant	0	0	0
Airport Official (Program Sponsors)	12	10	10
Aviation Planner	0	0	0
Contractor	0	0	0
FAA	0	0	0
HVAC / Energy Engineer	0	0	0
Manufacturer	0	0	0
Program Manager / Design Consultant	12	12	9

COMMENT: AIP grant certifications are concerned about adverse impacts on National Register buildings only. Given this, it is not clear why so many programs consider local or state register properties as being historic for program purposes.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 75.- Does your program have either a Programmatic Agreement or Memorandum of Understanding that defines guidelines for treatment of historic structures?	
	Programmatic Agreement	Memorandum of Understanding
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	6	3
Aviation Planner	0	0
Contractor	0	0
FAA	3	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	8	8

COMMENT: For Update Guidelines, need to clarify what is the difference between a PA and a MOU.

ACRP 02-24 Research Team | Main Survey Data Analysis

A) Please select the category that best describes your involvement in sound insulation programs:	B) 76.- Please identify the parties that are signatories to the above documents. (Select all that apply)					
	State Historic Preservation Officer	FAA	Local historic preservation commission	Local building or planning official(s)	Airport sponsor	Other
Acoustical Consultant	0	0	0	0	0	0
Airport Official (Program Sponsors)	8	7	3	1	7	1
Aviation Planner	0	0	0	0	0	0
Contractor	0	0	0	0	0	0
FAA	2	2	1	0	1	0
HVAC / Energy Engineer	0	0	0	0	0	0
Manufacturer	0	0	0	0	0	0
Program Manager / Design Consultant	11	9	11	7	9	0

COMMENT: Need to look at individual responses to see if there are typical parties that are normal signatories.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 77.- Does your program conduct its own surveys to determine if there are historic or potentially historic structures that are eligible for acoustical treatment?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	10	10
Aviation Planner	0	0
Contractor	0	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	12	5

COMMENT: For programs that do not conduct their own surveys to identify historic structures, it is logical to assume that this information is available from other sources or that some programs are not looking for this information.

ACRP 02-24 Research Team | Main Survey Data Analysis

A) Please select the category that best describes your involvement in sound insulation programs:	B) 78.- If yes, then does your program hire a preservation consultant to perform the surveys?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	7	8
Aviation Planner	0	0
Contractor	0	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	11	3

COMMENT: For all those programs that answered “no,” the question remains of whom, if not a preservation consultant, conducts historic surveys. This is answered in the next question, #79.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 79.- If a preservation consultant is not involved, then who makes the determination of whether structures are historic or potentially historic?			
	State Historic Preservation Office	Local historic preservation commission	Local building or planning officials	Other
Acoustical Consultant	0	0	0	0
Airport Official (Program Sponsors)	3	3	4	1
Aviation Planner	0	0	0	0
Contractor	0	0	0	0
FAA	0	0	0	0
HVAC / Energy Engineer	0	0	0	0
Manufacturer	0	0	0	0
Program Manager / Design Consultant	5	4	3	0

COMMENT: For Updated Guidelines, the question of who should be conducting the historic surveys is a Best Practice question that should be addressed. Attention should be given to the Secretary of Interior Standards for qualifications of persons or entities that have proper qualifications.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 80.- Are treatments to historic structures bid separately from non-historic structures?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	3	8
Aviation Planner	0	0
Contractor	0	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	10	7

COMMENT: This response indicates that there does not seem to be a Best Practice approach to separate bidding of historic structures. This is somewhat surprising given special products and skills required to appropriately treat historic structures. (See next question)

A) Please select the category that best describes your involvement in sound insulation programs:	B) 81.- Does your program stipulate special qualifications for contractors who bid and work on historic homes?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	3	10
Aviation Planner	0	0
Contractor	0	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	3	12

COMMENT: The “no” answer here is surprisingly unequivocal. For Updated Guidelines, attention should be paid to the at Secretary of Interior Standards to see if there are any contractor qualifications recommended for working on National Register structures.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 82.- Acoustical products appropriate to the treatment of historic structures are readily available.	
	Agree	Disagree
Acoustical Consultant	4	6
Airport Official (Program Sponsors)	11	4
Aviation Planner	0	0
Contractor	4	3
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	8	10

COMMENT: Interesting divergence of opinion in answers. Contractors, PM’s and Acoustical Consultants are almost 50/50 split in agreeing/disagreeing on availability of product for historic.

ACRP 02-24 Research Team | Main Survey Data Analysis

A) Please select the category that best describes your involvement in sound insulation programs:	B) 83.- It is more expensive to acoustically treat a historic structure than a non-historic structure.	
	Agree	Disagree
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	17	0
Aviation Planner	0	0
Contractor	7	0
FAA	0	0
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	20	0

COMMENT: No disagreement here. Yes, treating historic structures is more expensive. How much more? See next question.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 84.- If you agreed with the previous statement, please estimate the cost premium for acoustically treating a historic structure taking into account both hard and soft costs.					
	0% to 20%	20% to 40%	40% to 60%	60% to 80%	80% to 100%	More than 100%
Acoustical Consultant	0	0	0	0	0	0
Airport Official (Program Sponsors)	3	4	4	2	0	1
Aviation Planner	0	0	0	0	0	0
Contractor	0	2	3	0	1	0
FAA	0	0	0	0	0	0
HVAC / Energy Engineer	0	0	0	0	0	0
Manufacturer	0	0	0	0	0	0
Program Manager / Design Consultant	1	5	5	3	1	2

COMMENT: Most respondents in all categories identify cost premium for historic products as being in the range of 20% to 60%.

CHAPTER 5

DATA ANALYSIS — DESIGN TREATMENTS-ARCHITECTURAL

5.1 QUESTIONS & INTEREST GROUP

The questions in this section of the survey focused on the architectural aspects of treating structures for sound insulation. The majority of the questions concentrated on residential treatments, since they constitute the largest portion of sound insulation programs across the country. The survey sought to identify aspects of programs for consistency or divergence across program policies and local regulations.

Of the 37 questions analyzed here, the following groups participated in the questions, although not everyone addressed each question to which they were invited.

<u>Group</u>	<u>Number of Respondents</u>
1. FAA	14
2. Airport Officials (Program Sponsors)	29
3. Acoustical Consultants	12
4. Contractors	7
5. HVAC / Energy Engineers	9
6. Program Managers / Design Consultants	31

5.2 ANALYSIS

5.2.1 Architectural Treatments – Residential

33. What types of residential properties does your program (region) treat?

The proportion of residential properties treated in programs averaged across the regions is calculated at 50% for single family (detached and attached), 37% for multi-family properties and 13% of assisted living or other. Properties listed in the “Other” category included fire stations, orphanages, special needs dormitories, nursing homes and other institutional. In the various regions the proportions vary by +/- 5-9% depending on if that region has properties in the “Other” Category. Only the Central Region identified itself as currently limiting treatments to single family properties.

	Acoustical Consultant	Airport Official	FAA	Program Manager
Single Family Detached	12	26	12	30
Single Family Attached (Duplexes, row houses)	11	22	11	25
Multi-family Condominiums (Individually owned units)	10	18	11	20
Multi-family Apartments (Rental property)	9	11	11	21
Assisted Living	7	6	9	5
Other	3	3	2	3

	Single Family Detached	Single Family Attached (Duplexes, row houses)	Multi-family Condominiums (Individually owned units)	Multi-family Apartments (Rental property)	Assisted Living	Other
Alaska Region (AK)	2	2	2	2	1	0
Central Region (IA,KS,MO,NE)	2	1	0	0	0	0
Eastern Region (DC,DE,MD,NJ,NY,PA,VA)	2	2	2	1	1	0
Great Lakes Region (IL,IN,MI,MN,ND,OH,SD,WI)	5	5	4	2	1	0
New England Region (CT,ME,MA,NH,RI,VT)	2	2	2	2	2	0
Northwest Mountain Region (CO,ID,MT,OR,UT,WA,WY)	4	4	2	1	1	2
Southern Region (AL,FL,GA,KY,MS,NE,SC,TN)	5	3	3	3	2	2
Southwest Region (AR,LA,NM,OK,TX)	2	2	2	2	2	1
Western Region (AZ,CA,HI,NV)	10	8	8	5	2	0
FAA Headquarters, DC	3	3	3	3	3	0

34. Does your program (region) provide different treatments within different noise contours?

The majority of responses (70%) indicated that their program does not provide different treatments in different contours. Interestingly the majority of FAA respondents indicated that they provide different treatments in differing contours.

	Yes	No
Acoustical Consultant	6	6
Airport Official (Program Sponsors)	5	20
FAA	8	5
HVAC / Energy Engineer	2	6
Program Manager / Design Consultant	6	24
Total	27	61

35. Are there special issues in your program requiring special treatment attention?

More than 55% of the responses indicate there are no special issues in their programs. Of those indicating special conditions, cargo hub operations occurs the least. Accommodations for Environmental Impact Agreements had the highest presence as an issue. In the “Other” category hurricane wind requirements and custom home glazing was mentioned twice.

	Military operations	Cargo hub airport with nighttime operations	EIS granted improvements (eg. code improvements)	No	Other
Acoustical Consultant	2	0	2	5	3
Airport Official (Program Sponsors)	0	1	2	19	3
HVAC / Energy Engineer	0	0	2	5	1
Program Manager / Design Consultant	3	0	0	21	3
Total	5	1	6	50	10

36. What are some of the special treatments in your program to meet these special issues?

There was a relatively even spread of usage of the special treatments mentioned with wall treatments being the least used. The results indicate that approximately 25% of the respondent programs use special treatments.

	High STC windows in bedrooms	Ceiling treatments in higher DNL (CNEL) contours	Wall treatments	Special HVAC systems	Other
Acoustical Consultant	6	5	4	5	3
Airport Official (Program Sponsors)	4	4	2	5	5
HVAC / Energy Engineer	2	2	2	3	0
Program Manager / Design Consultant	7	8	7	8	4
Total	19	19	15	21	12

37. Do Homeowners have options in their selection of treatments? Choose all that apply

Of 71 respondents to this question, five indicated that their program offered no options for Homeowner selections. The other 66 respondents indicated at least options for prefinished color choices. The least available option was any selection of brands or size for mechanical systems.

	Materials like vinyl or wood	Colors of prefinished products	Styles of doors or windows	Options for upgrades@ homeowner cost	Mechanical system size or brand	No choices
Acoustical Consultant	8	10	9	5	0	2
Airport Official (Program Sponsors)	11	22	20	5	1	3
HVAC / Energy Engr.	2	6	6	2	1	1
Program Manager / Design Consultant	17	28	27	8	2	0
Total	38	66	62	20	4	6

38. What acoustic performance criteria do you use in selecting treatment products?

Based on the number of people in each of the two categories, most respondents are using at least two acoustic criteria in selecting products. STC is the dominant criteria used by a factor of three over the next highest criteria. The next is field tests presuming in-place products or sample installations for testing. Air infiltration is next as a measure of a product’s acoustic performance and is used primarily by Program Manager/Designers as opposed to Acoustical Consultants. OITC is used by 50% of the Acoustical Consultants but only 10% of the Program Manager/Designers in selecting treatment products. Sones are used to rate fan motors, and were included to see if they were used by programs to select bathroom and other fans to assist ventilation. 17% of the Program Manager/Designers indicated they use this metric.

	STC	OITC	NLR based on modeling	Air infiltration	Field tests	Sone rating
Acoustical Consultant	12	6	5	2	6	0
Program Manager / Design Consultant	28	3	6	11	9	5
Total	40	9	11	13	15	5

39. What types (material, composition, etc.) of sound insulating window products do you offer?

Twenty-six PM/Designers and 23 Program Sponsors responded to this question. 88% of the PM/Designers indicated more than one type of window product/treatment was used in their work. Seventy-nine percent of Program Sponsors indicated more than one type of window product/treatment was used in their program. Insulated wood windows with or without secondary/storm windows were indicated half as often as vinyl or metal products and STC 38 vinyl was used the least.

	Four track dual aluminum	Four track dual vinyl	Composite vinyl with attached secondary (storm) window	Insulated wood windows	Insulated wood windows with secondary window	Laminated glazing	Secondary window over existing windows	STC 38 vinyl windows	Other
Airport Official (Program Sponsors)	10	15	8	7	7	9	8	5	2
Program Manager / Design Consultant	17	14	14	7	8	15	17	4	4

40. Which manufacturers of windows do you install?

The list of manufacturers identified as being installed in programs is consistent with question 39 above in terms of the percentages of use by product type.

	Program Manager
Graham, York, PA	19
Mon-Ray, Minneapolis, MN	14
Sound Solutions, Chicago, IL	13
St Cloud Windows, St Cloud, MN	13
Sound Control Systems, Larson Industries, Brookings, SD	11
Milgard, Tacoma, WA	11
Harvey Industries, New England	10
Marvin Windows, Warroad, MN	8
TM Cobb, Riverside, CA	6
JB Sash, Chelsea, MA	5
Other	7
Totals	117

41. What types (material, composition, etc.) of prime and/or secondary door products do you offer?

The range of door product seemed fairly well distributed across the categories offered.

	Program Manager	Airport Official
Flush metal doors	13	8
Flush wood doors	20	16
Stile and Rail wood doors	15	6
Embossed metal doors	9	5
Full lite primary doors	15	6
Secondary door (swinging or sliding) in conjunction with primary product	21	14

Sliding door - wood	11	8
Sliding door - vinyl or fiberglass	13	16
Sliding door - aluminum	13	13
Other	5	2
Totals	135	94

42. Which manufacturers of doors do you install?

Twenty-six of the PM/Designers responded to this question. Of those, the percent of usage of each door manufacturer is reported below.

	Program Manager	
Hess/Armaclad, Waynesboro, PA	19	73%
PEM Millwork, Minneapolis, MN	14	54%
Sound Control Systems of Larson Industries, Brookings, SD	13	50%
Mon-Ray, Minneapolis, MN	13	50%
JB Sash, Chelsea, MA	7	27%
Harvey Industries, New England	6	23%
TM Cobb, Riverside, CA	3	12%
Amweld/Firedoor	3	12%
St Cloud Windows, St Cloud, MN	2	8%
Century Doors	0	
Other	8	31%
Totals	88	

43. In addition to windows and doors, do you treat any of the following noise pathways into the home?

Twenty-eight of the 31 participating PM/Designers, 25 of 29 Program Sponsors and all 12 of the Acoustical Consultants responded to this question. Of those, the percent of usage of each item is reported below. Some of the disparity in the percentage response can be attributed to the fact that the PM/Designers and Acoustical Consultants work on multiple projects and they may be different than the programs being represented by the Sponsors.

	Program Manager		Airport Official		Acoustical Consultant	
Ceiling treatments where construction is insufficient	14	50%	9	36%	12	100%
Wall treatments where construction is insufficient	8	29%	9	36%	10	83%
Optional additional noise insulation for special rooms	4	14%	3	12%	3	25%
New fireplace doors	15	54%	6	24%	1	8%
Baffles to attic openings	21	75%	10	40%	9	75%

Attic hatch or pull-down stair treatments	24	86%	17	68%	10	83%
None, windows, doors and fresh air only	3	11%	6	24%	7	58%

44. Do the jurisdictions you serve require documents stamped by a licensed Architect for program work?

The responses to this question indicate 80% or more of programs are in jurisdictions requiring construction documents sealed by design professionals.

	Program Manager	Airport Official	HVAC / Energy Engineer
Yes	22	20	8
No	6	5	0
Totals	28	25	8

5.2.2 Residential Code Compliance & Existing Deficiencies

45. Does your program encounter housing with existing deficiencies?

The response to this question was almost unanimous that houses with existing deficiencies are part of all sound insulation programs reporting in this survey. This indicates a consistent need for programs to have clear policies and a good working relationship with local authorities having jurisdiction for building permits and inspections.

	Program Manager	Airport Official	Manufacturer
Yes	28	25	7
No	0	1	1
Totals	28	26	8

46. How are code deficiencies addressed?

With the high incidence of programs encountering code deficiencies, the following responses indicate the large majority of the programs require the Homeowner to address the condition prior to the work being constructed. The next largest portion of the respondents defer the home's participation and require the condition to be rectified prior to the home moving forward in the design or construction process. A small minority of the programs provides the sound insulation treatments anyway or contribute (presumably) local funds to treat the deficient condition.

	Program Manager	Airport Official	HVAC / Energy Engineer
Homeowner must correct prior to work	17	14	5
House is deferred until condition is corrected or removed from treatment	9	9	1
Treatments are provided by program anyway	1	1	1
Deficiencies are incorporated into program scope of work	1	2	1
Totals	28	26	8

47. Does your program provide funding assistance for homeowners to correct the conditions?

There are a handful of programs that assist Homeowners with remediating their deficiencies. The four affirmative responses from PM/Designers to “Yes, set amount available per house”, all represented the same program, however the other five affirmative responses all represented different programs.

	Program Manager	Airport Official
Yes	2	0
Yes, set amount available per house	4	2
Yes, up to a percentage of value of the house or program scope of work	0	0
Yes, they are referred to affiliated grant source	0	1
No	22	22
Totals	28	25

48. If homeowner assistance funding is available, who qualifies for it?

The majority of programs offering assistance do not have an income determination to qualify for the funding to help correct deficiencies.

	Program Manager	Airport Official
Based on income	1	1
Based on projected cost of work to be done	0	0
Based on age	0	0
All homeowners are eligible	5	2
Determined on case by case basis	3	0
Totals	9	3

5.2.3 Architectural Treatments - Schools & Public Facilities

49. Do you treat buildings other than residential? If so, what type of buildings?

Of the 31 PM's participating in the survey, 58% (18) indicated they work on programs that treat public facilities. Of the 29 Program Sponsors participating in the survey 48% (14) indicated they work on programs that treat public facilities. Although three of the other sponsors who did not address this question have studied or treated public facilities. This would bring the Program Sponsors percentage to 58% (17).

The largest category of public facility receiving treatment is primary and secondary education. Averaging for all categories of respondents the next largest category is comparable between early education and places of worship. The next group is colleges, medical and community centers, with libraries, museums and other receiving the fewest responses.

	Program Manager	Airport Official	Acoustical Consultant	FAA	HVAC / Energy Engineer
Schools (elementary thru high school)	18	13	10	11	2
Schools (early education, daycare)	9	7	8	7	2
Schools (college, professional, trade)	3	3	3	4	1
Places of Worship (churches, temples, mosques, etc.)	15	6	9	5	2
Hospitals, nursing facilities	3	4	4	4	1
Community Centers	4	2	3	2	2
Libraries	2	2	1	2	0
Museums	0	0	0	2	0
Other	2	2	0	0	0
Totals	56	39	38	37	10

Airport Official Other Program Manager Other	Other High School under renovation declined participation Other After completion of Residential we will do all other noise Other detention facilities Other sleeping quarters of fire stations
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50. What acoustic criteria do you use to determine if a public building is eligible for treatment?

Interestingly, 50% of the Program Sponsors who indicated that they treat public facilities did not respond to this follow-up question. 64% of the Acoustical Consultants indicate they use speech interference and L(max) for eligibility in addition to DNL readings.

	Program Manager	Airport Official	Acoustical Consultant	FAA
Interior noise level based on speech interference	6	3	6	0
Interior noise level based on DNL	13	4	9	10
Interior noise level based on Lmax during time of use	3	1	6	4
Totals	22	8	21	14

5.2.4 Existing Construction

113. What types of exterior finishes are most common in you RSIP Program?

Of the 23 PM/Designers responding to this question, five indicated they have only one type of exterior finish as the prevalent condition in their program. The balance of the respondents have multiple types of exterior finishes to address as they install treatments in their programs.

	Program Manager	Contractors
Wood siding	14	5
Vinyl / composite siding	16	7
Brick / stone veneer	14	5
Stucco	15	5
Other	1	1
	60	23

114. What type of wall construction do you typically find in your RSIP Program?

Of the 23 PM/Designers responding to this question, six indicated they have only one type of wall condition as the prevalent condition in their program. Standard wood frame construction is the most common wall system with block/CMU occurring in 49% of the programs.

	Program Manager	Contractors
Wood frame (2x4)	20	7
Wood frame (2x6)	7	3
Block / CMU	11	4
Brick bearing wall	9	2
Other	1	1

115. What window & door types are most commonly found in your RSIP Program?

Twenty-three PM/Designers responded to this question. Projecting products (jalousie and casement windows and French doors) are less common but by a small margin.

	Program Manager
Double hung / single-hung	21
Slider	19
Fixed-lite / picture window	20
Jalousies	9
Casement / projected	15
Patio doors - sliding	20
Patio doors - swinging, french	16
Other	2

116. Do the existing windows typically have secondary or "storm windows" applied?

This response shows a definitive response away from treating the existing product with storms only.

	Program Manager	Airport Official
Yes	5	0
No	18	1
Totals	23	1

117. Do the existing prime doors typically have secondary or "storm doors" applied?

This response shows a response away from treating the existing product with storms only but by less of a margin than windows.

	Program Manager	Airport Official
Yes	9	0
No	14	1
Totals	23	1

5.2.5 Window & Door Replacement

118. Is Low-E glazing; or other high performance glazing, part of the product specification?

The 95% majority of respondents indicate that Low-E glazing or other high performance glazing is a routine part of product specifications.

	Program Manager	Airport Official	Contractors
Low-E when standard to product manufacturer	13	0	5
Tint allowed to meet Solar Heat Gain Coefficient	2	0	0
Tint and/or Low-E allowed if pre-existing	4	0	2
No	2	1	0
Totals	21	1	7

119. What STC ratings are currently required for the window products used?

The majority of respondents indicate STC is the metric for selecting window products and that the performance range for product specifications is between STC 39 and 45.

	Program Manager	Contractors
STC 32-34	0	1
STC 35-38	4	2
STC 39-41	11	4
STC 42-45	13	5
OITC 27-31	0	0
OITC 32-34	1	0
OITC 35-38	0	0
OITC 39-41	0	0
No STC or OITC specified, based on modeling of noise reduction	0	0
Totals	29	12

120. What STC ratings are currently required for the door products used?

The majority of respondents indicate STC is the metric for selecting door products and that the performance range for product specifications is between STC 35 and 41.

	Program Manager	Contractors
STC 32-34	6	3
STC 35-38	12	3

STC 39-41	9	6
STC 42-45	1	3
OITC 27-31	0	0
OITC 32-34	0	0
OITC 35-38	0	0
OITC 39-41	0	0
No STC or OITC specified, based on modeling of noise reduction	1	0
Totals	29	15

121. What performance rating is required for the window products used?

The majority of respondents indicate Residential grade is the performance class for selecting window products although most products used in RSIP meet the LC or light commercial performance class. The five classifications used in the question are no longer applicable and have been altered by the revised AAMA standard, although Residential remains as a class in the new system. See Industry Developments for a discussion.

	Program Manager	Contractors
R Residential	13	4
LC Light Commercial	2	1
C Commercial	3	0
HC Heavy Commercial	1	0
AW Architectural	0	1
Totals	19	6

122. What performance rating is required for the door products used?

Only three of thirty-one Project Managers answered this “Fill in the blank” question. The answers were 1. preapproved goals, 2. commercial and 3. STC.

Performance grades for doors vary more widely than windows and are dependent on the material used in their construction. Several industry organizations oversee door products according to the material in the door. STC performance can be tested but is not often common for residential products except for those manufacturers who routinely supply to SI programs.

Doors are often evaluated for sound insulation purposes by field test or other metric during pilot programs. Commercial doors for non-residential programs have more availability of STC rated products.

123. Does your program require a stated thermal performance for the window products approved?

The responses for this question were mixed-up with another question and the results are removed from the survey.

124. Are there more stringent product performance requirements mandated in your area, like energy conservation, wind load, or impact resistance?

Four of the five PM/Designers indicated affirmatively have projects in the southern hurricane region. The fifth respondent is in the west coast where the new Green Building Code has just been enacted.

	Program Manager	Contractors
Yes	5	1
No	17	5
Totals	22	6

125. Are all products independently tested, by an approved testing agency, for performance compliance?

The two PM/Designers responding in the negative work on programs that have specialty products that are field tested and/or computer modeled for performance by engineers.

	Program Manager	Contractors
Yes	20	6
No	2	0
Totals	22	6

126. What window installation methods do you currently use?

With 20 PM/Designers responding, the number of responses indicates that the first two options are routinely used. The “jump the frame installation detail is indicated as a minority condition.

	Program Manager	Contractors
"Pocket replacement" - Setting new window in existing (old) window frame.	16	6
"Total tear-out"- Removing existing window frame back to the rough opening.	17	6
"Jump the frame" - Setting new window over existing aluminum window frame.	4	3
Other	4	0

127. If more than one installation method is used, what criteria determine when each technique is utilized?

	Program Manager	Contractors
Type of exterior finish surrounding window opening (stucco /brick / siding etc.)	13	4
Condition of existing window frame	13	3
Interior finish	8	2
Egress window modifications	11	4
Cost of installation	1	0
Other	3	2

128. When the "pocket replacement" system is used, is the perimeter of the existing window frame and the building framing insulated?

	Program Manager	Contractors
Yes	14	4
No	4	2
Totals	18	6

129. Does your RSIP program require the modification of window openings to meet egress code compliance?

Of those responding to this question over 75% indicate they modify window openings to meet egress codes as part of their program scope of work.

	Program Manager	Contractors
Yes	17	6
No	5	0
Totals	22	6

5.2.6 Secondary Applications

133. Does your program use secondary (storm) systems or (e.g. storm windows or storm doors) in non-historic treatments?

Of those responding to this question over 80% indicate they use secondary or storm products to assist in meeting acoustic goals.

	Program Manager	Airport Official	Contractors
Yes	18	0	6
No	4	1	0
Totals	22	1	6

134. If yes, what are the most common applications for secondary systems? (Select all that apply)

Of 31 PM's 18 answered this question along with six of seven Contractors. An over 2/3rds majority of both groups indicate they use secondary products in all of the mentioned categories.

	Program Manager	Contractors
Exterior applied storm windows	12	5
Interior applications including skylites, specialty shapes	15	6
Swinging storm doors over prime entry doors	15	5
Sliding & swinging storm doors over prime patio doors	13	6
Other	0	0
Totals	55	22

CHAPTER 6

DATA ANALYSIS — HVAC/VENTILATION AND ENERGY

6.1 QUESTIONS & INTEREST GROUP

General observations from the information gathered from the 32 HVAC/ Energy related questions provided some interesting insights into the similarities of issues across the country on SIMS related projects. The respondents were exclusively HVAC/Energy Engineers involved in similar or related type of projects.

6.2 ANALYSIS

The following take-away from the study is as noted below.

15. Do you believe that all parties have a clear understanding of their roles and responsibilities throughout the Program?

A surprising 78% of the respondents felt that the roles and responsibilities were well understood, from the homeowners to the airport and city officials. This speaks well of the upfront outreach programs and early discussions with the various parties involved.

31. Should FAA policy recognize the goal of energy reduction as well as noise reduction in S! Programs?

The HVAC/ENERGY engineer respondents were unanimous in their belief that the FAA policy should clearly recognize energy reduction as a primary goal in addition to the noise reduction.

32. If there is additional cost to achieve energy reduction beyond the cost necessary to meet noise reduction goals, should this additional cost be eligible for reimbursement?

As an adjunct to this, 78% of these respondents and 48% of the Airport officials felt that this energy reduction cost should be part of the sound mitigation FAA burden. It is interesting to note that 85% of the FAA survey participants felt that the cost of energy reduction was a part of their overall goal.

44. Do the jurisdictions you serve require documents stamped by a licensed Architect/Engineer for program work?

It was not too surprising but it was good to see 88% of the respondents indicated that the work required under the program had to be design and sealed by a professional Architect or Engineer.

46. How are code deficiencies addressed?

Sixty-three percent of respondents indicated the residential and one can assume by extension, the non-residential code deficiencies encountered during a SIMS survey, the program required the owner to correct the code deficiency prior to sound mitigation work being performed.

49. Do you treat building other than residential? If so, what types of buildings? Select all that apply:

Of the respondents only two people indicated in their areas, community related facilities were eligible for sound mitigation services. It was obvious it was not considered universal throughout the country.

190. New air conditioning and heating systems often have an electrical impact due to the increased energy requirement of the system. Does your program remediate these impacts by upgrading the electrical service if needed?

A common side effect of the SI program requires electrical upgrades to the facility. Eighty-eight percent of respondents indicated it was considered part of the cost of the sound mitigation program.

191. Does your program address the ventilation requirements caused by sealing up the building envelope?

Similarly with respect to upgrades to ventilation systems as a result of SI program, 88% respondents indicated it was considered part of the requirements of the program.

189. Does your program provide for air conditioning and/or heating systems for homes that previously did not have these systems installed?

For homes that previously did not have air conditioning or heating systems, two people answered “usually” and one person answered “never” being considered part of the scope of the program.

200. If higher efficiency equipment than was required by code alone was provided by the program, what contributed to that choice?

When system replacement was part of the program, high efficiency equipment was identified as code required or mandated by Green Initiatives three-fourths of the time.

204. Does your program provide insulation in any of the following locations?

With regards to insulation as part of the program, the recognition for upgrades to the roof / attic insulation it was nearly universally included as part of the program.

Overall the study revealed some differences in how various areas interpret the needs and requirements under the FAA guidelines. In the areas of installation of new and or upgraded HVAC systems, there was a large difference in how this is being addressed. Although the study was predominantly directed towards residential, it is safe to extrapolate similar differences are seen towards the non-residential sound mitigation projects.

The survey also indicated the universal understanding that the ventilation requirements of residential and non-residential buildings are a vital component to the health and safety of the occupants. The respondents understood that when a facility is treated to mitigate the transmission of sound into the building, ventilation is impacted and would need to be addressed in the most efficient manner possible.

The study also pointed out how the overall industry awareness of the need for energy conservation and green approaches to maintaining comfortable environments within homes and

non-residential buildings has dramatically increased over the last decade. The energy rebates in most regions of the country is a strong indication of that very fact. National energy standards and local code energy guidelines have had significant impact of the energy efficiency of the designs and of the equipment installed. It will be important for the FAA to recognize this component within future sound mitigation programs.

The International Energy Conservation Code (IECC) as a recognized component of the International Code family of Codes has set new standards for efficiency of building envelope, lighting and HVAC equipment, over and above existing minimum code requirements. The increased standards apply in both residential and non-residential buildings. Currently in many areas, the IECC is an optional part of the International Codes, but as code updates are occurring, jurisdictions across the country are adopting the IECC as a mandatory component of building construction. It is recognition that overall total building performance, from site lighting to water heating is needed to minimize the country's energy footprint. This, along with the ASHRAE standards for residential and non-residential occupant ventilation, are becoming driving mandates for proper (and verifiable) ventilation systems.

CHAPTER 7

DATA ANALYSIS — PRODUCTS

7.1 ANALYSIS

15. Do you believe that all parties have a clear understanding of their roles and responsibilities throughout the program (i.e., FAA, airport, city, homeowners, architect, acoustical consultant, contractor and vendors)?

The interesting numbers here are the results provided by the Aviation Planner and the FAA. It appears (by the survey) that the Aviation Planner and the FAA have less confidence in the roles and responsibilities throughout the program than any other participant class surveyed. There may be a disconnect between PM/Design Consultants and the FAA when it comes to this issue. However, since the part 150 program is an FAA initiative, it is problematic to see the difference in their perception as to the clear and defined roles and responsibilities between parties.

Participant Class	Yes	No
Acoustical Consultant	67%	33%
Airport Official	69%	31%
Aviation Planner	22%	78%
Contractor	85%	14%
FAA	58%	42%
HVAC /Energy Eng.	78%	42%
MFG	36%	64%
PM / Design Consultant	83%	17%

31. Should FAA policy recognize the goal of energy reduction as well as noise reduction in SI programs?

As most consultants, officials, planners and contractors lean toward the recognition of energy reduction goals; the FAA (by a 2/3 majority), does not agree that energy reduction goals should be part of sound insulation programs. It is noticeable that the FAA's goals do not mesh with the Green initiatives embraced by the Federal Government. Of course, HVAC/Energy Engineers overwhelmingly embrace energy reduction initiatives. Manufacturers lean heavily towards the energy reduction goal as well, however the 37% of the manufacturers that do not wish to recognize the energy reduction goals may have more issues with the energy values themselves, as some products may not meet new energy standard guidelines established by organizations such as the IECC.

Participant Class	Yes	No
Acoustical Consultant	58%	42%
Airport Official	58%	42%
Aviation Planner	55%	45%
Contractor	57%	33%
FAA	31%	69%
HVAC/Energy Eng.	100%	0%

MFG	71%	29%
PM / Design Consultant	63%	37%

32. If there is an additional cost to achieve energy reduction beyond the cost necessary to meet noise reduction goals, should this additional cost be eligible for reimbursement?

It is apparent that the FAA has a strong sentiment against increasing program costs. It is also interesting to note that program sponsors and Design Consultants do not share the same sentiments as the FAA. However, with energy guidelines at the forefront of the Federal Government's green initiative, energy standards inevitably will become code issues and part of the program specifications. Although the expense of providing more expensive products that meet new energy standards maybe inevitable, PM/Design Consultants will probably be met with a "push back" from the FAA regarding expanding budgets to cover such additional costs.

Participant Class	Yes	No
Acoustical Consultant	58%	42%
Airport Official	48%	52%
Aviation Planner	34%	66%
Contractor	43%	57%
FAA	15%	85%
HVAC/Energy Eng.	78%	22%
MFG	71%	29%
PM / Design Consultant	58%	42%

63. Should the OITC metric replace STC in future material specifications for RSIPs?

Acoustical Consultants and PM/Design Consultants agree for the most part that STC should not be replaced by the OITC metric in material specifications. (The results found in the "Airport Official" category have been abandoned since it reflects the answer of only one respondent, therefore skewing the result percentage that may not reflect an adequate cross-section of this group).

Participant Class	Yes	No
Acoustical Consultant	36%	64%
Airport Official		100%
Aviation Planner	n/a	n/a
Contractor	n/a	n/a
FAA	n/a	an/
HVAC/Energy Eng.	n/a	n/a
MFG	n/a	n/a
PM / Design Consultant	36%	64%

64. How often should products be retested for acoustical performance?

As a net result, only 5% of respondents suggest not testing products at all. The remaining 95% of the respondents surveyed agree products should be retested, but they are split over at which

intervals the testing should occur. Of the respondents polled, 57% believe testing should be conducted every 10 years, while 38% opted for retesting when the manufacture makes a product change. With the net result of 95% that products should be retested, maybe both of the suggested intervals should be incorporated into the best practices guidelines. This would mean a testing requirement that would state to the affect that products would be tested (at a minimum) of every 10 years, or when a manufacturer changes or updates a product design.

Product testing not only provides performance information, it also provides to the PM/Design Consultant an independent review of the materials used in the assembly of the product tested. This information can be used as a product review tool that provides PM/Design Consultants the information to randomly check product assemblies installed in the field for compliance. This type of scrutiny may have headed off the recent accusations regarding a specific manufacturer that has been supplying (apparently for many years) a product with a different glass package than what was submitted in their tested data.

Participant Class	Every Ten Years	Only When Changes	Not Required
Acoustical Consultant	30%	70%	0%
Airport Official	100%	0%	0%
Aviation Planner	n/a	n/a	n/a
Contractor	28%	72%	0%
FAA	n/a	n/a	n/a
HVAC/Energy Eng.	n/a	n/a	n/a
MFG	43%	43%	14%
PM / Design Consultant	37%	58%	4%

130. Does your RSIP program recognize and incorporate the American Society for Testing and Materials (ASTM) E2112 "Standard practice for Installation of Exterior Windows, Doors & Skylights" guidelines?

The accumulative result indicates that overall approximately 70% of all respondents indicate that they incorporate the ASTM E2112 standards. Based on contractors' responses, 67% recognize the standards, while 33% of contractors are not familiar with the document. PM/Design Consultants indicated that 70% of these respondents recognized the standard, while 11% did not recognize or incorporate the standard, and an additional 18% of PM/Design consultants were not familiar with the standard. ASTM E2112 is the document developed in response to the problem of excessive water intrusion through poor fenestration installation techniques. The document was designed to provide technical guidance to organizations that work with the installation of fenestration products in residential and light commercial applications. Proper flashing, sealing and installation techniques of fenestration products are critical components ensuring the sustainability of the product and the structure they are installed into. RSIP programs should incorporate these types of standards to ensure the work they are performing, meets published standards.

Participant Class	Yes	Not Familiar	No
Airport Official	100% (1 response)	0%	0.0%
Contractor	67%	33%	0.0%
PM / Design Consultant	70%	15%	15.0%
Accumulative	70.37%	18.52%	11.11%

131. Has the Environmental Protection Agency's "Renovation, Repair, and Painting" Final Rule (40 CFR 745) been implemented in your program?

Approximately 82% of respondents, (both contractor and PM/ Design Consultants) have implemented the "Renovation, Repair, and Painting" final Rule (40CFR 745). Approximately 18.5% of respondents have not implemented this new EPA law. The final rule (40CFR 745) was effective as of June 23, 2008, and was fully implemented April 22, 2010. That means RSIP programs that have not implemented this guideline are in violation of this EPA ruling and subject to significant fines of up to \$32,500.00 per violation, per day.

Participant Class	Yes	NO
Contractor	83%	17%
PM / Design Consultant	81%	19%
Accumulative	81.48%	18.52%

132. If yes, what additional costs (per window and door opening) are associated with implementing the rule?

It appears that the costs incurred with implementing the Renovation, Repair, and Painting final rule are still in the process of being defined. Contractors may have a better idea of the true additional costs incurred since the "hard costs" associated to the implementation of the rule are directly related to the contract work they provide. Over time, we would expect to find more closely defined values, possibly closely related based on geographic region. The rule is quite extensive and requires individuals (other than contractors), who also provide onsite services to be "lead certified" as well. Therefore, there are additional expenses or soft costs that programs will incur when implementing this ruling. One additional expense associated with the implementation of this rule; for one current RSIP program, was the additional insurance costs associated with the additional coverage required for the liability associated with the proper implementation of the rule and performance of the contractor to properly perform the additional work.

Contractor Response:	PM / Design Consultant Response:
10%	None
20%	Not Determined
4-man hours	Minimal
\$30-\$90.00/ Window	\$50.00 / Window
\$40.00 / Window	10%
	\$250.00 / Window
	\$500-1000/Residence

135. What factors were considered in identifying the products to be used in your program?

Factors considered in identifying products provide a well-rounded view of this process. Airport officials see the recommendations of the PM/Consultant and Acoustical Consultant to be equally important, and the overriding factors, in indentifying the products used in RSIP programs. However, they do appear open to the review of products provided by manufacturers and outreach programs. The PM/Design Consultant respondents also feel the strongest factors associated in deciding which products to be used come from the recommendations of the PM/Design consultant and the Acoustical consultant. This group also sees a greater value in manufacture-originated contact. The Contractor respondents strongly see the Acoustical Consultants recommendation as the major factor in identifying products. As an accumulative subset, the recommendations of the Acoustical Consultant are the most highly regarded recommendation found in the survey. The combination of the PM/Design Consultant and the Acoustical Consultant recommendations make up 57% of the factors considered when identifying products for use. The remaining 35% of the factors are spread out over the remaining categories with only 15% of the factors considered coming directly from manufacturer originated contact. This question puts into perspective the need for the consultant groups to become "experts" in the performance, styles, features, operation and installation methods of the various acoustical window products offered into RSIP programs. It also stresses the significance of the manufacturers strong relationships with these groups, providing information and support to these consultant groups in order to assist them when making such recommendations.

Participant Class	PM / Consultant Recommendation	Acoustical Consultant Recommendation	Outreach to Local MFG	ANMS Conf Vendor display	MFG Originated Contact	Other
Acoustical Consultant	n/a	n/a	n/a	n/a	n/a	n/a
Airport Official	31.0%	31.0%	10.0%	10.0%	12.0%	6.0%
Aviation Planner	n/a	n/a	n/a	n/a	n/a	n/a
Contractor	25.0%	75.0%	0.0%	0.0%	0.0%	0.0%
FAA	n/a	n/a	n/a	n/a	n/a	n/a
HVAC/Energy Eng.	n/a	n/a	n/a	n/a	n/a	n/a
MFG	17.0%	23.0%	17.0%	14.0%	23.0%	6.0%
PM / Design Consultant	29.0%	31.0%	10.5%	4.0%	15.0%	10.5%
Accumulative	26%	31%	11.4%	8.6%	15.0%	7.1%

136. What product procurement methodologies have you tried?

With 68% of the respondents indicating this method, the contractor purchase category continues to be the strongest procurement methodology in the industry. In that regard it is an interesting statistic that shows methods other than contractor purchase make up 32% of the remaining respondents. In some cases respondents may not know the difference between the Sponsor Bulk Procurement and Consultant/CM Purchase methodologies. It would also be of interest to see what additional methodologies have been used (listed in the "other" category) that makes up the 4% of procurement methodologies under the Airport Official respondents.

Participant Class	Sponsor Bulk Procurement	Contractor Purchase	Consultant/CM Purchase	Other
Acoustical Consultant	n/a	n/a	n/a	n/a
Airport Official	15.0%	73.0%	8.0%	4.0%
Aviation Planner	n/a	n/a	n/a	n/a
Contractor	17.0%	83.0%	0.0%	0.0%
FAA	n/a	n/a	n/a	n/a
HVAC/Energy Eng.	n/a	n/a	n/a	n/a
MFG	31.0%	38.0%	19.0%	13.0%
PM / Design Consultant	14.0%	81.0%	5.0%	0.0%
Accumulative	19%	68%	9.0%	4.0%

137. How satisfied are homeowners with the products and options available in your RSIP program?

It appears that in general terms, program participants feel that homeowners are satisfied with the products that are being supplied into SIP programs. Sixty-eight percent of the respondents questioned felt most homeowners tipped the scales towards the "satisfied" or "most satisfied" categories. Twenty-two percent of the respondents felt homeowner satisfaction fell in the least satisfied categories. Further investigating in what region of the country most homeowners were perceived to be most satisfied or least satisfied with the products available, the following observations were noted:

Regions with the most satisfied homeowners: Central region, Great Lakes Region, southern Region and Western Region.

Regions with the Least Satisfied Homeowners: New England Region and the Northwest Mountain region

Other regions not listed did not provide an answer to the question.

Participant Class	Most Satisfied			Least Satisfied		
	1	2	3	4	5	
Acoustical Consultant						
Airport Official	42%	32%	5.0%	16.0%	5.0%	100.0%
Aviation Planner	0%	0%	0.0%	0.0%	0.0%	
Contractor	17.0%	33.0%	0.0%	33.0%	17.0%	100.0%
FAA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HVAC/Energy Eng.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MFG	41.0%	25.0%	17.0%	17.0%	0.0%	100.0%
PM / Design Consultant	36.0%	36.0%	9.0%	9.0%	9.0%	99.0%
Percentage by category	37%	32%	8.5%	15.2%	6.8%	100%

138. When was the last new product introduced to the project?

Most new products introduced into RSIP programs were introduced when approached by a manufacturer and/or when new technologies were introduced. In aggregate, 57% of the respondents believed these were the two main reasons for introducing new products into their RSIP program. The contractor group was the only respondent group that felt most products were introduced at the program inception. However, there was only one respondent in the contractor category, which may or may not represent the majority of the respondents in that cross section. Accumulatively, new technologies are the main reason for new products being introduced. Thirty-four percent of manufacturer respondents feel the most effective way of introducing new products into RSIP program is through direct sales efforts.

Participant Class	At Program Inception	When new tech. was introduced	When Approached By MFG	After Conference or Trade Show	After Comm. Demand
Acoustical Consultant	n/a	n/a	n/a	n/a	n/a
Airport Official	13.0%	43.0%	35.0%	9.0%	0.0%
Aviation Planner	n/a	n/a	n/a	n/a	n/a
Contractor	50.0%	12.5%	12.5%	12.5%	12.5%
FAA	n/a	n/a	n/a	n/a	n/a
HVAC/Energy Eng.	n/a	n/a	n/a	n/a	n/a
MFG	22.0%	22.0%	30.0%	17.0%	9.0%
PM / Design Consultant	23.0%	42.0%	27.0%	8.0%	0.0%
Accumulative	23%	34%	28.8%	11.3%	3.8%

139. What barriers are in place (If any) that make it difficult to add additional product lines to your RSIP?

A slight conflict arises from the respondent results to this questions. Airport officials and contractors take a strong position that the main barrier to additional product implementation is the cost associated with the design of new details & specifications associated with adding additional product lines. The PM/Design Consultants feel that community sensitivity is a greater factor than the costs associated with adding additional product lines: "Are you guys getting a bad rap?" Manufacturers lean slightly towards program costs, but have a sensitivity to the community issues that may develop. It appears that airport officials may argue against additional dollars being spent to add additional products to existing programs. However, "best practices" should include the implementation of the best overall products and technologies weighed against a competitive cost structure. Because programs can last for long periods of time, product developments and technical enhancements are bound to occur and should be reviewed as a program "best practice." If programs cannot design strategies to implement new product lines and technologies, the program may suffer from spending premium dollars on old technology or outdated products.

Participant Class	Community Sensitivity	Program costs to design new details & Specifications
Acoustical Consultant	N/A	N/A
Airport Official	35%	65%
Aviation Planner	N/A	N/A
Contractor	40%	60%
FAA	N/A	N/A
HVAC/Energy Eng.	N/A	N/A
MFG	45%	55%
PM / Design Consultant	54%	46%
Accumulative	43%	57%

140. Are there any Sponsor and/or community concerns regarding the energy efficiency of the products used in your RSIP?

From an accumulative perspective it appears that approximately half of the respondents polled have concerns regarding the energy efficiency of the products used. However, as you begin to separate the respondents' responses, it is quite evident that airport officials do not believe that energy efficiency should be a concern of the program. The push for energy efficient products is from the PM/ Design consultant and manufacturing respondents. It is unclear who represents the "community" concerns regarding this issue. We assume that these concerns are referenced through the PM/ Design Consultants respondents. If that is the case, the net result would be that Sponsors do not have concerns for energy efficient products, while communities push for the use of energy efficient products.

Participant Class	Yes	No
Acoustical Consultant	N/A	N/A
Airport Official	33%	67%
Aviation Planner	N/A	N/A
Contractor	17%	83%
FAA	N/A	N/A
HVAC/Energy Eng.	N/A	N/A
MFG	85%	15%
PM / Design Consultant	67%	33%
Accumulative	54%	46%

141. Have longevity goals been specified for the acoustical effectiveness of windows installed in your program? (I.e., number of years windows are expected to meet noise reduction goals?)
Yes/No

There may be some cross over from the association of a products warranty to the issue of the longevity of acoustical effectiveness. In most cases manufacturers do not warrant the performance of their products long term. Most product warranties cover component parts, finishes and assembly. The airport officials and PM/Design Consultants feel that longevity goals

are in place; however, contractors strongly disagree. Contractors overwhelmingly believe there are no such standards.

Participant Class	Yes	No
Acoustical Consultant	N/A	N/A
Airport Official	74%	26%
Aviation Planner	N/A	N/A
Contractor	0%	100%
FAA	N/A	N/A
HVAC/Energy Eng.	N/A	N/A
MFG	46%	54%
PM / Design Consultant	61%	39%
Accumulative	55%	45%

141A. If yes, what is the goal?

Airport officials feel strongly that the longevity goals regarding acoustical effectiveness of windows falls between 20 years and the duration of the warranty period. PM/Design Consultants see the goal as 10 years and the duration of the warranty. Most PM/Consultants see these two categories as the same set of measures. (IE: standard window warranty is 10 years). The single contractor respondent felt the goal was 10 years. Window manufacturers have a different assessment with 100% of the respondents believe the longevity goals to be 10 years or less. As previously mentioned, longevity of a window products performance is not normally covered in the warranty document. Normal wear on perimeter seals, weather-stripping and gaskets can cause a significant performance issue over a period of time. Obviously the glazing package and the acoustical performance associated with that component part of the product should perform well over a long period of time. PM/Design consultants would do well to make sure that during their product reviews that component parts, weather-stripping and gasket are of good quality, and that these components are easy to replace and readily available.

Participant Class	5 years	10 years	15 years	20 years	Duration of Product Warranty	Other
Acoustical Consultant	N/A	N/A	N/A	N/A	N/A	N/A
Airport Official	12.5%	12.5%	0.0%	19.0%	50.0%	6.0%
Aviation Planner	N/A	N/A	N/A	N/A	N/A	N/A
Contractor	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
FAA	N/A	N/A	N/A	N/A	N/A	N/A
HVAC/Energy Eng.	N/A	N/A	N/A	N/A	N/A	N/A
MFG	17.0%	83.0%	0.0%	0.0%	0.0%	0.0%
PM / Design Consultant	0.0%	58.0%	0.0%	0.0%	42.0%	0.0%
Accumulative	8.6%	42.9%	0.0%	8.6%	37.1%	2.9%

141B. If the longevity goal is that of the warranty, what is the typical length of window warranties?

These two questions (141A, 141B) validate the opinion expressed in question #141. As the respondents answers pattern current product warranty specifications, (mainly 10 year duration). It appears that respondents identify window warranties to include acoustical effectiveness. This is probably not the case. In most cases, window manufacturers do not mention the duration of the performance of the products in their warranties (other than glass seal failures). Most product warranties will cover components, materials, finishes and fabrication, but do not address performance. It maybe important to review product warranties and properly inform airport officials regarding what is covered in those warranties.

142. Have longevity goals been specified for the acoustical effectiveness of doors installed in your program? (I.e., number of years doors are expected to meet noise reduction goals?)

The same response as 141.

Participant Class	Yes	No
Acoustical Consultant	N/A	N/A
Airport Official	63%	36%
Aviation Planner	N/A	N/A
Contractor	17%	83%
FAA	N/A	N/A
HVAC/Energy Eng.	N/A	N/A
MFG	60%	40%
PM / Design Consultant	67%	33%
Accumulative	58%	42%

142A. If yes, what is the goal?

Door warranties vary widely based on the manufacturer and the material used to assemble the door. Wood doors generally carry a warranty of five years or less, while insulated steel doors generally carry a 10-year warranty. That is probably why you see a generally even distribution between the five-year, 10-year, and duration of product warranty categories. However, as expressed earlier, the warranty does not generally cover the longevity of the performance of the product.

Participant Class	5 years	10 years	15 years	20 years	Other
Acoustical Consultant	N/A	N/A	N/A	N/A	N/A
Airport Official	60.0%	33.0%	0.0%	7.0%	0.0%
Aviation Planner	N/A	N/A	N/A	N/A	N/A
Contractor	75.0%	25.0%	0.0%	0.0%	0.0%
FAA	N/A	N/A	N/A	N/A	N/A
HVAC/Energy Eng.	N/A	N/A	N/A	N/A	N/A
MFG	50.0%	40.0%	0.0%	0.0%	10.0%

PM / Design Consultant	71.0%	21.0%	0.0%	0.0%	7.0%
Accumulative	62.8%	30.2%	0.0%	2.3%	4.7%

142B. If the longevity goal is that of the warranty, what is the typical length of the system warranties?

The majority of all respondents refer to a five-year warranty, with 30% of respondents indicating a 10-year warranty period.

Participant Class	5 years	10 years	15 years	20 years	Other
Acoustical Consultant	N/A	N/A	N/A	N/A	N/A
Airport Official	60.0%	33.0%	0.0%	7.0%	6.0%
Aviation Planner	N/A	N/A	N/A	N/A	N/A
Contractor	75.0%	25.0%	0.0%	0.0%	0.0%
FAA	N/A	N/A	N/A	N/A	N/A
HVAC/Energy Eng.	N/A	N/A	N/A	N/A	N/A
MFG	50.0%	40.0%	0.0%	0.0%	10.0%
PM / Design Consultant	71.0%	21.0%	0.0%	0.0%	7.0%
Accumulative	62.8%	30.2%	0.0%	2.3%	4.7%

144. What window and door manufacturers are currently approved for use on historic structures in your RSIP program?

The following chart lists the respondents' manufacturers by product type.

Wood Window	Aluminum Windows	Steel Windows	Other (Fiberglass)	Doors
Marvin	St. Cloud	Bliss Nor-Am	Milgard	Eggers
Eagle	Graham	Hopes		JB Sash
JB Sash	Torrance			Pem Millwork
Kolbe Kolbe				Maiman Co.
Larson / SCS				Torrance
Pella				Vancouver
SP Custom				
TM Cobb				

145. What is the material composition of the window & door products approved for historic products?

As may have been expected, wood products continue to be the major material of choice for products approved for use in historic structures. It is interesting to see that a small amount of fiberglass materials are filtering into use on historic projects.

Wood	Fiberglass	Aluminum	Steel
46.5%	4.7%	30.2%	18.6%

146. What are the STC ratings of the window & door products approved for historic products?

STC ratings for historic products cover a full spectrum of results. Accumulatively, the largest category falls in the STC 39-41 range. It is interesting to note that OITC figures are only recognized under the Manufacturer respondents. PM/Design consultants have a variety of STC ranges approved for historic use. The results of these respondents maybe influenced by specific product type availability rather than overall STC performance. This is further supported by 30% of the PM/Design respondents indicating that no STC or OITC is specified.

Participant Class Rating	Contractor	Manufacturer	PM / Design	Accumulativ e
			Consultant	
STC 32-34	17.0%	7.1%	30.0%	16.7%
STC 35-38	33.0%	7.1%	0.0%	10.0%
STC 39-41	33.0%	14.3%	20.0%	20.0%
STC 42-45	0.0%	14.3%	20.0%	13.3%
OITC 27-31	0.0%	14.3%	0.0%	6.7%
OITC 32-34	0.0%	14.3%	0.0%	6.7%
OITC 35-38	0.0%	7.1%	0.0%	3.3%
OITC 39-41	0.0%	14.3%	0.0%	6.7%
No STC or OITC Specified	17.0%	7.1%	30.0%	16.7%

147. Are products supplied with true divided-lites or simulated divided-lites?

True Divided Lites	12.9%
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Simulated Divided Lites	45.2%
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Both	41.9%
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100.0%

148. What windows & door types are most commonly found in the historic structures in your RSIP Program?

Double-hungs/Single-hungs and fixed-lite consisted of 57% of the total window and door types found in historic structures. The Casement/Projected category totaled 20% (although historically speaking, most of these products are probably projected windows). French Swinging doors were 18% of the total survey results. (All results were rounded).

Participant Class Rating	Contractor	Manufacturer	PM/Design Consultant	Accumulative
Double Hung/Single-hung	28.0%	39.1%	31.0%	32.9%
Fixed-lite/Picture Window	28.0%	17.4%	26.0%	23.7%
Jalousies	5.0%	0.0%	3.0%	2.6%
Casement/Projected	11.0%	26.1%	20.0%	19.7%
French Swinging Doors	28.0%	17.4%	14.0%	18.4%
Other	0.0%	0.0%	6.0%	2.6%

149. Are windows in historic structures restored, refurbished, and re-glazed with heavy sheet glazing to increase their STC performance?

Accumulatively the respondents are divided right down the middle. The "Airport Official" result should be removed since it is the opinion of one respondent and may not properly represent all airport officials. If that were the case, the "yes" respondents would pull ahead (slightly) in this close race. It is interesting to note that the majority of PM/Design consultants indicate that they do not refurbish and re-glaze with heavy sheet glass, while the majority of Contractor respondents claim to proceed with this practice. One suggestion for such an anomaly would be if more contractors from a program where this system is utilized completed the survey, or if more of the PM/Design Consultants that did not invoke this practice completed the survey.

Participant Class	Yes	No
Airport Official	0%	100%
Contractor	80%	20%
MFG	67%	33%
PM / Design Consultant	30%	70%
Accumulative	50%	50%

150. If yes, what noise reduction performance has been achieved by using this restoration method?

The subset to review for this question is the PM/Design Consultant respondents. Seventy-five percent of these respondents indicated that they do not test historic dwellings, with 25% of PM/Design Consultants indicating that they receive a 5+DB NLR reduction result. Are they only testing historic buildings in which they know (or have a pretty good indication) they will pass? There is a strong emphasis towards not testing in both the Contractor and PM/Design Consultant categories. The results from the Manufacturer respondents does nothing but soften the accumulative results across the entire spectrum of the chart.

Participant Class	1-2db NLR	3-4 db NLR	5+ db NLR	Do Not Test
Contractor	33%	0%	0.0%	67.0%
MFG	25%	25%	25.0%	25.0%
PM / Design Consultant	0%	0%	25.0%	75.0%
Accumulative	18.18%	9.08%	18.18%	54.44%

151. When replacing windows in historic structures, which installation methods do you currently use?

The accumulative results indicate that most programs utilize the total tear-out method of replacing windows in historic structures. The independent respondent results further solidify this claim. 34.62% of total respondents indicate that they have used the pocket replacement method as well. Keep in mind that there maybe an issue with defining what a pocket replacement is. In some cases it is defined by placing a new window (including master frame) into an existing window frame. However, in San Diego, for instance, they install new sash into existing window frames. This method could also be defined as a pocket replacement; however the two finished products are totally different.

Participant Class	Jump the Frame	Pocket Repl.	Total Tear-out
Airport Official	0%	100%	0.0%
Contractor	0%	40%	60.0%
MFG	10%	40%	50.0%
PM / Design Consultant	10%	20%	70.0%
Accumulative	7.69%	34.62%	57.69%

152. Are secondary (storm) acoustical glazing panels applied over historic windows?

Secondary storm windows appear to be an important part of acoustically treating historic windows. Since a strong majority of respondents are using them, it is probably a good issue to expound upon in the best-practices guidelines. One item to maybe investigate is the issue of heat build-up between the historic windows and the storm window and the potential to damage brass coming on historic leaded glass sash.

Participant Class	Yes	No
Airport Official	0%	100%
Contractor	80%	20%
MFG	89%	11%
PM / Design Consultant	100%	0%
Accumulative	88%	12%

171. From a Contractor's and Supplier's perspective, what is the impact of bid package size on construction cost?

Bid package size impacts the two respondent groups differently. Both respondent groups find smaller bid packages; as found in the five-bid package, to be of a size that will increase costs. From 25- to 50-home bid packages Contractor respondents are equally mixed between the three category choices. This maybe for a variety of factors, including company size, individual mobilization costs and geographic location from the Contractor's main location. However, when bid packages reach 100 homes, contractor respondents unanimously see an economy of scale. Manufacturer respondents have mixed responses at the 25-home bid pack category, but show a strong correlation between cost savings and the 50- and 100-home bid packages. Freight cost

may have a large underlying impact to the small bid package response. Many manufacturers do not have a freight system in place to ship smaller quantities effectively. Although production issues may reflect some of the respondents opinions, most fenestration products for RSIP programs are custom built for each application, so although there would be economies of scale regarding assembly, there may be little economies of scales regarding raw materials and fabrication due to the increase in product quantities per order.

Participant Class	Contractor			Manufacturer		
	Increase Cost	Decrease Cost	No impact	Increase Cost	Decrease Cost	No Impact
5-Bid Package	100.0%	0.0%	0.0%	92.0%	8.0%	0.0%
25-Bid Package	33.0%	33.0%	33.0%	23.0%	15.0%	62.0%
50- Bid Package	33.0%	33.0%	33.0%	0.0%	46.0%	54.0%
100- Bid Package	0.0%	100.0%	0.0%	0.0%	69.0%	31.0%

173. From a Contractor's and Supplier's perspective, what items below have the greatest impact on cost?

As a group, consistency of bidding initiates the most "significant impact" response from both groups surveyed, followed by specified duration of construction for each unit. For the contractor respondents, DBE Goals and Consistency of Bidding were two most significant impact items identified by contractors. Size of program and specified duration of construction for each unit were also items identified as creating significant cost impacts for contractors. From the manufacturers standpoint, consistency of bidding ranks number one as having the most significant cost impact. Inspection approach and specified duration of construction for each unit were the next items that caused a significant cost impact to manufacturers.

As a group, length of workmanship warranty and the time of construction were events had the least cost impact to each group, followed by the product selections and length of product warranty.

Participant Class	No Impact	Contractor			Significant Impact	
	1	2	3	4	5	
DBE Goals	0.0%	0.0%	0.0%	67.0%	33.0%	0.0%
Length Of Workmanship Warranty	17.0%	50.0%	33.0%	0.0%	0.0%	67.0%
Time of Construction	33.0%	33.0%	33.0%	0.0%	0.0%	66.0%
Quality of Bid Documents	0.0%	17.0%	50.0%	33.0%	0.0%	17.0%
Consistency of program	0.0%	17.0%	67.0%	17.0%	0.0%	17.0%
Consistency of Bidding	0.0%	0.0%	0.0%	50.0%	50.0%	0.0%
Size of program	17.0%	0.0%	0.0%	67.0%	17.0%	17.0%
Length of product Warranty	17.0%	17.0%	50.0%	17.0%	0.0%	34.0%
Product Selections	17.0%	17.0%	17.0%	33.0%	17.0%	34.0%
Inspection Approach	17.0%	33.0%	0.0%	33.0%	17.0%	50.0%
Bid Package Size	17.0%	17.0%	33.0%	33.0%	0.0%	34.0%
Per week starts	17.0%	33.0%	17.0%	17.0%	17.0%	50.0%
Specified duration	17.0%	0.0%	17.0%	50.0%	17.0%	17.0%

Participant Class	No Impact	Manufacturer			Significant	Impact #
	1	2	3	4	5	
DBE Goals	36.0%	29.0%	21.0%	7.0%	7.0%	0
Length Of Workmanship Warranty	17.0%	50.0%	14.0%	29.0%	7.0%	0.0%
Time of Construction	33.0%	57.0%	14.0%	21.0%	7.0%	0.0%
Quality of Bid Documents	0.0%	29.0%	14.0%	29.0%	21.0%	7.0%
Consistency of program	0.0%	57.0%	14.0%	7.0%	21.0%	0.0%
Consistency of Bidding	0.0%	0.0%	29.0%	29.0%	42.0%	5
Size of program	50.0%	7.0%	29.0%	14.0%	0.0%	6
Length of product Warranty	17.0%	43.0%	14.0%	36.0%	7.0%	0.0%
Product Selections	17.0%	43.0%	14.5%	14.5%	21.0%	7.0%
Inspection Approach	17.0%	7.0%	0.0%	29.0%	14.0%	50.0%
Bid Package Size	17.0%	21.0%	0.0%	29.0%	7.0%	43.0%
Per week starts	14.0%	0.0%	36.0%	21.0%	29.0%	11
Specified duration	17.0%	7.0%	7.0%	29.0%	29.0%	29.0%

CHAPTER 8

DATA ANALYSIS — CONSTRUCTION AND COSTS

8.1 ANALYSIS — COSTS

The survey results obtained from the cost related questions portion of the Best Practices Survey were very consistent and will strongly support the establishment of best practices within the Guideline.

Over 85% of respondents indicated that they were somewhat or completely satisfied with program cost estimating throughout the course of their respective Programs, with over 50% indicating they were completely satisfied. The indicated high level of satisfaction with cost estimating allows one to draw the inference that the survey respondent's response to approach questions can be utilized for identification of best practices. The survey results indicate the following practices lead to the high satisfaction results:

154. At what phase were program costs including construction costs first estimated:

Approximately 50-65% of respondents depending on category of respondent started developing cost estimates for their Programs in the initial stages of their development, namely prior to or during preparation of the Part 150 study.

155. At what phase were program costs refined to include detailed construction cost estimated:

Sixty-five percent of respondents refined their cost estimates during preparation of bid documents or during a pilot phase.

160. What approach was used to determine construction costs: (Select all that apply)

Benchmarking against other similar programs was indicated as the most popular approach to cost estimating, with R.S. Means, previous guidelines, or local contractor estimates being utilized about 30% of the time.

162. Did actual SIP costs resulting from completion of an initial phase of construction cause you to alter any of the following: (Select all that apply)

Respondents indicated that treatment offerings (eight responses), product selections (three responses) and policies (five responses) were adjusted to meet financial constraints or expectations over time.

156. Were estimated per home sound insulation costs an important consideration in initial establishment of your program.

157. Did you establish any cost goals prior to initiating your program?

Forty-five percent of respondents indicated they established cost goals prior to commencing a program, and 65% of Sponsors indicated cost was an important consideration in establishing their programs. With such a mixed message from respondents regarding establishing cost prior to program development, or cost goals, it appears that potentially other factors such as public relations may drive the early development of programs.

159. Who prepared your construction cost estimates:

Consultants were primarily tasked with cost estimating.

161. How accurate were your initial estimates of per home cost for SIP:

Sixty to 80% of estimates were within 10% of actual costs, and over 90% of estimates were within 30% of estimated costs.

164. What sound insulation treatments are included within your program: (Select all that apply)

Typical sound insulation treatments were consistent including windows, doors, HVAC, electrical upgrades, insulation and minor sheet rock installation. Less than 10% of respondents indicated significant gypsum wall-board installation was included within their programs.

166. What is your typical construction cost per Single Family home including product if provided by Sponsor:

167. What is your typical construction cost per Multi- Family unit (townhouse, duplex) including product if provided by Sponsor:

Typical single-family unit construction cost split evenly (~30%) with the following ranges: \$20-\$30k (31%), \$30-\$40k (25%), and \$40-\$50k (25%). For both apartment and condo units it appears typical unit cost were approximately \$10k less than program single-family costs. For multi-family, 33% were \$20-30k.

170. From a Contractor's perspective what is the impact on cost of having DBE Subcontracting Goals established for projects:

Contractors indicated that DBE requirements significantly increase construction costs.

171. From a Contractor's and Supplier's perspective what is the impact of bid package size on construction cost:

Contractors and suppliers indicated that project costs have a direct relationship to bid package size with costs increasing for five-unit bid packages and decreasing for 100-bid packages.

173. From a Contractor's and Supplier's perspective what items below have the greatest impact on cost*Rate each item 1 thru 5, 1 being no impact and 5 significant impact

Respondents indicated that bid package size (18), poor quality bid documents (12), program size (12), and inconsistent bidding schedules (9) drive up construction costs.

8.2 ANALYSIS — CONSTRUCTION DELIVERY APPROACH

The survey results obtained from the Construction Delivery Approach questions portion of the Best Practices Survey were very consistent and will strongly support the establishment of best practices within the Guideline.

Over 95% of respondents indicated that their expectations were met or exceeded in regards to their current approach to delivery of their sound insulation program. The indicated high level of satisfaction method of delivery allows one to draw the inference that the survey respondent's response to approach questions can be utilized for identification of best practices. The survey results indicate the following practices lead to the high satisfaction results:

175. During what Phase of establishment of your SIP did you first discuss your method of Program Delivery?

Fifty-three percent of respondents indicated their delivery approach was discussed prior to or during completion of their Part 150 Study.

176. During what Phase of establishment of your SIP did you finalize your method of Program Delivery?

Seventy-six percent of respondents indicated their delivery approach was refined and finalized during the contract document preparation or pilot phase.

177. Were construction contractors required to be prequalified prior to bidding your Projects:

Forty-seven percent of respondents required some form of contractor pre-qualification.

178. Which (if any) of the following issues contributed to your selection of your current SIP delivery system: (Select all that apply):

For Sponsors the primary factor in determining their delivery approach was their contracting requirements. Of secondary importance to Sponsor in determining a delivery approach was pace of their program, cost, in-house capability, and desire for homeowner satisfaction. It was interesting that Project Manager/Consultant responses did not match the Sponsor responses in regards to what most impacts selection of a delivery approach in regards to Sponsor In-House Capability and Sponsor Contracting Requirements. Sponsors were much more sensitive to these two issues.

180. Who is responsible for overall management of your construction activities for your SIP delivery approach:

181. Who is responsible for detailed inspection and acceptance of construction work:

Responses related to management of contractors during construction indicate Sponsors desire for an overall management role during construction with consultants providing for the detailed oversight. PM responses indicate that they primarily are responsible for the overall management role. Use of an independent third party entity to manage construction was utilized by less than 10% of the respondents.

183. Have you modified your SIP delivery approach over time?

Over 70% of Sponsors indicated that their delivery approach has been modified over time in response to pace of program, contractor performance issues, and public relations.

185. How often do you review your SIP delivery system:

Over 60% of respondents indicate they review their delivery approach annually or on a regular basis. Unfortunately 20% of respondents indicated they review their delivery approach only after failure.

186. If you have modified your SIP delivery system over time how do you feel the modifications have benefited your Program:

The majority of respondents have indicated that they realized measurable benefits by modifying their delivery approach over time.

187.- From a Contractor's perspective rate each approach in regards to how well you feel the Delivery Approach lends itself to a successful construction phase:

Survey participant opinions of Program success indicated the highest satisfaction level was with the Design-Bid-Build-Single Prime (traditional design, public bid, Single GC constructs) approach with 58% indicating this approach was very successful, and 37% indicating this approach was successful.

Opinion of success for Design-Bid-Build-Multi Prime (traditional design, public bid, multiple prime contractors) approach indicated 65% felt approach was successful, but 35% felt approach was not successful.

The remaining delivery approaches were not favorably viewed by the respondents including; Design-Bid-Build with Some Elements Design Build (traditional design, public bid, GC constructs with some elements designed by contractor); Design-Bid-Build (owner specifies conceptual plan, joint venture of designer and contractor design and build project); Design-Bid-Build with Construction Management Not At Risk (traditional design, public bid of trade packages as prescribed by CM (Sponsor holds contracts), CM Supervises multiple prime contractors on sponsors behalf, CM not responsible for delivering on a fixed price); Design-CM At Risk(traditional design, CM selected at fixed price to complete projects construction); Single Parcel Approach (Design-Homeowner Selects Min. Three Bidders from prequalified Contractors-Low Bidder Constructs or Homeowner Selects Contractor and Pays Difference Between Selected Contractor and Low Bidder). For the above approaches, 50% of respondents indicate they felt that the delivery approaches were unsuccessful.

CHAPTER 9

ANALYSIS SURVEY RESULTS — PROGRAM FUNDING AND REPORTING

9.1 OVERVIEW

The survey questions (#20 – #30) were developed to identify program funding and reporting processes that are currently utilized throughout sound insulation programs nationwide.

Respondents included Acoustical Consultants, Airport Officials, Aviation Planners, FAA (regional and headquarters) and Program Managers.

9.2 QUESTIONS & INTEREST GROUP

The ACRP 02-24 research team conducted an on-line survey of current practices in sound insulation. The survey focused on the following sound insulation professionals:

<u>Group</u>	<u>Number of Responses</u>
1. Acoustical Consultants	2
2. Airport Officials (Program Sponsors)	11
3. Aviation Planners	1
4. FAA	11
5. Program Managers / Design Consultants	9

9.3 ANALYSIS

Questions were developed to try and understand the perceived differences that exist between regions and how they affect sponsor and consultant reporting and closeout procedures.

The analysis is broken down into three categories that typically define the grant reporting process.

- Grant Procurement
- Grant Reporting
- Grant Closeout

Each category has survey questions pertinent to the subject matter.

9.3.1 Grant Procurement

Question #20 asks respondents how they submit grant applications to procure grants. Airport Sponsors and Consultants have been receiving direction from FAA that policy is forthcoming that will require grants to be issued in two segments.

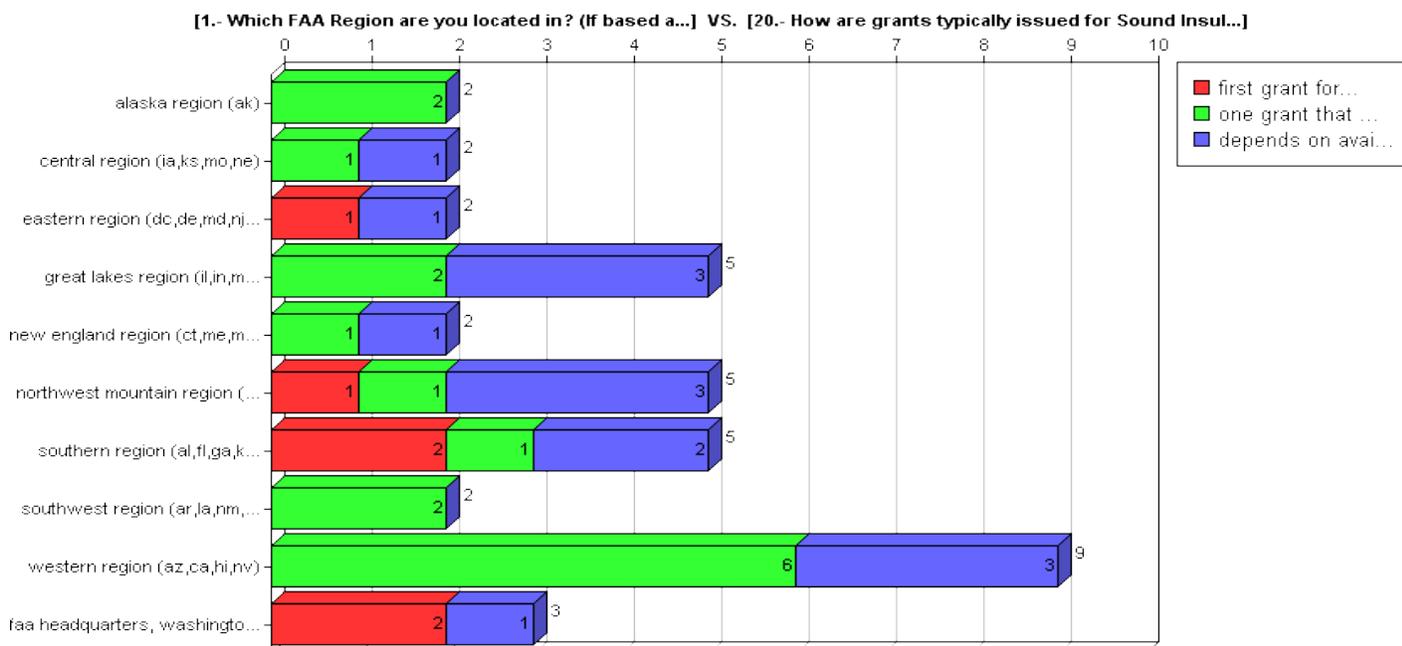
- 1). Design
- 2). Construction (after bids are confirmed)

The chart below shows the sound insulation industry is currently following three methods for grant procurement with the greater percentage (12.9%) applying for grants that include both design and construction.

20. How are grants typically issued for Sound Insulation Programs?

Result	Responses	Percentage	Graph
First grant for design, second grant for construction	6	4.8%	
One grant that includes both design and construction	16	12.9%	
Depends on availability of grant funds	15	12.0%	

Further analysis of the survey results (below) show that the Western-Pacific Region has the greater percentage of grant offerings that include both design and construction but FAA Headquarters shows and stricter adherence to what is perceived to be policy direction.

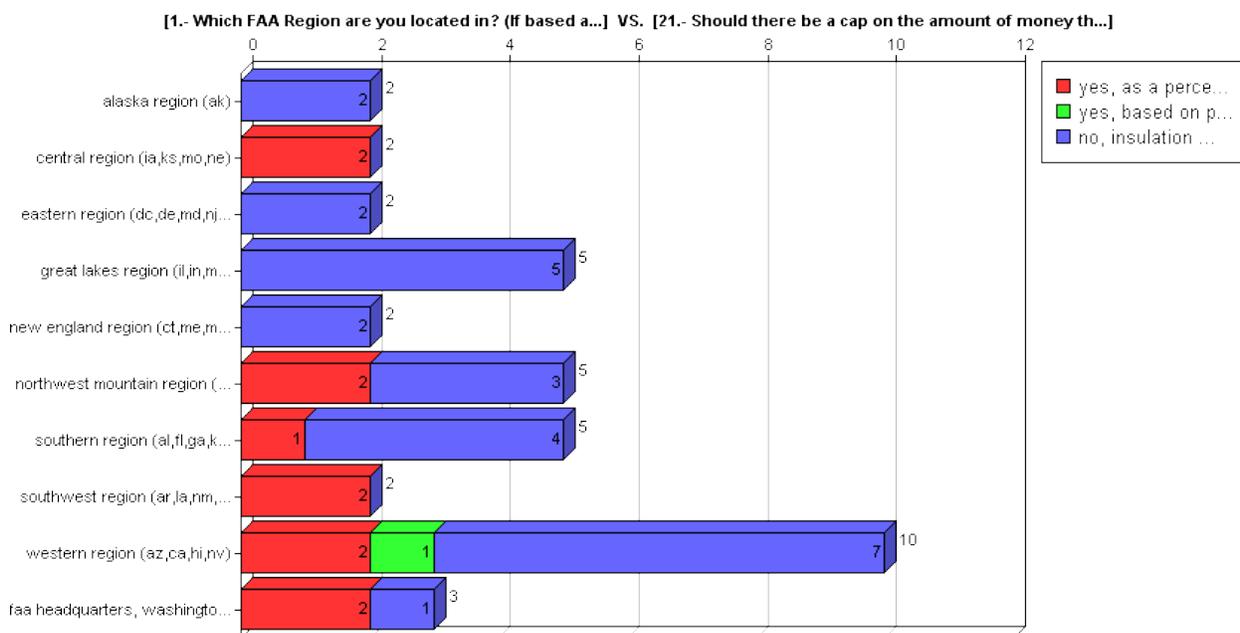


Question #21 asks how housing stock can affect grant funding request. Some sponsors and consultants have to consider is the value of treatments exceeding the value of home in the current housing market. The data collected for this survey question illustrates an inconsistency with the perceived understanding of how grants should be issued.

21. Should there be a cap on the amount of money that is spent to insulate a residential structure?

Result	Responses	Percentage	Graph
Yes, as a percentage of the structure's value	19	15.3%	
Yes, based on Part 150 forecasts	2	1.6%	
No, insulation is dependent on program policies, standards and housing stock.	56	45.1%	

The graph below shows that the greater percentage (45.1%) of regions are of the opinion that programs should have the flexibility to draft policy based on sound insulation needs and not value of homes within regions.



The value of these questions can be utilized by Airport Officials and Consultants in determining how to submit their grant applications and for future budget planning.

9.3.2 Grant Reporting

Question #23 is where we get into reporting cycles and requirement. Airport Sponsors and Consultants are unsure of when reports are due and what type of information the FAA wants to receive.

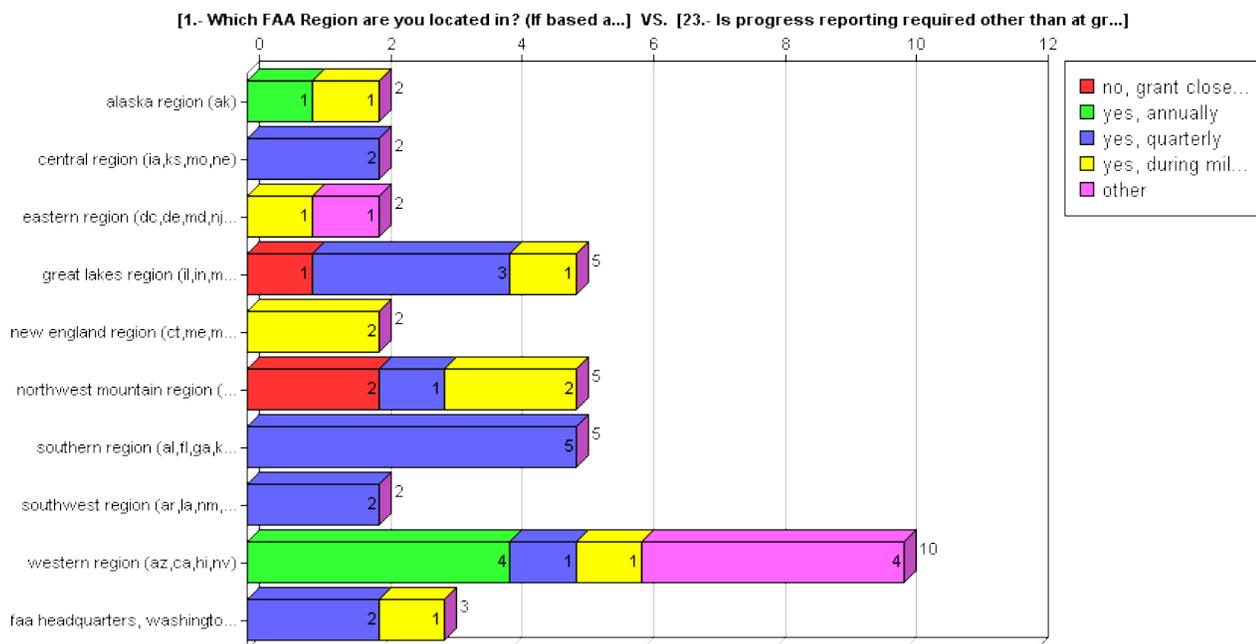
The chart below illustrates that there are differing reporting requirements within each region.

23. Is progress reporting required other than at grant closeout? At what frequency?

Result	Responses	Percentage	Graph
No, grant closeout reporting only	7	5.6%	
Yes, annually	6	4.8%	
Yes, quarterly	25	20.1%	
Yes, during milestones such as when ready to bid or after construction	16	12.9%	
Other	10	8.0%	

There may be circumstances within each region that require the reporting cycle to differ but as you further compare the survey results, there are differing reporting cycles as noted by airport officials and consultants. The graph's below is evident that inconsistent policy exists on project reporting.

Please select the category that best describes your involvement in sound insulation programs:	B) 23. - Is progress reporting required other than at grant closeout? At what frequency?				
	No, grant closeout reporting only	Yes, annually	Yes, quarterly	Yes, during milestones such as when ready to bid or after construction	Other
Acoustical Consultant	0	0	0	0	0
Airport Official (Program Sponsors)	2	5	11	4	4
Aviation Planner	0	0	0	0	0
Contractor	0	0	0	0	0
FAA	1	0	6	5	1
HVAC / Energy Engineer	0	0	0	0	0
Manufacturer	0	0	0	0	0
Program Manager / Design Consultant	4	1	8	7	5

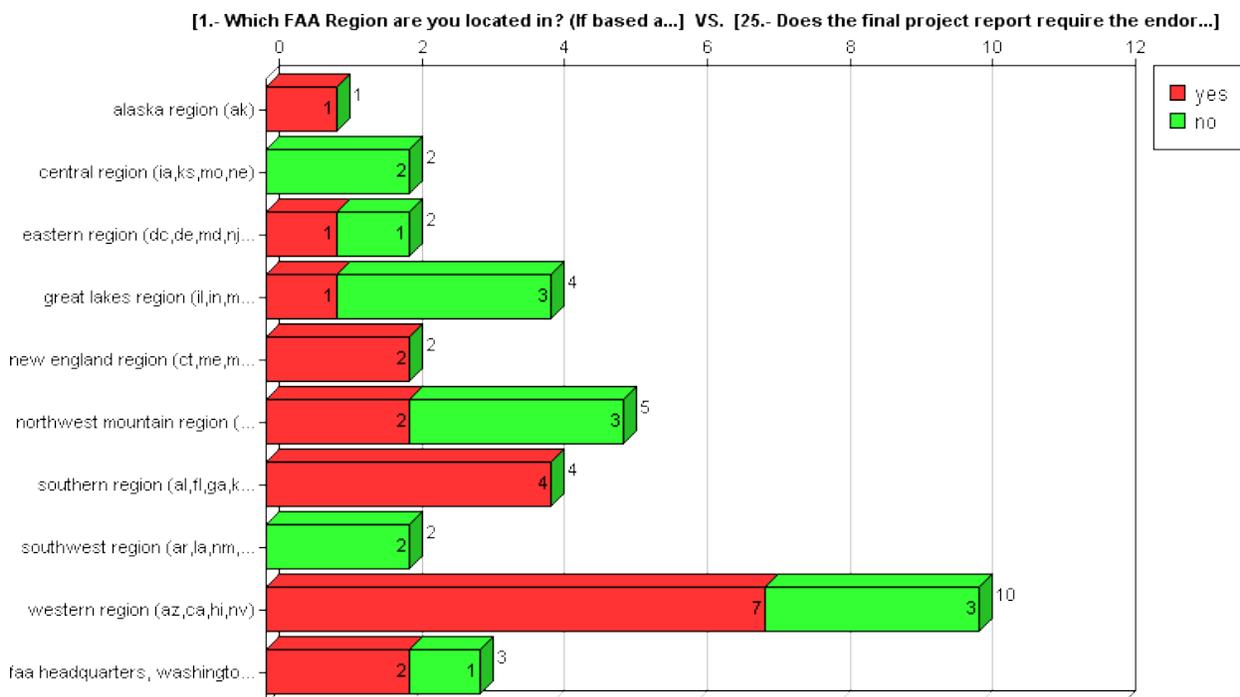


Question #25 shows that there is a definite split in how programs confirm acoustical properties of existing structures for their respective programs.

25. Does the final project report require the endorsement of a Registered Professional Engineer experienced in acoustics?

Result Responses Percentage Graph

Yes	38	30.6%	
No	37	29.8%	



Only the Southern and New England Regions require a Registered Professional to confirm acoustics. I am uncertain as to how the regions that do not require a Registered Professional to validate testing protocols. The practice of not validating acoustical properties could raise questions and lead to possible litigation.

9.3.3 Grant Closeout

Question 28. Is there a standard checklist for the programs closeout process?

The survey results from this question are of concern because 24.5% of the respondents from Airport Officials, FAA and Consultants do not acknowledge or may not be aware that a standard closeout checklist exists within their region. More importantly, 50% of the FAA respondents did not acknowledge that a standard checklist existed.

A) Please select the category that best describes your involvement in sound insulation programs:	B) 28. Is there a standard checklist for the programs closeout process?	
	Yes	No
Acoustical Consultant	0	0
Airport Official (Program Sponsors)	21	4
Aviation Planner	0	0
Contractor	0	0
FAA	5	5
HVAC / Energy Engineer	0	0
Manufacturer	0	0
Program Manager / Design Consultant	20	6

9.4 CONCLUSION

The survey included eleven (11) questions that tried to define the program reporting and funding processes. The survey questions that are used for this analysis were selected on the basis of their relationship to the main categories listed. They also best represent the responses from the FAA, Sponsors and Consultants, and clearly reveal that inconsistencies in program policy and reporting exist.

Standardization of all forms and checklists needs to be addressed by the FAA to minimize inconsistencies in program reporting. The inconsistency in program policy and guidelines (AIP Handbook – Order 5100.38C), which the industry is directed to comply with, is possibly attributed to the interpretation of the AIP Handbook that comes within the FAA ADO regional system. These interpretations are then communicated and carried out by airport officials and consultants.