

WELLINGTON SCHOOL BUILDING COMMITTEE
MINUTES
May 31, 2017
Wellington School Community Room
7:30 AM

Meeting #184

Committee Members Attending: Joe Barrell, John Bowe, Gerry Boyle, Patricia Brusch, Laurie Graham, Mark Haley, Bill Lovallo, Heidi Sawyer, Eric Smith

Liaisons Attending: Fred Domenici, Scott Brinch, Amy Spangler

Clerk: Chris Kochem

Guests: Deni Findlay, Pinck & Co., Deborah Marai

Mark Haley, Chair, called the meeting to order at 7:40 a.m.

Interior Noise Mitigation

Mr. Haley summarized the report that was received from Acentech. There are three noise mitigation projects to discuss:

- Doors – seals around them
- Cafeteria, atrium, and gym – modify tectum (while the gym is the best for managing noise, it could be improved)
- Classrooms - sealing walls between each classroom, especially where the flutes (metal deck) meet the ceiling

Of the above, there are plans and specs for the doors so the doors are ready to go out to bid. Acentech offered some options for door hardware but verification is needed to confirm that all doors (classroom versus office) would have the same hardware requirements.

Deborah Marai, Pinck & Co., presented a report titled, ***Belmont Wellington School Interior Noise Mitigation, Phase I – Noise Mitigation Recommendation***. She discussed the recommendations for the issues:

- Sound transfer at the doors - door gasketing is needed for 90 doors (classroom to classroom, classroom to office, office to office)
- Flutes (metal decks) – seal the flutes where they meet the demising wall
- Cafeteria, atrium, gym – install better and more sound absorbing panels in these three major areas

Joe Barrell asked that Pinck & Co. verify that the HVAC systems will not be affected by any of the recommendations. Ms. Marai said that the Town of Belmont's on-call architect needs to look at the entire design of the building.

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There was discussion about how to manage the timeline for these projects. It was noted that obtaining the door hardware would only require a short lead time. Joe Barrell asked about doing a pilot area of one section and then testing to see how that section works. He pointed out that the labor market is very tight right now so it could be hard to find the staffing. Mark Haley noted that the project is too big to be done in-house because it would require eight workers for three weeks to do all the doors. If the decision is to do a pilot section and the cost is less than \$10,000, then the pilot section would not be subject to the bidding process. He said that Pinck and TBA Architects are working on a proposal and suggested going out to bid in January 2018 with the goal of doing the project during the summer of 2018.

Pat Bruschi strongly objected to waiting another school year before the door gasketing is completed. She said she was expecting that a proposal was going to be presented at this meeting. There was discussion about how the WBC could support Pinck so that the door gasketing could be done as soon as possible.

Gerry Boyle was recently appointed to be a member of the WBC by the Town Moderator. Mr. Boyle will set up a working group to develop a set list of services and a concept design for the flutes and the large spaces. He explained that, for the calendar year, the on-call architect, TBA Architects may provide services to the WBC, not to exceed \$50,000, and that, as the OPM, Pinck & Co. may provide services, not to exceed \$53,000.

Bill Lovallo made a motion for the WBC to approve the on-call Architect (TBA) and the on-call OPM (Pinck & Company) up to their annual contractual cap limits, for full services of the installation of the Wellington School door gasketing to occur this summer plus, by September 15, 2017, the development of a concept plan for acoustic solutions for the flutes and the open areas. The motion was seconded by Eric Smith and was unanimously approved.

There was then discussion about the flutes. Acentech is proposing a spray that will expand into the entire space and fill the gaps. There is concern about the aesthetics of this process because there will be overspray onto the ceiling and the wall. Bill Lovallo suggested that the WBC bring in a contractor to do multiple mock-ups for the flutes to see which solution brings the best results.

For the cafeteria, atrium, gym, it was noted that, as part of Value Engineering during the planning for the Wellington, the amount of soundproofing was reduced. There is currently one inch of tectum on the existing walls of the cafeteria and the open spaces. The recommendation is to use 2 inches of tectum in these spaces. As part of the decision-making process major considerations will be the design, cost, and product effectiveness. It is not yet known if the current panels will have to be removed and replaced or if the current panels could be left as they are with additional material added. Pat Bruschi recommended consulting the design plans from when the Wellington was built.

Heidi Sawyer left the meeting at 8:50 a.m.

Gerry Boyle noted that the report, ***Belmont Wellington School Interior Noise Mitigation, Phase I – Noise Mitigation Recommendation***, has an error on page 2 of 6. In the section titled, Project 1 – Estimated Construction Cost, the wording of the second line is incorrect. Instead of 'Estimated cost per door', this line should read 'Estimated cost for materials'. The amount remains the same at \$26,000.

Deni Findlay and Deborah Marai left the meeting at 8:53 a.m.

Secretary Compensation

Pat Brusch noted that the WBC secretary compensation has been set at \$28 per hour since 2009 and there was agreement with her recommendation that this compensation be increased to \$30 per hour.

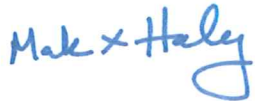
Pat Brusch made a motion to raise the secretary compensation to \$30 per hour, with the increase retroactive to the meeting of March 22, 2017. Eric Smith seconded the motion and it was unanimously approved.

Approval of Minutes

Pat Brusch moved approval of the minutes from the March 22, 2017 meeting. Eric Smith seconded the motion and it was unanimously approved.

Eric Smith made a motion to adjourn the meeting at 8:57 a.m. The motion was seconded by Pat Brusch and unanimously approved.

Respectfully submitted,



Mark Haley
Chair

May 25, 2017

Mr. Gerald Boyle
Director of Facilities
Town of Belmont
19 Moore Street
Belmont, MA 02478

Re: Belmont Wellington School Interior Noise Mitigation
Phase 1 – Noise Mitigation Recommendations (Revision 0)

Dear Gerry,

Attached please find Belmont Wellington School Mitigation Projects report including scope of work, proposed schedules and estimated costs for the Door Gaskets, Deck Flutes and Acoustical Wall Panels.

The report is a compilation of Acentech's 5/9/17 report recommendations and discussions during our recent conference calls.

We look forward to speaking with you on Thursday, May 25, 2017 at 1:00am.

Sincerely,

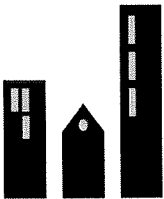
Deni

Denise A Findlay
Project Manager
Pinck & Co.

Attachments:

PCI 5/10/17 Cover Letter
Acentech 5/9/17 Report
PCI 5/25/17 Project Report

REPRESENTING OWNERS FROM CONCEPT TO CLOSEOUT



PINCK & CO

98 Magazine Street
Boston, MA 02119

221 Industry Avenue
Springfield, MA 01104

T 617.445.3555

F 617.445.3511

pinck-co.com

- If the pre-construction portion of this project cannot maintain the aggressive schedule necessary to have installation of gaskets at all 87 doors completed this summer, the remainder of the scope could easily be completed over school vacation weeks.

Project 1 - Estimated Construction Cost

Estimated cost for labor:	\$26,000
Estimated cost per door (materials):	\$26,000
Design contingency (20%):	\$10,500
<u>GC General Conditions and Mark-up:</u>	<u>\$16,000</u>
Estimated Construction Cost:	\$78,500
Owner's Construction Contingency (15%):	\$12,000
Soft Costs (Designer, OPM):	TBD

Project 1 - Next steps

- Bring on Belmont On-Call Architect TBA (potentially with acoustic consultant, such as Acentech), and approval of proposal for design services
- Approval of PCI OPM services for next phase(s) of work
- Design team survey doors to assess type of gaskets and sound traps needed; conditions vary
- Design team specify door hardware (gaskets and sound traps)
- Design team produce technical bid documents
- PCI assist Town of Belmont with production of front-end bid and contract documents
- Once this process starts, may need to re-evaluate the amount of door gasket installation that can take place over the summer
- Advertise and bid
- Award construction contract / Belmont approvals
- General contractor submittals, design team review
- Construction

2. Project 2 - Deck Flutes in Classrooms and Offices

Project 2 - Summary

Mitigating the noise that travels between classrooms and offices is a more involved project. Acentech's proposal to mitigate this issue is expected to have substantial impact, but there are technical, aesthetic and cost concerns to be considered. There is insufficient time to address these concerns and line up this project for the Summer 2017 break, however the Town should consider the option of performing mitigation areas for a limited area (3 classrooms) in order to assess the proposed

Project 2 – Next Steps

- Bring on Belmont On-Call Architect TBA, and approval of proposal for design services
- Approval of PCI OPM services for next phase(s) of work
- For the immediate future, the focus should be planning, design and potential completion of a limited scope project (as discussed above). If a small (under \$10K) project is undertaken, the addressed areas should be retested to determine noise isolation improvements.
- A count of flutes needs to be conducted, and existing conditions will be verified by the architect.
- As part of the design process, a determination is to be made regarding the product to seal the flutes in an aesthetically pleasing and (most) cost-effective manner.
- Once the design approach is approved, the design team will produce bid documents, PCI will assist the Town with development of the front-end bid and contract documents, and the project will be able to go out to bid.
- It is anticipated that the majority of this scope will be completed over the Summer 2018.

3. Project 3 - Acoustical Wall Panels

Project 3 – Summary

As mentioned in Acentech's May 9, 2017 report, the 1" Tectum panels are installed in the Cafetorium and Atrium. Acentech's original design recommendation was to use the 2" Tectum Finale panels, which have a higher sound absorption rate. In addition, Acentech performed sound testing in the Classrooms next to the Stairwells due to noise concerns in these areas. To reduce noise-build up, Acentech is recommending to add acoustical panels in the Stairwells, in addition to adding better sound absorbing and larger quantities of acoustic panels in the Cafetorium and Atrium.

Acoustic wall panel quantity, type and locations will require a lengthy verification process, design input, decision making and documentation for bidding. Lead times for products vary between standard versus custom sizes and finishes. There is insufficient time to address the panel installation Summer 2017. Also, with the logistics issue of equipment use needed for demolition and installation, it is likely this project would need to occur during Summer 2018.

Project 3 – Scope

- Due to required design decisions and product lead times, this work cannot take place over Summer 2017 break

Project 3 – Next Steps

- Bring on Belmont On-Call Architect TBA, and approval of proposal for design services
- Approval of PCI OPM services for next phase(s) of work
- A count of panel locations and finishes needs to be conducted, and existing conditions will be verified by the architect.
- Design team to provide options for panel locations
- During design, selection of new panel sizes and finishes must consider the original design intent.
- Once the design approach is approved, the design team will produce bid documents, PCI will assist the Town with development of the front-end bid and contract documents, and the project will be able to go out to bid.
- It is anticipated that design, approvals and bidding would be completed by early 2018 for the construction to happen Summer 2018.

Summary

The goal is to move quickly on Project 1 – Doors to complete this project over Summer 2017 prior to the new school year beginning.

The Project 2 – Flute sound proofing products and count will take slightly longer. However, installing sound proofing in some locations in Summer 2017 will allow a sample area to be tested to document the level of improvement, in particular, in Classrooms.

Project 3 – Acoustical Wall Panels will have the longest design timeframe. There is insufficient time to accomplish milestones for construction over Summer 2017. Equipment logistics may not allow this project to be done during one week vacations.



ACENTECH

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Cambridge MA 02138
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acentech.com



May 9, 2017

Deborah Marai
Pinck & Co., Inc.
98 Magazine Street
Boston, MA 02119

Subject: Acoustical Report
Roger Wellington School
Belmont, MA
Acentech Project 628508

Dear Deborah:

We visited the Roger Wellington Elementary School on April 11, April 14, April 18, and April 19, 2017. The first two visits were visual site inspections of the classrooms, cafetorium, and atrium. We conducted sound isolation measurements at several classrooms and offices during the latter two visits. We understand that since our 2013 assessment, there is continued concern over excessive noise and sound isolation issues. This report documents our observations, measurement results, and recommendations.

SOUND ISOLATION MEASUREMENTS

To evaluate the sound isolation between several pairs of adjacent spaces at the Wellington School, we conducted acoustical field measurements by placing a loudspeaker playing pink noise in a "source" room, and then measuring the transmitted noise level in adjacent "receiver" locations. These tests quantify sound isolation in terms of the Noise Isolation Class (NIC) metric: a greater NIC value indicates a greater level of sound isolation between the spaces measured.

All measurement results are shown graphically in *Appendix A* attached at the end of the report.

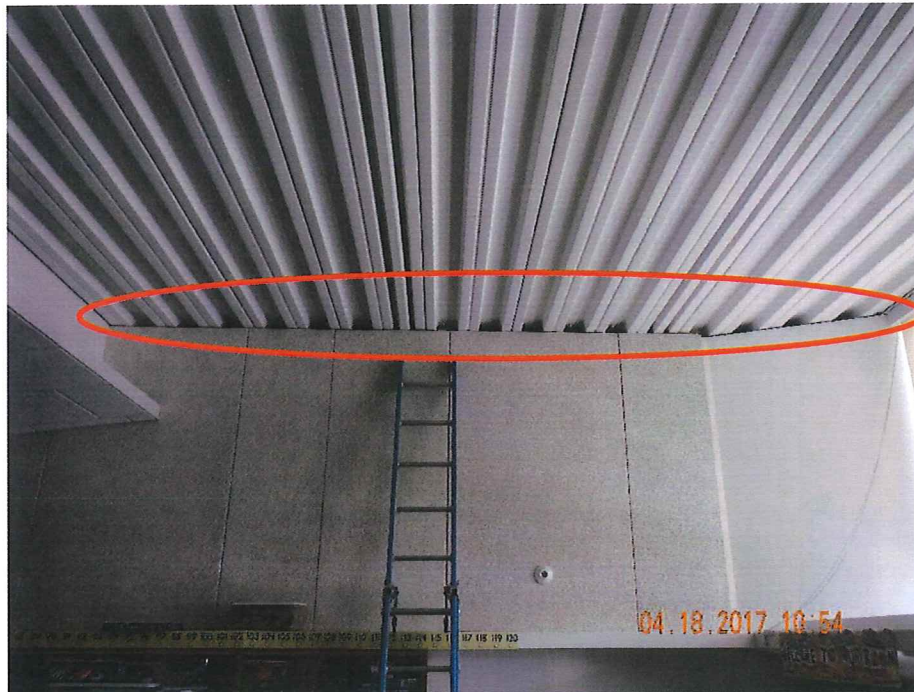
Classroom to Classroom

The sound isolation of demising walls between classrooms without communicating doors ranged from NIC 27 to NIC 46. The isolation between classrooms with communicating doors were NIC 29 to 34, measured at the center of the room.

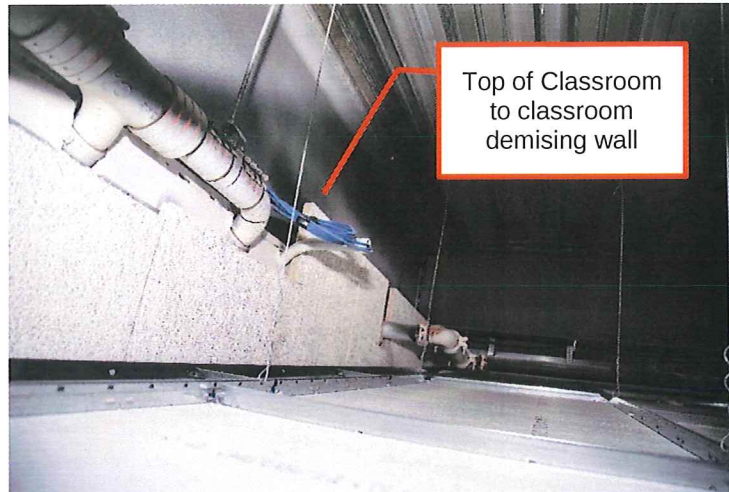
We attribute the primary sources of sound transmission to be the communicating doors and the sealing of the exposed metal deck: When measured at the communicating door, the measurements were 8 to 10 NIC points lower than at the center of the room. At the height of the metal deck, measurements were 4 to 10 NIC points lower than at the center.

While on site, we observed that the flutes of the exposed deck in classrooms and offices were filled with a single 1"-thick foam plug glued into the deck (see below). This detail is insufficient for two reasons which will both need to be addressed:

- 1) The foam plug itself does not provide sufficient sound isolation between rooms. The entire depth of the demising wall will need to be filled with mineral fiber (which we describe in further detail in "Recommendations" section below).
- 2) There was no sealant around the plugs and between the wall and deck. We observed clear gaps seen between the bottom of the deck flutes and the top of the wall head track (indicated with arrows below).

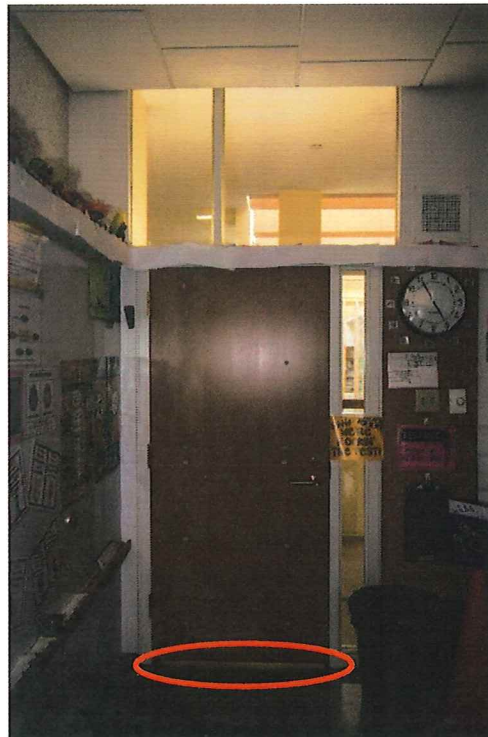


The sound isolation was significantly better in the portion of the classrooms under the dropped acoustic ceiling tile (at the corridor side of the rooms). Above the dropped ceiling, the deck flutes run parallel to the demising walls, and no visible gaps were observed within the demising wall.



Circulation Spaces to Classrooms

The measured sound isolation at corridor walls (with the entry door closed) was between NIC 17 to NIC 34. The variation in these measurements was mostly due to the distance from the doorway. The doors were not sealed and many of them had large undercuts (such as shown below). This poor acoustical performance can be especially problematic where classrooms are adjacent to noisy public areas, such as the Atrium.



Measurements at the clerestory windows were 11-17 points higher than at the entry door, suggesting that sound attenuation through the glazing is substantially better than under and around the door, even when the doors are shut.

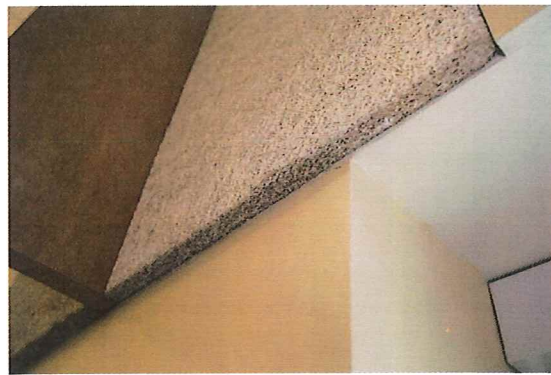
We understand that the classrooms adjacent to the stairwells are distracting to some students, and that the stairs are used continuously throughout the day. The sound isolation between the stairwells and the adjacent classrooms was NIC 46, which is the expected performance for the demising wall type, and the partitions appear to be well sealed. The stair treads appear to be structurally tied to the wall, which could make heavy foot traffic be audible in the adjacent classroom. In addition, because there is no acoustically absorptive treatment within the stairwells, it is possible that there could be distracting noise build-up within the stairwells that could transmit through the walls.

Office Spaces

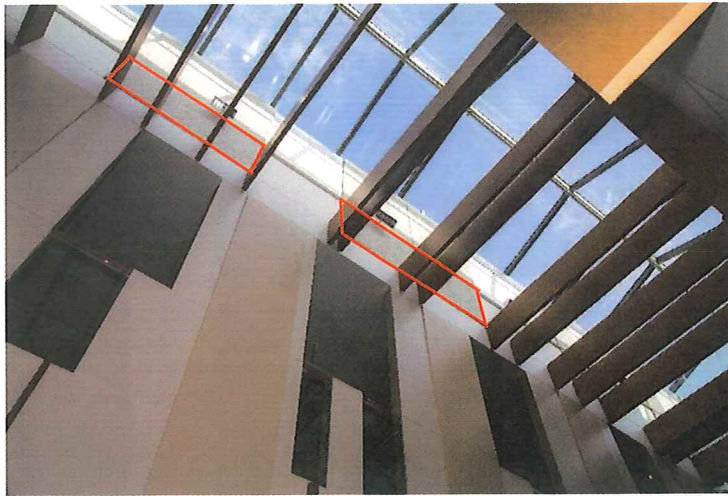
The measured sound isolation between offices was NIC 25 to NIC 40. Similar to the classrooms, the acoustic weak points between offices appear to be the exposed deck and the communicating doors; sound isolation near the deck and close to the doors measured 3 to 7 points lower than when measured at the center of the room. We investigated the sound isolation at the window alcove between Office 144 and Office 146 and found that the sound isolation at the window was only one point lower than when measured at the center of the room.

Acoustical Treatment

The panels in the Cafetorium, Atrium, and Gymnasium appear to be standard Tectum panels (see below), rather than Tectum Finale panels (which are 2" thick minimum) or standard Tectum on furring with glass fiber insulation behind, as we had originally recommended. By themselves, the standard panels are only about half as effective as the recommended options.



While the reverberation in all three of these spaces is noticeable (refer to *Appendix C* for our 2013 comments on the measured reverberation time), the Atrium is the space that generates the most noise complaints. This is because of the hard surfaced floor and walls with nowhere near enough acoustical treatment to control the excessive reverberant build-up of noise. The only acoustically absorptive treatment are the few Tectum panels (which also appear to be standard 1" thick panel rather than Tectum Finale/furred Tectum with glass fiber backing) located very high on the walls (see below). As a rule of thumb, in large, open spaces, we typically recommend an amount of acoustically absorptive treatment that is equivalent to the area of the largest vertical wall.



RECOMMENDATIONS

2013 Acoustical Report

This report in its entirety can be found in *Appendix C* at the end of this report. We visited the Wellington School in August 2013 to measure the reverberation and sound isolation of various spaces. From this report, we had the following recommendations:

- **Horizontal Sound Isolation:** add full perimeter seals to the communicating doors of all classrooms. Inspect the gasketing of the flutes of the exposed deck.
- **Vertical Sound Isolation:** Add area rugs or wall-to-wall-carpeting in second floor classrooms to reduce furniture scraping noise. Please note that although we have not commented on this issue in this report, furniture scraping noise is still apparent and carpeting would help.
- **Reverberation:** Add acoustically absorptive material with a minimum NRC 0.8 rating to the Atrium, Gymnasium, and Cafetorium.

In addition to the comments in this report, we offer the following recommendations:

Improve Deck Seals

The current deck seals are NOT sufficient and have been shown to be a significant acoustical leak. We recommend filling the flutes of the exposed metal deck with Hilti Speed Plugs (*Appendix B – B.1*). You will also need to seal both ends of the plugs AND where the bottom of the deck flutes meet the top of the wall track with a resilient sealant similar to 3M FireDam Spray 200 (*Appendix B – B.2*).

Doors

All communicating doors and all corridor doors of the classrooms and offices should have a full set of seals including the following (all recommended Zero International products are indicated in *Appendix B - B.3, B.4, and B.5* at the end of the report):

1. Full perimeter neoprene bulb seals at the head and jambs.
2. Door bottom seal
 - a. The seals installed on the door of the Gym Office (see below) seem to work fairly well, and may be substituted for the recommended Zero International door bottom seals, although we do not know of the product that was chosen.



3. Threshold with neoprene gasket

All of the products listed above are surface mounted (rather than requiring the existing doors to be rabbeted), but the doors will likely have to be removed for the products to be installed. Regardless of the products chosen, the bottom of the seal **MUST** make contact with the threshold in order to be effective.

Reverberation Reduction for Atrium, Gymnasium, and Cafetorium and Stairwells

1. Increase the amount of acoustically absorptive treatment within Atrium, Gymnasium, and Cafetorium. Refer to the attached elevations (*Appendix D - D.1 – D3*). The blue hatch indicates Tectum Finale (*Appendix B - B.6*) (or Tectum mounted on furring with 1" batt insulation/duct liner behind). The yellow- and red-hatched areas indicate minimum recommended coverage of 2" fabric-wrapped glass fiber panels (minimum NRC 0.85) such as Owens Corning/Conwed Designscape Respond (*Appendix B - B.7*), or Kinetics HardSide (*Appendix B - B.8*). Given the problems with reverberation in the atrium space, we'd recommend going even further with the addition of absorptive fabric-wrapped panels, as indicated by the green-hatched areas.
2. Finally, to reduce noise build up within the stairwells, add acoustical panel to as much of the stairwell walls as possible on each level (using the products described above). Please note this will not address structural-borne footfall noise.

* * * * *

I trust that this provides the information you require at this time. If you have questions, please contact me at 617.499.8081 or Bob Berens at 617.499.8028.

Sincerely,

Kristen Murphy
Consultant

CC: Robert Berens (Acentech), Denise Findlay (Pinck)

Enclosed:

APPENDIX A – SOUND ISOLATION MEASUREMENT RESULTS

APPENDIX B – CUTSHEETS

B.1: HILTI SPEED PLUGS CUTSHEET

B.2 : 3M FIRE DAM SPRAY 200 CUTSHEET

B.3 : ZERO INTERNATIONAL PERIMETER GASKET CUTSHEETS

B.4 : ZERO INTERNATIONAL DOOR SWEEPS CUTSHEET

B.5 : ZERO INTERNATIONAL THRESHOLD CUTSHEET

B.6: TECTUM FINALE CUTSHEET

B.7: CONWED DESIGNSCAPE RESPOND CUTSHEET

B.8 : KINETICS NOISE CONTROL HARD SIDE CUTSHEET

APPENDIX C – WELLINGTON SCHOOL ACOUSTICS ASSESSMENT, ACENTECH 2013

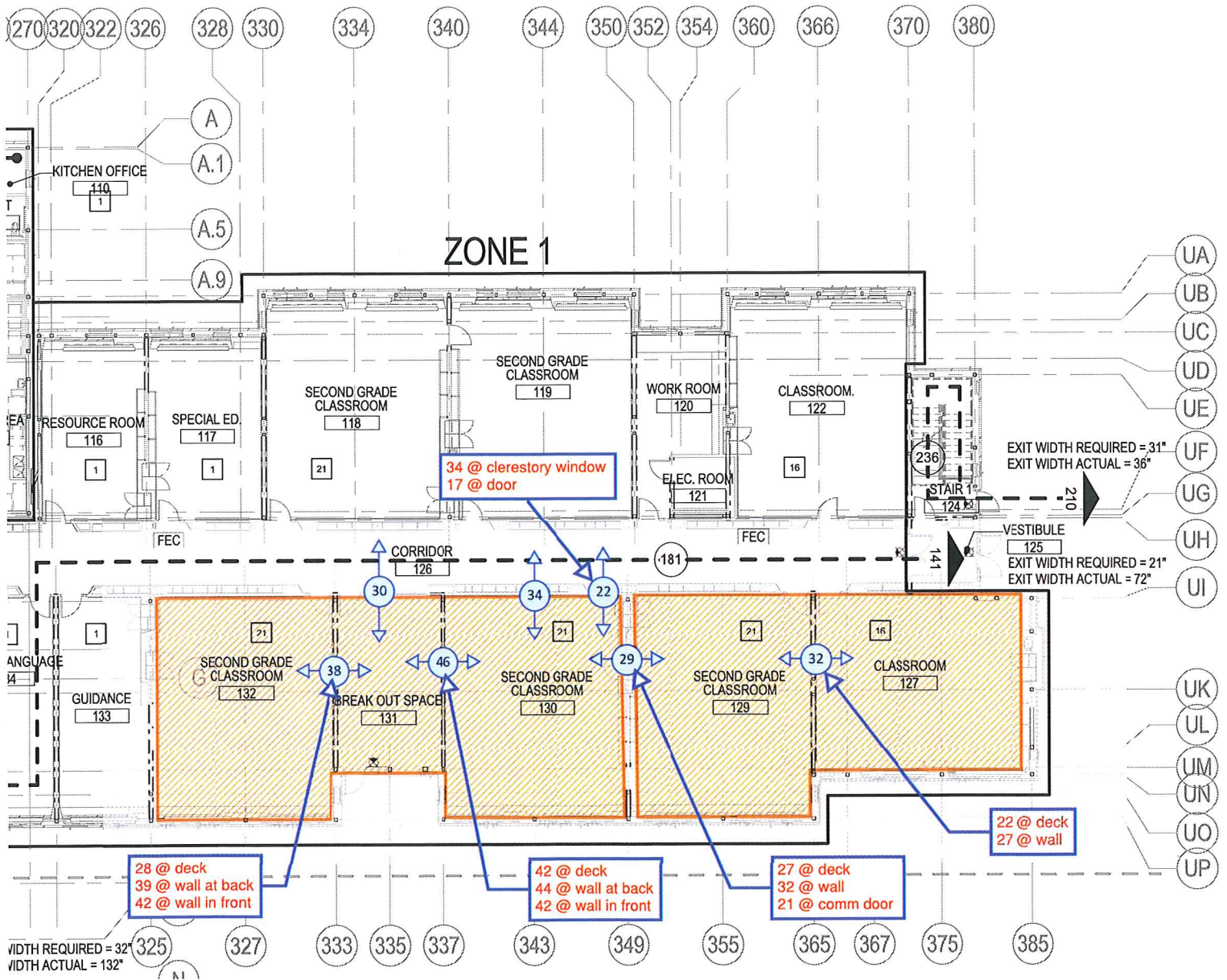
APPENDIX D – ELEVATIONS

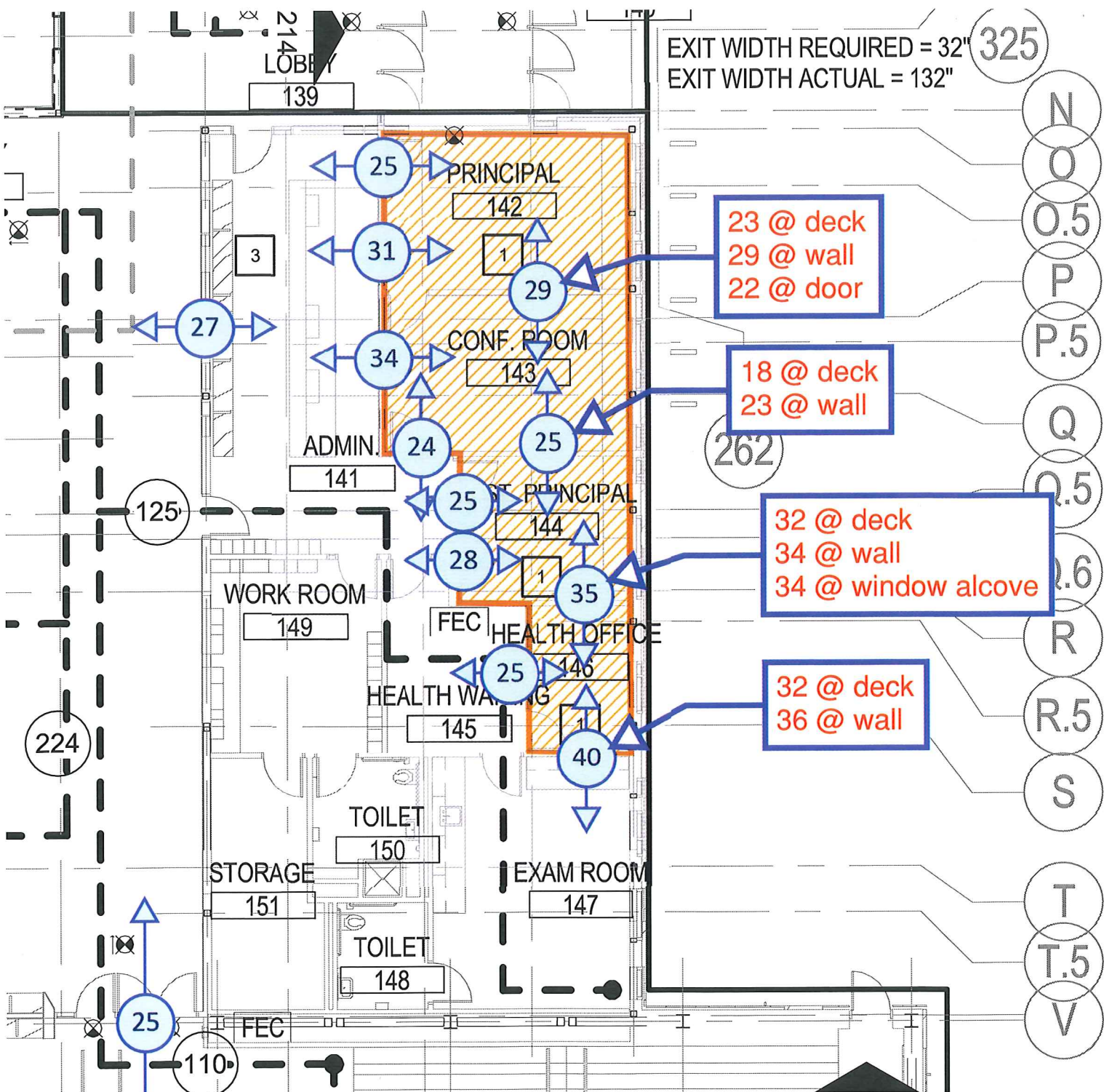
D.1 : CAFETERIA ELEVATIONS

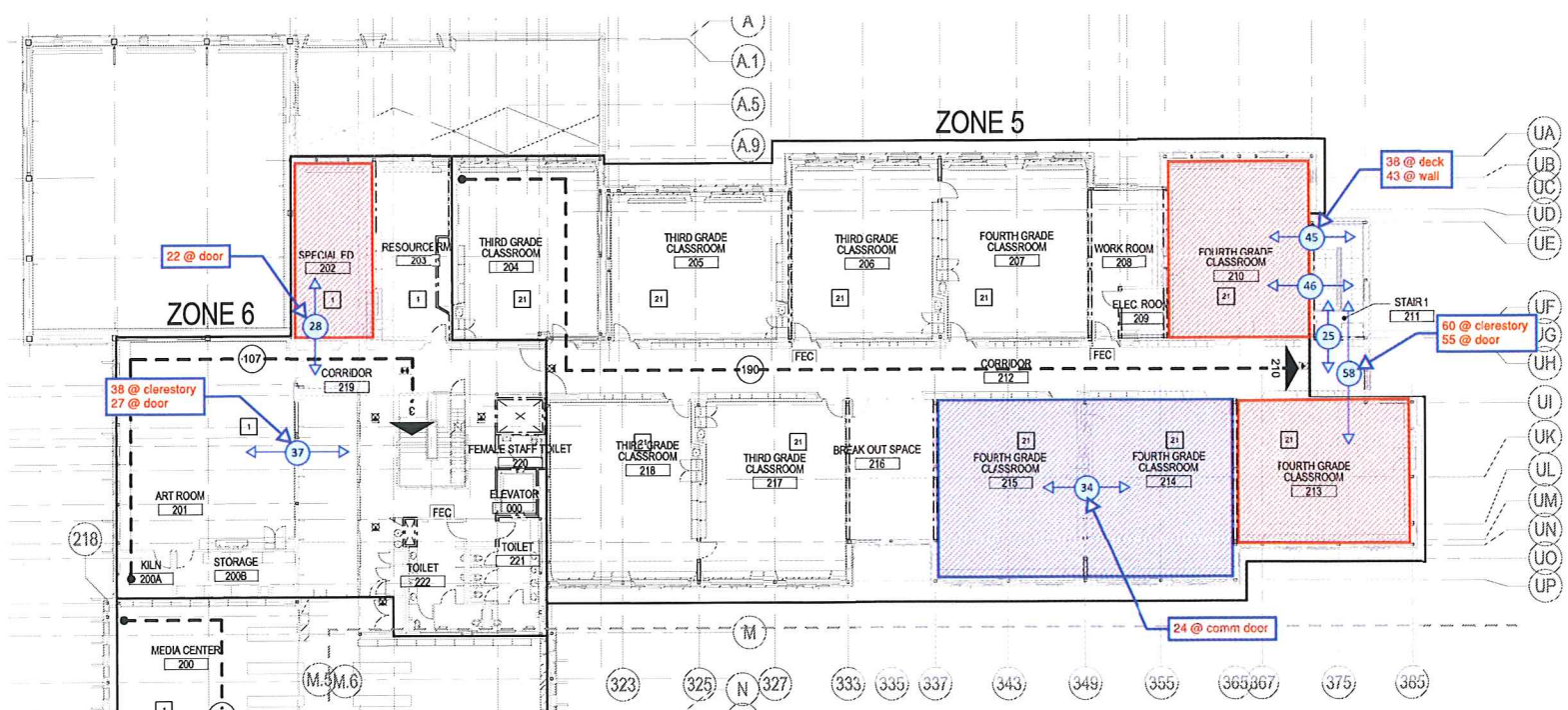
D.2 : ATRIUM ELEVATIONS

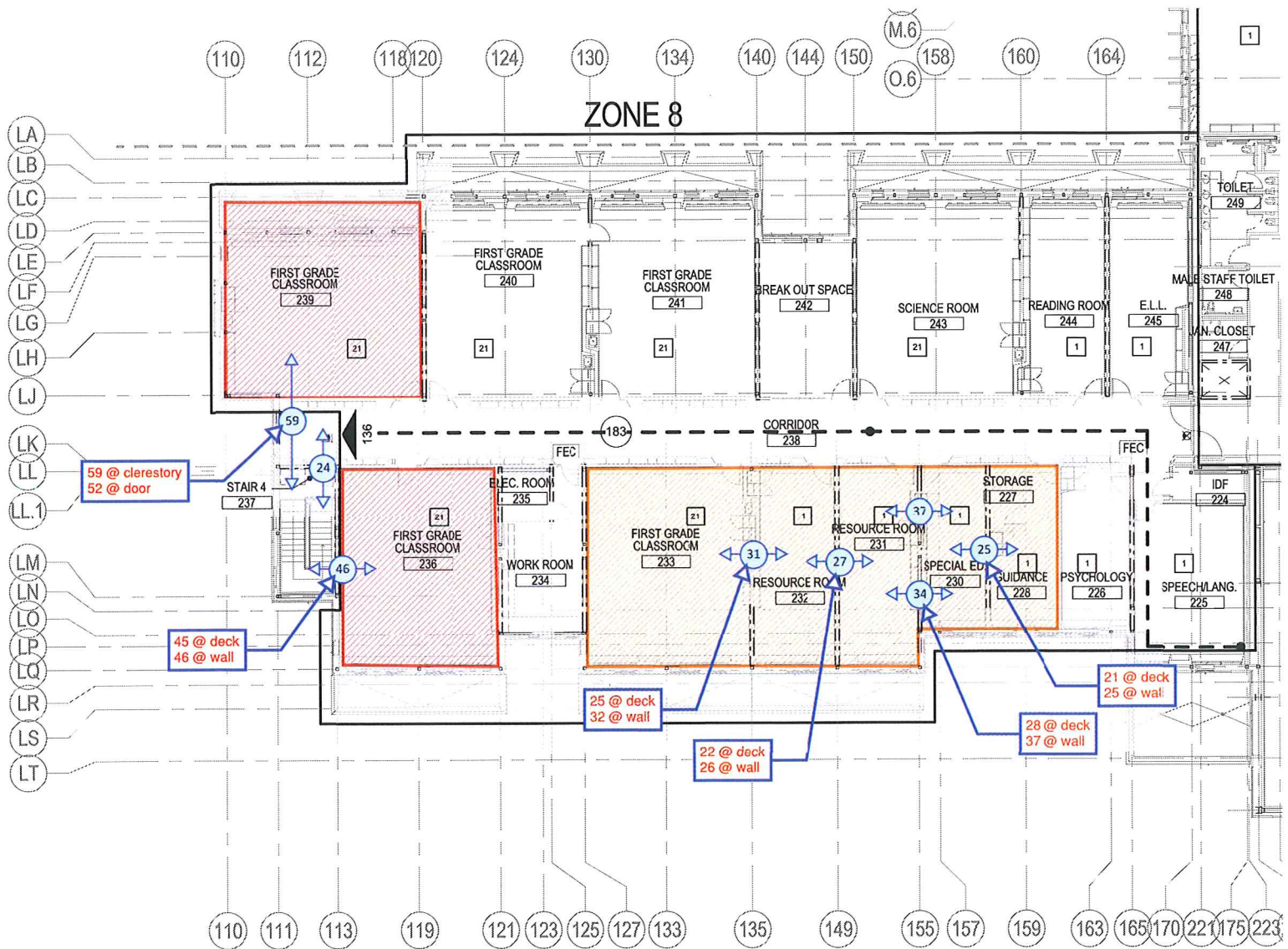
D.3 : GYMNASIUM ELEVATIONS

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Speed Strips (CP 767)

Speed Plugs (CP 777)

Product description

- CP 777: Pre-formed mineral wool plugs for 1.5", 2" and 3" decks
- CP 767: Pre-formed mineral wool strips suitable for joint applications

Product features

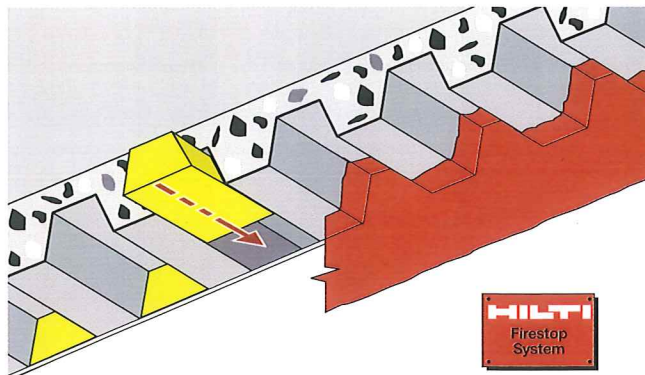
- Pre-cut to industry standard size decking flutes
- Reduces material waste
- 3 sizes available
- Pre-cut — leaves no gaps or voids
- Smooth surface provides cost effective spray coverage
- Safe to use — no asbestos/inorganic, will not mildew
- Up to 60% faster than castle cutting!

Areas of application

- Top-of-wall

Tested and approved

- UL Classified when used in conjunction with CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, CP 672 Speed Spray, or CFS-SP WB Firestop Joint Spray

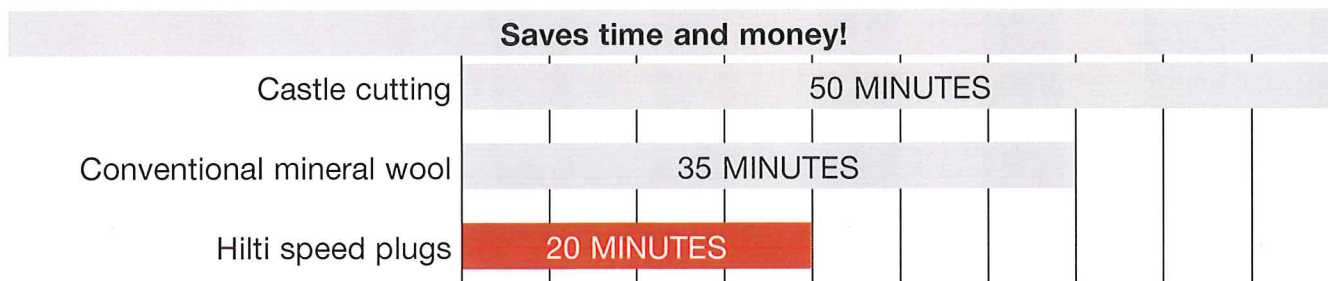
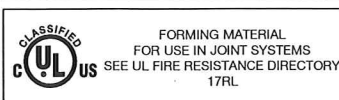


Technical Data

CP 767 and CP 777

Tested in accordance with

- UL 2079
- ASTM E 1966
- ASTM C G12 Type I-IUB



60% Faster than castle cutting

43% Faster than conventional mineral wool

*Based upon 40 linear feet of installation. Actual results may vary.

Installation instructions for CP 777

Notice

- Before handling, read Material Safety Data Sheet and product label for safe usage and health information.

- Instructions below are general guidelines — always refer to the applicable drawing in the UL Fire Resistance Directory or Hilti Firestop Systems Guide for complete installation information



Easy one step installation — simply cut to length and install.



Full coverage pre-cut flute configuration leaves no gaps or voids.



Superior finish smooth surface allows quick and cost effective coverage with Hilti CFS-SP WB Firestop Joint Spray.



Easy to utilize — Speed Strips in joints between wall substrate and bottom of deck. Compress per UL System.



Hilti Firestop
Saving lives
through innovation
and education

Hilti. Outperform. Outlast.

Hilti, Inc. (U.S.) 1-800-879-8000 • www.us.hilti.com • en español 1-800-879-5000 • Hilti Firestop Systems Guide



FireDam™ Spray 200

New faster drying
firestop spray for
construction joints.

***From 3M, the industry leader in
fire protection technology:***

3M™ FireDam™ Spray 200 is ideal for sealing building joints, penetration seals and perimeter joints.

Applied as a 1/8 inch (3 mm) thick coating with an airless sprayer, this water-based coating dries in ambient conditions to form a flexible seal with compression/extension of up to +/- 25% of nominal joint width.



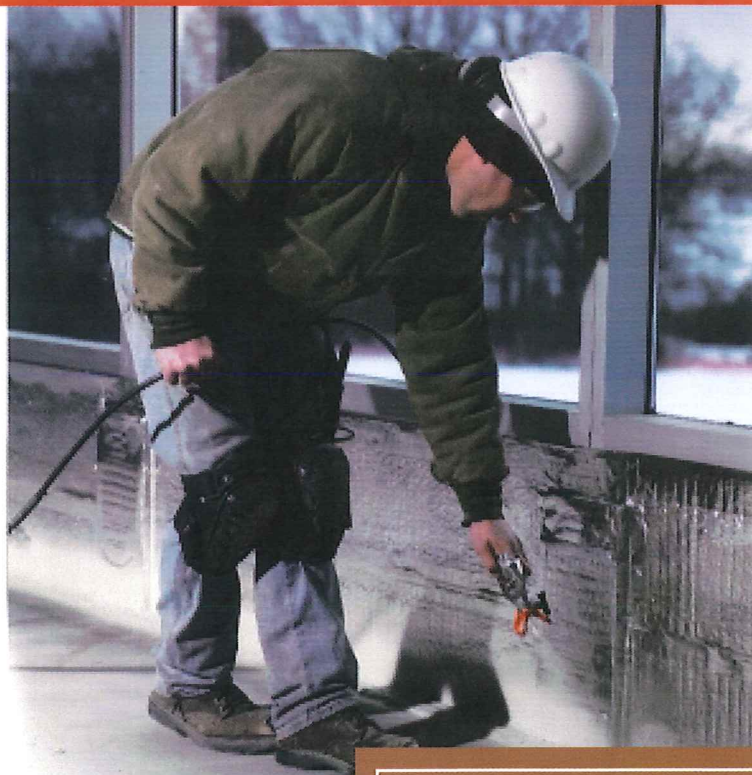
***Ideal for head of wall, floor to wall
and perimeter joints!***

3M FireDam Spray 200 meets IBC requirements and is tested for up to 4 hours. It's available from any 3M Authorized Fire Protection Products Distributor in five-gallon pails.

- Fast drying
- Dries to a neutral gray color
- Highly elastic
- High-cling properties help prevent sagging
- Applied with conventional airless sprayers
- Cleans easily with water (no solvents required)
- Superior adhesion to most construction materials
- Paintable when cured

3M – The Leader in Fire Protection

For more than 25 years, 3M has consistently delivered innovative firestop systems to building professionals. Effective and easy to install, 3M™ FireDam™ Spray 200 is part of a family of 3M fire protection products that offer affordable, long-lasting solutions in a variety of commercial, industrial and residential applications.



APPLICATIONS

3M FireDam Spray 200 is ideal for sealing head of wall, floor to wall and perimeter joints between fire-rated floors (concrete, fireproofed fluted steel decks) and fire-rated walls (gypsum, concrete). It helps control the transmission of fire, heat, smoke, noxious gas and water before and during exposure to fire, while maintaining the integrity of the fire-rated construction.

3M™ FireDam™ Spray 200

shown with airless sprayer



SPECIFICATIONS

3M FireDam Spray is a sprayable, water-based coating that dries in ambient conditions to form a flexible seal. The coating is listed by independent test agencies such as Intertek and UL. It's been cycled to meet the wind sway and thermal category of ASTM E 1399 (500 cycles at a minimum 10 cycles/minute). The coating was fire tested and evaluated under the pass/fail criteria conditions of ASTM E 1966 and UL2079 at the maximum extended joint width. The coating has also been tested and evaluated under the pass/fail criteria conditions of ASTM E 814 and UL 1479 for through penetrations. It complies with IBC, ICC, BOCA, ICBO, SBCCI and NFPA Code #101.

800-328-1687
www.3m.com/firestop

Warranty and Limited Remedy. This product will be free from defects in material and manufacture for a period of ninety (90) days from date of purchase. 3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's application. If the 3M product is defective within the warranty period stated above, your exclusive remedy and 3M's sole obligation shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product.

Limitation of Liability. Except where prohibited by law, 3M will not be liable for any loss or damage arising from a 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.



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SOUND TRAP COMPONENTS

The following descriptions will provide a basic understanding of how the various components in these systems work. We also highlight the distinguishing features of other available components. Some of those alternatives may be used interchangeably to achieve similar ratings. Other options may have relatively greater impact on the overall rating as a trade-off for various design features.

If you are considering substituting an alternate or optional component, consult our Engineering Department to determine the likely impact on the performance of the system.

We use the following symbols to identify specific parts that work best with our featured SOUND TRAP systems.

- (((S-52))) **STANDARD**
SOUND TRAP-52 systems
- (((S-49))) **STANDARD**
SOUND TRAP-49 systems
- (((S-P))) **STANDARD**
SOUND TRAP-PAIRS systems

- (((Alt-52))) **ALTERNATE**
SOUND TRAP-52 systems

- (((Alt-49))) **ALTERNATE**
SOUND TRAP-49 systems

- (((Alt-P))) **ALTERNATE**
SOUND TRAP-PAIRS systems

CAD

This symbol means that CAD drawings for the part shown are available online at our website. Go to www.zerointernational.com and click on the Catalog and CAD Library menu button to get to the login screen for our CAD Drawing Library.

Head & Jamb Protection

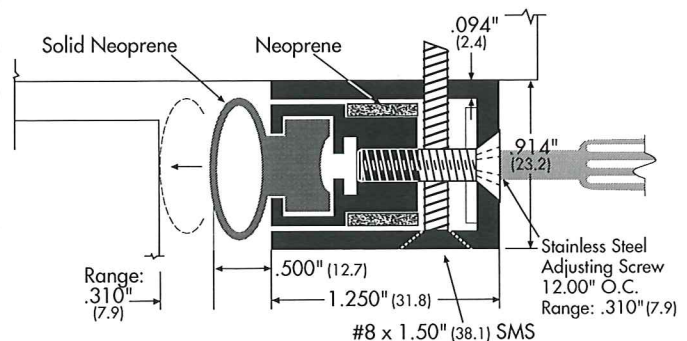
Model #770

(((S-52))) (((S-P)))

CAD

Secured directly to the door jamb, this acoustical gasket features our unique Compress-O-Matic® design with a sound-absorbing neoprene bulb that compresses to form a tight seal as the door is closed. It includes adjusting screws for field correction of irregular clearances that might compromise actual sound performance. When used with a metal cased-opening frame, the #770 offers the added benefit of eliminating the need for an additional frame stop—and its unaesthetic projection into the door opening.

The gasket is also listed for use with both wood and metal acoustical doors with fire listings ranging from 20 to 90 minutes under both negative and positive-pressure testing standards. Its exceptional engineering, design features and performance have made the #770 a long-time favorite of acoustical engineers and specifiers.

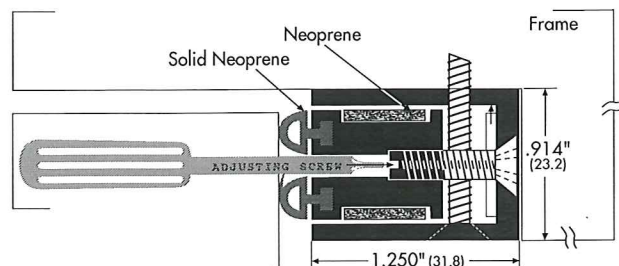


Model #7770

(((Alt-52)))

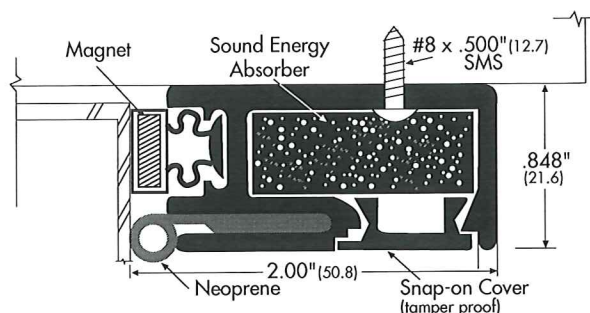
CAD

This variation on the #770 Compress-O-Matic features two smaller neoprene bulbs. Designed to provide greater design latitude, the gasket accommodates adjustment from the front of the gasket so that end moldings can be used to cover the frame.

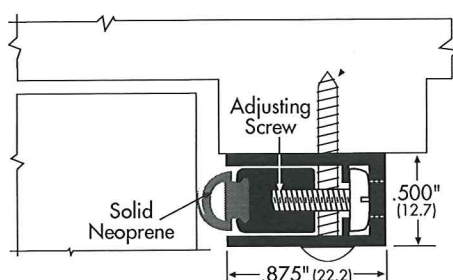


Model #3708**Alt-52****CAD**

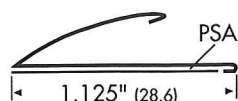
This head and jamb seal provides performance that is very comparable to the #770. Suitable for metal doors, it features a snap-on cover and magnet for streamlined design that eliminates exposed mounting screws.

**Model #870****S-49**

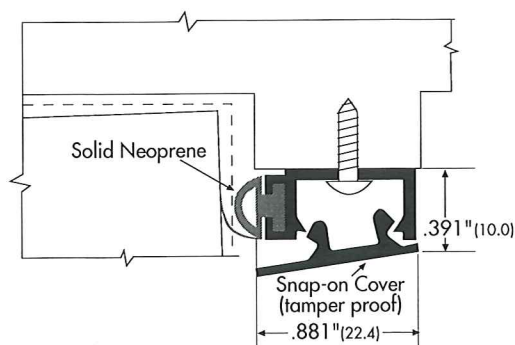
Adjusting screws make the #870 the preferred head and jamb seal for SOUND TRAP-49 systems. This Compress-O-Matic gasket is much thinner than the #770 in order to fit into an opening with a frame stop. Its reduced mass means that the #870 also has a relatively lower sound rating

**Model #119WB****S-52****S-49****CAD**

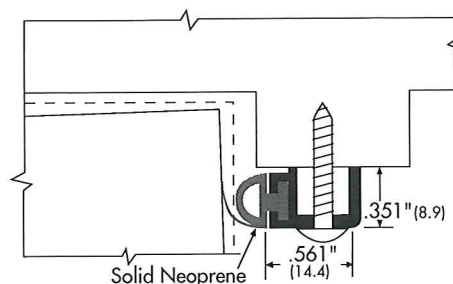
This self-adhesive bronze spring seal provides excellent supplemental protection and is recommended for all SOUND TRAP systems. Mounted on top to the frame—and at the bottom to the door—it is compressed with a spring action as the door is closed. The trapped air surrounding the seal furnishes additional sound reduction.

**Model #475****Alt-49****CAD**

A non-adjustable alternative to the #870, the #475 also installs to the frame stop. It incorporates a solid neoprene bulb with an extra "finger" that helps compensate for misalignment in the door. As the finger compresses against the rubber bulb, it is also compressed by the door itself. Tamper-proof design featuring a snap-on cover protects the gasket from impact.

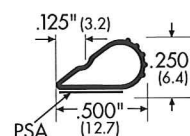
**Model #485****Alt-49****CAD**

This gasket is similar in design to the #475 without the snap-on cover.

**Model #188****Supplemental****CAD**

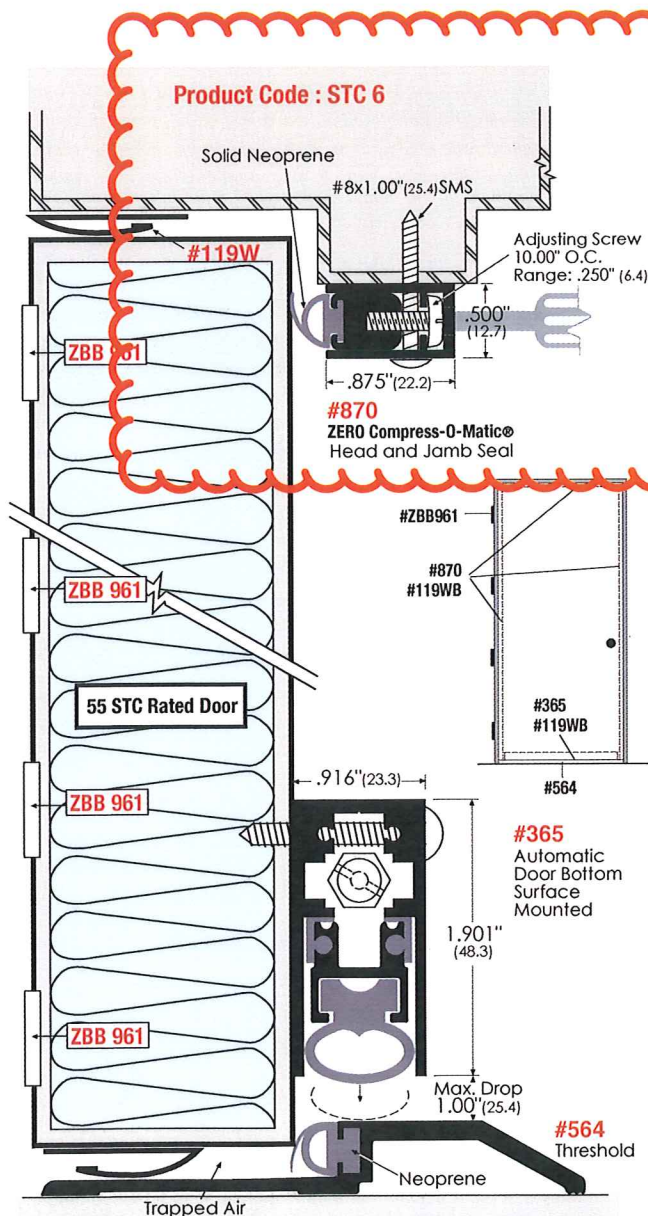
Applying this self-adhesive neoprene seal will provide additional protection for any Sound Trap system

Tear Drop
Compress-O-Matic®



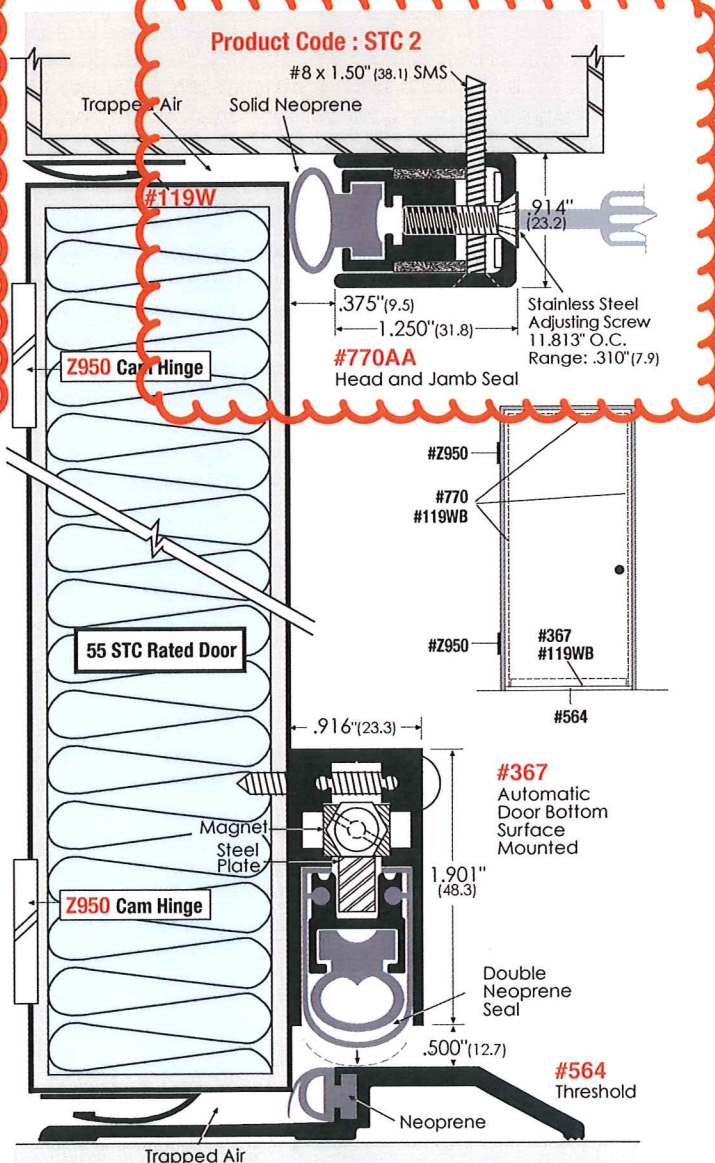
SOUND TRAP 49 STC SEALING SYSTEM

SOUND TRAP 49 STC rated systems for single doors feature several alternative head and jamb seals designed for use with frame stops. The 49 STC value they provide means that loud speech will be heard only faintly and cannot be understood on the opposite side of the door. That level of acoustic performance provides very good sound control suitable for a variety of applications ranging from busy schools to multi-family residential buildings and any settings requiring private conversations, such as doctors' offices, counseling centers and churches. A metal frame **with a stop** is required.



SOUND TRAP 52 STC SEALING SYSTEM

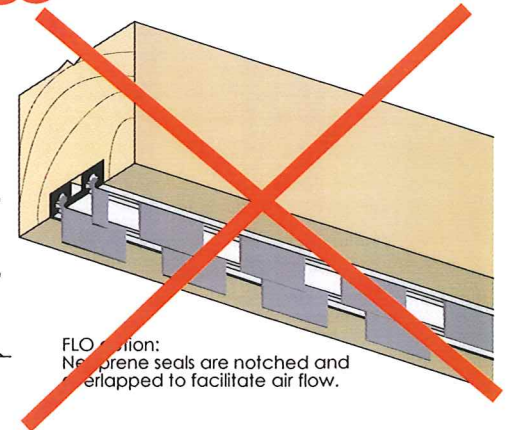
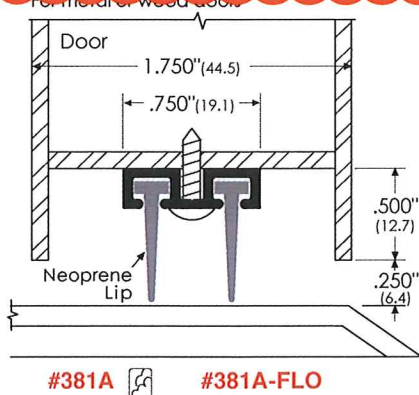
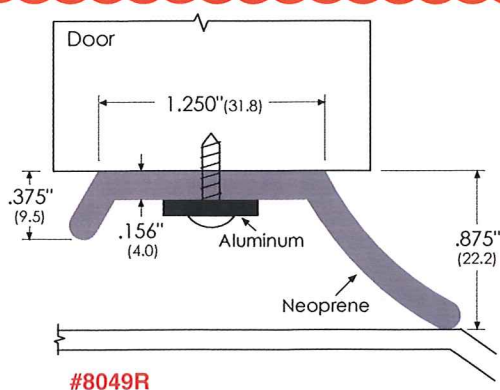
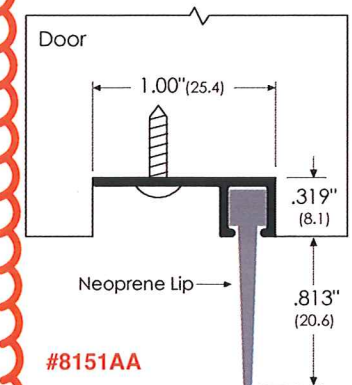
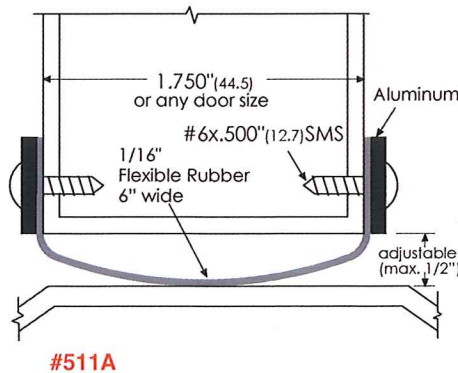
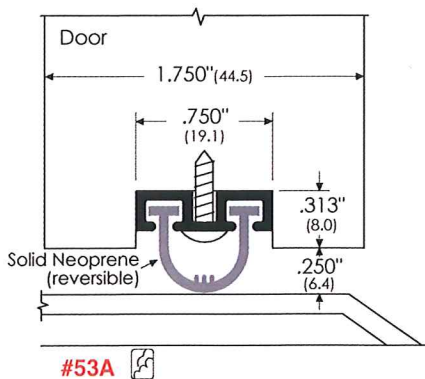
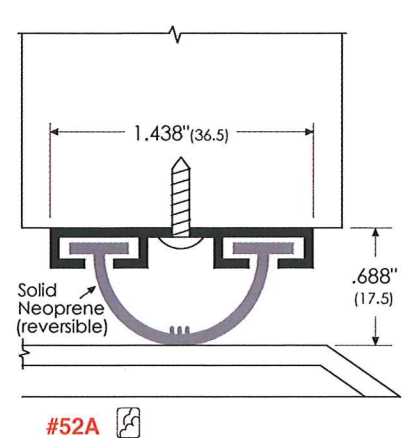
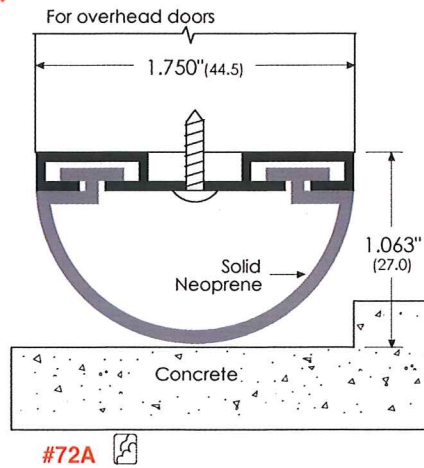
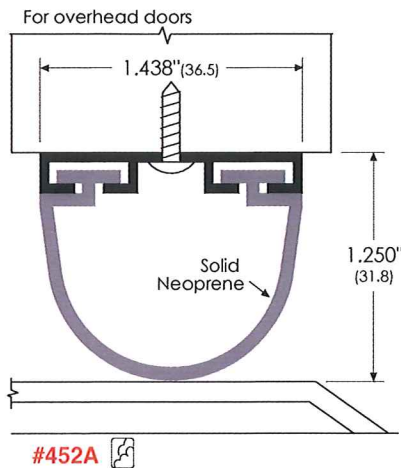
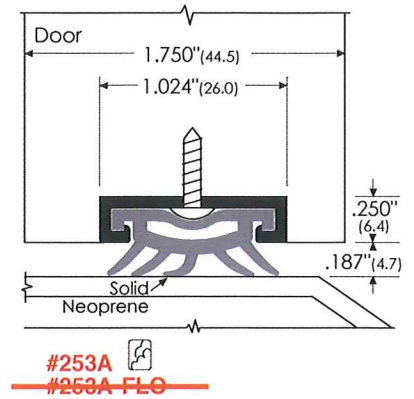
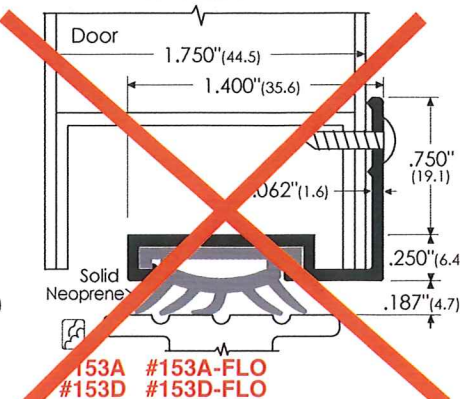
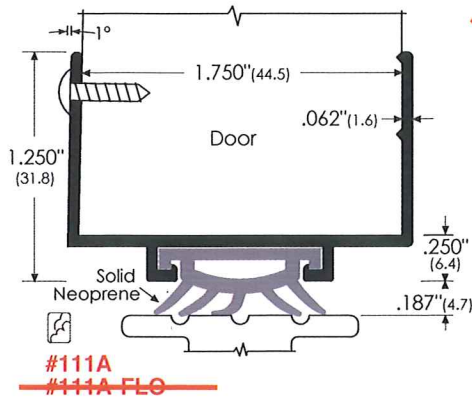
Our **SOUND TRAP 52 STC** rated systems are designed for use with sound-rated single metal doors with a cased-opening frame. They provide an STC 52 rating when properly fitted with STC 55 or higher acoustical doors. That level of sound control means loud sounds will be heard only faintly, or not at all, on the opposite side of the door, which satisfies the typical needs of recording studios and performance halls. It is also suitable for office buildings and other commercial facilities that need to mute very loud noise originating from outside, such as the sound of aircraft overhead or heavy traffic nearby, as well as interior equipment noise. A metal frame **without a stop** is required in order to use the Model #770 adjustable head and jamb seal, which is an important component in this system. The #770 is recommended for ensuring the highest possible rating for most purposes.



Sill Protection Sweeps



Note: A = Aluminum
D = Dark Bronze Anodized
R = Rubber
AA = Clear Anodized
FLO = Flo Option



Rabbeted Thresholds



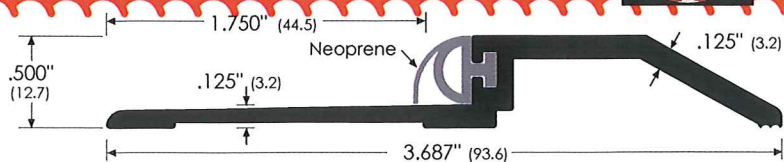
Note: A = Aluminum

B = Bronze

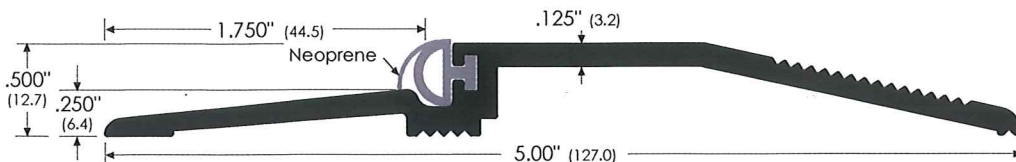
D = Dark Bronze Anodized

Thresholds can be ordered with E (Epoxy Abrasive), EL (Epoxy Abrasive Photoluminescent) or V3 (Full Body Strength) options.

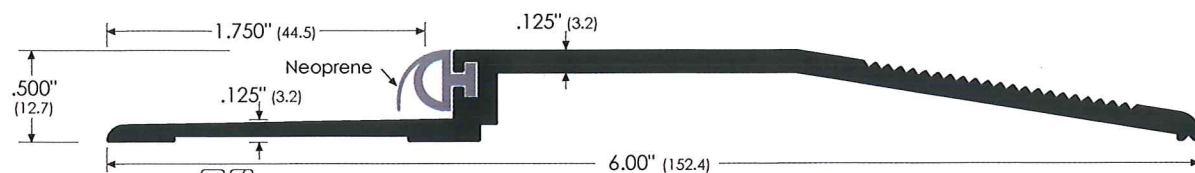
Thresholds



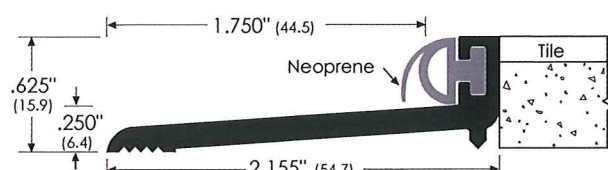
#564A #564B #564D



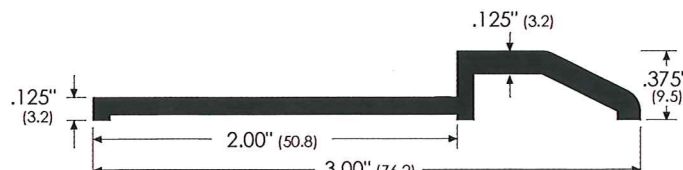
#566A #566B (Not shown)



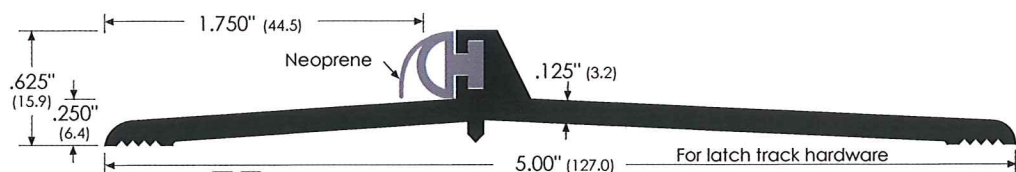
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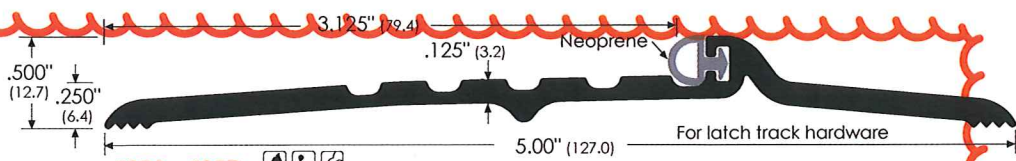
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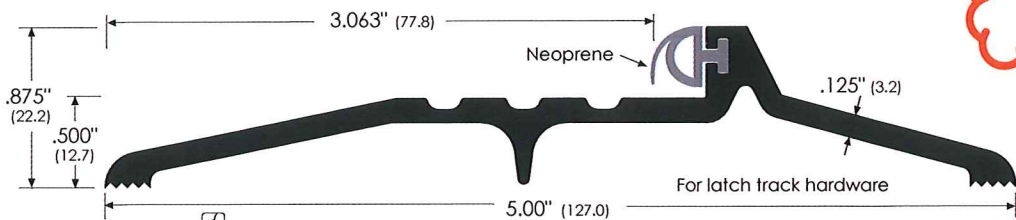
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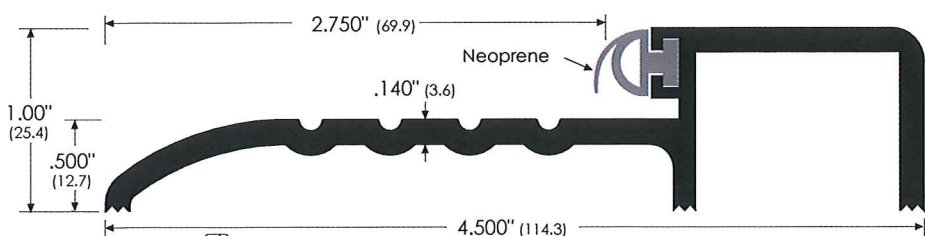
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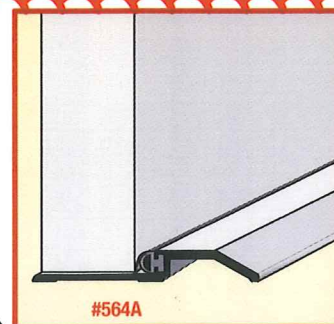
#65A #65B



#560A



#561A



#564A



SPECIFY THIS SPECIAL FEATURE

EBF= Extruded Bulb/Finger

The Neoprene gasket is designed with an extra lip for double seal protection, and to compensate for any warping or misalignment during installation.

ZERO Compress-O-Matic®



#560A

TECTUM Finalé Wall Panel System - High NRC Panel

NEW AND IMPROVED

Tectum Finalé panels are a high NRC (Noise Reduction Coefficient) solution for spaces that require acoustic dampening. A composite of Tectum Panels, Tectum spacer strips and MinWool-1200®, Finalé panels have an NRC of .85 to 1.00 and a Class A interior finish.

Whenever a space calls for the highest possible sound absorption, and anywhere activities demand abuse-resistant panels, Tectum Finalé panels are an unmatched design solution.

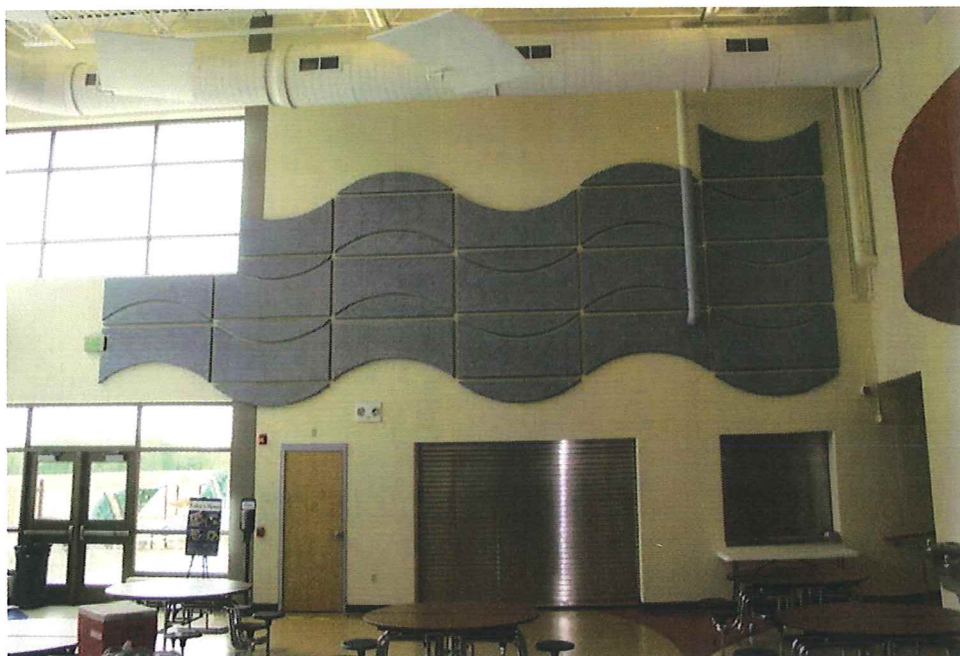
SIZES, FINISHES

The Tectum Finalé Wall Panel is available in various thicknesses. Finalé panels come in widths of 23 3/4" and 47 3/4" with beveled long edges, in lengths from 48" – 144". Factory finish is in natural, painted white or custom colors from the Sherwin Williams palette. Field machinable using standard woodworking tools, Tectum Finalé offers custom design options while delivering unmatched acoustic performance.

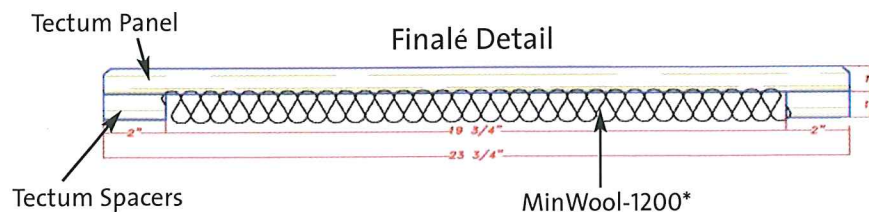
*MinWool-1200

MinWool is high-density, non-combustible insulation made of organic Basalt (Volcanic Rock) fibers. MinWool absorbs noise while resisting moisture, mold, mildew and fungal growth.

©MinWool-1200 is a registered trademark of Johns Manville.



Alpha Hart Lewis Elementary School
Columbia, MO



P.O. Box 3002
Newark, OH 43058

TECTUM^{INC.}
The Noise Control Solution

105 S. 6th St.
Newark, OH 43055

TECTUM FINALÉ ACOUSTICAL PERFORMANCE

Panel Type	SOUND ABSORPTION COEFFICIENTS							SAA
	125	250	500	1000	2000	4000	NRC	
1" Finalé w/MinWool (2" Overall Thickness)	.13	.49	1.04	1.05	.87	.95	.85	.87
1 1/2" Finalé w/MinWool (2 1/2" Overall Thickness)	.17	.62	1.13	.94	.90	.90	.90	.90
2" Finalé w/MinWool (3" Overall Thickness)	.27	.88	1.23	.85	.99	.88	1.00	.97

TECTUM FINALÉ PRODUCT DETAILS

Panel Type	Nominal Thickness* (inches)	Actual Size (inches)	Edge Detail	Factory Finish	Light Reflectance	Flame Spread	Weight P/SF
Finalé w/MinWool	1"	Widths: 23 3/4", 47 3/4" Lengths: 48" - 144"	Long Edges Beveled	White, Natural, Custom Colors	.75 / .60	0-25	3.00
	1 1/2"						4.00
	2"						5.00

* Thickness includes the Tectum panel only; add 1" for finished size.

ENVIRONMENTAL STATEMENT

TECTUM PRODUCTS' COMPOSITION

The wood fibers (excelsior) used in Tectum panels come from Wisconsin aspen trees. The Wisconsin aspen is a self-propagating tree. When cut, a new tree will begin to grow back from its root structure. In addition, all Wisconsin Aspen used for Tectum is air-dried. No drying kilns are used. The wood is stored in racks to age naturally. No chemicals are used in the production of any excelsior purchased by Tectum Inc.

All excelsior used in Tectum products comes from a single source that is Forest Stewardship Council certified. These programs are a comprehensive system of objectives and performance measures that integrate the perpetual growing and harvesting of trees with the protection of wildlife, plants, soil and water quality. All loggers are trained to adhere to FSC principles.

Magnesium oxide is mixed with magnesium sulfate (Epsom salts) to form the primary binder. The magnesium sulfate solution has been manufactured on site by reclaiming waste materials since production began in 1949. The secondary binder is composed of sodium silicate and calcium carbonate (limestone). All of the water used in the manufacture of Tectum is captured and recycled.

MORE INFORMATION

For complete information about Tectum products and LEED, please see our Marketing Bulletins M-81 (Tectum Products and LEED Certification) and M-83 (Tectum Products and LEED Q & A) or our Environmental Statement. All of these materials are available online at tectum.com/leed.

TECTUM PRODUCTS AND LEED

Tectum Inc. fully endorses the LEED Green Building Rating System. Our products may contribute to the following LEED credit areas:

Energy & Atmosphere (EA)

Prerequisite 2: Minimum Energy Performance

Credit 1: Optimized Energy Performance

Materials & Resources (MR)

Credit 2: Construction Site Waste Management

Credit 4: Recycled Content

Credit 5: Regional Materials

Credit 6: Rapidly Renewable Resources

Credit 7: Certified Wood

Indoor Environmental Quality (EQ)

Prerequisite 3 (LEED for Schools):

Minimum Acoustical Performance

Credit 3.1 & 3.2: Construction IAQ Plans

Credit 4.1: Low-Emitting Materials,

Adhesives and Sealants

Credit 4.4: Low-Emitting Materials,

Composite Wood & Agrifiber Products

Credit 10 (LEED for Schools): Mold Prevention

Credit 11 (LEED for Schools): Low-Impact Cleaning and Maintenance Equipment Policy

Innovation (ID)

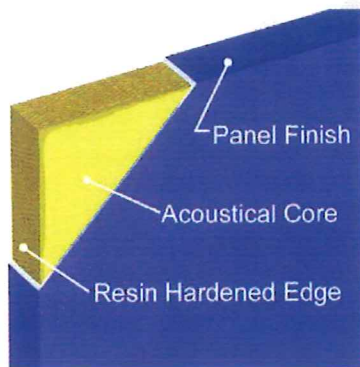
Credit 1: Innovation in Design



Conwed Wall Technology

Product Data Sheet

RESPOND® A SERIES A100/A200/A300/A400



APPLICATION

The Conwed Designscape|Wall Technology Respond® A Series (A100, A200, A300, and A400) panels are economical, all purpose acoustical wall and ceiling panels designed for use where sound absorption and value are the main criteria. This series panel is suitable for auditoriums, theatres, offices and libraries; anywhere noise control is needed and critical lighting and high abuse resistance are not factors.

CONSTRUCTION

The core construction is a dimensionally stable 6-7 PCF fiberglass board with chemically hardened edge protection. Finishes are completely adhered to the face of the panel and returned to the back for a full finished edge. All corners are fully tailored.

SIZE AVAILABILITY

Available thicknesses are $\frac{3}{4}$ ", 1", 1- $\frac{1}{2}$ ", 2", 3", and 4". Standard maximum size is 4' x 10'. 4" maximum is 4' x 6' or 24 square feet. Custom size is our standard!

EDGE DETAIL

All edges are resin hardened, unless otherwise specified. Available choices include: square, radius, bevel, and radius corners.

FINISHES

A wide variety of fabrics are available from all major brands, including Guilford, Maharam, Knoll, Carnegie, and Designtex. A comprehensive selection of vinyl coverings is available from Sanitas Kalahari, Designtex and Maharam.

MOUNTING

Standard mountings include spot and perimeter adhesive, Z-clip, concealed splines, impaling clips, hook & loop, and magnetic fasteners. Z-Bar to Z-Bar is recommended for ceilings.

ACOUSTICAL PERFORMANCE

Our products are constantly modified to achieve their maximum acoustical performance while providing the aesthetics desired in their applications. Panels are available in a variety of thickness, and their performances are tested in accordance to ASTM procedures in a NVLAP accredited laboratory.

Please consult with your Sales Representative, or the Company's Technical Services Department for assistance in determining the proper panels, and their acoustical specifications, for your application.

R-VALUE

The R-Value is resistivity to heat or cold, and is an important factor in choosing a finish.

Thickness	R-Value
1"	4.1
1- $\frac{1}{2}$ "	6.2
2"	8.3
3"	12.5
4"	16.6

FIRE PERFORMANCE

All components have been tested according to ASTM E 84* and have a **Class I/A rating**.

RECYCLED CONTENT

A Series panels can utilize an Owens Corning fiberglass board core that is third-party certified for recycled content. The board is certified by SCS to contain at least 57% recycled glass.

And for your LEED® project, our acoustical panels can help you qualify for recycled content points under the Materials and Resources section. Other LEED® categories may also apply depending upon the project requirements.



WARRANTY

3-YEAR WARRANTY

A Series Acoustical panels have a limited 3-year warranty starting from date of shipment. The panels are warranted to be free from defects in material and workmanship.

See product warranty for details and limitations.

* The ASTM E 84 standard should be used to measure and describe the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment, which takes into account all of the factors, which are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest 5 rating.



KINETICS™ HardSide ACOUSTICAL WALL PANELS

A combination of great appearance, superior acoustical performance, and design flexibility makes HardSide Acoustical Wall Panels the perfect solution for many interior reverberant noise problems.

HardSide is a traditional acoustical wall panel offering design versatility. A variety of shaped edges and panel thicknesses allow you to design for the desired appearance and acoustics. The perfect solution for many reverberant noise problems, HardSide delivers superior performance.

The core of this panel is a 6-7 PCF fiberglass board. The edges are chemically hardened for durability. Fabric facing, from the FR-701 collection from Guilford of Maine or factory-approved, customer-selected fabric, is stretched over the panel, wrapped and bonded around the edges for a crisp, finished look. Vinyl finishes are also available.

Design for panel sizes up to a maximum 4 ft. x 10 ft. or custom shaped panels with angled or contoured perimeter cuts.

HardSide - Acoustical Wall Panels

DESCRIPTION

A versatile fiberglass acoustical wall panel wrapped in a wide selection of fabrics or vinyls.

Available with hardened shaped edges.

Engineered sound control with thicknesses from 1 to 4 inches and sizes up to 4 ft. x 10 ft.

5 ft. x 10ft. option available with 66-inch wide fabric.

COMPOSITION

6-7 PCF density fiberglass core

Chemically hardened edges

Wrapped in fabric from Guilford of Maine, or factory-approved customer-selected material

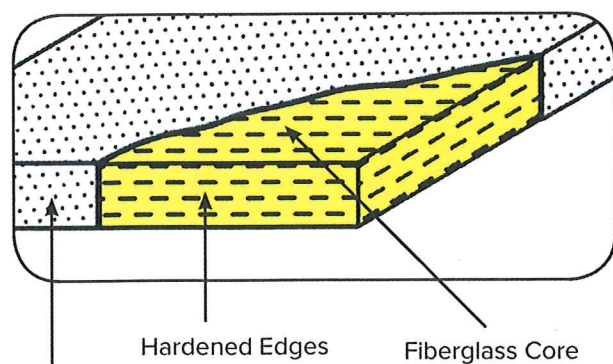
FIRE TEST DATA

Class A per ASTM E84

ACOUSTICAL PERFORMANCE

Sound Absorption per ASTM C-423. Type A Mounting

Frequency, (Hz)	125	250	500	1000	2000	4000	NRC
1" Thick	0.05	0.32	0.82	1.04	1.02	1.01	0.80
2" Thick	0.29	0.82	1.10	1.04	1.01	1.02	1.00
3" Thick	0.90	1.03	1.06	1.01	0.98	0.97	1.00
4" Thick	1.02	1.11	1.03	1.01	1.03	1.03	1.05



APPLICATIONS

- Interior surfaces where superior acoustical performance is required.
- Conference Rooms
- Schools/Classrooms
- Auditoriums
- Media Rooms
- Multi-Purpose Rooms
- Churches
- Office Spaces
- Reception Areas
- Home Theaters
- Pro Theaters

MOUNTING

HardSide Impaling Clips with Adhesive

Rotofast Clips for ceilings

Z-Clips - movable

Velcro - movable

See *HardSide cloud panels* for ceiling suspension

EDGE OPTIONS

Square



Bevel



Radius



Pencil



kineticsnoise.com
sales@kineticsnoise.com
1-800-959-1229



November 11, 2013

Mr. William Lovallo
Wellington Building Committee
Town of Belmont
121 Orchard Street
Belmont, MA 02478

Subject: Wellington School Acoustics Assessment - DRAFT
Wellington School
Belmont, Massachusetts
Acentech Project No.: 623729

Dear Bill:

We understand that occupants of Belmont's newly-constructed Wellington School have voiced concern over excessive noise and sound isolation issues within their new building. In response, you requested that Acentech perform a structured assessment of the school's acoustics in order to identify practical methods of eliminating or reducing these problems. Robert Berens and I visited the school on August 13, and August 21, 2013, to measure the reverberation and sound isolation in various spaces throughout the building. This letter contains the results of this assessment.

Sound Isolation

To evaluate the sound isolation at the Wellington School, we conducted field acoustical measurements to assess both airborne (Noise Insulation Class – NIC) and structure-borne (Impact Sound Reduction – ISR) sound isolation between several pairs of adjacent classrooms. These tests allow us to quantify the sound isolation: a greater NIC or ISR value indicates a greater level of sound isolation between the spaces measured. These tests also allow us to compare the results to school design guidelines that came into effect after the Wellington was built. Current design guidelines call for laboratory sound isolation values between classrooms of at least 50 for airborne sound, and at least 45 for structure-borne sound. Field measurements that show somewhat lower isolation (by 5 points or less) are typically deemed acceptable (an NIC of 45 and an ISR of 40).

Horizontal Sound Isolation

The airborne isolation provided by the classroom demising partitions appears to be substantially degraded by "leaks" in the partition, such as the communicating doors and the partition heads. Table 1, below, shows the results of horizontal sound isolation tests measured at the door ("at door") and at the center of the partition (overall). The data show that the measurements at the door are 4 to 10 points lower than those measured at the center of the partition, indicating that the door is the primary source of airborne sound transmission.

Table 1: Airborne Sound Isolation Measurement Results between Horizontally Adjacent Classrooms.

Partition Tested	Airborne Sound Isolation (NIC) at Door	Airborne Sound Isolation (NIC) Overall
Classroom 214 to 215	24	34
Classroom 172 to 174	25	29

The data in Table 1 also reports better “overall” sound isolation between Classroom 214/215 in comparison to Classroom 172/174. This difference could be attributed to a number of possible causes, including:

1. the size of the overall partition is smaller in 172/174 due to the adjoining bathroom and so we were closer to door when making the overall measurement,
2. some sound may transmit through the adjoining bathroom, as it contains a door to each classroom,
3. the sound could transmit through the flutes of the ceiling deck if the flutes are not completely sealed.

It is likely that all three of these aspects degrade the perceived sound isolation at this partition; however, we observed that the adjoining bathroom did not appear to be a dominant sound transmission path. Moreover, we localized the transmitting sound to the top of the partition, at the flutes, which we did not notice between Classroom 214/215. This suggests that some partitions may still require better seals at the flutes.

Vertical Sound Isolation

The airborne vertical sound isolation tested at approximately NIC 50 at both measurement locations. This is an appropriate level of airborne sound isolation between adjacent classrooms.

The impact sound isolation testing produced a wide range of ISR results, reported in Table 2. Although the impact sound isolation at the exposed deck is low, the sound isolation improves by more than 10 points in portions of the lower classroom beneath the ACT ceiling, and improves by more than 30 points when the upper classroom has carpet.

Table 2: Structure-Borne Sound Isolation Measurement Results between Vertically Adjacent Classrooms.

Partition Tested	Structure-Borne Sound Isolation (ISR) at Exposed Deck	Structure-Borne Sound Isolation (ISR) over Carpet or ACT Portion
Classroom 214 to 129	27	64 (carpet in 214)
Classroom 241 to 174	28	41 (ACT Ceiling in 174)

In addition to the ISR measurements, we also measured the sound levels while moving two chairs: one with tennis balls on its feet, and one without tennis balls. We measured the following sound levels in the classroom below:

- A background noise level of 24 dBA (no moving chair in the classroom above).
- A sound level of 29 dBA when moving the chair with tennis-ball feet.

- A sound level of 57 dBA when moving the chair without tennis-ball feet.

Moving chairs with and without tennis-ball feet were both audible in the bottom classroom, as is indicated by comparing the background sound level to the sound levels measured while the chairs were being moved around. However, although still audible, moving a chair with tennis-ball feet produces noise levels in the classroom below that are much more compatible with the existing background sound levels typical of the classrooms.

Circulation Spaces to Classrooms and Offices

In general, the airborne sound isolation between the Atrium/Gymnasium and sound sensitive spaces are consistent with our expectations for these types of adjacencies. Our measurement results are given in Table 3, below. The sound isolation between the Gymnasium and Atrium (NIC 25) and between the Atrium and Main Office (NIC 27) is limited by the doors at these adjacencies. Cumulatively, these partitions (which include doors) give an NIC of 56 between the Gymnasium and the Main Office. This result is consistent with current standards.

Table 3: Airborne Sound Isolation Measurement Results between the Atrium/Gymnasium and Sound Sensitive Spaces.

Partition Tested	Airborne Sound Isolation (NIC)
Gymnasium to Atrium	25
Gymnasium to Main Office	56
Atrium to Main Office	27
Atrium to Classroom 215	69
Atrium to Corridor outside Media Center	13

The airborne sound isolation between the Atrium and the classrooms is also consistent with our expectations, yielding a value of NIC 69 between the Atrium and Classroom 215, for example: a value that is consistent with current industry guidelines for these types of adjacencies. However, we understand that school occupants are experiencing high levels of sound transmission between the circulation areas and the classrooms or other sound sensitive areas. This may be due to high sound generation within the circulation spaces, rather than poor sound isolation.

Reverberation Time

Reverberation time is a measure of how quickly sound decays within a room: longer reverberation times indicate that the space preserves sound better, whereas shorter reverberation times show that the room allows sound to dissipate faster. Reverberation time is related to the room's volume and the acoustical absorption within the room. Current industry guidelines call for a maximum reverberation time of 0.6 seconds in classrooms that are 10,000 cu. ft. or less, and a maximum reverberation time of 0.7 seconds in classrooms that are between 10,000 cu. ft. and 20,000 cu. ft.

Classrooms

We measured the reverberation time in four classrooms. Our measurements range between 0.5 and 0.6 seconds. This is appropriate for learning environments of this size, and is consistent with current industry standards. Our measurement results are reported in Table 4.

Table 4: Classroom Reverberation Times.

Room Measured	Reverberation Time (seconds)
Classroom 215	0.5
Classroom 240	0.5
Classroom 174	0.5
Classroom 129	0.6

Large Spaces

We also measured the reverberation time in some of the larger spaces throughout the building, including the Gymnasium, Atrium, and Cafetorium. The reverberation times measured in these larger spaces ranged between 1.0 seconds to 1.3 seconds. These values, reported in Table 5, are acceptable for spaces of this volume. However, upon closer inspection of the acoustic response in each room, we noticed strong, early reflections. These early reflections can interfere with intelligibility and speech communication. Degradation in speech communication can cause occupants to speak louder in order to communicate, in turn, raising the overall sound level and encouraging occupants to speak even louder.

Table 5: Large Spaces Reverberation Times.

Room Measured	Reverberation Time (seconds)
Atrium	1.2
Gymnasium	1.3
Cafetorium	1.0

Recommendations

To improve the acoustical conditions discussed above, we offer the following recommendations.

Horizontal Sound Isolation

To improve horizontal sound isolation between classrooms, full perimeter, adjustable neoprene gaskets should be installed at the communicating doors. These gaskets should include a bottom seal and seals on both jamb and head. Best results will be obtained if the gaskets shown for “Type 2” or “Type 3” doors on the attached detail sheet are employed.

Once the communicating doors have been gasketed, sound isolation should be noticeably better than under current conditions. However, sound transmission may continue to be more noticeable at some partitions in comparison to others. In these cases, it is likely that another transmission path exists, most likely where the flutes of the deck meet the head of the partition. We understand that efforts have been made to seal the top of the walls to the deck above, but the work should be inspected if sound isolation continues to be an issue after the doors have been adequately gasketed.

Vertical Sound Isolation

The vertical airborne sound isolation is sufficient as is and does not require improvement. However, the structure-borne, or impact sound isolation could well be improved. The most cost-effective way to enhance vertical structure-borne sound isolation would be to install large area rugs or wall-to-wall carpeting in the second-floor classrooms. This would provide cushioning against the scraping of un-treated furniture feet, as well as hard-soled shoes, that is so audible in the first-floor spaces.

Circulation Spaces to Classrooms and Offices

The existing sound isolation between circulation spaces and classrooms/offices appear to be typical of these types of adjacencies. It is likely that the character of the sound produced in the circulation spaces can be reduced using sound absorptive finishes. See the "Reverberation" section below for more information.

Reverberation Reduction for Atrium, Gymnasium, and Cafetorium


The acoustical properties of the surface finishes in the large Atrium, Gymnasium, and Cafetorium spaces allow the reverberation times in these rooms to be acceptable, and in keeping with the volumes of these rooms. However, reducing early reflections of sound in these spaces will help enhance speech intelligibility, which, in turn, will help obviate the need for raised voices, and should help reduce the general reverberant build-up of sound within these rooms. Increasing the existing areas of sound-absorptive wall treatments with an NRC of 0.80 or greater in each of these spaces will help reduce reverberation times and will help make these spaces less noisy. We will work with you and the architect to determine appropriate locations and materials that could be installed to address the reverberation issues.

* * * * *

We trust that this report provides you with the information you need at this time. If you have any questions, please feel free to contact me at 617-499-8025.

Sincerely,

ACENTECH INCORPORATED

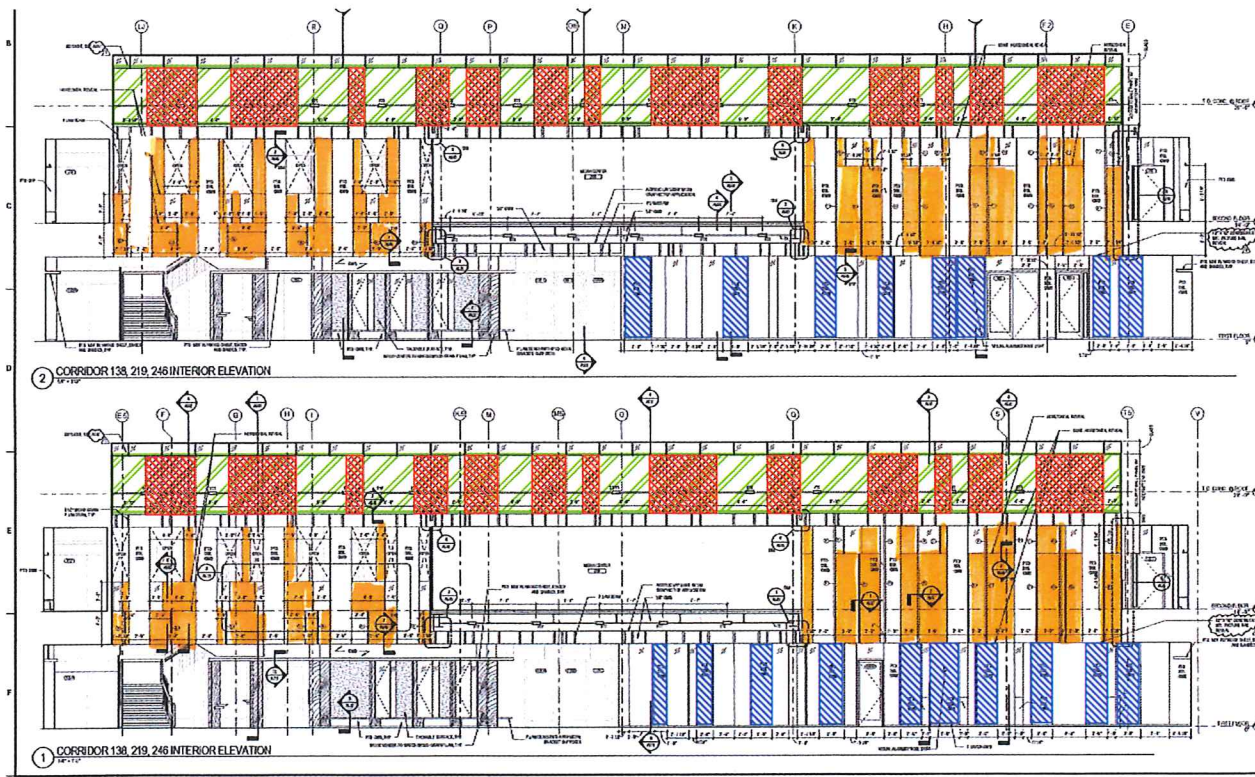


Alicia J. Larsen
Consultant

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Cc: Robert Berens, *Acentech, Inc.*

Encl: Acentech Door Types



ROGER WELLINGTON ELEMENTARY SCHOOL

ONDOVVEREES ELEMENTARY

Project Status

REVISIONS

Rev.	Date	Description
1	03/01/02	03/01/02

Drawing Name

CORE CORRIDOR INTERIOR ELEVATIONS

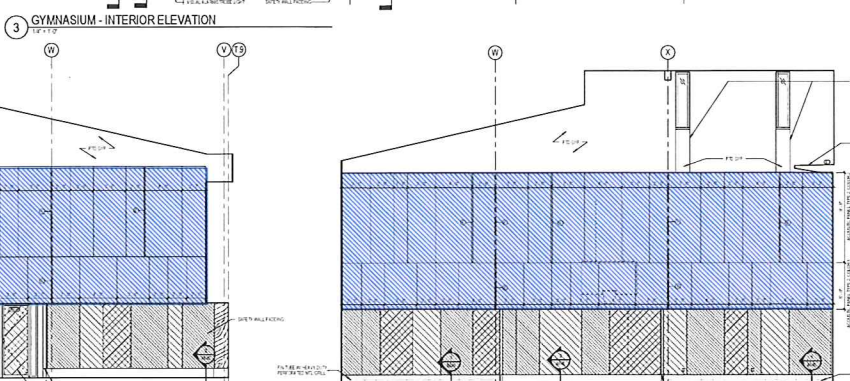
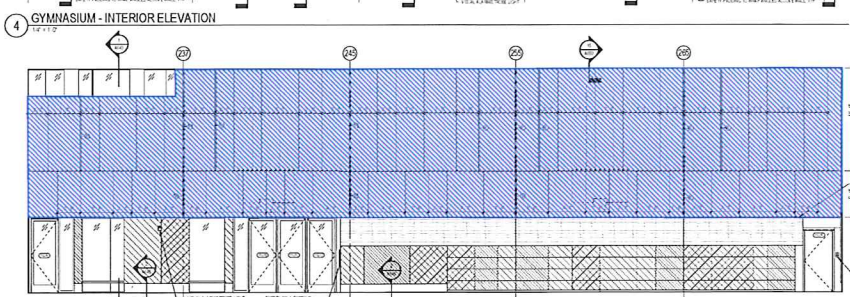
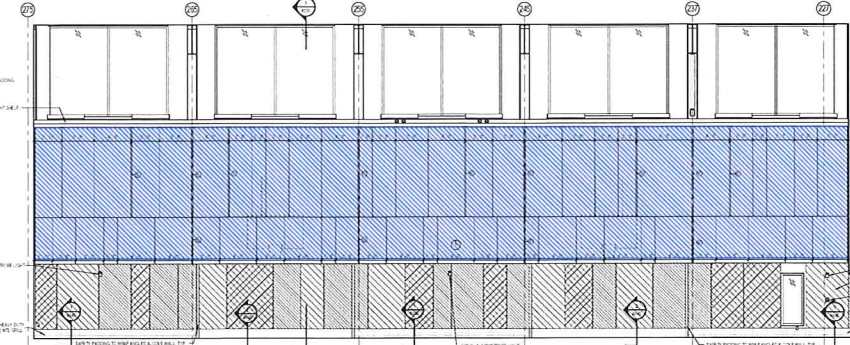
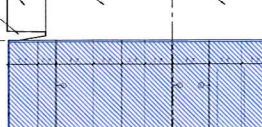
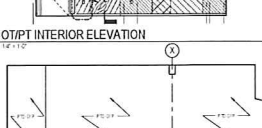
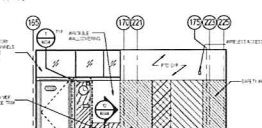
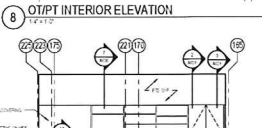
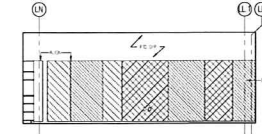
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Project No. 0000-10

Drawing Number

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MATERIALS	
	ACOUSTIC INSULATION
	ACOUSTIC CEILING TILES
	ACOUSTIC WALL PANELS
	ACOUSTIC FLOOR PANELS
	ACOUSTIC CEILING TILES
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ROGER WELLINGTON ELEMENTARY SCHOOL

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Project Status

100% COMPLETE

100% COMPLETE

100% COMPLETE

Revisions

No.	Date	Description
1		
2		
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Drawing Name

GYMNASIUM - INTERIOR ELEVATIONS

GYMNASIUM - INTERIOR ELEVATIONS

GYMNASIUM - INTERIOR ELEVATIONS

Book Associated

Project No.

0000100

Drawing Number

A608B

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