

## **Dockstader PRPS**

**Part of Block 5, Plan 43M-1907  
Brampton ON**  
SW22434.00

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**ACOUSTIC, NOISE AND VIBRATION CONTROL  
Basis of Design Report**

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## 1.0 Introduction

At the request of Diamond Schmitt Architects, Thornton Tomasetti (TT) presents this acoustic design review and basis of design report for the design of the Dockstader Peel Regional Paramedic Services (PRPS) at Part of Block 5, Plan 43M-1907 in Brampton, ON (Project).

TT understands that the project consists of a 3-storey building with the ground floor containing all entry points into the building for all program types (i.e., staff, public, loading and services) and the second floor of the building containing two categories of programming: Program related to the Expanded Training areas and support service for that zone as well as locker rooms and fitness spaces for paramedic staff. The top level of the building is dedicated to Mechanical, IT services, and electrical services.

The following areas of acoustics are considered for this project based on the currently available information:

- Interior Sound Isolation
- Room Acoustics
- MEP Noise & Vibration Control

The acoustic requirements and recommendations established in this report are based on past TT experience, industry best practices, and commonly referenced guidelines such as those published by ASHRAE. A detail list of design recommendations is provided in a checklist-style Summary of Recommendations, along with associated detail sketches, schedules, and product cut sheets in Appendix B. Refer to Appendix A for definitions of acoustic terms used throughout this report.

## 2.0 Interior Sound Isolation

### 2.1 Speech Privacy Potential

Speech Privacy for enclosed spaces is a function of the sound isolating performance of the demising construction between spaces measured in the field as Noise Isolation Class (NIC) and the background noise level in the receiving space measured in Noise Criteria (NC). The sum of these two metrics is referred to as the Speech Privacy Potential ( $SPP = NIC + NC$ ) and has been found to correlate well with the subjective evaluation of speech privacy shown in Table 1.

Table 1: Subjective evaluation of Speech Privacy Potential.

Privacy	SPP	Subjective evaluation of STC rating
None	<60	No speech privacy
Poor	60	Normal voices audible and intelligible most of the time.
Fair	65	Normal voices audible and sometimes intelligible. Raised voices intelligible.
Good	70	Normal voices audible but mostly unintelligible. Raised voices partially intelligible.
Very Good	75	Normal voices barely audible. Raised voices audible but mostly unintelligible.

Privacy	SPP	Subjective evaluation of STC rating
Excellent	80	Normal voices inaudible. Raised voices barely audible but unintelligible.
Outstanding	85	Shouting barely audible but unintelligible.

## 2.2 Sound Transmission Class

Wall and floor/ceiling assemblies provide a certain level of sound isolation between two spaces depending on the assembly. These assemblies are usually specified by sound transmission class (STC) ratings, a laboratory tested rating.

The NIC performance of an assembly in the field will typically measure 5 to 10 points lower than the STC rating. This is due to the influence of flanking paths as well as imperfections in the construction of the assemblies. For this reason, it is recommended that partitions are selected with an STC rating that is 5 to 10 points higher than the required NIC rating so that performance in the field will meet the design criterion. The expected SPP performance based on the design STC rating of the partition, and the receiver room background noise is provided in Table 2

Table 2: Speech Privacy Potential based on partition STC and receiver room background noise level.

Partition STC	SPP based on Receiver Room Background Noise (NC)			
	NC 25	NC 30	NC 35	NC 40
<b>30</b>	45	50	55	60
<b>35</b>	50	55	60	65
<b>40</b>	55	60	65	70
<b>45</b>	60	65	70	75
<b>50</b>	65	70	75	80
<b>55</b>	70	75	80	85
<b>60</b>	75	80	85	85+

\*Sound masking typically provides approximately NC 35 in enclosed rooms (e.g. private offices), and NC 40 in open spaces (e.g. open offices)

## 2.3 Assembly Types

Typical assemblies with corresponding STC ratings are provided in Table 3. Project Specific recommended STC ratings are provided in Section 2.6

Table 3: Typical gypsum board constructions to achieve STC ratings.

STC Target			Typical Construction
Wood Stud	20 Ga Metal Stud	25 Ga Metal Stud	
34	42	45	2 layers: 1-layer 5/8" GWB each side of studs.
37	47	52	3 layers: 2 layers 5/8" GWB on one side of studs, single layer on other side.
40	52	55	4 layers: 2 layers 5/8" GWB each side of studs.
47	52		2 layers: Staggered stud with 1-layer 5/8" GWB each side of studs
51	54		3 layers: Staggered stud with 2 layers of 5/8" GWB on one side of studs
56	58		4 layers: Staggered stud with 2 layers 5/8" GWB each side of studs
60	61		3 Layers: Double Stud (2 independent rows of studs (to tie braces), min. 1" space on separate plates) with 2 layers 5/8" GWB on one outer side of studs.
65	66		4 Layers: Double Stud (2 independent rows of studs (to tie braces), min. 1" space on separate plates) with 2 layers 5/8" GWB on outer side of studs.

The following apply to all partitions and should be addressed in the architectural drawings:

- All partitions full-height slab-to-slab, acoustically sealed, and batt insulation in stud cavities.
- Metal studs with STC ratings based on minimum 3-5/8" deep studs at 16" o.c. Lighter gauge studs perform better. Heavier gauge studs perform worse and if used may require partition upgrades, such as resilient clips.
- Wood Studs STC based on 2"x4" at 16" o.c. 2"x6" studs may increase expected STC listed by 1. Larger spacing between studs perform better and could be reviewed if included.
- Substituting a layer of 5/8" Type X GWB with a layer of 1/2" plywood would have negligible effect to the STC rating.
- Apply multiple layers of drywall with staggered joints.
- Wherever GWB meets another material, seal with acoustical sealant.
- No continuous GWB layers on the room-side of corridor walls, i.e., interrupt GWB at all intersections.
- Offset outlet boxes on opposite sides of partition min. 24" and in separate stud spaces.
- Provide outlet boxes acoustically sealed to GWB for all electrical and data connections, even if outlet boxes are not required per local codes.
- Use sound barrier pads (Hilti, or equal) for all outlet boxes in sound rated partitions.
- Provide 5-sided GWB enclosures around outlet/junction boxes larger than four-gang.
- Fill penetrations through acoustically rated partitions (ducts, pipes, conduit, cable trays, etc.) with batt insulation and/or fire safing and seal airtight with acoustical sealant.
- Avoid cable tray penetrations through partitions between enclosed spaces. Enter from corridor only and tightly pack cable trays with batt insulation once cables are pulled.
- Avoid recessed elements in STC 50 or higher partitions. TT will review any areas where recessed elements are required.

## 2.4 Door Types

The following table defines door types for various levels of sound isolation. Door louvers or undercuts other than what is indicated below are not acceptable as a means of air return.

Table 4: Typical door type to achieve STC ratings.

Assembly Type	STC Target	Typical Construction
1	20	Glass frameless or sliding doors. Avoid for spaces that require sound isolation
2	30	Solid core wood or insulated metal doors with door bottom fitted for minimal clearance to finished floor. No return air undercut, or louvers are permitted. Provide acoustical seals such as Pemko Series 88 Sound Seals or equal on the jambs and head and overlapping astragals for double lead doors such as Pemko 355S or equal.
3	35	Same as above, with the replacement of the door bottom with automatic door bottom such as Pemko 430 or 434 (RL/PKL) or equal and ADA compliant threshold hardware.
4	TBD	Sound-rated assemblies as needed, with STC rating specified on drawings and coordinated with standalone specification section (template to be issued as required).

## 2.5 Sidelites and clerestory glass

Consider the guidelines in Table 5 for interior glass based on maintaining the sound isolation of the base partition/door construction:

Table 5: Interior Glass Recommendations.

Location	Glass Area	Minimum Glass
Partitions with doors	Equal or smaller than a single leaf door	3/8" monolithic or 1/4" laminated
Partitions with doors	Larger than a door	1/2" monolithic or 3/8" laminated
Partitions without doors	Any	Requires case-by-case review

## 2.6 Recommended STC Ratings

Recommended SPP targets, partition STC ratings, and door types based on typical adjacencies are provided in Table 6. Note that these performance ratings are based on minimum background sound levels per Section 4.0.

Table 6: Recommended SPP targets, STC ratings and door types by room adjacency types.

Critical Room	Adjacent Room	SPP Target	Partition STC	Door Type
<b>Level 1</b>				
Workstations	Corridor A	75	50	3
	Meeting Rooms 110 & 111	75	50	3
	Parade Room	75	50	N/A
Meeting Room (110)	Corridor A	75	50	3
	Meeting Room (111)	75	50	N/A
	Lobby	75	50	N/A
	Workstation	75	50	N/A
Cafeteria	Corridor A	70	45	2
Vehicle Bay	Corridor A	75	55	N/A
<b>Level 2</b>				
Quiet Room	Prayer Room	75	50	N/A
	Corridor 2B	75	50	3
	Washroom	75	50	N/A
	Servery	75	50	N/A
	Stairwell	80	55	N/A
Expanded Training III	Servery	75	50	3
	Expanded Training II	75	50	N/A
	Corridor 2A	75	50	3
Expanded Training II	Expanded Training I	75	50	N/A
	Expanded Training III	75	50	N/A
	Corridor 2A	75	50	3
Expanded Training I	Expanded Training II	75	50	N/A
	Corridor 2A	75	50	3
	Storage	75	50	N/A
	GN Washrooms	75	50	N/A
Prayer Room	Washroom	75	50	3
	Corridor 2B	75	50	3
	Quiet Room	75	50	N/A
	Servery	75	50	N/A
FM Office	Fitness	75	50	N/A
	Janitor	75	50	N/A
	Corridor 2B	75	50	3

## 2.7 Operable Partitions

With any operable partition, speech privacy is limited, and some audible sound transmission is unavoidable. This would be a limitation for the operable partition currently shown between Expanded Training rooms. We recommend providing a standard gypsum board partition (see previous section) to achieve desirable speech privacy between these rooms.

If operable partitions are desired despite the sound isolation limitations, include the following minimum requirements for operable partitions in relevant specifications and contract documents. These requirements are based on providing the best possible sound isolation typically available for single operable partitions.

- Laboratory sound rating: Minimum Sound Transmission Class (STC) of 50
- Installed performance: Minimum Noise Isolation Class (NIC) 42 per ASTM E336
- Operable pressure seals for the top, bottom and sides

The deflection of the overhead structure should be reviewed by the structural engineer and operable partition manufacturer to confirm that seals will maintain closure.

Surrounding constructions above and to the side must provide sound isolation equivalent to the operable partition and require detailed review. This includes providing a break in the drywall where adjoining partitions meet the operable partition and providing an overhead barrier bulkhead between the operable partition and structural deck consisting of double gypsum board on each side that is acoustically sealed. Penetrations in the overhead barrier including air ducts should also be avoided.

## 3.0 Room Acoustics

### 3.1 Reverberation Control

Occupied spaces should include appropriate quantities of sound-absorptive surfaces to control reverberant noise, promote good speech intelligibility in speech sensitive spaces, and control sound propagation in open plan areas and corridors. Reverberation criteria and initial guidelines for sound-absorptive materials in each space type are summarized in Table 7.

Table 7: Reverberation times for various room types.

Room Type	Mid-Frequency (500, 1000, 2000 Hz) Reverberation Time (s)
Meeting Rooms (110 & 111)	0.6
Expanded Training Rooms (I, II, and III)	0.8
Private Offices/Prayer Room/Quiet Room	0.6
Workstations	0.7
Cafeteria	0.8

Target reverberation times for each type of space are determined based on the use of each room. product examples are provided in Appendix B.

## 4.0 Mechanical Noise & Vibration Control

### 4.1 Background Sound Levels (HVAC)

Noise Criteria (NC) ratings will be used to specify background sound levels for this project. The ASHRAE applications handbook provides guidelines that will be followed for the room types that exist in the proposed building.



Table 8 gives background sound level criteria for the applicable space types. Equivalent NC levels are provided for the ANSI 12.60 background sound level limits. For spaces that the ANSI standard did not provide any background sound limits, recommended NC levels are provided based on industry guidelines (e.g. ASHRAE) and TT's experience with similar projects.

Table 8: Background Sound Level Criteria by Room Type.

Room Type	NC Level (dBA)
Offices, Meeting Rooms, Quiet Room, Expanded training Rooms	NC 30 - 35 (35 dBA)
Workstations	NC 35 - 40 (40 dBA)
Cafeteria	NC 40 - 45 (50 dBA)
Corridors	NC 35 - 40 (45 dBA)

Meeting the criteria above will depend on the specifics of equipment locations, sound levels and duct layouts. This information will be reviewed once it is available to provide feedback and noise control recommendations to the design team. Some general recommendations to guide the design are provided below.

## 4.2 Major systems (HVAC)

Major equipment including air handlers and exhaust fans will be located on the roof. Detailed analysis for noise and vibration control will be carried out once equipment selections are finalized and sound data is provided. Consider the following initial design guidelines:

- Consider selection of quiet equipment whenever possible or provide alternative options for evaluation to minimize the need for noise treatments.
- Configure air handlers with side openings and horizontal duct runs into shafts instead of vertical penetrations directly into occupied floors.
- To the extent possible, place the noisiest equipment where noise sensitive spaces such as private offices and meeting rooms are least expected.
- Sound data for mechanical equipment selections and any alternative options should be reviewed early for noise to outdoor occupied areas and surrounding areas. Noise control options may include sound attenuators and/or sound screens.

## 4.3 Air Distribution (HVAC)

The following general design parameters should be used to achieve the least amount of system-generated noise and assure containment of noise at or near its source:

- Main supply/return/exhaust ducts shall not be installed directly above spaces with a noise criterion of NC-35 or less.
- Air supply/return/exhaust air shafts and mechanical equipment rooms shall not be located adjacent to occupied critical spaces.
- Use the following air velocity limits (fpm) as a guideline for sizing main ductwork

Table 9: Maximum airspeed limits in ductwork.

Noise Criterion	NC-45	NC-40	NC-35	NC-30
Main branch above suspended ceiling – Rectangular duct	2000	1800	1500	1300
Duct within 6m (20 feet) of supply diffuser/return grille	900/1000	850/950	800/900	700/800
Duct within 3m (10 feet) of supply diffuser/return grille	700/800	650/750	600/700	500/600
Supply Diffuser – ‘free’ velocity	550	500	450	400
Return Grille – ‘free’ velocity	650	600	550	500

Note: These velocity guidelines assume good airflow conditions. The presence of elbows, fittings, or abrupt duct transitions may require lower air velocities. If these guidelines conflict with any safety requirements, such as in duct air velocities for fume exhaust systems or room exhaust, the safety requirements shall supersede the acoustical guidelines.

- Avoid VAV boxes above NC-35 or quieter spaces, and fan coil units shall not be located directly above NC-35 or quieter spaces
- Minimize penetrations in sound-rated partitions and acoustically seal all such penetrations (see concept in Figure 1).

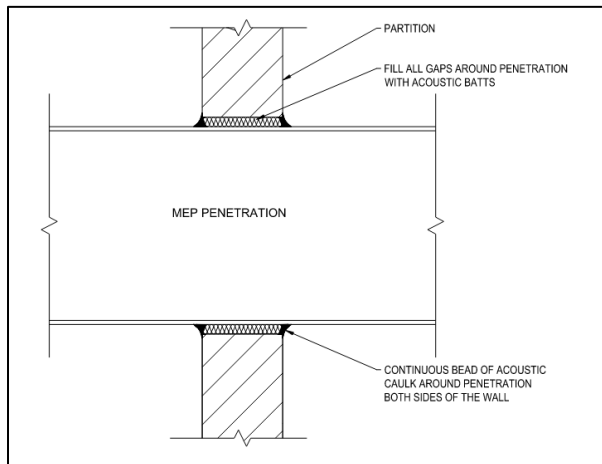


Figure 1: MEP penetration concept

- Door undercuts for air return are unacceptable for spaces with acoustical partitions.
- Provide acoustically lined transfer ducts through all acoustical partitions near or above doors. Transfer air ducts should be internally acoustically lined with a 25mm (1") thick acoustic duct liner and include a 90-degree elbow at each end of a minimum 1m (3 foot) duct length. The smallest cross-sectional dimension (width or height) should not exceed 150mm (6").
- Select supply diffusers and return grilles at least 5 NC points below the NC design criterion for the space served.

- Locate volume dampers in-branch ductwork at least 1.5m (5 feet) away from diffusers serving NC 40 spaces and at least 2m (10 feet) away from diffusers serving NC 30 and 35 spaces.
- No dampers should be located within diffuser necks, and opposed blades should not be allowed. For fire/smoke dampers, use only out-of-flow devices.
- Consider using an acoustic flex duct as this may reduce the need for other noise treatments pending noise analysis to meet project background noise criteria. Install flex duct per SMACNA 1993, Chapter 10 and with adequate support and smooth turns to avoid any kinks resulting in re-generated noise. Limit the length of flex duct (any type) to 1.5m (5 feet) or less to maintain smooth airflow conditions.

#### **4.4 Vibration Isolation**

Structure borne noise can result in excessive or annoying noise propagating throughout a building. Once equipment selections and locations are determined and complete equipment schedules provided, we will issue a standalone vibration control specification for mechanical, electrical, and plumbing systems including piping and ductwork. This will address project requirements in terms of equipment vibration levels and equipment isolation from the building structure and include a detailed equipment isolation schedule based on equipment type, size and location relative to vibration sensitive spaces. In the meantime, make provisions for the following:

- All major rotating or reciprocating mechanical equipment should have spring isolation with a minimum static deflection ranging from 25mm (1") to 75mm (3") depending on proximity to vibration sensitive areas and support conditions.
- Fractional horsepower equipment would require minimum vibration isolation, typically pads sized to provide static deflections up to 6mm (0.25"), depending on equipment location and rpm.
- All conduit, piping, and ductwork connected to vibration-isolated equipment should at a minimum be vibration isolated for the first 10m (30 feet) horizontally from equipment.
- For stable support conditions, concrete inertia bases should be provided for pumps and external steel bases for large fans. Minimum 100mm (4") thick housekeeping concrete pads for major equipment would also be considered typical.
- Equipment selections with direct-drive fans often have lower vibration and can be more finely balanced than belt-drive fans and operate at higher frequencies and are preferred to minimize the need for vibration isolation.

#### **4.5 Electrical Systems**

Transformers located inside the building should not make contact with partitions and should be resiliently mounted to floor slabs using neoprene pads or mounts sized for a minimum of 6mm (0.25") static deflection, 40 durometers, or softer. Avoid placing transformers close to interior partitions adjoining tenant spaces to prevent bothersome electrical "hum" noise that may carry into tenant areas. Transformers should also be procured to meet the NEMA sound rating for their class.

All electrical connections to vibration isolated equipment should be made with adequate lengths of flexible conduit to prevent noise and vibration transmission.

## 4.6 Plumbing Systems

General guidelines for base-building plumbing noise control are as follows and include domestic water, waste lines, and roof drains.

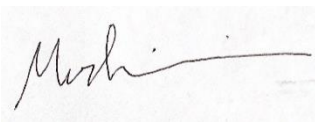
- Plumbing supply, return and waste lines near occupied spaces should be attached using resilient mounts by Acousto-Plumb, Holdrite, or approved equal.
- Pipe riser supports to be isolated from building structure with neoprene pads
- It is not necessary to resiliently mount vent piping. Similarly, roof drains do not require resilient mounting if made of cast iron and not routed through or over acoustically sensitive areas.
- Piping Clearances— Allow for at least 25mm (1") gap between the outside of any pipe and a building element and acoustically seal.
- Size pipes for minimal flow velocities; this should range from 5 to 7 ft/s when near occupied spaces.
- Limit pressure at fixtures to 60 psi to reduce noise generation.
- Install air chambers or shock-absorbing devices to prevent water hammer in lines subject to abrupt shut-off.
- Avoid placing acoustically sensitive spaces common with plumbing walls.

## 5.0 Concluding Comments

We trust that these general recommendations meet the needs of the current phase of the design.

Please do not hesitate to contact us if there are any questions.

Yours Truly,



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Disclaimer: Achieving the required noise control requirements relies on correct incorporation of noise control recommendations into Architectural and Mechanical drawings and specifications, as well as correct installation during construction. On Request, TT will conduct drawing reviews and onsite reviews of noise control measures and provide observations as appropriate; however, notwithstanding the foregoing, it is expressly understood and agreed that TT shall not have control or charge of and shall not be responsible for the acts or omissions, including but not limited to means, methods, techniques, sequences and procedures, of the Design Professionals and/or Contractors performing design and/or construction on the Project. Accordingly, TT shall not be held responsible for the failure of any party to properly incorporate the noise control measures stated in this report.

## Appendix A

**Decibel, dB** – A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure (20  $\mu$ Pa).

**Ambient Noise** – The sound level in a given environment usually comprised of many sources in many directions near and far with no particular sound dominant.

**A-weighted Sound Level, dBA** – The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.

**Community Noise Equivalent Level, CNEL** – The average A-weighted noise level during a 24-hour day, obtained after addition of 5 dB in the evening (7:00 pm to 10:00 pm) and after addition of 10 dB to sound levels measured in the night (between 10:00 pm and 7:00 am).

**Day/Night Noise Level, LDN (or DNL)** – The average A-weighted noise level for a 24-hour period, obtained after addition of 10 dB to levels measured in the night (10:00 pm to 7:00 am).

**Background Noise** - The total noise from all sources other than a particular sound that is of interest.

**Sound level meter** - An instrument that measures sound in dB. Various features are incorporated into such instrument including frequency bands, integration of sound over time and display of average, minimum, and maximum levels.

**Sound pressure level** - the ratio, expressed in decibels, of the mean-square sound pressure level to a reference mean-square sound pressure level that by convention has been selected to approximate the threshold of hearing (0.0002  $\mu$ bar)

**Frequency** – The number of times per second that the oscillation of a wave of sound or that of a vibrating body repeats itself, expressed in Hertz (Hz).

**Octave band** - The frequency range of one octave of sound frequencies. The upper limit is always twice the frequency of the lower limit. Octave bands are identified by the geometric mean frequency or center between the lower limit and the upper limit.

**Sound Transmission Class (STC)** – A laboratory measured single-number rating system used to compare the sound isolating characteristics of partitions used to separate occupied spaces.

**Noise Isolation Class (NIC)** - A field measured single number rating used to compare the sound isolating characteristics of the total construction between two enclosed spaces that are acoustically connected by one or more paths.

**Noise Criteria (NC) Curves** – These curves define the limits that the octave-band spectrum of a noise source must not exceed to achieve a level of occupant acceptance.

## **Appendix B: Acoustic Sketches and Attachments**

	Design meets acoustic recommendation
	Coordination in Progress
	Design does not meet acoustic recommendations.

100% Design Review

Item	Area of Concern	Discipline	Drawing/ Specification	Current Design	Point of Concern	Criteria	Recommendation	Status
General								
AC-0.01	Steel Studs in STC Rated Partitions	ARCH	A040	-	STC Rating	-	<p>Stud gauge for acoustically rated partitions must be 25 gauge or lighter. Use of heavier gauge studs will reduce the acoustic performance.</p> <p>If heavier gauge studs are required, then resilient channel or equivalent acoustically resilient construction should be used.</p> <p>Stud gauge should be indicated on drawings for acoustically rated partitions.</p>	Stud gauge is not currently indicated on Rated Metal Partition Schedule. Notes to be added to the schedule specifying stud gauges.
AC-0.02	Gypsum Board	ARCH	A040	16mm Gypsum Board	STC Rating	-	<p>Gypsum board in acoustically rated partitions should be 5/8" Type X, with a minimum surface mass of 2.2lb/sq.ft.</p> <p>Lightweight gypsum board must not be used.</p>	Partition Schedules only show 16mm Gypsum Board. Notes to be added to the partition schedule to specify that the gypsum boards should be of Type X.
AC-0.03	Flanking walls	ARCH	-	-	STC Rating	-	<p>Flanking walls should not be continuous across STC rated separating walls (i.e., interior GWB should be interrupted by the separating wall). See sketches <b>01/ACSK-01</b> and <b>02/ACSK-01</b> for schematic.</p>	Details to be added to the drawings.
AC-0.04	Partitions terminating at window mullions	ARCH	-	-	STC Rating	-	<p>Provide a mullion cap as indicated in sketch <b>03/ACSK-01</b> or provide commercial mullion cap such as Mull-it-over</p>	Details to be added to the drawings.
AC-0.05	Junction Boxes in Wall	ARCH ELEC	A040	-	STC Rating	-	<p>Do not provide back to back outlets in STC rated walls. Provide at least one full cavity space between junction boxes on opposite sides of the wall.</p>	Note to be added to drawing A040
AC-0.07	Acoustic sealant at STC rated partitions	ARCH	A040	-	STC Rating	-	<p>Ensure that the STC rated walls are completely sealed around the full perimeter. See sketch <b>01/ACSK-02</b></p>	Details to be added to the drawings.
AC-0.08	Gypsum wall above interior glazing	ARCH	-	-	STC Rating	-	<p>Provide bulkhead above interior glazing as shown in <b>02/ACSK-02</b></p>	Details to be added to the drawings.
AC-0.09	MEP penetrations in acoustically sensitive walls	ARCH MECH	-	-	STC Rating	-	<p>All penetrations through acoustically sensitive walls to be sealed airtight as follows:</p> <ul style="list-style-type: none"> <li>- provide 1/4" to 1/2" gap between pipe/duct and gypsum board or CMU, and ensure no contact between wall framing materials and pipe/duct penetration</li> <li>- seal gap on both sides with non-hardening acoustic caulk (paintable silicone caulk may be used where aesthetic finish is required).</li> </ul> <p>Where gaps are too large to be sealed with caulk, apply gypsum board patch achieve sealable gap as described above. Refer to sketch <b>03/AC-SK-02</b></p>	Details provided in Mechanical drawings (M800-Detail 5)
Level 1								

	Design meets acoustic recommendation
	Coordination in Progress
	Design does not meet acoustic recommendations.

100% Design Review

Item	Area of Concern	Discipline	Drawing/ Specification	Current Design	Point of Concern	Criteria	Recommendation	Status
AC-1.01	Workstation - Corridor A	ARCH	A105	P310	STC Rating	STC 45	Partition type P310 is suitable.	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule. To specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.02	Staff Vestibule - VEPA Support Office	ARCH	A108, Detail 1	PR31I	STC Rating	STC 45	Partition type PR31I is suitable.	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule. To specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.03	Corridor A - Vehicle Bay	ARCH	A105	PR51I	STC Rating	STC 55	Partition type PR51I meets the recommended STC rating.	Design meets acoustic recommendations
AC-1.04	Meeting Room - Workstation	ARCH	A105	P310	STC Rating	STC 50	Partition type P310 is suitable.	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule. To specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.05	Meeting Room - Meeting Room	ARCH	A105	P310	STC Rating	STC 50	Partition type P310 is suitable	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule. To specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.06	Workstation - Parade Room	ARCH	A105	P310	STC Rating	STC 50	Partition type P310 is suitable	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule to specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.07	Cafeteria - Corridor A	ARCH	A105	P310	STC Rating	STC 45	Partition type P310 is suitable	Partition type P310 has a STC rating of 52 (OBC SB3 S5a). P310 STC specification to be updated in Metal Stud Partition Types Schedule. To specify that the 16mm GWB should be of type X and metal studs should be 25 gauge or lighter.
AC-1.08	Cafeteria	ARCH	A201	APN2 (Acoustic Panel Ceiling)	Reverberation	0.8s	An ACT having minimum NRC 0.6 is required such as Armstrong Cortega Fire Guard 5/8". Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-10.08	Workstation	ARCH	A201	ACT1A (Not specified)	Reverberation	0.8s	Typical ACT in offices and meeting rooms to have minimum NRC rating of 0.75.  Armstrong Fine Fissured High NRC has an NRC rating of 0.75 and is recommended.	Acoustic ceiling tile details required for review
AC-10.09	Meeting Room (110)	ARCH	A201	ACT1A (Not specified)	Reverberation	0.6s	Typical ACT in meeting room (110) to have minimum NRC rating of 0.85.  Armstrong Painted Nubby Open Plan (foil) 1" has an NRC rating of 0.85 and is recommended.	Acoustic ceiling tile details required for review
AC-10.10	Meeting Room (111)	ARCH	A201	ACT1A (Not specified)	Reverberation	0.6s	Typical ACT in meeting room (111) to have minimum NRC rating of 0.9.  Armstrong Optima Open Plan 1" has an NRC rating of 0.93 and is recommended.	Acoustic ceiling tile details required for review
Level 2								



	Design meets acoustic recommendation
	Coordination in Progress
	Design does not meet acoustic recommendations.

100% Design Review

Item	Area of Concern	Discipline	Drawing/ Specification	Current Design	Point of Concern	Criteria	Recommendation	Status
AC-2.01	Prayer Room	ARCH	A202	ACT1A (Not specified)	Reverberation	0.6s	An ACT having minimum NRC 0.64 is required such as Armstrong Fine Fissured Beveled Tile 3/4". Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-2.02	Quiet Room	ARCH	A202	ACT1A (Not specified)	Reverberation	0.6s	An ACT having minimum NRC 0.7 is required such as Armstrong Fine Fissured High NRC 3/4". Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-2.03	FM Office	ARCH	A202	ACT1A (Not specified)	Reverberation	0.6s	An ACT having minimum NRC 0.6 is required such as Armstrong Cortega Square Lay-in 5/8". Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-2.04	Expanded Training II and III	ARCH	A202	APN1 (Linear wood grille) & APN2 (Acoustic Panel Ceiling)	Reverberation	0.7s	An ACT having minimum NRC 0.9 is required such as Armstrong Optima Open Plan 1". Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-2.05	Expanded Training I	ARCH	A202	APN1 (Linear wood grille) & APN2 (Acoustic Panel Ceiling)	Reverberation	0.7s	An ACT having minimum NRC 0.9 is required such as Armstrong Optima Open Plan 1" and the coverage should be increased by 50%. Product detail to be provided for acoustic performance review.	Acoustic ceiling tile details required for review
AC-2.05	Expanded Training I, II and III - Corridor 2A	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.06	Expanded Training III - Servery	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.07	Servery - Corridor 2A	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.08	Prayer Room - Quiet Room	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.09	FM Office - Fitness	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.10	Fitness - GN Locker Room	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.11	Expanded Training I - GN WC	ARCH	A106	P31O	STC Rating	STC 50	Partitionn type P31O meets the recommended STC rating.  Note that the STC rating will be met with a 25 guage (or lighter) metal stud.	Design meets acoustic recommendations
AC-2.12	Corridor 2A - Vehicle Bay	ARCH	A106	P31O	STC Rating	STC 55	Partition type PR51I meets the recommended STC rating.	Design meets acoustic recommendations

Design meets acoustic recommendation  
Coordination in Progress  
Design does not meet acoustic recommendations.

100% Design Review

Item	Area of Concern	Discipline	Drawing/ Specification	Current Design	Point of Concern	Criteria	Recommendation	Status
AC-2.13	Servery Room	ARCH	A202	ACT1A (Not specified)	Reverberation	0.7s	An ACT having minimum NRC 0.6 is required such as Armstrong Cortega Angled Tegular 5/8". Product detail to be provided for acoustic performance review.	Design meets acoustic recommendations
AC-2.14	VAV in Quiet Room (217)	MECH	M401	VAV inside the Quiet Room	NC	NC 35	VAV boxed should be outside rooms with NC 30 or under	VAV box should be relocated
AC-11.05	Expanded Training Rooms, demountable partitions	ARCH	A106	Side-folding partition	STC Rating	STC 35	Demountable partition selection to be reviewed for STC performance. Manufacturer STC test data to be provided.	Demountable partition details required for review

	Design meets acoustic recommendation
	Coordination in Progress
	Design does not meet acoustic recommendations.

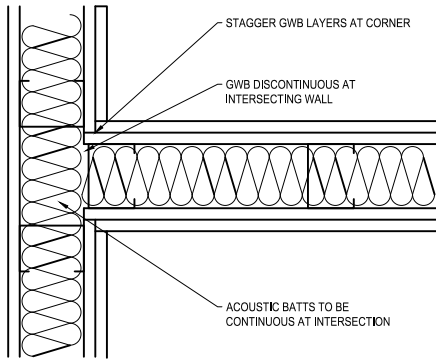
**VIBRATION ISOLATION REQUIREMENTS**

**100% Design Review**

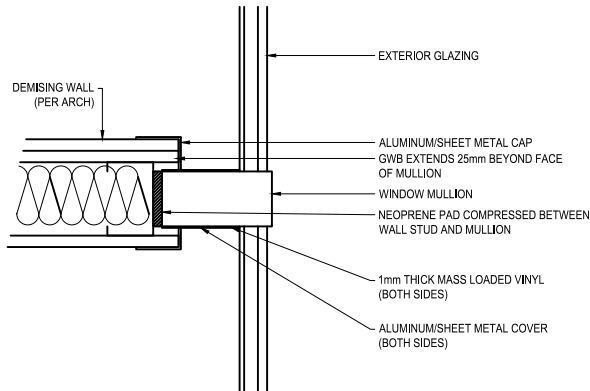
Item Number	Tag	Description	Basis of Design	Location	HP (W)	Equip RPM	VFD	Base	Isolator Type	Minimum Static Deflection	Status
V1	AHU-01 through 03	Air Handling Units - Internal Isolation	-	Roof	-	-	N	-	PR or MR	0.25"	Coordination Ongoing. Provide unit and isolator submittals for review.
V2	FCU-01 through 04	Air Handling Units - Internal Isolation	-	Various	-	-	N	-	Rubber/Spring Hangers	0.75"	Coordination Ongoing. Provide unit and isolator submittals for review.
V3	ASHP-01/02/03	Centrifugal Water Cooled Chiller with Scroll Compressors	-	Roof	-	-	N	-	PR	0.25"	Coordination Ongoing. Provide unit and isolator submittals for review.

**Notes:**

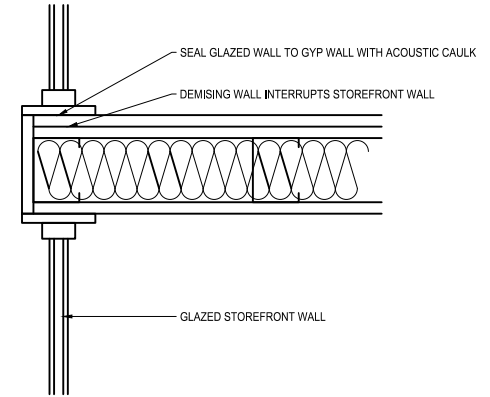
- Pipes connected to isolated equipment to have vibration isolation of the same type for the first 25 horizontal feet from the equipment.
- Pipes and ductwork should make no contact with the structure. Provide resilient penetrations and proper supports to avoid direct contact with slabs, partitions, and/or structural framing.
- Isolator and base types in the following vibration schedule refer to:
  - FS - Free standing springs such as Mason Industries Type SLF or approved equal. Use independent snubbers as required such as Mason Type Z-1225 or approved equal. Restrained or housed springs are not recommended.
  - RS - Restrained springs such as Mason Industries Type SLR or approved equal. Do not use fully-housed springs.
  - MR - Resilient floor mounts such as Mason Industries Type ND or BR, or approved equal
  - PR - Resilient pads such as Mason Industries Type Super W or approved equal. Use 40 durometer or softer pads and select pads and size footprint to achieve specified deflection. Use neoprene shoulder washers such as Mason Type HG for all
  - HR - Neoprene hangers such as Mason Industries Type HD or approved equal, 40 durometer or softer.
  - HS - Spring hangers such as Mason Industries Type 30 or approved equal.
  - HRS - Resilient Spring Hanger such as Mason Industries Type 30N or equal.
  - ISB - Integral Structural Steel Base such as Mason Type M, N, WF, or equal. Provide height saving brackets as needed to maintain minimum 2" clearance below the base.
  - ICB - Inertia Concrete Base such as Mason Type K or equal. Provide height saving brackets as needed to maintain minimum 2" clearance below the base.



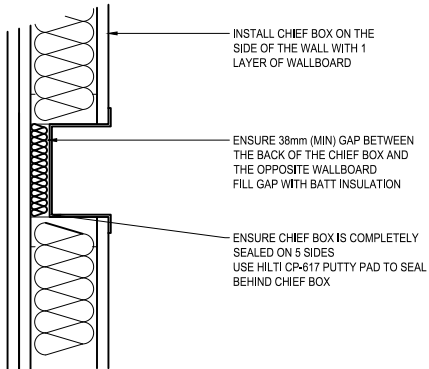
01 PARTITION AT INTERSECTING WALL



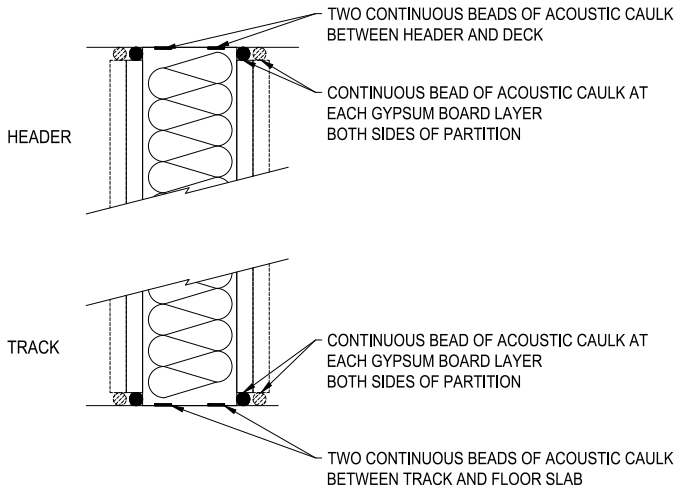
03 PARTITION AT EXTERIOR WINDOW MULLION



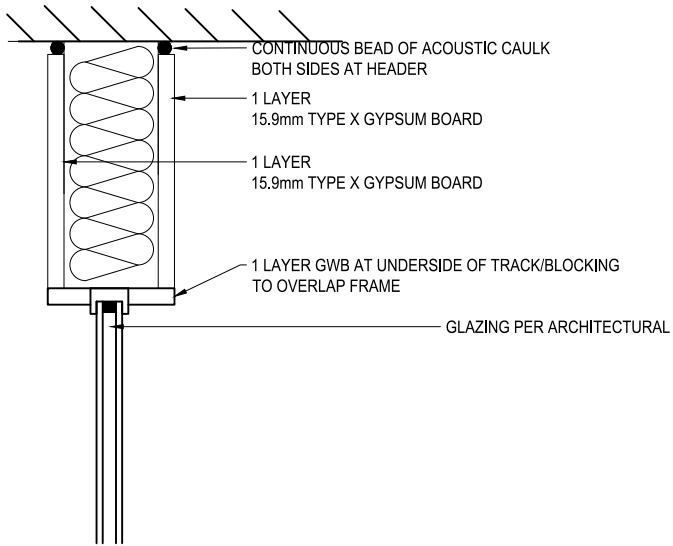
02 PARTITION AT GLAZED STOREFRONT



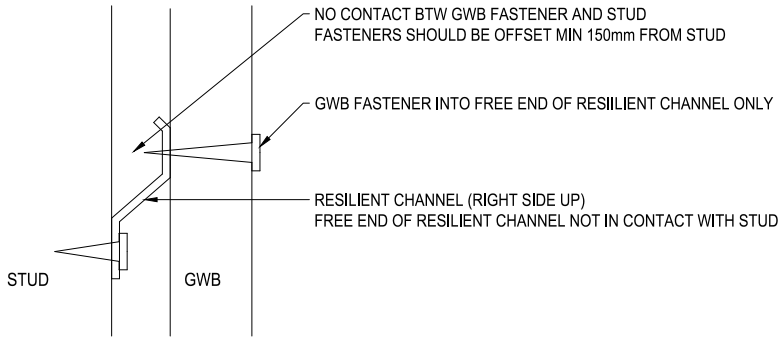
04 DEMISING PARTITION AT CHIEF BOXES



01 ACOUSTIC SEAL AT TRACK AND HEADER

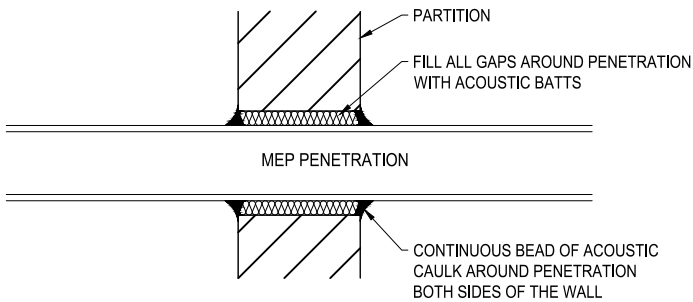


02 GWB WALL ABOVE GLAZING

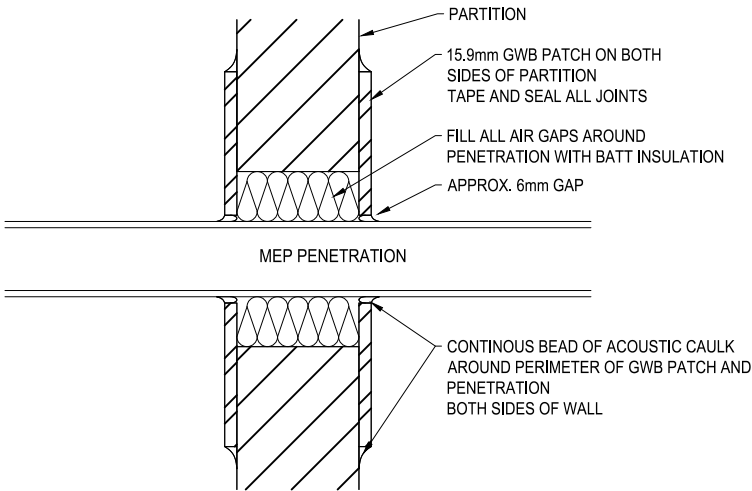


- INSTALLATION NOTES:
1. RESILIENT CHANNEL TO BE INSTALLED WITH FREE END FACING UP
  2. FASTEN ONLY THE BOTTOM END OF THE RESILIENT CHANNEL TO THE STUD
  3. INSTALL WALLBOARD ON RESILIENT CHANNEL SIDE OF THE WALL FIRST AND BEFORE INSTALLING BATT INSULATION TO ALLOW INSPECTION OF RESILIENT CHANNEL FROM THE OTHER SIDE OF THE WALL
  4. WHEN INSTALLING WALL BOARD, CHALK LINE STUDS AND RESILIENT CHANNEL FREE END TO GUIDE FASTENER LOCATIONS
  5. OFFSET WALLBOARD FASTENERS FROM STUDLINE BY 150mm (MIN)
  6. INSPECT WALLBOARD INSTALLATION FROM OPPOSITE SIDE OF THE PARTITION TO ENSURE WALLBOARD FASTENERS DO NOT "SHORT-CIRCUIT" WALLBOARD TO THE STUD

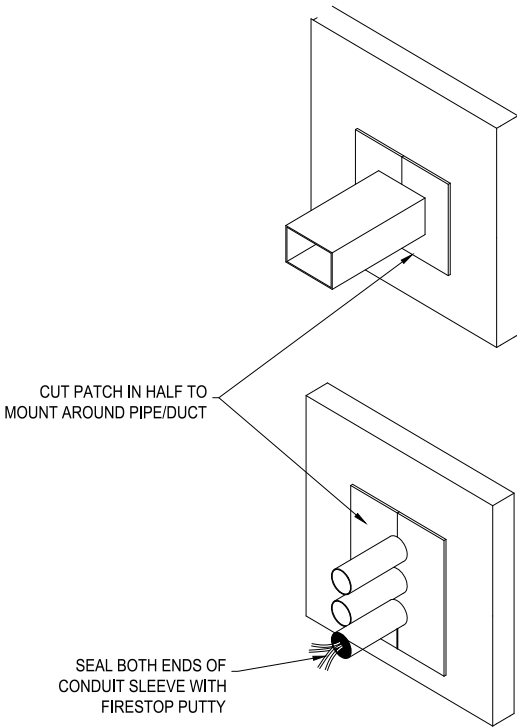
04 RESILIENT CHANNEL INSTALLATION



03a TYPICAL MEP PENETRATION ACOUSTIC SEAL



03b GWP PATCH FOR OVERSIZED PENETRATIONS



- NOTES:
1. CONDITIONS APPLY TO BOTH SIDES OF THE PARTITION
  2. GWP PATCH SHALL NOT TOUCH DUCT OR PIPE. SEAL AIR GAP WITH ACOUSTIC CAULK
  3. PROVIDE SUFFICIENT SPACE BETWEEN PENETRATIONS TO ALLOW GWP PATCH BETWEEN PENETRATIONS

03 MEP PENETRATION ACOUSTIC SEAL

# OPTIMA® Open Plan

## Square Lay-in

fine texture



Items 3152 & 3153



Optima Open Plan Square Lay-in with Prelude® 15/16" Exposed Tee grid; Axiom® Classic Trim

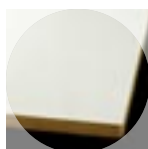
### Key Selection Attributes

- Outstanding acoustical performance for open plan areas, both Articulation Class (180-210) and NRC (0.90-1.00)
- Smooth, clean, durable finish – Washable, Impact-resistant, Scratch-resistant, Soil-resistant
- 30-Year Limited System Warranty against visible sag, mold/mildew and bacterial growth
- Energy-saving high light-reflective finish
- Non-directional visual reduces installation time and scrap
- Compatible with the TECHZONE™ Ceiling Systems. Items 3152, 3153, 3156, 3158 only.
- Smaller size panels available (1 carton min. order). Info: [armstrong.com/specials](http://armstrong.com/specials)

### Typical Applications

- Open plan offices
- Computer rooms
- Corridors (walls-to-deck)
- Auditoriums
- Waiting rooms/nurses stations – assists in addressing HIPAA requirements
- Areas with indirect lighting systems

### Detail



OPTIMA Open Plan  
Square Lay-in



OPTIMA Open Plan  
with PRELUDE 15/16"  
Exposed Tee grid

### Color



White (WH)



# OPTIMA® Open Plan

## Square Lay-in

fine texture

Recycled Content: 82%

armstrong.com/greengenie

### LEED® Credits

Energy	Waste Mgmt	Recycled Content	Local Materials	Renewable Materials	Daylight & Views
✓	✓	✓	✓		✓
Location Dependent					

### LEED for Schools

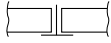











Acoustics	Low Emitting or CHPS
✓	✓

\$\$\$\$\$

## Visual Selection

## Performance Selection

Dots represent highest level of performance.

Edge Profile	Item No.	Dimensions	UL Classified	Acoustics			Fire Rating	Light Reflect	Sag Resist	Anti-Microbial	VOC Formaldehyde	Durable				Recycle Program
				NRC	AC	CAC						Wash	Impact	Scratch	Soil	
<b>OPTIMA† Open Plan</b> 15/16" Square Lay-in 	<b>3150</b>	2' x 2' x 3/4"		0.90	180	N/A	Class A	0.90	HumiGuard+	Inherent	Low	•	•	•	•	Yes
	<b>3150M</b>	600 x 600 x 19mm		•	•			•	•	•		•	•	•	•	•
	<b>3152</b>	2' x 2' x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3152M</b>	600 x 600 x 25mm		•	•			•	•	•		•	•	•	•	•
	<b>3159</b>	2' x 2' x 1-1/2"		1.00	200	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3159M</b>	600 x 600 x 38mm		•	•			•	•	•		•	•	•	•	•
	<b>3352*</b>	2' x 2' x 1"		0.90	200	26	Class A	0.90	•	•	Low	•	•	•	•	—
	<b>3352M</b>	600 x 600 x 25mm		•	•			•	•	•		•	•	•	•	—
	<b>3151</b>	2' x 4' x 3/4"		0.90	180	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3151M</b>	600 x 1200 x 19mm		•	•			•	•	•		•	•	•	•	•
	<b>3153</b>	2' x 4' x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3153M</b>	600 x 1200 x 25mm		•	•			•	•	•		•	•	•	•	•
	<b>3155</b>	2' x 4' x 1-1/2"		1.00	200	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3155M</b>	600 x 1200 x 38mm		•	•			•	•	•		•	•	•	•	•
	<b>3353*</b>	2' x 4' x 1"		0.90	200	26	Class A	0.90	•	•	Low	•	•	•	•	—
	<b>3353M</b>	600 x 1200 x 25mm		•	•			•	•	•		•	•	•	•	—
	<b>3356*</b>	2' x 4' x 1-1/2"		0.95	210	26	Class A	0.90	•	•	Low	•	•	•	•	—
	<b>3356M</b>	600 x 1200 x 38mm		•	•			•	•	•		•	•	•	•	—
	<b>3156</b>	20" x 5' x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3156M</b>	500 x 1500 x 25mm		•	•			•	•	•		•	•	•	•	•
	<b>3158</b>	30" x 30" x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3158M</b>	750 x 750 x 25mm		•	•			•	•	•		•	•	•	•	•

\* CAC Backing (not recyclable)

† U.S. Patent 6,103,360

CAC backing available on all products as a special order

## Suspension Systems

15/16" Standard: Prelude®

## Physical Data

### Material

3150-3153, 3155, 3156, 3158, 3159 – Fiberglass with DuraBrite® acoustically transparent membrane  
3352, 3353, 3356 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

### Surface Finish

DuraBrite with factory-applied acrylic latex paint

### Fire Performance

ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less. (UL labeled)

### ASTM E1264 Classification

Type XII, Form 2, Pattern E  
Fire Class A

### Sag Resistance

HumiGuard® Plus – superior resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.

### Low Formaldehyde

Low formaldehyde – contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality," California Code Title 24, and other building types in CHPS Section 01350.

### Anti Mold/Mildew & Bacteria

Fiberglass substrate is inherently resistant to the growth of mold, mildew and bacteria.

### Insulation Value

3150, 3151 –  
R Factor – 3.0 (BTU units)  
R Factor – 0.53 (Watts units)  
3152, 3153, 3156, 3158, 3352, 3353 –  
R Factor – 4.0 (BTU units)  
R Factor – 0.70 (Watts units)  
3155, 3159, 3356 –  
R Factor – 6.0 (BTU units)  
R Factor – 1.05 (Watts units)

### Backloading Recommendation

Contact TechLine for specific information

### 30-Year Performance Guarantee & Warranty Information

See warranty details at [armstrong.com/warranty](http://armstrong.com/warranty)

### Application Considerations

Products with CAC backing are not recyclable.

### Weight; Square Feet/Carton

3150, 3151 – 0.44 lbs/SF; 128 SF/ctn  
3152, 3153 – 0.45 lbs/SF; 96 SF/ctn  
3155, 3159, 3356 – 0.61 lbs/SF; 64 SF/ctn  
3156 – 0.47 lbs/SF; 100 SF/ctn  
3158 – 0.47 lbs/SF; 75 SF/ctn  
3352, 3353 – 0.46 lbs/SF; 96 SF/ctn

TechLine™ / 1 877 ARMSTRONG

1 877 276 7876

[armstrong.com/ceilings](http://armstrong.com/ceilings) (search: optima)

CS-3048-509

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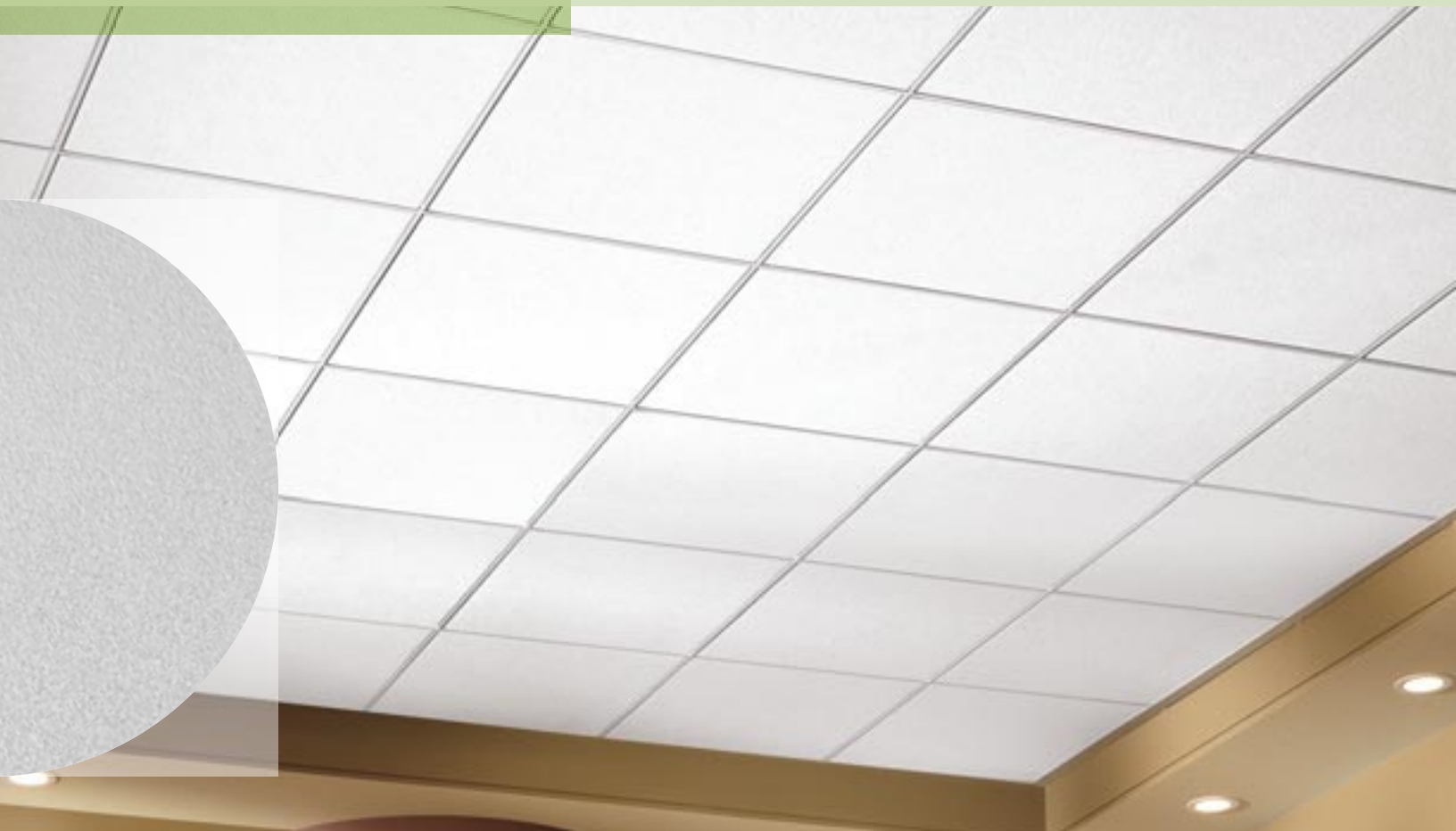


# OPTIMA® Open Plan

Tegular  
fine texture



Items 3250 & 3251



Optima Open Plan Tegular (2' x 2') with Sonata™ 9/16" Dimensional Tee grid; Axiom® Classic Trim

## Key Selection Attributes

- Outstanding acoustical performance for open plan areas, both Articulation Class (190-200) and NRC (0.90-1.00)
- Smooth, clean, durable finish – Washable, Impact-resistant, Scratch-resistant, Soil-resistant
- 30-Year Limited System Warranty against visible sag, mold/mildew and bacterial growth
- Energy-saving high light-reflective finish
- Non-directional visual reduces installation time and scrap
- Compatible with the TECHZONE™ Ceiling Systems. Items 3250, 3251, 3252, 3257, 3258, 3259 only.
- Smaller size panels available (1 carton min. order). Info: [armstrong.com/specials](http://armstrong.com/specials)

## Typical Applications

- Open plan offices
- Computer rooms
- Corridors (walls-to-deck)
- Auditoriums
- Healthcare – assists in addressing HIPAA requirements (walls to deck)
- Areas with indirect lighting systems
- Open plenum areas (in acoustical custom clouds)

## Detail



OPTIMA Open Plan  
Square Tegular



OPTIMA Open Plan Tegular  
with INTERLUDE® XL 9/16"  
Dimensional Tee grid



OPTIMA Open Plan Tegular  
with SILHOUETTE® 9/16"  
Bolt-Slot grid  
with 1/8" reveal



OPTIMA Open Plan Tegular  
with PRELUDE® 15/16"  
Exposed Tee grid

## Color



White (WH)





# OPTIMA® Open Plan

Tegular  
fine texture

Recycled Content: 82%

armstrong.com/greengenie

LEED® Credits

Energy	Waste Mgmt	Recycled Content	Local Materials	Renewable Materials	Daylight & Views
✓	✓	✓	✓		✓
Location Dependent					

LEED for Schools

Acoustics	Low Emitting or CHPS
✓	✓

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## Visual Selection

## Performance Selection

Dots represent highest level of performance.

Edge Profile	Item No.	Dimensions	UL Classified	Acoustics			Fire Rating	Light Reflect	Sag Resist	Anti-Microbial	VOC Formaldehyde	Durable				Recycle Program
				NRC	AC	CAC						Wash	Impact	Scratch	Soil	
9/16" Square Tegular	<b>3251</b> <b>3251M</b>	2' x 2' x 1" 600 x 600 x 25mm		0.95	190	N/A	Class A	0.90	HumiGuard+	Inherent	Low	•	•	•	•	Yes
	<b>3355*</b> <b>3355M</b>	2' x 2' x 1" 600 x 600 x 25mm		0.90	200	26	Class A	0.90	•	•	Low	•	•	•	•	–
	<b>3254</b> <b>3254M</b>	2' x 2' x 1-1/2" 600 x 600 x 38mm		1.00	200	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3257</b> <b>3257M</b>	2' x 4' x 1" 600 x 1200 x 25mm		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3259</b>	30" x 30" x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3263</b>	1' x 2' x 1"		N/A	N/A	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
15/16" Square Tegular	<b>3250</b> <b>3250M</b>	2' x 2' x 1" 600 x 600 x 25mm		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3354*</b> <b>3354M</b>	2' x 2' x 1" 600 x 600 x 25mm		0.90	200	26	Class A	0.90	•	•	Low	•	•	•	•	–
	<b>3253</b> <b>3253M</b>	2' x 2' x 1-1/2" 600 x 600 x 38mm		1.00	200	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3252</b> <b>3252M</b>	2' x 4' x 1" 600 x 1200 x 25mm		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3258</b>	30" x 30" x 1"		0.95	190	N/A	Class A	0.90	•	•	Low	•	•	•	•	•
	<b>3264</b>	1' x 2' x 1"		N/A	N/A	N/A	Class A	0.90	•	•	Low	•	•	•	•	•

\* CAC Backing (not recyclable)

† U.S. Patent 6,103,360

CAC backing available on all products as a special order

## Suspension Systems

9/16"	Standard: Interlude®, Silhouette® Bolt-Slot, Sonata™, Suprafine®, Trimlok® Screw-Slot
15/16"	Standard: Prelude®

## Physical Data

### Material

3250, 3251, 3252, 3253, 3254, 3257, 3258, 3259, 3263, 3264 – Fiberglass with DuraBrite® acoustically transparent membrane  
3354, 3355 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

### Surface Finish

DuraBrite with factory-applied acrylic latex paint

### Fire Performance

ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less. (UL labeled)

### ASTM E1264 Classification

Type XII, Form 2, Pattern E  
Fire Class A

### Sag Resistance

HumiGuard® Plus – superior resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.

### Low Formaldehyde

Low formaldehyde – contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality," California Code Title 24, and other building types in CHPS Section 01350.

### Anti Mold/Mildew & Bacteria

Fiberglass substrate is inherently resistant to the growth of mold, mildew and bacteria.

### Insulation Value

3250, 3251, 3252, 3257, 3258, 3259, 3354, 3355, 3263, 3264 –  
R Factor – 4.0 (BTU units)  
R Factor – 0.70 (Watts units)  
3253, 3254 –  
R Factor – 6.0 (BTU units)  
R Factor – 1.05 (Watts units)

### Backloading Recommendation

Contact TechLine for specific details

### 30-Year Performance Guarantee & Warranty Information

See warranty details at [armstrong.com/warranty](http://armstrong.com/warranty)

### Application Considerations

Products with CAC backing are not recyclable.

1' x 2' products are not intended for a full ceiling installation and are not UL Classified for acoustics.

### Weight; Square Feet/ Carton

3250, 3251, 3252, 3257 – 0.55 lbs/SF; 96 SF/ctn  
3253, 3254 – 0.78 lbs/SF; 64 SF/ctn  
3258, 3259 – 0.53 lbs/SF; 75 SF/ctn  
3263, 3264 – 0.55 lbs/SF; 48 SF/ctn  
3354, 3355 – 0.57 lbs/SF; 96 SF/ctn

TechLine™ / 1 877 ARMSTRONG  
1 877 276 7876

[armstrong.com/ceilings](http://armstrong.com/ceilings) (search: optima)  
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