

# Comparative Study of Soundproofing and Sound Dampening Insulation

## Final Report

Prepared For: 

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# Introduction

The topic under investigation is to figure what options are available to help soundproof and dampen the noises from your neighbors' condo units. Clearly, when the condos were built, the contractors did not create a dense enough barrier between the walls to help block out sounds. Because of the lack of a barrier to absorb sounds from other condo units, it has created a stressful situation for yourself because it is effecting your living space (quiet time) and your ability to focus on work you bring home with you to complete in the evening or weekend time.

Since the warnings given to your neighbors from the Board of Directors for your condo complex have been ignored, the option of home improvement to your condo (specifically with installation of sound dampening insulation to your ceiling and walls) will be beneficial. Not only will your goal of sound dampening/absorbing occur, so that you may enjoy quieter rooms - but this can also be beneficial for future tenant owners as you plan on selling your unit when the property values go up. This improvement could be desirable and what your future condo unit owner(s) may be looking for... quieter rooms. If this improvement is not made, and you attempt to sell your condo, anyone that comes to view it may hear the noisy TV and sounds from the above unit and could deter them from buying the condo.

The purpose for this study and research is to help determine which available insulation will be most effective at dampening the sounds and most cost effective based on your needs and specifications.

## Noise and Controlling Noise

For sound and noise to travel, it is important to stop noise at the source, or control the transmission path<sup>1</sup>. If there is little or no absorbing material in between walls, the rooms are considered "acoustically hard," when there is material, it is considered "acoustically soft"<sup>2</sup>. Noise control is the technology of obtaining an acceptable noise level<sup>3</sup>, which is our goal – finding the best option at making an acceptable noise level for you.

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<sup>1</sup> Harris, Cyril, *Noise Control in Buildings: A Guide for Architects and Engineers*, pg 1.7

<sup>2</sup> Harris, David, *Noise Control Manual for Residential Buildings*, pg 43

<sup>3</sup> Harris, Cyril, pg 1.2

Our goal with the insulation is to find a good barrier to block the air, which sound travels through, to help reduce the vibration of sound waves and particles<sup>4</sup>. When placing sound-absorbing materials between the ceiling and walls, it will effectively reduce the high-frequency noise<sup>5</sup>.

### **Study Minimum Specifications**

To make a decision about which type of insulation to use, the researcher has selected three possible types of insulation (in **Study Options**) to choose from and the following list of criteria are what will need to be reviewed in order to narrow down a decision:

- Material that can dampen or eliminate sounds
- Material that is readily available at local area hardware stores
- Making sure you get your money's worth (reasonable cost for amount of material purchased), as well as any other potential supply costs (depending on the installation process)
- Areas most effective for installation of insulation (to provide a barrier and dampen and/or eliminate noise)
- Minimize potential health risks (material of insulation)
- Minimize heating/cooling costs, and potentially bring up property value upon future sale

### **Study Options:**

After looking at the types of inventory at local area hardware stores (Lowe's and Home Depot), the options of insulation are as follows:

- Stone Wool insulation batts
- Denim Insulation batts
- Foam Sheet Insulation

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<sup>4</sup> Harris, Cyril, pg 1.4

<sup>5</sup> Harris, David, pg 43

**Study Evaluative Criteria:**

From discussing with you your needs and worries about this process and to keep things as healthy, cheap, and clean (little mess), the solutions (insulation type) will be evaluated using the following criteria:

- Effectiveness of dampening/blocking sound
- Cost
- Health risks (if the material is made from something harmful)
- Time and ease of installation (from start to finish)
- Other benefits (helping with actual heating insulation, lowering heating costs, improving property value, etc).

The purpose of this Final Report is to present the final analysis and recommendation of the potential options for sound dampening/absorbing insulation that you can install on your own into your condo unit. Conclusions and Recommendations are also found in this report. This Final Report is organized into the following sections: **Introduction, Research Data, Data Analysis, Conclusions, Recommendations, and Bibliography.**

## Research Data

*The material Cost that is presented is based on the materials searched for at local hardware stores (Lowe's and Home Depot).*

### Note:

**When comparing the insulation types, an R-Value appears on all insulation packages. This R-Value stands for the resistance of heat flow, the higher the value – the better. Heat wants to flow into a cooler area, so the R-Value indicates how well warm air flows into the air pockets of the insulation to hold onto the heat<sup>6</sup>.**

### Stone Wool Insulation Batts

#### *Description*

Stone wool insulation, is also known as “rock wool”<sup>7</sup> because it is a rock-based mineral fiber made of Basalt (from a volcano) rock and recycled slag. It is made by melting the materials and they are spun into fibers<sup>8</sup>.

**Figure 1: Basalt Rock and Recycled Slag**



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<sup>6</sup> “What does R-Value mean?”, [www.howtohomeinsulation.com/insulation\\_basics\\_rvalue.html](http://www.howtohomeinsulation.com/insulation_basics_rvalue.html)

<sup>7</sup> CertainTeed Saint-Gobain, “Stone Wool, Rock Wool,” [www.certainteed.com/products/insulation/stone-wool-\(rock-wool\)#](http://www.certainteed.com/products/insulation/stone-wool-(rock-wool)#), 2013

<sup>8</sup> Roxul, [www.roxul.com/stone+wool](http://www.roxul.com/stone+wool)

### *Effectiveness of Dampening/Blocking Sound*

Stone wool insulation can be used to help reduce air bourn sound within the home when installed in both walls and ceilings. If reducing impact sound is the primary concern, additional measures should be taken such as the addition of resilient channels of a sound absorbing layer between a subfloor and the joints. It is dense and made to absorb sound<sup>9</sup>.

### *Costs (Based on available supplies at local area hardware stores)*

Roxul 12-pack

47in length, 15 ¼ in width, 3in deep

Various R-value ratings

Price range from \$40-50 a pack<sup>10</sup>

Roxul 12-pack

27in length, 12in width, 3 ¼ in deep

(Only one R-Value rating type available)

~\$42 a pack<sup>11</sup>

**Figure 2: Package of Stone Wool Insulation**



<sup>9</sup> [REDACTED], Interview, May 17, 2013

<sup>10</sup> Lowes: Building Supplies/Stone Wool Insulation, [www.lowes.com](http://www.lowes.com)

<sup>11</sup> Home Depot: Stone wool insulation, [www.homedepot.com](http://www.homedepot.com)



### *Health Risks*

To reduce the amount of harmful material, organic binders are used in manufacturing the stone wool batts to eliminate volatile components<sup>12</sup>. There is a risk of getting irritation of the eyes, skin, nose, and throat<sup>13</sup> so basic precautions of safety gear including goggles and wearing long sleeved protective gear is recommended.

**Figure 3: Safety Precautions with Stone Wool Installation**



### *Time and Ease of Insulation*

Stone wool batts can easily be cut with a knife and can be easily made into a better fit around electrical boxes, wiring, plumbing, ducts, etc<sup>14</sup>.

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<sup>12</sup> Roxul

<sup>13</sup> OSHA, [www.osha.gov/dts/chemicalsampling/data/CH\\_254980.html](http://www.osha.gov/dts/chemicalsampling/data/CH_254980.html)

<sup>14</sup> PR Web, [www.prweb.com/releases/Roxul/Stonewool/prweb2700104.htm](http://www.prweb.com/releases/Roxul/Stonewool/prweb2700104.htm)

## *Other Benefits*

- Resists fire and can withstand temperatures up to 2,000 degrees Fahrenheit<sup>15, 16</sup>
- Non-combustible<sup>17</sup>
- Moisture resistant, non-corrosive, non-deteriorating, and mildew-proof<sup>18</sup>
- Denser than traditional insulation<sup>19</sup>, which reduces airflow and sound transmissions<sup>20</sup>
- Helps home stay warmer in winter and cooler in summer (reduced heating/cooling costs)<sup>21</sup>

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<sup>15</sup> CertainTeed Saint-Gobain

<sup>16</sup> Roxul

<sup>17</sup> Roxul

<sup>18</sup> CertainTeed Saint-Gobain

<sup>19</sup> Roxul

<sup>20</sup> PR Web

<sup>21</sup> PR Web

## Denim Insulation Batts

### *Description*

Denim insulation, also known as recycled denim, recycled cotton, and blue jean insulation<sup>22</sup> is the made into a green, clean, and effective insulation product<sup>23</sup>. Post-industrial denim scraps<sup>24</sup> and old blue jeans are collected by textile recycling companies and made into insulation<sup>25</sup>.

### **Figure 4: Recycling Used Jeans**



### *Effectiveness of Dampening/Blocking Sound*

Denim insulation is made into a three-dimensional microstructure which effectively traps, isolates, and controls sound<sup>26,27</sup>. It is more of an insulator of sound, than it is an insulator of air<sup>28</sup>.

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<sup>22</sup> "What is Denim Insulation and What Can It Do?", [www.totallyinsulated.co.uk/denim-insulation.html](http://www.totallyinsulated.co.uk/denim-insulation.html)

<sup>23</sup> Bonded Logic, Inc., "Recycled Denim Reborn as Sustainable Insulation", [www.bondedlogic.com](http://www.bondedlogic.com)

<sup>24</sup> Rodriguez III, Gene, "Recycled Denim Insulation versus Fiberglass", [www.life123.com/home-garden/building-renovations/insulation/denim-insulation.shtml](http://www.life123.com/home-garden/building-renovations/insulation/denim-insulation.shtml)

<sup>25</sup> Bonded Logic, Inc.

<sup>26</sup> Rodriguez III, Gene.

<sup>27</sup> Sound Away Commercial and Residential Soundproofing, [www.soundaway.com/Ultratouch\\_Denim\\_Insulation\\_s/79.htm](http://www.soundaway.com/Ultratouch_Denim_Insulation_s/79.htm)

<sup>28</sup> "What is Denim Insulation and What Can It Do?"

## Cost

\*Not available in the online search of Lowes.com. Did not come up in search results for being able to purchase this type of insulation online or in a store near my report reader.

## UltraTouch

15in width, 93in length

Various R-Values

Sold in smaller packs (1 or 6) or in a pack of 12 bags, ranging in price from \$499-\$539. Which breaks down to about ~\$41-45/bag<sup>29</sup>

## Figure 5: UltraTouch Brand Denim Insulation



## Health Risks

Denim insulation is not made with any chemical irritants, no volatile organic compounds, no formaldehyde, and no fiberglass<sup>30 31</sup>. It will not cause itching of the eyes, skin or respiratory system<sup>32</sup>. Unlike other insulations that breakdown and release dust into air ducts and the air, denim insulation does not breakdown like that and will not spread irritants<sup>33</sup>. It can however absorb moisture easily and

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<sup>29</sup> Home Depot: Denim insulation, [www.homedepot.com](http://www.homedepot.com)

<sup>30</sup> Rodriguez III, Gene.

<sup>31</sup> Sound Away Commercial and Residential Soundproofing

<sup>32</sup> "What is Denim Insulation and What Can It Do?"

<sup>33</sup> Go Green. "Benefits of Recycled Denim Insulation", [www.gogreen.org/blog/benefits-of-recycled-denim-insulation](http://www.gogreen.org/blog/benefits-of-recycled-denim-insulation), 2012.

can attract rodents<sup>34</sup> which could cause for mold and mildew growth and rodent nests.

### *Time and Ease of Insulation*

Denim insulation can be installed easily and can be cut with a knife<sup>35</sup> and made to fit around electrical boxes, wires, pipes, ducts, etc. It can dull knives easily<sup>36</sup> which would require more supply costs.

### *Other Benefits*

- Improves heating and cooling efficiency resulting in energy and cost savings<sup>37</sup>
- Reduces landfill waste<sup>38,39,40</sup> because it is a recycled product from collections from textile recycling companies
- Has a Class A fire resistance rating, meaning it will less likely spread fire if one should break out in your home<sup>41</sup>

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<sup>34</sup> “What is Denim Insulation and What Can It Do?”

<sup>35</sup> Rodriguez III, Gene.

<sup>36</sup> Rodriguez III, Gene.

<sup>37</sup> Sound Away Commercial and Residential Soundproofing

<sup>38</sup> “What is Denim Insulation and What Can It Do?”

<sup>39</sup> Bonded Logic, Inc.

<sup>40</sup> Rodriguez III, Gene.

<sup>41</sup> Go Green.

## Foam (Styrofoam type/Expanded Polystyrene) Sheet Insulation

### *Description*

Foam insulation sheets are used as an effective insulation material against cold, heat, moisture, and is an effective sound barrier<sup>42</sup>. It is a lightweight and rigid insulation<sup>43</sup> made of polystyrene balls and compressed and formed into blocks which are later cut for whatever desired specification of length, height, and width.

### *Effectiveness of Dampening/Blocking Sound*

Foam sheet insulation can effectively absorb sound coming from any direction<sup>44</sup> and blocks air transfer<sup>45</sup> which can greatly reduce excess noise.

### *Cost*

Several different brands available

Ranging in thickness of ¼ in to 2in, 2ft or 4ft wide, and 4ft to 8ft in length

Various R-Values

Price ranges from \$13-\$50 for a single sheet<sup>46</sup>

Owens Corning Foamular brand

Thickness of 2in, 4ft width, 8ft length

\$29.45 per piece<sup>47</sup>

### *Health Risks*

According to some manufacturers some of the foam sheet insulation has minimal amounts of or is completely chlorofluorocarbon (CFC) and hydro-chlorofluorocarbon (HCFC) free<sup>48</sup>. The foam sheets are composed of organic elements such as carbon, hydrogen, and oxygen (which are not harmful)<sup>49</sup>, but recent studies have found that some foam sheets may contain flame retardants

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<sup>42</sup> Do It Yourself, "Where to Use Foam Insulation Sheets," [www.doityourself.com/stry/where-to-use-foam-insulation-sheets#.UaOpVqDn9Ms](http://www.doityourself.com/stry/where-to-use-foam-insulation-sheets#.UaOpVqDn9Ms)

<sup>43</sup> Insulation Corporation of America, "EPS: Expanded Polystyrene"

<sup>44</sup> Do It Yourself

<sup>45</sup> Nunan, Jon, Home Advisor, "Sheet Foam Facts and Findings"

<sup>46</sup> Lowes: Foam sheet insulation, [www.lowes.com](http://www.lowes.com)

<sup>47</sup> Home Depot: Foam sheet insulation, [www.homedepot.com](http://www.homedepot.com)

<sup>48</sup> Insulation Corporation of America

<sup>49</sup> Insulation Corporation of America

(sprayed on) which are harmful to human health and the environment<sup>50</sup>. A minor risk as an irritant to eyes and respiratory systems, not an irritant to skin.

### *Time and Ease of Installation*

The foam sheets can be easily cut with a knife into any shape and can be easily put into tighter fitting areas<sup>51</sup>. They are usually installed in a variety of places, such as walls, an attic/roof/ceiling, floor, basement, and recording studios<sup>52</sup>. The down side to the installation of the foam sheets is that it would require the whole wall of sheet rock to be taken down<sup>53</sup> in order for the foam sheets to be placed in the wall. As they are not as easily foldable or bendable to stick through a smaller (few inch gap) cut into the sheet rock wall.

### *Other Benefits*

- Can be cut into whatever shape that is needed<sup>54,55</sup>
- Not easy to ignite, but can catch fire if in the right condition<sup>56</sup>
- Low cost, energy efficient<sup>57</sup>
- Does not absorb water, will not grow bacteria<sup>58</sup>

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<sup>50</sup> Science Daily, "Health and Environmental Risk in Flame Retardants in Building Insulation"

<sup>51</sup> MeYau, Tuscan, "Advantages of Foam Board Insulation"

<sup>52</sup> Do It Yourself

<sup>53</sup> [REDACTED], Interview, May 30, 2013

<sup>54</sup> Nunan, Jon

<sup>55</sup> MeYau, Tuscan

<sup>56</sup> Nunan, Jon

<sup>57</sup> Insulation Corporation of America

<sup>58</sup> Insulation Corporation of America

# Data Analysis

## Effectiveness of Dampening/Blocking Sound

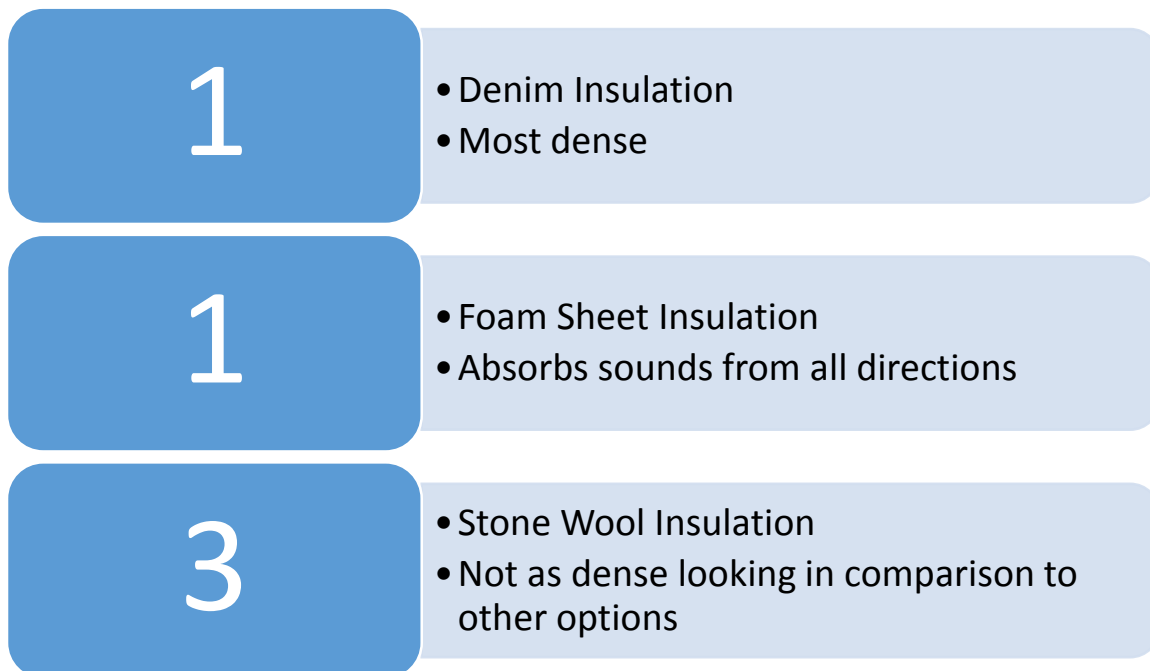
**Stone Wool Insulation Batts** were recommended at Home Depot from the insulation expert there (but this was mainly the only thing they had available). From looking at the bats, they seem more dense which is what is needed (the more available air that sound has to travel through the louder the sound will be).

**Denim Insulation Batts** seem to be highly recommended and denser than stone wool, thus eliminating the amount of air within the insulation for sound to travel through.

**Foam (Styrofoam type/Expanded Polystyrene) Sheet Insulation** is very light weight and engineered specifically for absorption of sounds coming from all directions.

Figure 6 below shows ranking of the possible options (based on their denseness and ability to absorb sounds. Denim and Foam from the research, seemed to be about the same effectively.

**Figure 6: Ranking on Effectiveness of Dampening/Blocking Sound**





## Cost

**Stone Wool Insulation Batts** are reasonably priced, and you could definitely be under your \$500 maximum budget.

**Denim Insulation Batts** were not available at local Lowes Hardware stores, price is comparable to stone wool.

**Foam (Styrofoam type/Expanded Polystyrene) Sheet Insulation** is definitely the cheapest insulation out of the three compared for this project. However, because of its inability to be folded easily, it cannot be installed through just a slot cut into the sheet rock of the wall. The entire wall must be taken down in order for the foam to be installed, then new sheet rock installed – which will bring up the cost of supplies need.

**Figure 7: Cost Comparison of Materials at Local Hardware Stores**

Ranking	Material	Lowes	Home Depot	Need other supplies
1	Stone Wool	\$40-50/pack Most variety	\$42/pack	Minimal
2	Denim	N/A	\$41-45/pack	Minimal
3	Foam Sheet	\$13-50/sheet More variety	\$29.45/sheet (2in x 4ft x 8ft)	Many are needed: Sheet rock, paint, texture

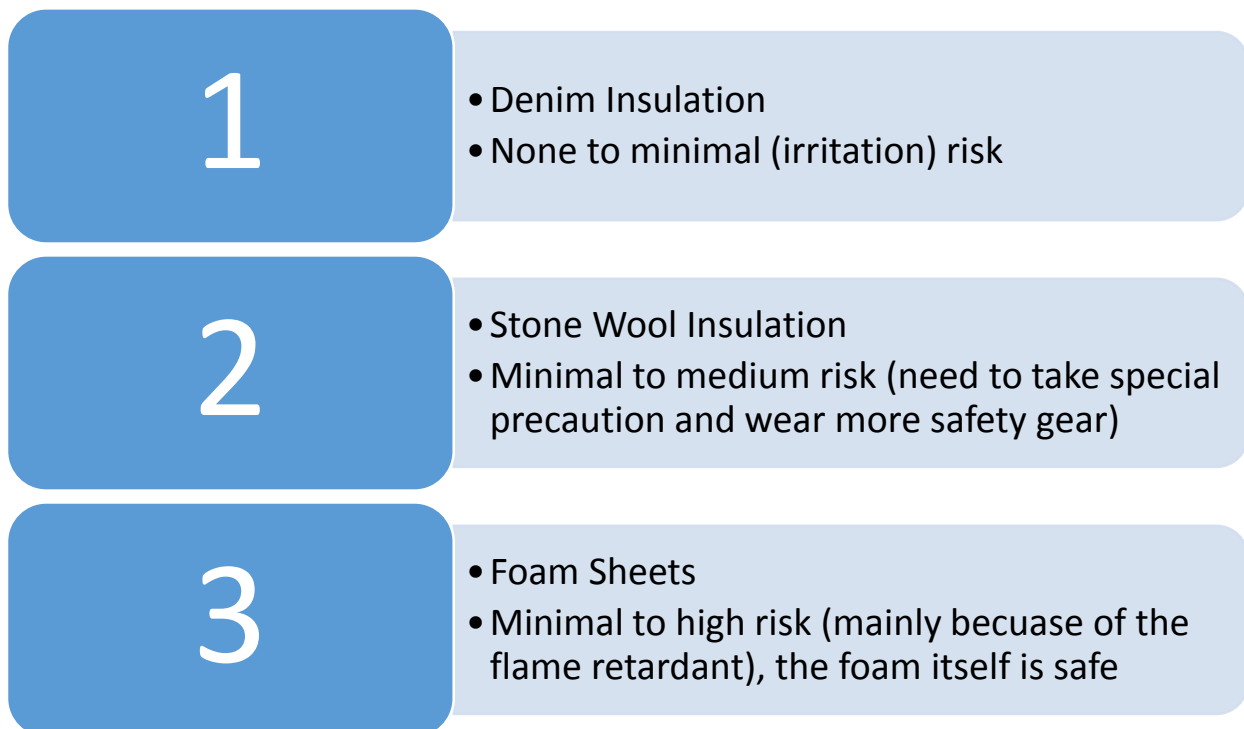
## Health Risks

**Stone Wool Insulation Batts** are very messy and can cause eye, skin, and respiratory irritation. It is highly recommended that protective glasses, long sleeves, and gloves be worn.

**Denim Insulation Batts** seem to be the most clean and safe from the products studied. It is recommended to wear safety glasses for the sake of preventing small denim dust particles from irritating the eyes.

**Foam (Styrofoam type/Expanded Polystyrene) Sheet Insulation** create very little dust and waste and doesn't irritate sensitive areas. However, some foam sheets could have been sprayed with flame retardants which are dangerous and harmful to your health.

**Figure 8: Ranking of Health Risks of Insulation Materials (rank is in order from best material – with little or no risk, to the worst material – with a great amount of risk).**



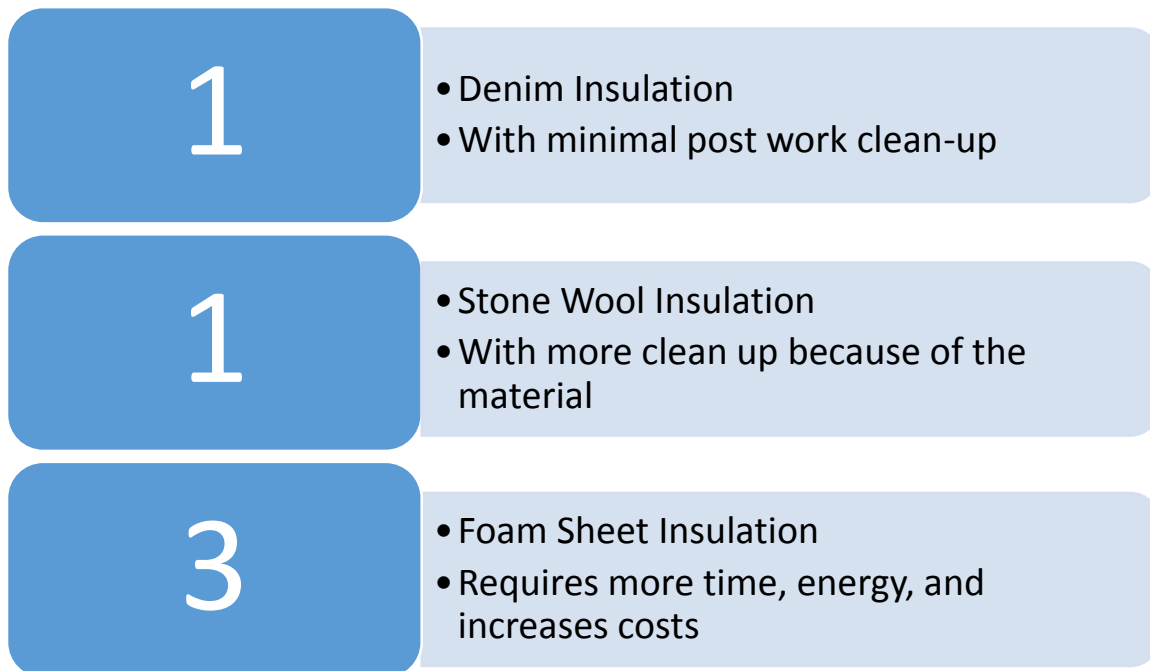
## Time & Ease of Installation

**Stone Wool Insulation Batts** will take a very short amount of time to install from start to finish. Estimated time: 1 productive weekend. Clean up could add into time because the stone wool breaks down into a dusty material when cut with a knife.

**Denim Insulation Batts** will require about the same amount of time for installation like stone wool. However, the clean-up will be easier and not as messy. Estimated time: 1 productive weekend.

**Foam (Styrofoam type/Expanded Polystyrene) Sheet Insulation** will require a longer time to install because all the sheet rock needs to be taken down (not only a time factor, but an increase to cost and supplies). Estimated time: 3+ days.

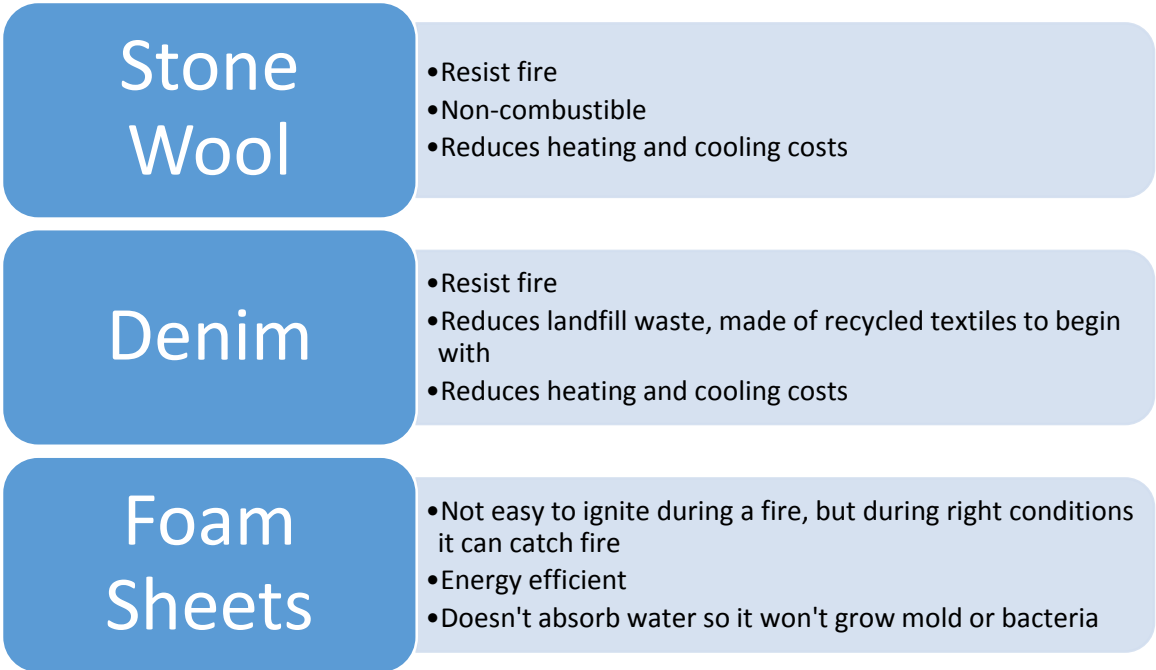
**Figure 9: Ranking of Time & Ease of Installation**



**Other Benefits**

Below is Figure 10, showing the summary of the other benefits for each insulation type (in no particular order or ranking).

**Figure 10: Other Benefits Summary**



# Conclusions

Below is a summary of the rankings of the qualities that could be ranked with values.

**Figure 11: Ranking Summary**

	Stone Wool	Denim	Foam Sheets
Effectiveness of Sound Dampening	<b>3</b>	<b>1</b>	<b>1</b>
Health Risks	<b>2</b>	<b>1</b>	<b>3</b>
Time and Ease of Installation	<b>1</b>	<b>1</b>	<b>3</b>

From the rankings, and generally thinking about completing this project to your satisfaction – I would say that the denim insulation is the best option. Based on the ranking values, denim insulation received all “1’s” for ranking from the criteria.

The cost ranking and comparison was not included in the final ranking because one store did not have stone wool insulation and with just the purchase of the insulation, you’ll be well below your \$500 maximum budget. You have all safety supplies, left over sheet rock from other home improvement projects (not enough to use if you decided to use foam sheet insulation), as well as paint and texture from other home projects.

# Recommendations

Based upon the research and data, the data analysis, and conclusions, I highly recommend using the denim insulation which can be purchased from Home Depot, conveniently located 15 minutes from your condo in Woodinville, WA.

I agree with the findings and the qualities found in the comparative study. The denim insulation can meet your needs for sound dampening/blocking noises from your neighbors’ condo units. The denim insulation also is the best option health risk wise as well, because you are constantly concerned that every material will give you cancer or mesothelioma.

The decision is ultimately up to you. If you need to ask questions, get information, or any clarification on anything, please let me know and I can help. Let me know when a decision has been made and I can help with the installation.

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