

Cal Poly Preschool Learning Lab Music Garden Design

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Colleges, universities and other educational institutions are always looking to improve their learning environments in order to provide students with the best resources, so that they can get the best education. This idea of improving learning environments not only applies to higher education but should be applied to primary education, especially for younger children. Young children should have a learning environment that they can actively engage with that can help them become more creative. This project aims to create a new environment for preschoolers that can allow them to interact with to test their cognitive skills and to give the preschoolers a creative space to learn. It was decided to design a music wall for the Cal Poly Preschool Learning Lab that the preschoolers could interact with. The music wall was to have musical instruments attached to the wall that could be easily removed, rearranged and replace to accommodate the changing needs of the preschool. The project was also to be attached to a pre-existing wooden deck and wooden fence. This paper describes how the project was initially inceptioned, the development and design process of the project, the final project design and lessons learned throughout the process.

Key Words: Music Garden, Preschool, Peg Board, Learning Space, Project

Introduction

This project was an interdisciplinary project-based project and came about through Cal Poly's Preschool Learning Lab and The American Institute of Architecture Students (AIAS) Freedom by Design. The Preschool recently had a wooden deck installed that was attached to a wooden fence and thought that this space could use something that could be a little more engaging for the preschoolers. The Preschool initially reached out to Cal Poly's AIAS to design a creative space that the preschoolers could use for their existing wooden deck and fence.

AIAS Freedom by Design wanted some assistant from someone with a better construction background and sent out an email stating "FBD is creating an engaging/interactive musical space dedicated to a former teacher: Mrs. Pauline. The clients would like to have a pegboard with safe attachable instruments. We would love for a CM student to work with us in refining our design. Furthermore, the CM student would help us choose long-lasting materials and creating an easy assembly process for the structure. The involvement of this project will take place throughout Winter Quarter." This email was sent out to all CM students, and this is where I reached out to AIAS, joining them as a part of my senior project.

Inception

The first step in assisting the AIAS was to come up with a list of materials that would be suitable for a music garden that was to remain outdoors. I created a list of materials that varied from metals to plastics to wood with each material having its pros and cons. To highlight some of the materials that

were on that list, I selected cedar and pressure treated wood. Some of the pros about cedar were that it is a very durable wood, being used a lot for decking and siding due to its natural ability to resist decay, rot and insects. It is also a wood so it can be easily cut and painted, as well as it is relatively inexpensive to other materials. Some of the cons of cedar were that it would need to be maintained every couple of years, as well as being a wood so it could be scratched or dented fairly easy. Looking at pressure treated wood, the pros of this material were that it has a coating that makes it resistant to insects and fungal infections. The material can also be easily cut and painted and the biggest factor being that this material is notably cheaper than cedar or redwood. Some of the downside of using this material are that due to the wood's pressure treatment, it contains chemical compounds that are not entirely safe for human use and need careful handling.

After long discussion it was decided to use a combination of pressure treated and cedar wood for the project. The pressure treated wood would be used for the structural part of the project, where the preschoolers would have no interaction with. The areas of the project that would be more exposed and would be in contact with the preschoolers would use the all-natural cedar wood.

Design

The next step was the design process, and this is where the students at AIAS excelled. I assisted in the design process by offering some insight on what would be feasible to construct and what wouldn't be. The students from AIAS created a concept board where they shared multiple designs, before voting on a final design.

Once the design was finalized it was my turn to design into a full set of construction documents that we could use to obtain permits and physically build the project. Because we were planning on building off of an existing structure, it was important to verify in the field the exact dimensions, so that the construction documents could accurately reflect the dimensions of the music garden. Once the dimensions were obtained, I first built out the existing structures in Revit to get a 3D model of where the music garden would get attached to. The next challenge was to figure out how the design from AIAS would actually be able to attach to the existing wooden fence. In the first reiteration of the project, it was determined that the existing diagonal braces would be able to be removed from the existing 4x4 posts.

PROPOSED PROJECT TO BE DIRECTLY ATTACHED TO PRE-EXISTING 4x4 POSTS

CROSS MEMBERS TO BE REMOVED AND REPLACED WITH HORIZONTAL MEMBERS



Figure 1: Existing structure located at the Preschool showing where the project will be attached.

This made the design process simple as the diagonal braces would be replaced by 2x4 horizontal braces that would have 2x4 vertical framing members attached on top. This would then make it easy to attach the actual project to the 2x4 vertical framing members, as well as to drill the necessary holes for the pegs.

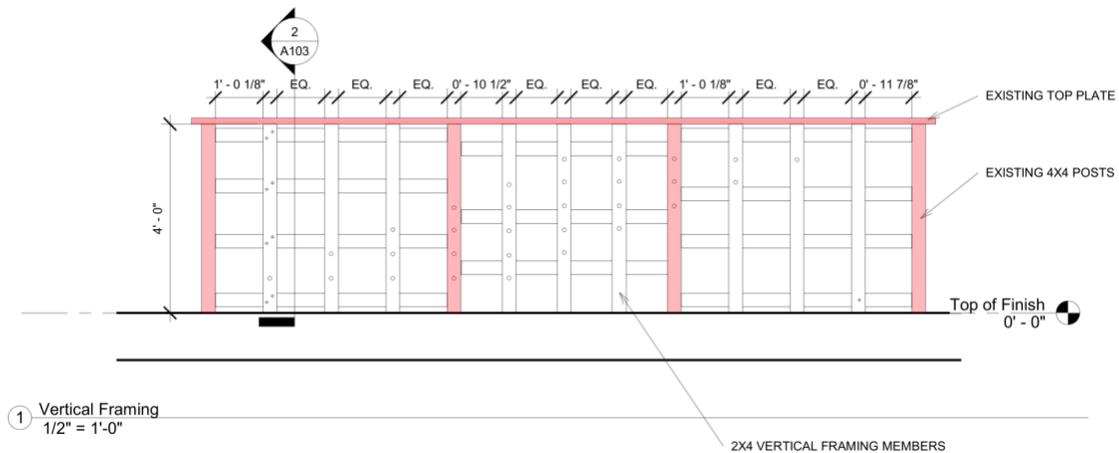


Figure 2: Initial design of the structure that will support the “music garden”.

This design was implemented in the first round of construction documents and was submitted for permitting. After waiting a couple of weeks after initially applying for a permit, the construction documents came back and were determined to be unsuccessful. It turned out that we would not be able to remove the existing diagonal bracing. This meant that we would have to come up with a design that would work around the bracing. After a lot of discussion and working through many design iterations we determined that the best design would keep the same 2x4 horizontal and vertical system, however we would cut the 2x4s around the existing diagonal bracing. We would attach the 2x4 horizontal framing members to the existing diagonal bracing using screws and nailing plates so that the horizontal framing members would be flush with the existing diagonal bracing. By aligning the horizontal framing members flush to the existing diagonal bracing would allow for easy attachment of the 2x4 vertical members.

Deliverables

The original plan was to be able to fully construct the project on site, however due to many delays in design changes and waiting for permitting the final project deliverable became creating a meaningful design that met the requirements of the client as well as a full set of detailed construction documents waiting for approval to obtain a building permit that include:

- Project Site Location
- Existing Conditions
- Project Rendering
- Horizontal Framing Elevation
- Vertical Framing Elevation
- Front Finish Elevation

- Wall Section Detail
- Detail of Hardware used to install framing
- Elevation showing heights of peg holes

Lessons Learned

The number one lesson learned from this project was that everything takes much longer than initially anticipated. This first came around from the design process of the project. There became many changes that wanted to be done to the music garden and this ended up elongating the design process further and further. Another lesson learned was that the permitting process could take a long time as well. It was assumed that once our final design was submitted it would not take more than a week to get the project design approved for construction, however the permitting process is solely dependent on the organization who can approve the permits and how busy that organization is. If that organization is especially busy, the permitting process can take a very long time. In addition to this, if the initial construction documents need to be changed (like this project did) it can double the time it takes to get a permit as the process starts from the beginning. For the most part waiting for a permit to get approved is out of our control, however what we can control is our expectations of the time it takes to get a permit and account for this time when planning a project.

Another lesson learned from this project is that when designing any project, the initial design will often be vastly different than the final project. This can be because of external changes of scope or unknown existing conditions that will affect the design of the project. It was learned that you sometimes have to design around a condition that you can't change (in our case it was the diagonal bracing). This taught me that you have to get creative when coming up with a solution to the problem.

As an interdisciplinary project this project had benefited the students by allowing Cal Poly students to experience something outside of their field. For this project, it was learning about the design process and how difficult it is to put an accurate set of plans. Graduating student becoming a project engineer will be looking at plans every day, and students apart of this project now have a better understanding of how those plans were put together and can understand why there might be some errors in the plans.

The next steps to this project will be to physically construct the music garden and have the project installed at the Cal Poly Preschool Learning Lab. There has been a loose budget of what the project will cost, and funding has already been obtained. To construct this project a detailed list of materials will need to be created from the construction documents and a plan of the construction site will need to be laid out.

Project Photos

The next four pages show the final construction documents that were submitted to Cal Poly for a building permit and are currently awaiting approval.

Sheet List	
Sheet Name	Sheet Number
Title Sheet	G100
Project Site	G101
Existing Conditions	G102
Project Proposal	A100
Front Elevation	A101
Wall Section	A102
Peg Hole Layout	A103



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AIAS Freedom
by Design

Music Garden

Title Sheet

Project Number	Project Number
Date	Issue Date
Drawn By	Author
Checked By	Checker

G100

Scale

Figure 3: Title Sheet listing all the sheet in the construction documents.

SITE LOCATION OF PROPOSED PROJECT





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Project Site

Project Number	Project Number
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G101

Scale

Figure 4: Site location of proposed project showing where the music garden will be located.

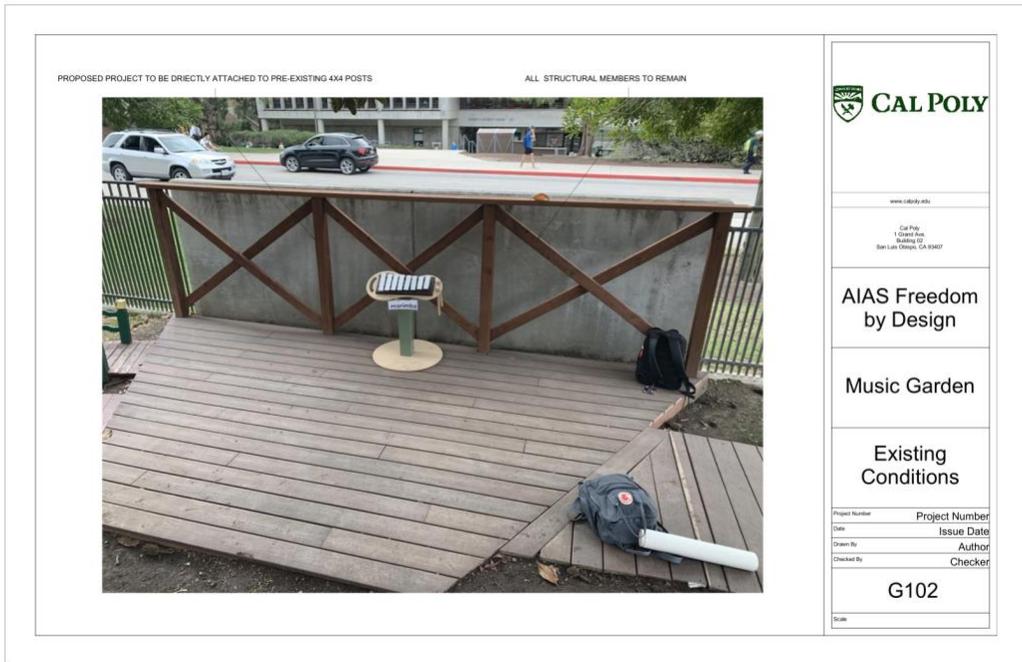
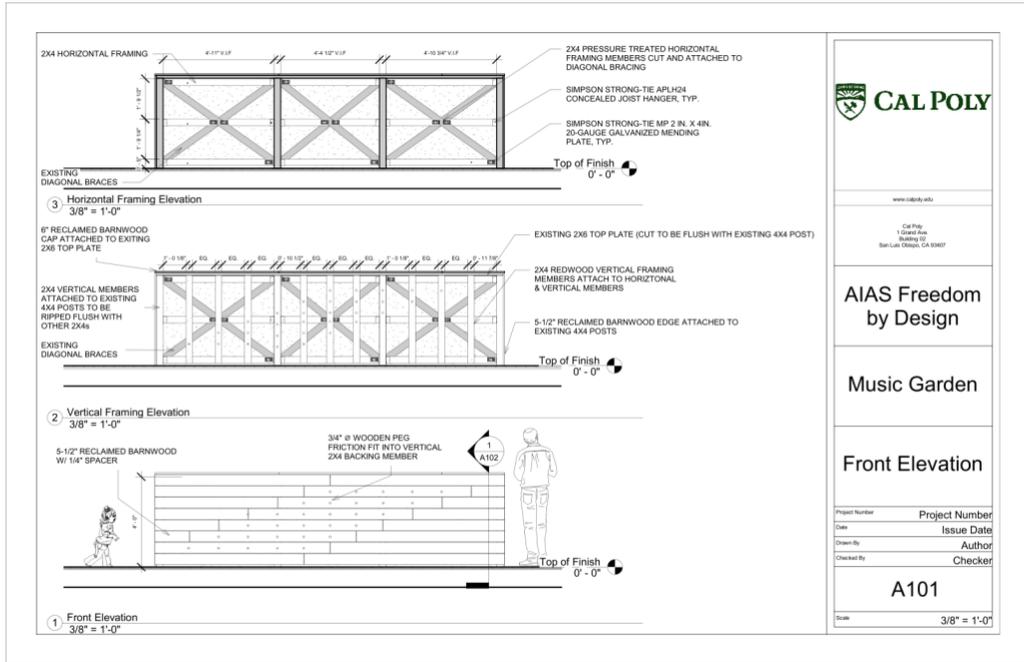


Figure 5: Existing conditions showing what the proposed project will be attached.



Figure 6: Revit rendering showing what the project will look like once it is constructed.



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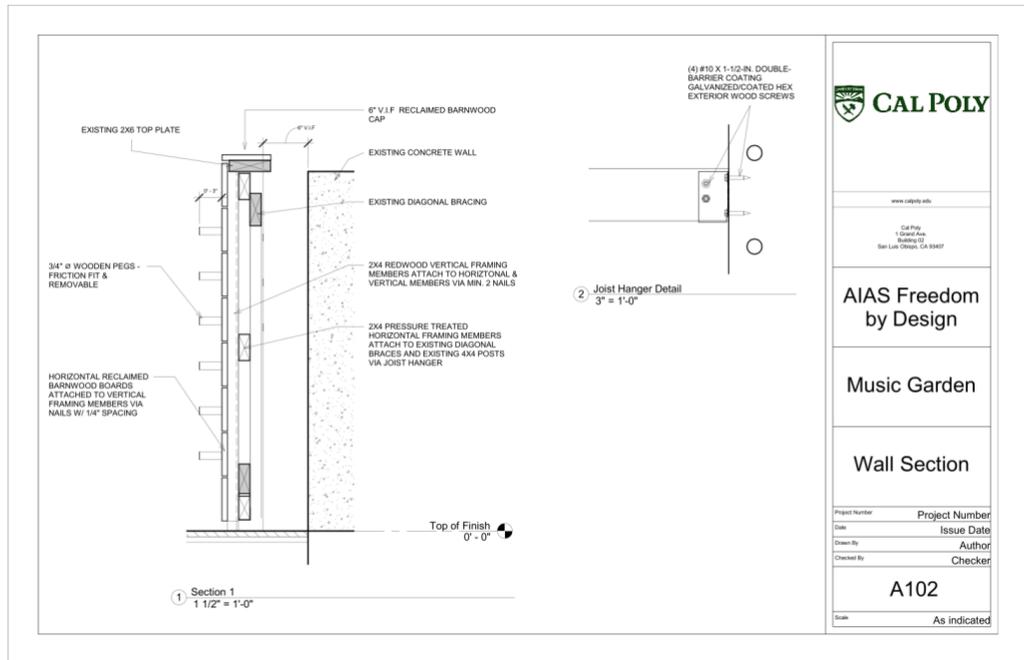
AIAS Freedom by Design

Music Garden

Front Elevation

Project Number	Project Number
Date	Issue Date
Drawn By	Author
Checked By	Checker
A101	
Scale	3/8" = 1'-0"

Figure 7: Elevations showing the horizontal framing, vertical framing and front elevations.



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Music Garden

Wall Section

Project Number	Project Number
Date	Issue Date
Drawn By	Author
Checked By	Checker
A102	
Scale	As indicated

Figure 8: Wall detail showing a cut section of the project and a detail of the joist hanger.

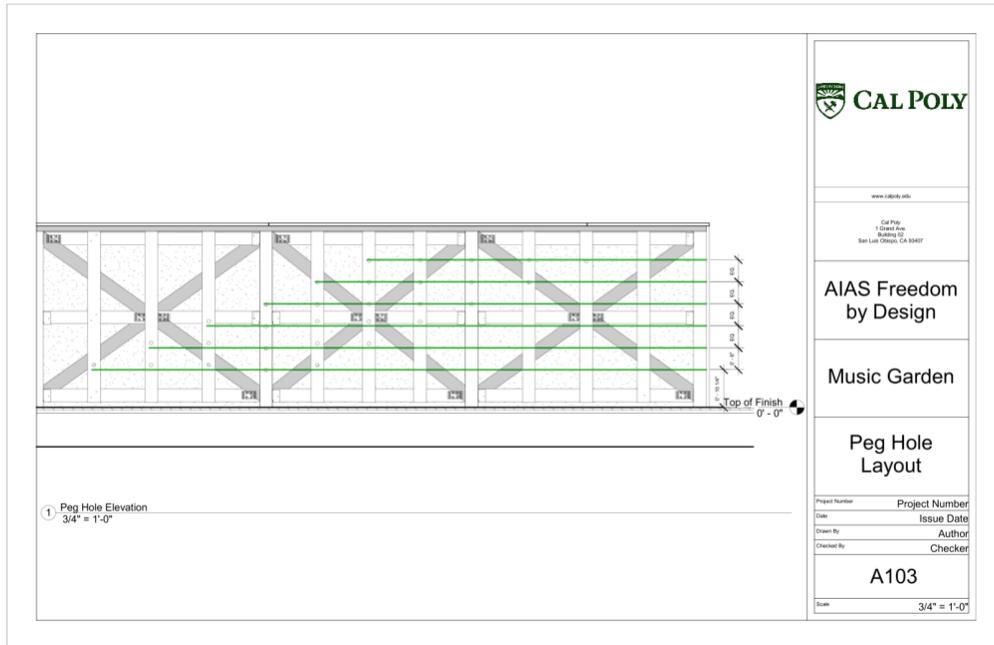


Figure 9: Front elevation of the project showing the height of each peg hole.