



# Interactive Model of Santa Fe Indian School Campus for Community Planning and Education

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## **Abstract**

The Santa Fe Indian School is looking for new means to remember the past and imagine the future. We developed a framework for a 3D model and digital archive for the past campus of SFIS and a 3D model for planning purposes. We recommend giving the students the opportunity to further their education in technologies and methods used to continue these projects.

## Executive Summary

With plans for expansion after consequences due to demolition of the old campus, the Santa Fe Indian School (SFIS) has plans for expanding education within the curriculum for the purpose of developing ways of presenting future plans to the community. In addition, information regarding the old campus was not collected, and later lost with the demolition. SFIS needs a system of gathering information for this issue to not occur in the future. SFIS also requires an interactive method for future development of the campus that allows for community involvement. Our project addresses assisting SFIS with capturing change by remembering the past and imagining the future. Our goals for our project include: creating a 3D physical and digital model of the Santa Fe Indian School; utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time; and collecting and embedding photos, audio files, and general information into the digital 3D model. To connect these unrelated elements of our project together, we incorporated the students of SFIS into our project process.

To aid in capturing the past of SFIS, a virtual representation of the old SFIS campus was created using the softwares SketchUp, Photoshop and Google Earth Pro. We used SketchUp to create the 3D models of the past campus by using blueprints and referring to the timeline function in Google Earth Pro. To create the textures we used for the faces of the buildings, we employed Photoshop to edit photographs of any obstacles disrupting the building. Once all of the buildings were complete, we imported the models into Google Earth Pro by geo-locating the buildings within SketchUp. Once imported into Google Earth Pro, we embedded the buildings with various historical data to capture the old campus as it once was. In addition, a guideline for creating a digital archive of information about the past SFIS campus was created, with an example of an archive being embedded into some of the SketchUp models within Google Earth Pro. SFIS has a need for digitizing their archive because it is currently a paper archive. As a proof of concept, we embedded a video and links into the Google Earth Pro file. The links embedded into the buildings led to wiki pages containing detailed information about the building the link was embedded in. The video links to a YouTube video that demonstrates the evolution of the SFIS campus through various time periods. The photographs used for both creating the buildings and for the Wiki pages were all scanned and digitized using the Genius Scan app.



Figure 1: Virtual Model of Old Campus in Google Earth

To assist in creating tools for planning the future of the SFIS campus, a physical model of the current SFIS campus was created using the softwares and technologies AutoCAD, Google Earth Pro, AutoDesk Inventor, ReplicatorG, and a Flashforge 3D printer. We used AutoCAD to create the 2D outline of the buildings from past blueprints and AutoCAD files of the buildings. For the buildings that we did not have blueprints for, we used the measuring tool within Google Earth Pro to obtain measurements of the buildings. We employed AutoDesk Inventor to extrude the model and create 3D features of the buildings such as stairs and varying building heights. We then used ReplicatorG to convert the 3D models into G code the 3D printer can comprehend. Lastly, the FlashForge 3D printer printed all of the models for the current campus and potential future additions. When 3D printing the models, there were some issues with warping due to temperature, and tests needed to be done to determine the correct temperature to use. The 3D models were placed onto a canvas printout of the campus for an accurate representation. In addition, models of potential and to-be-constructed buildings of the SFIS campus were produced. The purpose of these models is to allow for the SFIS community to physically interact with the model. Moving the potential designs to various parts of the campus would allow for the community to visualize the potential changes to the campus in the future and allow for more efficient planning.



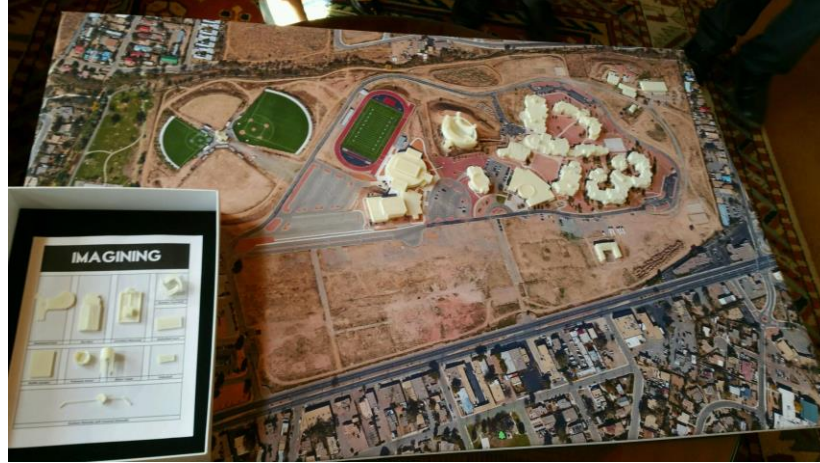


Figure 2: Physical Model of New Campus on Canvas

When speaking to different individuals at SFIS, we realized there was a need to prioritize community involvement at the school through our project. To connect the 3D virtual archive and the 3D printed model of the project as one, the students were educated on how to replicate our results through a series of workshops, demonstrations, and manuals that explained the various technologies and techniques used. We held a meeting to engage high school students within the dorm to determine the level of interest in the project. Afterwards, we invited them back to attempt using AutoCAD through a workshop we developed. We also engaged an architectural class in the techniques of AutoDesk Inventor because they had knowledge of AutoCAD. We hope by engaging the students in these softwares and technologies, they will build upon the results of our project, make use of our manuals, and utilize them within their communities.

With a student population that is accustomed to hands on activities, it is important to incorporate these methods into the curriculum of the school. With technologies such as Simtable, 3D printers, and various Computer Aided Drafting (CAD) softwares available to the staff and students of SFIS, interactive methods of teaching and planning are a reality. With the assistance of our sponsor, Kimball, and other faculty members, we informed the community of the potential that rests within their school, and assisted in the continued growth of the school through technology.

We gave our final presentation to the high school dorm, an architectural class, and a drafting class to create a lasting impact and give information to both faculty and students on what our project encompasses and how the students and faculty of SFIS can expand upon the project in the future. Important staff of SFIS attended these presentations including the superintendent and the principals of both the middle and high school. These influential members thoroughly enjoyed our presentation, which initiates the likelihood that our project will continued to be built upon. The staff was also notified about the workshops we hosted and some attended to gain a better understanding of the technologies being used. We left behind a series of manuals explaining how to use each type of technology, along with our methodology and recommendations to enhance the process in the future.

Throughout the seven weeks, we were able to successfully complete the virtual model of the pre-demolition era of SFIS, a 3D printed model of the current campus on a canvas of the satellite view of SFIS, and hold workshops to bring awareness and teach students how to utilize the technology we used to further our project in the future. We were able to set up an excel file to log information from the archive for organization and easy usage. Based off of our accomplishments, we have recommendations to further the project after our departure.

We recommend the students of SFIS learn how to use the technologies and tools our group used to complete this project; therefore, allowing further development of the virtual model of the past campus, along with creating potential developments for the current campus. We recommend the students continue to utilize the manuals, along with faculty incorporating our methods and project into their curriculum to further enhance the project. We suggest the students be involved with archiving to learn about their history. We had confirmation from one teacher about incorporating oral archiving into her class to build off of our project; this will be set in place for the academic year 2015-2016. Because SFIS focuses on understanding their past to better assist their community and the Nineteen Pueblo of New Mexico, The Simtable, an immersive tool for planning and interactive information delivery, would be useful in conveying stories, media, and feedback on future plans and as an educational tool. The data can then be displayed to the SFIS board for decisions to be made. There are also more efficient ways to improve the digital archive.

With the 2D and 3D design classes we presented to, we propose incorporating a project involving expansion on the virtual models as information is unveiled and adding to the physical campus as new developments are constructed. To better utilize our methods of digitally creating models, we recommend photos of all the buildings be photographed to include every angle of the building. The photos should have minimal obstructions such as people, vehicles, and vegetation; hence, reducing the amount of manipulations needed in Photoshop and improving the realism of the digital models. Along with incorporating these technologies into the classroom, we encouraged the students during our presentations to explore the possibilities of expanding the campus by incorporating their ideas. These ideas included a skatepark and a laundromat. With these ideas, we expressed the administration's willingness to ponder the ideas more if they 3D printed a design and placed it on the 3D model of the present campus.

To assist more with the administration's visualization of the campus, we recommend working with the Santa Fe County GIS to gain access to topographical information of SFIS property. With this information, the school can order a routed foam to overlay the satellite data on. The routed foam will help decision makers and donors conceptually understand the space. They can visualize the flow of water by using foam. For a more accurate model, the school can work with Simtable. The Simtable is available for use at SFIS to develop a water simulation for their school. The water simulation will allow for better planning of buildings and other structures; this allows for strategic planning to avoid areas that may be prone to flooding.

Our goal was to properly represent the past of SFIS, create planning tools for the future of SFIS, and connect these parts into one cohesive project. Change to education within SFIS is a vital aspect of the school's mission, and the students of SFIS are the products of the education. Educating the students on the processes and technology we used to complete our project will allow for growth of the project.

Equipping the students with the knowledge of our project will allow for the students to utilize the processes we used for their Senior Honors Project (SHP). The SHP is a project all students need to complete within their senior year at SFIS. The students are free to create the project, as long as the project addresses an issue within their tribal communities. After completing their SHP, the students will have gained real world knowledge and problem solving skills. Later on, students have the option to become professionals within their own communities, or return to SFIS as faculty members. These students are able to educate the new generations of students of the available technologies; this creates a continuous cycle of education within SFIS and the Pueblo tribes.

In conclusion, we hope to have left behind a foundation of our project that the students of SFIS can build upon. The students will continue to expand upon the 3D virtual model, the 3D physical model and the digital archive for generations to come. The continued development of the project will lead to an enriched environment of student participation within SFIS. The students will eventually use technology as a tool to teach the history of their school and communities to the future generation of students. Our interactions with the faculty on campus propose hope for future developments with the project. These methods will continually be progressed upon and lead to further development of SFIS.

## Authorship

For review, every member in our group contributed to editing each section.

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## 1. Introduction

The United States Federal Government established the Santa Fe Indian School (SFIS), formerly known as the United States Indian School (USIS), in 1890 to educate Native American children from tribes throughout the Southwestern United States. SFIS was created by the United States government with a mission “to assimilate the native child.”<sup>1</sup>

While academic preparation was one aspect of Indian Schools, cultural assimilation was featured prominently in the United States government’s mission. “Through the boarding schools, reformers, educators, and federal agents waged cultural, psychological, and intellectual warfare on Native students as part of a concerted effort to turn Indians into ‘Americans.’”<sup>2</sup> The students of the boarding schools were often punished if they practiced their native traditions and language. John Brown Jr., a former student of an Indian boarding school stated, “You’re going to school. You’re supposed to only speak English. And it was true. They did practice that and we got punished if you was caught speaking Navajo.”<sup>3</sup>

As the United States modified its Federal Indian Policy, changes in Native American educational policies followed suit. Since these shifts, SFIS has been a leader in Native American Boarding Schools with their vision to allow the students to “participate in the culture of their communities, and will have the skills to pursue the education or careers that will benefit them, their families, and their people.”<sup>4</sup>

As SFIS continues to grow, it is important for the SFIS community to be involved in showcasing the history of their campus, and involvement in the process for future planning. Our goal is to assist Santa Fe Indian School by creating an essential structure to capture the past and plan for the future of the SFIS campus. Interactive 3D models will aid the school in future planning and education. With SFIS having past experience with demolition and restoration of their campus, it is important for SFIS to have a clear scope of their objectives before making decisions. We believe these tools will allow students to better make decisions within their own communities, while gaining a sense of the history of their school. SFIS realizes the potential our project has for the future development of their campus.

Previous work relating to our project is the Cochiti Plaza Project, a previous WPI Interactive Qualifying Project (IQP). The Cochiti Plaza team designed an interactive model that could be used for planning with the Cochiti Pueblo. The Cochiti Plaza IQP group successfully modeled the Cochiti Plaza, both physically and digitally, to allow for an interactive planning process. However, time constraints prevented them from delving more into the various uses of the models and they struggled converting files for 3D printing. With this foregoing knowledge, we felt more prepared for this component of our project.

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<sup>1</sup> Santa Fe Indian School. (2011). *About SFIS*. Retrieved February 9, 2015, from Santa Fe Indian School: [http://www.sfis.k12.nm.us/about\\_sfis](http://www.sfis.k12.nm.us/about_sfis)

<sup>2</sup> Davis, J. (2001). *OAH Magazine of History*, 15(2), 20. Retrieved February 6, 2015, from <http://www.jstor.org/stable/25163421>

<sup>3</sup> Boarding Schools: Struggling with Cultural Repression. (n.d.). Retrieved February 13, 2015, from <http://nmai.si.edu/education/codetalkers/html/chapter3.html>

<sup>4</sup> Santa Fe Indian School. (2011). *About SFIS*. Retrieved February 9, 2015, from Santa Fe Indian School: [http://www.sfis.k12.nm.us/about\\_sfis](http://www.sfis.k12.nm.us/about_sfis)

## 2. Background

The Spanish encountered a group of Natives in the Southwestern United States and named them *Pueblo*, the Spanish word for town because of the style of buildings they inhabited and “to distinguish them from nomadic tribes.”<sup>5</sup> Today, there are nineteen distinct Pueblos in New Mexico: Acoma, Cochiti, Isleta, Jemez, Laguna, Nambe, Ohkay Owingeh, Picuris, Pojoaque, Sandia, San Felipe, San Ildefonso, Santa Ana, Santa Clara, Santo Domingo, Taos, Tesuque, Zia, and Zuni.<sup>6</sup> The geographical locations of the New Mexico Pueblos can be seen in Figure 3.



Figure 3: Map of the Nineteen New Mexico Pueblo<sup>7</sup>

The Pueblo Indians first made contact with European settlers in 1539 when the Spanish visited the Zuni Pueblo. The Spanish established missions throughout the Southwest to educate Pueblo Indians in various practical skills and religion. In reaction to economic, religious, and political oppression by the Spanish, the Pueblos united to form a military to drive the Spanish out called the Pueblo Revolt. This proved the Pueblo were capable of uniting under a common cause. This trend would continue for multiple centuries. Throughout these following centuries, the Pueblos were able to preserve their culture as power shifted from Spanish rule in 1692 and Mexican rule in 1821. When United States occupation occurred in 1846, the usual policies of the United States to remove and relocate Native Americans was halted because the Pueblo Indians were peaceful and settled in permanent villages.<sup>8</sup>

Many policies regarding the Pueblo have been made, under the United States government, regarding the governing body and rights of the Pueblos. “In 1847, the New Mexico territorial legislature passed an act entitled “Indians” which recognized the Pueblo as political and corporate bodies... which did not recognize the Pueblos as the original owners of the land,

<sup>5</sup> Hyer, S. (1990). *One house, one voice, one heart: Native American education at the Santa Fe Indian School*. Santa Fe, NM: Museum of New Mexico Press.

<sup>6</sup> Indian Pueblo Cultural Center. (2007). *The 19 Pueblos of New Mexico*. Retrieved from Indian Pueblo Cultural Center: <http://indianpueblo.org/19pueblos/index.html>

<sup>7</sup> Ibid.

<sup>8</sup> Hyer, S. (1990). *One house, one voice, one heart: Native American education at the Santa Fe Indian School*. Santa Fe, NM: Museum of New Mexico Press.

but claimed that their occupancy rested on grants of land by foreign governments.”<sup>9</sup> In 1850, James S. Calhoun negotiated a treaty between the United States and the Pueblo where each Pueblo “shall never be diminished, but may be enlarged whenever the Government of the United States shall deem it advisable.”<sup>10</sup> However, the United States never recognized the treaty.

The population of the twenty Pueblo tribes in 2010, according to the United States Census, was estimated at 62,540. The twenty Pueblo include the Nineteen Pueblo of New Mexico and the Ysleta del Sur Pueblo in El Paso, Texas. However, this number does not include the Hopi Pueblo of Arizona who are designated as a separate entity by the United States Census with a population of 18,327.<sup>11</sup>

## 2.1. American Indian Boarding Schools

The original concept of the Indian Boarding Schools began as a social experiment predating the Civil War. Around the 1860s, the United States Federal Government created “day schools” to educate native children about Western Civilization. The United States’ impression of the education process of Native American day schools was it being ineffective; the students did not retain the knowledge acquired at school when they returned home because the knowledge acquired at the day schools was not practiced at the homes of the Pueblos. After deciding this method of education was ineffective, the concept of Indian Boarding Schools was born.<sup>12</sup>

### 2.1.1. Indian Boarding Schools Origins

In the 1870s, the concept of Indian Boarding Schools came into fruition. Army Lt. Richard Henry Pratt captured seventy-two Native American prisoners who fought against the Army; he tested his version of the social experiment that was previously attempted on the children. Figure 4 displays a photo of Richard H. Pratt.

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<sup>9</sup> Ojibwa. *Native American Netroots*. September 2011, 2011. <http://nativeamericannetroots.net/diary/1066> (accessed February 13, 2015).

<sup>10</sup> Ibid.

<sup>11</sup> Norris, Tina, Paula L. Vines, and Elizabeth M. Hoeffel. “The American Indian and Alaska Native Population: 2010.” *United States Census: 2010* (2010): n. pag. *United States Census Bureau*. Web. 4 Mar. 2015. <<http://www.census.gov/search-results.html?q=hopi+indians&search.x=0&search.y=0&search=submit&page=1&stateGeo=none&searchtype=web>>.

<sup>12</sup> Indian Boarding School. (2006, September 1). Retrieved February 13, 2015, from <http://www.pbs.org/indiancountry/history/boarding2.html>



**Figure 4: Lieutenant Richard Henry Pratt, Founder and Superintendent of Carlisle Indian School, in Military Uniform and With Sword 1879<sup>13</sup>**

Pratt desired to mold the “savages” into “civilized” people.<sup>14</sup> Pratt taught the Native American prisoners how to speak English and educated the Native Americans on European society and religion. After this educational experiment, sixty-two of the Natives went to the Hampton Institute in Virginia. Deciding to extend the experiment further, Pratt was able to convince Native American families to allow their children to attend his boarding school. Richard H. Pratt founded the Carlisle Indian Industrial School in 1879<sup>15</sup>; the difference being, unlike day schools, Carlisle was located over one thousand miles away from the reservation. The Carlisle Indian Industrial School was the first boarding school specifically for Native Americans. The reasoning behind positioning the school a great distance from the reservations was that Pratt believed distance would help break the ties to Native American culture. He has been quoted as saying, “In Indian civilization I am a Baptist, because I believe in immersing the Indian in our civilization and when we get them under, holding them there until they are thoroughly soaked.”<sup>16</sup> Pratt desired to remove the children from their Native roots, and he was harsh in the actions he took. Figure 5 shows some of the students outside of the Carlisle Indian Industrial School.

<sup>13</sup> Choate, John N. of Carlisle, Pennsylvania - <http://siris-archives.si.edu/ipac20/ipac.jsp?&profile=all&source=~!siarchives&uri=full=3100001~!73507~!0#focus>

<sup>14</sup> *Official Report of the Nineteenth Annual Conference of Charities and Correction* (1892), 46–59. Reprinted in Richard H. Pratt, “The Advantages of Mingling Indians with Whites,” *Americanizing the American Indians: Writings by the “Friends of the Indian” 1880–1900* (Cambridge, Mass.: Harvard University Press, 1973), 260–271.

<sup>15</sup> Indian Boarding School. (2006, September 1). Retrieved February 13, 2015, from <http://www.pbs.org/indiancountry/history/boarding2.html>

<sup>16</sup> Indian Boarding School. (2006, September 1). Retrieved February 13, 2015, from <http://www.pbs.org/indiancountry/history/boarding2.html>





Figure 5: Carlisle Indian Industrial School<sup>17</sup>

Being that Pratt was from the Armed Forces, his background dictated how he operated the school. The students were forced to cut their hair, a symbol of their pride. One boarding school student was quoted as saying, "[Long hair] was the pride of all Indians. The boys, one by one, would break down and cry when they saw their braids thrown on the floor. All of the buckskin clothes had to go and we had to put on the clothes of the White Man."<sup>18</sup> The students were stripped of all traces of what their culture was, such as: their long hair, their clothing, and their native language. The same student went on to say, "This is when the loneliness set in, for it was when we knew that we were all alone. Many boys ran away from the school because the treatment was so bad, but most of them were caught and brought back by the police."<sup>19</sup> Having to deal with the oppression of the school and lack of contact from their families, the students were struck with a feeling of loneliness.

### 2.1.2. Reformation of Indian Boarding Schools

Changes to the system of the Indian Boarding School took place between the 1920s and the early 2000s.<sup>20</sup> In the 1920s, Hubert Work, the U.S. Secretary of the Interior, authorized an investigation on the conditions of Indian Boarding Schools; the group reported their findings in the Meriam Report that highlighted the failures of the boarding school system.<sup>21</sup> In the presidency of Franklin D. Roosevelt, a shift in Federal Native American policy began when President Roosevelt established the Indian New Deal with the purpose of protecting the Native population residing within the United States. The cornerstone of the Indian New Deal was the Indian Reorganization Act in 1934. This act allowed for the Native Americans to construct their own constitutions and govern themselves.<sup>22</sup> In the same year, the Johnson O'Malley Act was

<sup>17</sup> Hunt, Darek. "BIA's Impact on Indian Education Is an Education in Bad Education." 30 Jan 2011. Retrieved 3 Nov 2013.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> 1819-2013: A History of American Indian Education. (2013, December 4). Retrieved February 28, 2015, from <http://www.edweek.org/ew/projects/2013/native-american-education/history-of-american-indian-education>.

<sup>21</sup> The Meriam Report (1928) investigates failed U.S. Indian policy. (n.d.). Retrieved February 28, 2015, from <http://www.wisconsinhistory.org/turningpoints/search.asp?id=952>

<sup>22</sup> Federal Indian Law For Alaska Tribes. Indian Reorganization Act (1934). Retrieved March 2, 2015 from TM112 Course Materials: <https://tm112.community.uaf.edu/unit-2/indian-reorganization-act-1934/>

passed to fund Native American education.<sup>23</sup> In the year 1966, the Rough Rock Demonstration School was opened. The school was on Navajo land, and was the first boarding school controlled by the Indians.<sup>24</sup> Seeing the success of the Rough Rock Demonstration School, a report was filed in 1969 entitled “Indian Education: A National Tragedy, A National Challenge”, which stated that the U.S government’s assimilation policy “has had disastrous effects on the education of Indian children”.<sup>25</sup> Following this report, the Indian Education Act of 1972 established the Office of Indian Education.<sup>26</sup> The Indian Self Determination and Educational Assistance Act, established in 1975, gave the American Indians the opportunity to legislate “self-determination through community-based schooling.”<sup>27</sup> In 1990, the Native American Languages Act granted language rights to Native Americans. The Esther Martinez Native American Languages Preservation Act was established in 2006, which created programs for Native American Language immersion. These various changes to the governing of Indian Boarding Schools brought needed reform.<sup>28</sup>

## 2.2. Santa Fe Indian School (SFIS)

The Federal Government established the Santa Fe Indian School (SFIS) in 1890 to educate Native American children from tribes throughout the Southwestern United States. The purpose of creating SFIS was an attempt to assimilate the Native American children into the wider United States culture and economy.<sup>29</sup>

### 2.2.1. SFIS Origins

SFIS began as the United States Indian School (USIS) in 1890, one of twenty-five large Indian boarding schools established across the United States with the purpose of assimilation by removing children from their culture, and forcing what the United States had established as the “norm” for a public school curriculum. The original campus consisted of 30 buildings constructed over three-decades. In the 1920s, the federal government’s agenda towards Native American education shifted to support a syllabus that embraced the ethnic background of the Native Americans while still emphasizing assimilation. During the shift, teachers used art throughout the curriculum as a means to connect their academic work with their culture. From the repercussions of World War II, the agenda of the Bureau of Indian Affairs shifted to focus on post-high school vocational training, while completely eliminating high school education.

USIS was then converted into the Institute of American Indian Arts (IAIA). The purpose of IAIA was to be an “upper level high school and junior college level” arts school. Students

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<sup>23</sup> Johnson-O'Malley Program Fact Sheet. (n.d.). Retrieved February 28, 2015, from <http://ncidc.org/education/jomfactsheet>

<sup>24</sup> Collier, J. (1988). Survival At Rough Rock: A Historical Overview Of Rough Rock Demonstration School. *Anthropology & Education Quarterly*, 19(3), 253-269.

<sup>25</sup> American Indian Education Foundation (AIEF) - providing support for Indian Education throughout the United States - American Indian Education Foundation. (n.d.). Retrieved February 28, 2015, from [http://www.nrcprograms.org/site/PageServer?pagename=aief\\_hist\\_1960](http://www.nrcprograms.org/site/PageServer?pagename=aief_hist_1960)

<sup>26</sup> History of Indian Education - OIE. (2005, August 25). Retrieved February 28, 2015, from <http://www2.ed.gov/about/offices/list/oese/oie/history.html>

<sup>27</sup> Manuelito, K. (2005, March). *Anthropology & Education Quarterly. Indigenous Epistemologies and Education: Self-Determination, Anthropology, and Human Rights*, 36, pp. 73-87.

<sup>28</sup> 1819-2013: A History of American Indian Education. (2013, December 4). Retrieved February 28, 2015, from <http://www.edweek.org/ew/projects/2013/native-american-education/history-of-american-indian-education>.

<sup>29</sup> Santa Fe Indian School. (2011). *About SFIS*. Retrieved February 9, 2015, from Santa Fe Indian School: [http://www.sfis.k12.nm.us/about\\_sfis](http://www.sfis.k12.nm.us/about_sfis)



were notified of this shift and given the option to transfer to Albuquerque Indian School or a public school in the area. The decision to convert USIS into the IAIA was greatly protested by the USIS faculty and perceived as the federal government imposing their policy upon USIS to further force assimilation. “IAIA opened in 1962 offering courses in painting, sculpture, ceramics, creative writing, textile design, and dramatic arts.” Figure 6 is a map of the campus during this time period.

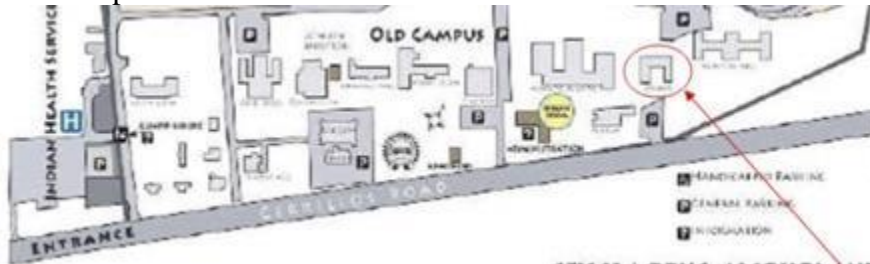


Figure 6: Map of Past SFIS Campus

In 1975, the All Indian Pueblo Council (AIPC) was formed; it was the first Indian organization to utilize the laws in place to contract an education for their children. The All Indian Pueblo Council began taking control of Albuquerque Indian School (AIS). The All Indian Pueblo Council was unhappy with the current management of AIS and wished to focus more on educational methods to properly prepare their students for the professional world. The council asserted power over AIS using the newly passed Indian Self-Determination Act to plan a new curriculum for AIS. The campus of AIS was not in a structurally functioning state to facilitate the rapidly growing student population. The leaders of the Pueblo observed that IAIA had a smaller maximum capacity, but greater land acreage along with structurally sound facilities. With these factors considered, the council was successful in migrating AIS to Santa Fe and renaming the school the Santa Fe Indian School (SFIS).

Eventually, the AIPC was able to leverage complete control of the school and curriculum. In 2001, with the passing of the SFIS Act, the school took ownership of the land.<sup>30</sup> The school functions by use of a trust held by the Nineteen Pueblo Governors of New Mexico. These acts allow for complete educational sovereignty of the school, by the Pueblos.<sup>31</sup> Figure 7 is the current campus of SFIS.

<sup>30</sup> Santa Fe Indian School. (2011). *About SFIS*. Retrieved February 9, 2015, from Santa Fe Indian School: [http://www.sfis.k12.nm.us/about\\_sfis](http://www.sfis.k12.nm.us/about_sfis)

<sup>31</sup> Santa Fe Indian School. (2011). *Trust Responsibilities*. Retrieved February 9, 2015, from Santa Fe Indian School: [http://www.sfis.k12.nm.us/trust\\_responsibilities](http://www.sfis.k12.nm.us/trust_responsibilities)

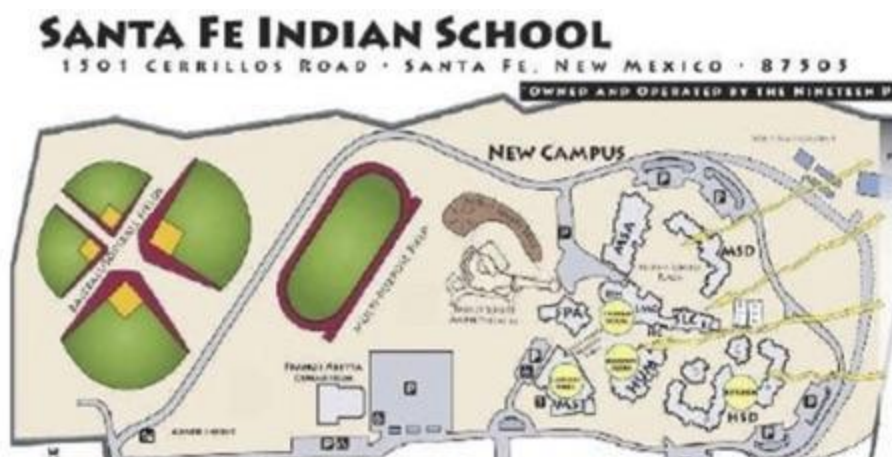


Figure 7: Santa Fe Indian School Current Campus<sup>32</sup>

### 2.2.2. SFIS Reform

Since officially taking control of SFIS, the nineteen Pueblo Tribes began to take action in demolishing and renovating SFIS in the early 2000s. In 2008, SFIS razed eighteen buildings, the most they had ever razed at one time. Some preservationists were upset by the demolition. School officials stated: “After completing various assessments over the past five years, the Santa Fe Indian School exercised its sovereign authority and due diligence to take action by demolishing buildings to remove the imminent health, safety, and security threats to protect the students and staff of SFIS, including the general public.”<sup>33</sup> There was questioning of whether SFIS had the right to raze the buildings. After reviewing the different laws and regulations, the authority granted from sovereignty overruled the Historic Preservation Acts; the Pueblo were able to demolish the historic buildings without retribution.<sup>34</sup>

The Santa Fe Indian School stated the buildings being torn down contained asbestos and that they did not have the funds to repair or maintain the buildings. The demolition of these historic buildings, in turn, had many benefits for the Tribes. “A Pueblo governor reportedly called the demolition of the buildings “a spiritual cleansing” for his people.”<sup>35</sup> “Spiritual cleansing” was desired by the Pueblo Tribes after years of attending Indian Boarding Schools and assimilating to different ideals.<sup>36</sup> The restoration of the school contributed to enhancing and reviving the overall cultural experience of the school. Figure 8 is of the demolition of the past SFIS campus.

<sup>32</sup> Wikipedia. (2014, April 20). *Santa Fe Indian School*. Retrieved from Wikipedia: [http://en.wikipedia.org/wiki/Santa\\_Fe\\_Indian\\_School](http://en.wikipedia.org/wiki/Santa_Fe_Indian_School)

<sup>33</sup> Willis, E. (2008, December 15). *Santa Fe Indian School Razes 18 Buildings*. Retrieved February 9, 2015, from National Trust for Historic Preservation: <http://www.preservationnation.org/magazine/2008/todays-news/demolitions-at-santa-fe.html>

<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.



Figure 8: Demolition of Santa Fe Indian School<sup>37</sup>

The rebuilding of the school was a collaborative design build project between Albuquerque offices of Flintco Construction and Arctic Slope Regional Corporation (ASCG). To create a homely environment, SFIS included fireplaces in the dorms and classrooms. SFIS believes creating a familiar environment will prevent students from becoming homesick and possibly reduce the dropout rate.<sup>38</sup>

The Nineteen Pueblo Tribes were the most influential in the construction of the school as opposed to the architects who designed the school.<sup>39</sup> The Nineteen Pueblo Tribes assured the architecture reflected their traditions and contained elements of their typical architecture. “A crucial factor in the project’s success was sighting the school buildings to replicate a pueblo village while preserving views with religious significance... The buildings radiate out from a central plaza that is the focus of the site design.”<sup>40</sup> The campus was designed with the intention of facilitating student comfort. The project had nineteen owners, each a governor of one of the Nineteen Pueblo Tribes. These owners had conflicting views of the project goals increasing the project difficulty, but enhancing the project’s outcome. Joseph Abeyta, the Director of SFIS at the time, believed that these new renovations were their chance to take back ownership of the school and what it represents. They would ensure the school “would reflect and sustain their culture.”<sup>41</sup> These desires were fulfilled through the design of the project which included buildings constructed in adobe style, and round rooms, to stimulate spirituality. With further construction and planning in the future, SFIS has a need to develop a reliable planning system.

<sup>37</sup> Wikipedia. (2014, April 20). *Santa Fe Indian School*. Retrieved from Wikipedia: [http://en.wikipedia.org/wiki/Santa\\_Fe\\_Indian\\_School](http://en.wikipedia.org/wiki/Santa_Fe_Indian_School)

<sup>38</sup> Wendel, K. R. (2004, September 1). School Design Reflects Students' Culture. *School Design Reflects Students' Culture*, 66, 3. Retrieved February 9, 2015, from [http://au4sb9ax7m.search.serialssolutions.com/?ctx\\_ver=Z39.88-2004&ctx\\_enc=info%3Aofi%2Fenc%3AUTF-8&rft\\_id=info:sid/summon.serialssolutions.com&rft\\_val\\_fmt=info:ofi/fmt:kev:mtx:journal&rft.genre=article&rft.atitle=Santa+Fe+Indian+School&rft.jtitle=Southwest](http://au4sb9ax7m.search.serialssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rft_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&rft.genre=article&rft.atitle=Santa+Fe+Indian+School&rft.jtitle=Southwest)

<sup>39</sup> Ibid.

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

### 2.2.3 Future Planning of SFIS

Since the demolition of the past SFIS campus, the communities have been more alert to the actions SFIS takes. The demolition of the SFIS' old campus has created unutilized land. Funding from the federal government gives SFIS the opportunity to construct new buildings on this unoccupied land. SFIS considers The Nineteen Pueblo communities' opinions when developing new ideas for architecture and landscape of the school. The school is concerned about modelling the future plans and predicting how they will impact existing structures. They were unable to foresee the results of their original demolition and remodelling of the school in 2008. The school has many plans for student involvement in the planning process and have a need to establish a way to predict long term effects of water flow in particular areas.<sup>42</sup> SFIS has a desire to preserve the cultures of the tribes and to stay true to who they are as people. To do this, they are looking for new ways of presenting their ideas to the communities. To help plan the future, the process begins with the education of the community.

### 2.2.4. Education of SFIS

The goals of SFIS are to educate the students by clarifying what they must accomplish, supported by an education of Native American culture as the foundation. "The Santa Fe Indian School remains a pivotal institution and educational training ground for the development of Indian students and their communities."<sup>43</sup> The strong relationship the school has with its tribal communities and parents is a fundamental aspect of the SFIS experience. Today there are 624 students enrolled at SFIS in grades 7-12. Out of 624 students, 155 commute and 469 live in the dorms. The school is currently 54% girls and 46% boys. Figure 9 below displays the distribution of children from different tribes who attend the school.<sup>44</sup>

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<sup>42</sup> Roy Herrera, Personal Correspondence, March, 26, 2015

<sup>43</sup> New Mexico State Record Center and Archives. (2010). Santa Fe Indian School. New Mexico, United States.

<sup>44</sup> Kimball Sekaquaptewa, Personal Correspondence, February 26, 2015

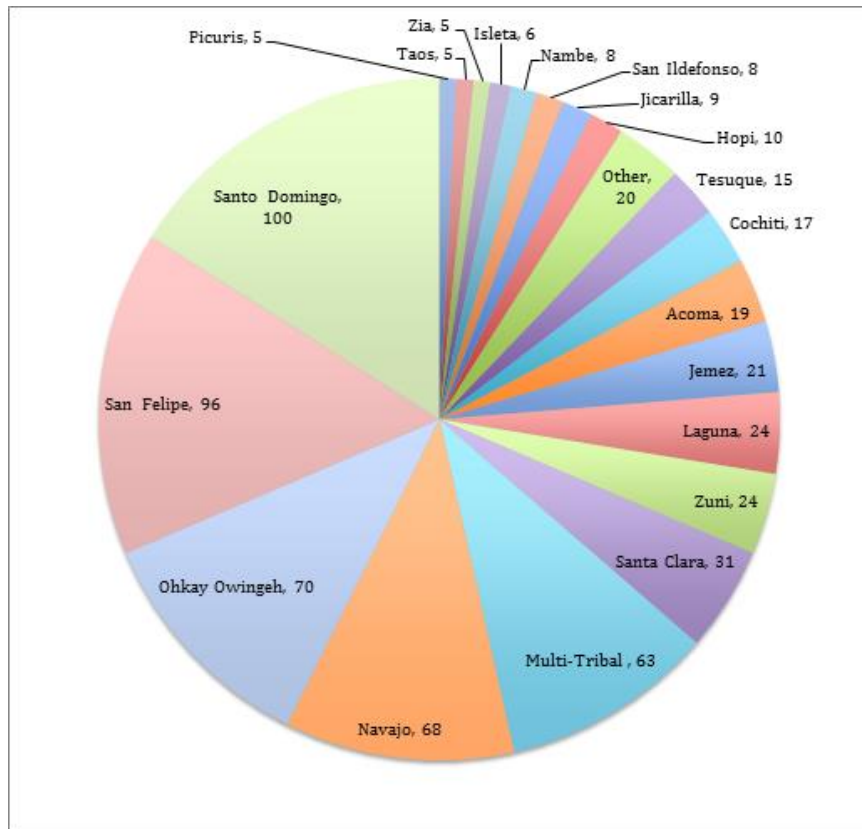


Figure 9: Tribal enrollment at SFIS

With enhancing the educational experience and developing a new style of teaching, SFIS is looking to capitalize on the opportunities at hand and incorporate more technology into their plans. We hope to assist their educational experience by an expansion of different technological usage. We hope to achieve this by demonstrating the use of technology to acquire knowledge of the history of SFIS. The past has created who they are, and with newfound control, the school can shape their future.

#### 2.2.4.1. Hands-On Learning

Hands-on learning is learning by practical application. Not only is the application fun and engaging, but it is more productive than traditional teaching methods. Studies have suggested “that long-term memory might be more easily recollected using learning methods for which the student is familiarized with the material through understanding real examples, rather than studying only mathematical concepts and artificial problems practiced for homework.”<sup>45</sup> Another benefit of active learning methods is the opportunities in which it allows for group-oriented work between students. Figure 10 is an infographic illustrating the retention rate for various forms of learning.

<sup>45</sup> Kvam, P. H. (2000). The American Statistician. American Statistical Association.



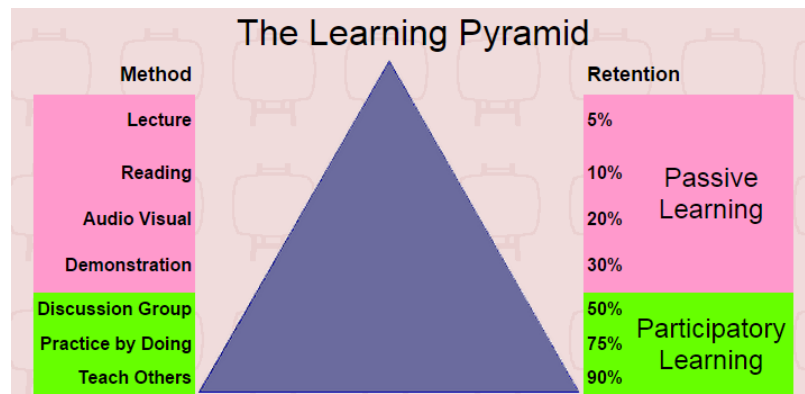


Figure 10: The Learning Pyramid<sup>46</sup>

With concern to SFIS, many of the methods and techniques spoken are exhibited within their current curriculum. Mini projects can be found within some classes. For example, a calculus class at SFIS completes real world, hands-on projects using calculus. One project consisted of taking a picture of a building and a person and based off of the picture the students; used calculus to determine the height of the student, the height of the building, and the distance between the two. Another project was a “murder mystery”. The students would use math to determine the height of a person based off of the spacing between the footsteps; the chemical composition of fingerprints; and using times and locations of faculty and staff to determine who committed the crime.<sup>47</sup> SFIS also employs a science fair for freshmen, sophomores, and juniors and a year-long senior project required for graduation. All of these methods and projects lead to a more immersive learning experience with improved results compared to traditional learning techniques. These methods exemplify the advance teaching methods that SFIS enacts. The skills and benefits gained from an interactive learning experience are quite large and better replicate the environment of the job force. By immersing the students in this style of learning at a young age, the possibilities are immense for what can be accomplished.

#### 2.2.4.2 Technology In Education

Technology has become a staple in the American educational experience in the past couple decades. Technology, such as iPads, computers, and SMART boards, are commonplace among middle school and high school classrooms. The use of technology begins in highschool and carries over into the college and university levels. Science, technology, engineering, and mathematics (STEM) based schools, such as WPI, are common places where advanced computer softwares, 3D printers, and complex laboratory equipment are utilized. SFIS is no different with the trend of technology within the classroom. Classes teaching Computer Aided Design programs such AutoCad and AutoDesk Inventor are offered at SFIS. SFIS owns two 3D printers that can be utilized by students and faculty. SFIS has access to interactive media tools, such as Simtable, for various purposes. SFIS understands the importance of implementing technology within its curriculum and continuing to innovate the educational experience. With these technologies at hand, the students can both enhance the future of education and planning as well as advance their archives to remember the past.

<sup>46</sup> Hall, J. J. (2002). *The Learning Pyramid*. Retrieved from Teaching Methods and Retention: <http://www.simulations.co.uk/pyramid.htm>

<sup>47</sup> Cynthia Salvatierra, Personal Correspondence, March, 18, 2015

## 2.3. Archiving

Archiving is a way to organize information from the past that can be accessed by members of the community. “The goal of archiving is to preserve data for long periods of time.”<sup>48</sup> Archiving has continued to develop as utilization of technology has risen in popularity. Forms of digital archiving include information presented on discs and various forms of online digital media.<sup>49</sup> When developing an archive, it is important to consider how the information will be organized. If the information is not accessible and user friendly, it will not be a successful archive.

### 2.3.1. Digital Archiving

One type of archive is an oral history. A famous account of an oral history archive is located in Germany. The archive is typically referred to as “German Memory”. Beginning when modern recording technology was available, approximately 1,500 Germans’ accounts of history throughout the times were recorded. Some issues with archiving oral recordings are obtaining the rights to the videos, organization of transcripts and audio files, and deterioration of tapes. To avoid issues of obtaining rights to the materials, a member of the “German Memory” archive suggests receiving verbal or written consent from the interviewee. When archiving audio and video tapes, a common issue is the deterioration of the cassette tapes. Transferring the recordings onto CD-ROMs is an effective form of preservation of the material because this prevents further deterioration. The transferring of the data from the cassette tape as soon as possible prevents further deterioration.<sup>50</sup>

Digital archiving is a way to store data without the complications of deteriorating cassette tapes, or the decaying of old documents. The pros of digital archiving include “offer[ing] fast access to information; permit[ting] simple linking of data and information; requir[ing] less space; allow[ing] automatic duplication of filing of data; and regulat[ing] support digital archiving”<sup>51</sup> These archives are broken up into three layers as seen Figure 11.

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<sup>48</sup> Troppens, U. (2009-07). Archiving. Storage networks explained : basics and application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE (pp. 281). Chichester, UK: John Wiley & Sons, Ltd.

<sup>49</sup> Troppens, U. (2009-07). Archiving. Storage networks explained : basics and application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE (pp. 282). Chichester, UK: John Wiley & Sons, Ltd.

<sup>50</sup> Leh, A. (2000, December). Problems of Archiving Oral History Interviews. The Example of the Archive "German Memory.". 1. Retrieved from file:///C:/Users/Mikayla%20Filippone/Downloads/1025-3231-1-PB.pdf

<sup>51</sup> Troppens, U. (2009-07). Archiving. Storage networks explained : basics and application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE (pp. 282). Chichester, UK: John Wiley & Sons, Ltd.

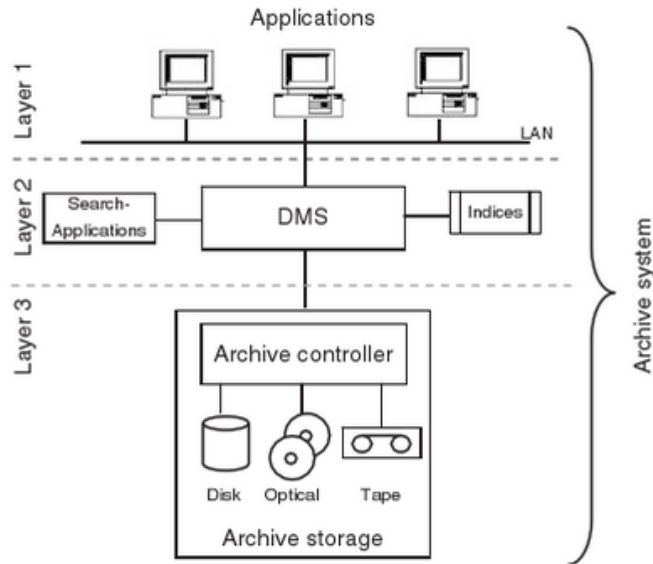


Figure 11: Layers of Archiving<sup>52</sup>

These layers differentiate the files of information and the organization of the archive. With the Document Management System (DMS), the disks, optical, and tapes can be sorted within the computer. The digitized information can be better managed because a mirror-archive storage can be created. The mirror-archive allows for back-up when failures occur and decreases the failure time of accessing the archive. The storage of the information on a computer allows for many people to access the information compared to having one accessible copy needed to be shared amongst individuals. Since interfaces are not standardized between the archive storage, DMS, and the applications, it is important for archives to have protocol converters.<sup>53</sup> These converters help exchange data to be readable by the server. Archiving can be more complex, but is not included within the scope of our project.

### 2.3.2. SFIS Archive

SFIS has their own archive filled with various documents, audio tapes and pictures. Their archives are not accessible to many people because the librarians are one of the few groups of people trained to facilitate access to the archives. They know which materials can and cannot be shared or used by the public. The SFIS archive includes documents and pictures from Alumni who were willing to donate them to the school. It is currently not being often utilized for any purposes. SFIS has an aspiration to allow the archived information to be more accessible to the students, Alumni, and the native communities. Ultimately, they would like to keep SFIS and the Pueblos past alive through the SFIS archives seen in Figure 12.

<sup>52</sup> Troppens, U. (2009-07). Archiving. Storage networks explained : basics and application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE (pp. 282). Chichester, UK: John Wiley & Sons, Ltd.

<sup>53</sup> Ibid.





Figure 12: SFIS Current Archive

As SFIS thrives, it continues to be a leading example of the potential a Native American Boarding school can achieve, it is important to continue innovating and reimagining the Native American Boarding experience; SFIS looks to accomplish this by the continued growth and evolution of their campus. With old buildings being razed and the planning of new buildings, it is important to have a clear direction of where SFIS is heading. Understanding the origins of SFIS will aid in guiding the school forward. To aid with these goals, we will construct a past model of SFIS for remembering and educating about the old campus. We will also construct the new campus to aid with planning in education and the future development of the SFIS campus.

### **3. Methodology**

The mission of this project was to assist Santa Fe Indian School by creating an essential structure to capture the past and plan for the future of the SFIS campus. We accomplished this by:

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.

For future planning and development, we constructed the present day SFIS campus model. Not only is the campus of the school continuing to change, the curriculum is changing as well. With a student population that is accustomed to hands on activities, it is important to incorporate these methods into the curriculum of the school. With technologies such as Simtable, 3D printers, and various Computer Aided Drafting (CAD) softwares available to the staff and students of SFIS, interactive teaching and planning is a reality. With the assistance of the faculty of SFIS, we hope to inform the community of the potential that rests within their school, and assist in the continuing growth of the school through technology. We worked at the Santa Fe Indian School from March 16, 2015 until May 6, 2015 for the completion of this project.

#### **3.1. Creating a Digital and Physical Representation of SFIS Campus**

This section will discuss our procedure for creating a digital and physical representation of the SFIS campus. A physical representation of the SFIS campus was created for the purpose of visualizing the campus for future planning. A digital representation of the SFIS campus was created for the purpose of housing the digital archive. We accomplished this by creating 3D printed models of the current SFIS campus and creating digital 3D models of the past SFIS campus.

##### **3.1.1. Creating 3D Printed Model of Current SFIS Campus**

To create a physical representation of the current SFIS campus, many steps were necessary. First, we edited all of the pre-existing CAD files obtained from our Sponsor of the current SFIS campus. This was necessary because many of the files were in unuseable formats. For buildings without pre-existing CAD files, 2D floor plans were created. After the 2D floor plans were created and edited, they were exported into a different CAD software to be extruded. Once the extrusions were complete, the model was converted into an applicable format for 3D printing. The model was then ready to be printed.

###### **3.1.1.1. Editing Premade CAD Files of the Current SFIS Campus**

To accurately represent the buildings of the current SFIS campus, measurements of the outer perimeters were needed. We received access to AutoCAD files that contained architectural blueprints of some of the buildings. We were able to use these files to determine the dimensions of the buildings. Figure 13 is an example of one of the architectural blueprints that was used.

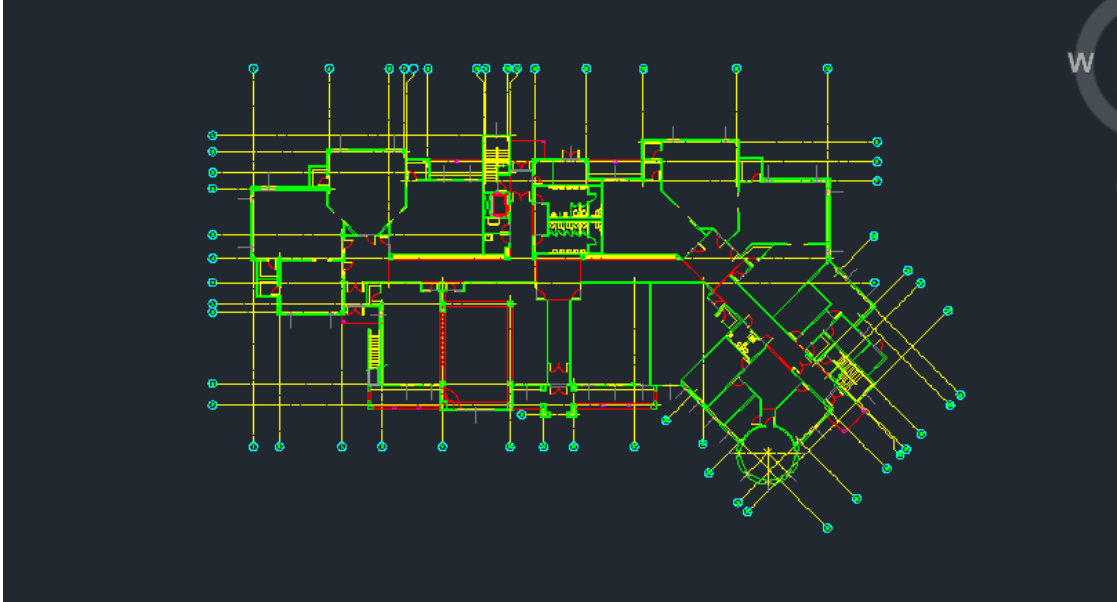


Figure 13: Architectural Blueprint of Humanities Building

Deleting all but the outer perimeter allowed for the creation of a 2D perimeter of the current campus.

### 3.1.1.2. Creating 2D Floor Plan CAD Files for Non-Existing Buildings

Since we did not have the CAD files of all the buildings, we needed to obtain the measurements of the buildings to recreate the buildings ourselves. We obtained the measurements of buildings we did not have CAD files for by observing the buildings and using the measuring tool within Google Earth Pro. Google Earth Pro is a global positioning software that allows the user to view satellite imagery from around the world. Within Google Earth Pro, there is a measurement tool that allows for measuring distances within the satellite imagery between two points. Figure 14 shows the measuring tool of Google Earth being utilized on the Pueblo Pavilion Wellness Center.

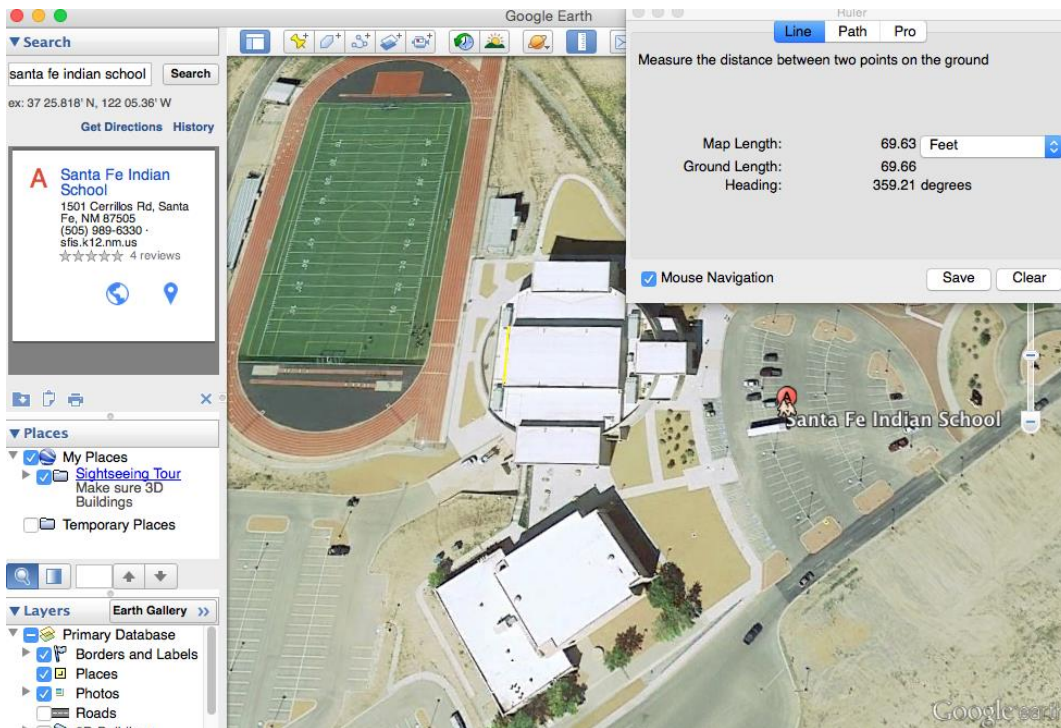


Figure 14: Google Earth Measuring Tool being utilized on Pueblo Pavilion Wellness Center

Measurements of the buildings were taken three times, and the average of the measurements were the dimensions used. This process allowed for the creation of a 2D perimeter of the current campus. We created the perimeter using AutoCAD.

### 3.1.1.3. Extruding the CAD Files Using 3D Modelling Software

After the perimeter was designed, the file was imported into Autodesk Inventor, a three-dimensional CAD software used for extruding 2D drawings. We selected Autodesk Inventor, compared to other 3D modelling softwares, because it is a powerful CAD software and allows students access to a free license for three years. We originally explored using another software called Rhinoceros. It was not as user-friendly and had limitations compared to Autodesk Inventor.

Within Autodesk Inventor, the two dimensional drawing was extruded; this involves selecting a two dimensional drawing and raising it into a three dimensional representation of the figure. After all of the extrusions were made, the model was shelled: the process of hollowing the drawing to save material for printing. After the model was finished, it was saved as an Standard Tessellation Language (STL) file. STL is widely used for rapid prototyping and is compatible with the FlashForge 3D printer. After the model was converted to STL format, it was ready to be 3D printed.

### 3.1.1.4 Converting CAD Files into an Applicable Format for 3D Printing

The STL files were opened in ReplicatorG, a Computer Aided Manufacturing (CAM) software; the model was resized, rotated, and moved to the desired form. The desired form aligned with both our scale of the models and with the size of the printing platform. We had to resize the buildings multiple times to discover the correct scale. We sometimes had to rotate

them in various directions to optimize printing. ReplicatorG then created a G code; the common name for the most widely used numerical control programming language for STL. The G code converts the 3D model to instruct the 3D printer the locations to move the nozzle, the speed of the nozzle path, and temperature of the platform and nozzle. The scale we decided to print at was 1:900 due to the size of the printing platform. Once the G code was generated, ReplicatorG sends the code to the FlashForge 3D printer to print the model. We used this method to 3D print all of the buildings.

#### **3.1.1.5 3D Printing the Models**

When printing the models, we sent the G Code to the FlashForge 3D printer. The FlashForge 3D printer heats up the platform and extruder to the temperature levels sent by the ReplicatorG code. Once the printing process began, it was important to watch the models for deformations and extruding issues. If issues occurred, it was important to refer back to the ReplicatorG code and adjust accordingly.

#### **3.1.2. Creating Digital Models of Old SFIS Campus**

To create the digital representation of the old campus, the original 2D blueprints of the buildings were obtained. Once the blueprints were obtained, 3D models were created based from the blueprints. When the models were created, photographic textures were added to the models to accurately represent the buildings. Once all the models had been textured, the models were imported into a geographical information program that created the campus.

##### **3.1.2.1. Obtaining 2D Floor Plans of Old SFIS Campus**

Before we began creating the models, we needed to obtain measurements of the buildings. We had to look back to the original hand drawn architectural blueprints that were gathered from the historical archive to gain measurements. Figure 15 shows an example of an architectural blueprint for the old campus.





Figure 16: Google Earth Pro Measurement Tool on old SFIS Campus

There was an AutoCAD file that contained a representation of the entire old SFIS Campus in addition to the buildings. Figure 17 shows what the AutoCAD file of the old campus looked like.

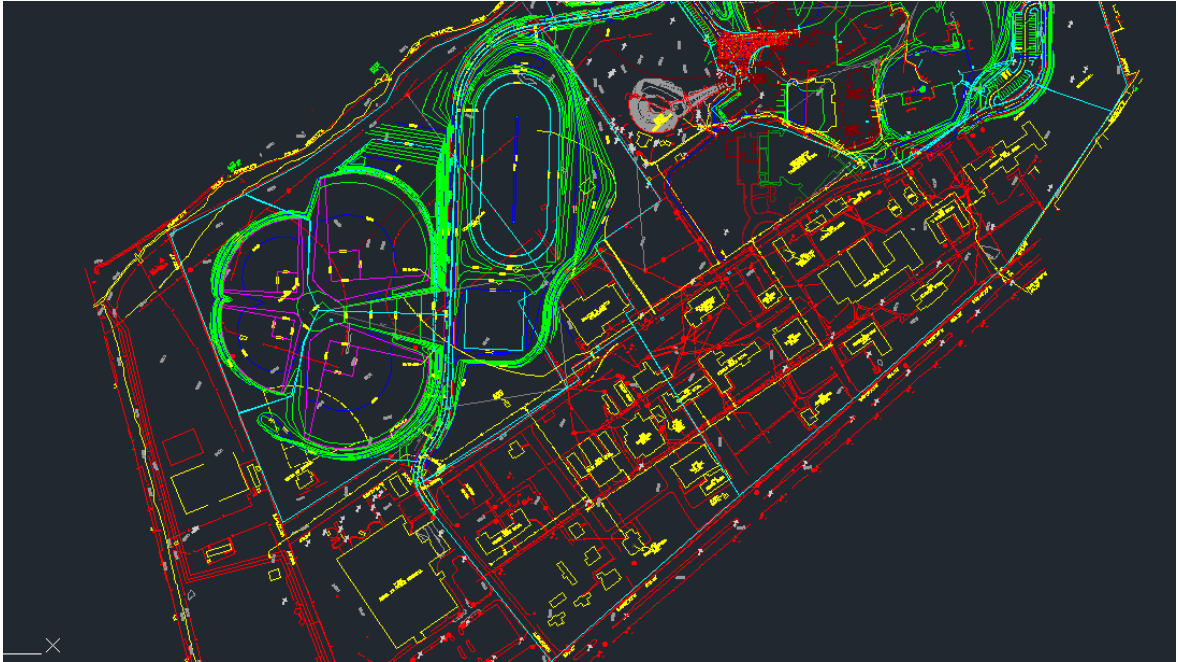


Figure 17: CAD drawing of old SFIS campus

We utilized all of these resources to determine the dimensions of the model.

### 3.1.2.2. Extruding the Floor Plans Using a 3D Modelling Software

Once the dimensions were found, we used SketchUp, a 3D modeling software created by Google, to extrude the buildings. We chose to use SketchUp because it is compatible with Google Earth Pro. Within SketchUp, we could create a 2D floor plan and extrude it to the desired dimension and height. It was assumed that one story equals twelve feet, and the information gathered from the archives informed us of how many stories each building contained. Using the measurements acquired from previous versions of Google Earth Pro and other information gathered, we developed 3D virtual models using SketchUp.

### 3.1.2.3. Adding Photographic Textures to the Buildings

Using the photographs of the old SFIS campus, we were able to recreate the exterior faces of the buildings. We used Photoshop, a photo editing software, by taking the digital scanned images that we collected from SFIS and manipulating them. We cropped the photos for each face of the building and deleted the background of the picture. We then removed any obstructions such as cars, trees, and people by using a content-aware tool to increase the quality. The content-aware tool uses context clues to fill the picture with an image the computer believes would be there.

The purpose of editing the photos was to illustrate the building surfaces as realistically as possible. We built the models in SketchUp and overlaid photos to the corresponding face of the buildings by importing them as textures.

#### **3.1.2.4. Importing Models into a Geographical Information Program**

Once the buildings were completed, we geo-located the models to their correct geographical locations to ready them for exportation into Google Earth Pro. Google Earth Pro allows the user to create a saved file of imported SketchUp files and other embedded information. Geo-location of the buildings was accomplished by importing an overlay of the desired area from Google Earth Pro into SketchUp and placing the building onto the corresponding building footprint. The SketchUp models of the past SFIS campus were imported into our Google Earth Pro file and placed in their geographical correct position according to the satellite imagery of the past SFIS campus.

### **3.2. Interactive Media Demonstration**

Once the physical and digital representations of the SFIS Campus were finished, we utilized various demonstration methods. We developed an interactive demonstration with both the physical and digital models of the campus to demonstrate how the models could be used to interact with students for education and interact with the administration for future planning. We accomplished this by displaying the past and present SFIS campus and interacting with the physical and digital models.

#### **3.2.1. Displaying the Past and Present SFIS Campus**

To display the past and present campuses of SFIS, we utilized various demonstration methods. We displayed satellite imagery of the past model, virtually, on Google Earth Pro. To display the present campus, we printed out Satellite imagery onto a canvas. The canvas, along with the printed current campus and potential future additions, were displayed physically.

#### **3.2.2 Interacting with the Physical and Digital Models.**

The physical and virtual models were created for the purpose of interaction. The past campus was able to be virtually toured and clicked upon to access embedded wiki articles, photos, and videos within the buildings and the campus. The current campus allowed for an immersive planning and educational experience where various proposed additions could be 3D printed and moved around the printed satellite map of the campus. Hence, the physical 3D model allowed for an opportunity where community involvement could easily occur. The community was able to observe the current campus and was able to imagine what potential changes may look like.

### **3.3. Creating an Online Historical Archive of SFIS For The Purpose of Historical Preservation**

This section will discuss our procedure for creating a digital archive of the SFIS' pre-demolition campus. We developed a process to digitize the information found within the current SFIS archive. The archive is currently in paper format and is not very accessible, hence, converting the archive to a digital format will allow for easier accessibility. By making the archive more accessible, many members of the native community will be given the opportunity to learn and remember their past. To create the archive, pictures and documents regarding SFIS were scanned to convert to a digital format. In addition, various video clips regarding SFIS were collected. With all the information gathered, online encyclopedia pages that are publicly



accessible were produced. Finally, the encyclopedia pages were embedded into a geographical information program for further interaction.

### **3.3.1. Scanning Pictures and Documents Regarding SFIS**

SFIS had many documents, photos, and recordings that were relevant to the development of SFIS throughout its history as an Indian Boarding School. We gained access to the SFIS Archives by receiving permission from both the high school Principal and the Superintendent. For us to enter the archiving room, we needed supervision by one of the librarians trained to access the archives. We could only use certain materials because of issues regarding copyright and ownership of the material. Many of the items in the archive were in paper format; therefore, it was necessary to convert these various forms of media into a digital format because we needed digital media to create the online archive. We accomplished this by using the mobile app Genius Scan, along with the scanners present at SFIS. Genius Scan is a free app available for download on all major smartphones.

#### **3.3.1.1. Community Involvement in Gathering Stories of the Past SFIS**

We first met with a woman named Anya Dozier Enos, from the Santa Clara Pueblo. She gave us insight on the buildings and atmosphere of IAIA during her attendance. Gathering information about when the school was administered by IAIA is essential to transitioning the different phases of the SFIS Campus. We met with Ted Jojola, a Professor of Community and Regional Planning at the University of New Mexico. He was insightful on how to approach our project; he was able to expand upon our knowledge of the Native community, how the Native community approaches conflicts, and how important community involvement is to the Natives. In response to our conversation, we planned to meet with members of the SFIS community, selected by our Sponsor, to further our knowledge of the progressive changes SFIS experienced. We wanted the archives to reflect the school and the Pueblo community as a whole because of the importance of community involvement.

### **3.3.2. Collecting Video Clips Regarding SFIS**

We collected a video clip of the change in the SFIS campus from brick to adobe as a proof of concept. We used a software called Camtasia to capture a clip from “This is Our Home” documentary video about the history of SFIS. We uploaded the video onto YouTube to allow the video to be accessed by anyone.

### **3.3.3. Creating Online, Publicly Accessible, Encyclopedia Pages**

Using the gathered information, we updated the SFIS Wikipedia page and created Santafedia pages of specific information pertaining to Santa Fe to archive the information. Wikipedia and SantaFedia are wikis; websites that allow collaborative editing by its users of the information. Wikipedia was used for a broad overview of the campus’ history, while Santafedia was used for specific information pertaining to the campus such as the history of past buildings. Santafedia is an online encyclopedia, similar to Wikipedia, but specific to Santa Fe, New Mexico. We used the coding tools within the Wikipedia and Santafedia websites to format the documents.

### **3.3.4. Embedding Archives into a Geographical Information Program**

Google Earth Pro allows for embedding information into points designated within the program. We embedded the information into the models to allow for an interactive experience.

This interactive experience includes selecting a building and popping-up links, pictures, and videos that correlate to the building, or area, being selected. The links embedded within the points linked to the section of the wiki page that correlates to the given building the point resides in. The links that contained videos led to a YouTube video.

## 4. Results

With the purpose of assisting Santa Fe Indian School with historical preservation, planning, and community involvement, our project resulted in a guide for creating models in SketchUp, AutoCAD/Autodesk Inventor, 3D printing, Photoshop, Wiki article creation, and Google Earth Pro usage. We created physical models of the present campus, along with digital models of the past campus. We archived historical data from the old campus to be used in Wiki pages, along with creating a video presentation to display this information. We used the physical representation of the present campus, along with the potential addition models to be displayed on a canvas and could be manipulated to visualize potential plans. Finally, we tied all of these activities together by teaching the students of SFIS how to complete some of these tasks themselves to allow for a continuation of the work we accomplished. We hope these methods are continually progressed upon and lead to further development of SFIS. Figure 18 is a culmination of all aspects of our project, tied together by student involvement.

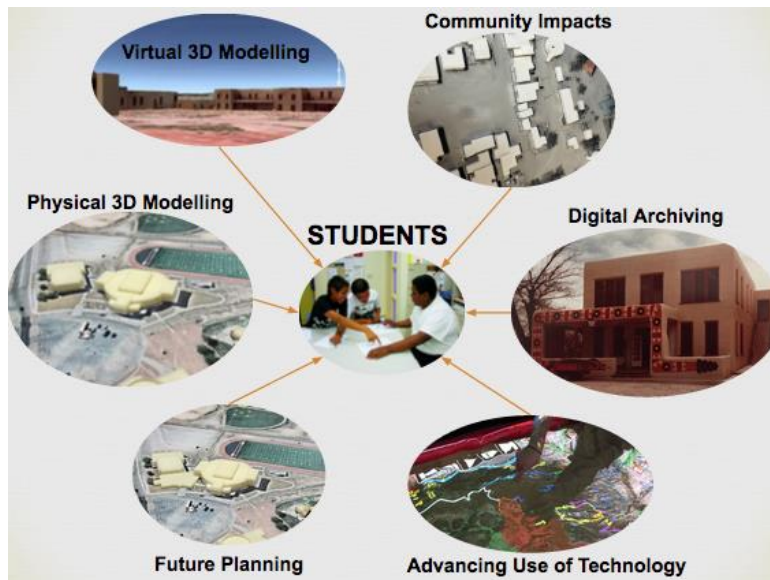


Figure 18: Concluding Slide of Presentation

### 4.1. Digital Representation of SFIS Past Campus

Figures 19 and 20 are results of the 3D digital representation of the past SFIS campus. These two buildings were created in SketchUp.

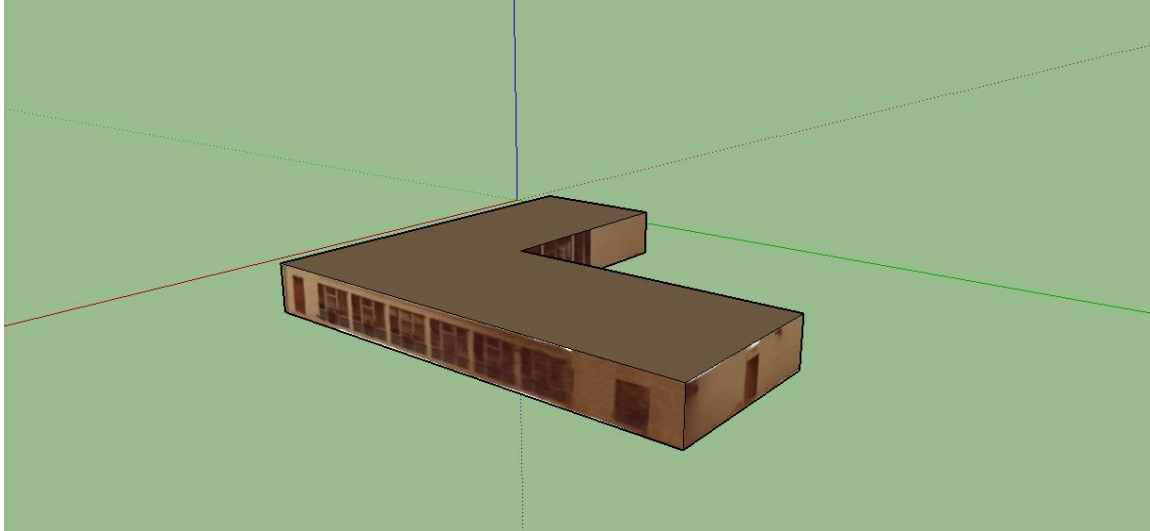


Figure 19: Administration Building

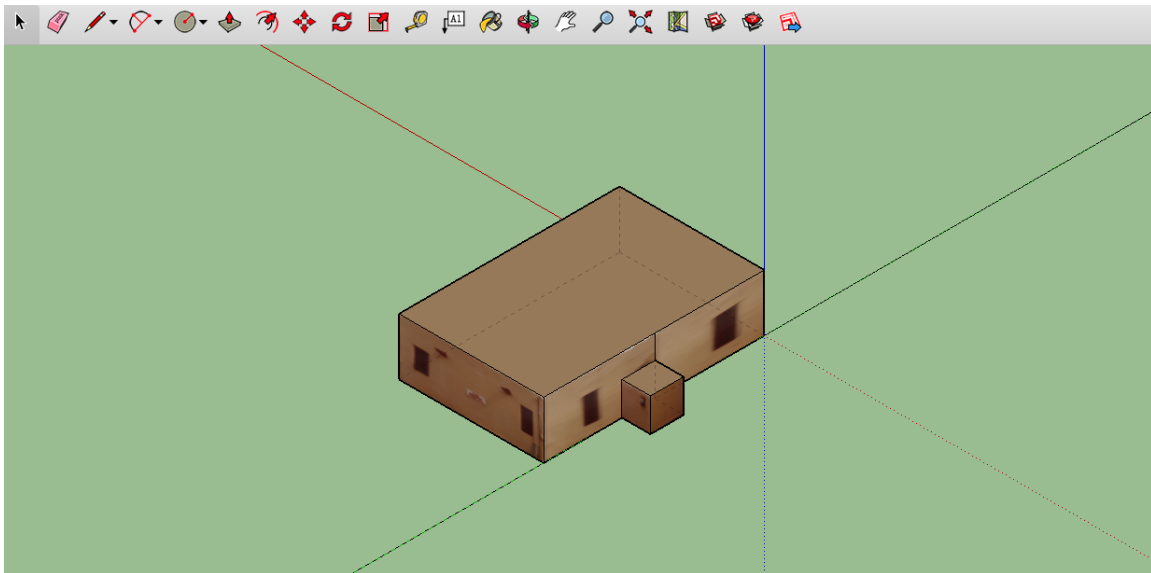


Figure 20: Counseling Center

Additional editing was needed for some pictures as seen in Appendix A. View Figure 21, below, to see a side of the Counseling Center fixed in Photoshop.

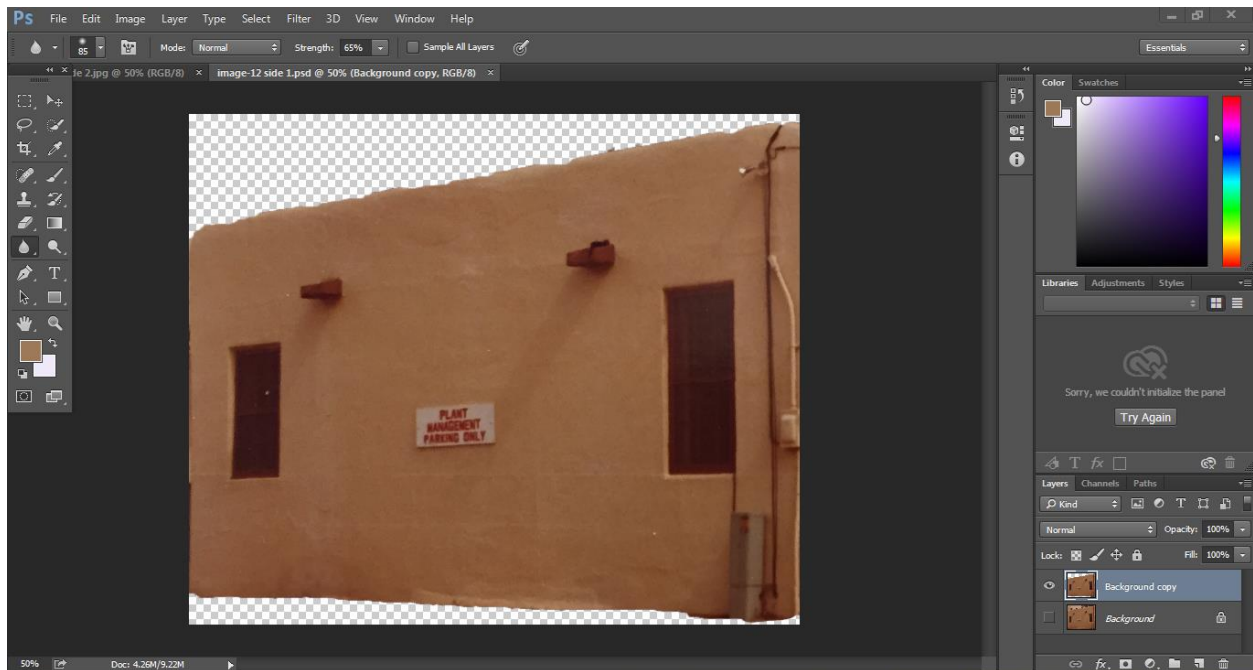


Figure 21: A side of the Counseling Center Manipulated in Photoshop

View Figure 22, below, to see the Counseling Center with textures.

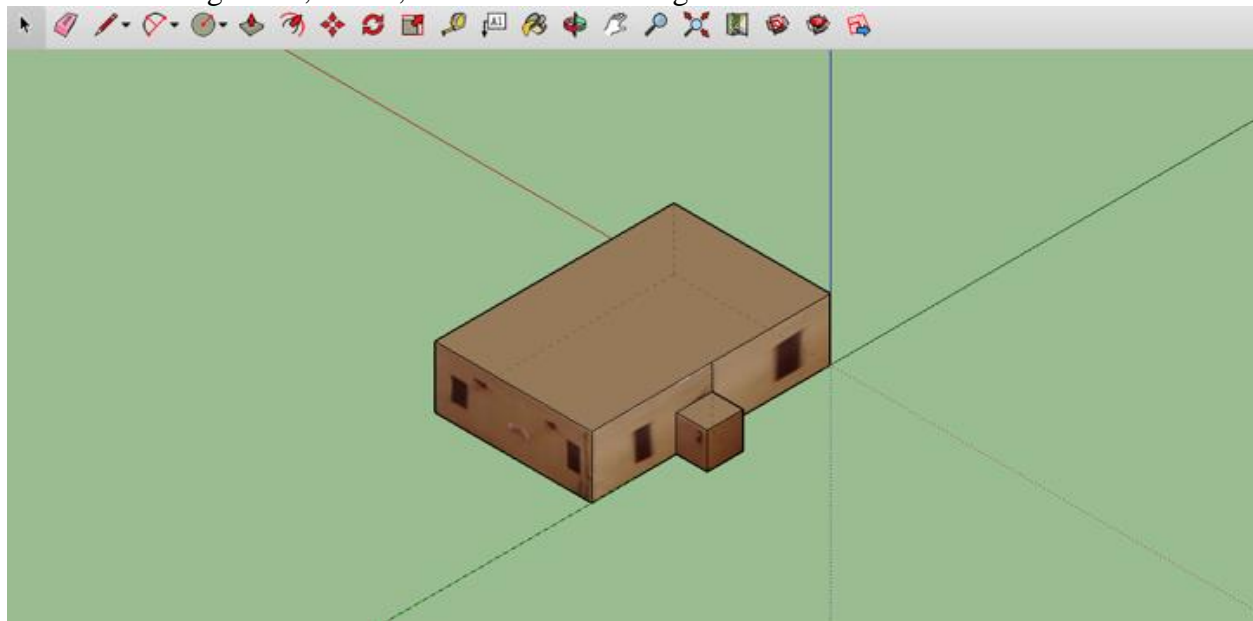


Figure 22: Counseling Center with Textures

Refer to Appendix B for details on the process of adding textures to models. Figure 23 is an example of using SketchUp to create and extrude the Counseling Center (Building 307).

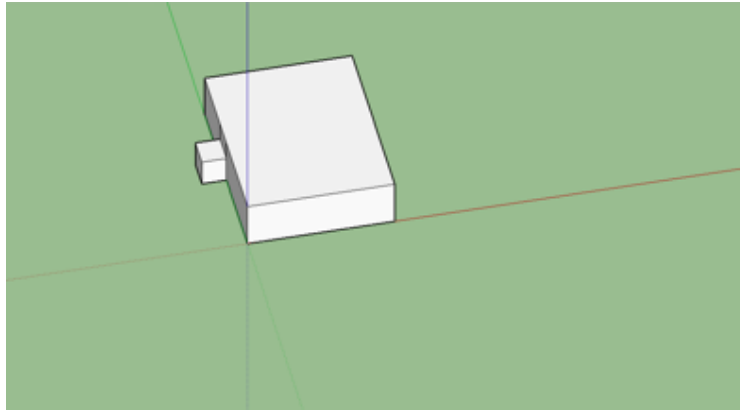


Figure 23: 3D SketchUp Model of Building 307

Refer Appendix B for directions on using SketchUp. Figure 24 is an example of using SketchUp to export the SFIS past campus into Google Earth Pro. Refer to Appendix B for instructions on using Google Earth Pro.

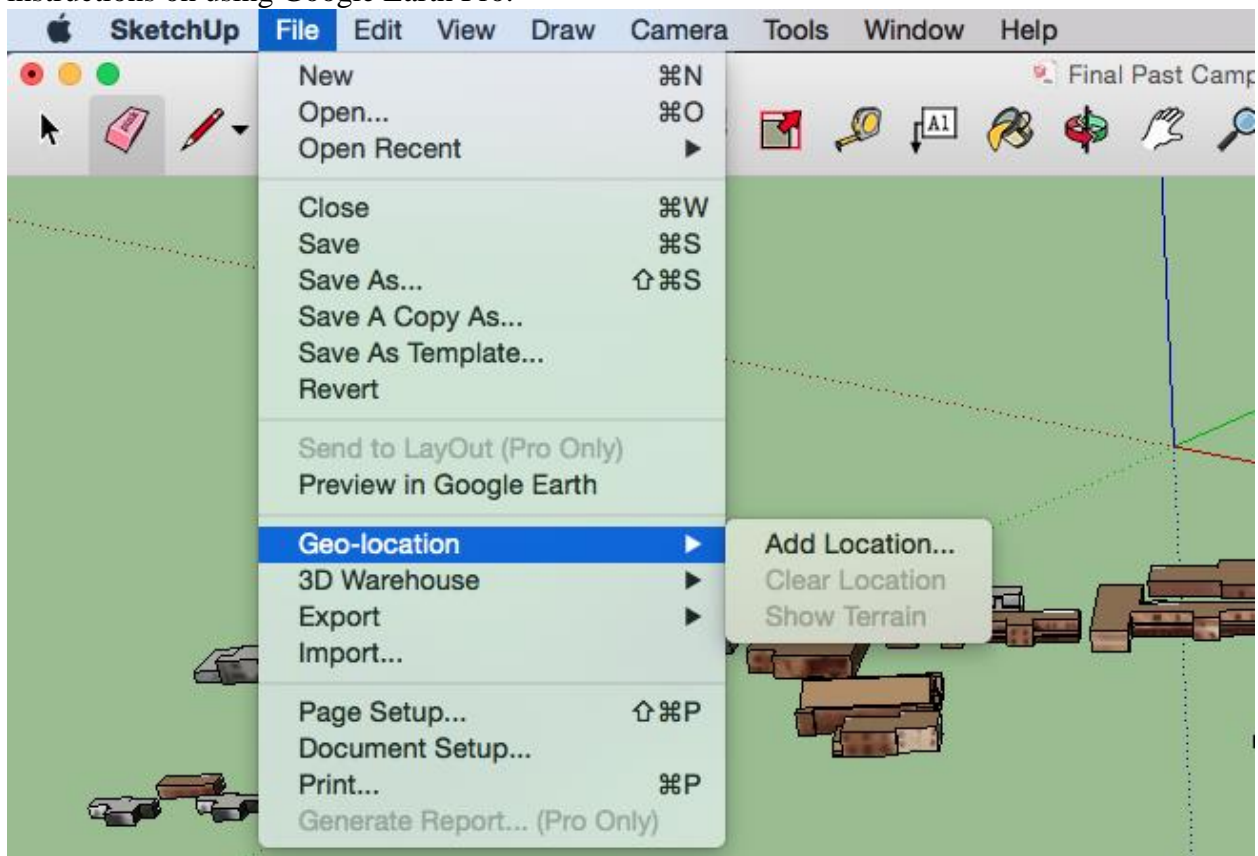


Figure 24: Past SFIS Campus Before Importation into Google Earth Pro

Using photos manipulated within Photoshop, the faces of each building were applied as textures to portray an accurate representation of the building. In total, we created 34 digital models of the past SFIS campus, along with manipulating photos in Photoshop. We were able to create most of the models analyzing blueprints of the razed buildings. For buildings we did not have measurements for, we used Google Earth Pro's historical imagery feature to view satellite imagery of the past SFIS campus. We used Google Earth Pro's measuring tool to obtain an estimate of the perimeter of the buildings. We did not have to represent the current campus in

SketchUp because 3D models already existed within Google Earth Pro. The process of taking the images of the buildings and manipulating them into the images for the textures of the SketchUp model is stated in Appendix A. The process of creating the SketchUp model with the textures and embedding the model in Google Earth Pro is stated in Appendix B.

#### 4.2. Creating a Physical Model of the SFIS Present Campus

In total, twenty-four buildings were created to represent the current campus, along with ten potentially additions and three definite additions. This was completed by using the provided CAD measurements, extruding them, then converting them into a file the 3D printer is capable of processing. The process of creating the CAD models is stated in Appendices D and E. The process of 3D printing the CAD models is stated in Appendix C. Look at Figures 25 through 31 for a chronological representation of the process to create the physical model of the present SFIS campus. After the blueprint was obtained, it required editing to remove unnecessary details. Figure 25 is an example of what the drawing looks like after editing.

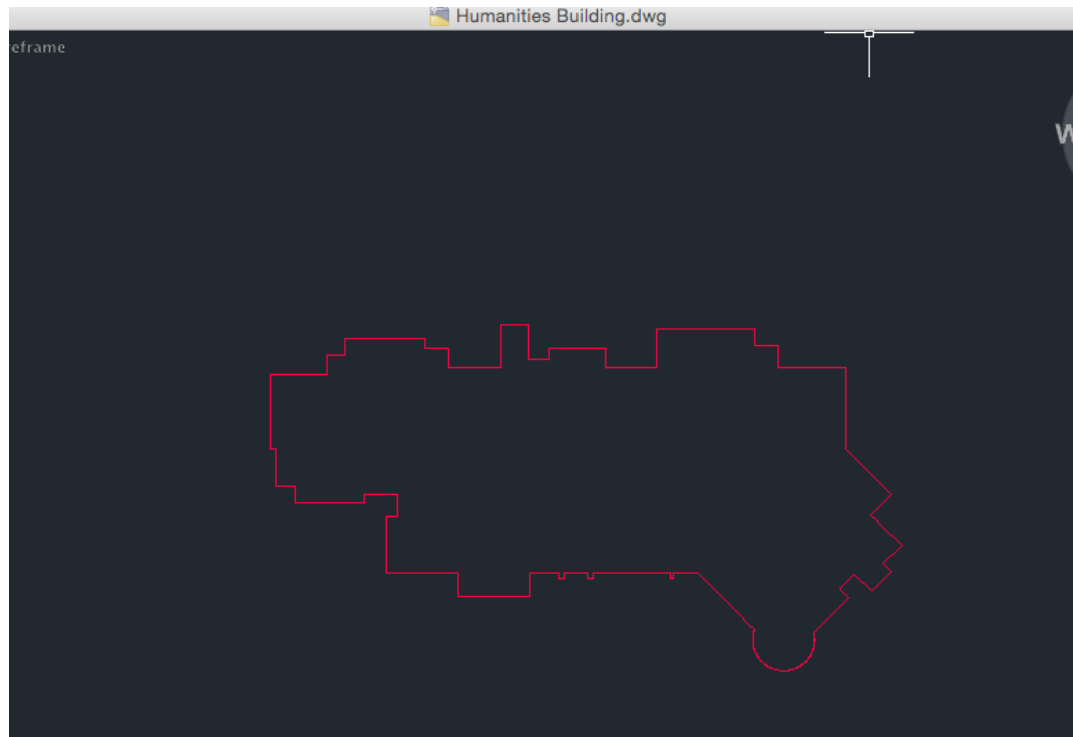


Figure 25: Edited drawing of Humanities Building

Figure 26 shows the CAD drawing of the Pueblo Pavilion Wellness Center that was created from the measurements in Google Earth.

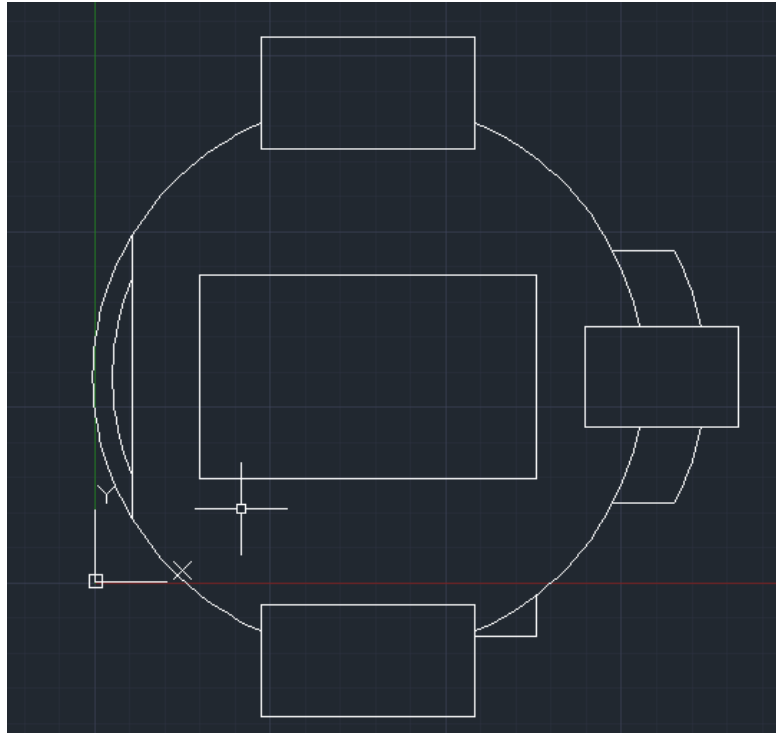


Figure 26: CAD Drawing of Pueblo Pavilion Wellness Center

An example of a completely finished 3D modeled building is in Figure 27 below.

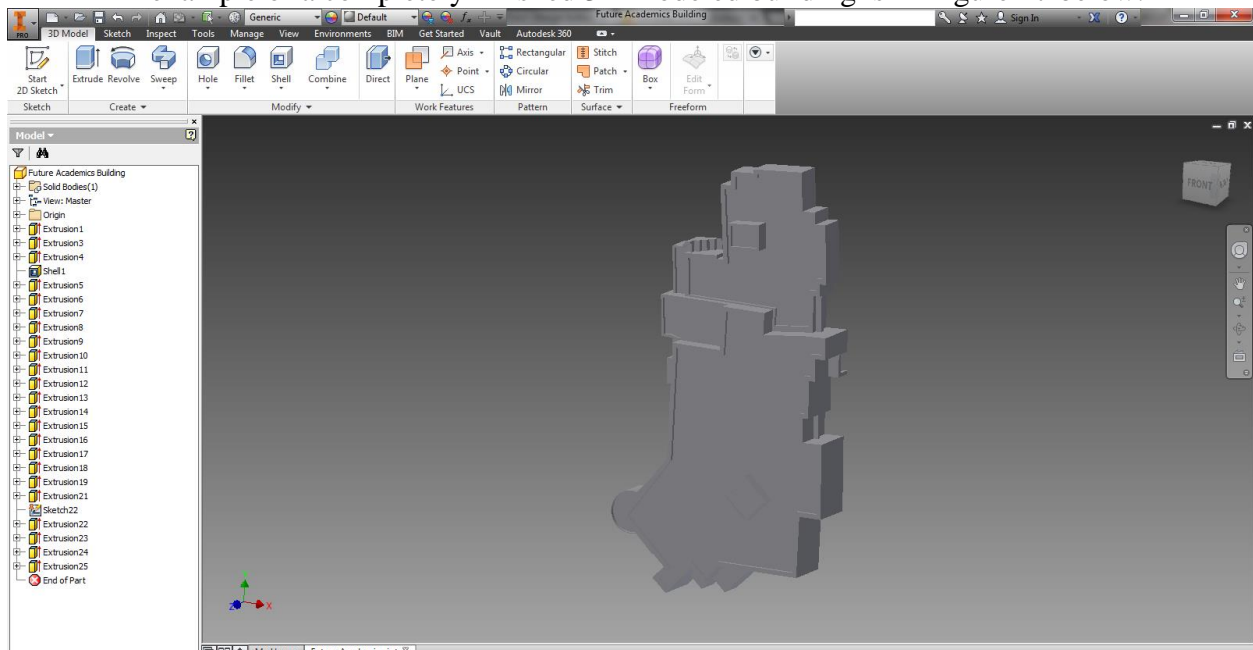


Figure 27: Humanities Building in Inventor



An example of a rescaled building properly rotated is in Figure 28 below.

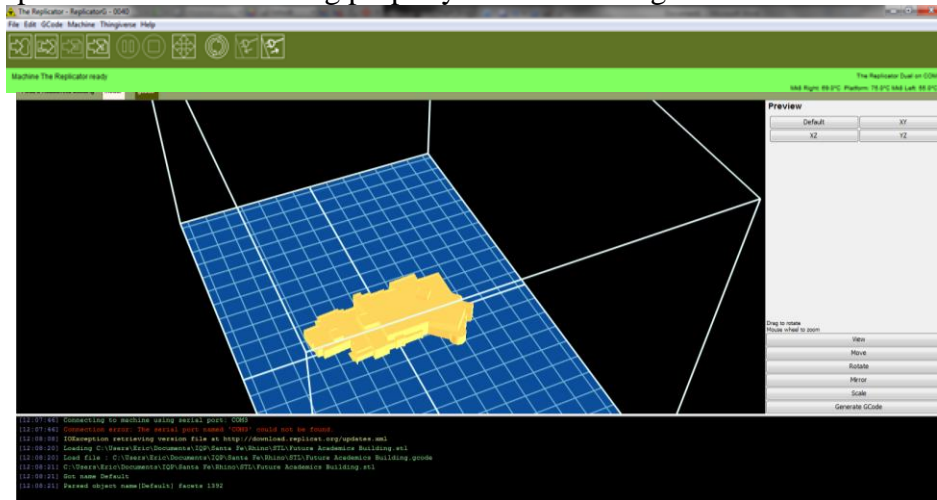


Figure 28: Humanities Building in ReplicatorG

We originally ran into issues when printing the models. When printing at 240°C, the buildings would fray and the tops would melt as shown in Figure 29. We researched other temperatures online and found 230°C; this still was not ideal. We continued to have fraying. We then tried many different temperatures from 200-230°C, and found the best temperature to use is 217°C. We printed most of the buildings at this temperature. We also tried layer thicknesses between 0.1mm to 0.4mm to get the best printing resolution and found the best resolution at 0.2mm.



Figure 29: Nozzle temperature set to 240°C

An example of a properly printed building is in Figure 30 below. Refer to Appendix C. For changing out filament or resetting the printer, refer to Appendix L.



Figure 30: Humanities Building

Figure 31 represents the results of the process we used to create the 3D physical models of the present SFIS campus, showing our 3D printed models on a Google Earth image printed out on a piece of paper. We used a tan color filament to accurately represent that actual color of the adobe structures.



Figure 31: Picture of 3D printed buildings on Google Earth printed paper

### 4.3. Archiving Information

To archive information in a user accessible format, we created wiki pages illustrating the obtained data. In total we created ten additions to the SantaFedia wiki page and edited the Santa Fe Indian School Wikipedia page. We also downloaded a video discussing the history of Santa Fe Indian School. All of this information is embedded within the virtual models of the past and present SFIS campus and is accessible by clicking on the buildings and the links to the wiki pages and YouTube videos.

In Figure 32, the quality of the Genius Scan can be seen in one of our archived photos. Due to time limitations, we were only able to gather information from one session in the archives. Refer to Appendix G for guides on how to use these technologies.



Figure 32: Genius Scanned Photo of the Library Annex Building



An example of the setup of the Wikipedia page can be seen in Figure 33, below. The links can be found [here](#) and [here](#). Refer to Appendix F for instructions on how to create wiki pages.

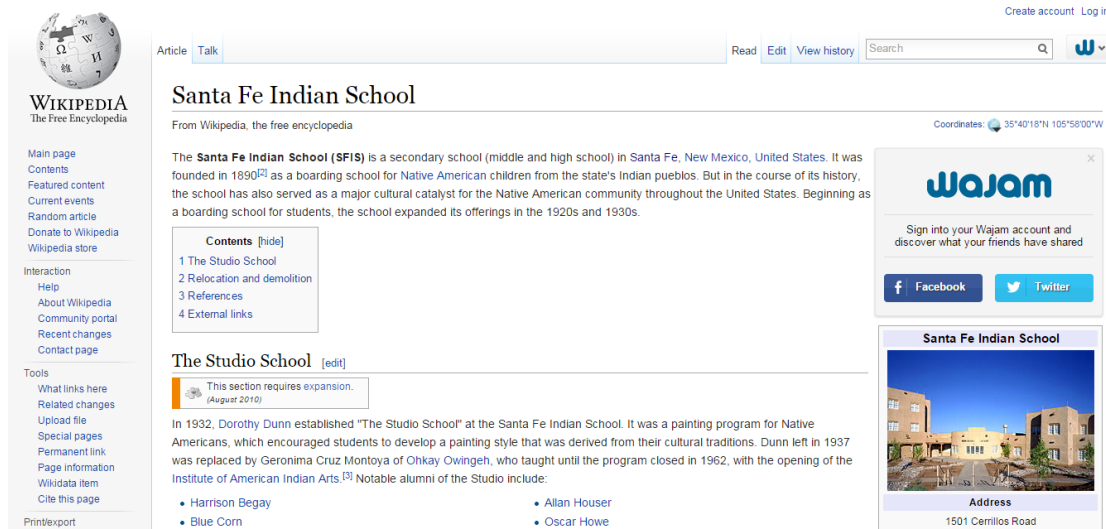


Figure 33: Example of the SFIS Wikipedia Page

Due to time constraints, we were only able to gather a clip from that one video. We were able to upload the video onto YouTube and embed the video into the 3D virtual model of the past campus on Google Earth Pro. This video can be seen by using this URL: [Google Earth to a Wiki Page](#). Figure 34 is an example of the ability to click on a building within Google Earth Pro with embedded information that is shown in the video. Refer to Appendix B for instructions on how to use Google Earth Pro.

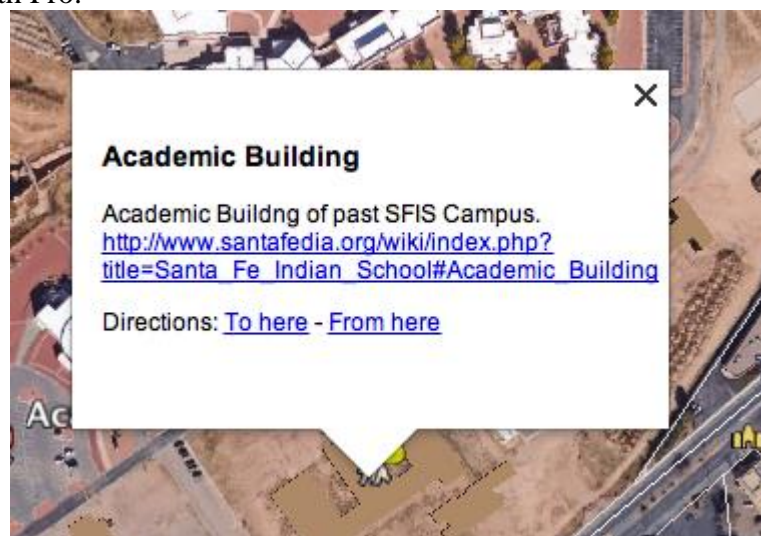


Figure 34: Example of Embedded Information in Google Earth Pro

When speaking to Ted Jojola, he asked many questions about our goals and the impact we want to have from completing the project. We reevaluated our methods and realized we needed more involvement and input from the community. However, due to time constraints, we were unable to interview members of the community.

#### 4.4. Results of Teaching SFIS Students

As a culmination of our project, we developed instruction manuals to teach SFIS students the methods we used during our project for future replication. This allows for a continuation of our project after we have left and allows students to impact their school and communities. In total, we created eight manuals for Photoshop, SketchUp/Google Earth Pro, AutoCAD, AutoDesk Inventor, ReplicatorG, 3D Printing, Wiki Article Creation, and Genius Scan. We were able to interact with students in both class environments and in workshops. We worked with sixty-eight different students throughout a seven week time span. We allowed these students access to our manuals and administered workshops to introduce both the softwares and our project in hopes of the students continuing our project.

Our methods in measuring interest allowed the students to interact with the technology and decide whether they had a continued interest. Based upon positive feedback, we concluded the students were engaged by our workshops. This feedback was based upon circulating an attendance sheet at the end of our workshops and presentations and requesting the students' email addresses if interested in additional information; we received email addresses from fifty-six students. We would have attempted to gauge interest sooner in the process, but were unable to because we had unfinished deliverables, the process of gaining access to the students, and we lagged in connecting with influential faculty members. Our workshops and presentations can be found in Appendix H-K.

#### 4.5. Interactive Presentation Results

To complete the interactive presentation, we produced a video touring the old campus in Google Earth Pro in first person perspective to observe the 3D digital models, and other information that we found useful to SFIS. Our video can be viewed at this web address: <https://www.youtube.com/watch?v=d6zWa306Nvc>. In addition, we produced a video that illustrates the archive being accessed through one of the virtual models of the old SFIS campus. Our video can be viewed at this web address: [https://www.youtube.com/watch?v=z6wI\\_FpesaY](https://www.youtube.com/watch?v=z6wI_FpesaY).

The physical presentation was interactive with the students and faculty. We had the 3D physical model displayed as seen in Figure 35, below. The attendees of the presentations were able to place the imagining the future buildings onto the model and test different locations.



Figure 35: Physical Model of Current and Imagining Future Campus for Demonstration

## 5. Conclusion

With the fulfillment of our project, we have aided SFIS in remembering the past campus, along with imagining the future by using the model of the current campus. We created a physical model of the current campus, and 3D virtual model of the past campus. Within the past campus, we have embedded data within the models to further preserve the history of SFIS within Google Earth Pro. Creating the present campus aids SFIS in planning for the future, while creating the past campus allows for preservation of SFIS' past. In the process of aiding SFIS through our project, we educated the students on the methods and technology we used throughout our project with workshops and demonstrations. The students have been informed about the various types of technology with the hope of utilization of the technology in the Senior Honors Projects and faculty implementation within their curriculums. After the Senior Honors Project, the students will either go on to become professionals within their respective communities, or return to become faculty members at SFIS. The current students would be able to teach the future generation of students, creating a cycle of education within the SFIS community. Figure 36 displays a cycle of how this project could have lasting impacts over time.

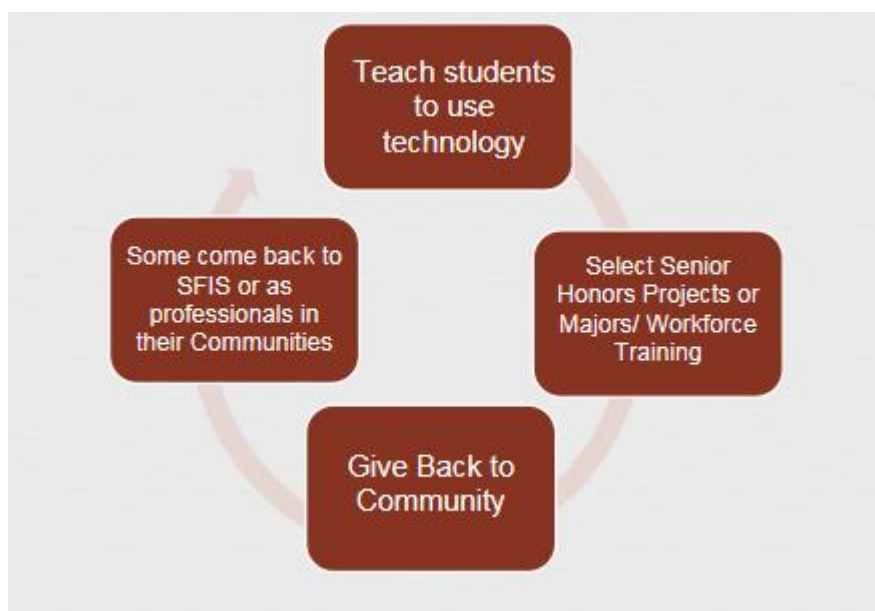


Figure 36: Lasting Impacts Cycle

Through the teaching of various technologies, the students and faculty of SFIS are not only able to expand upon the work we accomplished, but use technology as a tool to teach the history of their school. Utilization of technology for the purpose of cultural preservation is an important objective for SFIS as time progresses. SFIS does not wish to lose sight of their history, but understand the need to adapt as technology becomes an unavoidable part of society.

## 6. Recommendations

We have established recommendations to further expand upon our work. We recommend the students of SFIS learn how to use the technologies and tools our group used to complete this project; therefore, allowing further development of the virtual model of the past campus, along with creating potential developments for the current campus. This knowledge will allow for the students to impact their own communities as well. The guides of our methods are in Appendices A-F. To better utilize our methods of digitally creating models, we recommend photos of all the buildings be photographed to include every angle of the building. The photos should have minimal obstructions such as people, vehicles, and vegetation; hence, reducing the amount of manipulations needed in Photoshop and improving the realism of the digital models. Due to availability and convenience, we recommend SFIS explore implementing classes to teach students how to use technology such as Simtable and the 3D printer. These tools are owned by SFIS and should be implemented within the student' class work to provide examples of real-world applications of STEM. Simtable can also be used as an immersive tool for planning to display a full representation of the past, present, and future SFIS campuses. Because SFIS focuses on understanding their past to better assist their community and the Pueblo Tribes, Simtable would be useful in conveying stories, media, and feedback on future plans and as an educational tool. The data can then be displayed to the SFIS board for a decision to be made. There are also more efficient ways to improve the digital archive.

### 6.1. Implementation of Technology within the SFIS Community

One of the most important aspects of our project is the aspect of interaction between the community and technology. The school is expanding and would appreciate students' input. The students have begun formulating ideas for future buildings that they would like to see built.

Currently, SFIS has AutoCAD and Architecture classes. A potential addition to these classes is a project for designing a future building for SFIS and the best model will be 3D printed and given to the administration. We were able to participate in assisting students from these classes in performing the different steps needed to create a model for 3D printing using AutoCAD and Inventor.

Another possibility for incorporating the 3D printer in the current curriculum is in the Calculus class. In this class, student work with 3D equations for creating disks, and cylinders. Using CAD software, the students could create 3D models of the equations and print out the models as part of a project. This process could assist in students conceptual understanding of the material by interacting with the equations in a more visual way.

SFIS currently has an architectural class. SketchUp is a CAD software with simpler 3D modeling methods than Inventor. Since SketchUp was developed by Google, the models it produces can be imported into Google Earth Pro. Both of these features are ideal for an introduction architectural class since SketchUp is user friendly and Google Earth Pro shows topography and other Geographic features that could impact the building model. SketchUp and Google Earth Pro can be downloaded for free, allowing for accessibility for all parties interested.

When presenting these ideas to the Superintendent and other members of the administration, we discussed how the students and/or faculty can use the Simtable to create an interactive experience with Google Earth and their 3D models. The community will be able to visualize how these future plans will affect the campus and the surrounding areas, promoting a discussion of the pros and cons of each location. They can use the water simulation to see if the new plans would be affected by rainfall positively or negatively.

SFIS owns a Simtable that is currently not being utilized. Simtable, an interactive media display, works well with Google Earth projections. This capability would be best utilized in an architectural class presentation and for water, fire, and evacuation simulations.

The recommended changes are able to be implemented with the use of the manuals we created regarding the technologies previously spoken about. These manuals allow for replication of our process by anyone.

## **6.2. Improving Archive**

To improve the archive in the future, we recommend interviewing SFIS Alumni and current students for first hand accounts of SFIS, logging information into excel, and improving accessibility to archives.

### **6.2.1. Interviewing SFIS Alumni and Current Students for First Hand Accounts of SFIS**

Storytelling is one way to convey information; this form of archiving data was favored by our Sponsor, Kimball Sekaquaptewa. We recommend discussing topics of interest to the Alumni and current students of SFIS along with arranging focus groups to interview and ask questions.

The questions we recommend asking are as follows:

1. “Did you enjoy school?
2. What kind of student were you?
3. What would you do for fun?
4. Are you still friends with anyone from that time in your life?
5. What are your best memories of grade school/high school/college/graduate school? Worst memories?
6. Was there a teacher or teachers who had a particularly strong influence on your life? Tell me about them.
7. Do you have any favorite stories from school?<sup>54</sup>
8. If you could change one thing about the current SFIS Campus, what would it be?

We recommend receiving written permission to record these conversations and use them in SFIS’ archives. One may use a written contract to avoid plagiarism and gaining rights to the material. The Alumni and current students could be asked the same questions to give a scope of how the times have changed over the years. Some Alumni work at the school today and have seen the changes over time, and could contribute valuable information based upon their experience.

### **6.2.2. Logging Information**

We recommend that information gathered for the archive be logged into Excel. Excel allows for a high level of organization of the information gathered. When creating the wiki pages, the Excel spreadsheet can be easily referenced when inputting the information. Including the students in this process will allow them to further learn about their history and gain archiving experience. Figure 37 is an example of how the spreadsheet could be set up and added to.

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<sup>54</sup> Great Questions List. (n.d.). Retrieved May 2, 2015, from <http://diy.storycorps.org/great-questions-list/#school>



Building #	IAIA Building Name	SFIS Building Name	Construction Date	Sq Footage	Demolished	Latitude	Longitude
1	Administration Building	Administration	1962	6,632	2012	35°40'13.37"N	105°57'56.31"W
10	Outdoor Theatre	Paolo Solen Amph	1970	28,647	--		
11	Gymnasium	Abeyta Gym	1970	2,717	--	35°40'14.18"N	105°58'6.38"W
110.11	Gymnasium				--		
12	Plant Management Shop	Maintenance Shop	1971	1,973	--		
2	Academic Building	Middle School Achademy	1961	9,355	2012	35°40'15.57"N	105°57'56.07"W
3	Student Center	Canteen	1962	2,717	2005	35°40'14.62"N	105°57'59.82"W
301	Student Sales	Admissions	1909	2,370	2008	35°40'10.95"N	105°57'58.40"W
302	Fine Arts	Fine Arts	1898	18,516	2008	35°40'13.33"N	105°57'59.04"W
303	Men's Dorm	Middle Dorm	1890	17,914	2008	35°40'12.52"N	105°58'1.66"W
304	Crandal Hall/Men's Dorm	Crandal Hall	1890	9,822	2008	35°40'11.62"N	105°58'3.15"W
305	Weaving and Traditional Techniques	Snake Building	1897	7,564	2008	35°40'9.10"N	105°58'1.85"W
306	Gymnasium	Old Gym	1927	11,902	2008	35°40'9.63	105°58'2.69"W
307	Counseling Center	Facility Management	1908	1,466	2008	35°40'11.14"N	105°58'3.99"W
308	Dining Hall	Kitchen/Dining Hall	1908	16,742	2008	35°40'10.45"N	105°58'4.56"W
309	Girl's Dorm	Main Dorm	1907	37,173	2008	35°40'9.50"N	105°58'6.16"W
313	Warehouse	Warehouse	1891	6,500	2005	35°40'12.13"N	105°58'4.46"W
315	Paint Shop	Paint Shop	1934	1,915	2005	35°40'11.30"N	105°58'5.71"W
316	Cultural Studies Center	Quarters	1908	1,613	2005		
316	Employee Quarters	Quarters	1908	1,613	2005		

Figure 37: Example of Excel Spreadsheet

### 6.2.3. Improving Accessibility to Archives

We recommend the archives be more accessible to students, faculty, and alumni. By completely digitizing today's archive, anyone who is interested in the history of SFIS will be able to access the information with permission from the school. We recommend informing students of the archive already available to them and looking into different ways it can be utilized by the students. With allowing access to the archives, people will become more conscious of gathering information in the future for a historical archive. With improved accessibility, the community of SFIS will better understand the roots from which they came from, allowing for improved decision making regarding the future of SFIS.

### 6.3. Enhancing the 3D Physical and Digital Model

To enhance the 3D physical model, we recommend acquiring the topographical information required to produce the routed foam terrain; it can be acquired by meeting with the Santa Fe County GIS department and obtaining their LIDAR data. LIDAR is a remote sensing technology that measures distance by lighting an area with a laser and measuring the distance of the reflected light. The 3D models of the current campus could be positioned on the routed foam terrain to coordinate with their geographical position, while Simtable, a simulation platform used for interactive presentations, projects the satellite imagery from Google Earth Pro onto the routed foam terrain. Simtable would help with creating a more immersive planning experience. We also recommend to continue adding 3D printed models to the current campus as new buildings are created. We recommend creating 3D virtual models of potential future plans and export them into Google Earth Pro. This will allow the parties of interest to visualize how the campus will look walking through if the addition is made. They will be able to utilize the model to raise money for the addition and the community can imagine how the campus will be affected by the additions.

Regarding the digital past SFIS model, we recommend building upon our work by adding more information to the model. This information can include the various eras SFIS has experienced through its history. The process we used to produce the building in the pre demolition era of SFIS could be used to create buildings from other eras and incorporated into our Google Earth Pro file. The buildings can potentially have archive information embedded within them.

By using an immersive format such as the 3D virtual campus to convey information from the past, the likelihood the information being conveyed to new generations increases. Students of coming generations will use more technology as time progresses. If information is not conveyed through technology, the information could be lost. To encompass both the past and future, a timeline can be created with the models. As one travels through the timeline, different building models will rise and be demolished. We believe these recommendations will build upon the framework we have left behind.

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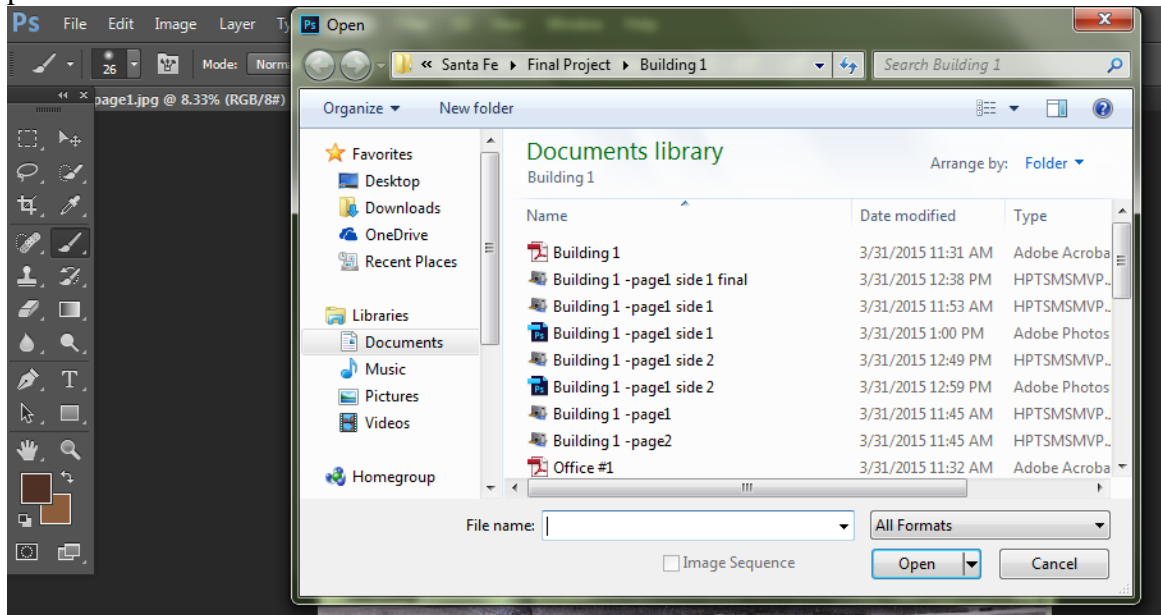
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## Appendices

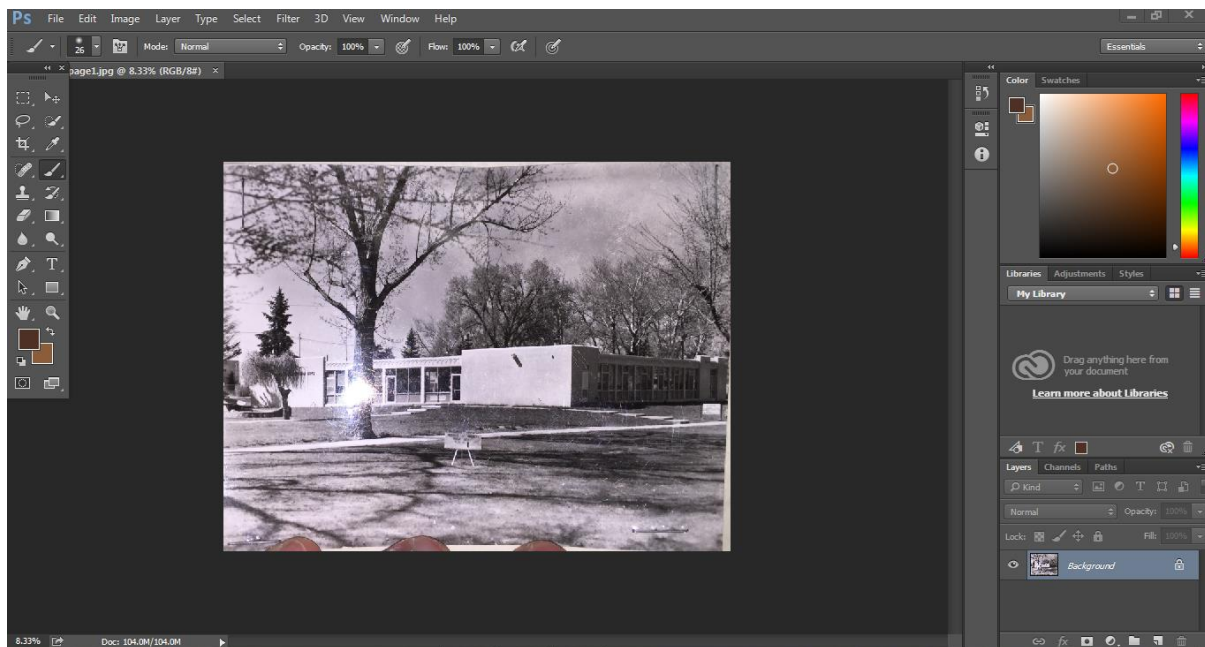
### Appendix A: Photoshop Manual

#### Photoshop Buildings Manual

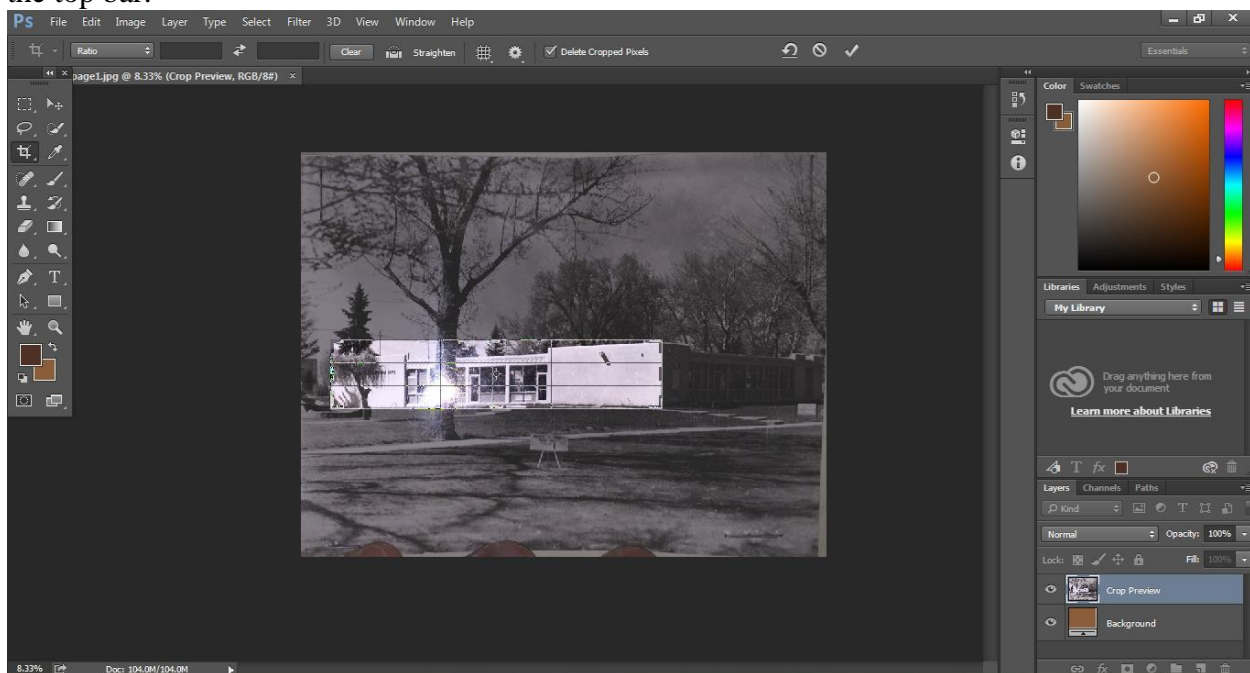
1. First begin by opening the file you would like to edit. Click the **File** Button in the top left corner. Scroll down to **Open** and select a file from your computer. Select **Open** as seen in the picture below.



2. After opening the picture you would like to edit, figure out which face of the building you would like to crop. For this example we will select the left face.

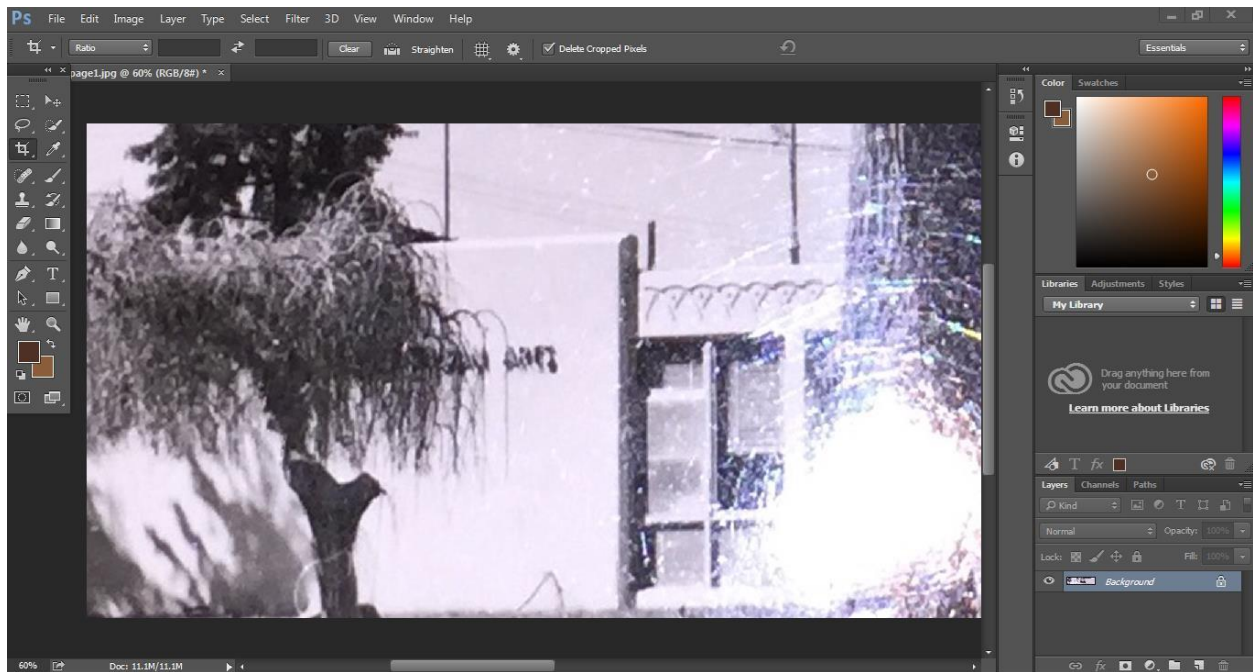


3. Select the **Crop** button and adjust the corners until the area you would like is within the boundaries of the corners. See below. Once you are ready to crop the picture, click the check in the top bar.

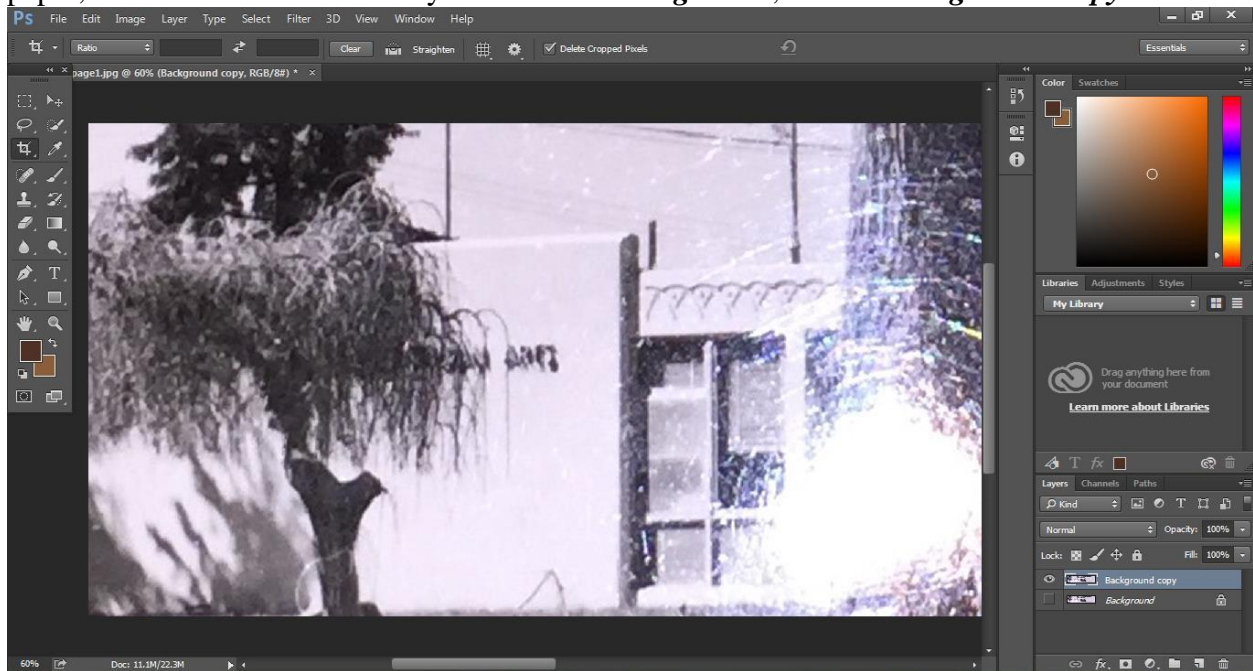


4. Go to the bottom left corner of the page and adjust the percentage until you have a good view of your building.

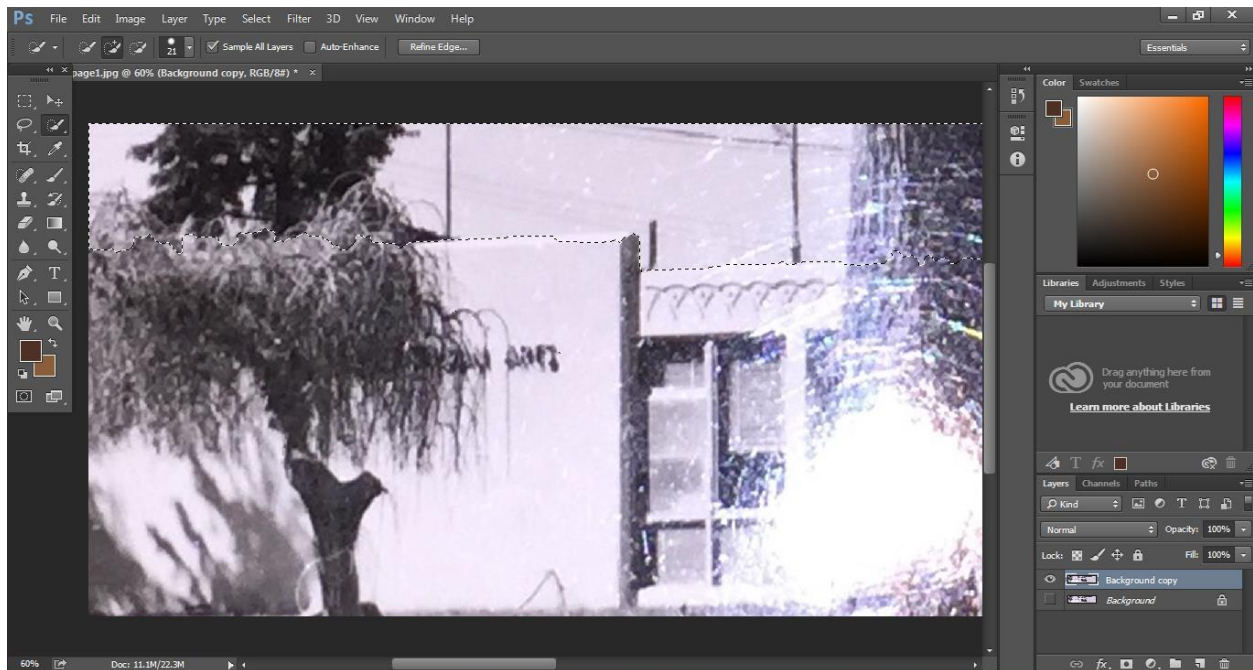




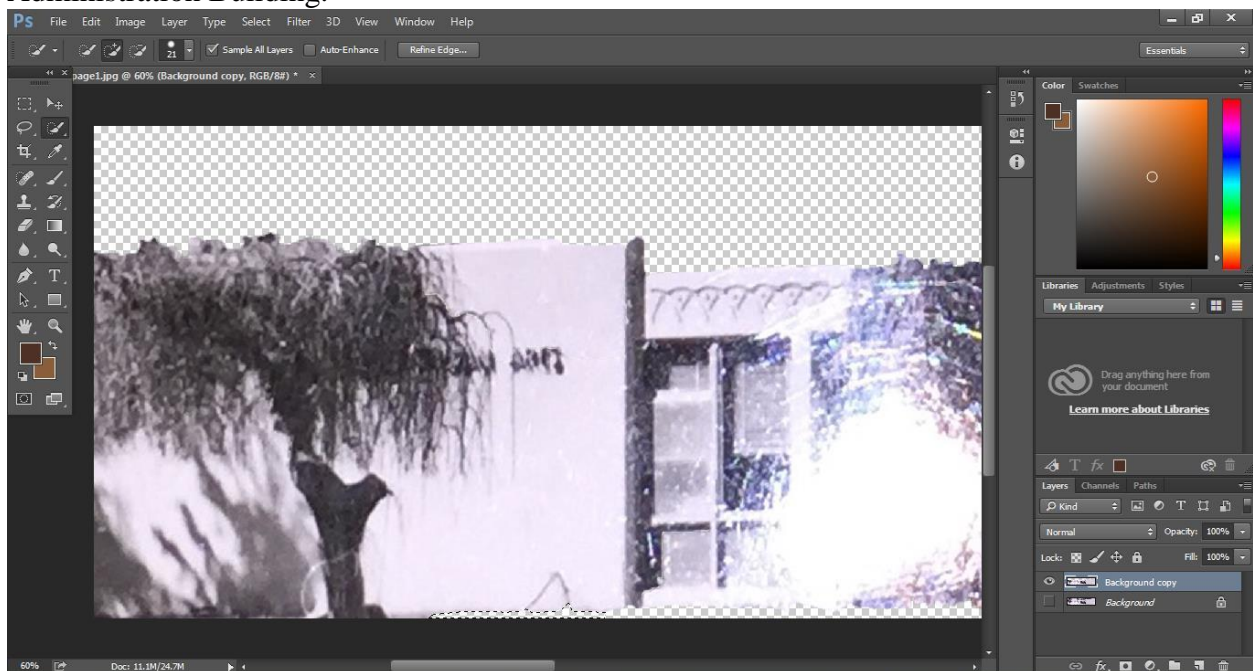
5. Select the **Background** on the right hand side and slide it down to the blank piece of paper, as seen below. Click the eye next to the **Background**, not the **Background Copy**.



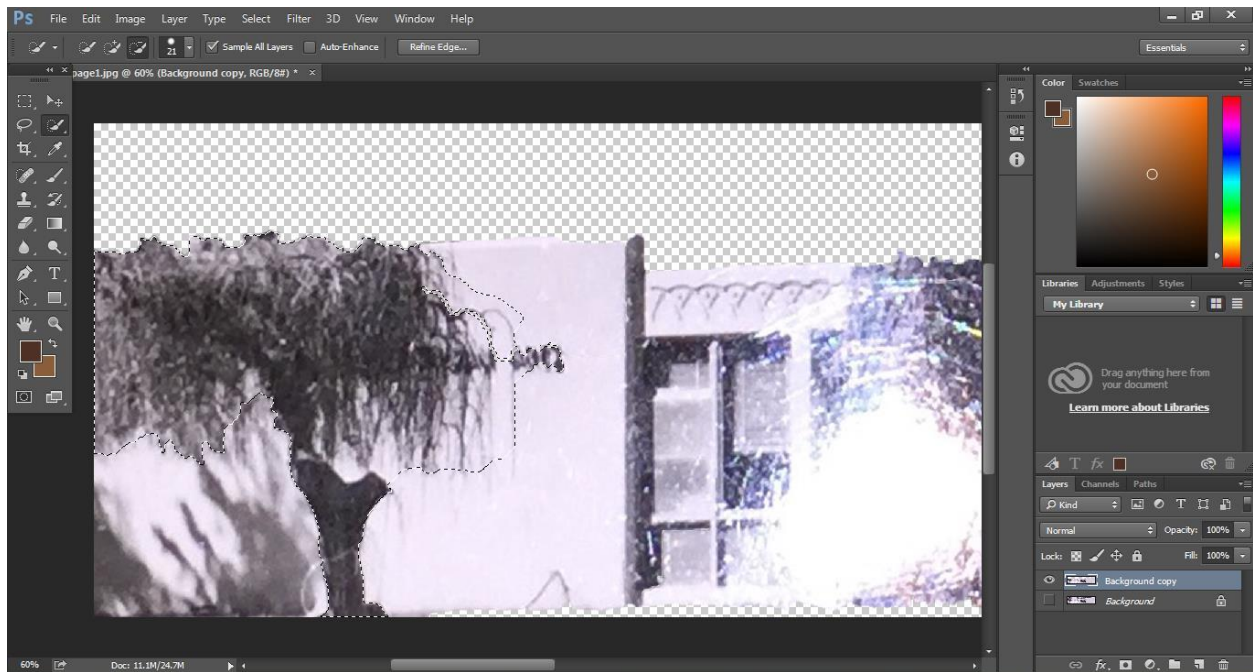
6. Click the **Quick Selection** button in the left column, as seen below. Begin to highlight an area you would like to delete.



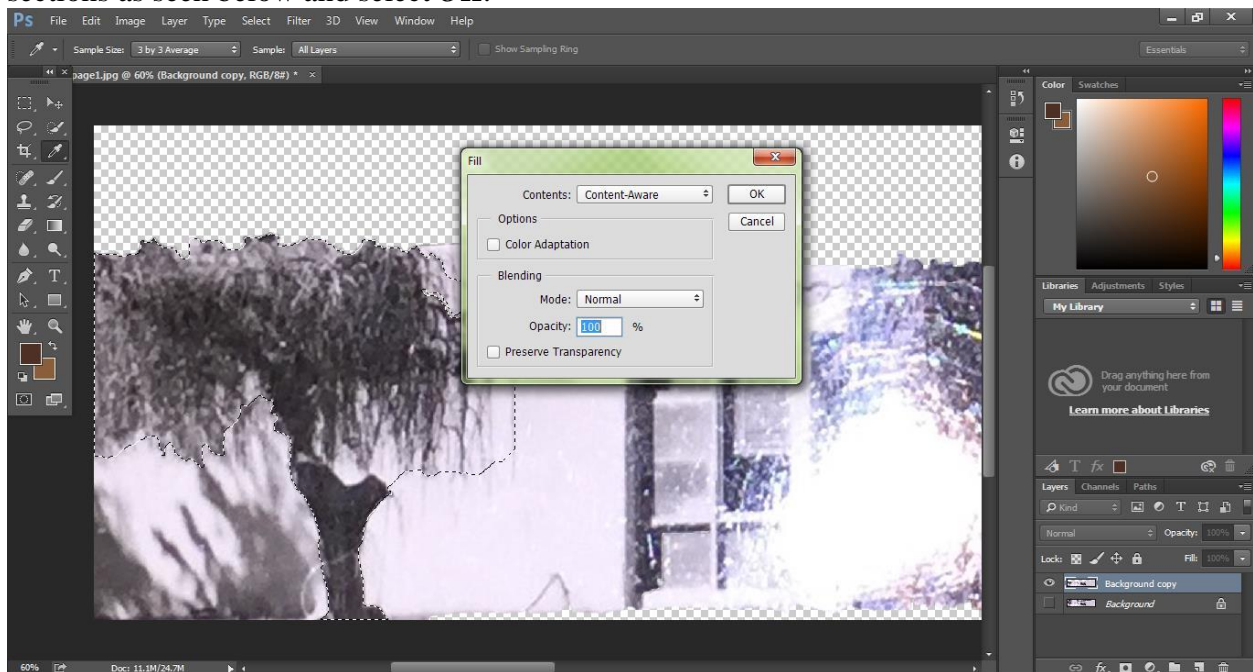
7. Click **Delete**. Continue until you only have the item you would like. In this case, the Administration Building.



8. In this example, there is an unwanted tree in front of the building. To remove the tree we will first select it using the **Quick Selection** button.

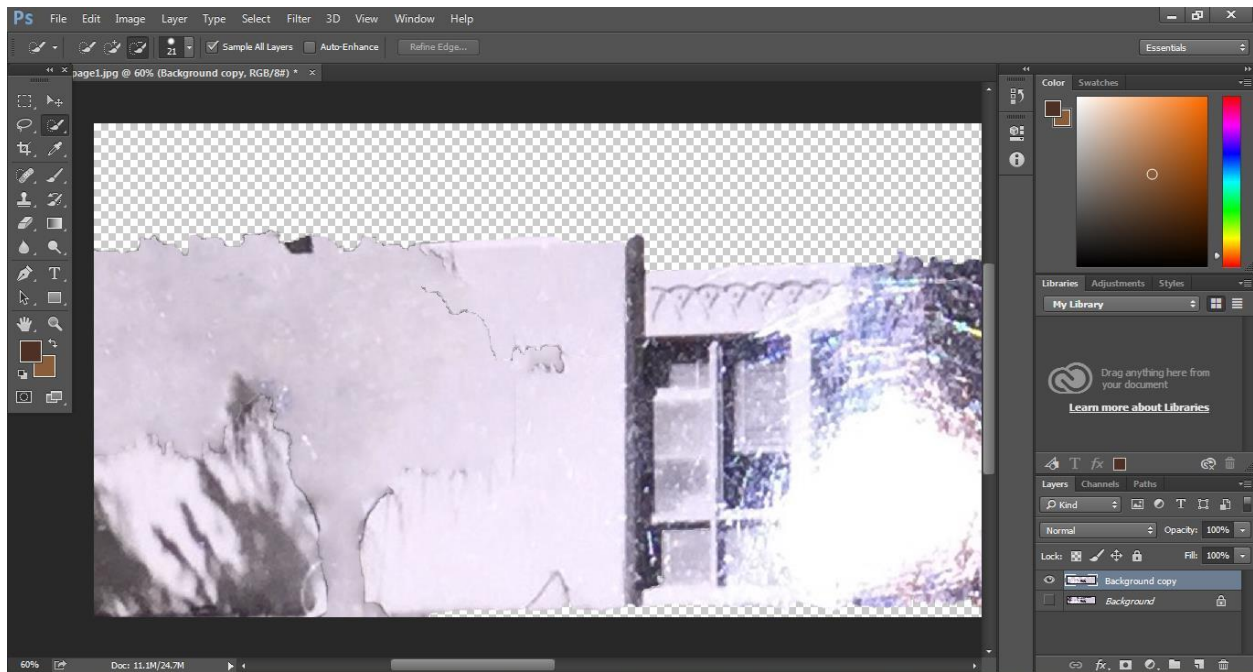


9. Next, click on **Edit** in the top bar. Scroll down to **Fill...** and click on it. Fill out the sections as seen below and select **OK**.

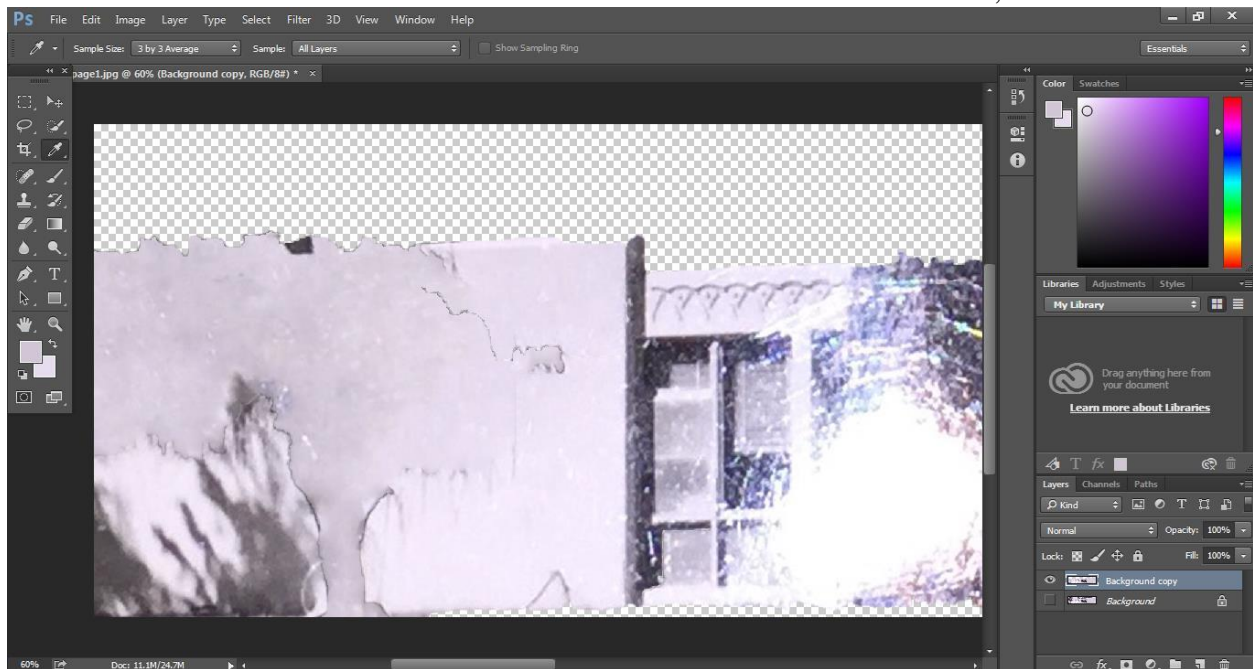


10. Click on **Select** in the top bar and scroll down to **Deselect**. Click on **Deselect** and your picture may look like the one seen below.

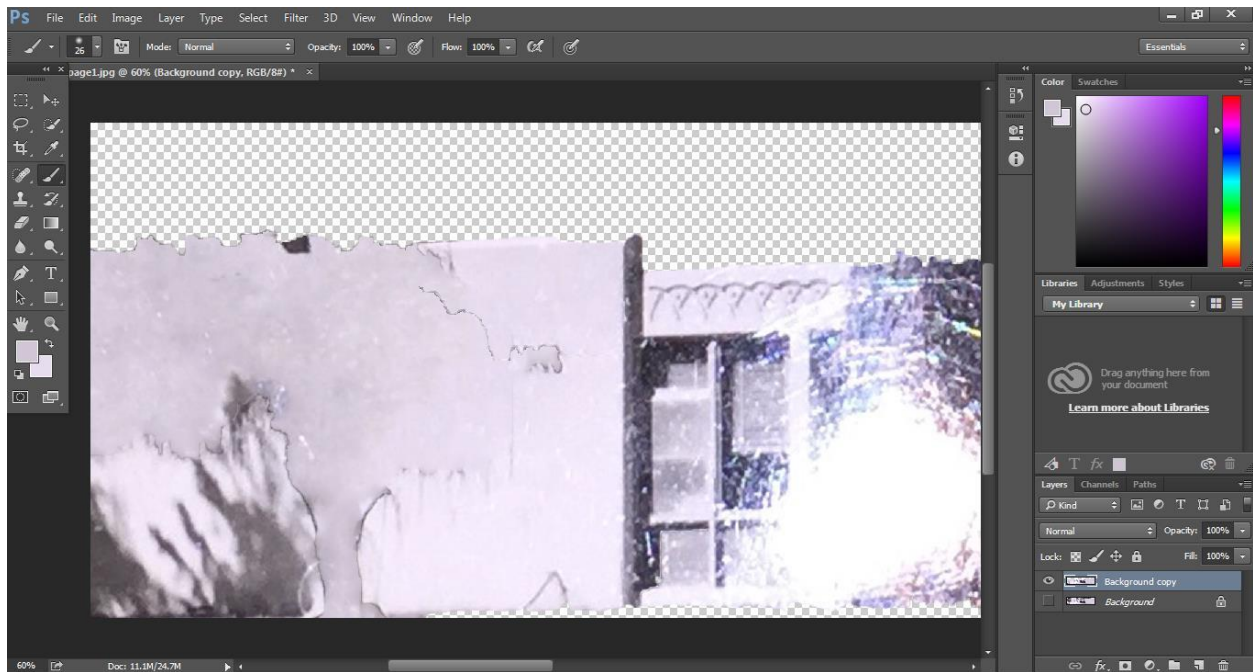




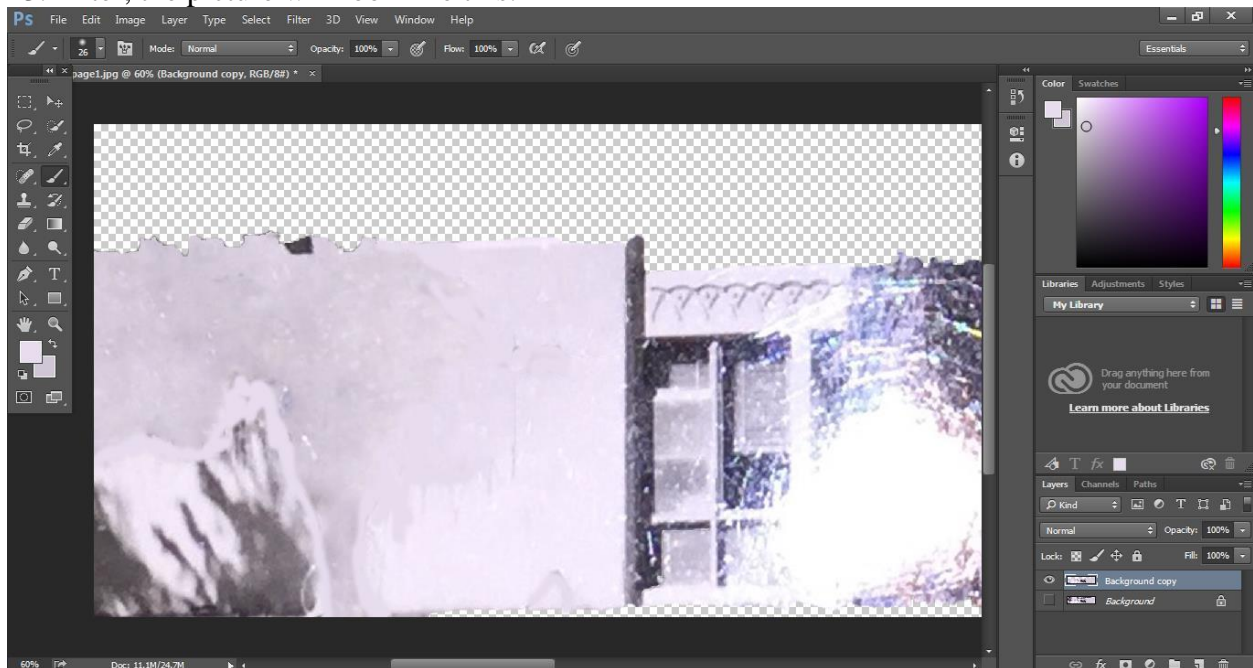
11. We can still see some lines from the tree. To fix this, we will select the ***Dropper*** in the sidebar to the left. We will click on an area of a similar shade to the selection, as seen below.



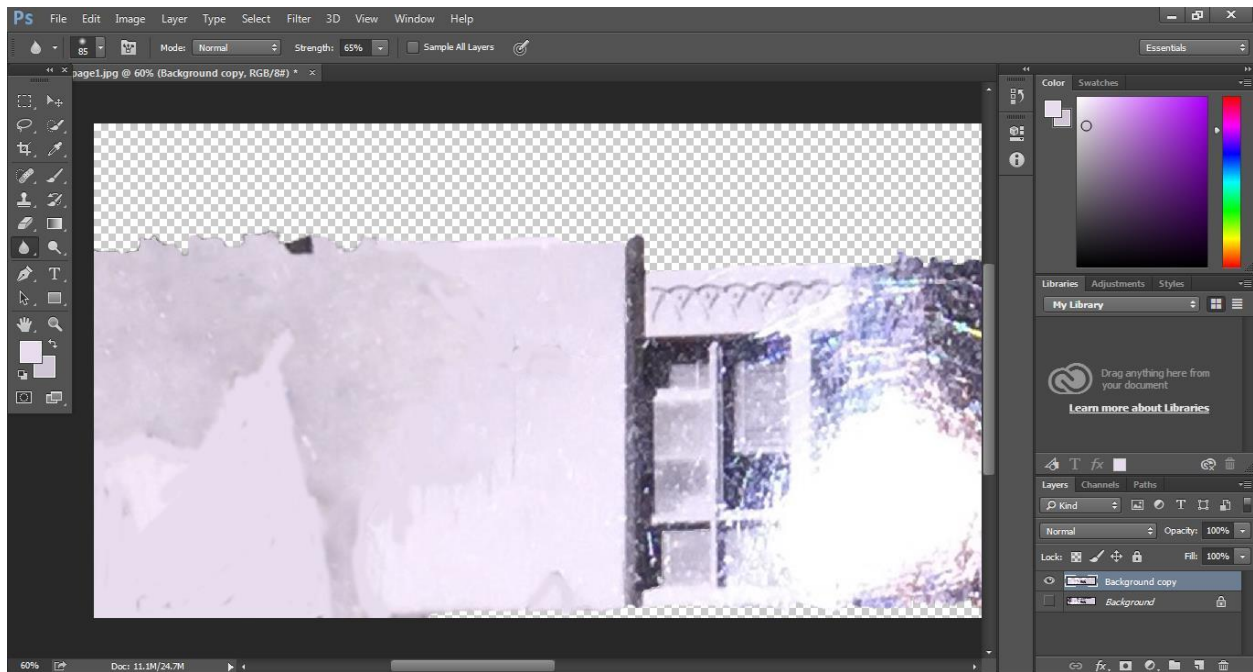
12. Click on the ***Paintbrush*** and begin painting the areas of concern.



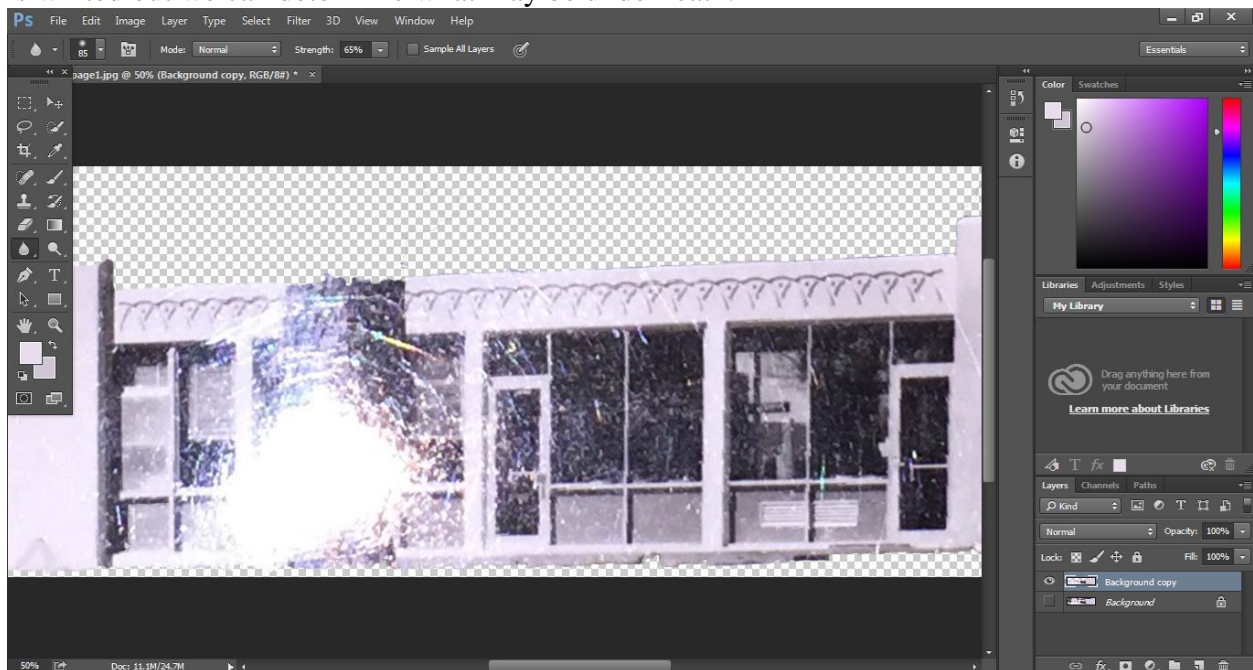
13. After, the picture will look like this.



14. To make the changes less noticeable, you may want to blur the area a bit. Select the **Blur** tool; the water droplet symbol in the left sidebar. The results will look similar to the ones below.

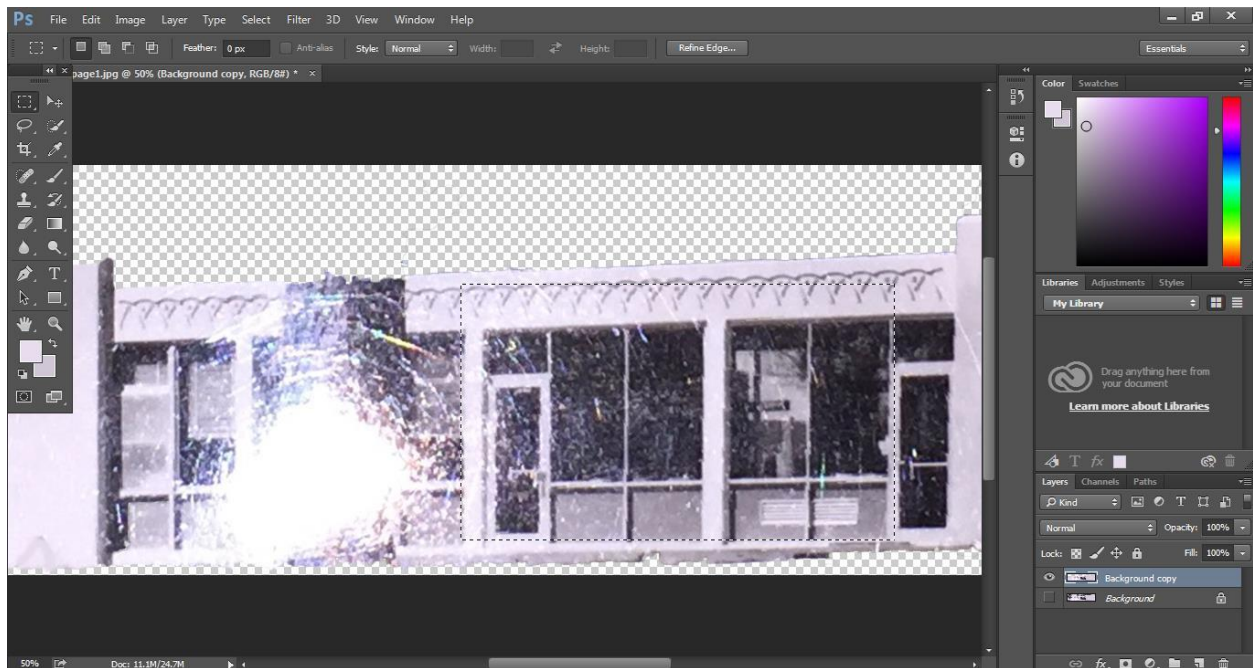


15. If your picture does not have the best quality, you may want to use other sections of the picture as context clues. As seen below, these two sections look very similar; though, one section is whited out we can determine what may be underneath.

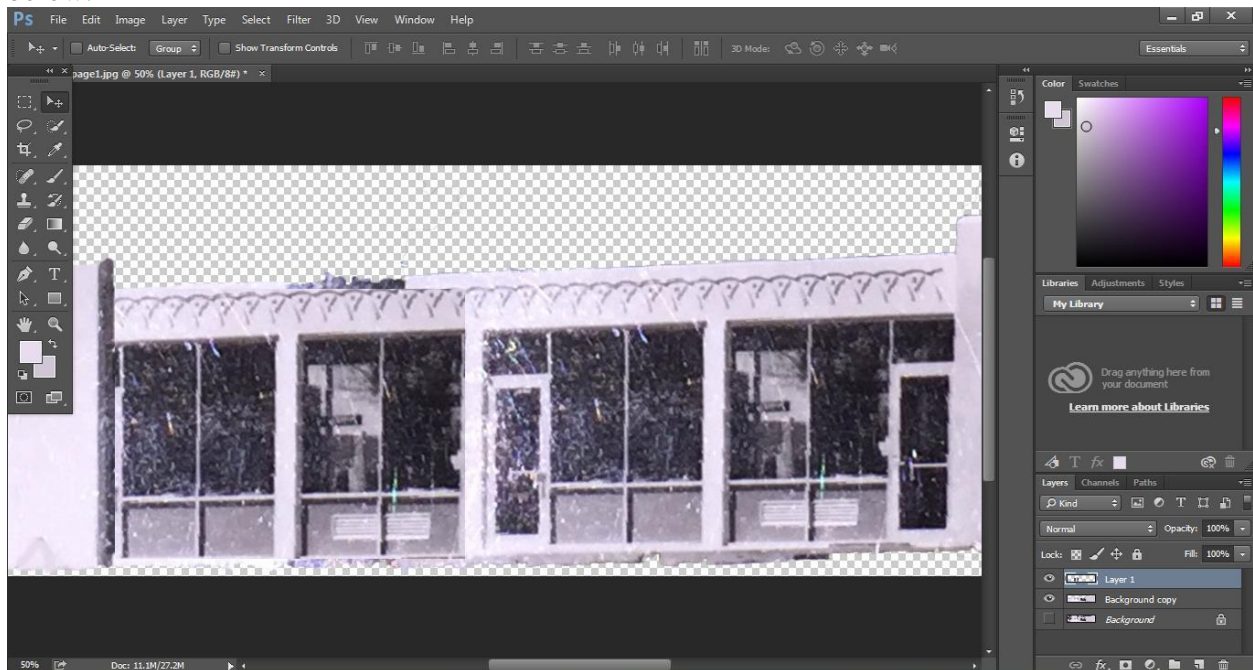


16. Select the ***Rectangular Marquee Tool*** and make a selection around the decent part of the building, as seen below. Click ***ctrl + C*** to copy this selection.



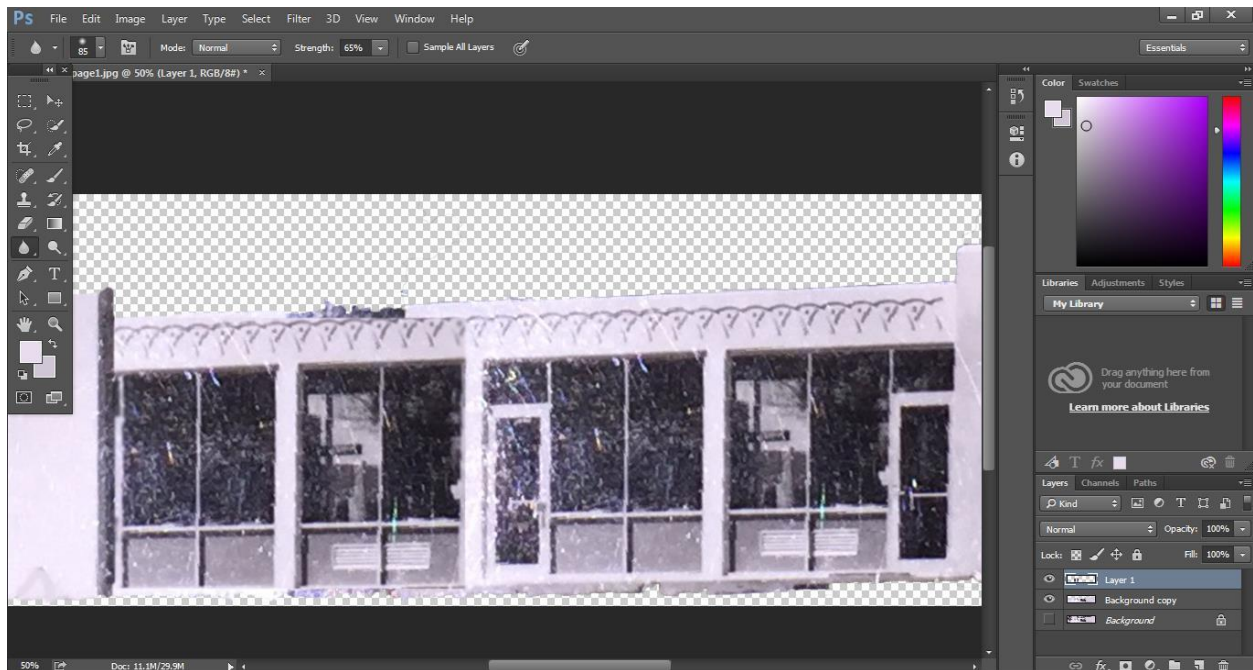


17. Click **ctrl + V** to paste the picture. Select the **Move Tool** on the left sidebar, pointed out below. Move the object over the area of interest and your picture will look something like the one below.

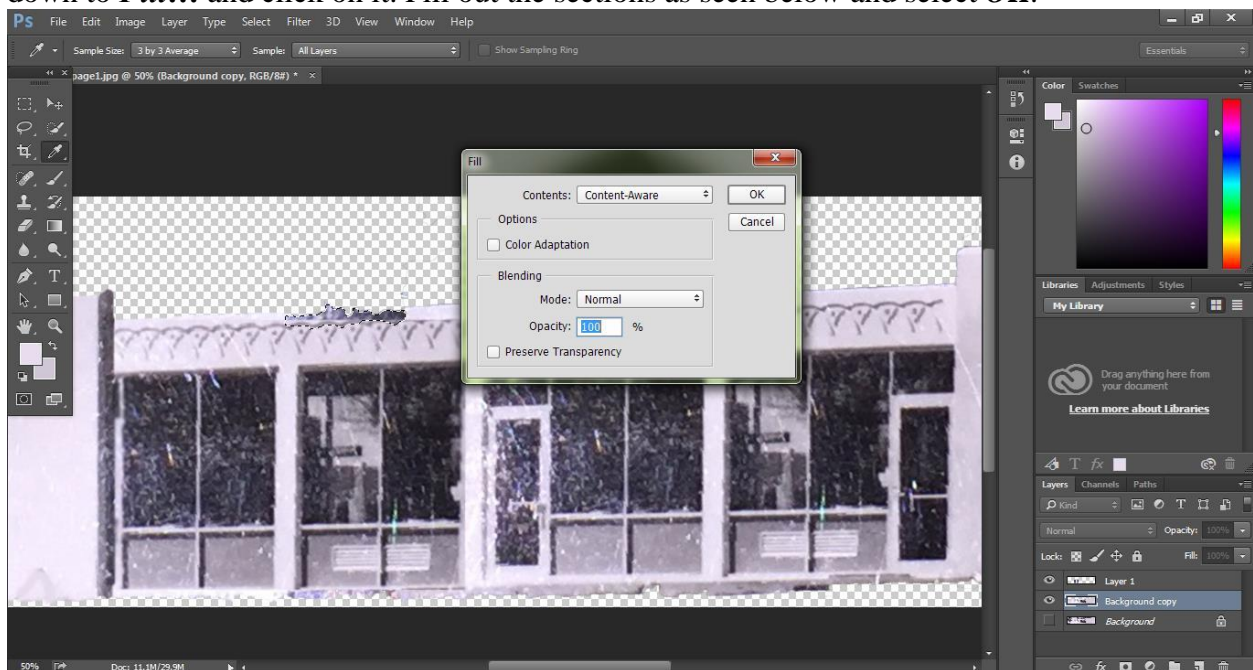


18. As you can see, there are defined lines on the picture. Click the Blur Tool and blur the edges of the piece moved. Your picture may now look like the one below.

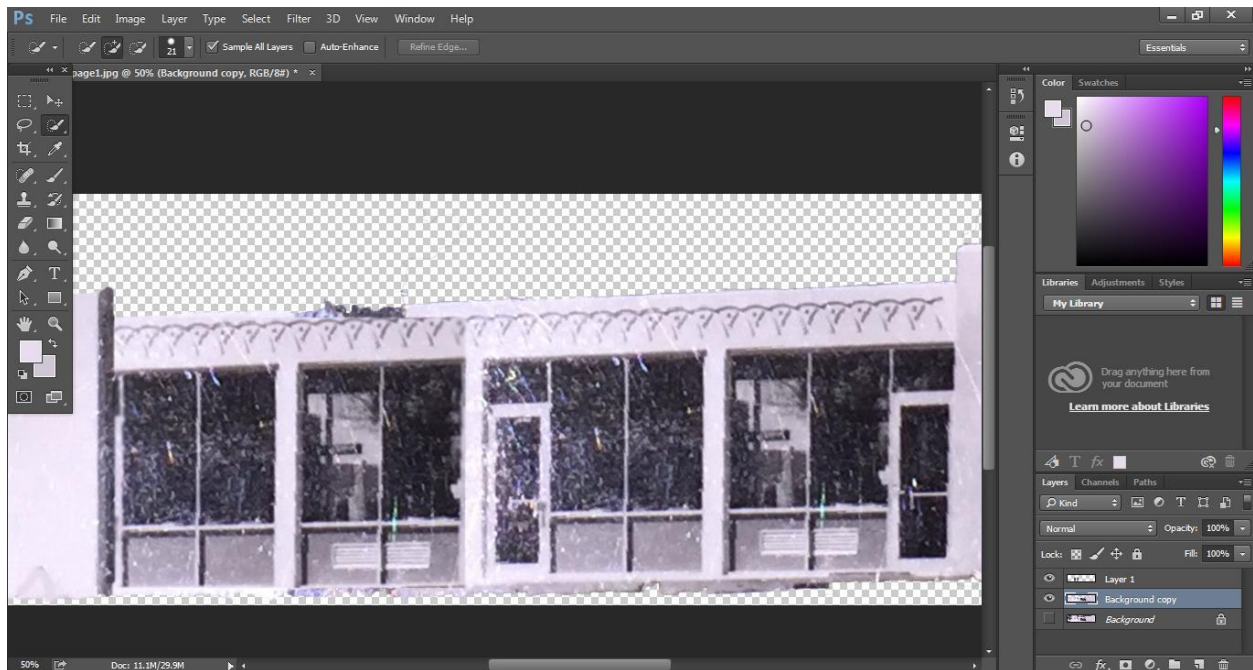




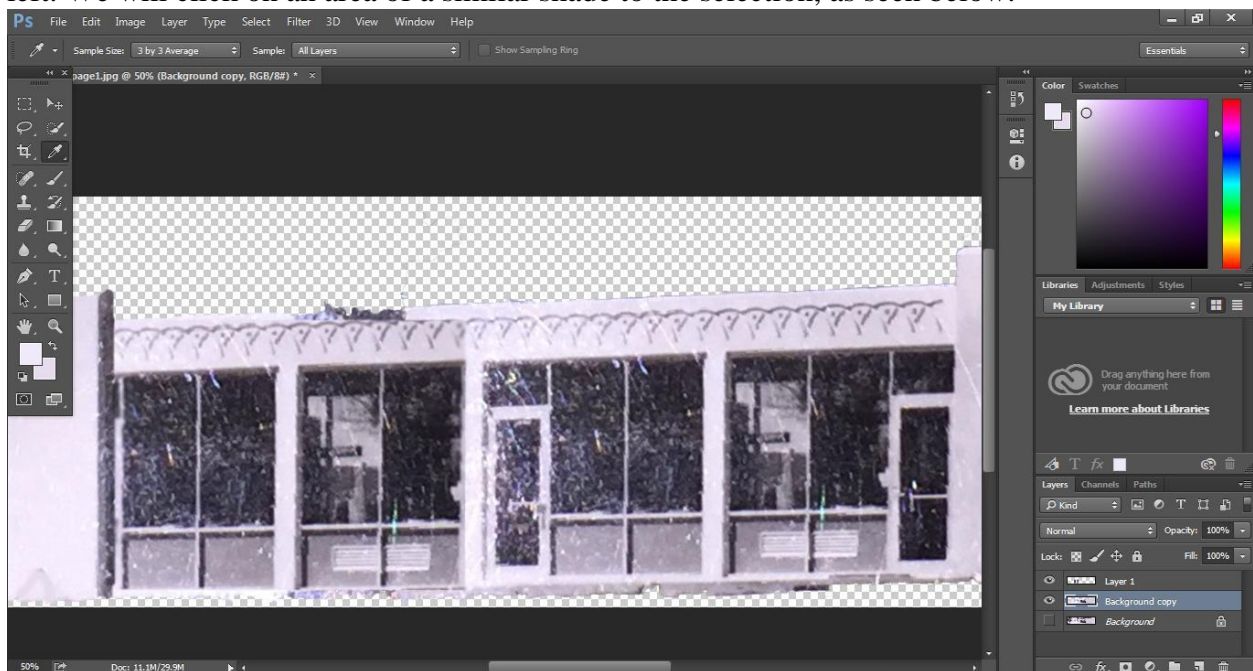
19. There is still a piece of the tree. To remove it, we will use the **Quick Selection** process. Click the **Quick Selection** button. Select the **Background Copy** layer in the bottom right hand corner. Select the area of interest, in this case: the tree. Next, click on **Edit** in the top bar. Scroll down to **Fill...** and click on it. Fill out the sections as seen below and select **OK**.



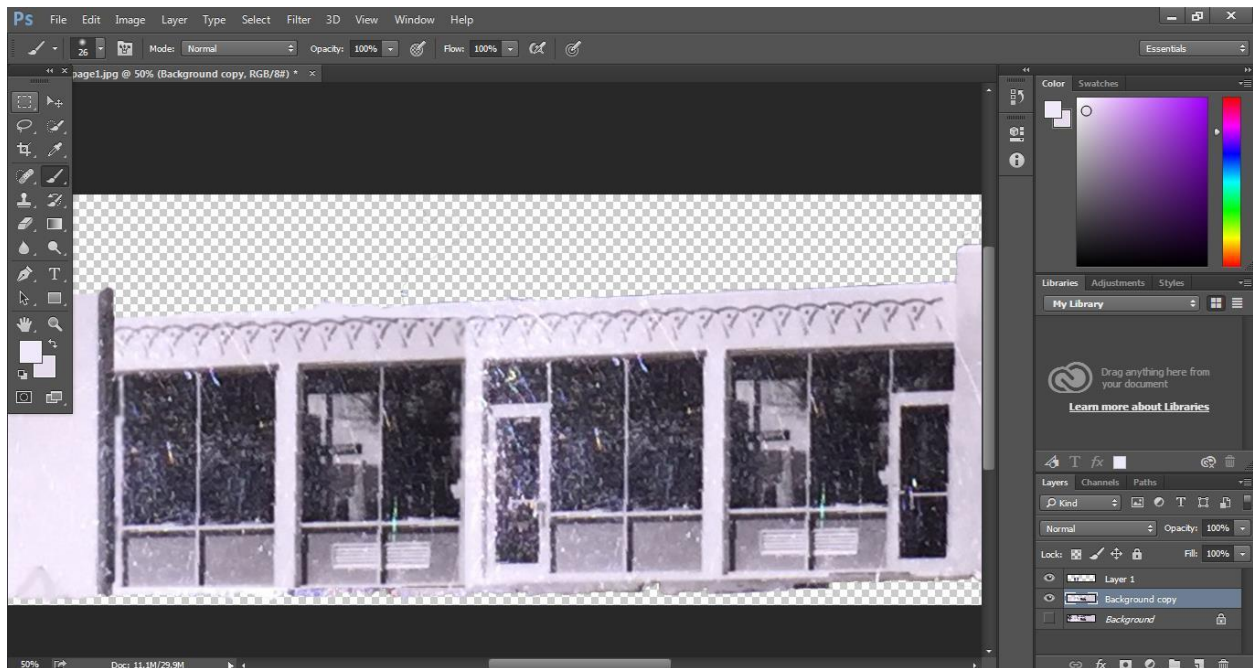
20. Click on Select in the top bar and scroll down to **Deselect**. Click on **Deselect** and your picture may look like the one seen below. As you can see, the tree is still seen at the top.



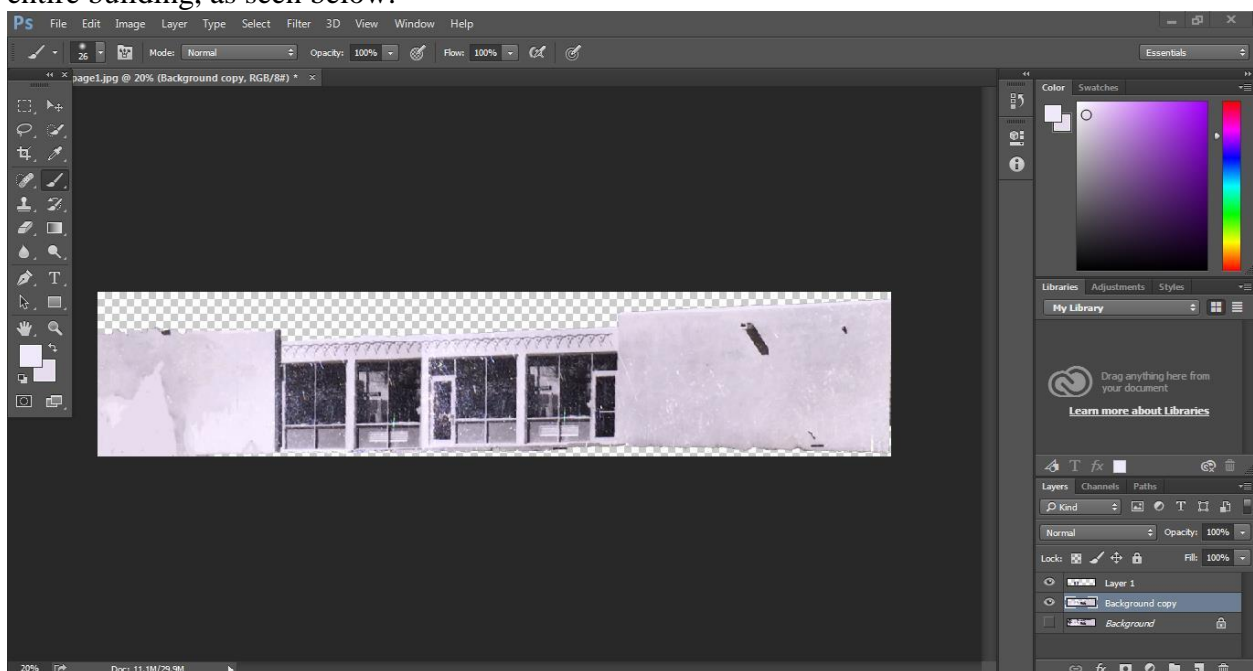
21. To fix this, we may want to try to paint over the area. Select the ***Dropper*** in the sidebar to the left. We will click on an area of a similar shade to the selection, as seen below.



22. Click on the ***Paintbrush*** and begin painting the areas of concern. The results will look as follows:

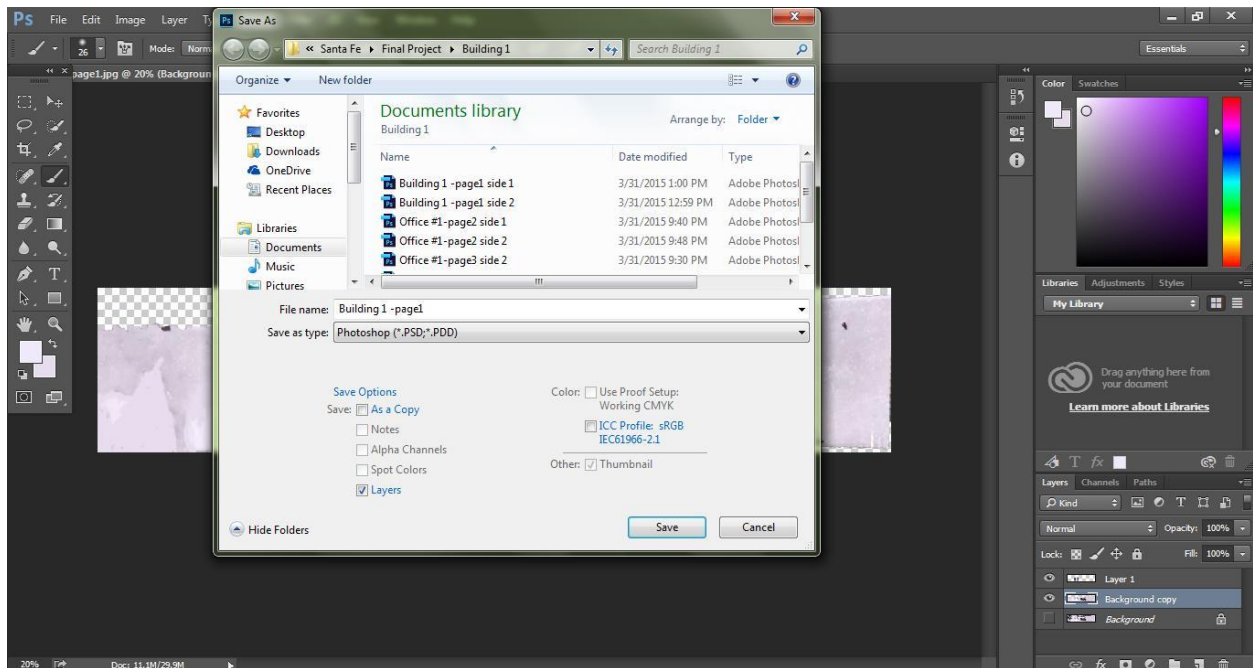


23. Go to the bottom left corner of the page and adjust the percentage until you can see your entire building, as seen below.

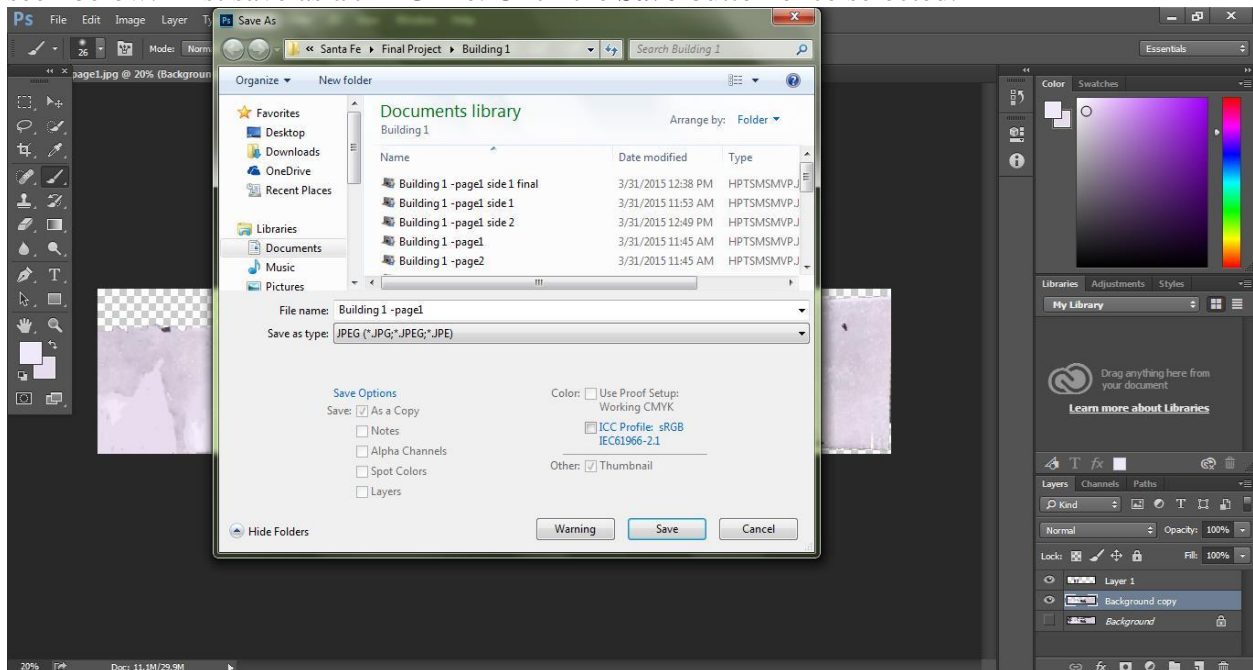


24. Your building is complete. Go to the top bar, select **File** and scroll down to **Save As...**, click it. A menu will pop up as seen below. First save as a Photoshop file. Click the **Save** button once selected.





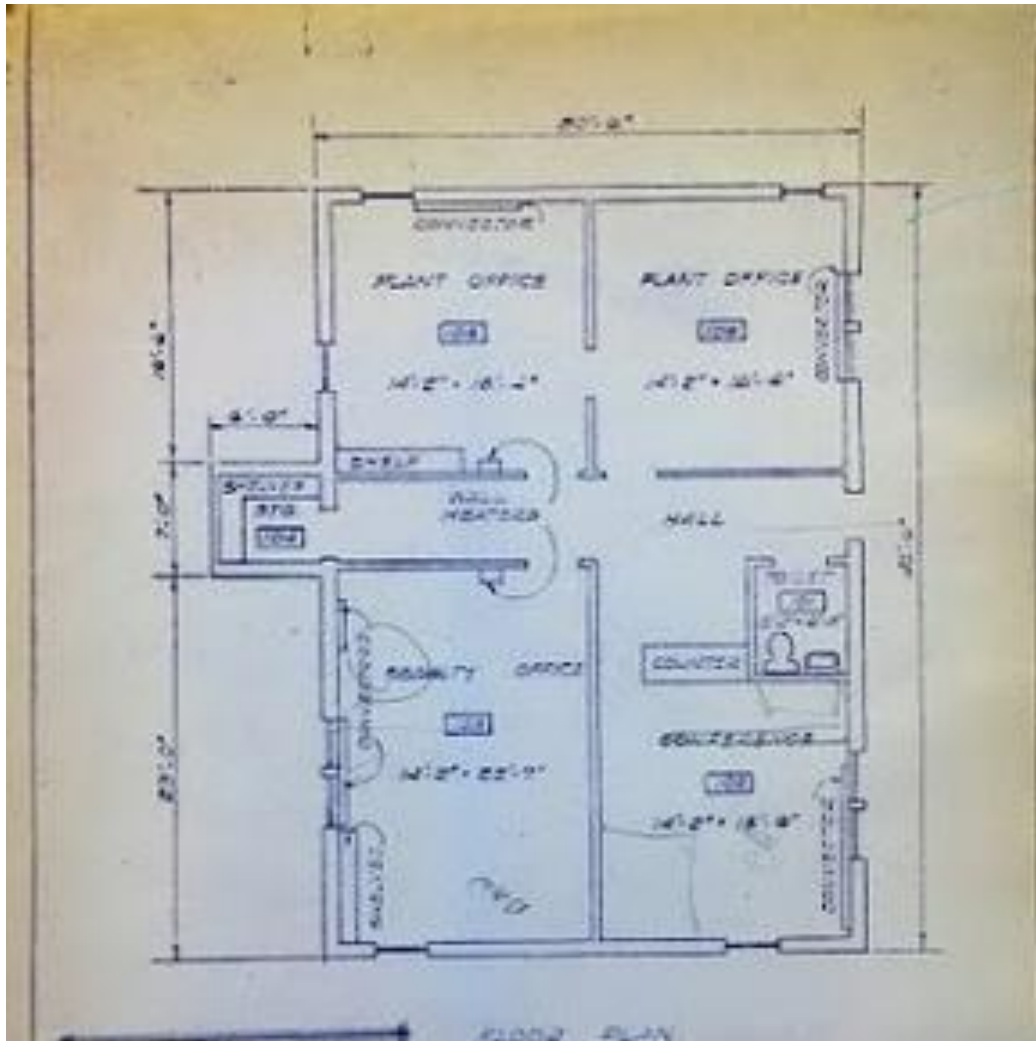
25. You should also save the photo as a JPEG for more uses. This is a standard image. To do this, go to the top bar, select **File** and scroll down to **Save As...**, click it. A menu will pop up as seen below. First save as a JPEG file. Click the **Save** button once selected.



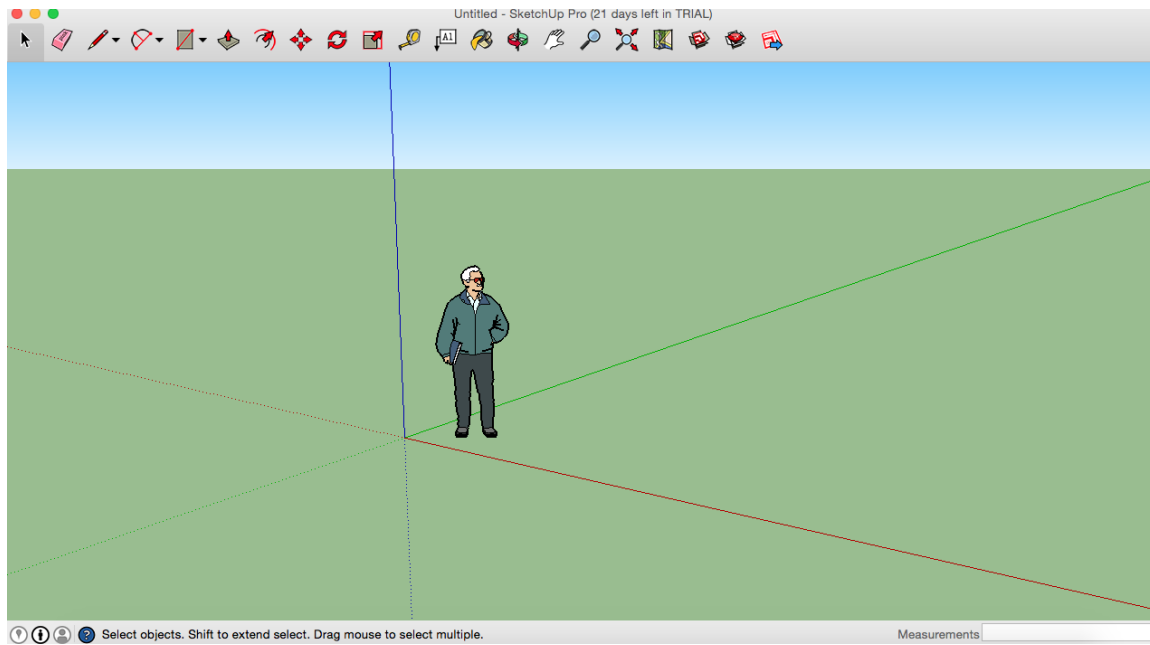
## Appendix B: SketchUp Manual

### Creating the Two Dimensional Drawing

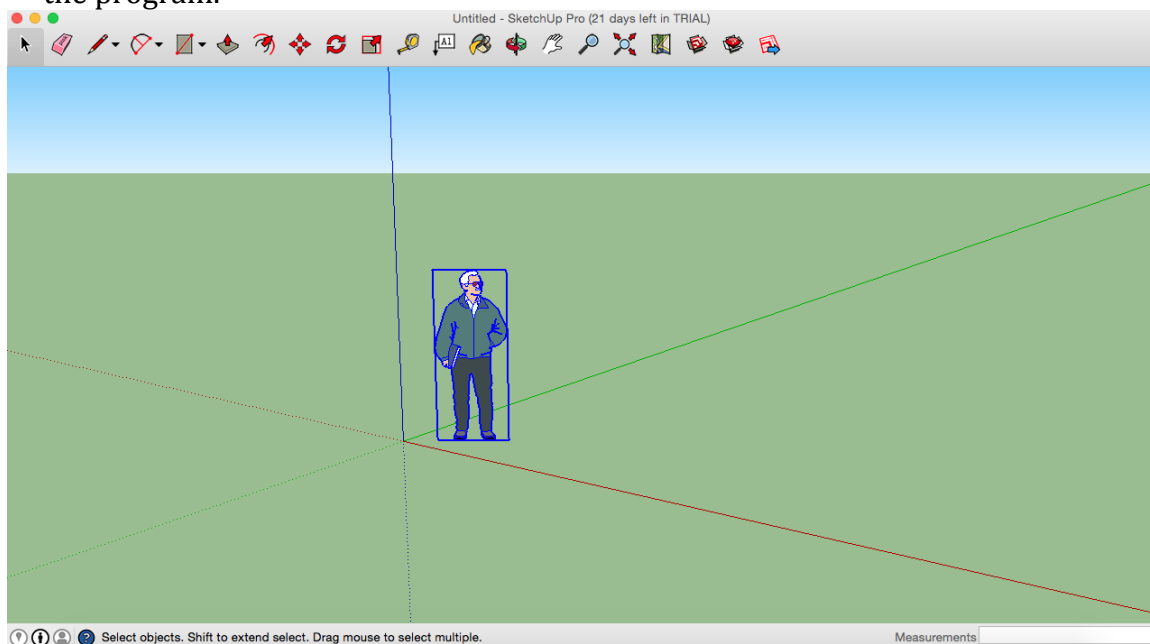
For the purpose of this manual, the process of creating a single building will be detailed. When utilizing SketchUp to create a two-dimensional drawing of a building, it is important to first begin with a blueprint to come up with the dimensions for the outer perimeter.



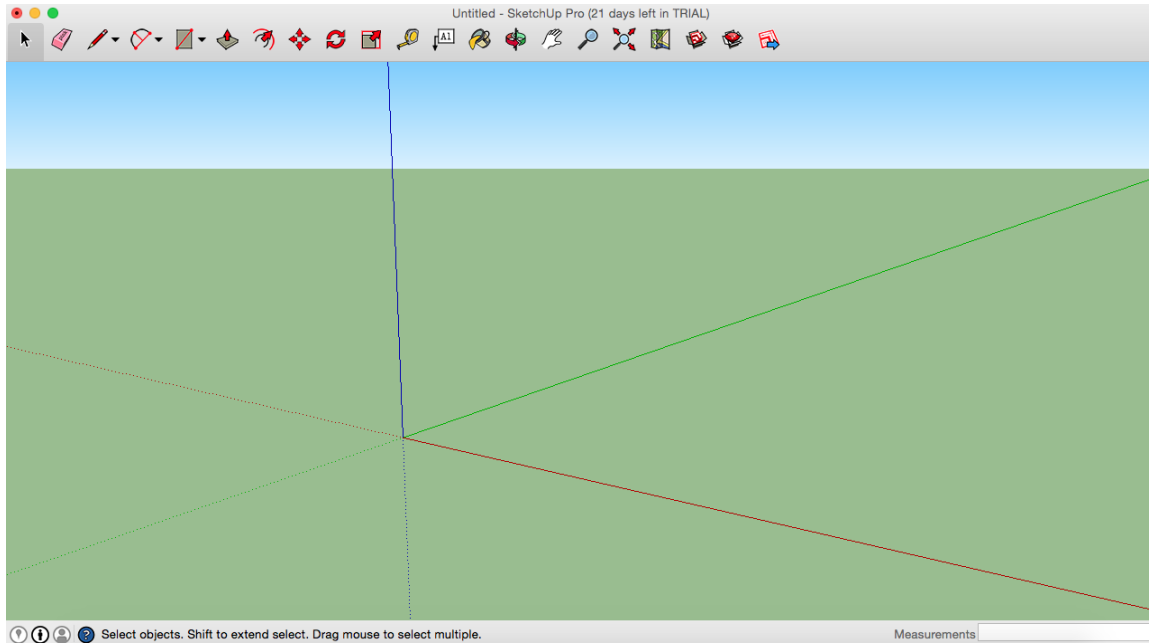
This figure shows the architectural blueprint of the Institute of American Indian Arts Counseling Center, referred to as building 307. The measurements given in this blueprint will help with creating the initial two-dimensional drawing. When opening SketchUp to create a new drawing, the following screen will appear:



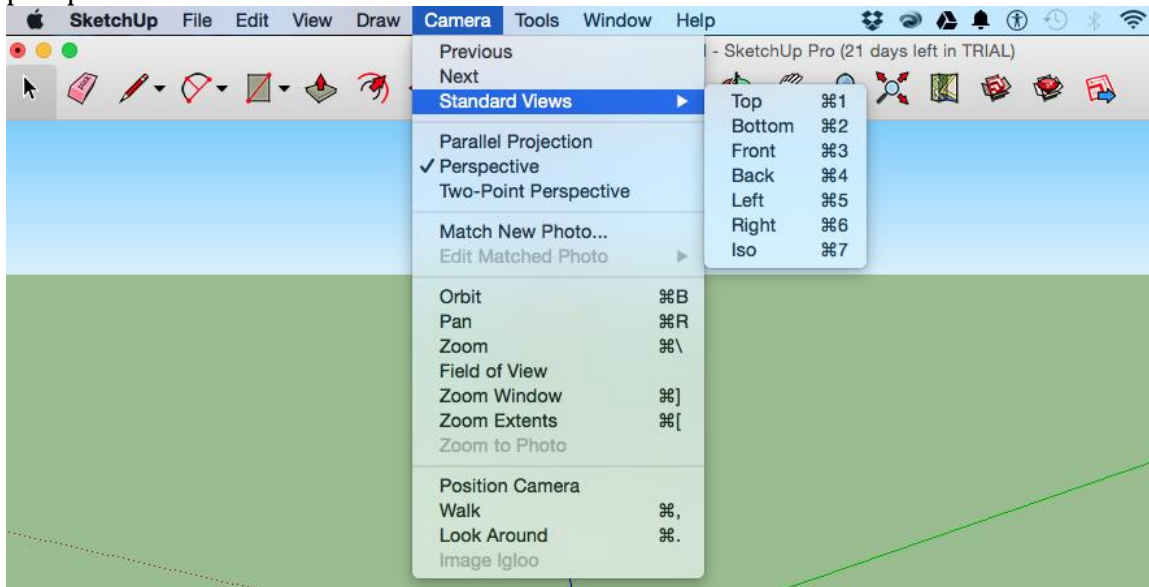
1. This is the standard screen for SketchUp. To begin, delete the male figure that appears in the program.



2. Once the figure is highlighted, it can be deleted.

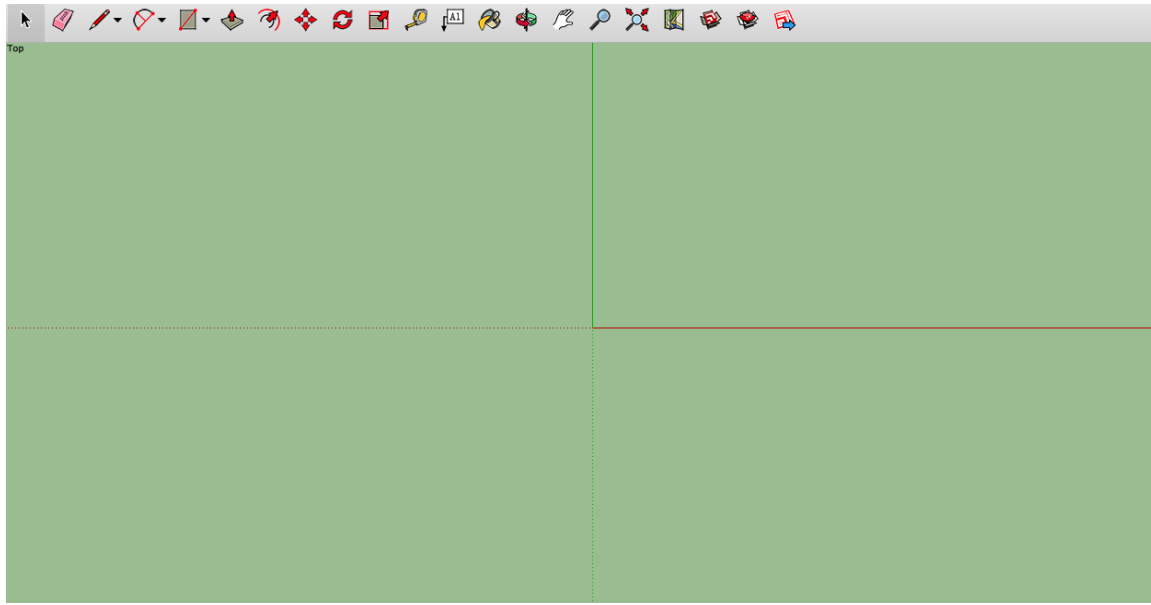


3. To begin the drawing, the view of the program should be changed to a top down perspective.

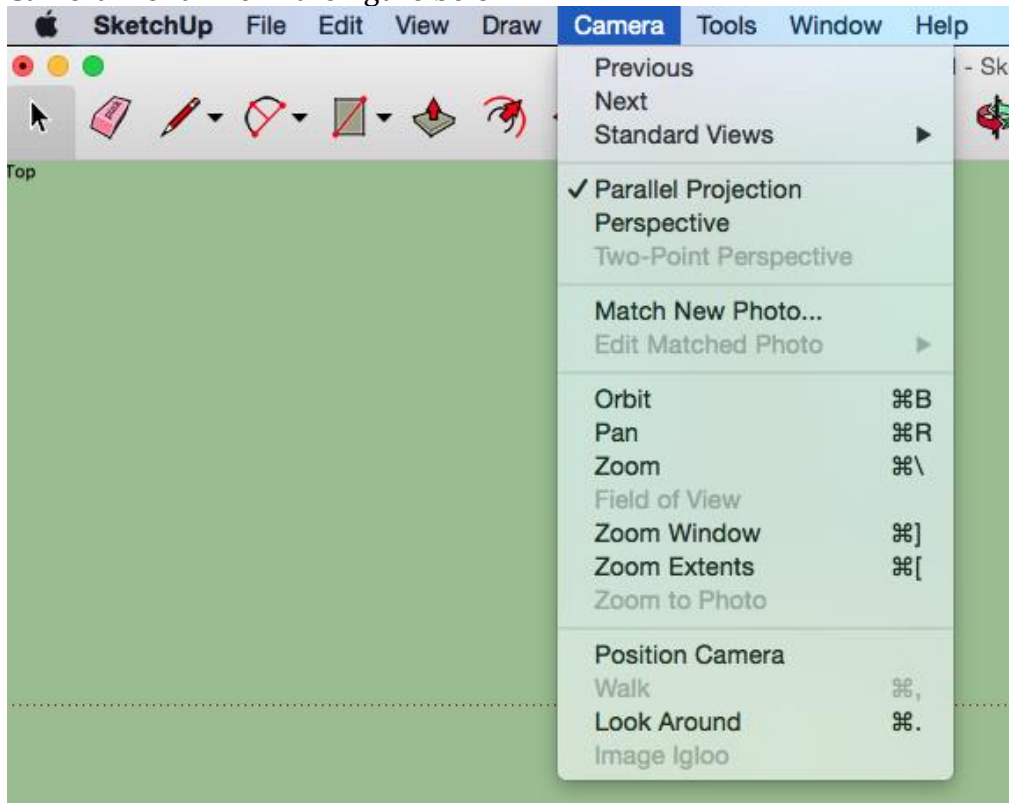


4. This can be done by going into the Camera Menu, going to Standard Views menu, and selecting "Top". The screen will change from three dimensions to two dimensions like in the figure below.

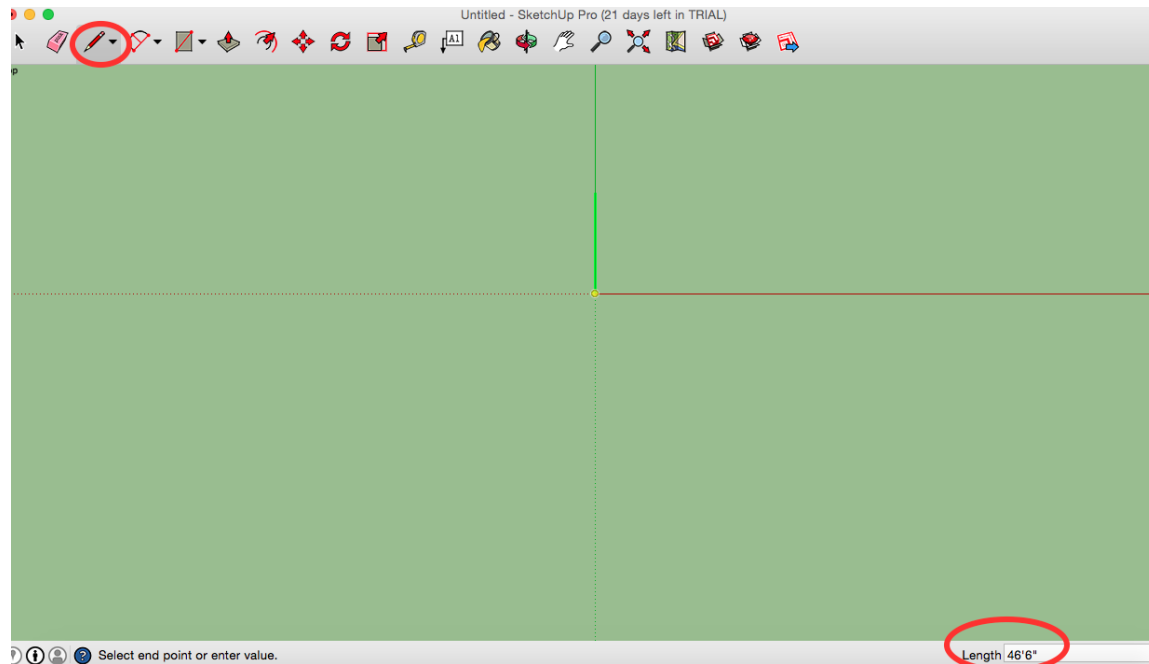




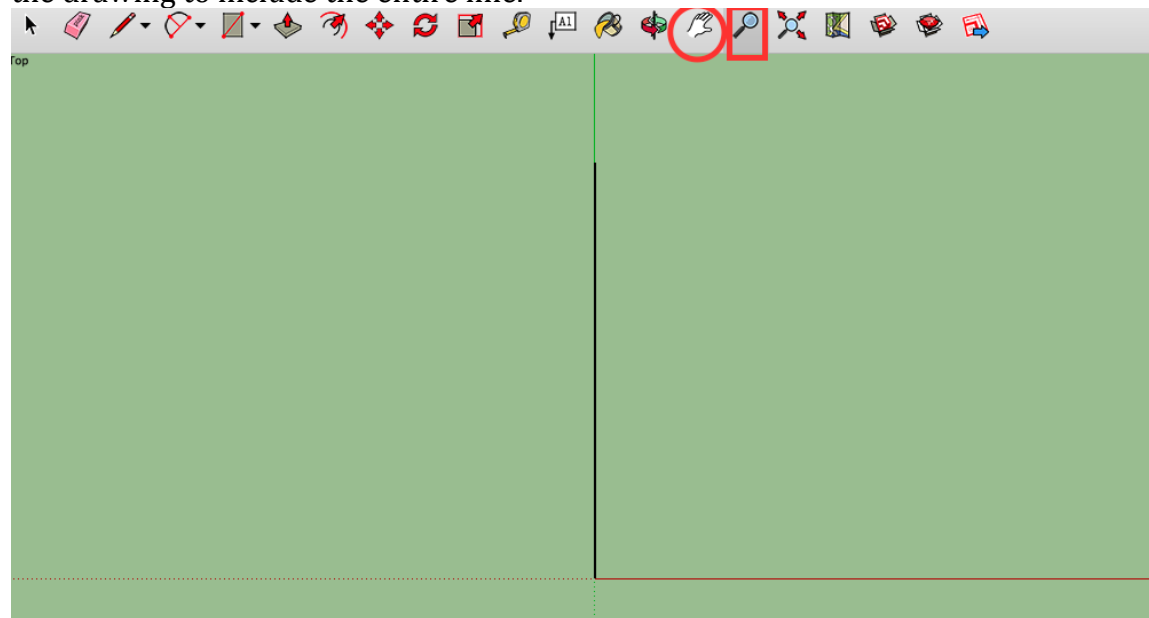
5. The Camera should also be changed from Perspective to Parallel Projection within the Camera Menu like in the figure below.



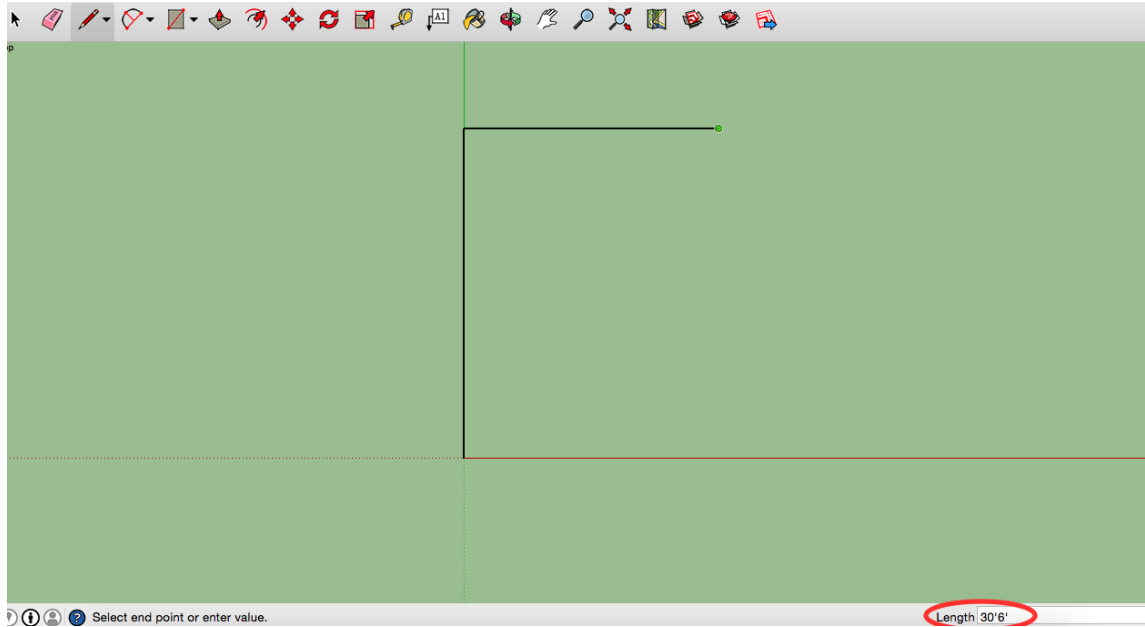
6. Using the Line tool in the top left corner, pick the first point of line by clicking on a point. Move the mouse in the general direction that the line will go in. Using the Length dialog box, type in the desired measurement from the blueprint.



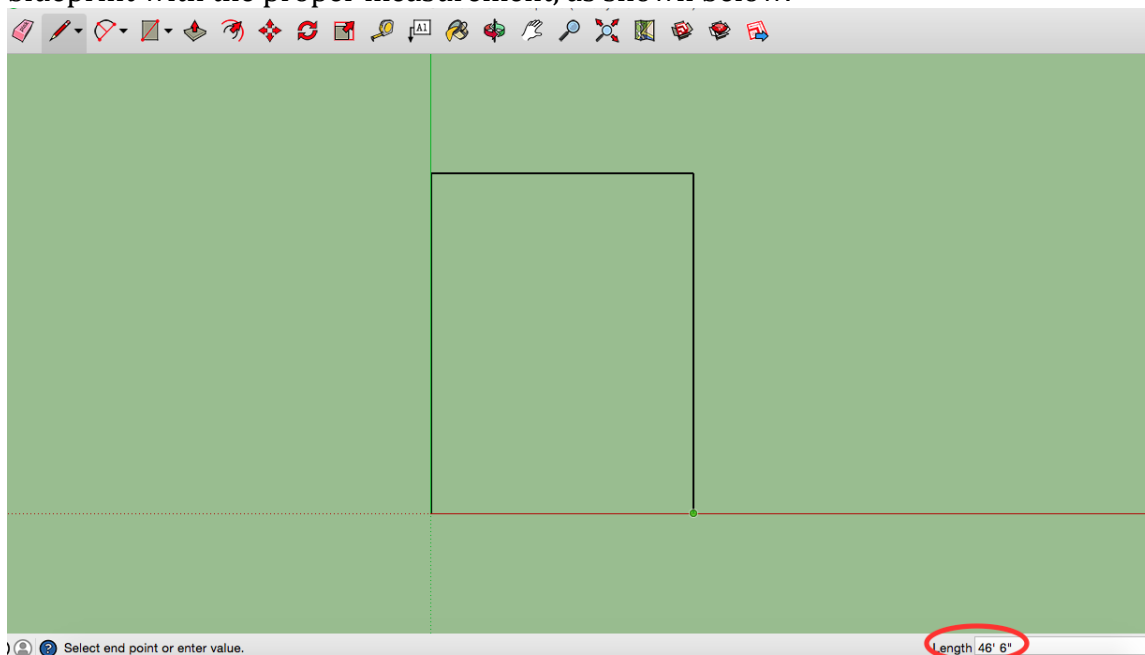
7. Using the Pan Option (the hand) for dragging the view of the drawing, as well as the Zoom Option (the magnifying glass) to control the zoom of the drawing, change the view of the drawing to include the entire line.



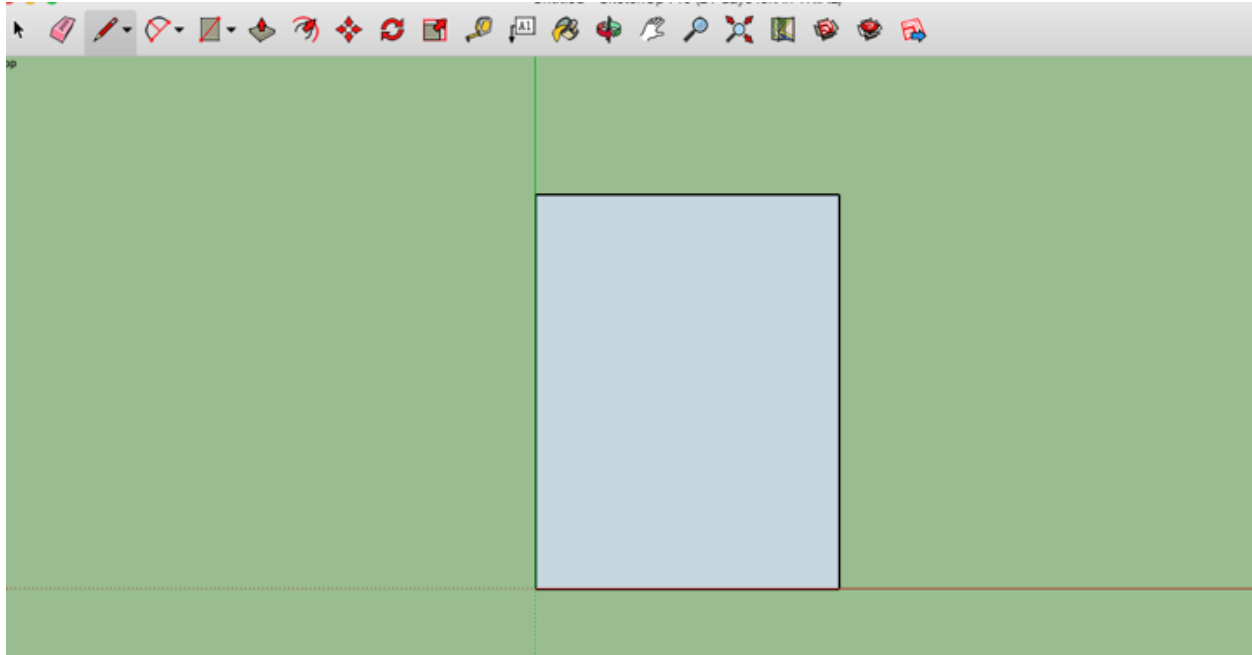
8. From end of the first line, create a second line to represent another portion of the blueprint with the proper measurement, as shown below.



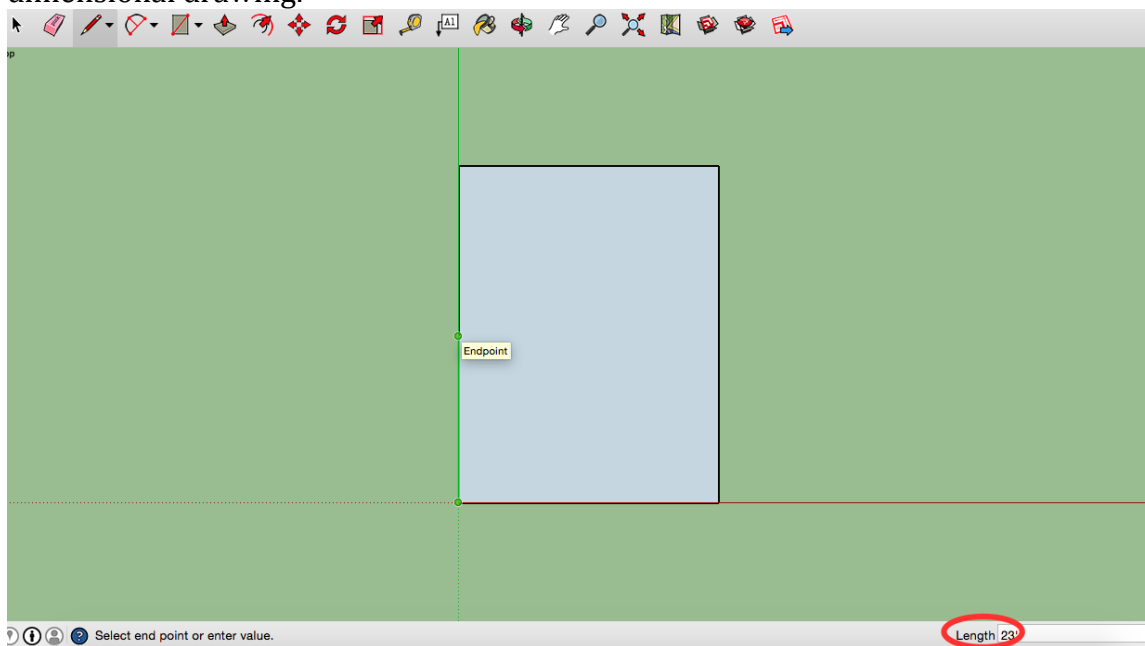
9. From the end of the second line, create a third line to represent another portion of the blueprint with the proper measurement, as shown below.



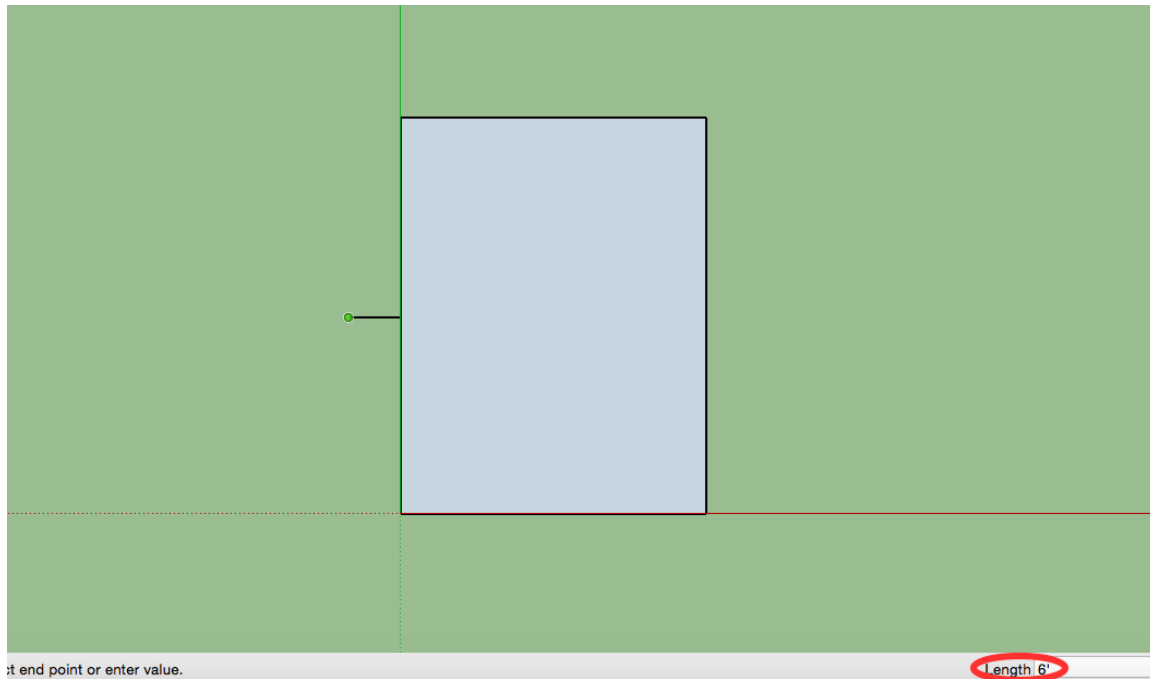
10. Connect the end of the third line to the beginning of the first line to complete the large portion of the building.



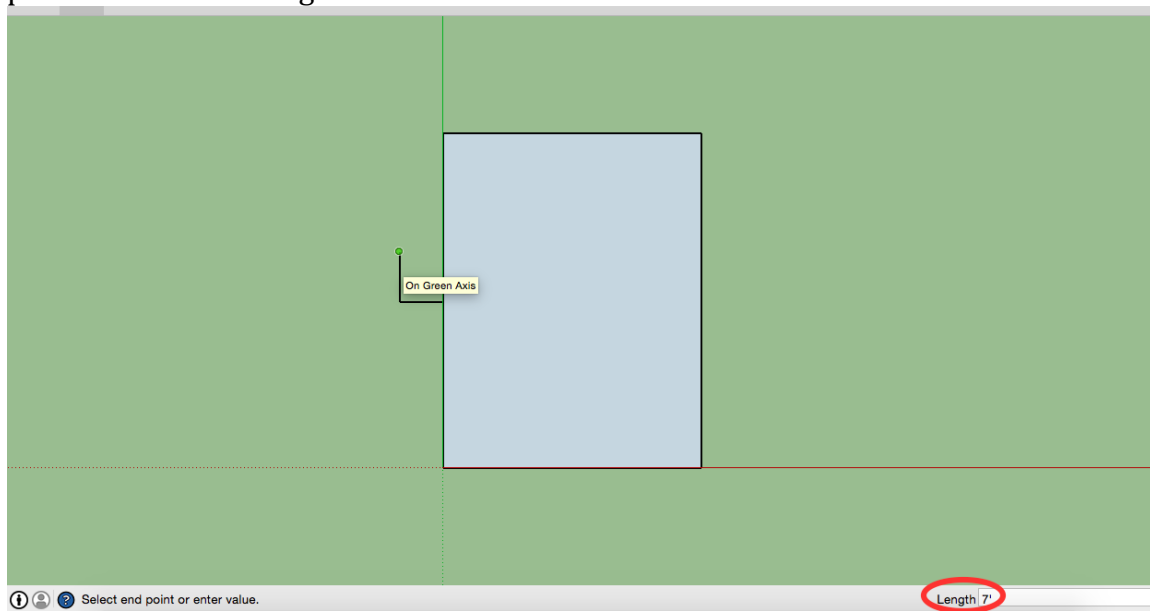
11. The box should be grey within the drawing. If it is not, then the drawing is not fully connected. Once this portion is created, it is time to create the smaller portion of the two-dimensional drawing.



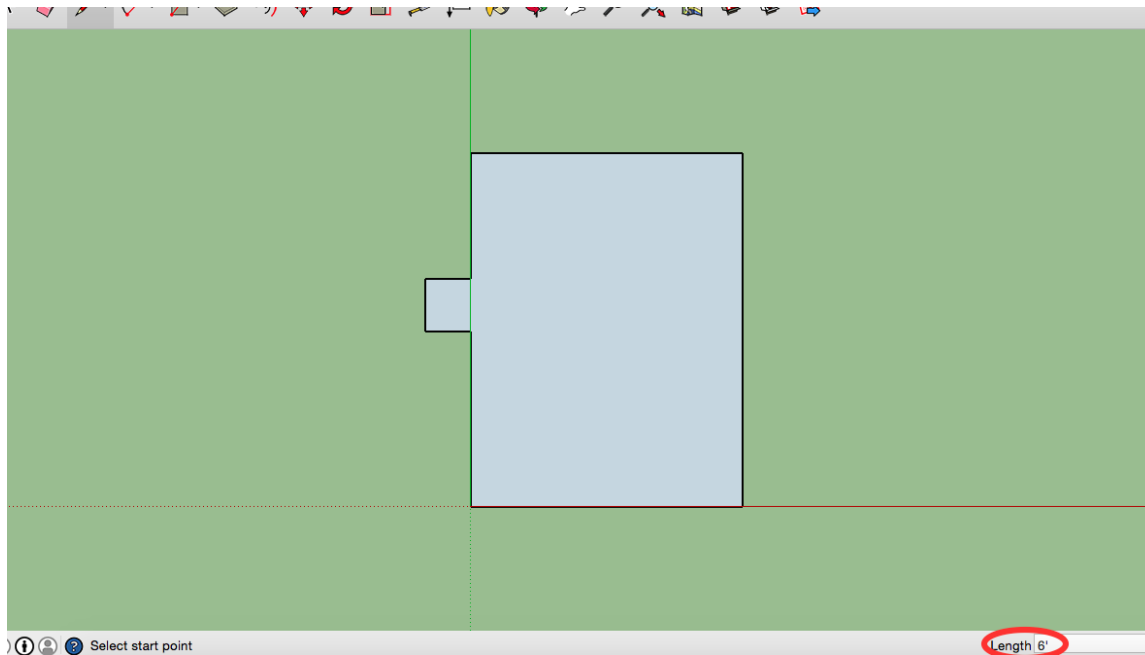
12. From the end of the line that was just created, begin to draw a new shape to represent the rest of the two-dimensional drawing.



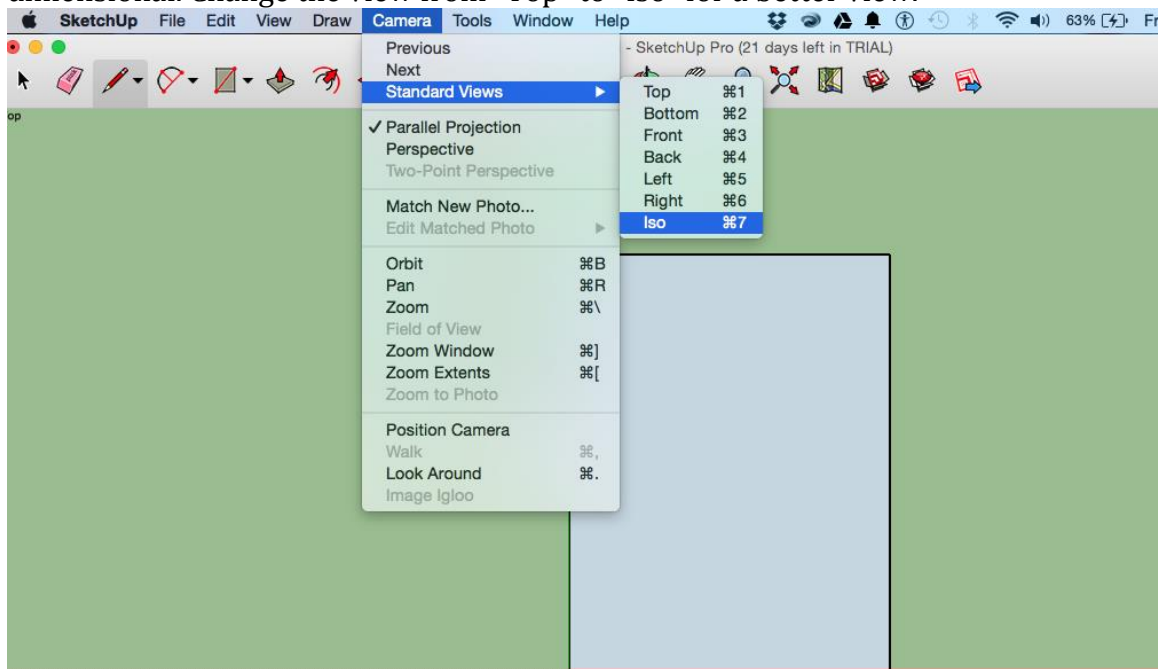
13. From the end of the line that was just created, draw the next line to represent the next portion of the building.

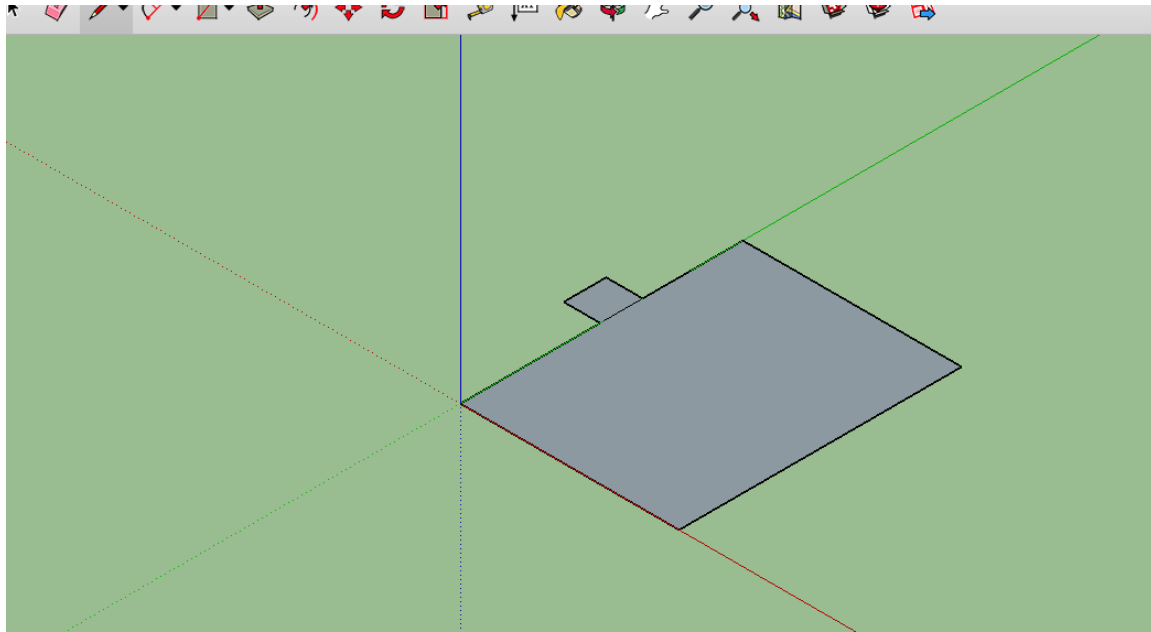


14. From the end of the last line, create a line that would complete the drawing like in the figure below.



15. Once the two-dimensional drawing is completed, it is time to begin making the three-dimensional. Change the view from “Top” to “Iso” for a better view.





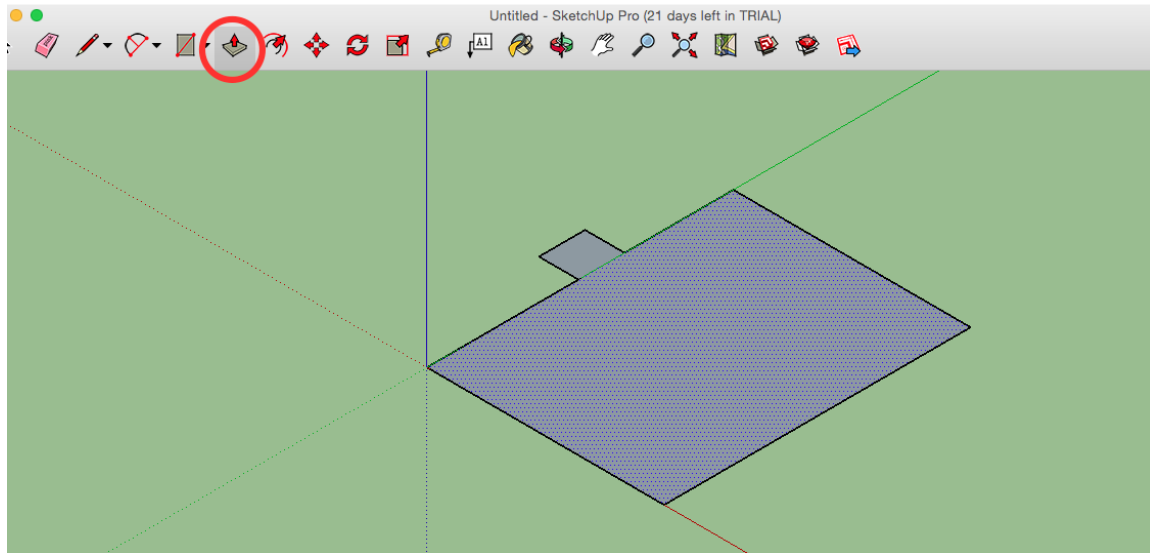
## Creating the Three Dimensional Model

Photos of the actual building are needed to determine the size of the extrusion of the three dimensional model.

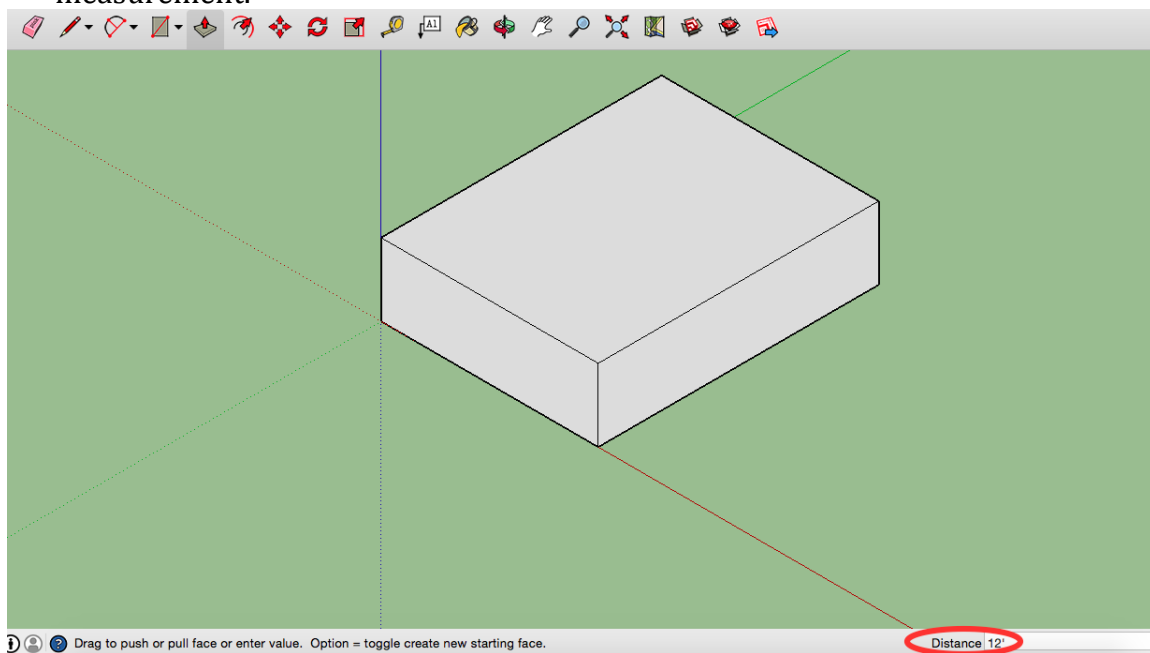


From the photo above, it can be determined that the building is one story tall, while the smaller portion is shorter than one story. It is assumed that one story equals 12 feet. In order to start creating the three-dimensional model, the Push/Pull feature must be used on the larger portion of the drawing.

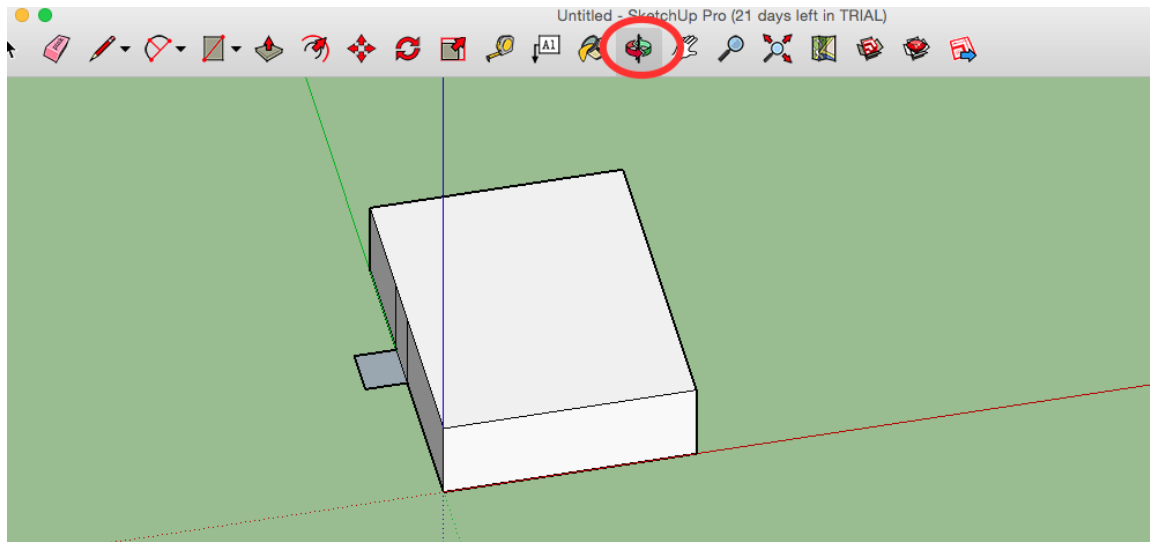




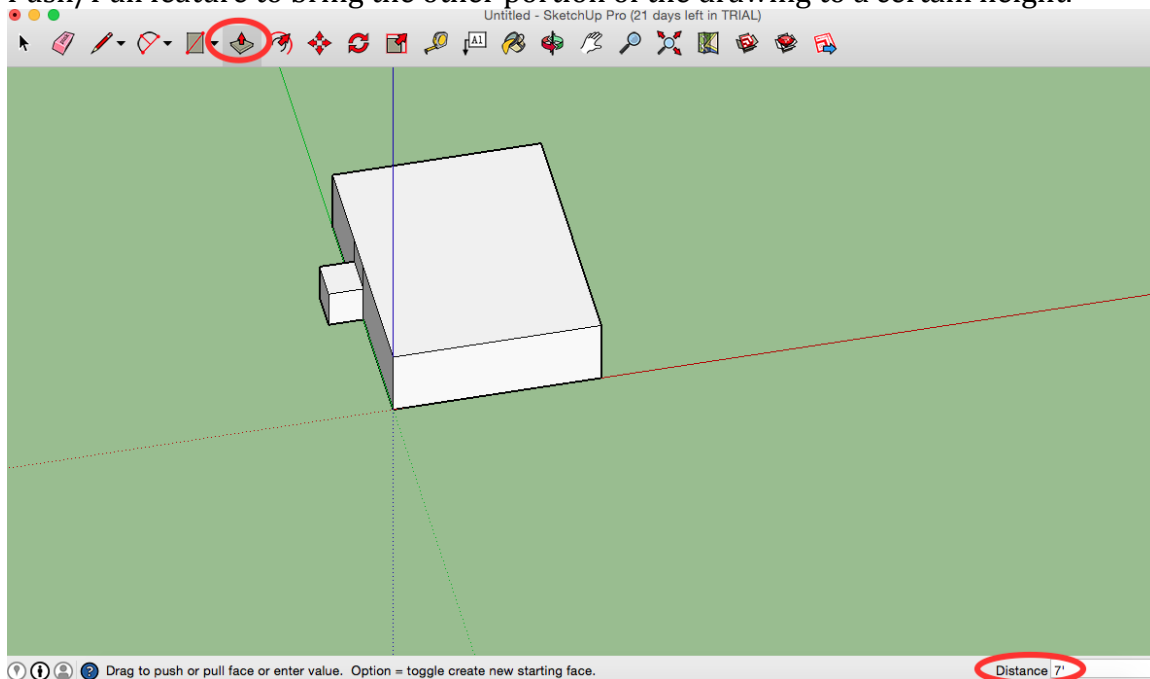
1. Once this portion is selected, use the Distance dialog box to type in the desired measurement.



2. In order to control the view of the drawing, use the orbit feature to rotate the drawing to bring the other portion into view.

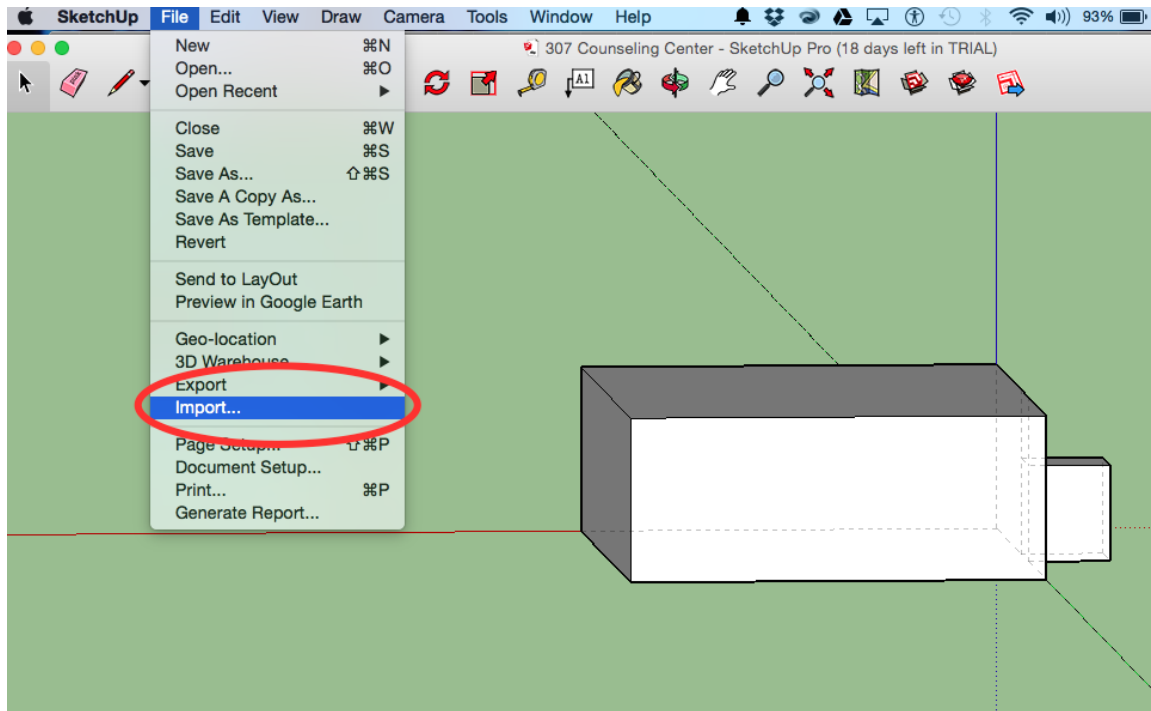


3. Since this portion is less than a story, the height will have to be estimated. Use the Push/Pull feature to bring the other portion of the drawing to a certain height.

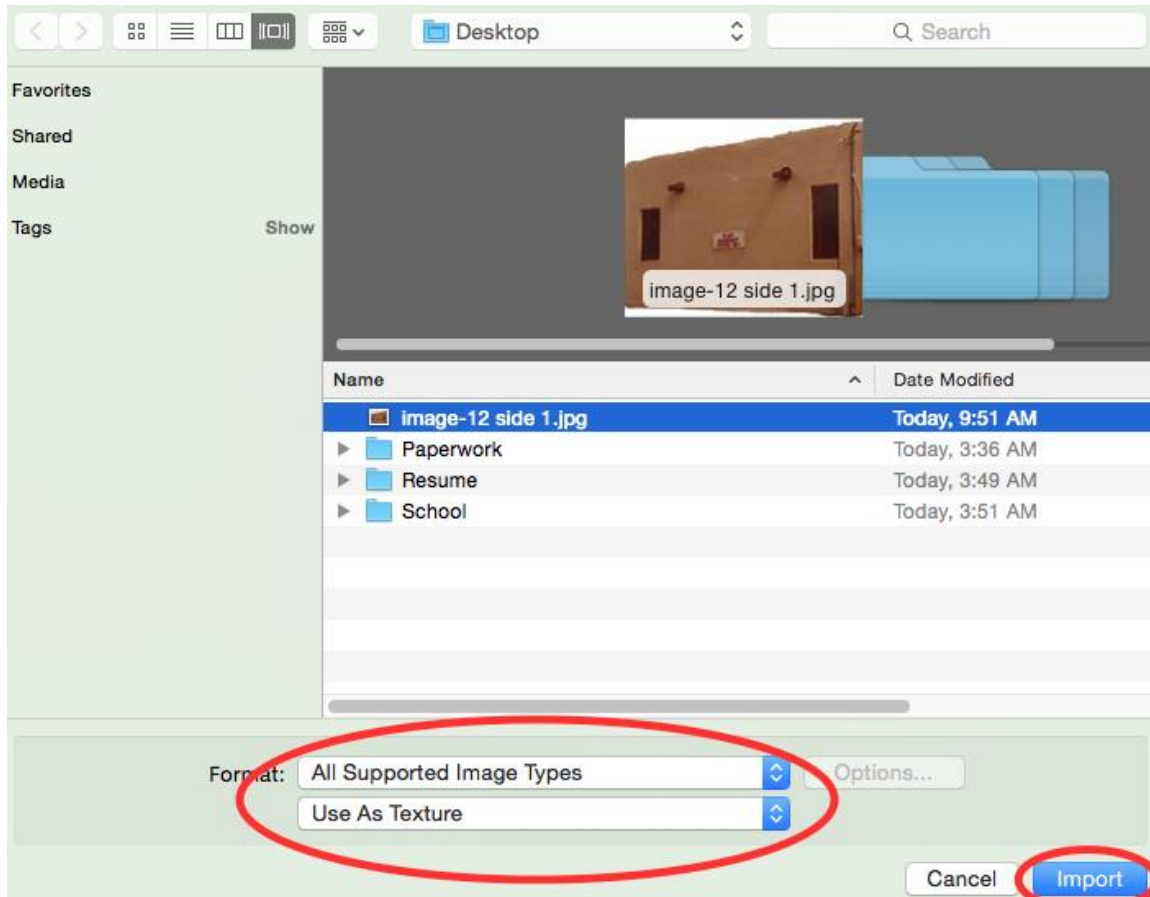


4. Once the model has been created, it is time to place the images on it to create the final product. To begin, click the import option in the file menu.

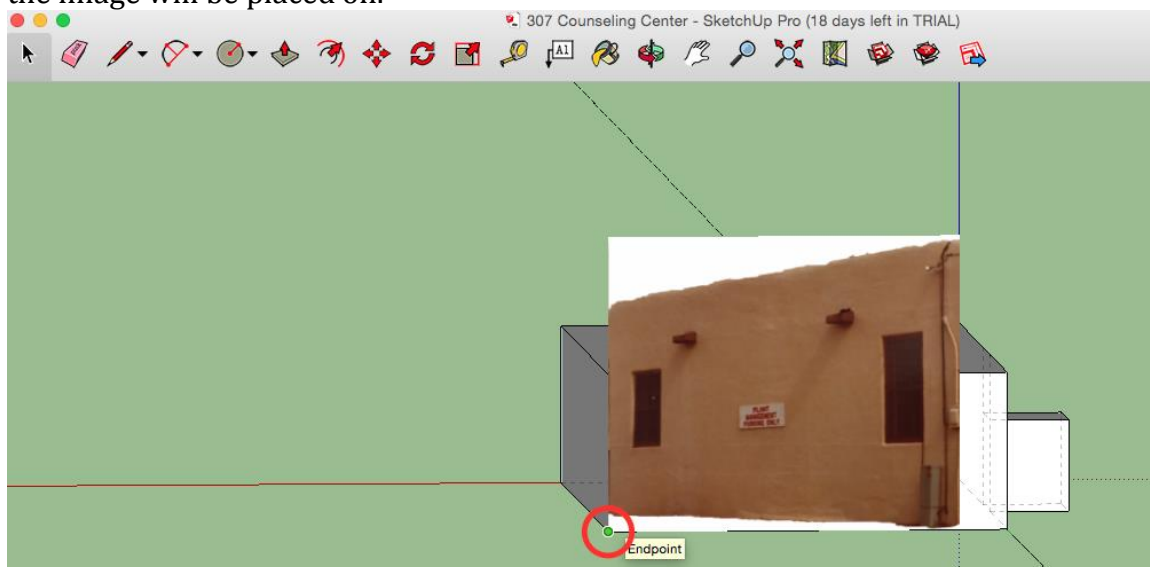
## Placing Textures on Building



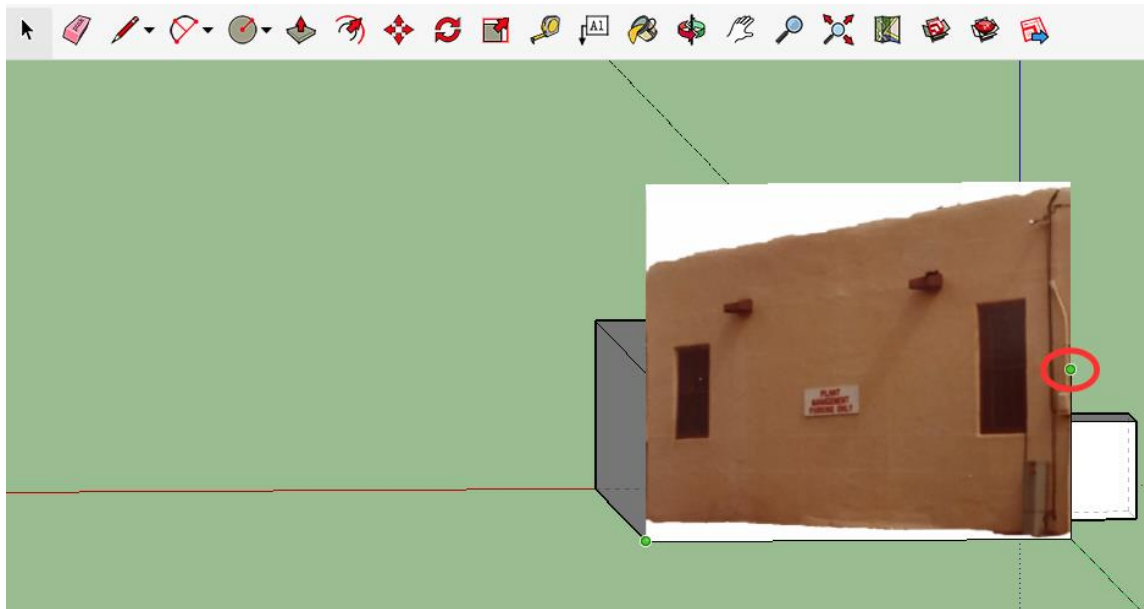
1. Once this is clicked, a menu will appear, showing the files on the computer being used. Within the menu, look for the image that will be used for a texture. Within the menu, there are two drop-down boxes. In the first box, which determines the format of the file being searched for, select the option “All Supported Image Types” to allow for the image to be a selectable option. In the second drop-down box, select the “Use As Texture” in order to be able to place the image on the building. Once this is done, click the “Import” button to bring the image into SketchUp.



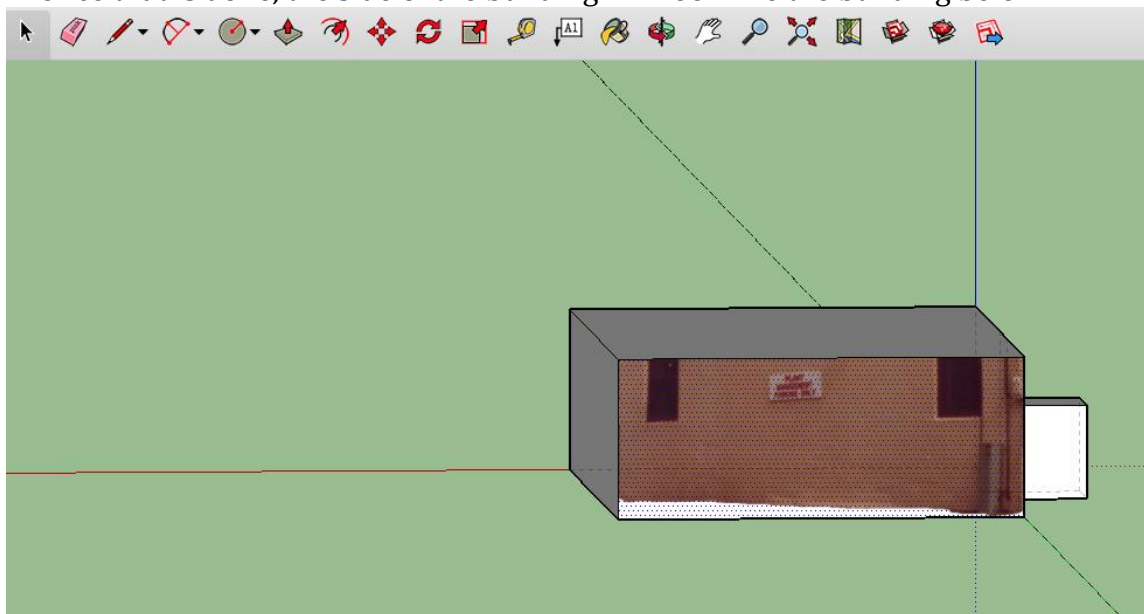
2. When the image is imported into SketchUp, click a corner of the side of the building that the image will be placed on.



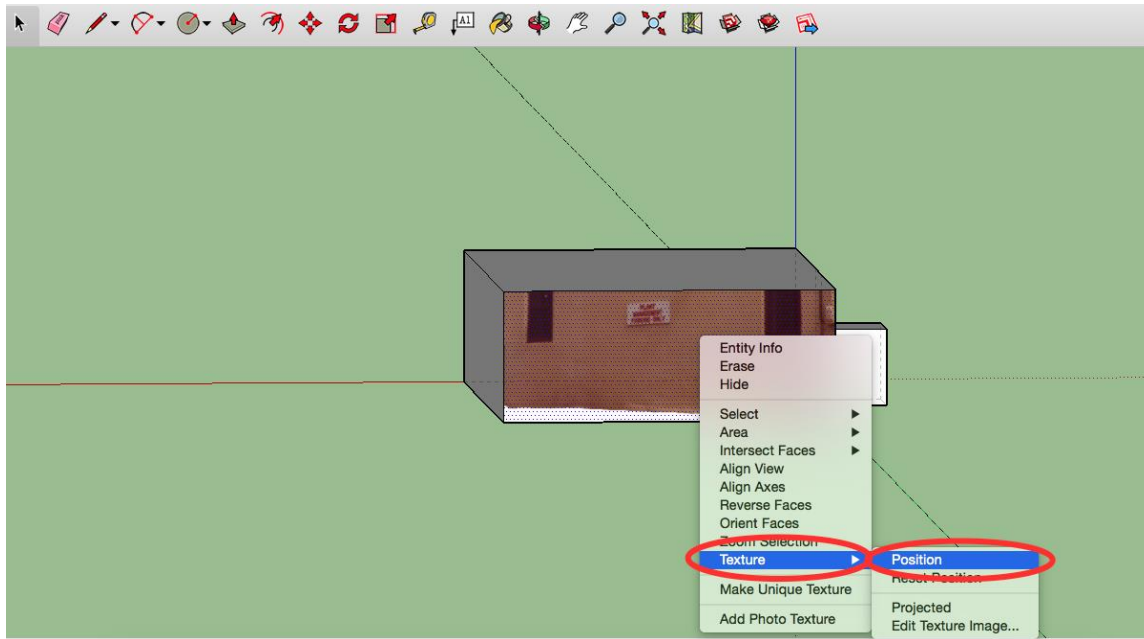
3. After selecting the first corner of the side, click the corner that is diagonal from the first one.



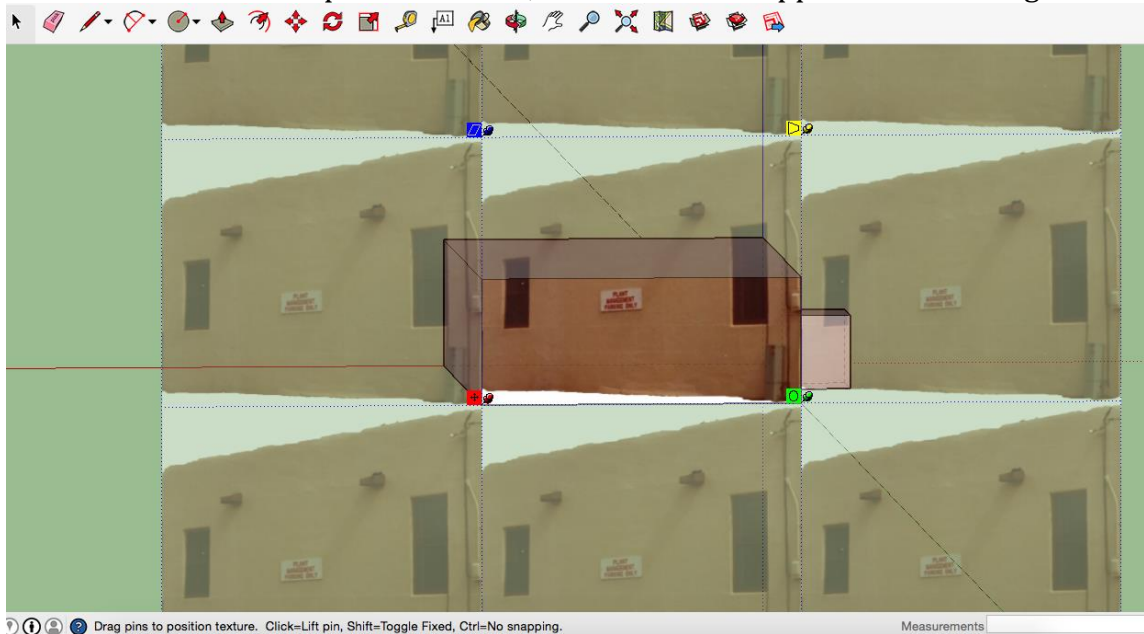
4. Once that is done, the side of the building will look like the building below.



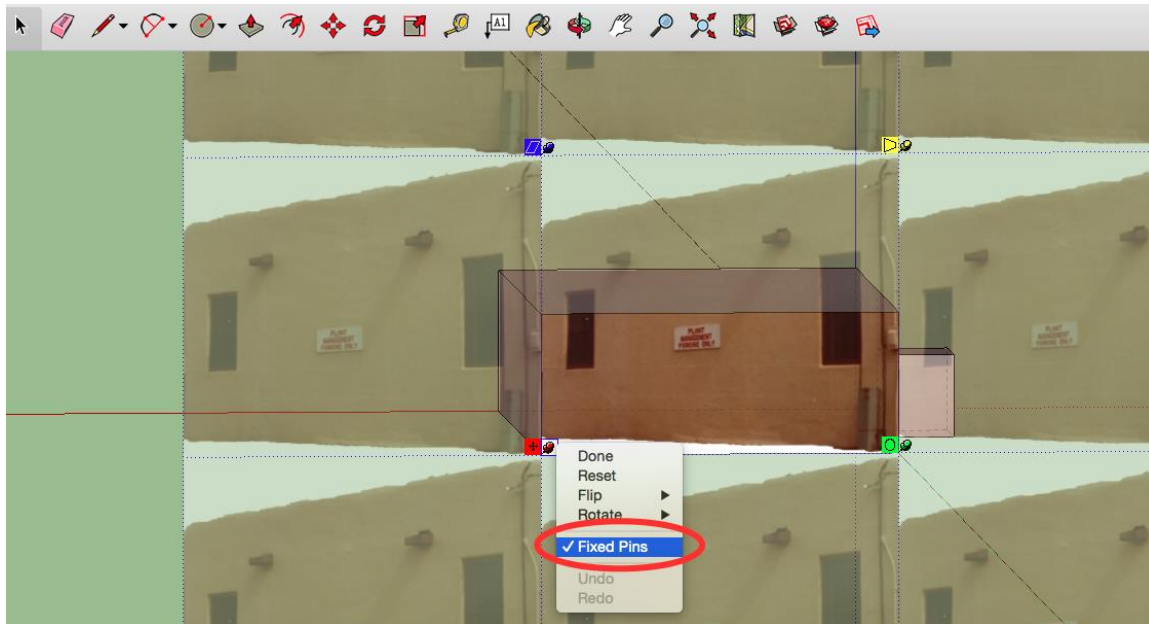
5. Notice that the image does not line up with the side of the building. In order to fix this, right click on the side of the building to make a menu appear. Within the menu, there is a "Texture" menu that will have the "Position" option.



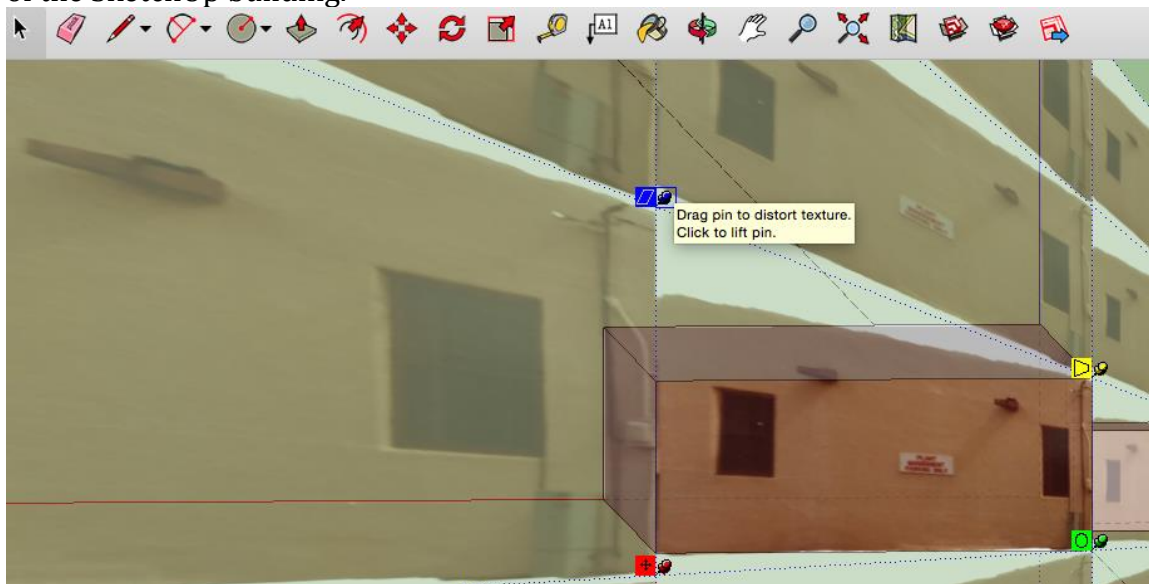
6. Once the “Position” option is clicked, a screen should appear like the image below.



7. In order to drag the image’s corners to make the image fit the building, the pins must be allowed to move freely. Right click on the pin open up a menu. Within the menu, there is an option for “Fixed Pins”. Make sure this option is unchecked.

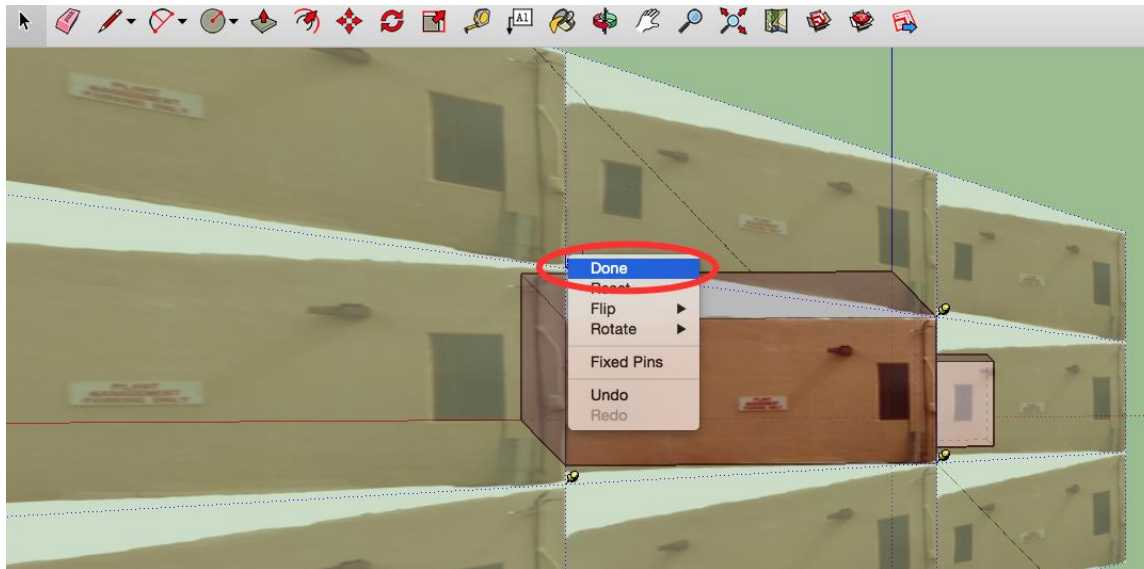


8. Drag each pin so that the corner of the building in the image matches up with the corner of the SketchUp building.

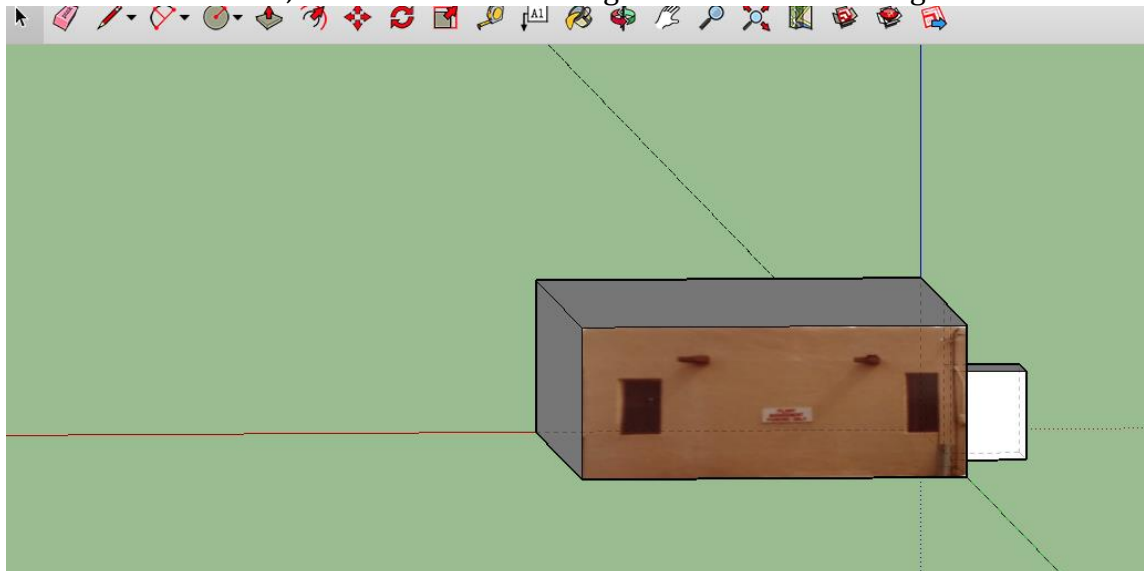


9. Once the image has been properly cropped onto the building, right click the image and select done.

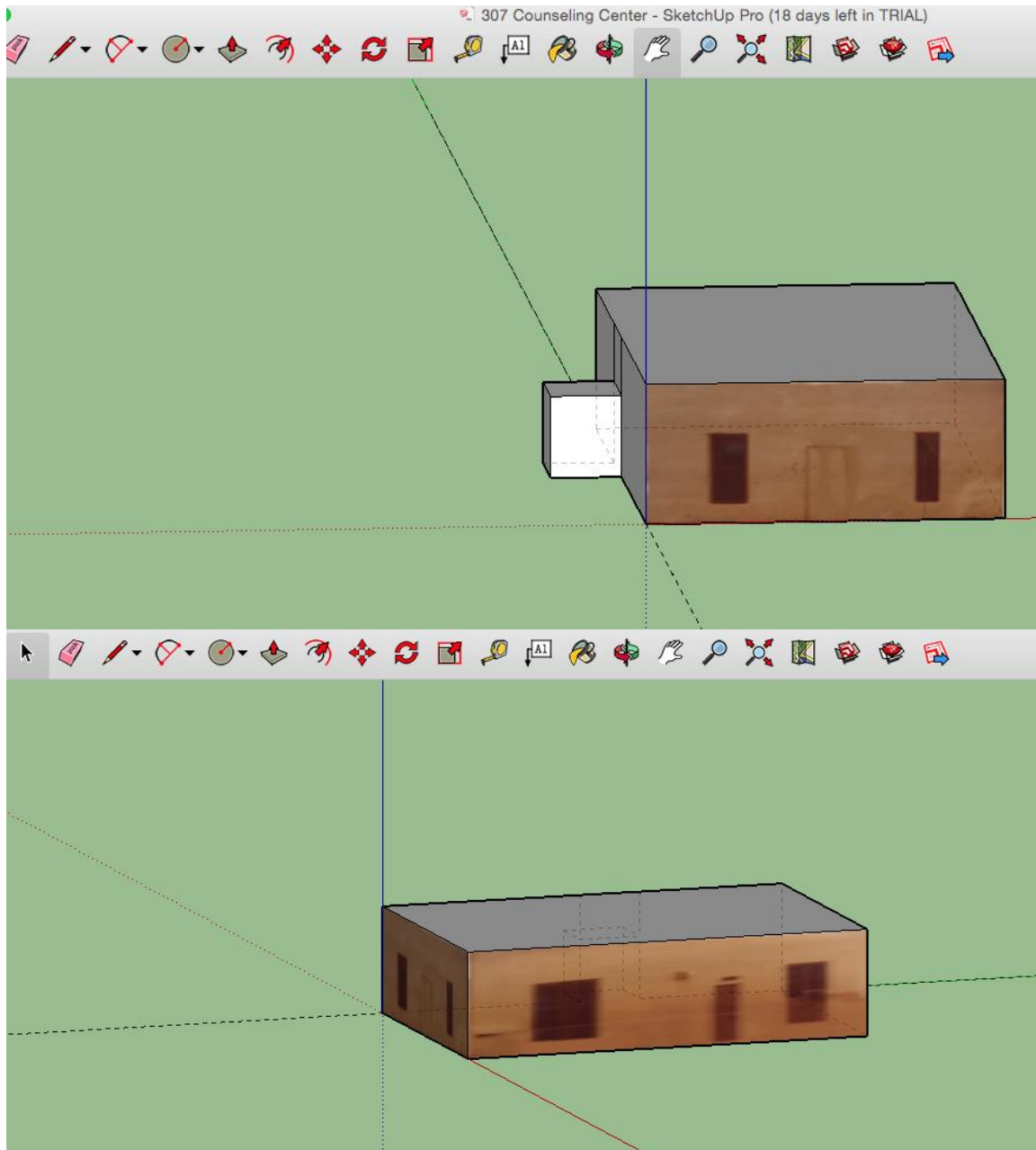


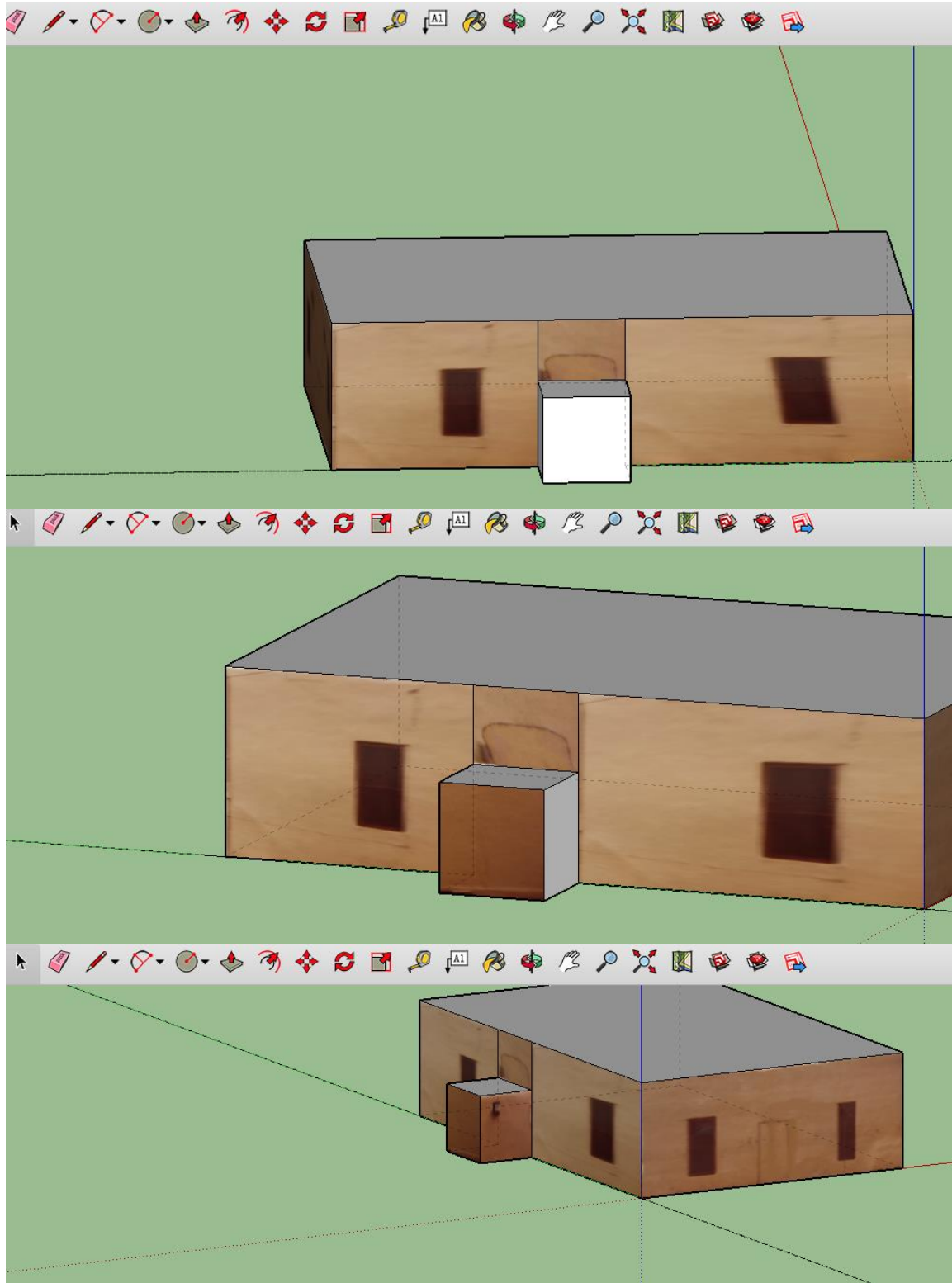


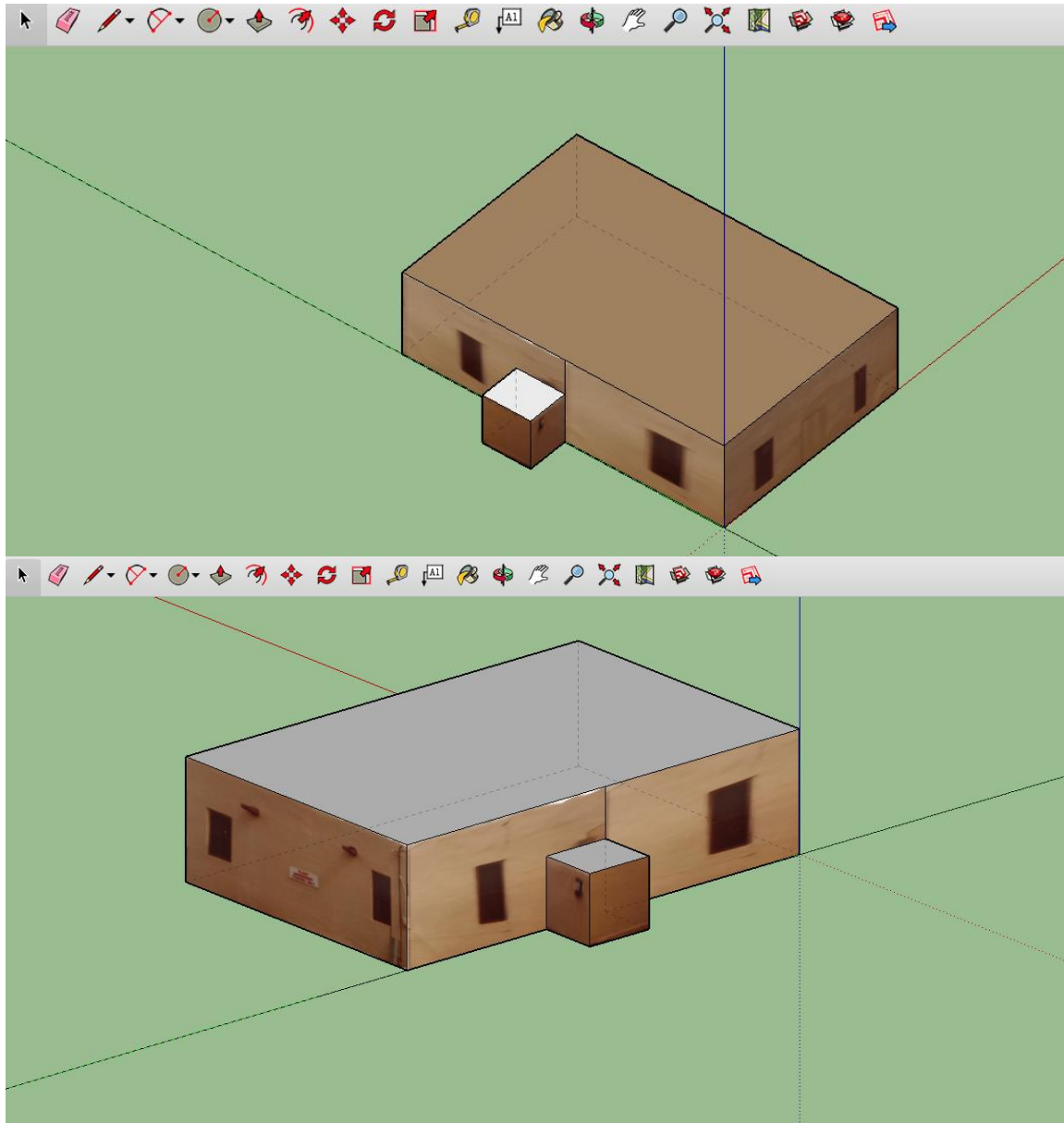
10. Once this is done, this side of the building will look like the image below.



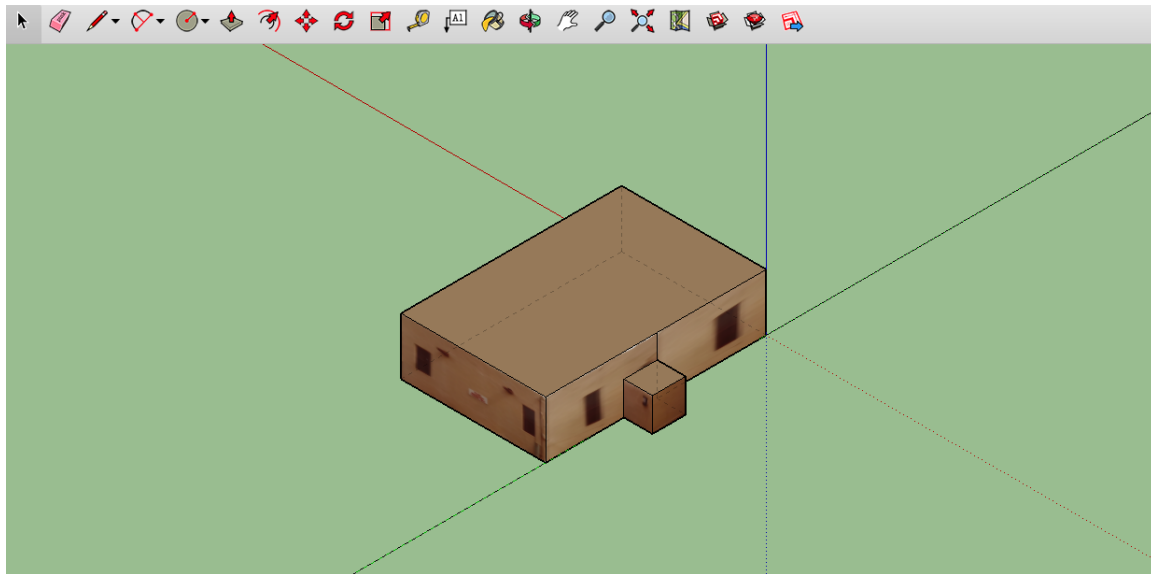
11. Continue the process of placing a texture on all of the walls of the building. Below are images of the rest of the walls with textures.



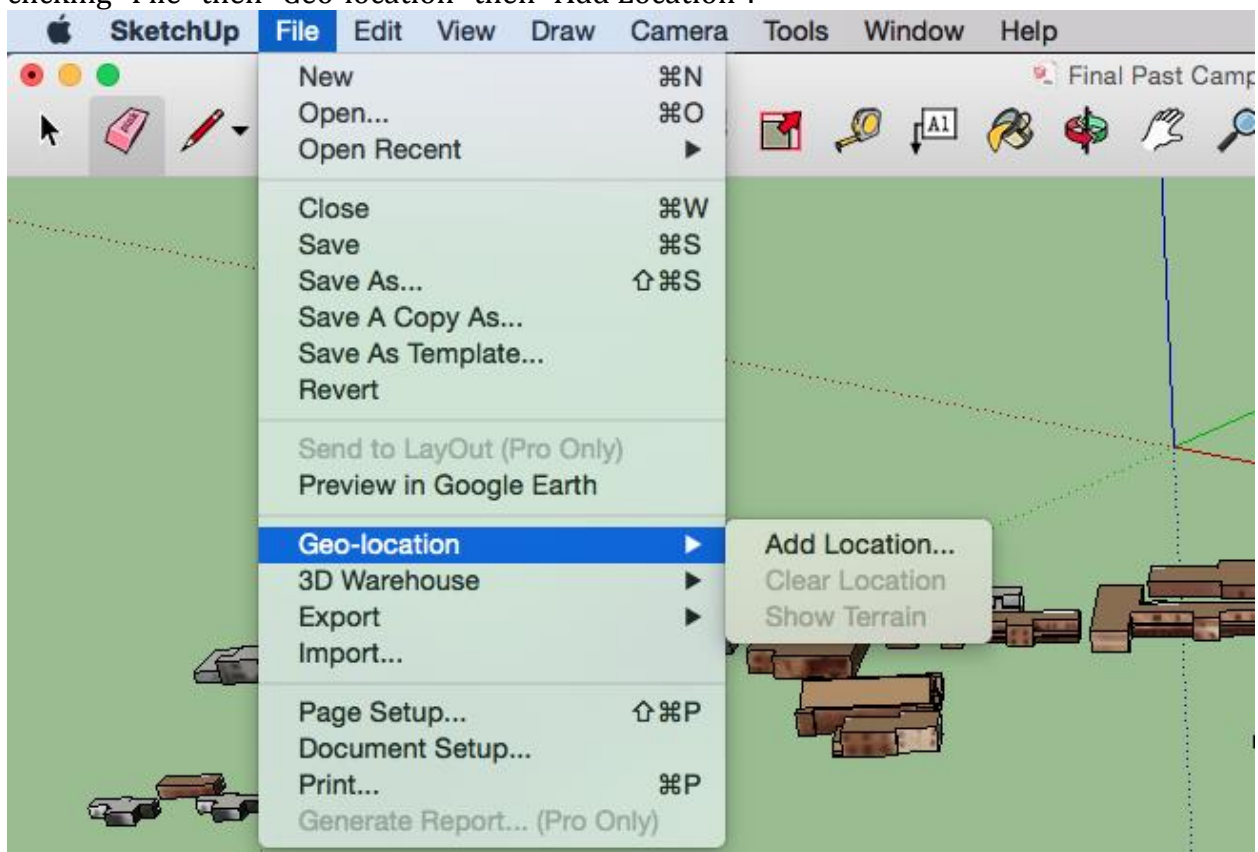




12. Now that all the textures have been placed on the building, the model is complete.

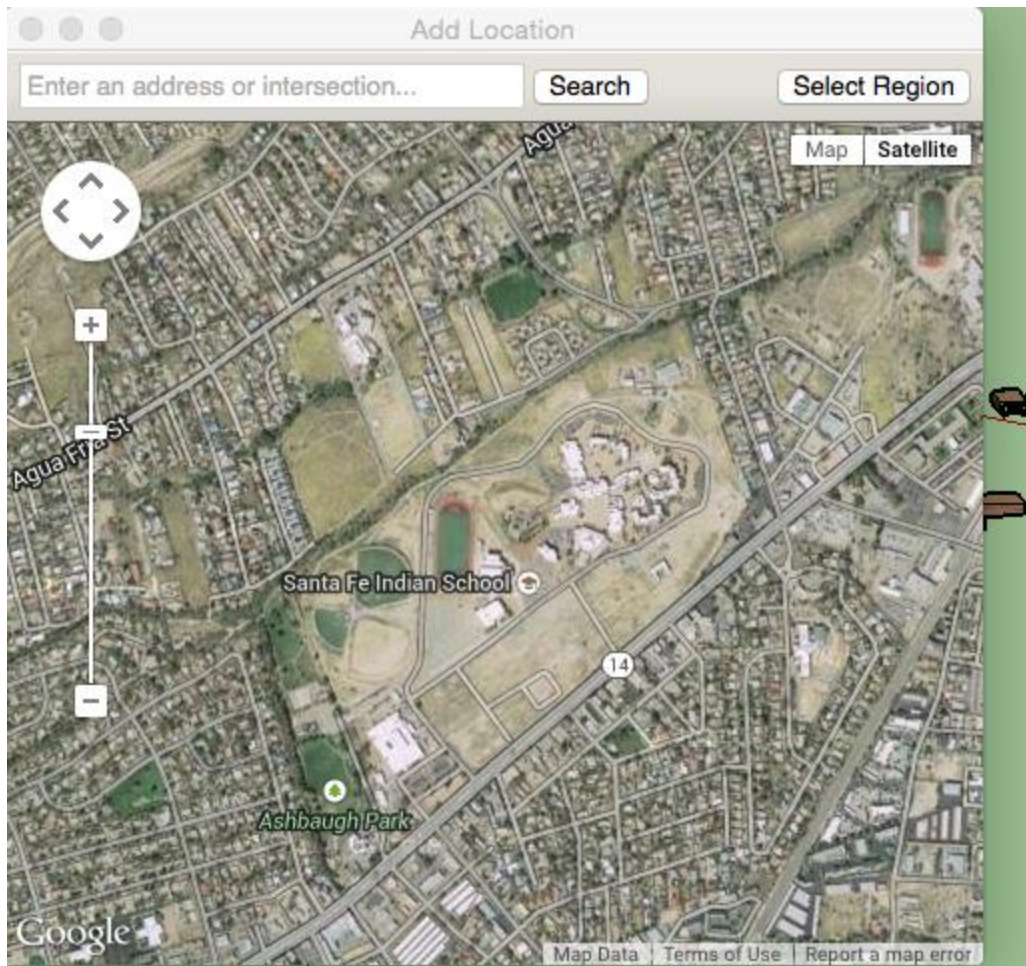


13. Once the model is complete, it is time to export it into Google Earth Pro. Start by clicking “File” then “Geo-location” then “Add Location”.



14. After selecting “Add Location” you will be brought to a Google Earth window. Select “Select Region” to select the desired region to import into Sketchup.





15. After the geo-located area is brought into SketchUp, position the buildings on top of the imprints of their locations. You may have to resize the buildings. Make sure the Google Earth Terrain layer is on when positioning the buildings. Make sure the buildings are not floating above the geo-located area or sunken into it. Below is an example of a completed overlaying of the past SFIS campus.



16. If satisfied with the positioning of the buildings, select “File” then “Preview in Google Earth”. This imports the models into Google Earth Pro, in the locations positioned within



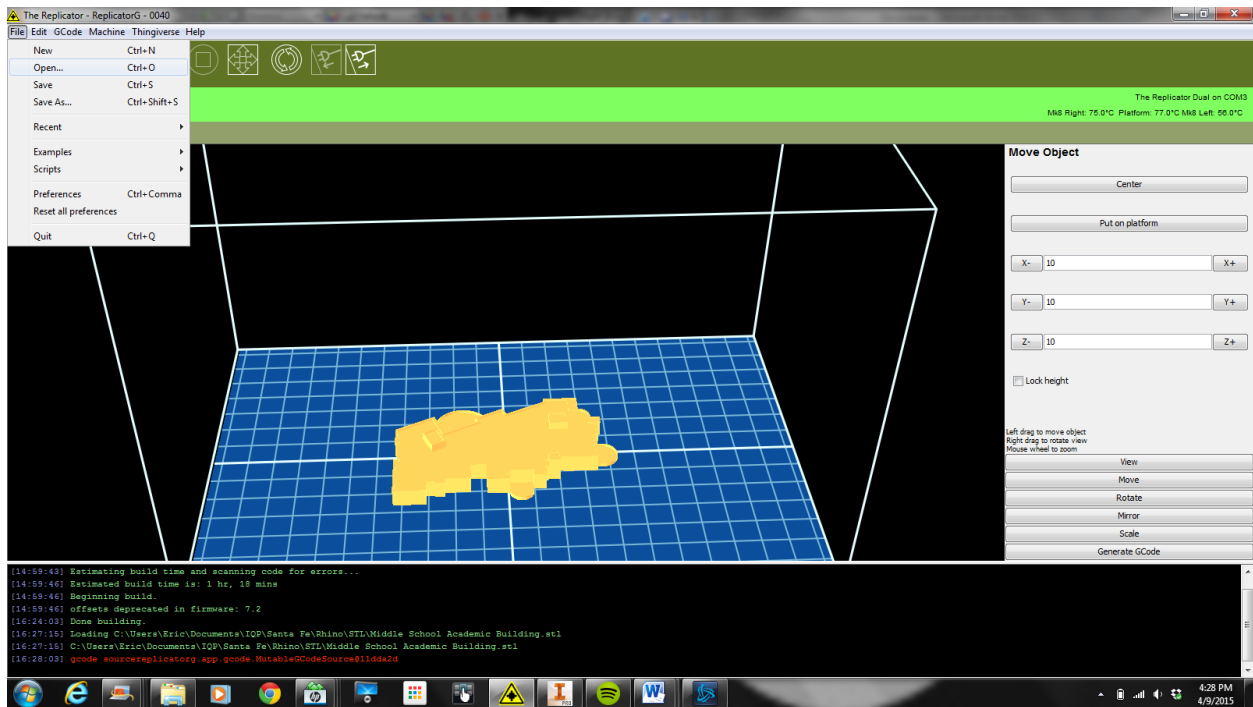
SketchUp. This can be seen in the photo below.



## Appendix C: ReplicatorG Manual

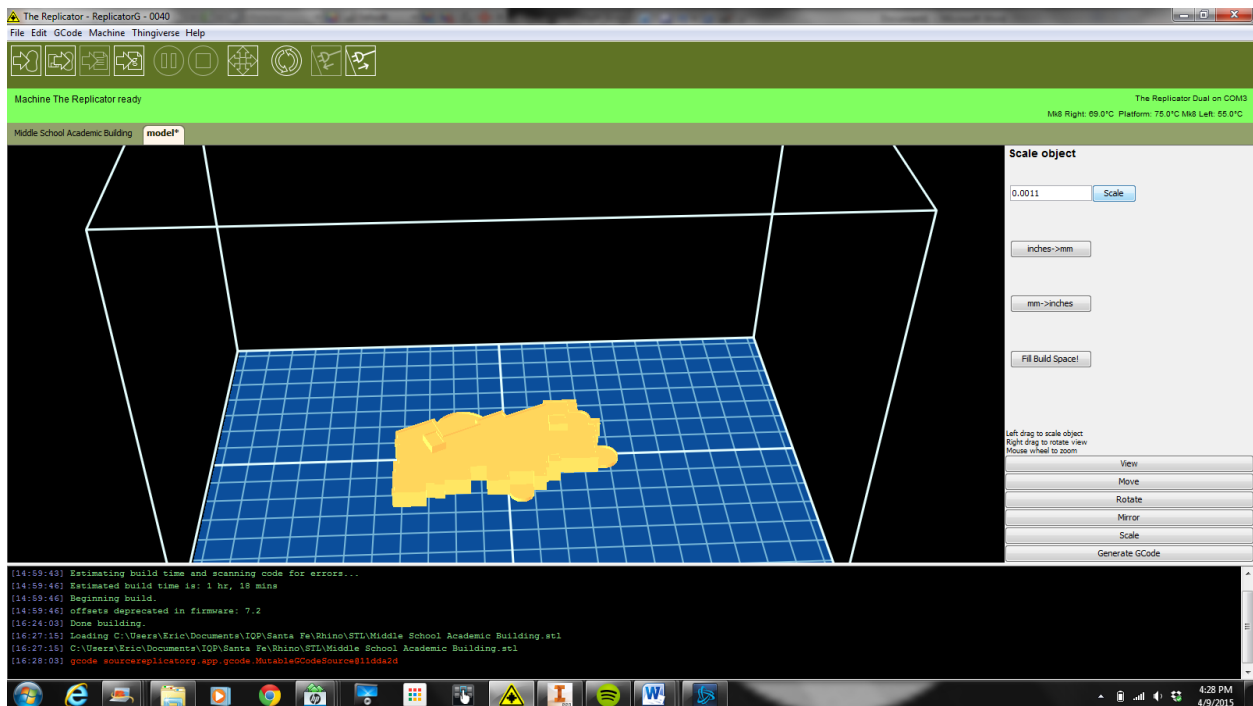
### ReplicatorG Manual

1. Go to "File" then "Open" to import the desired STL file

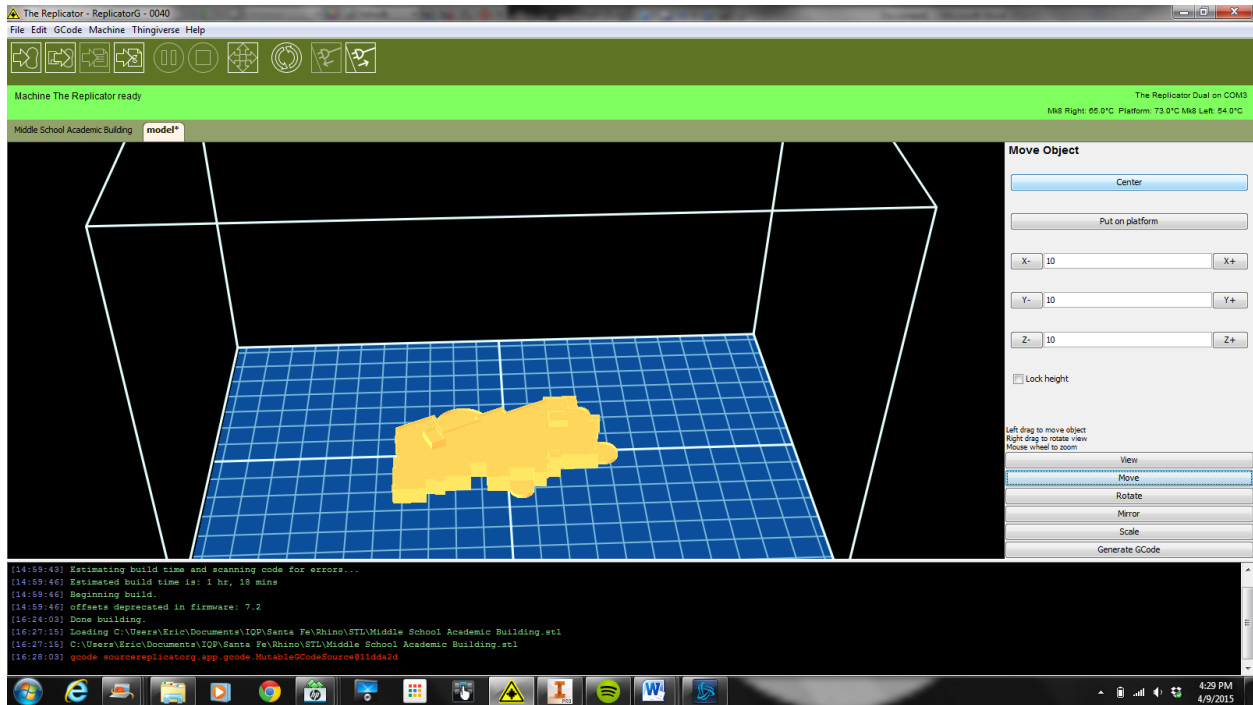


2. Press “Scale” to scale the model to the appropriate size (1/900<sup>th</sup> scale is 0.0011, if model is in feet use 0.0011, if model in Inches, use 0.0132)

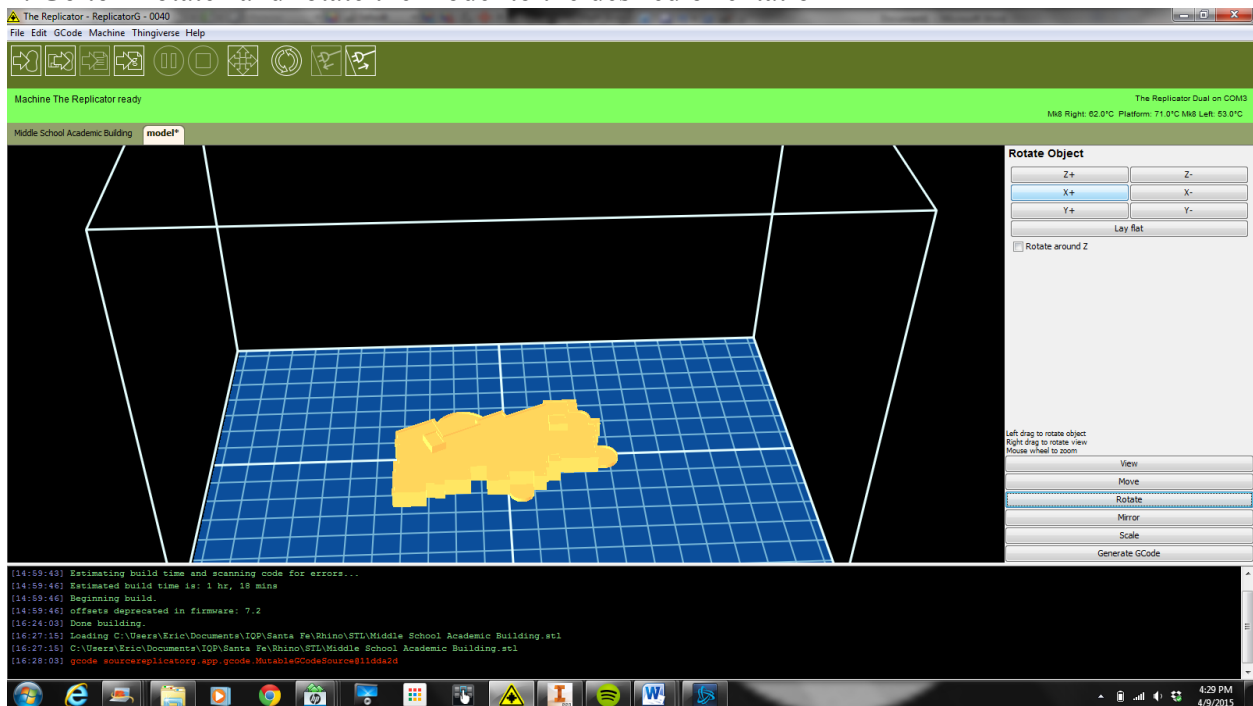
Note: the imported STL must be saved in mm units. If imported in other units, ReplicatorG may be unable to edit or change the model



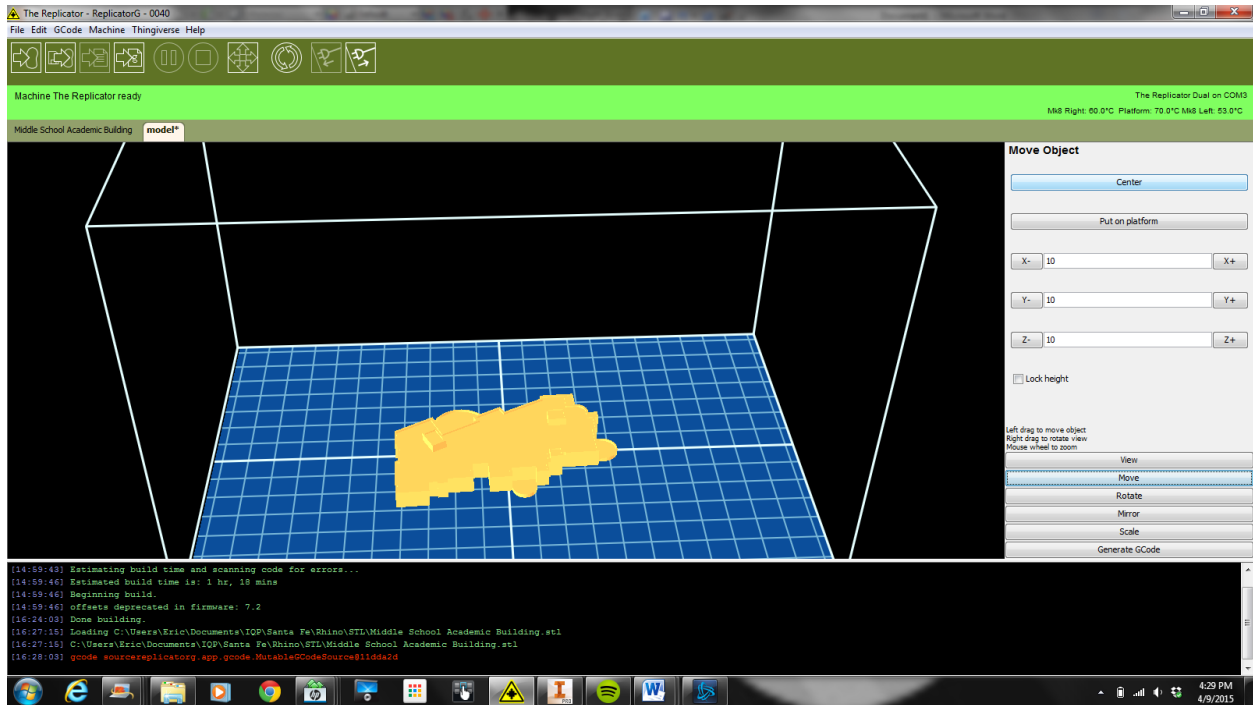
3. Go to “Move” then press “Center”



#### 4. Go to “Rotate” and rotate the model to the desired orientation

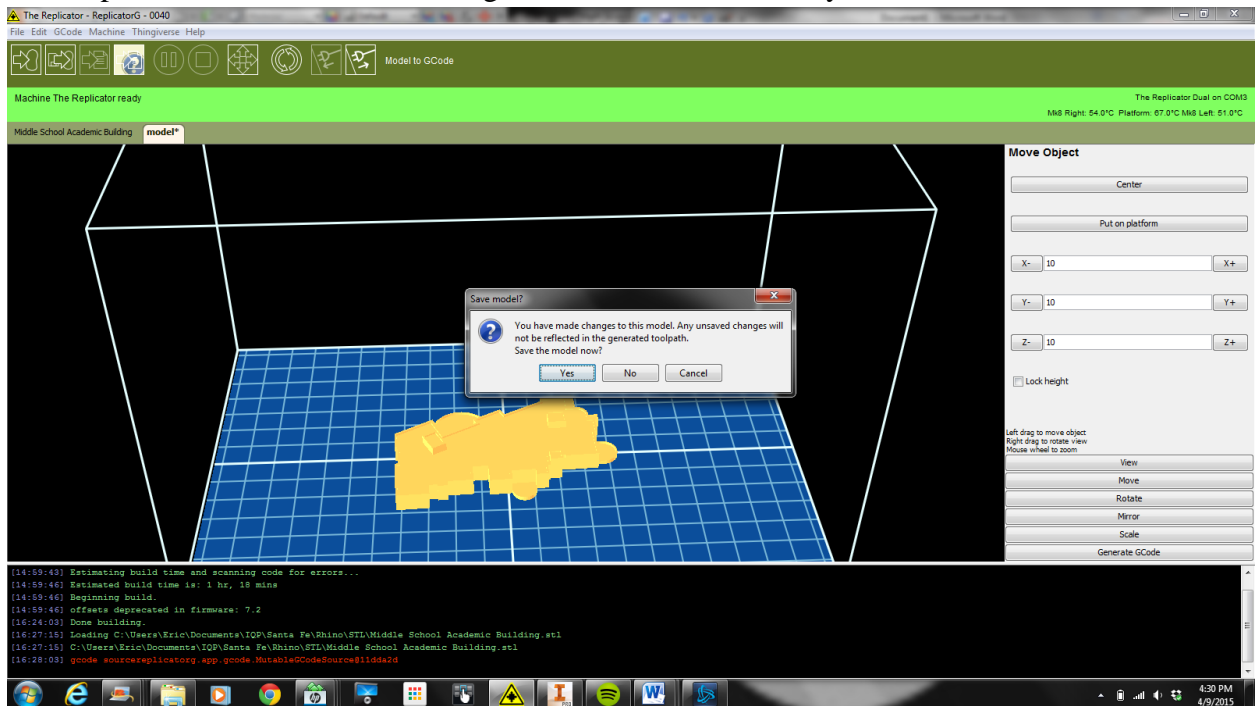


#### 5. Go to “Move” and press “Put on Platform” and “Center”



6. Press “Model to G Code”, Press “Yes”, edit parameters appropriately, then press “Generate G Code”

Note: If you do not save the model, ReplicatorG may print the model as it was initially imported rather than all the changes in orientation and size you have made.



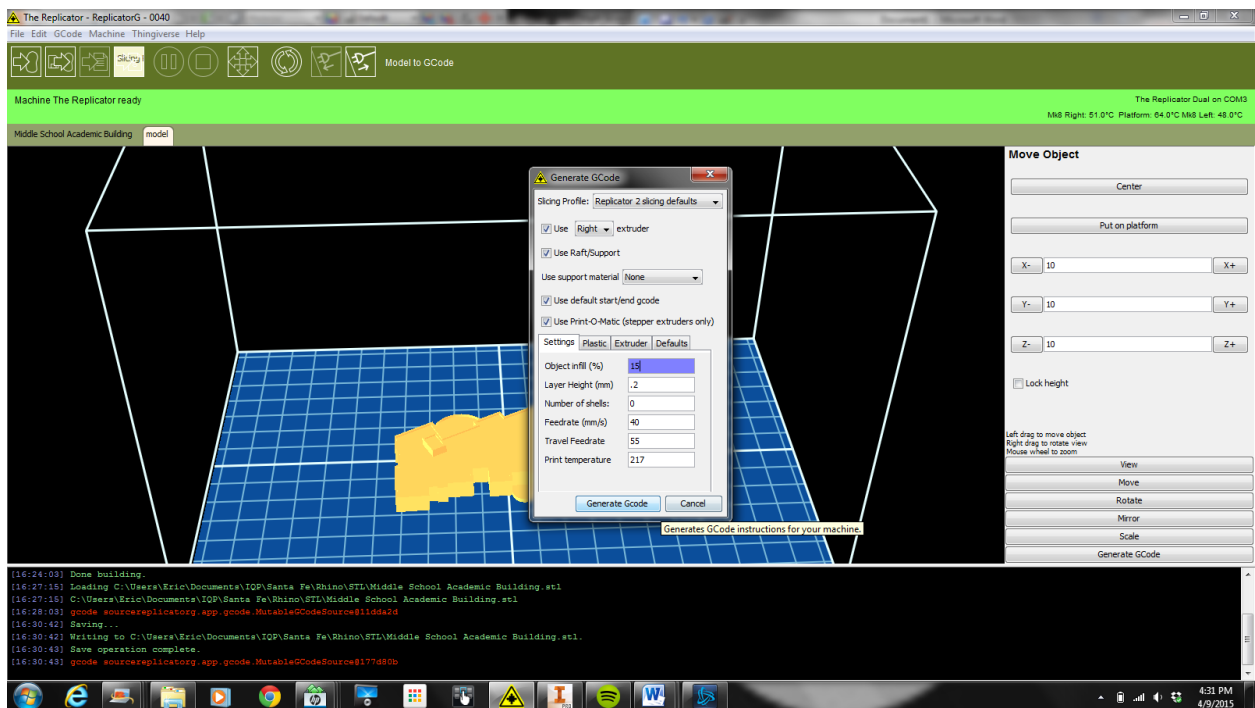


Note 1: Rafting creates a waffle like grid on the platform which makes the models easier to remove without damaging the base. There are few occasions that rafting is not needed.

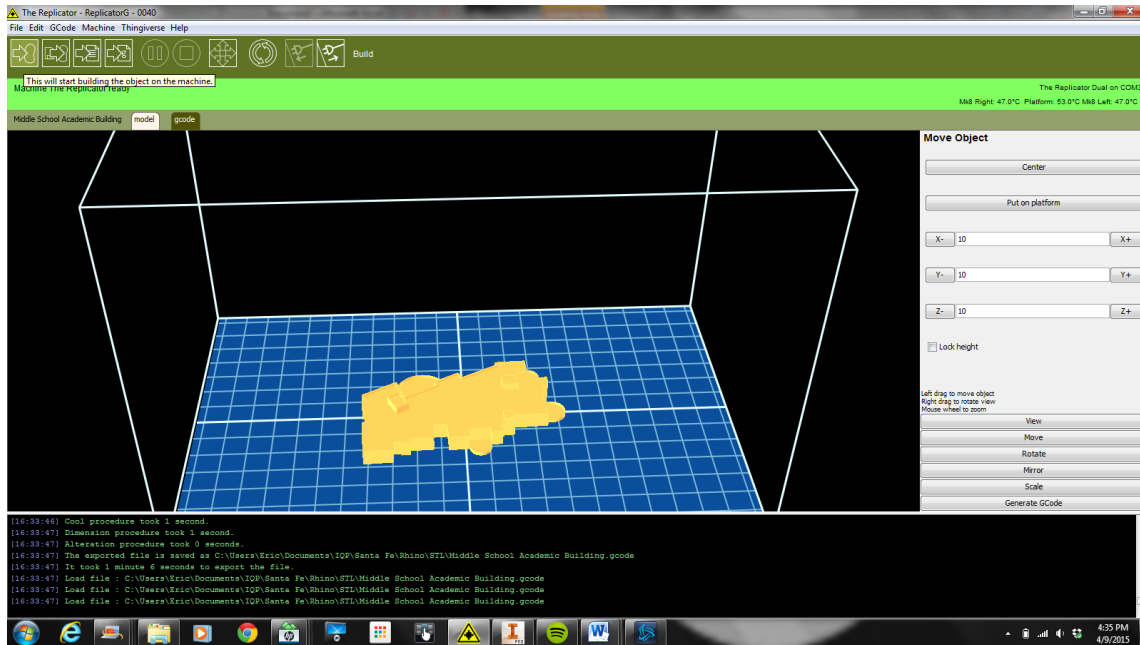
Note2: a smaller layer thickness is better for details but can generate “Stringy” results if temperature is too high or layer thickness is too thin.

Note 3: Thin shells are prone to have holes melted in them. Try a lower temperature, increasing the Object Fill percentage, generating a thicker shell in the STL model, or adding support material.

Note 4: Temperature is important for proper printing. If the temperature is too high, the layer may melt, look stringy, or have holes. If the temperature is too low, the model may bend or curve at edges due to cooling too quickly.



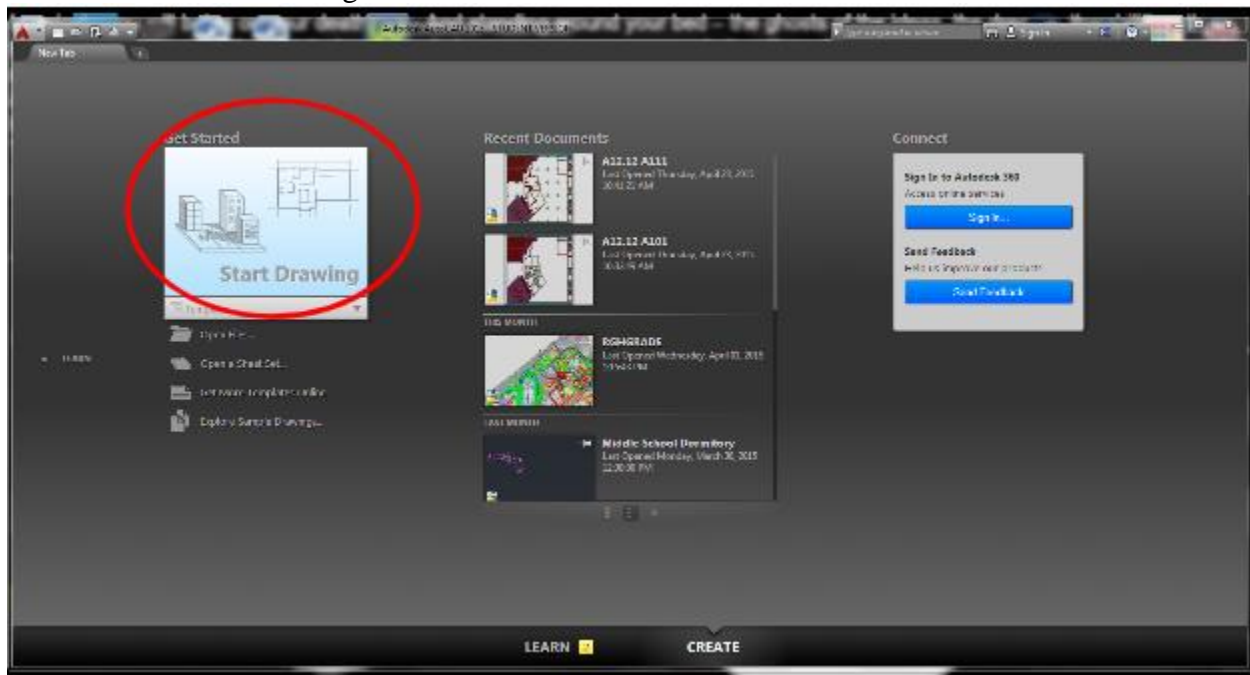
7. After the G code is generated, press send to printer.



## Appendix D: AutoCAD Manual

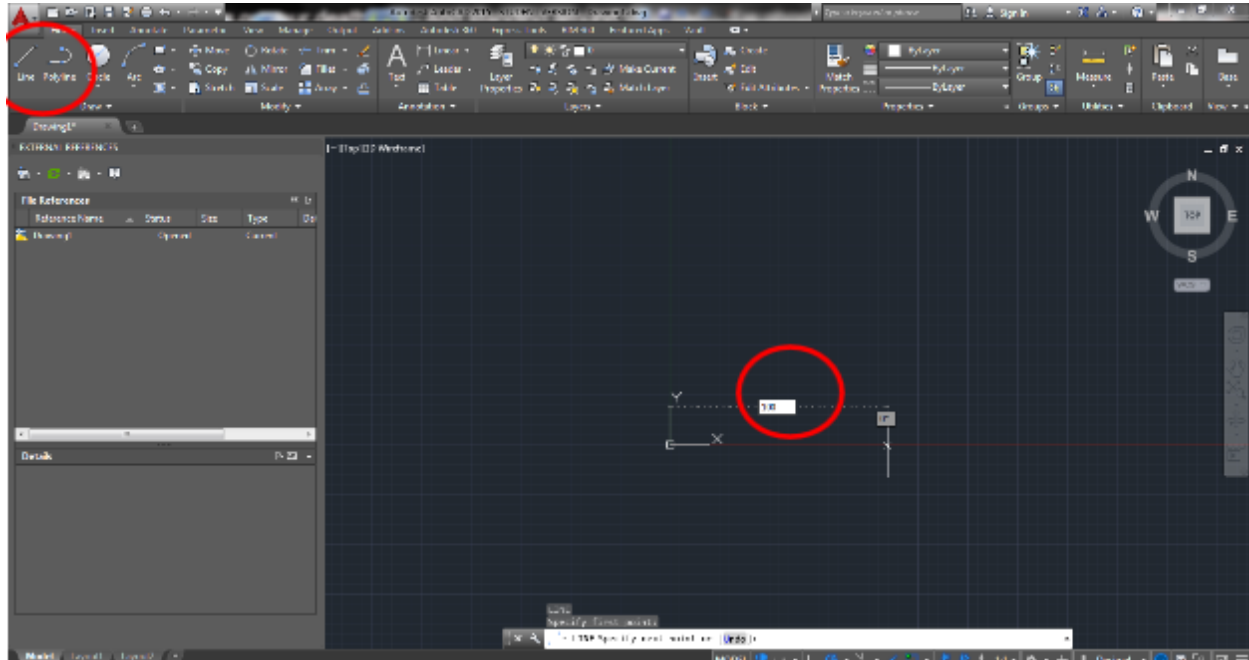
### AutoCAD Manual

#### 1. Press Start Drawing

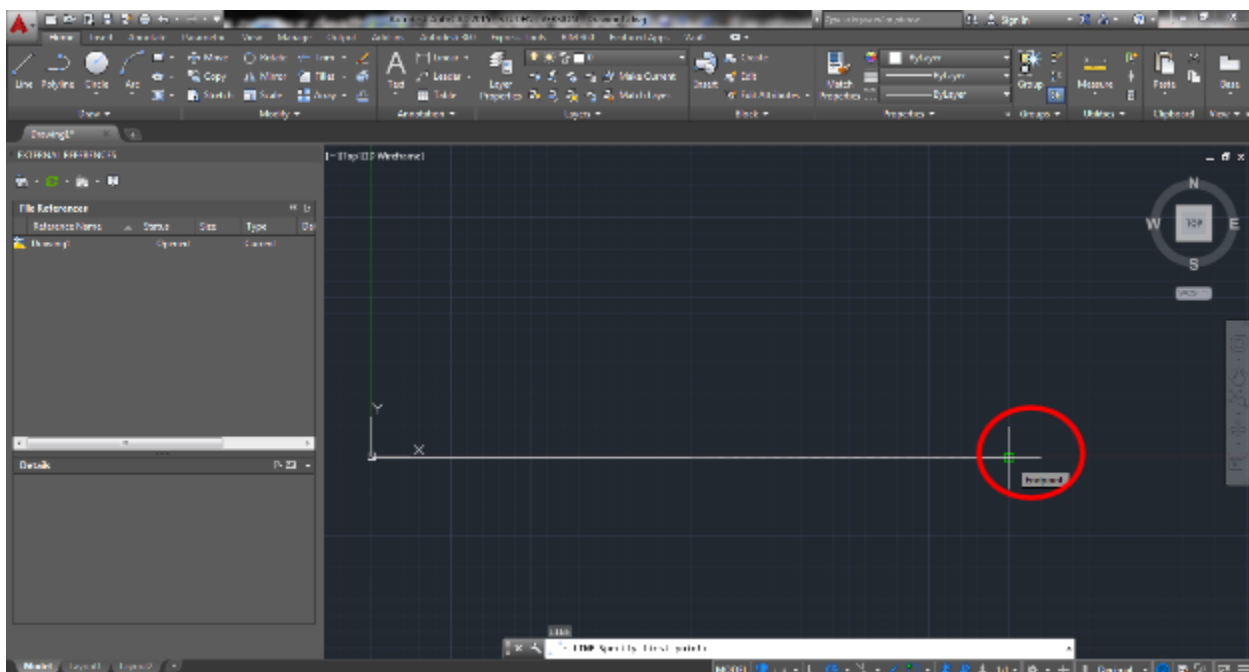




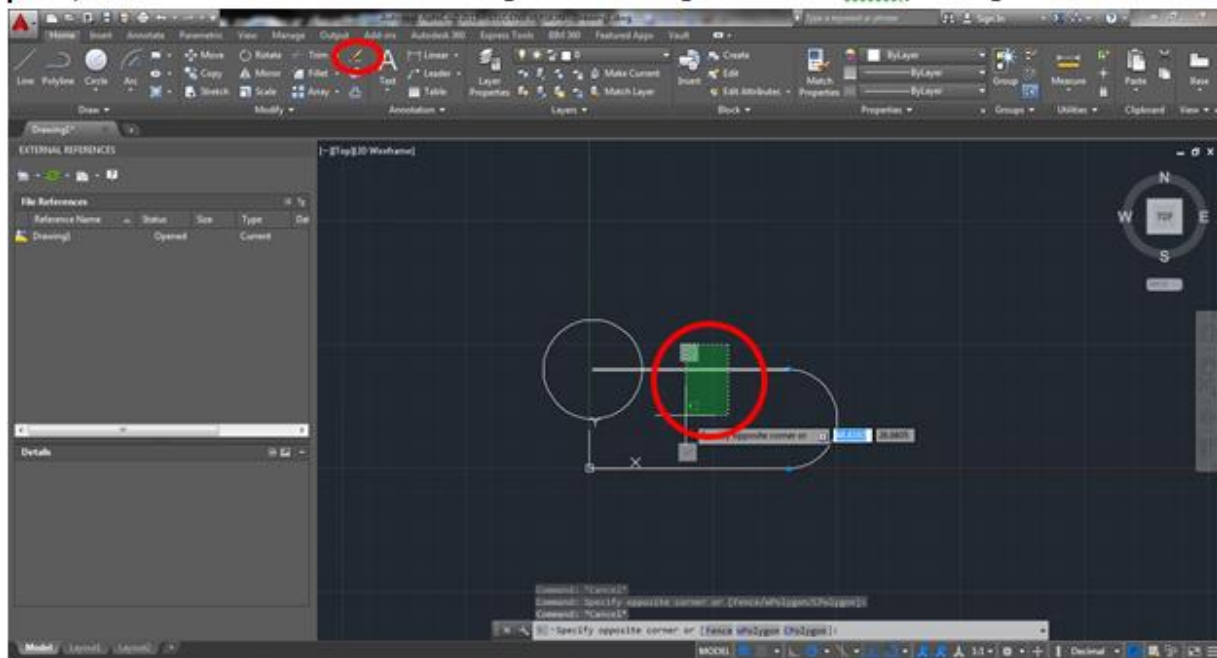
2. Press the Line button, click on the origin, and enter the desired length



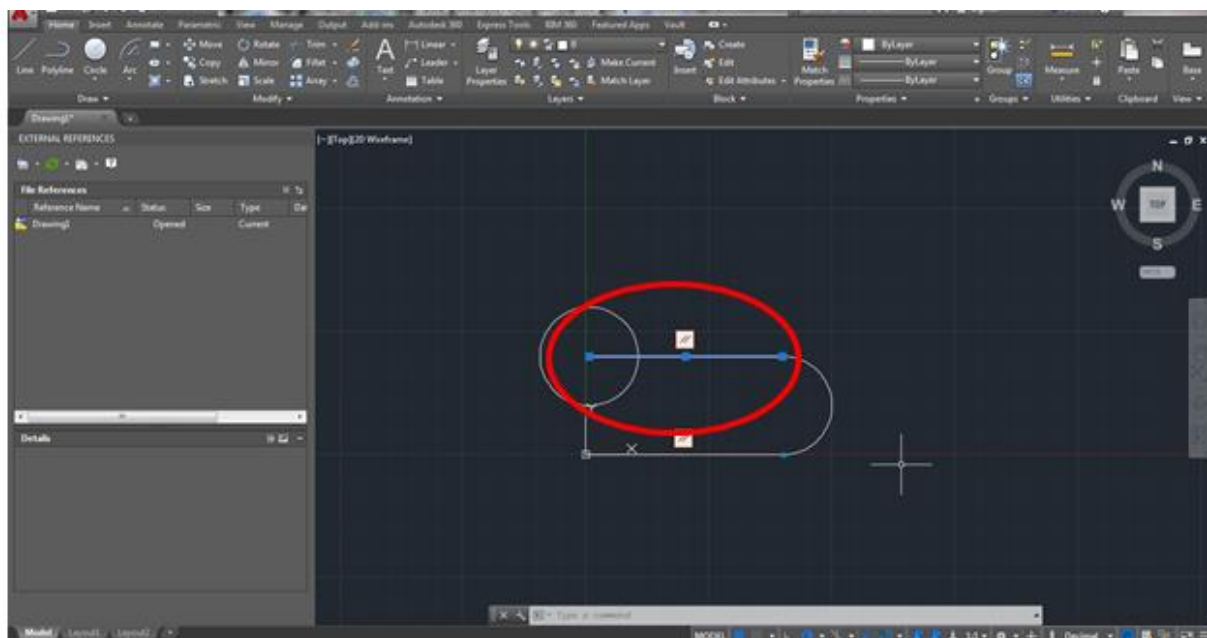
3. The line feature will stay connected to the endpoint of the previous line. Continue drawing lines from the end point of the previous line (should see a green square). This green square is the location of a start point, endpoint, or a point of interest



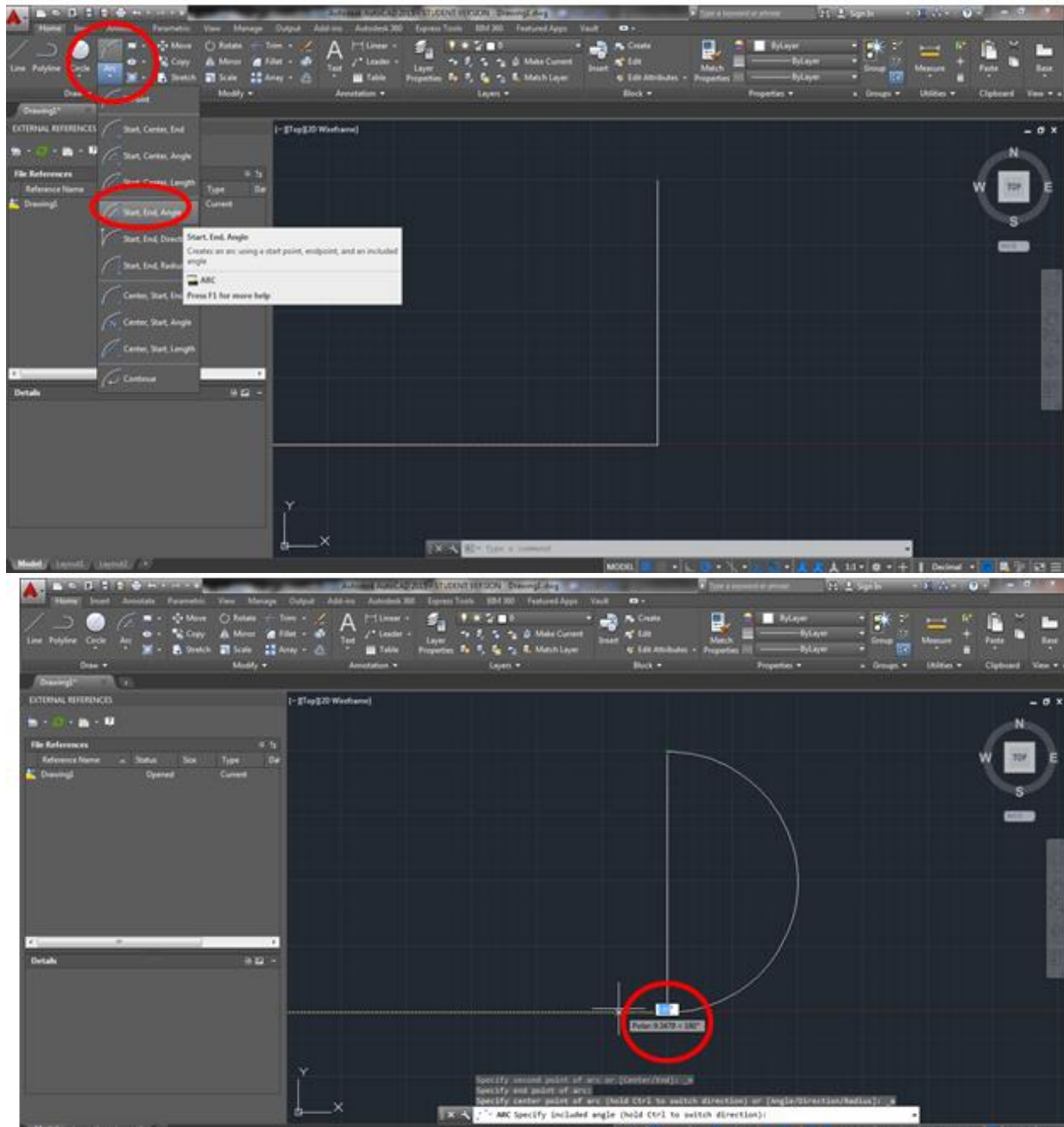
4. If you need to delete something, left click (do not click and hold) and drag the highlighted area over the drawing feature to be deleted or left click on the feature. This will select the feature. Then press delete. Another method is using ease, selecting the feature, then pressing enter.



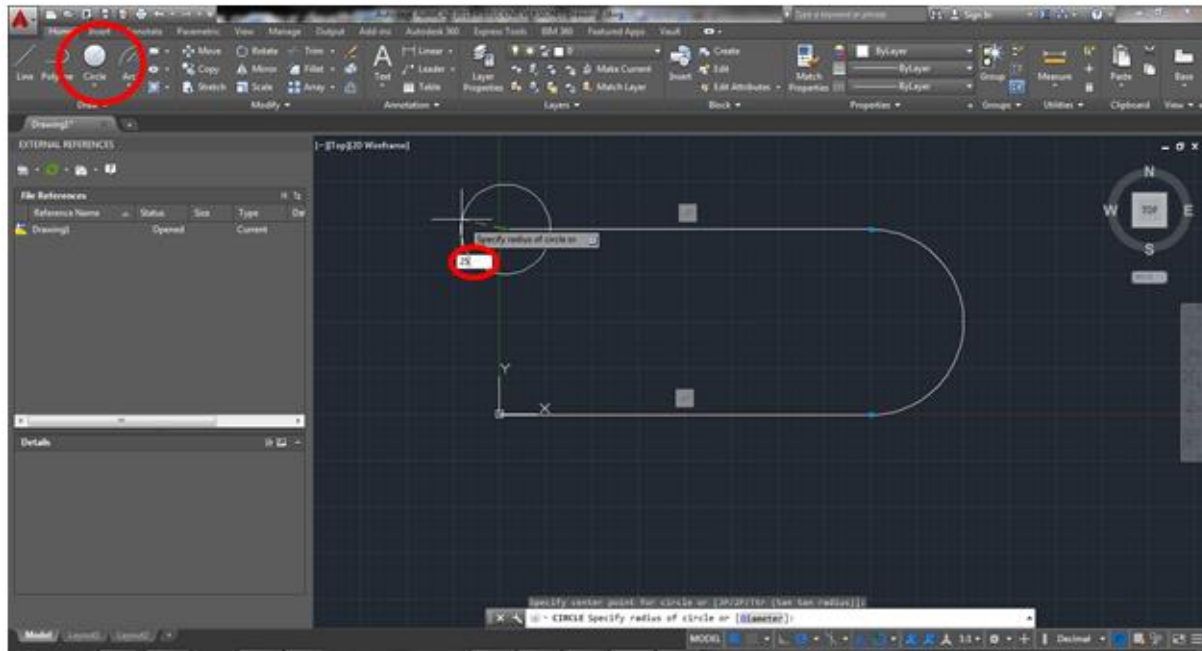
This feature has been selected



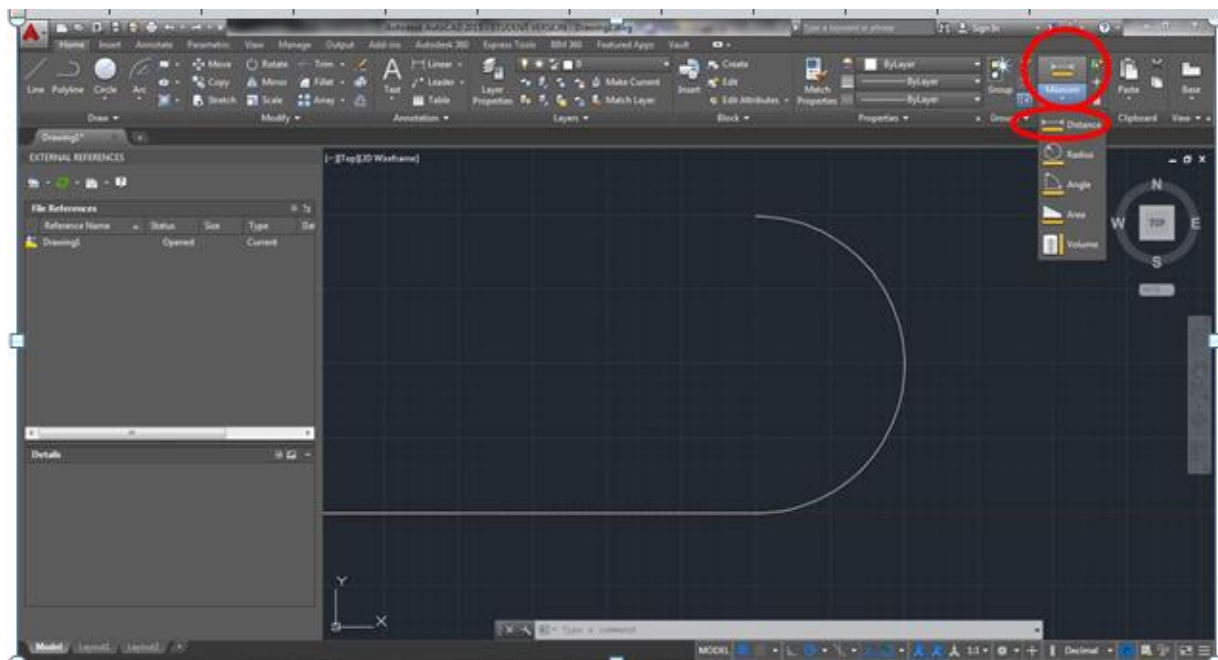
5. For adding an Arc, begin by drawing a reference line. A reference line is a line that will be used for drawing another portion of the design, but is deleted one that portion of the design is made. Use the reference line to create the start and end point of the arc. In Arc, select Start, End, Angle. Left click on the start and endpoints of the line then type on the desired angle and press enter. Afterwards, delete the extra line.

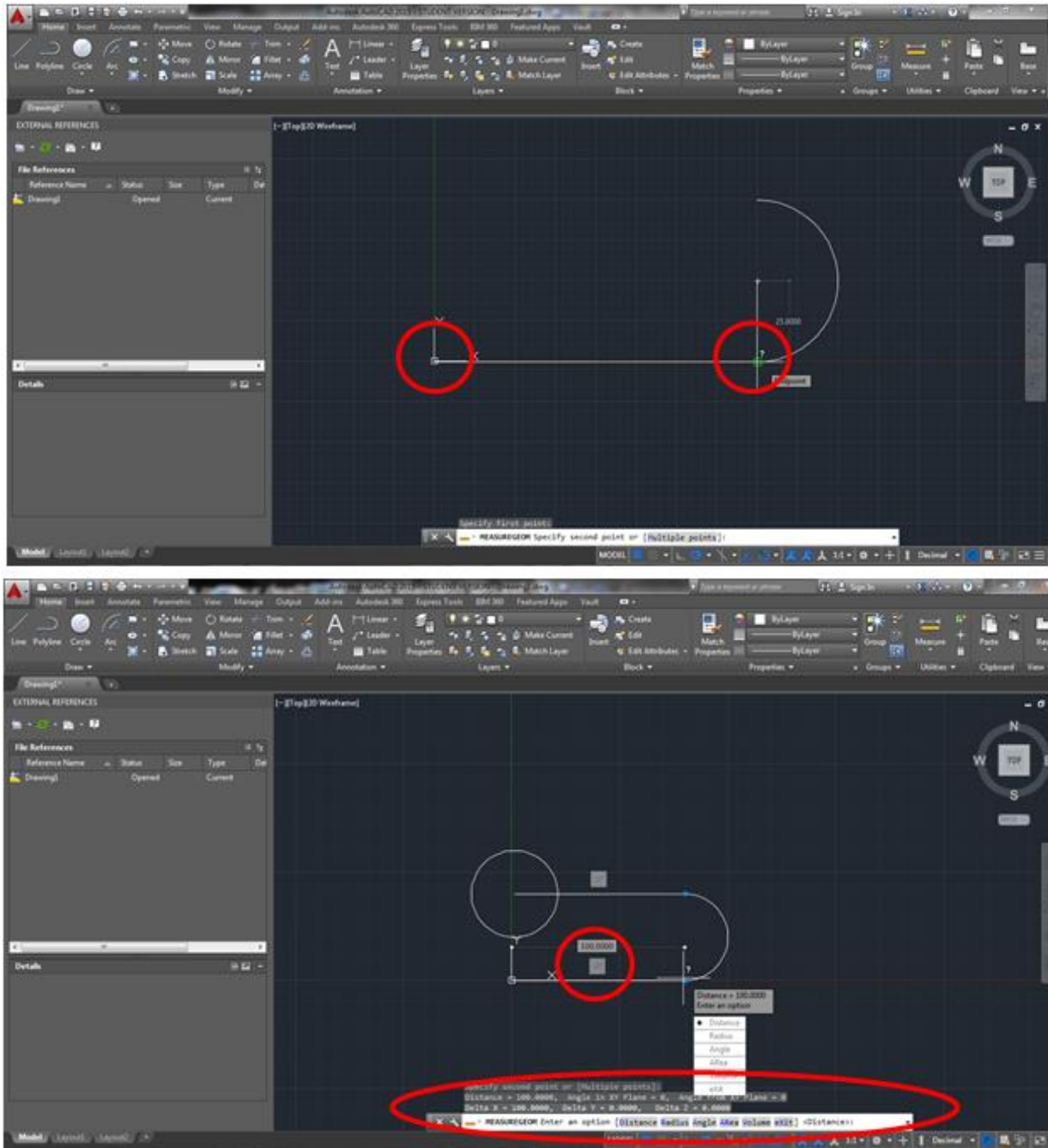


6. For adding a circle, left click on the circle icon, then left click on the location you would like to place the center of your circle. Then type the size of the radius and press enter.



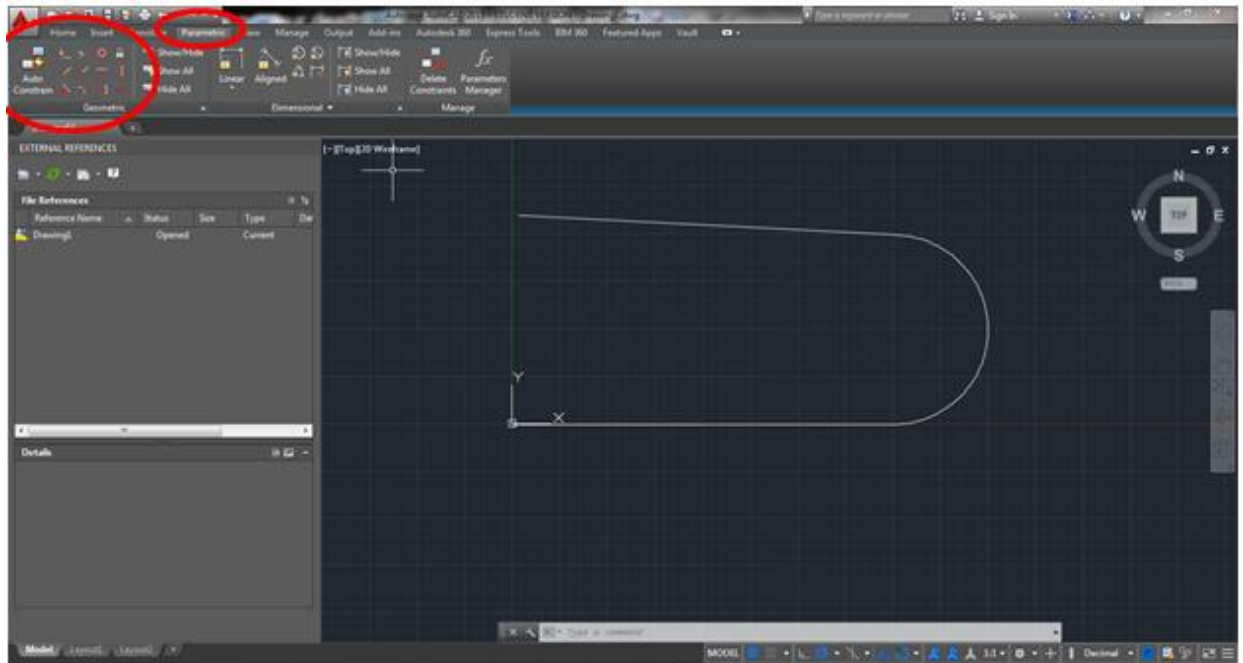
7. For using the measure tool, select distance. Then left click on the starting point, and left click on the ending point and a read out of the distance will appear at the bottom of the screen



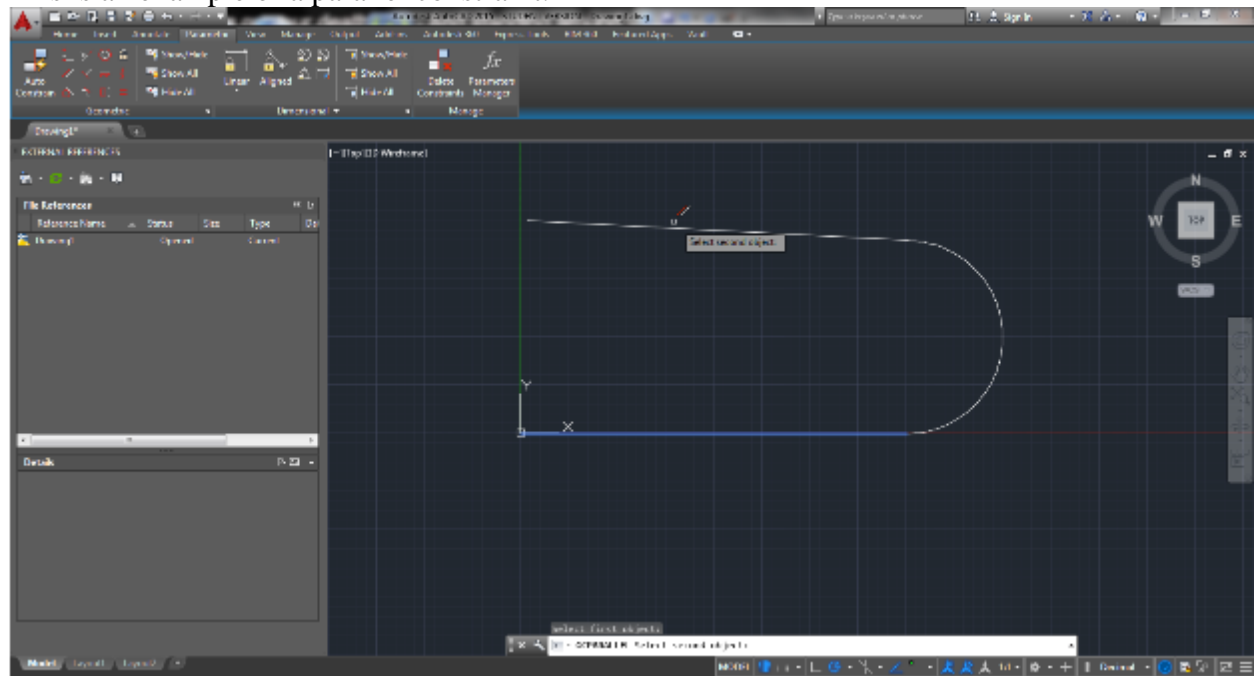


8. For adding constraints, go to the parametric tab and press the constraint you will to apply. First, select the feature you wish to stay stationary then select the feature you wish to manipulate. Then, return to the home tab.

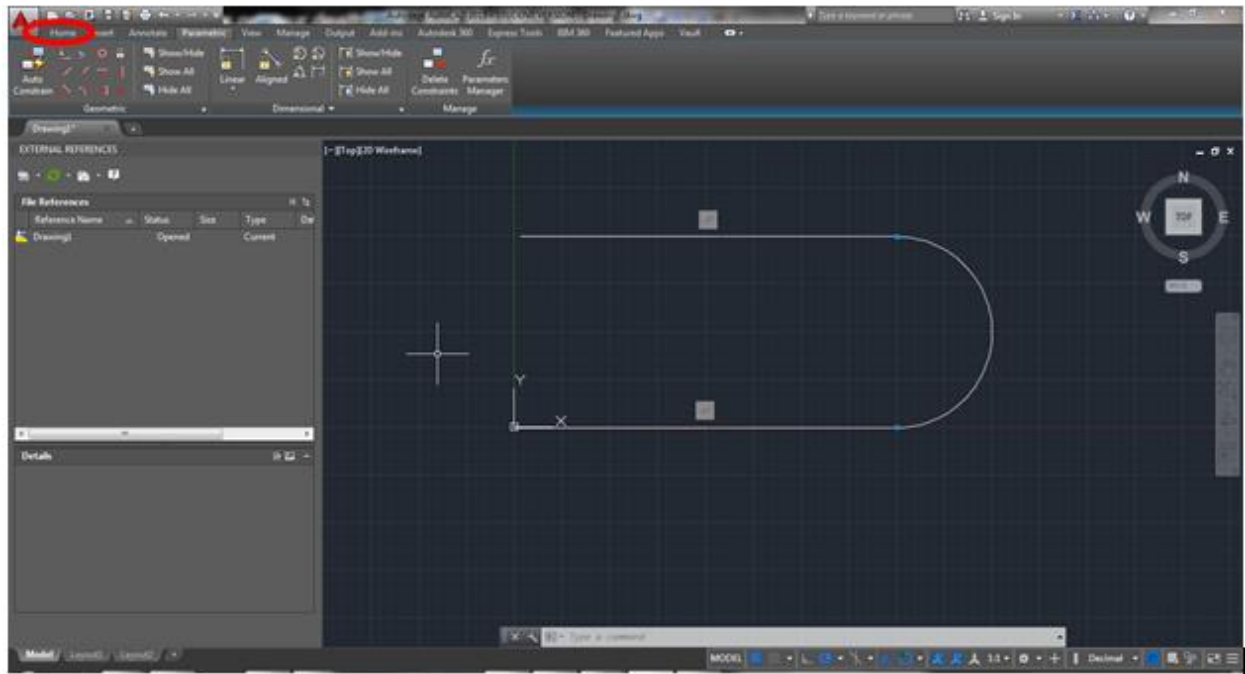




This is an example of a parallel constraint.







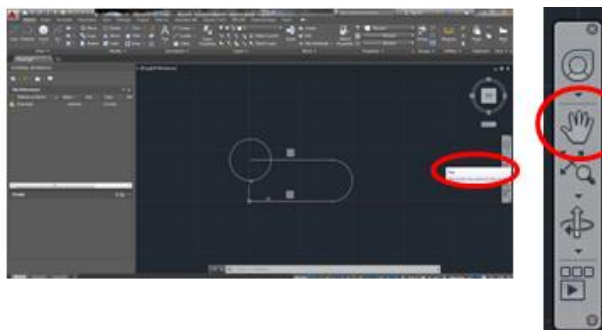
Useful things to know:

Ctrl z = undo (undoes entire Polyline)

To get out of polyline, press esc

Select pan if you wish to move

Your view in the document

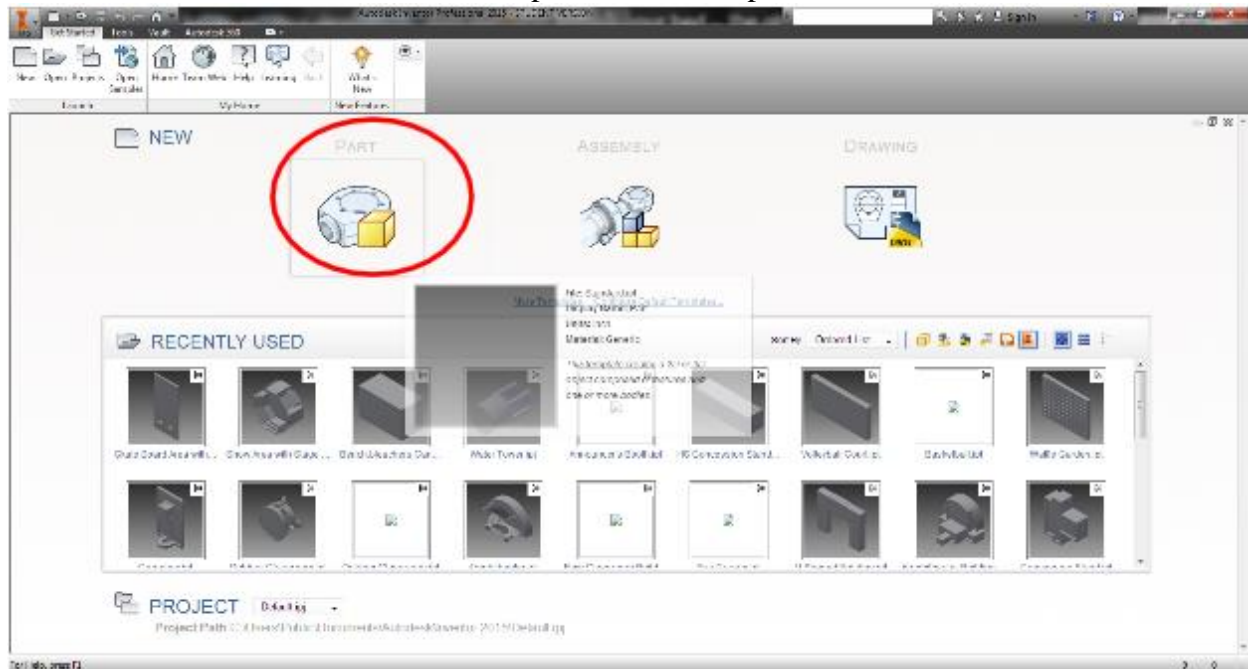


## Appendix E: Inventor Manual

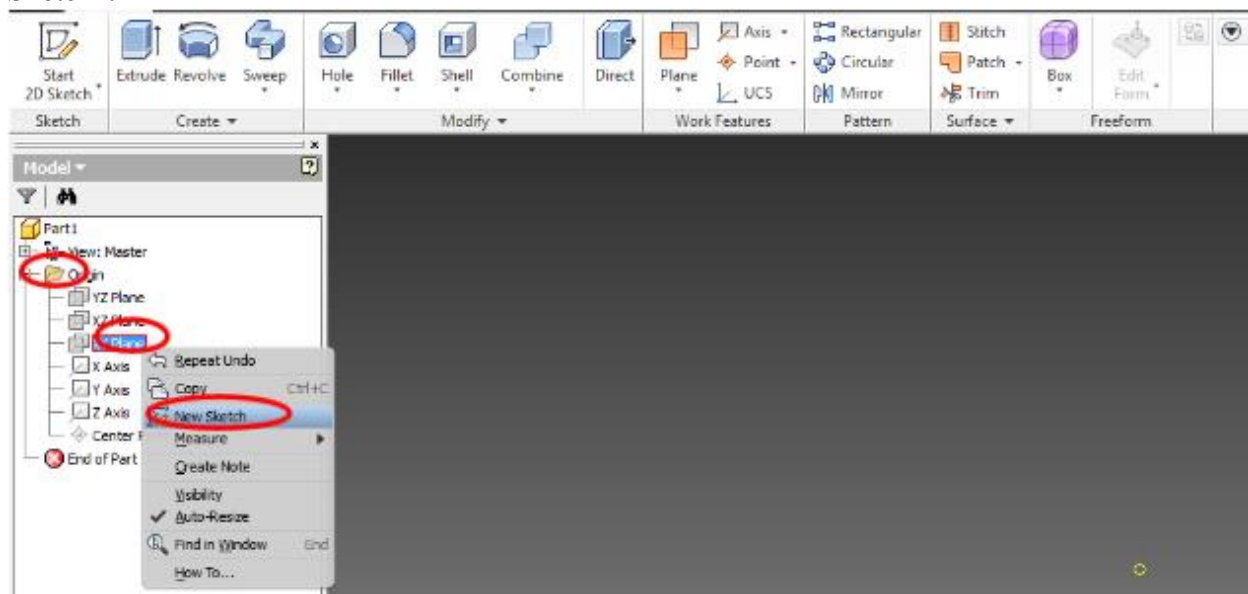
### AutoDesk Inventor Manual

#### How to Design a building in Inventor

1. In new, double left click Part to open a blank new part document.



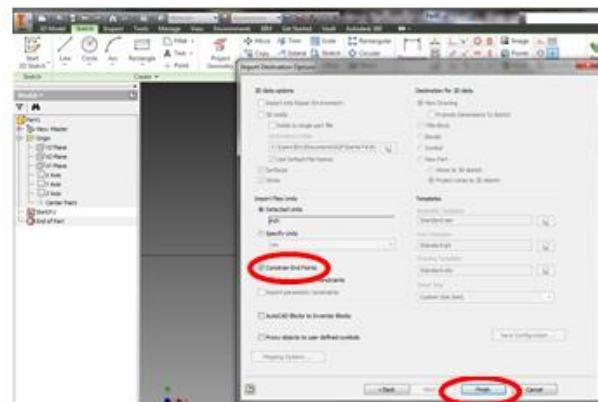
2. Left click on the “+” next to the Origin then right click on the “XY plane” and select “New Sketch”.



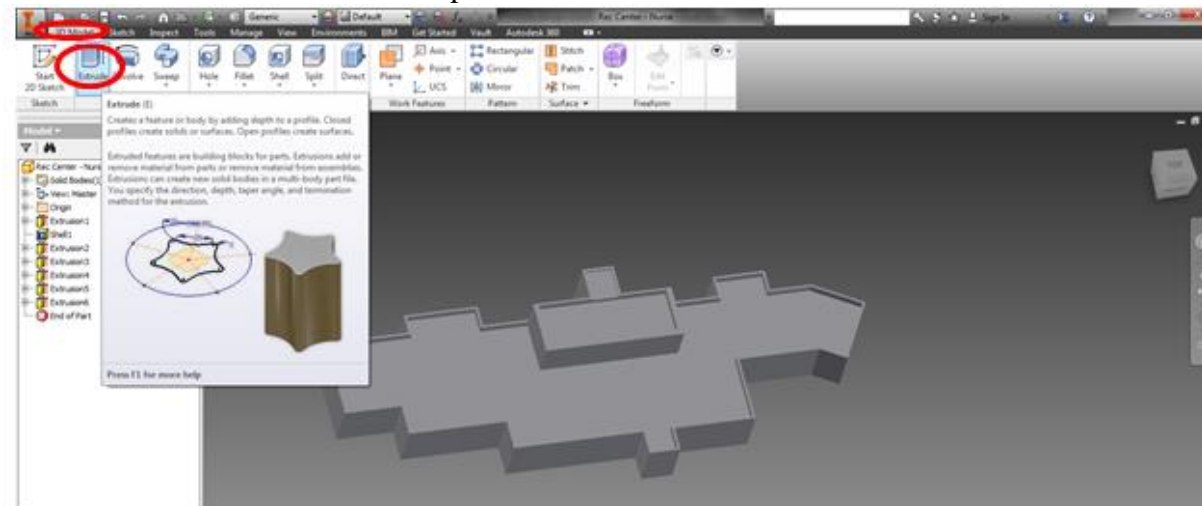
3. In the Sketch Tab, select ACAD to find the drawing you wish to import then press open.



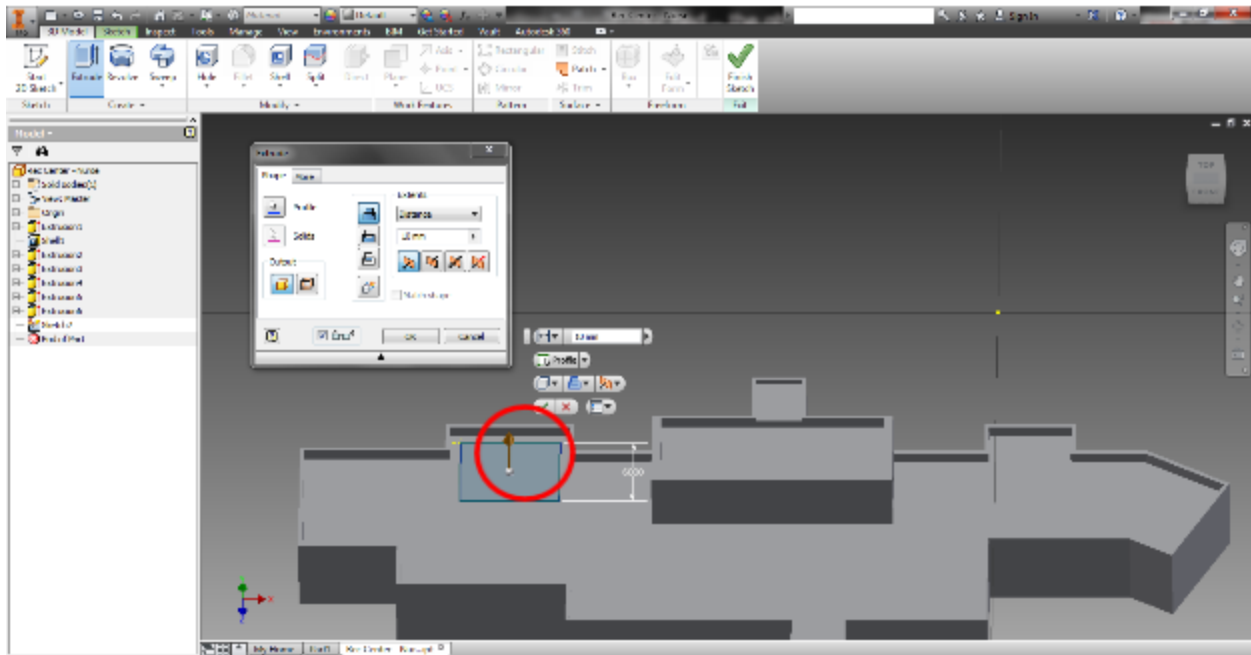
4. Select all elements you wish to import then press next. Select Constrain End Points then press Finish.



5. Switch to the 3D Model tab and press extrude.



6. Using the Profile, Select the profile(s) of the area(s) you are looking to extrude (you should see a ball with an arrow)

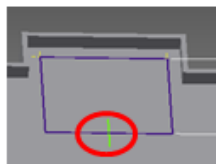


Note: If the profile is highlighted but the area does not show a ball with an arrow rising from the surface or the surface extends past the profile, then the sketch is not fully defined. This may be due to an open profile, intersecting lines, and/or not enough constraints.

Open Profile



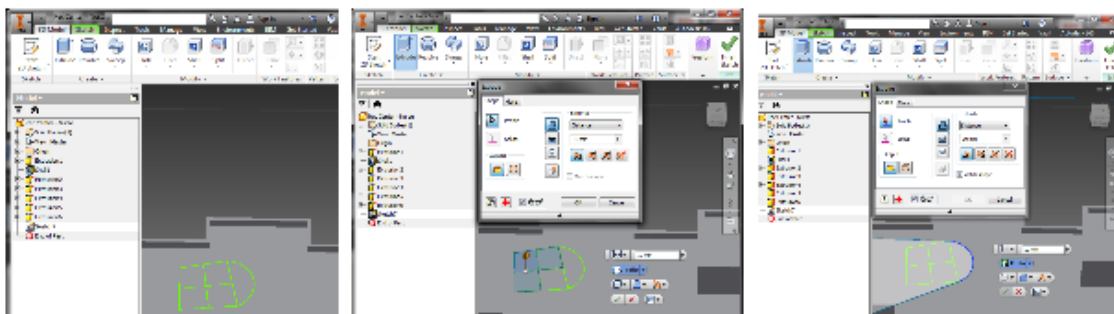
Intersecting Lines



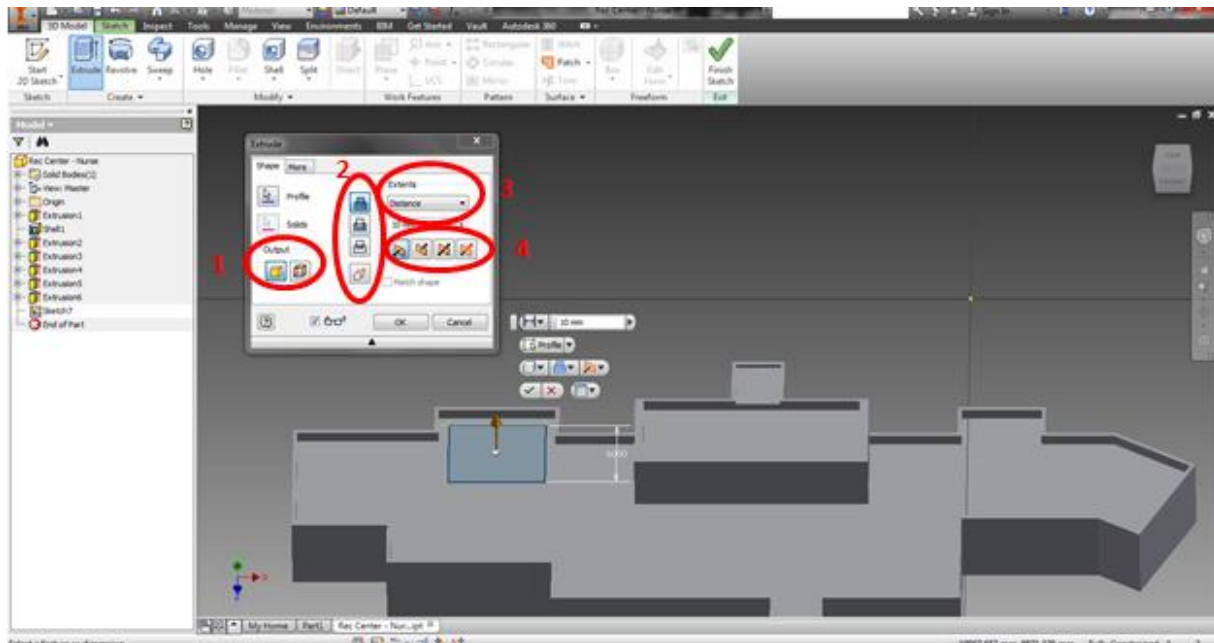
Not enough constraints



Note Continued: If you are unsure of what the issue is, a technique for finding the section causing the problem is by dividing the sketch into sections and trying to select each profile.



7. Extrude (Extends a sketch profile out along a straight line) the Surface.



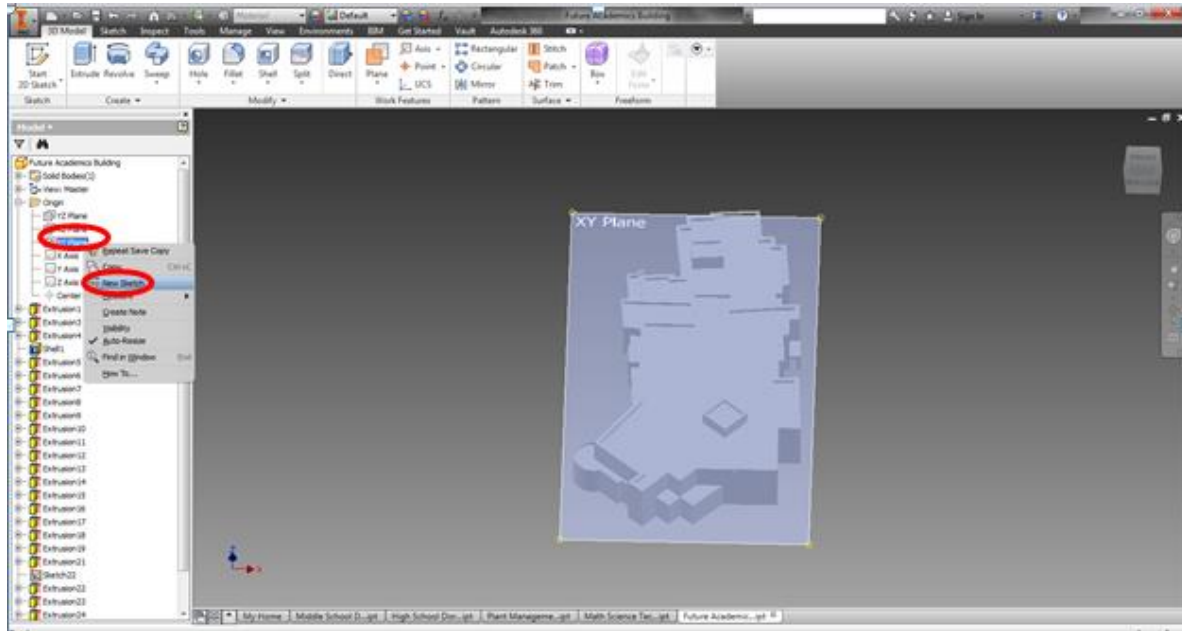
Note 1: The output is the fill the extrusion operation is going to produce. There are two types of outputs; solid and surface. The “Solid” output produces a fully filled in solid extrusion. “Surface” extrudes the outer edges but does not fill the middle. Most extrusions use the Solid output.

Note 2: These extrusion operations are how the extrusion is going to shape the part. There are 4 types of extrusions operations; join, cut, intersect, and new solid. “New Solid” creates a volume and does not require an existing extrusion while the other three operations require an existing volume. The “Join Operation” adds volume from a sketched profile on top of an existing extrusion, the “Cut Operations” removes volume from an existing extrusion based upon a sketch, and the “Intersect Operation” creates a feature from a shared volume from a sketch and an existing feature.

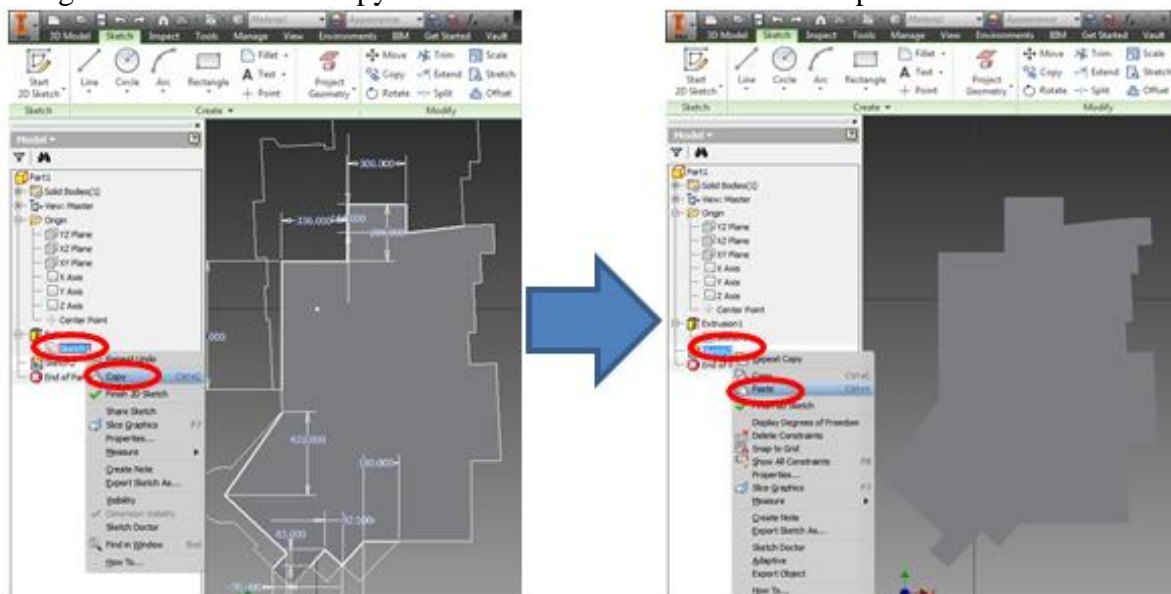
Note 3: These methods will tell the extrusion operation how far to extend the operation. There five methods of extending the surface; Distance, To Next, To, Between, and All. “Distance” tells the profile to be extended an inputted distance, “To Next” extends the profile to the next feature, “To” extend the profile to a selected feature, “Between” extends the profile between two features, and “All” extends the profile through the entire volume and is typically used with the Cut Operation.

Note 4: These arrows show the direction of the extrusion. The options are forward, backward, evenly forward and backward, and unevenly forward and backward. For unevenly forward and backward, there will be two distance inputs to specify the distance for each direction.

8. Make a new sketch.

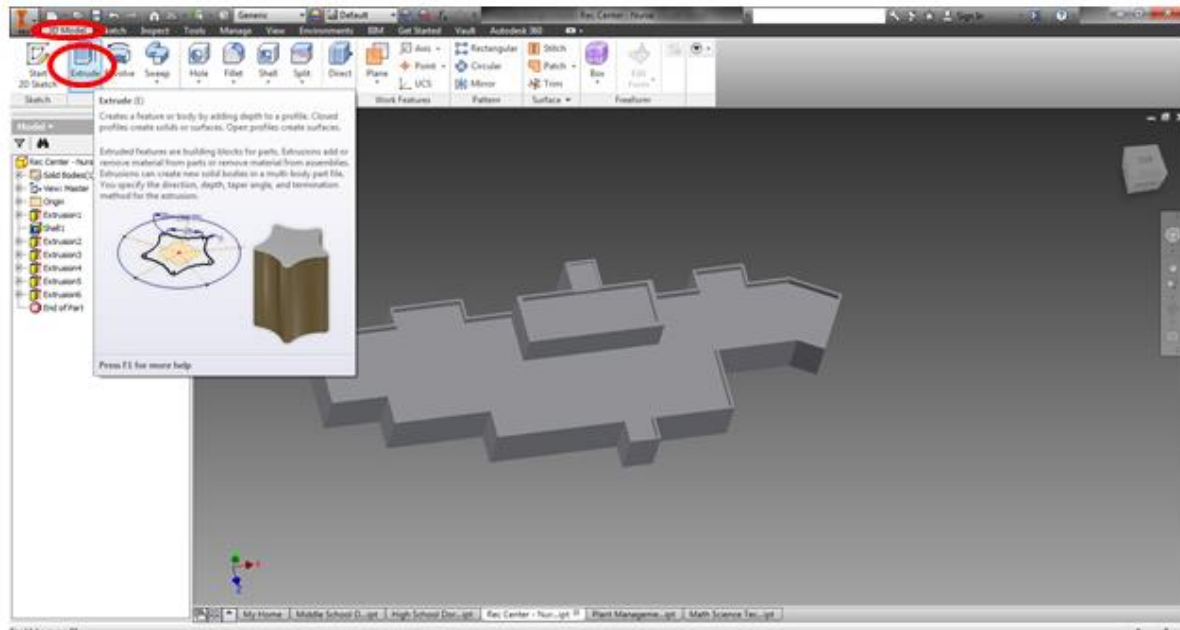


9. Right Click on Sketch Copy the Sketch from first Extrusion and paste into new Sketch.



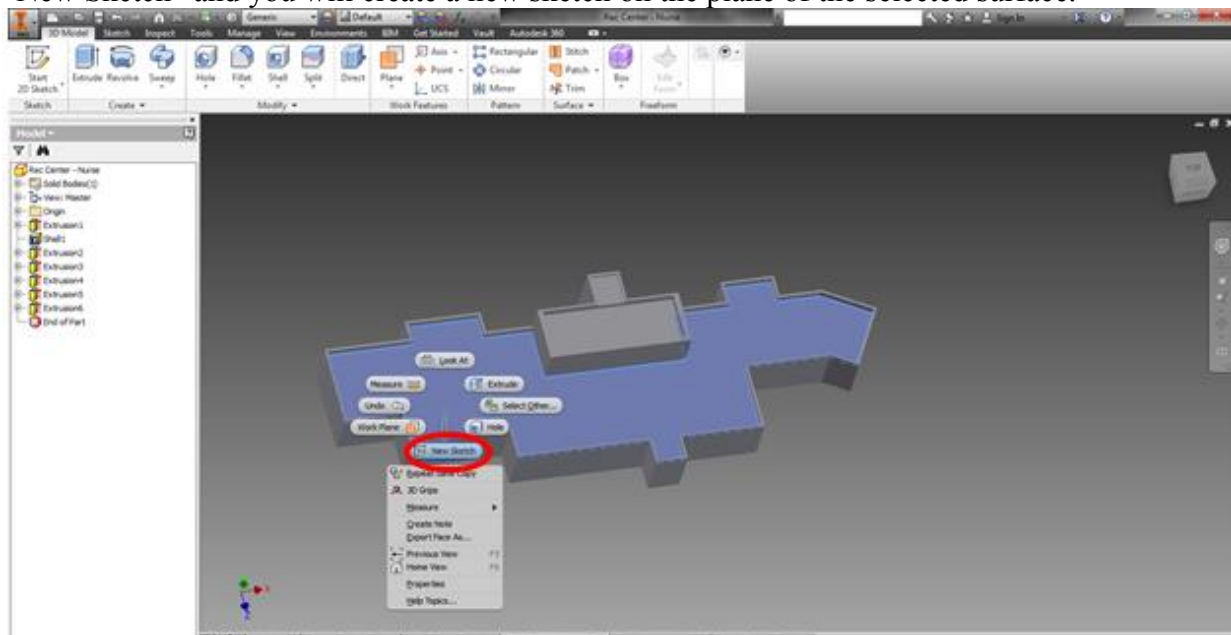
10. Extrude Surface.





## 11. Make a new Sketch

Note: For creating a sketch on an existing surface, right click on the desired surface and select “New Sketch” and you will create a new sketch on the plane of the selected surface.

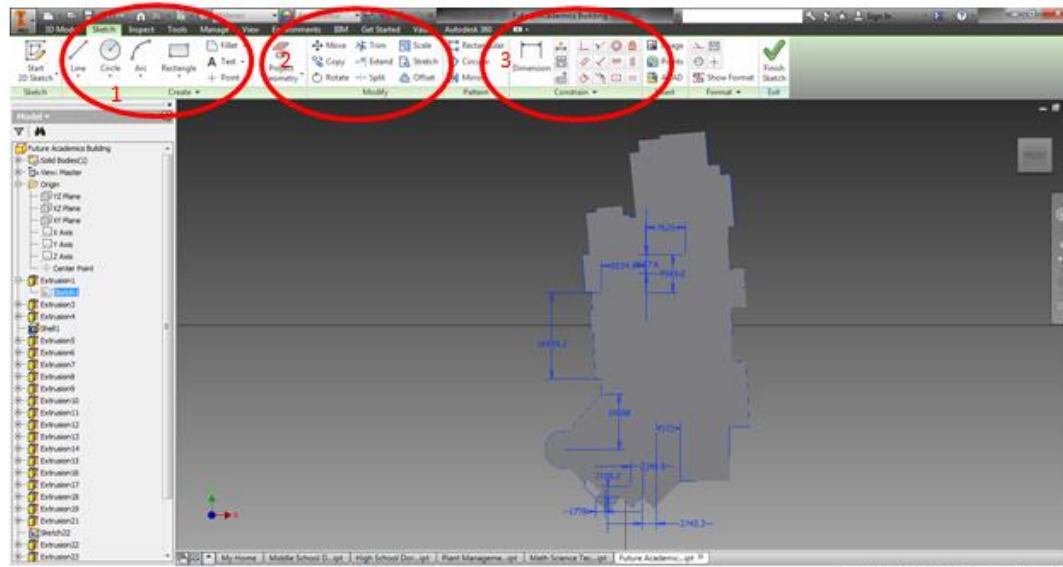


## 12. Create a sketch using tools in sketch such as Line, Arc, ect to edit old sketch as needed for the feature you are looking to create.

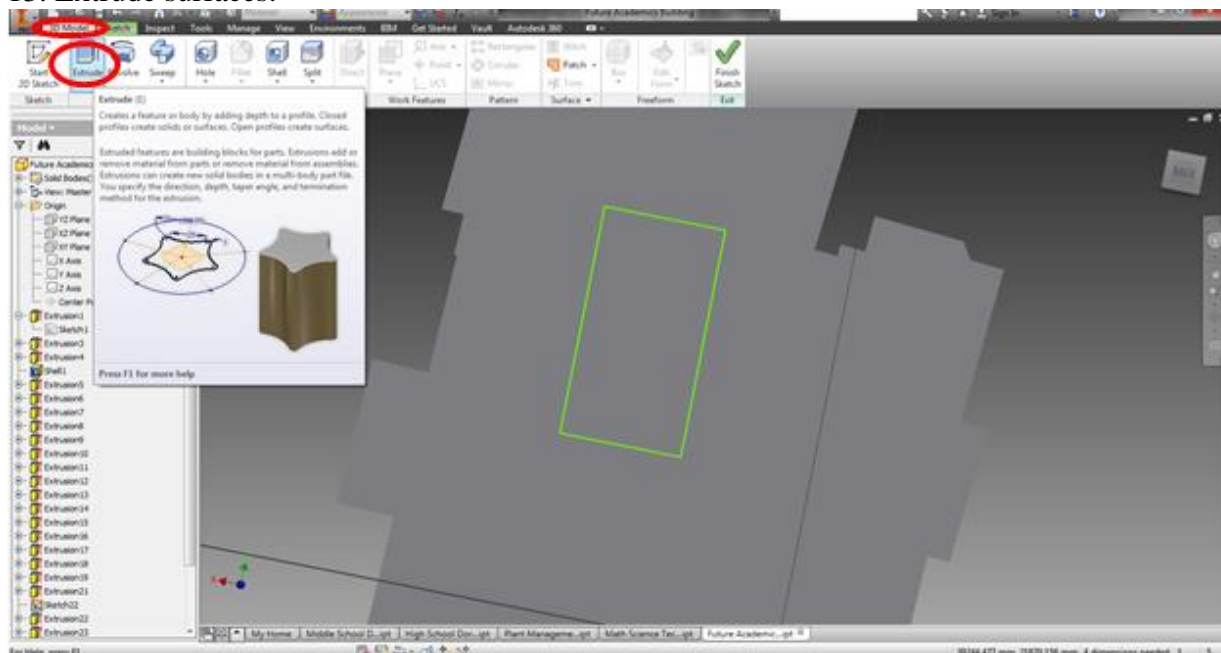
Note 1: Lines are generally the most used but require more constraints (limiting factors to the sketch so Inventor understands exactly what you are looking to create)

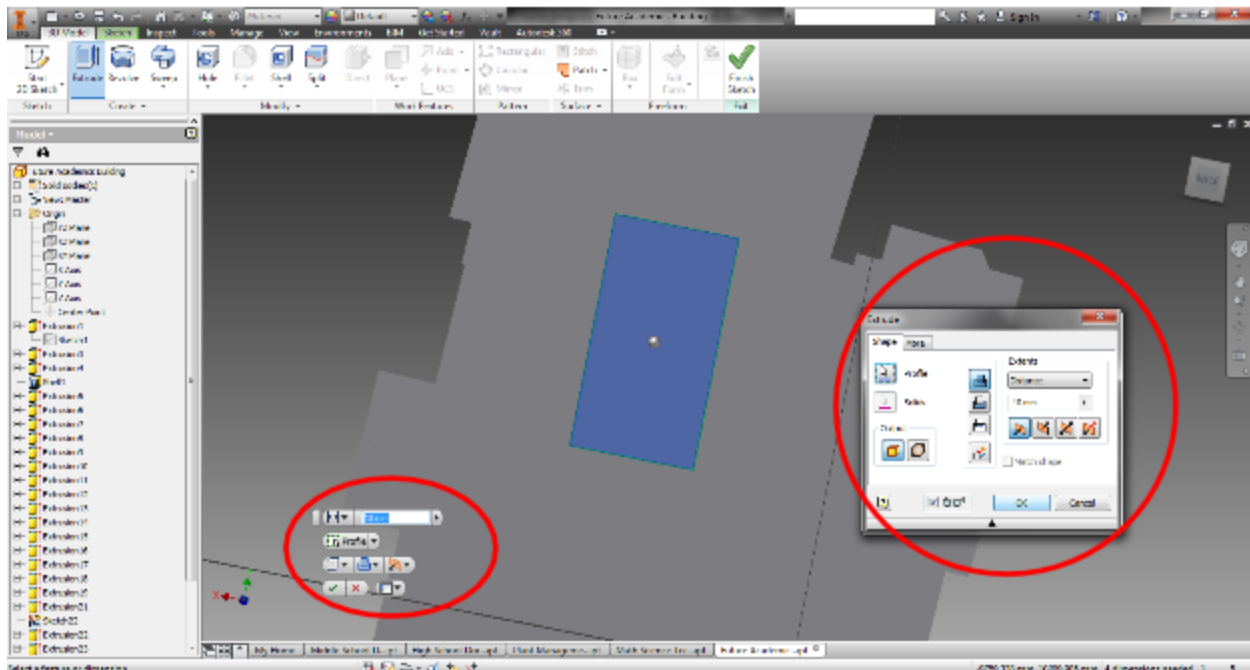
Note 2: Constraints are vital to the proper creation of your feature. If you do not adequately label your drawing with constraints, Inventor will either make assumptions on what you are trying to do or send you errors.

Note 3: This section allows for you to modify your sketch such as rotating, moving, scaling, ect. Select the desired method, select the profile you want to modify, input the parameters of the modification, and press ok.



### 13. Extrude surfaces.



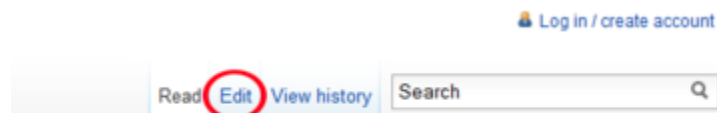


14. Repeat steps 11 through 13 until the building is complete.

## Appendix F: Wiki Editing Page and Google Earth Pro Linking Manual

### Wiki Editing Page and Google Earth Pro Linking Manual

1. Create an account for the wiki website you are concerned with editing an article for.



2. If you wish to edit an article, click on the edit button at the top right of the page as seen above.

## Editing Santa Fe Indian School

**B** **Ab** **A** **W** **U** **Y** **U** **U**

```
{{Infobox
|title = Santa Fe Indian School
|image= [[File:SFIS_logo.jpg|200px|The Santa Fe Indian School Logo]]
|headerstyle = background:#FFCC00;
|header1 = Contact Information
|label2 = Address
|data2 = 1501 Cerrillos Road, Santa Fe, NM 87505
|label3 = Phone Number
|data3 = (505) 989-6330
|label4 = Website
|data4 = www.sfis.k12.nm.us
|header5 = Information
|label6 = Established
|data6 = 1890
|label7 = Grades
|data7 = 7-12
|label8 = Students
|data8 = 700
|header9 = Location
|label10 = Map
|data10 = {{#display_points:<1501 Cerrillos Road, Santa Fe, NM 87505> |height=300 |width=300}}
}}
The Santa Fe Indian School ([http://en.wikipedia.org/wiki/Santa_Fe_Indian_School_SFIS]) is a boarding and day school for Native American students from the
[http://www.indianpueblo.org/19pueblos/index.html 19 Pueblos of New Mexico]. The school is owned and operated by the pueblos, which are spread throughout the state.
```

Summary:

☐ This is a minor edit ☐ Watch this page

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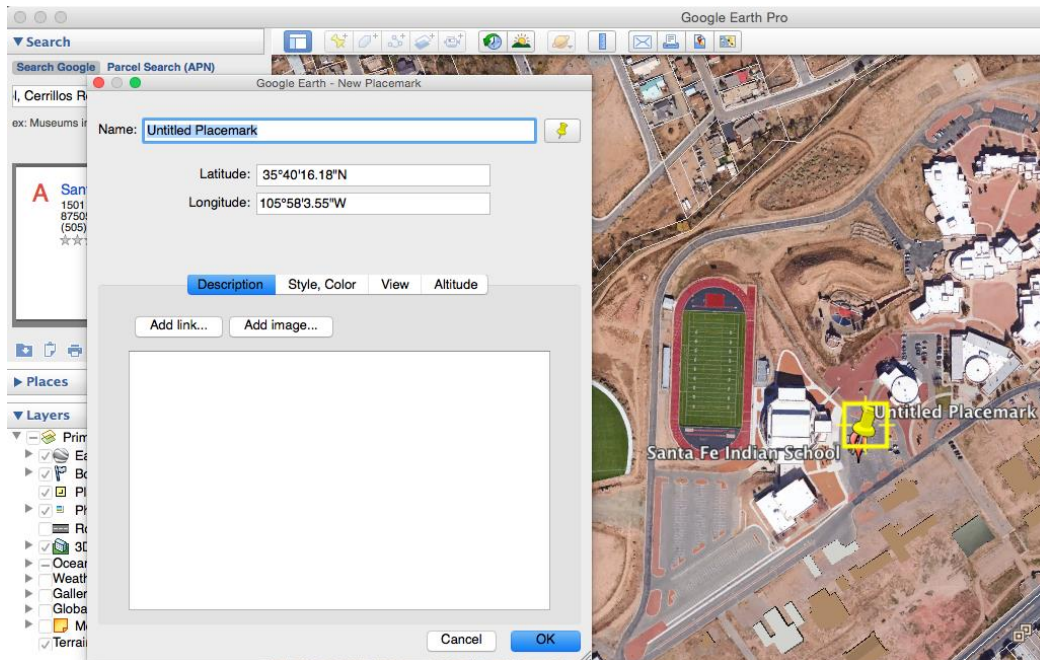
3. After clicking the edit link, you will be brought to a page as seen above. All of the editing to the page can be done here by using wiki coding syntax
4. When editing, please refer to the wiki cheat sheet for how to properly use the coding syntax used to edit a page. The page can be found [here](#).

**Edit summary** (Briefly describe the changes you have made)

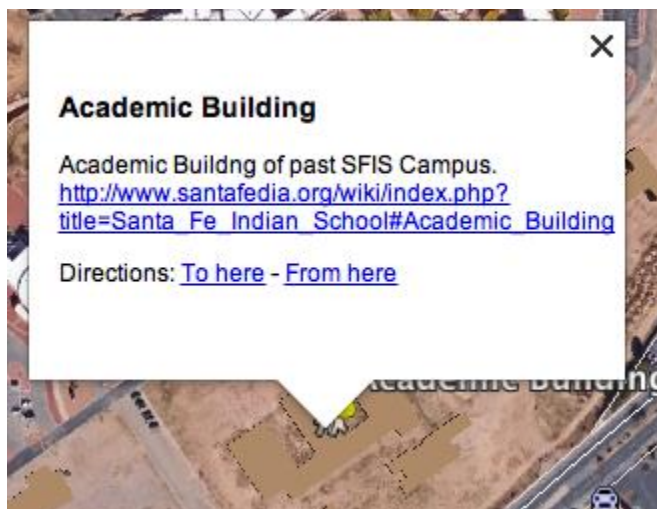
☐ This is a minor edit ☐ Watch this page

By clicking the "Save Page" button, you agree to the [Terms of Use](#), and you irrevocably agree to release your contribution under the [CC-BY-SA 3.0 License](#) and the [GFDL](#). You agree that a hyperlink or URL is sufficient attribution under the Creative Commons license.

5. Once the page is in an acceptable state, make sure to preview the page as seen above.
6. If satisfied with the results, save the page for submission
7. To link the article from Google Earth, first you must create a placemark within Google Earth Pro. Do this by clicking on the yellow pin in the top left of the Google Earth Pro program as seen below.



7. Once you have selected the placemark button, you are able to move the placemark to wherever on the map you desire. Once you are happy with the location of the placemark, you are able to add general information, photos, and URLs to the placemark information popup. An example of a completed placemark can be seen below.



8. By clicking on the link in the pop up, you will be brought to a wiki page of the building being viewed. An example of this can be seen below.

---

## Academic Building

- IAIA Era Name: Academic Building
  - SFIS Era Name: Middle School Academy
  - Construction Date: 1961
  - Demolished: 2012

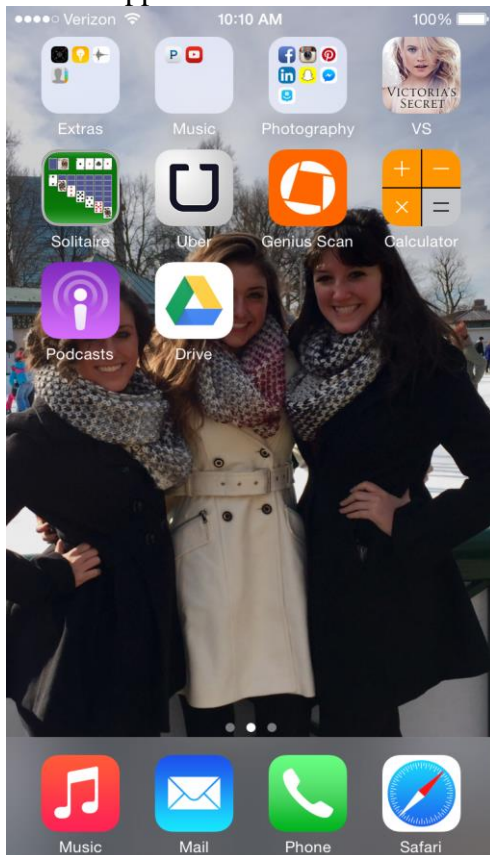
## Fine Arts

- IAIA Era Name: Fine Arts
  - SFIS Era Name: Fine Arts
  - Construction Date: 1898
  - Demolished: 2008

## Appendix G: Genius Scan Manual

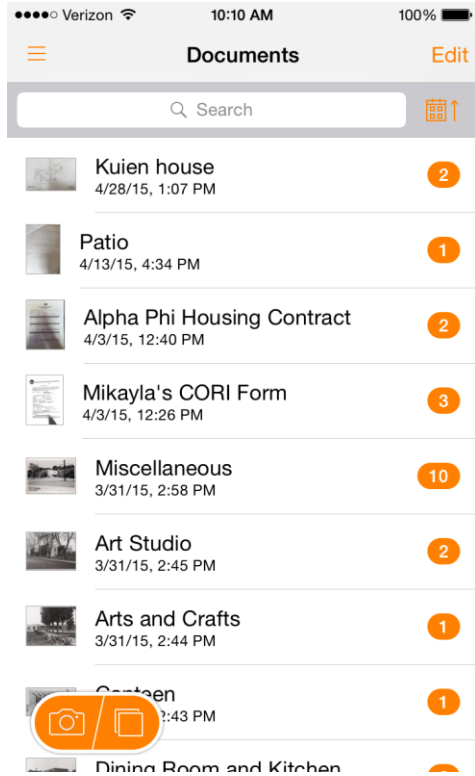
### Genius Scan Manual

1. Download the Genius Scan App to your Smartphone. Next, *Click* on the Genius Scan App.





2. Once you are in the App. It will look like the picture below. Click on the picture of the camera on the bottom left corner of your screen.



3. Take a picture of the document you would like to scan. Once the picture is taken, a screen will appear like the one below.



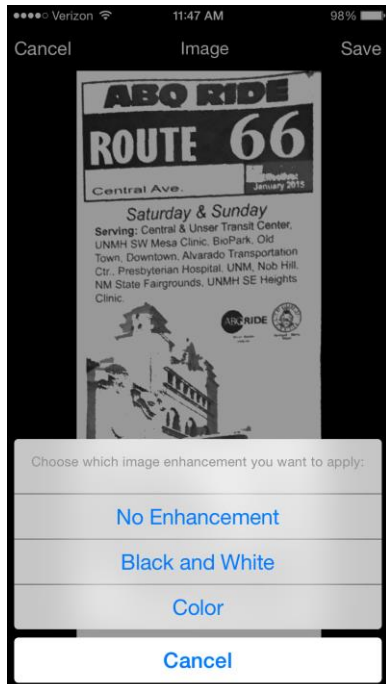
4. Next, take to orange edges and line them up with the edges of the document.



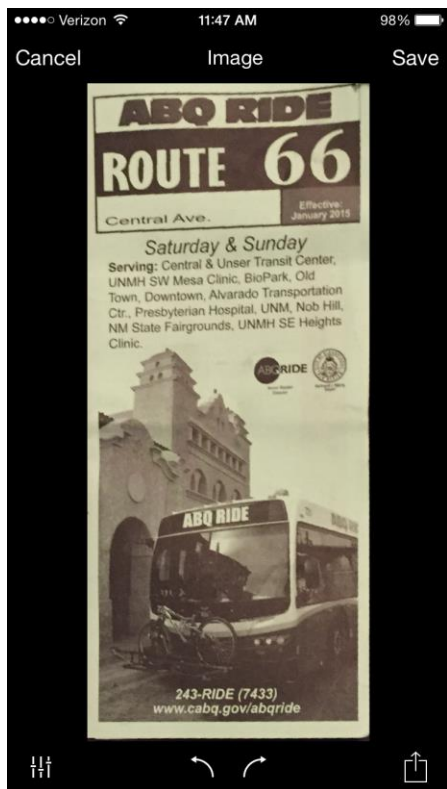
5. Once in place, select the *Use* button in the bottom right-hand corner of your screen. The photo will appear like the one below, auto-enhanced. If this is undesirable, select the button in the bottom left-hand corner of your screen.



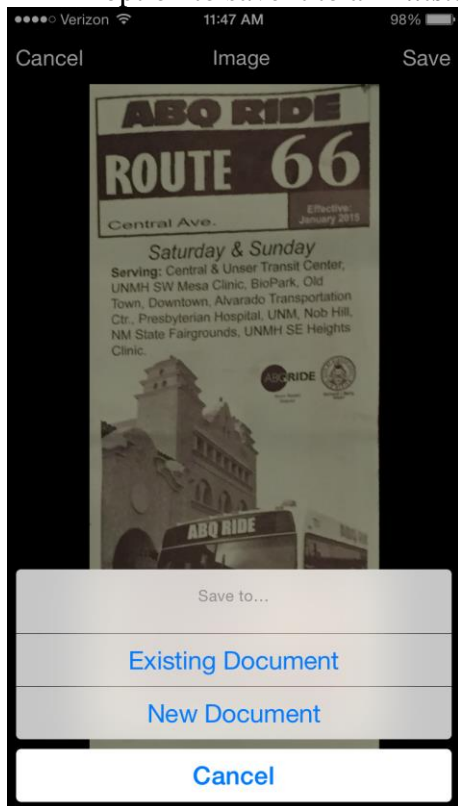
6. Select the No Enhancement button from the screen below.



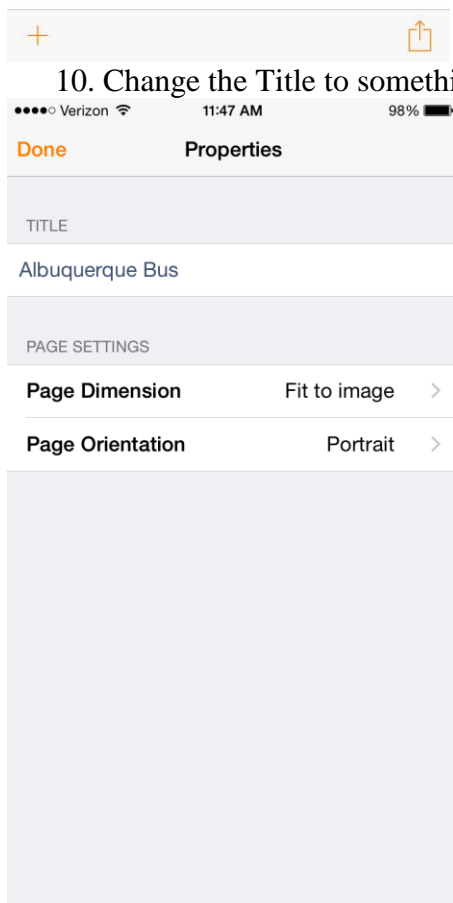
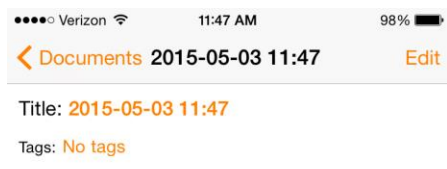
7. The scan should render back to its original format, as seen below.



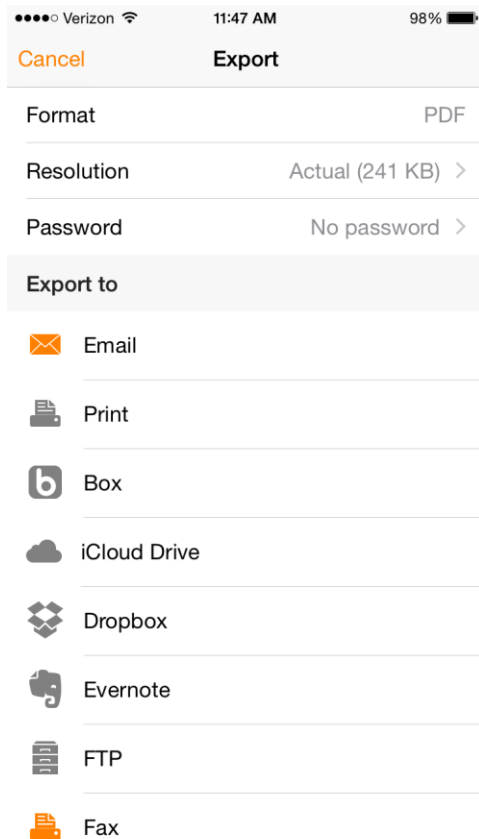
8. Next, select the Save button in the top right-hand corner of the screen. It will give you the option to save it to an *Existing File* or to a *New Document*.



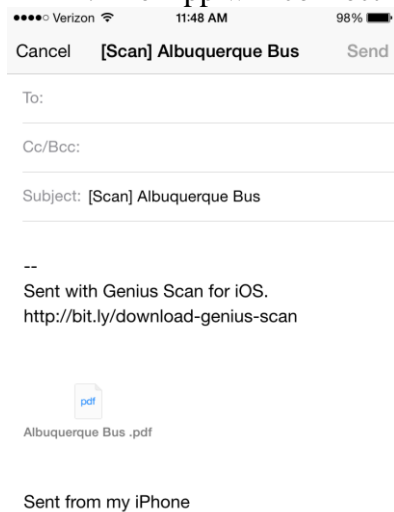
9. If you select a *New Document*. The screen will appear like the one below.



11. You will then have the option to send the scanned images as a PDF to anyone. Select **Email** to do so.



12. The App will connect with your email and can send the PDF.





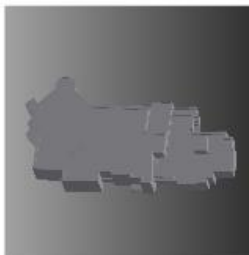
# ENGINEERING THE FUTURE

---

Santa Fe Indian School



## Why Are We Here?



## How You Can Get Involved

- Proposing New Ideas for the Campus, such as:



- Designing These New Ideas for the Campus



## Adding Buildings to Google Earth

## Modeling for Printing

## Technology Workshop

Mikayla Filippone  
Zachary Rahl  
Joseluis Velez  
Eric Zandrow

## The Exercise

- Create 2D drawings of buildings on the SFIS Campus.
- Learn about different CAD techniques.

## Software

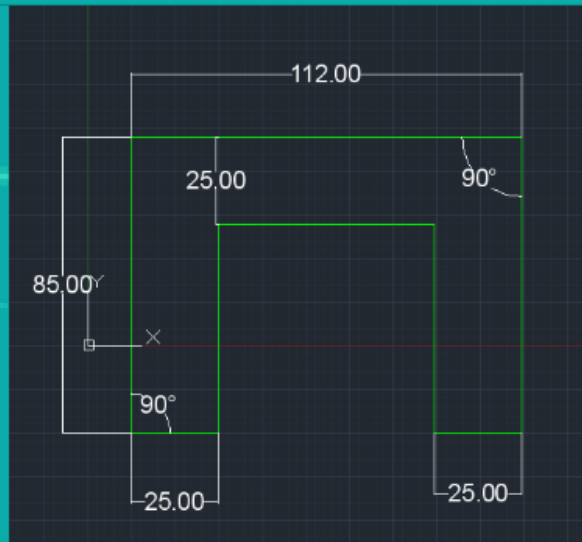
- We will be working with AutoCAD.
- AutoCAD is a 2D drawing software that can be used by architects.

## Materials

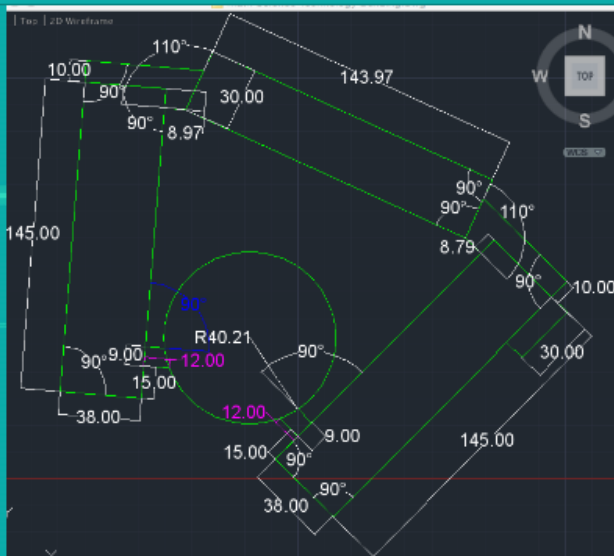
You will be given the following:

- A Manual that will introduce basic concepts and techniques within AutoCAD
- The dimensions of 3 buildings from the Campus of varying levels of difficulty.

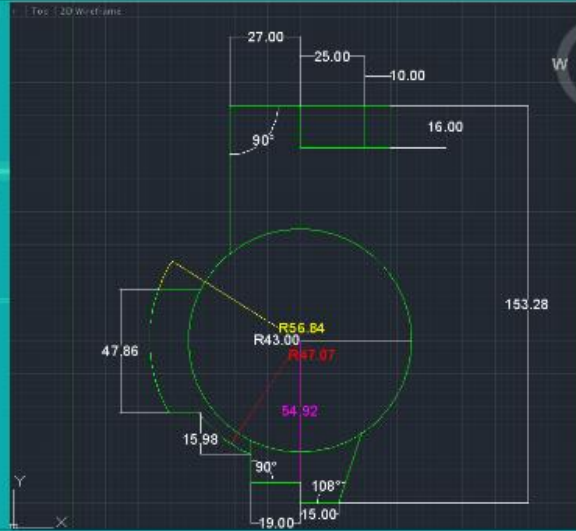
## U Shaped Building



## Math, Science and Technology Building



# Administration Building



## Appendix J: AutoCAD to Inventor Architectural Class Presentation

### AUTOCAD TO INVENTOR: An Architectural Experience



# Who are we?

## Worcester Polytechnic Institute(WPI) Students

Mikayla Filippone  
Zach Rahl  
Jose Velez  
Eric Zandrow



# Why are we here?

To complete a Junior Project.  
To create 3D printed models based on designs  
To show students how to use CAD software



# What is CAD and why is it important?

CAD software is used by companies to produce almost everything in modern life

Buildings, Cars, computers, ect

Inventor is the CAD software we will be introducing you to today

We used this software to design and 3D print buildings on Campus

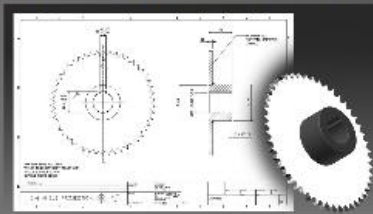


## AutoCAD to Inventor

We create a video of our design process and manual for how to follow the process.

We would like to give you the opportunity to convert your AutoCAD files into 3D digital models for this class

Please watch our video, read our manual and we are here if you have any questions or need any assistance



Pictures from

[http://farm3.staticflickr.com/2257/3534516458\\_48e4e8595f\\_z.jpg](http://farm3.staticflickr.com/2257/3534516458_48e4e8595f_z.jpg)

[http://www.con7.com/portals/0/iStock\\_person-and-org-chart\\_web.jpg](http://www.con7.com/portals/0/iStock_person-and-org-chart_web.jpg)

<http://autodeskmfg.typepad.com/a/6a0148c7f4076d970c0168e7453a26970c-pi>

<http://cdn.instructables.com/FHT/6Y4Y/H82U29US/FHT6Y4YH82U29US.LARGE.jpg>

## Appendix K: Final Presentation

# Santa Fe Indian School Campus: Remembering and Imagining



By Team SFIS:  
Mikayla Filippone  
Zachary Rahl  
Joseluis Velez  
Eric Zandrow



## Our Mission is...

---

To create a framework to assist Santa Fe Indian School in capturing the past and planning for the future of the SFIS campus.

## Lasting Impacts

---



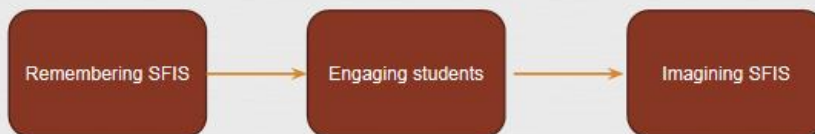
# Focal Points of Project

---

- Involving the community to:
  - Remember SFIS History
  - Create a school environment that reflects the values of the students' home communities
  - Shape the direction of campus land use planning and academic programs

## Connecting Past to Future

---



Virtual Model of Old Campus



New Health Education Complex



## Recent Past SFIS 1977-Present

- Albuquerque to Santa Fe
- Home away from home
- \$50M New Campus
- Santa Fe Indian School Act: Trust Land Transfer
- Demolition of Old Campus
- Working towards a better future



SNAKE Building

## Albuquerque to Santa Fe 1977-1981

- Due to conditions, AIS moved to Santa Fe, becoming SFIS.



AIS Campus 1900



AIS Campus 1977



## Albuquerque to Santa Fe 1977-1981

---

- Due to conditions, AIS moved to Santa Fe, becoming SFIS.



AIS Campus 1977



Crandall Hall on SFIS Campus 1981

## Home Away From Home

- SFIS became an extension of community
- Pueblo took control of the Indian School and determined an education aligned with Pueblo beliefs



Students in Traditional Clothing at SFIS

## Santa Fe Indian School Act 2001

- Pueblo took control of the Santa Fe Indian School and determined an education aligned with Pueblo beliefs



Joseph Abeyta: First Superintendent 100% Native

## \$50M New Campus 2007

---

- SFIS received a \$50 million dollar grant around 2007 during the Bush administration which funded the expansion of the new SFIS campus



Final Product of \$50M New Campus

## Demolition of Old Campus 2005-2012

---

- Between 2005-2012, all of the past Santa Fe Indian School Campus was razed, with eighteen of the buildings being razed in 2008 alone.



Picture from 2008 after Old Campus was demolished.

## Working Towards A Better Future



## Objectives

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.
4. Introducing technology to enhance the SFIS curriculum across subject matter.



# Objectives

---

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.
4. Introducing technology to enhance the SFIS curriculum across subject matter.

## Physical Model of Current Campus

---

- Created using:
  - Blueprints



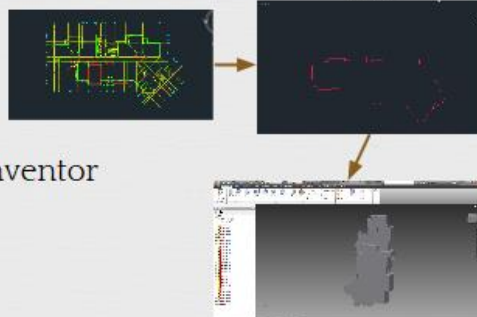
## Physical Model of Current Campus

- Created using:
  - Blueprints
  - AutoCAD



## Physical Model of Current Campus

- Created using:
  - Blueprints
  - AutoCAD
  - Autodesk Inventor

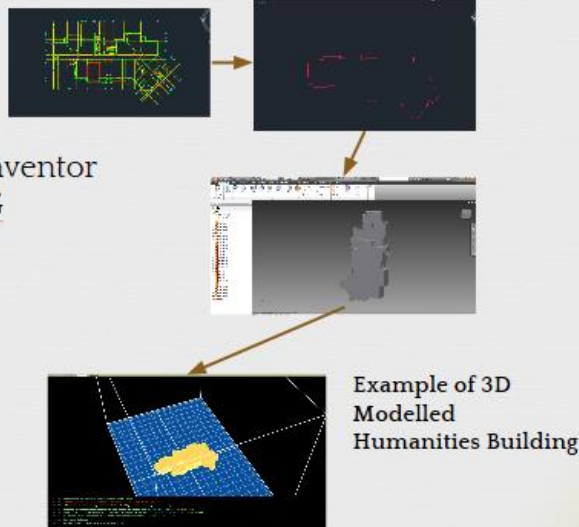


Example of 3D  
Modelled  
Humanities Building



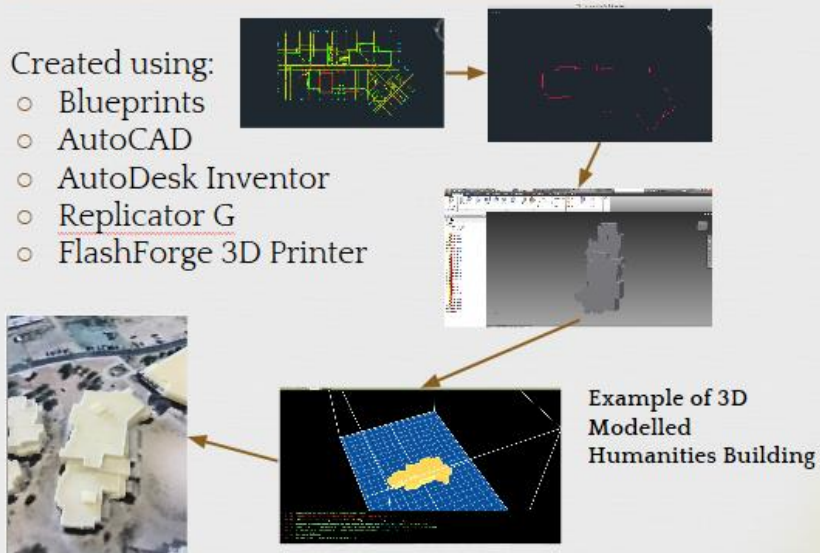
## Physical Model of Current Campus

- Created using:
  - Blueprints
  - AutoCAD
  - AutoDesk Inventor
  - Replicator G



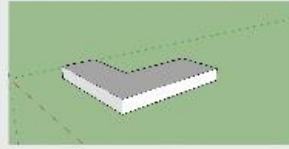
## Physical Model of Current Campus

- Created using:
  - Blueprints
  - AutoCAD
  - AutoDesk Inventor
  - Replicator G
  - FlashForge 3D Printer



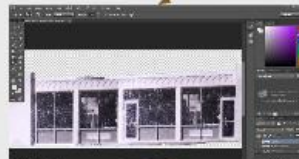
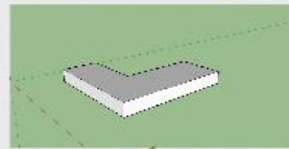
# 3D Virtual Model

- Created using:
  - SketchUp



# 3D Virtual Model

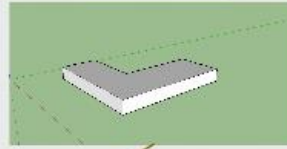
- Created using:
  - SketchUp
  - Photoshop



3D Modelled  
Administration  
Building

## 3D Virtual Model

- Created using:
  - SketchUp
  - Photoshop
  - Google Earth Pro



3D Modelled  
Administration  
Building

## Future of Campus Models

- Teach Students to use software for replication in the future.
- Keep up to date with adding information to both the physical and digital models.



# Objectives

---

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.
4. Introducing technology to enhance the SFIS curriculum across subject matter.

# Background

---

- Changes to the campus, i.e. demolition in 2008



# Historical Campus



## Background

- SFIS owns many upcoming technologies
  - Technology could be used in classes
  - Technology could be used in more versatile ways
  - Students could learn how to use these technologies for Senior Project



Simtable

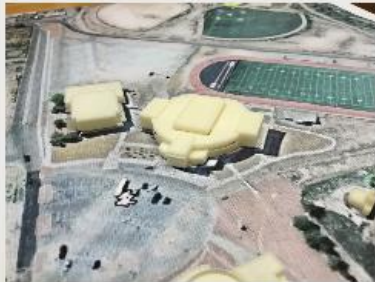


FlashForge 3D Printer



# Capturing Future SFIS

- Campus Development
  - Visualizing potential new additions to the campus



Current Abeyta Gym and Pueblo Pavillion



Future Building: Health and Education Complex

# Future Planning with Students

- Use students to help create 3D models for proposed campus



## Future Planning with Students

---

- Use students to help create 3D models for proposed campus
- Allow student to present and propose future changes to the campus

## Future Planning with Students

---

- Use students to help create 3D models for proposed campus
- Allow student to present and propose future changes to the campus
- Work with Simtable to develop a more interactive experience for planning and water flow.

# Future Planning with Students

- Develop Timeline of campus to scroll through different eras



Pre-Demolition  
Campus



SFIS Campus  
Today



## Objectives

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.
4. Introducing technology to enhance the SFIS curriculum across subject matter.

# SFIS Archive

- Today's Archive:
  - Not easily accessible to:
    - Students
    - Faculty
    - Alumni



Current SFIS Archive

## Virtual History of Campus

- Developed a 3D virtual model of the old SFIS Campus
- Embedded historical:
  - Images
  - Oral Histories
  - Video



Digital Representation of Old and New Campus

## Example of Interactive Archive



## Digital Archive

- Build Digital Archive with help of students

Building #	IAIA Building Name	SFIS Building Name	Construction Date	Sq Footage	Demolished	Latitude	Longitude
1	Administration Building	Administration	1962	6,832	2012	35°42'13.37"N	106°57'56.31"W
10	Outdoor Theatre	Pablo Soler Amph	1970	28,947	--		
11	Gymnasium	Abeylea Gym	1970	2,717	--	35°42'14.18"N	106°58'5.38"W
110.11	Gymnasium				--		
12	Plant Management Shop	Maintenance Shop	1971	1,973	--		
2	Academic Building	Middle School Academy	1961	9,356	2012	35°42'15.57"N	106°57'56.07"W
3	Student Center	Canteen	1962	2,717	2005	35°42'14.62"N	106°57'56.82"W
301	Student Sales	Admissions	1909	2,370	2008	35°42'10.95"N	106°57'58.40"W
302	Fine Arts	Fine Arts	1898	18,516	2008	35°42'13.33"N	106°57'58.04"W
303	Men's Dorm	Middle Dorm	1890	17,914	2008	35°42'12.52"N	106°58'1.66"W
304	Crandall Hall/Men's Dorm	Crandall Hall	1890	9,822	2008	35°42'11.62"N	106°58'3.15"W
305	Weaving and Traditional Techniques	Snake Building	1897	7,564	2008	35°42'09.10"N	106°58'1.85"W
306	Gymnasium	Old Gym	1927	11,902	2008	35°42'09.63	106°58'2.68"W
307	Counseling Center	Facility Management	1908	1,466	2008	35°42'11.14"N	106°58'3.99"W
308	Dining Hall	Kitchen/Dining Hall	1908	16,742	2008	35°42'10.45"N	106°58'4.58"W
309	Girl's Dorm	Main Dorm	1907	37,173	2008	35°42'09.50"N	106°58'5.16"W
313	Warehouse	Warehouse	1891	6,500	2005	35°42'12.13"N	106°58'4.46"W
315	Paint Shop	Paint Shop	1934	1,915	2008	35°42'11.30"N	106°58'5.71"W
316	Cultural Studies Center	Quarters	1908	1,813	2005		
316	Employee Quarters	Quarters	1908	1,813	2005		

# Digital Archive

---

- Build Digital Archive with help of students
- Incorporate Archiving into curriculums

## List of Past Campus Buildings

The buildings discussed in this section no longer exist. They range through multiple era's of the history of SFIS.

### Academic Building



Academic Building

- IAIA Era Name: Academic Building
- SFIS Era Name: Middle School Academy
- Construction Date: 1961
- Demolished: 2012

# Objectives

---

1. Creating a 3D physical and digital model of the Santa Fe Indian School.
2. Utilizing a 3D model of the past and present campuses to aid in conceptually visualizing changes to the campus over time.
3. Collecting and embedding photos, audio files, and general information into the digital 3D model.
4. Introducing technology to enhance the SFIS curriculum across subject matter.



# Technology and Education

---

- Created Manuals to add to Living History Project
  - Archiving Oral Histories

# Technology and Education

---

- Created Manuals to add to Living History Project
  - Archiving Oral Histories
- Engaging Student Interest
  - Calculus Class
  - High School Dorm Presentation
  - AutoCAD Workshop
  - Architectural Class



Eric Zandrow Presenting  
to Architectural Class



# Future of Education

- Incorporate different technologies into the curriculum
- Have students continue building upon the pieces we began to create throughout the project
- Have students utilize the manuals we made to perform a similar process on their respective Tribes: Senior Project



Eric Zandrow Presenting  
to Architectural Class

# Community Planning

- Community Planning
  - Cochiti Pueblo
  - Santo Domingo Pueblo



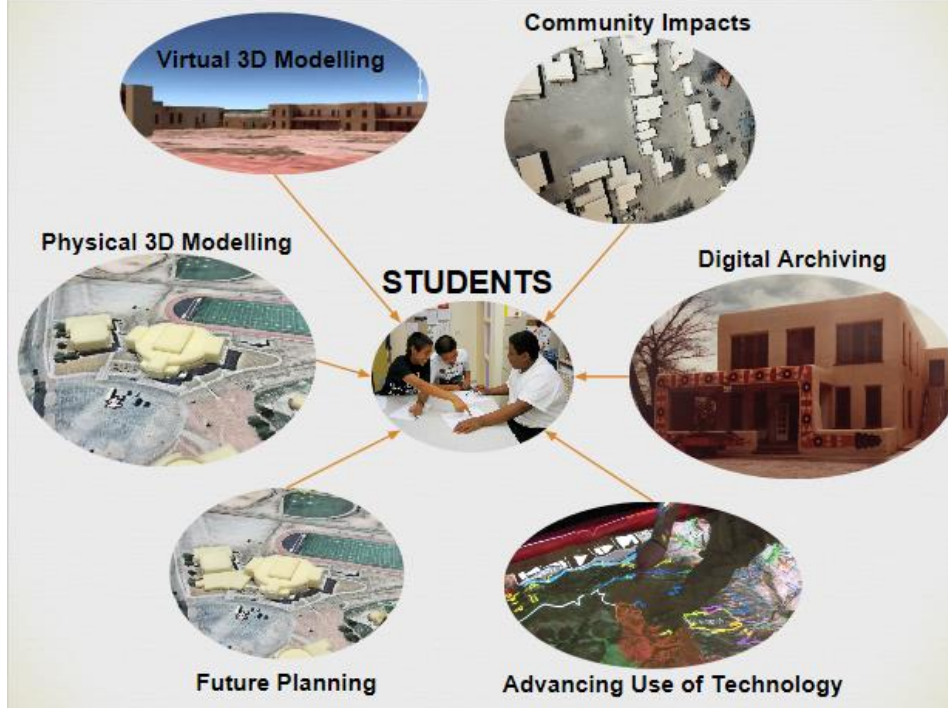
3D Model of Cochiti Pueblo

# Conclusion

Teaching  
Students  
Different  
Technologies

Utilization  
within their  
Tribes

Making a  
Difference  
within their  
Communities



## 3D Model Demonstration

- Upcoming Construction
  - Announcer's Booth
  - Health Education Complex
  - Outdoor Classroom
- Potential Additions:
  - Waffle Garden
  - Bus barn
  - Cemetery Memorial
  - Skate Park
  - Student Laundromat
  - Water Tower
  - Middle School Plaza Rotunda
  - High School Student Living Powwow Arena

## Acknowledgements

Thank you to...

**Our Sponsors:** Kimball Sekaquaptewa and Matt Pecos

**Our Advisors:** Scott Barton and Fabio Carrera

**A Special Thanks to:**

Superintendent Roy Herrera

High School Principal Felisa Guilbert

Director of Instruction Larkin Vigil

Director of Student Living Louise Naranjo

Director of Curriculum and Professional Development:

Anya Dozier Enos

Diane Pierce

Gerri Lovato

Jeane Gonzales

Sandra Eichwald

SFIS Students

**Team SFIS:** Mikayla Filippone

Zachary Rahl

Joseluis Velez

Eric Zandrow

**Team Website:**

<https://sites.google.com/site/sf2015sfis>

### Appendix L: 3D Printer Manual-FlashForge

Changing out Filament

1. Go to Utilities and press middle button
2. Use the up and down arrows to select the change filament option and press middle button

3. Use up and down arrows to select desired option (right extruder options only, load or unload) and the press middle button.
4. The Extruder will heat up to assist with the changing of filament.

Unloading: Once the extruder is heated up, press the clip on top of the extruder down and pull out filament and press the middle button. This will bring you back to the change filament menu.

Loading: the extruder will heat up and start trying to extrude the filament. Once the extruder is properly heat, press the clip on top of the extruder and insert the filament. The filament will start being extruded out. Once the filament is being fed through, press the middle button to stop.

5. Once the filament is replaced, press the back button “<-“until you return to the main menu

For resetting printer if the printer is stopped middle print, such as the USB is disconnected mid print.

1. Press the back button “<-“ and press cancel print.
2. A message will appear to confirm the cancellation, use the up and down arrows to select yes and the press the middle button

The Printer will return the platform and extruder to their starting positions. Once the platform has cooled, remove the material and the printer is ready for another print.