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Technical Direction of Little Women, The Musical

Matt Gilbertson
Minnesota State University, Mankato

TECHNICAL DIRECTION OF

LITTLE WOMEN, THE MUSICAL

by

MATTHEW A. GILBERTSON

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This thesis has been examined and approved.

Examining Committee:

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George E. Grubb, Chairperson

_____

Dr. Jane Earley, Dean Emeritus

_____

Melissa Rosenberger, Director

_____

Steven Smith, Lighting Designer

_____

David McCarl, Costume Designer

ABSTRACT

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This document is a thesis submitted in partial fulfillment of the Master of Fine Arts degree in theatre. It is a written account of the author Matthew A. Gilbertson's process in creating the technical direction of Minnesota State University, Mankato's production of *Little Women, The Musical* in the fall of 2017. This document details the process from pre-production to completion of the production. It includes a historical chapter discussing the history of moving scenery and the role it has played shaping modern theatre machines. It also contains a process journal and developmental analysis of the technical director. Appendices and works cited are included.

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I would like to begin by acknowledging the educators who planted the seed of an idea that has led me to a life in the arts, Mr. Parker and Mr. Quinlan. To those who watered that seed, Peter Lerohl, Scott Ford, Dr. Jack Bibee, Dr. Tom and Patti McCarthy. To those that brought the plant to harvest, Matthew Caron, Paul Finocchiaro, my advisor and friend George Grubb, Dr. Heather Hamilton, Dr. Paul J. Hustoles, David McCaral, John David Paul, Melissa Rosenberger, Steven Smith and Nick Wayne. Special thanks to my friend and mentor Dr. Jane Earley for sitting on my committee, it is an honor. Thank you all. I would not be where I am today without you along this path.

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CHAPTER I

EARLY PRODUCTION ANALYSIS

This chapter contains the early production analysis for the technical direction of *Little Women, the Musical*. The production's music and book are by Jason Howland and lyrics by Mindi Dickstein. It will take place in the Ted Paul Theatre at Minnesota State University, Mankato. It is directed by Mellissa Rosenberger with scenic design by Erin Wegleitner, costume design by Emily Kimball, lighting design by Steven Smith, sound design by George Grubb, stage managed by Brittny Hollenbeck, and with technical direction by this author, Matthew A. Gilbertson. The production will run from September 28 - 30 and October 5 - 8 in the year 2017. This production is part of Minnesota State University, Mankato's sesquicentennial celebration season.

Based on the classic and beloved novel Little Women, by Louisa May Alcott, *Little Women, the Musical* captures the same themes of growing up, coming of age and chasing one's dreams. Like in the novel, the home of the March family plays an important physical and symbolic role in the show. As a result, the scenic design will also play an important role in this production.

From a scenic point of view, the house will serve as an anchor to the story, at times it almost becomes another character in the show. The scenic designer

has spent much time focused on recreating the March house. The March house was based on the Alcott family home in Massachusetts. Wegleitner brings to the table many first-hand research images of the exterior of the house. These will become immensely important to the technical director who will strive to recreate the details of the house. She also has provided postcards of the interior of the home. As a technical director, these images help in the recreation of details. One example is of the windows on the side of the house. The research images show clearly the type of windows, the style of mullions and even details in the trim work. The technical director feels a special obligation to honor this place and the details and make them present on this set because it is based on an actual location and the research is available. Other details the first-hand research shows include the type of foundation, the colors and patina of the wood siding and the general shape of the home. The technical director is grateful for this research provided by the scene designer.

Wegleitner presented a model of her set and included a few rough ground plans for discussion. The model displayed a three-story house that has a base of 20' by 36'. The house needs to be able to track, or travel, upstage and downstage. There are a variety of ways to accomplish this movement such as manually pushing the unit by hand or automating the tracking of the unit.

No matter the method of movement, casters (wheels) are required. The decision to use straight or rigid casters is an early decision the technical director

must make. Swivel casters allow the wheel to move in any direction, similar to an office chair. A rigid caster does not swivel, tracks along a single plane, like the rear wheels of a vehicle. Because the unit is only moving in two directions, upstage and downstage, rigid casters are the best choice. If one were to use a swivel caster the wheel would have to spin around for it to change directions. This could cause the entire unit to no longer move in a straight line. It would eventually drift off track and move from its desired path of travel. The rigid caster remains in a single plane. There is no side to side rotation of the wheel. This creates much less of a chance of deviation from the desired path. Since the set moves to many spikes or locations in the show, repeatability and consistency are important. Rigid casters will provide the best chance of this happening.

When planning on the construction and manipulation of a unit of this size it is easiest to start from the ground and work up. After deciding which type of caster is best suited for the required movement, the next consideration is how to design and build a frame for such a large unit. Wegleitner designed the footprint of the unit so it would be possible to build the base out of stock platforms. A platform is a common structure used in theatrical construction meant for walking on. A stock platform is a common size that is used regularly eg. 4′ x 8′, 4′ x 6′ or 4′ x 4′. It would take 22 4′ x 8′ platforms and one 4′ x 4′ platform to create this particular unit. When combining that many platforms there is a risk of failure due to so many points of connection. If this were to happen, it would

be extremely difficult to repair. A better solution would be to create a single unit that is 20′ x 36′. Given the unavailability of wood boards at the lengths required, steel would prove an optimal material because it can easily be obtained in lengths up to 24′. It can also be welded together to essentially become a single beam that can run the required 36′. Steel will fix the problems that would be present if platforms were to be used. There are, however, a few downsides to using steel. The first is the cost. Two types of steel will be used for this build. The first is 2″ x 2″ box steel and the second is 2″ x 1″ box steel. The cost of those materials is $1.70 per foot and $1.16 per foot respectively and given the high number of linear feet needed, means this would be a considerable expense. Another downside to this material is that the fabrication and assembly of the steel require special expertise in welding. Welding is not a skill with which all carpenters in this shop have experience at, nor is this the task to learn how to weld on because the margin of error is so small. The details of the welding process will be discussed in upcoming paragraphs. However, the technical director believes even given these downsides, steel is the correct choice for the frame of the wagon.

Addressing how the casters will be attached to the base is a challenge the technical director must address. A previous production at the college required many rigid casters, so acquiring the casters will not be an issue. The issue will be attaching them to the base. An easy solution could be to weld the casters directly

to the frame. However, this would render the casters unusable for future productions. Another solution could be fabricating a bracket of some kind. Using a bracket to hold the caster and attaching this to the frame would allow the casters to be detached after the show and reused. These brackets would have to be custom pieces designed by the technical director and produced in the shop.

After the unit is framed and castered the next issue to solve will be how to move it. Since the dawn of theatre, scenery has moved on stage. The ekkyklema, the Deus ex Machina, the pageant wagon, the hell mouth and the chariot and pole system are all examples of moving scenery throughout time. It is the final example, the chariot and pole system, developed by a scenic engineer named Giacomo Torelli in the 1600s, that would serve to be the basis for how scenery moved on stage for the next 250 years. In this system, there were tracks in the stage that scenery would travel along. Below the stage deck were large poles mounted on wagons that were pushed by stagehands. The poles would attach to the scenic units above, and while being moved, they created the illusion of the scenery moving on its own without a visible stagehand. Modern theatrical automation is the exercise of using a motor and a programmable computer to move the scenic unit in lieu of human power. It is the desire of the technical director to use automation for the movement of the March house. Designing and implementing an automation system is not a task commonly attempted at this university because of its inherent new and complex challenges. However the

payoff for the technical director will come with the knowledge gained in getting to use this technology.

The next part of the unit after the frame, wheels and movement source is the deck. The steel frame needs to have a layer of material on top of it. This material will provide a surface to build the set on as well as provide a place for the actors to ride on. With cost being an ongoing concern the best material to serve the purpose and function would be 3/4" OSB. OSB stands for "oriented strand board". This type of material comes in sheets that are 4' x 8' in size and 3/4" thick. It is a more cost-effective material than a standard 3/4" plywood. The cost for a sheet of OSB is about $20.00 and the cost of a sheet of 3/4" CDX plywood is about $40.00 at this time. It is commonly accepted that OSB has a stronger shear strength than plywood of the same thickness but it does not hold fasteners as effectively. This is acceptable for this application. The fasteners that will be used to attach the OSB will not rely only on the OSB. They will anchor into the steel. Given the dimensions of the unit, it is estimated that it will take about 23 sheets of OSB to cover the unit. At $20.00 a sheet, it will cost $460 to deck the unit.

With a firm foundation to build on and a system of movement, the next in the process is to create the walls and platforms for the unit. As drafted, the second and third floor only take up the furthest upstage 8' of the footprint. The first floor takes up the downstage 12' of the unit. Wegleitner's design allows for

the structure needed to build vertically to be masked by the upstage walls of the first floor. This will make it so standard stud walls can be used to support the floors above. A stud wall is a series of vertical beams sandwiched between a top and bottom horizontal beam that ties them together. This provides a solid foundation for the floors above to rest upon. These stud walls will run upstage to downstage from the furthest upstage edge of the wagon downstage just short of 8'. If built structurally, the walls on the first floor can also be used as supports for the floors above.

The cost of having three floors is an immediate concern of the technical director but a factor that will be worked out. The cost of a unit grows significantly as one builds vertically. This is due to the type and amount of material needed to safely and structurally build the unit. Because the first floor will be created out of steel, there will be stock platforms free to use on the other floors. However, there may not be enough for both floors. Some may have to be built. Given the budget limitations, a technical director might ponder if the design could be executed successfully with only two of the three floors. How important are all three floors? Could the design be executed with the same intent with only two floors? This is a question that will be brought up at a later production meeting after more details are worked out. Cost, not ability, would be the driving concern for that choice.

There are two other wagon units that roll on and off in the show. A wagon is simply a platform with wheels. The first is a simple boardwalk unit. As drafted, this seems to be a standard wagon with some wood planking on it to give the appearance of the boardwalk. It appears to be a 6′ x 8′ wagon. This should be able to be pulled out of stock and castered with wheels available in the shop inventory. The wood planking should be able to be pulled from stock as well. This unit may be able to use air casters to create a seamless transition. An air caster is a caster that is connected to a pneumatic system and moves up and down. When the system is filled with air it pushes the caster down and thus lifts the platform up off the frame. When the air is released it gently sets the unit on the frame and the casters retreat under the platform. When the platform is set on its frame it creates a solid and stable structure on which to act. Then, when it is time to move it off, it quietly lifts and the wagon can be removed.

The second wagon unit is set at the top of the show and is double-sided, meaning it has acting space on both sides of the unit. It will make three or four appearances on stage. One side of the wagon represents an exterior of a boarding house in New York City. When turned around, the wagon reveals the interior of the boarding house. As drafted the unit is 8′ x 20′. For a wagon, this size is a logistical concern for the technical director. Units move onstage from the wings through vertical hanging curtains called legs. The spaces between those curtains are called a portal or sometimes a lane. When blocking a show

these portals are numbered one, two, three and so on. Typically, in this venue, the average portal size is four to six feet wide. With an eight-foot-wide unit like this one, the legs will either need to be flown out of the way to accommodate the transition or paged, to pull back. Flying the curtains would be the least ideal method. When something flies, or is lifted in a production it tends to be distracting for the audience. It is rather spectacular and unnatural for something to fly out on stage. Since this will have to happen multiple times it could pose a real threat of pulling the audience's focus. A simple page of the curtain would be less obtrusive and faster. However, this method has a drawback. Often it exposes the wing, or offstage area, to the audience. This can take the audience out of the time and place of the show. If not done with subtle care, it can also cause the pipe it is attached to to swing and become a distraction. The length of the unit is also a bit of a concern. This unit will need to rotate from the interior to exterior onstage and it will be very close to the house while turning. This could pose a problem in production. This is an important scenic piece that establishes a new and different location than that of the March house. It is the goal of the technical director to find a way that it can maintain its purpose and serve its functionality without it becoming a distraction.

There are some issues and limitations outlined in this chapter that can be solved with conversation, re-working of a design or creative solutions in the shop. One limitation that cannot be changed is the budget. The scenic budget

for this production is $2,750.00. The scenic designer has requested $200.00 of this budget for wallcoverings and other supplies. This leaves $2,550.00 for materials. An early estimation of expenses breaks down as follows, $1,000.00 for steel, $1,500.00 for building materials. These estimates are conservative. Because this is the first production of the season at Minnesota State Mankato, there is little material in stock and much will need to be purchased new. Also, this production has a rather conservative budget for the scale of the show. However, when this production is done, large quantities of common materials, the OSB, 12' lengths of 2" x 4" and most of the steel, will be able to be reused by future productions, so even if this production does go over budget, a very plausible expectation, the next shows will benefit by needing to spend less, or nothing, on these materials. In the end, the overall budgets should balance out.

Another limitation that exists that cannot be changed is the allocation of labor. The scene shop is staffed by students with abilities all over the spectrum of experience. Some returning carpenters will bring great leadership and experience to this build, however given that this is the first production of the season there will be more students coming into the shop who have little or no carpentry experience. This production will combine skill sets based on wood carpentry, steel construction, and automation. The technical director feels confident in his ability to use the labor that he has in an effective and efficient way. There may need to be additional shop days to focus on specialty tasks such

as fabrication, welding, rigging and automation, but that would be expected. The timeline for this build will be fast and short. It technically has 20 days in the shop, but some of that time will be spent cleaning and organizing the shop after the summer stock season leaves.

Even with the limitations associated with this build, and the challenges it will contain, the technical director is not deterred. He will use his 12 years of professional and academic experience to complete this build on time. The strategy to accomplish this will include the technical director being organized and ready for each shop day. He will have a clear list of goals and expectations for each shift and the materials to set up the labor for success. He will have clear and competent drafting for the staff to build from. Finally, to ensure the build is completed by the deadline, he will strive to manage his and other staff's time wisely. As the great Tyrone Guthrie once said, "The most important job of a director is to manage other people's time."

CHAPTER II

A History of Moving Scenery

The origin of theatre can be traced to the 5th century BCE when Aeschylus introduced the second actor on stage. Along with the act of performing theatre, the mechanics and stage machinery can also be traced nearly as far, hiding in the background. This chapter will trace theatre mechanics and stage machinery from its origin in the 5th century BCE to the Renaissance of the 1700's AD. The chapter will specifically highlight the foundation of stage mechanics in the Greek and Roman period, then jump to the middle ages, then move to the rediscovery of the Greek and Roman machines and their application in the Renaissance, leading to the 1700's. It will conclude with a look at how these early theatre machines created the foundation for modern automated scenery.

Historian Oscar Brockett says "In the fifth century, a limited amount of machinery was available for special effects. The most important devices were the ekkyklema and the machine or machina" (27). He continues by saying "The Machina, or crane, was used to show characters in flight or suspended above the earth" (27). This was a device used very frequently by playwrights of the time. Thomas G. Chondros author of "'Deus-Ex-Machina' Reconstruction and Dynamics" gives readers a bit of etymology and history. He says:

The word mechanism is a derivative of the Greek word mechane (which meant machine). While it was used for the first time by Homer in the Iliad to describe the political manipulation, it was used with its modern meaning first in Aeschylu's times to describe the stage machine used to bring the gods or the heroes of tragedy on stage, known with the Latin term Deus ex machina. Mechanema- Mechanism, in turn, means an assemblage of machines and was first used by Aristophanes. (87)

Along with some history on machine itself Chondros also draws focus to a new word, "mechanopoios". It meant "the machine maker or engineer" (87). He speculates that the mechanopois was also the operator of the machina. The crane was made of beams, wheels, and ropes. It was a very complex machine and thus made sense for the designer to also be the operator.

Fig. 2. It is clear to see how the ekkyklema served as the foundation for the modern stage wagon.
Source: http://www.didaskalia.net/

The second type of machine that Brockett noted was the ekkyklema. "The ekkyklema was probably a platform that could be rolled out through the central doorway of the skene" (27). Scholars are not in agreeance on the design of the ekkylema. Some speculate it was similar to a modern-day wagon, a rolling

platform. Some, Brockett says, say that it "revolved or turned" and further speculates "others associate it with the upper story of the scene house or with the side doors" (27). What is not contended is its purpose. It was used to show or reveal action that had happened off stage, such as violence. It was also used to help clarify a tableau. Both the ekkyklema and the mechene were used primarily in tragedy but also were used in comedy. When used in comedy, they commonly used them to parody tragedy. These two devices were the foundation for Greek theatre machines and would serve as a starting point for stage mechanics.

The next important machine has roots that start in the Hellenistic period circa 300 BCE. Scholars mark the start of the Hellenistic period with the death of Alexander the Great in 323 and ending in 31 BCE with the conquest of the last Hellenistic kingdom by Rome (www.ancient.eu/Hellenistic_Period). During this period, shifts start to happen. The structure of the plays start to effect the scenic demands of the shows. Brockett talks about the effects of the shrinking size of the chorus and its speculative relationship to creation of the thyromata. The thyromata was a large second level of acting space that had one to seven tall doorways. These doorways could serve as individual prosceniums. "Some scholars have also assumed that thyromata were created to permit greater scenic illusion" (Brockett, 39). Within these openings one would find the great machine

of the Hellenistic period, the periaktoi. In chapter VI of book V of "De Architectura", written by Vitruvius in the first century BCE, he describes the periaktoi and its location, "Beyond are spaces provided for decoration-places the Greeks call περιάκτοι, (periaktoi) because in these places are triangular pieces of machinery which revolve, each having three decorated faces"(www.ProjectGutenberg.org). He continues by describing their usage "When the play is to be changed, or when gods enter to the accompaniment of sudden claps of thunder, these may be revolved and present a face differently decorated" (www.ProjectGutenberg.org). In section nine of the chapter he talks about the three different kinds of scenes that could be on periaktoi. "There are three kinds of scenes, one called the tragic, second, the comic, third, the satyric" (151). The periaktoi, ekkyklema and the mechene were the main technologies that would carry theatre into the next theatrical period, Roman Theatre.

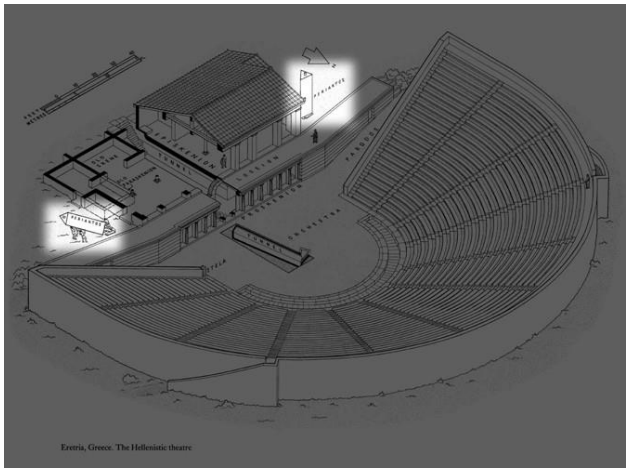


Fig. 3. Here the periaktoi can be seen in place in a model of a typical Greek theatre.
Source: Lillian Mckenzie
www.slideplayer.com

The Roman theatre era falls at the relative waning years of the Greek period. Brockett's time line on page 77 says that Greek plays were being written

from “534 BCE until c. 150 CE”. Roman plays were being written from “240 BCE until c. 65 CE”. As a result of the overlap the two shared many types of theatre technology. The Roman period brought about a few large changes to the structure of the theatre space. The theatre itself was now built onto a foundation as opposed to being found in a natural setting like a hill side. The structures also became much larger. However, the technology in the machines, specific to the theatres, did not change much.

In the large amphitheaters there were many types of technological advancements such as the earliest trapdoors, stage elevators and the ability to flood the venue to host nautical battles. However, the technology of the amphitheater is out of the scope of this paper which will continue to focus specifically on the acting theatre.

After the fall of the Roman Empire there was a large lull in theatre. This time was called the dark ages. Brockett says, “Following the disintegration of the Roman Empire, organized theatrical activities had virtually disappeared in Western Europe as conditions returned to a state similar to the period that proceeded the emergence of drama in the sixth century B.C.E.” (71). The next time theatre technology would be used in a significant way would be during the second century A.D. in the churches, and by no means would the technology

they were to use be new technology. Spectacle became one of the more important elements in the churches.

The use of the flying machines was extremely popular. The machines were set up using ropes and pulleys that were connected to banisters in the top of the churches. Brockett notes the account of Bishop Abraham of Souzdal at one of the more elaborate liturgical plays he saw in Florence, "In one, showing Christ's Ascension into Heaven, the actor portraying Christ was raised upward by means of ropes and pulleys to be engulfed in simulated clouds and then united with God and the Angels in Heaven (a platform some 50 feet above the church floor)" (76,77).

HELL-MOUTH

Not all the Hell-Mouths seen in the miracle plays were so elaborate as this one taken from an old print.

Fletcher, R. H. A History of English Literature. Boston: Richard G. Badger, 1916. 110.

Fig. 4. Source: www.luminarium.org

Another significant machine used during this time was the Hell mouth ("hellmouth", "hell-mouth" and "Hell mouth" were all used interchangeably between sources of research. This paper will use "Hell mouth" unless quoted otherwise). This structure was used to symbolize, as the name implies, the mouth or entrance into hell. It juxtaposed a heaven scene that would have been present as well. The Hell mouth could be extremely large and elaborate.

Some of them required many operators to make them function. Miriam Van Scott describes the Hell mouth in a chapter of his book "The Encyclopedia of Hell":

> … the hellmouth was an important piece of scenery. The most elaborate of these were actuated; hinged doors decorated with painted (or even sculpted) jaws that could open and close according to the action of the play. Sinners were cast into it; the saved were yanked out. Lavish productions included smoke, stench, and shrikes that spewed forth from the hellmouth to heighten the excitement. (160)

Not all the technologies were as spectacular as the high flying effects or the shocking Hell mouth. A simple machine that could be easily taken for granted is the trapdoor. The trapdoor was used on a grand scale in Roman amphitheater like the Circus Maximus or the Coliseum. They were not employed extensively in a theatre setting until the 1500's when they were used in the liturgical dramas. Brockett says about trapdoors, "Trapdoors permitted sudden appearances, disappearances, and the skillful substitution of effigies for live actors in scenes of violence" (90).

As theatre became more secular and moved from churches and pageants to indoors, the technology changed with it. The scenic structure became more popular and important. Scenery is not necessarily machinery but the scenery

was moved by machinery and that is where the technology took large strides. An early example of this was in the how the wings, or what modern theatre would call flats, moved. Taking a page from the Greeks' book these wings were commonly periaktoi. R.W. "Rick" Boychuck writes about some of the technical issues with using periaktoi in his fascinating book "Nobody Looks Up: The History of the Counterweight Rigging System 1500-1925", "If a scene had, for instance, four pairs of wings it would take eight men to operate them. It was inevitable that each of the wings would start at a different moment, proceed at different speeds and stop its movement at a different moment" (117). Nicola Sabbatini, in 1638 wrote about the technology that was being invented at the time for moving scenery in his book "Practica di Fabricar Scene, e Machine ne Teatri". In this he highlighted some of his inventions to more efficiently move scenery. While these were strides forwards it would be less than ten years later that the real game changer in theatre machinery would make his mark. His name is Giacomo Torelli.

Torelli's contribution systematically changed theatre technology for centuries to come. Boychuck writes of Torelli, "Giacomo Torelli (1608-1678) an engineer, architect and stage designer ushered in a type of stage machinery for scene changes that would last for 250 years. Dubbed *il gran stregone* or *the great*

wizard his inventions and machines made scenic effects magical for audiences in Europe" (119).

Torelli's major contributions were the creation of the chariot and pole system and the tambour. This was sometimes called the "carriage and pole system" (Boychuck, 119). As a point of clarification Boychuk notes that Torelli is contended as the creator of the chariot and pole system. He writes "It has been suggested that the chariot and pole system was not developed first by Torelli but rather by architect and theatrical designer Bernando Buontalenti or architect Giovoni Battista Aleotti" (119). He concludes "Torelli, however, can be credited at least with having made the invention popular…"(119). For the purpose of this paper, the creator of the machine is not as important as the machine itself.

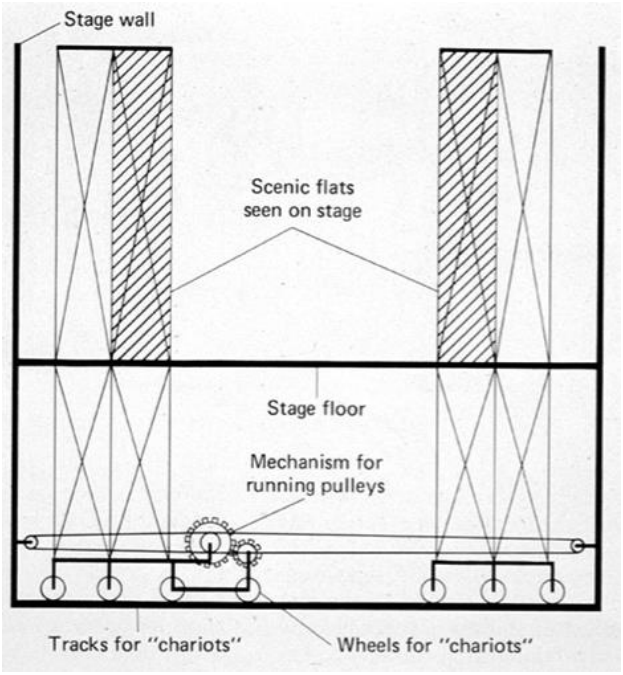


Fig. 5. Illustrated here we can see two of Torelli's inventions. The chariot and pole system as well as the tambour the mechanism for running pulleys.

Source
www.domenicoscarlatti.wordpress.com

The chariot and pole system allowed scenery to be moved by machine with only a few operators. This created a clean scene change. Wings started to move and stop together. Boychuk describes how it was a two-part machine, "One part – the chariot – was located under the stage. It ran on wheels from side-to-side in a track" (45). "… The second part – the pole – was located above the stage. The pole could be a single pole or a double pile resembling a ladder. The pole was inserted into the chariot through slots in the stage floor. In the later Torellian period the poles could be as many as 9 meters (30 feet) high" (45,46).

Tambour is French for drum. In figure five the tambour is labeled as "mechanism for running pulleys". This devise was used by the operator to give mechanical advantage to ease the moving of the scenic wings. There could be up to 12 pairs of wings that moved at the same time so some sort of advantage was needed. The tambour would evolve along with the chariot and pole system to adapt to the needs of theatre as they changed. The tambour would eventually be found in the air being used for overhead rigging.

As a side note, one might look at the tambour and draw a line of similarity to that of a ship's wheel or a capstan and think on the myth that theatre rigging had its roots in the nautical profession. Bochum spends an entire section of his book dispelling this belief. His main defense that Torelli came first lies in the fact

that the ship's wheel would not be invented for many more years. So one could draw a line from theatre to marine carpentry and not the other way around.

Looking back at the history of theatre machines one can draw a line of connectivity throughout the time of 500 BCE to 1700 AD. History would show that ideas were reused and repurposed. During the time of rebirth inventors did not, initially, set out to create new ideas. They looked back at ancient texts like "De Architectura" to draw inspiration from the Greeks and Romans. As the demands of productions evolved the technology evolved with it. Productions continue to evolve and demand new technologies. From rock and roll shows with stages that fly around the arena like a deus-ex-machina to automated wagons that travel access the stage like a chariot and pole the line of connectivity continues today. The act of revealing and concealing visual elements is as old as storytelling, we just accomplish these using different methods.

CHAPTER III

JOURNALS

21 April 2017

Today was the first production meeting. Director Mellissa Rosenberger presented her concept. She wants this production to have similar qualities to the book and movie which the audience would be familiar with. She talked about the warmth and sincerity of the story. What this information means to me is a realistic set. With the story revolving around the house, it will be a main focal point for the production. There is not much information that I can run with yet in the process but I do know I am excited for this production and team.

28 April 2017

This was our second production meeting. It is my belief that at this meeting the role of the technical director is to primarily just listen. I am a firm believer that the designers should have time to live in a place where anything is possible. There have been many experiences in my time both professionally and in academia when I think the final product suffers from big ideas that have been shot down too early in the process. This is the third show I have worked on with director Mellissa Rosenberger, and she has expressed appreciation in the past for

those views. She too likes there to be a time where ideas have the freedom to just be out there and sees the benefits of having no boundaries.

Scenic designer Erin Wegleitner presented her early design concept and ideas. She would like to replicate as best as she can the original home of the author, Louisa May Alcott. Alcott based the description of the home in Little Women after her childhood home. It was a bit shocking to hear that she hoped to have a complete three-story home. Another surprise was that she wanted the house to move. This excited me. My first thought was that I may be able to use automation for this production. We have the gear on hand in the shop and I have wanted to use it for a long time. This could be the chance to do so.

Rosenberger responded to the design choices with much excitement. She too thinks it would be great to have a replica of the actual home. She gave positive feedback to the idea of it moving and thought it was a necessity to support the scenes that took place outside of the house. We shall see where the design takes us from here.

23 August 2017

The show is heading into the shop today. As is typical the first few days will be spent getting the shop in order after the summer season. This year seemed exceptionally rough. There were platforms and wagons that were not struck and in general the shop is in a bit of disrepair. I have drafting ready to start building walls, however, I do not think I will be able to start. The first thing I want to do is strike and organize the shop. Then I will take an accurate inventory of the stock lumber on hand. After that, we can start building a few walls while we wait for my lumber order to come in.

24 August 2017

After dedicating much needed time to cleaning and organizing I think the shop is in a good spot to start building. Many of my walls will be made of 2" x 4" lumber and act as structural walls. There was quite a bit of leftover 2" x 4" material that we can use to get started. We managed to build many of the shorter walls without the purchasing new materials. However, we do not have any material needed to face the walls. This material is on my lumber order and I think I should have time later this week to pick it up.

28 August 2017

Today I picked up my lumber order. This lumber order will allow us to face all the units, build the large stud walls and work on the window units. One missing component that is my steel order and it should arrive later this week. I was waiting on some steel to be shipped to the yard. Because of the wait and the size of the order, the steelyard will deliver it. It should arrive on Thursday which is ideal due to the labor available and the amount of steel that will need to be cleaned and cut. I will make sure to be ready for that time with detailed cut lists and job assignments.

31 August 2017

With all the needed materials for the build on hand or already used we are in good shape. All of the walls are completed and stud walls are built. The last component is the steel frame for the house to ride on. The steel arrived this morning and cleaning began on it. At the same time, I set up a jig and started cutting out the pieces. The steel order was just over 1,000 pounds of 2″ x 2″ box steel and 1″ x 2″ tube steel. There will need to be some angle iron used in the build but that is available in stock. By the end of the day, we were able to clean all the steel and cut most of it as well.

1 September 2017

In our production meeting this morning I got some much needed answers. The most important question that had been floating around in hallway conversations was the shape and size of the pit extension. We all were not on the same page on this subject. George Grubb, my advisor and I thought we knew what was going on and the music director, scene designer and director were all thinking different things. In the end, we decided to go with a 7'-pit extension with a straight downstage edge. At one point there was a discussion of using a curved apron and only having a little cut out for the conductor. This was a style that was used this summer for Highland Summer Theatre. However, the curved pieces had been struck and thrown away. To recreate this shape would have come at a great cost both financially and in time. Other important items discussed included the downsizing of the New York wagon. This was a very good choice in my opinion as the sheer size of the original unit would have been extremely cumbersome to manipulate.

I set a goal of having the automation ready and usable by September 17th. This will be six days before the first technical rehearsal. However, with such an important element it is a necessity to have it functioning as soon as possible.

After settling on the size of the pit extension I went to the shop to cross reference our platform inventory to the amount I would need on this show. I discovered that there was a large shortage of stock platforms. It would appear

that these platforms were taken apart this summer and used for materials which is both frustrating and confusing. I shared the findings with Grubb who was also frustrated with the choice to strike the stock. We decided that the missing platforms would be rebuilt and the cost would come out of the general shop budget and not my show budget. This was a relief as my budget is stretched as it is. Now the only cost is time.

2 September 2017

Today I called a small Saturday work call to focus on welding the frame. I called in one experienced welder and one novice welder. The more experienced welder and I worked on the frame while the novice welder worked on the fabrication and assembling of the brackets that would be used to hold the casters to the frame. Both processes were tedious. Sixty pieces of angle iron were needed to be cut to fabricate the thirty brackets. Then the welds needed to be ground down and three holes were drilled into each piece. Not all of these steps were able to be completed on Saturday. As far as the frame went, extra care was taken to ensure that each weld was accurate and precise. If one measurement was off it could lead to a cascading effect of errors. Due to the size of this project that would simply not be an option. Because of the time taken, the frame was not finished either. By the end of the day, even though neither of the projects were completed I left feeling good about the work that was done.

6 September 2017

At end of day the entire steel frame was welded, the fabrication and assembly of the caster brackets were complete and nearly all of the wall units were built and read to be loaded in. Tomorrow will be an exciting day. We will be lifting the frame and setting it on custom wooden jacks. These jacks will hold the unit up off the ground so that the caster, and bracket, can be welded to the frame.

7 September 2017

This morning's goal is to lift the 1,000-pound frame and put it on the jacks without bending it. To accomplish this, I decided to use the fly system. This idea came from past shows that I have done where we built a custom lighting grid for a show produced onstage in the arena configuration. The idea was to fly in three pipes, chain the frame to the pipes, load the arbors from the loading gallery with about 330 pounds of weight each. Then lift the three lines together high enough to set the jack and then land the frame in the jacks. After it was set we unloaded the weight from the gallery and flew out the pipes. This was a bit unconventional and initially was met with a bit of skepticism from my advisor. However, after its successful completion all were happy with the result. The entire process took a bit over two hours to complete but the time was well spent. The project was completed accurately, without damage to the frame and most

importantly. safely. In the afternoon work started on attaching the wheels to the frame.

8 September 2017

We end the week with lots of progress completed. Yesterday all of the custom caster brackets with mounted wheels were welded on the frame. It was then pulled from the jacks. We were rather excited to see how it rolled. It rolled very nicely. There was a bit of drift in the movement of the frame, but that was to be expected in something so large. This will be corrected with the installation of a track system to guide the wagon. George Grubb and I were able to set up the automation station and rig the wagon to move. This was the biggest moment of success for myself on the build so far. Seeing the large steel frame move onstage using the automation system was a great relief, knowing that the system worked.

11 September 2017

This week marks a big push for the shop. This upcoming weekend we will be hosting the Northern Boundaries Section of USITT Conference. As part of that conference Grubb and I will be doing a session on automation and automated scenery. It is my hope that we will have the wagon moving with the use of cues, have it decked and the drifting problem solved. This would really

show off the technology that we have here on campus as well as the chance for me to show off a great project.

With those goals in mind, today we installed the tracking system. The details of how the tracking system worked is laid out in chapter four. We encountered some issues with the first idea but were able to fix those issues by the end of the day.

14 September 2017

With the tracking system in place and the automation system connected and tested, I felt confident with laying down the deck on top of the frame. The deck consisted of 23 and a half sheets of OSB. In the three-hour morning shift we were able to install nearly all of them. The remaining sheets were installed quickly in the afternoon. Because all of the walls and stud walls were completed, we could load in with much ease. The dramatic change from a steel frame on the floor to having walls and a set of stairs installed was stunning. I stayed after the shop closed to have a show and tell session with the director. She walked in and was awestruck at the size and progress. I felt proud of how hard the shop worked and shared the praise received with them the next day.

15 September 2017

Heading into the weekend I had a few ambitious goals. The first was to get the attic floor installed and walkable for rehearsals. The second was to get the New York unit installed on its wagon. My primary focus will need to be with a team that will be installing the attic. At the same time a second team will work on the New York set. The process of getting the attic floor up on the stud walls was a bit precarious. Each platform weighs over 100 pounds and needed to be lifted up 10' to the top of the studs. The process was a bit cumbersome and involved many people on tall ladders. After the first platform was on top of the stud walls it was secured to it. After two platforms were secure, a carpenter then transitioned to the platforms and could lift up the platforms in a more efficient and less precarious way. All of the platforms were able to be put on the stud walls and met my daily goal. The other team in charge of the New York unit did a good job getting most of it completed. I was not able to offer as much support to them so I was not too disappointed that it was not completed.

18 September 2017

Although the platforms on the third floor were able to be set in place, it was not able to be used by the actors during weekend rehearsals. As a result, the priority for the day was to make it accessible for rehearsals. To do this we added treads to the stairs as well as some additional cross supports. The supports came

in the form of using sheets of plywood connecting the studs. We also built a safety rail on the upstage side. This rail was something I suggested to the scenic designer to make it functional as well as aesthetic. I suggested that it could look like a stud wall and not just a railing. She agreed to the idea and we built it. With safety measures in place the attic floor is ready for acting rehearsals and the upcoming technical rehearsals.

19 September 2017

Tonight's technical rehearsal was designated to focus on sound. However, it was also the first time that I ran the automation for a rehearsal. I had hoped for and succeeded in having rough cues ready for each transition. Seeing the house move as a part of the show was very rewarding. The automation cues still have more work to do regarding programing within the cues but to see it function was great! I do have some concerns regarding the cable that is pulling the house upstage and downstage. When the house first starts its movement, the cable goes slack on the ground. This should not happen. I consulted a colleague, Tom Fagerholm of the University of Southern Illinois, who has much experience with this type of system and he offered much appreciated advise. It may be too great of a load for the size of cable that is being used. He also suggested adding more tension to the system. I will take this advice and see how things progress.

The night was not all good, however. On the large New York unit a caster plate came undone and as a result got lodged under the unit. The rehearsal had to be stopped, and I had to limp the unit offstage. I felt disappointed with the failure. Grubb reassured me that it was not my tech rehearsal day and so it was not that big of a deal. Upon investigation of the failure, I found that the size of screws used to hold the caster plate onto the platform were incorrect. Things like this happen from time to time when supervisors are of varying ability and knowledge levels. As a technical director it makes me more aware of how clear instructions need to be. We will fix the caster in the shop and I will have someone examine all of the plates on this unit to make sure this will not happen again.

20 September 2017

As warned earlier in the week the total load weight of 4,000 pounds may be too much for the 1/8" cable that was used, even with the multitude of casters. The cable went slack while pulling the load and it jumped the grooves in the drum that spools the cable and became pinched and unusable. The house was in the downstage position and failed on an upstage travel path. The cable failed in such a way that the winch was not able to move the house, and given how the system is set up the winch is the only way to make it move. It was stuck. The rehearsal was stopped and I asked for 10 minutes to try to fix the issue. It was

unlikely that the issue could have been resolved in that short amount of time, but I wanted to try. Grubb and I removed tension from the system so we could remove the cable that was no longer usable. We then pushed the house into its upstage position. Then we tried to spool new cable on the drum, forgetting in the moment that by doing that to one side it would have a negative effect on the other side. We struggled in the heat of the moment and eventually agreed to stop the patching of the problem and wait until tomorrow to make a more permanent solution. Again, frustrated with the failure, Grubb still reminded me that these problems should be happening now. The time to run without errors was still to come and I was ahead of schedule by having things finished this far already.

21 September 2017

Today was a fixit day. Heeding the advice and further consulting with Fagerholm, Grubb and I went on a quest to get bigger cable. We found 3/16" cable at a store in Mankato that also sold the needed hardware to complete the system. We were fortunate to find the parts that we needed in town. If not, it would have been a long journey to Minneapolis to find the correct parts. Back at the shop we pulled the old cable off the winch, and with a fresh mindset correctly rigged the house on the first try. In the process we had to manually move the house two more times. I ran many tests with the system after the new

cable was on and it performed beautifully. I worried that the new cable would have an effect on how the cues ran but it did not. Fagerholm advised checking the cable daily for the next few days to determine if there were changes in tension.

My takeaway from this experience was to do more careful research and math. There is no doubt this was a new experience for me and frankly, our program, to use automation on this scale. The entire process was full of learning. I think keeping a cool head and embracing issues like the ones we are going through now is going to be key to both the success of the production and my educational process.

21 September 2017

After a long tech week it is finally tech day for scenic and I felt great! There have not been any issues with the other units. There are still some small paint notes but I think Wegleitner and I have managed the time on the set and the available labor well. We are in a great place!

The automation worked flawlessly tonight. It was nice not to have any issues with the house. I have been running all of the cues up until tonight when the stage manager called the show. They did a great job calling cues where I wanted them. The next few rehearsals will help lock that into place. I made adjustments to the cues as I saw them, but nothing too big. I feel like the

adjustments that I am making could go unnoticed by most of the audience but it is important to me to get it right. The final cue in the show in particular could have the potential to help add a solid bookend to the show. I talked with the lighting designer and director about what I was seeing and the possibility of lighting and automation getting on the same page to accomplish an even more impactful effect. Steven Smith, lighting designer, agreed and said he would play with the timing of his cue to go with automation to help create a more unified picture.

25 September 2017

The tech and dress rehearsals ran smoothly from my perspective. There were not any issues with automation, and the set functioned as needed. I took a few touch up notes over the weekend but they were easily addressed early in the week. The director had very few notes for me during the tech rehearsal process. The purposefulness and consistency of each cue is something I take a lot of pride in. I am aware that the nuance and reason for the cues will most likely go completely unnoticed by the audience, but that is the goal. The audience should experience a complete production and not notice the subtlety of the set changes. They should be seamless and I feel like they are. I am ready to open and share the amazing work of a great shop staff and crew as well as let the story be told by an extremely talented cast and orchestra.

CHAPTER IV

POST PRODUCTION ANALYSIS

Little Women, the Musical closed on Sunday, October 8, 2017. The show was a success in terms of positive reactions from director Melissa Rosenberger, scene designer Erin Wegleitner, technical advisor George Grubb and in the personal and technical growth of technical director Matthew A. Gilbertson. The scale of the set and incorporation of automation as part of the scenery made this show one of the most ambitious and difficult builds of the technical director's career to date. The set was completed on time. However, it ran over the $2750 budget by $599.55. This chapter will bookend the process of the construction of the set and implementation of the automation effect. In doing so it will first look at the material and time estimations. It will then detail the building process of the automated unit. It will cover lessons learned about using automation as a scenic device. Finally, it will discuss the growth of the technical director throughout the process.

The first element of the process to address is the budget. As stated in the opening, this show went over budget. The scenic budget was $2,750. Of that budget, Wegleitner spent $260 on the wallpaper. $1,020.00 was spent on steel, $1,945.55 was spent on lumber and specialty hardware and $120 was spent on

rigging equipment for the automation effect. There were many factors that caused the budget overage, some within the control of the technical director some out of his control. The process for assigning budgets to shows at this venue is done without any knowledge of design ideas. At the time of allocation, the idea of a moving set requiring a large wagon that needed to be decked was not part of the consideration. The cost of the steel frame and the flooring material used to create the base of the house cost $1,643.24. The third floor of the house was supported by six 11'-6" tall stud walls. Each stud wall contains nearly 60 feet of reusable 2" x 4" material. Like the flooring, this will create significant cost savings for the builds to come.

When a show goes over budget the materials cost comes out of a general shop budget, likewise, when a show goes under budget, the excess also goes into the general shop budget. The investment in this material now will save the shop for the shows to come. It is common to have some reusable material but rarely is it the case to have so much material in "like new" condition. These will be put to a good use on the next show.

In this next section of the chapter, the author will address questions brought up in chapter one about specific scenic units. He will also discuss processes on how he overcame his perceived obstacles.

Starting at the bottom of the house and working vertically the frame of the house is the first item to address. The 20' x 36' frame was created out of steel.

The steel frame was designed to contain 4′ x 8′ sections with two toggles in each section. A toggle is a support beam within the shape. This would provide an area to easily lay and attach the deck. The outside perimitor of the 4′ x 8′ sections were constructed out of 2″ x 2″ 16-gauge box steel. The toggles were constructed out of 1″ x 2″ 16-gauge rectangular tube steel. The technical director ordered the steel from a local vendor in Mankato, Minnesota. Upon delivery, the steel was cleaned and cut to length in one shop day. One of the obstacles with using steel is that it requires specialized labor skills to weld it together. There are only a few staff members who have the capabilities to weld at the level of precision required for this task.

A weekend work call was requested by Gilbertson to have uninterrupted time on just welding. At that work call, Gilbertson had a novice welder, Felipe Escudero, working on the fabrication of custom brackets for the casters of the unit. While Escudero worked on the brackets Gilbertson and Dalen O'Connell, both experienced welders, started work on the frame. The margin of error for the placement of each piece was very small. If one measurement was off it could have a cascading effect on the rest of the welds and the overall shape of the unit. If the frame and its perpendicular angles were not square it could cause the wagon not to move straight upstage and downstage or it could put unnecessary strain on the casters. This process was time-consuming and because all the work had to be done on the floor it was also physically exhausting. Gilbertson and

O'Connell switched off working on the frame for seven hours and still did not complete the frame as hoped for. Gilbertson and O'Connell's process of measuring and alignment was meticulous but resulted in an error-free product. The value of quality work often comes at the cost of time. However, when available, the result of a project of this magnitude being constructed correctly the first time far outweighs the cost of time. The frame was completed early the next week and the next steps could commence.

After the frame was completed the next challenge was to mount the casters. Gilbertson designed a custom bracket that would allow the caster to be bolted to it and then the bracket with the caster could be mounted on the frame. He designed it out of two pieces of angle iron cut with a miter at 45-degrees. When welded together the bracket would form a 90-degree angle. Three holes were then drilled into the bracket and the caster was bolted onto it. Lock washers and lock nuts were used to mitigate the potential of the caster coming loose or nuts falling off. The brackets were mounted so that the head of the bolt was to be flush with the top of the steel frame. This would allow the decking material to lay flat on the steel. After production of the 30 brackets, there was still the issue of lifting the 998-pound frame to be able to attach the brackets and casters.

To support the frame in a position off the ground where the casters could be welded onto it. Gilbertson had the shop make jack stands out of 2" x 4"

lumber and plywood. The stands had a 2" slot that the steel tubing of the frame would sit in. Once the frame was cradled in the jacks it would be secure and the brackets could be attached while the platform was in its elevated position.

After the show was over Gilbertson reflected on his choice to weld the brackets on versus trying to bolt the bracket to the frame. The time and cost of bolting the 26 caster and brackets would have been great. The cost of special hardware and quality steel cutting drill bits would have added to the already over budget build. Furthermore, the precision and attention to detail to cut holes that were truly straight and clean would have been asking a lot of the labor available to the task. The tradeoff would have been much more reusable steel. When striking the frame, the technical director did his best to make cuts that would result in longer and more reusable pieces, but the brackets were a challenge to work around. In the end, the technical director is confident in his choice of assembly. The reusability of materials, in this case, was not as big of a priority as the correctness of the outcome.

The next issue to solve was the problem of physically lifting the frame to put the jacks underneath. Because the frame had to be welded in place on stage, it provided the opportunity to use the counterweight system in the theatre to lift the frame. A counterweight system is a theatrical system that allows objects to move in a vertical direction over the stage. Most commonly it is used for hanging curtains, lights or drops. The system works by creating an equal load on

the pipe as well as on the arbor, or counterweight side of the machine. Gilbertson had the idea to use three line sets to safely lift the frame off the ground. To do this he first had to figure out the total weight of the frame, 998.5 pounds. Then he flew in the three line sets and attached the frame to them. He then had each of the lines loaded with 1/3 of the total weight. Once an equilibrium of weight was achieved he could have all three lines lift the frame together, lock it in place, set the jack stands, and then lower the frame in the stands. The method worked flawlessly and the caster brackets were welded in place later that day.

Much time was put into the placement of the casters. The first goal was to limit the amount of deflection in the steel. By making sure there were never more than eight unsupported feet of steel the deflection was minimal. Other factors that came into play included the diameter and working load of the casters. The casters selected were rigid 6" casters with an individual working load of 300 pounds. Another consideration was to make sure the friction coefficient of the casters would allow the winch to move the wagon. The friction coefficient is the amount of force it takes to make a wheel turn when under a load. The more casters one uses, the less force is required. The final math resulted in the need for 26 casters. The amount of force required to move the unit with 26 casters was around 300 pounds. A general rule is to take three times the amount of force needed to move the unit to figure out the amount of force

needed to make it start to move (300 x 3 = 900 lbs. required to get the house moving with a 4,000 lbs load).

With the frame sitting on its 26 casters the next step was to lay the deck. As anticipated in chapter one, oriented strand board or OSB was used. Twenty-six and a half sheets were needed to cover the frame. On top of the OSB, the designer requested the playable area to be decked with lauan. Lauan is a form of plywood that is typically 1/4" thick. This required 15 sheets to cover the space. The steel, lauan and OSB accounted for nearly $1,700 of the $2,750 budget and that is before any walls were placed on the unit. With a foundation established, the next phase of construction could begin.

As discussed in chapter one, the March family home served as a scenic anchor for the musical. In all but one scene, the house was visible, in every moment of the production. When not being interacted with it served as a visual reminder for the audience of the importance of home to the protagonist. The design of the home went through many iterations during the pre-production process. As outlined in chapter one, Gilbertson had concerns with a design that had three complete floors. When he spent time with a ground plan and elevations he created an estimation of the cost that was far over budget. He looked at different tactics to achieve the goals of the director and designer. However, the proposed design was not practical for the budget and time available for this show. It is always disappointing to have to say "no" to a great

design, but it is at times the job of the technical director to be grounded in the reality of time and money. At a production meeting, Gilbertson presented his concerns. The concerns were met with both disappointment and understanding. Gilbertson estimated that in order to achieve the desired design it would have required approximately $2000 more than the budget allowed. Gilbertson presented a few ideas on how to adapt the design to the desired effect that would not accrue much additional cost. The collaborative result was a design that served the functions needed by the director, met the aesthetic desires of the scenic designer and could be built in the time allotted by the technical director and shop.

With the need for significant changes to the design, it put pressure on Wegleitner to produce drafting in a short amount of time. The lower level of the home did not change, so the technical director was able to create his technical drawings for the false deck and the first-floor walls. While this was an effective use of the time, in retrospect it was not the most structurally sound method of construction. To support the attic level Gilbertson intended to use both stud walls in between the stock platforms which served as the floor, and also the lower level walls. Because the drawings for the first floor and the second floor came in two batches, and the time available did not allow for the shop to remain idle while waiting for the second floor, the wall was built in two pieces. This created a horizontal seam in the middle of the wall that resulted in a loss of

potential structural support. This would not have been the case if the walls were built as a single piece. Using the walls as structure resulted in a greater cost than what would typically be the case for a theatrical wall. If it need not be a weight bearing wall it could have been framed out of 1" x 4" material in lieu of the 2" x 4" material used. The cost difference of $1.43 per board seems insignificant, however, because of the quantity of boards required, it becomes significant.

There were a few examples during the build process where the technical director influenced the design choices of the scenic designer. One example was in suggesting eliminating the clapboard siding on the sides of the house. Having built more than 20 shows in the Ted Paul Theatre, Gilbertson is familiar with the sightlines of the space. Wegleitner, who has spent much less time in the space struggled with the relationship of the size of the house and how it would fit in the proscenium. The technical director fortuitously mentioned on a few occasions the idea of cutting the siding on the sides knowing it would not be seen, however, the designer remained steadfast to her design. It was not until the walls were completely up and it was clear the siding would not be seen that Wegleitner agreed that it was not needed.

Another design choice that the technical director influenced was the layout of the second-floor landing and escape. It was originally designed so that the actors would walk up the first floor stairs to get to a landing with a door and could choose to either go through the door and down an escape staircase or turn

and go up to the attic. After seeing a rehearsal of the show, Gilbertson brought up the idea of adding a wall and turning the landing into a hallway that would turn left and give the illusion of more space. At the end of the hall would be the escape staircase masked and out of the sight of the audience. This would create a more natural flow of the home. The director agreed and so did the scene designer. With this change, the escape staircase could be built on the wagon and no additional units would need to be constructed, moved or stored. There are many examples of where the scenic designer and technical director successfully collaborated and it resulted in a well-received product that both were happy with.

Aside from the house, there was one other scenic unit in the show. This was the New York boarding house wagon. This wagon was 8′ x 16′ and contained a two-sided wall that was 16′ wide by 12′ tall. On one side of the unit was an exterior scene and the other was an interior. This unit had a few challenges during the build process. One of the biggest was how the base platform was to be made. Typically, this wagon would have been put together with four 4′ x 8′ platforms, however, after using 4′ x 8′ platforms as the base for the attic and the landing, there were not enough left in stock for this unit. So this wagon was built from an assortment of stock sizes bolted together. This required more legs, casters and fasteners to keep its strength. To help with the strength, the decking was also installed to span the seams of the platforms. The type of

caster used was an air caster. This allowed the unit to smoothly move on and off stage but be securely set on its legs when it was being used. This proved to be an effective unit for the needs of the show.

The final element this chapter will address is the use of automation to move the house. From the start of the production, it was the desire of the technical director to use automation as the method of movement for the house. This decision came from a place of opportunity. Minnesota State Mankato owns the winch, drive box and other necessary equipment to create this effect so it was a viable option to use. Automated scenery is changing the way professional theatre is done. As mentioned in chapter two, one would be hard pressed to not find automation on any major production mounted today. So, to have the opportunity to design, build and implement an automation effect on this scale is a great opportunity for the technical director. This section of the chapter will first talk about the components of the system, then talk about the system design, followed by the implementation and concluding with lessons learned along the way.

This automated system had four major parts. The first is the winch and motor, the second is the drive box, followed by the control software and finally the show controller. The winch and motor used in this system were the Creative Connors Push Stick. This is a winch with a drum that is grooved to fit cable that

is 7/16" to 1/2" thick. It has a maximum load limit of 1,000 lbs. It can reach speeds of 27" per second.

The drive box is what controls the motor. This drive box is called the Stagehand AC. It is where the power is supplied and contains the "brain" of the system. That brain is what controls the speed of the motor, the braking of the motor and the position of the motor.

The next part of the system is the control software. The software used for this production is called Spikemark. It is a free software created by Creative Connors to interface with their products. In the software, the operator creates the cues for the show. These cues can be made unique by changing factors like length of the cue or the speed it takes to execute the cue. For this production, there were four locations where the house would live: Far upstage, far downstage, mid-stage and a transition location. To move between these locations a total of 16 unique cues were written for the show.

The final component in the automation system works closely with the software. It is the show controller, called The Showstopper. A show controller is what the operator uses to execute the cues. He or she loads the next cue and then hits the "GO" button to activate it. They also can stop or "E-Stop" a cue while it is happening. An E-Stop or emergency stop is used if things are not going as planned or if there is an issue with the system. Activation of the E-Stop will immediately stop the movement of the winch bringing the moving unit to a

standstill. Knowing what equipment is available is the first step in system design. Next, is figuring out how to get the scenery to interact with the automation equipment.

It was decided by Gilbertson and advisor Grubb that they would move the wagon from a centralized point. That point would have two eye bolts that faced opposite of each other. There would be two lines that would come off the winch. On one side of the cable drum, the cable was wrapped around the drum just over half way. Then with the house in the downstage position, the cable was run downstage to a sheave. It wrapped around the sheave and was terminated to the downstage facing eye bolt. Then a length of cable was cut so that it could be manually wrapped around the drum three times and then terminate to the upstage facing eye bolt of the wagon, still in the downstage position. This system is commonly called a "roll-on, roll-off" or "roll-o" system. The name comes from the movement of the cable. As the wagon moves upstage cable is being rolled onto one side of the drum bringing the wagon closer while also rolling cable off the other side of the drum.

In a theoretical world pulling a unit from the exact center would result in it moving in a perfectly straight-line upstage and downstage. However, this project was not theory; it was practical. All the elements in the system have a chance for error or to exert a force on the machine to make it not travel in a straight line. As a result, a system of guardrails was needed to keep the wagon

inline. Many ideas were discussed to accomplish this. The final idea involved two tracks near the offstage edge of the wagon. These tracks were made of a 20′ stick of 2″ x 2″ box steel sitting on top of a 2″ x 4″. Attached to the wagon frame were custom built brackets that held horizontally facing rigid casters that faced onstage and met the steel rail. These sets of wheels riding on either end of the wagon were what held it in place. In the first attempt at this model, only two wheels were used on each side. This became an issue because the downstage wheels would eventually leave the track when the wagon went to its most downstage position. When the wheels would leave the track, there was still a bit of drift in the wagon, making it not move in a straight line. To correct this problem another set of casters were added to the frame. These casters never left the track and thus at any given time there would be four points of contact with the rail and when in the upstage position, there were six. This proved to be an effective solution to keeping the 4,000 lbs. wagon in line.

The house became functional and was able to be cued early in the tech week process. It was the goal of the technical director for the actors to get as much time on the unit as possible to adjust to the piece moving many times with them moving on it. Gilbertson worked closely with the director to make sure the automation cues served both a practical purpose and a design function. For example, at times the house simply needed to move to allow for a scene transition. Gilbertson could program the cue to be slow and subtle and it would

sneak out during the scene and thus not take any focus away from the action. Conversely, at times it needed to move quickly into place. The cue that best exemplifies the artistic function of automation was at the end of the show. Jo and Bhaer make a cross upstage to the kitchen and then exit. While they are exiting the house starts to move with them upstage and the lights start to dim to a blackout and the orchestra decrescendos on their last note. These elements working together created a beautiful ending to the show.

In the conclusion of chapter one the author set goals in order to complete this challenging build successfully and on time. It states goals that include being organized and ready for each work day. It also talks about managing people's time wisely. Finally, it states he will need to be on top of the drafting and make sure it is clear and error free. These goals proved to be a good bar. The production was finished on time and met the expectations of the director, scene designer and technical director. The use of automation was a new but valuable expectance for the technical director. It allowed him exposure to new techniques that will be extremely valuable to him in his future endeavors.

CHAPTER V

PROCESS AND DEVELOPMENT

Prior to starting the Master of Fine Arts program at Minnesota State University, Mankato the technical director worked for over ten years as a freelance theatre artist serving in many capacities. He spent four years between the completion of his undergraduate degree and starting his graduate schooling. During that time, he served as the scene shop manager for Anoka Ramsey Community College, where he supervised the construction of ten productions. At the same time, he worked for Maple Grove Senior High School as a teaching artist for six productions including the direction of a competitive one-act play, placing second in the section, and serving as the scenic designer for their production of *Les Miserables*. As a freelance technician, Gilbertson worked for various theatres as a stage manager, scenic designer, props artist, lighting designer and sound designer. One of his greatest accomplishments was to serve as the Assistant Stage Manager for the North American Tour of Disney's *Beauty and The Beast* produced by NETworks Presentations, LLC. However, it was his work as an adjunct professor at Anoka Ramsey Community College (ARCC) that led to the choice to attend graduate school. It was there that he became confident in his desire to work in academia at the collegiate level. During his time at

ARCC, he was only allowed to teach one course due to his low level of seniority and qualification. Without a master's degree, he would not be able to teach as much as he hoped. If teaching higher education is to be the goal, then more education would be required. His diverse background has proven to be a benefit while in graduate school. The combination of professional and academic work has brought perspective to what the author still has to work on and what he has been able to contribute to others.

During his time in school, the scholar has tried to put a focus on his craftsmanship and finding meaning within his work. To do this he has sought out perspectives that promote the idea that learning is never done and craftsmanship is important. The following books have been important to the scholar's journey and would be a great recommendation for fellow craftsmen seeking the same values:

- Shop Class As Soulcraft, An Inquiry into the Value of Work by Matthew B. Crawford
- Why We Make Things and Why It Matters by Peter Korn
- Good Clean Fun by Nick Offerman.

Thus far in his time at Minnesota State Mankato he has served as the technical director for *A Christmas Story: the Musical* (awarded a departmental certificate of merit for Outstanding technical direction) the rigging and flying

coordinator for *Mary Poppins* (Kennedy Center American College Theatre Festival, Certificate of Merit) the production stage manager of *The Full Monty* (awarded a departmental certificate of merit for Outstanding stage management), the technical director for *Aida* (awarded a departmental certificate of merit for Outstanding Technical Direction) and has worked over 1,500 hours in the scene shop as teaching assistant and shop supervisor. He has also developed and taught a class in stage management. Working in many capacities has helped the technical director to grow his renaissance approach to theatre, specializing in technical direction, but being open to learning different tracks and seizing new opportunities.

One of the ways the technical director has seized new opportunities is in his course load. The job of the technical director is inherently skill based but that is not to take away from the value of the theory or research of the art as well. Having an holistic understanding of both the art and the craft is important.

Gilbertson has taken academic, artistic and craft focused classes. Theatre Research, Theatre History I, Theatre History II, Theatre Theory and Criticism, Dramaturgy and Director Designer Communication Seminar are examples of classes having a more academic focus. These classes further developed the author's academic approach to the art. They focus on approaching the art from the perspective of the past and analyzing the script with techniques developed by former leaders in the field.

In the research class the author learned how his work can contribute to the field. In that class, he contributed new work to the field on the subject matter of the "Ghost Light" and he traced the historical timeline of the Deus Ex Machina from the Greeks to the 1700's. Both papers were submitted for publication. This research served as part of the inspiration and basis for the research chapter of this thesis. Writing these papers has helped focus the author's writing voice and structure. The formal MLA writing style was new for the author and these classes provided a firm foundation in the style preparing for this thesis.

The academic focused class that the author took the most away from was Dramaturgy. In this class, he created a dramaturgical protocol based on a production titled *Rez Road 2000* by Native playwright Jim Northrup . For this assignment, he linked the theoretical production with the timely protests surrounding the Dakota Access Pipeline project in the winter of 2017. This project helped the technical director to understand the power and purpose theatre can have or represent. On a personal note, it helped the author re-connect to his Native heritage and explore in greater detail his family's history. This protocol was submitted as apart of the 2017 KCACTF Design Technology and Management Expo and won the Regional Dramaturgy Award.

To nurture the technical director's artistic knowledge, he took classes that included Costume Design, Virtual Lighting & Advanced Design Lab and Advanced Sound Technology: Digital Audio Systems. These classes provide

exposure to new design areas that the technical director had not had prior knowledge of.

The costume design class provided a perspective of the costume designer's role in the collaborative process. It unlocked new thoughts regarding considerations that should be made in construction of the set, in relationship to the costumes. How will the costumes interact with the set? How does the material choice affect the costumes? Questions like these were not a priority of the technical director prior to this class, but now are a consideration in his process.

In the virtual lighting class the technical director was exposed to new software that he found incredibly interesting. This software is called WYSIWYG, (What You See Is What You Get). This software is used to render both scenic and lighting designs in virtual reality. The projects were a great refresher on conventional lighting design but more so, the potential of designing with moving lights. It also introduced the technical director to the process of scenic rendering in virtual 3D. While rendering, one creates the scenic and lighting elements in virtual platform on a computer. Although lighting is not the focus of the technical director, the lessons learned in this class will help him in his quest to becoming a well-rounded technician, designer and educator.

The last of the artistic classes taken by the author straddles the line

between design and craft. The Advanced Sound Technology: Digital Audio Systems class had a focus on new technologies that are changing the way sound can be produced and perceived. The class coincided with a transition within the theatres at the university to becoming a digital audio space by incorporating hardware and software called Dante. To be a part of that transition while taking the class was rewarding and a unique opportunity. It provided a front row seat to see how the infrastructure of the venue changed with changes in technology and industry standards. The final project in the class involved creating a hypothetical digital audio system. Being able to complete this project with an understanding of how the parts of this system worked was a success for the author.

Many of the classes the technical director took had the goal of enhancing his skills as a craftsman. Those classes included Advanced Technical Direction, Advanced Drafting for the Theatre, Technical Direction, and Construction Safety. A technical director should not only be finding ways to improve their skills in construction, methods and safety but also in organization and planning. These classes have helped that growth.

In Technical Direction and Advanced technical direction, the processes of the technical director were discussed. The technical director took the advanced class first and then the basic class due to the class schedule. In basic technical direction, items such as rudimentary and intermediate drafting techniques were

discussed as well as basic construction methods. This served the technical director more as a drafting refresher than new content. The course provided opportunities to assist some of the undergraduate students who often sought help from the author on projects or assignments. Perhaps the greatest skill the technical director took away from this class was regarding paperwork. A new text titled The Technical Director's Toolkit was used and it provided templates for estimations and materials usage. These Excel templates have been used and modified by the technical director on all of his shows that followed the class, including this thesis. Making his paperwork transition from utilitarian to functional and aestheticaly pleasing is a point of growth for the technical director.

The advanced class provided new material that the technical director had not had formal training in. Sections that covered technical engineering like beam strength, spans, and nontraditional materials were of the most importance. With these sections being the newest material for the author it encouraged independent follow up on the subject matter. Sometimes one learns even more when they personally take on the responsibility of learning the new material rather then it being lectured to them. Beam calculations and understanding span strength were of the utmost importance in building the thesis set. The final assignment for this course involved creating a complete show packet. A show packet contains information including estimation paperwork, drafting, shop lists

and expense paperwork. Reflecting on this project and the work completed the technical director sees how much growth has happened since the start of graduate school. The implementation of templates in drafting and paperwork has made his work look cleaner and more professional. The goal of paperwork is for the technical director to convey the needed information to those who are using the paperwork. Coming from the background as an independent contractor, the paperwork completed was simple and basic. It served his needs because often the technical director was also the carpenter. With formalization and implementation of industry standards, the work now contains a style that represents a level of professionalism and unity of process.

Perhaps the class that most helped cement the idea of professional-looking paperwork and standards was Advanced Drafting for the Theatre. This class, like many of his classes, the author had taken before as an undergraduate. It was also taught with undergraduate learners. However, it is now under the instruction of George Grubb. At the start of the semester Grubb reinforced the fundamentals of hand drafting, but quickly transitioned to the more relevant and timely computer-aided drafting. Many of the projects required were not inherently difficult for the author but it was in the process of taking the time to add style and detail where the student learned most. Drafting style is a reflection on the effort and professionalism of the technical director. He has learned that simple is not always the solution and there is great value in style.

The final course that focused on craftsmanship was Construction Safety. This course was taught through the Construction Management Department. Completion of this course (with a perfect score) earned the technical director a certification of completion of OSHA's CFR 1926, 30-hour course. While the work that is done in theatre differs greatly from that of construction, the practices of safety are the same. Safety is the most important part of running a scene shop whether at the academic, independent or professional level. As the capstone to this course, the technical director applied skills learned in his academic, artistic and craft-based classes to complete his project. He set out to do independent research in the field of noise exposure in the scene shop and produce a publishable and presentable document. The goal of this project was to evaluate the level of noise a scenic carpenter was exposed to in a single shift and to see how shop standards align with OSHA standards regarding the use of hearing protection. This project was well received by the instructor, departmental faculty and around the industry. Gilbertson has been selected and asked to share his research at both academic and professional conferences including the Northern Boundaries Section of The United States Institute for Theatre Technology's Fall conference (2017) and the Minnesota Theatre Alliance State Wide Theatre Conference (2017). At both conferences, he presented his findings and made some recommendations to promote the safety of all workers in the industry. The knowledge gained by doing this project will forever shape the way shops will be

run by the technical director.

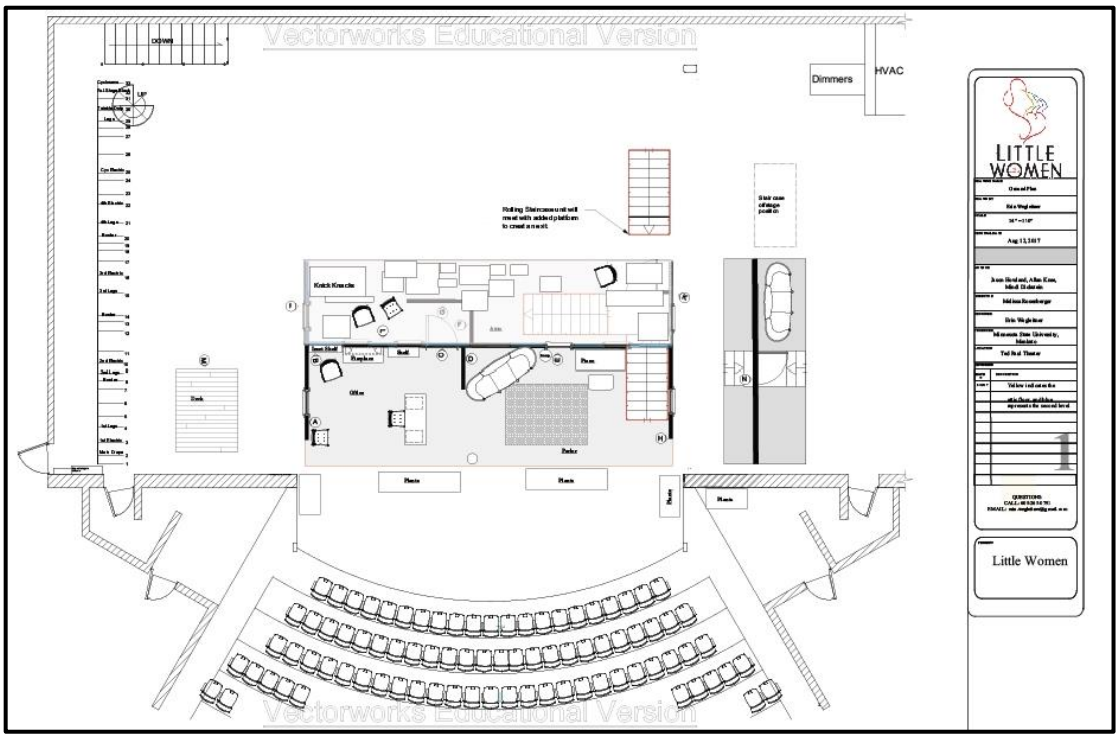
Aside from the work completed at Minnesota State Mankato, Gilbertson also has spent time learning in the form of an internship. During the Summer between his first and second year of schooling, he spent seven weeks in Louisville, Kentucky working for ZFX Flying Effects and EZ-Hoist. While there he rotated threw many of the departments at the shop including the harness sewing room, the automation testing department, shipping and receiving and some work in fabrication. He and fellow intern Isaac Sawle also were able to spend many hours working alongside the owner and founder of the company Robert Dean on some of his special projects. They also assisted Royal Marty, who was transitioning in the role of head of automation. The entire staff at ZFX were extremely generous with their time, hospitality and knowledge. Leaving the internship, the technical director had a new appreciation for the value of creating good quality work, taking the time to have a product that functions but also looks great.

The graduate program at Minnesota State Mankato has been an invaluable experience for the scholar. The classes have taught him to think academically, artistically and work on the mastery of his craft. The experiences working with students in the scene shop or classroom will inevitably make him a better educator in the future. With that, the learning is not done. If there is one lesson to take away from the educational experience, it is that one is never done

learning. There will always be new technologies that will change the way the craft is produced but there will also be the fundamental skills that can be improved on.

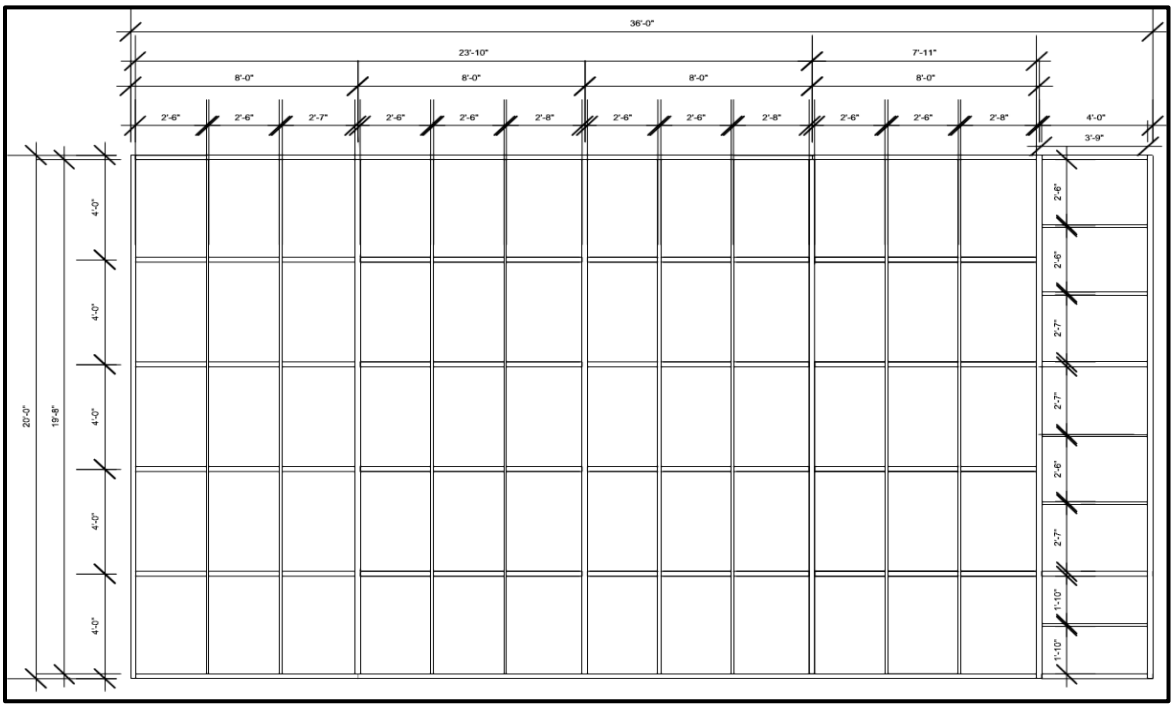
APPENDIX A

TECHNICAL DRAWINGS

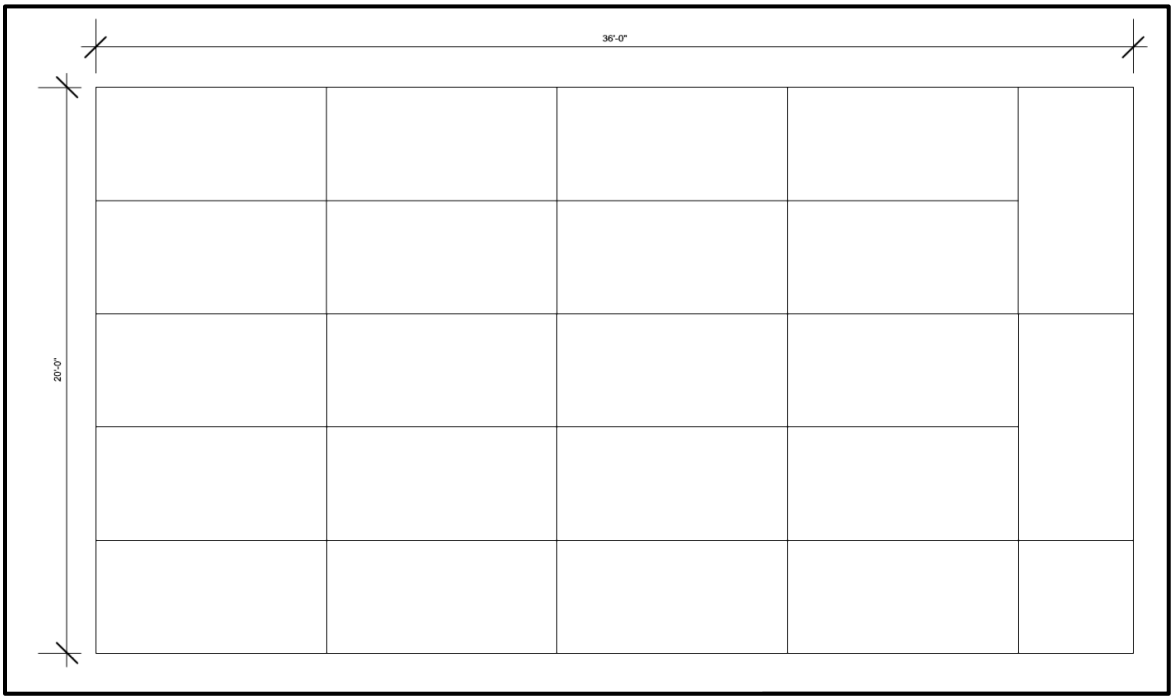


DESIGNER'S GROUND PLAN

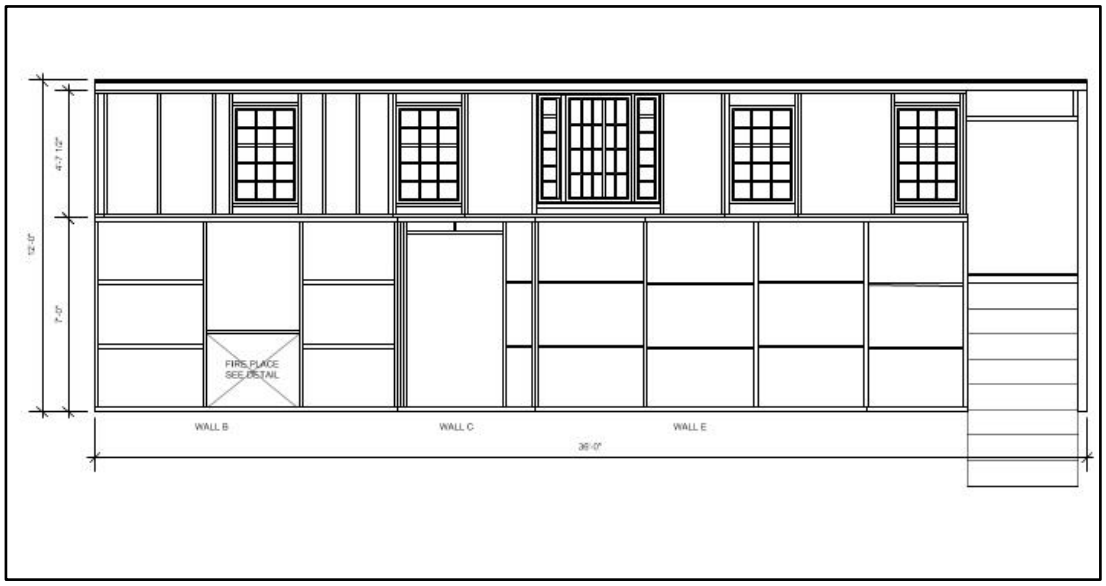
N.B.: APPENDIX NOT IN SCALE



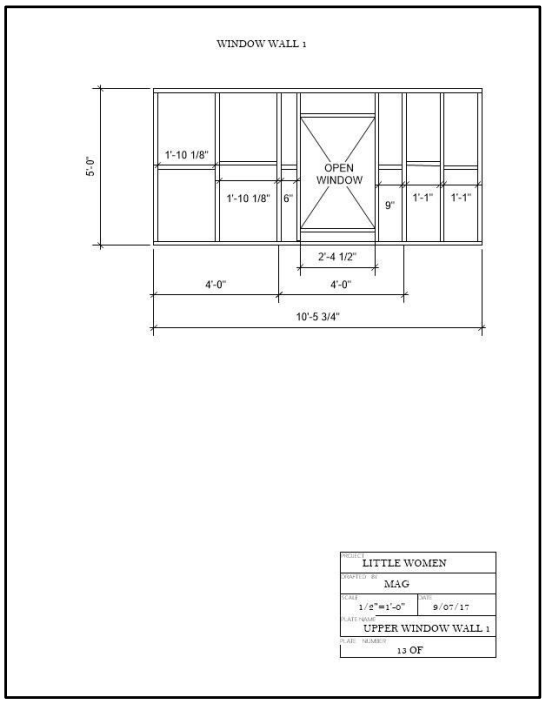
STEEL FRAMING FOR HOUSE WAGON

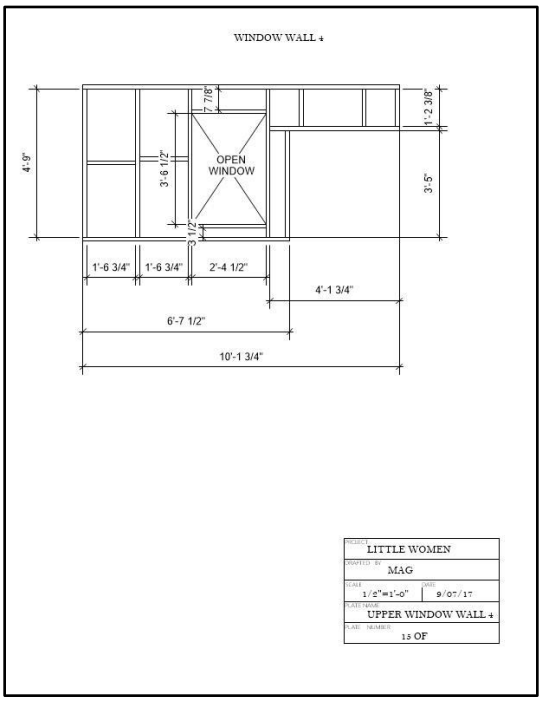


4′ X 8′ OSB DECK LAYOUT

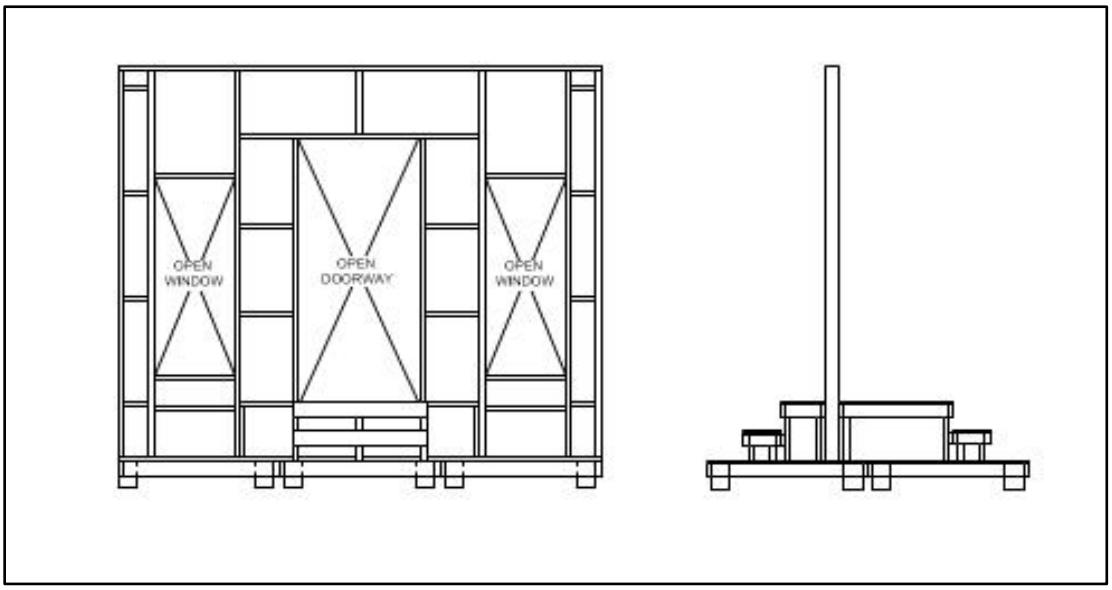


FRONT TECHNICAL ELEVATION OF HOUSE UNIT

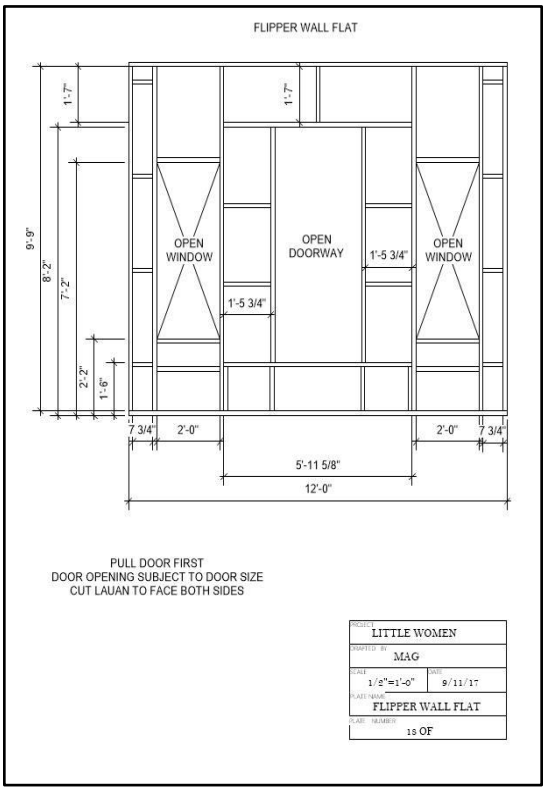


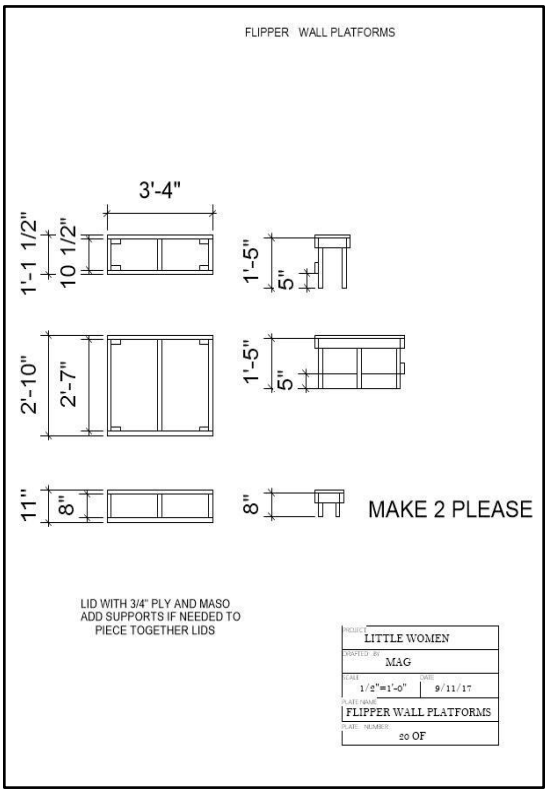


TECHNICAL DRAWINGS FOR WINDOW UNITS



FRONT TECHNICAL ELEVATION OF NEW YORK UNIT



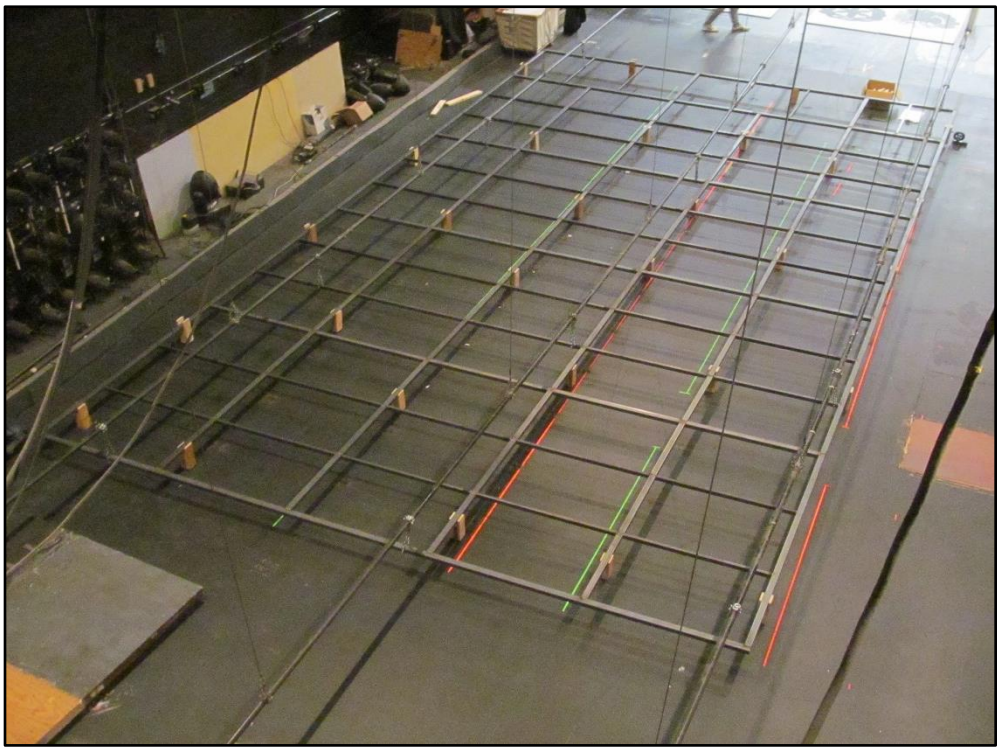


TECHNICAL DRAWINGS FOR NEW YORK UNIT

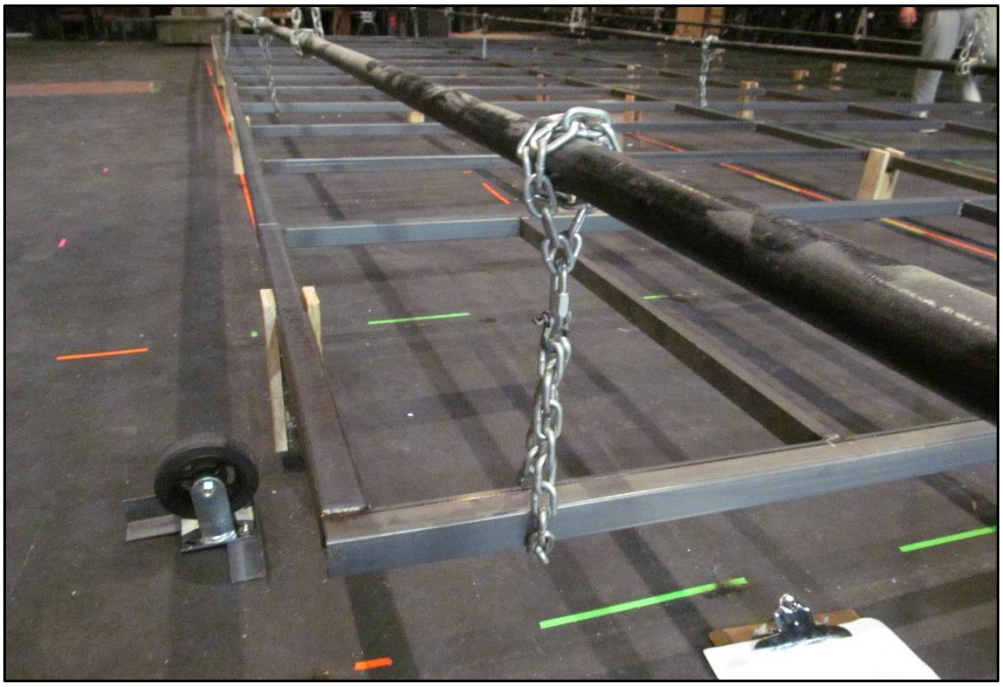
APPENDIX B

PROCESS AND PRODUCTION PHOTOGRAPHS

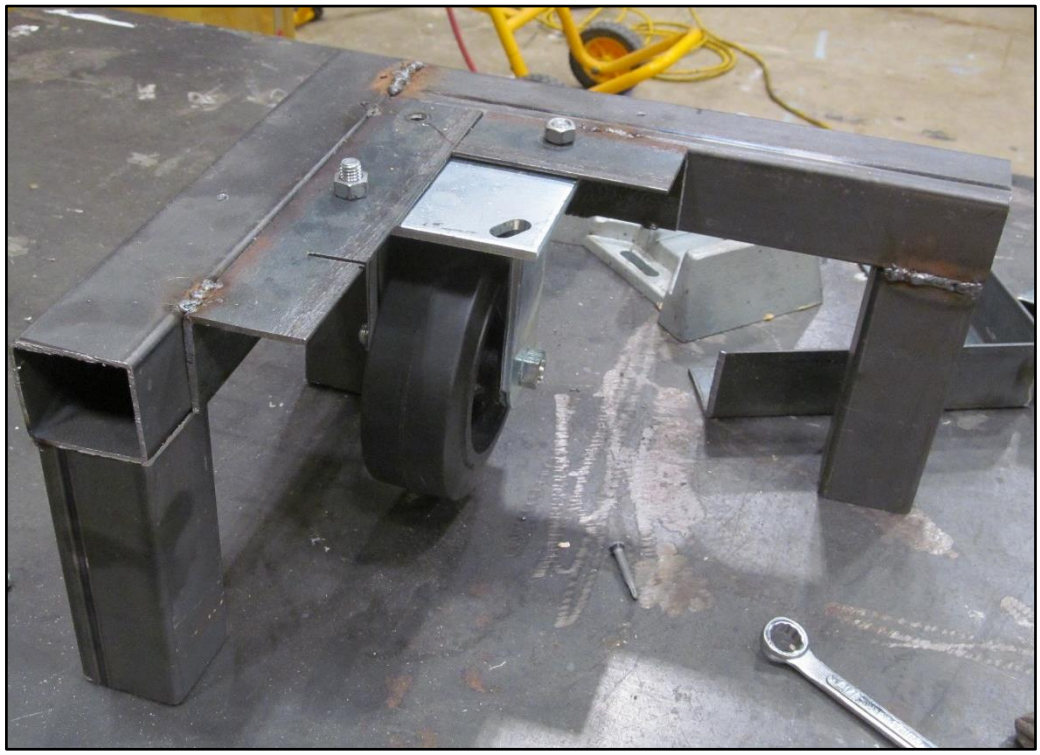
WELDING OF THE HOUSE FRAME



COMPLETED FRAME ON BLOCKS IN PREPARATION FOR CASTERS



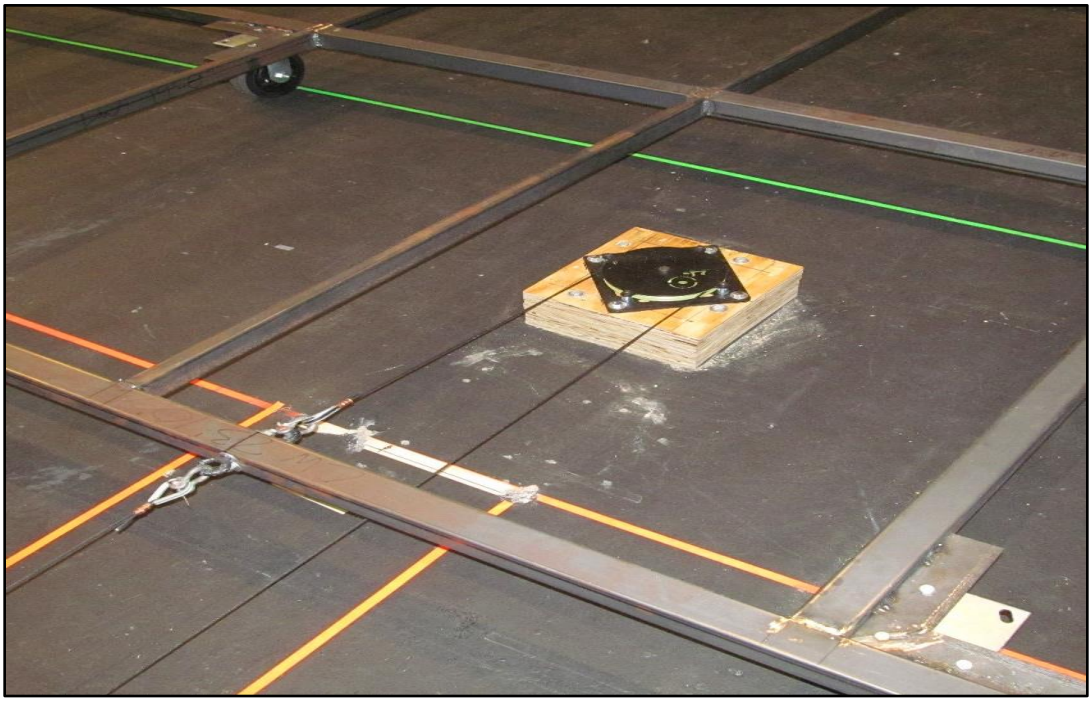
STEEL FRAME LIFTED OFF THE STAGE WITH THREE FLY LINES



CUSTOM CASTER BRACKET PROTOTYPE

FABRICATION OF CASTER BRACKETS

"PUSH STICK" DECK WINCH AND DRIVE BOX



TERMINATION AND TURNAROUND PULLY

PROCESS PHOTOGRAPHS OF THE HOUSE INSTALLATION

LAYER OF 3/4" OSB INSTALLED

LAUAN LAID IN ACTING AREA. FIRST FLOOR WALLS INSTALLED.

SOME OF THE ATTIC STUD WALLS INSTALLED.

SECOND FLOOR LANDING INSTALLED.

ALL STUD WALLS ARE UP. SECOND FLOOR ESCAPE STAIRS INSTALLED.

WINDOW WALLS ARE INSTALLED. STAIRS TO ATTIC ARE INSTALLED.

END OF DAY 3. PLATFORMS FOR ATTIC NEARLY COMPLETED.

SOME WINDOWS INSTALLED.

EARLY TECHNICAL REHEARSAL. ATTIC USEABLE FOR REHEARSAL.

WINDOWS INSTALLED. ATTIC RAIL INSTALLED.

PRODUCTION PHOTOGRAPH WITH THE HOUSE IN ITS

DOWNSTAGE POSITION

HOUSE IT ITS UPSTAGE MOST POSITION. NEW YORK UNIT DOWNSTAGE.

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