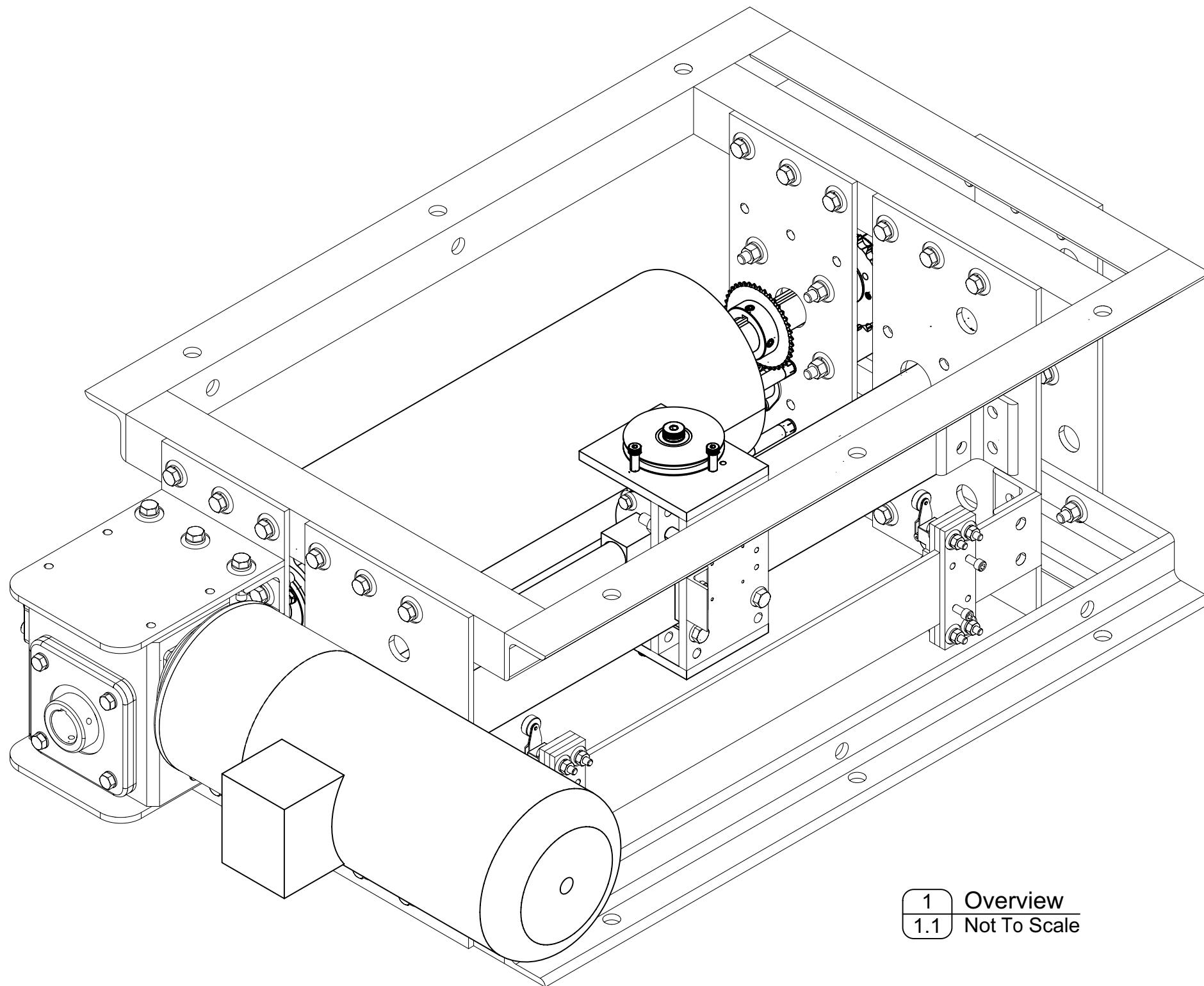


# 120V Project

## Appendix I - Construction Documents

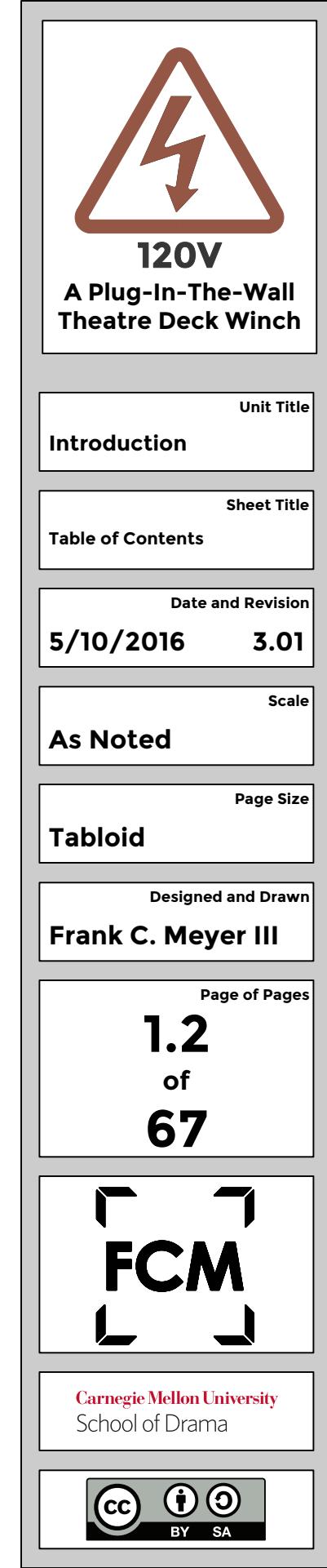


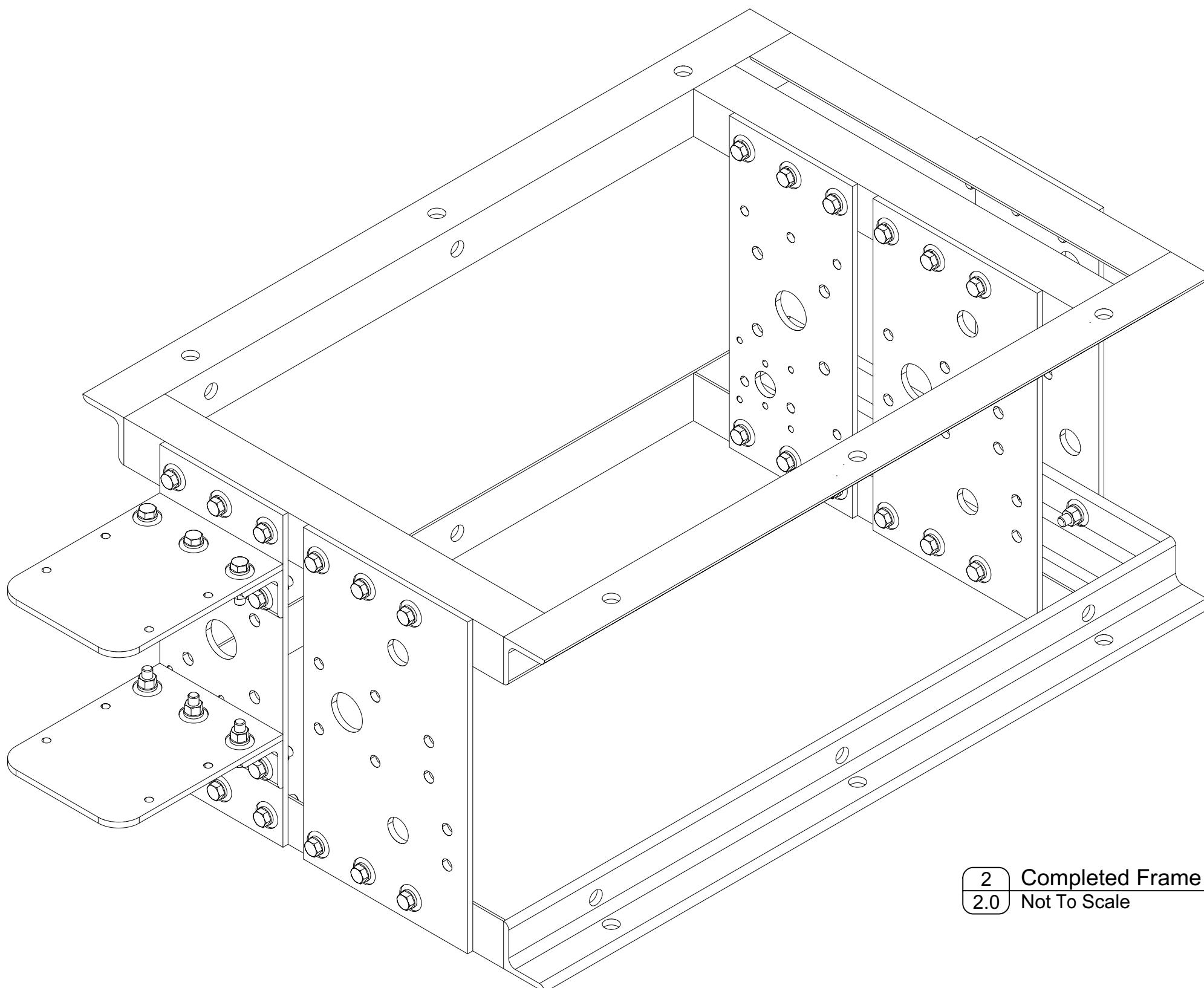
1 Overview  
1.1 Not To Scale

	120V
A Plug-In-The-Wall Theatre Deck Winch	
Unit Title	
Introduction	
Sheet Title	
Cover Page	
Date and Revision	
5/10/2016	3.01
Scale	
As Noted	
Page Size	
Tabloid	
Designed and Drawn	
Frank C. Meyer III	
Page of Pages	
1.1 of 67	
Carnegie Mellon University School of Drama	
CC BY SA	

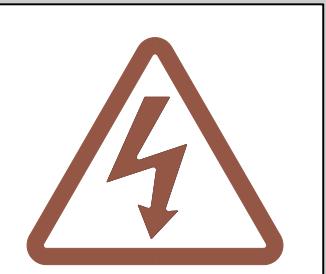
1.1	Introduction	Cover Page
1.2	Introduction	Table of Contents
2	Frame Assembly	Completed Frame Overview
2.1	Frame Construction	Gearbox Support Angle Iron
2.1	Frame Construction	Long Angle Iron
2.11	Frame Construction	Encoder Mounting Plate A
2.12	Frame Construction	Encoder Mounting Plate B
2.13	Frame Construction	Rear Mounting Plate
2.14	Frame Construction	Screw Retaining Plate
2.2	Frame Construction	Short Angle Iron A
2.3	Frame Construction	Short Angle Iron B
2.4	Frame Construction	Bottom Frame Weldment
2.5	Frame Construction	Top Frame Weldment
2.6	Frame Construction	Front Mounting Plate
2.7	Frame Construction	Right Mounting Plate
2.8	Frame Construction	UHMW Bearing Plate
2.9	Frame Construction	Motor Mount Plate
3	Winder Assembly	Winder Completed
3.1	Winder Assembly	Winder Exploded
3.1	Winder Assembly	Winder Sheave Plate
3.11	Winder Assembly	Winder Screw Plate
3.2	Winder Assembly	Winder Weldment
3.3	Winder Assembly	Winder Weldment Exploded
3.4	Winder Assembly	Winder Limit Tab
3.5	Winder Assembly	Winder UHMW Pad
3.6	Winder Assembly	Winder Rider Bar
3.7	Winder Assembly	Winder Angle Tab
3.8	Winder Assembly	Winder Ball Screw
3.9	Winder Assembly	Winder Clamp Plate
4.1	Limit Assembly	Limit Bar
4.3	Limit Assembly	Limit Switch Mounting Plate
4.4	Limit Assembly	Limit Switch Spacer Plate
4.5	Limit Assembly	Limit Switch Clamping Plate
5	Drum Assembly	Drum Completed
5.1	Drum Assembly	Drum Welding Assembly
5.2	Drum Assembly	Clip Tapping Details
5.3	Drum Assembly	Drum Clips
5.4	Drum Assembly	Drum Weldment Layout
5.5	Drum Assembly	Drum Pipe
6.1	Frame Assembly	Completed Frame Overview
6.2	Frame Assembly	Mounting Plate Assembly
6.3	Frame Assembly	Gearbox Support Assembly
7.1	Winder Installation	Rider Bar Assebly
7.2	Winder Installation	Retaining and Bearing Plates
7.3	Winder Installation	Winder Installation
7.4	Winder Installation	Ball Screw Install
7.5	Winder Installation	Screw Sprocket Install
7.6	Winder Installation	Mounting Plate Re-Install
7.7	Winder Installation	Winder Complete Overview
8.1	Limit Installation	Limit Bar Installation
8.2	Limit Installation	Limit Switch Installation
9.1	Drum Install	Drive Bearings Install

9.2	Drum Install	Drive Drum Install
9.3	Drum Install	Drum Spacing Detail
9.4	Drum Install	Chain Install Detail
10.1	Encoder Assembly	Encoder Parts Callout
10.2	Encoder Assembly	Parts Callout Cont.
10.3	Encoder Assembly	Alignment Detail
10.4	Encoder Assembly	Chain Install
11.1	Power Transmission	Gearbox Install
11.1	Power Transmission	Gearbox Install
11.2	Power Transmission	Motor & Brake Install
11.2	Power Transmission	Motor & Brake Install
13.1	Wiring Diagrams	5V Wiring
13.2	Wiring Diagrams	24V Wiring
13.3	Wiring Diagrams	120V Wiring
13.4	Wiring Diagrams	Motor Power Wiring
13.5	Wiring Diagrams	Brake and Motor Internal
13.6	Wiring Diagrams	Encoder Termination
13.7	Wiring Diagrams	Limit and E-stop





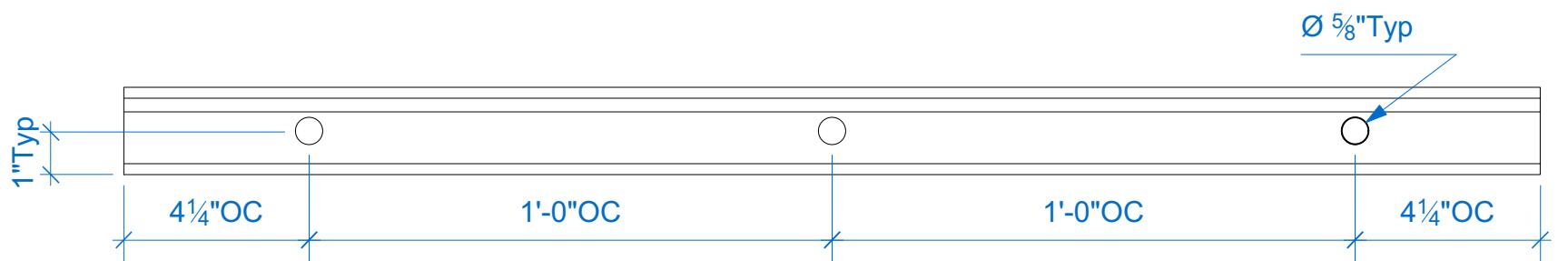
2 Completed Frame Assembly  
2.0 Not To Scale

 <b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title <b>Frame Assembly</b>
Sheet Title <b>Completed Frame Overview</b>
Date and Revision <b>5/10/2016 3.01</b>
Scale
<b>As Noted</b>
Page Size <b>Tabloid</b>
Designed and Drawn <b>Frank C. Meyer III</b>
Page of Pages <b>2 of 67</b>

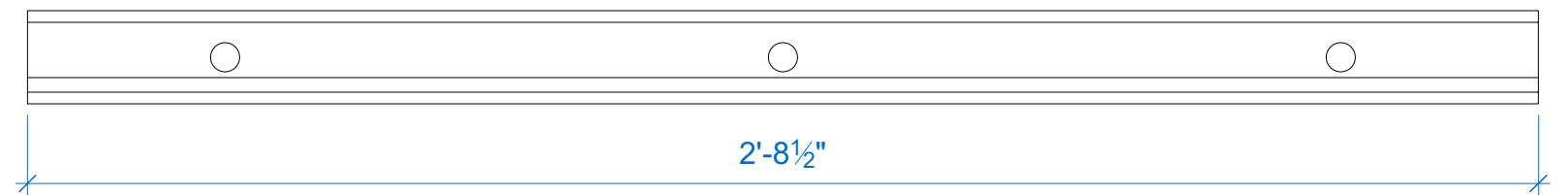
Carnegie Mellon University School of Drama


# VECTORWORKS EDUCATIONAL VERSION

1 Top View  
2.1 Scale: 3" = 1'-0"



2 Front View  
2.1 Scale: 3" = 1'-0"

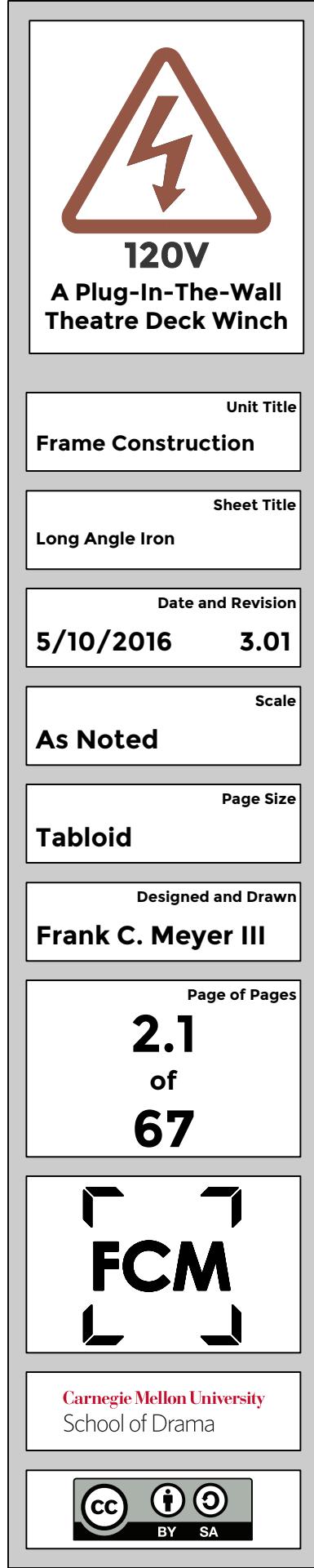
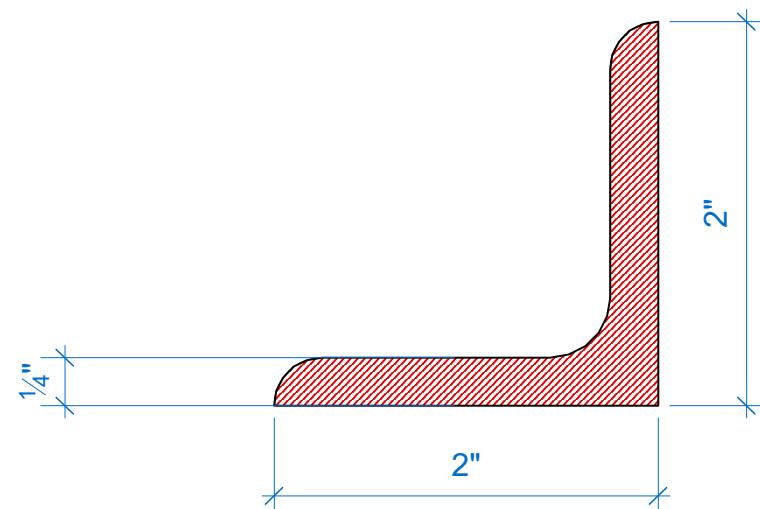


4 Isometric Projection  
2.1 Not To Scale

## General Notes

- Material is 2"x2"x1/4" Angle Iron

3 Section Detail  
2.1 Scale: Actual Size

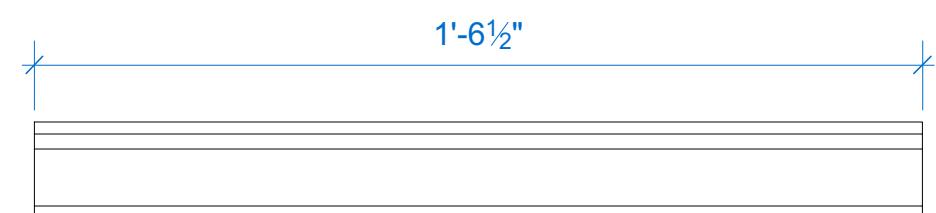


**Build 4 (Four) As Drawn**

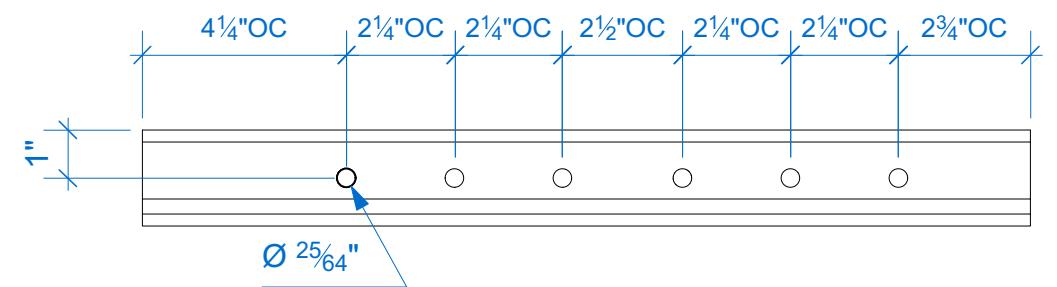
VECTORWORKS EDUCATIONAL VERSION

# VECTORWORKS EDUCATIONAL VERSION

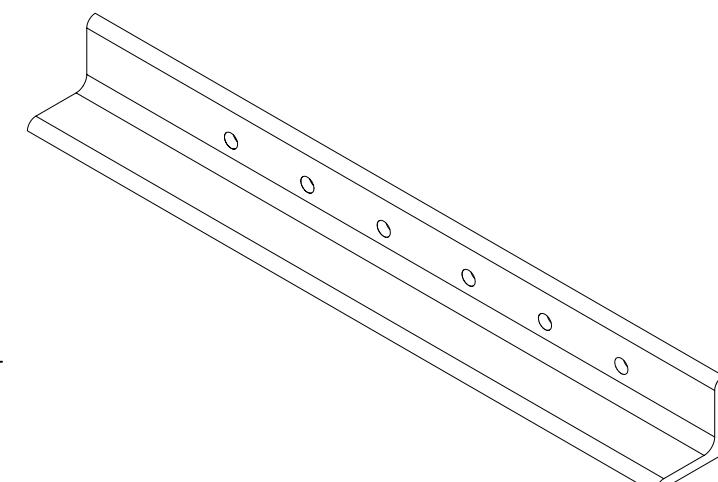
1  
2.2 Top View  
Scale: 3" = 1'-0"



2  
2.2 Scale: 3" = 1'-0"  
Front View



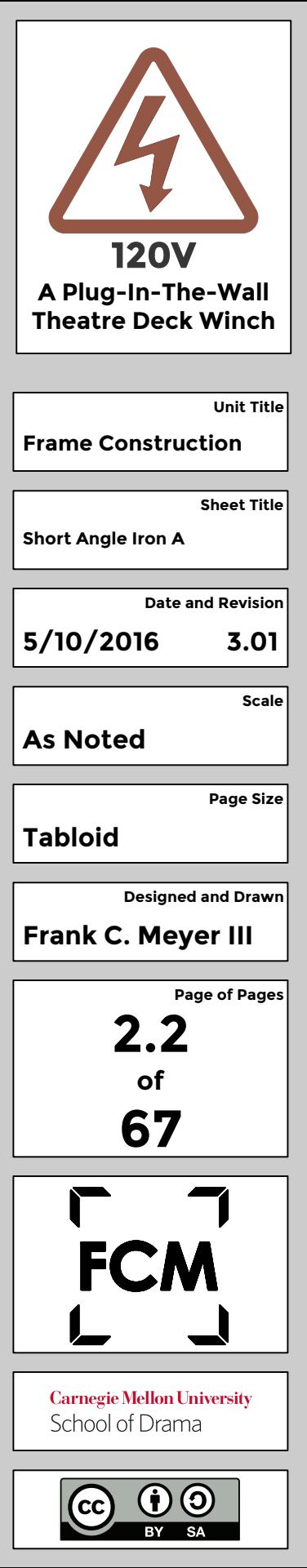
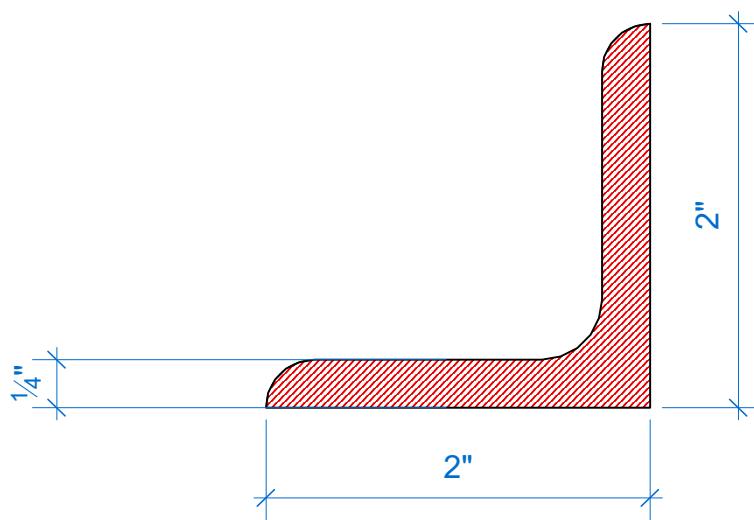
4  
2.2 Isometric Projection  
Not To Scale



## General Notes

- Material is 2"x2"x1/4" Angle Iron

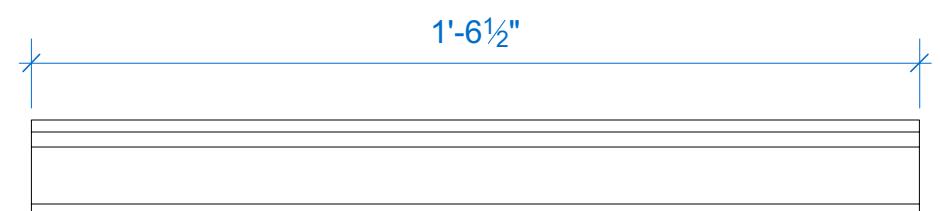
3  
2.2 Section Detail  
Scale: Actual Size



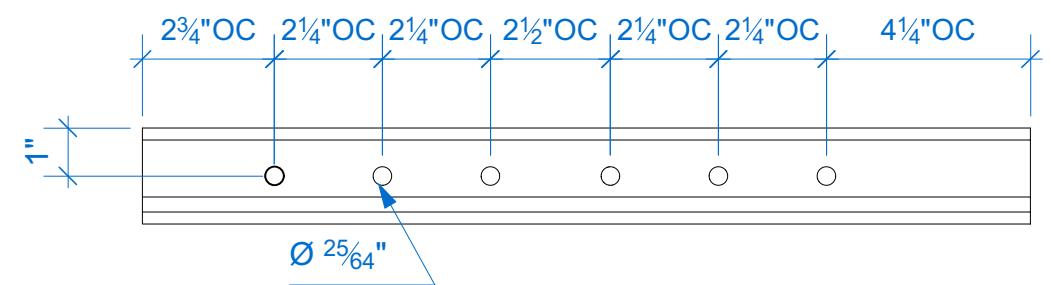
**Build 3 (Three) As Drawn**

# VECTORWORKS EDUCATIONAL VERSION

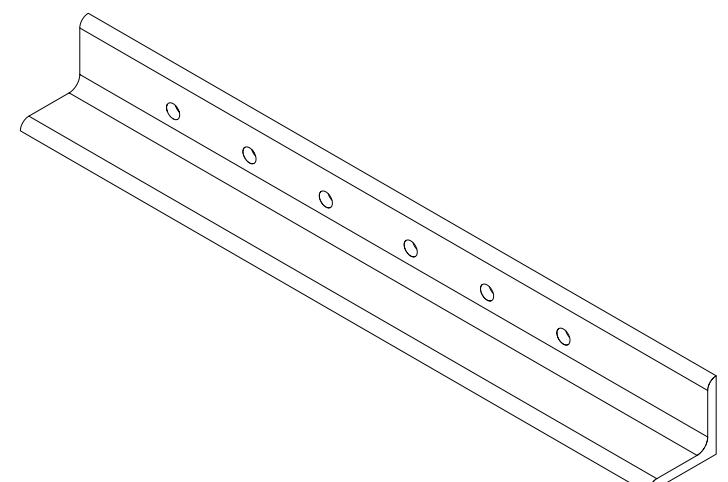
1 Top View  
2.3 Scale: 3" = 1'-0"



2 Front View  
2.3 Scale: 3" = 1'-0"



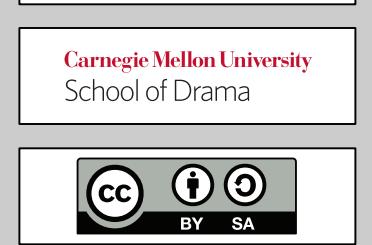
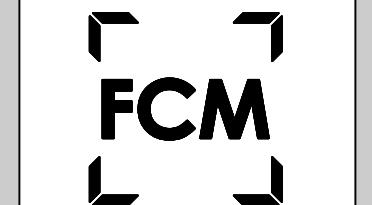
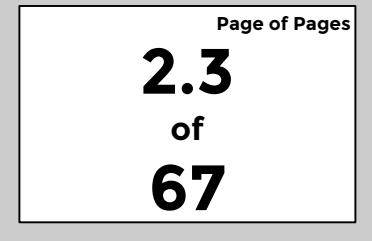
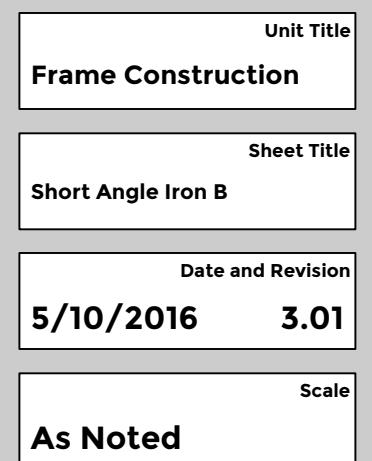
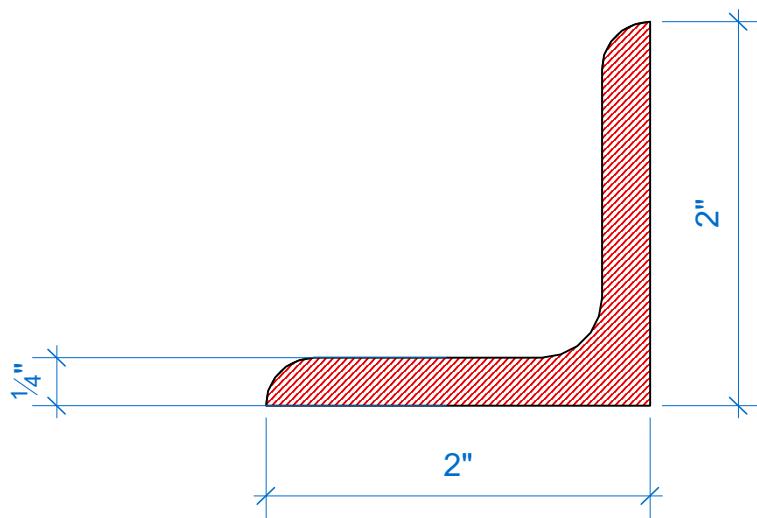
4 Isometric Projection  
2.3 Not To Scale



## General Notes

- Material is 2"x2"x1/4" Angle Iron

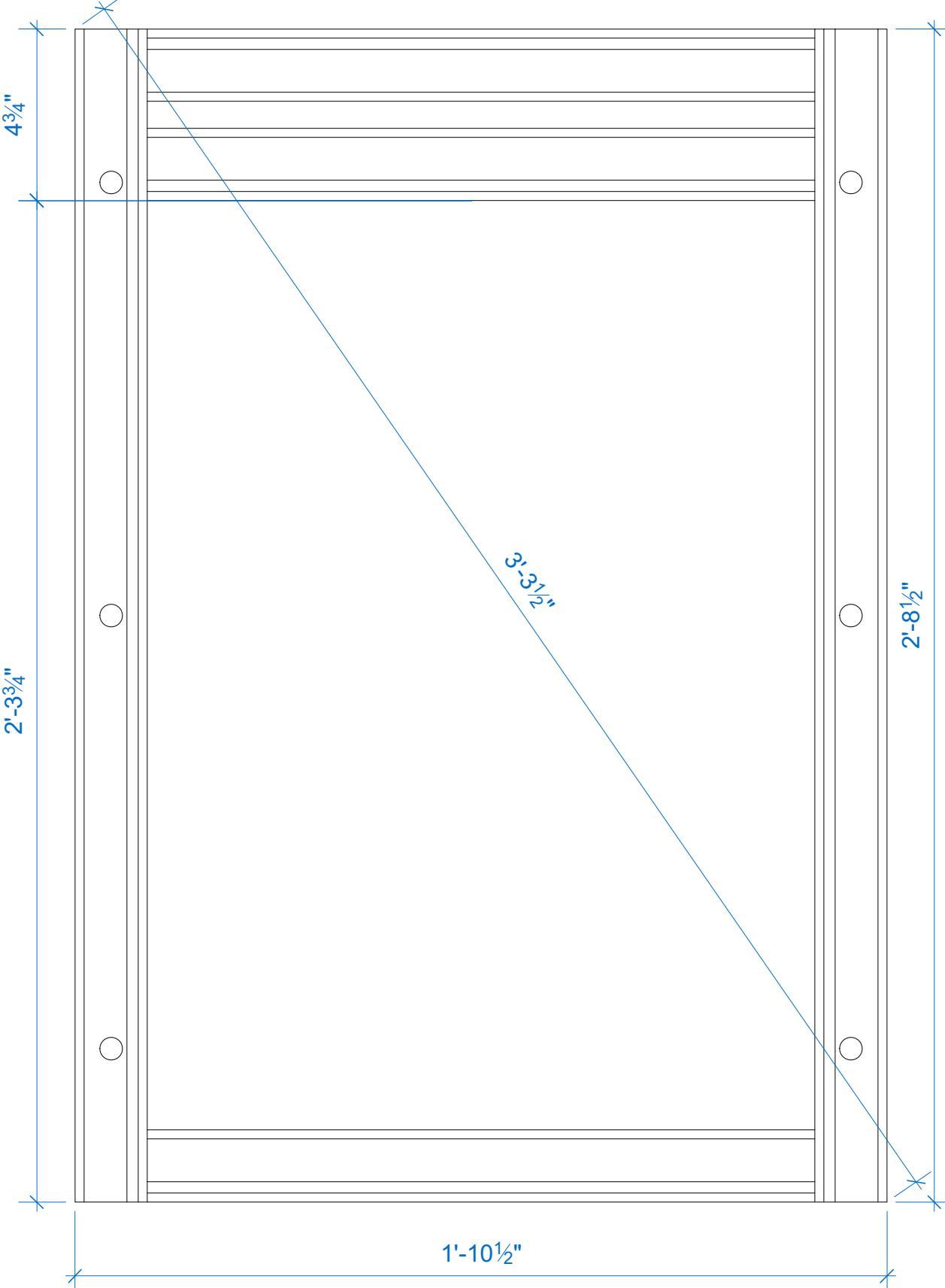
3 Section Detail  
2.3 Scale: Actual Size



**Build 3 (Three) As Drawn**

VECTORWORKS EDUCATIONAL VERSION

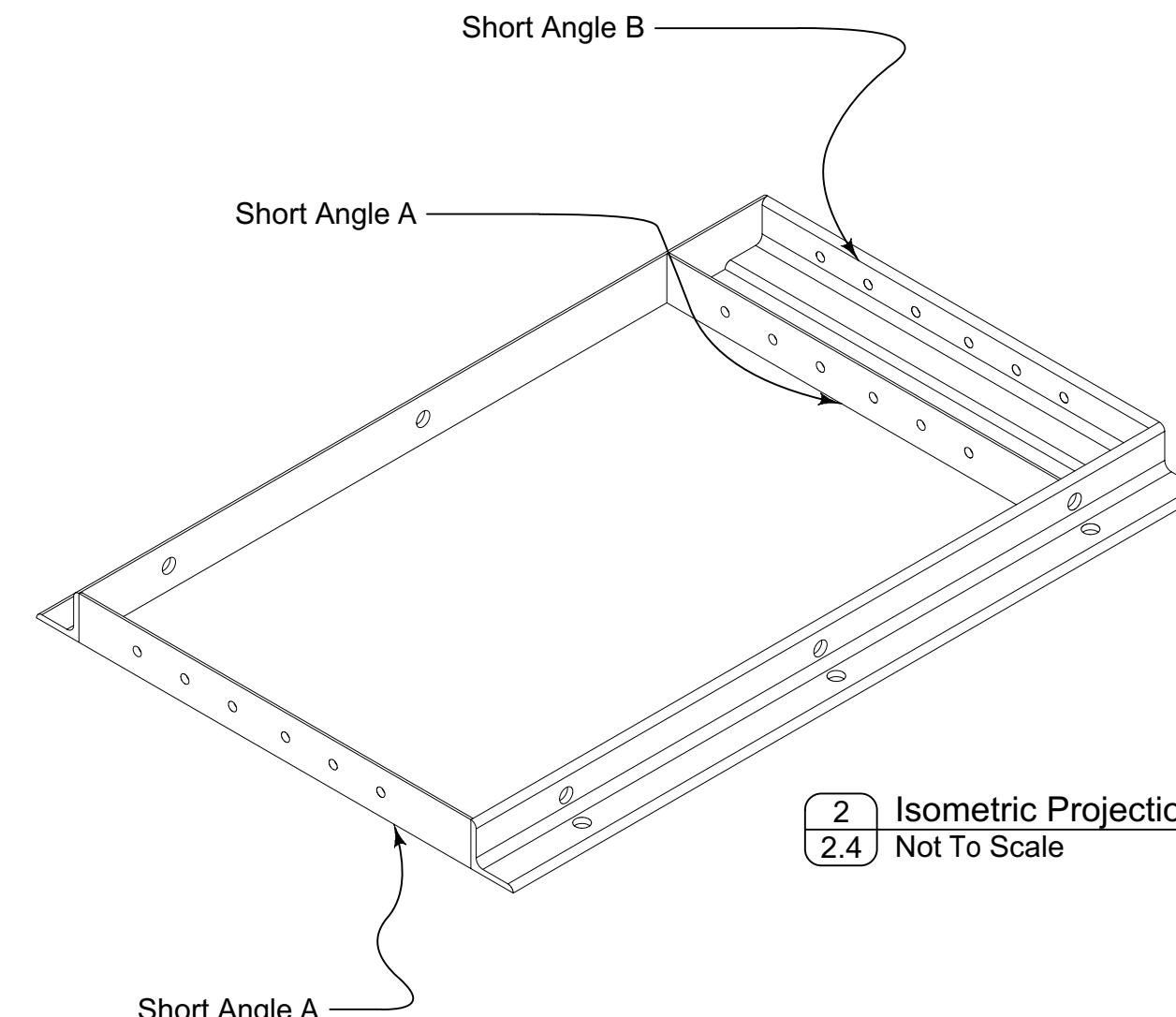
1  
2.4 Weldment Layout  
Scale: 3" = 1'-0"



# VECTORWORKS EDUCATIONAL VERSION

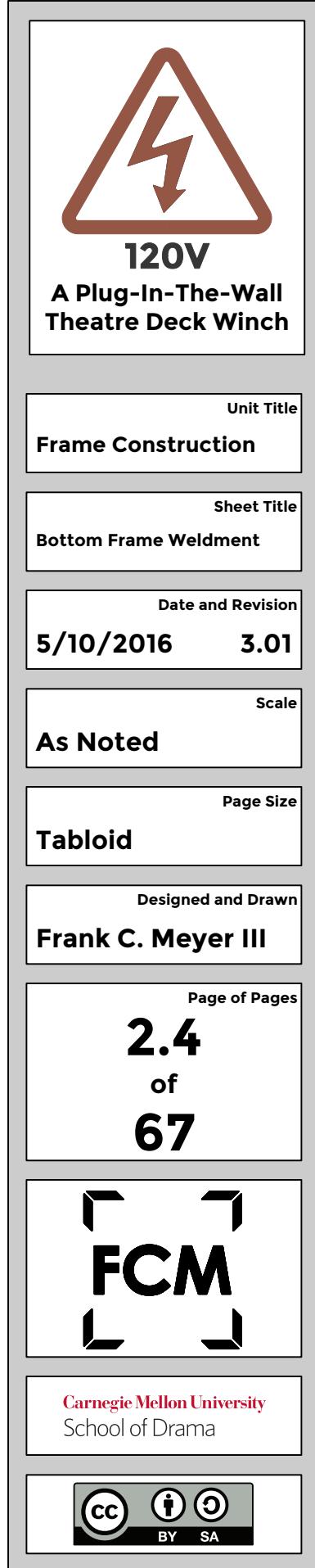
## General Notes

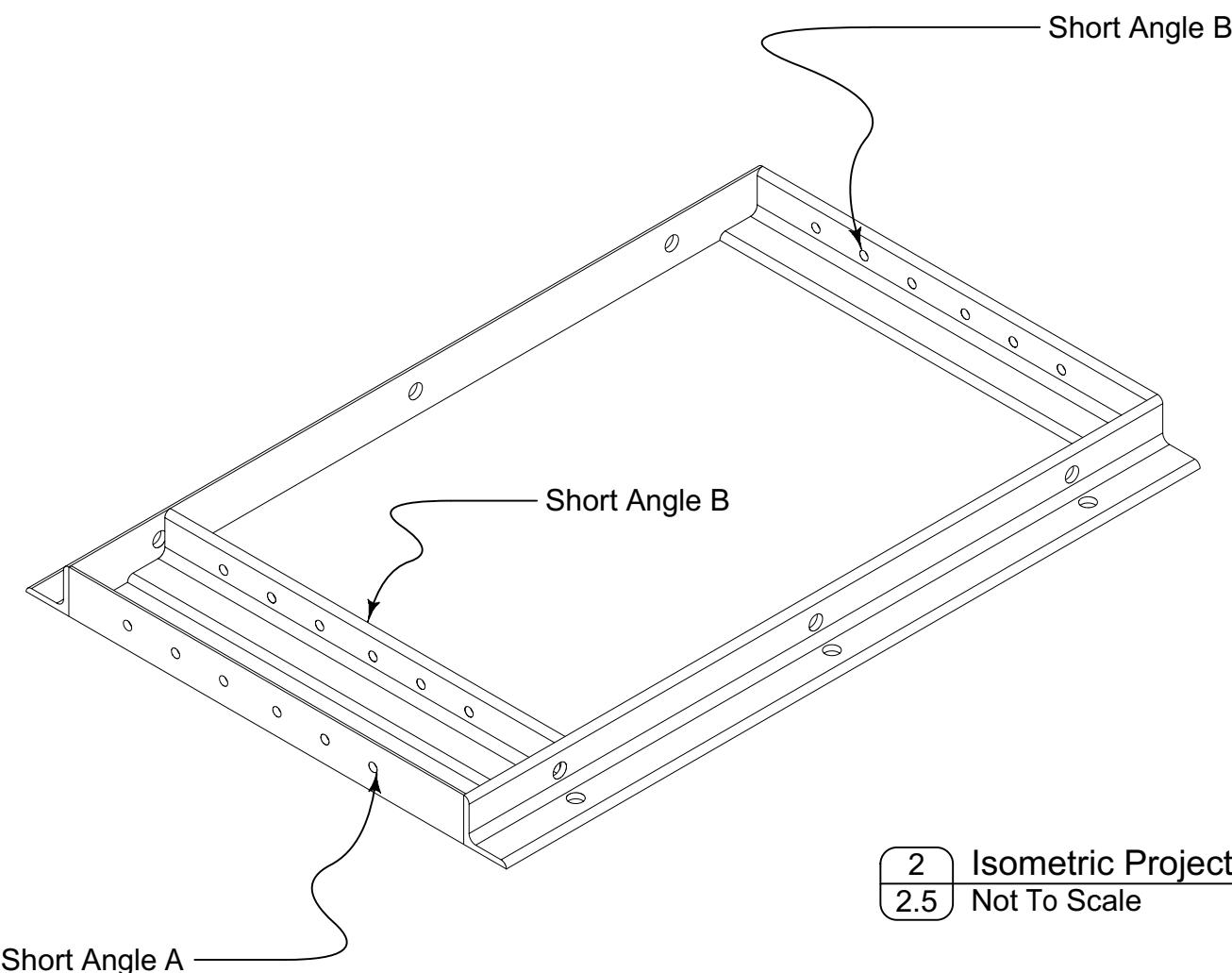
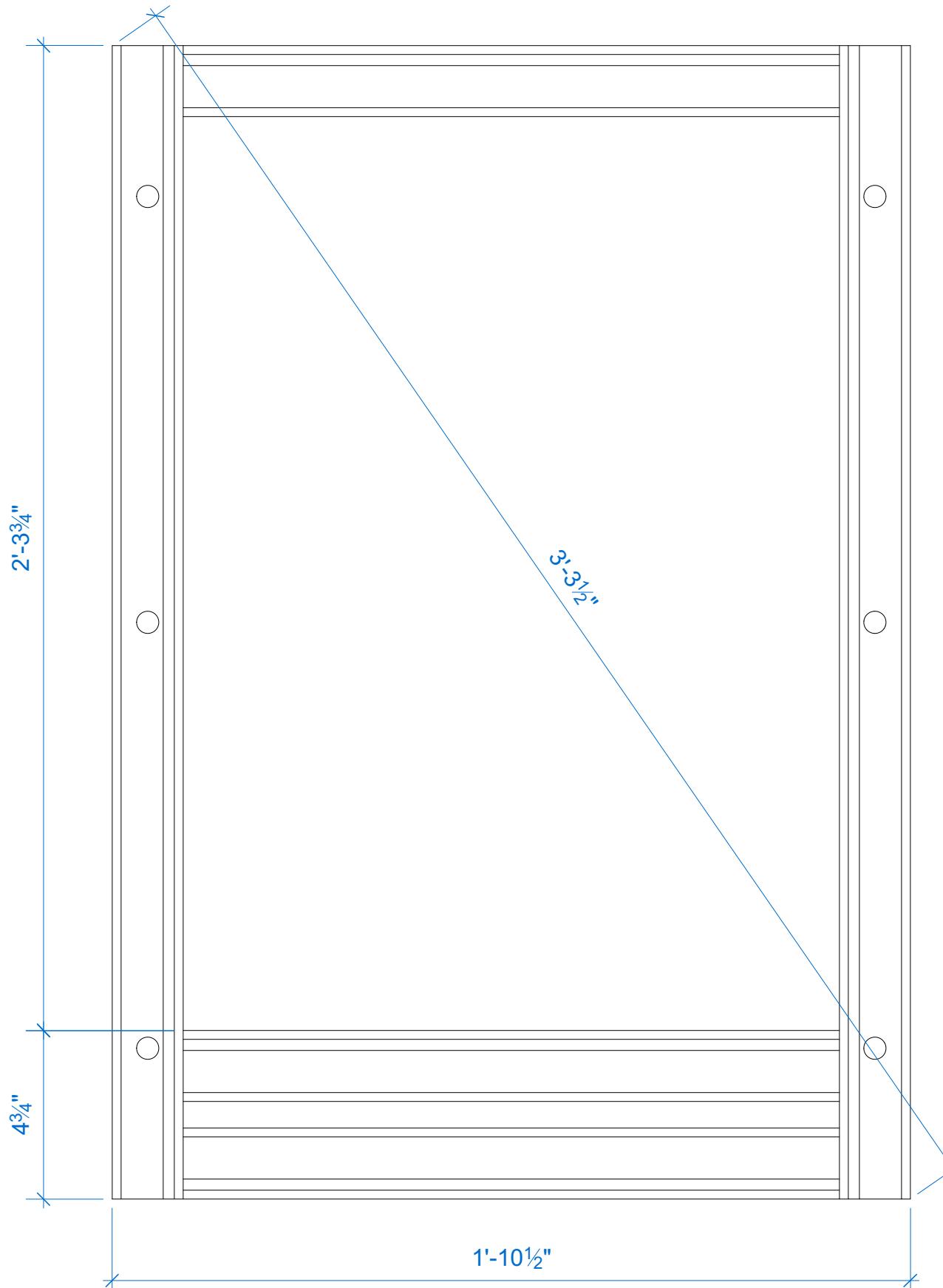
1. Prep Metal as Appropriate and Weld All Around.



2  
2.4 Isometric Projection  
Not To Scale

**Weld 1 (One) As Drawn**

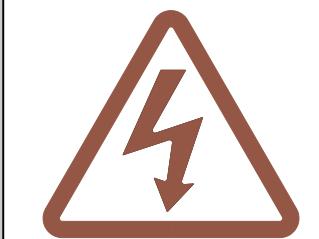




**Weld 1 (One) As Drawn**

General Notes

1. Prep Metal as Appropriate and Weld All Around.



**120V**

A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

**Frame Construction**

Sheet Title

**Top Frame Weldment**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

Designed and Drawn

**Frank C. Meyer III**

Page of Pages

**2.5  
of  
67**

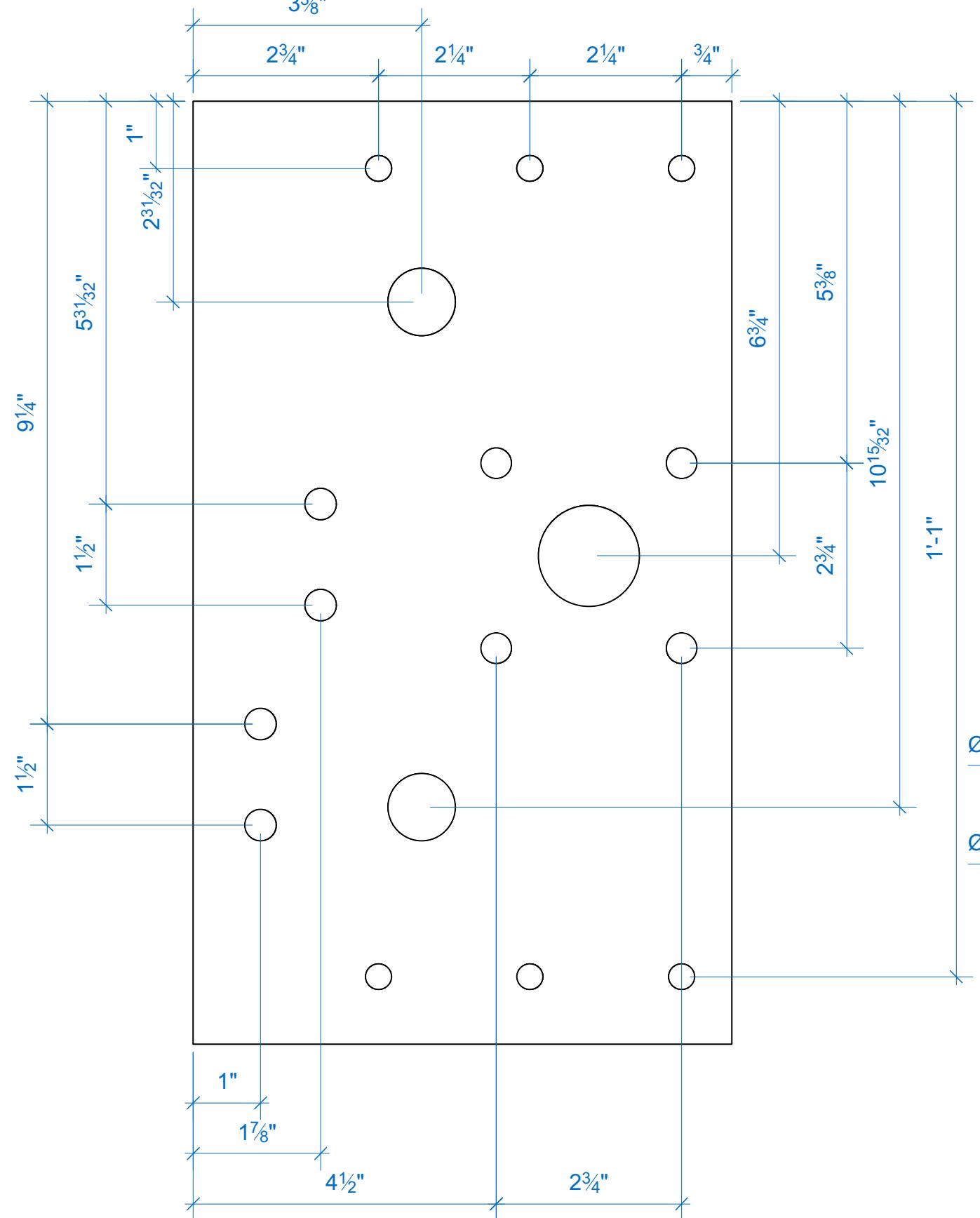
**FCM**

Carnegie Mellon University  
School of Drama

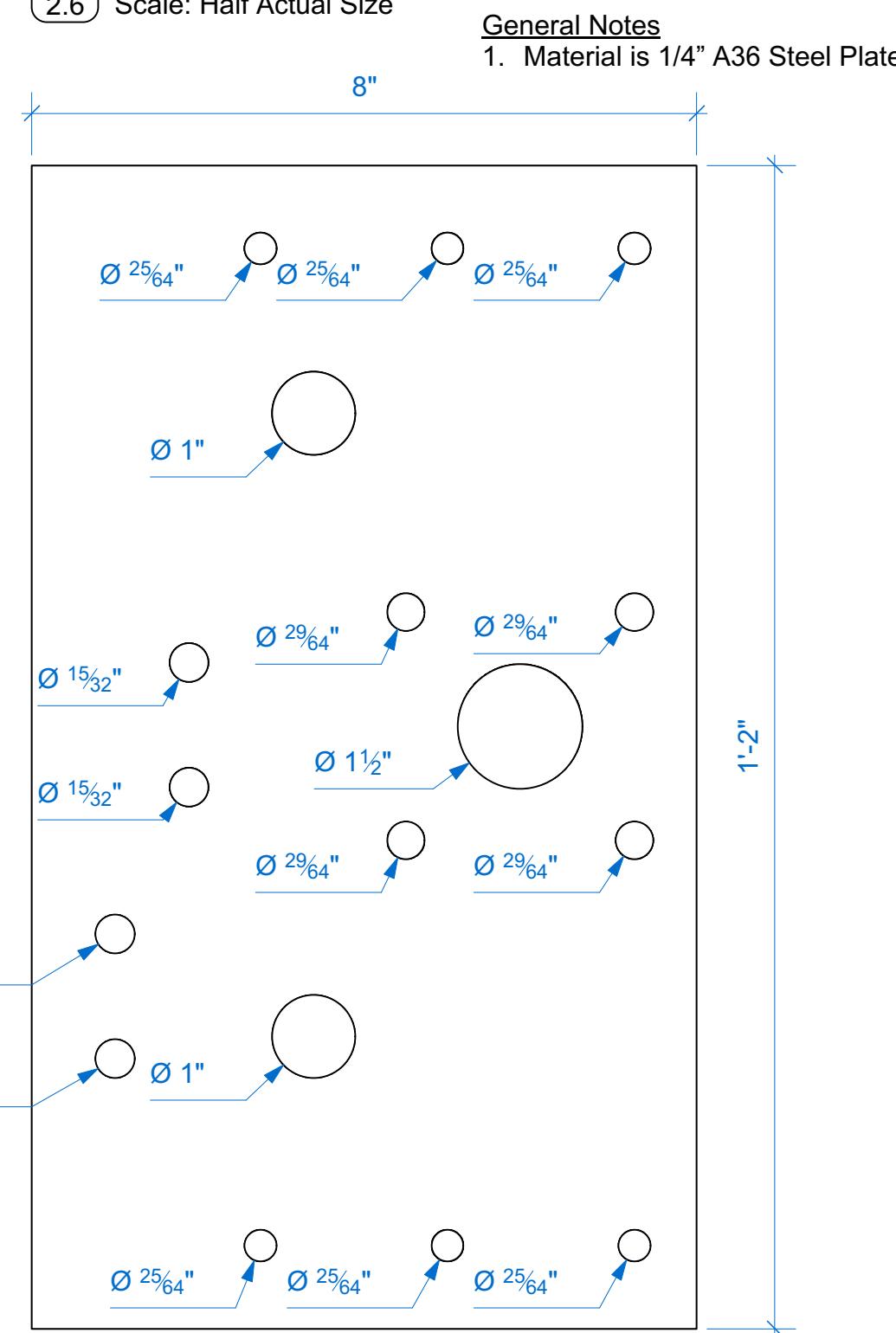


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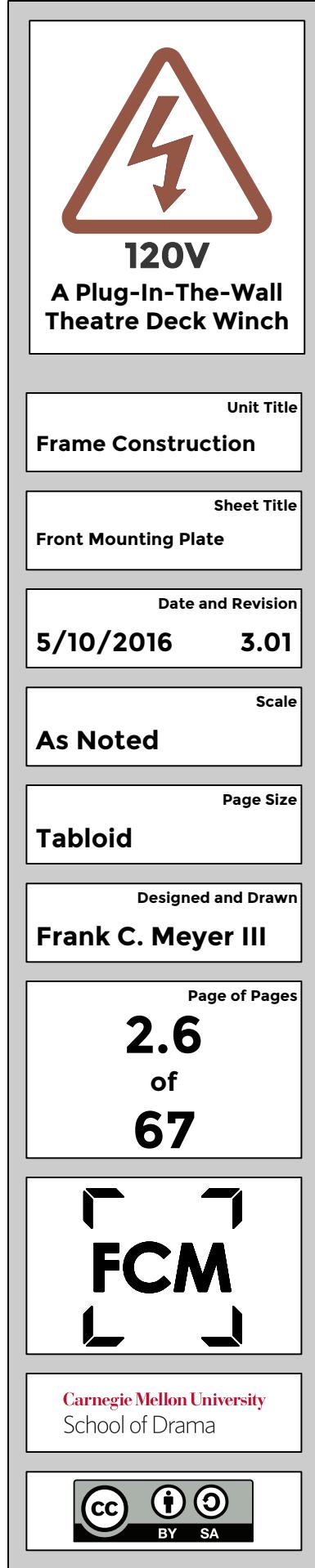
**1**  
2.6 Layout Detail  
Scale: Half Actual Size



**2**  
2.6 Hole Diameter Detail  
Scale: Half Actual Size



General Notes  
1. Material is 1/4" A36 Steel Plate

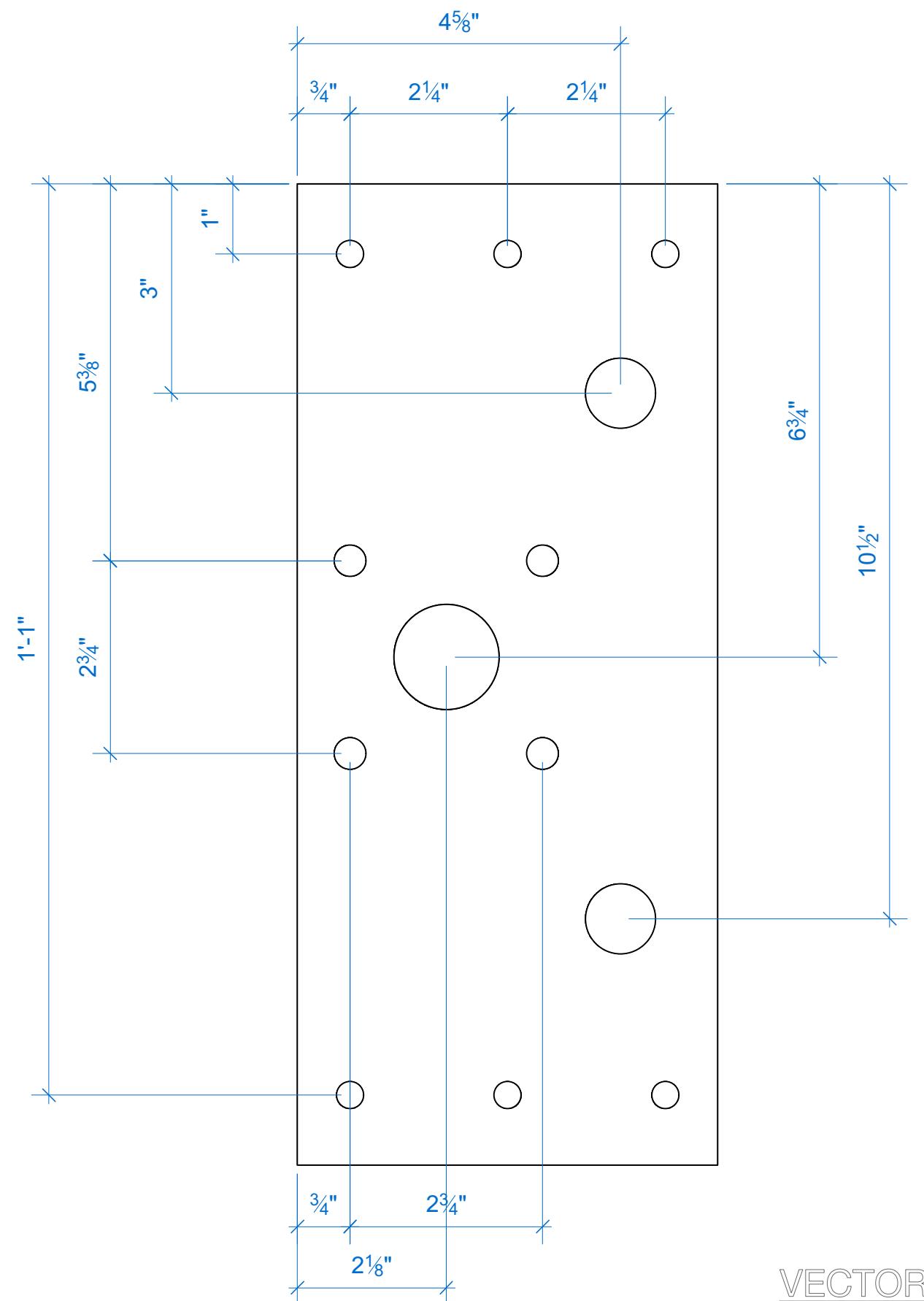


**Build 2 (Two) As Drawn**

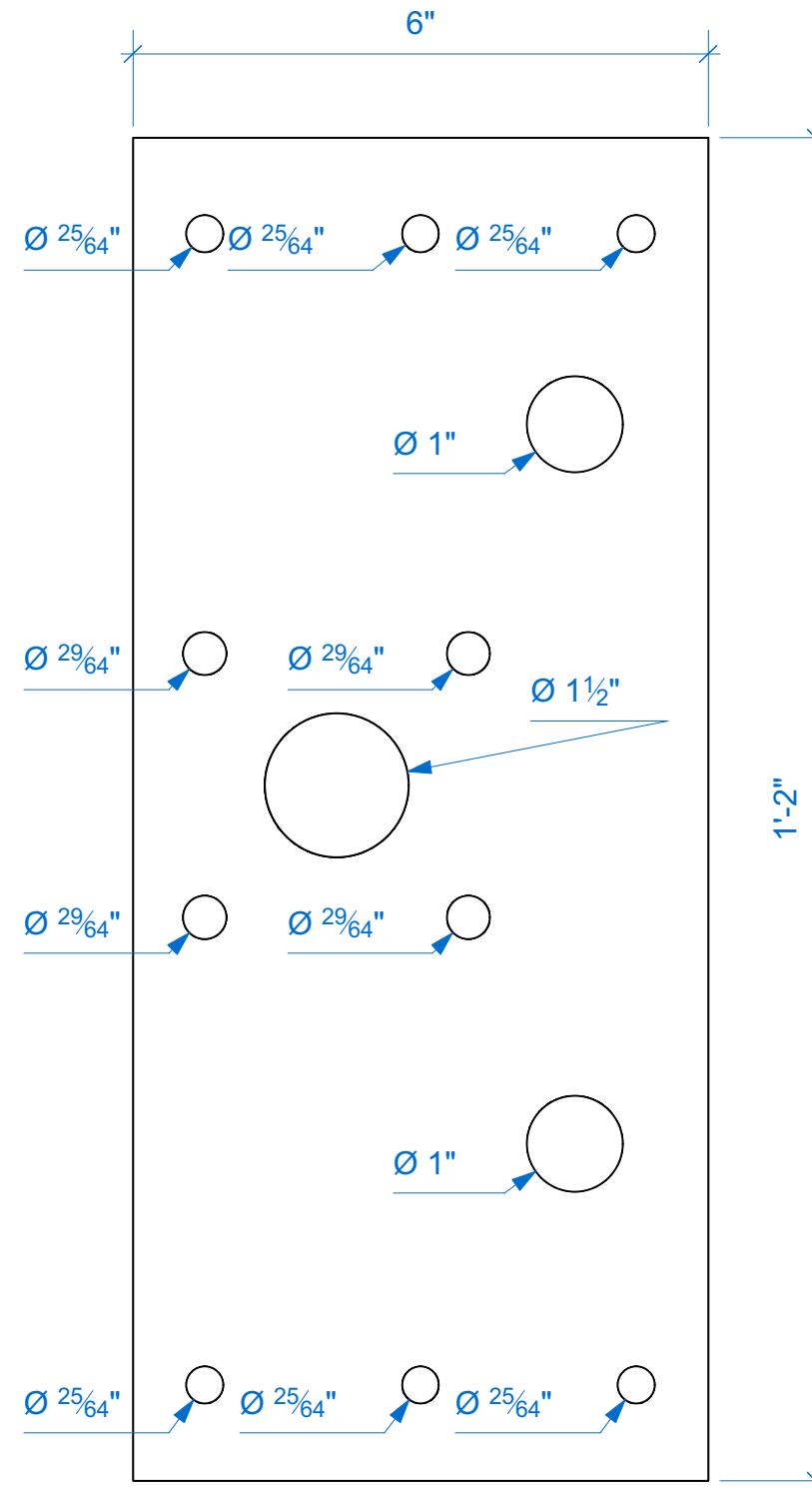
# VECTORWORKS EDUCATIONAL VERSION

# VECTORWORKS EDUCATIONAL VERSION

**1**  
2.7 Layout Detail  
Scale: Half Actual Size

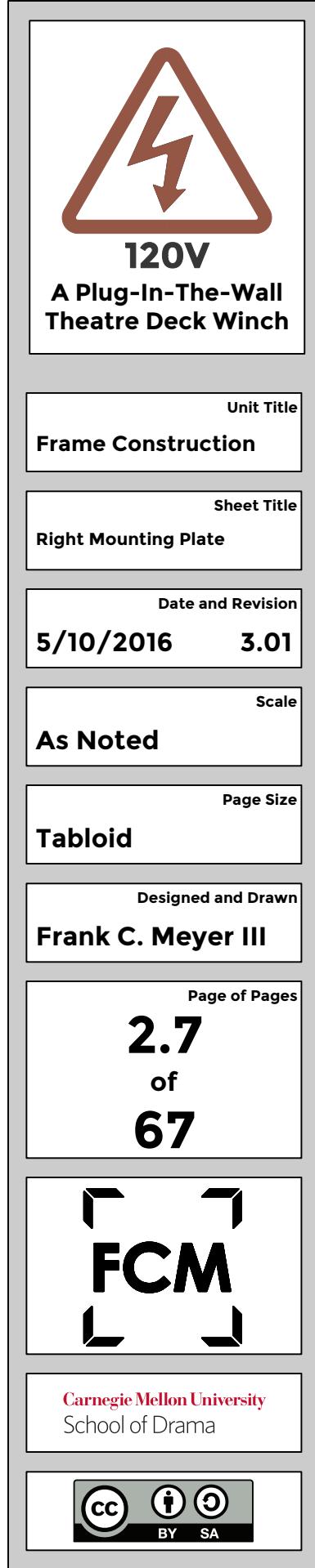


**2**  
2.7 Hole Diameter Detail  
Scale: Half Actual Size



## General Notes

- Material is 1/4" A36 Steel Plate

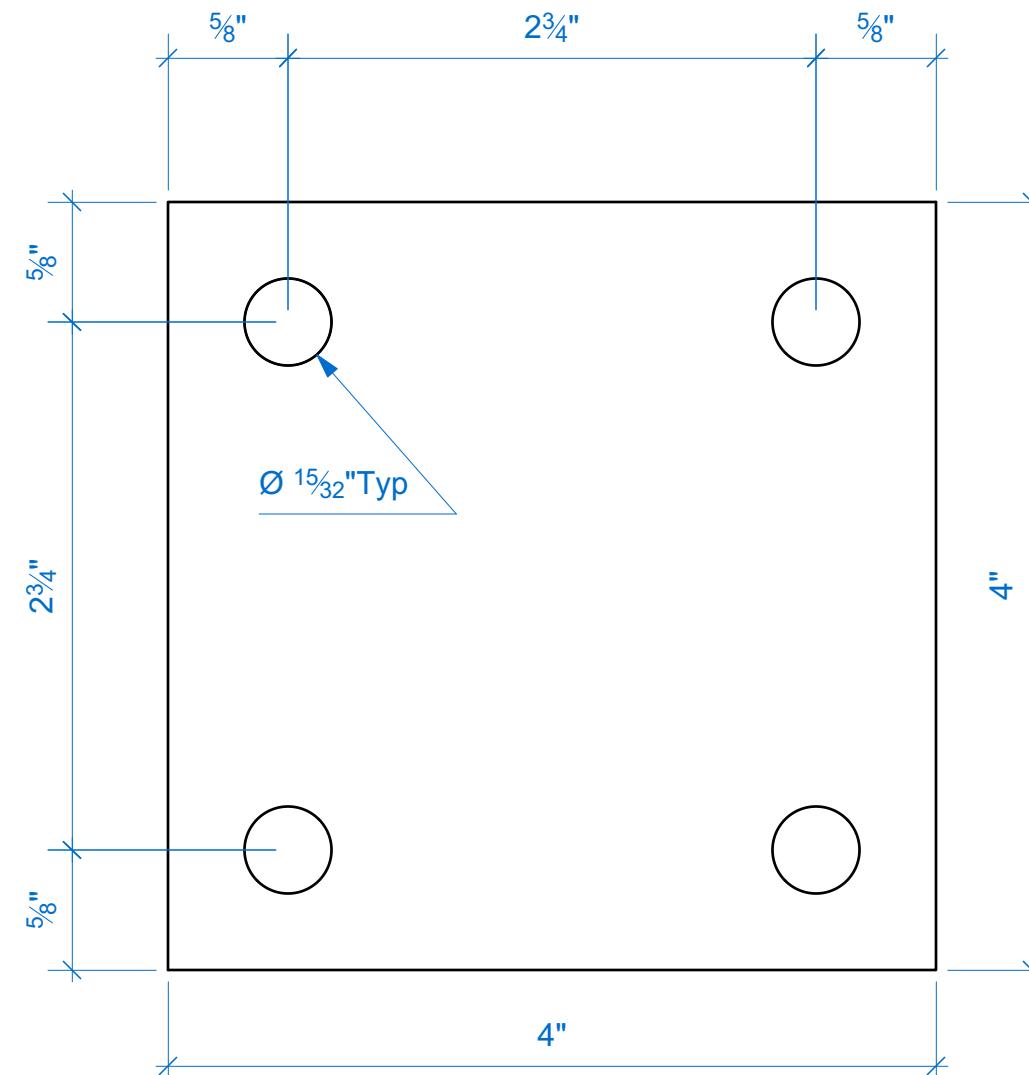


**Build 1 (One) As Drawn**

VECTORWORKS EDUCATIONAL VERSION

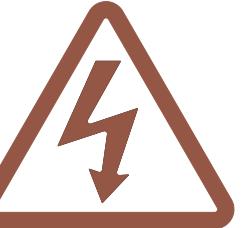
# VECTORWORKS EDUCATIONAL VERSION

1 Layout Detail  
2.8 Scale: Actual Size



## General Notes

- Material is 1/4" A36 Steel Plate



**120V**

A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

**Frame Construction**

Sheet Title

**UHMW Bearing Plate**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

Designed and Drawn

**Frank C. Meyer III**

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67**

**FCM**

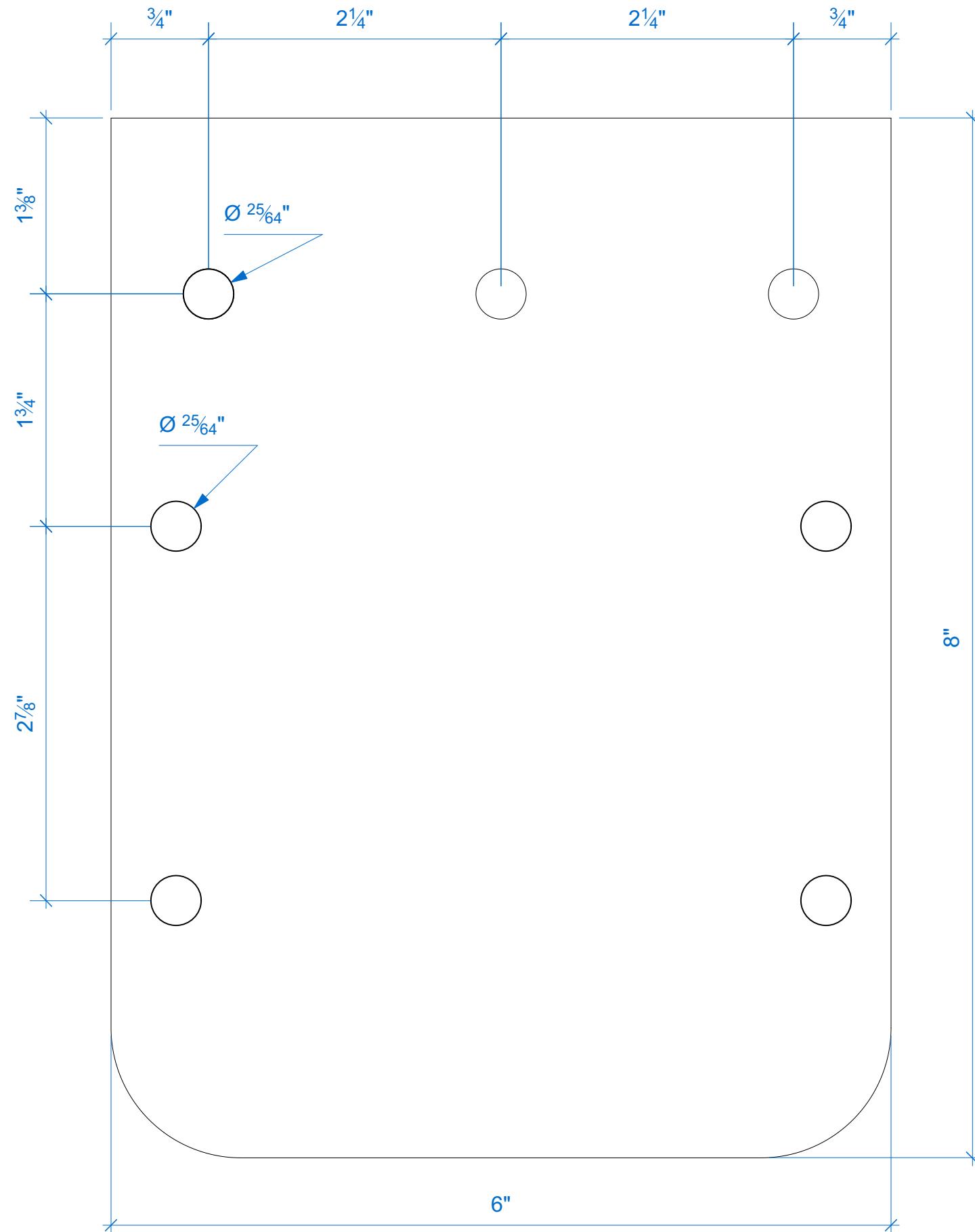
Carnegie Mellon University  
School of Drama



**Build 2 (Two) As Drawn**

VECTORWORKS EDUCATIONAL VERSION

# VECTORWORKS EDUCATIONAL VERSION

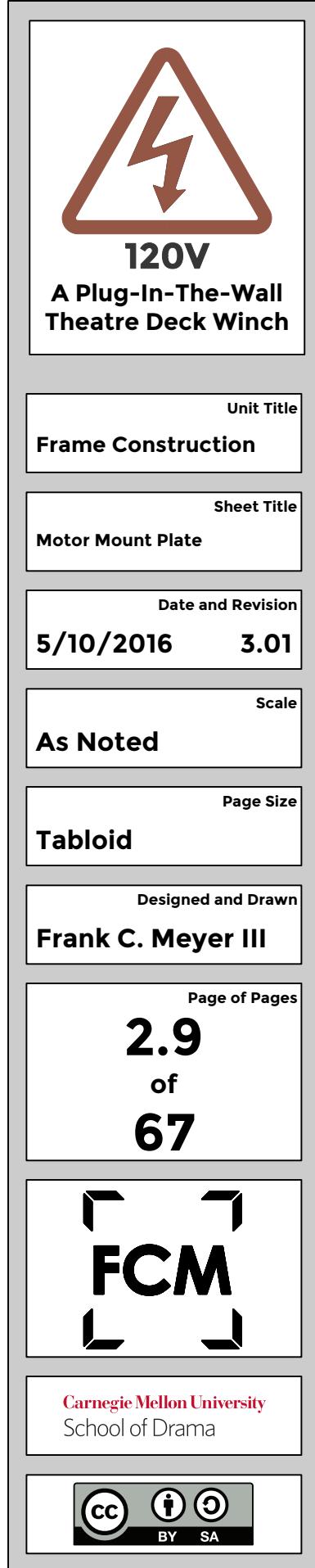


## General Notes

1. Material is  $1/4''$  A36 Steel Plate
2. Fillet As Desired - This Corner Sticks Out Of Finished Winch

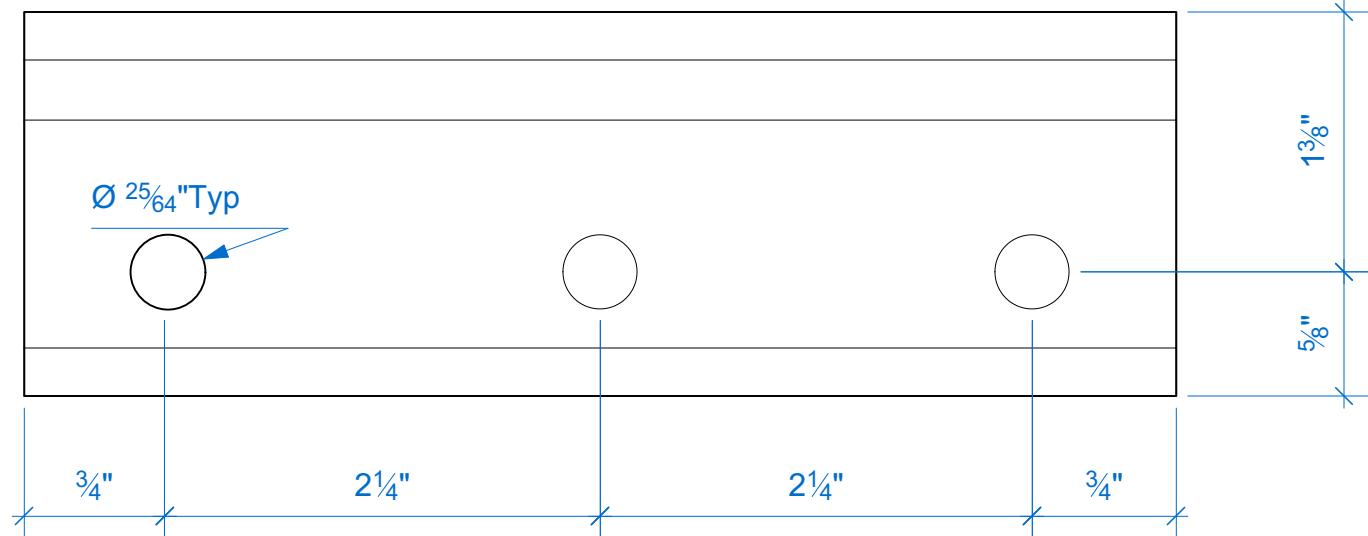
1  
2.9 Layout Detail  
2.9 Scale: Actual Size

**Build 2 (Two) As Drawn**

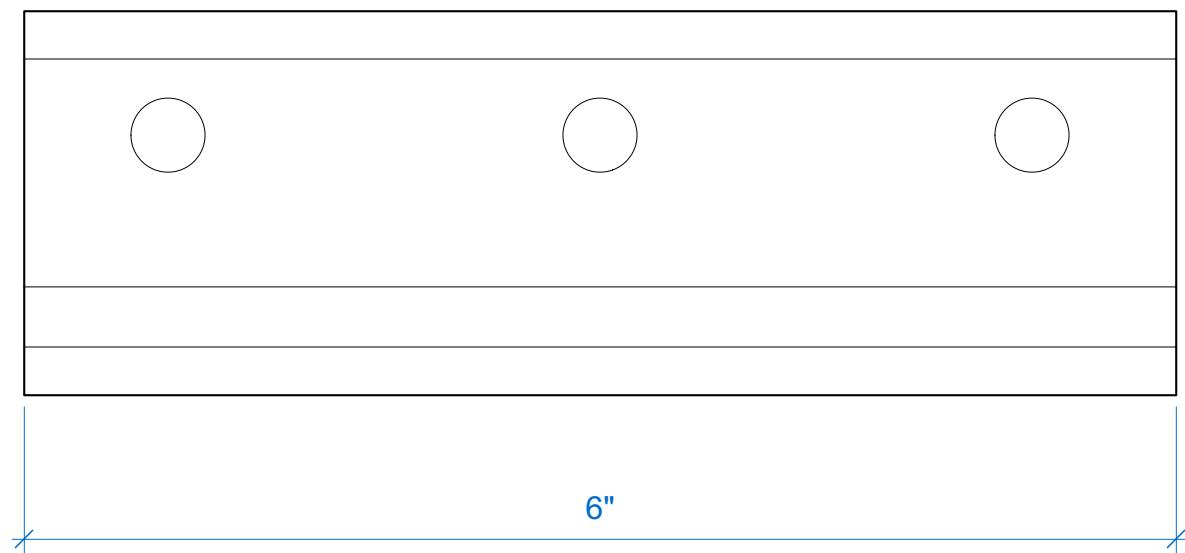


# VECTORWORKS EDUCATIONAL VERSION

1 Top View  
2.10 Scale: Actual Size

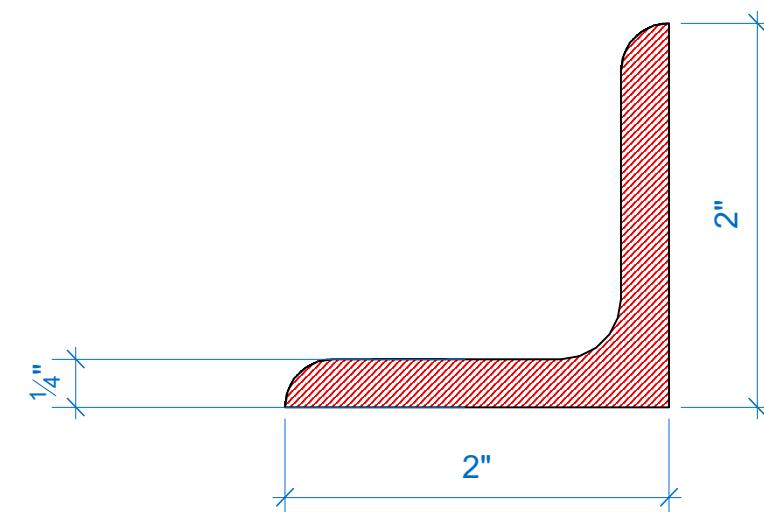


2 Front View  
2.10 Scale: Actual Size

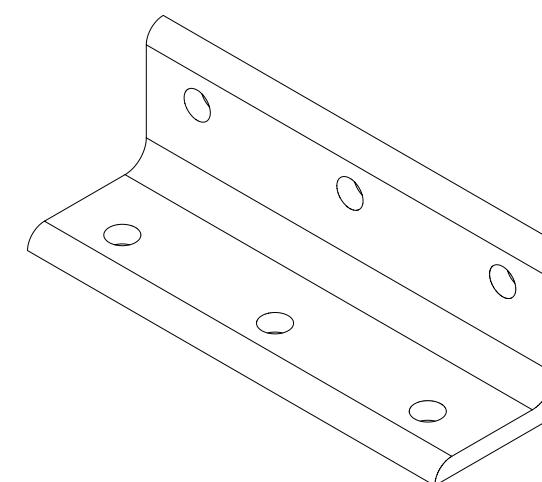


General Notes  
1. Material is 2"x2"x1/4" Angle Iron

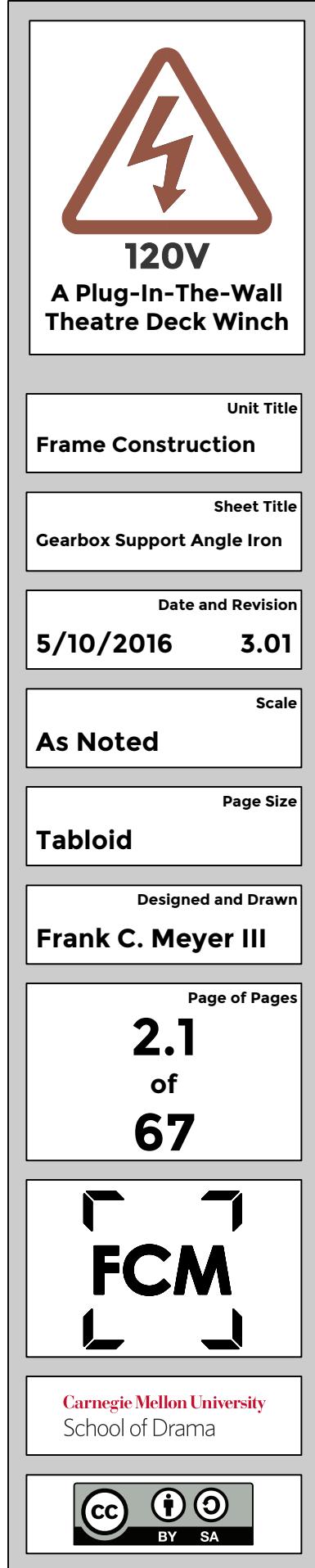
3 Section Detail  
2.10 Scale: Actual Size



4 Isometric Projection  
2.10 Not To Scale

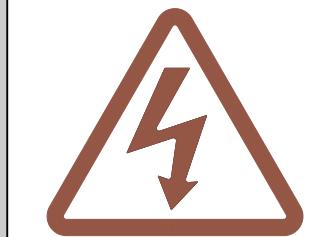


**Build 2 (Two) As Drawn**



General Notes

1. Material is 1/4" A36 Steel Plate

**120V****A Plug-In-The-Wall  
Theatre Deck Winch**

Unit Title

**Frame Construction**

Sheet Title

**Encoder Mounting Plate A**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

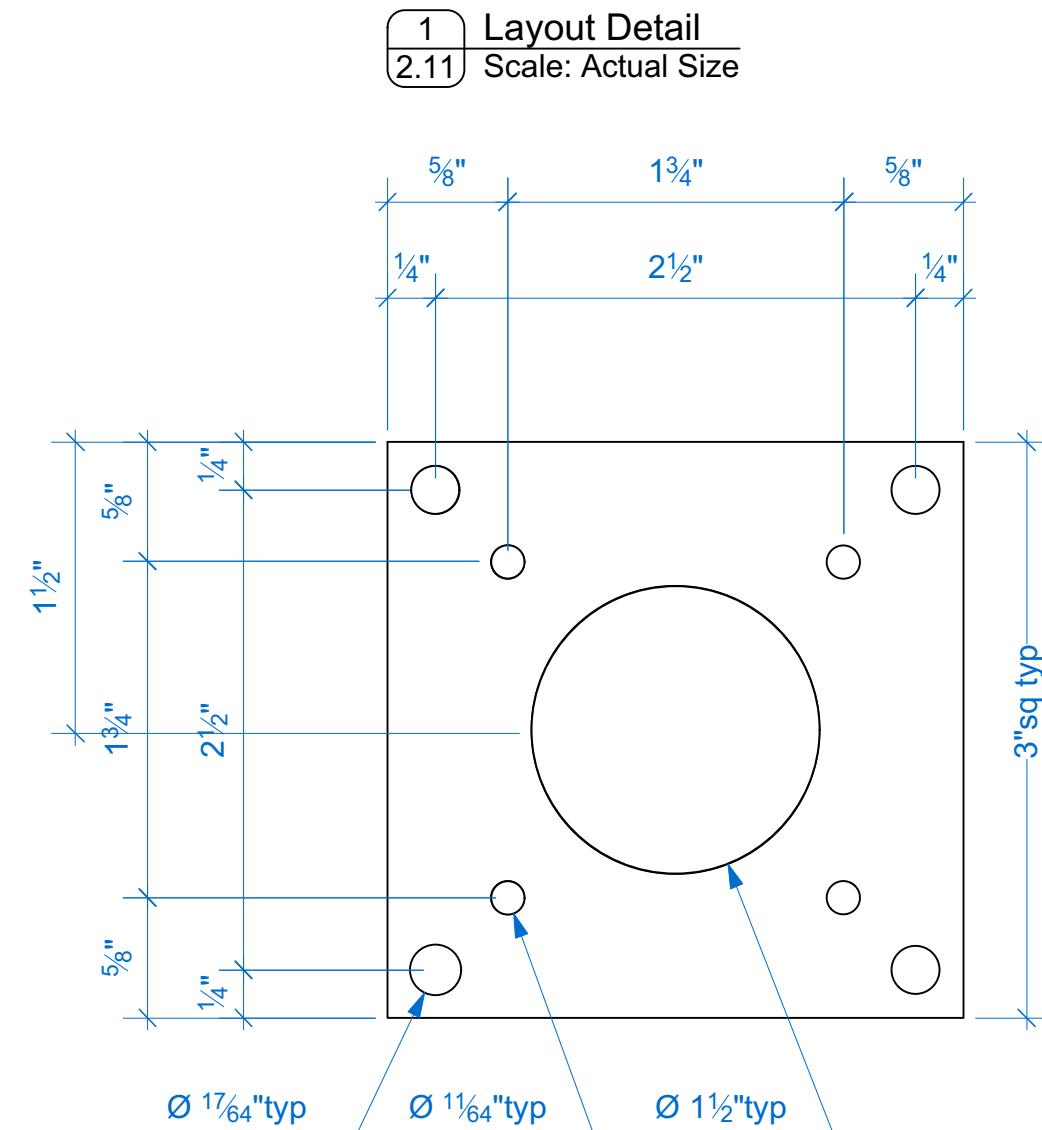
Designed and Drawn

**Frank C. Meyer III**

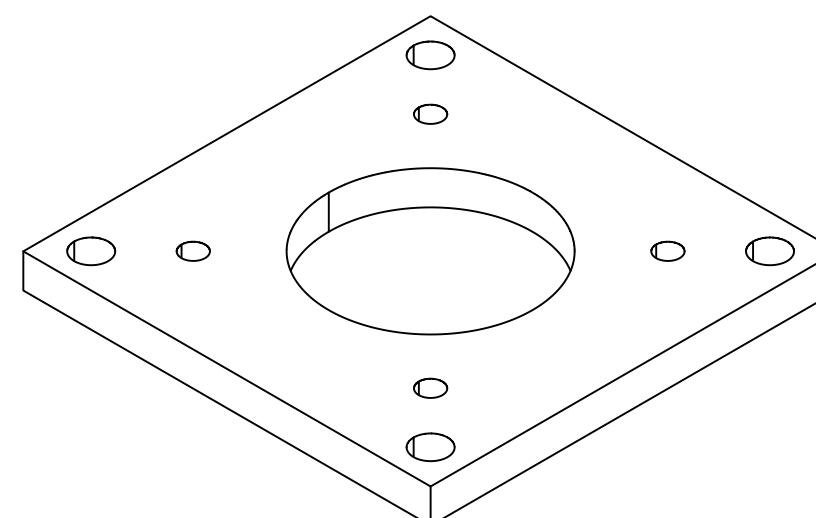
Page of Pages

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of  
67**

**FCM**

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**2 Isometric Projection**  
2.11 Not To Scale

**Build 1 (One) As Drawn**

**120V****A Plug-In-The-Wall  
Theatre Deck Winch**

Unit Title

**Frame Construction**

Sheet Title

**Encoder Mounting Plate B**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

Designed and Drawn

**Frank C. Meyer III**

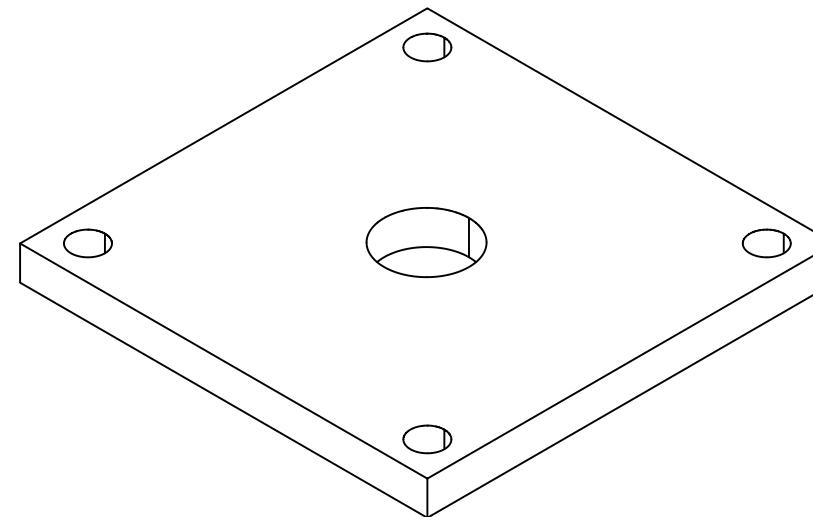
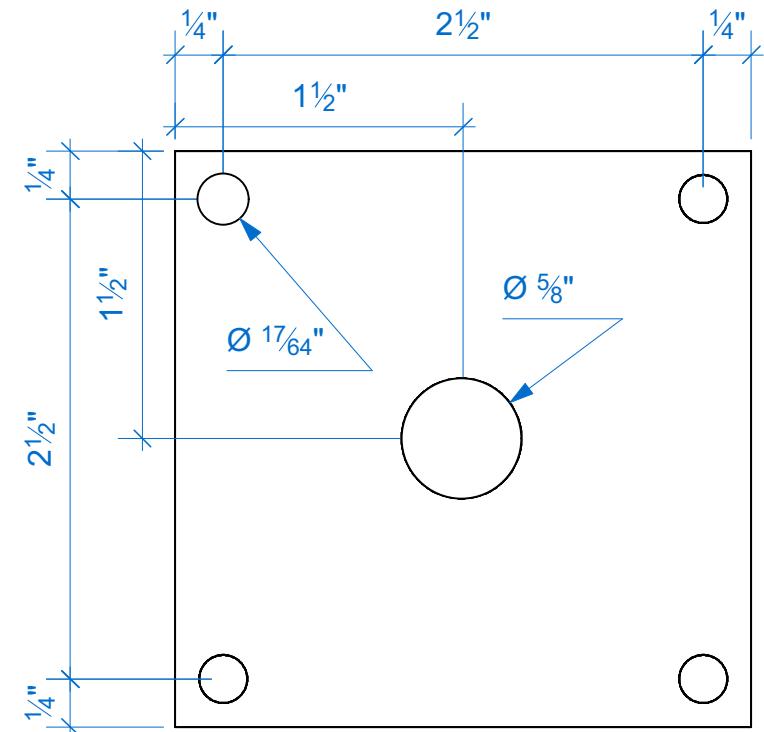
Page of Pages

**2.12  
of  
67**

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**3 Layout**  
2.12 Scale: Actual Size

**1 Isometric Projection**  
2.12 Not To Scale

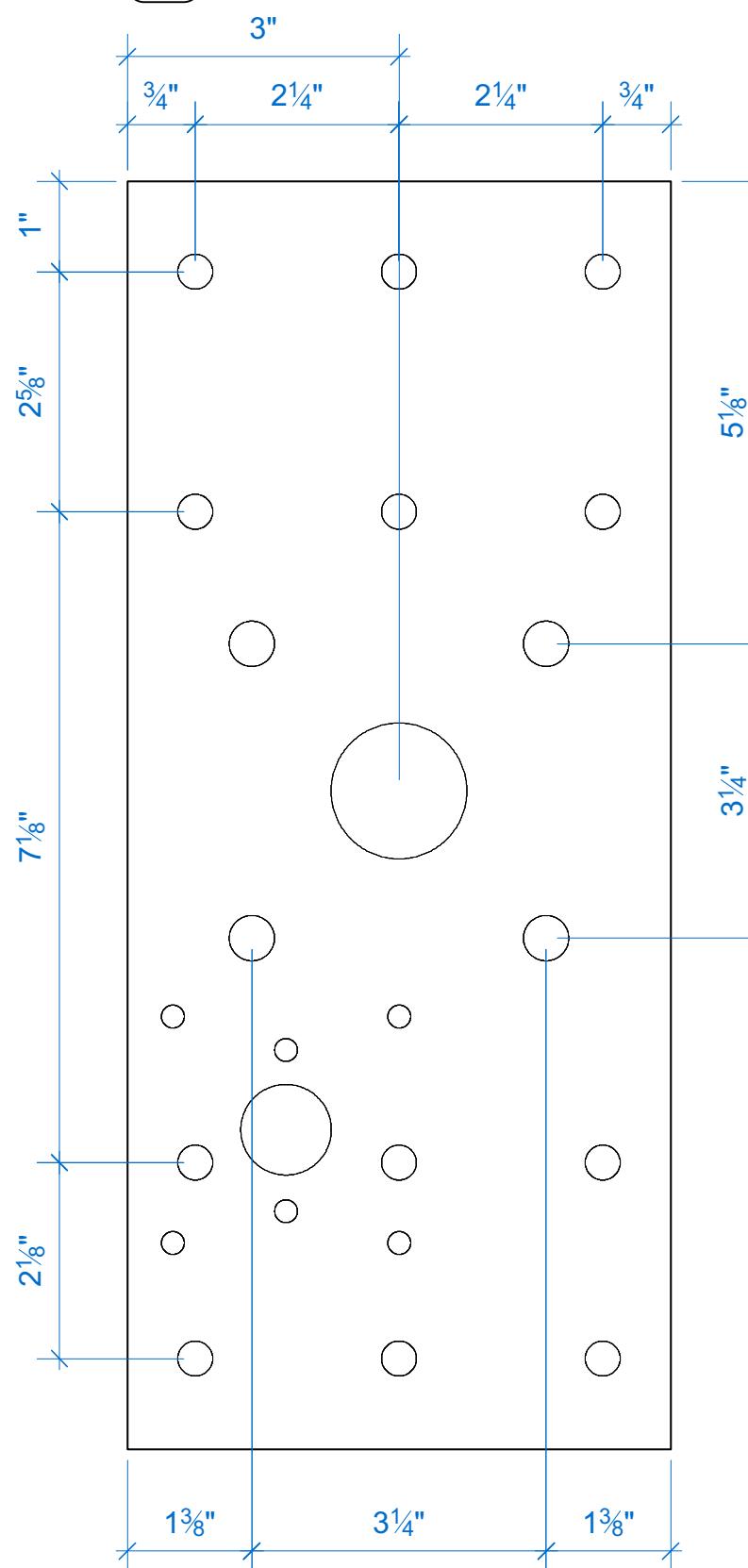
**Build 1 (One) As Drawn**

# VECTORWORKS EDUCATIONAL VERSION

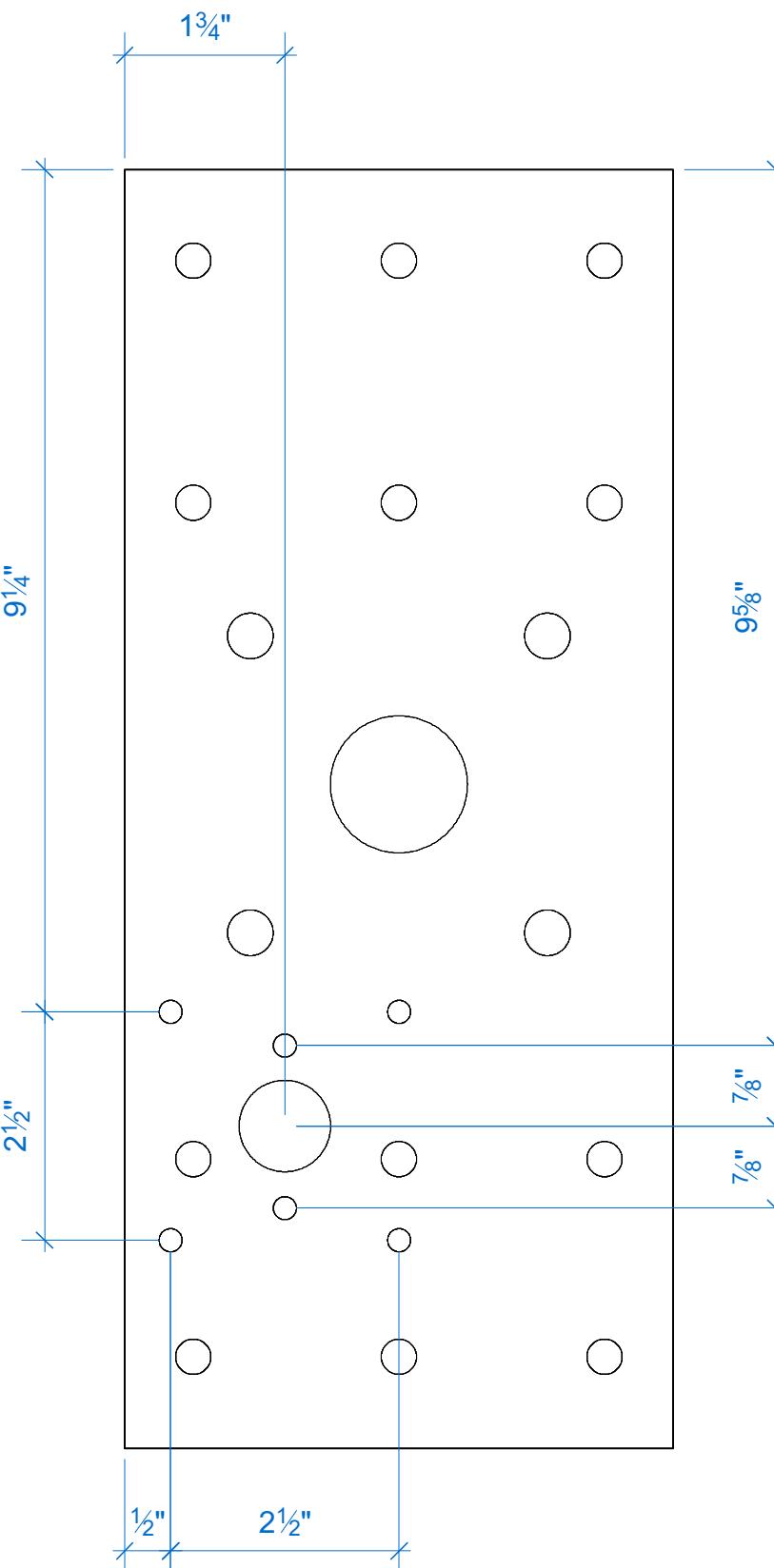
## General Notes

1. Material is 1/4" A36 Steel Plate

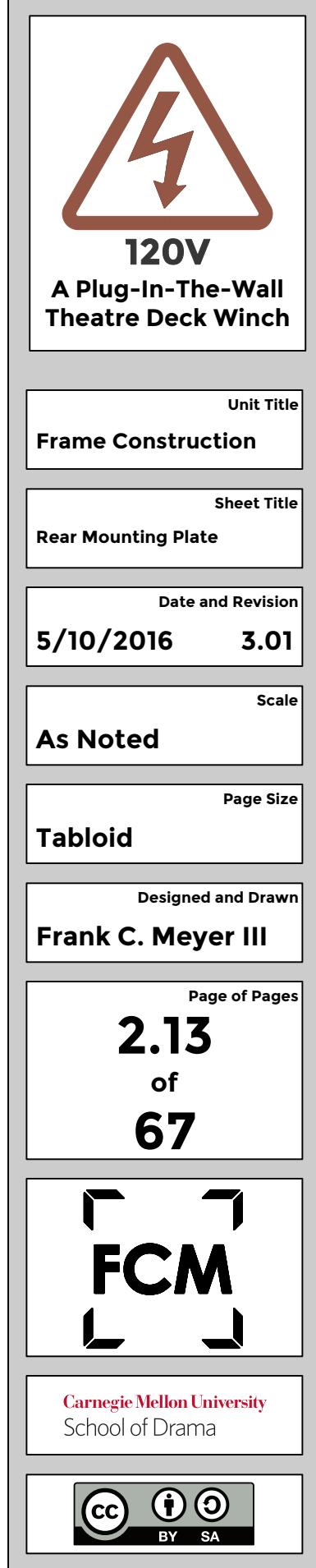
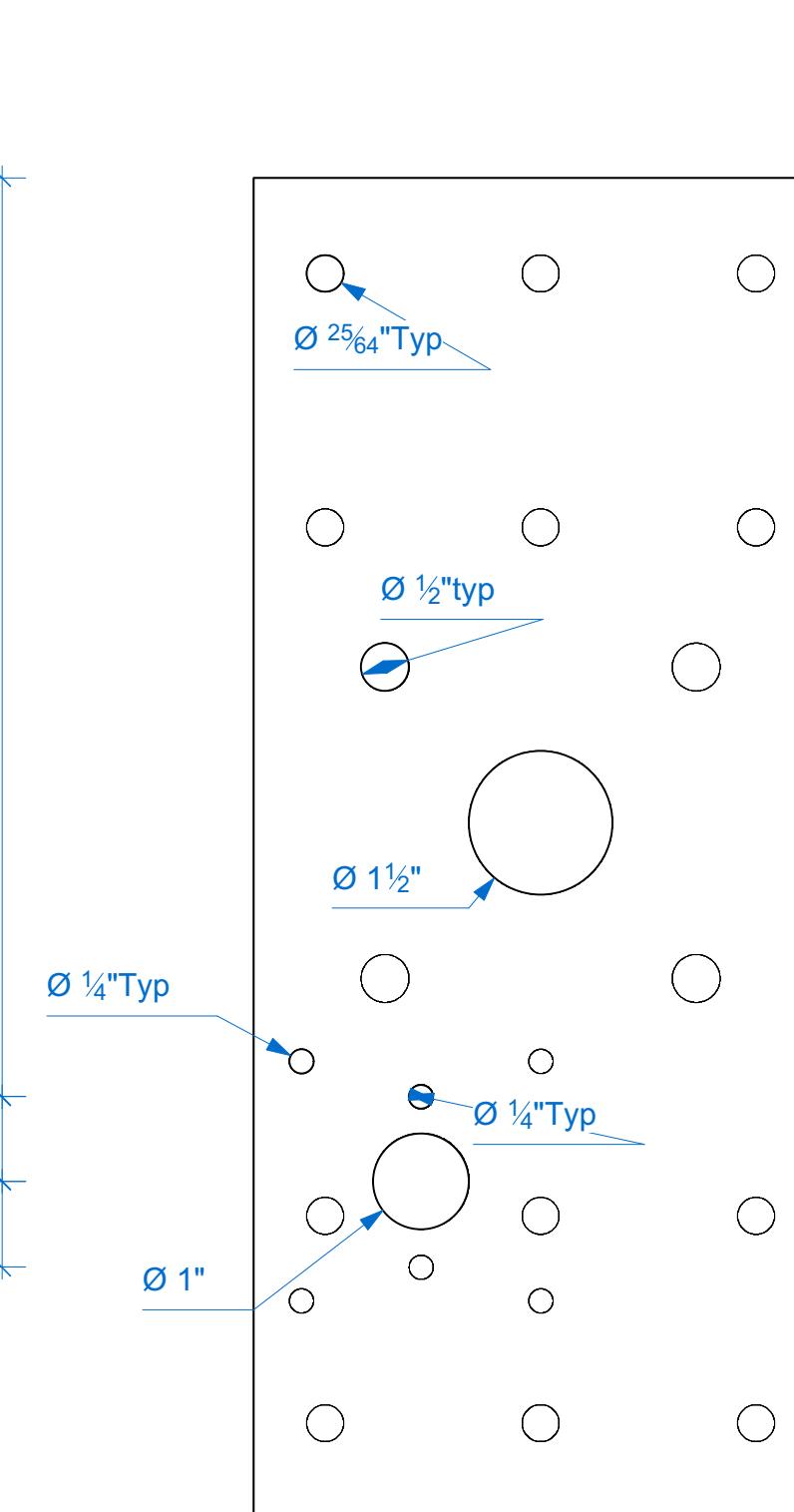
**1 Mechanical Mounting Holes**  
2.13 Scale: Half Actual Size



**2 Encoder Mounting Holes**  
2.13 Scale: Half Actual Size



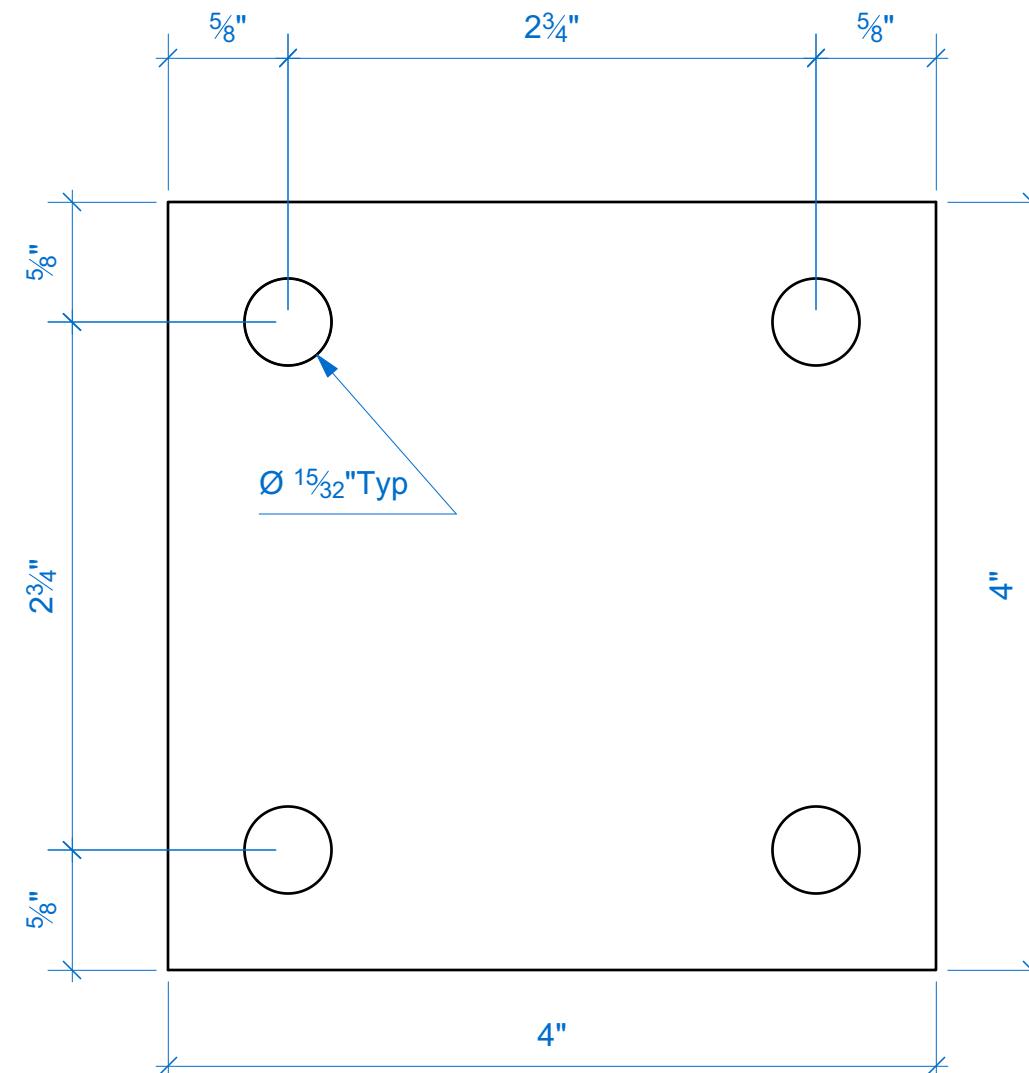
**3 Diameters**  
2.13 Scale: Half Actual Size



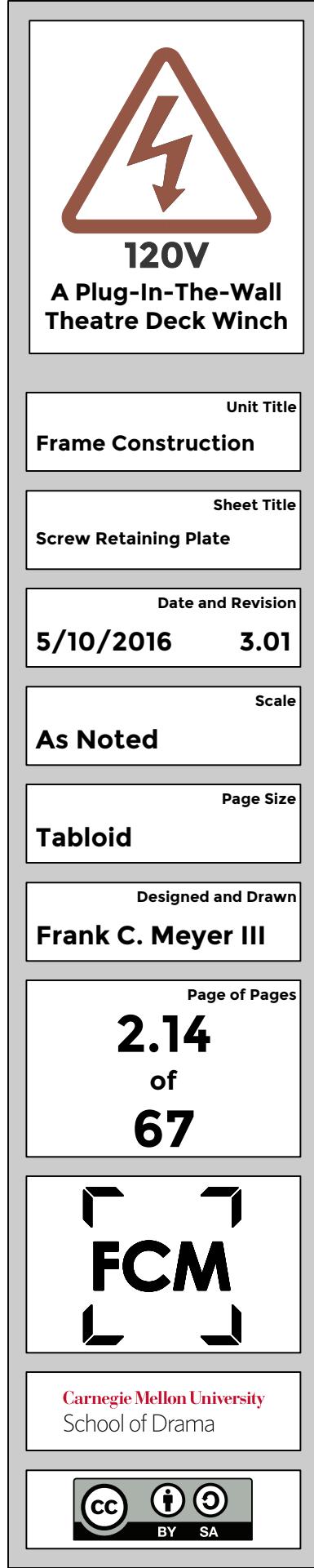
**Build 2 (Two) As Drawn**

# VECTORWORKS EDUCATIONAL VERSION

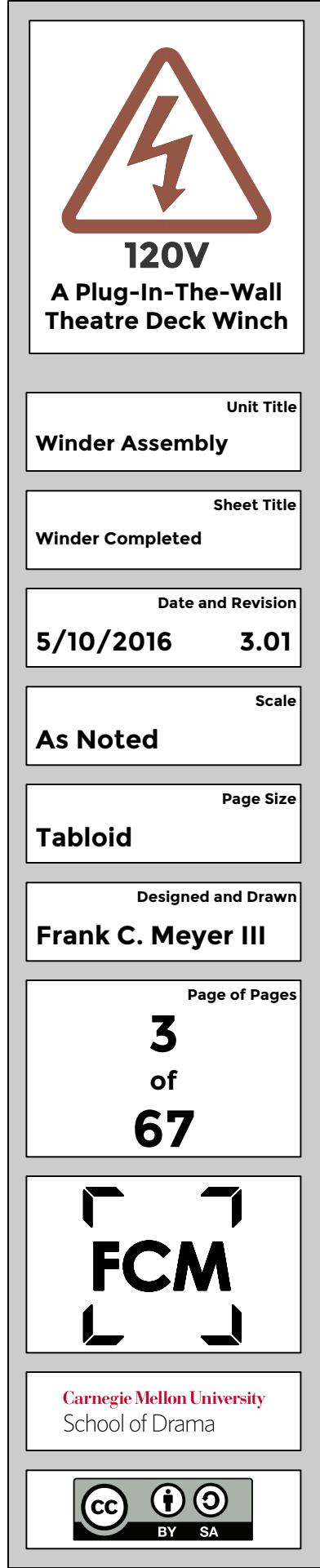
2 Layout Detail  
2.14 Scale: Actual Size

General Notes

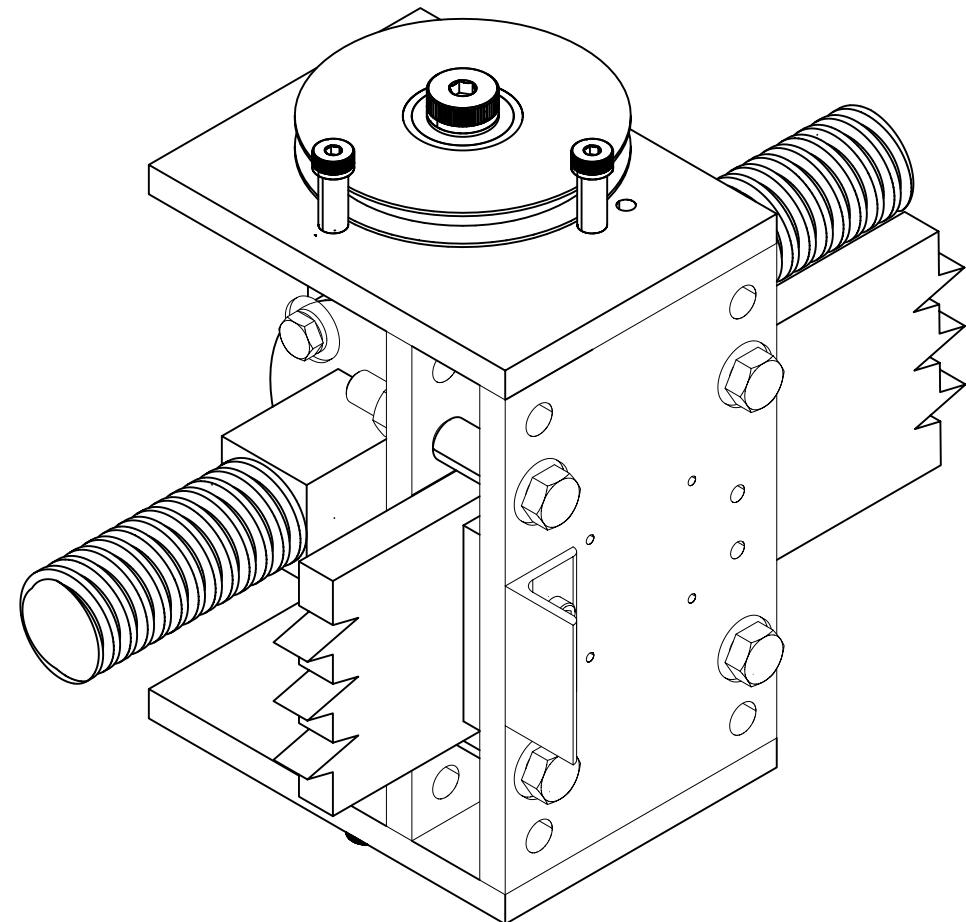
1. Material is 1/4" UHMW Plastic



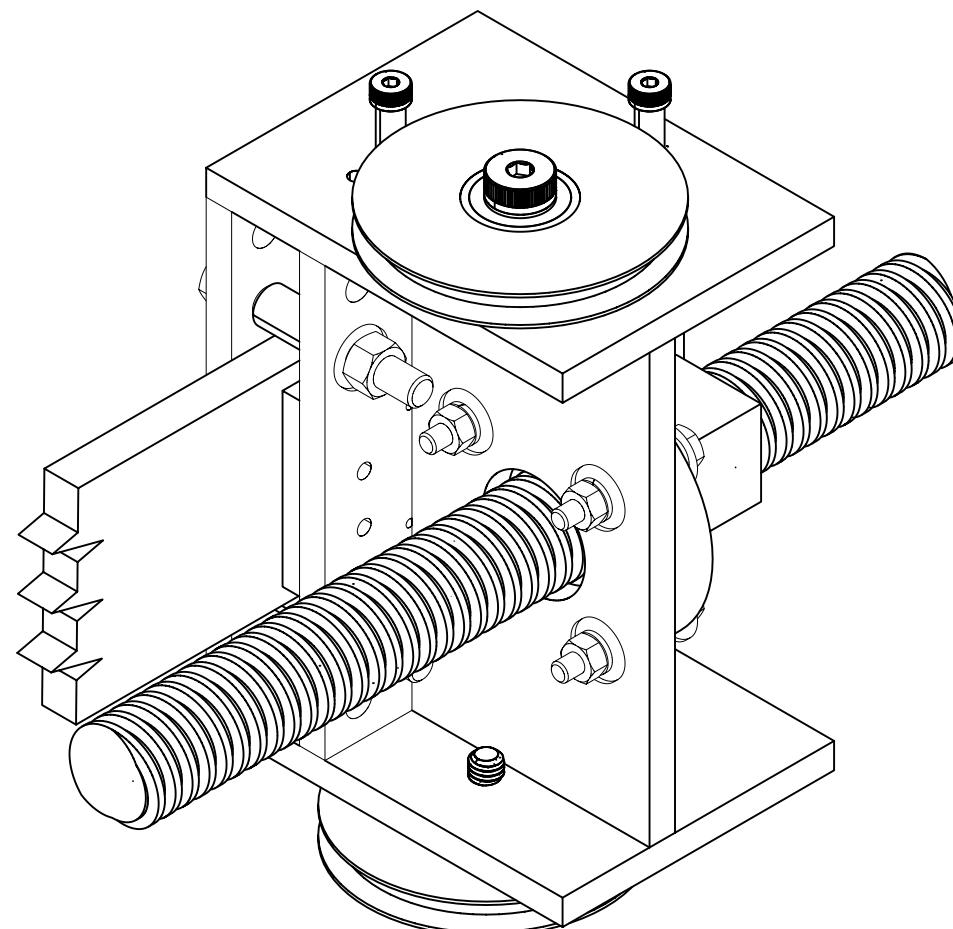
**Build 2 (Two) As Drawn**



2 Right Isometric Projection  
3.0 Not To Scale



1 Rear Left Isometric Projection  
3.0 Not To Scale

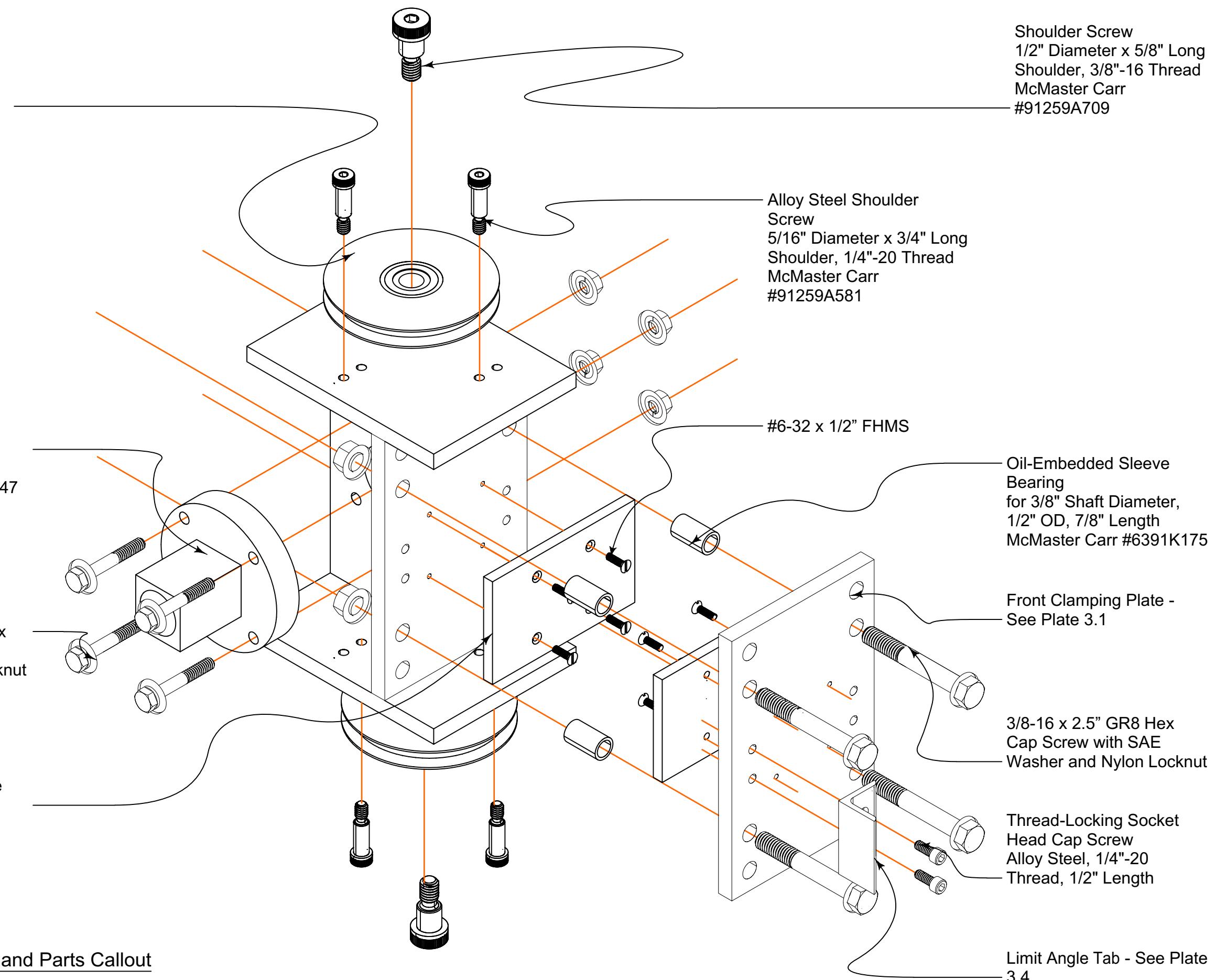


#### General Notes

1. Shown with Segment of Rider Bar and Ball Screw - See Plate 3.10 & 3.12 for additional details on those components.

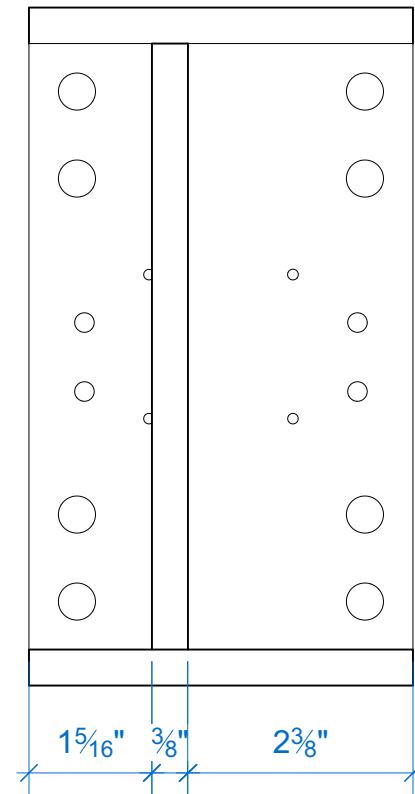
# VECTORWORKS EDUCATIONAL VERSION

Heavy Duty Nylon Pulley  
for Wire Rope  
with Easy-Turn Bearings,  
for 3/16" Rope Diameter,  
3-1/2" OD  
McMaster Carr #9466T84

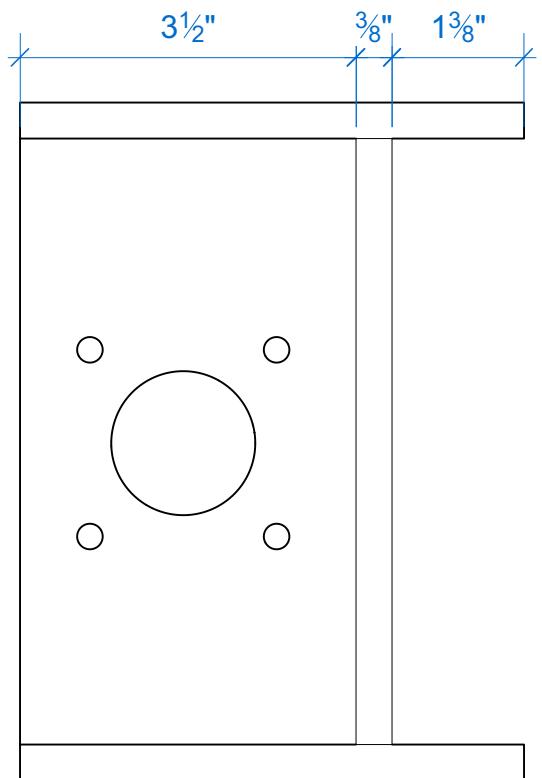


# VECTORWORKS EDUCATIONAL VERSION

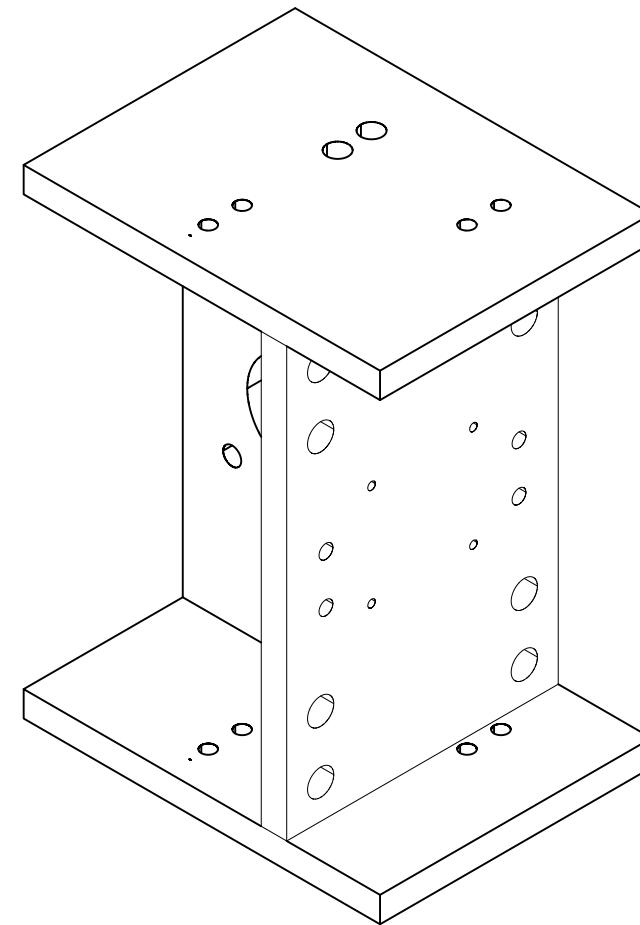
**1** Rear Elevation  
3.2 Scale: Half Actual Size



**2** Right Elevation  
3.2 Scale: Half Actual Size



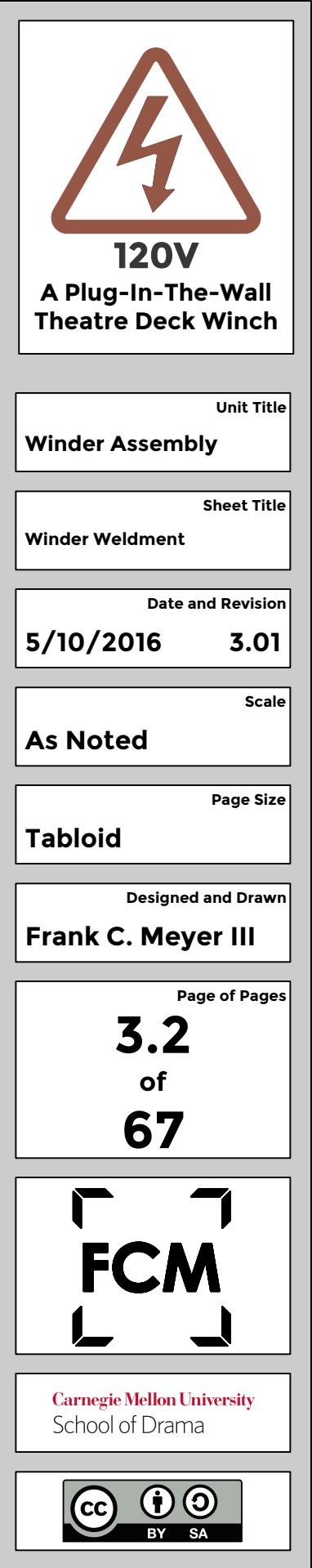
**3** Isometric Projection  
3.2 Not To Scale



#### General Notes

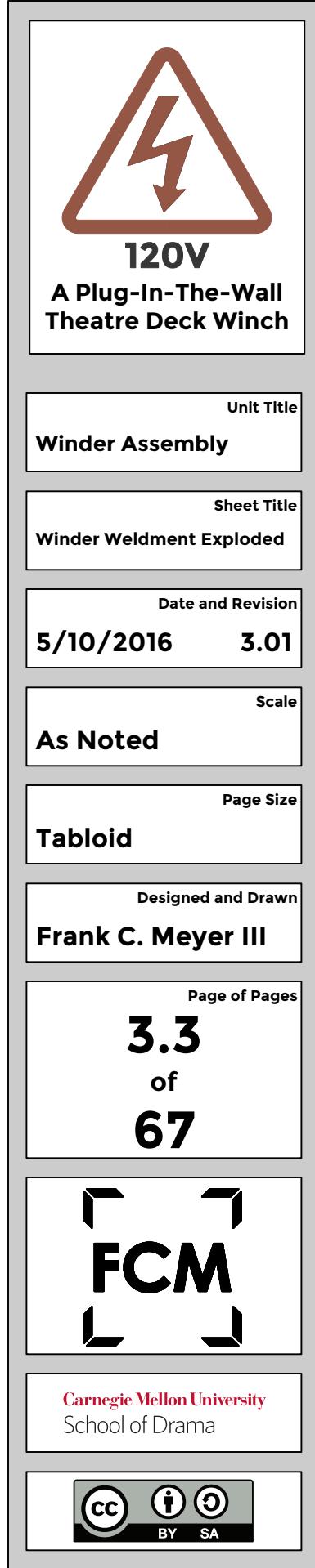
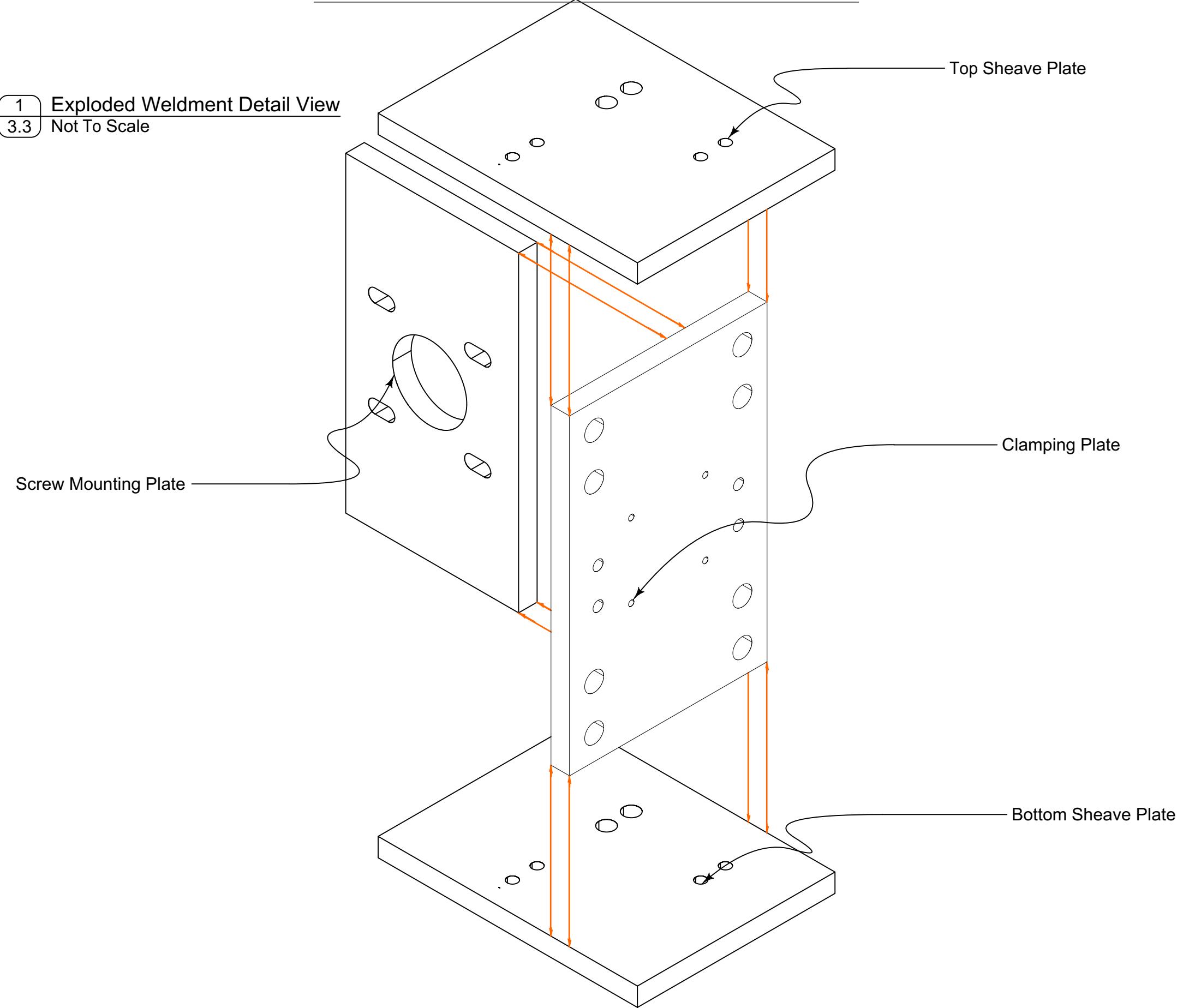
1. Prepare Metals as Appropriate for Welding Process.
2. Fixture, Tack, and Weld all Edges as practical.
3. Avoid welding areas near threaded and drilled holes. Place temporary fasteners in holes to protect threads as needed.
4. Ensure Weld Beads Do Not Obstruct Fastener Clearance Holes.

**Weld 1 Assbly. As Drawn**

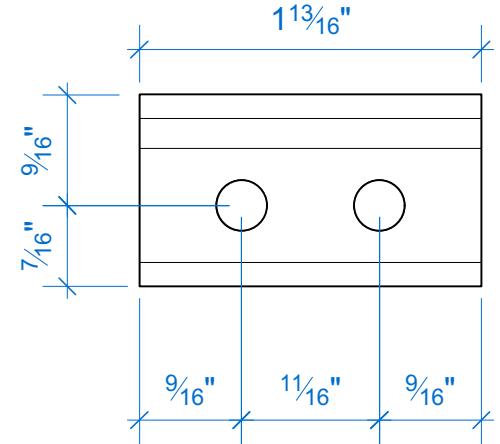


# VECTORWORKS EDUCATIONAL VERSION

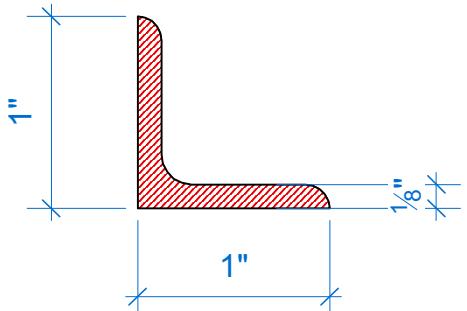
1 Exploded Weldment Detail View  
3.3 Not To Scale



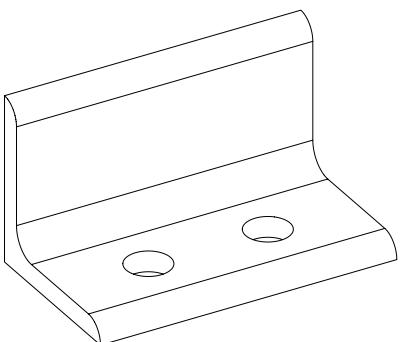
**1** Top View  
3.4 Scale: Actual Size



**2** Section Detail  
3.4 Scale: Actual Size



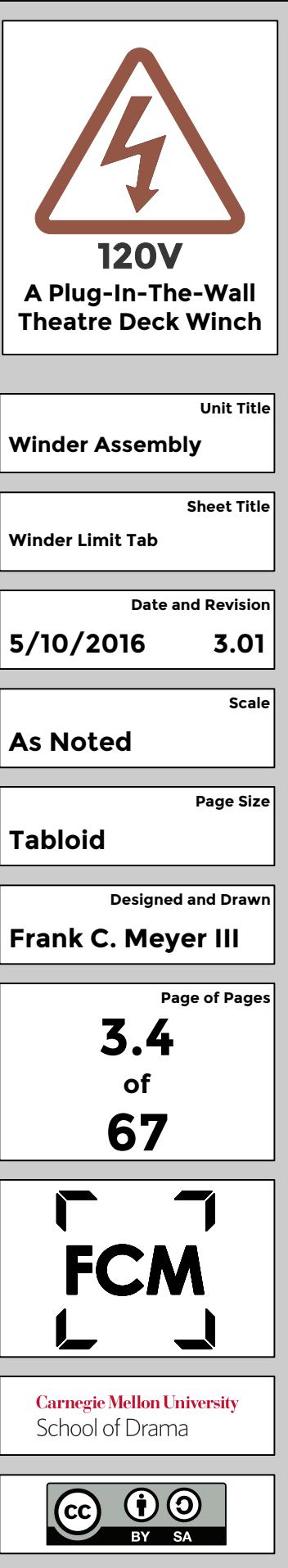
**3** Isometric Projection  
3.4 Not To Scale



## General Notes

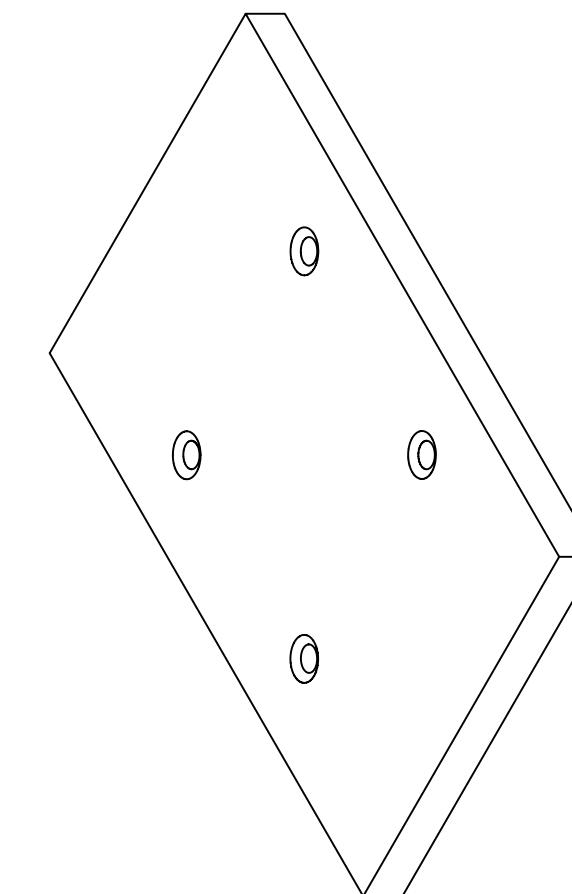
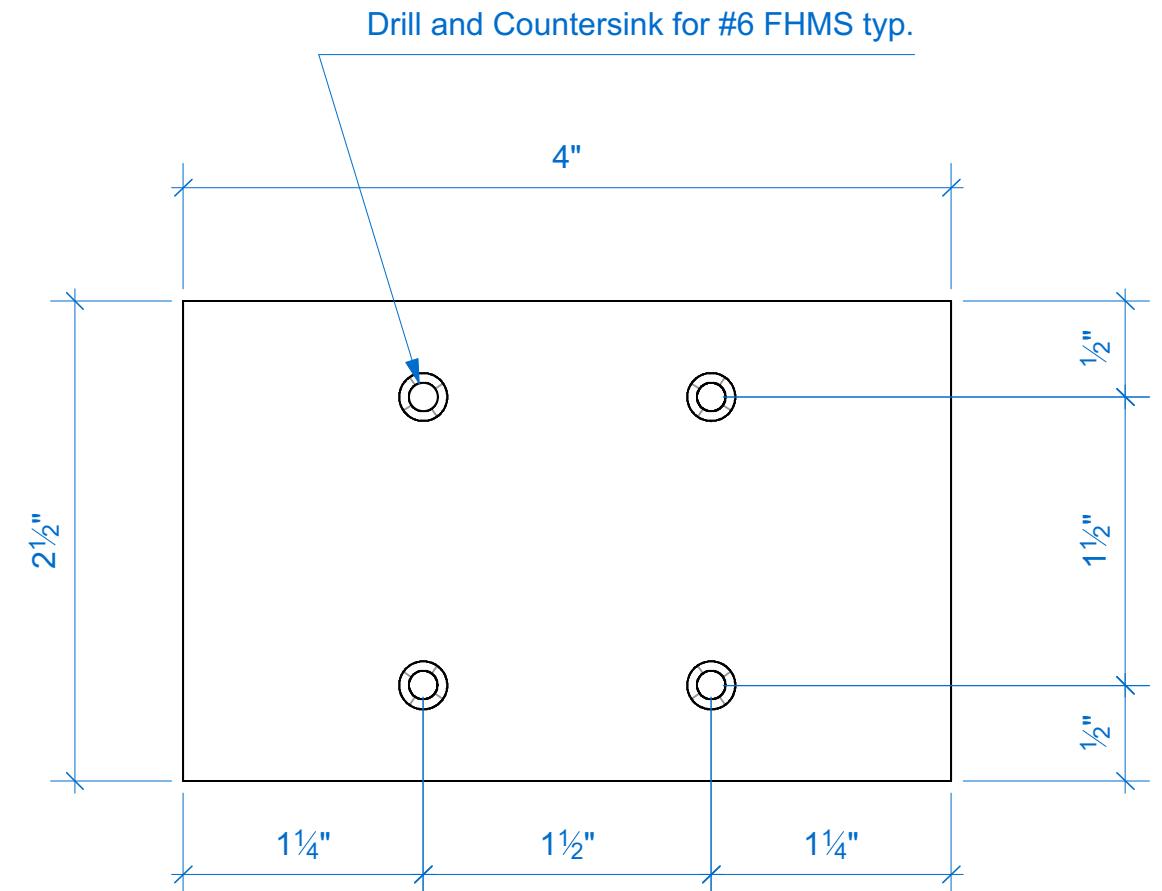
1. Material is 1x1x1/8" Angle Iron

**Build 1 (One) As Drawn**



**1** Layout Details  
3.5 Scale: Actual Size

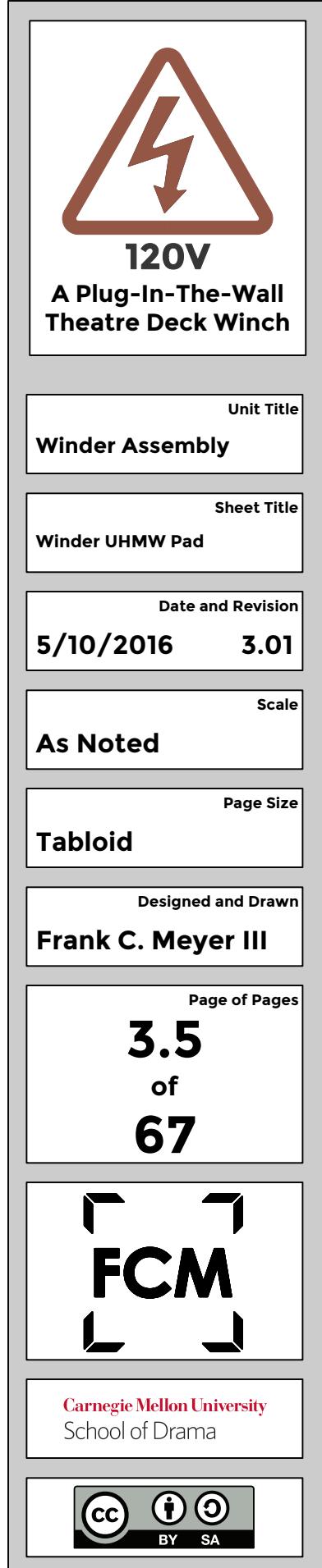
**2** Isometric Projection  
3.5 Not To Scale



#### General Notes

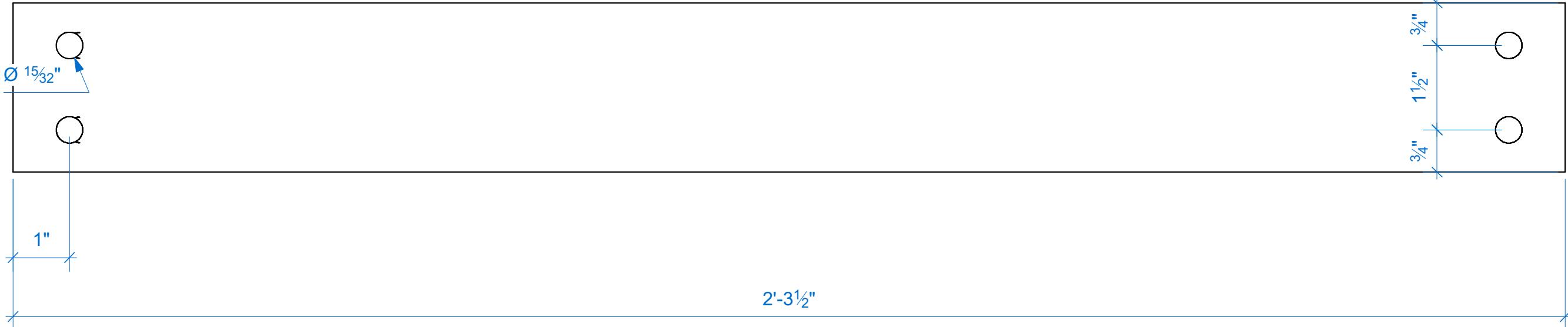
1. Material is 1/4" UHMW Plastic

**Build 2 (Two) As Drawn**



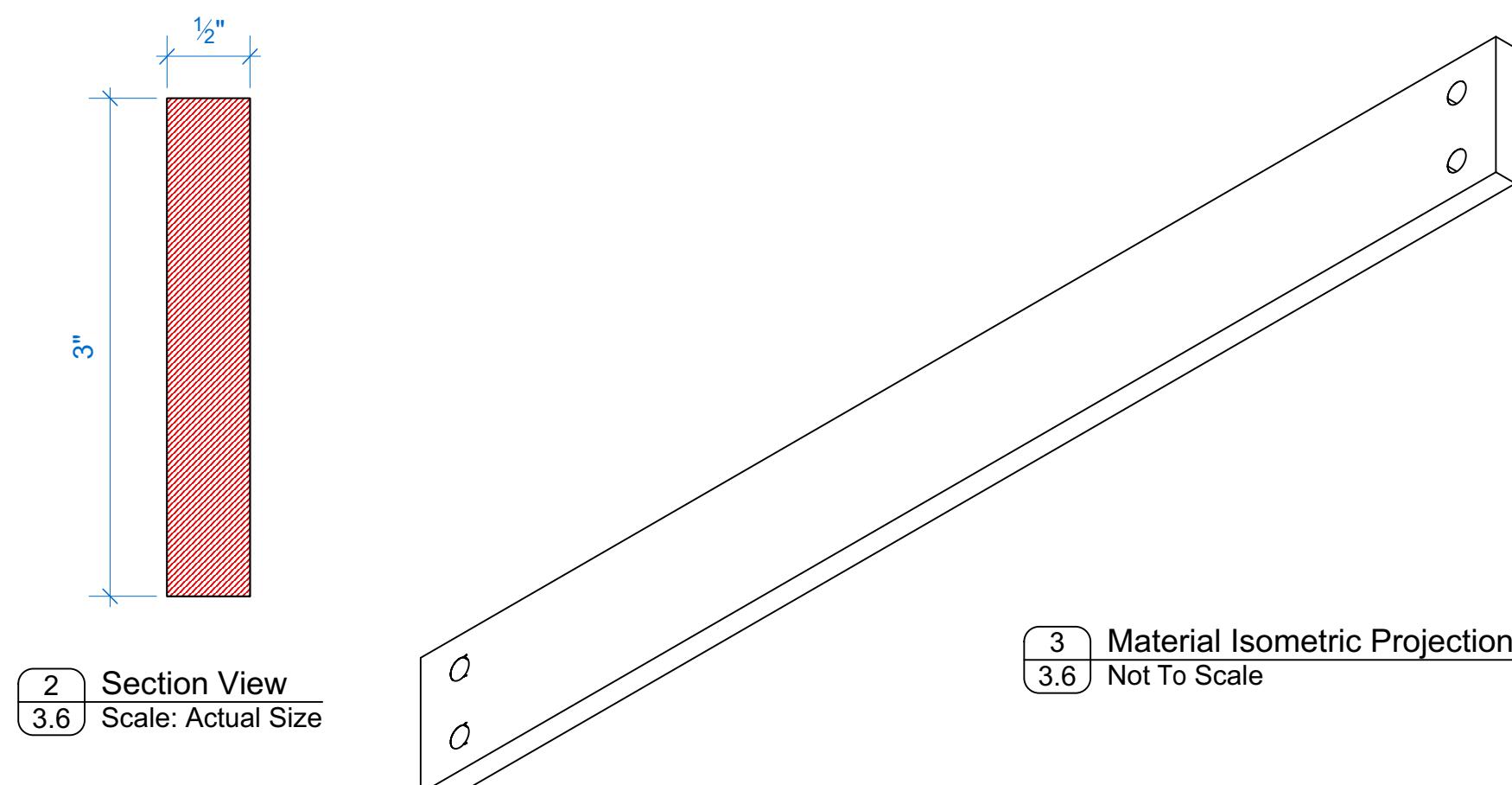
# VECTORWORKS EDUCATIONAL VERSION

1 Layout Detail  
3.6 Scale: Half Actual Size



## General Notes

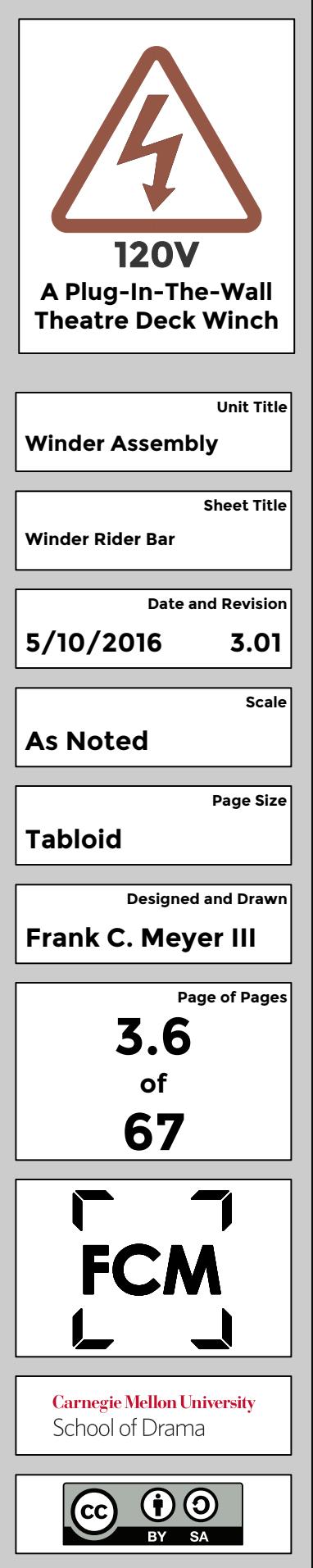
1. Material is Multipurpose 4140/4142 Alloy Steel Rectangular Bar Hardened Tight-Tolerance, 1/2" Thick, 3" Wide
2. We purchased this material from McMaster-Carr. Part Number 8892K67.
3. We cut this material with an angle grinder and cutoff wheel, as the material was too hard for our cold cutting saw. This material could also be cut with an abrasive cutting chop saw. Be careful not to impart too much heat to the material, as this will affect the material properties.
4. We drilled these holes with a carbide coated drill bit. We started small and worked up 3-4 sizes to get to final hole diameter.
5. It is important to use a tight tolerance bar stock for this. Hot Rolled A36 Steel is not manufactured to tolerances acceptable for this application.



2 Section View  
3.6 Scale: Actual Size

3 Material Isometric Projection  
3.6 Not To Scale

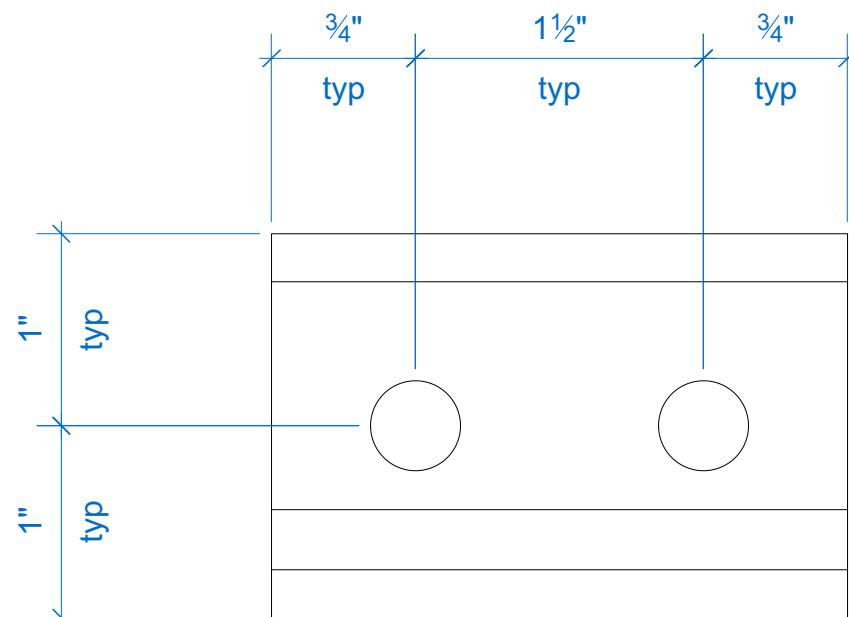
**Build 1 (One) As Drawn**



# VECTORWORKS EDUCATIONAL VERSION

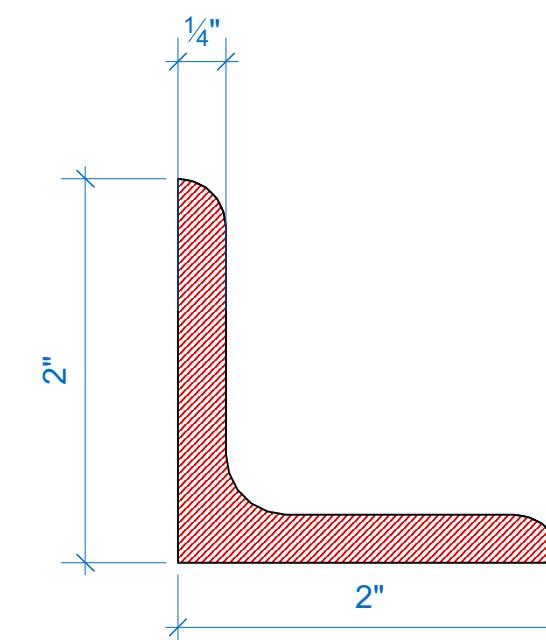
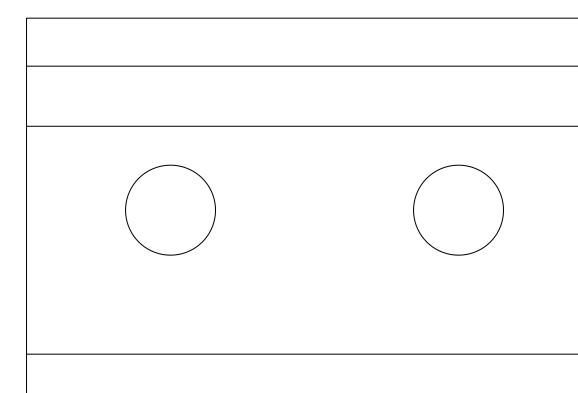
## General Notes

1. Material is 2x2x1/4 A36 Angle Iron

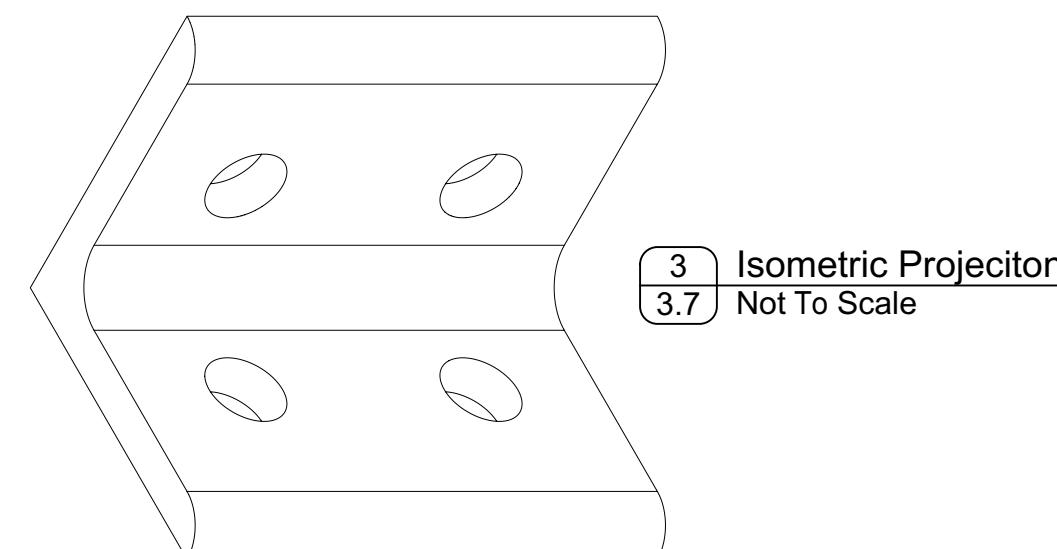


**1** Front View  
3.7 Scale: Actual Size

**2** Right View  
3.7 Scale: Actual Size



**4** Section Detail  
3.7 Scale: Actual Size



**Build 4 (Four) As Drawn**



Unit Title  
**Winder Assembly**

Sheet Title  
**Winder Angle Tab**

Date and Revision  
**5/10/2016 3.01**

Scale  
**As Noted**

Page Size  
**Tabloid**

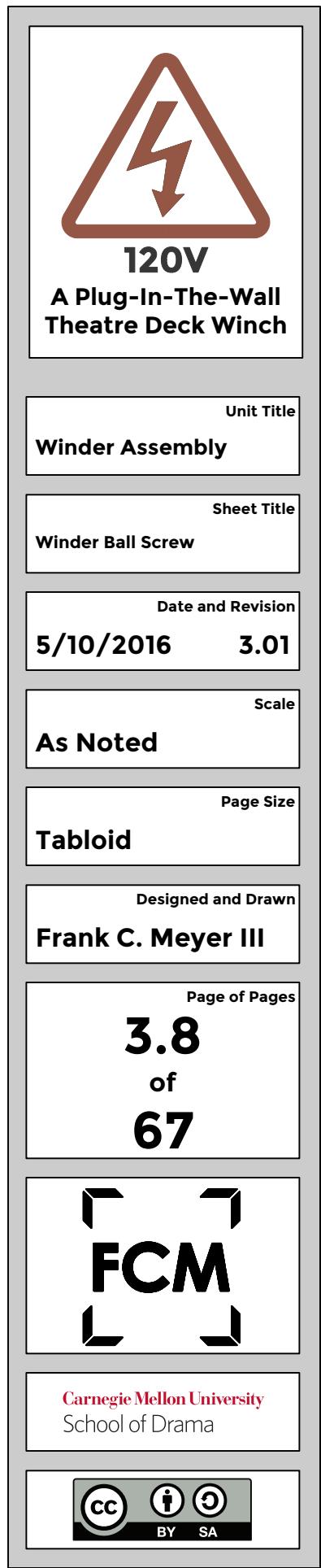
Designed and Drawn  
**Frank C. Meyer III**

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**1** Cut Detail  
**3.8** Scale: 3" = 1'-0"



#### General Notes

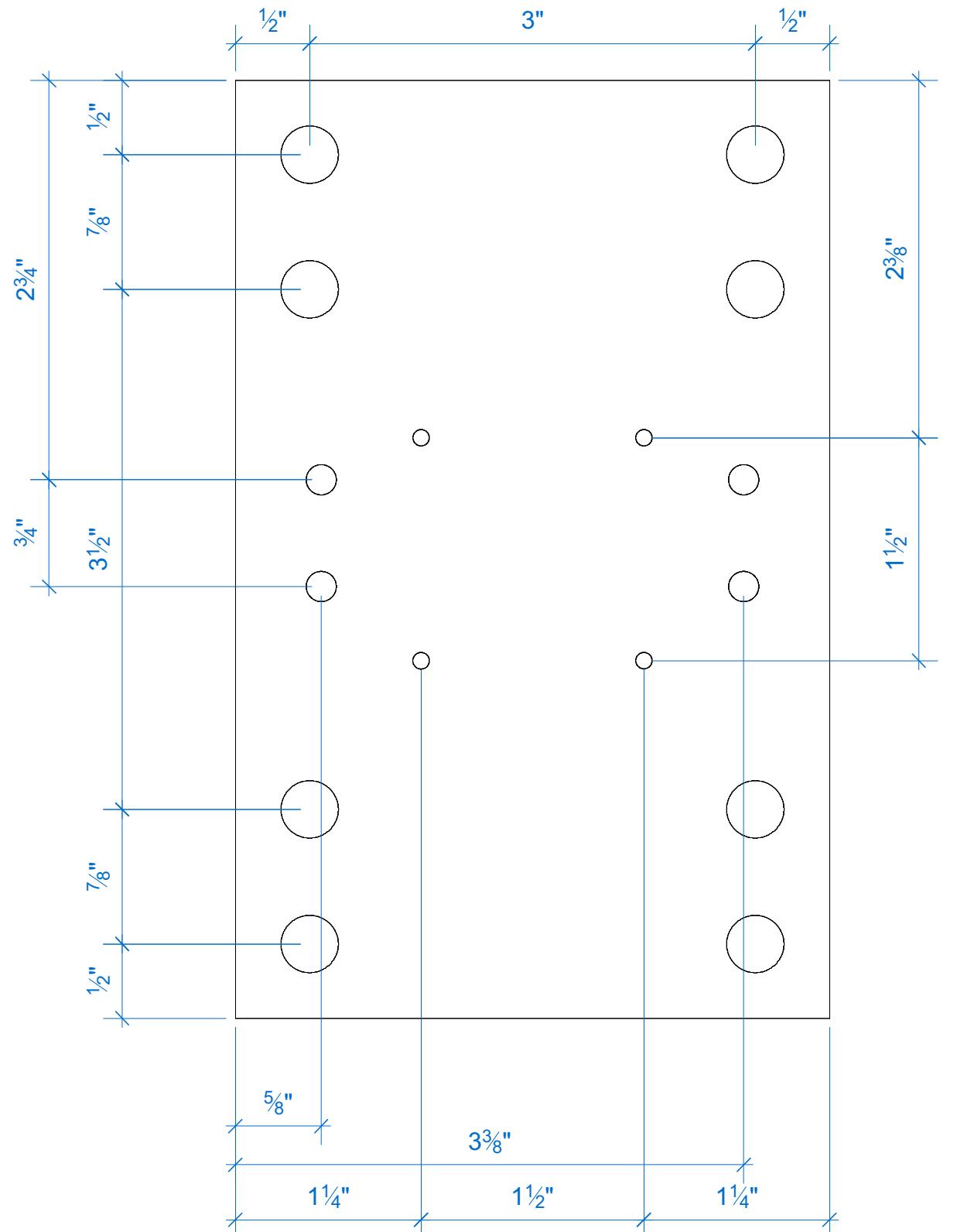
1. Threaded Indicated in Drawing Are NOT Accurate.
2. Cut To Length from 1" Diameter 1/4" Lead Ball Screw Stock.
3. We purchased this stock from McMaster-Carr. Part Number 5966K27.
4. We cut this material with a cutoff wheel on an angle grinder. There are other ways. Be sure that cut is as square to stock as possible.

# VECTORWORKS EDUCATIONAL VERSION

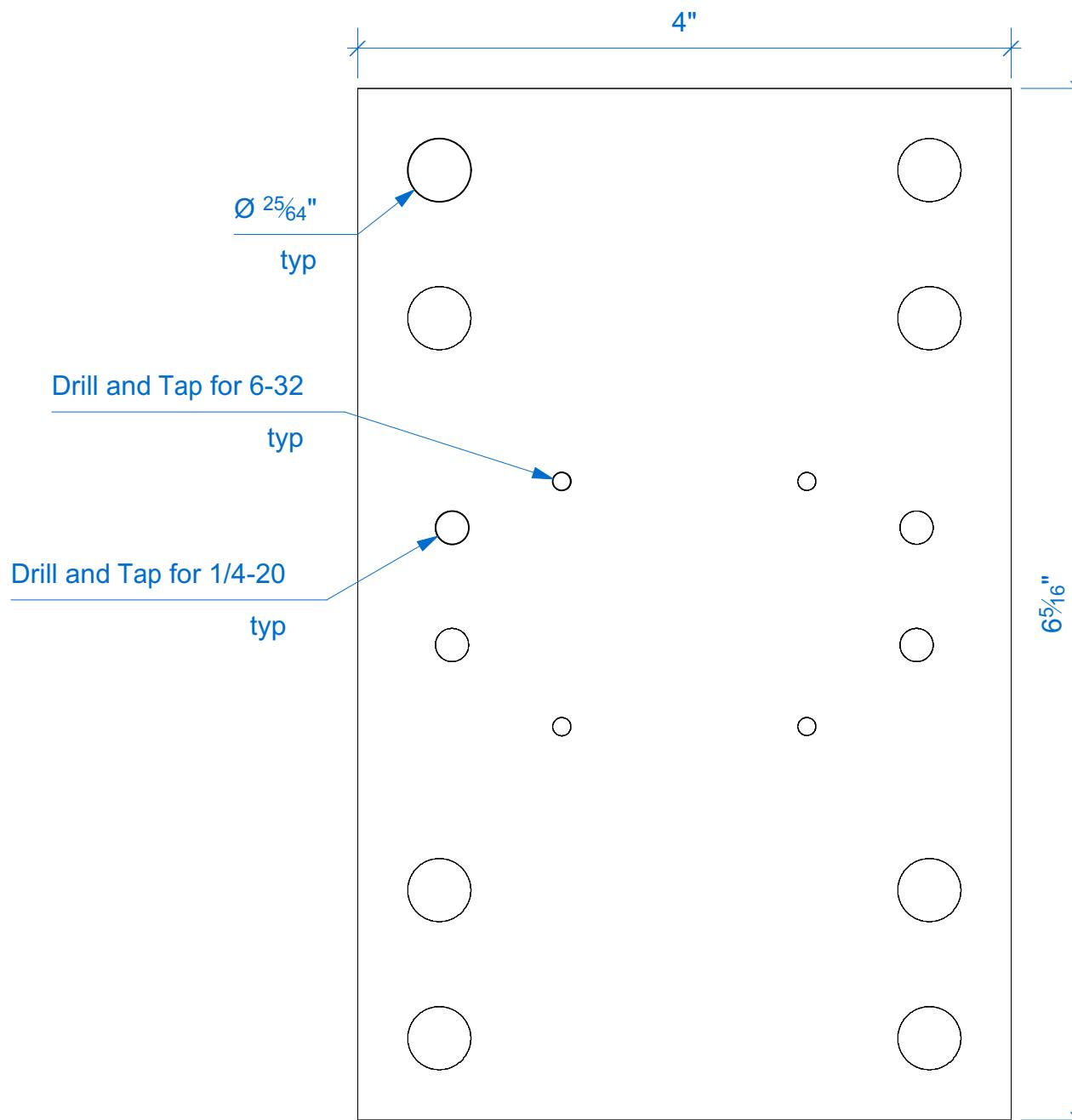
## General Notes

1. Material is 3/8" A36 Steel Plate

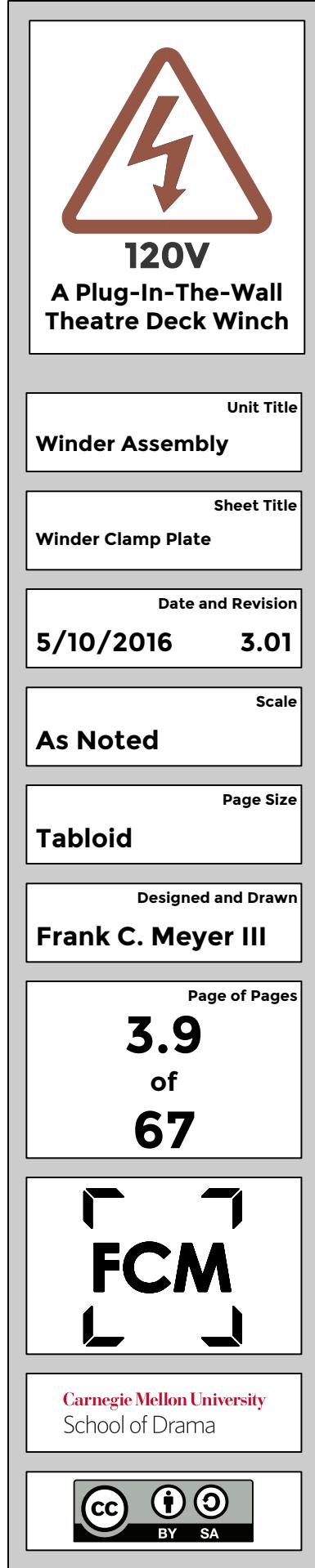
**1** Layout Detail  
3.9 Scale: Actual Size



**2** Diameter Detail  
3.9 Scale: Actual Size



**Build 2 (Two) As Drawn**

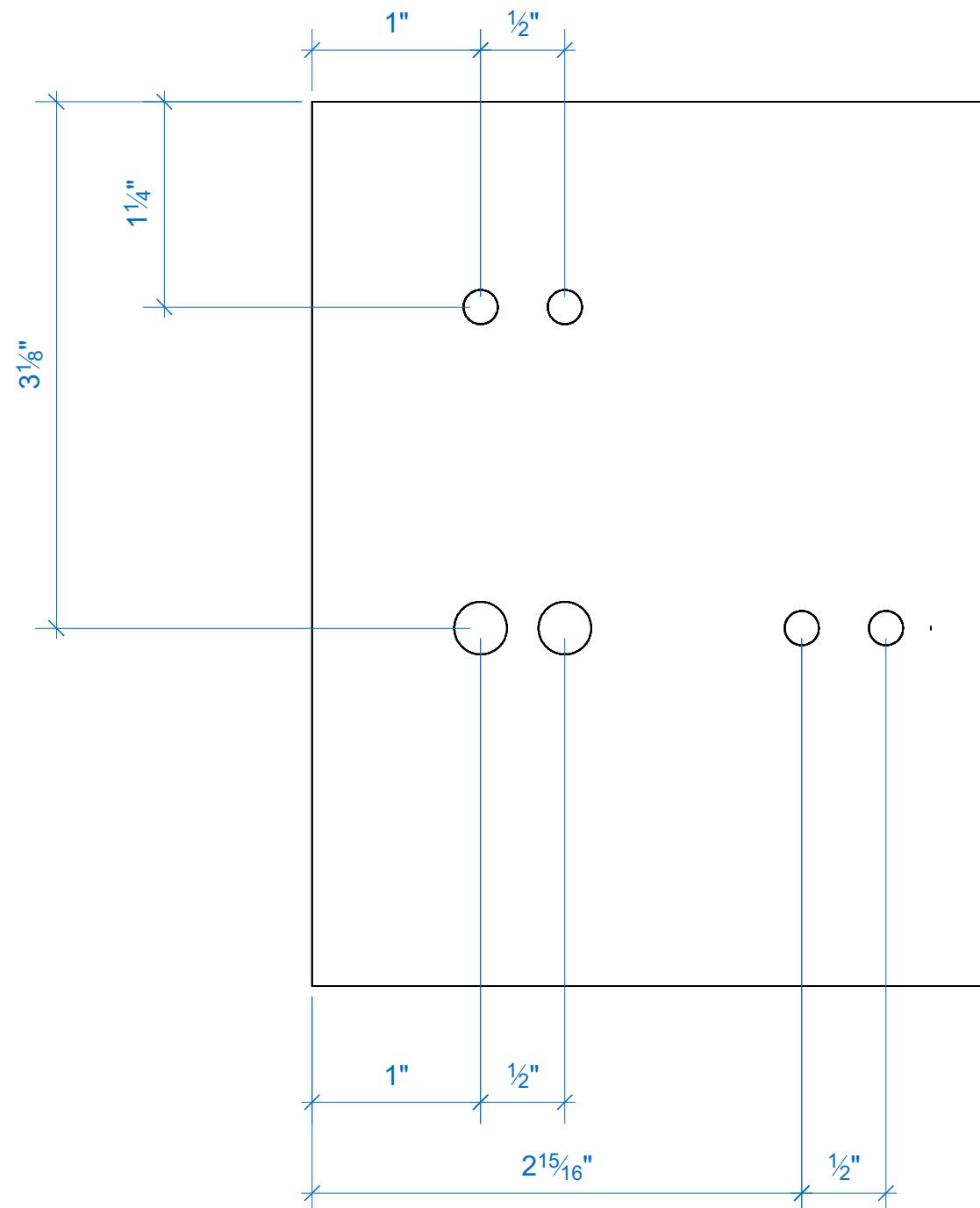


# VECTORWORKS EDUCATIONAL VERSION

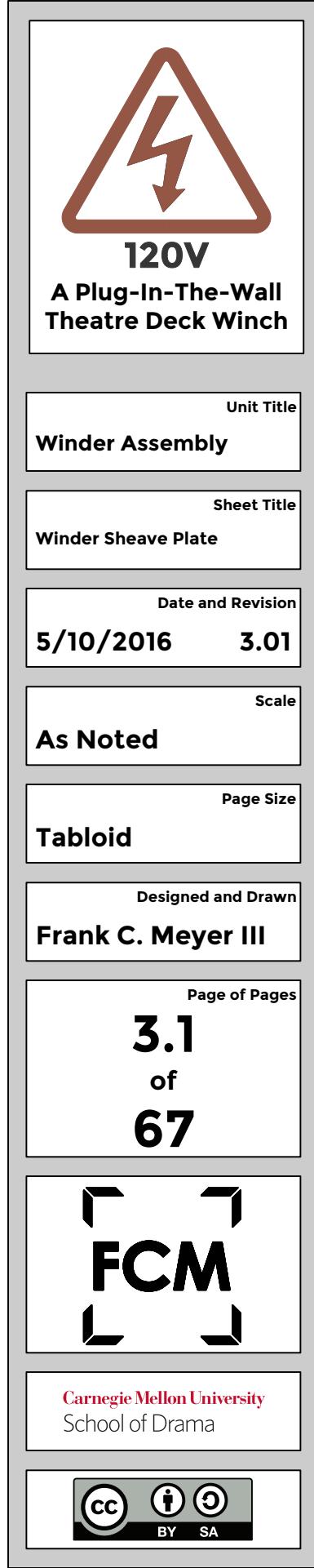
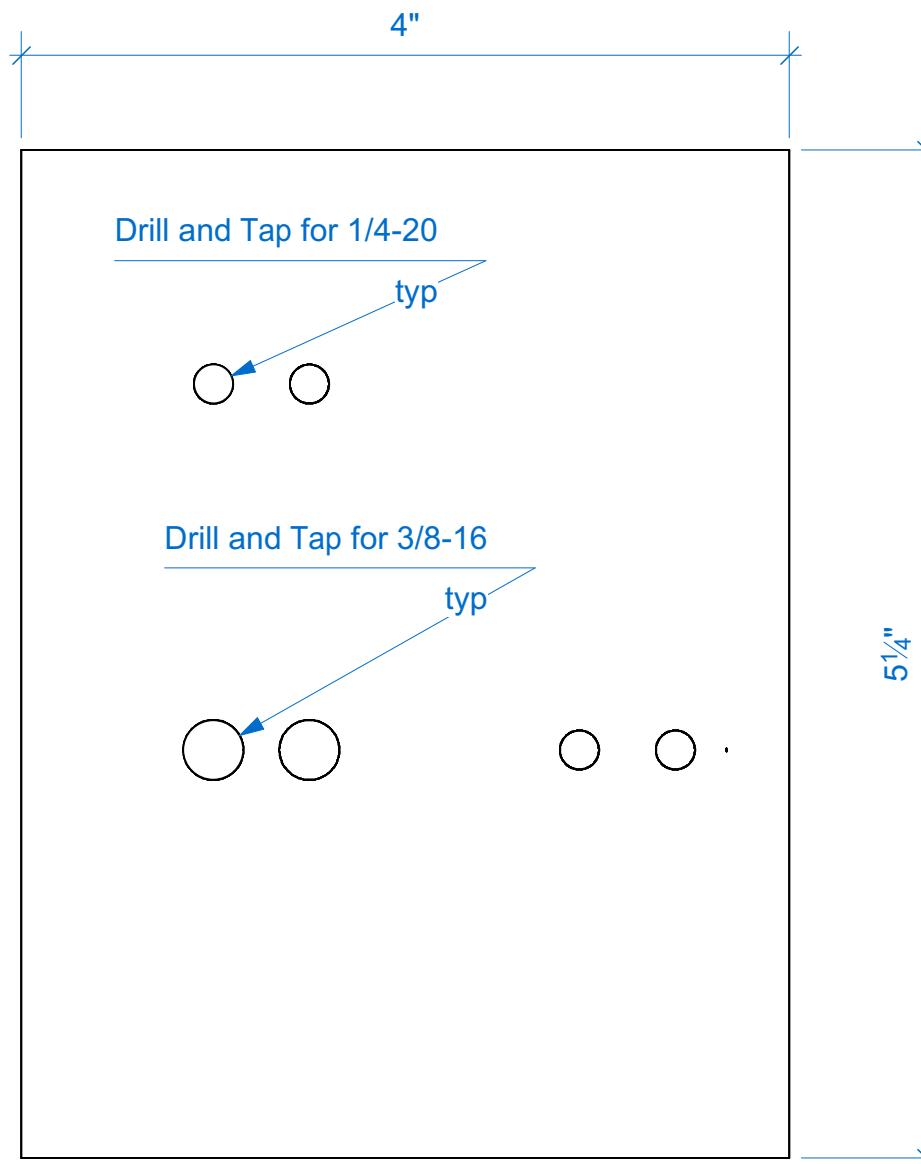
## General Notes

1. Material is 3/8" A36 Steel Plate

### 1 Layout Details 3.10 Scale: Actual Size

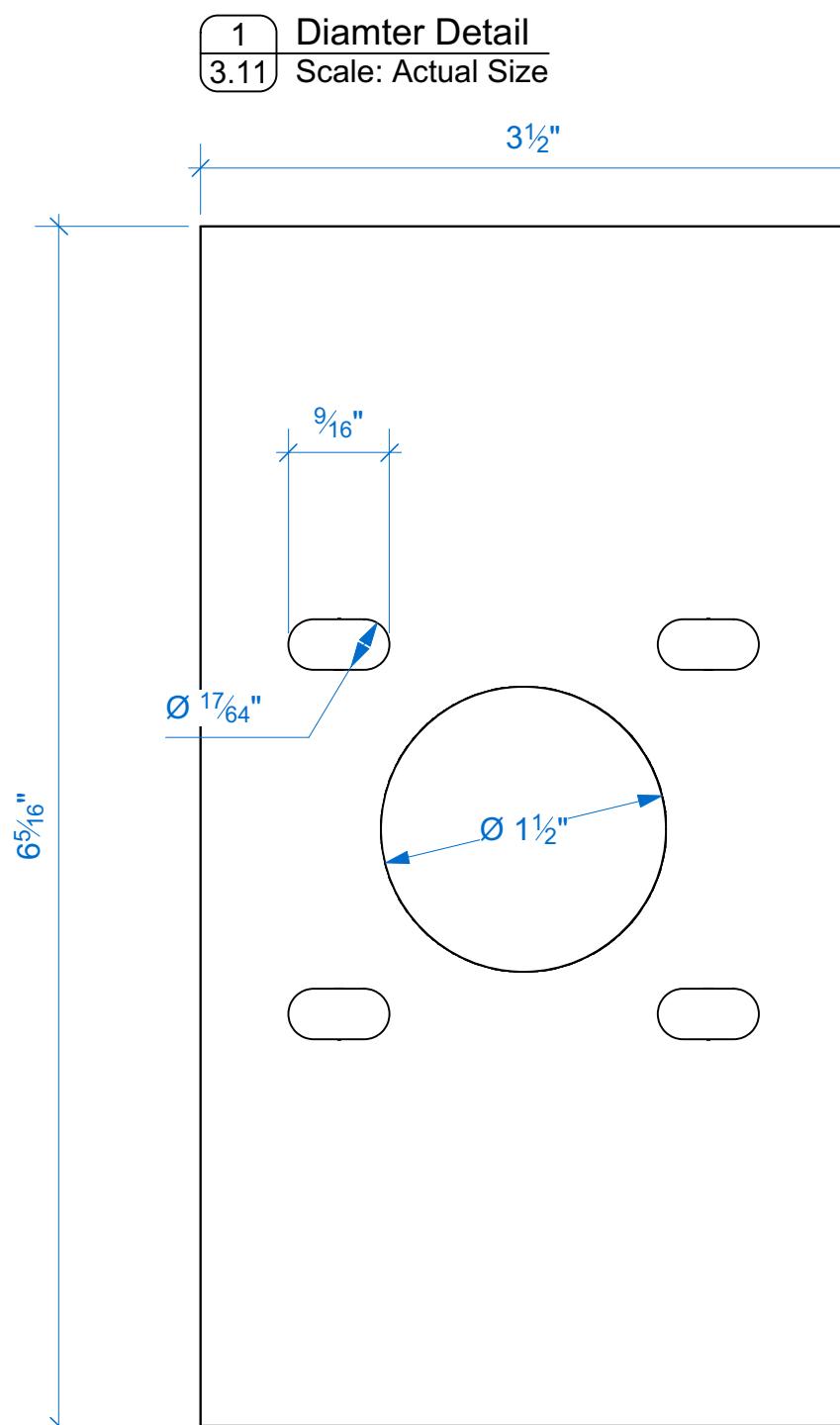
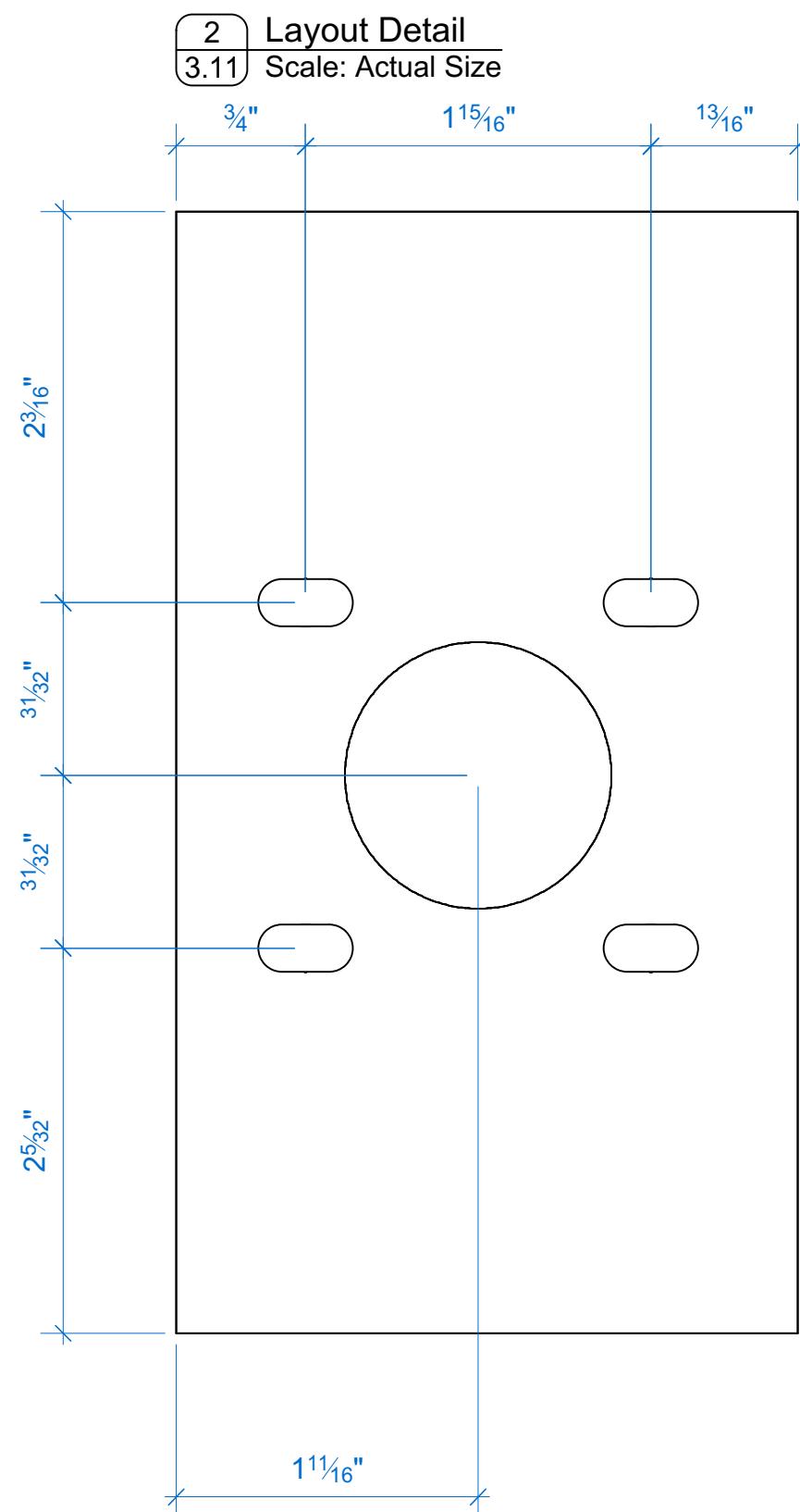


### 2 Diameter Details 3.10 Scale: Actual Size

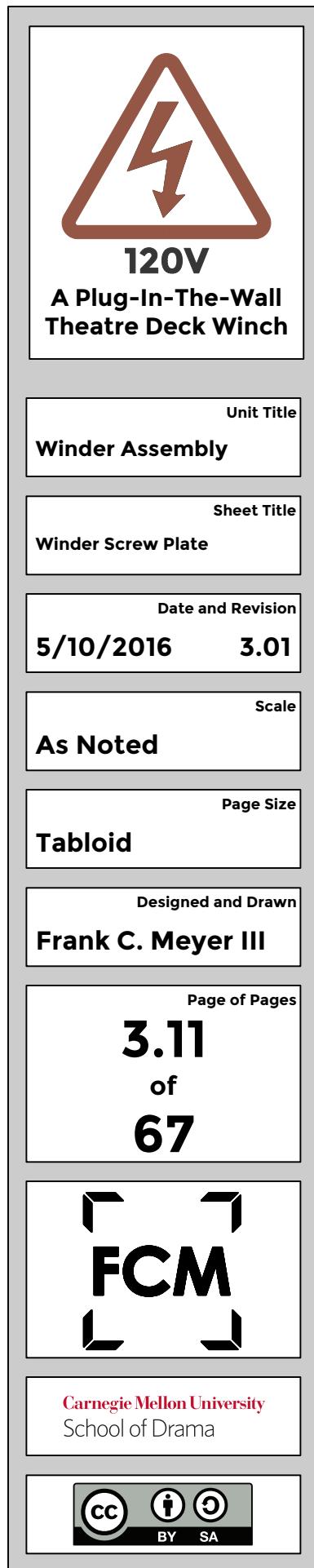


**Build 2 (Two) As Drawn**

VECTORWORKS EDUCATIONAL VERSION

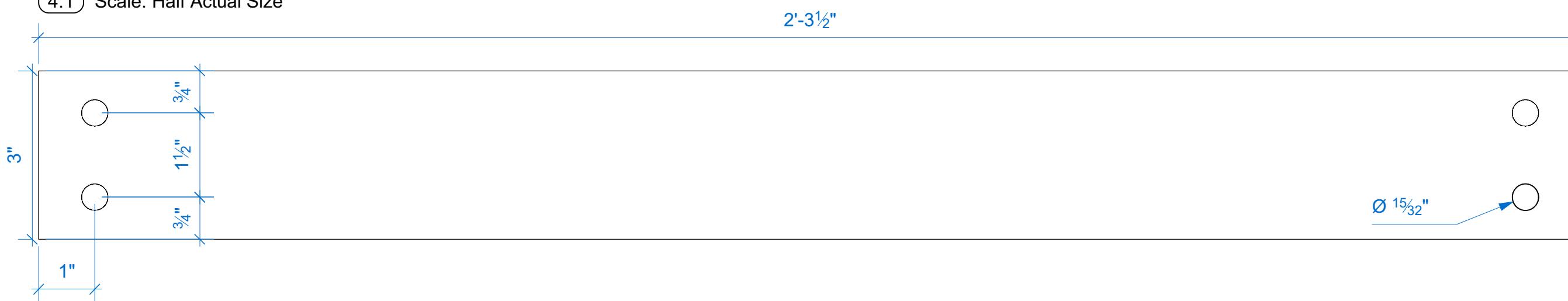


**Build 1 (One) As Drawn**



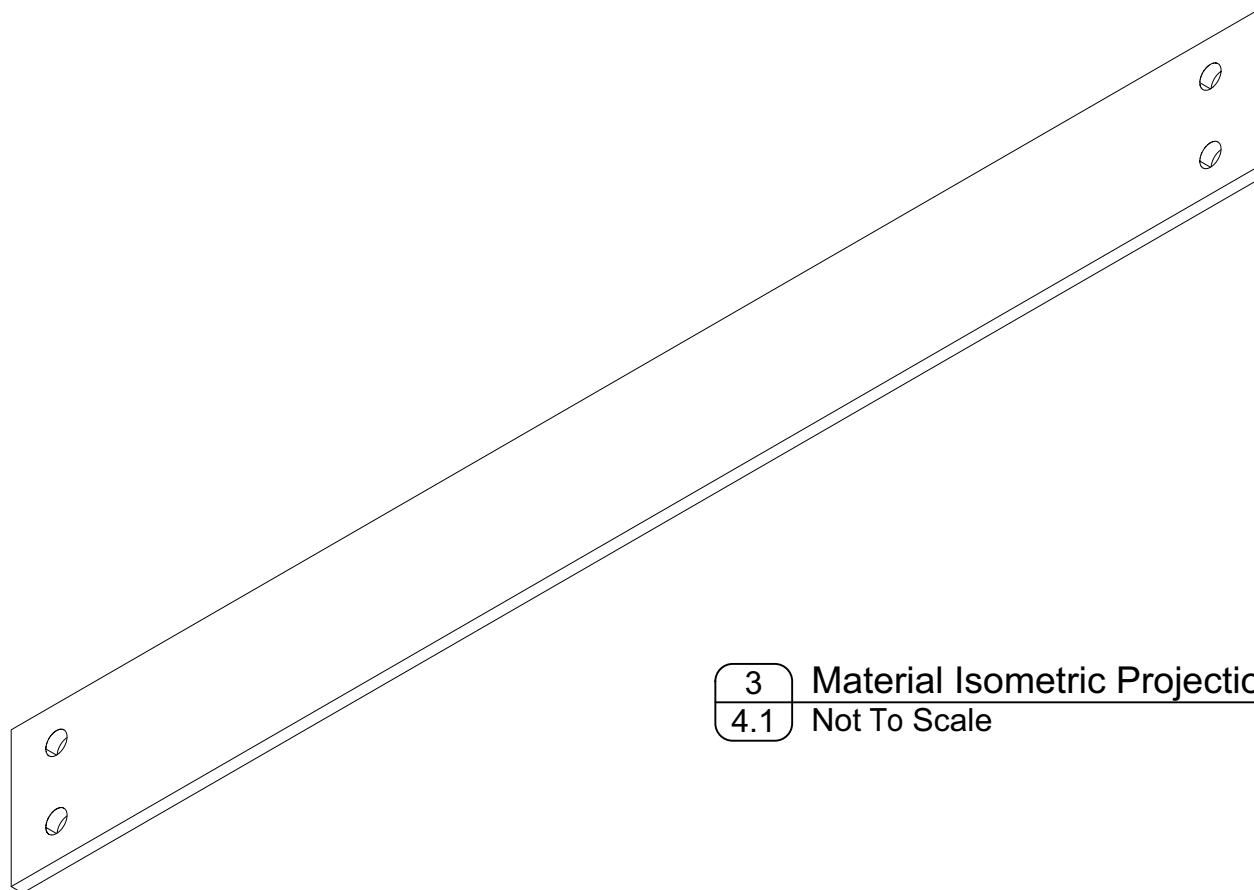
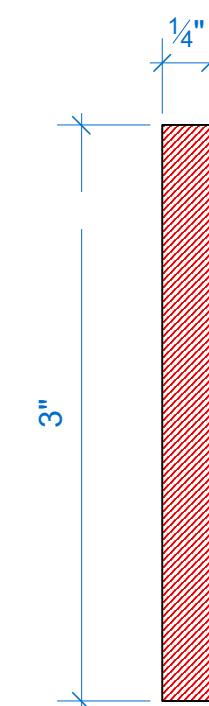
# VECTORWORKS EDUCATIONAL VERSION

1  
4.1 Layout Detail  
Scale: Half Actual Size



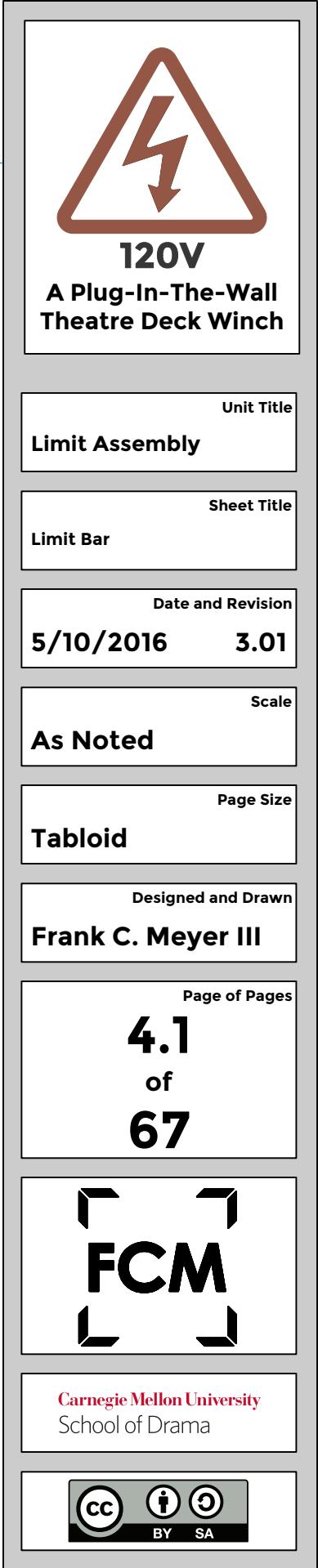
General Notes  
1. Material is A36 HRFB

2  
4.1 Section View  
Scale: Actual Size



3  
4.1 Material Isometric Projection  
Not To Scale

**Build 1 (One) As Drawn**



# VECTORWORKS EDUCATIONAL VERSION

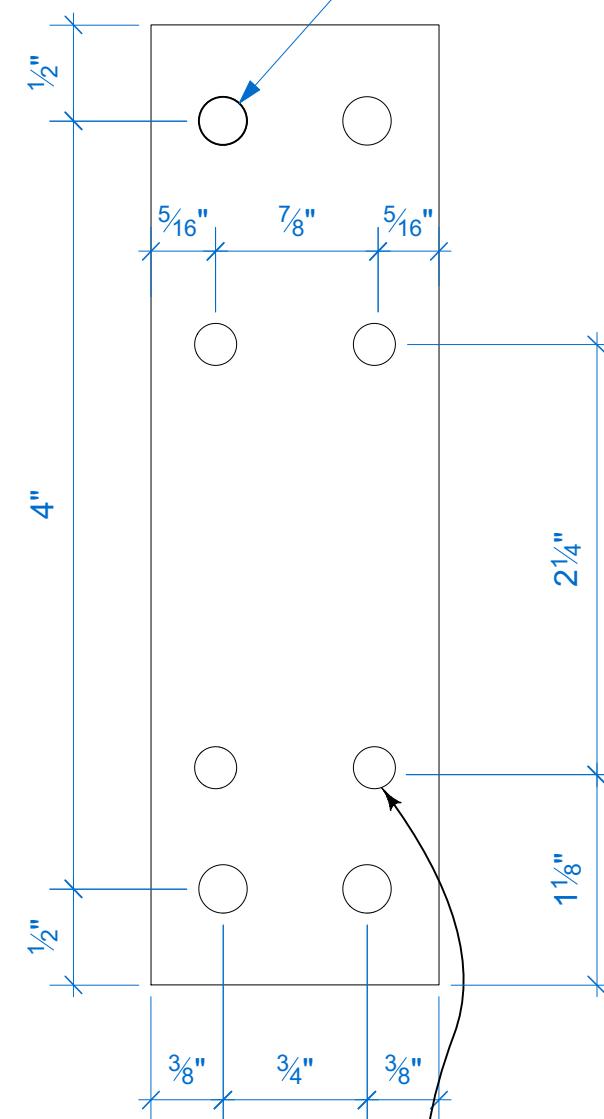
# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Material is 1/4" A36 Steel Plate

**1** Front View  
4.3 Scale: Actual Size

Drill and Tap for 1/4-20



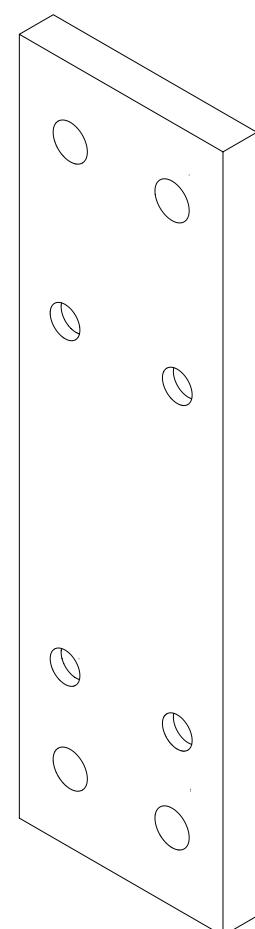
Verify Mounting Pattern  
with Limit Switch. Drill and  
Countersink for Supplied  
Mounting Screws.

**2** Side View  
4.3 Scale: Actual Size

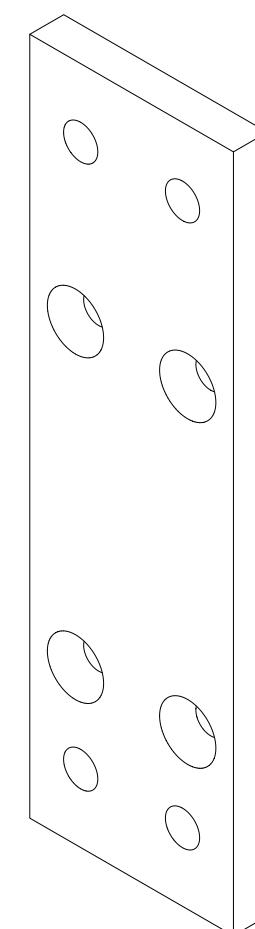
1/4"

5"

**3** Front Isometric Projection  
4.3 Not To Scale



**4** Rear Isometric Projection  
4.3 Not To Scale



**120V**

A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

**Limit Assembly**

Sheet Title

**Limit Switch Mounting Plate**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

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**Frank C. Meyer III**

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**4.3  
of  
67**

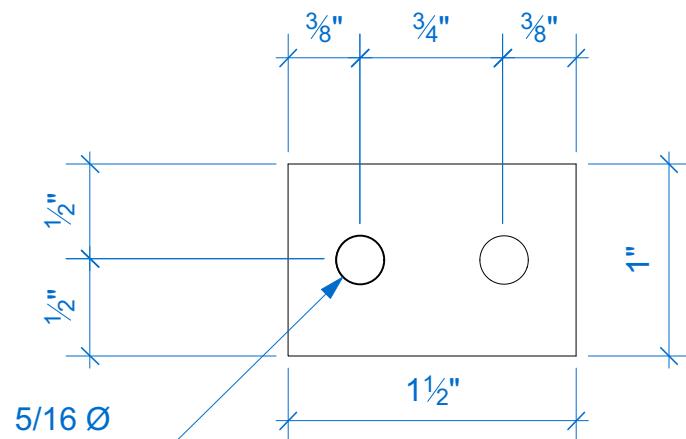
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**Build 2 (Two) As Drawn**

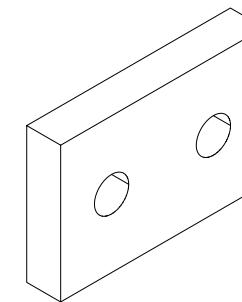
**1** Front View  
4.4 Scale: Actual Size



**2** Side View  
4.4 Scale: Actual Size



**3** Isometric Projection  
4.4 Not To Scale



Unit Title  
**Limit Assembly**

Sheet Title  
**Limit Switch Spacer Plate**

Date and Revision  
**5/10/2016 3.01**

Scale  
**As Noted**

Page Size  
**Tabloid**

Designed and Drawn  
**Frank C. Meyer III**

Page of Pages  
**4.4 of 67**

**FCM**

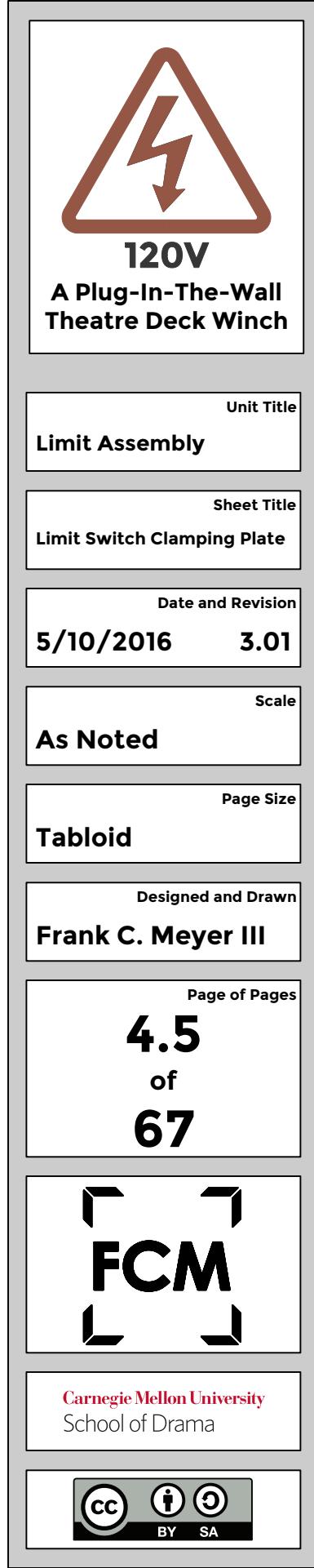
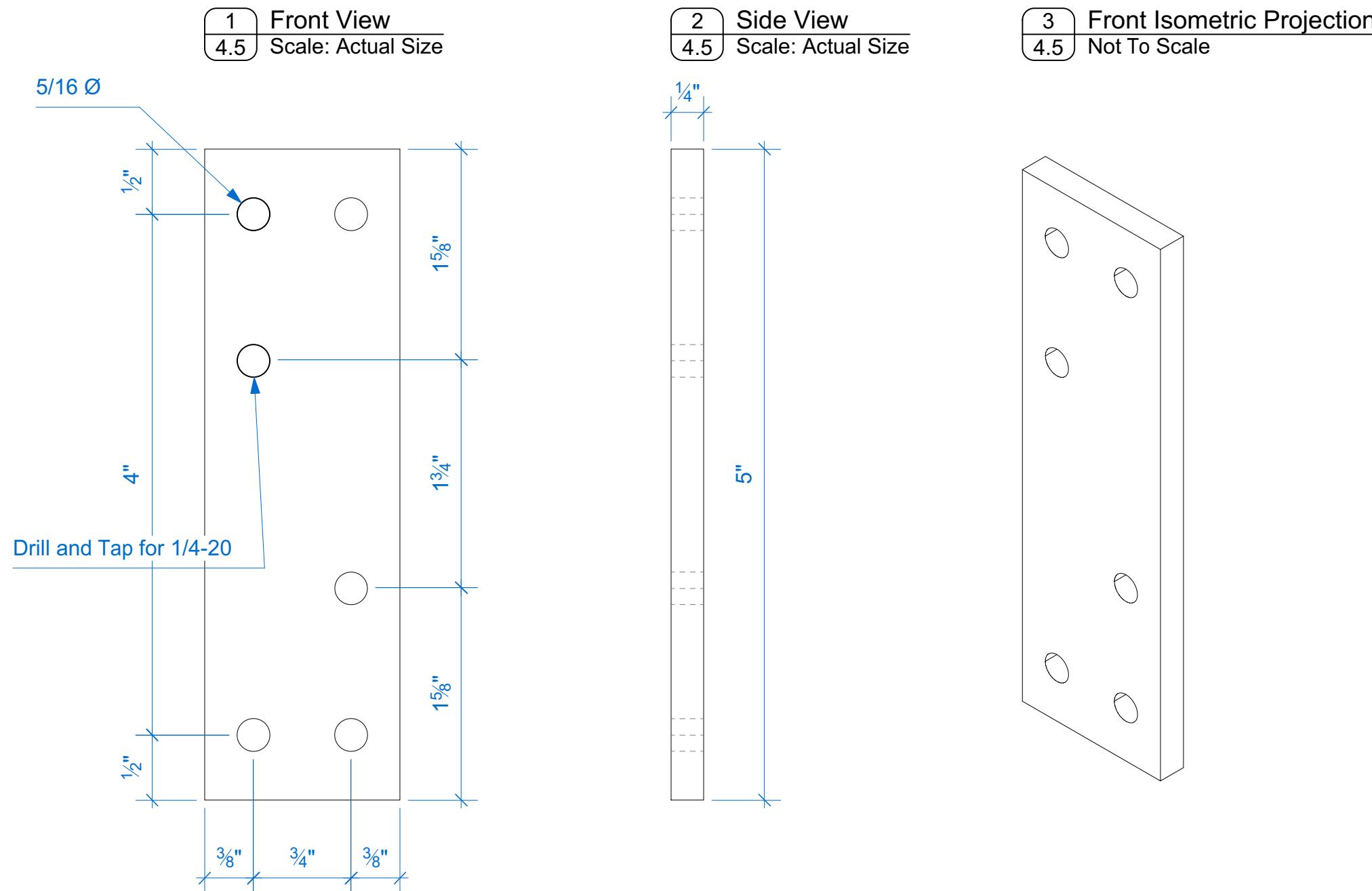
Carnegie Mellon University  
School of Drama

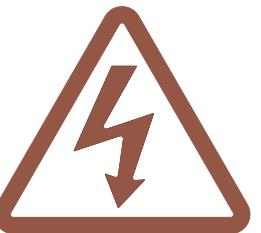
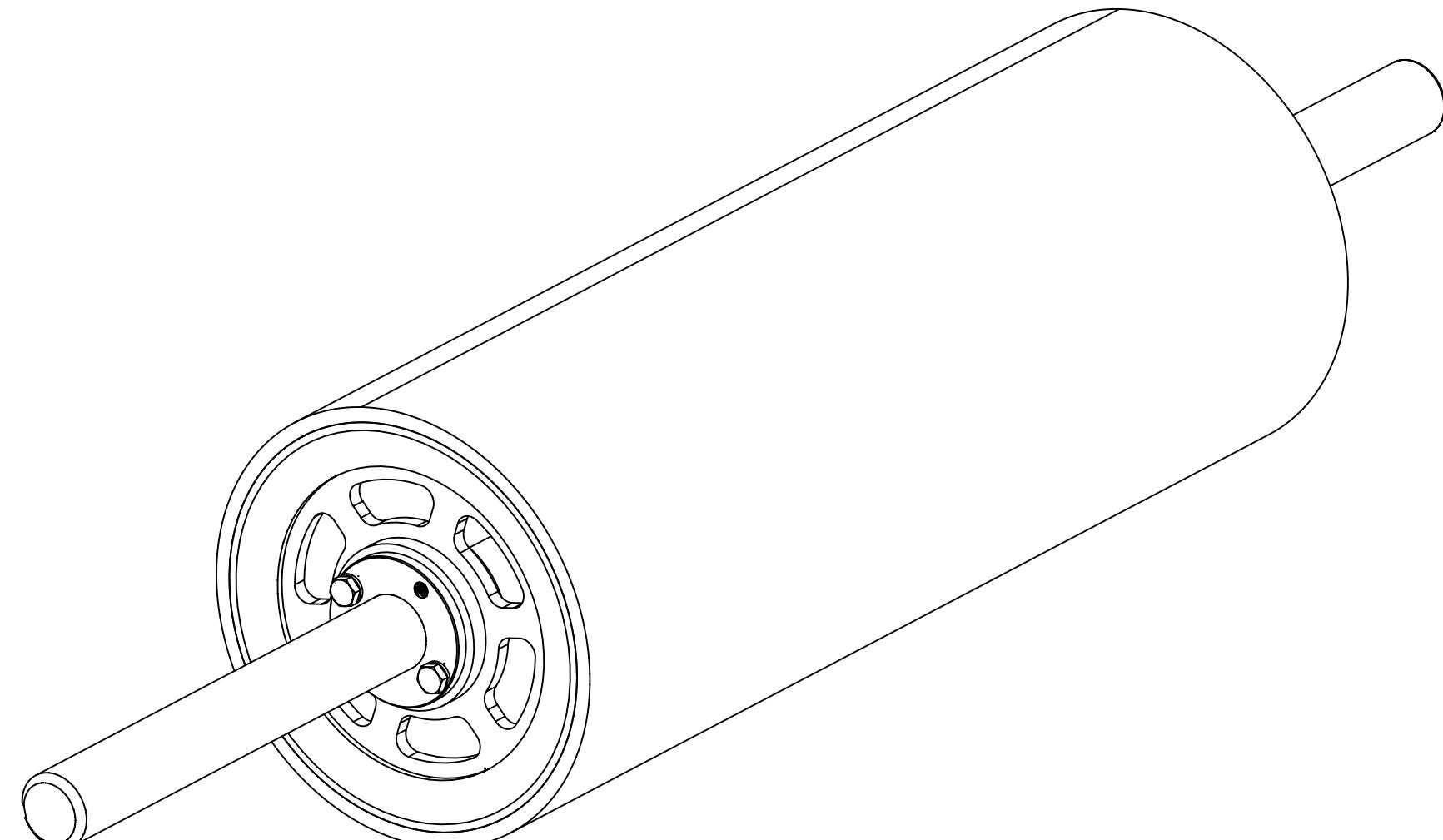


**Build 4 (Four) As Drawn**

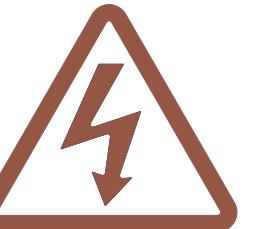
General Notes

1. Material is 1/4" A36 Steel Plate

**Build 2 (Two) As Drawn**

**120V****A Plug-In-The-Wall  
Theatre Deck Winch****Unit Title**  
**Drum Assembly****Sheet Title**  
**Drum Completed****Date and Revision**  
**5/10/2016 3.01****Scale**  
**As Noted****Page Size**  
**Tabloid****Designed and Drawn**  
**Frank C. Meyer III****Page of Pages**  
**5 of 67****Carnegie Mellon University**  
School of Drama

1	Drum Completed Assembly
5.0	Not To Scale

**120V****A Plug-In-The-Wall  
Theatre Deck Winch**

**1 Exploded Assembly View**  
**5.1 Not To Scale**

Drum Pipe - See Plate 5.1

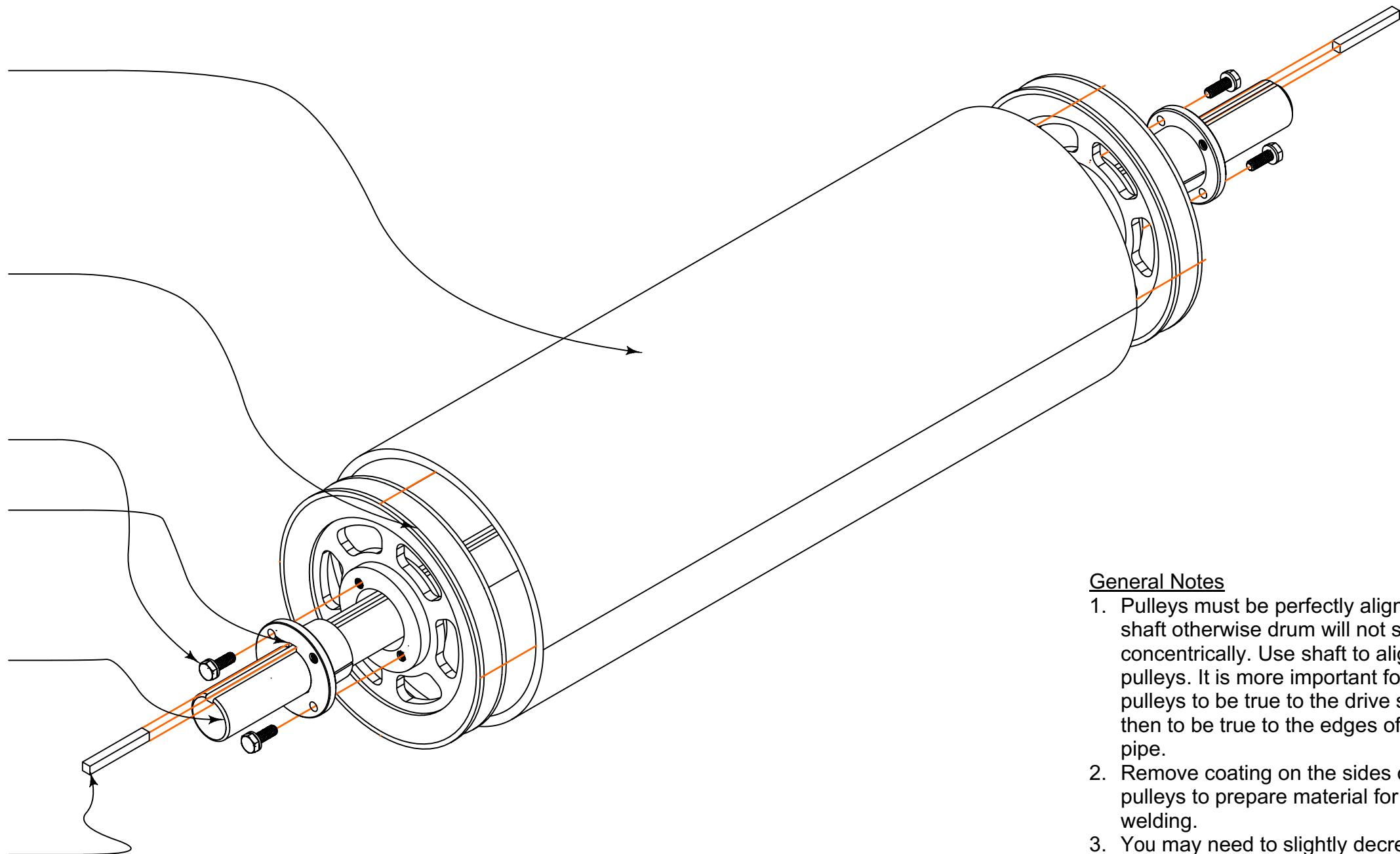
Split-Tapered  
Bushing-Bore Pulley  
for a-Section and  
B-Section V-Belts, 6.75"  
OD  
McMaster Carr # 6407A27

1/4-20 Cap Screws -  
Supplied with Bushing

Split-Tapered Bushing,  
Style H  
1-1/4" Bore  
McMaster Carr # 6086K19

Fully Keyed 1045 Steel  
Drive Shaft  
1-1/4" OD, 1/4" Keyway  
Width, 36" Length  
McMaster-Carr #  
1497K402

1/4" ANSI Key Stock -  
Supplied with Bushing

**General Notes**

1. Pulleys must be perfectly aligned on shaft otherwise drum will not spin concentrically. Use shaft to align pulleys. It is more important for the pulleys to be true to the drive shaft than to be true to the edges of the pipe.
2. Remove coating on the sides of the pulleys to prepare material for welding.
3. You may need to slightly decrease pulley OD to fit in drum. We let ours free-spin on a belt sander ever-so-gently.
4. Be extra careful not to bend the shaft. No hammer-like-action should be required for assembly.

Unit Title

**Drum Assembly**

Sheet Title

**Drum Welding Assembly**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

Designed and Drawn

**Frank C. Meyer III**

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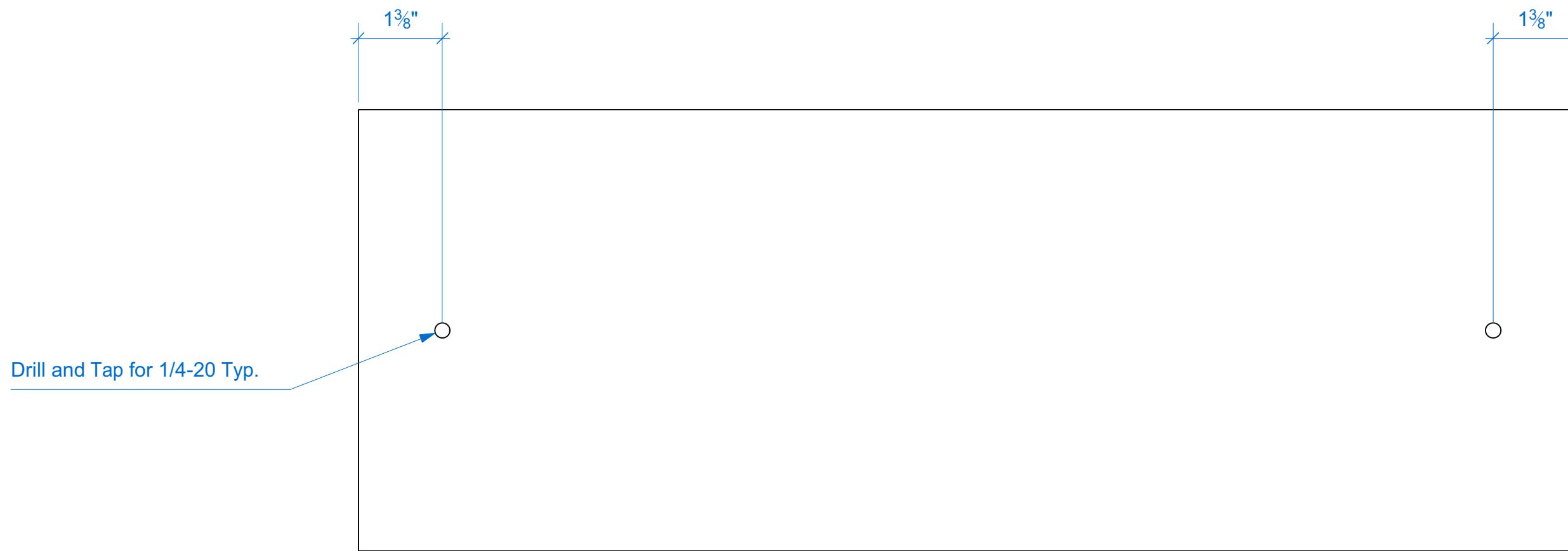
**5.1  
of  
67**

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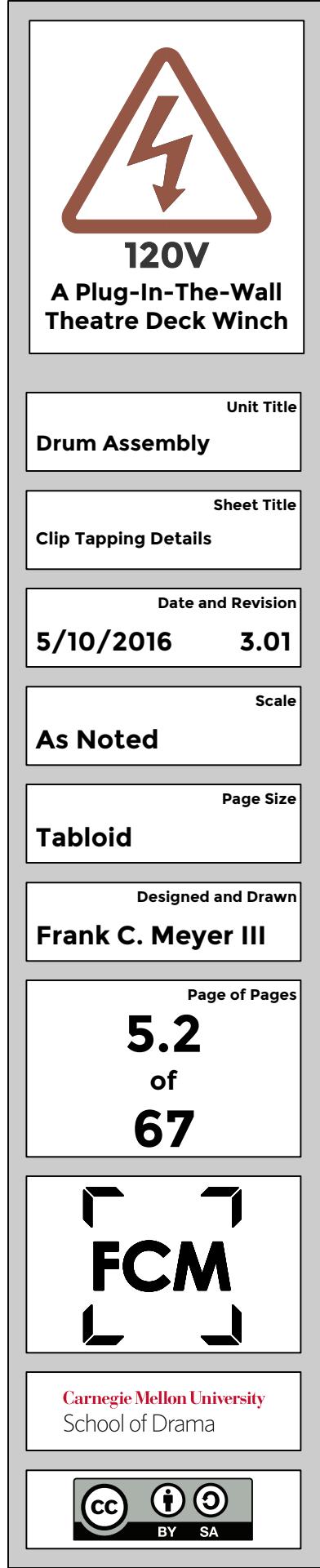
# VECTORWORKS EDUCATIONAL VERSION

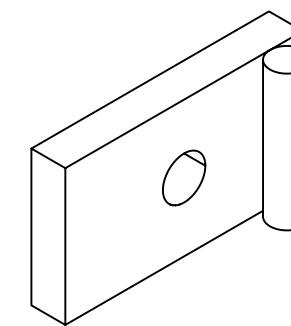
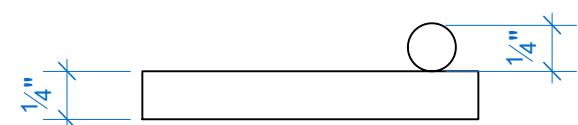
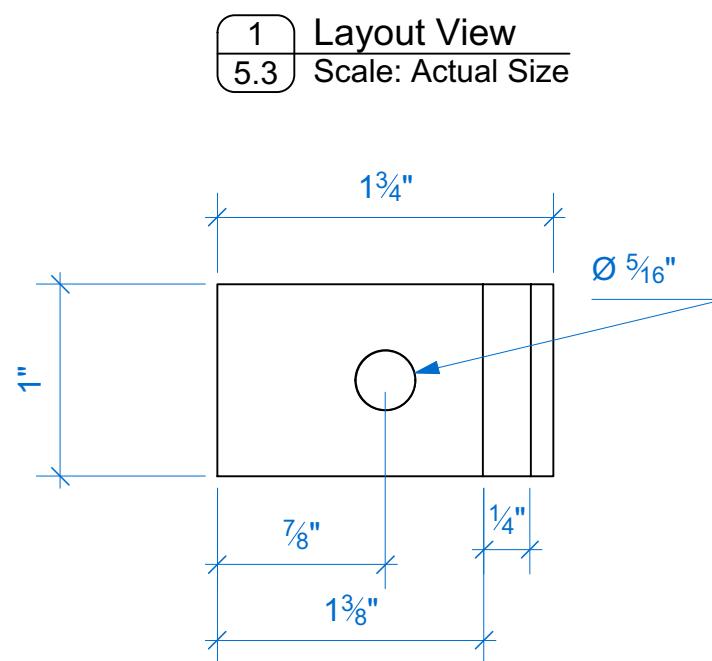


1 Clip Tapping Detail  
5.2 Scale: Half Actual Size

## General Notes

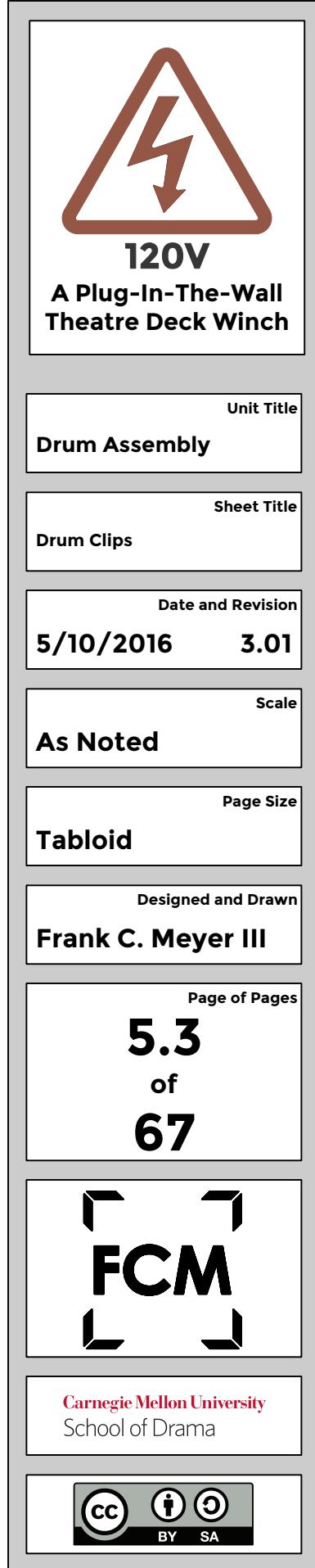
1. Tap Four Holes, as drawn, and mirrored on the opposite side of the drum

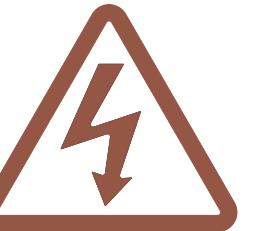
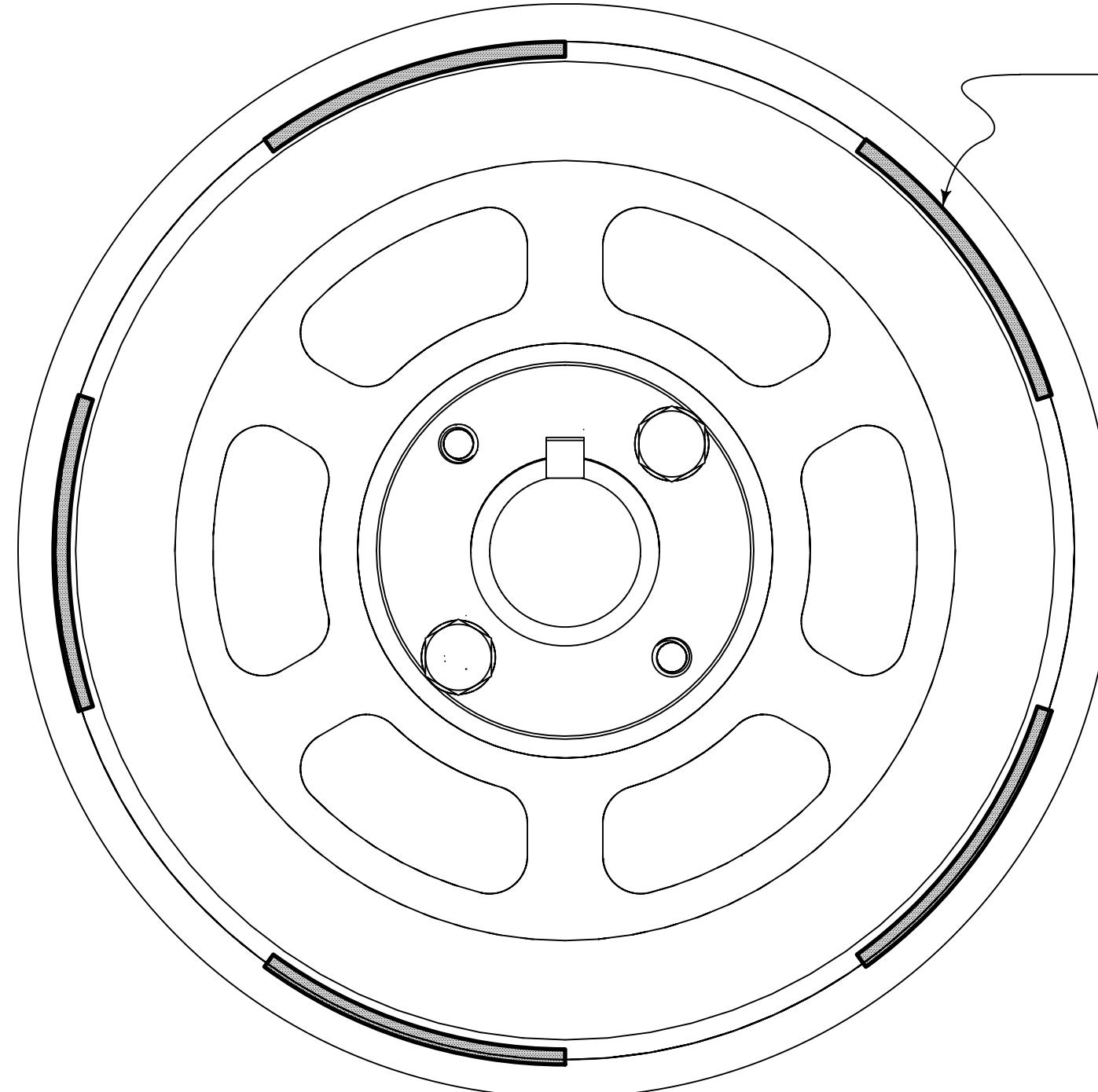




3  
5.3 Projection  
Not To Scale

**Build 4 (Four) As Drawn**



**120V****A Plug-In-The-Wall  
Theatre Deck Winch****General Notes**

1. Ensure metal is properly prepared before welding.
2. Tack and stitch weld. Allow material to cool thoroughly between each welding session. This process should be a half day process. Don't try to rush it.
3. Wrap drive shaft with electrical tape or other protective material prior to welding. Do not allow welding slag to bond to drive shaft.

Closed Root Groove Weld  
Drum To Sheave as  
Shown or Practical.

Unit Title  
**Drum Assembly**

Sheet Title  
**Drum Weldment Layout**

Date and Revision  
**5/10/2016 3.01**

Scale  
**As Noted**

Page Size  
**Tabloid**

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**5.4 of 67**

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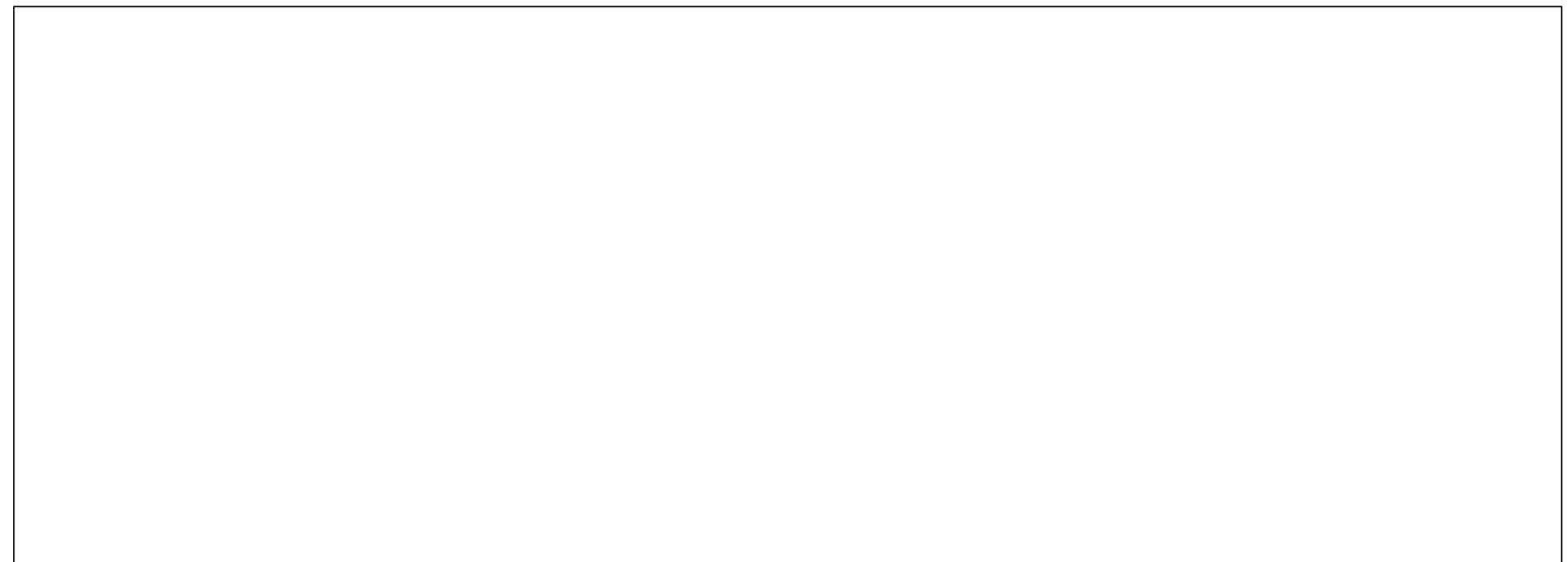


**Weld 1 Assbly. As Drawn**

# VECTORWORKS EDUCATIONAL VERSION

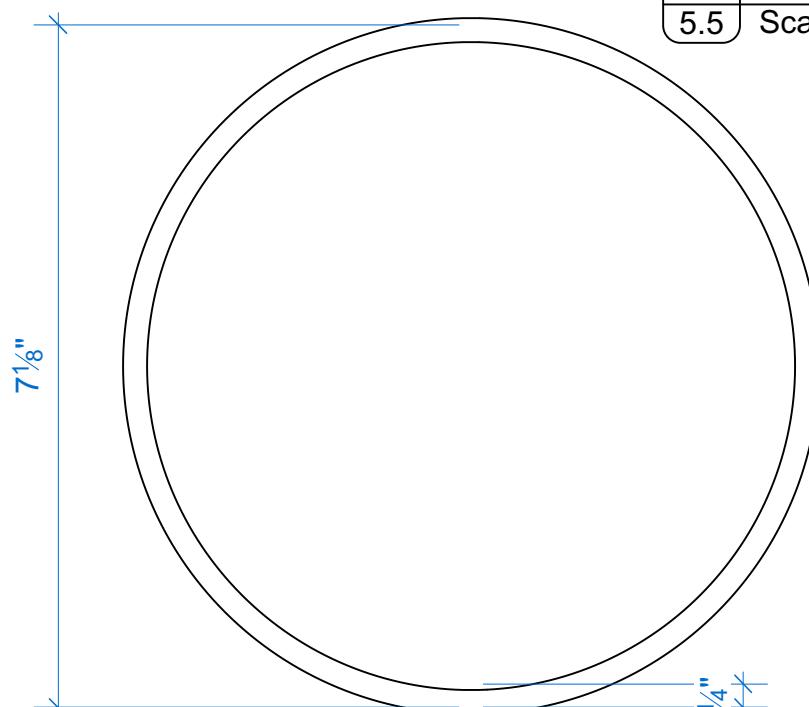
## General Notes

1. Material is 7.75" OD Steel Round Tube with 1/4" Wall. DOM Weldless preferred.
2. We cut this with a deep through horizontal band saw. Alternatively, scribing the circle and cutting with an angle grinder would yield an acceptable result.

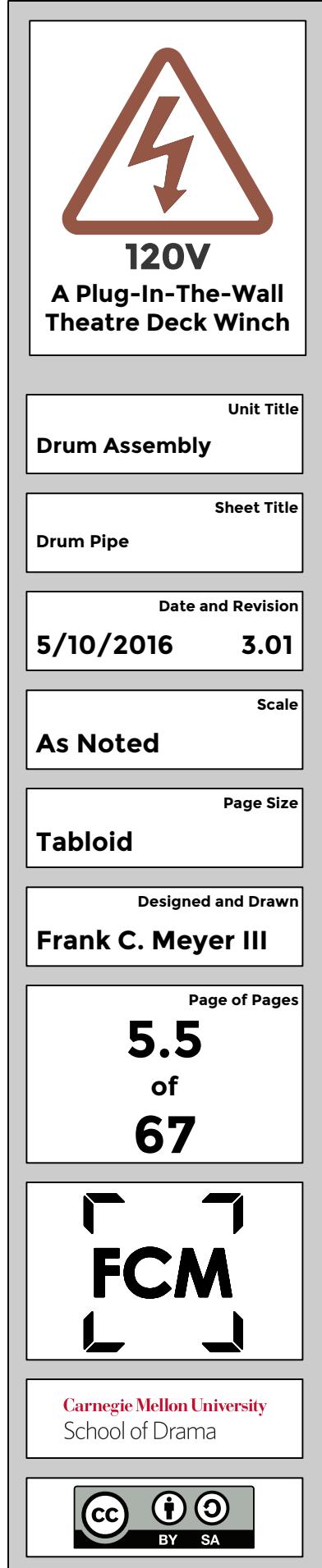


1'-8"

1 Drum Length Detail  
5.5 Scale: Half Actual Size

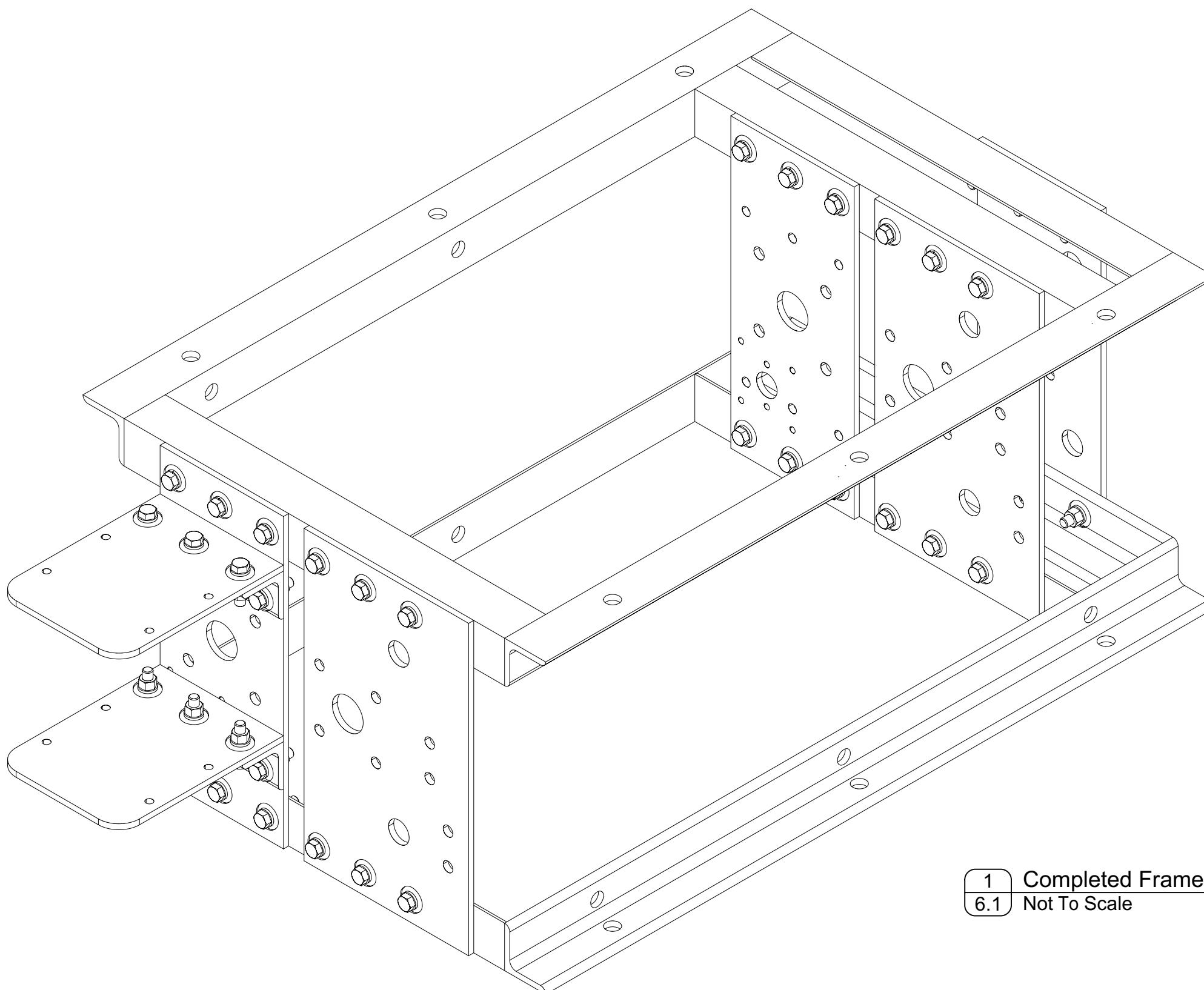


2 Drum Profile  
5.5 Scale: Half Actual Size

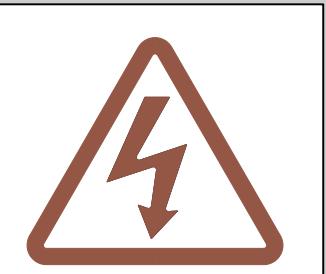


**Build 1 (One) As Drawn**

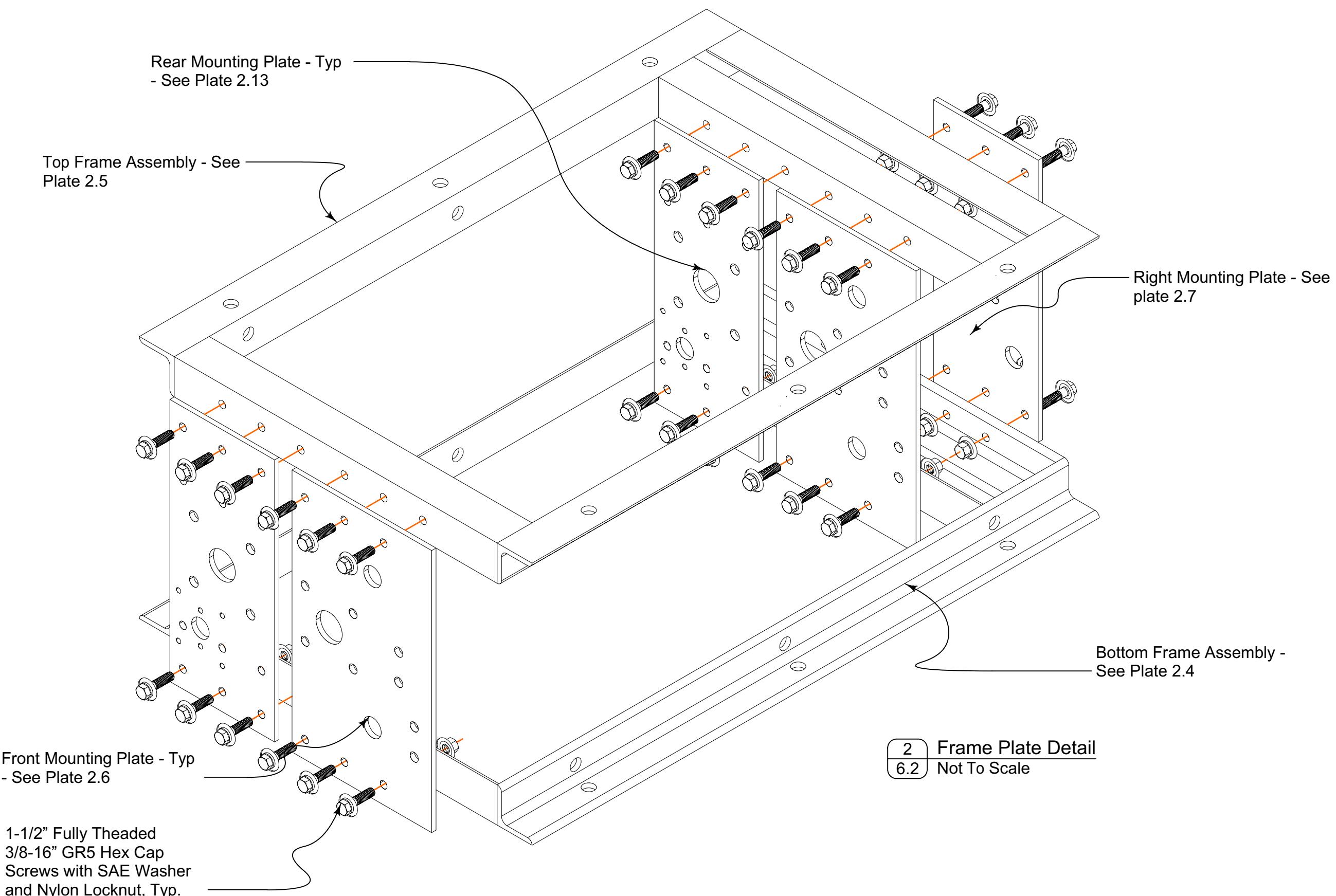
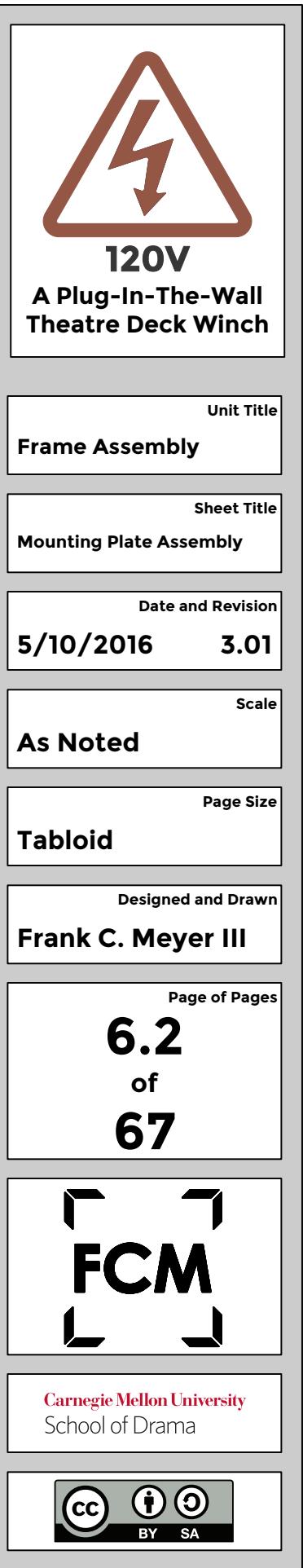
VECTORWORKS EDUCATIONAL VERSION

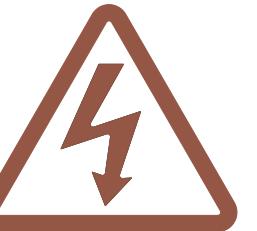


1 Completed Frame Assembly  
6.1 Not To Scale

 <b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title <b>Frame Assembly</b>
Sheet Title <b>Completed Frame Overview</b>
Date and Revision <b>5/10/2016 3.01</b>
Scale
<b>As Noted</b>
Page Size <b>Tabloid</b>
Designed and Drawn <b>Frank C. Meyer III</b>
Page of Pages <b>6.1 of 67</b>

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**120V****A Plug-In-The-Wall  
Theatre Deck Winch**

Unit Title

**Frame Assembly**

Sheet Title

**Gearbox Support Assembly**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

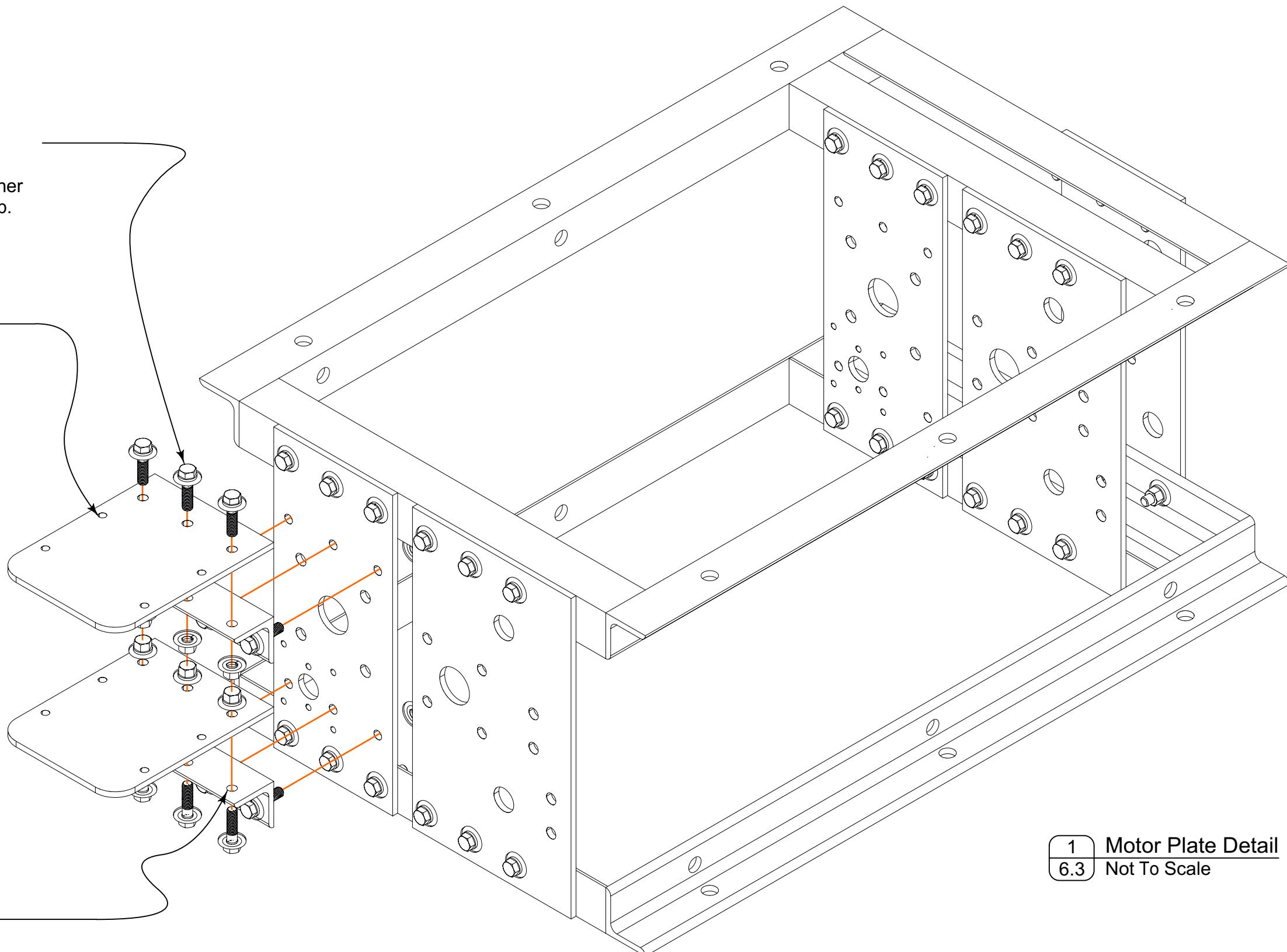
**Tabloid**

Designed and Drawn

**Frank C. Meyer III**

Page of Pages

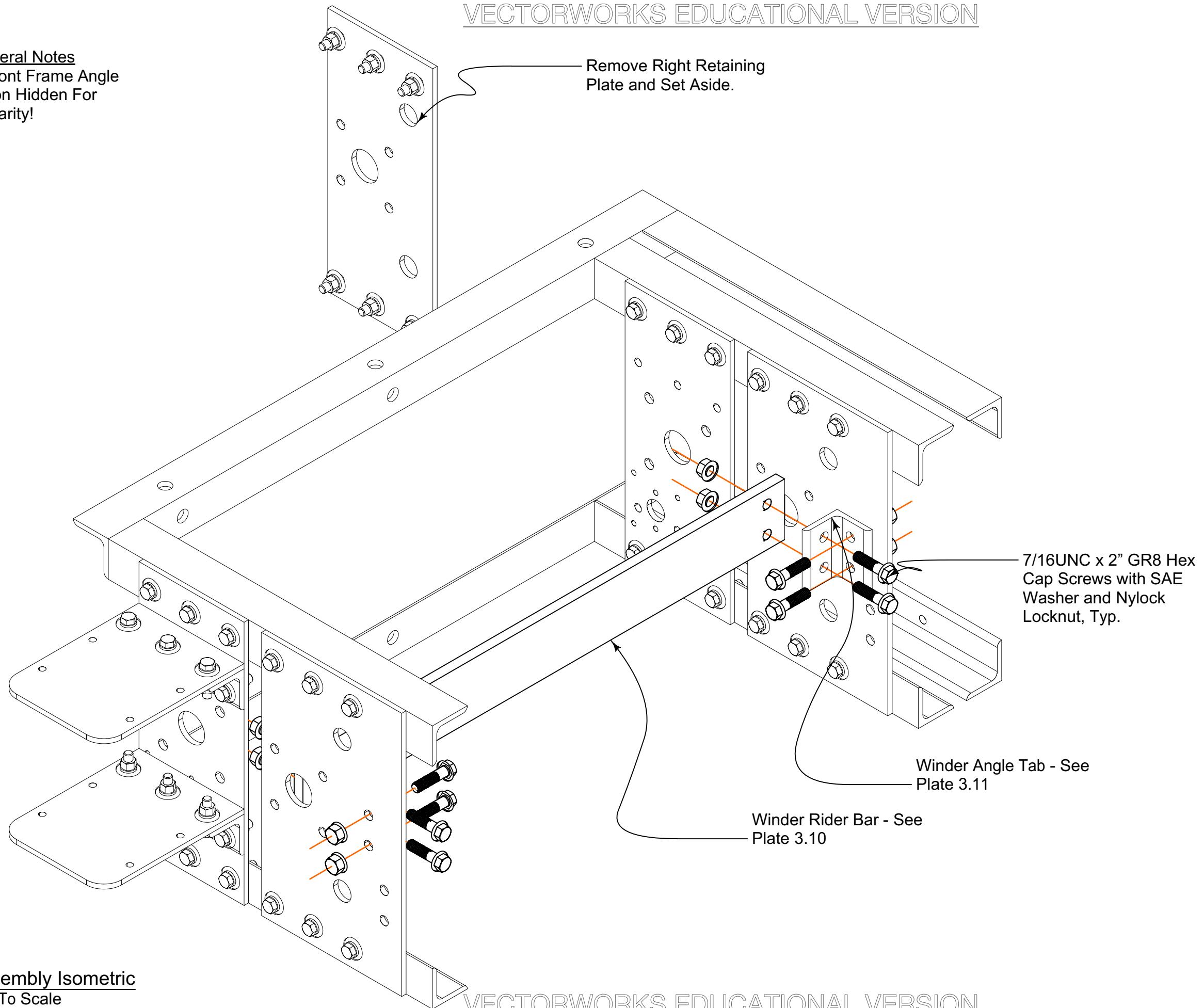
**6.3  
of  
67**

Carnegie Mellon University  
School of Drama

# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Front Frame Angle  
Iron Hidden For  
Clarity!



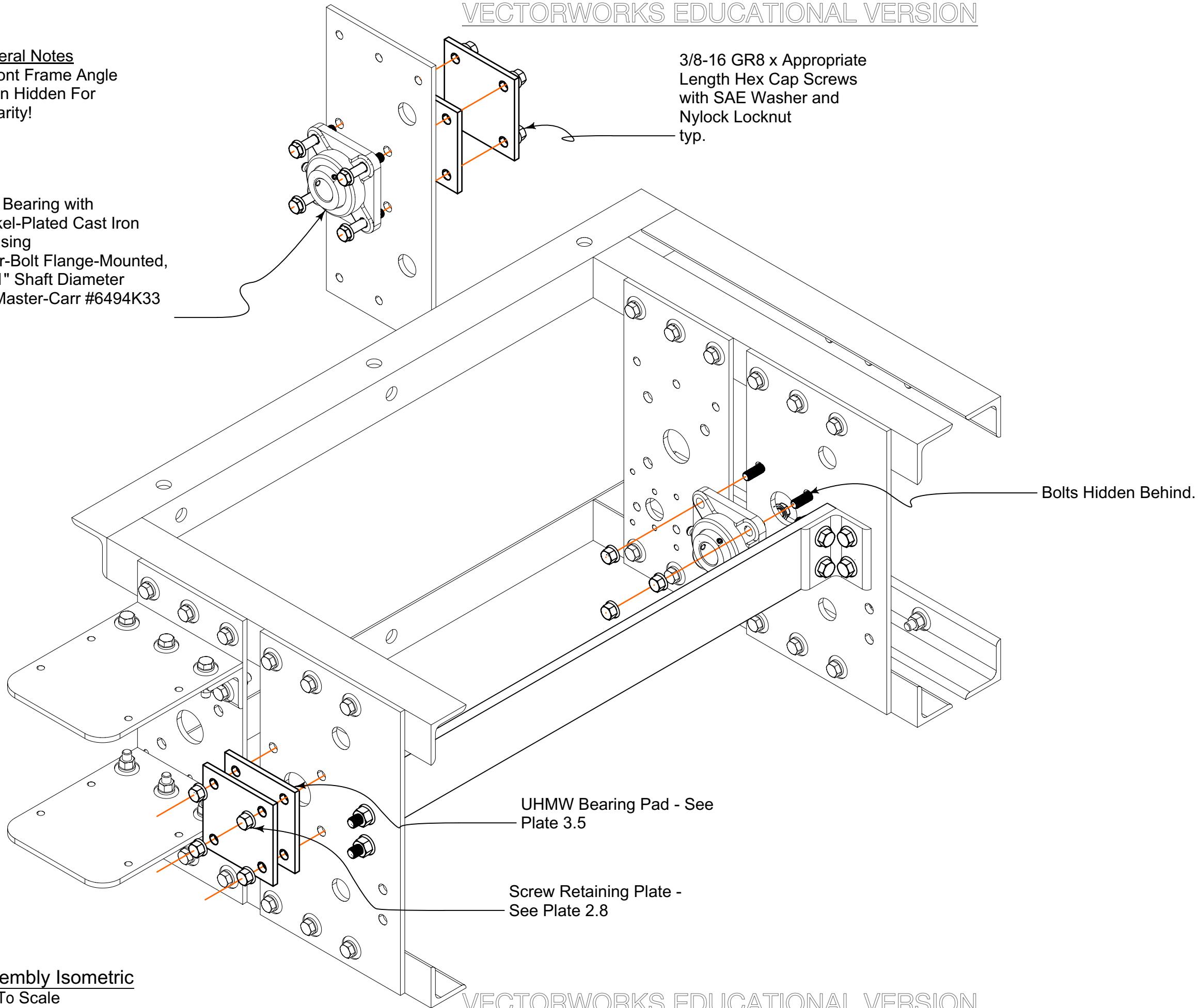
	<b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title	<b>Winder Installation</b>
Sheet Title	Rider Bar Assebly
Date and Revision	<b>5/10/2016</b> <b>3.01</b>
Scale	As Noted
Page Size	Tabloid
Designed and Drawn	<b>Frank C. Meyer III</b>
Page of Pages	<b>7.1</b> of <b>67</b>
Carnegie Mellon University School of Drama	

# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Front Frame Angle  
Iron Hidden For  
Clarity!

Ball Bearing with  
Nickel-Plated Cast Iron  
Housing  
Four-Bolt Flange-Mounted,  
for 1" Shaft Diameter  
McMaster-Carr #6494K33  
typ.

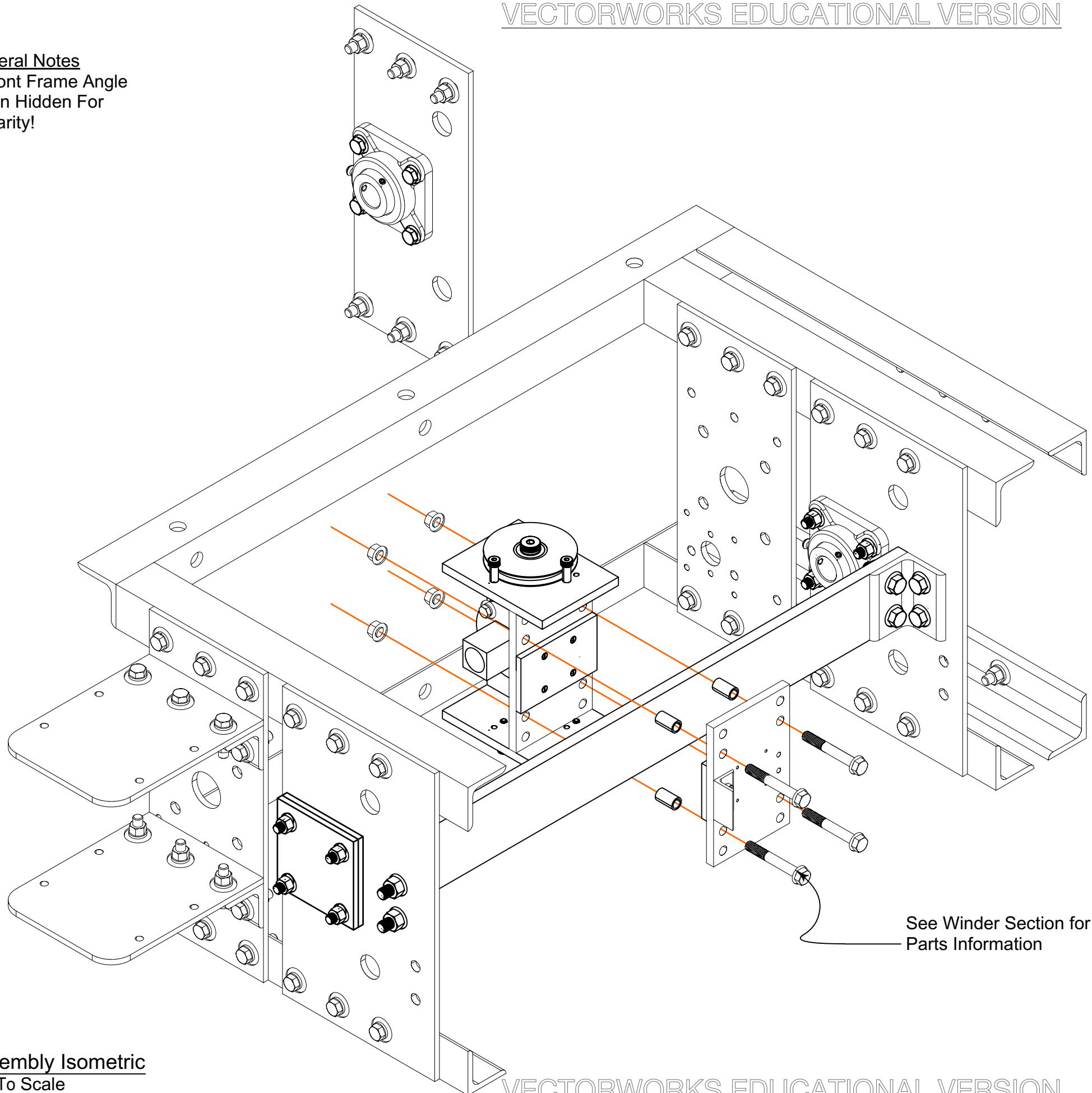


	<b>120V</b>
<b>A Plug-In-The-Wall Theatre Deck Winch</b>	
Unit Title	<b>Winder Installation</b>
Sheet Title	<b>Retaining and Bearing Plates</b>
Date and Revision	<b>5/10/2016 3.01</b>
Scale	<b>As Noted</b>
Page Size	<b>Tabloid</b>
Designed and Drawn	<b>Frank C. Meyer III</b>
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# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Front Frame Angle  
Iron Hidden For  
Clarity!



1 Assembly Isometric  
7.3 Not To Scale

VECTORWORKS EDUCATIONAL VERSION

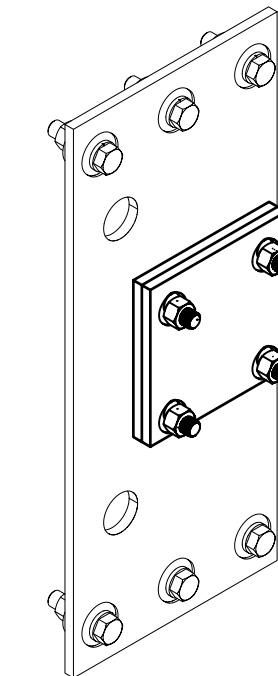
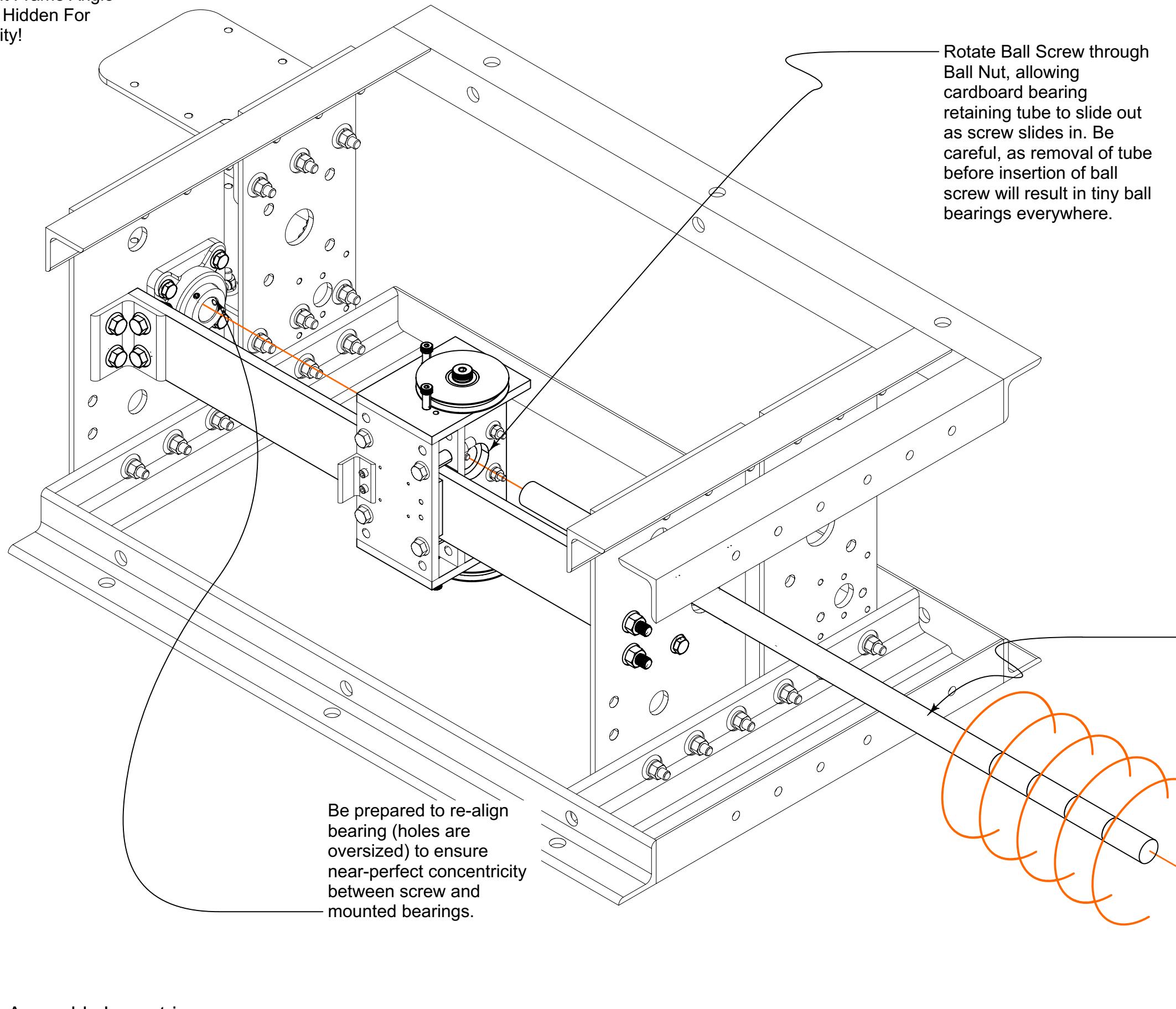
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Unit Title	<b>Winder Installation</b>
Sheet Title	<b>Winder Installation</b>
Date and Revision	<b>5/10/2016 3.01</b>
Scale	<b>As Noted</b>
Page Size	<b>Tabloid</b>
Designed and Drawn	<b>Frank C. Meyer III</b>
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<b>FCM</b>	
Carnegie Mellon University School of Drama	
CC BY SA	

General Notes

1. Front Frame Angle

Iron Hidden For Clarity!

VECTORWORKS EDUCATIONAL VERSION



**120V**  
A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title  
Winder Installation

Sheet Title  
Ball Screw Install

Date and Revision  
5/10/2016 3.01

Scale  
As Noted

Page Size  
Tabloid

Designed and Drawn  
Frank C. Meyer III

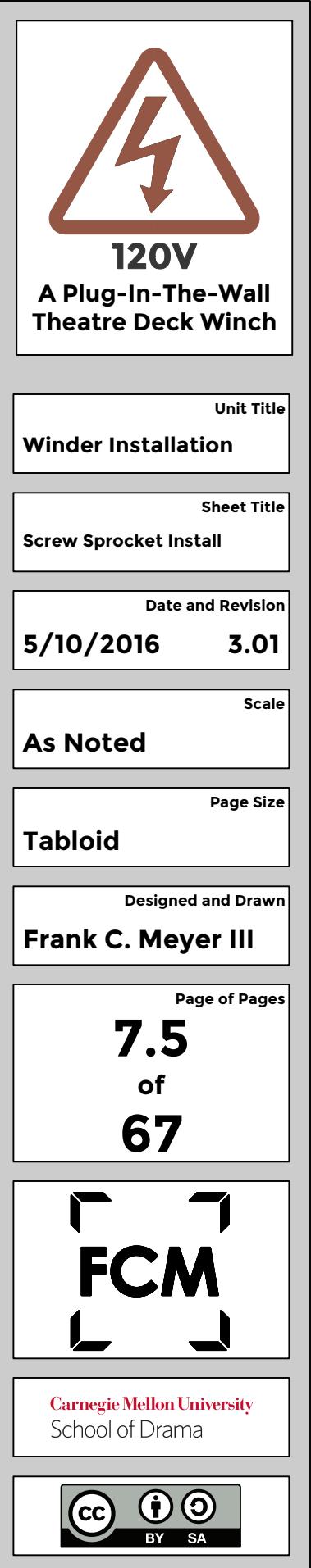
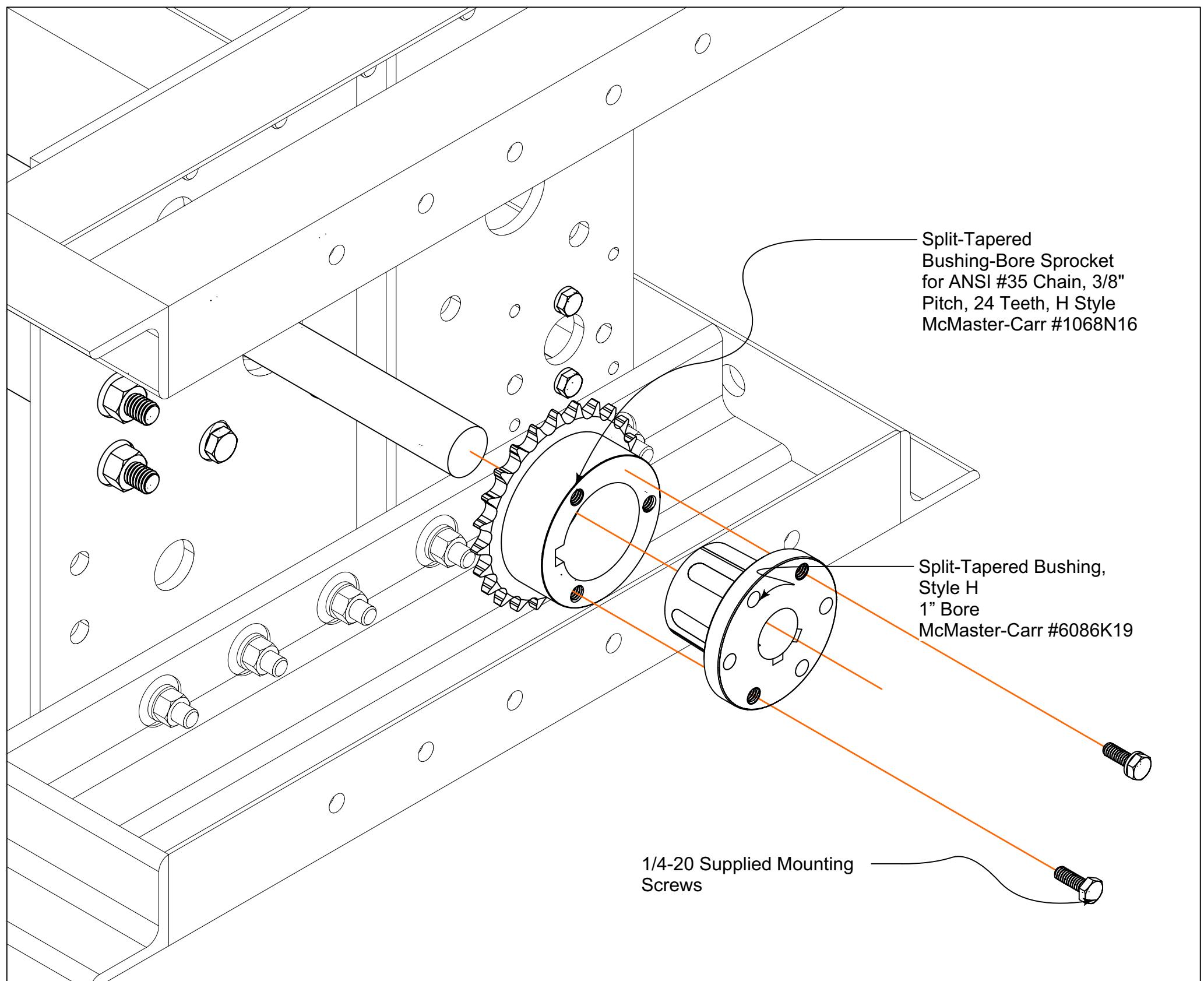
Page of Pages  
7.4  
of  
67

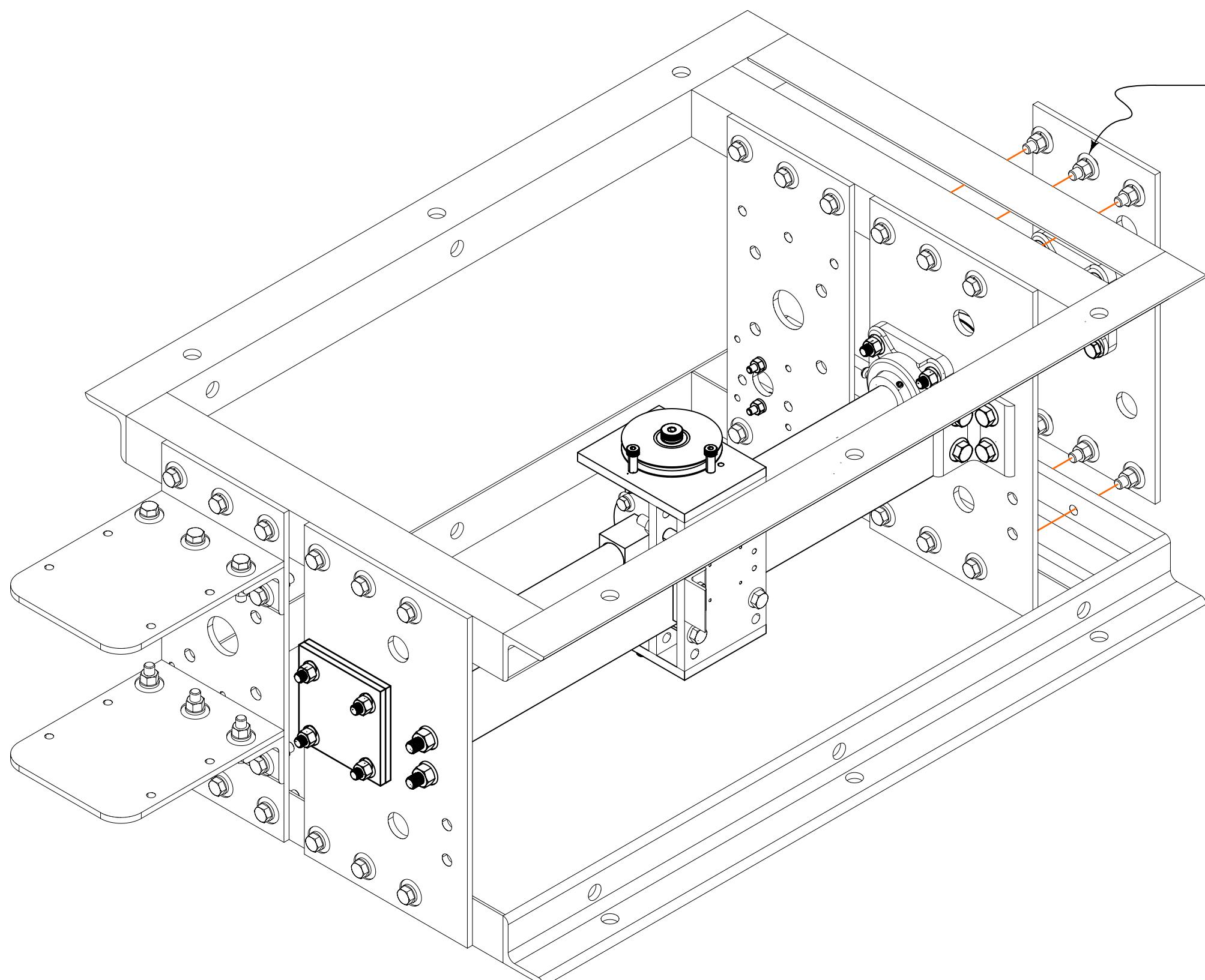
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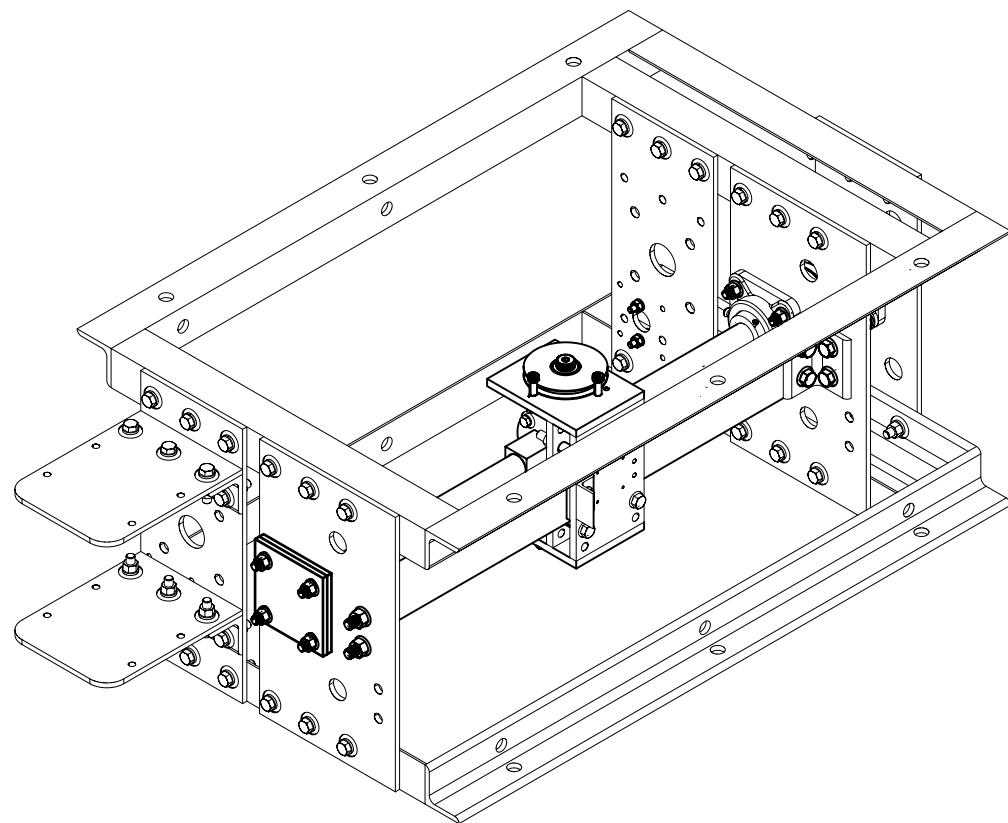
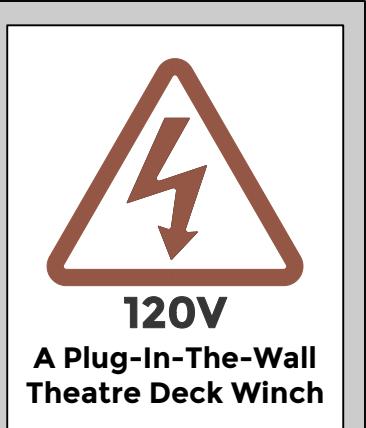
General Notes

1. Depending on the Machining Finish of the Ball Screw, additional shimming of the split taper bushing may be required. For the prototype, we used stainless steel shim tape available from McMaster Carr.
2. Shim Tape:  
McMaster Carr #1143N21  
Shim Tape, 1" Wide, 0.004" Thick, 9' Long
3. Applying Shim Tape Is An Iterative Process. Apply Layers of Tape Until Bushing Slip Fits On Screw. Tighten Bushing, Loosen Bushing, Add A Layer of Tape. Repeat those steps until another layer of shim tape cannot be added.
4. While this process seems sub-standard, we used an inspection laquer on the sprocket screw connection, and never noticed any time of slip of the bushing to the screw.
5. As an alternative to shim tape friction fit, shim tape and a mig welder will yield a strong connection. Ensure perfect concentricity before welding. You don't want to have to do it twice.

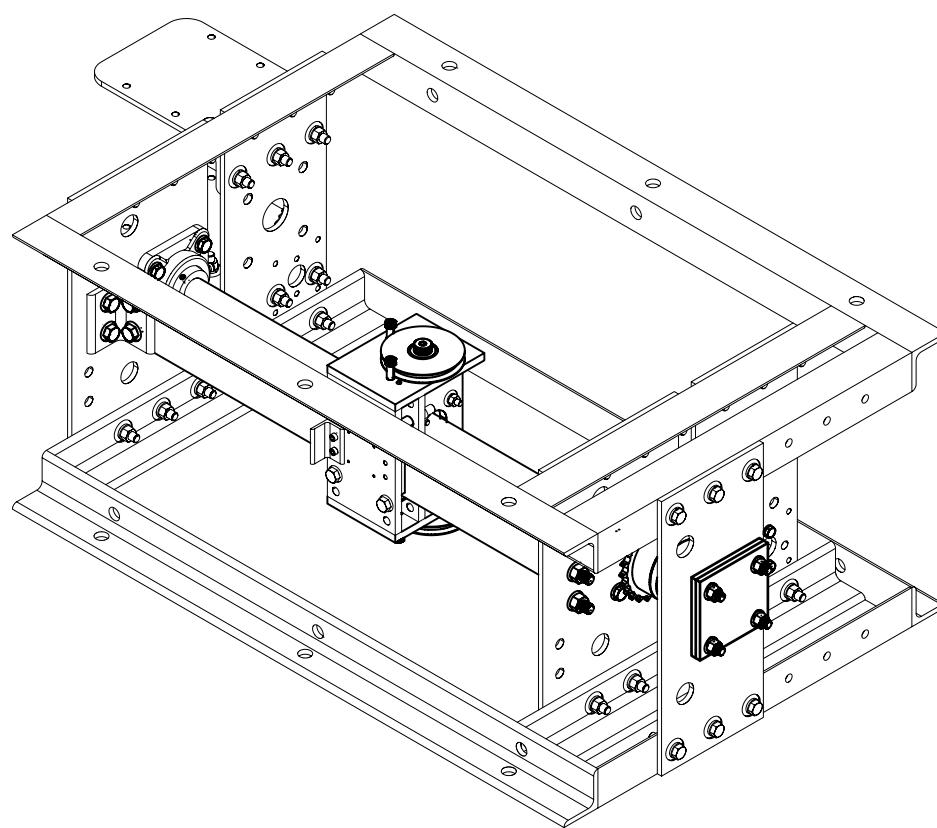




	<b>120V</b>
<b>A Plug-In-The-Wall Theatre Deck Winch</b>	
Unit Title	
<b>Winder Installation</b>	
Sheet Title	
<b>Mounting Plate Re-Install</b>	
Date and Revision	
<b>5/10/2016</b>	<b>3.01</b>
Scale	
<b>As Noted</b>	
Page Size	
<b>Tabloid</b>	
Designed and Drawn	
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Carnegie Mellon University School of Drama	



1 Right Isometric Projection  
7.7 Not To Scale



2 Left Isometric Projection  
7.7 Not To Scale

Unit Title  
**Winder Installation**

Sheet Title  
**Winder Complete Overview**

Date and Revision  
**5/10/2016 3.01**

Scale  
**As Noted**

Page Size  
**Tabloid**

Designed and Drawn  
**Frank C. Meyer III**

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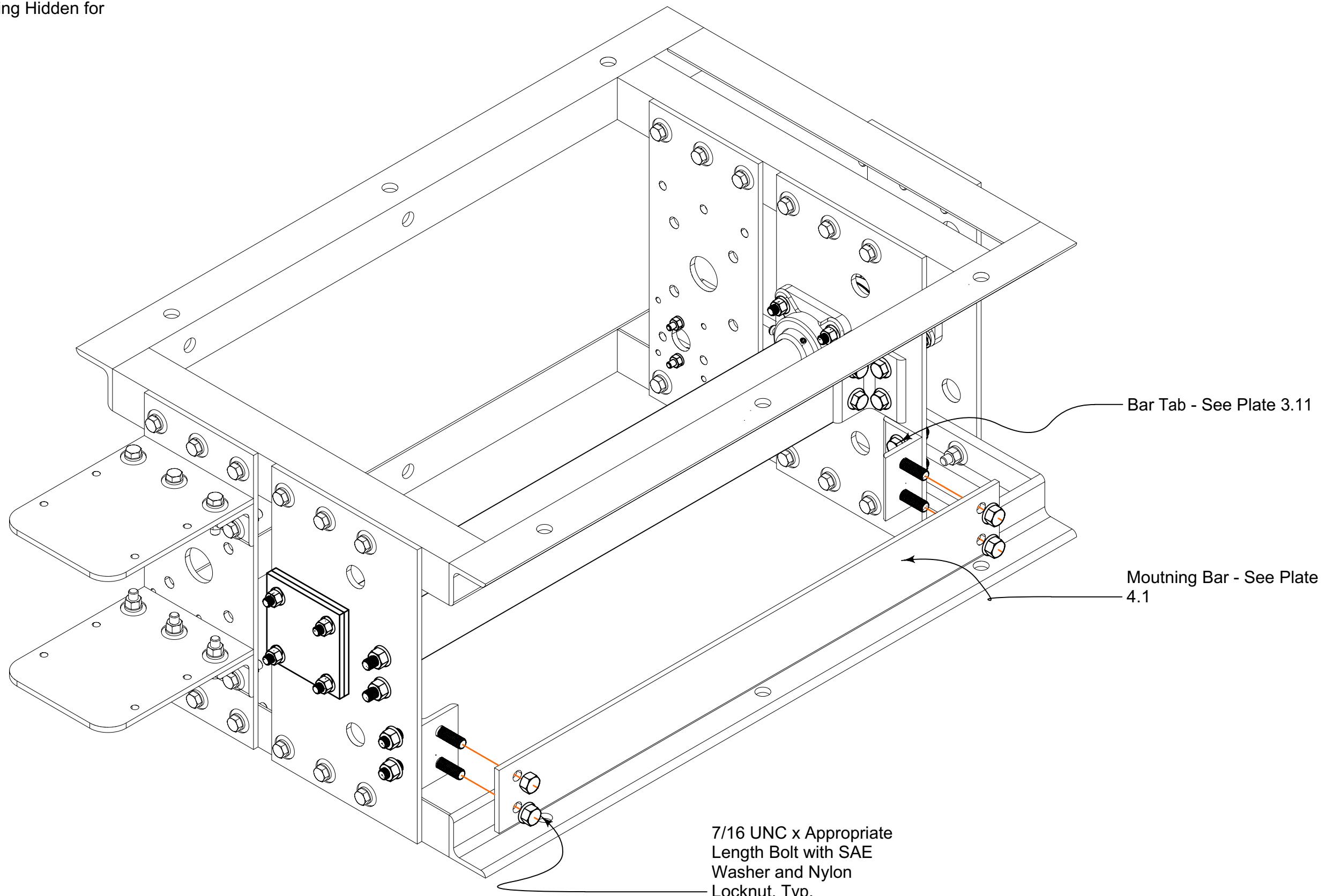
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# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Winder and Ball Screw  
Threading Hidden for  
Clarity



1 Assembly Projection  
8.1 Not To Scale

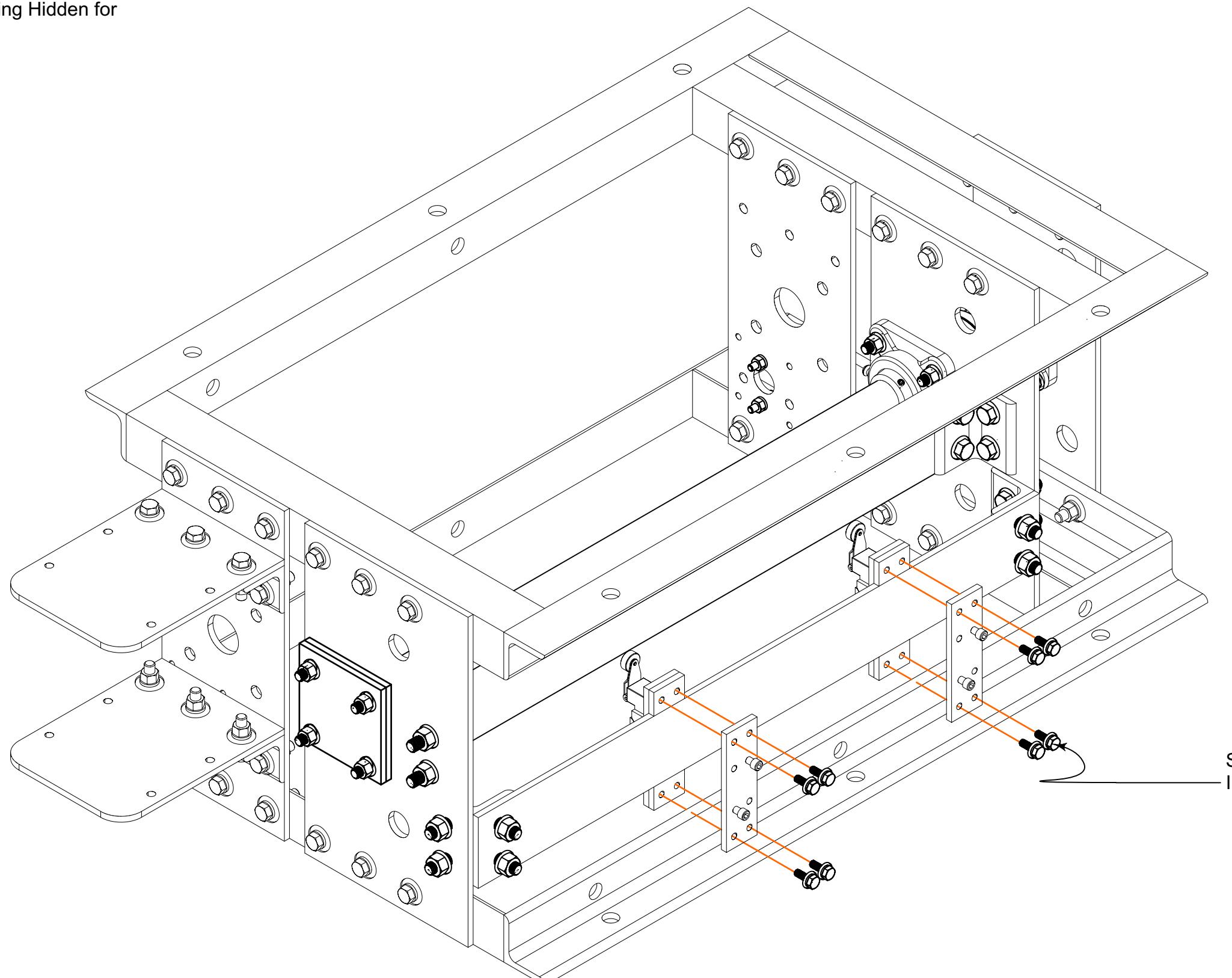
	<b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title	
Limit Installation	
Sheet Title	
Limit Bar Installation	
Date and Revision	
<b>5/10/2016      3.01</b>	
Scale	
As Noted	
Page Size	
Tabloid	
Designed and Drawn	
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Page of Pages	
<b>8.1</b> of <b>67</b>	
Carnegie Mellon University School of Drama	

# VECTORWORKS EDUCATIONAL VERSION

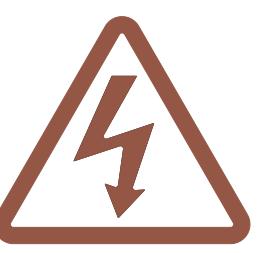
# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Winder and Ball Screw  
Threading Hidden for  
Clarity



1 Assembly Projection  
8.2 Not To Scale

 <b>120V</b> A Plug-In-The-Wall Theatre Deck Winch	Unit Title
	Limit Installation
	Sheet Title
	Limit Switch Installation
	Date and Revision
<b>5/10/2016</b>	<b>3.01</b>
	Scale
	As Noted
	Page Size
	Tabloid
	Designed and Drawn
<b>Frank C. Meyer III</b>	
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<b>8.2</b>	<b>of</b>
	<b>67</b>
<b>FCM</b>	
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# VECTORWORKS EDUCATIONAL VERSION

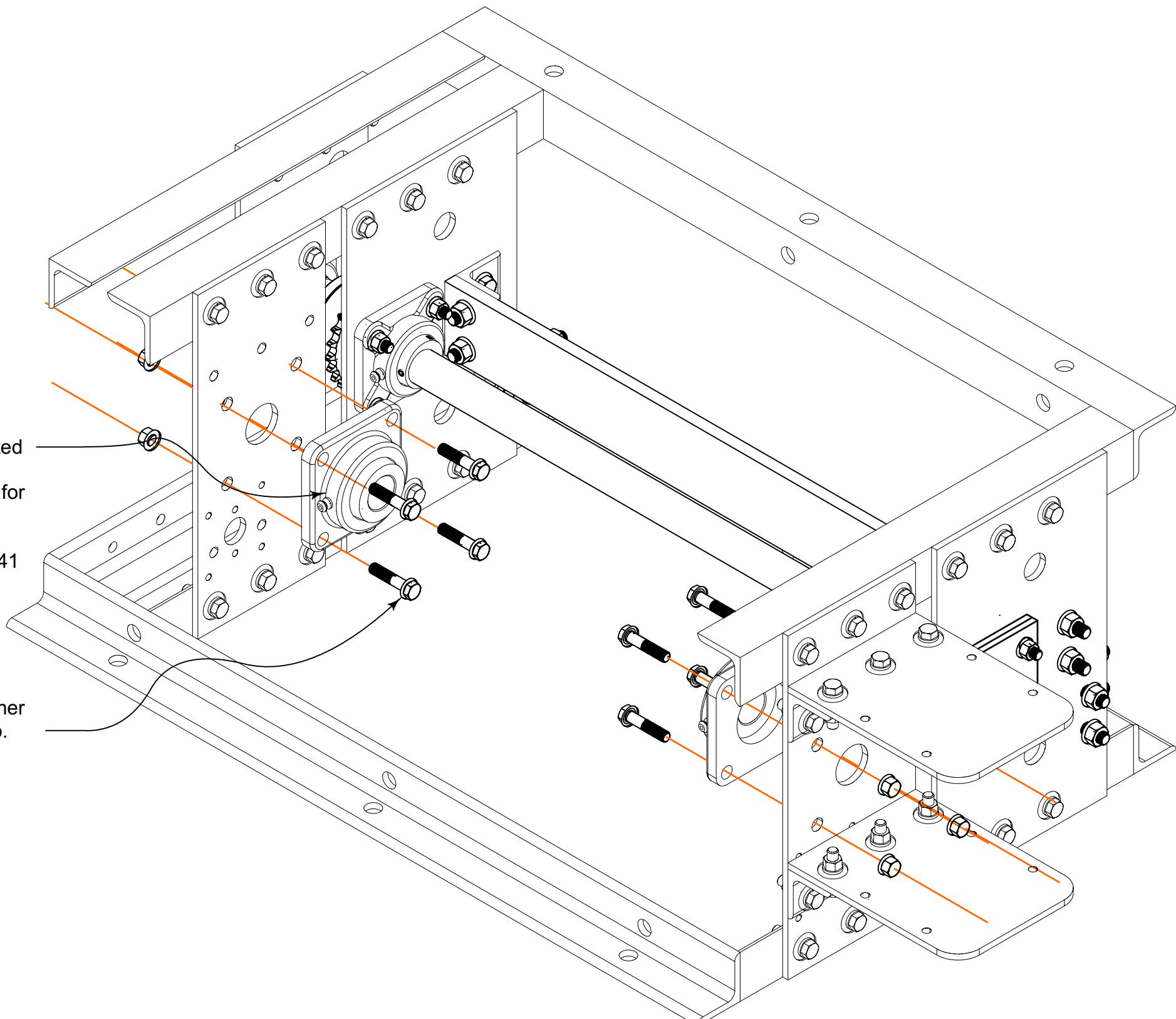
# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. Frame Selections, Ball Screw Thread, and Winder Hidden for Clarity.

Four-Bolt Flange-Mounted Ball Bearing with Cast Iron Housing, for 1-1/4" Shaft Diameter, 4-1/4" High McMaster-Carr #5967K41 Typ.

3/8-16 x Appropriate Length GR5 Hex Cap Screws with SAE Washer and Nylon Locknut, typ.

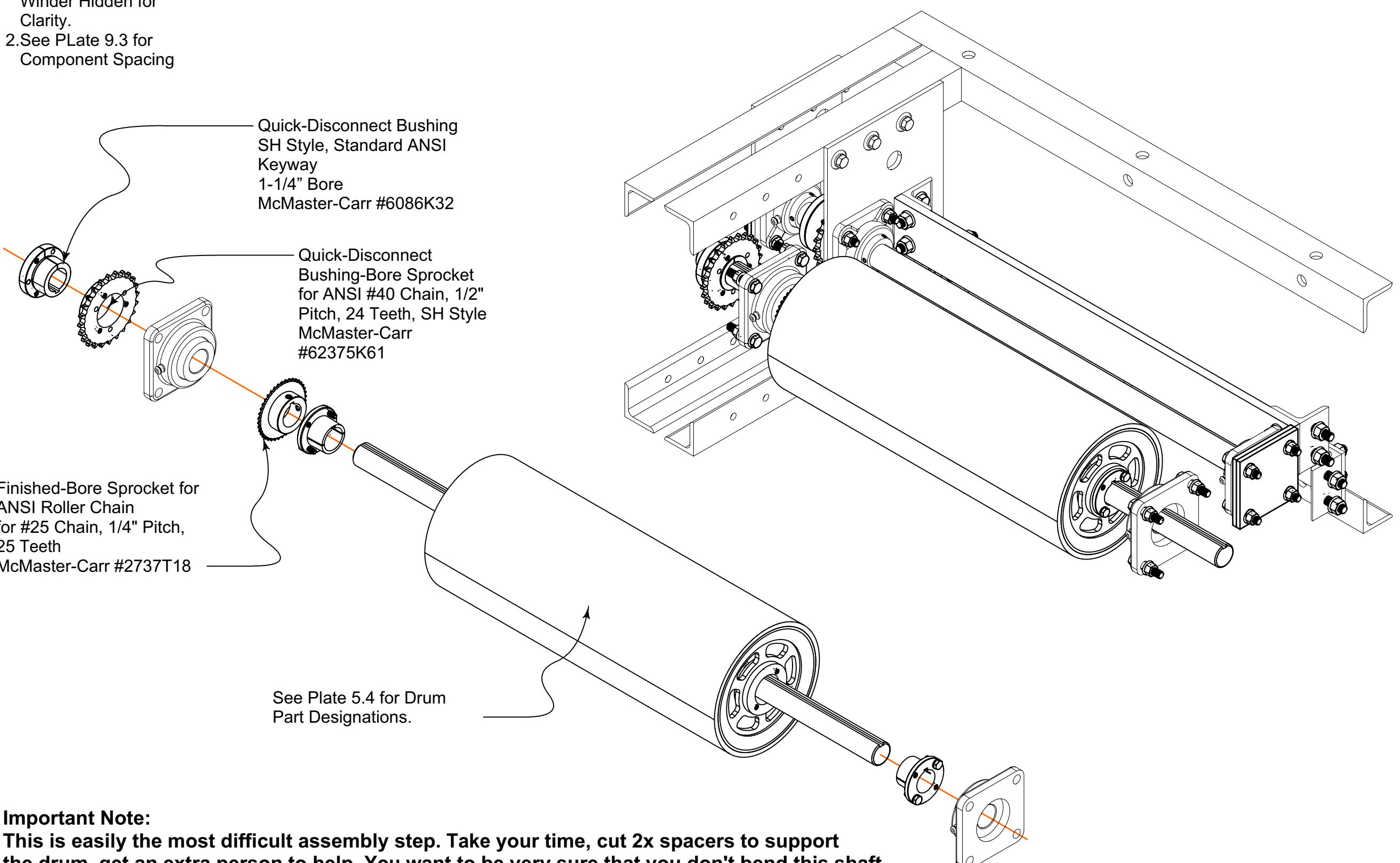


	<b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title	Drum Install
Sheet Title	Drive Bearings Install
Date and Revision	5/10/2016 3.01
Scale	As Noted
Page Size	Tabloid
Designed and Drawn	Frank C. Meyer III
Page of Pages	9.1 of 67
<b>FCM</b>	
Carnegie Mellon University School of Drama	

# VECTORWORKS EDUCATIONAL VERSION

## General Notes

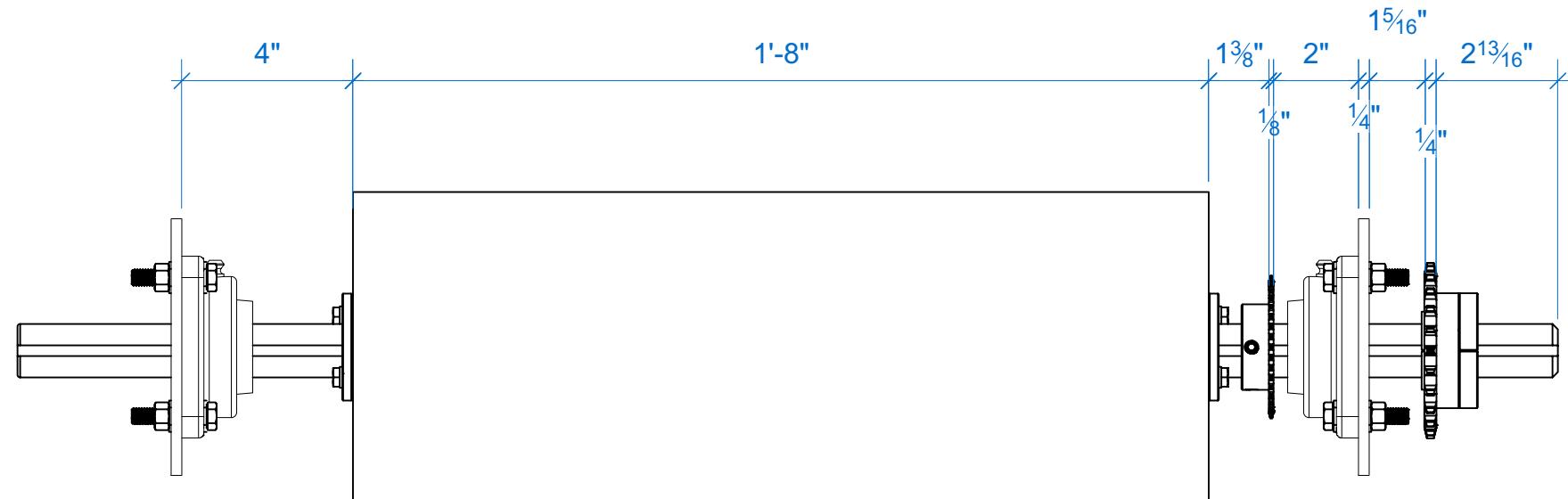
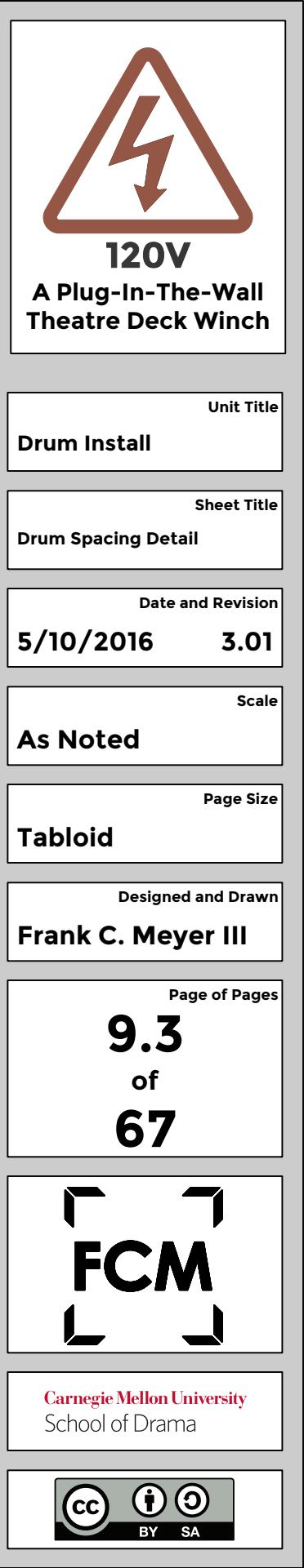
1. Frame Selections, Ball Screw Thread, and Winder Hidden for Clarity.
2. See Plate 9.3 for Component Spacing



## Important Note:

This is easily the most difficult assembly step. Take your time, cut 2x spacers to support the drum, get an extra person to help. You want to be very sure that you don't bend this shaft. Be prepared to loosen mounted bearings to ease alignment.

	<b>120V</b>
A Plug-In-The-Wall Theatre Deck Winch	
Unit Title	Drum Install
Sheet Title	Drive Drum Install
Date and Revision	5/10/2016 3.01
Scale	As Noted
Page Size	Tabloid
Designed and Drawn	Frank C. Meyer III
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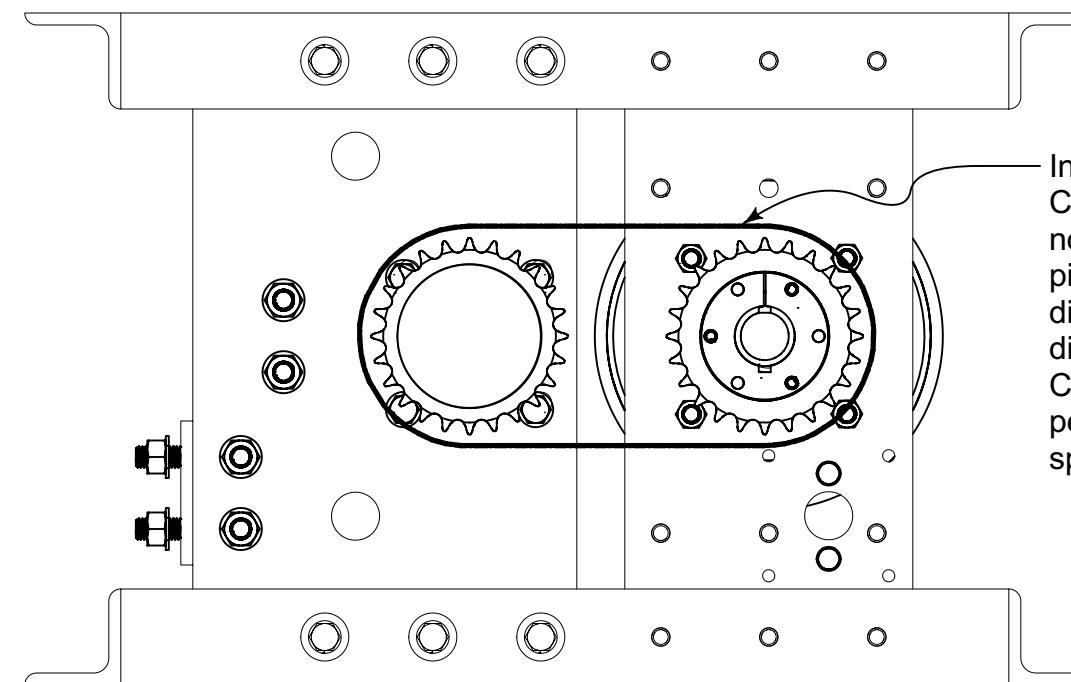
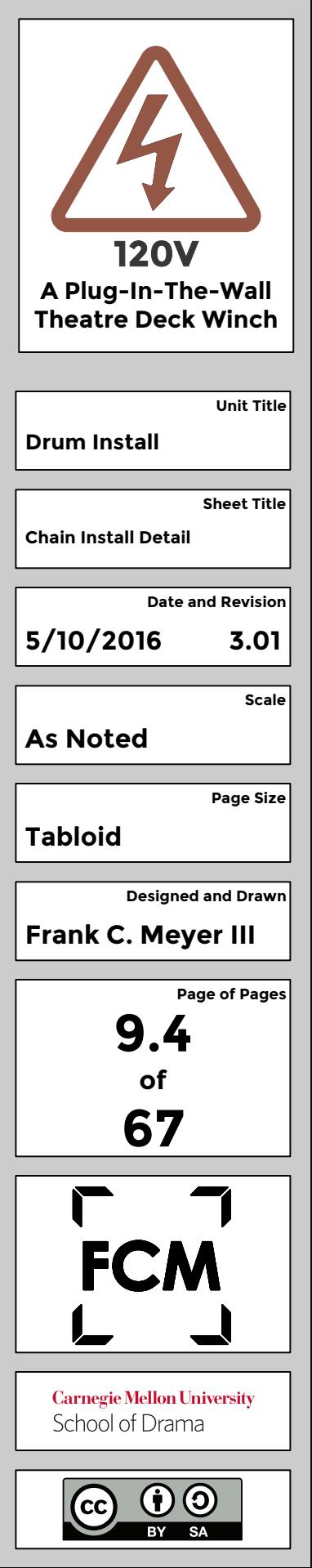
1  
9.3 Plan View - Framing Removed  
Scale: 3" = 1'-0"

#### General Notes

1. All Unnecessary Parts Removed For Clarity.
2. Parts spacing indicated is a good place to start. Some adjustment may be necessary to ensure proper alignment, specifically with chain sprockets.

General Notes

1. Right Mounting Plate, Screw Retaining Plate, UHMW Pad, And Hubs Removed for Clarity

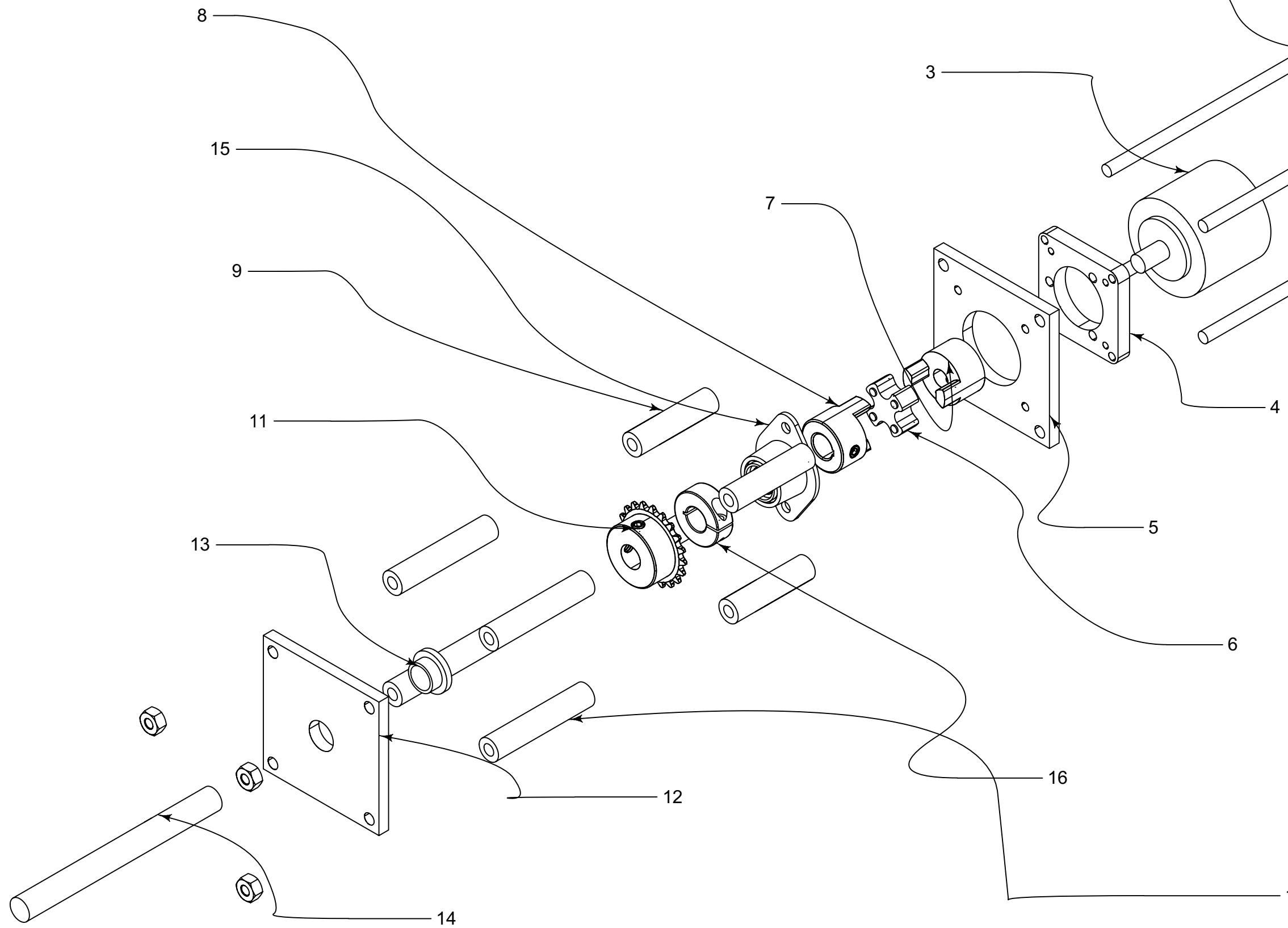


Install ANSI 40 Roller Chain. Roller Chain should not require tensioning, pitch diameter and distance should be divisible by ANSI 40 Roller Chain Pitch. Ensure perfect alignment between sprockets.

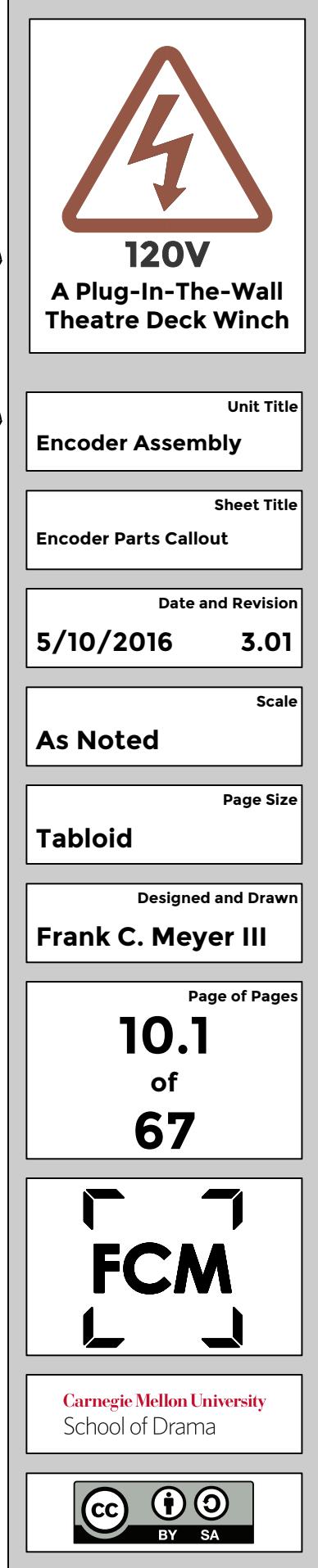
1 Chain Installation Details  
9.4 Scale: 3" = 1'-0"

**1** Encoder Parts Callout  
10.1 Not To Scale

General Notes  
1. See next page for key notes.



**VECTORWORKS EDUCATIONAL VERSION**

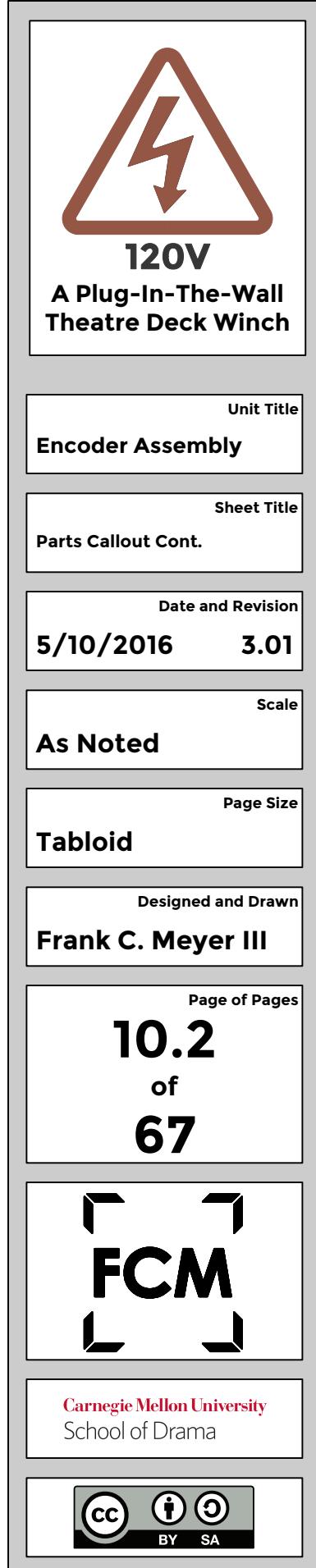


# VECTORWORKS EDUCATIONAL VERSION

## Notes

1. 1/4-20 Nylock Locknut
2. 1/4-20 Threaded Rod - 7" Length
3. ENCODER 100 PPR 0.375in SOLID LINE-DRIVER 5VDC 2m (6.5ft) CBL MED DUTY Automation Direct #: TRDA-20R1N100VD
4. MNTG FLANGE SQUARE FOR TRDA-20 SERIES ENCODERS METAL Automation Direct #:TRDA-20SND
5. Encoder Mounting Plate A - See Plate 2.11
6. Buna-N Spider for 1-5/64" Outside Diameter Flexible Shaft Coupling McMaster-Carr #6408K84

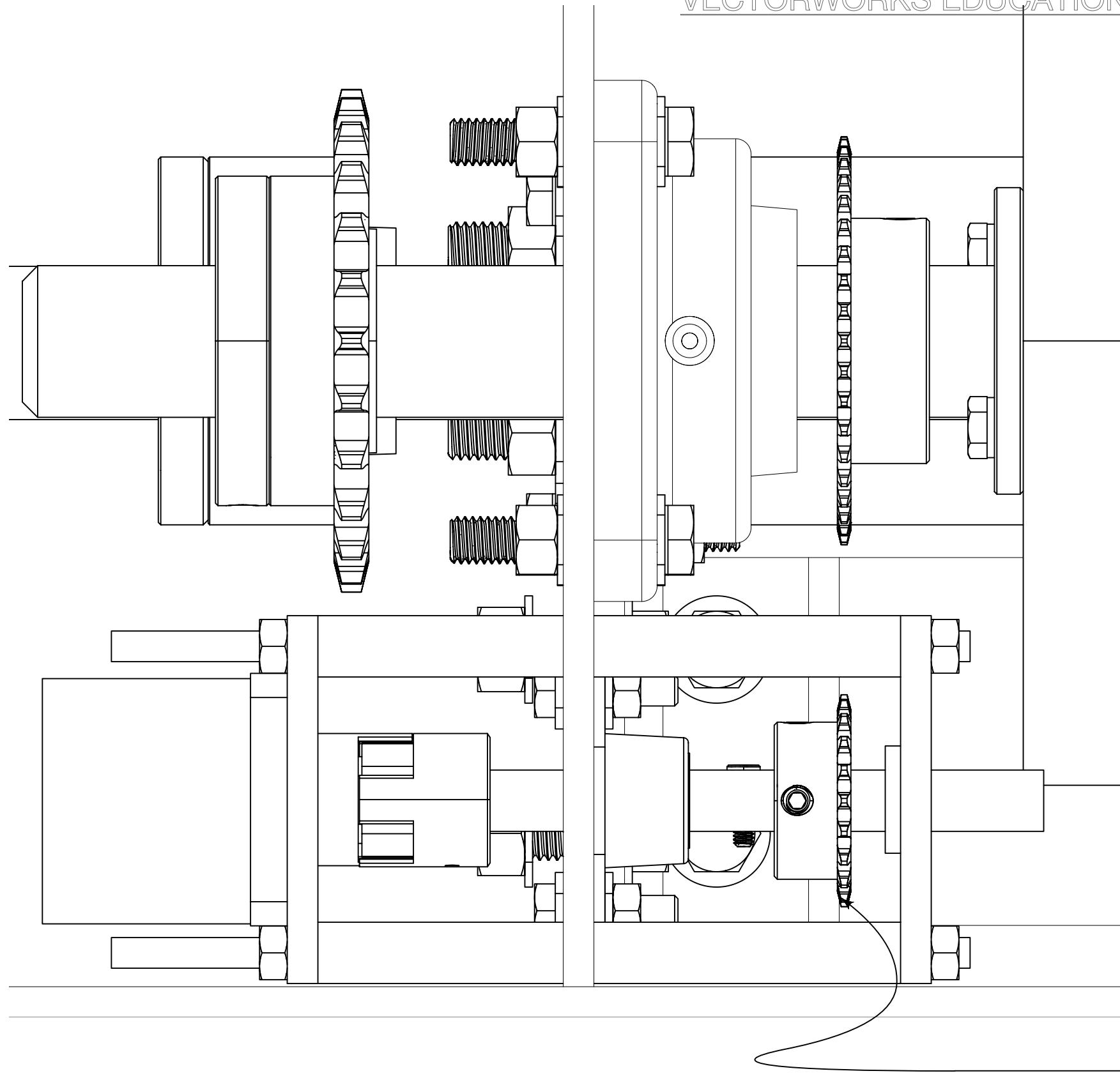
7. Flexible Shaft Coupling, Hub for 3/8" Diameter Shaft McMaster-Carr #6408K11
8. Flexible Shaft Coupling Hub for 1/2" Shaft Diameter McMaster Carr #6408K11
9. Unthreaded Spacer Stock Black Polypropylene, 0.502" OD McMaster Carr #92377A120 Cut at 2"
10. Unthreaded Spacer Stock Black Polypropylene, 0.502" OD McMaster Carr #92377A120 Cut at 2 1/2"
11. Finished-Bore Sprocket for ANSI Roller Chain for #25 Chain, 1/4" Pitch, 25 Teeth McMaster-Carr #2737T18
12. Encoder Mounting Plate B - See Plate 2.12
13. Oil-Embedded Flanged Sleeve Bearing with PTFE Ultra-Low-Friction, for 1/2" Shaft Diameter, 5/8" OD, 3/8" Long McMaster-Carr #1677K7
14. Hardened Precision Steel Shaft 1/2" Diameter, 8" Length McMaster-Carr #6061K103
15. Light Duty Two-Bolt Flange-Mounted Roller Bearing for 1/2" Shaft Diameter McMaster - Carr #1434K6
16. Two-Piece Clamp-on Shaft Collar for 1/2" Diameter, Black-Oxide Steel McMaster-Carr #6436K14



Not To Scale

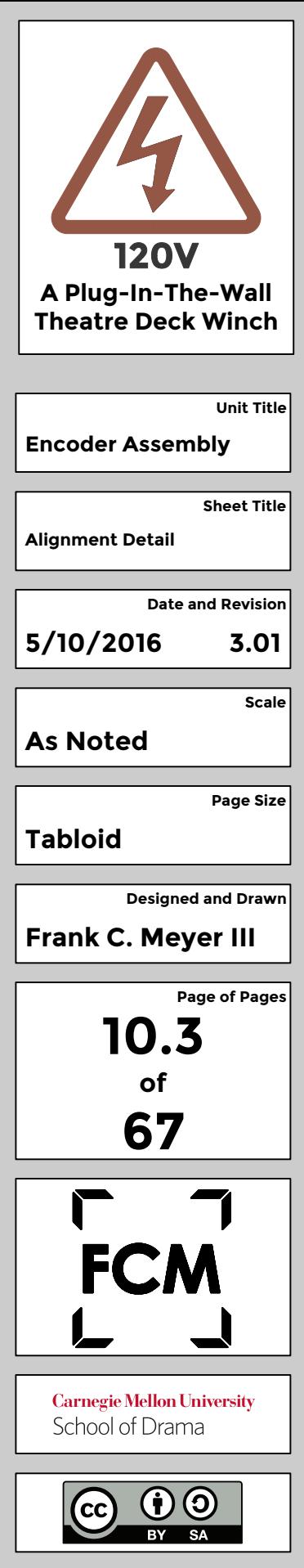
10.2 Encoder Parts Schedule

# VECTORWORKS EDUCATIONAL VERSION



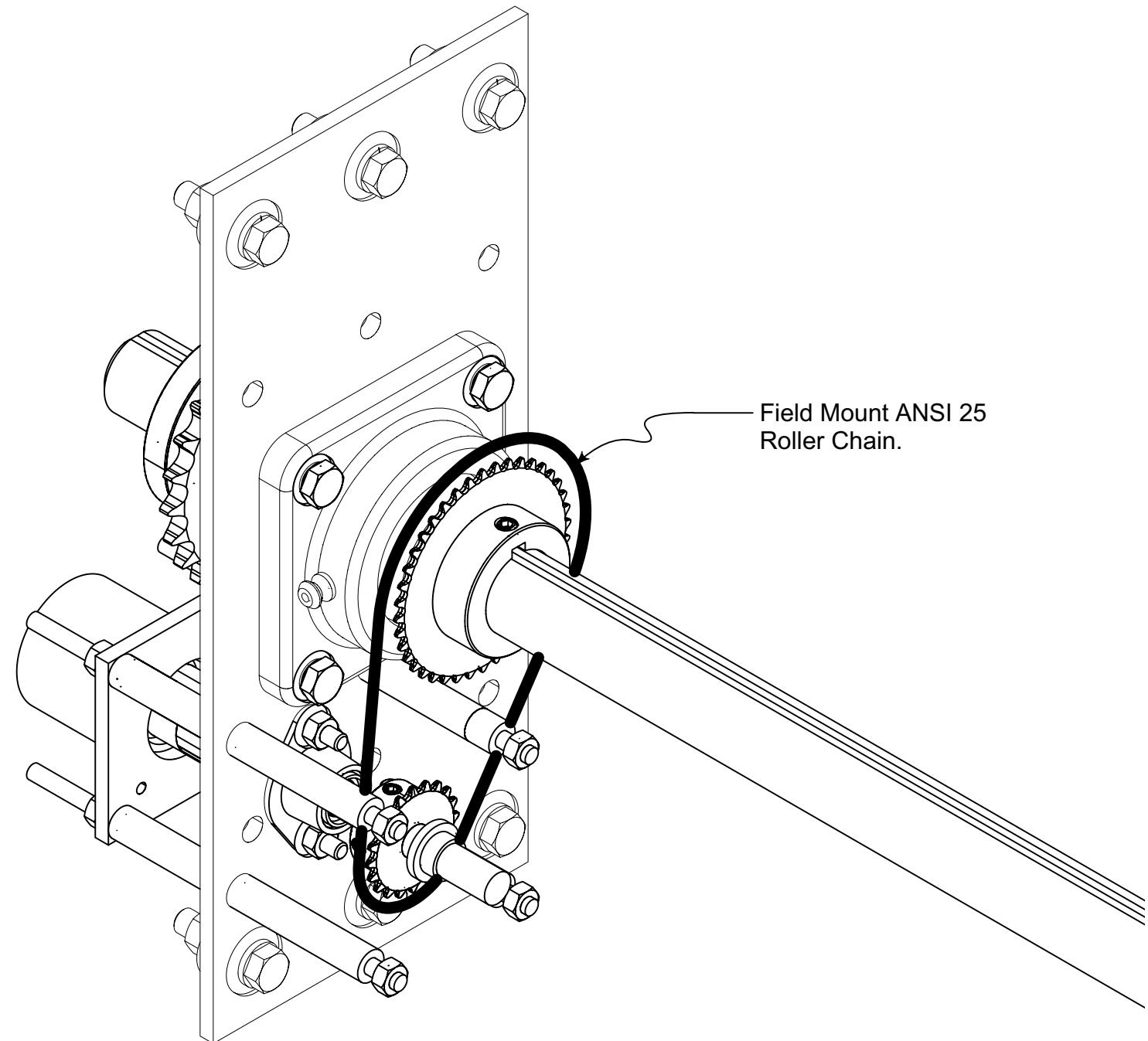
1 Encoder Mounting and Spacing Detail  
10.3 Scale: Actual Size

Field Align Chain  
Sprockets



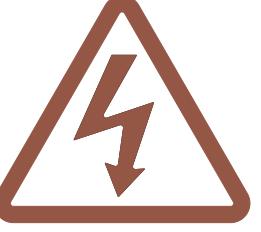
General Notes

1.Many  
Components  
Hidden for Clarity



1 Chain Mounting Detail  
10.4 Not To Scale

	<b>120V</b> A Plug-In-The-Wall Theatre Deck Winch
Unit Title	<b>Encoder Assembly</b>
Sheet Title	<b>Chain Install</b>
Date and Revision	<b>5/10/2016 3.01</b>
Scale	<b>As Noted</b>
Page Size	<b>Tabloid</b>
Designed and Drawn	<b>Frank C. Meyer III</b>
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**120V**  
A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title		
<b>Power Transmission</b>		
Sheet Title		
<b>Gearbox Install</b>		
Date and Revision		
<b>5/10/2016</b>	<b>3.01</b>	
Scale		
<b>As Noted</b>		
Page Size		
<b>Tabloid</b>		
Designed and Drawn		
<b>Frank C. Meyer III</b>		
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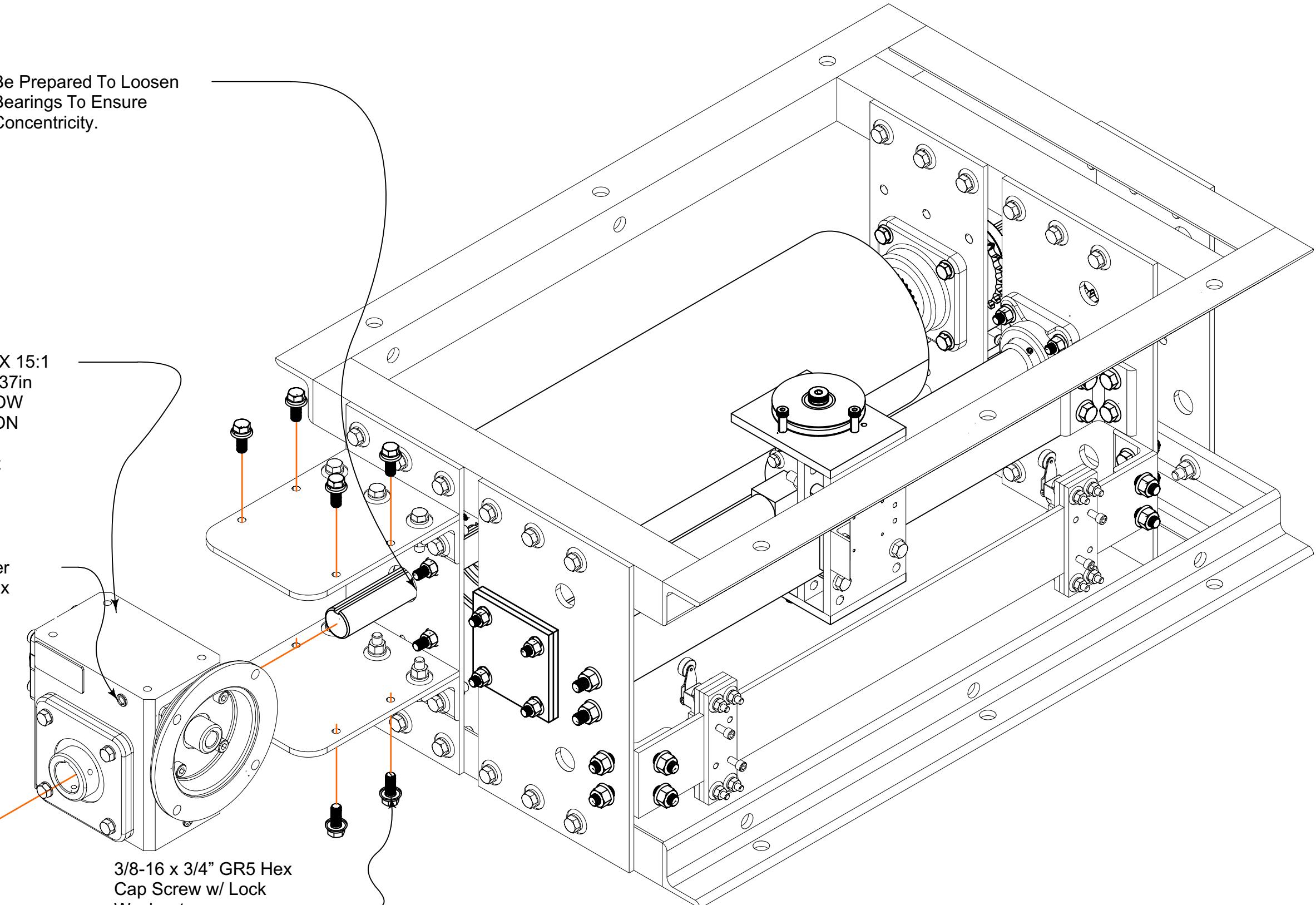
Be Prepared To Loosen  
Bearings To Ensure  
Concentricity.

WORM GEARBOX 15:1  
56C-FACE 1hp 2.37in  
CTR DIST HOLLOW  
SHAFT CAST IRON

Automation Direct  
#:WG-237-015-H

Place Vent Plug After  
Install - See Gearbox  
Documentation

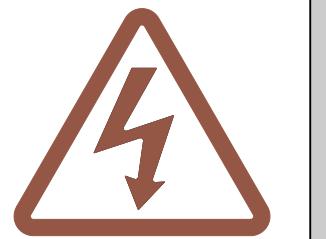
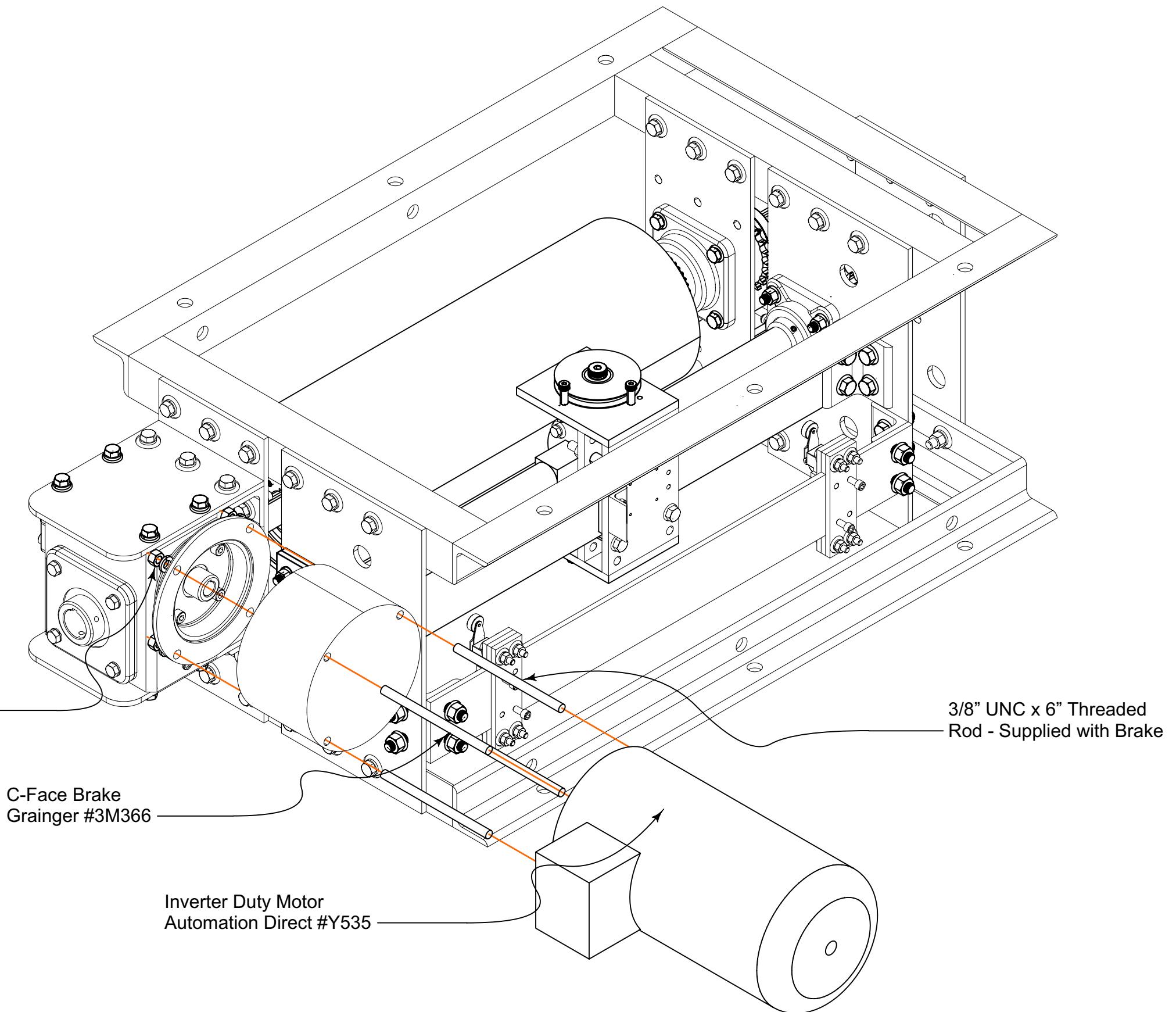
3/8-16 x 3/4" GR5 Hex  
Cap Screw w/ Lock  
Washer typ.



# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. We had a lot of trouble configuring the brake, but others who have used the same model did not. Your Milage May Vary. Be sure to consult the manual.



**120V**

A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

**Power Transmission**

Sheet Title

**Motor & Brake Install**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

**Tabloid**

Designed and Drawn

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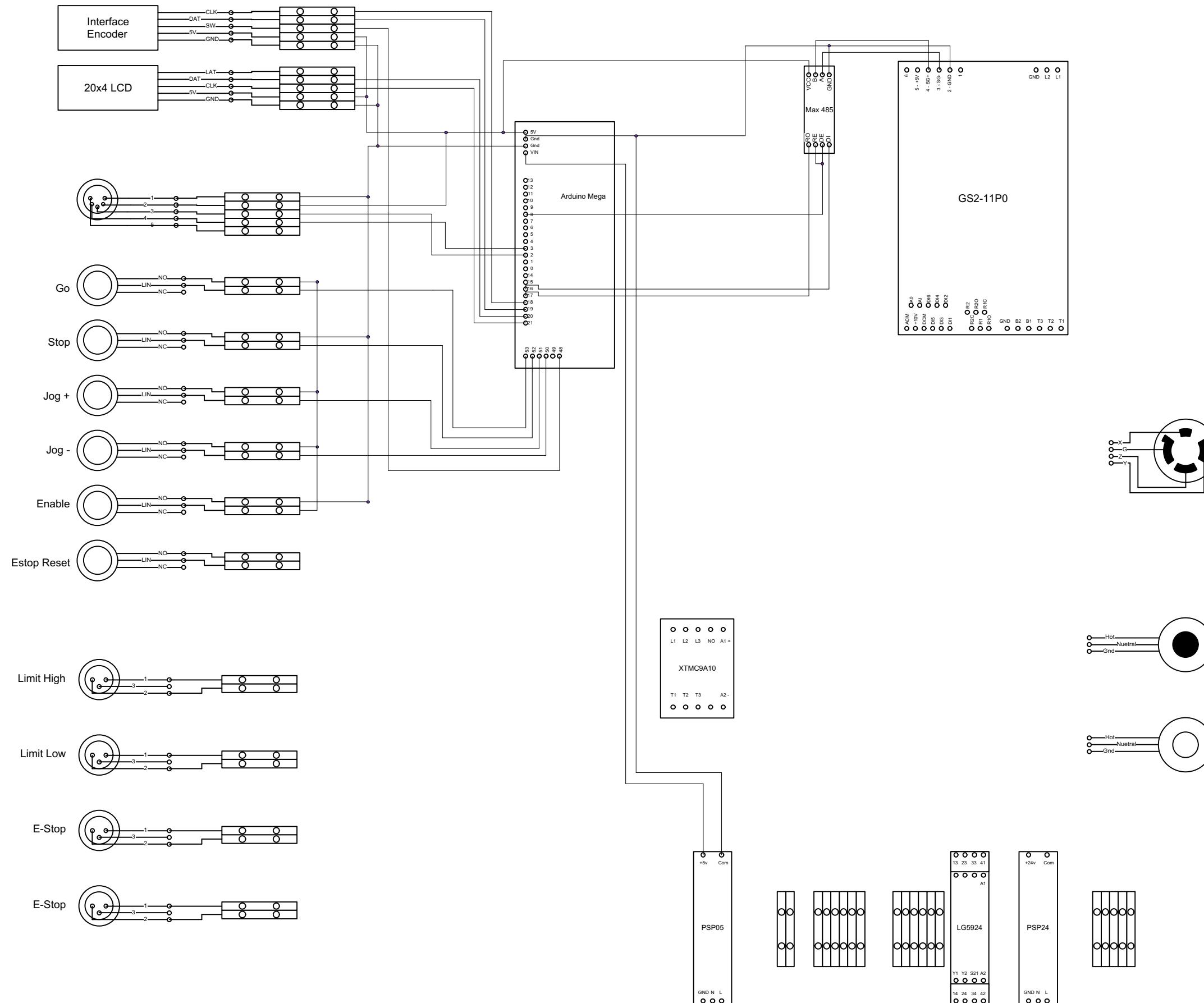
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# VECTORWORKS EDUCATIONAL VERSION

## General Notes

1. All 5v  
Connections made with 20ga stranded MTW/THHN.



Unit Title  
**Wiring Diagrams**

Sheet Title  
**5V Wiring**

Date and Revision  
**5/10/2016 3.01**

Scale  
**As Noted**

Page Size  
**Tabloid**

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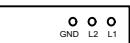
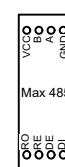
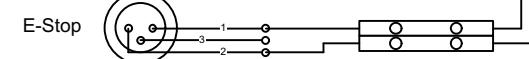
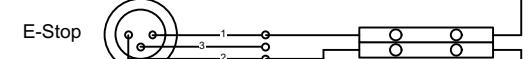
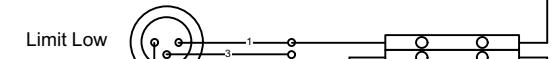
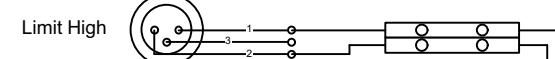
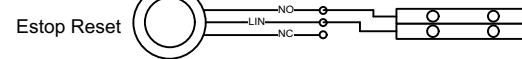
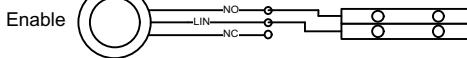
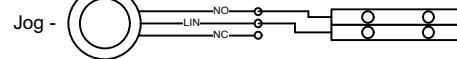
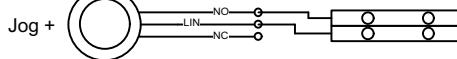
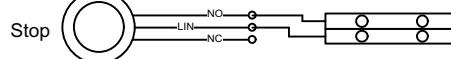
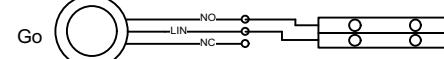
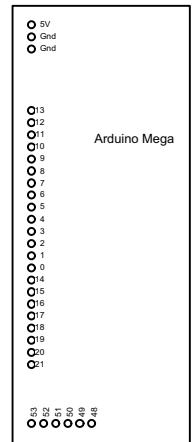
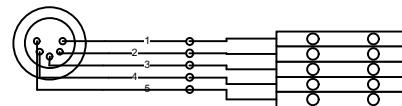
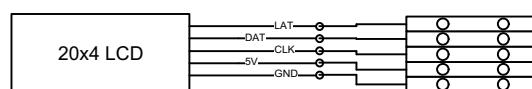
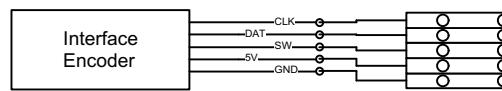
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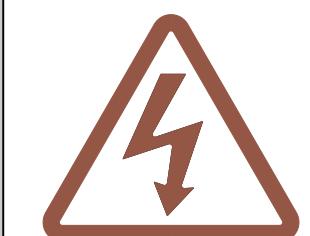
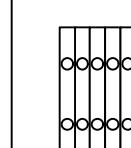
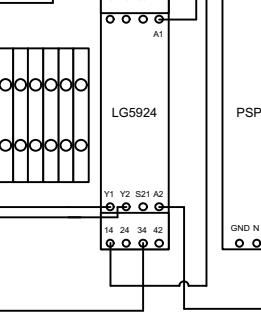
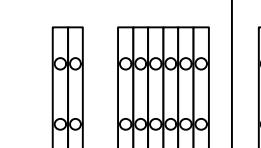
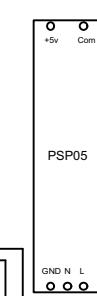
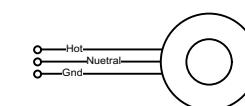
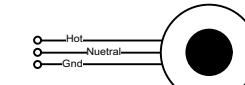
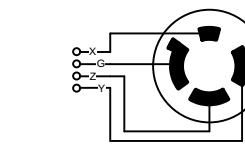
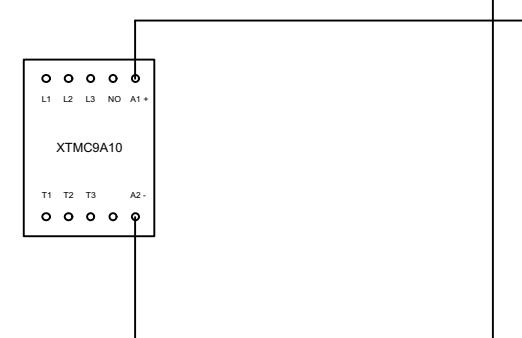


# VECTORWORKS EDUCATIONAL VERSION

General Notes  
1. All 24v  
Connections made with 16ga stranded MTW/THHN.



GS2-11P0



120V

A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

Wiring Diagrams

Sheet Title

24V Wiring

Date and Revision

5/10/2016 3.01

Scale

As Noted

Page Size

Tabloid

Designed and Drawn

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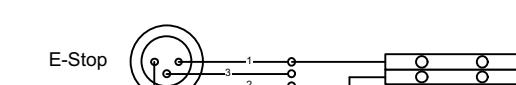
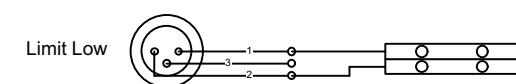
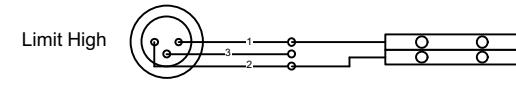
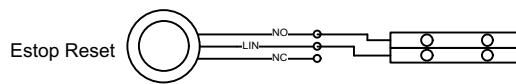
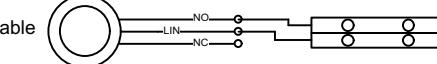
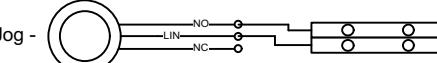
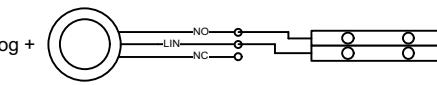
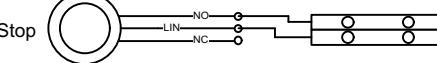
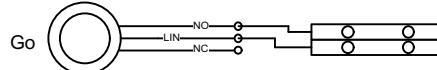
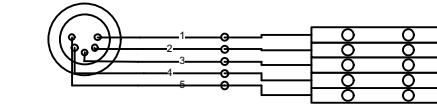
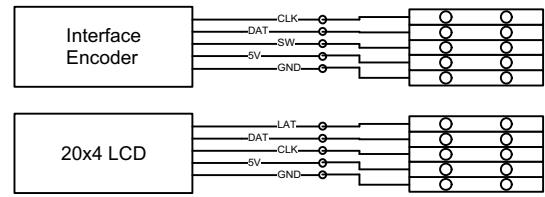
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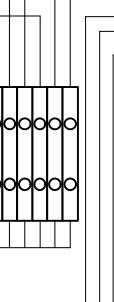
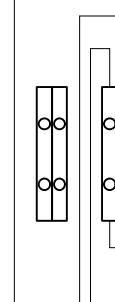
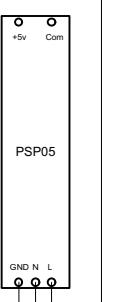
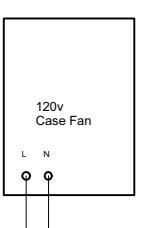
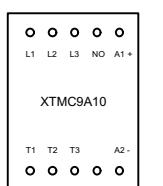
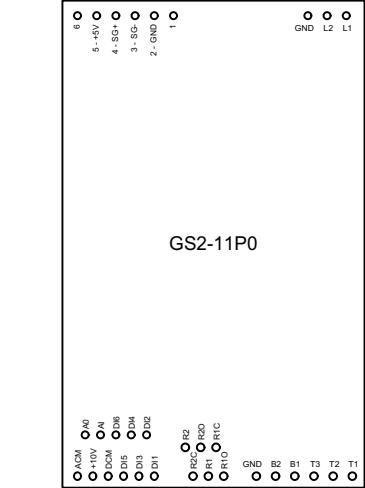
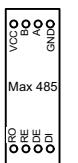
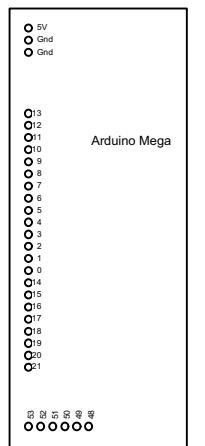


## General Notes

1. All High Voltage Connections made with 12ga stranded MTW/THHN.



## VECTORWORKS EDUCATIONAL VERSION



## VECTORWORKS EDUCATIONAL VERSION



**120V**

**A Plug-In-The-Wall  
Theatre Deck Winch**

Unit Title

**Wiring Diagrams**

Sheet Title

**120V Wiring**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

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Designed and Drawn

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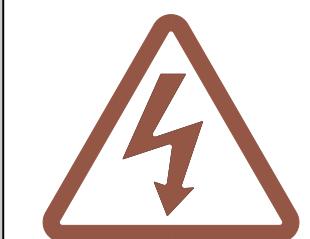
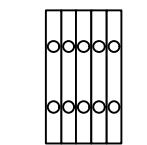
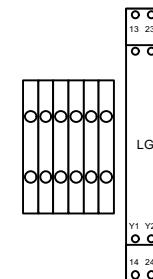
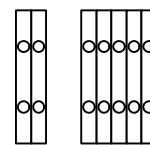
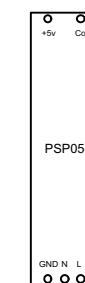
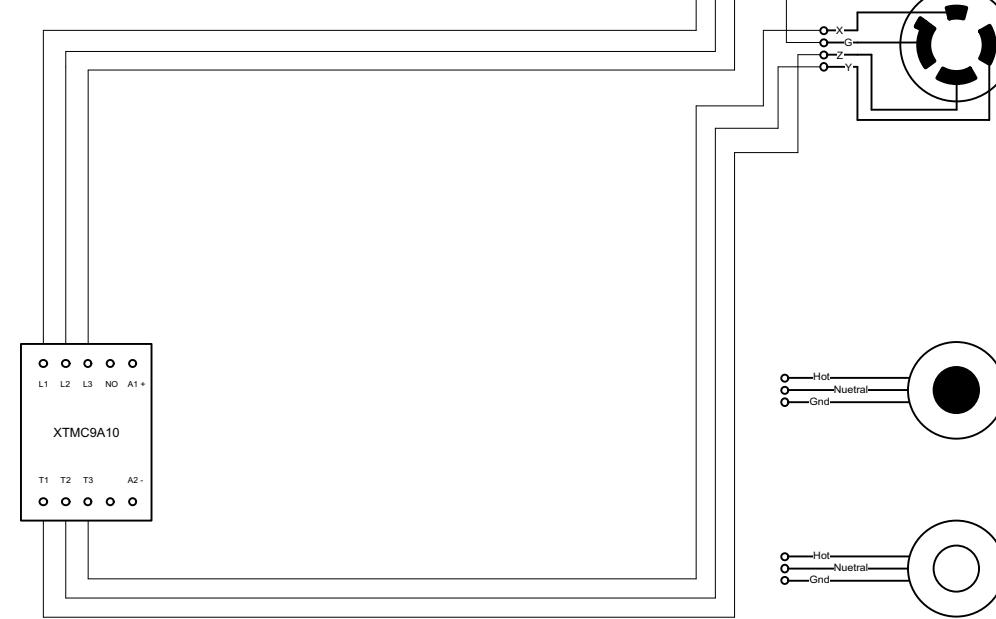
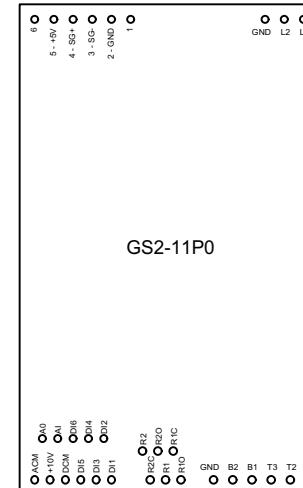
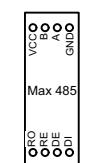
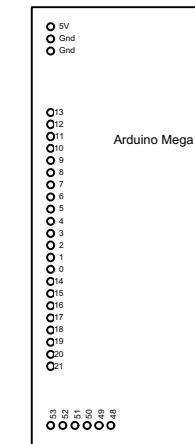
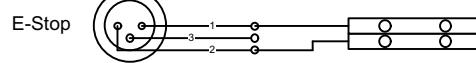
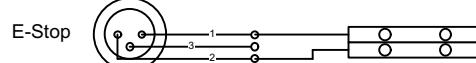
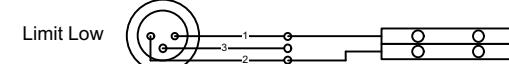
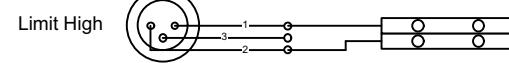
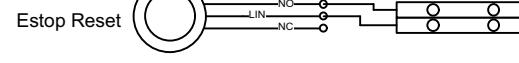
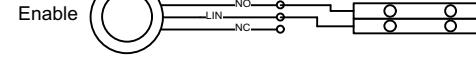
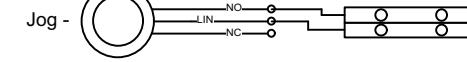
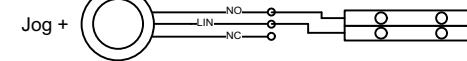
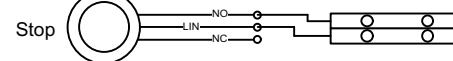
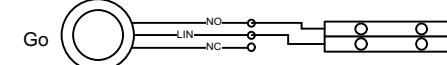
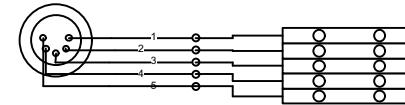
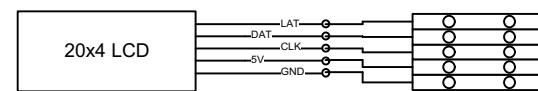
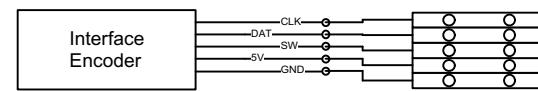
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School of Drama



# VECTORWORKS EDUCATIONAL VERSION

General Notes

1. All High Voltage Connections made with 12ga stranded MTW/THHN.



**120V**  
A Plug-In-The-Wall  
Theatre Deck Winch

Unit Title

**Wiring Diagrams**

Sheet Title

**Motor Power Wiring**

Date and Revision

**5/10/2016 3.01**

Scale

**As Noted**

Page Size

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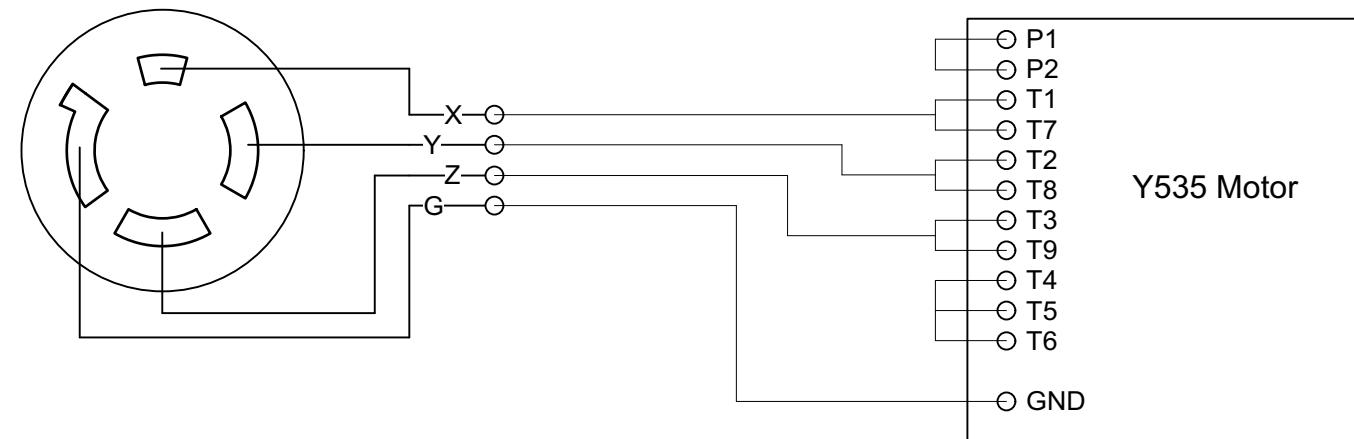
Carnegie Mellon University  
School of Drama



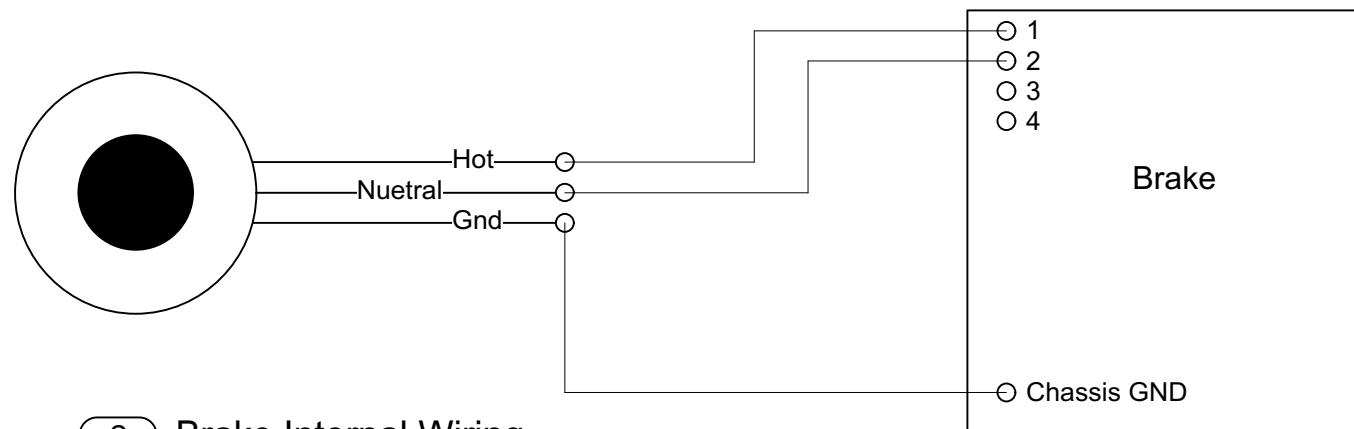
# VECTORWORKS EDUCATIONAL VERSION

## General Notes

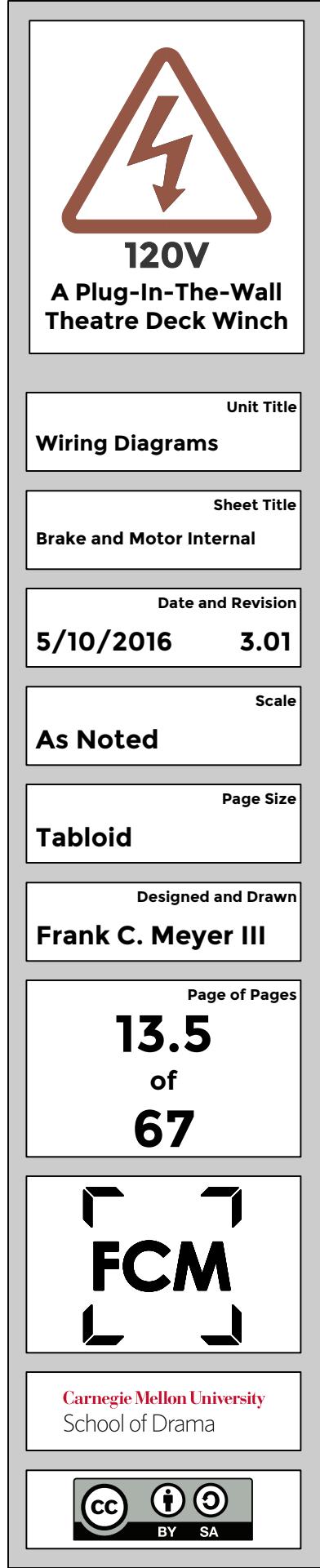
1. All Internal Wiring Connections Completed With Lever Nuts.
2. Motor to Cabinet connection is 12/4 SO/SJO/Similar
3. Brake to Cabinet connection is 12/3 SO/SJO/Similar



1 Motor Internal Wiring  
13.5 Not To Scale

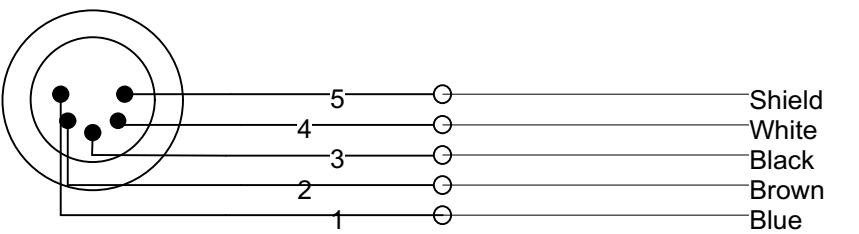


2 Brake Internal Wiring  
13.5 Not To Scale

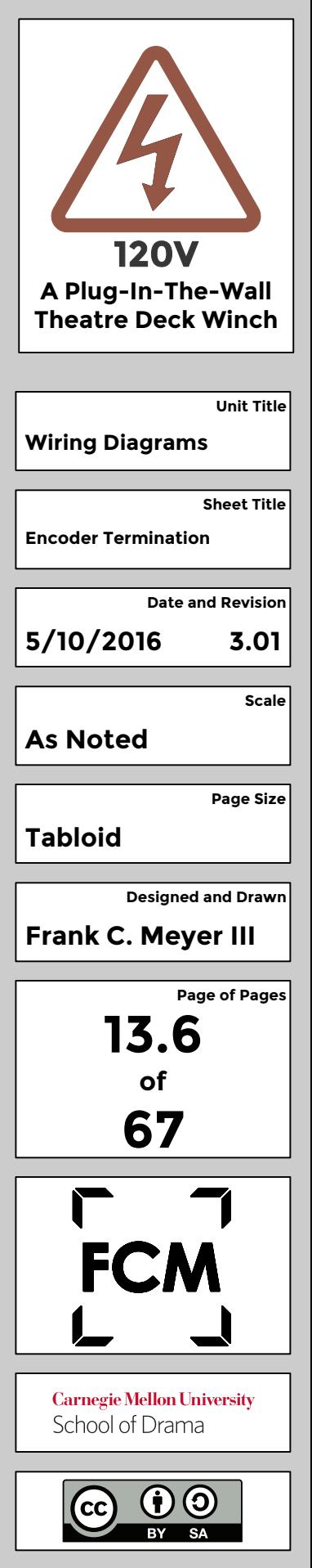


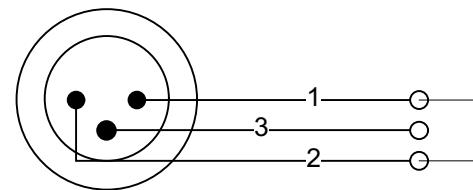
General Notes

1. Cable termination is XLR5 Male.
2. Use best wiring practices when wiring and soldering all connections.

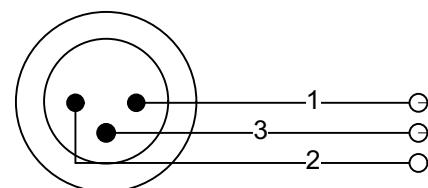


1 Encoder Cable Termination Detail  
13.6 Not To Scale





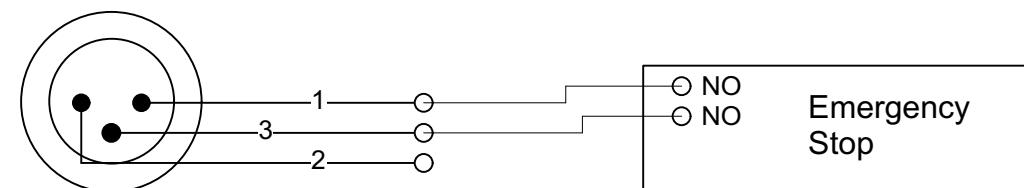
**1** Bypass Dongle  
13.7 Not To Scale



**2** EOT Limit Switch  
13.7 Not To Scale

NO  
 NO  
 NC  
 NC

Honeywell  
SZL-VL-A



**3** Emergency Stop Switch  
13.7 Not To Scale

General Notes

1. All cable mount connectors are XLR3M.
2. Cable is 2 Conductor + Shield. Essentially Microphone Cable.



Unit Title  
**Wiring Diagrams**

Sheet Title  
**Limit and E-stop**

Date and Revision  
**5/10/2016 3.01**

Scale  
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