Term Project Drawing Standards

General Instructions

Within this document are the SE 3 drawing standards for the Final Term Project Construction Drawings to be compiled by each team. You are required to follow all instructions and standards listed. Please ask the SE 3 Teaching Team for any clarifications or questions about what is expected.

Disclaimer Please note that the examples shown throughout this document are from past student projects and *may not 100% represent the requirements for this Term Project*. However, they are all visually appealing and have many good qualities that represent the general expectations.

The complete drawing set should include a consistent look and feel between the drawings created by AutoCAD and SolidWorks. The drawing set has specific sheet requirements, which are outlined below. It is up to each team to decide the best way to organize their drawings in order to convey their Assembly clearly.

The Drawing set includes two main components: 1) Solidworks Construction Drawings, which show all of the necessary information that a builder needs to construct the various parts of the assembly, and 2) AutoCAD Experimental Test Setup Plan View and Elevations, which demonstrate how the team's assembly fits into the test track with creative background elements.

General Drawing Guidelines

- ✓ All Solidworks drawings shall be compiled on **sheet size A** and use **ANSI standards**.
- ✓ AutoCAD drawings shall be compiled on either sheet size A or C (designated within this document) and use English standards.

- ✓ Use the provided title block for Solidworks and AutoCAD drawings (there are two templates provided). Teams need to fill in all appropriate information in the title block and make sure it is not only consistent between sheets, but consistent between software programs as well.
- ✓ Title Page, General Note Sheet (including legends, symbols, table of contents), and Layout and Elevations are to be created in AutoCAD (more instructions within this document).
- ✔ Construction Drawings, including views (plans, elevations, 3D representations), sections, and detail sheets are to be created in Solidworks (more instructions within this document).
- ✓ Title page may be in color if desired, but all other pages should be printed to PDF in grayscale.
- ✓ Use the **Representative Fraction** notation (1:2, 1:5, etc.) for denoting scale (do not use Architectural or Engineering scale)

Sheet Numbering

General Instructions

- All Final Drawings must follow this given sheet numbering format
- Sheets must be compiled in alphabetical and numerical order
- Sheet number is always located in the bottom right hand corner of the sheet

Discipline Designator – One or two alphabetical characters that identifies the sheet as a member of a subset

Sheet Type Designator - One numerical character

Sheet Sequence Number – Two numerical characters. Start at 01.

Discipline Designator

G	General (provided by SE 3 Teaching Team)			
Α	Conference - Valor			
AA	Team 1			
AB	Team 2			
AC	Team 3			
AD	Team 4			
AE	Team 5			
AF	Team 6			
AG	Team 7			
AH	Team 8			
AI	Team 9			
AJ	Team 10			

Sheet ID Name Format

A A N N N

Discipline Designator

AA	N N	Ν
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Sheet Type Designator



Sheet Sequence Number

A = alphabetical characterN = numerical character

AK	Team 11
AL	Team 12
AM	Team 13
AN	Team 14
AO	Team 15
AP	Team 16
AQ	Team 17
AR	Team 18
AS	Team 19
В	Conference - Mystic
BA	Team 1
BB	Team 2
BC	Team 3
BD	Team 4
BE	Team 5
BF	Team 6
BG	Team 7
BH	Team 8
BI	Team 9
BJ	Team 10
BK	Team 11
BL	Team 12
BM	Team 13
BN	Team 14
С	Conference - Instinct
CA	Team 1
СВ	Team 2
CC	Team 3
CD	Team 4
CE	Team 5
CF	Team 6
CG	Team 7
СН	Team 8
CI	Team 9
Cl	Team 10
СК	Team 11
CL	Team 12
СМ	Team 13
CN	Team 14

(G) General – Will be used by the SE 3 Teaching Team for additional pages to complete the class drawing set. Each team should only use the Discipline Designator for their Assembly for the entire set of drawings.

Sheet 7	V pe	Desi	ignator
0			0.10.00

Number	Description
0	General Notes Sheet (AutoCAD) & Summary Sheet [includes the Sheet Index
	and Total Assembly Bill of Materials] (Solidworks)
1	Build Schematic - plan, elevations, & isometric (Solidworks)
2	Subassembly – includes exploded views, subassembly BoM, etc. (Solidworks)
3	Subassembly – includes exploded views, subassembly BoM, etc. (Solidworks)
4	Subassembly – includes exploded views, subassembly BoM, etc. (Solidworks)
5	Subassembly – includes exploded views, subassembly BoM, etc. (Solidworks)
6	Placements (Solidworks)
7	Custom Parts (Solidworks)
8	Plan View of Experimental Test Setup (AutoCAD)
9	Elevation View(s) of Experimental Test Setup (AutoCAD)

Sheet Sequence Number

The sheet sequence number should always start at 01 and subsequently increase.

Sometimes it is valuable to group sheets within a single sheet type designator, either for clarity or in case more sheets are added and would be confusing out of order. These are typically spaced at increments of 10. Let's say you started numbering all your subassemblies as 201 202 203 204 205 and then realized you wanted to add a page between 203 and 204. You can't go and renumber everything. So instead you separate all of your subassemblies into different sheet designator which will allow you to add another page to your first one without renumbering.

For example:

Suppose you want to create a 2nd subassembly, you would use sheet type designator "300". You could number your three pages that represent the subassembly and BOM using "301", "302" and "303". That way, if later you decide that you want to add details to the first subassembly (section "200") as a separate sheet, you can go back and call it "202" (or whatever is next in the series) and it will still be grouped in order without going back to renumber all the sheets when adding pages.

You never want to renumber the sheets.

Additionally, if you have more than 4 subassemblies in your project ("200" through "500") you can add more subassemblies on the "20" increment or "50". For example, if you have 8 subassemblies, you could use 200, 250, 300, 350, 400, 450, 500, 550. This keeps them spaced apart so you can still add pages to the subassemblies without renumbering the whole set.

Sheet Number	Sheet Title		
AA001	General Notes Sheet		
AA002	Summary Sheet		
AA101	Build Schematic Sheet		
AA201	Main Subassembly		

Example Table of Contents (Sheet Index) for Conference Valor - Team 1:

AA202	Main Subassembly
AA301	Auxiliary Subassembly
AA302	Auxiliary Subassembly
AA401	Support Assembly A
AA501	Support Assembly B
AA601	Placements
AA651	Support Placements
AA652	Support Placements
AA701	Custom Parts
AA801	Experimental Test Setup Plan View
AA901	Experimental Test Setup Front Elevation View
AA911	Experimental Test Setup Left Elevation View
AA921	Experimental Test Setup Right or Back Elevation View

Title Block

Title blocks should be included on all sheets except for the title sheet, use the templates provided. Information presented in the title blocks should look consistent from sheet to sheet no matter what software was used to create the drawing. Title blocks should include the following:

- SE 3 course number and term project title "Final Term Project Construction and Experimental Test Setup Drawings"
- Team Number (optional: Team Name/Company Name/Logo)
- Conference Name
- Sheet Title
- Sheet Size
- Sheet Number
- Scale (Either listed or noted to see details)
- Units (Either listed or noted to see details)
- Drawn By (Name & Date)
- Checked By (Name & Date)

PHASE 1

Solidworks Construction Drawings

All sheets that contain different views to aid in the construction of the Assembly shall be done in Solidworks. This applies to all views within sheet type designator numbers 0 through 7.

Drawings shall include all necessary dimensions, callouts, and views that allow the Assembly to be replicated. Do not be repetitive or excessive.

All views and tables should be properly labeled with appropriate headers and detail numbers.

Clarifications to aid in the compilation of these drawings:

- All parts used need to be listed by official name and part number (use the online catalog) in any Bill of Materials list.
- String is not required to be modeled in Solidworks (as it can be very difficult) but must be noted, drawn in, and/or added in a bill or materials where appropriate so the viewer can clearly understand how those parts are utilized and the quantity of string to use.

Summary Sheet (Sheet Type Designator 0)

Following the General Notes Sheet (done in AutoCAD), include a Summary Sheet which contains the following:

- 1) Sheet Index Table (i.e. table of contents)
- 2) Total Assembly Bill of Materials
 - a. This lists every Fischertechnik library part, provided connectors, and team custom parts used
 - b. For any modifications to the provided Fischertechnik parts or connectors, create your own part number using 4 digits
 - c. For custom parts, create your own part number using 3 digits
 - d. Must have a part number, description, and quantity column as shown in the example below. **BoM CANNOT be manually edited, all data must be properly filled out in the part and referenced correctly in Solidworks.**
- 3) A mini isometric image of your assembly

You may break this into 2 pages if you cannot fit the Sheet Index and Bill of Materials on the same page.

Example:Part

SHEET	HEET INDEX		TOTAL ASSEMBLY		Jaccos School PROPRIETARY AND CO THE INFORMATION CON DRAWING IS THE SOLE UC SANDIGO AND REPORT	of Engineeri ONFIDENTIAL IANED IN THIS ROPERTY OF OUCCION IN PA
NUMBER	SHEET TITLE	DADTNO		OR AS A WHOLE WITHOU PERMISSION OF UC SAN DIE	THE WRITTEN	
S.00	Title Sheet	PART NO. DESCRIPTION QTY.			DO NOT SCALE E	RAWING
S.10	Build Schematic	36921	Girder 60	5	UNO DIMENSIONS	ARE IN MM
S.20	Main Tower Subassembly	38240	Building Block V15 Corner	14		tion
S.30	Auxiliary Tower Subassembly	32850	Building Block 15x15	5	2 2	nica.
S.40	Support Subassembly A	33047	Building Block 15x50x5 Will Gloove	5	e ro	mu ers
S.50	Support Subassembly B	36950	Girder 15 With 2 Pins	3		om
S.60	Support Subassembly C	36922	Girder 15	4	S and	ngii
S.70	Start Ramp Support Subassembly	36293	Girder 120	1	I Ro vsse	phico for E
00.2	End Ramp Support	37238	Building Block 5 with 2 pins	2	Ti ≽g	db
3.00	Subassembly	38428	Building Plate 15x30x5 With 3 Grooves	3		E 3 C
S.90	Tower Placement	37237	Building Block 5	2	j j j	S
S.91	Support Placement	31982	Spring Cam	1	DIECT	URSE
\$ 0.2	Elevible Bail Diacoment	31981	Angular Block 15	3	PRC	00
3.72	Flexible Kall Flacement	151715	90 Curve	1	PART NUMBER	K005
		37468	Building Block 7,5	1	DESIGNED BY	DATE
		38244	Mounting Plate 15x75	1	-Tessica Tuazou	4/9/2018
		155901	Flexible Rail Profile 90mm, Green	4	CHECKED BY	
		143234	Flexible Rail Profile 180mm, Green	1	APPROVED BY	
		32985	Base Plate 258x186	1	REV QTY: 1	
		0]	0 SCALE:	1:5 OF 12
					SIZE DWG. N	.00
	5 4	h.,	3 2		1	

Build Schematic (Sheet Type Designator 1)

Following the Summary Sheet, include a Build Schematic sheet which contains the following:

- 1) A plan view of your assembly
- 2) An isometric view of your assembly (3rd angle view)
- 3) A front and side (you can choose left or right) elevation of your assembly
- 4) On the elevation views, you must indicate your subassemblies with a leader arrow, state the name of the subassembly, and the page number where it can be found. Use the designation "X/AAYYY" where "AAYYY" is the page (per the sheet numbering provided) and "X" is the detail number on that page (see the subassembly section for more information)



Subassemblies (Sheet Type Designator 2 - 5)

These sections are for your various subassemblies within the main assembly. These are the pages that will show someone how to put together the subassembly so they must be **clear**.

Each subassembly page must include:

- 1) At least one elevation view and 1 isometric view
 - a. Some subassemblies may require more views to show all the parts
- 2) At least 1 exploded view, showing the audience how to put together the subassembly
- 3) One or more views need to include bubbles that link to a BoM table that shows which parts are included in this subassembly
- 4) Include notes as necessary to clarify how pieces are put together, including any leader lines or drawing lines

If you need more than one page, make sure you add a note saying which page to find the BoM if the bubbles are shown on a different page (otherwise they are referencing nothing).

Example:





Placements (Sheet Type Designator 6)

This section shows the audience how all the subassemblies come together for the final assembly. It must clearly show how to put this kit together and be buildable. You may have multiple pages that accomplish this. Include any number of elevations, isometric images, exploded views, etc. that complete the task. Be sure to properly label the subassemblies so the audience can follow, in addition to including notes and dimensions where appropriate.





Custom Parts (Sheet Type Designator 7)

Provide a plan view, at least one elevation view, and one isometric view for your custom parts (should be two per team member). Include dimensions that provide an overall understanding of the size of your part(s).



PHASE 2

AutoCAD Experimental Test Setup Plan View and Elevation Drawings

All sheets that contain different views to aid in showing the overall Experimental Test Setup shall be done in AutoCAD. This applies to all views within sheet type designator numbers 8 through 9.

Drawings shall include all necessary dimensions, callouts, and views that allow the Experimental Test Setup to be understood. Do not be repetitive or excessive.

Experimental Test Setup Plan View and Elevations are required to clearly demonstrate the team's creativity and skills in AutoCAD.

Experimental Test Setup Plan and Elevation View Drawings (Sheet Type Designator 8 & 9)

Refer to the Term Project Guidelines for requirements of this section. It is repeated below for reference:

- 1) Each team will create their own elevation view and plan views of the experimental test setup that includes custom creative backgrounds and other decorative components
 - a. One team member will do the plan view, and each remaining team member will do one of the other elevation views (Front, Right, Left, or Back).
 - b. Be creative to add interesting backgrounds from the various views. You can place your experimental setup in the desert, the beach, the mountains, the city, etc.., and add interesting components to create your custom background
 - i. Your scenery MUST include the End Zones and the rest of the test set up
 - c. Create your own layers that make sense for the project. Be clear and organized. Do not put everything in the view onto only 1 or 2 layers.
- 2) In EACH of your AutoCAD drawings, each view must include a minimum of:
 - a. 3 images from the internet that are pulled in as blocks (such as people, trees, etc.)
 - b. 1 complex item that is traced from an internet image
 - c. 1 complex item that is drawn by hand
 - d. Screen video recordings of ALL of these are required so the teaching team can see that these instructions were followed for each student.
 - e. Additionally, label each item with a leader arrow and note that indicates which method was used to create or place it

Video Recordings:

Each member of the team will create a folder in their GrabCAD team workspace to upload the videos indicated in Step 2 (a through c) above. Since one team member is working on their own view (plan or elevation), the minimum requirements per view must be completed by each team member separately.

The videos required are screen recordings (you can use zoom to do this) that show the teaching team how each student followed instructions to draw or place items using the methods indicated in a through c (3 blocks, 1 complex traced image, and 1 hand drawn image). These recordings do not require heavy editing or formal compilation but must show and explain enough of the work that proves you have accomplished the task following the required method. Also, we do not want 60 min videos. They should be short snippets throughout your drawing effort to show the process so some minimal editing to string these together may be required.

Example:





PHASE 3

Title Sheet

Title sheet should be created in AutoCAD on **sheet size A** and include the following:

- SE 3 course number and term project title "SE 3 Pokémon Challenge Term Project"
- Team Number (optional: Team Name/Company Name/Logo)
- Conference Name
- Date
- A single isometric view of the Assembly (a Solidworks image file imported into AutoCAD)
- The title "Final Drawings for the XXX Assembly", where XXX is the name of your project
- List of team member names

Title sheet should NOT include the following:

- Title block
- Multiple views or photos of the Assembly
- Legends or symbols table
- General project notes
- Table of Contents





General Notes Sheet

General Notes Sheet shall be created in AutoCAD on **sheet size A** and include the following:

- Page number is "XX001" where "XX" is the appropriate Disciple Designator
- Any legends or symbols tables needed
- A section called Sheet Type Designator that summarizes your numbering sequence.
- A written section titled "Project Learned Results"
 - As a numbered list, describe the various concepts, techniques, applications, etc. that you learned while doing this term project (individually and/or as a team)
 - Keep each numbered item concise
 - Must have at least 10 items that show in-depth understanding of the course (i.e. do not write "We learned AutoCAD", "We learned SolidWorks". A better example would be, "We learned how to effectively design parts in SolidWorks that were able to be 3D printed, using techniques such as ____.")
- A written section titled "Project Challenges"
 - As a numbered list, describe the various challenges that you faced during the course of this project
 - Keep each numbered item concise

• Must have at least 5 items that show-in depth understanding and specific details (i.e. do not write "The project was challenging", etc.)

Example:

			J OF C
SHEET TYPE DESIGNATIONS	PF	ROJECT LEARNED RESULTS	ALL
NUMBER DESCRIPTION			
0 GENERAL	1)		
1 PLANS			
2 ELEVATIONS	2)		
3 SUBASSEMBLIES / MECHANISMS			1.15
4 LARGE SCALE VIEWS	3)		ST TO
5 3D PRINT DETAILS			IN DIED
6 ACRYLIC DETAILS	4)		
9 CONSTRUCTION PROCESSES			SE3- RUBE GOLDBERG COMPETITION
TABLE OF CONTENTS	5)		
CD 001 - GENERAL NOTES			CONFERENCE
CD 011 - ISOMETRIC VIEW	6)		
CD 012 - EXPLODED VIEW	"		RUBE CUBE 43
CD 101 - PLAN VIEW			DRAWN: RYAN SITAR 6/8/17
CD 201 - ELEVATIONS	7)		CHECKED: GRAHAM MARTIN 6/8/17
CD 301 - ACRYLIC BALL RAMP	1 81		APPROVED BY: SCOTT SPROUSE 6/8/17
CD 302 - BALL RAMP POSITIONS	"		DIMENSIONS ARE IN INCHES
CD 311 - HAMMER SUBASSEMBLY	9)		TOLERANCES:
CD 321 - BIRD STARTER SUBASSEMBLY			FRACTIONAL +/- 1
CD 331 - WHIRLY BIRD	10		32
CD 341 - DOMINO STAIRS			
CD 351 - FINAL SPINNER ASSEMBLY			
CD 401 - HAMMER MAIN BODY		PROJECT CHALLENGES	
CD 402 - BIRD STARTER SPINNER			
	1)		MATERIAL: NA
CD 501 - BASE OF BALL RAMP DETAIL			FINISH : NONE
CD 502 - BALL GUIDE DETAIL	2)		COMMENTS:
CD 503 - BUCKET DETAIL			
CD 504 - BIRD STARTER COLUMN DETAIL			
CD 505 - DOMINO WITH HOLE DETAIL			
_CD 506 - LOCKING MECHANISM DETAIL			SHEET TITLE:
CD 601 - HAMMER SUPPORT DETAILS			
CD 602 - HAMMER MAIN BODY DETAILS			GENERAL DETAILS
CD 901 - # ACRYLIC SHEET CONSTRUCTION	5)		
CD 902 - 16 ACRYLIC SHEET CONSTRUCTION			
CD 911 - CONSTRUCTION PROCEDURE			SCALE: NA

Complete Drawing Set Submission

At the end of Phase 3, teams will submit a complete drawing set in PDF form. It must be in the following order (matching the page numbers):

- Title Page (AutoCAD, phase 3)
- General Notes Sheet (AutoCAD phase 3)
- Summary Sheet (Solidworks phase 1)
- Build Schematic (Solidworks phase 1)
- Subassembly sheets (Solidworks phase 1)
- Placements (Solidworks phase 1)
- Custom Parts (Solidworks phase 1)
- Experimental Test Setup Plan View (AutoCAD phase 2)
- Experimental Test Setup Elevation View(s) (AutoCAD phase 2)