LANL Unique Sequence Pin Extractor Senior Design Project

CAD Handbook

Rev	Change Description	Initials	Date Modified
A	Creation	MDH	10/07/2017
B	Updated definitions	MDH	10/09/2017

Contents

Purpose

With any project, it is important to maintain an organized structure. This ensures productivity and consistency in products. This document serves to define, explain, and maintain a structure for the LANL Unique Sequence Pin Extractor Project as well as the revision control strategy used by the team.

The procedures outlined in this document will increase efficiency by decreasing the possibility of overwriting (working on the same file at the same time), duplicate parts, incorrect revisions, and other time-intensive scenarios.

Expectations

It is important that any person working on a CAD document of any type follows the formats, structures, and procedures outlined in this document. Failure to do so will create a blocker for productivity, hindering hide project.

The following is a list of expectations of any person working on parts, drawings, or assemblies for the LANL Unique Sequence Pin Extractor Project:

- All files will be created and edited using only SolidWorks 2017-2018 Edition
- All drawings will be created on Size B Design Center Colorado templates
- All new files will be created according to "Creating a new file" procedure outlined in the **Procedures** section of this document
- All files will be edited according to the "Editing an existing file" procedure outlined in the **Procedures** section of this document

Definitions

Archived – A file that is no longer needed
Checked In – A file that is not in a "Checked_Out" and is available for use by any team member
Checked Out – A file that is currently being edited and exists in a "Checked_Out" folder
Establishment - check, approve, release, transmit
Fit – Item size, mating, mounting, attachment, or connection
Form – Item material, composition, general shape, or other physical parameters which characterize part
Function – Item purpose, operation, or performance (such as: method of use, operating range, safety, compatibility, reliability, accuracy, etc.)
Interchangeability – Ability of item to replace and be replaced
Preparation (Design) - Edit, request review, record changes
Procedure – Sequential document describing how to perform a given action
Registration - Give document a title, describe, allocate numbers
Released – A file that is production ready or has already been produced
Revision - change control, edit, request review, record changes
Use - publish, find, view, redline, print
Voided – A file that is corrupted to the point it can no longer be used
WIP (Work In Progress) – File that is created and being edited
Withdrawal - approve, hide from view

Getting Started

Downloading the proper version of SolidWorks can be done by visiting the ITLL SolidWorks software resource page (https://itll.colorado.edu/resources/solidworks_software) and filling out the form. An email will be sent to the user's Colorado.edu address. An instructional document will be included in said email with a procedure of how to download and install the correct version of SolidWorks.

Once SolidWorks 2017-2018 is installed, the proper drawing templates should be downloaded and installed. This can be done by following the instructions on the Senior Design D2L page under the "SolidWorks Templates" tab in the content section. **IMPORTANT:** *One should follow these instructions very deliberately as this is vital to proper revision control.* If there are questions, contact the CAD Engineer.

The proper version of SolidWorks with the templates pre-installed is available on all ITLL and Idea Forge computers.

When editing files, it is important to emulate the Google Drive folder structure. The best way to do this is to right-click the main folder, LANL_CAD, select download, then unzip somewhere locally. Then delete "Setup," "Checked_Out," and "ARCHIVE" sub-folders as well as all existing SolidWorks files included in the zip file. Note that files are not to be stored locally, only edited locally. This is solely to set up the file structure for smooth editing.

File Life Cycle

Every file created will follow this life cycle. Parts, drawings, and assemblies will each have their own definitions for each cycle.
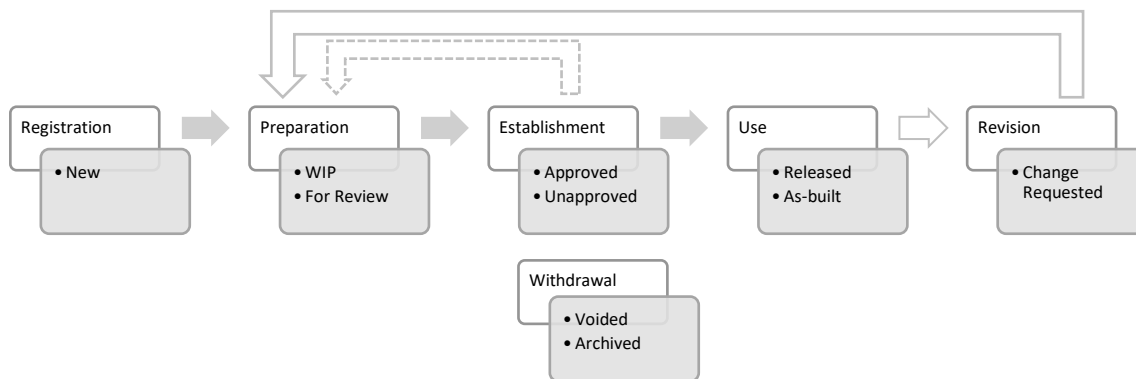

Figure 1 – Graphic representation of the life cycle of a SolidWorks CAD file.

Parts
1. Registration
    a. New – new file created
2. Preparation
    a. WIP (Work in Progress) – File editing in progress
    b. For Review – Part finished and ready for review

3. Establishment
   a. Approved – Part is complete, integratable into assembly, meets specifications, all analysis is complete and accurate
   b. Unapproved – Part is incomplete, not integratable into assembly, does not meet specifications, analysis shows design flaw. Part must descend back to preparation phase.
4. Use
   a. Released – Part is approved and ready to be manufactured
   b. As-built – Part has been released and built
5. Revision
   a. Change requested – Needed change is recognized after part has been put into use. Part must go back to preparation phase and repeat cycle. Change could occur before or after part is manufactured. Any changes made on paper are a revision and must be added to digital file.
6. Withdrawal
   a. Voided – Part is not useable, new part must be created
   b. Archived – Part is no longer needed

Drawings
1. Registration
   a. New – new file created
2. Preparation
   a. WIP (Work in Progress) – Drawing editing in progress
   b. For Review – Drawing finished and ready for review
3. Establishment
   a. Approved – Drawing is complete, fully dimensioned, material is specified, has been reviewed by shop manager
   b. Unapproved – Part is incomplete, not integratable into assembly, does not meet specifications, analysis shows design flaw. Part must descend back to preparation phase.
4. Use
   a. Released – Drawing is plotted on 11"x17" paper and is ready to be brought into machine shop for manufacturing
   b. As-built – Part has been built and any paper edits have been added to drawing file
5. Revision
   a. Change requested – Needed change is recognized after part has been put into use. Drawing must go back to preparation phase and repeat cycle. Change could occur before or after part is manufactured. Any changes made on paper are a revision and must be added to digital file.
6. Withdrawal
   a. Voided – Drawing is not useable, new drawing must be created
   b. Archived – Part and thus drawing is no longer needed

Assemblies
1. Registration
    a. New – new assembly file created
2. Preparation
    a. WIP (Work in Progress) – Assembly editing in progress
    b. For Review – Assembly finished and ready for review
3. Establishment
    a. Approved – Assembly is complete, all parts are present, exploded view is created, all mates are defined properly
    b. Unapproved – Assembly is incomplete, parts are missing from assembly, parts are not mated correctly, parts are not integratable into assembly, assembly must go back to preparation phase
4. Use
    a. Released – Assembly is approved and ready to be built
    b. As-built – Assembly has been build and all changes have been integrated into the digital file
5. Revision
    a. Change requested – Needed change is recognized after part has been put into use. Assembly must go back to preparation phase and repeat cycle. Change could occur before or after part is manufactured. Any changes made on paper are a revision and must be added to digital file.
6. Withdrawal
    a. Voided – Assembly is not useable, new assembly must be created
    b. Archived – Assembly is no longer needed

Revision Control
Every part, drawing, and assembly is differentiated by its individual part number and file extension. Revisions of files are controlled by revision numbers with two parts, a whole number and decimal. The decimal part of the revision number increments with minor changes. The revision number will increment to the next whole number with substantial design changes. If a design change alters the part to the point of changing its interface with the assembly, it must be assigned a new part number. Best judgement should be used when assigning new part numbers or revision numbers.

File Structure
The file structure, as seen in Fig. 2, has been designed to keep track of files as they are edited and protect files while they are being edited. SolidWorks files exist in three subdirectories, LANL_CAD\DRAWINGS\, LANL_CAD\PARTS\, and LANL_CAD\ASSEMBLIES. Any files in these folders are considered "Checked In" and are available for use by any team member. In each of the folders listed prior, there is a Checked_Out folder. This folder holds any files that are actively being edited. No file in this folder is to be downloaded locally so that only one team

member is editing a file at a time. It is imperative that files are "Checked Out" before they are edited, and that they are "Checked In" as soon as they are done. See **Editing a File** procedure.
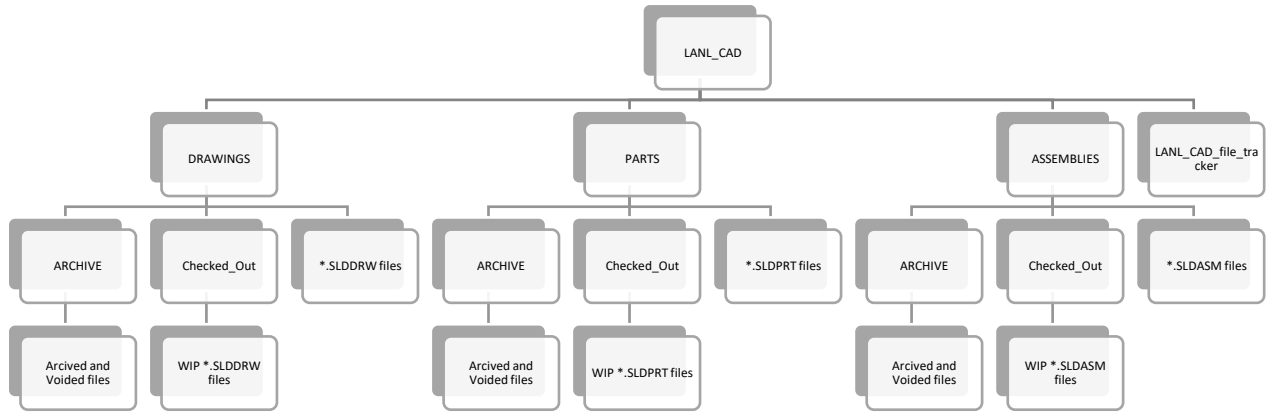

***Figure 2** – Revision control file structure of the LANL_CAD Google Drive Folder*

Part Numbers

A part number is assigned to all parts, drawings, and assemblies. A part number is a random, unique six-digit numerical number. Anytime a part is altered to the point of its interface with the assembly changing, it must be assigned a new part number.

Major Revisions

A file begins at revision 1.0. Anytime a major revision is made, changing form, fit, or function, a new major revision number must be assigned to the part. On drawings, if dimensions, notes, or any other aspect fundamental to the production of the part is changed, a new major revision number should be assigned. On an assembly, if parts are added/removed, interfaces are changed, mates are added/removed, or any other change is made that changes the form, fit, or function of the assembly, a new major revision number should be given to the assembly.

Minor Revisions

Minor revision numbers should be assigned if a change does not affect the form, fit, or function of a part. Examples include changing the color or finish of a part, updating the material, updating title blocks, or any other change that does not warrant a new major revision number.

Null Revisions

A null revision is one that does not require any revision number update. This includes fixing misspellings, adjusting the layout of a drawing, changing the orientation of a part in an assembly, or any other change that does not affect the larger design in any substantial way.

Procedures

Purpose of Procedures

Procedures are created so that all members of the design team are creating files in a consistent manner. They exist for the sake of not having surprises when editing files or procuring drawings for manufacturing. A procedure consists of six parts: purpose, scope, application, definitions, requirements, and the procedure itself. Following procedures may take more upfront time, but they save time in the long run. Following procedures is a vital part of teamwork and is also a common courtesy. Any fundamental questions about procedures should be addressed to the point-of-contact on the project, the CAD Engineer.

Creating a New Part File

Purpose

Adding a new file is the first step in any CAD design process. It is important to follow this procedure as the registration must be completed properly. This procedure documents how and where to create a new file, and how to properly register a new file.
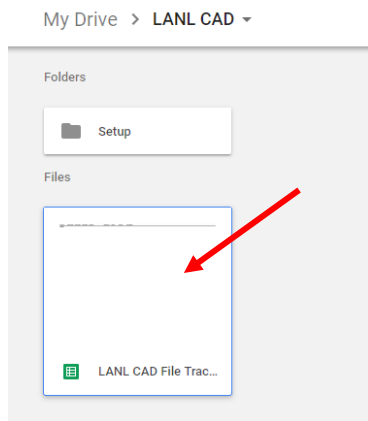
Scope

This procedure applies to the creation of a new part file.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, Design Center Colorado part template, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Navigate to "LANL CAD" Google Drive Folder and open LANL_CAD_file_tracker

2. Wait for "CAD Editor" side panel to open then select "Add File" button
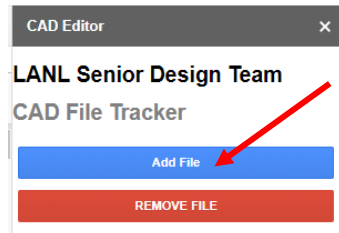
3. Select "Part" radio button, fill in the fields, then click "Create." This will create an entry in the spreadsheet with required information
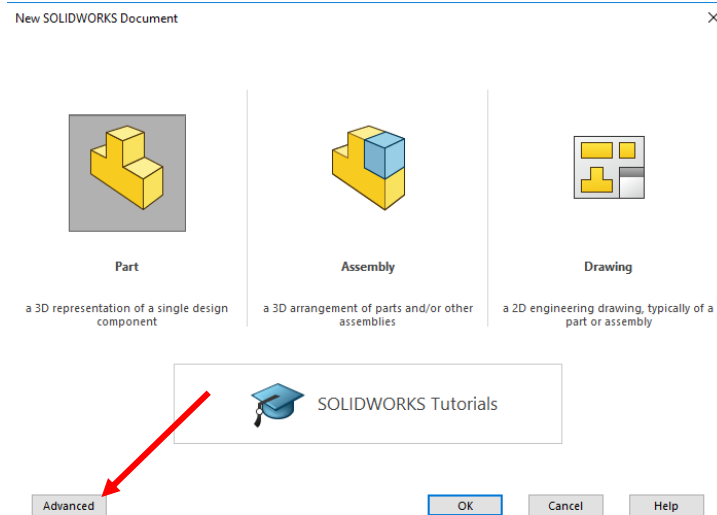
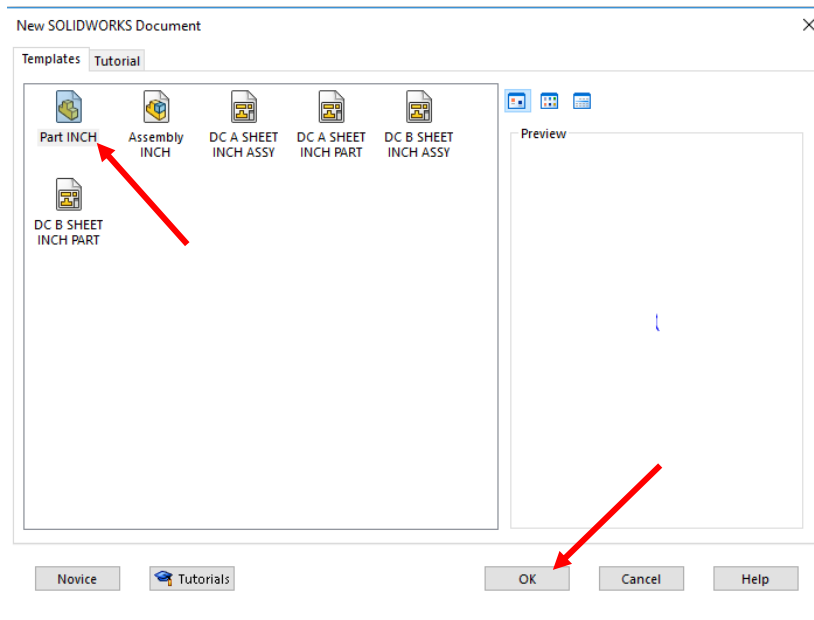|	A	B	C	D	E	F	G	H	I
1	File Type	Phase Status	Part Number	Description	Filename	Depends on	Creator	Revision	Last Modified
2	Part	Registered	731691	O-Ring for case assembly	731691.sldprt	N/A	Matt	1.0	Sat Oct 07 2017

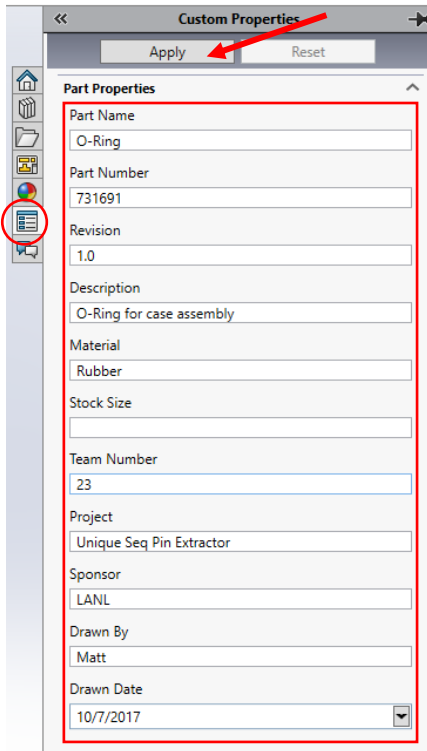4. Open SolidWorks
5. Select new document button
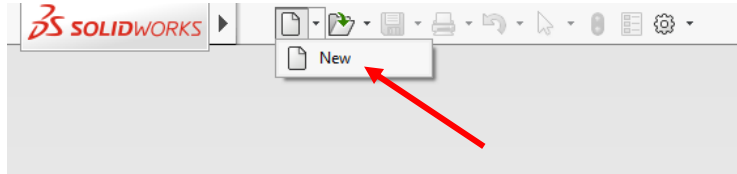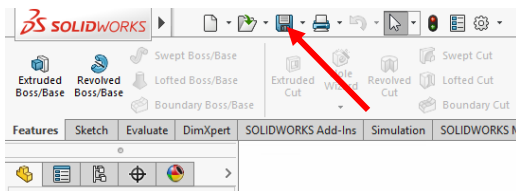

6. Select advanced option

7. Select "Part INCH" then click "OK"

8. Select "Custom Properties" and fill in as many of the following blocks as possible then click "Apply."

9. Select the save icon, enter the filename as "######.SLDPRT," then click save (where ###### is the part number). Save the part into the local LANL_CAD\PARTS\ folder (see **Getting Started**)

10. Upload the part file to the Google Drive Folder "LANL_CAD\PARTS\"
11. Delete the file locally once it is in the Google Drive Folder

Creating a New Drawing File

Purpose

Adding a new file is the first step in any CAD design process. It is important to follow this procedure as the registration must be completed properly. This procedure documents how and where to create a new file, and how to properly register a new file.

Scope

This procedure applies to the creation of a new drawing file for an existing part.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, Design Center Colorado size B drawing template, part file, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

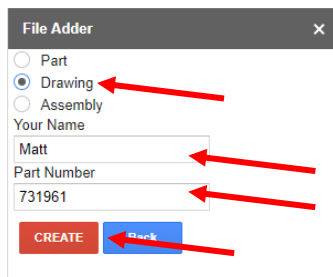1. Navigate to "LANL CAD" Google Drive Folder and open LANL_CAD_file_tracker
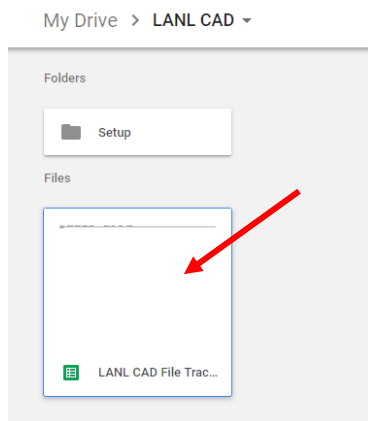
2. Wait for "CAD Editor" side panel to open then select "Add File" button
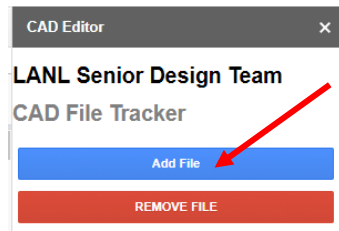

3. Select "Drawing" radio button, fill in the fields, then click "Create." This will create an entry in the spreadsheet with required information. In the "Part Number" field, enter the part number for which the drawing is being created.

File Type	Life Cycle Status	Phase Status	Part Name	Part Number	Description	Filename	Depends on	Creator	Revision	Last Modified	Last Modifier
Part	Preperation	For Review	O-Ring	731691	O-Ring for case assembly	731961.SLDPRT	N/A	Matt	2.3	Mon Oct 09 2017	Matt
Drawing	Registered	New		731961	N/A	731961.slddrw	731961	Matt	1.0	Mon Oct 09 2017	

4. Download the part specified in the prior step by right clicking and selecting "download" and place into the correct local folder
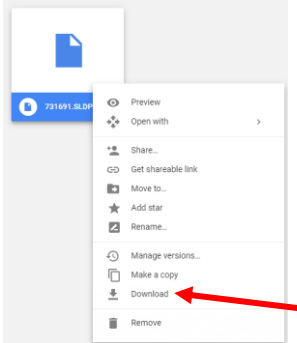
5. Open the part in SolidWorks then select File → Make Drawing from part
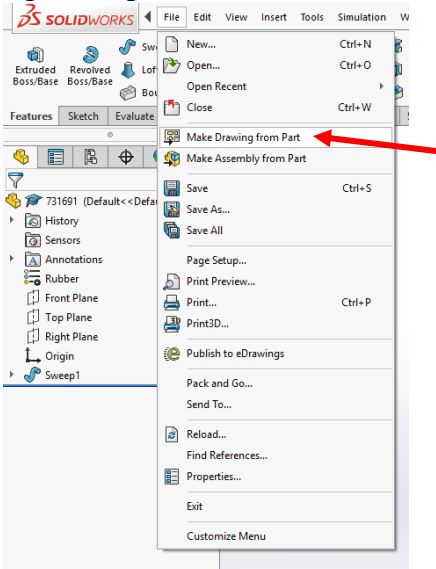
6. Select "DC B SHEET INCH PART" for a part or "DC B SHEET INCH ASSY" for an assembly then click "OK." All drawings for this project will be created on B Size sheets.

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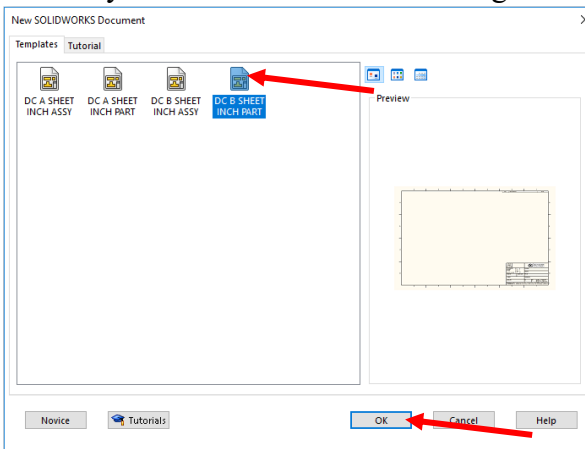
7. Save the file locally using the name specified on the LANL_CAD_file_tracker spreadsheet.
8. Upload the part file to the Google Drive Folder "LANL_CAD\PARTS\"
9. Delete the file locally

Creating a New Assembly File

Purpose

Adding a new file is the first step in any CAD design process. It is important to follow this procedure as the registration must be completed properly. This procedure documents how and where to create a new file, and how to properly register a new file.
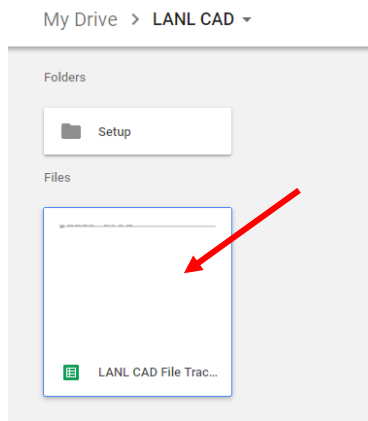
Scope

This procedure applies to the creation of a new assembly file composing of existing parts.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Navigate to "LANL CAD" Google Drive Folder and open LANL_CAD_file_tracker

2. Wait for "CAD Editor" side panel to open then select "Add File" button
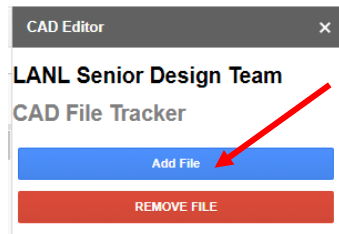
3. Select "Assembly" radio button, fill in the fields, then click "Create." This will create an entry in the spreadsheet with required information. In the "Dependency Part Numbers" field, enter the part numbers for which the assembly is being created. Once characters are entered into this field, a blank field will be added below for additional part numbers.

File Adder ✕

○ Part
○ Drawing
◉ Assembly

Your Name
Matt

Assembly Name
Case

Description
Case assembly

Dependency Part Numbers
731961
839737
430308
Part Number...

CREATE　**Back**

File Type	Life Cycle Status	Phase Status	Part Name	Part Number	Description	Filename	Depends on	Creator	Revision	Last Modified	Last Modifier
Part	Preperation	For Review	O-Ring	731691	O-Ring for case assembly	731961.SLDPRT	N/A	Matt	2.3	Mon Oct 09 2017	Matt
Drawing	Registered	New		731961	N/A	731961.slddrw	731961	Matt	1.0	Mon Oct 09 2017	
Part	Registered	New	Case Lid	839737	Lid of the case	839737.sldprt	N/A	Matt	1.0	Mon Oct 09 2017	
Part	Registered	New	Case Body	430308	Main case part	430308.sldprt	N/A	Matt	1.0	Mon Oct 09 2017	
Assembly	Registered	New	Case	367879	Case assembly	367879.sldasm	731961 839737 430308	Matt	1.0	Mon Oct 09 2017	

4. Download the required part and assembly files and place into the correct local folder(s)
5. Open SolidWorks
6. Select File → New…
7. Select "Assembly INCH" from the "Advanced" window then click "OK"
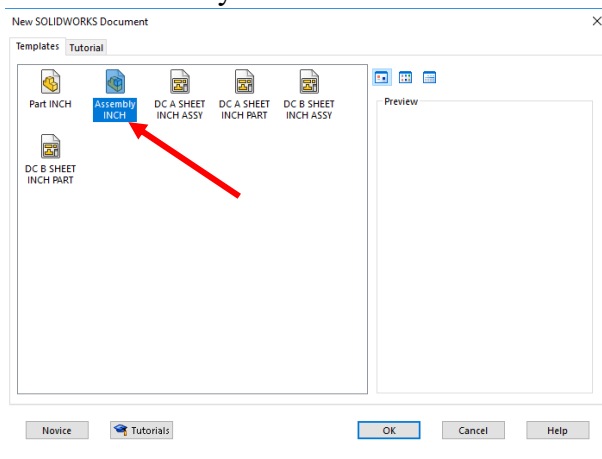
8. Insert the base component
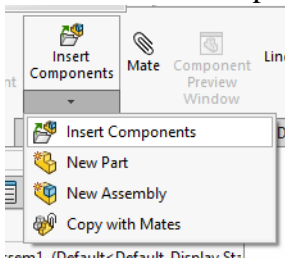
7. Select "Custom Properties" on the right toolbar then fill in the required information from the spreadsheet. "Part Number" and "Assembly Number" are both to be filled with "Part Number" from the spreadsheet.

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8. Save the assembly in the local LANL_CAD\ASSEMBLY\ folder as ######.SLDASM where ###### is the part number for the assembly
9. Upload the file to the LANL_CAD\ASSEMBLIES\ folder and delete all local files

Editing a File

Purpose

Editing files is necessary for the design process. This procedure documents how to properly edit a file and document the revisions. It is important that this procedure is followed closely to maintain proper revision control and promote productivity.
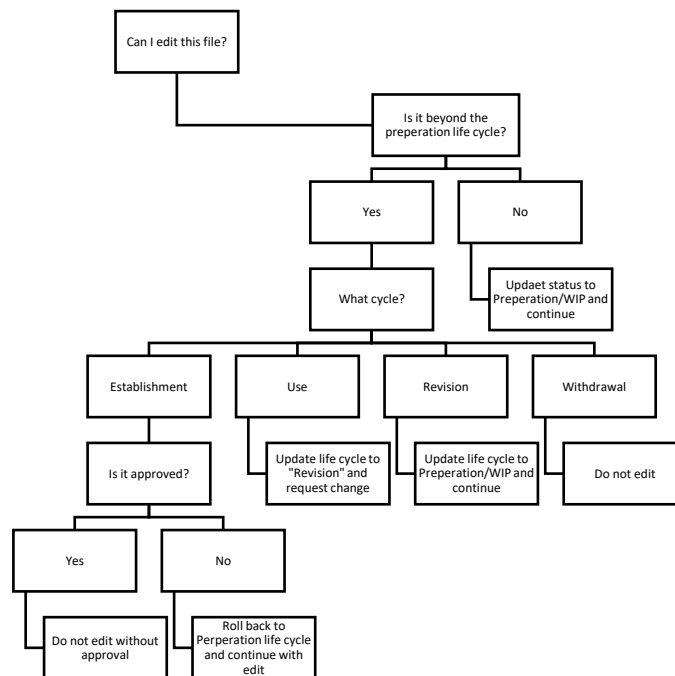
Scope

This procedure applies to any file that needs to be edited.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Open LANL_CAD_file_tracker Google sheet.
2. Make sure you are authorized to edit the file by following the below flowchart. No file shall be edited unless it is in the Preparation/WIP phase of its life cycle. Any confusion should be addressed to the CAD Engineer.

```
                        Can I edit this file?
                               |
                        Is it beyond the
                        preperation life cycle?
                          /            \
                       Yes             No
                        |               |
                   What cycle?      Updaet status to
                        |           Preperation/WIP and
                        |                continue
      /---------+---------+---------\
Establishment    Use     Revision   Withdrawal
     |            |          |           |
Is it approved?  Update    Update     Do not edit
     |           life cycle to  life cycle to
   /    \        "Revision" and  Preperation/WIP and
 Yes    No       request change  continue
  |      |
Do not  Roll back to
edit    Perperation life cycle
without and continue with
approval edit
```

3. Find part to be edited, change "Last Modified" to today's date and change "Last Modifier" to your name.
4. Move (NOT copy) file(s) into "Checked Out" folder in their respective folders
5. Download the needed files and distribute to the proper local folders (see Getting Started to see how to set up local hierarchy)
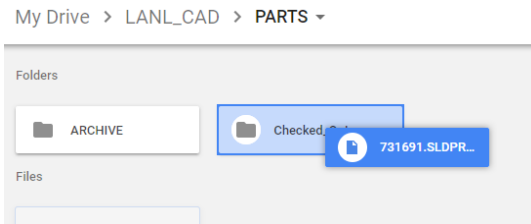
6. Make any edits necessary
7. Save all files
8. Upload files into correct Checked_Out Folder. Ensure it was uploaded as a new version
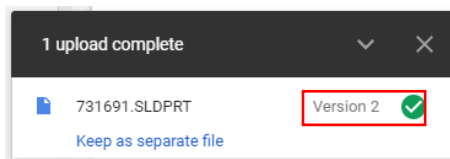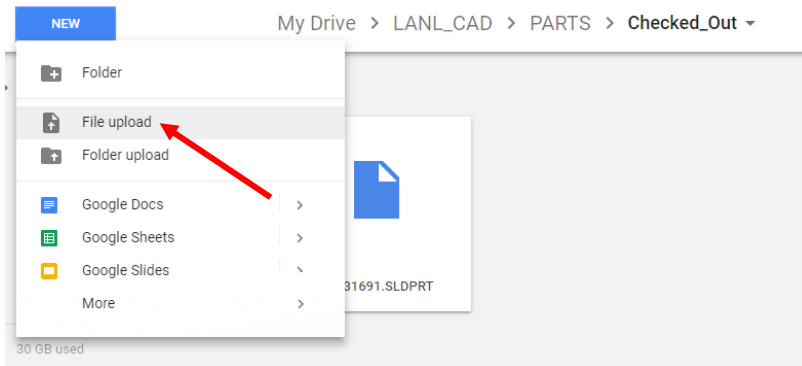
9. Drag the file(s) back out of the "Checked_Out" folder
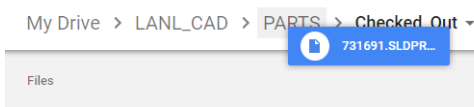
10. Update the revision number in the LANL_CAD_file_tracker spreadsheet to reflect the change. Recall revision scheme from the "Revision Control" section of this document

File Type	Life Cycle Status	Phase Status	Part Name	Part Number	Description	Filename	Depends on	Creator	Revision	Last Modified	Last Modifier
Part	Preperation	For Review	O-Ring	731691	O-Ring for case assembly	731961.SLDPRT	N/A	Matt	2	Mon Oct 09 2017	Matt
Drawing	Registered	New		731961	N/A	731961.slddrw	731961	Matt	1.0	Mon Oct 09 2017	
Part	Registered	New	Case Lid	839737	Lid of the case	839737.sldprt	N/A	Matt	1.0	Mon Oct 09 2017	

11. Delete all files locally

Changing a File's Life Cycle Status
Purpose
It is necessary to change a file's life cycle status when it is ready for the next phase or needs to be depreciated to a prior stage.
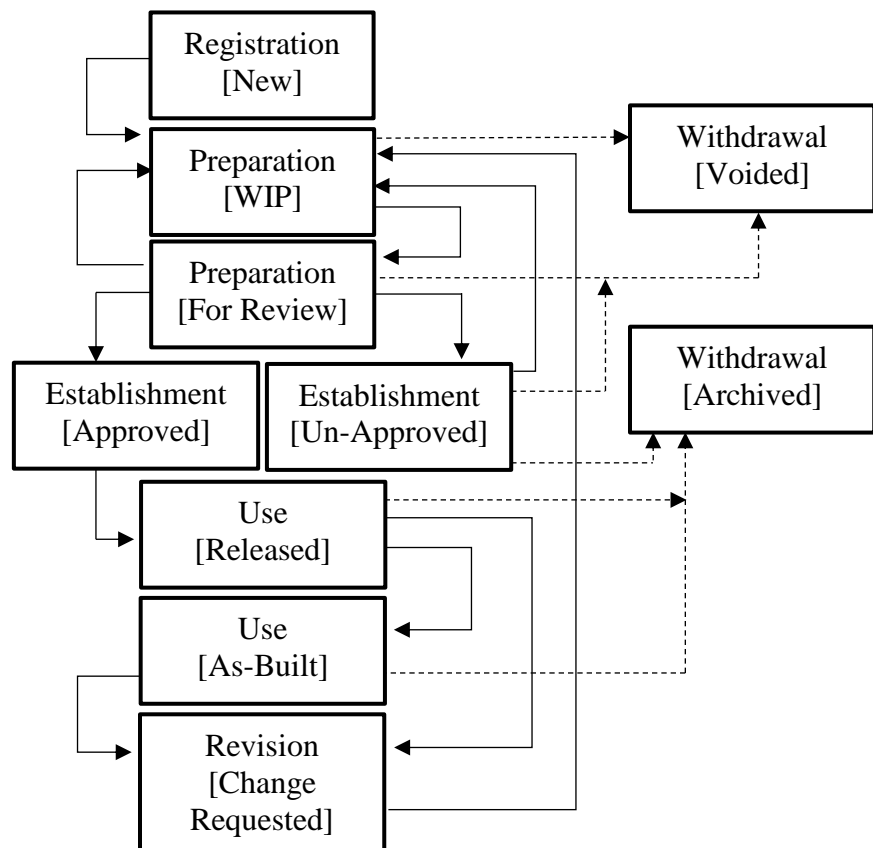
Scope
This procedure applies to any file that needs a life cycle phase change.

Requirements
Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Open LANL_CAD_file_tracker spreadsheet
2. Find file to be changed
3. Select corresponding cell for "Life Cycle Status" and update as needed. Repeat for the Phase Status
4. Life Cycle changes can only change in the sequence seen below

Voiding a File

Purpose

Voiding a file is necessary when a file becomes corrupted to the point of needing a new file. This may happen when geometries become too complex, mates begin to conflict and cannot be resolved, or any other issue that may arise in SolidWorks due to user error or program error.

Scope

This procedure applies to any file that needs to be voided.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, approval to void the file, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Get approval from CAD engineer
2. Remove file from any and all assemblies it is currently a part
3. Drag the file to the ARCHIVE folder in its respective folder
4. Update or Void any associated drawings
5. Update its status in the LANL_CAD_file_tracker spreadsheet by updating its life cycle status and phase then selecting the file and clicking "Remove File" in the "CAD Editor" panel.

Archiving a File

Purpose

It may become necessary to archive a file when it is deemed that the file is no longer needed. This may occur with design changes. This procedure documents how to properly archive a file.

Scope

This procedure applies to any file that may need to be archived for any reason.

Requirements

Requirements include SolidWorks 2017-2018, internet access, LANL CAD Google Drive folder, approval to archive a file, and LANL CAD File Tracker Google Sheet. Contact CAD Engineer for access.

Procedure

1. Get approval from CAD engineer
2. Remove file from any and all assemblies it is currently a part
3. Drag the file to the ARCHIVE folder in its respective folder
4. Update or Withdrawal any associated drawings
5. Update its status in the LANL_CAD_file_tracker spreadsheet by updating its life cycle status and phase then selecting the file and clicking "Remove File" in the "CAD Editor" panel.