BERKELEY LAB
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U.S. DEPARTMENT OF ENERGY
Office of Science

CAD in SMP

The future of SCCAD | News and Added Features from CAD / EG Division

P. Mallon

11 February 2025

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Context

- SCCAD is overloaded, and contains numerous duplicate items with hard-to-decipher names
- Traceability is becoming more important in MDP
  - Reuse of existing parts is a tradition
  - Starting/stopping/restarting projects with new team members occurs occasionally
- Necessity of change management is variable in MDP but generally increasing

- wtParts opens the door to change management and creation of BOMs for projects that need it

This feature must be activated in SCCAD

Design work in SCCAD is mostly “Sandbox” design

- “Conceptual Assembly Layouts” (Sandboxes) are critical to our work
- These mock-ups should be followed and complemented by a single “official” released assembly that serves as a reference for all of SMP
- LBNL Creo Parametric Modeling Standards EG-1000-0824A §7.1.3 provides guidance

7.1.3. Conceptual Assembly Layout (CAL)

A **CAL** (**C**onceptual **A**ssembly **L**ayout) is a user specific Assembly that the user creates to assist in his / her design process and contains reference assemblies to start with, it is regarded as a Layout Assembly where preliminary concepts can be created and interference checked. User would create their Conceptual Design Assembly and/or Part within their CAL's until they are ready to Revise or Change Released Assemblies.

- The CAL gives you the great flexibility when using **Simplified Reps** to enhance clarity and to control what you would like visible for your design.
- The CAL does not need to be ***“Checked In”***, but should be **Saved and Uploaded** to prevent data loss.
- The CAL can be Checked in if you ever want to Share it with another users
- The CAL will never be Released.

- Example: A sandbox of the released 36” header model may be created exclusively to test fit CCT6 structure, and named appropriately
- Other options exist, but lead to cluttered assembly perpetually in “working” state:
  - Representations
  - Groups

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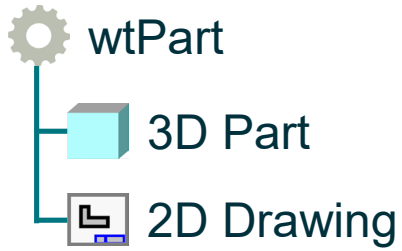
Quick overview of wtParts (wt = Windchill Technology)

- Concept originated from Change Management II (CMII) in 1970s
- PTC implemented this concept into Windchill 7 (2000s)
- Implemented at the Lab in 2019, initially CAD-centric
  - Can also link MS Office, PDF, image, video, and zip files
- Primary benefits:
  - Allows implementation of Change Management
  - Links all related objects together
  - Offers controlled, managed BOMs, which allows reporting and serialization
  - CAD group is more likely to help us if wtParts is activated



Source: engtraining.lbl.gov 201-02

Of the active BCMT Windchill Products, SCCAD is the only one not using wtParts by default

- SCCAD is the oldest active Windchill product at the lab (created 2007)
  - 6974 CAD objects, 4769 of which use the SU- prefix
  - 169 released CAD objects, as of 2 Dec. 2024
- ***It is time to activate wtParts in SCCAD***

Windchill product	Unique ID / Category prefix	wtParts on?
High Field Test Facility Dipole	DF	Yes
LCLS-II	LC	Yes
MARS Demonstrator	MR	Yes
Superconducting Magnet Group (SCCAD)	SU	No
FRIB Magnets	SU	Yes
LARP QXF	SU	Yes
SC Gantry	SU	Yes
SMP Cabling Facility	SU	Yes
SCU R&D (ended 2017)	SX	No

Category code prefix is independent from Windchill product

Category Codes and DCC

- Six-digit category codes are used to organize drawings and documents (Eng'g notes, specifications, work instructions) in the DCC

SU ## ##

Program (Supercon) | Funding/Area | Task/Subsystem

- They are used as parameters in Creo Parametric that auto-fill the title blocks in drawings (as long as the template is used)

SU:

PROJECT NAME: SUPERCONDUCTING MAGNET PROGRAM		ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY UNIVERSITY OF CALIFORNIA			
DRW REF DOC: EG-1000-0923	DRAWING UNITS: mm-kg-s	54: FRIB2 NB3SN ECR MAGNET			
SCALE: 1:7 PRINT NOT TO SCALE	THIRD ANGLE	14: PRACTICE SEXTUPOLE COIL MIRROR MAGNET OUTER CYLINDER			
SHEET SIZE: B	SHEET: 1 OF 1	CATEGORY CODE: SU5414	LIFECYCLE STATE: Released	ITEM NUMBER: SU-1018-5005	REV: A

Funding (Title1)
Subsystem (Title2)
Name (Detail_Title)

DOCUMENT CONTROL CENTER
LAWRENCE BERKELEY NATIONAL LABORATORY
U.S. DEPARTMENT OF ENERGY

MENU: DCC, Search Documents, Category Codes, Document Types, Drawing Notes, Other LBNL Repositorie, DCC Help, Issue Reports, Approvals, Signature Setup, Log Out

CATEGORY CODES

SU - SUPERCONDUCTING MAGNET PROGRAM

Click here to view all category codes for this project

Code	SUPERCONDUCTING MAGNET PROGRAM	Items
SU - 00	SMP - GENERAL	2 items
SU - 01	SMP - DOCUMENTATION	1 item
SU - 10	SMP - FACILITIES AND EQUIPMENT	17 items
SU - 11	SMP - LARGE MAGNETS	4 items
SU - 12	SMP - HIGH FIELD RESEARCH	4 items
SU - 20	SMP - OPERATIONS	2 items
SU - 22	SMP - CONDUCTOR AND CABLE	8 items
SU - 23	SMP - TECHNOLOGY DEVELOPMENT	4 items
SU - 24	SMP - TECHNOLOGY TRANSFER	1 item
SU - 30	SMP - LARP COLLABORATION	1 item
SU - 31	SMP - LARP MODEL MAGNETS	12 items
SU - 32	SMP - LARP CABLE DEVELOPMENT	1 item
SU - 33	LARP QXF	14 items
SU - 40	SMP - SPECIAL PROJECTS	1 item
SU - 41	SMP - ECR SOURCES	2 items
SU - 50	WORK FOR OTHERS	1 item
SU - 51	FRIB-ECR MAGNET DESIGN STUDY	5 items
SU - 52	SUPERCONDUCTING GANTRY MAGNET	12 items
SU - 53	FRIB ECR MAGNET	4 items
SU - 54	FRIB2 NB3SN ECR MAGNET	12 items
SU - 55	HIGH RIGIDITY SPECTROMETER MAGNETS	11 items
SU - 60	SMP - MAGNET TEST FACILITY UPGRADE	2 items

Category Codes and Windchill

Name	Description
Engineering Metrology	For the Engineering Metrology group
ePIC Detector	
FEL	Free Electron Laser (FEL) Light Source (FL)
FRIB Magnets	FRIB Magnets (SU)
GRETA	Gamma-Ray Energy Tracking Array
HFTFD	High Field Test Facility Dipole
HIFAR	Heavy Ion Fusion Projects (58)
LARP QXF	LARP QXF (SU)
LBNL	General Engineering (AA)
LBNL Template Prod…	LBNL Template Product - IN PROGRESS
LCLS-II	Linac Coherent Light Source II
LHC	Large Hadron Collider (LH)
LZ	LZ EXPERIMENT (LZ)
MARS-D	
Model Manager Vault	Data in this Product are Locked, they are updated in Creo Elements and Model Manager and simply Read only …
Molecular Foundry	Molecular Foundry (MF)
PHYSICS	PHYSICS DEPARTMENT (PH)
PXIE RFQ	Project X Injector Experiment RFQ (PX)
RHIC	Reletivistic Heavy Ion Collider (RH)
SC Gantry	SUPERCONDUCTING MAGNET DEVELOPMENT FOR PROTON AND HEAVY ION THERAPY GANTRIES (SU)
SCCAD	Super Conducting Magnet Group (SU)
SCU R&D	Superconducting Undulator R&D (SX)
SMP Cabling Facility	SMP Cabling Facility

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- Category codes and Windchill products are independent
  - SU (SMP) numbers/projects are used outside of the SCCAD Windchill product
  - Therefore, SU numbers can be used in a potential new “SCCAD2” product

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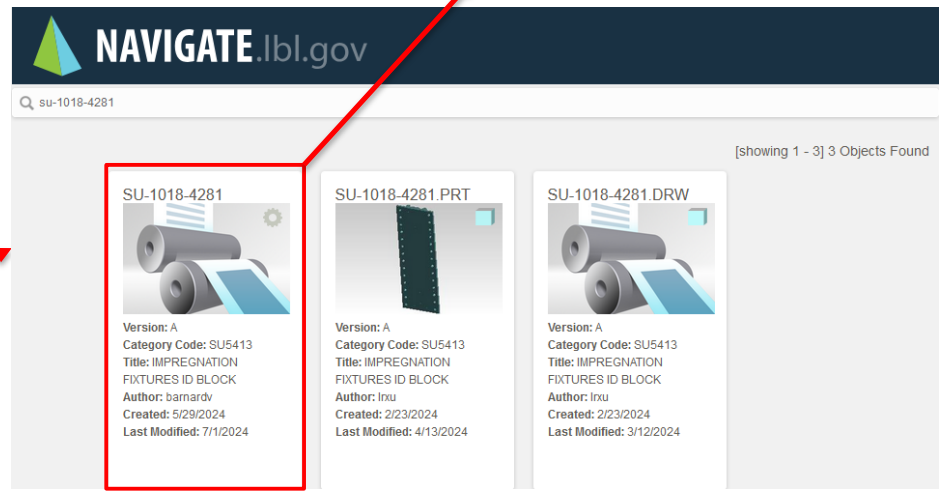
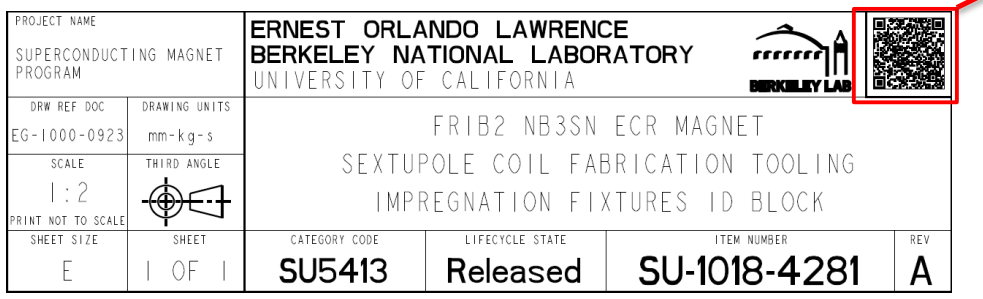
Navigate.lbl.gov and QR Codes

- Links to:
  - Windchill object
  - DCC page
  - .PRT and .DRW objects





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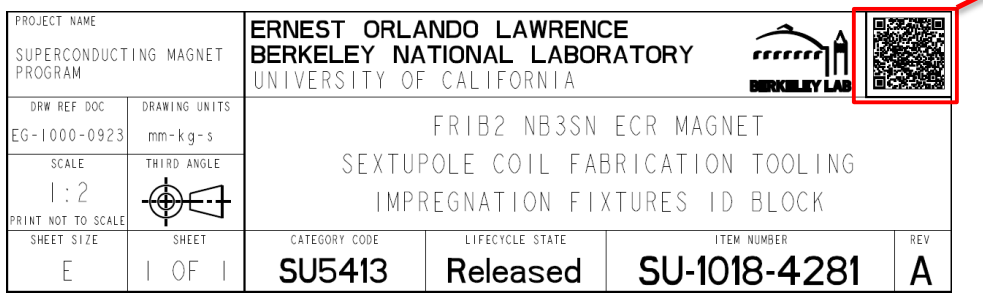

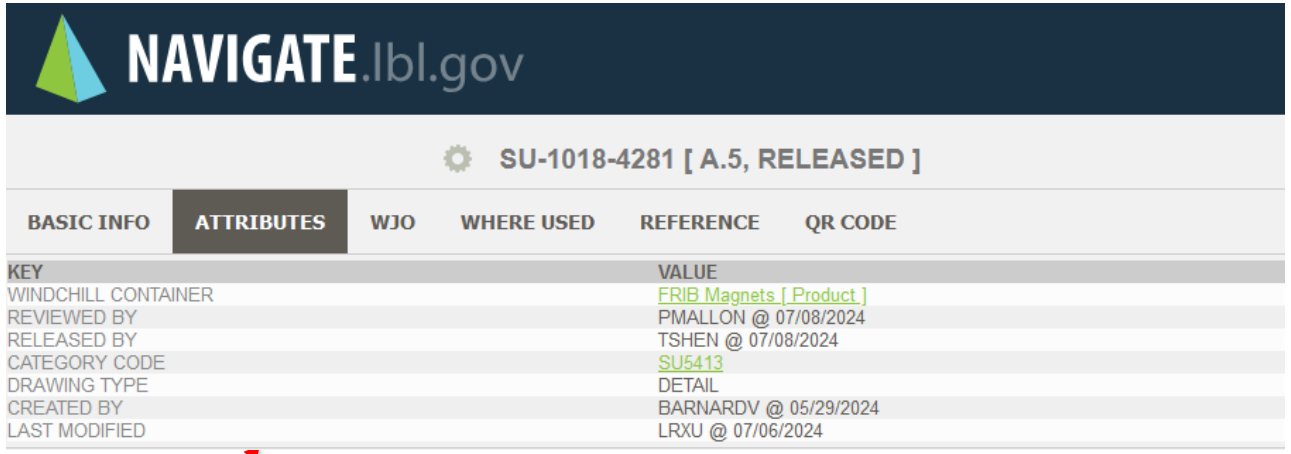

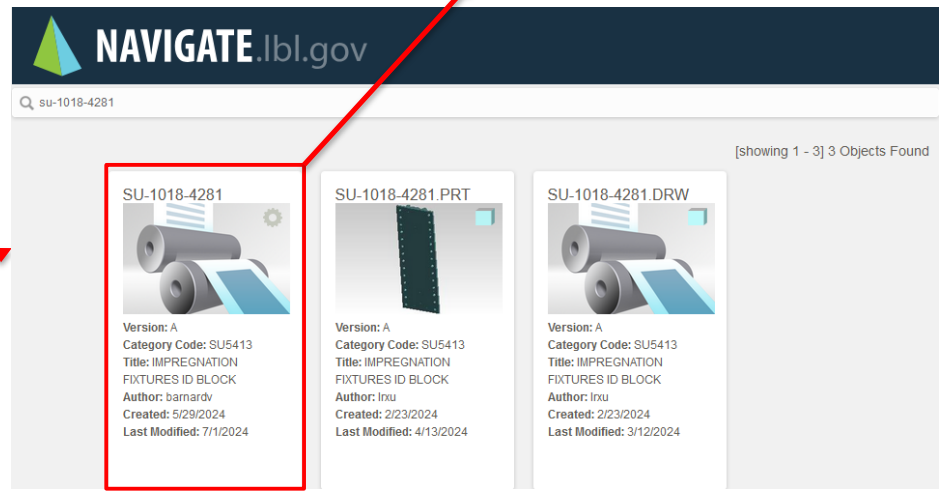

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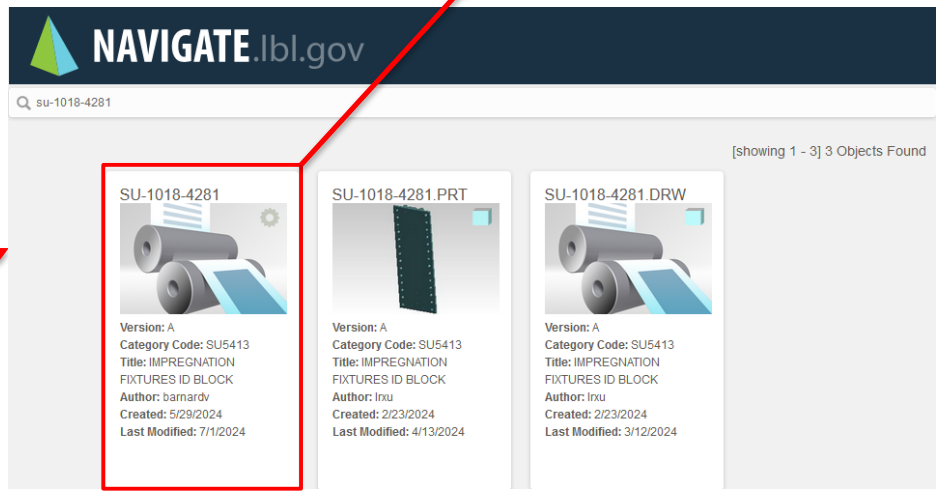

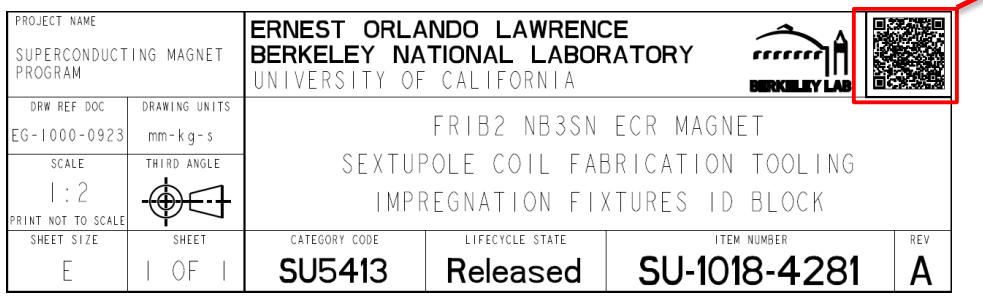

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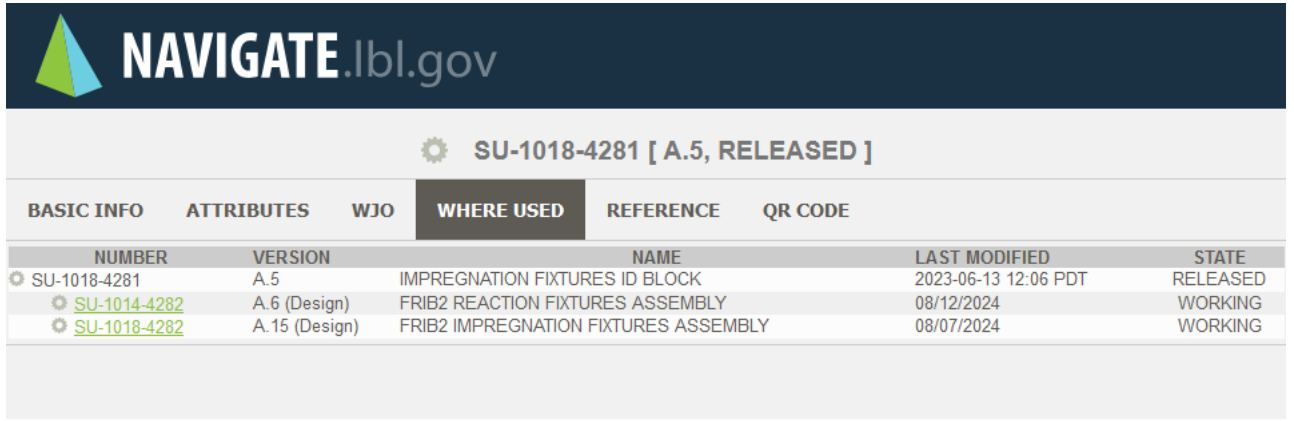

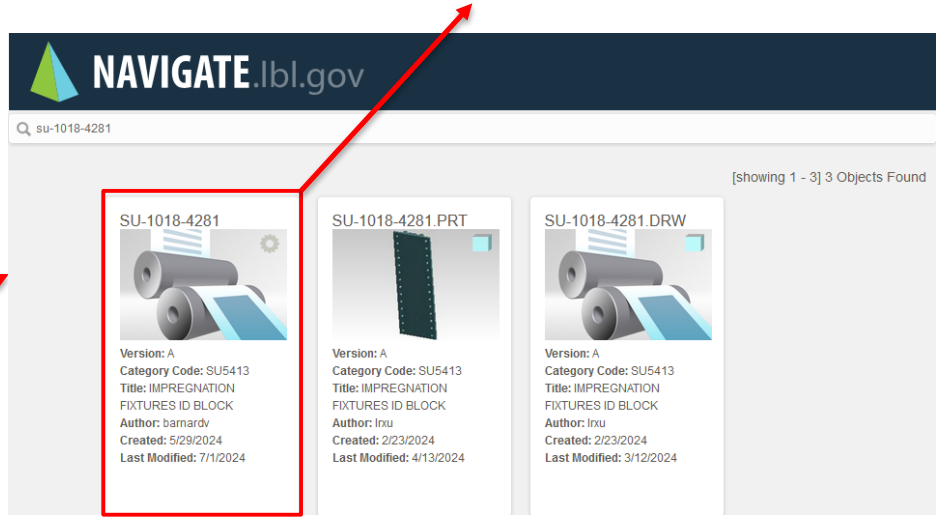

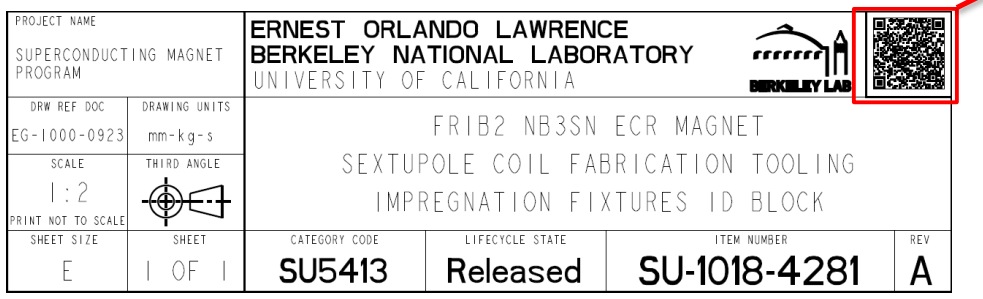

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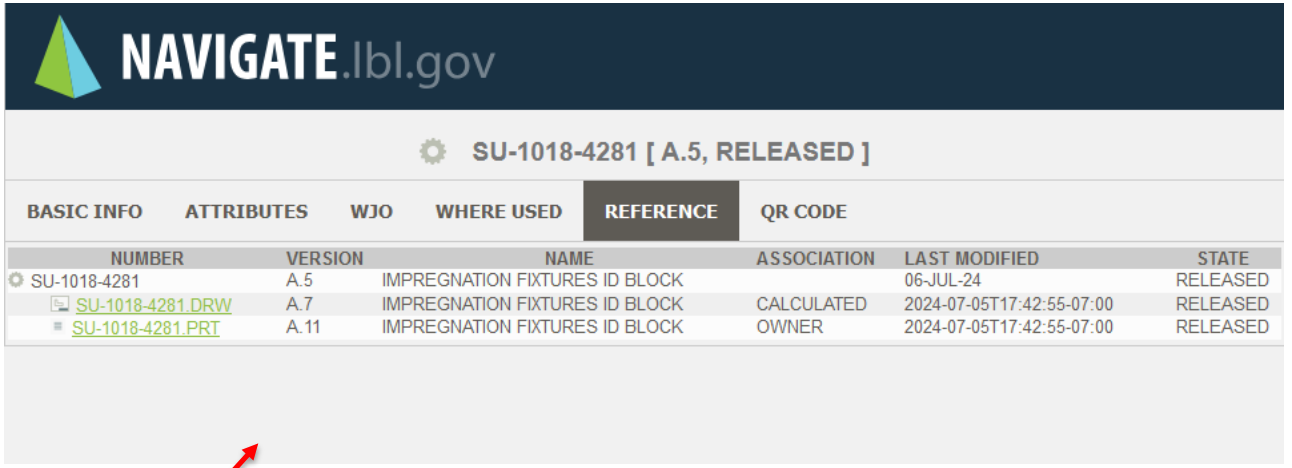
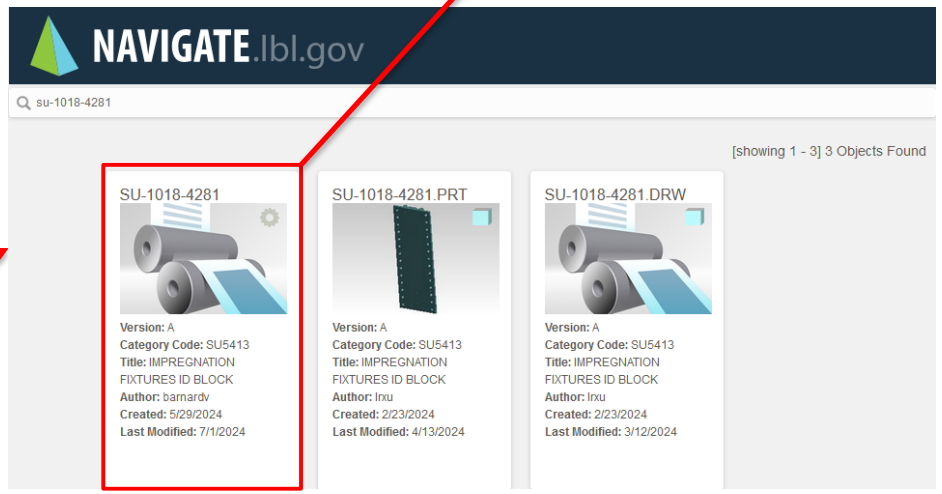
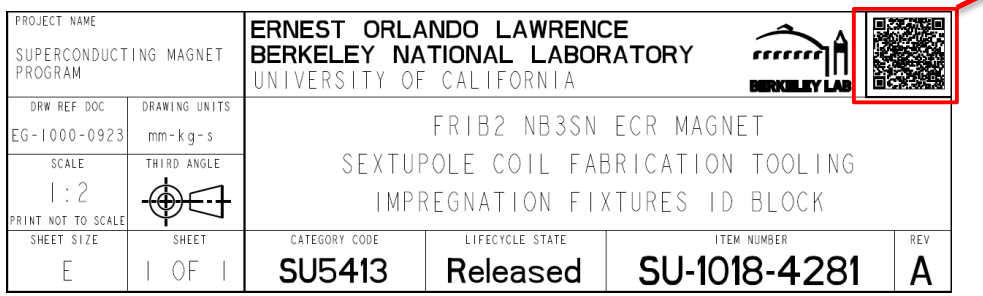


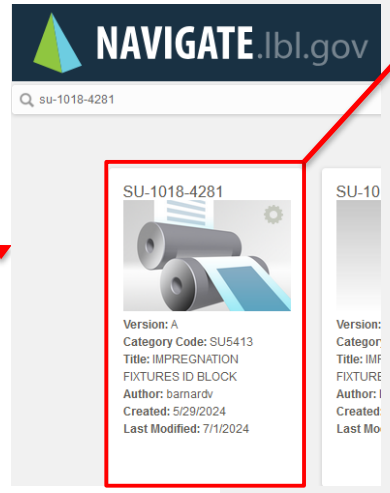


PROJECT NAME	ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY UNIVERSITY OF CALIFORNIA		
SUPERCONDUCTING MAGNET PROGRAM			
DRW REF DOC: EG-1000-0923	DRAWING UNITS: mm-kg-s	FRIB2 NB3SN ECR MAGNET SEXTUPOLE COIL FABRICATION TOOLING IMPREGNATION FIXTURES ID BLOCK	
SCALE: 1:2 PRINT NOT TO SCALE	THIRD ANGLE		
SHEET SIZE: E	SHEET: 1 OF 1	CATEGORY CODE: SU5413	LIFECYCLE STATE: Released
ITEM NUMBER: SU-1018-4281	REV: A		

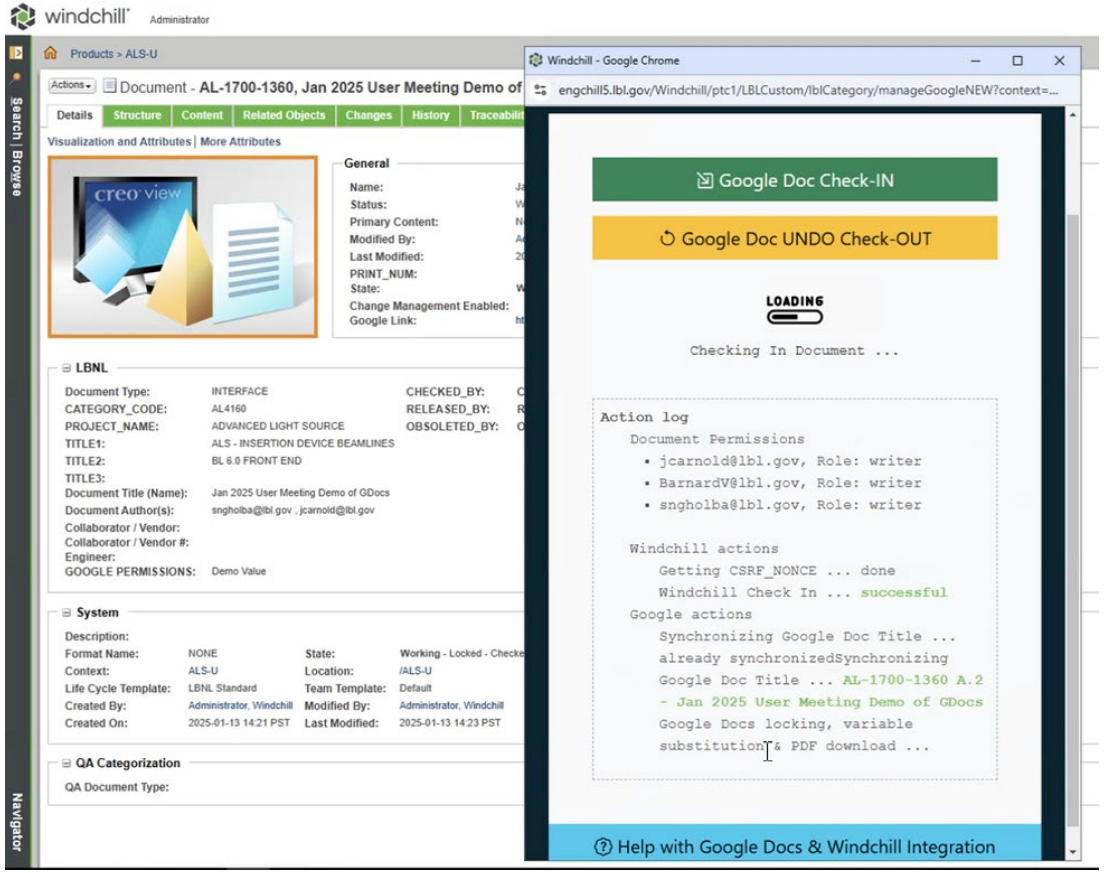
Navigate.lbl.gov and QR Codes

- Code can be printed with label maker or laser-etched on physical part





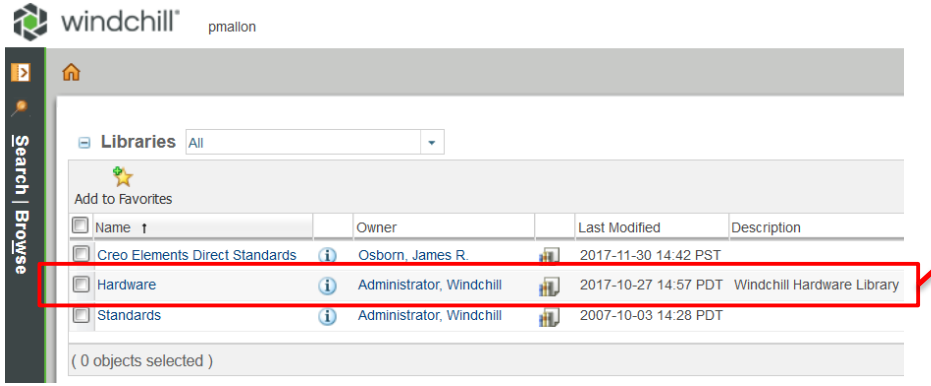
Google Drive integration into Windchill

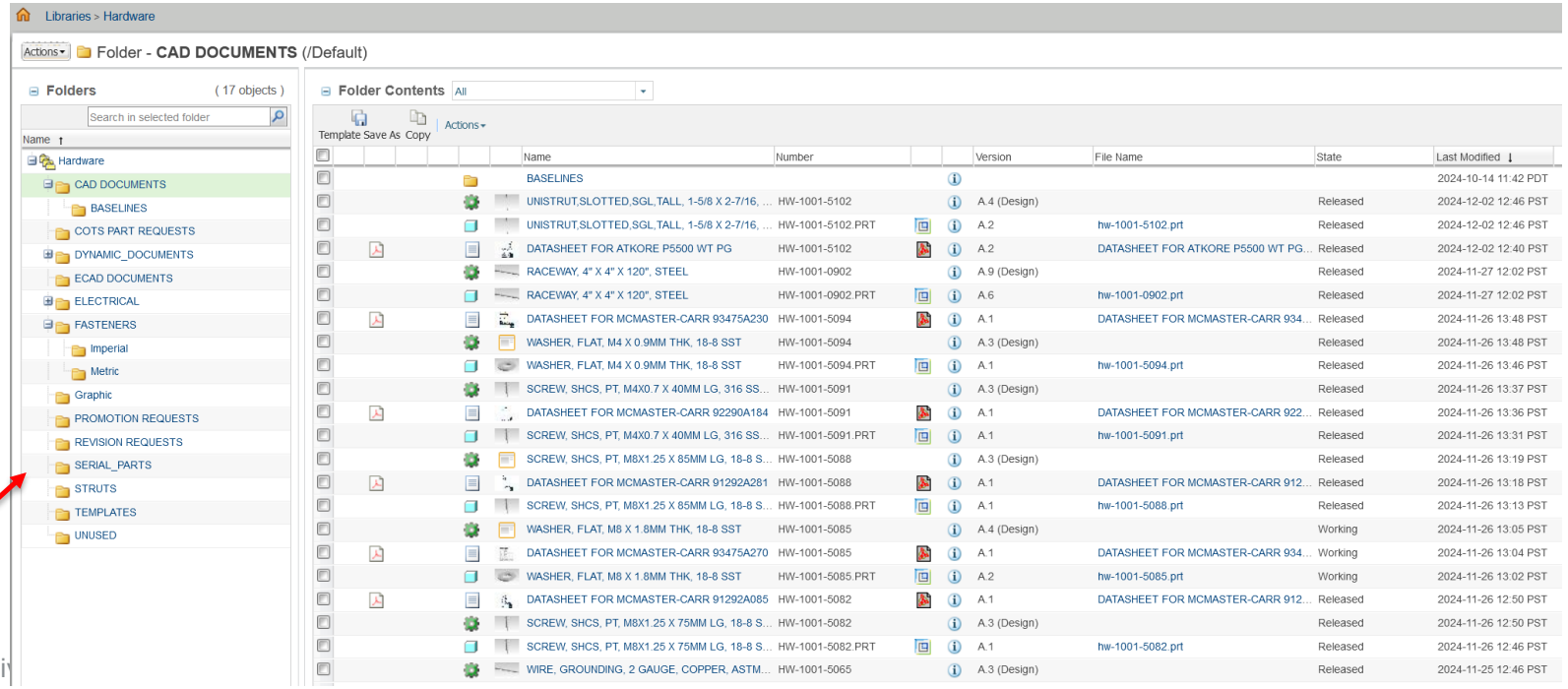


- Check in/check out and promotion features are in development
- Documents retain the usual Google features
  - Simultaneous editing
- Templates under development include Windchill cover sheets

Commercial off-the-shelf (COTS) part library is becoming well developed

- This allows us to keep our own products (SCCAD, SC Gantry, FRIB Magnets, HFTFD, etc.) free of COTS parts by keeping them in the Windchill “Hardware” library
- This is largely hardware, but can be any commercially available part
- We can add to the library quickly (Ryan is our COTS expert)
- A search utility exists



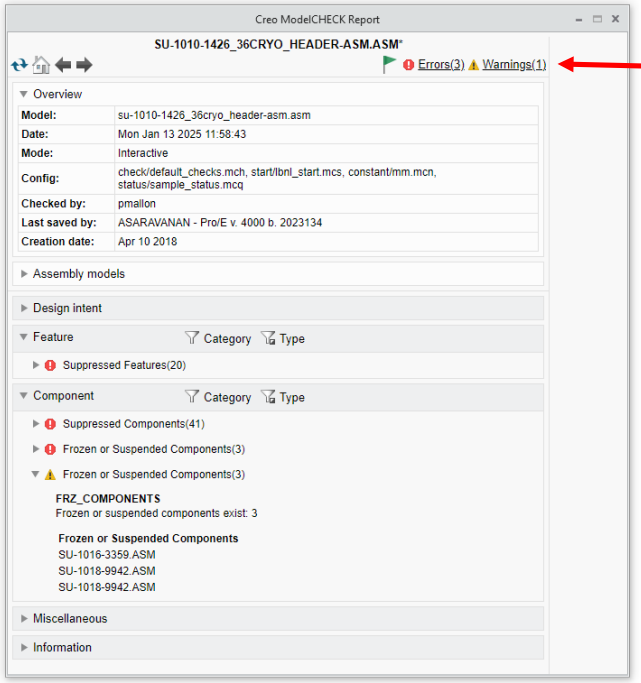


CAD group at LBNL has been “promoted” to department level entity

- Drawing “Checkers” Bill Holmquist & Gordon Lyall provide last check in all ALS-U drawings
  - This could become a required part of promotion process for the entire lab
- We could go either of two ways:
  - Stop releasing parts/drawings
  - Embrace the opportunity to create models/drawings that reflect what we need

CAD Department enforcing compliance with modeling standards effective Feb. 2025

- Creo Parametric and Windchill BOM performance issues in ALS-U are prompting this change, which will affect Creo Parametric users Lab-wide.



[level1-engineering] Action Required: CAD Modeling Issues & ModelCHECK Compliance Inbox ×

LBNL Engineering Division <engineering@lbl.gov> 3 Jan 2025, 09:37 (10 days ago)
to level1-engineering

Sent on behalf of:

Samantha Gholba
CAD Department Head

Fabrice Matichard
ME Department Head & ALS-U Chief Engineer

Dear CAD users,

We have been experiencing Creo Parametric performance issues and Windchill Bill of Material [BOM] issues due to CAD modeling standards & rules not being followed. This was discussed at our CAD User meeting on 12/09/2024, during which we requested to not ignore ModelCHECK warnings and errors. The CAD team and I would like to thank all of you who are already addressing these ModelCheck warnings promptly.

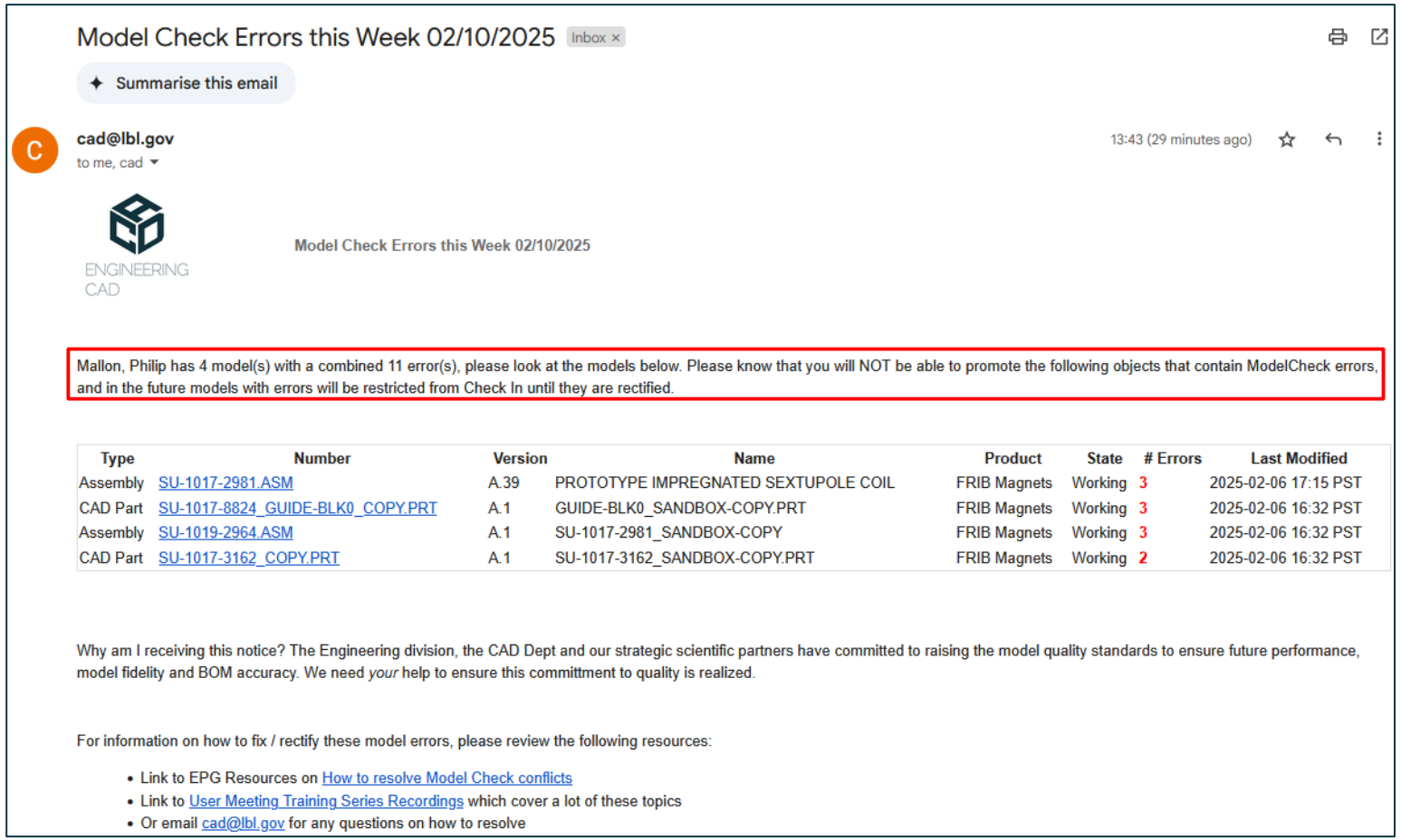
In addition to this communication and training effort, we are also going to implement more rigorous rules:

- It will soon NOT be possible to promote any data if it has any ModelCHECK errors. This shall become effective in February 2025, and we'll send a notification with the exact date.
- We will implement a transition period of about four weeks, starting the first week of January.
  - During that transition period, we ask everyone to take the habit to address any issues that they see while working on objects.
  - Note: it's possible that the last person who modified a part did not create the issue, BUT the issue must be addressed, so if you modify an object, SAVE it and ModelCHECK points out an issue, you need to fix it before you check it back into Windchill.
- To further facilitate the transition period, we are pulling Reports weekly on Windchill objects to ensure resolution of modeling issues.
  - Here is a table report that shows only data with errors from 12/09/2024 - 12/18/2024
  - Please check for your name and address the corresponding errors
  - We will add a new tab to this Report every week
- Finally, we have created a general help page on EPG to provide guidance and help on how to address these modeling issues. We will continually add to this resource until we have good examples of all the relevant topics. Please reach out to the CAD team if there are some modeling issues that you can't resolve.

Thank you for your help and attention in this matter,

The Engineering CAD Team
Fabrice Matichard, ME Dept Head & ALS-U Chief Engineer

CAD Department enforcing compliance with modeling standards effective Feb. 2025



Model Check Errors this Week 02/10/2025 Inbox ×

Summarise this email

cad@lbl.gov 13:43 (29 minutes ago)
to me, cad

ENGINEERING CAD

Model Check Errors this Week 02/10/2025

Mallon, Philip has 4 model(s) with a combined 11 error(s), please look at the models below. Please know that you will NOT be able to promote the following objects that contain ModelCheck errors, and in the future models with errors will be restricted from Check In until they are rectified.

Type	Number	Version	Name	Product	State	# Errors	Last Modified
Assembly	SU-1017-2981.ASM	A.39	PROTOTYPE IMPREGNATED SEXTUPOLE COIL	FRIB Magnets	Working	3	2025-02-06 17:15 PST
CAD Part	SU-1017-8824_GUIDE-BLK0_COPY.PRT	A.1	GUIDE-BLK0_SANDBOX-COPY.PRT	FRIB Magnets	Working	3	2025-02-06 16:32 PST
Assembly	SU-1019-2964.ASM	A.1	SU-1017-2981_SANDBOX-COPY	FRIB Magnets	Working	3	2025-02-06 16:32 PST
CAD Part	SU-1017-3162_COPY.PRT	A.1	SU-1017-3162_SANDBOX-COPY.PRT	FRIB Magnets	Working	2	2025-02-06 16:32 PST

Why am I receiving this notice? The Engineering division, the CAD Dept and our strategic scientific partners have committed to raising the model quality standards to ensure future performance, model fidelity and BOM accuracy. We need *your* help to ensure this committment to quality is realized.

For information on how to fix / rectify these model errors, please review the following resources:

- Link to EPG Resources on How to resolve Model Check conflicts
- Link to User Meeting Training Series Recordings which cover a lot of these topics
- Or email cad@lbl.gov for any questions on how to resolve

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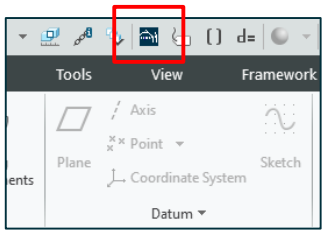
Summary: Impacts and Action to Take

- Using wtParts and releasing more parts is a natural progression
  - It may not be applicable/desirable for all projects
  - We will not use all aspects of wtParts – this is too heavy for MDP
  - Our designers are already taking advantage of this system in other contexts
- Formally releasing parts for fabrication:
  - Enforces rigor and helps catch mistakes
  - Helps us trace our property and what's been purchased
  - Protects us during procurement
  - Reduces the risk of needing rework
- **Actions:**
  - Turn on wtParts in SCCAD
  - Be more deliberate and organized with our use of sandboxing
  - Release parts before fabrication and revise before re-work
  - Consider requesting a "SCCAD2" product for new MDP projects, keeping SU- numbers and category codes

Thank You

Bonus: best practice reminders for efficient promotion

- Always use the LBNL template (either metric or imperial) when creating new parts
  - Always create a new drawing using the LBNL parameters button from the .prt file
- Part numbers must conform to the SU-XXXX-XXXX format, and names must be names
- External references are not allowed and will prevent promotion starting in February
- Do not use duplicate assemblies (only one “official” assembly)
  - “Sandbox” assembly copies for mockup should be labeled as such and are not meant to be released (see EG-1000-0824A §7.1.3)
  - In check-in comments, note which version of original was used (e.g. A.37, B.17)
- wtPart must created if it doesn’t already exist, and must be in promotion package
- Use custom check-in to log your changes in the comment box
- Use commercial off-the-shelf (COTS) parts from the HW- library to keep our Windchill products uncluttered
- In assembly drawings, use mfr./vendor BOM to cross-reference vendor part with HW- number



ITEM	QTY	ITEM NO.	DESCRIPTION	MATERIAL	MANUFACTURER	MANUFACTURER PART NO
4	6	HW-1001-4645	NUT, HEX, M10X1.5 X 8MM THK, 18-8 SST, DIN 934, ISO 4032	SSTL_18-8	MCMASTER-CARR	91828A415
3	6	HW-1001-4642	WASHER, FLAT, M10 NOM. ID X 20MM OD X 2.2MM THK, 18-8 SST	SSTL_18-8	MCMASTER-CARR	93475A280
2	3	SU-1018-5018	MIRROR MAGNET YOKE TIE ROD, M10 X 949	SSTL_316	MCMASTER-CARR	94185A165
1	9	SU-1018-5001	MIRROR MAGNET BOTTOM YOKE	STEEL_1018_CARBON		