Transformation of Physical Configuration Legacy Information

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2023 SURF Colloquium

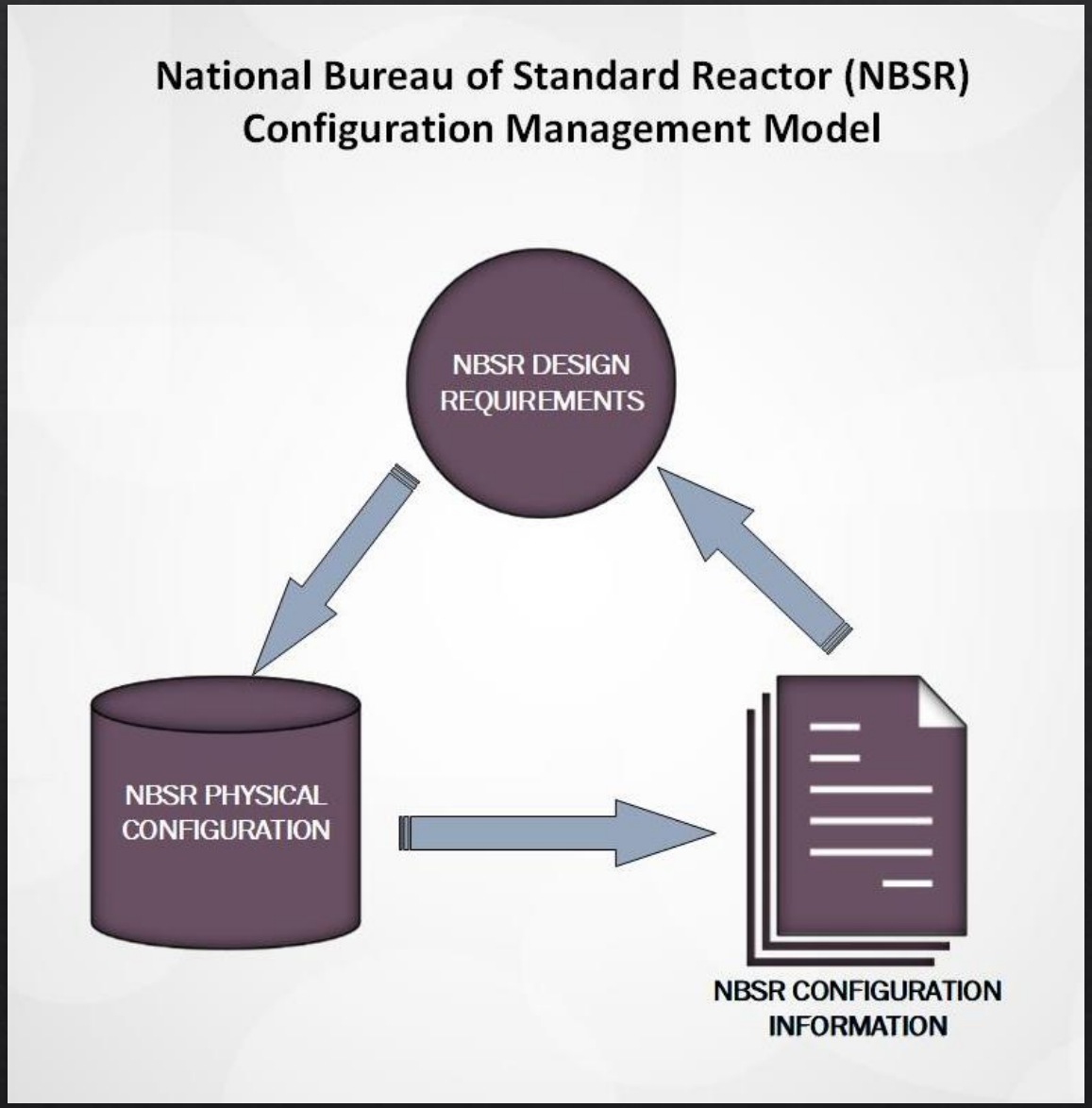
NIST CENTER FOR NEUTRON RESEARCH

CHRNS CENTER FOR HIGH RESOLUTION NEUTRON SCATTERING NIST

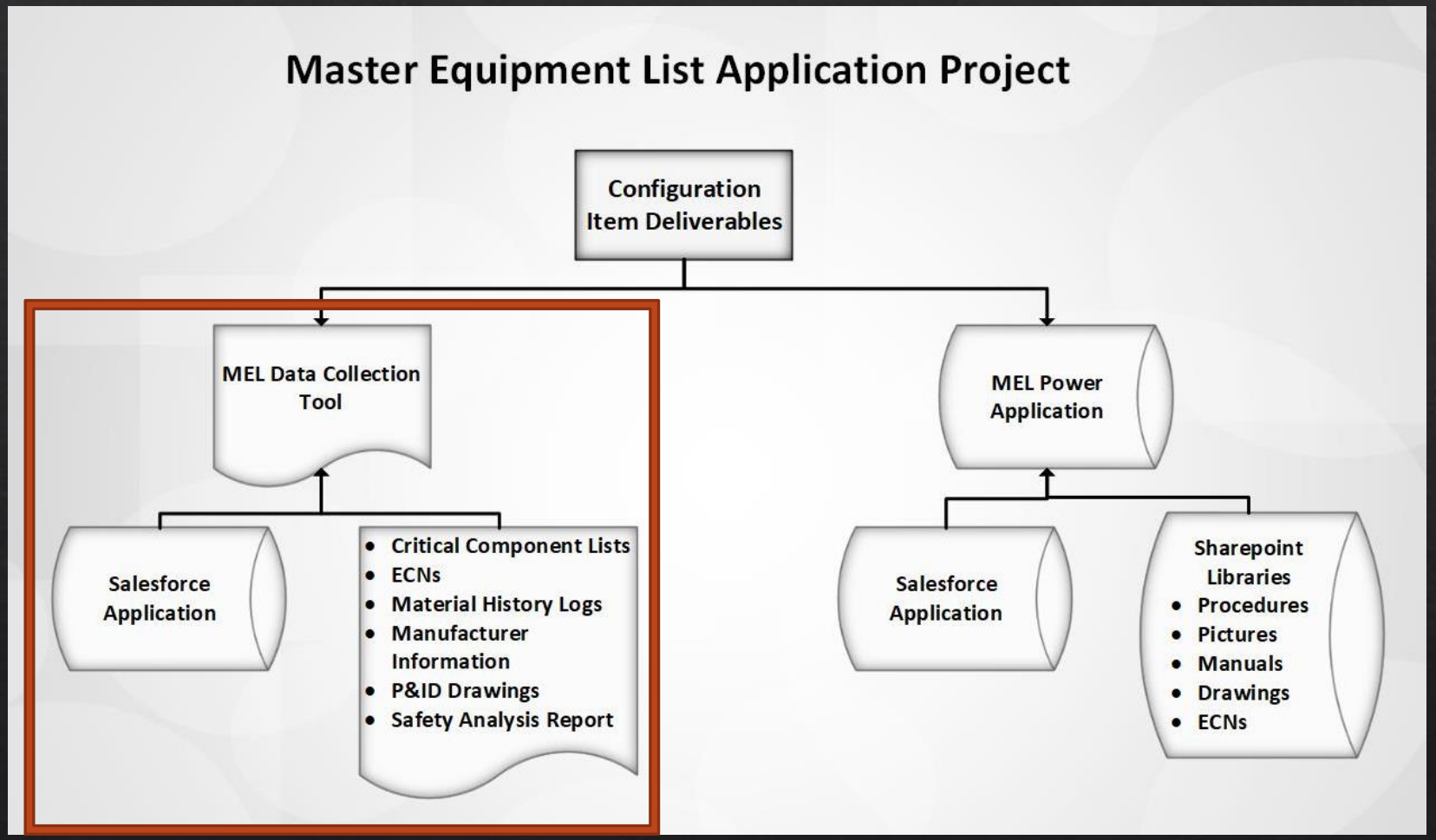
What Is It?

- Configuration Management (CM)
  - Systematic approach for identifying, documenting, and changing the characteristics of a facility's structures, systems and components
- Master Equipment List (MEL)
  - Compilation of every component in the physical configuration of the facility
- Enterprise Asset Management System (EAMS)
  - Digital database of component management operations
- National Bureau of Standards Reactor (NBSR) - Reactor at the NCNR

Why Does NBSR Need CM?



Physical Data Collection Tool



Legacy Information Formatting

- Very few components, little information

CO_2 Critical Component List

Valve	Location	Discription	Position	Justification
COV-2	South Yard	CO_2 Bulk Tank Isolation	NO	This valve grouping is the direct flow path of the cavity purge. If any of these valves fail closed, cavity purge would stop and the eventual build up of ^{41}Ar would cause a major scram on the stack.
COV-4	B-2	Regulator Valve Set at 25 psig	NO	
COV-5	B-2	Junction Isolation	NO	
COV-18	B-2	Junction Isolation	NO	
COV-20	B-1	Check Valve	NO	
COV-21	B-1	Junction Isolation	NO	
COV-25	B-1	Inlet to Cavity Purge Flow Meter	NO	
COV-26	B-1	ypass of Cavity Purge Flow Mete	NC	
COV-27	B-1	Outlet of Cavity Purge Flow Mete	NO	
COV-38	Process Room	Junction Isolation Valve	NO	

Key

NO	Normally Open
NC	Normally Closed

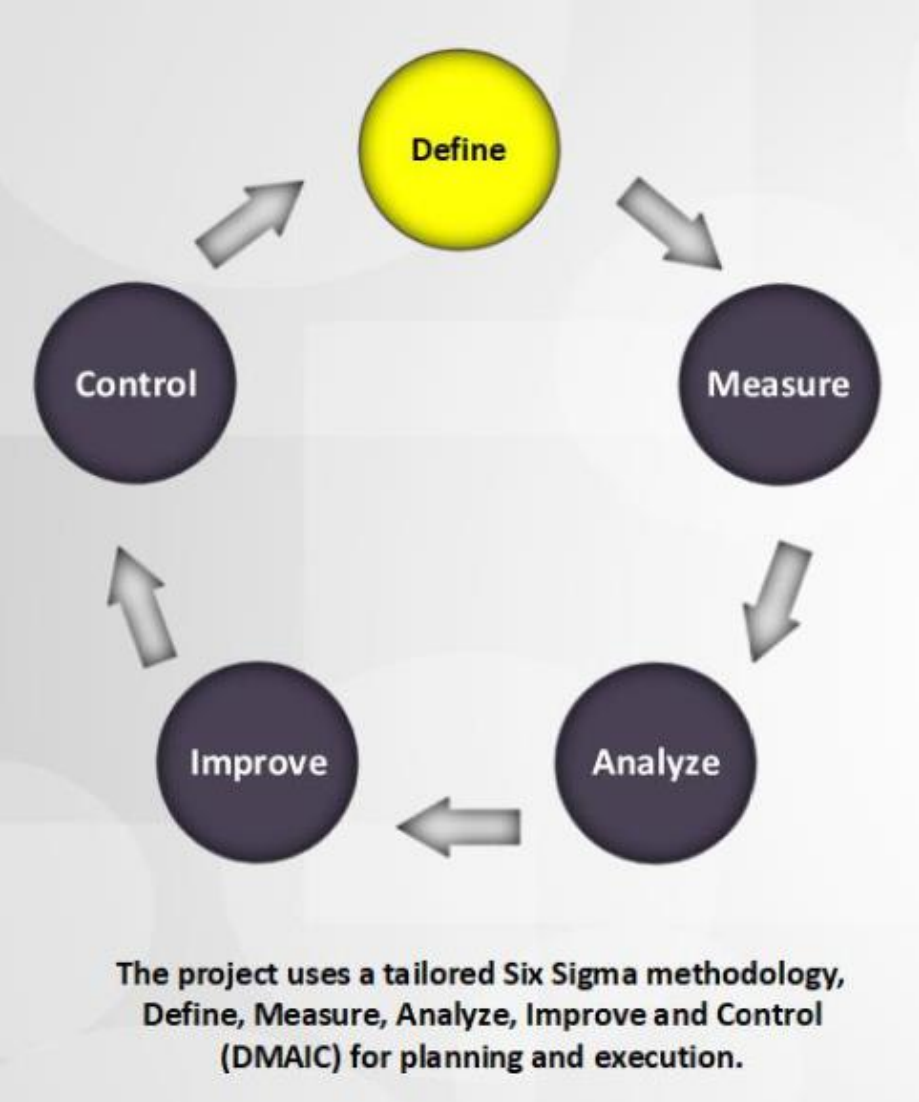
Solenoids for Compressed air system (drawing number E-60-017)

Component	Supplies/Description	System	Critical Component	Notes	Photos	Normal Position	Location of Component
SV-301 ?	SCV-5	Secondary	YES	Cooling to HE-2 (Cryostats) the solenoid may be internal to valve		NO (ATO	D001, West Wall, Overhead
SV-251	ACV-11 (Discharge of SF-19 Process Room EMG. Ventilation)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	Pool Area Mezzanine, West w
SV-141	ACV-1	Ventilation	Yes	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NO (ATO/ATC)	B-1
SV-152	ACV-12 (Building Relief)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	B-1
SV-142	ACV-2 (Inlet to SF-11 Process Room H&V Supply)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NO (ATO/ATC)	B-1
SV-143	ACV-3 (Outlet of EF-27 Process Room)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NO ATO/ATC	Behind B-1 Door
SV-147	ACV-7 (1st & 2nd Floor Exaust)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NO (ATO/ATC)	Behind B-1 Door
SV 149	ACV-9 (Outlet of EF-6 & Inlet to SF-2)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Behind B-1 Door
SV-148	ACV-8 (Outlet of EF-5 & Inlet to SF-2)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Behind B-1 Door
SV-145	ACV-5 (inlet to EF-6)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Behind B-1 Door
SV-144	ACV-4 (Inlet to EF-5)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Behind B-1 Door
SV-150	ACV-10 (From Process Room to EMG. Ventilation)	Ventilation	YES	Required per O.I. 1.1 and Major Scram (Cririca component Defintion #9 & #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	B-1 Behind EF-23 Ducting
SV-146 ?	SCV-6	Secondary Cooling		Not on valve checklist, but still on DWG. E-60-17 Possibly removed from system			
SV-226	HEV-77 (Helium Makeup)	Helium Sweep	No	Not on valve checklist, but still on DWG. E-60-17 & D-60-34		Auto	B-1 in overheaed
SV-216	RWV-12	Liquid Waste	No				
SV-207	RWV-3	Liquid Waste	No				
SV-205	RWV-2	Liquid Waste	No				
SV-209	RWV-119	Liquid Waste	No				
SV-210	RWV-101	Liquid Waste	No				
SV-221	RWV 1	Liquid Waste	No				
SV-208	#2 RET. PUMP RWV 5	Liquid Waste	No				
SV-212	#2 RET. PUMP RWV 4	Liquid Waste	No				
SV-213	RWV-113	Liquid Waste	No				
SV-109	DWV-31 Reactor Quick Fill (at Emergency Tank)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1 (Cririca component Defintion #2, #3 & #9)	R:\Reactor Systems\Com	Neutral/Closed	C200 Emergency Cooling Stati
SV-110	DWV-29 (Emergency Cooling to D2O Experimental Cooling)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Gagged Closed	C200 Emergency Cooling Stati
SV-111	DWV-30 (Emergency Cooling to D2O Experimental Cooling)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Gagged Closed	C200 Emergency Cooling Stati
SV-231	DWV-40 (EMER. TANK MAKE-UP)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Neutral/Closed	C200 Emergency Cooling Stati
SV-112	DWV-32 (Emergency Cooling to Reserve Tank)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Neutral/Closed	C200 Emergency Cooling Stati
SV-113	DWV-33 (Emergency Cooling to Reserve Tank)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Neutral/Closed	C200 Emergency Cooling Stati
SV-114	DWV-34 (Emergency Cooling to Plena)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Neutral/Closed	C200 Emergency Cooling Stati
SV-115	DWV-35 (Emergency Cooling to Plena)	D2O Auxilary Emergency Cooling	YES	Required per T.S. 3.3.2, O.I.1.1.A (Cririca component Defintion #2, #3 & #9)	\\ncnrshares\Reactor$\R	Neutral/Closed	C200 Emergency Cooling Stati
SV-219	WTV-1 (Pool make up)	Storage Pool/Storage Pool Cooling	NO			NC	Pool area, West Wall
SV-201	Emergency Door Seal (Back Door)	Confinement Building	Yes	Required per O.I. 1.1. A and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	South Wall outside of EMG. D
SV-202	Truck Door Seal	Confinement Building	Yes	Required per O.I. 1.1. A and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	C100 Above Truck Door
SV-203	South Door Seal	Confinement Building	Yes	Required per O.I. 1.1. A and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	C100 Above South Door
SV-204	North Door Seal	Confinement Building	Yes	Required per O.I. 1.1. A and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	C100 Above North Door
SV-218	B-2 Door Seal	Confinement Building	Yes	Required per O.I. 1.1. A and Major Scram (Cririca component Defintion #9 & #11)		NC (ATO/ATC)	B-2 Above Door
TT #7783	FTV-1	Refueling/Panel/Cannon	YES	Required for Refueling. (Critical Component Definition #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Pool Area, North Wall
TT #7783	FTV-2	Refueling/Panel/Cannon	YES	Required for Refueling. (Critical Component Definition #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Pool Area, North Wall
TT #7783	FTV-3	Refueling/Panel/Cannon	YES	Required for Refueling. (Critical Component Definition #11)	\\ncnrshares\Reactor$\R	NC (ATO/ATC)	Pool Area, North Wall

Beginning of the MEL

	A	B	C	D	E	F	G
1	Source Sheet	Component ID	Type	System	SubSystem	Description	Normal Operating Configur
2							
3	Electrical Power System	24V Safety Relay Power Supply #1					
4	Electrical Power System	24V Safety Relay Power Supply #1					
5	Electrical Power System	28V Power Supply #1					
6	Electrical Power System	28V Power Supply #2					
7	Electrical Power System	48V Power Supply #1					
8	Electrical Power System	48V Power Supply #2					
9	Tritium Monitoring RM 3-4,3-5	ACV-22				RM 3-5 sample point on EF-3	NO
10	Tritium Monitoring RM 3-4,3-5	ACV-23				RM 3-5 sample point on EF-27	NO
11	Tritium Monitoring RM 3-4,3-5	ACV-24				RM 3-5 sample point on EF-5&6	NO
12	Tritium Monitoring RM 3-4,3-5	ACV-25				RM 3-4 sample point on EF-4	NO
13	Tritium Monitoring RM 3-4,3-5	ACV-26				RM 3-4 sample point on EF-23	NO
14	Tritium Monitoring RM 3-4,3-5	ACV-27				RM 3-4 sample point on SF-19	NO
15	Tritium Monitoring RM 3-4,3-5	ACV-28				Solenoid for 3-5 to sample EF-3,27	NO
16	Tritium Monitoring RM 3-4,3-5	ACV-29				Solenoid for 3-5 to sample EF-5,6	NC
17	Tritium Monitoring RM 3-4,3-5	ACV-30				Solenoid for 3-4 to sample EF-4,23	NO
18	Tritium Monitoring RM 3-4,3-5	ACV-31				Solenoid for 3-4 to sample SF-19	NC
19	Tritium Monitoring RM 3-4,3-5	ACV-32				Isolation of 3-4 from blower	NO
20	Tritium Monitoring RM 3-4,3-5	ACV-33				Isolation of 3-5 from blower	NO
21	Tritium Monitoring RM 3-4,3-5	ACV-35				Inlet isolation for blower 1	NO*
22	Tritium Monitoring RM 3-4,3-5	ACV-36				Inlet isolation for blower 2	NC*
23	Tritium Monitoring RM 3-4,3-5	ACV-37				Discharge isolation for blower 1	NO**
24	Tritium Monitoring RM 3-4,3-5	ACV-38				Discharge isolation for blower 2	NC**
25	Secondary System Critical Component List	Aux-1 MOTOR ONLY			2" Aux Booster pump		
26	Secondary System Critical Component List	Aux-1 PUMP ONLY			2" Aux Booster pump		
27	Secondary System Critical Component List	Aux-2 MOTOR ONLY			2" Aux Booster pump		
28	Secondary System Critical Component List	Aux-2 PUMP ONLY			2" Aux Booster pump		
29	Beam Port Facilities	BT-1 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
30	Beam Port Facilities	BT-2 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
31	Beam Port Facilities	BT-3 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
32	Beam Port Facilities	BT-4 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
33	Beam Port Facilities	BT-5 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
34	Beam Port Facilities	BT-6 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
35	Beam Port Facilities	BT-7 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
36	Beam Port Facilities	BT-8 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Open when requested by experimenters (A1
37	Beam Port Facilities	BT-9 (Solenoid)	Valve			Beam Tube In-Pile Shutter	Replaced by Pee Wee
38	Electrical Power System	Compressor Distribution					
39	Secondary System Critical Component List	Cooling Tower #1			Rejecting excess heat to environment		
40	Secondary System Critical Component List	Cooling Tower #2			Rejecting excess heat to environment		
41	Secondary System Critical Component List	Cooling Tower #3			Rejecting excess heat to environment		
42	Secondary System Critical Component List	Cooling Tower #4			Rejecting excess heat to environment		
43	Secondary System Critical Component List	Cooling Tower #5			Rejecting excess heat to environment		
44	CO2_System	COV-18	Valve			Junction Isolation	Normally Open
45	CO2_System	COV-2	Valve			CO2 Bulk Tank Isolation	Normally Open
46	CO2_System	COV-20	Valve			Check Valve	Normally Open
47	CO2_System	COV-21	Valve			Junction Isolation	Normally Open
48	CO2_System	COV-25	Valve			Inlet to Cavity Purge Flow Meter	Normally Open
49	CO2_System	COV-26	Valve			Bypass of Cavity Purge Flow Meter	Normally Closed
50	CO2_System	COV-27	Valve			Outlet of Cavity Purge Flow Meter	Normally Open
51	CO2_System	COV-38	Valve			Junction Isolation Valve	Normally Open
52	CO2_System	COV-4	Valve			Regulator Valve Set at 25 psig	Normally Open
53	CO2_System	COV-5	Valve			Junction Isolation	Normally Open
54	Electrical Power System	Critical Power Panel #1				Critical Power Panel #1	
55	Electrical Power System	Critical Power Panel #2				Critical Power Panel #2	
56	Electrical Power System	Critical Power Panel #3				Critical Power Panel #3	
57	Helium Sweep ListV2	CWV-112	Valve	Helium Sweep & Supply	Helium Sweep	Chilled Water Supply to Chiller	Open
58	Helium Sweep ListV2	CWV-113	Valve	Helium Sweep & Supply	Helium Sweep	Chilled Water Return from Chiller	Open
59	Electrical Power System	Diesel Generator A				Diesel Generator A	
60	Electrical Power System	Diesel Generator B				Diesel Generator B	
61	Primary System Critical Components	DP-1			Primary Cooling		As Required
62	Primary System Critical Components	DP-2			Primary Cooling		As Required

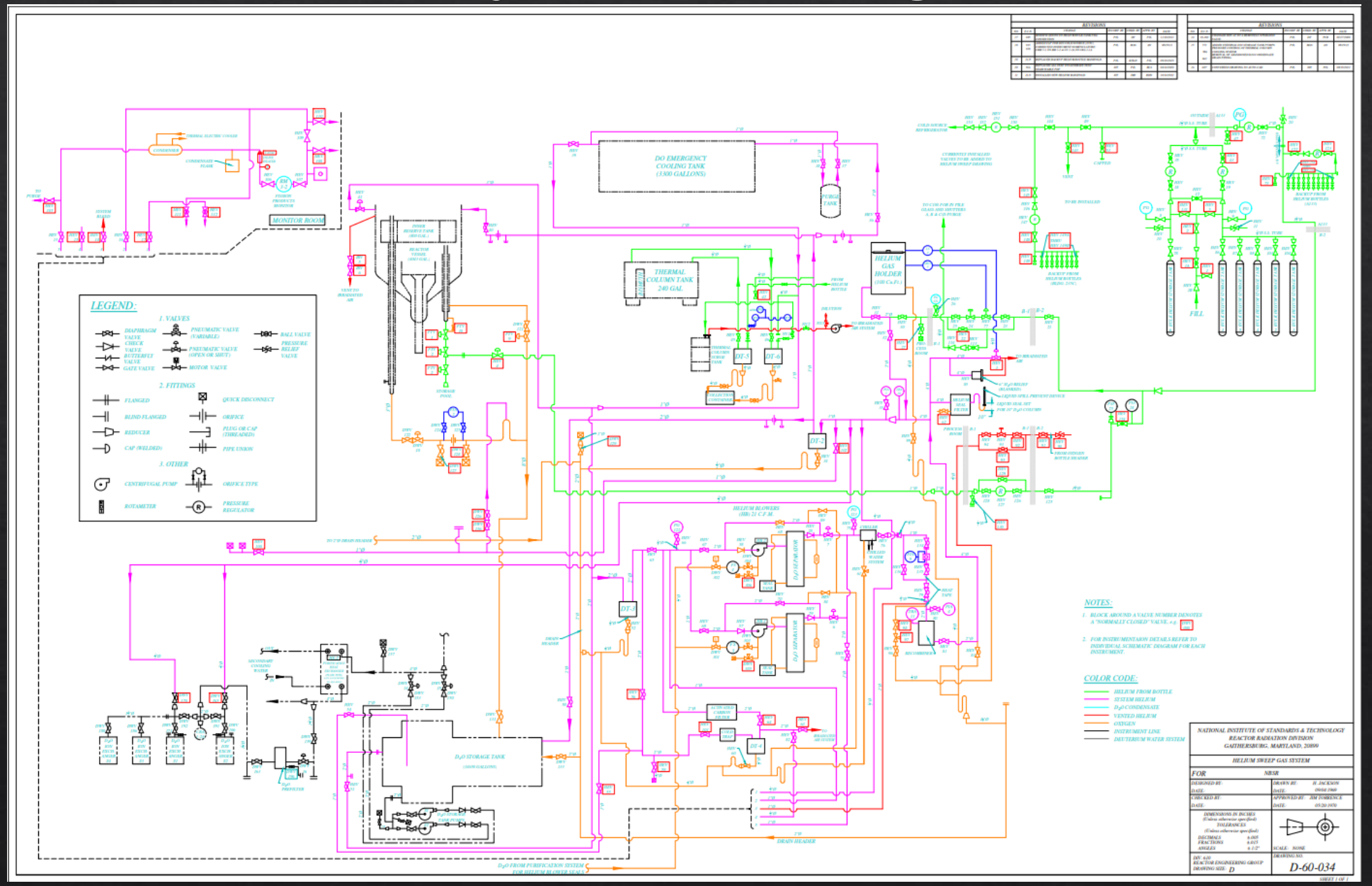
Data Collection Rules



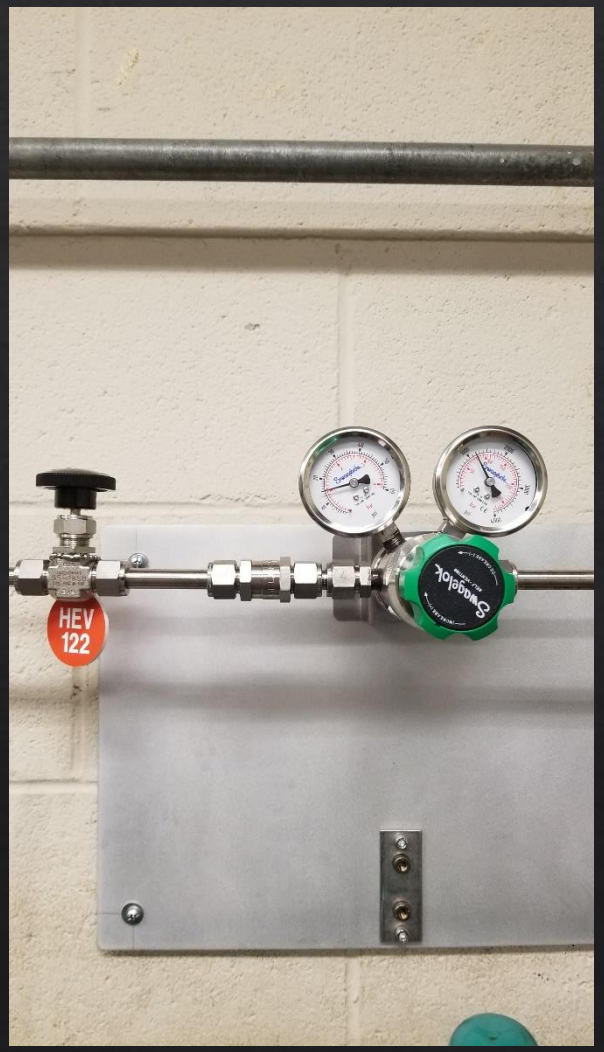
The project uses a tailored Six Sigma methodology, Define, Measure, Analyze, Improve and Control (DMAIC) for planning and execution.

PROJECT AREA	DEFINED ITEMS
Initial systems scope	37 Systems as identified in the Safety Analysis Report
Minimum data collection	35 Data Points
Initial data collection rules	#One System - Complete data collection through Verification #Verify all system components on associated drawing(s) #Verify drawing information through physical field review of component. #Take picture(s) of component including identifying manufacturer information
Data sources	#Approved drawings #Engineering Change Notices #Salesforce maintenance records #Material records #Field walkdown #Component pictures
Data verification methods	#Peer check drawing data load #Field review of components #Pictures supporting independent review
Assumptions	#Drawings reflect accurate physical configuration of components #All ECNs record sufficient information to match with specific affected components #All components are assigned a unique identification #All components contain sufficient manufacturer information to trace details #Salesforce trouble tickets traceable to specific components
Risks	#Lack of component as built documentation #Physical access to components limited due to reactor operations / other conditions #Historical use of slang references to systems / components as opposed to formal nomenclature #Lack of manufacturing info on component or weathering and wear to components removed identifiable information #Component manufacturers out of business or acquired limiting available information #Components without tags #Naming convention for untagged equipment could result in conflicts with existing component tags #Sharepoint Online Power Apps may not be able to support relationships among all supporting reference source tables #Drawing information may be incorrect

System Drawings



Field Walk-Down and Pictures



Verification

- Checklist built into MEL
- Helped keep track of progress
- Performing all three would cross-check data
- Tracked which drawings included each component

B	C	D
Drawing Revie…	Field Revie…	Pictur…
No	No	Yes
No	No	No
No	No	No
No	No	No
No	No	No
Yes	No	No
Yes	No	Yes
Yes	No	Yes
Yes	No	Yes
Yes	No	Yes
No	No	No
No	No	No
Yes	No	Yes
No	No	No
No	No	Yes
Yes	No	Yes
Yes	No	Yes
No	No	No

N
Drawing Number
D-60-022
D-60-034_R21
D-60-034_R21
D-60-022
D-60-022
D-60-022
D-60-022
D-60-022
D-60-022
D-60-022
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D-60-022
D-60-022
D-60-022
E-60-036_R25
D-60-022
D-60-022
D-60-022
D-60-022'D-60-024_R5
D-60-022'D-60-024_R5
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Power App


Master Equipment Solution App
Pictures Library
Procedure Library
Manuals Library
Drawings Library
ECN Library
Help
Contact
Search Component ID
New Equipment Record
HEV-144
Ball Valve
NT-HEX-19
Relief Valve
NT-HEX-18
Relief Valve
HEV-1B
Check Valve
HEV-1A
Ball Valve
HEV-153
Gate Valve
HEV-104
Gate Valve
HEV-12
Ball Valve
Selected Equipment SnapShot: HEV-144
Component ID
HEV-144
Component Type
Ball Valve
Critical Component
No
Location
South Yard
Safety Function
System
Helium Sweep & Supply
SubSystem
Helium Supply
Manufacturer
Apollo
Catalog Number
Model
86A-205-01
Serial Number
NA
Power Source
Voltage
Amperage
Control style
Status
Active
Technical Specification
Maintenance Owner G...
ROE
Size
1"
Normal Operating Con...
Open
Installation Date
Diaphragm RD
Refurbish Date
Pictures
ECNs
Drawings
Manuals

User Aid Creation

1. **Brief Explanation of what the MEL is and where it is located**

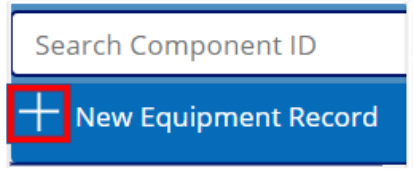
The Master Equipment List (MEL) Is a searchable compilation of NBSR operational components. The MEL is specific the NBSR, including only components related to the operation and safety of the reactor. The MEL consists of multiple supporting information tables located on the NIST SharePoint Online. Users primarily access the table information through a central front end "Power App" application. The application allows user to view, edit and add equipment records as required. The MEL will be used to create a Computerized Maintenance Management System (CMMS), a digital database of component management operations.

2. **MEL User Features**
   - Central location for retrieval of critical information required to support development of preventative and corrective maintenance plans
   - Efficient user search interface for retrieval of component information
   - Efficient retrieval of component reference information and available sources.
   - Effective communication of component and reference information status.
   - Efficient user-friendly MEL update methods
   - Effective user interface
   - Access to the source libraries

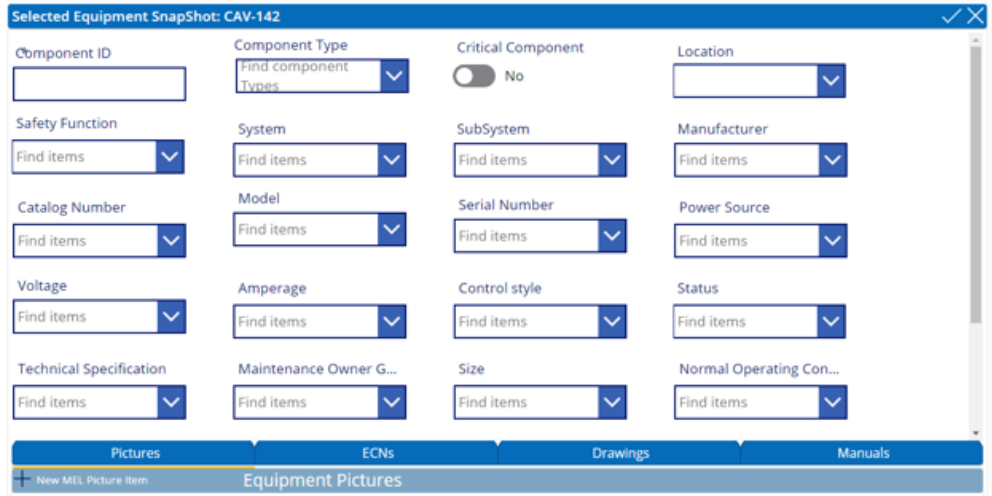
7. **Steps for loading new components**

Some users can add new components to the MEL. The user should first confirm the component ID does not already exist in the MEL. Users should review the given definitions of each category of information. They should also look at the naming convention of other components from the same system. (For Example, HEV for Helium System Valve, SCV for Secondary Cooling Valves.) Each component should have a unique component ID number, and be created in sequential order. Most categories have a drop-down select menu to choose from. In the Description and Notes sections, you are able to freely type a message to convey any needed extra information. Users will have a section to input their sources of information used for the component info. Try to add as much information as possible.

- First, click on the Plus sign below the search bar.



- The main window will now be blank. You can now input information on the new component, and create a unique component ID.



- At the bottom, enter any sources used to gather the component information. To add a new source to the component, select the desired source tab, and click the plus sign .

- Remember to hit the save button to save any added sources

Lessons learned from the project

- More important to be adaptable than always correct
- Evaluating scope of a project at the beginning makes the future easier
- Easier to prevent problems than to fix them

Acknowledgements

- Michelle Dudley – Mentor
- SURF/CORE directors
- Nelay Sharma – Fellow CORE intern
- Lance Kingsbury – Operator
- Jimyung Ryu – QA International Associate
- Nageshwar Bhonagiri – Senior Sharepoint Developer
- The Center for High Resolution Neutron Scattering (CHRNS) is a national user facility jointly funded by the NIST Center for Neutron Research (NCNR) and the National Science Foundation (NSF) under Agreement No. DMR-2010792.

NIST CENTER FOR NEUTRON RESEARCH

CHRNS CENTER FOR HIGH RESOLUTION NEUTRON SCATTERING