





# STEP Files as Part of Product Definition (Inseparable Assemblies): Continuation from PTC Live Global 2014

## Sandia National Laboratories:

### (Corporate)

- **Warhead systems engineering and integration**
- **Design agency for nonnuclear components**
- **Defense, energy, and security**



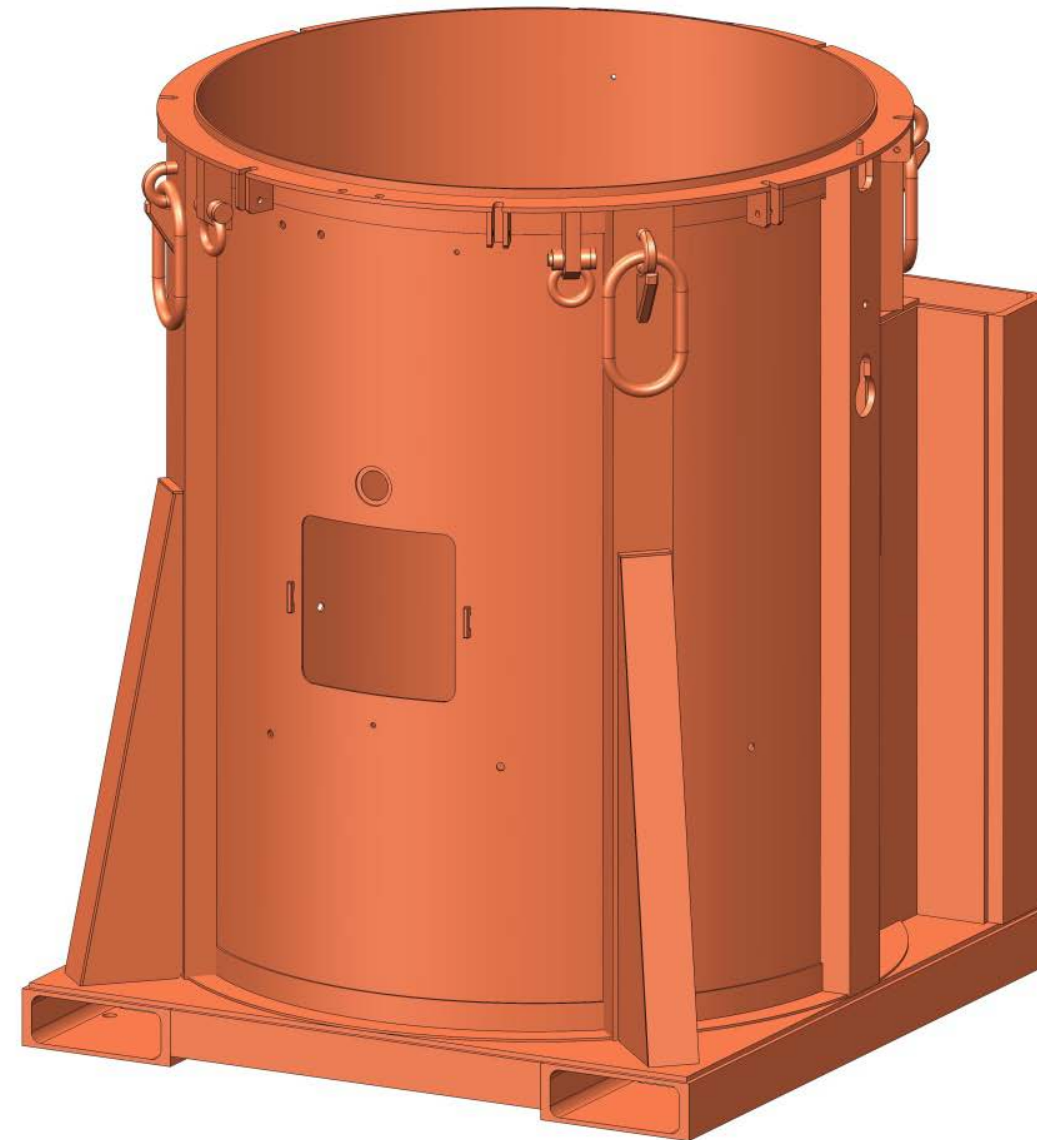
### (Department)

- **Plan and execute engineering design services**  
CAD Engineering, Design Analysis, Configuration Management
- **Manage engineering product data**  
Product Data Management Solutions



Overview:

- **Identify**
- **Authorize**
- **Configuration Manage**

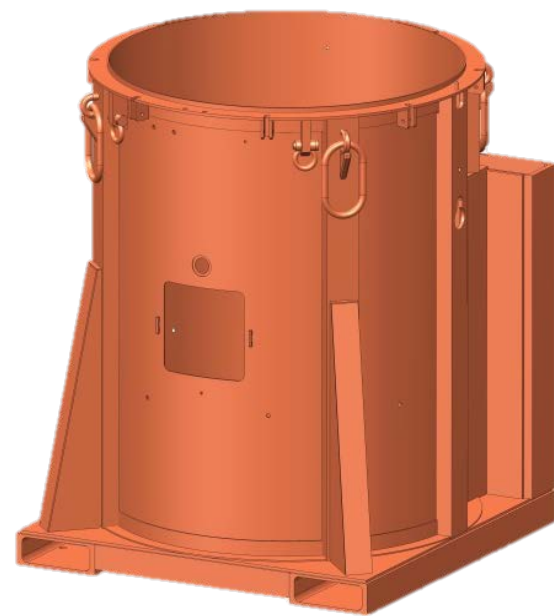


Agenda:

- **Support Model introduction**
- **Brief on 2014's presentation**
- **Process development**
- **Definitions / requirements**
- **Discussion / questions**

Support Model:

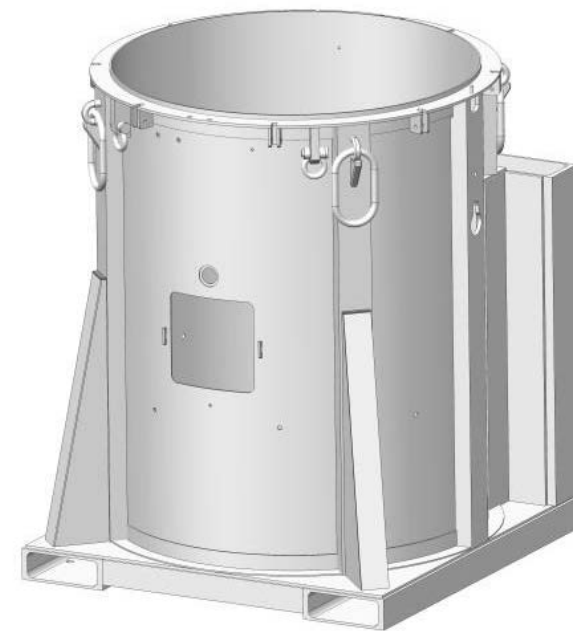
- **STEP file equivalent to 3D CAD model geometry**
- **Serves as a recognized method of definition**
- **Identified with an “SH” prefix**



.ASM (exported)



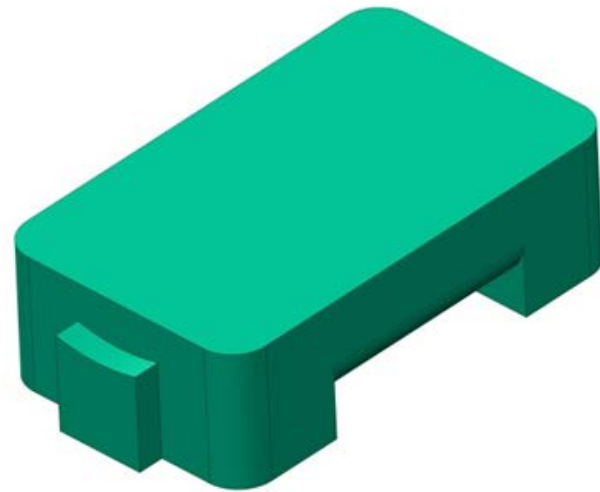
SH56789-000 (.STP)



.ASM (imported)

Support Model (2014):

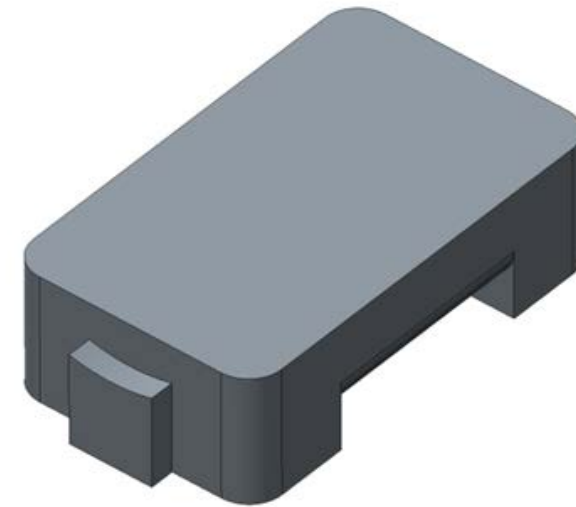
- **Single piece part definition**
- **New definition only**
- **SH prefix**



.PRT (exported)



SH12345-000 (.STP)



.PRT (imported)





Business case:

- **Enables use of 3D geometry by manufacturing**
- **Enables control of sensitive or proprietary information**
- **Enables long-term retention of 3D model geometry**

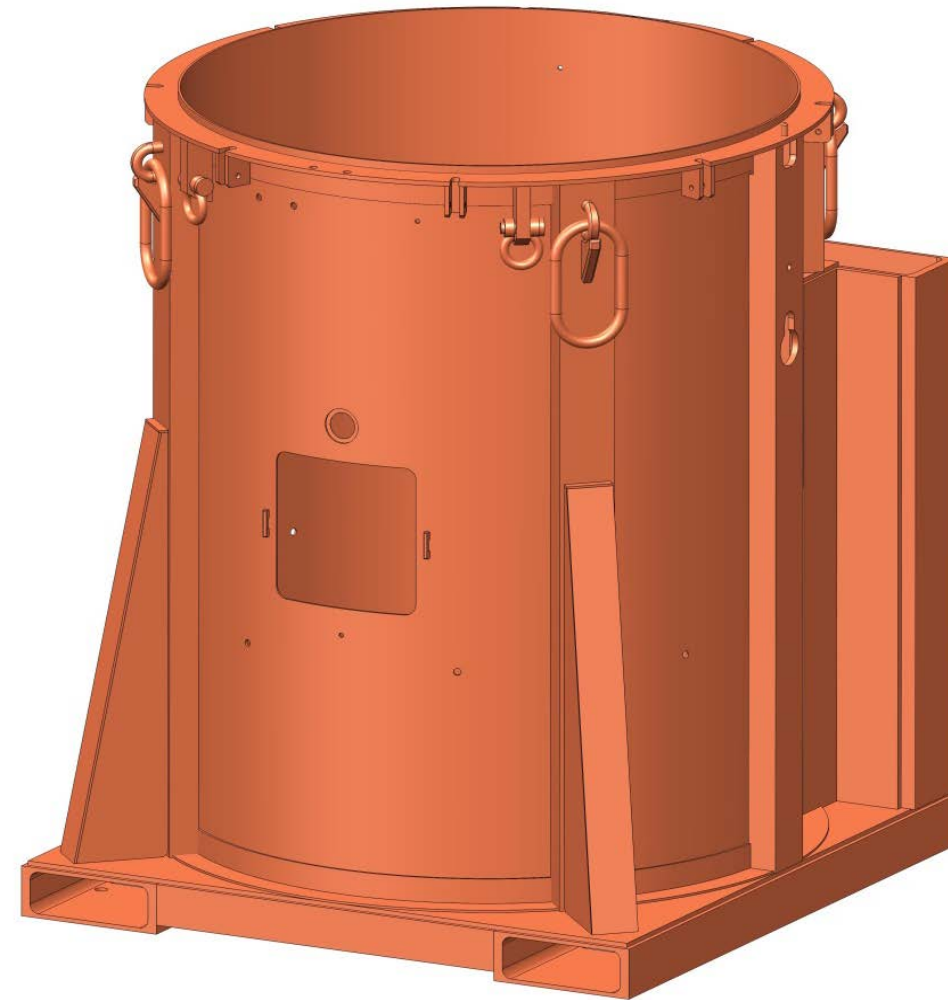
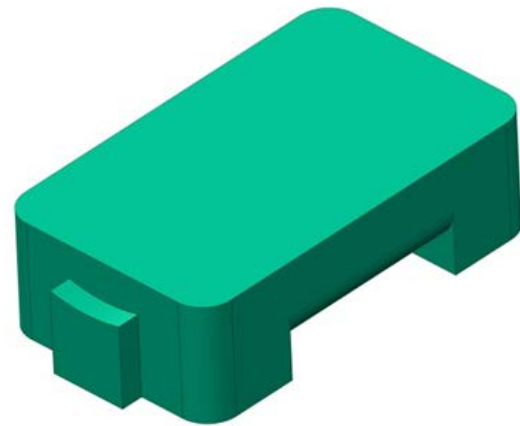
Process development:

- **MCAD / CM planning**
- **Long-term data and documentation requirements**
- **Pull from manufacturing partners**
- **Customer and industry indicators**



Product definition:

- Information set
- Specific acceptance requirements
- Processes



## STEP:

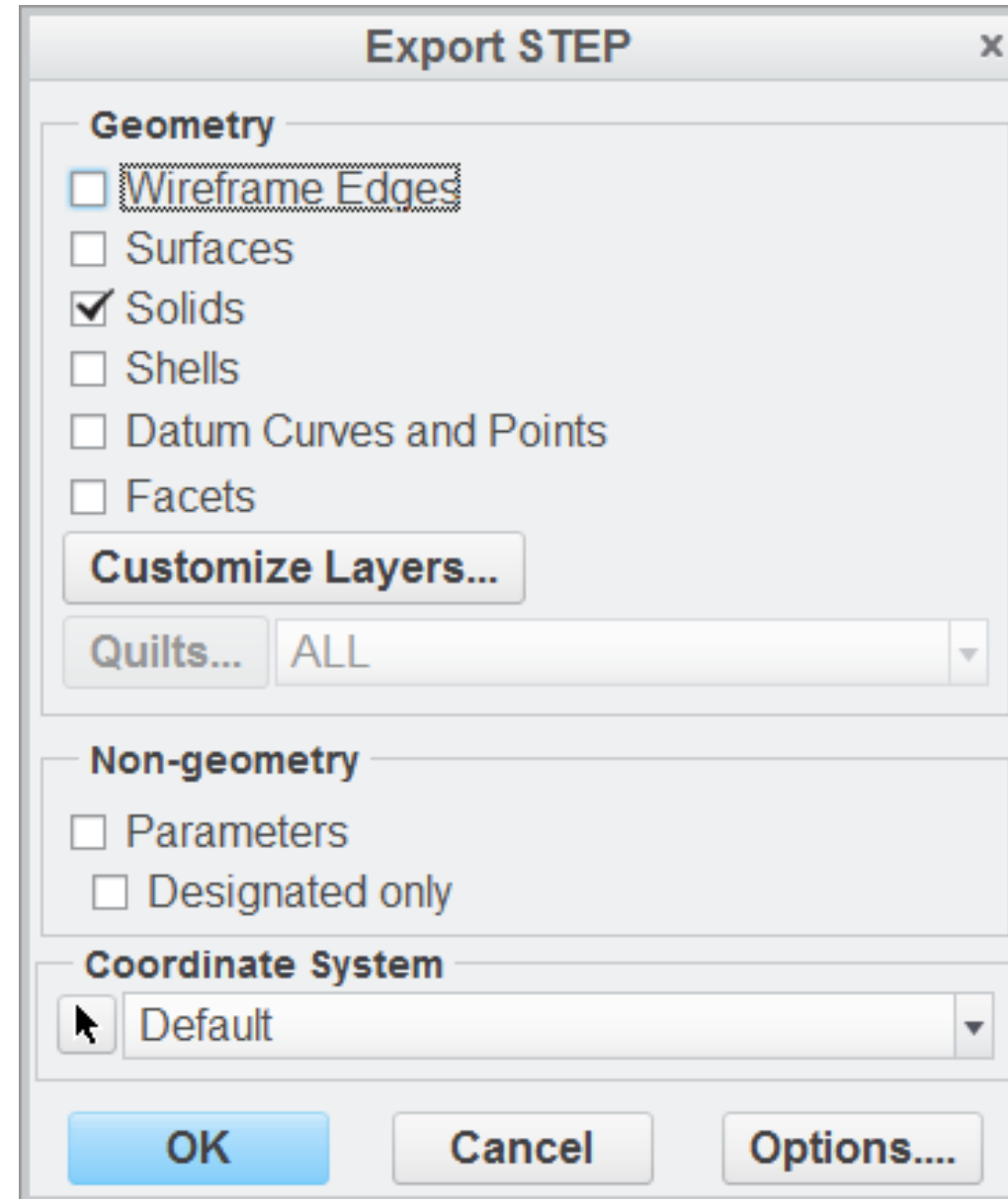
- **S**Tandard for the **E**xchange of **P**roduct model data (.stp)
- ISO 10303 contains complete set of STEP documents (parts)
- Application Protocols (APs) are the implementable parts
- AP203, Configuration Controlled 3D Design of Mechanical Parts and Assemblies

Example:

```
ISO-10303-21;  
HEADER;  
FILE_DESCRIPTION(('','2;1');  
FILE_NAME('56789-000-UNC','2015-03-02T','MCAD_user'),(  
'Sandia National Laboratories',  
'MCAD SOFTWARE, 2015',  
'MCAD SOFTWARE, 2015','');  
FILE_SCHEMA(('CONFIG_CONTROL_DESIGN'));  
ENDSEC;  
DATA;  
#2=CARTESIAN_POINT('',(0.E0,0.E0,2.5E-1));  
#3=DIRECTION('',(0.E0,0.E0,1.E0));  
#4=DIRECTION('',(0.E0,0.E0,0.E0));  
#5=AXIS2_PLACEMENT_3D('','#2,#3,#4);
```

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Example:





Process document:

## IDENTIFICATION, SUPPORT MODEL (SH), 3D CAD PART

<u>DOCUMENT NUMBER</u>	<u>ISSUE</u>	<u>RELEASE/CHANGE NO.</u>	<u>DATE</u>
SPRT-MOD-ID	A	10112013SNL	10/11/13
SPRT-MOD-ID	B	05302014SNL	05/30/14
SPRT-MOD-ID	C	10202014SNL	10/20/14

### Callout:

**SUPPORT MODEL REPRESENTS (1) GEOMETRY PER SPRT-MOD-ID.**

(1) Insert “**MEAN**” or “**NOMINAL**” to represent the Support Model’s state of geometry.

## Dimensions:


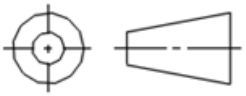
- **Mean**
- **Nominal**
- **Limit / Single Limit**

Process requirement:

```
ISO-10303-21;  
HEADER;  
/*  
TITLE: SUPPORT MODEL, INSEPARABLE ASSEMBLY  
CONTROL NUMBER: SH56789-000  
ISSUE: A  
NATIVE FILE USED TO GENERATE STEP: 56789-000-UNC  
CAGE CODE: 14213  
DEFINITION RELEASE: 03022015SNL  
MODEL CLASSIFICATION: UNCLASSIFIED  
NOTE: SUPPORT MODEL REPRESENTS MEAN GEOMETRY PER SPRT-MOD-ID.  
*/  
FILE_DESCRIPTION(('','2;1');  
FILE_NAME('56789-000-UNC','2015-03-02T',('MCAD_user'),(  
'Sandia National Laboratories'),
```

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Process requirement:

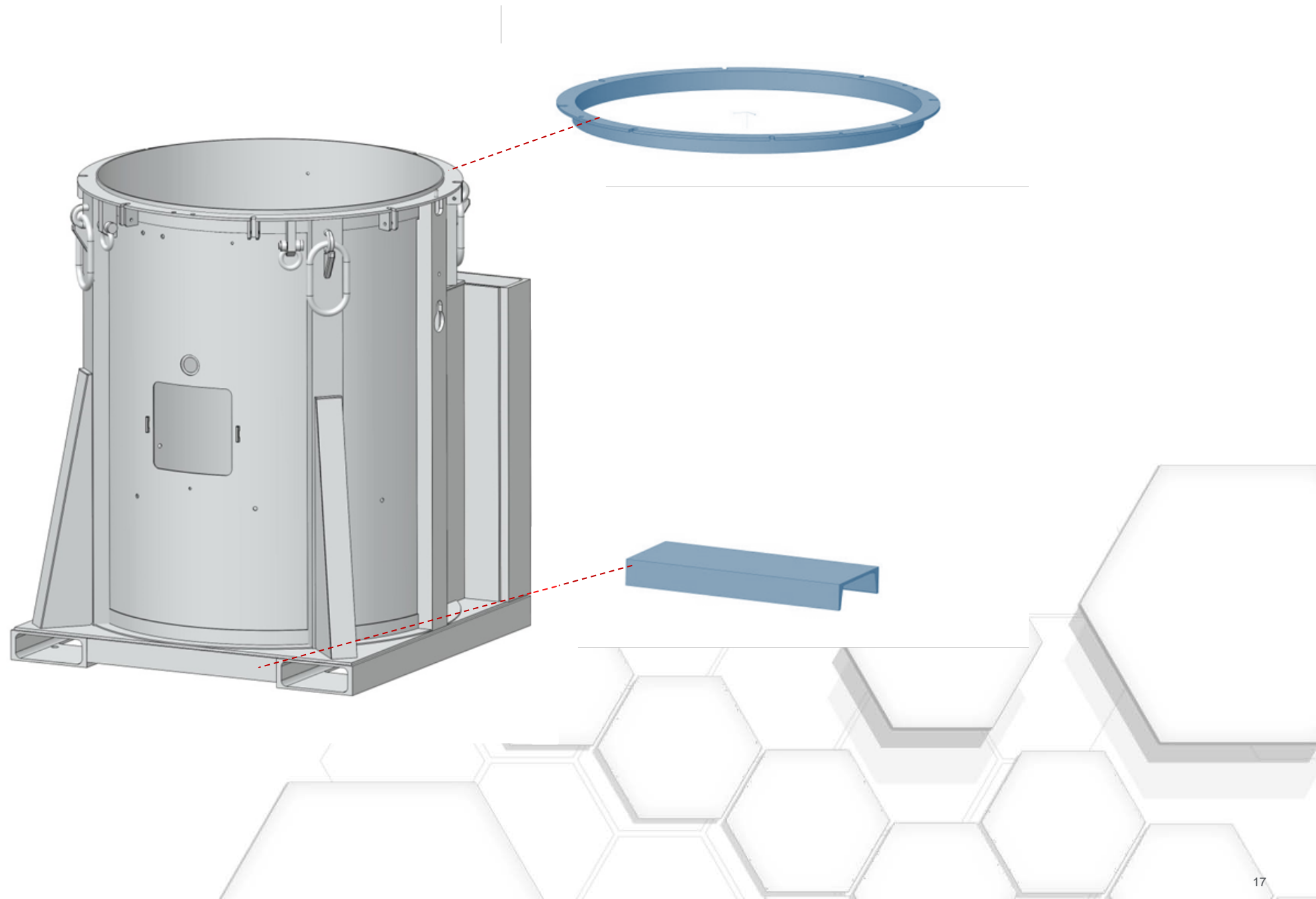
→	AR	SH56789-000	SUPPORT MODEL, INSEPARABLE ASSEMBLY					
	ARS	DDDDDD	MATERIAL			3		
	ARS	DDDDDD	MATERIAL			2		
	ARS	DDDDDD	MATERIAL			1		
→	NA	SPRT-MOD-ID	IDENTIFICATION, SUPPORT MODEL, 3D CAD PART					
	NA	CCCCCC	WELDING REQUIREMENTS					
	NA	BBBBBB	MARKING REQUIREMENTS					
	NA	AAAAAA	GENERAL PRODUCT DEFINITION REQUIREMENTS					
	NO REQD	PART/CONTROL NO	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE	ITEM		
		QUANTITY	NA = NO QUANTITY FOR DOCUMENTS	PM = PROCESS MATERIAL	AR = AS REQUIRED			
		ABBREVIATIONS:	ALT = ALTERNATE	EM = EXPENSE MATERIAL	ARS = AS REQUIRED FOR ASSEMBLY			
56789-000	 SANDIA NATIONAL LABORATORIES P. O. BOX 5800 ALBUQUERQUE, NM 87185		TITLE <b>INSEPARABLE ASSEMBLY</b>			A		
	ENGLISH							
	THIRD ANGLE PROJECTION 		PART CLASSIFICATION <b>UNCLASSIFIED</b>		SIZE <b>C</b>		DRAWING NUMBER <b>56789</b>	ISSUE <b>A</b>
			DRAWING CLASSIFICATION <b>UNCLASSIFIED</b>		CAGE 14213		SCALE 1/1	SHEET 1 OF 1
PART NO.			STATUS SA - REL - 02 MAR 2015					



Process requirement:

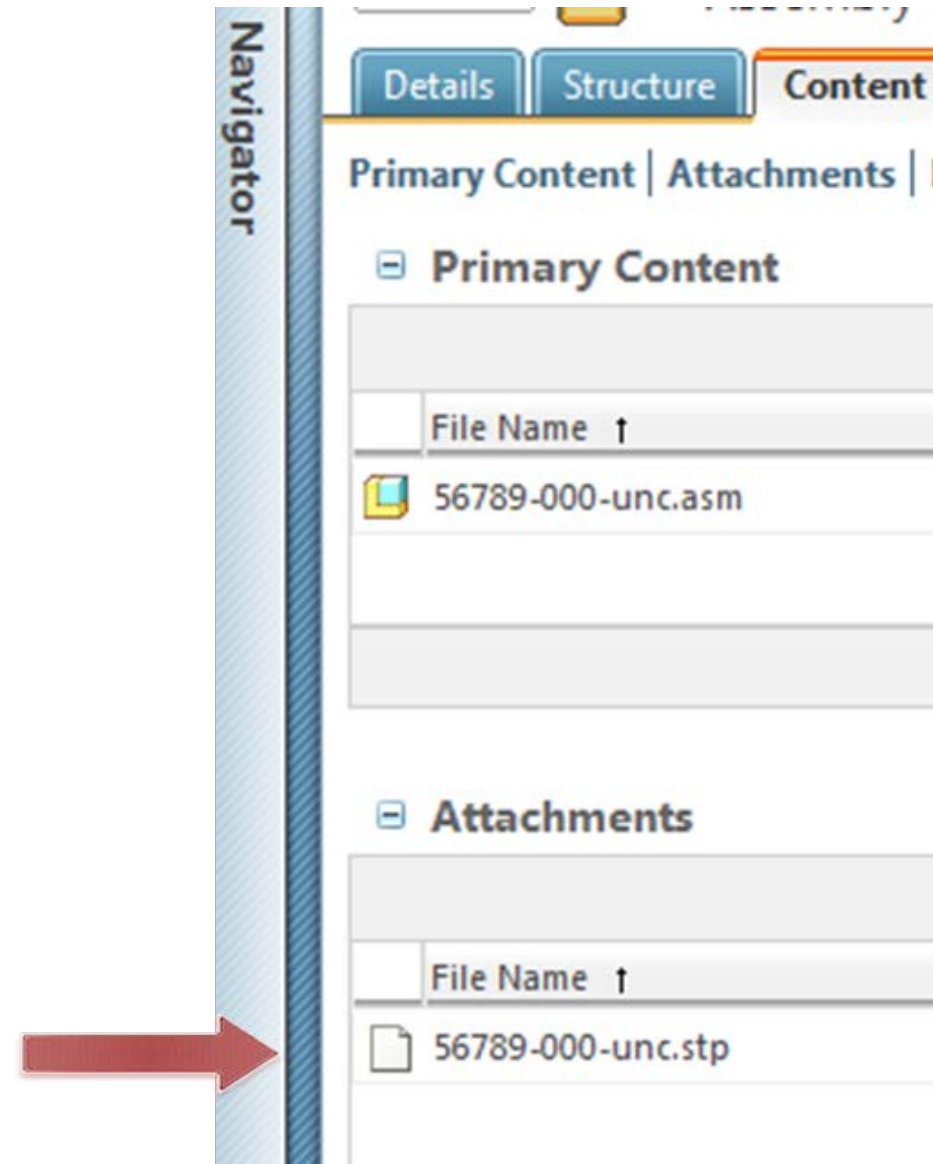
Message Log	
File	Edit View
• Reading STEP data.	
• Reading 56789-000-unc.stp. Step 1: 100 percent	
• Reading 56789-000-unc.stp. Step 2: 100 percent	
• Reading 56789-000-unc.stp. Step 3: 100 percent	
• Reading 56789-000-unc.stp. Step 4: 100 percent	
• Reading 56789-000-unc.stp. Step 5: 100 percent	
• Reading 56789-000-unc.stp. Step 6: 100 percent	
• Reading 56789-000-unc.stp. Step 7: 100 percent	
• Reading 56789-000-unc.stp. Step 8: 100 percent	

- 56789-000-UNC\_34.ASM
  - Annotations
    - ASSY\_CSYS
    - ASSY\_RIGHT
    - ASSY\_TOP
    - ASSY\_FRONT
  - Import Feature id 40
  - 56789-ITEM1-UNC\_3.PRT
  - 56789-ITEM4-UNC\_3.PRT
  - 56789-ITEM6-UNC\_3.PRT
  - 56789-ITEM23-UNC\_3.PRT



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Process requirement:



Process requirement:

- **Support Model and graphic drawing form a compatible set**
- **Compatible set is maintained at the same issues**
- **Changes are driven by the associated native part and drawing files**

Process requirement:

- Authorize the Support Model for use by a Definition Release
- Place Definition Release and product definition into configuration and/or records management system



Example:

<u>Number</u>	<u>Issue</u>	<u>Title</u>
56789	A	INSEPARABLE ASSEMBLY
SH56789	A	SUPPORT MODEL, INSEPARABLE ASSEMBLY

### **AUTHORIZATION DETAILS**

- 1. Definition release authorizes use of drawing 56789 and Support Model SH56789 in support of manufacturing and product acceptance activities.**
- 2. Record copy of drawing 56789 and Support Model reside in the corporate records management system.**

Benefits of process:

- **Establishes requirements for consistency in Support Models**
- **Eliminates assumptions regarding intended use via authorization**
- **Provides long-term traceable record to retrievable 3D data**

Summary of process:

- **Identify** the Support Model within product definition
- **Authorize** the Support Model by Definition Release
- **Configuration manage** a STEP file that is geometrically equivalent to the associated 3D CAD native model file

Discussion / Questions:

- **Similar methods in your product definition?**
- **Questions?**



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