

Integrating “Smart Documents” into PLM and the Digital Thread

THE VALUE OF PERFORMANCE.
NORTHROP GRUMMAN

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PLM Road Map™ & PDT North America 2019

PLM for Professionals – Product Lifecycle Innovation

CIMdata®

May 29-30, Tysons Corner, VA

-eurostep-

Agenda

- What's the problem?
- Is it really a problem?
- What does a smart document look like?
- Smart documents in PLM
- Benefits of smart documents
- What is the potential?

The document quagmire

- Large amounts of information
- Stacks and folders of specifications
- Information extraneous to task at hand
- Large amounts of cross referencing
- Verify the latest version



Lets Go Electronic!

Electronic solution



Applications:

Microsoft Word, Excel, PowerPoint

Adobe FrameMaker, PageMaker

Arbortext

Others

- Convert to PDF format
- Include hyperlinks
- Store in PDM system

Electronic is not enough!

Is it really a problem?

A Simple Printed Wiring Board Drawing Note

“UNLESS OTHERWISE SPECIFIED PERFORM ELECTRICAL TESTS PER FIND NUMBER 106”

FIND NUMBER 106:

“PRINTED WIRING BOARDS, RIGID, FABRICATION REQUIREMENTS”

Parts list find number 106

"PRINTED WIRING BOARDS, RIGID, FABRICATION REQUIREMENTS"
DOCUMENT PAGE COUNT - 24

4 GOVERNMENT / NATIONALLY RECOGNIZED PUBLICATIONS

12 REFERENCED DOCUMENTS

6 INDUSTRY PUBLICATIONS (ANSI, IPC, SAE)

2 GOVERNMENT PUBLICATIONS

11 INDUSTRY PUBLICATIONS (ASTM, ANSI, IPC)

4 OTHER NGSC DOCUMENTS

2 OTHER NGSC DOCUMENTS (AS APPLICABLE)

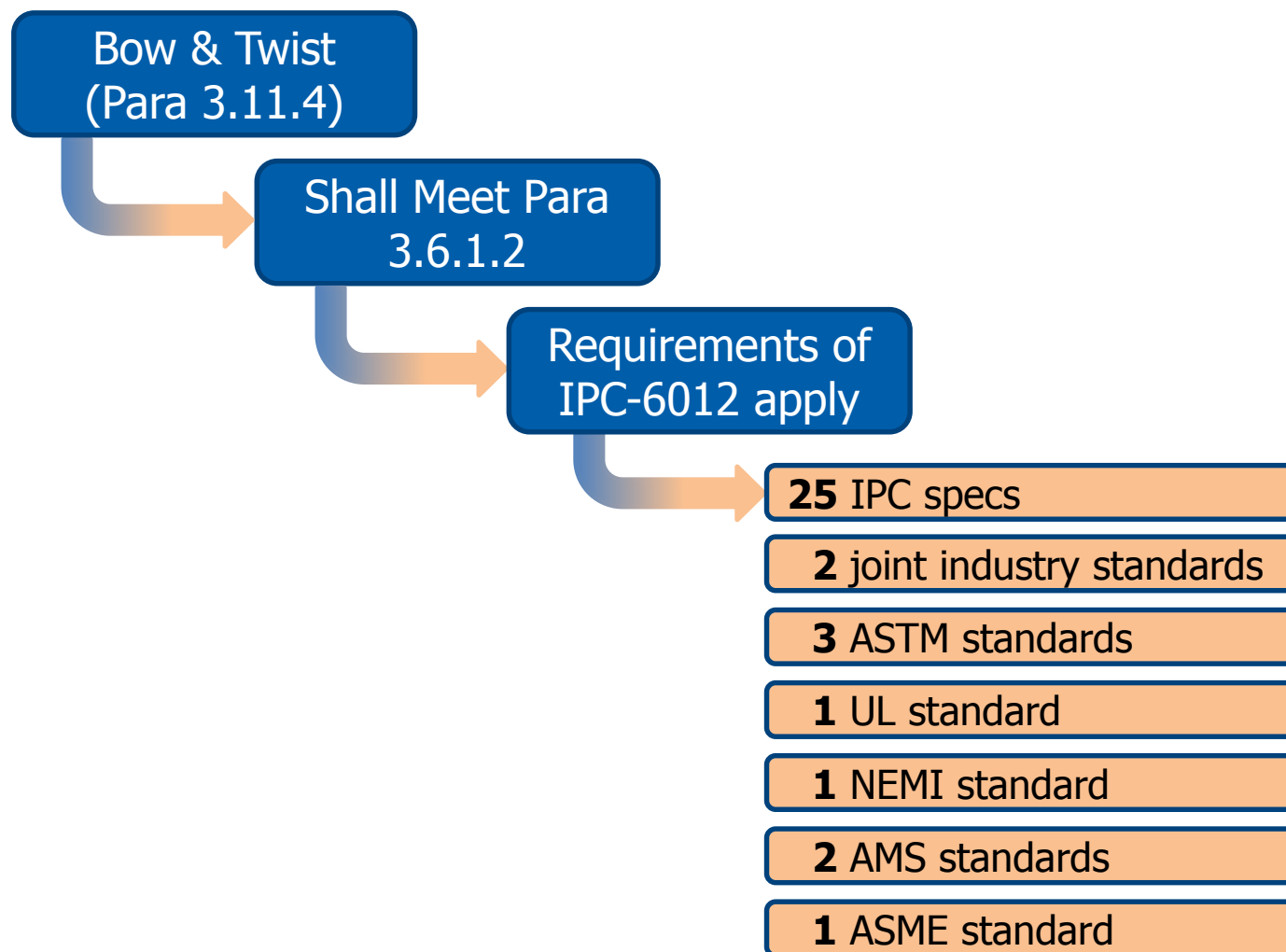
2 GOVERNMENT PUBLICATIONS

12 INDUSTRY PUBLICATIONS (ASTM, ANSI, IPC)

4 OTHER NGSC DOCUMENTS

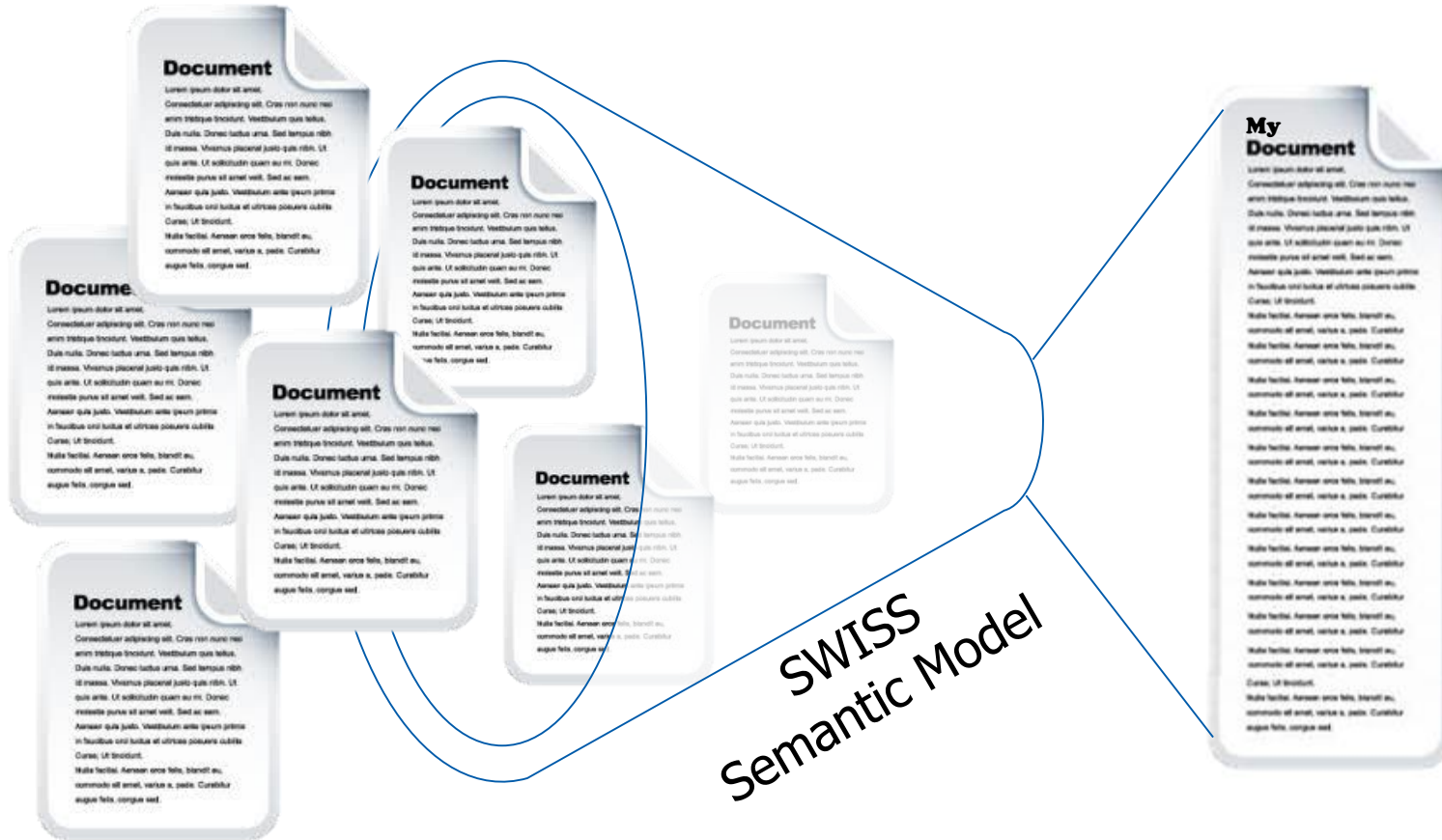
Represents 40+ Unique Documents

Let's narrow further



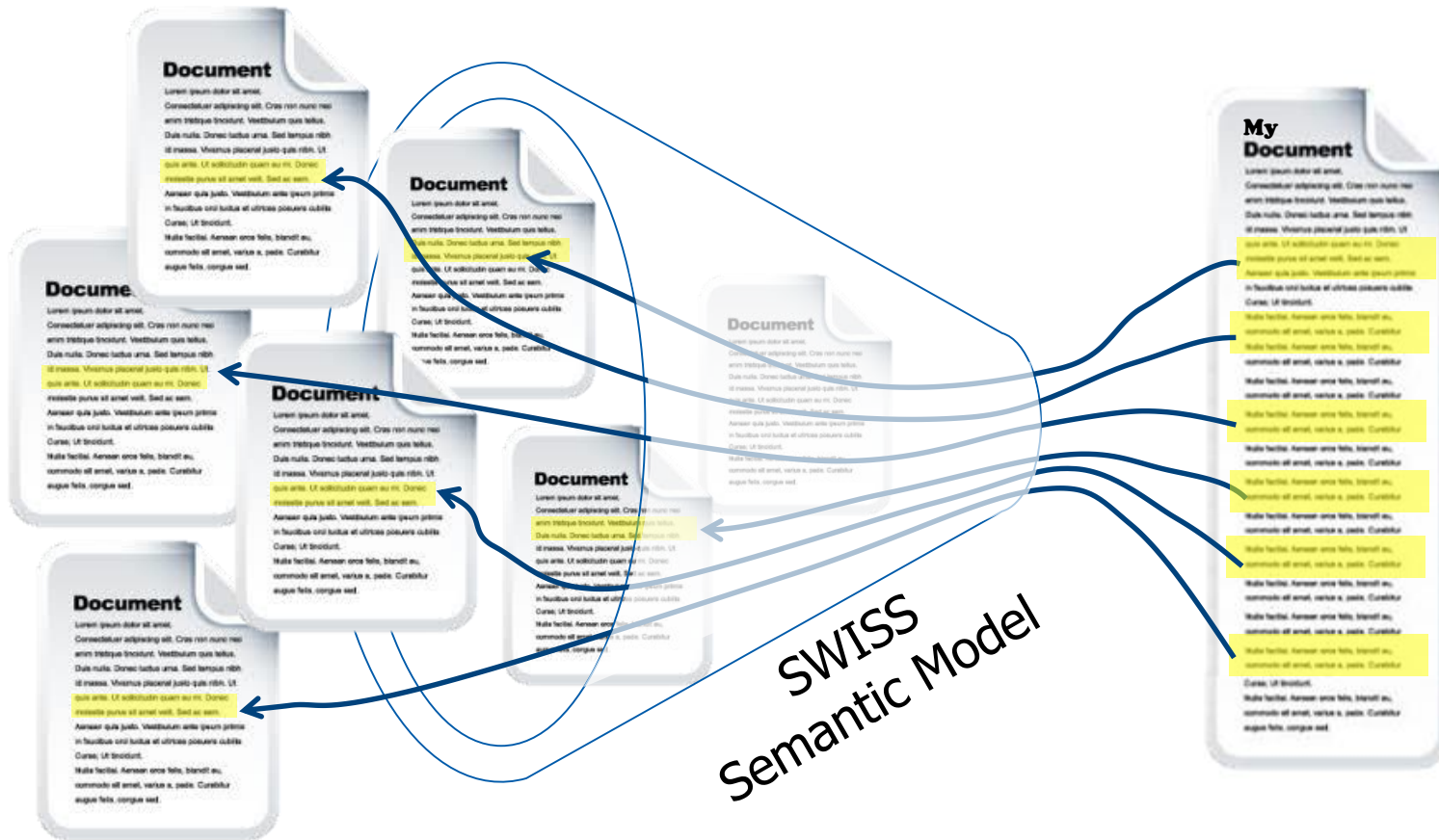
37 Unique Documents

Leverage transclusion



Looks & Acts Like Standard Cut & Paste

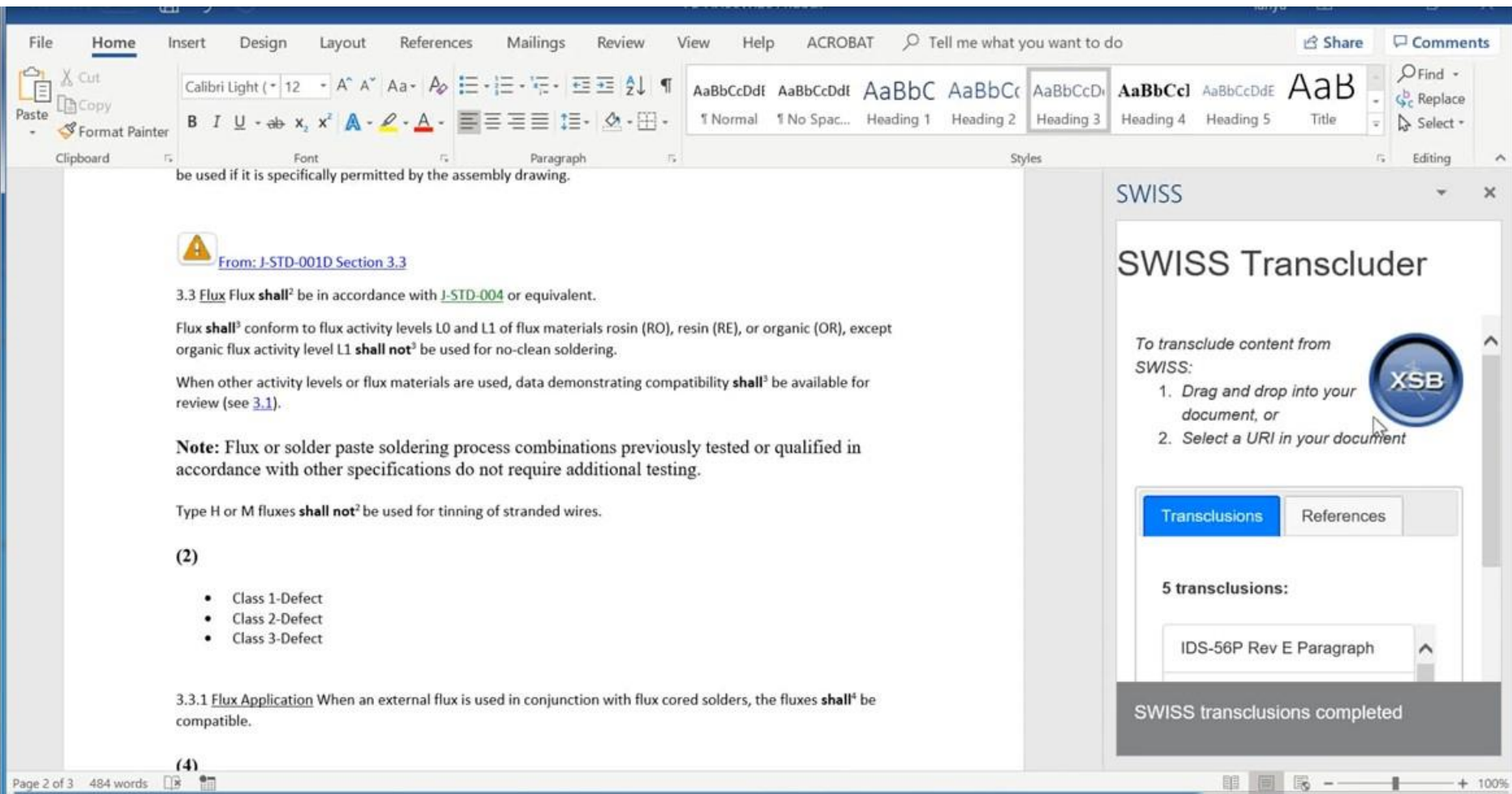
Let's make it smart!



SWISS
Semantic Model


Two Way Communication!

What does a smart document look like?



The screenshot displays a Microsoft Word document with a sidebar titled "SWISS". The document text includes a warning icon and a link to "J-STD-001D Section 3.3", followed by a paragraph about flux activity levels. A "Note" section discusses flux or solder paste combinations. A list of defects (Class 1-Defect, Class 2-Defect, Class 3-Defect) is shown. The sidebar "SWISS" contains a title "SWISS Transcluder", instructions to drag and drop content or select a URI, a "Transclusions" button, a list of 5 transclusions (including "IDS-56P Rev E Paragraph"), and a status bar indicating "SWISS transclusions completed".

be used if it is specifically permitted by the assembly drawing.

 [From: J-STD-001D Section 3.3](#)

3.3 Flux Flux **shall**² be in accordance with [J-STD-004](#) or equivalent.

Flux **shall**³ conform to flux activity levels L0 and L1 of flux materials rosin (RO), resin (RE), or organic (OR), except organic flux activity level L1 **shall not**³ be used for no-clean soldering.

When other activity levels or flux materials are used, data demonstrating compatibility **shall**³ be available for review (see [3.1](#)).

Note: Flux or solder paste soldering process combinations previously tested or qualified in accordance with other specifications do not require additional testing.

Type H or M fluxes **shall not**² be used for tinning of stranded wires.

(2)

- Class 1-Defect
- Class 2-Defect
- Class 3-Defect

3.3.1 Flux Application When an external flux is used in conjunction with flux cored solders, the fluxes **shall**⁴ be compatible.

(4)


Page 2 of 3 484 words

SWISS

SWISS Transcluder

To transclude content from SWISS:

1. Drag and drop into your document, or
2. Select a URI in your document



Transclusions References

5 transclusions:

IDS-56P Rev E Paragraph

SWISS transclusions completed

Defines the Authoritative Source!

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What does a smart document look like?



From: J-STD-001D Section 3.3

3.3 Flux Flux **shall**² be in accordance with J-STD-004 or equivalent.

Flux **shall**³ conform to flux activity levels L0 and L1 of flux materials rosin (RO), resin (RE), or organic (OR), except organic flux activity level L1 **shall not**³ be used for no-clean soldering.

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Type H or M fluxes **shall not**² be used for tinning of stranded wires.

(2)

- Class 1-Defect
- Class 2-Defect
- Class 3-Defect

3.3.1 Flux Application When an external flux is used in conjunction with flux cored solders, the fluxes **shall**⁴ be compatible.

Defines the Authoritative Source!

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What changed at the source?

Type H or M fluxes **shall not**² [D1D2D3] be used for tinning of stranded wires.

(2)

- ~~Class-1 Defect~~
- ~~Class-2 Defect~~
- ~~Class-3 Defect~~

3.3.1 Flux Application When an external flux is used in conjunction with flux cored solders, the fluxes shall [D1D2D3] be compatible both from a cleaning process standpoint and a chemical standpoint. Objective evidence of compatibility, e.g., surface insulation resistance testing, ion chromatography testing, shall [N1D2D3] be available for review, see 1.8.7 and Appendix C. IPC-9202 and IPC-9203 are examples for qualification testing. ~~When an external flux is used in conjunction with flux cored solders, the fluxes shall~~⁴ be compatible.

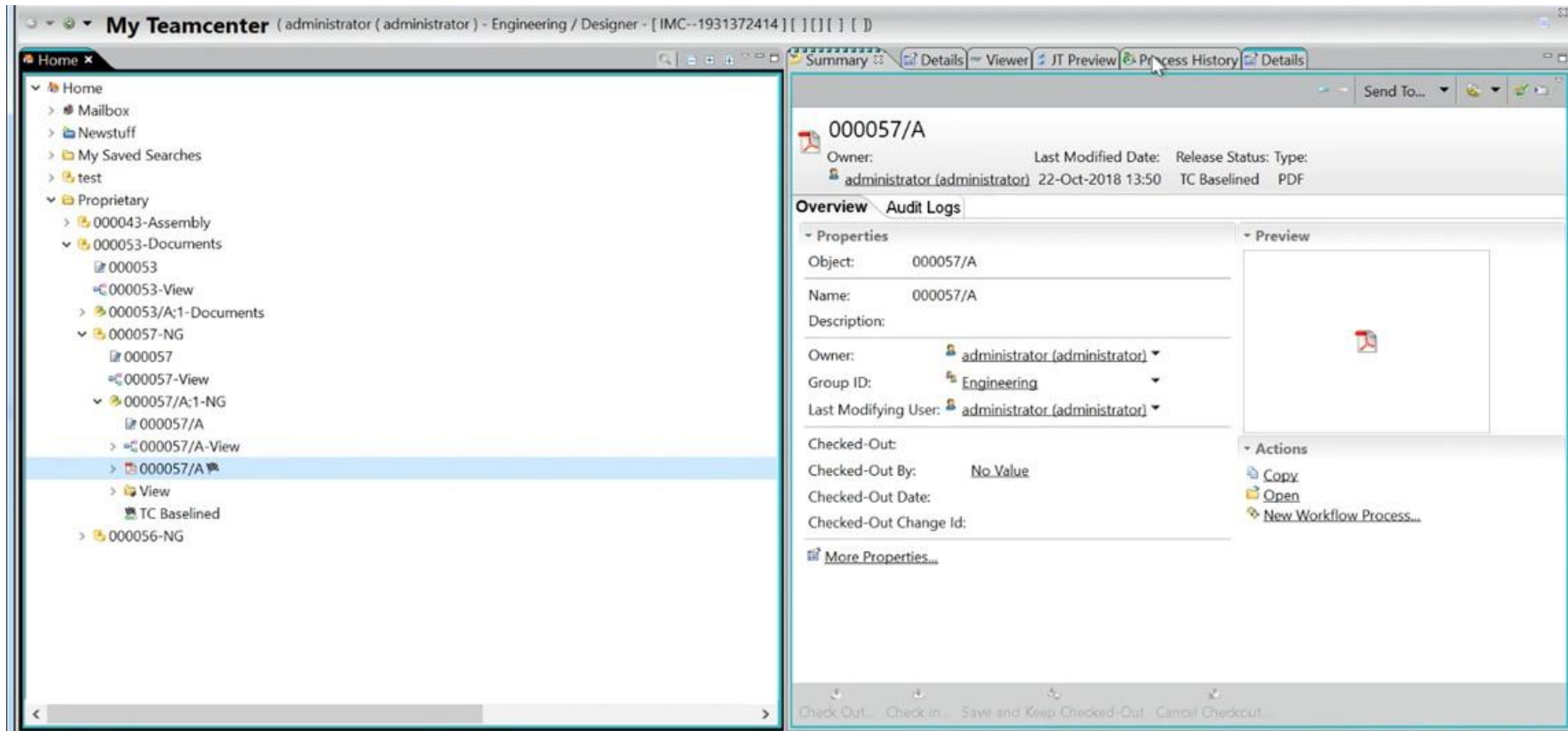
(4)

- ~~Class-1 Defect~~
- ~~Class-2 Defect~~
- ~~Class-3 Defect~~

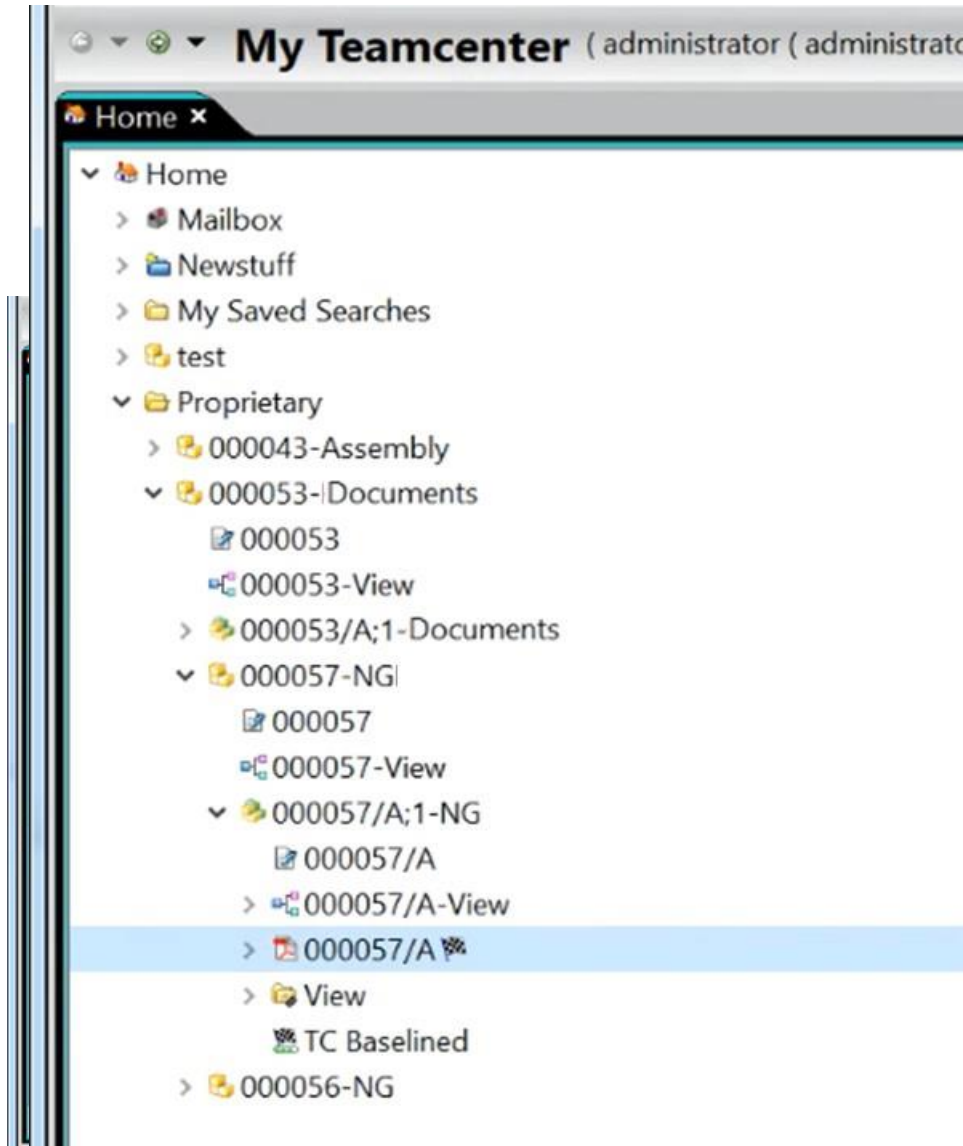
That is a Smart Document!

PLM representation

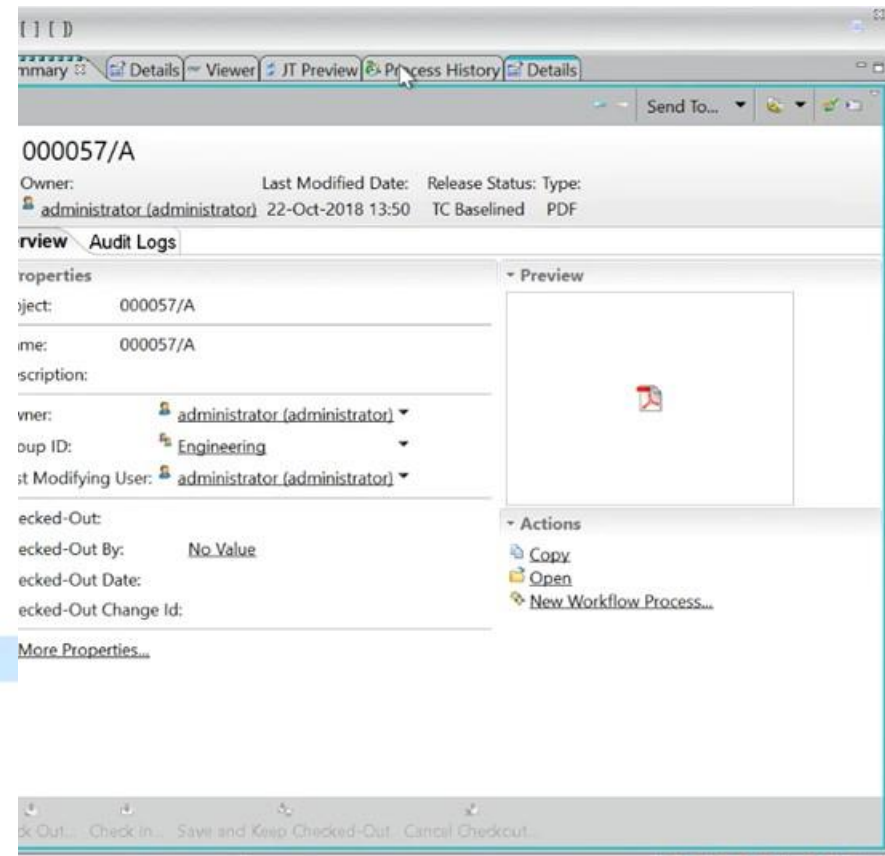
Engineering BOM
Manufacturing BOM
Bill Of Process
Product Structure



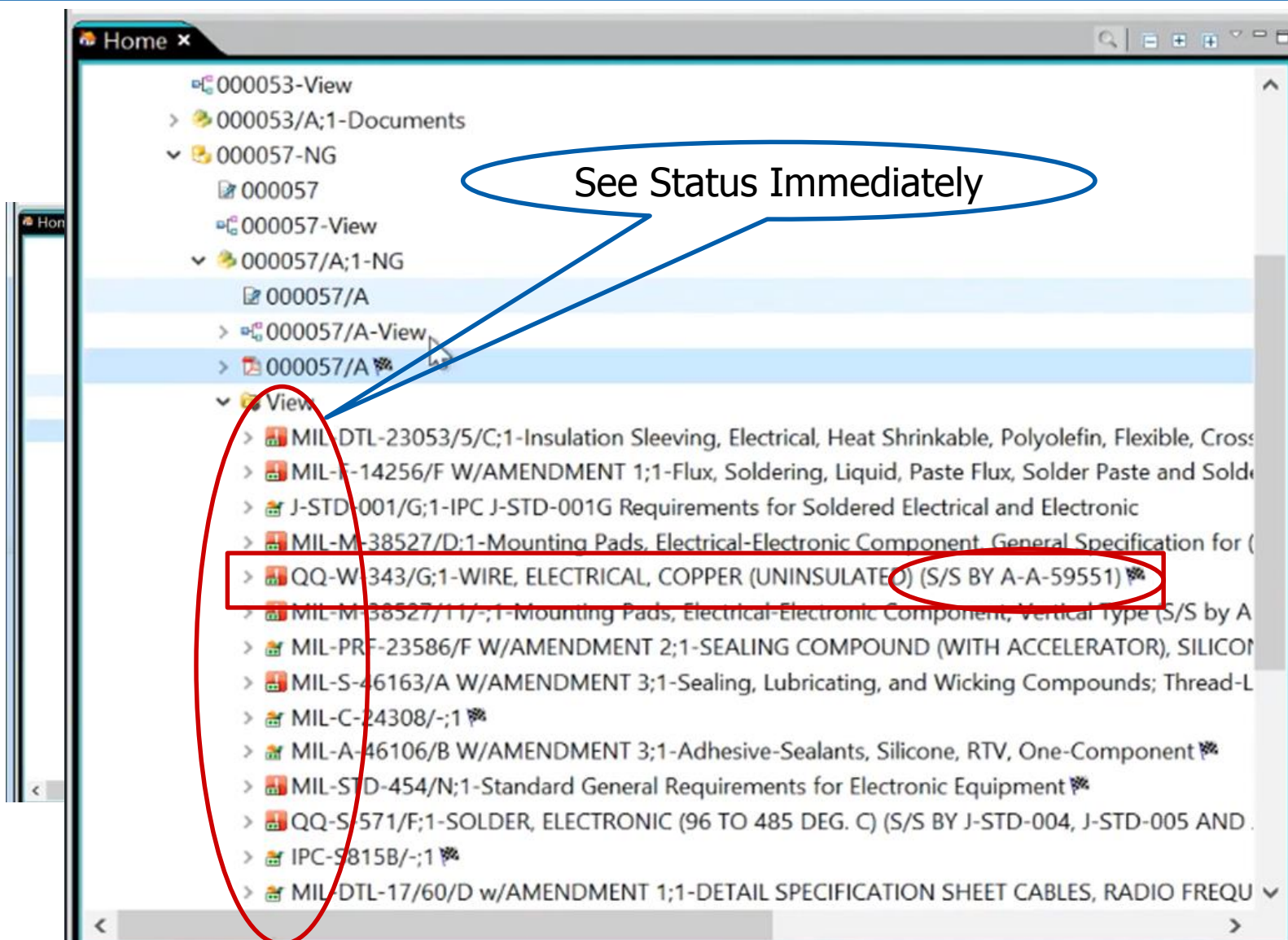
PLM representation



Engineering BOM
Manufacturing BOM
Bill Of Process
Product Structure



PLM expanded view



See the details

Summary Details Viewer JT Preview Process History Details

Send To...

QQ-W-343/G;1-WIRE, ELECTRICAL, COPPER (UNINSULATED) (S/S BY A-A-59551)

Owner: administrator (administrator) Last Modified Date: 22-Oct-2018 13:51 Release Status: CANCELLED Type: Swiss Link Revision

Overview Related Datasets Available Revisions Audit Logs

Item Revision Properties

Description:

Item: QQ-W-343-WIRE, ELECTRICAL, COPPER (UNINSULATED) (S/S BY A-A-59551)

Release Status: CANCELLED

Date Released: 17-Apr-1997 20:00

Effectivity: CANCELLED 17-Apr-1997 20:00 to UP (NONE)

URL: http://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=50957

Latest: Y

Owner: administrator (administrator)

Group ID: Engineering

Last Modifying User: administrator (administrator)

Checked-Out:

Checked-Out By: No Value

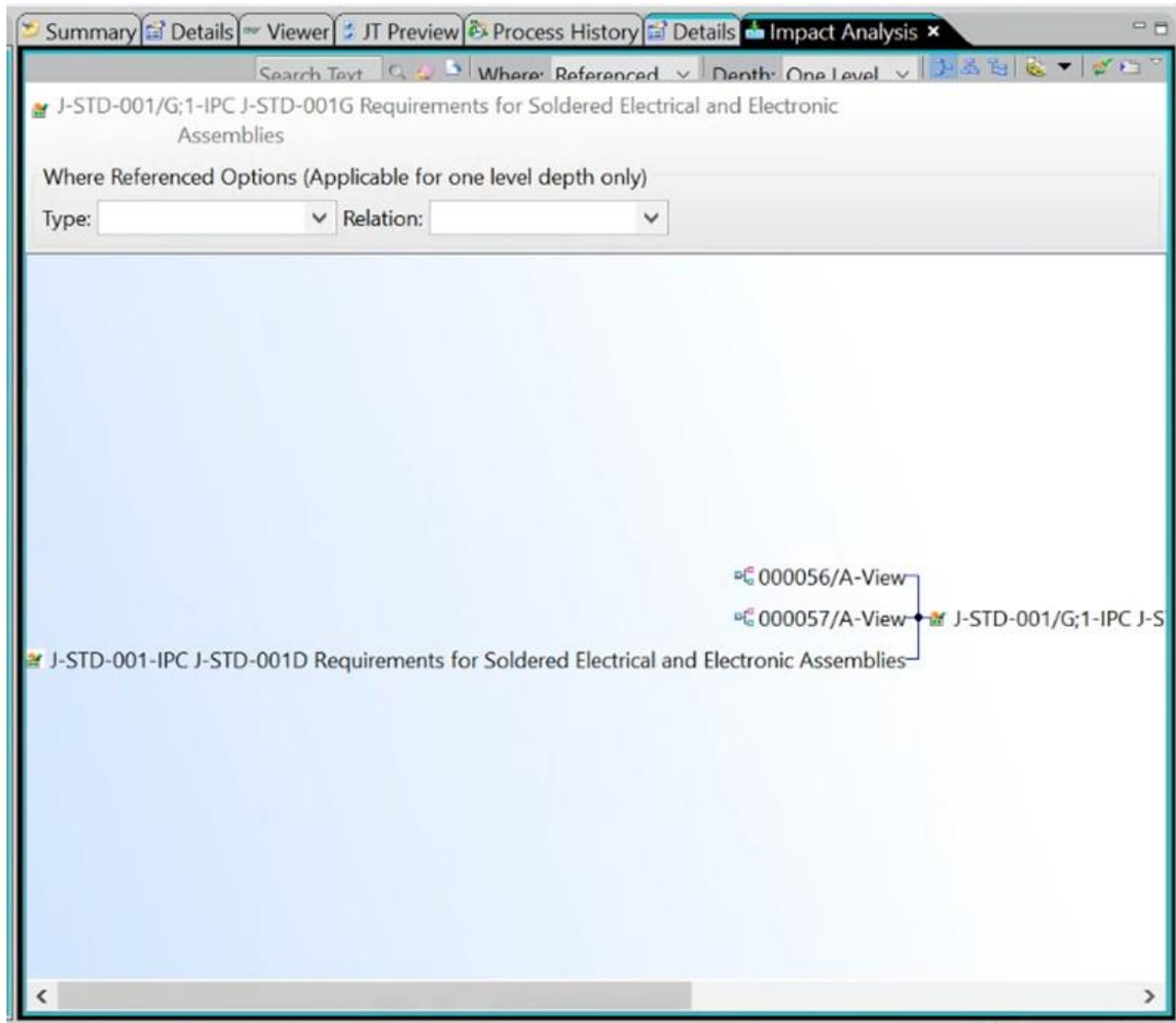
[More Properties...](#)

Preview

Actions

- Copy
- Revise...
- New Workflow
- Save As

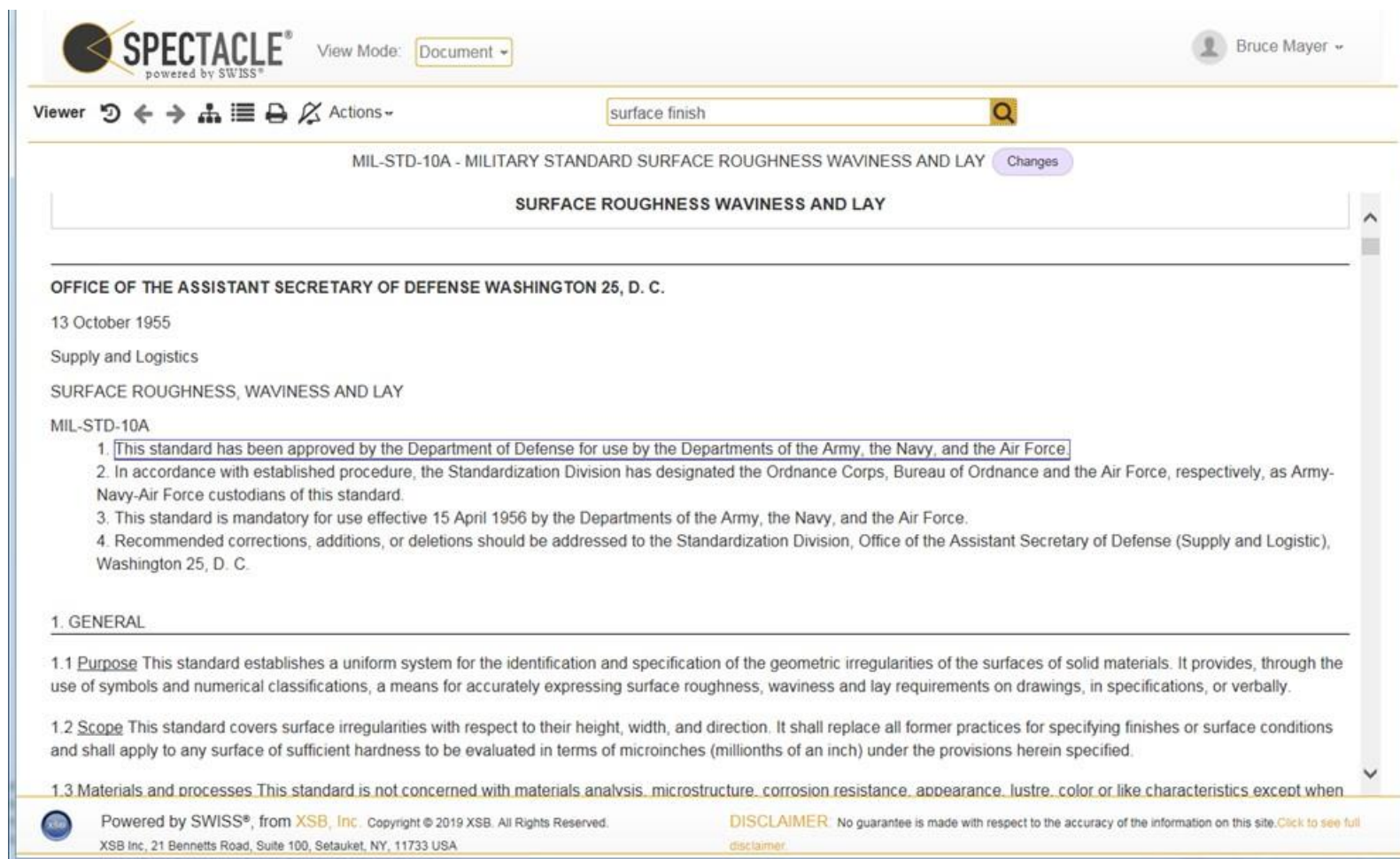
PLM where used



Augmented reality




Augmented reality



SPECTACLE®
powered by SWISS®

View Mode: Document

Bruce Mayer

Viewer  Actions

MIL-STD-10A - MILITARY STANDARD SURFACE ROUGHNESS WAVINESS AND LAY Changes

SURFACE ROUGHNESS WAVINESS AND LAY

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE WASHINGTON 25, D. C.

13 October 1955

Supply and Logistics

SURFACE ROUGHNESS, WAVINESS AND LAY

MIL-STD-10A

1. This standard has been approved by the Department of Defense for use by the Departments of the Army, the Navy, and the Air Force.
2. In accordance with established procedure, the Standardization Division has designated the Ordnance Corps, Bureau of Ordnance and the Air Force, respectively, as Army-Navy-Air Force custodians of this standard.
3. This standard is mandatory for use effective 15 April 1956 by the Departments of the Army, the Navy, and the Air Force.
4. Recommended corrections, additions, or deletions should be addressed to the Standardization Division, Office of the Assistant Secretary of Defense (Supply and Logistic), Washington 25, D. C.

1. GENERAL

1.1 Purpose This standard establishes a uniform system for the identification and specification of the geometric irregularities of the surfaces of solid materials. It provides, through the use of symbols and numerical classifications, a means for accurately expressing surface roughness, waviness and lay requirements on drawings, in specifications, or verbally.

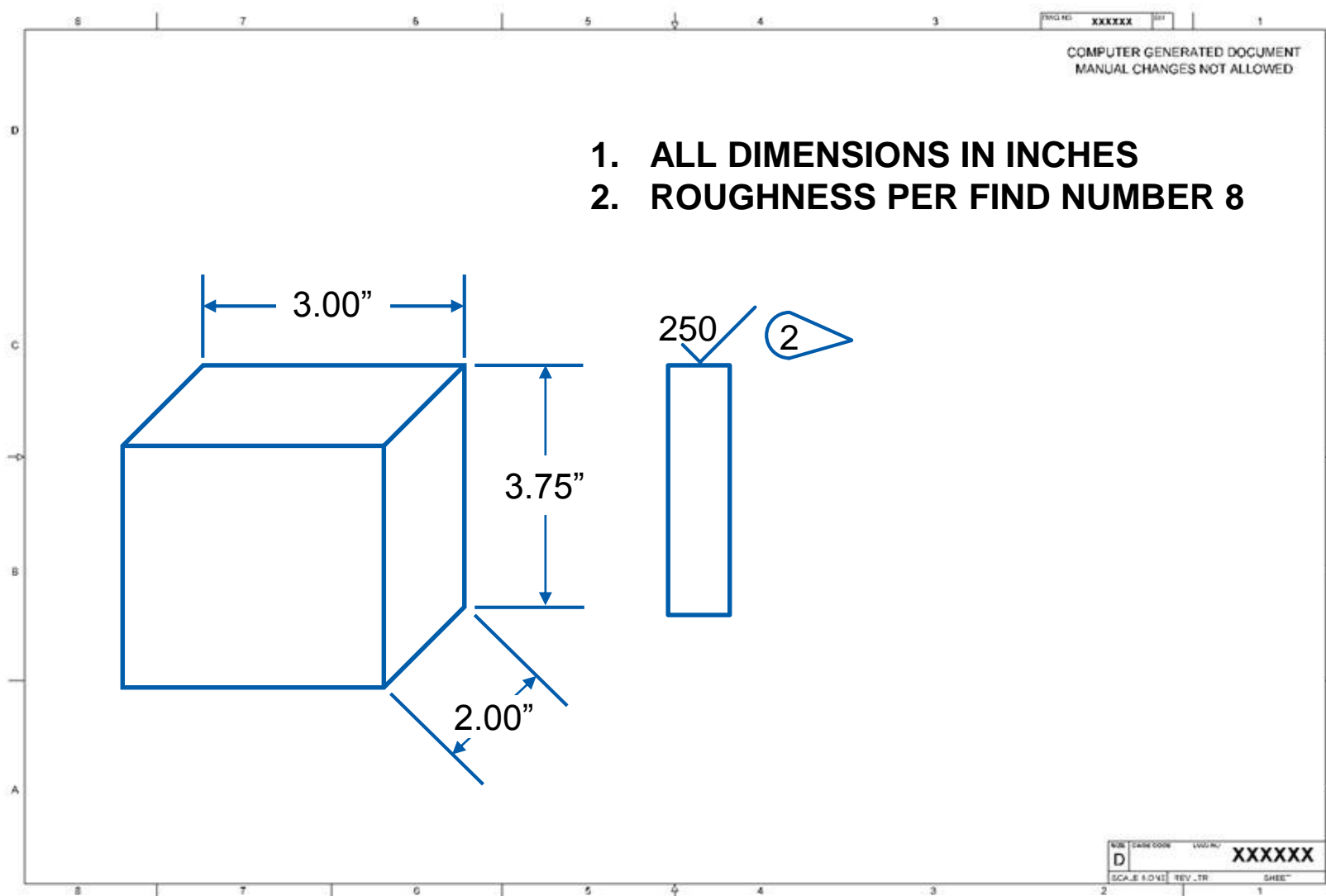
1.2 Scope This standard covers surface irregularities with respect to their height, width, and direction. It shall replace all former practices for specifying finishes or surface conditions and shall apply to any surface of sufficient hardness to be evaluated in terms of microinches (millionths of an inch) under the provisions herein specified.

1.3 Materials and processes This standard is not concerned with materials analysis, microstructure, corrosion resistance, appearance, lustre, color or like characteristics except when


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What about drawings?





What about drawings?



View Mode: Document

 Bruce Mayer


Viewer  Actions 

MIL-STD-10A - MILITARY STANDARD SURFACE ROUGHNESS WAVINESS AND LAY Changes

5.2.4 Effect on drawings, specifications, etc In normal design applications the numerical difference between the values obtained from the roughness height averaging method and the RMS method is not large enough to warrant the conversion of drawings, specifications, etc. However, on critical surfaces where slight differences in surface roughness is significant, the 11 percent conversion factor may be used.

Table V

Roughness Height Rating	General Application of Roughness Height Ratings
1000 ✓	Very rough, low grade surface resulting from sand casting, torch or saw cutting, chipping or rough forgings. Machine operations are not required as appearance is not objectionable. This finish, rarely specified, is suitable for unmachined clearance areas on machinery, jigs, and other rough construction items.
500 ✓	Very rough, low grade surfaces, where smoothness is of no object, resulting from heavy cuts and coarse feeds in milling, turning, shaping, boring, and from very rough filing, rough disc grinding and snagging. This surface is suitable for clearance areas on machinery, jigs, and fixtures. This surface roughness may be obtained by natural processes of sand casting or rough forging.
250 ✓	Coarse production surfaces, for unimportant clearance and cleanup operations, resulting from very coarse surface grind, rough file, disc grind, and from rapid feeds in turning, milling, shaping, drilling, boring, grinding, etc., where definite tool marks are not objectionable. This roughness may also be produced on the natural surfaces of forgings, permanent mold castings, extrusions and rolled surfaces. Surfaces with this roughness value can be produced very economically and is used to a great extent on parts where stress requirements, appearance, and conditions of operations and design permit.
125 ✓	This is the roughest surface recommended for parts subject to leads, vibration, and high stress. This surface roughness is also permitted for bearing surfaces when the motion is slow and the loads are light or infrequent, but not to be specified for fast rotating shafts, axles, and parts subject to severe vibration or extreme tension. This surface is a medium, commercial machine finish in which relatively high speeds and fine feeds are used in taking light cuts with well-sharpened tools, and may be economically produced on lathes, milling machines, shapers, grinders, etc. The surface finish may also be obtained on permanent mold castings, die castings, extrusions, and rolled

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SCALE 1:0.15

REV. TR

SHEET

DATE CODE

1000007

XXXXXX

Benefits of a smart document

- Identify authoritative source change
 - What if a critical value changed in a table?
- Recognize change impact
- Proactive not reactive
- Demonstrable digital thread of documents
- Ensure compliance
- Maximize continuous improvement
 - Is there a best practice update?
 - Is there a change due to lessons learned?

Work Smarter NOT Harder!

Maximize the digital thread

- Purposeful specifications
- Version cognizance
- Managed in PLM/PDM/ERP
- Linked to CAD data
- Get the most out of your documents
- What about AI - ask questions "How do I"
- Think outside the box

SMART CONNECTED DOCUMENTS!