

GENERAL DYNAMICS

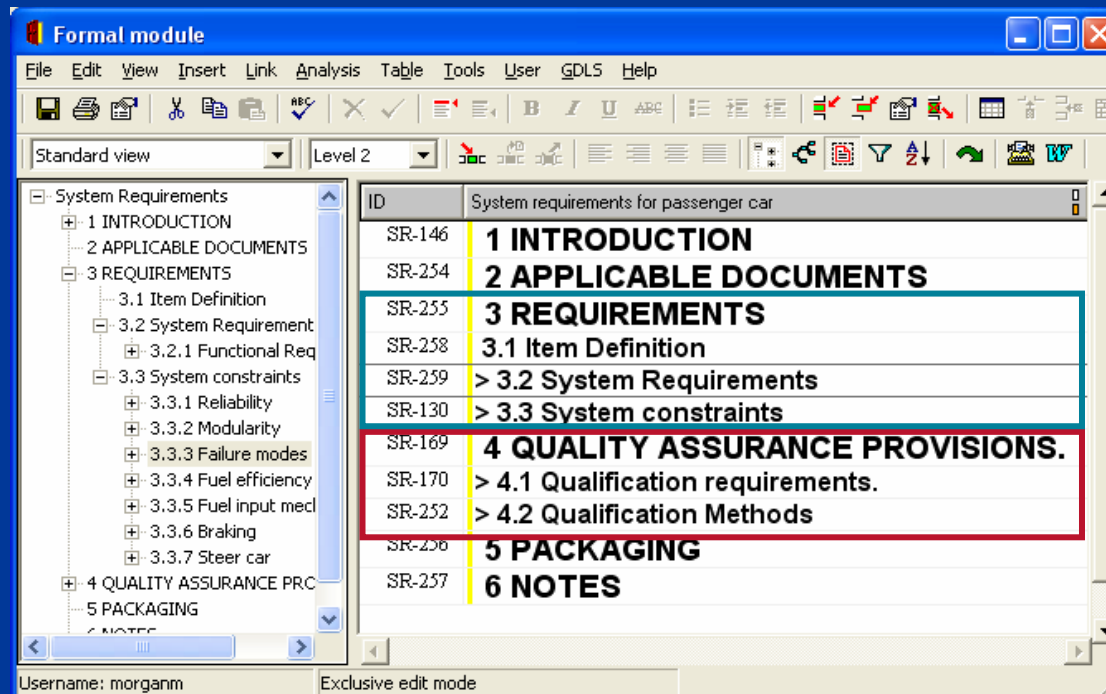
Land Systems

Automatic generation of Requirement Specifications (Verification Section) – in DOORS

Monika Morgan
Feb 08, 2008

Requirement Specifications

- Department of Defense requirement specifications are primarily composed of six sections (per MIL-STD-961D), including one for Requirements (Section 3) and another for Quality Assurance Provisions (aka Verification) (Section 4).



Verification Section (4.0)

- The Verification Section is composed of:

Formal module

File Edit View Insert Link Analysis Table Tools User GDLS Help

Standard view All levels

System Requirements

- 1 INTRODUCTION
- 2 APPLICABLE DOCUMENTS
- 3 REQUIREMENTS
- 4 QUALITY ASSURANCE PROVIS
- 4.1 Qualification requiremen
- 4.1.1 Responsibility for i
- 4.1.2 Inspection records
- 4.1.3 Design qualification
- 4.1.4 Functional testing.
- 4.1.5 Acceptance testin
- 4.1.6 Test conditions.
- 4.1.7 Qualification matr:
- 4.2 Qualification Methods
- 4.x ... (starting at 4.2)
- 5 PACKAGING
- 6 NOTES

ID	System requirements for passenger car
SR-169	4 QUALITY ASSURANCE PROVISIONS.
SR-170	4.1 Qualification requirements.
SR-171	4.1.1 Responsibility for inspection.
SR-173	4.1.1.1 Inspection equipment.
SR-175	4.1.2 Inspection records.
SR-177	4.1.3 Design qualification.
SR-180	4.1.3.1 Qualification plan.
SR-182	4.1.3.2 Test plan.
SR-184	4.1.3.3 EMR, nuclear hardening test plans.
SR-186	4.1.3.4 Test sequence.
SR-188	4.1.3.5 Final reports.
SR-190	4.1.4 Functional testing.
SR-192	4.1.5 Acceptance testing.
SR-194	4.1.6 Test conditions.
SR-196	4.1.7 Qualification matrix.
SR-252	4.2 Qualification Methods

Verification Cross Reference Index (VCRI)

Verification Methods

Username: morganm Read-only mode

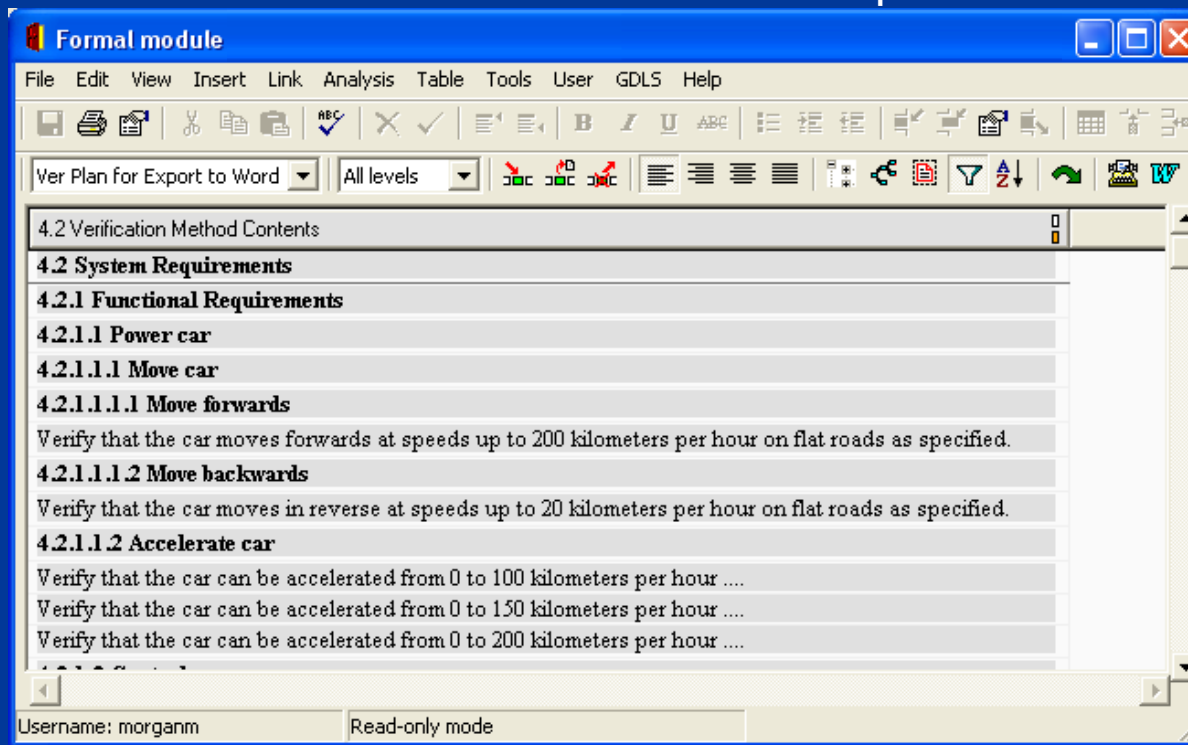
Verification Section – VCRI Matrix Template

- Within this table, the outline for Section 3 is repeated in “Section 3 Par.”
- “Section 4 Par” (Qualification Methods) paragraph numbering is very similar, usually only replacing the “3.” with “4.”.

Verification Legend		<u>Method</u>					
		N/A	Not Applicable				
		A	Analysis				
		I	Inspection				
		D	Demonstration				
		T	Test				
		Method					
Section 3 Par	Requirement Title	N/ A	A	I	D	T	Section 4 par

Verification Section – Verification Methods

- Each object is covered by a plan for testing the requirement
- It may be written with a “Shall” as a test requirement.
- Structure of this section follows structure for Requirement Section (3.0)



The Problem

- In the past, these documents were generated manually, initially using typewriters and more recently word-processor software.
 - Creating and maintaining the VCRI matrix using available table functions can be very cumbersome.
 - Since the VCRI table and the Verification Method section are both organized to match the structure of Section 3, their contents will be affected by any changes in structure to the requirements.
 - Some Engineers claim that the requirements and section structure are stable once populating Section 4. However, the maintenance is still required and can be very tedious when changes do occur.
 - Even when using a requirements management tool like DOORS®, a user may be tempted to directly populate their VCRI and Verification Method sections directly in Section 4.

DOORS For Specifications

- Many corporations now require requirements to be captured into some kind of database, which allows the capability to show traceability to customer requirements.
- Our company has chosen Telelogic's DOORS®, which also allows requirements to be organized to resemble the document being published.
- The skeleton for the document is organized per specific document standards and generally a template module is created to contain the basic structure and a standardized set of attributes and views to the data.
- The template is then used for creating new modules.

Key Verification Attributes

- The “Verification Method” attribute has enumerated values to allow the user to indicate how a requirement would be verified. These values may include:
 - N/A (used for non-requirement objects, including headers)
 - Analysis
 - Inspection
 - Demonstration
 - Test
- If the attribute is set up as a multi-pick, the user should make the best single pick (there may be certain situations where two values are appropriate, but this is the exception).

Key Verification Attributes – Cont'd

- The “Verification Plan” attribute is intended to contain a sentence or two on how the requirement is to be tested and may be written as a test requirement. This attribute is not intended for major detailed plans, as this detailed information would be handled in a separate Verification Plan document.
- Tables or Figures in section 3 can be referenced

Key Verification Attributes – Cont'd

- Tables or Figures that are unique for testing can be included directly in Section 4.2.
- Besides indicating how each requirement will be tested, establishing values for both of these attributes also helps to isolate/correct requirements that may have not been written well (i.e. not testable).

Key Verification Views

- Three specific views have been created to facilitate editing and reporting the values of these attributes.
 - “Verification – Editing”
 - “VCRI for export to MS Word”
 - “Ver Plan for export to MS Word”
- These 3 views provide the basic layout and a simple filter. Specific filters can be created when exporting limited requirements for a specification.

Key Views – Editing Attributes

- The “Verification – Editing” view was created to allow the user to populate verification related attributes for each of the requirements.
- Generally, it is filtered to display all the requirements in section 3, their ancestor parents and the key verification attributes listed above.
- Other verification type attributes that will be used for testing down the line may also be included in this view (status, comments, etc.)

Key Views – Editing Attributes, Cont'd

Formal module

File Edit View Insert Link Analysis Table Tools User GDLS Help

Verification - Editing All levels

ID	System requirements for passenger car	Verification Method	Verification Plan
SR-255	3 REQUIREMENTS		
SR-258	3.1 Item Definition		
SR-259	3.2 System Requirements		
SR-1	3.2.1 Functional Requirements		
SR-2	3.2.1.1 Power car		
SR-3	3.2.1.1.1 Move car		
SR-4	3.2.1.1.1.1 Move forwards		
SR-5	The car shall be able to move forwards at all speeds from 0 to 200 kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.	Test	Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.
SR-6	3.2.1.1.1.2 Move backwards		
SR-7	The car shall be able to move backwards to a maximum speed of 20 Kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.	Test	Verify that the car moves in reverse at speeds up to 20 kilometers per hour on flat roads as specified.
SR-8	3.2.1.1.2 Accelerate car		
SR-9	The car shall be able to accelerate from 0 to 100 Kilometers	Test	Verify that the car can be accelerated from 0 to 100

Username: morganm Read-only mode

Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

morganm@gdls.com

Key Views – VCRI Matrix

- The “VCRI for export to MS Word” view is prepared to look like the intended VCRI matrix.
- Individual columns display an “X” for each of the enumerated values of the “Verification Method” attribute. This is handled by DXL layout code. While this code can be very simple and included in each column, a customized script was written that provides the following:
 - Ability for the designer to pass the attribute name and enumerated value (set up for multi-pick enumerated attributes).
 - Verification that the provided attribute name exists and if not, displays an error directly in the layout column. This error message is for the designer’s sake and is not intended for receipt by a user.
 - Automatic classification of Header Objects as “N/A”.

Key Views – VCRI Matrix, Cont'd

- The “Section 4 Par” column displays the paragraph structure for Section 4.2, which corresponds directly with the Section 3 paragraph structure.
- This view is exported to Microsoft Word (MS Word) as a table in a separate document and then is added to the VCRI template (as seen earlier) via a copy/paste.

Key Views – VCRI Matrix, Cont'd

Formal module

File Edit View Insert Link Analysis Table Tools User GDLS Help

VCRI For Export to Word All levels

Requirement Paragra	Title	N/A	A	I	D	T	Section 4 Paragraph
3.2.1.1	Power car	X					4.2.1.1
3.2.1.1.1	Move car	X					4.2.1.1.1
3.2.1.1.1.1	Move forwards	X					4.2.1.1.1.1
3.2.1.1.1.1.0-1	Move forwards					X	4.2.1.1.1.1.0-1
3.2.1.1.1.2	Move backwards	X					4.2.1.1.1.2
3.2.1.1.1.2.0-1	Move backwards					X	4.2.1.1.1.2.0-1
3.2.1.1.2	Accelerate car	X					4.2.1.1.2
3.2.1.1.2.0-1	Accelerate car					X	4.2.1.1.2.0-1
3.2.1.1.2.0-2	Accelerate car					X	4.2.1.1.2.0-2
3.2.1.1.2.0-3	Accelerate car					X	4.2.1.1.2.0-3
3.2.1.2	Control car	X					4.2.1.2
3.2.1.2.1	Switch on car	X					4.2.1.2.1
3.2.1.2.1.0-1	Switch on car				X		4.2.1.2.1.0-1
3.2.1.2.2	Control speed	X					4.2.1.2.2
3.2.1.2.2.0-1	Control speed			X			4.2.1.2.2.0-1
3.2.1.2.2.0-2	Control speed			X			4.2.1.2.2.0-2
3.2.1.2.2.0-3	Control speed				X		4.2.1.2.2.0-3

Username: morganm Read-only mode

Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

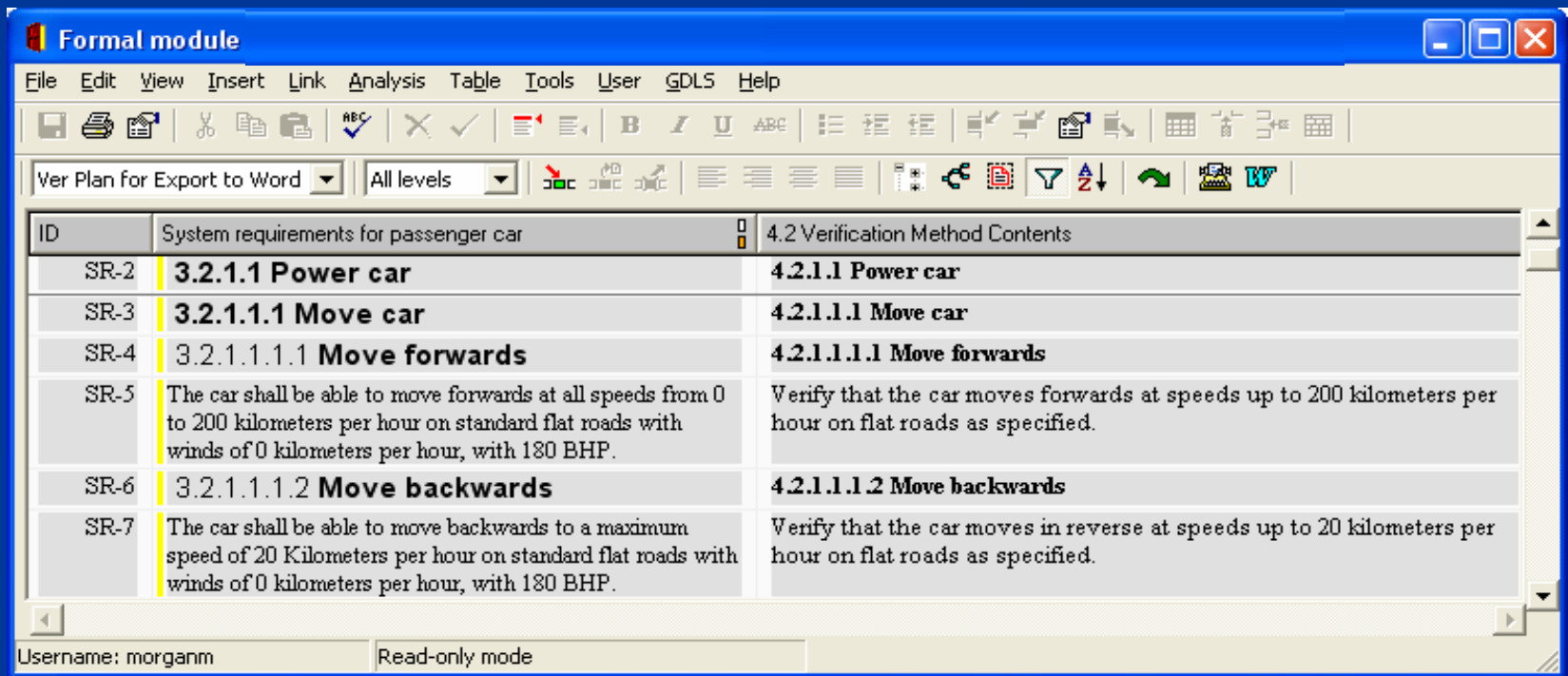
morganm@gdls.com

Key Views – Verification Plan

- The “Ver Plan for export to MS Word” view is prepared to look like section 3, showing all headers and text, but the text in this case displays the contents of the “Verification Plan” attribute.
 - This view can be setup to display all objects that have a value in this attribute, while skipping those that do not, and can include figures, tables and their captions.
 - The capability to display figures/captions recognizes that while figures in section 3 may be referenced, some cases require special values in the tables or figures.

Key Views – Verification Plan, Cont'd

- While this view displays 3 columns, the ID and requirement columns are provided for context and must be removed before exporting the view to Microsoft Word in Book format. The results of the export would be copy/pasted into section 4.2 of the Main Document.



Formal module

File Edit View Insert Link Analysis Table Tools User GDLS Help

Ver Plan for Export to Word All levels

ID	System requirements for passenger car	4.2 Verification Method Contents
SR-2	3.2.1.1 Power car	4.2.1.1 Power car
SR-3	3.2.1.1.1 Move car	4.2.1.1.1 Move car
SR-4	3.2.1.1.1.1 Move forwards	4.2.1.1.1.1 Move forwards
SR-5	The car shall be able to move forwards at all speeds from 0 to 200 kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.	Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.
SR-6	3.2.1.1.1.2 Move backwards	4.2.1.1.1.2 Move backwards
SR-7	The car shall be able to move backwards to a maximum speed of 20 Kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.	Verify that the car moves in reverse at speeds up to 20 kilometers per hour on flat roads as specified.

Username: morganm Read-only mode

Key Views – Verification Plan, Cont'd

- The Export to Word function can be extended to display this column with the same styling as the Object Text/Object Heading column, instead of being exported as attributes of Object Text.

The screenshot displays the 'Formal module' application window. The main window shows a hierarchical tree view of a verification plan. The selected item is '4.2.1.1.1.1 Move forwards', which is expanded to show its content: 'Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.' Below this, other sub-items like '4.2.1.1.1.2 Move backwards' and '4.2.1.1.2 Accelerate car' are visible. The status bar at the bottom of the window indicates 'Username: morganm' and 'Read-only mode'.

Overlaid on the right side of the window is the 'Export To Word - DOORS' dialog box. The 'General' tab is active, showing various options for exporting the document to a Word file. The 'Append 'Object Identifier' to 'Object Text' (Requirements)' checkbox is checked, which corresponds to the bullet point in the text above. Other checked options include 'Use 'Paragraph Style' attribute', 'Use 'Verification Paragraph Style'', 'Add 'N/A' to empty headings', 'Center images on page', 'Center tables on page', and 'Resize larger images to fit on page'. The 'Template name' field is set to 'C:\Documents and Settings\morganm\My Document'. The 'Export...' button is visible at the bottom right of the dialog.

Ready for Export

- A specification is handled by 3 separate exports:
 - Main Document, which includes the contents in Sections 1-6
 - VCRI Matrix
 - Verification Plan
- The export can be handled:
 - Manually - manually merged and polished
 - Semi-automated - A single script could be developed that performs the exports and merges. Some manual polishing will be required afterwards.

Export Templates

- In preparation for the exports, MS Word template files (.dot files) have been created to direct the exports, provide headers/footers, a cover page, a Table of Contents and style formatting for the whole document. They also provides caption styles for Table and Figure captions.
 - **Document contents and Section 4.2 contents:**
 - Draft Release for the document contents (only for internal reviews)
 - Official Release for the document contents
 - **VCRI Matrix:**
 - Verification Template

Exporting a Specification

Contents	View Name	Export Template	Book/Table
Main Document	CIDS Export to MS Word	Official Release	Book
VCRI	VCRI for export to MS Word	Verification	Table
Verification Plan	Ver Plan for export to MS Word	Official Release	Book (1)
	Ver Plan for export to MS Word	Official Release	Table (2)

Notes: (1) Verification Plan exported via an extended Export to Word function

(2) Verification Plan exported via the “Out of the Box” Export to Word function

Exporting the Main Document

- A view, such as “CIDS Export to Word” would include only the main column (Object Text and Object Heading)
- The view can be extended with the desired filter based on allocation attributes, if necessary
- The results of this export will be the working copy towards a completed specification. The VCRI and Verification Plan exports will be merged into this document within Section 4. The resulting MS Word document will be referred to as the “Main Document”.

Exporting the Main Document - View

The screenshot displays two overlapping windows from the 'Formal module' application. The background window, titled 'Formal module', shows a document titled 'System requirements for passenger car'. The document content includes a table of contents with sections: 1 INTRODUCTION, 2 APPLICABLE DOCUMENTS, 3 REQUIREMENTS, 3.1 Item Definition, 3.2 System Requirements, 3.2.1 Functional Requirements, 3.2.1.1 Power car, 3.2.1.1.1 Move car, 3.2.1.1.1.1 Move forwards, 3.2.1.1.1.2 Move backwards, and 3.2.1.1.2 Accelerate car. The foreground window is the 'Export To Word - DOORS' dialog box, which has 'General' and 'Advanced' tabs. The 'General' tab is active, showing various export options. The 'Template name' field is set to 'gic UG 2007\Templates\CiDS Example Template.dot'. The 'Export...' button is highlighted.

Formal module
File Edit View Insert Link Analysis Table Tools User GDLS Help

CIDS Export to Word All levels

System requirements for passenger car

1 INTRODUCTION
These are the functional system requirements for the development of a new passenger motor vehicle as derived from the user requirements.
The car will have a world wide market.

2 APPLICABLE DOCUMENTS

3 REQUIREMENTS

3.1 Item Definition

3.2 System Requirements

3.2.1 Functional Requirements

3.2.1.1 Power car

3.2.1.1.1 Move car

3.2.1.1.1.1 Move forwards
The car shall be able to move forwards at all speeds from 0 to 200 kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.

3.2.1.1.1.2 Move backwards
The car shall be able to move backwards to a maximum speed of 20 Kilometers per hour on standard flat roads with winds of 0 kilometers per hour, with 180 BHP.

3.2.1.1.2 Accelerate car
The car shall be able to accelerate from 0 to 100 Kilometers per hour in 10 seconds on standard flat roads with winds of 0 kilometers per hour.
The car shall be able to accelerate from 100 to 150 kilometers per hour at a rate of 5 kilometers per second on standard flat roads with winds of 0 kilometers per hour.

Username: morganm Read-only mode

Export To Word - DOORS
General Advanced

Use 'Paragraph Style' attribute Use 'Verification Paragraph Style'

Allow style mapping

Ignore DOORS table borders, put all borders on all cells

Ignore DOORS column widths in table layout export, AutoFormat instead

Use normal template

Template name:
gic UG 2007\Templates\CiDS Example Template.dot Browse...

Use horizontal line separators in book layout exports

Save Word document after every 100 objects

Prepend 'Object Identifier' to 'Object Text' (SRS)

Append 'Object Identifier' to 'Object Text' (Requirements)

Append 'Variants' to 'Object Text' (Requirements)

Add 'N/A' to empty headings

Center images on page

Center tables on page

Resize larger images to fit on page

Export... Close Help

Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

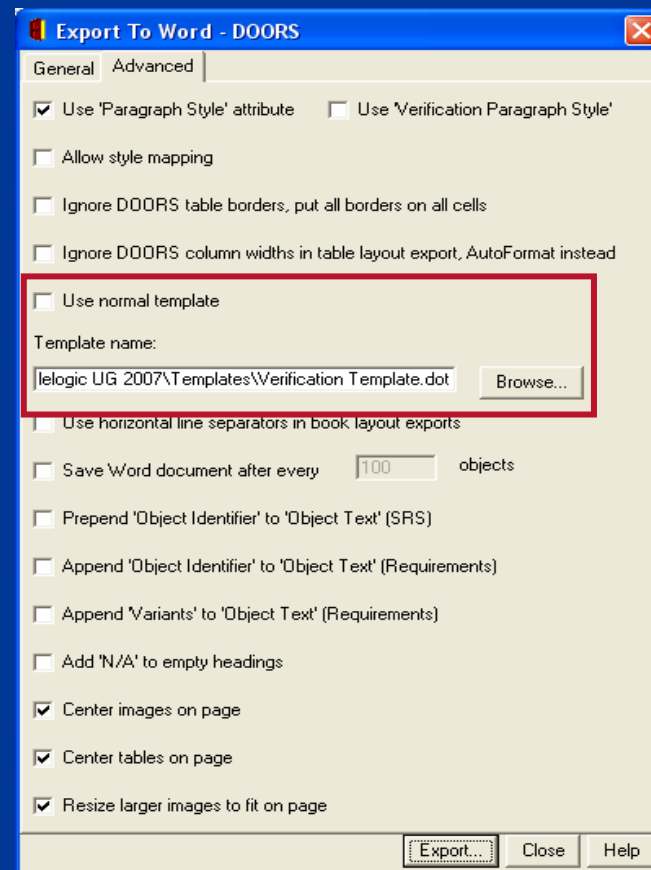
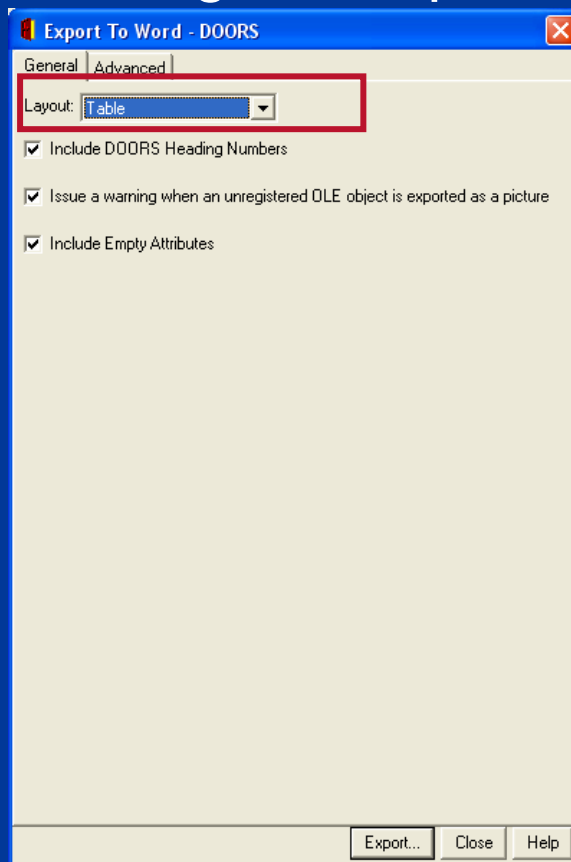
morganm@gdls.com

Exporting the VCRI Matrix

- The matrix is supplied via a view like the “VCRI for export to MS Word”, which can be tailored for specific specifications.
- The view is filtered to only show requirements and headers in Section 3, normally starting at 3.2.
- The view is exported as a MS Word Table.
- Selecting to use a specific export template like “Verification Template.dot” will provide an empty VCRI table at the top of the file with desired formatting for columns.

Exporting the VCRI Matrix, Cont'd

- Running the Export to Word function:



Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

morganm@gdls.com

Exporting the Verification Plan

- The Verification Plan contents is supplied via a view like the “Ver Plan for export to MS Word”, which can be tailored for specific specifications.
- The view is filtered to show requirements and headers in Section 3, normally starting at 3.2.
- The Verification Plan export needs some special handling. Exporting in Book format normally leads to undesired effects, listing the column as an attribute for each requirement object.

Exporting the Verification Plan, Cont'd

- The Export to Word script can be extended to export this column as if it were the main column, which would then assign styles to Headers and captions if tables/figures are included.
- The final results of this export are in a new MS Word document and need to be merged in to the Main Document under Section 4.2.

Verification Plan – Better Effects as Book

- Exporting via “Extended” Export to Word function.

The image displays two windows side-by-side. On the left is the 'Export To Word - DOORS' dialog box, with the 'Advanced' tab selected. A yellow arrow points from the 'Use Verification Paragraph Style' checkbox in the dialog to the corresponding heading in the Word document on the right.

Export To Word - DOORS (Advanced Tab):

- Use 'Paragraph Style' attribute
- Use 'Verification Paragraph Style'
- Allow style mapping
- Ignore DOORS table borders, put all borders on all cells
- Ignore DOORS column widths in table layout export, AutoFormat instead
- Use normal template
- Template name: g:\c\UG 2007\Templates\CIDS Example Template.dot
- Use horizontal line separators in book layout exports
- Save Word document after every 100 objects
- Prepend 'Object Identifier' to 'Object Text' (SRS)
- Append 'Object Identifier' to 'Object Text' (Requirements)
- Append 'Variants' to 'Object Text' (Requirements)
- Add 'N/A' to empty headings
- Center images on page
- Center tables on page
- Resize larger images to fit on page

Microsoft Word Document (Section 4.2 good export.doc):

- File Edit View Insert Format Tools Table Window Help Adobe PDF Acrobat Comments
- Heading 4 Times New Roman 14
- Final Showing Markup Show
- Normal.NewMacros.Macro1
- 4.2.1 Functional Requirements
- 4.2.1.1 Power car
- 4.2.1.1.1 Move car
- 4.2.1.1.1.1 Move forwards
- Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.
- 4.2.1.1.1.2 Move backwards
- Verify that the car moves in reverse at speeds up to 20 kilometers per hour on flat roads as specified.

Summary

- While there may be some overhead on the export, the end result leads to a full document, without the maintenance drawbacks of needing to keep the section 4 structure current with Section 3. Some overhead can be diminished by automating the process.
- While the requirements should be stable once Section 4 is being populated, there is still the opportunity for change and re-arrangement.
- Therefore, some form of automation for Section 4 is a worthwhile endeavor to be setup by the DOORS team for any company that needs to provide consistent exports of specifications.

Appendix – Steps to Exporting a Document

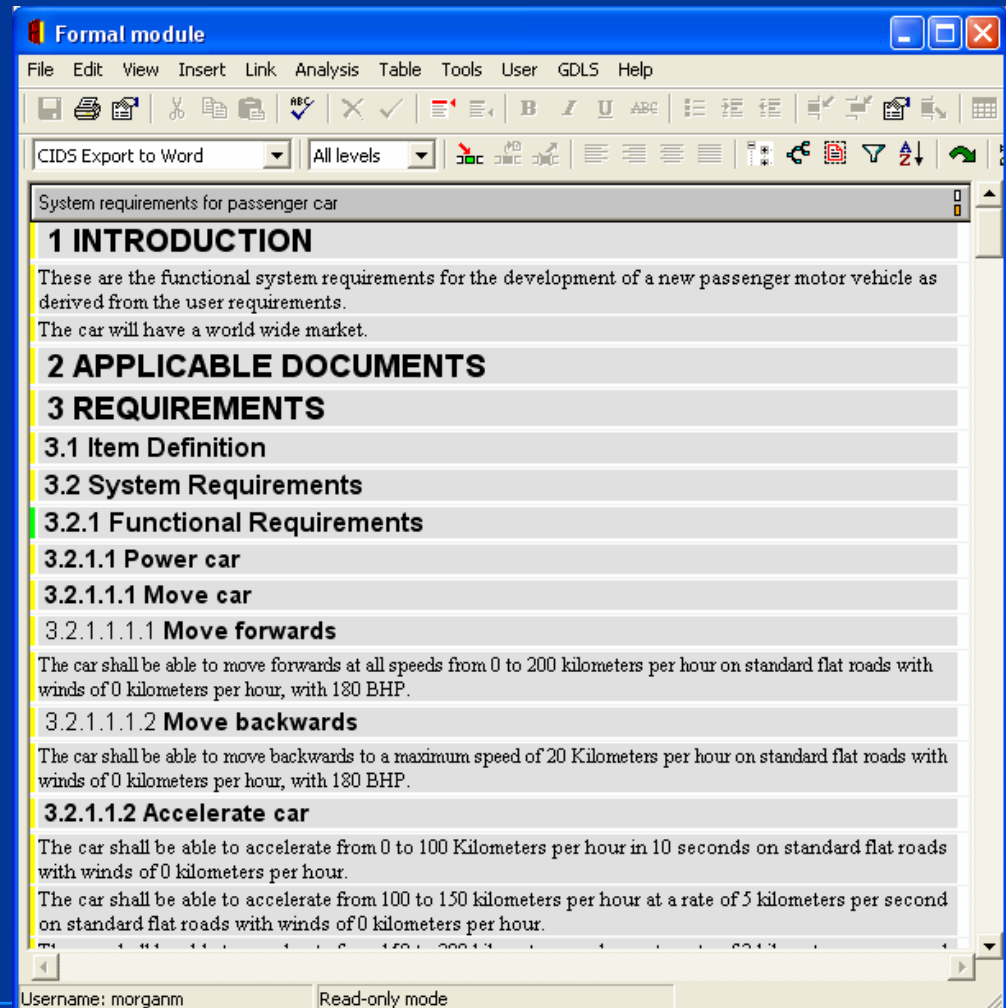
- The following steps are provided for exporting requirements as a specification in more detail.
- While a script can be prepared to automate these exports, this exercise will be covering the manual approach
- We have a customized version of the Export to Word function provided by Telelogic. Therefore snapshots may show extra features that won't be seen for the original function.

Export from DOORS to Word – GDLS Specific Options

- GDLS Extras include the following features:
 - Append the Object identifier on requirements
 - Append Variant names when the requirement is not Common?
 - Add N/A for empty sections
 - Browsing for a customized template starts at the desired folder, instead of the default Microsoft folder.
 - Capability to print Verification Plan information in document format for section 4.3.n

Export a CIDS – Export Main Document

- Export the document body from the DOORS module, including all headers and requirement objects within sections 1 through 6 satisfying the required filter.
- Only export the column containing the heading and object text attributes.

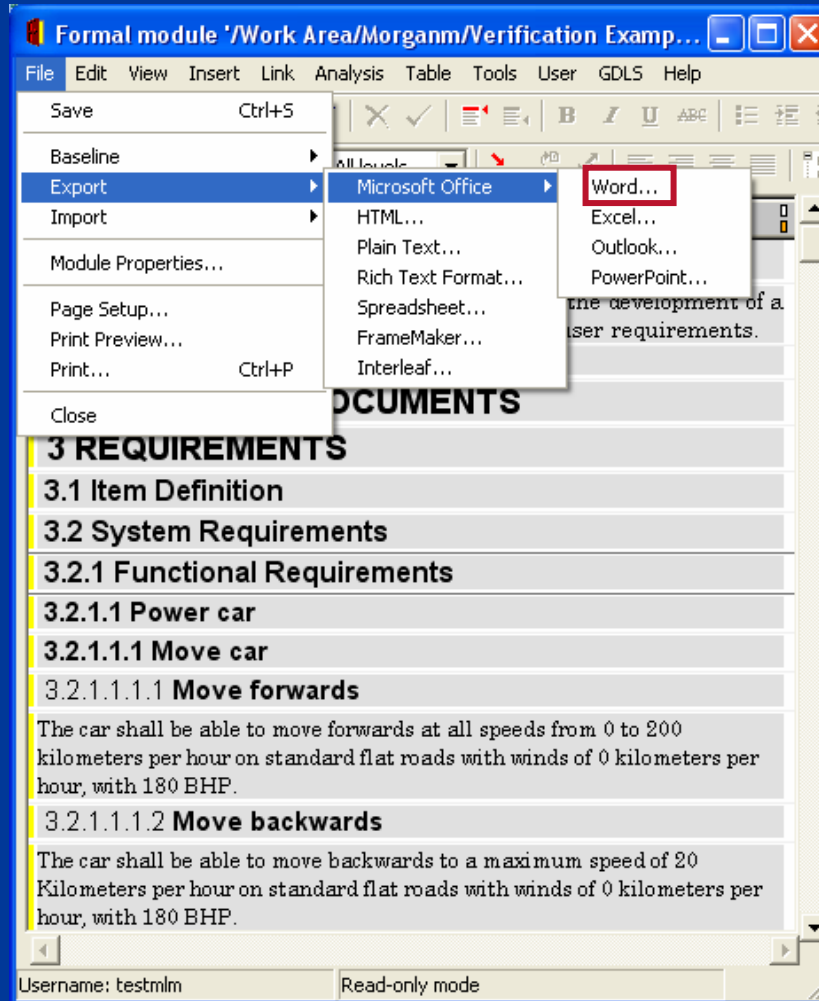


Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

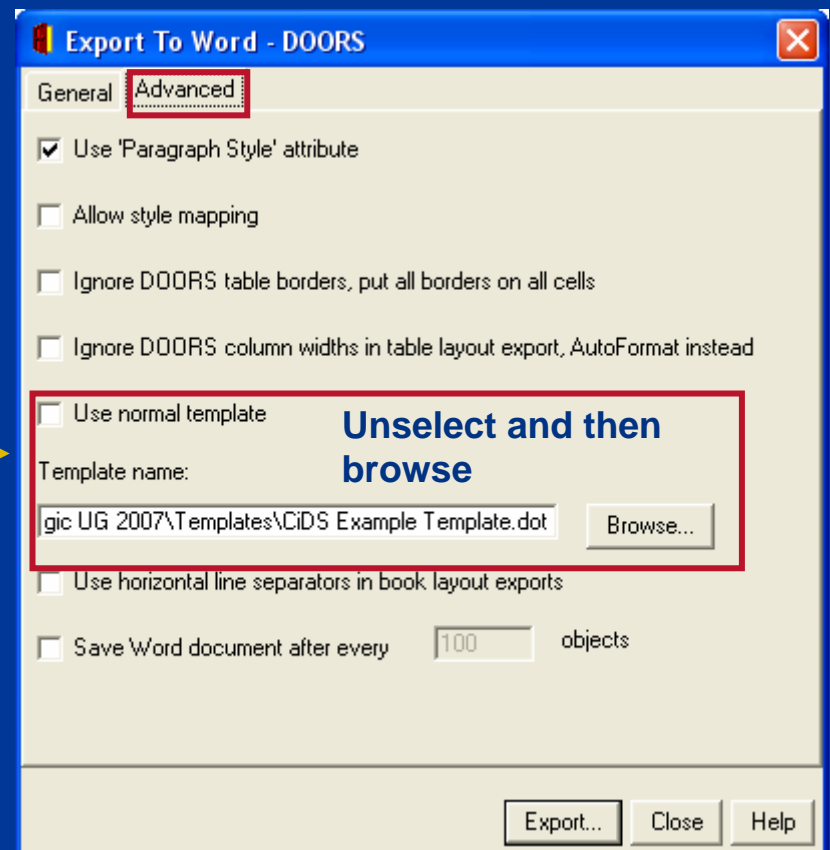
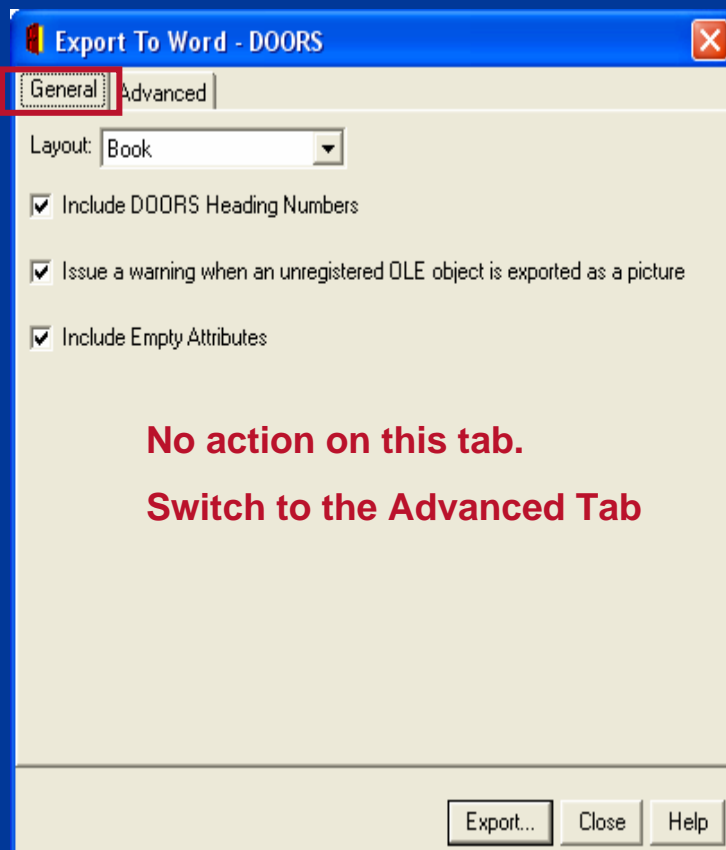
morganm@gais.com

Export a CIDS – Export Main Document, Cont'd

- Initiate the “Export to Word” function



Export a CIDS – Export Main Document, Cont'd

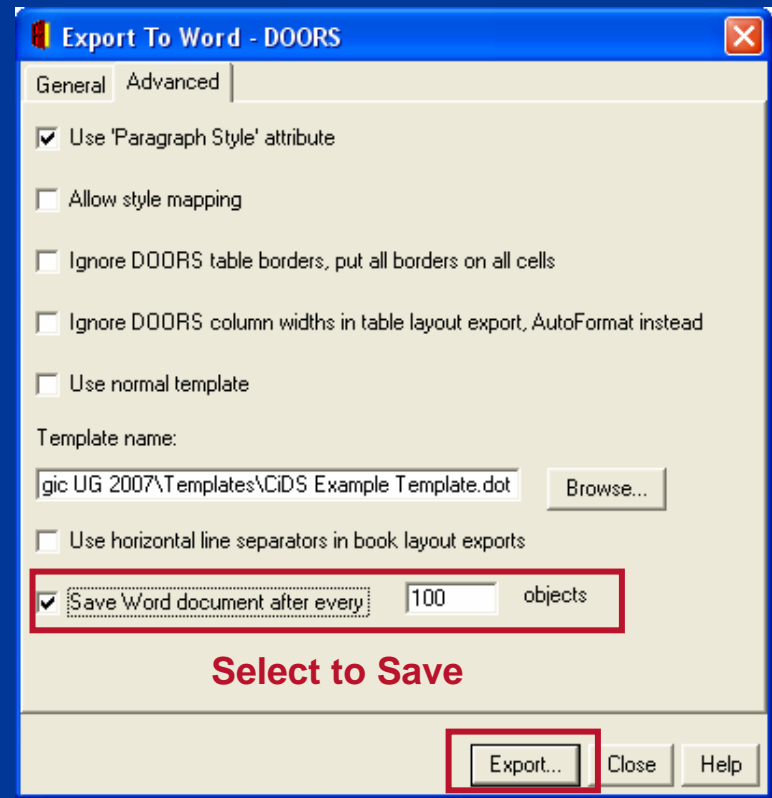


Export a CIDS – Export Main Document, Cont'd

- For large documents, it's helpful to select “**Save document after every 100 objects**”. When this option is selected, provide a file name once prompted (see next page for file name specifics).

- Click the **Export** button. Minimize the Microsoft Word window once it appears on screen (This process slightly speeds up the export as it doesn't have to keep refreshing the window)

- If you get a prompt about a style not available, click **OK**.



Export a CIDS – Export Main Document, Cont'd

- Save the file twice (The file name should include the DOORS module being exported and the date that it was exported from DOORS):
 - Save the newly generated Word document as a raw (untouched) file in your working directory:
 - Save again, but as a working file to contain the final CIDS document as follows.
- The working document will now be referred to as the “Main Document”. Minimize this window for later usage.

Export a CIDS – Export VCRI Matrix

- Export the VCRI matrix from the DOORS module, including all headers and requirement objects within sections 3.0, starting at 3.2, satisfying the required filter.
- Change to the view: “VCRI Export To Word”

Export a CIDS – Export VCRI Matrix, Cont'd

Select "VCRI Export To Word" view

Formal module

File Edit View Insert Link Analysis Table Tools User GDLS Help

VCRI For Export to Word All levels Verification Method

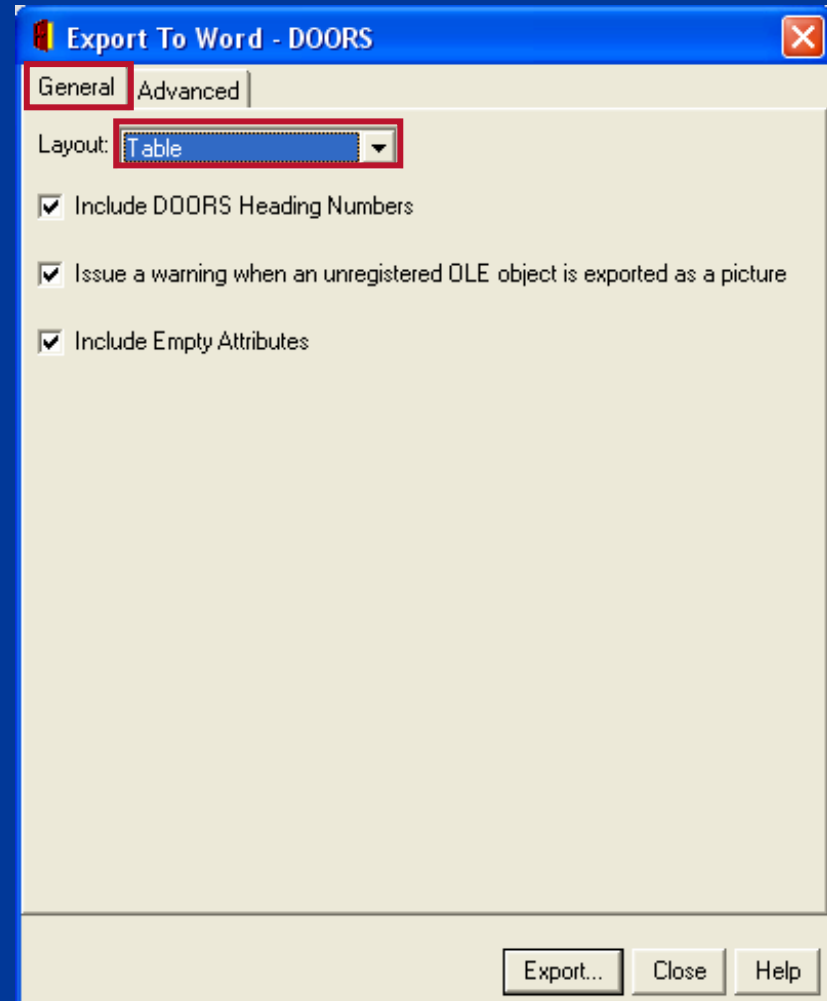
Requirement Paragraph	Title	N/A	A	I	D	T	Section 4 Paragraph
3.2.1.1	Power car	X					4.2.1.1
3.2.1.1.1	Move car	X					4.2.1.1.1
3.2.1.1.1.1	Move forwards	X					4.2.1.1.1.1
3.2.1.1.1.1.0-1	Move forwards					X	4.2.1.1.1.1.0-1
3.2.1.1.1.2	Move backwards	X					4.2.1.1.1.2
3.2.1.1.1.2.0-1	Move backwards					X	4.2.1.1.1.2.0-1
3.2.1.1.2	Accelerate car	X					4.2.1.1.2
3.2.1.1.2.0-1	Accelerate car					X	4.2.1.1.2.0-1
3.2.1.1.2.0-2	Accelerate car					X	4.2.1.1.2.0-2
3.2.1.1.2.0-3	Accelerate car					X	4.2.1.1.2.0-3
3.2.1.2	Control car	X					4.2.1.2
3.2.1.2.1	Switch on car	X					4.2.1.2.1
3.2.1.2.1.0-1	Switch on car				X		4.2.1.2.1.0-1
3.2.1.2.2	Control speed	X					4.2.1.2.2
3.2.1.2.2.0-1	Control speed			X			4.2.1.2.2.0-1
3.2.1.2.2.0-2	Control speed			X			4.2.1.2.2.0-2
3.2.1.2.2.0-3	Control speed				X		4.2.1.2.2.0-3

Username: morganm Read-only mode

Set via the Verification Editing view

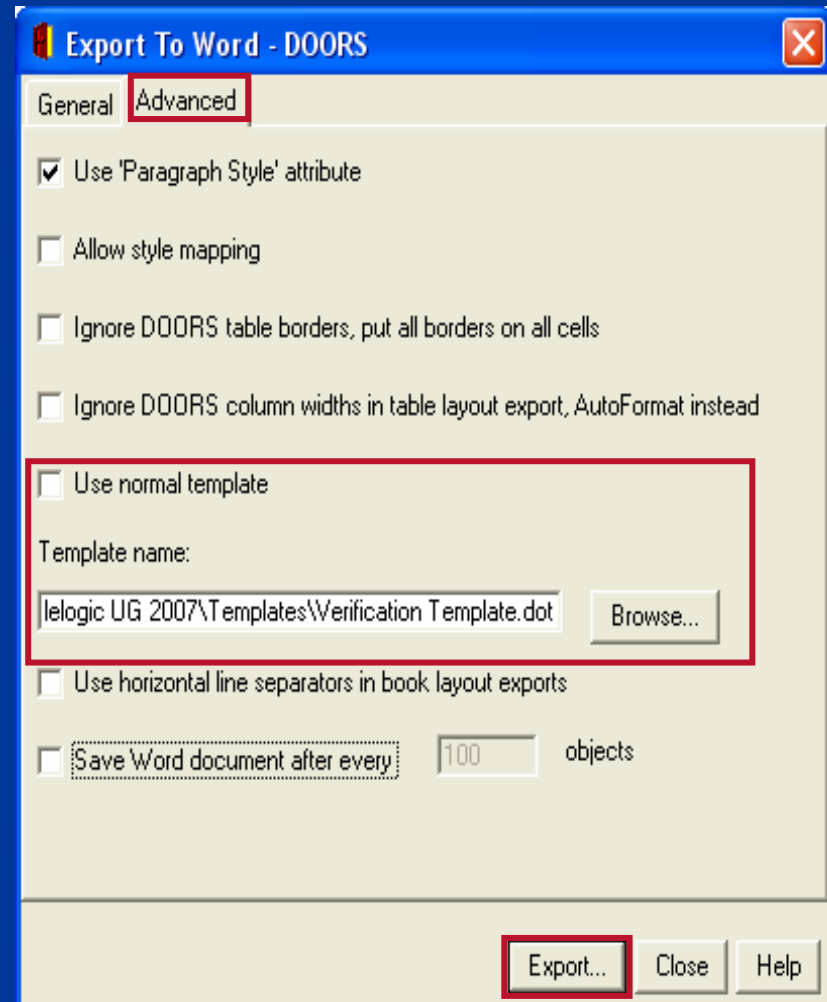
Export a CIDS – Export the VCRI Matrix, Cont'd

- Then select to export to Word using **Table** option on the **General** tab



Export a CIDS – Export the VCRI Matrix

- Switch to Advanced Key
- De-select to “Use normal template”, and browse to select the “Verification Template” in its place.
- Click the **Export** button. **Minimize the MS Word file** once it appears on screen (This process slightly speeds up the export as it doesn't have to keep refreshing the window)



Export a CIDS – Export VCRI Matrix, Cont'd

- The resulting MS Word document includes:
 - the VCRI table template as an MS Word table. Optionally, it may be divided in two with the legend as separate from rest of table.
 - the exported VCRI contents, in a separate MS Word table.
- Save the file as a raw file in your selected working folder
- Scroll down to the exported table
- Delete the top row that contains the column header

Export a CIDS – Export VCRI Matrix, Cont'd

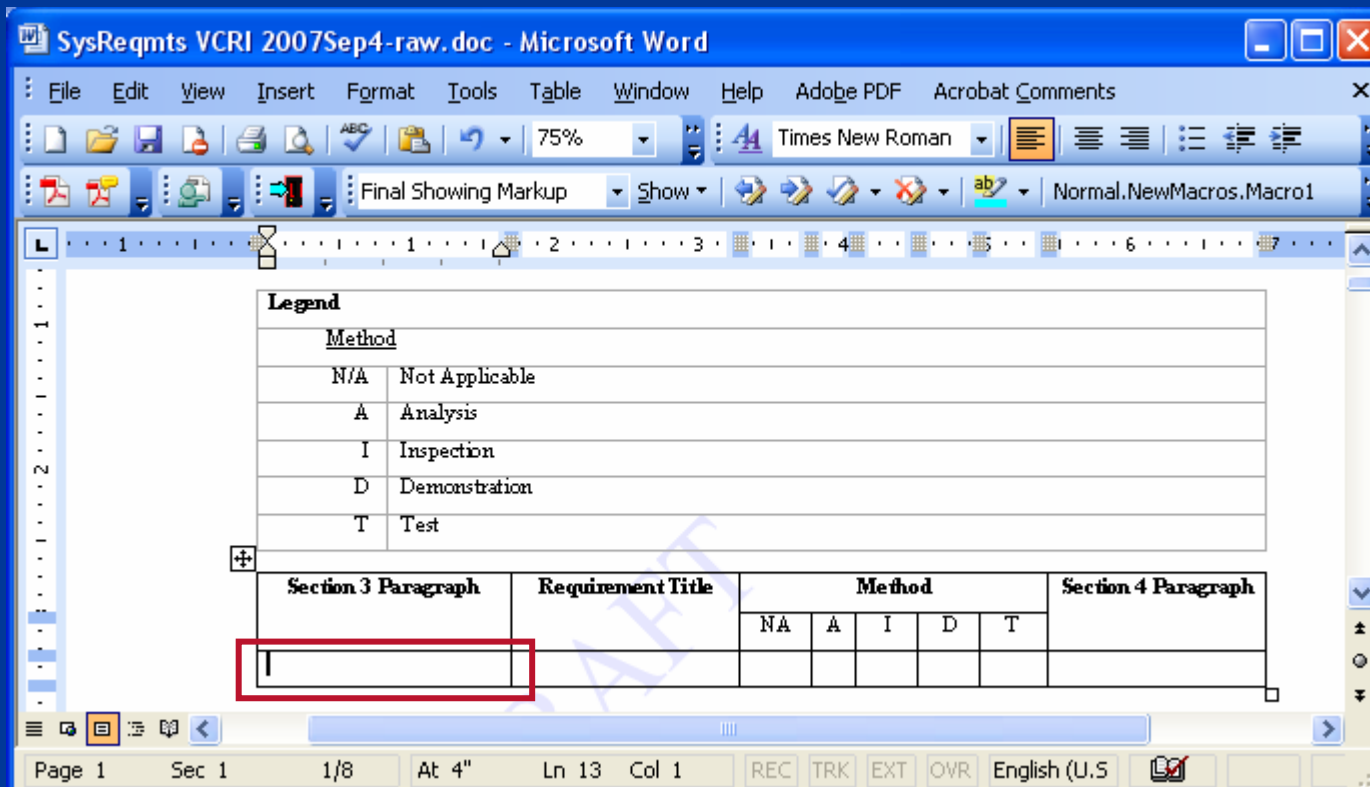
- Select all columns but not the right most control character column and select to Copy (CTRL-C). Do this by moving cursor to top of table, turning to black arrow and dragging across rows.

The image shows two screenshots of Microsoft Word. The top screenshot shows a table with a yellow box highlighting the rightmost column, which contains control characters. A yellow arrow labeled "Do" points to the black arrow cursor at the top of this column. The bottom screenshot shows the same table with a red box highlighting the rightmost column. A red arrow labeled "Don't" points to the white arrow cursor at the top of this column.

	System Requirements		
4.2	System Requirements	X	4.2
4.2.1	Functional Requirements	X	4.2.1
4.2.1.1	Power use	X	4.2.1.1
4.2.1.1.1	Move car	X	4.2.1.1.1
4.2.1.1.1.1	Move forwards	X	4.2.1.1.1.1
4.2.1.1.1.0-1	Move forwards	X	4.2.1.1.1.0-1
4.2.1.1.2	Move backwards	X	4.2.1.1.2

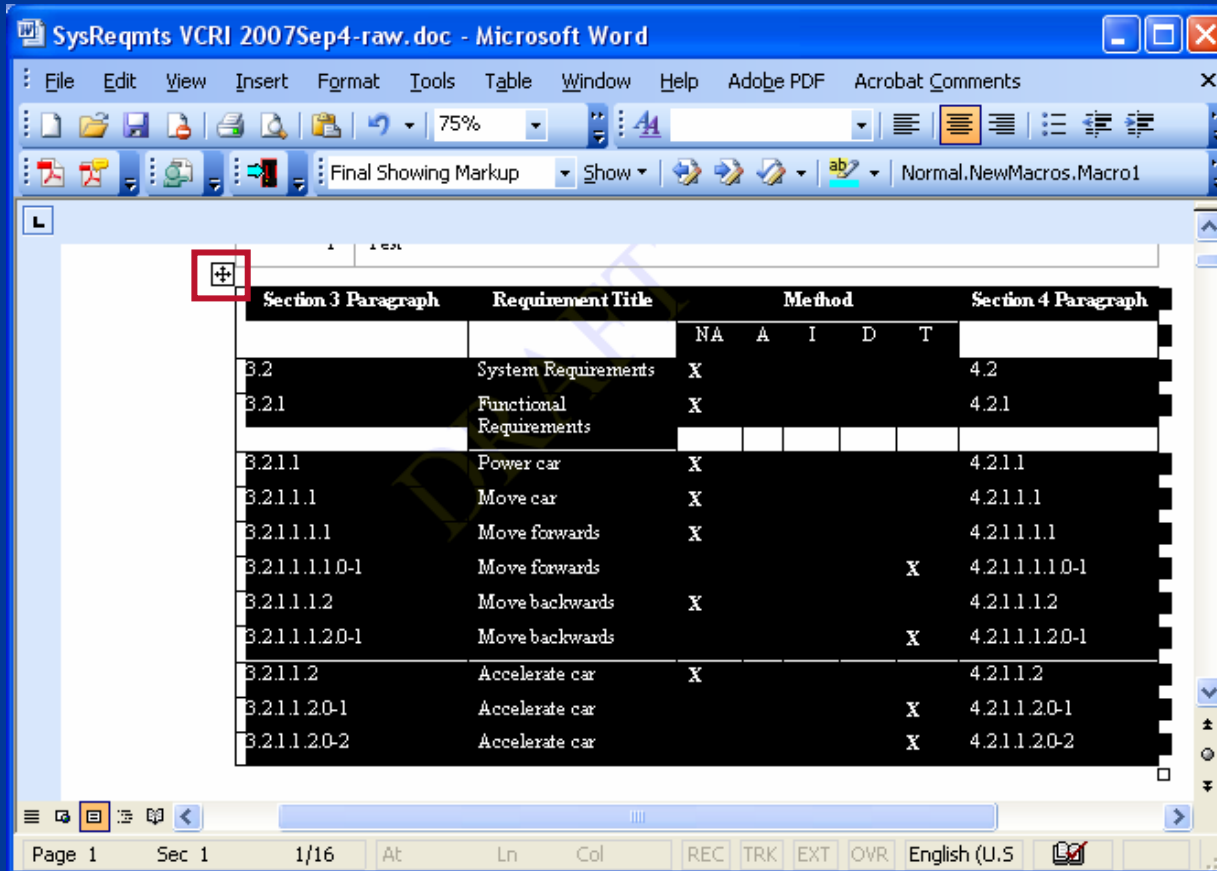
Export a CIDS – Export VCRI Matrix, Cont'd

- Scroll back to top and paste the VCRI contents from the clipboard into the leftmost cell of the first empty row in the VCRI table.



Export a CIDS – Export VCRI Matrix, Cont'd

- Select the newly populated VCRI formatted table and select to copy

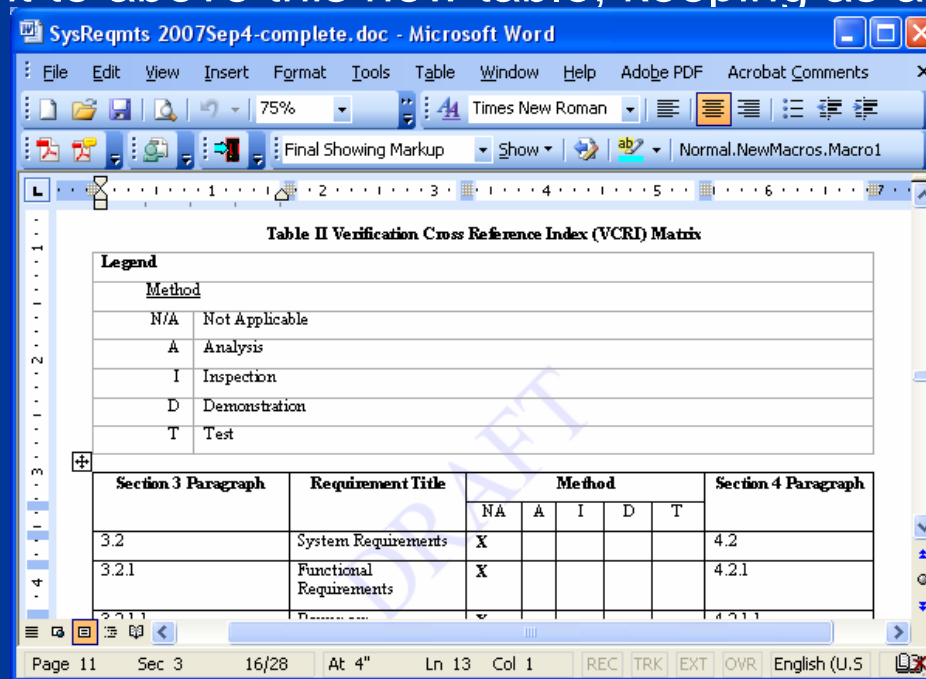


Approved for Public Release, Distribution Unlimited, GDLS approved, log 2008-01, dated 02/06/08

morganm@gdls.com

Export a CIDS – Export VCRI Matrix, Cont'd

- Maximize the Main Document and move down the existing stub VCRI matrix. Select the stub VCRI and select Paste (CTRL-V).
- If the Legend is separate, Copy/Paste it also from the VCRI document to above this new table, keeping as a separate table.



Export a CIDS – Export VCRI Matrix, Cont'd

- Note, the new table now follows the Table Caption but did not replace the stub table.
- Scroll to the end of the new table. Delete the stub table and the italicized instructions that follow.
- If the heading row does not already repeat, select the first two rows and select Heading Rows Repeat from the Table pull-down menu. May need to click to unselect and then again to select (as a toggle).

Exporting the VCRI Matrix, Cont'd

- Delete the instruction text in the main document and the VCRI template block.

The screenshot shows a software window titled "Formal module" with a menu bar (File, Edit, View, Insert, Link, Analysis, Table, Tools, User, GDLS, Help) and a toolbar. The document content includes:

- System requirements for passenger car
- Demonstration. An uninstrumented test where success is determined on the basis of observations alone.
- Test. Instrumented tests verified by actual measurement that the equipment meets the requirements of the specification when subjected to the actual conditions (or simulated conditions) specified.
- Table IX Verification Cross Reference Index (VCRI Matrix)**
- Verification Legend**

Method	Category		
N/A	Not Applicable	DV	Design Verification
A	Analysis FA	First Article	
I	Inspection	A	Acceptance
D	Demonstration	X	Component Level Verification
T	Test		

Section 3 Par.	Requirement Title	Category			Section 4 Par.
		FA	A	X	

The contents of the VCRI table just above will be provided to the "Export to Word" view in DOORS. DO NOT FILL IN THIS TABLE, it is for export purposes only. This table should not be duplicated here in this module, as it would be duplicated and would have to be maintained in two places. The owner/users of this module should use the "Verification" view to fill in the Verification Method attribute, at a minimum. This attribute is used to create the actual view used for a separate export to produce a document. The filter for this view will only show all objects within sections 3.0 through 3.7 and ignores objects marked for deletion.

[Please remove this statement once exported to document upon the first pass export of text for full document. Do not delete from this DOORS module.]

- 4.2 Qualification Methods**

4.x ... (starting at 4.2)

The contents of the Verification Plans section will be provided to the "Verification Paragraph" view in DOORS. The headers from section 3.0 should not be duplicated here in this module, as they would be duplicated and would have to be maintained in two places. The owner/users of this module should use the "Verification" view to fill in the Verification Method attribute, at a minimum. This attribute is used to create the actual view used for a separate export to produce a document. The filter for this view will only show all objects within sections 3.0 through 3.7 and ignores objects marked for deletion. Remove extra columns from the Verification Method Contents column showing the contents of section 4.3 ("4.3 Verification Method Contents"). Select the Export to Word view on the Advanced Tab.

[Please remove this statement once exported to document upon the first pass export of text for full document. Do not delete from this DOORS module.]

- 5 PACKAGING**

Username: morganm Read-only mode

Export a CIDS – Export Verification Plan

- Change to the “**Ver Plan for Export to Word**” view. This not only sets up the columns, but filters on Section 3 only, where the Verification Plan attribute is not empty.
- Delete the Object ID and Section 3 columns before exporting, Leaving only the “**4.3 Verification Method Contents**” column only.

The screenshot shows a software window titled "Formal module '/Work Area/Morganm/Verification Examples - UGC2007/S...". The window displays a table with the following columns: ID, System requirements, and Verification Method Contents. The table contains the following data:

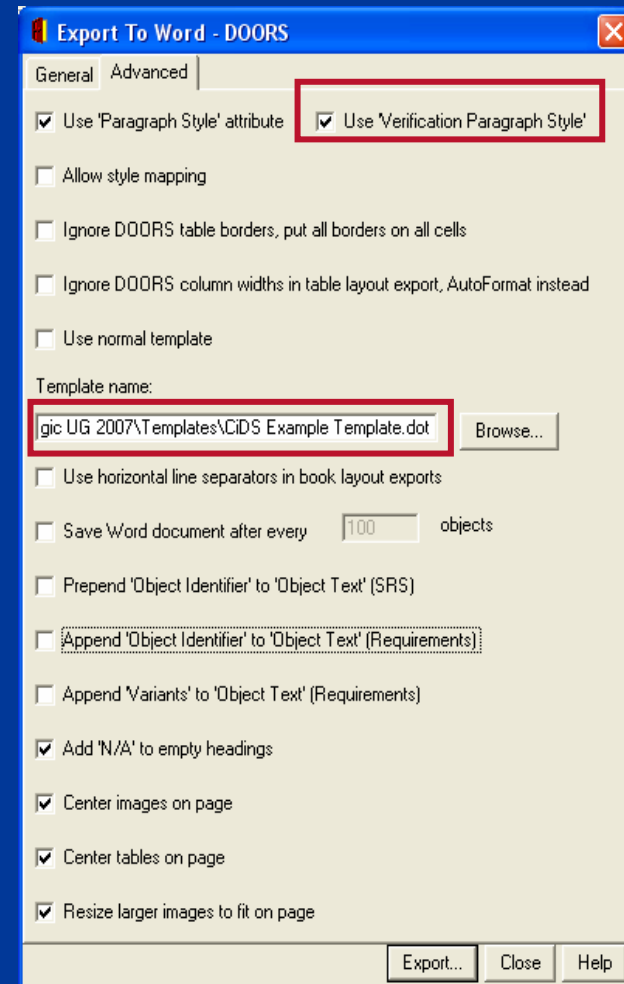
ID	System requirements	Verification Method Contents
SR-1	3.2.1 Functional Requirements	4.2.1 Functional Requirements
SR-2	3.2.1.1 Power car	4.2.1.1 Power car
SR-3	3.2.1.1.1 Move car	4.2.1.1.1 Move car
SR-4	3.2.1.1.1.1 Move forwards	4.2.1.1.1.1 Move forwards
SR-5	The car shall be able to move forwards at all speeds from 0 to 200 kilometers per hour on flat roads with winds of 0 kilometers per hour, with 180 BHP.	4.2.1.1.1.1 Move forwards Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.

A red box highlights the "Ver Plan for Export to Word" dropdown menu in the top left corner of the window. A red arrow points from the "4.2.1.1.1.1 Move forwards" row in the table to a zoomed-in view of that row in a separate window titled "Formal module '/Work Area/Morgan...". The zoomed-in view shows the following text:

4.2.1.1.1.1 Move forwards
Verify that the car moves forwards at speeds up to 200 kilometers per hour on flat roads as specified.

Export a CIDS – Export Verification Plan, Cont'd

- Select Export to Word, via an extended version of the function.
 - General tab: no actions
 - Switch to the Advanced tab;
 - Select “Use ‘Verification Paragraph Style’” feature.
 - Uncheck “Use normal template”
 - Browse and select the same template you used for the Main Document to apply same styles to headers and text.
 - **Export.** A new MS Word document will be opened.



Export a CIDS – Export Verification Plan, Cont'd

- **Save** the newly generated Word document as a raw (untouched) file in your selected working folder
- Scroll down to the text containing the Verification Plan sections, select all of sections from 4.3.1 to the last section and copy (**CTRL-C**).
- Maximize the **Main Document window**, paste (**CTRL-V**) starting after the header, “4.2 Qualification Method”.
- Remove the italicized instructions, if not removed during previous instructions for the VCRI table export.

Export a CIDS – Export Verification Plan, Cont'd

Delete Text

Replaces *Italic Text*

SysReqmts 2007Sep4-raw.doc - Microsoft Word

File Edit View Insert Format Tools Table Window Help Adobe PDF Acrobat Comments

100% Times New Roman

Final Showing Markup Show

4.2 Qualification Methods

4.2.1 Functional Requirements

4.2.1.1 Power car

4.2.1.1.1 Move car

4.2.1.1.1.1 Move forwards

Verify that the car moves forwards at speeds up to 200 kilometers per hour on

4.2.1.1.1.2 Move backwards

Verify that the car moves in reverse at speeds up to 20 kilometers per hour on

4.2.1.1.2 Accelerate car

Verify that the car can be accelerated from 0 to 100 kilometers per hour

Verify that the car can be accelerated from 0 to 150 kilometers per hour

Verify that the car can be accelerated from 0 to 200 kilometers per hour

Page 13 Sec 3 15/18 At Ln Col REC TRK EXT OVR English (U.S)

SysReqmts 2007Sep24-corrected.doc - Microsoft...

File Edit View Insert Format Tools Table Window Help

Adobe PDF Acrobat Comments

75% Times New Roman

Final Showing Markup

4.2 Qualification Methods

4.2.1 Functional Requirements

4.2.1.1 Power car

4.2.1.1.1 Move car

4.2.1.1.1.1 Move forwards

Verify that the car moves forwards at speeds up to 200 kilometers per hour on

4.2.1.1.1.2 Move backwards

Verify that the car moves in reverse at speeds up to 20 kilometers per hour on

4.2.1.1.2 Accelerate car

Verify that the car can be accelerated from 0 to 100 kilometers per hour

Verify that the car can be accelerated from 0 to 150 kilometers per hour

Verify that the car can be accelerated from 0 to 200 kilometers per hour

Page 17 Sec 3 22/28 At 1.5" Ln 3 Col 18 REC

Alternative Exports for Verification Plan

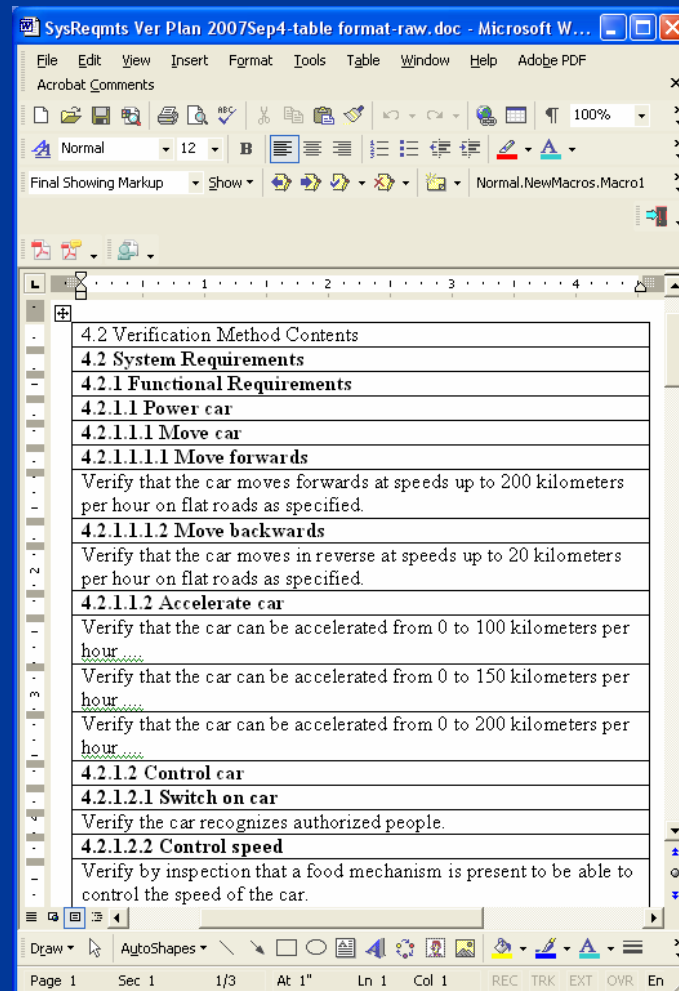
- Besides the capability of extending the Export to Word function, the following methods described in the following slides:
 - Export as a Table
 - Export as a Book (Undesired results, not recommended)

Verification Plan –Effects as Table

- The “4.2 Verification Method Contents” column could be exported as a Table to MS Word and then converted to text.
 - No styles are provided for Headers and would have to be applied by hand.
 - Can be done easily via the Style Formatting, but still takes time.

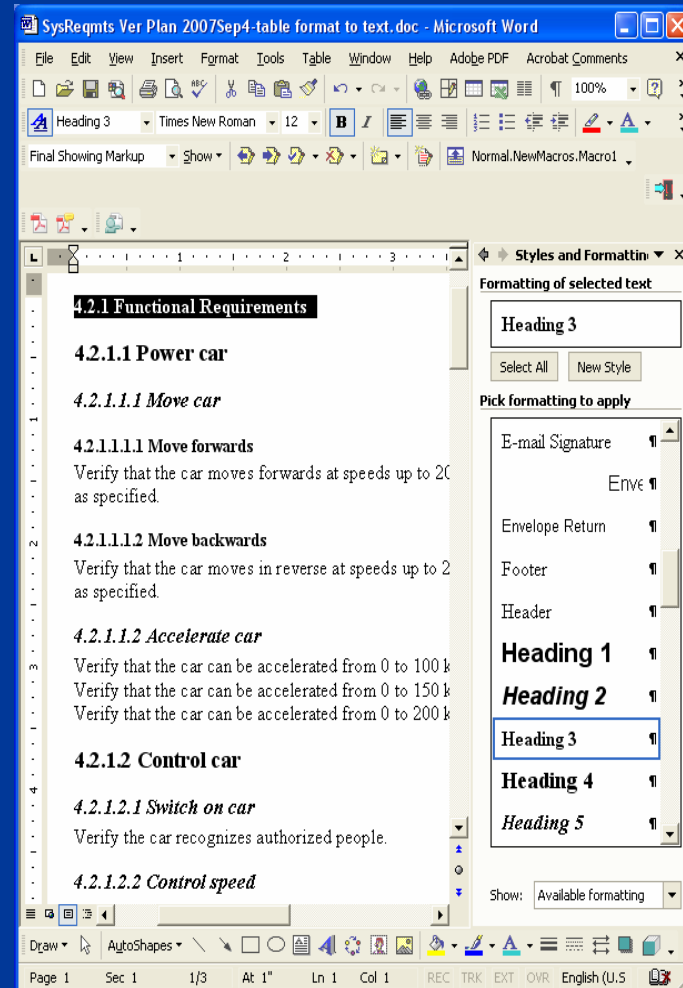
Verification Plan –Effects as Table

- Exporting via “Out of the Box” Export to Word function as a Table.



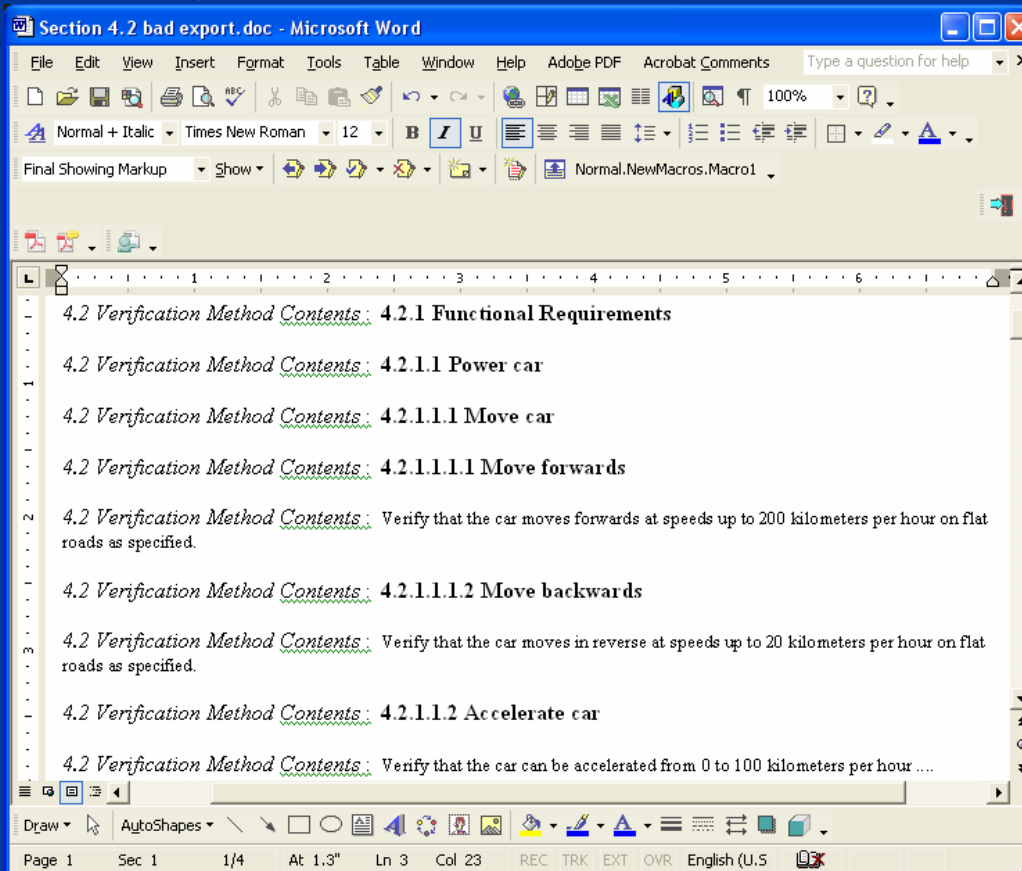
Verification Plan –Effects as Table

- Headers need to be formatted as MS Word Heading styles



Verification Plan – Undesired Effects as Book

- Exporting via “Out of the Box” Export to Word function.



Export a CIDS – Remaining Tasks

- Prepare Front Page supplying info for the following items:
 - Subsystem/component name for module
- Update the page headers for unique MS Word sections to include name of subsystem/component represented (e.g. engine)

Export a CIDS – Remaining Tasks, Cont'd

- For Tables and Figures: Captions should be on the same page as the table or figure: table caption before the table; figure captions after the table. If possible, keep the referencing object with the table/figure and caption, allowing all 3 objects to be on one page. This can be handled by manual page breaks or setting the paragraph style for the referencing requirement to be “Keep with Next”.
- Update the Table of Contents, Table of Tables and Table of Figures as one of last steps.
- Switch to the Advanced Tab, no changes on General tab.

GENERAL DYNAMICS

Monika L. Morgan
General Dynamics Land Systems
morganm@gdls.com
586-825-5685