CertTech TestStand Tool Qualification Kit Compliances/Findings/Observations Report

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REFERENCE:

RTCA/DO-178B *Software Considerations in Airborne Systems and Equipment Certification*, RTCA, Washington, DC, December 1, 1992

RTCA/DO-330 *Software Tool Qualification Considerations*, RTCA, Washington, DC, December 13, 2001

Software Review Job Aid *Conducting Software Reviews Prior to Certification Job Aid*, Aircraft Certification Service, Rev. 1 dated January 16, 2004.

DOCUMENTS REVIEWED:

Doc. Number	Title	Rev.
TE00003-20	NI TestStand Tool Qualification Plan	1.0
TE00003-30	NI TestStand Tool Operational Requirements	1.0
TE00003-40	NI TestStand Tool Requirements Verification Testing Procedure	1.0
TE00003-50	TestStand Tool Qualification Accomplishment Summary Document	1.0
TE00003-60	NI TestStand Tool Trace Matrix	1.0
TE00003-70	TestStand Coding Standard	1.0

DATA REVIEWED:

Data Type	File name or Category
Review	TestStand TQP_Review.xls
Review	TestStand TOR_Review.xls
Review	TestStand Tool Requirements Verification Testing Procedure.xls
Review	TestStand TQAS_Review.xls
Review	TestStand Tool Trace Matrix.xls
Review	TestStand Coding Standard_Review.xls
Results	66 files Report results from running the TQ Test Scripts

The summary of each Compliance, Finding, and Observation is found the table below.

SUMMARY:

Four Tables herein below were extracted from DO-330 Annex A - Tool Qualification Objectives include the only requirements for TQL 5 Tool Qualifications. The reports provided to me by CertTech staff demonstrate that these objectives have been met and in many cases exceeded.

An overview of each table is provided below:

- Table T-0 addresses the Tool Operational Processes, including the Tool Requirement process, Tool Operational Integration process, and the Tool Operational Verification and Validation process.
- Tables T-8, T-9, and T-10 address the integral processes of configuration management, quality assurance and certification authority liaison respectively and are applicable to the complete tool life cycle.

OBSERVATIONS:

There are some words of instruction to the Tool Kit user included in the NI TestStand Tool Requirements Verification Testing Procedure in sections 3.2, 3.3, 3.4 and 3.5. My opinion is that words of this nature need to be included in a NI Test Stand Tool Qualification Kit User's Guide to instruct the Kit users on how to utilize the Kit. These sections of the Testing Procedure then need to reflect the results or outcomes of these user activities.

Further the subset of NI TestStand operations which are qualified are not well indentified. This Users Guide could include that information directly or pointers on how to retrieve that information. The Tool Operational Requirements Table of Contents for section 2 could be used for that purpose.

Also, I believe your Tool Kit could be made more marketable if you help your customers with recommended wording for the TestStand Tool Qualification overviews in the PSAC (Preliminary Software Aspects of Certification) and the SVP (Software Verification Plan). The SOI #1 thru #4 information provided hereinbelow could be helpful in identifying the plans where tool qualifications required should be mentioned.

Herein below are SOI #1 thru #4 Evaluation Activity/Questions which were extracted from the FAA Software Job Aid and have been edited to only include all references to **Tools**. The new TestStand Tool Qualification Kit User's Guide needs to assist to TestStand Tool Qualification Kit user in making sure that all of these Activity/Questions are addressed. These are the questions that a certification authority or DER will address regarding Tool Qualifications in their review of the TestStand Tool Qualification Kit user's certification data to insure compliance to DO-178. It would be worthwhile to review your document set to see that these questions are all addressed and are easy to locate.

FINDINGS:

In TE-00003-40

3.2.1 Installing files from the TE00003-10 media

Locate the installer (setup.exe) from the installation media. Run the installer to start the installation process. It is recommended, but not required, to install the tool qualification kit to the 'C:\TestStand Qualification Kit\' directory.

NOTE: The installation requires administrative privileges. Running the verification software doesn't.
NOTE: The intended user must have write privileges for the TestStand Tool Qualification Kit directory.
NOTE: Restarting the PC may be required after installation is complete.

In TE-00003-50

7.1 COMPLIANCE STATEMENT

The TestStand tool is used to automate the collection and analysis of test data during requirements-based verification testing activities and complies with all applicable process and documentation requirements for Verification Tools as defined in section 12.2 of RTCA/DO-178B and FAA Order 8110.49 Chapter 9, as well as Section 12.2 of RTCA/DO-178C and RTCA/DO-330. The tool qualification artifacts including the Tool Qualification Plan (TQP), the Tool Operational Requirements (TOR), the Test Procedures and Verification Results (TPVR), the raw test result files (actual and expected), and this Tool Qualification Accomplishment Summary (TQAS) have been archived in accordance with the applicable configuration management processes and procedures, and are available for review.

The following 4 Tables extracted from DO-330 Annex A - Tool Qualification Objectives include the only requirements for TQL 5 Tool Qualifications. The reports provided to me by CertTech staff demonstrate that these objectives have been met and in many cases exceeded.

An overview of each table is provided below:

- Table T-0 addresses the Tool Operational Processes, including the Tool Requirement process, Tool Operational Integration process, and the Tool Operational Verification and Validation process.
- Tables T-8, T-9, and T-10 address the integral processes of configuration management, quality assurance and certification authority liaison respectively and are applicable to the complete tool life cycle.

Table T-0 Tool Operational Processes

	Objective		Applicability by TQL					Output		Control Category by TQL				
	Description	Ref.	1	2	3	4	5	Description	Ref.	1	2	3	4	5
Planning Process														
1	The tool qualification need is established.	4.1 [Note 1]	❍	❍	❍	❍	❍	Tool-specific information in the Plan for Software Aspects of Certification	10.1.1	①	①	①	①	①
Tool Operational Requirements Process														
2	Tool Operational Requirements are defined.	5.1.1.a	❍	❍	❍	❍	❍	Tool Operational Requirements	10.3.1	①	①	①	①	②
Tool Operational Integration Process														
3	Tool Executable Object Code is installed in the tool operational environment.	5.3.1.a	❍	❍	❍	❍	❍	Tool Executable Object Code Tool Installation Report	10.2.4 10.3.2	② ②	② ②	② ②	② ②	②
Tool Operational Verification and Validation Process														
4	Tool Operational Requirements are complete, accurate, and consistent.	6.2.1a	●	●	❍	❍		Tool Operational Verification and Validation Results	10.3.4	②	②	②	②	
5	Tool operation complies with the Tool Operational Requirements.	6.2.1b	●	●	❍	❍	❍	Tool Operational Verification Cases and Procedures Tool Operational Verification and Validation Results	10.3.3 10.3.4	② ②	② ②	② ②	② ②	② ②
6	Tool Operational Requirements are sufficient and correct	6.2.1.aa	●	●	❍	❍	❍	Tool Operational Verification and Validation Results	10.3.4	②	②	②	②	②
7	Ensure software life cycle process needs are met by the tool.	6.2.1.bb	❍	❍	❍	❍	❍	Tool Operational Verification and Validation Cases and Procedures Tool Operational Verification and Validation Result	10.3.3 10.3.4	②	②	②	②	②

Note 1: This activity is part of the software planning process and is not fully described in this document. Refer to the domain document (for example, DO-178C or DO-278A)

Table T-8 Tool Configuration Management Process

	Objective		Applicability by TQL					Output		Control Category by TQL				
	Description	Ref.	1	2	3	4	5	Description	Ref.	1	2	3	4	5
1	Configuration items are identified.	7.1.a	❍	❍	❍	❍	❍	Tool Configuration Management Records	10.1.13	②	②	②	②	②
2	Baselines and traceability are established.	7.1.b	❍	❍	❍	❍		Tool Configuration Index Tool Configuration Management Records	10.1.11 10.1.13	① ②	① ②	① ②	① ②	
3	Problem reporting, change control, change review, and configuration status accounting are established.	7.1.c 7.1.d 7.1.e 7.1.f	❍	❍	❍	❍		Tool Problem Reports Tool Configuration Management Records	10.1.12 10.1.13	② ②	② ②	② ②	② ②	
4	Archive, retrieval, and release are established.	7.1.g	❍	❍	❍	❍	❍	Tool Configuration Management Records	10.1.13	②	②	②	②	②
5	Tool development environment control is established.	7.1.h	❍	❍	❍	❍		Tool Configuration Management Records Tool Development Environment Configuration Index	10.1.13 10.1.10	② ①	② ①	② ①	② ②	

Table T-9 Tool Quality Assurance Process

	Objective		Applicability by TQL					Output		Control Category by TQL				
	Description	Ref.	1	2	3	4	5	Description	Ref.	1	2	3	4	5
1	Assurance is obtained that tool plans and standards are developed and reviewed for consistency.	8.1.a	●	●	●			Tool Quality Assurance Records	10.1.14	②	②	②		
2	Assurance is obtained that tool processes comply with approved plans.	8.1.b	●	●	●	●	●	Tool Quality Assurance Records [Note 1 & 2]	10.1.14	②	②	②	②	②
3	Assurance is obtained that tool processes comply with approved standards.	8.1.b	●	●	●			Tool Quality Assurance Records [Note 2]	10.1.14	②	②	②		
4	Assurance is obtained that transition criteria for the tool life cycle processes are satisfied.	8.1.c	●	●	●			Tool Quality Assurance Records	10.1.14	②	②	②		
5	Tool conformity review is conducted.	8.1.d	●	●	●	●	●	Tool Quality Assurance Records [Note 1]	10.1.14	②	②	②	②	②

Note:
1. For TQL 5, Tool Quality Assurance Records may be part of the Software Quality Assurance Records.

2. The nature of the approved plans and standards varies by TQL

Table T-10 Certification Liaison Process for Tool Qualification

	Objective		Applicability by TQL					Output		Control Category by TQL				
	Description	Ref.	1	2	3	4	5	Description	Ref.	1	2	3	4	5
1	Communication and understanding between the applicant and the certification authority is established.	9.0	❍	❍	❍	❍	❍	Tool-specific information in Plan for Software Aspects of Certification	10.1.1	①	①	①	①	①
								Tool Qualification Plan [Note 1]	10.1.2	①	①	①	①	①
2	The means of compliance is proposed and agreement is obtained.	9.0	❍	❍	❍	❍	❍	Tool-specific information in Plan for Software Aspects of Certification	10.1.1	①	①	①	①	①
								Tool Qualification Plan [Note 1]	10.1.2	①	①	①	①	①
3	Compliance substantiation is provided.	9.0	❍	❍	❍	❍	❍	Tool-specific information in Software Accomplishment Summary	10.1.16	①	①	①	①	①
								Tool Accomplishment Summary [Note 2]	10.1.15	①	①	①	①	
								Tool-specific information in Software Life Cycle Configuration Index	10.1.17	①	①	①	①	①
								Tool Configuration Index [Note 3]	10.1.11	①	①	①	①	
4	Impact of known problems on the Tool Operational Requirements is identified and analyzed.	9.0	❍	❍	❍	❍	❍	Tool-specific information in Software Accomplishment Summary	10.1.15	①	①	①	①	①

Notes:
1. For TQL 5, this may be satisfied by the Plan for Software Aspects of Certification.
2. For TQL 5, this may be satisfied by the Software Accomplishment Summary.
3. For TQL 5, this may be satisfied by the Software Life Cycle Configuration Index.

LEGEND:

●	The objective should be satisfied with independence.
❍	The objective should be satisfied.
Blank	Satisfaction of objective is at applicant's discretion.
①	Data satisfies the objectives of Control Category 1 (CC1).
②	Data satisfies the objectives of Control Category 2 (CC2).

The following SOI #1 thru #4 Evaluation Activity/Questions are extracted from the FAA Software Job Aid and have been edited to only include all references to **Tools**. The new TestStand Tool Qualification Kit User's Guide needs to assist to TestStand Tool Qualification Kit user in making sure that all of these Activity/Questions are addressed. These are the questions that a certification authority or DER will address regarding Tool Qualifications in their review of the TestStand Tool Qualification Kit user's certification data to insure compliance to DO-178.

Item #	SOI #1 Evaluation Activity/Question	DO-178B objective(s)
1.1	**Review all plans (PSAC, SCMP, SQAP, SDP, SVP, software tool qualification plans, etc.) and standards. Based on your review of all the plans, consider the following questions:**	
1.1.6	Do the plans and standards address the software change process and procedures for the airborne software and tools (if tools are used)?	• A-1, #1,2
1.1.7	Are all software tools identified in the plans and is rationale included for why each does or does not need to be qualified?	• A-1, #4
1.2	**Determine if additional considerations defined in Section 12 of DO-178B have been documented and addressed in the plans. Consider the following questions:**	
1.2.3	Verify that software tools are identified and explained in the plans. Consider the following questions: • Do the plans provide rationale for why tools do or do not need to be qualified? (I.e., Does the use of tools result in the elimination, reduction, or automation of processes or activities found in DO-178B? Is the output of the tool verified by manual (review) or other means (another tool or activity)?) • Is service history claimed for the use of any tool? If so, has the tool changed or is it being used in the same way as previously used? Does the documented tool service history support the intended use for the current development?	• A-1, #3, 4
1.2.4	Are tools to be qualified supported with a tool qualification plan (either in the PSAC or in a separate document)? Verify that tools are properly categorized into development, configuration management, or verification tools. Verify that the plan for qualification of tools is documented and adequate for the specified tool use. Note: Section 12.2 of DO-178B and Chapter 9 of Order 8110.49 provide specific guidelines regarding software tool qualification.	• A-1, #3, 4
1.3	**Review PSAC and consider the following questions:**	
1.4	**Review SDP and consider the following questions:**	

Item #	SOI #1 Evaluation Activity/Question	DO-178B objective(s)
1.4.6	Has the software development environment been adequately defined (e.g., documentation tools, requirements definition and capture tools, traceability tools, design tools (including architecture, derived requirements and low-level requirements definition and capture tools), coding tools (including code templates, code editors, compiler options and optimizations to be used), integration tools (including linkage editors and loaders, linking and loading procedures and tools), development host computer environment, tools to ensure protection of baselined software life cycle data such as configuration management and control tools, access privileges, etc.)? Additionally: • Are tool users' guides, restrictions, and limitations available and known by the software developers using them? • Do any of the tools support enforcement of the software standards, transition criteria, data baselining and approval process, etc.? For example: (1) does the code editor tool or compiler enforce any coding rules, restrictions, or limitations? (2) does the document control (CM system) enforce access privileges to data and ensure no unauthorized changes to baselined data?	• A-1, #3
1.5	**Review the SCM plan and consider the following questions:**	
1.5.4	Does the SCM plan provide for the following items? • Configuration identification of software life cycle data. • Baselining of all configuration control 1 (CC1) data. • Problem reporting, change control, and configuration status accounting. • Archival, retrieval, and release. • Data retention provisions supporting airworthiness requirements. • Software load control and part numbering to include any additional considerations required for electronic part numbering. • Configuration management of the software life cycle development environment includes tools. • All DO-178B life cycle data to be maintained consistently with the configuration control category associated with the software level.	• A-8, #1-6
1.5.5	Will applicable aspects of the SCM plan, environment, tools, training and procedures be conveyed to any sub-tier suppliers of components of the system and subcontractors to ensure their compliance to the approved plans, standards and procedures?	• A-8, #1-6
1.6	**Review the SQA plan and consider the following questions:**	
1.6.5	Are there any deviations proposed for this project from the SQA plans and procedures? If so, are those deviations identified and justified?	• A-1, #2 • A-9, #2
1.6.11	Will applicable aspects of the SQA plan, environment, tools, training, and procedures be conveyed to any sub-tier suppliers of components of the system and subcontractors to ensure their compliance to the approved plans, standards, and procedures?	• A-1, #1-3, 7 • A-9, #1-2
1.7	**Review the SVP and consider the following questions:**	

Item #	SOI #1 Evaluation Activity/Question	DO-178B objective(s)
1.7.3	Will applicable aspects of the SVP plan, environment, tools, training and procedures be conveyed to any sub-tier suppliers of components of the system and subcontractors to ensure their compliance to the approved plans, standards, and procedures?	• A-1, #1-3, 7 • A-3 to A-7 (all objs)
1.7.5	Does the SVP describe the verification method used for each software verification activity? Specifically: • Are methods, checklists, tools and procedures described for conducting reviews of software requirements, design, coding, and integration? • Are methods, checklists, tools and procedures described for conducting analyses of traceability, change impact, timing, memory usage, stack usage, common shared resource (memory, I/O ports, buffers and devices, floating point processor, cache, etc.) usage, requirements-based test coverage, structural coverage, normal range coverage, robustness test coverage, data coupling, control coupling, etc.? • Are methods, checklists, tools and procedures described for conducting reviews of test plans, test procedures, test cases, and test results? • Are methods, checklists, tools and procedures described for conducting testing of software high-level requirements, software derived requirements, software low-level requirements, software components, software integration, hardware-software integration, normal range, and robustness? • Will most of the formal software verification testing be conducted on a "host" computer environment or on the target environment? Note: If conducted on a host, justification should be provided for why the testing is valid for the target environment. • Will most of the formal software verification testing be conducted on the executable object code embedded in the target environment, or on another form of the software (e.g., assembly language) on a "host" computer environment? Note: If conducted on software other than the final airborne software load, justification should be provided for why the testing is valid for the airborne software in the target environment. • If software verification test credit will be claimed for testing conducted on system benches, laboratory, integrated system facilities, do the plans and procedures describe how those activities will be conducted and software test results and coverage analyses documented? • Is there a well-defined process and procedure for ensuring that deficiencies detected during the testing process will be conveyed to and corrected by the software development process and team?	• A-1, #1-3

Item #	SOI #1 Evaluation Activity/Question	DO-178B objective(s)
1.7.6	Does the SVP describe the verification environment, including the test equipment? Consider the following questions: • Are there any automated tools? If so, do any of the tools need to be qualified? • Is there any overlap between various kinds of testing (e.g., overlap of system and requirements-based testing)? • Is the division of the testing task between suppliers and sub-contract suppliers adequately addressed and controlled?	• A-1, #1-3
1.7.11	For Levels A, B, and C software, do the plans address all aspects of structural coverage analysis? For example, are the following addressed: • tools and tool qualification, if tools are used for structural coverage analysis and results recording • the relationship between requirements-based testing and measuring structural coverage • a process for determining when additional requirements-based tests should be added if coverage is not achieved as expected • a procedure for regression analysis and testing, if necessary • the transition criteria to start and end structural coverage analysis • regression analysis and testing with respect to the unique requirements for structural coverage • processes and procedures for conducting analyses of data coupling (data interfaces and dependencies between system components) and control coupling (execution interfaces and dependencies between system components) **NOTE:** See *A Practical Tutorial on Modified Condition/Decision Coverage* [3] for additional information on MC/DC.	• A-1, #1-3 • A-7, #5-8
1.7.13	If verification tools are used, consider the following questions to determine whether the tool(s) needs to be qualified: • Does the tool eliminate, reduce or automate a process or activity related to compliance with DO-178B? • Can the verification tool allow an existing error to remain undetected? If so, what classes of errors can the tool fail to detect? Is there another verification activity performed to detect these classes and instances of errors? • Is the output of the verification tool(s) verified manually or by another tool? **NOTE:** See section 12.2 of DO-178B and chapter 9 of Order 8110.49 [2] for more information on tools.	• A-1, #1-4
1.7.14	If verification tools are reused, does the SVP (or other document) address possible reuse of verification tools? For example, is credit being claimed from previous tool qualifications or will the tool qualification data be used in a future program?	• A-1, #1-4
1.8	**Develop an understanding of the system from applicant's plans, safety assessment, standards, and briefings.**	

Item #	SOI #1 Evaluation Activity/Question	DO-178B objective(s)
1.9	**Review the software development standards and consider the following questions:**	
1.10	**Review the plans to determine if real-time aspects of the software implementation have been addressed. Consider if the following questions have been addressed in the plans:**	
1.10.7	Is an integrated development environment (IDE) used? Will any of the tools be qualified? Are dependencies and interactions between the tools of the environment document and well understood? Are the tools in the IDE compatible with one another and with other tools used in the development and verification processes? Is this well documented?	• A-1, #3
1.10.8	Do the plans describe how the development environment will be preserved for any future changes to software? Does the applicant or developer have plans and procedures for managing changes to the tools and analyzing their impact on already approved as well as future systems and projects?	• A-1, #3, 6

Item #	SOI #2 Evaluation Activity/Question	DO-178B objective(s)
2.1	**Analyze high-level requirements and associated derived high-level requirement(s) traceability to the selected system level requirement.**	
2.2	**Review the software design and design data and determine compliance to DO-178B Table A-4.**	
2.3	**Review the software architecture.**	
2.4	**Review the software code/integration data to determine if objectives of DO-178B Table A-5 are met.**	
2.5	**Determine if the requirements and design have been reviewed, considering the following real-time questions:**	
2.6	**Determine if the real-time aspects of the system development have been addressed. Consider the following questions:**	
2.7	**Review the configuration management data to determine compliance to DO-178B Table A-8.**	
2.7.2	Review Baselining Activity and consider the following questions:	
2.7.3	Are tools used in the development environment under configuration control?	• A-8, #6
2.8	**Review the Problem Reports and changes to software life cycle data for impact on software code.**	
2.9	**Review of Archival, Retrieval, and Release Procedures.**	
2.10	**Review the Software Quality Assurance Data to assure that the objectives of DO-178B Table A-9 are met.**	
2.11	**Optional: Review sampling of the applicant's test cases and procedures (even if they are in preliminary format). Review for adequacy of the test cases. The actual activities and questions for review of test cases and procedures is in SOI #3; however, it is a good practice to give some initial feedback to the applicant on test case development.**	• A-6, #1-5
2.12	**Determine if the memory management has been adequately addressed. Consider the following questions:**	
2.13	**Consider the following questions, if tools are used:**	
2.13.1	Is tool qualification needed? If so: • Has a tool qualification plan been developed and reviewed? • Has the tool qualification plan been followed? • Has tool qualification data been developed and reviewed?	• A-2, #4 • Section 12.2 and applicable objectives

Item #	SOI #2 Evaluation Activity/Question	DO-178B objective(s)
2.14	**If partitioning/protection is used, consider the following questions:**	
2.15	**If a RTOS is used consider the following questions:**	

Item #	SOI #3 Evaluation Activity/Question	DO-178B objective(s)
3.1	**Is there evidence that the SVP and other plans related to verification, integration, and testing are being followed (e.g., progress against timeframes, staffing etc.)?**	• A-9, #1
3.2	**Sample the applicant's test cases and consider:**	
3.3	**Review test cases and procedures, considering the following questions:**	
3.3.2	Do the test cases and procedures adhere to the relevant plans and standards? For example, have coding standards, especially those relevant to limitations of structural coverage tools, been followed?	• A-7, #1
3.4	**Review checklists for test cases, procedures, and results, considering the following questions:**	
3.5	**Determine effectiveness of test program by: (1) assessing results of requirements-based tests, (2) assessing failure explanations and rework, and (3) assessing coverage achievement.**	
3.5.1	**Assess results of requirements-based testing, considering the following questions:**	
3.5.2	**Have all high-level and low-level requirements been tested?**	• A-7, #3, 4
3.5.3	**Assess failure explanations and rework, considering the following questions:**	
3.5.4	**Assess structural coverage achievement, considering the following questions:**	
3.6	**Review the hardware/software (HW/SW) integration process data to determine compliance to DO-178B Table A-6.**	
3.7	**Determine if data and control coupling have been properly carried out. (See CAST-19 [7], Data and Control Coupling Clarification, for further information)**	• A-7, #8
3.8	**Review verification cases and procedures.**	
3.9	**Review verification results.**	
3.10	**Review the configuration management data to assess compliance to DO-178B Table A-8.**	
3.11	**Review the Problem Reports and changes to software life cycle data for impact on software code.**	
3.12	**Review the Archival, Retrieval, and Release Procedures.**	

Item #	SOI #3 Evaluation Activity/Question	DO-178B objective(s)
3.13	**Review the Software Quality Assurance Data to assure compliance to DO-178B Table A-9.**	
3.14	**Perform a build and load, using the applicant's approved instructions.**	
3.15	**If tool qualification is required, review tool qualification data, considering the following questions:**	
3.15.1	Do the plans state which tools are being qualified and the rationale for qualification? (Note: This might be in the Plan for Software Aspects of Certification or a separate tool qualification plan for verification tools.)	• A-1, #4 and applicable objectives
3.15.2	Are the specific tool requirements documented? DO-178B, section 12.2.3.15 lists the typical information that should be included in the Tool Operational Requirements document.	• A-1, #4 and applicable objectives
3.15.3	Does the Tool Operational Requirements make known all of the tool's functions?	• A-1, #4 and applicable objectives
3.15.4	If a qualified tool is used for structural coverage, does the tool qualification data address whether the tool needs to instrument the code to perform the analysis? If the tool does need to instrument the code, has the effect of the instrumentation on the code been assessed?	• A-1, #4 and applicable objectives
3.15.5	If the tool measures coverage at the object code level, is additional analysis available to support the equivalence of coverage at the object and source code levels? (**Note:** See CAST-17 [8] for information on coverage at the object code level.)	• A-1, #4 and applicable objectives
3.15.6	Is the tool qualification analysis sufficient to discover errors in the tool and limitations of the tool's functions?	• A-1, #4 and applicable objectives
3.15.7	Does the tool qualification data address how tool deficiencies that are found while the tools are being used in a certification project should be handled?	• A-1, #4 and applicable objectives
3.15.8	Does the tool qualification data detail how changes to the tool will be evaluated and controlled?	• A-1, #4 and applicable objectives
3.15.9	Are procedures for using each tool documented?	• A-1, #4 and applicable objectives
3.15.10	Are limitations of the tool that may affect assessment of coverage clearly documented and addressed (e.g., the limitations discussed in chapter 4 of the MC/DC tutorial)?	• A-1, #4 and applicable objectives