Critical Design Review

The following material was extracted from Section 50 of Mil. Std. 1521 (now withdrawn) to provide additional definitions for the format and content of the Critical Design Review (CDR).

This document has been extensively tailored for the purpose of CMPE450/451. The following nomenclature is used:

(M) = mandatory content for CMPE450/451 CDR (bold text!)
(D) = desired content for CMPE450/451, as appropriate and as time permits. Teams must make their own decisions regarding which content to include.
(O) = optional content for CMPE450/451, as appropriate and as time permits. Teams must make their own decisions regarding which content to include
(N) = not required for CMPE450/451. When a higher-leveled paragraph is marked (N), none of the sub-paragraphs need be addressed.

This document was last revised on March 1, 2018 by EFC LaBerge for use in the Spring 2018 CDR presentations.

The Spring 2018 CDR presentations will occur in class during the following regularly scheduled class times: Friday, March 9, 10-11 AM, Monday, March 12, 10-11 AM, Wednesday, March 14, 10-11 AM, Friday March 16, 10-12 N.

This will be the final in-class presentation of the Capstone sequence. The final review will be the poster session. Additional details on the poster will be forthcoming.

All team members must present in roughly equal duration during the team presentations. This is your last chance to present for me, so work to impress me!

I've used the (somewhat outdated) MIL-SPEC language so that you can see how a formal requirement on content is presented to the contractor. In this case, you are the contractor teams and I am the customer. There are many things that aren't relevant and I've cut most of them out.

HINT: Use the artifacts, analyses, layouts, CAD drawings, etc. that you have already done as part of your work. You shouldn't be creating a lot of new material for this presentation, although you will, of course, be creating new slides.

I do not expect a simple rehash of your PDR.

50. Critical Design Review

50.1 General.

The Critical Design Review shall be conducted on each configuration item prior to fabrication/production/coding release to insure that the detail design solutions, as reflected in the Draft Hardware Design Specification, Software Detailed Design Document (SDDD), Interface Design Document(s) (IDD(s) satisfy requirements established by the hardware Development Specification.
[…]

50.1.1 Equipment/Facilities configuration items.
The detail design […] shall be reviewed. […] .

50.1.2 Computer Software configuration items (CSCIs).
The CDR for a CSCI shall be a formal technical review of the CSCI detail design, including database and interfaces. The CDR is normally accomplished for the purpose of establishing integrity of computer software design at the level of a Unit's logical design prior to coding and testing. […] The primary product of the CDR is a formal identification of specific software documentation, which will be released for coding and testing.

50.1.2.1 Since computer software development is an iterative process, the completion of a CDR for a CSCI is not necessarily sufficient for maintaining adequate visibility into the remaining development effort through testing.

50.2 Items to be Reviewed. The team [contractor] shall present the following for review by the contracting agency:

50.2.1 HWCIs

- **a. (M) Adequacy of the detail design to [achieve the specified system performance].**
- b. (D) […E]ngineering drawings [or schematics of sufficient detail to assess the completeness of the design effort. …] c
- . Adequacy of the detailed design in the following areas:

(1) (M) Electrical design
(2) (M) Mechanical design
(3) (O) Environmental control and thermal aspects
(4) (N) Electromagnetic compatibility
(8) (O) Reliability/Maintainability/Availability
(9) (N)System Safety Engineering
(10) (N) Security Engineering
(11) (N) Survivability/Vulnerability (including nuclear)
(15) (N) Standardization
(16) (N) Design versus Logistics Trade-off analyses.

- j. (N) Life cycle costs
- m. (N) Findings/Status of Quality Assurance Program
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50.2.2 CSCIs.

- **a. (M) [Review the functionality and interfaces for the Computer Software Configuration items, if any….].**
- b. (D) Supporting documentation describing results of analyses, testing, etc.[…]
- e. (D) [Interface Control Documents as appropriate. …]
- f. (D) Progress on activities required by PDR
- h. (D) Updated operation and s upport documents
- **i. (M) Schedules for remaining milestones.**

  (M) Please provide a summary of any testing that has been done, and information about your final demo, if available.

There are no further Mandatory items after this point, but there are multiple desired items.

50.3 Detailed Design Evaluation

50.3.1 HWCIs. Detailed block diagrams, schematics, and logic diagrams shall be compared with interface control drawings to determine system compatibility. Analytical and available test data shall be reviewed to insure the hardware Development Specification has been satisfied. As a minimum, the information presented during CDR shall provide descriptions and status for the following:

- a. (D) Detailed logic flow diagrams
- b. (D) Processing algorithms
- c. (D) Circuit diagrams
- d. (D) Clock and timing data (e.g., timing charts for micro- instructions)
- e. (D) Real and Virtual Memory
- h. (D) Input/output data description
- i. (D)Diagnostics

50.3.2 CSCIs.

The contractor shall present the detailed design (including rationale) of the CSCI to include:

- a. (D) The assignment of CSCI requirements to specific software modules, the criteria and design rules used to accomplish this assignment, and the traceability of module designs to satisfy CSCI requirements.
- b. (D) The overall information flow between software modules, the method(s) by which each module gains control, and the sequencing of modules relative to each other.
- c. (O) The design details of the CSCI including data definitions, timing and sizing, data and storage requirements and allocations.
- d. (D) The detailed design characteristics of all interfaces, including their data source, destination, interface name and interrelationships; and, if applicable, the design for direct memory access. The contractor shall also give an overview of the

key design issues of the interface software design, and indicate whether data flow formats are fixed or subject to extensive dynamic changes.

- e. (O) The detailed characteristics of the data base. Data base structure and detailed design, including all files, records, fields, and items. Access rules, how file sharing will be controlled, procedures for data base recovery/ regeneration from a system failure, rules for data base manipulation, rules for maintaining file integrity, rules for usage reporting, and rules governing the types and depth of access shall be defined. Data management rules and algorithms for implementing them shall be described. Details of the language required by the user to access the database shall also be described.

50.5 (N) Design Reliability.
50.5.1 Review the most recent predictions of hardware and software reliability and compare against requirements specified in hardware Design Specification and Software Requirements Specification. For hardware, predictions are substantiated by review of parts application stress data.
50.5.3 Review completed Reliability Design Review Checklist to insure principles have been satisfactorily reflected in the configuration item design.
50.5.4 Review applications of redundant configuration item elements or components to establish that expectations have materialized since the PDR.

50.5.5 Review detailed HWCI reliability demonstration plan for compatibility with specified test requirements. The number of test articles, schedules, locations, test conditions, and personnel involved are reviewed to insure a mutual understanding of the plan and to provide overall planning information to activities concerned.

50.5.6 Review the failure data reporting procedures and methods for determination of failure trends.
50.5.8 Review on-line diagnostic programs, off-line diagnostic programs, support equipment, and preliminary technical orders (and/or commercial manuals) for compliance with the system maintenance concept and specification requirements.
50.5.9 Review software reliability prediction model and its updates based upon test data and refined predictions of component usage rates and complexity factors.

50.6 (N) Design Maintainability.
50.6.1 Review the most recent predictions of quantitative maintainability and compare these against requirements specified in the HWCI Development Specification and Software Requirements Specification.

50.6.6 Review detailed maintainability demonstration plan for compatibility with specified test requirements. Supplemental information is provided and reviewed to insure a mutual understanding of the plan and to provide overall planning information to activities concerned.

50.7 (N) Human Factors.
50.7.1 Review detail design presented on drawings, schematics, mockups, or actual hardware to determine that it meets human performance requirements of the HWCI

Development Specification and Software Requirements Specification. Interface Requirements Specification(s), and accepted human engineering practices.

50.7.2 Demonstrate by checklist or other formal means the adequacy of design for human performance.

50.7.4 Evaluate the following human engineering design factors:

- a. Operator controls
- b. Operator displays
- c. Maintenance features
- d. Anthropometry
- g. Internal environmental conditions (noise, lighting, ventilation, etc.)
- h. Training equipment
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50.8 (N) System Safety.
50.8.1 Review configuration item detail design for compliance to safety design requirements.
50.8.2 Review acceptance test requirements to insure adequate safety requirements are reflected therein.
50.8.3 Evaluate adequacy of detailed design for safety and protective equipment/devices.
50.8.4 Review configuration item operational maintenance safety analyses and procedures.

50.13 Test.
50.13. (M) [Review the provisions for testing and demonstration of the device. …] .

50.13.2 (N) Review all available test documentation for currency, technical adequacy, and compatibility with Section 4.0 of all Specification requirements.

50.13.3 (O) For any development model, prototype, etc., on which testing may have been performed, examine test results for design compliance with hardware Development, Software Requirements, and Interface Requirements Specification requirements.

50.13.4 (N) Review quality assurance provisions/qualification requirements in HWCI Product, Software Requirements, or Interface Requirements Specifications for completeness and technical adequacy. Section 4.0 of these specifications shall include the minimum requirements that the item, materiel, or process must meet to be acceptable.

50.13.5 (N) Review all test documentation required to support test requirements of Section 4.0 of HWCI Product Specifications for compatibility, technical adequacy, and completeness.

50.13.7 (N) Review Software Test Descriptions to ensure they are consistent with the Software Test Plan and they thoroughly identify necessary parameters and prerequisites to enable execution of each planned software test and monitoring of test results. As a minimum, test descriptions shall identify the following for each test:

- a. Required preset hardware and software conditions and the necessary input data, including the source for all data.
- b. Criteria for evaluating test results.
- c. Prerequisite conditions to be established or set prior to test execution.
- d. Expected or predicted test results.

50.14 (N) Maintenance and Maintenance Data.
50.14.1 (N) Review adequacy of maintenance plans.
50.14.2 (N) Review status of unresolved maintenance and maintenance data problems since the PDR.
50.17.2 (N)Insure plans are initiated for configuration item re-allocations that may be necessary due to actions occurring prior to, or during, CDR.

50.19 (N) Post Review Action.
50.19.1 (N) After completing the CDR, the contractor shall publish and distribute copies of Review minutes. The contracting agency officially acknowledges completion of a CDR.