Quality Assurance Planning Documents

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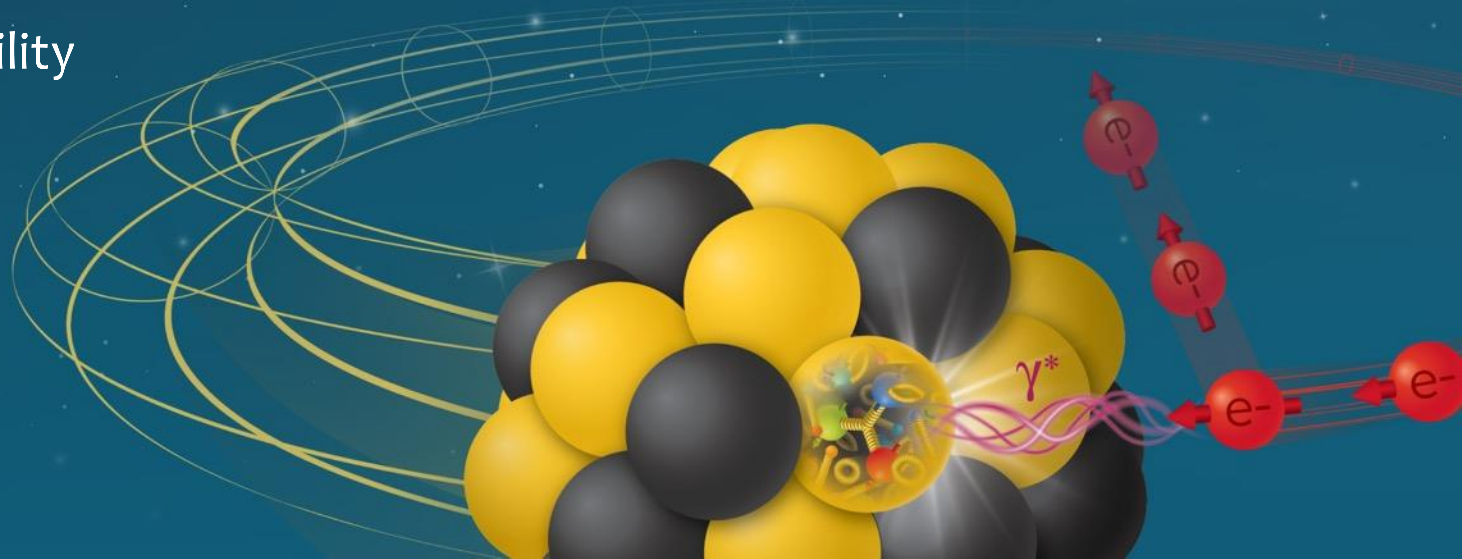

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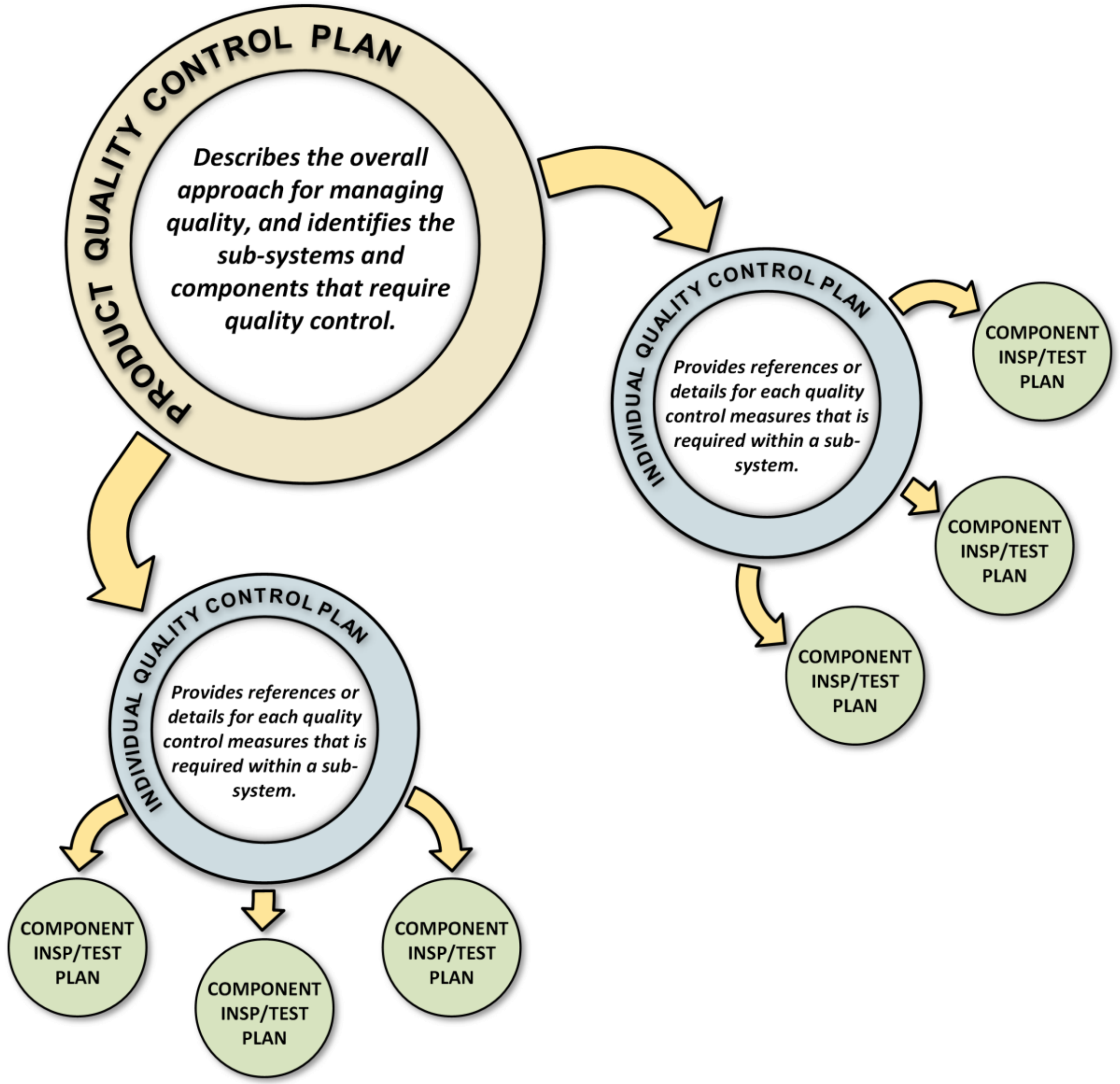
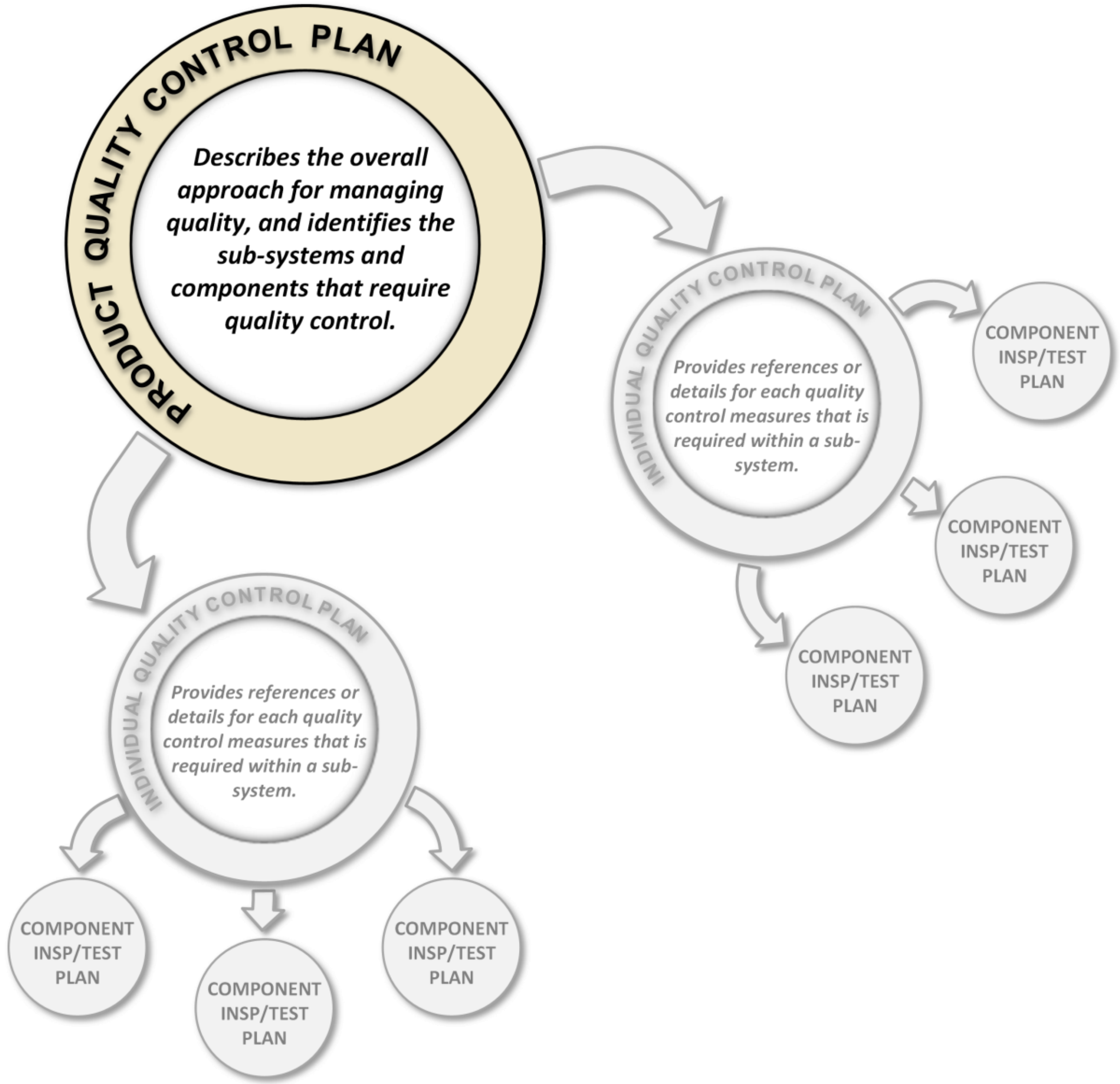
Hierarchy of Quality Assurance Documentation



Quality assurance planning documents exist in a hierarchy, where the highest level documents provide general guidance and lower level documents become increasingly specific.

1. **Product Quality Control Plan**
   Describes the overall approach for managing quality assurance issues, and identifies the systems, sub-systems, and components that will require quality control measures.
2. **Individual Quality Control Plan**
   Provides references (or details) for each quality control measure that is required by within a sub-system or collection of components.
3. **Component Inspection & Test Plans**
   Provide detail methods, measures, and processes for assuring quality control for individual components throughout their development lifecycle.

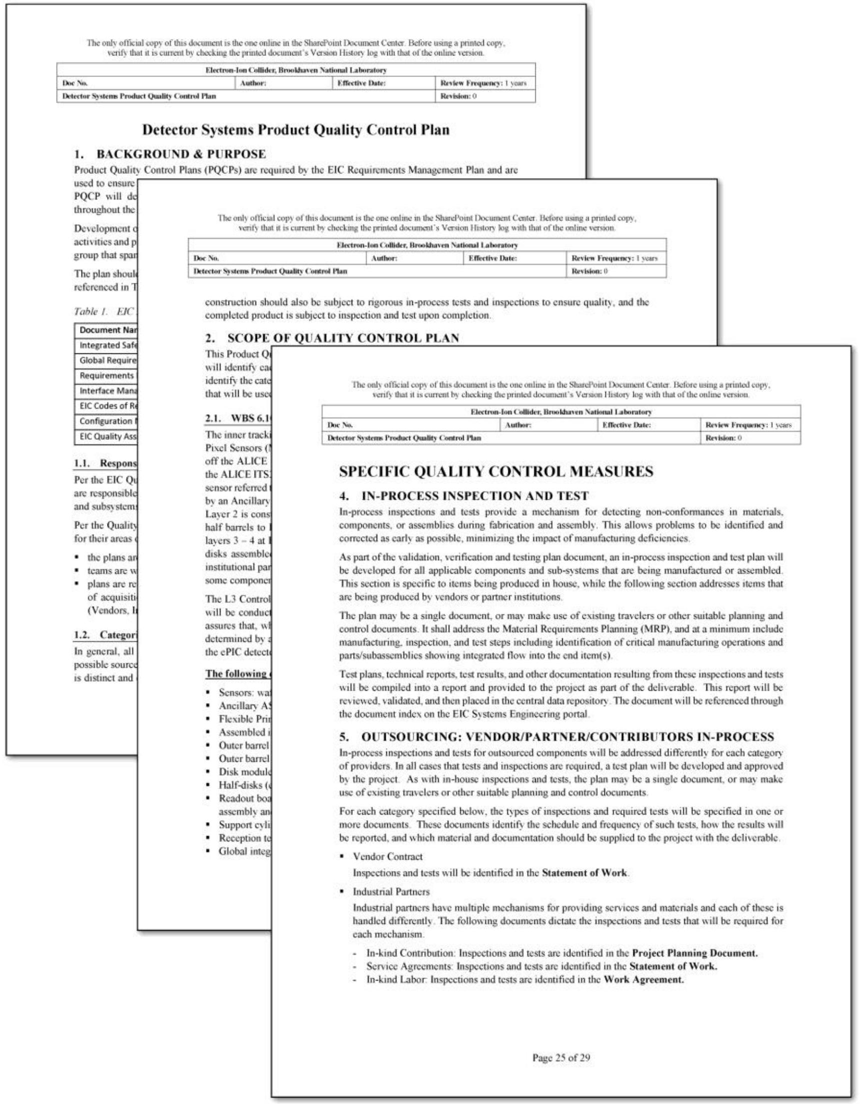
The Product Quality Control Plan



The Product Quality Control plan typically refers to a single Level-2 WBS (*system*) and performs the following functions:

1. **Establishes General Quality Assurance Requirements**
   Provides the governing definitions that are used throughout subsequent plans, including: scope definition, categories of providers, effected sub-systems and components, and requirements traceability.
2. **Defines Specific Quality Control Measures**
   Identifies and defines each of the specific quality control measures that must be addressed in the subsequent documents.
3. **Identifies Components Requiring Quality Control**
   Examines the system at the Level-3 or Level-4 sub-detector level, and identifies each component that will be subject to quality control measures.
4. **Establishes Expectations for Quality Control Measures**
   Establishes the expectations for how each quality control measure must be addressed, and identifies assumptions and constraints that exist within the larger system.

The Product Quality Control Plan – Quality Control Measures



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Electron-Ion Collider, Brookhaven National Laboratory			
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Detector Systems Product Quality Control Plan			Revision: 0

SPECIFIC QUALITY CONTROL MEASURES

4. IN-PROCESS INSPECTION AND TEST

In-process inspections and tests provide a mechanism for detecting non-conformances in materials, components, or assemblies during fabrication and assembly. This allows problems to be identified and corrected as early as possible, minimizing the impact of manufacturing deficiencies.

As part of the validation, verification and testing plan document, an in-process inspection and test plan will be developed for all applicable components and sub-systems that are being manufactured or assembled. This section is specific to items being produced in house, while the following section addresses items that are being produced by vendors or partner institutions.

The plan may be a single document, or may make use of existing travelers or other suitable planning and control documents. It shall address the Material Requirements Planning (MRP), and at a minimum include manufacturing, inspection, and test steps including identification of critical manufacturing operations and parts/subassemblies showing integrated flow into the end item(s).

Test plans, technical reports, test results, and other documentation resulting from these inspections and tests will be compiled into a report and provided to the project as part of the deliverable. This report will be reviewed, validated, and then placed in the central data repository. The document will be referenced through the document index on the EIC Systems Engineering portal.

5. OUTSOURCING: VENDOR/PARTNER/CONTRIBUTORS IN-PROCESS

In-process inspections and tests for outsourced components will be addressed differently for each category of providers. In all cases that tests and inspections are required, a test plan will be developed and approved by the project. As with in-house inspections and tests, the plan may be a single document, or may make use of existing travelers or other suitable planning and control documents.

For each category specified below, the types of inspections and required tests will be specified in one or more documents. These documents identify the schedule and frequency of such tests, how the results will be reported, and which material and documentation should be supplied to the project with the deliverable.

- Vendor Contract

  Inspections and tests will be identified in the **Statement of Work**.

- Industrial Partners

  Industrial partners have multiple mechanisms for providing services and materials and each of these is handled differently. The following documents dictate the inspections and tests that will be required for each mechanism.

  - In-kind Contribution: Inspections and tests are identified in the **Project Planning Document.**
  - Service Agreements: Inspections and tests are identified in the **Statement of Work.**
  - In-kind Labor: Inspections and tests are identified in the **Work Agreement.**

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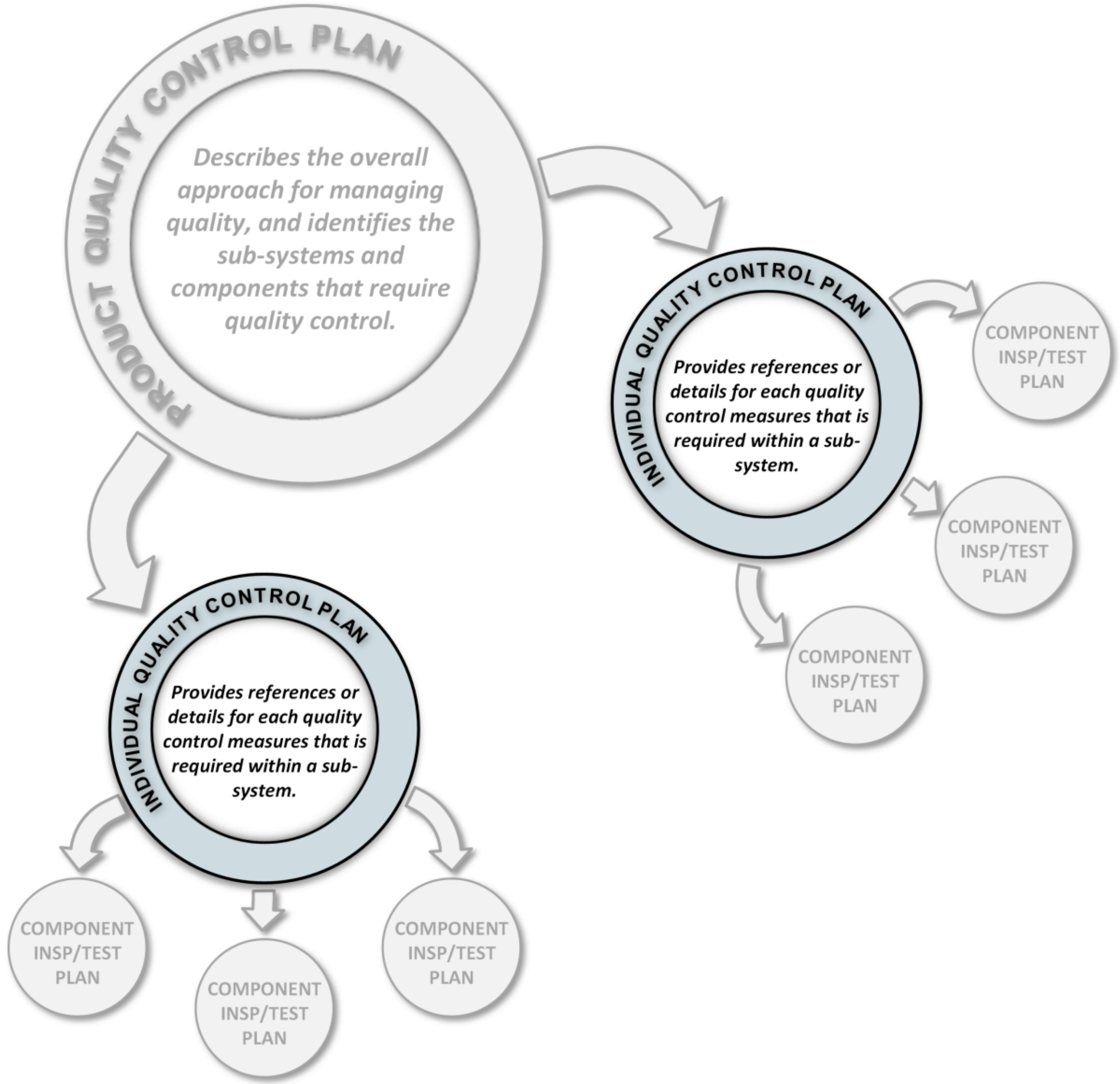
The following measures are defined within this plan:

1. **In-Process Inspection and Test**
   Inspections and tests that will be performed on components that are built in-house.
2. **Outsourcing: Vendor/Partner/Contributor In-Process**
   Inspections and tests that will be performed on components that are built by others.
3. **Incoming Inspection and Acceptance Tests**
   Inspections and tests that will be performed when components are received.
4. **Travelers, Procedures, and Checklists**
   Documentation that must be delivered with manufactured components.
5. **Verification Plans: Methods and Activities**
   Methods that will be used to ensure that the component meets critical performance parameters.
6. **Deliverable Documentation and Records**
   Documentation that must be delivered for inclusion in the project documentation.
7. **Associated Equipment**
   Additional equipment that will be required for measurements and calibration.
8. **Calibration Plans**
   Any requirements for calibration of components and/or tools associated with testing.
9. **Serialization and Material Traceability Requirements**
   Requirements for serializing components for identification and tracking.
10. **Planned Partner and Vendor Communication & Visits**
    Requirements for scheduled visits with partners and vendors to assure quality production.
11. **Control of Nonconformances**
    How deviations from quality expectations will be addressed.
12. **Packaging/Transportation/Shipping**
    Requirements for packing, shipping, and transporting manufactured components.

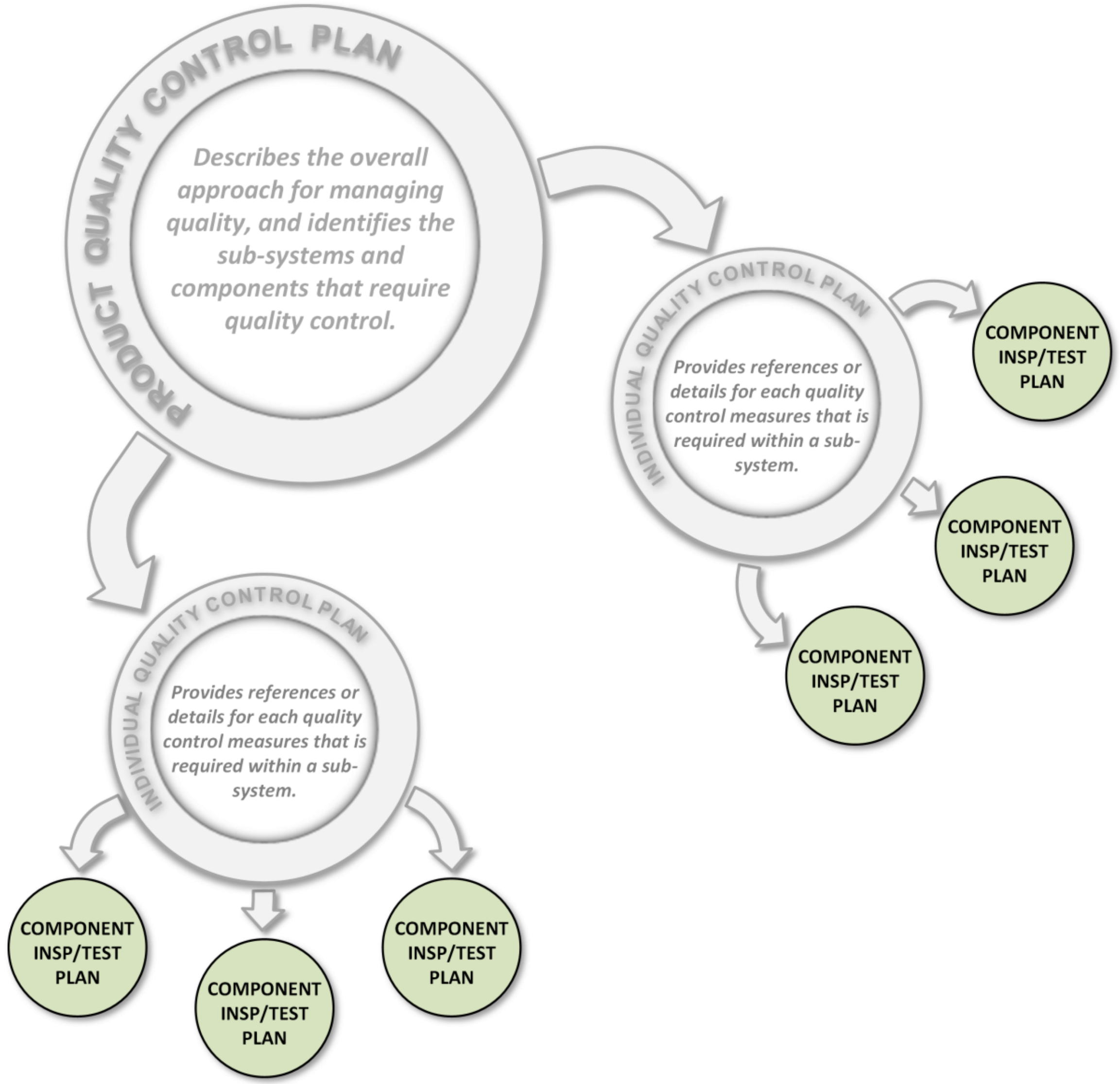
The Individual Collective Quality Control Plan



Individual Product Quality Control Plans (IQCP) typically refer to a single Level-3 or Level-4 WBS sub-system (*as categorized in the L2 product quality control plan*) and provide references or details for how the quality control requirements in the Product Quality Control Plan will be satisfied. These plans are:

1. **Auto-Generated Where Possible**
   Whenever possible, the IQCP will be auto-generated using a spreadsheet that provides details about the components that are included in the plan, and references to external Inspection and Test Plans.
2. **Detailed Where Necessary**
   For details that are not provided in an existing Inspection and Test Plan, it may be necessary to provide specific detailed information within the IQCP.
3. **A Roadmap for Reviewers**
   The IQCP provides a standard format for reviewers to use to find documentation that may exist in numerous locations and various formats.

The Inspection and Test Plan



Inspection and Test Plans are stand-alone documents that provide quality assurance information for individual components and parts. They are *highly specific, functionally formatted*, and *developed/maintained by systems experts*.

These documents are the heart of our quality control program and may include:

- Material Properties
- Test Setups and Plans
- Matrices of Component Quality Data
- Required Environmental Conditions
- Testing Resource Requirements

The Inspection and Test Plan Example - Aerogel

The Aerogel Test Stand Quality Assurance and Quality Control Procedures for the ePIC Detector RICH Sub-Systems provides the following details:

1. Aerogel Tile Property Definitions
   - Refractive Index
   - Transparency
   - Density
   - Homogeneity
   - Hydrophobicity
   - Thickness
2. Processes and Procedures for Each Tile Property
3. Individual Experimental Setups, including
   - Diagrams
   - Equipment Lists
4. Record Keeping Requirements

See https://eic.jlab.org/Detector/#QUASet for examples of all documents

Questions?