NOvA
Quality Assurance Program

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DOE O 414.1c Quality Assurance

OBJECTIVES.

A. To ensure that DOE products and services meet or exceed customers' expectations.

B. To achieve QA for all work based upon the following principles.

1. That quality is assured and maintained through a single, integrated, effective QA program (i.e., management system).
2. That management support for planning, organization, resources, direction, and control is essential to QA.
3. That performance and quality improvement require thorough rigorous assessment and corrective action.
4. That workers are responsible for achieving and maintaining quality.
5. That environmental, safety, and health risks and impacts associated with work processes are minimized while maximizing reliability and performance of work products.

C. To establish quality process requirements to be implemented under a QAP for the control of suspect/counterfeit items (S/CIs) and control of safety software.

- Director's Policy out for Review, Lab QAP being written
- NOvA QAP Written following 414.1c. (NOvA-doc-1925)

The QAP must address the following management, performance, and assessment criteria.

10 Quality Assurance Criteria

(following 414.1c)

Management/Criterion 1—Program.

- Organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing work are established through the policies set forth in the NOvA Project Execution Plan and Project Management Plan.
- Management processes, including planning, scheduling, and providing resources for work are addressed through the use of Open Plan, monthly reports, and regular project meetings.

10 Quality Assurance Criteria

(following 414.1c)

Management/Criterion 2—Personnel Training and Qualification.

- NOvA Project Manager requires all Project personnel to be trained & have appropriate experience for the work they are performing
  - Fermilab employees and NOvA collaborators working at Fermilab receive training in accordance with Fermilab policies
- Personnel conducting work at collaborating institutions are trained in accordance with the policies of those institutions.
  - Where special safety or technical training is necessary, this is specifically stated in a Memorandum of Understanding (MOU)
- In order to ensure that training skills are maintained at an appropriate level, an Individual Training Needs Assessment (ITNA) is required for Fermilab employees on an annual basis or whenever a change in job assignment and/or job hazards occurs.

10 Quality Assurance Criteria

Management/Criterion 3—Quality Improvement.

- The NOvA Project Manager has the overall responsibility for effecting quality improvement throughout the project and is supported in this effort by the Technical Board.
- At the project level, the Technical Board takes steps to detect and prevent quality problems, identify the cause and correction of quality issues, and provide for improvement.
- The Level 2 Managers are responsible for developing and documenting processes, making technical specifications for subsystem elements and carrying out QA procedures to ensure that products and procured items conform to these specifications
- Achieving quality is a line responsibility. The Project encourages personnel to eliminate problems and improve performance.

10 Quality Assurance Criteria

Management/Criterion 4—Documents and Records.

- Quality non-conformances identified during operations, inspections, and design reviews are documented as appropriate.
- For problems with Fermilab-procured items and services, the Business Services Section (BSS) Procurement Department is provided with details regarding non-conformances (Section 3.3.4 of the NOvA QAP).
- Quality non-conformances for products and services procured outside of the Fermilab system are reported to the Project Manager (PM) by the Level 2 Manager.
- PM determines which records require document control as part of the Configuration Management Program (NOvA-doc-131, breakout talk).
- These and other documents are maintained in a document database, DocDB.
  - Database is accessible via the World-Wide Web and is password-protected.
  - Each project document is assigned a unique identification number and its versions are tracked by date and submitter, with a record of the changes made.
  - Early versions and drafts remain accessible.
  - DocDB is used to organize project and ES&H reviews.

10 Quality Assurance Criteria

Performance/Criterion 5—Work Processes.

- NOvA Technical standards, administrative controls and hazard controls are described in the PEP, PMP, PSAD, NOvA TDR and Hazard Analysis Document.
- PM requires that each Level 2 Manager develop means for analyzing work processes to determine if the work is sufficiently complex or hazardous to be performed to written procedures.
- Level 2 work processes, including those performed off-site, are reviewed by the Technical Board to ensure that an appropriate level of safety and quality is achieved.
- Items for the NOvA Project will be secured as appropriate, using the graded approach, based on cost, risk and schedule implications.
- PM requires that each Level 2 Manager analyze their work process measuring and test equipment to determine the appropriate calibration requirements and develop an effective program for the necessary calibration activities (you have heard many details on this in Plenary talks).

10 Quality Assurance Criteria

Performance/Criterion 6—Design.

- The technology of the NOvA Project is based upon designs that have been used successfully in previous similar experiments
- Research & Development phase aimed at optimizing these technologies in beamline components and detectors
- Level 2 Managers are scientists and engineers who are experienced in applying the engineering principles needed to produce beamline components and detectors.
  - They are supported by the project mechanical and electrical engineers, who assist in developing and reviewing project designs.
- Designs undergo internal reviews for technical scope, cost, schedule and safety.
- The internal reviews are preparatory for external reviews by the Fermilab Director and the DOE

(More details on the design review process in the Engineering Review Process breakout talk.)

10 Quality Assurance Criteria

Performance/Criterion 7—Procurement. (see Procurement Plan breakout talk)

- The Fermilab Business Services Section has appointed a liaison to the NOvA Project, who advises the project on the preparation of major procurements.
- Procurement criteria are understood by Level 2 Managers and Level 2 Managers are involved with Fermilab Procurement on this.
- Subsystem managers who make procurements for NOvA as part of the work specified in an MOU or SOW may opt to do so through their home institutions.
  - Such procurements are made in accordance with the procedures of that institution. In such cases, the procurement method is specified in the MOU or SOW.
- All components must be fabricated to pre-determined design specifications that will allow them to operate properly when integrated into the total system
- Agreements will be in place with each vendor that explicitly states the operating parameters of the piece or pieces they construct.
  - These agreements will also assign the responsibilities for testing and verification of the final product.
- Procured items must meet established requirements and perform as specified. In some cases, random testing of a certain percentage of components will be performed and documented by an independent organization.

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Performance/Criterion 8—Inspection and Acceptance Testing. (many examples in Plenary Talks)

- Level 2 Managers assume the chief role in this process.
- Contracted work, purchased equipment, or items produced in Fermilab shops requiring formal inspection and acceptance testing must be identified.
  - Inspection techniques to be used will be defined by the testing group.
- Testing requirements and techniques may be referenced in the resource loaded schedule, a procurement contract, a MOU, or a Hazard Assessment document.
- Level 2 Managers are required to identify essential safety items or systems that require formal inspection and testing and to develop the acceptance criteria using technically and scientifically defensible methodology.
  - For example simulations stipulate the light yield from muons at the far end of the PVC modules.
- In cases where industry standards exist, these standards are applied and the test equipment is used and maintained in accordance with such standards.
- In cases where the acceptance criteria are based on the particular requirements of the NOvA experiment, industry standards may not exist and test procedures and equipment must be designed and fabricated specifically for these items.
  - For example: custom device for quickly measuring the attenuation length of WLS fiber.

10 Quality Assurance Criteria

Assessment/Criterion 9—Management Assessment.

- NOvA Project Manager prepares a monthly report summarizing the status of the project, assesses progress and implements changes as necessary
  - Requirements for the monthly report are specified in the PMP.
  - Each Level 2 Manager submits a summary of their work for assessment by the Project Manager.
- Level 2 subsystems within the NOvA Project are discussed and reviewed by the Technical Board during the research & development phase through weekly Technical Board Meetings.
- Additional reviews and workshops may be organized on an *ad hoc* basis for selected technical systems and components, e.g., electronics cards or software.
- NOvA Project Manager has the authority to form an ad hoc review team to investigate quality assurance or quality control non-conformances if the need arises.

(Monthly Report Breakout talk)

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Assessment/Criterion 10—Independent Assessment.

- Independent assessment of the NOvA Project comes from several sources.
  - Collaboration meetings where other neutrino experiment collaborators attend and provide critical feedback.
  - Engineering Review Process (see breakout talk)
  - The NOvA ES&H Review Committee to ensure that the NOvA Project complies with Fermilab ES&H requirements.
  - Particle Physics Division requires an Operational Readiness Clearance for assembly or operation of experimental facilities, including test stands.
    - As appropriate, the NOvA ES&H Review Committee will recommend whether to grant an ORC or partial ORC for such activities on NOvA.
  - Accelerator Division requires an Accelerator Readiness Review (ARR) before allowing commissioning of a beamline with beam.
    - The NOvA ES&H Review Committee will provide input to the ARR Committee.
  - FNAL Director's Reviews
  - DOE Reviews