

**QA CHECKLIST FOR LQCD MAJOR COMPUTING  
HARDWARE SYSTEM DEPLOYMENT FOR COMPUTING  
DIVISION (CD) – FY10 Ds PROCUREMENT**

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## 1 Purpose

The purpose of this checklist is to address quality assurance requirements as defined in the Fermilab's [Integrated Quality Assurance](#) (IQA) manual and the LQCD-ext Quality Assurance Plan.

This checklist addresses quality assurance information related to FY10 Lattice QCD Fermilab deployment of the major hardware associated with FY10 Ds cluster and the work-package 215302WKP for Computing Division (CD). This deployment is deemed to be a high-risk work process as defined by the Graded Approach Procedure. In order to be considered a high-risk deployment, one or more of the following selection criteria must be met:

- A. Major processes identified on lists of processes defined by each laboratory organization: No
- B. Reasonable likelihood of a 3 month delay (or 2 months for projects with duration less than 9 months) of the laboratory schedule: No
- C. **Total project cost greater than \$500K:** Yes. With the PO cost of 1,429,470.00, Ds procurement fulfills this condition.
- D. Reasonable likelihood of an occurrence, or repetitive occurrences, with cost impact greater than \$100K: No
- E. Safety or environmental hazards, liabilities or risks greater than those generally accepted in an industrial environment: No.
- F. Reasonable likelihood of a significant reduction in the public trust or scientific reputation: No.
- G. Judgment of line management: No.

Five different sections of the IQA document are applicable to a major hardware deployment. These are:

- Chapter 5: Work Process
- Chapter 6: Design Process
- Chapter 7: Procurement
- Chapter 8: Inspection and Acceptance Testing
- Chapter 10: Suspect/Counterfeit Items

The checklist is based on the IQA requirements for each of the above chapters.

## 2 Usage

The text in the Section 3 is considered to be a part of the Quality Assurance documentation for the procurement. The IQA requirements for each item in the checklist are detailed in the section 4. When filling out the checklist, the appropriate document names are referenced only once. The use of the checklist is guided by the Graded Approach identified for the system under consideration. This checklist may also be used for other similar procurement.

## 3 Quality assurance checklist for the Ds system deployment

## System Description

- a. System Name: Ds – FY2010 FNAL Major Hardware Procurement for the LQCD-ext project
- b. Brief system description: A computing cluster optimized for price/performance for Lattice QCD Physics Simulation
- c. Reason why it is a high-risk item using Graded Approach: Total Requisition (#216302) cost; \$1,498,400.00 > \$500K
- d. Designation of Design Authority (DA; also the Site Managers for the LQCD Fermilab LQCD site): Don Holmgren

This deployment is associated with the Project Code 560 and the Task code: 560.08.01.03.03 & .01. The procurement was executed using the following Purchase Orders (PO):

1. PO 593788 LQCD cluster 1,429,470.00
2. PO 594835 2 Satabeast - \$ 65,520.00 Sataboy – \$27140.00
3. PO 594833 2 Head nodes \$ 8,460.00
4. PO 595120 FY10 Lustre Cluster System - \$40,926.00

Detailed documents are available at:

1. The RFP web site (restricted)<sup>i</sup>: <http://www.usqcd.org/rfp2010/>
2. Activity log WIKI (restricted)<sup>ii</sup> : <http://lqcdbbackup.fnal.gov/twiki/> Follow the "September 2010 Cluster" link in section 3.

### 3.1 Work process

#### 3.1.1 Work process control

- a. Workmanship standards: See Attachment A: Fermilab US Lattice QCD Cluster Technical Specification FY2010 to the Request for Proposal (RFP)<sup>iii</sup> for workmanship standard specification for the supplier.
- b. Equipment to be used: No specific equipment is needed by CD employees. The system is installed by the supplier at the GCC Computer Room C (GCCC). Suppliers are trained in Fermilab procedures. Job Hazard Analysis (JHA) and Supplier Training Records are maintained.
- c. Specification for materials: The Ds cluster is specified in RFP and purchase order documents.
  - Main hardware specification: For LQCD-ext Cluster, Attachment A for the purchase orders contain detailed technical specifications. Additional requirements are included in the Attachment B.
  - Auxiliary hardware packages: For smaller purchases, details for the off-the-shelf equipment are specified in the purchase order as line items.
- d. Process measurement points: For the Ds cluster, detailed acceptance test sequence is described in the Attachment A section E.2 of the RFP. During the acceptance test process, milestone data are logged in the WIKI log. High-level milestones are also tracked in the LQCD-ext Work Breakdown Structure (WBS).
- e. Measurement standards: The performance requirements and the methods of collecting and analyzing the data for the integrated cluster system are specified in the LQCD-ext

Benchmarking Document<sup>iv</sup>. Results of the incremental benchmark testing are documented in the WIKI log.

### **3.1.2 Specific controls for procurement work processes**

#### **3.1.2.1 Item control**

Description of how items are identified and controlled, with their traceability maintained during receipt, shipping, storage, handling, installation, use, and disposal: For the Ds cluster, the supplier follows the workflow specified by CD Facility Management group and Fermilab Properties group. CD Facility Management group in conjunction with Fermilab Properties office is responsible for recording item control information in the appropriate databases. Once the supplier assembles the equipment, CD staff members coordinate with the supplier regarding the storage, handling, installation and use according to the Terms and Conditions specified in the Purchase Order.

#### **3.1.2.2 Maintenance**

Maintenance plan documentation: The system is maintained by the supplier under the three year mandatory warranty. It is allowed to run beyond this period if it remains trouble-free. When the system is no longer maintainable or not cost effective to maintain, it is decommissioned and disposed of by CD.

#### **3.1.2.3 Readiness review**

- a. Readiness review procedure: The Acceptance Test procedure defined in the Attachment A: Section E.2 is equivalent to the general purpose Readiness Review procedure for the supplier.
- b. Does this deployment require additional readiness reviews at specified intervals? If yes, explain: For major systems like LQCD-ext clusters, additional readiness reviews are held. After the completion of the supplier Acceptance Test procedure, CD system administrators and Site Managers execute various system deployment activities to get the cluster ready for production. Then, the system is turned over to the Friendly Users for further fine-tuning. At the conclusion of Friendly User testing, the system is release to general users. At this point the system is declared to be in production.

## **3.2 Design process**

### **3.2.1 Design process steps**

#### **3.2.1.1 Planning documents**

- a. Controlled, documented requirements, including acceptance criteria:
  - Request for Information (RFI) package that includes the conceptual design of the cluster
  - RFI Responses from the interested suppliers and other types of feedbacks from suppliers
  - Additional information obtained by the design engineers from other sources including similar procurements in other laboratories and conference proceedings.

- b. Design documents with iteration: RFP Work Package with all attachments constitutes the design document package. These are controlled in the CD docDb. See iterations for the Attachment A for Technical Specification on the web.
- c. Project management plans, cost, and schedule estimates with baseline: See LQCD-ext Project cost and schedule information in the annual OMB300 submission documents and other project documents. Detailed schedule and progress status is recorded in the MS project file. Procurement plans are presented to the DOE Annual Progress Review Committee.
- d. Additional planning documents: Following documents are also used for planning purposes:
  - a. LQCD-ext Risk Management Plan
  - b. LQCD-ext Risk Register

#### 3.2.1.2 Input

- a. Documentation of design inputs and constraints, including applicable orders, codes, standards, policies, and procedures, etc.:
  - a. LQCD-ext Acquisition Strategy document
  - b. Input from RFI responses
  - c. Documentation of previous USQCD installations at FNAL and Jlab
- b. Records of reviews for accuracy and completeness and to identify any ambiguity or conflict:
  - a. The scope of program including the acquisition strategy was reviewed by the DOE Progress Review Team during the annual review in April 2010.
  - b. RFP review meeting minutes and agendas are posted on the RFP web site.
  - c. Records of the results of Best Value Evaluation activities (May 22 – June 16) for this package is maintained in the RFP web site.

#### 3.2.1.3 Process documentation

- a. Design process management procedure including the process of design modification: Design documents, including Technical Specifications, Benchmarking standards, Best Value Identification criteria<sup>v</sup> are developed by the DA and his team and extensively reviewed in a collaborative manner using a series of meetings (April 22 – May 22) held with key developers and facility representatives. The procurement package is also reviewed by the Fermilab Buyer. Once released to a predefined list of prospective bidders, if amendments/clarifications are made to RFP, it is communicated to the list of bidders. The final award is given using a documented best value identification process. Minutes of the meeting and the scoring information are documented.
- b. Governing documentation for collaborative design activities, e.g. Memoranda of Understanding (MOU) and/or Statements of Work (SOW), Project Execution Plan: Available funding for the hardware procurement at Fermilab is managed using the approved LQCD-ext Project Execution Plan<sup>vi</sup> approved by the DOE HEP and NP executives. The Acquisition Strategy and the high-level design of the proposed hardware are reviewed during the annual DOE Progress Reviews
- c. Risk assessment documentation to define the level of steps / level of rigor of controls prior to commencement of work: The LQCD-ext project has a Risk Management Plan<sup>vii</sup> and maintains an active Risk Register<sup>viii</sup> for the facility deployment and operation that is

updated every quarter. Special assessments are done before any new and unique hardware deployment.

#### 3.2.1.4 Outputs

- a. Design documentation including drawings, specifications, test/inspection/acceptance plans, fabrication/assembly procedures, maintenance requirements, and reports:  
Following documents contains the comprehensive design output:
  - a. The Cluster layout<sup>ix</sup> at the GCC (version 2)
  - b. Benchmarking for the FY10 Procurement of the SC Lattice QCD-ext
  - c. RFP work package and four associated amendments
  - d. Attachment A for the specification and example drawings
  - e. Attachment B for requirements and proposal evaluation criteria
- b. Final post-production and/or construction As-built drawings and fabrication/assembly procedures showing actual configuration: The Cluster layout<sup>x</sup> at the GCC (version 2).
- c. The final design closeout documentation package, including manuals (electronic or otherwise) qualification test results, final revisions of fabrication drawings, marked as-built drawings, proof-tests, operational readiness review/readiness assessments documents etc:
  - a. Acceptance test procedure<sup>xi</sup>
  - b. Acceptance test results
  - c. EquipDB database report (list of compute nodes under inventory control)

#### 3.2.1.5 Review

Review documentation (as appropriate, design reviews may be formal, structured, documented, comprehensive and objective at a level commensurate to the scope and complexity of the design to ensure conformance to requirements): N/A. This activity occurs during the LQCD-ext Project Annual Progress Review.

#### 3.2.1.6 Verification and validation

Documentation of verification and validation: The system is delivered incrementally with multiple racks delivered and installed at a time. These racks are tested incrementally. The supplier fixes problems identified during the acceptance testing. The payment is made as the racks are approved and signed by the Requestor (DA). Records of the signature and payment are maintained by the Fermilab Accounts Payable. The process described in the Fermilab Procurement Manual<sup>xii</sup> is followed.

#### 3.2.1.7 Changes

- a. Requirements change management procedure: Requirements changes and clarifications are managed using amendments to the procurement work package for the RFP. As of date, only one “no-cost” change was made to the PO.
- b. Design change management procedure including procedure for temporary modifications: As of date, there is no defined CD procedure for managing design changes. However, as of 11/1/2010, for this deployment, no major design changes requiring additional costs were needed.
- c. Records of requirements and design change including approval records: Records of amendments to RFPs are maintained at the RFP web site. Amendments were reviewed

by the RFP review committee and the Fermilab Buyer. There is no formal procedure for to maintain changes to requirements, other than change requests negotiated by the buyer using relevant Terms and Conditions. However, as of 11/1/2010, requirements changes were minor and involved no change in cost.

### 3.2.1.8 Configuration management

Configuration control record including plans, specifications, analyses, design and basis for design: Original layout plan for the cluster is under revision control using CD docDb. Each compute component is under item control using the Properties database. When an item associated with the cluster fails during the warranty period, the element is mostly fixed by the supplier “in situ”. If that is not possible, then the supplier removes the item and takes it out of service for repair at the supplier site. If the whole unit is being exchanged (replaced with another new whole unit by the supplier), the supplier would bring both the old whole unit and new replacement whole unit to the CD Logistics counter (PREP) and the counter would follow the "Whole Unit Exchange" procedure. This procedure is posted in the CD document database, document # 3149-v2. Some suppliers have their own “material move” processes. However, the current Ds supplier does not have such a process and depends on PREP for material moves.

## 3.3 *Procurement*

### 3.3.1 *Procurement documents*

Contents of the Request for Information (RFI) package: To assess the existing technical capability within the community of suppliers of cluster computing system, a RFI was sent out to the suppliers. At that time, suppliers had the option of running specific benchmarking software package to assess the capabilities of their proposed hardware to determine their own capabilities.

Content of the RFP package: The RFP package contains the full specification, evaluation criteria, Fermilab standard contractual requirements, and the benchmarking package. Once the RFP is released, it is mandatory for the suppliers to run the benchmarking software and perform other tests to derive the capability of their proposed hardware to meet the Fermilab’s requirements.

### 3.3.2 *Supplier evaluation*

The supplier evaluation procedure is defined in the Fermilab Procurement Manual. For the large LQCD-ext procurement a “Best Value Evaluation” process is defined specific to the procurement.

### 3.3.3 *Purchase requisition review*

Procedure for reviewing procurement packages: The RFP is reviewed by a committee of Subject Matter Experts and members of senior management. Once the package is readied by the committee, the buyer from the Fermilab procurement department reviews the package. Approvals of senior management are required for the The LQCD-ext cluster procurement package. After the RFP responses are received, the Best Value Evaluation

team determines which supplier should get the Purchase Order (PO) award. The recommendation is documented in the LQCD RFP website.

### **3.4 Inspection and acceptance testing**

#### **3.4.1 Inspection and testing process**

- a. Documentation of inspection and acceptance testing plans including item characteristics and processes to be inspected/acceptance tested, inspection techniques, acceptance criteria, hold points, and the organization responsible for performing the inspection: See Section 3.1.2.3. Acceptance test document<sup>xiii</sup>.
- b. Corrective and/or preventative action procedure including tracking mechanism: All corrective actions are followed up through CD Service Desk.
- c. Procedure to control nonconforming items: Items associated with Ds are purchased with a three-year warranty which is equal to the typical life-time of the equipment. Non-conforming (failed, damaged or items that failed to meet specification) items are either fixed by the supplier on-site or removed for replaced after completing the Material Move process at CD PREP desk.

#### **3.4.2 Inspection and test records**

Documentation of inspection and test results: Performance of the cluster is incrementally recorded in the WIKI log for the cluster. Additional records related to failures are also recorded in this web page.

#### **3.4.3 Control of measuring and test equipment**

[This section is not applicable to this particular procurement] No precision hardware is required for the installation and measurements related to the Ds cluster.

- a. Documentation of the measuring and test equipment (M&TE) used for inspection and acceptance tests including M&TE standards: N/A
- b. Uniquely identified and traceable calibration records: N/A
- c. Identification of computer programs that are part of the calibration of the equipment when calibrating and/or checking the equipment for use: N/A

### **3.5 Suspect and counterfeit items(S/CIs)**

#### **3.5.1 Prevention**

Procedure to prevent the purchase of S/CIs: Subcontract requirements for Suspect and Counterfeit Items are defined in the section 38 of the Fermilab Subcontract General Provisions (FL-1) document<sup>xiv</sup>. This document is attached to all RFP work packages. The CD division has a trained S/CI coordinator who is responsible for overseeing all S/CI related activities for the division as specified by the laboratory's S/CI program<sup>xv</sup> document. Managers associated with the facilities received training prescribed by the Laboratory. See the detailed Controlling Suspect/Counterfeit Items Procedures.

#### **3.5.2 Detection**

Inspection records for detecting S/CIs: The Laboratory procedure "Controlling Suspect/Counterfeit Items Procedure 1006.1001<sup>xvi</sup>" provides the details for the detection methods for S/CIs. Common S/CI

items are shackles, slings, bolts and circuit breakers. Using the lab-wide, ITNA process, CD trains individuals who are likely to come across common S/CI items in S/CI procedures.

### **3.5.3 Reporting**

Procedure for reporting S/CIs: The Laboratory procedure “Controlling Suspect/Counterfeit Items Procedure 1006.1001” provides the details for the detection methods for S/CIs. CD line management is responsible for forwarding any suspect items discovered by the staff members to the CD S/CI coordinator for further investigation.

## **4 Excerpts from IQA: QA requirement for the system deployment process**

In this section, excerpts from the applicable sections from IQA associated with major computer system deployment are given for reference only.

### **4.1 Work process**

Work includes the design, operation, maintenance, modification, and construction of experiments, accelerators, systems, and procedures by Fermilab employees, regardless of location, and any personnel working on-site at Fermilab. A graded approach is used to determine the level of controls applied to work performed at Fermilab.

The set of controls applied to work processes includes:

- written procedures for activities of sufficient complexity or potential hazard
- periodically monitoring and assessing performance
- personal accountability
- Specific provisions for activities not otherwise covered in this document, including facilities management, maintenance, materials management, shipping and receiving

#### **4.1.1 Work process control**

Management defines workmanship standards, equipment to be used, and specification for materials, process measurement points, and measurement standards.

#### **4.1.2 Specific controls for work processes not already defined**

##### **4.1.2.1 Item control**

Using a graded approach, items are identified and controlled, with their traceability maintained during receipt, shipping, storage, handling, installation, use, and disposal. These controls are commensurate with the item's application, usage, and associated risk and are managed by divisions/sections/centers.

The requirements for controlling and maintaining property, equipment, items, and the site infrastructure follow DOE Order 430.1B, *Real Property Asset Management*. Personal property is controlled according to the Property/Inventory Control Policy & Procedure Manual.

Chapter 10 describes the control of Suspect/Counterfeit Items.

#### 4.1.2.2 Maintenance

Divisions/sections/centers are responsible for ensuring maintenance is performed on facilities and equipment under their care. FESS is the primary maintenance service provider for facilities and the laboratory's infrastructure and these services are agreed upon between FESS and the divisions/sections/centers. Maintenance plans are documented by divisions/sections/centers. The organization coordinating or performing the maintenance is responsible for ensuring that records of maintenance are kept.

#### 4.1.2.3 Readiness review

Readiness reviews are conducted prior to the start of operations that are new or have been significantly changed. The extent and detail of the reviews are commensurate with the scale, cost, complexity, hazards, and programmatic significance. Reviews which require ES&H approval to operate accelerator facilities are required to follow FESHM 2010. Divisions/Sections/Centers document readiness reviews for specific activities performed in their respective areas. In addition certain research projects are required by orders other than DOE O 414.1C to perform readiness reviews at specified intervals.

#### 4.1.2.4 Calibration of process equipment

It is the responsibility of each division/section/center to identify, monitor and maintain key process equipment that requires calibration or verification. Results are maintained. (See also: Chapter 8 Inspection and Acceptance Testing.)

## 4.2 *Design process*

### 4.2.1 *Design process steps*

The following steps are applied as appropriate, using graded approach.

#### 4.2.1.1 Planning

The requirements, including acceptance criteria, are understood by all relevant divisions/sections/centers and departments. These requirements are documented and updated accordingly.

All parties agree on the organizational and technical interfaces and arrange information and communication channels.

After sufficient design iteration, requirements, plans, cost, and schedule estimates are established as the baseline. From this stage forward changes are managed in accordance with the project's configuration management plan and implementing procedures.

#### 4.2.1.2 Input

Design inputs and constraints, including applicable orders, codes, standards, policies, and procedures, etc., are identified. Design inputs are reviewed for accuracy and completeness and to identify any ambiguity or conflict.

#### 4.2.1.3 Process

The design process translates inputs into design output documents and actions that are technically correct and compliant with requirements.

The design process is managed by the DA. The design process controls are applicable to in-house, contracted, and collaborative design activities and services. Those providing contracted design services are evaluated and selected based on their ability to meet specified requirements demonstrated by equivalency of their programs or adherence to Fermilab processes. Collaborative design activities are generally governed by Memoranda of Understanding (MOU) and/or Statements of Work (SOW).

Design processes apply to original design and design modifications.

Design efforts undergo risk evaluation by the DA to define the level of steps / level of rigor of controls prior to commencement of work. When applied to research and development activities, design processes are tailored to meet the controls necessary for successful outcomes. As appropriate, R&D / experimental plans specify the necessary controls and documentation contained in the activity's / project's Project Execution Plan and are approved by the DA.

#### 4.2.1.4 Outputs

The completed design is recorded in design output documents such as drawings, specifications, test/inspection/acceptance plans, fabrication/assembly procedures, maintenance requirements, and reports. As-built drawings and fabrication/assembly procedures are maintained after production or construction to show actual configuration.

A documentation package, including qualification test results, final revisions of fabrication drawings, marked as-built drawings, proof-tests, operational readiness review/readiness assessments, etc., is assembled and retained as the final design closeout package.

#### 4.2.1.5 Review

Reviews are conducted at a level commensurate to the scope and complexity of the design to ensure conformance to requirements. As appropriate, design reviews may be formal, structured, documented, and are comprehensive and objective.

Design reviews are performed by technically knowledgeable persons and may include technical experts from outside the design team and in certain cases, outside of the laboratory.

#### 4.2.1.6 Verification and validation

Fermilab has a documented verification process that reviews design outputs against their ability to meet requirements.

Design validation is accomplished through the use of the construction or assembly or by testing the complete prototype system (or subsystem) during and after assembly. Results of validation tests are documented and maintained.

#### 4.2.1.7 Changes

A design change is defined as one that alters a component or system function, method of performing the function, or design configuration.

Levels of change control vary with the magnitude of the proposed change. Proposed changes are reviewed by the same organizations that reviewed and approved the original design. This ensures that changes do not inadvertently challenge or violate safety or operational boundaries or conditions set by the original design.

Temporary modifications receive the same levels of control as permanent modifications. Clients inform the DA of any new requirements/changes to specifications or acceptance methods via established communication channels. The DA reviews changes to the functional requirements and specifications against their ability to meet requirements.

Changes to requirements are documented and all relevant divisions/sections/centers and departments are made aware of the changes involved.

#### 4.2.1.8 Configuration management

Configuration control includes plans, specifications, analyses, design and basis for design. They provide an accessible, archived history of initial baseline, modifications, and changes.

Changes, additions, and modifications to the design processes are controlled in accordance with the activity's or project's configuration management plan and implementing procedures. Closeout documentation is inspected, reviewed, and accepted by the DA.

### **4.3 Procurement**

#### **4.3.1 Procurement documents**

Fermilab procurement documents are generated and managed in accordance with the Procurement Manual. These documents include specifications, standards, and other applicable documents referenced in the purchase requisition and are incorporated into the purchase order.

#### **4.3.2 Supplier evaluation**

Prospective suppliers are evaluated based upon their ability to meet quality, technical, and financial performance criteria, and to operate in a safe and environmentally compliant manner. The graded approach is used to determine the level of evaluation and controls. Potential suppliers should be identified early in the design and procurement process to allow sufficient time to evaluate their capabilities. The supplier evaluation process is the joint responsibility of Procurement and the requester when technical expertise is necessary.

Evaluation and monitoring of supplier's performance during the life cycle of the purchase order are performed to ensure that technically acceptable items are produced and services continue to meet the quality, technical, delivery, and other performance requirements. Corrective actions in accordance with purchase order terms and conditions are implemented should suppliers not perform as required.

Flow down of requirements to subcontractors at any tier is assured through terms and conditions of the purchase order.

The supplier evaluation and monitoring process is addressed in the Procurement Manual.

### ***4.3.3 Purchase requisition review***

The purchase requisition is created, owned, and processed by the requestor and division/section/center or area requisition preparer. Responsibility for the accuracy of purchase requisition data and requirements resides with the requestor. Requisitions are reviewed and approved by the requisitioning organization prior to being processed by BSS Procurement. Controls are applied based on purchase categories, dollar value and ES&H impact. Procurement may return incorrect or incomplete purchase requisitions. A history of issues and revision is maintained within the financial system.

## ***4.4 Inspection and acceptance testing***

This section establishes the process for the inspections and tests performed at Fermilab that verify that the physical and functional aspects of items, services, and processes meet requirements and are fit for use. The performance expectations, inspections, and tests are considered during the design phase and where appropriate, are specified in the design output and/or procurement documents. The graded approach is used to determine the level of controls applied to specific activities by division/section/center heads or project managers.

### ***4.4.1 Inspection and testing process***

Inspection and acceptance testing plans, where applicable, identify item characteristics and processes to be inspected/acceptance tested, inspection techniques, acceptance criteria, hold points, and the organization responsible for performing the inspection. Where deficiencies are identified appropriate corrective and/or preventative actions are taken.

For this LQCD-ext hardware purchase, a major fixed price procurement, section 4 of the Fermilab Fixed Price Subcontract Terms and Condition (FL-2.pdf) document, attached to the RFP, contains the guiding principles for Inspection and Testing.

#### ***4.4.1.1 Control of non-conforming items***

Items that do not conform to specified requirements are subject to controls to prevent their inadvertent installation or use. Divisions/sections/centers are responsible for control of nonconforming items. Controls include identification, documentation, evaluation, segregation (when practical), item disposition (reject, repair, rework, use-as-is), and notification to affected organizations: This RFP contains a three-year warranty requirement. The Warranty clause for the procurement is described in the section 5 of the FL-2.pdf document. The supplier is responsible for fixing any issues with the hardware when notified by the LQCD-ext engineers using a Fermilab servicedesk ticket. Any non-conforming item is returned to the supplier immediately and not held in the premises.

### ***4.4.2 Inspection and test records***

Documentation and preservation of Inspection and test results: The inspection and test status of items or processes requiring examination are clearly identified to ensure that only those with acceptable results are used. At a minimum inspection/test records identify the following: item(s)

inspected, the inspection/test procedure used, who performed the inspection/test, the identification number(s) of the M&TE used to perform the inspection/test, the inspection/test data, the inspection/test criteria, and the inspection/test results.

#### ***4.4.3 Control of measuring and test equipment***

The measuring and test equipment (M&TE) used for inspection and acceptance tests are identified, calibrated, maintained, and controlled commensurate with their intended use. Procedures are established by divisions/sections/centers for testing, retesting, adjusting, and recalibrating M&TE.

Equipment is checked to ensure it is the proper type, range, accuracy, and precision and is uniquely identified and traceable to its calibration records.

The process of calibration compares an unknown, a test item, or an instrument with reference standards according to a specific procedure. Calibration standards are traceable to the National Institute of Standards and Technology or equivalent. Where no recognized standard exists, the basis for calibration is defined and documented.

When M&TE or standards are found to be out of tolerance, appropriate evaluations are performed to assess any adverse impact on previous inspection, testing, data collected or calibration using that equipment and to determine the acceptability of items previously inspected or tested and appropriate notifications made. The evaluation, including conclusions, is documented.

All M&TE equipment not operating to specifications is identified and pulled from service or locked out and are not returned to service until passing calibration requirements.

Consideration is given to computer programs that are part of the calibration of the equipment when calibrating and/or checking the equipment for use.

#### ***4.5 Suspect and counterfeit items***

##### ***4.5.1 Prevention***

Methods to prevent the purchase of S/CIs are based on making all purchases from reputable suppliers and distributors:

##### ***4.5.2 Detection***

The primary means of detecting S/CIs is through inspection.

##### ***4.5.3 Reporting***

If S/CIs are discovered, the reporting process follows the Suspect/Counterfeit Items Program and supporting procedures. This includes notifying the area supervisor, senior safety officer, and quality assurance representative. FESHM manual 3010 is consulted to determine the appropriate reportability category.

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- <sup>i</sup> RFP documents: <http://www.usqcd.org/rfp2010/>
  - <sup>ii</sup> WIKI: <http://lqcdbackup.fnal.gov/twiki/>
  - <sup>iii</sup> Attachment A: Fermilab US Lattice QCD Cluster Technical Specification FY2010
  - <sup>iv</sup> Benchmarking for the FY10 Procurement of the SC Lattice QCD Computing Project Extension
  - <sup>v</sup> US FNAL LQCD RFP 2010 Best Value Award Process
  - <sup>vi</sup> LQCD-ext Project Execution Plan
  - <sup>vii</sup> LQCD-ext Risk Management Plan
  - <sup>viii</sup> LQCD-ext Risk Register
  - <sup>ix</sup> Ds Cluster Layout (CD docDB 4113-v1)
  - <sup>x</sup> Ds Cluster Layout (CD docDB 4113-v3)
  - <sup>xi</sup> LQCD Ds Procurement – Non-Sensitive Documents (CD docDB 4176)
  - <sup>xii</sup> Fermilab Procurement Manual
  - <sup>xiii</sup> LQCD Ds Procurement – Non-Sensitive Documents (CD docDB 4176)
  - <sup>xiv</sup> Fermilab Subcontract General provisions (FL-1 Rev12-09) – see the section on S/CI
  - <sup>xv</sup> Suspect/Counterfeit Items Program 1006  
[http://www.fnal.gov/directorate/OQBP/index/oqbp\\_active\\_procedures/Suspect%20Counterfeit%20Items%20Program%20Rev001.pdf](http://www.fnal.gov/directorate/OQBP/index/oqbp_active_procedures/Suspect%20Counterfeit%20Items%20Program%20Rev001.pdf)
  - <sup>xvi</sup> Controlling Suspect/Counterfeit Items Procedure 1006.1001  
[http://www.fnal.gov/directorate/OQBP/index/oqbp\\_active\\_procedures/Controlling%20Suspect%20Counterfeit%20Items%20Procedure%20Rev001.pdf](http://www.fnal.gov/directorate/OQBP/index/oqbp_active_procedures/Controlling%20Suspect%20Counterfeit%20Items%20Procedure%20Rev001.pdf)