SUBJECT:	Fermilab Assessment Manual – Chapter 4 Independent Assessment Procedure – Form 1	**NUMBER:**	3902.1004 FORM 1
RESPONSIBILITY:	Quality Assurance Manager	**REVISION:**	000 C1
APPROVED BY:	Head, Office of Quality and Best Practices	**EFFECTIVE:**	

FERMILAB INDEPENDENT ASSESSMENT REPORT FORM

Fermilab Independent Assessment Report	
Assessment Number & Title: 11-IA-QA-001 TD Suspect/Counterfeit Item (S/CI) and Inspection and Acceptance Testing	**Version:003**
Date(s) of Assessment: 10/18/10 – 10/29/10	
Performing Organization: Office of Quality & Best Practices (OQBP)	

Assessed Organization(s):
Technical Division(TD):

- Quality & Materials (Q&M)
- Test & Instrumentation (T&I)
- Magnet Systems
- Superconductivity and Radio Frequency Development (SRF)

Report content

This report contains the following sections:

- Assessment Activities & Scope
- Scope Limitations
- Activities Reviewed Within This Assessment
- Description of Implementation & Effectiveness of Observed Activities
- Conclusions
- Findings
- Observations & Recommendations
- Commendable Practices

Assessment Activities & Scope:

The implementation & effectiveness of Inspection and Acceptance Test and S/CI controls applied to the TD Departments listed above were examined via interview, document review and observation relative to the Integrated Quality Assurance (IQA) and Fermilab Integrated Contractor Assurance Program (FICAP).

Scope Limitations:

The scope of this assessment was limited to those activities or services associated with S/CI and Inspection and Acceptance Testing within Fermilab's Technical Division. Procurement activities and IQA section 8.5 "Control of Measuring and Test Equipment (M&TE)" were not within the scope of this assessment.

Activities Reviewed Within this Assessment:

- Creation of Device Assembly Travelers
- Cavity Incoming Inspection and Acceptance Testing
    - Visual Inspection
    - Mechanical Measurements
    - Vacuum and Leak Test
    - RF Test
- In-Process SRF Cavity Testing on Existing VTS1 Test Stand

- Cavity Parameters and Data Analysis
- Design and Construction of New Test Stands VTS2 and VTS3
- Incoming Parts Inspection
- Incoming Superconducting Magnet Inspection and Test
- In-process Super Conducting Inspection and Acceptance Test
- Superconducting Magnet Test Result Collection and Data Processing
- Test requirements Design for R&D and Production Magnets
- Incoming Conventional Magnet Test and Inspection
- In-Process Testing of Conventional Magnets
- Control of Nonconforming Items
- S/CI Coordinator Activities
- Control of S/CI Activities

Description of Implementation & Effectiveness of Observed Activities:

Inspection and Acceptance Testing:
The requirements for Inspection and Acceptance Testing found in IQA Chapter 8 are met and effectively implemented within the TD organizations assessed. Although no evidence of noncompliance within the selected IQA criteria was observed, a number of observations and commendable practices were identified.

Roles and responsibilities of personnel involved in test and inspection are documented in TD's Quality Management Program (File 01), and Project Management of Accelerator Support Jobs TD-2050 (File 02). Interviews with a customer liaison, Process Engineering Group members and Product and Project Engineers indicated that these roles are well defined and understood.
The customer liaison ensures that effective communication is established between TD and customers and documents communications, technical specifications and other requirements. Most current requests are for building newly designed devices and/or, rebuilding / refurbishing existing magnets. The complexity of these requirements varies based on the extent of initial design, design modification, rebuild or refurbish work. These requirements and design specifications are communicated to the Process Engineering Group, who works with production and engineering to create and maintain Travelers (either paper-based or in the electronic traveler system, Vector) and Part Kits for each fabrication project. The Project Engineer provides detailed design drawings and technical requirements and conducts design reviews.

Work activities were observed and 82 documents examined during this assessment. TD inspection and acceptance test processes are well defined. Test Process Description (File 03), Cavity Inspection Document (File 04) and 9-cell coordinate measuring machine (CMM) measurement (File 05) are examples of these processes.

Product performance expectations, inspections, and tests are considered during the design phase, and where appropriate, are specified in the design outputs such as magnet specification documents or Travelers. The Assembly Traveler constitutes the Test Plan and contains inspection requirements and procedures such as Tooling Lists, Initial Device Under Test (DUT) Preparation and Item Characteristics. The travelers usually are accompanied with other technical requirement documents such as Engineering Specifications and Fabrication Component Kit List, Shim Plan and Coil Arrangement, and Ground Wrap System.

Ten Assembly Travelers reviewed were fully compliant with specified their test requirements. The US-LHC Accelerator Research Program (LARP) Long Quadrupole Coil Assembly Traveler (TR - 333879) is an example of this compliance for a Superconducting R&D magnet. This traveler includes an Engineering Fabrication component Kit List (File 06), and a Traveler Revision Report (TRR) (File 07). The assessment team reviewed a Shim Plan, Shim System for TQM04 (using Coil 35) (File 08), which indicates the locations and type of shims needed to be used to build a magnet, and a Coil Arrangement and Ground Wrap System which contains the required Engineering Specifications (File 09). These documents were given to the Technician for test and inspection of the magnet in production.

The observation of work and review of documentation for Conventional Magnet, NOvA MLAW 8GeV Recycler Lambertson Coil Winding/Insulation Traveler (TR 333968) (File 10) and 1.3 GHz Cavity Visual Inspection Traveler (TR 333876) (File 11) confirmed the same observation.

The assessment team observed a sufficient number of inspections in each Traveler. As the need for regular or hold point inspection is identified they are included in a Traveler. Hold point inspections are approved by authorized personnel. Independent inspections are specified where necessary.

Clear inspection and acceptance criteria for test and inspection of production magnets were observed. Formal pass/fail criteria are not applied to data collected from tests of prototype or R&D activities.

Test results are saved in several databases. The results from prototype and R&D testing are used for writing Technical Papers and Fabrication Reports (File 12) and (File 13).

The assessment team observed appropriate corrective and/or preventative actions taken where deficiencies were identified. In TD, identified nonconforming items are documented in Discrepancy Reports (DR) or Quality Control Reports (QCR). DR procedures are described in Discrepancy Reporting System TD-2040 (File 14). DRs are initiated by a First Hand Observer and maintained on-line. They contain the description and cause of the discrepancy, item disposition (reject, repair, rework, use-as-is), a section for a Corrective and Preventive Action Plan and sections for Verification, Review, Archiving and Closure for tracking to completion.

QCRs contain the type of discrepancy, individual part information such as part number, part name, purchase order number and receiving date. They also include the discrepancy details and final disposition with the signatures of appropriate personnel such as the requisitioner, product/engineering manger and quality control (File 15). After inspection, failed or accepted items are tagged accordingly to identify the status of the items and prevent inadvertent use of failed items (File 16).

TD's inspection and test results are documented and preserved. Inspection and test records identify the tester/inspector's name, test stand or test bed and its configuration, DUT and the date that test or inspection was performed (File 06, 11, 12 &17).

Suspect Counterfeit Items:

The requirements for prohibiting and controlling S/CIs found in IQA Chapter 10 are met within the assessed TD organizations. The assessment found no non-compliance however, because no Suspect/Counterfeit Items

have been discovered by TD personnel since Suspect/Counterfeit Item (S/CI) Program, 1006, and Controlling Suspect/Counterfeit Items Procedure, 1006.1001, became effective on 3/19/10, the assessment team was not able to fully verify adherence to these requirements.

Personnel interviewed were aware of the S/CI Coordinator's role and responsibilities and the S/CI reporting process, The S/CI coordinators had the required S/CI knowledge and had received the new S/CI tags. The older S/CI items were tagged using older S/CI metal and paper tags. All of the incoming inspection team members had S/CI training.

The incoming inspection team and other staff were aware of the risks associated with S/CI. To avoid incoming S/CI, the incoming inspectors had checklists and drawings. The assessment team verified the accuracy of the S/CI bolts checklists (File18). DR 4641(File 19), suspect bolts installed on the 30-ton trolley, dated 10/20/2008 and DR 10057, suspect bolts in a coil winding table purchased in May of 1984, dated 1/28/2010 (File 20). Both documents indicated the effectiveness of TD in detection, reporting and controlling nonconforming bolts.

For other S/CI items DR 10011, two Liftall slings which had "China" on the shackles found in 5/29/2009 (File 21) and DR 4642 shackle on an assembly found in 2/19/2009 (also File 22) were reviewed. These DRs show TD full compliance with the IQA requirements.

Conclusions:
The assessed TD organizations employ effective systems of inspection and acceptance testing to verify that the physical and functional aspects of items meet requirements and are fit for use.

Suspect/Counterfeit Items requirements are compliant and have been successfully implemented within TD organizations assessed. TD personnel interviewed were aware of S/CI procedures and compliant with the IQA requirements. However, because no Suspect/Counterfeit Items have been discovered by TD personnel since implementation of the Suspect/Counterfeit Item (S/CI) Program, 1006, or Controlling Suspect/Counterfeit Items Procedure, 1006.1001, the assessment team was not able to fully verify adherence to these requirements.

The assessment team found no instances of noncompliance and our observations indicated a high level of compliance to the selected quality system requirements. Five observations and four commendable practices were identified as listed below.

Findings:

None

Observations and Recommendations:

1. **Observation:** The TD-2010, "Technical Division Quality Management Program" document, posted on the TD website, is dated 4/3/2001 and does not reflect the current organizational changes. For example this document refers to Development and Test (DT) department. This department name is no longer used.
   Recommendation: Update TD-2010 and ensure that documents contain the most current information.

2. **Observation :** The TD Discrepancy Reporting System TD-2040 Version 3, page 7 , section 9-10a Corrective Action table, indicates "…If the Responsible Authority decides that there is no appropriate corrective action, then "N/A" should be recorded, along with an explanation as to why no corrective action is required." Out of 10 DRs observed 3 DRs (DR 10037, 10036 and 10015) had no explanation as to why no corrective action was required.
   Recommendation: Communicate the value of the adding the explanation to the corrective action section when NA is applied to the responsible authorities so they understand. Consider adding the explanation as a requirement.

3. **Observation:** The magnet test group in the T&I department utilizes several Data Acquisition Systems (DAQ). Operation and support of these systems reduce productivity and increase the need for many subject matter experts. Some of these systems use old and outdated hardware which is no longer available for purchase.
   Recommendation: Consider allocating resources to update this equipment to improve productivity and down time.

4. **Observation:** The T&I department collects data in several databases some of which are not easily accessible to the others when needed.
   Recommendation: Consider allocating resources to invest in a common database in order to reduce maintenance and make data access easier.

5. **Observation:** TD's computer network is fragmented. Test teams need to access several servers and network elements using different applications and interfaces.
   Recommendation: Consider allocating resources to invest in a connected and more robust network that may be less expensive and easier to access and operate.

Commendable Practices:

1. The use of WebDat to store, access and query data is a very effective tool. Its interface through the internet makes it easy to use and accessible.
2. The Locks in the e-log system used by the T&I department is an effective way to document and communicate changes made to the test configurations. This tool shows the history of modifications and deviations from the standard configuration of the test stands.
3. The Vector Traveler system provides easy access to systematically maintain documents and information.
4. The T&I Department Improvement Plan for Magnet and Cavity Test Facilities analyzes different risks and opportunities associated with the state of test facility systems. This provides clarity in strategic planning and the decision making process.

Titles and Names of Person Interviewed:

Ted Beale
Jamie Blowers
Rodger Bossert
Ruben Carcagno
Mark Champion
Bob Jensen
Timergali Khabiboulline

Min Jeong Kim
Mike Lamm
Jerzy Nogiec
Darryl Orris
Joe Ozelis
Derek Plant
Rob Riley
Dan Smith
Pat Sanchez
Cosmore Sylvester
Jan Szal
George Velev
Dana Walbridge
Marty Whitson

Documents Reviewed:

TID-N-75: Procedure to Authorize Personnel for IB1 SRF Cavity Handling
TID-N-76: Procedure for Preparing SRF Cavities for Testing
T&I controlled document template
TID-N-15: Conduct of IB1 Test Facility Operations
TID-N-59: T&I Engineering Work Process Guidelines - v0
TID-N-73: T&I Document Control Policy and Procedures
TID-N-93: T&I Department QA Program Description
TID-N-16: Guidelines for Working in Industrial Buildings 1 and 1A
TID-N-19: Test and Instrumentation Department Records
Industrial Buildings 1 and 1A Security
TID-N-223: VCTF Cavity Test Procedures
PPE requirement for operating panel breakers in IB1/IB1-A
TID-N-55: DUT Safety Data Sheet Procedure (Superconducting)
TID-N-20: Test Process Description
TID-N-92: T&I Organizational Structure
TID-N-124: DUT Safety Data Sheet Procedure (Conventional)
TID-N-174: VCTF SRF Cavity Handling Training Plan
TID-N-242: Procedure for Dressed 9-Cell SRF Cavity Handling at IB1
TID-N-151: T&I Hipot Procedure
DRAFT, Cryogenic operating procedure for VTS 100 K hold
TID-N-40: T&I Calibration Program
TID-N-273: VMTF Magnet Inspection Procedure.doc
TID-N-6: Cryogenic Checks for the VMTF Device Under Test - Safety Data Sheets (DUT-SDS)
TID-N-276: VTS 100 K Cryogenic Operating Procedures
IB1 SRF Cavity Handling
TD Discrepancy Report,
Fabrication and Test of the MM Nb3 Sn Quadrupole Model Bases on Dipole-type Collar
Magnet Test Operations TS-9/MPS-1/2 Authorized Users List
Magnet Test Operations TS-6/MPS-1/2 Authorized Users List
Magnet Test Operations TS-A/booster Corrector PS Authorized Users List

Magnet Test Operations TS-3/MPS-1/2 Authorized Users List
Magnet Test Operations TS_2/CPS-1 Authorized Users List
LQS01b CVT WIRING & CHECK OUT FORM
TQC02Eb Coil arrangement and Ground Wrap System
Shim System for TQM04 (USING ALL COILS)
MQXB15 Fabrication Report TD-06-034
VCTF Cavity Test Procedures
VCTF RF/Cavity Test Operations Authorized operators List
T&I Hi-Pot Procedures
TID-N-276 VTS 100 K Cryogenics Operations
Technical Specifications for Welding Titanium Helium Vessels at Fermilab
Procedure for 9-Cell Cavity 120 degree Celsius Bake out
Magnet Test Operations
TID-N-174: VCTF SRF Cavity Handling Training Plan
TID-N-169: VTS Insulating Vacuum Checklist
TID-N-73: T&I Document Control Policy and Procedures
TID-N-168: VTS Cryogenic Operating Procedure
Machine Shop Specification Quality Implementation Plan TD-2100 Version 2
Nine Cell Coordinate Measurement Machine (CMM) measurement traveler 333897
NOvA - MLAW 8GeV Recycler Lambertson Coil Winding/Insulation 333968 Rev. A
TD7010 Working Guidelines Document (Rev. 1.0)
Energy Doubler, Vacuum Leak Test Specification; General component
Flow of Parts and Assemblies Received at TD Component Storage facility (IB-4) TD-PF001
LARP_LQS01b Magnet Description
CMM print-out 1.3GHZ TESLA rf CAVITY ASSEMBLY MEASUREMENTS
Hins Test Flowchart 4/27/09
Hins Power Leads, Solenoid, and Cryostatted Solenoid Traveler for testing in IB-1
Test and Instrumentation Department Conduct of Operations
TD Organizational Chart
Test and Instrumentation Department Reporting Structure (Effective December 1st, 2007)
Tevatron Test Stand 2/6 Operation Procedure
IB1 Test Operations Schedule- FY10
TD ENG FABRICATION COMPONENT KIT LIST
1.3 GHz Cavity Visual Inspection Traveler
TD ENG DRAWING RELEASE
TD-2010 Quality Management Program Version 2
TD-2050 Project Management of Accelerator Support Jobs Version 3
TD-2030 Device Data Management System
TD-2040 Discrepancy Reporting System Version 3

Standards, Regulations, and Other Program Requirements Applied:

The specific criteria applied to this assessment were:

Chapter 8 – Inspection and Acceptance Test (IQA)
Chapter 10 – Suspect and Counterfeit Items (IQA)

Other relevant requirements applicable to this assessment:

1006 Suspect/Counterfeit Items Program
1006.1001 Controlling Suspect/Counterfeit Items Procedure

Describe or List Any Other Assessment Methods Used: None

Corrective Action Plans Issued:

None

Assessors' Names (asterisk indicates team leader):
Susan Rahimpour* Tim Miller John Dawson

Submitted by: Susan Rahimpour **Date:** 11/29/10

Distribution:

Giorgio Apollinari
Jamie Blowers
Ruben Carcagno
Mark Champion
Mike Lamm
Jim Rife
Romesh Sood
Jeff Cotton
Bob Grant
Jed Heyes

Attachments:

File 01 - TD-2010 Quality Management Program Version 2
File 02 - TD-2050 Project management of Accelerator Support Jobs.
File 03 - TID-N-20: Test Process Description
File 04 - TID-N-76: Procedure for Preparing SRF Cavities for Testing
File 05 - Nine Cell Coordinate Measurement Machine (CMM) measurement traveler 333897
File 06 - US-LHC Accelerator Research Program (LARP) Long Quadrupole Coil Assembly Engineering Fabrication
File 07 - LARP Long Quadrupole Coil Assembly component Kit List
File 08 - Shim System for TQM04(using Coil 35)
File 09 - TQC02Eb Coil Arrangement and Ground Wrap System
File 10 - NOvA - MLAW 8GeV Recycler Lambertson Coli Winding/Insulation (TR 333968)
File 11 - Cavities Testing Cavities Vector Traveler 1.3 GHz Cavity Visual Inspection Traveler (TR 333876)
File 12 - MQXB15 Fabrication Report
File 13 - Test of 90-mm Nb3Sn Quadrupole Model Based on Dipole-type Collar
File 14 - TD-2040 Discrepancy Reporting System
File 15 - Product/Engineering Manger and Quality Control (QCR) #31237
File 16 - Tags Sample
File 17 - Vacuum Leak Test
File 18 - S/CI Head mark List and Suspect Stainless Steel Fastener head mark List
File 19 - http://tdserver1.fnal.gov/blowers/projects/QA/S-CI/PW8_trolley_2008-10/DR_4641.pdf
File 20 - http://vector-onsite.fnal.gov/Tools/DiscrepancyReport/DisplayDiscrepancyReportReadOnly.asp?qsDRNo=10057
File 21 - http://vector-onsite.fnal.gov/Tools/DiscrepancyReport/DisplayDiscrepancyReportReadOnly.asp?qsDRNo=10011
File 22 - http://tdserver1.fnal.gov/blowers/projects/QA/S-CI/Shackles_2009-02-19/DR_4642.pdf