PIP-II Building Infrastructure Materials Quality Control Plan

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# Scope of Quality Control (QC) Plan

The procurement of the mechanical and electrical materials needed to connect the mains to the point of use resides under WBS #121.04.04 (Building Infrastructure). This Quality Control plan covers the specific QC checks required for these materials, where the results are recorded/stored, and the surrounding processes that ensure the delivery of these materials to the PIP-II Project for installation.

# Acceptance Tests and Criteria

As materials are received, project staff will perform visual inspections of each item to ensure they meet the required specifications set forth by the Project. The tests will be performed at the Fermilab receiving location.

Inspections of electrical components will entail the following:

1. Cables
   1. Inspect delivery papers and cross check with the purchase order.
   2. Remove outer protective wrapping, check for punctures, scrapes, cuts, and any indications that it is not continuous
   3. After the visual inspection, inspector to use a length meter and perform a continuity/length check
   4. The cable coordinator will be the cable inspector. Refer to the PIP-II Cable Pull and Document Plan (PIP-II Docdb #2892) for additional information on roles and responsibilities.
2. Connectors
   1. The inspector will review 10-25% of the total received connectors.
   2. Expensive, long-lead, and special connectors will be reviewed 100% of the time.
   3. Inspect delivery papers and cross check with the purchase order.
3. Racks
   1. Inspect delivery papers and cross check with the purchase order.
   2. Remove outer protective wrapping, check for dents and any other superficial damages.

Inspections of mechanical components will entail the following:

1. Chillers and Cooling Skids
   1. Check if bill of lading corresponds with purchase requisition (i.e. description, model #, partial shipments, etc.)
   2. Check for any outside damage such as dents and scratches
   3. Check if any new cooling skid delivered was inspected and approved for shipment by a designated Fermilab employee
   4. Engineer to check if skid was shipped with ASME labels attached to the pressure vessel and entire skid was snoop leak checked (up to 15 PSIG compressed air) and hydrotested at 1.5X of design pressure. All necessary testing paperwork is to be shipped with the skid.
   5. Engineer to check the actual skid with design drawings
2. Flow Meters
   1. Check if bill of lading corresponds with purchase order (i.e. description, model #, partial shipments, etc.)
   2. Verify quantity
   3. Check for any outside damage such as dents and scratches
3. How about prefabricated piping assemblies? I assumed we would get some sections of manifolds pre-assembled from vendors.
   1. Do we need to do any X-rays anywhere?
   2. Where do we check piping for freedom from debris (or flush debris out)
   3. Any cleanliness specs for piping?
4. Is SCI inspection necessary for any BLDGI hardware? Maybe circuit breakers?

The checks described above shall be documented in a traveler.

# 3.0 Requirements Traceability

The traceability of requirements can be found in the metadata sheets; TC # ED0008083. It is in this metadata sheet where the Functional Requirements Specifications (FRS) are identified and how each flow down to a Technical Requirements Specification (TRS). From here, verification methods such as demonstrations, tests, and inspections are performed to verify each TRS is met.

For every TRS, a verification method along with the location of the results are identified in this metadata sheet. A timeframe and status of the verification efforts are also identified in this sheet.

Lastly, this sheet also provides upwards traceability from the FRS to the Physics Requirements Document (PRD) and ultimately the Global Requirements Document (GRD) where applicable.

# 4.0 Travelers, Procedures, and Checklists

A list of Travelers for receiving inspection is provided below, along with the Material that corresponds with each.

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| **Material** | **Traveler Serial #** |
| Cables | TBD |
| Connectors | TBD |
| Racks | TBD |
| Ion Source LCW Chiller | TBD |
| RFQ Intermediate Cooling Skid | TBD |
| RFQ Wall Cooling Skid | TBD |
| RFQ Vane Cooling Skid | TBD |
| Absorber Cooling Skid | TBD |
| Chiller for RFQ Circulators | TBD |
| High Resolution Flow Meters | TBD |
| Flow Meter Vortex | TBD |
| Flow Meters for Interlock Cryomodule Couples | TBD |

# 7.0 Verification Plans: Methods & Activities

A master tracking spreadsheet will be used to document all the purchased materials, the phasing of deliveries, received items, inspections that have been performed, storage location of the item, and whether it has been transferred to the L3 that will be responsible for installing the item. The document number for this master spreadsheet is ED0012523.

# 8.0 Deliverable Documentation and Records

A copy of the master spreadsheet along with the Traveler, and any Incoming Inspection Forms, if used, will be delivered to the installation L3 with each item as they are approved.

# 9.0 Associated Equipment

A length meter will be necessary to perform continuity/length checks for cables. No special equipment will be required to perform inspections of mechanical parts/materials.

# 10.0 Calibrations Plans

There are no calibration requirements for the equipment listed above.

# 11.0 Traceability Requirements

Materials will be tracked using the master spreadsheet as previously discussed.

# 12.0 Training and Qualification

A mechanical engineer will be required to perform the inspections and site visits for the chillers and cooling skids. The cable coordinator will be responsible for inspecting all cables. Refer to the PIP-II Cable Pull and Document Plan (PIP-II Docdb #2892) for additional information.

# 13.0 Planned Vendor Communication & Visits

All cooling skids ordered from a vendor will be subject to a field shop inspection by the design mechanical and controls engineers prior to shipment. All other mechanical items will be off-the-shelf material purchases.

# 14.0 Control of Nonconformances

Nonconformances will be identified through inspections and shall be documented via discrepancy reports. Items that fail inspection will be returned to the vendor. The master tracking spreadsheet will be used to document these returns.

# 15.0 Transportation/Shipping

All materials covered by this plan will require common shipping methods and packaging to ensure safe and reliable transportation to Fermilab.

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