

PIP-II Utility Plant Building Functional Requirements Specification

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Document Approval

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Revision History

Revision	Date of Release	Description of Change
	25 October 2017	Initial Release
Rev A	27 June 2019	Updated to Revised Format/Incorporated Comments

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1. Purpose

An FRS describes the project needs and/or requested behavior of a system or component. The document typically outlines what is needed by the end user as well as the requirements and requested properties of inputs and outputs. The FRS specifies the functions that a system or component must perform and establishes consensus among stakeholders on what the system is expected to provide.

2. Scope

This FRS addresses the functional requirements of the Utility Plant Building including the mechanical equipment space, LCW equipment space, control room, support spaces and adjacent exterior site work.

3. Acronyms

FESHM	Fermilab ES&H Manual
FRCM	Fermilab Radiological Control Manual
FRS	Functional Requirements Specification
ICW	Industrial chilled water
LCW	Low Conductivity Water
L2	WBS Level 2
L3	WBS Level 3
PIP-II	Proton Improvement Plan II Project
SCD	System Configuration Document
TC	Teamcenter
UPB	Utility Plant Building
WBS	Work Breakdown Structure

4. Reference

#	Reference	Document #
1	Conventional Facilities Engineering Process Document Management	ED0002857
2	Conventional Facilities System Configuration Document (SCD)	ED000813
3	Fermilab Engineering Manual	-
4	Fermilab Environmental Safety and Health Manual	-
5	Fermilab Radiological Control Manual	-
6	PIP-II Project Assumptions	PIP-II-doc-144
7	PIP-II – Fermilab Interface Document	PIP-II-doc-528

5. Key Assumptions

The assumptions for the Utility Plant Building include:

1. The LCW equipment shall be provided, delivered, installed and commissioned by the Linac Installation and Commissioning subproject;

6. Functional Requirements

Requirement #	Requirement Statement
F-121.06.04-A001	The UPB shall provide a safe environment for employees and the public.
F-121.06.04-A002	The UPB shall provide space and infrastructure for the LCW equipment.
F-121.06.04-A003	The UPB shall provide space and infrastructure for unloading/loading activities.
F-121.06.04-A004	The UPB shall provide exterior space for cooling towers.
F-121.06.04-A005	The UPB shall provide control room space.
F-121.06.04-A006	The UPB shall comply with the overall character of the PIP-II campus and applicable portions of the Fermilab Campus Plan.
F-121.06.04-A007	The UPB shall be located adjacent to the PIP-II Linac Complex.
F-121.06.04-A008	The flatness and levelness of the new floor slabs shall be designed for normal construction tolerances.
F-121.06.04-A009	The HVAC systems shall conform to ASHRAE 90.1 and ASHRAE 62.
F-121.06.04-A010	Ventilation outside air shall be supplied to the spaces in accordance with the requirements of ASHRAE 62.1.
F-121.06.04-A011	All plumbing work shall be designed in accordance with Illinois Plumbing Code and Standard Specifications for Water & Sewer Main Construction in Illinois.
F-121.06.04-A012	The equipment in the UPB shall require conventional vibration isolation in order to avoid impacting the operation of the Linac.
F-121.06.04-A013	Domestic water utilities shall be extended to or routed to the UPB.
F-121.06.04-A014	The sanitary sewer system shall be extended to or routed to the UPB.
F-121.06.04-A015	The ICW system shall be extended to or routed to the UPB.
F-121.06.04-A016	The chilled water infrastructure shall be extended to or routed to the UPB.
F-121.06.04-A017	The data/communication infrastructure shall be extended to or routed to the UPB.
F-121.06.04-A018	The primary 13.8 kV electrical power from the existing sitewide electrical system shall be extended to the UPB and include the construction of concrete encased duct banks.
F-121.06.04-A019	The building power transformers shall be located away from the building on a concrete pad.

7. Safety Requirements

The system shall abide by all Fermilab ES&H (FESHM) and all Fermilab Radiological Control Manual (FRCM) requirements including but not limited to:

Pressure and Cryogenic Safety
<ul style="list-style-type: none"> FESHM Chapter 5031 Pressure Vessels
<ul style="list-style-type: none"> FESHM Chapter 5031.1 Piping Systems
<ul style="list-style-type: none"> FESHM Chapter 5031.5 Low Pressure Vessels and Fluid Containment
<ul style="list-style-type: none"> FESHM Chapter 5031.6 Dressed Niobium SRF Cavity Pressure Safety
<ul style="list-style-type: none"> FESHM Chapter 5032 Cryogenic System Review
<ul style="list-style-type: none"> FESHM Chapter 5033 Vacuum Vessel Safety
Electrical Safety
<ul style="list-style-type: none"> FESHM Chapter 9110 Electrical Utilization Equipment Safety
<ul style="list-style-type: none"> FESHM Chapter 9160 Low Voltage, High Current Power Distribution Systems
<ul style="list-style-type: none"> FESHM Chapter 9190 Grounding Requirements for Electrical Distribution and Utilization Equipment
Radiation Safety
<ul style="list-style-type: none"> FRCM Chapter 8 ALARA Management of Accelerator Radiation Shielding
<ul style="list-style-type: none"> FRCM Chapter 10 Radiation Safety Interlock Systems
<ul style="list-style-type: none"> FRCM Chapter 11 Environmental Radiation Monitoring and Control
General Safety
<ul style="list-style-type: none"> FESHM Chapter 2000 Planning for Safe Operations
Construction Safety
<ul style="list-style-type: none"> FESHM Chapter 7010 ES&H Program for Construction
<ul style="list-style-type: none"> FESHM Chapter 7030 Excavation
<ul style="list-style-type: none"> FESHM Chapter 7060 Fall Protection
<ul style="list-style-type: none"> FESHM Chapter 7070 Ladder & Scaffold Safety
Environmental Protection
<ul style="list-style-type: none"> FESHM Chapter 8011 Groundwater Protection – Excavations and Wells
<ul style="list-style-type: none"> FESHM Chapter 8012 Sedimentation and Erosion Control Planning

<ul style="list-style-type: none"> • FESHM Chapter 8025 Wastewater Discharge to Sanitary Sewers
<ul style="list-style-type: none"> • FESHM Chapter 8026 Surface Water Protection
<ul style="list-style-type: none"> • FESHM Chapter 8050 Domestic Water Protection
<ul style="list-style-type: none"> • FESHM Chapter 8080 Air Emissions Control Program
<ul style="list-style-type: none"> • FESHM Chapter 8081 Refrigeration Management
Material Handling and Transportation
<ul style="list-style-type: none"> • FESHM Chapter 10100 Overhead Cranes and Hoists
<ul style="list-style-type: none"> • FESHM Chapter 10110 Below-the-hook Lifting Devices

Any changes in the applicability or adherence to these standards and requirements require the approval and authorization of the PIP-II Technical Director or designee.

In addition, the following codes and standards in their latest edition shall be applied to the engineering, design, fabrication, assembly and tests of the given system:

ASME B31.3 Process Piping
ASME Boiler and Pressure Vessel Code (BPVC)
CGA S-1.3 Pressure Relief Standards
NFPA 70 – National Electrical Code
IEC Standards for Electrical Components

In cases where International Codes and Standards are used the system shall follow FESHM Chapter 2110 Ensuring Equivalent Safety Performance when Using International Codes and Standards and requires the approval and authorization of the PIP-II Technical Director or designee.

Additional Safety Requirements that are not listed in the general list above shall be included in the Requirements table in the Functional Requirements section.