21. (6.2.G.02) Personnel Access Control Building

21.1 Functions, Basic Configuration, and Interfaces

21.1.1 Functions

The primary functions performed by the personnel and access control building (PACB) are to house, support, protect, provide a suitable environment, and to provide and control access to the materials, equipment and processes which are located inside the building. Further, the PACB provides the controlled pathway for personnel access to the potentially contaminated zones in the tokamak, tritium, hot cell and radwaste buildings. There are no experimental laboratories in the building. The building provides general services such as: lighting, HVAC, power, fluids and is linked to other parts of the site through communications computer networks. The following sections describe the functions of the building in more detail.

21.1.1.1 Accommodate Personnel, Equipment and Materials

The PACB is used primarily by the ITER plant staff engaged in maintenance and worker radiation protection activities. Space for about 140 technicians, engineers, managers and other workers will be provided. The building provides space for change rooms and shower, health physics, first aid and laundry. All personnel entering the potentially contaminated areas of the hot cell building, radwaste building, tokamak building and tritium building will do so through this facility. The building is designed to bear the loads such as dead-weight loads, vibration loads and so on caused by components and processed materials. The building also bears the load caused by installing and transporting components.

21.1.1.2 Protect Materials, Equipment and Personnel from External Hazards

The building provides the resistance for anticipated wind, snow, and other environmental loads. The building shall also resist seismic loads, consistent with the protection of health and safety of workers (UBC requirements - see section 21.2.1.2).

21.1.1.3 Provide Required Building Services

The building provides building services such as lighting, HVAC, potable water, sanitary facilities, drainage, communications networks, low voltage electrical service and fire protection. It also provides systems including access control, fire detection and alarms, and communications. Design requirements for each of these aspects are described in section 21.2.1.

21.1.1.4 Provide Heating, Ventilation, and Air Conditioning (HVAC)

The building provides air quality sufficient to meet the requirements by using a conventional HVAC system. The design of the ventilation systems of the PACB must provide pressure, flow gradients and a pathway for the removal of air flows from uncontaminated regions towards areas with more probability of contamination. The building provides air quality and conditions suitable for the comfort of plant workers.

21.1.2 Basic Configuration

The PACB is a two-level building located so that it is contiguous with the tokamak building, the tritium building, the hot cell building and the radwaste building. The above-grade structures use structural steel framing. The building has floor levels at grade, + 3.60 m and a roof level at + 7.40 m. The PACB is divided into two zones based on potential contamination ranging from "white" (uncontaminated) to "green" (potential contamination) with distribution ducts to partitioned rooms with different degrees of airborne and surface contamination). The PACB provides the controlled pathway for the personnel access to the potentially contaminated zones in the tokamak, tritium, hot cell and radwaste buildings. The foundation of the building shall be set below grade so that the finished floor level matches the grade level.

21.1.3 Interfaces

The PACB has interfaces with the following WBS elements:

WBS	Title
4.3.C	Steady State Electrical Power Distribution
4.5	CODAC
4.6.C	Access Control
6.1.A	Site General Layout
6.2.A	Tokamak Buildings
6.2.B	Hot Cell Building
6.2.G	Radwaste and Personnel Building
6.2.S	Utility Tunnels & Site Improvements
6.5.C	Potable & Fire Water
6.5.D	Sewage (Sanitary and Industrial)

21.2 Requirements

21.2.1 Design

The requirements for the PACB are derived from the functions of the building. The requirements identified below are not complete because equipment designers continue to provide new interface information. However, the information is sufficient to identify all the requirements which control the overall configuration and general design concept of the building.

21.2.1.1 General

21.2.1.1.1 Working Space and Amenities

The PACB shall provide sufficient space for change rooms and showers, health physics (HP) monitoring and analysis laboratory and control centre, first aid and laundry, and amenities for an occupancy of 140 people.

21.2.1.1.2 Access, Maintenance and Parts Storage Space

The building shall provide a controlled access route for personnel access to the potentially

contaminated zones in the tokamak, tritium, hot cell and radwaste buildings, space for normal maintenance, materials handling equipment and storage appropriate, and good access to all equipment within the building. The building shall have large aisles and doors for the moving of large objects.

21.2.1.1.3 HVAC and Building Service Space

The building shall provide space for HVAC systems and other building services.

21.2.1.1.4 Health Physics (HP) Monitoring and Analysis Laboratories

The building shall provide space for the HP monitoring and analysis laboratory.

21.2.1.1.5 Electrical Load Distribution Centre

The electrical load distribution centre (LC-9) shall provide power to the PACB. Approximately 105 m^2 are required for LC-9.

21.2.1.1.6 Landscaping

The building shall be provided with appropriate landscaping for erosion control and a pleasant environment.

21.2.1.2 Seismic

The PACB shall be non-safety importance class (non-SIC) and shall withstand SL-0 seismic conditions with peak horizontal and vertical accelerations as specified in the PDS, or UBC and industrial health and safety requirements, which provide for a minimum of 0.05 g horizontal seismic force.

21.2.1.3 Structural

21.2.1.3.1 Components supported by the Building Structure

The building shall support its own weight as well as the weight of all installed equipment in the building.

21.2.1.3.2 Live Loads supported by the Slabs

The structure shall support the weight and forces of all movable and active equipment, systems, and structures located on the slabs.

21.2.1.3.3 Wind Loads

The building shall withstand horizontal wind conditions of up to 140 km/h defined at 10 m above grade.

21.2.1.3.4 Snow Loads

The building shall withstand snow loading conditions of up to 300 kg/m^2.

21.2.1.4 Nuclear

The PACB shall have a separate HVAC system and other appropriate controls to prevent the spread of radioactivity. Local shielding will be provided as needed.

21.2.1.5 Electrical

21.2.1.5.1 Building Lighting Service

The building shall provide appropriate, permanently-installed normal and emergency electrical lighting.

21.2.1.5.2 Building Electrical Service

The building shall provide low-voltage (~ 100 - 230 V and ~ 400 V welding power) electrical service to all areas of the building where needs for this service are anticipated.

21.2.1.5.3 Building Electrical Grounding Grid

The PACB shall have an electrical grounding grid placed around the basemat with connections to the plant-wide grounding network and with robust grounding terminals at electrical service power outlet locations inside the building.

21.2.1.5.4 Lightning Protection System

The building shall have lightning protection systems with connection to specified grounding terminals.

21.2.1.6 Potable Water and Drainage

The building shall provide potable water and drainage systems for lavatories, showers and drinking fountains.

21.2.1.7 HVAC Systems

The building shall provide air quality sufficient to meet the requirements by using a conventional HVAC system. The design of the ventilation systems of the PACB shall provide pressure, flow gradients and a pathway for the removal of air flows from regions of uncontaminated towards areas with more probability of contamination. In a green zone room, where personnel may be continuously working, the ventilation system shall be in a "once-through" mode. This system shall provide two to three air changes per hour. Fresh air will be filtered to remove particulate, and heated or cooled to match the building temperature. The HVAC system will keep the building generally at a positive relative pressure. Major components (such as fans, heat exchangers, etc.) shall be installed in pairs each with 50% capacity, so that the system can continue partial operation during maintenance activities.

21.2.1.8 Fire Protection

The building shall provide fire detection, alarm, and mitigation systems commensurate with

the occupancy and fire risk loading.

21.2.1.9 Internal Communication

The building shall provide an internal communication system, including distribution of telephone connections, local area computer network, a public address system, and appropriate warning systems (plant emergency, fire, etc.).Telephone access points will be provided with noise shields where necessary.

21.2.1.10 Access Control

The PACB provides the personnel pathways to access the buildings which are radiologically controlled because they involve radiation hazards. Access control procedures will be applied to most spaces in the building. Badges will be required, and workers and visitors will be tracked electronically when they cross certain boundaries within the plant. Provisions for worker escape will include at least two routes of egress from each space.

21.2.1.11 Materials

21.2.1.11.1 Structural

The building foundation will be a cast-in-place reinforced concrete mat, locally thickened to provide stiffness and point load bearing, and the superstructure will be prefabricated structural steel. Siding and roofing will be metallic, with integral insulation where appropriate.

21.2.1.11.2 Electrical

All cables will be made with copper and should have the 15 kV, 6 kV and 0.6 kV rated insulation voltage for 11 kV. Cable insulation should meet the following requirements:

- insulation material XLPE preferred, PVC not accepted;
- max. permissible temperature of conductor:
  - continuous 90°C,
  - under short circuit conditions 250°C;
- acid gas content zero halogen, according to IEC-754;
- fire retardancy according to IEC-332-3

Table 21 (6.2.G.02) -1 IEC Relevant Material

IEC #	Technical Committee	Title
332-1 to 3	SC 20C	Test on electric cables under fire conditions
728	SC 12G	Cable distribution systems
754	SC 20C	Tests on gases involved during combustion of electric cables
840	SC 20A	Test on electric cables 30 kV to 150 kV

21.2.1.12 Instrumentation and Control

Building systems, including HVAC and any other subsystems which have actively controlled components shall comply with ITER plant standards for control and communication protocols, and shall provide appropriate interfaces to CODAC.

21.2.2 Operation and Maintenance

The operations and maintenance (O&M) requirements for the PACB are derived from the systems which occupy the building, and from the functions of the building.

21.2.2.1 Operation and Control of Building Services

Building service systems shall incorporate instrumentation and control to manage system operation. Manual control over lighting, power distribution, large doors, and fluid supply is expected to be adequate. Automatic controls with manual override capability will be installed for the operation of HVAC and fire alarm and suppression systems. Operation and control of building systems will be centralised in building control panels located within the building. Status of building support systems will be provided to the CODAC system. However, no site services building support systems will be directly controlled from the ITER main control room.

21.2.2.2 Maintenance of Building Services

The operation of most building service systems may be interrupted for maintenance activities. However, HVAC systems will include sufficient installed redundancy that at least 50% of normal service can be maintained while one unit is removed from service for maintenance.

21.2.3 Surveillance and In-service Inspection

21.2.3.1 General

There are no surveillance and in-service inspection requirements for the PACB apart from the usual, annual, visual inspections of the building for noting the status of the overall condition, and for monitoring for any deterioration. In addition, there may be legal inspections for some of the building service equipment such as cranes and fire detection, alarm, and mitigation systems, and the confinement of radioactive materials.

21.2.3.2 Corrosion Protection and Control

The PACB shall be painted and provided with passive corrosion protection features (galvanising) where appropriate to assure that the design life of the structure is at least 30 years, which is the expected combination of ITER construction and operating periods.

21.2.4 Quality Assurance (QA)

The QA requirements for the PACB are those established by the uniform building code (or equivalent).

21.2.5 Reliability Assurance

There are no special reliability assurance requirements for the PACB structure. Building systems shall be designed to meet all functional requirements with the lowest overall lifetime cost, including effects of unavailability and cost of maintenance and repair. HVAC components and equipment shall be designed, procured, and installed in accordance with industrial codes and standards

21.3 Codes and Standards

The PACB shall be designed in accordance with the 1994 uniform building code (or equivalent). Good engineering practice, as expressed in the "Ninth Edition of the American Institute of Steel Construction (AISC) Manual of Steel Construction", shall also be employed.