SPECIALIZED HEALTHCARE &
MEDICAL EDUCATION DEPARTMENT
GOVERNMENT OF THE PUNJAB

No. SO (STAND) 1-30/2020
PROCUREMENT WING
Dated Lahore 21st November, 2025

NOTIFICATION

NO. SO (STAND) 1-30/2020; In pursuance of the recommendations of the notified PVMS Committees and subsequent approval of **Departmental Standardization Committee (DSC)**, the Competent Authority has been pleased to approve the PVMS specification of **Single Energy Linear Accelerator LINAC (Oncology Specialty)** for all the Procuring Agencies under the administrative control of SHC & ME Department.

2 The procurement process shall be carried out strictly in accordance with Punjab Procurement Rules-2014 and other relevant rules / regulations / policies.

3 Need of the Procuring Agency for items (main / optional) must be reasonably justified.

4 All Procuring Agencies (Hospitals, Medical Colleges, Universities, and Institutions) under the administrative control of the SHC&ME Department are bound to follow these PVMS Specifications.

SECRETARY
SPECIALIZED HEALTHCARE AND
MEDICAL EDUCATION DEPARTMENT

No & Date Even: -

A Copy is forwarded for information & necessary action to;

1. All VCs & Principals of Medical Health Institutions, SHC&ME Department.
2. All Superintendents of Teaching Hospitals, SHC&ME Department
3. All Head of Special Medical Institutions, SHC&ME Department
4. Director ICT Cell, SHC&ME Department, with the request to upload these PVMS Specification on the Departmental website.
5. PSO to Secretary SHC & ME Department, Lahore.
6. P.S to Special Secretary (D&R), SHC&ME Department.
7. P.A to Additional Secretary (Procurement), SHC&ME Department.

21-11-25
(ENGR. MUHAMMAD ATEEB)
SECTION OFFICER (STANDARDIZATION)

Clinical Specialty	Oncology
Generic Name	SINGLE ENERGY LINEAR ACCELERATOR
Clinical Purpose	Single Energy Linear accelerator (LINAC) is a machine that is commonly used to deliver external beam radiation treatments to cancer patients. In this way the LINAC with single energy can target and destroy cancerous cells in a precise area of a patient's body with minimal exposure to the surrounding health tissues.

TECHNICAL SPECIFICATIONS

Note: The procuring agency may choose the C-ARM/Helical/Ring Base Technology (I/O to specify any one) and the participating firm must quote their latest, purpose build and dedicated Equipment. These are the generalized specification and their technological advancement may vary as per the need or requirement of the Procuring Agency.

GENERAL REQUIREMENTS FOR LINEAR ACCELERATOR:

General requirements, other performance and safety parameter of the linear accelerator must fulfil the requirements of the international standards /IEC 61217, 60976 and 60601-1-2-1)

- Waveguide: Travelling/Standing wave

RADIATION TREATMENT BEAMS:

Photon Beams

- Single photon beam energy: 6MV FF/6MV FFF (I/O to specify).
- Photon Beam Dose rate 500 CGY /MU/min or more
- Photon field sizes range continuously variable from < (2 x 2) cm to (25 x 25) cm (or more) in the plane containing the isocenter.
- Photon beams should fulfil the recommendation of the international standards/IEC 976/977 regarding radiation field uniformity and stability

MECHANICAL RANGES AND POSITIONS INDICATORS:

- Gantry Rotation Range not less than 360°/(±180°).
- Gantry Rotation speed range from 0 to 6°/sec (1 RPM or more).
- Collimator rotation speed range from 0 to 12°/sec (1RPM or more) or Equivalent Beam-Shaping Mechanism.
- Accuracy of angle indicators/Set angles ± 0.5°.
- Distance Source to isocenter not less than 85 cm (± 0.2).
- Distance from Radiation Head to isocenter not less than 40 cm.
- Isocenter height over the floor not higher than 130 cm (±5).
- Deviation of the radiation beam axis (radiation isocenter) with rotation of the collimator and gantry (as defined in international standards/IEC 976/977) not more than 1mm radius.

- Room laser or integrated system acceptable for isocenter coordinate system.
- Light field indicator of the position of the radiation field or Equivalent Workflow or as per manufacturer's design.
- Coincidence of radiation field edge with light field edge: not more than 1 mm for field sizes up to 20cm x 20cm, not more than 1% for larger field sizes or Equivalent Workflow.
- Optical distance meter which indicates the distance from radiation source to patient surface on the central axis in range: 75 to 170 cm, resolution not more than 5 mm, or Equivalent Workflow or as per manufacturer's design.
- The accelerator should be fitted with a guard system that protects against a collision between the radiation head and the patient on the table or any other object. If activated it should stop and inhibit any movements of the gantry, head and table or as per manufacturer's design.

LINAC DOSIMETRY SYSTEM:

- Integrated Dose Monitors System
- Two independent Ionization chambers/Dual Chambers (as per international standards/ IEC 60601-2-1)
- Linearity / Proportionality not more than 1%
- Repeatability / Reproducibility less than 1%
- Stability / dependence on angle not more than 1% for any gantry and radiation head angle or as per manufacturer's design.

FINE RESOLUTION DYNAMIC MULTIFUNCTIONAL MLC FOR RT, SBRT, SRS /Tomo Helical (as per manufacturer's design):

- Maximum Field Size - 25 cm x 25 cm (or more)
- Minimum Field Size - < (2 x 2) cm
- Number of leaves – 64 or more
- Leave width projection/field shaping resolution of MLC at isocenter – 5 mm for all leaves and over the whole field area
- Maximum distance between leaves on same leaf guide not less than 20 cm.
- Leaves inter-digitation capable
- Leaves Maximum retracted position not less than 14 cm from field center line
- Leaves Maximum extended position not less than 14 cm over field center line (over travel)
- Maximum Leaf speed not less than 2.5 cm/sec for conventional jaws, dynamic Field defining diaphragm Maximum retracted position not less than 20 cm or dual layer MLC.
- For conventional jaws, dynamic Field defining diaphragm Maximum over-travel distance not less than 10 cm or dual layer MLC.
- Field edge penumbra not more than 11 mm
- Average transmission through the leaves not more than 0.5% (according to transmission definition in IEC 60601-2-1)
- Peak leakage between leaves not more than 0.5% (according to definition in IEC

60601-2-1 or as per international standards)

- Leaf position accuracy not more than 1 mm (≦0.5 RMS)
- Leaf position repeatability not more than 0.9 mm.

RADIATION TREATMENT DELIVERY MODES:

Conformal Radiation Therapy (3D CRT) with MLC / Conformal Radiation Therapy (CRT) with integrated wedge/dual layer MLC beam Shaping/ Tomo Helical.

- Intensity Modulated Radiation Therapy (IMRT)
- Automatic sequencing of the treatment beams during CRT / IMRT/ VMAT/ Tomo Helical
- Standard Arc Radiation Therapy/ Tomo Helical
- Dynamic Arc Therapy/ Tomo Helical
- Volumetric Modulated Arc Therapy/ Tomo Helical
- (Automatic Integrated Wedge or Dynamic Wedge function providing wedge field angles from 0° to 60°, and a maximum field size not less than 30cm x 40cm for conventional MLC)/ dual layer MLC beam Shaping mechanism.
- Assisted Set-Up - Remote from Control room automatic positioning of the gantry, collimator, beam geometric parameters and the table movement to the positions specified in the field prescription.

PATIENT SUPPORT TABLE:

Patient Table Motions.

- Longitudinal, Range not less than 100cm.
- Transversal, Range not less than 25cm (±20cm).
- Vertical, Range not less than 42cm.
- Patient Table Motion Control - Manual and Motorized
- Patient Table Position indicators accuracy ±1mm or ≦0.5° in the whole range/ Couch catcher design.

Table Top.

- Patient load not less than 200 kg
- Low –absorption, carbon-fiber couch top for IGRT applications
- Remote Correction of patient position

KV/MV ELECTRONIC PORTAL IMAGE DEVICE:

- Motorized retractable/Integrated
- Flat detector matrix of amorphous silicon technology with resolution no less than 1024 x 1024 pixels/KV Detector.
- Pixel size at isocenter: not more than 0.5 mm, at detector: not more than 0.5 mm or KV Imaging.
- Image acquisition Modes – (Single, Double, Multiple or Fluoroscopic (movie) image acquisition) or (MVCBCT Imaging) or (KVCBCT Imaging).
- Support of DRR, Digital simulator images, RT image and RT plan objects/ KV Imaging.

- Patient auto select mode
- Real-time imaging of IMRT segments in single, multiple or movie-loop mode to support verification of dose conformance and QA of treatment quality/KV Imaging.
- Computer controlled automated image acquisition and comprehensive analysis functions
- Anatomy/structure registration with reference images, template matching, annotations, geometrical measurements, image approval.
- On-line (at the linac) and Off-line (remote) analysis

PATIENT IMMOBILIZATION 3D-CRT/IMRT/VMAT/TOMO HELICAL:

Breast Immobilization:

- Carbon Fiber Breast board with an elevation system complete or equivalent
- Bi-Axial Arm Support, MT-TAS-R/L.
- Wrist support, MT-TWS-S
- Hip stop
- Round head cup.

Head and Neck Immobilization:

- Head and Neck immobilization designed for routine head and shoulder immobilization as an add-on system or equivalent
- Baseplate for head and neck treatment in supine and prone position
- Patient comfort pillows
- Prone Pillows for Prone treatments
- Thermoplastics Masks IMRT Reinforced Head only
- Thermoplastics Masks IMRT Reinforced Head, neck and shoulder

Pelvis Immobilization:

- Foam Bellyboard system for patient-friendly non-invasive positioning or equivalent.
- Baseplate for treatment in prone position
- Small insert
- Medium insert
- Large insert

<u>TREATMENT PLANNING SYSTEM:</u>

Full MLC-based planning system consisting of:

- 3D-CRT Licensed Treatment Planning
- 3D-CRT + IMRT Licensed Treatment Planning
- 3D-CRT + IMRT + VMAT/Tomo Helical Licensed Treatment Planning
- Doctor WS (Image fusion, contouring, simulation, plan review, etc)
- TPS should have applications for contouring, beam placement, block/port definitions, and real-time DRRS Having latest AI-based auto-segmentation/template-based auto-segmentation/Atlas-based auto-segmentation tools.
- Template Assisted/Driven planning

- Full DICOM connectivity for import and export of images, dose plans, structured,
- registration, etc
- Multiple plan review with plan addition, subtraction and integrated DVH statistics analysis, profiles, etc
- Fully integrated fusion of CT with CT/MR/PET/NM images for CT simulation or treatment planning utilization.
- Conventional 3D-CRT planning support
- Multiple cost function support: Radiobiological (EUD for serial organs AND parallel organs) and Physical (Dose volume-based constraints)
- Multiple isocenters per plan possible.

Dose calculation algorithms:

- Latest Treatment Planning Algorithms.
- 2 planning workstations with VMAT Licence
- 2 contouring workstations

RECORD & VERIFY AND ONCOLOGY INFORMATION SYSTEM (as per manufacturer's Recommendation)

- R&V system should provide all Record and Verify functionality system for image-guided RT, SRT and SRS.
- The R&V verification system should handle all manufacturers of linacs in the hospital and their technology as MLC, EPID, IMRT, IGRT.
- It shall be possible to add physicists check fields to a patient prescription without adding dose to the accumulated clinical dose to the patient.
- Server- Client based system allows access to patient data from any PC in the department - 5 or more Client WS
- It shall address the clinical information Management needs across the entire spectrum of cancer in the department.
- Image-Enabled Oncology EMR, with a single Patient Database
- IGRT support On-line and Off-line, including full tools for registration and analysis.
- It shall be able to accept plans from any Treatment Planning System and CT-Simulation (as per manufacturer's design)
- Quality Assurance mode to validate the dosimetry treatment plans prior to treatment
- It shall provide statistics, evaluation and analysis tools on all procedures done at the clinic and produce standard and customized reports.

ALLIED EQUIPMENT/ACCESSORIES:

- CCTV / Camera system (with remote zoom & focus facility and display monitor in console area
- Laser alignment system (Separate/integrated)
- A patient communication system: from treatment room to console area shall be supplied.

- Survey meter/detection system for showing LINAC beam ON indication & real time
- dose display at console area.
- All the MEPG requirements (including HVAC system and Backup Air Conditioning System for the full functionality and safety of the equipment, will be the responsibility of the supplying firm (I/O to specify as per actual requirement)
- All the Power requirement including, Transformer, Generators, ATS Panels, PFI Panels and other related work will be the responsibility of the supplying firm (I/O to specify as per actual requirement)
- UPS: High quality online UPS compatible with the LINAC(Imported).
- Air Compressor/Chiller & Water RO System: Cooling system as per LINAC & site requirements. (I/O to specify as per actual requirement)
- All the dosimetry system for QA with all accessories(I/O to specify as per actual requirement).
- Any other item/accessory to ensure full functionality of the equipment.

CIVIL WORK:

- Construction of bunker must be as per manufacturer design and as per requirements of PNRA following the WHO/International Safety Standards and for the full functionality of the equipment will be responsibility of the firm.

Any of mentioned two certificates required.
MHLW/FDA, CE