



# TESTING & COMMISSIONING (PRE HANDING OVER TECHNICAL ACTIVITY)

12 October 2016

# WHAT IS TESTING & COMMISSIONING ?

**T & C** is the process of assuring that all systems and components of a building or industrial plant or equipments are designed, installed, **tested**, operated, and maintained according to the operational requirements of the owner or final client.

## Who Should Attend T&C ?

- ▶ Project desk officer
- ▶ Engineer
- ▶ End User
- ▶ Pegawai Asset
- ▶ Liaison Officer

# T & C ACTIVITIES

TOTAL  
ACTIVITY:4

SPECIFICATIONS  
/QUANTITY  
COMPLIANCE

FUNCTIONALITY  
TEST

SAFETY TEST

STATUTORY  
REQUIREMENT  
COMPLIANCE

WARRANTY PHASE

# SPECIFICATIONS/QUANTITY COMPLIANCE

**ALL SPECIFICATIONS COMES WITH THE MACHINE/EQUIPMENTS  
MUST COMPLY WITH TENDER / CONTRACT DOCUMENT**

EXAMPLE : X RAY TUBE WITH 80KW GENERATOR, RESISTIVE  
TOUCHSCREEN/DIRECT WIFI PRINTING,60 CM BORE SIZE

**ALL EQUIPMENTS/MACHINES/ACCESSORIES QUANTITY MUST  
FOLLOW TENDER/CONTRACT BQ**

EXAMPLE : 2 CT SCAN INJECTORS, 1 BODY MATRIX COIL, 1 SPINE  
COIL

# FUNCTIONALITY TEST

The functionality of the machine must be as same as it intended to be or more and can not be less.

For example: X Ray can perform exposure, Film printer can print an image on film, ventilator can perform ventilating mechanical function.

# SAFETY TEST

Electrical Safety Test is compulsory for all medical equipment

1. ENCLOSURE LEAKAGE CURRENT OR TOUCH CURRENT
2. PATIENT LEAKAGE CURRENT
3. PATIENT AUXILIARY CURRENT (NO EFFECT TO PATIENT)

# STATUTORY REQUIREMENTS COMPLIANCE

## IEC 60601

EN 60601-1 applies to all Medical Electrical Equipment and Medical Electrical Systems. Intended by its manufacturer to be used: in the diagnosis, treatment, or monitoring of a patient; or for compensation or alleviation of disease, injury or disability. This includes a wide range of medical devices, for example:

- High Frequency Surgical Equipment
- Cardiac Defibrillators
- Patient Monitors
- Therapeutic and Diagnostic Ultrasound Equipment
- Medical Lasers
- Patient Ventilators
- Infant Incubators and Warmers

# WARRANTY PHASE

## Medical Equipment

Warranty period for medical equipment starts right after T & C and the period depends on what ever stated during the tendering process.

## Medical Equipment with Building

Warranty period for medical equipment that comes with building starts right after the handing over of the project and the period depends on what ever stated during the tendering process.

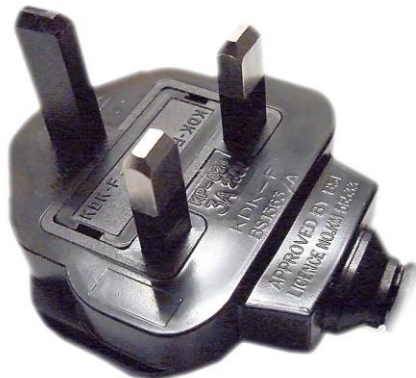


# ISSUES/PROBLEM DURING T & C

Electrical Safety Test Not Done/Fail

Machine/equipment/accessories not according to specs

Supplies plug top is not a medical grade plug top



# SAMPLE OF T & C FORM/CHECK LIST

<input type="checkbox"/> Installation <input type="checkbox"/> Transfer ( <input type="checkbox"/> months <input type="checkbox"/> Other )		Responsible Technologist	Person in charge	Approved by	Person in charge	Approved by	Person in charge
Reporting Department _____ Report Date ____/____/____						Division	
Destination Facility and Room Name		System Name		<input type="checkbox"/> RADspeed <input type="checkbox"/> RADspeed M <input type="checkbox"/> RADspeed MF500		System No. [SN]	
Equipment Configuration	X-ray generator	X-ray tube Support	X-ray tube	Collimator	Bucky Table	Bucky Stand	
Model	<input type="checkbox"/> UD150B-40 <input type="checkbox"/> UD150V-40 <input type="checkbox"/> UD150L-40 <input type="checkbox"/> UD150L-40E <input type="checkbox"/> UD150L-40F	<input type="checkbox"/> CH-200 <input type="checkbox"/> CH-200M <input type="checkbox"/> FH-20HR <input type="checkbox"/> FH-20HS <input type="checkbox"/> FH-21HR <input type="checkbox"/> FH-21HS	<input type="checkbox"/> 0.6/1.2P18DE <input type="checkbox"/> 0.6/1.2P323DK <input type="checkbox"/> 1/2P18DK <input type="checkbox"/> 1/2P38D <input type="checkbox"/> ( )	<input type="checkbox"/> R-300 <input type="checkbox"/> R-30H <input type="checkbox"/> R-20J	<input type="checkbox"/> BK-200 <input type="checkbox"/> BK-120MK <input type="checkbox"/> BK-12HK <input type="checkbox"/> ( )	<input type="checkbox"/> BR-120 <input type="checkbox"/> BR-120M <input type="checkbox"/> BR-120T <input type="checkbox"/> ( )	
Serial No.							
Measurement Date		/ /		Room Temp/Humidity		Temperature °C Humidity %	
Measured by				Dept.			
Check Item	Description	Result		Remarks			
Power supply	Voltage between LU/LV	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check voltage on terminal board in high-voltage generator. Within ±10 % of rated voltage			
	Voltage between LV/LW	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail				
	Nominal power supply voltage _____ V	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail				
	Confirm ground terminal.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail				
Power supply (image processing unit)	Voltage between single-phase power supply terminals	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	Within ±10 % of rated voltage			
	Confirm ground terminal.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A				
Radiography 60 kV / 320 mA / 200 ms (64 mAs)	TkV (tube voltage)	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check TkV waveform. (1 V/20 kV) TkV = 3.0 V ±10 %			
	TmA (tube current)	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check TmA waveform. (1 V/200 mA) TmA = 1.6 V ±10 %			
	sec (exposure time)	msec	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check TkV waveform width. msec = 200 msec ±10 %			
Radiography 100 kV / 200 mA / 100 ms (20 mAs)	TKV (tube voltage)	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	TkV = 5.0 V ±10 %			
	TmA (tube current)	V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	TmA = 1.0V ±10 %			
	sec (exposure time)	msec	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	msec = 100 msec ±10 %			
X-ray Tube Support	Longitudinal movement	Confirm movement and lock functions.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check also click intercept action (CH only).		
	Transversal / forward/backward movement	Confirm movement and lock functions.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Check also click intercept action (CH only).		
	Vertical movement	Confirm movement and lock functions.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail			
	Rotation around horizontal axis	Confirm movement and lock functions.		<input type="checkbox"/> Pass <input type="checkbox"/> Fail			
	Rotation around	Confirm movement and		<input type="checkbox"/> Pass <input type="checkbox"/> Fail			

