How the new IUSS standard will affect clinical engineers

Presentation to CEASA AND SAFHE 31 July 2014

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Supported by

Department of Health
INFRASTRUCTURE UNIT SUPPORT SYSTEMS PROJECT
GUIDELINES NORMS AND STANDARDS

Council for Scientific and Industrial Research
Development Bank of Southern Africa
Introduction

“We shape our buildings, thereafter they shape us” (Churchill)

- Service delivery in the healthcare sector is profoundly affected by the built infrastructure provided to support it

NATIONALLY

- 4122 public healthcare facilities
- Current replacement of healthcare buildings - 40 Years
- Current replacement value – R312.4 Billion (MERC)
- Inconsistent quality, budgeting and programming:
  - Inaccurate budgeting, poor spending patterns
  - Undermining equity
  - Lack of transparency, and
  - Lack of confidence
Introduction

- Weak health infrastructure law:
  - SAHNorms (public sector) repealed
  - R158 (private sector) – outdated
  - R187 (WC) and draft regulations (GP, FS)
- Built environment professionals have no healthcare specialisation, and vice versa
  - Challenges in line department – implementing communication
- Initial capital cost: maintenance: service delivery
  - 1 : 5 : 25
IUSS Guidelines, Norms and Standards
An initiative of the Department of Health supported by CSIR

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End of life
- 10.4 Decommissioning
- 10.5 Deconstruction
- 10.6 Recycling
- 10.7 Demolition

Disposal
- 10.1 Disposal preparation
- 10.2 Transfer
- 10.3 Reinstatement

Status change
- 9.5 Change of functional use by occupant administration
- 9.4 Refurbishment, adaptation, alteration, change of use

Occupancy and use
- 9.2 Maintenance and condition management
- 9.3 Occupants’ facility
- 9.1 Asset operations

Pre-project stages
- 1 Conception of need
- 2 Feasibility
- 3.1 Authorization
- 3.2 First procurement

Portfolio management
- 0.1 Portfolio strategy
- 0.2 Portfolio requirements
- 0.3 Project initiation

Overall enterprise
Demand

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Portfolio operations

Property management

Project delivery
- 4 Initial or outline conceptual design
- 5 Preliminary design
- 6.1 Detailed (coordinated) design
- 6.2 Construction procurement
- 7 Production information
- 8.1 Construction
- 8.2 Commissioning

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... sustainable set of infrastructure guidelines, norms and standards for all levels of health care facilities for all stages of the health infrastructure lifecycle

Process

Discussion status
- Basic research
- Stakeholder workshops
- Published online
- Expert individuals/teams assigned

Development status
- Active peer review - clinical
- Active peer review - Built environment
- Republished

Proposal status
- Presented to relevant professional bodies
- Final technical and language edit
- Formatting
- NHC endorsement of process
  25 October 2013
- Regulation

Approval

Monitor
Review
Update

www.iussonline.co.za
The documents outline the policy and service context, to illustrate the desired planning principles and design considerations of Clinical spaces such as in-patient units.

- Part A outlines the national and provincial service and policy context which are the basic determinants of the planning and design principles;
- Part B contains planning and design guidance, design considerations, functional relationships between specific units within the nursing college;
- Part C develops these principles into a room requirements list;
- Part D contains room data sheets and
- Part E includes some indicative equipment lists and case studies.

**INPATIENT FACILITIES**

The adult inpatient unit is the clinical unit in a hospital where patient bed space and clinical treatment space is combined to provide a therapeutic unit for clinical diagnosis, medical and nursing care and treatment for patients admitted to the hospital.

The document outlines:
- General design and planning principles;
- Location and inter departmental relationships;
- Flow patterns;
- Functional Zones;
- Inpatient activities;
- Operational design considerations;
- Room requirements.

**PAEDIATRICS**

Key design principles for planning a paediatric facility:

a) Dedicated paediatric facilities;

b) Child centred design;

c) Friendly healthcare environments for children and young people;

d) Family-oriented;

e) Play area;

f) Outside spaces;

g) Education;

**NURSING EDUCATION INSTITUTIONS**
ACTS & REGULATIONS
The National Health Act, 2003 (Act No. 63 of 2003) which provides guidelines for service delivery in South Africa

Services provided by hospitals are categorized in the Government Gazette No 185, 2nd March 2012.

ROOM REQUIREMENTS
- Description & function
- Location & relationships
- Activities
- Services
- Special considerations

EMERGENCY CENTRES
Discussion Draft 1.3

The Emergency Centre (EC) is defined as the dedicated area in a health facility that is organized and administered to provide a high standard of emergency care to those in the community who are in need of acute or urgent care. It forms the direct portal of entry for patients requiring emergency services. The patient flow through the EC determines the main areas within the Emergency Centre:
- Resuscitation area;
- Majors area
- Minors area

MATERNITY CARE FACILITIES

The maternity care facilities, collectively known as the maternity unit (MU), provide services for the safe antenatal, birthing and postnatal care of mothers and their new born babies in a comfortable environment that facilitates the normal physiological process of pregnancy and birth. The service includes all perinatal services that include: antenatal care, delivery rooms, postnatal care, neonatal and kangaroo mother care and termination of pregnancy management. These services are provided in terms of the promulgated levels of care for healthcare services.

South Africa's healthcare system is predominantly nurse-based, requiring nurses to have the competence and expertise to manage the country's burden of disease and to meet South Africa's healthcare needs. The essential role of nurses is recognized by the Minister of Health as critical to achieving "A long and a healthy life for all South Africans". Strategic Plan for Nursing Education, Training and Practice 2012/13 – 2016/17
Building engineering services

- Policy and service context described
  - the minimum acceptable standard,
  - recommended best practice,
  - and maximum practical limit

- Professional services scope:
  - summaries of collated information
  - technical feasibility, benefits & risks
  - regulatory compliance issues
  - financial feasibility and risks
  - consents and approvals lists
  - additional surveys, tests, analyses, studies and investigations
Building engineering services

- Maintenance
- Lifecycle costing
- Commissioning
- Retrofitting & decommissioning
  - Heating, ventilation & air-condition
  - Electrical
  - Medical gases
  - Wet services
- Sustainability and the environment
- Infection prevention and control
Integrated tools

- **Strategic view:**
  - Demand drivers
    - Population size
    - Epidemiology, etc.
  - Supply constraints
    - Staff
    - Operational budget, etc.

- **Operational requirements:**
  - User consultation
  - Value engineering
  - Uncertainty, churn
Processes complete/ underway

- Input into National Core Standards
- Liaising with National Treasury
- Representation on SANS Committees
  - SANS 204
  - SANS 1544
  - SANS 10400-O
- International & national interest groups, including
  - SAFHE, CEASA and SAMED
  - International Union of Architects – Public Health Group
    - Networks and reference material from all continents
    - GUPHA (Global University Programme in Health Architecture)
- Extensive stakeholder engagement
Implications for practice

*Gazetted*

- No. 37348 R 116, 17 February 2014
- No. 37790 R 512, 30 June 2014
- Forthcoming...
### Clinical services
- Adult Inpatient Services
- Laboratories
- Mental Health
- Adult Critical Care
- Emergency Centres
- Maternity Care Facilities
- Oncology
- Outpatient Services
- Paediatric and Neonatal Facilities
- Pharmacy
- Primary Health Care
- Diagnostic Radiology
- Adult Physical Rehabilitation
- Adult Post-acute Services
- Facilities for Surgical Procedures
- TB Services

### Support services
- Admin & Related
- General Hospital Support
- Catering Services
- Linen and Laundry
- Hospital Mortuary Services
- Nursing Education Institutions
- Health Facility Residential
- Central Sterilising Services Department
- Training and Resource Centre
- Infrastructure Design for Waste Management

### Healthcare environment/crosscutting issues
- Generic Room Data
- Security
- Engineering design principles
- Environment and Sustainability
- Materials and Finishes
- Future healthcare environments
- Healthcare Technology
- Inclusive environments
- Infection prevention & control
- Information Technology & Infrastructure

### Procurement and operation
- Integrated infrastructure planning
- Project planning and briefing
- Space guidelines
- Cost Guidelines
- Innovative Building Technologies
- Commissioning
- Maintenance
- Decommissioning
- Capacity development

### LEGEND
- X Gazetted
- Guidelines
- Toolkits
- Position papers
- Regulations
Implications for practice

- Public information
- Application by provincial departments of health
  - New building projects (incl. adds & alts)
  - Not requiring upgrade of existing facilities
- Voluntary standard
  - Deviations motivated in IDMS
  - Consultants and professional service providers not absolved of duties of due diligence
Implications for practice

- NHC selection of general regulatory mechanism(s) and principles (including “grandfather clauses”)
  - Consultants instructions to measure in locations and according to building elements to be made mandatory
  - Classification, representation and reporting codified
Implications for practice

- Dynamic, responsive
  - Health Infrastructure Norms Advisory Committee to be established
  - Webportal
  - Interim website [www.iussonline.co.za](http://www.iussonline.co.za)

- Implementation adoption and institutionalisation phase
  - Capacity building
  - Test-in-use
IUSS Online
Improving healthcare infrastructure delivery through collaboration
A collaboration between: The CSIR, the National Department of Health and the Development Bank of Southern Africa

Welcome to
Infrastructure Unit Support Services (IUSS)

The Council for Scientific and Industrial Research (CSIR), the National Department of Health (NDoH) and the Development Bank of Southern Africa (DBSA), each with specific roles in optimising the acquisition and management of South Africa’s public healthcare facilities, have produced the National Health Infrastructure Norms and Standards Guidelines.

Publication of Health Infrastructure Norms and Standards Guidelines

The Minister of Health, hereby publish, in terms of the National Health Act No 63 of 2003, the Health Infrastructure Norms and Standards Guidelines in relation to Building Engineering Services, Infrastructure Design for Public Management of Healthcare Facilities and Emergency Centers. The guidelines are for public reference information and for application by Provincial Departments of Health in the planning and implementation of public sector health facilities. The approved guidelines will be applicable to the planning, design and implementation of all new building projects. Any deviations from the voluntary standards should be motivated during the Infrastructure Delivery Management Systems (IDMS) gateway approval process. The guidelines should not be seen as a requirement necessitating the alteration and upgrading of all existing healthcare facilities. Professional service provider instructions should be adapted to require mandatory measurement in locations and according to building elements on all building projects not yet documented for tender purposes. A further process for extracting the essential criteria from the guidelines for inclusion as health regulations will follow. Read more here.

You will find the gazetted documents under the Norms & Standards menu under the “Gazetted” items.

**Gazetted – Clinical services**

**Gazetted – Support services**

**Gazetted – Cross-cutting issues**

**Gazetted – Procurement and operation**

Norms & standards

The development of guidelines, norms and standards has been structured into work package sets and 45 work packages including facilities and departments, regulations, engineering services, infection prevention and control, equipment, sustainability and environment, tomorrow’s healthcare environments, have been identified. A development programme has been initiated.

Project management

Customisation and implementation of a Project Management Information System (PMIS) for the NDoH IUSS Project Office has been initiated. The PMIS will consolidate data on all healthcare infrastructure projects in South Africa and identify where support from the PMSU could improve delivery.
What does this mean for Clinical Engineers?
Maintenance Focus

- The Maintenance approach must have a strategic focus.
- Whilst the current emphasis is on backlogs in maintenance, we must start positioning ourselves to “do maintenance better”
- To do this we should take a systems view

People
Processes
Information and Knowledge
Supporting Tools
General Principles

- Asset Knowledge
- Zero Based Budgeting
- 80% Planned / 20% Unplanned (Proactive)
- Prioritisation / Risk
- Levels of Service
- Statutory Obligations
- Information Management
- Lifecycle Approach
- Continuous Improvement
- Cost Effective
Maintenance Definitions

Planned Maintenance
(Preventative & Predictive)

- Preventative (Use Based)
  (Scheduled)
    - Equipment
    - Statutory

- Predictive (Inspection Based)
  (Corrective)
    - Equipment
    - Statutory

Design Out
(Redesign)

- < 10%

Unplanned Maintenance
(Breakdown)

- < 10%

Servicing

- Current Expenditure

Replacement Renewal

- Capital Expenditure
  - Current Expenditure

Refurbishment Rehabilitation

- Capital Expenditure

Repair

- Current Expenditure
## Condition Ratings

(McDulling, Horak & Cloete)

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>5</strong> As New</td>
<td>The fabric, element or building is either new or has recently been maintained; does not exhibit any signs of deterioration.</td>
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<tr>
<td><strong>4</strong> Maintenance Required</td>
<td>The fabric, element or building exhibits superficial wear and tear, minor defects, minor signs of deterioration to surface finishes and requires maintenance/servicing. It can be reinstated with routine scheduled or unscheduled maintenance/servicing.</td>
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<tr>
<td><strong>3</strong> Repairs Required</td>
<td>Significant sections or elements require repair, usually by a specialist. The fabric, element or building has been subjected to abnormal use or abuse, and its poor state of repair is beginning to affect surrounding elements. Backlog maintenance work exists.</td>
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<tr>
<td><strong>2</strong> Renovations Required</td>
<td>Substantial sections or elements have deteriorated badly, suffered structural damage and require renovations. There is a serious risk of imminent failure. The state of repair has a substantial impact on surrounding elements or creates a potential health or safety risk.</td>
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<tr>
<td><strong>1</strong> Replacement Required</td>
<td>The fabric, element or building has failed, is not operational or deteriorated to the extent that does not justify repairs, but should rather be replaced. The condition of the element actively contributes to the degradation of surrounding elements, or creates a safety, health or life risk.</td>
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</tbody>
</table>
Key Elements to be Addressed

• In-House vs. Outsourcing
• Incremental Improvement
• The Plan – Do – Check – Adjust Cycle
• Organisational Issues
  – Staffing
  – Reporting Lines
  – Skills
  – Training
  – Attitude
  – Delegations
• SCM
## Functional Area Classification

- **Functional Area**
  - Very High Risk
  - High Risk
  - Normal Risk
  - Low Risk

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<th>Level 2</th>
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</table>
Elemental Classification

- Componentalisation of Facility
  - Building Fabric
  - Mechanical, electrical & Plumbing

<table>
<thead>
<tr>
<th>High Level Structure</th>
<th>Description</th>
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<tbody>
<tr>
<td>1  Non maintenance elements (unless below standard)</td>
<td>21 Mechanical - Laundry Equipment</td>
</tr>
<tr>
<td>2  External Envelope &amp; Finishes</td>
<td>22 Mechanical - Refrigeration</td>
</tr>
<tr>
<td>3  Windows</td>
<td>23 Mechanical - Medical Gasses and LP</td>
</tr>
<tr>
<td>4  External Doors</td>
<td>24 Fire Protection, Sprinklers, Extinguishers and CO2</td>
</tr>
<tr>
<td>5  Roofs, Gutters Downpipes and External Ceilings</td>
<td>25 Other</td>
</tr>
<tr>
<td>6  Internal Divisions</td>
<td>26 Site Sewerage</td>
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<tr>
<td>7  Internal Doors</td>
<td>27 Site Stormwater</td>
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<tr>
<td>8  Floor Finishes</td>
<td>28 Site Water Retuculation</td>
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<tr>
<td>9  Internal Finishes on Walls</td>
<td>29 Site Electrical Reticulation</td>
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<tr>
<td>10 Ceilings</td>
<td>30 Emergency Power</td>
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<tr>
<td>11 Fixtures/Fittings excl sanitary</td>
<td>31 Boundary Walls, Fencing and Gates</td>
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<tr>
<td>12 Internal Plumbing</td>
<td>32 Retaining Walls</td>
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<tr>
<td>13 Internal Electrical</td>
<td>33 Roads and Open Parking</td>
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<tr>
<td>14 Communications, IT, Access Control</td>
<td>34 Carports/Undercover Parking excluding surface</td>
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<tr>
<td>15 Fire Detections &amp; Monitoring</td>
<td>35 Covered Walkways</td>
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<tr>
<td>16 Mechanical - HVAC</td>
<td>36 Sport Facilities</td>
</tr>
<tr>
<td>17 Mechanical - Hot Water Generation</td>
<td>37 Landscaping and Gardens</td>
</tr>
<tr>
<td>18 Mechanical - Autoclaves</td>
<td>38 Sundary Small buildings</td>
</tr>
<tr>
<td>19 Mechanical - Lifts</td>
<td>39 Sloping site and abnormal ground conditions</td>
</tr>
<tr>
<td>20 Mechanical - Kitchen Equipment</td>
<td>40 Demolitions</td>
</tr>
</tbody>
</table>
Maintenance Schedules

- Maintenance Schedules (per element) will identify the:
  - Component
  - Relative priority (with respect to the component and its location classification)
  - Required work (maintenance tasks)
  - Service Interval (per maintenance task)
  - Time Tolerance – for reactive maintenance tasks (performance management)
  - Skills requirements
  - Materials requirements
  - Estimated Budget Requirements (Links to Cost Norms)
General Policy Issues (Implementation of Principles)

- Compilation of Asset Registers
- Condition Assessments per element
- Classification of Maintenance into:
  - Maintenance Programme
  - Rehabilitation Programme
  - Replacement
- Budgeting for scheduled and backlog (deferred) maintenance
- Budget allowance to be 3% to 4% of current replacement cost
- Target Condition of 4 or above (after backlog is eradicated) Recording of deferred maintenance
- Skills Audits, Training, Reporting Lines
- Supporting systems
Information Technology and Infrastructure
Information Technology and Infrastructure
Precautionary matrix

![Image of construction plans]

*Courtesy: Nicholas Thorne*

<table>
<thead>
<tr>
<th>LOW RISK</th>
<th>MODERATE RISK</th>
<th>HIGH RISK</th>
<th>HIGHEST RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Office areas</td>
<td>• Rehabilitation Unit</td>
<td>• High Care Units/Wards</td>
<td>• Operating Rooms</td>
</tr>
<tr>
<td>• Service areas</td>
<td>• Endoscopy Units</td>
<td>• Surgical Units/Wards</td>
<td>• CSSD - Central Sterile Supply Department</td>
</tr>
<tr>
<td>• Plantrooms</td>
<td>• Nuclear Medicine</td>
<td>• Trauma / Resus Room</td>
<td>• Cardiac Cath Lab</td>
</tr>
<tr>
<td>• Kitchens</td>
<td>• Physical Therapy</td>
<td>• Eye Centre</td>
<td>• Intensive Care Units</td>
</tr>
<tr>
<td></td>
<td>• Radiology/MRI</td>
<td>• Laboratories (specimen)</td>
<td>• Medical Unit/Wards</td>
</tr>
<tr>
<td></td>
<td>• Procedure Rooms</td>
<td>• Theatre – non-surgical</td>
<td>• Any area caring for immunocompromised patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pediatric Units/Wards</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pharmacy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Surgical Stores</td>
<td></td>
</tr>
</tbody>
</table>
## Inspection and Non-Invasive Activities

Includes, but is not limited to:
- removal of ceiling tiles for visual inspection limited to 1 tile per 10 square metres
- painting (but not sanding)
- wall covering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection

### TYPE A

## Small scale, short duration activities which create minimal dust

Includes, but is not limited to:
- installation of telephone and computer cabling
- access to chase spaces
- cutting of dry walls or ceiling where dust migration can be controlled

### TYPE B

## Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies

Includes, but is not limited to:
- sanding of walls for painting or wall covering
- removal of floor coverings, ceiling tiles and casework
- new wall construction
- minor duct work or electrical work above ceilings
- major cabling activities
- any activity which cannot be completed within a single workshift

### TYPE C

## Major demolition and construction projects

Includes, but is not limited to:
- activities which require consecutive work shifts
- requires heavy demolition or removal of a complete cabling system
- new construction.

### TYPE D
<table>
<thead>
<tr>
<th>TYPE</th>
<th>LOW RISK</th>
<th>MODERATE RISK</th>
<th>HIGH RISK</th>
<th>HIGHEST RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE A</td>
<td>I</td>
<td>II</td>
<td>II</td>
<td>III/IV</td>
</tr>
<tr>
<td>(Non Invasive / Inspection)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE B</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>(Minimal Dust)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE C</td>
<td>I</td>
<td>II</td>
<td>III/IV</td>
<td>IV</td>
</tr>
<tr>
<td>(Moderate Dust)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE D</td>
<td>II</td>
<td>III/IV</td>
<td>III/IV</td>
<td>IV</td>
</tr>
<tr>
<td>(Major Demolition)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Courtesy: Nicholas Thorne*
<table>
<thead>
<tr>
<th>Class I</th>
<th>Precautionary Measures – Before and During Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Execute work by methods to minimize raising dust from construction operations.</td>
</tr>
<tr>
<td></td>
<td>• Immediately replace a ceiling tile displaced for visual inspection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class II</th>
<th>Precautionary Measures Upon Completion of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Provide active means to prevent airborne dust from dispersing into atmosphere.</td>
</tr>
<tr>
<td></td>
<td>• Water mist work surfaces to control dust while cutting.</td>
</tr>
<tr>
<td></td>
<td>• Seal unused doors with duct tape.</td>
</tr>
<tr>
<td></td>
<td>• Block off and seal air vents.</td>
</tr>
<tr>
<td></td>
<td>• Place dust mat at entrance and exit of work area</td>
</tr>
<tr>
<td></td>
<td>• Remove or isolate HVAC system in areas where work is being performed.</td>
</tr>
<tr>
<td></td>
<td>• Wipe work surfaces with disinfectant</td>
</tr>
<tr>
<td></td>
<td>• Contain construction waste before transport in tightly covered containers.</td>
</tr>
<tr>
<td></td>
<td>• Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.</td>
</tr>
<tr>
<td></td>
<td>• Remove isolation of HVAC system in areas where work is being performed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class III</th>
<th>Precautionary Measures Upon Completion of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.</td>
</tr>
<tr>
<td></td>
<td>• Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.</td>
</tr>
<tr>
<td></td>
<td>• Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.</td>
</tr>
<tr>
<td></td>
<td>• Contain construction waste before transport in tightly covered containers.</td>
</tr>
<tr>
<td></td>
<td>• Cover transport receptacles or carts. Tape covering unless solid lid.</td>
</tr>
<tr>
<td></td>
<td>• Do not remove barriers from work area until completed project is inspected by the owner’s Safety Department and Infection Control Department and thoroughly cleaned by the owner’s Environmental Services Department.</td>
</tr>
<tr>
<td></td>
<td>• Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.</td>
</tr>
<tr>
<td></td>
<td>• Vacuum work area with HEPA filtered vacuums.</td>
</tr>
<tr>
<td></td>
<td>• Wet mop area with disinfectant.</td>
</tr>
<tr>
<td></td>
<td>• Remove isolation of HVAC system in areas where work is being performed.</td>
</tr>
</tbody>
</table>

**Courtesy: Nicholas Thorne**
<table>
<thead>
<tr>
<th>Class IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Isolate HVAC system in area where work is being done to prevent contamination of duct system.</td>
<td>• Remove barrier material carefully to minimize spreading of dirt and debris associated with construction.</td>
</tr>
<tr>
<td>• Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.</td>
<td>• Contain construction waste before transport in tightly covered containers.</td>
</tr>
<tr>
<td>• Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.</td>
<td>• Cover transport receptacles or carts. Tape covering unless solid lid.</td>
</tr>
<tr>
<td>• Seal holes, pipes, conduits, and punctures appropriately.</td>
<td>• Vacuum work area with HEPA filtered vacuums.</td>
</tr>
<tr>
<td>• Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site.</td>
<td>• Wet mop area with disinfectant.</td>
</tr>
<tr>
<td>• All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.</td>
<td>• Remove isolation of HVAC system in areas where work is being performed.</td>
</tr>
<tr>
<td>• Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department.</td>
<td>• Perform deep clean and carry out Particle Count testing in completed areas where required.</td>
</tr>
<tr>
<td>• Perform periodic particle count tests in adjacent occupied spaces during construction as well a bacteriological tests using Agar plates.</td>
<td></td>
</tr>
</tbody>
</table>

**Courtesy: Nicholas Thorne**
Key steps in commissioning health technology

1. Check documentation
2. Prepare equipment for use
3. Undertake safety tests
4. Initial calibration
5. Calibration
6. Function tests
7. Record the results
Valid replacement criteria

i. Equipment will be replaced only when one of the following valid reasons has been fulfilled:
   a. it is worn out beyond repair (has reached the end of its natural life);
   b. it is damaged beyond repair;
   c. it is unreliable – faulty, old, unsafe;
   d. it is clinically or technically obsolete;
   e. spare parts are no longer available; and
   f. it is no longer economical to repair.

and one of the following valid reasons has also been fulfilled:
   g. utilisation statistics are available to show that it is still required; and
   h. a demonstrated clinical or operational need still exists.

ii. Equipment will not be replaced simply because:
   • it is old;
   • staff do not like it; and
   • a newer model has arrived on the market.

Judging when it is time to condemn equipment

Senior maintenance staff need to study the equipment, and judge:
   • whether the equipment fulfils any of the valid replacement criteria (see above);
   • whether the equipment has outlived its (internationally/locally) advised typical “lifetime”;
   • the equipment’s track record and state of health, as documented in its service history records; and
   • whether it will be necessary to override the average expected lifespan and condemn the equipment early, or even to extend the lifespan of the equipment.
HT Guideline

Task Team
Mladen Poluta, Gift Mphefu, Riaan van der Watt, Sam Bakhane, Madga Coetzer, Terry Downs, Hennie van Tonder

Glossary/Definitions

• Part A
  – Background

• Part B
  – Life Cycle of HT

• Part C
  – Examples/Tables
HT Guideline

• Part A
  – Frame Within Infrastructure Development and Operations
  – Focus on durable ME + relate consumables
  – Relevance to other national HT Documents

• Part B
  – Planning and budgeting process
  – Needs Assessment
  – Asset Management
  – Budget and Financing
  • Estimate for costing of consumables (as % of OPC)
HT Guideline

• Part B (Continued)
  – Specifications
    • *Example in Part C*
  – Selection Criteria
  – Commissioning
  – Training
  – Operations and Maintenance
    • *Risk model with calculated Risk Values*
    • *Maintenance p.a. as % of CRC*
Table 4: Equipment groupings and related risk and maintenance factors

<table>
<thead>
<tr>
<th>GRP CODE</th>
<th>GROUP DESCRIPTION</th>
<th>Defined risk</th>
<th>Total risk Factor (%)</th>
<th>% Maint. of repl. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUCLE</td>
<td>Auxiliary Cleaning/Sterilising Equipment</td>
<td>B-Medium</td>
<td>56%</td>
<td>3.5%</td>
</tr>
<tr>
<td>CAUOTH</td>
<td>Auxiliary Other Specialised Equipment</td>
<td>B-Medium</td>
<td>52%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CAUSPE</td>
<td>Auxiliary Special Medical furniture</td>
<td>B-Medium</td>
<td>68%</td>
<td>3.0%</td>
</tr>
<tr>
<td>CAUMED</td>
<td>Auxiliary General Medical furniture</td>
<td>C-Low</td>
<td>20%</td>
<td>3.0%</td>
</tr>
<tr>
<td>CAUTES</td>
<td>Auxiliary Test Equipment</td>
<td>B-Medium</td>
<td>74%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CAUFUR</td>
<td>Auxiliary General Administrative Furniture</td>
<td>C-Low</td>
<td>18%</td>
<td>2.5%</td>
</tr>
<tr>
<td>CAUAPP</td>
<td>Auxiliary General Appliances</td>
<td>C-Low</td>
<td>20%</td>
<td>3.0%</td>
</tr>
<tr>
<td>CAUSOF</td>
<td>Auxiliary Software and Communication Systems</td>
<td>B-Medium</td>
<td>74%</td>
<td>12.0%</td>
</tr>
<tr>
<td>CBDAUD</td>
<td>Diagnostic Audiology</td>
<td>B-Medium</td>
<td>72%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CBDFLE</td>
<td>Diagnostic Flexible Endoscopes</td>
<td>B-Medium</td>
<td>74%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CBDMIC</td>
<td>Diagnostic Microscopes</td>
<td>B-Medium</td>
<td>74%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CBDPAT</td>
<td>Diagnostic Pathology Devices</td>
<td>B-Medium</td>
<td>66%</td>
<td>5.5%</td>
</tr>
<tr>
<td>CRDRIG</td>
<td>Diagnostic Rigid Scopes</td>
<td>R-Medium</td>
<td>69%</td>
<td>5.5%</td>
</tr>
</tbody>
</table>
HT Guideline

• Part B (Continued)
  – Maintenance Intervals
  – Maintenance Approach

A. High-risk with high maintenance intensity – typical outsourcing with comprehensive service contracts and short-term implementation:
  - Anesthesia Units
  - Angioplasty Systems
  - Apheresis Units
  - Autotransfusion Units
  - Brachytherapy Systems
  - Circulatory Assist Units, Cardiac, Intra-Aortic Balloon
  - Collimators, Radiographic
  - Densitometers, Bone
  - Heart-Lung Bypass Units
  - Heat Exchangers, Heart-Lung Bypass
  - Hemodialysis Units
  - Peritoneal Dialysis Units
  - Positive Airway Pressure Units, Continuous
  - Pulsatile Pressure Generators, Heart-Lung Bypass
  - Radiographic Systems/Units
HT Guideline

- Part B (Continued)
  - CMMS
  - Staffing

Table 9: Typical staff complements (technical) for a self-supporting HT maintenance department

<table>
<thead>
<tr>
<th>Resource</th>
<th>C-Low</th>
<th>B-Medium</th>
<th>A-High</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic high</td>
<td>0.00</td>
<td>3.82</td>
<td>5.68</td>
<td>9.50</td>
</tr>
<tr>
<td>Electronic medium</td>
<td>0.44</td>
<td>4.28</td>
<td>0.81</td>
<td>5.53</td>
</tr>
<tr>
<td>Electronic low</td>
<td>0.03</td>
<td>0.02</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Mechanical high</td>
<td></td>
<td>1.14</td>
<td>0.01</td>
<td>1.15</td>
</tr>
<tr>
<td>Mechanical medium</td>
<td>1.09</td>
<td>3.12</td>
<td>0.01</td>
<td>4.22</td>
</tr>
<tr>
<td>Mechanical low</td>
<td>0.28</td>
<td>0.06</td>
<td></td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.79</strong></td>
<td>**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What do we need to Maintain?

Theoretical Combined Asset Register

- L3 – Hospital
- L2 – Hospital
- CHC
- Clinic

Standard Equipment List (SEL)

NDoH

Province “1”

Province “2”

L3 Hospitals

L2 Hospitals

Hospital X

Location

Service Package

Planning Units

“Generic Facility Layout”
Maintenance Model 2 (Who, When, Where, How)

Maintenance Criteria for each item in the SEL

Item 1 – Anaesthetic Delivery Unit
• Preventive Maintenance Interval – 6 months
• Mean Time to Service – 2hr
• Mean Time to Repair – 6hr
• Technician Skill level – BA 5

Item 2 – Ultrasound Scanner
• Preventive Maintenance Interval – 6 months
• Mean Time to Service – 2hr
• Mean Time to Repair – 4hr
• Technician Skill level – DI 4

Complete Maintenance Plan with Resource Requirements ("Ideal")

Adjusted for Risk

Priority Maintenance Plan with Resource Requirements

Theoretical Combined MSI Register

Risk Assessment for each item in the SEL

Physical Risk

Functional Risk

Technology Intensity

Maintenance Intensity

Volume Risk
Part C - Annexures

<table>
<thead>
<tr>
<th>Standard Description (UMDNS Format)</th>
<th>Alternative Description</th>
<th>UMDNS Code</th>
<th>Group Description</th>
<th>Group Code</th>
<th>Risk Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylic Curing Units, Dental</td>
<td>Visible Curing Light</td>
<td>16353</td>
<td>Clinical Biomedical Therapeutic Dental Equipment</td>
<td>CBTDEN</td>
<td>B-Medium</td>
</tr>
<tr>
<td>Aerators, Ethylene Oxide</td>
<td>Aerator, Ethylene Oxide</td>
<td>10045</td>
<td>Clinical Auxiliary Cleaning/Sterilizing Equipment</td>
<td>CAUCLE</td>
<td>B-Medium</td>
</tr>
<tr>
<td>Amalgamators</td>
<td></td>
<td>10082</td>
<td>Clinical Biomedical Therapeutic Dental Equipment</td>
<td>CBTDEN</td>
<td>B-Medium</td>
</tr>
<tr>
<td>Amnioscopes</td>
<td></td>
<td>10088</td>
<td>Clinical Biomedical Diagnostic Pathology</td>
<td>CBDRIG</td>
<td>B-Medium</td>
</tr>
</tbody>
</table>

- **Standard Description**: Aspirator, Dental
- **Alternative Description**: Dental Suction
- **UMDNS Code**: 10212
- **Group Description**: Clinical Biomedical Therapeutic Dental
- **Group Code**: CBTDEN
- **Risk Group**: B-Medium
HT - What you can’t see!

- NDOH PMSU – Maintenance Workstream
  - Effort to develop a National Maintenance Strategy
  - Include both Facilities and HT
  - HT Model with HR requirement to national Skills Development forum
  - Maintenance Plans to be developed in each province
In Conclusion

• How will the new IUSS standard affect clinical engineers?

• How did the discovery of the Higgs-Boson particle on 14 March 2013 affect you?
Acknowledgements