

# **Experience as an Infection Control Nurse in Introduction of Guidelines for Hospital Construction & Renovation**

Tan Kwee Yuen  
Senior Nurse Clinician  
Infection Control  
Singapore General Hospital

# Implementation Strategies

- Engage
- Educate
- Execute
- Evaluate

# Engage

- Collaborate with respective department:
- Construction Manager , Architect, Engineers, Contractors, Plant services
- The Owner
- The Client
- The Design Team (A/M/E/C)
- The End User (Operator)
- Housekeeping
- Infection Control Practitioners

# Engage

- Include leadership, role models and unit champion
- Engage executive leadership



# Engage

- Multidisciplinary team input when writing guideline
- Consultation with trained individual with expertise in infection control prevention during renovation and construction

# Educate

- Educational program include infection control Risk Assessment, risk factor, route of transmission, outcomes associated with infection, prevention measures, adverse effects of contact isolation, role of HCP, compliance rate with IPC measure



# ICRA - Steps

- 14 steps-tool

- Assess **environment** risk
- Assess **patient** risk
- Match the level of Infection Control **Precautions**



ICRA\_matrix\_pe  
rmit\_2009

| Patient Risk Group | Construction Project Type (Environment Risk) |          |          |          |
|--------------------|--|----------|----------|----------|
|                    | Type A                                       | Type B   | Type C   | Type D   |
| Low                | I  | II       | II       | III / IV |
| Medium             | I  | II       | III      | IV       |
| High               | I  | II       | III / IV | IV       |
| Highest            | II   | III / IV | III / IV | IV       |

**Class of Precautions\***

\* Class of Precautions **III or IV** requires Infection Control approval

# Educate

- Target education programs on the basis of HCP, appropriate level for all relevant personnel
- Provide evidence that supports use of selected strategies eg: using Facility Guidelines Institute (FIG) guideline or APIC infection prevention manual



Residential Health, Care, and Support Facilities

Hospitals and Outpatient Facilities

TWO-BOOK SET: Hospitals and Outpatient Facilities AND Residential Health, Care, and Support Facilities

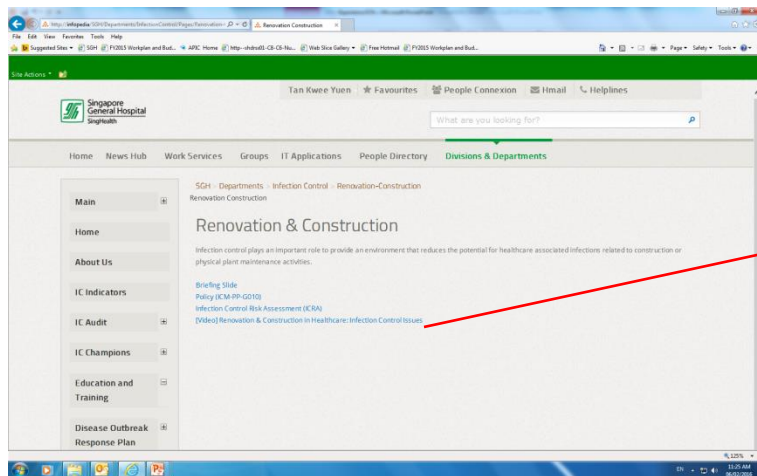
We are the authoritative source for guidance on health care facility planning, design, and construction in the United States. Our consensus-based, research-informed guidelines are used by regulators, designers, builders, and facility owners around the country and abroad to protect public health, safety, and welfare.





# Educate

- E-learning for respective staff main contractors, sub-contractor, coaching sessions and one-on-one engagement on renovation site eg: putting up hoarding, cleaning process



# Educate

- Provide standardized educational materials eg. Guidelines, skill training, observation tools
- External resources for Healthcare staff eg: CDC guideline

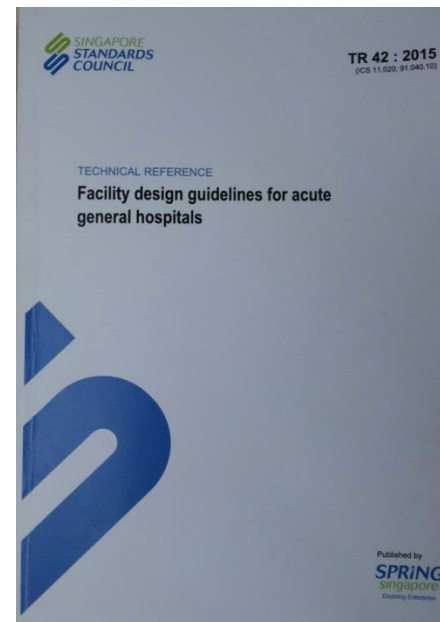
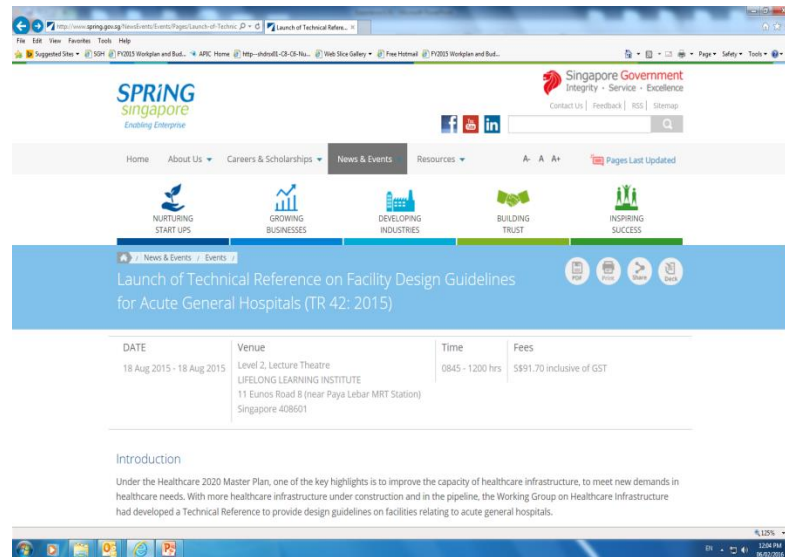
[http://www.cdc.gov/hicpac/pdf/guidelines/eic\\_in\\_HCF\\_03.pdf](http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf)

## Guidelines for Environmental Infection Control in Health-Care Facilities

Recommendations of CDC and the Healthcare Infection Control  
Practices Advisory Committee (HICPAC)

U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention (CDC)  
Atlanta, GA 30333

2003



<http://www.spring.gov.sg/NewsEvents/Events/Pages/Launch-of-Technical-Reference-on-Facility-Design-Guidelines-for-Acute-General-Hospitals-TR42-2015-20150818.aspx>

# Educate

- Conduct workshops or update session for facilities team, nursing team, other stakeholders



# **Execute : Decision making?**

- Hoarding
- Dust Control
- Management of debris
- Other Challenges

# Hoarding

- **Hoarding** : selection of type of hoarding due to patient movement and space constraint
  - Type of hoarding to select for the specific renovation
  - Is the room totally close or activity and patient care still need to continue
  - Will the hoarding affect patient movement and able to remove immediately during an emergency situation
  - How major is the project?

# “Sarong” Hoarding for small project



# Type of hoarding without patient or activity functioning



Plastic Hoarding



Plaster Hoarding



# Hoarding with anteroom

- Large, dusty projects (Class IV)
- Gasketed door frames
- Full perimeters of walls tightly sealed





# Other types of hoarding for large projects (Class IV) and external projects



Calcium silicate hoarding



Metal hoarding

# Hoarding at the source



# Cover up the soil to minimize dust migration



# Execute: Type of item available for control dust?

- **Dust control** – HEPA filter, create negative pressure room to remove dust, dust screen and etc
  - Which type to choose?
  - Who maintain the cleanliness
  - Can the item selected used for all area to control dust



# **Window netting for non air-conditioned areas (including corridors)**

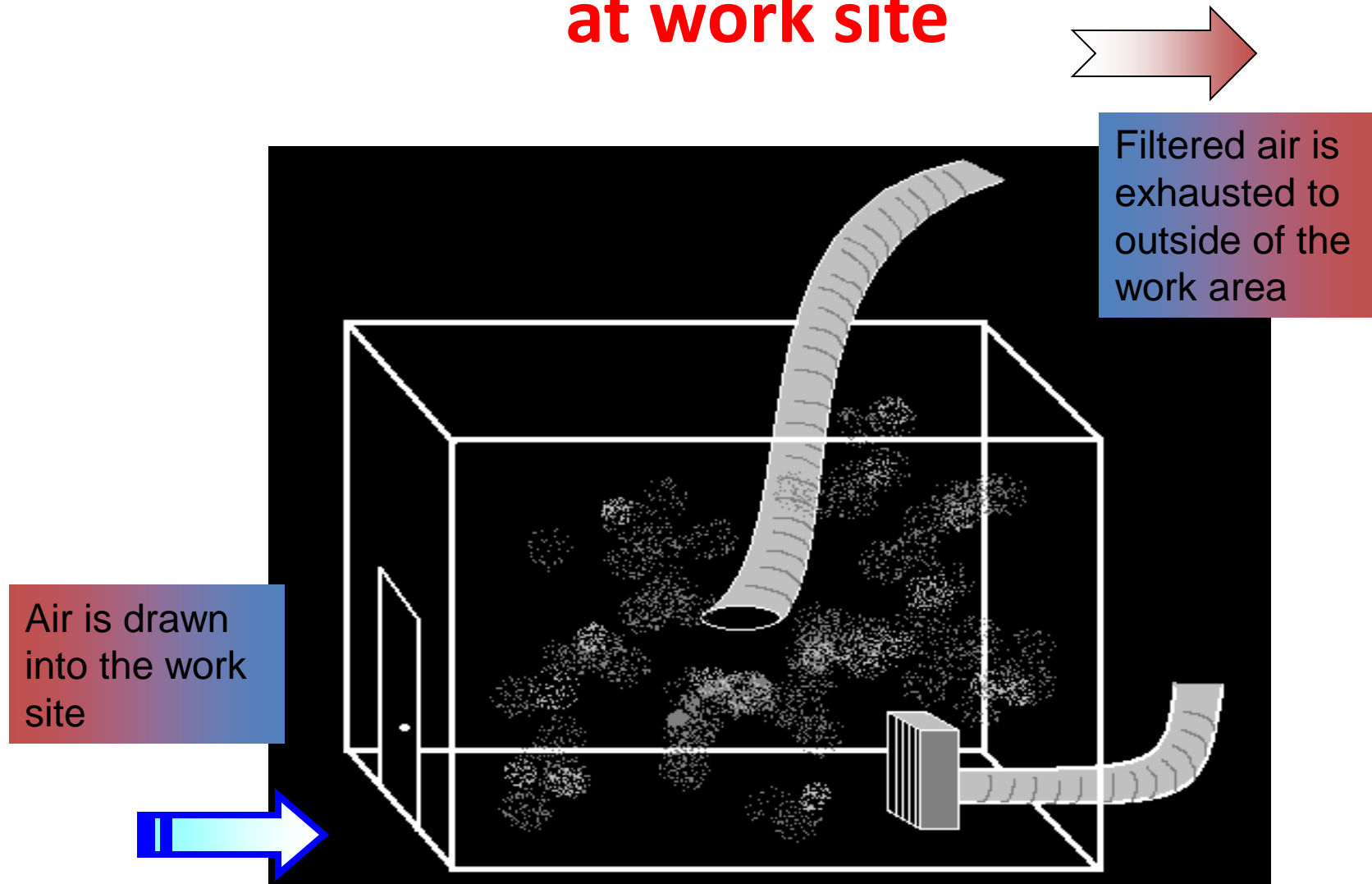




Regular maintenance: vacuum + wash weekly



# Creating negative pressure at work site



# Negative pressure HEPA filter



- Capture particulates
- Create negative pressure at the site in relative to adjacent areas
- Filters are to be sealed and bagged securely at point of use before disposal





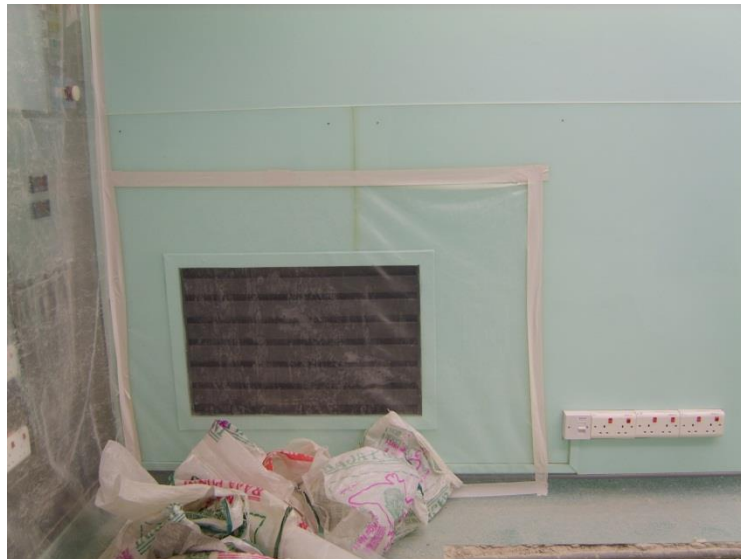
# Portable HEPA Filter

- Portable HEPA filters are used at areas with high risk patients
- Trained staff to change filter and technical support from vendor



# Methods to maintain negative pressure within the work site: Isolate HVAC

- Seal air vents, air intakes, grills
- Shut down HVAC system
- Add filters



# Use dust / tacky mat for dust containment





# Cleaning during and after renovation

- Damp mop the adjacent areas frequently
- Cleaning; manpower support for weekend
- Cleaning solution use such as sodium hypochlorite 5000ppm



# Execute: How to remove debris from renovation site

- **Debris Management**
  - How to conceal waste during transportation
  - Choose the appropriate route
  - Appropriate time to remove debris

**Bag debris into securely tied bag and  
remove daily  
(at agreed hours – low traffic period)**



# Transport debris in a cart with lid



Wipe down the outer surface before leaving the work site



# Designated route for debris transportation



Additional layer of vinyl flooring

A photograph of a dark, polished floor, likely in a hallway or room. A bright light source, possibly a doorway or window, is visible in the background, creating a strong reflection on the floor. The floor has a mottled, dark grey or black appearance with some lighter patches. The text "Change to clean attire before leaving the site" is overlaid in white at the bottom right.

Change to clean attire  
before leaving the site

# Traffic control

- Minimize procedure and waiting time near work zones
- Use a separate route – away from patients and staff

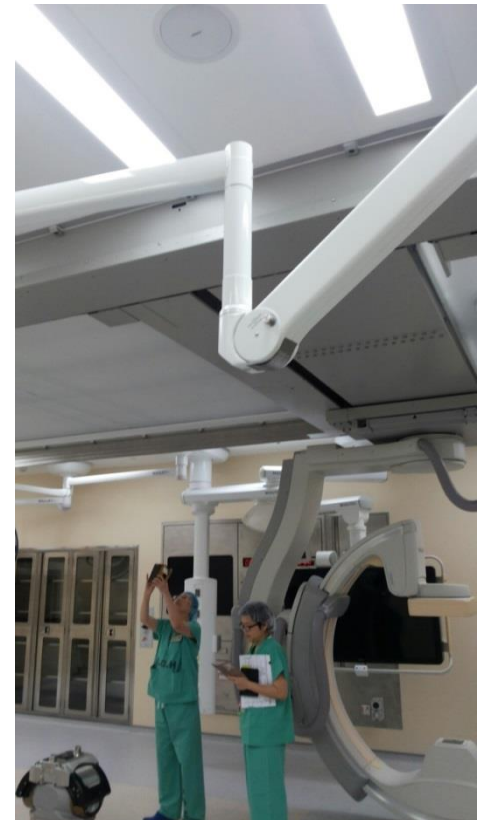


# Other Challenges in execute phase

- Operation theatre: timeline constraint
- Water supply during water shut down
- Constrain in improving air exchange, install HEPA filter due to old building
- Constrain in creating sink in upgrading site due to existing piping and drainage system and selection of tap to prevent splashing
- Changing of new sink using mushroom pop up to facilitate cleaning
- Remodeling ward:
  - Propose to decrease number of beds for creation of toilet facilities in individual cubicle
  - Decanting of patient: bed limitation

# Operating Theatre

- Operating theatre(OT): timeline to include microbial sampling prevent delay in re-opening OT



# Water Supply

- Water supply during water shut down
  - Emergency Water Supply Planning Guide for Hospital and Healthcare Facilities, Atlanta;U.S. Department of Health and Human Services;2011 (recommendations of American Water Work Association and Centers for Disease Control and Prevention), accessible from <http://www.calhospitalprepare.org/sites/main/files/file-attachments/emergency-water-supply-planning-guide.pdf>



# Creation of HEPA filter for isolation ward

- Constraint in improving air exchange, install HEPA filter due to old building
- Involve expert input in creation of HEPA filter in new isolation ward in an old building
- Discuss guideline to check alignment with national law with respect to air discharge



# New sink creation

- Constrain in creating sink in upgrading site due to existing piping and drainage system
- Selection of tap to prevent splashing





# Sink Drainage System

- Replacement or changing of new sink drainage system using mushroom pop up to facilitate cleaning

Old sinks drainage system with grooves



Grooves

New sinks drainage system without grooves



# Remodeling ward

- Propose to decrease number of beds for creation of toilet facilities in individual cubicle
- Decanting of patient: bed limitation



C class Bed



B2 class Bed

# Evaluate

- Assess compliance with infection prevention practices
- Review and update educational materials
- Monitor renovation and construction outcomes
- Monitor the trend on aspergillous

# **Assess compliance with infection prevention practices**

- Performed by site contractor or supervisor
- Performed by Infection Control nurse on site inspection

# Monitor renovation and construction outcome

- **Fungal Air Sampling** : Random air sampling is conducted 6 monthly at selected areas to monitor fungal spore counts during major construction



**THANK YOU**