

# Sputum Booth Concept and Prototype Development

## Objective:

The objective of this activity was to produce a standardised, best practice concept for sputum booth applications.

## Background:

Most TB patients accessing services at healthcare facilities require access to facilities for sputum induction and collection. Sputum induction and collection is considered a high risk activity due to the nature of TB transmission and the methods normally used. For this reason facilities are required that reduce transmission risk during the procedure to acceptable levels. The normal method is to achieve airborne contamination control through both isolation and aerodynamic effects. That implies the separation of the procedure from other activities and using ventilation to rapidly reduce the airborne contamination levels in the space used for the procedure. The best accepted infrastructure intervention for achieving this is by the application of a dedicated ventilated sputum collection booth. Sputum booths can be either mechanically or naturally ventilated.

## Deliverables:

Three types of sputum booths were to be conceptualised as part of the program. These were a naturally ventilated booth, a free-standing mechanically ventilated booth for indoor use and a compact device for sputum induction and collection of bed-bound patients.

## Discussion:

Two designs of outdoor, naturally ventilated sputum booths were conceptualised and detailed.

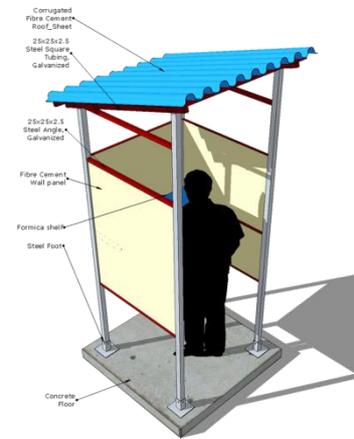


Figure 1

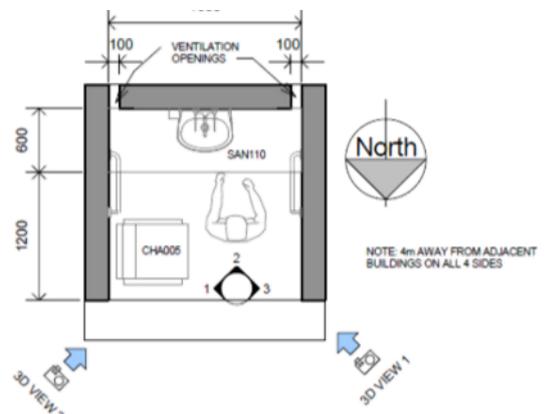


Figure 2

A **lightweight and low cost sputum booth** was developed for use in remote rural settings and was published as part of the IUSS TB services guideline. This design is suitable for off-site construction and remote deployment. It offers a minimum of privacy and shelter during use but is provided with no services such as lighting and water (See Figure 1). This design was the result of an effort to incorporate and standardise the best of numerous similar booths seen in the facilities across South Africa.

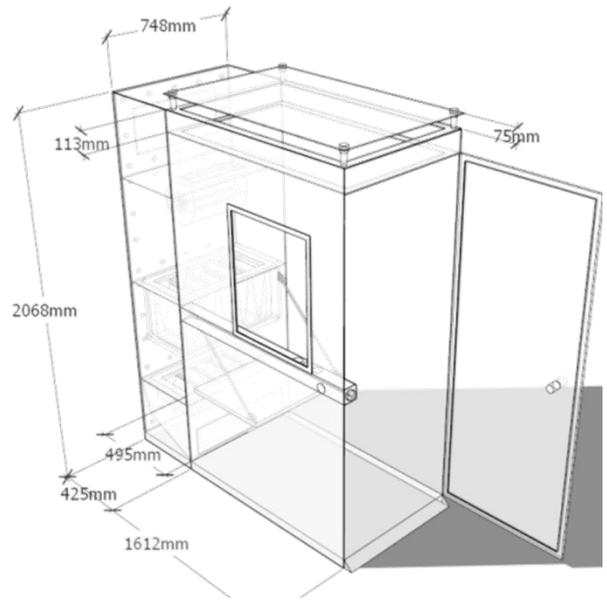


Figure 3

A **masonry construction sputum booth** concept was developed and published as part of the same IUSS TB services guideline. This booth offers a higher level of privacy and comfort. Also services such as hand rails, seating and hand washing facilities are included in the plan.

For indoor applications, a **mechanically ventilated sputum booth** was developed.

The CSIR developed and constructed a complete prototype of this concept. The device is a fully mobile enclosed sputum collection booth. The concept included a novel solution in that it is compact enough for transport through a facility by lifts and regular single door openings (see Figure 3). It includes a mechanical exhaust ventilation system with integral EN1822 H13 aerosol filtration. Pre filtration is included to provide protection to the HEPA filter. The booth can accommodate a wheelchair bound user and includes an electronic door interlock which can ensure that sufficient time elapses between users for air flushing. The air distribution regime applied within the booth is a near plug flow with a downward velocity of 0.45m/s (see Figure 4)

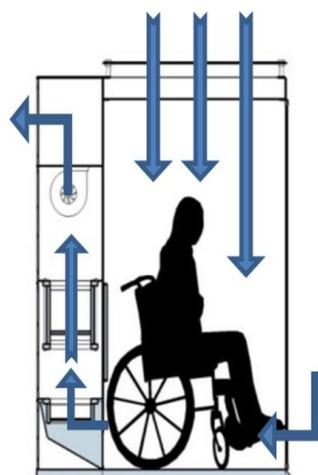


Figure 4

The prototype was demonstrated at the PEPFAR Partners TB IC Seminar on the 28th of February 2014 and delivered to Kalafong hospital on the 14 August 2014 for use at their TB Focal Point (see Figure 5)

On the 14 – 15 August, on-site safety tests and training of end-users and relevant hospital managers were conducted. This prototype remains in operation at Kalafong as the time of writing.

***Lessons learned:***

During the development and application of the mechanical and lightweight sputum booths the team found that clinical staff were very receptive of the concept of safer sputum collection. There was, however, a perception that a mechanical sputum booth would be a superior and safer solution. The team does not share this perception as a naturally ventilated booth can offer higher degrees of separation and



Figure 5

ventilation. This resulted in the drafting on a defined order of preference for the selection of booth types in the IUSS TB Services guide. The guide recommends that mechanical booths only be implemented where there is no option for an external naturally ventilated space.