

# Symposium Addresses Plumbing Systems' Role in Spread of SARS

Jill Dirksen, ASPE Technical Director

The World Plumbing Council—with the support of the International Association of Plumbing and Mechanical Officials (IAPMO) and the sponsorship of ASPE, ASSE, PHCC and many other plumbing-related societies across the country—held an International SARS Symposium in Los Angeles February 11-12, 2004. Consisting of individuals from around the world, the meeting's main focus was to identify the role plumbing systems played in the spread of the SARS (Severe Acute Respiratory Syndrome) Coronavirus.

Russ Chaney, executive director of IAPMO, hosted the two-day symposium and started it off by reporting on the World Health Organization (WHO) SARS meeting held in Rome, Italy, September 23- 25, 2003. It was at this meeting that the WHO identified inadequate plumbing as a contributor to the spread of SARS and saw the need to invite the plumbing industry "to the WHO table." The WHO acknowledges that expertise in the plumbing industry would further contribute to increasing the knowledge of proper plumbing systems and their necessity around the world.

At the World Plumbing Council (WPC) meeting, held in the summer

**Julius Ballanco, PE, President of JB Engineering and Code Consulting, P.C., makes his presentation, "Floor Drain Trap Seal Protection," on the first day of the symposium.**



of 2003, a presentation by Henry Hung was the impetus for the International SARS Symposium. It was his research—the concentrated study on and evaluation of what is considered the source of the first SARS outbreak, the Amoy Gardens Apartments in Hong Kong, SAR, People's Republic of China—that played an important role in the material presented at this SARS Symposium.

Both days of the symposium the attendees were welcomed by Bob Courtner, IAPMO president and Stuart Henry, chairman of the World Plumbing Council and executive director of the Master Plumbers and Gasfitters Association of Western Australia. Stuart later gave a presentation on training and the challenges surrounding global skills development for plumbing.

## Outbreak of SARS at Amoy Gardens

Allen Inlow, IAPMO's chief field officer, presented a paper by Henry Hung (vice chairman of the World Plumbing Council and owner of Rigid Plumbing Ltd.) detailing Hung's extensive site research of the SARS outbreak at Amoy Gardens as it relates to plumbing systems. Hung began by identifying the index case, a physician from Shenzhen, People's Republic of China, who visited his brother, a resident at the Amoy Gardens Apartments. While visiting, the physician had diarrhea and used the bathroom. (Fecal matter carries the SARS Coronavirus. Other bodily fluids that may carry the virus are vomit and urine.) As a result, a pathway for the virus to potentially affect Amoy Gardens had been established.



Hung noted several things that possibly contributed to the spread of the SARS Coronavirus. These were:

**Water Shortage.** When the outbreak happened, water was at a shortage. Occupants of each of the living spaces used saltwater to flush toilets or maintain a floor drain trap seal. Saltwater was provided at each building, but the occupants had to carry it up to their respective quarters to maintain the system. It is not uncommon for Asian countries to utilize saltwater to maintain plumbing systems where gray water may be used for such systems. Still, a drawback is degradation of the plumbing system due to salt build-up and possible corrosion.

**Cleaning Methods.** Because an automatic trap primer was not installed, the sanitary systems relied on regular water usage in order to sustain a trap seal for each fixture. Wash-down techniques for cleaning had been replaced with mopping. This change, ever so slight as it may be, affected the amount of water floor drains received. As a result of evaporation with no means of water to replenish, the trap seal may have been compromised and lost.

**Exhaust Systems.** Exhaust fans at Amoy Gardens Apartments not only exhausted the bathroom, but also provided the means with which the tenants cooled living spaces. Hung reported that fans were sized ten times larger than required for the bathroom exhaust systems to help cool the rest of the living space sufficiently. Due to the conflict of exhausting *and* cooling the spaces, a balance for these systems could not occur. A demand for a larger volume of air from the exhaust fan had to be compensated in some way. Hence, the fan pulled air from any

Photos by ASPE.

source to balance the system. One such source could have been a trap that had lost its seal.

When trap seals evaporate they leave a pathway for sewer gases to escape or be pulled into the living space. Within the sewer gases, pathogens may be carried in an aerosol form. In the Amoy Gardens case, the SARS Coronavirus was capable of being carried on an aerosol such as fecal droplets. Later in the symposium Mark Sobsey further discussed animal and human pathogens within our environment. The public safety and concern is a real one, especially in light of the SARS outbreak, he said.

### Review of Building Systems, Layout, and Research

An interesting part of the evaluation and identification of the problem in the Amoy Gardens test case is that coordination and integration of building systems and layout must be reviewed. Hung discussed the location of the piping risers with respect to light-wells for the living spaces and ventilation systems. Strong upward wind currents channeled and allowed fecal droplets to spread through the light-well from the source, and possibly, to other living spaces.

Even after code review, changes happen in the field—furthering the attention to integration of building systems and layout. John Garvelink, co-owner of Commercial Design engineering, Ltd., and Malcolm Sweet, president of Condaire, Inc., talked about the relationships between all parties involved in the construction of a building—from concept to final inspection. Relationships ensure quality of work, but also the health and safety of those workers on any given project. Garvelink and Sweet emphasized the role local, state, and national contractor associations take to support the process of awareness, training, and certification.

John Swaffield, head of the School of the Built Environment, Heriot-Watt University, Edinburgh, Scotland, and Dr. Lynne Jack, a lecturer in Environmental Services Engineering at the School, made a presentation focused on multi-level drainage systems and its effect on trap seal retention. Visual inspection of

a trap seal may not always prove sewer gases to be restricted from entering a facility, they noted. The main ways air from one side of a trap seal travels to the other are as follows: Pressure on the system pushing (air-entrained) bubbles through a trap seal without any loss of the trap seal, partial trap seal loss while air is pushed through the trap, and the obvious—complete loss of a trap seal allowing sewer gases to pass freely. When a system failure occurs, cross-contamination is likely. Swaffield and Jack also simulated what happens to one toilet when another toilet is flushed.

How do we prevent trap seal loss? Julius Ballanco, PE, President of JB Engineering and Code Consulting, P.C., shared with the attendees the answer to this very question. Trap primers activated by pressure drop on a line or fed by gravity and mechanical devices may all prevent trap seal loss. Ballanco discussed the first two methods and noted how these two methods may potentially be misused. Most designers understand how these two methods work but need to remember where to use them, he said.

The third method Ballanco discussed, mechanical devices, are simple yet effective. Fitting directly under the floor drain grate, this round disc allows water to pass to the sanitary system as required. However, it also restricts sewer gases from entering into the occupied space. This restriction is achieved by 'flaps,' which work on the concept of weight and pressure. When water drains, the weight of the water opens the flaps, allowing the water to pass. Conversely, sewer gases traveling back to the floor drain close the flaps by applying pressure to the underside and sealing it against the body of the device. Pressure the device may with-

stand is around 2 inches water column. (Currently, Ballanco is on Working Group 1072, Floor Drain Trap Seal Protection Devices, the standards committee developing the guidelines to ensure these devices perform.)

### Certifications and Consensus

Shahin Moinian, Senior Director of IAMPO Research and Testing, Inc. detailed the role of certification of products to codes and standards and the actual use of such products. Moinian also explained the process that certification bodies go through to obtain accreditation and maintain it. Over time, systems may deteriorate and fail as they did at Amoy Gardens. Product re-certification—through periodic

**More than 100 public-health, plumbing, and building professionals from seven countries heard a variety of presentations. Attendees were allowed to ask questions after each presentation.**



inspection of plumbing systems—maintains the level of quality set forth by codes and standards.

Even after identifying the problem, establishing simulations, and providing materials and equipment that meet a minimum level of acceptance, proper installation is still important. Mike Massey, executive director of the Piping Industry Progress and Education Trust Fund (P.I.P.E.) and executive vice president of the National Inspection Testing and Certification Corporation, covered the application of certifying personnel and how it can increase public safety and health. Certification and training programs for those installing plumbing systems are in place across the country.

Journeymen and Apprentices of the United States and Canada (UA), shared how these programs are promoting the skilled trades and a high level of craftsmanship. She went on to say that individuals may choose to enhance their knowledge through a college education, and the training programs allow the transition to happen smoothly.

### Reaching Consensus

To conclude the technical portion of the Symposium, Charles Watson, professor of public health and executive dean of health sciences, Curtin University of Technology, Perth, Western Australia, briefly outlined the topics covered at the symposium: How the virus first appeared at Amoy Gardens Apartments, research that has been conducted on improperly vented systems and the associated loss of trap seal, means and methods to prevent trap seal loss, promoting the plumbing trades to ensure quality installation, and identifying the role re-inspection or re-certification plays in maintaining an installed system.

As the symposium began to wind down, attendees began the work of formulating a consensus statement rep-

resenting the plumbing industry as a whole to present to the WHO. During the time set aside to formulate a consensus statement, a three-person panel, consisting of Bob Miodonski (editorial director, *Contractor* magazine), John Smartt (head of plumbing and refrigeration, School of Construction, Dublin Institute of Technology), and Michael Frost (director, Michael Frost & Associates Pty. Ltd.), presented a statement to start discussion and formulation among the group.

Unfortunately, the consensus statement was not finalized at the symposium. This was understandable given the lack of prior notice of the attempt to be made and because of the many facets of the plumbing industry. Incorporating all the potential information and possibilities into one concise document is going to be difficult enough; doing it in a few hours proved an unaccomplishable Herculean task. However, the panel has been charged to work on the draft. It will formalize all of the comments from the floor (including a draft statement submitted by ASPE) and mesh them with the proposed draft originally presented to the group in attendance. Within the

next few weeks, the panel will submit the revised document to those who were at the symposium for review and to request comments and corrections. The finalized statement is to be presented to the WHO and represent the plumbing industry as a whole. (If, as a member of ASPE, you have some experience with the SARS virus and/or other information that would be relevant for a consensus statement, please be sure to contact the ASPE Technical Director, Jill Dirksen, at the ASPE office.)

Finally, many things are still not known which contribute to the final resolve of reducing or even eradicating this virus from living spaces. It will take a conscious effort from us all to ensure on this particular issue and other issues the safety of the general public, the world, and ourselves. ■



*Jill Dirksen is Director of Technical Services for ASPE. If you have additional questions, comments or concerns, Jill may be e-mailed at [jdirksen@aspe.org](mailto:jdirksen@aspe.org).*

### The ASPE Role at the SARS Symposium

When ASPE was asked to become a sponsor of the World Health Organization's symposium on SARS (along with numerous other organizations), Board of Directors agreed given its importance for the public's health and safety, and because it seemed to be a worthwhile endeavor for the plumbing industry. However, in the interest of "speed, timeliness and cooperation," the agreement was provided without an actual printed or final agenda available for consideration.

In this regard, part of the final agenda included the concept of building a consensus for a statement from the U.S. plumbing industry. While laudable, this action proved to be unachievable given the limited time available, and with no forewarning, made it impossible for interested parties to be prepared or provide any pre-symposium material on the subject. However, ASPE did, prior to the consensus-building portion of the meeting, enter a quickly drafted proposed potential consensus concept. In hindsight, this quickly drafted paper proved important, as it provided a balance to a consensus paper "drafted" during the symposium by a predetermined group of individuals unknown and unannounced until the symposium and resulted in a "different" view of the proceedings for consideration. This, in turn, helped slowed the consensual agreement

process down so as to allow interested parties more time to consider what would be the "consensual" output from this symposium.

The program was billed to be all about SARS, but as the program unfolded, it became obvious that among the participants there were many separate organizational agendas. First and foremost, the number of technical papers presented on SARS and related plumbing-industry information was limited. However, those that were presented provided excellent material.

Among some of the attendees and within a number of the presentations, there was an obvious bias against "mechanical" devices used within plumbing systems. This in itself seems ludicrous given all the "mechanical" devices that are already a basic part of a plumbing system: Water closets, bath and kitchen fixtures, and even some piping systems.

Another bias seemed to be on what material should or should not be presented on behalf of the world organization. Given the many pathogens that are evident throughout a plumbing system, it would have been useful to have more information on how other viruses/bacteria are dealt with in hospitals and other commercial and institutional environments. Although there would seem to have been lots and lots of potential technical material available, much of it was not available or presented — a significant disappointment to this attendee.

—Stanley Wolfson, ASPE Executive Director

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