JENSEN HUGHES

Advancing the Science of Safety

PRIVATE MODE FIRE ALARM SYSTEM OPERATIONS AND CASE STUDY

Shamim Rashid-Sumar, P.E.

30 April 2017

Safety Design in Buildings

Riyadh Conference

Sunday, April 30, 2017, Moevenpick Hotel Riyadh

PRESENTER

Shamim Rashid-Sumar, P.E..

Vice President – Development, Middle East – JENSEN HUGHES

Ms. Shamim Rashid-Sumar has over 16 years of experience in building and fire code consulting, fire dynamics, timed egress modeling, and performance based design. Since graduating with a B.S. in Fire Protection Engineering from the University of Maryland, she has performed fire protection evaluations, prepared fire and life safety strategies and design specifications, fire alarm system design, and other engineering analyses and studies.

As a registered Professional Engineer in the United States, she has worked on a multitude of projects including government facilities, hospitals and medical centers, airport terminals, high-rise buildings, hotels, and shopping malls.

Shamim was instrumental in establishing and currently serves as President of the UAE International Chapter of the Society of Fire Protection Engineers (SFPE). She is also an NFPA 101 International Instructor, a member of the UAE Code Committee, and a member of the SFPE International Committee on Membership and Chapters Relations.

LEARNING OBJECTIVES

- Understand Private Mode Fire Alarm Operation
- Describe the cost impact and operational advantages to Private Mode
- Indentify areas where Private Mode may help a facility
- Understand application of Private Mode in Case Study

The purpose of this presentation is to convey technical knowledge to the conference participants.

The presentation also contains slides with text that summarises the content of the presentation and the main learning objectives.

These may be used to update CPD records for relevant organisations including the Chartered Institute of Building (CIOB).

FIRE SAFETY CONCEPTS TREE – NFPA 550

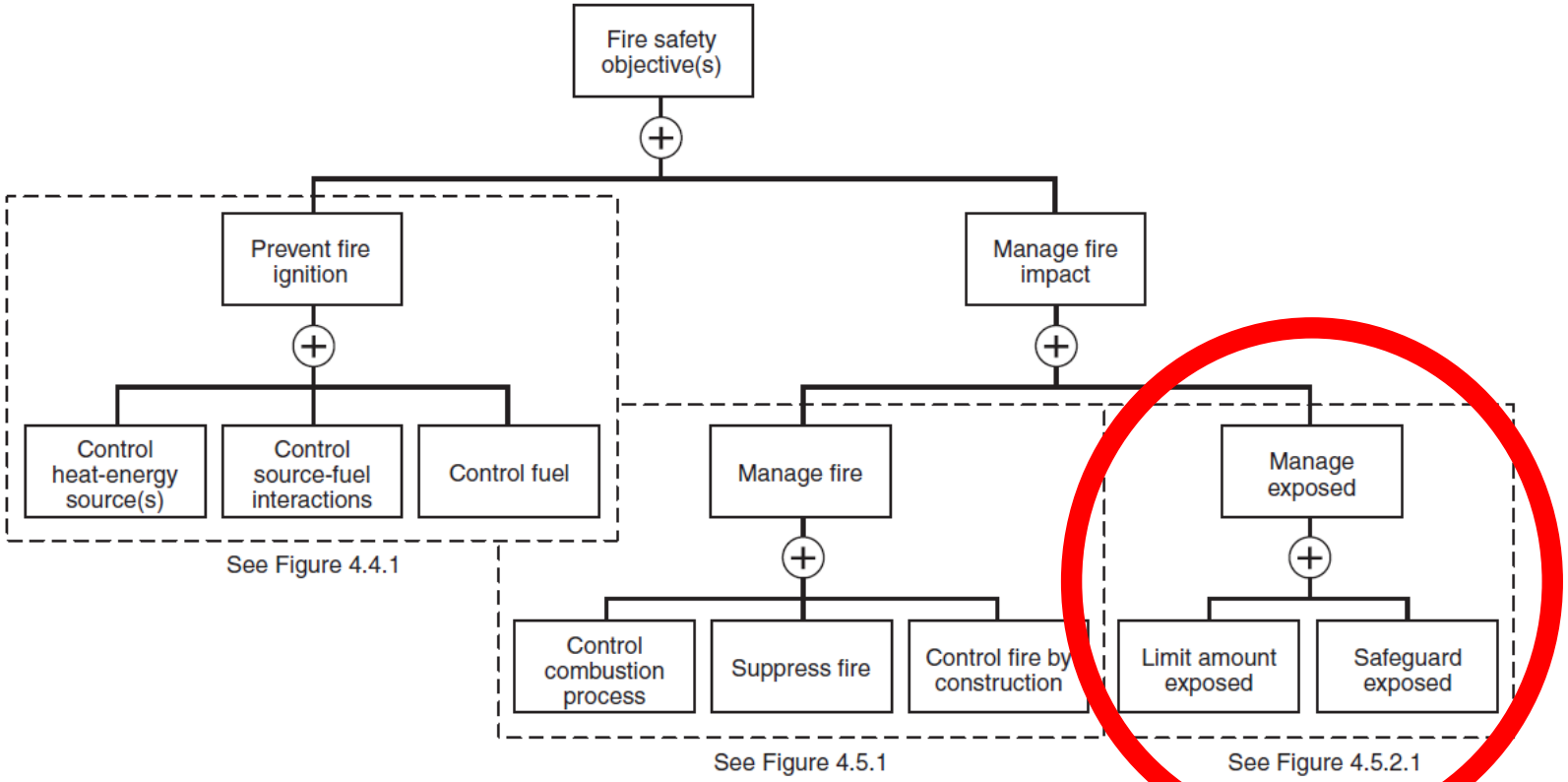


FIGURE 4.3 Top Gates of the Fire Safety Concepts Tree with Selected Lower-Tiered Gates.

FIRE SAFETY CONCEPTS TREE – NFPA 550

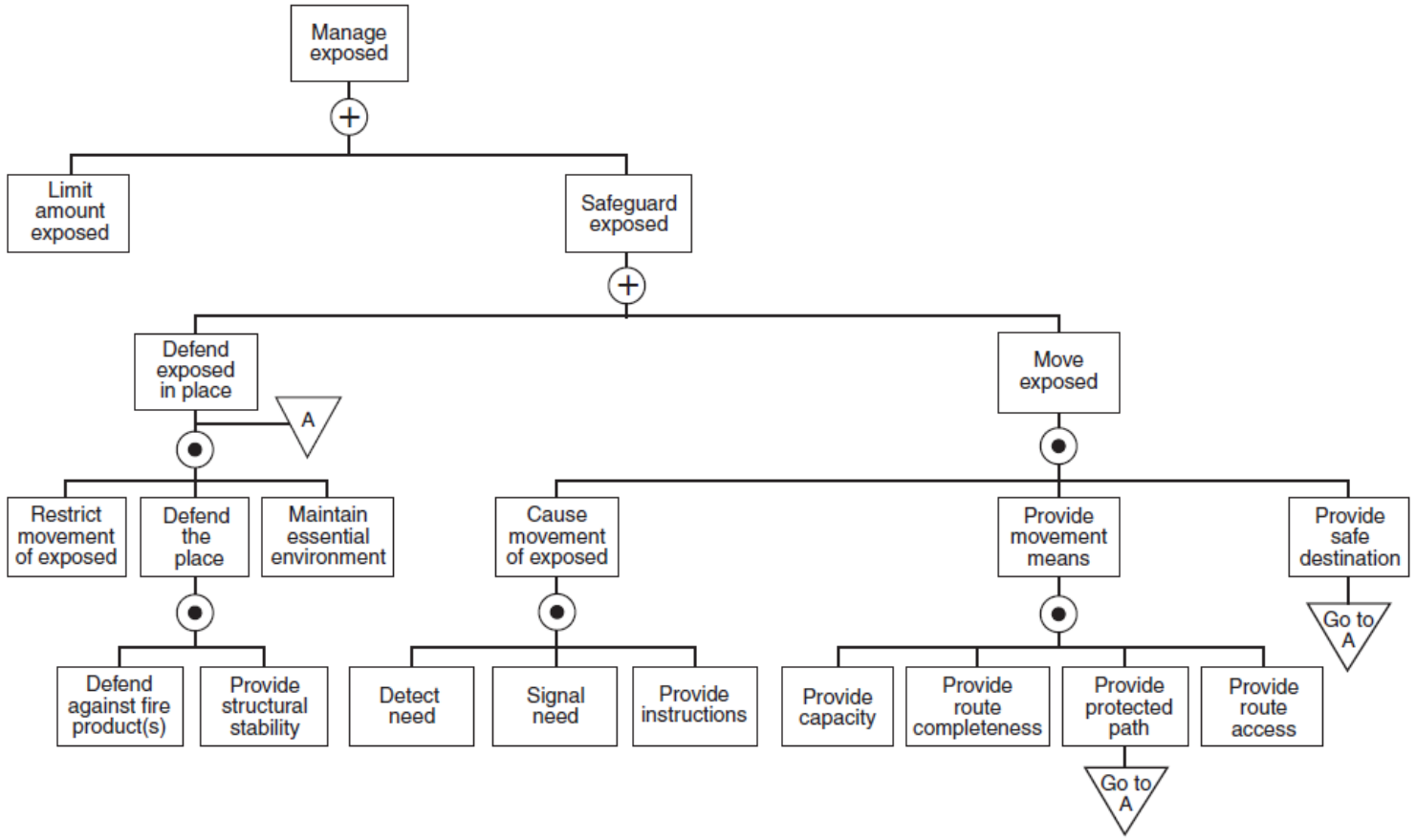
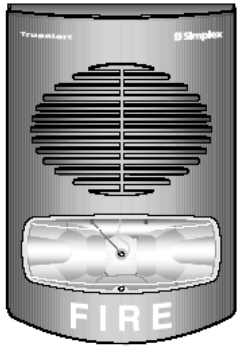


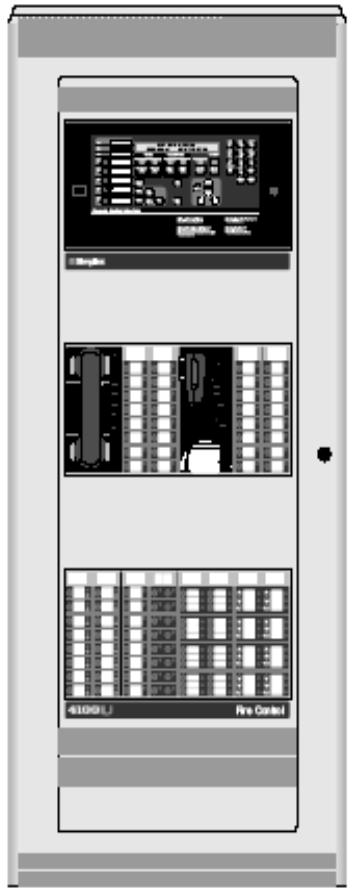
FIGURE 4.5.2.1 "Manage Exposed" Branch of Fire Safety Concepts Tree.

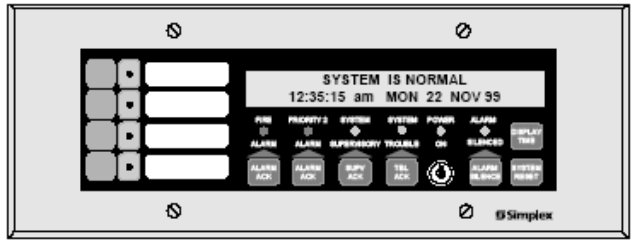
PUBLIC MODE

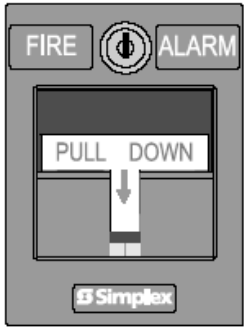
TYPICAL FIRE ALARM SYSTEM OPERATION

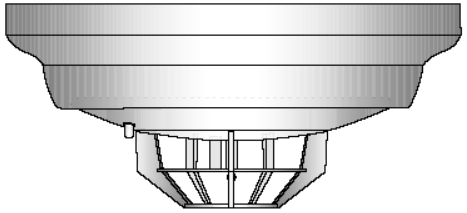
- Sounds in all occupied areas
- Visual alarms in all occupied areas
- At least 15 db above ambient noise
- Evacuation begins





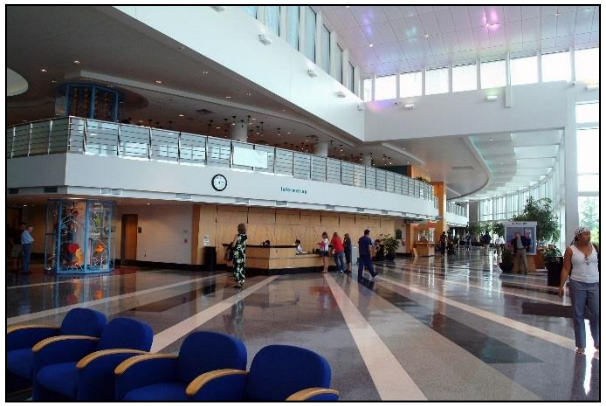






HEALTH CARE USES

HEALTH CARE USES






PRIVATE MODE

- Allowed when occupants are not capable of responding without assistance (Defend in Place Occupancies)
- Alerts *only* responding staff
- Audible and Visual alarms in staff areas (coded chime systems)
- Systems often have a *general alarm* feature
- Sound pressure levels 10 db above ambient
- Fire emergency response begins

COST IMPACTS OF PRIVATE MODE

- Less total equipment required
- Less on-going maintenance
- Negotiation costs for first approval

ADVANTAGES OF PRIVATE MODE

- Staff only is alerted. Patients and guests are part of the defend in place strategy.
- Only the affected area and personnel are involved.
- Audible and visual alarms can be omitted in critical care areas such as OR’s.
- Less disruption to non-affected areas of the facility.

AREAS FOR PRIVATE MODE USE

OPERATING ROOMS

- Procedures cannot stop for fire emergencies remote from the OR.
- Emergency procedures within the OR’s are well defined.
- Patients are not capable of responding and are fully dependent on staff.

AREAS FOR PRIVATE MODE USE (CONT'D)

PATIENT SLEEPING AND BEDROOMS

- Staff is present at all times.
- Notification of the staff from the public areas is possible.
- Patient room fire alarm tone or visuals are not required to alert the staff.
- Guests are best instructed by the staff.

CASE STUDY OVERVIEW

PROJECT DESCRIPTION

- Identification of unusual requirements
- Creative application of NFPA 72-2010
- Gaining project acceptance by AHJ
- Engineering fire alarm system component applications to meet project requirements
- Final testing and City acceptance

PROJECT DESCRIPTION

- Phoenix Children's Hospital constructed a new neo-natal intensive care facility in the Banner Good Samaritan Hospital High Risk Labor and Delivery Unit in 2010.
- The completed NICU will have 60 rooms, 6 nurses' stations and a family support area.
- Ratio of staff to patients will be 2.5:1

PROJECT DESCRIPTION

The patient care area is access-restricted and the family support area is open to the Hospital public areas.

UNUSUAL FIRE ALARM REQUIREMENTS

BASED ON PATIENT CARE NEEDS

- Normal fire alarm signals arguably are detrimental to patient's (neonate's) well being.
- Life support equipment utilizing muted alarm sounds of the same frequencies as fire alarm sounds.
- NICU unit is integrated in an existing high-rise hospital with standard high-rise fire alarm system.

IDENTIFICATION OF POTENTIAL PATIENT REACTION TO FIRE ALARM SIGNALS

- Flash rate and intensity of standard strobe lights could cause retinal burns to the infants because they cannot blink their eyes fast enough.
- Harsh fire alarm alerting sounds could cause a Vaso-Vagal response which could lead to seizures.

PHOENIX CHILDREN'S HOSPITAL™

To whom it may concern;

I am writing this letter to request careful consideration to the fire emergency notification system that is being designed for implementation in Phoenix Children's Hospital McDowell Campus NICU.

Premature infants are not neuro-developmentally prepared to appropriately handle the impact of fire alarm strobe light intensity. Alarm sounds are also detrimental to the delicate sensory development of our neonates.

If you should have any question or require a more detailed discussion with me on this subject please feel free to contact me at [redacted]

Sincerely,

Mark Shwer, MD
Medical Director
Phoenix Children's Hospital
Neonatal Intensive Care Unit

PROJECT DESCRIPTION

- The NICU facility was constructed adjacent to the high incidence pregnancy unit in Banner Good Samaritan Hospital.
- High incidence patients have life threatening conditions to either the patient or the infants.
- Due to the high number of infants who require life support for an extended period, the Phoenix Children's Hospital NICU was located in Good Samaritan Hospital.

PROJECT DESCRIPTION (CONT.)

- Good Samaritan is a high-rise building with an NFPA 72, IBC high-rise fire alarm and voice evacuation management system.
- This system configuration required a separate voice control panel for the NICU integrated into the existing Notifier fire alarm system.

SOLVING THE PROBLEM

- Research the IBC Building Code and IFC Fire Code for applicable sections.
- Research NFPA 72 for possible alternative alarms.
- Utilize information gathered from research to conceive a potential solution.
- Prepare and submit documents to the City of Phoenix for approval.

IBC - 2012 EDITION AND IFC - 2012 EDITION

APPLICABLE CODE SECTIONS

- IBC 907.2.6 Exception and IFC 907.2.6 Exception
  - Allows the use of Private Mode in accordance with NFPA 72

NFPA 72 – 2010 EDITION

APPLICABLE CODE SECTIONS

- Section 10.7.2 allows distinctive signals
  - 10.7.2 – Audible alarm notification appliances for a fire alarm system shall produce signals that are distinctive from other similar appliances used for other purposes in the same area.
- Section 10.7.6 – The distinction among signals shall be as follows:
  - (1) Fire alarm signals shall be distinctive in sound from other signals, shall comply with the requirements of 18.4.2.1 and their sound shall not be used for any other purpose.

NFPA 72 – 2010 EDITION

APPLICABLE CODE SECTIONS (CONT'D)

- Section 18.4.4 addresses the sound levels for private mode operation which will fit nicely into the application. It states:
  - 18.4.4.1 – To ensure that audible private mode signals are clearly heard, they shall have a sound level at least 10 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 1.5 m (5 ft) above the floor in the occupiable area, using the A-weighted scale (dBA).

NFPA 72 – 2010 EDITION

APPLICABLE CODE SECTIONS (CONT'D)

- Section 14.4.13 requires voice messages to comply with Intelligibility requirements of 18.4.10.
  - 18.4.10 – Where required, emergency voice/alarm communications systems shall be capable of the reproduction of pre-recorded, synthesized, or live (e.g., microphone, telephone handset, and radio) messages with voice intelligibility.

NFPA 72 – 2010 EDITION

APPLICABLE CODE SECTIONS (CONT'D)

- Section 18.4.1.2 – Sound pressure levels shall not exceed 110 dB
- Section 18.6 – Visible notification appliances used in the private mode shall be of a sufficient quantity and intensity and located so as to meet the intent of the user and the authority having jurisdiction.

PROPOSED SOLUTION

- Utilizing the Code references, and with an understanding of the role that the Hospital's trained staff plays in the infant's safety, we proposed the following application that, while unusual, is code compliant and meets the most unusual needs of the critically ill neonatal infants.
  - Proposed the use of classical music as the "distinctive sound" for the alarm signal followed by a pre-recorded voice message given in a soothing female voice.
  - The specific music selected is from Aaron Copeland's American Opera "The Tenderland". This piece was selected because it is pastoral in nature and is played by a full orchestra. The full orchestration allows for multiple frequencies of sound that would be heard by most occupants.

APPEAL TO THE FIRE MARSHAL

- While we felt that our application of opera music was allowed by the Codes, we filed an Appeal to the Fire Marshal to document their agreement with the application.
- We also included a request to eliminate strobe lights in the patient care areas only.
- The appeal included several items not required by Code, but dictated by the special nature of “defending in place” for the babies.

ITEMS INCLUDED IN THE APPEAL

- Strobe lights in all nurses' stations, offices, support rooms and areas, washrooms and public areas.
- Fire alarm annunciators in all nurses' stations that annunciate all patient rooms in the NICU.
- Speakers and strobes in all family support areas
- Voice system override from Hospital Fire Command Center "all call" microphone.

ITEMS INCLUDED IN THE APPEAL (CONT'D)

- Special training of all assigned staff in responding to the fire alarm system with detailed lesson plans, sign in sheets and tests.
- The use of "private mode" signaling as allowed by NFPA 72.
- Speakers would be generously distributed in the patient care areas.

NICU CORRIDOR

PATIENT CARE AREA

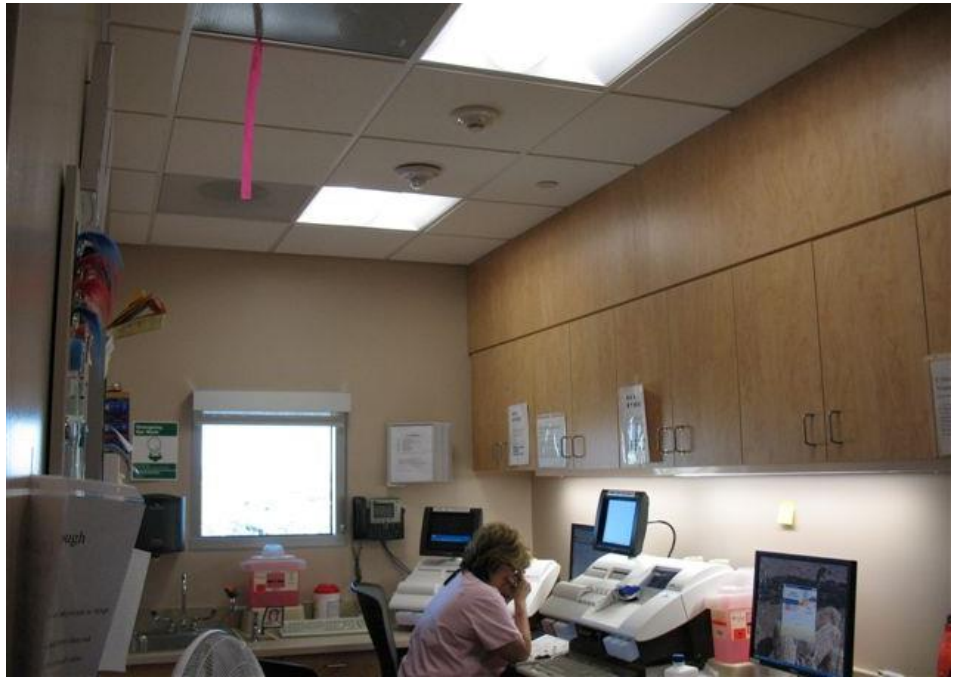
SPEAKER AND SMOKE DETECTOR

ANNUNCIATOR IN NURSES' STATION

SPEAKER WITH STROBE IN NURSES' STATION

NICU OFFICE

SPEAKER/ STROBE



PHARMACY SUPPORT AREA

SPEAKER/ STROBE

FIRE MARSHAL RESPONSE

THE FIRE MARSHAL ALLOWED THE APPEAL AND ACCEPTED THE DESIGN WITH SEVERAL STIPULATIONS.

- All equipment must comply with NFPA 72 and be U.L. listed.
- The sound level of the music must be at least 45 dB and 10 dB above average ambient sound levels.
- Visual alarms in all public and common use areas.
- A written report of specialized training provided to the staff.

APPROVAL

- All of the stipulations were met and approval was granted.
- The system was designed and installed as approved.

TESTING

FIRE ALARM TESTING INCLUDED THREE SENIOR SUPERVISORS OF THE FIRE MARSHAL'S STAFF.

- The system met and exceeded all expectations.

CONCLUSION

- The Fire Department supervisors not only accepted the system, they endorsed the efforts of all involved in the protection of the neonatal infants.
- The experiences of the hospitals, Fire Department staff, JENSEN HUGHES Engineers and the contractors have led to additional “specialized system designs” in other area hospitals.

QUESTIONS?

Contact

Shamim Rashid-Sumar, PE.
+9714 228 2841
ssumar@jensenhughes.com

For More Information Visit
jensenhughes.com

JENSEN HUGHES
Advancing the Science of Safety