

FEATURE

Safety at Fusionopolis 2 in Singapore: An integrated approach

The Agency for Science, Technology and Research (A*STAR) Singapore undertook one of the largest laboratories and cleanroom building and relocation project in Singapore, relocating 4 of her research institutes to Fusionopolis 2. Located in a high rise high density environment, the project presents added challenges for both design and construction as well as operational Health, Safety & Environment (HSE) controls. A multi-prong approach to management of safety at Fusionopolis 2 had to be adopted for both the design and construction phase as well as the operational management of safety in the complex.

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BACKGROUND

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector agency that spearheads

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economic oriented research to advance scientific discovery and develop innovative technology. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit society.¹ A*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities organised into Biomedical Research Council (BMRC) and Science and Engineering Research Council (SERC) (see [Table 1](#)), these research entities are primarily located in Biopolis and Fusionopolis (see [Figure 1](#)).

Covering 30 ha of the one-north development, the Fusionopolis cluster is designed to provide an environment conducive to growth in information and communications technologies (ICT), media, physical sciences and engineering industries.² Fusionopolis Two (F2) has a total gross floor area of 103,635 square metres (1.12 million sq ft) spread across the three towers – Innovis, Kinesis and Synthesis (see [Figure 2](#)). With its state-of-the-art facilities at the heart of one-north's Fusionopolis cluster, the \$450 million Fusionopolis Two (F2) provides co-location opportunities for research, innovation and enterprise, aimed at sparking interdisciplinary collaborations amongst the public sector and with private sector. This system is intended to support knowledge sharing and simulate creativity in science and technology, leading to new areas of economic growth for Singapore.

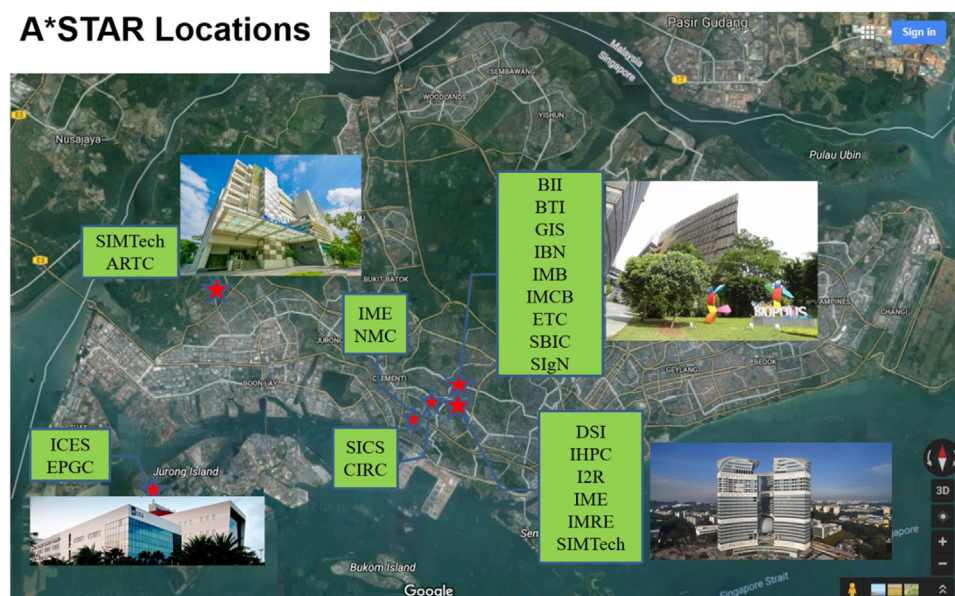
Cumulating in the official opening on 19 October 2015, Fusionopolis 2 project is one of the largest laboratory

and cleanroom building and relocation project in Singapore. Anchored at Fusionopolis Two are the following A*STAR science and engineering research institutes: the Data Storage Institute (DSI), the Institute of Microelectronics (IME), the Institute of Materials Research and Engineering (IMRE), and the Singapore Institute of Manufacturing Technology (SIM-Tech). Together the four institutes occupy a total gross floor area of over 63,800 square metres (686,900 sq ft) of offices, workshops, dry and wet laboratories, clean rooms and vibration sensitive labs along with central support facilities and infrastructure such as compressed air, specialty gases, process cooling and waste water treatment system. Other tenants for Fusionopolis 2 include the Japanese IT group NEC, the private equity firm Credence Partners, Sodexo and the technology giant Apple.³

Locating the institutes in a high-density, high-rise environment like One North presents added challenges for both design and construction as well as operational Health, Safety and Environment (HSE) controls. The quantity and variety of chemicals quadruple to over 5,000 different chemicals. The high-rise buildings that require complex fire protection and high human density (ca ~3000) posed unique challenges for management of emergency responses. A multi-prong approach to management of safety at Fusionopolis 2 had to be adopted for both the design & construction phase as well as the operational management

Table 1. A*STAR Organisation Chart and Its Research Entities.

Agency for Science, Technology and Research (A*STAR)	
Biomedical Research Council	Science and Engineering Research Council
Bioinformatics Institute (BII)	Data Storage Institute (DSI)
Bioprocessing Technology Institute (BTI)	Institute of Chemical and Engineering Sciences (ICES)
Experimental Therapeutics Centre (ETC)	Institute of High Performance Computing (IHPC)
Genome Institute of Singapore (GIS)	Institute for Infocomm Research (I ² R)
Institute of Molecular and Cell Biology (IMCB)	Institute of Microelectronics (IME)
Institute of Bioengineering and Nanotechnology (IBN)	Institute of Materials Research and Engineering (IMRE)
Institute of Medical Biology (IMB)	Singapore Institute of Manufacturing Technology (SIMTech)
Singapore Bio-imaging Consortium (SBIC)/	National Metrology Centre (NMC)
Clinical Imaging Research Centre (CIRC)	
Singapore Institute for Clinical Sciences (SICS)	Advanced Remanufacturing and Technology Centre (ARTC)
Singapore Immunology Network (SIgN)	

A*STAR Locations**Figure 1. Locations of A*STAR research institutes in Singapore.****Figure 2. Fusionopolis 2.**

of safety in the complex. In this paper, important considerations to safety in these two phases will be discussed.

We hope these experiences can be helpful for universities and institutes who are planning for their new facilities.

DESIGN AND CONSTRUCTION

During initial design planning, the plans called for DSI, IME, IMRE and SIMTech to occupy different towers at Fusionopolis 2, each having their own set of facilities and offices. However this will result in duplication of space,

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