CSDM Asia 2016

Integrated Infrastructure Value-Chain Planning for Industrial Estates and Buildings
About JTC

- A statutory board under the Ministry of Trade & Industry
- Formed in 1968 to spearhead Singapore’s industrialisation programme & develop industrial estates and related infrastructure

**JTC’s role in the evolution**

- Focus remains on traditional role of providing key infrastructure to support strategic economic activities
  - Prepared land with ready infrastructure
  - Ready-built space
- Expanding role to provide supporting amenities to meet demand from changing demographics of end users while promoting land productivity
JTC’s Portfolio

- No. of estates: 46
- Land area: 7,400 hectares
- Ready-built space: 3.2 million sqm
- No. of companies: 5,200

- Wafer Fabrication Parks
- Seletar Aerospace Park
- Logistics Parks
- Jurong Island
- one-north
- CleanTech Park
- Tuas Biomedical Park
Outline of Presentation

- Integrated Infrastructure Value Chain Systems
- JTC Surface Engineering Hub Systems Design
- JTC nanoSpace @ Tampines Systems Design
- Jurong Island Systems Design
- one north Systems Design
Integrated Value Chain Systems
An Industrial Developer’s Perspective

Interconnectivity

At building level systems

At industrial estate level
Integrated Value Chain Systems
An Industrial Developer’s Perspective

Systems at Building Level
Systems at Building Level

- Understanding the industry value-chain and manufacturing processes
- Translating requirements into building services and systems
- Linking the systems up and implementation into building designs
- Sharing of two unique building systems for surface engineering and semiconductor electronics
JTC Surface Engineering Hub

<table>
<thead>
<tr>
<th>Building Name</th>
<th>JTC Surface Engineering Hub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Floor Area</td>
<td>26,242 sqm</td>
</tr>
<tr>
<td>Usage</td>
<td>a unique, first-of-its-kind multi-tenanted development in Singapore that integrates companies along the entire surface engineering value-chain</td>
</tr>
<tr>
<td>TOP Date</td>
<td>17 December 2013</td>
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</tbody>
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JTC Surface Engineering Hub
Centralised Wastewater Treatment System
Wastewater is segregated into three main streams - one each for general heavy metals, cyanide and chromium - before being centrally treated at the CWTP, where contaminants are removed. This enables the wastewater to meet the standard permissible requirements before it is discharged to the public sewers.

Sub-Trench would channel spillages to CWTP in the event of pipe burst to mitigate pollution risk of trade effluent flowing into public drains.

Double containment detail (clear enclosure) for gravity flow down pipes to prevent accidental spillages from polluting the facility and potentially injuring occupants.
Stacks for Customers to install exhaust ducts from scrubbers

Visualization of customers’ exhaust ducts installation

Stacks with pre-installed gravity flow down pipes with low resistance for customers to discharge segregated industrial wastewater directly to the CWTP

Visualization of pre-installed gravity flow down pipes with low resistance with space provision for installing an additional pipe to cater to a new wastewater stream in future

1. No floor traps at individual production units as a safety feature to prevent unintended discharge of trade effluent into the house sewers
2. Common toilets provided at each floor with security cameras as deterrent against unauthorized discharge of trade effluent into house sewers
3. 2 penstocks, one for treated trade effluent from the CWTP and the other for common grey/black water where source out of specifications discharge can be identified, isolated and rectified
<table>
<thead>
<tr>
<th><strong>Building Name</strong></th>
<th><strong>JTC nanoSpace @ Tampines</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Floor Area</strong></td>
<td>22830sqm</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>Multi Tenanted Cleanrooms with Support Facilities</td>
</tr>
<tr>
<td><strong>Commencement Date:</strong></td>
<td>2nd May, 2015</td>
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<tr>
<td><strong>Completion Date</strong></td>
<td>30th March, 2017</td>
</tr>
</tbody>
</table>
1. External vibration sources e.g. traffic
2. Vibration transmission within same level
3. Vibration transmission across different levels

JTC nanoSpace @ Tampines
Extensive Vibration Mitigation
JTC nanoSpace @ Tampines
Extensive Vibration Mitigation
People and Goods/Utilities Movement

- Raw Material (Non Hazardous)
- Special Chemicals & Gases
- Hazardous Chemicals
- Chilled Water
- Bulk Gases
- Power
- People
JTC nanoSpace @ Tampines
Air Handling Routing

Make Up Air Units

Dedicated shafts for tenants

Chiller Plant located at roof level with cooling tower on top

Scrubber Yard

No equipment located within vibration sensitive zone

Area demarcated for Chiller replacement/installation

Make up Water Tank

Cooling Tower

ACID EXHAUST
GENERAL EXHAUST
HEAT EXHAUST
CHEMICAL PIPES
GAS PIPES
DRAINAGE

Dedicated shaft for each tenant
2 types of gases.
Type 1 - Bulk and Inert gases e.g. Nitrogen, Argon, etc.
Type 2 - Flammable Gas, e.g. LPG, Hydrogen, etc.
JTC nanoSpace @ Tampines
Electrical Network Routings

- JTC HT board & Transformer on L2 of ESS
- Electrical riser to roof for cleanroom and chiller plant cables
- Electrical under-ground pipe duct

JTC LT board for tenants to tap
JTC nanoSpace @ Tampines
Electrical Network Routings

- Cleanroom incoming cable horizontal run along external
- Cleanroom incoming cables from below, and enter L2 to L4
- Tenant genset by tenant
- JTC standby genset for essential building services
Integrated Value Chain Systems
An Industrial Developer’s Perspective

Systems at Estate Level
Systems at Estate Level

- Understanding the estate level industry value-chain and manufacturing processes
- Translating requirements into infrastructure services and systems
- Sharing of two unique estate systems – Jurong Island and one-north
Jurong Island
An Integrated Petrochemical Ecosystem

Jurong Island
- Created from merger of 7 smaller islands
- Integrated world-class chemical hub comprising oil, petrochemical & specialty chemical industries
- One of the world’s largest oil refining hubs & oil trading centres
- One of Asia’s largest olefins production centre
- Home to more than 100 companies
Jurong Island
Petrochemical Manufacturing Value Chain

Synergy from cluster development

Concept of a vertically integrated structure

Network of pipelines interlinking companies

Access to feedstock & products
Jurong Island
Linking the value-chain – Create the Land

- 7 islands: 991 ha
- Phase 1: 281 ha
- Phase 2: 373 ha
- Phase 3A: 34 ha
- Phase 3B: 915 ha
- Phase 4: 360 ha

Total: 2,954 ha
Jurong Island
Linking the value-chain: Feedstock
Jurong Island
Linking the value-chain: 3rd party Service Providers

**Capabilities**

- **Utilities**
- **Logistics**
- **Industrial chemicals & gases**
- **Engineering services**
- **Waste management**

**Services**

- **steam, cooling water & high grade industrial water**
- **storage & terminalling**
- **service corridor**
- **solids handling**
- **trucking**
- **natural gas**
- **industrial gases**
- **synthesis gas**
- **chlor-alkali**
- **integrated maintenance services**
- **chemical waste incineration**
- **wastewater treatment**

**Companies**

- SembCorp Utilities, Keppel Energy, Power Seraya
- Vopak, Oiltanking, Universal, Helios Horizon Terminals
- SembCorp Utilities, Keppel Pipenet
- Katoen Natie
- Poh Tiong Choon, SH Cogent
- PowerGas, SembGas, Gas Supply
- Air Products, SOXAL, IPG
- Linde, SembAP, SOXAL
- Chemical Industries Far East
- Rotary Engineering, PEC
- SembCorp Utilities, SembCorp Utilities, Keppel Integrated Engineering
Jurong Island
Linking the value-chain: Terminals & Storage

Storage Facilities of raw and finished products, e.g. Vopak Terminals, Poh Tong Choon Logistics, Oil tanking
Jurong Island
Linking the value-chain: Jurong Rock Caverns
Jurong Island
Building the Supporting Infrastructure

- Causeway link between mainland and JI
- Marine facilities such as jetties, berths, slipways, and other loading and unloading facilities
- Roads and drains
- JI Checkpoint
Jurong Island
Building the Supporting Infrastructure

Amenity Facility - Sakra Oasis with Carparks

Waste treatment and sewer systems

electricity, water and telecommunications services

Fire fighting services, e.g. Jurong Island Fire Station built by JTC, Banyan Fire Station recently completed by SCDF
one-north
Biopolis - 1st group of 7 buildings that was planned and built with an integrated District Cooling System & Pneumatic Waste Conveyance System which was able to serve all the developments.
Fusionopolis One – largest steel building project for JTC during its conception. Its unique design consists of 3 high-rise towers (Symbiosis 22 storeys, Connexis North 24 storeys and Connexis South 21 storeys) linked by sky bridges alongside an Experimental Theatre supported at six stories above ground perched above a single column support.

Fusionopolis Two – comprising 3 towers of total 103,635 sqm space, features Singapore’s largest multi-storey R&D clean room facility and is designed with stringent micro-vibration requirement of VC-E at Tower C.
Mediapolis -
A 19 ha land development of high-quality media content, as well as R&D in interactive digital media, supported by a strong and robust IT infrastructure and a synergistic business environment.
one-north
People connectivity

- Connection and integration of public and private transportation
- Personal Mobile Device
• Pre-laid uPVC Pipes for Telecom Services
• To provide a plug-and-play network
• Reduce road digging and provide a common backbone infrastructure
one-north
District Cooling System

- Integrated District Cooling System (DCS) of 40,000 RT capacity in Biopolis to supply chilled water to all the developments within the 1st phase. First large-scale DCS System in Singapore
- 2nd DCS plant housed in Mediapolis’s Multi-Utility Hub.
Building Communities and Encouraging Collaboration
one-north
Placemaking and Community Building

FREE Movie Screening @ one-north Park
TIME: 7.30PM - 9.00PM

FANTASTIC FRIDAYS @ one-north
BEER AND MUSIC NIGHT
20 NOV
6.00 pm - 10 pm

FANTASTIC FRIDAYS @ one-north
FREE BEER & SNACKS

FANTASTIC FRIDAYS @ one-north
FREE POPCORN, CANDY FLOSS & DRINKS
22 JAN
7.30 pm

FANTASTIC FRIDAYS @ one-north
FREE Outdoor Movie Screening
Join us for our 2nd edition of Movie Night @ one-north, where we will be screening the action-packed blockbinder Jurassic World, starring Chris Pratt! Free seating will be provided as long as your colleagues, friends and family show up on time for the perfect outdoor screening experience.

FREE Admission! OPEN TO PUBLIC!

Download the one-north app for updates on Fantastic Fridays and more!
Thank You