

# Use of iDrain in St. Andrew School Project

Presented by:



**Lian Soon Construction Pte Ltd**



# Contents

- Company Introduction
- iDrain – The Durable Reusable ECM Drain\*

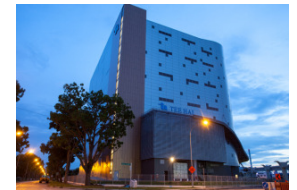
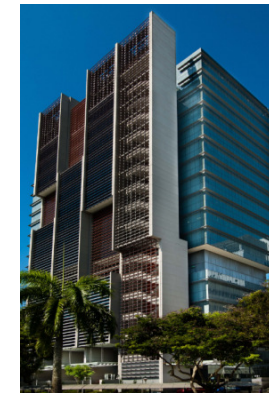
*\*WSH Innovation Award 2016*

*\*SCAL WSH Innovation Award 2016*

*\*SCAL Productivity & Innovation Award 2016*



- **More than 35 years of experience in building construction.**
- **Undertaken a wide range of projects for the private and public sectors, including the building of residential, commercial, industrial, educational institutions, recreational complexes.**
- **Licensed BCA Registered Company**
  - **CW01 - General Building (A1)**
  - **CW02 - Civil Engineering (C1)**
  - **CR06 - Interior Decoration & Finishing Works (L4)**
  - **CR09 - Repairs and Redecoration (L2)**



## System Certification

- Achieved internationally recognized certifications for it's Management Systems that equates to greater Productivity, Safety & Quality.



### ISO & Other Certifications:

- ISO 9001
- ISO 14001
- OHSAS 18001
- bizSAFE Star
- bizSAFE Partner
- BCA G&G Builder



## Recent Awards



- SCAL PIA 2016 – Gold Award
- **WSH Innovation Award 2016 (National & Industry Level)**
- BCA BIM Award 2016 – Gold Award
- **WSH Award 2013- Certificate of Commendation**
- BCA Construction Productivity Award 2013  
(*Gold Award - PS21 Project*)
- **Enterprise 50 - 2012 (1<sup>st</sup> Position)**
- BCA Construction Productivity Awards 2011
  - Best VAP Builder
  - Best VAP Improvement Award



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- Company Introduction
- **iDrain – The Durable Reusable ECM Drain**



## Background of the Project



ECM Drainage system is a **legal requirement** by PUB before any earthworks can commence.

Is a **fixed-temporary structure**.

To be **demolished at certain stage** or at the **tail-end** of the project.

Is normally constructed using C7 concrete channel.

**Conventional ECM Drain:**  
C7 Concrete Channel Drain





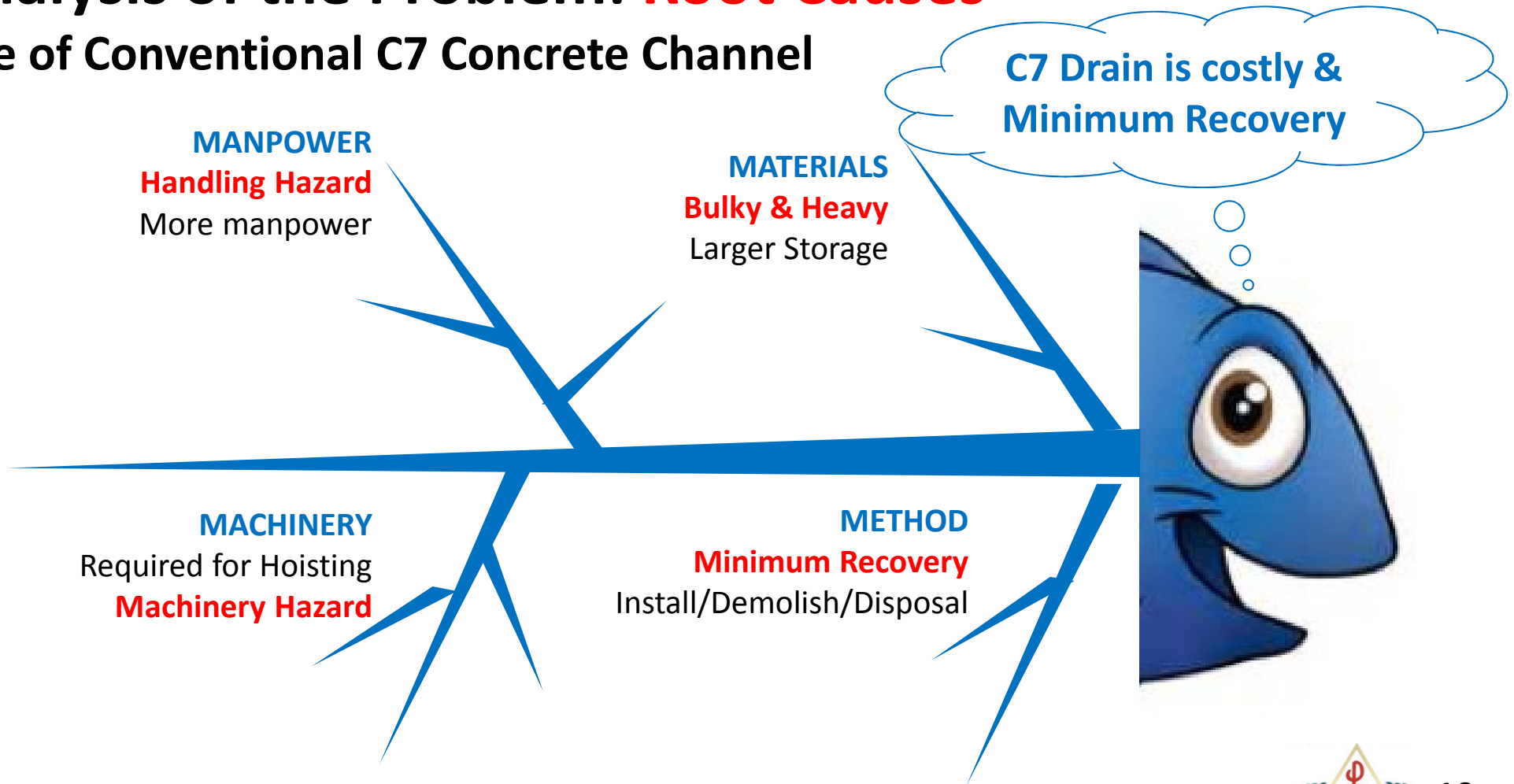
## Background of the Project



C7 Concrete Channel ECM Drain is **prone to damage**.  
**Pure Expense/High recurring cost** (install/demolish at certain stage)  
Post **hazards** to workers – install/maintain/demolish)  
**Environmental issues** due to poor maintenance.

# Analysis of the Problem: **Root Causes**

## Use of Conventional C7 Concrete Channel



***Project Objective:***

**To innovate an alternative to conventional C7 Concrete Drain**

***Strategies:***

- 1) To find an alternative durable/reusable material**
- 2) To design an innovative and practical equivalent of C7 concrete channel**
- 3) To reduce risk exposure of workers**



# 1) Finding a Durable-Reusable Material

Parameters	Option 1	Option 2	Option 3
Material	Plastic*	Aluminum**	Mild Steel
Characteristics (20%)	Very Light	Light & Durable	Moderately Light & Very Durable
Reusable (20%)	Yes	Yes	Yes
Recyclable (20%)	Yes	Yes	Yes
Environmental Friendly (20%)	No	Yes	Yes
Cost Effective (20%)	No	No	Yes
Overall Score	60%	80%	100%

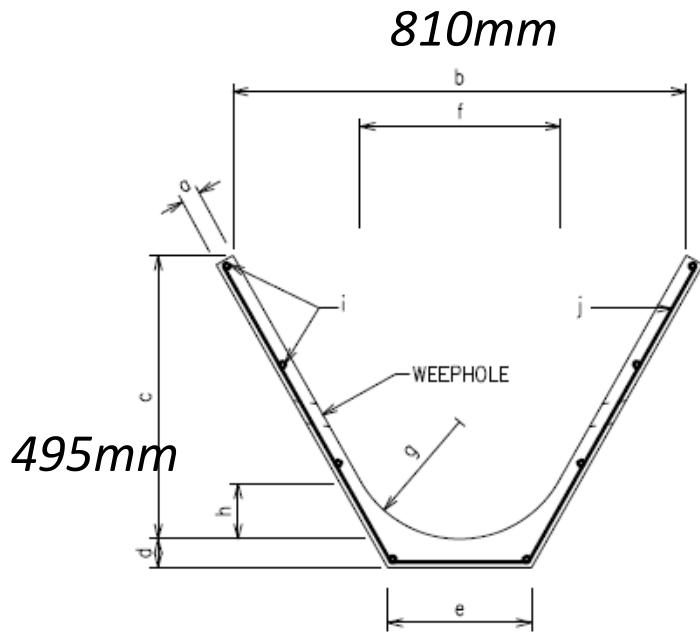
Legend:

\*Customized size & Plastics are non-biodegradable

\*\*Aluminum sheet is very expensive. 40% more expensive than mild steel.



## 2) Designing an innovative & practical C7 equivalent



**TYPE C7, C7A, C7B, C8, C8A, C8B**

SCALE 1:20

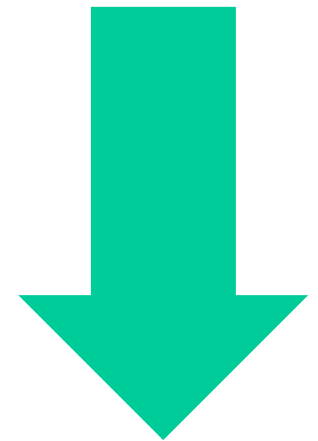
280mm

TYPE	a	b	c	d	e	f	g	h	i	j
C7	50	810	495	75	280	300	R155	115	N.A.	N.A.
C7A	50	595	335	75	280	300	R155	115	N.A.	N.A.
C7B	50	395	195	65	190	225	R115	80	N.A.	N.A.
C8	50	1200	750	75	380	535	R310	155	8R6-300	4R10-150
C8A	50	900	535	75	305	380	R195	150	6R6-300	4R10-150
C8B	50	995	610	75	330	455	R250	145	6R6-300	4R10-150

## 3) Reduce Risk Exposure to workers

C7 Drain (RL)	Installation of ECM Drain	iDrain (RL)
High	Installation using Excavator *	Eliminated
High	Exposure to Hot Weather	Reduced
High	Handling of Heavy Load	Eliminated

2 High Risk  
Eliminated  
1 High Risk  
Reduced



Legend:

\*Excavator with Lifting Machine (LM) Certificate.

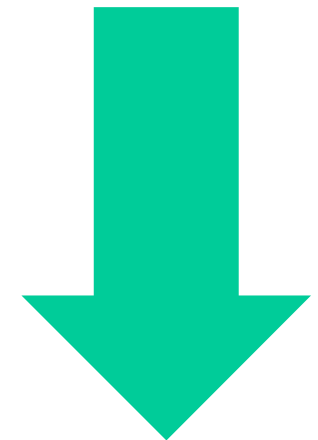
RL = Risk Level



## 3) Reduce Risk Exposure to workers

C7 Drain (RL)	Demolition of ECM Drain	iDrain (RL)
High	Removal using Excavator	Eliminated
High	Exposure to Dust & Noise	Eliminated
High	Exposure to Hot Weather	Reduced

2 High Risk  
Eliminated  
1 High Risk  
Reduced



Legend:

RL = Risk Level

Results of the 3 Strategies were collected.

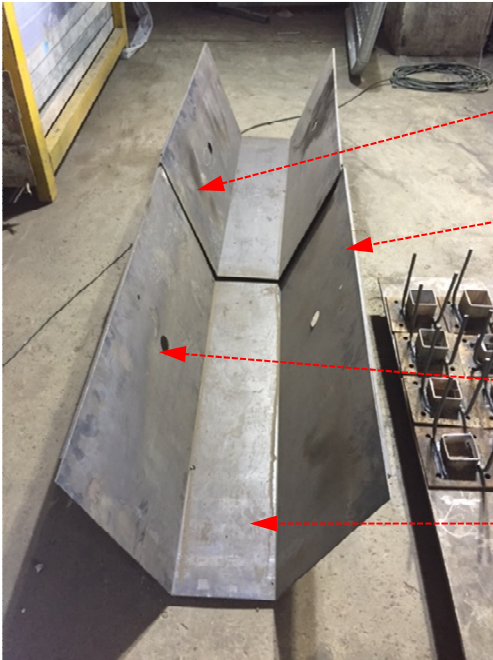


## Introduction of iDrain: The Durable Reusable ECM Drain





## Introduction of iDrain – The Durable-Reusable ECM Drain



- 3mm thick (S275 Mild steel)
- 9mm flat bar stiffener along its perimeter and center section
- Weep hole provisions
- Galvanized coated to prevent rapid corrosion

iDrain specifications:

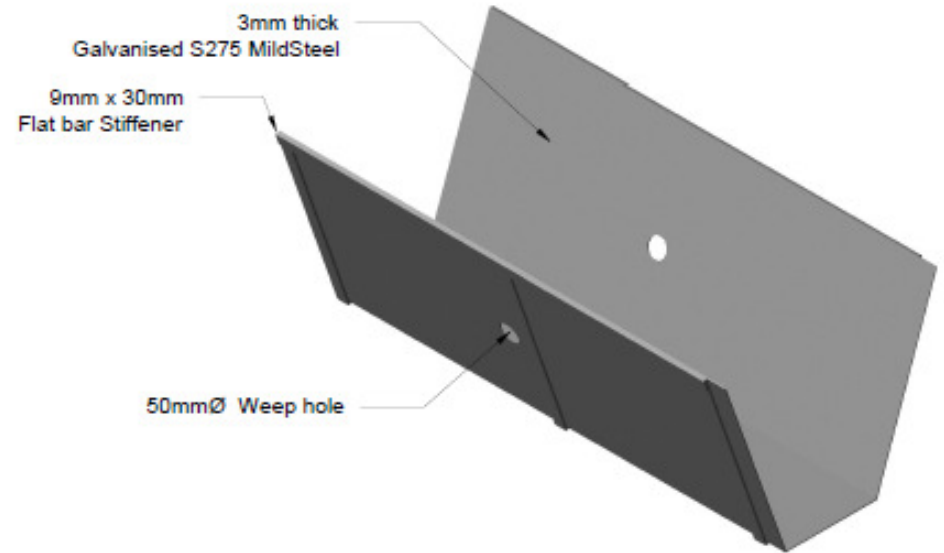
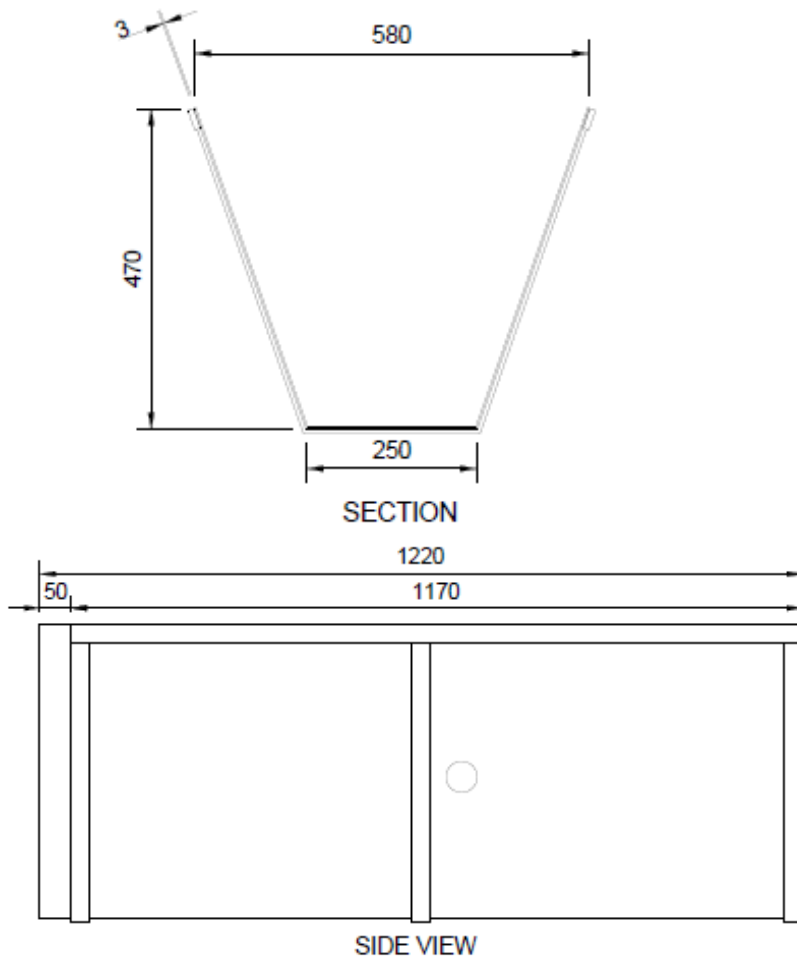
Length: 1220mm

Width: 580mm

Weight: 38 kg



## Designing an innovative & practical C7 equivalent



## Designing an innovative & practical C7 equivalent

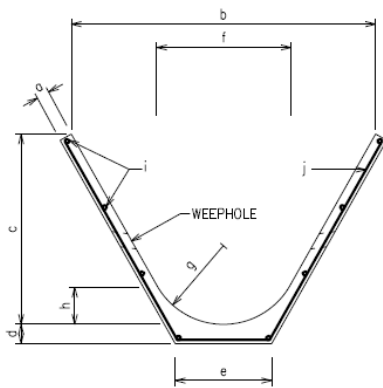
- Corrosion protection (Galvanized Coated)
- Eliminate connection joint sealing (Overlapping joints)
- Improved flow\* (MS plate is more fluid in terms of water flow)
- Reusable to >5 cycle years (100% ROI after 2<sup>nd</sup> use)

\* Manning's coefficient of roughness in average velocity flow in open channel



## Notable Comparisons (C7 Drains vs iDrain)

C7 Drain	Physical Comparison	iDrain
70kg	Weight	38 kg (72% Wt. Reduction)
600mm	Length	1220 mm (100% increase)
810mm	Section (top opening)	580mm
495mm	Depth	470mm



TYPE C7, C7A, C7B, C8, C8A, C8B

SCALE 1:20

### Notes:

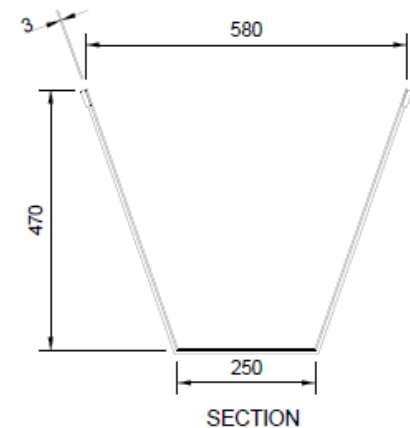
iDrain is 2x length of the C7 Drain.

iDrain is easier to maintain & clean.

Manning's coefficient of roughness:

C7 Drain = 0.025

iDRAIN = 0.012



## Notable Comparisons (C7 Drains vs iDrain)

C7 Drain	Process Comparison	iDrain
Yes	Excavate Trench using Excavator	Yes
Required	Hoisting of the drain using Machinery	<b>Not Required</b>
Using Machinery + Manpower	Installation of the drain	Manual
Required using cement	Sealing of the joint	<b>Not required</b>
Yes	Backfilling works	Yes
Using Machinery	Removal of the drain	Manual
Required	Disposal of debris	<b>Not Required</b>

### Process Change: From 7 Steps to 4 Steps (No Hoisting/ No Sealing of Joints/ No Disposal)

Notes:

100m = C7 Drain = 3 days to complete = 2 Workers + 1 Rigger/Signalman + 1 Excavator Operator

100m = iDrain = 1 day to complete = 2 Workers



## Notable Comparisons (C7 Drains vs iDrain)

C7 Drain	Safety	iDrain
High	Exposure to heavy machinery*	<i>Eliminated</i>
Moderate	Exposure to heavy manual lifting	<i>Eliminated</i>

Notes:

The change in material equate to safer methodology.

Total elimination of hazards associated to heavy machinery.

Eliminate manual lifting of heavy material.

\* Excavator with Lifting Machine Certificate (LM)



## Notable Comparisons (C7 Drains vs iDrain)

C7 Drain	Health	iDrain
Moderate	Exposure to Noise (Removal)	<i>None</i>
Long	Exposure to hot weather (during Installation)	<i>Reduced</i>
High	Exposure to Dust (Removal)	<i>Low</i>
Moderate	Productivity*	<i>Very High</i>

Notes\*:

C7 installation rate at 100m = 2-3 days.

iDrain installation rate at 100m = 1 day (Reduction of 67%)

Resulting to shorter exposure to hot weather = faster to complete.

No need to seal the connection joints. Overlapping method.



## Notable Comparisons (C7 Drains vs iDrain)

C7 Drain	Environmental	iDrain
Minimum recovery	Sustainability	<i>Reusable</i>
Mixed Waste	Disposal	<i>Recyclable</i>

Notes:

iDrain is made of superior material (mild steel) – equating to longer life cycle to reuse.  
Use of iDrain will result in the reduction of the amount of waste to be dispose.  
Environmental friendly – recycle after the reusable life of 5 years.  
Disposed as scrap metal – cost recovery.





## Application of iDrain at Project 1: ST. JOSEPH INSTITUTION A&A PROJECT



Use 2 manpower to install - overlapping.



Complete installation.



Two-man carry – moderately light weight.



Stacking of iDrain for storage.

## Application of iDrain at Project 2: NUS RVA Project



Regular cleaning of iDrain.



Two-man carry – moderately light weight.



Stacking of iDrain for storage.

**Construction Productivity Conference and Masterclass  
 "Managing Construction Productivity through Better Planning"**

Date: 24 May 2017, Wednesday | Time: 8.30am – 5.00pm | Orchard Hotel

Time	Agenda
08:30am	Registration
09:00am	Welcome Address by Mr Kenneth Lee, President, SCAL
09:15am	Launch of SCAL Productivity & Innovation Award (PIA) 2017
09:20am	iDrain - The Durable-Reusable ECM Drain by Mr Ruel P. Antola, Head of Safety Department, Lian Soon Construction Pte Ltd Gold Award Winner of SCAL Productivity & Innovation Award (PIA) 2016
09:30am	Effective Measurement to Facilitate Improvement (from a Study on Construction Productivity initiated by SCAL and Singapore Chinese Chamber of Commerce & Industry) by Professor George Ofori, London South Bank University, UK
10:15am	Tea break
11:00am	Good Practice in the Management of Time in Complex Projects by Mr Alan Midgley, Director, AG Midgley Ltd, London, UK
11:45pm	Question and Answer Session
12:30pm	Lunch
02:00pm	Going Lean for Construction Productivity by Dr. Nguyen Thi Gui, Research and Development Manager, Lean Station Pte Ltd, Singapore
02:45pm	Advanced Workface Planning / Packaging by Professor Stephen Kajewski, Head of the School of Civil Engineering and Built Environment, Queensland University of Technology (QUT) and Director of the QUT Project Management Academy
03:30pm	Question and Answer Session
04:15pm	Networking and Refreshment
05:00pm	End of Conference



For enquiries please contact: Ms Eileen Yee (eyee@scal.com.sg) |  
 Mr Tan Wei Euan (weixuan@scal.com.sg) at 6753 9030 or visit www.scal-academy.com.sg



**SCAL Construction Productivity Conference 2017  
 Orchard Hotel (Resource Speaker) / 24 May 2017**

**Sharing of our winning entry (Innovative Drain) in WSH &  
 Productivity Innovation Award 2016.**





**NWSH Carnival 2017**  
**22 April 2017**  
**SG Sports Hub (Exhibitor)**

**Participated in National WSH Campaign 2017 to share our Innovative Drain.**



**Staff & Sub-Contractors took time-off to participate in the event.**



**EXHIBITOR - BUILD TECH ASIA 2016: SINGAPORE EXPO/ 18-20 OCTOBER 2016**

  
**SCAL Productivity & Innovation Awards 2016 Competition**



**Innovative Drain (iDrain)  
 The Durable Reusable ECM Drain**

- Durable
- Light-weight
- Easy to install
- Eliminates use of heavy machinery
- Reduces manpower requirement
- Eliminates lifting requirement
- Stackable – save space for storage
- Easy to recover and re-usable
- Increased productivity

**Notable Comparisons (iDrain vs iDrain)**

Item	Standard	iDrain
Weight	100kg	10kg
Length	3000mm	3000mm
Width	100mm	100mm
Height	100mm	100mm

**Productivity Table**

Item	Standard	iDrain
Installation	1000m	2000m
Removal	1000m	2000m
Storage	1000m	2000m

**2016 Increased**

**Notable Comparisons (iDrain vs iDrain)**

Item	Standard	iDrain
Weight	100kg	10kg
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 **Lian Soon Construction Pte Ltd**



**THE STRAITS TIMES**

**Steel drain puts less strain on time and labour**

Construction company wins top award for cost-saving innovation in basic productivity

**Jackie Ho**

Construction company wins top award for cost-saving innovation in basic productivity



**Build Tech Asia 2016  
 Singapore Expo (Exhibitor)  
 18-20 October 2016**

**Showcase Lian Soon Innovative Product to the industry and to the public**

**3-day event allows us to introduce Lian Soon Construction to the viewing public/industry players when they visited the booth**



**SCAL Construction Safety Health & Security Seminar 2016**

Date: 22 June 2016, Wednesday  
Time: 1:00pm – 5:30pm  
Venue: Employment and Employability Institute (e2i)

**Programme**

- 1.00 pm Registration
- 1.45 pm Guests to be seated
- 2.00 pm Welcome Address by Mr Kenneth Loo  
President, The Singapore Contractors Association Ltd
- Opening Address by Mr Sam Tan  
Minister of State, Prime Minister's Office and Ministry of Manpower
- 2.10 pm Presentation to Winners of SCAL WSH Innovation Awards 2016 and SCAL WSH Supervisors Awards 2016
- 2.15 pm Presentation by Gold Award Winner of SCAL Innovation Convention 2016 – LSC Innovation Team from Lian Soon Construction Pte Ltd
- 2.30 pm Safety Perspectives in PPVC Projects by Mr Allan Low, Teambuild Engineering and Construction



## SCAL Construction Safety, Health & Security Seminar 2016 (Resource Speaker) 22 June 2016

Presenting our winning entry in WSH Innovation Award 2016 to industry players,  
Sharing our good practices on how our innovative product (iDrain) improve safety and productivity.





**WSH AWARDS 2016**  
**WSH Innovation Awards**  
**Marina Bay Sands**  
**26 July 2016**  
*National Level*



**SCAL WSH Innovation Awards 2016**  
**Gold Award**  
**e2i Jurong East**  
**22 June 2016**  
*Industry Level*

## Conclusion

- **Safer, Faster & Efficient** as compared to C7 concrete drain
- **Higher Productivity (+67%)** as it requires lesser manpower & zero heavy machinery
- Sustainable as **iDrain is Reusable for 5 years**
- Green Product as **iDrain is Recyclable**





# Use of iDrain in St. Andrew School Project

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**The End. Safe Regards.**

