(ICS 13.030.40)

SINGAPORE STANDARD Code of practice for pneumatic waste conveyance system

Incorporating Amendment No. 1





SS 642:2019+A1:2020 (ICS 13.030.40)

SINGAPORE STANDARD

Code of practice for pneumatic waste conveyance system

Published by Enterprise Singapore

All rights reserved. Unless otherwise specified, no part of this Singapore Standard may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying and microfilming, without permission in writing from Enterprise Singapore. Request for permission can be sent to: standards@enterprisesg.gov.sg.

© Enterprise Singapore 2020

ISBN 978-981-48-3563-3

This Singapore Standard was approved on 1 February 2019 by the Environment and Resources Standards Committee (ERSC) under the purview of the Singapore Standards Council.

First published, 2019 Amendment No.1, 2020

ERSC consists of the following members:

		Name	Capacity
Chairman	:	Prof Reginald Tan	Individual Capacity
Deputy Chairmen	:	Mr Dalson Chung Mr Norman Lee	National Environment Agency Individual Capacity
Secretary	:	Ms Lee Mong Ni	Enterprise Singapore
Members		Mr Benedict Chia Dr Chiu Kuang Ping Mr Alex Chong Mr Michael Ho	National Climate Change Secretariat Singapore Water Association Agency for Science, Technology and Research Waste Management and Recycling Association of Singapore
		Mr Jadhav Nilesh	Nanyang Technological University
		Ms Kavita Gandhi	Sustainable Energy Association of Singapore
		Mr Khor Seng Teng	Hyflux Ltd
		Mr Kok Yixiong	Enterprise Singapore
		Mr Kelvin Liew	SembWaste Pte Ltd
		Dr Lim Mong Hoo	Individual Capacity
		Mr Collin Lim Yew Tee	Singapore Manufacturing Federation
		Dr Pang Chee Meng	PUB, Singapore's National Water Agency
		Mr Steve Seah	SP Group
		Ms Yvonne Soh	Singapore Green Building Council
		Dr Song Bin	Individual Capacity
		Mr Tan Sze Tiong	Housing & Development Board
		Ms Jen Teo Pui Heng	Singapore Environment Council
		Mr Toh Chee Ming	Singapore Chemical Industry Council
		Mr Toh Eng Shyan	Building and Construction Authority
		Er. Alfred Wong	The Institution of Engineers, Singapore
		Mr Yap Ong Heng	Ministry of Transport
		Mr Yeo Lai Hin	Energy Market Authority
		Er. Yeow Mei Leng	Association of Consulting Engineers, Singapore

ERSC sets up the Technical Committee on Solid Waste Management to oversee the preparation of this standard. The Technical Committee consists of the following members:

		Name	Capacity
Chairman	:	Mr Dalson Chung	Individual Capacity
Deputy Chairman	:	Ms Melissa Tan	Waste Management and Recycling Association of Singapore
Secretary	:	Ms Lee Mong Ni	Enterprise Singapore
Members	:	Dr Edward Ang	Building and Construction Authority
		Mr Lam Yan Hoe	National Parks Board
		Mr Eddy Lau	Singapore Green Building Council
		Mr Kenneth Lim	National Environment Agency
		Dr Varughese Philip	Agri-Food and Veterinary Authority
		Mr Matt Stanelos	Singapore Manufacturing Federation
Co-opted Member	:	Mr Paul Tan Hang Meng	Individual Capacity

The Technical Committee sets up the Working Group on Pneumatic Waste Conveyance System to prepare this standard. The Working Group consists of the following experts who contribute in their *individual capacity*:

		Name
Co- Convenors	:	Mr Chang Tze Lum Mr Paul Tan Hang Meng
Secretary	:	Ms Christina Choong
Members	:	Mr Cheong Kong Chuan Mr David Heng Mr James Hung Mr Lawrence Liau Mr Sri Skanda Rajah S Ratnam Ms Tan Ai Li Mr Daniel T'ng Mr Tsang Pui Sum Ms Wan Siew Fung Dr Wong Teck Neng
		Ms Kristen Yeung Yu Ching
_		Mr Yuen Yee Jing
Resource Members	:	Mr Mervin Ho Mr Ong Leng Teck Mr Tan Cheong Huat

The organisations in which the experts of the Working Group are involved are:

Atticus Consulting Pte Ltd City Developments Limited Colex Environmental Pte Ltd Design International Architects ENVAC Singapore Pte Ltd Greenwave Solutions Pte Ltd Housing & Development Board JTC Corporation Ministry of Manpower Nanyang Technological University National Environment Agency Ngee Ann Polytechnic PV Vacuum Engineering Pte Ltd Stream Environment (S) Pte Ltd

Contents

Foreword 6		
1	Scope 8	
2	Normative references 8	
3	Terms and definitions 9	
4	General requirements 11	
5	Feeding and discharge system 14	
6	Conveyance system 29	
7	Collection station 35	
8	Operation and maintenance 46	
Annex	es	
А	Recommended maintenance plan 50	
В	Sample testing and commissioning checklist 51	
С	Guide on replacement interval for major equipment and components 55	
Tables		
1	Noise limits for PWCS near residential units 22	
2	Background noise correction factor 23	
3	Recommended minimum pipe thickness for mild steel (low carbon steel) API 5L Grade B pipe 29	
Figure	5	
1	Examples of chute hopper 16	
2	An example of label positions for typical refuse hoppers 17	
3	Signage for general waste 18	
4	Signage for recyclables 18	
5	An example of break-fall design on temporary storage section 20	
6	Location of noise measurement for an air intake valve at the ground level 22	
7	An example of a discharge valve room layout 24	
8	An example of working space within the DV room (normal arrangement) 26	
9	An example of working space within the DV room (contingency arrangement) 27	
10	Examples of an inspection chamber layout 34	
11	Schematic diagram of a collection station 36	
12	Location of noise measurement for the exhaust outlet at the collection station 37	
13	Acoustic requirements at the container hall 38	
14	An example of an exhaust air pipe layout (in series) 43	
15	An example of an exhaust air pipe layout (in parallel) 44	

Foreword

This Singapore Standard was prepared by the Working Group on Pneumatic Waste Conveyance System set up by the Technical Committee on Solid Waste Management under the purview of the ERSC.

The pneumatic waste conveyance system (PWCS) is an established technology first introduced in Europe in the 1960s and may be implemented in individual developments and/or across multiple types of developments. The PWCS is largely automated and service providers may monitor and operate multiple systems remotely. Over the last 20 years, there has been widespread adoption of PWCS in Singapore, which has brought about several benefits, namely reduced manual handling of waste, improved hygiene and well-being of workers, increase in value-added jobs and reduction of pests and odour nuisance in the environment.

This standard aims to ensure a level playing field for interested local and overseas manufacturers and suppliers by providing basic requirements for the design, construction and installation and set provisions for the proper use and maintenance of PWCS in Singapore. This would also provide greater assurance in terms of quality, reliability and durability to all the users of the system.

In preparing this standard, reference was made to the following publications:

- 1. BS 1703:2005 Refuse chutes and hoppers Specification
- 2. BS 5906:2005 Waste management in buildings Code of practice
- 3. SS 594:2014 Terminology for waste management
- 4. Technical guideline on boundary noise limits for air conditioning and mechanical ventilation systems in non-industrial buildings (2nd Edition, 2018)

Permission was obtained from the following organisations for the reproduction of their works:

- Housing & Development Board for the "Dos & Don'ts" signage for general waste.
- National Environment Agency for the "Dos & Don'ts" signage for recyclables and for materials from the *Technical guideline on boundary noise limits for air conditioning and mechanical ventilation systems in non-industrial buildings* (2nd Edition, 2018).

The figures included as examples in this Singapore Standard are collectively contributed by the Working Group members for the sole purpose of illustration. The inclusion of figures in this Singapore Standard does not connote any endorsement whatsoever of any product, service and/or design concept by the Working Group and Enterprise Singapore.

Acknowledgement is made for the use of information from the above publications / organisations and for the contributions by the Work Grouping Members.

This standard is expected to be used by real estate developers, consultants, designers, professional engineers, architects, PWCS providers, PWCS service contractors, facilities management professionals and relevant government agencies.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

- Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "Mature standards". Mature Standards will not be subject to further review, unless there are requests to review such standards.
- 2. An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.

3. Compliance with a SS or TR does not exempt users from any legal obligations.

Code of practice for pneumatic waste conveyance system

1 Scope

This standard specifies the requirements for the design, construction, installation, testing and commissioning and maintenance of a pneumatic waste conveyance system (PWCS) that serves gravity chutes for general waste and recyclables generated from residential, commercial and mixed-use developments.

The scope of this standard covers the specifications and performance of the feeding and discharge system, conveyance system and collection station but excludes the requirements for waste collection vehicles and driveway design.

This standard does not include the requirements for:

- waste conveyance using a pipeline intervention gadget (PIG) concept;
- feeder for a full vacuum system; and
- the conveyance of pure food waste from food establishments.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification 5L	Specification for line pipe
API Standard 1104	Welding of pipelines and related facilities
ASHRAE 52.1	Gravimetric and dust-spot procedures for testing air-cleaning devices used in general ventilation for removing particle matter
ASHRAE 52.2	Method of testing general ventilation air-cleaning devices for removal efficiency by particle size
ASTM A234 WPB	Specification for piping fittings of wrought carbon steel and alloy steel for moderate and high temperature service
ASME B16.9	Factory-made wrought butt welding fittings
ASME BPVC Section IX	Welding, brazing and fusing qualifications
ASTM E1444	Standard practice for magnetic particle testing
ASTM E273-15	Standard practice for ultrasonic testing of the weld zone of welded pipe and tubing
DIN 30670	Polyethylene coatings of steel pipes and fittings – Requirements and testing
DIN 30722	Roller contact tipper vehicles, roller containers