Assets Planning and Delivery Group
Engineering

DESIGN STANDARD DS 53

Vacuum Sewerage Standard

VERSION 2
REVISION 0

AUGUST 2023

FOREWORD

The intent of Design Standards is to specify requirements that assure effective design and delivery of fit for purpose Water Corporation infrastructure assets for best whole-of-life value with least risk to Corporation service standards and safety. Design standards are also intended to promote uniformity of approach by asset designers, drafters and constructors to the design, construction, commissioning and delivery of water infrastructure and to the compatibility of new infrastructure with existing like infrastructure.

Design Standards draw on the asset design, management and field operational experience gained and documented by the Corporation and by the water industry generally over time. They are intended for application by Corporation staff, designers, constructors and land developers to the planning, design, construction and commissioning of Corporation infrastructure including water services provided by land developers for takeover by the Corporation.

Nothing in this Design Standard diminishes the responsibility of designers and constructors for applying the requirements of the Western Australia's Work Health and Safety (General) Regulations 2022 to the delivery of Corporation assets. Information on these statutory requirements may be viewed at the following web site location:

Overview of Western Australia's Work Health and Safety (General) Regulations 2022 (dmirs.wa.gov.au)

Enquiries relating to the technical content of this Design Standard should be directed to the Senior Principal Engineer, Wastewater Conveyance Engineering, Engineering Advisory Section, Engineering. Future Design Standard changes, if any, will be issued to registered Design Standard users as and when published.

Head of Engineering

This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.

Users should use and reference the current version of this document.

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Water Corporation accepts no liability for any loss or damage that arises from anything in the Standards/Specifications including any loss or damage that may arise due to the errors and omissions of any person. Any person or entity which relies upon the Standards/Specifications from the Water Corporation website does so that their own risk and without any right of recourse to the Water Corporation, including, but not limited to, using the Standards/Specification for works other than for or on behalf of the Water Corporation.

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Any proposed dispensation from the Standards is not permitted without prior acceptance from the Standard's Custodian. Any such dispensation shall only apply to the specific project and is non-transferrable to other projects.

REVISION STATUS

The revision status of this standard is shown section by section below:

REVISION STATUS						
SECT.	**VER./ REV.**	**DATE**	**PAGES REVISED**	**REVISION DESCRIPTION (Section, Clause, Sub-Clause)**	**RVWD.**	**APRV.**
1	1/0	28.02.06	All	New Version	VF	JB
All	**2/0**	**01.08.23**	**All**	**New Version**	**SP**	**KP**

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CONTENTS

1 Guideline

The vacuum sewer, vacuum pumping station and pressure main shall be designed in accordance with WSA06-2008 Vacuum Sewerage Code of Australia. The following guideline further clarifies the Water Corporation vacuum sewerage infrastructure design requirements. The guideline shall also be read in conjunction with DS50 and DS51.

a. The vacuum sewer shall be designed to carry the Sewer Design Flow (1.5 times of Daily Flow) as defined in DS50.

b. The peak flow to each vacuum valve pit shall use 3.2 as the peak factor (3.2 times of Daily Flow). The number of service connections to a single-valve vacuum valve pit shall not exceed its maximum design flow capacity of 0.25L/s.

c. The Required Emergency Storage Volume (RESV) of each vacuum valve pit shall be the product of Sewer Design Flow and the Required Emergency Storage Time (REST). The REST is either 3 hours or 6 hours as determined by the Water Corporation.

d. The total SDF in the vacuum mains shall not exceed the maximum flow capacity given on WSAA Drawing VAC-1100.

e. The maximum length of vacuum mains shall comply with WSAA Drawing VAC-1100, except the DN80 valve service line shall have a maximum length of 30m. The DN80 service line is only allowed to have one collection chamber.

f. The top of the vacuum pumping station top floor slab shall be a minimum of 150mm above the 1 in 100 year flood level.

g. The maximum spacing between vacuum valve pits shall be 150m.

h. The availability of the pipe fittings should be confirmed during the design stage, especially the ‘Wye’ pieces as shown on the Water Corporation Drawing EM90-5-2. These fabricated ‘Wye’s allow adequate separation between the vacuum mains for connection and injecting the flow into the mains in an angle to facilitate the liquid flow towards downstream.

i. The summation of the static lift losses in each vacuum main shall not exceed 4m. The lift losses shall be calculated from the vacuum vessel sewer connection to the vacuum interface valve located at the end of each main. The lift height is the difference between pipe invert to invert at the lift. The static lift loss is determined by the lift height subtracting the pipe diameter. Refer to Figure 9.3 of WSA06 for the illustration of the static lift loss and lift height.

j. The lift heights should be 300mm for DN100 vacuum sewers and 450mm for DN150 and larger vacuum sewers. Uphill sections shall be designed with no more than five lifts consecutively spaced at no less than 6m apart with a minimum of 75mm fall between lifts.

k. The division valve shall be provided at every connection to another vacuum main.

l. Downhill vacuum sewers shall have a minimum grade of 1 in 500. A minimum of 15m 1 in 500 pipe section shall be provided coming into a lift.

m. It is preferred to connect vacuum valve pit within 6m upstream of a lift. Vacuum valve pit or vacuum branch sewer shall not be connected within 6m downstream of a lift.

n. Double vacuum valve pit is not preferred unless specific approval is obtained from the Water Corporation.

o. Vacuum sewers and valve pits shall not be located in private property.

p. The property connections to vacuum sewer system, and the property sewers including inspection shaft and additional vent shall be installed as per AS/NZS 3500:2003 Part 2 Clause 3.18.

q. The Designer shall contact the Water Corporation regarding the existing scheme capacity to accept additional flow when designing a network expansion.

r. The Designer shall provide the number of lots being served and the residential planning code or intended development other than residential, and additional flow in the application submission.

2 Standard and Example Drawings

DRAWING	ISSUE	TITLE
FO27-5-1	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 1 STATION LAYOUT
FO27-5-2	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 1 PROCESS FLOW DIAGRAM
FO27-5-3	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 1 COLLECTION TANKS
FO27-5-4	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 1 COMPOST ODOUR CONTROL FILTER
FO27-7-1	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 MECHANICAL LAYOUT PLAN
FO27-7-2	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 MECHANICAL SECTIONS – SHEET 1 OF 3
FO27-7-3	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 MECHANICAL SECTIONS – SHEET 2 OF 3
FO27-7-4	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 MECHANICAL SECTIONS – SHEET 3 OF 3
FO27-7-5	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 COLLECTION TANK DETAILS
FO27-7-6	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 2 PROCESS FLOW DIAGRAM
FO27-8-1	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 3 MECHANICAL SECTIONS – SHEET 1 OF 3
FO27-8-2	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 3 MECHANICAL SECTIONS – SHEET 1 OF 3
FO27-8-3	A (DRAFT)	TYPICAL VACUUM PUMPING STATION – EXAMPLE 3 MECHANICAL SECTIONS – SHEET 1 OF 3
FO27-23-1	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-24-1	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-24-2	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-26-1	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-28-1	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-30-1	CANCELLED	REFER TO DRG EM90-5-1,3,4 AND 6 FOR VACUUM COLLECTION CHAMBER AND EMERGENCY STORAGE PIPE DETAILS
FO27-32-1	CANCELLED	REFER TO DRG EM90-5-2 FOR VACUUM MAIN DETAILS
EM90-5-1	E	DN1050 COLLECTION CHAMBER WITH ONE VACUUM INTERFACE VALVE, 1.8 & 2.4 METRES DEEP – SEPARATE VALVE PIT

EM90-5-2	E	DETAILS
EM90-5-3	D	COLLECTION CHAMBER & DN600 EMERGENCY STORAGE PIPE GENERAL ARRANGEMENT AND DETAILS
EM90-5-4	C	DN1500 COLLECTION CHAMBER, WITH TWO VACUUM INTERFACE VALVES 1.8 & 2.4 METRES DEEP– SEPARATE VALVE PIT
EM90-5-6	C	DN1500 COLLECTION CHAMBER, WITH ONEVACUUM INTERFACE VALVE 1.8 & 2.4 METRES DEEP– SEPARATE VALVE PIT
EM90-5-8	C	PRE-CAST SINGLE VACUUM VALVE PIT STRUCTRAL AND REINFORCEMENT DETAILS
EM90-5-9	C	PRE-CAST DOUBLE VACUUM VALVE PIT STRUCTRAL AND REINFORCEMENT DETAILS

END OF DOCUMENT