

General Specification for Civil Engineering Works**2020 Edition****AMENDMENT NO. 3/2026****VOLUME 1****SECTION 1 General****TESTING**

- (a) Clause 1.40 **Replace** “HOKLAS for the relevant tests” **with** “Hong Kong Accreditation Services under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests (hereinafter referred to as the “Accredited Laboratories”)”, **add** “certificates/” **before** “reports” **and add** “Test certificates/reports issued by Accredited Laboratories shall be in an electronic form, unless otherwise approved by the Engineer. Any such approvals, together with justification, shall be documented. Each electronic test certificate/report shall be authenticated by a digital signature that complies with the requirements of the Electronic Transactions Ordinance (Cap. 553);” **in item (1)(b).**
- (b) Clause 1.42 **Replace** “a test report” **with** “test certificates/reports” **and remove** “in sealed envelop” **after** “the Engineer” **in item (2).**
- Add** “certificates/” **before** “reports”, **remove** “in sealed envelop” **after** “the Engineer” **and add** “If hard copy certificates/reports are to be issued, they shall be submitted to the Engineer in a sealed envelope.” **in item (3).**
- Add** “certificates/” **before** “reports” **in item (4).**

VOLUME 2

SECTION 22 Water Supply Pipeworks

SWABBING

- (a) Clause 22.72 **Add** “Swabs shall be packed in polyethylene bags or other packaging accepted by the Engineer and stored in sheltered areas unless being used. Swabs shall be marked with a serial number.” **after** “during construction.” **in item (3).**

Add “. Prior to insertion, the Contractor shall demonstrate the pipe and the swab are clean.” **after** “adjacent to the trench”, **replace** “the” **with** “The” **before** “pipe shall then be” **and** “Prior placement of reserve swabs in the pipeline and at tee branches for future swabbing operations shall not be allowed.” **after** “through the pipeline.” **in item (5).**

Add new item (9) as “The Contractor shall record and submit the following information immediately after the swabbing operation:

- (a) Start and end time of the swabbing,
- (b) Start and end locations of the swabbed main,
- (c) Travelling time and distance of the swabbing run,
- (d) Serial number of the swab,
- (e) Dimensional measurements of the swab before and after swabbing,”

Add new item (10) as “After swabbing, the pipeline shall be flushed and capped to prevent contamination and intrusion of foreign materials.”.

- (b) Clause 22.82 **Add new item (c)** “All valves shall be operative and functional over the entire operation range at maximum working pressure of the pipeline.”.

APPENDIX 22.1

PRESSURE TESTS ON PIPELINES

- (c) Clause 22.1.2 **Add new item (g) as** “Flowmeter accurate to 0.1 litre, if PE pipelines are tested.”.

Add new item (h) as “Continuous temperature logger accurate to 1°C for water inside pipeline, if PE pipelines are tested.”.

- (d) Clause 22.1.3 **Replace** “testing starts” **with** “pressure is applied” **in item (f).**

Add new item (g) as “Filling shall be made from locally lowest points to

facilitate venting air from valves.”

(e) Clause 22.1.4 **Add new clause 22.1.4 as following**

“(1) The procedure for polyethylene pipelines shall be the same as other pipelines, except that

$$\text{Rate of filling} \leq 12.5\pi D^2 \text{ litre per second}$$

where D is the nominal diameter of the pipe (mm)

(2) Where filling of water could not be made at locally lowest points of the pipeline, or where air valves are not present in all locally highest points for venting, swabbing shall be performed to remove air pockets.”

(f) Clause 22.1.5 **Update item (2) as**

$$\text{“Permitted leakage} = 0.02 \times D \times L \times \frac{t}{24} \times \frac{P}{10} \text{ litre}$$

where:

- D is the nominal diameter of the pipe (mm)
- L is the length of pipeline tested (km)
- t is the test period (hr)
- P is the average test pressure (m)”

(g) Clause 22.1.6 **Add new clause 22.1.6 as following**

“(1) Polyethylene pipelines shall not be tested together with other pipelines.

(2) Duration for keeping the pipeline filled for allowing absorption to take place and achieving conditions as stable as possible prior to applying pressure shall be shortened to 24 hours.

(3) When pressurising the tested pipeline to the specified test pressure, the volume of water added shall be recorded. The initial air content shall be determined by the following formula:

$$\text{Initial air content (\%)} = (V - E) / A$$

where:

- V is volume of water added during pressurising
- E is increase in internal volume of pipeline
- A is reduction in volume of trapped air due to pressurising

When introducing an additional 100m head from atmospheric pressure to 100m of high density polyethylene pipeline with Standard Dimension Ratio (SDR) of 11, E and A shall follow the values below:

Nominal size of pipeline (mm)	E (L)	A (L)
63	2	2

75	3	3
90	5	4
110	7	6
125	9	7
140	11	9
160	15	12
180	19	15
200	23	19
225	29	24
250	36	30
280	45	37
315	57	47
355	73	60
400	92	76
450	116	97
500	144	119
560	181	150
630	229	190

Assumptions:

- Polyethylene is assumed to have a Young's Modulus of 986 MPa.
- Pipeline is idealised as thin-wall cylinder to determine hoop stress.
- Water is assumed to be incompressible.

If initial air content is 4% or above, the pipeline shall be depressurised and swabbing of pipeline shall be performed to remove trapped air. The pipeline shall then be pressurised to the specified test pressure to determine the initial air content, and swabbing shall be repeated until initial air content is below 4%.

(4) The pipeline shall be left at specified test pressure for at least 12 hours before the test period begins.

(5) During the test period, pressure of the pipeline shall be monitored by means of a continuous pressure recorder, and maintained within -5% to 0% of the specified test pressure for 5 hours. Temperature shall be recorded at five minute intervals over the test period.

(6) Readings shall be taken, and the pressure shall be restored to the specified test pressure at the beginning and the end of the test period, and every 30 minutes therein.

(7) The volume of water added from the second till the third hour ($\Delta V(3h-2h)$), both inclusive, shall be recorded. Likewise, the volume of water added from the fourth hour and fifth hour ($\Delta V(5h-4h)$) shall be recorded. In addition to other compliance criteria, the following criteria shall be satisfied:

$$\Delta V(5h-4h) \leq 0.55 \Delta V(3h-2h) + 0.00014 D L P$$

where:

- D is the nominal diameter of the pipe (mm)
- L is the length of pipeline tested (km)
- P is the average test pressure (m)”

(h) Clause 22.1.7 **Add** “For polyethylene pipes, the following additional items shall be reported:

(j) The rate of filling polyethylene pipelines to the nearest 0.1 litre per second.

(k) The temperature of the water inside pipeline to the nearest 1°C.

(l) The amount of water added to the pipeline over the test period to nearest 0.1 litre.

Pressures recorded shall be presented in charts in reports and the data shall be separately submitted electronically.”

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