

<b>KLM Technology Group</b>  Project Engineering Standard	  www.klmtechgroup.com	Page : 1 of 16
		Rev: 01
		July 2016
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>Underground Gravity Sewer</b> <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

KLM Technology Group has developed; 1) Process Engineering Equipment Design Guidelines, 2) Equipment Design Software, 3) Project Engineering Standards and Specifications, and 4) Unit Operations Manuals. Each has many hours of engineering development.

KLM is providing the introduction to this guideline for free on the internet. Please go to our website to order the complete document.

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### Table of Contents

<b>1.0</b>	<b>SCOPE .....</b>	<b>3</b>
<b>2.0</b>	<b>REFERENCES.....</b>	<b>3</b>
2.1	Specifications.....	3
2.2	Industry Codes and Standards.....	3
2.3	Government Regulations.....	4
<b>3.0</b>	<b>DEFINITIONS .....</b>	<b>4</b>
<b>4.0</b>	<b>REQUIREMENTS.....</b>	<b>5</b>
4.1	General .....	5
4.2	Materials .....	6
4.3	Construction.....	9
4.4	Exfiltration Test .....	14
4.5	Considerations for Existing Facilities.....	15

<b>KLM Technology Group</b>  Project Engineering Standard	  www.klmtechgroup.com	Page : 2 of 16
		Rev: 01
		July 2016
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>Underground Gravity Sewer</b> <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

## 1.0 Scope

This specification describes the requirements for materials, installation, and testing of underground gravity sewers. Requirements for pipe, inlet structures, manholes, and appurtenances for sanitary, storm, and industrial process sewers are included. Requirements for pressurized pipe, double-contained, and emission-controlled industrial process sewers in environmental applications are not included.

## 2.0 References

Applicable parts of the following specifications, industry codes and standards, and references shall be considered an integral part of this Specification. The edition in effect on the date of offer award shall be used, except as otherwise noted. Short titles will be used herein where appropriate.

### 2.1 Specifications

### 2.2 Industry Codes and Standards

- American Society for Testing and Materials (ASTM)
  - ASTM A36 - *Standard Specification for Carbon Structural Steel*
  - ASTM A74 - *Standard Specification for Cast Iron Soil Pipe and Fittings*
  - ASTM C14 - *Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe*
  - ASTM C76 - *Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe*
  - ASTM C425 - *Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings*
  - ASTM C443 - *Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets*
  - ASTM C478 - *Standard Specification for Precast Reinforced Concrete Manhole Sections*
  - ASTM C564 - *Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings*

<b>KLM Technology Group</b>  Project Engineering Standard	  <a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a>	Page : 3 of 16
		Rev: 01
		July 2016
<b>KLM Technology Group</b> #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>Underground Gravity Sewer</b> <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

- ASTM C700 - *Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated*
- ASTM C969 - *Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines*
- ASTM C1433 - *Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers*
- ASTM D422 - *Standard Test Method for Particle - Size Analysis of Soils*
- ASTM D1248 - *Standard Specification for Polyethylene Plastics Molding and Extrusion Materials*
- ASTM D2321 - *Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications*
- ASTM D1785 - *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120*
- ASTM D2564 - *Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems*
- ASTM D2855 - *Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings*
- ASTM D3212 - *Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*
- ASTM D3350 - *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*
- ASTM F477 - *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*
- American Association of State Highway and Transportation Officials (AASHTO)
  - AASHTO M 36 - *Interim Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains*
  - AASHTO M 294 - *Standard Specification for Corrugated Polyethylene Pipe, 300- to 1200-mm Diameter (for Storm Sewers and Culverts)*

### 2.3 Government Regulations

- Occupational Safety and Health Administration
  - 29 CFR 1926 Subpart P - *Excavations*

<b>KLM Technology Group</b>  Project Engineering Standard	  <a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a>	Page : 4 of 16
		Rev: 01
		July 2016
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>Underground Gravity Sewer</b> <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

### 3.0 Definitions

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*offer documents:* Any and all documents, including design drawings, that purchaser has transmitted or otherwise communicated, either by incorporation or by reference, and made part of the legal offer or purchase order agreement between purchaser and supplier.

*supplier:* The party responsible for performing excavation, backfill, and pipe installation, including work executed through the use of sub-contractors.

*owner:* The party who owns the facility wherein the underground gravity sewer will be installed.

*purchaser:* The party who awards the offer to the supplier. The purchaser may be the owner or the owner's authorized agent.

*flowable fill:* An engineered blend of materials (controlled low-strength material) used as self-leveling and self-compacting backfill and bedding.

*standard dimension ratio (SDR):* The ratio of the pipe outside diameter (inches) to the minimum wall thickness (inches).

### 4.0 Requirements

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#### 4.1 General

##### 4.1.1 Quality Control

- 4.1.1.1 Sewers shall be fabricated, installed, and tested in accordance with this Specification; with codes, standards, and procedures specified in this Specification; and with all applicable codes and regulations of the controlling national and local jurisdictions.
- 4.1.1.2 Purchaser shall have the right to inspect, at purchaser's expense, all materials and workmanship and shall have unrestricted entry to the fabrication shop at all times work is being performed.
- 4.1.1.3 Purchaser can reject improper, inferior, or defective materials and workmanship at any stage of production.
- 4.1.1.4 All defective materials and workmanship shall be repaired or replaced at no additional cost to purchaser.
- 4.1.15 Purchaser inspection shall not replace the supplier's quality control procedures and responsibility for compliance with all applicable requirements for the material, fabrication, and installation.