

# ATLB-1350: STORM, SANITARY AND WATER DRAWINGS

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## Cuyahoga Community College

**Viewing: ATLB-1350 : Storm, Sanitary and Water Drawings**

**Board of Trustees:**

2017-06-29

**Academic Term:**

Spring 2019

**Subject Code**

ATLB - AIT-Construct/Hazard Material

**Course Number:**

1350

**Title:**

Storm, Sanitary and Water Drawings

**Catalog Description:**

Advanced course covering the interpretation of construction drawings used for the installation of storm water and sanitary sewer systems and water lines. Also included are safety considerations as prescribed by the Occupational Safety and Health Administration (OSHA), and a review of basic math concepts needed for establishing proper grade and slope and estimating pipe and bedding requirements.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

## Requisites

**Prerequisite and Corequisite**

Prerequisite(s): Departmental approval: admission to Laborer's apprenticeship program.

## Outcomes

**Course Outcome(s):**

Discuss the different types of piping systems used for sewer systems and water supply including materials, safety requirements and estimating procedures as shown civil drawings.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Differentiate between storm, sanitary and water systems as shown on civil drawings.
2. Define the terms and abbreviations used on civil drawings.
3. List the different types of piping and piping appurtenances used on sewer and water systems.
4. Identify the various materials that are used for pipe bedding shown on plans, sections and details.
5. Discuss trench safety procedures required for related installations.
6. Apply basic math concepts to establish proper pipe locations, depth and grades.
7. Interpret civil drawings to estimate pipe and pipe fittings, access fixtures and bedding requirements.

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**Course Outcome(s):**

Analyze civil drawings to establish sanitary and storm water systems, including piping requirements, locations and depths, connections and backfill requirements.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Determine pipe depths from invert elevations and flow lines as shown on drawings.
2. Compile a list of pipe connections from site and civil drawings.
3. Identify the various types of bedding used for sewer and water line installations.
4. Identify the different types of pipe and pipe fittings used in a sanitary and storm water system.
5. Identify horizontal pipe and manhole locations on civil drawings.

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**Course Outcome(s):**

Interpret civil and mechanical construction drawings to identify various pipes used for water supply, pipe locations, appurtenances and building connections.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the respective water supply terms used on civil drawings.
2. Identify the different types of pipe used for water supply.
3. Interpret civil drawings to locate pipe locations and tie-ins.
4. Evaluate plan and profile drawings to establish waterline depth.
5. Identify and locate respective pipe connections.
6. Locate fire hydrants and various service valves from civil and mechanical drawings.
7. Estimate excavation bedding requirements for waterline installations.

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**Course Outcome(s):**

Discuss the safety procedures as prescribed by the Occupational Safety and Health Administration (OSHA) that need to be followed during pipe installations.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the safety terms as defined in Subpart P in the OSHA standard.
2. List the different types of soil found on excavations.
3. Discuss the requirements for maximum allowable slope for respective soils.
4. Discuss the OSHA requirement for soil pile placement.
5. List the Personal Protective Equipment (PPE) required for pipe installations in trenches.
6. List and explain the worker protection per soil type as prescribed by OSHA.
7. Discuss the Ohio Revised Code as it compares to Subpart P of OSHA.
8. Differentiate between a Competent Person and a Qualified Person as defined by OSHA.

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**Methods of Evaluation:**

1. Quizzes
2. Tests
3. Classroom participation

**Course Content Outline:**

1. Piping systems
  - a. Sanitary
    - i. Filtration
    - ii. Septic
  - b. Storm water
    - i. Under drain
    - ii. Retention ponds
    - iii. Detention
    - iv. Storm main
  - c. Waterline

- i. Domestic
      - 1. Copper
      - 2. Plastic
    - ii. Non-potable
  - d. Terminology
    - i. Catch basin
      - 1. Curb
      - 2. Inlet
    - ii. Manholes
    - iii. Inverts
    - iv. Slope and percent
    - v. Bedding
    - vi. Laterals
    - vii. Bell and spigot
    - viii. Spring line
    - ix. Backfill
    - x. Swale
  - e. Apputances
    - i. Catch basins
    - ii. Manholes
    - iii. Cleanouts
    - iv. Lateral connections
    - v. Vents
  - f. Math applications
    - i. Exfiltration tests
    - ii. Retention volume
    - iii. Excavation
    - iv. Bedding
    - v. Pipe and accessories
- 2. Sanitary and storm water sewer systems
  - a. Sanitary
    - i. Waste
      - 1. Gravity
      - 2. Forced
    - ii. Green solutions
    - iii. Septic
  - b. Storm water
    - i. Under drain
    - ii. Mains
    - iii. Ponds
      - 1. Retention
      - 2. Detention
  - c. Sewer pipe
    - i. Ductile iron
    - ii. Concrete
    - iii. High density polyethylene
    - iv. Clay
    - v. Polyvinyl chloride PVC
    - vi. Corrugated metal
  - d. Pipe locations
    - i. Civil drawings
    - ii. Mechanical plans
    - iii. Sections and details
    - iv. General notes
  - e. Connections
    - i. Lateral
    - ii. Manhole
    - iii. Catch basins

- iv. Bell and spigot
- v. Mechanical joints
- f. Bedding
  - i. Purpose
    - 1. Support
    - 2. Grade
  - ii. Types
    - 1. Sand
    - 2. Crushed stone
    - 3. Pea stone
    - 4. Earth
- 3. Water supply lines
  - a. Terminology
    - i. Ductile iron
    - ii. Mechanical joints
    - iii. Slip joints
    - iv. Hydrants
    - v. Corporation stop
    - vi. Curb stop
    - vii. Gate valve
    - viii. Back flow preventer
    - ix. K copper line
    - x. Thrust block
    - xi. Soil PH
    - xii. Valve box
  - b. Pipe types
    - i. Concrete
    - ii. Ductile iron
    - iii. Copper
    - iv. Poly vinyl chloride PVC
    - v. Asbestos
    - vi. Cast iron
  - c. Pipe locations
    - i. Civil drawings
    - ii. Site features
    - iii. Mechanical drawings
  - d. Profiles and plans
    - i. Vertical alignment
    - ii. Depth with respect to grade
    - iii. Stationing
    - iv. Hydrant locations
    - v. Valve locations
    - vi. Bends and tees
    - vii. Connection
  - e. Hydrants
    - i. Dry barrel
    - ii. Wet barrel
    - iii. Flow
    - iv. Residual
    - v. Private
    - vi. Public
  - f. Water line bedding
    - i. Sand
    - ii. Angular gravel
    - iii. Crushed slag
    - iv. Earth
    - v. Advantages

- 1. Grading
- 2. Cost efficiency
- 3. Support
- vi. Disadvantages
  - 1. Installation costs
  - 2. Erosion factor
  - 3. Compaction
  - 4. Material cost
  - 5. Grading
- 4. Excavation safety
  - a. Terminology
    - i. Competent person
    - ii. Trench
    - iii. Sloping
    - iv. Shoring
    - v. Shielding
    - vi. Benching
    - vii. Trench box
    - viii. Spoils
    - ix. Unconfined comprehensive strength
    - x. Qualified person
  - b. Soil type
    - i. Type A
      - 1. Unconfined comprehensive strength
      - 2. Non-fissured clay
      - 3. Slope allowance
    - ii. Type B
      - 1. Unconfined comprehensive strength
      - 2. Angular stone
      - 3. Slope allowance
    - iii. Type C
      - 1. Granular soil
      - 2. Water infiltration
      - 3. Poor quality
    - iv. Stable rock
  - c. Maximum allowable slope
    - i. OSHA requirement
    - ii. Angle of repose
    - iii. Worker safety
  - d. Spoil placement
    - i. Excavation distance
    - ii. Depth of excavation
    - iii. Surcharge force
  - e. Personnel Protective Equipment (PPE)
  - f. Worker protection
    - i. Soil type
    - ii. Shoring
    - iii. Shielding
    - iv. Benching
  - g. Ohio Revised Code
    - i. Excavation classification
    - ii. Worker protection
    - iii. Traffic control
  - h. Competent person
    - i. Excavation oversight
    - ii. Soil identification
    - iii. Worker protection
    - iv. Experienced worker
    - v. Contractor placement

- vi. Hazard recognition
- vii. Hazard abatement authority
- i. Qualified person
  - i. Worker protection design
  - ii. Non-authoritative
  - iii. Experienced

## Resources

Thomas P. Olivo, C. Thomas Olivo. *Basic Blueprint Reading and Sketching*. current. Delmar Learning; Clifton Park, NY, 2005.

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Charles D. Willis. *Blueprint Reading for Commercial Construction*. current. Albany, NY; Delmar Publishers Inc, 1979.

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Arthur Siegle. *Basic Plane Surveying*. current. Albany, NY; Delmar Publishers, 1979.

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## Resources Other

"Construction Surveying"

<http://surveying.wb.psu.edu/psu-surv/SURIs/construction.htm>

Construction Surveying and Project Layout

<http://cset.mnsu.edu/cm/students/aic-study-guide/level1kconstsurveying.pdf>

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