# ATLB-2660: GRADE CHECKING

## Cuyahoga Community College

### Viewing: ATLB-2660 : Grade Checking

**Board of Trustees:**
2012-06-28

**Academic Term:**
Spring 2019

**Subject Code**
ATLB - AIT-Construct/Hazard Material

**Course Number:**
2660

**Title:**
Grade Checking

**Catalog Description:**
The layout and interpretation of surveyor stakes for highway construction. Included is the application of math concepts required for determing slope and elevation of roadways at sub-grade and top pavement, centerlines, and shoulders. The set up and operation of curbing machines and grade lasers is covered.

**Credit Hour(s):**
4

**Lecture Hour(s):**
4

### Requisites

**Prerequisite and Corequisite**
Departmental approval: admission to the Construction Tending and Hazardous Material Abatement program.

### Outcomes

**Course Outcome(s):**
1. Apply related math concepts to establish various cuts and fills that are required in highway and general building construction.

**Objective(s):**
1. Translate standard measurements taken in feet, inches and fractional parts of an inch to feet and decimal parts of a foot.
2. Compare standard measurement to engineered measurement.
3. Compute various percentages to establish grades.
4. Differentiate between percents and ratios.
5. Explain how various slopes relate to highway construction.
6. Define the terms related to grade checking and highway construction.

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**Course Outcome(s):**
2. Identify the techniques of setting up the curbing machine for locating curbs, sidewalks, and concrete pavement.

**Objective(s):**
1. Adjust the stringline to the required cuts and fills.
2. Assess the set-up of the stringlines for accuracy.
3. Identify the components of the machine.
4. Position the stringline of the curbing machine to locate the line and grade wands.

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**Course Outcome(s):**
3. Demonstrate the proper set-up techniques required for using the grade laser to establish grades, slopes, and elevations.

**Objective(s):**

1. Identify the parts of the tripod and adjust it to properly receive the laser.
2. Explain the function of the laser and discuss its operation.
3. List the set-up procedures of the grade slope laser and adjust to operate properly.
4. Explain the differences between visible beam and infrared lasers.
5. Identify the settings of the laser receiver and use it to interpret readings.
6. Recognize and identify the safety precautions when using lasers and list the respective OSHA regulations.

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**Course Outcome(s):**

4. Interpret the differences between projected and level grades.

**Objective(s):**

1. Explain how projected grades are used in highway construction.

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**Course Outcome(s):**

5. Demonstrate the ability to interpret highway construction drawings and install the required stakes and lath for respective elevations.

**Objective(s):**

1. Discuss the application of level grades and how they are applied.
2. Compute respective elevations that are required at roadway centerline, edge of pavement, and shoulder.
3. Interpret highway typical section drawing to determine thickness sub-grade materials, top of stone, and finish pavement heights.
4. Identify and interpret surveyor stakes, hubs, and lath including stationing, cuts, fills, and offsets.
5. Interpret cross section drawings to identify stations and elevations.
6. Develop and extrapolate slope cards required to create highway slopes.
7. List the hand tools that are required for grade checking.
8. Demonstrate proper use of Locke levels.
9. Demonstrate the ability to measure using standard and engineering rulers.
10. Transfer respective grade using levels, plumb bobs, rulers, and hammers.

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**Methods of Evaluation:**

1. Tests
2. Quizzes
3. Class participation

**Course Content Outline:**

1. Math application
    a. Measurement conversion
        i. Feet, inches, fractional part
        ii. Decimals
        iii. Metric
    b. Standard measure vs. engineered
    c. Percentages
        i. Establish grades
        ii. Highway profiles
        iii. Pipe elevation
    d. Percents vs. ratio
    e. Rate
        i. Cross slopes
        ii. Parking lots
    f. Slopes and highway construction
2. Curbing machine

   a. Components
      i. Wands
      ii. Pins
      iii. String
   b. String line
      i. Positioning
      ii. Tautness
      iii. Alignment
   c. String line adjustment
      i. Cuts
      ii. Fills
      iii. Alignment
   d. Set up verification
3. Grade laser
   a. Function
      i. Establish grades
      ii. Transfer grades
   b. Operation
      i. Beam rotation
      ii. Set up
      iii. Optics
      iv. Signal and receivers
   c. Set up procedures
      i. Tripod
      ii. Placement
      iii. Level
      iv. Adjustment
   d. Beams
      i. Visible
      ii. Infrared
      iii. Beam width
   e. Laser receiver
      i. Clamps
      ii. Volume control
      iii. Display settings
      iv. Operation
      v. Information received
   f. Safety
      i. Placards
      ii. OSHA regulations
      iii. Jobsite worker awareness
4. Grades
   a. Projected
      i. Slope
      ii. Roadway requirements
      iii. Highway
   b. Level
      i. Application
      ii. Curb heights
      iii. Roadway crowns
   c. Calculations
      i. Centerline
      ii. Pavement
      iii. Shoulders
      iv. Interpolation of contours
   d. Highway drawings

i. Sub-grade
ii. Top of stone
iii. Finish pavement
iv. Centerlines

e. Surveyor stakes
i. Interpretation
ii. Offsets
iii. Cuts
iv. Fills
v. Grade markings

5. Stake Installation
a. Drawing interpretation
i. Sections
ii. Plans
iii. Typicals
iv. Stations
v. Elevations

b. Slope cards
i. Development
ii. Interpretation
iii. Math application

c. Hand tools
i. Locke level
ii. Folding ruler and tape measure
iii. Plumb bob
iv. Hammers

d. Locke level
i. Function
ii. Calibration
iii. Application
iv. Limitation

e. Measuring
i. Standard
ii. Engineered
iii. Metric

f. Grade transfer
i. Hand tools
ii. Lath
iii. Drawings
iv. Math
v. Field notes
vi. Slope cord

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## Resources

LIUNA Training and Education Fund. *Roadway Construction.* Pomfret Center, CN: LIUNA Training and Education Fund, 2007.

LIUNA Training and Education Fund. *Construction Referencing Systems.* FundPomfret Center, CN: LIUNA Training and Education, 2007.

Crawford, Wesley G. *Construction Surveying and Layout.* 2nd ed. West Lafayette, IN: Creative Construction Publishing Co., 1995.

Nick Capachi. *Excavation Grading Handbook.* Craftsman Book Co, 2005.

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**Resources Other**

1. en.allexperts.com/q/...1093/.../online-grade-checking-exercises.htm
2. www.tpub.com/content/engine/14081/css/14081_448.htm
3. en.allexperts.com/q/...1093/.../online-grade-checking-exercises.htm

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