Chapter 28
TESTING AGENCY REPORTS AND INSPECTIONS

SECTION 2801 - GENERAL

2801.1 Consultant’s Recommendations for Scope of Work: For most projects, Colorado State University engages professional agencies to provide investigation, testing, analysis and construction inspection services for the project. The Consultant shall assist CSU in determining types, locations and quantities of testing necessary to satisfy data and analysis information required as a basis for complete and accurate design. Such studies may include but not be limited to investigations of surface or subsurface conditions, environmental impact, traffic, building performance, concealed component imaging and hazardous materials as required to design the Projects. The advised scope of such surveys, tests and investigations shall be submitted to the Project Manager as soon as possible and no later than the preliminary Design Analysis Report.

2801.2 Certification of Construction Inspectors: State of Colorado Buildings Program requirement.

A. Inspections required by the building code must be performed and signed by qualified inspectors certified by the International Code Council.

B. Professional Engineers registered in the State of Colorado may be acceptable for special inspections with prior approval of the State Buildings Program through the Project Manager.

2801.3 Building Inspection Report: (State Form SBP-BIR)

A. All inspections, whether interim or final, shall be noted on the Building Inspection Record. The Testing Agency’s inspector shall be responsible for asking the Contractor to produce the BIR for annotation and signature at the time of inspection on site. Construction inspectors shall sign the Building Inspection Report and include their ICC certification or State of Colorado PE registration.

SECTION 2802 - TESTING LABORATORY

2801.2 Qualifications: The testing agency laboratory shall be licensed to operate as a commercial testing laboratory and shall have been inspected by AMRL or CCRL within the last three years. The registered Professional Engineer (Colorado) in charge of the laboratory shall be a full time employee of the laboratory and have a minimum of five (5) years of experience in construction materials testing. Laboratory and field technicians qualified for performing the work as demonstrated through certification by NICET, ACI, NRMCA, PCA, AWS, ASNT or a degree in a related engineering field with construction field experience. All laboratory and field equipment to be used for the project shall be calibrated and certified in conformance to national standards. Upon request, records of inspections, documentation showing correction of deficiencies and AMRL or CCRL reference sample program test results shall be made available for review by the Project Manager.

2802.2 Control of Measuring and Test Equipment: The Testing Laboratory shall select measuring and test equipment in such a manner as to provide proper type, range, accuracy, calibration and tolerance for determining compliance with specified requirements. Measuring and test devices shall be calibrated, adjusted, and maintained at prescribed intervals prior to use, based upon equipment stability and other conditions affecting measurement. Provisions shall be made for the proper handling and storage of equipment. Calibration shall be accomplished using certified standards that have a known traceable relationship to the National Institute of Standards and Technology. Every calibrated measuring and test device shall show the current status, date of last calibration, and the due date for the next calibration. Calibration records shall be maintained as quality records and shall be made available for inspection upon request by the Project Manager.

2802.3 Surveillance of Inspections: When the laws, ordinances, rules, regulations, or orders of any public agency having jurisdiction, require the University’s surveillance of inspections or tests,
Consultant shall notify the Project Manager of the place, date and time forty-eight (48) hours prior to the inspection/test operation.

2802.4 Retain tested materials and data: The Testing Agency shall be responsible for maintaining tested materials and testing data until Final Completion of the Project or Construction Contract, or at such time as the Project Manager notifies the ITA in writing. Tests and tested materials shall be available at time of Bid and during the Bidding process for review by proposers.

SECTION 2803 - GEOTECHNICAL SOILS TESTING PRECAUTIONS

2803.1 General: Unless otherwise directed by the Project Manager, a Colorado Licensed Surveyor shall layout and locate all test pit locations for soils tests prior to sampling.

2803.2 PROTECTION OF PROPERTY AND WORK IN PROGRESS: The Geotechnical Testing Agency shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury, or loss to:

A. Property at the Work site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

B. The Geotechnical Testing Agency shall give all notices and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the safety of property or its protection from damage, injury, or loss and further, shall cooperate and keep the University and other contractors informed of all of the Geotechnical Testing Agency's precautions for the protection of the Work.

C. If any of the Geotechnical Testing Agency's operations destroy or damage any real or personal property, public or private, the Geotechnical Testing Agency shall promptly repair or replace such property before the University will accept the Work performed under the Contract.

2803.3 Protection of University, Municipal and Public Service Utility Systems: Before any Work is started, the Geotechnical Testing Agency shall communicate with all governmental agencies and private entities which have jurisdiction over utility systems which might be affected by the Work. After Work is begun, the Geotechnical Testing Agency shall perform in a manner designed to reduce the potential for disrupting the operations of utilities to a minimum.

2803.4 Protection of the Environment: The Geotechnical Testing Agency shall comply with all applicable federal, state and local environmental protection rules, laws and regulations and accept responsibility for compliance with all environmental quality standards, limitations and permit requirements, including but not limited to the University's noise control ordinance, federal and state air quality standards for fugitive dust control, prevention of surface and groundwater contamination and hazardous and other waste disposal practices and procedures.

2803.6 Hazardous Materials: The Geotechnical Testing Agency shall exercise the utmost care if the storage or use of hazardous materials required for the performance of the Work. Activities related to the purchase, storage, use, removal, treatment, and disposal of such hazardous materials shall at all times be the sole responsibility of the Geotechnical Testing Agency and shall be supervised and carried out by personnel properly qualified to perform such activities. Any activities requiring the purchase, storage, use, removal, treatment or disposal of hazardous materials shall not be started without first notifying the Project Manager in writing of the proposed activity and receiving the Project Manager's written acceptance of that action. The use and storage of explosives is not allowed.

2803.7 Archeological and Historical Discoveries: The Geotechnical Testing Agency shall inform the Project Manager of any evidence which might suggest to a lay person that archaeological, historical
materials or human remains may be present in the Work area. Upon making such a discovery, the Geotechnical Testing Agency shall do whatever is necessary to avoid disturbing that Work area. This may require the work be redirected or stopped until the Project Manager determines how to proceed.

SECTION 2804 - GEOTECHNICAL REPORT

2804.1 Available Information To establish the scope of work for the geotechnical report, the Geotechnical Engineer shall confer with the CSU Project Manager and the Design Consultant to collect available information regarding the proposed construction, such as:

A. Building use
B. Number of levels
C. Loading,
D. Allowable movement tolerances
E. Parking and pavement areas
F. Site grading
G. Retaining wall locations
H. Borrow and cut areas.

2804.2 Boring and Sampling The Geotechnical Engineer shall confer with the CSU Project Manager and the Design Consultant regarding the number and location of borings and the frequency and type of tests likely to be necessary for the project.

A. Minimum Geotechnical Boring
   a. 1 boring for every 2,500 to 5,000 square feet of building footprint
   b. 1 boring per level of multi-elevation lower levels
   c. 1 boring per 20,000 square feet of pavement or flatwork
   d. 1 boring per 250 linear feet of roadway
   e. 1 boring at each bridge abutment
   f. 1 boring every 100 linear feet of retaining wall requiring geotechnical design parameters
   g. Borings at unique features – pools, water features, large signs, monuments
   h. 1 boring every 5 acres of developed space if potential exists for future structures

B. Minimum Geotechnical Boring Depth
   a. Paving areas: shallow (5 to 10 feet)
   b. Building areas: at least 25 feet deep or minimum 10 feet into bedrock, whichever is deeper, with at least one boring 50 feet deep. Where deep foundation systems will be used, bedrock penetration shall be at least 20 feet deep.

C. Frequency of Sampling
   a. Initial – every 5 feet of depth
   b. If soil conditions are consistent across the site, frequency may be reduced at the discretion of the Geotechnical Engineer,

2804.3 Testing

A. Typical Tests The Geotechnical Consultant shall provide a standard unit rate sheet with the costs associated for each test available and confer with the Project Manager and Design Consultant regarding the type and number of tests necessary.
   a. Natural moisture content and in-place density: 2 tests per foundation boring, 1 test per pavement boring.
   b. Atterberg Limits Test: 2 tests per foundation boring
   c. -#200 Sieve Analysis (all fine grained soils): 2 tests per foundation boring
   d. Swell Consolidation Testing, 1 ksf Surcharge: 1 test per foundation boring
   e. Swell Consolidation Testing, 200 psf Surcharge: as needed for pavements
   f. Sulfate Testing: minimum 1 per structure
g. Unconfined Compressive Strength Test: 1 per structure
h. Sulfate / Resistivity / pH Tests: minimum 2 per project
i. Soil Support Test, R-value or Resilient Modulus: minimum of one sample per project on a representative subgrade sample

B. Additional Tests as Applicable
a. Full Gradation Sieve Analysis: when more than 50% retained on the #200 sieve
b. Sulfate / Resistivity / pH Tests: for multiple cohesive soils in contact with concrete or steel
c. Swell Consolidation: for multiple types of soil encountered
d. Unconfined Compressive Strength: for multiple types of soil encountered
e. Suction Test; for expansive soil conditions
f. Proctor Test
g. Direct Shear: retaining walls and slopes
h. Triaxial Strength: for overburden soft soils supporting heavy structures
i. Rock Quality: for cemented bedrock that can be cored (not effective for most stone in vicinity of CSU)
j. Permeability

2804.3 Scope of Report The Geotechnical Report should address the following issues:

A. Site, soil and geologic conditions, including bedrock and groundwater
B. Potential geohazards, including faults, radon gas, underground mines
C. Foundation recommendations: bearing capacity of shallow foundations and/or end-bearing capacity and skin friction values for deep foundations. Movement potential of 1-inch or less.
D. Alternative foundation feasibility
E. Floor slab recommendations: post construction total movement of 1-inch or less with differential movement potential 1/2 the total value over a given length such as 30 feet. Verify with the Structural Engineer or Architect regarding acceptable movement tolerance.
F. Lateral earth pressure recommendations for below grade levels
G. Seismic site classifications
H. Excavation considerations
I. Project earthwork: site grading, backfill recommendations and soil stabilization
J. Soil corrosivity information
K. Underdrain recommendations and waterproofing concerns
L. Utility excavation recommendations
M. Temporary and permanent slope configurations
N. Exterior flatwork subgrade preparation
O. Pavement thickness and subgrade recommendations
P. Surface drainage recommendations

2804.4 Contents

A. Cover:
   a. CSU project name and number,
   b. Date,
   c. Geotechnical Consultant name, address, phone and email.
B. Letter of transmittal and certification with original signature and seal of the Geotechnical Engineer
C. Table of Contents
D. Project Narrative:
E. Purpose of investigation
F. Proposed construction
G. Site and field exploration
H. Laboratory tests
I. Site conditions
J. Subsurface conditions
K. Engineering analysis, conclusions and recommendations
PART II - CSU DESIGN STANDARDS

CHAPTER 28 - TESTING AGENCY REPORTS

L. Site plan and boring location diagram, including survey coordinates
M. Boring logs
N. Laboratory test results
O. Notes, definitions and terminology

SECTION 2805 - CONSTRUCTION TESTING AND INSPECTION

2804.1 All test and inspection records and documents shall be prepared, identified, and maintained by the Testing Agency and copies submitted to the Project Manager. Records shall be protected from damage, deterioration, or loss. Retention time for all quality records shall be not less than three (3) years from date of final payment.

2804.3 Test results: Test results shall be submitted to the Project Manager after completion of inspections/tests and prior to incorporation of the item(s) into the Work unless the test or inspection must be done after installation. Field density and moisture tests shall be reported in draft form immediately at the test site with typed final test results given with 48 hours. If the CSU inspector is not present for the actual test, the draft results shall be transmitted to the Project Manager at the end of the day. All other inspection and test results shall be submitted within forty-eight (48) hours of the inspection or test. Test reports shall include worksheets showing any and all calculations used in obtaining the test results. All test results must be reviewed and signed by a registered licensed engineer in the State of Colorado. The signature represents that the test procedures used are in strict conformance with the applicable testing standard, the calculated data are true and accurate, the tools and equipment used were in calibration, the sample was not contaminated and the persons running the test were qualified.

In addition, the testing laboratory shall prepare and submit to the Project Manager a Monthly Summary Report each month, which summarizes the activities and results for the quality control tests and inspections conducted during that period. The Monthly Summary Report shall consist of both graphics and text and at a minimum shall identify all test types, test locations, testers, test results, any calculations used, specifications, whether the test passed or failed, and the material supplier, installer and Consultant. Material performance trends shall include a statistical evaluation of each type of test, results of which shall be clearly stated in an overview for each Monthly Report. The Monthly Report shall be submitted per Chapter 33 requirements.

2804.4 Records: Records (reports) of inspection and test activities are quality records and shall be maintained, in a manner that provides integrity of item identification, acceptability, and trace-ability. Reports shall identify the following:

A. Testing Agency and Engineer’s name
B. Contract number and title
C. Testing Laboratory Name
D. Name of items inspected/tested including a physical description, model and make.
E. Quantity of items
F. Inspection/test procedure used and any deviation from national standards.
G. Date the sample(s) was taken and the date the test was made.
H. Where tests were performed including environmental condition where applicable.
I. Name of inspector/tester.
J. Observations/comments.
K. Specified requirements in the contract that the item must meet.
L. Acceptability.
M. Deviations/nonconformance.
N. Corrective Action.
O. Evaluation of results.
P. Signature of authorized evaluator.
Q. Where the material was installed.

END OF CHAPTER 28