

## NON-PROJECT SPECIFIC GENERAL ENGINEERING SCOPE OF WORK CDOT WESTERN SLOPE (REGIONS 3 and 5)

### CONTRACT ADMINISTRATION:

General administration of these contracts will be delegated to the Regions by contract. Active day-to-day administration and monitoring of contract task orders will be delegated to Regional Resident Engineers, Program Area Design Team Managers, or CDOT PEs within each task order.

Type of work may include all or parts of the following activities:

- A. General Engineering Services - the scope for general engineering and design services may include but shall not necessarily be limited to:
  - 1) Provide conceptual drawings, graphs, data collection, or charts for the Region's planning, environmental, or other units as needed.
  - 2) Conduct Studies - transportation, environmental, etc.
  - 3) Provide support for region planning activities, including assistance with public information and public meetings.
  - 4) Provide design support for off systems or other modes of transportation alternatives.
  - 5) Provide drafting support or CADD services. All CADD work for CDOT will be conducted using MicroStation and Openroads Software and configuration, latest versions used by CDOT.
  - 6) Provide lighting plans and analysis.
  - 7) Provide support research or search county, state or other areas for records or documents relevant to the project or task.
  - 8) Provide or acquire design services as required to complete tasks not specifically defined in the outline, but that may be required by specific task order.
  
- B. Bridge/Structural Design Activities - the scope of work for bridge design activities may include:
  - 1) Provide design services for various highway structures or portions of highway structures.
  - 2) Furnish detailing services including drafting and quantity calculations for various highway structures or portions of highway structures.
  - 3) Inspect and rate highway bridges.
  - 4) Provide bridge design and detailed review of work performed by other designers.
  - 5) Provide wall design and detailed review of work performed by other designers.
  - 6) Provide structural selection reports and structure selection studies.
  - 7) Provide a structure concept study.
  - 8) Obtain structural data.
  - 9) Provide foundation investigation report.
  - 10) Coordinate with outside agencies; for example, railroad agencies.
  
- C. Roadway Design Activities - the scope of work for roadway design activities may include:

Exhibit A

- 1) Provide design services including quantity calculations for the various components of roadway construction, which could include intersection layout, interchanges, signals, structures, lighting, landscaping, irrigation design, ditch design, waterline, and sanitary sewer design.
  - 2) Furnish detailing and drafting services utilizing MicroStation and In Road software, latest CDOT adopted versions utilizing CDOT format. Other software required for design services and communication of information are Microsoft office products such as Word, Excel, and Power Point. In addition, ProjectWise or and/or cloud based storage solutions may be required for file sharing. Other formats or software products may be required for specific tasks such as traffic modeling or truck turning movements.
  - 3) Attend scoping reviews, design office reviews, field inspection reviews, and final office reviews and provide minutes as appropriate.
  - 4) Prepare (PS&E Package) final plans, specifications and provide the CDOT project manager with detailed estimates that can be entered into CDOT Trns-port application system
  - 5) Prepare revisions under-advertisement to plans or specifications when necessary.
  - 6) Design and layout of intersections and interchanges.
- D. Hydrology Activities - design aids and software will meet, at minimum, recommendations provided by FHWA for Hydraulics Engineering Software. The scope of work for hydrology design activities will follow procedures as outlined in CDOT's Drainage Design Manual and may include:
- 1) Collect historical drainage data.
  - 2) Compute basin drainage data.
  - 3) Select run-off parameters and predict peak flow using multiple methods.
- E. Hydraulics Design Activities - design aids and software will meet, at minimum, recommendations provided by FHWA for Hydraulics Engineering Software. The scope of work for hydraulics design activities will follow procedures as outlined in CDOT's Drainage Design Manual and may include:
- 1) Provide the size and location of drainage structures and facilities.
  - 2) Furnish storm sewer design.
  - 3) Furnish erosion protection design and NPDES requirements.
  - 4) Furnish quantity calculations for drainage structures including irrigation and permanent BMP's for surface drainage.
  - 5) Design of water and wastewater systems.
  - 6) Irrigation system designs including, but not limited to, typical ditches, traveling gun irrigation systems and other center pivot systems.
- F. Landscape Architectural Activities - the scope of work for landscape architectural activities may include:
- 1) Provide estimates of quantities of native seeding and mulching for the FIR plans.
  - 2) Determine most economic landscape alternative, finalize concept, and complete the plan.

Exhibit A

- 3) Verify that an acceptable safe recovery distance exists between traveled way and all trees to be planted.
- 4) Coordinate all special permits that may be required.
- 5) Coordinate ROW requirements.
- 6) Write Special Provisions and submit to the CDOT/PM with the completed roadside plans.
- 7) Submit the approved plan/special provisions to the Design Engineer for inclusion in the Project Plans.
- 8) Verify availability of plant materials and submit letter to the CDOT/PM certifying that designated plants are available.
- 9) Provide recommendations for alternative landscape designs and recommendations for Best Management Practices for temporary and permanent erosion protection.
- 10) Provide Storm Water Plan Sheets with BMP locations and quantity calculations.
- 11) Design wetland mitigation areas.

G. Geotechnical Services for Design - the scope of work for design services may include:

- 1) Provide field sampling and testing of existing pavements and soils necessary for proper pavement design as per the CDOT Pavement Design Manual.
- 2) Perform boring and subsurface geotechnical investigations for Structure Selection Reports and/or additional documents as needed.
- 3) Provide testing results used in the design process that are certified by a professional engineer.
- 4) Provide other geotechnical services as requested in writing, including but not limited to subsurface investigations, instrumentation, foundation reports, landslide evaluations, MSE wall designs, soil nail designs, and retaining wall designs.

H. Environmental Services - the scope of work for environmental services may include:

- 1) Review environmental conditions and determine required permits.
- 2) Delineation and mitigation recommendations of wetlands.
- 3) Prepare and/or review environmental documents for CDOT projects.
- 4) Conduct and prepare environmental surveys and clearance reports.

I. Design Services under Construction - the scope of work for design services under construction may include:

- 1) Review of actual subsurface conditions to verify structural design.
- 2) Review and approval of shop drawings.
- 3) Changes in design based on field conditions.
- 4) Services as needed per PE stamp requirements on design drawings.
- 5) Claim and schedule analysis.
- 6) Analysis of VE proposals.
- 7) Analysis of construction phasing false work, shoring, methods statements, and CPM schedules (Microsoft Project and/or Primavera).

J. Constructability Review Services - the scope of work services constructability services may include:

Exhibit A

- 1) Review design documents at all phases of a project and provide reports detailing any and all issues, including:
  - a. Identifying any alleged design errors and/or omissions, built-in flaws, site logistics and constraints that may impact construction material or contractor procurement, work activities, construction costs, and overall project delivery schedule.
  - b. Prepare and maintain detailed lessons learned and best practices logs, as requested.

K. Utility Investigation Activities - the scope of work for utility investigation may include:

- 1) Act as liaison and/or Utility Coordinator between CDOT units, local agencies and the utility companies during design as it pertains to information, scheduling, coordination and documents.
- 2) The Consultant will be responsible for obtaining all permits for work within CDOT ROW related to SUE investigations separate from the SUE consultant.
- 3) Coordination of scoping meetings with all utility providers and meeting minutes.
  - a. Using CDOT Utility Checklist for each utility provider.
  - b. Coordinating work with SUE consultant.
  - c. Obtain GIS information from utility providers.
- 4) Request and receipt of utility maps and easements from utility companies will be coordinated with CDOT project manager and with CDOT UEPM.
- 5) The consultant will conduct a review of utility information share findings with SUE consultant and CDOT UEPM.
- 6) Request franchise agreements from the local agencies. Determine responsible party for cost implications.
- 7) Request any secondary utility provider feeds, laterals, services and other attachments to the main utility provider's facility.
- 8) Consultant to work with SUE consultant, surveyor and CDOT UEPM that information is adjusted and matches CDOT project datum.
- 9) Provide photos of existing utility facilities and conditions in the project limits.
- 10) Review and comment on SUE related plans with CDOT project manager and CDOT UEPM.
- 11) Develop mapping and associated pertinent information of existing utilities, street lighting, irrigation ditch facilities and railroad facilities within the project limits of each construction project underground-at grade-overhead utilities
- 12) Ascertain and define all utility, street lighting, irrigation ditch and railroad conflicts within the highway construction project limits by an in-depth review of complex highway plans. Contact individual utility, irrigation and railroad companies to convey and jointly resolve these conflicts. The typical construction project requires contact with 4-6 individual companies. Underground-at grade-overhead utilities
- 13) Schedule and conduct subsequent meetings with utilities to resolve complex issues.
- 14) The Consultant shall conduct and document an investigation of the project area to determine existing utility conditions within the project limits. As part of the investigation the Consultant will meet with all utility providers and collect

utility key maps for all utilities in the project area, identify all known utilities, ownership, type, size and special conditions should utility relocation be required, and research and obtain copies of utility easements (public and private) and utility franchise agreements to determine conditions under which the utility was established in its present location (e.g. by revocable permit or by a privately owned easement). The utility investigation requirements are to meet C.R.S. 9-1.5-103 and follow CI/ASCE 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

- 15) Utility Investigation Methodology
  - a. Project Scoping
    1. This work is included in the Project Scoping Plan Set for the Project Scoping meeting as directed by CDOT.
    2. Utility base mapping (QL C-D) at a minimum, to be refined to Quality Level A or B, as required.
    3. Use existing survey project control data, GIS data, plans and electronic data from utility providers, and field survey to prepare utility design plans.
  - b. FIR (Field Inspection Review)
    1. This work is performed at 30% design, prior to FOR Plan development
    2. Quality Level A -D Utility Investigation, as required
  - c. FOR (Final Office Review)
    1. This work is performed at 60% design, during FOR Plan development
    2. 3D Modeling, if required.
  - d. PS&E (Plans, Specifications & Estimate)
    1. Ready for Utility Clearance and Advertisement

L. Grant Writing Services

- 1) Funding needs analysis - Work with the CDOT to assess the validity of current funding priority areas and identify new priority areas for funding.
- 2) Grant Funding Research - Conduct research to identify grant resources including, but not limited to federal, state, foundation, agencies and organizations that support CDOT'S funding needs and priorities.
- 3) On-call Grant Research - In addition to the areas defined above other areas may be also identified through the Funding needs analysis process and throughout the duration of the contract.
- 4) Grant proposal Development - Provide grant proposal writing services associated with the completion of grant applications on behalf of CDOT, including the preparation of funding abstracts, production and submittal of applications to funding sources

M. Independent Cost Estimator (ICE) Services

- A. Obtain and develop cost estimates for small, medium, large, and major highway/bridge construction projects that are comparable to Contractor's methods of estimating and accuracy and should be free of risk and unbalancing.
- B. Develop schedule estimates for large highway/bridge Construction projects that are comparable to Contractor's methods and accuracy.
- C. Work constructively with individuals in a team environment to develop scope of work, construction methodology, and other assumptions that result in accurate cost estimates

- and schedules.
- D. Prepare a cost estimate that can be used to negotiate the Construction Contract and agree to a Construction Agreed Price (CAP).
  - E. Work with the owner to develop a suggested workflow of the Contractor's coordination plan. Including a flowchart for the negotiation process.
  - F. Work with the Project Team to develop an agreed upon common cost model to be used by all parties for consistency.
  - G. Create a Vendor/Subcontractor database to build networks and procure independent quotes for ICE estimates.
  - H. Services may include the following activities:
    - a. Prepare and present opinions of probable construction cost (OPCC) estimates and a final bid estimate based upon design plans, specifications, and scoping meetings with CDOT, their Consultants and/or Contractors.
    - b. Prepare resource loaded schedules that can be analyzed for risk, length, logic, milestones, production, and assumptions.
    - c. Attend scope and project review meetings/assumption clarification meetings with CDOT, its Consultants and/or Contractors.
    - d. Review and comment on Contractor and/or Consultant prepared cost estimates for magnitude of opinion of probable construction cost and assumptions.
    - e. Prepare and present a final construction schedule estimate based upon design plans, specifications, and scoping meetings with CDOT, their Consultants, and/or Contractors.
    - f. Review Contractor and/or Consultant prepared schedules for accuracy, logic, milestones, and assumptions.
    - g. Attend meetings to resolve differences in assumptions, logic, and/or accuracy between estimates and/or schedules with CDOT, their Consultants, and/or Contractors.
    - h. Consultant shall be prepared to compare and review Contractors estimates in an "open-book" environment that quantifies means and methodologies, crew productivities, crew size and make up, unit rates, mark-ups for in-directs and anticipated fee.
    - i. Consultant shall provide the means to forensically deconstruct Contractor OPCC Estimates and Construction Agreed Price (CAP) package proposals.
    - j. Consultant shall provide specialty estimators when ICE team does not have specific experience estimating unique work packages (tunneling, drill and blast, underwater work, segmental or accelerated bridge construction, Intelligent Transportation Systems, Connected Vehicle, traffic signals, etc.)
    - k. Consultant shall be prepared to provide services for Construction Manager/General Contractor, Design-Bid-Build, and Design-Build projects.
    - l. Consultant shall provide written analysis and recommendations to improve its usefulness to the project team after schedule reviews.
    - m. Consultant shall perform sensitivity analysis to support evaluation of alternative concepts developed by various CM/GC team members to ascertain benefits to project schedules as needed.
    - n. The Consultant shall demonstrate practicality in approach and concentrate remarks and discussions on critical path and high-risk activities while avoiding the details of perfect schedule administration.
    - o. The ICE may be required to attend and participate in Risk Identification and Risk Management meetings.
    - p. The ICE may be required to create an independent estimate for long lead time

Exhibit A

items for a CMGC project.

- q. The ICE may be required to perform “ad hoc” or interim estimates used in alternatives analysis during the design phase.
  - r. ICE may be required to obtain and analyze subcontractor quotes to obtain the best value for the project with consideration of the project's DBE Goal participation.
- O. Other Services - As requested Design and/or General Engineering SOW by the Regions and specified in the task orders for other services not specified above may be requested on an as needed basis.

The scope of work for these services will include the details of the SOW and General Engineering Requirements.