Massachusetts Department of Transportation
Highway Division

Architects and Engineers Review Board
Prequalification Categories

Definitions

May 2013

The following are the minimum standards for each Architects and Engineers (A&E) Review Board Prequalification Category. A firm must meet the standards listed for each category in which they request Prequalification. (Request is made on Page 2 of the ADM-016 Form.) The A&E Review Board will prequalify a firm on the basis of the review of the completed ADM-016 Form and, where applicable, reports of Performance Evaluation and Records of Design.

A. Major Environmental Documentation

This type of work involves the preparation of major environmental documentation in the form of Environmental Impact Statements, Environmental Assessments or Environmental Impact Reports (EIS, EA, EIR) which are necessary to conduct the full analysis and evaluation of the environmental, social and economic effects of transportation improvements on the human and natural environment. This work is specifically performed to meet the requirements of the National and Massachusetts Environmental Policy Acts. The firm must demonstrate it has the necessary experience preparing and completing major environmental documentation for transportation projects. The firm must demonstrate it has the ability and experience to conduct early coordination and public involvement programs, environmental analysis, and preliminary engineering design to adequately identify, avoid and minimize impacts, describe mitigation measures, select a preferred alternative and apply for necessary permits. Detailed analysis must be made for each alternative under consideration and shall include the full range of applicable environmental and socioeconomic topics.

Preparation of Major Environmental Documentation requires a minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts and other appropriate licenses and registrations as required. The firm must be able to perform the majority of multi-disciplinary analysis required in-house with their own staff.

B. Basic Roadway Design

This type of work involves the design/redesign of two-lane roadways. Design activities may include minor geometric modifications, including widening, vertical profile and horizontal alignment and the production of plans, specifications and related design studies in accordance with MassDOT and FHWA standards. Design of drainage structures may also be required. Project construction cost is generally under $1 million. A minimum of one registered Professional Engineer in the Commonwealth of Massachusetts is required.

C. Intermediate Roadway Design

This type of work involves the design/redesign of multi-lane roadways on existing or new location. Design activities may include simple grade-separated interchanges such as diamonds and cloverleafs, roadway widenings that increase capacity, and the production of plans, specifications and related design studies in accordance with MassDOT and FHWA standards. Design of drainage retention/detention systems and structures may also be required. Project construction cost is generally between $1 million and $10 million. A minimum of two Registered Professional Engineers in the Commonwealth of Massachusetts is required.

D. Complex Roadway Design

This type of work involves the design of multi-lane high-volume (30,000+ ADT) highways with multi-level and/or multiple interchanges on existing or new location. Design activities include the production of plans, specifications and related design studies in accordance with MassDOT and FHWA standards. Project construction cost is generally over $10 million. A minimum of two Registered Professional Engineers in the Commonwealth of Massachusetts is required.

E. Basic Bridge Design/Rating

This type of work involves the production of bridge designs, construction plans and specifications; preparation of bridge rating reports; and providing bridge construction inspection services; all which meet the specific requirements of MassDOT and the Federal Highway Administration. This work includes bridge betterment projects; new bridge or bridge rehabilitation projects of short (20 to 60 feet), simple span, multi-stringer bridges with composite decks; abutment type substructures with either shallow or deep foundations; culverts; and the rating of such structures. A minimum of two Registered Structural or Civil Professional Engineers in the Commonwealth of Massachusetts is required.

F. Intermediate Bridge Design/Rating

This type of work involves the production of bridge designs, construction plans and specifications; preparation of bridge rating reports; and providing bridge construction inspection services; all which meet the specific requirements of MassDOT and the Federal Highway Administration. This work includes new bridge or bridge rehabilitation projects of medium span (60 to 120 feet), multi-stringer, single or multi-span bridges of simple or continuous type construction with composite decks; simple, medium-span, non-redundant and fracture critical structures such as trusses or through plate girders; abutment and pier substructures with either shallow, deep, or underwater foundations; and the rating of such structures. A minimum of two Registered Structural or Civil Professional Engineers in the Commonwealth of Massachusetts is required.

G. Complex Bridge Design/Rating

This type of work involves the production of bridge designs, construction plans and specifications; preparation of bridge rating reports; and providing bridge construction inspection services; all which meet the specific requirements of MassDOT and the Federal Highway Administration. This work includes new bridge or bridge rehabilitation projects of long span (greater than 120 feet), multi-stringer, multi-span bridge structures of continuous type construction with composite decks; long, multi-span non-redundant and fracture critical bridge structures such as trusses or through plate girders; complex interchange structures involving multi-level crossings; unusual structure types such as curved girder bridges, segmental concrete bridges, bridges with extreme skews, high level structures or other non-moveable bridge structures; abutment and pier substructures with either with either shallow, deep or underwater foundations for all of the above structure types; and the rating of such structures. A minimum of two Registered Structural or Civil Professional Engineers in the Commonwealth of Massachusetts is required.

G1. NBIS Bridge Inspection

This type of work involves the field inspection of all types of bridge structures (except moveable) and the preparation of accurate and complete inspection reports in accordance with the National Bridge Inspection Standards. The inspections include:

- Routine
- Fracture Critical
- Special Member
- Culvert
- Closed Bridge
- Damage

The firm is required to have access to all equipment necessary to carry out a hands-on inspection/evaluation of all components as required by the type of inspection.

The firm is required to employ a minimum of one Inspection Program Manager and two Inspection Team Leaders. These personnel must meet the following qualifications (23CFR, Part 650, Subpart C, §650.309):

A. The Inspection Program Manager shall possess the following minimum qualifications:
    1. Be a Massachusetts registered Professional Engineer, or have 10 years bridge inspection experience; and
    2. Have successfully completed a Federal Highway Administration (FHWA) approved comprehensive bridge inspection training course.
B. The Inspection Team Leaders shall possess the following minimum qualifications:
    1. Have the qualifications specified in part A of this section; or
    2. Have 5 years bridge inspection experience and have successfully completed an FHWA approved comprehensive bridge inspection training course; or
    3. Be certified as a Level III or Level IV Bridge Safety Inspector under the National Society of Professional Engineer's program for National Certification in Engineering Technologies (NICET) and have successfully completed an FHWA approved comprehensive bridge inspection training course; or
    4. Have all of the following:
        i. A bachelor's degree in engineering from an Accreditation Board for Engineering and Technology (ABET) accredited college or university;
        ii. Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering (EIT) examination;
        iii. Two years of bridge inspection experience; and
        iv. Successfully completed an FHWA approved comprehensive bridge inspection training course, or
    5. Have all of the following:
        i. An associate's degree in engineering or engineering technology from an ABET accredited college or university;
        ii. Four years of bridge inspection experience; and
        iii. Successfully completed an FHWA approved comprehensive bridge inspection training course.

H. Moveable Bridge Design/Rating

This type of work involves the production of bridge designs, construction plans and specifications; preparation of bridge rating reports; providing construction inspection services for bascule, lift, swing or other common types of moveable bridges, including all electrical and mechanical systems required for the operation of the bridge; all which meet the specific requirements of MassDOT and the Federal Highway Administration. A minimum of two Registered Structural or Civil Professional Engineers in the Commonwealth of Massachusetts is required.

H1. Moveable Bridge Inspection

This type of work involves field inspection of moveable bridge structures and the preparation of accurate and complete inspection reports, all in accordance with the National Bridge Inspection Standards.

The firm shall meet the requirements and qualifications set forth under Category G1, Bridge Inspection, as modified by the following:

- The firm is required to employ a minimum of one Inspection Team Leader, and
- The firm is required to employ a minimum of one electrical engineer to inspect the electrical systems associated with moveable bridges and a minimum of one mechanical engineer to inspect the mechanical systems associated with moveable bridges. Each of these individuals must have a minimum of 5 years experience in the inspection and evaluation of their respective moveable bridge systems.

I. Traffic Operations Studies and Design

This type of work involves the study of existing traffic operations/patterns. It includes roadway, sign and signal inventories, intersection and crossing diagrams, analyses of crash records, traffic counts and projections, travel times, level of service analyses, safety assessments, bicycle and pedestrian accommodation, parking practices, etc. It also includes the preparation of construction plans, traffic management plans and specifications for recommendations made as the result of traffic operations studies. Additionally, it includes geometric design or operational improvements oriented to relieve major traffic problems and/or to improve safety, which involve signalization, pavement marking, signing, lighting, minor highway reconstruction, and determination of right-of-way requirements. A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts is required.

J. Geotechnical Engineering Including Soils and Foundation Studies

This type of work is defined as geotechnical engineering as it relates to soils, foundation analysis and design, and foundation studies. Firms qualified for this type of work must be able to design boring programs which include the following: insitu penetration tests, sampling and classifications of soils and rock, geophysical techniques, cone sounding, field vane and permeability tests and instrumentation installation. They should also be able to design laboratory test programs to define soil and rock parameters for design. Based on the above field and laboratory testing, the firm must be able to determine the type and depth of foundations for bridges and other transportation related structures; determine soil bearing capacity and predict soil settlement; determine slope stability in

embankment construction; prepare surcharge and stage construction time schedules; perform pile load tests and all other relevant geotechnical and foundation studies in accordance with MassDOT standard procedures and specifications. A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts is required.

K1. Construction Oversight

This type of work is defined as the management of highway and bridge construction projects in accordance with MassDOT plans, standard specifications and construction details. The work under this category involves field tasks, such as taking measurements, performing elementary survey, inspecting materials and ensuring general contractor compliance with plans and specifications. Related duties may also include review of contractor schedules, all necessary detailed record keeping, developing "as built drawings", shop drawing reviews, performing contract quantity calculations, preparing bi-weekly pay estimates, ensuring State and Federal EEO compliance, completing contractor performance records and ensuring contractor wage compliance.

Firms must have specific knowledge/experience in most or all of the following areas of construction work: concrete testing/placement, bituminous and polymer concrete pavement products, excavation/cut/fill operations, utilities construction, placement of structural and reinforcing steel, steel sheeting, pile driving and testing, electrical/highway lighting, maintaining safe work zones consistent with the project's traffic management plan and traffic signal systems.

A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts is required. NICET Level II-IV, certification is desired for inspection services.

K2. Construction Contract Assistance

This type of work involves providing non-field construction contract assistance, such as analyzing construction claims and construction schedules and providing MassDOT with documentation to assist in the negotiation of settlements of construction claims.

Firms that provide non-field services must have expertise with Critical Path Method (CPM) scheduling and analysis, MassDOT Standard Specifications for Highways and Bridges, and Massachusetts General Laws pertaining to MassDOT construction contracts.

A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts is required.

L. Hydraulics and Hydrology

This type of work requires a demonstrated understanding of the characteristics of hydrology and fluid mechanics involved with the flow of water in or through highway drainage or bridge structures. The firm shall have the ability to:

- perform hydraulic analysis to determine tailwater rating curves for culverts or to analyze other situations in which uniform or nearly uniform flow conditions exist,
- analyze and compute water surface profiles using the step-backwater method for bridge design or other gradually-varied flow situations in rivers and streams,

- identify a drainage area associated with a design point,
- develop a composite flood runoff hydrograph that would occur within the drainage area under a given storm event,
- route the flood hydrograph to and through the design point.

Due to the interactive and complex nature of water surface profile and flood routing computations, the firm must also have the in-house facility to perform these computations with hydrologic computer applications presently accepted as standard engineering practice.

M. Materials Inspection and Testing

This type of work is defined as the inspection, sampling and testing of construction materials such as concrete, steel, soils and other materials related to highways and bridges. Work also involves the inspection of the fabrication of steel members, prestressed concrete beams and other structural pieces, and precast items such as barriers, conduit, manholes and similar items. The firm shall have the ability to sample and test the materials or to ship samples to MassDOT's Research and Materials Laboratory, all in conformance to MassDOT, AASHTO, AWS and ASTM standards. Laboratories performing physical and/or chemical analysis on steel or other metals shall be accredited by a national program such as NADCAP, A2LA or NIST. All other laboratories shall be accredited by the AASHTO Accreditation Program. Individuals performing the inspection, sampling and testing work shall be qualified under an acceptable national and/or regional certification program.

N. Architecture

This type of work is defined as architectural services, including structural, mechanical and electrical disciplines. Typical work includes the development of new designs, renovation plans, structural design and modifications, heating, air conditioning and ventilation (HVAC) studies, etc. A minimum of one Registered Architect in the Commonwealth of Massachusetts is required.

O. Landscape Architecture

The following requirements and demonstrated ability, and/or experience in performing the following duties are necessary for qualifying to provide landscape architecture services:

- Minimum of one Registered Landscape Architect in the Commonwealth of Massachusetts.
- Ability to design to guidelines of the Americans with Disabilities Act and the Massachusetts Architectural Access Board.
- Ability to identify and evaluate historic, natural and cultural landscape elements and design appropriate mitigation and restoration solutions. Design elements may include but not be limited to: trees, shrubs, groundcovers, wildflowers, site furniture, site lighting, pavement patterns, pedestrian and bicycle paths, rest areas, walls, berms, fences, detention/retention facilities, signs and information boards, and other features.
- Knowledge of federal, state, and professional guidelines, policies, codes and procedures regarding highway design, structures, grade changes, stairways, railings, fences, barriers, and ecological restoration and enhancement of land associated with transportation projects.

- Knowledge and ability in selecting suitable, hardy, maintainable trees, shrubs, groundcovers and wildflowers for visual enhancement, expansion or re-establishment of ecological zones, wildlife habitats, erosion control, visual screening, windbreaks and snowbreaks.

P. Transportation Planning

This type of work is defined as the study and analysis of alternate transportation systems and the study and analysis of urban area and regional transportation. Basic elements include: data collection, modeling alternate systems, preparation of Major Investment Studies, cost estimates, forecasting future transportation needs for a 20 or 30-year period, analyses of TDM/TSM (Transportation Demand and System Management) alternatives, public involvement programs, consideration of ecological and community value factors, and inventories for all modes of transportation. A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts is required.

Q. Intelligent Transportation Systems

This type of work is defined as the integration of computer, communications and control technologies for traffic management applications. Firms should demonstrate expertise in at least one and illustrate working knowledge in all of the following areas: computerized traffic control systems, freeway operations control, incident management, communications, information processing, systems engineering, traffic simulation models, and human factors.

R. Transit and Rail Systems Design

This type of work is defined as the design of railroad trackage, turnouts, diamond crossings and appurtenances, signal systems, rubberized grade crossings, highway/rail preemption systems and analysis of the impacts to railroad movements/operations. A minimum of one Registered Professional Engineer in both the civil and electrical categories in the Commonwealth of Massachusetts is required.

U. Subsurface Utility Engineering

The work under this category involves the investigation, identification, assessment and mapping of subsurface utility facilities associated with highway, bridge and tunnel projects. Specific work activities include records research, site surveys, geophysical investigations and non-destructive air vacuum excavation. Firms must have the experience and ability to provide services in accordance with The American Society of Civil Engineers' *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*, CI/ASCE 38-02. Firms must be capable of providing services at Quality Levels A and B.

Firms must possess the experience, personnel and in-house equipment necessary to accomplish utility search and trace functions for both metallic and non-metallic facilities using geophysical techniques such as electromagnetic, magnetic and elastic wave methods and non-destructive excavation methods. Equipment should include, but not be limited to, ELF, VLF and LF electromagnetics, magnetometers, closed-circuit television, ground-penetrating radar, resonant sonics, non-destructive air vacuum excavation equipment, surveying and data recording equipment, and AutoCAD Civil 3D.

A minimum of one Registered Professional Engineer in the Commonwealth of Massachusetts or one Registered Professional Land Surveyor in the Commonwealth of Massachusetts is required. Firms must also possess a minimum of one geophysicist or a professional with demonstrated background, training and experience in geophysical exploration.

V. Value Engineering

The work under this category involves the performance of systematic reviews and analyses of projects during the project development and design phases by multidisciplined teams of persons not involved in each project. These reviews and analyses yield recommendations for providing the needed project functions safely, reliably, efficiently and at the lowest overall cost; improving the value and quality of the project; and reducing the time to complete the project.

Firms must possess the experience and personnel necessary to provide multidisciplined teams to complete Value Engineering studies or must demonstrate the ability to organize and oversee Value Engineering studies, in accordance with MassDOT and FHWA guidelines.

Specialists in Environmental Engineering

A1. Cultural Resources

Specialists in Archaeology, History, Architectural History, Architecture, and Historic Architecture must meet, at a minimum, the professional qualification standards as set forth in 36 CFR Part 61 Appendix A and 950 CMR 70 (as amended).

Archaeological Investigations. Firms must have the minimum professional qualifications and demonstrated professional experience in the appropriate specialties (i.e. archaeology, anthropology, social and architectural history, and physical sciences) and in all three phases of archaeological investigations: reconnaissance and intensive surveys; site examination; and data recovery. The firms must also have adequate laboratory and curatorial facilities to meet project requirements.

Architectural Survey/Inventory and Historic Evaluation. Firms must have the minimum professional qualifications and demonstrated professional experience in the field of Architecture, Architectural History, and Historic Architecture. The firm must evidence capability in the areas of: documentary research/analysis; physical research/analysis in identifying historic structures commonly found in New England; and knowledge of the evaluation criteria for National Register eligibility.

Historic American Engineering Record (HAER) Documentation for Historic Bridges. Firms must have the minimum professional qualifications and demonstrated professional experience in the field of civil engineering history, including specifically, direct professional experience with historic bridges. The firm must evidence capability in the areas of: documentary research/analysis; physical research/analysis; archival-quality photography; and archival-quality drafting.

Historic American Buildings Survey (HABS) Documentation for Historic Buildings. Firms must have the minimum professional qualifications and demonstrated professional experience in the field

of Architecture, Architectural History, and Historic Architecture. The firm must evidence capability in the areas of: documentary research/analysis; physical research/analysis; archival-quality photography; and archival-quality drafting.

A2. Hazardous Waste – Site Investigation and Assessment

This type of work involves performing preliminary site assessments, risk assessments, and limited site investigations on releases of oil and hazardous materials to soil, groundwater, and surface water. Firms qualified for this type of work must be able to demonstrate prior experience in Massachusetts. The firm also must have access to one or more Licensed Site Professionals (LSPs) as licensed by the Massachusetts Department of Environmental Protection and all applicable federal and state licenses and certificates necessary to perform the above operations. Such work may also require the services of Certified Industrial Hygienists, and asbestos and lead certifications.

A3. Hazardous Waste – Remediation

This type of work involves performing comprehensive site investigations, feasibility studies, remedial design, and other remedial actions, in accordance with the Massachusetts Contingency Plan (310 CMR 40.000 as amended) and other applicable, relevant and appropriate laws and regulations. Firms qualified for this type of work must be able to demonstrate prior experience in Massachusetts. The firm must also have as full-time staff: one or more Professional Engineers; one or more Licensed Site Professionals (LSPs); one or more hydrogeologists, and have all applicable federal and state licenses and certificates necessary to perform oil and hazardous materials investigation, design, construction, and operation and maintenance.

A4. Wetlands – Delineation and Assessment

This type of work involves wetland identification and delineation using the State and Federal methodology including accurate identification and classification of hydric soils, hydrophytic vegetation, and hydrologic indicators (using the 1987 Army Corps of Engineers Delineation Manual, the 1995 Department of Environmental Protection Handbook on "Delineating Bordering Vegetated Wetlands", and the 2005 Wetlands Protection Act (WPA) regulations as amended.) The firm must demonstrate previous experience in Massachusetts.

The work includes the assessment of wetland functions and values by methodologies approved by the Army Corps of Engineers (including the Highway Methodology Supplement on Functions and Values – a descriptive approach, and "WEThings" assessment methodology for wildlife habitat) and as defined by the Wetlands Protection Act regulations and policies. The firm must have a thorough understanding of and demonstrated permitting experience with State and Federal wetlands and water resource regulations including WPA Chapter 91 Waterways License, Section 401 Water Quality Certification, Coastal Zone Management Consistency Determination Policies, Section 404 Dredge and Fill permits including the Programmatic General Permit, the Highway Methodology, the Section 404-b1 guidelines and the individual permit process, National Pollutant Discharge Elimination System General Permit for Storm Water, and U.S. Coast Guard Bridge Permit.

A5. Wetlands – Mitigation

This type of work involves designing, constructing, and monitoring wetland replication sites. Firms must have demonstrated ability in the following:

- Conducting Groundwater level monitoring
- Replicating various wetland functions and values
- Design of hydrophytic planting plans and experience in transplanting native and nursery stock wetland plants
- Development of specifications for hydric soil
- Surface grading to achieve wetland hydrology
- Flood storage compensation
- Design of temporary and permanent erosion control measures including installation of hay bales and silt fences, and other techniques such as bioengineering
- Development of specifications which will allow successful construction of replication areas.

A6. Water Quality – Assessment

This type of work includes the assessment of both existing and proposed water resource quality, particularly with respect to contaminates in storm water runoff. Firms must have a thorough understanding of and demonstrated experience in the following:

- The regulations and permit process for 401 Water Quality Certifications and National Pollutant Discharge Elimination System (NPDES) permits
- Formulation of a water quality monitoring program, with sampling methods and locations
- Quantitative analyses of water contaminants
- Development and use of hydrologic models, (e.g., mass-balance, TR-55, P-8 (for storm water))
- Identification of water quality contaminants and their potential sources.

A7. Water Quality – Mitigation

This type of work involves the ability to design and implement Best Management Practices (BMPs) as determined by the water quality assessment that was conducted for a project. Firms should be familiar with the Department of Environmental Protection's Stormwater Management Policy and Performance Standards, and should have a working knowledge of MassDOT's Storm Water Handbook. Experience in construction and monitoring is preferred. Firms should have demonstrated experience in:

- Design and installation of erosion and sediment control techniques such as hay bales, silt fences and bioengineering.
- Design and installation of various types of BMPs including wet and dry detention/retention basins, water quality enhancement areas and vegetated drainage ditches. BMPs should include source reduction as well as "end-of-pipe" methods.
- Design and installation of a variety of dewatering systems (e.g., cofferdams, sedimentation basins, etc.).

A8. Air Quality

This type of work involves modeling highway-related air quality impacts. Firms must maintain the latest version of all U.S. EPA air quality models for modeling mobile source emissions and dispersion modeling. Firms must have the ability to interpret and understand traffic data for use in air quality models and must have a working knowledge of the Federal and State Air Quality Conformity Regulations (23 CFR part 51 and 310 CMR part 60 as amended). Firms must demonstrate evidence of appropriate professional staffing levels to perform the required analyses.

A9. Noise Studies

This type of work includes modeling highway traffic noise and designing highway noise barriers. Firms must maintain the latest in traffic noise prediction software and noise measuring equipment. For highway noise studies, the software shall include the current FHWA approved noise prediction/barrier design program. The firm shall produce all input files to the noise model digitally. Noise measuring equipment must meet or exceed American National Standards Institute (ANSI) Standard S1.4 Type 1 specifications. The ability to interpret and understand traffic data for use in highway traffic noise models and a working knowledge of the Federal and State procedures for abatement of highway traffic noise (23 CFR part 772 and MHD Type I and Type II guidelines) is required. The firm must demonstrate evidence of appropriate professional staffing levels to perform the required analyses.

Surveyor Services

S1. Engineering Field Survey

Any professional service provided under this category shall be performed in accordance with M.G.L. Chapter 81 – State Highways, and 250 CMR 6.03, the Procedural and Technical Standards for the Practice of Land Surveying in the Commonwealth of Massachusetts – Construction Layout Surveys.

The work under this category involves field survey tasks associated with the construction of general highway and bridge projects. Field Surveyors must have the personnel, instruments and equipment to perform electronic field book (data collector) staking for construction lay out and to gather field survey data electronically in AutoCAD Civil 3D format.

A minimum of one Registered Professional Land Surveyor in the Commonwealth of Massachusetts in direct charge and supervision in accordance with the Rules and Regulations Governing Professional Engineers and Land Surveyors (250 CMR 2.00 – 6.00) is required. The firm is also required to have a minimum of two years experience performing field survey tasks associated with the construction of general highway and bridge projects.

S2. Total Station AutoCAD Base Plan Services

Any professional service provided under this category shall be performed in accordance with M.G.L. Chapter 81 – State Highways, and 250 CMR 6.02, the Procedural and Technical Standards for the Practice of Land Surveying in the Commonwealth of Massachusetts – Data Accumulation Surveys – Topographic, Utilities, Site and Hydrographic.

The work under this category involves the collection of electronic field survey data and the completion of AutoCAD Base Plans. Firms prequalified under this category must have the personnel, instruments and equipment to:

- Gather field survey data electronically in AutoCAD Civil 3D format.
- Deliver fully edited AutoCAD Civil 3D drawing files and all other data output project files.
- Deliver complete, edited, stamped Base Plans in accordance with MassDOT Highway Division requirements.

A minimum of one Registered Professional Land Surveyor in the Commonwealth of Massachusetts in direct charge and supervision in accordance with the Rules and Regulations Governing Professional Engineers and Land Surveyors (250 CMR 2.00 – 6.00) is required. The firm is also required to have a minimum of two years experience performing total-station survey work collecting data electronically, providing AutoCAD Civil 3D work products, and delivering completed Base Plans ("existing conditions" or site plans).

S3. Layout Document Preparation

Any professional service provided under this category shall be performed in accordance with M.G.L. Chapter 81 – State Highways, and 250 CMR 6.01, the Procedural and Technical Standards for the Practice of Land Surveying in the Commonwealth of Massachusetts – Cadastral, Original and Retracement Surveys.

The work under this category involves the collection of electronic field survey data, the completion of AutoCAD Base Plans and the completion of Layout/Easement Plans and written instruments. Firms prequalified under this category must have the personnel, instruments and equipment to:

- Gather field survey data electronically in AutoCAD Civil 3D format.
- Deliver fully edited AutoCAD Civil 3D drawing files.
- Deliver complete, edited, stamped Layout/Easement Plans on mylar in accordance with MassDOT Highway Division and Registry of Deeds requirements.
- Deliver complete, edited, written instruments in accordance with MassDOT Highway Division and Registry of Deeds requirements.

A minimum of one Registered Professional Land Surveyor in the Commonwealth of Massachusetts in direct charge and supervision in accordance with the Rules and Regulations Governing Professional Engineers and Land Surveyors (250 CMR 2.00 – 6.00) is required. The firm is also required to have a minimum of two years experience preparing Layout Plans and

associated written instruments suitable for recording at the Registry of Deeds, and delivering AutoCAD Civil 3D work products.

S4. Photogrammetry

The services provided under this category shall include flight planning, acquisition of aerial photography and the development of engineering Base Plans and digital data. Firms prequalified under this category must have the personnel, instruments and equipment to:

- Develop flight plans and select appropriate flight line layout including the selection of height, scale and instrumentation.
- Deliver aerial photography including contact prints and electronic image files.
- Develop and translate aerial photography data into engineering Base Plans and digital data.
- Deliver complete, edited AutoCAD Civil 3D drawing files and all other data output project files in accordance with MassDOT Highway Division requirements.

The firm shall have a minimum of one Certified Photogrammetrist (CP) through the American Society for Photogrammetry and Remote Sensing (ASPRS). The firm is also required to have a minimum of two years experience performing photogrammetry work, providing aerial photography and AutoCAD Civil 3D work products.