

**Mn/DOT Office of Technical Support—Consultant Services**  
**Work Type Definition**  
 Rev. 1.1 (9/7/04)

Work Type Name	<b>15.1 Subsurface Utility Engineering (SUE)</b>
<i>Work Type Owner</i>	Office of Technical Support, Utility Agreements Engineer, (Marilyn Remer)
<i>Work Type Input</i>	<p>Inputs may include some or all of the following:</p> <ul style="list-style-type: none"> <li>• Highway information showing the project limits, alignment, profile, benchmark data, drainage, coordinate data, CADD files, and any other applicable information;</li> <li>• A preliminary list of utilities or agency contact persons within the project limits;</li> <li>• Any quality level D and C information that others have previously acquired;</li> <li>• Input and approval of all test hole locations; and</li> <li>• A letter of introduction.</li> </ul>
<i>Work Type Definition</i>	<p>Subsurface Utility Engineering (SUE) is the engineering process that accurately and comprehensively identifies, characterizes, and maps underground utility facilities needed for highway plans. Its major activities include designating, locating, and data management. These activities, when combined with traditional record research, coordination with utility owners, and site surveys, provide high quality utility information for use during project development and design.</p> <p>Project coordination:</p> <ul style="list-style-type: none"> <li>• Work closely with Mn/DOT to facilitate the orderly progress and timely completion of the project;</li> <li>• Attend an initial meeting and an on site inspection to ensure familiarity with existing conditions and project requirements;</li> <li>• Develop a work plan that includes a description of the tasks to be performed and a proposed schedule of activities;</li> <li>• Meet with Mn/DOT periodically to coordinate the work effort, discuss progress, and resolve problems;</li> <li>• Provide Mn/DOT with copies of diaries and correspondence that document work-related communications between the consultant, utility owners, outside agencies, and/or private landowners;</li> <li>• Obtain all necessary permits and rights of entry from Mn/DOT local jurisdictions, and/or private landowners;</li> <li>• Provide all maintenance and traffic control to perform the work. <b>Traffic control devices are furnished and installed according to the current Field Manual for Temporary Traffic Control Zone Layouts (MN MUTCD);</b></li> <li>• Provide all necessary equipment, supplies, and support personnel, including surveying capability; and</li> <li>• Advise Mn/DOT of utility risks and recommend an appropriate quality level of utility data for a given project area at the appropriate time within the appropriate project planning and design process. Mn/DOT will then specify the desired quality level of utility data to the Consultant.</li> </ul> <p>Designating:</p> <ul style="list-style-type: none"> <li>• Designate, record, and mark the appropriate horizontal location of existing underground utilities and their major laterals to existing buildings (quality level B described in the publication <i>ASCE Standard CI/ASCE 38-02</i>);</li> <li>• Separately submit all quality level B utility designating data to Mn/DOT in digital format compatible with Mn/DOT's CADD system; and</li> </ul>

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<i>Work Type Definition Continued</i>	<p>Locating:</p> <ul style="list-style-type: none"> <li>• Review plans and recommend areas to Mn/DOT that require locating test hole sites within the project limits;</li> <li>• Recommend changes to Mn/DOT’s location plan based on SUE best practices and obtain utility company records as required;</li> <li>• Obtain all necessary permits and rights of entry from Mn/DOT, local jurisdictions, and/or private landowners;</li> <li>• Neatly cut and remove the existing pavement or surface, with a maximum cut area of 225 square inches unless unusual circumstances exist;</li> <li>• Excavate test holes to expose the utility in a manner that insures the safety of excavation and prevents any damage to the utility;</li> <li>• Comply with all applicable utility damage prevention laws and coordinate with the utility inspectors as required;</li> <li>• Investigate, evaluate, measure, and record all utility data ascertainable from each test hole site;</li> <li>• Be responsible for any damage to the utility during excavation;</li> <li>• Stop work and notify appropriate agencies in the event of utility damage;</li> <li>• Backfill the excavation with the appropriate material around the utility structure and compact, in lifts, with appropriate devices;</li> <li>• Permanently restore the pavement or any other area within the limits of the original cut at the time of backfill to equal or better condition than it was before excavation;</li> <li>• Furnish, install and color code a permanent above-the-ground marker directly above the centerline of the structure and record the elevation of the marker;</li> <li>• Completely clean up the work site to equal or better condition than it was before excavation;</li> <li>• Tie all vertical elevations to a minimum of two checked benchmarks;</li> <li>• Return utility “locating” information (quality level A described in the publication <i>ASCE Standard CI/ASCE 38-02</i>) to Mn/DOT in a digital format compatible with Mn/DOT’s CADD system that includes the following information:             <ul style="list-style-type: none"> <li>○ Elevation of the top and/or bottom of the utility tied to datum of the furnished plan;</li> <li>○ Elevation of the existing grade over the utility at the test hole;</li> <li>○ Horizontal location referenced to the project coordinate datum after performing all required survey work;</li> <li>○ Outside diameter of the pipe or width of the duct banks and configuration on the non-encased multi-conduit systems;</li> <li>○ Utility structure material compositions and conditions;</li> <li>○ Pavement thickness and type, where applicable;</li> <li>○ Identification of benchmarks used to determine elevations;</li> <li>○ Elevation with an accuracy of +/- 0.05 feet; and</li> </ul> </li> </ul>

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	Data Management: <ul style="list-style-type: none"> <li>• Assemble and present designating and locating information in a format compatible with Mn/DOT’s CADD standards;</li> <li>• Obtain and record field information in field books and draft onto plan sheets in electronic format using the current MicroStation and GEOPAK™ that Mn/DOT uses under the supervision of a Minnesota Licensed Professional Engineer.</li> </ul>
<i>Work Type Output</i>	Products or deliverables that meet all project-specific requirements and any requirements described in the publication <i>ASCE Standard CI/ASCE 38-02</i> .
<i>Specific Examples of Output</i>	Deliverables include complete and accurate set(s) of electronic location information plans for all utilities within the specified area. Outputs may include some or all of the following: <ul style="list-style-type: none"> <li>• Utility location plans, produced using Mn/DOT’s Level 2 CADD standards <a href="http://www.dot.state.mn.us/caes/cadd/toc.html">http://www.dot.state.mn.us/caes/cadd/toc.html</a>;</li> <li>• Electronic reports and location (database) information; and</li> <li>• Test hole information on a certification form.</li> </ul>
<i>Quality Attributes of Output</i>	The deliverables must meet the form and content requirements listed for SUE based on ASCE Standard CI/ASCE 38-02.
<i>Levels of Work Type Output</i>	The SUE provider must be able to complete the following levels of subsurface utility engineering based on the ASCE Standard CI/ASCE 38-02: <ul style="list-style-type: none"> <li>• <b>Level B</b> involves the use of surface geophysical techniques to determine the existence and horizontal position of underground utilities;</li> <li>• <b>Level A</b> involves the use of nondestructive digging equipment at critical points to determine the precise horizontal and vertical position of underground utilities, as well as the type, size, condition, material, and other characteristics.</li> </ul>

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<b>15.1 Subsurface Utility Engineering Minimum Technical Qualifications</b>	
<b><i>Requirements of the Professional Staff</i></b>	
<i>Minimum Number of Staff</i>	<p>The number of professional and technical support personnel must be recorded and updated. Key personnel must include: (Note: number of personnel will increase if project dictates.)</p> <ul style="list-style-type: none"> <li>• A minimum of 3 field staff to complete the project in the given time frame;</li> <li>• A minimum of 2 professional and technical support staff as indicated below:               <ul style="list-style-type: none"> <li>• A minimum of 1 project engineer that is a Minnesota Licensed Professional Civil Engineer with at least 3 years of SUE experience to be directly involved in the development of the contract deliverable documents; and</li> <li>• A minimum of 1 surveyor that is experienced in surveying the utility features and is a Minnesota Licensed Land Surveyor to perform the required survey work <b>OR will have to hire and manage an approved sub-consultant from the 9.4 Design/Location Surveys work type under the Pre-Qualification Program to survey the utility features.</b></li> </ul> </li> </ul> <p><i>Note: the following duties may be done by the 2 professional staff but if there is a larger project there may need to be a separate person to do these functions: 1) one project manager who is experienced in managing multiple subsurface utility engineering projects to manage all aspects of the work; and 2) one quality manager that is knowledgeable of the ASCE Standard Guideline for Collecting and Depicting Existing Subsurface Utility Data (CI/ASCE 38-02).</i></p>
<i>Professional Certification/Licensure</i>	<p>There must be a minimum of one professional that is a Minnesota Board Licensed Civil Engineer. One professional that is a Minnesota Licensed Land Surveyor <b>OR indicate that you will be using an approved firm from the 9.4 Design/Location Surveys work type under the Pre-Qualification Program.</b></p>
<i>Qualifying Experience</i>	<p>SUE personnel must have:</p> <ul style="list-style-type: none"> <li>• Engineering training (a minimum of Bachelor Degree in Civil Engineering), experience, knowledge, and expertise in the appropriate areas necessary to do the project in accordance with the American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and Mn/DOT design policies, procedures, practices, and standards; and</li> <li>• Minimum of 3 years experience using SUE.</li> </ul>
<b><i>Requirements of Firm</i></b>	
<i>Past Record &amp; Experience of Firm</i>	<p>The SUE provider must be able to:</p> <ul style="list-style-type: none"> <li>• Provide details of the scope of SUE work performed for 3 years minimum satisfactory subsurface utility engineering experience on highway projects;</li> <li>• Provide designating, locating, and data management services as indicated in the ASCE Standards;</li> <li>• Survey SUE data acquired during the designating and locating phases to project control and transfer it into Mn/DOT's CADD system and/or onto its plans; and</li> </ul>

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<i>Equipment</i>	<p>A wide range of equipment is necessary to detect the variety of underground utilities that may be present. The SUE provider must own or rent:</p> <ul style="list-style-type: none"> <li>• Magnetic, elastic wave, and other geophysical designating equipment;</li> <li>• Vacuum excavation or comparable nondestructive locating equipment;</li> <li>• Surveying and data recording equipment; and</li> <li>• Software systems compatible with Mn/DOT’s CADD system.</li> </ul>
<b><i>Submittal Requirements</i></b>	
<i>Requirements of Professional Staff</i>	<p>Key personnel must include a project manager and a project engineer who have adequate experience in managing SUE projects, and at least one Minnesota Licensed Professional Civil Engineer. Evidence of experience must include:</p> <ul style="list-style-type: none"> <li>• Resumes that document the qualifications and experience of staff in the category/level of work that must be done;</li> <li>• Personal experience histories of the firm’s principals or key personnel;</li> <li>• A list of <b>all</b> SUE projects, including the scope of SUE work performed, during the last 3 years;</li> <li>• Documentation of other professional or technical personnel used to support pre-qualification.</li> </ul>
<i>Requirements of Firm</i>	<ul style="list-style-type: none"> <li>• Experience of the firm in the category shall be documented by reference to completed projects.</li> <li>• A signed and notarized form indicating the firm is capable of using Mn/DOT’s Level 2 CADD Standards. The form is located on the Web Site under Overview and Application Information.</li> <li>• One project example from the last 3 years that includes the following: 1) Test Hole Sheets; 2) Sample deliverables showing designated utilities, and 3) Utility composite clearly identifying utilities at quality levels A, B, C and/or D.</li> <li>• The firm must have protection for any contracting agency against errors and omissions of data collection, interpretation, and management.</li> </ul>
<i>Project Documentation</i>	<ul style="list-style-type: none"> <li>• Project examples may be submitted electronically on CDs or submitted in hard copy (i.e. reports, plans, etc.).</li> </ul>

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