Section 626  Temporary Steel Plate Trench Bridging

626.1 Description. This specification covers the temporary bridging of the roadway or sidewalk to accommodate excavation work by permit or contract. Steel plates are occasionally used in areas where an excavation is made in the roadway for repairs or utility work, providing temporary protection to motorists and pedestrians and continued movement of traffic. When backfilling operations cannot be completed by the end of the authorized work shift, steel plates (meeting the requirements below) may be used to temporarily cover the excavation. All plate(s) shall be visibly identified with permittee's / contractor's name and 24 hour notification telephone number. All plates must be installed such that there will not be any rocking, noise, hammering or shaking of adjacent property. Installation and maintenance shall be overseen by the permittee's / contractor's competent person.

626.1.1 Definition of Competent Person. The designated competent person should have and be able to demonstrate the following:

626.1.1.1 Training, experience, and knowledge of: soil analysis; use of protective systems; and requirements of 29 CFR Part 1926 Subpart P.

626.1.1.2 Ability to detect: conditions that could result in cave-ins; failures in protective systems; hazardous atmospheres; and other hazards including those associated with confined spaces.

626.1.1.3 Authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

626.2 Materials and Manufacture.

626.2.1 Plate Material. The steel shall be semi-killed or killed. The steel for plate(s) shall be manufactured in accordance with one of the following:

626.2.1.1 ASTM A 36 Grade 36 (Yield Strength of 36,000 psi).

626.2.1.2 ASTM A 572 Grade 50 (Yield Strength of 50,000 psi).

626.2.2 Plate Dimensions. The plate(s) must extend beyond the edge of the trench wall to adequately support the traffic loads on it. Plate(s) shall be large enough to allow minimum of 2 foot of bearing on each side of the excavation. Plates shall be placed perpendicular or parallel to the direction of travel. In all situations, the longitudinal edges of the steel plates shall not be in the wheel path.

626.2.2.1 Thickness. For trench widths less than or equal to 4.0 feet as determined in the direction of travel, steel plates shall have a minimum thickness of 1 inch.

626.2.2.2 Structural Design. For trenches and excavations with spans greater than four (4.0) feet as measured in the direction of travel, a structural design, to include plate dimensions, thickness, ASTM A 36 or ASTM A 572 steel grade, and minimum shoring or bracing requirements, shall be prepared by a structural professional engineer registered by the Missouri Division of Professional Registration and approved by the Engineer.
Consideration shall also be made for traffic volume and composition, duration and size of excavation and weather conditions. A minimum factor of safety of 4.0 is required. In accordance with the Design Criteria Manual 50.22 Bridge Structure Design, the design loading for plates spanning a trench width exceeding 4.0 feet shall be the more severe of:

626.2.2.2.1 Vehicular Traffic Areas.
   a) St. Louis County T45 Loading;
   b) St. Louis County HS25 Loading;
   c) Other loading conditions as specified by permit or in the contract documents.

626.2.2.2 Non-Vehicular Traffic Areas.
   a) OSHA, AASHTO, ADA standards, and as directed by 626.4.11.

626.2.2.3 Plate Deformations. All plating used shall be without deformations (warping, cracking, etc.) and shall be subject to straightedge testing. Plate removal will be required if plate is permanently deformed. Steel trench plate deformation may occur during loading, but if a steel plate is deformed without loading to at least 0.5 inch per 10 feet in length the plate shall be removed and replaced.

626.2.2.4 Welding. To hold multiple plates tightly together, plates may require a 6 inch long tack weld for stability. When the steel is to be welded, a welding procedure suitable for the grade of steel and intended use is to be utilized. See ASTM A6, Appendix X3 for information on weldability.

626.2.3 Plate Skid Resistance. The utility or contractor shall maintain a non-skid surface on the plate. Plate(s) without the required skid-resistant surfacing will require removal. Surfacing requirements are not required in areas not exposed to traffic or pedestrian movements. Epoxy-coated plates are not approved for use. The utility or contractor shall be responsible for periodically monitoring skid resistance, reporting results to the Engineer, and removing deficient plates from service.

626.2.3.1 The manufacturer may elect to imprint waffle-shaped patterns or right-angle undulations to achieve skid resistance on the steel plate wearing surface. The maximum vertical deviation within the pattern shall be no more than 0.25 inch.

626.2.3.2 Vehicular Traffic Areas. For products proposed for use in vehicular traffic areas, test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with ASTM E 303 using the British Pendulum Tester and have an initial British Pendulum Number (BPN) of no more than 60 and no less than 50. Plates will be rejected for use when the BPN value is 40 or less when tested in accordance with ASTM E 303.

626.2.3.3 Non-Vehicular Traffic Areas. For products proposed for use in non-vehicular traffic areas, test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with
Temporary Steel Plate Trench Bridging

ASTM E 303 using the British Pendulum Tester and have an initial British Pendulum Number (BPN) of no more than 50 no less than 40. Plates will be rejected for use when the BPN value is 30 or less when tested in accordance with ASTM E 303.

626.2.4 Plate Reflectivity Marking. Temporary steel plates installed on roadways open to vehicular traffic should be marked with a durable and highly reflective white pavement marking tape no less than 4 inches in width meeting the requirements of Section 621.2.3, Temporary Removable Detour Grade Tape. The 3 inch distance from the plate's edge to the tape may be varied depending on the conditions. The marking pattern used should, at a minimum, include all four corners of the plate. Replacement of the markings shall be based on a visual assessment performed periodically at night by a moving inspection vehicle. Any leg of the marking that has lost fifty percent or more of its conspicuity (retro reflectivity, or when damaged, torn or missing) shall be replaced.

626.2.4.1 Plates with All Sides Less than 6 Feet in Length. Reflective tape minimum corner length, in each direction shall be 1.0 feet.

626.2.4.2 Plates with Any Side Greater Than or Equal to 6 Feet in Length. Reflective tape minimum corner length, in each direction shall be 2.5 feet.

626.2.4.3 Reflective Markings Skid Resistance. The surface of the markings provides an initial and retained minimum skid resistance value of 50 and 45 BPN, respectively, when tested according to ASTM E 303. Tape replacement will be required when skid resistance falls below a BPN of 45.

626.3 Equipment. The contractor or utility shall supply appropriate equipment to deliver, place and install steel plates in accordance with manufacturer's recommendations.

626.4 Construction Requirements. The contractor or utility shall be responsible to ensure that the steel plate(s), shoring, and trench plate securing systems meet minimum specifications and are properly installed and maintained. The contractor or utility shall be responsible for any claims that may be associated with the use of steel plating. Whenever steel plating is installed on County roadways, work will be provided in accordance with the following.

626.4.1 Notification.

626.4.1.1 Non-Emergency. Notify County Inspector at least 48 hours in advance of placing steel plates in roadway.

626.4.1.2 Emergency. All emergency work situations (i.e., water main break, ruptured gas main, sanitary sewer break) shall be reported immediately by telephone to the Department. Emergency work occurring within normal working hours (7:30 a.m. to 4:00 p.m., Monday through Friday) shall be reported to the Department's Permit Inspection Section at (314) 615-1150. Emergency work occurring at other hours or on Saturdays, Sundays and holidays shall be reported to the St. Louis County Police Information Center at (314) 889-2341. The Department will dispatch its personnel as required by the emergency situation.

626.4.2 Vertical Clearance. Contractor or utility shall maintain a vertical clearance for overhead installations of not less than 15 feet, 6 inches from the road surface.
626.4.3 **Vertical Grade Limitations.** Contractor or utility shall install and maintain plates with the following pavement vertical grade limits:

626.4.3.1 **Vehicle Areas.** Apply plating on streets with vertical downhill or uphill grades of 5 percent or less.

626.4.3.2 **Non-Vehicle Areas.** Apply plating on non-vehicle (pedestrian) areas with vertical downhill or uphill grades of 8 percent or less.

626.4.4 **Advanced Warning.** Traffic control devices shall be in place before trench excavation is made and during plating period. Materials shall be in accordance with Section 1063. All temporary traffic control devices shall be manufactured and installed in accordance with Section 612, Traffic Control Devices, as shown on the plans, as specified in accordance with current MUTCD requirements, and be NCHRP 350 compliant.

626.4.4.1 **Roadways with Posted Speeds Greater than 45 MPH.** DIP (WO8-2) or BUMP (WO8-1) signs shall be installed depending on the profile of the roadway. STEEL PLATE AHEAD (WO8-24), DIP, or BUMP signs shall be installed depending on the profile of the roadway or use of steel plating on the roadway. SPEED LIMIT (R2-1, GO20-5aP) signs may be used to reduce speed through the excavation area.

626.4.4.2 **Roadways with Posted Speeds Equal to or Less than 45 MPH.** STEEL PLATE AHEAD, DIP, or BUMP signs shall be installed depending on the profile of the roadway or use of steel plating on the roadway.

626.4.5 **Open Trench Length Allowed.** The maximum length of open trench allowed to be covered with steel plates shall be a total of fifty (50) lineal feet or as approved in the permit, the contract documents or in writing by the Engineer.

626.4.6 **Shoring and Bracing.** Trenches and excavations shall be adequately shored and braced to withstand highway traffic loads in accordance with Section 726.3.11.9, Bracing and Shoring.

626.4.7 **Stability.** Each plate must be fully supported around the perimeter to prevent wobbling or rocking with non-asphaltic shims and installed to operate with minimum noise.

626.4.8 **Securing.** The plates shall be secured to prevent any movement. Trench plates shall not be overlapped or stacked on top of another plate. Steel plate bridging shall be secured against displacement by using adjustable cleats, shims or other devices. Securing devices shall not extend above the wearing surface of the plate. When steel plates are removed, the dowel holes in the pavement shall be backfilled with graded fines of an asphalt concrete mix (asphalt pavement) or a pre-approved pre-mix non-shrink rapid set concrete material (concrete pavement). Steel plate bridging and shoring shall be installed using either Method (1) or (2):

626.4.8.1 **Method 1: Roadways with Posted Speeds Greater than 45 MPH.** The pavement shall be cold-planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate(s). The approach and ending plates shall be attached to the roadway by a minimum of two Grade 60 No. 4 or equivalent dowels pre-drilled into the corners of the plate and drilled 3 inches into the pavement; subsequent plates shall be butted to each other. The gap between the edge
of the plate(s) and the adjacent pavement shall be filled with Type "D" Bituminous or Commercial asphalt pavement in accordance with Section 405.

626.4.8.2 Method 2: Roadways with Posted Speeds Equal to or Less than 45 MPH. Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two Grade 60 No. 4 or equivalent dowels pre-drilled into the corners of the plate and drilled 2 inches into the pavement; subsequent plates are butted to each other.

626.4.9 Ramping. Plates shall be secured and ramped on all sides with a trench plate securing device, to ensure a smooth transition from the road surface to the top of the plate surface and back to the road surface. Ramping slope shall not exceed 12:1 (H:V or 8.5 percent) and can be accomplished by mechanical fastening or wedging asphalt. Ramping with approved bituminous asphalt shall be made, to the nearest 6 inches, with a minimum taper length of 12 inches to cover all edges of the steel plate. If a mechanical fastening trench plate securing system is used it shall be installed per manufactures direction and continuously maintained around all outside edges of the trench plate(s) until removal of the plate(s).

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<tr>
<th>Minimum Ramp Taper Lengths</th>
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<tr>
<td>Vertical Distance (V) (inch)</td>
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<tr>
<td>V ≤ 1</td>
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<td>1&lt; V ≤ 1 ½</td>
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626.4.9.1 Option 1 Wedging Asphalt. Ramps shall be constructed using Type "C" Bituminous or fine-graded Commercial asphalt pavement in accordance with Section 405.

626.4.9.2 Option 2 Mechanical Fastening. One pre-approved method of securing steel trench plates involves a perimeter restraint consisting of polypropylene (PP). The PP securing system shall be substantially similar, or equal to, the Plate Lock Trench Plate Securing System which is pre-approved for use. Other systems shall be submitted to the Engineer for review a minimum of 48 hours prior to use.

626.4.10 In-Place Time Limit. Unless specifically noted in the provisions of the contract or permit, plate bridging shall not exceed 7 consecutive working days.

626.4.11 Non-Vehicle Areas. When required to keep sidewalks or non-vehicle areas open, bridging may be secured by plywood with a skid-resistant surface. Design loading shall have a minimum factor of safety of 4.0. Plywood used in pedestrian areas shall be a minimum of ¾ inch thick, provide a non-skid surface, be a minimum of 5 feet in width, have an OSHA-approved handrail, extend a minimum of 2 feet past the surface edge of trench, and have approach ramps not to exceed 8.5 percent for a vertical height not to exceed 30
Pedestrian bridging shall meet current ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) requirements.

**626.4.12 Maintenance.** The permit holder or contractor’s competent person shall maintain records that the plate(s) have been checked a minimum of two times a day by the permit holder or contractor. Records shall include the location, time and date inspected and the inspector’s name, title, company information (name, address, telephone number), and any action taken. Records shall be submitted to the Engineer within 48 hours after removal of temporary bridging.

**626.4.12.1 County Emergency Repair.** If County forces must correct emergency condition due to excavation and plate placement or movement, the contractor or utility will be charged for cost of corrective measures required. The Contractor or utility shall be responsible for having the defective work, materials or equipment corrected, repaired or replaced within three (3) hours after notification by the Engineer. Unless otherwise approved by the Engineer, if defective materials or equipment cannot be repaired or replaced within this time, the Contractor shall make arrangements for their temporary replacement with similar materials or equipment. In any event, if directed by the Engineer, immediate repairs and/or adjustments are determined to be necessary to provide for the safe and efficient movement of traffic, and the Contractor or utility is not capable of making such repairs and/or adjustments to the satisfaction of the Engineer; the Engineer will order County personnel or other qualified Engineers or technicians to make immediate repairs and/or adjustments. The Contractor or utility will be charged the entire cost of the work performed by County or other qualified personnel (if paid by the County). The Contractor or utility will be charged for all labor (including benefits and indirect overhead), materials, and equipment furnished by the County in making immediate repairs and/or adjustments. There will be a three (3) hour minimum call-up time for overtime. The work performed by County or other qualified personnel will in no way waive continued maintenance of the temporary trench bridging by the utility or Contractor.

**626.4.12.2 Seasonal Requirements.** When approved for use, between November 15 and April 15 steel plate corner limits shall be marked with a 2 inch square stake painted International Orange and extending at least 4 feet above the ground, placed adjacent to the plated edge of the roadway.

**626.5 Method of Measurement.** Final measurement will not be made for temporary steel plate trench bridging.

**626.6 Basis of Payment.** No direct payment will be made for furnishing, placing, maintaining, and removal of plate(s) and any incidental items necessary to complete the work unless specifically provided as a pay item in the contract.