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CONSTRUCTION SURVEY**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Construction survey includes qualified personnel, equipment, and supplies required for, but not limited to, the following:

- A. Project Control
- B. Grading
- C. Bridges, Structural Walls, and Reinforced Box Culverts
- D. Pipe Culverts
- E. Sanitary and Storm Sewers
- F. Water Mains
- G. Paving
- H. Replacement of Disturbed Monuments
- I. Additional Items Included in the Contract Documents

1.02 DESCRIPTION OF WORK

Construction survey and staking necessary for construction of the project as shown in the contract documents.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

- A. Qualifications:** Upon request, submit a resume identifying survey personnel and their respective qualifications to the Engineer for review.
- B. Documentation:** Format the survey work documentation in a manner acceptable to the Engineer. Ensure documentation is sufficient to prove means and methods used to transfer design intent to construction stakes. Check tie-ins with existing roadways, structures, and utilities prior to staking; notify the Engineer if discrepancies are found.
 - 1. Benchmarks:** Submit descriptions and elevations of new permanent benchmarks. Establish benchmarks on existing durable fixtures not subject to frost action or disturbance.
 - 2. Replacement of Disturbed Monuments:** Upon completion of construction, submit the following to the Engineer.
 - a. Description of new monuments using existing features for reference.
 - b. Horizontal position of new monument by state plane or local coordinate system.
 - c. Elevation of new monuments including level run documentation for new benchmarks.
 - d. Recorded section corner certificates and property pin replacement if applicable.
 - 3. Staking Records:** Upon request, submit all field books, computer-aided design and drafting (CADD) files, digital log files, etc.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS**A. Qualifications:**

1. Perform construction survey directly by or under responsible charge of a Professional Engineer or Professional Land Surveyor licensed in the State of Iowa.
2. Set new monuments or reset disturbed monuments under the responsible charge of a Professional Land Surveyor licensed in the state of Iowa.

B. Obtain Engineer's approval when interpolating grades or using cross-sections to obtain alignments and elevations.

C. The Jurisdiction will provide benchmarks, right-of-way corners, and primary control points from the original survey in the contract documents. Roadway alignment data will be provided as required for construction.

1.08 MEASUREMENT AND PAYMENT

A. Construction Survey: If the contract documents specify that the Contractor is responsible for construction survey, measurement and payment will be as follows.

1. **Measurement:** Lump sum item; no measurement will be made.
2. **Payment:** Payment will be at the lump sum price for construction survey.
3. **Includes:** Lump sum price includes, but is not limited to, the costs of resetting project control points, re-staking, and any additional staking requested beyond the requirements of this section.

PART 2 - PRODUCTS**2.01 HUBS**

Provide hardwood, metal, or plastic stakes of sufficient size and length to prevent stake movement due to adjacent construction activity.

2.02 LATH

Provide wood lath that is approximately 3/8 inch thick by 1 1/2 inches wide by 48 inches long.

PART 3 - EXECUTION**3.01 EQUIPMENT**

- A. Utilize survey equipment with a level of accuracy appropriate for the type of work being staked.
- B. Do not use GPS equipment for staking the vertical elements of paving hubs, bridges, structural walls, or reinforced box culverts.

3.02 PROJECT CONTROL

Provide all horizontal and vertical control data to the Jurisdiction at the completion of each phase of the construction survey work activity.

- A. Primary Monuments:** Primary survey monuments are established by the Jurisdiction prior to project construction.
 - 1. Replace primary monuments disturbed by construction.
 - 2. Reference a minimum of three ties to durable objects (trees, fence posts, station marks, etc.) in the description of the new monument.
- B. Secondary Monuments:** Secondary control points are established by the Contractor or Contractor's Surveyor during construction to facilitate staking or instrument calibration.
 - 1. Place in locations likely to survive construction.
 - 2. Reference to the primary monuments with a resulting error radius not to exceed 0.10 feet.
 - 3. Replace any points disturbed during construction. Points do not need to be replaced after construction.
- C. Benchmarks:** Utilize the benchmarks shown in the contract documents to establish all other vertical control on the project site.
 - 1. Establish new permanent vertical control benchmarks on new structures (bridges, reinforced box culverts), fire hydrants, or power poles located in the project limits.
 - 2. Identify permanent benchmarks.
 - 3. Transfer elevations from construction plan benchmarks to new permanent benchmarks using a digital level or a three-wire leveling method.
 - 4. Record descriptions and elevations of new permanent benchmarks.
- D. Property Limits:** If specified, mark all construction easements, permanent easements, and rights-of-way with flagged lath at 100 feet intervals on tangents; at the PC and PT of curves; at 25 feet intervals on curves; and at all angle points.

3.03 CONSTRUCTION STAKING

For each construction operation specified in the contract documents, provide stakes as follows. If approved by the Engineer, staking frequency may be modified as long as the level of accuracy appropriate for the type of work is achieved.

A. Grading:

1. Conventional Grading:

- a. Set slope stakes left and right (nails or wood hubs) at 100 foot intervals, or less if needed, for all embankment or roadway excavation. Mark slope stakes with wooden lath depicting station, offset, and elevation reference (cut or fill) to all pertinent breaks in the slope.
- b. In lieu of slope stakes, set a 100 foot grid with lath over project limits for mass grading with cut or fill marked for finished grade elevation. Finished grade refers to the finished surface of construction (top of paving for paved areas, top of black dirt for unpaved areas).
- c. For paved areas, in addition to the 100 foot grid, set lath at appropriate offsets around the perimeter at 50 foot intervals, high and low points, and points of inflection. Mark lath with cut or fill to finished grade (top of paving).
- d. For building pads, set lath at appropriate offsets for building corners or gridlines. Provide a semi-permanent benchmark, consisting of a 2 foot wooden hub or rebar, set to the same elevation as the proposed finished floor elevation.
- e. Set finished grade stakes (blue tops) at 100 foot intervals at both edges of paving and along centerline for roadways, and in a 100 foot grid in parking areas. Mark blue tops with a stake chaser or similar method.

2. GPS Machine-Controlled Grading:

- a. Establish GPS control points consisting of a minimum of 5 semi-permanent points located around the perimeter of the site. Points may be established horizontally using GPS, but transfer elevations of said points from an original benchmark located in the construction documents using a total station or level.
- b. Provide grade check stakes at an approximate spacing of 300 feet on roadways.
- c. Provide approximately 20 grade control check stakes for building pad and parking areas.

B. Bridges, Structural Walls, and Reinforced Concrete Box Culverts:

1. Provide appropriate offsets for centerline of abutments, piers, back of parapets, face of walls, etc.
2. Provide stakes consisting of a tacked wooden hub with a lath. Clearly mark offset distance and referenced line identification: centerline roadway, abutment, pier, etc.
3. Clearly mark height of cut or fill to a pre-determined elevation reference: flowline, top of wall, top of footing, etc. For structural walls, provide elevation reference to either top of wall or top of footing. Do not reference off of bottom of wall.
4. Set a minimum of two semi-permanent benchmarks, consisting of a 2 foot wooden hub or rebar, for each structure. Transfer elevation to benchmarks from construction plan benchmarks using a total station or level.

3.03 CONSTRUCTION STAKING (Continued)

5. Perform an independent check of all the above stakes. Independent check can be performed by an independent survey crew or by arbitrary verification of the location of the stakes as placed in the field.
 - a. For an arbitrary verification, survey stakes and control points in an arbitrary coordinate system and then rotate digitally into the design file to verify accuracy with the contract documents.
 - b. Notify Contractor of any discrepancies within 24 hours of placing the stakes for each structure.

C. Pipe Culverts:

1. Place stakes for offsets to ends of pipe, labeled with offset distance, and cut or fill to proposed flowline of the new culvert.
2. Place stakes for all bends in the pipe alignment. Provide two offset stakes, one along each pipe segment bearing, at bends to accurately place bend location.
3. For culverts over 100 feet in length, set offset stakes 50 feet and 100 feet from end of pipe and every 100 feet thereafter. Label stakes with offset distance and elevation reference to the flowline of the proposed pipe.

D. Sanitary and Storm Sewers:

1. Place stakes for all manholes, intakes, cleanouts, and other structures associated with new sewer.
2. Provide offset stake for each structure set at 10 to 15 feet. Offset may be increased for deep sewers.
3. For back of curb intakes, set two offset stakes along the curb alignment to properly align the new grate. Stakes may also be offset perpendicular to the curb alignment as required to avoid conflicts with the proposed storm sewer.
4. Place stakes for all bends in the pipe alignment. Provide two offset stakes, one along each pipe segment bearing, at bends to accurately place bend location.
5. For pipe sections over 100 feet in length, set offset stakes 50 feet and 100 feet from end of pipe and every 100 feet thereafter. Label stakes with offset distance and elevation reference to the flowline of the proposed pipe.

E. Water Mains:

1. Place stakes for proposed water main on line (no offset) at 100 foot intervals. Label stakes as centerline of water main with elevation reference to the top of the proposed pipe to ensure sufficient depth is achieved.
2. Place stakes for all hydrants, valves, bends, tees, and other appurtenances with appropriate offsets. Label stakes with offset distance and elevation reference to proposed finished grade adjacent to the hydrant, valve, bend, tee, or other appurtenance.
3. Place stakes at all crossings of storm sewers and sanitary sewers. Label stakes with top of pipe elevations at the crossing for water mains and sewer mains to ensure proper depth and vertical separation.

3.03 CONSTRUCTION STAKING (Continued)**F. Paving:**

1. Set paving hubs at appropriate offsets around perimeter of paved areas. Place hubs at grade breaks (high and low points), points of horizontal deflection (bends), and 25 foot intervals in between. Label stakes with offset distance and elevation reference to the top of paving.
2. For paving areas wider than 60 feet, set paving hubs at appropriate offsets on 25 foot intervals along interior bays or drive lanes. Label stakes with offset distance and elevation reference to the top of paving.
3. Place stakes for curb drop locations for sidewalk ramps and driveways. Set hubs on both sides of the drop curb at the bottom of the drop to ensure the appropriate width of curb opening is achieved. Label stakes with offset distance and elevation reference to top of paving.
4. Place stakes for sidewalks and trails on one side only at appropriate offsets. Place stakes at 50 foot intervals in straight and level sections and 25 foot intervals for horizontal or vertical curves. Label stakes with offset distance and elevation reference to the top of paving.

3.04 DISTURBED MONUMENTS

Replace land corners, property corners, permanent reference markers, and benchmarks specified in the contract documents, or if disturbed during construction.

END OF SECTION

MOBILIZATION**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Project Mobilization

1.02 DESCRIPTION OF WORK

Mobilization includes preparatory work, operations performed, or costs incurred prior to beginning work on the various items on the project site.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

- A. When a bid item for mobilization is included on the proposal form, comply with this section for measurement and payment.
- B. When the proposal form does not include a bid item for mobilization, all costs incurred by the contractor for mobilization are incidental to other work and no separate payment will be made.

1.08 MEASUREMENT AND PAYMENT**A. Mobilization:**

- 1. **Measurement:** Lump sum item; no measurement will be made.
- 2. **Payment:**
 - a. When 5% of the original contract amount has been completed, 25% of the contract price for mobilization will be paid.
 - b. When 10% of the original contract amount has been completed, 50% of the contract price for mobilization will be paid.
 - c. When 50% of the original contract amount has been completed, 100% of the contract price for mobilization will be paid.
- 3. **Includes:** The unit price for mobilization may include the following.
 - a. The movement of personnel, equipment, and supplies to the project site.
 - b. The establishment of offices, buildings, and other facilities necessary for the project.
 - c. Bonding, permits, or other expenses incurred prior to construction.

PART 2 - PRODUCTS

None.

PART 3 - EXECUTION

None.

END OF SECTION

PAVEMENT MARKINGS**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Permanent Pavement Markings, Symbols, and Legends
- B. Removable Pavement Markings, Symbols, and Legends
- C. Temporary Delineators
- D. Raised Pavement Markers
- E. Removal of Pavement Markings, Symbols, and Legends
- F. Grooves Cut for Pavement Markings, Symbols, and Legends

1.02 DESCRIPTION OF WORK

- A. Furnish, install, maintain, and remove permanent or temporary pavement markings, temporary delineators, and raised pavement markers, such as for:
 - 1. Diversions and on-site detours where the need for this work is anticipated as part of the traffic control plan to accommodate traffic during construction.
 - 2. Replacing markings obliterated during construction activities on roads open to public traffic.
 - 3. Changing markings on roads open to public traffic where the necessary changes result from staged construction.
 - 4. Replacing markings that are obsolete.
 - 5. Marking newly completed pavement surfaces.
 - 6. Replacing existing markings that have faded or worn away on roads open to public traffic.
- B. Permanent pavement markings are intended to remain in place after the project is completed. Temporary markings are designated for removal, will be obliterated during construction, or require changes during construction.
- C. Diversions are installations or modifications for the transfer of traffic on four lane or wider roadways to lanes that would normally carry traffic in the opposite direction. Diversions provide for continuous but restricted traffic flow from both directions for divided highways. Diversions usually include crossovers.
- D. On site detours are temporary roadways specifically constructed to accommodate traffic during construction.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants as well as the following:

- A. Submit a list of pavement marking materials proposed for use on the project.
- B. Provide the Engineer with a copy of the manufacturer's recommendations for applying the pavement marking.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. General:**

1. Painted, taped, or removed lines will be measured in stations based upon a single 4 inch width.
2. The length of each type of marking will be as specified in the contract documents and will consider measured field adjustments.
3. The measurement for dashed and dotted lines will be adjusted to exclude the skips.
4. Measured lengths of lines wider than 4 inches will be multiplied by a width factor as follows:

$$\text{Width Factor} = \text{Actual Width} / 4 \text{ inches}$$

B. Painted Pavement Markings, Solvent/Waterborne:

1. **Measurement:** Each type of painted pavement marking will be measured in stations.
2. **Payment:** Payment will be made at the unit price for each type of painted pavement marking.
3. **Includes:** Unit price includes, but is not limited to, reflectorizing spheres, layout, surface preparation, and application of marking paint.

C. Painted Pavement Markings, Durable:

1. **Measurement:** Each type of painted pavement markings will be measured in stations.
2. **Payment:** Payment will be made at the unit price for each type of painted pavement marking.
3. **Includes:** Unit price includes, but is not limited to, layout, surface preparation, and application of marking paint.

1.08 MEASUREMENT AND PAYMENT (Continued)**D. Painted Pavement Markings, High-Build:**

1. **Measurement:** Each type of painted pavement markings will be measured in stations.
2. **Payment:** Payment will be made at the unit price for each type of painted pavement marking.
3. **Includes:** Unit price includes, but is not limited to, layout, surface preparation, and application of marking paint.

E. Permanent Tape Markings:

1. **Measurement:** Each type of marking tape will be measured in stations.
2. **Payment:** Payment will be made at the unit price for each type of tape marking.
3. **Includes:** Unit price includes, but is not limited to, layout, surface preparation, and application of marking tape.

F. Wet, Retroreflective Removable Tape Markings:

1. **Measurement:** Wet, retroreflective removable tape markings will be measured in stations.
2. **Payment:** Payment will be made at the unit price per station for wet, retroreflective removable tape markings.
3. **Includes:** Unit price includes, but is not limited to layout, surface preparation, application, and removal.

G. Painted Symbols and Legends:

1. **Measurement:** Each type of painted symbol and legend will be counted.
2. **Payment:** Payment will be made at the unit price for each painted symbol and legend.
3. **Includes:** Unit price includes, but is not limited to, layout, surface preparation, and application of each symbol and legend.

H. Precut Symbols and Legends:

1. **Measurement:** Each type of precut symbol and legend will be counted.
2. **Payment:** Payment will be made at the unit price for each precut symbol and legend.
3. **Includes:** Unit price includes, but is not limited to, layout, surface preparation, and application of each symbol and legend.

I. Temporary Delineators:

1. **Measurement:** Each temporary delineator installed and removed will be counted.
2. **Payment:** Payment will be made at the unit price for each delineator.
3. **Includes:** Unit price includes, but is not limited to, installation and removal of delineators.

1.08 MEASUREMENT AND PAYMENT (Continued)**J. Raised Pavement Markers:**

1. **Measurement:** Each raised pavement marker installed and removed will be counted.
2. **Payment:** Payment will be made at the unit price for each marker.
3. **Includes:** Unit price includes, but is not limited to, installation and removal of pavement markers.

K. Pavement Markings Removed:

1. **Measurement:** Pavement markings removed will be measured in stations. Removable marking tape or markings obliterated during construction will not be measured.
2. **Payment:** Payment will be made at the unit price for pavement markings removed.
3. **Includes:** Unit price includes, but is not limited to, pavement marking removal and waste material collection, removal, and disposal.

L. Symbols and Legends Removed:

1. **Measurement:** Each symbols or legends removed will be counted.
2. **Payment:** Payment will be made at the unit price for each symbol or legend removed.
3. **Includes:** Unit price includes, but is not limited to symbol and legend marking removal and waste material collection, removal, and disposal.

M. Grooves Cut for Pavement Markings:

1. **Measurement:** Measurement will be in stations and will be equivalent to the quantity of pavement markings associated with the grooving.
2. **Payment:** Payment will be made at the unit price per station.
3. **Includes:** Unit price includes, but is not limited to, layout, cutting grooves, collection and disposal of removed material, and additional groove width and transition length beyond the pavement marking dimensions.

N. Grooves Cut for Symbols and Legends:

1. **Measurement:** Each symbol or legend groove will be counted.
2. **Payment:** Payment will be made at the unit price for each symbol or legend groove.
3. **Includes:** Unit price includes, but is not limited to, layout, cutting grooves, and collection and disposal of removed material.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Provide pavement marking materials that comply with Iowa DOT Section 2527.
- B. Pavement marking materials include:
 - 1. Wet, retroreflective removable tape markings
 - 2. Painted Pavement Markings:
 - a. Waterborne and solvent based paint pavement markings
 - b. Durable paint pavement markings
 - c. High-build waterborne paint pavement markings
 - 3. Regular marking tape
 - 4. Temporary delineators
 - 5. Raised pavement markers
 - 6. Channelizer markers
 - 7. Preformed polymer tape
 - 8. Removable, nonreflective preformed tape
 - 9. Profiled pavement marking tape
 - 10. Intersection marking tape

PART 3 - EXECUTION**3.01 EQUIPMENT**

A. General: Utilize equipment complying with Iowa DOT Section 2527.

B. Pavement Marking Equipment:

1. Capable of placing two lines simultaneously with either line in a solid or intermittent pattern in yellow or white.
2. Capable of applying reflectorizing spheres at the required rate with a pressurized system.
3. All guns in full view of the operator at all times.
4. Equipped with a metering device to register the accumulated length of reach gun, each day.
5. Designed so the pressure gages of each proportioning pump are visible to the operator at all times during operation to monitor fluctuations in pressure.
6. Capable of applying paint without dilution.

C. Pavement Marking Removal:

1. Operates without the release of dust.
2. Recovers all removed material.
3. Includes a waste collection and transfer system and for dry wastes, ensure the system incorporates high-efficiency particulate absorption (HEPA) methods and equipment.

D. Pavement Grooving:

1. Utilize grooving equipment with stacked diamond cutting heads mounted on a floating head with controls capable of providing uniform depth and alignment.
2. If pavement is grooved by dry cutting, provide equipment that is self vacuuming.
3. When requested, make available to the Engineer a caliper, depth gage, or depth plate, for use in measuring groove depth.

3.02 CONSTRUCTION

A. General:

1. Comply with the requirements of the MUTCD for traffic control during all pavement marking operations.
2. Install all pavement markings according to the product manufacturer's published recommendations.

3.02 CONSTRUCTION (Continued)

3. Ensure the following for all painted and taped pavement markings:
 - a. Uniform thickness
 - b. Uniform distribution of reflectorizing spheres throughout the line width
 - c. Line widths as specified, with a tolerance of $\pm 1/4$ inch for 4 inch lines and $\pm 1/2$ inch for wider lines
 - d. Symbols and Legends are visually proportional to contract documents with an out-to-out tolerance of ± 6 inches
 - e. Markings have sharp edges and cutoffs at the ends
 4. For all painted markings:
 - a. Apply the paint without dilution
 - b. Apply reflectorizing spheres immediately to the wet-paint with a pressurized system
 5. For all tape products, follow the manufacturer's recommendations for surface dryness, primers, adhesives, and other surface preparation requirements. Unless otherwise specified by the tape manufacturer, meet the following test for determining surface dryness before applying the tape:
 - a. In an area of direct sunlight where the tape will be applied, place an 18 inch by 18 inch piece of polyethylene (a green or black garbage bag may be used). There should not be any holes or tears in the polyethylene.
 - b. Tape down all the edges of the polyethylene sheet to seal all the edges and not allow any air movement to get under the polyethylene.
 - c. Firmly tamp the tape using the tamper cart or by foot tamping.
 - d. Allow 20 to 25 minutes for the polyethylene to be exposed to the direct sunlight.
 - e. Remove the polyethylene from the road surface. If no moisture is present on the underside of the polyethylene or on the road surface, the tape can be applied.
 - f. If any moisture is present, allow another hour to pass and repeat the test until no moisture is found.
- B. Surface Preparation:** For all pavement markings, ensure the pavement surface is dry and free from dirt, dust, oil, curing compound, and other contaminants that may interfere with markings properly bonding to the surface.
1. Clean surface to at least 1 inch wider than the anticipated marking.
 2. Unless otherwise specified, sweep the pavement surface with a rotary broom or street sweeper.
 3. Shoot an air blast on the pavement surface immediately prior to placing the new marking. The air blast is not intended to remove large amounts of dust, but only the residue that might be left from the removal and cleaning operation.
 4. When pavement markings are placed on newly constructed PCC pavements, remove the existing curing compound film from horizontal surfaces in these locations. Curing compound film need not be removed from curbs or other vertical surfaces. Remove the curing compound in a manner that does not damage the underlying pavement.

3.02 CONSTRUCTION (Continued)**C. Painted Pavement Markings:**

1. **Waterborne and Solvent Based Paint:** Apply paint and reflectorizing spheres at the nominal rates shown in the following tables.

Table 11,030.01: Waterborne Paint Application Rates

Line Width	Wet-Film Thickness	Paint	Reflectorizing Spheres
4"	14 mils	343 ft of solid line per gallon of paint	9.0 lb/gal

Table 11,030.02: Solvent-based Paint Application Rates

Line Width	Wet-Film Thickness	Paint	Reflectorizing Spheres
4"	16 mils	300 ft of solid line per gallon of paint	9.0 lb/gal

2. **Durable Paint Pavement Markings:**
 - a. Use the same binder thickness as applied on the National Transportation Product Evaluation Program (NTPEP) deck with a tolerance of 10%.
 - b. Bead application rate is at the discretion of the Contractor.
 - c. Construct durable pavement markings to comply with the following retroreflectivity requirements when tested according to Iowa DOT Materials I.M. 483.04.

Table 11,030.03: Minimum Coefficient of Retroreflected Luminance

White line, symbols, and legends	300 mcd/ft ² /ft-cdl.
Yellow line	200 mcd/ft ² /ft-cdl.

3. **High-Build Waterborne Paint Pavement Markings:**
 - a. Provide binder thickness of 0.022 inches \pm 0.0025 inches.
 - b. Bead application rate is at the discretion of the Contractor.
 - c. Construct high-build waterborne paint pavement markings to comply with the following retroreflectivity requirements when tested according to Iowa DOT Materials I.M. 483.04.

Table 11,030.04: Minimum Coefficient of Retroreflected Luminance

White line, symbols, and legends	300 mcd/ft ² /ft-cdl.
Yellow line	225 mcd/ft ² /ft-cdl.

- D. **Marking Tape:** If grooving is specified, do not inlay the tape into hot HMA.

1. **Inlaid:** When the installation of preformed polymer pavement marking material or profiled pavement marking tape is in conjunction with placement of HMA, inlay the tape by positioning it on the HMA prior to the final rolling. Perform the installation of the tape according to the manufacturer's recommendations.
2. **Grooved:** When grooving is specified, install marking tape in recessed groove according to the manufacturer's recommendations.

- E. **Temporary Delineators:** Mount temporary delineators 4 feet above the pavement on delineator posts. Install posts 2 feet from the outside edge of the shoulder at locations specified in the contract documents.

3.02 CONSTRUCTION (Continued)

F. Raised Pavement Markers: Ensure markers continually exposed to traffic do not extend more than 3/4 inch above the pavement surface.

G. Pavement Marking Layout and Location:

- 1. Permanent Markings:** Place all lines within 2 inches of reference location. The location of edge lines may be referenced to the pavement edge. The locations of other longitudinal lines may be referenced to accurately locate longitudinal joints. Where reference locations do not exist or are not reliable, locate the lines as follows:
 - a. For straight or nearly straight lines, reference the locations to a string line set between marking line points.
 - b. For curves, reference the locations to closely spaced marking line points. For sharp curves, a spacing of 10 feet may be required.
 - c. Other equally effective systems the Engineer approves.
- 2. Temporary Markings:** The location of temporary pavement marking will be specified in the contract documents or as directed by the Engineer to maximize the effectiveness of the traffic control plan.

H. Removal of Pavement Markings:

- 1. Staging:**
 - a. At the start of construction and at each change in staging, remove all existing pavement markings that conflict with the pavement marking plan.
 - b. Prior to final pavement marking, remove all temporary pavement markings.
 - c. The Engineer may designate other pavement markings for removal to maximize the effectiveness of the traffic control plan.
- 2. Process:**
 - a. Remove existing painted pavement markings so that 90% or more of the pavement is visible. Tightly adhering markings may remain in the bottom of the tining and other depressions on the pavement surface, but ensure they are not visible to the motorist during daytime or nighttime. Remove tape markings according to the manufacturer's recommendations. Ensure removal processes do not cause functional damage to the transverse or longitudinal joint sealant materials.
 - b. Conduct pavement marking removal operations in a manner so that the finished pavement surface is not damaged or left in a pattern that may mislead or misdirect the motorist. When the operations are completed, power broom the pavement surface. Remove all marking removal debris from the pavement surface before the pavement is open to public traffic.
 - c. Perform pavement marking removal to a width no less than the width of the existing or new pavement markings plus 1 inch. Remove the entire area of the existing symbol or legend in a rectangular shape so no directionality may be observed from the removed symbol or legend.
 - d. Removal of pavement markings may be performed by vacuum blasting, vacuum dry grinding, wet grinding, shot blasting, or high pressure water blasting. Open abrasive blasting or dry grinding without containment is not allowed.

I. Markings Obliterated During Construction:

1. On sections of pavement open to traffic, place pavement markings where construction or traffic operations have obliterated existing markings.

3.02 CONSTRUCTION (Continued)

2. Replace markings obliterated during construction within 3 calendar days after the operation that obliterated the markings has been completed. At intersections with Iowa DOT highways, replace all obliterated edge lines, lane lines, no passing zones, and centerlines prior to opening to traffic.
 3. Place symbols and legends within 3 calendar days from the day the road is open to traffic.
- J. Grooving for Pavement Markings:** When specified in the contract documents, place pavement markings in a groove cut into the pavement surface. Dry or wet cut the groove in a single pass.
1. **Groove Depth:** Construct groove according to pavement marking material manufacturer's recommendations with the following minimums.
 - a. **Paint:** Minimum groove depth of 60 mils.
 - b. **Tape:** Minimum groove depth of 100 mils.
 2. **Groove Width:** Marking width plus 1 inch with a tolerance of minus 0.0 inches and plus 0.2 inches.
 3. **Groove Length:** Full length of tape plus 3 inches minimum grooving transition on either end. Do not use a continuous groove for dash markings. When replacing existing dash markings, start cycle so most of the existing marking is removed with the groove. No additional removal of existing markings is required.
 4. **Groove Position:** Locate grooves a minimum of 2 inches from edge of longitudinal joints.
 5. **Finished Surface:** Ensure the bottom of the groove has a fine corduroy-like texture. The maximum allowable rise between the high and low points across the width of the groove is 10 mils.
 6. **Groove Cleaning:** Ensure the surface to receive the marking is free from dust, dirt, or other contaminants that may interfere with the marking properly bonding.
 - a. **Dry Cutting:** Vacuum and broom grooves using a high pressure air blast for the final cleaning.
 - b. **Wet Cutting:**
 - 1) Immediately flush the groove with high pressure water and recover the removed material.
 - 2) Allow the surface to dry a minimum of 24 hours to a visibly dry condition.
- K. Limitations:**
1. **General:**
 - a. Coordinate pavement marking application with other construction work and associated traffic control changes.
 - b. Complete the placement of pavement markings before the lane, road, on-site detour, or diversion is open to traffic.
 - c. If unavoidable circumstances result in not being able to complete the pavement marking placement or removal specified for that day, provide traffic control until the pavement marking placement or removal work is completed.
 - d. Follow the manufacturer's written recommendations for all details of application.

3.02 CONSTRUCTION (Continued)**2. Temperature Restrictions:**

- a. Waterborne and Solvent Based Paint Pavement Markings:** Comply with Table 11,030.05.

Table 11,030.05: Pavement Marking Temperature Restrictions

Type of Marking	Oct. 23 to April 7	April 8 to April 22	April 23 to Oct. 7	Oct. 8 to Oct. 22
Waterborne Paint	not allowed	45° F	45° F	45° F
Low Temperature Waterborne Paint with Rohm & Haas XSR Resin	35° F	35° F	35° F	35° F
Solvent Based Paint	No restrictions	No restrictions	(a)	No restrictions

(a) Only use solvent-based paint if temperature requirements for waterborne paint cannot be met.

b. Durable Paint Pavement Markings:

- 1) Air and pavement surface temperature are 40°F and rising.
- 2) The Engineer may allow placement of durable paint at temperatures below these values based on the durable paint manufacturer's written recommendations.

c. High-Build Waterborne Paint Pavement Markings:

- 1) Air and pavement surface temperature are 50°F and rising.
- 2) When temperatures are below 50°F, the Engineer may approve the use of marking products denoted by the manufacturer as "low-temperature." When approved, low-temperature paints may be applied when temperatures are between 32°F and 50°F.

d. Marking Tape Pavement Markings:

- 1) Air and pavement surface temperature are 50°F and rising.
- 2) Minimum overnight temperature of 40°F the night before application
- 3) The Engineer may allow placement of marking tape at temperatures below these values based on the marking manufacturer's written recommendations.

END OF SECTION

TEMPORARY SERVICES DURING CONSTRUCTION**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Maintenance of Postal Service
- B. Coordination of Solid Waste Collection

1.02 DESCRIPTION OF WORK

- A. Maintain postal service to all properties within the project area.
- B. Maintain solid waste collection to all properties within the project area. Solid waste includes garbage, recycling, and yard waste.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Maintenance of Postal Service:**

1. **Measurement:** Lump sum item; no measurement will be made.
2. **Payment:** Payment will be at the lump sum price for maintenance of postal service.

B. Maintenance of Solid Waste Collection:

1. **Measurement:** Lump sum item; no measurement will be made.
2. **Payment:** Payment will be at the lump sum price for maintenance of solid waste collection.

PART 2 - PRODUCTS

2.01 MAILBOXES

- A. Curbside Mailboxes:** Provide standard curbside mailboxes complying with US Postal Service (USPS) STD-7B.
- B. Cluster Mailboxes:** Provide cluster box units complying with USPS-B-1118.

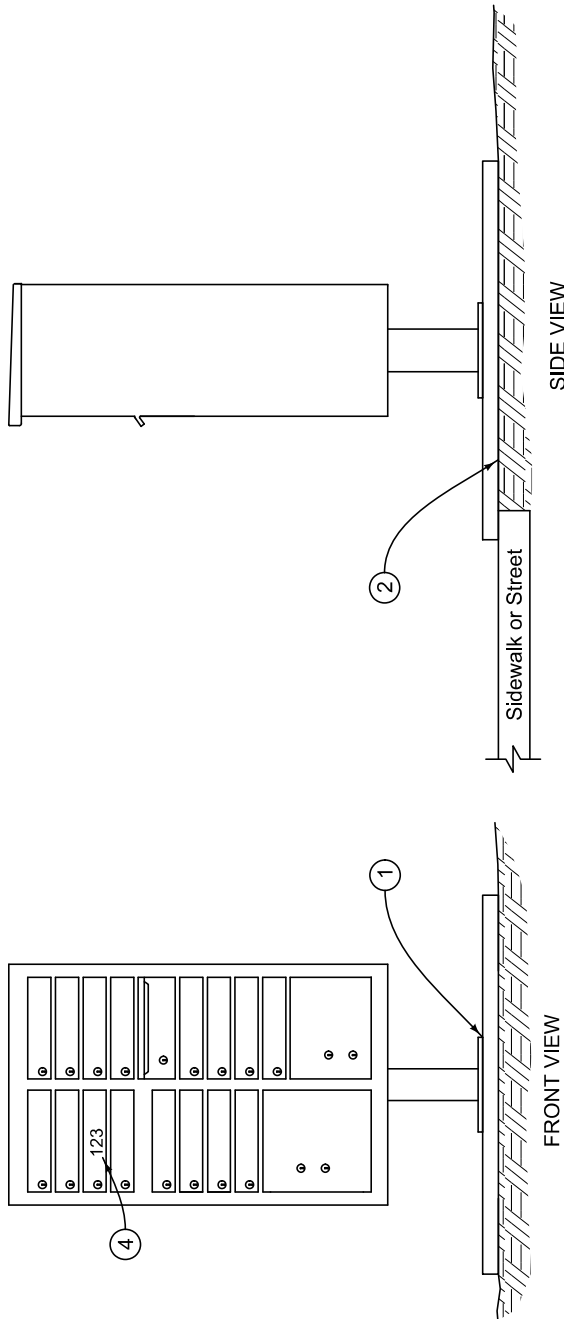
PART 3 - EXECUTION**3.01 POSTAL SERVICE**

- A. Coordinate delivery of mail with the USPS.
- B. Maintain postal service to all properties within the project area. Meet the needs of physically challenged individuals within the project area.
- C. When construction staging prohibits access to normal mailbox locations by the USPS, establish temporary mail service as follows:
 - 1. Coordinate with the USPS to establish an acceptable location for a temporary group mailbox.
 - 2. Verify proposed location with the Engineer prior to installation.
 - 3. Erect and maintain a temporary group mailbox or provide a temporary USPS approved cluster box unit complying with Figure 11,040.101.

3.02 SOLID WASTE COLLECTION

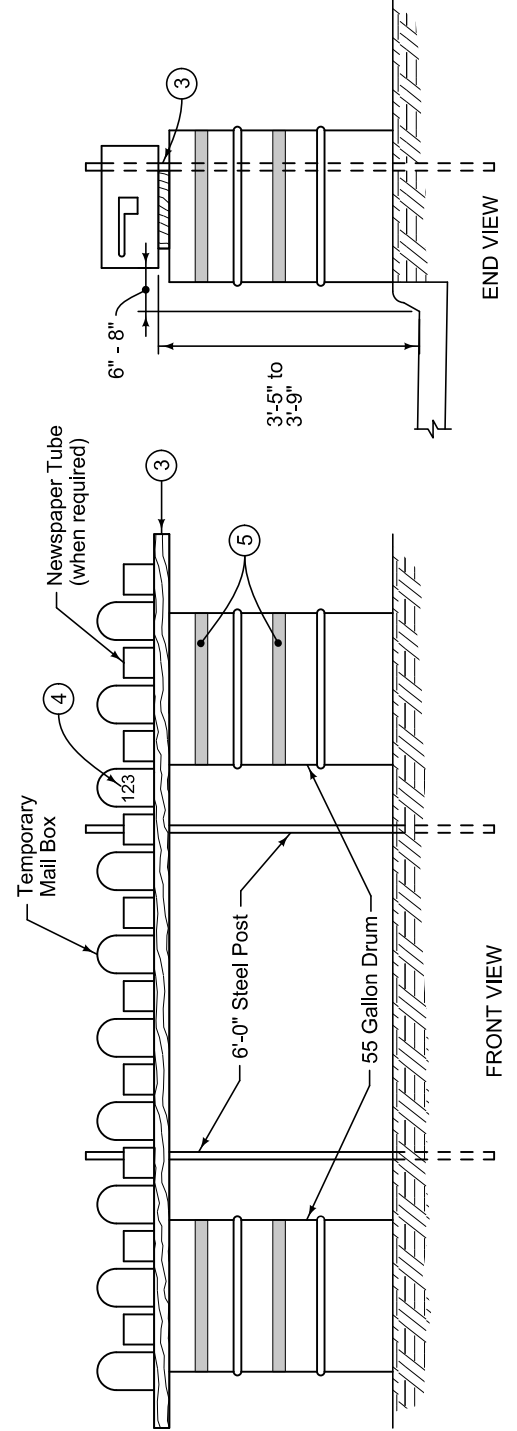
- A. Coordinate collection of solid waste with property owners and the solid waste collection agencies operating in the project area.
- B. Maintain access for solid waste collection vehicles during construction.
- C. When construction staging prohibits access to normal collection locations by solid waste collection vehicles, comply with the following:
 - 1. Coordinate with solid waste collection agencies to establish a common location for collection outside the inaccessible area.
 - 2. Coordinate with residents/businesses within the project area for the alternate solid waste collection procedures.
 - 3. Affix a temporary label to solid waste containers identifying the property owner's or renter's name or address.
 - 4. Prior to the normal collection time, gather containers from properties within the inaccessible area, and transport to the common location accessible by solid waste collection vehicles.
 - 5. Return solid waste containers to each property within 24 hours after collection.

END OF SECTION



- ① Attach cluster box unit to a stable skid or anchor plate.
- ② Set cluster box on firm and level ground adjacent to sidewalk or street paving. Provide anchorage as needed to prevent overturning.
- ③ Provide a 2 inch x 12 inch plank with length as required. Firmly attach mailboxes and newspaper tubes to plank. Secure plank to steel posts for lateral support.
- ④ Label each mailbox with property address.
- ⑤ Attach two bands of 2 inch wide reflectorized tape to each barrel.

TEMPORARY CLUSTER BOX UNIT



TEMPORARY GROUP MAILBOX

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	New	11040.101
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TEMPORARY MAILBOXES

TEMPORARY SIDEWALK ACCESS**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Temporary Residential Access
- B. Temporary Granular Sidewalk
- C. Temporary Longitudinal Channelizing Device

1.02 DESCRIPTION OF WORK

- A. Construct a temporary access to residential properties impacted by construction.
- B. Construct a granular surfaced, temporary, public sidewalk.
- C. Construct temporary longitudinal channelizing device along a public sidewalk to delineate the pedestrian access route.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Temporary Pedestrian Residential Access:**

1. **Measurement:** Granular surfacing for temporary pedestrian residential access will be measured in square yards.
2. **Payment:** Payment for temporary pedestrian residential access will be made at the unit price per square yard.
3. **Includes:** The unit price for temporary pedestrian residential access includes, but is not limited to, supplying and placing granular material, continuous maintenance of granular surface, removal of temporary granular sidewalk, and restoring disturbed surfaces to a condition equal to that which existed prior to construction.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Temporary Granular Sidewalk:**

1. **Measurement:** Temporary granular sidewalk will be measured in square yards.
2. **Payment:** Payment for temporary granular sidewalk will be made at the unit price per square yard.
3. **Includes:** The unit price for temporary granular sidewalk includes, but is not limited to, excavation, grading, timber edging, supplying and placing granular material, continuous maintenance of granular surface, removal of temporary granular sidewalk, and restoring disturbed surfaces to a condition equal to that which existed prior to construction.

C. Temporary Longitudinal Channelizing Device:

1. **Measurement:** Temporary longitudinal channelizing device will be measured in linear feet along the top rail support.
2. **Payment:** Payment for longitudinal channelizing device will be made at the unit price per linear foot.
3. **Includes:** The unit price for temporary longitudinal channelizing device includes, but is not limited to construction, placement, maintenance, and removal of the device.

PART 2 - PRODUCTS**2.01 GRANULAR SURFACING**

Provide Class V fine limestone complying with Iowa DOT Article 4109.02, Gradation No. 8 in the Aggregate Gradation Table and the quality requirements of Iowa DOT Article 4117.03 for temporary residential access or a temporary granular sidewalk.

2.02 TEMPORARY LONGITUDINAL CHANNELIZING DEVICE

- A. Construct channelizing device from common dimensional lumber and construction fasteners. Comply with Figure 11050.102.
- B. Provide a manufactured pedestrian guidance system complying with the requirements of the *American's with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)* and the MUTCD.
- C. Other alternatives that comply with the ADAAG and MUTCD requirements may be allowed upon approval of the Engineer.

PART 3 - EXECUTION**3.01 TEMPORARY PEDESTRIAN RESIDENTIAL ACCESS**

This item is for the construction of a temporary granular path through the project area for pedestrian access to residential properties when street and sidewalk access area is impacted by construction. This access is not intended to provide access to the general public.

- A. Construct a 4 foot wide granular path through the project area as required to maintain access to residential properties.
- B. Place granular material directly on the existing surface to a nominal depth of 3 inches.
- C. Grade the granular surface smooth and compact.
- D. Maintain the surface of the path in a firm, stable, and slip resistant condition.
- E. Relocate or replace path as required by construction staging.
- F. Place additional granular material as directed by the Engineer.

3.02 TEMPORARY GRANULAR SIDEWALK

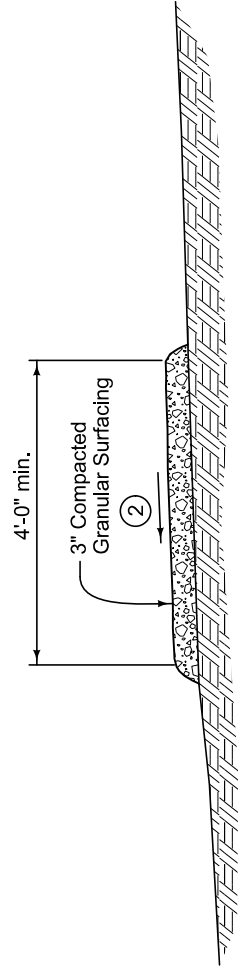
- A. Construct temporary granular sidewalk at locations specified in the contract documents.
- B. Excavate existing ground surface to a nominal depth of 4 inches. Install 2 by 4 edging along both sides of the excavation.
- C. Place granular surfacing between edging and compact.
- D. Maintain the surface of the granular sidewalk in a firm, stable, and slip resistant condition.
- E. Place additional granular material as directed by the Engineer.

3.03 TEMPORARY LONGITUDINAL CHANNELIZING DEVICE

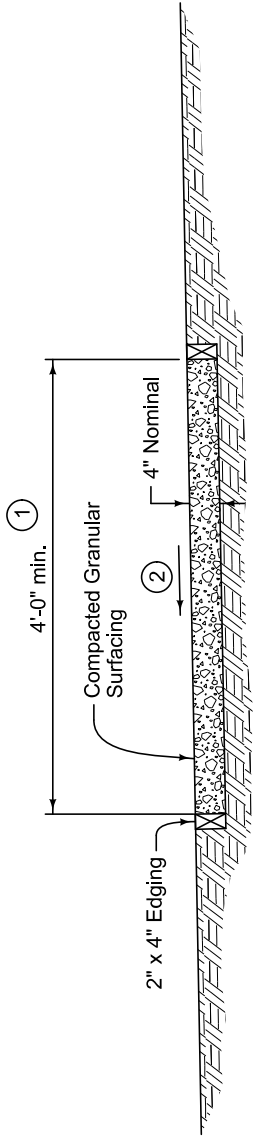
- A. Construct temporary longitudinal channelizing device according to Figure 11050.102, or erect manufactured or other approved pedestrian railing system.
- B. Locate device as specified in the contract documents.
- C. Add additional posts, braces, base plates, screws, nails, sandbags, or other appurtenances as required to maintain device in a stable condition at no additional cost to the Contracting Authority.

END OF SECTION


- ① If sidewalk width is less than 5 feet, provide 5 foot long by 5 foot wide passing spaces at 200 foot intervals.
- ② Target cross slope of 1.5% with a maximum cross slope of 2%.

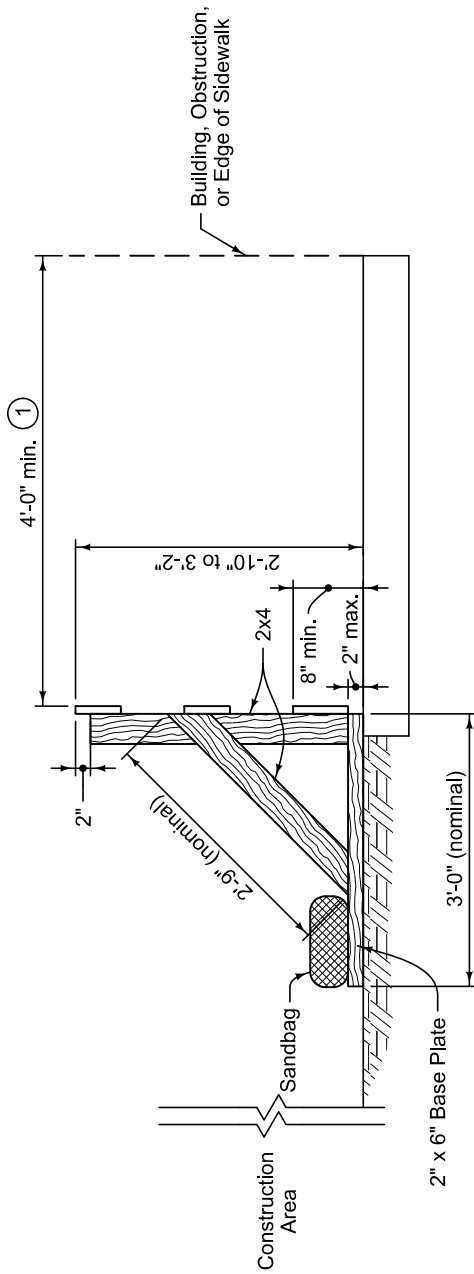


TEMPORARY RESIDENTIAL ACCESS

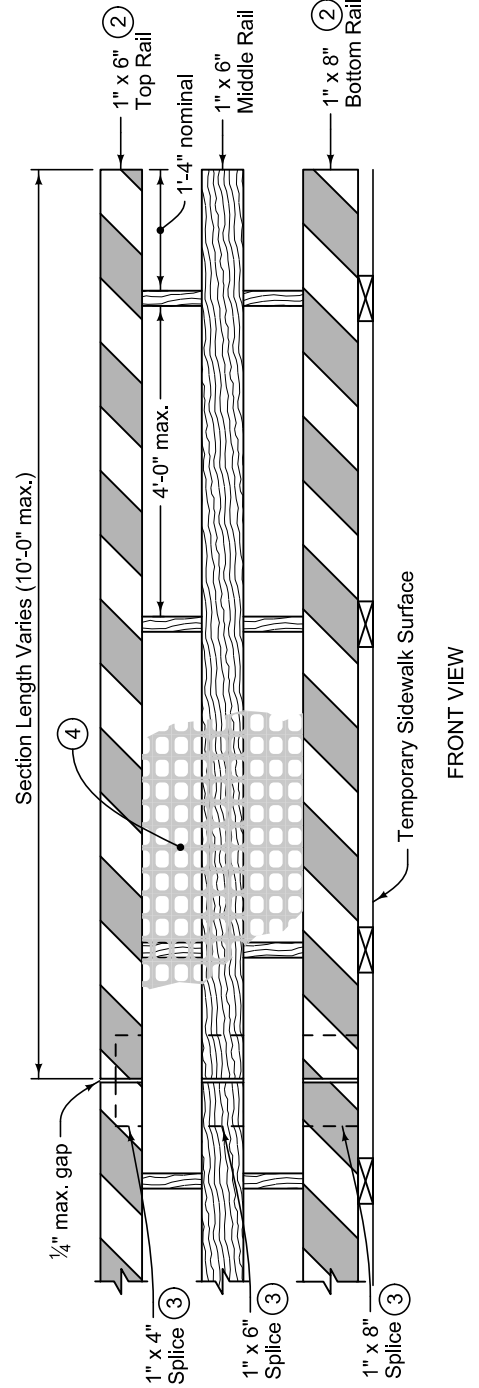


TEMPORARY GRANULAR SIDEWALK

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	New	
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TEMPORARY GRANULAR SIDEWALK AND TEMPORARY RESIDENTIAL ACCESS		



END VIEW



- ① If sidewalk width is less than 5 feet, provide 5 foot long by 5 foot wide passing spaces at 200 foot intervals.
- ② Provide non-reflective orange and white sheeting on top and bottom rails.
- ③ Attach 12 inch long splice boards on the back side of rails at joints between sections.
- ④ When specified in the contract documents, install orange construction safety fence between the top of the bottom rail and the bottom of the top rail.

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	New	11050.102
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TEMPORARY PEDESTRIAN CHANNELIZING DEVICE

CONCRETE WASHOUT**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Concrete Washout

1.02 DESCRIPTION OF WORK

Provide and maintain concrete washout system.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Concrete Washout:**

1. **Measurement:** Lump sum item; no measurement will be made.
2. **Payment:** Payment will be at the lump sum price for concrete washout.
3. **Includes:** Lump sum price includes, but is not limited to, providing concrete washwater containment, collection, and disposal.

PART 2 - PRODUCTS**2.01 CONCRETE WASHOUT**

Provide a concrete washout system that retains all concrete washwater and complies with one of the following:

A. Manufactured Washout Containment:

1. **Concrete Washout Containers:** Provide roll-off type metal container that is leak-proof and designed specifically for collection of concrete and concrete washwater. When concrete pumper trucks are utilized, provide a ramp or other means to allow access for pumper trucks.
2. **Concrete Washout Collection Bags:** Provide leak-proof collection bags designed specifically for collection of concrete and concrete washwater.
3. **Chute Washout Box:** Provide ready mixed trucks with on-vehicle chute washout system to collect concrete washwater for return to the ready mixed plant.

B. Non-Manufactured Containment:

1. **Below-grade System:** For excavated pits, provide an impermeable plastic liner with a minimum thickness of 10 mils.
2. **Above-grade Containment:** For containment areas constructed from earthen berms, provide a double thickness of impermeable plastic liner with a minimum thickness of 10 mil per sheet.

- C. Prohibited Products:** Silt fence, unlined hay bales, unlined earthen embankments, and other practices that may allow concrete washwater to leak out of the containment area or to come in direct contact with the ground are not allowed.

PART 3 - EXECUTION**3.01 CONCRETE WASHOUT**

- A. Provide concrete washwater containment on all projects where concrete washwater will be generated. Clearly mark the location of the washout area and provide directions to truck drivers.
- B. Locate concrete washout containment systems a minimum of 50 feet from proposed or existing storm sewer intakes, open ditches, or waterbodies.
- C. Collect all concrete washwater from ready mixed trucks, pumper trucks, and cleaning of tools and other equipment.
- D. Retain concrete washwater within the containment system until the water evaporates or is collected and disposed.
- E. Prior to rain events, lower the liquid level or cover the concrete washout containment area to prevent overflow.
- F. Clean out the concrete washwater containment area when it reaches 75% of the total capacity.
- G. Hardened solids may be removed from the containment area and disposed of as other non-hazardous wastes or may be broken up and used on the site for other appropriate uses.

3.02 CLEANUP AND REMOVAL

- A. Remove all manufactured washout containment facilities from the project area.
- B. For excavated pits, pump out and properly dispose of all remaining water, remove any hardened solids, and remove all plastic liner materials and fill pit area flush with surrounding ground.
- C. For above-grade containment facilities, pump out and properly dispose of all remaining water, remove any hardened solids, and remove all plastic liner materials and spread out earthen berms.

END OF SECTION

