Section G: WEIGH-IN-MOTION (WIM) SYSTEM

INDEX OF SHEETS

G1  General Layout with Index
G2 - G7  Estimate of Quantities
         and General Notes
G8  Table of Conduit Quantities
G9  Overall Layout
G10 - G11 Removal Sheets
G12  Conduit Notes
G13 - G19 Plan Sheets with Details
G20 - G24 Standard Plates

Project Location
Approx. MRM 236
2. PROJECT OVERVIEW

This section outlines the basic items of work and equipment to be furnished by the Contractor under this contract. This summary is provided to familiarize the prospective bidder with the basic scope of the project. All labor, scheduling, general supervision and equipment necessary for installation is to be supplied by the Contractor.

2.1 SITE DESCRIPTION

The Weigh-in-Motion System consists of:

- one weigh-in-motion scale, an Overheight Detector, and an overhead Automatic Vehicle Identification (AVI) antenna for reading truck transponders installed in the southbound lanes
- two weigh-in-motion scales installed in the northbound lanes

on I-29 Northeast of Sisseton and north of the Sisseton Port of Entry. The existing WIM instrumentation will be removed to permit replacement of the new Weigh-in-Motion System, which will be composed of new and reused components, will be installed in new concrete pavement.

The reinstalled system and associated equipment shall interface directly with existing Port of Entry equipment. Full documentation, equipment installation, and testing shall be provided.

2.2 WIM SYSTEM VENDOR

The Contractor shall contract with the vendor that originally supplied the existing weigh-in-motion system to supply the components and technical assistance required to construct the Weigh-in-Motion System in accordance with the plans and specifications.

International Road Dynamics (IRD) 702 43rd Street East
Saskatoon, SK Canada S7K3T9
Phone (306) 653-6600   Fax (306) 242-5599

2.2.1 SPECIFICATION OF QUANTITIES

<table>
<thead>
<tr>
<th>Bid Item Number</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
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<tr>
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<td>Weigh-In-Motion System</td>
<td>1</td>
<td>Each</td>
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<tr>
<td>110E0100</td>
<td>Remove Concrete Footing(s)</td>
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<td>110E1100</td>
<td>Remove Concrete Pavement</td>
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<tr>
<td>110E1150</td>
<td>Remove Signal Equipment</td>
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<td>635E5030</td>
<td>Type 2 Electrical Junction Box</td>
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<tr>
<td>635E5050</td>
<td>Type 3 Electrical Junction Box</td>
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<td>635E5101</td>
<td>Controller Cabinet</td>
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<td>Remove and Reset Signal Pole</td>
<td>3</td>
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<td>3&quot; Rigid Conduit, Schedule 80</td>
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<tr>
<td>635E5180</td>
<td>2/0 #14 AWG Copper Tray Cable, K2</td>
<td>271</td>
<td>Fl</td>
</tr>
</tbody>
</table>

2.2.2 DESIGN/CONSTRUCTION

All equipment furnished under this contract, including any equipment purchased from other manufacturers, shall be new and of the latest design currently in production. Used equipment or discontinued models shall not be accepted.

2.3 SCOPE OF WORK

The Contractor shall provide all labor and materials necessary to complete the installation. The Contractor shall coordinate equipment installation dates and notify the SDDOT Project Engineer 30 days prior to equipment delivery. The Contractor shall supply four (4) sets of system schematic drawings for review and approval at least 30 days prior to equipment delivery.

2.4 DELIVERY

The Contractor shall coordinate equipment delivery dates and notify the SDDOT Project Engineer 30 days prior to installation. The installation of all equipment shall be the responsibility of the Contractor, and shall integrate directly with the existing Port of Entry equipment. The Contractor shall install all material furnished by IRD and the equipment removed for reset in accordance to IRD specifications and installation instructions. SDDOT personnel must be present to observe and inspect the installation. The Contractor shall coordinate with the manufacturer to correct any defective equipment or other technical problems. If unforeseen technical problems develop with this installation, the Contractor shall provide all engineering and manufacturer’s technical assistance needed for proper installation.

2.5 INSTALLATION

The Contractor shall coordinate equipment installation dates and notify the SDDOT Project Engineer 30 days prior to installation. The installation of all equipment shall be the responsibility of the Contractor, and shall integrate directly with the existing Port of Entry equipment. The Contractor shall install all material furnished by IRD and the equipment removed for reset in accordance to IRD specifications and installation instructions. SDDOT personnel must be present to observe and inspect the installation. The Contractor shall coordinate with the manufacturer to correct any defective equipment or other technical problems. If unforeseen technical problems develop with this installation, the Contractor shall provide all engineering and manufacturer’s technical assistance needed for proper installation.

2.6 STORAGE

Contractor may use an area designated by the Project Engineer within the Sisseton Port of Entry to store new and reused components of the Weigh-in-Motion System. Any components stored there shall be the responsibility of the Contractor and will not be monitored by Port of Entry personnel.

2.7 RISK OF DESTRUCTION OR DAMAGE

The Contractor shall be responsible for any destruction or damage to existing pole footings shown on plans and to equipment purchased or provided by SDDOT under this contract until the equipment has been installed as specified, inspected, and accepted by SDDOT.

2.8 INCIDENTAL WORK

Incidental work includes, but is not limited to, the restoration of all disturbed areas to the satisfaction of the Engineer. Contractor shall pull all wiring and terminate all connections. Contractor shall coordinate all material deliveries with IRD. All costs for this incidental work shall be incidental to the contract unit price for “Weigh-In-Motion System”.

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3. INFORMATION TO BE SUBMITTED

3.1. ITEMS TO BE SUBMITTED

Upon being awarded the project, the Contractor shall submit the following information to the SDDOT Office of Research:

- A technical description, system block diagram, equipment specifications, and an equipment list with model numbers and options of all equipment proposed to be furnished, including any equipment purchased from other manufacturers.
- A method by which replacement parts may be obtained. The WIM vendor must stock system replacement parts for a minimum of ten (10) years from which SDDOT may order.
- A warranty description, including the procedure and authorized warranty service station(s) used to obtain warranty service. The Contractor shall warrant all equipment supplied, including equipment from other manufacturers, against defective materials and workmanship. The minimum warranty shall be as follows:

  "During the first 120 days following Installation Acceptance by SDDOT, all repairs, including factory labor and materials necessary to correct any failures shall be made at the Contractor's sole cost. During the following 240 days, the warranty shall be limited to the replacement of any materials including shipping charges. Any labor costs during the 240-day period will be the responsibility of SDDOT. SDDOT, at its discretion, may require that complete replacement modules be supplied."

If the Contractor's normal warranty exceeds the warranty terms specified in this section, the Contractor shall provide a copy of the warranty in his bid proposal.

3.2. AS-BUILT ITEMS TO BE SUBMITTED

If any elements of the Weigh-in-Motion System are constructed differently from what is stated in the plans, the Contractor shall supply as-built plans to IRD to draft onto existing drawings for future reference. The final as-built plans shall be furnished to the SDDOT Office of Research. The as-built plans shall include conduit layouts, wiring diagrams, or other drawings depicting the changes from the original plans.

4. REMOVAL OF EXISTING COMPONENTS

4.1. REMOVE CONCRETE FOOTING

The Contractor shall remove the existing concrete footings for the WIM Cabinet and the existing WIM scale vaults. All work associated with removing the concrete footing and scale vaults shall be incidental to the contract unit price per Lump Sum for "Remove Concrete Footing".

<table>
<thead>
<tr>
<th>Station</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>395+97.0 - 52' L</td>
<td>NB Scale Vault</td>
</tr>
<tr>
<td>395+95.0 - 58' R</td>
<td>SB Scale Vault</td>
</tr>
<tr>
<td>395+94.8 - 83' R</td>
<td>WIM Cabinet Base</td>
</tr>
</tbody>
</table>

4.2. REMOVE SIGNAL EQUIPMENT

The Contractor shall disconnect all electrical and fiber optic cabling prior to removal of any equipment. Weigh-in Motion equipment indicated on the Existing Removal Layouts shall be removed for reset. The list of signal equipment items to be removed for reset shall include, but is not limited to, WIM Scales, WIM Cabinet, Overheight Detectors, AVI Antenna, AVI Cabinet, Camera, Illuminator, Illuminator Cabinet, Fiber Optic Cable, and Electrical Copper Wire. The Fiber Optic Cable and Electrical Copper Wire shall be disconnected at the WIM Cabinet and pulled back to the junction boxes shown on the Existing Removal Layouts. The WIM equipment shall be stored at a safe location to protect equipment prior to resetting.

Contractor shall provide the six removed WIM Scale platforms to IRD without charge, in exchange for the six platforms IRD supplied to SDDOT under warranty of the existing WIM system.

All costs to remove the existing conduit shown on the Existing Removal Layouts.

4.3. REMOVE SIGNAL POLES

The Contractor shall remove the existing signal poles shown in the plans. After the poles have been removed for reset they shall be stored at a safe location to protect equipment prior to resetting. The storage location shall be approved by the Project Engineer prior to removal of poles.

All work involved in removing, storing, and resetting of the existing poles shall be incidental to the contract unit price for "Remove and Reset Signal Poles".

4.4. REMOVE NEW CONCRETE PAVEMENT

The Contractor shall remove sections of the new mainline paving section in the southbound driving lane and both northbound lanes to permit the installation of WIM Scales. The concrete shall be sawcut the full depth of paving and shall be incidental to the contract unit price per Square Yard for "Remove Concrete Pavement".

The 300-foot section containing the WIM shall be blanket ground to meet ASTM E1318 smoothness specifications for weigh-in-motion sites before cutting out the pavement to install the WIM vaults for the single load cell scales.
5. SENSOR INSTALLATION
The Contractor shall install sensors for detecting vehicle overheight, vehicle presence, vehicle identification, vehicle speed, axle spacing, axle count, and axle weight.

5.1. INSTALL WIM SCALES
Contractor shall reset the IRD Weigh-In-Motion (WIM) Scales at approximately Station 395+95 SBL I-29, Station 395+97 NBL I-29 in accordance with IRD Single Load Cell Scale installation instructions and drawings. Contractor shall supply and install scale vaults including rebar, concrete, and conduit. The concrete used for the WIM Scale shall be Class M6 concrete per section 462.3 of the Standard Specifications. Contractor shall submit mix design to IRD and SDDOT for approval prior to construction. Contractor shall remove and reset the existing Precast Concrete Headwalls required for scale drain pipes.

In each lane, the WIM scale shall be constructed of two independent weighing platforms placed side-by-side across the lane. Each platform shall incorporate load transfer torque tubes to transfer all loading onto the weighing surface to the single load cell so scale accuracy is not affected by the location of the truck’s tires on the platform.

The WIM system shall conform to ASTM E1318 “Standard Specification for Highway Weigh-in-Motion (WIM) System with User Requirements and Test Method” accuracy requirements for a Type III system in all lanes.

Each load cell shall be serviceable and removable from the scale module without the need to remove the scale mechanism. The load cell removal shall require only one person with normal tools and shall be accomplished within 30 minutes.

Each scale module shall incorporate two offscale detectors at the outside edges of the weighing surface. The offscale detectors shall be integrated into the scale assembly to sense any vehicle missing the weighing surface of the scale. The offscale detectors shall be field replaceable.

The WIM scale shall be weather sealed and water tight. There shall be no intrusion of water, ice, snow, salt, debris, dirt, moisture, or sand into the load cell, the load cell wiring compartment, the weighing mechanism, or the entire WIM scale in general.

The WIM scale and frame shall be grounded with ground rods. The load cell and its signal processing electronic components and modules shall be protected against lightning.

5.2. INSTALL LOOP DETECTORS
Contractor shall install IRD-supplied preformed loops at all locations specified in the plans (Refer to Sheet G19 of G24 of the plans, “Section A-A: Loop Detail”) and in accordance with IRD installation instructions. Contractor shall coordinate with the paving Contractor to place loops prior to paving.

An IRD representative shall direct installation of loops. The wiring from each lane’s instrumentation shall exit the pavement through conduit to a pull box in the nearest shoulder’s inslope. Pavement sensor locations shall be determined and all the conduit and pull boxes for sensor cabling shall be installed. The wiring shall then be pulled through conduit from the pull boxes to the cabinet.

All costs to install the loops, pull wire, terminate all connections, and coordinate with paving Contractor shall be incidental to the contract unit price for “Weigh-In-Motion System”.

5.3. INSTALL PIEZOELECTRIC SENSORS
Contractor shall install IRD-supplied piezoelectric sensors at all locations specified in sheet G13 of G24 of the plans and in accordance with IRD installation instructions. An IRD representative shall direct installation of sensors. Contractor shall sawcut the sensors as detailed in the plans and seal all sensors with sealant supplied by IRD.

All costs to sawcut and install the piezoelectric sensors, pull wire, and terminate all connections shall be incidental to the contract unit price for “Weigh-In-Motion System”.

5.4. INSTALL OVERHEIGHT DETECTOR
Contractor shall reset the Overheight Detector system at the Advanced WIM Location. Contractor shall furnish, install, and terminate all electrical wiring in accordance with plans to run power from the junction box to the Overheight Detector System.

The detector shall use pulsed infrared light emitting diodes to reduce the effect of ambient light. The detector and light source shall be pole mounted, one on each side of the roadway. The height of the system shall be installed at 14'-1" and be adjustable plus or minus one foot.

Cables shall enter at the bottom of the support pole. All cables shall exit near the top of the pole through a stress relief connector attached to the pole and flex conduit to the overheight sensor. The flexible conduit shall be long enough to allow the adjustment of the Overheight Detector plus or minus one foot from the installation height of 14'-1".

All costs to furnish electrical wiring, reset Overheight Detector system, pull all wiring, and terminate all connections shall be incidental to the contract unit price for “Weigh-In-Motion System”.

5.5. RESET SIGNAL POLES
The Contractor shall reset the existing signal poles on the existing footings as shown in the plans.

### PEDESTAL SIGNAL POLE

<table>
<thead>
<tr>
<th>Station</th>
<th>Pole</th>
<th>Quantity (Each)</th>
</tr>
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<tbody>
<tr>
<td>395+90.95 - 21.0' R</td>
<td>W1</td>
<td>1</td>
</tr>
<tr>
<td>395+90.95 - 83.5' R</td>
<td>W2</td>
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<td><strong>Total</strong></td>
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<td><strong>2</strong></td>
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### SIGNAL POLE WITH 30' MAST ARM

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<th>Quantity (Each)</th>
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</thead>
<tbody>
<tr>
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<td>W3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

Station and offset shown are for reset locations. Offsets are to edge of poles.

All costs of work involved in removing, storing, and resetting of the existing poles shall be incidental to the contract unit price for “Remove and Reset Signal Poles”.

5.6. RESET OVERHEIGHT DETECTOR
Contractor shall reset the Overheight Detector system at the Advanced WIM location. Contractor shall furnish, install, and terminate all electrical wiring in accordance with plans to run power from the junction box to the Overheight Detector System.

The detector shall use pulsed infrared light emitting diodes to reduce the effect of ambient light. The detector and light source shall be pole mounted, one on each side of the roadway. The height of the system shall be installed at 14'-1" and be adjustable plus or minus one foot.

Cables shall enter at the bottom of the support pole. All cables shall exit near the top of the pole through a stress relief connector attached to the pole and flex conduit to the overheight sensor. The flexible conduit shall be long enough to allow the adjustment of the Overheight Detector plus or minus one foot from the installation height of 14'-1".

All costs to furnish electrical wiring, reset Overheight Detector system, pull all wiring, and terminate all connections shall be incidental to the contract unit price for “Weigh-In-Motion System”.
5.7. RESET AUTOMATIC VEHICLE IDENTIFICATION (AVI) HARDWARE

The Contractor shall reset the Automatic Vehicle Identification antenna at the Advance WIM location, on the non-rotating mast arm pole W3. Automatic Vehicle Identification antenna shall be aimed by the Contractor using IRD-supplied alignment tool.

Contractor shall reset the Automatic Vehicle Information cabinet for the Advance WIM scale and terminate all connections. Cabinets and antennae shall be installed on the Automatic Vehicle Identification pole. Contractor shall furnish, install, and terminate all electrical wiring in accordance with plans to run power from the junction box to the AVI Antenna.

The AVI reader shall be able to read and write to transponders at operating speeds up to 80 mph and correctly report the transponder ID to the preclearance system with an accuracy of 99.95%.

The AVI reader and antenna shall meet the environmental specifications listed for the WIM system.

All costs to reset the Automatic Vehicle Identification antenna, Automatic Vehicle Identification cabinet, furnish electrical wiring, and wire the system and terminate all connections shall be incidental to the contract unit price for “Weigh-In-Motion System”.

5.8. RESET CAMERA

Contractor shall reset camera equipment including camera housing, infrared illuminator, power pack, and brackets/cabling on the Automatic Vehicle Identification pole W3. Contractor shall furnish, install, and terminate all electrical wiring in accordance with plans to run power from the junction box to the camera equipment.

All costs to furnish electrical wiring, reset all camera equipment, pull all wiring, and terminate all connections shall be incidental to the contract unit price for “Weigh-In-Motion System”.

6. ELECTRONIC EQUIPMENT

6.1. WEIGH-IN-MOTION (WIM) CABINET

The WIM electronics cabinet shall be placed near the ROW line on the west side of southbound I-29 as necessary to interface with the existing system. Contractor shall supply and install base for cabinet including concrete footing, rebar and j-bolts, and shall reset the existing type “334” WIM cabinet onto the cabinet pedestal shall be concrete with adequate dimensions to support the supplied cabinet. The base of the cabinet shall stand between one and two feet above the ground. Note requirement for additional conduit stubs in site layout drawings and systems specifications.

<table>
<thead>
<tr>
<th>Controller Cabinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
</tr>
<tr>
<td>395+95.0 - 85' R</td>
</tr>
</tbody>
</table>

Contractor shall install IRD-supplied iSINC WIM electronics in the controller cabinet. Contractor shall terminate all sensor cables at the cabinet.

Connections to all sensors and ancillary equipment must be conveniently located on the system front panel. The system shall provide a minimum of 25W power supply with 12VDC battery backup for extended operation up to 30 days.

All wiring in the cabinet shall use copper conductors (aluminum conductors are not acceptable) and shall be sized in accordance with the applicable sections of the current edition of the National Electrical Code and Section 10 of NEMA Standards Publication T5-1, latest revision. All cabinet wiring shall be neat and firm. All assemblies and panels shall be easily accessible for maintenance purposes. Live or hot parts of any electrical equipment inside the cabinet shall be suitably covered with Plexiglas and a warning label to prevent electrical shock.

An incandescent light fixture and lamp shall be mounted at the top front on the inside of the cabinet to provide illumination of the entire cabinet interior. The light fixture and lamp shall not interfere with the installation and removal of equipment from the cabinet. It shall be possible to easily remove and replace the lamp without interference. The lamp shall be energized by a 2-position toggle switch located on the Auxiliary Switch Panel and labeled “CABINET LAMP POWER”.

A 120 volt, 60 Hz utility outlet shall be provided in the cabinet. This outlet shall be used to facilitate service and testing and is not intended to provide power to equipment resident to the cabinet.

The Contractor shall supply power to WIM cabinet location, furnish and install all power cabling, roadside junction boxes, conduit, conduit fittings, and apparatus, power conductors, and connection of power conductors to controller cabinet necessary to provide a 240/120 VAC split phase 30 Amp/leg service. This service must maintain 104 VAC for a 33 Amp surge per leg.

Costs of all work including materials, equipment to furnish cabinet base and reset cabinet and WIM electronics shall be incidental to contract unit price for “Controller Cabinet”.

6.2. ELECTRONICS

Signal processing electronics shall be located next to the WIM scales in a roadside cabinet. These electronics will be responsible for retrieving vehicle data and communicating it to the station computer in the scale building for further processing.

The electronics shall include interfaces for the following components:

- Weigh in motion scales
- Axle sensors
- Loops
- Offscale detectors
- Overheight Detectors
- AVI Reader and Writer

The WIM system electronics must provide a facility for viewing vehicle records and sensor diagnostics directly, without ancillary equipment. The system must be of a modular design to aid in system maintenance, troubleshooting and in-field servicing. The system must be of a durable, industrial design and construction and must enable continuous operation with automated startup in the event of a power outage.

6.3. COMMUNICATIONS

The system electronics must support the following technologies:

- Ethernet network interface
- Two RS-232 interfaces, one for external communications, one for local
- Local user interface for system configuration and fault diagnosis
- Wireless connection capabilities for configuration and maintenance
- Remote administration via Telnet, PPP
- Remote file download via FTP

6.4. ENVIRONMENTAL

The system electronics shall be designed to operate reliably in a temperature range of -40 °C to 70 °C / -40 °F to 158 °F. If necessary, temperature control devices shall be installed in the cabinet to maintain the WIM system at allowable operating temperatures.
6.5. CIRCUIT PROTECTION

Contractor shall provide protection against lightning, electrostatic discharge, and other transient high voltage surges as listed below. The surge protection equipment shall meet all applicable surge test requirements of latest IEEE Test Standards, and shall operate under the specified environment conditions.

A. AC LINE PROTECTOR

An AC Line Protector Unit shall be provided for the 120 volts, 60 Hz power source. The Protector Unit shall include a thermal circuit breaker, and EMI/RFI noise suppression for diverting and clamping high voltage surges to limit the maximum voltage reaching the sensitive electronic equipment during a transient pulse. The unit shall be approved by Underwriter Laboratories (UL).

The AC Line Protector shall provide protection against surges that may enter electronic equipment through Line to Neutral paths (Differential Mode) or through Line or Neutral to Ground paths (Common Mode).

The AC Line Protector shall be contained in a single enclosure with appropriate terminations for interconnecting cables to the assemblies requiring 120 volts, 60 Hz protected power.

B. DATA LINE PROTECTOR

A Data Line Protector Unit shall be provided at the Field Station telephone line termination and shall protect the electronic equipment from the hazardous and damaging effects of over-voltage transients induced on the data line (telephone line). The unit shall have a protection clamping time of less than 10 nanoseconds and a maximum clamping voltage of 150 volts peak, and shall protect in both the Common Mode and Differential Mode.

The Data Line Protector shall be contained in a single enclosure with appropriate terminations for interconnecting cables to the telephone line and Automatic-Answer Modem, and provisions for connecting a minimum No. 6 AWG copper ground wire to equipment ground.

C. DETECTOR AMPLIFIER INPUT PROTECTOR

If applicable, Detector Amplifier Input Protector circuitry shall be provided at the input of each Loop Detector Amplifier unit to electrically isolate the loop from the detector amplifier circuitry and protect the circuitry from lightning and other electrical surges.

D. GROUNDING

All bonding and grounding shall be in accordance with the National Electrical Code and with the manufacturers’ instructions. In addition, one ground rod shall be placed at the foundation pad. The ground rod shall be 3/4 inch diameter by 8 feet long. Connection of ground rods shall be with No. 1/0 AWG copper wire bonded to the control cabinet.

6.6. CONDUIT INSTALLATION

The Contractor shall supply and install all cabling, conduit, conduit fittings, junction boxes and apparatus necessary for cabling from:

- Advance WIM/AVI site to existing junction boxes shown on plan sheets.
- AVI antennas to the WIM cabinet at the advance WIM/AVI site.
- All loops, overhead poles, and piezoelectric sensors from the Advance WIM location to the WIM cabinet.

The conduit shall be buried at a minimum depth of 4 feet beneath the roadway surface and a minimum of 3 feet under all other areas within the ROW such that it will not be damaged.

The contractor shall use rigid, schedule 60 conduit under all roadways and all conduit under roads shall be bored. The following table lists approximate locations shall be bored under existing roadway.

<table>
<thead>
<tr>
<th>Station</th>
<th>to Station</th>
<th>Crossing</th>
<th>Length (Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>395+91.0 - 80.5 R</td>
<td>395+91.0 - 24.0 R</td>
<td>I-29 SB</td>
<td>56</td>
</tr>
<tr>
<td>396+27.6 - 85.0 R</td>
<td>396+27.6 - 23.0 R</td>
<td>I-29 SB</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 118</td>
</tr>
</tbody>
</table>

Trenching shall include all sand bedding, backfilling, refurbishing, compacting and removal of all excavated materials as required. Boring, if necessary shall be done in accordance with SDDOT’s standard specification. All costs associated with boring and trenching shall be incidental to the contract unit price per foot of “2” Rigid Conduit, Schedule 80”.

The Contractor shall leave pull ropes for cables in all spare conduits.

6.7. PULLBOXES/JUNCTION BOXES

Contractor shall furnish and install all pullboxes/junction boxes as necessary for cabling. Pullboxes/Junction boxes shall be Type 2 for all fiber optic wiring and be spaced no further than 200’ apart. Type 3 Junction boxes shall be used for all electrical wiring and be spaced no further than 500’ apart. Junction boxes shall be placed at all 90° bends.

Cabling and splices shall be high quality and waterproof. The pull boxes shall be strategically located such that they are high on the inslope near the shoulder’s edge and easily accessible. If cable splices are necessary, they shall be located in the pull boxes and meet SDDOT specifications.

All cost to furnish and install pullboxes/junction boxes shall be incidental to the contract unit price of “Type 2 Electrical Junction Box” and “Type 3 Electrical Junction Box”. See standard plate 635.65.

6.8. ELECTRICAL SERVICE

Contractor shall furnish and install all materials to provide working electrical service as shown on plan sheets. All cost to furnish and install all materials needed to provide working electrical services shall be incidental to the contract bid items for Electrical Junction Box, Rigid Conduit, and Copper Wire.
7. SYSTEM ACCEPTANCE

The testing procedures to demonstrate compliance with the contract requirements must be carried out jointly by the Contractor, IRD, and SDDOT personnel at the site.

Acceptance of the system shall consist of two parts. The first part follows installation, calibration, and testing and is termed 'Installation Acceptance'. The second part follows a successful 30-day performance period and is termed 'Final Acceptance'.

7.1. INSTALLATION ACCEPTANCE

The Contractor shall test the system, as specified in Subsections A, B, C and D to SDDOT's satisfaction.

A. WEIGHT TESTING

The accuracy of the system is dependent on the pavement's smoothness and must be within ±5% 95% of the time for gross weights, within ±10% 95% of the time for groups of axles, and within ±15% 95% of the time for individual axles. This accuracy shall be determined by comparing the WIM readings with the static weight of a 5-axle tractor-semitrailer with gross weight between 75,000 and 80,000 pounds. The tandem axles on the tractor and trailer shall not be spaced more than 55" apart. This vehicle shall use air-ride suspension and carry a non-shifting load. The static weight shall be recorded at a certified static scale and the driver shall produce the weigh ticket to the Project Engineer.

The test with this vehicle shall consist of a minimum of 10 runs over the scales in each lane within the normal range of highway speeds at the site, made after the last calibration of the system and after the last hardware and software changes, if any are needed.

The Contractor shall secure and pay for any and all test trucks used in testing the system. The Contractor shall be responsible for any traffic control that may be needed during the testing of the system. All costs related to the testing of the system shall be included in the contract unit price for the "Weigh-In-Motion System".

B. AXLE SPACING TESTING

The test for axle spacing accuracy shall be conducted concurrently with Axle Weight Testing, using the 5-axle tractor-semitrailer test truck. The spacing between axles recorded by the WIM equipment shall be within 6 inches of spacings measured manually by tape measure for axle spacings less than or equal to 10 feet and within ±5% for axle spacings greater than 10 feet, 95% of the time.

C. VEHICLE CLASSIFICATION TESTING

The system must properly classify a minimum of 90% of all vehicles and 95% of all 5-axle tractor-semitrailers. The test which SDDOT may conduct at the site shall be to visually classify vehicles to verify proper classification.

D. VEHICLE SPEED TESTING

The speed recorded by the system may be checked by SDDOT to verify that 95% of the vehicle speeds collected are within ±2 mph of their actual speed determined by a properly calibrated speed detector.

7.2. Upon FINAL ACCEPTANCE

INSTALLATION ACCEPTANCE and after verbal notification by IRD to the SDDOT Project Engineer the system shall undergo a 30-day performance period constituting 30 consecutive days in which no remedial action or interpretation is required by the Contractor, IRD, or SDDOT personnel to view or obtain data and tables that are being accumulated.

Upon completion of 30 consecutive days of successful operation, beginning with the start of the most recent 30-day test period, the system will be considered accepted. SDDOT reserves the option to check the performance of the system at any time during the life of this contract following testing procedures outlined in Section 7.1. Major malfunctions will be taken into consideration of acceptance or rejection of the system.

8. MEASUREMENT AND PAYMENT

8.1. METHOD OF MEASUREMENT

Measurement for the WIM will not be made. The quantity shown in the plans will be the quantity used for payment.

8.2. BASIS OF PAYMENT

Payment to the Contractor for the WIM System portion of the contract shall be as follows:

A. The first partial payment will be 70% of the contract lump sum unit price for “Weigh-In-Motion System”. The first partial payment will be made upon Installation Acceptance as defined in Section 7.1.

B. The final payment will be 30% of the contract lump sum unit price for “Weigh-In-Motion System”. Final payment will be made upon Final Acceptance as defined in Section 7.2.

Payment will be full compensation for labor, equipment, tools, materials, and all other items of work required to furnish, install, and test the WIM System.
### Sisseton Weigh Scale

<table>
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<th>Pullbox - T</th>
<th>Pullbox - W</th>
<th>Pullbox - X</th>
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### Conduit and Cable Quantities

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<th>Rigid Conduit</th>
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### Total

| 194 | 617 | 144 | 102 | 56 | 55 | 271 | 9 | 4 |
NOTES:

1. CABINET WITH WIM ELECTRONICS.
2. CABINET FRAME.
3. FULL BOX/JUNCTION BOX.
4. PULL THROUGH SHOULDER FOR CONDUIT.
5. FOR LOOP AND FIELD DETAILS, SEE DRAWING SHEET G15.
6. FOR SLC SCALE DETAILS, SEE DRAWING SHEET G17 & G18.
7. OVERHEAD - SEE SHEET G16 FOR INSTALLATION DETAILS.
8. SHOULDER WIM POWER: 120V 10A SERVICE. TYPICAL OPERATING CURRENT 10A. EXTERNAL LOAD CENTER REQUIRED.
9. HD/CAMERA POLE - SEE SHEET G15 FOR INSTALLATION DETAILS.
10. UNDER ROOF.

PROTECT IN PLACE APPROX STATION 396+20

PROTECT IN PLACE APPROX STATION 396+90

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DETAIL LAYOUT FOR PROPOSED RESET ADVANCED AVI/CAMERA DETAIL

STATION 396+16.60 - 83.50' R

NOTES: (THIS SHEET ONLY)

- GUARDRAIL IS REQUIRED - SEE SECTION F

INTERNATIONAL ROAD DYNAMICS INC.
SASKATOON SASKATCHEWAN CANADA

SITE LAYOUT
I-29 MAINLINE WIM SORTER
SISSETON POE, SOUTH DAKOTA DOT
GENERAL NOTES:

Base details are provided for example only and are not intended to be a complete design.

The Contractor shall furnish and install a rodent screen in the signal pole above the transformer base. The rodent screen shall be a galvanized steel mesh with a maximum opening size of 1/4 inch. The rodent screen shall be friction fitted or installed by other methods approved by the Engineer.

All costs for furnishing and installing the rodent screen, including labor, equipment, and materials, shall be included in the contract unit price per each for the corresponding signal pole bid item.

December 23, 2008

Published Date: 4th Qtr. 2009

POLE FOOTING

Published Date: 1st Qtr. 2014
**ELECTRICAL JUNCTION BOXES**

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<tr>
<td>2</td>
<td>Open Bottom with Gasket</td>
<td>13&quot; x 18&quot; x 23&quot; - 28&quot; x 18&quot;</td>
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<tr>
<td>3</td>
<td>Open Bottom with Gasket</td>
<td>17&quot; x 22&quot; x 24&quot; - 30&quot; x 16&quot;</td>
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<tr>
<td>4</td>
<td>Open Bottom with Gasket</td>
<td>20&quot; x 33&quot; x 36&quot; - 48&quot; x 24&quot;</td>
</tr>
</tbody>
</table>

**GENERAL NOTES**

The cover shall be gasketed with a minimum of two stainless steel bolts and washers.

The cover shall have a lifting eye.

*The surface of the cover shall have a minimum wet and dry coefficient of friction value of 0.5 as determined by ASTM F 606.*

**The surface of the cover shall have a lifting eye in accordance with the American National Standards Institute (ANSI) Society of Cable Telecommunications Engineers (OSCE) TT 2001 Specification for Underground Enclosure Integrity. The loading requirement for all the electrical enclosure boxes shall be Tier 6 in ANSI/SCIE TT 2001.**

The electrical enclosure boxes shall be UL listed.
GENERAL NOTE:
The Buried Cable Marker shall be plastic, approximately 6' wide, and shall be
capable of sustaining a minimum of a 350% tolerance of elongation without
tearing. The Buried Cable Marker shall have a life expectancy approximately
equal to that of the conductor/below it. A phrase indicating the presence of
a buried electric circuit below shall be printed in a contrasting color on the cable
marker. The Buried Cable Marker shall be subject to approval by the Engineer.
All costs associated with furnishing and installing the Buried Cable Marker shall
be incidental to the contract unit price per Foot for the bid item used for the
electrical conductor.
The concrete shall be Class M6. The concrete shall conform to the requirements of section 446 of the Standard Specifications. It is estimated that each unit weighs approximately 210 pounds.

All reinforcing steel shall conform to ASTM A416 Grade 60 and shall be epoxy coated.

The reinforcing steel shall be securely retained to prevent displacement during placement of concrete. It is estimated that 1.5 pounds of reinforcing steel is required for each unit.

The pipe shall be placed in the concrete headwall with the pipe and flush with the concrete surface adjacent to the rodent screen.

The rodent screen shall be galvanized 13 GA. steel with a diamond shaped flattened mesh pattern. The size shall be 1/2". The size refers to the measurement across the smallest diamond shaped opening measured from the centers of the wires.

The rodent screen shall be galvanized in accordance with ASTM A123 after all shop welding has been completed.

The drawing indicates using 1/2" fillets; however, 3/8" chamfers may be substituted for the 1/2" fillets.

All costs for furnishing and installing the concrete headwall including equipment, labor, and materials including concrete, reinforcing steel, retaining rods, and rodent screen shall be incident to the contract unit price per each for Precast concrete headwall for Drain.

Published Date: 1st Qtr. 2014

PRECAST CONCRETE HEADWALL FOR DRAIN

PLATE NUMBER 680.03

Sheet 1 of 1