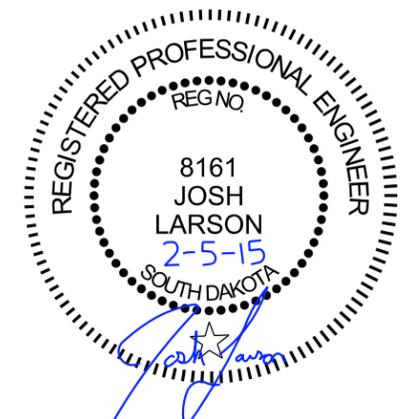
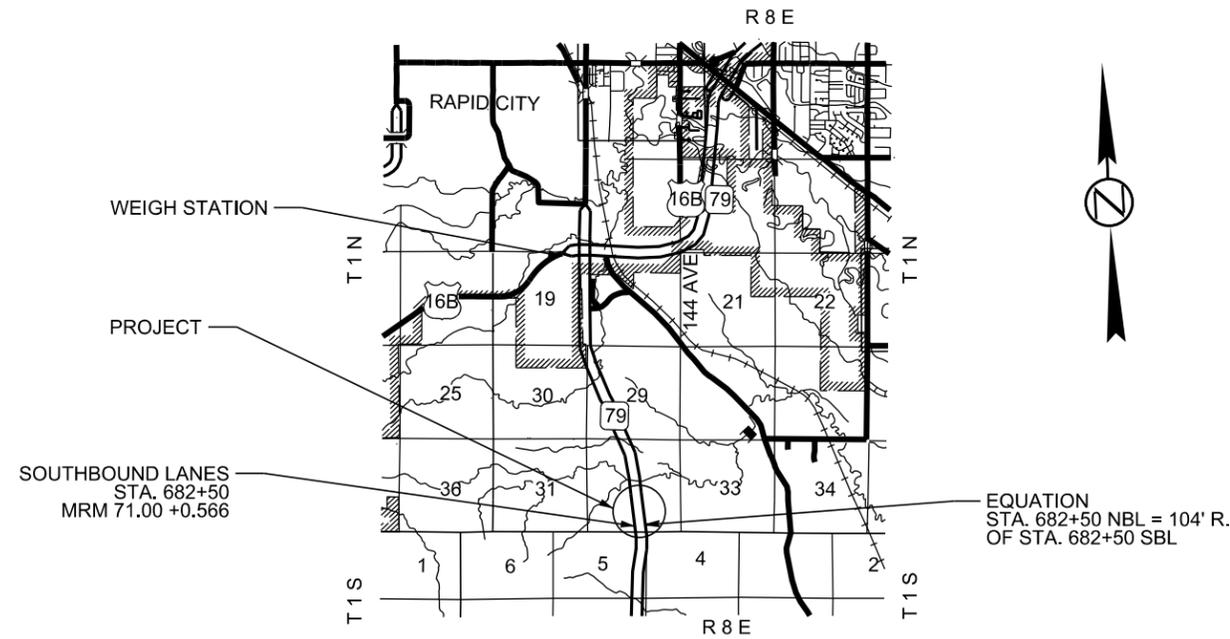


# Section G: WEIGH-IN-MOTION (WIM) SYSTEM

## INDEX OF SHEETS

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## 1. SECTION G - ESTIMATE OF QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3500	Weigh-In-Motion System	1	Each
635E5302	Type 2 Electrical Junction Box	11	Each
635E5303	Type 3 Electrical Junction Box	4	Each
635E5400	Electrical Service Cabinet	1	Each
635E5410	Controller Cabinet	1	Each
635E8110	1" Rigid Conduit, Schedule 40	403	Ft
635E8120	2" Rigid Conduit, Schedule 40	2031	Ft
635E8125	2.5" Rigid Conduit, Schedule 40	1456	Ft
635E8130	3" Rigid Conduit, Schedule 40	117	Ft
635E8220	2" Rigid Conduit, Schedule 80	60	Ft
635E8230	3" Rigid Conduit, Schedule 80	60	Ft
635E9011	1/C #1 AWG Copper Wire	12784	Ft
635E9020	1/C #10 AWG Copper Wire	1476	Ft
680E2010	Precast Concrete Headwall for Drain	3	Each

## 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 Overview Camera, a License Plate Reader Camera, and a Changeable Message Sign installed in the northbound lanes
- two weigh-in-motion scales installed in the southbound lanes

on SD Hwy 79 South of Rapid City and south of the Rapid City Port of Entry. The new Weigh-in-Motion System will be installed in existing concrete pavement.



## 2.2. WIM SYSTEM VENDOR

The Contractor shall contract with a vendor to supply all of the required components and technical assistance to construct a Weigh-In Motion (WIM) System in accordance with the plans and specifications. The SDDOT Office of Research is aware of one vendor that can supply a WIM system that meets the requirements of these plans and specifications. Use of any other vendor must be approved by the SDDOT Office of Research. The following vendor is suggested:

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

International Road Dynamics shall henceforth be "IRD" in these plans.

Locations of IRD-supplied equipment are shown in the plans. IRD shall provide technical instructions and assistance during installation. All equipment and materials shown as supplied or installed by IRD shall be supplied, installed, and paid for under this contract except where indicated otherwise.

All costs associated with the vendor contract, including equipment and technical assistance costs, shall be incidental to the various bid items indicated in the plans.

### 2.3. SCOPE OF WORK

The Contractor shall install equipment approximately as follows:

- Three lanes of (WIM) Single Load Cell Scales
- One lane of Automatic Vehicle Classification (AVC) Piezoelectric Axle Sensors
- One Overview Detector System, illuminator and power pack hardware
- One License Plate Reader (LPR) Camera, illuminator and power pack hardware
- One Changeable Message Sign
- One type 334 WIM Cabinet
- One WIM electronics and other electronic equipment
- One iROC E-Screening System – using LPR for lookup
- Fiber optic cable
- Electrical copper wiring

IRD-supplied equipment under this contract is approximately as follows:

- Three lanes of WIM Single Load Cell frames (two frames per lane, six frames total)
- Three lanes of WIM Single Load Cell scale platforms (two platforms per lane, six platforms total)
- One Overview Detector Camera, illuminator and power pack hardware
- One License Plate Reader (LPR) Camera, illuminator and power pack hardware
- One Changeable Message Sign
- Three Piezoelectric Axle Sensors
- One iROC E-Screening System
- Ten inductive loops
- All fiber optic cable

## 2.4. DESIGN/MANUFACTURE

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.

## 2.5. DELIVERY

The Contractor shall coordinate equipment delivery 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.

## 2.6. 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 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.

## 2.7. STORAGE

Contractor may use an area designated by the Project Engineer within the Port of Entry to store new 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. The Contractor shall coordinate storage with the SDHP Motor Carrier Services group at (605) 773-4578.

## 2.8. RISK OF DESTRUCTION OR DAMAGE

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

## 2.9. INCIDENTAL WORK

Incidental work includes, but is not limited to the following items: 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 610 days, the warranty shall be limited to the replacement of any materials including shipping charges. Any labor costs during the 610-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. SENSOR INSTALLATION

The Contractor shall install sensors for detecting vehicle overheight, vehicle presence, vehicle identification, vehicle speed, axle spacing, axle count, and axle weight.

#### 4.1. INSTALL WIM SCALES

Contractor shall install the IRD Weigh-In-Motion (WIM) Scales at approximately Station 682+50 SBL and NBL SD HWY 79 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 Specifications. Contractor shall submit mix design to IRD and SDDOT for approval prior to construction. Contractor shall furnish and install 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 on 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.

Costs of all work including materials, equipment to furnish and install scale vaults, install scales, and install drainage systems as detailed in the plans shall be incidental to contract unit price per each for "Weigh-In-Motion System".

#### 4.2. INSTALL LOOP DETECTORS

Contractor shall install IRD-supplied preformed loops at all locations specified in the plans and in accordance with IRD installation instructions.

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 sawcut and install the loops, pull wire, and terminate all connections shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

#### 4.3. INSTALL PIEZOELECTRIC SENSORS

Contractor shall install IRD-supplied piezoelectric sensors at all locations specified in 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 per each for "Weigh-In-Motion System".

#### 4.4. INSTALL TEMPERATURE SENSOR

Contractor shall install IRD-supplied temperature sensor at location specified in the plans and in accordance with IRD installation instructions.

An IRD representative shall direct installation of temperature sensor. The wiring from the 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 temperature sensor, pull wire, and terminate all connections shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

#### 4.5. INSTALL LICENSE PLATE READER CAMERA

Contractor shall install camera equipment including camera housing and brackets/cabling on the License Plate Reader pole. Contractor shall install illuminator, power pack, junction box, and brackets/cabling on the Illuminator pole. Contractor shall furnish, install, and terminate all electrical wiring in accordance with plans to run power from the junction box to the camera equipment and illuminator equipment.

All costs to install all camera and illuminator equipment, pull all wiring, and terminate all connections shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

#### 4.6. INSTALL OVERVIEW CAMERA

Contractor shall install camera equipment including camera housing, illuminator, power pack, and brackets/cabling on the Overview Camera pole. 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 install all camera and illuminator equipment, pull all wiring, and terminate all connections shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

### 5. ELECTRONIC EQUIPMENT

#### 5.1. WEIGH-IN-MOTION (WIM) CABINET

The WIM electronics cabinet shall be placed near the ROW line on the east side of northbound SD Hwy 79. Contractor shall supply and install base for cabinet including concrete footing, rebar and j-bolts, and shall install the type "334" WIM cabinet onto base. 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.

##### CONTROLLER CABINET

Station	Location	Quantity (Each)
682+50.0 R	WIM NBL	1
Total		1

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 TS-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 install cabinet and WIM electronics shall be incidental to contract unit price per each for "Controller Cabinet".

#### 5.2. 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
- LPR Reader System
- iROC E-Screening System

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.

#### 5.3. 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

#### 5.4 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.



**5.5. 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. All costs to provide circuit protection shall be incidental to the contract unit price per each for "Controller Cabinet".

**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 transients 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 those 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.

**5.6. CHANGEABLE MESSAGE SIGN**

Contractor shall install IRD-supplied changeable message sign at the location specified on sheets G11 and G12 of the plans and in accordance with IRD installation instructions. An IRD representative shall direct installation of changeable message sign. All costs to install all changeable message sign equipment shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

**5.7. CONDUIT INSTALLATION**

The Contractor shall supply and install all cabling, conduit, conduit fittings, junction boxes and apparatus necessary for all cabling shown on the plan sheets.

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.

Contractor shall use rigid, schedule 80 conduit under all roadways and all conduit under roads shall be bored. The following table lists approximate locations shall be bored under existing roadway.

**BORING LOCATIONS**

Station	Crossing	Length (Ft)
682+49.0	SD HWY 79 NBL	60
682+51.0	SD HWY 79 NBL	60
Total		120

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 Specifications. All costs associated with boring and trenching shall be incidental to the contract unit price per foot for "2" Rigid Conduit, Schedule 80" and "3" Rigid Conduit, Schedule 80".

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

All cost to furnish and install conduit and all conduit fittings shall be incidental to the contract unit price per linear foot for "1" Rigid Conduit, Schedule 40", "2" Rigid Conduit, Schedule 40", "2.5" Rigid Conduit, Schedule 40", "3" Rigid Conduit, Schedule 40", "2" Rigid Conduit, Schedule 80", and "3" Rigid Conduit, Schedule 80". All costs to bore under existing roadways shall be incidental to the contract unit price per linear foot for "2" Rigid Conduit, Schedule 80" and "3" Rigid Conduit, Schedule 80".



**5.8. 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 per each for "Type 2 Electrical Junction Box" and "Type 3 Electrical Junction Box". See standard plate 635.65.

**5.9. ELECTRICAL SERVICE CABINET**

Contractor shall furnish and install all materials to provide electrical service board as shown on plan sheet G25 of the plans. Contractor shall trench underground service from existing transformer location to new electrical service board. Contractor shall coordinate trenching with Black Hills Power. All cost to furnish and install all materials needed for the electrical service board and all costs associated with trenching shall be incidental to the contract unit price per each for "Electrical Service Cabinet".

**5.10. ELECTRICAL SERVICE**

Contractor shall furnish and install all materials to provide working electrical service as shown on plan sheets G22 – G25 of the plans. Contractor shall coordinate with Black Hills Power to provide service from the existing transformer at approximately Sta 689+00 to the new Electrical Service Cabinet at the WIM location. 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.

**5.11. INTERNET SERVICE**

Contractor shall provide working high speed internet service at the WIM cabinet location. The internet service shall meet all IRD requirements for upload and download speeds. The Contractor shall coordinate with an internet service provider to provide service at this location. After final installation of internet service the SDDOT shall assume responsibility for the internet service at this location.

At the existing weigh station building the SDDOT shall provide a workstation consisting of a computer with a 22 inch monitor and internet service. This work station shall include an adequate operating system to run the WIM software. IRD shall install all WIM software and provide training to operate the WIM software.

All costs to provide high speed internet service to the WIM cabinet, install WIM software on SDDOT workstation, and all training to operate the software shall be incidental to the contract unit price per each for "Weigh-In-Motion System".

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G6	G28

## 6. 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'. The SDDOT Office of Research shall review all acceptance testing results prior to Installation Acceptance and Final Acceptance.

### 6.1. 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  $\pm 6\%$  95% of the time for gross weights, within  $\pm 10\%$  95% of the time for groups of axles, and within  $\pm 15\%$  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 20 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 per each for "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  $\pm 6$  inches of spacings measured manually by tape measure for axle spacings less than or equal to 10 feet and within  $\pm 5\%$  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 classification scheme shall be FHWA Scheme F. 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  $\pm 2$  mph of their actual speed determined by a properly calibrated speed detector.

### 6.2. 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 intervention 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 6.1. Major malfunctions will be taken into consideration of acceptance or rejection of the system.

## 7. MEASUREMENT AND PAYMENT

### 7.1. METHOD OF MEASUREMENT

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

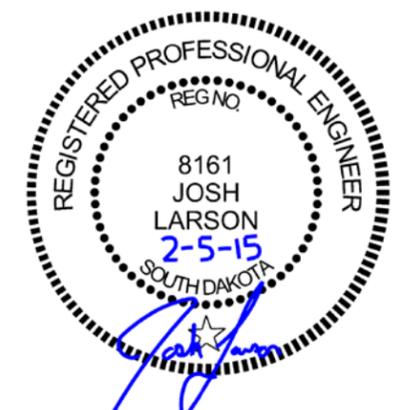
### 7.2. BASIS OF PAYMENT

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 unit price per each for "Weigh-In-Motion System". The first partial payment will be made upon Installation Acceptance as defined in Section 7.1.

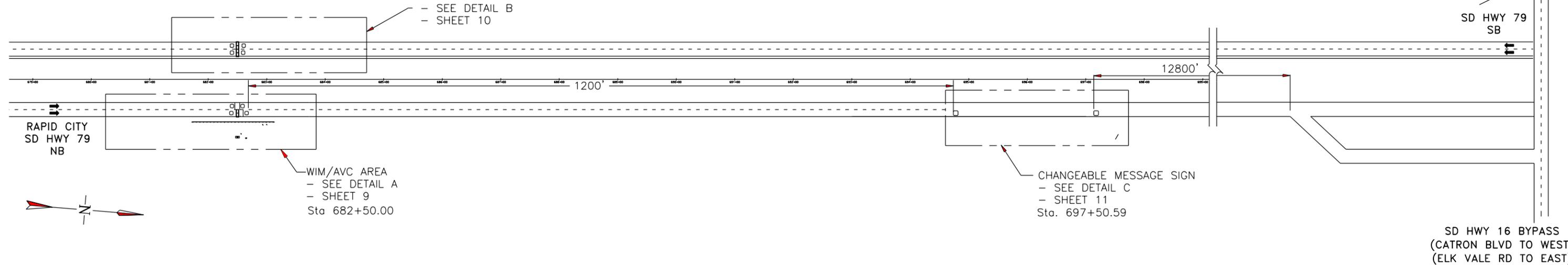
B. The final payment will be 30% of the contract unit price per each for "Weigh-In-Motion System". Final payment will be made upon Final Acceptance as defined in Section 7.2.

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.





# SIGNAL CONDUITS:



### LEGEND:

- L - INDUCTIVE LOOP
- P - PIEZOELECTRIC SENSOR
- S - SINGLE LOAD CELL SCALE
- T - TEMPERATURE SENSOR
- E - ROADSIDE ENCLOSURE
- CMS - CHANGEABLE MESSAGE SIGN
- LPR - LICENSE PLATE READER CAMERA
- OVC - OVERVIEW CAMERA
- [1] - SIGNAL CONDUIT
- [1] - POWER CONDUIT
- [A] - NOTE
- [Z] - TYPE 2 JUNCTION BOX
- [W] - TYPE 3 JUNCTION BOX

### POWER CONDUITS: (All items supplied by Contractor)

- [1] CABINET ENCLOSURE POWER
- [2] CMS SWITCHED POWER (REPORT/BYPASS SIGNALS)  
CMS CONSTANT POWER
- [3] CMS SWITCHED POWER (REPORT/BYPASS SIGNALS)
- [4] CMS CONSTANT POWER
- [5] LPR CAMERA POWER
- [6] OVERVIEW CAMERA/ILLUMINATOR POWER
- [7] ILLUMINATOR POWER

### SIGNAL CONDUITS: (All conduit supplied by Contractor) (All wiring supplied by IRD)

- [1] 1" CONDUIT  
1-LOOP WIRE
- [2] 2" CONDUIT  
2-3PR 20AWG (SLC LEAD)  
4-2C 18AWG (OFF-SCALE LEAD)
- [3] 1" CONDUIT  
1-RG58 COAXIAL CABLE (PIEZO LEAD)
- [4] 1" CONDUIT  
1-TEMPERATURE SENSOR LEAD
- [5] 2" CONDUIT  
4-LOOP LEADS  
3-RG58 COAXIAL CABLE (PIEZO LEADS)  
1-TEMPERATURE SENSOR LEAD
- [6] 2" CONDUIT  
2-3PR 20AWG (SLC LEAD)  
4-2C 18AWG (OFF-SCALE LEAD)
- [7] 2" CONDUIT  
1-COMM CABLE (LPR)
- [8] 2" CONDUIT  
2-2C 18AWG (LOOP LEADS)
- [9] 2" CONDUIT  
1-2C 18AWG (LOOP LEADS)

- [10] 2" CONDUIT  
1-CAT5 CABLE (OVERVIEW CAMERA)
- [11] 2" CONDUIT  
2-LOOP LEADS  
2-RG58 COAXIAL CABLE (PIEZO LEAD)
- [12] 3" CONDUIT  
4-LOOP LEADS  
4-3 PR 20AWG (SLC LEAD)  
8-2C 18AWG (OFF SCALE LEAD)
- [13] 2" CONDUIT  
4-3PR 20AWG (SLC LEAD)  
8-2C 18 AWG (OFF SCALE LEAD)
- [14] 2" CONDUIT  
1-COMM CABLE (ILLUMINATOR)

### GENERAL NOTES:

TYPICAL LAYOUT IS SHOWN. OTHER SENSORS MAY BE REQUIRED AND ARE SHOWN IN PROJECT DOCUMENTATION.

SENSOR SPACING SHOWN IS TYPICAL SPACING REQUIREMENT, ACTUAL SENSOR SPACING MAY BE ALTERED TO SUIT SITE CONDITIONS BY THE IRD FIELD REPRESENTATIVE.

ALL CONNECTIONS BETWEEN SENSORS AND LEAD CABLES ARE DONE IN PULL BOX AND ARE SOLDERED THEN SEALED FOR WATERPROOFING. NUMBER AND PLACEMENT OF PULL BOXES NOT SHOWN.

CABLES MUST BE PROTECTED BY PVC SLEEVES WHERE THEY CROSS PAVEMENT JOINTS/CRACKS.

IRD RECOMMENDS THAT PULL BOXES BE NO FURTHER THAN 200' APART.  
IRD RECOMMENDS THE MINIMUM SIZE FOR PULL BOXES IS 18" X 18" X 12".

EXACT ROUTING OF CONDUIT TO BE DETERMINED ON SITE.

DRAWING NOT TO SCALE.



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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INTERNATIONAL ROAD DYNAMICS INC.  
SASKATOON SASKATCHEWAN CANADA

DWG. TITLE:  
**SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

DWG. No. <b>MSDVWS01</b>	REV.: 1
CAD FILE: MSDVWS01.DWG	SHEET OF

NOT TO SCALE

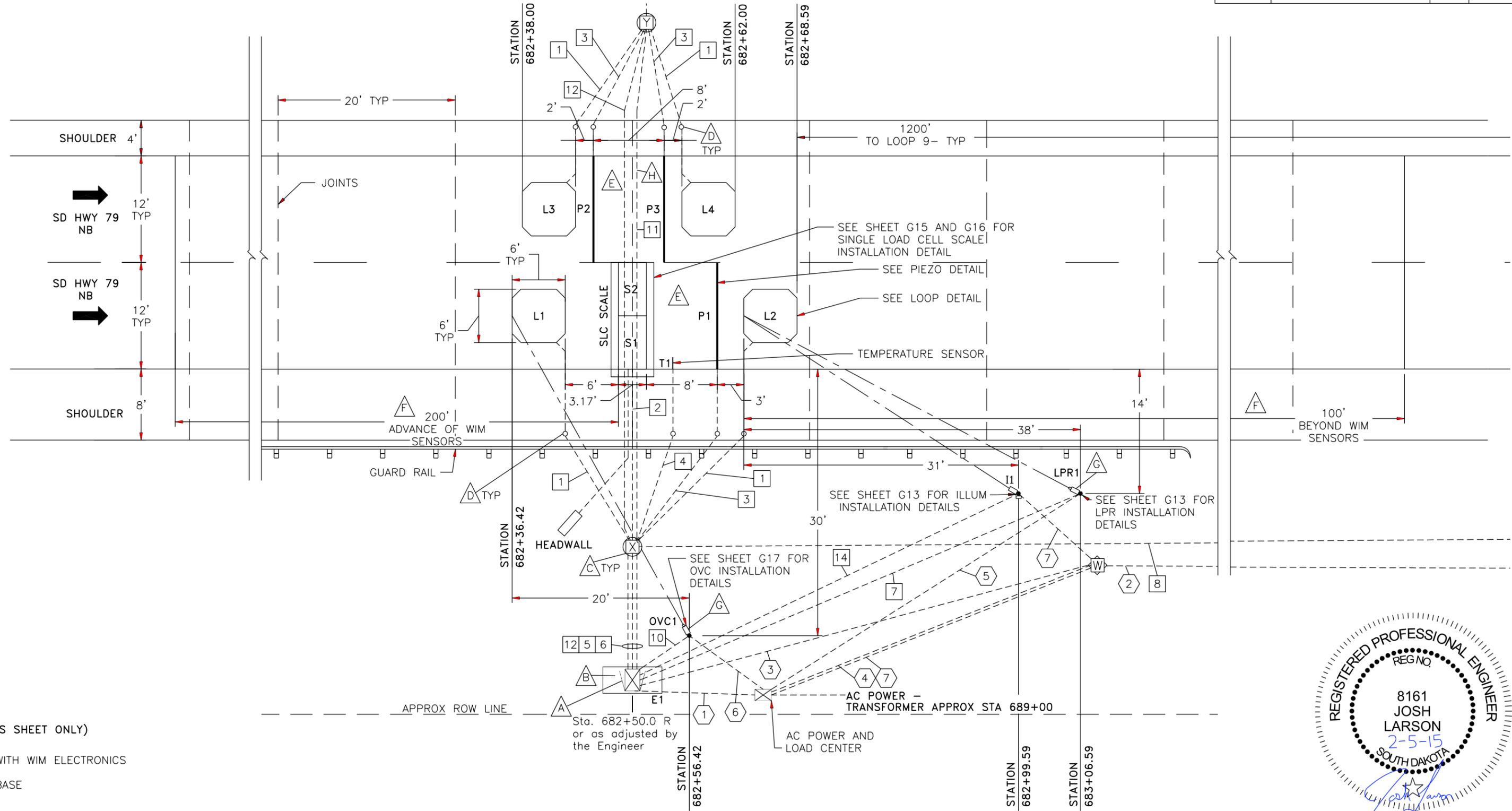
SIZE: B

DIMENSIONS IN: FEET

# DETAIL LAYOUT FOR NEW MAINLINE WIM SENSORS (DETAIL A)

(DETAIL A)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G9	G28



**NOTES: (THIS SHEET ONLY)**

- CABINET WITH WIM ELECTRONICS
- CABINET BASE
- PULL BOX.
- DRILL THROUGH SHOULDER FOR CONDUIT.
- PAVEMENT ON EITHER SIDE OF EACH SENSOR MUST BE FREE OF JOINTS AND CRACKS FOR 4'.
- SITE CONDITIONS AS PER ASTM E1318-09 FOR ALL LANES.
- POLE LOCATION MUST ALLOW ADEQUATE RIGHT-OF-WAY OR PROTECT WITH GUARDRAIL OR USE OF BREAK-AWAY POLE AS REQUIRED BY LOCAL CONSTRUCTION CODES.
- CONDUIT SHALL BE PLACED USING BORING, JACKING OR ALTERNATIVE METHOD THAT DOES NOT REQUIRE THE SURFACE OF THE ROAD TO BE CUT.



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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NOT TO SCALE  
 SIZE: B  
 DIMENSIONS IN: FEET

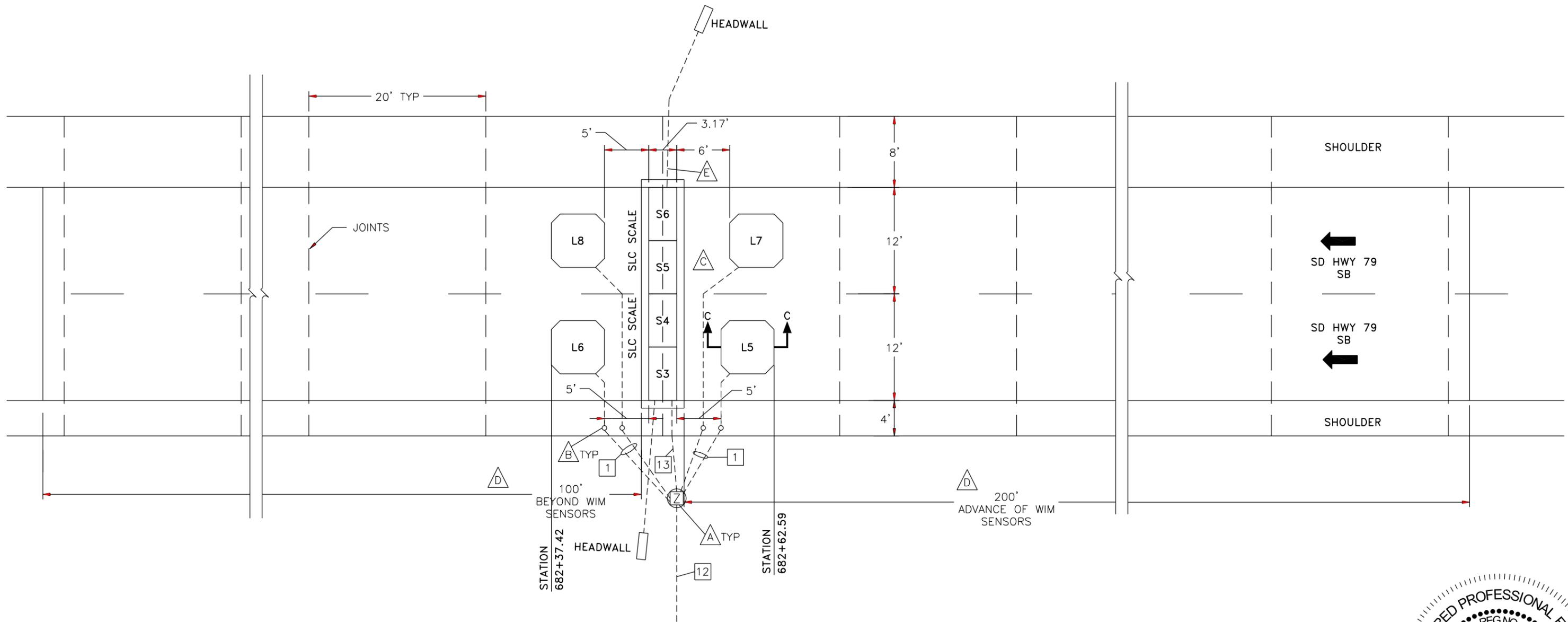
**INTERNATIONAL ROAD DYNAMICS INC. SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE: **SITE LAYOUT VIRTUAL WEIGH STATION RAPID CITY, SOUTH DAKOTA**

DWG. No. **MSDVWS01** REV.: 1  
 CAD FILE: MSDVWS01.DWG SHEET OF

# DETAIL LAYOUT FOR NEW MAINLINE WIM SENSORS (DETAIL B)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G10	G28



**NOTES: (THIS SHEET ONLY)**

- A PULL BOX.
- B DRILL THROUGH SHOULDER FOR CONDUIT.
- C PAVEMENT ON EITHER SIDE OF EACH SENSOR MUST BE FREE OF JOINTS AND CRACKS FOR 4'.
- D SITE CONDITIONS AS PER ASTM E1318-09 FOR ALL LANES.
- E CONDUIT SHALL BE PLACED USING BORING, JACKING OR ALTERNATIVE METHOD THAT DOES NOT REQUIRE THE SURFACE OF THE ROAD TO BE CUT.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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NOT TO SCALE

SIZE: B

DIMENSIONS IN: FEET

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**SASKATOON SASKATCHEWAN CANADA**

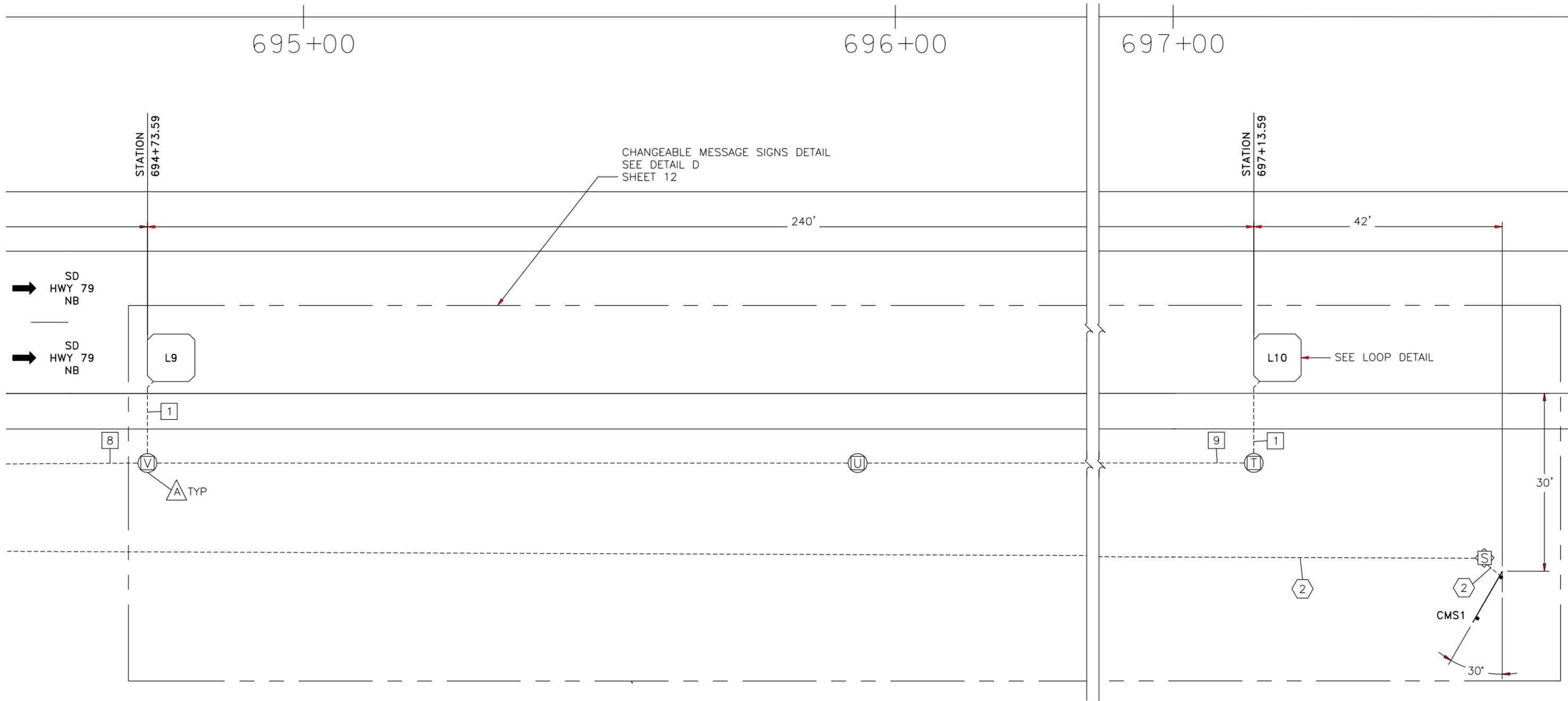
DWG. TITLE:  
**SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

DWG. No. <b>MSDVWS01</b>	REV.: 1
CAD FILE: MSDVWS01.DWG	SHEET OF



# DETAIL C – CHANGEABLE MESSAGE SIGNS

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G11	G28



**NOTES:** (THIS SHEET ONLY)

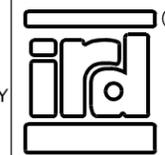
PULL BOX.



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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SIZE: B

DIMENSIONS IN: FEET

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DWG. TITLE:  
**SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

DWG. No. **MSDVWS01**

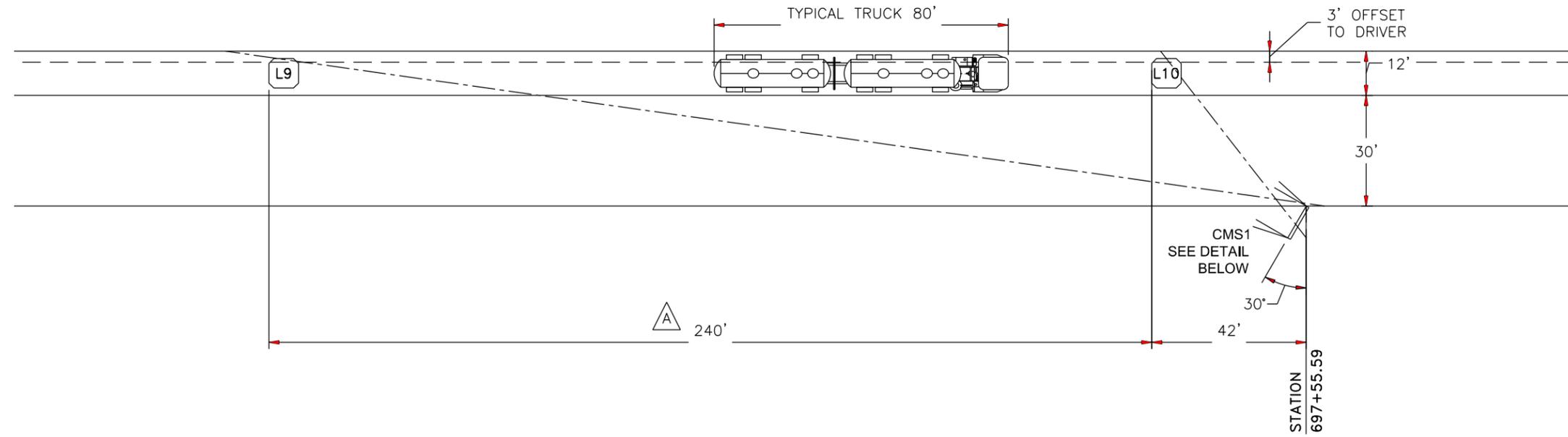
CAD FILE: MSDVWS01.DWG

REV.: 1

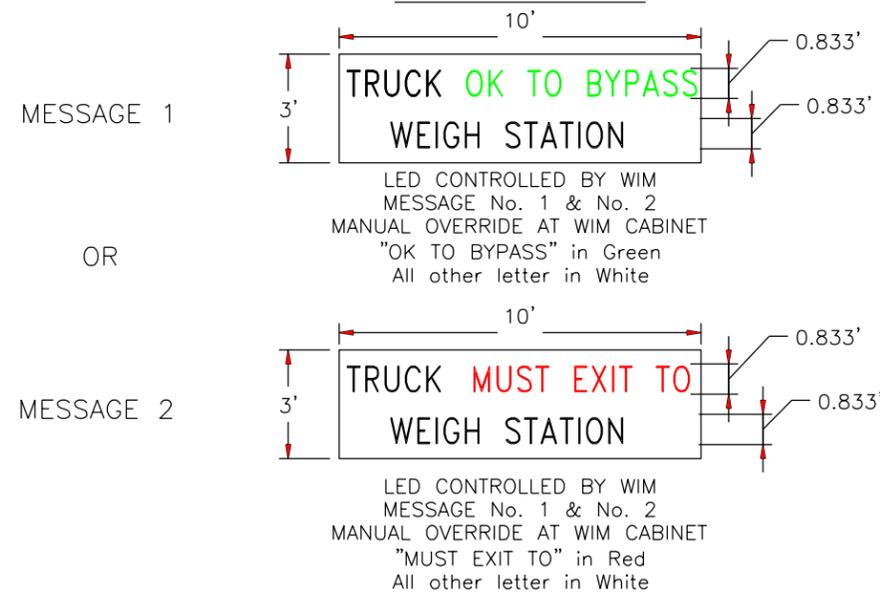
SHEET OF

# DETAIL D – CHANGEABLE MESSAGE SIGN DETAIL

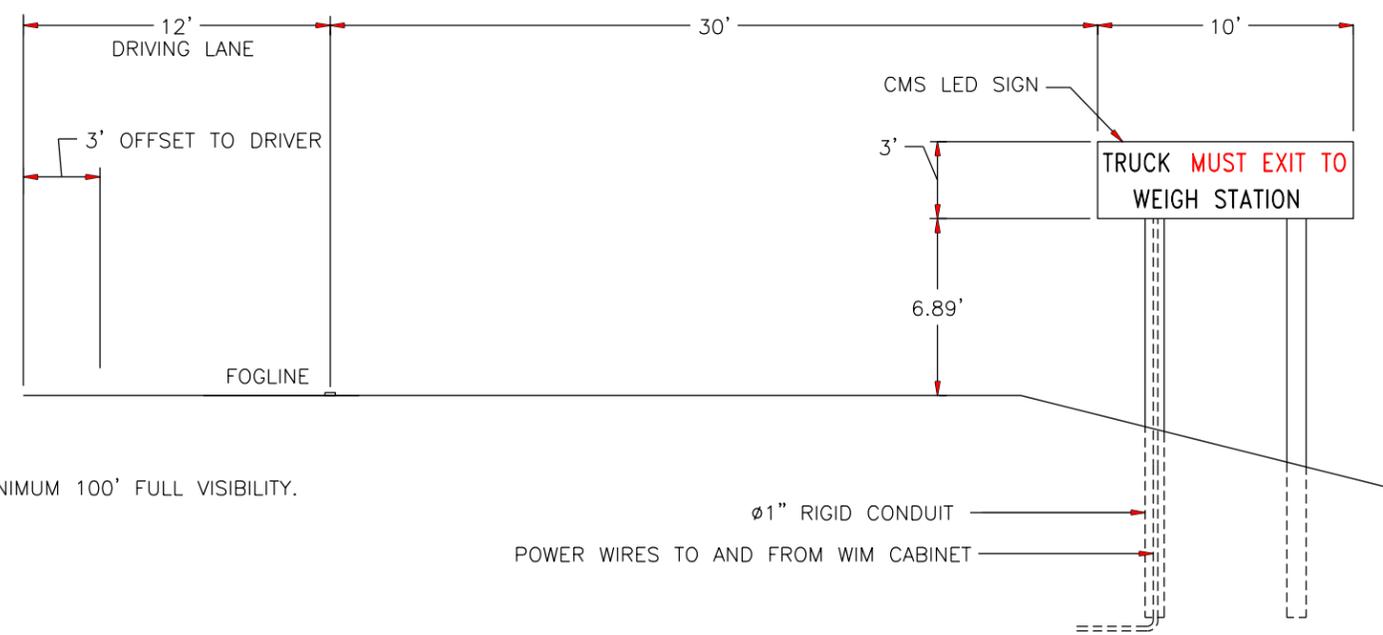
STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G12	G28



### CMS SIGN DETAIL

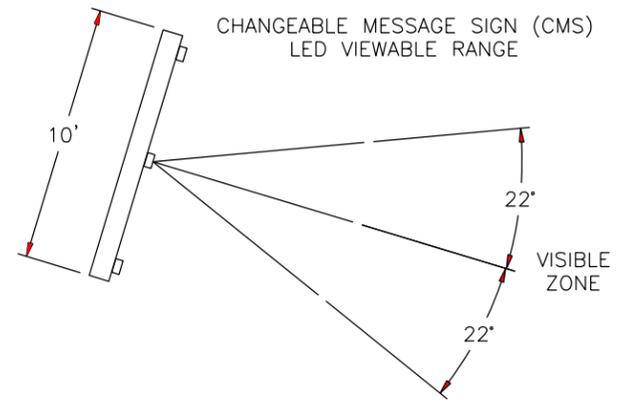


### SIGN GEOMETRY



### NOTES: (THIS SHEET ONLY)

SIGNS SET TO ENSURE MINIMUM 100' FULL VISIBILITY.



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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SIZE: B

DIMENSIONS IN: FEET

**INTERNATIONAL ROAD DYNAMICS INC.  
SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE:  
**SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

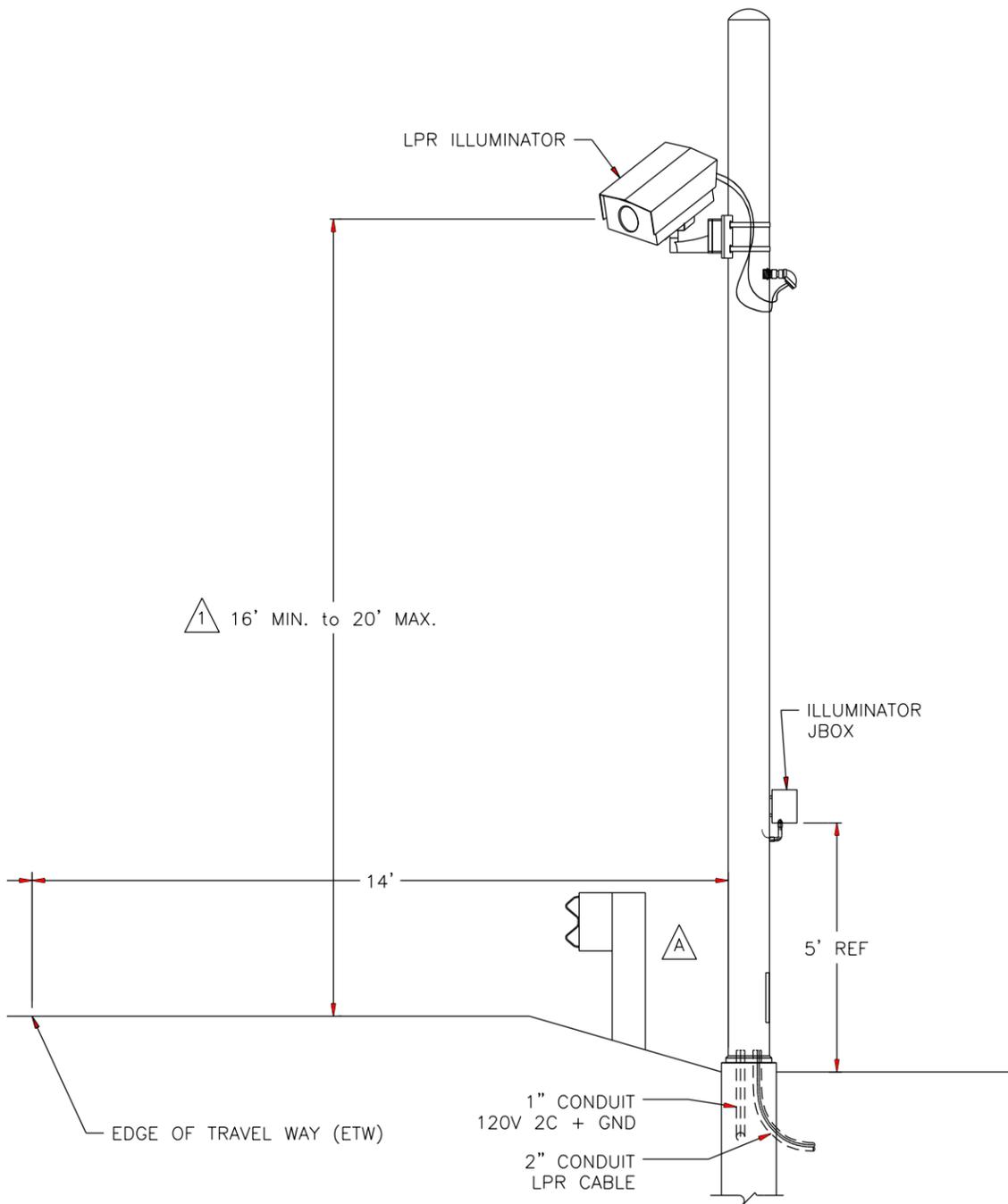
DWG. No. **MSDVWS01**      REV.: 1

CAD FILE: MSDVWS01.DWG      SHEET OF

# ILLUMINATOR INSTALLATION DETAIL

## VIEW FACING DOWNSTREAM

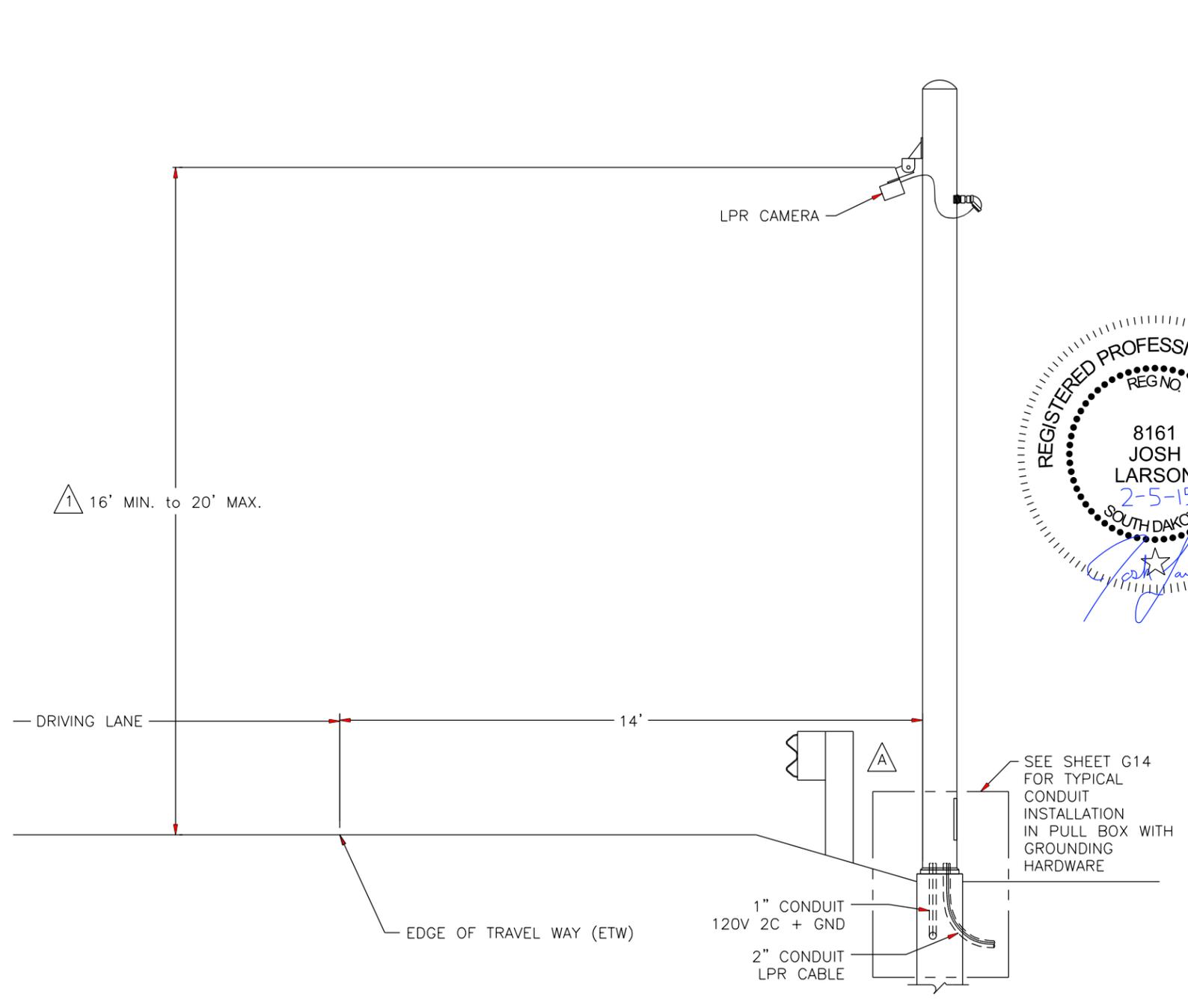
STATION 682+99.59



# LICENSE PLATE READER CAMERA INSTALLATION DETAIL

## VIEW FACING DOWNSTREAM

STATION 683+06.59



**NOTES:** (THIS SHEET ONLY)

- ① HEIGHT RELATIVE TO HIGHEST POINT OF ROADWAY.
- Ⓐ GUARDRAIL IS REQUIRED - SEE SECTION F FOR DETAILS

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
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SIZE: B

DIMENSIONS IN: FEET

**INTERNATIONAL ROAD DYNAMICS INC. SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE: **SITE LAYOUT VIRTUAL WEIGH STATION RAPID CITY, SOUTH DAKOTA**

DWG. No. **MSDVWS01** REV.: 1

CAD FILE: MSDVWS01.DWG SHEET OF

# LICENSE PLATE READER CAMERA INSTALLATION DETAIL

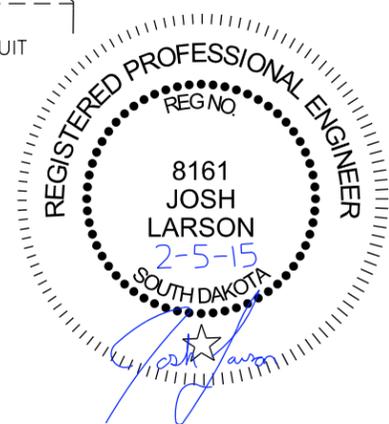
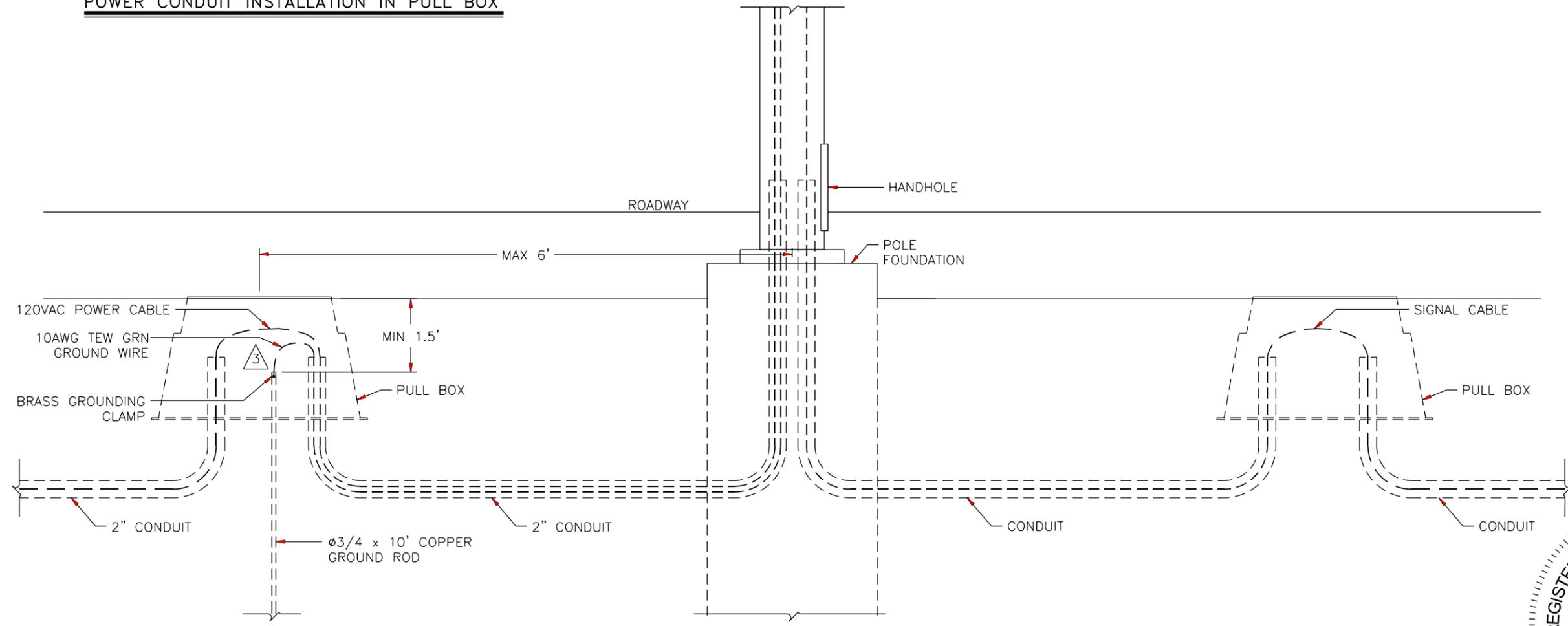
STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G14	G28

## REAR VIEW – FACING ROADWAY

### TYPICAL CONDUIT INSTALLATION IN PULL BOX

STATION 683+06.59

#### POWER CONDUIT INSTALLATION IN PULL BOX



**NOTES:**

- 1 POLE AND FOUNDATION DESIGN NOT PROVIDED BY IRD.
- 2 CONDUITS TO MEET LOCAL ELECTRIC CODE.
- 3 EQUIPMENT TO BE CONNECTED TO EARTH GROUND IN COMPLIANCE WITH NATIONAL ELECTRICAL CODE AND LOCAL STANDARDS.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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SIZE: B

DIMENSIONS IN: FEET

**INTERNATIONAL ROAD DYNAMICS INC.  
SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE: **SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

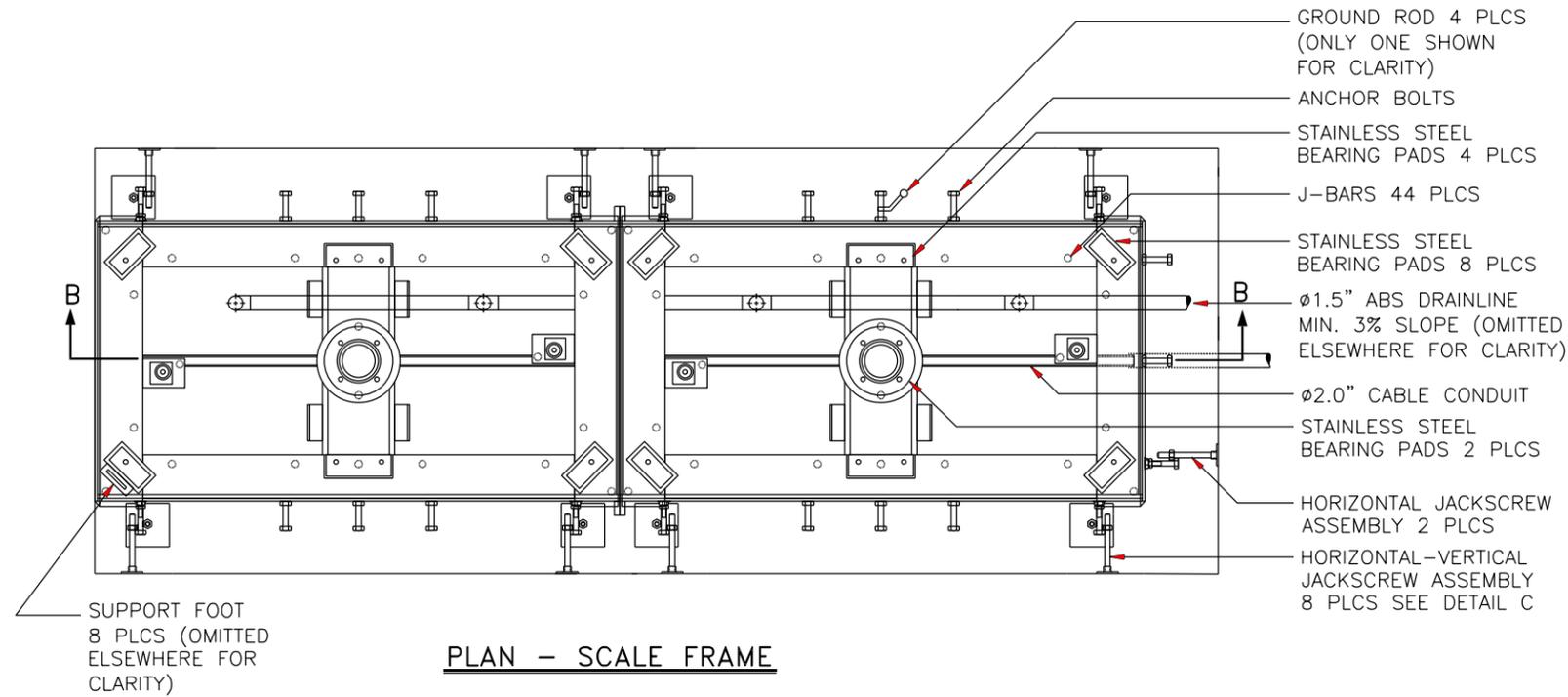
DWG. No. <b>MSDVWS01</b>	REV.: 1
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**SINGLE LOAD CELL INSTALLATION DETAIL**

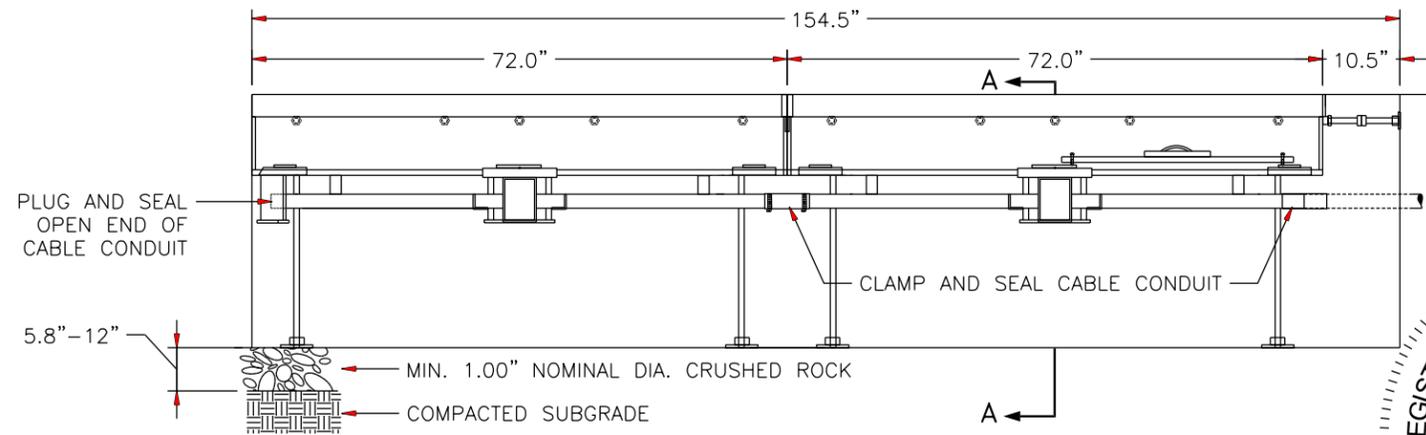
STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G15	G28

**GENERAL INSTALLATION INSTRUCTIONS:**

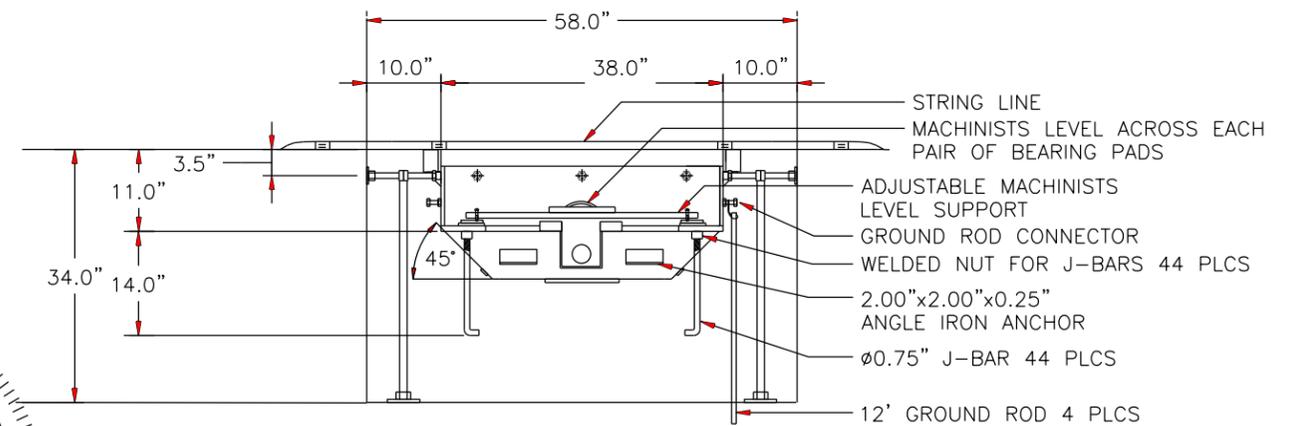
- SHIPMENT INCLUDES: FRAMES, J-BARS, O-RINGS, GROUND ROD CONNECTORS, 2-10' LENGTHS OF DRAIN PIPE - 3 TEES AND 1 ELBOW, ALL NECESSARY CONCRETE ANCHOR BOLTS, JACK SCREWS, LOCATING SCREWS, SUPPORT PADS, CONDUIT CONNECTING HOSE AND CLAMPS, AND GROUND RODS.
- INSTALL CONCRETE ANCHOR BOLTS, JACK SCREWS AND J-BARS ONTO SCALE FRAMES.
- EXCAVATE SCALE VAULT TO DEPTH OF 40" AND COMPACT PIT BOTTOM.
- PLACE 6" OF 1" NOMINAL CRUSHED ROCK AND VIBRATE COMPACT.
- SET FRAME IN PREPARED PIT WITH NECESSARY REBAR CAGE IN PLACE.
- INSTALL DRAIN PIPES AND CONDUITS. SEAL ALL CONNECTIONS. DRAINAGE AT EDGE OF ROADWAY MUST ALLOW FREE FLOW AWAY FROM THE OUTLET OF DRAIN PIPE. THE OUTLET MUST BE WELL ABOVE THE HIGH WATER LEVEL OF THE DITCH OR MANHOLE. THE FLOW ALONG THE DRAIN AND AWAY FROM THE OUTLET MUST BE MAINTAINED AT ALL TIMES.
- USE JACK SCREWS TO POSITION FRAME PROPERLY - HORIZONTALLY AND VERTICALLY.
- INSTALL GROUND CLAMPS AND GROUND RODS.
- LOCATE THE EDGE OF THE SCALE FRAME FLUSH WITH THE SURROUNDING ROAD SURFACE USING A STRING LINE FROM THE ROADWAY ACROSS THE CORNERS OF THE SCALE FRAME.
- FINAL SET OF THE SCALE USING A MACHINISTS LEVEL MOUNTED ON AN ADJUSTABLE SUPPORT, SPANNING ACROSS ADJACENT SCALE BEARING PADS TO ENSURE THAT ALL FRAME EDGES ARE PARALLEL AND THERE IS NO TWIST IN THE SCALE FRAME.
- WET PIT WALLS.
- POUR AND VIBRATE CONCRETE AROUND FRAME. CONCRETE SHOULD HAVE MAX. SLUMP OF 3"[76.2].
- SLOPE AND FINISH PIT SURFACE AND SCALE FRAME FLOOR FOR PROPER DRAINAGE TO DRAINPIPE INLET.
- CONCRETE MUST MEET THE FOLLOWING SPECIFICATIONS:  
 1500PSI [10MPA] - INSTALL PLATFORM IN FRAME  
 3000PSI [20MPA] - OPEN TO TRAFFIC  
 4500PSI [30MPA] - ULTIMATE STRENGTH



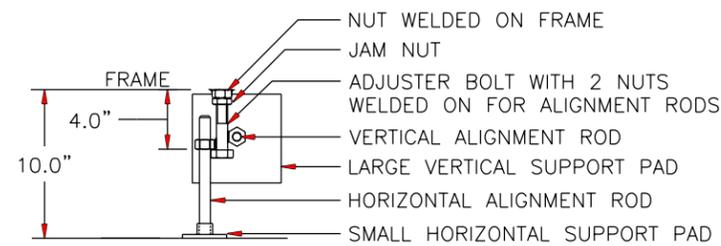
**PLAN - SCALE FRAME**



**SECTION B-B**



**SECTION A-A**



**PLAN OF FRAME ALIGNMENT JACK SCREWS - DETAIL C**



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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NOT TO SCALE  
 SIZE: B  
 DIMENSIONS IN: INCHES

**INTERNATIONAL ROAD DYNAMICS INC. SASKATOON SASKATCHEWAN CANADA**

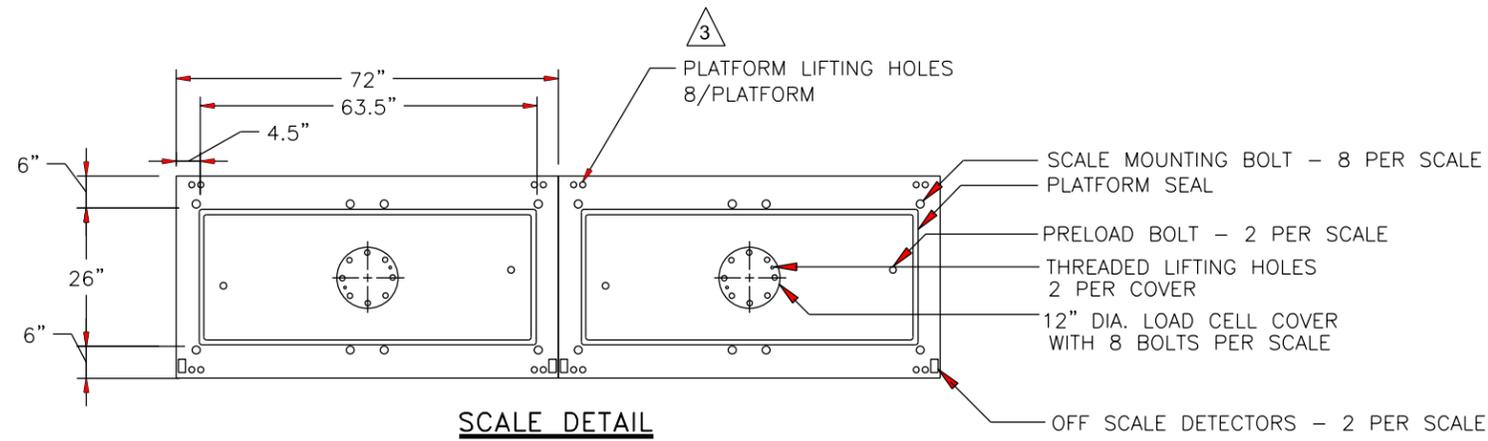
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DWG. No. **MSDVWS01** REV.: 1

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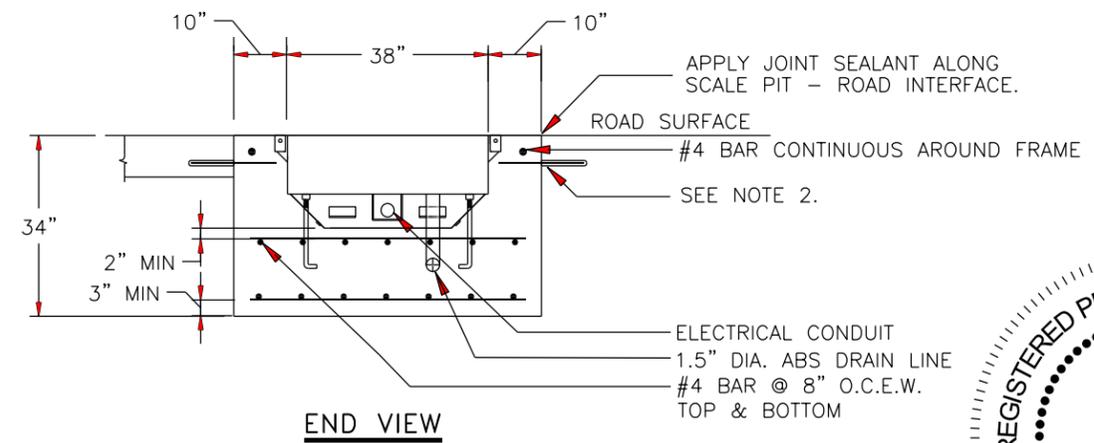
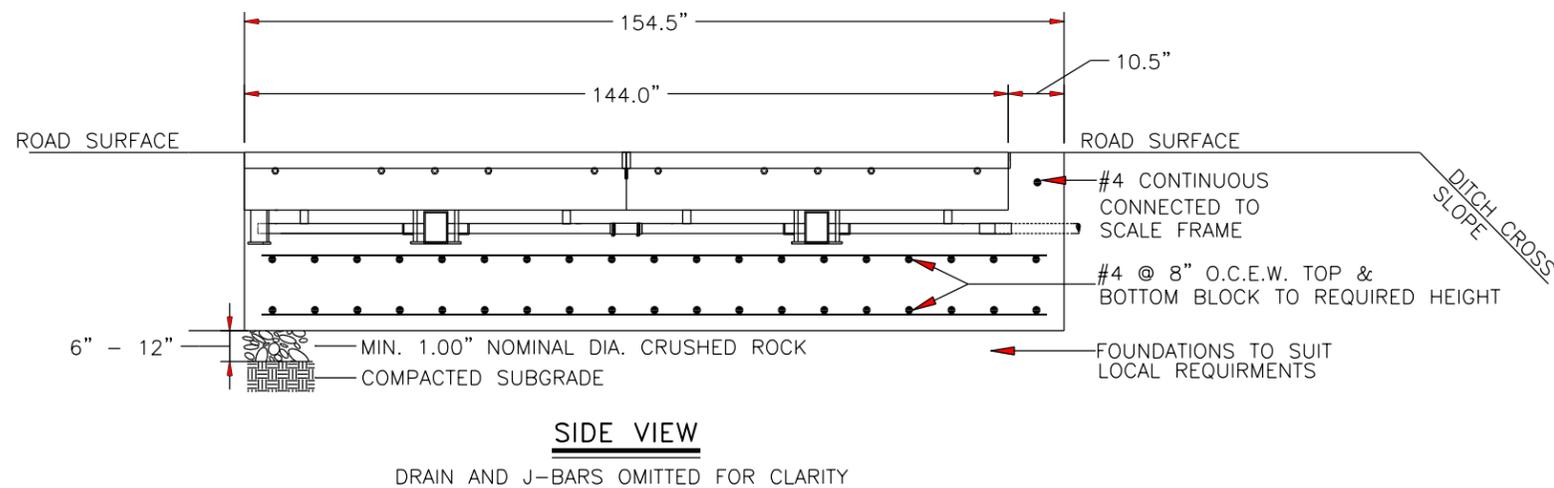
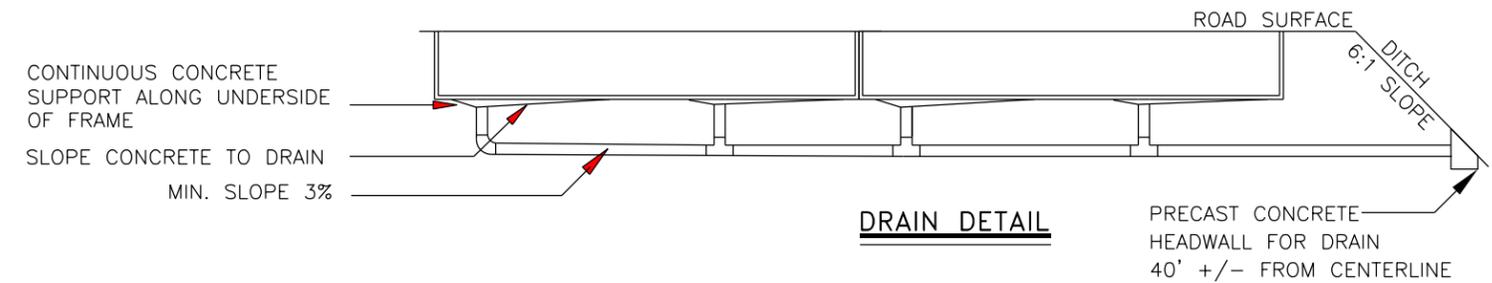
**SINGLE LOAD CELL INSTALLATION DETAIL**

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G16	G28



**NOTES:**

1. REINFORCEMENTS AND DOWELS AS SHOWN ARE MINIMUM REQUIREMENTS AND MAY BE SUPERCEDED BY STATE CONSTRUCTION CODES.
  2. FOR PCC PAVEMENTS INSTALL 1-1/8"Ø x 16" EPOXY COATED DOWELS IN 1-1/4"Ø x 8" DEEP HOLE @ 16" O.C. SECURE DOWEL INTO HOLE WITH EPOXY. ENSURE DOWELS ARE EXACTLY 90° TO LONGITUDINAL PAVEMENT DIRECTION BOTH VERTICALLY AND HORIZONTALLY.
3. SEE 69028801 FOR LIFTING PROCEDURE.



REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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NOT TO SCALE

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DIMENSIONS IN: INCHES

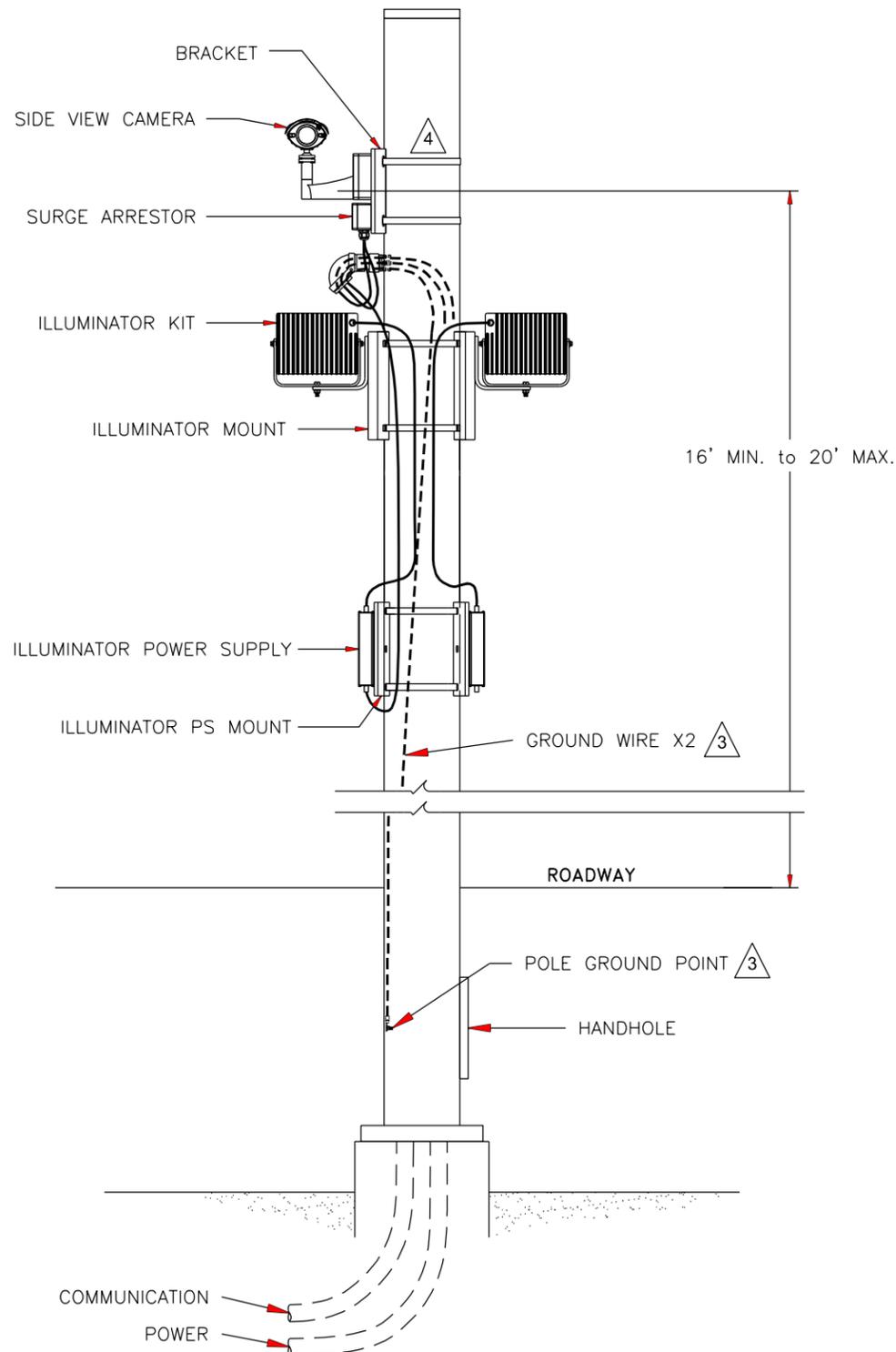
DWG. No. **MSDVWS01** REV.: 1

CAD FILE: MSDVWS01.DWG SHEET OF

**OVERVIEW CAMERA/ILLUMINATOR POLE LAYOUT**  
STATION 682+56.42

**VIEW FACING ROADWAY**

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	HR Y502(00)	G17	G28



**NOTES: (THIS SHEET ONLY)**

1 POLE DESIGN MAY REQUIRE REVIEW BY LOCAL PROFESSIONAL ENGINEER. POLE FOUNDATIONS HAVE BEEN DESIGNED BY SDDOT OFFICE OF BRIDGE DESIGN. POLES OR CONFIGURATIONS DIFFERENT THAN THAT SHOWN MAY REQUIRE REDESIGN OF POLE FOOTINGS (ALL 3 POLES).

2 CONDUITS TO MEET LOCAL ELECTRIC CODE.

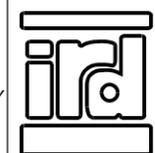
3 EQUIPMENT TO BE CONNECTED TO EARTH GROUND IN COMPLIANCE WITH NATIONAL ELECTRICAL CODE AND LOCAL STANDARDS.

4 CONTRACTOR TO SUPPLY 3/4" STAINLESS STEEL BANDING FOR ATTACHING EQUIPMENT.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
1	PRELIMINARY RELEASE	LPe/RCz			

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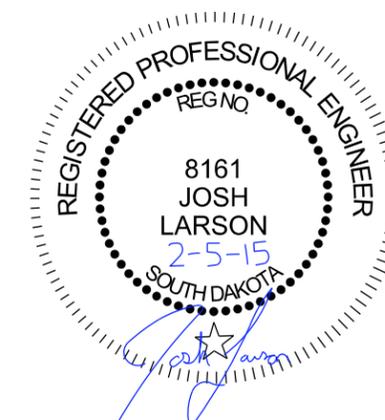


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DIMENSIONS IN: FEET

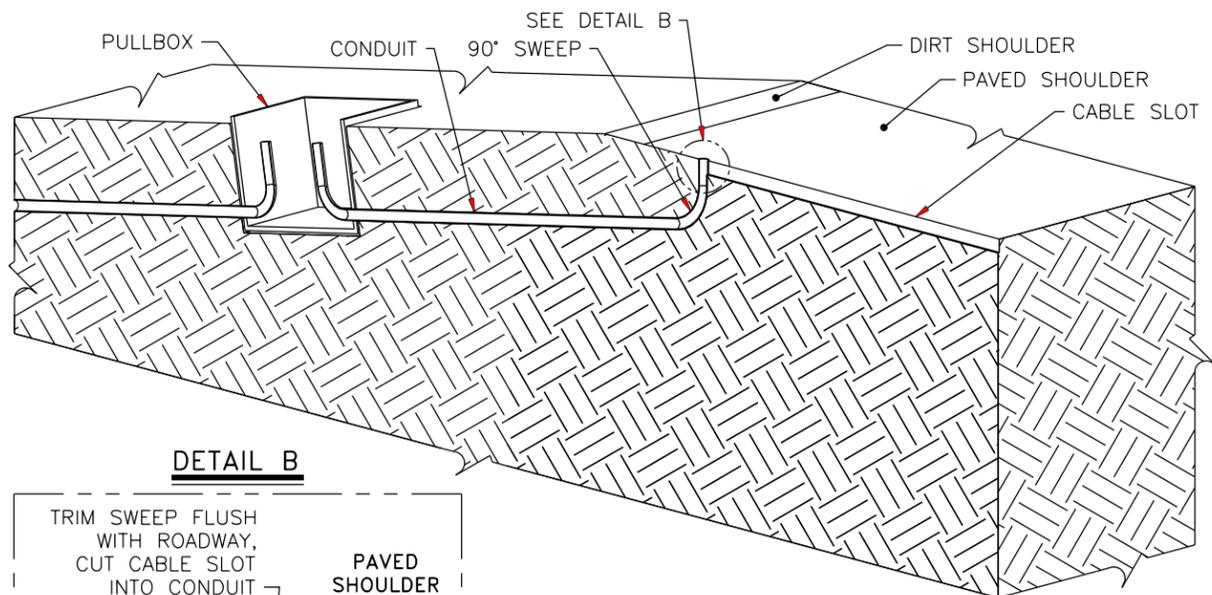
**INTERNATIONAL ROAD DYNAMICS INC.**  
**SASKATOON SASKATCHEWAN CANADA**

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**SITE LAYOUT  
VIRTUAL WEIGH STATION  
RAPID CITY, SOUTH DAKOTA**

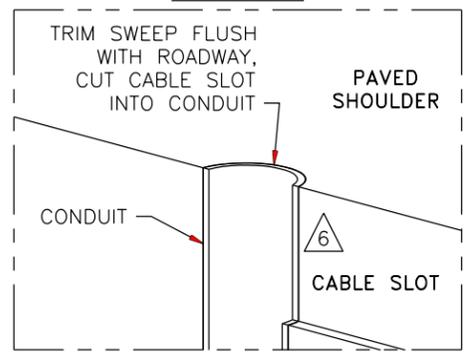
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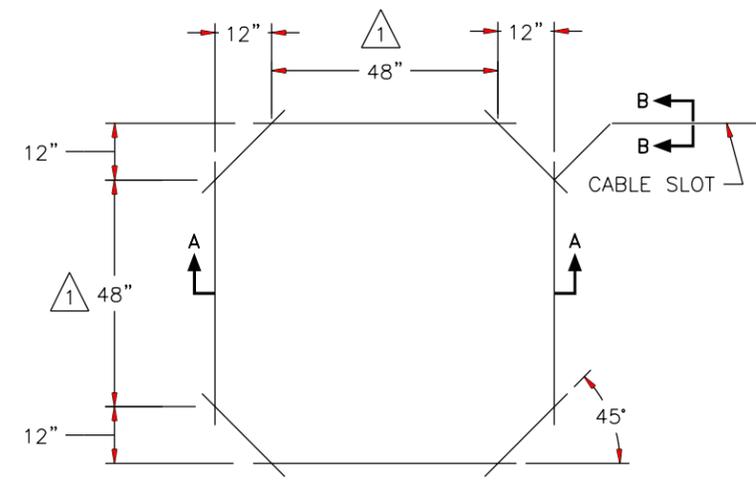
### CABLE ROUTING DETAILS



#### DETAIL B



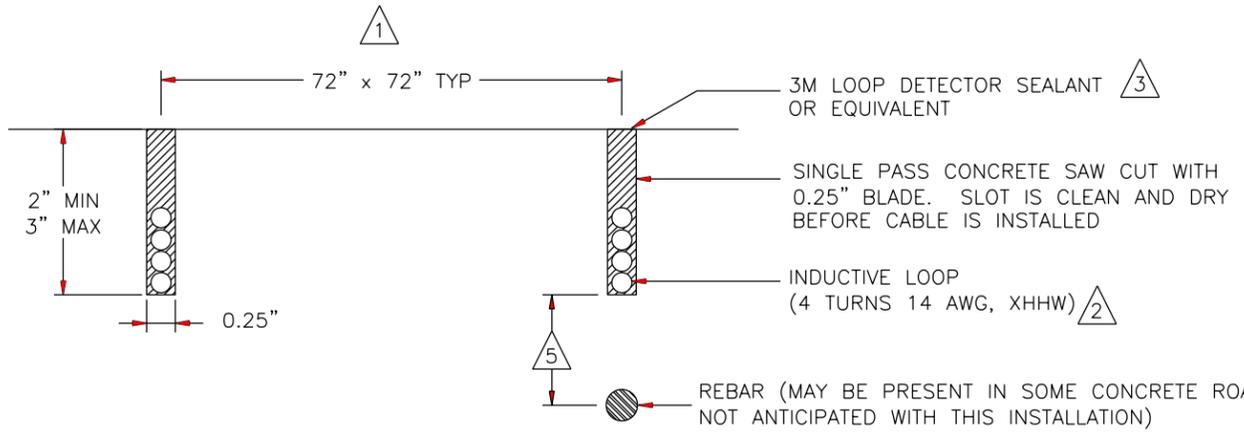
### OCTAGON LOOP DIMENSION DETAIL



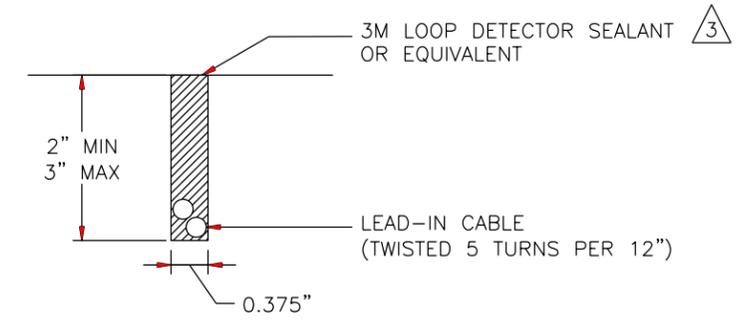
72" x 72" LOOP SHOWN



#### SECTION A-A



#### SECTION B-B



#### NOTES:

- 1 LOOP SIZE AS SPECIFIED ON SITE LAYOUT AND IN ACCORDANCE WITH IRD 3EGR0001.
- 2 NUMBER OF TURNS AS SPECIFIED ON SITE LAYOUT AND IN ACCORDANCE WITH IRD 3EGR0001.
- 3 USE CAULKING GUN
- 4 LOOP INSTALLATION MANUALS:  
690279 - PERMANENT OCTAGON LOOPS  
690289 - PERMANENT SQUARE LOOPS
- 5 IF THE LOOP IS INSTALLED OVER REBAR, THERE MUST BE A MINIMUM OF 2" CONCRETE BELOW AND A MINIMUM OF 1" FILL ABOVE THE WIRES.
- 6 CORE DRILL OR CUT NOTCH IN PAVED SHOULDER FOR SWEEP. PLUG SWEEP OPENING, COVER WITH LOOP SEALANT.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
A	INITIAL RELEASE	JGi/GDo	DPr	GDo	DEC 21/05
B	ADD NOTE 5. ECO-01.	JGi/ACo	DPr	DBo	AUG 31/06
C	UPDATE CABLE ROUTING DETAILS AS PER REDLINES - ECO-2008.	JGi/MLo	THa	MLo	FEB 17/11
D	MOVE REBAR IMAGE AND NOTE TO SECTION AA - ECO-4753.	JGi/SpJ			

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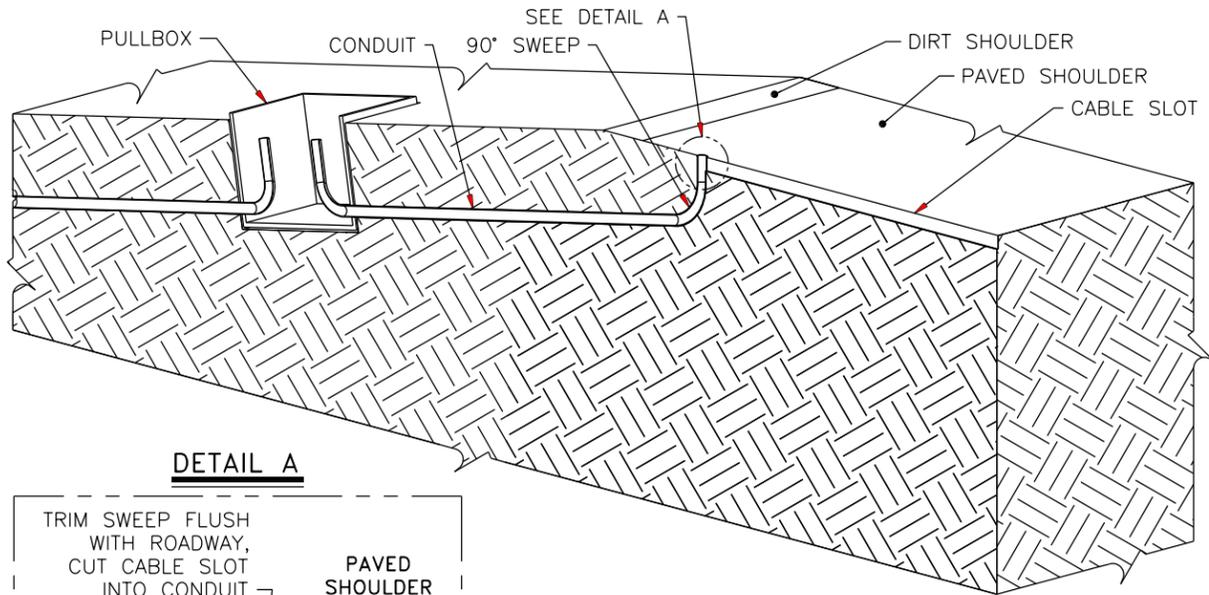
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DIMENSIONS IN: INCHES

**INTERNATIONAL ROAD DYNAMICS INC. SASKATOON SASKATCHEWAN CANADA**

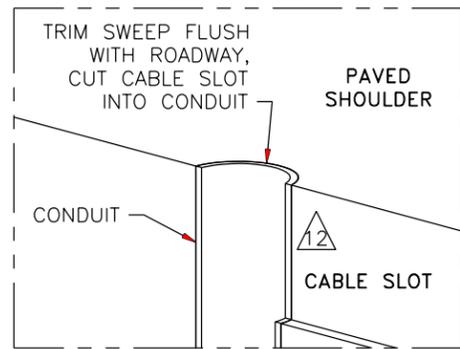
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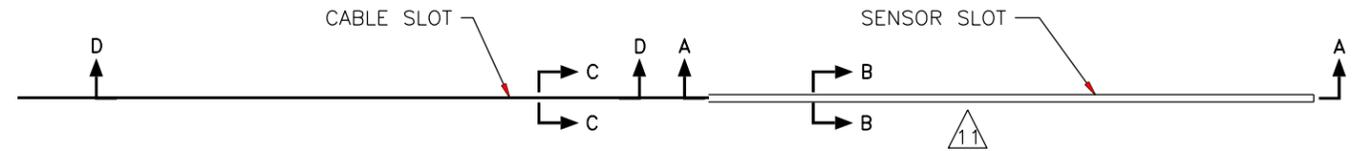
**SECTION D-D (CABLE ROUTING DETAILS)**



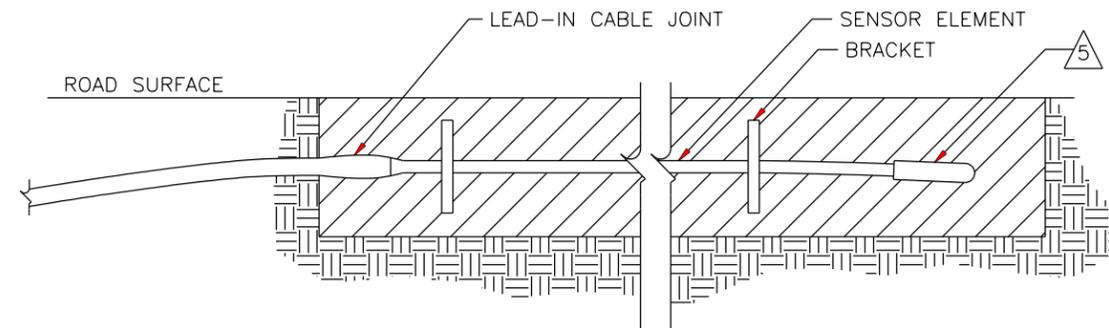
**DETAIL A**



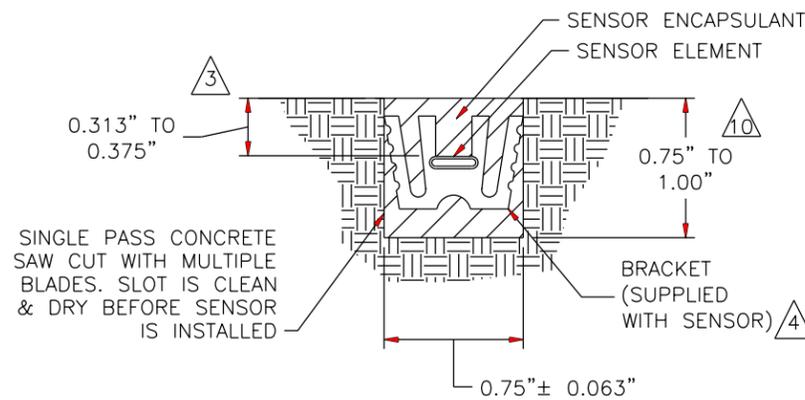
**PLAN VIEW - SENSOR INSTALLATION**



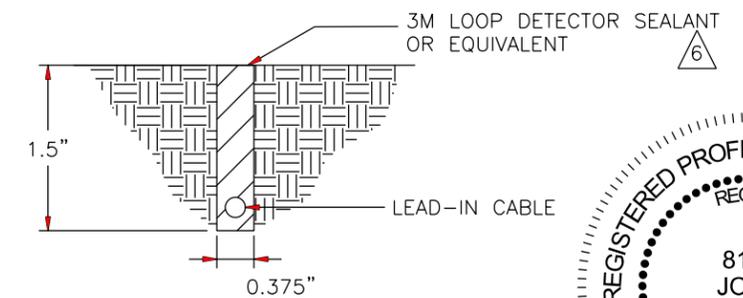
**SECTION A-A**



**SECTION B-B**



**SECTION C-C**



**NOTES:**

- CRACKS OR SAW CUTS IN THE ROADWAY MUST NOT BE LOCATED CLOSER THAN 18" UPSTREAM AND 18" DOWNSTREAM OF THE PIEZOELECTRIC SENSOR.
- SLOT LENGTH IS 6" LONGER THAN SENSOR.
- USE THE DEPTH GAGE SUPPLIED WITH EACH SENSOR TO SET THE SENSOR AT THE CORRECT DEPTH. CHECK DEPTH ALONG THE ENTIRE LENGTH OF THE SENSOR.
- SPACE THE BRACKETS EVENLY OVER THE LENGTH OF THE SENSOR, USING ALL SUPPLIED 0.75" BRACKETS. EXTRA 1.0" BRACKETS ARE SUPPLIED WHICH ARE USED ONLY IN THE CASE THAT THE SLOT IS CUT TOO WIDE.
- PUT A SLIGHT BEND AT THE END OF THE SENSOR TO LOWER THE HEIGHT OF THE END CAP TO THE SAME HEIGHT AS THE SENSOR TO ENSURE SUFFICIENT DEPTH OF ENCAPSULANT ABOVE THE SENSOR.
- USE IRD CAULKING GUN
- CHECK THE RESISTANCE OF THE SENSOR BY PLACING A DIGITAL MULTIMETER ACROSS THE CENTER CONDUCTOR OF THE BNC CONNECTOR AND THE OUTER BODY. THE READING SHOULD BE INFINITY.
- CHECK THE VOLTAGE OUTPUT OF THE SENSOR BY MONITORING THE METER WHEN A TRUCK PASSES OVER THE SENSOR INSTALLED IN THE ROADWAY. AS THE TRUCK PASSES OVER THE SENSOR, VOLTAGE DEFLECTION SHOULD BE OBSERVED.
- PIEZO INSTALLATION MANUAL: 690275.
- FOR ADDITIONAL PROTECTION OF THE SENSOR, INSTALLATION DEPTH MAY BE INCREASED WITH CORRESPONDING INCREASE IN CUT DEPTH AND GROUT. DECREASED SIGNAL AMPLITUDE AND QUALITY WILL RESULT.
- LOCATE AND ORIENT SENSOR AND CABLING ACCORDING TO SYSTEM DOCUMENTATION.
- CORE DRILL OR CUT NOTCH IN PAVED SHOULDER FOR SWEEP. PLUG SWEEP OPENING, COVER WITH LOOP SEALANT.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
A	INITIAL RELEASE	GDo/JGI	DPr	GDo	DEC 21/05
B	CHANGES AS PER ECO-01.	JGI/HFe	MLo	THa	SEP 14/09
C	IN "PLAN VIEW - SENSOR...", REMOVE LANE OUTLINES; ADD NOTE 11; UPDATE CABLE ROUTING DETAILS PER ECO-1852	JGI/SpJ			

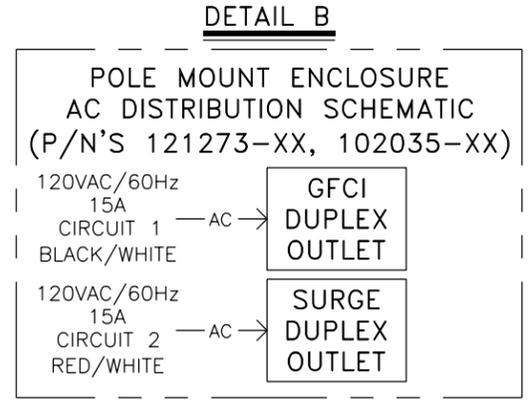
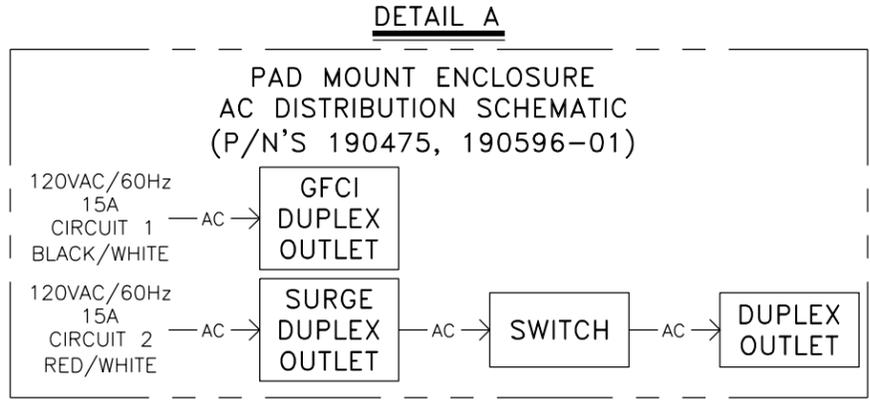
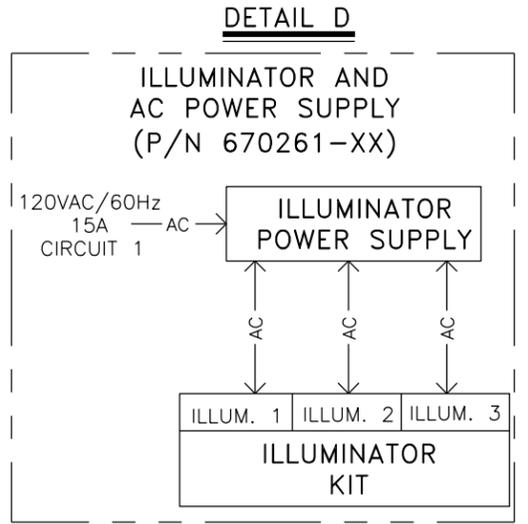
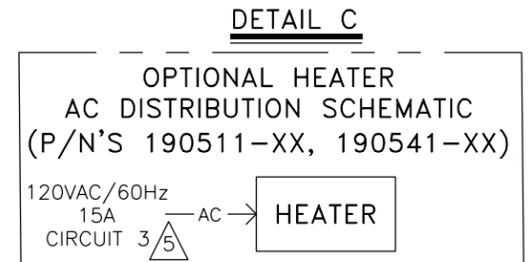
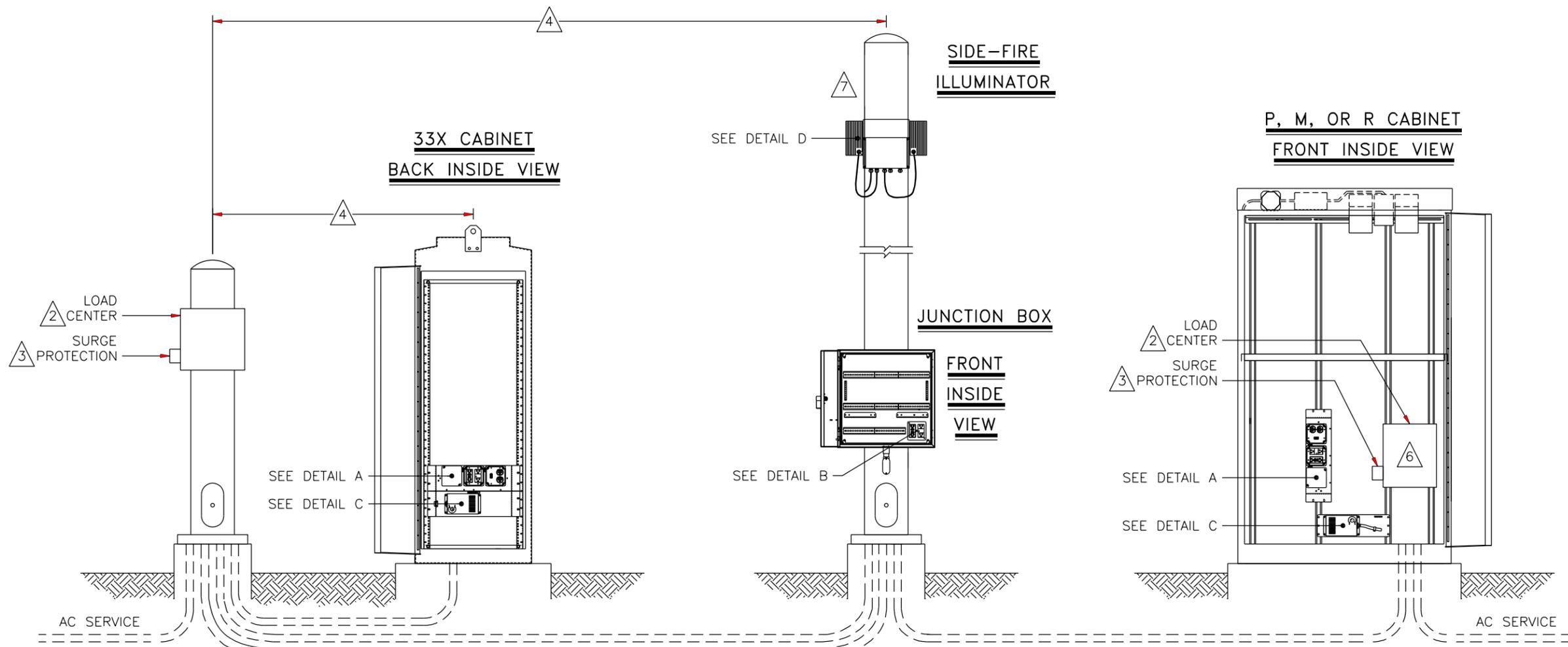
**CONFIDENTIAL**  
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NOT TO SCALE  
 SIZE: B  
 DIMENSIONS IN: INCHES

**INTERNATIONAL ROAD DYNAMICS INC. SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE: **INSTALLATION BL TYPE PIEZO SENSOR**

DWG. No. **81300201** REV.: C  
 CAD FILE: 81300201.DWG SHEET OF



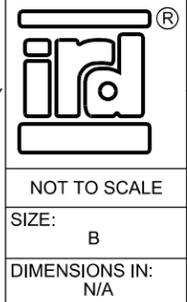
**NOTES:**

- 1 ALL ELECTRICAL DEVICES, GROUNDING, BONDING, WIRING AND MOUNTING MUST MEET THE NATIONAL ELECTRICAL CODE NFPA70 AND LOCAL ELECTRICAL CODE.
- 2 PROVIDE SUITABLE OUTDOOR LOAD CENTER.
- 3 EQUIPMENT MUST BE PROTECTED WITH AN ANSI/IEEE C62.41 CATEGORY C RATED PROTECTION DEVICE WITH A MINIMUM PEAK CURRENT HANDLING CAPABILITY OF 36KA (8/20μS) INSTALLED AT THE LOAD CENTER OR SUB LOAD CENTER.
- 4 30m MAXIMUM CABLE LENGTH BETWEEN CATEGORY C PROTECTOR AND ENCLOSURE(S).
- 5 CIRCUIT 3 OPTIONAL DEPENDING ON PRESENCE OF HEATER.
- 6 LOAD CENTER MAY BE LOCATED INSIDE ENCLOSURE WHERE SPACE PERMITS.
- 7 REFER TO PRODUCT DOCUMENTATION FOR OEM EQUIPMENT NOT SHOWN.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
C	CHANGES AS PER ECO-04	SS/MGa	MLo	BMc	JAN 9/07
D	MODIFY AC DISTRIBUTION PANEL TO MATCH 190475; SECONDARY ENCLOSURE WIRING; NOTES AS PER ECO-11	JGi/BMc	DPr	RBe	July 24/09
E	ADJUST NOTES 3 & 5 PER REDLINES - ECO-2248.	JGi/CHe	CHe	MLo	MAR 18/11
F	REFER TO REDLINES - ECO-2890	JGi/MLo	MLo	SpJ	AUG. 25/11
G	CHANGED AS PER ECO-6095.	YMa			

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**INTERNATIONAL ROAD DYNAMICS INC.  
SASKATOON SASKATCHEWAN CANADA**

DWG. TITLE:  
**120VAC CABINET POWER INSTALLATION  
ROAD SIDE ELECTRONICS**

NOT TO SCALE

SIZE: B

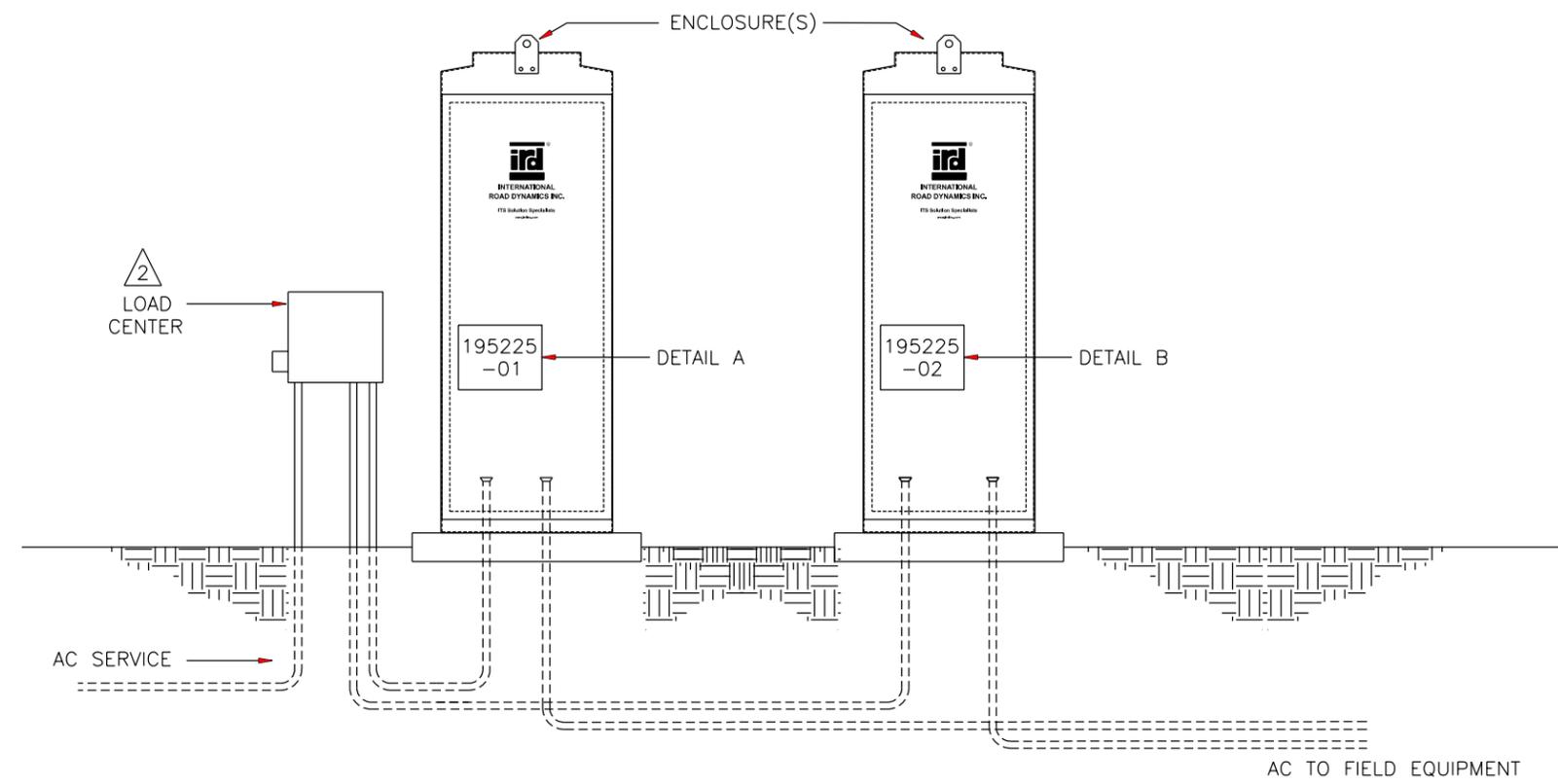
DIMENSIONS IN: N/A

DWG. No. **81300907**

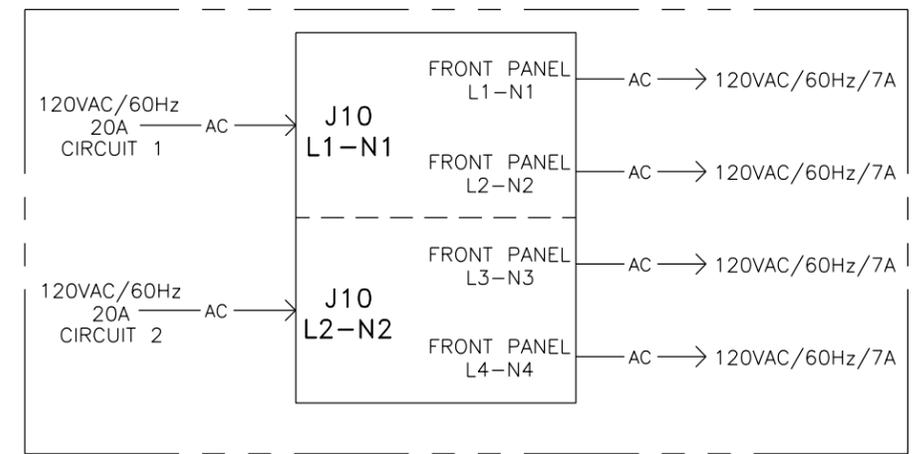
CAD FILE: 81300907.DWG

REV.: G

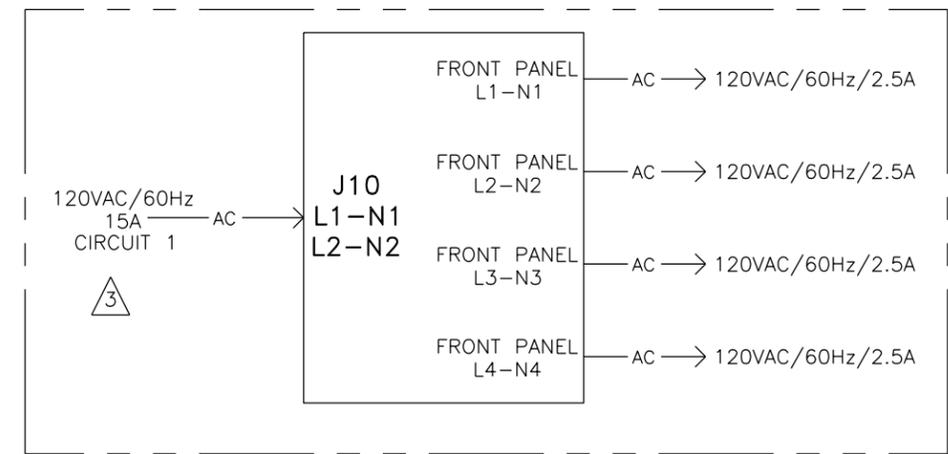
SHEET OF



**DETAIL A**



**DETAIL B**



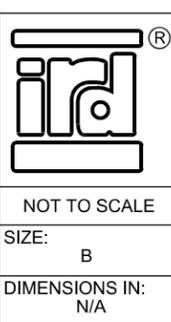
**NOTES:**

- ALL ELECTRICAL DEVICES, GROUNDING, BONDING, WIRING AND MOUNTING MUST MEET THE NATIONAL ELECTRICAL CODE NFPA70 AND LOCAL ELECTRICAL CODE.
- CABINET AND LOAD CENTER POWER INSTALLATION
- CONNECT L1 TO L2 AND N1 TO N2.

REV.	DESCRIPTION	DWN/DSN	APPR.	APPR.	DATE
A	PREVIOUSLY PRE-RELEASED AS REV 1	SS/BMc	BMc	MLo	OCT 10/06
B	CHANGE PN 195195-01 TO 195225-01; CHANGE PN 195195-02 TO 195225-02. ECO-05.	JG/MLo	DFI	MLo	FEB 9/07
C	CHANGES AS PER ECO-06.	SS/BMc			

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**INTERNATIONAL ROAD DYNAMICS INC.**  
SASKATOON SASKATCHEWAN CANADA

DWG. TITLE:  
**120VAC OUTPUT PNL  
POWER INSTALLATION  
ROAD SIDE ELECTRONICS**

DWG. No. **81300908** REV.: C

CAD FILE: 81300908.DWG SHEET OF

STATE OF SOUTH DAKOTA	PROJECT	SHEET No.	TOTAL SHEETS
	HR Y502(00)	G22	G28

## ABBREVIATIONS

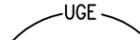
THESE ABBREVIATIONS COMPRISE A STANDARD LIST; NOT ALL ABBREVIATIONS MAY APPEAR ON THIS PROJECT.

A or AMP	AMPERE	MCB	MAIN CIRCUIT BREAKER
A.C.	ALTERNATING CURRENT	MDP	MAIN DISTRIBUTION PANEL
A/E	ARCHITECT & ENGINEER	MFS	MAIN FUSIBLE SWITCH
A.F.F.	ABOVE FINISHED FLOOR	M.H.	METAL HALIDE
A.F.G.	ABOVE FINISHED GRADE	MLO	MAIN LUG ONLY
A.H.J.	AUTHORITY HAVING JURISDICTION	MTD	MOUNTED
A.I.C.	AMPERE INTERRUPTING CURRENT	M.V.	MERCURY VAPOR
B.U.H.	BLAST UNIT HEATER	N.C.	NORMALLY CLOSED
b.c.	BELOW COUNTER	N.E.C.	NATIONAL ELECTRIC CODE
		NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
C or CONDUIT	CONDUIT	NEU	NEUTRAL
CB OR C/B	CIRCUIT BREAKER	N.L.	NIGHT LIGHT
CCT	CIRCUIT	N.O.	NORMALLY OPEN
CU	COPPER	O.H.	OVERHEAD
C.U.H.	CABINET UNIT HEATER	P	POLE
D.C.	DIRECT CURRENT	PB	PUSH BUTTON
DC	DISTRIBUTION CABINET	PH	PHASE
DISC	DISCONNECT	PLBG	PLUMBING
DN	DOWN	pr	PAIR
E.C.	ELECTRICAL CONTRACTOR	P.R.V.	POWER ROOF VENTILATION
EC	ELECTRICAL CABINET	PS	PULL SWITCH
FBO	FURNISHED BY OTHERS	PVC	PLASTIC CONDUIT
FLA	FULL LOAD AMPERES	PWR	POWER
FLU	FLUORESCENT	QTZ	QUARTZ
FUS	FUSE OR FUSIBLE	REC OR RECEPT	RECEPTACLE
G.C.	GENERAL CONTRACTOR	REFRIG	REFRIGERATOR
GEN	GENERATOR	R.H.	RADIANT HEAT
GND or GRD	GROUND	R.M.S.	ROOT MEAN SQUARE
HZ	HERTZ (CYCLES)	SFR	SAFETY RECEPTACLE
ISO	ISOLATED / ISOLATION	SPR	SPLIT WIRE RECEPTACLE
IG	ISOLATED GROUND RECEPTACLE	SCC	SHORT CIRCUIT CURRENT
I.C.	INTERRUPTING CURRENT	SHLD	SHIELD OR SHIELDED
I.M.C.	INTERMEDIATE METAL CONDUIT	S.N.	SOLID NEUTRAL
INC	INCANDESCENT	SW	SWITCH
JB	JUNCTION BOX	T.C.	TEMPERATURE CONTROL
KCMIL	THOUSAND CIRCULAR MIL	TC	TELEPHONE CABINET
KV	KILOVOLT	TEL	TELEPHONE
KVA	KILOVOLT-AMPERE	TR or TRANS	TRANSFORMER
KW	KILOWATT		
		U.G.	UNDERGROUND
		U.H.	UNIT HEATER
		U.V.	UNIT VENTILATOR
		V	VOLT
		W	WATT or WIRE
		w/	WITH
		WP	WEATHERPROOF
		WTR OR H2O	WATER
		XFMR	TRANSFORMER
		∅	PHASE

## INDEX OF ELECTRICAL DRAWINGS

- G22 ELECTRICAL TITLE SHEET
- G23 ELECTRICAL SITE PLAN
- G24 ENLARGED ELECTRICAL PLANS
- G25 ELECTRICAL DETAILS AND SCHEDULES

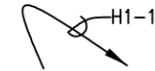
### CONDUIT

 UGE UNDERGROUND CONDUIT

### MOTORS

 MOTOR CONNECTION

### HOMERUNS

 1 - SINGLE POLE CIRCUIT  
(Circuit No's)

### OTHER

 JUNCTION BOX

### PANELS AND TERMINATIONS BOARDS

 PANELBOARD

SEE DRAWINGS FROM IRD FOR FURTHER ELECTRICAL REQUIREMENTS. ELECTRICAL SPECIFICATIONS PROVIDED WITH THESE DOCUMENTS APPLY TO ALL ELECTRICAL WORK DONE ON THIS PROJECT.

### REFERENCE INDICATION

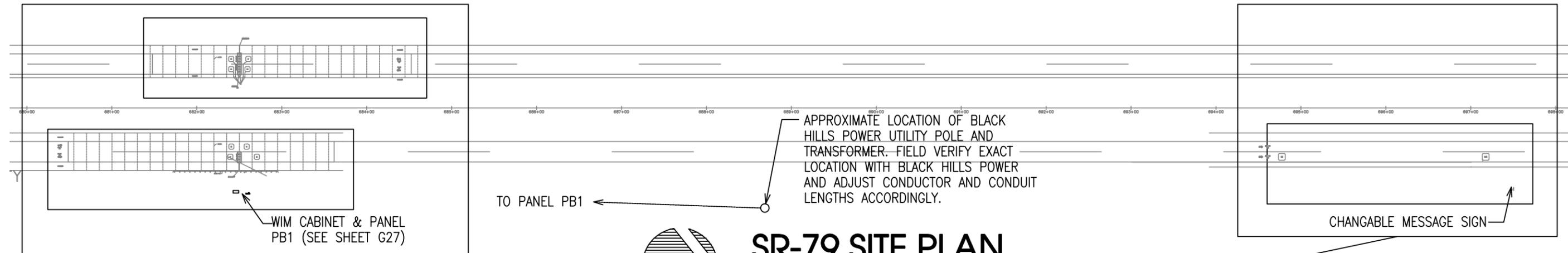
-  SEE NOTE INDICATED BY NUMBER
-  SEE EQUIPMENT INDICATED BY NUMBER
-  REVISION
-  REVISION CLOUD



STATE OF SOUTH DAKOTA	PROJECT	SHEET No.	TOTAL SHEETS
	HR Y502(00)	G23	G28

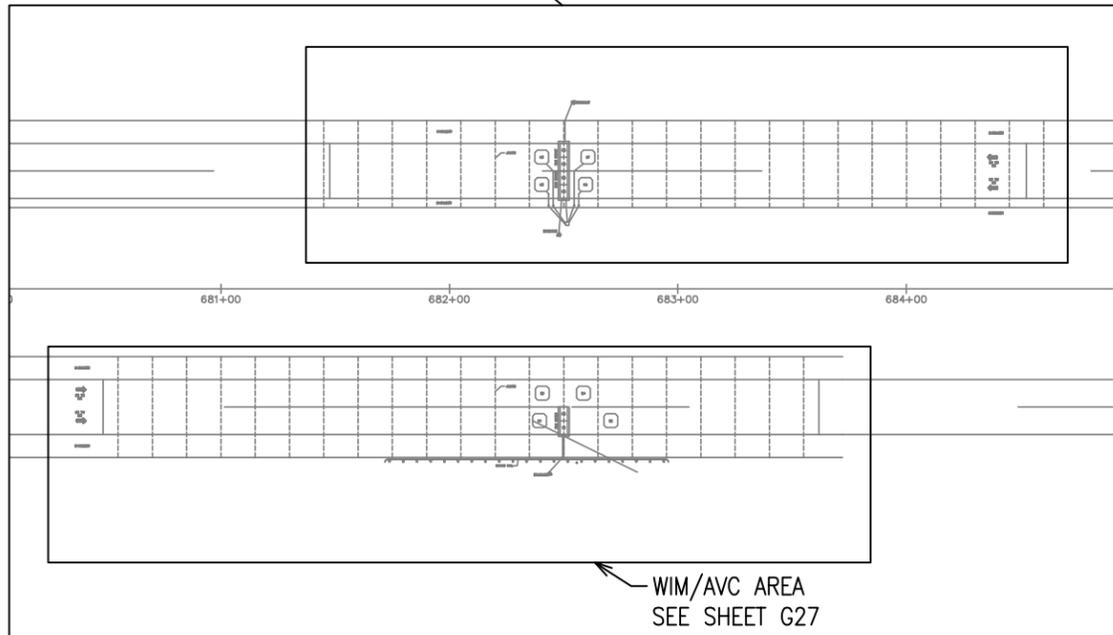


REFERENCE IRD DRAWINGS  
FOR ADDITIONAL DIMENSIONS  
AND DETAILED POWER AND  
SIGNAL REQUIREMENTS



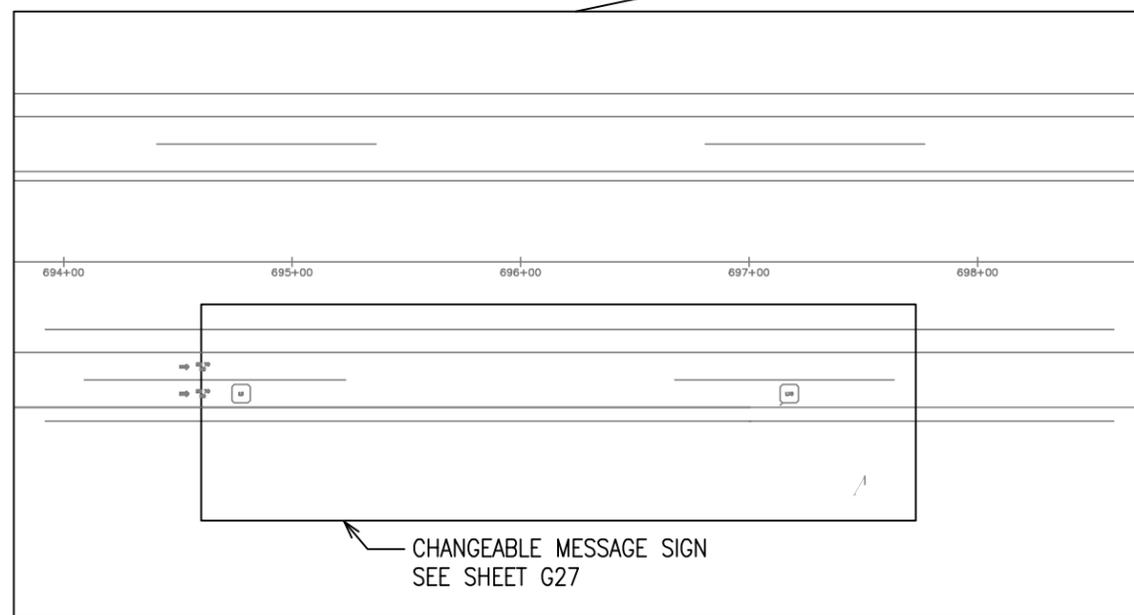
### SR-79 SITE PLAN

1" = 120'-0"



### ENLARGED SR-79 SITE PLAN

1" = 80'-0"



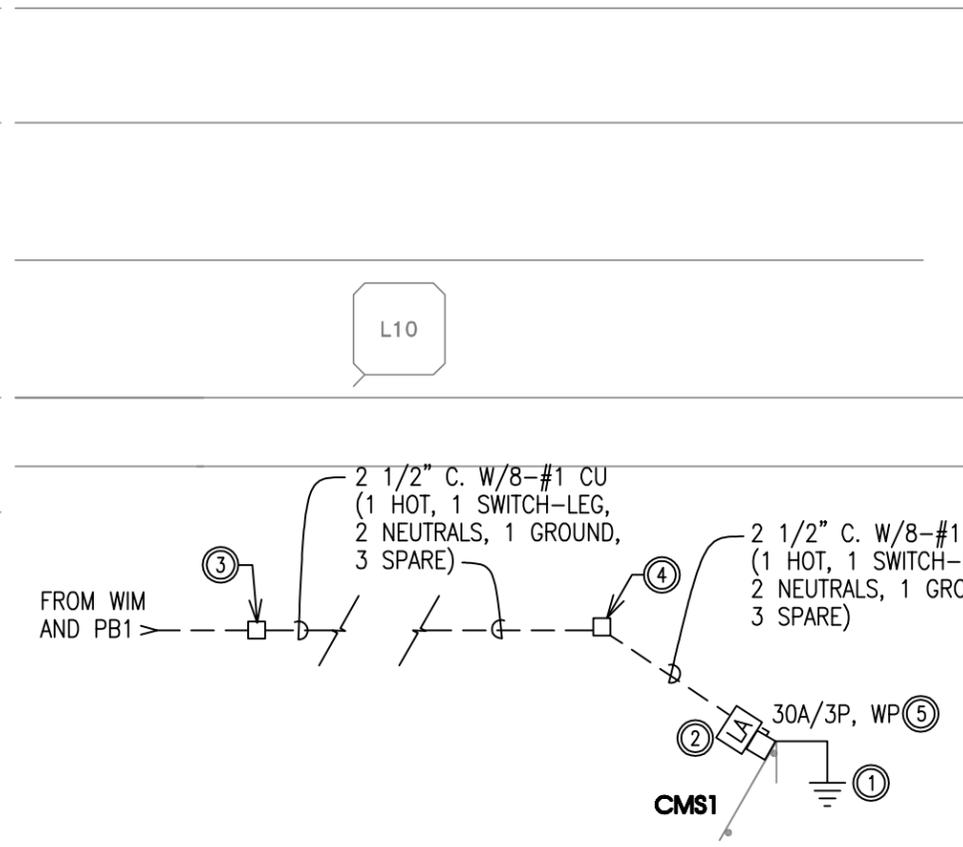
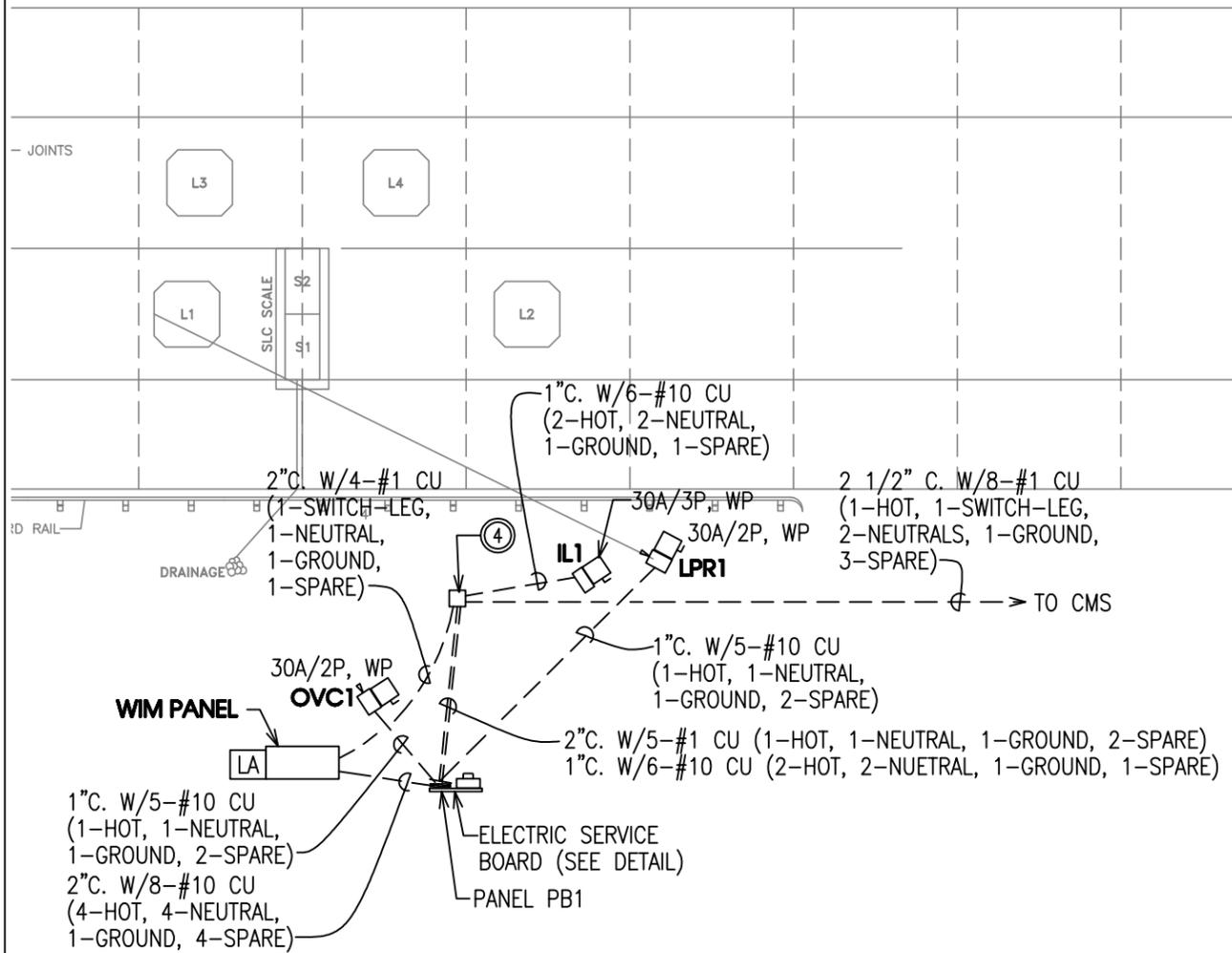
### ENLARGED SR-79 SITE PLAN

1" = 80'-0"



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46839 262nd STREET • SIOUX FALLS, SD • 57107  
PH: (605) 297-3647 • FAX: (605) 297-3681  
Email: info@pegrouppengr.com

STATE OF SOUTH DAKOTA	PROJECT	SHEET No.	TOTAL SHEETS
	HR Y502(00)	G24	G28



NOTES:

1. PROVIDE SUPPLEMENTAL GROUND ROD BONDED TO DISCONNECT GROUND LUG. TYPICAL FOR ALL DISCONNECTS.
2. PROVIDE DELTA LA SERIES LIGHTNING ARRESTOR AT DISCONNECT. TYPICAL FOR ALL DISCONNECTS.
3. PROVIDE 24" X 24" X 12" IN-GROUND PULLBOX EVERY 500FT OR AS REQUIRED BY CONDUCTOR SPOOL LENGTH.
4. PROVIDE 24" X 24" X 12" IN-GROUND PULL BOX.
5. SLUG ANY UNUSED POLE IN DISCONNECT SWITCH. TYPICAL.



**WIM ENLARGED PLAN**

1/16" = 1'-0"

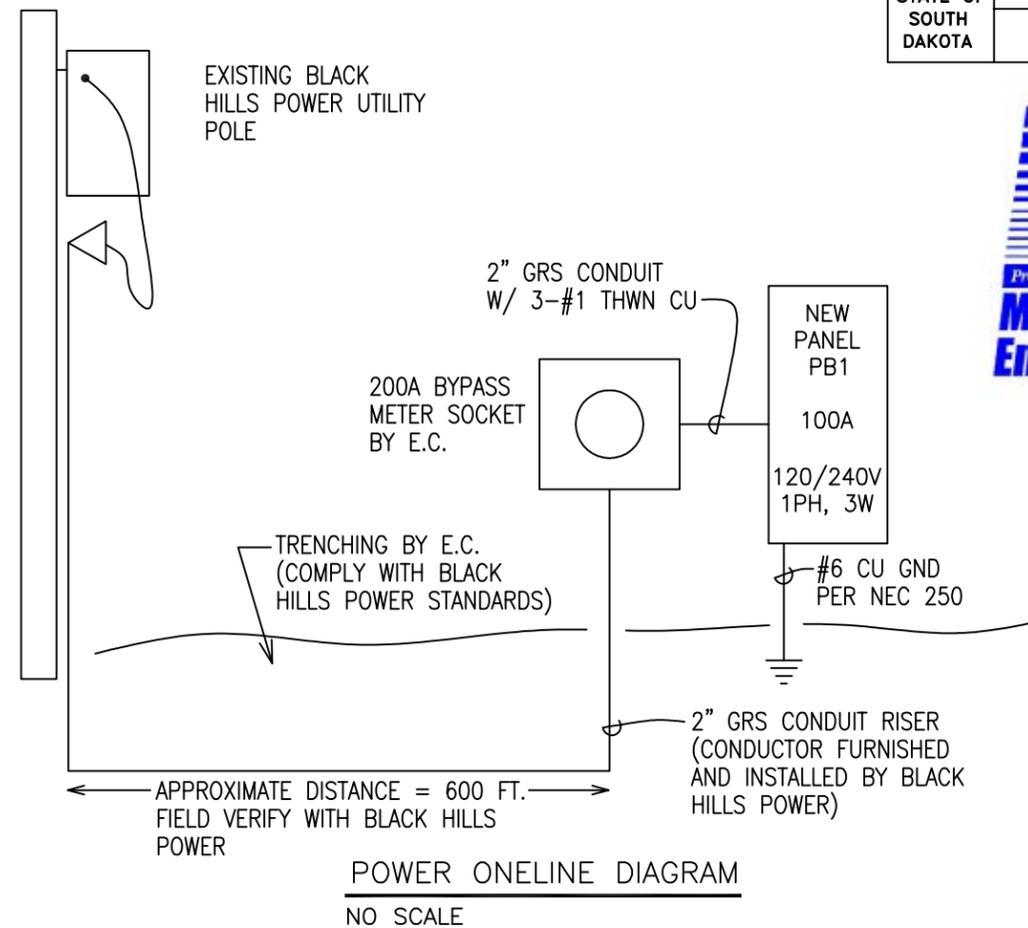
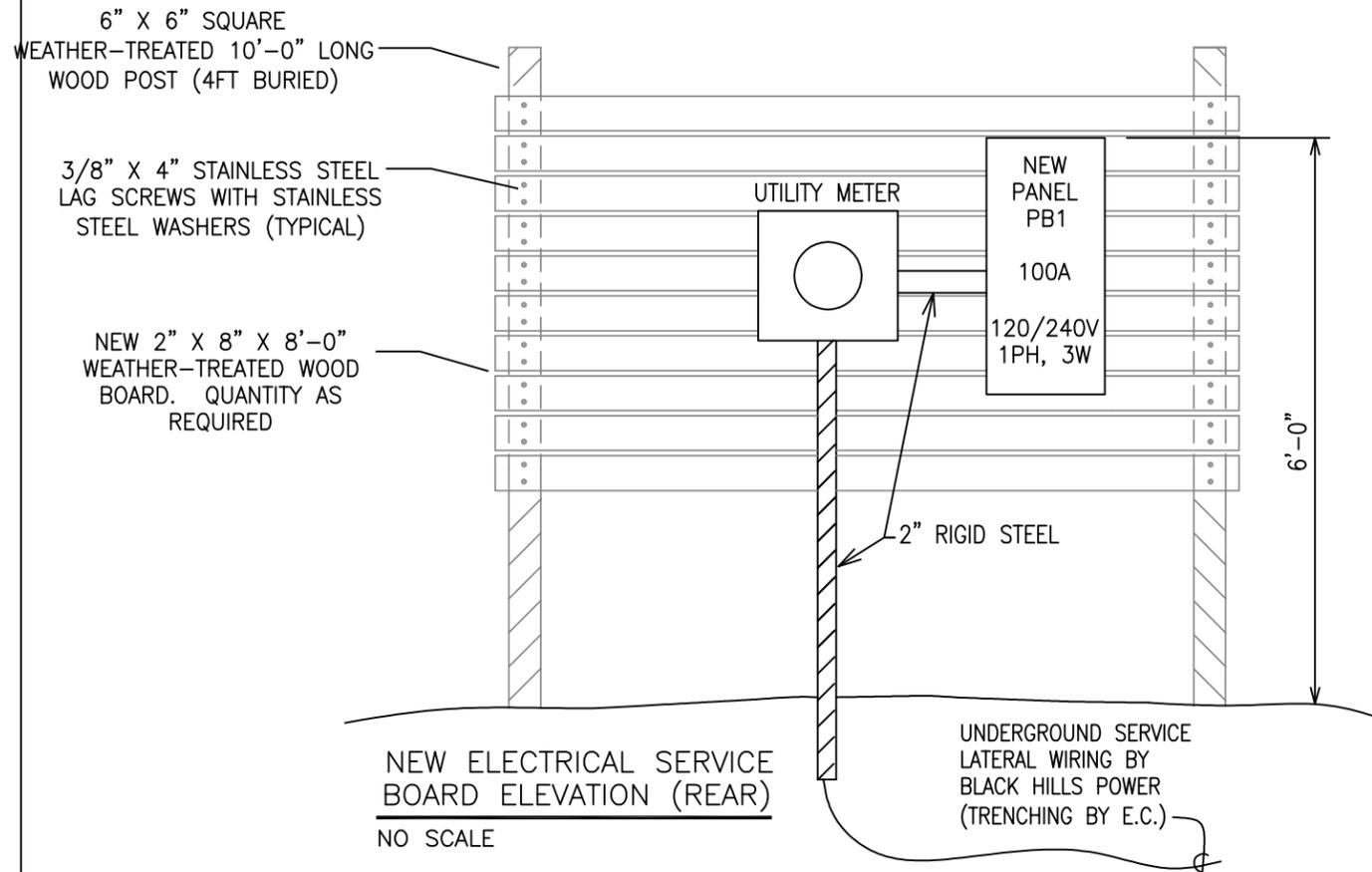


**CHANGEABLE MESSAGE SIGN PLAN**

1/16" = 1'-0"



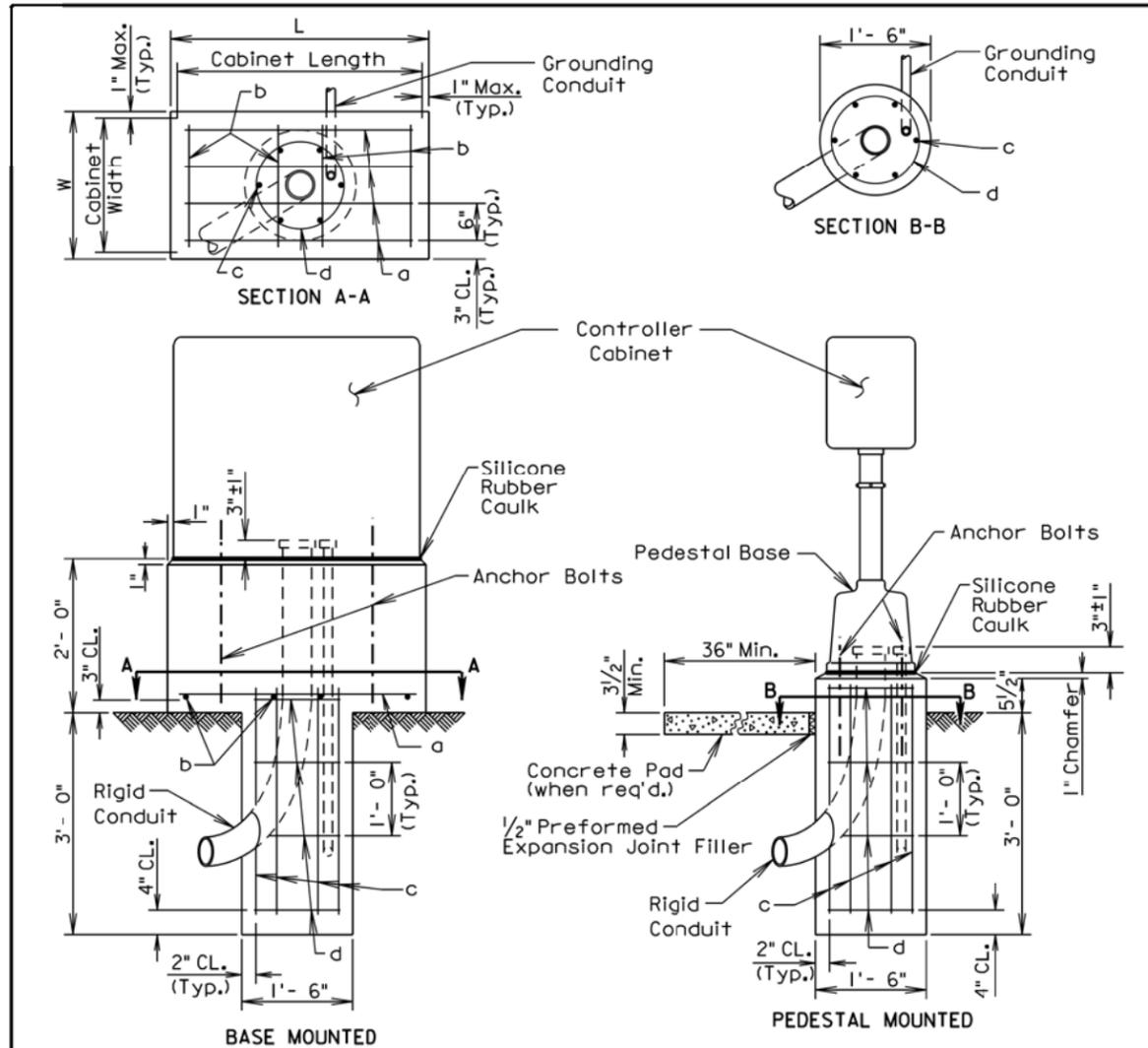
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* PANEL "PB1"		VOLTS 120/240V		PHASE 1		WIRE 3		MAIN CAPACITY 100		AMPS				
(NEMA 3R)		MOUNTING SURFACE		FEEDER SIZE		SEE ONELINE DIAGRAM		MAIN CONNECTION		MCB				
CCT NO	ITEM FED	DISTRIBUTION WATTS	WIRE SIZE	CIRCUIT BREAKER			N	CIRCUIT BREAKER			DISTRIBUTION WATTS	ITEM FED	CCT NO	
				AMP	POLES	FRAME		FRAME	POLES	AMP				
1	LPR1	1000	10	15	1	22KAIC	L1	22KAIC	1	15	10	1000	WIM PANEL	2
3	IL1	1000	10	15	1	22KAIC	L2	22KAIC	1	15	10	1000	WIM PANEL	4
5	IL1	1000	10	15	1	22KAIC	L1	22KAIC	1	15	10	1000	WIM PANEL	6
7	CMS	1000	1	15	1	22KAIC	L2	22KAIC	1	20	-	0	SPARE	8
9	OVC1	1000	10	15	1	22KAIC	L1	22KAIC	1	20	-	0	SPARE	10
11	SPARE	0	-	20	1	22KAIC	L2	22KAIC	1	20	-	0	SPARE	12
13	SPARE	0	-	20	1	22KAIC	L1	22KAIC	1	20	-	0	SPARE	14
15	SPARE	0	-	20	1	22KAIC	L2	22KAIC	1	20	-	0	SPARE	16
17	SPARE	0	-	20	1	22KAIC	L1	22KAIC	1	20	-	0	SPARE	18
19	SPARE	0	-	20	1	22KAIC	L2	22KAIC	1	20	-	0	SPARE	20

\* PROVIDE FACTORY INSTALLED TVSS





**GENERAL NOTES:**

The above ground portion of the footing shall conform to the base of the controller to the satisfaction of the Engineer.

Conduits shall be sealed and water-tight until the conductor cables are installed.

If the controller is not located within or adjacent to an existing sidewalk, the Contractor shall provide a concrete pad as directed by the Engineer.

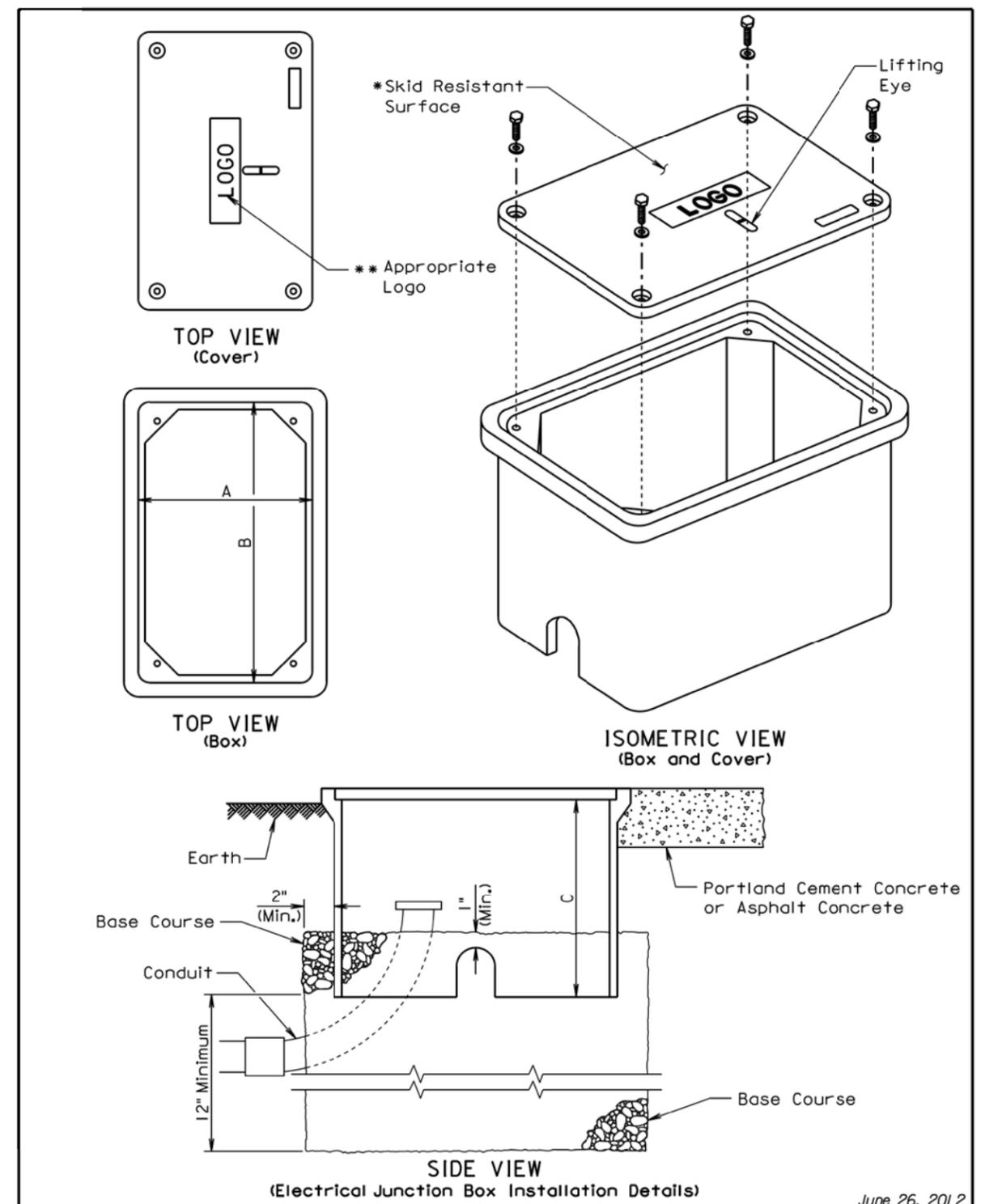
Anchor bolts and related hardware shall conform to the controller manufacturer's requirements and recommendations.

A continuous bead of silicone rubber caulk shall provide a weather-tight seal between the base and the concrete.

Reinforcing Schedule (for one footing)					
Mk.	No.	Size	Length	Type	Bending Detail
a	*	3	L - 4"	Str.	
b	*	3	W - 4"	Str.	
c	6	6	3'- 0"	Str.	
d	4	3	4'- 0"	T3	

**Note:** Dimensions are out to out of bar  
 \* Vary number of bars as required by footing size.

March 31, 2000



**ELECTRICAL JUNCTION BOX**

TYPE	DESCRIPTION	DIMENSIONS		
		A	B	C
1	Open Bottom with Gasket	11"-15"	18"-21"	18" (Min.)
2	Open Bottom with Gasket	13"-18"	23"-28"	18" (Min.)
3	Open Bottom with Gasket	17"-22"	24"-30"	18" (Min.)
4	Open Bottom with Gasket	28"-33"	36"-48"	24" (Min.)

**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 609.

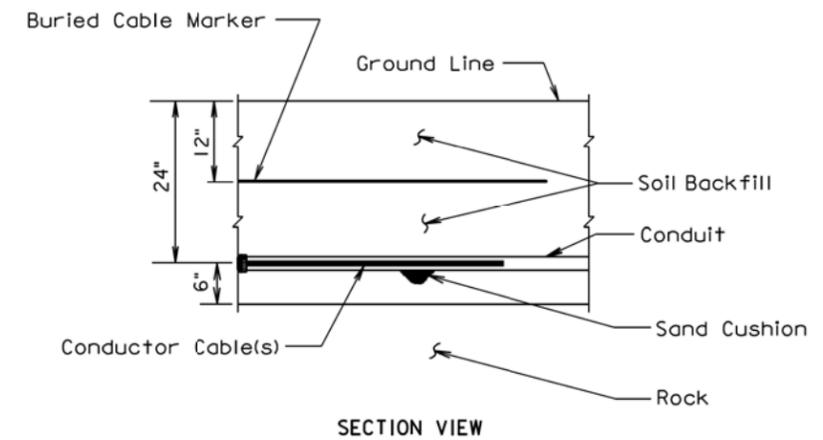
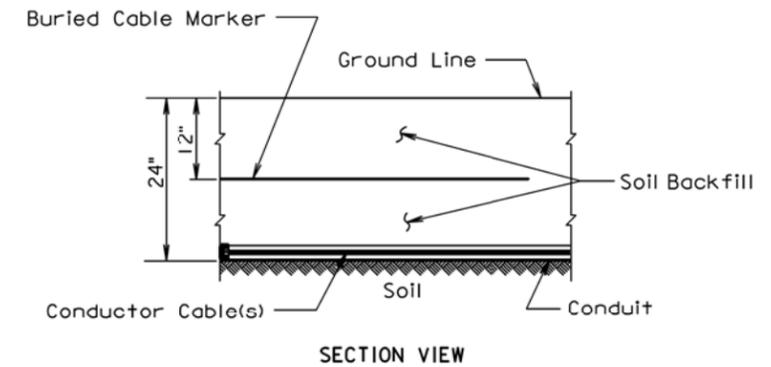
\*\*The cover of the junction box shall have the appropriate logo in one inch size letters and shall be recessed. When the junction box contains cables or wires for a traffic signal then the logo shall be "Signal". When the junction box contains lighting conductors then the logo shall be "Lighting".

The electrical junction boxes shall comply with the American National Standards Institute (ANSI)/Society of Cable Telecommunications Engineers (SCTE) 77 2007 Specification for Underground Enclosure Integrity. The loading requirement for all the electrical junction boxes shall be Tier 8 of ANSI/SCTE 77 2007.

The electrical junction boxes shall be UL listed.

June 26, 2012

Published Date: 4th Qtr. 2014	S D D O T	ELECTRICAL JUNCTION BOXES TYPE 1 THROUGH TYPE 4	PLATE NUMBER 635.65
			Sheet 2 of 2



**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(s) beneath 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.

March 31, 2000

Published Date: 4th Qtr. 2014	S D D O T	CONDUIT INSTALLATION	PLATE NUMBER 635.76
			Sheet 1 of 1

