THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

August 28, 2020

DESIGN BULLETIN No. 20-04

SUBJECT: VWIM Base Sheets Updates

The following revisions and additions have been made to the Illinois Tollway Base Sheets M-ITS-1600 series and the associated Virtual Weigh-In-Motion (VWIM) and Tire Anomaly Classification System special provision:

- Revised the layout for 3, 4 and 6 lanes and created (3) sheets for each lane configuration to show the layout, conduit/wiring sizes and conduit locations.
- Revised the details for precast (replacement) or cast-in-place (new construction) installation.
- Tightened up the sensor/loop arrangement.
- Revised cabinet foundation detail.
- Combined the overheight detector onto the camera poles and added distance of poles to VWIM sensors.
- Added detail for preformed loops and eliminated detector housings in shoulder.
- Increased size of median junction boxes to accommodate Vectorsense electronics box.
- Revised to utilize JPC pavement in VWIM section (new construction) with no overlay to allow diamond grinding.
- Revised to allow asphalt or concrete shoulders.
- Added details for sensor installation.

The affected Base Sheets are per below:


Design Section Engineers (DSE) are hereby directed to incorporate this design bulletin into all contracts currently under design, currently being advertised and all future contracts. DSEs shall use the revised drawings and special provision for the VWIM system.

Paul D. Kovacs, P.E.
Chief Engineering Officer

08/31/2020

Date
## Illinois Tollway Base Sheet Revisions

### Section M  Base Sheet Drawings

<table>
<thead>
<tr>
<th>Drawing</th>
<th>Modification Summary</th>
<th>Effective: 2020-08-28</th>
</tr>
</thead>
<tbody>
<tr>
<td>MITS-1600</td>
<td>Weight-In-Motion Cabinet and Foundation Details</td>
<td>Revised cabinet foundation heights, added detail of front door and revised foundation note 1.</td>
</tr>
<tr>
<td>MITS-1601</td>
<td>Weight-In-Motion IP Camera Details</td>
<td>Revised details to show all devices on the IP camera poles, use 22.5° median poles, revised conduits and cabling, and clarified setback requirements.</td>
</tr>
<tr>
<td>MITS-1602</td>
<td>Weight-In-Motion Loop Detector Details</td>
<td>Added loop cable routing details, added preformed loop details, removed detector housings, and revised notes.</td>
</tr>
<tr>
<td>MITS-1603</td>
<td>Weight-In-Motion Site Layout 3 Lanes (3 sheets)</td>
<td>Complete revision to this sheet. Previous sheet was for 4 lanes. Created 3 sheets for site overview, wiring layout and site layout.</td>
</tr>
<tr>
<td>MITS-1604</td>
<td>Weight-In-Motion Site Layout 6 Lanes (3 sheets)</td>
<td>Complete revision to this sheet. Previous sheet was for detector housing. Created 3 sheets for site overview, wiring layout and site layout.</td>
</tr>
<tr>
<td>MITS-1605</td>
<td>Weight-In-Motion Site Layout 6 Lanes (3 sheets)</td>
<td>Complete revision to this sheet. Previous sheet was for detector housing. Created 3 sheets for site overview, wiring layout and site layout.</td>
</tr>
<tr>
<td>MITS-1606</td>
<td>Weight-In-Motion Junction Box Detail</td>
<td>Increased size of junction box to accommodate Vectorsense electronics box, revised conduits to match revised layouts and revised notes.</td>
</tr>
<tr>
<td>MITS-1607</td>
<td>Weight-In-Motion Height Detector</td>
<td>Added IP cameras and IR illuminators to poles, clarified pole types and detector height requirements, eliminated metric units, and revised conduit/anchorholes to match revised layouts.</td>
</tr>
<tr>
<td>MITS-1608</td>
<td>Weight-In-Motion Quartz Sensor Details</td>
<td>New sheet</td>
</tr>
<tr>
<td>MITS-1609</td>
<td>Weight-In-Motion Vectorsense Sensor Details</td>
<td>New sheet</td>
</tr>
</tbody>
</table>
PLAN/ELEVATION

SECTION A-A

SCALE: 1/8" = 1'-0"

SECTION B-B

SCALE: 1/8" = 1'-0"

PLAN

SCALE: 1/8" = 1'-0"

WIM CABINET FOUNDATION NOTES:

1. Coordinate size of conduit stub-up grouping with WIM controller cabinet. Bottom conduit size: 3" x 3"; 10" max. 2. Concrete = 4000 psi min. 3. Reinforcing bar: Size: 3/8" for WIM. 4. Provide shop drawings prior to construction. 5. Include conduits.

WIM CONTROLLER FOUNDATION DETAILS

SCALE: 1/8" = 1'-0"

NOTES:

1. The WIM internal cabinet layout shall be as per WIM manufacturer's recommendation and approved by the Illinois Tollway.
2. Seal cabinet to foundation joint with silicone sealant to prevent water intrusion. Locate cabinet above high water level.

NOTE TO DESIGNER

This base sheet shows typical new construction but it is not a standard drawing. It requires completion by the designer prior to insertion into a contract. Minor modification files and the "TollRoad Standards Manual" are available on the Illinois Tollway website. The designer shall accept the responsibility of the design of this sheet upon its completion and insertion into the contract. All "Note to Designer" boxes shall be removed by the designer prior to insertion of the sheet into the plan set.
NOTE:
1. The number of cameras and associated cabling shall be in accordance with the vehicle weight manufacturer's requirements to provide full vehicle coverage of all lanes indicated on the plans.
2. See weigh-in-motion weigh detector sheet for additional details of weigh-overload detector installation.

Illinois Tollway
Weigh-in-Motion
IP Camera Details

NOTE TO DESIGNER:
This base sheet shows typical new construction but it is not a standard drawing. It requires completion by the designer prior to insertion into a contract. Microstation files and the "CAD Standards Manual" are available on the Illinois Tollway Website. The designer shall accept the responsibility of the design of this sheet and its completion and insertion into a contract. All notes to designer boxes shall be removed by the designer prior to insertion of the sheet into the plan set.

M-175-1601
8-28-2009
SITE OVERVIEW

SIDE NOTES:
- Concrete Median Barrier
- Shoulder
- Lane 1: 12'-0"
- Lane 2: 12'-0"
- Lane 3: 12'-0"
- OVC2: OVC-25
- OVC: OVC-25
- T: Transmitter

GENERAL NOTES:
1. All connections between sensors and lead cables shall be done within a pull box by soldering then sealing for watertightness. Placement of pull boxes may be different from that shown in field installations.
2. AC power cables must be run in separate conduits/pull boxes from signal cables on separate inside pull boxes with a braid.
3. Sensor spacing shown is typical. Spacing requirements actual sensor spacing may be altered to suit site conditions if approved by the engineer and/or manufacturer representative.
4. Site conditions must meet AASHTO FLEXIBLE TYPE I REQUIREMENTS to achieve optimal HWM system performance.
5. A concrete pavement section on straight grade with no vertical curves and no superelevation transitions is required for HWM panels. From 50' before the sensors up to 50' after the sensors, to ensure long-term performance and reduce maintenance, concrete grading of the 3.5' length of concrete pavement shall occur after precast panels are installed.
6. Cables must be protected by PVC sleeves where they cross pavement.
7. Additional drainage may be required depending on slope of roadway.
8. Paint/white paint of conduit to be determined on site.
9. Provide 18" minimum spacing between adjacent median barrier junction works.
10. OVC and out-of-service systems shall be installed to unforeseen to 20' downstream of HWM sensors. Poles shall be appropriately painted with each other as shown on this sheet.
CONCRETE MEDIAN BARRIER

SHOULDER

LANE 1

LANE 2

LANE 3

SHOULDER

NOTES: (VIE SHEET ONLY)

A. GENTLY CURVE CONDUIT AS NECESSARY TO FOLLOW ROAD SLOPE AND TO PASS OVER INTERSECTING CONDUIT. NO BY-PASS FITTINGS PERMITTED. ONLY SWIVELS.

B. CONDUIT AND FITTINGS, OTHER THAN AT PRECAST PAVEMENT CONSTRUCTION LOCATION, ARE PLACED BELOW THE AGGREGATE LAYER. INSTALLED WITH SEDGING SAND, GRADE SAND SURROUNDS CONDUITS AND FITTINGS AND COMPACT THE MATERIAL.

C. CONDUIT DEPTH SHALL BE 33'-0" TO 48'-0" MAX BELOW TOP OF PAVEMENT.

DATE TO DESIGNERS

THE BASE SHEET SHOWS TYPICAL NEW CONSTRUCTION BUT IT IS NOT A STANDARD DRAWING. IT REQUIRES COMPLIANCE BY THE DESIGNER PRIOR TO INSERTION INTO A CONTRACT. VDITIONS AND EDIS ON THE ILLINOIS TOLWAY WEBSITE. THE DESIGNER SHALL ACCEPT THE RESPONSIBILITY OF THE DESIGN OF THIS SHEET UPON ITS COMPLETION AND INSERTION INTO A CONTRACT. ALL "NOT TO BE INFRIGED" BORDERS SHALL BE REMOVED BY THE DESIGNER PRIOR TO INSERTION OF THE SHEET INTO THE PLAN FILE.

DATE: 06-28-2020
NOTE TO DESIGNERS

READ AND CONSIDER THE FOLLOWING TEXT:

1. ALL CONSTRUCTIONS BETWEEN SENSORS AND LED LENSES SHALL BE DONE WITHIN A MILL BOX BY SOLID INSTEAD OF SEALING MATERIALS. MILL BOXES MAY BE MODIFIED FROM THOSE SHOWN TO MEET SITE REQUIREMENTS.

2. AC POWER CABLES MUST BE RUN IN SEPARATE CONDUITS/RELAYS FROM SIGNAL CABLES ON SEPARATE INSULATED CONDUCTORS WITH A DIVIDER.

3. SENSOR SPACING SHOWN IS TYPICAL. SPACING REQUIREMENTS, ACTUAL SENSOR SPACING MAY BE ADJUSTED TO MEET SITE CONDITIONS APPROVED BY THE ENGINEER AND MANUFACTURER'S RECOMMENDATIONS.

4. SITE CONDITIONS MUST MEET ANSI EXCEPT TYPE 3 REQUIREMENTS TO ACHIEVE OPTIMAL SYSTEM PERFORMANCE.

5. A CONCRETE PAVEMENT SECTION ON STRAIGHT GAGE WITH NO VERTICAL CURVES AND NO SURFACE WELDING TRANSITIONS IS REQUIRED FOR WAVE MARES. FROM 20 FT BEFORE THE SENSORS UP TO 30 FT AFTER THE SENSORS, TO IMPROVE LONG-TERM PERFORMANCE AND REDUCE MAINTENANCE.

6. THROUGH GAGING OF THE 55-FT LENGTH OF CONCRETE PAVEMENT SHALL OCCUR AFTER PRECAST PANELS ARE INSTALLED.

7. CABLES MUST BE PROTECTED BY PVC SLEEVES WHERE THEY CROSS PAVEMENT JUNCTIONS/SCREWS.

8. ADDITIONAL GAGING MAY BE REQUIRED DEPENDING ON SLOPE OF ROADWAY.

9. PROPER ROUTING OF CABLES TO BE DETERMINED ON SITE.

10. PROVIDE 6' MOUNTING SPACING BETWEEN ADJACENT MEDIAN BARRIER RAILWORKS.

NOTE: (THIS SHEET ONLY)

CABINET WITH WIM ELECTRONICS.
CABINET FOUNDATION.

M-115-18ED
(SHEET 1 OF 3)
NOTES: (WEIGHT ONLY)

A. Gently curve conduit as necessary to follow road slope and to pass over intersecting conduit. No BOP type fittings permitted. Only swgs.

B. Conduit and fittings, other than at precast pipe, connection locations are placed below the aggregate layer. Backfill with bedding sand, engine sand, subbase, conduit and fittings and compact the materials.

C. Conduit depth shall be 33" min to 45" max below top of pavement.
2" PVC SCH 80 CONDUIT BETWEEN THE JUNCTION BOXES WITH VECTORSENSE ELECTRONICS AND AS REQUIRED FOR CABLING (TYP).

40"X4"X12" JUNCTION BOX

LEAD-INS TO QUARTZ SENSORS, LANE LOOPS, VECTORSENSE SENSORS.

PLAN VIEW

2" PVC SCH 80 CONDUIT BETWEEN THE JUNCTION BOXES WITH VECTORSENSE ELECTRONICS AND AS REQUIRED FOR CABLING (TYP).

40"X4"X12" JUNCTION BOX

TOP VIEW

4" HIGH ETCHED "WIN" ON OUTSIDE FACE OF JUNCTION BOX - COVER PLATE COLORED RED.

TAPPED HOLES FOR COVER PLATE SCREWS (2D REGUS)

SECTION B-B

NEOPRENE GASKET

10 GA. NO. 316 STAINLESS STEEL

SIZE AND NUMBER OF HOLES PER PLAN

60"X4"X12" JUNCTION BOX, INSTALLED WITH TOP 1/4" ABOVE TOP OF BARRIER.

NOTE TO DESIGNER

THIS BASE SHEET SHOWS TYPICAL NEW CONSTRUCTION BUT IT IS NOT A STANDARD DRAWING. IT REQUIRELY COMPLETION BY THE DESIGNER PRIOR TO INSERTION INTO A CONTRACT. MICROFILM FILES AND THE "C&D STANDARDS MANUAL" ARE AVAILABLE ON THE ILLINOIS TOLLWAY WEBSITE. THE DESIGNER MUST ACCEPT THE RESPONSIBILITY OF THE DESIGN OF THIS SHEET UPON ITS COMPLETION AND INSERTION INTO A CONTRACT. ALL "NOTE TO DESIGNER" BOXES MUST BE REMOVED BY THE DESIGNER PRIOR TO INSERTION OF THE SHEET INTO THE PLAN SET.

SECTION A-A

1" PVC DRAIN PIPE (SEE NOTE 3)

3" PVC SCH 80 CONDUIT (TYP., SIZE AND NUMBER PER PLAN)

QUARTZ, VECTORSENSE, AND LOOP SENSOR LEAD-INS, REMOVE OR END PVC CONDUIT APPROX. 2" BELOW PAVEMENT SURFACE AT SENSORS AND CVP CONDUIT OPENING WITH METALLIC CAP, SEE PREFORMED LOOP DETECTOR DETAILS FOR LOOP CABLE ROUTING DETAILS.

NOTES:

1. THE JUNCTION BOX SHALL BE ACCESSIBLE FROM THE TOP OF MEDIAN BARRIER.

2. DUCT SHALL BE CUT AND REMOVED AT JUNCTION BOX CONNECT OPENED AND INSIDE BOX. ELECTRICAL CONDUITS SHALL PRESTRIPE 1/2" INTO BOX.

3. CONTRACTOR SHALL INSTALL 1" PVC PIPE TO DRAIN JUNCTION BOX TO AGGREGATE SUBGRADE. INSTALL S.S. SCREEN OVER DRAIN INSIDE JUNCTION BOX.

4. SUPPLEMENTARY OR BARRIER WALL PROHIBITED AT JUNCTION BOXES.

M-ITS-1606

MEIGH-IN-MOTION JUNCTION BOX DETAIL

2" LONG SWEEP (24" RADIUS) PVC SCH 80 ELBOW FOR CONDUIT UNDER PAVEMENT, (TYP., SIZE AND NUMBER PER PLAN)

DATE: 6-28-2007
Notes:

1. Bend mounting bracket to pole at appropriate height.
2. Mount, move and aim the overweight transmitter and receiver in accordance with the manufacturer's instructions.
3. Detector and bracket weight: 40 lbs
4. Detector housing size: 11-1/2" x 10" x 8-3/4".
5. Detector power: 115 VAC, 0.3 AMP.

Sensor Configuration

Sensor Detail

Note to designer:

This base sheet shows typical new construction. It is not a standard drawing. It requires completion by the designer prior to insertion into a contract, specification files and the State standards manual. It is available on the Illinois tollway website. The designer shall accept the responsibility of the design of this sheet upon its completion and insertion into a contract. All notes to designer work shall be removed by the designer prior to insertion of the sheet into the plan set.
QUARTZ SENSOR INSTALLATION

PLAN VIEW - SENSOR INSTALLATION

SECTION AA

NOTES:
A. FOR INSTALLATION PROCESS REFER TO MANUFACTURER'S INSTALLATION MANUAL.
B. SLOT PROFIL IS 6" DEEPER THAN SENSOR.
C. SET SENSOR FLUSH OR SLIGHTLY DEEPER THAN ROAD SURFACE USING INCLUDED LEVELING BEAMS.
D. CHECK THE RESISTANCE OF THE SENSOR BY PLACING A DIGITAL MULTIMETER ACROSS THE CONTACT TERMINAL OF THE BNC CONNECTOR AND THE OUTER BODY. THE RESISTANCE SHOULD BE INFINITY.
E. 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 OUTPUT SHOULD BE OBSERVED.
F. CYLINDERS OR SAG CUTS IN THE ROADWAY MUST NOT BE LOCATED CLOSER THAN 18" UPSTREAM AND 18" DOWNSTREAM OF THE CENTERLINE OF THE SENSOR.
G. SENSOR MUST BE GROUND FLUSH WITH ROAD SURFACE AFTER CEMENT WAS CURED.
P. CONNECT INDIATED GROUND WIRE PER MANUFACTURER RECOMMENDATIONS, OTHER END OF GROUND WIRE CONNECTS CABINET GROUND BUSBAR.

NOTE TO DESIGNER:
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M-115-1608
WEIGH-IN-MOTION
QUARTZ SENSOR DETAILS
DATE: 08-26-2020
NOTE TO DESIGNER

THIS SHEET SHOWS TYPICAL NEW CONSTRUCTION, BUT IT IS NOT A STANDARD DRAWING; IT REQUIRESS
COMPLETION BY THE DESIGNER PRIOR TO INSTALLATION INTO A CONTRACT. ILLINOIS TOLLWAY ILLUSTRATES THE DESIGNER SHALL ACCEPT THE
RESPONSIBILITY OF THE DESIGN OF THIS SHEET UPON ITS
COMPLETION AND INSTALLATION INTO A CONTRACT. ALL
NOTE TO DESIGNER BOXES SHALL BE REMOVED BY THE
DESIGNER PRIOR TO INSPECTION OF THE SHEET INTO THE
PLAN SET.

WORKS:

A. CHECKS IN THE ROADWAY MUST BE LOCATED CLOSER
THAN 12" UPSTREAM AND 12" DOWNSTREAM OF THE CENTERLINE
OF THE SENSOR.

B. SLOT LENGTH IS 2" LONGER THAN SENSOR.

C. 6" MAXIMUM DISTANCE BETWEEN SENSOR AND ELECTRONICS
BOXES HANDHELD OR INSTRUCTION BOX.

D. SENSOR GROUT MUST BE GROUND FLUSH WITH ROAD SURFACE
AFTER GROUT HAS CURED.