

# CATHODIC PROTECTION NOTES

## PURPOSE

THE PURPOSE OF THESE NOTES IS TO DESCRIBE THE TOTAL SYSTEM AND TO PROVIDE SPECIFICATIONS FOR THE MATERIALS TO BE FURNISHED, THE METHOD OF INSTALLATION AND THE METHOD OF PAYMENT.

## DESCRIPTION

THE CATHODIC PROTECTION SYSTEM (CP) TO BE INSTALLED ON BRIDGE NO. LAK-44-5.10 WILL PREVENT THE CORROSION OF THE REINFORCING STEEL BY LOWERING ITS POTENTIAL TO A VALUE WHERE RUST-PRODUCING ELECTRO-CHEMICAL REACTIONS WILL NOT OCCUR.

THIS SYSTEM USES LOW DIRECT CURRENT VOLTAGES IN THE BRIDGE DECK. THE MAXIMUM VOLTAGE WILL BE 24 VDC AND THE MAXIMUM CURRENT INTO THE DECK WILL BE 20 AMPS DC. A 120 VAC CIRCUIT WILL RUN FROM THE UTILITY COMPANY POWER POLE TO THE RECTIFIER WHERE IT WILL BE CONVERTED TO DIRECT CURRENT.

THE POSITIVE SIDE OF THE SYSTEM, THE ANODE, WILL BE ATTACHED TO THE SCARIFIED DECK AND OVERLAID WITH *superplasticized Dense Conc. (SDC)*. THE CURRENT TO THE ANODE FOR THE CATHODIC PROTECTION SYSTEM SHALL BE SET SUCH THAT CATHODIC PROTECTION OF BOTH THE TOP AND BOTTOM MATS OF REINFORCING STEEL IS PROVIDED. THE CONTRACTOR SHALL SELECT THE TYPE OF ANODE MATERIAL FROM THE FOLLOWING LIST OF ACCEPTABLE PRODUCTS:

- LIDA CN25 MANUFACTURED BY DOW CHEMICAL COMPANY, HOUSTON, TEXAS.
- ELGARD 210 TITANIUM ANODE MESH MANUFACTURED BY ELTECH SYSTEMS CORPORATION, CHARDON, OHIO.

## MATERIAL SUPPLY CONTACTS FOR THESE ANODE MATERIALS ARE:

- LIDA CN25 - RON CORMIER, HOUSTON, TEXAS (713)-978-3923
- ELTECH ELGARD 210 - DAVID TREFZGER, CHARDON, OHIO (216)-285-0352

THE CONTRACTOR SHALL USE CONSTRUCTION TECHNIQUES THAT WILL AVOID DIRECT METAL CONTACT BETWEEN THE ANODE AND ANY BRIDGE STEEL AND WILL AVOID LOOSENING THE ANODE ATTACHMENT TO THE DECK DURING APPLICATION OF THE BONDING GROUT. THE CONTRACTOR SHALL NOT DRIVE HEAVY EQUIPMENT ON THE ANODE. *Concrete trucks delivering the SDC may not drive directly on the anode mesh, however, they may drive on plywood & plastic sheeting which has been placed to protect the anode.*

THE CONTRACT WORK SHALL CONSIST OF THE CONTRACTOR FURNISHING AND INSTALLING THE CATHODIC PROTECTION SYSTEM DESCRIBED HEREIN, EMPLOYING A QUALIFIED CORROSION ENGINEER TO PERFORM THE SPECIFIED TESTS AND REPORTS, AND TURNING OVER TO THE DEPARTMENT A FUNCTIONING CP SYSTEM FREE OF SHORTS AND BREAKS AND OPERATING IN A CONSTANT VOLTAGE MODE WITH THE CORRECT SETTING TO PREVENT REINFORCING STEEL CORROSION.

## SPECIFICATIONS FOR CATHODIC PROTECTION WORK

### RECTIFIER/CONTROLLER

- THE RECTIFIER/CONTROLLER (R/C) UNIT SHALL BE FURNISHED WITH POSITIVE OUTPUT DESIGNS AS FOLLOWS:

VOLTAGE	TOTAL CURRENT	NO. OUTPUTS	CURRENT RATING PER OUTPUT
24VDC	40A	2	20A

ONE OUTPUT SHALL BE CONNECTED TO THE CATHODIC PROTECTION SYSTEM AS INDICATED BY THE WIRING DIAGRAM SHOWN IN THE PLANS FOR EACH ANODE SYSTEM OPTION. THE SECOND OUTPUT IS PROVIDED AS A SPARE.

THE R/C UNIT SHALL BE CAPABLE OF CONTROLLING CURRENT INTO EACH OUTPUT BY WIREWOUND POWER RHEOSTATS MOUNTED ON THE FRONT PANEL. THE RHEOSTATS SHALL HAVE AN ADJUSTABLE RESISTANCE RANGE AND SHALL HAVE A POWER RATING ADEQUATE TO MATCH THE RESISTANCE RANGE PROVIDED. THE CONTRACTOR SHALL DETERMINE IN THE FIELD THE APPROPRIATE RESISTANCE RANGE TO PROVIDE FOR THE INSTALLED CP SYSTEM. THE RANGE SELECTED SHALL BE SUCH THAT UNDER NORMAL OPERATING CONDITIONS, THE RHEOSTAT WILL BE SET IN THE MIDDLE OF THE RANGE. EACH RHEOSTAT SHALL BE ADJUSTABLE BY A KNOB ON THE PANEL. THE KNOB SHALL POINT TO A DIAL INDICATING THE MINIMUM AND MAXIMUM RESISTANCE.

- THE INPUT OF THE R/C UNIT SHALL BE 120 VOLTS SINGLE PHASE 60HZ RATED FOR 6 AMPS.
- THE RECTIFIER SHALL BE AIR COOLED WITH SELENIUM OR SILICON STACKS OR AN APPROVED EQUAL DESIGN. THE DC OUTPUT SHALL BE FILTERED.

- THE R/C UNIT SHALL HAVE A NON-CONDUCTIVE FRONT PANEL WITH THE FOLLOWING ITEMS:

- ON-OFF CIRCUIT BREAKER TO CONTROL AND PROTECT THE RECTIFIER AND DC CIRCUITS.
- A DIGITAL VOLT/AMP METER AND SELECTOR SWITCH CAPABLE OF METERING AND DISPLAYING THE CURRENT AND VOLTAGE OUTPUT FOR EACH CIRCUIT AND THE HALF CELL VOLTAGE OF EACH INSTALLED REFERENCE CELL. THE VOLTMETER INPUT IMPEDENCE SHALL BE AT LEAST 10 MEGOHMS. THE METER DISPLAY SHALL BE L.E.D. AND NOT SUBJECT TO DAMAGE DUE TO TEMPERATURES OF -30 DEGREES F.
- A SEPARATE POWER METER CAPABLE OF METERING THE TOTAL POWER INPUT TO THE R/C UNIT.

- TRANSIENT PROTECTION DEVICES CONSISTING OF GAS TUBE DEVICES OR APPROVED EQUAL SHALL BE PROVIDED TO PROTECT THE RECTIFYING ELEMENT AND METER.

- THE R/C UNIT HOUSING SHALL BE A SINGLE 11-GAUGE STEEL CASE MOUNTED AT EYE LEVEL HEIGHT ON THE POWER SERVICE POLE. THE HOUSING SHALL BE HOT DIPPED GALVANIZED WITH ALL NECESSARY KNOCK-OUTS AND FITTINGS TO ACCOMMODATE THE PLAN CONDUIT. ALL OPENINGS SHALL BE SCREENED. THE HOUSING DOOR SHALL BE LOCKABLE AND SHALL HAVE A PADLOCK WITH A BRONZE OR BRASS LOCK BODY AND A CORROSION-PROTECTED STEEL SHACKLE. THREE PADLOCK KEYS SHALL BE SUPPLIED TO THE CITY ENGINEER FOR THE CITY OF PAINESVILLE.

- THE R/C UNIT SHALL BE FURNISHED WITH A 120 VAC 15 AMP DISCONNECT SWITCH HOUSED IN A STAINLESS STEEL NEMA 4 ENCLOSURE LOCKABLE IN THE ON POSITION. THE DISCONNECT SWITCH PADLOCK SUPPLIED SHALL BE THE SAME AS THAT FOR THE R/C UNIT.

- THE R/C UNIT SHALL BE FURNISHED WITH A 3/8" COPPER CLAD, 8 FOOT LONG GROUND ROD AND GROUNDING CONNECTIONS. GROUND WIRE SHALL BE #8 AWG IN 3/4" CONDUIT.

- SCHEMATIC AND WIRING DIAGRAMS OF THE R/C UNIT SHALL BE FURNISHED AND APPROVED BEFORE INSTALLATION.

- THE CONTRACTOR SHALL INSTALL THE R/C UNIT, DISCONNECT SWITCH, AND GROUND ROD ON THE POWER SERVICE POLE TO THE SOUTHEAST OF THE BRIDGE. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY HARDWARE TO MAKE THE CONDUIT AND WIRING CONNECTIONS WITH THE BRIDGE, DISCONNECT SWITCH, AND GROUND ROD FROM THE R/C UNIT.

- THE BASIS OF PAYMENT FOR FURNISHING AND INSTALLING THE R/C UNIT WITH ALL NECESSARY WIRING, HARDWARE, AND CONDUIT IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS IN A PROPERLY FUNCTIONING CONDITION SHALL BE THE CONTRACT BID ITEM: ITEM SPECIAL - 1 EACH RECTIFIER/CONTROLLER UNIT.

## CATHODIC SYSTEM

### ANODE MESH

THIS SECTION DESCRIBES THE MATERIALS, LABOR AND INCIDENTALS NECESSARY TO INSTALL THE ANODE MESH.

THE ANODE MESH AND CURRENT CONDUCTORS SHALL BE INSTALLED AS SHOWN IN THE PLANS. THE MESH SHALL BE FIELD WELDED TO THE CURRENT CONDUCTORS AT EACH POINT OF CONTACT BETWEEN THE MESH WIRE JUNCTIONS AND THE CONDUCTORS. THE CURRENT CONDUCTORS SHALL BE SUPPLIED BY THE ANODE MESH MANUFACTURER. THE WELDING OF THE MESH TO THE CONDUCTORS SHALL BE BY AN ELECTRIC WELDING MACHINE AND USING METHODS RECOMMENDED BY THE ANODE MESH MANUFACTURER.

THE CURRENT CONDUCTORS SHALL BE BENT AND PLACED THROUGH ACCESS HOLES DRILLED THROUGH THE DECK AND CONNECTED TO THE ANODE LEAD AS SHOWN IN THE WIRING DIAGRAM AND PLAN DETAILS. EACH CONDUCTOR AND LEAD CONNECTION SHALL BE BELOW THE DECK IN A JUNCTION BOX ATTACHED TO THE UNDERSIDE OF THE DECK. THE PORTION OF THE CONDUCTOR THROUGH THE DECK SHALL BE INSULATED WITH RAYCHEM FCSM 6/2 HEAT SHRINKABLE TUBING OR APPROVED EQUAL. THE CONDUCTOR LEAD CONNECTION SHALL BE BOLTS AND NUTS THROUGH THE CONDUCTOR AND TERMINALS CRIMPED ON THE LEAD WIRES AND INSULATED WITH APPROVED HEAT SHRINKABLE TUBING. THE ACCESS HOLE SHALL BE SEALED WITH EPOXY MORTAR MEETING ODOT SS 956.

THE ANODE MESH SHALL BE SECURELY HELD IN PLACE BY 1" DIAMETER PLASTIC BUTTONS WITH 1-1/4" STEMS INSERTED INTO DRILL HOLES IN THE DECK. ONE PLASTIC BUTTON PER 10 SQ. FT. OF DECK SHALL BE INSTALLED. THE PLASTIC BUTTONS SHALL BE SUPPLIED BY THE ANODE MESH MANUFACTURER.

### ANODE PLACEMENT, GENERAL

THE REQUIREMENTS OF THIS SECTION SHALL APPLY TO PLACEMENT OF THE ELGARD 210 AND LIDA CN25 ANODE SYSTEMS.

DUST FROM HOLE DRILLING SHALL BE REMOVED BEFORE OVERLAYING. THE ANODE SHALL BE PLACED AS THE LAST ITEM OF WORK PRIOR TO OVERLAY WORK. CONTACT BETWEEN THE ANODE AND REINFORCING STEEL AND OTHER BRIDGE STEEL SHALL BE PREVENTED. THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER THAT SUCH CONTACT DOES NOT EXIST BEFORE OVERLAY WORK. THE DEMONSTRATION SHALL CONSIST OF SHOWING THAT THERE IS A HIGH RESISTANCE BETWEEN ALL PORTIONS OF THE ANODE AND THE REINFORCING STEEL, GUTTERS, AND EXPANSION PLATES. ANY SUCH CONTACT FOUND BEFORE OR AFTER THE OVERLAY WORK SHALL BE LOCATED AND CORRECTED AT THE CONTRACTOR'S EXPENSE. ALL CONDUIT, GUTTERS, EXPANSION PLATES, AND ALL OTHER EMBEDDED OR EXPOSED METAL SHALL BE ELECTRICALLY CONTINUOUS WITH THE REINFORCING STEEL. THIS CONTINUITY SHALL BE DEMONSTRATED BY THE CONTRACTOR AND ALL DISCONTINUITIES SHALL BE ELIMINATED BY THE CONTRACTOR BEFORE PLACEMENT.

Burgess & Niple, Limited		Engineers and Architects		bn		12 / 15	
CATHODIC PROTECTION NOTES							
BRIDGE NO. LAK-44-0510 JACKSON STREET OVER S.R. 44							
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISION		
SJS	JLP		WAC	WAC 12/89			