

KOSCIUSZKO BRIDGE RF ILLUMINATION

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JAN 14 2002



Issues

- Workers arriving via man-lift to bridge platform/structure experience “RF burns/shocks when transitioning from lift to bridge
- Concern for worker safety and possible fire hazard associated with this event

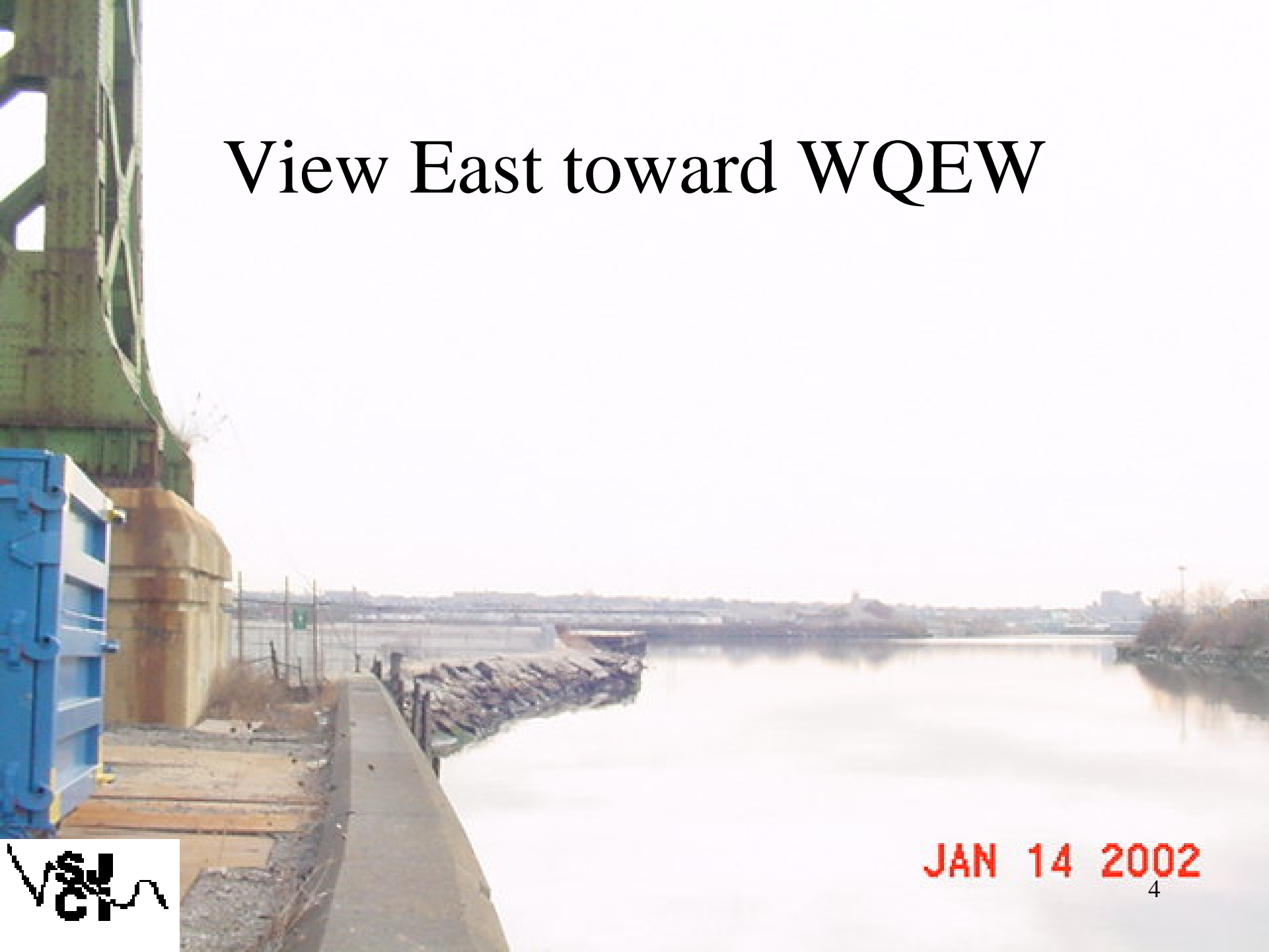


RF Induction Source

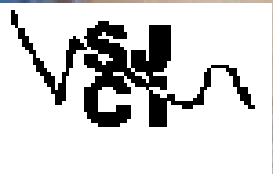
- WQEW AM broadcast transmitter on a heading of 140 degrees true from center of bridge at a range of 1 mile.
- Electric field strength at bridge is 2.15 volts/meter, 1.560 MHz (1560 kHz)
(courtesy of Carl T. Jones corp. – Herman Hurst)



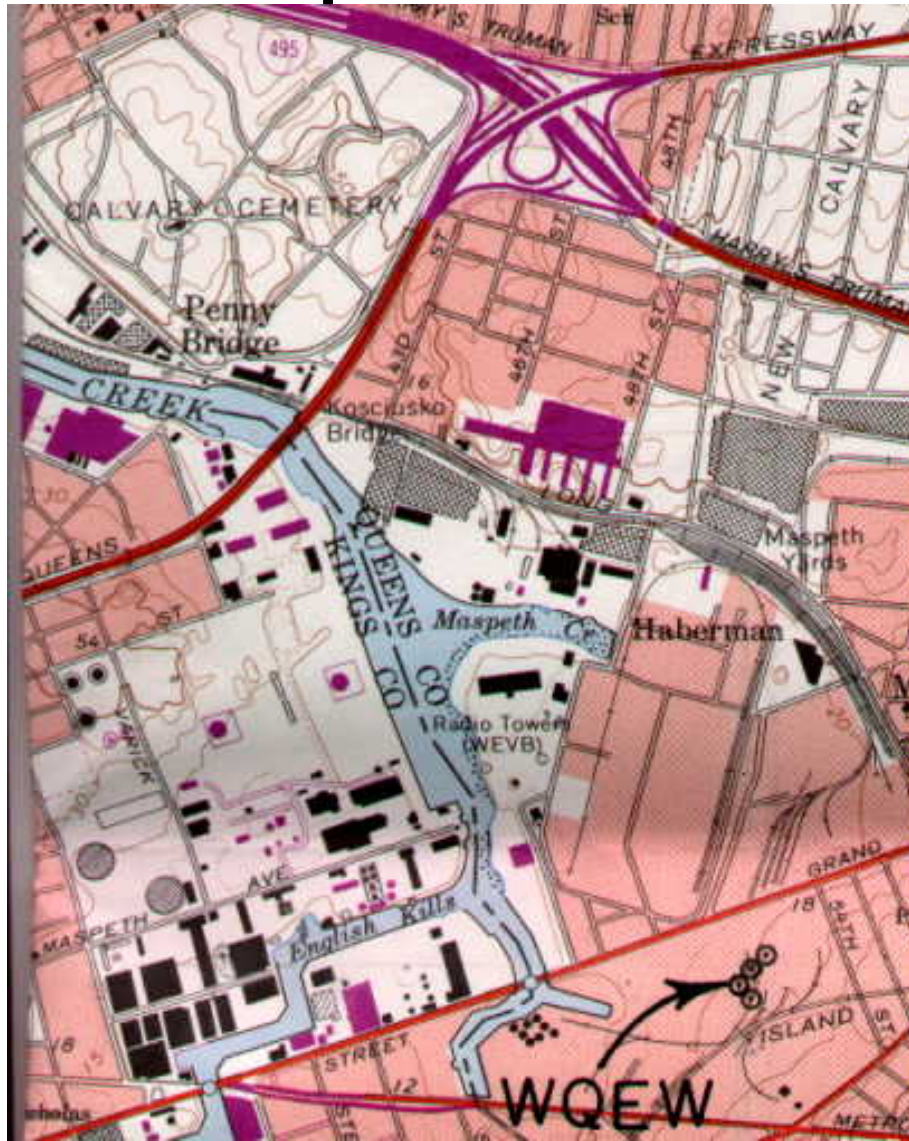
View East toward WQEW



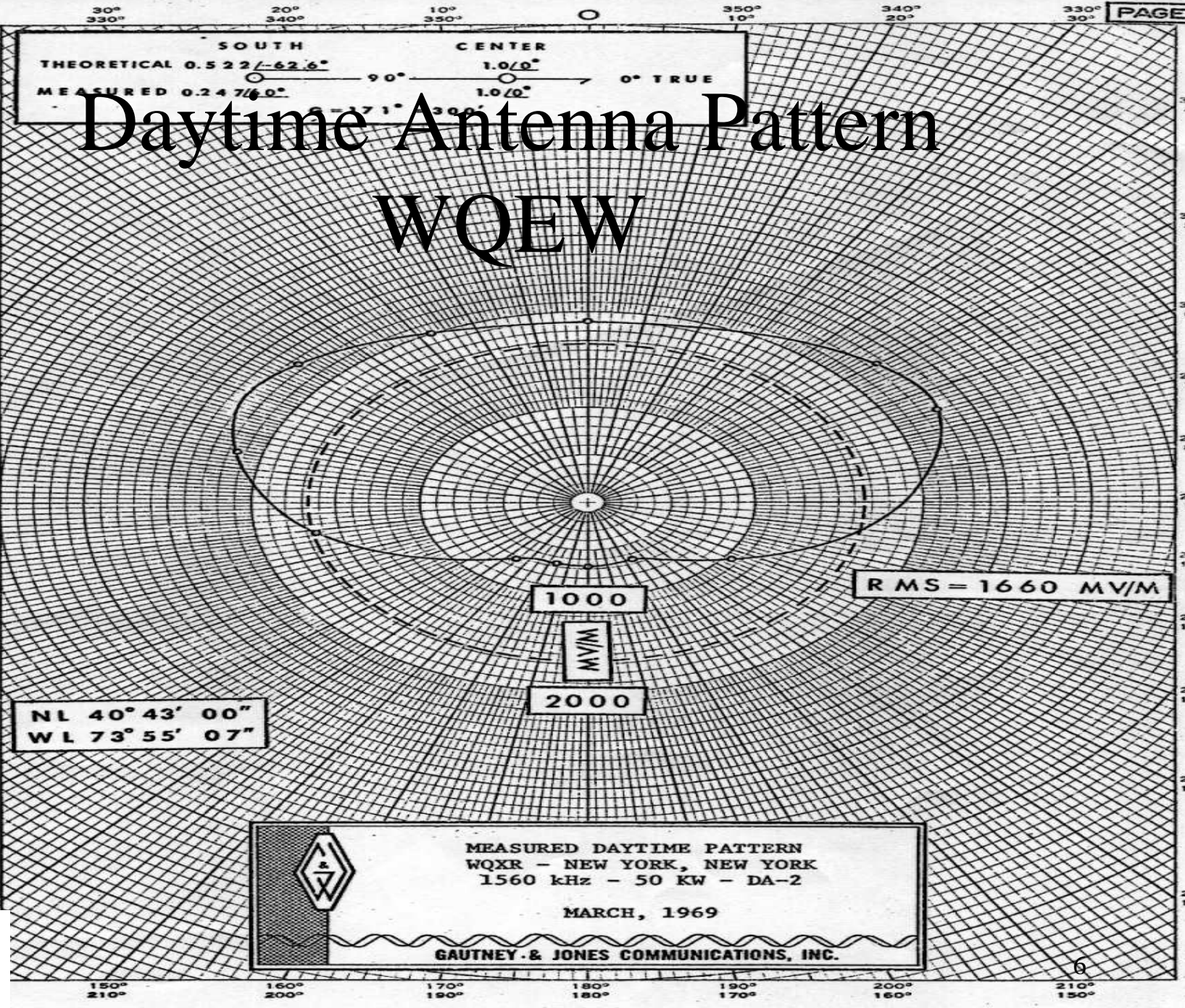
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Map of Area



BRIDGE
HEADING
-320°



EUBENF. STZBEN CO.
No. 4 U. S. A.

NO. 340-P DIETZBEN GRAPH PAPER
POLAR CO. NYNATE



Magnitude of Problem

- Voltages induced on both bridge and man-lift range in amplitude from 30 – 120 volts open circuit depending on height above ground of both man-lift and bridge location
- Total power intercepted by bridge is approximately 100 watts. (Power density of .01 watts per sq. Meter X 10,000 square meters)



Solution(s)

- Connect “electrically short” cable (less than 20 feet) between man-lift bucket structure and bridge structure prior to disembarking from man-lift. This limits voltage difference between lift and bridge to about 12 volts



Solution(s) (Cont.)

- Use man-lift with modified design to incorporate lift platform made from dielectric non-conductive material (I.E. Fiberglass)

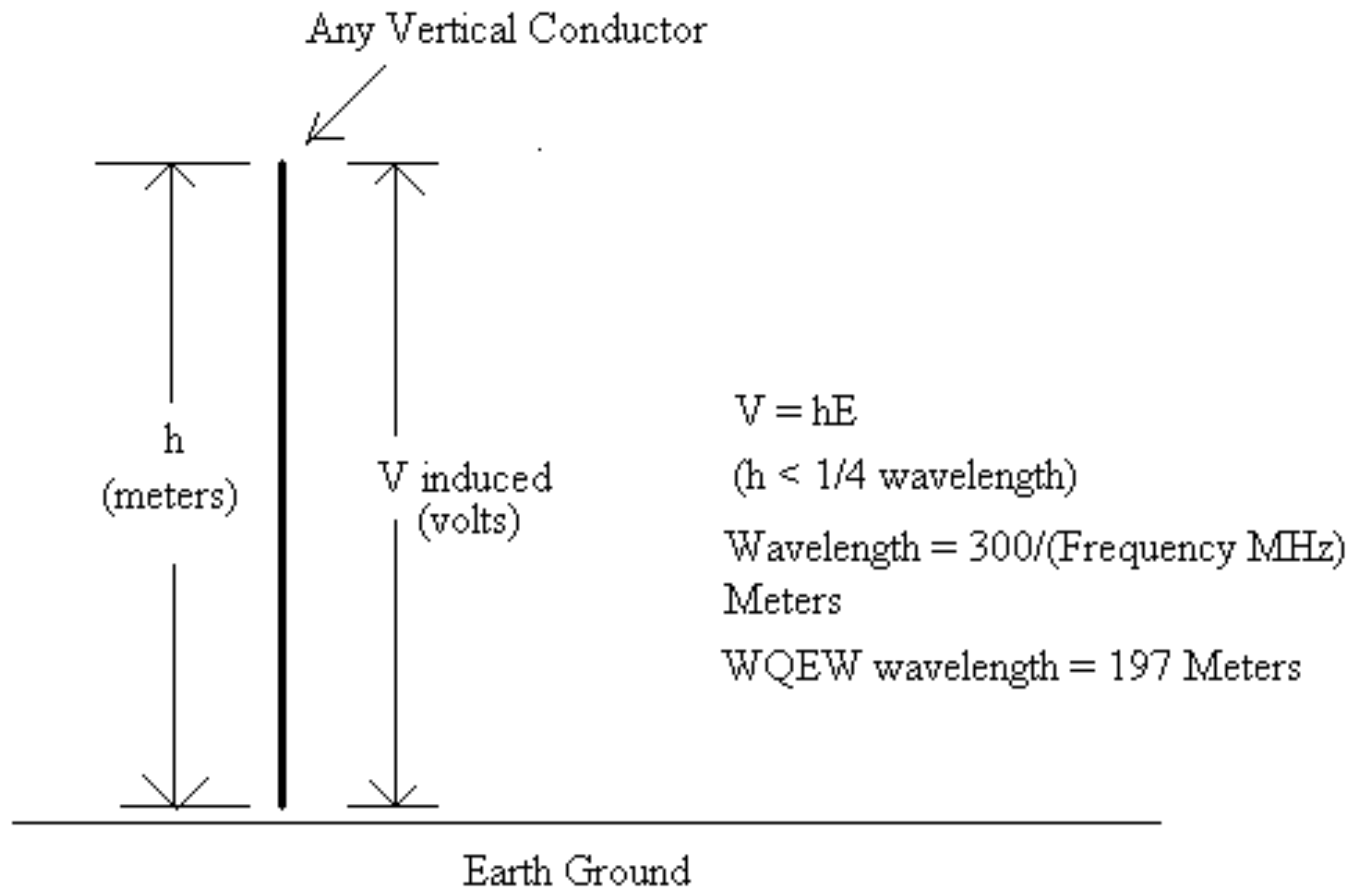


NY State DOT Desired Fix

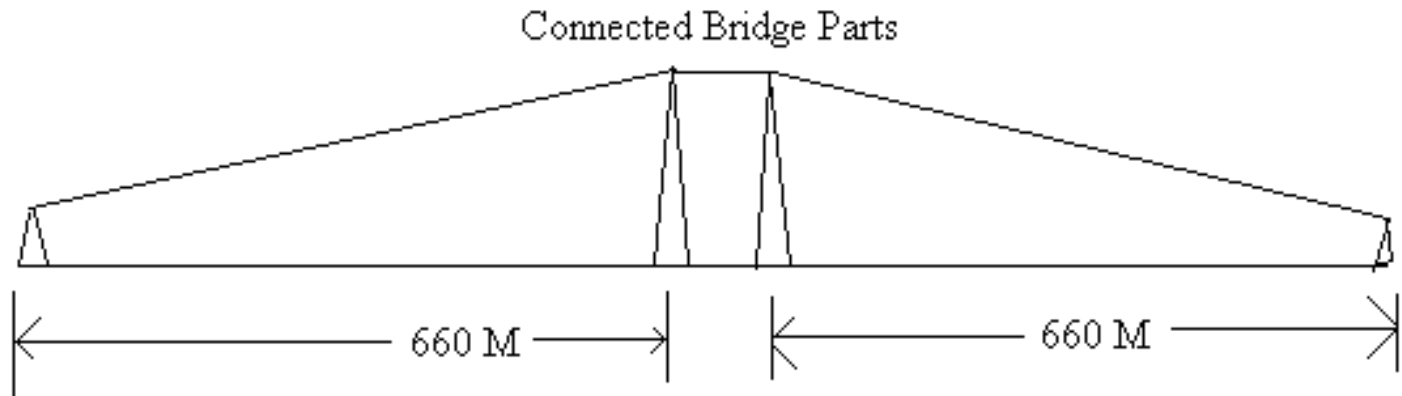
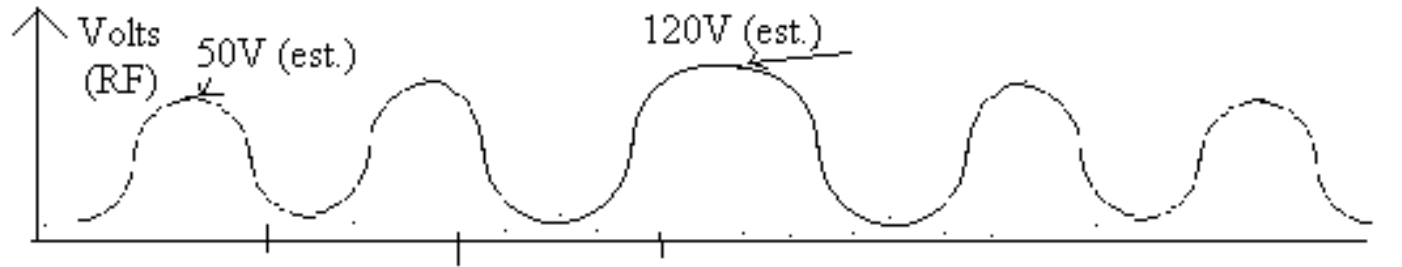
- A scheme to cause the bridge voltage with respect to the man-lift platform to be small (less than 30 volts) regardless of the height of the man-lift or the location on the bridge structure
- No external connections to be made between the man-lift and the bridge



Concept of Effective Height



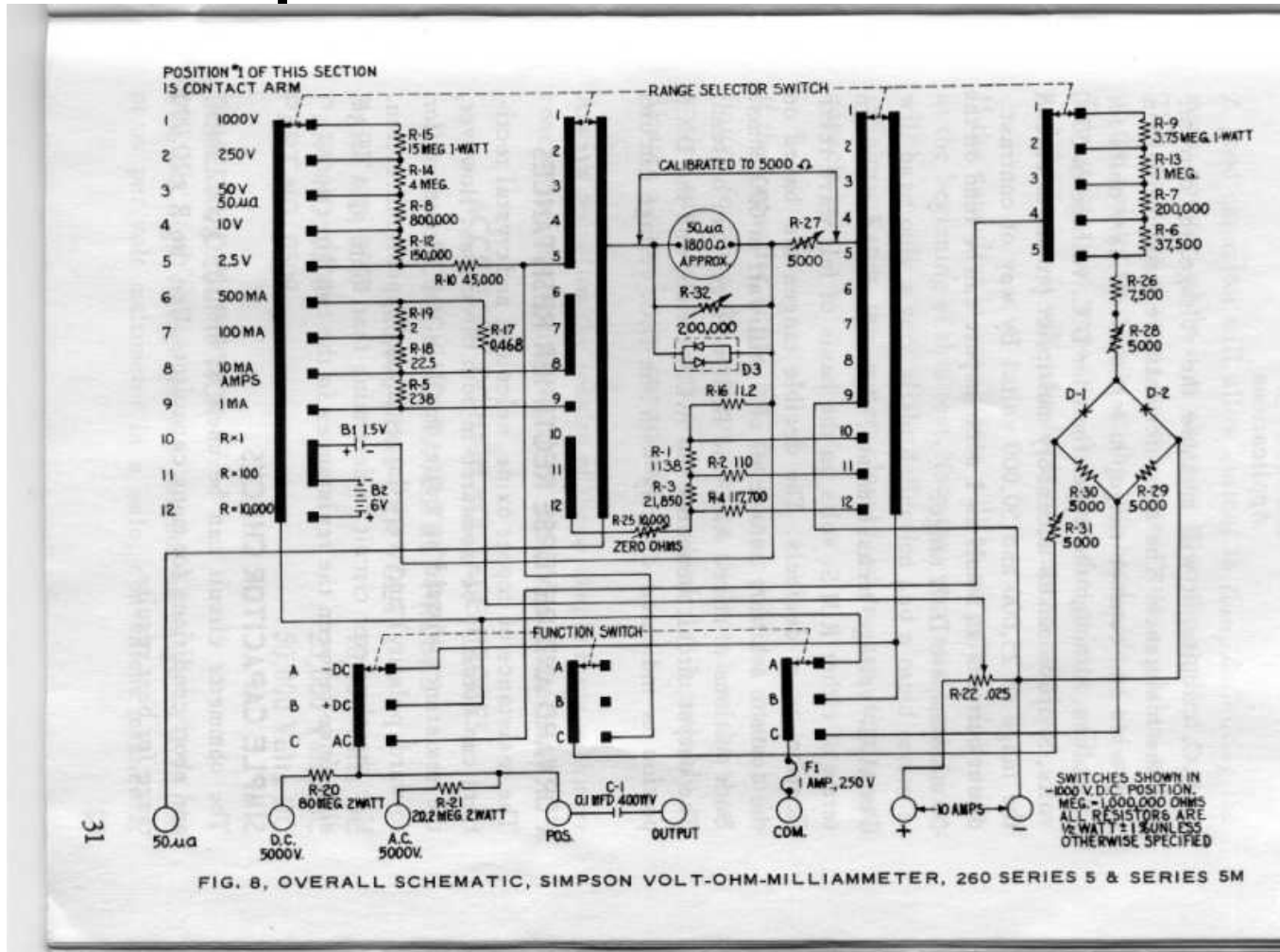
Bridge Volts (WRT Earth)



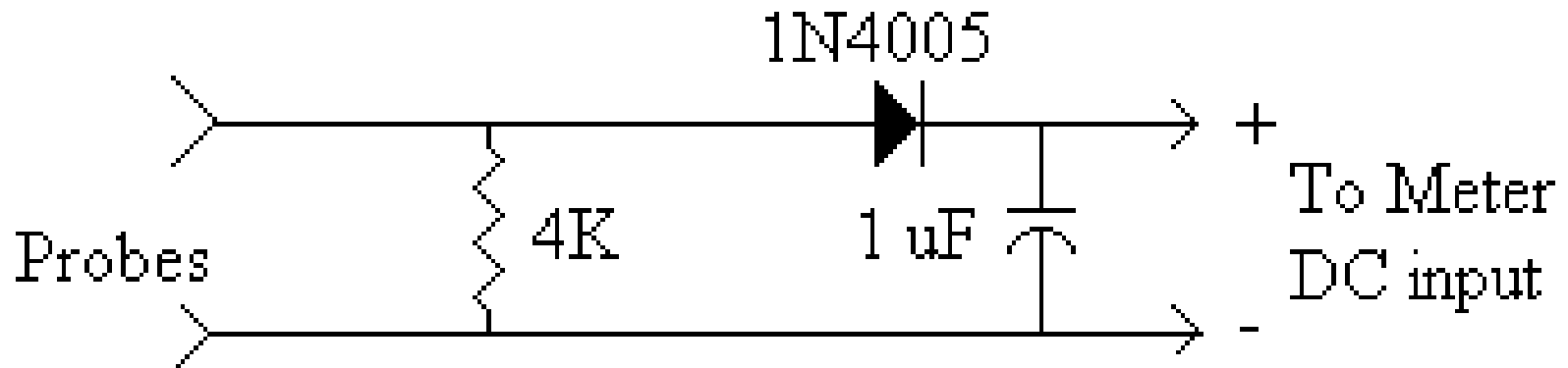
Man Lift/Tower (60 volts)



Simpson 260 Schematic



RF to DC converter



NY DOT Desired Fix Issues

- Not possible to suppress voltage at tower excitation points because towers themselves are antennas
- Any conductor running from ground to any point above ground is also an antenna



NY DOT Desired Fix Issues (Cont.)

- Voltage along span(s) varies as a function of distance by as much as 120 volts
- Voltage is induced on man-lift as a function of height of man-lift and can be as high as 80 volts with respect to earth
- Man-lift cannot be grounded or predicted as to voltage induced due to variable height



NY DOT Desired Fix Issues (Cont.)

- Even if bridge were zero volts everywhere, voltage induced on man-lift would result in voltage difference sufficient to create sensation



Photo of Joe Faro Just After I Told Him About This



Safety Issues

- **All traffic, persons, equipment on bridge surface are safe because they are at same potential as bridge surface**
- **Shocks are nuisance in nature and are not life threatening. RF currents flow on skin only and do not penetrate the human body**



Safety Issues (Cont.)

- **Bridge inspection devices (I.E “Travelers” and “Snooper”) as the dimensions of these devices are such that only about 20 volts maximum may be induced.**
- **Workers on chain link platform under bridge do not get shocked as voltage there will not exceed 10 volts with respect to bridge.**



Conclusions

- Only problem is use of man-lift without benefit of jumper strap
- “Grounding” of bridge is a practical impossibility and not effective as solution anyway due to voltage present on man-lift



Recommendations

- Use local “jumper cable” connection between man-lift and bridge structure prior to disembarking from man-lift onto bridge
- Do not attempt a bridge grounding scheme. It appears to be not practical and as mentioned before not beneficial

