KOSCIUSZKO BRIDGE RF ILLUMINATION

Steve Jensen Consultants Inc.

March 26, 2002

Issues

- Workers arriving via man-lift to bridge platform/structure experience “RF burns/shocks when transitioning from lift to bridge

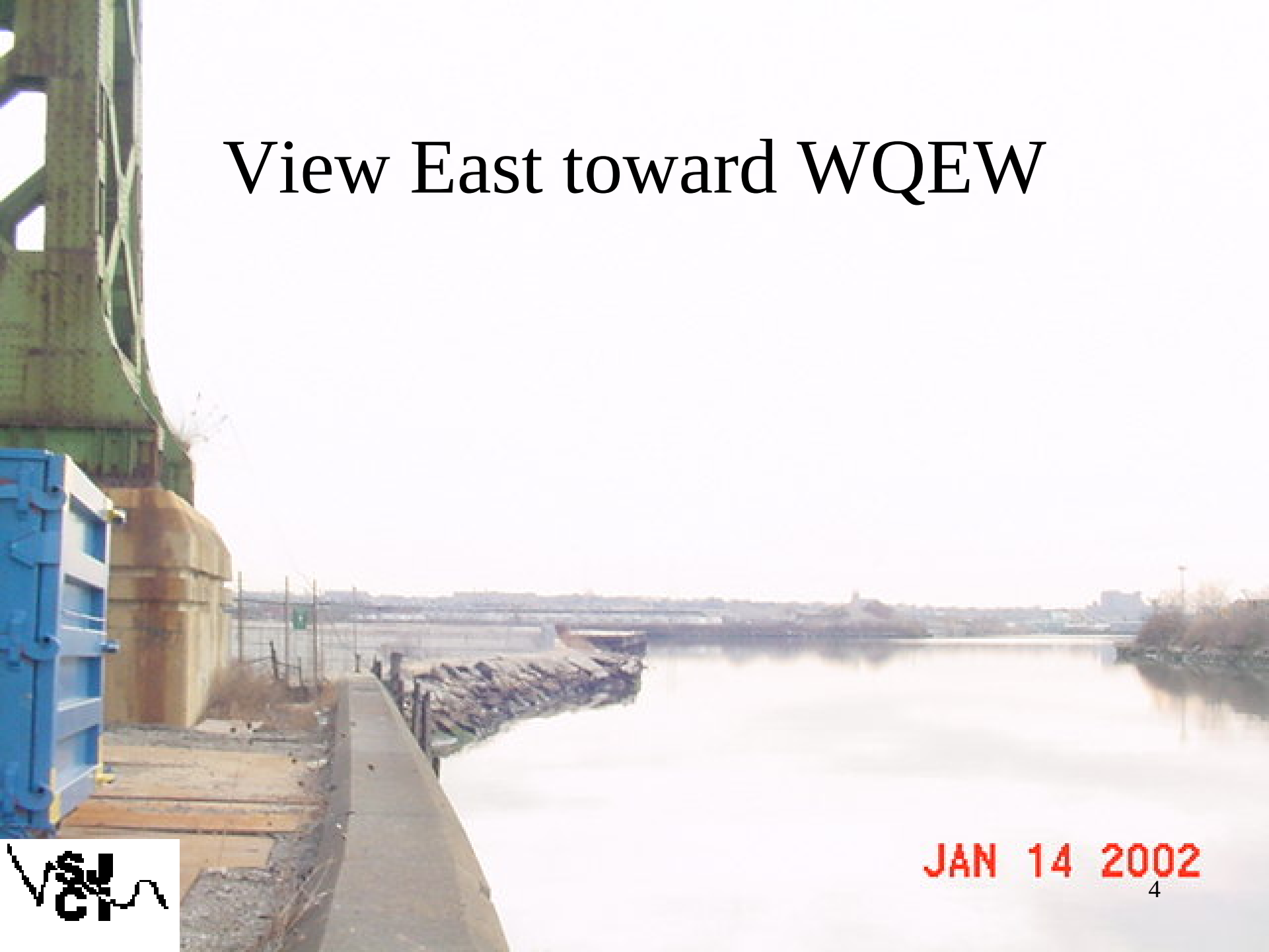
- Concern for worker safety and possible fire hazard associated with this event

RF Induction Source

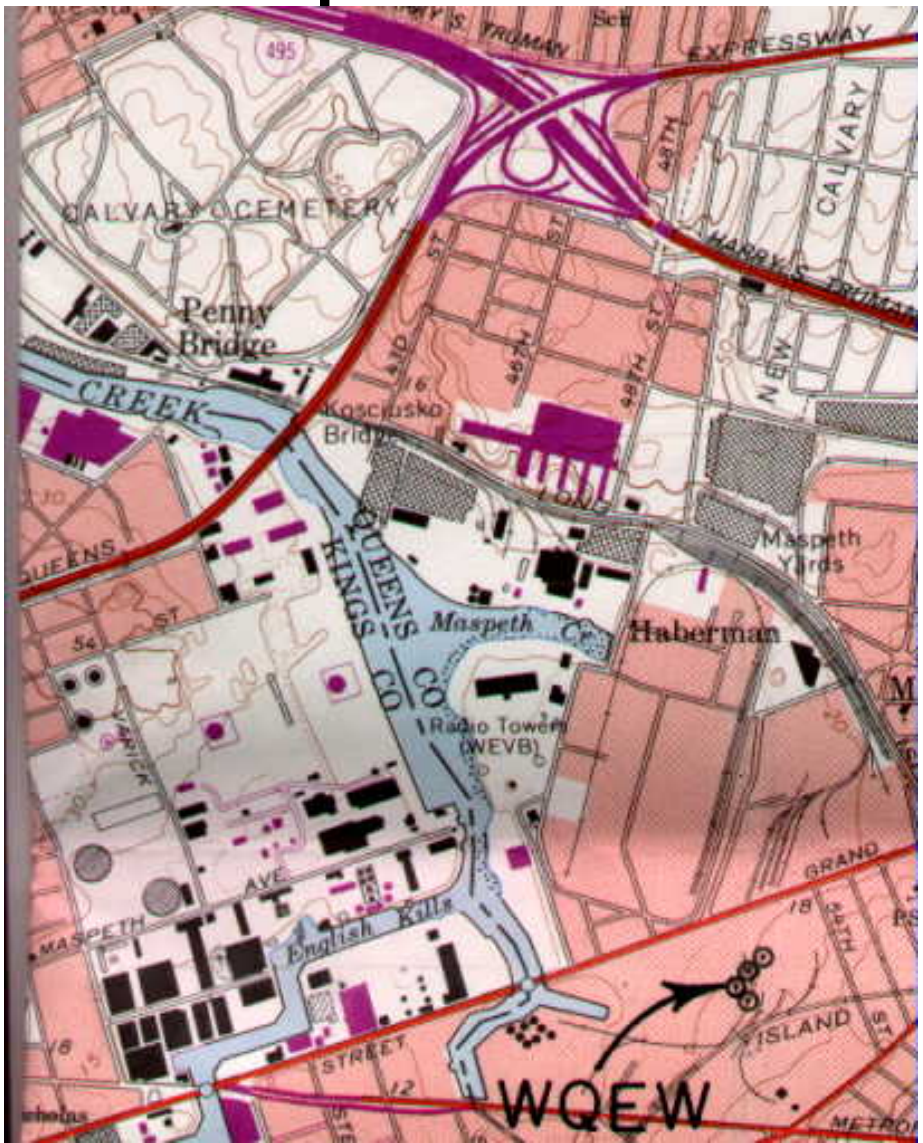
- WQEW AM broadcast transmitter on a heading of 140 degrees true from center of bridge at a range of 1 mile.

- Electric field strength at bridge is 2.15 volts/meter, 1.560 MHz (1560 kHz) (courtesy of Carl T. Jones corp. – Herman Hurst)

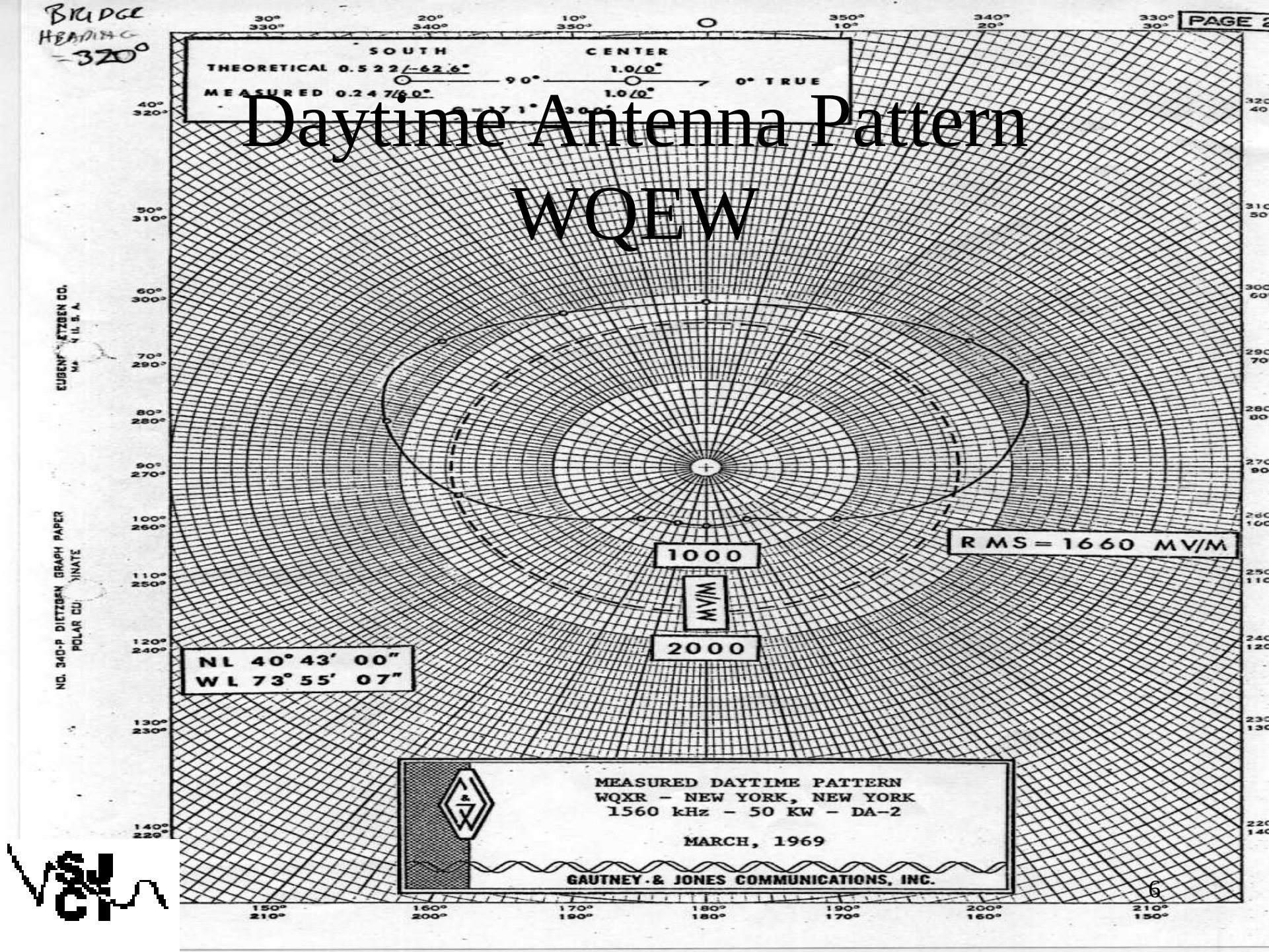
View East toward WQEW



Map of Area


EXPRESSWAY
CALVARY CEMETERY
Penny Bridge
CREEK
Kosciusko Bridge
QUEENS
KINGS CO
Maspeth Yards
Haberman
Radio Towers (WEVB)
AVE
English Kills
STREET
ISLAND
GRAND
WQEW

Daytime Antenna Pattern
WQEW



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.)

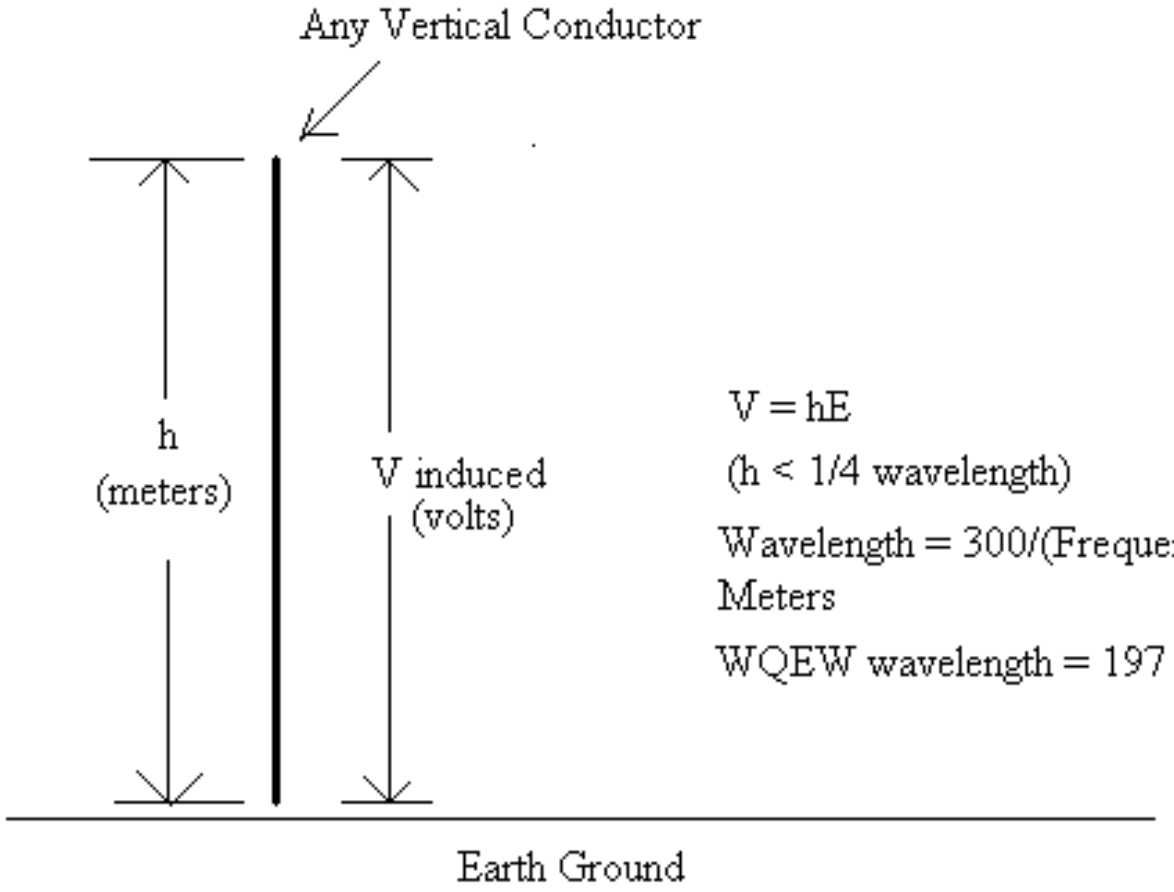
- Use man-lift with modified design to incorporate lift platform made from dielectric non-conductive material (I.E. Fiberglass)

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



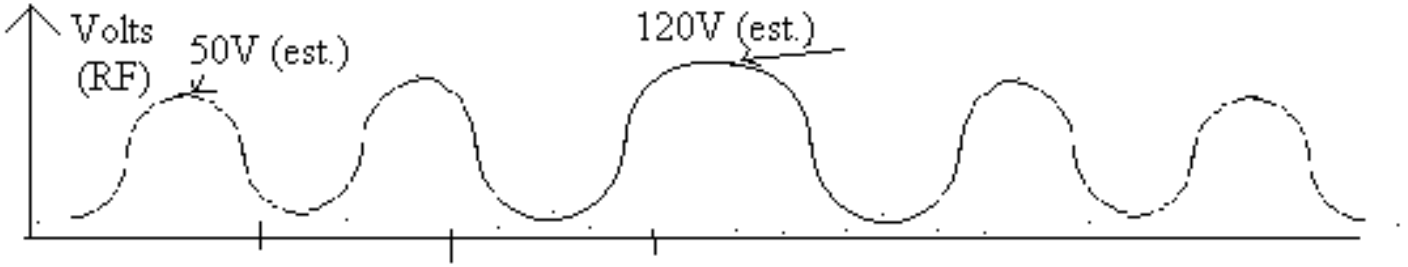
$V = hE$

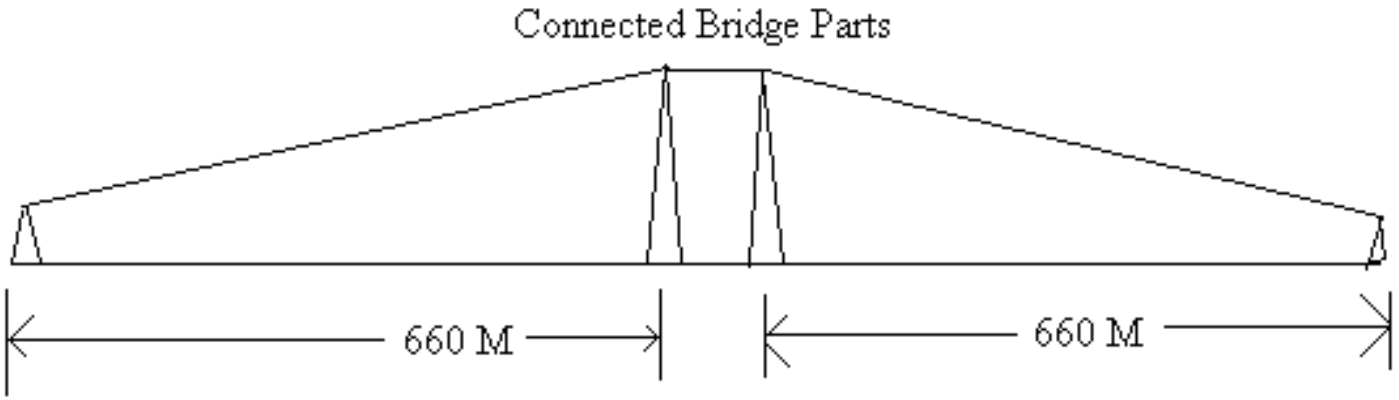
(h < 1/4 wavelength)

Wavelength = 300/(Frequency MHz) Meters

WQEW wavelength = 197 Meters

Bridge Volts (WRT Earth)





Man Lift/Tower (60 volts)

Simpson 260 Schematic

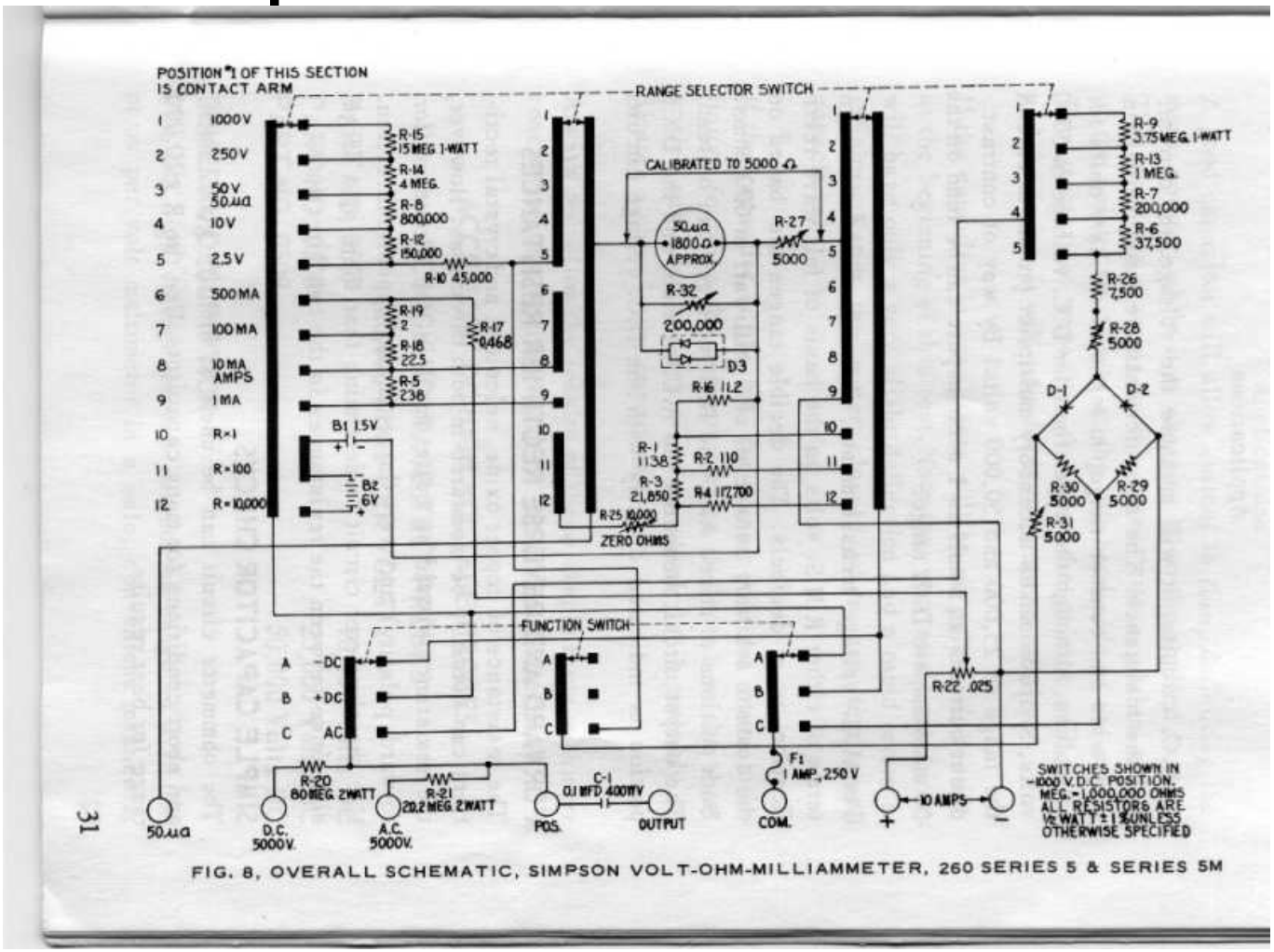
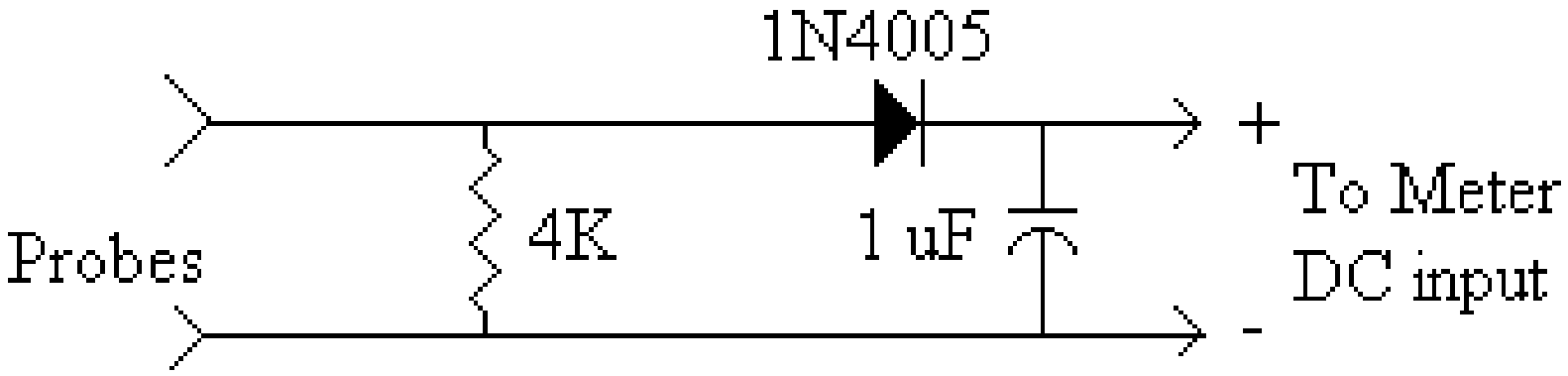


FIG. 8, OVERALL SCHEMATIC, SIMPSON VOLT-OHM-MILLIAMMETER, 260 SERIES 5 & SERIES 5M

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