Hydro Excavation and Portable Bonding Mats

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Today’s presentation …

1) Basics about hydrovacs and hydro excavation

2) Findings of the APIC study
Hydro excavation

- Hydrovac trucks
  - excavate soil around buried facilities – “daylighting”
  - power cables, natural gas pipelines, communications, etc.

- Water heated to soften hard clays and frozen ground
Anatomy of the Hydro Excavator

- Boom
- Debris Storage Tank
- Water Storage Tank
- Water Heater
- Chassis
- Operator & Swamper
- High pressure wash system
- Vacuum System
Hydro excavation

- Simple and straightforward, right?
- Equal measures of art and science
By the numbers

- Cost of typical hydrovac truck?
  - $500,000 to $600,000
By the numbers

- Hire out rates for truck?
- $240 to $300 per hour
By the numbers

- Capacity of water tank – 5000 litres
- Capacity of debris tank – 9000 litres
By the numbers

- Temperature range of water – up to 93°C
- Maximum pressure – 2500 psi
CREW SETTING UP
URETHANE DIG TUBE COVER

URETHANE DIGGING LANCE COVER
LOCATING 72 KV TRANSMISSION LINES AND HIGH PRESSURE GAS LINES

TOTAL FOCUS
EPCOR’s work practice

- Pressure and temperature limited
  - 1500 psi during exposure
  - 38°C

- Lance in continuous motion, minimum distance away

- Oscillating spray head
Water jet on conductors
Damage to typical conductors
Technique is critical
Skilled operators

- Hydro excavation is today’s preferred method of exposing buried facilities

- Equivalent to “exposing by hand”
Portable bonding mats

- Introduced to EPCOR in 2007

- Introduced to prevent operator injury
  - if energized cable is damaged and shorts to ground

- In 2011 EPCOR operators question safety benefits – APIC study starts
Portable bonding mats

- Conductive wires
- Sewn or laminated to a flexible textile backing
Portable bonding mats

- Mats bonded to the digging lance and dig tube
TYPICAL SET-UP
Portable bonding mats

- Ideally create an equipotential or “equal potential” area

- If water stream cuts through energized cable, wand *could* become energized

- Mats bonded to lance and dig tube – operator at “equal potential” and “safe”
Concerns

- Stepping off or having one foot off the energized mat
- Voltage difference "step potential"

WHERE’S THE MAT? WHERE ARE THE OPERATOR’S FEET?
Concerns
 Setting up,
repositioning,
stowing,
constantly handling – damage to mats

BROKEN BRAIDING

HOLE
Concerns

- Hydrovac operations are wet and muddy
- Mats can become very slippery – fall hazard
APIC findings

- Mat cannot provide an equipotential surface
- Foot can miss contact with braiding
APIC findings

- Textile layer does not provide insulation
- Not dielectrically tested
APIC findings

- Braided copper conductor sewn into mat
- Has insufficient capacity to carry fault current
APIC findings

- Consistent with findings of report prepared for Hydro One and Ontario Power Generation
  
  • *Performance Testing of Gradient Mats. Kinectrics Inc. Report No.: K-015481-001-RA-0001-R00, February 24, 2011*
Mat use discontinued at EPCOR

- As of March 2013

- Contractors can continue to use them if they wish
  - EPCOR hydrovac crews no longer use them
Safety measures in place

1) Cables de-energized if possible
2) Hot line tagging when requested
   ▪ makes breakers trip faster at lower fault currents
Safety measures in place

3) Most conductors have concentric neutral construction
Safety measures in place

4) Heightened operator awareness, skill and training
Safety measures in place

5) Limits on water pressure and temperature
Safety measures in place

6) Oscillating spray head required
Safety measures in place

7) Protective urethane covers on water lance and dig tube
QUESTIONS?