

Transmountain Burnaby Crude Oil Storage



Project Scope – Transmountain Terminal



- Expansion of Crude Oil Terminal – adding 14 large oil storage tanks
- Terminal Storage Capacity - 3.6 million bbl. to 5.6 million bbl.
- City of Burnaby BC, 275,000 people – Metropolitan Vancouver
- Operated by Transmountain Pipeline – Government of Canada
- Expansion of 750-mile pipeline from Edmonton, Alberta to Vancouver BC
- 300 to 890 million bbl. per day
- Oil Exports to USA Westcoast & International markets
- Very complex & challenging project



BRITISH
COLUMBIA

ALBERTA

WASHINGTON



TRANSMOUNTAIN

TRANS MOUNTAIN EXPANSION PROJECT
CONFIGURATION MAP

December 19, 2018

- NEW PUMP STATION
- EXISTING PUMP STATION (DEACTIVATED)
- EXISTING PUMP STATION
- ADJACENTLY LOCATED PUMP STATIONS
- TERMINAL
- METERING FACILITIES
- EXISTING PIPELINE - ACTIVE
- EXISTING PIPELINE - REACTIVATED
- NEW PIPELINE
- EXISTING PIPELINE - INACTIVE

Project Scope



- Burnaby Terminal - Secondary Containment for 14 crude oil storage tanks
- Firewater Retention Pond - 2.1 million gallon
- 28' to 33' Vertical Shotcrete Wall
- Stormwater Pond – 5.3 million gallons
- Sumas Terminal - Lining of 3 Crude Oil Tanks & Firewater Pond



- Enviro Liner 6000 was tested & approved – Chemical resistance to crude oil, mechanical & flexibility properties
- Polyolefin Alloy - blend of LLDPE & HDPE with advanced UV/AO
- 1,044,000 ft² 40 mil under tank foundation and tank floor area
- 305,000 ft² 60 mil DS textured around perimeter berms
- 702,000 ft² of Geocomposite tank floor area above the liner
- 145,000 ft² of 60 mil Fire Retardant Spray Applied Elastomeric Polymer

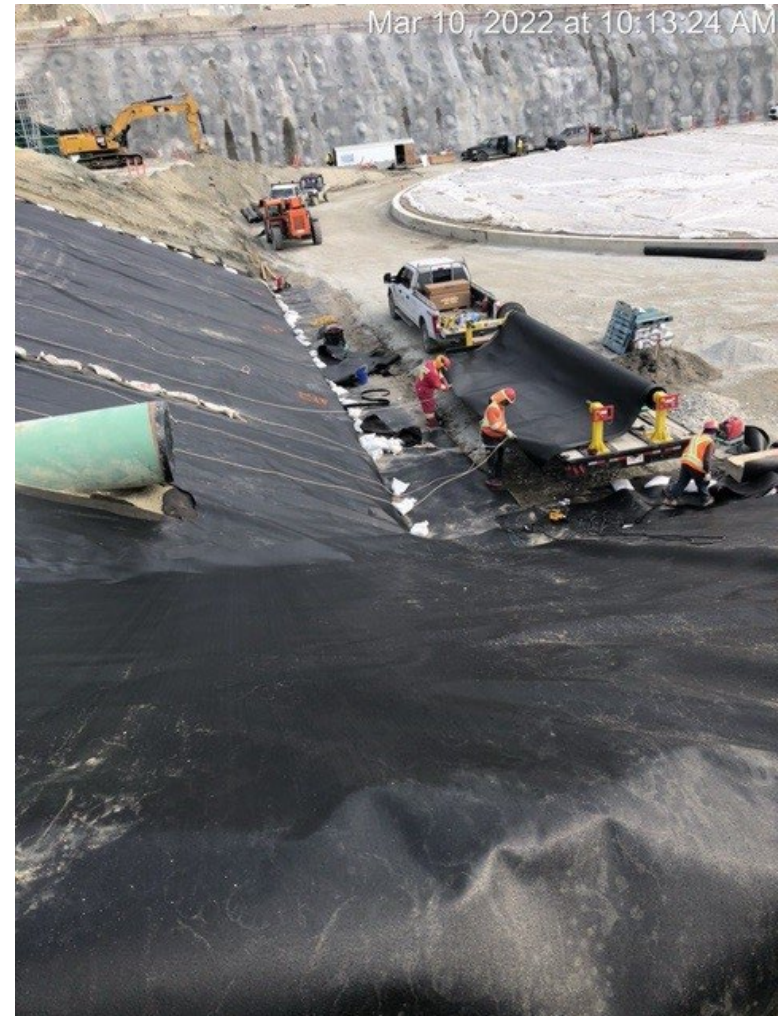
Project Scope



- 14 Under Tank Area
 - 40 mil Smooth Geomembrane
 - 10 & 16 oz. Non-Woven, Sand
 - Mechanically attached to the internal ring beam
 - Double Lined 40 mil Sumps
- 14 Outside Tank Floor Area
 - 40 mil Smooth Geomembrane
 - 10 oz Non-Woven, Geocomposite
 - Mechanically attached to outside tank ring beams
- 14 Berm Walls 3/1 Slope
 - 60 mil DS Geomembrane
 - 10 & 10 oz. Non-woven
 - 8" of Concrete on top of Liner



- North Shotcrete Wall - 23' – 33'
 - 60 mil Spray Applied Polymer Liner
 - 8 oz. Conductive Geotextile
 - 10 oz Non-Woven Geotextile
- Fire Retention Pond
 - 80 mil DS Geomembrane
 - 10 oz. Non-Woven
 - Spray Applied North Wall, Mechanically Attached for shotcrete wall
- Stormwater Retention Pond
 - 80 mil DS Geomembrane
 - 10 oz Non-Woven Cushion & Geocomposite on floor area



Project Scope



- Destructive & Non-Destructive Testing
 - Peel and Shear Testing of Seams
 - Pressurized Air Channel Testing
 - Vacuum Chamber, Air Lance
 - Mechanical Point Stress
 - Electrical Spark & Dipole Testing
- Field welded & fabricated liner components
- Third Party CQA



- Installation Complexity
 - Structure, Penetrations, Ramps, Walls, Slopes, Approved Site Access - Mob/Demob
- Engineering Design Changes
 - Numerous complex design changes
- Limited Site Access and Congestion
 - Multiple Trades – Mechanical, Civil, Structural, Steel, Inspectors, Government, Traffic and Site Access problems
- Inclement NW Weather Conditions
 - Snow, Rain, Wind, Heat
- Environmental Sensitivities
 - Governments, First Nations, Wildlife, Environmentalist, Blockades, Media, Residence
- Safety
 - COVID, H2S PPE, Full Respirators, Congested Traffic, Vertical Walls, Wet slippery conditions



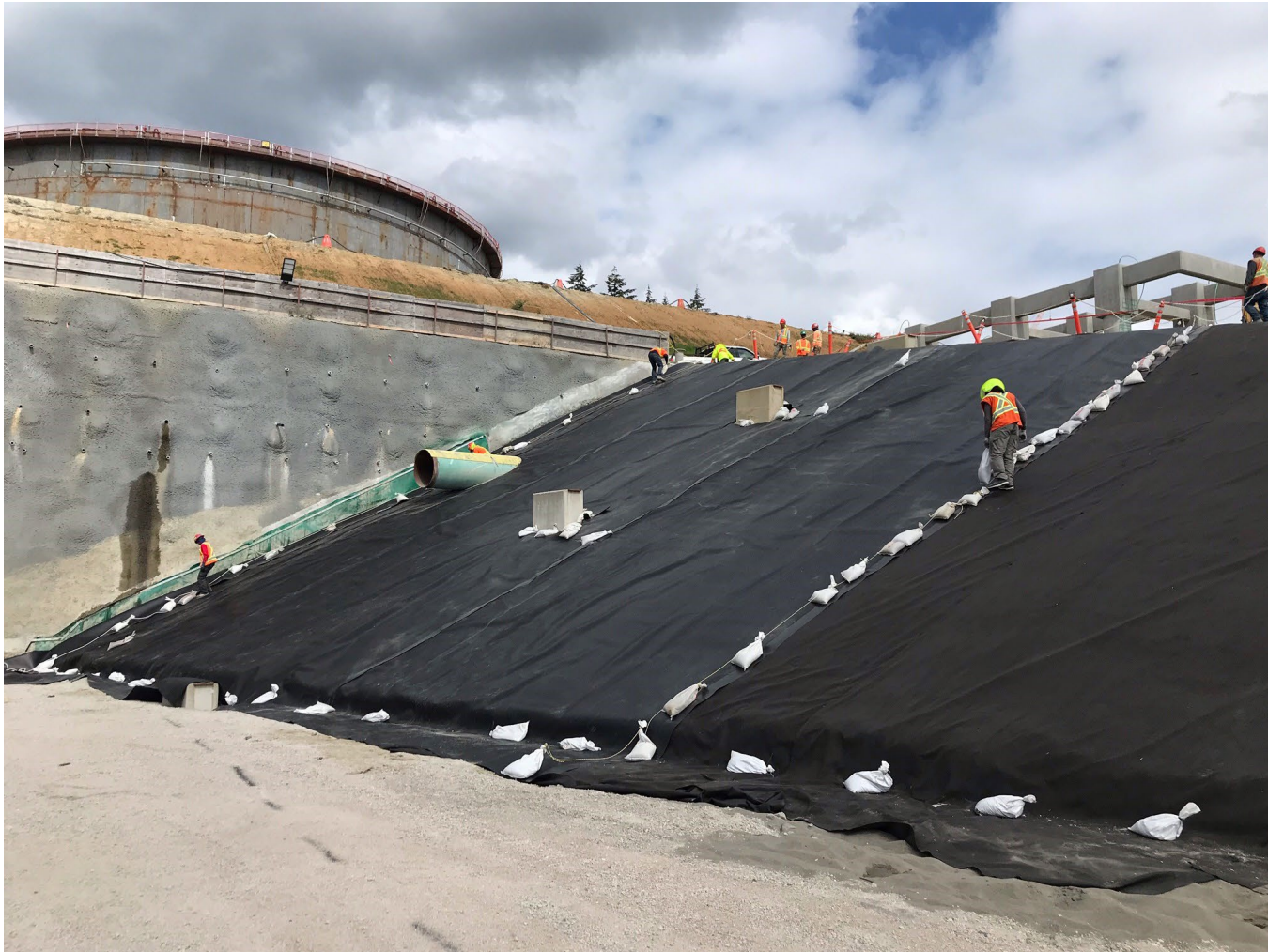
Installation



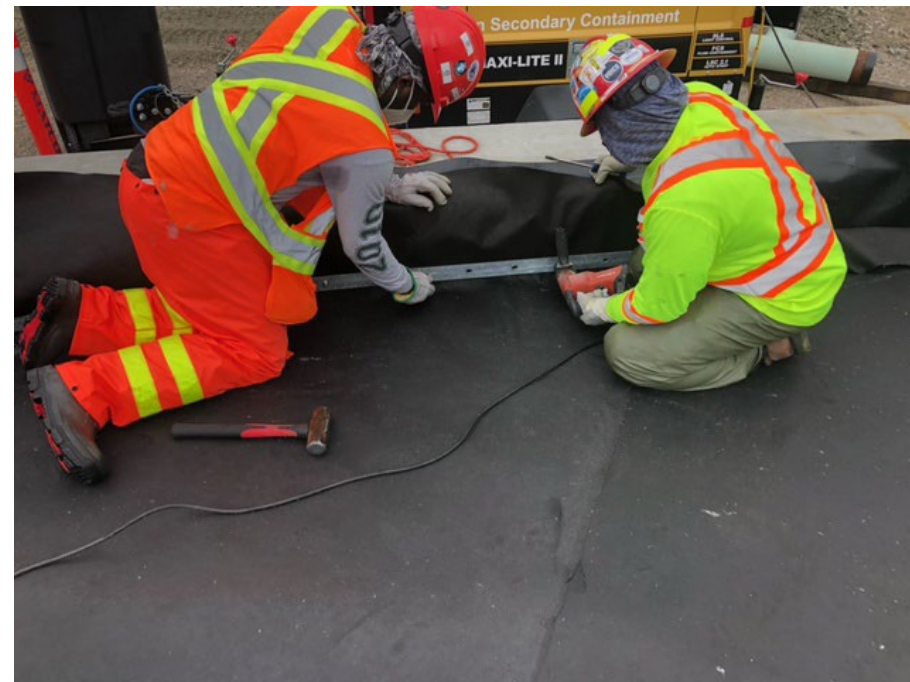
Installation



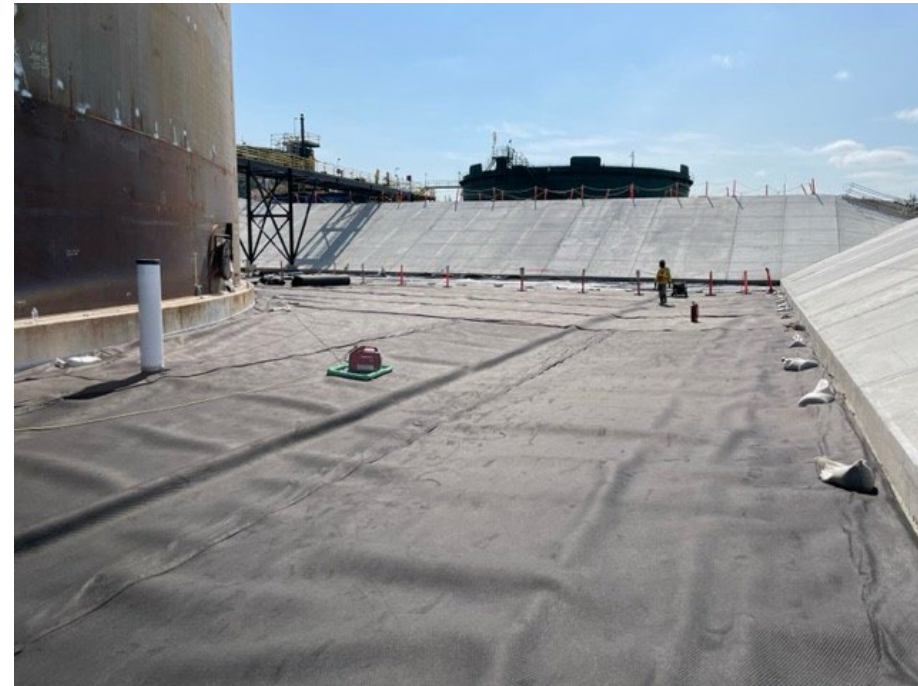
Installation



Installation

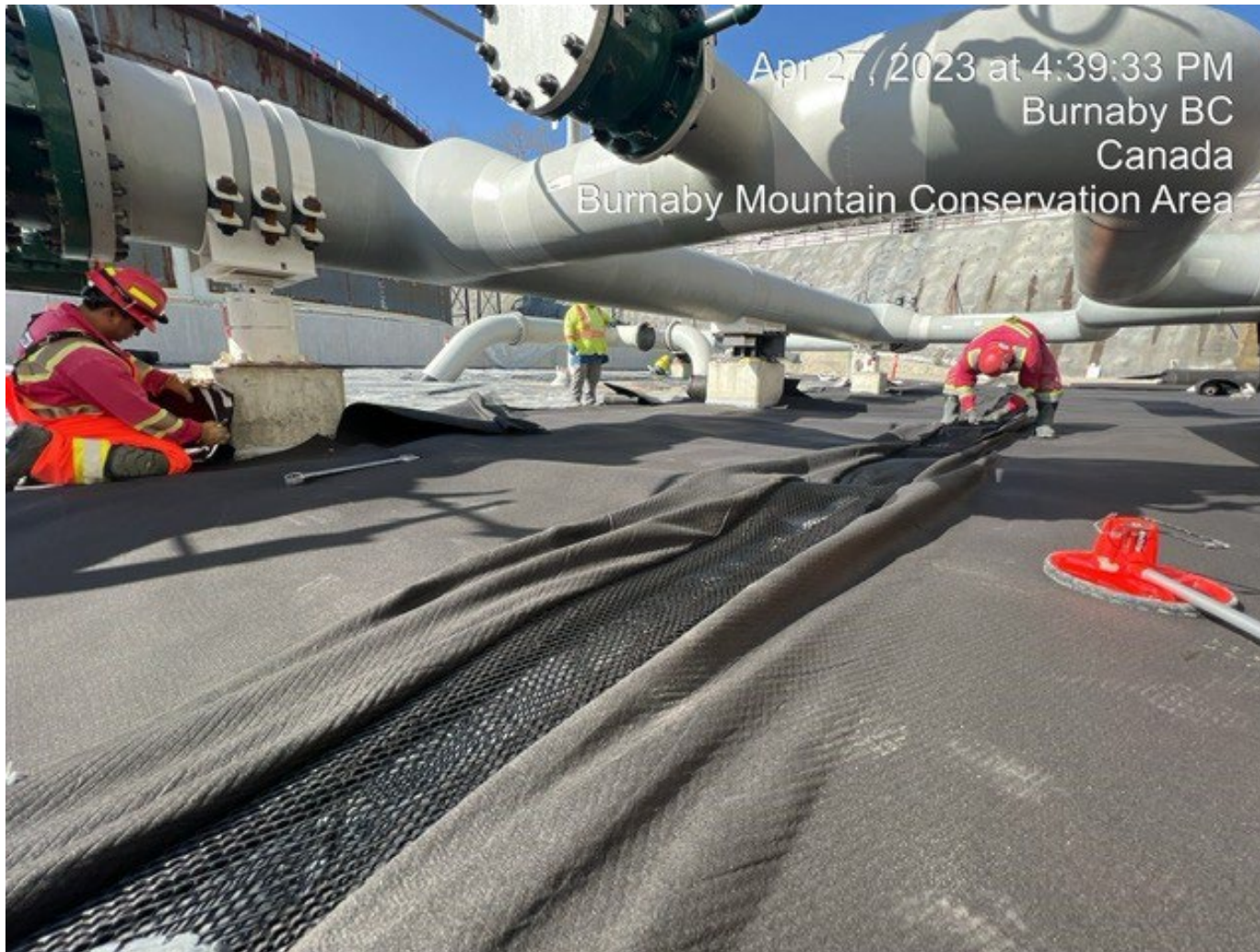


Mechanical connection of 40 mil liner to internal tank ring beam on 6" centers

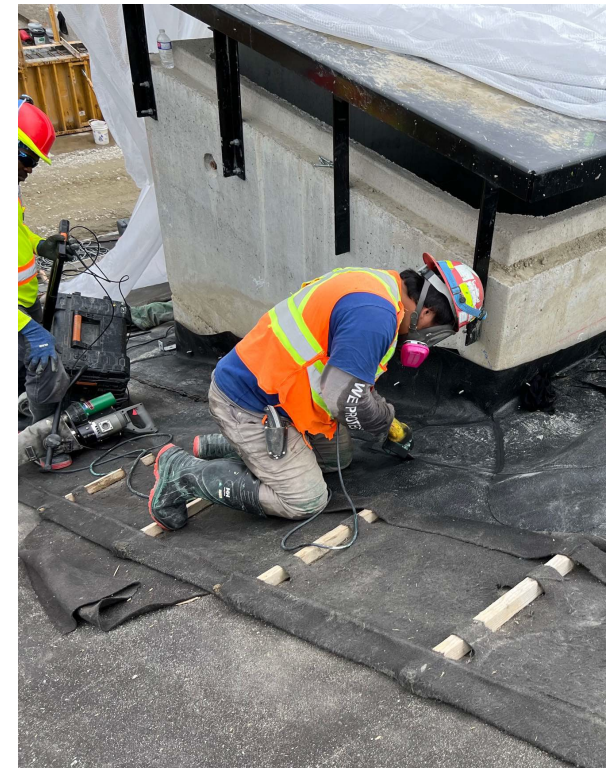


Mechanical connection of 40 mil liner to outside tank ring beam on 6" centers

Mechanical Connections – Pipes & Structures

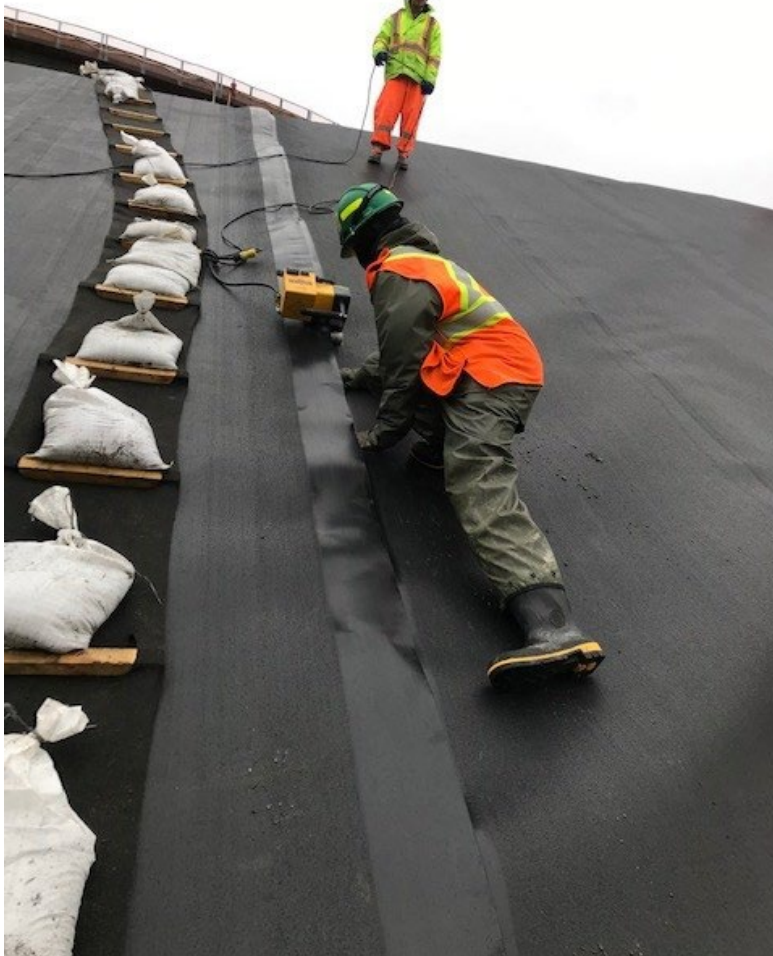


Mechanical Connections – Pipes & Structures



Total of 325 pipe penetrations in tank area – 17" to 24" plus structures

Liner Welding & CQA



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Vertical Walls - Spray Applied Polymer



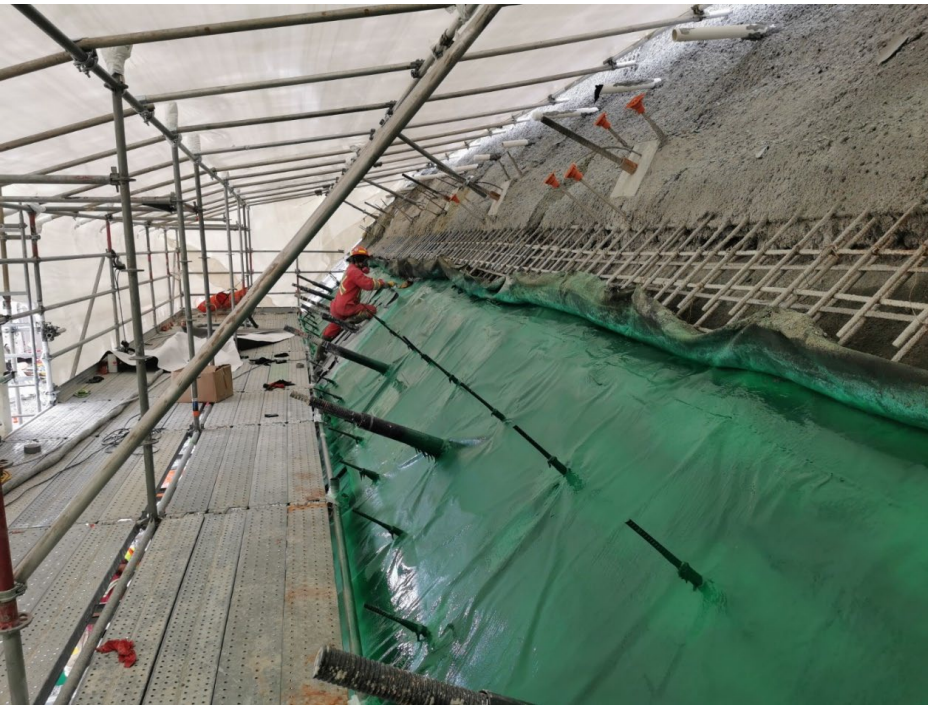
Vertical Walls - Spray Applied Polymer



Vertical Walls - Spray Applied Polymer

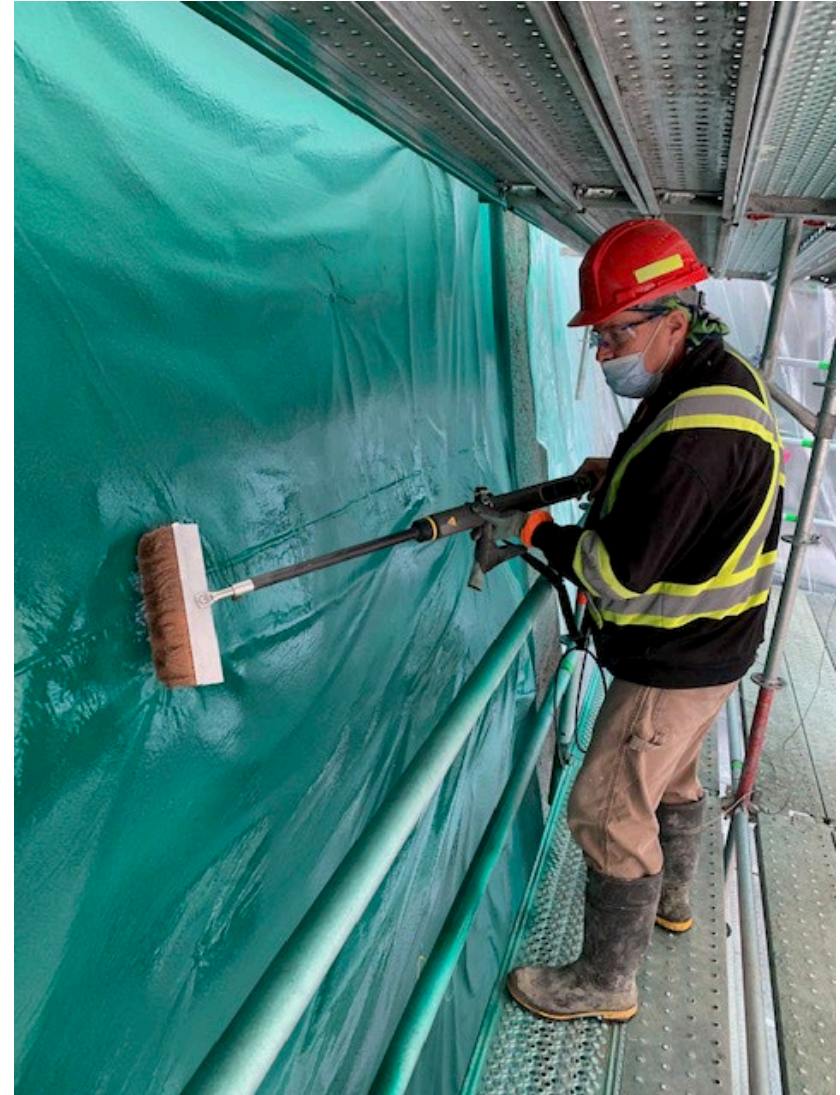


Vertical Walls - Spray Applied Polymer



Total of 8500 penetrations through the vertical shotcrete wall area

Vertical Walls - Spray Applied Polymer



Vertical Walls & Floor Connection

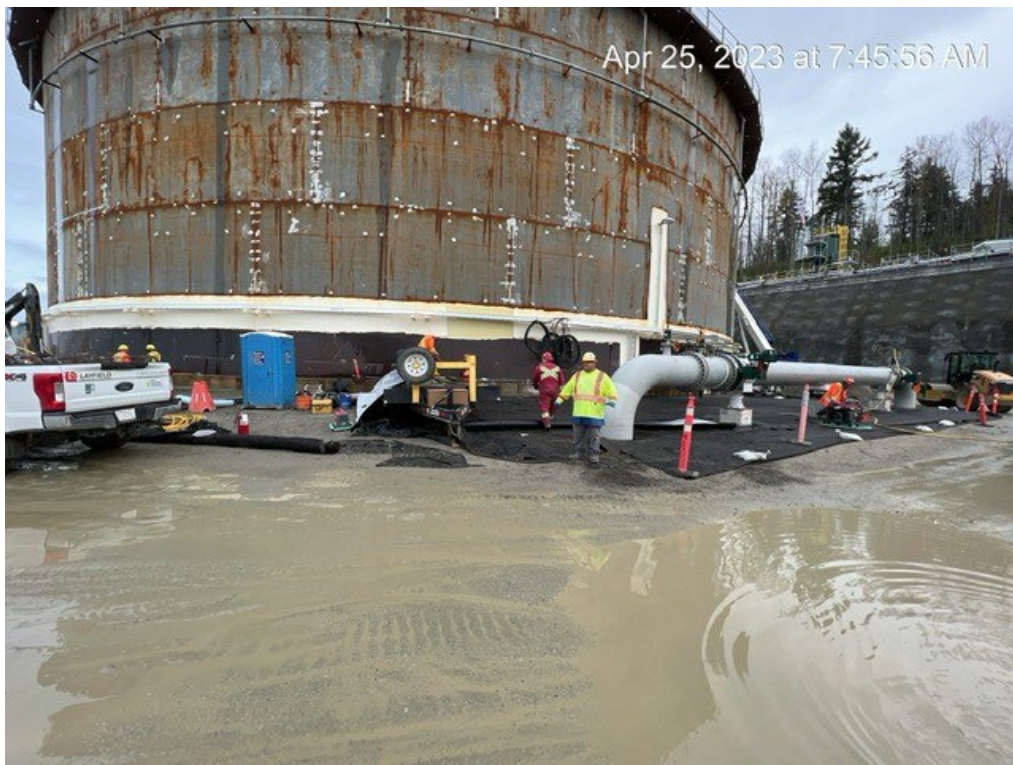


Special 14" PE transition strip allowing mechanical attachment bar at 3" center of 40 mil tank floor & 60 mil berm liner to the 60 mil shotcrete spray applied liner



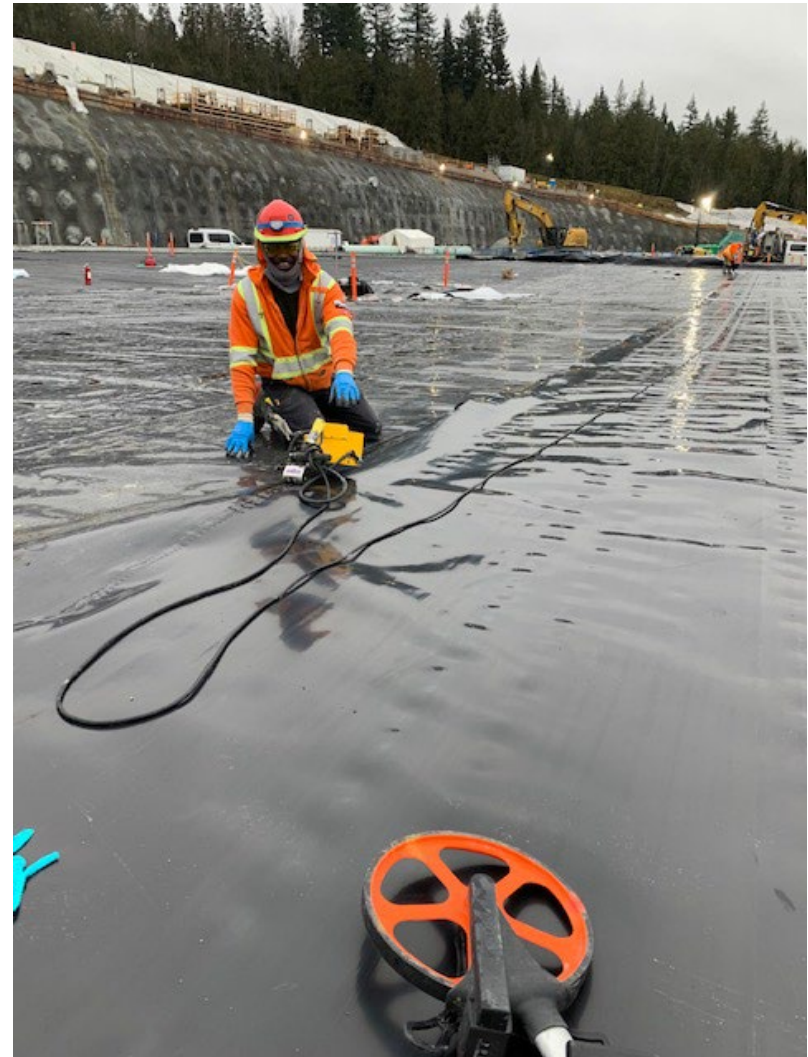
Weather







- Project Started July 24, 2020 – Completed November 2024
- 110,000 Hours of construction
- COVID, Extreme Weather, Site Congestion, Subgrade Access, Design Changes, Safety, Environmental Concerns,
- Project Management & Planning
- Use of Innovative Geosynthetic Materials
- Teamwork from all stakeholders



Acknowledgements



- KLTP Team – Kiewit & Ledcor Trans-Mountain Partnership
- Quantum Chemical – Dave Martin
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- Layfield Canada Construction Group
- Tinus Du Plessis – Layfield Construction Superintendent
- Jason Wheeler – Layfield Canada Construction Manager



Thank You Questions

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