Sustainable Technology

Journée technique du CFMS du 25 mars 2009

Présentation by Peter (Pierre) Wu

Terre Armée

A Tribute to Henri Vidal
Journée hommage ả Henri Vidal
(1924 – 2007)

Reinforced Earth® Industrial Works

Ouvrages Industriels en Terre Armée®

Earlier Industrial Application

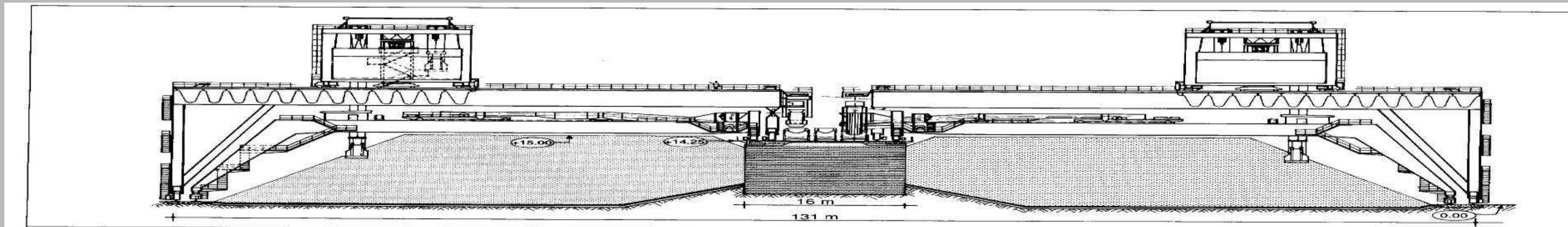
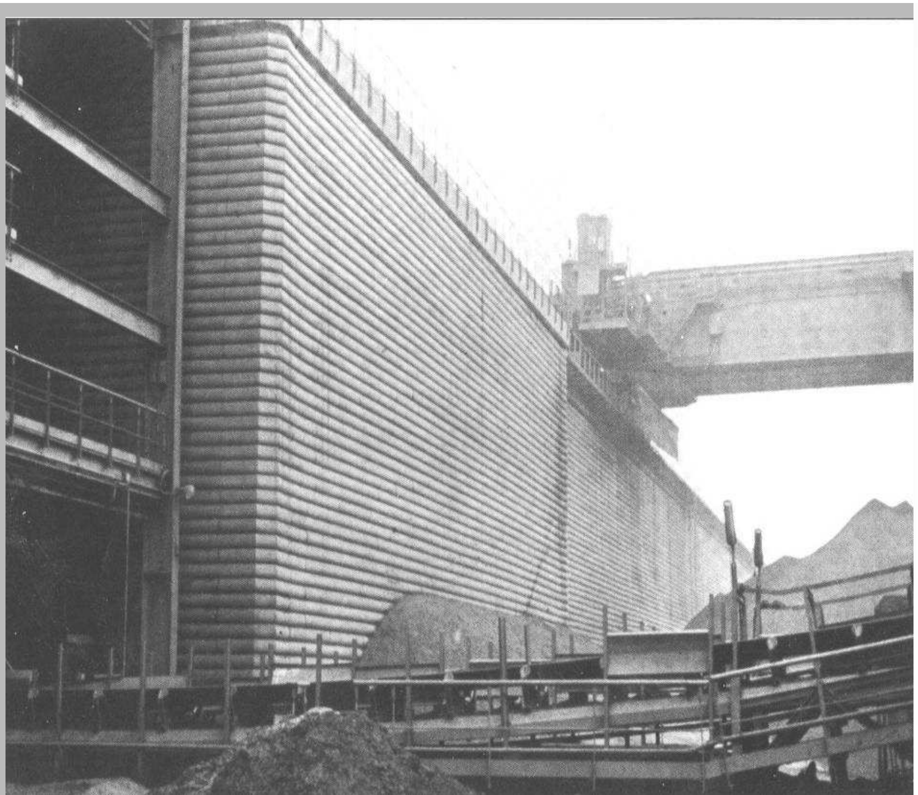
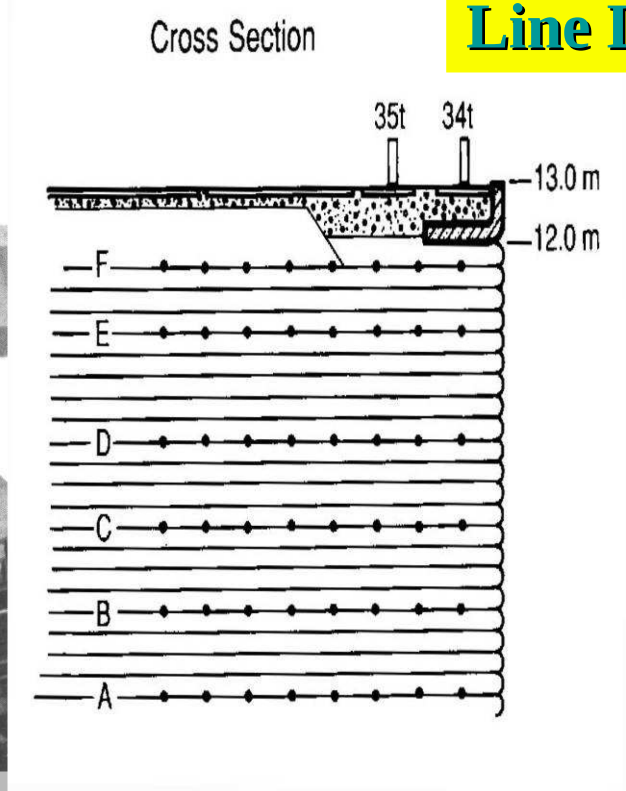


Figure 1: Ore storage at the Port of Dunkirk, France.



Line Loads

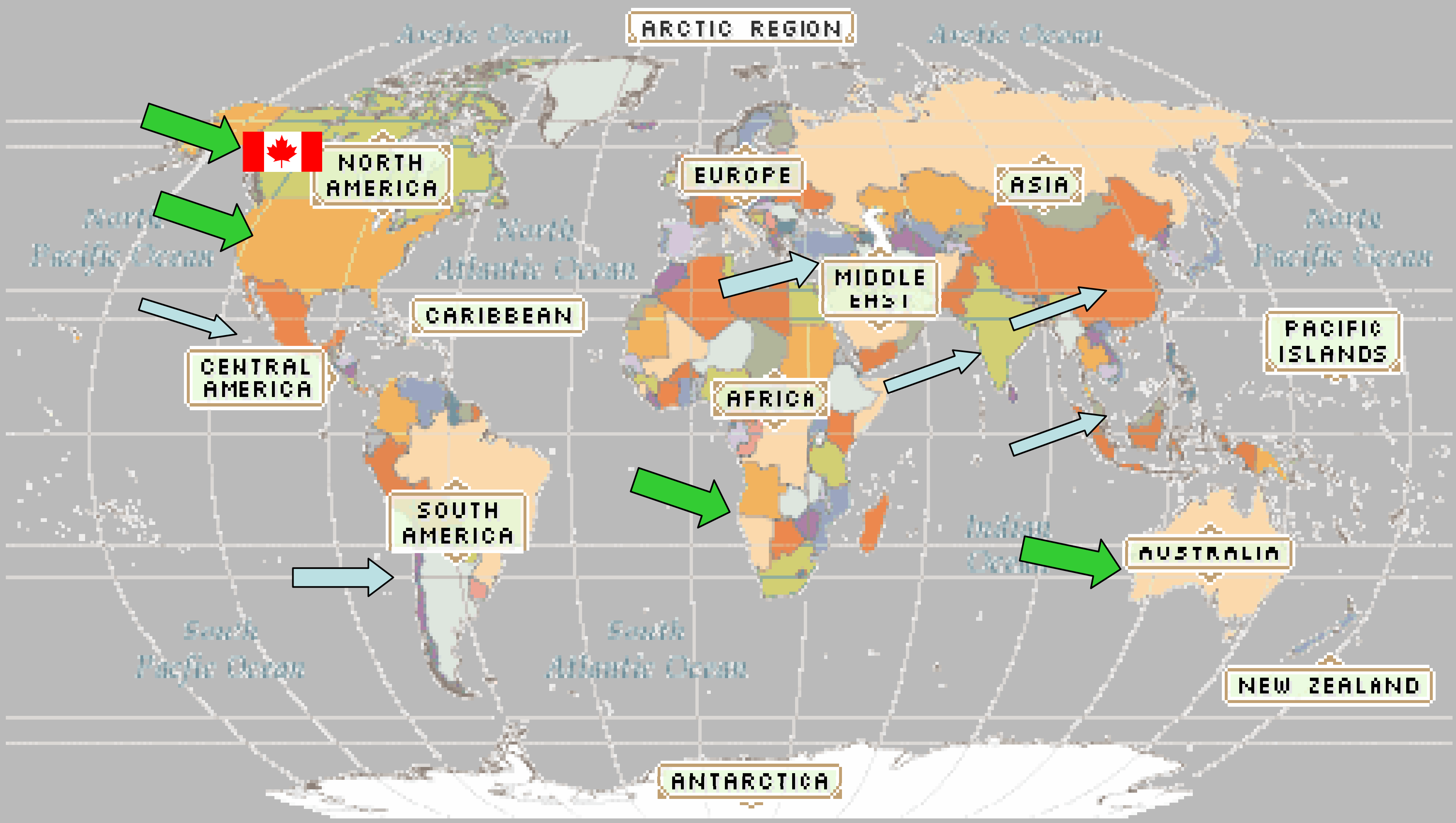


Proven Heavy Load Support Capacity

Earlier Application
Tweedpad, South Africa

High Walls
& High Surcharges

Global Applications



Industrial Applications

Truck Dumps – Demonstration of Load Support

Reinforced Earth Company Ltd.
Oil Sand Experience

- **25 years** in oil sands
- **32 projects** (40 structures) to date
- **various structures & products**
  - TerraClass (precast facing)
  - Terratrel Classic (wire mesh facing)
  - Terratrel Light (wire mesh facing)
  - Terramet (steel facing)
  - TechSpan precast arch

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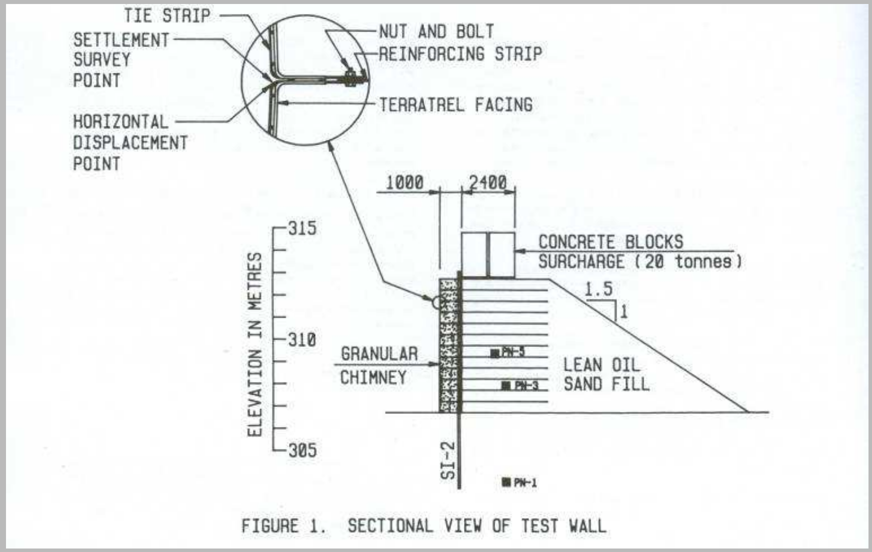
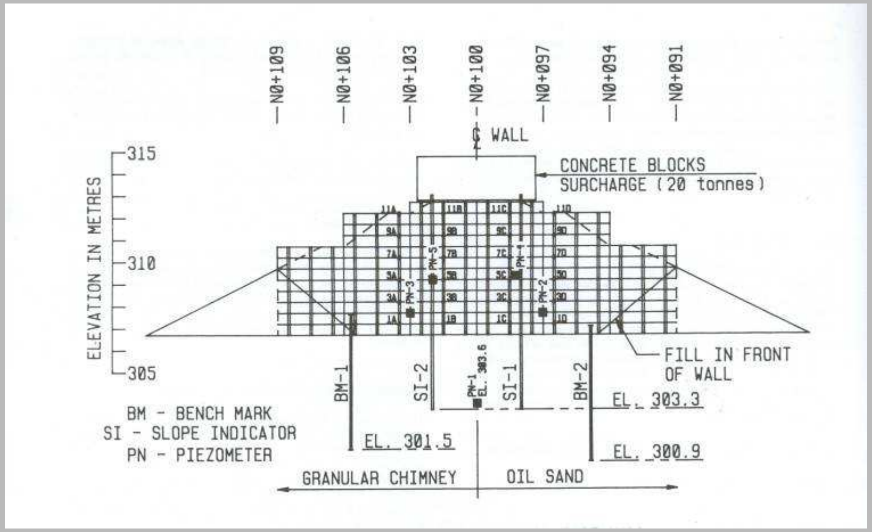
Oil Sands Experience

RECO No.	Project Name	Province	Const Date	Max H	Application
301	Syncrude Truck Dump	Alberta	01-Sep-84	11.0	Truck Dump
344	Syncrude Truck Dump II	Alberta	01-Jun-85	11.0	Truck Dump
868	Syncrude APS III	Alberta	01-Jun-91	14.3	Truck Dump
1241	Suncor APS	Alberta	20-Apr-93	18.0	Truck Dump
1247	Cyclofeeder Wall	Alberta	01-Aug-93	8.9	Retaining Wall
1172	Road Relocation - Syncrude	Alberta	03-Aug-93	11.4	Abutment
1285	Conveyor Walls	Alberta	07-Sep-93	8.5	Retaining Wall
1320	Conveyor Walls 2	Alberta	10-Jan-94	8.5	Retaining Wall
1185	Syncrude TechSpan Wingwalls/CollarWall	Alberta	15-Apr-94	15.2	Arch
1351	Scrubber Building	Alberta	01-Aug-94	15.8	Retaining Wall
1591	Conveyor Walls 3	Alberta	29-Apr-96	8.5	Retaining Wall
1563	Syncrude Surge - North Mine	Alberta	01-Aug-96	15.0	Truck Dump
1539	Syncrude Crusher T01	Alberta	13-May-97	16.5	Truck Dump
1538	Suncor New Mine	Alberta	06-Aug-97	24.5	Truck Dump
1595	Syncrude Crusher T02	Alberta	21-Jul-98	16.5	Retaining Wall
1671	Aurora Mine	Alberta	06-Oct-98	16.0	Retaining Wall
2054	Millenium IPS Walls	Alberta	10-Aug-99	3.7	Retaining Wall
2031	Millenium Bridge Culvert Walls	Alberta	15-Sep-99	14.5	Retaining Wall
2222	Froth Booster Pumphouse Wall	Alberta	05-Jul-00	6.1	Retaining Wall
2109	Muskeg Froth Tank Walls	Alberta	15-Aug-00	8.8	Retaining Wall
1751	Shell Oil Sands (Muskeg)	Alberta	07-Apr-01	19.0	Truck Dump
2651	Tails Pumphouse - Suncor	Alberta	29-Aug-03	4.5	Retaining Wall
2476	Syncrude North Mine APS	Alberta	04-Sep-03	18.7	Truck Dump
2762	Syncrude 9A South Bridge	Alberta	16-Aug-04	10.4	Abutment
2597	Aurora 3 SW Quadrant	Alberta	18-Aug-04	18.0	Truck Dump
2777	Syncrude 10A Bridge	Alberta	23-Aug-04	11.0	Abutment
2763	Syncrude 9A North Bridge	Alberta	22-Sep-04	11.7	Abutment
2851	Suncor Steepbank 2	Alberta	13-May-05	21.0	Truck Dump
2522	Canadian Natural Resources Limited	Alberta	07-Aug-06	19.9	Truck Dump
2865	Muskeg River Crusher	Alberta	07-Nov-07	18.0	Truck Dump
3060	Suncor Bridge Steepbank	Alberta	15-Feb-07	20.0	Hauler Crossing BA
3367	Suncor Plant 300	Alberta	15-Aug-08	10.3	Retaining Wall
	TOTAL 32 Projects		**Cdn. $21 Million**		**86,000m2**

Syncrude APS I
first RE wall used in oil sand mining (1984)

Syncrude APS II (1985)





Syncrude APS III Test Wall Verify the use of Lean Oil Sand & Terratrel Facing

Terratrel Facing & Oil Sands Backfill

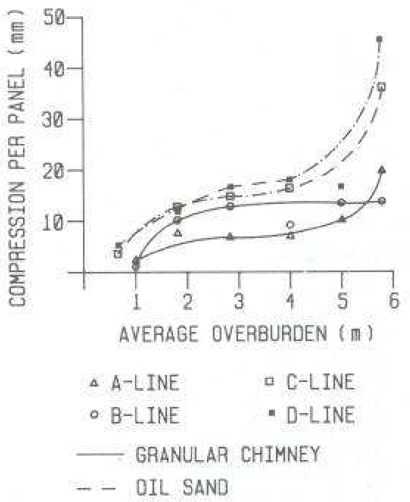


FIGURE 3. COMPRESSION OF 500 mm HIGH PANELS ON TEST WALL

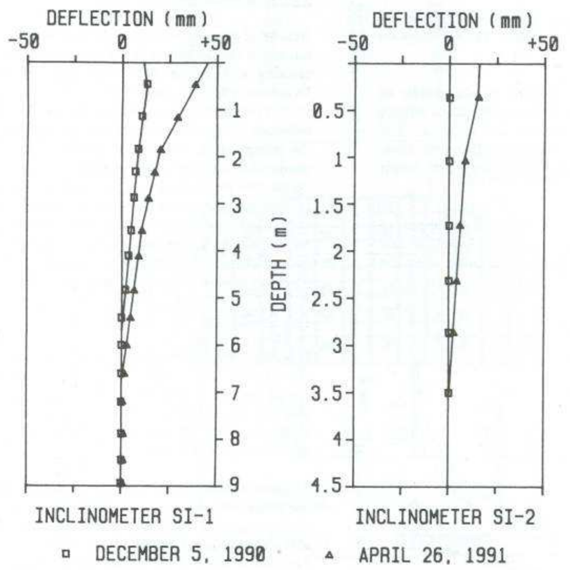


FIGURE 4. TEST WALL INCLINOMETER RESULTS

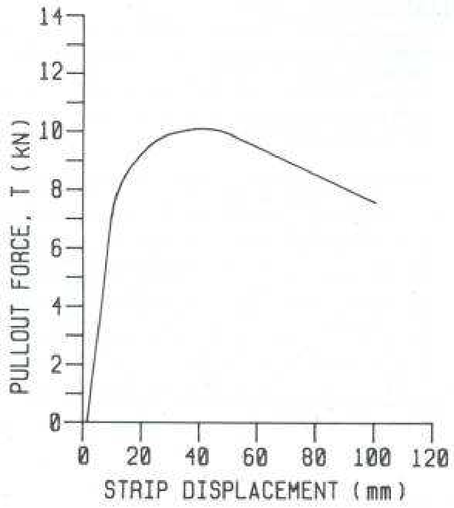


FIGURE 5. TYPICAL PULL-OUT TEST RESULT

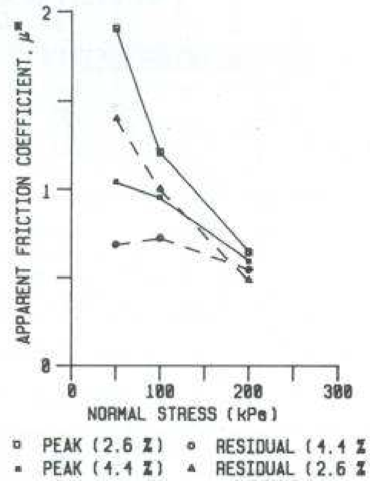


FIGURE 6. FRICTION COEFFICIENT RESULTS FROM PULL-OUT TEST

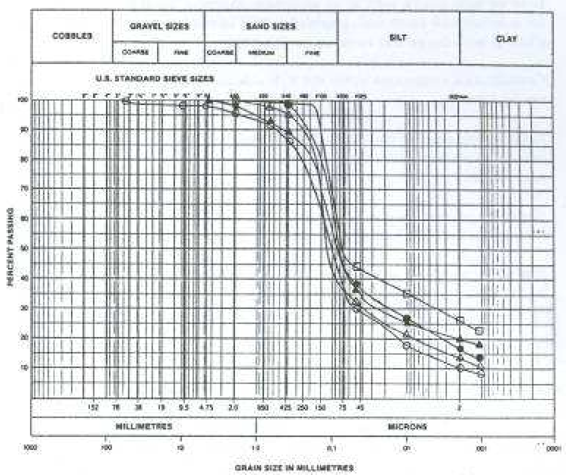


FIGURE 10. GRADATION OF LEAN OIL SAND

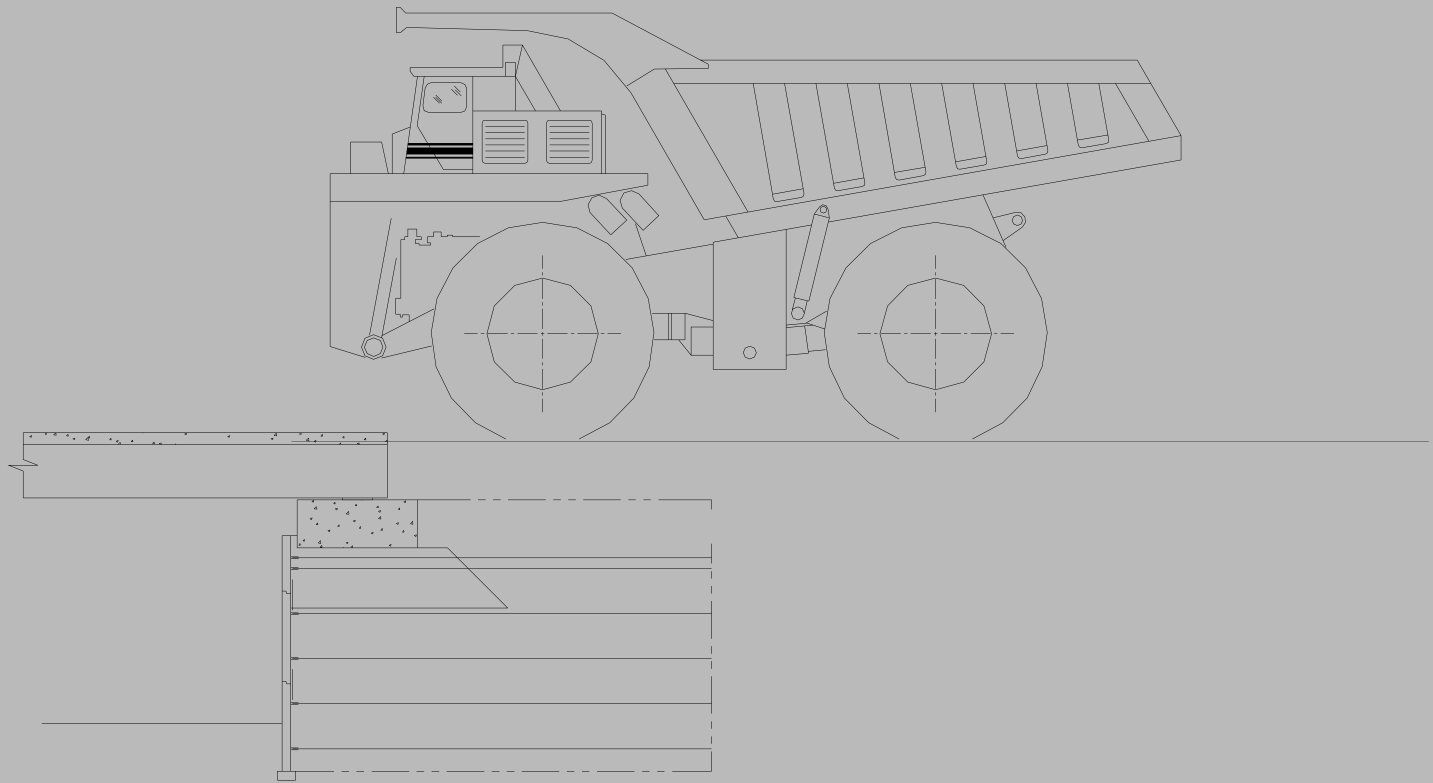
Syncrude APS III Dump Wall
Lean Oil Sand Backfill

Surcharge from 240 tonne Payload

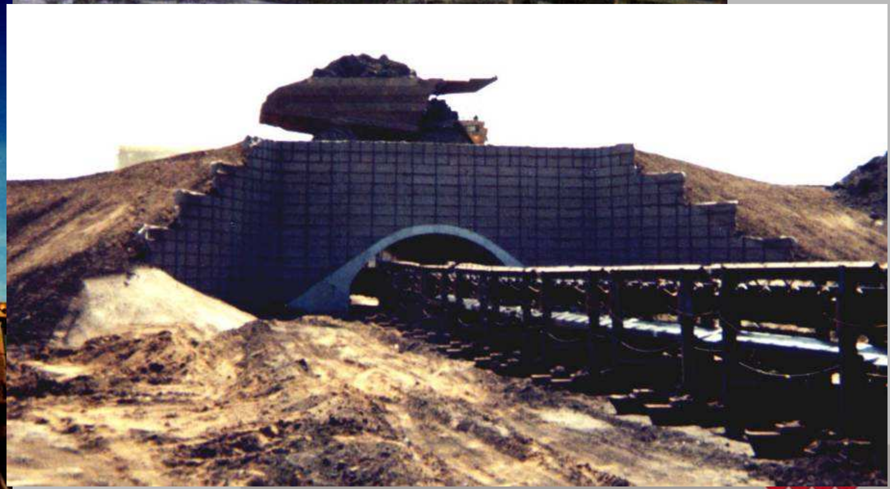
To 380 tonne Payload (Caterpillar 797B)

Mining Truck Drives over Bridge Tunnel

(yes it's drawn to scale !) : 450 Kpa

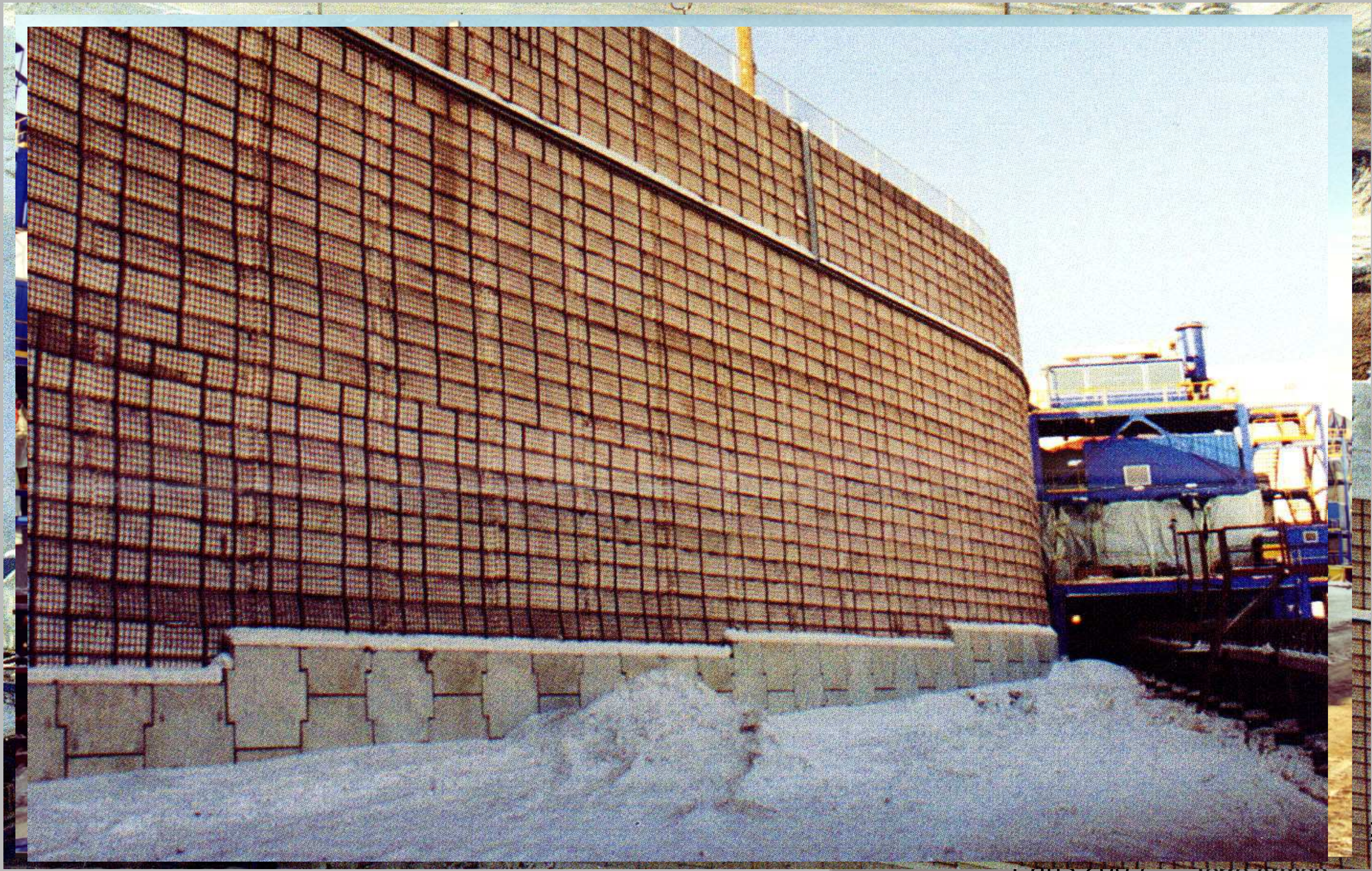


Syncrude Conveyor Overpass No. 1, 2 & 3



Syncrude Cyclofeeder Wall
Terramet Facing

Suncor's First Dump Wall 3,000m2, 18 metre high



Syncrude Twin Conveyor **TechSpan** Arches

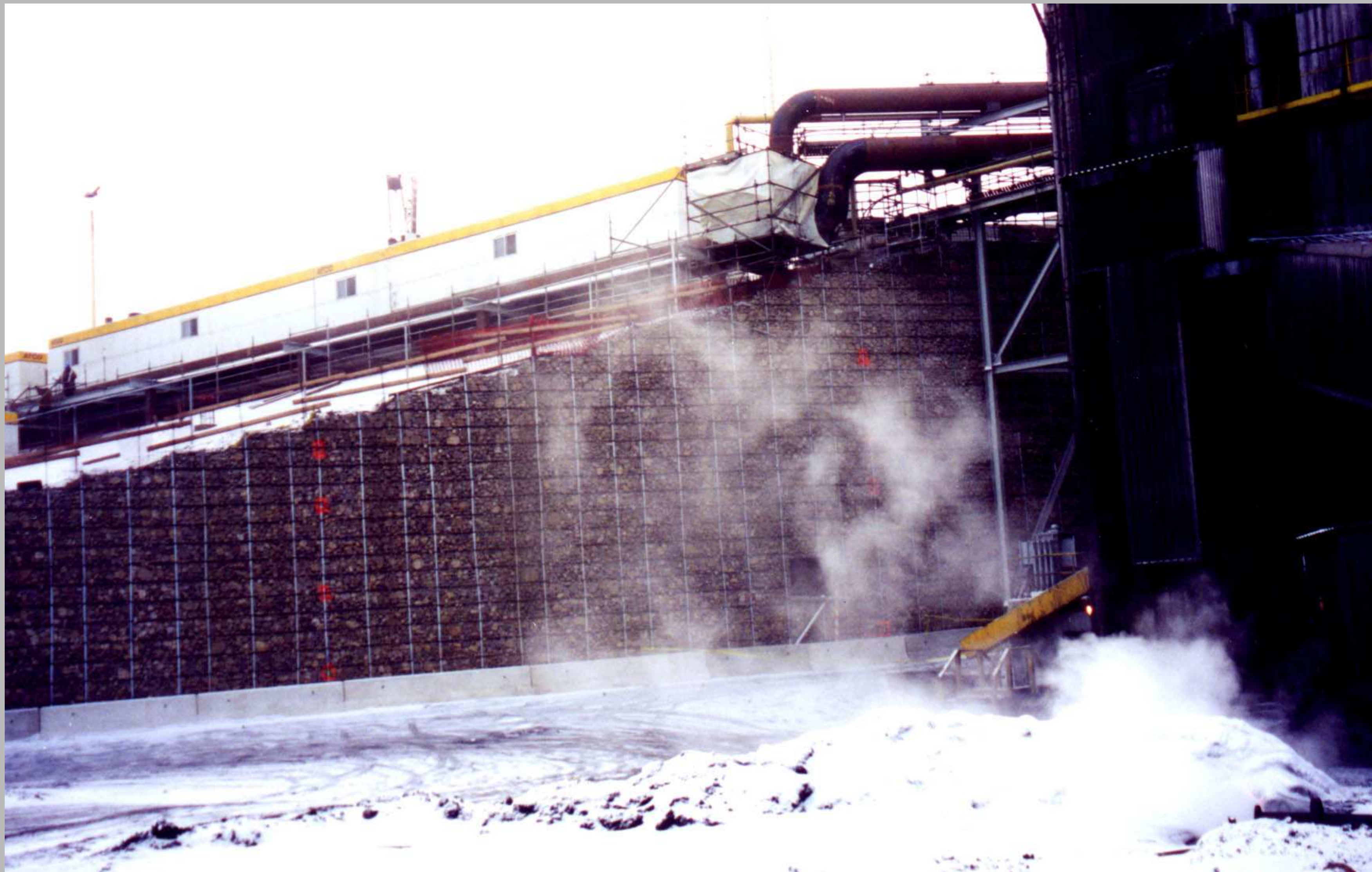
Syncrude Conveyor Underpass During Construction No Interruption to Belt

Inside Syncrude's 14- metre Span TechSpan

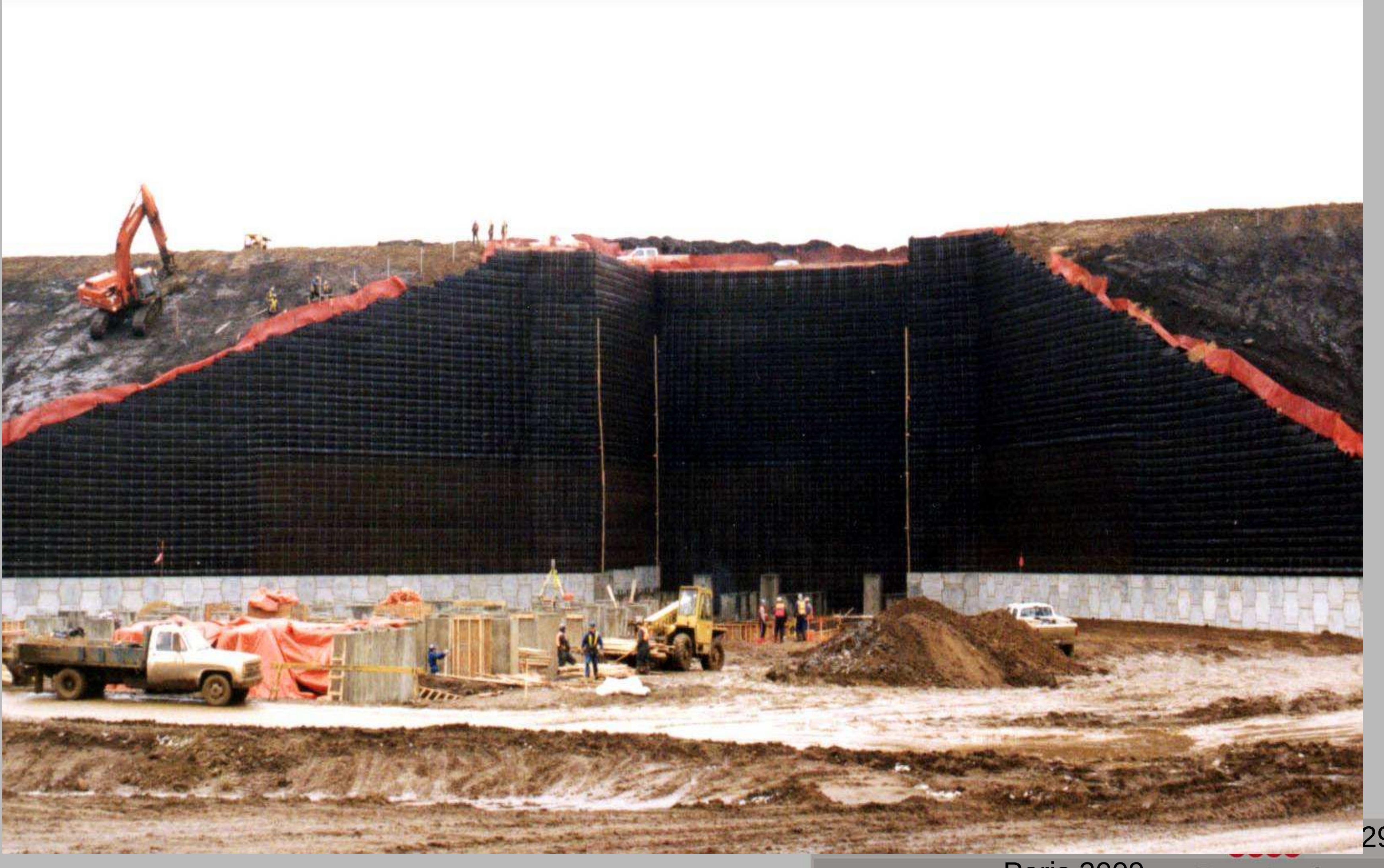
Syncrude Twin Conveyor Underpass with TerraClass Walls

Syncrude Heavy Hauler Underpass / Hwy 63

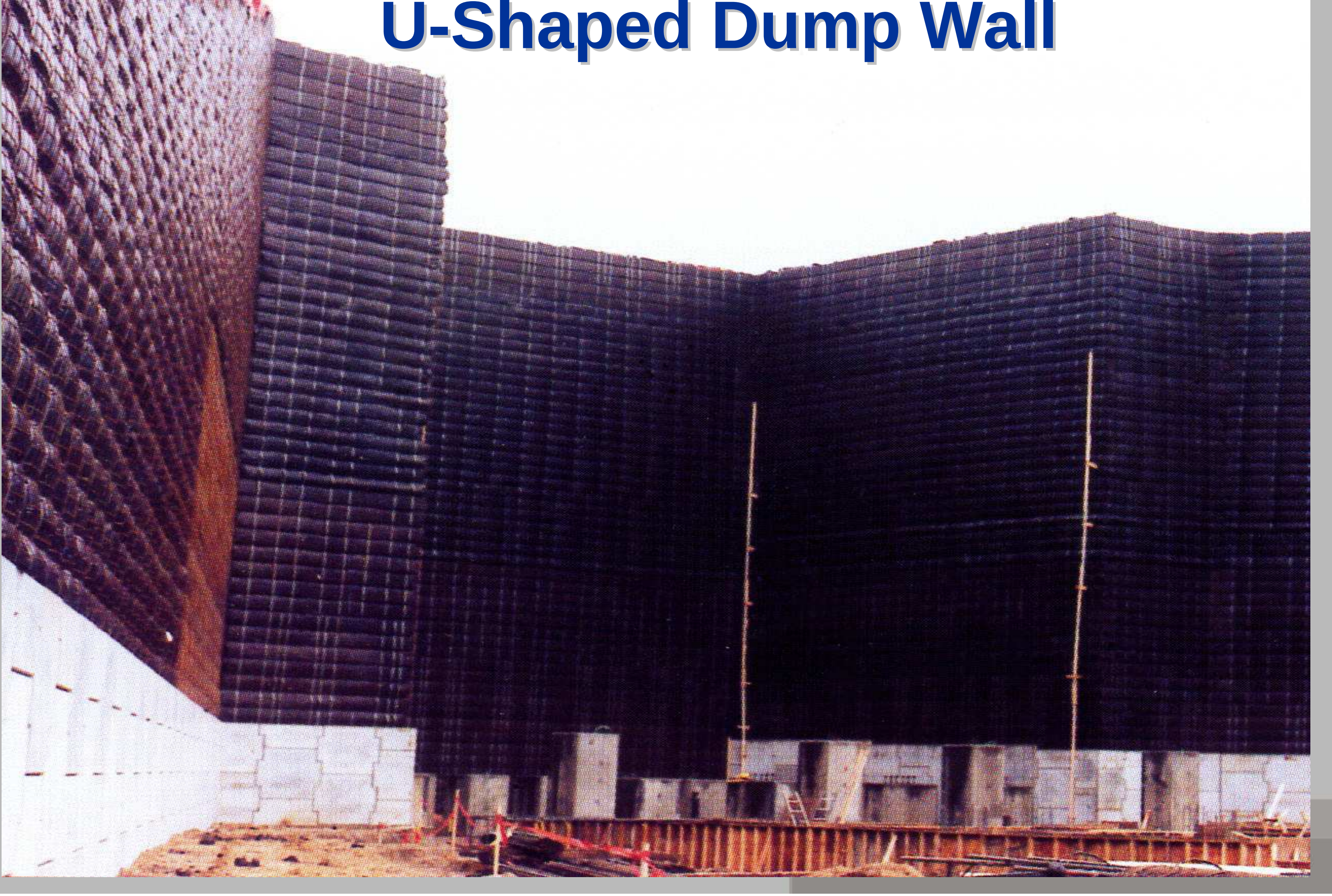
Suncor SO2 Scrubber
Galvanized Terratrel with Lean Oil Sand Fill



Suncor Steepbank Mine



Suncor's Steepbank Mine U-Shaped Dump Wall



Suncor's Steepbank Mine

Highest Terratrel Dump Wall 25m

Syncrude North Mine Surge Facility

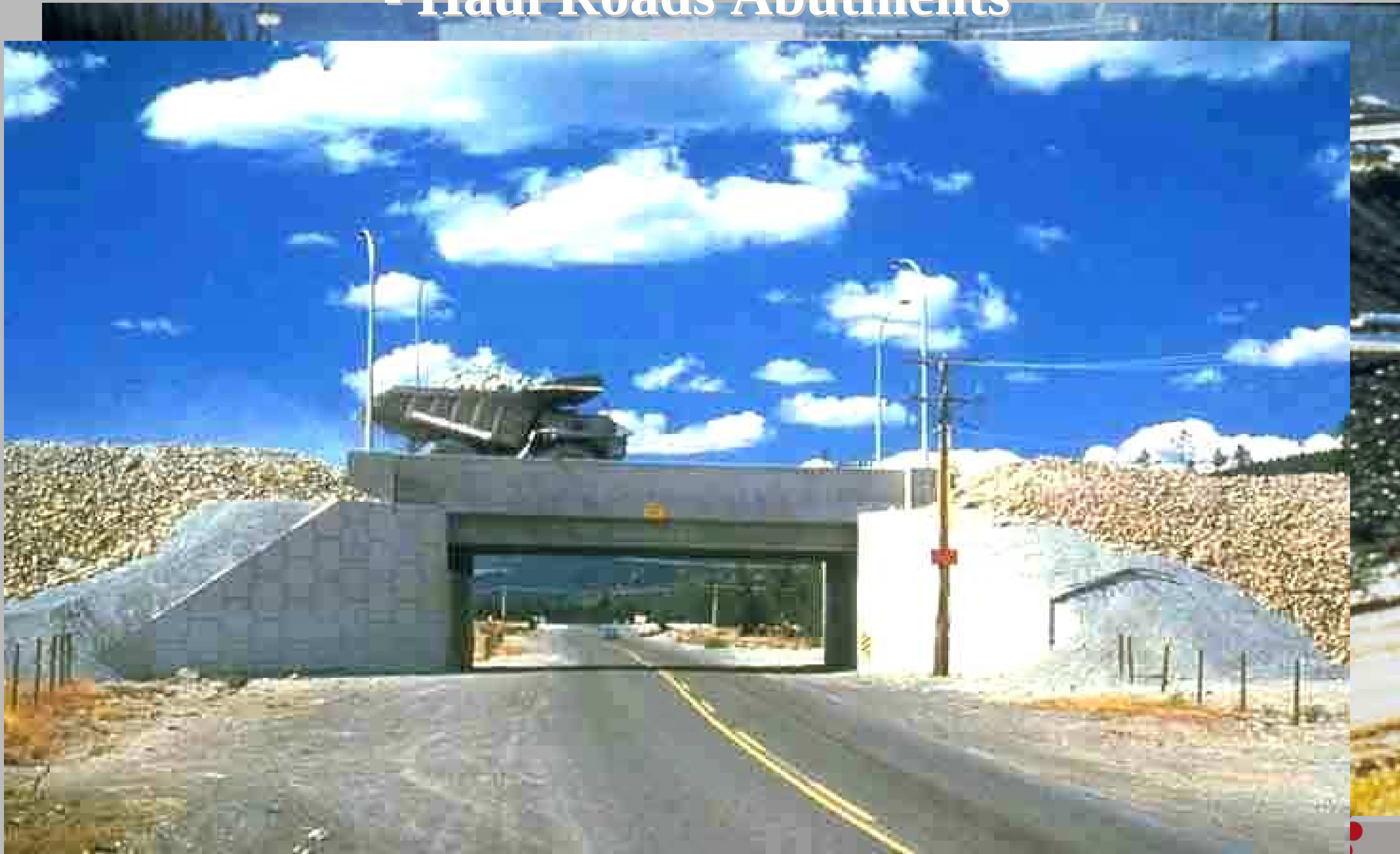
Syncrude North Mine Surge Facility

16m oil sand mobile surcharge on R.E.wall

Syncrude North Mine T-01
Hopper Construction for Twin Dump

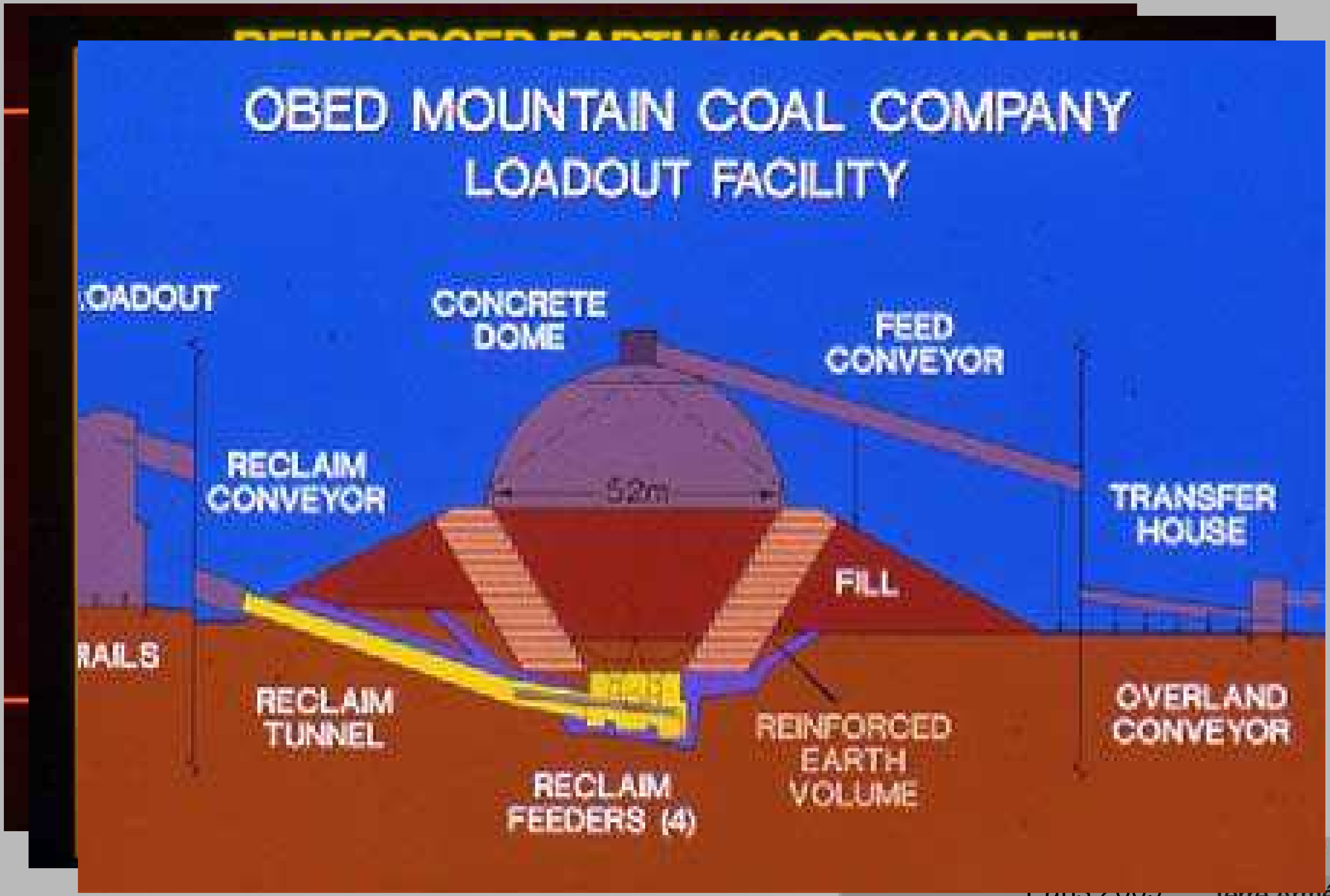
Canadian Natural Resources Limited
Twin Truck Dump

Heavy Surcharge Applications
- Haul Roads Abutments

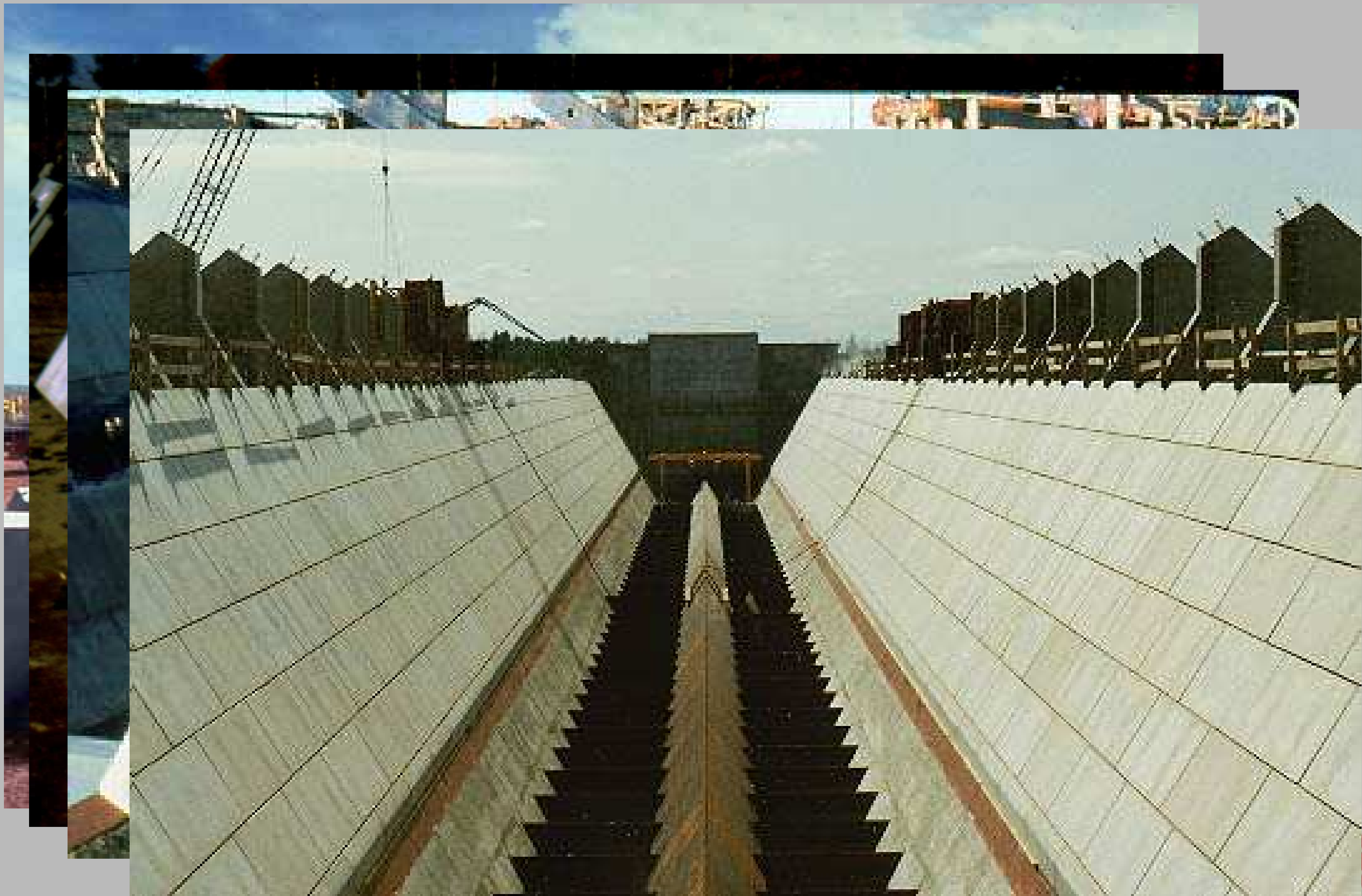


Containment Dikes & Tank Farms

Storage Facility / Sloped-Panel Applications



Storage Facility / Sloped-Panel Applications



Storage Facility Projects

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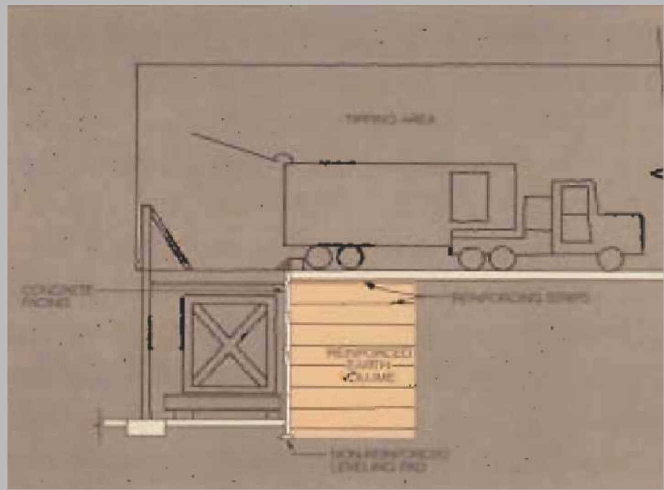
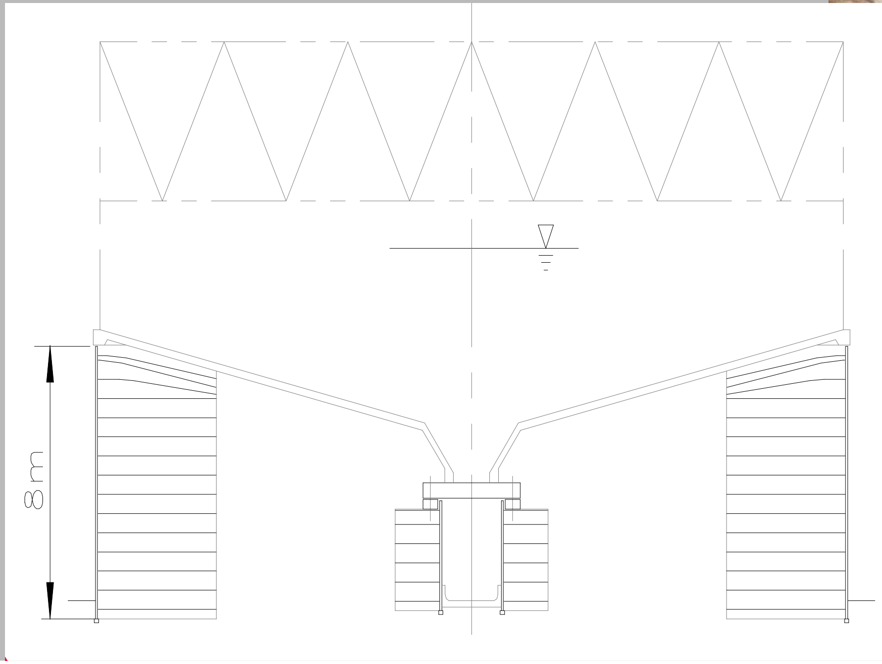
Cordero Mine
Gillette, Wyoming

Storage Projects

Solid Waste Transfer Station



Other Projects
Shell Oil's Froth Tank



Shell Oil's Froth Tank

Other Projects
Georgia Pacific Gypsum Plant– Multiple Applications

A Bridge Crossing for
a Heavy Crawler – 1,354 tonnes, 4.5m wide footing, 500 kPa

Sustainable Technology

The Journey Continues …

Thank you, Merci

Terre Armée