



Equinox Engineering Ltd.

Equinox Engineering Ltd is a world class provider of EPCM services to the global oil and gas marketplace.

Founded in 1997, Equinox has successfully executed over 4,000 significant projects in Canada and around the world.

We have a worldwide presence with offices in Calgary (Canada), Brisbane (Australia) and Mumbai (India) with projects executed in fourteen countries and three continents.

Pipelines Expertise

Equinox has industry leading expertise in engineering design and installation of pipelines and pipeline facilities.

Our services include scoping, routing and conceptual design, Front End Engineering Design (FEED), Detail Design through to construction management and operations support for gas, oil and liquids, water, steam and refined product pipelines.

Our highly skilled, technical team provides expertise in pipeline routing, mechanical design, hydraulic analysis, stress analysis, hydrate control, material selection, civil and earthworks design, crossing designs (HDD), as well as environmental and regulatory compliance.

Our terrain experience includes prairie, foothills, forest, mountains, wetlands, muskeg, rainforest as well as remote, desert climates. Our construction experience ranges from severe, winter weather environments to challenging wet, tropical regions.



Equinox delivers focused and experienced **Premium Teams** customized with the best **Technical Expertise** to align with **Client Culture** to ensure repeatable and **Successful Projects**



Gathering Lines



Trunk Lines



Sales Lines

Pipeline Categories

Equinox has extensive knowledge and expertise in all phases of pipeline system design, material selection and construction. Our experience includes the design and installation of 1000's of kilometers of pipe ranging from 3" to 36" diameter. This includes all types of terrain ranging from hard rock to farmland to forest to muskeg.



COAL SEAM GAS

The gas condition and production requirements of Coal Seam Gas (in Australia) and Coal Bed Methane (in North America) are well known to Equinox. We have extensive experience with development and transportation of these typically low volume, low pressure, sweet gas programs. We have a strong background in the wellsite and gathering infrastructure and compression requirements for large CSG or CBM developments.



NATURAL GAS

Equinox has designed and installed 1000's of kilometers of natural gas pipelines, including sweet and sour, low and high pressure, single and multiphase including gathering lines up to transmission lines. This includes significant experience with unconventional gas gathering and transportation and multi-well pad design and gathering.



ACID GAS

Equinox has extensive experience with high H₂S and CO₂ rates and the unique design and material requirements (as well as regulatory requirements) for acid gas pipelines, acid gas compression and acid gas disposal. We have executed numerous severe service pipelines (with up to 99% acid gas composition) and provide safe, fit-for-purpose designs.

OIL & LIQUIDS

Equinox designs and installs varying diameters of liquids pipelines for crude oil, condensate, ethane, natural gas liquids, diluted bitumen (dilbit) and synthetic bitumen (synbit) in single or multiphase arrangements. We also provide expertise for facilities such as pump stations, terminals, tank farms, blending facilities and truck / rail / barge loading facilities.



STEAM & THERMAL

Equinox is an industry leader in high temperature, above-ground steam and oil emulsion pipelines for SAGD and CSS heavy oil projects. We are experts in the specialized design requirements for high temperature (350°C) pipelines including mechanical design, material specification, hydraulic analysis, stress analysis, expansion loops combined with civil requirements of severe winter and deep muskeg environments.



WATER

Equinox has designed hundreds of kilometers of source water and make-up water, utilized for steam generation for thermal projects, as well as for hydraulic fracturing in unconventional reservoirs. We also specialize in produced water, or flow-back water pipelines (including sour water, oily water, brackish and saline) as well as water treatment, disposal or recycling.



Pipeline Capabilities

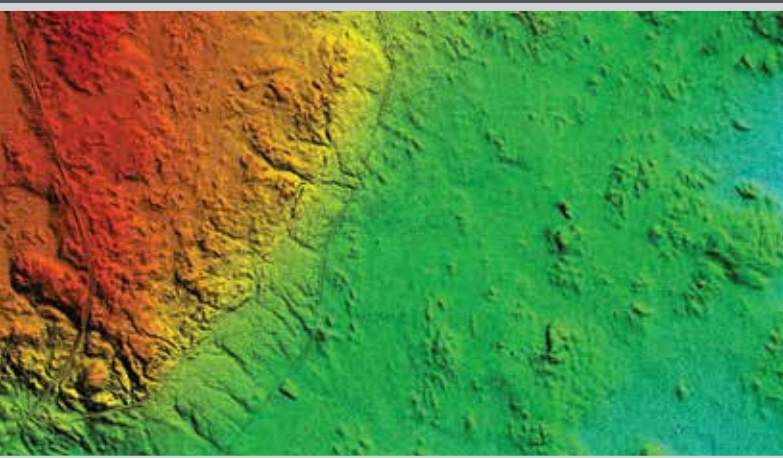
Equinox provides mechanical design and stress engineering expertise for all pipeline requirements. We deliver complete EPCM services with specialization in route selection, geomatics, mechanical design, hydraulic analysis, material selection and stress analysis. Our instrumentation team also provides expertise in communication, control systems, SCADA, leak detection and metering.



ROUTE SELECTION

Equinox provides Route Planning expertise leveraging our knowledge of regulatory requirements as well as pipeline design, construction and operations. We advise and provide numerous services such as:

- Terrain Review
- ROW Access Planning
- Constructability
- Regulatory & Compliance
- Crossing Methodology
- Log Decks
- TWS Requirements
- ROW Reclamation



GEMATICS

Designing, developing and operating systems for collecting and analyzing spatial information regarding a proposed project site/route is an Equinox corporate specialty. Applications include:

- Geographic Information Systems (GIS)
- Global Positioning Systems (GPS)
- Spatial Data Management
- Digital Mapping, Digital Terrain Models & LiDAR
- Automated Pipeline Design (including Alignment Sheet generation using Bluesky Software)
- 3D Laser Scanning



MECHANICAL DESIGN

Equinox's mechanical design team provides expertise in pipeline design, pipeline studies and planning. This includes:

- Crack propagation studies
- Puncture resistance and fracture studies
- Wall thickness calculations
- ROW bend planning
- Corrosion mitigation planning
- Hydrotest section planning
- Pipeline commissioning planning
- Watercourse & 3rd party crossing methodologies

HYDRAULIC ANALYSIS

The Equinox design team specializes in hydraulic analysis and is proficient in selecting the appropriate hydraulic approach based on project priorities. Analysis includes:

- Flow regimes and erosion velocities
- Pump requirements
- Pigging frequency recommendations
- Condensate drop out and sweeping
- Hydrate analysis



MATERIAL SELECTION

Pipeline integrity begins with material selection and the Equinox mechanical design team is adept at choosing the appropriate material for the intended design purpose. In addition to conventional carbon steels, Equinox has experience regarding the following alternate materials:

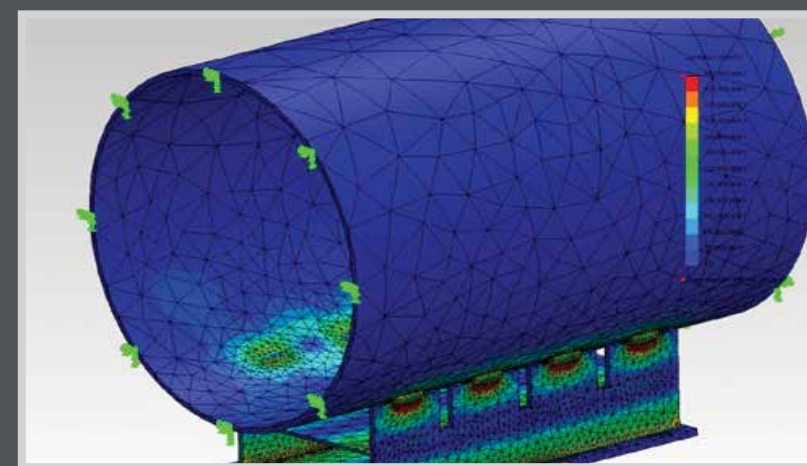
- Fiberspar
- HDPE Pipe
- Flexpipe (reinforced poly)
- Flexsteel
- Fiberglass
- Stainless Steel
- Duplex Pipe



STRESS ANALYSIS

Equinox's design team understands the importance of accurately mitigating stress and thermal loads. We implement design strategies to accommodate expansion and contraction while optimizing capital costs:

- Define stress acceptance levels
- Understand pipeline anchoring philosophy
- Project pipe movements
- Evaluate and mitigate slug analysis
- Provide transient analysis for shut down scenarios
- Utilize proven, innovative shoe designs



Selected Projects



SOUTH PEACE PIPELINE

This South Peace Pipeline is a 92 km x 20" sour gas pipeline in northern British Columbia, Canada. The scope includes thirteen Line Block Valve stations, ESD valves, smart pigging facilities, complete SCADA design, receipt point water analyzers and H₂S & CO₂ measurement.

The pipeline route runs through agricultural and forested terrain, as well as wetlands and deep muskeg requiring extensive buoyancy control. In addition, several sections run through regions of rocky, hilly terrain. The route includes four (4) major river crossings, three (3) Horizontal Directional Drills (HDD), twenty-five additional watercourse crossings, two (2) rail crossings and highway crossing of the Hart Highway.

The project was executed with the engineering cost being under budget and the project finishing two months ahead of schedule.



SOUTH MONTNEY Sour Gas Pipeline

This program included design and construction of several sour gas trunklines and lateral pipelines installed to connect 25 unconventional multiwell pad locations to a central gas processing plant in northern Canada.

The project includes 70 km of 16" sour gas gathering trunklines (sized for a capacity of 360 MMscfd), 46 km of 4" lined produced water gathering, and 60 km of fuel gas supply lines. Gathering Lines (laterals) include 10" sour gas, 3" water and 3" fuel gas. In total, the project consists of over 425 km of pipelines installed, with ten major river / creek crossings, Horizontal Directional Drills (HDD), ESD stations, smart pigging facilities and complete SCADA.

Notable features include multiple lines in common trench construction. Logistical challenges included working in remote, northern muskeg regions with severe winter weather construction environments.

PRIMROSE PIPELINES

Oil Emulsion & Steam Flowlines

The Primrose thermal pipeline development program is for bitumen transportation in northern Canada. Projects involve over 40 kilometers of high temperature, above ground pipelines – including trunklines, laterals and valve stations to provide transportation and gathering from numerous Cyclical Steam Stimulation (CSS) wellpads to three Central Processing Facilities.

Steam pipeline diameters are typically 24" (grade 550) for trunklines and 16" (grade 448) for laterals. Oil (bitumen) emulsion pipeline diameters are typically 24" for trunklines and 16" for laterals (grade 359). Fuel gas distribution pipelines are mainly 3" pipelines.



STANLEY TO KIUNGA Condensate Pipelines & Terminal

The 40 km x 6" pipeline transports 5,800 bpd of condensate from the Stanley Gas Plant to the Kiunga Terminal routed through dense, jungle terrain in an active seismic (earthquake) zone.

The Kiunga Terminal includes a 75,000 bbl floating roof condensate storage tank with two centrifugal condensate loading pumps and a connecting 2 km x 12" condensate pipeline that delivers up to 88,000 bpd from the terminal to the Fly River Barge Loading Facility.



SALESKI TO NIPISI Dilbit Pipeline

The 157 km x 16" Diluted Bitumen pipeline has a capacity of 42,000 bpd. This FEED study focuses on the pipeline routing, engineering design and capital cost estimate for this NPS 16, grade 448 carbon steel, externally coated, buried pipeline. It includes facilities at Saleski inlet (rough diluent blending, metering and pumping facilities) and the Nipisi Terminal (trim diluent blending, condensate storage and metering facilities).





Pipeline Facilities Gas

- Compression
- Line Block Valves
- Pigging Facilities
- Slug Catchers

Equinox capabilities include the design and installation of gas pipeline field facilities such as pigging facilities, slug catchers, ESD stations, Line Block Valves, risers, meter stations as well as delivery and receipt point analyzers.

Our extensive gas compression experience includes centrifugal, reciprocating, rotary screw and vane type compressors, with gas turbine, natural gas engine, steam turbine and electric drivers.



Pipeline Facilities Liquids

- Pump Stations
- Truck / Rail Loading
- Terminals
- Tank Farms
- Batching, Blending
- Measurements



Equinox specializes in liquids pipeline facilities design and construction for crude oil, condensate, diluted bitumen, ethane, LPG and refined products.

Our technical team provides complete design and construction solutions for pump stations, terminals, storage facilities and tank farms, batching and blending facilities, measurement and metering as well as truck loading, rail loading and barge loading operations.





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