

# ENGINEERING

## *Surerus Murphy has Invested in a World-Class Roster of Engineering and Technical Talent;*

*People who bring technical skill sets to construction projects and who look at a project holistically to perform safe, high-quality work for clients and find efficiencies in the process.*

### **SURERUS MURPHY ENGINEERS ARE KNOWLEDGEABLE IN THE APPLICATION AND USE OF SPECIALIZED EQUIPMENT:**

- Engineers use the latest technology to offer safe, efficient and high-quality construction solutions for all areas, and including steep slopes, congested urban areas and complex crossings.
- Engineers actively participate in steering groups with clients to develop industry-leading best practice and construction plans.
- Many engineers have drone pilot certificates to operate drones, which gather real-time, as-built field data to monitor active construction and inform future decisions.
- Engineers bring a wealth of experience working to the highest technical standards in some of the most difficult terrain environments and weather conditions in Canada and around the globe.

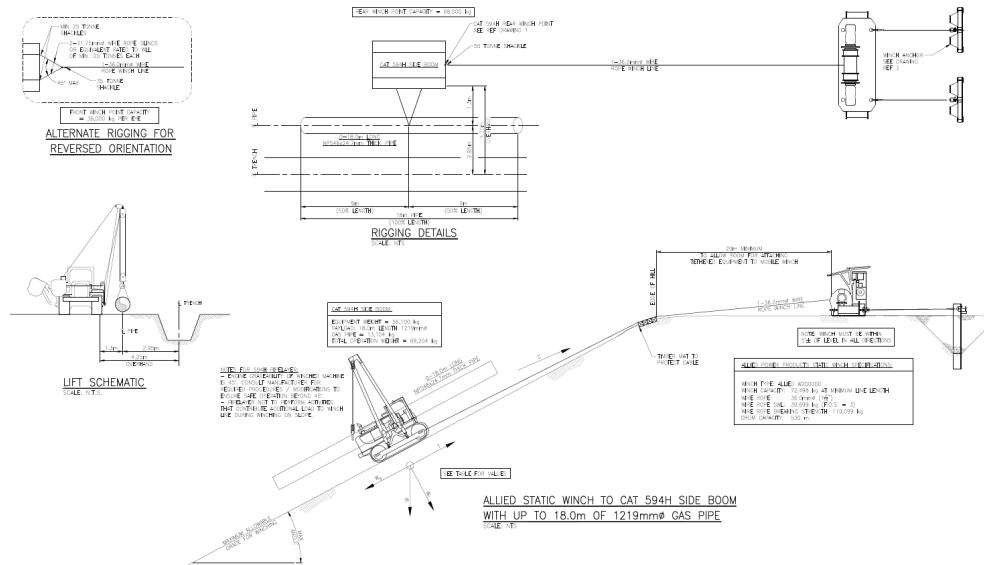
### **ENGINEERS BY THE NUMBERS:**

- 30+ full-time Surerus Murphy employees, engineers, engineers-in-training, engineering technologists and surveyors are working on pipeline and other construction projects throughout western Canada.
- Typical pipeline projects are staffed by a lead engineer, 2-3 project engineers and a CAD technologist, with additional engineering staff according to the scope of work.
- Up to 15 certified drone pilots amongst the engineering and survey team, including dedicated drone pilots according to project needs.





## EXAMPLE: STEEP SLOPE DESIGN CALCULATIONS



## DRIVING EFFICIENCY THROUGH INNOVATION AND INVESTMENT:

### • In-house engineering expertise in steep slope construction:

- Building pipelines in western Canada's beautiful, mountainous landscape demands skill and knowledge to safely plan and install pipe at extreme angles and hazardous slopes
- Surerus Murphy engineers develop hazardous slope execution plans based on calculations that verify equipment lifting capacity, traction factors, and winching requirements for each slope
- Surerus Murphy engineers perform calculations and evaluate data that is correlated to real-world test. In this way we ensure hazardous slope activities are planned and executed to the highest safety standards

### • Surerus Murphy engineers have developed equipment innovations, and ensured appropriate compliance and necessary certification of the innovations, to improve the safety and efficiency of site-specific tasks:

- Equipment such as our winches are upgraded, tested, and regularly inspected for use applications
- Steep slope equipment has custom-engineered anchor points for winching activities in mountainous terrain
- Bespoke designs for winching scenarios are reviewed, evaluated by third-party experts, tested, and re-tested to validate engineering designs

### • Drones provide real-time video, photogrammetry, and LiDAR data to monitor construction and support design planning:

- Engineers and technicians fly drones over a project site at regular intervals to capture data that yields information to the project team and client
- Data is processed in-house to feed business intelligence tools that increase efficiencies, lower project costs and improve safety
- Photogrammetry provides the capability for survey-grade data acquisition, allowing for surface modelling that generates a fine level of detail of existing and as-built terrain
- Combining the digital terrain models with the GPS capabilities installed on the equipment fleet enable engineers to ensure the optimal grade and ditch design is followed in the field, improving productivity and contributing industry leading reduction in caliper indications

### • Problem-solving for clients:

- Surerus Murphy engineers interpret the project owner's design and ensure the work on the ground is compliant with the design's intent.
- Design issues including those associated with slope stability, environmental sensitivities, stress restrictions on pipe, changes in pipe geometry, discrepancies in drawings, etc., can arise – these issues require solutions in a matter of days, not weeks or months to ensure project efficiency is maintained

# Stories from the Field

## **ENGINEERS WITH GLOBAL EXPERIENCE ASSIST IN PRODUCING CRITICAL PLANS IN LIMITED TIME TO ENSURE PROJECTS STAY ON SCHEDULE**

On the Coastal GasLink Project, Surerus Murphy's engineering team had just 10 days to produce environmental mitigation plans for its crews conducting the stripping, grading and pipe stringing that were more robust than what the client design team had initially proposed. Surerus Murphy's engineers used in-house CAD capabilities, informed by real-time field data collected by company drones and GIS-enabled equipment to assist the environmental team in producing new plans. It was Surerus Murphy's global engineering expertise and investment in critical technologies that allowed the project team to address this challenge quickly and efficiently.

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## **APPLIED SCIENCE SOLVE AN ENGINEERING CONUNDRUM AND SAVES MONEY**

In the summer of 2021, Surerus Murphy's team on the Coastal GasLink project scrutinized the client's entry pit shoring design for a Direct Pipe Install (DPI) crossing of the Burnt River. It called for a 1.5m-deep concrete plug in the base of the entry pit for the expected hydrostatic conditions; the client wanted the entry angle and entry point as low as possible to avoid the need for cranes. This approach would have required 30,000 cubic metres of graded surface material and sourcing concrete from 2.5 hours away. Surerus Murphy's engineering team calculated that by increasing the elevation of the launch point and moving it back from the water table, the pipe could be installed using side booms without the expense of bringing in cranes or the need for the concrete plug. In all, engineers saved the client approximately \$750,000 on just this one design change.

## **GLOBAL TALENT SUPPORTS LOCAL CHALLENGES**

At Jacko Lake, a \$250M sub-section within Spread 5A of the \$1B Trans Mountain Expansion Project, Surerus Murphy engineers were tasked with figuring out how to install a 36-in. pipe within a series of 2m-wide tunnels totalling 4.2km in length and featuring horizontal and vertical curves. The Canadian team consulted with Murphy Group's global engineering expertise for pipe installation techniques that address the challenging characteristics without placing excessive force on the pipe.

On the Coastal GasLink Project, Surerus Murphy's engineering team was preparing the lowering-in plan and had many discussions with the client regarding stress caused to the pipe and changes to pipe geometry during the lowering-in process. Surerus Murphy's team felt that a more efficient plan than that provided by a third-party contracted by the client was possible without adversely affecting pipe integrity or crew safety. Surerus Murphy accessed Murphy Group expertise to rerun the analysis, enabling them to propose a less costly approach that didn't require as many sidebooms. This resulted in significant savings and Coastal GasLink was appreciative of Surerus Murphy's collaborative but insistent challenging of the design assumptions.

Surerus Murphy Joint Venture's in-house engineering talent is just one way the organization demonstrates its commitment to being the contractor of choice for its people and its clients by delivering safe and quality work. Surerus Murphy's shared values: "Never Harm. Trust. Integrity and Assured Delivery." make the organization a staple in the pipeline industry and in every community in which it works.

"We work with the project owner's Engineer of Record to inform solutions, because ultimately, we're the ones building it."

**Bill Gavinchuk, Surerus Murphy  
Project Engineering Lead**

## **OUR ENGINEERING EXPERTISE IS A TECHNICAL BENEFIT WE PASS ON TO OUR CLIENTS:**

Surerus Murphy engineers work collaboratively with project owner Engineers of Record (EOR) by testing assumptions with real-time field data, and support EORs in developing and evaluating alternate designs or strategies that remain compliant and can be implemented effectively. Surerus Murphy's values: Never Harm, Trust, Integrity and Assured Delivery make the organization a staple in the pipeline industry and in every community in which it works.



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