



Dave Rogstad
PRESIDENT & CEO

# Our goal is to be the industry's best source and best value for complete turn-key construction services and related products.

The safety of our employees, clients, and project environments is our foremost priority. We strive to exhibit a high level of corporate responsibility by being actively engaged in the support of the community. Our mission is supported by these core values: Zero Accidents; Best People; Technical Leadership; Communication; Financial Success; Sustainable/Responsible Business.

#### A TRADITION OF EXCELLENCE

Frontier-Kemper Constructors, Inc. (FKCI) is widely recognized as a leader in underground and heavy civil construction. With more than \$3.1 billion in projects successfully completed throughout the Americas, we are known for our expertise in the engineering and construction of deep shafts and tunnels of all sizes and complexity.

FKCI provides a wide range of construction services and related manufactured products. We build tunnels for highways, railroads, subways, and rapid transit systems. We construct tunnels, shafts, and other facilities for water supply and wastewater transport. We develop and equip underground mines for coal, salt, copper, gold, and other minerals. Our FKC-Lake Shore Division designs and installs innovative Hoisting, Elevator, And Vertical Conveyance Systems.

#### A RECORD OF ACHIEVEMENT

FKCI has completed more than 475 construction contracts involving nearly 120 miles of tunnels and slopes and 37 miles of vertical shafts.

Our core workforce consists of 85 executive, managerial, and professional employees; including Professional Engineers, registered in more than 20 states, with another 100 Field Engineers, Superintendents, Project Managers, and specialized staff for machinery installation work. Frontier-Kemper's clients can be confident in knowing that their projects are in the hands of capable people who are committed to the highest quality work, the highest safety standards, and full performance of contract commitments.

2018 EMR: 0.99

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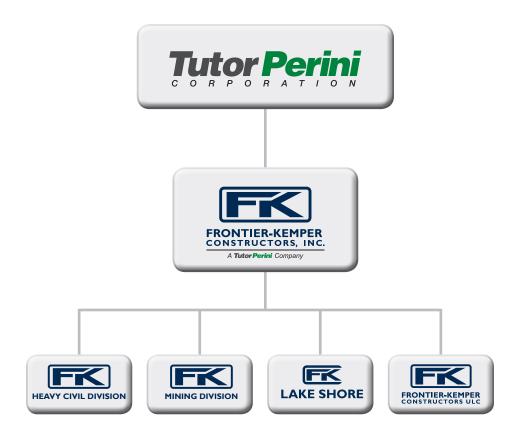
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On June 1, 2011, Tutor Perini Corporation acquired 100% of the stock of Frontier-Kemper Constructors, Inc. from Deilmann Haniel International Mining and Tunneling GmbH. Tutor Perini, headquartered in Sylmar, California, is a leading civil and building construction company offering diversified general contracting and design/build services to private clients and public agencies throughout the world. Tutor Perini has provided construction services since 1894 and had \$4.7 billion in revenue in 2017. Frontier-Kemper is a wholly-owned subsidiary of Tutor Perini Corporation.







## **GLOBAL REACH**

### **CIVIL CONSTRUCTION MARKETS**

- o CSO-Combined Sewer Overflow
- Environment
- Mine Development
- o Power/Hydroelectric
- Transportation
- Wastewater
- Water

### MINE DEVELOPMENT MARKETS

- Coal
- o Copper
- Gold
- Potash
- Salt
- o Silver
- Heavy Civil Underground

### **FKC-LAKE SHORE MARKETS**

- Commercial/Industrial
- Construction
- o Heavy Civil Underground
- o Mining-Underground & Open Pit





Dave Rogstad
PRESIDENT & CEO



Steve Redmond
VP of CIVIL CONSTRUCTION



Dana Markee CHIEF FINANCIAL OFFICER



**Don Ackerman**VP & CHIEF ESTIMATOR

## **UNIT MANAGERS & OPERATIONAL SUPPORT**

Christine Linden: Engineering Manager Dana Markee: Chief Financial Officer

Jim McMahon: General Manager, FKC-Lake Shore

Kevin Smyth: General Manager, Equipment & Shop Services

**Kyle Wooton:** Mine Division General Manager

Phillip Kittinger: Safety Manager

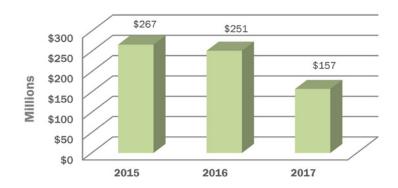
Robyn Taylor: Human Resources Manager

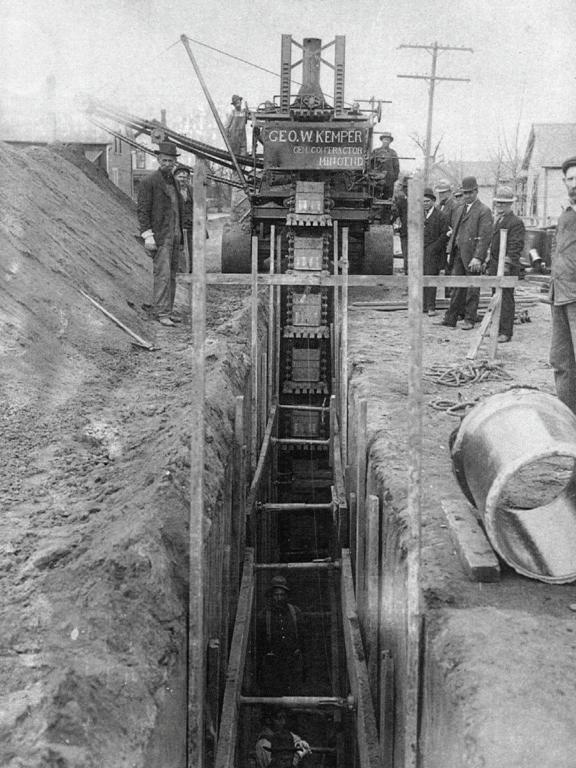
Stephen Horning: Controller

Steve Redmond: VP of Civil Construction



## **ANNUAL REVENUE**







From left: Bruce Kemper, George Kemper, & Maxwell Kemper

Forged at the turn of the century in North Dakota, the George F. Kemper Construction Company built railway grades and bridges for the Northern Pacific Railway.

With the completion of the railway, the business moved to newly developing southern California where George's son, Maxwell F. Kemper, and grandson, R. Bruce Kemper, built a solid reputation in tunneling and tunnel lining.



Kemper Construction Company's steam shovel in the early 1900's.



From left: Dyke Howell & Dan McFadden

Frontier Constructors, a mining contractor based in Colorado, was established in 1965. Kemper Construction joined Frontier Constructors to form Frontier-Kemper Constructors in 1971.

Frontier-Kemper later established its headquarters and shop facilities in Evansville, Indiana-strategically located to serve the Midwestern and Appalachian coalfields.







1907 **Kemper Construction** is established.



1965 **Frontier Constructors** is established.

1971 Frontier-Kemper Constructors is formed.



Dan McFadden & Dyke Howell standing on 1 of 3 flumes built on the High Line Canal to replace those destroyed by the Platte River flood in 1965.



In 1979, Frontier-Kemper became affiliated through share ownership with Deilmann-Haniel GmbH of Dortmund, Germany—a respected company with more than 130 years of significant accomplishments in the mine construction and equipment fields.

In 1988, FKCI became affiliated through share ownership with Wayss & Freytag—an international tunneling contractor with extensive expertise in soft ground TBM tunneling. In 1999, Wayss & Freytag transferred ownership to HBG (a holding company for W&F).

After its merger with the Heitkamp Group in 1989, the Heitkamp-Deilmann-Haniel

Group comprised one of the largest and most respected mining, tunneling, civil and industrial construction contractors in Europe.

In 2001, Frontier-Kemper expanded its engineered machinery and equipment capabilities by forming the FKC-Lake Shore Division and acquiring the hoisting machinery assets of Lake Shore Mining from the Oldenburg Group.

In 2002, the Heitkamp-Deilmann-Haniel Group acquired HBG's (W&F) shares in Frontier-Kemper; making FKCI a whollyowned subsidiary of HDH.

 $\Lambda$  ATON GMBH



2006

Heitkamp-Haniel Group sold 51% to ATON GmbH. 2007

ATON GmbH becomes sole owner of DHI Group. 2011

Tutor Perini acquired 100% ownership of FKCI.

In 2006, the Heitkamp-Deilmann-Haniel Group sold 51% of its ownership in six subsidiaries to privately-owned German investment company ATON GmbH.

In 2007, ATON GmbH acquired the remaining 49% interest held by Heitkamp-Deilmann-Haniel-making Aton the sole owner and shareholder of the DHI Group, Deilmann-Haniel International Mining and Tunneling GmbH.

In June 2011, Tutor Perini Corporation acquired 100% ownership of Frontier-Kemper. Tutor Perini is a leading civil and building construction company offering diversified general contracting and design/ build services to private clients and public agencies throughout the world. Tutor Perini has provided construction services since 1894 and is headquartered in Sylmar, CA.



TBM TUNNELING
DRILL & BLAST TUNNELING
REHABILITATION & MAINTENANCE
TECHNICAL SERVICES

At Frontier-Kemper we offer many services through our broad range of Civil Construction expertise. We specialize in the construction of tunnels and other underground spaces while offering expertise associated with transit and sewer systems. Frontier-Kemper has also played a significant role in major highway, power plant, dam, and design/build projects across North America.



FRONTIER-KEMPER CONSTRUCTORS, INC.

A **Tutor Perini** Compan

## **SERVICES**

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## **HEADOUARTERS OFFICE**

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SEATTLE, WA: 21-ft. diameter TBM pushes through the southbound wall of the University Link Light Rail Extension. [project on pg. 33]



- Hard Rock TBM
- Mixed Face TBM
- EPB (Earth Pressure Balanced) TBM
- Slurry Shield TBM

Frontier-Kemper has constructed more than 70 tunnels across North America using hard-rock and soft-ground Tunnel-Boring Machines, Road Headers, Shields, and other methods.



QUEENS, NY: Transportation tunnel excavated with Slurry Shield TBMs. [project on pg. 35]



## **DRILL & BLAST TUNNELING**

At FKCI we are skilled at conventional Drilland-Blast excavation as well as the Shotcrete Method (also known as the Seguential Excavation Method or New Austrian Tunneling Method).

Highway Tunnels are often large in crosssection and require conventional Drilland-Blast excavation methods. Frontier-Kemper led the joint venture projects on the Hanging Lake Tunnels on I-70 in Glenwood Springs, Colorado, the Haiku Approach & Tunnels on Hawaii's H3, and the Silver Cliff Tunnels on the shore of Lake Superior in Wisconsin.



GLENWOOD SPRINGS, CO: Drill-and-Blast excavation method used to construct the Hanging Lakes Highway Tunnels on I-70 in Colorado.



TRAIL, BC: Formwork for the final concrete lining of a Drill-and-Blast Penstock Tunnel at the Waneta Dam Tunnels project. [project on pg. 39]



# TECHNICAL SERVICES

In support of our primary role as a heavy construction contractor, Frontier-Kemper also provides owners and partners with complete engineering and design services for underground excavation.

- Engineering Services
- · Electrical Services
- Shop & Yard Services





# **REHABILITATION & MAINTENANCE**

Frontier-Kemper is experienced in performing both new and rehabilitation work as well as maintenance projects. Notable projects include the rehabilitation of the Delaware and New Croton Aqueducts in New York.



BRONX, NY: Maintenance work being performed in the New Croton Aqueduct. [project on pg. 37]



## **CHINATOWN STATION EXCAVATION**

LOCATION: SAN FRANCISCO, CA MARKET: TRANSPORTATION

OWNER: CITY AND COUNTY OF SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.



Chinatown Station is one (1) of three (3) underground stations being constructed as part of the Central Subway Project in downtown San Francisco. Under subcontract to Tutor Perini, Frontier-Kemper is responsible for the excavation and initial support of the Underground Station Cavern. The work includes approx. 45,000 bcy of excavation and about 27,000 cy of shotcrete placement. The NATM/Sequential Excavation Method (SEM) is being utilized for the excavaiton of the station.

### **Cross-Cut Cavern**

- Roughly 58-ft. tall; 48-ft. wide
- 70-If. in length;
- excavated c/s area of approx. 2,255 sf.

### North Platform Cavern

- Roughly 47-ft. tall; 60-ft. wide
- 116-If. in length;
- excavated c/s area of approx. 2,228 sf.

### South Platform Cavern

- Roughly 47-ft. tall; 60-ft. wide
- 176-If. in length;
- excavated c/s area of approx. 2,228 sf.

#### **Crossover Cavern**

- Roughly 41-ft. tall; 60-ft. wide
- 268-If. in length;
- excavated c/s area of approx. 1,942 sf.
- Emergency Egress Shaft
- (2) Emergency Egress Tunnels



Cut-Away throuth the Headhouse & Cross-Cut Cavern of the Completed Chinatown Station



### JOHN HART DAM GENERATING STATION REPLACEMENT

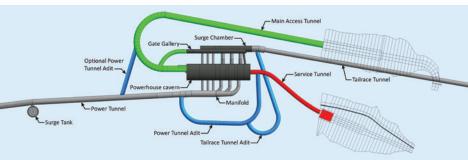
LOCATION: CAMPBELL RIVER, BC, CANADA

MARKET: HYDROELECTRIC
OWNER: BC HYDRO

CONTRACTOR: FRONTIER-KEMPER/ASL JV



On February 25, 2014, BC Hydro awarded SNC Lavalin, as Design/Build Contractor, the John Hart Generating Station Replacement Project. The current generating station is aging, has experienced increasing reliability issues, and is at risk due to seismicity concerns. SNC Lavalin has subcontracted all civil construction to ASL JV who has sub-contracted all underground excavation to FK/ASL (Frontier-Kemper as the managing partner in the JV).



Overview Map of FK/ASL Scope of Work

- Underground Powerhouse (+64,000m3: 94m long x 20/22m wide x 40m tall)
- Power Tunnel (8.3m tall x 8.1m wide x 1,500m long)
- Tailrace Tunnel mined top heading & bench (10.7m tall x 6.5m wide x 600m long)
- Powerhouse Access Adit (6.2m tall x 9.0m wide x 401m long)
- Surge Chamber mined in two passes (14.6m tall x 9.0m wide x 86m long)
- Gate Chamber mined top heading & bench (11.3m tall x 6.0m wide x 79m)
- · Various Gate Slots
- Surge Shaft (+100m tall x 4.3m dia)
- Intake Shaft (+/-45m deep x 6.5m dia)
- Assortment of Access Tunnels (6.2m tall x 6.0m wide x 1,000m)
- 200mm Concrete Inverts in all tunnels



### EAST SIDE ACCESS CM006-MANHATTAN NORTH STRUCTURES

**LOCATION:** NEW YORK, NY (MANHATTAN)

**MARKET: TRANSPORTATION** 

**OWNER: NY MTA CAPITAL CONSTRUCTION** 

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.





The MTA's East Side Access Project is a multi-billion dollar infrastructure project designed to bring Long Island Railroad to Grand Central Station in New York City. Contract CM006 (the Manhattan North Structures Package) involves the installation of permanent structural concrete lining and fit-outs within tunnels, caverns, and interior structures. CM006 also includes the rehabilitation of the 63rd Street Tunnel and construction of the 63rd Street Tunnel duct bench.

### **Concrete/Shotcrete Applications**

- 10.051 ft. of tunnel arch
- 7,140 ft. of tunnel invert
- (3) caverns (including various wyes, cross-overs, inverts, walls, and arches)
- (2) multi-level ventilation structures (walls, elevated slabs, connecting tunnels, adits, and arches)
- (6) cross passages
- 15,600 ft. of concrete duct benches
- 1,000,000 sf. of waterproofing membrane will be installed

### 63rd Street Tunnel Rehabilitation

- · Concrete spall repair
- Lead abatement
- · Asbestos abatement
- Drainage
- Invert repairs



### PARADISE WHITNEY INTERCEPTOR

LOCATION: LAS VEGAS, NV MARKET: WASTEWATER

**OWNER: CLARK COUNTY WATER RECLAMATION DISTRICT** 

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC./PIPE JACKING UNLIMITED, INC.



## PWI 669

- 6,550 LF of 60-in. Flowtite FRP pipe using Slurry Microtunneling
- (8) drives with drive lenghts ranging from 520 LF to 1,500 LF
- Shaft depths ranging from 20 ft. to 30 ft. deep

### **PWI 668**

- 5,550 LF of 60-in. Flowtite FRP pipe using Slurry Microtunneling
- (7) drives with drive lengths ranging from 200 LF to 1,050 LF



TBM/Pipe Jacking hole-thru at one of the Paradise Whitney drives (Las Vegas, NV)





## **SEYMOUR-CAPILANO TWIN TUNNELS**

LOCATION: NORTH VANCOUVER, BC, CANADA

MARKET: WATER/WASTEWATER

**OWNER: GREATER VANCOUVER WATER DISTRICT** 

CONTRACTOR: SEYMOUR-CAP PARTNERSHIP (FKC ULC/J.F. SHEA/AECON JV)



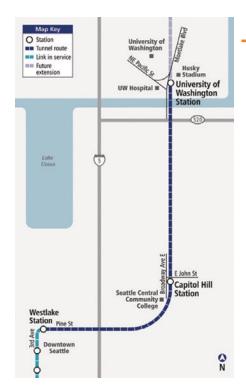
Twin, 12.5-ft. (3.8m) diameter tunnels. One tunnel will be used to transport raw water from the Capilano Reservoir to the Seymour Treatment Plant. The second tunnel will return the treated water to the Capilano Water Distribution Network. Boring of the Raw Water Tunnel was completed in October 2010, and the Treated Water Tunnel excavation was completed in November 2011.

- (2) 12.5-ft. Diameter Tunnels-TBM, Total Length=20,813 ft.
- Tunnel Support & Control of Groundwater
- Drill & Blast Excavation of Underground Chambers
- (2) Raise-Bored Shafts-885 ft. Deep X 13-ft. Diameter
- Installation & Backfill Grouting of Steel Lining in all Shafts & Portions of Tunnels
- Interconnection Pipes from Shafts to Nearby Water Mains



TBM hole-thru at the Seymour-Capilano Treated Water Tunnel.





### UNIVERSITY LINK LIGHT RAIL

LOCATION: SEATTLE, WA MARKET: TRANSPORTATION OWNER: SOUND TRANSIT

CONTRACTOR: TRAYLOR BROS./FKCI JV

Two, bored tunnels connecting the University of Washington to downtown Seattle. This project is a 3.15-mile extension of Sound Transit's current light rail transportation system.

- (2) 18'-10" Diameter Tunnels-TBM
- 11,400 LF/each
- Segmentally Lined
- (16) Excavated Cross Passages
- · Site Civil Work
- Installation of Slurry Diaphragm Walls
- Excavation & Bracing of the Crossover Box



Future site for the University of Washington Station near Husky Stadium.



## **EAST SIDE ACCESS QUEENS TUNNELS**

LOCATION: QUEENS, NY MARKET: TRANSPORTATION

**OWNER:** NEW YORK CITY METROPOLITAN TRANSIT AUTHORITY **CONTRACTOR:** GRANITE/TRAYLOR/FRONTIER-KEMPER JV



East Side Access is a public works project being undertaken by the Metropolitan Transportation Authority (MTA) in New York City. The tunnels are designed to bring Long Island Railroad (LIRR) trains into a new station located below Grand Central Terminal. [East Side of Manhattan on 42nd street]

- (4) 19.5-ft. Diameter Tunnels
- Combined Length of 10,500 LF
- (2) Soft Ground Slurry Shields Used to Construct the Tunnels
- Lined with Precast Concrete Segments
- (3) Shafts-Include Cross Passages for Emergency Access and Ventilation



Tunnel A lined with precast concrete segments-with track in invert and utilities hung from the walls.



## **NEW CROTON AQUEDUCT REHABILITATION**

LOCATION: BRONX, NY

MARKET: WATER/WASTEWATER

**OWNER:** NEW YORK CITY DEPT. OF ENVIRONMENTAL PROTECTION **CONTRACTOR:** FRONTIER-KEMPER/SCHIAVONE/PICONE, JV



Aqueduct rehabilitation of approx. 30 miles—from the Croton Lake Gate House (just north of Westchester County) to Shaft 33 in Manhattan. Additional work includes rehabilitation of 32 shafts and surface and site structures along the tunnel alignment.

- Clean Tunnel Lining
- · Brick Repairs
- Crack Repairs
- Grouting
- Epoxy Coating



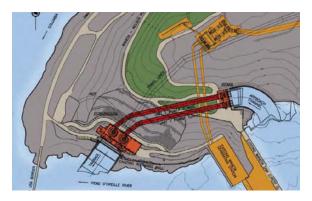
Rehabilitation of the New Croton Aqueduct-grouting behind the brick lining.



#### **WANETA DAM TUNNELS**

LOCATION: TRAIL, BC, CANADA
MARKET: POWER/HYDROELECTRIC
OWNER: AECON/SNC LAVALIN JV

**CONTRACTOR:** WANETA TUNNELERS PARTNERSHIP (REDPATH/FRONTIER-KEMPER)



Two, parallel, Penstock Tunnels were constructed using Drill-and-Blast methods. The purpose of the project was to expand the capacity of the existing 450 Megawatt (MW) Waneta Dam by installing a second powerhouse to generate up to 335 MW from water that was being spilled over the dam.

- (2) 32.8-ft. Diameter, Parallel, Penstock Tunnels
- Tunnels Run Uphill at 14% and 17%
- Lengths = 675 LF & 660 LF
- (1) 20-ft. x 20-ft. Access Adit, 374 LF
- Tunnels Lined with 300mm Thick, Cast-in-Place, Concrete Liner



Inside one of the penstock tunnels during placement of the cast-in-place, concrete liner.



### **ASHLU CREEK HYDRO TUNNEL & SHAFT**

LOCATION: SQUAMISH, BC, CANADA MARKET: POWER/HYDROELECTRIC

**OWNER:** ASHLU CREEK INVESTMENTS (INNERGEX & LEDCOR PARTNERSHIP)

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, ULC



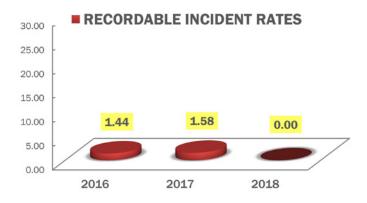
Ashlu Creek was a design-build-operate-transfer, run-of-the-river, hydroelectric project. The project consisted of a diversion weir, drop shaft, tunnel, and down-river powerhouse. The weir diverts part of the river into the drop shaft and tunnel which then conveys the water 4.3km downstream to a powerhouse and is finally discharged back into Ashlu Creek. Tunnel excavation was completed in February 2009, and raise boring of the intake shaft was completed in May 2009.

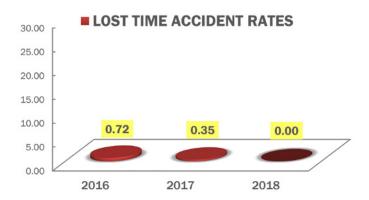
- (1) Power Tunnel—13.4-ft. Diameter, 2.75 miles
- (1) Intake Shaft-11.5-ft. Diameter, 460 VF
- Upriver Diversion Weir
- Downriver Powerhouse



Completed hydroelectric project near Squamish, British Columbia.

With safety a core value, we nurture a culture that will protect our employees, visitors to our projects, and everyone who calls the areas around our work sites "home." We pride ourselves on protecting people, property, and the environment. That is the commitment all of us at Frontier-Kemper make, to each other and our clients.





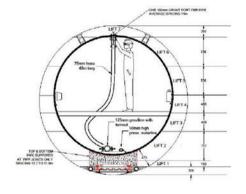


# 1.4km (4,600 ft.) OF GROUTING COMPLETED AT THE SEYMOUR-CAPILANO TWIN TUNNELS PROJECT

DATE: JANUARY 2013

LOCATION: NORTH VANCOUVER, BC, CANADA

In 2012, the Seymour-Capilano Partnership began backfill grouting the annular space between the steel lining and tunnel wall at the Capilano ends of both tunnels [project on pg. 23]. The grout mix was developed by the Seymour-Capilano Partnership and is 2.5 denser than cellular foam, or lightweight grout, which is typically used for long distance pumping. The basic layout scheme was to place the grout in seven, horizontal lifts around the pipe. As of January 2013, SCP had completed grouting around the first and longest (1.4km) of four, steel, tunnel liners.





## +17% GRADE, 200m (656-ft) CONCRETE-LINED TUNNEL COM-PLETED AT WANETA DAM TUNNELS PROJECT

DATE: AUGUST 2012

LOCATION: TRAIL, BC, CANADA

Concrete lining for two, parallel, Penstock Tunnels was completed by the Waneta Tunnelers Partnership (Redpath/Frontier-Kemper JV) at the Waneta Dam Expansion Project [project on pg. 33]. Each tunnel was approximately 200m in length and 10m in diameter. The tunnels were excavated at an uphill slope at 14% and 17% and were to be lined with a 300mm thick, cast-in-place concrete liner. To complete the concrete lining in such a large scale and challenging condition, the formwork supplier, Ceresola, and Frontier-Kemper partnered together to design a form operated by a hydraulic trailer 20m in length. After extensive planning and testing, the concrete lining operation went smoothly and was completed as scheduled.



Inspection of the 7.5m walking, beam-style tunnel form designed to operate on a 17% slope.

# MINE DEVELOPMENT



At Frontier-Kemper we are committed to providing comprehensive, mine development services to our owners and partners. We have developed underground mines for coal, salt, copper, gold, and other minerals throughout North America. In order to meet mine development requirements, we utilize a variety of methods and equipment for permissible or non-permissible applications.



#### **SERVICES**

- 47 BLIND DRILLING
- **49** RAISE BORING
- 50 CONVENTIONAL SHAFT SINKING
- **51** SLOPE CONSTRUCTION
- **51** TECHNICAL SERVICES

## **CURRENT PROJECTS**

- 53 SOLVAY VENT SHAFT #4
- 55 BUCHANAN VENT SHAFT #16

#### RECENTLY COMPLETED PROJECTS

- 57 FREDONIA UNDERGROUND DRILLING FACILITY
- **59** BARRICK CORTEZ NVR & SVR
- **61** GIBSON CO. SHAFT & SLOPE
- **62** MINING SAFETY RECORD
- 63 ACHIEVEMENTS-WORLD RECORD
- 64 ACHIEVEMENTS-NORTH AMERICAN RECORD

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CRESCENT VALLEY, NV: The FK350MT Blind Drilling System set up at Barrick Gold Corp.'s Cortez Hills' Mine [project on pg 59]



## **BLIND DRILLING (FK350MT)**

To provide solutions for mechanically excavated, deep, large-diameter, Blind-Drilled Shafts, Frontier-Kemper, Wirth GmbH, and ACI entered a joint cooperation agreement to build a Blind Shaft Drilling System. The result is the FK350MT, one of the largest, safest, and most efficient A-Frame type drilling rigs in North America.

Blind drilling excavation is performed from the surface—no underground work is required. FKCI has completed more than 5,000 ft. of Blind-Drilled Shafts across the US. As currently configured, the FK350MT is capable of drilling shaft diameters up to 20 ft. and depths of more than 1.500 ft.



OAKTOWN, IN: The Blind Drilling System set up at Black Panther's Oaktown Fuel Mine No. 1.





BIRMINGHAM, AL: The 81-R Raise Drill used to set a North American Record 22-ft. diameter, raise-bored shaft. [pg. 64]



- RBM 211
- RBM 7 SP
- Robbins 81-R
- Herrenknecht RBR 600 VF

To date, Frontier-Kemper has pulled more than 22 miles of Raise-Bored Shafts. The raise bore machine excavates in a circular motion from the bottom of the shaft to the surface without the need for explosives. The Herrenknecht RBR 600 VF has recently been added to FKCI's fleet of raise drills. This drill has double the thrust capacity and nearly double the torque capacity of the 81-R.

Our drills are run by highly trained teams with decades of experience. In recent years, we have expanded our services past traditional mining-type environments into highly populated urban areas.



Typical configuration of the 81-R Raise Drill.

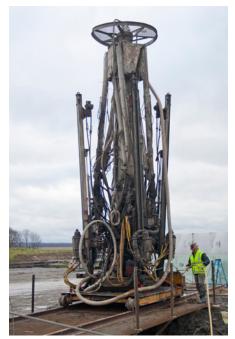
## **SERVICES**



## **CONVENTIONAL SHAFT SINKING**

Conventional shaft sinking is a drill-andblast excavation method that requires no restrictions on shaft depth or diameter. Frontier-Kemper has sunk more than 100 Production, Ventilation, and Service Shafts for mining projects in all types of geological conditions. A typical project includes:

- Drilling & Blasting (Jumbo Drill)
- · Mucking & Hoisting
- Shaft Lining
- Dewatering
- Ventilation



McCLEANSBORO, IL: Jumbo Drill on-deck at a shaft sinking project in Illinois.



Conventional Shaft Sinking operations at a Kentucky coal mine.



- · Continuous Miner
- Drill & Blast
- Roadheader

FKCI has completed more than 8 miles of slope construction. We have driven slopes in all types of ground conditions with various lengths, sizes, and incline/decline angles. We are equipped to handle even the most demanding slope projects.



## **TECHNICAL SERVICES**

In support of our primary role as a heavy construction contractor, we also provides owners and partners with complete engineering and design services for underground excavation.

With licensed engineers in the Electrical, Mechanical, and Civil Engineering disciplines, FKCl's design capabilities include:

- Mine Shaft & Slope Ground Support
- Specialized Equipment
- Grouting
- · Construction Dewatering
- Water-Tight Linings



Open cut slope excavation at a Southern Illinois coal mine.



## **SOLVAY VENT SHAFT #4**

LOCATION: GREEN RIVER, WY

MARKET: SODA ASH

OWNER: SOLVAY SODA ASH JV

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.



This project involves the design and construction of a 22-ft. (inside diameter), dual compartment, concrete-lined shaft. The shaft is being constructed using the bore and slash method.

- (1) shaft-1,508 VF
- 22-ft. Inside Diameter
- Concrete-Lined
- Raise Bored to 16'-6" Diameter
- Drilled and Slashed to 24'-28' Diameter



The 81-R Raise Drill setup in Green River, WY.



## **CONSOL VENT SHAFT #16**

LOCATION: RICHLANDS, VA

MARKET: COAL

OWNER: CORONADO COAL LLC

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.

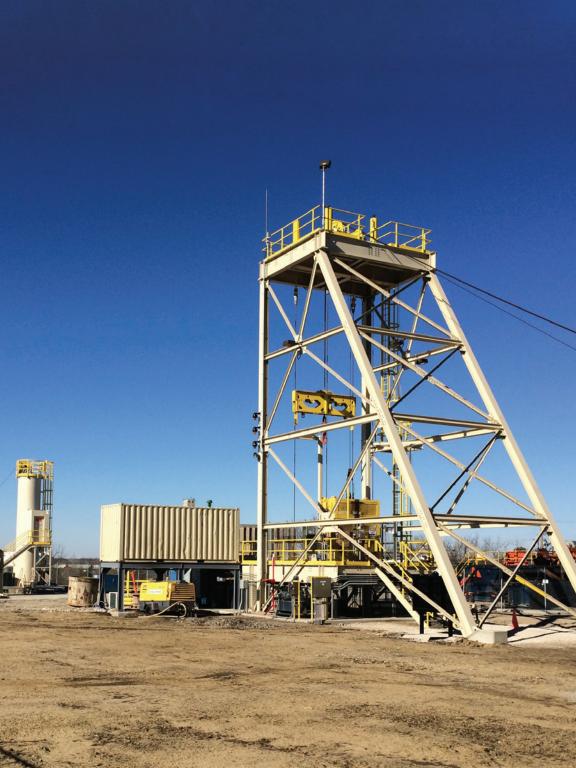


FKCI is wrapping up construction at Buchanan Mine-Vent Shaft #16. This project consisted of:

- (1) Ventilation Shaft
- 1,285 VF
- 18-ft.Inside Diameter
- Concrete-Lined



Conventional Shaft Excavation on Vent Shaft #12-site similar to Vent Shaft #16.



### FREDONIA UNDERGROUND DRILLING FACILITY

LOCATION: FREDONIA, KS

MARKET: OIL

**OWNER:** WILSON COUNTY HOLDINGS

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.



FKCI recently completed construction of the Fredonia Underground Drilling Facility. This project consisted of:

- (1) Main Access Shaft
- (1) Underground Drilling Gallery
- (1) Emergency Escape/Ventilation Shaft
- (1) Tunnel-Connecting the 2 Shafts
- Permanent Headframe & Hoisting System
- Hybridized Ventilation/Emergency Hoisting System



FKCI crew preparing for installation of the ground support in the Drilling Gallery.



#### **BARRICK CORTEZ NVR & SVR**

LOCATION: CRESCENT VALLEY, NV

MARKET: GOLD

OWNER: BARRICK GOLD CORP. OF NORTH AMERICA CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.



- (2) Blind-Bored, Vent Shafts
- NVR-14-ft. Diameter, 1,475 VF
- NVR-Steel-Lined to 12-ft. Diameter
- SVR-16-ft. Diameter, 1,800 VF

FKCI completed the North Vent Raise (NVR) at Barrick Gold Corp.'s Cortez Hills' Mine in July 2012. The NVR reached 1,475 VF, to date, this is FKCI's deepest Blind-Drilled Shaft. The South Vent Raise (SVR) is under construction and expected to be completed in late 2013.

The NVR was to be concrete-lined but was changed to steel lining at the owner's request. This required 148 pieces of steel lining to be installed using a gantry system. The NVR is the first Blind-Drilled, Steel-Lined Shaft in this region of the US.



The fully operational Gantry System lowering a welded, steel can into the NVR.



## **GIBSON CO. SHAFT & SLOPE**

LOCATION: OWENSVILLE, IN

MARKET: COAL

OWNER: GIBSON COUNTY COAL, LLC

CONTRACTOR: FRONTIER-KEMPER CONSTRUCTORS, INC.



This project involves the design and construction of a 30-ft. (inside diameter), dual compartment, concrete-lined shaft and a dual compartment, over/under slope.

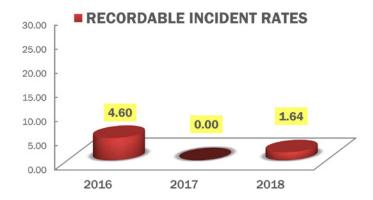
The shaft is being constructed using conventional shaft sinking methods, while a Joy Continuous Miner is being used to excavate the slope.

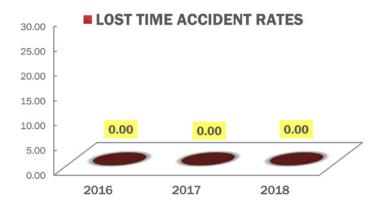
- (1) shaft-577 VF, 30-ft. Diameter
- Dual Compartment, Concrete-Lined
- (1) Over/Under Slope-2,200 LF
- 15 ft. x 16 ft. Dual Compartment



The beginning stages of slope construction in Owensville, IN.

Our mutual responsibility is to abide by all relevant state, federal, and local regulations, as well as the safety rules we establish for each project. We are each accountable to the company and each other, with a common goal of making sure that no accidents or injuries occur. Our Safety Program focuses on accident prevention. It addresses the responsibilities, accountability, and discipline that we all share and accept as the key to maintaining a safe, healthy, and productive workplace.





# NEW WORLD RECORD SET WITH THE FK350MT!

DATE: FEBRUARY 23, 2011 LOCATION: MACEDONIA, IL

On February 23, 2011, Frontier-Kemper completed a 20-ft. diameter, Blind-Drilled Shaft for Cline Resources' Sugar Camp Mine in Southern Illinois. The final depth of the shaft was 980 ft.—setting a new world record for the largest, full-face, Blind-Drilled Shaft ever constructed. The shaft was drilled using the FK350MT Blind Drilling System.



The FK350MT Blind Drill at Illinois' Sugar Camp Mine.



Charlie Ernst-Blind Drilling Superintendent (far right) and his crew pose with the world record-breaking, Blind Drilling System.

## **FKCI BREAKS NORTH AMERICAN RECORD!**

**DATE:** JULY 22, 2010

LOCATION: BIRMINGHAM, AL

On July 22, 2010, Frontier-Kemper set a new, North American record for a 22-ft. diameter, Raise-Bored Shaft using the Robbins 81-R Raise Bore Machine. This project was located at Drummond Company's Shoal Creek Mine near Birmingham, AL. The total reaming depth was 1,197 VF.



The 22-ft. diameter hole-thru at Shoal Creek Mine.



The 81-R Raise Drill set up in Birmingham, AL.



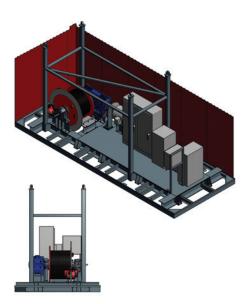


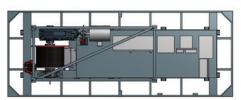
#### **EMERGENCY ESCAPE HOISTS**

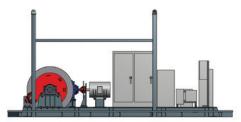
FKC-Lake Shore offers standard or custom-designed Escape Hoist packages to provide emergency underground egress. We have standard packages for depths up to 1500' of lift. The standard cage is 3' x 4' with a sliding door for normal access but also hinged for unrestricted access to load a stretcher. (Exceeds MSHA Bulletin #P12-03 Specs)

HOIST ARRANGEMENT:	Complete System is Unitized on a Common Base
DRUM TYPE:	Drum Winder
DRUM SIZE:	36" Width; (varies by depth)
HOIST SPEED:	250 FPM
DEPTH:	2,000 ft.
TYPICAL CAGE SIZE:	2.5 ft <sup>2</sup> /Person
CAGE GUIDES AVAILABLE:	Ropes; Steel
ROPE SIZE:	<sup>3</sup> ⁄ <sub>4</sub> " Diameter
ROPE ATTACHMENT(S):	Socket w/Safety Bridal
BRAKE SYSTEM:	Spring Applied Caliper Brakes/Hydraulic Release
LINE PULL:	Approx. 10,000 lbs.

All data in the above table is approximate and based on standard designs. Custom designs are available.







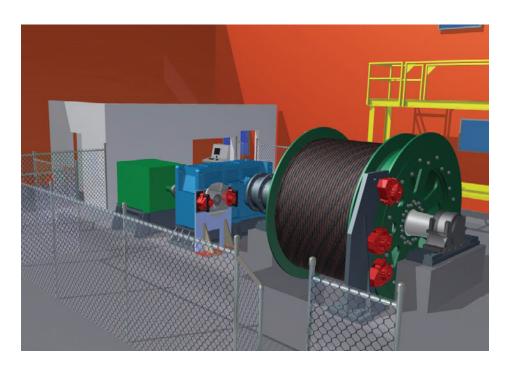


## **SLOPE (INCLINE) HOISTING SYSTEMS**

To transport personnel and supplies up and down mine slopes, FKC-Lake Shore offers standard and custom-designed Slope Hoist packages. Our standard hoists are rated for 80T, 100T, and 125T on a  $16^{\circ}$  slope.

HOIST ARRANGEMENT:	In-Line/Off-Set with Turning Sheave Assembly
DRUM TYPE:	Drum Winder
HOIST SPEED:	500 FPM-Normal/250 FPM-Heavy
DEPTH:	3,000' at 16°; Up to 4,000' at 16°; Others Custom
ROPE SIZE:	1.625"-1.875"
ROPE ATTACHMENT(S):	Open Spelter Socket
CONVEYANCE:	FKC-Lake Shore Brakeman Car; Mine Supply Car
PAYLOADS:	45,000-70,000 lbs Line Pull; (80T-125T at 16°)

All data in the above table is approximate and based on standard designs. Custom designs are available.



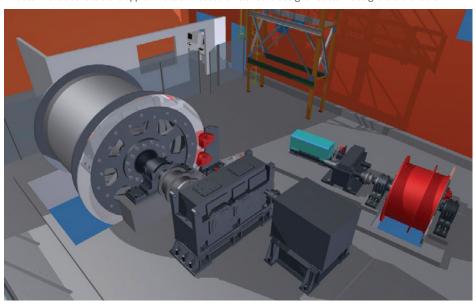


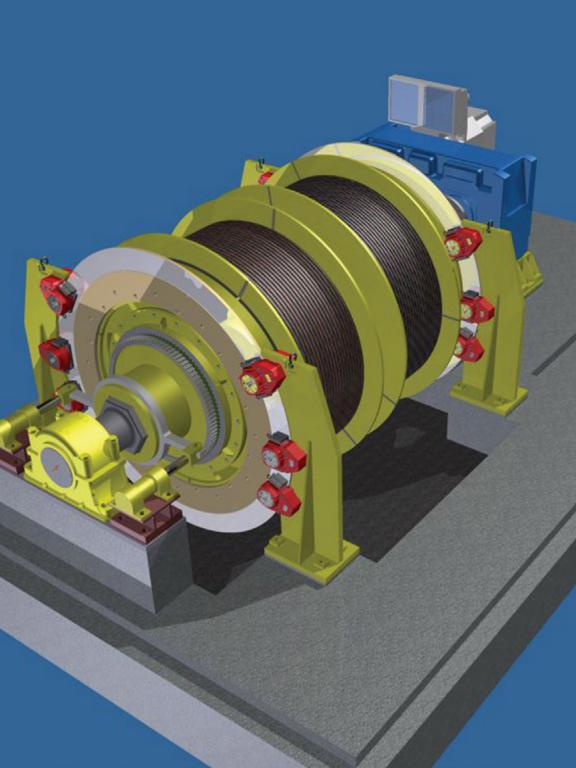
#### **SERVICE HOISTS**

Service Hoisting Systems are used to transport personnel and supplies through vertical shafts. FKC-Lake Shore offers standard over/under designs for 15T, 20T, and 25T on shafts up to 1,000 ft. deep. For deeper shafts, we offer Friction Hoists for 20T, 30T, and 40T applications. Custom Double Drum Hoists are also available.

HOIST ARRANGEMENT:	Ground Mounted / Tower Mounted
DRUM TYPE:	Drum Winder; Friction Hoist; Over/Under; Double Drum
DRUM SIZE:	Up to 12 ft.
HOIST SPEED:	As Required
DEPTH:	2,000 ft. (deeper available with custom design)
TYPICAL CAGE SIZE:	2.5 ft <sup>2</sup> /Person
CAGE GUIDES AVAILABLE:	Ropes, Steel, & Wood
ROPE SIZE:	1"-2.25" Diameter
ROPE ATTACHMENT(S):	Short Couple Thimble(s) (Cappels)
BRAKE SYSTEM:	Spring Applied Caliper Brakes/Hydraulic Release
CAGE PAYLOADS:	5T-50T

All data in the above table is approximate and based on standard designs. Custom designs are available.

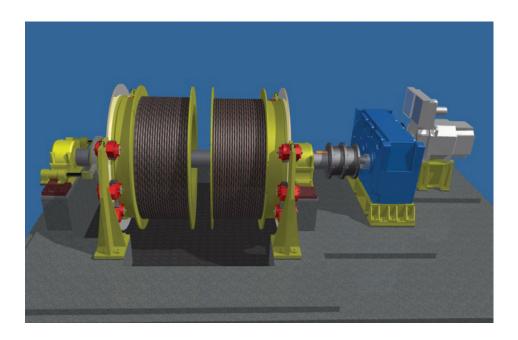




## **PRODUCTION HOISTS**

FKC-Lake Shore offers custom-designed Production Hoisting Systems to bring mined materials from underground to the surface. Double Drum or Koeppe (Friction) Hoists are available to meet the production needs of our mining customers.

HOIST ARRANGEMENT:	Typically Ground-Mounted
DRUM TYPE:	Drum Winder; Friction Hoist; Double Drum
CONVEYANCE:	Jeto Skips with Optional Cage for Personnel
HOIST SPEED:	As Required
DEPTH:	Up to 2,000 ft. (deeper available with custom design)
ROPE ATTACHMENT(S):	Short Couple Thimble (Cappels)
GUIDE SYSTEM:	Ropes, Steel, & Wood
BRAKE SYSTEM:	Spring Applied Caliper Brakes/Hydraulic Release
SKIP PAYLOADS:	4T-35T

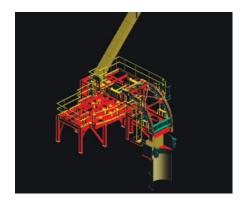




#### **VERTICAL CONVEYOR SYSTEMS**

FKC-Lake Shore offers custom-designed Flexowell and Pocketlift Vertical Conveyor solutions to transport mined materials from underground to the surface. We can accommodate lifts from 10m-700m. Tonnage rates depend upon depth and material density.

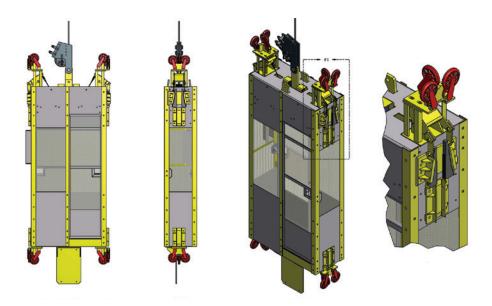
TYPE:	Flexowell & Pocketlift
MAX LIFT:	2,100 ft. (700m)
MAX TONNAGE:	2,000 TPH at 1,000 ft. (330m) (varies by depth and density)
BELT CONSTRUCTION:	Fabric & Steel Cord Base Belts
BRAKING:	External Backstops & Spring-Applied Hydraulic Release
CONTROLS:	FKC-Lake Shore Controls Soft-Start or VFD

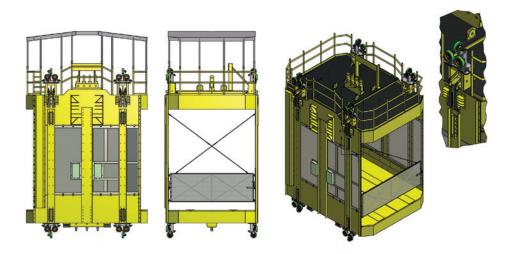










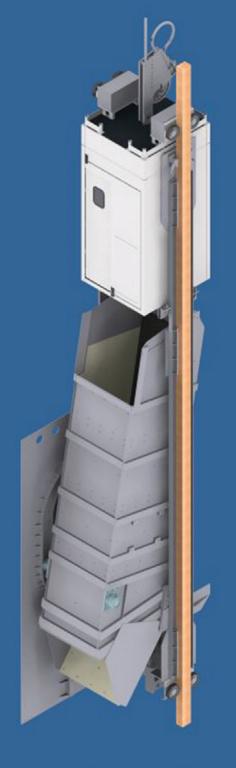


## **CAGES**

FKC-Lake Shore offers custom-designed Cages to transport personnel and material in vertical shafts. Cages can be built from steel, aluminum, or stainless steel to meet the needs of the underground environment. Broken rope safeties are available for steel guides, wooden guides, and rope guides.

TYPE:	Single, Double, or Triple Deck
MATERIAL:	Steel; Aluminum
GATES:	Swing; Bi-Parting
GUIDES:	Steel; Wood; Rope
SAFETY MECHANISM:	Dogs (Steel, Wood, or Rope)
DESIGN CRITERIA:	2.5 ft²/Person; 100 lbs./ft²
GUIDES:	FKC-Lake Shore 3-Wheel Guide System



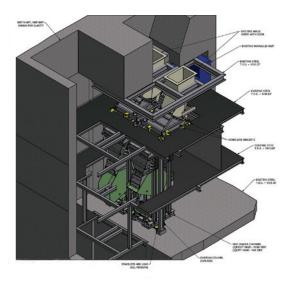


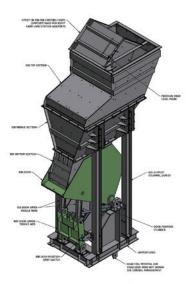


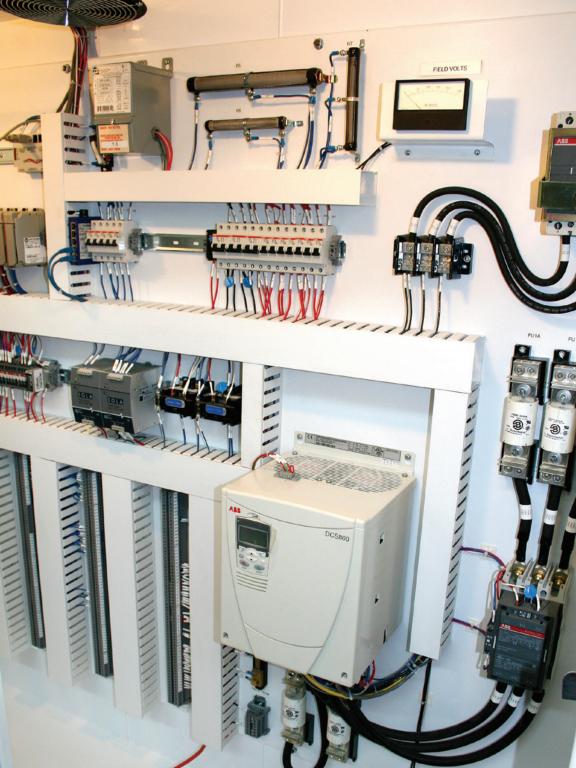
## **SKIPS & SKIP LOADING STATIONS**

The Lake Shore patented "Jeto" Bottom-Dump Skip, designed for faster, cleaner dumping, is in use throughout the world in all types of mines-metallic and non-metallic. This Skip is designed to achieve proper balance while providing rugged strength, long wear life, and minimum dead weight. With the "Jeto," the center-of-gravity puts all weight directly on the hoist rope whether loaded, partially loaded, or empty.

TYPES:	"Jeto" Bottom-Dump
CAPACITY (TONS):	35T; custom larger available
MATERIAL:	Aluminum, Steel
LINERS:	Steel, Poly, Aluminum, AR, Tri-blaze, Astralloy
OPTIONAL:	Safety Dogs; Platforms or Cages for Man Riding



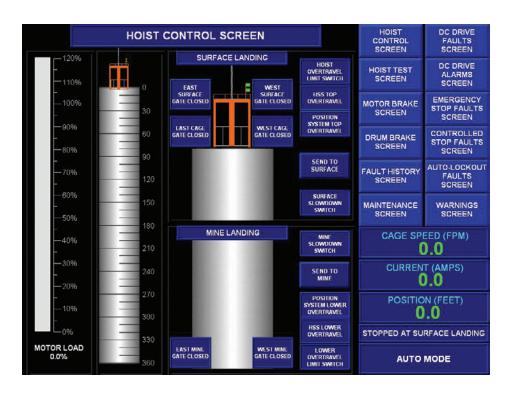




#### **ELECTRICAL CONTROLS**

FKC-Lake Shore provides standard and custom-designed AC & DC control packages for Escape Hoists, Slope Hoists, Service Hoists, Production Hoists, and Vertical Conveyors.

HOISTS:	AC & DC Hoist Controls (Production, Service, Slope, Escape)
VERTICAL BELTS:	VFD Controls for Vertical Belts
ELEVATORS:	ANST 17. Controls for Elevators
DIGITAL LILLY:	Hoist Safety Supervisor (HSS)

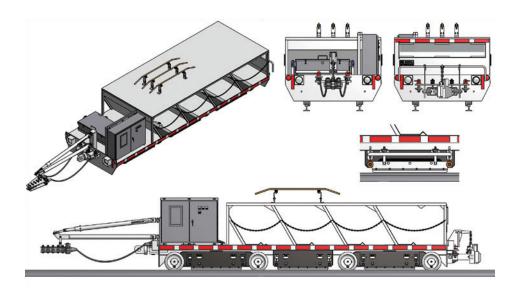




#### **BRAKEMAN CARS**

FKC-Lake Shore manufactures standard or custom designed Brakeman Cars to provide personnel with access to slope mines. Our standard Brakeman Car line consists of a 16-man Brakeman Car with 6 brakes, a 20-man Slave Car with 6 brakes, and a 4-man Barney Car with 2 brakes. Each standard car comes with multiple end configurations to match the needs of the mine.

TYPE:	16-Man Brake Car; 20-Man Slave Car; "Barney" Maintenance Car
BRAKE SYSTEM:	48VDC Electromagnetic Brake System
SAFETY FEATURES:	Overspeed & Rollback Protection through Onboard Controls
MATERIAL:	Steel
FEATURES:	Fold Down Seats to Accommodate a Stretcher

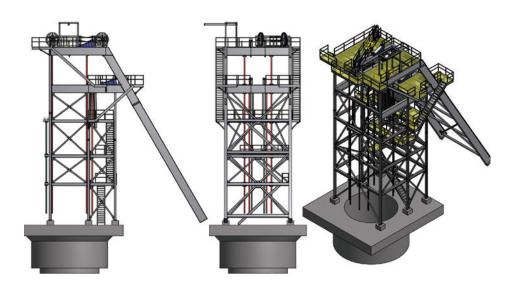




# **HEADFRAMES**

FKC-Lake Shore offers custom designed Headframes for Service, Production, and Escape Hoists for any shaft configuration.

TYPE:	Tower Mounted; Ground Mounted
DESIGN:	Production, Service, Development (open & enclosed)



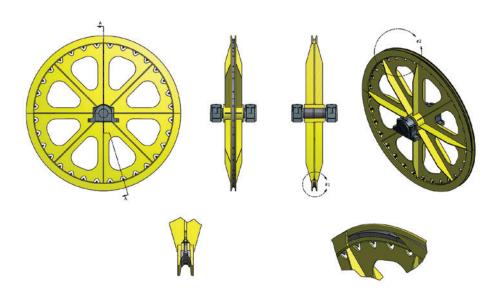




#### **SHEAVES**

FKC-Lake Shore offers standard or custom-designed Sheaves to deflect wire ropes from the hoist to the conveyance in single-rope or multi-rope configurations. FKC-Lake Shore Sheaves are of fabricated steel construction with forged steel hubs and steel shafting. A variety of rim sections and hub/bearing configurations are offered.

TYPES:	Single & Multi-Rope Clusters
LINERS:	Poly & Steel (Bolt-In) or Solid T1 Rims
CAPACITY:	50T
DIAMETER:	15 ft.
BEARING LIFE:	L10=100,000 hours
TYPICAL D/d RATIO:	80:1





Our FKC-Lake Shore Field Services Group offers a team of skilled, proven technicians who can perform many special tasks; including installing, upgrading, repairing, and maintaining system components such as Hoists, Skips, Skip Loaders, Cages, and Elevators. We offer services such as:

#### INSPECTION & REPAIR OF:

- Hoisting Systems
- Elevator Systems
- Vertical Conveyance Systems
- · Cages, Skips, & Brakeman Cars
- Sheaves
- Electrical Components

# COMPREHENSIVE PREVENTIVE MAINTENANCE PROGRAM (PMP)

- Certified Wire Rope NDT
- Certified Vibration Analysis
- Certified Thermal Imaging
- Inventory Control

#### THE GROUP ALSO OFFERS:

- Rope Changes
- Controls Systems Upgrades
- Misc. Emergency Repair Work

WHAT IS PREVENTIVE MAINTENANCE? Preventive maintenance is the planned maintenance of plant and equipment that is designed to improve equipment life and avoid any unplanned maintenance activity. Preventive Maintenance includes lubrication, cleaning, adjusting, and minor component replacement to extend the life of equipment and facilities. Its purpose is to minimize breakdowns and excessive depreciation. Neither equipment nor facilities should be allowed to go to the breaking point. A Preventive Maintenance Program should include:

- Non-Destructive Testing
- Periodic inspection
- Preplanned maintenance activities
- Maintenance to correct deficiencies found through testing or inspections

**FKC-LAKE SHORE FIELD SERVICES PREVENTIVE MAINTENANCE PROGRAMS** As a leading manufacturer of hoisting and vertical conveyance systems in North and South American mining and underground construction markets, FKC-Lake Shore is uniquely qualified to administer a successful preventive maintenance program through:

- Safety—With FKC-Lake Shore, "Safety First" is a core value; not just a motto. We are dedicated to ensuring your work place remains a safe and healthy work environment at all times.
- Personnel—Our management and field service personnel are knowledgable with the servicing requirements and unique challenges these complex systems encounter in everyday use. Highly trained and competent field technicians are motivated to keep your down-time and production delays to an absolute minimum.
- **Equipment**—Maintaining hoisting and vertical conveyance systems requires special equipment. From Non-Destructive Testing (NDT), to thermal imaging and vibration analysis, we have the equipment and expertise to perform the kind of preventive/predictive maintenance that will ensure the highest degree of reliability.
- Documentation—We understand the need for precise and complete documentation of maintenance activities. Our technicians are familiar with the reporting/ recording requirements of MSHA.
- **Scheduling**—We understand the frequency and servicing requirements needed to maintain a trouble-free hoisting and conveyance system. Automated scheduling and dispatch systems ensure we are performing the correct procedure at the correct time. We also recognize that production is the source of your revenue and we will provide flexible options that will work within your operations schedule.
- Proficiency—Preventive maintenance requires a technical proficiency and ability beyond the scope of everyday operations. Our technicians are experienced in tackling every possible scenario and are equipped to handle even the most complicated maintenance requirements.

#### SYSTEM EVALUATION

We begin every PM program with a system evaluation. During an initial visit to the site, we will review:

- Core system configuration and general specifications
- Existing maintenance practices
- Critical spares evaluation and inventory
- · Production and maintenance cycles
- Meet with maintenance personnel to review program

#### 90-DAY SERVICES

- General inspections of system to include: Gearing, Brakes, Drums, Ropes, Switches, Motors, Cage, Shaft, Pits, and Landings
- Operational checks of entire system
- Adjustments to: Brakes, Limits, and Positioning
- Lubrication of: Door Rollers, Guide Rollers, and Lilly
- Critical Spares Inventory
- · Comprehensive inspections of: controls, motors, drives, gears, couplings, pinions, head-frames, sheaves, and counterweights
- Insulation resistance (Megger) readings of motors
- Brake load tests (MSHA requirement)
- Safety-dog tests (MSHA requirement)
- Thermal imaging of: electrical systems, motors, gears, and bearings
- Lubrication and oil analysis sampling
- Vibration Analysis of major components

#### **180-DAY SERVICES**

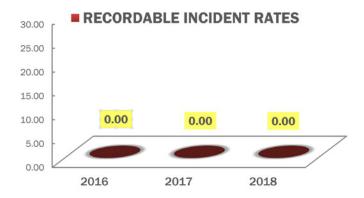
- NDT: Non-Destructive Wire Rope Test and evaluation (MSHA requirement)
- Filter Changes
- Laser Alignment of gear, shaft, and sheave systems

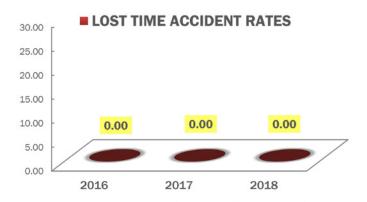
# 24/7 EMERGENCY RESPONSE & SUPPORT (1.877.554.8600 / opt. 2)

 Priority access and dispatching from our industry leading emergency response system

# FKC-LAKE SHORE SAFETY RECORD

With safety a core value, we nurture a culture that will protect our employees, visitors to our projects, and everyone who calls the areas around our work sites "home." We pride ourselves on protecting people, property, and the environment. That is the commitment all of us at Frontier-Kemper make, to each other and our clients.







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