

## Part 3: Rewarding Careers in Structural Engineering I Designing Structures for 3MM lb. Impact Loads

In Part 1 of our series on rewarding structural engineering careers, we talked about the engineers, designers, and technicians who work in industrial processing facilities and turn ideas into new products that make advances in our modern world possible. In Part 2 of this series, we discussed industrial coking units and the unique loading challenges the drums present to the structural engineering team. In Part 3 of this series, we'll be discussing the unique challenges of the coke chutes, which receive the brunt of the impact load caused by coke unloading.

During the unloading cycle of the operation, the cut coke is dumped when a valve at the bottom of the coke drum is opened. The roughly 3 million lbs. of coke then free-falls 20 or more feet to the face of the inclined chute, creating substantial impact loads. This impact loading occurs every 12 to 24 hours, 365 days / year. The chutes are typically made of concrete but occasionally steel. The coke is very abrasive, contains sulfur and oils, and is typically at a temperature over 500 degrees F when it leaves the drum. After striking the chute, the coke then flows down-hill to the coke pit, where it is temporarily stored for removal to a coke storage yard or put in trucks, rail cars, or barges for its next destination - typically a steel mill - to be used as an energy source for the mills' blast furnaces.



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The repeated impact loading of hot, abrasive coke onto the concrete or steel chutes is highly damaging to the chutes and creates many challenges for Structural Engineers to repair or retrofit. Brindley Engineering has conducted the field evaluations of dozens of coke chutes and has designed repairs plans or retrofits for all of them.

Some examples of projects that our BE structural engineers have conducted on coke chutes include:

- Coker unit FEA modelling and field evaluations of concrete and steel chute structures to determine the source and magnitude of the problems for developing a repair.
- Engineering patch repairs to the chutes utilizing specialty shotcrete materials.
- Designing coke chute slide plate systems to serve as wear plates to chutes and extend their life.




Brindley Engineering's structural team has conducted these types of assessments, materials analysis, engineering & design, and construction oversight on dozens of coke chutes. An engineer who is experienced in steel and concrete can handle these analysis as they learn about the unique materials, loadings, and operations of the units.

In Part 4 of our series on rewarding structural engineering careers, we'll explore how the structural engineers at Brindley Engineering analyze and mitigate structural collapse for cooling towers, fluid catalytic crackers, and other units in industrial environments that have been damaged by corrosion, water hammer, and other unanticipated conditions.

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