

# PENNSYLVANIA FROZEN COAL CRACKERS<sup>®</sup> *"The Newest Generation"*



**Pennsylvania**  
**Crusher** 

*The Most Choices, The Most Experience*

# The Frozen Coal Cracker®; the original made better



*When Pennsylvania introduced the original 'Frozen Coal Cracker' over 40 years ago, it was quickly adopted by the power generation industry. Over the following decades, Pennsylvania has made continuous refinements to the design... refinements which today make this unit the most effective machine available for reducing frozen coal. The Pennsylvania Model FCC continues to be recognized as the standard unit for this application.*

The term "Frozen Coal Cracker" was originated by our company and is a trademark of Pennsylvania Crusher Corporation.

## Frozen Coal— Causes and Effects

Pennsylvania Crusher was approached by the power generation industry in the 1940's to help solve their frozen coal problems. The industry was using sledge hammers, pneumatic hammers and other labor intensive methods to break up coal so that it could enter the coal handling system.

Studies found that coal freezes in rail cars only when its free moisture content exceeds its inherent moisture capacity, and that the strength of this bond increases as the free moisture increases. Coarse coal with good particle size distribution freezes more readily than fine coal because the larger particles hold a much thicker film of water. The compressive strength of the frozen coal also increases as temperatures drop. At  $-20^{\circ}\text{F}$ , it has about 80% greater strength than it has at  $+15^{\circ}\text{F}$ .

This explains why frozen lumps as large as four feet thick are not uncommon in rotary dump operations, creating serious jam-ups in hoppers, in conveying systems and transfer points.

Frozen coal even causes unloading problems at plants located in warm weather areas, if the rail cars have originated in or passed through freezing, wet weather.

In addition to jamming the coal handling system, frozen coal chunks frequently require that conveying systems be pitched at inclines no greater than 15 degrees. This requires longer conveyors and more space for the entire coal handling system.

The major application for Pennsylvania Frozen Coal Crackers is under rotary car dumps. This is the point where most frozen coal problems can be solved.



## The Pennsylvania Frozen Coal Cracker Concept

In our analyses of frozen coal handling problems, we determined that most of the major problems caused by frozen coal would be eliminated by a system which performed as follows:

- the coal is unloaded at rotary car dump stations from rail cars or from stockpile storage directly into the "cracker" via open-throated hoppers, without using grates over the dump hopper.
- the cracker must have a low profile, enabling it to fit into any space.
- the cracker must have an extremely wide feed opening so that large frozen chunks can enter the chamber.
- frozen chunks larger than the feed opening must be exposed to the shearing action of the teeth on the revolving roll. This shearing action must reduce those large chunks to the point where the teeth can pull them into the cracker for further reduction by impact, shear and compression.
- the cracker must reduce the large frozen chunks completely and feed a minus 6" to 8" output size to the conveyors.
- the operator must be able to start the cracker up under a head of coal, using a normal torque motor!
- the entire breaker plate assembly of the cracker must be externally adjustable to control product size and to compensate for wear.

The original Pennsylvania Frozen Coal Cracker met all those criteria and has performed in power stations throughout cold weather areas for over forty years.



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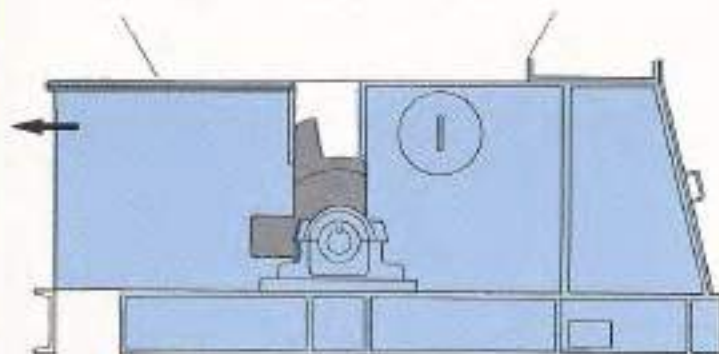
# Newest Models

Pennsylvania now introduces the new FCC and FCCR Frozen Coal Crackers. Using these latest models, power plant operators now gain far greater operating flexibility.



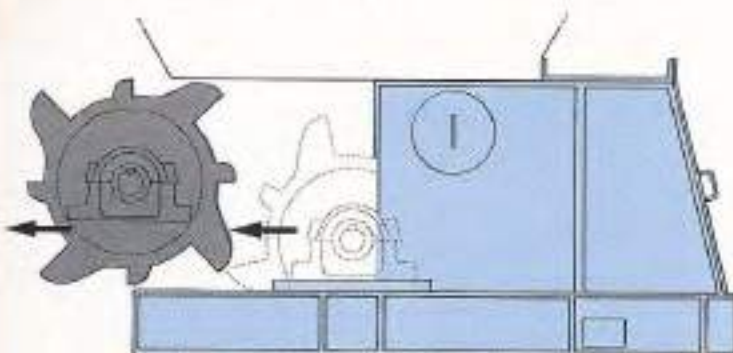
## Model FCC

The Model FCC, offered in seven sizes, is designed so that its entire roll assembly can now be removed for warm weather operation without disturbing the feed system. Removal of the roll is performed by a small work crew with a minimum of effort using conventional hoisting equipment.



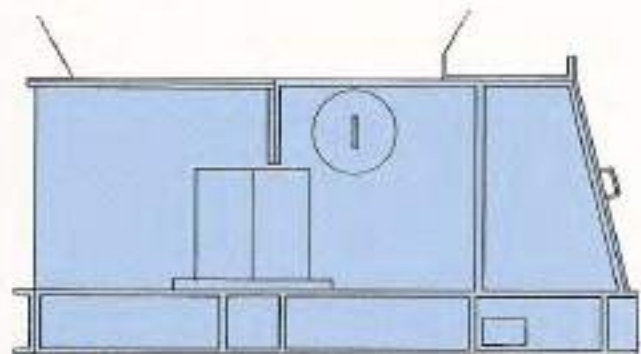
### STEP 1

Remove shim, seal plate and front frame section



### STEP 2

Remove roll



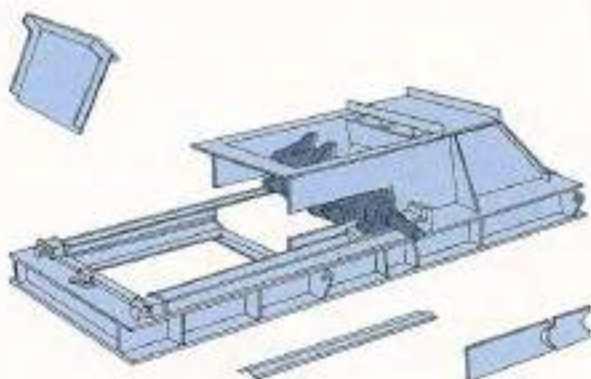
### STEP 3

Replace frame section, shim and seal plate

## Model FCCR

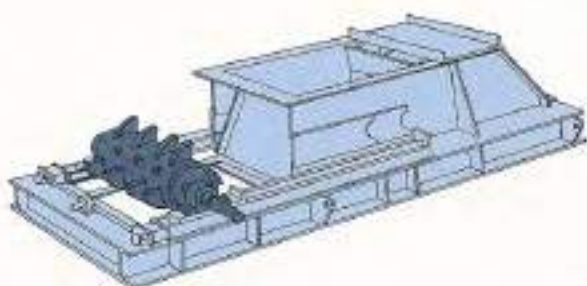
The FCCR offers even greater speed and flexibility for this operation. The frame of this model incorporates two parallel ways along which the roll assembly, including bearings, can be retracted during warm weather. For the retraction process, the FCCR contains a screw mechanism, actuated by a one horsepower power source such as an air drill or electric motor. No hoisting equipment is required and the drive, the chain and chain casing remain fully connected to the roll at all times.

Full retraction of the roll is completed in only ten minutes. The roll shell is stored in retracted position on the frame, fully aligned and ready to be re-inserted when freezing conditions return. This model is offered in seven sizes.



### STEP 1

Remove covers



### STEP 2

Retract the roll and replace covers

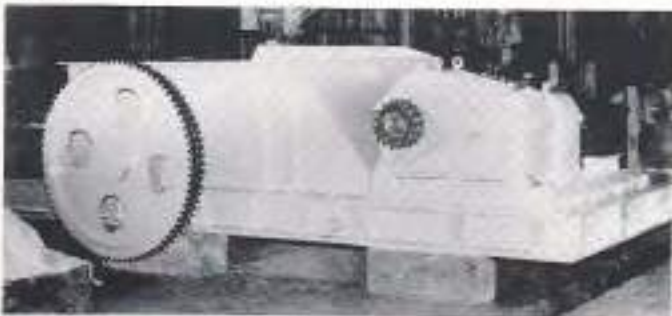
In both the FCC and FCCR models, when the roll shell is removed or retracted as the case may be, the remaining empty frame acts as a dust-tight chute for the unhindered passage of coal. This eliminates unnecessary wear on the working parts of the unit during warm weather months or milder winters.

Protection is provided for all Pennsylvania Frozen Coal Crackers by a spring-loaded toggle mechanism which acts automatically. This feature allows the breaker plate to retreat instantly when uncrushable material enters the cracking chamber. As soon as such material is clear of the chamber, the breaker plate returns immediately to normal position.



Protection from uncrushables

Included with all models is a unique drive system which incorporates motor, coupling and speed reducer on a single modular frame, separate from the cracker itself. This module allows positioning the drive assembly according to space requirements of your installation. The design of this assembly incorporates a slip type coupling between the motor and the speed reducer. This feature allows the crusher to be started under choke feed conditions. This coupling also helps to protect the motor.



Unique drive system

All components of Pennsylvania Frozen Coal Crackers provide reliable service and low maintenance under the most rugged conditions that will ever be encountered.

The frame is fabricated of steel plate and structural shapes, while the roll shaft is machined from forged alloy steel.

All Pennsylvania FCC and FCCR models have spherical anti-friction roller bearings enclosed in split housings to simplify bearing inspection and shaft removal. The roll shell is designed as one piece, with the teeth welded in place to eliminate any chance of these teeth chipping off and causing damage to downstream handling equipment.

Whenever maintenance or inspection is required, our unique design allows all such procedures to be performed easily and quickly.

The benefits of Pennsylvania Frozen Coal Crackers may be summarized as follows:

- frozen coal is quickly reduced in size, allowing it to enter the coal handling system immediately at normal feed rates.
- unloading of unit trains is speeded, resulting in the reduction or elimination of demurrage charges.
- damage and wear caused by large frozen lumps of coal are eliminated.
- hopper jams, wedging and damage to conveyor belts are eliminated.
- the amount of expensive yard equipment and manpower needed to handle frozen chunks is reduced or eliminated.
- overall downtime and labor attributable to frozen coal handling problems are eliminated or sharply reduced.
- changeover to warm or cold weather operation is greatly simplified, with no need to disturb the feed hopper.

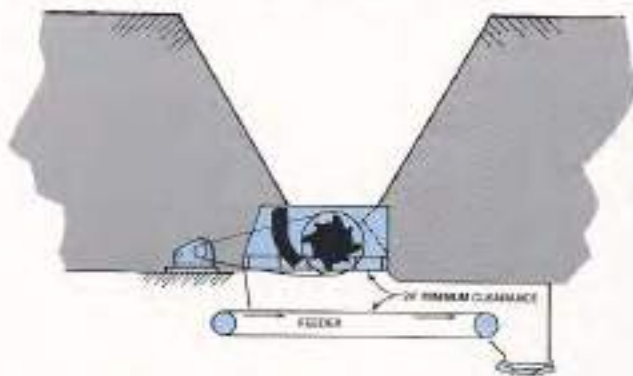
Pennsylvania can perform a study of your particular frozen coal handling situation and determine exactly how a frozen coal cracker will solve the problem. Our recommendations will include sizing of the cracker and of the drive motor, and we can provide ideas on the best feeding methods.

Pennsylvania Crusher is involved in the manufacture of numerous types of crushers, breakers and other reduction equipment for an unusually wide variety of materials. In applications engineering, in test crushing and field service, our experience is unmatched in the industry.

Our parts and service department is ranked among the most responsive in the entire equipment field. This department assists with installation, service, parts stocking and other highly useful programs, all designed to save time and money and improve crushing performance.

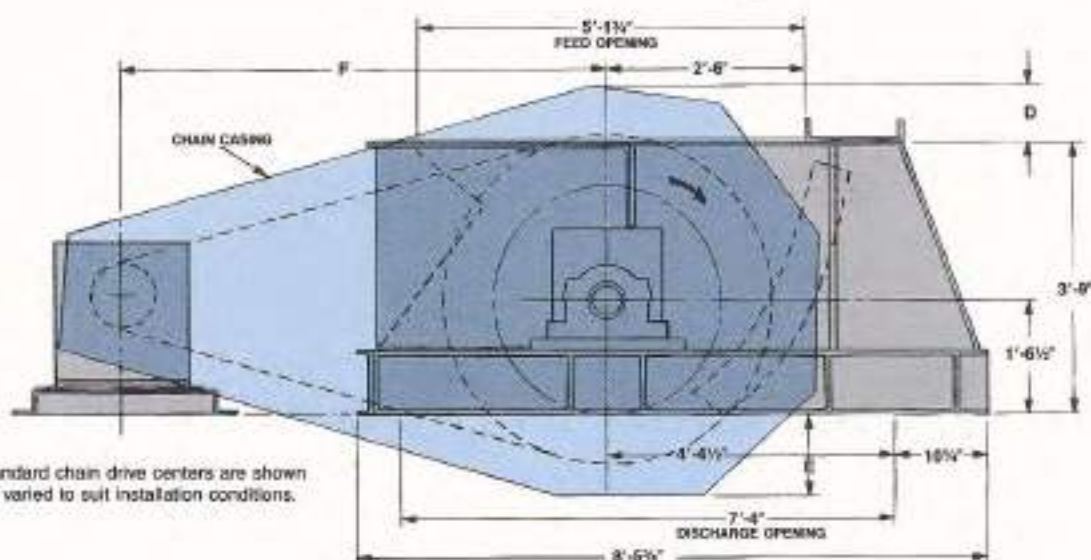
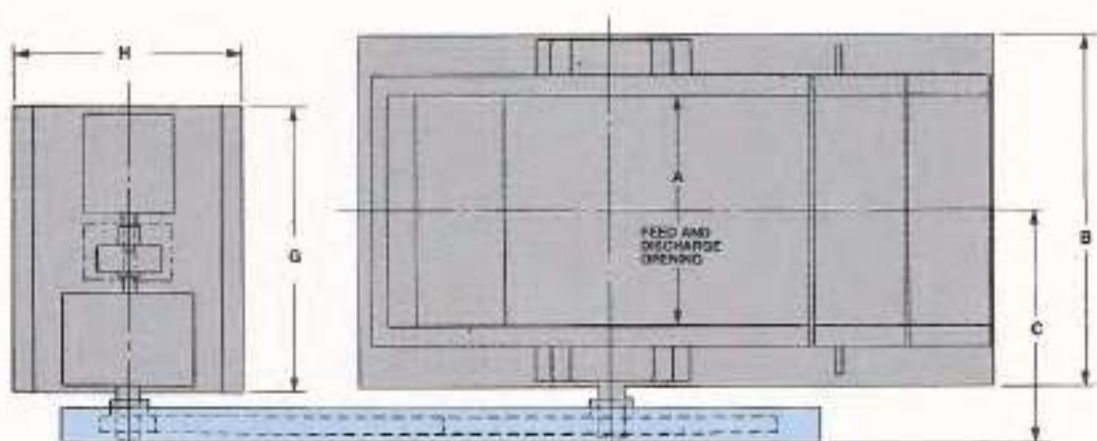
We offer complete training of your maintenance personnel; our service information manuals will give your staff a complete understanding of the best practices to follow for routine maintenance, installation and for trouble-shooting procedures.

If you have any questions regarding Pennsylvania Crusher products or services, please contact your local Pennsylvania representative.



Typical Frozen Coal Cracker Installation as Installed under a Rotary Car Dump or Reclaim Hopper

# The Model FCC



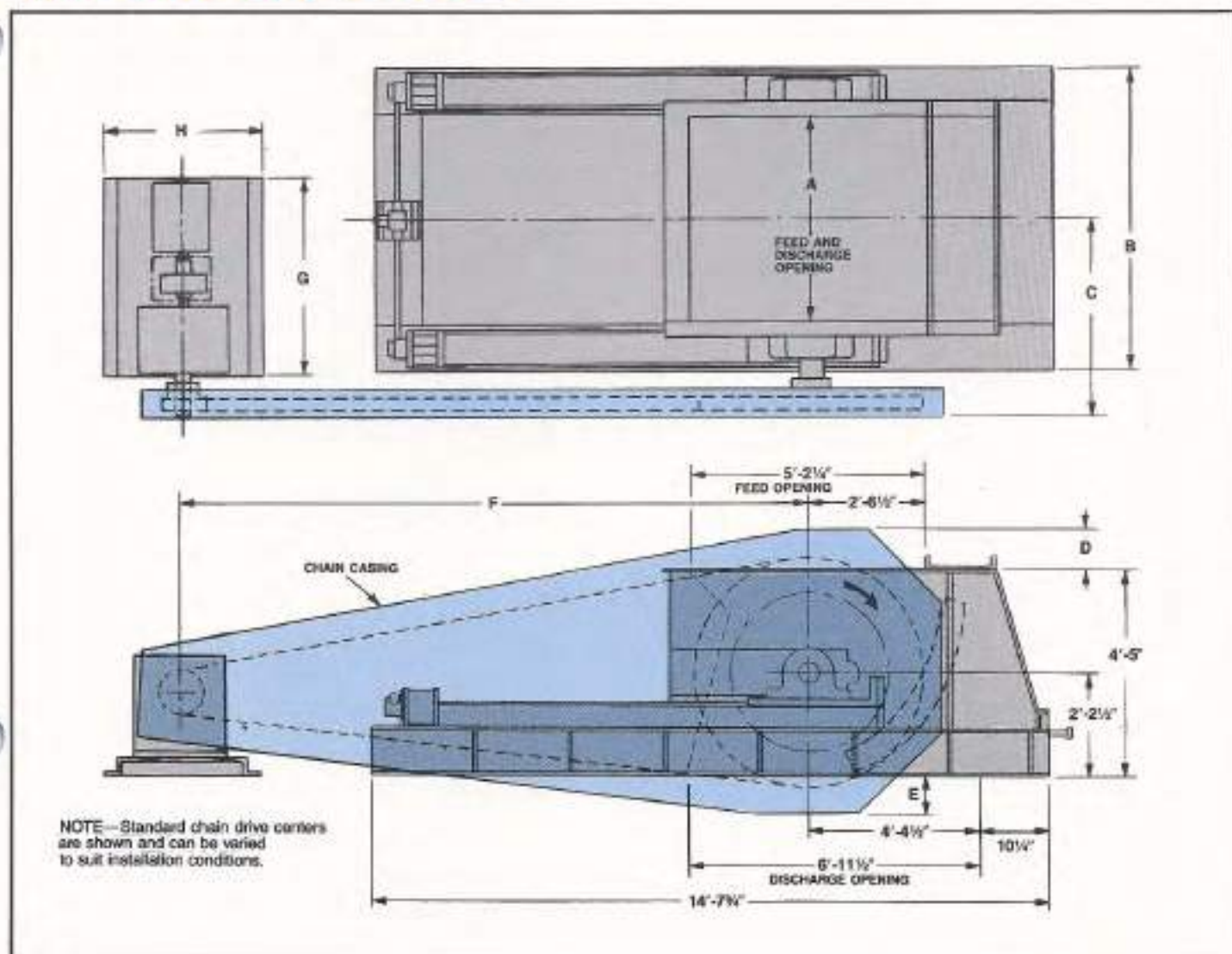
NOTE—Standard chain drive centers are shown and can be varied to suit installation conditions.

## DIMENSIONS

SIZE	A	B	C	D	E	F	G	H	TOTAL WEIGHT (LBS)
30 x 40	3'-6 3/4"	5'-4 1/2"	3'-9 3/4"	5 1/2"	1'-2 1/2"	7'-6 1/2"	4'-7"	3'-11"	13,600
30 x 50	4'-4 3/4"	6'-2 1/2"	4'-2 3/4"	8 1/4"	1'-5"	7'-7 1/4"	4'-7"	4'-2"	15,400
30 x 60	5'-2 3/4"	7'-0 1/2"	4'-7 1/2"	11 1/2"	1'-8"	7'-7 1/4"	5'-0"	4'-2"	17,000
30 x 72	6'-2 3/4"	8'-0 1/2"	5'-3 3/4"	1'-3 1/2"	2'-1 3/4"	7'-6 1/4"	5'-6"	4'-8"	20,900
30 x 84	7'-2 3/4"	9'-0 1/2"	5'-11"	1'-3 1/2"	2'-1 3/4"	7'-6 1/2"	6'-0"	4'-8"	23,100
30 x 100	8'-6 3/4"	10'-4 1/2"	6'-6 3/4"	1'-8 3/4"	2'-6 1/2"	7'-7 1/2"	6'-4"	5'-2"	29,000
30 x 120	10'-2 3/4"	12'-0 1/2"	7'-5 1/2"	1'-8 3/4"	2'-6 1/2"	7'-7 1/2"	6'-10"	5'-2"	34,800

Dimensions are approximate only and subject to change without notice. Certified drawings are furnished for installation.

# The Model FCCR



## SIZES AND CAPACITIES PENNSYLVANIA FCC and FCCR FROZEN COAL CRACKERS

Capacities shown are based on reducing precrushed coal weighing 50 pounds per cubic foot that has frozen into agglomerated lumps to a nominal 6" output size. For other output sizes, consult with Pennsylvania Crusher Corporation for capacity information.

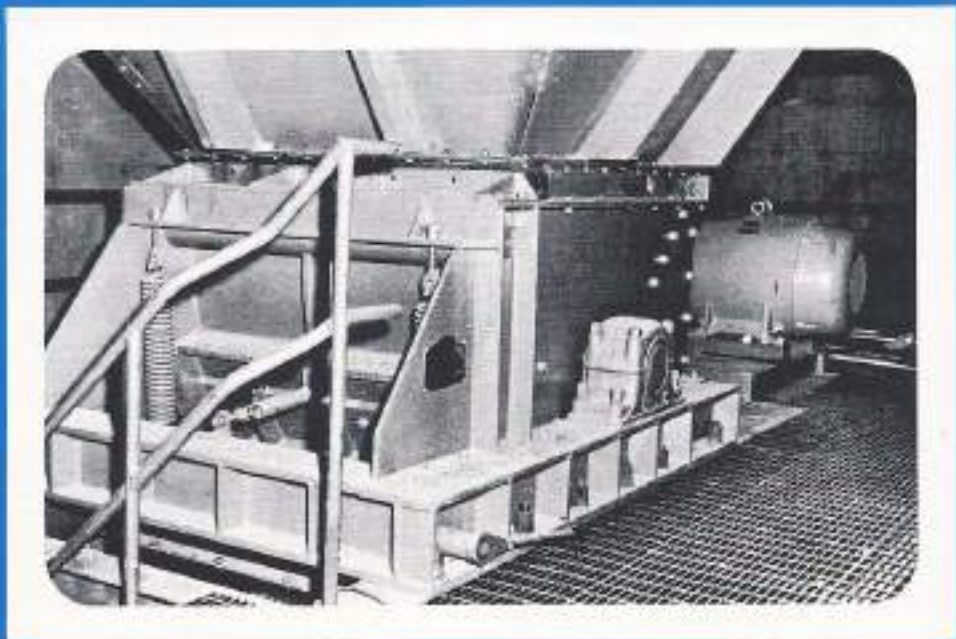
SIZE	CAPACITY	HP
30 x 40	625 TPH	60
30 x 50	750	75
30 x 60	1000	100
30 x 72	1250	125
30 x 84	1500	150
30 x 100	1800	150
30 x 120	2100	200

## DIMENSIONS

SIZE	A	B	C	D	E	F	G	H	TOTAL* WEIGHT (LBS)
30 x 40	3'-6 3/4"	5'-8 1/4"	3'-10 1/2"	5 1/2"	1'-3 1/2"	11'-11 1/2"	4'-7"	3'-11"	21,600
30 x 50	4'-4 3/4"	6'-6 1/4"	4'-3 1/2"	8 1/4"	1'-5"	12'-0 1/4"	4'-7"	4'-2"	23,400
30 x 60	5'-2 3/4"	7'-4 1/4"	4'-8 1/4"	11 1/2"	1'-8"	12'-0 1/2"	5'-0"	4'-2"	25,000
30 x 72	6'-2 3/4"	8'-4 1/4"	5'-4 1/4"	1'-4 1/2"	2'-1 3/4"	11'-11 1/4"	5'-6"	4'-8"	28,900
30 x 84	7'-2 3/4"	9'-4 1/4"	6'-0"	1'-4 1/2"	2'-1 3/4"	11'-11 1/2"	6'-0"	4'-8"	31,100
30 x 100	8'-6 3/4"	10'-8 1/4"	6'-6"	1'-8 1/4"	2'-6 1/2"	12'-0 1/2"	6'-4"	5'-2"	37,000
30 x 120	10'-2 3/4"	12'-4 1/4"	7'-4 1/4"	1'-8 1/4"	2'-6 1/2"	12'-0 1/2"	6'-10"	5'-2"	42,800

Dimensions are approximate only and subject to change without notice. Certified drawings are furnished for installation.

\*includes drive (less motor)



*Typical installation of a Pennsylvania Frozen Coal Cracker at Public Service Company of New Hampshire, Merrimack Station.*

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