



**CARDOX**  
INTERNATIONAL LIMITED



*CIVILS QUARRING MINING  
high pressure rock/concrete  
breaking system*

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*North American Distributor*

***Force Vector, Inc.***

*P.O. Box 2519 · Bridgeview, IL 60455*

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# CIVILS

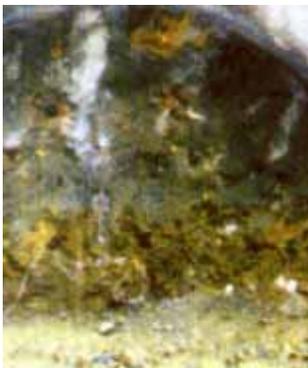
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## Rock Excavation



Newry Bypass - Excavation of rock adjacent to busy road.

## Tunnelling, Trenching and Shaftsinking



Before:

After:

Greece - Athens Metro System.  
Four CARDOX Tubes breakout centre section of tunnel.

South Africa - Excavation  
of shaft adjacent to main  
road under gas, electricity  
and water mains



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## Underwater Excavation



Before:

CARDOX Tube about to be activated.



During:

Diver can stay in water, no shockwave, no noise.



After:

No danger to marine life. Used in close proximity to ships/structures.

- Harbour Deepening and Widening
- Excavations of Seabed for Cable/Pipeline installations
- Breaking Concrete Overspills
- Deepening of Riverbeds

**CADOX, a fast, efficient and safe way to break rock.**



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# Concrete Demolition

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The Keban Dam, Eastern Turkey  
Breaking out of 4 channels each 6.5m wide across spillways of dam.



Before:

After:

CARDOX Tubes placed in drill holes.

Engineers view the results. The reinforced concrete is completely broken.



Busy stretch along River Thames, London. Excavation of reinforced concrete dolphin adjacent to exclusive new apartment block and half a mile from the tower of London in one direction and Canary Wharf seen in the background.

CARDOX Tubes are placed and wired - up.

CARDOX Tubes break the reinforced concrete.



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## Yields in various applications

Applications	Excavations/Strata Type	Average yield per CARDOX Tube in cubic metres
Quarrying	General Dimensional Stone	3 to 6 5 to 20
General Open Cut Excavations	Hard / Medium Rock	3 to 5
Foundation Excavations	Hard Rock Medium Rock	0.75 to 1 1 to 1.5
Trench Excavations	Hard Rock Medium Rock	0.6 to 1 0.75 to 1.5
Tunnel Excavations	Hard Rock Medium Rock	0.5 to 0.75 0.75 to 1.5
Concrete Excavations	Mass Concrete Lightly Reinforced Concrete Heavily Reinforced Concrete	2 to 4 1 to 2 0.75 to 1

**CARDOX, controlled concrete demolition for sensitive areas.**



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# QUARRYING

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## Dimensional Stone Quarrying



Two CARDOX Tubes split and heave a block of over 50 tonne.



CARDOX Tubes applied horizontally to lift a block along its natural bed plane.



When using CARDOX, very little wastage results, as the gas splits and heaves along natural fissures and bed planes.

### What the Quarry Managers say...

- "Fewer drill holes required than when using black powder."
- "Lower cost than using black powder."
- "Easier to use than other methods."
- "Lower noise emission than explosives."
- "Horizontal and vertical applications."
- "Less waste."
- "Virtually no dust."
- "No magazine required."
- "No stemming operation needed."
- "Longer shelf life than other methods."

**All the benefits of explosives.. with none of the headaches.**



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# MINING

Increase the value of your coal or mined ore!



## THE CARDOX ACTION



The controlled pressure begins...



...at the back of the hole...



...forward heave without shattering...



A better and cleaner product mined.

## THE BENEFITS OF CARDOX

- Mines Inspectorate
- Classified as Non-Explosive
- No Special permits for storage, use, transportation
- Safety in gaseous mines
- Large clean lump coal/ore produced
- Dramatic reduction in fine coal/ore
- Continuous mining - no need to evacuate mine, immediate return to work face
- Virtually no dust
- Cost effective
- Usually fewer holes than conventional methods
- Increased output
- Instantaneous results
- Indefinite shelf life
- No shock waves or damaging vibration
- Delay systems available

**Cardos Tubes are refilled and reused continually for over 15 years.**

**With the new Tube Recharging Unit, Tubes are refilled with liquid CO<sub>2</sub> in less than a minute.**



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# THE CARDOX PRODUCT

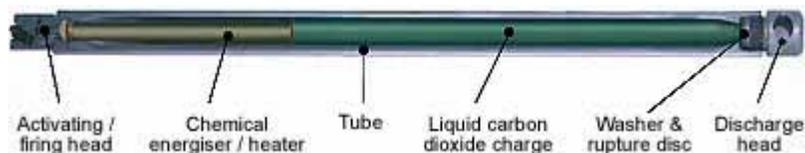
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## What is CARDOX?

Originally developed for use in fiery coal seams, the CARDOX System is extensively used for breaking rock, concrete and many other materials expeditiously, with complete safety and without any adverse effects. CARDOX produces instantaneously a powerful heaving force, using carbon dioxide which cracks and breaks the material along natural and/or induced fracture plains whilst heaving it away from the mass of rock/concrete.

## The CARDOX tube

Cardox Tube Cut-away



## HOW it works

One or more holes are drilled in the material to be broken and the CARDOX Tube(s) inserted. A connection is then made from the Tube(s) to a low tension activator, and on passing an impulse from this to the charged Tube(s), the low tension electric fuse initiates a rapid reaction in the energiser causing the liquid carbon dioxide in the Tube to change into gas, increasing its volume by 600 times in the process. The instantaneous build-up in pressure reaches the yielding pressure of the rupture (shear) disc which bursts releasing a heaving mass of CO<sub>2</sub> which breaks the surrounding material. The whole process takes less than 1 second. By selecting the thickness of the rupture disc, the power of the Tube can be regulated to suit all conditions. After recovery the Tube, the heater and rupture disc are replaced, the liquid CO<sub>2</sub> recharged and the Tube is ready to be used again.



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# Types of CARDOX Tube & Suitability Guide

Type of Tube	B20	B37	B50	F57	F57-L	C74
Nominal Diameter inch (mm)	1.854 (47)	1.854 (47)	1.854 (47)	53 (2.090)	53 (2.090)	67 (2.610)
Length inch (mm)	21.46 (545)	38.19 (970)	51.02 (1,296)	42.56 (1,081)	58.74 (1,492)	35.44 (900)
Weight lbs. (kg)	12.01 (5.45)	18.03 (8.18)		28.06 (12.73)	44.09 (20)	37.08 (16.82)
CO2 Charge lbs. (kg)	0.63 (0.29)	1.32 (0.60)		1.94 (0.88)	2.75 (1.25)	2.75 (1.25)
Shear Disc Type	SD-75 SD-100 SD-150	SD-75 SD-100 SD-150	SD-75 SD-100 SD-150	SD-300 SD-350 SD-370 SD-390	SD-300 SD-350 SD-370	SD-200 SD-250
Shear Disc Product Code	800-007 800-008 800-009	800-007 800-008 800-009	800-007 800-008 800-009	800-010 800-011 800-012 800-013	800-010 800-011 800-012	800-014 800-015
Rupture Pressure tons/in <sup>2</sup>	9 12 15	9 12 15	9 12 15	8 12 15 17.5	8 12 15 17.5	8 12
Rupture Pressure kg/cm <sup>2</sup>	1390 1854 2320	1390 1854 2320	1390 1854 2320	1236 1854 2320 2700	1236 1854 2320	1236 1854
Heater (Chemical Energiser)	D77.5 D77.5 D77.5	D77.5 D77.5 D77.5	D77.5 D77.5 D77.5	D115 D115 D115 D115	D115 D115 D115	D145 D145
Size of Drilling Bit inch (mm)	2 (51)	2 (51)	2 (51)	2.25 (57)	2.25 (57)	3 (76)

## B20 TUBE

Secondary breaking of rock or concrete. Thin section concrete.

## B37 TUBE

Coal/Ore Mining. Secondary breaking of rock or concrete. Silo, kiln works, Mass concrete. Thin section concrete.

## F57 TUBE

Coal/Ore Mining. Quarry, Tunnelling & Trenching. Large scale excavation of rock. Reinforced/ Mass Concrete.

## F57-L TUBE

(Elongated F57 Tube) Coal Mining Quarrying.

## C74 TUBE

Silo, kiln works. Porous, fissured rock. Mass concrete.



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