

# EROSION CONTROL BMPS FOR HIGHWAY & ROAD CONSTRUCTION

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# EROSION CONTROL & SEDIMENT CONTROL



Soil erosion is a natural process. Accelerated erosion from construction is largely preventable. Capturing fine soil particles (clays) is more difficult.

# WHAT IS EROSION?



Detachment  
(rain, wind, ice and gravity)

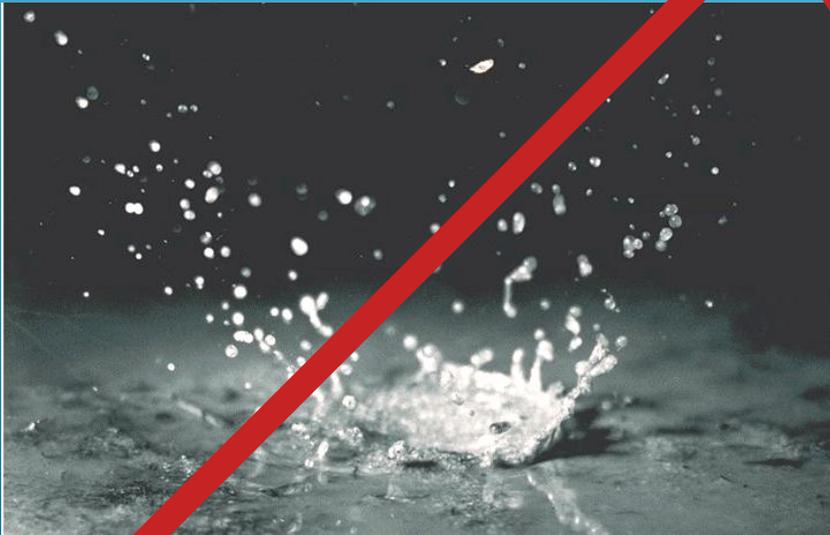


Transport  
(sheet, rill and gully)



Deposition  
(bottom of slope)

# WHAT IS EROSION CONTROL?



Preventing or Minimizing  
the Soil Detachment

- Preserving existing vegetation
- Limiting the time soil is exposed to the elements
- Mulch, erosion matting & polymers
- Site restoration and revegetation

# WHAT IS SEDIMENT?



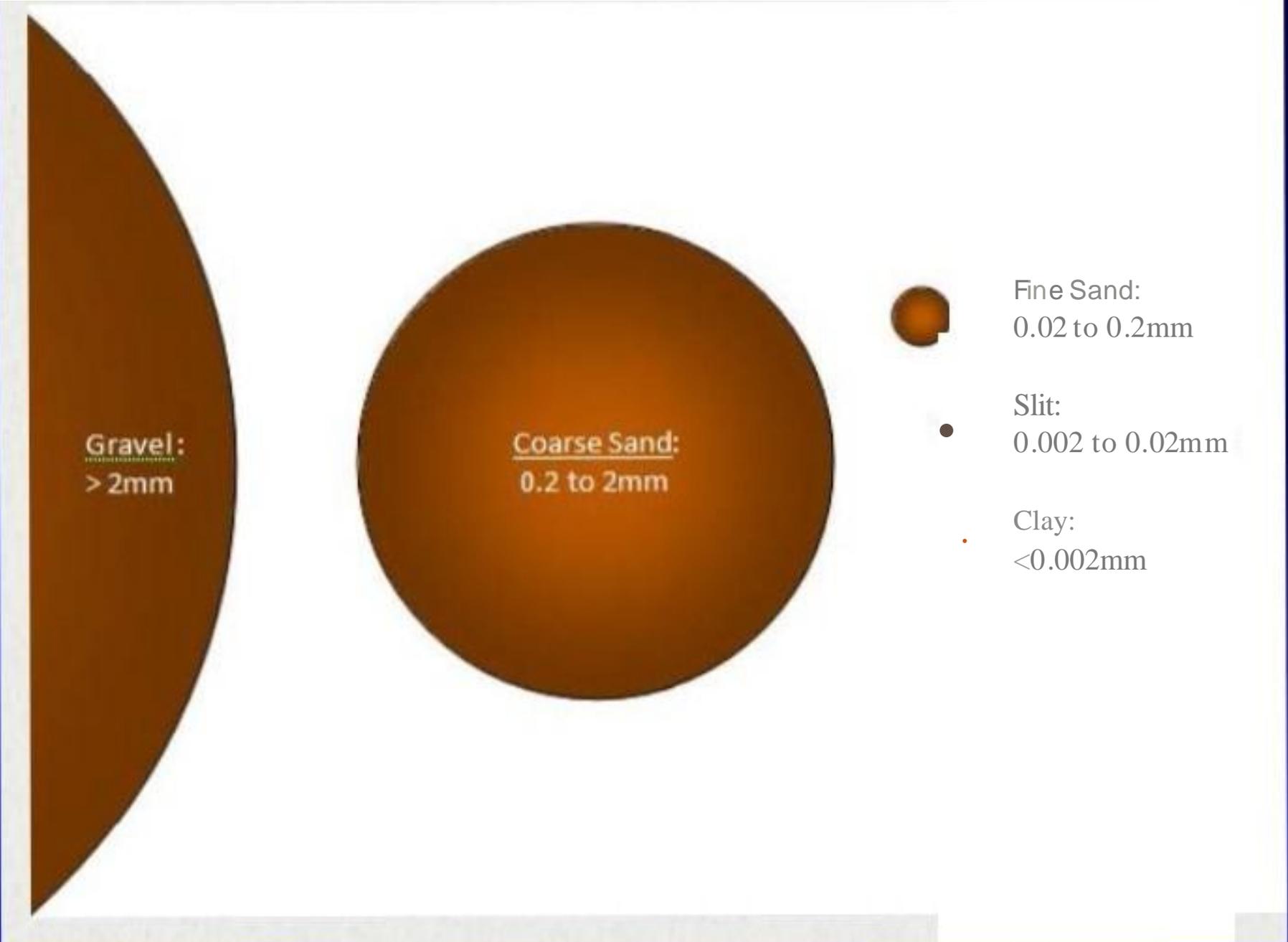
Solid material that is transported by runoff, suspended within runoff or deposited by runoff from its original source

# WHAT IS SEDIMENT CONTROL?



Capturing eroded soils in runoff before letting them enter waterways, wetlands or leaving the site.

Can be done using filtering or settling.



The diagram illustrates the relative sizes of different soil particles. On the left, a large brown semi-circle represents Gravel (> 2mm). In the center, a large brown circle represents Coarse Sand (0.2 to 2mm). To the right, three smaller brown shapes represent Fine Sand (0.02 to 0.2mm), Slit (0.002 to 0.02mm), and Clay (< 0.002mm). The sizes decrease significantly from left to right.

Gravel:  
> 2mm

Coarse Sand:  
0.2 to 2mm

Fine Sand:  
0.02 to 0.2mm

Slit:  
0.002 to 0.02mm

Clay:  
< 0.002mm



Excessive sedimentation can make lakes and streams uninhabitable for fish and invertebrates



THAT'S GREAT!

What Does It All Mean  
For County Highways?



I'm shovel ready!

# WHAT ARE BMPS?

Best Management Practices (“BMPs”) are measures that are implemented to protect water quality and reduce the potential for pollution associated with storm water runoff.



In this photo: erosion mats, triangular silt dike, straw bales and mulch.

# BMP CATEGORIES

## Erosion Control

- Erosion Matting
- Mulch
- Polyacrylamide
- Seeding
- Dust Control
- Tarps

## Sediment Control

- Silt Fence
- Ditch Checks
- Surface Roughening
- Filter Strips
- Basins & Traps
- Storm Inlet Protection
- Dewatering

## Site Management

- Existing Vegetation
- Diversions
- Construction Entrances
- Phasing

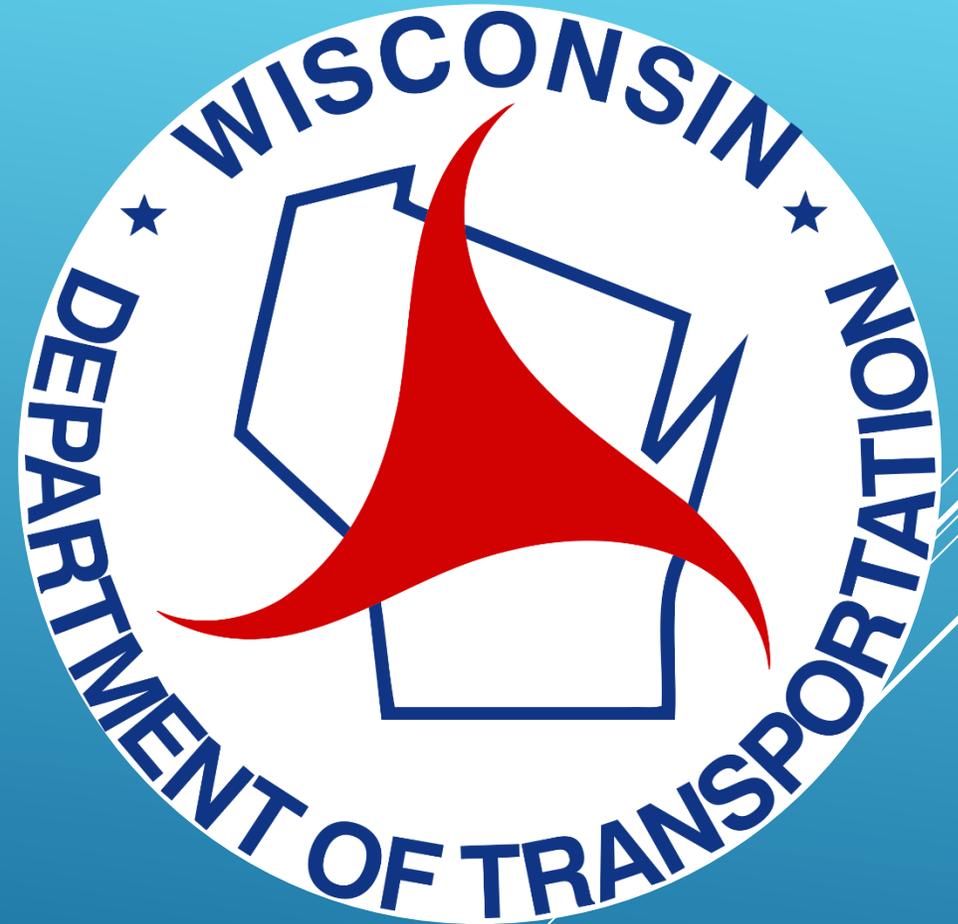
## Common Sense

- Wattles
- Rock Bags
- Stone Burritos
- Pipe Drops

# TECHNICAL DESIGN STANDARDS



Construction site erosion & sediment control Standards  
[dnr.wi.gov](http://dnr.wi.gov)



WisDOT procedures and standards  
[wisconsindot.gov](http://wisconsindot.gov)

# EROSION MATTING



## Channels

**CHANNEL EROSION CONTROL MATRIX  
(Concentrated Flow Application)**

TYPE OF EROSION CONTROL DEVICE	PERMITS/LE EROSION LENGTH	DITCH GRADE															REMARKS	
		< 2%																
		2% - 4%			4% - 6%			6% - 9%*			9% - 12%*							
		Mac. Length (ft.)	300	600	1200	300	600	1200	300	600	1200	300	600	1200	300	600		1200
Seed with properly anchored mulch	0.6	█	█	█														Anchor mulch per specifications.
Sod ditch checks with seed and mulch	N/A	█	█	█	█	█												Install one ditch check for every 1 foot of drop. Sod stakes required.
Temporary ditch checks (hay bales or approved manufactured alternatives listed in the WisDOT PAL)	N/A	█	█	█	█	█												Install one ditch check for every 2 feet of drop. Maximum 200' spacing. Not recommended for slopes less than 1%.
Sod ditch liner	1.0	█	█	█														Upstream end must be buried. Additional sod stakes required.
Double netted light duty (WisDOT Class I Type B) erosion mat	1.5	█	█	█	█	█												Only mat type products allowed.
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	1.5	█	█	█	█	█												Upstream end must be buried. Additional sod stakes required. Two bid items needed.
Stone or rock ditch checks, or Rock-Filled Filter Bags	N/A	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Use No. 2 coarse aggregate, railroad ballast, or breaker run. Install one ditch check for every 2 feet of drop. Use in conjunction with a channel lining.
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	2.0	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Heavy duty synthetic (WisDOT Class III Type A) erosion mat or turf reinforcement mat (WisDOT Class III Type B)	2.0	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Germination may be a problem with Class III Type A mats. An ECRM is required for initial erosion protection for Class III Type B mats.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type C) mat	3.5	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.
Riprap ditch checks	N/A	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Place top of downstream ditch check level with bottom of upstream ditch check. Use in conjunction with a channel lining.
Heavy duty synthetic turf reinforcement (Class III Type D) mat	5	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.
Light riprap	4	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Outfalling, overtopping and scour need to be addressed. Use 2' minimum ditch depth.
Medium riprap	5	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Heavy riprap	8	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	

Riprap measures apply to all ditch types. Use of these measure requires engineering judgement and design.

## Erosion Control and Storm Water Product Acceptability Lists

## Slopes

**SLOPE EROSION CONTROL MATRIX**

TYPE OF EROSION CONTROL	SLOPE												REMARKS
	6:1 or flatter (7)		4:1		3:1		2.5:1		2:1		1:1		
	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	SLOPE LENGTH	
Seed with properly anchored mulch	█	█	█	█	█	█	█	█	█	█	█	█	
Single netted light duty (WisDOT Class I Type A) erosion mat	█	█	█	█	█	█	█	█	█	█	█	█	
Light duty single netted 100% biodegradable (WisDOT Urban Type A) erosion mat	█	█	█	█	█	█	█	█	█	█	█	█	Use only 100% biodegradable anchors for urban mats.
Light duty double netted 100% biodegradable (WisDOT Urban Type B) erosion mat	█	█	█	█	█	█	█	█	█	█	█	█	Use only 100% biodegradable anchors for urban mats.
Bonded Mulch (WisDOT Type A Soil Stabilizer)	█	█	█	█	█	█	█	█	█	█	█	█	May be applied over Class III Type B, C, or D mats in place of erosion control revegetation mats.
Polymer (WisDOT Type B Soil Stabilizer)	Used in conjunction with other BMPs effective up to a 2:1 slope. Not effective in sand. When used alone effective up to a 3:1 slope. Stand alone use appropriate for earthen stock piles, temporary, and late season applications												
Double netted light duty (WisDOT Class I Type B) erosion mat	█	█	█	█	█	█	█	█	█	█	█	█	⊗
Sod	█	█	█	█	█	█	█	█	█	█	█	█	⊗
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	█	█	█	█	█	█	█	█	█	█	█	█	
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	█	█	█	█	█	█	█	█	█	█	█	█	⊗
Heavy duty synthetic erosion control revegetation mat (WisDOT Class III Type A)	█	█	█	█	█	█	█	█	█	█	█	█	Germination may be a problem with Class III Type A mats.
Riprap	█	█	█	█	█	█	█	█	█	█	█	█	Angle of repose must be considered, see FDM Chapter 13.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type B or C) mat	█	█	█	█	█	█	█	█	█	█	█	█	A soil stabilizer or ECRM will be required for initial erosion protection.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type D) mat	█	█	█	█	█	█	█	█	█	█	█	█	A soil stabilizer or ECRM will be required for initial erosion protection.
Slope paving or grouted riprap	█	█	█	█	█	█	█	█	█	█	█	█	Consider clear zone requirements. Only use in limited circumstances such as overflow areas near bridges.

Uses grade and slope length to identify acceptable product classes

# DEWATERING

Good



Bad



Fabric opening size must be less than .2 mm, fine sand is .02 to .2 mm, so silts and clays pass right through. Secondary containment is needed to catch smaller particles.  
Also, dewatering bags should be placed on undisturbed soil.

# Silt Fence

Trenched into the ground

Top support cord



# DITCH CHECKS

Ends are higher than the middle

Trenched into the ground

Double Row

Temporary

Before restoration



# Ditch Checks?



# Wattle, triangular silt dike and rock bags!



DON'T USE REBAR STAKES



09.16.2015



09.16.2015

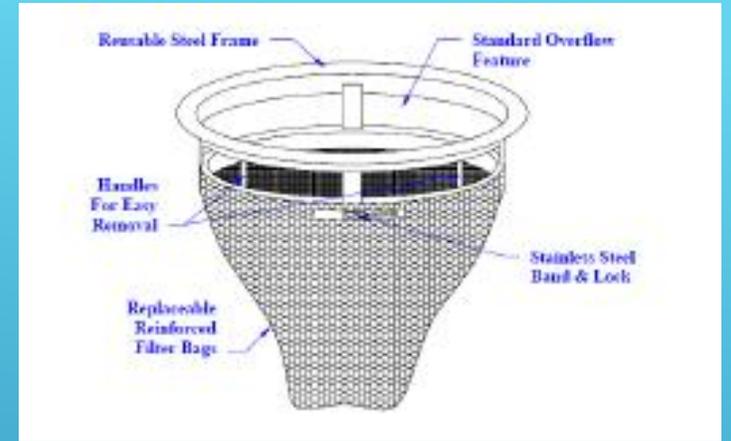
# STORM SEWER INLET PROTECTION







# Type D Inlet Protection



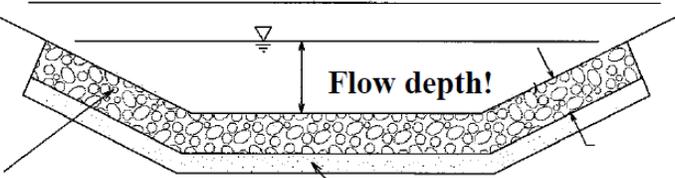
# BIOFILTER?



# POLYACRYLAMIDE



# RIPRAP CHANNELS



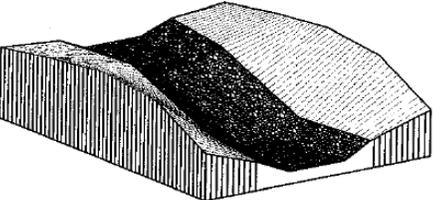
Flow depth!

Specify rock size & grade

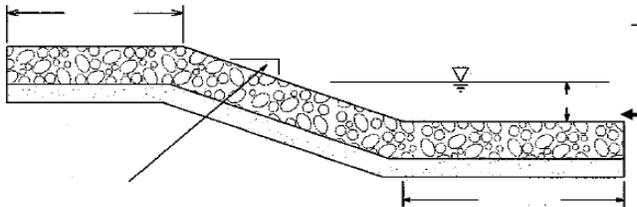
Base or fabric

## Rock-Lined Channel & Chute

Design & Construction



Rock Chute (grade drop)



Specify elevations and slopes

End minimum 1' below water elevation

The diagram shows a cross-section of a rock-lined channel with a trapezoidal shape. It includes a water table symbol (inverted triangle) and a vertical arrow indicating the flow depth. Labels point to the rock lining and the base or fabric. The second diagram is a 3D perspective view of a rock chute showing a downward slope. The third diagram shows a cross-section of a rock-lined channel with a grade drop, including a water table symbol and a vertical arrow indicating the flow depth. Labels point to the rock lining and the base or fabric. A note indicates that the end of the channel should be a minimum of 1 foot below the water elevation.

# BASINS AND TRAPS



Traps: Drainage areas 1 to 5 acres



Basins: Drainage areas larger than 5 acres

...AND THE KITCHEN SINK TOO!

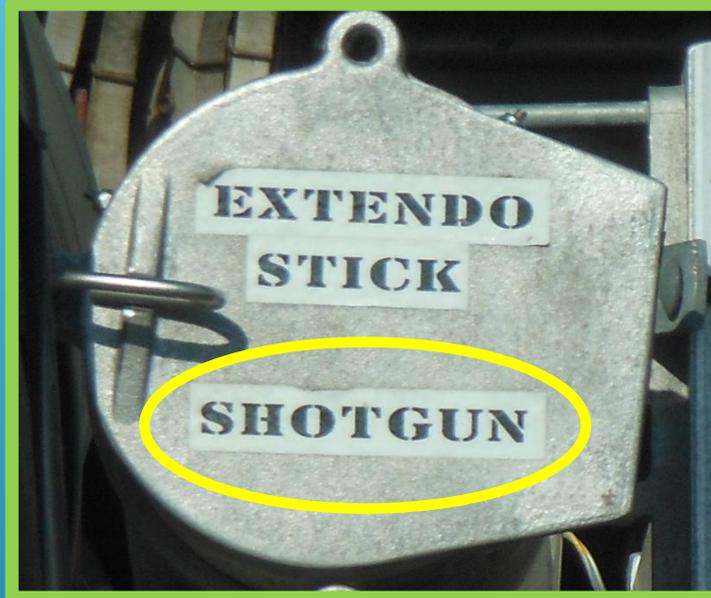


# CATASTROPHIC FAILURES

Prepare for it, they happen!



# The End



Questions?