

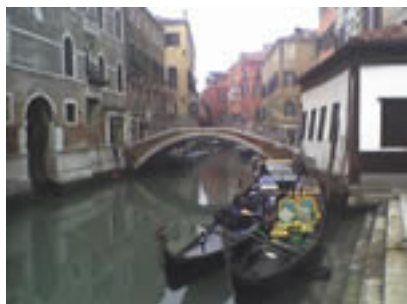


UIE working group
Power Quality

Voltage Dip Immunity of Equipment and Installations

TUTORIAL

Classification of
Equipment Dip Immunity
Dip Immunity Labels
(Part 7)



The First International Conference on Smart Grids, Green
Communications and IT Energy-aware Technologies

ENERGY 2011

May 22-27, 2011 - Venice/Mestre, Italy



Voltage Dip Immunity Labels: Purpose

- ❑ Facilitate communication & exchange of information on dip immunity
- ❑ Advice on what steps to take to ensure that process is not adversely affected by voltage dips
- ❑ Allow equipment manufacturers to report dip immunity of their equipment using only a few key test points



Immunity Classes & Applications

- Classification of equipment dip immunity and equipment behavior:

Voltage dip immunity labels

- Classification of equipment dip immunity
- Equipment Performance Criteria

- ***Assessment and improvement*** of process dip immunity



Voltage Dip Immunity Labels

1. What degree/level of equipment dip immunity is required?
 - Introducing equipment dip immunity classes
2. What is the required behavior of equipment during and after a voltage dip?
 - Equipment performance criteria

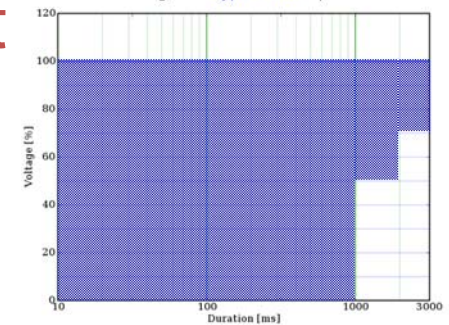


Classification of Equipment Dip Immunity

5 Classes are introduced

- Class A - highest level of equipment immunity
- Class B - good level of equipment immunity
- Class C1 - reasonable level of equipment immunity
- Class C2 - similar to class C1, take into account certain nominal voltage levels
- Class D - basic level of equipment immunity

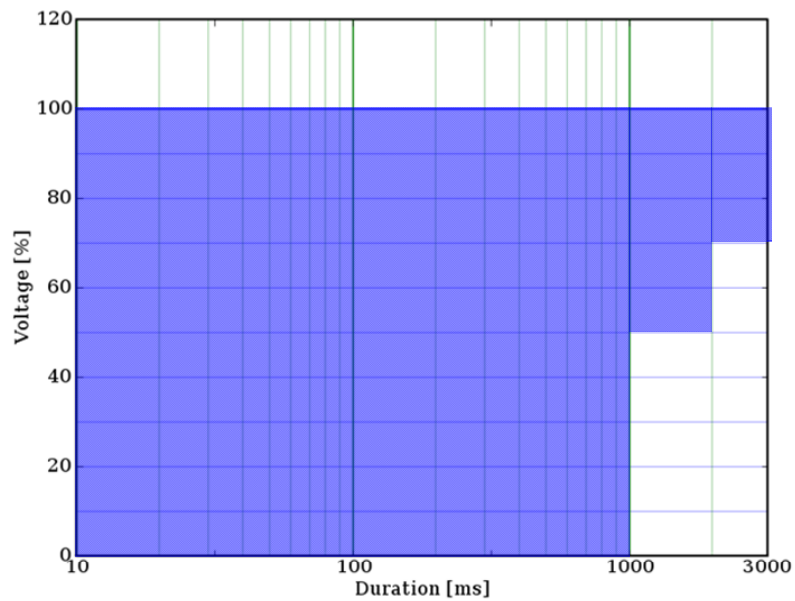
Class A specification of equipment dip immunity against type I + II dips



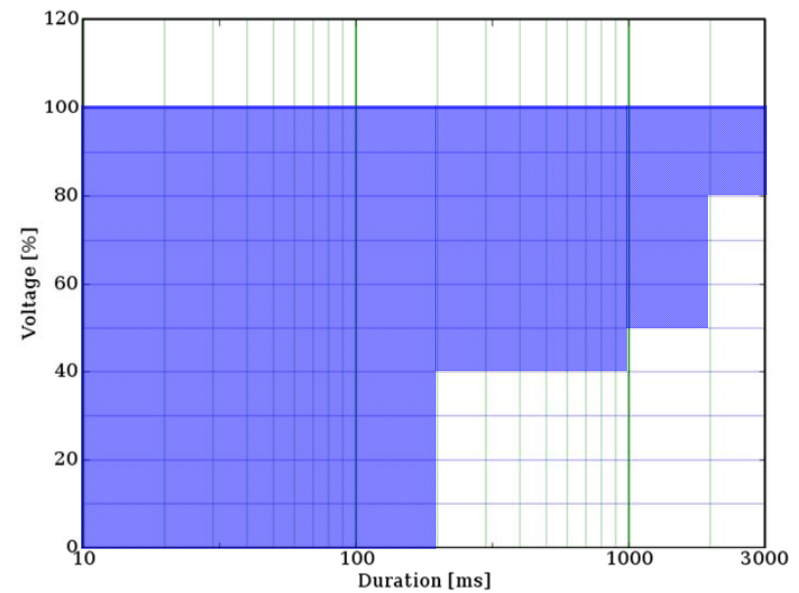


Class A

Class A specification of equipment dip immunity against type I + II dips



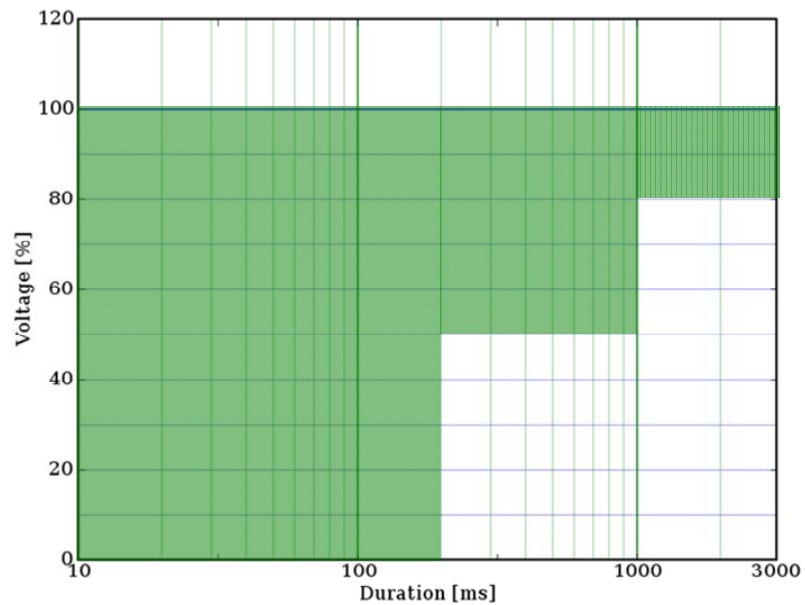
Class A specification of equipment dip immunity against type III dips



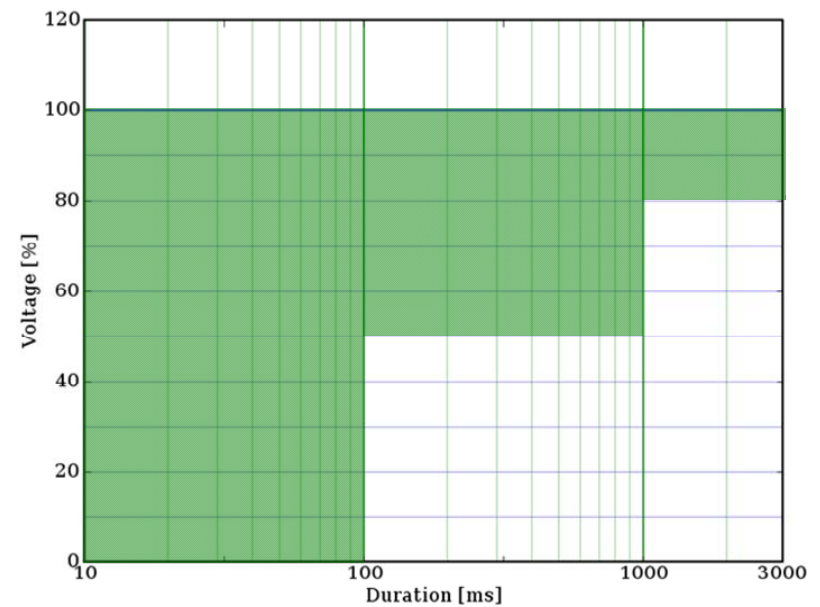


Class B

Class B specification of equipment dip immunity against type I + II dips



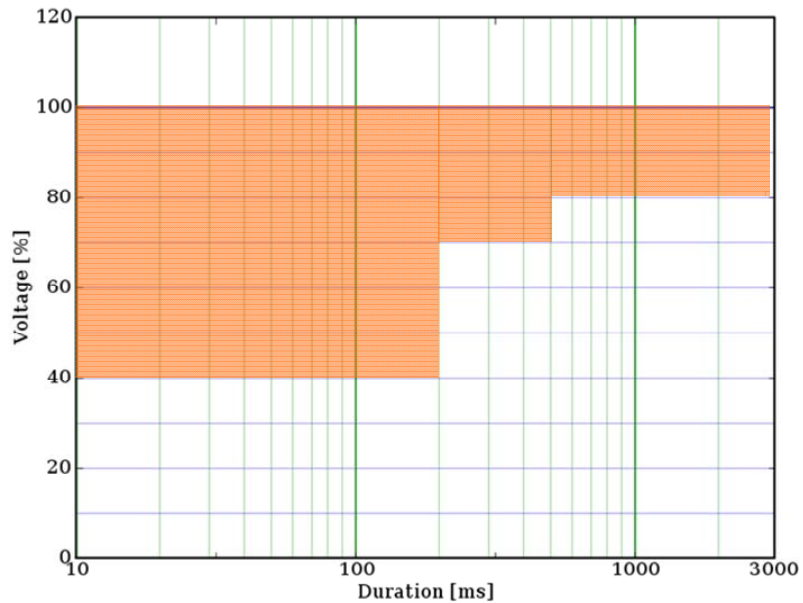
Class B specification of equipment dip immunity against type III dips



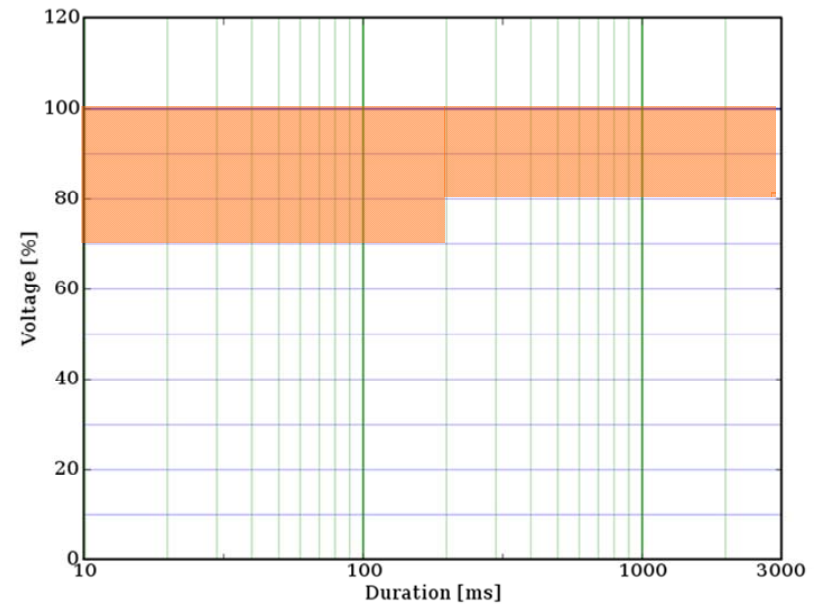


Class C1

Class C1 specification of equipment dip immunity against type I + II dips



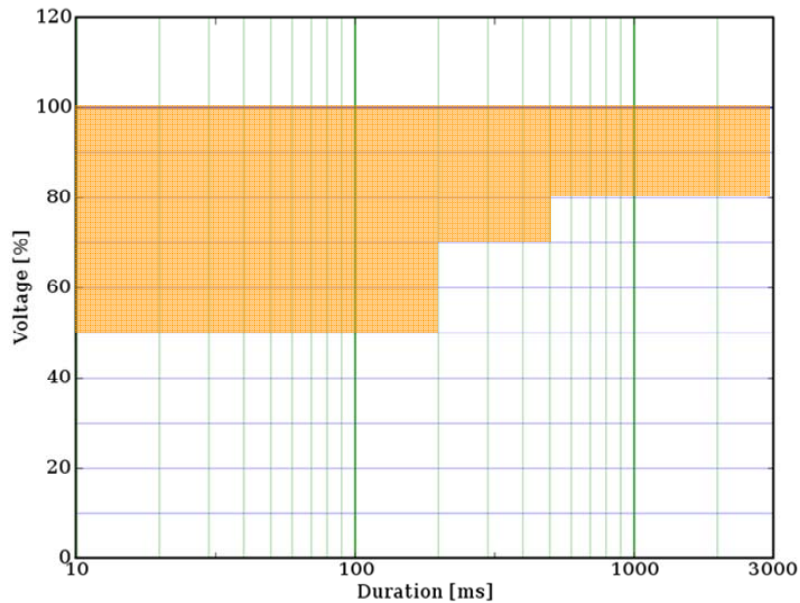
Class C1 specification of equipment dip immunity against type III dips



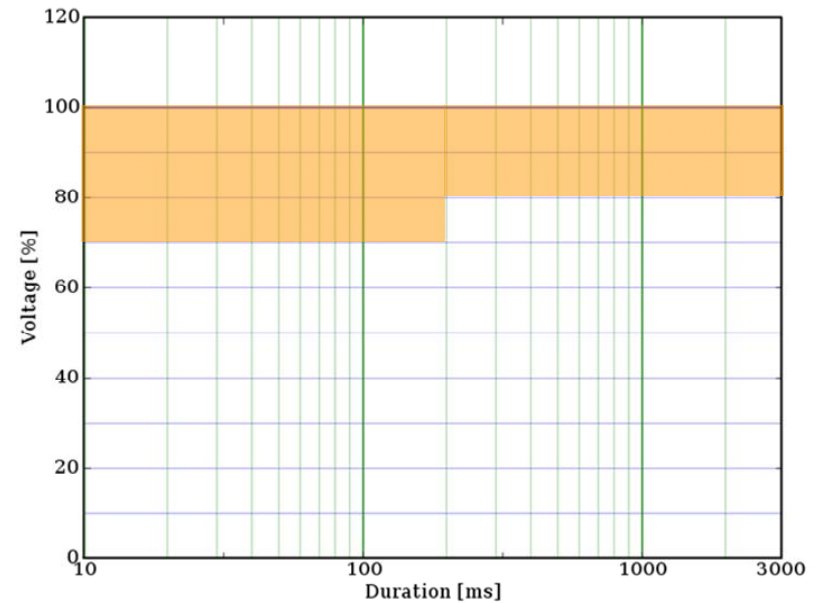


Class C2

Class C2 specification of equipment dip immunity against type I + II dips



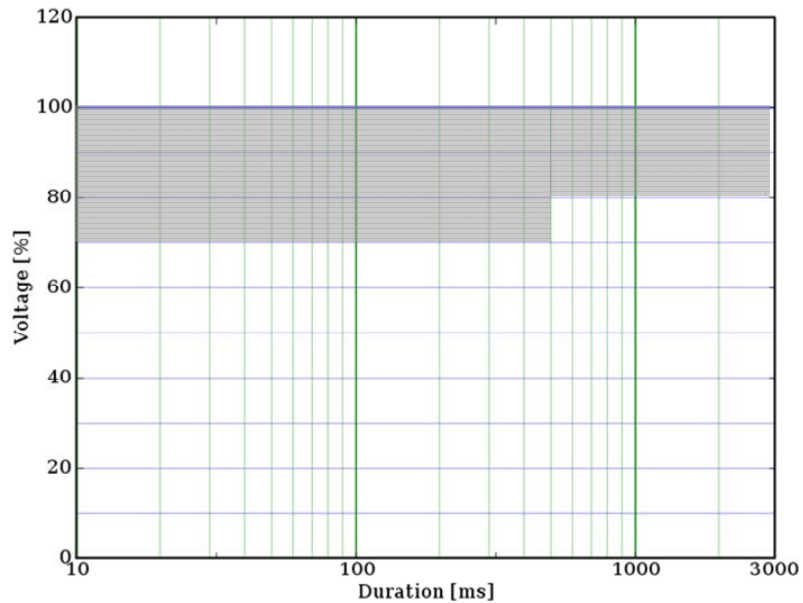
Class C2 specification of equipment dip immunity against type III dips



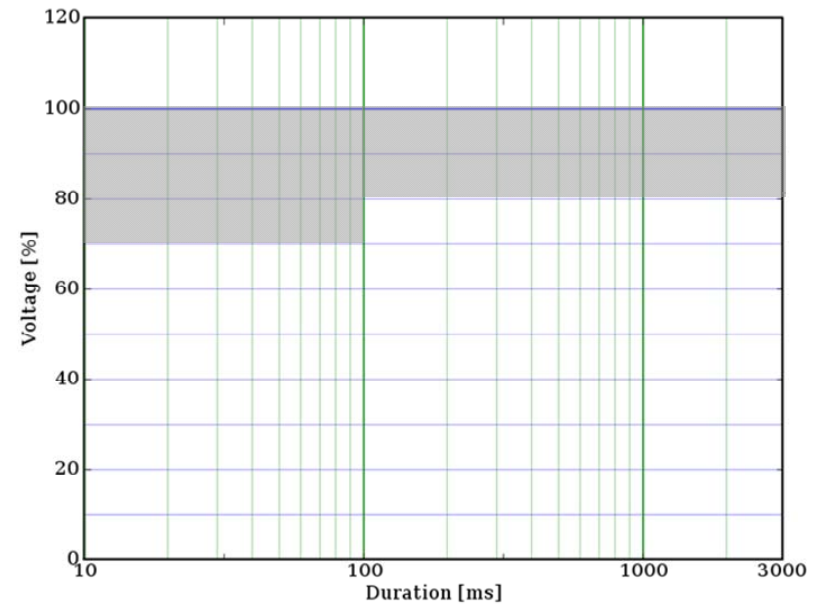


Class D

Class D specification of equipment dip immunity against type I + II dips

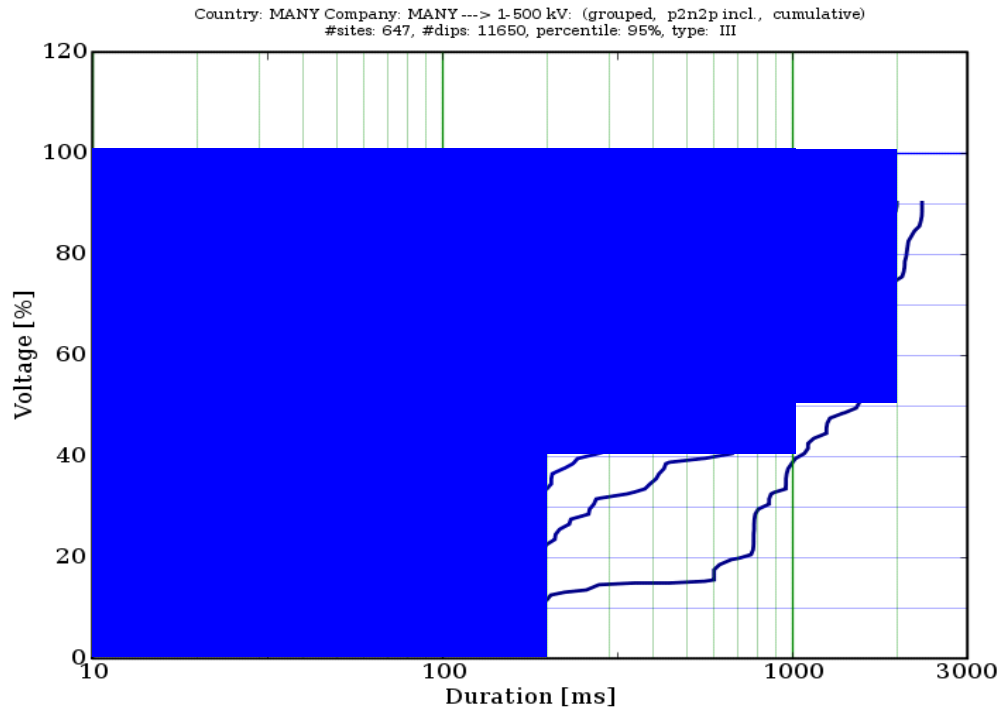


Class D specification of equipment dip immunity against type III dips





Class A specification of equipment dip immunity against Type III dips



?4,5 / year
 $3,5-1+1,5-0,5+1=4,5$

CP95



Typical exposure site

	Cumulated probability	Equipment with Class A immunity	Equipment with Class B immunity	Equipment with Class C1 immunity	Equipment with Class C2 immunity	Equipment with Class D immunity
		Equipment will trip less this number per year				
Type I dips	CP50	0	0	1	1	4.5
Type II dips	CP50	0	0	1	1	6.5
Type III dips	CP50	0	1	5	5	6
TOTAL	CP50	0	1	7	7	17



Low exposure site

	Cumulated probability	Equipment with Class A immunity	Equipment with Class B immunity	Equipment with Class C1 immunity	Equipment with Class C2 immunity	Equipment with Class D immunity
		Equipment will trip less this number per year				
Type I dips	CP25	0	0	0	0	2
Type II dips	CP25	0	0	0	0	2.5
Type III dips	CP25	0	0	2	2	2.5
TOTAL	CP25	0	0	2	2	7



High exposure site

	Cumulated probability	Equipment with Class A immunity	Equipment with Class B immunity	Equipment with Class C1 immunity	Equipment with Class C2 immunity	Equipment with Class D immunity
		Equipment will trip less this number per year				
Type I dips	CP75	1	1	4.5	5.5	9
Type II dips	CP75	1	1	6.5	7.5	14
Type III dips	CP75	1	4	10.5	10.5	11
TOTAL	CP75	3	6	21.5	23.5	34

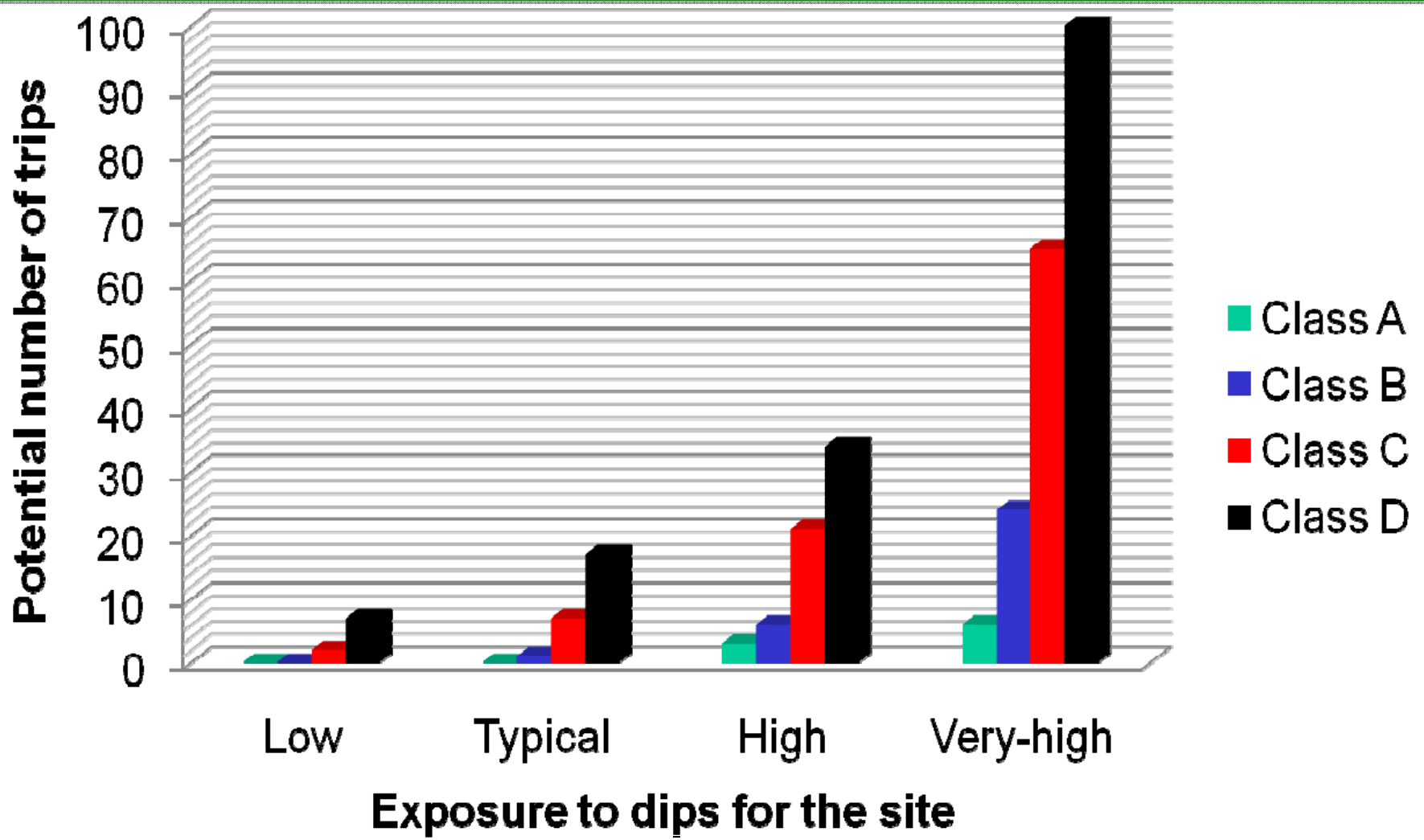


Very high exposure site

	Cumulated probability	Equipment with Class A immunity	Equipment with Class B immunity	Equipment with Class C1 immunity	Equipment with Class C2 immunity	Equipment with Class D immunity
		Equipment will trip less this number per year				
Type I dips	CP95	1	4	13.5	17.5	26.5
Type II dips	CP95	1	7	21.5	24.5	38
Type III dips	CP95	4.5	13.5	30	30	35
TOTAL	CP95	6.5	24.5	65	72	99.5



Potential number of trips





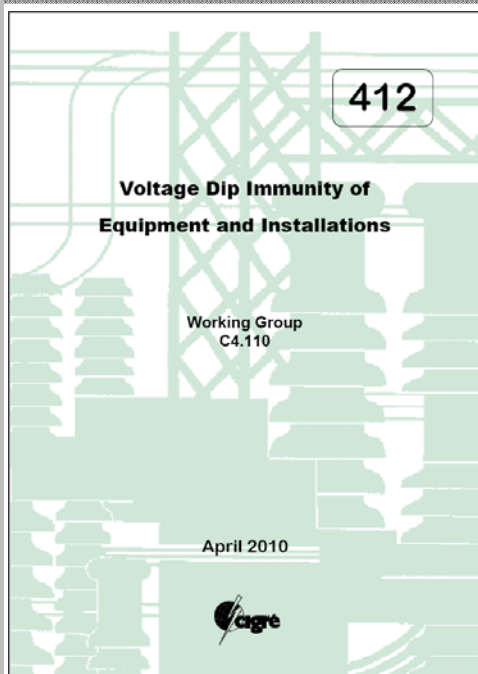
Equipment Performance Criteria

- Full (normal) operation
- Self-recovery
- Assisted-recovery



Voltage dip immunity labels

Voltage dip immunity label		Equipment performance criteria		
		Full operation	Self-recovery	Assisted-recovery
Immunity class	A			
	B			
	C1			
	C2			
	D			



The report can be obtained in electronic format for free from:

www.uie.org;

a hardcopy can be purchased from

www.e-cigre.org

CIGRE/CIRED/UIE Joint Working Group C4.110

**Voltage Dip Immunity of
Equipment and Installations**

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