TABLE 6.4
Examples of Active IPLs

IPL	Comments *Assuming an adequate design basis and inspection/maintenance procedures*	PFD from Literature and Industry	PFD Used in This Book (For screening)
Relief valve	Prevents system exceeding specified overpressure. Effectiveness of this device is sensitive to service and experience.	$1 \times 10^{-1} - 1 \times 10^{-5}$	1×10^{-2}
Rupture disc	Prevents system exceeding specified overpressure. Effectiveness can be very sensitive to service and experience	$1 \times 10^{-1} - 1 \times 10^{-5}$	1×10^{-2}
Basic Process Control System	Can be credited as an IPL if not associated with the initiating event being considered (see also Chapter 11). (See IEC 61508 (IEC, 1998) and IEC 61511 (IEC, 2001) for additional discussion.)	$1 \times 10^{-1} - 1 \times 10^{-2}$ ($>1 \times 10^{-1}$ allowed by IEC)	1×10^{-1}
Safety Instrumented Functions (Interlocks)	See IEC 61508 (IEC, 1998) and IEC 61511 (IEC, 2001) for life cycle requirements and additional discussion		
SIL 1	Typically consists of: Single sensor (redundant for fault tolerance) Single logic processor (redundant for fault tolerance) Single final element (redundant for fault tolerance)	$\geq 1 \times 10^{-1} - < 1 \times 10^{-2}$	This book does not specify a specific SIL level. Continuing examples calculate a required PFD for a SIF
SIL 2	Typically consists of: "Multiple" sensors (for fault tolerance) "Multiple" channel logic processor (for fault tolerance) "Multiple" final elements (for fault tolerance)	$\geq 1 \times 10^{-2} - < 1 \times 10^{-3}$	
SIL 3	Typically consists of: Multiple sensors Multiple channel logic processor Multiple final elements	$\geq 1 \times 10^{-3} - < 1 \times 10^{-4}$	

Note: Multiple includes 1 out of 2 (1oo2) and 2 out of 3 (2oo3) voting schemes

"Multiple" indicates that multiple components may or may not be required depending upon the architecture of the system, the components selected and the degree of fault tolerance required to achieve the required overall PFD and to minimize unnecessary trips caused by failure of individual components (see IEC 61511 (IEC, 2001) for guidance and requirements).

Corrected Signs:

For SIL 1

CCPS LOPA Range in Table 6.4: $\geq 1 \times 10^{-1} - < 1 \times 10^{-2}$

Corrected Range: $< 1 \times 10^{-1}$ to $\geq 1 \times 10^{-2}$

For SIL 2

CCPS LOPA Range in Table 6.4: $\geq 1 \times 10^{-2} - < 1 \times 10^{-3}$

Corrected Range: $< 1 \times 10^{-2}$ to $\geq 1 \times 10^{-3}$

For SIL 3

CCPS LOPA Range in Table 6.4: $\geq 1 \times 10^{-3} - < 1 \times 10^{-4}$

Corrected Range: $< 1 \times 10^{-3}$ to $\geq 1 \times 10^{-4}$