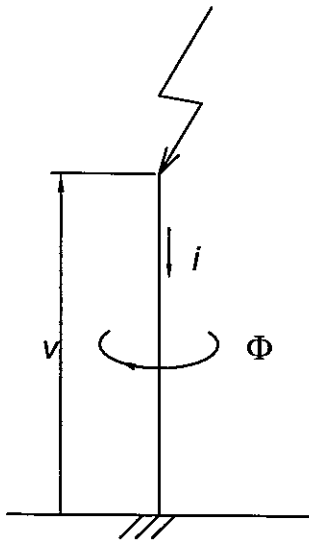


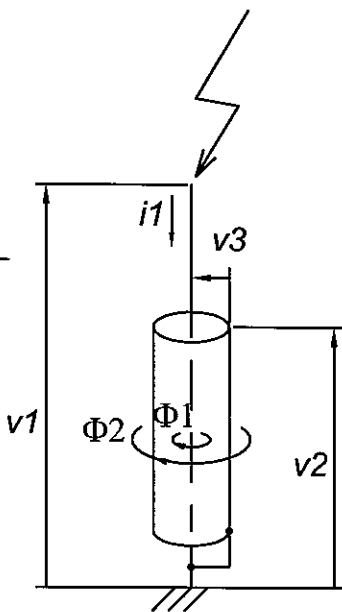
Fig. 1 Conventional (single core) down conductor



Assume,  
 Down conductor inductance is 1 micro Henry/m  
 Down conductor length is 50 m  
 i is 25kA / 5 micro sec.

$$\begin{aligned}
 v &= d\Phi/dt \\
 &= L * di/dt \\
 &= 1 \text{ micro Henry/m} * 50 \text{ m} * 25\text{kA} / 5 \text{ micro sec.} \\
 &= 250 \text{ kV}
 \end{aligned}$$

Fig. 2 Coaxial cable down conductor



Assume  
 $\Phi_1 + \Phi_2$  is same as  $\Phi$  in Fig.1 (there is no current on the shield conductor, therefore there is no cancellation on  $\Phi_2$ )  
 $i_1$  is same as  $i$  in Fig. 1  
 Coaxial cable length is 50 m  
 Coaxial cable inductance is 40 nano Henry / m

$$\begin{aligned}
 v_1 &= (d\Phi_1 + d\Phi_2)/dt = d\Phi_1/dt + d\Phi_2/dt \\
 v_2 &= d\Phi_2/dt \\
 v_3 &= v_1 - v_2 = d\Phi_1/dt + d\Phi_2/dt - d\Phi_2/dt = d\Phi_1/dt
 \end{aligned}$$

$$\begin{aligned}
 v_1 &= (d\Phi_1 + d\Phi_2)/dt \\
 &= d\Phi/dt \\
 &= 250 \text{ kV}
 \end{aligned}$$

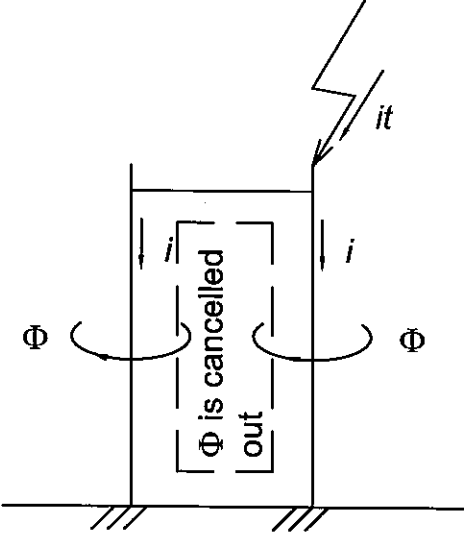
$$\begin{aligned}
 v_3 &= d\Phi_1/dt \\
 &= L * di_1/dt \\
 &= 40 \text{ nano Henry} * 50 \text{ m} * 25\text{kV} / 5 \text{ micro sec.} \\
 &= 10\text{kV}
 \end{aligned}$$

$$\begin{aligned}
 v_2 &= v_1 - v_3 \\
 &= 250\text{kV} - 10\text{kV} \\
 &= 240\text{kV}
 \end{aligned}$$

Voltage reduction by applying coaxial cable, in this example is 10kV/250kV = 4 percent.

NO	Q'TY	ITEM	REFERENCE
DESIGNED BY	CHECKED BY	APPROVED BY	FILE NAME
AS	AS	N/A	CoaxDC01
DATE	SCALE	TITLE	
13 DEC 02	N/A	COAXIAL CABLE FOR DOWN CONDUCTOR	
DWG. NO.	REV	SHT	CONT SHT
COAX DC01	0	1	2

Fig. 11 Conventional down conductors

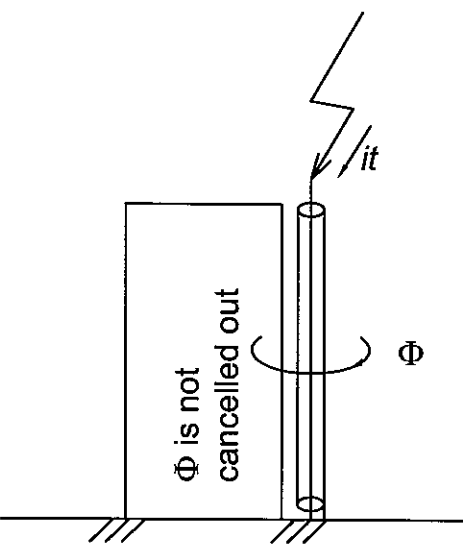


The lightning current is distributed among the parallel connected down conductors and/or structural frames.

The building internal space will receive less magnetic flux ( $\Phi$ ), because

1. distributed currents will induce magnetic flux ( $\Phi$ ) with oppsite directions.
2. current ( $i$ ) in each down conductor is smaller than total lightning current ( $it$ ).

Fig. 12 Coaxial cable down conductor



Coaxial down conductor is isolated from other conductors such as structural frames, thus will not have parallel current path.

Total lightning current ( $it$ ) will induce magnetic flux without cancellation. Shield conductor of the coaxial cable does not carry any current, thus has no function to reduce magnetic flux ( $\Phi$ ).

Conventional down conductors will induce less magnetic flux inside the structure than Coaxial cable down conductor does. Less flux means less interference to the wiring system and equipment inside the structure.

NO	Q'TY	ITEM	REFERENCE
DESIGNED BY	CHECKED BY	APPROVED BY	FILE NAME
AS	AS	N/A	CoaxDC02
			DATE
			13 DEC 02
			SCALE
			N/A
N/A		TITLE	
		COAXIAL CABLE FOR DOWN CONDCTOR	
PT. ANI INTERNATIONAL		DWG. NO.	REV
		COAX DC02	0
		SHT	2
		CONT SHT	