

2014 12

1	.....	1
2	.....	2
3	.....	5
3.1	.....	5
3.2	.....	6
3.3	.....	8
4	.....	18
4.1	.....	18
4.2	.....	20
4.3	.....	23
4.4	.....	24
4.5	.....	27
5	.....	53
5.1	.....	53
5.2	.....	54
6	.....	56
6.1	.....	56
6.2	.....	56
6.3	.....	59
A	.....	61
B	.....	63
C	.....	64

D	.....	77
	.....	78
1	.....	78
3	.....	80
4	.....	92
5	.....	108

1

1.0.1  
" )

( "

1.0.2

1.0.3

1.0.4

1.0.5

## 2

### 2.0.1 Cutting High-slope

20m

30m

### 2.0.2 Accident

### 2.0.3 Risk

### 2.0.4 Safety

### 2.0.5 Hazard or Danger

### 2.0.6 Risk Factors

2.0.7 General Risk Factors

2.0.8 High Risk Factors

2.0.9 Risk Identification

2.0.10 Risk Analysis

2.0.11 Risk Estimation

2.0.12  
Safety

Risk Assessment in Construction

2.0.13

General Risk Assessment

2.0.14

Specific Risk Assessment

### 3

#### 3.1

##### 3.1.1

##### 3.1.2

1      20m

30m

2

20m

3

20m

4

20m

##### 3.1.3

##### 3.1.4



3. 1. 5

3. 2

3. 2 1

3. 2 2

3  
10 5

3. 2 3

5 4  
R 4  
3 2  
1  
W

W=1

W=0

W=0 1

1

3-1

3-1

1		$R_1$	W	1
2		$R_2$	W	$D = W \times R$ $W$ $i = 1 \dots 5$
3		$R_3$	W	$R$ $1 \dots 4$ $W$
4		$R_4$	W	$D$
5		$R_5$	W	2 $D \quad 3.5$ $3.5 \quad D \quad 2.5$ $2.5 \quad D \quad 1.5$ $D \quad 1.5$

3. 2. 4

Dr

Dr

Dr 3.5

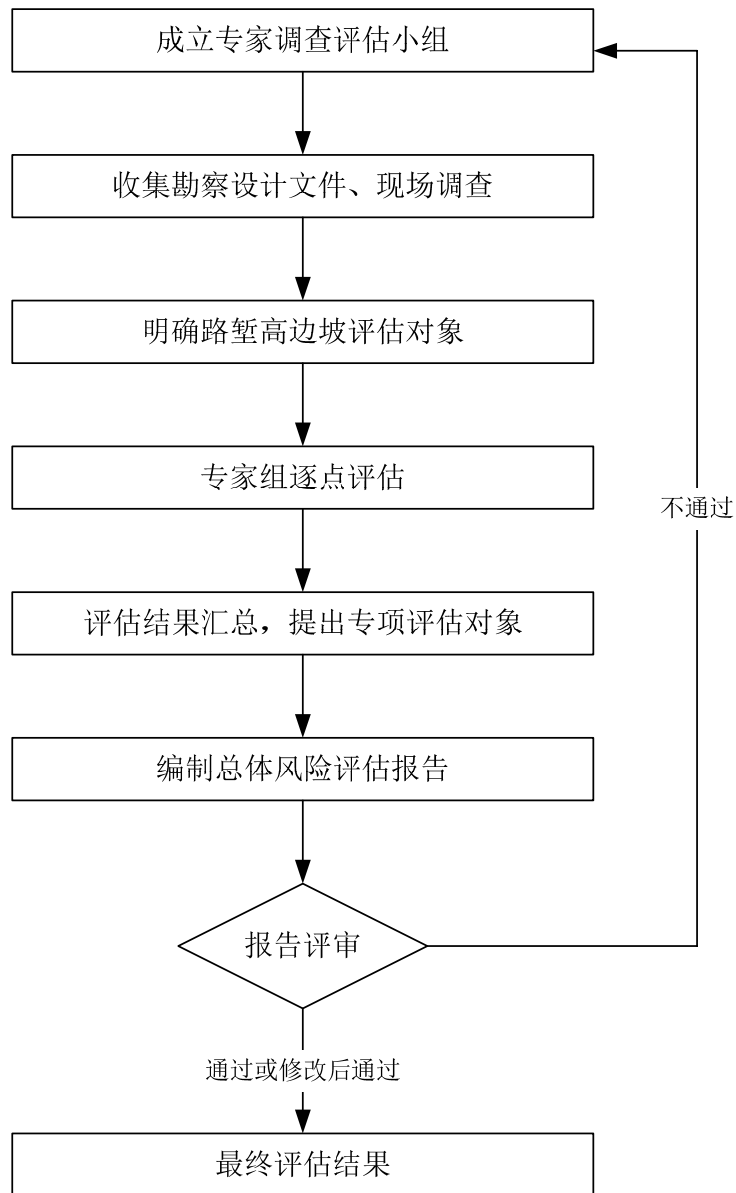
3.5 Dr 2.5

2.5 Dr 1.5

Dr 1.5

3.2.5

3-1



3-1

3.3

3.3.1

3.3.2

"

"

3-1

$$\gamma = \frac{2n - 2m + 1}{n^2}$$

3-1

—

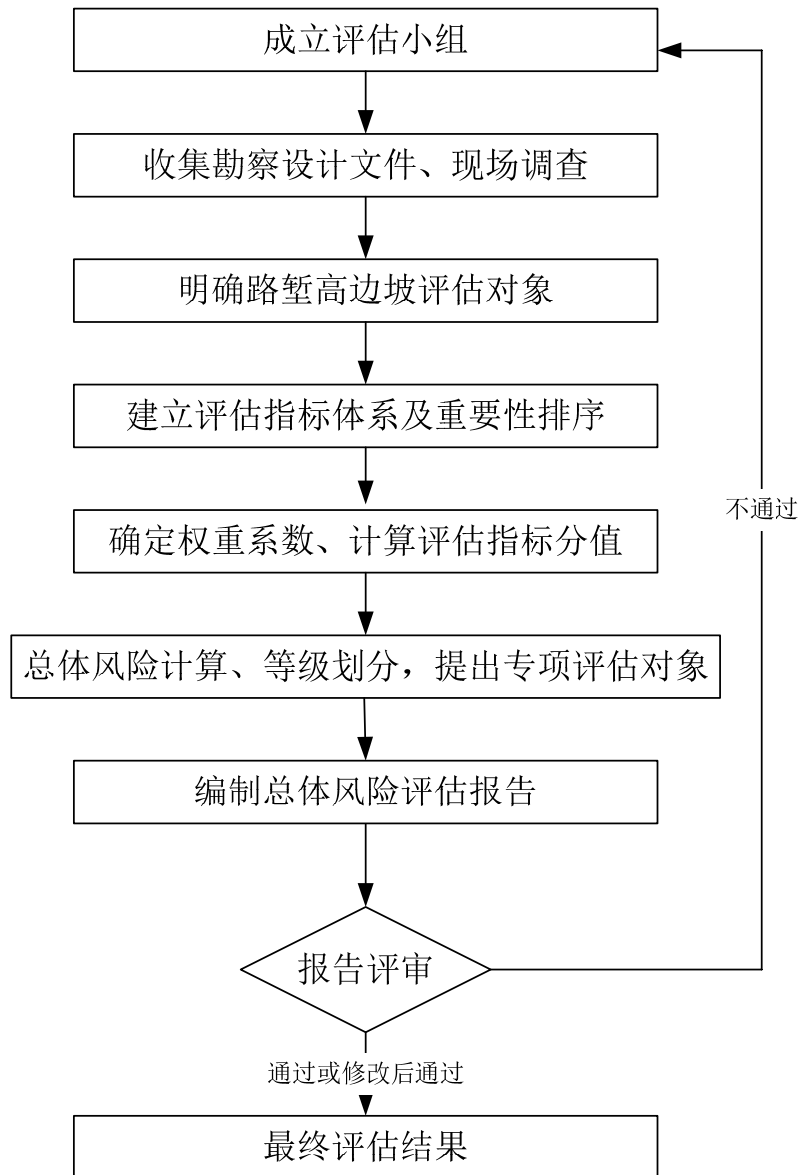
n—

m—

m n

3.3.3

3-2



3-2

3.3.4

5

3-2

3-2 11

3-2

			R <sub>j</sub>		( i <sub>j</sub> )	X <sub>j</sub>		
X <sub>i</sub>	X <sub>11</sub>	H 40m H 60m	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	1 H 60m H 80m 100
		30m H<40m 40m H<60m	50	74				2
		20m H<30m 30m H<40m	25	49				h 12m h 15m
		H<20m H<30m	0	24				h 6m h 8m h=8m h=10m
	X <sub>12</sub>	15°	75	100	R <sub>12</sub>	12	X <sub>12</sub> = R <sub>12</sub> × 12	25° 100
		10° <15°	50	74				
		5° <10°	25	49				
		<5°	0	24				

		$R_j$		$(i_j)$	$X_j$			
$X_{21}$			75 100	$R_{21}$	$_{21}$	$X_{21} =$ $R_{21} \times \quad_{21}$	( ) " "	
			50 74					
			25 49					
			0 24					
$X_2$	$X_{22}$		75 100	$R_{22}$	$_{22}$	$X_{22} =$ $R_{22} \times \quad_{22}$	$=0^\circ$ $=45^\circ$ $=60^\circ$	
								50 74
								25 49
								0 24

			R <sub>j</sub>		( i <sub>j</sub> )	X <sub>j</sub>		
X <sub>23</sub>		0.25H	75	100	R <sub>23</sub>	23	X <sub>23</sub> = R <sub>23</sub> × 23	
		0.25 0.5 H	50	74				
		0.75 H	25	49				
		1.0 H	0	24				
X <sub>31</sub>		5	75	100	R <sub>31</sub>	31	X <sub>31</sub> = R <sub>31</sub> × 31	5 1000mm 100
		800mm						
		5	50	74				
X <sub>3</sub>		600-800mm						



			$R_j$		$(i_j)$	$X_j$	
		5 300-600mm	25	49			
		5 300mm	0	24			
$X_{32}$			75	100	$R_{32}$	$_{32}$	$X_{32} =$ $R_{32} \times \quad_{32}$
			50	74			
			25	49			
			0	24			
$X_{41}$			75	100	$R_{41}$	$_{41}$	$X_{41} =$ $R_{41} \times \quad_{41}$
			50	74			
			25	49			
			0	24			
$X_4$	$X_{42}$	0.5H 1.0H	75	100	$R_{42}$	$_{42}$	$X_{42} =$ $R_{42} \times \quad_{42}$

			$R_j$		$(i_j)$	$X_j$	
		1. OH 1. 5H	50	74			
		1. 5H 2. OH	25	49			
			0	24			
$X_5$	$X_{51}$	1	75	100			
		2	50	74	$R_{51}$	$X_{51} =$ $R_{51} \times$	100

			$R_j$		$(i_j)$	$X_j$	
		3	25	49			
		3	0	24			
$X_{52}$			75	100	$R_{52}$	$_{52}$	$X_{52} =$ $R_{52} \times$ $_{52}$
			50	74			
			25	49			
			0	24			

			$R_j$		$(i_j)$	$X_j$	

3. 3. 5

3-2 3-3

$$F = \sum_{j=1}^n X_j \quad 3-2$$

$$X_j = R_j \cdot i_j \quad 3-3$$

$$X_j = \sum_{i=1}^n R_{ij} \cdot i_j \quad i=1 \ 2 \ 3 \ 4 \ 5 \ j=1 \ 2 \ \dots$$

n n

$$F = \sum_{i=1}^n \sum_{j=1}^n R_{ij} \cdot i_j \quad 3-3$$

3-3

	F
	F > 60
	45 < F < 60
	30 < F < 45
	F < 30

3-2

4

4.1

4.1.1

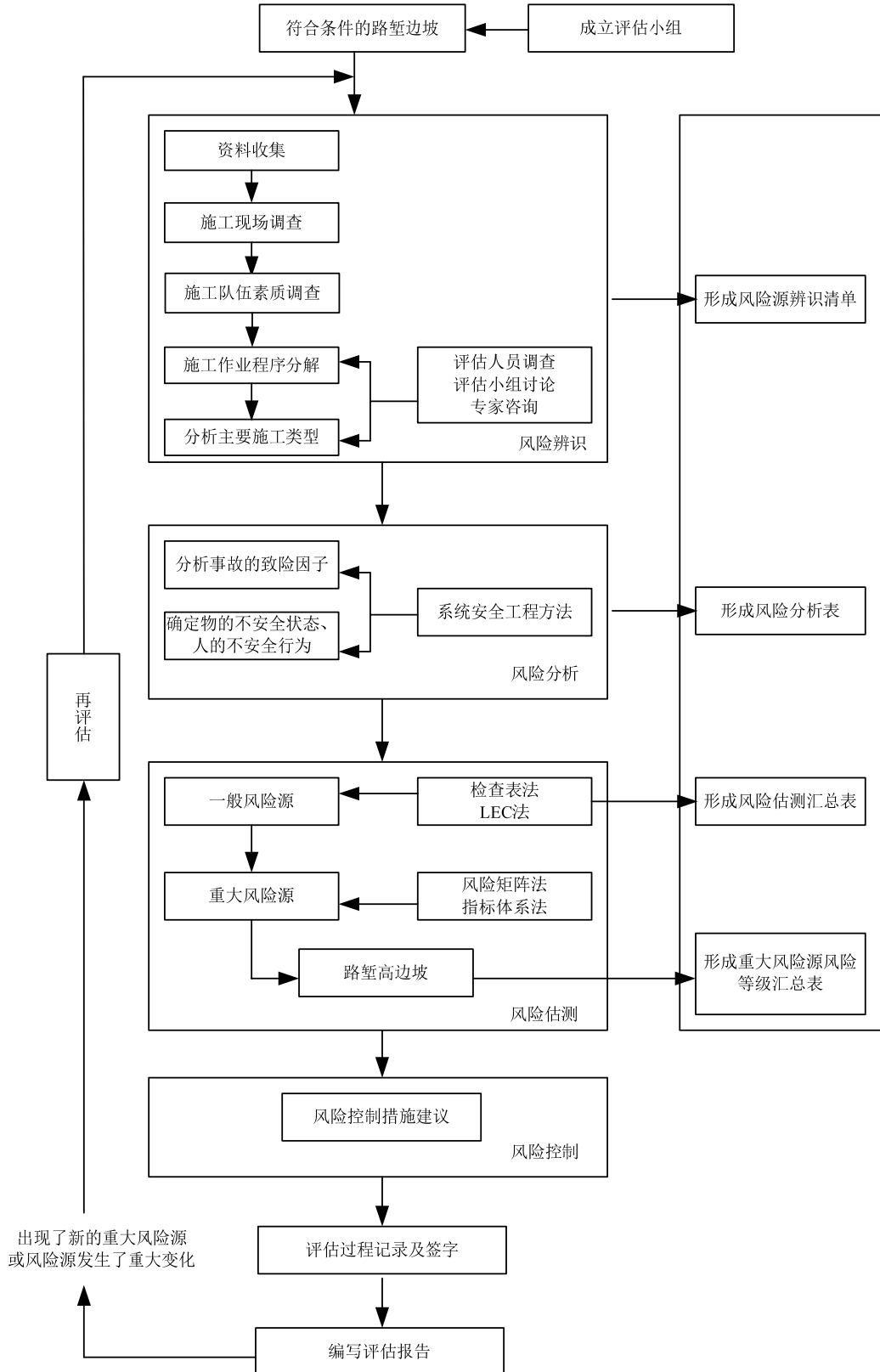
4.1.2

1

2

4.1.3

4-1



4-1

4. 1. 4

4. 1. 5

1

2

4. 2

4. 2 1

4. 2 2

1

2

3

4

5

4. 2 3

1

2

3

4. 2 4

1

2



3

4.25

4.26

A

4.27

4-1

4-1

1	1	
2	2	
...	...	
N	N	

4.28

B

4. 3

4. 3. 1

4. 3. 2

4. 3. 3

4. 3. 4

4. 3. 5

4-2

## 4-2

		1	2	3	4			
1								
2								
.....								
N								

4. 4

4. 4. 1                    =                    ×

" × "

4. 4. 2

1

2

4. 4. 3

4-3

4. 4. 4

4-4

4-3

0.3	1		4
0.03 0.3	0.1		3
0.003 0.03	0.01		2
0.003	0.001		1

1

2

4-4

			4
			3
			2
			1

4-1

$$L=(1 \ 4)H$$

4-1

H—

m

L—

m

4. 4. 5

4-5

4. 4. 6

4-6

4-5

1	1						
2	2						
...	...						
N	N						

4-6

		1	2	3	4
	4	Orange	Orange	Red	Red
	3	Yellow	Orange	Orange	Red
	2	Yellow	Yellow	Orange	Orange
	1	Blue	Yellow	Yellow	Orange

4.5

4.5.1

4.5.2

4-4

4.5.3

4.5.4

1

2

3

4

5

6

4. 5. 5

4. 5. 6

4-7

4. 5. 7

4-8

D<sub>6</sub>

4-7

			R <sub>j</sub>		( i <sub>j</sub> )	X <sub>j</sub>			
X <sub>1</sub>	X <sub>11</sub>	H 40m H 60m	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	1 H 60m H 80m 100	
		30m H<40m 40m H<60m	50	74				2	
		20m H<30m 30m H<40m	25	49				h 12m h 15m h 6m h 8m h=8m h=10m	
		H<20m H<30m	0	24				3	
	X <sub>12</sub>		15°	75	100	R <sub>12</sub>	12	X <sub>12</sub> = R <sub>12</sub> × 12	
		10° <15°	50	74	25°				
		5° <10°	25	49	100				
		<5°	0	24					
				75	100	R <sub>21</sub>	21	X <sub>21</sub> = R <sub>21</sub> × 21	
			50	74					



X <sub>2</sub>	X <sub>21</sub>		R <sub>j</sub>		( i j )	X <sub>ij</sub>	
		25 49					
		0 24					
X <sub>3</sub>	X <sub>31</sub>		75 100	R <sub>22</sub>	22	X <sub>22</sub> = R <sub>22</sub> × 22	
			50 74				
		2	25 49				
		1	0 24				
			75 100	R <sub>31</sub>	31	X <sub>31</sub> = R <sub>31</sub> × 31	
	50 74						
	25 49						
	0 24						

		$R_j$		$( \quad ij )$	$X_{ij}$	
$X_{32}$		75	100	$R_{32}$	$_{32}$	$X_{32} =$ $R_{32} \times \quad_{32}$
		50	74			
		25	49			
		0	24			
$X_{33}$		75	100	$R_{33}$	$_{33}$	$X_{33} =$ $R_{33} \times \quad_{33}$
		50	74			
		25	49			
		0	24			

			R <sub>j</sub>		( i <sub>j</sub> )	X <sub>j</sub>		
X <sub>4</sub>	X <sub>41</sub>	5 800mm	75	100	R <sub>41</sub>	41	X <sub>41</sub> = R <sub>41</sub> × <sub>41</sub>	5 5 1000mm
		5 600-800mm	50	74				
		5 300-600mm	25	49				
		5 300mm	0	24				
X <sub>42</sub>			75	100	R <sub>42</sub>	42	X <sub>42</sub> = R <sub>42</sub> × <sub>42</sub>	
			50	74				
			25	49				
			0	24				

			$R_j$		$( \quad ij )$	$X_{ij}$	
$X_5$	$X_{51}$	0.5H 1.0H	75	100	$R_{51}$	$_{51}$	$X_{51} =$ $R_{51} \times \quad_{51}$
		1.0H 1.5H	50	74			
		1.5H 2.0H	25	49			
			0	24			

4-8

		D <sub>b</sub>		
			1.3 D <sub>b</sub> <1.5	D <sub>b</sub>  0.8  1.2  1.3
			1.2 D <sub>b</sub> <1.3	
			1.1 D <sub>b</sub> <1.2	
			1.0 D <sub>b</sub> <1.1	

4.5.8

4-9

4-9

			R <sub>j</sub>		( i j )	X <sub>j</sub>		
X <sub>1</sub>	X <sub>11</sub>	H 16m	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	H 20m 100
		12m H 16m	50	74				
		8m H 12m	25	49				
		H 8m	0	24				
	X <sub>12</sub>	60°	75	100	R <sub>12</sub>	12	X <sub>12</sub> = R <sub>12</sub> × 12	70° 100
		45° H 60°	50	74				
		30° H 45°	25	49				
		H 30°	0	24				
	X <sub>13</sub>	L 40m	75	100	R <sub>13</sub>	13	X <sub>13</sub> = R <sub>13</sub> × 13	60m 100 L
		30m L 40m	50	74				
		20m L 30m	25	49				
		L 20m	0	24				
X <sub>2</sub>	X <sub>21</sub>	a	75	100	R <sub>21</sub>	21	X <sub>21</sub> = R <sub>21</sub> × 21	a b
		b	50	74				
		c	25	49				
			0	24				
	X <sub>22</sub>		75	100	R <sub>22</sub>	22	X <sub>22</sub> = R <sub>22</sub> × 22	
			50	74				
			25	49				
			0	24				

			$R_j$		$(ij)$	$X_j$		
$X_3$	$X_{31}$		75	100	$R_{31}$	${}_{31}$	$X_{31} =$ $R_{31} \times {}_{31}$	
			50	74				
			25	49				
			0	24				
	$X_{32}$	$2/3$	75	100	$R_{32}$	${}_{32}$	$X_{32} =$ $R_{32} \times {}_{32}$	
		$1/3$	50	74				
		$1/10 \quad 1/3$	25	49				
		$1/10$	0	24				
$X_4$	$X_{41}$		75	100	$R_{41}$	${}_{41}$	$X_{41} =$ $R_{41} \times {}_{41}$	
		$2 \quad 2$	50	74				
		$1 \quad 1$	25	49				
			0	24				

		R <sub>j</sub>		( i j )	X <sub>j</sub>		
X <sub>42</sub>		75	100	R <sub>42</sub>	42	X <sub>42</sub> = R <sub>42</sub> × <sub>42</sub>	
		50	74				
		25	49				
		0	24				
X <sub>43</sub>	h>24m	75	100	R <sub>43</sub>	43	X <sub>43</sub> = R <sub>43</sub> × <sub>43</sub>	h 30m 100
	16m<h 24m	50	74				
	8m<h 16m	25	49				
	h 8m	0	24				
X <sub>51</sub>		75	100	R <sub>51</sub>	51	X <sub>51</sub> = R <sub>51</sub> × <sub>51</sub>	GB50021-2001
		50	74				
		25	49				
		0	24				
X <sub>5</sub>		75	100	R <sub>52</sub>	52	X <sub>52</sub> = R <sub>52</sub> × <sub>52</sub>	



	$X_{52}$		$R_j$		$(ij)$	$X_j$		
			50	74				
			25	49				
		0	24					
	$X_{53}$		75	100	$R_{53}$	$_{53}$		$X_{53} =$ $R_{53} \times$ $_{53}$
			50	74				
		25	49					
		0	24					

4. 5. 9

4-10

4-10

			(R <sub>j</sub> )		( i <sub>j</sub> )	(X <sub>j</sub> )		
X <sub>1</sub>	X <sub>11</sub>	L 35m	75	100	R <sub>11</sub>	11	X <sub>11</sub> =	L 45m 100
		25m L 35m	50	74				
		15m L 25m	25	49				
		L 15m	0	24				
	X <sub>12</sub>	h	75	100	R <sub>12</sub>	12	X <sub>12</sub> =	
			50	74				
			25	49				
			0	24				
X <sub>2</sub>	X <sub>21</sub>		75	100	R <sub>21</sub>	21	X <sub>21</sub> =	
			50	74				
			25	49				
			0	24				
	X <sub>22</sub>	30°	75	100	R <sub>22</sub>	22	X <sub>22</sub> =	40°
		20° 30°	50	74				
		10° 20°	25	49				
		10°	0	24				

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )		
X <sub>23</sub>			75	100	R <sub>23</sub>	23	X <sub>23</sub> = R <sub>23</sub> × 23	
			50	74				
			25	49				
			0	24				
X <sub>31</sub>			75	100	R <sub>31</sub>	31	X <sub>31</sub> = R <sub>31</sub> × 31	0.5 1.0m
			50	74				
			25	49				
			0	24				
X <sub>32</sub>			75	100	R <sub>32</sub>	32	X <sub>32</sub> = R <sub>32</sub> × 32	
			50	74				
			25	49				
			0	24				
X <sub>41</sub>			75	100	R <sub>41</sub>	41	X <sub>41</sub> = R <sub>41</sub> × 41	
			50	74				
			25	49				
			0	24				

		(R <sub>j</sub> )		(i, j)	(X <sub>j</sub> )		
X <sub>42</sub>		75	100	R <sub>42</sub>	42	X <sub>42</sub> = R <sub>42</sub> × 42	10m
		50	74				
		25	49				
		0	24				
X <sub>43</sub>		75	100	R <sub>43</sub>	43	X <sub>43</sub> = R <sub>43</sub> × 43	
		50	74				
		25	49				
		0	24				

4. 5. 10

4-11

4-11

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )			
X <sub>1</sub>	X <sub>11</sub>	H 12m	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	16m H 100	
		10m H 12m	50	74					
		8m H 10m	25	49					
		H 8m	0	24					
	X <sub>12</sub>			75	100	R <sub>12</sub>	12	X <sub>12</sub> = R <sub>12</sub> × 12	
				50	74				
				25	49				
				0	24				
	X <sub>13</sub>		h <sub>0</sub> 4m	75	100	R <sub>13</sub>	13	X <sub>13</sub> = R <sub>13</sub> × 13	5m h <sub>0</sub> 100
			2.5m h <sub>0</sub> 4m	50	74				
			1.5m h <sub>0</sub> 2.5m	25	49				
			h <sub>0</sub> 1.5m	0	24				
	X <sub>2</sub>	X <sub>21</sub>		75	100	R <sub>21</sub>	21	X <sub>21</sub> = R <sub>21</sub> × 21	
			50	74					
			25	49					
			0	24					

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )			
X <sub>22</sub>			75	100	R <sub>22</sub>	22	X <sub>22</sub> =	30% 30% 50%	
			50	74					
			25	49					
			0	24					
X <sub>23</sub>		4m	75	100	R <sub>23</sub>	23	X <sub>23</sub> =	50% 70% 70%	
		2 4m	50	74					
		0 2m	25	49					
			0	24					
X <sub>3</sub>	X <sub>31</sub>	L>12m	75	100	R <sub>31</sub>	31	X <sub>31</sub> =		
		10m L 12m	50	74					
		8m L 10m	25	49					
		L 8m	0	24					
	X <sub>32</sub>		h>16m	75	100	R <sub>32</sub>	32	X <sub>32</sub> =	h 20m
			10m×h 16m	50	74				
			6m×h 10m	25	49				
			h 6m	0	24				
						R <sub>32</sub> × <sub>32</sub>	100		

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )		
X <sub>4</sub>	X <sub>41</sub>		75	100	R <sub>41</sub>	41	X <sub>41</sub> = R <sub>41</sub> × 41	10m
			50	74				
			25	49				
			0	24				

4. 5. 11

4-12

4-12

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )		
X <sub>1</sub>	X <sub>11</sub>	R 3.0m	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	R 3.6m 100
		2.0m R 3.0m	50	74				
		1.5m R 2.0m	25	49				
		R 1.5m	0	24				
	X <sub>21</sub>		75	100	R <sub>21</sub>	21	X <sub>21</sub> = R <sub>21</sub> × 21	
			50	74				
			25	49				
			0	24				

			(R <sub>j</sub> )		(i j)	(X <sub>j</sub> )		
X <sub>2</sub>	X <sub>22</sub>		75	100	R <sub>22</sub>	22	X <sub>22</sub> = R <sub>22</sub> × 22	30% 30% 50% 50% 70% 70%
			50	74				
			25	49				
			0	24				
	X <sub>23</sub>		75	100	R <sub>23</sub>	23	X <sub>23</sub> = R <sub>23</sub> × 23	
			50	74				
			25	49				
			0	24				
X <sub>3</sub>	X <sub>31</sub>	S 2m	75	100	R <sub>31</sub>	31	X <sub>31</sub> = R <sub>31</sub> × 31	S 3m 100
		1m S 2m	50	74				
		0 S 1m	25	49				
		S=0	0	24				
	X <sub>32</sub>	>1.5m	75	100	R <sub>32</sub>	32	X <sub>32</sub> = R <sub>32</sub> × 32	S 2.5m 100
		1 S 1.5m	50	74				
		0.5 S 1m	25	49				
		S 0.5m	0	24				
	X <sub>33</sub>		75	100	R <sub>33</sub>	33	X <sub>33</sub> = R <sub>33</sub> × 33	
			50	74				
			25	49				
			0	24				



			(R <sub>j</sub> )		(i, j)	(X <sub>j</sub> )		
X <sub>4</sub>	X <sub>41</sub>		75	100	R <sub>41</sub>	41	X <sub>41</sub> = R <sub>41</sub> × 41	10m
			50	74				
			25	49				
			0	24				

4. 5. 12

4-13

4-13

			(R <sub>j</sub> )		(i, j)	(X <sub>j</sub> )		
X <sub>1</sub>	X <sub>11</sub>	R 30cm	75	100	R <sub>11</sub>	11	X <sub>11</sub> = R <sub>11</sub> × 11	R 36cm 100
		20cm R 30cm	50	74				
		10cm R 20cm	25	49				
		R 10cm	0	24				

			(R <sub>j</sub> )		(i <sub>j</sub> )	(X <sub>j</sub> )			
X <sub>2</sub>	X <sub>21</sub>		75	100	R <sub>21</sub>	21	X <sub>21</sub> = R <sub>21</sub> × 21		
			50	74					
			25	49					
			0	24					
	X <sub>22</sub>		75	100	R <sub>22</sub>	22	X <sub>22</sub> = R <sub>22</sub> × 22		
			50	74					
			25	49					
			0	24					
X <sub>3</sub>	X <sub>31</sub>		75	100	R <sub>31</sub>	31	X <sub>31</sub> = R <sub>31</sub> × 31		
			50	74					
			25	49					
			0	24					
	X <sub>32</sub>	P 5.0 MPa	75	100	R <sub>32</sub>	32	X <sub>32</sub> = R <sub>32</sub> × 32		P 5.5 MPa 100
		3.0 MPa P 5.0 MPa	50	74					
		1.0 MPa P 3.0 MPa	25	49					
		P 1.0 MPa	0	24					
X <sub>41</sub>		75	100	R <sub>41</sub>	41	X <sub>41</sub> = R <sub>41</sub> × 41			
		50	74						

$X_4$			$(R_j)$		$(i_j)$	$(X_j)$	
		25 49					
		0 24					
$X_{42}$			75 100	$R_{42}$	$_{42}$	$X_{42} =$	10m
			50 74				
			25 49				
			0 24				

4. 5. 13

4- 14

~~M~~A+B+C+D+E+F+G+H+I +J

4- 15

4-14

A		2	
		1	
		0	
B		2	
		0	
C		2	
		0	
D		2	
		1	
		0	
E		2	3 1 2
		1	
		0	
F		2	" A C "
		1	
		0	
G		2	
		1	
		0	
		2	
		1	

H		0	
I		2	
		1	
		0	
J		2	
	2	1	
	3	0	

4-15

M	
M 15	1.2
12 M 15	1.1
9 M 12	1
6 M 9	0.9
M 6	0.8

4.5.14

4-2

4-3

$$P = \cdot D_0 X_j \quad 4-2$$

$$X_{ij} = R_{ij} \quad 4-3$$

$$X_{ij} \quad i=1 \ 2 \ \dots \ m \quad j=1 \ 2 \ \dots \ n$$

$n \ m \quad n \quad i$

$D_0$ —

4-8

$D_0=1$

—

P

P

4-16

4. 5. 15

4-6

4-16

		P
	4	P 60
	3	45<P 60
	2	30<P 45
	1	P 30

4. 5. 16

4-17

4-17

1						
.....						
N						

5

5.1

5.1.1

5-1

5-1


5.1.2

5-2

5-2




5. 2

5. 2 1

5. 2 2

5. 2 3

5. 2 4

5. 2 5

1

2

5.26

1

2

3

5.27

1

2

5.28

C

6

6.1

6.1.1

6.1.2

6.1.3

6.2

6.2.1

1

1

2

3

4

5

2

1

2

3

3

4

5

6

1

2

3

4

7

6.2.2

1

1

2

3

4

5

6

2

3

4

5

6

1

2

3

4

7

6.2.3

1

2

3

4

5

6

6.2.4

1

2

3

6.3

6.3.1

6.3.2

6.3.3

6.3.4

# A

## A-1

1			
2			
3			
4			
5			
6		5	4



7			
8			
9			
10			
11			
12			

# B

## B-1

1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

C

C-1

	1	1	1
		2	2
	1	2	3
		3	4
			5
			6
	2	1	1
		2	2
			3
	3	1	1

		2	2
	4	1 2 3	1 2
	5	1 2 3	1 2 3m
	6	1 2	1 5m 2 15

C-2

1	1 2 3	1 2 3 4	1 2 3 4
2	1 2	1 2 3 4	1 2 3 4
3	1 2 3	1 2 3	1 2 3
4			1

		1	2
		2	10 15m 10m 45° 1 1 4 6
			3
			4
	5	1	1
		2	2
			3

C-3

	1	1 2 3	1 " " 2 3 4 5 6
	2	1 2	1 2 3 4 5 0.5m
	3	1	1 2 1.2m

		2	3 4 5
	4	1 2	1 2 10m 2 3m <sup>3</sup> 10 20min 3
	5	1 2 3	1 36V 2 3
	6	1	1



		2	2

C-4

	1	1 2	1 2 3 4 5
	2	1 2	1 2 3
	3	1 2	1 2 3

C-5

	1	1 2 3	1 2 0.5m 1.0m 3 1.5x 1.5m 2.5x 2.5m 4 5
	2	1 2	1 2 10m 2 3m <sup>2</sup> 10 20 3 4 5 6
	3	1	1

		2	2 3 4 5 6 " "
	4	1 2 3	1 36V 2 3

C-6

	1	1	1 2 3 1 4 " 5 6
	2	1 2	1 2 3 4
3	1		1

		2	2
		3	3
4	1	2	1
	2		2
	3		3
			36V
5	1		1
	2		2
		10 15m	4 6
		10m	
		45°	1 1
			3
			4
6	1		1

		2	2
			3
	7	1	1
		2	2
			3
			4
			5
			0.5m
	8	1	1
			2
			10m
			2 3m <sup>3</sup>
			10
		2	20min
			3
	9	1	1
		2	2

D

1

" "

" "

2

" "

" " " "

3

" "

" "

" "



1

1.0.2

1.0.3

1-1

A 1-1


1. Q. 4

3

3.1

3.1.2

20m

30m

500

20m

30m

3.1.3

3. 1. 4

3. 2

3. 2 1

3. 2 2

1

2 :

3

4

5

"

"

3. 2 3

5

4

D

3. 2 4

D

D

3. 2 5

3. 3

3. 3. 1

3.3.2

"

"

A.3-1

A.3-1

		1	2	3	4	5	6	7	8	9	10	11	12	
		1.00	—	—	—	—	—	—	—	—	—	—	—	=1
		0.75	0.25	—	—	—	—	—	—	—	—	—	—	=1
		0.56	0.33	0.11	—	—	—	—	—	—	—	—	—	=1
		0.44	0.31	0.19	0.06	—	—	—	—	—	—	—	—	=1
		0.36	0.28	0.20	0.11	0.05	—	—	—	—	—	—	—	=1
		0.31	0.25	0.19	0.14	0.08	0.03	—	—	—	—	—	—	=1
		0.27	0.22	0.18	0.14	0.10	0.06	0.03	—	—	—	—	—	=1
		0.23	0.20	0.17	0.14	0.11	0.08	0.05	0.02	—	—	—	—	=1
		0.21	0.19	0.16	0.14	0.11	0.09	0.06	0.03	0.01	—	—	—	=1
		0.19	0.17	0.15	0.13	0.11	0.09	0.07	0.05	0.03	0.01	—	—	=1
		0.17	0.16	0.14	0.12	0.11	0.09	0.07	0.06	0.04	0.03	0.01	—	=1
		0.16	0.15	0.13	0.12	0.10	0.09	0.08	0.06	0.05	0.03	0.02	0.01	=1

"

"

1

1

2

3

4

$x_1, x_2, \dots, x_n$

A 3-2

A 3-2

	$x_1$	$x_2$	...	$x_n$
$x_1$				
$x_2$				
...				
$x_n$				

T. L. Saaty

1-9



A. 3-3

A 3-3

1	
3	
5	
7	
9	
2, 4, 6, 8	
	$i \quad j \quad b_{ij} \quad j \quad i \quad b_{ji}=1/b_{ij}$

max

CR      CR < 0.1

$$CR = \frac{CI}{RI}$$

CI

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

n

RI

A. 3-4

A 3-4

RI

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.89	1.12	1.26	1.36	1.41	1.46	1.49

$$C_j = \frac{2(G_{jm2} - G_{j1} - G_{j2})(G_{j2} - G_{j1})}{(G_{jm2} - G_{jm1})}$$

$G_j$ —

$G_{m2}$   $G_{m1}$ —

$G_2$   $G_1$ —

$G_{m2}$   $G_{m1}$

$G_2$   $G_1$

$$W = \frac{1}{\Sigma} [C_1, C_2, C_3, C_4]$$

2

Checklist

" "

3.3.3

3-1

3-2

F

3-2

3.3.4

1

1

2

2

1

JTG C20 2011

1

2

3

2

JTG C20 2011

"

"

1: 500 1: 2000

1: 200 1: 1000

1: 200 1: 500

20m

3. 3. 5

4

4.1

4.1.2

5

11

11

1

1

2

3

4

5

4. 1. 5

4. 2

4. 2 1



4.2.7

B

4.3

4.3.1

1

2

3

4

5

6

4. 3. 2

1

2

3

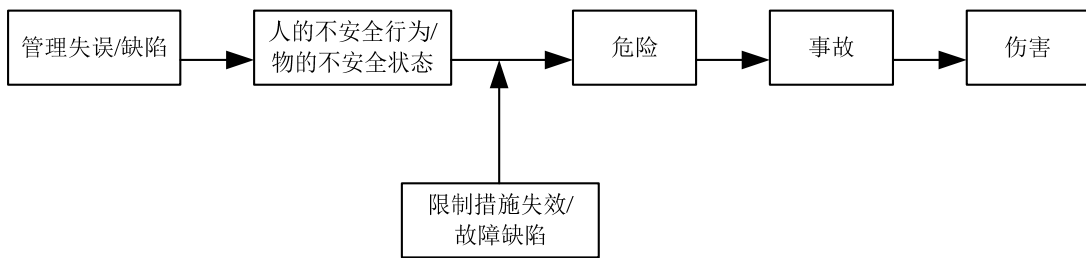
1

2

4.3.4

1

A.4-1



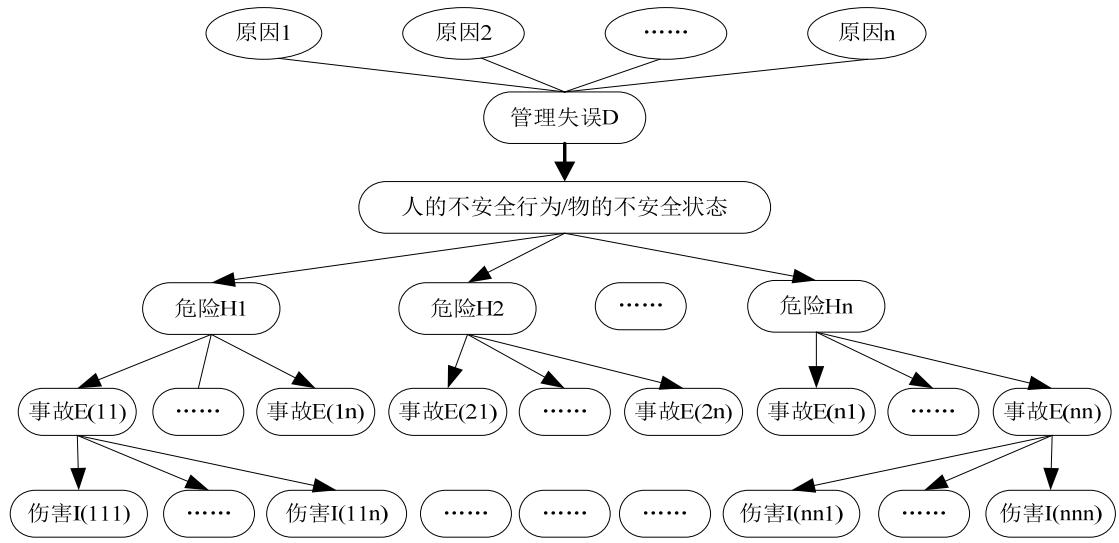
A.4-1

D

H<sub>1</sub> H<sub>2</sub> ..... H<sub>n</sub>

I<sub>111</sub> I<sub>112</sub> ..... I<sub>nnn</sub>

A.4-2

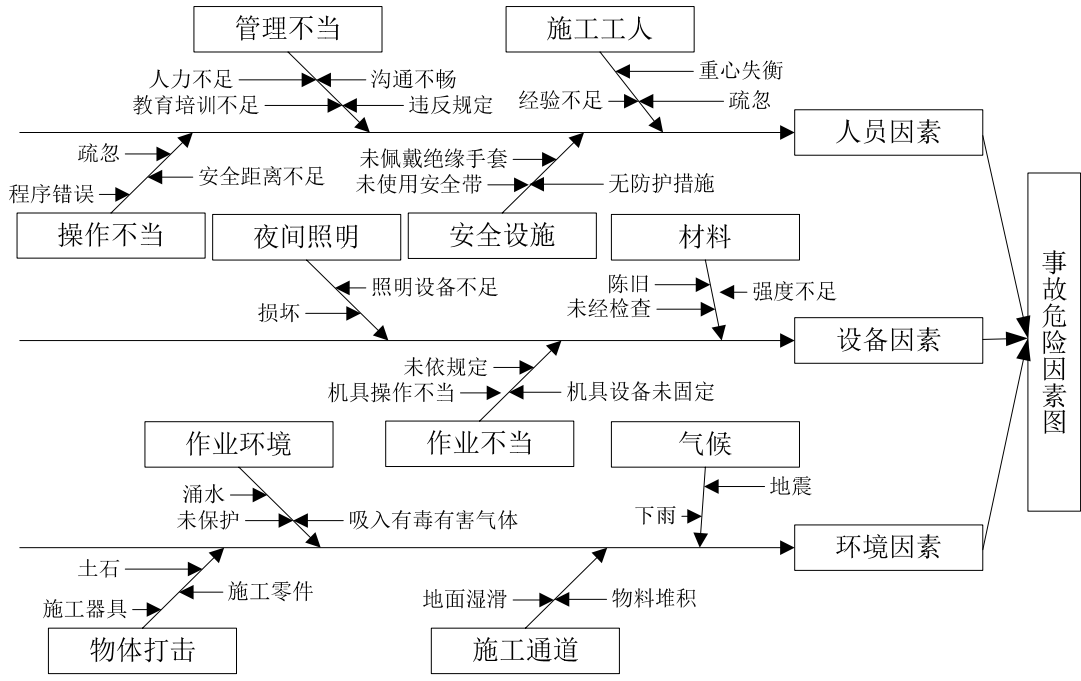


A 4-2

2

" "

A. 4-3



A 4-3

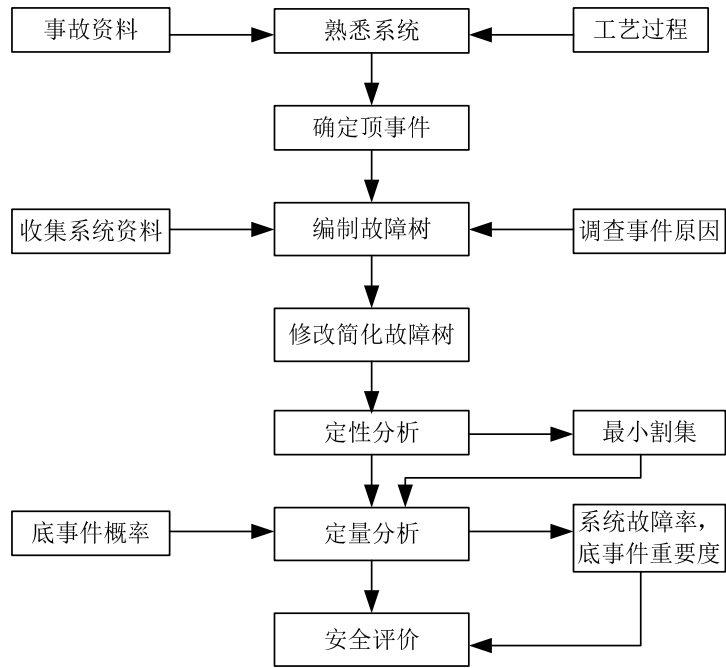
1

2

- -

3

A. 4-4



A 4-4

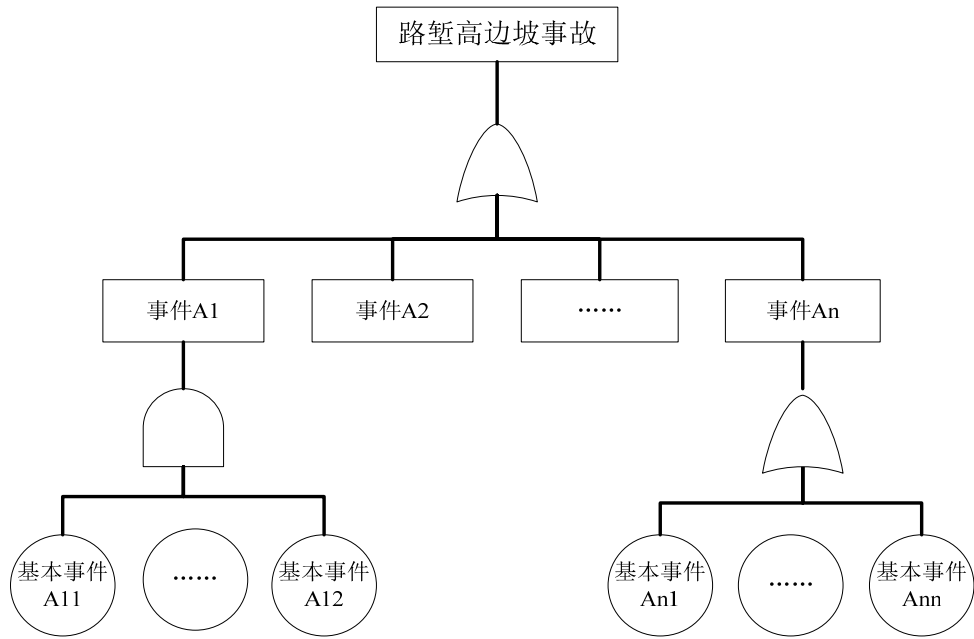
A 4-5

$B_2 \dots B_n$

$B_{11} \quad B_{12} \dots B_{1n}$

$A_1 \quad A_2 \dots A_n \quad B_1$

$A_{11} \quad A_{12} \dots A_{1n}$



A 4-5

GB/T4888-2009

4. 4

4. 4. 2

LEC

LEC

1

2

L—

E—



C—

3

L E C

L E C

D

$$D=L \times E \times C$$

L—

A. 4-1

E—

A. 4-2

C—

A. 4-3

D—

A. 4-4

A 4-1

L

	10	6	3	1	0.5	0.2	0.1

A 4-2

E

	10	6	3	2	1	0.5

A 4-3

C

	100	40	15	7	3	1
	10	3 9	1			

A 4-4

D	320	160 320	70 160	20 70	20
	5	4	3	2	1

1 2

3

5

4. 4. 4

A. 4-5

A. 4-6

1

A. 4-5

A 4-5

	1	2	3	4
	1  <2 1 <9	3  <9 10 <49	10  <29 50 <99	30  100

2

A. 4-6

A 4-6

	1	2	3	4
	100 Z 1000	1000 Z 5000	5000 Z 10000	Z 10000

4. 5

4. 5. 3

6

6

4. 5. 6

5 10

2

3

10

10

4. 5. 7

4. 5. 8

4. 5. 9

4. 5. 10

4. 5. 11

"

"

4. 5. 12

4. 5. 13

10

5

5.1

5.1.1

5.1.2