Crash Impact Frequencies

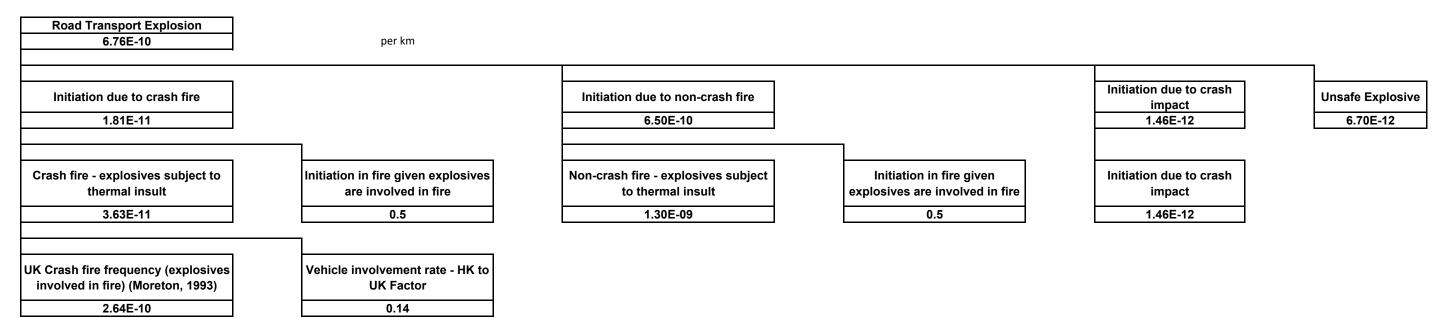
Expressway - LGV

Initiation due to crash impact - expressway 1.46E-12								
Initiation due to crash impact (high impact) 8.65E-14			Initiation due to crash impact (medium impact) 5.88E-13			Initiation due to crash impact (low impact) 7.84E-13		
Crash frequency (high impact) 8.65E-10	Explosives subject to significant shock impact	Initiation in impact	Crash frequency (medium impact) 5.88E-09	Explosives subject to significant shock impact	Initiation in impact	Crash frequency (low impact) 7.84E-08	Explosives subject to significant shock impact 0.1	Initiation in impact
Crash frequency - LGV - fatal accidents 5.91E-09	Route Scaling Factor (high impact) - Expressway	Safer driving factor for Explosive Vehicles	Crash frequency - LGV - serious injury accidents	Route Scaling Factor (medium impact) - Expressway 0.20	Safer driving factor for Explosive Vehicles 0.3	Crash frequency - LGV - serious injury accidents 1.29E-06	Route Scaling Factor (low impact) - Expressway 0.20	Safer driving factor for Explosive Vehicles

Crash Impact Frequencies

Non-Expressway - LGV Initiation due to crash impact - Non-Expressway								
9.57E-12								
Initiation due to crash impact			Initiation due to crash impact			Initiation due to crash		
(high impact) 2.41E-13			(medium impact) 4.00E-12			impact (low impact) 5.33E-12		
Crash frequency (high impact)	Explosives subject to significant shock impact	Initiation in impact	Crash frequency (medium impact)	Explosives subject to significant shock impact	Initiation in impact	Crash frequency (low impact)	Explosives subject to significant shock impact	Initiation in impact
2.41E-09	1	0.0001	4.00E-08	1	0.0001	5.33E-07	0.1	0.0001
Crash frequency - LGV - fatal	Route Scaling Factor (high	Safer driving factor	Crash frequency - LGV -	Route Scaling Factor (medium	Safer driving factor for	Crash frequency - LGV -	Route Scaling Factor (low	Safer driving factor
accidents 5.91E-09	impact) - Non-Expressway 1.36	for Explosive Vehicles 0.3	serious injury accidents 9.71E-08	impact) - Non-Expressway 1.37	Explosive Vehicles 0.3	serious injury accidents 1.29E-06	impact) - Non-Expressway 1.37	for Explosive Vehicles 0.30

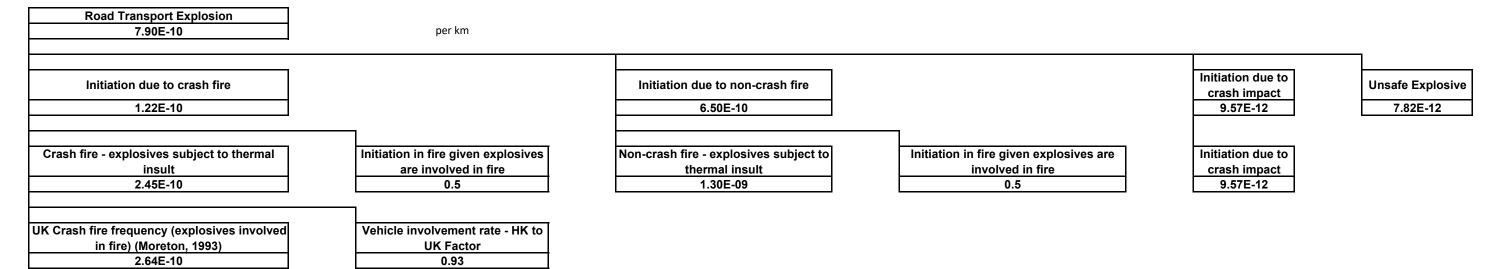
Expressway



^{1%} of total risk from Initiation due to crash fire, non-crash fire & crash impact

Unsafe Explosive

Non-Expressway



^{1%} of total risk from Initiation due to crash fire, non-crash fire & crash impact

Unsafe Explosive

2MIC Higher vibration due to 2 MIC detonated at tha same time

2MIC

Higher vibration due to 2 MIC detonated at the same time

7.21E-06

2.1-WD

Wrong design in time delay of one detonator
1.26E-09

2.2-W-DETON

1 detonator wrongly put into one sector which containes the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion

loaded into holes

3МІС

Higher vibration due to 3 MIC detonated at the same time

3MIC
Higher vibration due to 3 MIC
detonated at the same time

5.81E-08

OR

3.1-WD

Wrong design in time delay of two detonators

1.26E-11

3.2-W-DETON

Two detonators wrongly put into one sector which contains the same time delay detonator 3.63E-17

3.3-W-DETON-SC

Two detonators of other sectors connected wrongly to a surface connector of another sector 3.11E-13

3.4-W-SC

Use of two wrong surface connector 4.80E-11

3MIC-P-AD-DETON

Incorrect time default of 2 detonators due to manufacturer defect

5.20E-08

3MIC-P-AD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

6.00E-09

3MIC-ER-COMB

3 MIC detonated at the same time (Due to combination of two types of errors)

2.27E-11

4MIC

Higher than expected vibration due to 4 MIC detonated at the same time

4MIC

Higher than expected vibration due to 4 MIC detonated at the same time

5.89E-10

OR

4MIC-COMB-1

4 MIC detonated (due to same error occurred three times) at the same time

5.81E-10

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

1.45E-13

4MIC-COMB-3

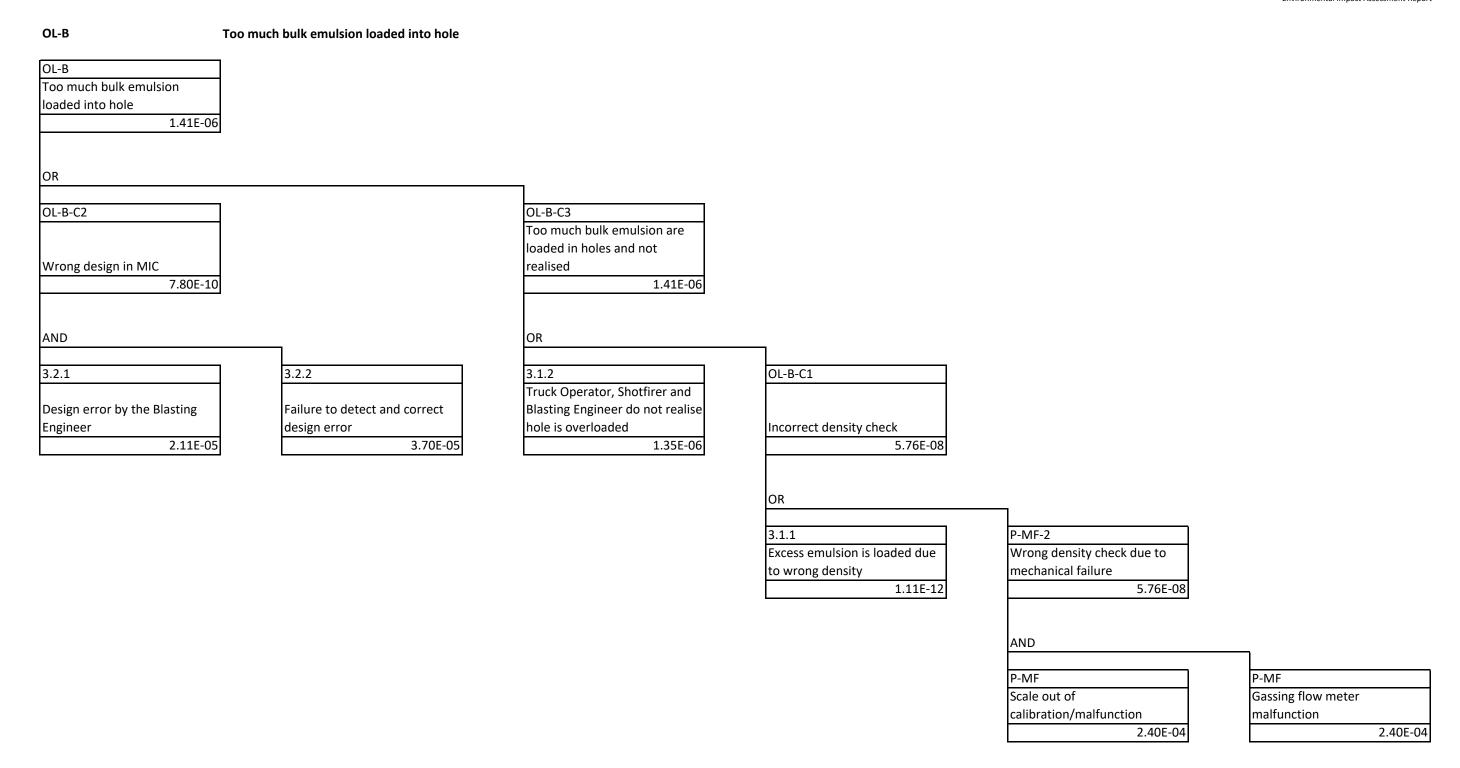
4 MIC detonated (due to three different errors occur at the same time) at the same time

2.68E-17

4MIC-COMB-4

4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time

8.17E-12



4.1-WD

4.1-WD				
Wrong design in time delay of three				
detonators				
1.26E-13				
AND			\neg	
3.1-WD			P-AD-DETON	
Wrong design in time dealy of two			Wrong design in time delay of	
detonators			additional detonator	
1.26E-11				0.01
AND				
2.1-WD	P-AD-DETON			
Wrong design in time delay of one	Wrong design in time delay of			
detonator	additional detonator			
1.26E-09		0.01		

Wrong design in time delay of three detonators

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

3.63E-19

AND

3.2-W-DETON

Two detonators wrongly put into one sector which contains the same time delay detonator

3.63E-17

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

4.3-W-DETON-SC

Two detonators of othe sectors connected wrongly to a surface connector of another sector

4.3-W-DETON-SC

Three detonators of other sectors connected wrongly to a surface connector of another sector

3.11E-15

AND

3.3-W-DETON-SC

Two detonators of other sectors connected wrongly to a surface connector of another sector

3.11E-13

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface conector of another sector

3.11E-11

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

4.4-W-SC

4.4-W-SC		
Use of three wrong surface		
connector		
4.80E-13		
AND		
2.4.14.62		2.42.60
3.4-W-SC		P-AD-SC
		Additional use of wrong surface
Use of two wrong surface connector		connector
4.80E-11		0.01
AND		
2.4-W-SC	P-AD-SC	
	Additional use of wrong surface	
Use of a wrong surface connector	connector	
4.80E-09	0.01	

Use of three wrong surface connector

4MD-DETON

Incorrect time default of 3 detonators due to manufacturer defect

4MD-DETON
Incorrect time default of 3
detonators due to manufacturer
defect

5.20E-10

AND

3MD-DETON

Manufacturer defect of two detonator such that time delay corresponds to another one

5.20E-08

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

AND

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

4MD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

4MD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

6.00E-11

3MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-09

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

AND

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

4-MIC-COMB-1

4 MIC detonated (due to same error occurred three times) at the same time

4-MIC-COMB-1

4 MIC detonated (due to same error occurred three times) at the same time

5.81E-10

OR

4.1-WD

Wrong design in time delay of three detonators

1.26E-13

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

3.63E-19

4.3-2-DETON

Three detonators of other sectors connected wrongly to a surface connector of another sector

3.11E-15

4.4-W-SC

Use of three wrong surface connector

4.80E-13

4MIC-P-AD-DETON

Incorrect time default of 3 detonators due to manufacturer defect

5.20E-10

4MIC-P-AD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

6.00E-11

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4.1-WD+OTH Wrong design in time delay of two detonator plus one other type of errors 4.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 9.08E-17 AND 4.1-WD 4.1-WD-OTH One error other than one Wrong design in time delay of wrong design in time delay of one detonator one detonator 1.26E-11 7.21E-06 AND 2.1-WD P-AD-DETON 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION Manufacturer defect of one Manufacturer defect of one One detonator wrongly put One detonator of a sector into one sector which contains connected wrongly to a detonator such that time surface connector such that Use of a wrong surface Wrong design in time delay of Wrong design in time delay of the same time delay surface connector of another delay corresponds to another time delay corresponds to Overcharge of emulsion more connector one detonator additional detonator detonator sector another one than required 1.26E-09 0.01 3.63E-15 3.11E-11 4.80E-09 5.20E-06 6.00E-07 1.41E-06 OL-B Too much bulk emulsion loaded into holes

4.2-W-DETON+OTH Two detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors 4.2-W-DETON+OTH Two detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors 2.62E-22 AND 4.2-W-DETON 4.2-W-DETON-OTH Two detonator wrongly put One error other than one into one sector which contains detonator wrongly put into a the same time delay sector which contains the same time delay detonator detonator 3.63E-17 7.21E-06 AND 2.2-W-DETON 2.3-W-DETON-SC OL-EMULSION 2.1-WD 2.4-W-SC MD-DETON MD-SC P-AD-DETON One detonator wrongly put One additional detonator One detonator of a sector Manufacturer defect of one Manufacturer defect of one surface connector such that into one sector which contains wrongly put into one sector connected wrongly to a detonator such that time Use of a wrong surface Overcharge of emulsion more the same time delay which contains the same time surface connector of another delay corresponds to another time delay corresponds to Wrong design in time delay of delay detonator one detonator another one than required detonator sector connector 3.63E-15 0.01 1.26E-09 3.11E-11 4.80E-09 5.20E-06 6.00E-07 1.41E-06 OL-B Too much bulk emulsion

loaded into holes

4.3-W-DETON-SC+OTH One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors 4.3-W-DETON-SC+OTH One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors 2.25E-18 AND 4.3-W-DETON-SC 4.3-W-DETON-SC-OTH One error other than one One detonator of each of two detonator of a sector connected wrongly to a sectors connected wrongly to surface connector of another a surface connector of another sector sector 3.11E-13 7.21E-06 AND 2.3-W-DETON-SC P-AD-DETON 2.2-W-DETON MD-DETON OL-EMULSION 2.1-WD 2.4-W-SC MD-SC One detonator of a sector One detonator of a sector One detonator wrongly put Manufacturer defect of one Manufacturer defect of one into one sector which contains detonator such that time surface connector such that connected wrongly to a connected wrongly to a surface connector of another Use of a wrong surface Overcharge of emulsion more surface connector of another Wrong design in time delay of the same time delay delay corresponds to another time delay corresponds to one detonator detonator another one than required sector sector connector 3.11E-11 0.01 1.26E-09 3.63E-15 4.80E-09 5.20E-06 6.00E-07 1.41E-06 OL-B Too much bulk emulsion loaded into holes

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4.4-W-SC+OTH Use of two wrong surface connector plus one other types of errors 4.4-W-SC+OTH Use of two wrong surface connector plus one other type of errors 3.46E-16 AND 4.4-W-SC 4.4-W-SC-OTH Use of two wrong surface One error other than use of a connector wrong surface connector 4.80E-11 7.21E-06 AND 2.4-W-SC P-AD-SC 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC MD-DETON MD-SC OL-EMULSION Manufacturer defect of one One detonator wrongly put One detonator of a sector Manufacturer defect of one surface connector such that connected wrongly to a detonator such that time into one sector which contain Use of a wrong surface Use of a wrong surface Wrong design in time delay of the same time delay surface connector of another delay corresponds to another time delay corresponds to Overcharge of emulsion more connector connector one detonator detonator sector another one than required 3.11E-11 5.20E-06 6.00E-07 4.80E-09 0.01 1.26E-09 3.63E-15 1.41E-06 OL-B Too much bulk emulsion loaded into holes 1.41E-06

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4MD-DETON+OTH Incorrect time default of two detonator due to manufacturer defect plus one other type of errors 4MD-DETON+OTH Incorrect time default of two detonator due to manufacturer defect plus one other type of errors 1.05E-13 AND 4MD-DETON MD-DETON-OTH Incorrect time default of two One error other than incorrect detonator due to time default of one detonator manufacturer defect due to manufacturer defect 5.20E-08 2.01E-06 AND MD-DETON P-AD-DETON 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-SC OL-EMULSION Manufacturer defect of one Manufacturer defect of one One additional detonator One detonator wrongly put One detonator of a sector detonator such that time wrongly put into one sector into one sector which contains connected wrongly to a surface connector such that delay corresponds to another which contains the same time Wrong design in time delay of the same time delay surface connector of another Use of a wrong surface time delay corresponds to Overcharge of emulsion more delay detonator one detonator detonator connector another one than required sector 5.20E-06 3.63E-15 4.80E-09 6.00E-07 0.01 1.26E-09 3.11E-11 1.41E-06 OL-B Too much bulk emulsion loaded into holes

4MD-SC+OTH Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 4MD-DETON+OTH Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 3.97E-14 AND MD-DETON-OTH 4MD-SC Two surface connector fail to One error other than incorrect provide necessary delay due time default of one detonator to manufacturer defect due to manufacturer defect 6.00E-09 6.61E-06 MD-SC P-AD-SC 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON OL-EMULSION Manufacturer defect of Manufacturer defect of one Manufacturer defect of one One detonator wrongly put One detonator of a sector surface connector such that surface connector such that into one sector which contains connected wrongly to a oneDETONATOR such that time delay corresponds to time delay corresponds to Wrong design in time delay of the same time delay surface connector of another Use of a wrong surface time delay corresponds to Overcharge of emulsion more another one another one one detonator detonator connector another one than required sector 3.63E-15 4.80E-09 5.20E-06 6.00E-07 0.01 1.26E-09 3.11E-11 1.41E-06 OL-B Too much bulk emulsion loaded into holes

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

1.45E-13

OR

4.1-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors

9.08E-17

4.2-W-DETON+OTH

Two detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors

2.62E-22

4.3-W-DETON-SC+OTH

One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors

2.25E-18

4.4-W-SC+OTH

Use of two wrong surface connector plus one other type of errors

3.46E-16

4MD-DETON+OTH

Incorrect time default of two detonator due to manufacturer defect plus one other type of errors

1.05E-13

4MD-SC+OTH

Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors

3.97E-14

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which containes the same time delay detonator plus one other type of errors except wrong design in time delay

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except wrong design in time delay

2.62E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

7.21E-06

OR

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.3-(WD)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay

4.3-(WD)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay

2.25E-16

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

4.3-(WD)-W-DETON-OTH

One error other than one detonator for a sector connected wrongly to a surface connector of another sector

7.21E-06

ΛÞ

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.4(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

4.4-(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

3.46E-14

AND

2.4-W-SC

Use of a wrong surface connector 4.80E-09

4.4-(WD)-W-SC-OTH

One error other than use of a wrong surface connector

7.21E-06

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

4(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

1.05E-11

AND

4MD-DETON

Incorrect time default of one detonator due to maufacturer defect

5.20E-06

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

4(WD)-MD-DETON-OTH

One error other than incorrect time default of 1 detonator due to manufacturer defect

2.01E-06

2.2-W-DETON 2.3-W-DETON-SC

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one
6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(WD)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except wrong design in time delay

4(WD)-MD-SC+OTH
One surface connector fail to provide
necessary delay due to manufacturer
defect plus one other type of errors
except wrong design in time delay
3.97E-12

AND

4MD-SC
One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(WD)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

6.61E-06

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector
4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(WD)-OL-EMULSION+OTH Overcharge of emulsion more

Overcharge of emulsion more than required plus one other type of error except wrong design in time delay of one detonator

Overcharge of emulsion more than required plus one other type of error except wrong design in time delay of one detonator

8.17E-12

AND

required

OL-EMULSION
Overcharge of emulsion more than

1.41E-06

4(WD)-OL-EMULSION-OTH

One error other than hole overload

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

5.80E-06

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector
4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

2.85E-20

AND

2.1-WD

one detonator

Wrong design in time delay of

1.26E-09

4(WD)-OTH-OTH

Two errors other then wrong design in time delay of one detonator

2.26E-11

OR

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except wrong design in time delay

2.62E-20

4.3-(WD)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay

2.25E-16

4.4-(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

3.46E-14

4(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

1.05E-11

4(WD)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except wrong design in time delay

3.97E-12

4(WD)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except wrong design in time delay of one detonator

8.17E-12

OL-B

holes

Too much bulk emulsion loaded into

1.41E-06

4.1-(W-DETON)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector 4.1-(W-DETON)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector 9.08E-15 AND 4.1-(W-DETON)-WD-OTH 2.1-WD Wrong design in time delay of one One error other than one wrong detonator design in time time of one detonator 1.26E-09 7.21E-06 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION One detonator of a sector connected Manufacturer defect of one Manufacturer defect of one surface Overcharge of emulsion more than wrongly to a surface connector of detonator such that time delay connector such that time delay another sector Use of a wrong surface connector corresponds to another one corresponds to another one required 3.11E-11 4.80E-09 5.20E-06 6.00E-07 1.41E-06

4.3-(W-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except one detonator wrongly put into one sector

4.2-(W-DETON)-W-DETON-SC+OTH

One detonator connected wrongly to surface connector of another sector plus one other error except one detonator wrongly put into one sector

2.25E-16

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

4.2-(W-DETON)-W-DETON-SC-OTH

One error other than one detonator for a sector connected wronglyh to a surface connector of another sector

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Maufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.4-(W-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except one detonator wrongly put into one

THE (IV DETON) IN SCIOTIN
4.4-(W-DETON)-W-SC+OTH
Use of one wrong surface connector
plus one other type of errors except
one detonator wrongly put into one
3.46E-1
AND
2 4-W-SC

.4-W-SC

Use of a wrong surface connector 4.80E-09

4.4-(W-DETON)-W-SC-OTH

One error other than use of a wrong surface connector

OR

2.1-WD

Wrong design in time delay od one detonator

1.26E-09

7.21E-06

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delauy corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-DETON)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

4(W-DETON)-MD-DETON
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of errors
except one detonator wrongly put
into one sector
1.05E-1

AND

MD-DETON

Incorrect time default of one deonator due to manufacturer defect

5.20E-06

4(W-DETON)-MD-DETON+OTH One error other than incorrect time default of one detonator due to manufacturer defect 2.01E-06

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-DETON)-MD-SC+OTH

One surface connector fail to provide necessay delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

1(W-DETON)	-MD-SC+OTH
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One surface connector fail to provide necessay delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

3.97E-12

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(W-DETON)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

6.61E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-DETON

Manufacturer defect of one detonator suchh that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except 1 detonator wrongy put into one sector which contains the same time delay detonator

4(W-DETON)-OL-EMULSION+OTH					
Overcharge of emulsion more than					
required plus one other type of error					
except 1 detonator wrongly put into					
one sector which contains the same					
time delay detonator					
8.17E-12					
AND					
OL EMULCION	A/M DETONI) OL FMALLICION OTLI				
OL-EMULSION	4(W-DETON)-OL-EMULSION-OTH				
Overcharge of emulsion more than	One error other than hole overload				
required 1.41E-06	5.81E-06				
1.41E-00	3.81E-00				
I					
	OR				
OL-B	2.1-WD	2.3-W-DETON-SC	2.4-W-SC	MD-DETON	MD-SC
		One detonator of a sector connected		Manufacturer defect of one	Manufacturer defect of one surface
Too much bulk emulsion loaded into	Wrong design in time delay of one	wrongly to a surface connector of		detonator such that time delay	connector such that time delay
holes	detonator	another sector	Use of a wrong surface connector	corresponds to another one	corresponds to another one
1.41E-06	1.26E-09	3.11E-11	4.80E-09	5.20E-06	6.00E-0

4(W-DETON)+OTH+OTH

One detonator wronly put into one sector which contains the same time delay detonator plus two other type of errors

4(W-DETON)+OTH+OTH
One detonator wronly put into
one sector which contains the
same time delay detonator
plus two other type of errors

8.23E-26

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4(W-DETON)-OTH-OTH

Two errors other than one detonator wrongly put into one sector which contains the same time delay detonator

2.27E-11

)R

4.1-(W-DETON)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector

9.08E-15

4.3-(W-DETON)-W-DETON-SC+OTH

One detonator connected wrongly to surface connector of another sector plus one other error except one detonator wrongly put into one sector

2.25E-16

4.4-(W-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except one detonator wrongly put into one

3.46E-14

4(W-DETON)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

1.05E-11

4(W-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

3.97E-12

4(W-DETON)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except 1 detonator wrongly put into one sector which contains the same time delay detonator

8.17E-12

holes

4.1-(W-DETON-SC)-WD+OTH	Wrong design in time delay of one detonator plus on	e other type of errors except use of a wrong sur	rface connector		
4.1-(W-DETON-SC)-WD+OTH	7				
Wrong design in time delay of one	7				
detonator plus one other type of					
errors except use of a wrong surface					
connector					
9.08E-15					
AND					
AND					
2.1-WD	4.1-(W-DETON-SC)-WD-OTH				
Managed asign in time adalase of an a	One error other than one wrong				
Wrong design in time delay of one	design in time delay of one				
detonator	detonator				
1.26E-09	7.21E-06				
	OR				
	OK				
	2.2-W-DETON	2.4-W-SC	MD-DETON	MD-SC	OL-EMULSION
	One detonator wrongly put into one	2.4 ** 30	Manufacturer defect of one	Manufacturer defect of one surface	GE ENVIOLENCE
	sector which contains the same time		detonator such that time delay	connector such that time delay	Overcharge of emulsion more than
	delay detonator	Use of a wrong surface connector	corresponds to another one	corresponds to another one	required
	3.63E-15	4.80E-09	5.20E-06	6.00E-07	1.41E-06
	0.001 20		5.202 00	5,552.57	
					OL-B
					Too much bulk emulsion loaded into

4.2-(W-DETON-SC)-W-DETON+OTH One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector

4.2-(W-DETON-SC)-W-DETON+OTH One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector 2.62E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-(W-DETON-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

7.21E-06

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.4-(W-DETON-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors exceot one detonator connected wrongly to a surface connector

4.4-(W-DETON-SC)-W-SC+OTH
Use of one wrong surface connector
plus one other type of errors exceot
one detonator connected wrongly to
a surface connector

3.46E-14

AND

2.4-W-SC

Use of a wrong surface connector

4.80E-09

4.4-(W-DETON-SC)-W-SC-OTH One error other than use of a wrong surface connector 7.21E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06

MD-SC Manufacturer defect of one surface connector such that time delay

corresponds to another one 6.00E-07 OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-DETON-SC)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

				_					
и	۱۱۸	/_Г	٦F٦	$\Gamma \cap \Gamma$	ころし	_N/ID.	-DET	ON+OTH	

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

1.05E-11

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect 5.20E-06

.20E-06

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

4(W-DETON-SC)-MD-DETON-OTH
One error other than incorrect time
default of one detonator due to

manufacturer defect

2.01E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-DETON-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

4(W-DETON-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

3.97E-12

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(W-DETON-SC)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

6.61E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

Manufacturer defect of one detonator suchh that time delay corresponds to another one

MD-DETON

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

4(W-DETON-SC)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except one detonator of a sector connected wrongly to a surface connector of another sector

Overcharge of emulsion more than required plus one other type of error

4(W-DETON-SC)-OL-EMULSION+OTH

except one detonator of a sector connected wrongly to a surface connector of another sector

8.17E-12

AND

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes
1.41E-06

2.1-WD

Wrong design in time delay of one detonator

4(W-DETON-SC)-OL-EMULSION-OTH

One error other than hole overload

5.81E-06

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.4-W-SC

Use of a wrong surface connector
4.80E-09

Manufacturer defect of one detonator such that time delay corresponds to another one

MD-DETON

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

MTR Corporation Ltd

Environmental Consultancy No.1603 Environmental Impact Assessment Study for Northern Link
Environmental Impact Assessment Report

4(W-DETON-SC)+OTH+OTH One detonator connected wrongly to a surface connector of another sector plus two other type of errors

4(W-DETON-SC)+OTH+OTH
One detonator connected
wrongly to a surface connector
of another sector plus two
other type of errors

7.05E-22

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

4(W-DETON-SC)-OTH-OTH
Two errors other than one
detonator of a sector
connected wrongly to a
surface connector of another

2.26E-11

ΩR

sector

4.1-(W-DETON-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

9.08E-15

4.2-(W-DETON-SC)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector

2.62E-20

4.4-(W-DETON-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors exceot one detonator connected wrongly to a surface connector

3.46E-14

4(W-DETON-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

1.05E-11

4(W-DETON-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

3.97E-12

4(W-DETON-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except one detonator of a sector connected wrongly to a surface connector of another sector

8.17E-12

4.1-(W-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

4	4	'W-SC)-WD+O	TII

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

9.08E-15

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4.1-(W-SC)-WD-OTH

One error other than one wrong design in time delay of one detonator

7.21E-06

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.2-(W-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except use of a wrong surface connector

4.2-(W-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except use of a wrong surface connector

2.62E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-(W-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

7.21E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.3-(W-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector

4.3-(W-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector

2.24E-16

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

4.3-(W-SC)-W-DETON-SC-OTH

One error other than one detonator for a sector connected wrongly to a surface connector of another sector

7.21E-06

ΛÞ

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except use of a wrong surface connector

4(W-SC)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except use of a wrong surface connector 1.04E-11

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

5.20E-06

2.1-WD

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

4(W-SC)-MD-DETON-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

2.01E-06

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector

4(W-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector

3.97E-12

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(W-SC)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

6.61E-06

1.26E-09

2.1-WD

Wrong design in time delay of one detonator

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(W-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except use of a wrong surface connector

4(W-SC)-OL-EMULSION+OTH	
Overcharge of emulsion more than	1
required plus one other type of en	ro
except use of a wrong surface	
connector	
8.16E	-1

AND

OL-EMULSION
Overcharge of emulsion more than
required
1.41E-0

.41E-06

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

4(W-SC)-OL-EMULSION-OTH

One hole other than hole overload

5.80E-06

Wrong design in time delay of one detonator 1.26E-09

2.1-WD

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one
6.00E-07

4(W-SC)+OTH+OTH

Use of a wrong surface connector plus two other type of errors

4(W-SC)+OTH+OTH
Use of a wrong surface
connector plus two other type
of errors

1.08E-19

AND

2.4-W-SC

Use of a wrong surface connector

4.80E-09

4(W-SC)-OTH-OTH

Two errors other than use of a wrong surface connector

2.26E-11

OR

4.1-(W-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

9.08E-15

4.2-(W-SC)-W-DETON+OTH
One detonator wrongly put
into one sector which contains

the same time delay detonator plus one other type of errors except use of a wrong surface connector

2.62E-20

4.3-(W-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector

2.24E-16

4(W-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except use of a wrong surface connector

1.04E-11

4(W-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector

3.97E-12

4(W-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except use of a wrong surface connector

8.16

4.1-(MD-DETON)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one detonator

4.1-(MD-DETON)-WD+OTH
Wrong design in time delay of one
detonator plus one other type of
errors except manufacturer defect of
one detonator

2.53E-15

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4.1-(MD-DETON)-WD-OTH
One error other than one wrong

design in time delay of one detonator

2.01E-06

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.2-(MD-DETON)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one detonator

					TO+V	

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one detonator

7.31E-21

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-(MD-DETON)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.01E-06

ΛP

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

OL-B

holes

Too much bulk emulsion loaded into

1.41E-06

4.3-(MD-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator 4.3-(MD-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator 6.27E-17 AND 2.3-W-DETON-SC 4.3-(MD-DETON)-W-DETON-SC-OTH One detonator of a sector connected One error other than one detonator for wrongly to a surface connector of a sector connected wrongly to a surface another sector connector of another sector 3.11E-11 2.01E-06 OR 2.1-WD 2.2-W-DETON 2.4-W-SC MD-SC OL-EMULSION One detonator wrongly put into one Maufacturer defect of one surface Wrong design in time delay of one sector which contains the same time connector such that time delay Overcharge of emulsion more than delay detonator Use of a wrong surface connector corresponds to another one detonator required 1.26E-09 3.63E-15 4.80E-09 6.00E-07 1.41E-06

4.4-(MD-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one detonator

4.4-(MD-DETON)-W-SC+OTH
Use of one wrong surface connector
plus one other type of errors except
manufacturer defect of one
detonator
9.64E-1

AND

2.4-W-SC

Use of a wrong surface connector

4.80E-09

4.4-(MD-DETON)-W-SC-OTH
One error other than use of a wrong surface connector
2.01E-06

)R

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.4-W-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(MD-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

4 / N	ח חו	ETON	1 1 1 1 1 1	SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

8.48E-13

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(MD-DETON)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

1.41E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

OL-F

Use of a wrong surface connector

2.4-W-SC

4.80E-09

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4(MD-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one detonator such that time delay corresponds to another one

4(MD-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one detonator such that time delay corresponds to another one 8.53E-13 AND OL-EMULSION 4(MD-DETON)-OL-EMULSION-OTH Overcharge of emulsion more than required One hole other than overload 1.41E-06 6.06E-07 OL-B 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-SC One detonator wrongly put into one One detonator of a sector connected Manufacturer defect of one surface sector which contains the same time Too much bulk emulsion loaded into Wrong design in time delay of one wrongly to a surface connector of connector such that time delay corresponds to another one detonator delay detonator another sector Use of a wrong surface connector holes 1.41E-06 1.26E-09 3.63E-15 3.11E-11 4.80E-09 6.00E-07

4(MD-DETON)+OTH+OTH

Manufacturer defect of one detonator such that time delay corresponds to another one plus two other type of errors

4(MD-DETON)+OTH+OTH
Manufacturer defect of one
detonator such that time
delay corresponds to another
one plus two other type of
errors

8.91E-18

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

5.20E-06

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06

4(MD-DETON)-OTH-OTH

Two errors other than manufacturer defect of one detonator such that time delay corresponds to another

1.71E-12

OR

4.1-(MD-DETON)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one detonator

2.53E-15

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one

7.31E-21

4.2-(MD-DETON)-W-DETON+OTH

detonator

4.3-(MD-DETON)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator

6.27E-17

OTH 4.4-(MD-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one detonator

9.64E-15

4(MD-DETON)-MD-SC+OTH
One surface connector fail to

provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

8.48E-13

4(MD-DETON)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one detonator such that time delay corresponds to another one

8.53E-13

4.1-(MD-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

4.1-	(MD-SC)-WD+0	HTC
------	--------	--------	-----

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

8.33E-15

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4.1-(MD-SC)-WD-OTH

One error other than one wrong design in time delay of one detonator

6.61E-06

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector
4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

4.2-(MD-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

4.2-(MD-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

2.40E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-(MD-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

6.61E-06

ΛP

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

OL-B

holes

Too much bulk emulsion loaded into

1.41E-06

4.3-(MD-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector 4.3-(MD-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector 2.06E-16 AND 4.3-(MD-SC)-W-DETON-SC-OTH 2.3-W-DETON-SC One detonator of a sector connected One error other than one detonator wrongly to a surface connector of for a sector connected wrongly to a surface connector of another sector another sector 3.11E-11 6.61E-06 2.2-W-DETON MD-DETON OL-EMULSION 2.1-WD 2.4-W-SC One detonator wrongly put into one Manufacturer defect of one Overcharge of emulsion more than Wrong design in time delay of one sector which contains the same time detonator such that time delay detonator delay detonator Use of a wrong surface connector corresponds to another one required 1.26E-09 3.63E-15 4.80E-09 5.20E-06 1.41E-06

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one surface connector

4.4-(MD-SC)-W-SC+OTH	Use of one
4.4-(MD-SC)-W-SC+OTH	
Use of one wrong surface connector	
plus one other type of errors except	
manufacturer defect of one surface	
connector	
3.17E-14	
	'
AND	
	,
2.4-W-SC	-
Use of a wrong surface connector	-
4.80E-09	

4.4-(MD-SC)-W-SC-OTH

One error other than use of a wrong surface connector

6.61E-06

2.1-WD
Wrong design in time delay of one detonator
1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B
Too much bulk emulsion loaded into holes
1.41E-06

4(MD-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except manufacturer defect of one surface connector

4(MD-SC)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of errors
except manufacturer defect of one
surface connector
7.35E-1

AND

Incorrect time default of one detonator due to maufacturer defect 5.20E-06

MD-DETON

Manufacturer defect of one
detonator such that time delay
corresponds to another one
5.20E-06

4(MD-SC)-MD-DETON-OTH
One error other than incorrect time default of one detonator due to manufacturer defect

1.41E-06

2.1-WD
Wrong design in time delay of one detonator
1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

Use of a wrong surface connector
4.80E-09

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B
Too much bulk emulsion loaded into holes
1.41E-06

4(MD-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one surface connector such that time delay corresponds to another one

4(MD-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one surface connector such that time delay corresponds to another one

7.33E-12

AND

OL-EMULSION Overcharge of emulsion more than required

1.41E-06

4(MD-SC)-OL-EMULSION-OTH

One error other than hole overload 5.21E-06

detonator

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

2.1-WD

Wrong design in time delay of one

1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector 3.11E-11

Use of a wrong surface connector 4.80E-09

2.4-W-SC

MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

4(MD-SC)+OTH+OTH

Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error

4(MD-SC)+OTH+OTH

Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error

8.83E-18

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

6.00E-07

4(MD-SC)-OTH-OTH

Two errors other than manufacturer defect of one detonator such that time delay corresponds to another one

1.47E-11

OF

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 6.00E-07

4.1-(MD-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

8.33E-15

4.2-(MD-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

2.40E-20

4.3-(MD-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector

2.06E-16

4.4-(MD-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one surface connector

3.17E-14

4(MD-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except manufacturer defect of one surface connector

7.35E-12

4(MD-SC)-OL-EMULSION+OTH
Overcharge of emulsion more

than required plus one other type of error except manufacturer defect of one surface connector such that time delay corresponds to another one

7.33E-12

Manufacturer defect of one surface

6.00E-07

connector such that time delay

corresponds to another one

Manufacturer defect of one

corresponds to another one

detonator such that time delay

5.20E-06

4.1-(OL-EMULSION)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except overcharge 4.1-(OL-EMULSION)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except overcharge 7.31E-15 AND 2.1-WD 4.1-(OL-EMULSION)-WD-OTH One error other than one wrong Wrong design in time delay of one design in time delay of one detonator detonator 1.26E-09 5.80E-06 2.2-W-DETON 2.3-W-DETON-SC MD-DETON 2.4-W-SC MD-SC

Use of a wrong surface connector

4.80E-09

One detonator of a sector connected

3.11E-11

wrongly to a surface connector of

another sector

One detonator wrongly put into one

sector which contains the same time

3.63E-15

delay detonator

4.2-(OL-EMULSION)-W-DETON+OTH One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge

4.2-(OL-EMULSION)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge

2.11E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

4.2-(OL-EMULSION)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

5.81E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector
4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4.3-(OL-EMULSION)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except overcharge

4.3-(OL-EMULSION)-W-DETON-SC+OTH					
One detonator connected wrongly to a					
surface connector of another sector plus					
one other error except overcharge					
1.81E-16					
AND					
2.3-W-DETON-SC	4.3-(OL-EMULSION)-W-DETON-SC-OTH				
One detonator of a sector connected	One error other than one detonator for a				
wrongly to a surface connector of another	sector connected wrongly to a surface				
sector	connector of another sector				
3.11E-11	5.81E-06				
	OR				
	-				
	2.1-WD	2.2-W-DETON	2.4-W-SC	MD-DETON	MD-SC
		One detonator wrongly put into one		Manufacturer defect of one	Manufacturer defect of one surface
	Wrong design in time delay of one	sector which contains the same time		detonator such that time delay	connector such that time delay
	detonator	delay detonator	Use of a wrong surface connector	corresponds to another one	corresponds to another one
	1.26E-09	3.63E-15	4.80E-09	5.20E-06	6.00E-0

4.4-(OL-EMULSION)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except overcharge

4.4-(OL-EMULSION)-W-SC+OTH Use of one wrong surface connector plus one other type of errors except overcharge

2.78E-14

AND

2.4-W-SC

Use of a wrong surface connector

4.80E-09

4.4-(OL-EMULSION)-W-SC-OTH One error other than use of a wrong surface connector

5.80E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator 3.63E-15 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06 MD-SC Manufacturer defect of one surface connector such that time delay corresponds to another one 6.00E-07

4(OL-EMULSION)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errorss except overcharge

4(OL-EMULSION)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errorss except overcharge 3.15E-12

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

5.20E-06

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

4(OL-EMULSION)-MD-DETON-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

6.06E-07

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON One detonator wrongly put into one

delay detonator 3.63E-15

sector which contains the same time

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector 3.11E-11 2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

4(OL-EMULSION)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except overcharge

4(OL-EMULSION)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except overcharge

3.12E-12

AND

defect

MD-SC
One surface connector fail to provide

6.00E-07

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one

necessary delay due to manufacturer

6.00E-07

4(OL-EMULSION)-MD-SC-OTH
One error other than incorrect time

defult of one detonator due to manufacturer defect

5.21E-06

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

Environmental Consultancy No.1603 Environmental Impact Assessment Study for Northern Link

Environmental Impact Assessment Report

4(OL-EMULSION)+OTH+OTH Overcharge of emulsion more than required and two other errors occur at the same time

4(OL-EMULSION)+OTH+OTH

Overcharge of emulsion more than required and two other errors occur at the same time

8.88E-18

AND

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

4(OL-EMULSION)-OTH-OTH
Combination of two other
different types of errors
6.31E-12

OR

Too much bulk emulsion

1.41E-06

loaded into holes

OL-B

4.1-(OL-EMULSION)-WD+OTH
Wrong design in time delay of
one detonator plus one other
type of errors except
overcharge
7.31E-15

4.2-(OL-EMULSION)-W-DETON+OTH
One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge

2.11E-20

4.3-(OL-EMULSION)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except overcharge

1.81E-16

4.4-(OL-EMULSION)-W-SC+OTH
Use of one wrong surface
connector plus one other type
of errors except overcharge
2.78E-14

4(OL-EMULSION)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of
errorss except overcharge
3.15E-12

4(OL-EMULSION)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of
errorss except overcharge
3.12E-12

4MIC-COMB-3

4 MIC detonated (due to three different errors occur at the same time) at the same time

4MIC-COMB-3

4 MIC detonated (due to three different errors occur at the same time) at the same time

2.68E-17

OR

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

2.85E-20

4(W-DETON)+OTH+OTH

One detonator wronly put into one sector which contains the same time delay detonator plus two other type of errors

8.23E-26

4(W-DETON-SC)+OTH+OTH

One detonator connected wrongly to a surface connector of another sector plus two other type of errors

7.05E-22

4(W-SC)+OTH+OTH

Use of a wrong surface connector plus two other type of errors 1.08E-19

4(MD-DETON)+OTH+OTH

Manufacturer defect of one detonator such that time delay corresponds to another one plus two other type of errors

8.91E-18

4(MD-SC)+OTH+OTH

Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error

8.83E-18

4(OL-EMULSION)+OTH+OTH

Overcharge of emulsion more than required and two other errors occur at the same time

8.88E-18

5.20E-06

4MIC-COMB-4

1.41E-06

4MIC-COMB-4 4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time 8.17E-12 AND OL-EMULSION 4MIC-OTH Overcharge of emulsion more than required One other type of errors 1.41E-06 5.81E-06 OL-B 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC One detonator of a sector Manufacturer defect of one 1 detonator wrongly put into connected wrongly to a Manufacturer defect of one surface connector such that one sector which containes the detonator such that time delay Too much bulk emulsion Wrong design in time delay of surface connector of another Use of a wrong surface time delay corresponds to loaded into holes same time delay detonator corresponds to another one another one one detonator sector connector

3.11E-11

4.80E-09

3.63E-15

4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time

1.26E-09

6.00E-07

3.1-WD

Wrong design in time delay of two detonators

3.1-WD	
Wrong design in time delay of two	
detonators	
1.26E-	<u>11</u>

AND

2.1-WD
Wrong design in time delay of one
detonator
1.26E-09

P-AD-DETON
Wrong design in time delay of
additional detonator
1.00E-02

3.2-W-DETON

Two detonator wrongly put into one sector which contains the same time delay detonator

2	.2	_\^	/_	ח	F٦	Γ	1	N
7	. /	- v	v -				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	N

Two detonator wrongly put into one sector which contains the same time delay detonator

3.63E-17

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

3.3-W-DETON-SC

Two detonators of othe sectors connected wrongly to a surface connector of another sector

3.3-W-DETON-SC

Two detonators of other sectors connected wrongly to a surface connector of another sector

3.11E-13

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface conector of another sector

3.11E-11

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

2	4-	١	٨	ı_	S	\mathbf{c}

Use of two wrong surface connector

3.4-W-SC	
Use of two wrong surface connector 4.80E-11	
AND	
2.4-W-SC	P-AD-SC
	Additional use of wrong surface
Use of wrong surface connector	connector
4.80E-09	0.01

3MD-DETON

Incorrect time default of 2 detonators due to manufacturer defect

3MD-DETON
Incorrect time default of 2
detonators due to manufacturer
defect

5.20E-08

AND

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

3MD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

3MD-SC
Surface connector fails to provide
necessary delay due to manufacturer
defect

6.00E-09

AND

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

6.00E-07

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

3MIC-ER-COMB

3 MIC detonated at the same time (Due to combination of two types of errors)

3MIC-ER-COMB

3 MIC detonated at the same time (Due to combination of two types of errors)

2.27E-11

OR

2.1-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors

9.08E-15

2.2-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors

2.62E-20

2.3-W-DETON+OTH

One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

2.25E-16

2.4-W-SC+OTH

Use of a wrong surface connector plus one other type of errors

3.46E-14

MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors 1.05E-11 MD-SC+OTH

Surface connector fails to provide necessary delay due to manufacturer defect plus one other type of errors 3.97E-12

OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of errors

8.17E-12

3.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 3.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 9.08E-15 AND 2.1-WD 3.1-WD-OTH One error other than one wrong design in time delay of Wrong design in time delay of one detonator one detonator 1.26E-09 7.21E-06 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION One detonator of a sector Manufacturer defect of one connected wrongly to a surface connector such that One detonator wrongly put Manufacturer defect of one into one sector which contains surface connector of another detonator such that time delay Overcharge of emulsion more Use of a wrong surface time delay corresponds to the same time delay detonator corresponds to another one another one than required sector connector 4.80E-09 3.63E-15 3.11E-11 5.20E-06 6.00E-07 1.41E-06 OL-B Too much bulk emulsion loaded into holes

3.2-W-DETON+OTH One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors

3.2-W-DETON+OTH

One detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors

2.62E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 3.63E-15

3.2-W-DETON-OTH
One error other than one

detonator wrongly put into a sector which contains the same time delay detonator

ΩR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

7.21E-06

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 6.00E-07

OL-EMULSION

Overcharge of emulsion more than required

1.41E-06

OL-B

Too much bulk emulsion loaded into holes

3.3-W-DETON-SC+OTH One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

3.3-W-DETON-SC+OTH One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

2.25E-16

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

3.3-W-DETON-OTH One error other than one

detonator of a sector connected wrongly to a surface connector of another sector

7.21E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 2.4-W-SC

Use of a wrong surface connector 3.63E-15

MD-DETON

4.80E-09

Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 6.00E-07 OL-EMULSION

Overcharge of emulsion more than required

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

3.4-W-SC+OTH Use of a wrong surface connector plus one other types of errors 3.4-W-SC+OTH Use of one wrong surface connector plus one other type of errors 3.46E-14 AND 2.4-W-SC Use of a wrong surface connector Use of a wrong surface connector wrong surface connector

4.80E-09

wrong surface connector
7.21E-06
OR
2.1-WD

Wrong design in time delay of one detonator
1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

3.63E-15

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

5.20E-06

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one
6.00E-07

Overcharge of emulsion more than required

1.41E-06

OL-EMULSION

OL-B
Too much bulk emulsion
loaded into holes
1.41E-06

3MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors 3MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors

AND

3MD-DETON 3MD-DETON-OTH Incorrect time default of one One error other than incorrect time default of one detonator detonator due to manufacturer defect due to manufacturer defect 5.20E-06 2.01E-06

1.05E-11

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 5.20E-06 2.1-WD

Wrong design in time delay of one detonator 1.26E-09 2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 3.63E-15 2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

2.4-W-SC

Use of a wrong surface connector 4.80E-09 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

OL-EMULSION

Overcharge of emulsion more than required 6.00E-07

OL-B

Too much bulk emulsion loaded into holes

1.41E-06

3MD-SC+OTH

Manufacturer defect of one

surface connector such that

time delay corresponds to

6.00E-07

another one

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors

31410-3610111	One surface connector fail to provide nece
3MD-DETON+OTH]
One surface connector fail to	
provide necessary delay due to	
manufacturer defect plus one	
other type of errors	
3.97E-12	
<u> </u>	-
AND	
3MD-SC	MD-DETON-OTH
One surface connector fail to	One error other than incorrect
provide necessary delay due to	time default of one detonator
manufacturer defect	due to manufacturer defect
6.00E-07	6.61E-06
	OR
	,
MD-SC	2.1-WD

2.1-WD

Wrong design in time delay of one detonator 1.26E-09 2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 3.63E-15 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector

3.11E-11

Use of a wrong surface connector

2.4-W-SC

4.80E-09

MD-DETON Manufacturer defect of oneDETONATOR such that time delay corresponds to another one

5.20E-06

OL-EMULSION

Overcharge of emulsion more than required 1.41E-06

OL-B

Too much bulk emulsion loaded into holes

OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error 8.17E-12 AND OL-EMULSION OL-EMULSION-OTH One error other than hole Overcharge of emulsion more than required overload 1.41E-06 5.81E-06 OL-B 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC One detonator of a sector Manufacturer defect of one One detonator wrongly put connected wrongly to a Manufacturer defect of one surface connector such that Too much bulk emulsion into one sector which contains surface connector of another detonator such that time delay time delay corresponds to Wrong design in time delay of Use of a wrong surface the same time delay detonator loaded into holes one detonator corresponds to another one another one sector connector 6.00E-07 1.41E-06 1.26E-09 3.63E-15 4.80E-09 3.11E-11 5.20E-06

3.1.1

3.1.1 Excess emulsion is loaded due to wrong density 1.11E-12 AND Truck Operator sets passing flow 3.1.1-C4

Truck Operator sets gassing flow meter or read density chart incorrectly

3.03E-02

OR

3.1.1-1

Truck Operator sets gassing flow meter incorredtly

Truck Operator sets gassing flow incorrectly

3.95E-03

Truck Operator reads density chart incorrectly

2.63E-02

Excess emulsion is loaded due to wrong density

Truck Operator reads scales or dentity incorrectly

3.65E-11

AND

3.1.1-C

Truck Operator reaeds scales or density chart incorrectly and not detected/corrected by Blasting Engineer/Shotfirer (prior to loading)

3.32E-04

3.1.1-C
Truck Operator reaeds scales or density chart incorrectly and not detected/corrected by Blasting Engineer/Shotfirer (in the middle of loading)

3.32E-04

3.1.1-C
Truck Operator reaeds scales or density chart incorrectly and not detected/corrected by Blasting Engineer/Shotfirer (towards end of loading)

3.32E-04

Failure to correct error by Shotfirer

5.08E-03

Failure to detect error by Shotfirer

3.39E-02

3.1.1-C

3.1.1-C Truck Operator reaeds scales or density chart incorrectly and not detected/corrected by Blasting Engineer/Shotfirer 3.32E-04 AND 3.1.1-C1 3.1.1-TO Failure to detect or correct density check error by Blastin Truck Operator reads scales or Engineer/Shotfirer density chart incorrectly 5.26E-02 6.30E-03 AND 3.1.1-3 3.1.1-4 3.1.1-BE 3.1.1-SF Truck Operator reads scales Truck Operator reads density chart Failure to detect or correct by Failure to detect or correct error by Blasting Engineer Shotfirer incorrectly incorrectly 2.63E-02 2.63E-02 1.62E-01 3.89E-02 OR OR 3.1.1-5 3.1.1-6 3.1.1-7 3.1.1-8 Failure to correct error by Blasting

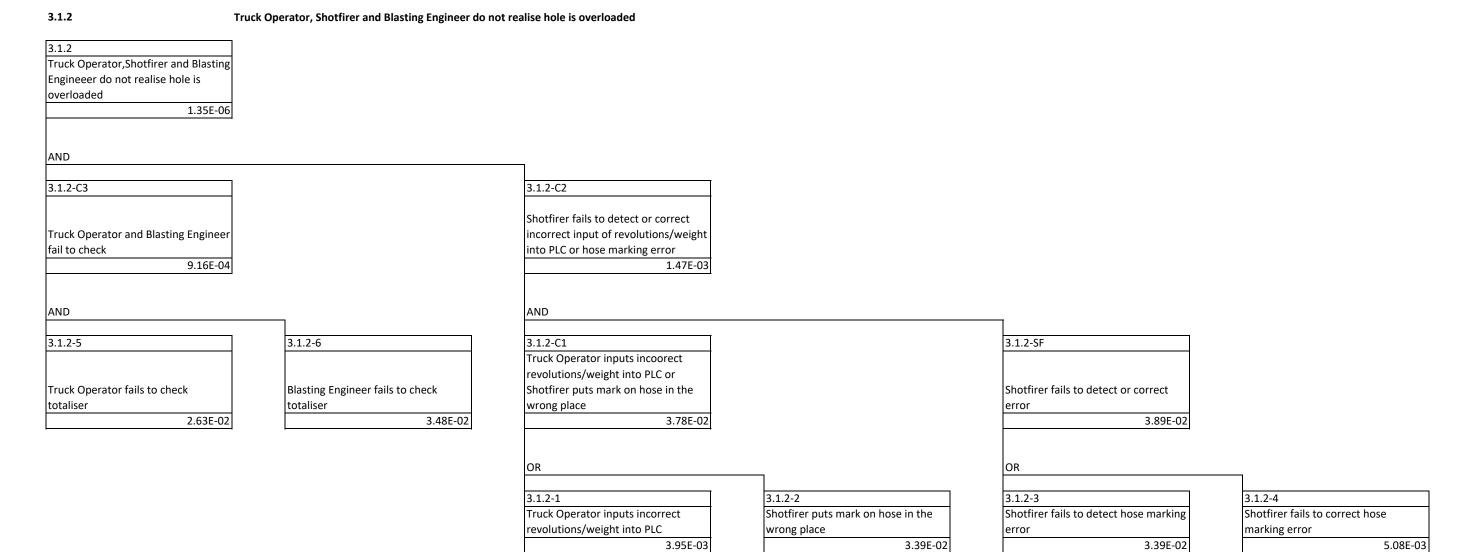
Engineer

5.22E-03

Failure to detect by Blasting Engineer

1.57E-01

Truck Operator reaeds scales or density chart incorrectly and not detected/corrected by Blasting Engineer/Shotfirer



3.2.1

3.2.1		
Design error by the Blasting Engineer 2.11E-05		
AND		
3.2.1-1	3.2.1-BE Failure to detect or correct error by	
Design error by Blasting Engineer	Blasting Engineer	
6.05E-04	3.48E-02	
	OR	
	3.2.1-2	3.2.1-3
		Blasting Engineer fails to correct
	Blasting Engineer fails to detect error	error
	3.03E-02	4.54E-03

Design error by the Blasting Engineer

3.2.2 Failure to detect and correct design error

3.2.2			
Failure to detect and correct design			
error			
3.70E-05			
AND			
3.2.2-RE		3.2.2-MD	
Failure to detect or correct error by		Failure to detect or correct error by	
Resident Engineer		Mines Division	
3.35E-02		1.10E-03	
OR		OR	
3.2.2-1	3.2.2-2	3.2.2-3	3.2.2-4
Resident Engineer fails to detect	Resident Engineer fails to correct		
error	error	Mines Division fails to detect error	Mines Division fails to correct error
2.92E-02	4.37E-03	5.52E-04	5.52E-04

2.1.1 Design Error by Blasting Engineer and Failure of Design Check and Correction

2.1.1		
Design Error by Blasting Engineer and		
Failure of Design Check and		
Correction		
1.05E-03		
AND		
2.1.1-1	2.1.1-BE	
	Failure to detect and correct error by	
Design error by Blasting Engineer	Blasting Engineer during modelling	
3.03E-02	3.48E-02	
	OR	
	2442	2442
	2.1.1-2	2.1.1-3
	Failure to detect error by Blasting	Failure to correct error by Blasting
	Engineer during modelling	Engineer during modelling
	3.03E-02	4.54E-03

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Failure to detect and correct error by Blasting Engineer, Mines Division, Shotfirer and Blasting Competent Supervisor

Mines Division

2.76E-02

2.1.2 Failre to Detect and Correct error by Blasting Engineer, Mines Division, Shotfirer and Blasting Competent Supervisor 1.19E-06 AND 2.1.2-MD 2.1.2-RE 2.1.2-SF 2.1.2-BCS Failure to detect and correct Failure to detect and correct Shotfirer fails to detect and Blasting Competent error by Resident Engineer error by Mines Division correct error Supervisor fails to detect and 3.35E-02 3.17E-02 3.35E-02 3.35E-02 2.1.2-1 2.1.2-3 2.1.2-2 2.1.2-4 2.1.2-5 2.1.2-6 2.1.2-7 Blasting Competent Failure to detect error by Failure to correct error by Failure to detect error by Failure to correct error by **Blasting Competent** Supervisor fails to correct

4.14E-03

Shotfirer fails to detect error

2.92E-02

Shotfirer fails to correct error

4.37E-03

Mines Division

error

4.37E-03

Supervisor fails to detect error

2.92E-02

Resident Engineer

4.37E-03

2.1.2

Resident Engineer

2.92E-02

2.1-WD

Wrong design in time delay of one detonator

2.1-WD
Wrong design in time delay of one
detonator
1.26E-09

AND

2.1.1

Design Error by Blasting Engineer and Failure of Design Check and Correction

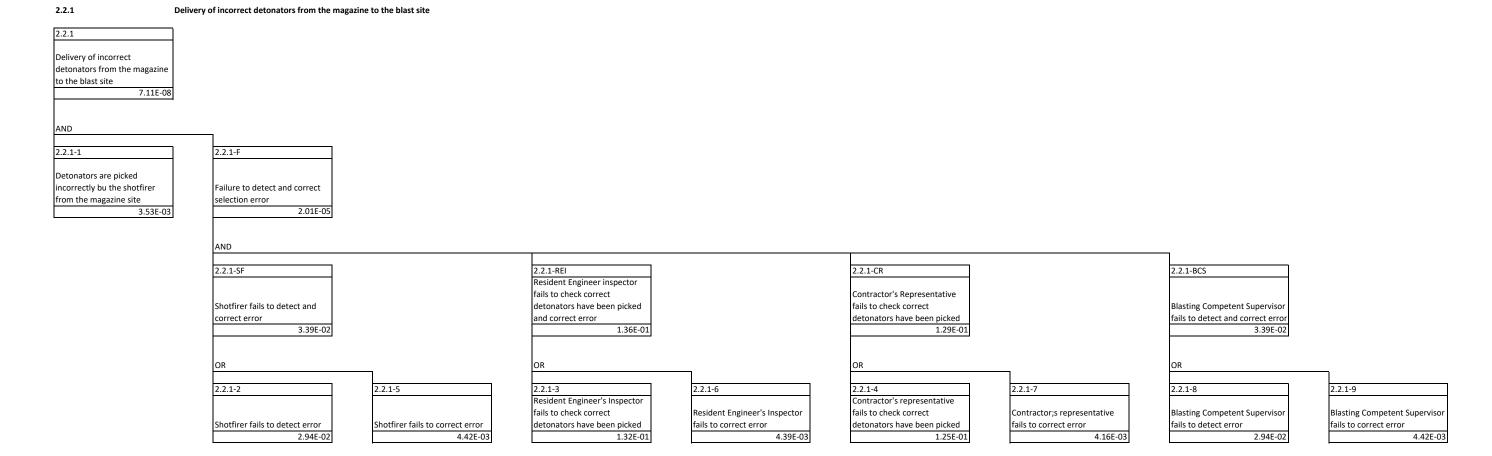
1.05E-03

2.1.2
Failure by Resident Engineer and
Mines Division to detect and correct
design error

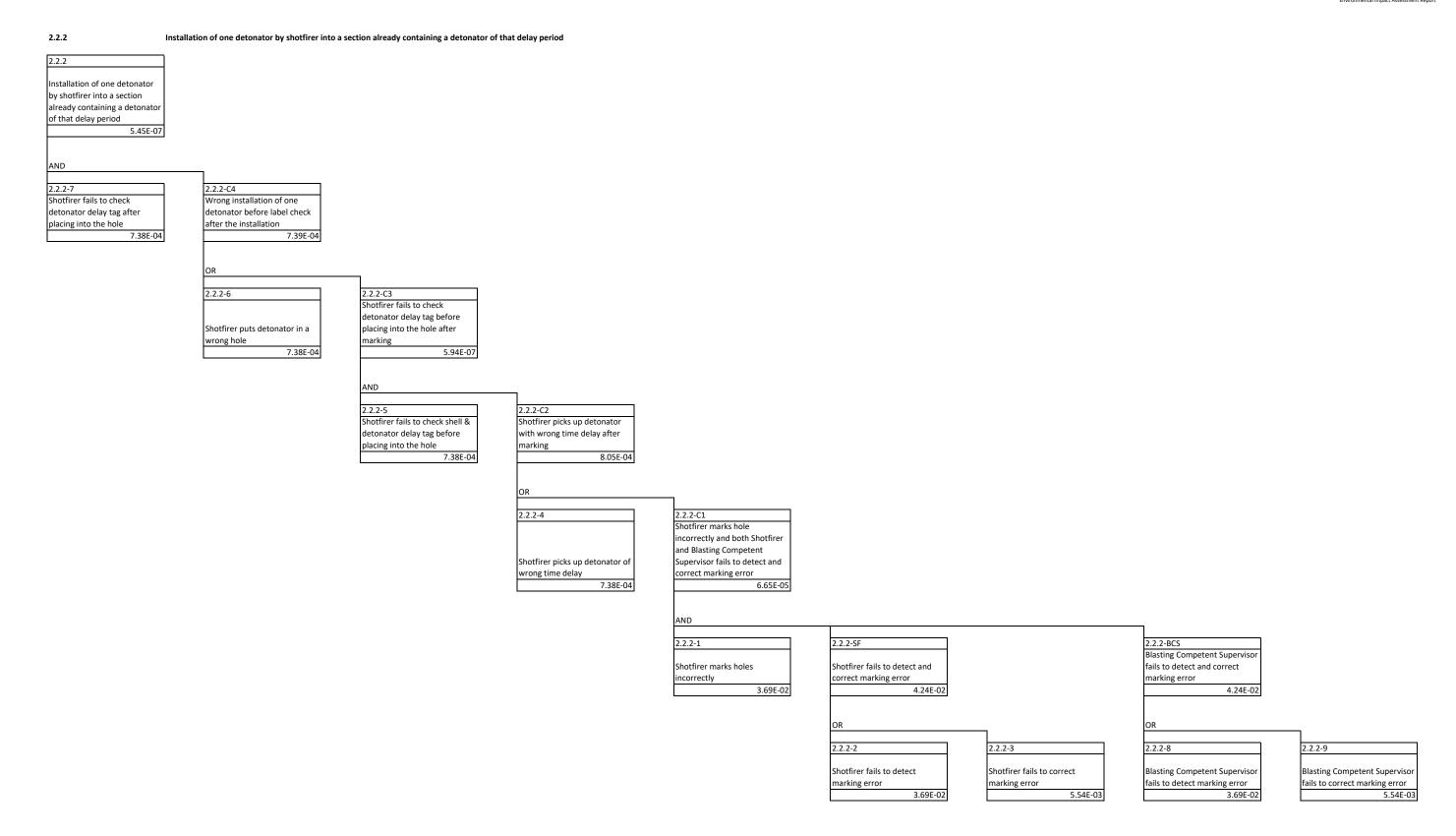
1.19E-06

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2.2.3 Shotfirer/Blasting Competent Supervisor fails to check and correct installation error

2.2.3			
Shotfirer/Blasting Competent			
Supervisor fails to check and correct			
installation error			
1.80E-03			
AND			
2.2.3-SF		2.2.3-BCS	
		Blasting Competent Supervisor fails	
Shotfirer fails to detect and correct		to detect and correct installation	
installation error of detonator		error of detonator	
4.24E-02		4.24E-02	
OR		OR	
2.2.3-1	2.2.3-2	2.2.3-3	2.2.3-4
Shotfirer leaves empty holes in the	2.2.3-2	2.2.3-3	2.2.3-4
blast face due to not realising there	Shotfirer fails to fill empty holes	Blasting Competent Supervisor fails	Blasting Competent Supervisor fails
are detonators left over	before detonation	to detect installation error	to correct insallation error
3.69E-02	5.54E-03	3.69E-02	5.54E-03

2.2-W-DETON

the magazine to the blast site

7.11E-08

One detonator wrongly put into one sector which contains the same time delay detonator

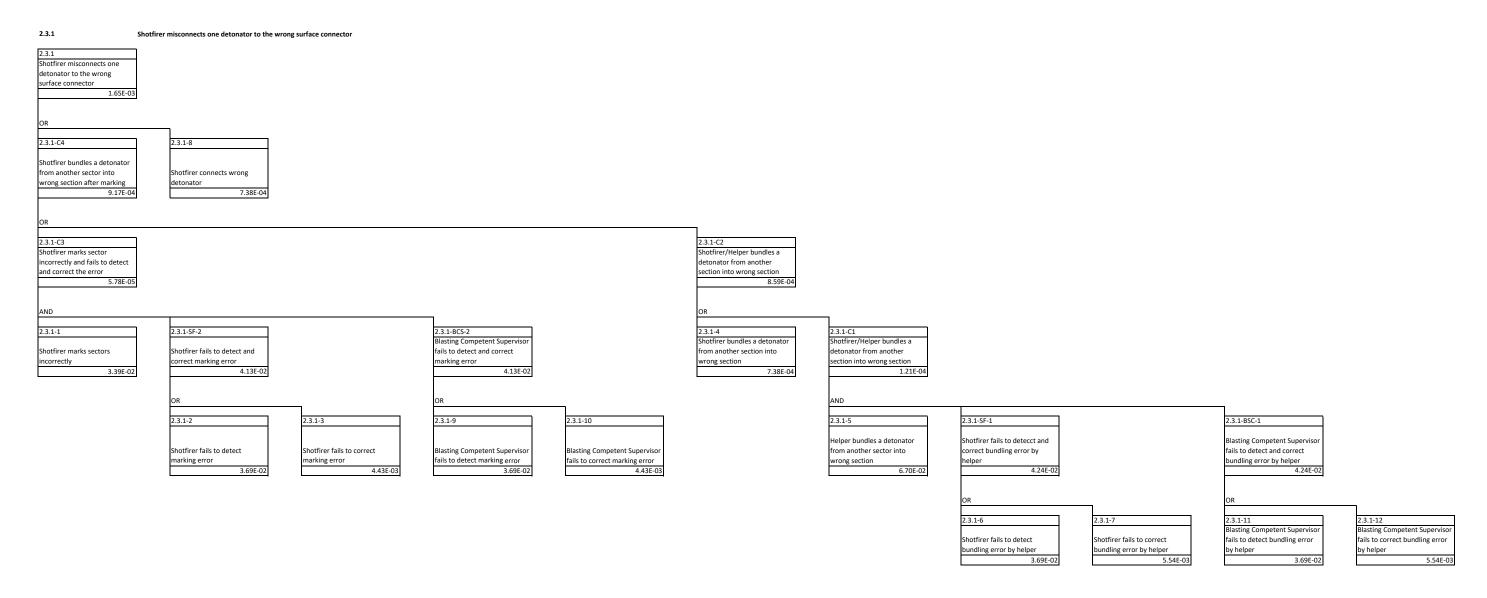
2.84E-05

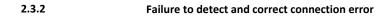
Installation Error

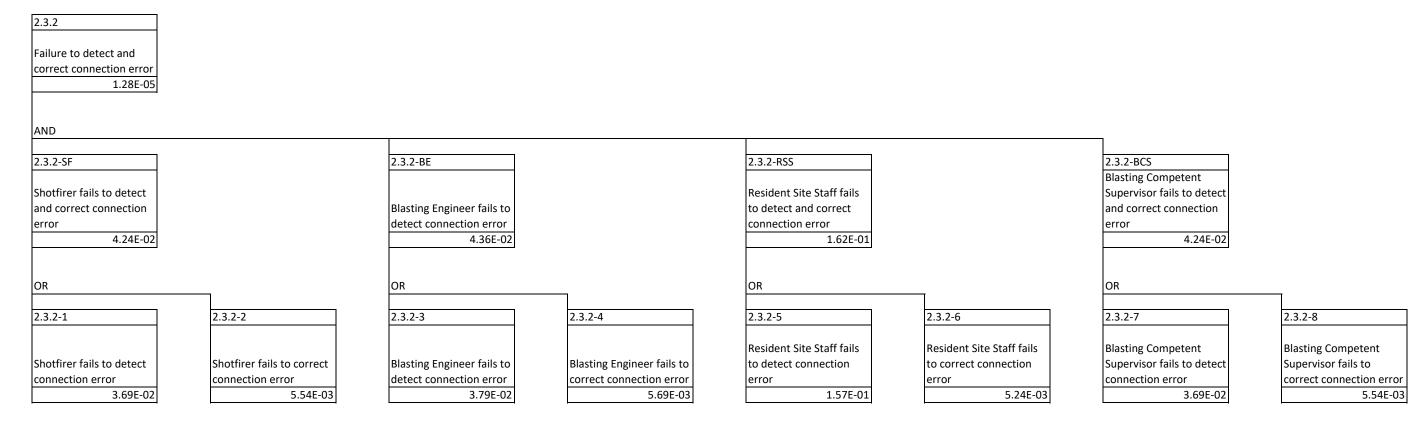
1.80E-03

2.2-W-DETON		
One detonator wrongly put into one		
sector which contains the same time		
delay detonator		
3.63E-15		
AND		
2.2.1	2.2.2	2.2.3
	Installation of One Detonator by	
	Shotfirer into a section already	Shotfirer /Blasting Competent
Delivery of incorrect detonators from	containing a detonator of that delay	Supervisor Fails to Check and Correct

period







2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

2.3-W-DETON-SC		
One detonator of a sector connected		
wrongly to a surface connector of		
another sector		
3.11E-11		
AND		
2.3.1	2.3.2	2.2.2
		Installation of one detonator by
		Shotfirer into a section already
Shotfirer misconencts one detonator	Failure to detect and correct	containing a detonator of that delay
to the wrong surface connector	connection error	period
8.60E-02	1.28E-05	2.84E-05

2.4.1 Incorrect Installation of Surface Connector

2.4.1	
Incorrect installation of surface	
connector	
1.48E-03	

ΩR

2.4.1-1
Shotfirer fails to check the colour of
the surface connector before
installing
7.38E-04

2.4.1-2
Shotfirer connects wrong surface connector

7.38E-04

2.4.2 Shotfirer/Blasting Competent Supervisor fails to detect and respond to error

3.69E-02	5.54E-03	3.69E-02	5.54E-03
Shotfirer fails to detect error	Shotfirer fails to correct error	to detect error	to correct error
		Blasting Competent Supervisor fails	Blasting Competent Supervisor fails
2.4.2-1	2.4.2-2	2.4.2-3	2.4.2-4
OR		OR	
112 72 02			
4.24E-02		4.24E-02	
error		to detect and correct error	
Shortfirer fails to detect and correct		Blasting Competent Supervisor fails	
2.4.2-SF		2.4.2-BCS	
AND			
1.6UE-US			
respond to error 1.80E-03			
Supervisor fails to detect and			
Shotfirer/Blasting Competent			
2.4.2			

Shotfirer fails to correct error

5.54E-03

Shotfirer fails to detect error

3.69E-02

2.4.3

Blasting Engineer fails to detect error

3.79E-02

Failure to detect and respond during final hook-up check

error

2.4.3 Failure to detect and respond during final hook-up check 3.01E-04 AND 2.4.3-BE 2.4.3-RSS 2.4.3-SF Blasting Engineer fails to detect and Resident Site Staff fails to detect and Shotfirer fails to detect and correct correct error correct error error 4.36E-02 4.24E-02 1.62E-01 2.4.3-2 2.4.3-3 2.4.3-4 2.4.3-5 2.4.3-1 2.4.3-6 Resident Site Staff fails to detect Blasting Engineer fails to correct Resident Site Staff fails to correct

1.57E-01

error

5.24E-03

error

5.69E-03

2.4-W-SC

Use of a wrong surface connector

2.4-W-SC		
Use of a wrong surface connector		
4.80E-09		
AND		
2.4.1	2.4.2	2.4.3
	Shotfirer/Blasting Competent	
Incorrect installation of surface	Supervisor Fails to Detect and	Failure to Detect and Respond during
connector	Respond to Error	Final Hook-up Check
8.86F-03	1.80F-03	3.01F-04

4.1.1 Excess cartridged are loaded into holes

4.1.1
Excess cartridges are loaded into

holes 7.38E-04

4.1.1-1

Shotfirer does not count number of cartridges picked up and loads too many

7.38E-04

4.1.2 Cartridges from blocked holes are not disposed of correctly

4.1.2
Cartridges from blocked holes are
not disposed of correctly
8 13F-03

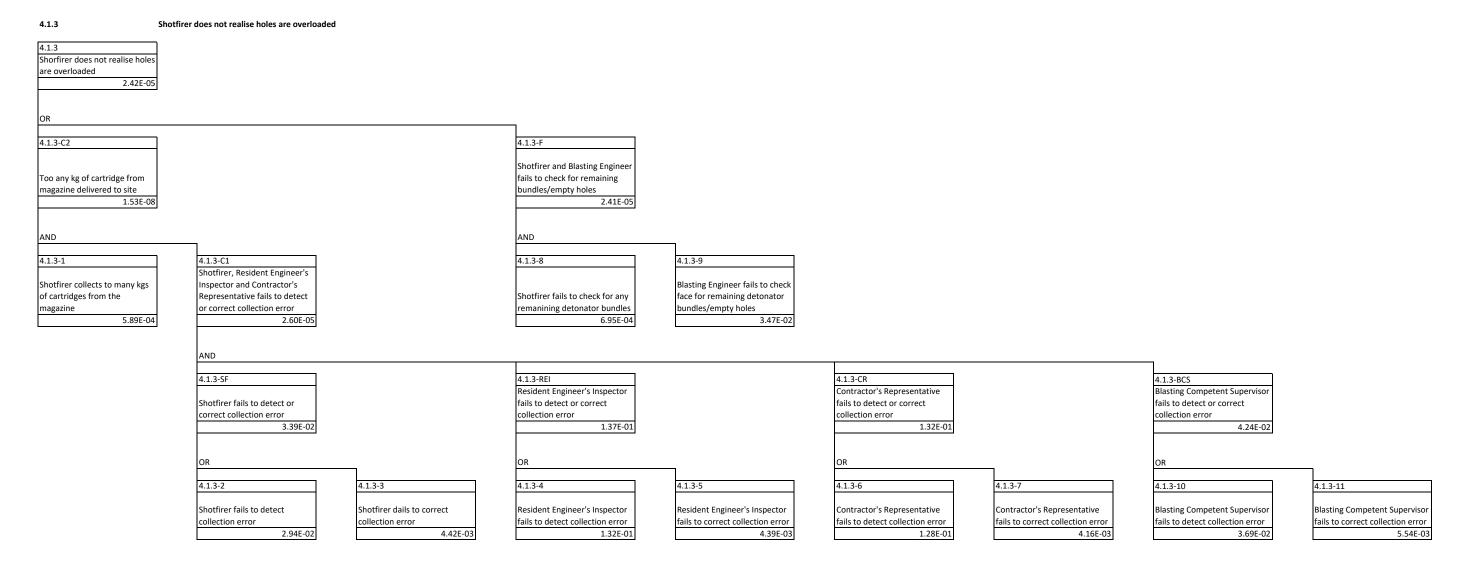
4.1.2-1

Shotfirer intentionally overloads lifter holes

8.13E-03

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4.2.1

4.2.1		
Design Error by the Blasting Engineer		
8.52E-05		
AND		
4.2.1-1	4.2.1-BE	
	Blasting Engineer fails to detect and	
Design error by Blasting Engineer	correct error	
6.05E-04	1.41E-01	
	OR	
	4.2.1-2	4.2.1-3
		Blasting Engineer fails to correct
	Blasting Engineer fails to detect error	error
	1.36E-01	4.54E-

Design Error by the Blasting Engineer

4.2.2 Failure to detect and correct design error

4.2.2			
Failure to detect and correct design			
error			
1.06E-03			
AND			
4.2.2-RE		4.2.2-MD	
Resident Engineer fails to detect and		Mines Division fails to detect and	
correct error		correct error	
3.35E-02		3.17E-02	
OR		OR	
4224	4222	4222	4 2 2 4
4.2.2-1 Residnent Engineer fails to detect	4.2.2-2 Resident Engineer fails to correct	4.2.2-3	4.2.2-4
error	error	Mines Division fails to detect error	Mines Division fails to correct error
2.92E-02	4.37E-03	2.76E-02	4.14E-03
2.521 02	4.371 03	2.700 02	4.140 03

2MIC Higher vibration due to 2 MIC detonated at tha same time

2MIC	
Higher vibration due to 2 N	ИIC
detonated at the same tim	ie
2.89	E-05
OR	
2.1-WD	

Wrong design in time delay of

1.26E-09

one detonator

2.2-W-DETON

2.3-W-DETON-SC

One detonator of a sector
connected wrongly to a
surface connector of another
same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector
connected wrongly to a
surface connector of another
sector
6.09E-10

2.4-W-SC

Use of a wrong surface connector

1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION
Too much cartridged emulsion loaded into holes
4.21E-06

3МІС

Higher vibration due to 3 MIC detonated at the same time

3MIC
Higher vibration due to 3 MIC
detonated at the same time

2.47E-07

OR

3.1-WD

Wrong design in time delay of two detonators
1.26E-11

3.2-W-DETON

Two detonators wrongly put into one sector which contains the same time delay detonator 1.61E-16

3.3-W-DETON-SC

Two detonators of other sectors connected wrongly to a surface connector of another sector 6.09E-12

3.4-W-SC

Use of two wrong surface connector 1.92E-10

3MIC-P-AD-DETON

Incorrect time default of 2 detonators due to manufacturer defect 2.30E-07

3MIC-P-AD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

1.70E-08

3MIC-ER-COMB

3 MIC detonated at the same time (Due to combination of two types of errors)

2.87E-10

4MIC

Higher than expected vibration due to 4 MIC detonated at the same time

4MIC

Higher than expected vibration due to 4 MIC detonated at the same time

2.58E-09

OR

4MIC-COMB-1

4 MIC detonated (due to same error occurred three times) at the same time

2.47E-09

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

1.83E-12

4MIC-COMB-3

4 MIC detonated (due to three different errors occur at the same time) at the same time

1.00E-15

4MIC-COMB-4

4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time

1.04E-10

OL-C-EMULSION	Too much cartridged emulsion loaded into holes					
OL-C-EMULSION Too much cartridged emulsion loaded into holes 4.21E-0	6					
OR						
4.2-WD Wrong design in MIC 9.06E-0	8	4.1-C3 Too many catridges are inserted in holes and not realised 4.12E-06				
4.2.1	4.2.2	OR 4.1-C1		4.1-C2		
Design error by the Blasting Enginee 8.52E-0	Failure to detect and correct design error	Too many cartridges are inserted in holes 4.10E-06		Cartridges from blocked holes inserted in other holes and not detected 1.40E-08		
		AND		AND		
		4.1.1 Excess cartridges are loaded into holes 1.70E-01	4.1.3 Shotfirer does not realise holes are overloaded 2.42E-05	4.1.2-BH Cartridges from blocked holes inserted in othe holes 5.80E-04		4.1.3 Shotfirer does not realise hole: are overloaded 2.42E-0!
				AND		
				4.1.2 Cartridges from blocked holes are not disposed of correctly 8.13E-03	P-BH Probability of blocked holes 0.07	

4.1-WD

4.1-WD Wrong design in time delay of three detonators 1.26E-13 AND 3.1-WD P-AD-DETON Wrong design in time delay of Wrong design in time dealy of two detonators additional detonator 1.26E-11 0.01 AND 2.1-WD P-AD-DETON Wrong design in time delay of one Wrong design in time delay of additional detonator detonator 1.26E-09 0.01

Wrong design in time delay of three detonators

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

1.61E-18

AND

3.2-W-DETON

Two detonators wrongly put into one sector which contains the same time delay detonator

1.61E-16

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

4.3-W-DETON-SC

Two detonators of othe sectors connected wrongly to a surface connector of another sector

4.3-W-DETON-SC

Three detonators of other sectors connected wrongly to a surface connector of another sector

6.09E-14

AND

3.3-W-DETON-SC

Two detonators of other sectors connected wrongly to a surface connector of another sector

6.09E-12

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface conector of another sector

6.09E-10

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

4.4-W-SC

4.4-W-SC		
Use of three wrong surface		
connector		
1.92E-12		
AND		
2.4.14.60		2.42.60
3.4-W-SC		P-AD-SC
		Additional use of wrong surface
Use of two wrong surface connector		connector
1.92E-10		0.03
_		
AND		
2.4-W-SC	P-AD-SC	
	Additional use of wrong surface	
Use of a wrong surface connector	connector	
1.92E-08	0.01	

Use of three wrong surface connector

4MD-DETON

Incorrect time default of 3 detonators due to manufacturer defect

4MD-DETON
Incorrect time default of 3
detonators due to manufacturer
defect

2.30E-09

AND

3MD-DETON

Manufacturer defect of two detonator such that time delay corresponds to another one

2.30E-07

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

AND

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

4MD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

4MD-SC
Surface connector fails to provide
necessary delay due to manufacturer
defect

1.70E-10

3MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-08

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

AND

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

4-MIC-COMB-1

4 MIC detonated (due to same error occurred three times) at the same time

4-MIC-COMB-1
4 MIC detonated (due to same error occurred three times) at the same time

2.47E-09

OR

4.1-WD

Wrong design in time delay of three detonators

1.26E-13

4.2-W-DETON

Three detonator wrongly put into one sector which contains the same time delay detonator

1.61E-18

4.3-2-DETON

Three detonators of other sectors connected wrongly to a surface connector of another sector

6.09E-14

4.4-W-SC

Use of three wrong surface connector

1.92E-12

4MIC-P-AD-DETON

Incorrect time default of 3 detonators due to manufacturer defect

2.30E-09

4MIC-P-AD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

1.70E-10

4.21E-06

4.1-WD+OTH Wrong design in time delay of two detonator plus one other type of errors 4.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 3.64E-16 AND 4.1-WD 4.1-WD-OTH One error other than one Wrong design in time delay of wrong design in time delay of one detonator one detonator 1.26E-11 2.89E-05 AND 2.1-WD P-AD-DETON 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION Manufacturer defect of one One detonator of a sector Manufacturer defect of one One detonator wrongly put into one sector which contains connected wrongly to a detonator such that time surface connector such that Wrong design in time delay of Wrong design in time delay of the same time delay surface connector of another Use of a wrong surface delay corresponds to another time delay corresponds to Overcharge of emulsion more one detonator connector additional detonator another one than required detonator sector 1.26E-09 0.01 1.61E-14 6.09E-10 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes

4.21E-06

4.2-W-DETON+OTH Two detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors 4.2-W-DETON+OTH Two detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors 4.65E-21 AND 4.2-W-DETON 4.2-W-DETON-OTH Two detonator wrongly put One error other than one into one sector which contains detonator wrongly put into a the same time delay sector which contains the detonator same time delay detonator 1.61E-16 2.89E-05 AND OL-EMULSION 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC P-AD-DETON 2.1-WD One detonator wrongly put One additional detonator One detonator of a sector Manufacturer defect of one Manufacturer defect of one into one sector which contains wrongly put into one sector connected wrongly to a detonator such that time surface connector such that which contains the same time surface connector of another the same time delay Wrong design in time delay of Use of a wrong surface delay corresponds to another time delay corresponds to Overcharge of emulsion more delay detonator than required detonator one detonator sector connector another one 1.61E-14 0.01 1.26E-09 6.09E-10 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes

4.3-W-DETON-SC+OTH One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors 4.3-W-DETON-SC+OTH One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors 1.76E-16 AND 4.3-W-DETON-SC 4.3-W-DETON-SC-OTH One error other than one One detonator of each of two detonator of a sector sectors connected wrongly to connected wrongly to a a surface connector of surface connector of another another sector sector 6.09E-12 2.89E-05 AND 2.3-W-DETON-SC OL-EMULSION P-AD-DETON 2.1-WD 2.2-W-DETON 2.4-W-SC MD-DETON MD-SC One detonator of a sector Manufacturer defect of one Manufacturer defect of one One detonator of a sector One detonator wrongly put into one sector which contains detonator such that time surface connector such that connected wrongly to a connected wrongly to a surface connector of another surface connector of another Wrong design in time delay of the same time delay Use of a wrong surface delay corresponds to another time delay corresponds to Overcharge of emulsion more detonator another one than required one detonator sector sector connector 6.09E-10 0.01 1.26E-09 1.61E-14 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes 4.21E-06

4.4-W-SC+OTH Use of two wrong surface connector plus one other types of errors 4.4-W-SC+OTH Use of two wrong surface connector plus one other type of errors 5.55E-15 AND 4.4-W-SC 4.4-W-SC-OTH Use of two wrong surface One error other than use of a connector wrong surface connector 1.92E-10 2.89E-05 AND 2.4-W-SC P-AD-SC 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC MD-DETON MD-SC OL-EMULSION One detonator wrongly put One detonator of a sector Manufacturer defect of one Manufacturer defect of one detonator such that time surface connector such that into one sector which contain connected wrongly to a Use of a wrong surface Use of a wrong surface Wrong design in time delay of the same time delay surface connector of another delay corresponds to another time delay corresponds to Overcharge of emulsion more connector connector one detonator detonator sector another one than required 1.92E-08 0.01 1.26E-09 1.61E-14 6.09E-10 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes 4.21E-06

4.21E-06

4MD-DETON+OTH Incorrect time default of two detonator due to manufacturer defect plus one other type of errors 4MD-DETON+OTH Incorrect time default of two detonator due to manufacturer defect plus one other type of errors 1.36E-12 AND 4MD-DETON MD-DETON-OTH Incorrect time default of two One error other than incorrect detonator due to time default of one detonator manufacturer defect due to manufacturer defect 2.30E-07 5.93E-06 MD-DETON P-AD-DETON 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-SC OL-EMULSION Manufacturer defect of one One additional detonator One detonator wrongly put One detonator of a sector Manufacturer defect of one detonator such that time wrongly put into one sector into one sector which contains connected wrongly to a surface connector such that which contains the same time the same time delay surface connector of another Use of a wrong surface time delay corresponds to Overcharge of emulsion more delay corresponds to another Wrong design in time delay of one detonator delay detonator detonator another one than required sector connector 1.61E-14 2.30E-05 0.01 1.26E-09 6.09E-10 1.92E-08 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes

4.21E-06

4MD-SC+OTH Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 4MD-DETON+OTH Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 4.63E-13 AND 4MD-SC MD-DETON-OTH Two surface connector fail to One error other than incorrect provide necessary delay due time default of one detonator to manufacturer defect due to manufacturer defect 1.70E-08 2.72E-05 OR MD-SC P-AD-SC 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON OL-EMULSION Manufacturer defect of one Manufacturer defect of one One detonator wrongly put One detonator of a sector Manufacturer defect of surface connector such that surface connector such that into one sector which contains connected wrongly to a oneDETONATOR such that surface connector of another Use of a wrong surface time delay corresponds to Overcharge of emulsion more time delay corresponds to time delay corresponds to Wrong design in time delay of the same time delay another one one detonator detonator another one than required another one sector connector 1.61E-14 1.70E-06 0.01 1.26E-09 6.09E-10 1.92E-08 2.30E-05 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into holes

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

4MIC-COMB-2

4 MIC detonated (due to same error occurred two times and one other error) at the same time

1.83E-12

OR

4.1-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors

3.64E-16

4.2-W-DETON+OTH

Two detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors

4.65E-21

4.3-W-DETON-SC+OTH

One detonator for each of two sectors connected wrongly to a surface connector of another sector plus one other type of errors

1.76E-16

4.4-W-SC+OTH

Use of two wrong surface connector plus one other type of errors

5.55E-15

4MD-DETON+OTH

Incorrect time default of two detonator due to manufacturer defect plus one other type of errors

1.36E-12

4MD-SC+OTH

Two surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors

4.63E-13

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which containes the same time delay detonator plus one other type of errors except wrong design in time delay

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except wrong design in time delay

4.65E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.89E-05

OR

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

Manufacturer defect of one surface

1.70E-06

connector such that time delay

corresponds to another one

4.3-(WD)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay 4.3-(WD)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay 1.76E-14 AND 2.3-W-DETON-SC 4.3-(WD)-W-DETON-OTH One detonator of a sector connected One error other than one detonator wrongly to a surface connector of for a sector connected wrongly to a another sector surface connector of another sector 6.09E-10 2.89E-05 2.2-W-DETON 2.4-W-SC MD-DETON MD-SC OL-EMULSION

Use of a wrong surface connector

1.92E-08

Manufacturer defect of one

corresponds to another one

detonator such that time delay

2.30E-05

One detonator wrongly put into one

sector which contains the same time

1.61E-14

delay detonator

Overcharge of emulsion more than

4.21E-06

4.21E-06

required

loaded into holes

4.4(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

4.4-(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

5.55E-13

AND

2.4-W-SC

Use of a wrong surface connector 1.92E-08

4.4-(WD)-W-SC-OTH

One error other than use of a wrong surface connector

2.89E-05

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

4MIC-(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

1.36E-10

AND

4MD-DETON

Incorrect time default of one detonator due to maufacturer defect

2.30E-05

4(WD)-MD-DETON-OTH

One error other than incorrect time default of 1 detonator due to manufacturer defect

5.93E-06

1.61E-14

∩R

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(WD)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except wrong design in time delay

4(WD)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except wrong design in time delay

4.63E-11

AND

4MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

4(WD)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

2.72E-05

1.61E-14

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

MD-SC

Manufacturer defect of one surface

1.70E-06

connector such that time delay

corresponds to another one

Manufacturer defect of one

corresponds to another one

Use of a wrong surface connector

1.92E-08

detonator such that time delay

2.30E-05

Too much cartridged emulsion

4.21E-06

loaded into holes

4(WD)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except wrong design in time delay of one detonator 4(WD)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except wrong design in time delay of one detonator 1.04E-10 AND OL-EMULSION 4(WD)-OL-EMULSION-OTH Overcharge of emulsion more than required One error other than hole overload 4.21E-06 2.47E-05 OL-C-EMULSION 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON

One detonator of a sector connected

6.09E-10

wrongly to a surface connector of

another sector

One detonator wrongly put into one

sector which contains the same time

1.61E-14

delay detonator

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

3.62E-19

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4(WD)-OTH-OTH

Two errors other then wrong design in time delay of one detonator

2.87E-10

OR

4.2-(WD)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except wrong design in time delay

4.65E-19

4.3-(WD)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except wrong design in time delay

1.76E-14

4.4-(WD)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except wrong design in time delay

5.55E-13

4MIC-(WD)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacuturer defect plus one other type of errors except wrong design in time delay

1.36E-10

4(WD)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except wrong design in time delay

1.04E-10

Overcharge of emulsion more

4(WD)-OL-EMULSION+OTH

than required plus one other type of error except wrong design in time delay of one detonator

Too much cartridged emulsion

4.21E-06

loaded into holes

4.1-(W-DETON)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector 4.1-(W-DETON)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector 3.64E-14 AND 4.1-(W-DETON)-WD-OTH 2.1-WD Wrong design in time delay of one One error other than one wrong detonator design in time time of one detonator 1.26E-09 2.89E-05 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION One detonator of a sector connected Manufacturer defect of one Manufacturer defect of one surface Overcharge of emulsion more than wrongly to a surface connector of detonator such that time delay connector such that time delay another sector Use of a wrong surface connector corresponds to another one corresponds to another one required 6.09E-10 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION

Too much cartridged emulsion

4.21E-06

loaded into holes

4.3-(W-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except one detonator wrongly put into one sector

4.2-(W-DETON)-W-DETON-SC+OTH One detonator connected wrongly to surface connector of another sector plus one other error except one detonator wrongly put into one sector 1.76E-14 AND 2.3-W-DETON-SC 4.2-(W-DETON)-W-DETON-SC-OTH One detonator of a sector connected One error other than one detonator wrongly to a surface connector of for a sector connected wronglyh to a surface connector of another sector another sector 6.09E-10 2.89E-05 MD-DETON OL-EMULSION 2.1-WD 2.4-W-SC MD-SC Maufacturer defect of one surface Manufacturer defect of one Wrong design in time delay of one detonator such that time delay connector such that time delay Overcharge of emulsion more than detonator Use of a wrong surface connector corresponds to another one corresponds to another one required 1.26E-09 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION

ne other type of errors except one detonator wrongly put into one

	Use of one wrong surface connector plus one or
4.4-(W-DETON)-W-SC+OTH]
Use of one wrong surface connector	
plus one other type of errors except	
one detonator wrongly put into one	
5.55E-13	
071	
071	
5.55E-13	4.4-(W-DETON)-W-SC-OTH
5.55E-13	·
5.55E-13	4.4-(W-DETON)-W-SC-OTH

2.1-WD Wrong design in time delay od one detonator 1.26E-09 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector 6.09E-10

MD-DETON Manufacturer defect of one detonator such that time delauy corresponds to another one 2.30E-05 MD-SC Manufacturer defect of one surface connector such that time delay corresponds to another one 1.70E-06 OL-EMULSION Overcharge of emulsion more than required 4.21E-06

OL-C-EMULSION Too much cartridged emulsion loaded into holes 4.21E-06

4(W-DETON)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

4(W-DETON)-MD-DETON Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector 1.36E-10

AND

MD-DETON

Incorrect time default of one deonator due to manufacturer defect

2.30E-05

4(W-DETON)-MD-DETON+OTH
One error other than incorrect time default of one detonator due to manufacturer defect

5.93E-06

1.26E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

2.1-WD

Wrong design in time delay of one detonator

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(W-DETON)-MD-SC+OTH

One surface connector fail to provide necessay delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

4(W-DETON)-MD-SC+OTH

One surface connector fail to provide necessay delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

4.63E-11

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4(W-DETON)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

2.72E-05

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator suchh that time delay corresponds to another one

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(W-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except 1 detonator wrongy put into one sector which contains the same time delay detonator

4(W-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except 1 detonator wrongly put into one sector which contains the same time delay detonator 1.04E-10 AND OL-EMULSION 4(W-DETON)-OL-EMULSION-OTH Overcharge of emulsion more than required One error other than hole overload 4.21E-06 2.47E-05 OL-C-EMULSION 2.1-WD 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC One detonator of a sector connected Manufacturer defect of one Manufacturer defect of one surface Too much cartridged emulsion Wrong design in time delay of one wrongly to a surface connector of detonator such that time delay connector such that time delay another sector corresponds to another one loaded into hole Use of a wrong surface connector corresponds to another one detonator 4.21E-06 1.26E-09 6.09E-10 1.92E-08 2.30E-05 1.70E-06

4(W-DETON)+OTH+OTH

One detonator wronly put into one sector which contains the same time delay detonator plus two other type of errors

4(W-DETON)+OTH+OTH
One detonator wronly put into
one sector which contains the
same time delay detonator
plus two other type of errors

4.61E-24

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4(W-DETON)-OTH-OTH

Two errors other than one detonator wrongly put into one sector which contains the same time delay detonator

2.87E-10

ΩR

4.1-(W-DETON)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except one detonator wrongly put into one sector

3.64E-14

4.3-(W-DETON)-W-DETON-SC+OTH

One detonator connected wrongly to surface connector of another sector plus one other error except one detonator wrongly put into one sector

1.76E-14

4.4-(W-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except one detonator wrongly put into one

5.55E-13

4(W-DETON)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

1.36E-10

4(W-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator wrongly put into one sector

4.63E-11

4(W-DETON)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except 1 detonator wrongly put into one sector which contains the same time delay detonator

1.04E-10

4.21E-06

4.1-(W-DETON-SC)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector 4.1-(W-DETON-SC)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector 3.64E-14 AND 4.1-(W-DETON-SC)-WD-OTH 2.1-WD One error other than one wrong Wrong design in time delay of one design in time delay of one detonator detonator 1.26E-09 2.89E-05 2.2-W-DETON 2.4-W-SC MD-DETON MD-SC OL-EMULSION One detonator wrongly put into one Manufacturer defect of one Manufacturer defect of one surface Overcharge of emulsion more than sector which contains the same time detonator such that time delay connector such that time delay delay detonator Use of a wrong surface connector corresponds to another one corresponds to another one required 1.61E-14 1.92E-08 2.30E-05 1.70E-06 4.21E-06 OL-C-EMULSION Too much cartridged emulsion loaded into hole

4.2-(W-DETON-SC)-W-DETON+OTH One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector

4.2-(W-DETON-SC)-W-DETON+OTH One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector

4.65E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-(W-DETON-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.89E-05

ΛP

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.4-(W-DETON-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors exceot one detonator connected wrongly to a surface connector

,
4.4-(W-DETON-SC)-W-SC+OTH
Use of one wrong surface connector
plus one other type of errors exceot
one detonator connected wrongly to
a surface connector
5.55E-13
AND
2.4-W-SC

Use of a wrong surface connector

1.92E-08

4.4-(W-DETON-SC)-W-SC-OTH

One error other than use of a wrong surface connector

2.89E-05

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION
Too much cartridged emulsion
loaded into hole
4.21E-06

4(W-DETON-SC)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

4(W-DETON-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

1.36E-10

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect 2.30E-05

OR

2.1-WD

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

5.93E-06

Wrong design in time delay of one detonator

4(W-DETON-SC)-MD-DETON-OTH
One error other than incorrect time
default of one detonator due to

manufacturer defect

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(W-DETON-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

4(W-DETON-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

4.63E-11

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4(W-DETON-SC)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

2.72E-05

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

Manufacturer defect of one detonator suchh that time delay corresponds to another one

MD-DETON

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

2.30E-05

1.70E-06

1.92E-08

4(W-DETON-SC)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except one detonator of a sector connected wrongly to a surface connector of another sector

1.26E-09

4(W-DETON-SC)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except one detonator of a sector connected wrongly to a surface connector of another sector 1.04E-10 AND OL-EMULSION 4(W-DETON-SC)-OL-EMULSION-OTH Overcharge of emulsion more than One error other than hole overload required 4.21E-06 2.47E-05 OL-C-EMULSION 2.4-W-SC MD-DETON 2.1-WD 2.2-W-DETON MD-SC Manufacturer defect of one Manufacturer defect of one surface One detonator wrongly put into one Too much cartridged emulsion loaded Wrong design in time delay of one sector which contains the same time detonator such that time delay connector such that time delay Use of a wrong surface connector corresponds to another one corresponds to another one delay detonator

1.61E-14

4(W-DETON-SC)+OTH+OTH One detonator connected wrongly to a surface connector of another sector plus two other type of errors

2.87E-10

4(W-DETON-SC)+OTH+OTH
One detonator connected
wrongly to a surface connector
of another sector plus two
other type of errors

1.75E-19

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

4(W-DETON-SC)-OTH-OTH Two errors other than one detonator of a sector

connected wrongly to a surface connector of another sector

n

4.1-(W-DETON-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

3.64E-14

4.2-(W-DETON-SC)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other yupe of errors except one detonator connected wrongly to a surface connector

4.65E-19

4.4-(W-DETON-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors exceot one detonator connected wrongly to a surface connector

4(W-DETON-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except one detonator connected wrongly to a surface connector

1.36E-10

4(W-DETON-SC)-MD-SC+OTH
One surface connector fail to
provide necessary delay due
to manufacturer defect plus
one other type of errors
except one detonator
connected wrongly to a
surface connector

connector of

4(W-DETON-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except one detonator of a sector connected wrongly to a surface connector of another sector

1.04E-10

4.1-(W-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

4.1-(W-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

3.64E-14

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4.1-(W-SC)-WD-OTH

One error other than one wrong design in time delay of one detonator

2.89E-05

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.2-(W-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except use of a wrong surface connector

4.2-(W-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except use of a wrong surface connector

4.64E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-(W-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.89E-05

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.3-(W-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector 4.3-(W-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector 1.76E-14 AND 2.3-W-DETON-SC 4.3-(W-SC)-W-DETON-SC-OTH One detonator of a sector connected One error other than one detonator wrongly to a surface connector of for a sector connected wrongly to a another sector surface connector of another sector 6.09E-10 2.89E-05 2.1-WD 2.2-W-DETON MD-DETON MD-SC OL-EMULSION One detonator wrongly put into one Manufacturer defect of one Manufacturer defect of one surface

sector which contains the same time

1.61E-14

delay detonator

detonator such that time delay

2.30E-05

corresponds to another one

connector such that time delay

1.70E-06

corresponds to another one

Wrong design in time delay of one

1.26E-09

detonator

Overcharge of emulsion more than

4.21E-06

required

OL-C-EMULSION

4(W-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except use of a wrong surface connector

4(W-SC)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of errors
except use of a wrong surface
connector

1.36E-10

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

2.30E-05

4(W-SC)-MD-DETON-OTH
One error other than incorrect time

default of one detonator due to manufacturer defect

5.91E-06

1.26E-09

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

2.1-WD

Wrong design in time delay of one detonator

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(W-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector

4(W-SC)-MD-SC+OTH One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector 4.63E-11

AND

MD-SC
One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4(W-SC)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

2.72E-05

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(W-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except use of a wrong surface connector

4(W-SC)-OL-EMULSION+OTH
Overcharge of emulsion more than required plus one other type of error except use of a wrong surface connector

1.04E-10

AND

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

4(W-SC)-OL-EMULSION-OTH

One hole other than hole overload

2.47E-05

OL-C-EMULSION

Too much cartridged emulsion loaded into hole

4.21E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4(W-SC)+OTH+OTH

Use of a wrong surface connector plus two other type of errors

4(W-SC)+OTH+OTH
Use of a wrong surface
connector plus two other type
of errors

5.49E-18

AND

2.4-W-SC

Use of a wrong surface connector

1.92E-08

4(W-SC)-OTH-OTH
Two errors other than use of a
wrong surface connector

2.86E-10

ΩR

4.1-(W-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except use of a wrong surface connector

3.64E-14

4.2-(W-SC)-W-DETON+OTH
One detonator wrongly put

into one sector which contains the same time delay detonator plus one other type of errors except use of a wrong surface connector

4.64E-19

4.3-(W-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except use of a wrong surface connector

1.76E-14

4(W-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except use of a wrong surface connector

1.36E-10

4(W-SC)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except use of a wrong surface connector

4.63E-11

4(W-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except use of a wrong surface connector

4.1-(MD-DETON)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one detonator Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one detonator 7.46E-15 AND 4.1-(MD-DETON)-WD-OTH One error other than one wrong

Wrong design in time delay of one

1.26E-09

detonator

4.1-(MD-DETON)-WD-OTH
One error other than one wrong design in time delay of one detonator

5.93E-06

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector

1.92E-08

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one
1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION
Too much cartridged emulsion
loaded into holes
4.21E-06

4.2-(MD-DETON)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one detonator

4.2-(MD-DETON)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one detonator

9.52E-20

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-(MD-DETON)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

5.93E-06

ΛP

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

Too much cartridged emulsion

4.21E-06

loaded into holes

4.3-(MD-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator 4.3-(MD-DETON)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator 3.61E-15 AND 2.3-W-DETON-SC 4.3-(MD-DETON)-W-DETON-SC-OTH One detonator of a sector connected One error other than one detonator for wrongly to a surface connector of a sector connected wrongly to a surface another sector connector of another sector 6.09E-10 5.93E-06 OR 2.1-WD 2.2-W-DETON 2.4-W-SC MD-SC OL-EMULSION One detonator wrongly put into one Maufacturer defect of one surface Wrong design in time delay of one sector which contains the same time Overcharge of emulsion more than connector such that time delay Use of a wrong surface connector detonator delay detonator corresponds to another one required 4.21E-06 1.26E-09 1.61E-14 1.70E-06 1.92E-08 OL-C-EMULSION

4.4-(MD-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one detonator

4.4-(MD-DETON)-W-SC+OTH
Use of one wrong surface connecto
plus one other type of errors except
manufacturer defect of one
detonator
1.13E-1
=

AND

2.4-W-SC

Use of a wrong surface connector

1.92E-08

4.4-(MD-DETON)-W-SC-OTH
One error other than use of a wrong surface connector
5.91E-06

)R

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.4-W-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into hole

4(MD-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

4(MD-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

7.19E-12

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4(MD-DETON)-MD-SC-OTH

One error other than incorrect time default of one detonator due to manufacturer defect

4.23E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

OL-EMULSION

Use of a wrong surface connector 1.92E-08

2.4-W-SC

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4(MD-DETON)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one detonator such that time delay corresponds to another one

•					
4(MD-DETON)-OL-EMULSION+OTH					
Overcharge of emulsion more than					
required plus one other type of error					
except manufacturer defect of one					
detonator such that time delay					
corresponds to another one					
7.24E-12					
<u>-</u>					
AND					
OL-EMULSION	4(MD-DETON)-OL-EMULSION-OTH				
Overcharge of emulsion more than					
required	One hole other than overload				
4.21E-06	1.72E-06				
	OR	1			
OL-C-EMULSION	2.1-WD	2.2-W-DETON	2.3-W-DETON-SC	2.4-W-SC	MD-SC
		One detonator wrongly put into one	One detonator of a sector connected		Manufacturer defect of one surface
Too much cartridged emulsion	Wrong design in time delay of one	sector which contains the same time	wrongly to a surface connector of		connector such that time delay
loaded into hole	detonator	delay detonator	another sector	Use of a wrong surface connector	corresponds to another one
4.21E-06	1.26E-09	1.61E-14	6.09E-10	1.92E-08	1.70E-06

4(MD-DETON)+OTH+OTH

Manufacturer defect of one detonator such that time delay corresponds to another one plus two other type of errors

4(MD-DETON)+OTH+OTH
Manufacturer defect of one
detonator such that time
delay corresponds to another
one plus two other type of
errors

3.35E-16

AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

2.30E-05

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

4(MD-DETON)-OTH-OTH

Two errors other than manufacturer defect of one detonator such that time delay corresponds to another

1.46E-11

7.46E-15

4.1-(MD-DETON)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one detonator 4.2-(MD-DETON)-W-DETON+OTH

One detonator wrongly put into the sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one detonator

9.52E-20

4.3-(MD-DETON)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one detonator

3.61E-15

4.4-(MD-DETON)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one detonator

1.13E-13

4(MD-DETON)-MD-SC+OTH

One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except manufacuturer defect of one detonator

7.19E-12

4(MD-DETON)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one detonator such that time delay corresponds to another one

7.24E-12

4.1-(MD-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

4.1-(MD-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

3.43E-14

AND

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

4.1-(MD-SC)-WD-OTH

One error other than one wrong design in time delay of one detonator

2.72E-05

OR

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.2-(MD-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

4.2-(MD-SC)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

4.37E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-(MD-SC)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.72E-05

ΛP

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

detonator such that time delay

2.30E-05

corresponds to another one

4.3-(MD-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector 4.3-(MD-SC)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector 1.66E-14 AND 4.3-(MD-SC)-W-DETON-SC-OTH 2.3-W-DETON-SC One detonator of a sector connected One error other than one detonator wrongly to a surface connector of for a sector connected wrongly to a surface connector of another sector another sector 6.09E-10 2.72E-05 2.2-W-DETON MD-DETON OL-EMULSION 2.1-WD 2.4-W-SC Manufacturer defect of one One detonator wrongly put into one

sector which contains the same time

1.61E-14

Use of a wrong surface connector

1.92E-08

delay detonator

OL-C-EMULSION
Too much cartridged emulsion

Overcharge of emulsion more than

4.21E-06

4.21E-06

required

loaded into holes

Wrong design in time delay of one

1.26E-09

detonator

Ise of one wrong surface connector plus one other type of errors except manufacturer defect of one surface connector

4.4-(MD-SC)-W-SC+OTH	U
4.4-(MD-SC)-W-SC+OTH]
Use of one wrong surface connector	1
plus one other type of errors except	
manufacturer defect of one surface	
connector	
5.22E-13	
AND	
	1
2.4-W-SC	
Use of a wrong surface connector	
1.92E-08	1

4.4-(MD-SC)-W-SC-OTH One error other than use of a wrong surface connector 2.72E-05

2.1-WD

Wrong design in time delay of one detonator 1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator 1.61E-14 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector 6.09E-10 MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

Overcharge of emulsion more than required 4.21E-06

OL-EMULSION

OL-C-EMULSION Too much cartridged emulsion loaded into hole 4.21E-06

4(MD-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except manufacturer defect of one surface connector

4(MD-SC)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of errors
except manufacturer defect of one
surface connector
9.72E-11
AND

MD-DETON Incorrect time default of one detonator due to maufacturer defect 2.30E-05 4(MD-SC)-MD-DETON-OTH One error other than incorrect time default of one detonator due to manufacturer defect 4.23E-06

2.1-WD

MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

Wrong design in time delay of one detonator 1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator 1.61E-14 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector 6.09E-10

Use of a wrong surface connector 1.92E-08

2.4-W-SC

Overcharge of emulsion more than required 4.21E-06

OL-EMULSION

OL-C-EMULSION Too much cartridged emulsion loaded into holes 4.21E-06

4(MD-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one surface connector such that time delay corresponds to another one

4(MD-SC)-OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of error except manufacturer defect of one surface connector such that time delay corresponds to another one

9.68E-11

AND

OL-EMULSION
Overcharge of emulsion more than required

4.21E-06

4(MD-SC)-OL-EMULSION-OTH

One error other than hole overload 2.30E-05

OL-C-EMULSION

Too much cartridged emulsion loaded into hole

4.21E-06

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time

delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector 1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

4(MD-SC)+OTH+OTH Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error 3.31E-16

4(MD-SC)+OTH+OTH

AND

MD-SC

One surface connector fail to provide necessary delay due to manufacturer defect

1.70E-06

4(MD-SC)-OTH-OTH

Two errors other than manufacturer defect of one detonator such that time delay corresponds to another one

1.95E-10

__

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 1.70E-06

4.1-(MD-SC)-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors except manufacturer defect of one surface connector

3.43E-14

4.2-(MD-SC)-W-DETON+OTH

Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except manufacturer defect of one surface connector

4.37E-19

4.3-(MD-SC)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except manufacturer defect of one surface connector

1.66E-14

4.4-(MD-SC)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except manufacturer defect of one surface connector 5.22E-13

4(MD-SC)-MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors except manufacturer defect of one surface connector

9.72E-11

4(MD-SC)-OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error except

manufacturer defect of one surface connector such that time delay corresponds to another one

9.68E-11

connector such that time delay

1.70E-06

corresponds to another one

detonator such that time delay

2.30E-05

corresponds to another one

4.1-(OL-EMULSION)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except overcharge 4.1-(OL-EMULSION)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except overcharge 3.11E-14 AND 2.1-WD 4.1-(OL-EMULSION)-WD-OTH One error other than one wrong Wrong design in time delay of one design in time delay of one detonator detonator 1.26E-09 2.47E-05 2.3-W-DETON-SC MD-DETON 2.2-W-DETON 2.4-W-SC MD-SC One detonator wrongly put into one One detonator of a sector connected Manufacturer defect of one Manufacturer defect of one surface

Use of a wrong surface connector

1.92E-08

wrongly to a surface connector of

6.09E-10

another sector

sector which contains the same time

1.61E-14

delay detonator

4.2-(OL-EMULSION)-W-DETON+OTH One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge

4.2-(OL-EMULSION)-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge

3.97E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

4.2-(OL-EMULSION)-W-DETON-OTH

One error other than one detonator wrongly put into a sector which contains the same time delay detonator

2.47E-05

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.4-W-SC

Use of a wrong surface connector

Manufacturer defect of one detonator such that time delay corresponds to another one

MD-DETON

2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4.3-(OL-EMULSION)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except overcharge

4.3-(OL-EMULSION)-W-DETON-SC+OTH

One detonator connected wrongly to a surface connector of another sector plus one other error except overcharge

1.51E-14

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

4.3-(OL-EMULSION)-W-DETON-SC-OTH

One error other than one detonator for a sector connected wrongly to a surface connector of another sector

2.47E-05

OR

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.4-W-SC

Use of a wrong surface connector 1.92E-08

2.30E-05

Manufacturer defect of one detonator such that time delay corresponds to another one

MD-DETON

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

4.4-(OL-EMULSION)-W-SC+OTH

Use of one wrong surface connector plus one other type of errors except overcharge

4.4-(OL-EMULSION)-W-SC+OTH Use of one wrong surface connector plus one other type of errors except overcharge

4.74E-13

AND

2.4-W-SC

Use of a wrong surface connector

1.92E-08

4.4-(OL-EMULSION)-W-SC-OTH One error other than use of a wrong surface connector

2.47E-05

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.2-W-DETON One detonator wrongly put into one sector which contains the same time delay detonator 1.61E-14 2.3-W-DETON-SC One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05 MD-SC Manufacturer defect of one surface connector such that time delay corresponds to another one 1.70E-06

4(OL-EMULSION)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errorss except overcharge

4(OL-EMULSION)-MD-DETON+OTH
Incorrect time default of one
detonator due to manufacturer
defect plus one other type of errors
except overcharge
3.96E-1
AND

MD-DETON

Incorrect time default of one detonator due to maufacturer defect

2.30E-05

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

4(OL-EMULSION)-MD-DETON-OTH
One error other than incorrect time
default of one detonator due to
manufacturer defect

2.1-WD

detonator

Wrong design in time delay of one sector w

1.72E-06

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

Use of a wrong surface connector 1.92E-08

2.4-W-SC

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

detonator such that time delay

2.30E-05

corresponds to another one

Use of a wrong surface connector

1.92E-08

connector such that time delay

1.70E-06

corresponds to another one

4(OL-EMULSION)-MD-SC+OTH One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except overcharge 4(OL-EMULSION)-MD-SC+OTH One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors except overcharge 3.91E-11 AND 4(OL-EMULSION)-MD-SC-OTH MD-SC One error other than incorrect time One surface connector fail to provide necessary delay due to manufacturer defult of one detonator due to defect manufacturer defect 1.70E-06 2.30E-05 2.3-W-DETON-SC MD-SC 2.1-WD 2.2-W-DETON 2.4-W-SC MD-DETON Manufacturer defect of one surface One detonator wrongly put into one Manufacturer defect of one One detonator of a sector connected

wrongly to a surface connector of

6.09E-10

another sector

sector which contains the same time

1.61E-14

delay detonator

Wrong design in time delay of one

1.26E-09

detonator

4(OL-EMULSION)+OTH+OTH Overcharge of emulsion more than required and two other errors occur at the same time

4(OL-EMULSION)+OTH+OTH Overcharge of emulsion more than required and two other errors occur at the same time 3.33E-16 AND OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

4(OL-EMULSION)-OTH-OTH Combination of two other different types of errors 7.92E-11

OL-C-EMULSION

Too much cartridged emulsion loaded into holes 4.21E-06 4.1-(OL-EMULSION)-WD+OTH Wrong design in time delay of one detonator plus one other type of errors except overcharge

3.11E-14

4.2-(OL-EMULSION)-W-DETON+OTH One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors except overcharge 3.97E-19

4.3-(OL-EMULSION)-W-DETON-SC+OTH One detonator connected wrongly to a surface connector of another sector plus one other error except overcharge 1.51E-14 4.4-(OL-EMULSION)-W-SC+OTH Use of one wrong surface connector plus one other type of errors except overcharge

4(OL-EMULSION)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errorss except overcharge 3.96E-11 4(OL-EMULSION)-MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errorss except overcharge 3.91E-11

G:\env\project\289062\10 Calculation\hazard\20220909 Fault Tree\NOL_Fault tree_MIC_Middle_South.xlsx

4MIC-COMB-3

4 MIC detonated (due to three different errors occur at the same time) at the same time

4MIC-COMB-3

4 MIC detonated (due to three different errors occur at the same time) at the same time

1.00E-15

OR

4(WD)+OTH+OTH

Wrong design in time delay of one detonator plus two other type of errors

3.62E-19

4(W-DETON)+OTH+OTH

One detonator wronly put into one sector which contains the same time delay detonator plus two other type of errors

4.61E-24

4(W-DETON-SC)+OTH+OTH

One detonator connected wrongly to a surface connector of another sector plus two other type of errors

1.75E-19

4(W-SC)+OTH+OTH

Use of a wrong surface connector plus two other type of errors 5.49E-18

4(MD-DETON)+OTH+OTH

Manufacturer defect of one detonator such that time delay corresponds to another one plus two other type of errors

3.35E-16

4(MD-SC)+OTH+OTH

Manufacturer defect of one surface connector such that time delay corresponds to another one plus two other type of error

3.31E-16

4(OL-EMULSION)+OTH+OTH

Overcharge of emulsion more than required and two other errors occur at the same time

3.33E-16

time delay corresponds to

1.70E-06

another one

detonator such that time delay

2.30E-05

corresponds to another one

Too much cartridged emulsion

4.21E-06

loaded into holes

Wrong design in time delay of

1.26E-09

one detonator

4MIC-COMB-4 4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time 4MIC-COMB-4 4 MIC detonated (due to charge overload and one other error occur at the same time) at the same time 1.04E-10 AND 4MIC-OTH OL-EMULSION Overcharge of emulsion more than required One other type of errors 4.21E-06 2.47E-05 OL-C-EMULSION 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC 2.1-WD One detonator of a sector Manufacturer defect of one connected wrongly to a Manufacturer defect of one surface connector such that 1 detonator wrongly put into

surface connector of another

6.09E-10

sector

Use of a wrong surface

1.92E-08

connector

one sector which containes the

same time delay detonator

3.1-WD

Wrong design in time delay of two detonators

3.1-WD	
Wrong design in time delay of two	
detonators	
1.26E	-11

AND

2.1-WD	
Wrong design in time delay	of one
detonator	
	1.26E-09

	P-AD-DETON			
Wrong design in time delay of				
	additional detonator			
	1.00F-02			

3.2-W-DETON

Two detonator wrongly put into one sector which contains the same time delay detonator

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Two detonator wrongly put into one sector which contains the same time delay detonator

1.61E-16

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

P-AD-DETON

Additional detonator wrongly put into one sector which contains the same time delay detonator

0.01

3.3-W-DETON-SC

Two detonators of othe sectors connected wrongly to a surface connector of another sector

\sim	~				$\overline{}$			_
~		٠٨.	1)	⊢ ∣		ın	I-S	

Two detonators of other sectors connected wrongly to a surface connector of another sector

6.09E-12

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface conector of another sector

6.09E-10

P-AD-SC

Additional detonator of a sector connected wrongly to a surface connector of another sector

0.01

3.4-W-SC	
Use of two wrong surface connector	
1.92E-10)

AND

3.4-W-SC

2.4-W-SC
Use of wrong surface connector
1.92E-08

P-AD-SC	
Additional use of wrong surface	
connector	
	0.01

Use of two wrong surface connector

3MD-DETON

Incorrect time default of 2 detonators due to manufacturer defect

3MD-DETON
Incorrect time default of 2
detonators due to manufacturer
defect

2.30E-07

AND

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one

2.30E-05

P-AD-DETON

Manufacturer defect of another detonator such that time delay corresponds to another one

0.01

3MD-SC

Surface connector fails to provide necessary delay due to manufacturer defect

3MD-SC
Surface connector fails to provide
necessary delay due to manufacturer
defect

1.70E-08

AND

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

P-AD-SC

Manufacturer defect of another surface connector such that time delay corresponds to another one

0.01

3MIC-ER-COMB

3 MIC detonated at the same time (Due to combination of two types of errors)

3MIC-ER-COMB
3 MIC detonated at the same time (Due to combination of two types of errors)

2.87E-10

OR

2.1-WD+OTH

Wrong design in time delay of one detonator plus one other type of errors

3.64E-14

2.2-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors

4.65E-19

2.3-W-DETON+OTH

One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

1.76E-14

2.4-W-SC+OTH

Use of a wrong surface connector plus one other type of errors

5.55E-13

MD-DETON+OTH

Incorrect time default of one detonator due to manufacturer defect plus one other type of errors

1.36E-10

MD-SC+OTH

Surface connector fails to provide necessary delay due to manufacturer defect plus one other type of errors

4.63E-11

OL-EMULSION+OTH

Overcharge of emulsion more than required plus one other type of errors

1.04E-10

4.21E-06

3.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 3.1-WD+OTH Wrong design in time delay of one detonator plus one other type of errors 3.64E-14 AND 2.1-WD 3.1-WD-OTH One error other than one Wrong design in time delay of wrong design in time delay of one detonator one detonator 1.26E-09 2.89E-05 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC OL-EMULSION Manufacturer defect of one One detonator of a sector One detonator wrongly put connected wrongly to a Manufacturer defect of one surface connector such that Overcharge of emulsion more into one sector which contains surface connector of another Use of a wrong surface detonator such that time delay time delay corresponds to the same time delay detonator corresponds to another one than required sector connector another one 1.92E-08 1.61E-14 6.09E-10 1.70E-06 4.21E-06 2.30E-05 OL-C-EMULSION Too much cartridged emulsion loaded into holes

3.2-W-DETON+OTH

One detonator wrongly put into one sector which contains the same time delay detonator plus one other type of errors

3.2-W-DETON+OTH

One detonator wrongly put into one sector which contains tha same time delay detonator plus one other type of errors

4.65E-19

AND

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 1.61E-14 3.2-W-DETON-OTH One error other than one

detonator wrongly put into a sector which contains the same time delay detonator

2.89E-05

2.1-WD

Wrong design in time delay of one detonator 1.26E-09

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

2.3-W-DETON-SC

2.4-W-SC

Use of a wrong surface connector 1.92E-08 MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05 MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 1.70E-06 OL-EMULSION

Overcharge of emulsion more than required

4.21E-06

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.21E-06

3.3-W-DETON-SC+OTH One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

3.3-W-DETON-SC+OTH

One detonator of a sector connected wrongly to a surface connector of another sector plus one other type of errors

1.76E-14

AND

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

3.3-W-DETON-OTH

One error other than one detonator of a sector connected wrongly to a surface connector of another sector

OΒ

2.1-WD

Wrong design in time delay of one detonator

1.26E-09

2.89E-05

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator 1.61E-14

2.4-W-SC

Use of a wrong surface connector

1.92E-08

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

MD-SC

Manufacturer defect of one surface connector such that time delay corresponds to another one 1.70E-06

OL-EMULSION

ch that ds to Overcharge of emulsion more than required

OL-C-EMULSION

Too much cartridged emulsion loaded into holes

4.21E-06

4.21E-06

3.4-W-SC+OTH Use of a wrong surface connector plus one other types of errors 3.4-W-SC+OTH Use of one wrong surface connector plus one other type of errors 5.55E-13 AND 2.4-W-SC 3.4-W-SC-OTH Use of a wrong surface One error other than use of a wrong surface connector connector 1.92E-08 2.89E-05

one detonator

OR

2.1-WD

Wrong design in time delay of

1.26E-09

2.2-W-DETON

One detonator wrongly put into one sector which contains the same time delay detonator

1.61E-14

2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

6.09E-10

MD-DETON

Manufacturer defect of one detonator such that time delay corresponds to another one 2.30E-05

MD-SC
Manufacturer defect of one surface connector such that time delay corresponds to another one

1.70E-06

Overcharge of emulsion more than required
4.21E-06

OL-EMULSION

OL-C-EMULSION
Too much cartridged emulsion loaded into holes
4.21E-06

MD-DETON

Manufacturer defect of one

corresponds to another one

detonator such that time delay

2.30E-05

3MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors 3MD-DETON+OTH Incorrect time default of one detonator due to manufacturer defect plus one other type of errors 1.36E-10 AND 3MD-DETON 3MD-DETON-OTH Incorrect time default of one One error other than incorrect time default of one detonator detonator due to manufacturer defect due to manufacturer defect 2.30E-05 5.93E-06

2.1-WD

one detonator

Wrong design in time delay of

1.26E-09

<u>.</u>
ulsion more
4.21E-06
4.21E-0
ged emulsion

OL-C-EMULSION

loaded into holes

Too much cartridged emulsion

4.21E-06

3MD-SC+OTH One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 3MD-DETON+OTH One surface connector fail to provide necessary delay due to manufacturer defect plus one other type of errors 4.63E-11 AND MD-DETON-OTH 3MD-SC One surface connector fail to One error other than incorrect provide necessary delay due to time default of one detonator manufacturer defect due to manufacturer defect 1.70E-06 2.72E-05 MD-SC 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON OL-EMULSION 2.1-WD One detonator of a sector Manufacturer defect of Manufacturer defect of one oneDETONATOR such that surface connector such that One detonator wrongly put connected wrongly to a into one sector which contains Overcharge of emulsion more time delay corresponds to Wrong design in time delay of surface connector of another Use of a wrong surface time delay corresponds to another one one detonator the same time delay detonator sector connector another one than required 1.26E-09 1.70E-06 1.61E-14 6.09E-10 1.92E-08 2.30E-05 4.21E-06

OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error OL-EMULSION+OTH Overcharge of emulsion more than required plus one other type of error 1.04E-10 AND OL-EMULSION OL-EMULSION-OTH One error other than hole Overcharge of emulsion more than required overload 4.21E-06 2.47E-05 OL-C-EMULSION 2.1-WD 2.2-W-DETON 2.3-W-DETON-SC 2.4-W-SC MD-DETON MD-SC Manufacturer defect of one One detonator of a sector One detonator wrongly put connected wrongly to a Manufacturer defect of one surface connector such that into one sector which contains surface connector of another detonator such that time delay Too much cartridged emulsion Wrong design in time delay of Use of a wrong surface time delay corresponds to the same time delay detonator loaded into holes corresponds to another one another one one detonator sector connector 4.21E-06 1.26E-09 6.09E-10 1.92E-08 1.70E-06 1.61E-14 2.30E-05

2.1.1

Design Error by Blasting Engineer and Failure of Design Check and Correction

2.1.1		
Design Error by Blasting Engineer and		
Failure of Design Check and		
Correction		
1.05E-03		
AND		
2.1.1-1	2.1.1-BE	
	Failure to detect and correct error by	
Design error by Blasting Engineer	Blasting Engineer during modelling	
3.03E-02	3.48E-02	
	OR	
	2.1.1-2	2.1.1-3
	Failure to detect error by Blasting	Failure to correct error by Blasting
	Engineer during modelling	Engineer during modelling
	3.03E-02	4.54E-03

2.1.2

2.1.2 Failre to Detect and Correct error by Blasting Engineer, Mines Division, Shotfirer and Blasting Competent Supervisor 1.19E-06 2.1.2-RE 2.1.2-MD 2.1.2-SF 2.1.2-BCS Failure to detect and correct Shotfirer fails to detect and Blasting Competent Failure to detect and correct error by Resident Engineer error by Mines Division correct error Supervisor fails to detect and 3.35E-02 3.17E-02 3.35E-02 3.35E-02 2.1.2-1 2.1.2-2 2.1.2-5 2.1.2-6 2.1.2-7 2.1.2-3 2.1.2-4 Failure to detect error by Failure to correct error by Failure to detect error by Failure to correct error by Blasting Competent Blasting Competent Resident Engineer Resident Engineer Mines Division Mines Division Shotfirer fails to detect error Shotfirer fails to correct error Supervisor fails to detect error Supervisor fails to correct 2.92E-02 4.37E-03 2.76E-02 4.14E-03 2.92E-02 4.37E-03 2.92E-02 4.37E-03

Failure to detect and correct error by Blasting Engineer, Mines Division, Shotfirer and Blasting Competent Supervisor

2.1-WD

Wrong design in time delay of one detonator

2.1-WD
Wrong design in time delay of one
detonator
1.26E-0

AND

2.1.1

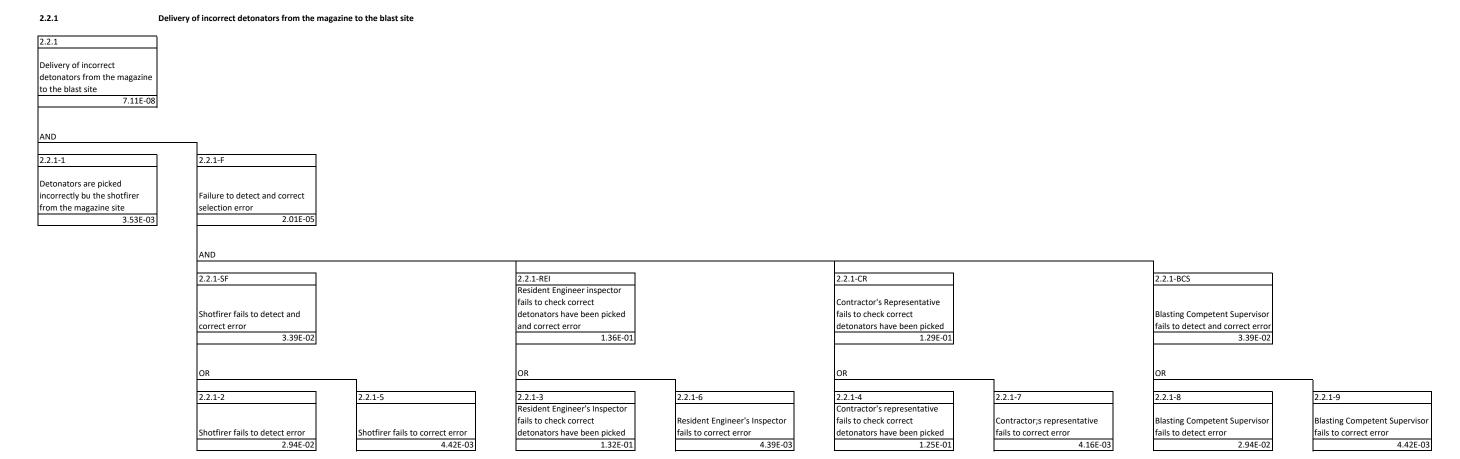
Design Error by Blasting Engineer and Failure of Design Check and Correction

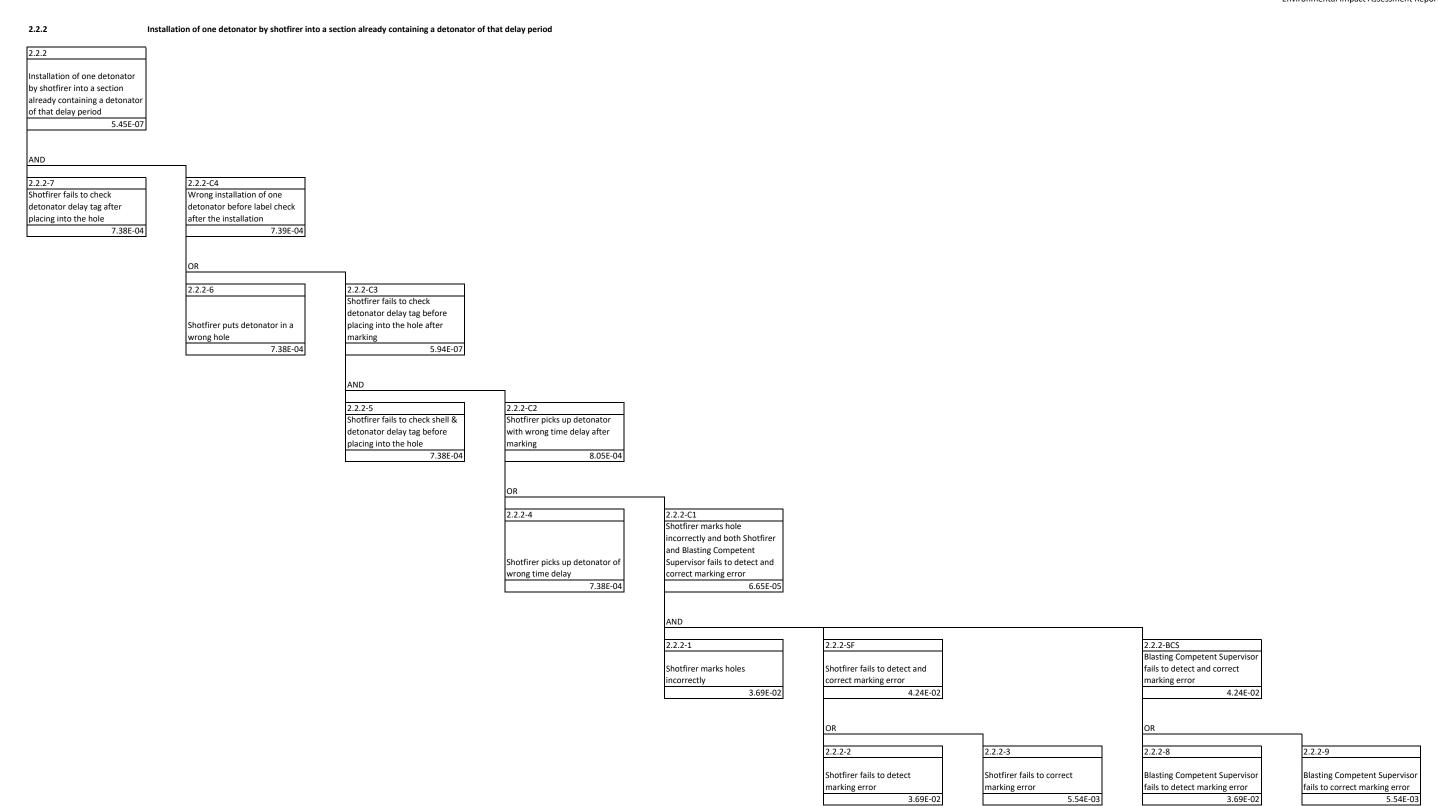
1.05E-03

2.1.2
Failure by Resident Engineer and
Mines Division to detect and correct

design error

1.19E-06





2.2.3 Shotfirer/Blasting Competent Supervisor fails to check and correct installation error

2.2.3			
Shotfirer/Blasting Competent			
Supervisor fails to check and correct			
installation error			
1.80E-03			
AND			
2.2.3-SF		2.2.3-BCS	
2.2.3 31		Blasting Competent Supervisor fails	
Shotfirer fails to detect and correct		to detect and correct installation	
installation error of detonator		error of detonator	
4.24E-02		4.24E-02	
OR		OR	
2.2.3-1	2.2.3-2	2.2.3-3	2.2.3-4
Shotfirer leaves empty holes in the			
blast face due to not realising there	Shotfirer fails to fill empty holes	Blasting Competent Supervisor fails	Blasting Competent Supervisor fails
are detonators left over	before detonation	to detect installation error	to correct insallation error
3.69E-02	5.54E-03	3.69E-02	5.54E-03

2.2-W-DETON

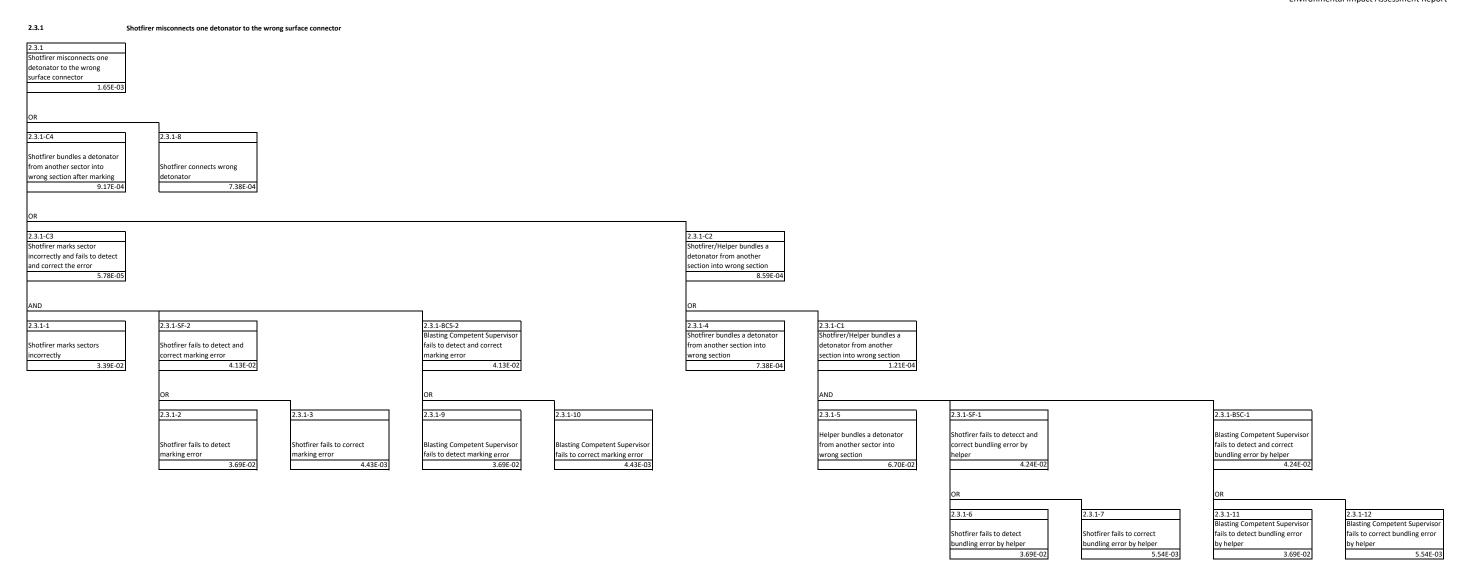
One detonator wrongly put into one sector which contains the same time delay detonator

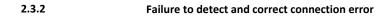
1.25E-04

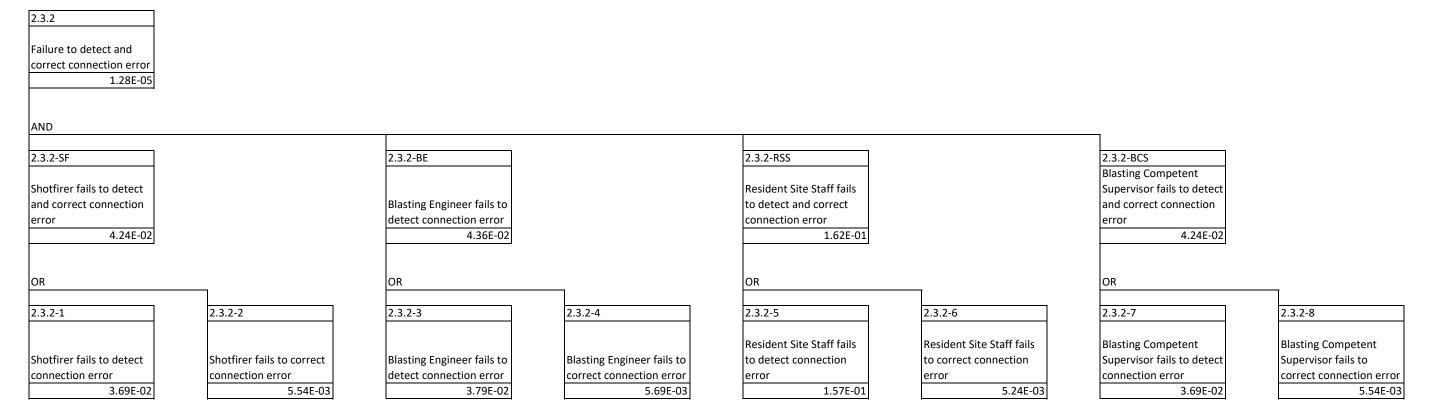
1.80E-03

2.2-W-DETON		
One detonator wrongly put into one		
sector which contains the same time		
delay detonator		
1.61E-14		
AND		
		2.2.2
2.2.1	2.2.2	2.2.3
	Installation of One Detonator by	
	motanation of one Determator by	
	Shotfirer into a section already	Shotfirer /Blasting Competent
Delivery of incorrect detonators from	·	Shotfirer /Blasting Competent Supervisor Fails to Check and Correct

7.11E-08







2.3-W-DETON-SC

One detonator of a sector connected wrongly to a surface connector of another sector

2.3-W-DETON-SC		
One detonator of a sector connected		
wrongly to a surface connector of		
another sector		
6.09E-10		
AND		
2.3.1	2.3.2	2.2.2
		Installation of one detonator by
		Shotfirer into a section already
Shotfirer misconencts one detonator	Failure to detect and correct	containing a detonator of that delay
to the wrong surface connector	connection error	period
3.81E-01	1.28E-05	1.25E-04

2.4.1

Incorrect Installation of Surface Connector

2.4.1	
Incorrect installation of surface	ce
connector	
_	1.48E-03

 \cap D

2.4.1-1
Shotfirer fails to check the colour of
the surface connector before
installing

2.4.1-2
Shotfirer connects wrong surface

7.38E-04

connector

2.4.2 Shotfirer/Blasting Competent Supervisor fails to detect and respond to error

2.4.2			
Shotfirer/Blasting Competent			
Supervisor fails to detect and			
respond to error			
1.80E-03			
AND			
2.4.2-SF		2.4.2-BCS	
Shortfirer fails to detect and correct			
		Blasting Competent Supervisor fails	
error		to detect and correct error	
4.24E-02		4.24E-02	
OR	$\overline{}$	OR	
2.4.2-1	2.4.2-2	2.4.2-3	2.4.2-4
2.4.2-1	2.4.2-2		
		Blasting Competent Supervisor fails	Blasting Competent Supervisor fails
Shotfirer fails to detect error	Shotfirer fails to correct error	to detect error	to correct error
3.69E-02	5.54E-03	3.69E-02	5.54E-03

5.54E-03

3.69E-02

2.4.3

Failure to detect and respond during final hook-up check

5.69E-03

2.4.3 Failure to detect and respond during final hook-up check 3.01E-04 AND 2.4.3-RSS 2.4.3-SF 2.4.3-BE Blasting Engineer fails to detect and Resident Site Staff fails to detect and Shotfirer fails to detect and correct correct error correct error error 4.36E-02 4.24E-02 1.62E-01 2.4.3-3 2.4.3-4 2.4.3-5 2.4.3-1 2.4.3-2 2.4.3-6 Blasting Engineer fails to correct Resident Site Staff fails to detect Resident Site Staff fails to correct Blasting Engineer fails to detect error error error error Shotfirer fails to detect error Shotfirer fails to correct error

5.24E-03

1.57E-01

3.79E-02

2.4-W-SC

Use of a wrong surface connector

2.4-W-SC		
Use of a wrong surface connector		
1.92E-08		
AND		
2.4.1	2.4.2	2.4.3
	Shotfirer/Blasting Competent	
Incorrect installation of surface	Supervisor Fails to Detect and	Failure to Detect and Respond during
connector	Respond to Error	Final Hook-up Check
3.54E-02	1.80E-03	3.01E-04

4.1.1

Excess cartridged are loaded into holes

1.1.1			
xcess	cartridges	are	I

Excess cartridges are loaded into holes

7.38E-04

4.1.1-1

Shotfirer does not count number of cartridges picked up and loads too many

7.38E-04

4.1.2

Cartridges from blocked holes are not disposed of correctly

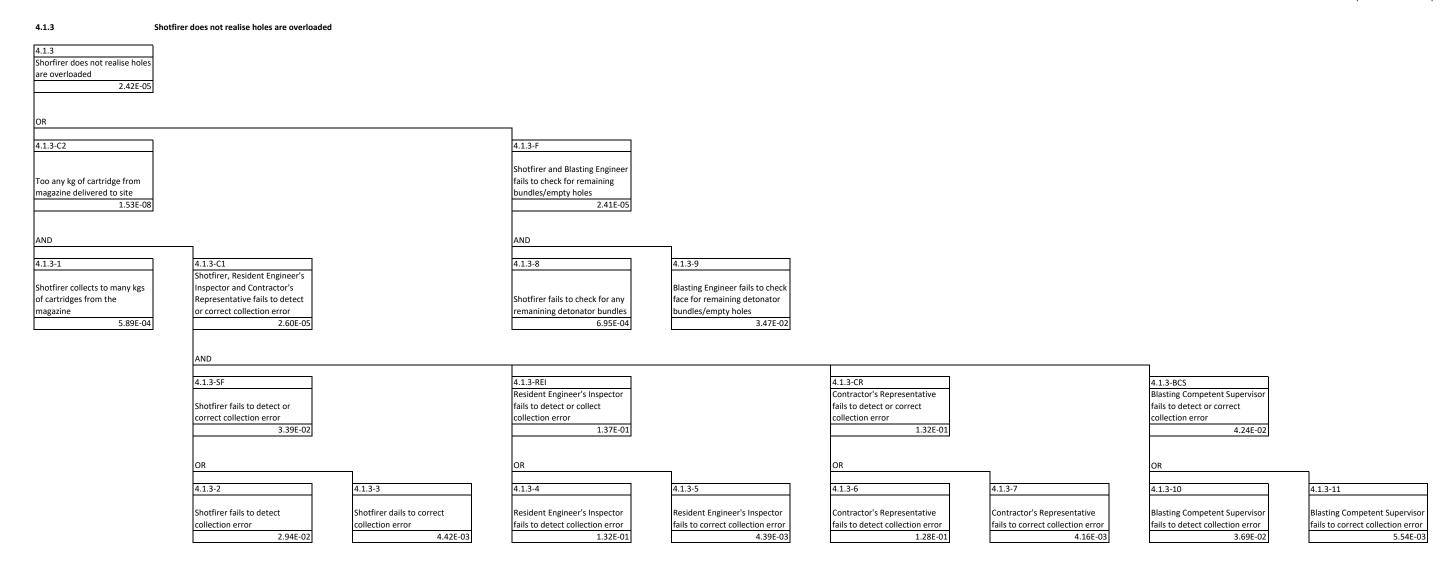
4.1.2
Cartridges from blocked holes are
not disposed of correctly
Q 12F_0

8.13E-03

4.1.2-1

Shotfirer intentionally overloads lifter holes

8.13E-03



4.2.1

4.2.1		
Design Error by the Blasting Engineer 8.52E-05		
AND		
4.2.1-1	4.2.1-BE Blasting Engineer fails to detect and	
Design error by Blasting Engineer 6.05E-04	correct error 1.41E-01	
	OR	
	4.2.1-2	4.2.1-3
	Blasting Engineer fails to detect error	Blasting Engineer fails to correct error
	1.36E-01	4.54E-0

Design Error by the Blasting Engineer

4.2.2 Failure to detect and correct design error

4.2.2			
Failure to detect and correct design			
error			
1.06E-03			
AND			
1000			
4.2.2-RE		4.2.2-MD	
Resident Engineer fails to detect and		Mines Division fails to detect and	
correct error		correct error	
3.35E-02		3.17E-02	
OR		OR	
4.2.2-1	4.2.2-2	4.2.2-3	4.2.2-4
Residnent Engineer fails to detect	Resident Engineer fails to correct		
error	error	Mines Division fails to detect error	Mines Division fails to correct error
2.92E-02	4.37E-03	2.76E-02	4.14E-03

1.1.1 Design Error by Blasting Engineer and Failure of Design Check

1.1.1				
Design Error by Blasting Engineer and				
Failure of Design Check				
1.05E-03				
AND				
1.1.1-1	1.1.1-C1			
Design error by Blasting Engineer and	Failure to detect or correct error by			
Failure of Design Check	Blasting Engineer			
3.03E-02	3.48E-02			
	OR			
	1112	1112		
	1.1.1-2	1.1.1-3		
	Failure to detect and correct error by	Failure to correct error by Blasting		
	Resident Engineer and Mines Division	Engineer during modelling		
	3.03E-02	4.54E-03		

1.1.2 Failure to detect and correct error by Resident Engineer and Mines Division

1.1.2					
Failure to detect and correct error by					
Resident Engineer, Mines Division					
and Shotfirers					
3.56E-05					
AND					
112.05		1.1.2.NAD		11255	
1.1.2-RE		1.1.2-MD		1.1.2-SF	
Failure to detect and correct error by		Failure to detect and correct error by		Failure to detect and correct error by	
Resident Engineer		Mines Division		Shotfirer	
3.35E-02		3.17E-02		3.35E-02	
OR		OR		OR	
1.1.2-1	1.1.2-3	1.1.2-2	1.1.2-4	1.1.2-5	1.1.2-6
Failure to detect error by Resident	Failure to correct error by Resident	Failure to detect error by Mines	Failure to correct error by Mines		
Engineer	Engineer	Division	Division	Failure to detect error by Shotfirer	Failure to correct error by Shotfirer
2.92E-02	4.37E-03	2.76E-02	4.14E-03	2.92E-02	4.37E-03

1.2.1 Failure by Blasting Engineer/Shotfirer to check and correct drilling error

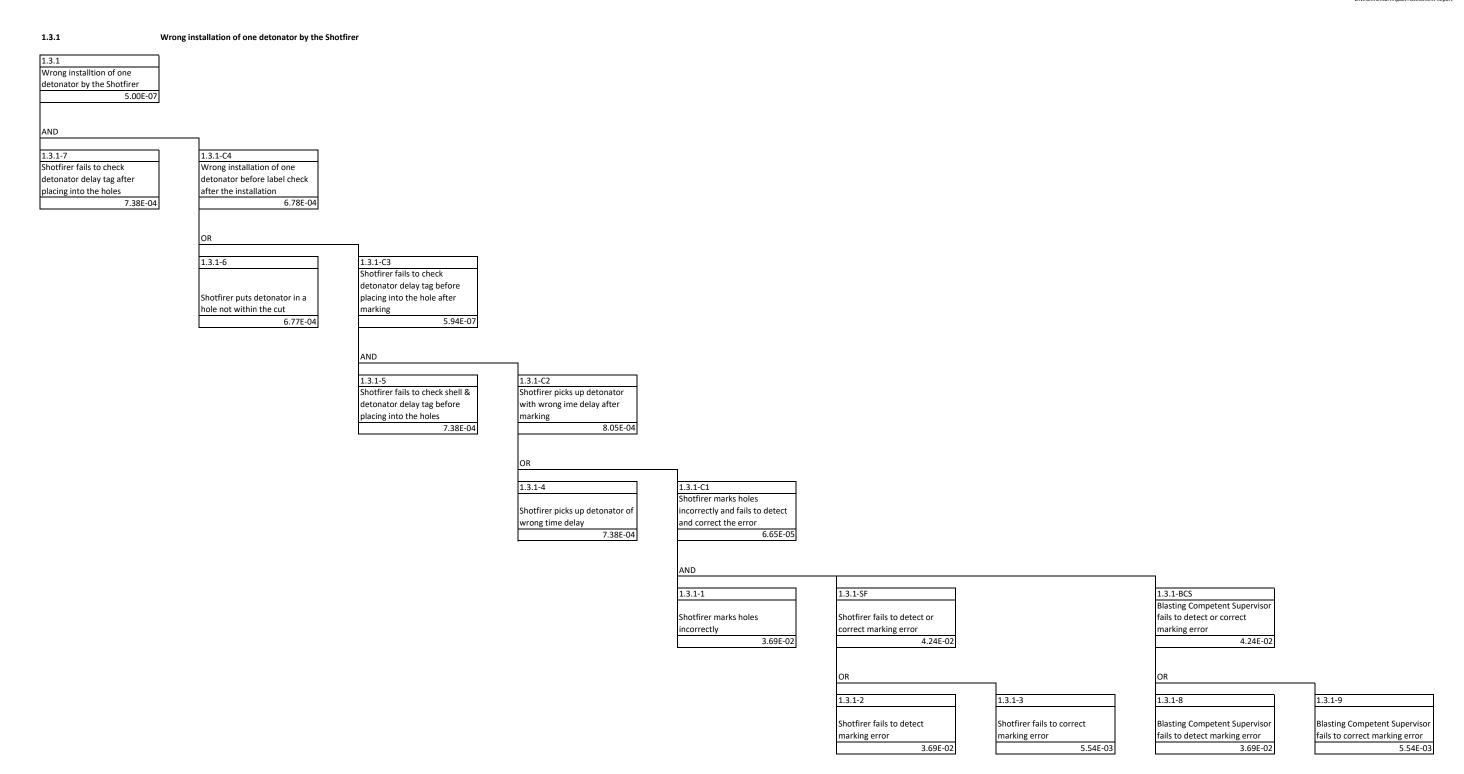
1.2.1	
Operator fails to drill correctly	
2.26E-02	
OR	
1.2.1-1	1.2.1-2
Surveors calculate incorrect co-	
ordinates, leading to operator having	Blasting Engineer inputs wrong
disc with incorrect information	information on to disc
2.20E-02	6.05E-04

1.2.2 Failure by Blasting Engineer/Shotfirer to check and correct drilling error'

1.2.2					
Failure by Blasting Engineer/Shotfirer to check and correct drilling error 7.61E-05					
AND					
1.2.2-BE Failure to detect or correct error by Blasting Engineer		1.2.2-SF Failure to detect or correct error by Shotfirer		1.2.2-BCS Failure to detect or correct error by Blasting Competent Supervisor	
4.32E-02		4.20E-02		4.20E-02	
OR		OR		OR	
1.2.2-1	1.2.2-3	1.2.2-2	1.2.2-4	1.2.2-5	1.2.2-6
Blasting Engineer fails to check holes	Blasting Engineer fails to correct	Shotfirer fails to check holes are		Blasting Competent Supervisor fails	Blasting Competent Supervisor faile
are drilled correctly	drilling error	drilled correctly	Shotfirer fails to correct drilling error	to check holes are drilled correctly	to correct drilling error
3.79E-02	5.22E-03	3.69E-02	5.08E-03	3.69E-02	5.08E-03

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are detonators left over

1.3.2 Shotfirer fails to detect and correct that there are holes without detonators left in the face

before detonation

5.54E-03

1.3.2	
Shotfirer fails to detect and correct	
that there are holes without	
detonators left in the face	
4.24E-02	
OR	
1.3.2-1	1.3.2-2
Shotfirer leaves empty holes in the	
blast face due to not realising that	Shotfirer fails to fill empty holes

3.69E-02

CH-WHD

CH-WHD Wrong hole diameter or location for relief holes at cut 8.79E-07					
OR					
CH-WHD-C1			CH-WHD-C2 Wrong location of drilling or incorrect frill size being used due to		
Wrong design in relief holes 1.88E-08			human error 8.60E-07		
AND	T		AND		
1.1.1	1.1.2	P-FF	1.2.1	1.2.2	P-FF
Design error by Blasting Engineer and Failure of design check	Failure to detect and correct error by Resident Engineer and Mines Division	Design error signidicant enough to cause higher vibration	Operator fails to drill correctly	Failure by Blasting Engineer/Shotfirer to check and correct drilling error	Design error signidicant enough to cause higher vibration
1.05E-03	3.56E-05	0.5	2.26E-02	7.61E-05	0.

Wrong hole diameter or location for relief holes at cut

CH-WD-TD V	Nrong design of time delay of more than 2 produ	ction holes in cut	
CH-WD-TD			
Wrong design of time delay of more			
than 2 production holes in cut 1.26E-13			
AND			
AND			
CH-WD-TD-C1		P-AD-DETON	P-AD-DETON
Wrong design of time delay of one		Wrong design of time delay of one	Wrong design of time delay of one
production hole in cut		additional production hole in cut	additional production hole in cut
1.26E-09		0.01	0.01
AND			
1.1.1	1.1.2		
	Failure to detect and correct error by		
Design error by Blasting Engineer and	Resident Engineer, Mines Division		
Failure of design check	and Shotfirers		

1.19E-06

1.05E-03

CH-WI-TD

Wrong installation of more than two detonators in cut (longer time delay from other sector put into the cut)

CH-WI-TD

Wrong installation of more than two detonators in cut (longer time delay from other sector put into the cut)

1.91E-11

AND

CH-WI-TD-C1

Wrong installation of one detonator in cut (longer time delay from other sector put into the cut)

1.91E-07

P-AD-DETON

Wrong installation of additional one detonator in cut (longer time delay from other sector put into the cut)

0.01

P-AD-DETON

Wrong installation of additional one detonator in cut (longer time delay from other sector put into the cut)

0.01

AND

1.3.1

Wrong installtion of one detonator by the Shotfirer

4.50E-06

1.3.2

Shotfirer fails to detect and correct that there are holes without detonators left in the face

4.24E-02

CH-TD-MD

Incorrect time default of more than two detonators due to manufacturer defect

CH-TD-MD
Incorrect time default of more than
two detonators due to manufacturer
defect

2.30E-09

AND

MD-DETON
Incorrect time default of one
detonator due to manufacturer
defect

2.30E-05

P-AD-DETON

Incorrect time default of one additional detonator due to manufacturer defect

0.01

P-AD-DETON

Incorrect time default of one additional detonator due to manufacturer defect

0.01

СН Higher than expected vibration due to cut hole error Higher than expected vibration due to cut hole error 8.81E-07 CH-WHD CH-C1 Wrong hole diameter or location for relief holes at cut Wrong time delay at cut 8.79E-07 2.32E-09 OR CH-WD-TD CH-WI-TD CH-TD-MD Wrong installation of more than two Incorrect time default of more than Wrong design of time delay of more detonators in cut (longer time delay two detonators due to manufacturer from other sector put into the cut) defect than 2 production holes in cut 1.26E-13 1.91E-11 2.30E-09

1.1.1 Design Error by Blasting Engineer and Failure of Design Check

1.1.1		
Design Error by Blasting Engineer and		
Failure of Design Check		
1.05E-03		
AND	\neg	
1.1.1-1	1.1.1-C1	
Design error by Blasting Engineer and	Failure to detect or correct error by	
Failure of Design Check	Blasting Engineer	
3.03E-02	3.48E-02	
	OR	
	1.1.1-2	1.1.1-3
		5 11 11 11 11 11 11
	Failure to detect and correct error by	Failure to correct error by Blasting
	Resident Engineer and Mines Division	Engineer during modelling
	3.03E-02	4.54E-03

4.37E-03

2.92E-02

1.1.2

1.1.2 Failure to detect and correct error by Resident Engineer, Mines Division and Shotfirers 3.56E-05 AND 1.1.2-RE 1.1.2-MD 1.1.2-SF Failure to detect and correct error by Failure to detect and correct error by Failure to detect and correct error by Resident Engineer Mines Division Shotfirer 3.35E-02 3.17E-02 3.35E-02 1.1.2-1 1.1.2-3 1.1.2-2 1.1.2-4 1.1.2-5 1.1.2-6 Failure to detect error by Resident Failure to correct error by Resident Failure to detect error by Mines Failure to correct error by Mines Engineer Engineer Division Division Failure to detect error by Shotfirer Failure to correct error by Shotfirer

4.14E-03

2.76E-02

Failure to detect and correct error by Resident Engineer and Mines Division

4.37E-03

2.92E-02

1.2.1 Failure by Blasting Engineer/Shotfirer to check and correct drilling error

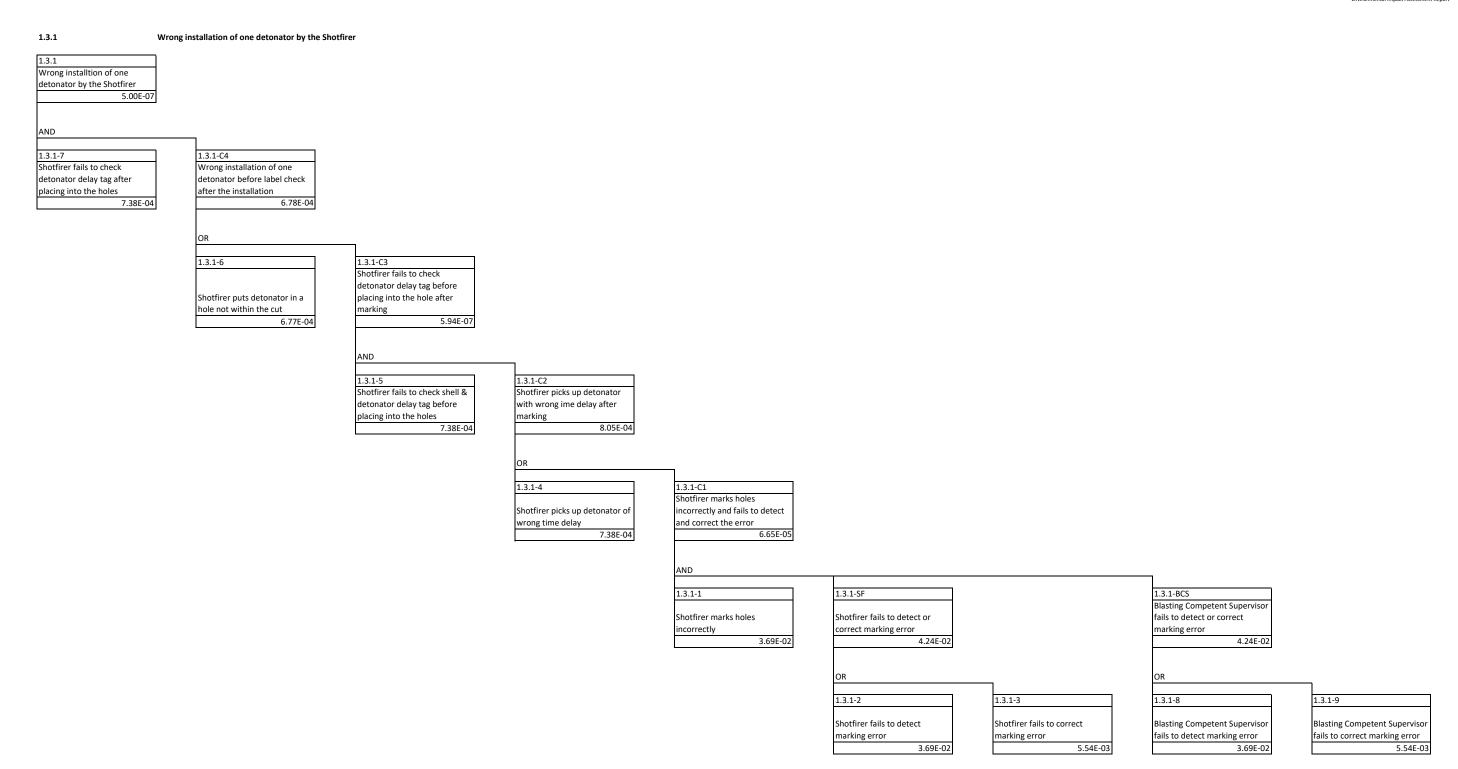
1.2.1	
Operator fails to drill correctly	
2.26E-02	
OR	
1.2.1-1	1.2.1-2
Surveors calculate incorrect co-	
ordinates, leading to operator having	Blasting Engineer inputs wrong
disc with incorrect information	information on to disc
2.20E-02	6.05E-04

1.2.2 Failure by Blasting Engineer/Shotfirer to check and correct drilling error

1.2.2					
Failure by Blasting Engineer/Shotfirer					
to check and correct drilling error					
7.61E-05					
AND				<u></u>	
1.2.2-BE		1.2.2-SF		1.2.2-BCS	
Failure to detect or correct error by		Failure to detect or correct error by		Failure to detect or correct error by	
Blasting Engineer 4.32E-02		Shotfirer 4.20E-02		Blasting Competent Supervisor 4.20E-02	
4.32E-02		4.20E-02		4.20E-02	
OR		OR		OR	
1.2.2-1	1.2.2-3	1.2.2-2	1.2.2-4	1.2.2-5	1.2.2-6
Blasting Engineer fails to check holes	Blasting Engineer fails to correct	Shotfirer fails to check holes are		Blasting Competent Supervisor fails	Blasting Competent Supervisor faile
are drilled correctly	drilling error	drilled correctly	Shotfirer fails to correct drilling error	to check holes are drilled correctly	to correct drilling error
3.79E-02	5.22E-03	3.69E-02	5.08E-03	3.69E-02	5.08E-03

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1.3.2 Shotfirer fails to detect and correct that there are holes without detonators left in the face

1.3.2		
Shotfirer fails to detect and correct		
that there are holes without		
detonators left in the face		
4.24E-02		

OR

1.3.2-1
Shotfirer leaves empty holes in the blast face due to not realising that are detonators left over

3.69E-02

1.3.2-2
Shotfirer fails to fill empty holes

before detonation

5.54E-03

CH-WHD

Wrong hole diameter or location for relief holes at cut

CH-WHD Wrong hole diameter or location for relief holes at cut 8.79E-07					
OR					
CH-WHD-C1			CH-WHD-C2 Wrong location of drilling or		
Wrong design in relief holes 1.88E-08			incorrect frill size being used due to human error 8.60E-07		
AND			AND		
1.1.1	1.1.2	P-FF	1.2.1	1.2.2	P-FF
Design error by Blasting Engineer and Failure of design check	Failure to detect and correct error by Resident Engineer and Mines Division	Design error signidicant enough to cause higher vibration	Operator fails to drill correctly	Failure by Blasting Engineer/Shotfirer to check and correct drilling error	Design error signidicant enough to cause higher vibration
1.05E-03	3.56E-05	0.5	2.26E-02	7.61E-05	0.

CH-WD-TD

CH-WD-TD Wrong design of time delay of more than 2 production holes in cut AND CH-WD-TD-C1 P-AD-DETON P-AD-DETON Wrong design of time delay of one Wrong design of time delay of one Wrong design of time delay of one additional production hole in cut additional production hole in cut production hole in cut 1.26E-09 0.01 0.01 AND 1.1.1 1.1.2 Failure to detect and correct error by Design error by Blasting Engineer and Resident Engineer, Mines Division Failure of design check and Shotfirers 1.05E-03 1.19E-06

Wrong design of time delay of more than 2 production holes in cut

CH-WI-TD

Wrong installation of more than two detonators in cut (longer time delay from other sector put into the cut)

CH-WI-TD Wrong installation of more than two detonators in cut (longer time delay from other sector put into the cut) 1.27E-11

AND

CH-WI-TD-C1

Wrong installation of one detonator in cut (longer time delay from other sector put into the cut)

1.27E-07

P-AD-DETON

Wrong installation of additional one detonator in cut (longer time delay from other sector put into the cut)

0.01

P-AD-DETON

Wrong installation of additional one detonator in cut (longer time delay from other sector put into the cut)

0.01

AND

1.3.1

Wrong installtion of one detonator by the Shotfirer

3.00E-06

1.3.2

Shotfirer fails to detect and correct that there are holes without detonators left in the face

4.24E-02

CH-TD-MD

Incorrect time default of more than two detonators due to manufacturer defect

CH-TD-MD
Incorrect time default of more than
two detonators due to manufacturer
defect

5.20E-10

AND

MD-DETON
Incorrect time default of one
detonator due to manufacturer
defect

5.20E-06

P-AD-DETON

Incorrect time default of one additional detonator due to manufacturer defect

0.01

P-AD-DETON

Incorrect time default of one additional detonator due to manufacturer defect

0.01

СН Higher than expected vibration due to cut hole error Higher than expected vibration due to cut hole error 8.79E-07 CH-WHD CH-C1 Wrong hole diameter or location for relief holes at cut Wrong time delay at cut 8.79E-07 5.33E-10 OR CH-WD-TD CH-WI-TD CH-TD-MD Wrong installation of more than two Incorrect time default of more than Wrong design of time delay of more detonators in cut (longer time delay two detonators due to manufacturer from other sector put into the cut) defect than 2 production holes in cut 1.27E-11 5.20E-10