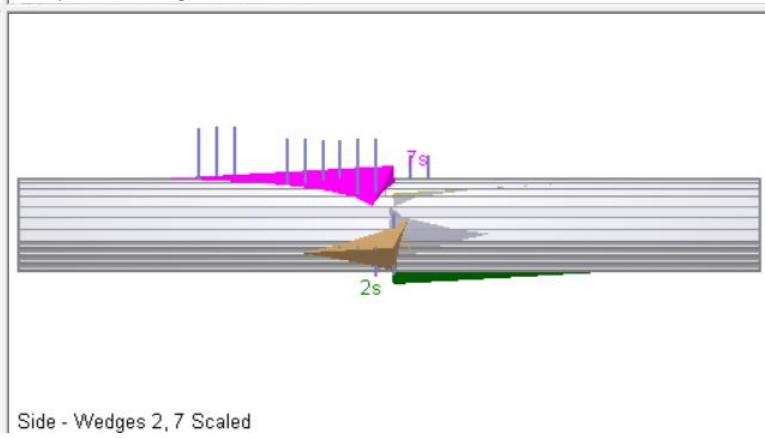
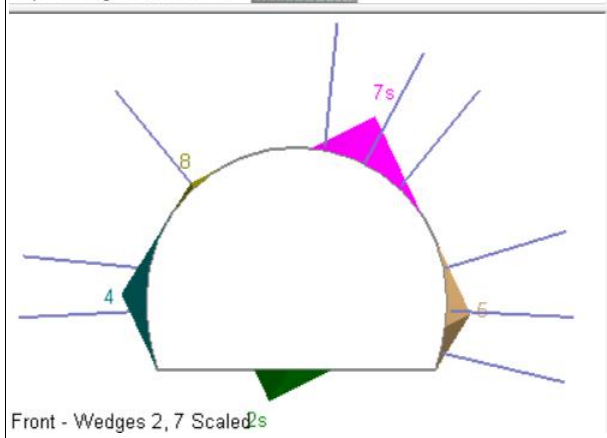
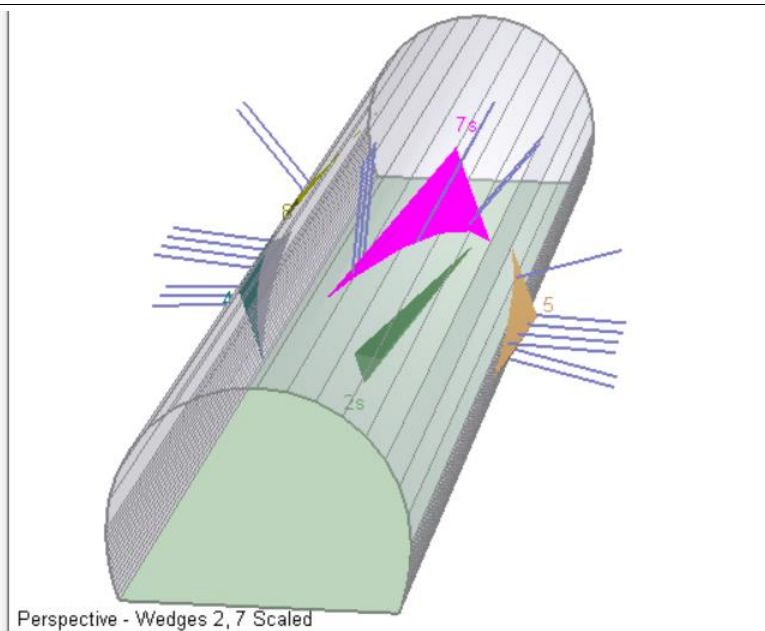
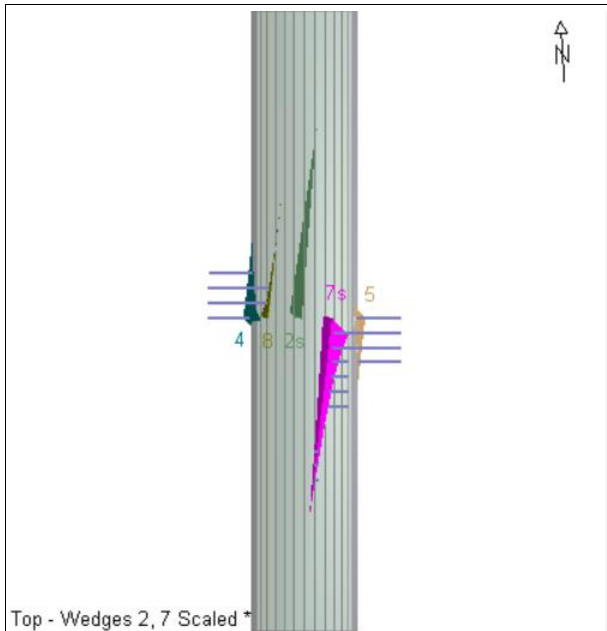


ANEXO 17
ANÁLISIS DE ESTABILIDAD DEL
SOSTENIMIENTO



Wedge Information

Floor wedge [2]
 Factor of Safety: stable
 Wedge Weight: 12.214 tonnes
 Apex Height: 1.10 m

Lower Left wedge [4]
 Factor of Safety: 62.171
 Wedge Weight: 12.525 tonnes
 Apex Height: 0.87 m

Lower Right wedge [5]
 Factor of Safety: 52.361
 Wedge Weight: 11.083 tonnes
 Apex Height: 0.85 m

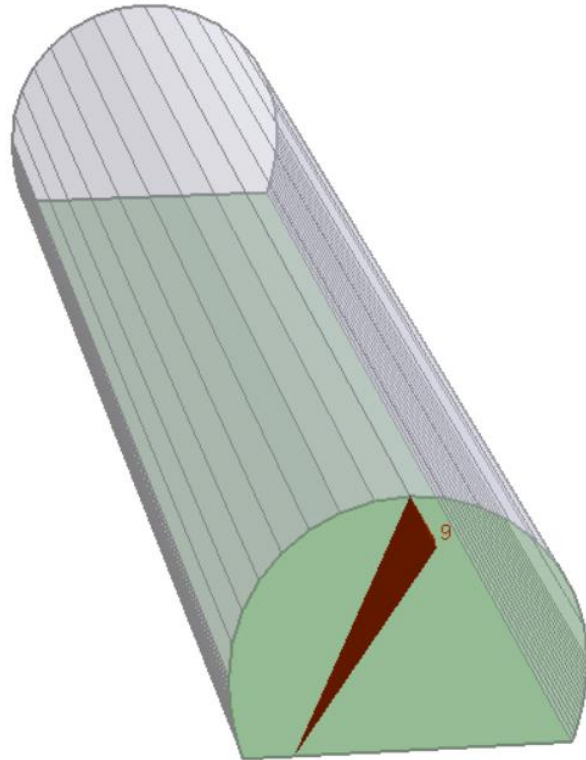
Roof wedge [7]
 Factor of Safety: 5.560
 Wedge Weight: 33.425 tonnes
 Apex Height: 1.67 m

Upper Left wedge [8]
 Factor of Safety: 102.478
 Wedge Weight: 0.539 tonnes
 Apex Height: 0.21 m



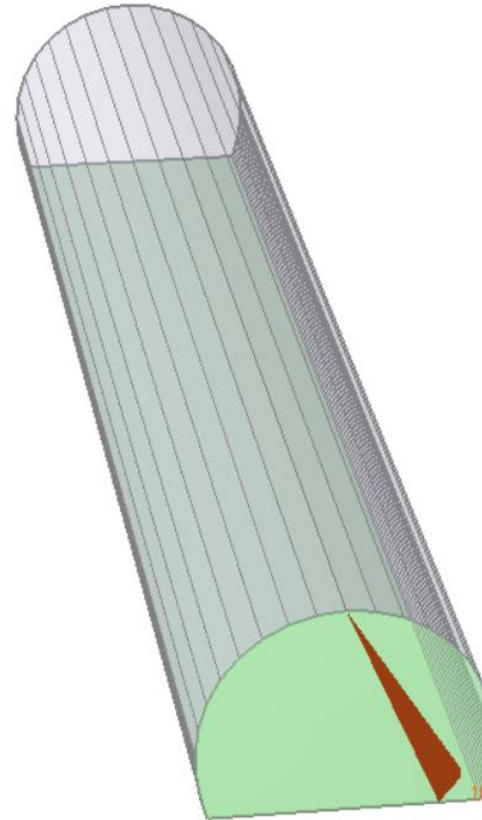
UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO			
FACULTAD DE INGENIERIA DE MINAS			
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-1	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 2:01:54 p.m.	<i>File Name</i>	R-1.weg

Near End wedge [9]
FS: 6.697



Weight: 3.416 tonnes, Apex Height: 0.73 m

Far End wedge [10]
FS: 54.188



Weight: 3.416 tonnes, Apex Height: 0.73 m



Wedge Information

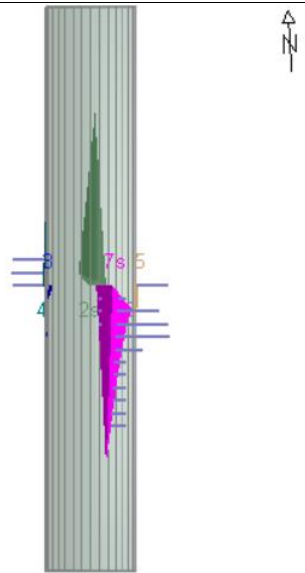
Near End wedge [9]

Factor of Safety: 6.697
Wedge Weight: 3.416 tonnes
Apex Height: 0.73 m

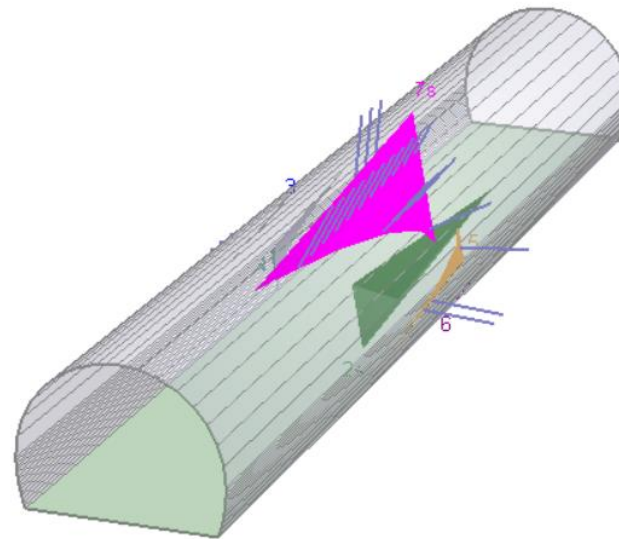
Far End wedge [10]

Factor of Safety: 54.188
Wedge Weight: 3.416 tonnes
Apex Height: 0.73 m

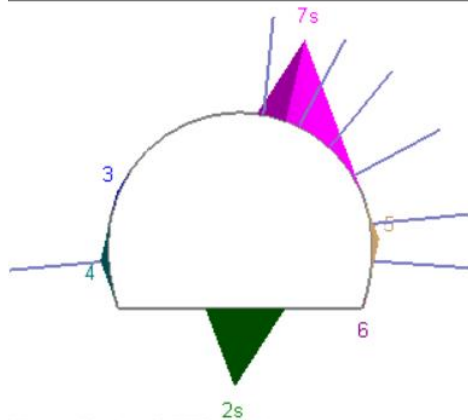
		UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO FACULTAD DE INGENIERIA DE MINAS	
		<i>Analysis Description</i> SOSTENIMIENTO CON PERNOS DE ANCLAJE CUÑAS PLANARES ZONA R-1	
<i>Drawn By</i> Bach. ANGEL CHRISTOPHER SOTO VILCA		<i>Company</i> UNA - PUNO	
<i>Date</i> Enero 2016, 10:41:15 a.m.		<i>File Name</i> R-1.weg	



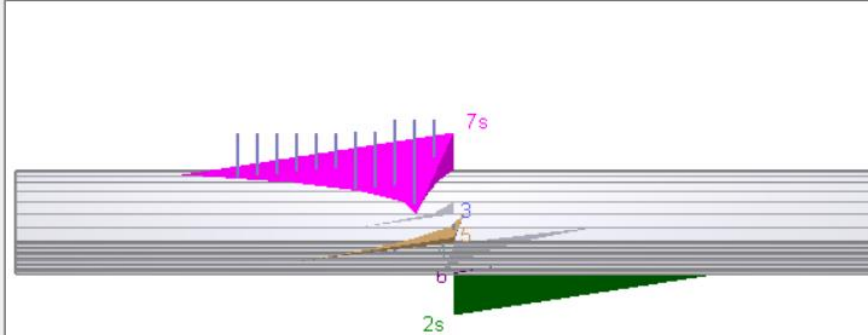
Top - Wedges 2, 7 Scaled



Perspective - Wedges 2, 7 Scaled



Front - Wedges 2, 7 Scaled *



Side - Wedges 2, 7 Scaled

Wedge Information

Floor wedge [2]

Factor of Safety: stable
Wedge Weight: 90.539 tonnes
Apex Height: 3.16 m

Upper Left wedge [3]

Factor of Safety: 430.698
Wedge Weight: 0.121 tonnes
Apex Height: 0.08 m

Lower Left wedge [4]

Factor of Safety: 90.282
Wedge Weight: 1.730 tonnes
Apex Height: 0.32 m

Lower Right wedge [5]

Factor of Safety: 153.075
Wedge Weight: 1.314 tonnes
Apex Height: 0.29 m

Lower Right wedge [6]

Factor of Safety: 2467.596
Wedge Weight: 0.004 tonnes
Apex Height: 0.03 m

Roof wedge [7]

Factor of Safety: 4.846
Wedge Weight: 121.084 tonnes
Apex Height: 3.35 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-2

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

Date

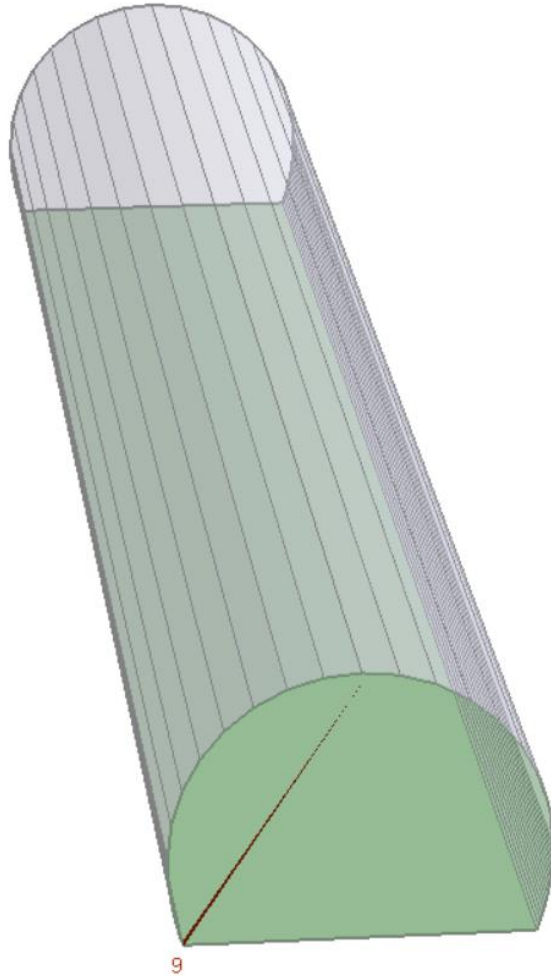
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File Name

R-2.weg

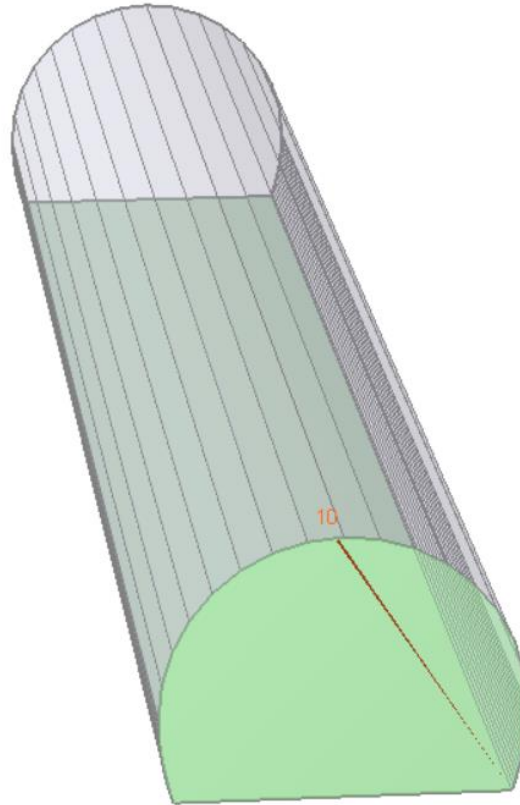


Near End wedge [9]
FS: stable



Weight: 0.015 tonnes, Apex Height: 0.04 m

Far End wedge [10]
FS: 1365.833



Weight: 0.015 tonnes, Apex Height: 0.04 m

Wedge Information

Near End wedge [9]

Factor of Safety: stable
Wedge Weight: 0.015 tonnes
Apex Height: 0.04 m

Far End wedge [10]

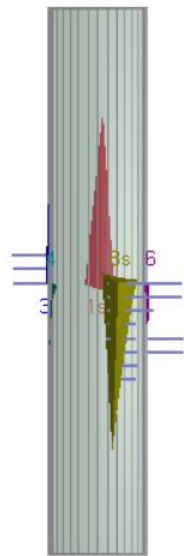
Factor of Safety: 1365.833
Wedge Weight: 0.015 tonnes
Apex Height: 0.04 m



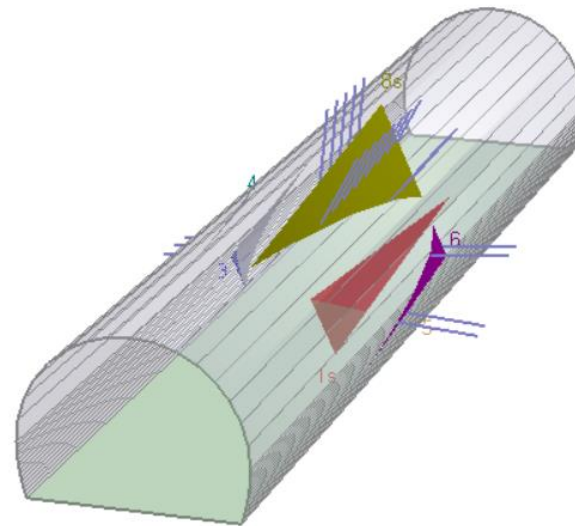
UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

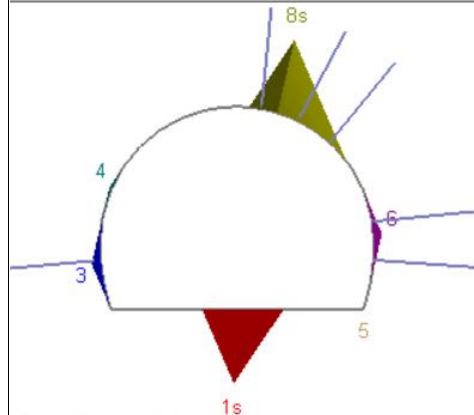
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-2	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 7:15:14 a.m.	<i>File Name</i>	R-2.weg



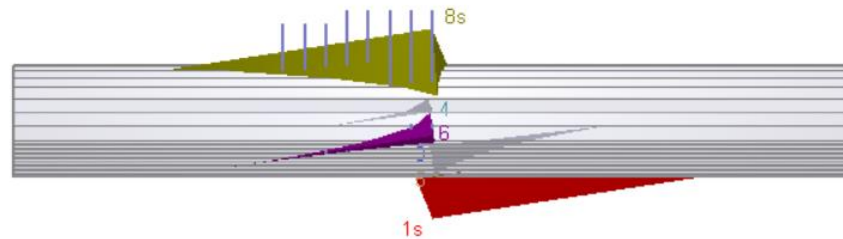
Top - Wedges 1, 8 Scaled



Perspective - Wedges 1, 8 Scaled *



Front - Wedges 1, 8 Scaled



Side - Wedges 1, 8 Scaled

Wedge Information

Floor wedge [1]

Factor of Safety: stable
Wedge Weight: 81.080 tonnes
Apex Height: 2.90 m

Lower Left wedge [3]

Factor of Safety: 73.057
Wedge Weight: 2.436 tonnes
Apex Height: 0.37 m

Upper Left wedge [4]

Factor of Safety: 389.282
Wedge Weight: 0.151 tonnes
Apex Height: 0.10 m

Lower Right wedge [5]

Factor of Safety: 2515.012
Wedge Weight: 0.004 tonnes
Apex Height: 0.03 m

Lower Right wedge [6]

Factor of Safety: 121.316
Wedge Weight: 1.865 tonnes
Apex Height: 0.34 m

Roof wedge [8]

Factor of Safety: 5.588
Wedge Weight: 89.911 tonnes
Apex Height: 2.91 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-2 COMBINACIÓN JOINT 1,2,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

Date

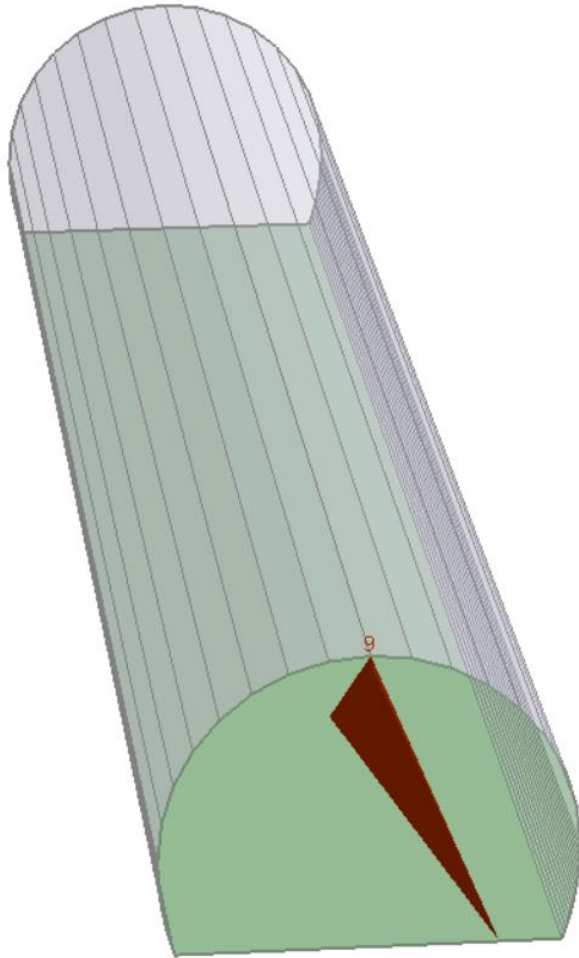
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File Name

R-2.weg

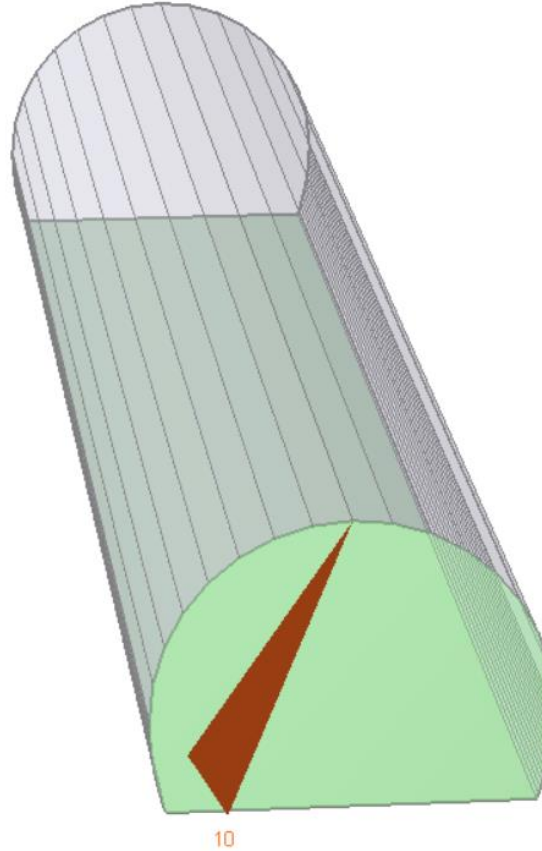


Near End wedge [9]
FS: 18.027



Weight: 3.598 tonnes, Apex Height: 0.60 m

Far End wedge [10]
FS: 324.450



Weight: 3.598 tonnes, Apex Height: 0.60 m

Wedge Information

Near End wedge [9]

Factor of Safety: 18.027
Wedge Weight: 3.598 tonnes
Apex Height: 0.60 m

Far End wedge [10]

Factor of Safety: 324.450
Wedge Weight: 3.598 tonnes
Apex Height: 0.60 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-2 COMBINACIÓN JOINTS 1,2,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

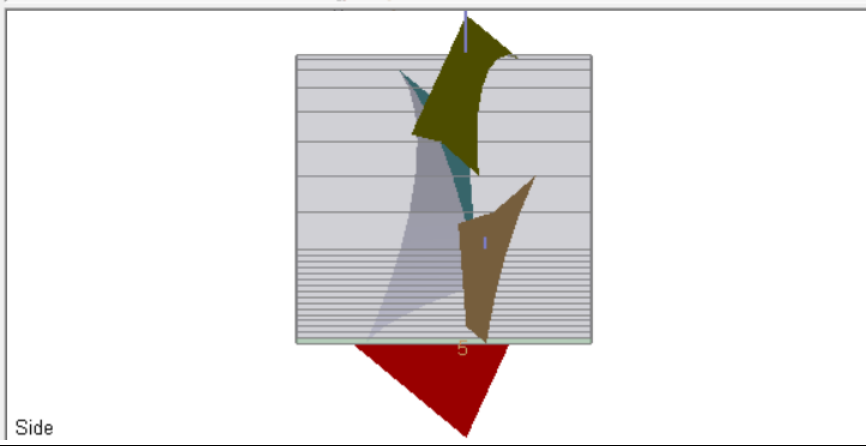
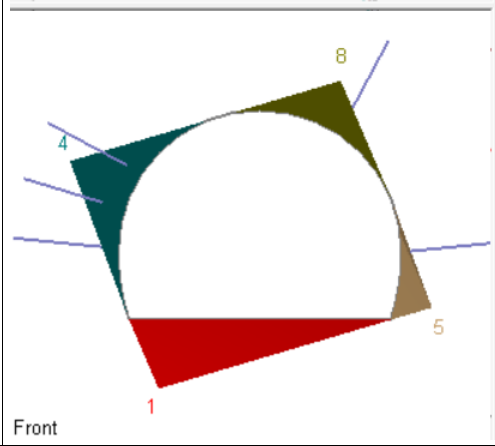
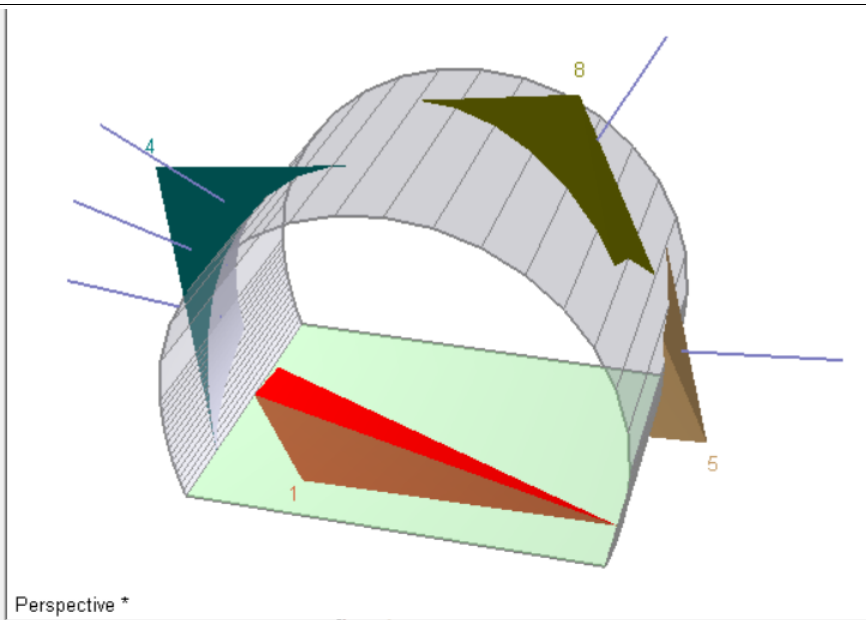
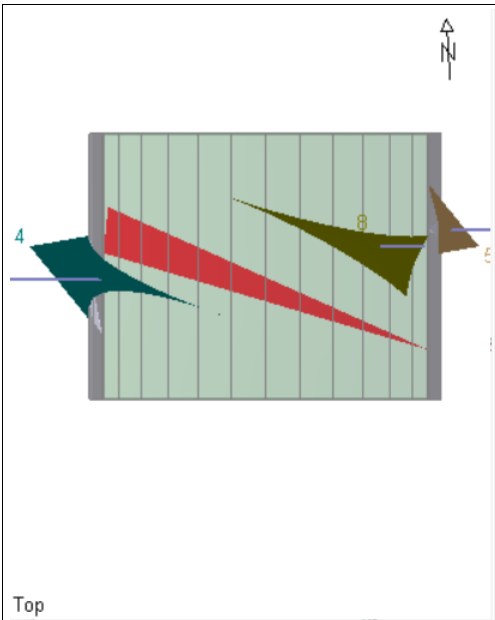
Date

Enero 2016, 6:45:54 p.m.

File Name

R-2.weg





Wedge Information

Floor wedge [1]

Factor of Safety: stable
 Wedge Weight: 16.394 tonnes
 Apex Height: 2.59 m

Upper Left wedge [4]

Factor of Safety: 16.770
 Wedge Weight: 14.348 tonnes
 Apex Height: 2.61 m

Lower Right wedge [5]

Factor of Safety: 159.760
 Wedge Weight: 3.019 tonnes
 Apex Height: 1.37 m

Upper Right wedge [8]

Factor of Safety: 20.884
 Wedge Weight: 6.102 tonnes
 Apex Height: 1.81 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS



Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-2 COMBINACIÓN JOINT 1,3,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

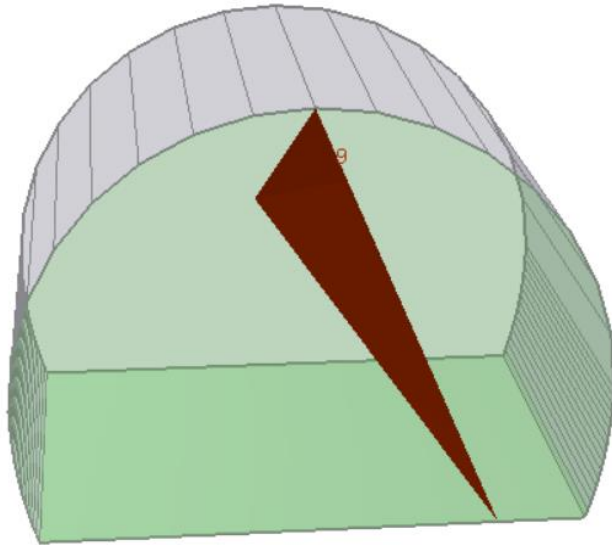
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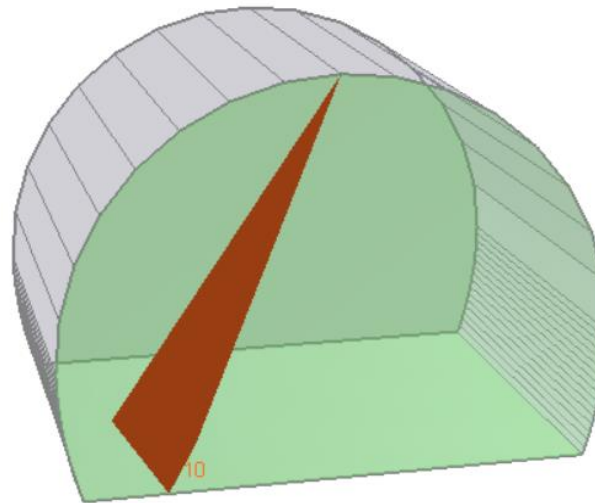
R-2.weg

Near End wedge [9]
FS: 20.018



Weight: 3.125 tonnes, Apex Height: 0.52 m

Far End wedge [10]
FS: 31.464



Weight: 3.125 tonnes, Apex Height: 0.52 m

Wedge Information

Near End wedge [9]

Factor of Safety: 20.018
Wedge Weight: 3.125 tonnes
Apex Height: 0.52 m

Far End wedge [10]

Factor of Safety: 31.464
Wedge Weight: 3.125 tonnes
Apex Height: 0.52 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-2 COMBINACIÓN JOINTS 1,3,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

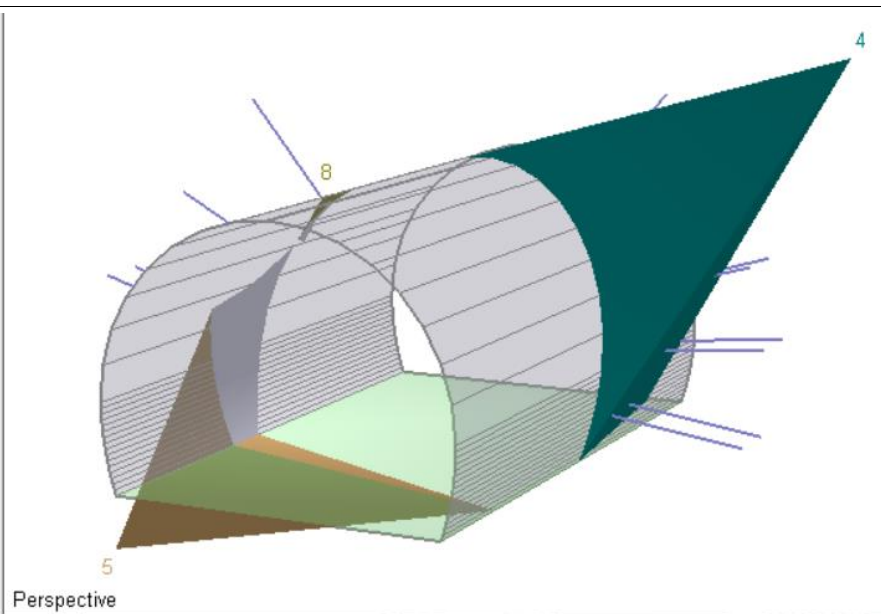
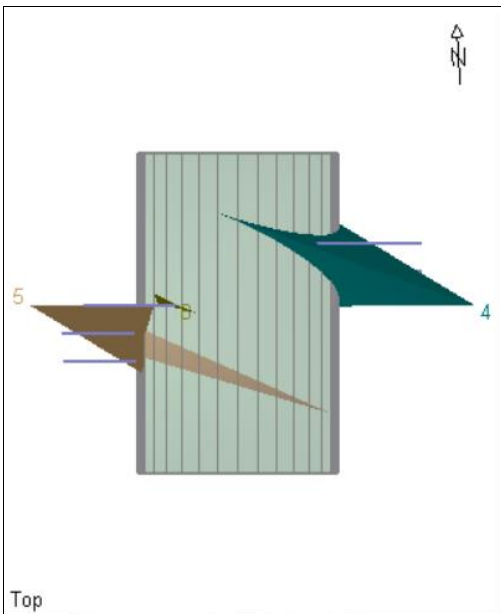
Date

Enero 2016, 10:56:34 a.m.

File Name

R-2.weg





Wedge Information

Upper Right wedge [4]

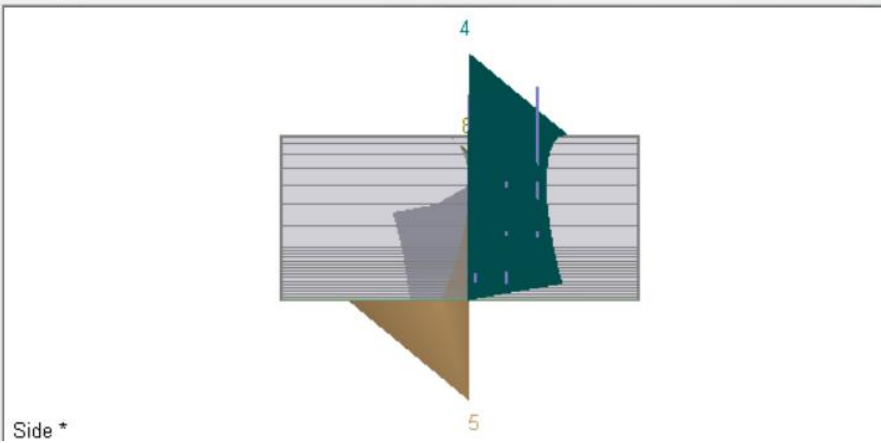
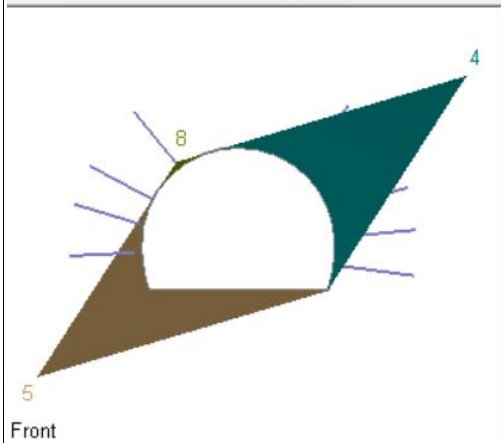
Factor of Safety: 4.809
 Wedge Weight: 153.699 tonnes
 Apex Height: 10.27 m

Lower Left wedge [5]

Factor of Safety: stable
 Wedge Weight: 87.428 tonnes
 Apex Height: 7.76 m

Upper Left wedge [8]

Factor of Safety: 467.705
 Wedge Weight: 0.150 tonnes
 Apex Height: 0.34 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO
FACULTAD DE INGENIERIA DE MINAS



Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-2 COMBINACIÓN JOINT 2,3,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

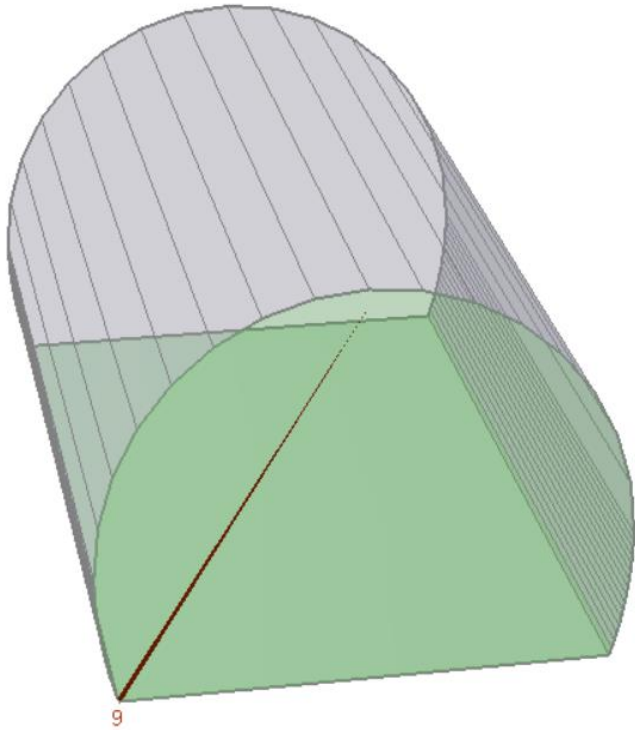
Date

Enero 2016, 7:18:17 p.m.

File Name

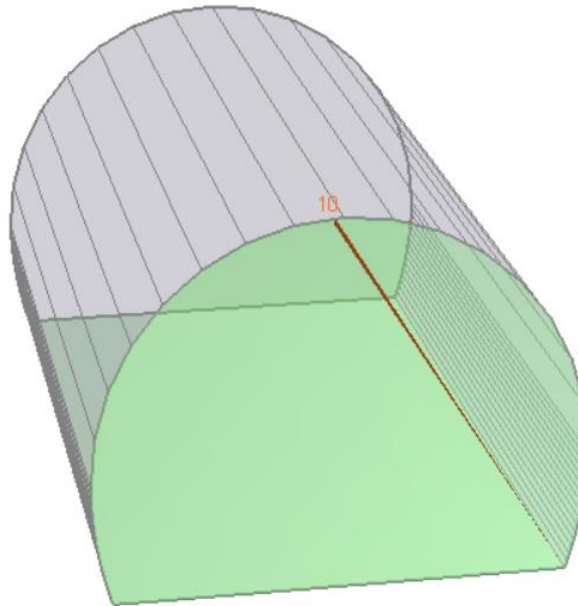
R-2.weg

Near End wedge [9]
FS: 2143.676



Weight: 0.015 tonnes, Apex Height: 0.04 m

Far End wedge [10]
FS: 1370.403



Weight: 0.015 tonnes, Apex Height: 0.04 m

Wedge Information

Near End wedge [9]

Factor of Safety: 2143.676
Wedge Weight: 0.015 tonnes
Apex Height: 0.04 m

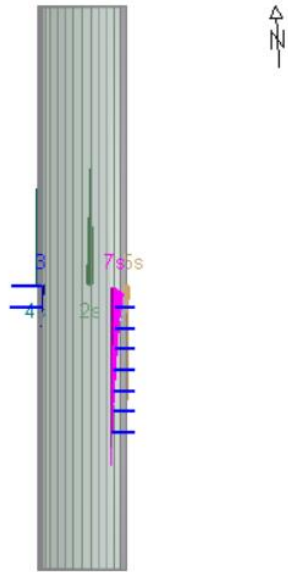
Far End wedge [10]

Factor of Safety: 1370.403
Wedge Weight: 0.015 tonnes
Apex Height: 0.04 m

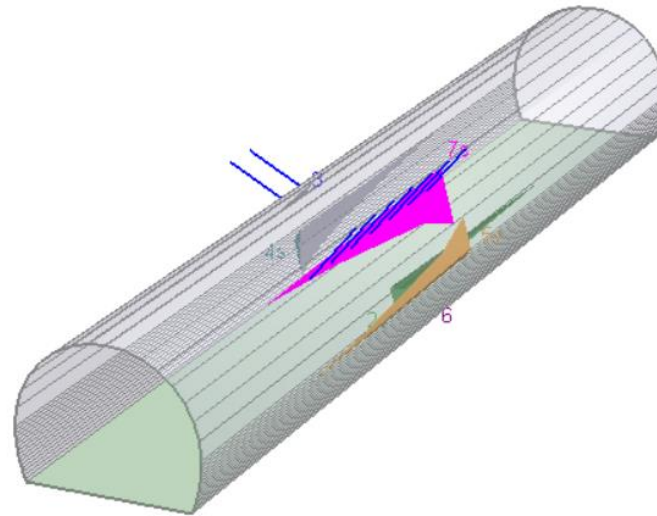


UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO
FACULTAD DE INGENIERIA DE MINAS

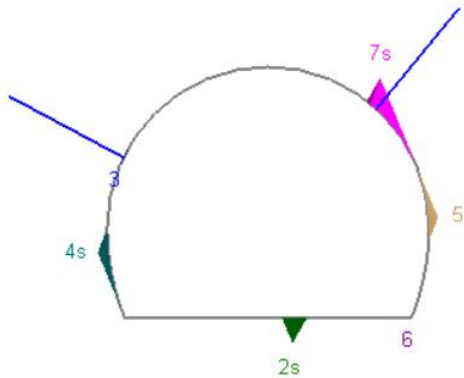
<i>Analysis Description</i>	SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-2 COMBINACIÓN JOINTS 2,3,4		
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 2:45:32 p.m.	<i>File Name</i>	R-2.weg



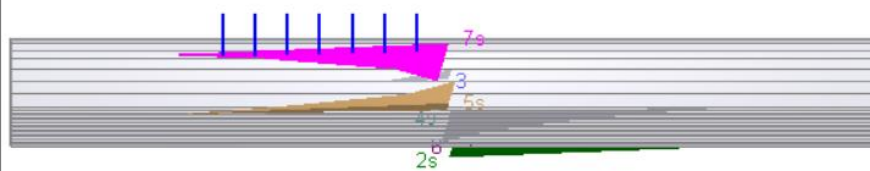
Top - Wedges 2, 4, 5, 7 Scaled



Perspective - Wedges 2, 4, 5, 7 Scaled



Front - Wedges 2, 4, 5, 7 Scaled *



Side - Wedges 2, 4, 5, 7 Scaled

Wedge Information

Floor wedge [2]

Factor of Safety: 104.993
Wedge Weight: 5.624 tonnes
Apex Height: 0.79 m

Upper Left wedge [3]

Factor of Safety: 440.908
Wedge Weight: 0.040 tonnes
Apex Height: 0.02 m

Lower Left wedge [4]

Factor of Safety: 9.438
Wedge Weight: 4.352 tonnes
Apex Height: 0.33 m

Lower Right wedge [5]

Factor of Safety: 14.454
Wedge Weight: 3.426 tonnes
Apex Height: 0.31 m

Lower Right wedge [6]

Factor of Safety: 23461.258
Wedge Weight: 0.000 tonnes
Apex Height: 0.00 m

Upper Right wedge [7]

Factor of Safety: 5.959
Wedge Weight: 11.771 tonnes
Apex Height: 0.82 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO
FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE - ZONA R-3

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

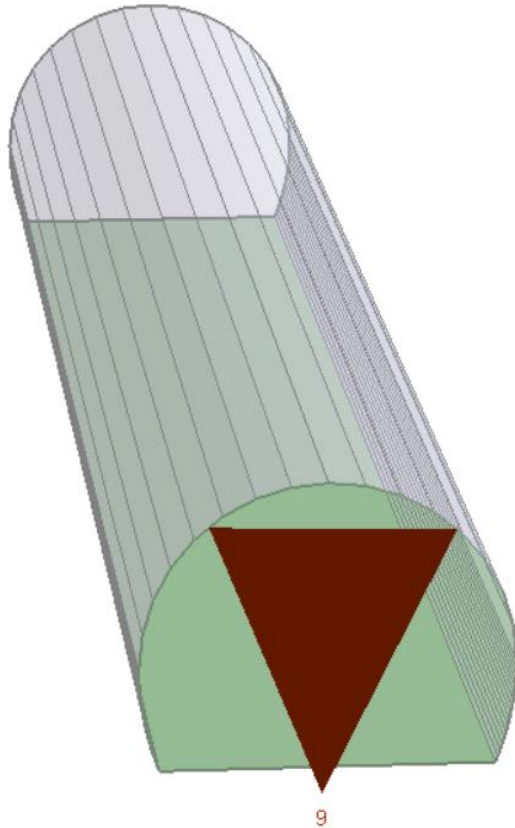
Date

Enero 2016, 3:41:17 p.m.

File Name

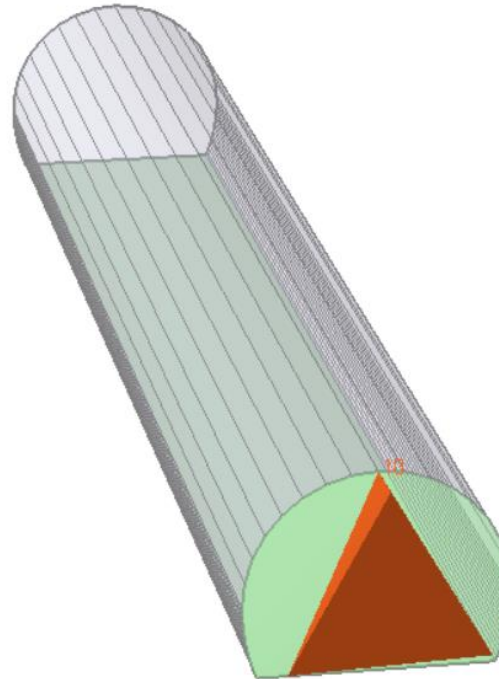
R-3.weg

Near End wedge [9]
FS: 364.764



Weight: 36.949 tonnes, Apex Height: 1.97 m

Far End wedge [10]
FS: 3.639



Weight: 59.402 tonnes, Apex Height: 2.31 m

Wedge Information

Near End wedge [9]

Factor of Safety: 364.764

Wedge Weight: 36.949 tonnes

Apex Height: 1.97 m

Far End wedge [10]

Factor of Safety: 3.639

Wedge Weight: 59.402 tonnes

Apex Height: 2.31 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-3

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

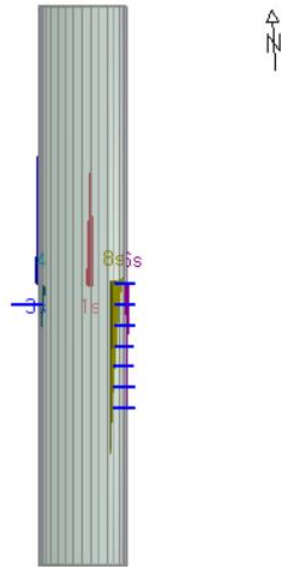
UNA - PUNO

Date

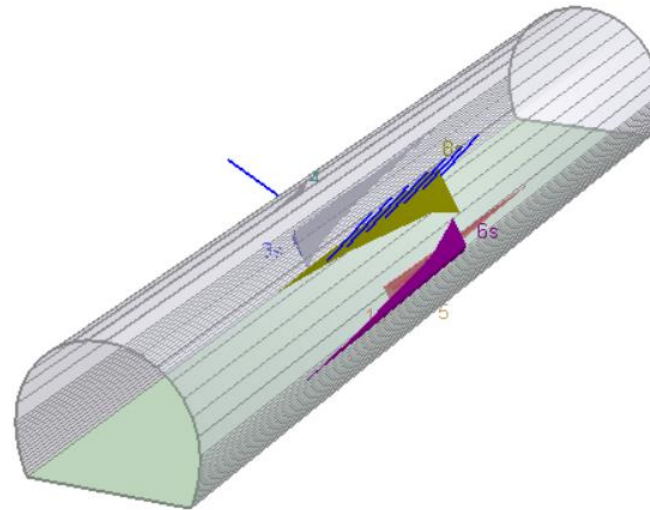
Enero 2016, 6:14:36 p.m.

File Name

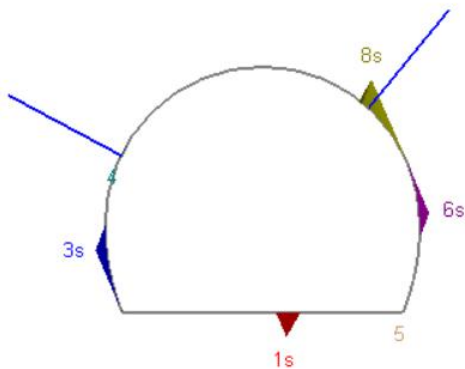
R-3.weg



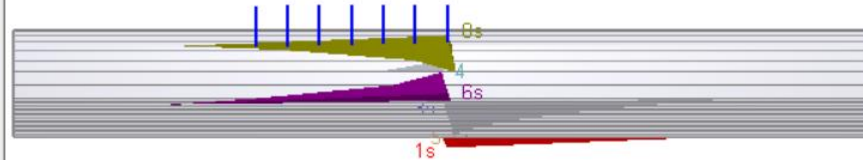
Top - Wedges 1, 3, 6, 8 Scaled



Perspective - Wedges 1, 3, 6, 8 Scaled



Front - Wedges 1, 3, 6, 8 Scaled



Side - Wedges 1, 3, 6, 8 Scaled *

Wedge Information

Floor wedge [1]

Factor of Safety: 104.917
Wedge Weight: 5.565 tonnes
Apex Height: 0.78 m

Lower Left wedge [3]

Factor of Safety: 8.497
Wedge Weight: 5.151 tonnes
Apex Height: 0.35 m

Upper Left wedge [4]

Factor of Safety: 265.525
Wedge Weight: 0.050 tonnes
Apex Height: 0.03 m

Lower Right wedge [5]

Factor of Safety: 24403.727
Wedge Weight: 0.000 tonnes
Apex Height: 0.00 m

Lower Right wedge [6]

Factor of Safety: 12.524
Wedge Weight: 3.942 tonnes
Apex Height: 0.32 m

Upper Right wedge [8]

Factor of Safety: 6.885
Wedge Weight: 10.153 tonnes
Apex Height: 0.76 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-3 COMBINACIÓN JOINT 1,2,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

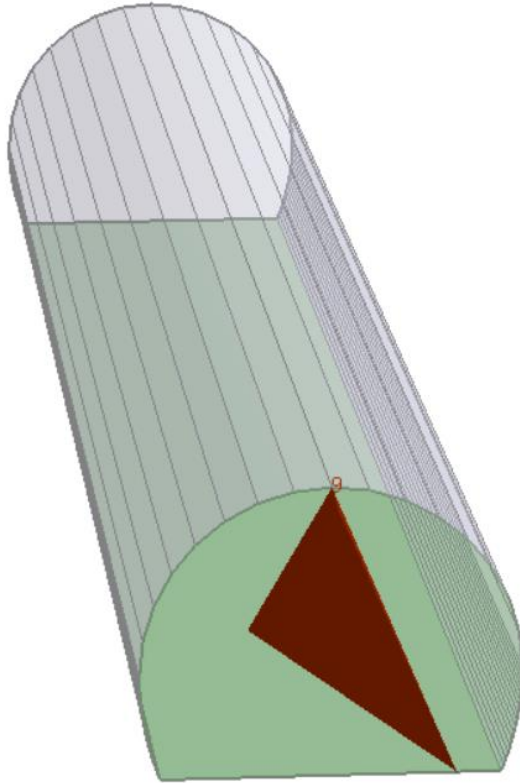
Date

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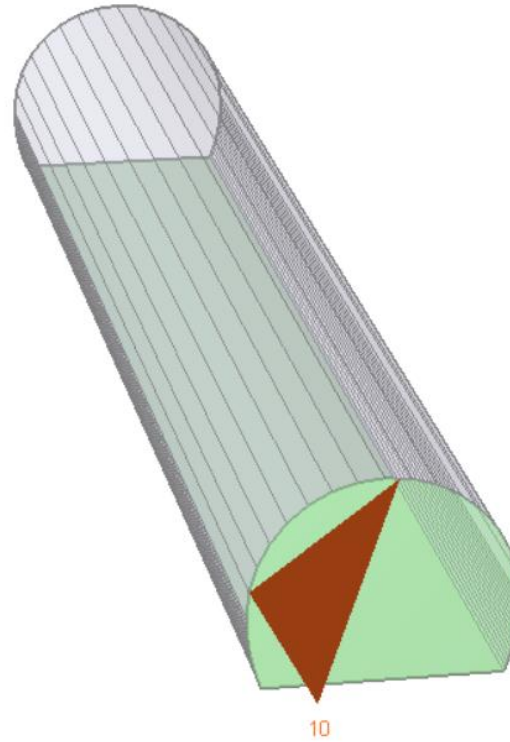
File Name

R-3.weg

Near End wedge [9]
FS: 4.237



Far End wedge [10]
FS: stable



Wedge Information

Near End wedge [9]

Factor of Safety: 4.237
Wedge Weight: 24.133 tonnes
Apex Height: 1.87 m

Far End wedge [10]

Factor of Safety: stable
Wedge Weight: 23.641 tonnes
Apex Height: 1.86 m

Weight: 24.133 tonnes, Apex Height: 1.87 m

Weight: 23.641 tonnes, Apex Height: 1.86 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-3 COMBINACIÓN JOINTS 1,2,4

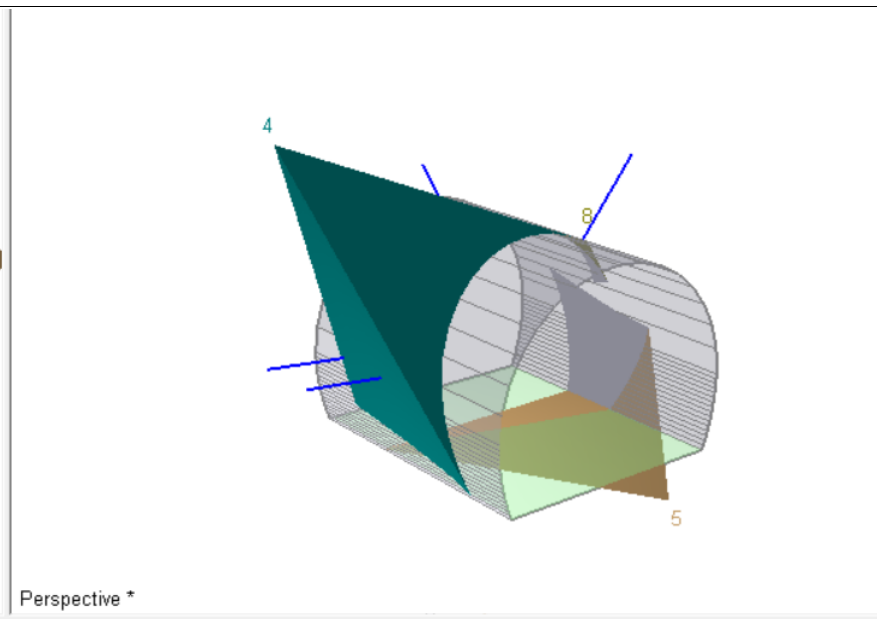
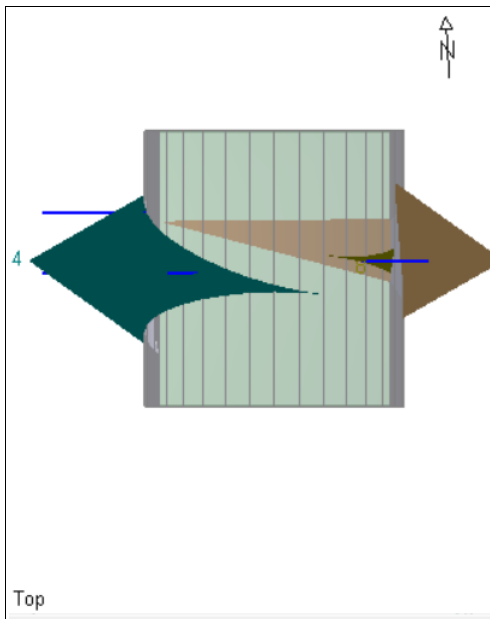
Drawn By Bach. ANGEL CHRISTOPHER SOTO VILCA

Company UNA - PUNO

Date Enero 2016, 8:43:56 a.m.

File Name R-3.weg





Wedge Information

Upper Left wedge [4]

Factor of Safety: 3.611

Wedge Weight: 138.062 tonnes

Apex Height: 8.16 m

Lower Right wedge [5]

Factor of Safety: stable

Wedge Weight: 106.674 tonnes

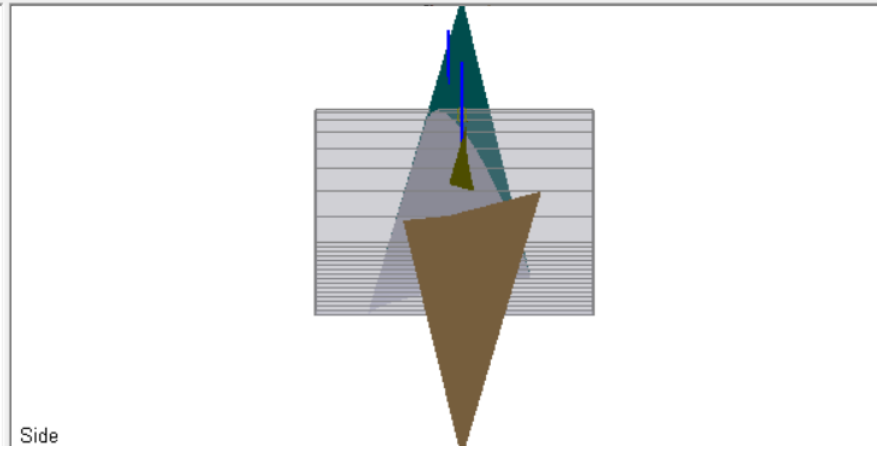
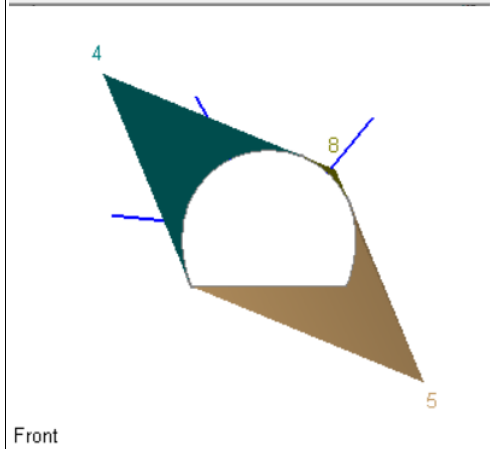
Apex Height: 6.91 m

Upper Right wedge [8]

Factor of Safety: 171.744

Wedge Weight: 0.308 tonnes

Apex Height: 0.39 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

DISEÑO DE SOSTENIMIENTO ZONA R-3 COMBINACIÓN JOINT 1,3,4

Analysis Description

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

Date

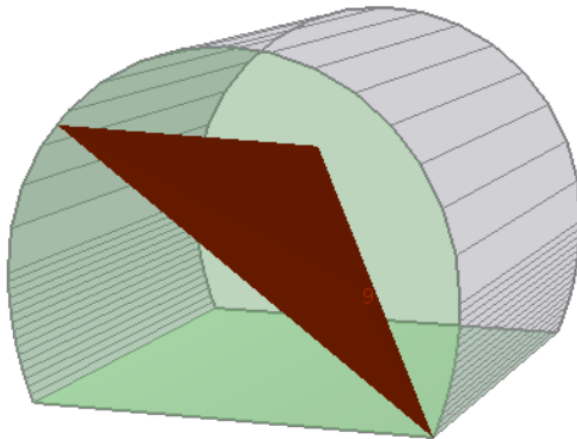
Enero 2016, 4:15:17 p.m.

File Name

R-3.weg

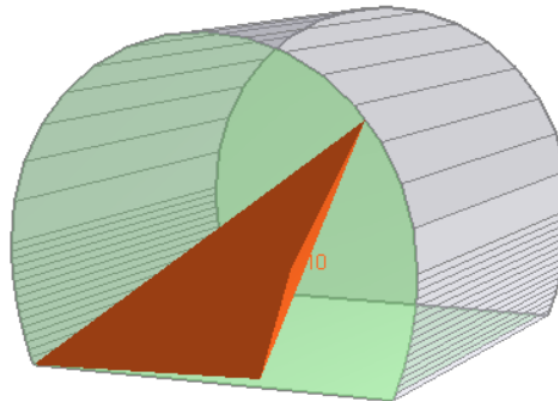


Near End wedge [9]
FS: 8.988



Weight: 11.258 tonnes, Apex Height: 0.77 m

Far End wedge [10]
FS: 9.292



Weight: 11.258 tonnes, Apex Height: 0.77 m

Wedge Information

Near End wedge [9]
Factor of Safety: 8.988
Wedge Weight: 11.258 tonnes
Apex Height: 0.77 m

Far End wedge [10]
Factor of Safety: 9.292
Wedge Weight: 11.258 tonnes
Apex Height: 0.77 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description DISEÑO DE SOSTENIMIENTO FALLA PLANAR ZONA R-3 COMBINACIÓN JOINTS 1,3,4

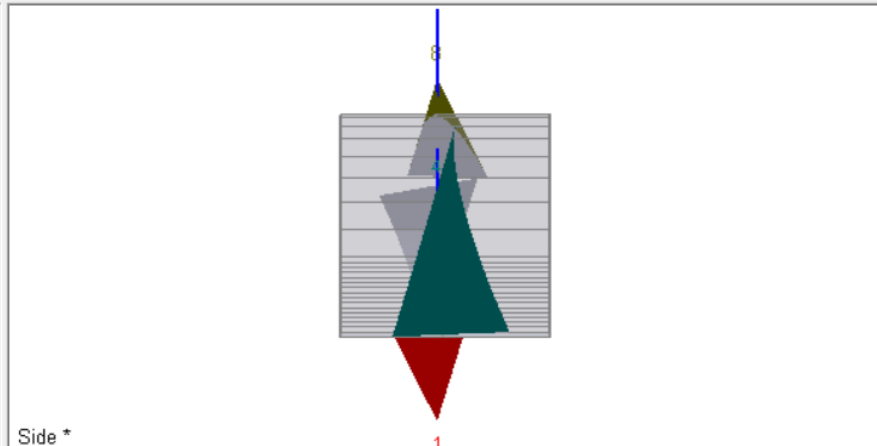
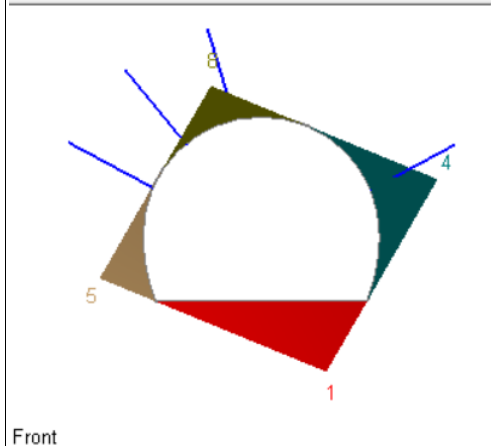
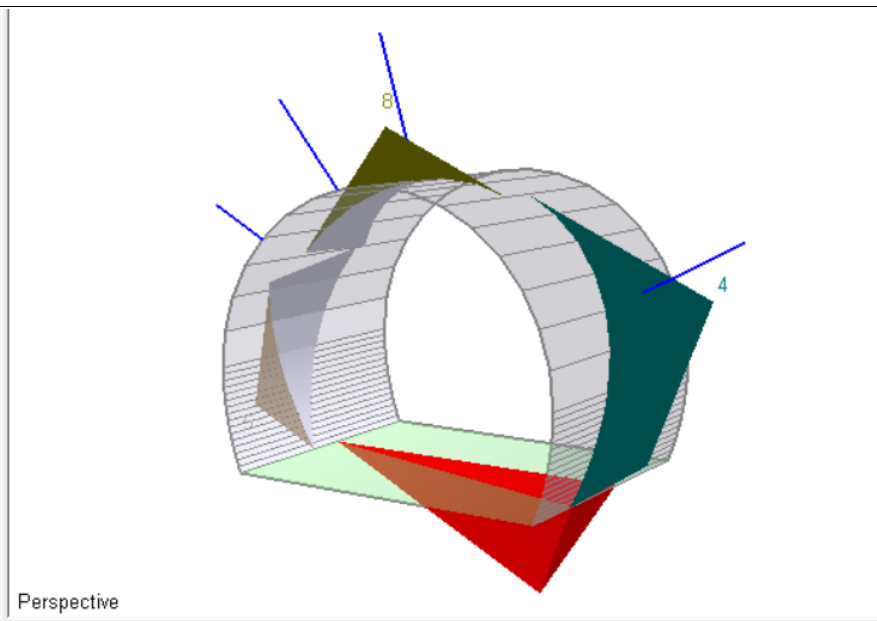
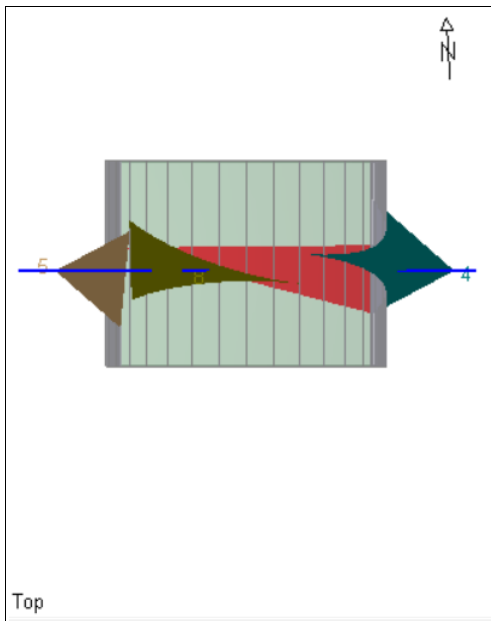
Drawn By Bach. ANGEL CHRISTOPHER SOTO VILCA

Company UNA - PUNO

Date Enero 2016, 12:14:15 p.m.

File Name R-3.weg





Wedge Information

Floor wedge [1]

Factor of Safety: stable
 Wedge Weight: 27.626 tonnes
 Apex Height: 2.92 m

Lower Right wedge [4]

Factor of Safety: 4.936
 Wedge Weight: 23.053 tonnes
 Apex Height: 2.77 m

Lower Left wedge [5]

Factor of Safety: 28.133
 Wedge Weight: 9.229 tonnes
 Apex Height: 1.96 m

Upper Left wedge [8]

Factor of Safety: 9.923
 Wedge Weight: 6.825 tonnes
 Apex Height: 1.63 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS



Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-3 COMBINACIÓN JOINT 2,3,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

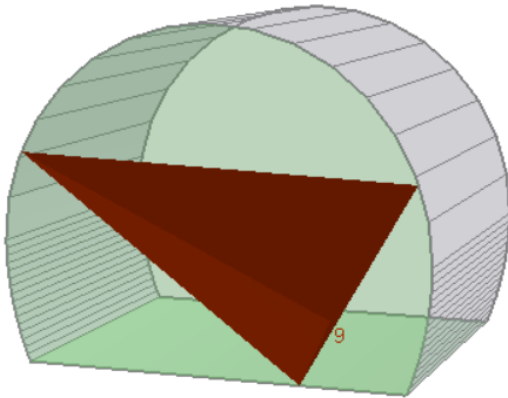
Date

Enero 2016, 5:10:57 p.m.

File Name

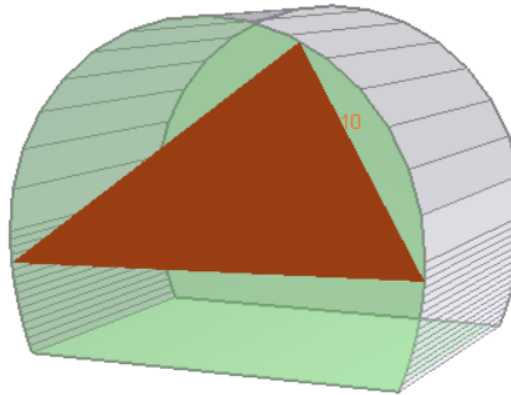
R-3.weg

Near End wedge [9]
FS: 9.024



Weight: 15.945 tonnes, Apex Height: 0.86 m

Far End wedge [10]
FS: 5.985



Weight: 20.032 tonnes, Apex Height: 0.92 m

Wedge Information

Near End wedge [9]

Factor of Safety: 9.024
Wedge Weight: 15.945 tonnes
Apex Height: 0.86 m

Far End wedge [10]

Factor of Safety: 5.985
Wedge Weight: 20.032 tonnes
Apex Height: 0.92 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

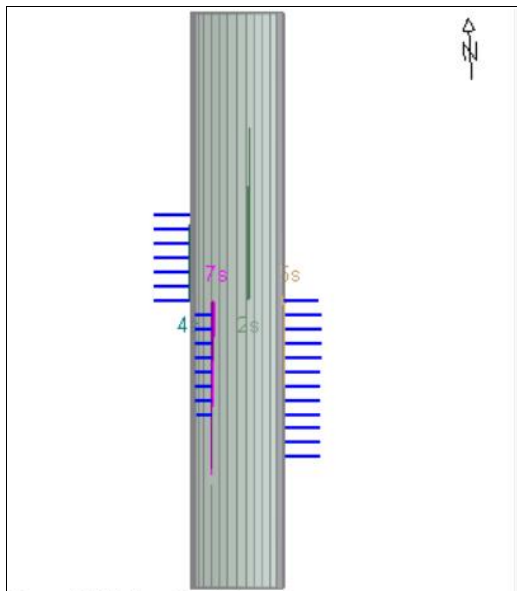
Analysis Description SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-3 COMBINACIÓN JOINTS 2,3,4

Drawn By Bach. ANGEL CHRISTOPHER SOTO VILCA

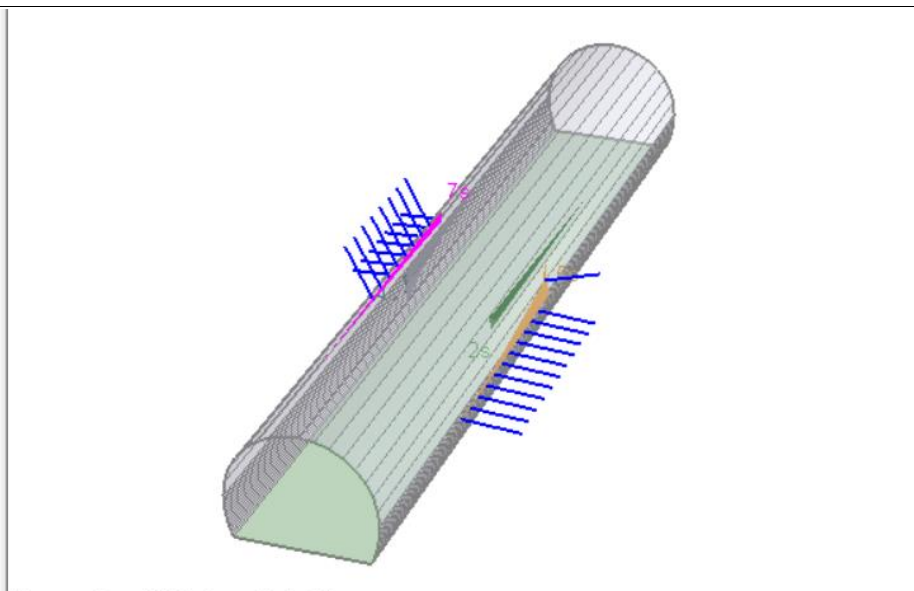
Company UNA - PUNO

Date Enero 2016, 3:12.56 p.m.

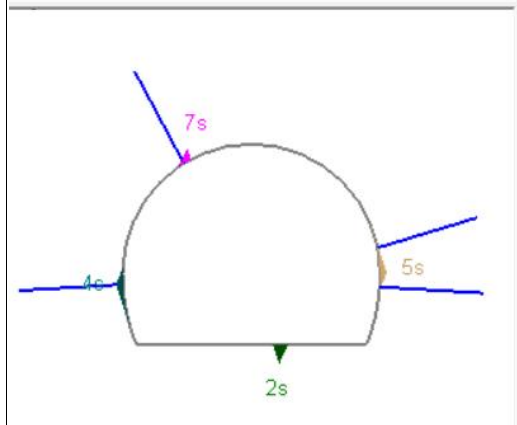
File Name R-3.weg



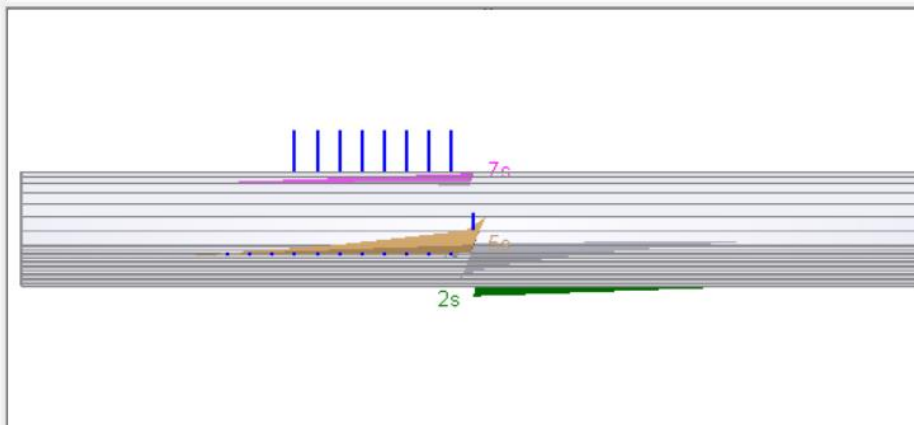
Top - All Wedges Scaled



Perspective - All Wedges Scaled *



Front - All Wedges Scaled



Side - All Wedges Scaled

Wedge Information

Floor wedge [2]

Factor of Safety: 103.210
 Wedge Weight: 3.717 tonnes
 Apex Height: 0.71 m

Lower Left wedge [4]

Factor of Safety: 22.030
 Wedge Weight: 3.213 tonnes
 Apex Height: 0.27 m

Lower Right wedge [5]

Factor of Safety: 37.172
 Wedge Weight: 2.896 tonnes
 Apex Height: 0.25 m

Upper Left wedge [7]

Factor of Safety: 40.089
 Wedge Weight: 2.570 tonnes
 Apex Height: 0.49 m

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FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE - ZONA R-4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

Date

Enero 2016, 12:13:12 p.m.

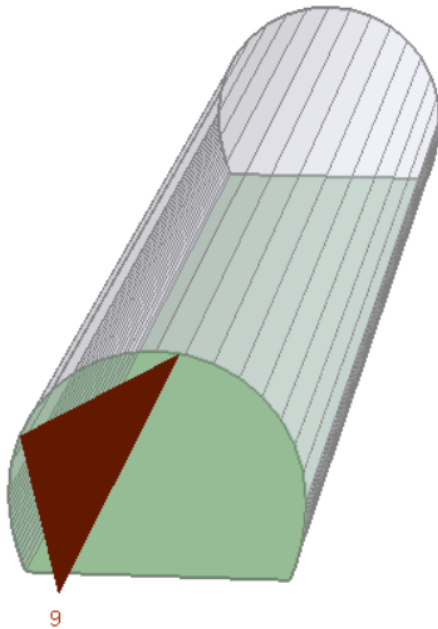
File Name

R-4.weg



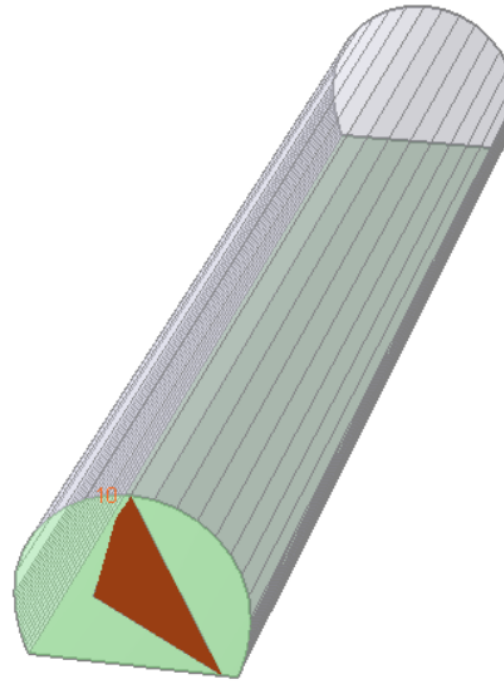
Near End wedge [9]
FS: 251.121

Zoom In (F5)



Weight: 28.961 tonnes, Apex Height: 2.18 m

Far End wedge [10]
FS: 3.907



Weight: 29.842 tonnes, Apex Height: 2.20 m

Wedge Information

Near End wedge [9]

Factor of Safety: 251.121
Wedge Weight: 28.961 tonnes
Apex Height: 2.18 m

Far End wedge [10]

Factor of Safety: 3.907
Wedge Weight: 29.842 tonnes
Apex Height: 2.20 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS



Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

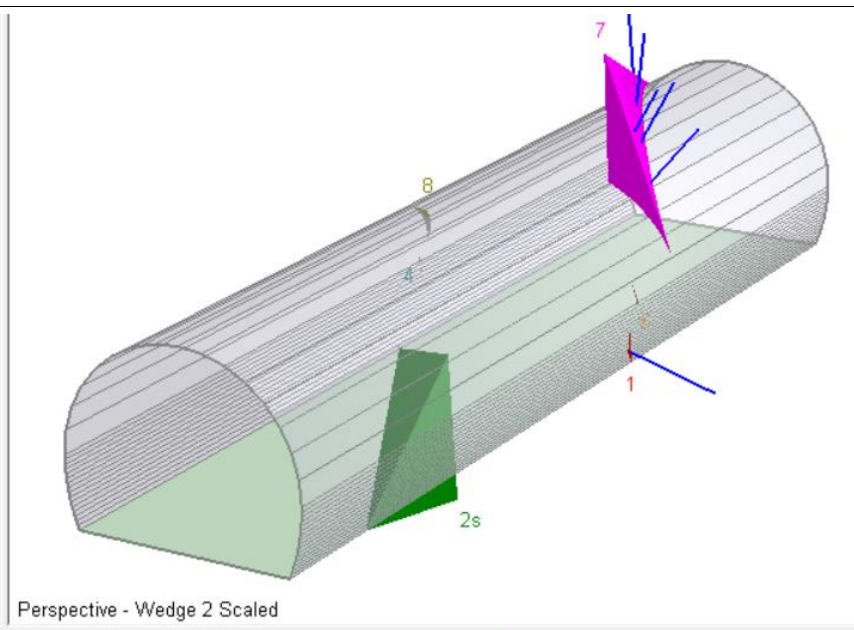
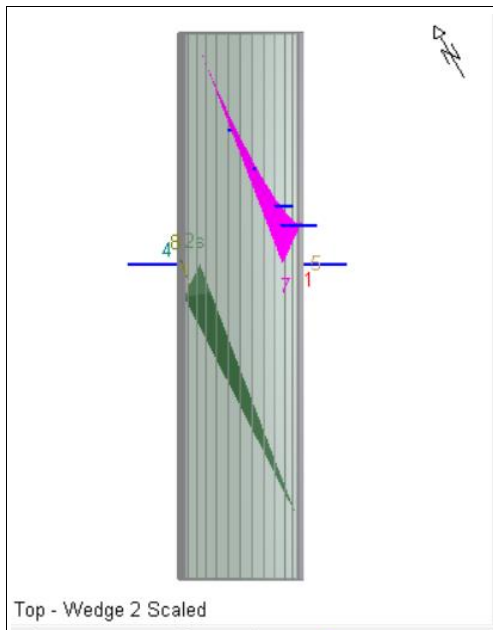
UNA - PUNO

Date

Enero 2016, 3:54:43 p.m.

File Name

R-4.weg



Wedge Information

Lower Right wedge [1]

Factor of Safety: 2321.441
 Wedge Weight: 0.032 tonnes
 Apex Height: 0.18 m

Floor wedge [2]

Factor of Safety: stable
 Wedge Weight: 126.704 tonnes
 Apex Height: 7.24 m

Lower Left wedge [4]

Factor of Safety: 1425.399
 Wedge Weight: 0.004 tonnes
 Apex Height: 0.06 m

Lower Right wedge [5]

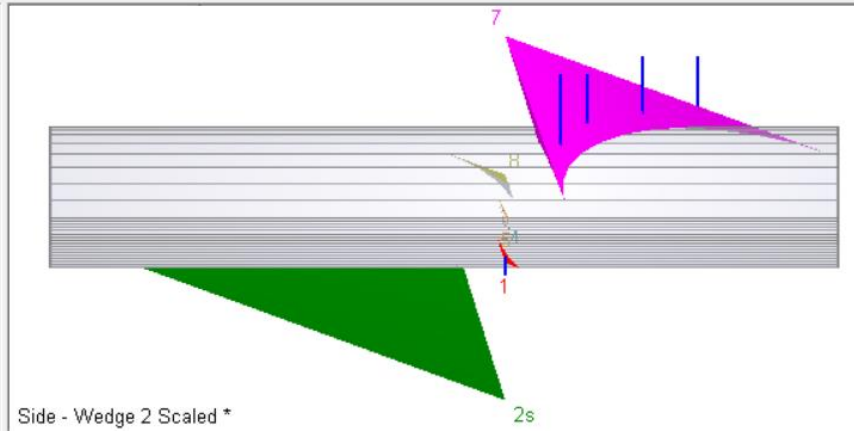
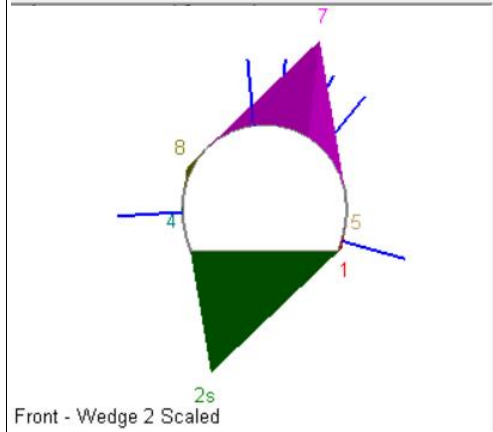
Factor of Safety: 1022.178
 Wedge Weight: 0.006 tonnes
 Apex Height: 0.06 m

Roof wedge [7]

Factor of Safety: 4.711
 Wedge Weight: 57.786 tonnes
 Apex Height: 5.58 m

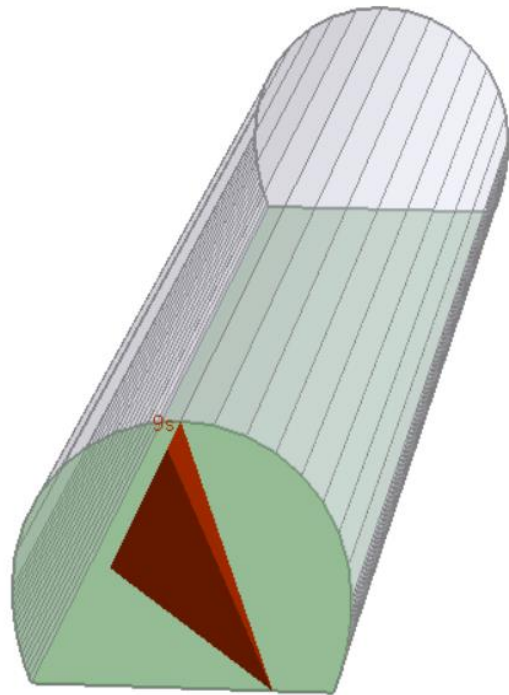
Upper Left wedge [8]

Factor of Safety: 180.331
 Wedge Weight: 0.132 tonnes
 Apex Height: 0.32 m



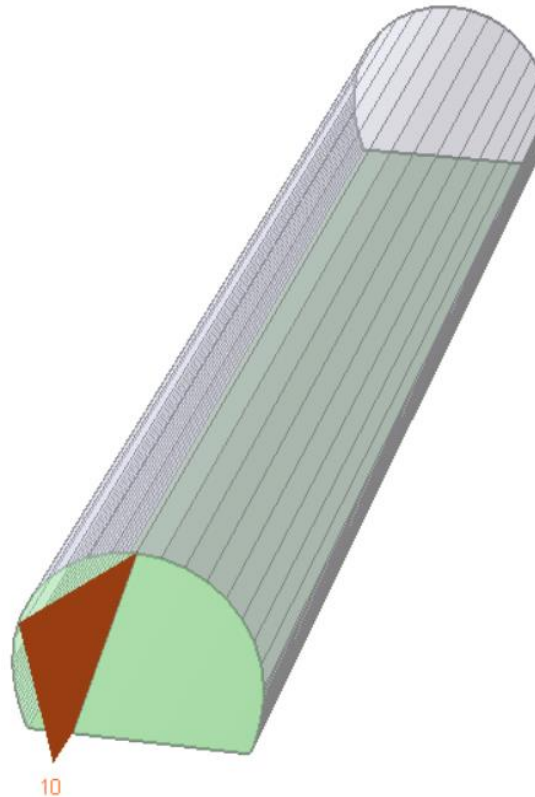
UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO			
FACULTAD DE INGENIERIA DE MINAS			
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-5 COMBINACIÓN JOINT 1,2,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 12:34:54 p.m.	<i>File Name</i>	R-5.weg

Near End wedge [9] Scaled
FS: 3.415



Weight: 32.700 tonnes, Apex Height: 2.67 m

Far End wedge [10]
FS: stable



Weight: 32.638 tonnes, Apex Height: 2.67 m

Wedge Information

Near End wedge [9]

Factor of Safety: 3.415
Wedge Weight: 32.700 tonnes
Apex Height: 2.67 m

Far End wedge [10]

Factor of Safety: stable
Wedge Weight: 32.638 tonnes
Apex Height: 2.67 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-4 COMBINACIÓN JOINTS 1,2,4

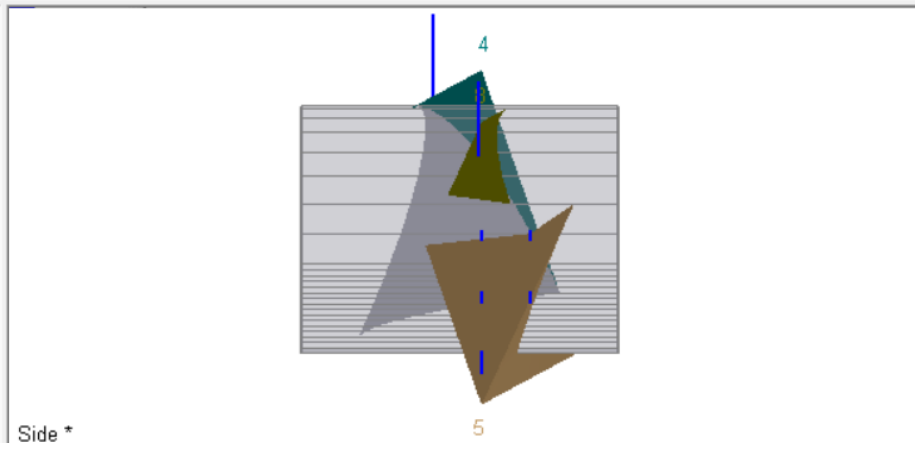
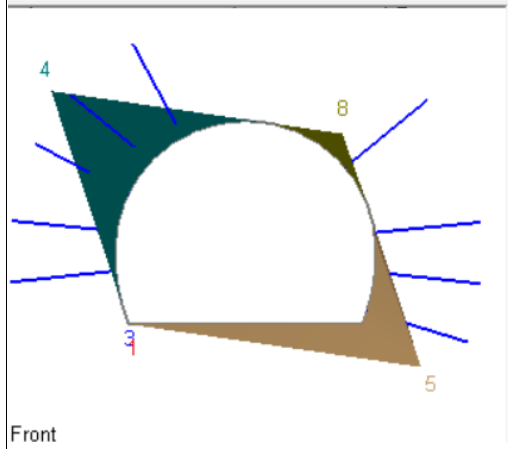
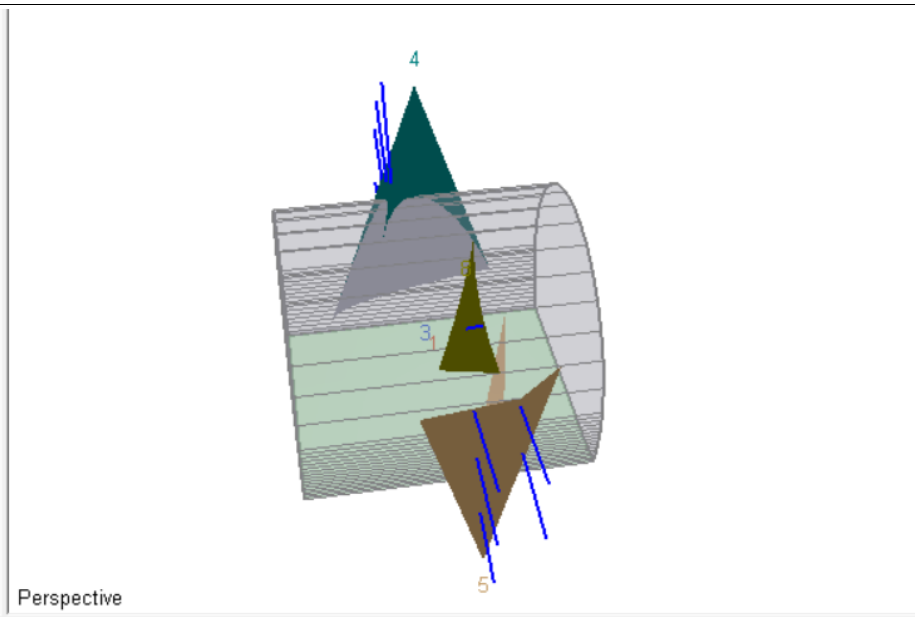
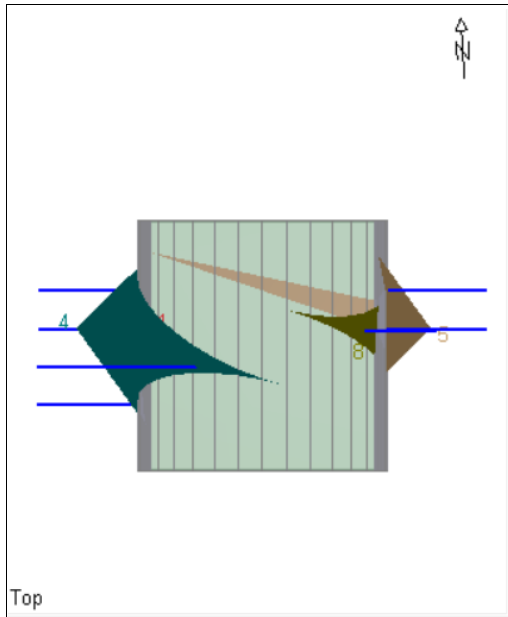
Drawn By Bach. ANGEL CHRISTOPHER SOTO VILCA

Company UNA - PUNO

Date Enero 2016, 2:35:35 p.m.

File Name R-4.weg





Wedge Information

Lower Left wedge [1]

Factor of Safety: 42033.620
 Wedge Weight: 0.000 tonnes
 Apex Height: 0.01 m

Lower Left wedge [3]

Factor of Safety: 8027.084
 Wedge Weight: 0.000 tonnes
 Apex Height: 0.00 m

Upper Left wedge [4]

Factor of Safety: 5.083
 Wedge Weight: 64.295 tonnes
 Apex Height: 4.60 m

Lower Right wedge [5]

Factor of Safety: stable
 Wedge Weight: 23.888 tonnes
 Apex Height: 2.75 m

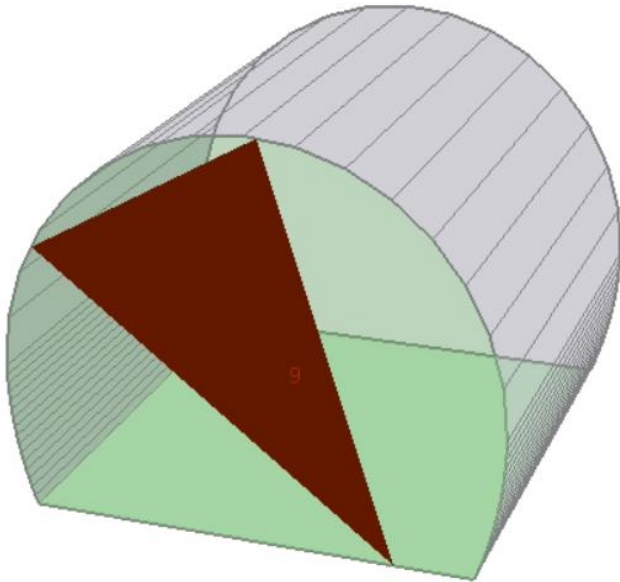
Upper Right wedge [8]

Factor of Safety: 37.409
 Wedge Weight: 1.873 tonnes
 Apex Height: 0.84 m

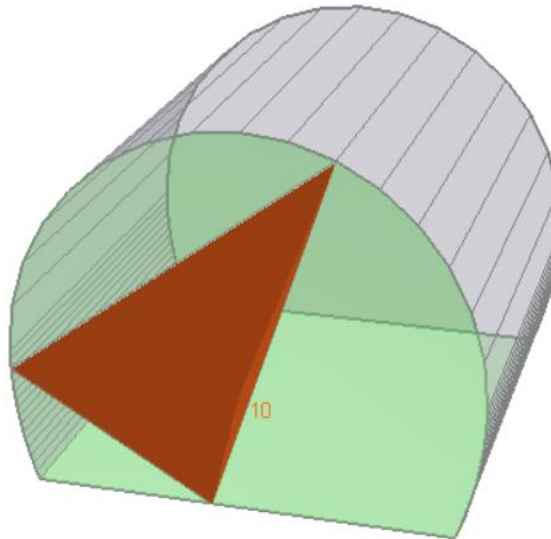


UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO			
FACULTAD DE INGENIERIA DE MINAS			
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-4 COMBINACIÓN JOINT 1,3,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 9:34:54 a.m.	<i>File Name</i>	R-4.weg

Near End wedge [9]
FS: 4.373



Far End wedge [10]
FS: 5.840



Wedge Information

Near End wedge [9]

Factor of Safety: 4.373
Wedge Weight: 28.207 tonnes
Apex Height: 1.53 m

Far End wedge [10]

Factor of Safety: 5.840
Wedge Weight: 24.489 tonnes
Apex Height: 1.46 m

Weight: 28.207 tonnes, Apex Height: 1.53 m

Weight: 24.489 tonnes, Apex Height: 1.46 m

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FACULTAD DE INGENIERIA DE MINAS



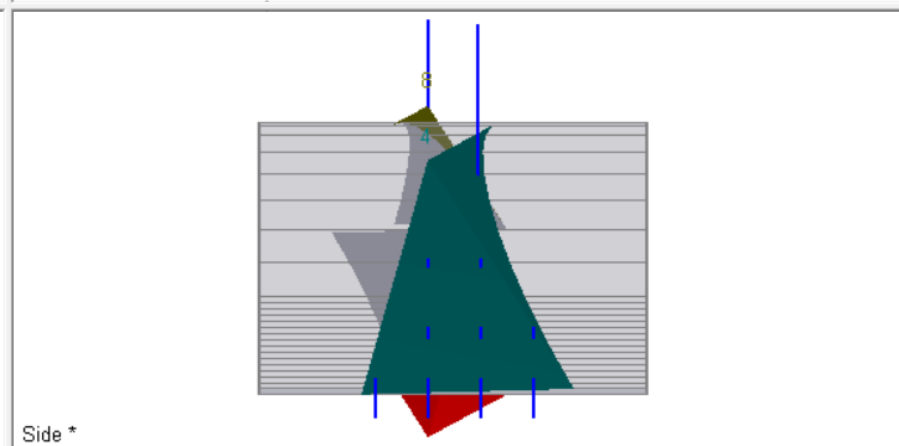
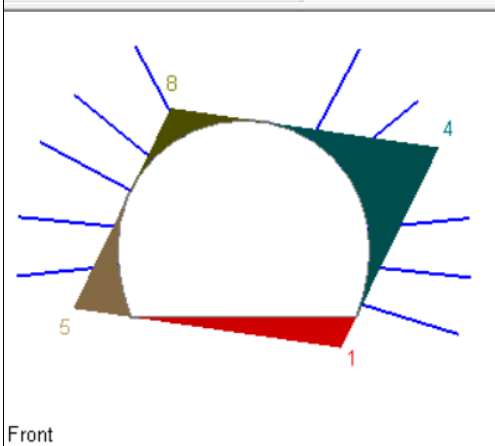
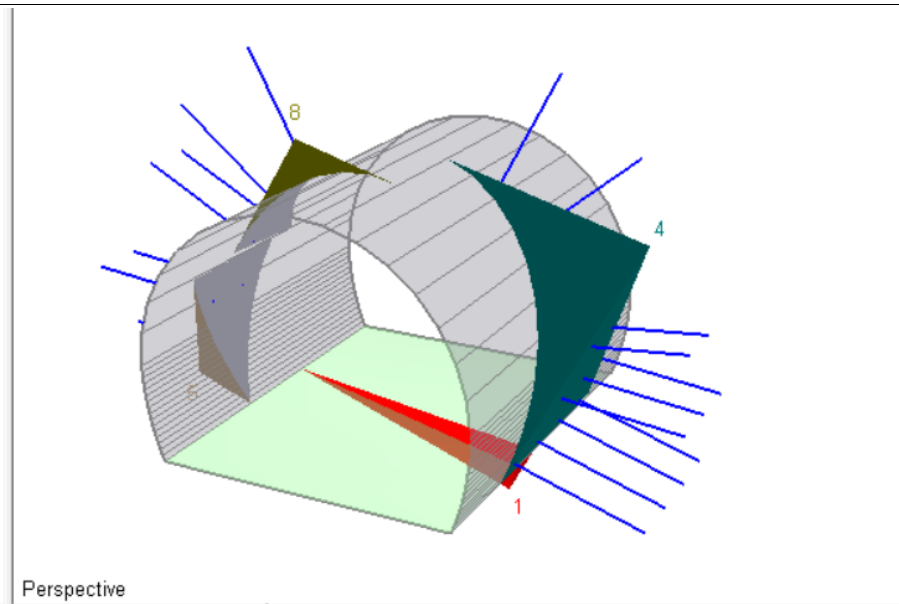
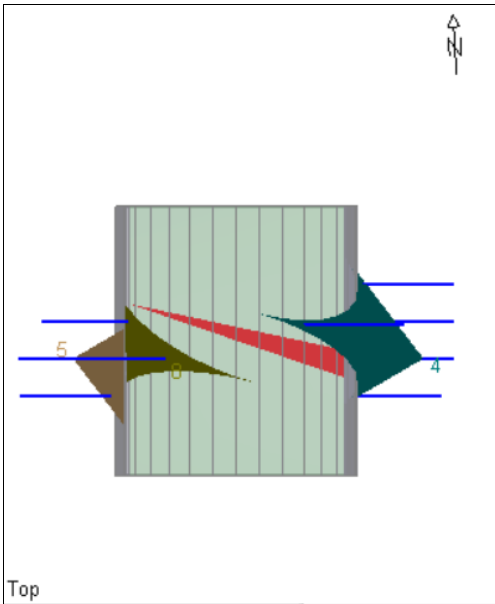
Analysis Description SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-4 COMBINACIÓN JOINTS 1,3,4

Drawn By Bach. ANGEL CHRISTOPHER SOTO VILCA

Company UNA - PUNO

Date Enero 2016, 10:15:16 p.m.

File Name R-4.weg



Wedge Information

- Floor wedge [1]
 Factor of Safety: stable
 Wedge Weight: 5.302 tonnes
 Apex Height: 1.20 m

- Upper Right wedge [4]
 Factor of Safety: 6.480
 Wedge Weight: 47.113 tonnes
 Apex Height: 3.63 m

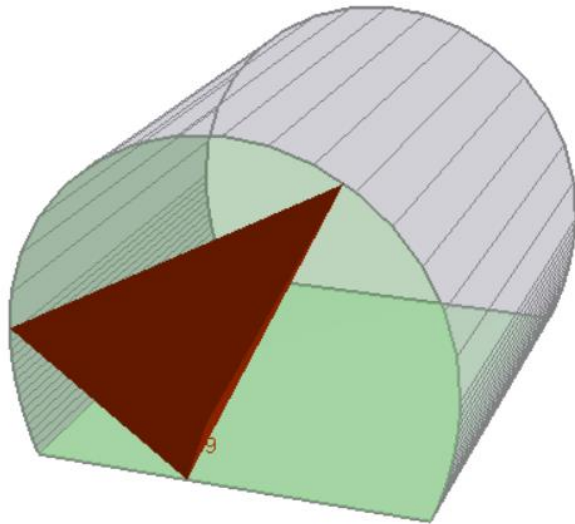
- Lower Left wedge [5]
 Factor of Safety: 125.622
 Wedge Weight: 11.252 tonnes
 Apex Height: 2.04 m

- Upper Left wedge [8]
 Factor of Safety: 28.343
 Wedge Weight: 4.254 tonnes
 Apex Height: 1.19 m

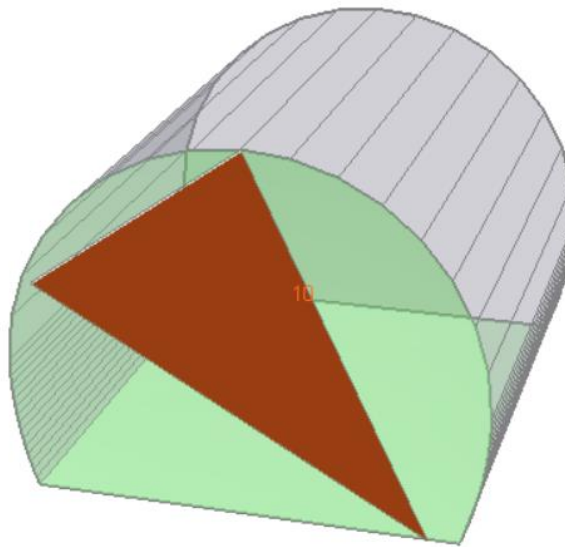


UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO			
FACULTAD DE INGENIERIA DE MINAS			
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-4 COMBINACIÓN JOINT 2,3,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 1:14:32 p.m.	<i>File Name</i>	R-4.weg

Near End wedge [9]
FS: 6.867



Far End wedge [10]
FS: 4.291



Wedge Information

Near End wedge [9]

Factor of Safety: 6.867
Wedge Weight: 23.326 tonnes
Apex Height: 1.37 m

Far End wedge [10]

Factor of Safety: 4.291
Wedge Weight: 31.016 tonnes
Apex Height: 1.51 m

Weight: 23.326 tonnes, Apex Height: 1.37 m

Weight: 31.016 tonnes, Apex Height: 1.51 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS



Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-4 COMBINACIÓN JOINTS 2,3,4

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

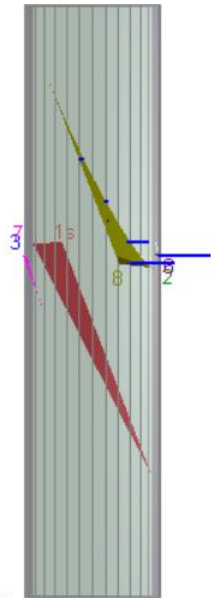
UNA - PUNO

Date

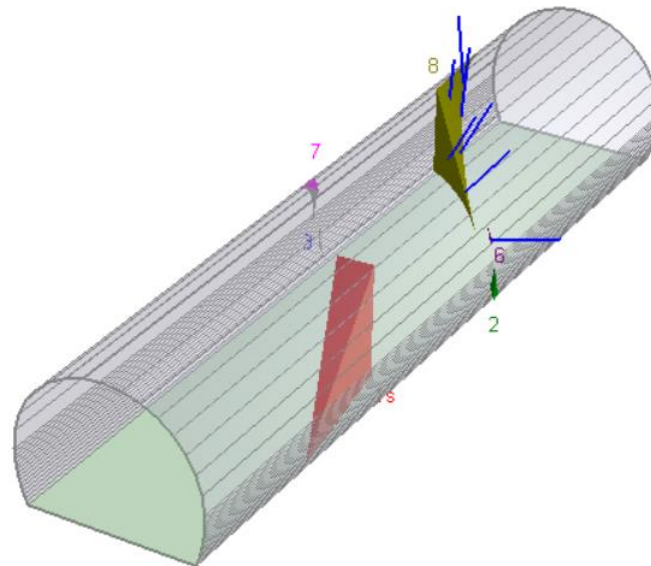
Enero 2016, 7:14:56 p.m.

File Name

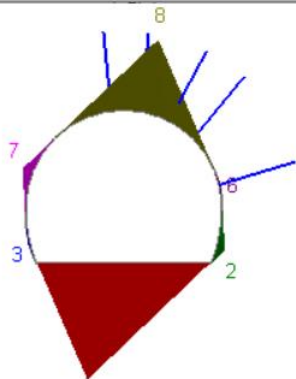
R-4.weg



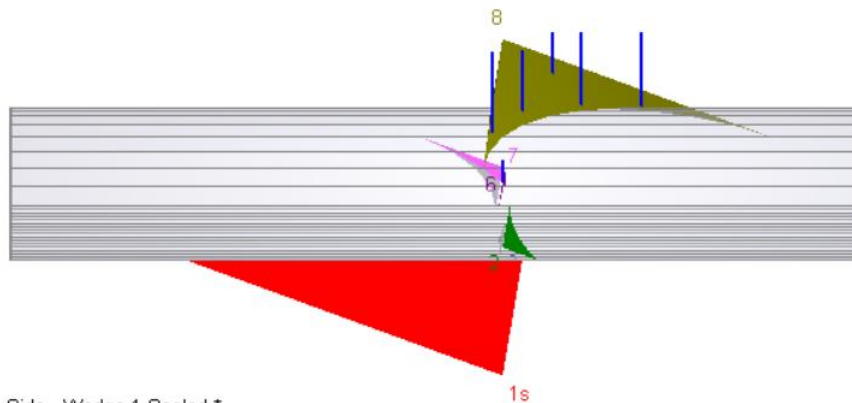
Top - Wedge 1 Scaled



Perspective - Wedge 1 Scaled



Front - Wedge 1 Scaled



Side - Wedge 1 Scaled *

Wedge Information

Floor wedge [1]

Factor of Safety: stable
Wedge Weight: 97.053 tonnes
Apex Height: 5.85 m

Lower Right wedge [2]

Factor of Safety: 212.335
Wedge Weight: 0.278 tonnes
Apex Height: 0.43 m

Lower Left wedge [3]

Factor of Safety: 331.904
Wedge Weight: 0.018 tonnes
Apex Height: 0.11 m

Upper Right wedge [6]

Factor of Safety: 485.850
Wedge Weight: 0.009 tonnes
Apex Height: 0.08 m

Upper Left wedge [7]

Factor of Safety: 56.692
Wedge Weight: 0.463 tonnes
Apex Height: 0.53 m

Roof wedge [8]

Factor of Safety: 4.132
Wedge Weight: 27.794 tonnes
Apex Height: 3.69 m

UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

FACULTAD DE INGENIERIA DE MINAS

Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE TIPO - ZONA R-5

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

UNA - PUNO

Date

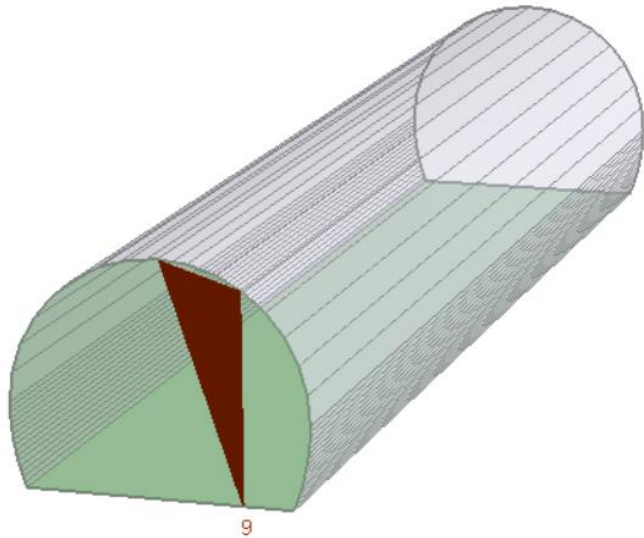
Enero 2016, 12:12:13 p.m.

File Name

R-5.weg

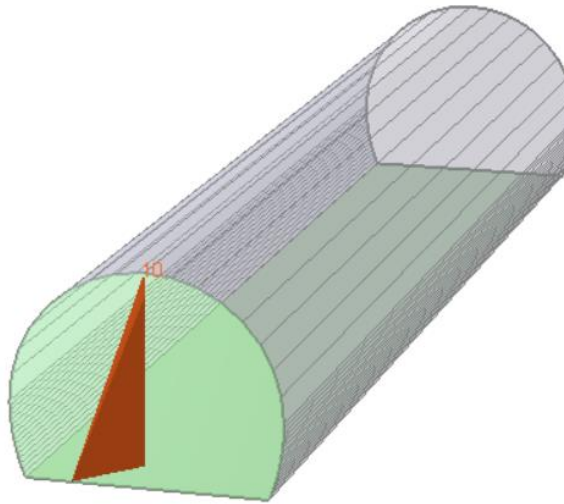


Near End wedge [9]
FS: 54.144



Weight: 9.096 tonnes, Apex Height: 1.09 m

Far End wedge [10]
FS: 7.776



Weight: 9.096 tonnes, Apex Height: 1.09 m

Wedge Information

Near End wedge [9]

Factor of Safety: 54.144
Wedge Weight: 9.096 tonnes
Apex Height: 1.09 m

Far End wedge [10]

Factor of Safety: 7.776
Wedge Weight: 9.096 tonnes
Apex Height: 1.09 m



UNIVERSIDAD NACIONAL DEL ALTIPLANO - PUNO

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Analysis Description

SOSTENIMIENTO CON PERNOS DE ANCLAJE FALLA PLANAR ZONA R-5

Drawn By

Bach. ANGEL CHRISTOPHER SOTO VILCA

Company

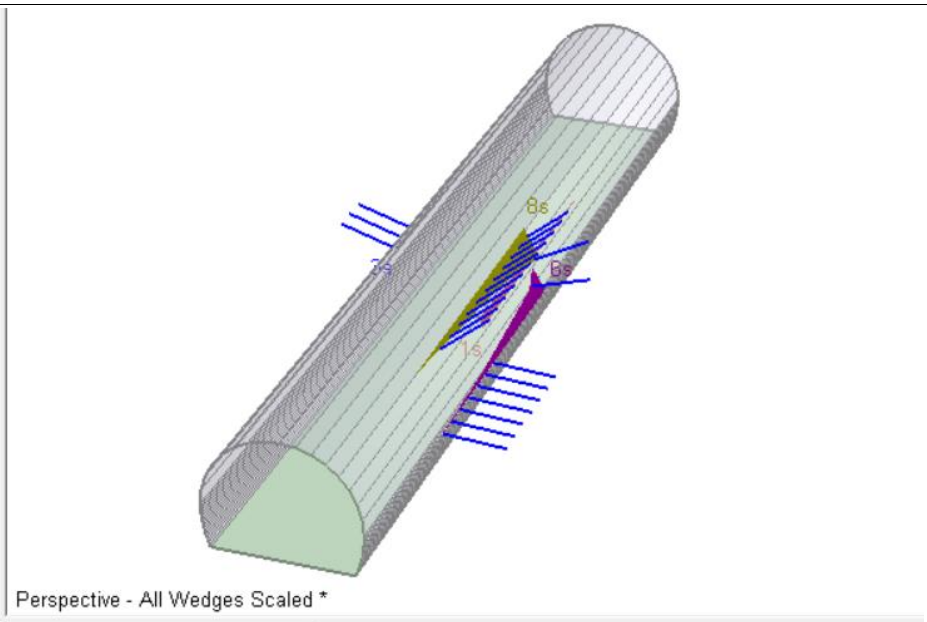
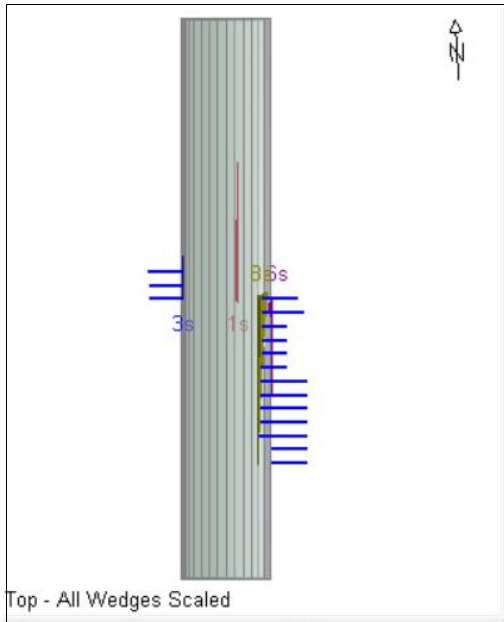
UNA - PUNO

Date

Enero 2016, 5:14:54 p.m.

File Name

R-5.weg



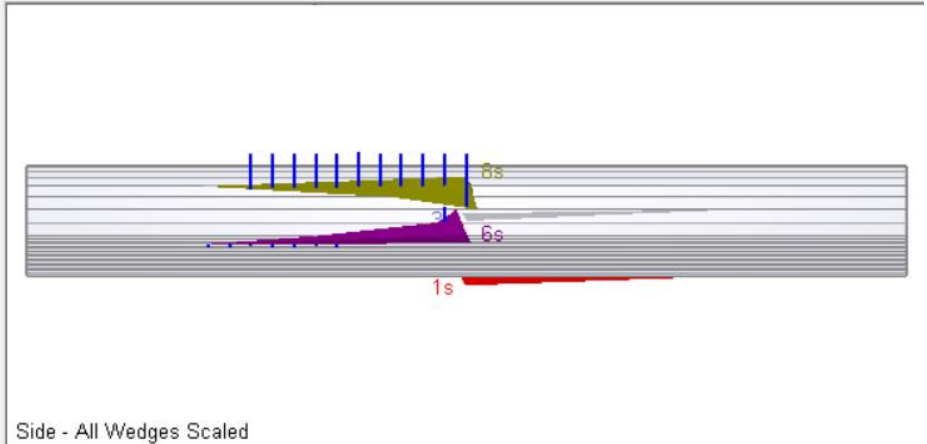
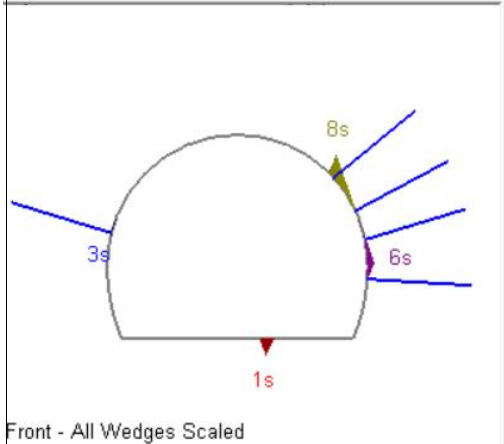
Wedge Information

Floor wedge [1]
 Factor of Safety: 103.444
 Wedge Weight: 3.433 tonnes
 Apex Height: 0.68 m

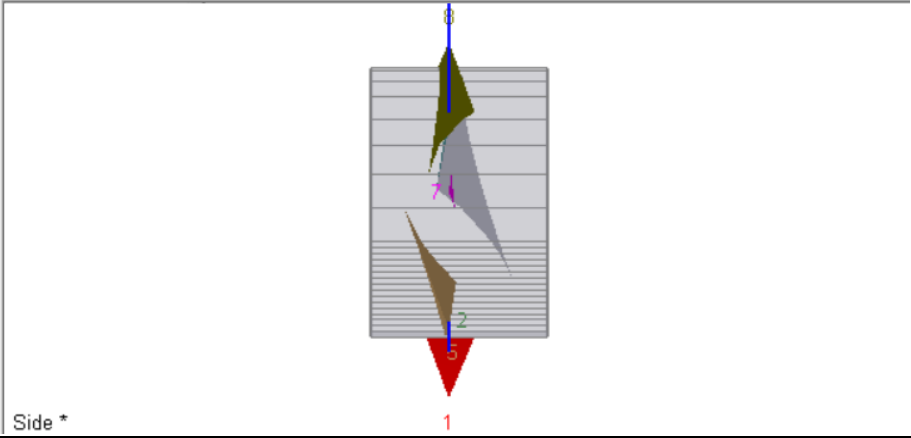
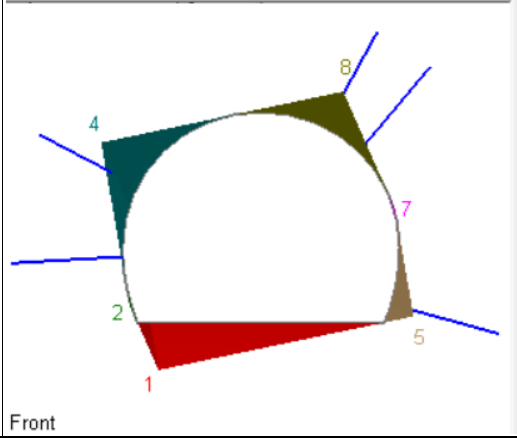
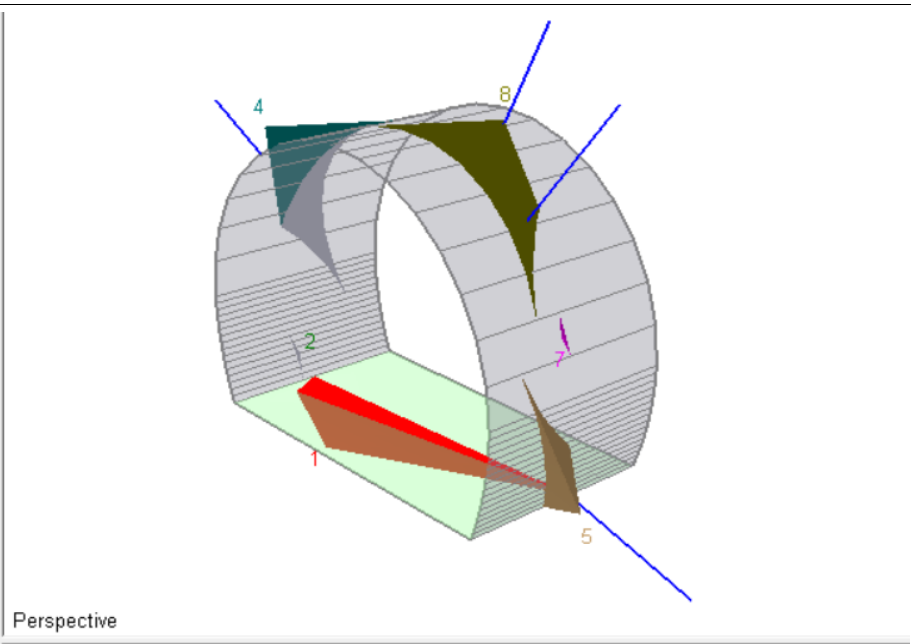
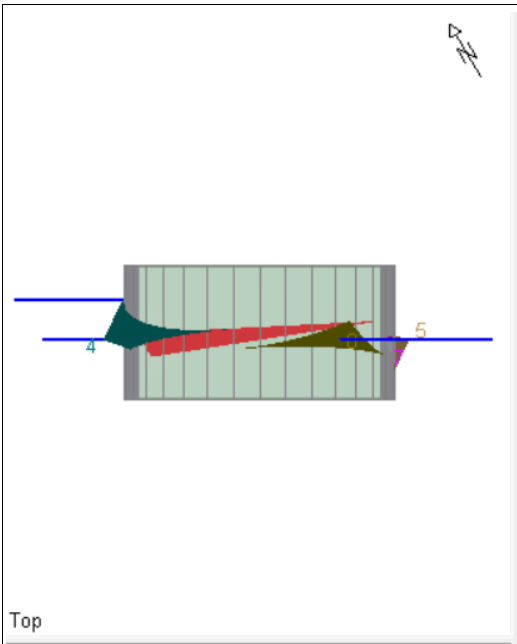
Upper Left wedge [3]
 Factor of Safety: 53.695
 Wedge Weight: 0.356 tonnes
 Apex Height: 0.07 m

Lower Right wedge [6]
 Factor of Safety: 11.685
 Wedge Weight: 3.246 tonnes
 Apex Height: 0.27 m

Upper Right wedge [8]
 Factor of Safety: 5.739
 Wedge Weight: 8.075 tonnes
 Apex Height: 0.69 m



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FACULTAD DE INGENIERIA DE MINAS			
<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-4 COMBINACIÓN JOINT 1,2,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 4:15:46 p.m.	<i>File Name</i>	R-4.weg



Wedge Information

Floor wedge [1]
 Factor of Safety: stable
 Wedge Weight: 6.283 tonnes
 Apex Height: 1.74 m

Lower Left wedge [2]
 Factor of Safety: 962.438
 Wedge Weight: 0.003 tonnes
 Apex Height: 0.05 m

Upper Left wedge [4]
 Factor of Safety: 6.914
 Wedge Weight: 5.064 tonnes
 Apex Height: 1.91 m

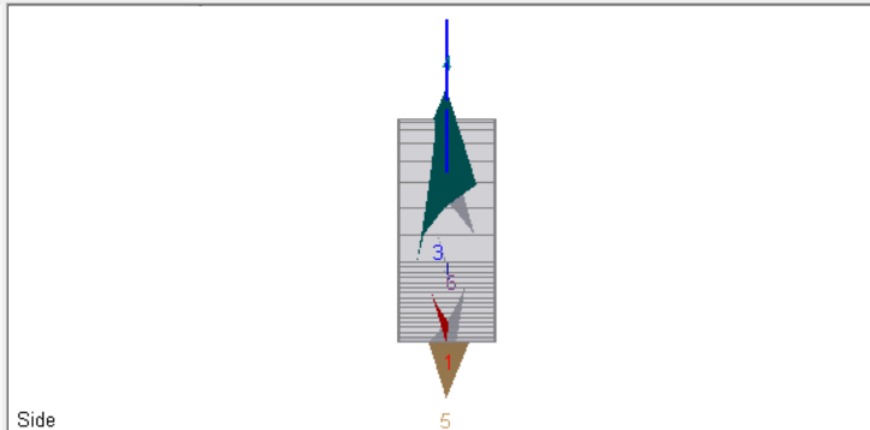
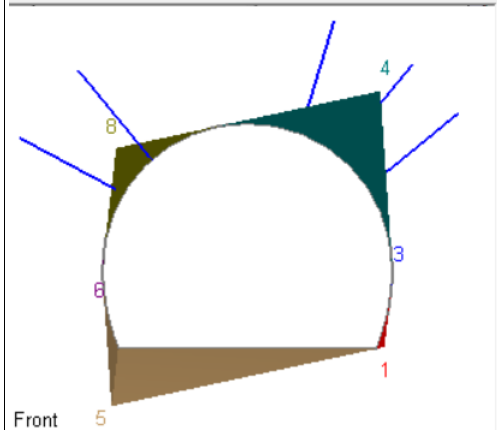
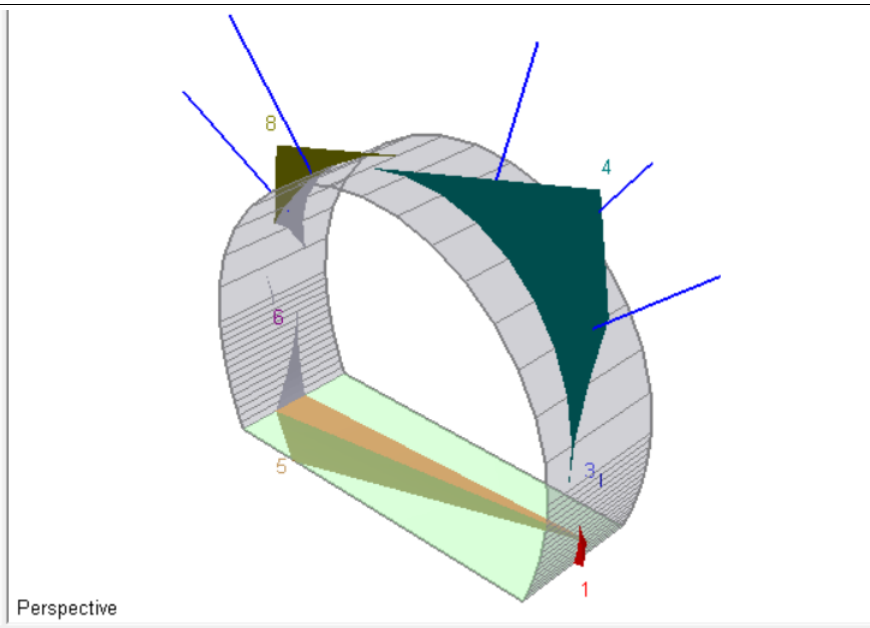
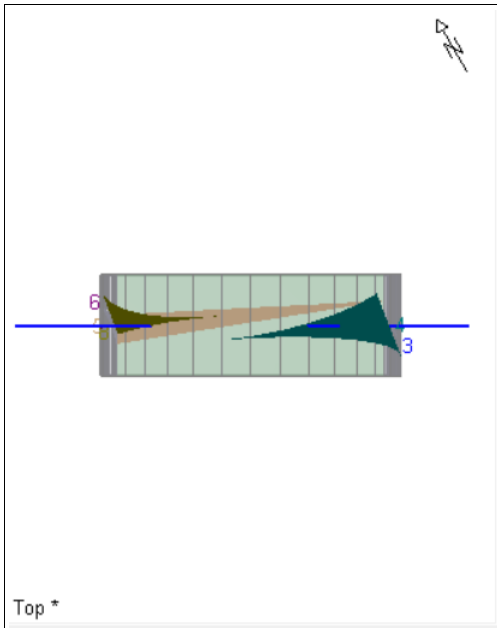
Lower Right wedge [5]
 Factor of Safety: 226.474
 Wedge Weight: 0.794 tonnes
 Apex Height: 0.89 m

Upper Right wedge [7]
 Factor of Safety: 256.740
 Wedge Weight: 0.003 tonnes
 Apex Height: 0.06 m

Upper Right wedge [8]
 Factor of Safety: 11.259
 Wedge Weight: 2.787 tonnes
 Apex Height: 1.48 m



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<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-5 COMBINACIÓN JOINT 1,3,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 3:14:15 p.m.	<i>File Name</i>	R-5.weg



Wedge Information

Lower Right wedge [1]
 Factor of Safety: 1395.884
 Wedge Weight: 0.040 tonnes
 Apex Height: 0.23 m

Lower Right wedge [3]
 Factor of Safety: 1905.564
 Wedge Weight: 0.000 tonnes
 Apex Height: 0.02 m

Upper Right wedge [4]
 Factor of Safety: 6.427
 Wedge Weight: 9.651 tonnes
 Apex Height: 2.62 m

Lower Left wedge [5]
 Factor of Safety: stable
 Wedge Weight: 7.944 tonnes
 Apex Height: 1.97 m

Lower Left wedge [6]
 Factor of Safety: 2691.444
 Wedge Weight: 0.001 tonnes
 Apex Height: 0.02 m

Upper Left wedge [8]
 Factor of Safety: 14.138
 Wedge Weight: 1.659 tonnes
 Apex Height: 1.13 m



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<i>Analysis Description</i>		SOSTENIMIENTO CON PERNOS DE ANCLAJE ZONA R-5 COMBINACIÓN JOINT 2,3,4	
<i>Drawn By</i>	Bach. ANGEL CHRISTOPHER SOTO VILCA	<i>Company</i>	UNA - PUNO
<i>Date</i>	Enero 2016, 10:45:32 a.m.	<i>File Name</i>	R-5.weg

