



# 22420 US 550\_PCCP on Clay\_FINAL\_24

File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx



## Design Properties

### JPCP Design Properties

Structure - ICM Properties	
PCC surface shortwave absorptivity	0.85

Doweled Joints	
Is joint doweled ?	True
Dowel diameter (in)	1.25
Dowel spacing (in)	12.00

Tied Shoulders	
Tied shoulders	True
Load transfer efficiency (%)	50.00

PCC joint spacing (ft)	
Is joint spacing random ?	False
Joint spacing (ft)	15.00

Widened Slab	
Is slab widened ?	True
Slab width (ft)	13.00

PCC-Base Contact Friction	
PCC-Base full friction contact	True
Months until friction loss	360.00

Sealant type	Other(Including No Sealant... Liquid... Silicone)
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Erodibility index	4
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Permanent curl/warp effective temperature difference (°F)	-10.00
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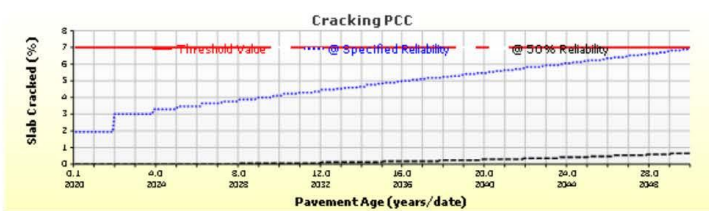
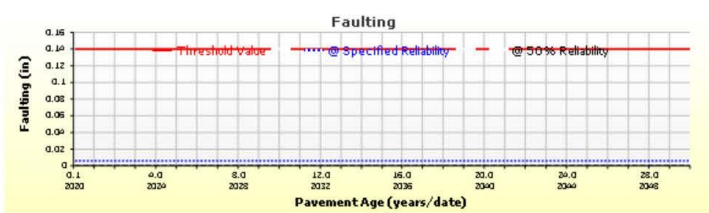


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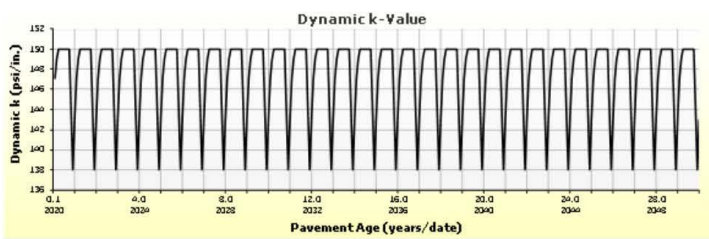
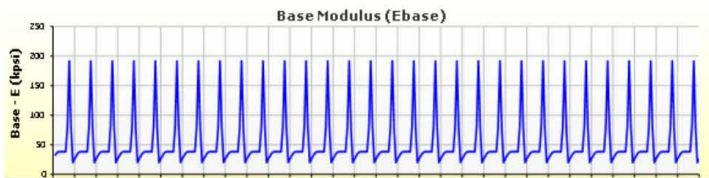
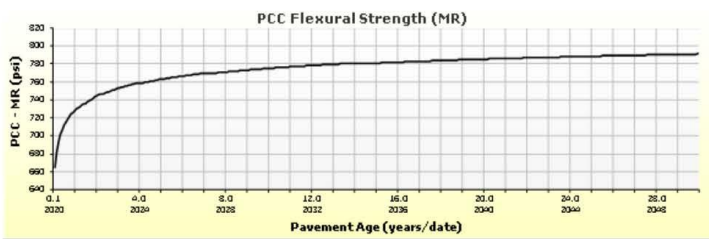
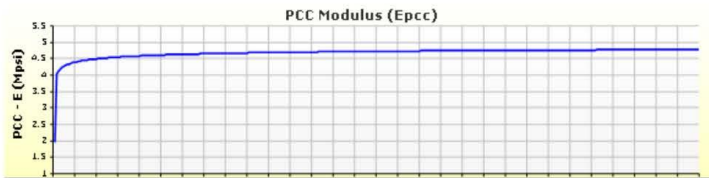
## Analysis Output Charts





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Report generated on:  
10/22/2018 9:46 AM

Version: 2.3.1-  
hotfix-

Created by:  
on: 8/5/2016 12:00 AM

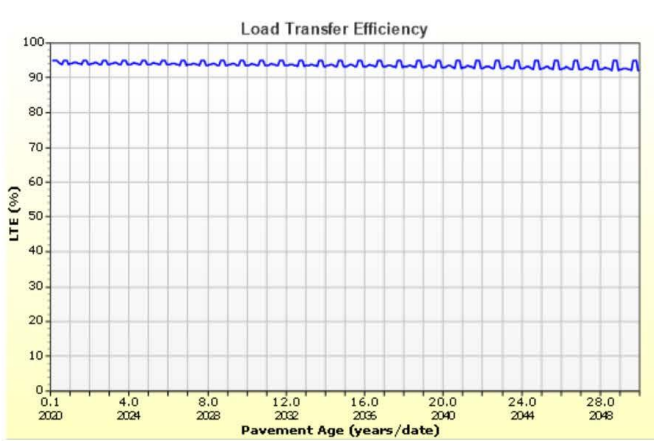
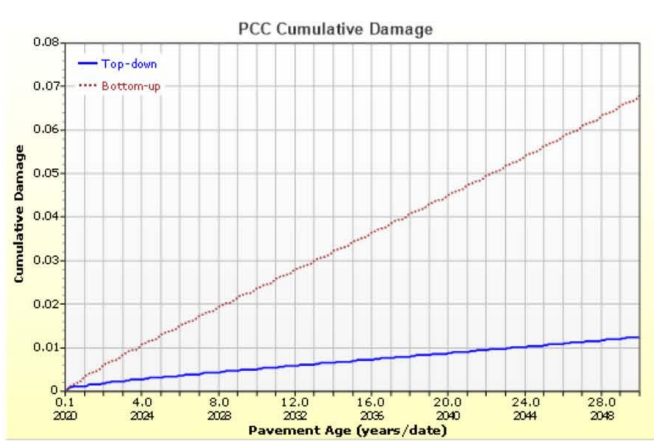
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on: 8/5/2016 12:00 AM

Page 9 of 15



# 22420 US 550\_PCCP on Clay\_FINAL\_24

File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx







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## Layer Information

### Layer 1 PCC : R5 Level 1 Lawson

PCC	
Thickness (in)	8.5
Unit weight (pcf)	140.8
Poisson's ratio	0.2

Thermal	
PCC coefficient of thermal expansion (in/in/°F x 10 <sup>^-6</sup> )	4.84
PCC thermal conductivity (BTU/hr-ft-°F)	1.25
PCC heat capacity (BTU/lb-°F)	0.28

Mix		
Cement type	Type I (1)	
Cementitious material content (lb/yd <sup>3</sup> )	600	
Water to cement ratio	0.44	
Aggregate type	Granite (3)	
PCC zero-stress temperature (°F)	Calculated Internally?	True
	User Value	-
	Calculated Value	81.8
Ultimate shrinkage (microstrain)	Calculated Internally?	True
	User Value	-
	Calculated Value	675.5
Reversible shrinkage (%)	50	
Time to develop 50% of ultimate shrinkage (days)	35	
Curing method	Curing Compound	

### PCC strength and modulus (Input Level: 3)

28-Day PCC modulus of rupture (psi)	650.0
28-Day PCC elastic modulus (psi)	3930000.0

### Identifiers

Field	Value
Display name/identifier	R5 Level 1 Lawson
Description of object	Mix ID # 2008196
Author	CDOT
Date Created	4/3/2013 12:00:00 AM
Approver	CDOT
Date approved	4/3/2013 12:00:00 AM
State	Colorado
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	Region 5
User defined field 2	
User defined field 3	
Revision Number	4



# 22420 US 550\_PCCP on Clay\_FINAL\_24

File Name: C:\Users\kempb\Documents\Projects\22420\_550\_160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx



## Layer 2 Non-stabilized Base : ABC Class 6

Unbound	
Layer thickness (in)	4.0
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

### Modulus (Input Level: 3)

<b>Analysis Type:</b>	Modify input values by temperature/moisture
<b>Method:</b>	Resilient Modulus (psi)

Resilient Modulus (psi)
25000.0

<b>Use Correction factor for NDT modulus?</b>	-
<b>NDT Correction Factor:</b>	-

### Identifiers

Field	Value
Display name/identifier	ABC Class 6
Description of object	Default material
Author	AASHTO
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

### Sieve

<b>Liquid Limit</b>	6.0
<b>Plasticity Index</b>	1.0
<b>Is layer compacted?</b>	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.7
Saturated hydraulic conductivity (ft/hr)	False	5.054e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.4

### User-defined Soil Water Characteristic Curve (SWCC)

<b>Is User Defined?</b>	False
<b>af</b>	7.2555
<b>bf</b>	1.3328
<b>cf</b>	0.8242
<b>hr</b>	117.4000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	8.7
#100	
#80	12.9
#60	
#50	
#40	20.0
#30	
#20	
#16	
#10	33.8
#8	
#4	44.7
3/8-in.	57.2
1/2-in.	63.1
3/4-in.	72.7
1-in.	78.8
1 1/2-in.	85.8
2-in.	91.6
2 1/2-in.	
3-in.	
3 1/2-in.	97.6



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File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx

## Layer 3 Subgrade : A-1-b

Unbound	
Layer thickness (in)	24.0
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

### Modulus (Input Level: 3)

<b>Analysis Type:</b>	Modify input values by temperature/moisture
<b>Method:</b>	Resilient Modulus (psi)

Resilient Modulus (psi)
15000.0

<b>Use Correction factor for NDT modulus?</b>	-
<b>NDT Correction Factor:</b>	-

### Identifiers

Field	Value
Display name/identifier	A-1-b
Description of object	Default material
Author	AASHTO
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

### Sieve

<b>Liquid Limit</b>	11.0
<b>Plasticity Index</b>	1.0
<b>Is layer compacted?</b>	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	124.2
Saturated hydraulic conductivity (ft/hr)	False	2.303e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	9.1

### User-defined Soil Water Characteristic Curve (SWCC)

<b>Is User Defined?</b>	False
<b>af</b>	5.8206
<b>bf</b>	0.4621
<b>cf</b>	3.8497
<b>hr</b>	126.8000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	13.4
#100	
#80	20.8
#60	
#50	
#40	37.6
#30	
#20	
#16	
#10	64.0
#8	
#4	74.2
3/8-in.	82.3
1/2-in.	85.8
3/4-in.	90.8
1-in.	93.6
1 1/2-in.	96.7
2-in.	98.4
2 1/2-in.	
3-in.	
3 1/2-in.	99.4



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File Name: C:\Users\kempb\Documents\Projects\22420\_550\_160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx



## Layer 4 Subgrade : A-7-6

Unbound	
Layer thickness (in)	Semi-infinite
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

### Modulus (Input Level: 3)

<b>Analysis Type:</b>	Modify input values by temperature/moisture
<b>Method:</b>	Resilient Modulus (psi)

Resilient Modulus (psi)
6482.0

<b>Use Correction factor for NDT modulus?</b>	-
<b>NDT Correction Factor:</b>	-

### Identifiers

Field	Value
Display name/identifier	A-7-6
Description of object	Default material
Author	AASHTO
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	32

### Sieve

<b>Liquid Limit</b>	44.0
<b>Plasticity Index</b>	27.0
<b>Is layer compacted?</b>	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	99.7
Saturated hydraulic conductivity (ft/hr)	False	1.504e-05
Specific gravity of solids	False	2.7
Water Content (%)	False	21.7

### User-defined Soil Water Characteristic Curve (SWCC)

<b>Is User Defined?</b>	False
<b>af</b>	133.7378
<b>bf</b>	0.5319
<b>cf</b>	0.0500
<b>hr</b>	500.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	81.0
#100	
#80	93.0
#60	
#50	
#40	94.0
#30	
#20	
#16	
#10	98.0
#8	
#4	99.0
3/8-in.	100.0
1/2-in.	100.0
3/4-in.	100.0
1-in.	100.0
1 1/2-in.	100.0
2-in.	100.0
2 1/2-in.	
3-in.	
3 1/2-in.	100.0



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File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Clay\_FINAL\_24.dgpx



## Calibration Coefficients

PCC Faulting			
$C_{12} = C_1 + (C_2 * FR^{0.25})$ $C_{34} = C_3 + (C_4 * FR^{0.25})$ $FaultMax_0 = C_{12} * \delta_{curving} * \left[ \log(1 + C_5 * 5.0^{EROD}) * \log \left( P_{200} * \frac{WetDays}{P_S} \right) \right]^{C_6}$ $FaultMax_i = FaultMax_0 + C_7 * \sum_{j=1}^m DE_j * \log(1 + C_5 * 5.0^{EROD})^{C_6}$ $\Delta Fault_i = C_{34} * (FaultMax_{i-1} - Fault_{i-1})^2 * DE_i$ $C_8 = DowelDeterioration$			
C1: 0.5104	C2: 0.00838	C3: 0.00147	C4: 0.008345
C5: 5999	C6: 0.8404	C7: 5.9293	C8: 400
PCC Reliability Faulting Standard Deviation			
0.0831*Pow(FAULT,0.3426) + 0.00521			

IRI-jpcp		
C1 - Cracking	C1: 0.8203	C2: 0.4417
C2 - Spalling	C3: 1.4929	C4: 25.24
C3 - Faulting	Reliability Standard Deviation	
C4 - Site Factor	5.4	

PCC Cracking				
$\log(N) = C1 * \left( \frac{MR}{\sigma} \right)^{C2}$ $CRK = \frac{100}{1 + C4 FD^{C5}}$	Fatigue Coefficients		Cracking Coefficients	
	C1: 2	C2: 1.22	C4: 0.6	C5: -2.05
PCC Reliability Cracking Standard Deviation				
Pow(57.08*CRACK,0.33) + 1.5				

# Pavement M-E Design Report – PCCP on Terrace Alluvium



## 22420 US 550\_PCCP on Gravel\_FINAL

File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Gravel\_FINAL.dgpx



### Design Inputs

Design Life: 30 years      Existing construction: -      Climate Data: 37.143, -107.76  
 Design Type: JPCP      Pavement construction: May, 2020      Sources (Lat/Lon)  
 Traffic opening: May, 2020

### Design Structure

Layer type	Material Type	Thickness (in)
PCC	R5 Level 1 Lawson	8.5
NonStabilized	ABC Class 6	4.0
Subgrade	A-1-b	Semi-infinite

### Joint Design:

Joint spacing (ft)	15.0
Dowel diameter (in)	1.25
Slab width (ft)	13.0 (w)

### Traffic

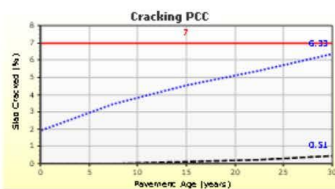
Age (year)	Heavy Trucks (cumulative)
2020 (initial)	589
2035 (15 years)	1,586,350
2050 (30 years)	3,497,640

### Design Outputs

#### Distress Prediction Summary

Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	200.00	149.48	90.00	99.77	Pass
Mean joint faulting (in)	0.14	0.01	90.00	100.00	Pass
JPCP transverse cracking (percent slabs)	7.00	6.33	90.00	92.35	Pass

#### Distress Charts







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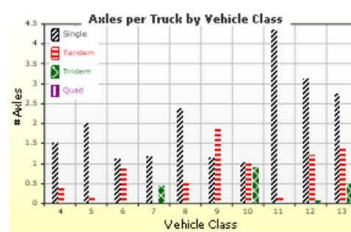
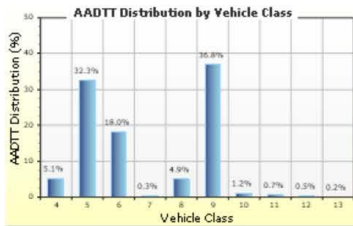
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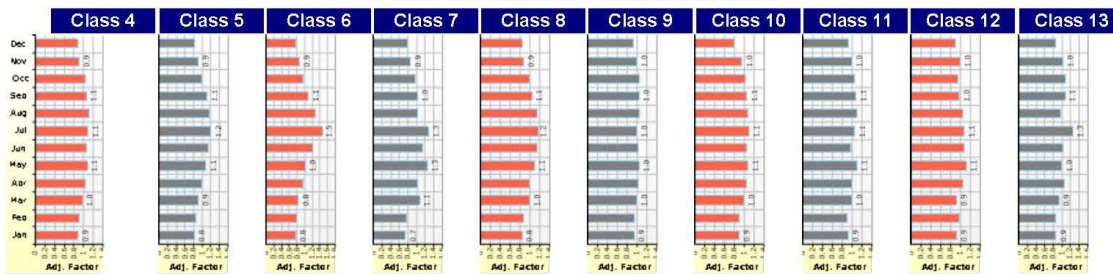
## Traffic Inputs

### Graphical Representation of Traffic Inputs

Initial two-way AADTT:	589	Percent of trucks in design direction (%):	50.0
Number of lanes in design direction:	2	Percent of trucks in design lane (%):	90.0
		Operational speed (mph)	45.0



### Traffic Volume Monthly Adjustment Factors





# 22420 US 550\_PCCP on Gravel\_FINAL

File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Gravel\_FINAL.dgpx



## Tabular Representation of Traffic Inputs

### Volume Monthly Adjustment Factors Level 3: Default MAF

Month	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
January	0.9	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	0.9
February	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	0.8
March	1.0	0.9	0.8	1.1	1.0	1.0	1.0	1.0	0.9	0.9
April	1.0	1.0	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.1
May	1.1	1.1	1.0	1.3	1.1	1.0	1.1	1.1	1.1	1.0
June	1.1	1.1	1.2	1.1	1.1	1.0	1.1	1.0	1.1	1.0
July	1.1	1.2	1.5	1.3	1.2	1.0	1.1	1.1	1.1	1.3
August	1.1	1.2	1.3	1.0	1.1	1.0	1.1	1.1	1.1	1.0
September	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.1	1.0	1.1
October	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.1
November	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0
December	0.9	0.8	0.8	0.8	0.8	0.9	0.8	0.9	0.9	0.9

### Distributions by Vehicle Class

Vehicle Class	AADTT Distribution (%) (Level 3)	Growth Factor	
		Rate (%)	Function
Class 4	5.1%	1.25%	Compound
Class 5	32.3%	1.25%	Compound
Class 6	18%	1.25%	Compound
Class 7	0.3%	1.25%	Compound
Class 8	4.9%	1.25%	Compound
Class 9	36.8%	1.25%	Compound
Class 10	1.2%	1.25%	Compound
Class 11	0.7%	1.25%	Compound
Class 12	0.5%	1.25%	Compound
Class 13	0.2%	1.25%	Compound

### Truck Distribution by Hour

Hour	Distribution (%)	Hour	Distribution (%)
12 AM	1.65%	12 PM	6.75%
1 AM	1.37%	1 PM	6.81%
2 AM	1.28%	2 PM	6.83%
3 AM	1.36%	3 PM	6.56%
4 AM	1.66%	4 PM	6.02%
5 AM	2.32%	5 PM	5.23%
6 AM	3.8%	6 PM	4.35%
7 AM	4.95%	7 PM	3.59%
8 AM	5.9%	8 PM	2.98%
9 AM	6.48%	9 PM	2.56%
10 AM	6.83%	10 PM	2.12%
11 AM	6.85%	11 PM	1.75%
Total		100%	

### Axle Configuration

Traffic Wander		Axle Configuration	
Mean wheel location (in)	18.0	Average axle width (ft)	8.5
Traffic wander standard deviation (in)	10.0	Dual tire spacing (in)	12.0
Design lane width (ft)	12.0	Tire pressure (psi)	120.0

Average Axle Spacing		Wheelbase			
Value Type	Axle Type	Short	Medium	Long	
Tandem axle spacing (in)	51.6				
Tridem axle spacing (in)	49.2	Average spacing of axles (ft)	12.0	15.0	18.0
Quad axle spacing (in)	49.2	Percent of Trucks (%)	17.0	22.0	61.0

### Number of Axles per Truck

Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.53	0.45	0	0
Class 5	2.02	0.16	0.02	0
Class 6	1.12	0.93	0	0
Class 7	1.19	0.07	0.45	0.02
Class 8	2.41	0.56	0.02	0
Class 9	1.16	1.88	0.01	0
Class 10	1.05	1.01	0.93	0.02
Class 11	4.35	0.13	0	0
Class 12	3.15	1.22	0.09	0
Class 13	2.77	1.4	0.51	0.04





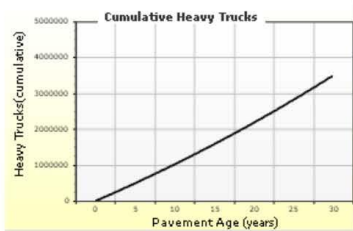
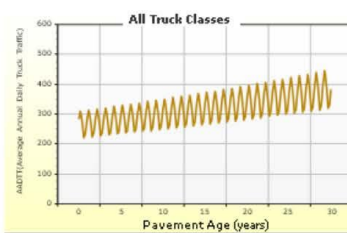
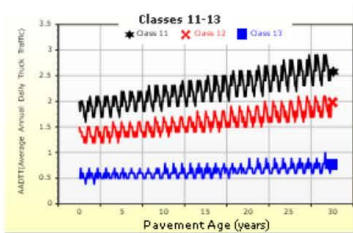
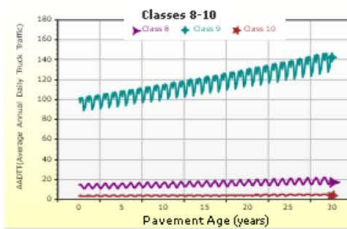
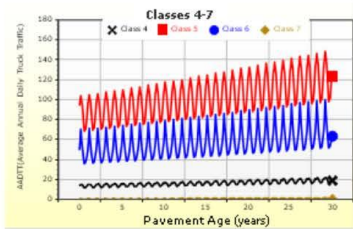
# 22420 US 550\_PCCP on Gravel\_FINAL

File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Gravel\_FINAL.dgpx



## AADTT (Average Annual Daily Truck Traffic) Growth

\* Traffic cap is not enforced





# 22420 US 550\_PCCP on Gravel\_FINAL

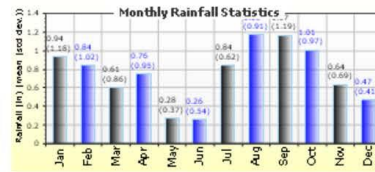
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## Climate Inputs

### Climate Data Sources:

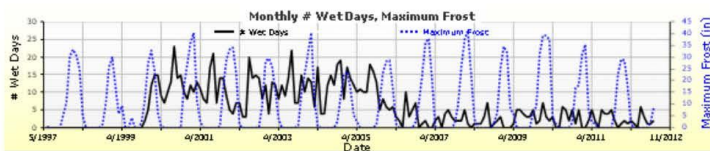
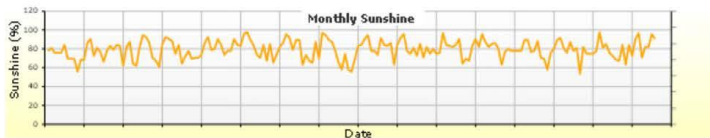
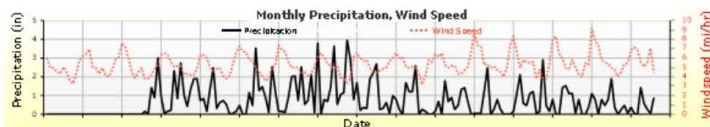
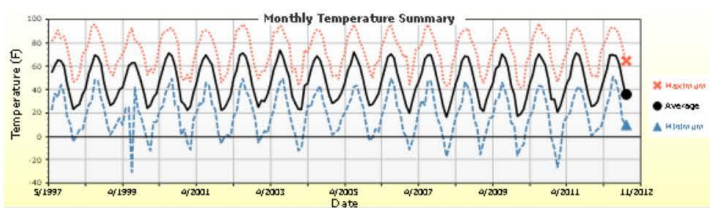
Climate Station Cities:	Location (lat lon elevation(ft))
DURANGO LA PLATA, C	37.14300 -107.76000 6685



### Annual Statistics:

Mean annual air temperature (°F)	47.07		
Mean annual precipitation (in)	8.96		
Freezing index (°F - days)	650.37		
Average annual number of freeze/thaw cycles:	163.30	Water table depth (ft)	10.00

### Monthly Climate Summary:



Report generated on: 10/22/2018 9:41 AM

Version: 2.3.1-hotfix-

Created by: on: 8/5/2016 12:00 AM

Approved by: on: 8/5/2016 12:00 AM

Page 5 of 14

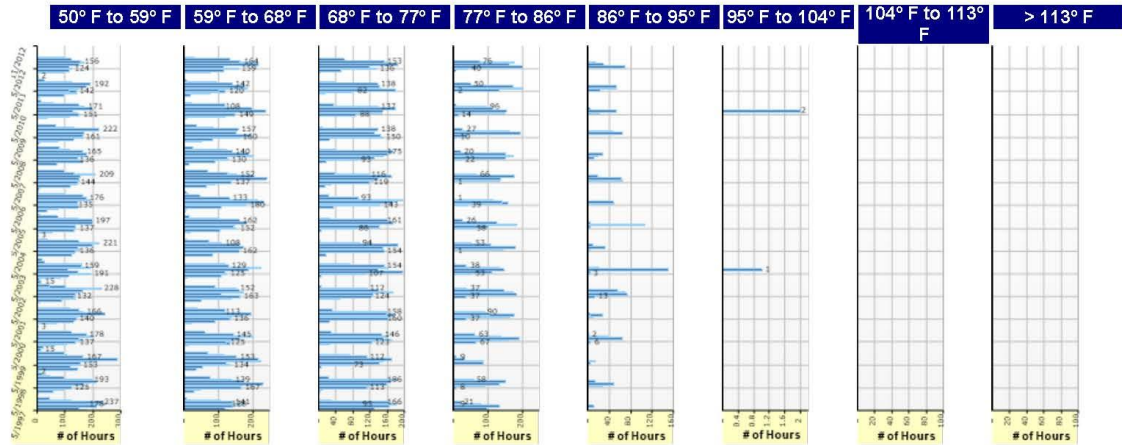
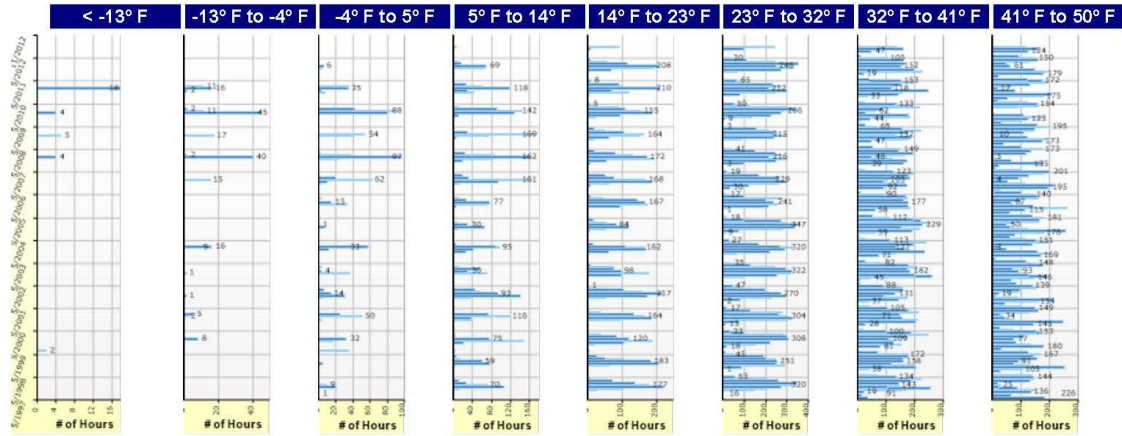


# 22420 US 550\_PCCP on Gravel\_FINAL

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## Hourly Air Temperature Distribution by Month:





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## Design Properties

### JPCP Design Properties

Structure - ICM Properties	
PCC surface shortwave absorptivity	0.85

Doweled Joints	
Is joint doweled ?	True
Dowel diameter (in)	1.25
Dowel spacing (in)	12.00

Tied Shoulders	
Tied shoulders	True
Load transfer efficiency (%)	50.00

PCC joint spacing (ft)	
Is joint spacing random ?	False
Joint spacing (ft)	15.00

Widened Slab	
Is slab widened ?	True
Slab width (ft)	13.00

PCC-Base Contact Friction	
PCC-Base full friction contact	True
Months until friction loss	360.00

Sealant type	Other(Including No Sealant... Liquid... Silicone)
--------------	---

Erodibility index	4
-------------------	---

Permanent curl/warp effective temperature difference (°F)	-10.00
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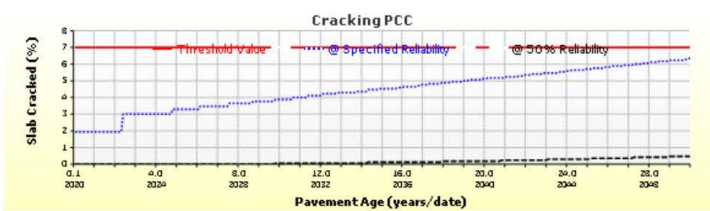
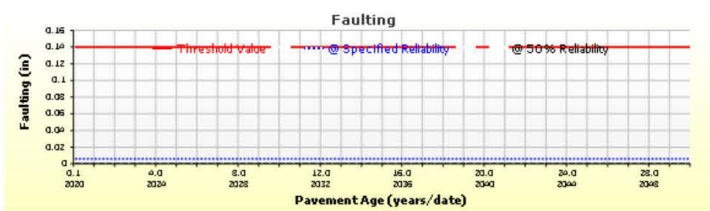


# 22420 US 550\_PCCP on Gravel\_FINAL

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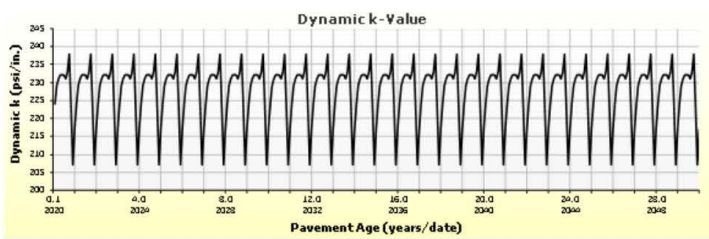
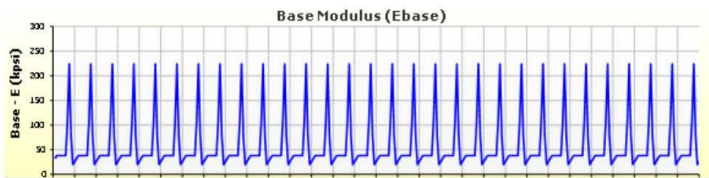
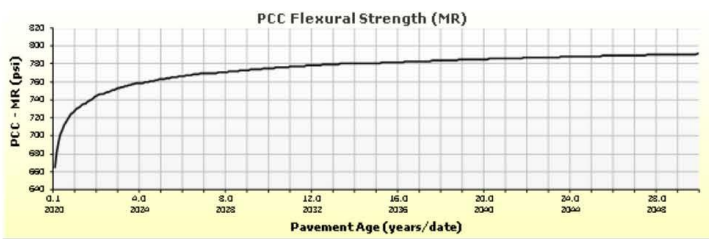
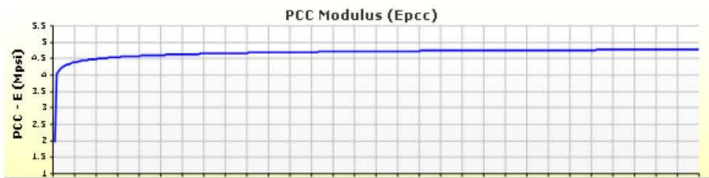
## Analysis Output Charts





# 22420 US 550\_PCCP on Gravel\_FINAL

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10/22/2018 9:41 AM

Version: 2.3.1-  
hotfix-

Created by:  
on: 8/5/2016 12:00 AM

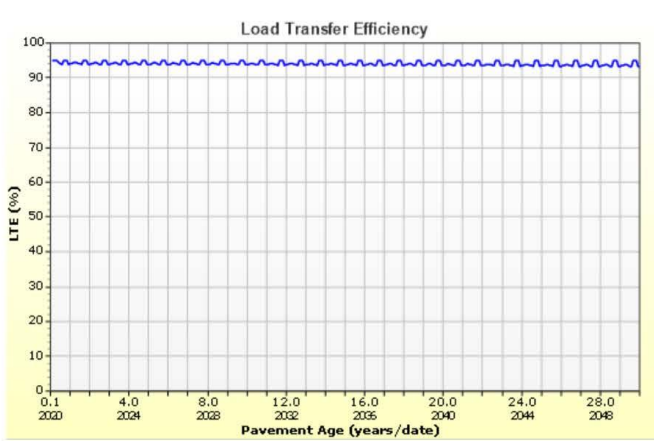
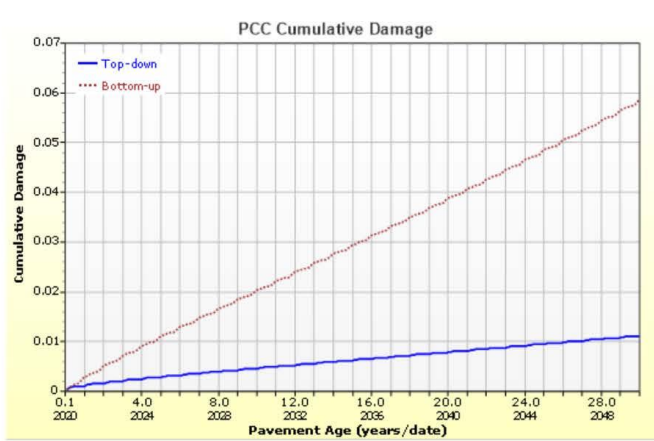
Approved by:  
on: 8/5/2016 12:00 AM

Page 9 of 14



# 22420 US 550\_PCCP on Gravel\_FINAL

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## 22420 US 550\_PCCP on Gravel\_FINAL

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### Layer Information

#### Layer 1 PCC : R5 Level 1 Lawson

PCC	
Thickness (in)	8.5
Unit weight (pcf)	140.8
Poisson's ratio	0.2

Thermal	
PCC coefficient of thermal expansion (in/in/°F x 10 <sup>^-6</sup> )	4.84
PCC thermal conductivity (BTU/hr-ft-°F)	1.25
PCC heat capacity (BTU/lb-°F)	0.28

Mix		
Cement type	Type I (1)	
Cementitious material content (lb/yd <sup>3</sup> )	600	
Water to cement ratio	0.44	
Aggregate type	Granite (3)	
PCC zero-stress temperature (°F)	Calculated Internally?	True
	User Value	-
	Calculated Value	81.8
Ultimate shrinkage (microstrain)	Calculated Internally?	True
	User Value	-
	Calculated Value	675.5
Reversible shrinkage (%)	50	
Time to develop 50% of ultimate shrinkage (days)	35	
Curing method	Curing Compound	

#### PCC strength and modulus (Input Level: 3)

28-Day PCC modulus of rupture (psi)	650.0
28-Day PCC elastic modulus (psi)	3930000.0

#### Identifiers

Field	Value
Display name/identifier	R5 Level 1 Lawson
Description of object	Mix ID # 2008196
Author	CDOT
Date Created	4/3/2013 12:00:00 AM
Approver	CDOT
Date approved	4/3/2013 12:00:00 AM
State	Colorado
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	Region 5
User defined field 2	
User defined field 3	
Revision Number	4





# 22420 US 550\_PCCP on Gravel\_FINAL



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## Layer 2 Non-stabilized Base : ABC Class 6

Unbound	
Layer thickness (in)	4.0
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

### Modulus (Input Level: 3)

<b>Analysis Type:</b>	Modify input values by temperature/moisture
<b>Method:</b>	Resilient Modulus (psi)

Resilient Modulus (psi)
25000.0

<b>Use Correction factor for NDT modulus?</b>	-
<b>NDT Correction Factor:</b>	-

### Identifiers

Field	Value
Display name/identifier	ABC Class 6
Description of object	Default material
Author	AASHTO
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

### Sieve

<b>Liquid Limit</b>	6.0
<b>Plasticity Index</b>	1.0
<b>Is layer compacted?</b>	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.7
Saturated hydraulic conductivity (ft/hr)	False	5.054e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.4

### User-defined Soil Water Characteristic Curve (SWCC)

<b>Is User Defined?</b>	False
<b>af</b>	7.2555
<b>bf</b>	1.3328
<b>cf</b>	0.8242
<b>hr</b>	117.4000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	8.7
#100	
#80	12.9
#60	
#50	
#40	20.0
#30	
#20	
#16	
#10	33.8
#8	
#4	44.7
3/8-in.	57.2
1/2-in.	63.1
3/4-in.	72.7
1-in.	78.8
1 1/2-in.	85.8
2-in.	91.6
2 1/2-in.	
3-in.	
3 1/2-in.	97.6



# 22420 US 550\_PCCP on Gravel\_FINAL

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## Layer 3 Subgrade : A-1-b

Unbound	
Layer thickness (in)	Semi-infinite
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

### Modulus (Input Level: 3)

<b>Analysis Type:</b>	Modify input values by temperature/moisture
<b>Method:</b>	Resilient Modulus (psi)

Resilient Modulus (psi)
15000.0

<b>Use Correction factor for NDT modulus?</b>	-
<b>NDT Correction Factor:</b>	-

### Identifiers

Field	Value
Display name/identifier	A-1-b
Description of object	Default material
Author	AASHTO
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

### Sieve

<b>Liquid Limit</b>	11.0
<b>Plasticity Index</b>	1.0
<b>Is layer compacted?</b>	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	124.2
Saturated hydraulic conductivity (ft/hr)	False	2.303e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	9.1

### User-defined Soil Water Characteristic Curve (SWCC)

<b>Is User Defined?</b>	False
<b>af</b>	5.8206
<b>bf</b>	0.4621
<b>cf</b>	3.8497
<b>hr</b>	126.8000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	13.4
#100	
#80	20.8
#60	
#50	
#40	37.6
#30	
#20	
#16	
#10	64.0
#8	
#4	74.2
3/8-in.	82.3
1/2-in.	85.8
3/4-in.	90.8
1-in.	93.6
1 1/2-in.	96.7
2-in.	98.4
2 1/2-in.	
3-in.	
3 1/2-in.	99.4



# 22420 US 550\_PCCP on Gravel\_FINAL

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## Calibration Coefficients

PCC Faulting			
$C_{12} = C_1 + (C_2 * FR^{0.25})$ $C_{34} = C_3 + (C_4 * FR^{0.25})$ $FaultMax_0 = C_{12} * \delta_{curving} * \left[ \log(1 + C_5 * 5.0^{EROD}) * \log \left( P_{200} * \frac{WetDays}{P_S} \right) \right]^{C_6}$ $FaultMax_i = FaultMax_0 + C_7 * \sum_{j=1}^m DE_j * \log(1 + C_5 * 5.0^{EROD})^{C_6}$ $\Delta Fault_i = C_{34} * (FaultMax_{i-1} - Fault_{i-1})^2 * DE_i$ $C_8 = DowelDeterioration$			
C1: 0.5104	C2: 0.00838	C3: 0.00147	C4: 0.008345
C5: 5999	C6: 0.8404	C7: 5.9293	C8: 400
PCC Reliability Faulting Standard Deviation			
0.0831*Pow(FAULT,0.3426) + 0.00521			

IRI-jpcp		
C1 - Cracking	C1: 0.8203	C2: 0.4417
C2 - Spalling	C3: 1.4929	C4: 25.24
C3 - Faulting	Reliability Standard Deviation	
C4 - Site Factor	5.4	

PCC Cracking				
$\log(N) = C1 * \left( \frac{MR}{\sigma} \right)^{C2}$ $CRK = \frac{100}{1 + C4 FD^{C5}}$	Fatigue Coefficients		Cracking Coefficients	
	C1: 2	C2: 1.22	C4: 0.6	C5: -2.05
PCC Reliability Cracking Standard Deviation				
Pow(57.08*CRACK,0.33) + 1.5				

# Pavement M-E Design Report – PCCP on Bedrock



## 22420 US 550\_PCCP on Claystone\_FINAL



File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Claystone\_FINAL.dgpx

### Design Inputs

Design Life: 30 years      Existing construction: -      Climate Data: 37.143, -107.76  
 Design Type: JPCP      Pavement construction: May, 2020      Sources (Lat/Lon)  
 Traffic opening: May, 2020

### Design Structure

Layer type	Material Type	Thickness (in)
PCC	R5 Level 1 Lawson	8.5
NonStabilized	ABC Class 6	4.0
Subgrade	A-1-b	24.0
Subgrade	A-6	Semi-infinite

### Traffic

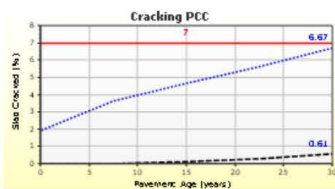
Joint Design:		Age (year)	Heavy Trucks (cumulative)
Joint spacing (ft)	15.0	2020 (initial)	589
Dowel diameter (in)	1.25	2035 (15 years)	1,586,350
Slab width (ft)	13.0 (w)	2050 (30 years)	3,497,640

### Design Outputs

#### Distress Prediction Summary

Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	200.00	149.61	90.00	99.76	Pass
Mean joint faulting (in)	0.14	0.01	90.00	100.00	Pass
JPCP transverse cracking (percent slabs)	7.00	6.67	90.00	91.18	Pass

#### Distress Charts





# 22420 US 550\_PCCP on Claystone\_FINAL

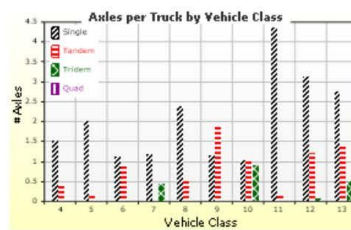
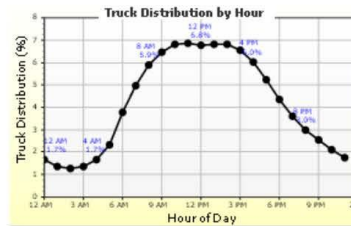
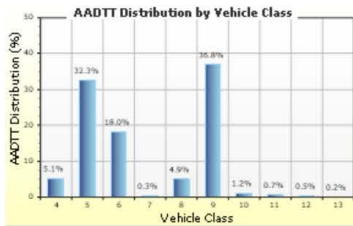
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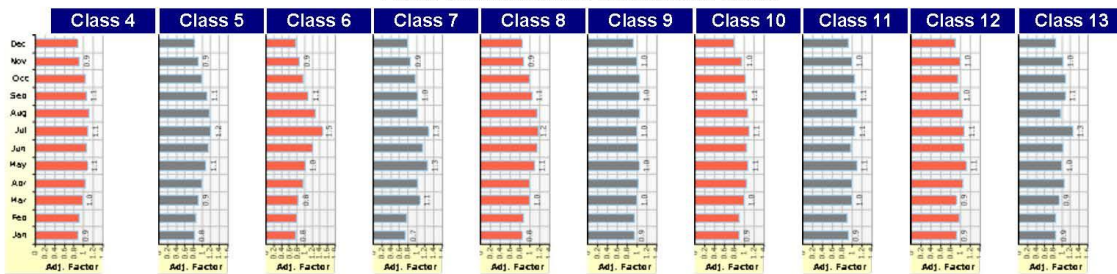
## Traffic Inputs

### Graphical Representation of Traffic Inputs

Initial two-way AADTT:	589	Percent of trucks in design direction (%):	50.0
Number of lanes in design direction:	2	Percent of trucks in design lane (%):	90.0
		Operational speed (mph)	45.0



### Traffic Volume Monthly Adjustment Factors







## 22420 US 550\_PCCP on Claystone\_FINAL



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### Tabular Representation of Traffic Inputs

#### Volume Monthly Adjustment Factors Level 3: Default MAF

Month	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
January	0.9	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	0.9
February	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	0.8
March	1.0	0.9	0.8	1.1	1.0	1.0	1.0	1.0	0.9	0.9
April	1.0	1.0	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.1
May	1.1	1.1	1.0	1.3	1.1	1.0	1.1	1.1	1.1	1.0
June	1.1	1.1	1.2	1.1	1.1	1.0	1.1	1.0	1.1	1.0
July	1.1	1.2	1.5	1.3	1.2	1.0	1.1	1.1	1.1	1.3
August	1.1	1.2	1.3	1.0	1.1	1.0	1.1	1.1	1.1	1.0
September	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.1	1.0	1.1
October	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.1
November	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0
December	0.9	0.8	0.8	0.8	0.8	0.9	0.8	0.9	0.9	0.9

#### Distributions by Vehicle Class

Vehicle Class	AADTT Distribution (%) (Level 3)	Growth Factor	
		Rate (%)	Function
Class 4	5.1%	1.25%	Compound
Class 5	32.3%	1.25%	Compound
Class 6	18%	1.25%	Compound
Class 7	0.3%	1.25%	Compound
Class 8	4.9%	1.25%	Compound
Class 9	36.8%	1.25%	Compound
Class 10	1.2%	1.25%	Compound
Class 11	0.7%	1.25%	Compound
Class 12	0.5%	1.25%	Compound
Class 13	0.2%	1.25%	Compound

#### Truck Distribution by Hour

Hour	Distribution (%)	Hour	Distribution (%)
12 AM	1.65%	12 PM	6.75%
1 AM	1.37%	1 PM	6.81%
2 AM	1.28%	2 PM	6.83%
3 AM	1.36%	3 PM	6.56%
4 AM	1.66%	4 PM	6.02%
5 AM	2.32%	5 PM	5.23%
6 AM	3.8%	6 PM	4.35%
7 AM	4.95%	7 PM	3.59%
8 AM	5.9%	8 PM	2.98%
9 AM	6.48%	9 PM	2.56%
10 AM	6.83%	10 PM	2.12%
11 AM	6.85%	11 PM	1.75%
		Total	100%

#### Axle Configuration

Traffic Wander		Axle Configuration	
Mean wheel location (in)	18.0	Average axle width (ft)	8.5
Traffic wander standard deviation (in)	10.0	Dual tire spacing (in)	12.0
Design lane width (ft)	12.0	Tire pressure (psi)	120.0

Average Axle Spacing		Wheelbase			
Value Type	Axle Type	Short	Medium	Long	
Tandem axle spacing (in)	51.6				
Tridem axle spacing (in)	49.2	Average spacing of axles (ft)	12.0	15.0	18.0
Quad axle spacing (in)	49.2	Percent of Trucks (%)	17.0	22.0	61.0

#### Number of Axles per Truck

Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.53	0.45	0	0
Class 5	2.02	0.16	0.02	0
Class 6	1.12	0.93	0	0
Class 7	1.19	0.07	0.45	0.02
Class 8	2.41	0.56	0.02	0
Class 9	1.16	1.88	0.01	0
Class 10	1.05	1.01	0.93	0.02
Class 11	4.35	0.13	0	0
Class 12	3.15	1.22	0.09	0
Class 13	2.77	1.4	0.51	0.04



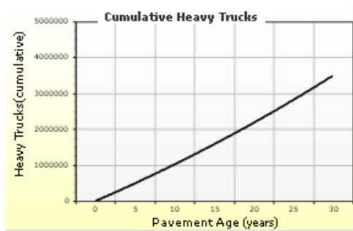
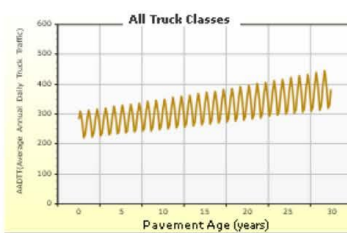
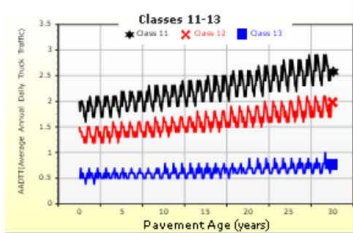
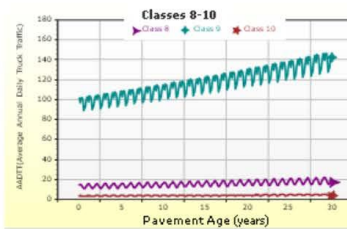
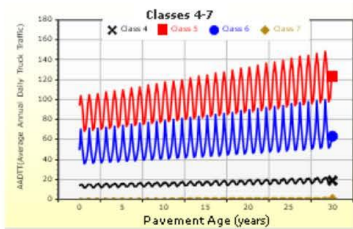
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## AADTT (Average Annual Daily Truck Traffic) Growth

\* Traffic cap is not enforced





# 22420 US 550\_PCCP on Claystone\_FINAL

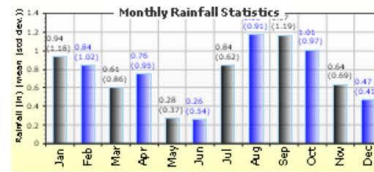


File Name: C:\Users\kempb\Documents\Projects\22420\_550\_160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Claystone\_FINAL.dgpx

## Climate Inputs

### Climate Data Sources:

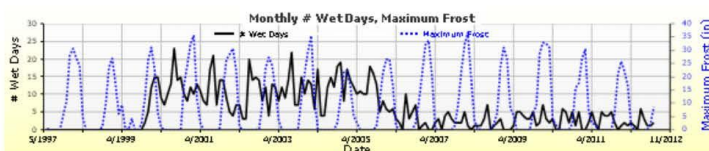
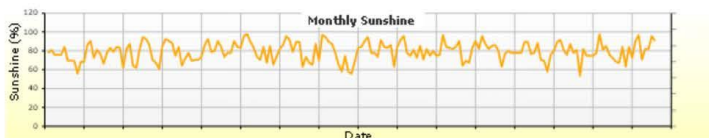
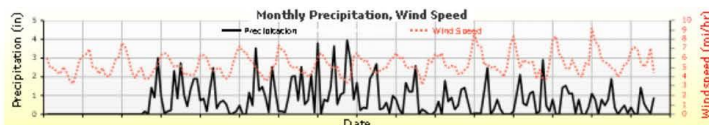
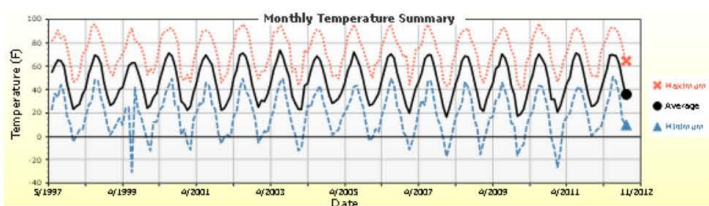
Climate Station Cities:	Location (lat lon elevation(ft))
DURANGO LA PLATA, C	37.14300 -107.76000 6685



### Annual Statistics:

Mean annual air temperature (°F)	47.07		
Mean annual precipitation (in)	8.96		
Freezing index (°F - days)	650.37		
Average annual number of freeze/thaw cycles:	163.30	Water table depth (ft)	10.00

### Monthly Climate Summary:



Report generated on: 10/22/2018 9:26 AM

Version: 2.3.1-hotfix-

Created by: on: 8/5/2016 12:00 AM

Approved by: on: 8/5/2016 12:00 AM

Page 5 of 15



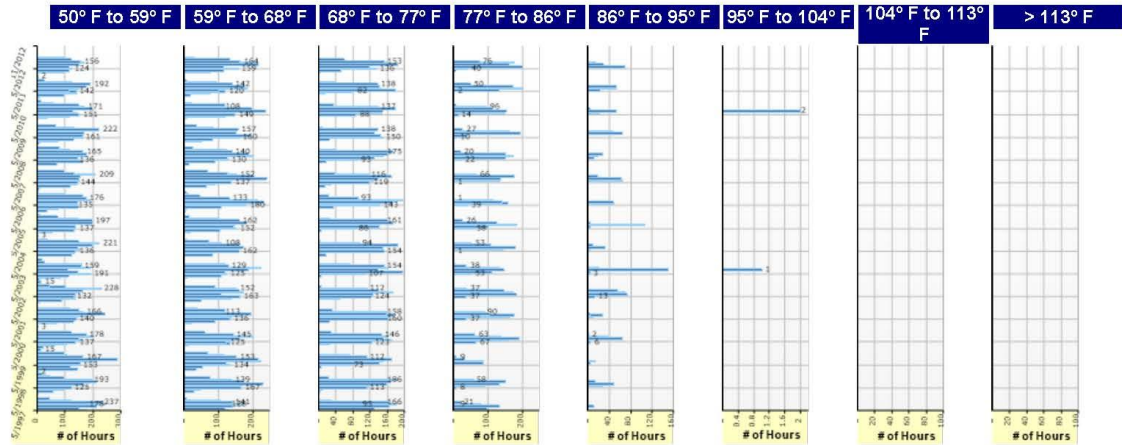
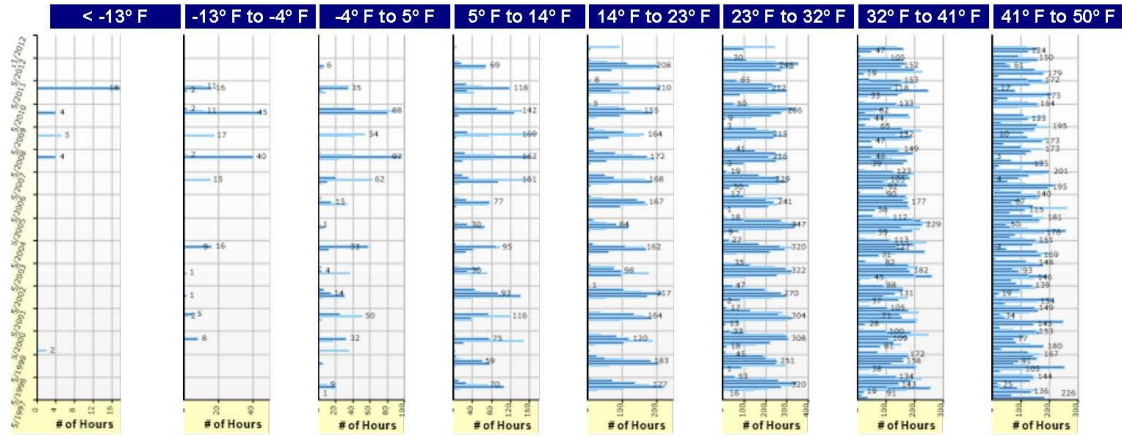


# 22420 US 550\_PCCP on Claystone\_FINAL



File Name: C:\Users\kempb\Documents\Projects\22420\_550 160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Claystone\_FINAL.dgpx

## Hourly Air Temperature Distribution by Month:





# 22420 US 550\_PCCP on Claystone\_FINAL



File Name: C:\Users\kempb\Documents\Projects\22420\_550\_160 Connection\Pavement Design\FINAL\22420 US 550\_PCCP on Claystone\_FINAL.dgpx

## Design Properties

### JPCP Design Properties

Structure - ICM Properties	
PCC surface shortwave absorptivity	0.85

Doweled Joints	
Is joint doweled ?	True
Dowel diameter (in)	1.25
Dowel spacing (in)	12.00

Tied Shoulders	
Tied shoulders	True
Load transfer efficiency (%)	50.00

PCC joint spacing (ft)	
Is joint spacing random ?	False
Joint spacing (ft)	15.00

Widened Slab	
Is slab widened ?	True
Slab width (ft)	13.00

PCC-Base Contact Friction	
PCC-Base full friction contact	True
Months until friction loss	360.00

Sealant type	Other(Including No Sealant... Liquid... Silicone)
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Erodibility index	4
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Permanent curl/warp effective temperature difference (°F)	-10.00
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