



Pavement & Materials
2023 CFL Annual A/E Meeting

Introduction - Staff



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Introduction

- Topics
 - Pavement Design and Rehabilitation Guidance
 - Guidance on Selecting FP-14 Sections for Use on Projects
 - Lessons Learned
 - Project Successes
 - Q&A

Pavement Design and Rehabilitation Guidance

- Questions from A/Es:
 - When is a formal pavement design needed?
 - ✓ When pavement structural improvements are included in project scope (not a pavement preservation project)

Pavement Design and Rehabilitation Guidance

- Questions from A/Es:
 - What about pavement designs for parking lots? Do we need them?
 - ✓ When traffic and subgrade conditions for parking lots are like the mainline route, you may use pavement design (SN) from mainline and apply to parking lot.
 - ✓ If the project is a standalone parking lot, a design is needed.

Pavement Design and Rehabilitation Guidance

- Questions from A/Es:
 - Discuss innovative design and rehabilitation practices, including planning of the field exploration and sampling.

Importance of Field Investigation

Investigate Existing Conditions

- Determine Subgrade Support for Pavement Design
- Determine Pavement Layer Thicknesses and Properties
 - Support Rehabilitation Method Decision (feasibility)
- Evaluate Need / Locations for Subexcavation or Other Spot Repairs
- Mitigation for Saturated / Wet Subgrade Conditions
- Pavement Distress Survey
- Evaluation of Potential Material Sources

Data Supported Decisions

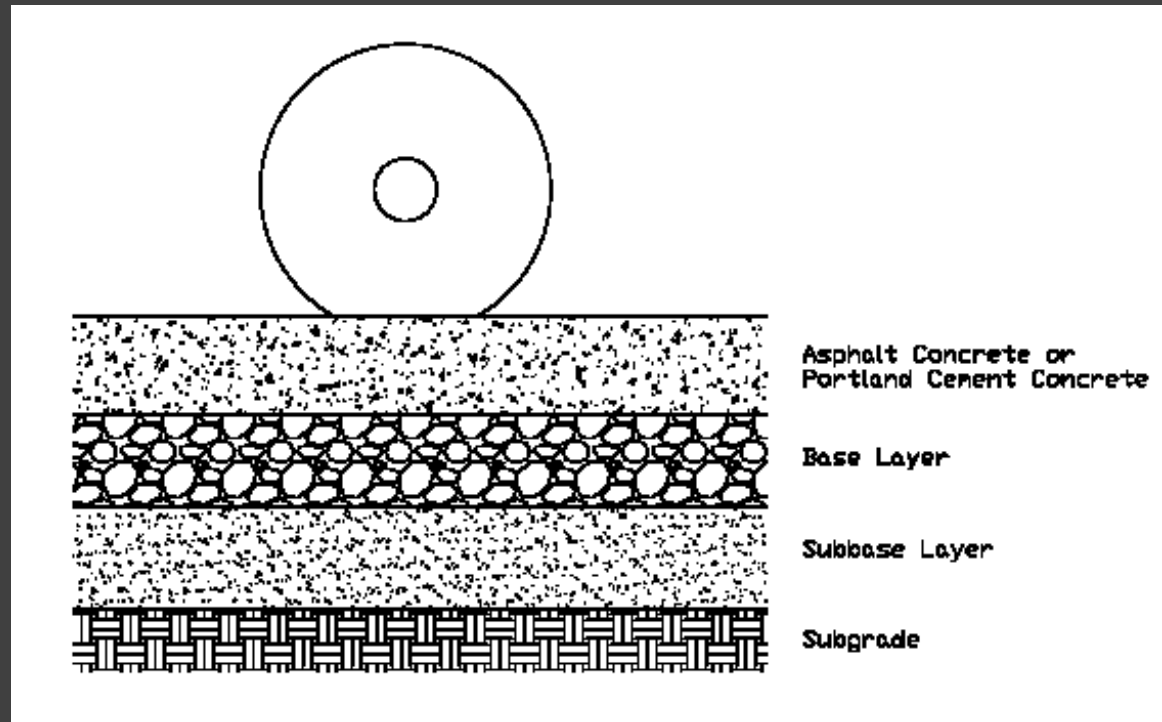
Field Investigation Layout



Importance of Field Investigation

Realm of influence

~ 5 feet



Importance of Field Investigation

Document Distress
and Other Conditions



Importance of Field Investigation



In Situ Testing

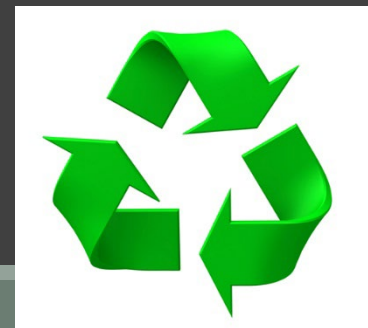
- Dynamic Cone Penetrometer
- Ground penetrating radar (GPR)
- Falling-weight deflectometer (FWD)



Dynamic Cone Penetrometer
(DCP)

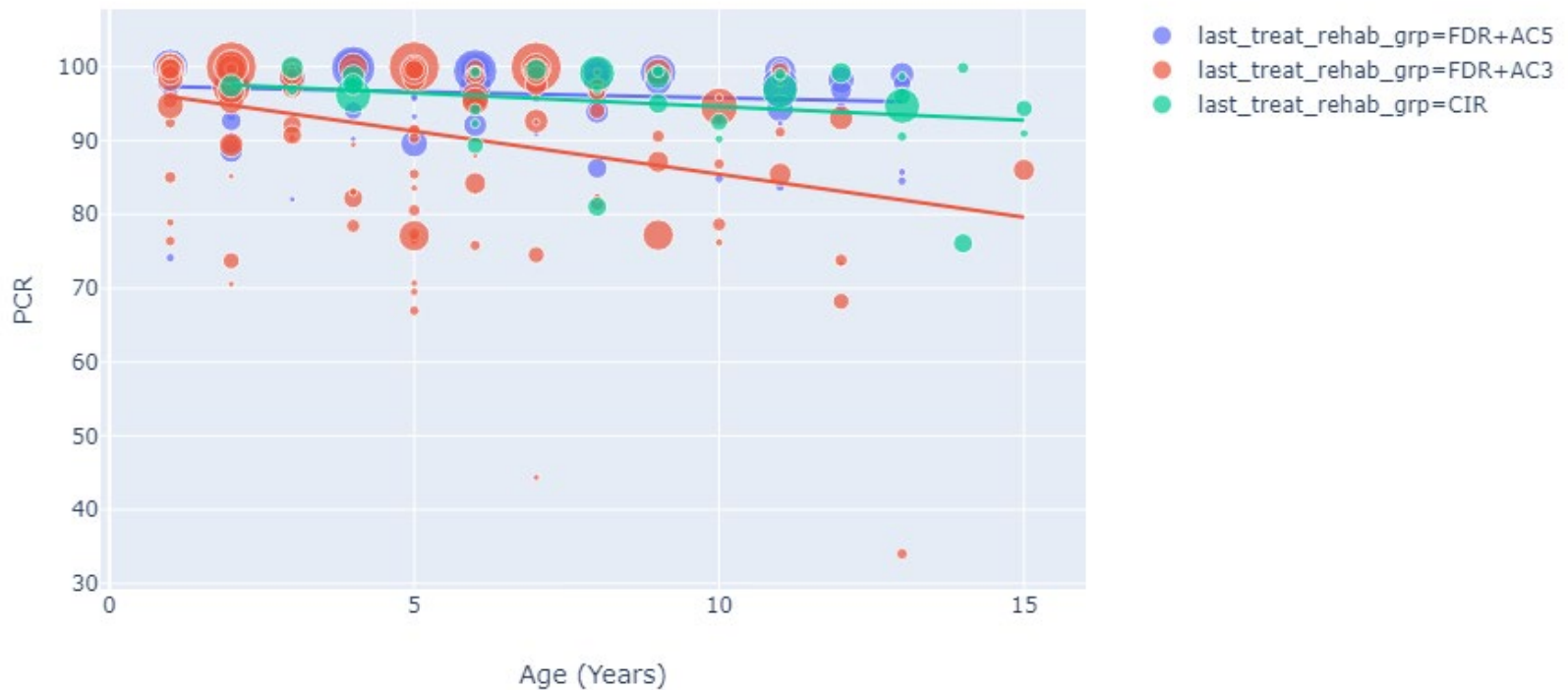
Pavement Design and Rehabilitation Guidance

- Maximize use of in-place recycling
 - FDR and CIR allows for re-use of the existing old asphalt and base
 - Allows for the reduction of costly and carbon intensive removal and importing operations – so very cost effective.
 - Great long-term performance



In-Place Recycling Performance – Global, with mileage based on bubble size

Treatment Condition by Age



Performance – Ice House Road



22 years old



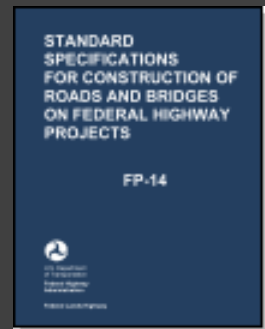
31 years old



Guidance on Selection FP-14
Sections for Use on Projects

Guidance on Selecting FP-14 Sections for Use on Projects

- Division 200 Earthwork
- Division 300 Aggregate and Base Courses
- Division 400 Asphalt Pavements and Surface Treatments
- Division 500 Rigid Pavements



Guidance on Selecting FP-14 Sections for Use on Projects

- Division 200 Earthwork
 - 203 Removal of pavement – good for small quantities
 - 204 for Subexcavation. Typically, a nominal quantity is added (~200 to 500 CUYD) even if no specific areas are identified.
 - 213 Subgrade stabilization – not often used. Can be appropriate for clayey areas in upper and lower Midwest.

Guidance on Selecting FP-14 Sections for Use on Projects

Division 300 Aggregate and Base Courses

301 Aggregate Base

- Gradation bands and material properties specified
- Percent within limits used for acceptance.
Use with ~5000 tons or greater

302 Minor Agg Base

- Conform to local state DOT gradation and material properties



Guidance on Selecting FP-14 Sections for Use on Projects

- Division 300 Aggregate and Base Courses
 - 303 Roadway Reconditioning – primarily used when an existing layer of base is to remain, but it needs to be graded, shaped, and recompact.

Guidance on Selecting FP-14 Sections for Use on Projects

- Division 300 Aggregate and Base Courses
 - 304 Full Depth Reclamation – SCR added for cases when removal of pavement section is needed in **spot locations** to correct for superelevation.



Guidance on Selecting FP-14 Sections for Use on Projects

- Division 300 Aggregate and Base Courses
 - 305 FDR with cement
 - 306 FDR with asphalt
 - 310 Cold in-place recycled asphalt



Guidance on Selecting FP-14 Sections for Use on Projects

401 (superpave)

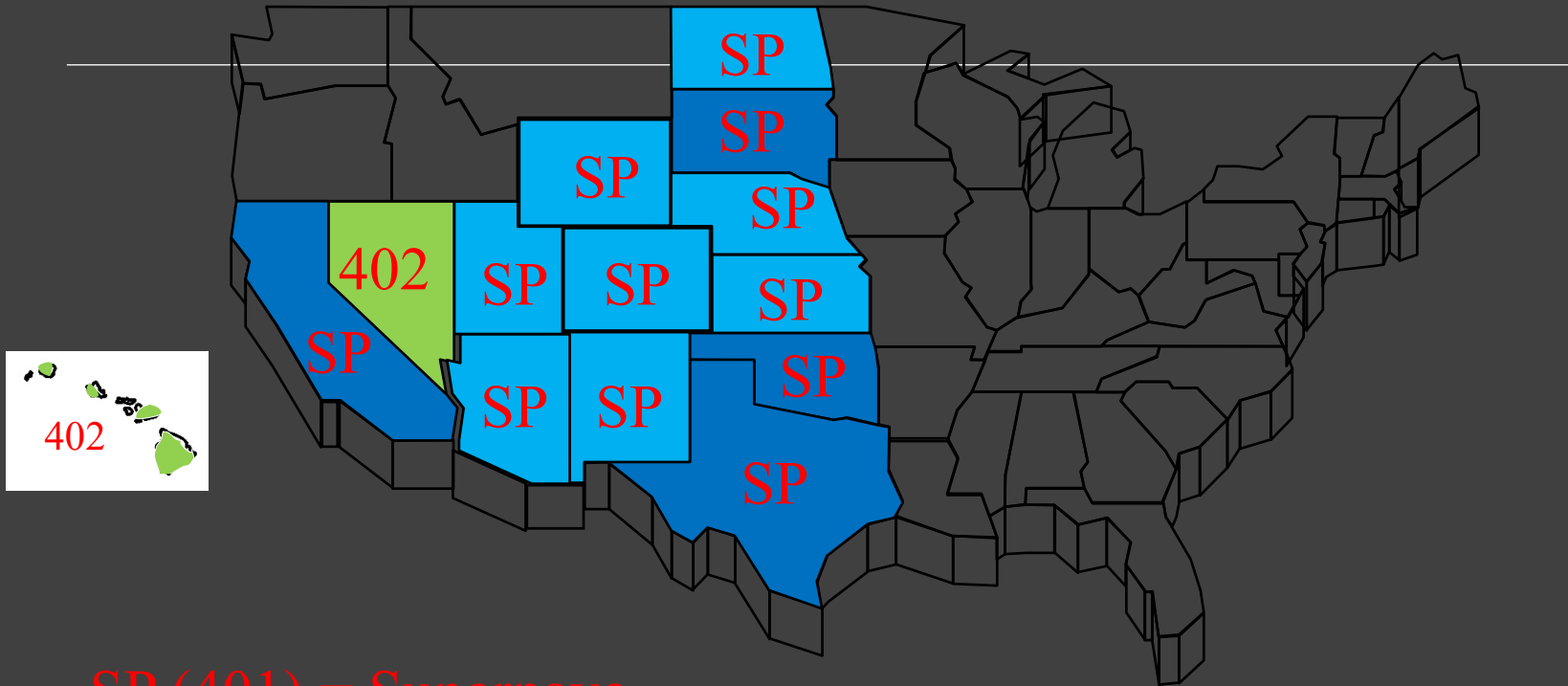
402 (Hveem)

- Percent within limits used for acceptance.
~7000 tons or greater
- Requires a job-mix formula to be developed
- Takes one month to verify mix (minimum)
- Roughness standard with incentive / disincentive

403

- Requires an approved state DOT job-mix formula
- Roughness is only controlled by straightedge

Mix Type Use by State

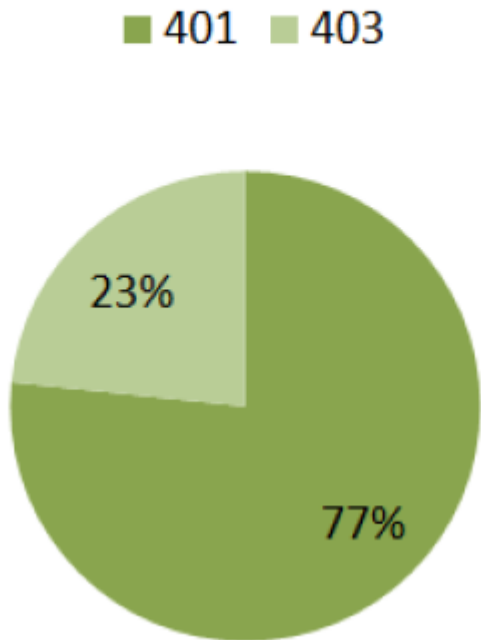


SP (401) = Superpave

402 = Hveem or Marshall

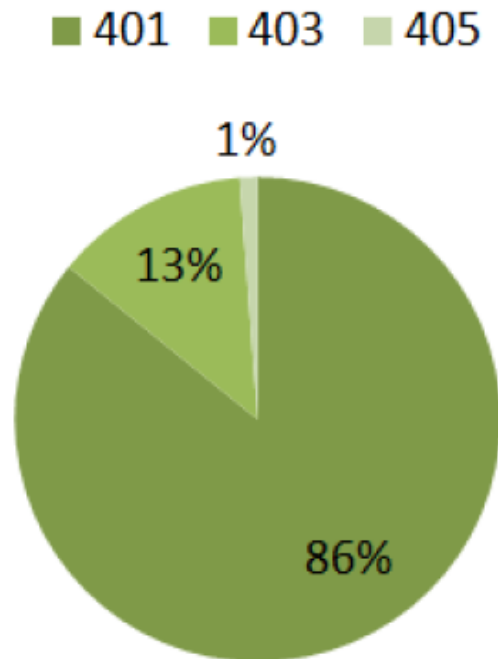
Total Distribution by Tonnage

Pavement Total Distribution by Tonnage



2020

Pavement Total Distribution by Tonnage



2019

Guidance on Selecting FP-14 Sections for Use on Projects

- Division 400 Asphalt Pavements and Surface Treatments
 - 406 Fog Seal
 - 411 Prime Coat
 - 412 Tack Coat

Used on nearly every paving project.

Guidance on Selecting FP-14 Sections for Use on Projects

- Division 500 Rigid Pavements
 - 501 Minor Concrete Pavement – Does not include slip forming as an option. Used for small quantity concrete paving such as low water crossings, roundabouts, or parking pads.

Guidance on Selecting FP-14 Sections for Use on Projects

- Division 200 Earthwork
- Division 300 Aggregate and Base Courses
- Division 400 Asphalt Pavements and Surface Treatments
- Division 500 Rigid Pavements

QUESTIONS



Lessons Learned

Lessons Learned

- Engagement & communication with CFL staff
- Dramatic rise in construction and materials cost has impacted project budgets
 - Do not sacrifice performance; rather reduce project length
 - Be innovative with cost effective solutions
- Field exploration and investigations are very important – Data driven decisions

Lessons Learned

- Wet, clayey subgrade – assure it is addressed
- Be comprehensive with material recommendations
 - Assure plans and SCRs align with final recommendations documented in the report

Materials Recommendations

Asphalt Binder Grade

Cement Type

Emulsified Asphalt Grade

Roughness Type

Lift Thickness

Mix Type

Acceptance (statistical vs. tested for conformance)

Auxiliary Materials (prime, tack, fog, etc.)

Amend / Develop SCRs, if needed

Materials Recommendations

Asphalt Binder Selection

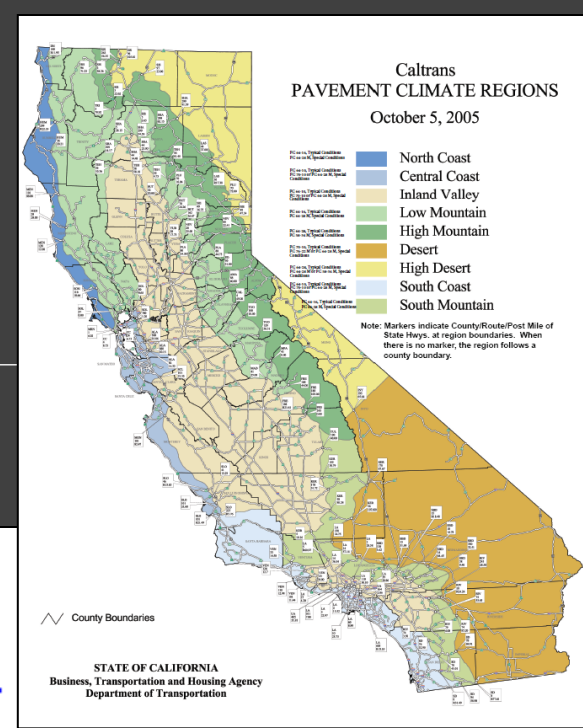
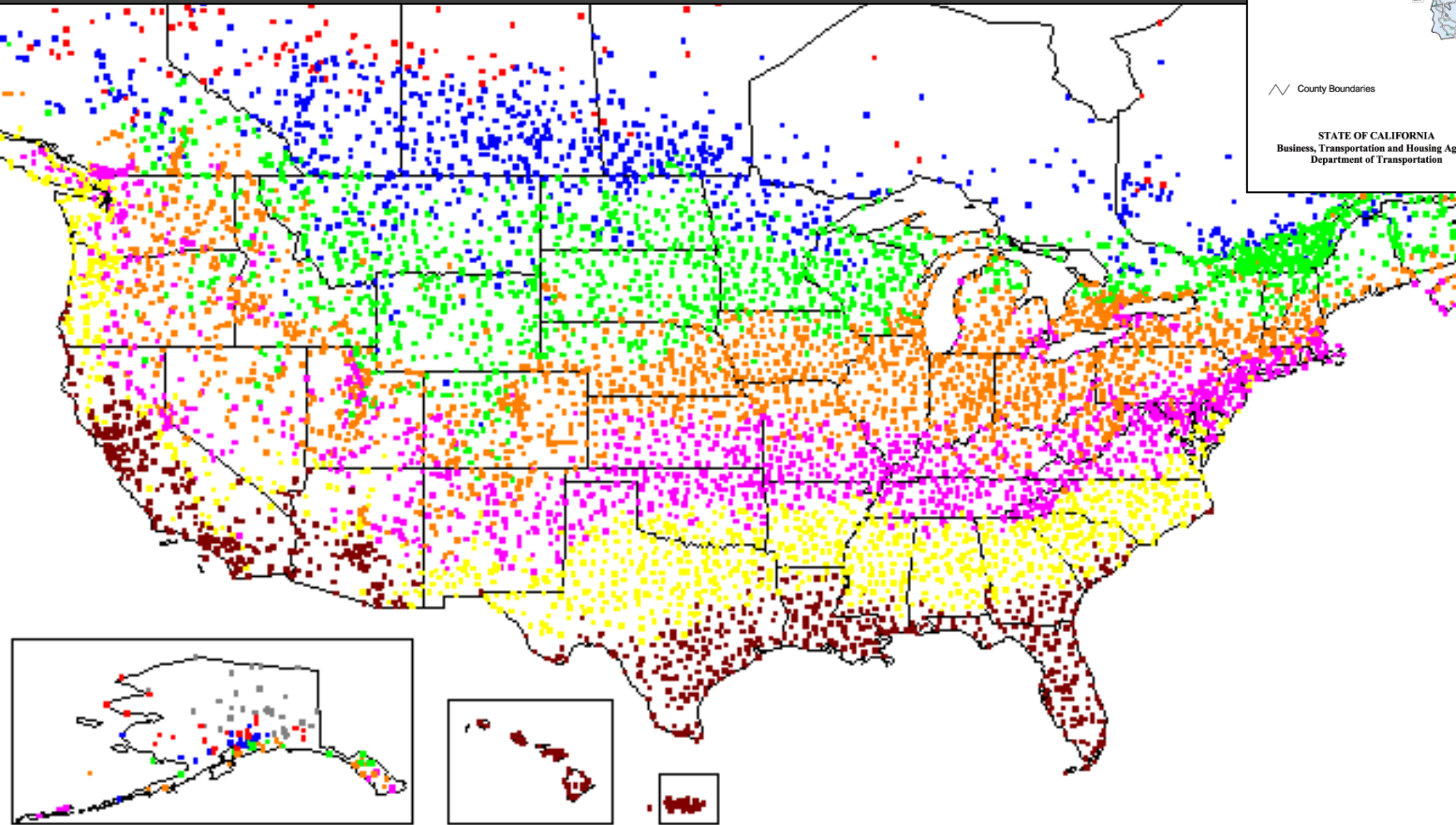
- Use LTPPBind software to select binder grade
- Verify that selected binder grade is locally available

Performance Graded (PG) Binder System:

- Uses a high and low temperature (Celsius)
- Grades are in 6 degree increments
- Example: Gunnison, CO, PG 58-34

| | | | | | |
|------------------------------|---------------|---------|----------|---------|-------|
| State/Province | CO | | | | |
| Station Name | GUNNISON 3 SW | | | | |
| Station ID | C03662 | | | | |
| County / District | GUNNISON | | | | |
| Last Year Data Avail. | 1997 | | | | |
| Latitude | 38.53 | | | | |
| Longitude | 106.97 | | | | |
| Elevation, m | 2163 | | | | |
| Air Temperature | Mean | Std Dev | Min | Max | Years |
| High Air Temperature, Deg. C | 29.6 | 1.1 | 27.6 | 32.8 | 30 |
| Low Air Temperature, Deg. C | -34.4 | 3.8 | -40 | -26.5 | 33 |
| Low Air Temp. Drop, Deg. C | 31.2 | 2.6 | 26.5 | 37 | 33 |
| Degree Days over 10 Deg. C | 2216 | 167 | 1893 | 2479 | 30 |
| Pavement Temperature and PG | HIGH | LOW | High Rel | Low Rel | |
| Pavement Temperature, C | 49.5 | -23.5 | 50 | 50 | |
| 50% Reliability PG | 52 | -28 | 98 | 90 | |
| >50% Reliability PG | 52 | -34 | 98 | 98 | |

Binder Grades: from LTPPBind (>95% reliability)





Project Successes

Oklahoma - Blackgum Road



Golden Gate
NRA -
Tennessee
Valley Parking





Questions?

THANKS FOR YOUR TIME