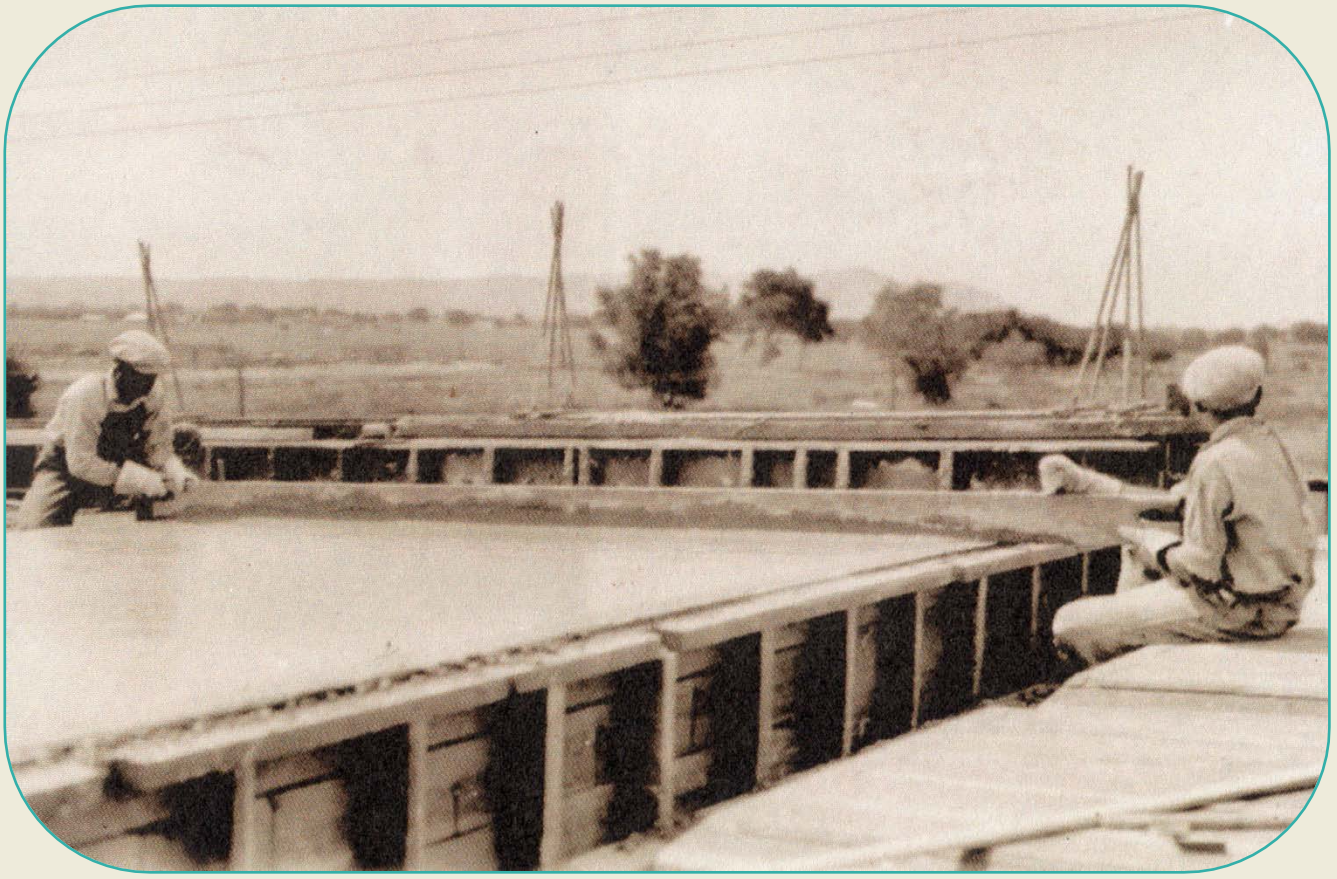
Bridges

CENTENNIAL 1912-2012

NM C -

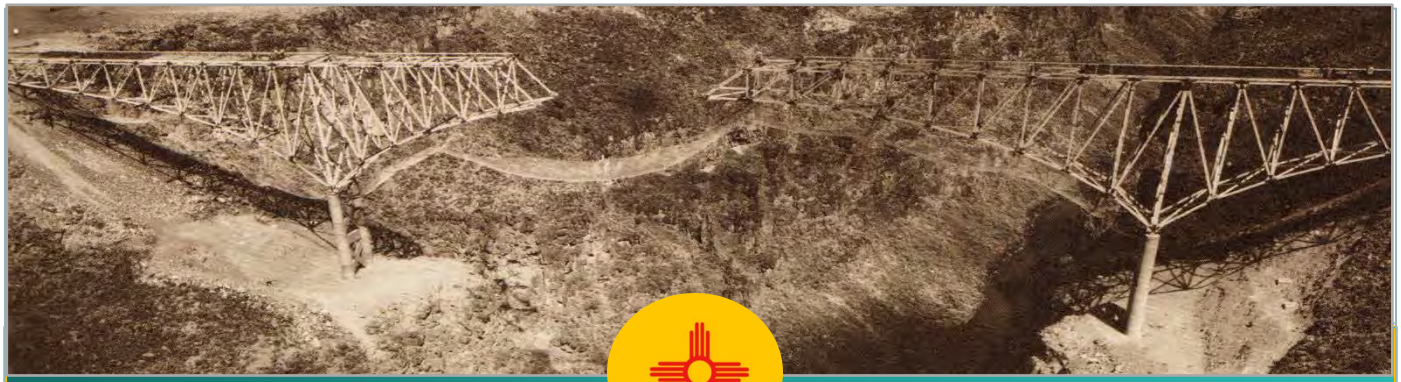
NEW MEXICO

LAND OF ENCHANTMENT



Las Cruces viaduct; finishing floor.
Source: NM Department of Transportation

NEW MEXICO CENTENNIAL 1912-2012



Overview: Bridges

New Mexico has 3715 vehicular bridges. The state owns 2972 bridges. The state owns 191 of the 319 bridges that are currently classified as structurally deficient. The state owns 158 of the 367 bridges that are currently classified as functionally obsolete. The median age of state-owned bridges is 43 years.

The Federal Highway Administration (FHWA) requires inspections to be performed at least once every 24 months on all publically owned bridges or culverts longer than 20 feet. The results of these biennial inspections, along with other non-inspection related data, are recorded in the FHWA's National Bridge Inventory (NBI) database to determine a sufficiency rating.

The inspections yield condition ratings, which are scaled from 0 to 9, for three structural categories; bridge deck, superstructure and substructure. Bridge decks include the deck itself plus the joints, rails and wearing surface. The superstructure includes all the primary load-carrying members, bearings, bracing and connections and the substructure includes all piers and abutments. The lowest of the three condition ratings is used in the following FHWA formula:

Sufficiency Rating =
S1 + S2 + S3 - S4 (0% to 100%)

S1 – measures the structural adequacy and safety (55% max)
S2 – measures serviceability and functional obsolescence (30% max)
S3 – measures essentialness for public use (15% max)
S4 – special reduction (10% max)

A component receiving a rating of 4 (a poor condition rating) will classify the structure as deficient, thereby making it eligible for federal funding. New Mexico has 686 bridges classified as deficient.

The formula calculates the sufficiency rating with up to 55% of the result coming from the structural condition, up to 30% from serviceability and functional obsolescence, up to 15% from its essentialness for public use, and up to 10% for special reductions per FHWA's specifications for the NBI and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.

Federal Highway Administration Criteria

The sufficiency rating indicates the bridge's capability to remain in service and is used for establishing eligibility and priority for replacement or rehabilitation with federal funding. It is formulated to a 0 – 100 scale.

A bridge with a sufficiency rating greater than 80 is ineligible for federal funds. A rating between 80 and 50 meets the requirement for federal rehabilitation funds, and below 50 qualifies the bridge for federal replacement funds. All bridges with a rating of less than 80 are considered deficient and are classified as either functionally obsolete (FO) or structurally deficient (SD).

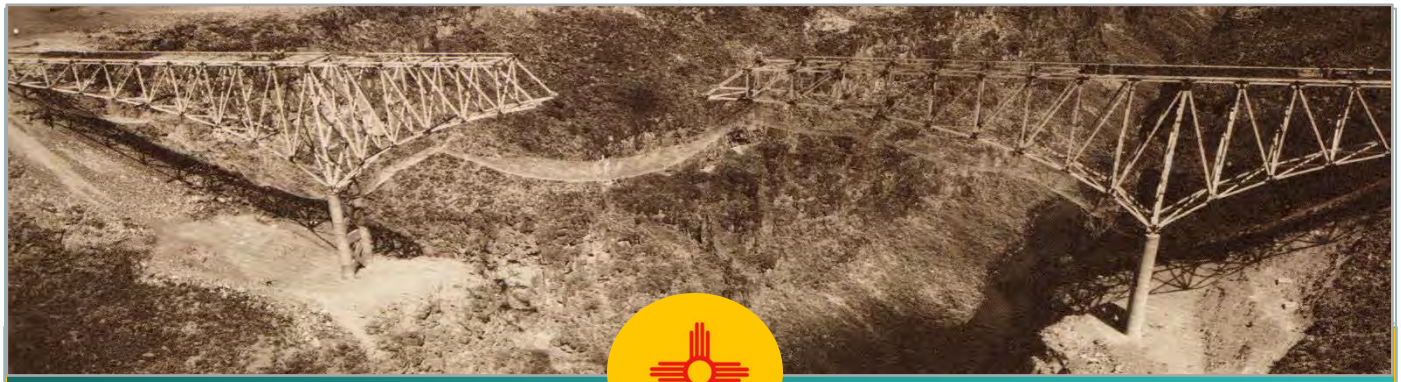
A FO bridge was designed and built to satisfy the design standards at the time of design and construction but has outdated geometrics, load-carry capacity and/or waterway adequacy. Geometric requirements have continually become more stringent to improve safety and design loads have increased with increasing vehicles weights and volume. Waterway adequacy requirements have become a part of the design process. The FO designation provides the owner an opportunity and the time to plan an upgrade to meet current design standards.

Overview (cont'd)

The SD classification for bridges means that either the condition rating is 4 or lower for a load-carrying component; or if unacceptable traffic interruptions may occur during high water levels. The SD designation does not necessarily mean that the structure is unsafe. SD bridges may remain in service but typically have weight limitations, fatigue or shear cracks, or significantly damaged or deteriorated components. SD bridges usually require more frequent inspections and more resources to maintain.

A deficient bridge must be either designated FO or SD. A bridge meeting both classifications would be classified as SD since this is the more significant of the two classifications. In addition to completing the NBI database, the NMDOT also records the condition of every bridge element per the FHWA's National Bridge Inventory Standards (NBIS) coding guidelines using the Pontis® Bridge Management System.

This includes 5 – 1 "Core Element" condition reporting for all bridge elements including every slab, beam, girder, bent, column, footing, pile, shaft or caisson. The Pontis® software models further bridge deterioration and recommends an optimal policy for preservation of the existing bridge infrastructure for a given budget.



Capacity

Operation and Maintenance

The cost of travel delays to the average driver due to bridge maintenance or rehabilitation is not a significant concern except in metropolitan areas.

The more significant delays occur on Interstate routes through Albuquerque or Las Cruces. Replacement or rehabilitation of several structures is presently ongoing in both cities.

Less than 5% of New Mexico bridges are weight restricted, closed to traffic or in jeopardy of being posted. Less than 10% are functionally obsolete compared to 13% nationally. The capacity of the system was given a grade of B.

Operation and Maintenance

NMDOT uses the Pontis® software originally developed by the FHWA to most effectively maintain and operate the 3,715 bridges throughout the state. This system uses the database of all bridge structures to recommend the most optimal policy for preserving the existing bridge infrastructure for a given annual budget.

Such operations and maintenance include, but are not limited to, pavement, roadside and bridge maintenance; traffic operations and assistance to traffic. The annual budget has to provide for labor, overhead, equipment, supply costs and contract maintenance.

Cost estimates to repair or replace the structurally deficient or functionally obsolete bridges in New Mexico is presently $178 million and this number will grow rapidly as their design life is exceeded. New Mexico spends between $20-25 million per year.

Approximately 35% of New Mexico bridges were built before 1962, and so are nearing the end of their design life. A grade of D- was assigned this portion of the evaluation.

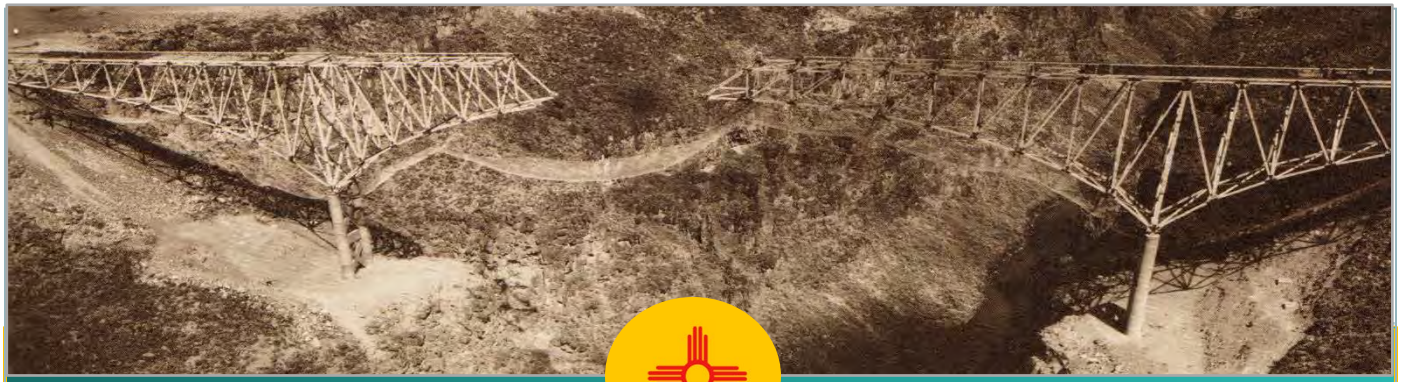
Condition

More than 18% of New Mexico's bridges are classified as either structurally deficient or functionally obsolete, which is 15th among the 50 states.

More than eight percent are classified as structurally deficient, and 10% are classified as functionally obsolete. If measured in terms of bridge count, 686 of New Mexico's 3715 bridges (more than 18%) are classified as deficient.

This includes those bridges classified as structurally deficient (8%, or 319 bridges), and those classified as functionally obsolete (10%, or 367 bridges). Several bridges along the heavily travelled I-10 and I-40 corridor have fatigue cracks that produce the "deficient classifications."

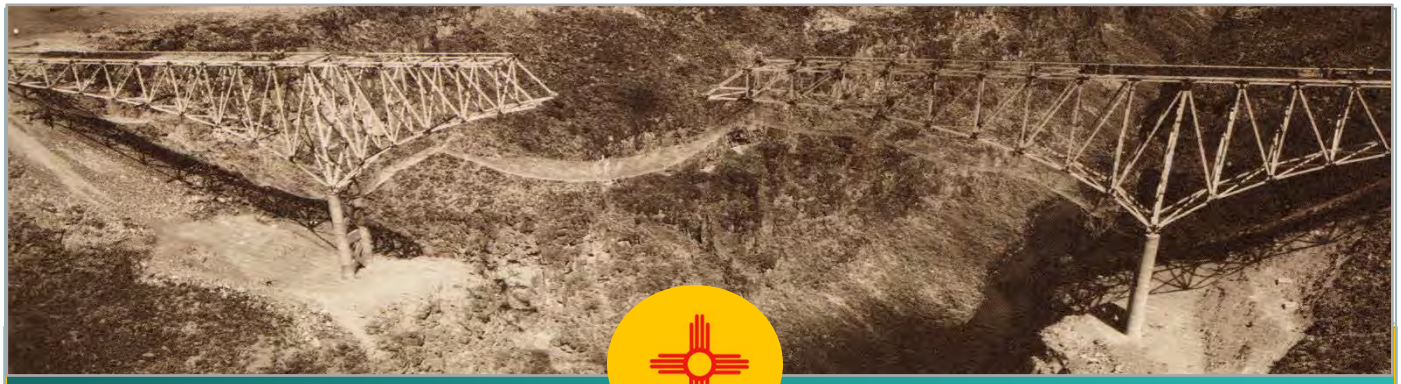
Inspection of the Rio Grande Gorge Bridge.



Condition (cont'd)

The average bridge deficiency rate of the 50 states and the District of Columbia (those bridges defined as being structurally deficient or functionally obsolete) is 25%. ASCE national set this 25% deficient bridge inventory at Grade C, thereby providing a datum for each state's evaluation of its bridge infrastructure. New Mexico is above the national average in the deficient category and the NMDOT has a goal to reduce the number of deficient bridges to five percent. This provided the primary basis for the grade determination of B for the condition category.

Safety inspection of complex truss bridge.



Public Safety

According to the FHWA, spending $100 million on highway safety improvements prevents 145 fatalities over a 10-year period, and studies have shown that every dollar invested in the national highway system produces $5.40 in economic benefits in improved safety, lower vehicle costs and reduced delays.

Highway bridges are the most vulnerable segment of our ground transportation system. However, since bridges represent a small fraction of the Highway system, extreme forces caused by floods, traffic impacts, seismic or terrorist acts are most likely to interrupt the highway function.

A grade of B is assigned to this portion of the evaluation.

Resilience

Resilience is the consideration of New Mexico's bridges against multiple extreme event loadings and the subsequent ability to quickly repair damage.

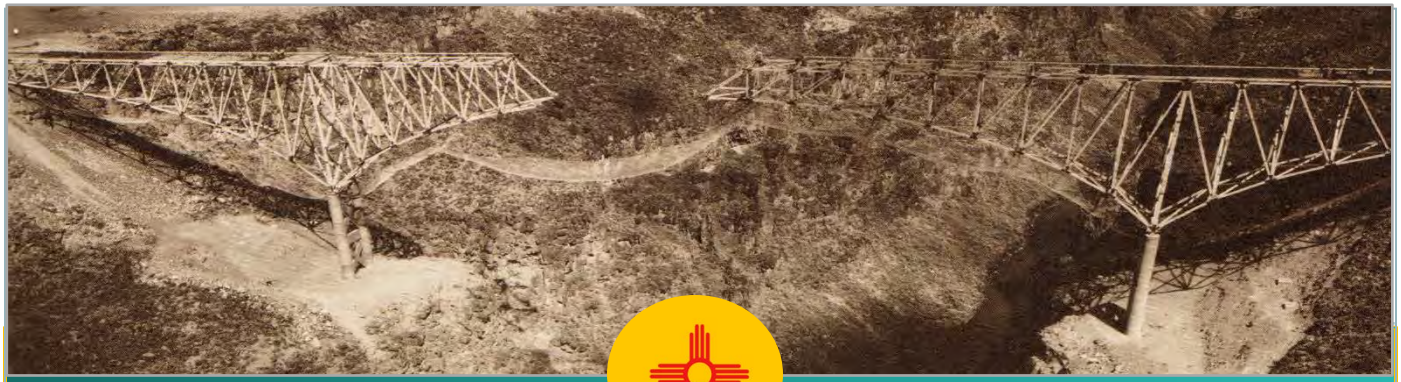
Transportation is so critical that it is imperative we have the ability to repair or replace damaged bridges quickly to assure minimal adverse impacts to public safety, the economy and security.

As noted above, bridges are the most vulnerable portion of our highway system. We must appraise our bridges against extreme event loadings.

New Mexico has the ability to quickly repair small and moderate size bridges but not large, complex structures with high traffic volumes.

Unfortunately, none of the bridges, to our knowledge, has been designed taking the possibility of terrorist acts into account.

The resulting grade for this category is a C-.



Funding

New Mexico is in the bottom quartile in the nation in both trucking fees and gas taxes, making for a weak funding base for transportation. These funding limitations placed New Mexico last in the Rocky Mountain states despite having the largest number of centerline and lane miles of any state in this region.

The gas tax in New Mexico is fixed rather than being indexed as most other states therefore as gas prices rise, the percent tax decreases, plus the state is having a significant decrease in gas purchases. Motivating the 14th least-populated state to absorb a much larger portion of the costs of rehabilitating or replacing deficient bridge inventory is a significant challenge.

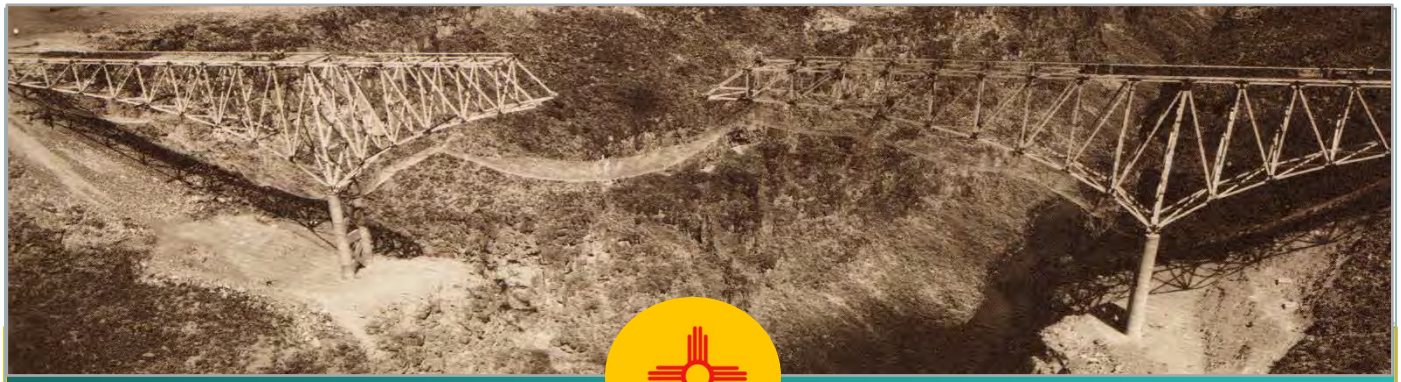
New Mexico is rapidly losing ground in replacement/rehabilitation of the bridges that are beyond their design life, plus the existence of structurally deficient and functionally obsolete bridges.

The funding for transportation at the state and federal levels has been static for several years with no end in sight.

Also about 35% of the present funds are dedicated to debt payment and inflation has significantly reduced the purchase power of the remaining funds.

As the demands for increased maintenance and operation funds increase, the funding needs have become critical.

The funding outlook for the next five years is very bleak; thus the resulting grade for this category is an F.



Planning

At the present time, more than 35% of New Mexico's bridges are more than 50 years old and a large block of bridges built for the Interstate System is rapidly approaching their design life. The design life is already exceeded when you consider the number of trucks passing through New Mexico.

The number of deficient bridges will rapidly increase over the near term. By 2018, more than half of all bridges currently in New Mexico will be more than 50 years old. Only the high dry climate of the state has prevented serious deficiency problems, but the large percentage of heavy truck traffic will soon negate that advantage.

Although the bridges being designed and built today have a design life of 75 years or greater, almost every bridge constructed prior to 1980 was designed to last only 50 years.

In addition to the looming expense of our aging and deteriorating bridges exceeding their design lives, additional burdens are being placed on our transportation systems, including rising construction costs, declining revenues, increased congestion, an expanding trucking industry, diversion of available funds, the need to improve bridge safety and new bridge needs, such as the ability to thwart terrorist attacks. Resultantly, this category received a D.

BRIDGES

The current evaluation process revealed that 35% of New Mexico's bridges have already reached their design life, and 50% will reach their design life by 2018.

These facts coupled with a bleak funding outlook resulted in an overall rating that is lower than is indicated by the condition alone.

Cost estimates to repair or replace bridges in New Mexico is $178 million, and this number will grow rapidly as each design life is exceeded.

Summary NM Bridges 2012:

C –

Evaluation Criteria	Grade
Capacity	B
Condition	B
Operations and Maintenance	D-
Public Safety	B
Funding	F
Planning (Future Needs)	D
Resilience	C-

Bridges Final Grade = C – (71.25)

Recommendations

Projects should be prioritized to give more attention to existing bridges by performing thorough inspections on a routine schedule, and following up on maintenance needs from field observations. In addition, Civil Engineers need to adopt and implement advanced analytical methods and non-destructive testing techniques to better evaluate the condition and remaining life of existing bridges.

State-of-the-art approaches toward determining the load capacity of existing bridges and enforcing load-posting restrictions could extend the service life of some bridges. In New Mexico, there is a strong bridge inspection and bridge management program in place to prioritize projects for the sustainability of existing bridges based on repair, rehabilitation, and retrofit needs. However, the lack of funding keeps the state from efficiently moving forward.

The engineering community must work closely with the transportation agencies to get the full attention of the political powers within the state and nation to provide a more sustainable funding program for the rehabilitation and replacement of bridges.