IOWA DOT

2021 ANNUAL BRIDGE REPORT

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SPECIAL POINTS OF INTEREST

- Poor bridges on the Primary Highway System have been reduced from 237 in 2009 to 32 in 2021.
- The average age of Primary Highway Bridges is 41 years. Half of these bridges are over 43 years old.
- The deck area of the bridges on the Primary Highway System is over 1074 acres or 1.68 square miles.

2021 BRIDGE DATA

This report is based on data provided to the Federal Highway Administration (FHWA) in March 2021. The National Bridge Inventory (NBI) data is submitted to the FHWA annually. The data submitted includes 116 data fields collected during biennial inspections. Once the data is submitted to the FHWA, they perform data analyses and determine the Good-Fair-Poor category.

The State is responsible for oversight of the statewide bridge inspection program according to federal regulations. All bridges are inspected by the local jurisdiction responsible for the roadway crossing a bridge. The State has delegated this responsibility to the local agencies through Iowa Code section 314.18.

The State's oversight of local bridge inspections is managed through the Structure Inspection and Inventory Management System (SIIMS). SIIMS is a web-based software system used to document all bridge inspections statewide. Oversight is also performed through annual field inspections of a group of counties and cities for quality assurance.

I-74 over Mississippi River

BRIDGE OWNERSHIP

Bridge ownership is based on the jurisdiction of the roadway where the bridge is located. There are three main categories of ownership in Iowa. Most bridges on public roadways are owned by the state, a county, or a city.

OWNERS	TOTAL	DECK AREA (FT^2)
STATE	4,184	46,766,635
COUNTIES	18,440	41,481,071
CITIES	1,209	8,210,645
TOTAL	23,833	96,458,351

COMMON BRIDGE TYPES

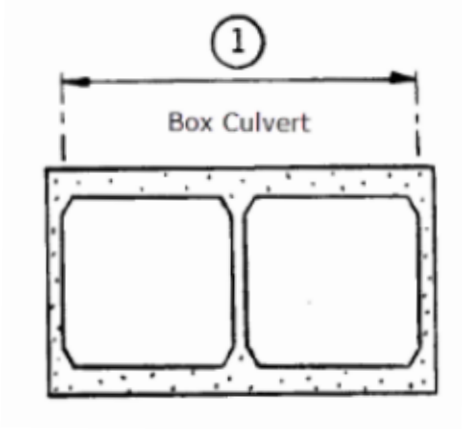
There are several common types of bridges on Iowa's roadways.

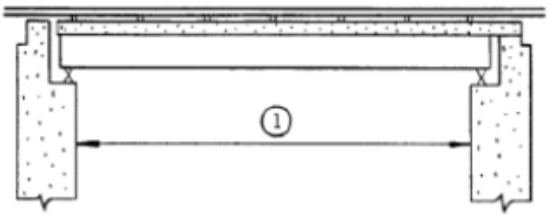
BRIDGE TYPES	STATE	COUNTY	CITY
PRE-STRESSED GIRDER	1,853	2,874	252
STEEL GIRDER	904	4,638	165
CONCRETE GIRDER	9	337	25
CONCRETE SLAB	561	4,186	284
TRUSS	10	729	19
TIMBER GIRDER	3	1,469	31
CULVERT	816	3,512	372
OTHER	28	695	61
TOTAL	4,184	18,440	1,209

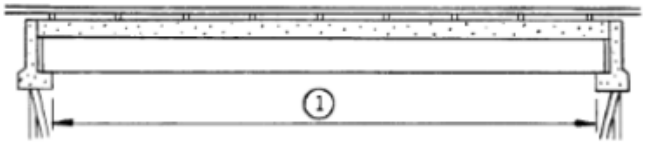
BRIDGE DEFINITION

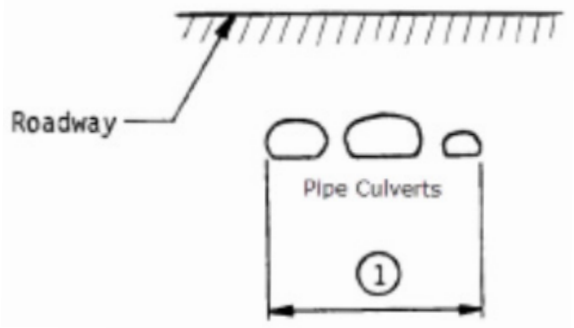
The FHWA definition of a bridge is any structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring-lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

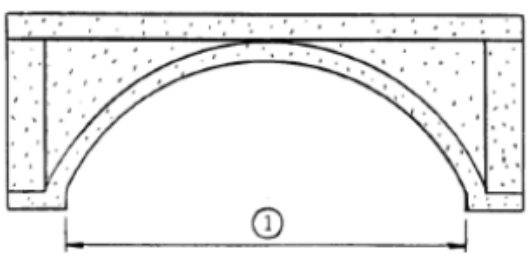
A BRIDGE IS A STRUCTURE WITH AN OPENING OF MORE THAN 20 FT.











BRIDGE CATEGORIZATION: GOOD-FAIR-POOR

The assignment of a classification of Good, Fair, or Poor is as defined by the FHWA for MAP-21 reporting and is based on the bridge's condition ratings for NBI Items: 58-Deck, 59-Superstructure, 60-Substructure, and 62-Culverts.

The method of assessment to determine the classification of a bridge will be the minimum condition rating. The condition rating of lowest rating of a bridge's 3 NBI Items, 58-Deck, 59-Superstructure, and 60-Substructure will determine the classification of the bridge. For culverts, the rating of its NBI Item, 62-Culverts, will determine its classification. Bridges and culverts will be classified as Good, Fair, or Poor based on the following criteria:

GOOD

When the lowest rating of any of the 3 NBI items for a bridge (Items 58-Deck, 59-Superstructure, 60-Substructure) is 7, 8 or 9, the bridge will be classified as Good. When the rating of NBI item for a culvert (Item 62-Culverts) is 7, 8, or 9, the culvert will be classified as Good.

FAIR

When the lowest rating of any of the 3 NBI items for a bridge is 5 or 6, the bridge will be classified as Fair. When the rating of NBI item for a culvert is 5 or 6, the culvert will be classified as Fair.

POOR

When the lowest rating of any of the 3 NBI items for a bridge is 4, 3, 2, 1, or 0, the bridge will be classified as Poor. When the rating of NBI item for a culvert is 4, 3, 2, 1, or 0, the culvert will be classified as Poor.

> *THE POOR CATEGORY DOES NOT INDICATE THERE IS A SAFETY ISSUE. POOR BRIDGES HAVE DETERIORATION OR DAMAGE THAT MAY NEED REPAIR OR REPLACEMENT IN THE NEAR FUTURE. A BRIDGE WILL BE CLOSED UPON FINDING IT IS UNSAFE.*

OWNERS	GOOD	FAIR	POOR	TOTAL
STATE	2,022	2,130	32	4,184
COUNTIES	6,814	7,354	4,272	18,440
CITIES	504	512	193	1,209
TOTAL	9,340	9,996	4,497	23,833

BRIDGE INSPECTION REQUIREMENTS

The Federal Highway Administration (FHWA) requires all bridges on public roads that carry traffic be inspected according to the National Bridge Inspection Standards (NBIS).

The NBIS defines a bridge, bridge inspection types, inspector qualifications, and load rating requirements.

The NBIS requires each bridge owner to provide a specific set of data items to FHWA annually.

These data items are defined in the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations' Bridges". There are 116 items required to be submitted annually for every bridge.

Most bridges must be inspected on a 24-month frequency at a minimum. More frequent inspections are required when a bridge meets specific criteria established by the State.

The FHWA allows a state to establish criteria to extend the inspection frequency for a given bridge to a maximum of 48 months. Iowa has approved criteria to extend the frequency to 48 months on some bridges.

5 in 1 Bridge carrying I-380 and city streets over the Cedar River dam

DISTRICT BRIDGES

District bridges are maintained by bridge repair crews. Each repair crew has three people who work together as a team or can work individually with help from other District employees.

The work they do is diverse and typically involves the following:

1. Epoxy injection of delamination in bridge decks
2. Deck patching
3. Joint repair
4. Backwall repair
5. Collision damage repair
6. Erosion repair
7. Approach pavement repair and void filling
8. Substructure concrete patching
9. Assign bridge repair work to District garage
10. Retrofit fatigue cracks in steel girders

Annual meetings between each District and the Bridges and Structures Bureau are held to determine programming needs. Annual needs are captured in the SIIMS program by District and Bridges and Structures Bureau staff throughout the year.

STATE ONLY	TOTAL	DECK AREA (FT^2)	POOR TOTAL	POOR DECK AREA (FT^2)
DISTRICT 1	807	9,430,681	4	26,122
DISTRICT 2	640	6,016,955	4	54,211
DISTRICT 3	613	4,897,730	6	30,752
DISTRICT 4	659	7,687,070	1	880
DISTRICT 5	609	6,536,665	9	37,633
DISTRICT 6	856	12,197,534	8	712,788
TOTAL	4,184	46,766,635	32	862,386

LOCAL PUBLIC AGENCY BRIDGES

Local Public Agencies (LPA) own the majority of the bridges in Iowa. LPA own 19,649 of the 23,833 bridges.

LPA also own most of the Poor bridges as well. These 4,465 Poor bridges account for 22.7 percent of the LPA bridge inventory and 16.9 percent of their total deck area.

These are high percentages, but the traffic volumes on most of these bridges is very low. Half of the Poor bridges on the county roadways carry fewer than 35 vehicles per day.

62.3 percent of the Poor bridges are Posted or Restricted in some way.

7.8 percent of the Poor bridges owned by LPA are closed to traffic. Closed bridges can remain in the inventory for 10 years. After 10 years, the FHWA requires they be removed from the inventory because they assume the bridge is not going to be replaced.

LPA	TOTAL	DECK AREA (FT^2)	POOR TOTAL	POOR DECK AREA (FT^2)
COUNTIES	18,440	41,481,071	4,272	7,239,436
CITIES	1,209	8,210,645	193	1,171,612
TOTAL	19,649	49,691,716	4,465	8,411,047

STRUCTURALLY DEFICIENT / POOR

The definitions for Structural Deficiency and Poor are the same. In January 2018 the definition of Structural Deficiency was modified by excluding two of the previous indicators—Structural Evaluation and Waterway Adequacy.

Structural Evaluation was based on the bridges load carrying capacity and/or condition ratings. The Waterway Adequacy was based on the bridge's size in relation to the waterway underneath.

Fifty percent of the Structurally Deficient bridges on the Local highway system carry fewer than 35 vehicles per day. Almost 80 percent carry fewer than 100 vehicles per day.

Of the 4,465 locally owned SD/Poor bridges, 348 are closed to traffic.

Restricted bridges are posted for restrictions other than load capacity. They can be restricted to one lane, one vehicle at a time, or a speed restriction.

ALTHOUGH IOWA HAS THE HIGHEST NUMBER OF STRUCTURALLY DEFICIENT (SD)/POOR BRIDGES IN THE COUNTRY, IOWA IS 7TH IN TOTAL SD/POOR DECK AREA.

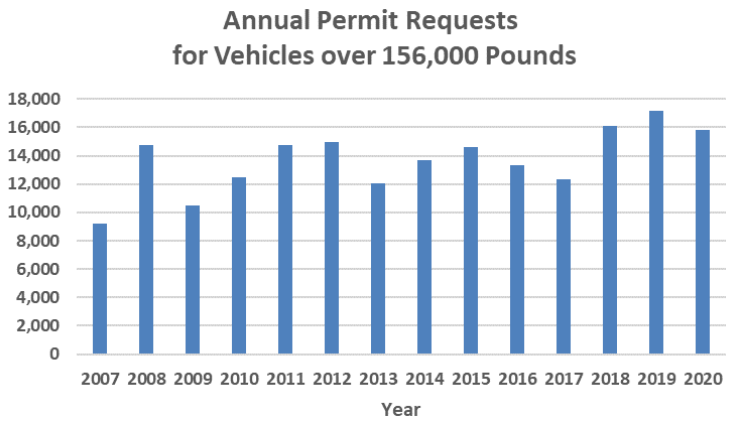
POOR BRIDGES	OPEN	POSTED	RESTRICTED	CLOSED	OTHER	TOTAL
STATE	28	3	1	0	0	32
COUNTY	1,158	2,428	278	329	79	4,272
CITY	97	70	5	19	2	193
TOTAL	1,283	2,501	284	348	81	4,497

HEAVY LOAD PERMITS

The Bridges and Structures Bureau is responsible for the review of all heavy load permit requests, on the Primary Highway System, for gross weights over 156,000 pounds or axle weights above 24,000 pounds. These permit requests are reviewed using the IAPS/Superload program. Each permit must specify the exact route they will be traveling. Every bridge along the proposed route is checked for adequate capacity to carry that specific vehicle. The analysis takes into account the load per axle and the axle spacing of the vehicle. This detailed check ensures the adequacy of the bridges along the proposed route.

The IAPS system also checks vertical and horizontal clearances along the route based on the height provided on the permit and accurate measurements of clearances stored in the DOT database.

Currently there are an average of over 1200 heavy load permit requests made each month. The number of permits has been increasing since 1997. The total number has doubled over the past 15 years.



NATIONAL BRIDGE INVENTORY

Bridges in the National Bridge Inventory (NBI) require inspection frequency for most bridges not to exceed 24 months according to the National Bridge Inspection Standards (NBIS).

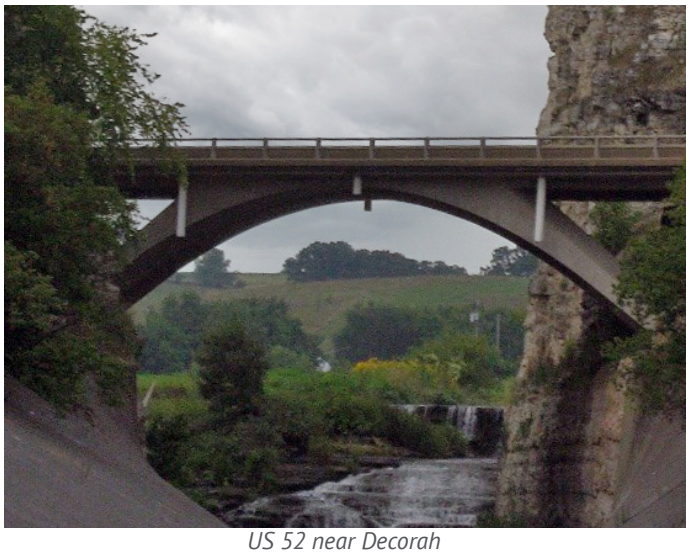
Structures included in the NBI are highway bridges on public roads.

Bridges not part of the NBI are structures such as: Railroad, Toll, Privately owned and Pedestrian bridges.

There were 618,465 bridges in the 2020 NBI nationally. 45,031 were considered to be in Poor condition.

IOWA RANKING IN THE FOLLOWING CATEGORIES	
Number of bridges	7th
Number of poor bridges	1st
Total Deck Area (ft^2)	18th
Poor Deck Area (ft^2)	7th
Number of NHS bridges	24th
Number of poor NHS bridges	41st
Poor NHS Deck Area (ft^2)	27th
Poor NHS Deck Area (% of total area)	35th

WHO HAS THE MOST IN THE FOLLOWING CATEGORIES?	
Number of bridges	Texas
Number of poor bridges	Iowa
Total deck area	Texas
Poor deck area	California
Number of NHS bridges	Texas
Number of poor NHS bridges	California
Poor NHS deck area	California
Poor NHS deck area (% of total area)	Rhode Island



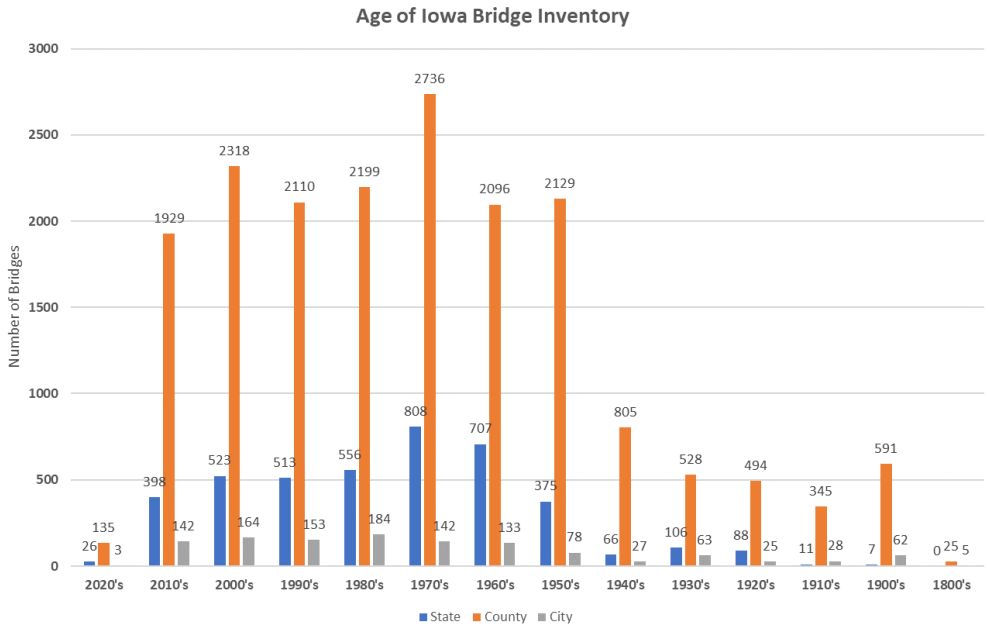
US 52 near Decorah

AGE OF BRIDGE INVENTORY

The average bridge age for Iowa's Primary Highway System is 41 years. Nationally the average age is 46 years. The common age used to describe how long a bridge should last has been 50 years. The average age of bridges replaced on the Primary Highway System is 64 years. Bridges built after the late 1970s will likely last longer than 64 years. The design of these bridges included epoxy coated reinforcing and the use of more integral abutments. Limiting the number of deck joints is common in new designs, which improves the longevity of a bridge.

On our Local Highway System, the average age is 46 years. The national average for Locally owned bridges is 43 years. Our Local bridge inventory makes up the majority of the Poor bridge category in Iowa.

In 7 years, the average age of bridges on the Primary Highway system will be 50 years. The average age of bridges on the interstate is 41 years.



AVERAGE DAILY TRAFFIC

The Average Daily Traffic (ADT) crossing a bridge is a major factor for making decisions to repair or replace a bridge.
Many bridges on the Secondary Highway System (county and city routes) do not have a very high ADT. Half of the Poor bridges on the County highway system carry fewer than 35 vehicles per day. The County highway system accounts for the majority of Poor bridges in the State. An ADT of 40 vehicles is considered "Low Volume".

> *HALF OF ALL THE POOR BRIDGES ON THE COUNTY HIGHWAY SYSTEM CARRY FEWER THAN 35 VEHICLES PER DAY.*

Counties do a good job maintaining the bridges that carry the majority of the traffic. Over half of the Poor bridges on the County highway system are posted for weight restrictions. The weight limits allow safe use of these bridges.

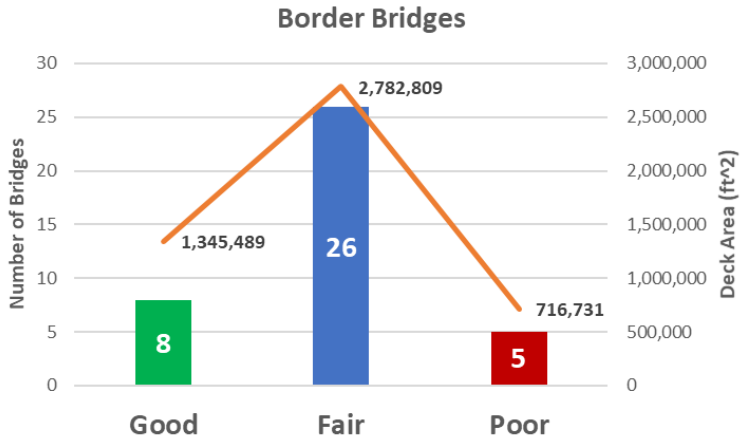
It is not cost effective for a local agency to spend a significant amount of money on their low volume bridges. With limited funding, it is best to keep a Poor bridge in service when it is able to accommodate the traffic crossing it.

	OWNER		
	STATE	COUNTY	CITY
Average ADT - all bridges	6,655	201	3,337
Median ADT - all bridges	3,540	45	1,600
Number of bridges	4,184	18,440	1,209
Average ADT - poor bridges	6,293	138	2,289
Median ADT - poor bridges	3,220	35	790
Number of poor bridges	32	4,272	193
Percent poor bridges	0.8%	23.2%	16.0%

BORDER BRIDGES

There are 39 bridges that are jointly owned by Iowa and neighboring states. Many of these bridges are complex structure types such as tied arch, continuous thru truss, cable stayed, suspension or segmental concrete.

Due to the large size and complexity of most of these bridges, they are cleaned annually and maintained at a higher level of repair. Several require painting two, three, or even four times during their life.



BRIDGE POSTING

Bridge posting is needed when the capacity of a bridge no longer meets the needs of the legal loads traveling on public highways.

There are many configurations of legal trucks that must be evaluated on every bridge. If the bridge doesn't have the capacity to carry any one of the many legal truck options, a posting sign must be installed at the bridge.

In Iowa, the legal limits are 80,000 pounds on the Interstate and 96,000 pounds on all other routes. These trucks must comply with the federal bridge formula that limits the gross weight on each axle group.

Bridge postings apply to any vehicle traveling on the bridge, other than fire apparatus, implements of husbandry being transported for repair or road maintenance equipment owned by the state or local agency.

POSTING SIGNS ARE AN ECONOMICAL WAY TO PROTECT THE PUBLIC AND KEEP A BRIDGE IN SERVICE FOR THE MAJORITY OF THE VEHICLES USING IT.

	POSTED	RESTRICTED	CLOSED	OTHER	TOTAL
STATE	17	1	3	0	21
COUNTY	3,964	739	332	135	5,170
CITY	104	10	19	3	136
TOTAL	4,085	750	354	138	5,327

NATIONAL HIGHWAY SYSTEM

The National Highway System (NHS) is a system of roadways the federal government has designated as essential for national connectivity.

There are 2,634 bridges on the NHS in Iowa. 2,586 of these bridges are on the Primary Highway System. The interstate system is included in the NHS.

There are over 3,000 lane miles of NHS pavement.

Federal requirements established in the FAST Act put limits on the percentage of deck area on the NHS that can be categorized as "Poor." Less than 10 percent of the bridge deck area on the NHS can be rated "Poor".

In 2021, the percentage of NHS bridge deck area rated "Poor" was 2.4 percent. This is well below the required limit of 10 percent.

	NUMBER OF BRIDGES	GOOD BRIDGES	FAIR BRIDGES	POOR BRIDGES	% POOR DECK AREA (FT^2)
STATE	2,586	1,277	1,294	15	2.2%
COUNTY	2	0	2	0	0.0%
CITY	46	17	24	5	10.5%
TOTAL	2,634	1,294	1,320	20	2.4%

BRIDGE FUNDING

The Bridges and Structures Bureau is currently using an optimization and prioritization system developed by Infrastructure Data Solutions, Inc. (IDS). This system uses NBI data from 1992 to present to develop deterioration models for the inventory of typical bridges. Culverts and border bridges are excluded from this analysis. Culverts don't have enough NBI data to make clear decisions on maintenance or replacement. Border bridges are unique and due to their larger size are not easily modeled using NBI data.

BRIDGE PROJECTS ARE REVIEWED BY THE BRIDGES AND STRUCTURES BUREAU AND THE DISTRICTS TO DETERMINE PRIORITIES FOR THE FIVE YEAR PROGRAM.

The IDS software creates a 20-year program for replacement, rehabilitation and repair based on set funding limits or condition targets. Scenarios have been created for an unlimited budget as well as a "Do Nothing" scenario. The unlimited budget shows what may be needed to maintain the inventory at a specified condition level. The "Do Nothing" budget shows what the deterioration rate of the inventory would be if no money was spent for 20 years.

The target levels are based on the Bridge Condition Index (BCI) developed by the Bridges and Structures Bureau. The BCI is based on similar calculations for the Sufficiency Rating created by FHWA. The BCI is more sensitive to changes in condition ratings for the different bridge components. This way, bridges can be compared to each other in a more detailed manner. This helps determine which bridges to choose for the program, when the funding is limited.

Annually the Bridges and Structures Bureau assists with updating a five-year transportation plan to program expenditures in order to maintain our bridges and improve the bridge inventory. The program consists of a variety of projects to build new bridges, replace bridges, rehabilitate bridges and preserve bridges with contract maintenance activities.

PROJECT COUNT BY WORK TYPE	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Bridge deck overlay	23	26	20	30	33	29	28
Bridge replacement	30	22	34	22	25	17	30
Bridge new	13	11	12	24	18	9	10
RCB culvert replacement	7	8	11	8	13	9	8
RCB culvert new	1	3	3	3	5	4	3
Bridge rehabilitation	1	1	2	3	1	4	10

FHWA METRIC COMPLIANCE

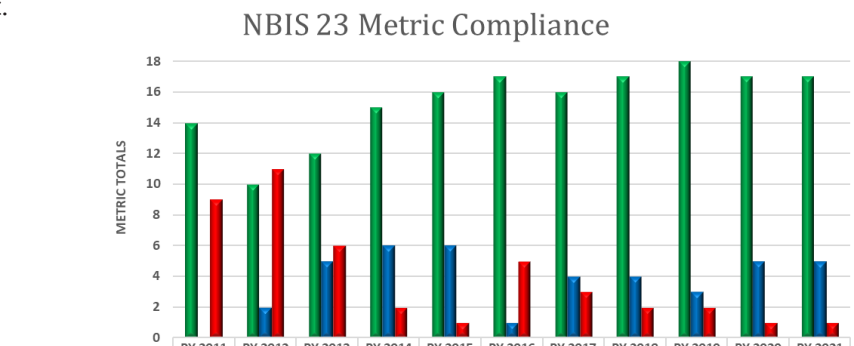
Annually the FHWA reviews each state's bridge inspection program against 23 metrics.

There are three levels of compliance for each metric.

1. COMPLIANCE
   All bridges meet the requirement

2. SUBSTANTIAL COMPLIANCE
   A small percentage of bridges need corrections to comply with the metric

3. CONDITIONAL COMPLIANCE
   A plan of corrective action is needed to become compliant with a metric



	PY 2011	PY 2012	PY 2013	PY 2014	PY 2015	PY 2016	PY 2017	PY 2018	PY 2019	PY 2020	PY 2021
Compliant	14	10	12	15	16	17	16	17	18	17	17
Substantially Compliant	0	2	5	6	6	1	4	4	3	5	5
Conditionally Compliant	9	11	6	2	1	5	3	2	2	1	1

FUNDING CATEGORIES FOR BRIDGE PROJECTS IN FY 2020

FY 2020	BRF	BRFN	IMN	IM-NHS	IMX	MB	MBIN	NHS	NHSN	NHSX	STPN	STP
Abutment Repair						$1,817,091	$29,430			$383,138		$24,885
Bridge Approach Repair						$244,052						
Bridge Cleaning		$644,011	$53,863									
Bridge Deck Overlay		$17,214,853	$2,223,664									
Bridge New-PPCB								$14,664,964	$40,309,325	$1,826,423		
Bridge New-Steel Girder								$4,761,859				
Bridge Painting			$344,489			$308,600	$723,501					
Bridge Rail Retrofit					$2,690,607							
Bridge Rehabilitation		$3,070,351	$3,803,282									
Bridge Repair		$1,789,248				$238,120	$216,837		$204,325		$20,536	
Bridge Replacement-CCS										$13,721,886		
Bridge Replacement-PPCB	$17,751,075			$10,396,344				$27,651,292				
Bridge Replacement-Steel Girder	$5,303,464											
Bridge and Approaches-CCS	$5,760,638	$1,002,961										
Bridge and Approaches-PPCB	$1,333,210											
Deck Joint Repair	$173,207				$317,754	$1,640,471	$6,257,564			$67,610		$54,914
PPCB Repair			$372,903						$262,586			
Pier Repair									$49,400			
Pipe Culverts									$1,329,147		$548,338	
RCB Culvert - Repair			$181,142									
RCB Culvert Extension - Single Box								$359,954	$267,355	$764,245		$647,622
RCB Culvert Extension - Triple Box				$747,593								
RCB Culvert Extension - Twin Box								$243,592		$757,147	$148,106	$248,315
RCB Culvert New - Single Box										$8,336,721		
RCB Culvert New - Triple Box	$2,867,255											
RCB Culvert New - Twin Box		$954,371										
RCB Culvert Replacement - Single Box	$916,763	$1,034,139							$805,159	$3,599,027	$15,659,252	
RCB Culvert Replacement - Triple Box	$1,548,789	$546,074										
RCB Culvert Replacement - Twin Box	$1,170,202								$439,589	$5,398,540		
Reconstruction - Bridge Widening								$8,793,530				
Reconstruction- RCB Culvert Ext - Triple								$949,188				
Retaining Wall-Cast-in-Place								$157,052				
Revetment			$122,490			$480,744			$364,737		$329,276	
Slope Protection					$123,740							
Structures - Miscellaneous			$339,728					$534,628	$416,631			
Total	**$36,824,602**	**$26,256,009**	**$7,441,561**	**$11,143,936**	**$3,132,101**	**$4,729,077**	**$7,227,332**	**$58,116,058**	**$44,448,254**	**$34,854,735**	**$16,705,507**	**$975,736**