Steel Bridge Coating Inventory for 2022

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Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

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Kentucky Transportation Cabinet
Commonwealth of Kentucky

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Research Report
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Steel Bridge Coating Inventory for 2022

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16. Abstract

The Kentucky Transportation Cabinet (KYTC) has replaced the lead-based coatings on many of its steel bridges over the past 30 years. In the 1980s and 1990s, inorganic zinc primers with vinyl topcoats were the go-to option for coating replacement projects. Since 2000, the typical choice for these projects has been organic zinc primers that are part of a two- or three-coat system. Some of these coatings have localized failures in high-stress areas. KYTC's current inventory of steel bridges numbers over 1,100 structures. Accounting for expected service lives, to properly maintain protective coatings on these bridges will require the Cabinet to paint at least 50 structures per year. To facilitate the agency's efforts, Kentucky Transportation Center (KTC) researchers audited the Cabinet's bridge inventory. KTC used a 10-point qualitative rating scale to evaluate the paint condition of each bridge. This exercise identified 116 bridges as candidates for full removal of the existing coating and recoating. Researchers met with the bridge engineers in each of KYTC's 12 districts to discuss the rankings and assist with prioritizing projects. An ArcGIS Online map was produced which catalogues key attributes of each bridge, including structure type, location, district, span length, facility carried, feature intersection, paint condition, a brief description, and pictures from the most recent inspection.

17. Key Words Bridges, inventory, corrosion, coatings, maintenance		**18. Distribution Statement** Unlimited with approval of the Kentucky Transportation Cabinet	
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1. Introduction

Over the past 25 to 30 years, lead-based coatings on many Kentucky Transportation Cabinet (KYTC) steel bridges have been removed and replaced. Nonetheless many bridges still have lead coatings. The typical replacement coating has been a zinc-based system. Older replacement coating projects completed in the 1980s and 1990s used inorganic zinc primers with vinyl topcoats. Those coating systems are reaching the ends of their service lives and need to be repaired or replaced. Since 2000 bridge maintenance painting projects have typically used organic zinc primers as part of a two- or three-coat system. Some of these have localized coating failures in high-stress areas.

KYTC currently maintains over 1,100 steel bridges. Based on anticipated coating service lives, properly maintaining the protective coatings of these structures will require painting at least 50 bridges per year. Preparing an up-to-date inventory of steel bridges that includes coating condition assessments is the first step KYTC bridge maintenance staff can take to develop a plan for maintaining protective coatings. Kentucky Transportation Center (KTC) researchers were tasked with Kentucky Statewide Planning and Research project (KYSPR) 22-614, *Steel Bridge Coating Inventory for 2022*, to assist KYTC with scheduling maintenance painting of steel structures in fiscal year 2022. This project followed a process similar to that used for Kentucky Highway Investigative Task (KHIT) 134, *Steel Bridge Coating Inventory*. Based on assessments, maintenance coating schedules and economical bridge coating strategies such as spot/zone painting or over-coating were developed for fiscal year 2022.

2. Project Activities

Preparing an up-to-date inventory of steel bridges that includes coating condition assessments is the first step in establishing a plan for maintaining bridge protective coatings as it can inform development of maintenance coating schedules and economical bridge coating strategies. For this project, KTC completed following tasks:

1. Use BrM (AASHTOWare™ Bridge Management software) to mine data on all state-owned and -maintained steel bridges, excluding border bridges, which will be part of a different assessment.
2. Sort steel bridges by district and paint condition.
3. Contact all district bridge engineers with the list generated from Tasks 1 and 2 to identify bridges that need to be painted, based on their assessment.
4. Generate a list of possible *Full Removal and Recoat* and *Spot, Zone, and Overcoat* bridges using the district engineer's unique knowledge of bridges in the district and potential needs.
5. Use information from Tasks 3 and 4 to produce an ArcGIS Online interactive map that includes pictures from the most current inspection and relevant data.

For all structural steel bridges, KTC conducted an independent inventory assessment in fall 2021 of KYTC bridge inspector coating assessments made during biennial inspections and recorded in BrM (i.e., county, district, bridge number, GPS location, paint condition, length, and type of main span construction). Data on paint condition were entered into a spreadsheet for further analysis. Steel bridges were sorted by district and paint condition. Analysis excluded the following structure types: county-owned steel structures, state border crossing structures, and railroad bridges as they require special permissions from railroad authorities.

For bridges without paint condition assessments in BrM, researchers downloaded all recent inspection pictures and insights from district engineers for further analysis. Each district bridge engineer was emailed the list of bridges classified as critical, and KTC met virtually with each to discuss how to rank bridges. There was discussion with district bridge engineers for inclusion of all bridges with a rating < 4 for the deck, superstructure, and substructure because they need additional maintenance or would not merit painting as they would likely be replaced in the near future. The meetings also gave district engineers the opportunity to prioritize bridges for maintenance painting and to add or remove structures based on their priorities. During the meetings, every structure was discussed in detail and classified as a candidate for *Full Removal and Recoat* and/or *Spot, Zone, and Overcoating*. Across KYTC's 12 districts, 116 bridges were identified as candidates for *Full Removal and Recoat* (Table 1). Figure 1 maps the locations of these bridges. For each bridge, the map catalogues key attributes, including structure type, location, district, span length, facility carried, feature intersection, paint condition, a brief description, and pictures from the most recent inspection. The interactive map can be viewed at the link below.

https://uky-edu.maps.arcgis.com/apps/instant/portfolio/index.html?appid=3efb3c5915b64dde8617e225bf1d3c5c

3. Recommendations

KTC recommends looking at each bridge mapped in Figure 1 to identify local factors that would impact maintenance coating operations (e.g., detour lengths if a single-lane bridge has to be closed, presence of open spaces for staging maintenance painting equipment, clearance below the decks). Pending onsite inspections, the maintenance action recommended for most bridges is total removal of existing coatings and application of a new two- or three-coat system. Heavily rusted areas should be pressure washed prior to abrasive blasting to reduce chloride contamination. Smaller bridges with low clearances over streams should have additional barrier and epoxy applied, with topcoat on facias only.

Table 1 List of Steel Structures Identified for Full Removal and Recoat

District	County	Bridge ID	Facility Carried by Structure	Length (ft)
01	Calloway (018)	018B00015N	KY-1836	41
01	Lyon (072)	072B00038N	KY-295	233.9
01	McCracken (073)	073B00065N	KY-3075	242.1
01	Lyon (072)	072B00058N	KY-6020	155.8
01	Lyon (072)	072B00013N	KY-295	253
01	Trigg (111)	111B00048R	I-24	307.1
01	Marshall (079)	079B00112N	KY-3456	251
01	McCracken (073)	073B00120L	I 24 NC	485.9
01	McCracken (073)	073B00120R	I-24	485.9
01	Lyon (072)	072B00044L	I-24 NC	407.2
01	Lyon (072)	072B00044R	I-24	407.2
02	Daviess (030)	030B00001L	LEWISPORT RD	138
02	Daviess (030)	030B00146N	KY-2127	24
02	Ohio (092)	092B00169N	KY-2718	49.9
02	Webster (117)	117B00020N	KY-370	312
02	McLean (075)	075B00065N	KY-85	1479
02	Henderson (051)	051B00044N	KY-136	26.9
02	Daviess (030)	030B00085L	WN-9007	189
02	Daviess (030)	030B00085R	WN-9007	189
03	Todd (110)	110B00027N	KY-107	32
03	Warren (114)	114B00009N	KY-101	480
03	Butler (016)	016B00061N	I-165	778
03	Butler (016)	016B00025N	KY-411	40
04	Breckinridge (014)	014B00050N	US-60X	253
04	Green (044)	044B00030N	KY-487	25
04	Hardin (047)	047B00022N	US-62	253
04	Hardin (047)	047B00130L	U.S. 62	352
04	Hardin (047)	047B00130R	US-62	352
04	Breckinridge (014)	014B00060N	US-60	481
04	Breckinridge (014)	014B00002N	KY-79	664
04	Breckinridge (014)	014B00016N	KY-144	327.1
04	Nelson (090)	090B00051N	US-31E	344.2
04	Hardin (047)	047B00128R	Bluegrass Parkway	372.1
04	Hardin (047)	047B00122N	Tunnel Hill Rd	314
04	Hardin (047)	047B00127L	WESTERN KENTUCKY P	436
04	Hardin (047)	047B00127R	WK-9001	436
04	Hardin (047)	047B00128L	Bluegrass Parkway	340.9

District	County	Bridge ID	Facility Carried by Structure	Length (ft)
05	Jefferson (056)	056B00052L	I-64 WB	116.9
05	Jefferson (056)	056B00052R	I-64 EB	115.5
05	Jefferson (056)	056B00118N	KY 1932	249
05	Jefferson (056)	056B00150N	PAYNE ST	187.3
05	Jefferson (056)	056B00162N	I-64 EB ON RAMP	137.8
05	Jefferson (056)	056B00163N	I-64 EB OFF RAMP	134.2
05	Jefferson (056)	056B00262N	KY 2048	407
05	Jefferson (056)	056B00281N	I-64 EB OFF RAMP	242.1
05	Jefferson (056)	056B00306N	S PARK RD	385
05	Jefferson (056)	056B00307N	KY 1065	432.1
05	Jefferson (056)	056B00315N	WOODRIDGE DR	272.3
05	Jefferson (056)	056B00317L	KY 841 WB	178
05	Jefferson (056)	056B00317R	KY 841 EB	178
05	Jefferson (056)	056B00318L	KY 841 WB	350.1
05	Jefferson (056)	056B00318R	KY 841 EB	350.1
05	Jefferson (056)	056B00319N	I-65 NB RAMP	287.1
05	Jefferson (056)	056B00320N	I-65 SB RAMP	281
05	Jefferson (056)	056B00322L	I-265 SB	185.5
05	Jefferson (056)	056B00322R	I-265 NB	185.5
05	Jefferson (056)	056B00323N	I-65 NB RAMP	253
06	Harrison (049)	049B00077N	KY 3016	306.1
06	Boone (008)	008B00048L	AIRPORT ACCESS RD	273
06	Boone (008)	008B00048R	AIRPORT ROAD	273
07	Boyle (011)	011B00048N	KY 52	455
07	Fayette (034)	034B00008N	RICHMOND ROAD	320
07	Boyle (011)	011B00038L	US 127B	508
07	Fayette (034)	034B00031L	NEW CIRCLE RD-OL	225.5
07	Bourbon (009)	009B00045N	US 68X (E MAIN ST)	140
07	Boyle (011)	011B00053N	KY-34	638.1
07	Fayette (034)	034B00085N	S 75 NC	310
07	Fayette (034)	034B00001N	US-25	399
07	Garrard (040)	040B00028L	US-27	1098
07	Garrard (040)	040B00028R	US-27	1098
07	Madison (076)	076B00070N	KY-1985	71.5
07	Mercer (084)	084B00030N	KY-1941	82
07	Scott (105)	105B00134N	KY-32	25
07	Woodford (120)	120B00022L	I-64 (WEST)	246
07	Woodford (120)	120B00022R	I-64 (EAST)	246
08	McCreary (074)	074B00034N	KY-700	59.7

District	County	Bridge ID	Facility Carried by Structure	Length (ft)
08	McCreary (074)	074B00019N	KY-1470	33
08	Adair (001)	001B00034N	KY-551	370
08	Pulaski (100)	100B00032R	US-27	707
08	Pulaski (100)	100B00087N	KY-80	1107
08	Pulaski (100)	100B00098N	KY-461	515.2
08	Pulaski (100)	100B00110N	KY 90	1711.6
08	Rockcastle (102)	102B00061N	CUT GAP RD	215.8
08	Wayne (116)	116B00036N	KY-90	526.62
08	Wayne (116)	116B00044N	KY-90	445.5
09	Fleming (035)	035B00004N	KY-597	37.1
09	Lewis (068)	068B00058N	KY-1068	29.9
09	Carter (022)	022B00112N	KY-7	306.1
09	Greenup (045)	045B00037N	US-23	366.1
09	Greenup (045)	045B00063N	KY-3306	157
09	Bath (006)	006B00064N	KY-1325	318.9
09	Rowan (103)	103B00063N	KY-519	366
09	Greenup (045)	045B00049N	US-23	354
09	Fleming (035)	035B00068N	KY-170	22
09	Fleming (035)	035B00070N	KY-11	410
09	Carter (022)	022B00127N	KY-986	183.1
09	Greenup (045)	045B00060N	KY-10	3526.9
10	Breathitt (013)	097B00114N	KY-1067	33.1
10	Perry (097)	097B00042N	KY-2447	261.2
10	Powell (099)	099B00080N	KY-11	287.1
11	Jackson (055)	055B00028N	KY-89	203
11	Harlan (048)	048B00032N	KY-72	84
11	Harlan (048)	048B00007N	KY-160	373
11	Clay (026)	026B00094N	KY-66	395
11	Whitley (118)	118B00045R	I-75	674
11	Clay (026)	026B00072N	HR-9006	206
11	Whitley (118)	118B00045L	I-75 NC	674
11	Whitley (118)	118B00094N	KY-296	445.9
11	Whitley (118)	118B00106N	MAIN STREET	463
12	Pike (098)	098B00053N	KY-1789	280
12	Letcher (067)	067B00102N	KY-15	149
12	Letcher (067)	067B00105N	KY-15	384.8
12	Letcher (067)	067B00081N	US-119	358.9
12	Martin (080)	080B00021L	KY-645 NC	112
12	Martin (080)	080B00021R	KY-645	112

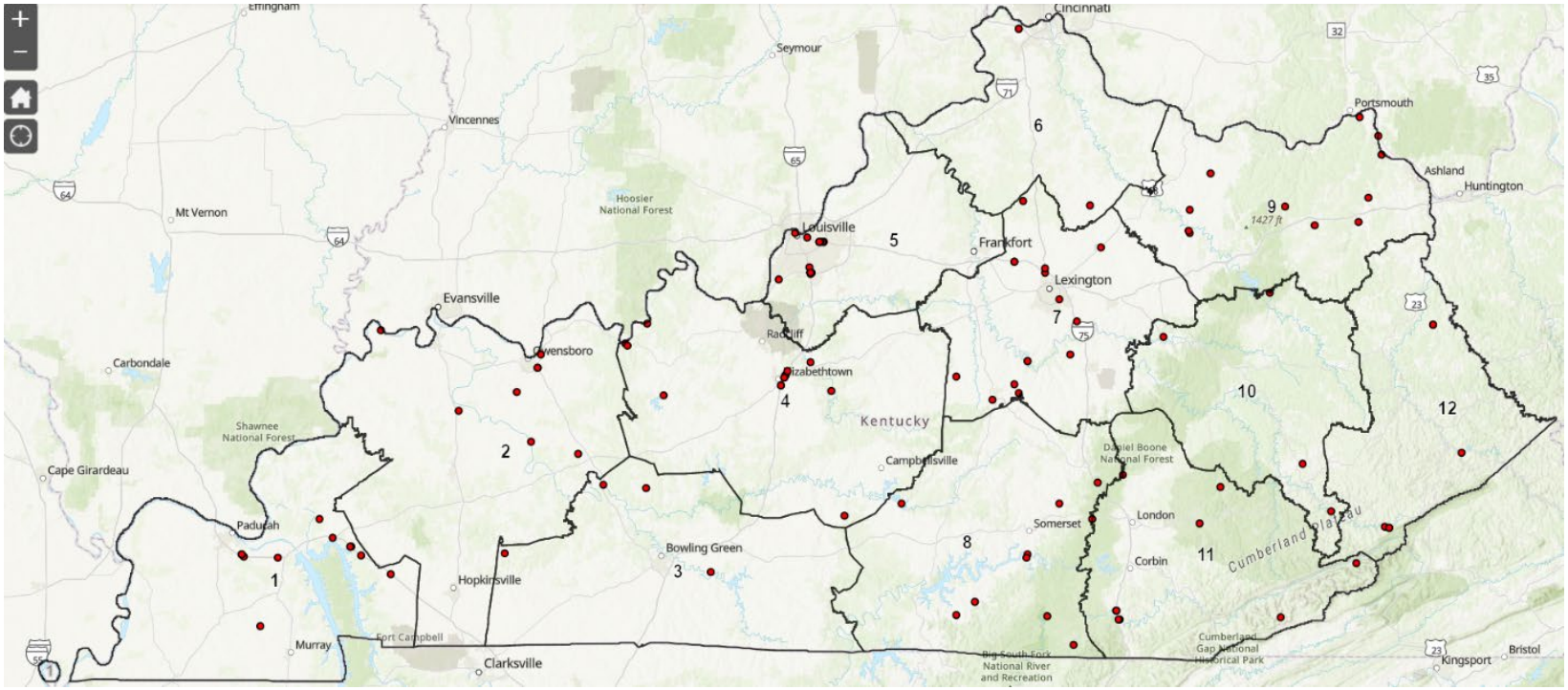

Figure 1 Map of Bridges Recommended for Full Removal and Recoat