INSPECTION OF LOUISIANA TIMBER BRIDGES

By

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Acknowledgements

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- Louisiana Transportation Research Center (LTRC)
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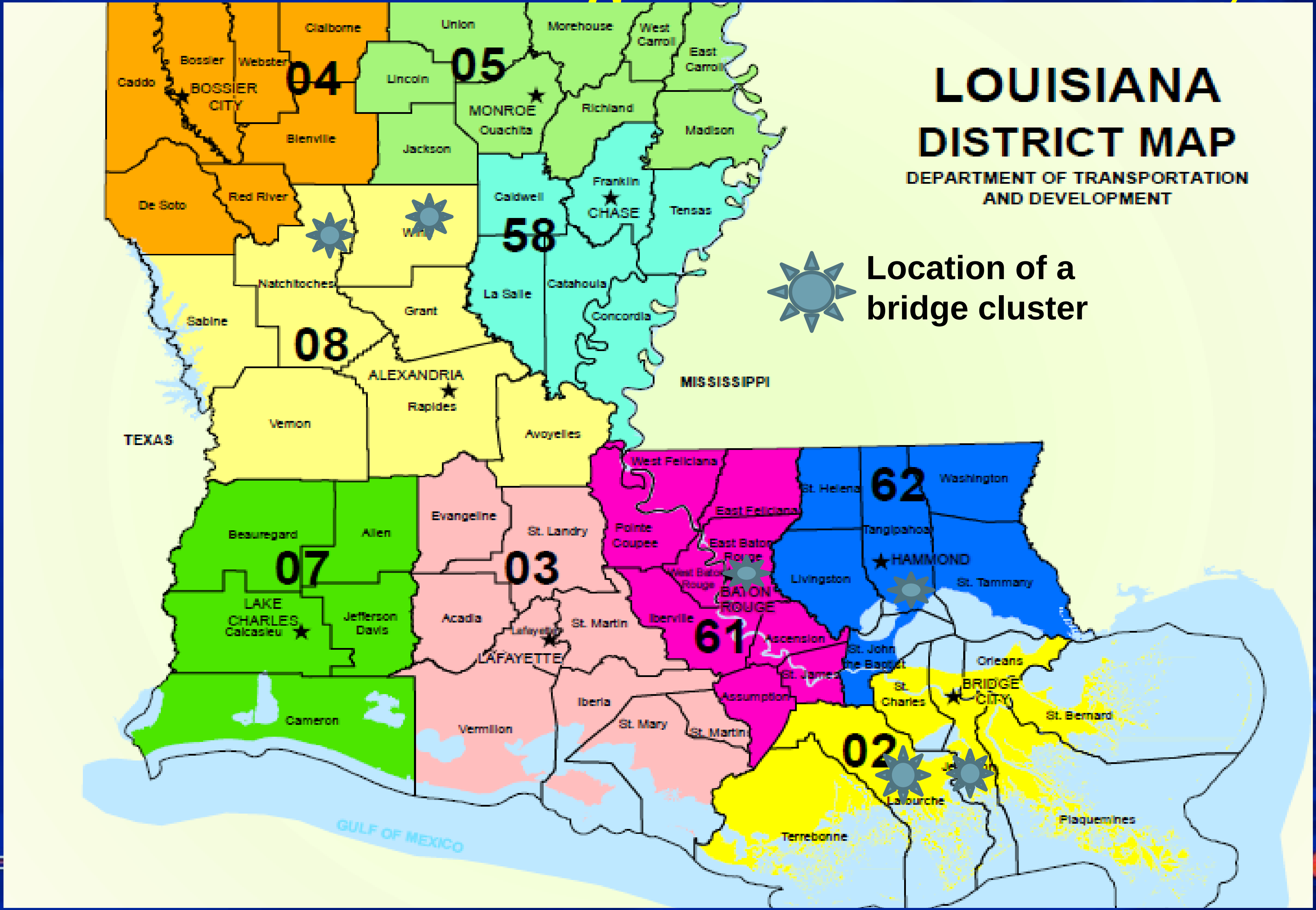
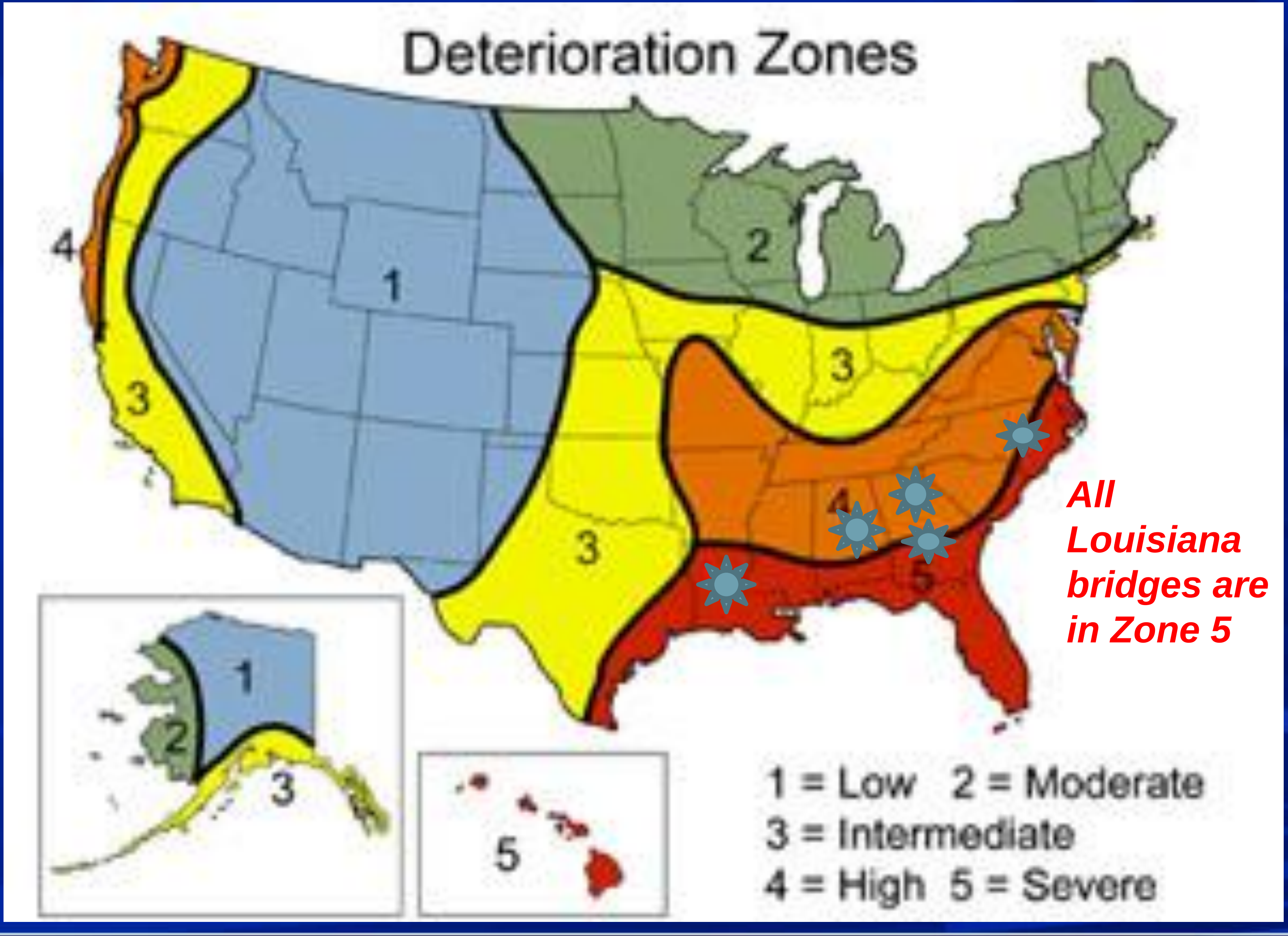
Overview of Timber Bridge Inventory Statistics

- Only 4% (24,267) of the nation's bridge (NBI) are timber bridges. However, nearly 8% (46,530) of the bridges have timber elements in the superstructure.
- Louisiana has the second largest number (2,068) of timber bridges in the nation, about one in twelve of are in Louisiana.
- Nearly two thirds of Louisiana timber bridges are either structurally deficient (47%) or functionally obsolete (16.5%).

Location of Bridges Selected for Study



Location of Bridges in Decay Zone



All Louisiana bridges are in Zone 5

Details of Bridges Inspected in District 08

Bridge No.	Decking	Runners / Overlay	Stringers	Piling	Length	Max Span	Num. Spans	Built
08-1	Timber Plank	7" Asphalt	Sawn Lumber	Timber	39	10	4	1967
08-2	Timber Plank	2" Gravel	Sawn Lumber	Timber	170	19	10	1977
08-3	Timber Plank	4" Asphalt	Sawn Lumber	Timber	58	19	3	1941
08-4	Timber Plank	4" Asphalt	Sawn Lumber	Timber	77	19	4	1941

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Details of Bridges Inspected in District 62

Bridge No.	Decking	Runners / Overlay	Stringers	Piling	Length	Max Span	Num. Spans	Built
62-1	Timber Plank	2" Gravel	Sawn Lumber	Timber	31	15	2	1980
62-2	Timber Plank	5" Gravel	Sawn Lumber	Timber	154	19	8	1960
62-3	Timber Plank	5" Asphalt	Sawn Lumber	Timber	58	19	3	1968

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Details of Bridges Inspected in District 02

Bridge No.	Decking	Runners / Overlay	Stringers	Piling	Length	Max Span	Num. Spans	Built
02-1	Timber Plank	Runners	Sawn Lumber	Timber	57	15	4	1960
02-2	Timber Plank	Runners	Sawn Lumber	Timber	53	15	4	1980

Details of Bridges Inspected in District 61

Bridge No.	Decking	Runners / Overlay	Stringers	Piling	Length	Max Span	Num. Spans	Built
61-2	Concrete	AC Ovrlay	Sawn Lumber	Timber	56	19	3	1974
61-1	Concrete	AC Ovrlay	Sawn Lumber	Timber	96	20	5	1960

INSPECTION METHODS

A five step procedure was adopted to conduct the bridge inspections and it involved the following:

- Labeling abutments, piers, girders, etc.
- Conducting initial visual assessment with hammer sounding
- Obtaining moisture content measurement in suspect & decay-prone areas
- Establishing baseline NDE data by collecting stress-wave & resistance micro-drilling data from areas of suspected sound wood;
- Investigating marked areas to measure the extent of internal deterioration by utilizing stress wave timer and resistance micro-drilling tool as needed.

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 62-2, East Baton Rouge Parish

Bridge 62-2, Drains in Concrete Deck

Bridge 62-2, Side View

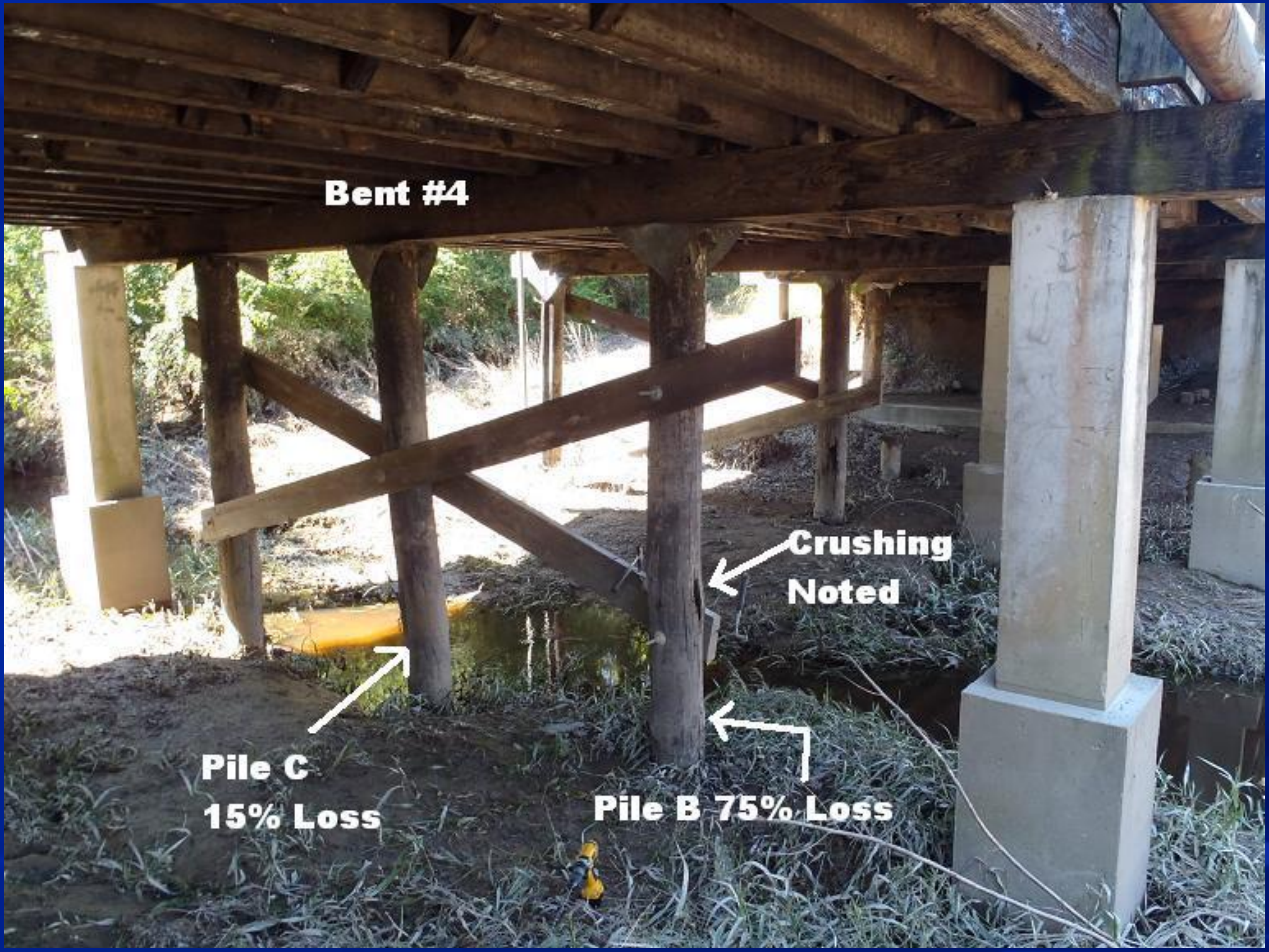
Bridge 62-2, View of Abutment

Bridge 62-2, View of Concrete Deck and Stringer Bracking

Bridge 62-2, Damaged Pile

Bridge 62-2, Pile Damage

Bridge 62-1, Decayed Pile



Bridge 62-2, Pile Damage

Bridge 62-2, Pile Damage

Bridge 62-1, Pile Damage

2

Bridge 62-1, Pile Damage

Bridge 62-2, Pile Damage

Bridge 62-2, Pile Damage

Bridge 62-1, Approach Road

Bridge 62-1

Bridge 62-1

Bridge 62-1


70%
Bent #3
70%
Pile E
Pile D
Pile C
1"
2"
2"
3"
Cross section of original 12"x12" cap between pile D & E
xx-decayed area of cap

Bridge 62-1

Bridge 62-1

Bridge 62-1

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

LTRC

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

LTRC

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

Bridge 08-4

CHALLENGES

- Some of the timber bridges originally selected for inspection could not evaluated because of the high water level, currents and inadequate headroom to conduct an inspection from a boat. Substitutions were made to ensure the desired number of bridges were inspected.
- In long-span bridges it was extremely difficult, if not next to impossible, to use the resistance microdrill to assess the condition of the stringers and deck due to height of the pile bent. Climbing the braces provide access only to the pile cap and the stringers at the supports.

CHALLENGES (contd.)

- Operating the microdrill at the top of the bent with one hand is nearly impossible without mobilizing Considerable equipment to gain access to the underside of long-span bridges with tall bents.
- Bridges with low clearance under the stringers offered a challenge also since it was difficult to operate the micro-drill in such small clearances.
- It was critical to have a three member team to conduct the investigation in order to manage the equipment and carry out the necessary documentation of the bridge inspection and assessment.

SUMMARY

- The absence of a durable vapour barrier between the wood deck and the asphalt overlay allowed moisture to be trapped at the interface of the deck and the overlay and contribute to the decay and deterioration of the deck.
- Once the asphalt cracks -- which it does due to the flexibility of the timber deck -- moisture travels to the wood deck and gets trapped above the deck if there is no provision for the moisture to escape.
- It is critical that a flexible and reliable vapour barrier be placed between the timber deck and the asphalt paving to improve the service life of the deck.

SUMMARY (contd.)

- The use of a water shedding groove in the timber deck board is important to avoid trapping of moisture.
- The use of timber abutments, while an easy alternative in some cases, should be avoided if possible to improve the service life of the overall bridge. The abutments can become a weak link in the bridge system.
- Timber pile deterioration in the zone of wetting and drying was observed in several bridges. Inexpensive treatment of piles sections in this zone with inorganic resins will significantly reduce pile deterioration which is the single most important reason for DOTs staying away from timber bridge systems.

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SUMMARY (contd.)

- The stringers in most of the bridges inspected were performing satisfactorily even after five decades and only occasional upgrading or strengthing was performed to repair damaged stringers or accommodate change in wheel loads.
- The key to performance of the timber bridge superstructure is the design and detail to keep it dry.
- A solution to improving the performance of the pile sub-structure is critical if timber is to be the material of choice for off-interstate highway bridges.

QUESTIONS ???