

8.0 CHAPTER 8 - TIMBER CORING

8.1 INTRODUCTION

Coring of timber elements is an effective method of determining the presence of rot. It is also a tool that can be used in forecasting the remaining service life of a bridge, and in helping to determine maintenance and construction requirements.

Generally, coring should be carried out by a minimum of 2 persons, at least one of which should have considerable experience, and be familiar with coring procedures and techniques. This person must also have sufficient experience to assess the core samples, and make the appropriate recommendations based on the findings.

Coring is generally carried out at least once in the service life of bridges with timber substructures. It is recommended that initial coring on timber substructure elements be carried out in year 25, unless visual evidence indicates coring is required sooner. If the initial timber coring finds evidence of only minor rot, additional coring may be required in subsequent years in order to monitor the progression of the rot.

A second coring may be required in year 40 if it is clearly determined that there is a minimum of 10 years life remaining in the bridge structure. If no rot was found in the previous inspection, cores should be taken in between the previous core holes.

Coring is also recommended prior to carrying out major maintenance or rehabilitation (i.e. girder or cap replacements, or concrete overlays).

Timber piles should be cored at times of low water, generally in the late fall, winter, or before or after irrigation seasons.

8.2 SAFETY

As noted above, coring should be carried out by a minimum of 2 people, using the appropriate personal protective equipment.

The inspectors must be aware of the following hazards:

- Use of ladders.
- Use of electrical devices near water.
- Potential for twisting wrists particularly when bit catches a drift pin or lag bolt.
- Working on uneven surfaces.
- Use of restricted chemicals such as creosote.
- Traffic accommodations.
- Thin ice.

8.3 TOOLS AND EQUIPMENT

The following equipment is required for timber coring:

- Drill – cordless or electric
- Generator, cords or extra cordless batteries
- 3/8" dia. bit x 12" long (include extra bits)
- Ladder (if required)
- 1/2" dia. fluted dowels
- Creosote
- Low pressure back-pack style sprayer
- Timber crayons
- Personal protection – rubber gloves, eye protection, dust mask, etc.
- Clip board, pencils and paper, timber coring forms
- Chain saw and associated protective equipment

8.4 CORING PROCEDURE

- Whenever possible, know the site you are going to core before you travel to it. It may be that the pier piles or caps are inaccessible in the summer due to excessive water depth. Reviewing the latest BIM inspection or photographs of the site can ensure that the coring is completed at the best time of year and that the inspector brings the proper equipment so that all timber members can be cored in a safe, effective manner.
- Begin coring approximately 300 mm from ends of caps, subcaps, and corbels and proceed at 1.5 m intervals.
- Core timber piles approximately 300 mm below top of pile, and again at or just above the visible waterline. For piles that are routinely exposed to water the inspector should try to determine where the pile is exposed to both air and water and take the core in that area. Rot is most likely located where the pile is exposed to water and air in an alternating cycle. If it is not possible to get to this area of the pile, then coring should be deferred.
- If no rot is encountered stop bit approximately 50 mm from backside of cap or pile.
- Stop coring as soon as rot is first encountered. Measure the depth of the hole and record the depth of sound timber. Resume coring through the rotted section, stopping again when it is determined that the rotted section has ended. Measure again and record the depth of the rotted timber. Resume coring again stopping approximately 50 mm from the backside of the cap or pile.
- When rot is found at a particular core hole, coring should continue at 200 mm intervals on either side of the initial core hole until sound timber is encountered. This step can be omitted if the initial core holes, spaced at 1.5 m intervals, all indicate the presence of rot.
- Disinfect the drill bit after each use by dipping in creosote or bleach. This will help to prevent the transfer of rot and fungus to the next core hole. The drill bit should be disinfected even if no rot is encountered in the core.
- Using a low pressure back-pack style sprayer, pump a small amount of creosote into the core hole, then seal the core hole by installing 1/2" diameter x 1" long fluted dowel plugs that have been soaked in creosote. Again, this step can be deleted if extensive rot is found in all of the core samples.
- Avoid coring in the immediate area where drift pins or lag bolts are likely located. There are small pockets of rot that may form around these locations that may not be indicative of the

condition of the entire cap. As well, it is possible to injure yourself if you hit a drift pin when coring.

When coring bridges in winter remember that heat from friction between the drill bit and the frozen timber can cause the shavings to appear moist. Wet or damp shavings may not indicate rot.

8.5 BIM LEVEL 2 TIMBER CORING FORM

A copy of the Level 2 Timber Coring Form is included at the end of this chapter. One copy of the form is used for each abutment or pier bent that is being cored. The bridge file number, date of timber coring and the name of the inspector and assistant inspector should be recorded on each form.

Each form has a sketch of a timber abutment or pier bent. Also each form has tables for recording the condition of the cores taken in timber caps/corbels and in timber piles. Each table has a number of thumbnails with descriptions into which each core location can be recorded. The form also has another table where other defects of timber piles can be recorded.

8.5.1 FILLING OUT TIMBER CORING FORM

- Record the abutment or pier number and direction on the form. Abutment and piers are numbered from south to north and west to east as shown in Section 1.3.1.
- Record the pile height and spacing as indicated on form.
- Record the timber cap size and indicate whether crowned (Y/N).
- Show the location of all cores on timber bent sketch. Number the core locations consecutively, in the direction South to North or West to East, starting with #1.
- In the tables provided record the identifying number of the timber cores that fit each thumbnail sketch description.
- For timber piles record location of any other defects noted.
- After completing and recording all the timber cores, the inspector must assign a rating number to each piece of timber cap/corbels and each timber pile.
- A general rating must then be assigned to the caps/corbels and the piles of this bent.
- Guidelines on assigning rating numbers are given in Section 8.5.2.

8.5.2 RATING GUIDELINES

- If cap/corbel or piles has no cores showing rot and no other defects affecting condition or functionality, rate 5 or more.
- If cap/corbel has rot only in cores at end of cap/corbel which is outside of any pile or girder, rate 5 or less.
- If cap/corbel has < 40 mm of rot in two or less cores, rate 4.
- If cap/corbel has between 40 and 80 mm of rot in one core only, rate 4.
- If cap/corbel has between 40 and 80 mm of rot in more than 1 core, rate 3 or less.
- If cap/corbel has > 80 mm of rot in one core only, rate 3.
- If cap/corbel has >80 mm of rot in more than one core, rate 3 or less.
- If cap/corbel has sidewall bulging less than 10 mm at one location only, rate 4 or less.

- If cap/corbel has bulging less than 10 mm at more than one location or more than 10 mm at one location, rate 3 or less.
- If cap or corbel shows signs of crushing, rate 2 or less.
- If pile has the beginning of rot in one core only, rate 4.
- If pile has rot in more than one core or has void in centre less than 0.25 of the diameter of the pile in one core, rate 3 or less.
- If pile has void in centre less than 0.25 of the diameter of the pile in more than one core or has void in centre of more than 0.25 of the diameter of the pile, rate 2 or less.

The general ratings of the caps/corbels and the piles are governed by the lowest rating of an individual cap/corbel or individual pile.

8.6 ADDITIONAL INFORMATION

If rot is found in a timber cap or subcap that is limited to the end of the cap only, and if there is sufficient length of cap overhanging the superstructure, cutting the rotted section of cap off with a chain saw may be an effective means of slowing or stopping the migration of rot further into the cap. A minimum of 6" of cap should remain after cutting. The cut end of the remaining cap should then be treated with 2 field coats of creosote, and ideally sealed with hot pour tar.

After a rotted timber element has been replaced with a new member, considerable experience, knowledge, and insight can be gained by utilizing the rotted timber as a test section before it is properly disposed of. Additional coring and recording can be done, and the core results analyzed. Then the member can be cut through with a saw, to correlate the core results and predictions with the actual condition of the cross section of timber at the core location.

BIM LEVEL II TIMBER CORING SKETCH

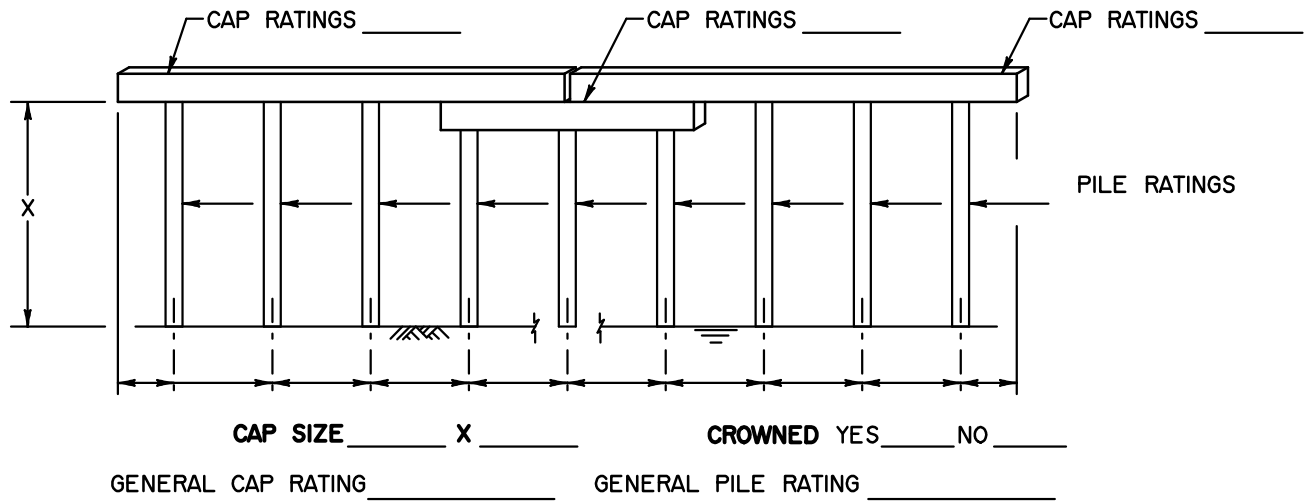
BRIDGE FILE: _____

DATE: _____

ABUTMENT/PIER: _____ LOOKING: _____

INSPECTOR: _____

ASSISTANT INSPECTOR: _____



CONDITION OF TIMBER CAPS/CORBELS

THUMBNAIL	DESCRIPTIVE CONDITION	APPLICABLE CORE LOCATIONS
	NO ROT-SHAVINGS ARE DRY, INTACT AND CURL AROUND BIT	
	BEGINNING TO ROT < 40mm - SHAVINGS CRUMBLE	
	ROT AND/OR VOID > 40mm < 80mm - SHAVINGS ARE DUST OR CONSISTENCY OF COFFEE GROUNDS	
	ROT AND/OR VOID > 80mm - SHAVINGS ARE DUST OR CONSISTENCY OF COFFEE GROUNDS	
	SIDEWALL BULGING LESS THAN 10mm	
	SIDEWALL BULGING MORE THAN 10mm	
	CRUSHING OF CAP - PILE PUSHING INTO BOTTOM OF CAP	

CONDITION OF TIMBER PILES

THUMBNAIL	DESCRIPTIVE CONDITION	APPLICABLE CORE LOCATIONS
	NO ROT-SHAVINGS ARE DRY, INTACT AND CURL AROUND BIT	
	BEGINNING TO ROT - SHAVINGS CRUMBLE	
	VOID IN CENTRE LESS THAN 0.25 (DIAMETER) - SHAVINGS ARE DUST OR CONSISTENCY OF COFFEE GROUNDS	
	VOID IN CENTRE MORE THAN 0.25 (DIAMETER) - SHAVINGS ARE DUST OR CONSISTENCY OF COFFEE GROUNDS	

OTHER DEFECTS - TIMBER PILES

	DESCRIPTIVE CONDITION	APPLICABLE CORE LOCATIONS
	PILE SPLIT OR CRACKED > 25mm	
	BROKEN AND/OR MUSHROOMING	
	VERTICAL/HORIZONTAL MISALIGNMENT	