Canadian Strategic Highway Research Program (C-SHRP)

SUMMARY OF C-LTPP MONITORING ACTIVITIES

June 1993 version
INTRODUCTION:

This document was produced only to assist the C-LTPP Provincial Contact Engineer in supervising or coordinating the yearly data collection exercise from now until the completion of the Canadian Long Term Pavement Performance Project in the year 2005. **This summary does not in any way, shape, or form, replace the original C-SHRP Pavement Research Technical Guidelines.** For a more comprehensive and detailed description of the required data collection activities, please refer to these guidelines.

The section numbers in this summary refer to the corresponding chapters in the C-SHRP Pavement Research Technical Guidelines. Furthermore, whenever a reference is made to a specific "Table" or "Figure", it may be located in these same guidelines.

We strongly encourage each agency to submit its collected C-LTPP data as soon as it becomes available. Regardless, the data submission time limit for all of the previous year’s data is April 1st of a given year.

For any further information, please call Luc Fréchette at the Transportation Association of Canada, (613) 736-1350.
## OVERVIEW

### REQUIRED C-LTPP MONITORING ACTIVITIES

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6. SURFACE DISTRESS:

Schedule:

- mapping and photo logging must be conducted once per year, when the pavement is dry.
- mapping and photo logging must also be conducted immediately before and immediately after any maintenance operation is performed on a C-SHRP section
- this data is to be submitted once per year

Format of the Required Data:

- SD1 Form: 5 forms for each 150m test section, with each covering a 30m subsection
- SD2 Form: 8 forms (i.e. a total of 16 colour copies of 3 1/2 x 5" colour photos) for each 150m test section

Summary of Procedure:

1) Form SD1

- Linear distresses (i.e. single or multiple cracks, potholes, small defects or deformations) and area distresses (alligator cracking, large defects or deformations) are drawn to scale as accurately and as clearly as possible on Form SD1.
- These distresses are then coded according to the type of distress (see Table 1) and the severity of the distress: Class 1 to 5 (Class 1=very slight; Class 5=very severe). Photographic examples of the numerous distress types with varying degrees of severity can be found in Figures 5 to 19.
- Uniform distresses (i.e. a surface defect covering 75% of the section or more) are to be described in the table on form SD1.
- Any shoulder distresses should be sketched on the map and described in the "remarks" box on form SD1.

NOTE: Refer to Figure 1 of the Surface Distress chapter for a clear and complete example of surface defects mapping.

2) Form SD2

- Photographs are to be taken on clear days when the pavement is dry.
- A person standing in the middle of the lane is to take a picture every 10m along the C-SHRP lane, as per Figures 3 & 4 in the Surface Distress chapter.
The CGRA Deflection Test Procedure is the chosen method for the determination of the load-deflection characteristics of flexible pavements employing the Benkelman Beam.

A) Long Term Changes

Long term changes in deflection are deemed to be the year to year change brought about by trafficking of the section and aging of the pavement.

Schedule:

- deflection measurements to be conducted every second year, in the same month that rehabilitation occurred.
- this data is to be submitted every second year.

Format of the required data:

- BB1 form:
  - 1 form for each 150m test section; include a note stating that this form is for "Long Term Changes".
  - include an additional column for temperature-corrected deflection readings, if applicable.
B) Seasonal Variation

Seasonal variation is the change in deflection which occurs in the pavement section due to changes in moisture and temperature of the pavement materials, during the non-freeze periods of the year.

Schedule:

- one year of monthly measurements for the non-freeze months.
- a non-freeze month is defined as a month in which the temperature of the pavement structure is above the freezing point
- this series of tests is to be conducted in one of the first five years of C-LTPP (1989-1994)

Format of the required data:

- BB1 form:
  - 1 form for each 150m test section; for each and every non-freeze month during the chosen year of testing; include a note stating that this form is for "Seasonal Variation".
  - include an additional column for temperature-corrected deflection readings, if applicable.

C) Spring Factor

The spring factor is aimed at discerning the peak deflection, and hence the weakest material state, experienced during the thawing of the pavement structure in spring. Also of interest is the characteristic rise and fall of deflection during the thaw period.

Schedule:

- weekly testing at each section for a minimum of 6 weeks during the spring
- the timing of this exercise is to be selected by the agency to ensure adequate bracketing of the expected peak deflection time
- spring deflection sequence to be conducted in three different years within the first five years of C-LTPP (1989-1994)

Format of the required data:

- BB1 form:
  - 1 form for each 150 m test section, for each and every week of the thaw period; include a note stating this this form is for the "Spring Factor".
  - include an additional column for temperature-corrected deflection readings, if applicable.
8. FALLING WEIGHT DEFLECTOMETER

Schedule:

- the provinces that own a Falling Weight Deflectometer are to obtain deflection measurements on their C-SHRP sections every 2nd year, coinciding with their Benkelman Beam deflection testing.
- for the remainder of the provinces, C-SHRP will perform the FWD measurements every 2nd year.
- the FWD data is to be submitted every 2nd year after testing

Format of the Required Data:

- **FWD1 Data:** ◆ the agency is to submit on diskette the output from the Dynatest FWD FIELD PROGRAM (*.FWD, *.F20, *.F25, etc.) in SI units ◆ the agency may submit completed FWD1 forms if it prefers

- **FWD2 Relative Calibration Log Form:** 1 form is required each time the FWD equipment is taken on site for testing

- **FWD3 Crack Mapping Form:** 16 forms (ie. 1 form for each of the 16 drop locations) are required per 150m test section

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9. PROFILE & CROSS-SECTION

Schedule:
- measurements to be performed once per year, preferably in the same month each year.
- data to be submitted once per year.

Format of the Required Data:

1) PC1 form (June 1993 version): 1 completed form for each 150m test section

2) Diskettes:

(i) Profile (longitudinal) Dipstick Data
- measurements to be performed with the dipstick profiler and reported on a properly identified 3 1/2" diskette in a LOTUS 123 or a LOTUS-compatible format (*.HWY or ASCII).

file naming convention: \[ P \underline{---} \underline{---} \underline{---} \underline{---} \cdot \underline{---} \underline{---} \]
- C-SHRP ID # for the test \( \text{section} \)
- minus the 1st digit
- software-specific extension (*.WK3, *.HWY, etc.)

ex: dipstick data for C-SHRP test section #8802031, downloaded using FACE software
\[ \rightarrow \text{filename} = \text{P802031 . HWY} \]

(ii) X-Section (transverse) Dipstick Data
- measurements to be performed with the dipstick profiler and reported on a properly identified 3 1/2" diskette in a LOTUS 123 or a LOTUS-compatible format (*.HWY or ASCII).
- the diskette(s) should contain 6 files for each and every 150m test section
  - ie: 1 file = 1 transverse X-Section from outer edge of pavement to centreline

file naming convention: \[ X \underline{---} \underline{---} \underline{---} \underline{---} \cdot \underline{---} \underline{---} \]
- Reference Station # (0-5)
- C-SHRP ID # for the test \( \text{section} \)
- minus the 1st digit
- software-specific extension (*.WK3, *.HWY, etc)

ex: dipstick data for C-SHRP test section #8707012, Reference Station 2, in LOTUS v.3.1
\[ \rightarrow \text{filename} = \text{X2707012 . WK3} \]
Summary of Procedures:

a) Profile:

1) Zero and test the dipstick instrument.
2) Record the date and the dipstick identification information on the PC1 form.
3) Mark the complete survey loop with a chalk line, or use twine and nails, as a guide for the dipstick operator. If the pavement is still in a non-rutted condition, try to use the same offsets and survey line as the previous years; otherwise, the survey should follow the centre of the wheel track ruts. Mark an "x" on the intersection of the outer wheel path line and Reference Station "0" - this will be the initial start point as well as the close of the dipstick loop.
4) Establish the offset distances, \( y_1 \) and \( y_2 \), from the edge of pavement to the outer and inner wheelpaths at Reference Stations "0" and "5", and record them on the PC1 form.
5) Place the dipstick on the initial start point, the "x", swing the instrument towards the inner wheel path and trace with chalk the arc that the dipstick's front foot makes. This can also be done with a string 300mm long held on the "x". Later, this marked arc will be used as a target for the operator to land on in order to close the loop exactly on the "x".
6) At the initial start point (the "x"), begin dipstick measurements in the outer wheelpath towards Reference Station "5".
7) Continue taking measurements along the outer wheel path at 300mm intervals to the end of the 150m test section (Reference Station "5").
8) At this point, the reading count number along with the last dipstick reading are to be entered manually on the PC1 form in order to identify the end of the outer wheel path. The dipstick's front foot is to be circled with chalk to mark this turning point on the pavement.
9) Without displacing the dipstick's leading foot, turn/rotate the instrument 90° and continue profiling in the same survey across Reference Station "5" to the inner wheelpath, at which point the reading count number along with the last dipstick reading are entered manually on the PC1 form in order to identify the beginning of the inner wheelpath. Once again, circle the dipstick's front foot with chalk.
10) In the same manner, rotate the instrument 90° and continue back along the inner wheelpath towards Reference Station "0" where once again the reading count number along with the last dipstick reading is required on the PC1 form in order to identify the end of the inner wheelpath, and the instrument’s foot circled with chalk.

11) Finally, rotate 90° and profile across Reference Station "0" towards the outer wheel path and the initial start point, "x". In order to close the survey exactly where it began, land the front foot of the dipstick anywhere on the chalk arc (marked in step 5) - the next turn/rotation will complete the survey loop on the "x".

**NOTE:** It is strongly recommended for the operator to mark the foot position with chalk at each corner. In the case where the operator makes an error such as jarring the dipstick, he or she can return to the last marked corner and start at this point without having to go back to the start of the loop.

b) **X-Section:**

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1) Change the feet of the dipstick to a **50mm spacing**.

2) Zero and test the dipstick.

3) At Reference Station "0", walk the dipstick from the outer wheelpath chalk line to as near the pavement edge as possible and mark this point. The dipstick transverse readings will begin at this marked point - this will ensure that one of the dipstick’s feet intersects with the longitudinal profile in the outer wheelpath. The same can be achieved by using a tape measure.

4) Placing the instrument at the marked point on the edge of pavement, begin taking dipstick measurements at 50mm intervals from this starting point towards the painted centreline. Make sure to record the initial dipstick reading on the PC1 form.

5) While profiling across the C-SHRP lane on Reference Station "0", indicate the reading **count number** along with the dipstick reading on the PC1 form, at the intersection of the outer wheelpath, the inner wheelpath, and finally at the centreline. The measurements end at the centreline.

6) Repeat steps 3, 4, and 5 for the remaining 5 Reference Stations (ie: every 30m) in the 150m test section.
10. TRAFFIC

A) Form T1: Yearly General Traffic Data

Schedule:

- yearly estimated and/or calculated traffic variables (ie. AADT, % Trucks, ESAL,...) are to be submitted once per year

Format of the Required Data:

- the previous year's data shall be reported in the table "Truck Volume and Distribution Since Original Construction" located on the bottom half of Form T1

B) Spreadsheet T2: Truck Volume Since Rehabilitation by Week

Schedule:

- a continuous 365 day weekly count on the C-SHRP site, to be collected by Automatic Vehicle Classification (AVC) or Weigh-in-Motion (WIM) systems
- all of the available data from June 1 to May 31 is to be submitted once per year
Format of the Required Data:

- the weekly classification data is to be reported on a properly-identified 3 1/2" diskette using the "T2" spreadsheet (LOTUS 123 format) which is available from the C-SHRP office

  file naming convention: a:\C-SHRP ID# \ T2 start date of survey period \ extension (mm/yy)

  ex: 8 months of classification data from June 1, 1993 obtained for the C-SHRP site #840604 submitted on diskette under a:\ 840604 \ T20693 . WK3

NOTE: - If there are complete missing weeks in the June 1 to May 31 monitoring period, please leave these rows blank in the T2 spreadsheet or on Forms T2

- If there is less than 7 complete days (168 hrs) of continuous data in any given week, please add a "% of week" column in the spreadsheet to inform us of the precise number of hours each week in which the classification equipment was in continuous operation

C) Spreadsheet T3: Axle Load Occurrences

i) Agencies with a permanent WIM system on the C-SHRP site

Schedule:

- a continuous 365 day vehicle weighing on the C-SHRP site
- all of the available data from June 1 to May 31 is to be submitted once per year

Format of the Required Data:

- the yearly axle load occurrences are to be reported on properly identified 3 1/2" diskettes containing 5 different "T3" spreadsheets corresponding to the 5 axle groups: steering, single, tractor tandem, tandem and tridem.

  example for the tandem axle group:
  the tandem "T3" spreadsheet should contain the # of times specific weights (of the tandem axles) were recorded by the WIM instrumentation for each of the 13 vehicle classes (FHWA Vehicle Classification System)

  file naming convention: a:\C-SHRP ID# \ T3 \ axle-group # (1 - 5) start date of survey period \ extension (mm/yy)

  1: steering; 2: single; 3: tractor tandem; 4: tandem; 5: tridem
NOTE: As it is unrealistic to expect continuous WIM data for 365 days, it is imperative that a separate T3 spreadsheet be used for each continuous survey period from June 1 to May 31. For example, if 4 "blocks", i.e. survey periods, of continuous weight data were obtained by the agency from June 1 to May 31:
4 X 5 axle groups = 10 separate T3 spreadsheets would be required for that year

ii) Agencies with a portable WIM system

Schedule:

- one 7 day continuous vehicle weighing on the C-SHRP site for each truck season during a given year
  - i.e.: a truck season is defined as a period of time during a calendar year when a significant change in expected truck weights occurs
- the preceding site-specific data must be supplemented with continuously (365 day) operated regional weigh-in-motion sites
  - i.e.: these regional WIMs must be selected from existing instruments located on highways which encounter similar vehicle classifications and weights as the C-SHRP site
- all of the above data between June 1 and May 31 is to be submitted once each year

Format of the required data:

- to be recorded on properly identified 3 1/2" diskettes containing 5 different "T3" spreadsheets corresponding to the 5 axle groups: steering, single, tractor tandem, tandem and tridem
- 5 "T3" spreadsheets are required for each of the 7 day truck seasons in a given year
- 5 "T3" spreadsheets are also required for each of the permanent regional WIM sites (NOTE: Include an "R" at the end of the filename to indicate a Regional WIM site; for example, a:\C-SHRP ID\T 3 #0 6 9 3 R.WK3)

File naming convention:

axle-group # (1 - 5) start date of survey period extension
1: steering; 2: single; (mm/yy)
3: tractor tandem;
4: tandem; 5: tridem

11. CLIMATIC DATA

Schedule:

- the average site-specific deicing chemical application rate and load restriction periods are to be monitored during the winter and spring months
- this data is to be submitted once each year immediately after the spring thaw

Format of the Required Data:

- Form C3 ("December 1992" version): 1 form for each C-SHRP test site

Comments:

- the remainder of the necessary climatic data (Form C2) will be collected by C-SHRP every year.

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12. MAINTENANCE DATA

Schedule:

- maintenance activities are to be performed as per the Provincial Highway Agency's regular schedule
- data forms are to be submitted each occasion after a maintenance operation is done on a C-SHRP site.
  * If no maintenance is performed in a given year, submit nonetheless form M5 for that year so that we can record this in the database.

Format of the required data:

- for each performed maintenance activity, the following must be submitted:
  1) Technical Form(s): - forms M1 & M2 if a seal coat operation was done
     - form M3 if a crack sealing operation was done
     - form M4 if a patching operation was done
  2) Cost Data Form (Form M5)
  3) Surface Defects Mapping Form (Form SD1):
     (Note: the proper code for each type of distress and maintenance treatment can be found in Table 1 of the Surface Distress chapter in the C-SHRP Guidelines)

Prior to each maintenance treatment:
- 5 mapping forms for each test section indicating all pavement distresses and old maintenance treatments
- include the heading "Prior to Maintenance" at the top of each of these forms
Immediately after each maintenance treatment:
- 1 mapping form for each 30 metre subsection of the pavement receiving any maintenance activity, **highlighting the new treatments**
- include the heading "Post-Maintenance" at the top of each of these forms

**Summary of Procedure:**

- accepted routine and preventive maintenance operations should be performed according to the Provincial highway agency's standard procedures and practice. However maintenance activities **should be deferred as long as possible** to allow the collection of critical data as the pavement deteriorates
- when maintenance is deemed necessary on one of the C-SHRP sections, the **C-LTPP Contact Engineer is to be notified** so that he may send out a survey crew.
- the survey crew must then complete for each test section:
  1) the pertinent technical form(s): ie: - forms M1 & M2 for seal coat applications;
     - form M3 for crack sealing;
     - form M4 for patching
  2) the maintenance cost data form M5
  3) sketches of the surface defects prior to the maintenance activity, and then a second set of sketches illustrating the new maintenance operations that were done

**Comments:**

- pavement maintenance performed on the C-LTPP monitoring sites will greatly influence the results of the C-SHRP pavement performance studies. **It is therefore vital to the success of this project that an accurate record of all maintenance activities and occurrences be retained.**
- it is the responsibility of the C-LTPP Contact Engineer to ensure that no maintenance activities are performed **without his/her approval and supervision.**
- major maintenance, restoration or rehabilitation activities should be postponed for the first 15 years (as long as this is realistically possible) since this type of activity will terminate the test section from the C-LTPP study. These types of major maintenance operations include:
  - milling, grinding, use of heater-planer
  - overlays, HMAC
  - edge drains
  - any other maintenance activity that affects the structural response of a pavement section

**13. SKID RESISTANCE DATA:**

**Schedule:**

- the agency chooses a preferred skid testing device which conforms to ASTM or AASHTO standards
- testing to be conducted once per year when the pavement surface temperature is above 0°C and the site has not been subjected to rainfall in the previous week
- this data is **to be submitted once per year**

**Format of the Required Data:**

- Form F1 ("February 1993" version): 1 form for each 150m test section