

State of Nevada
Department of Transportation
Materials Division

METHOD OF TEST FOR EVALUATION OF PAVEMENT RIDE QUALITY USING INERTIAL PROFILING SYSTEMS

SCOPE

This test method describes the procedure used for determination and verification of the ride quality of a pavement surface using an inertial profiler and Mean Roughness Index (MRI) as the quality measure and by using the International Roughness Index (IRI) to determine Areas of Localized Roughness.

This test method describes the procedure used for determination of the ride quality of a bridge deck or pavement surface using a walking profiler and using the IRI to determine Areas of Localized Roughness.

This test method describes the procedure used for certification of inertial profiling systems and inertial profiler operators.

SECTION I – Determining and verifying the ride quality of plantmix bituminous and Portland cement concrete pavement surfaces.

APPARATUS

Use an approved inertial profiling system that meets the requirements of the Standard Specifications for Road and Bridge Construction.

APPARATUS CALIBRATION

Calibration of the inertial profiler will be performed prior to each use as required by manufacturer's recommendations.

The Inertial profiler equipment and host vehicle should be warmed up in accordance with the manufacturer's recommendations before beginning the calibration tests. Tire pressures on the host vehicle should be inflated to the tire manufacturer's specifications.

The calibration and/or verification procedure may vary somewhat from manufacturer to manufacturer. Review the operator's manual for the inertial profiler that is furnished in order to become familiar with the actual procedure.

The following is a guideline of typical calibration and/or verification tests to be performed for inertial profilers:

1. Accelerometer Calibration:

The accelerometer calibration is performed by placing the inertial profiler on a relatively level surface and allowing the accelerometer or accelerometers to stabilize. Next, follow the steps as directed by the profiler's operating system. The profiler's software will determine whether or not the calibration was successful.

2. Longitudinal Distance Calibration:

The longitudinal distance calibration is performed by operating the inertial profiler on a straight and relatively level section of the roadway measuring at least 528 feet or 0.100 mile in length. The actual length of the test section will be measured using a temperature-compensated steel survey measurement tape, electronic survey instrument or other method as approved by the Engineer. The distance shown by the inertial profiler's computer display shall be within 0.10 percent of the actual length of the test section. If the distance measured is out of specification tolerance, adjust the inertial profiler's distance measurement subsystem in accordance with the manufacturer's specifications and perform the calibration test again.

3. Vertical Height Verification:

The vertical height verification is performed by placing the inertial profiler on a relatively level surface and placing first, a reference plate or plates, then a series of blocks of known thickness under the vertical height sensor. The reference plate or plates and blocks shall be provided by the inertial profiler manufacturer. Unless otherwise directed by the profiler manufacturer, complete the vertical height calibration by performing the following steps:

- a) Position the reference plate under the height sensor or sensors of the inertial profiler and allow the system to determine an elevation for the reference plate. Check to see that the plate rests solidly on the pavement surface in a relatively level position without any wobble before obtaining measurements. The reference plate should have adjusting bolts to allow for leveling.
- b) Position a 0.250 inch thickness block on top of the reference plate in the laser path beneath the height sensor and allow the system to determine an elevation to the top of the block.
- c) Remove the 0.250 inch thickness block from the reference plate and replace with a 0.500 inch thickness block and allow the system to determine an elevation to the top of the block.
- d) Remove the 0.500 inch thickness block from the reference plate and replace with a 1.000 inch thickness block and allow the system to determine an elevation to the top of the block.
- e) Remove the 1.000 inch thickness block from the reference plate and replace with a 2.000 inch thickness block and allow the system to determine an elevation to the top of the block.

If the inertial profiler is equipped with multiple vertical height sensors, this test shall be repeated for each sensor. Multiple sensors may be tested simultaneously if the profiler is equipped with enough blocks and plates and the inertial profiler's operating system allows for it.

Determine the difference between each measurement of each size of block and the average of ten measurements of the elevation of the reference plate to determine the thickness of each block as determined by the inertial profiler. Determine the absolute values of the difference between the measured thickness and the block known thickness. The average of the absolute differences for each block shall be less than or equal to 0.010 inch. If the average of the absolute differences for each block exceeds specification tolerance, adjust the inertial profiler's height measurement subsystem in accordance with the manufacturer's recommendations and perform the calibration test again.

4. Bounce Test:

The bounce test is performed by placing the inertial profiler in a relatively level area, ensuring that the surface being referenced is smooth and free of significant defects or irregularities. If a smooth surface is not obtainable, the reference plates as used for the vertical height verification may be placed under the height sensors. Initiate a data collection run using the inertial profiler's normal data collection software operating at a simulated travel speed equivalent to approximately the midpoint of the profiler manufacturer's recommended range for acceptable data collection. The simulated collection run will be performed over a simulated distance of 2,184 feet. Once the simulated collection run is initiated, allow the inertial profiler to collect a static profile over a simulated distance of 828 feet with the host vehicle as motionless as possible. Next, move the sensors approximately 1-2 inches vertically by gently "bouncing" the host vehicle up and down for a simulated distance of 528 feet. Every effort should be made to limit forward/backward movement of the vehicle and to keep the sensors as close to perpendicular as possible during the vertical movement. Finally, allow the host vehicle to return to a motionless state and collect a static profile for the remaining 828 feet of simulated distance.

Once the simulated run is completed, save and analyze the simulated collection data using the profiler software for each profile collected. Ensure that the static portions of the simulated run result in an IRI of less than 3.000 inches/mile and the dynamic or bounce portion of the simulated run is less than 8.000 inches/mile.

A log of the results for calibrations and verifications shall be kept with the inertial profiler and made available to the Engineer upon request.

METHOD OF MEASUREMENT

PREPARATION FOR MEASUREMENT

1. Prior to operating the inertial profiler, ensure the roadway is dry and free of any debris.
2. Locate and mark the location of any exception or leave out areas. Ensure that all exception or leave out areas are accounted for prior to beginning the measurement process.
3. Mark the location of the beginning of the lead-in section and the location of the beginning of the measurement run. A lead-in section length of roadway surface of up to 450 feet may be required to allow the filters on the inertial profiler to stabilize before measurement begins so that the accuracy of

the first 0.100 mile is consistent with the rest of the measured section. The operator should carefully consider the safety of the starting location when marking the beginning of the lead-in section.

4. Mark the location of the end of the measurement run and the end of the lead-out section. A lead-out section length of roadway surface of up to 450 feet may be required to allow the operator of the inertial profiler to maintain a constant speed at the point where the measurement ends, so that the accuracy of the last 0.100 mile is consistent with the rest of the measured section. The operator should carefully consider the ability to stop the inertial profiler safely when marking the end of the lead-out section.
5. Set Analysis Parameters to report in Mean Roughness Index (MRI).
6. Input the segment length to 528 feet or 0.100 mile
7. Input a reporting interval of less than or equal to 1.000 inch for each measurement run.
8. Input filter settings as “None”.
9. Set Localized Roughness to read bump and dip defect data in International Roughness (IRI) with the maximum threshold as determined by the Special Provisions and a base length of 25 feet.
10. Enable collection of Global Positioning System (GPS) data for each measurement run of the inertial profiler.
11. Input the beginning location of the measurement run.
12. Select appropriate “measure up” or “measure down” setting for distance measurement.

LIMITATION OF MEASUREMENT

1. When the new pavement surface elevation is the same as the existing pavement surface elevation, mark the beginning of the measured section at least 25 feet before the beginning of the new section of pavement and mark the end of measured section at least 25 feet past the end of new section of pavement. This measured section is intended to include the take-off and/or landing joints in the evaluation of ride quality.
2. When the new pavement surface elevation does not match the existing pavement surface elevation, mark the beginning of the measured section at least 25 feet past the beginning of the new section of pavement and mark the end of the measured section at least 25 feet before the end of the new section of pavement. This measurement is intended to exclude the takeoff and/or landing joints in evaluation of ride quality due to the disparity in elevation.

MEASUREMENT

1. Move the inertial profiler to the beginning of the measurement section.

2. Proceed with measurement as directed by the inertial profiler manufacturer. Measurement data shall be obtained in the same direction as the normal flow of traffic.
3. Measure Profiles within each traffic lane with the left or right side sensor path at 3 feet from and parallel to the respective left or right traffic lane line. The spacing between sensor paths shall be between 66 inches and 72 inches.
4. Stop measurement at any exceptions or leave out areas. Resume measurement using the correct location as indicated on the other end of the exception or leave out area. Repeat this process as needed to complete the measurement run.
5. Re-measure any pavement segment where the travel speed of the profiler is outside of the manufacturer's recommended operational speed at any point during the measurement, or if any operator and/or equipment errors are encountered during the measurement process.
6. Upon completion of measurement run, move the inertial profiler to a safe location, then save any relevant data to a file using an approved unfiltered electronic format that can be easily retrieved for review and submittal. The profile data must be compatible with ProVAL Pavement Profile Viewing and Analysis software. ProVAL is produced by the Transtec Group in cooperation with the Federal Highway Administration and is available for download by going to <http://www.roadprofile.com/>.

The file should be named as follows:

Contract/Route/Contractor/Surface/Direction/Lane/Date/Time/Location/Status

- Contract Number or Project No.
 - Route Number (IR __, US __, SR __, FR __...)
 - Contractor Name (Prime Contractor)
 - Surface Measured (PBS DG, PBS OG, PBS w/Chip Seal, PCCP...)
 - Direction of Lane (NB, EB, SB, WB)
 - Lane Number (Lane 1 is driver's left most lane increasing as lanes added to the right)
 - Date of Run (YYMMDD)
 - Time of Run (24 Hour Format)
 - Location of Run (Station to Station or Milepost to Milepost)
 - Status of Run (Preliminary, Informational, Initial, Final After Correction)
7. Submit the saved profile data to the Engineer within 24 hours of the completion of the measurement.
 8. Include the following within the submitted electronic profile data:
 - Raw profile data for each lane measured.
 - Ride quality analysis report of MRI for overall run of each lane measured.
 - Ride quality analysis report of MRI for each 0.1 mile of each lane measured.
 - Localized Roughness report for each wheel path of each lane measured.
 - GPS data file for each lane measured.
 - Current calibration and verification test results.

9. In addition to the electronic format file, a printout of the report of calibration for the profiler, the results of a measurement run and evaluation, and a printed summary report shall be provided to the Engineer within 24 hours of the completion of a measurement run.

EVALUATION OF PROFILES

1. Evaluate the entire length of the profile measurement section for compliance with MRI requirements found in the Special Provisions for the pavement being measured with the following exceptions:
 - Do not evaluate any measurements obtained within the lead-in and lead-out sections.
 - Do not evaluate any measurements obtained within 25 feet of a cattle guard or some other break in the continuous pavement surface.
 - Do not evaluate any measurements obtained within 25 feet of a concrete bridge deck (including approach slabs) unless the bridge deck also is to be overlaid with a new riding surface.

EVALUATION FOR AREAS OF LOCALIZED ROUGHNESS

1. Analyze the submitted profile data to determine any areas of IRI - Localized Roughness in excess of specification tolerances found in the Special Provisions for the pavement surface being measured.
2. Create a summarized list of areas that are in excess of the limits for IRI – Localized Roughness. Submit the summarized list to the Engineer for review and determination of the best method of correction for the defective areas.

REPORTING

1. The printed report shall be in a .pdf format.
2. The following information shall be submitted with the printed inertial profile report:
 - Name of data file.
 - Contract or Project number.
 - County.
 - Contractor.
 - Highway or route number.
 - Surface being tested.
 - Date of placement.
 - Date of testing.
 - Direction of traffic. (northbound, eastbound, southbound, westbound)
 - Direction of placement. (northbound, eastbound, southbound, westbound)
 - Lane number. (Lane 1 is driver's left most lane increasing as lanes added to the right)
 - Name of Tester.
 - Calibration results.

- Filter settings.
 - Localized Roughness settings.
 - Summary Report of Mean Roughness Index for each 0.1 mile segment.
 - Certification of the report by the profiler operator.
 - The title of the person certifying the report.
3. The following information shall be submitted with the report of any Areas of IRI - Localized Roughness Including:
 - A list of exception or leave out sections.
 - A list of any IRI - Localized Roughness defects in excess of specification limits.
 4. Measurements are to be reported using project mileposts as appropriate. A list of project mileposts will be provided on the project plans.
 5. Report the MRI and IRI inches/mile to the nearest 0.001 inch.
 6. Report each 528 feet or 0.1 mile section to the nearest 0.001 mile.

SECTION II – Determining the ride quality of bridge deck surfaces and bridge deck surface overlays.

APPARATUS

An International Cybernetics Corporation (ICC) SurPRO 4000 or a Surface Systems and Instruments (SSI) CS8800 walking profiler.

APPARATUS CALIBRATION

Calibration of the inertial profiler will be performed prior to each use as required by manufacturer's recommendations.

METHOD OF MEASUREMENT

PREPARATION FOR MEASUREMENT

1. Prior to performing measurements with the profiler, ensure the bridge deck and approach slabs are free of any debris and lane lines are established as shown in the striping detail of the project plans.
2. Set Localized Roughness to read bump and dip defect data in International Roughness (IRI) with the maximum threshold as determined by the Special Provisions and a base length of 25 feet.

3. Enable collection of Global Positioning System (GPS) data for each measurement run of the inertial profiler.
4. Input the beginning location of the measurement run.
5. Select appropriate “measure up” or “measure down” setting for distance measurement.

LIMITATION OF MEASUREMENT

If an open joint condition exists, do not include the open joint in the profile determination. Measure as close as practicable to the leading and trailing edge of the bridge deck or approach slab.

If the adjacent pavement surfacing has been completed to the level of the bridge deck and/or approach slab, include 25 feet of the pavement surface on either end of the bridge deck or approach slab.

MEASUREMENT

1. Move the inertial profiler to the beginning of the measurement section.
2. Proceed with measurement as directed by the inertial profiler manufacturer. Measurement data shall be obtained in the same direction as the normal flow of traffic.
3. Measure Profiles within each traffic lane 3 feet from and parallel to the respective left or right traffic lane line. Measure Profiles within the shoulder lane 3 feet from the shoulder lane line.
4. Stop measurement at any gaps in the bridge deck surface or open joints. Resume measurement using the correct location as indicated on the other end of the gap or open joint. Repeat this process as needed to complete the measurement run.
5. Re-measure any pavement segment if any operator and/or equipment errors are encountered during the measurement process.
6. Upon completion of measurement run, move the inertial profiler to a safe location, then save any relevant data to a file using an approved unfiltered electronic format that can be easily retrieved for review and submittal. The profile data must be compatible with ProVAL Pavement Profile Viewing and Analysis software.

The file should be named as follows:

Contract/Route/Contractor/Surface/Direction/Lane/Wheel Path/Date/Time/Location/Status

- Contract Number or Project No.
- Route Number (IR __, US __, SR __, FR __...)
- Contractor Name (Prime Contractor)
- Surface Measured (Bridge Deck, Deck Overlay)
- Direction of Lane (NB, EB, SB, WB)
- Lane Number (Lane 1 is driver’s left most lane increasing as lanes added to the right)

- Wheel Path (Left, Right, Shoulder)
 - Date (YYMMDD)
 - Time (24 Hour Format)
 - Location of Run (Station to Station or Milepost to Milepost)
 - Status of Run (Preliminary, Informational, Initial, Final After Correction)
7. Include the following within the electronic profile data:
- Raw profile data for each lane measured.
 - Localized Roughness report for each wheel path of each lane measured.
 - GPS data file for each lane measured.
 - Current calibration and verification test results.
8. In addition to the electronic format file, a printout of the report of calibration for the profiler, the results of a measurement run and evaluation, and a printed summary report will be provided to the Contractor within 24 hours of the completion of a measurement run.

EVALUATION FOR AREAS OF LOCALIZED ROUGHNESS

1. Analyze the collected profile data to determine any areas of IRI - Localized Roughness in excess of specification tolerances found in the Special Provisions for the type of surface being measured.
2. Create a summarized list of areas that are in excess of the limits for IRI – Localized Roughness. Submit the summarized list to the Engineer for review and determination of the best method of correction for the defective areas.

REPORTING

1. The printed report shall be in a .pdf format.
2. The following information shall be submitted with the printed inertial profile report:
 - Name of data file.
 - Contract or Project number.
 - County.
 - Contractor.
 - Highway or route number.
 - Surface being tested.
 - Date of placement.
 - Date of testing.
 - Direction of traffic. (northbound, eastbound, southbound, westbound)
 - Direction of placement. (northbound, eastbound, southbound, westbound)
 - Lane number. (Lane 1 is driver's left most lane increasing as lanes added to the right)

- Wheel Path. (Left, Right, Shoulder)
 - Name of Tester.
 - Calibration results.
 - Filter settings.
 - Localized Roughness settings.
 - Certification of the report by the profiler operator.
 - The title of the person certifying the report.
3. The following information shall be submitted with the report of any Areas of IRI - Localized Roughness Including:
- A list of the locations of any gaps or open joints.
 - A list of any IRI - Localized Roughness defects in excess of specification limits.
4. Report the IRI Areas of Localized Roughness inches/mile to the nearest 0.001 inch.

SECTION III – Certification of inertial profiler and inertial profiler operator

The inertial profiler and its operator must be able to successfully perform certification tests to establish compliance with the minimum requirements for accuracy and repeatability set forth in this Section. Inertial profilers and inertial profiler operators shall be certified annually.

APPARATUS

The NDOT certification facility will be located on FR WA45 which is located just northeast of the Eastlake Blvd Interchange (Exit 44) from I-580/US 395 in Washoe County, Nevada. The certification course will consist of a 2,000 foot long area of plantmix bituminous surface on which an 800 foot segment will be designated as the test section for certification of the candidate inertial profiler. This certification test section will be adjusted annually to establish different profiles to be used for certification. The certification course will be marked with two wheel paths consisting of dots placed at 5 foot intervals with a spacing of 69 inches between each wheel path. A minimum 300 foot run-up and run-out section will be provided on either end of the designated test section.

An International Cybernetics Corporation (ICC) SurPRO 4000 or Surface Systems and Instruments (SSI) CS8800 reference profiler will be used to establish a baseline profile from which the candidate inertial profiler will be judged for accuracy.

APPARATUS CALIBRATION

Prior to performing measurement runs for certification, calibrate the inertial profiler according to manufacturer's recommendations. A 528 foot longitudinal distance calibration course will be established at the certification facility.

CERTIFICATION OF INERTIAL PROFILING SYSTEMS

Reference Profiler – *This procedure is to be performed by a Department representative.*

Prior to allowing the candidate inertial profiler to perform measurement runs for certification, calibrate the reference profiler according to manufacturer's recommendations. Upon successful completion of the calibration procedures, perform three repeat runs of the reference profiler in each wheel path over the entire length of the designated test section. Operate the reference profiler using the procedures set forth in Section I of this Test Method.

Upon completion of each measurement run of the reference profiler, save the data to a designated file using a .ppf format.

Name the individual files as follows:

First four characters: "REF_" (Identification of the reference profiler)

Fifth, sixth, seventh characters: "PBS" (Plantmix Bituminous Surface)

Eighth Character: "W" (Walking Profiler)

Ninth Character: "L" (Left Wheel Path), "R" (Right Wheel Path)

Tenth and eleventh Character: "01 thru 03" (The number of the run)

Perform an analysis of the three measurement runs using the Profiler Certification Module in ProVAL. The repeatability score for the three measurement runs of the reference profiler must be 0.98 or higher. Upon successful completion of the analysis, choose the median of the three profile results from each wheel path as the basis for comparison of accuracy between the reference profiler and the candidate inertial profiler. The selected runs will be used to establish the basis for accuracy of the designated test section.

Candidate Inertial Profiler – *This procedure to be performed by the candidate operator.*

Upon successful completion of the appropriate calibration procedures, perform three runs of the candidate inertial profiler over the distance calibration course which will be contained within the limits of the designated test section. Traffic Cones with reflective tape will be provided to indicate the limits of the distance calibration course and to allow for automatic triggering of the Distance Measuring Instrument (DMI). The result from each run will be recorded by the Department representative. The absolute difference between each of the DMI readings of the candidate inertial profiler and the actual length of the DMI calibration course must be within 0.10 percent of the actual length of the DMI calibration course. All three runs must produce a passing result.

Upon successful completion of the DMI test, perform ten repeat measurement runs of the candidate profiler over the entire length of the designated test section as directed. If the candidate inertial profiler is only equipped with one height referencing device, perform ten measurement runs in each wheel path. The ten measurement runs will be used to determine the repeatability and accuracy of the candidate inertial profiler. Operate the candidate inertial profiler for each measurement run using the procedures set forth in Section I of this Test Method. Operate the inertial profiler at a constant speed within manufacturer's recommended limits over the designated test section for each of the ten runs. Traffic Cones with reflective tape will be provided to indicate the limits of the designated test section and to allow for automatic triggering of the Data collection. Data collection must be automatically triggered at the beginning and end of the designated test section. The beginning of the designated test section will be identified as the "zero" point of the data collection.

Upon completion of each measurement run, save the data to a designated file using a .ppf format. Name the individual file as follows:

First four characters: _ _ _ _ Identification of the candidate profiler (This is provided by the Department)

Fifth, sixth, seventh characters: "PBS" (Plantmix Bituminous Surface).

Eighth character: "H" (High-speed), "L" (Lightweight), "W" (Walking).

Ninth character: "L" (Left wheel path), "R" (Right wheel path), "B" (Both wheel paths).

Tenth and eleventh character: "01" through "10" (The number of the run).

Upon completion of the ten measurement runs, provide the unfiltered data from each measurement run of the candidate inertial profiler to the Department representative using a flash drive or other approved media. The submitted data is to be in a .ppf format.

The Department representative will analyze the data from the candidate inertial profiler for repeatability and comparison with the reference profiler for accuracy using the Profiler Certification Module of ProVAL Profile Viewing and Analysis Software. The Department will determine the version of ProVAL to be used during the certification process.

The results of the following will be determined during the analysis:

1. The overall repeatability score of the candidate inertial profiler for each wheel path. For candidate inertial profilers equipped with only one height referencing device, a repeatability score will be determined for each wheel path. The maximum offset will be set at 3 feet. The overall repeatability score of the candidate inertial profiler for each wheel path must be 0.92 or greater.
2. The overall accuracy score of the candidate profiler. For candidate inertial profilers equipped with only one height referencing device, an accuracy score will be determined for each wheel path. The overall accuracy score of the candidate inertial profiler must be 0.90 or greater.
3. The average percent difference of the IRI result from the candidate profiler and the IRI result from the reference profiler.

CERTIFICATION OF INERTIAL PROFILER OPERATOR

The operator of an inertial profiler that will be used for project level acceptance testing must be able to pass a written examination with a grade of at least 70% and be able to successfully demonstrate practical knowledge of the set-up, calibration, and operation of the inertial profiler that they will be operating in the field. If an operator will be operating multiple inertial profilers in the course of their work, the operator will need to demonstrate practical knowledge of each inertial profiler that they would potentially set-up, calibrate, and operate on an NDOT project. Successful completion of the written exam will be required once every five years. Successful demonstration of practical knowledge for a specific inertial profiler will be required annually.

REPORTING

A Department representative will document the results of the certification of the candidate inertial profiler. The documentation will include the following:

1. Identification of the candidate inertial profiler, including;
 - Date of Testing
 - Name of Department representative observing the testing,

 - Inertial Profiler identification,
 - Date of last certification (if applicable),
 - Owner of inertial profiler,
 - Make, model, and serial number of the inertial profiling system,
 - Make, model, and VIN of the host vehicle,
 - Software and software version for the profiler operating system,
 - Make, model, and serial number(s) of the height referencing device(s),
 - Number of wheel paths the candidate inertial profiler can measure in a given run,

2. Identification of certification testing parameters and results, including;
 - Name of the operator of the candidate inertial profiler,
 - Actual length of the DMI calibration course,
 - Absolute difference between the DMI measurement result of the candidate inertial profiler and actual length of the DMI calibration course, expressed as a distance and as a percentage of the actual distance, including a pass or fail indication. All three runs must return an acceptable result,
 - Overall repeatability score of the candidate inertial profiler including a pass or fail indication,
 - The average percent of difference between the IRI result from the candidate inertial profiler and the IRI result from the reference profiler,
 - Overall accuracy score of the candidate inertial profiler including a pass or fail indication, and
 - Overall result of the certification testing for the candidate inertial profiler including a pass or fail indication.

A Department representative will document the results of the certification of the candidate inertial profiler operator. The documentation will include the following:

- Date of Testing,
- Name of Department representative observing the testing,
- Name of the candidate operator,
- Date of last certification,
- Result of written examination indicating a pass or fail,
- Date of the written examination,
- Results of various questions related to the set up and calibration of the inertial profiler,
- The overall result of the practical examination indicating a pass or fail,
- List of inertial profilers the candidate operator is certified to operate on NDOT projects.

A certification card will be issued for each candidate inertial profiler upon successful completion of the inertial profiler equipment certification process. A certification card will be issued for each candidate operator upon successful completion of the inertial profiler operator certification process.

NOTES

Review inertial profiler operating manual to familiarize yourself with the equipment that will be used.