

CONTRACT #DTFH61-02-D-00139
NICHOLS CONSULTING ENGINEERS. Chtd.
TASK ORDER #03

**“Effect of Multiple Freeze Cycles and Deep Frost Penetration on Pavement
Performance and Cost”**

PERIOD OF PERFORMANCE

The period of performance for this task order is 30 months, commencing on the task order award date. However, should Option Years One and/or Two not be exercised for the base contract, this task order may be terminated at the discretion of the Contracting Officer.

CONTRACT ADMINISTRATION DATA

The Contracting Officer has designated Mr. Larry Wiser, HRDI, 202-493-3079, as the Contracting Officer’s Technical Representative (COTR) for this effort.

STATEMENT OF WORK

Tasks required to achieve the objectives of the task order are as follows:

Phase 1 (to be completed within 9 months of notice to proceed):

Task 1: Review pertinent literature to attain a thorough understanding of the pertinent prior research, and the LTPP data available to support this research.

Task 2: Identify the specific LTPP data to be used in the analysis, acquire the data, and process it as necessary to create the analysis database to be used in subsequent analysis.

Task 3: Make a comparison of performance data from the LTPP Seasonal Monitoring Program (SMP) sites that are located in the southern reaches of the wet-freeze zone or the northern reaches of the wet-no freeze zone versus those sites that are further north in the wet-freeze zone. Contrast these findings with pavement performance in the dry-freeze and wet-no freeze climatic regions.

Initial trend analysis studies should determine whether the SMP data support the contention that the rate of accumulation of pavement distress is greater (more rapid) in climatic zones where there is a large number of annual freeze-thaw cycles versus deep frost penetration.

The possibility of using LTPP SMP data to study the effect of frost penetration should be assessed by a trend analysis in which the rates of distress accumulation will be analyzed for correlation with the number and duration of partial thaw events as inferred from climatic (temperature) data. The trade off between material quality, availability of moisture beneath the pavement, and severity of frost penetration on the rate of distress accumulation should be included in the trend analysis.

Task 4: Identify the cost data required to complete the cost allocation component of the study, and contact the participating highway agencies to obtain the necessary data. Evaluate the adequacy of the data provided to support the conduct of a cost allocation study as part of the Phase 2 research effort.

Task 5: Prepare an interim report documenting the findings of Task 1 – 4. If the findings of the trend analyses conducted under Task 3 support the basic project assumptions, provide a detailed plan for Phase 2. This plan shall provide for:

- a. Analysis of the effect of multiple freeze-thaw cycles versus deep frost penetration on pavement performance for different pavement types. The study should attempt to quantify the effect on pavement performance based on the analysis of:
 - Pavement types (rigid, flexible)
 - Climatic data (rainfall, freezing index and thawing index from temperature data)
 - Frost depth (temperature sensors and resistivity data)
 - Deflection data (Stresses and strains calculated from layer material properties)
 - Performance data (distress and permanent deformation)
 - Soils and material properties
 - Traffic data
- b. Analysis of the extent to which local adaptations of materials standards and empirical pavement design practices have been effective at reducing the rate of pavement deterioration. Adjacent states in the same climatic zone can be expected to have developed different approaches to compensate for pavement deterioration due to freeze-thaw. The effectiveness of the different approaches should be compared.
- c. Determination of the cost associated with building and maintaining similar pavements to equal performance standards in various freeze to no-freeze climatic regions IF the cost data obtained in Task 4 is sufficient to support such determination. These costs should highlight any changes in material quality cost for new construction and life cycle cost associated with rehabilitations needed to maintain the pavement at similar levels of service.

This task would attempt to perform a cost allocation analysis based upon the following parameters:

- Climatic data (rainfall, freezing index and thawing index from temperature data)
- Frost penetration data (temperature sensors and resistivity data)
- Traffic data

- d. Preparation of a final report documenting the methods and findings of the Phase 2 analysis and including recommendations as to ways in which mechanistic design methods can appropriately consider the most effective adaptations or materials standards to minimize the acceleration of pavement damage due to freezing and thawing.

The project schedule shall allow one month for panel review of the interim report.

Task 6: Present the interim report and recommendations for Phase 2 work to the project panel. The panel meeting convened for review and discussion of the panel report will take place at the end of the one-month review period.

Phase 2:

Upon approval of the Phase 2 work plan prepared under Task 5, execute the plan.

Meeting participation:

The contractor shall prepare and present briefings to the project panel as follows:

1. In conjunction with the RFP Annual Meeting each year for the duration of the project.
2. Approximately 30 days after submission of the interim report. The contractor shall make the meeting arrangements in consultation with the COTR and shall reimburse allowable travel expenses (transportation and per diem) for the State Highway agency members of the panel attending this meeting.
3. Approximately 30 days after the submission of the draft final report (at the discretion of the project panel). The contractor shall make the meeting arrangements in consultation with the COTR and shall reimburse allowable travel expenses (transportation and per diem) for the State Highway agency members of the panel attending this meeting.