FY 2010 RESEARCH PROBLEM STATEMENT

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ODOT Research Unit
200 Hawthorne Ave. SE, Suite B-240
Salem, OR 97301-5192

Office Phone: (503) 986-2700
FAX Phone: (503) 986-2844

TITLE (*more info*)

Problems with Characterization of Willamette Silts Used in Embankments and Other Construction

PROBLEM (Description of need) (*more info*)

Willamette silts are found throughout the Willamette Valley. They are often utilized as construction materials for embankments or structures are built over or within them. Willamette silts are often characterized as low to medium plasticity silts and they are composed of some clay and some cohesionless silts. The amount of clay content varies by location. These types of soils are called transitional because they do not fall into the convenient classifications of either clay or sand. They are somewhere in between. Willamette silts often have enough plasticity to obtain intact specimens, so they are often considered to be cohesive soils for characterization purposes. Preliminary laboratory tests at OSU have shown that consolidation tests produce wildly inaccurate overconsolidation ratios (OCRs) in excess of ten (10) when it is well known that the soil's previous stress history indicates that it is normally consolidated (OCR=1). This example would conclude that the soil should have been considered a cohesionless soil rather than a clay for characterization purposes. However, as the clay content increases, as occurs in some deposits of Willamette silts, these soils eventually do transition into true cohesive character. So, in different locations Willamette silts should be considered a clay and others a sand. Different laboratory testing methods and different design methods should be used for either case. Inaccurate characterization results in errors in settlment and strength characterization of these transitional soils. These errors lead to inaccurate calibrations of numerical models, as well as inaccurate slope stability analysis affecting the performance of the geo-structures built from them or on them. These errors can lead to economic losses and safety issues for the public.

PROPOSED RESEARCH, DEVELOPMENT OR TECHNOLOGY TRANSFER ACTIVITY (*more info*)

The main problem with the different Willametter silts that are located in in different areas of the Willamette Valley is to determine when to consider it clay or a cohesionless soil during the characterization and design process. This research will consist of a laboratory investigation that will focus on developing simple means to make this determination, such as clay content, Atterberg Limits and permeability testing. The laboratory investigation will consist of first obtaining representative Willamette silts that can be used throughout the investigation. Then, laboratory tests will be performed on different versions of the soil by changing the clay content, so the threshold level where the soil behaves as a cohesive soil, as opposed to a cohesionless soil, can be discovered. Laboratory tests to be performed on each mixture of Willamette silt include, Atterberg Limits, consolidation testing, permeability testing, and drained and undrained triaxial compression tests.

Quantified recommendations will be made on how and when to properly classify Willamette silt as a clay or a sand. Also, there will be recommendations of how to use the obtained properties in the design process.

BENEFITS (*more info*)

The State Oregon in addition to the private geotechnical engineering community would greatly benefit with quantifiable recommendations on how to properly and accurately assess the properties of Willamette silt when the clay content varies. They will also benefit from recommendations on how to utilize the obtained soil properties in the design process.It should be noted that very little research has ever been performed on transitional type soils and this researcher is not aware of any existing recommendations like those that are proposed here. Accurate assessments of soil properties will provide better designs that are more economical/safe and less likely to involve future failures associated with stability and settlement.

CONTACT INFORMATION:

Name[1]: *Jerry A. Yamamuro*

Name[2]:

Address[1]: *Oregon State University*
Dept. of Civil and Construction Engineering
220 Owen Hall
Corvallis, OR 97331

Address[2]:

Email[1]: *yamamuro@engr.orst.edu*

Email[2]:

Phone[1]: 541-737-2014

Phone[2]:

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