City of Medford

DEPARTMENT OF PUBLIC WORKS

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To: Stephanie M. Burke, Mayor; Brian Kerins, DPW Commissioner; Paul F. Mochi, Building Commissioner Mochi; Lauren DiLorenzo, Community Development Director; Mark E. Rumley, City Solicitor

From: Timothy J. McGivern, City Engineer

Date: March 13, 2019

Re: MED-01: Engineering Directive regarding permanent soil nail retaining walls within public property owned by an entity other than City of Medford.

The purpose of this letter is to provide general engineering guidance and direction to the City of Medford and its Officials on permitting **permanent soil nail wall earth retention systems that have soil nails or other ground anchors within a public right-of-way, built, owned and maintained by an entity other than the City**. This type of structure is typically referred to as a "soil nail retaining wall". This type of wall is typically used to support earth cuts. It is the understanding of the Engineering Division that structures of this type do not exist in Medford at this time; however, structures of this type are expected in the future.

Generally, soil nails (also referred to as "tiebacks") are drilled into the undisturbed soil behind the face of an earth cut. Grout is typically used to secure a steel tendon in the center of the drill hole. Soil nails use friction with the surrounding soil to achieve the stability and structural integrity required to permanently support an earth cut.

The soil nails support the face of the wall. The function of the soil nails relies on the soil surrounding the nail, therefore the structural stability of a permanent soil nail wall relies on the function of the soil surrounding the soil nails. The function of the soil is passive; however, it inherently becomes a functioning element of the structural system.

A structure of this type will require a permanent easement area and associated agreement with the City. The easement area should be agreed upon by both entities. The easement area and agreement should be created under advisement of the design geotechnical or structural engineer registered and licensed in Massachusetts. The easement area line shall be offset a specified distance from the end of the soil nails. The offset distance shall be such that disturbance of soil beyond the easement line will not impact the integrity of the soil surrounding the soil nails.

Public rights-of-way typically have subsurface utilities that rely on the surrounding soil and bedding materials for their structural support. Soil nails shall be installed with an offset distance that allows full access to the utility lines with reasonable restrictions and conditions to protect the integrity of the soil nail system. Future potential construction means, and methods must be considered in this evaluation. Soil nails shall not be installed over existing utilities. The design geotechnical or structural engineer registered and licensed in Massachusetts shall determine the specified offset distances.

Due to their nature, soil nails limit future excavations of their surrounding soil. The City (as well as other entities) typically owns subsurface utilities within the public right-of-way. The City also typically owns the existing roadway infrastructure that is supported by the same soil. The permanent easement agreement shall establish a timely and effective process to obtain permits from the Owner to excavate soil and perform civil work within the easement area. This permit process should place reasonable restrictions and conditions on the proposed work to protect the integrity of the soil nail system.

Corrosion resistance is critical to the long-term structural integrity of the soil nail system. The soil surrounding the soil nails shall be evaluated for soil corrosion potential as part of the design process, and appropriate Corrosion Protection Systems shall be provided in the design. Grout cover at a minimum should be provided. Examples of additional systems include epoxy coatings, zinc coatings, encapsulation, sacrificial steel, etc. Determining soil corrosion potential will require soil tests. Soil tests associated with soil corrosion potential should be performed by a separate, third-party entity.

Soil reinforced with soil nails may rotationally settle along the slip plane of the wall over time. This is expected, normal settlement. The easement agreement shall include long-term monitoring of the potentially impacted utilities and roadway infrastructure. The long-term monitoring plan shall define acceptable limits of settlement and displacement and shall define steps to resolve the potential impacts. A base line condition of the public utilities must be established and agreed upon by the City prior to the start of construction of the soil nails. Examples of typical monitoring equipment includes inclinometers, survey points, strain gauges, etc. All required repairs resulting from settlement shall be made within a reasonable time frame and shall be at the expense of the Owner.

The construction process for soil nail walls includes load testing. The permitting and easement agreement shall include a requirement that the City receive timely copies of all test reports during and after construction. These include but are not limited to: Verification Load Tests, Proof Tests, and Creep Tests. Tests should be performed by a separate, third-party entity.

The structural stability of a permanent soil nail wall relies on the function of the soil surrounding the soil nails. This soil becomes a passive element of the structure and should be protected from disruption. The City will lose rights associated with this soil. In general, these rights are associated with, but not limited to, deep excavations. In exchange for these rights, and in the interest of minimizing soil disturbance once the work is complete, the Engineering Division recommends that the finished grade within

the easement area should be restored to new condition at the completion of the soil nail structure at the expense of the Owner. Any reasonable improvements to the finish grade should be completed at this time.

The Engineering Division recommends that permitting of this type of structure should include submission of information in the form of engineering plans, calculations, and reports prepared by a Professional Engineer to demonstrate compliance with this directive and current engineering standards. The City reserves the right to have the submission peer reviewed by a separate entity at the Owners or Proponents expense.

It should be noted that an easement agreement with the City of Medford does not relieve the project Proponent of obtaining other permits required by the City such as a Trench Permit, or a Building Permit. It also does not relieve them of obtaining permits required by other utility owners such as the MWRA.

References:

Soil Nails Walls Reference Manual: U.S. Department of Transportation Federal Highway Administration Publication No. FHWA-NHI-14-007, FHWA GEC 007 February 2015

Respectfully,

Timothy J. McGivern, PE
City Engineer