

AN ASSESSMENT OF THE DYNAMIC PROPERTIES OF ADAPAZARI
SOILS BY CYCLIC DIRECT SIMPLE SHEAR TESTS

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ADAPAZARI SOILS BY CYCLIC DIRECT SIMPLE SHEAR TESTS**

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

AN ASSESSMENT OF THE DYNAMIC PROPERTIES OF ADAPAZARI SOILS BY CYCLIC DIRECT SIMPLE SHEAR TESTS

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Among the hard-hit cities during 17 August 1999 Kocaeli Earthquake (Mw 7.4), Adapazarı is known for the prominent role of site conditions in damage distribution. Since the strong ground motion during the event was recorded only on a rock site, it is necessary to estimate the response of alluvium basin before any study on the relationship between the damage and the parameters of ground motion. Therefore, a series of site and laboratory tests were done on Adapazarı soils in order to decrease the uncertainty in estimation of their dynamic properties. In downtown Adapazarı, a 118 m deep borehole was opened in the vicinity of heavily damaged buildings for sample recovery and in-situ testing. The stiffness of the soils in-situ is first investigated by standard penetration tests (SPT) and by velocity measurements with P-S suspension logging technique. Disturbed samples were recovered by core-barrel and split-barrel samplers. 18 Thin-Walled tubes were successively used for recovering undisturbed samples. A series of monotonic and cyclic direct simple shear tests were done on specimens recovered from the Thin-Walled tubes. It is concluded that the secant shear modulus and damping ratio of soils exposed to severe shaking during the 1999 event are significantly smaller than those estimated by using the empirical relationships in literature. It is also observed that the reversed-S shaped hysteresis loops are typical for cyclic response of the samples.

Keywords: Cyclic direct simple shear, P-S suspension logging, standard penetration test, dynamic soil properties, Adapazarı.

ÖZ

ADAPAZARI ZEMİNLERİNİN DİNAMİK ÖZELLİKLERİNİN DEVİRLİ DİREKT BASİT KESME DENEYİ İLE DEĞERLENDİRİLMESİ

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17 Ağustos 1999 Kocaeli Depreminde (Mw 7.4) ağır hasar gören şehirlerden Adapazarı saha koşullarının hasar dağılımı ile belirgin ilişkisi ile bilinmektedir. Kuvvetli yer hareketi kaydının sadece bir kaya sahada alınması sebebi ile, hasar ve yer hareketi parametreleri arasındaki ilişkiyi inceleyen çalışmalarda öncelikle alüvyon basenin tepkisi tahmin edilmelidir. Bu doğrultuda, Adapazarı zeminlerinin dinamik özelliklerinin tahmininde belirsizliği azaltmak için bir seri saha ve laboratuvar deneyleri gerçekleştirilmiştir. Numune alınması ve sahada deneyler gerçekleştirilebilmesi için, 118 m derinliğinde bir sondaj kuyusu Adapazarı şehir merkezinde ağır hasarlı yapıların yakınlarındaki bir sahaya vurulmuştur. Yerinde zeminlerin sertliği ilk olarak standard penetrasyon deneyi (SPT) ve P-S askıda kaydetme yöntemleri ile tecrübe edilmiştir. Karotiyer ve SPT numune alıcısı ile örselenmiş numuneler elde edilmiştir. 18 ince cidarlı numune tüpü ile örselenmemiş numuneler alınmıştır. Örselenmemiş numuneler ile laboratuvarında bir seri tekdüze ve devirli direkt basit kesme deneyi gerçekleştirilmiştir. 1999 depremindeki yer hareketine maruz kalan zeminlerin sekant kesme modülü ve sönümleme oranlarının literatürde verilen ampirik yaklaşımlara göre daha düşük değerlerde olduğu sonucuna

varılmıřtır. Ters-S řeklindeki histeresis dnglerinin bu numunelerin devirli tepkisi iin tipik olduėu gzlemlenmiřtir.

Anahtar Kelimeler: Devirli direkt basit kesme deneyi, P-S askıda kaydetme, standard penetrasyon deneyi, dinamik zemin zellikleri, Adapazarı.