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黄土边坡动力响应的影响效应研究

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RESEARCH ON DYNAMIC RESPONSE EFFECTS OF LOESS SLOP

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全文: PDF (4007 KB) HTML (KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 根据随机地震荷载作用下黄土动三轴试验的动剪切模量表达式和试验参数编制子程序,采用MSC.Marc软件建立有限元模型,并基于人工合成地震动时程对黄土边坡进行动力响应分析,研究输入地震波的卓越频率、幅值以及入射角变化,对黄土边坡位移、速度、应力的动力响应,分析对响应幅值、频谱的影响效应。由研究结果可见:边坡位移、速度等响应时程的卓越频率远小于地震输入波的卓越频率,边坡岩土介质对地震波的高频成分有过滤或吸收作用; 边坡的动力响应幅值极大的受地震输入波卓越频率的影响,对于给定的边坡,它将对包含某一卓越频率成分的地震动时程的动力响应异常强烈; 输入地震波幅值的变化,只引起边坡动力响应幅值的线性变化,不改变边坡中响应时程的频谱特征; 当地震波以一定角度入射时,边坡动力应力响应时程包含了更多的高频成分,位移和速度响应幅值随入射角的增大而减小,且越靠近坡顶减速越快,而应力响应幅值在坡顶与坡腰、坡脚处具有不同的影响规律; 另外,地震荷载作用方向的改变,还对边坡动力响应放大系数有较大影响,当作用力方向非竖直时,动力响应放大系数随地震波入射角的增大而减小。

关键词: 黄土边坡 随机地震波 动力响应 卓越频率 动力响应放大系数

Abstract: This paper is based on dynamic shear modulus formula and correlative parameters of loess gained from three triaxial tests. The tests were acted by random seismic load. A subprogram of MSC.Marc was programmed. Finite element model acted by artificial earthquake wave was built to study dynamic response of loess slope. So, the displacement, velocity and stress transformation law of loess slope were analyzed when excellent frequency, amplitude and action direction of input seismic wave was changed. The results show that excellent frequency of slope displacement, velocity response time-history is much smaller than the input wave. A large number of high frequency wave was filtered when seismic wave transmit in slope soil. And dynamic response of loess slope was affected by the predominant frequency of seismic wave strongly. A giving slope was exceptional sensitive to certain seismic wave with predominant frequency. In addition, the changing of amplitude of seismic wave could alter the dynamic response amplitude of slope linearly, but couldn't transform the spectrum character of dynamic response of slope. The result also shows that the dynamic response time-history of slope contains more high frequency components when acting earthquake wave with certain action angle. Response amplitude of displacement and velocity reduced more quickly more close to the top when action angle increasing. Different effect law of stress response amplitude was shown in the top, middle and toe of slope. The changing of seismic wave acting direction affects dynamic response amplificatory coefficient also, which decreases with the increase of seismic wave acting angle when direction is un-vertical.

Key words: Loess slope Stochastic earthquake acceleration wave Dynamic response Predominant frequency Dynamic response amplificatory coefficient

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