ZORN LAB LWD

Laboratory Light Weight Deflectometer

According to ASTM E3331-22 (Standard test method for measuring target modulus using the Light Weight Deflectometer on laboratory compaction characteristic samples.)

Details

- **Load device with 5 kg drop weight**
  180 mm, 850 mm, 9,4 kg
  (Width, height, total weight)
- **Base plate**
  150 mm, 6,8 kg
  (Diameter, weight)
- **Electronics box**
  120 mm, 90 mm, 0,5 kg
  (Width, height, weight)

The ZORN LAB LWD is used to determine target modulus values for unbound soils and soil-aggregate as a basis for in-situ Light Weight Deflectometer testing.

The basis of the ASTM E3331-22 test method is the acquisition of LAB LWD deflection measurements on laboratory Proctor specimens at varying moisture contents. These deflection values are compared with the moisture and density characteristics of the same Proctor specimen to establish modulus targets for subsequent field testing with standard Light Weight Deflectometers.

By combining in-situ LWD performance testing with density-based laboratory procedures, this test method is a very useful addition to existing quality control steps.

Both the test method according to ASTM E3331-22 and details of the LAB LWD design are based on comprehensive scientific research, such as Transportation Pooled Fund Program Project TPF-5(285), led by the Maryland Department of Transportation State Highway Administration (USA) in 2017.

ZORN LAB LWD design details

Technologically, the ZORN LAB LWD is an adopted version of the known ZORN LWD field-test instrument as per ASTM E2835. Designed and manufactured by ZORN Instruments in Germany this compact LWD unit uses a 150 mm diameter load plate. It furthermore has a lighter falling mass (5 kg) that can be dropped from different pre-set drop heights, thus producing variably loads in order to flexibly test stiffness properties of different soil and aggregate materials.

The ZORN LAB LWD enables a systematic and repeatable correlation of density and moisture laboratory tests for various granular materials with stiffness or modulus testing. This new approach further widens the possibilities for using LWD devices in quality assurance and quality control of road and railway construction.

Technical specifications

M = 17 kg (total mass)
l = 26,4'' = 0,67 m (rod length)
m = 5 kg (falling weight)
h = 14,8'' = 0,375 m (falling height)
k = 0,306 10^6 N/m (spring constant)
R = 3,0'' = 75 mm (load plate radius)
F = 3,54 kN (max. impact force)
σ = 200 kPa (max. ground pressure)

The ZORN LAB LWD load plate is available in two diameter versions to either fit a 6-inch Proctor mold (inner diameter 152,4 mm) or the metric equivalent (inner diameter 150,0 mm).

Rules for combining laboratory and field tests

There are several different types of Light Weight Deflectometers currently available, with the two main types described in ASTM E2835 and E2583. To eliminate differences between measurements from different instruments, the same type of LWD must be used in the field test as in the laboratory test in terms of brand name, buffer stiffness and deflection measurement location. Please ask your local ZORN INSTRUMENTS representative for details.

Further use of the ZORN LAB LWD

Although originally designed for use on Proctor molds in a materials testing laboratory, the ZORN LAB LWD is also suitable for instant field testing. When used as a field instrument, the same automatic modulus calculation as for the ASTM E2835 Lightweight Deflectometer is available. However, users should be aware that due to the reduced base plate diameter and maximum impact force, the depth of influence is reduced to an estimated maximum of 200-300 mm.

Good to know

Recent studies have also shown that the ZORN LAB LWD can be used to directly test the relationship between water content and bearing capacity in fine-grained materials in the laboratory. This expands the potential applications of the Lightweight Deflectometer in regions where construction materials with a high proportion of fine grains (>15%) are regularly used.

Application in pictures

Picture 1
Specimen of compacted soil or soil-aggregate in 6-inch Proctor mould

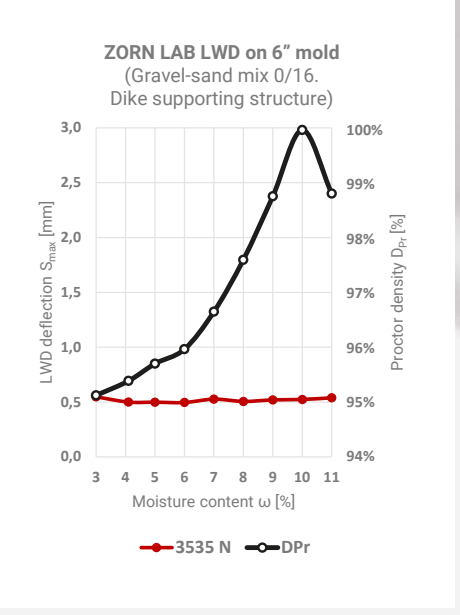
Picture 2
ZORN LAB LWD load plate placed on specimen surface

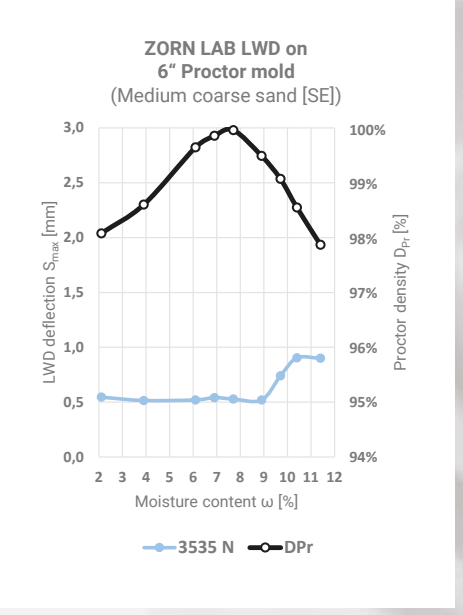
Picture 3
ZORN LAB LWD loading device positioned on the load plate

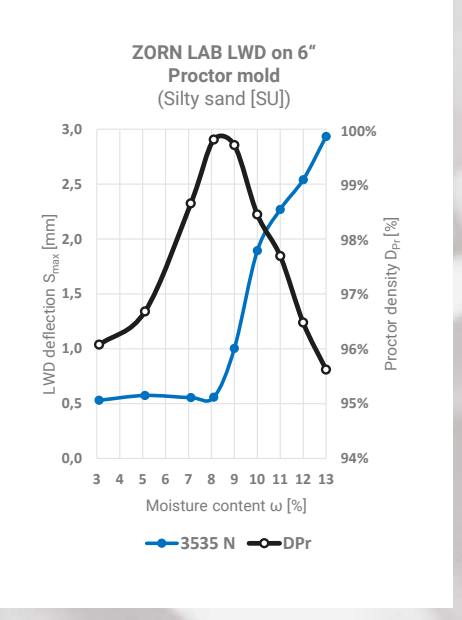
Picture 4
Test drops performed to measure LWD load plate deflections.

Picture 5
Automatic data acquisition with electronic LWD controller. (e.g. ZORN ZFG 3.1)

Picture 6
Adjustable release lever for variable drop-weight falling height.







Relevant technical standards:

- ASTM E3331: Standard Test Method for Measuring Target Modulus Using Light Weight Deflectometer (LWD) on Compacted Proctor Mold Samples
- ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
- DIN 18127: Soil, investigation and testing - Proctortest
- ASTM E2583: Standard Test Method for Measuring Deflections with a Light Weight Deflectometer (LWD), [Light Weight Deflectometer geophone type]
- ASTM E2835: Standard Test Method for Measuring Deflections Using a Portable Impulse Plate Load Test Device, [Light Weight Deflectometer accelerometer type)
- TP BF-StB part B 8.3: Technical testing regulations for soil and rock in road construction, Dynamic Plate Load Testing with the Light Drop-Weight Tester

ZORN INSTRUMENTS GmbH & Co. KG
Benzstraße 1 | 39576 Stendal | Germany

Telefon: +49 3931 / 25 27 3-0
Telefax: +49 3931 / 25 27 3-10

eMail: info@zorn-instruments.com
Web: www.zorn-instruments.com