Session 52

Bruce Dietrich

FDOT

Base Water Clearance Elevations effects on Construction and Pavement Performance

Topic Description

Background and status of on-going research on the effects of water elevation on pavement construction and performance.

Speaker Biography

Bruce Dietrich is a registered professional engineer in Florida. Bruce Dietrich has worked with the Florida DOT since 1979. He was named State Pavement Design Engineer in 1993. Prior to coming to FDOT, he spent four years of active duty service as a construction officer with the US Army Corps of Engineers. He is a 1975 graduate of Georgia Tech with a degree in Civil Engineering.

Base Water Clearance Elevations effect on Construction and Pavement Performance

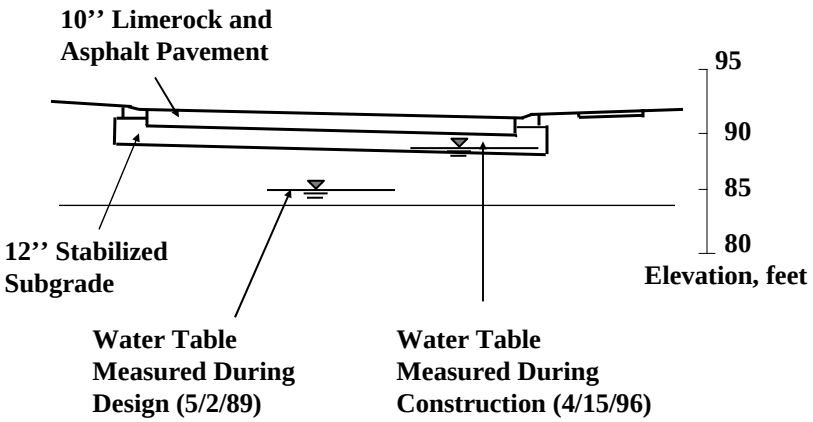
Bruce Dietrich, PE
FDOT State Pavement Design Engineer

2006
DESIGN CONFERENCE
Designing For More Than Bridges and Roads

Base Water Clearance Standards

- PPM Table 2.6.3
  - Multilane Roads – 3 feet
  - Rural two lane roads – 2 feet
- Based on Experience
  - Provides for constructability
  - Allows for some fluctuation in water levels
  - Important for good pavement performance

S.R. 551 (Goldenrod Road)
State Project No. 75200-3519
Orange County, Florida
Sta. 1+00



Rainfall Data

Month	1989 (inches)	1996(inches)
January	3.8	5.4
February	0.2	1.5
March	1.4	9.9
April	2.3	0.7
May	2.4	5.1
June	6.8	6.5
July	4.7	4.1

Consequences of Reduced Base Clearance

- **Constructability Problems**
- **Large Claims**
- **Time Delays**
- **Reduced Pavement Performance**

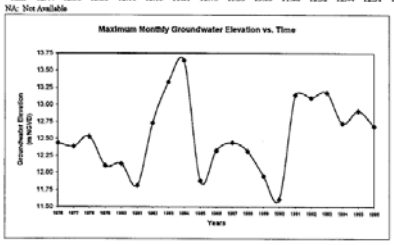
US 41 New Construction

Example of Fluctuating Water Table

USGS Well #272356082181302

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Oct	12.42	12.38	12.10	12.02	12.13	11.81	11.25	12.73	13.10	11.88	11.50	11.76	11.79	11.95	11.35	11.09	12.75	13.17	12.37	12.62	12.68
Nov	12.16	11.76	11.33	11.70	11.57	10.95	10.49	12.41	12.83	11.11	11.34	11.62	12.00	10.74	10.16	10.79	11.89	12.23	12.72	11.92	12.38
Dec	11.87	11.84	12.10	11.30	11.76	11.23	10.52	12.32	13.42	11.31	11.38	12.12	12.20	11.16	10.74	10.76	10.56	12.05	8.45	11.74	11.90
Jan	11.43	12.29	12.53	11.98	11.73	11.12	10.78	12.29	13.65	10.87	11.41	12.44	12.06	10.93	10.92	11.15	10.24	12.36	9.73	12.29	11.85
Feb	11.04	11.99	12.41	11.95	11.73	10.92	10.56	12.91	13.50	10.54	10.98	12.08	12.08	10.48	9.68	11.15	10.38	12.61	9.61	12.03	11.33
Mar	10.13	11.49	12.37	11.76	11.62	10.89	10.61	13.22	12.91	9.92	11.01	11.99	11.97	9.35	9.63	10.97	10.39	12.37	8.86	11.26	8.73
Apr	8.96	10.39	11.52	10.88	10.99	10.02	10.37	13.20	12.27	9.32	10.73	12.05	11.44	8.49	8.32	10.78	10.37	12.40	7.62	10.08	9.38
May	9.69	8.58	9.71	10.17	10.38	8.40	10.00	12.38	11.60	8.53	9.15	10.26	9.45	7.39	7.89	10.28	10.68	11.58	7.78	8.92	8.75
Jun	11.19	10.37	11.27	10.45	10.94	10.21	11.56	11.81	11.58	9.18	10.53	10.96	10.03	9.27	10.05	12.14	10.84	11.34	9.39	9.85	10.41
Jul	12.01	11.27	12.16	11.12	11.63	10.96	12.23	12.67	12.70	10.64	11.76	12.23	11.28	10.77	11.34	12.91	12.19	12.37	11.33	11.66	11.24
Aug	12.44	11.80	12.50	11.36	11.71	11.41	12.73	13.14	12.84	11.50	12.28	12.41	12.12	11.10	11.60	13.10	12.79	12.52	12.00	12.61	11.26
Sep	12.38	12.13	12.35	12.10	11.82	11.58	12.57	13.33	12.55	11.68	12.22	12.04	12.31	11.40	11.61	13.14	13.10	12.79	12.45	12.90	11.02
Max	12.44	12.38	12.53	12.10	12.13	11.81	12.73	13.33	13.65	11.88	12.32	12.44	12.31	11.95	11.61	13.14	13.10	13.17	12.72	12.90	12.68

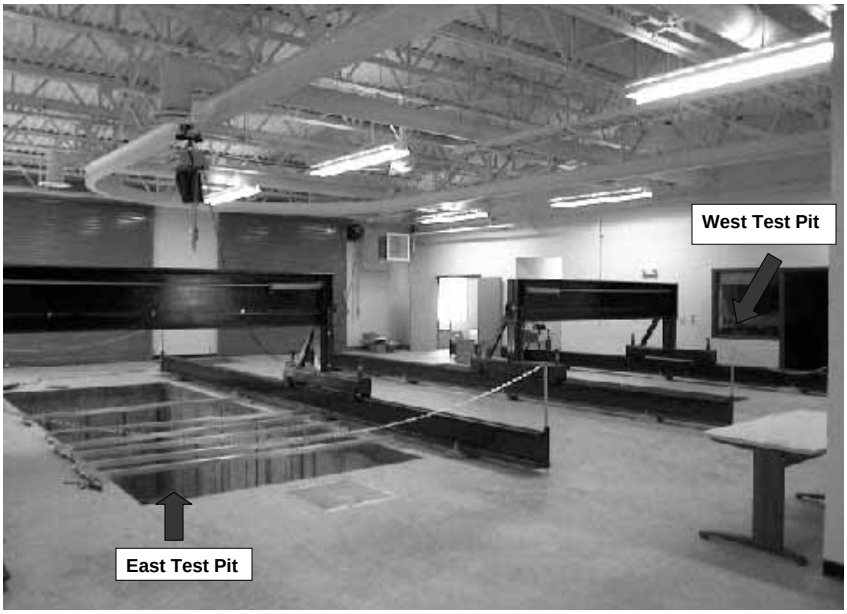
NA: Not Available

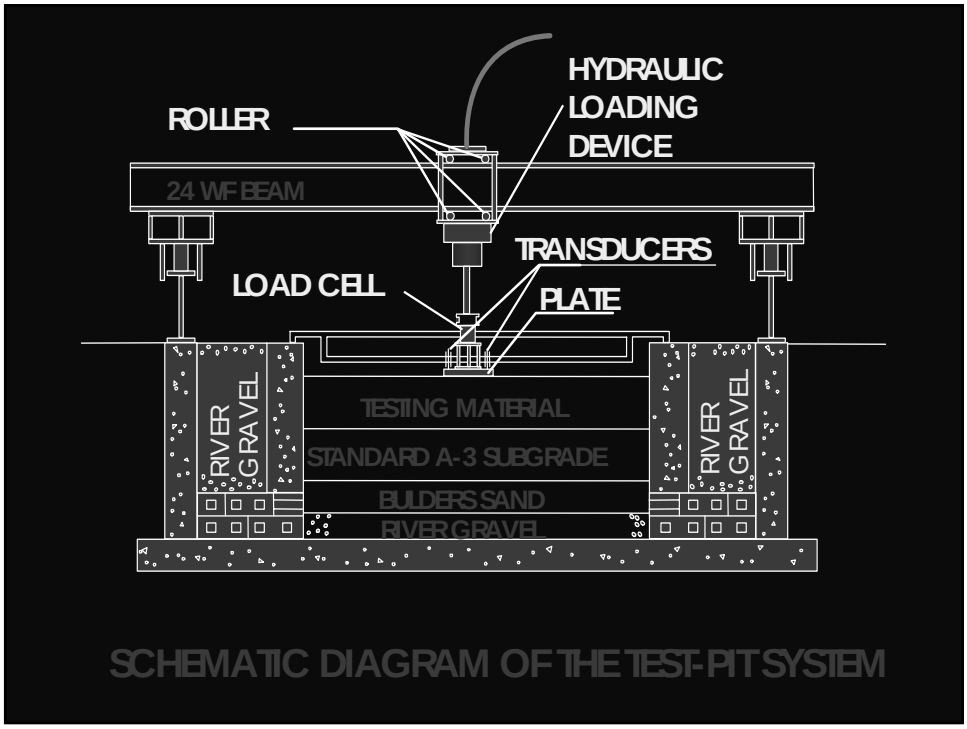


APPENDIX B-2(c)

144

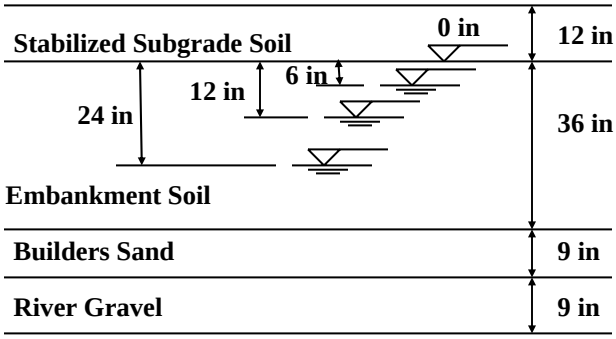
Two Test Pits Used in the Studies





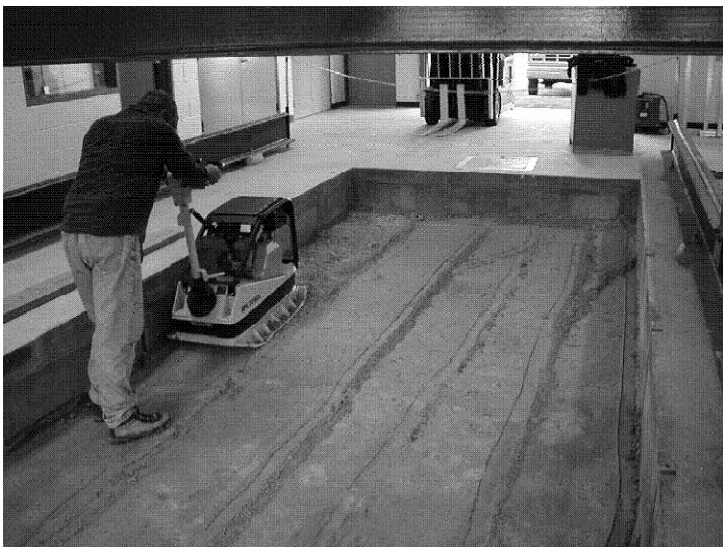
SCHEMATIC DIAGRAM OF THE TEST-PIT SYSTEM

West Test Pit (A-3 Embankment)

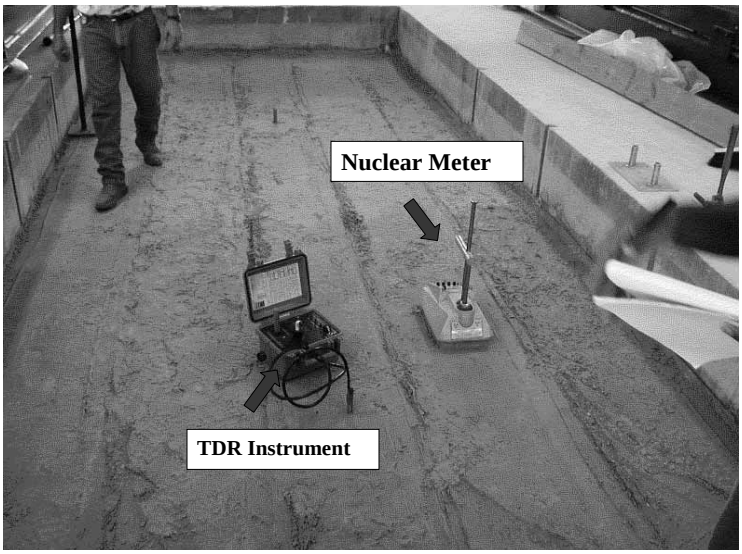


- Condition 1: 24 in below the interface
- Condition 2: 12 in below the interface
- Condition 3: 6 in below the interface
- Condition 4: 6 in below the interface (drained)
- Condition 5: 12 in below the interface (drained)

Compacting



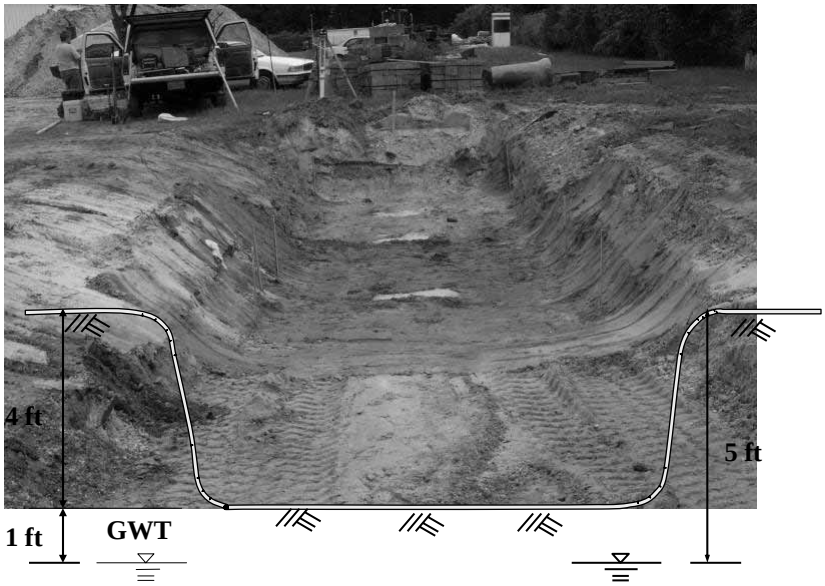
Density and Moisture Measurements



Capillary Rise

- **Approx. 18 inches for the A-3 soil**
- **Approx. 24 inches for the A-2-4 soil**

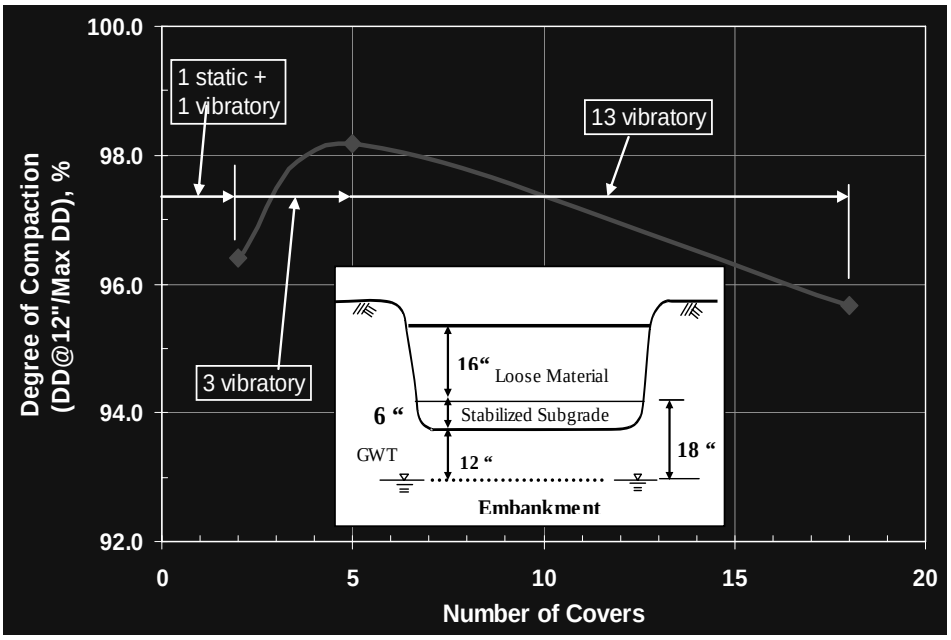
Lake Worth Site



Compacting

Density and Moisture Measurements

Degree of Compaction vs. Covers at -18 inch Water Level



Constructability Conclusions

- For high quality subgrade soils, 18 to 24” minimum groundwater clearance needed to achieve adequate compaction. Static compaction may be required.
- For drawdown conditions, water should be lowered to at least 24” below interface.
- Additional field studies needed for higher fines subgrades.

Continuing Studies

- Test Pit modulus studies BD 543-13
  - Varying fines, water levels
  - Try to quantify water clearance reduction effects on soil resilient modulus for increased pavement structure when standards can’t be met.
- Seasonal Variability of Groundwater Tables BD 545-55