

MASS. TITLE 5 FILL MATERIAL FOR SOIL ABSORPTION SYSTEMS

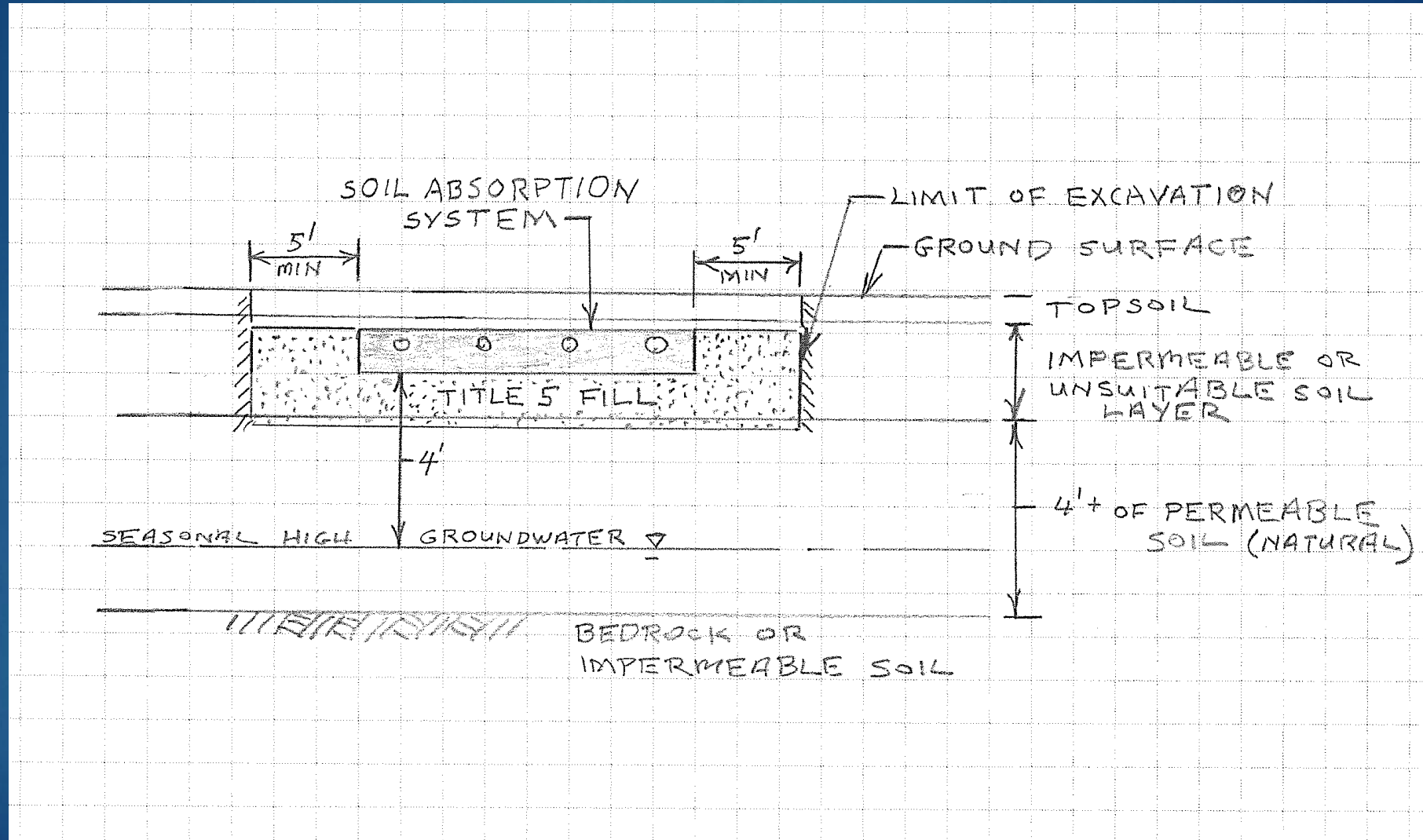
FREDRIC KING, PE, LEED AP

DGT ASSOCIATES, FRAMINGHAM, MA.

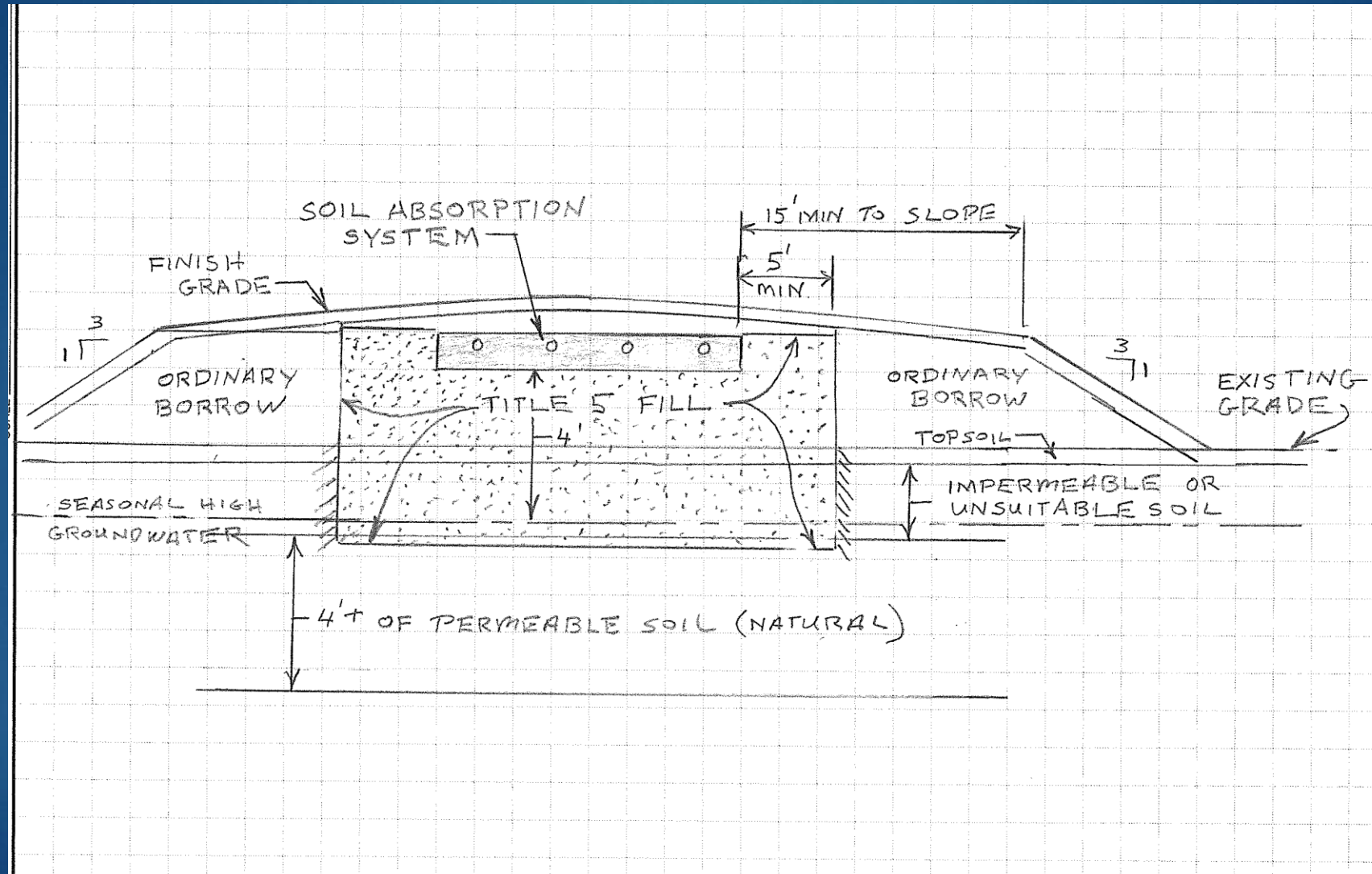
REFERENCE: 15.255 CONSTRUCTION IN FILL

- ▶ (1) ANY SYSTEM WHERE FILL IS REQUIRED TO REPLACE TOPSOIL, PEAT OR OTHER UNSUITABLE OR IMPERVIOUS SOIL LAYER ABOVE THE REQUISITE FOUR FEET OF NATURALLY OCCURING PERVIOUS MATERIAL IS A SYSTEM CONSTRUCTED IN FILL.

BELOW GRADE UNSUITABLE SOIL



MOUNDED FILL SYSTEM



ORIGIN OF THE CURRENT TITLE 5 FILL SPECIFICATION

- ▶ **MASS. DEP COMMISSIONS A COMPREHENSIVE STUDY BY DEFEO, WAIT AND ASSOCIATES (DW&A) AND ISSUED IN 1991.**
- ▶ **- FILL SPEC STUDIED AND PRESENTED WHAT MANY OTHER STATES WERE DOING, AND SOME EXAMPLE SPECS WERE PRESENTED.**
- ▶ **- WHICHEVER SPEC WAS DECIDED IT WAS RECOMMENDED THAT "THE MATERIAL AND ITS PLACEMENT BE CAREFULLY CONTROLLED IN ORDER TO MINIMIZE RISK OF SYSTEM MALFUNCTION OR FAILURE."**
- ▶ **- CURRENT FILL SPEC ISSUED BY DEP IN THE 1995 TITLE 5.**

REFERENCE: 15.255 CONSTRUCTION IN FILL

► 15.255 (3) FILL MATERIAL

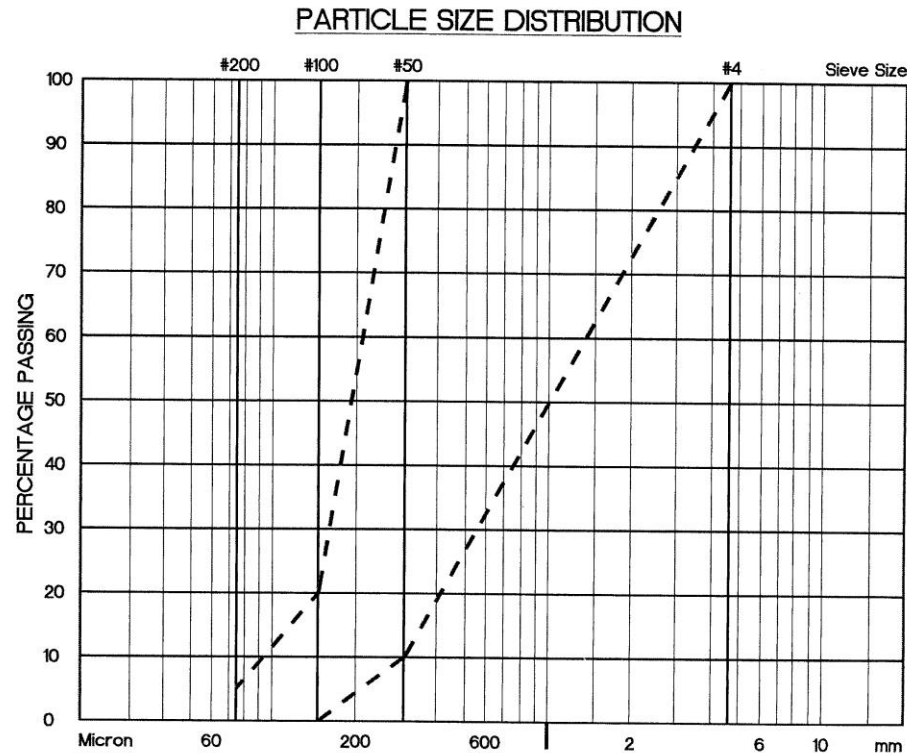
- CLEAN GRANULAR SAND (MAY CONTAIN GRAVEL)
- FREE OF ORGANIC MATTER, DELETERIOUS SUBSTANCES, REMEDIATION WASTE.
- NO MIXTURES AND LAYERS OF DIFFERENT CLASSES OF SOIL SHALL BE USED.
- NO STONES LARGER THAN 2 INCHES.
- MUST BE WITHIN THE LIMITS OF THE FOLLOWING SOIL GRADATION

TITLE 5 FILL MATERIAL GRADATION

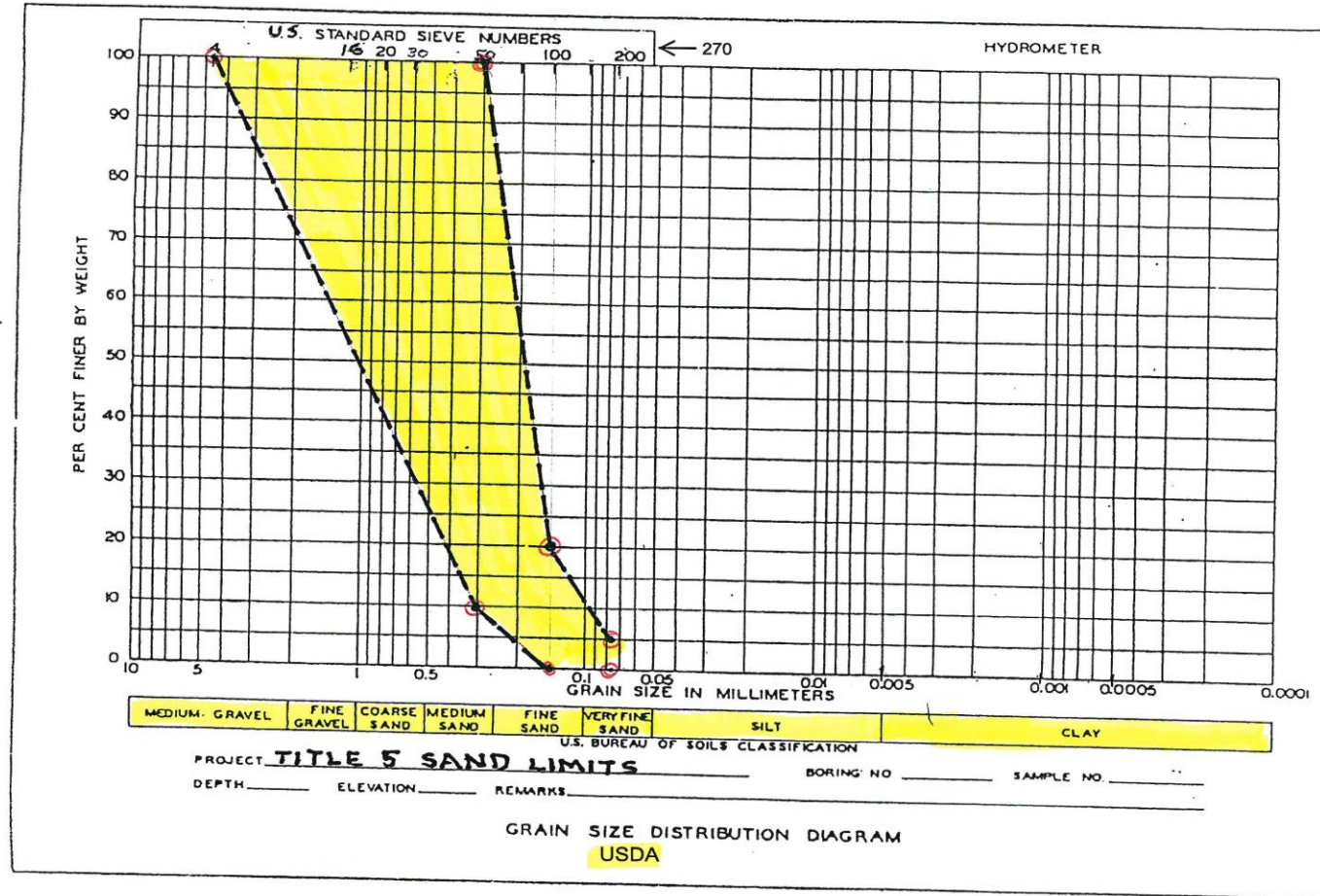
- UP TO 45% OF THE MATERIAL BY WEIGHT MAY BE RETAINED ON THE #4 SEIVE.
- THE PORTION OF THE MATERIAL PASSING THE #4 SEIVE MUST MEET THE GRADATION ON THE RIGHT

SIEVE SIZE	EFFECTIVE PARTICLE SIZE	% THAT MUST PASS SIEVE
# 4	4.75 mm	100%
# 50	0.30 mm	10% - 100%
#100	0.15 mm	0% - 20%
#200	0.075 mm	0% - 5%

A plot of the sieve analyses of the portion of the sample passing the #4 sieve shall fall on or between the lines on the following graph:



TITLE 5 SAND: WHAT DOES IT CONTAIN?



SOURCES OF TITLE 5 SAND

- ▶ **SAND AND GRAVEL PIT OPERATIONS**
- ▶ **BANK RUN SAND AND GRAVEL**
 - ▶ DIRECT FROM A SAND AND GRAVEL PIT (LITTLE TO NO PROCESSING)
- ▶ **PROCESSED SAND AND GRAVEL**
 - ▶ SAND BLEND PREPARED FOR A SPECIFIC PURPOSE
- ▶ **CRUSHER RUN AND PROCESSED SAND (RARELY USED FOR T-5)**
 - ▶ ROCK CRUSHER FOR LARGE AGGREGATE AND PROCESSED SAND BLEND

SAND AND GRAVEL PITS



SAND AND GRAVEL PITS



SAND AND GRAVEL PITS – DELTA SUNDERLAND, MA



DETERMINING COMPLIANCE

▶ 15.021 CERTIFICATES OF COMPLIANCE

- ▶ (2) THE DESIGNER IS RESPONSIBLE TO INSPECT THE SEPTIC SYSTEM DURING CONSTRUCTION AND CERTIFY THAT THE SEPTIC SYSTEM HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE PLANS AND TITLE 5.
- ▶ THE DESIGNER MUST PREPARE AN AS-BUILT PLAN.
- ▶ 15255 (3) REQUIRES THAT A SIEVE ANALYSIS BE PERFORMED THAT DEMONSTRATES THAT THE FILL MEETS EACH OF THE MATERIAL SPECIFICATIONS.
- ▶ THE SIEVE ANALYSIS MUST BE PERFORMED ON A REPRESENTATIVE SAMPLE(S) OF THE FILL.
- ▶ IN ORDER TO “CERTIFY” THAT THE INSTALLED SYSTEM MEETS TITLE 5, THE DESIGNER MUST HAVE A REPRESENTATIVE SAMPLE(S) OF THE MATERIAL FROM THE INSTALLED FILL TESTED AND RECEIVE A PASSING RESULT.
- ▶ THE TEST RESULTS ARE SUBMITTED TO THE APPROVING AUTHORITY.

HOW MANY SIEVE TESTS ARE REQUIRED?

- ▶ 15255 (4)
- ▶ SINGLE FAMILY RESIDENCE: ONE TEST “IF REQUIRED BY THE APPROVING AUTHORITY”.
- ▶ SYSTEMS OVER 2000 GPD: ONE TEST PER REMOVAL DAY IS REQUIRED? (WORDING FOR THIS IS ODD).
- ▶ APPROVING AUTHORITY CAN ALWAYS REQUIRE ADDED TESTS WHEN DEEMED NECESSARY.
- ▶ THE DESIGNER MUST BE SATISFIED THAT THE TESTING DONE IS SUFFICIENT TO CERTIFY THAT THE MATERIAL MEETS TITLE 5

RECOMMENDATIONS FOR NUMBER OF TESTS.

- ▶ THE DESIGNER NEEDS TO DETERMINE THE NUMBER OF TESTS THAT WILL BE NECESSARY IN ORDER TO CERTIFY THE SYSTEM AND TO PROTECT THE OWNER.
- ▶ THE DESIGNER SHOULD INFORM THE APPROVING AUTHORITY OF WHAT IS PLANNED AND ASK IF MORE WILL BE NECESSARY.
- ▶ DO NOT ACCEPT A TEST DONE BY THE SUPPLIER. THIS MAY NOT BE WHAT ACTUALLY GOT DELIVERED TO THE SITE.
- ▶ THE INSTALLER SHOULD SEE IF THE SUPPLIER WILL GUARANTEE THAT THE MATERIAL MEETS TITLE 5.

RECOMMENDATIONS CONTINUED

▶ HAVE THE FIRST LOAD DELIVERED AND HAVE THAT MATERIAL TESTED BEFORE MORE MATERIAL IS DELIVERED.

▶ WHO DOES THE TESTING?

- A LICENSED MATERIALS TESTING LAB.
- ENGINEERING FIRMS WITH TESTING EQUIPMENT AND A PE THAT WILL SUPERVISE AND CERTIFY THE RESULTS.
- MANY GEO-TECHNICAL ENGINEERING FIRMS DO THESE TESTS.
- U. MASS SOILS LAB

NOTE THAT AN OUTSIDE LAB WILL BE CERTIFYING ONLY TO THE SAMPLE THEY TESTED. THE DESIGNER WILL NEED TO CERTIFY THAT IT WAS A “REPRESENTATIVE SAMPLE”.

THE SIEVE TEST:

- ▶ **STANDARD PROCEDURES:**
 - ▶ **ASTM C 136 SIEVE ANALYSIS IS THE BASIC METHODOLOGY**
 - ▶ **ASTM D-75 SAMPLING STANDARDS – REPRESENTATIVE SAMPLE.**

TEST EQUIPMENT

OVEN



SIEVES AND SHAKER

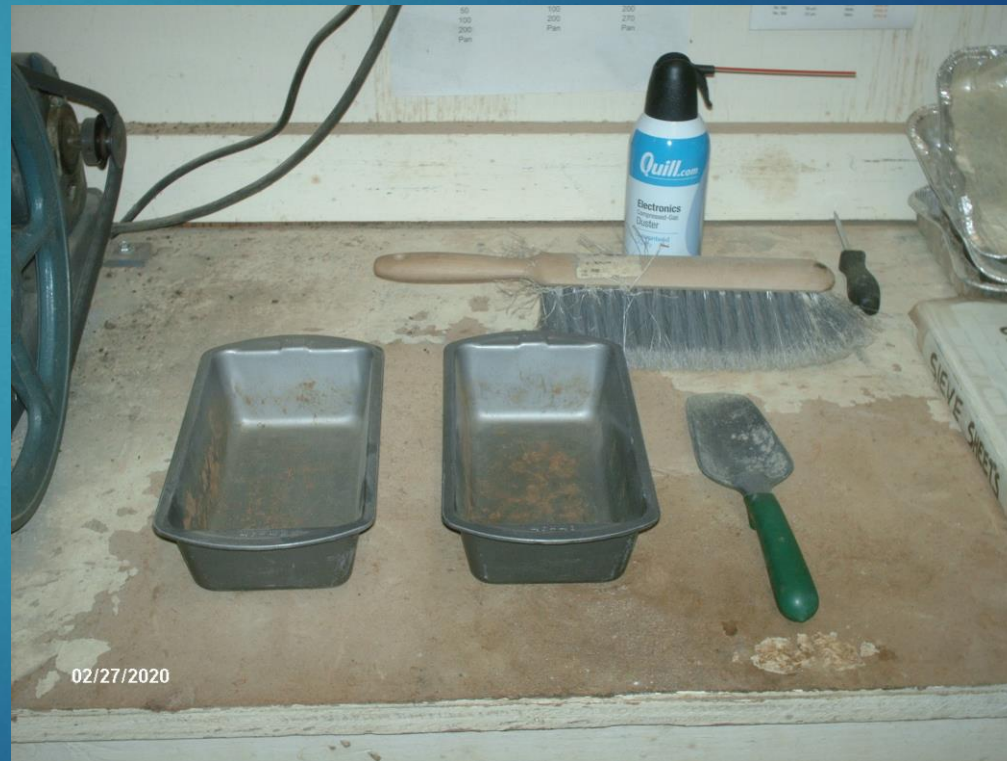


TEST EQUIPMENT

► SCALE AND PAN



DRYING PANS AND TOOLS



TITLE 5 SAND TEST REPORT



1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

CLIENT: (insert client name here)
SITE: (insert site address here)
City/Town, MA XXXXX

JOB NO.: XXXXX
DATE: (insert date here)

TITLE 5 SIEVE ANALYSIS DATA AND COMPUTATION SHEET

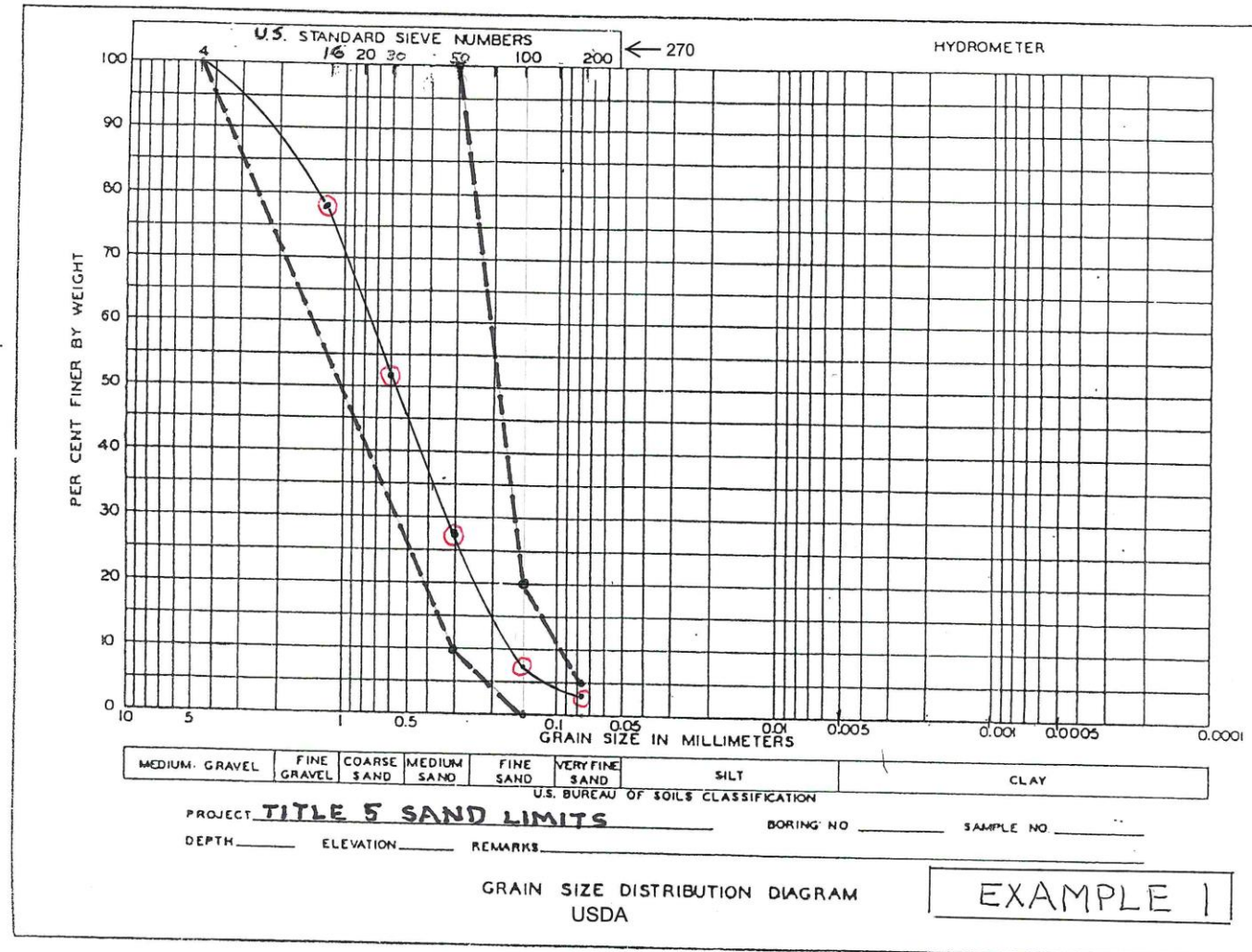
SAMPLE NO.: (sample no.) DATE SAMPLE TAKEN: (insert date here)
DESCRIPTION: (insert fill description)
TEST SAMPLE WEIGHT (g): (insert weight of sample)

Sieve No.	Sieve Weight (g)	Sieve & Soil Weight (g)	Soil Weight Retained (g)	Percent Passing	Of Portion Past #4 Percent Passing
2 inch	577.4	577.4	0.0	100.0	
4	914.2	1069.4	155.2	91.1	100.0
16	801.5	1149.8	348.3	71.0	77.9
30	703.9	1117.7	413.8	47.1	51.7
50	600.4	1088.4	488.0	19.0	20.8
100	627.5	838.0	210.5	6.8	7.5
200	524.9	590.6	65.7	3.1	3.4
PAN	849.7	902.8	53.1	0.0	0.0
TOTAL			1734.6		
PASS #4			1579.4		

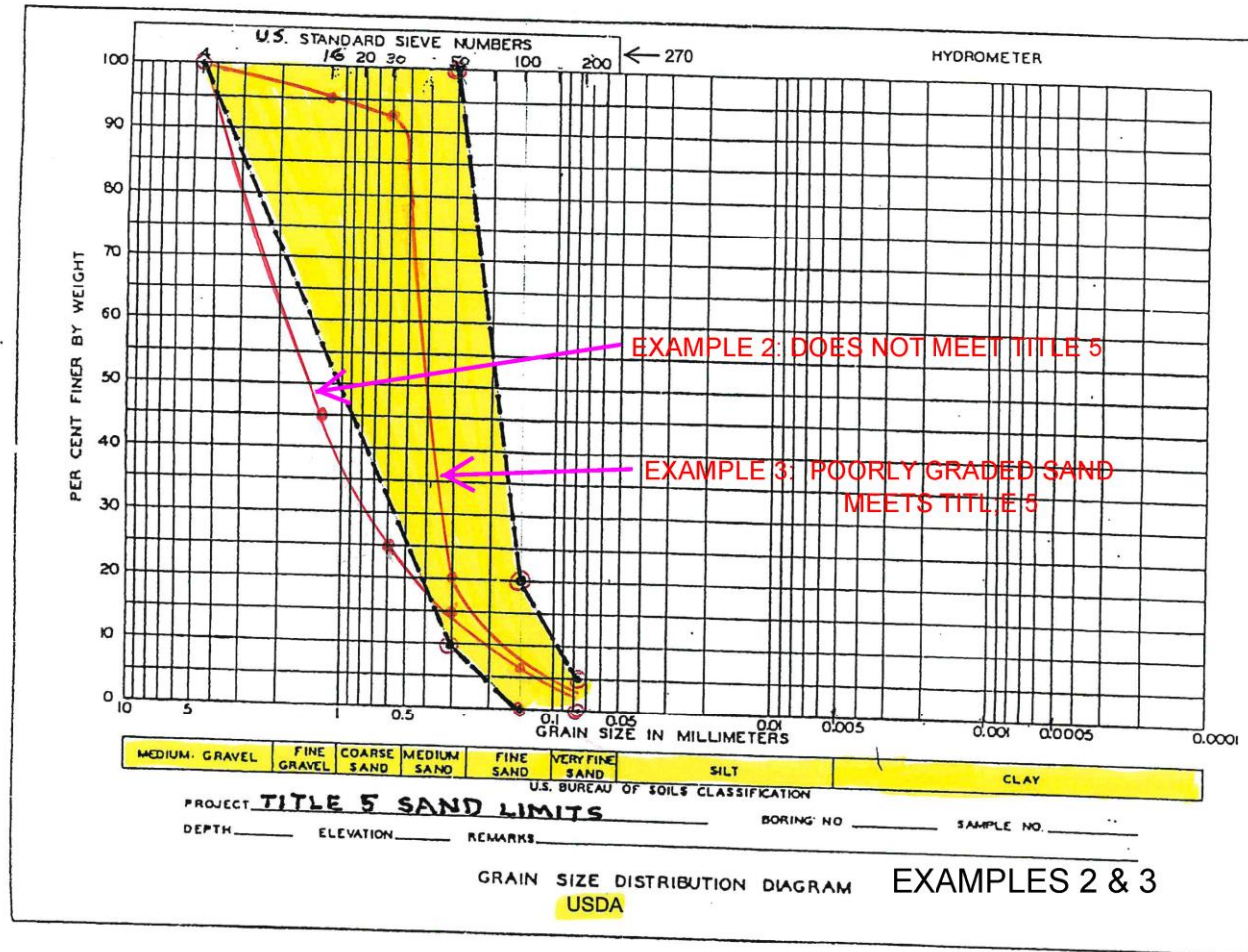
- 8.9 percent is retained on the #4 sieve.
(This value must be less than or equal to 45%)
- 20.8 percent of the fraction passing the #4 Sieve passes the #50 sieve.
(This value must be greater than or equal 10%.)
- 7.5 percent of the fraction passing the # 4 Sieve passes the #100 Sieve.
(This value must be less than or equal 20%.)
- 3.4 percent of the fraction passing the # 4 Sieve passes the # 200 Sieve.
(This value must be less than or equal 5%.)

Based on the above information, this soil sample PASSES , FAILS TO PASS
the gradation specifications as set forth in the Mass. State Environmental Code Title 5, 310 CMR 15.225(3).

EXAMPLE 1 DISTRIBUTION PLOT

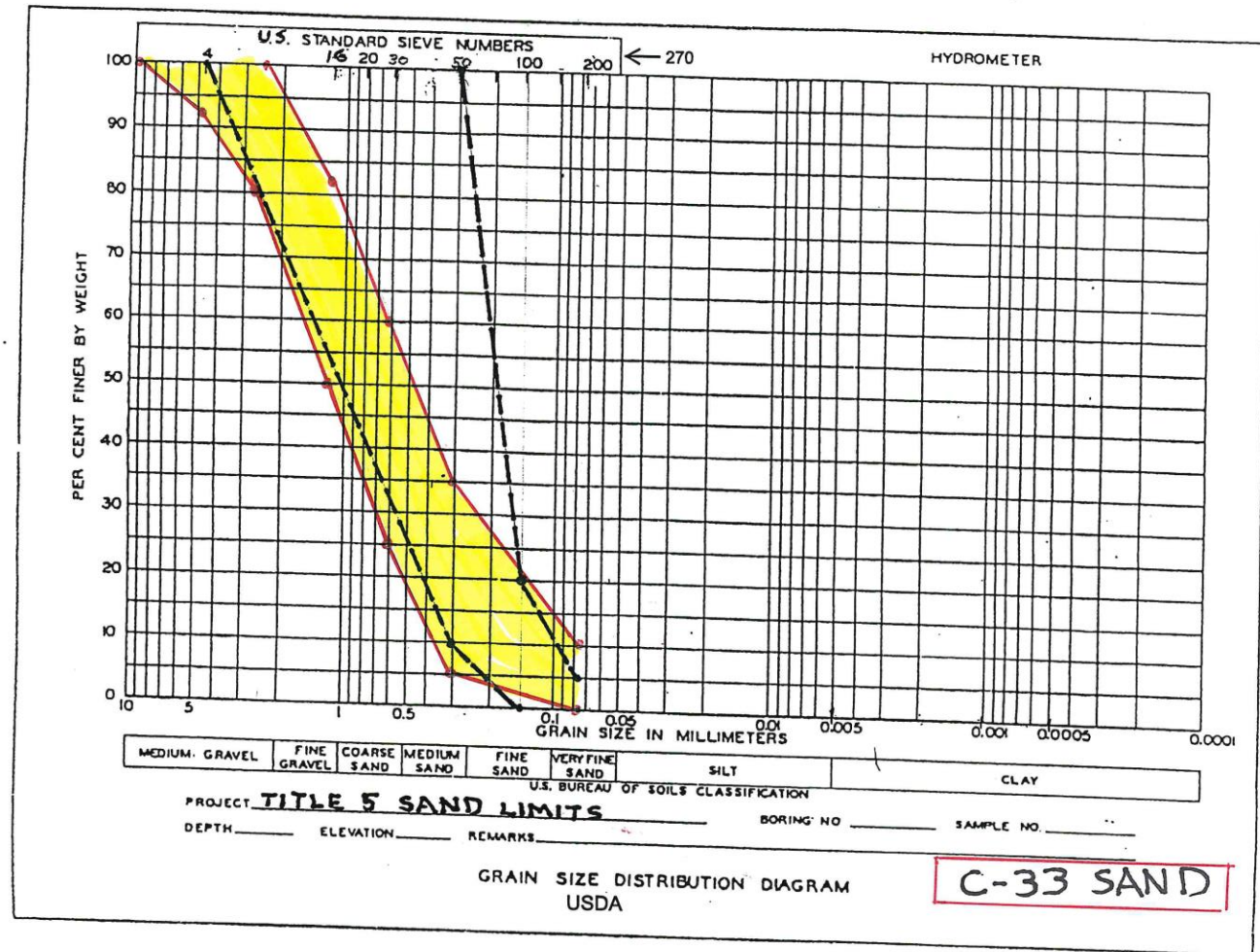


DISTRIBUTION PLOTS: EXAMPLES 2 & 3



C-33 SAND: AKA CONCRETE SAND

Sieve Specification	% Passing (ASTM C33)
9.5 mm (3/8 in)	100
4.75 mm (No. 4)	95 to 100
2.36 mm (No. 8)	80 to 100
1.18 mm (No. 16)	50 to 85
0.595 mm (No. 30)	25 to 60
0.297 mm (No. 50)	5 to 30
0.149 mm (No. 100)	--
75 μ m (No. 200)	0 to 10





QUESTIONS?