Drilled Shaft Inspector's Training
Homework #1

Multiple Choice: For each of the following questions, circle the letter of the answer that best answers the question.

1. At the time of concrete placement for a 3-foot diameter drilled shaft, a dry shaft is _____

   A. A shaft that requires casing for excavation to its design depth.
   B. A shaft that requires slurry to stay open.
   C. A shaft with no more than 3 inches of water present in the bottom of the excavation at the beginning of the pour.
   D. A shaft with 12 inches or more of water.

2. Auger bits are generally classified as ____

   A. Button bits
   B. Earth or Rock
   C. Flighted or unflighted
   D. None of the above.

3. In determining RQD, core pieces equal to or over ___ in length from the recovered core are used.

   A. 1″
   B. 2″
   C. 4″
   D. 6″

True or False: For each statement, circle True or False.

True False 4. The Contractor must submit a detailed report specific to the project prepared by a qualified slurry consultant if they propose to use a mineral slurry.

True False 5. Slurry is sometimes used in the Casing construction method.

True False 6. A soil described as Silty Gravel could contain up to 50% silt.

7. Soil properties that can be identified in the field include:

   A. Size, Color, Plasticity
   B. Size, Color, Hardness
   C. Texture, Hardness, Plasticity

8. Rock properties that can be identified in the field include:

   A. Size, Color, Plasticity
   B. Color, Hardness
   C. Texture, Hardness, Plasticity

9. The Engineer has how many calendar days to approve or reject the drilled shaft installation plan after receipt of all submissions?

   A. 5 days
   B. 10 days
   C. 15 days
   D. 21 days

10. If the Contractor's key personnel change or the Contractor proposes a significant revision of the approved shaft installation plan, what must be done?

    A. Continue with work as normal
    B. Explain to Contractor they have to have only those people described in plan can be there
    C. Hold an additional meeting with the key people before any more work is done
    D. Call Project manager and let contractor continue work

11. On a Drill Log, the drilling abbreviation LW represents which of the following?

    A. Lost Water
    B. Low unit weight of material
    C. Saturated sands
    D. None of the above

12. On which of the following plan set sheets will you find the Hydraulic Data Table?

    A. Foundation Data Sheet
    B. Bridge Plan and Elevation Sheet
    C. Footing Plan Sheet
    D. None of the above

13. What is the circumference of an 8-foot diameter drilled shaft?

    - _____

14. What volume of concrete can be placed in an 8-foot diameter shaft that is 40 feet deep?

    - _____

Using the Plan Set Handout, Special Provisions and the Geotechnical and Foundation Report for the Calapooya Creek Bridge Replacement, answer the following questions.

15. What length of 8-foot diameter drilled shaft (in feet) is planned for this project?

    - _____

16. What is the design shaft tip elevation of the 8-foot diameter drilled shaft?

    - _____

17. At what depth can the driller expect to encounter the mudstone (Calapooya Unit-5) in the drilled shaft?

    - _____

18. How many crosshole sonic log (CSL) tubes are required?

    - _____

19. What length of permanent casing is required for the drilled shaft?

    - _____

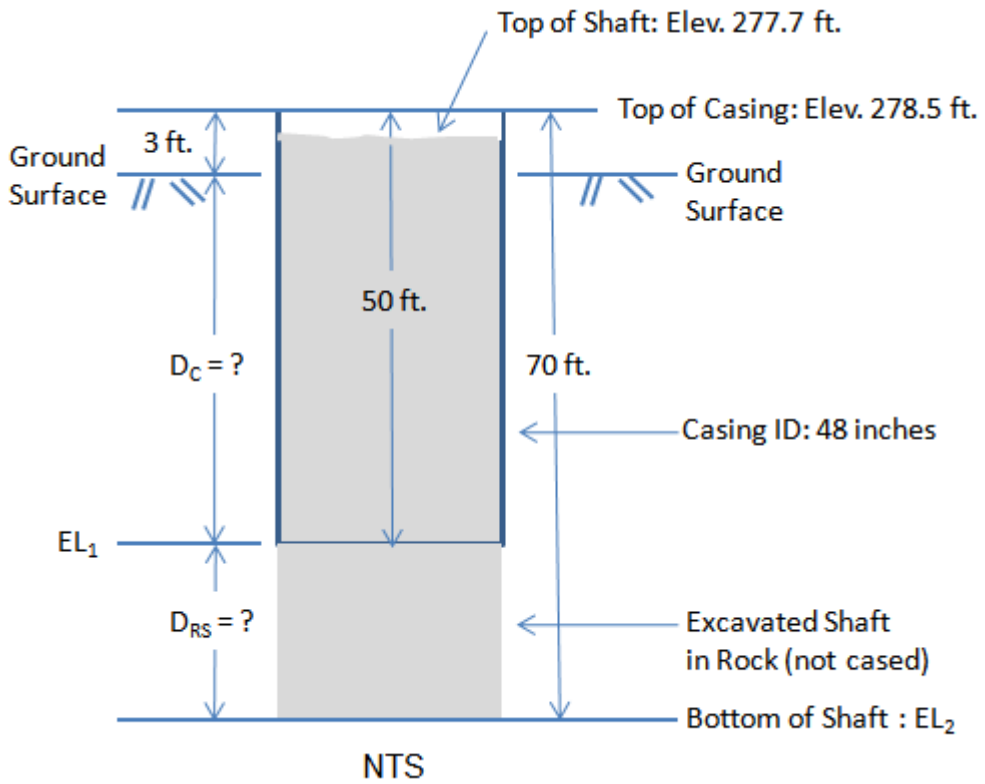
True or False: For each statement, circle True or False.

True False 20. The required minimum length for testing mechanical splices for a #8 bar is 72 inches.

True False 21. The estimated quantity of drilled shaft reinforcement for Structure 20861 is 10,000 pounds.

Drilled Shaft Inspector's Training
Homework #2

Problem Number 1



DETERMINE

1. Length of casing below ground surface (D_C)

2. Elevation at bottom of casing (EL_1)

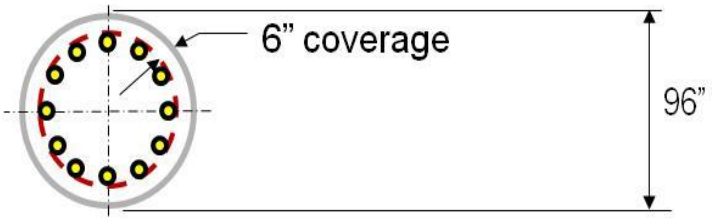
3. Elevation at bottom of shaft (EL_2)

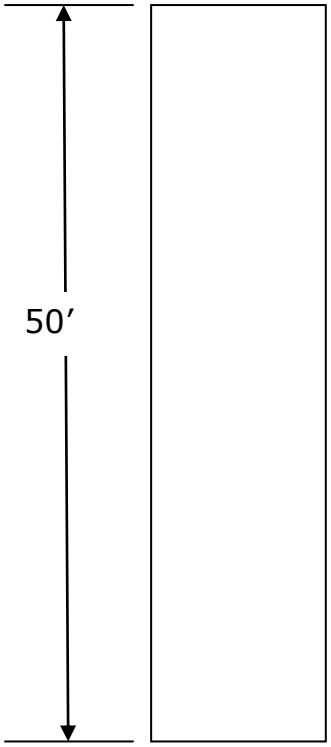
4. Theoretical volume of concrete in cyd

Problem Number 2

The plans for a bridge show that the drilled shaft diameter is to be 96″ and that all concrete cover is to be 6″. The length of the drilled shaft is 50′. Determine the total number of side spacers required based on the specification below. Also, draw and dimension the location of the spacings on the shaft below.

00512.45(d) Concrete Cover - Maintain the required concrete cover shown by placing concentric spacer bars or other approved devices around the reinforcing cage. Place spacing devices on minimum 10 foot vertical spacings the full length of the shaft. At each 10 foot level, place spacers on a minimum 30 inch circumferential spacing with at least three spaces per level. Do not use wood spacers or concrete dobies.





Oregon Department of Transportation

DRILLED SHAFT CONCRETE PLACEMENT LOG

PROJECT	BRIDGE NO.	CONTRACT NO
Homework #1 Drilled Shaft	12345	CON10000

BENT	STATION	SHAFT NO.	SHAFT DIAMETER
1	206+12.22 LT	#2	8 feet

DRILLED SHAFT CONTRACTOR	INSPECTED BY	CERT. NO.	DATE
Diggin Deep Drilled Shaft Construction	Abby Normal	41071	7/22/2013

REFERENCE ELEVATION	SHAFT TOP ELEVATION	REBAR CAGE TOP ELEVATION:	AT START	AT FINISH
241.62	242.8		245.5	246.9

DEPTH TO WATER OR SLURRY	SHAFT BOTTOM ELEVATION	REBAR DESIGN ELEV.	REBAR WITHIN SPEC? ☐ YES ☑ NO
30.9 ft	174.9	245.8	

TOP OF ROCK ELEVATION	SHAFT LENGTH	REBAR CAGE CENTERED WITHIN SPEC? ☑ YES ☐ NO
179.3		

SHAFT CONCRETE INFORMATION

Placement Method

NO Free Fall

X Tremie

De-Airing Method

YES Tremie Plug

NO Tremie Cap

NO Relief Valve

Volume in Lines

#	ID	Length	Volume
3	8 inch	20 feet	cy
			cy
			cy
			cy

Total Volume in Lines (VL) cy

Estimated Waste Concrete (VW) 5 cy

Begin Pour: Date: 7/22/2013 Time: 7:00 AM

End Pour: Date: 7/22/2013 Time: 12:00 PM

Shaft Completion Time: 12:45 PM
(including casing removal)

Total Concrete Volume Delivered (TVD)

Total Concrete Volume In Shaft; cy (=TVD-VL-VW)

Truck No.	Concrete Volume	Slump	Arrival Time	Start Time	Finish Time	Tremie Depth	Depth To Concrete	NOTES (delays, additives, breaching, casing removal)
1	10 cyd	9.8	6:50 AM	7:10 AM	7:15 AM	66 ft	63.2	
2	10 cyd	9.5	8:00 AM	7:20 AM	7:28 AM	66 ft	59.9	
3	10 cyd	10	8:15 AM	7:35 AM	7:45 AM	66 ft	54.1	
4	10 cyd	9.1	8:45 AM	7:55 AM	8:05 AM	66 ft	47.2	
5	10 cyd	9.6	8:50 AM	8:10 AM	8:15 AM	66 ft	42.2	
6	10 cyd	8.7	8:10 AM	8:35 AM	8:45 AM	42 ft	36.8	
7	10 cyd	9.9	8:25 AM	9:15 AM	9:25 AM	42 ft	30.1	
8	10 cyd	8.6	9:10 AM	9:35 AM	9:50 AM	42 ft	24.6	
9	10 cyd	9.6	9:40 AM	10:00 AM	10:15 AM	42 ft	19.1	
10	10 cyd	9.2	10:10 AM	10:45 AM	10:50 AM	20 ft	13.6	
11	10 cyd	7.9	10:40 AM	11:05 AM	11:15 AM	20 ft	9	
12	10 cyd	8.1	11:10 AM	11:35 AM	11:40 AM	10 ft	2.2	
13	10 cyd	9.9	11:30 AM	11:50 AM	12:00 PM	10 ft	0	

Total Concrete Volume Delivered (TVD)

INSPECTOR SIGNATURE

DATE

NOTES:

CASING REMOVAL

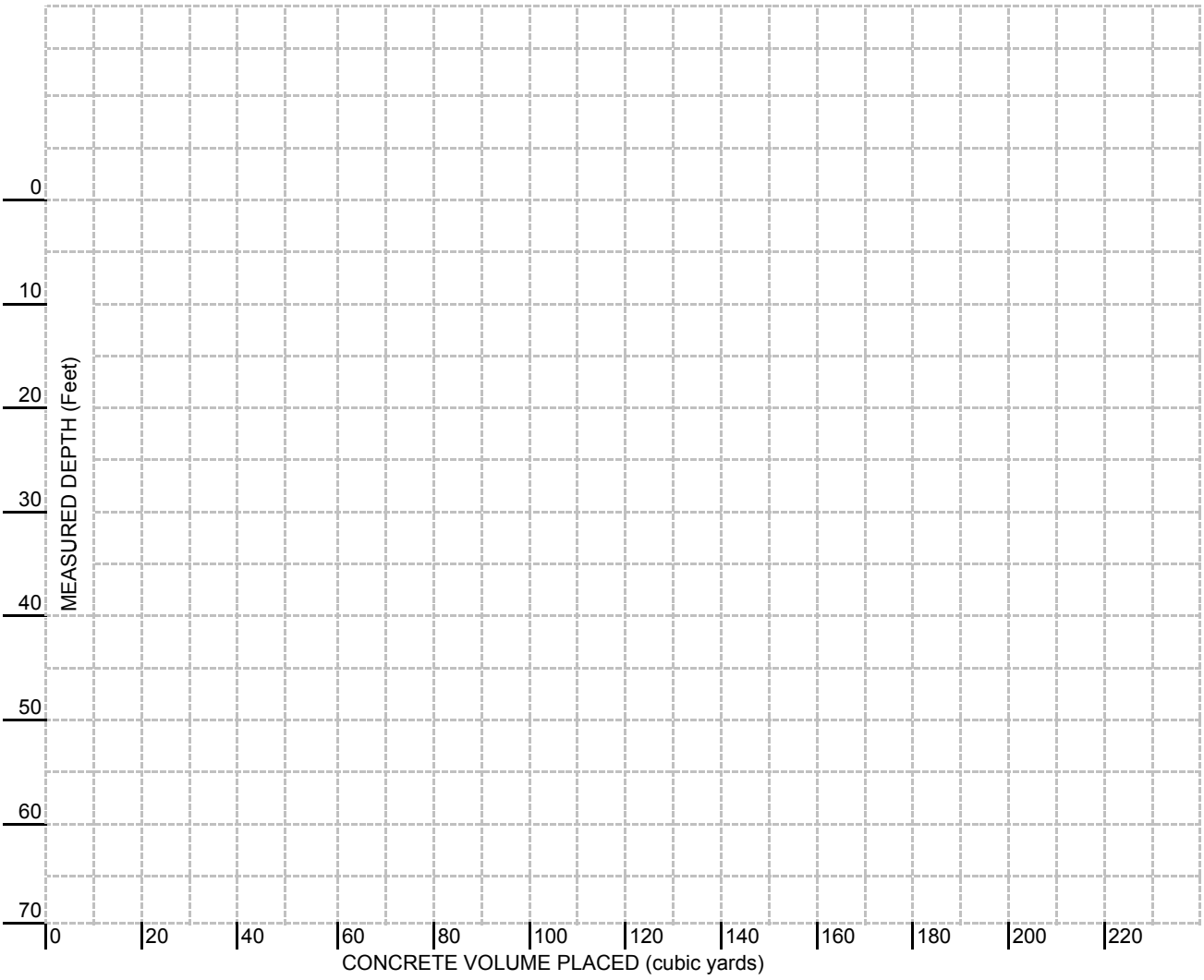
	OD	Top Elev.	Bot. Elev.	Start	Finish
	6.3 ft	316.5	289.5	10:35 AM	11:00 AM
Permanent Casing	N/A				

DRILLED SHAFT CONCRETE VOLUMES

PROJECT		BRIDGE NO.	CONTRACT NO	
Homework #1 Class Drilled Shaft		12345	CON10000	
BENT	STATION	SHAFT NO.	SHAFT DIAMETER	
1	206+12.22 LT	#2	8 feet	
DRILLED SHAFT CONTRACTOR		INSPECTED BY	CERT. NO.	DATE
Diggin Deep Drilled Shaft Construction		Abby Normal	41071	7/22/2013

CONCRETING CURVE

Prior to pouring concrete, a plot should be made showing the theoretical concrete surface (by depth or elev.) vs. concrete volume placed. During concrete placement the actual concrete surface vs. the actual concrete volume placed is then plotted.



VOLUME CALCULATIONS

Volume Delivered	TVD	_____	cy	Notes/Comments: _____
Volume in Lines	VL	_____	cy	_____
Wastage	VW	_____	cy	_____
Volume Placed (= TVD-VL-VW)	VP	_____	cy	_____
Theoretical Volume ($\pi(D^2/4)$(Shaft Length,ft)/27)	VT	_____	cy	_____
Overpour (VP-VT)	OP	_____	cy	_____

Oregon Department of Transportation

DRILLED SHAFT CONCRETE PLACEMENT LOG

PROJECT	BRIDGE NO.	CONTRACT NO
Homework #2 Extra Drilled Shaft	12345	CON10000

BENT	STATION	SHAFT NO.	SHAFT DIAMETER
2	300+00	#3	8 feet

DRILLED SHAFT CONTRACTOR	INSPECTED BY	CERT. NO.	DATE
Diggin Deep Drilled Shaft Construction	Abby Normal	41071	2/3/2013

REFERENCE ELEVATION	SHAFT TOP ELEVATION	REBAR CAGE TOP ELEVATION:	AT START	AT FINISH
315	310		309	309.5

DEPTH TO WATER OR SLURRY	SHAFT BOTTOM ELEVATION	REBAR DESIGN ELEV.	WITHIN SPEC?	
15	245	309	☑ YES	☐ NO

TOP OF ROCK ELEVATION	SHAFT LENGTH	REBAR CAGE CENTERED WITHIN SPEC?		
N/A			☑ YES	☐ NO

SHAFT CONCRETE INFORMATION

Placement Method

NO Free Fall

YES Tremie

De-Airing Method

NO Tremie Plug

NO Tremie Cap

NO Relief Valve

Volume in Lines

#	ID	Length	Volume	
4	6	25		cy
				cy
				cy
Total Volume in Lines (VL)				cy
Estimated Waste Concrete (VW)			2	cy

Begin Pour: Date: 7/18/2013 Time: 8:00 AM

End Pour: Date: 7/18/2013 Time: 10:35 AM

Shaft Completion Time: 11:00 AM
(including casing removal)

Total Concrete Volume Delivered (TVD)

Total Concrete Volume In Shaft; cy (=TVD-VL-VW)

Truck No.	Concrete Volume	Slump	Arrival Time	Start Time	Finish Time	Tremie Depth	Depth To Concrete	NOTES (delays, additives, breaching, casing removal)
1	10 CY	9.8	7:50 AM	8:00 AM	8:15 AM	65	60.3	Initial QCT concrete test - passes
2	10 CY	9.5	8:00 AM	8:20 AM	8:28 AM	65	55.6	
3	10 CY	10	8:15 AM	8:35 AM	8:50 AM	65	50.9	
4	10 CY	9.1	8:45 AM	8:55 AM	9:05 AM	65	46.2	
5	10 CY	9	8:55 AM	9:10 AM	9:30 AM	50	41.5	
6	10 CY	8.8	9:05 AM	9:40 AM	10:10 AM	50	36.8	
7	10 CY	7.5	10:15 AM	10:40 AM	10:50 AM	50	32.1	
8	10 CY	10	11:05 AM	11:20 AM	11:30 AM	40	27.4	
9	10 CY	10	11:30 AM	11:40 AM	12:00 PM	40	22.7	
10	10 CY	10	12:05 PM	12:20 PM	1:30 PM	30	18	
11	10 CY	9	1:45 PM	1:50 PM	2:10 PM	30	13.3	
12	10 CY	9.5	2:15 PM	2:40 PM	3:10 PM	30	9.16	

_____ **Total Concrete Volume Delivered (TVD)**

INSPECTOR SIGNATURE _____ DATE _____

NOTES: _____

CASING REMOVAL

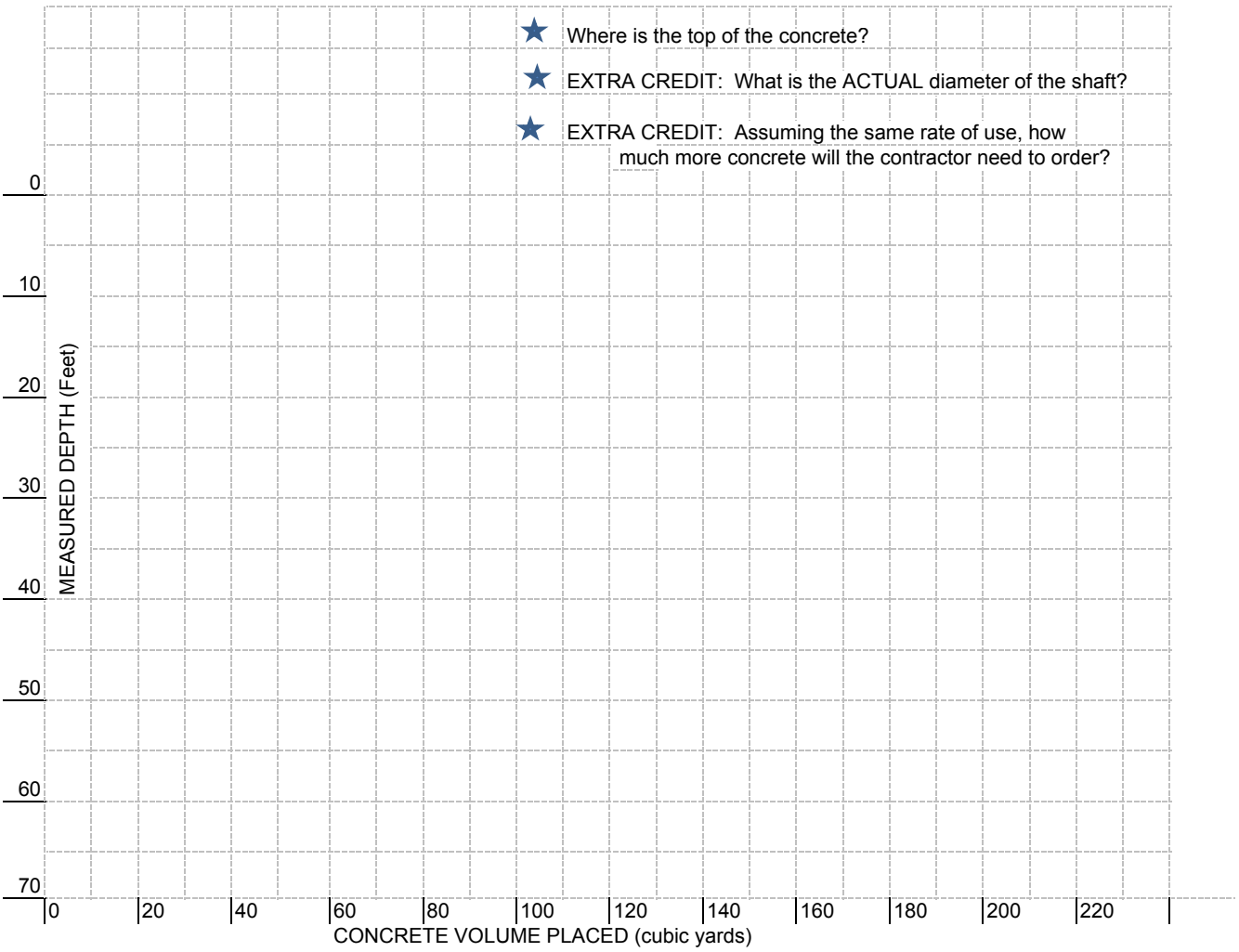
	OD	Top Elev.	Bot. Elev.	Start	Finish
	N/A	N/A	N/A	N/A	N/A
Permanent Casing	N/A				

DRILLED SHAFT CONCRETE VOLUMES

PROJECT		BRIDGE NO.	CONTRACT NO	
Homework #2 Extra Drilled Shaft		12345	CON10000	
BENT	STATION	SHAFT NO.	SHAFT DIAMETER	
2	300+00	#3	8 feet	
DRILLED SHAFT CONTRACTOR		INSPECTED BY	CERT. NO.	DATE
Diggin Deep Drilled Shaft Construction		Abby Normal		2/3/2013

CONCRETING CURVE

Prior to pouring concrete, a plot should be made showing the theoretical concrete surface (by depth or elev.) vs. concrete volume placed. During concrete placement the actual concrete surface vs. the actual concrete volume placed is then plotted.



VOLUME CALCULATIONS

Volume Delivered	TVD	____	cy	Notes/Comments: _____
Volume in Lines	VL	____	cy	_____
Wastage	VW	2.0	cy	_____
Volume Placed (= TVD-VL-VW)	VP	____	cy	_____
Theoretical Volume ($\pi(D^2/4)$(Shaft Length,ft)/27)	VT	____	cy	_____
Overpour (VP-VT)	OP	____	cy	_____