

SECTION FOUR

LIST OF FIGURES FOR ALL OIL WELLS

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Figure: 2- Cross Section Schematic of Oil Production Well

Figure: 3- Cross Section of Well with Various Components

Figure: 4- Oil Well Production Rod Deconstruction

Figure: 5- Schematic of Gamma, VDL, CCL Geophysical Logging Tool

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Figure: 8- Cement Bond Log Interpretation Models and Signatures

Figure: 9- Schematic of Cast Iron Bridge Plug

Figure: 1

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Oil Country Fittings

Tubing Swages & Casing Swages

Swage Nipples Oil Country Tubing & Casing non EUE ends	Size				Length	Standard Weight		XS/XH Weight		XXS/XXH Weight				
	Pipe	O.D.	Reduced to			in	mm	lbs	kg	lbs	kg	lbs	kg	
	NPS DN	in mm	NPS	DN	in									mm
	1	25	1.315	33	¼ - ¾	8 - 20	3½	89	0.66	0.30	0.66	0.30	1.00	0.45
	1¼	32	1.660	42	¼ - ½	8 - 15	4	102	1.00	0.45	1.00	0.45	1.5	0.68
					¾ & 1	20 & 25	4	102	1.00	0.45	1.00	0.45	1.5	0.68
	1½	40	1.900	48	¼ - ¾	8 - 20	4½	114	1.2	0.53	—	—	2.0	0.91
					1 & 1¼	25 & 32	4½	114	1.2	0.53	1.00	0.45	2.0	0.91
	2	50	2¾	60	¼ - ¾	8 - 20	6½	165	2.5	1.1	3.0	1.4	4.3	1.9
					1 - 2 O.D.	25 - 50 O.D.	6½	165	2.0	0.91	2.3	1.1	4.3	1.9
	2½	65	2¾	73	¼ - ¾	8 - .75	7	178	3.0	1.4	3.5	1.6	8.0	3.6
					1 - 1½	25 - 40	7	178	3.0	1.4	3.5	1.6	8.0	3.6
					2 & 2½	50 - 52	7	178	3.0	1.4	3.5	1.6	8.0	3.6
	3	80	3½	89	1 - 1½	25 - 40	8	203	4.5	2.0	6.0	2.7	11	5.0
					2 & 2½	50 - 65	8	203	4.5	2.0	6.0	2.7	11	5.0
	4	100	4½	114	1 - 1½	25 - 40	9	229	7.0	3.2	10.0	4.5	18	8.2
					2 - 4 O.D.	50 - 100 O.D.	9	229	7.5	3.4	10.0	4.5	18	8.2
	5	127			1 - 1½	25 - 40	10	254	9.5	4.3	15	6.8	24	11
					2 - 4½ O.D.	50 - 100 O.D.	10	254	9.5	4.3	15	6.8	24	11
	5½	140			1 - 1½	25 - 40	11	279	13	5.7	17	7.7	33	15
					2 & 2½	50 & 65	11	279	13	5.7	17	7.7	33	15
	6¾	168			3 - 5 O.D.	80 - 125 O.D.	11	279	13	5.7	17	7.7	33	15
					1 - 1½	25 - 40	12	305	17	7.7	25	11	46	21
					2 & 2½	50 & 65	12	305	17	7.7	25	11	46	21
					3 - 4 O.D.	80 - 100 O.D.	12	305	17	7.7	25	11	46	21
	7	178			4 - 6 O.D.	100 - 150 O.D.	12	305	17	7.7	25	11	46	21
					1 - 1½	25 - 40	12	305	17	7.7	25	11	—	—
					2 - 2½	50 - 65	12	305	17	7.7	25	11	—	—
					3 - 5 O.D.	80 - 125 O.D.	12	305	17	7.7	25	11	—	—
	7¾	194			5½ O.D. & 6 O.D.	140 O.D. & 150 O.D.	12	305	17	7.7	25	11	—	—
					2 - 3	50 - 75	13	330	24	11	32	15	—	—
					4 O.D. - 6 O.D.	100 O.D. - 150 O.D.	13	330	24	11	32	15	—	—
	8	219			6¾ O.D. - 7 O.D.	168 O.D. - 175 O.D.	13	330	24	11	32	15	—	—
2 - 3					50 - 75	13	330	29	13	44	20	—	—	
4 - 6 O.D.					100 - 150 O.D.	13	330	29	13	44	20	—	—	
9	244			6¾ O.D. & 7¾ O.D.	168 O.D. - 194 O.D.	13	330	29	13	44	20	—	—	
				2 - 3	50 - 75	14	356	38	17	48	22	—	—	
				4 - 6 O.D.	100 - 150 O.D.	14	356	38	17	48	22	—	—	
10¾	273			6¾ O.D. & 8¾ O.D.	168 O.D. - 219 O.D.	14	356	38	17	48	22	—	—	
				2 - 3	50 - 75	15	381	48	22	68	31	—	—	
				4 - 6 O.D.	100 - 150 O.D.	15	381	48	22	68	31	—	—	
				6¾ O.D. - 7¾ O.D.	168 O.D. - 194 O.D.	15	381	48	22	68	31	—	—	
				8¾ O.D. & 9 O.D.	219 O.D. - 245 O.D.	15	381	48	22	68	31	—	—	



All swage nipples on this page are made from J-55, K-55, N-80 or the most appropriate material available. Casing threads (8 Rd.) on one end with any thread or finish (beveled) on the other end. Also includes casing sizes where no thread is specified

PROJECT INFORMATION		APPROVAL STAMP
Project:		Q Approved
Address:		Q Approved as noted
Contractor:		Q Not approved
Engineer:		Remarks:
Submittal Date:		
Notes 1:		
Notes 2:		

J.B. Smith oil country tubular fittings, swages and bull plugs add an important dimension to the industry's leading line of flow control products offered by Anvil. J.B. Smith is a respected name and its products are well known for high quality and consistency.

Full Traceability

All J.B. Smith swages, bull plugs, tubing and casing nipples, and chambers are traceable to the original mill test report. To ensure traceability, all fittings are steel stamped as follows:

Material Specification

- Material Grade WPB (ASTM A234 - Line Pipe)
- Material Grade J-55, K-55, L-80, N-80 (API 5CT - Oil Country Sizes)

Raw Material Code

Each is stamped with unique JBS material code for traceability to material type, details of purchase and mill test report.

Heat Treatment

Items made to specification grades requiring final heat treatment bear an additional two letter code for heat treatment traceability.



Swage Nipples, Bull Plugs, Oil Country Fittings,

Manufacturing Specification

J.B. Smith manufactures swage nipples and bull plugs in accordance to the

Couplings, Stainless Swages

applicable specification, API 5CT, ASTM A234, MSS SP-95. Materials include symbol -

ASTM A106, GR B seamless pipe, A-1000 low to medium carbon, fine grain

All J.B. Smith products conform to the following applicable specifications:

- **API 5B** – Threading Oil Country size
- **API 5CT** – Raw material, Process, End Finish (Oil Country Sizes)
- **ASME B1.20.1** – Threading Line Pipe
- **ASME B16.9** – Weld Bevels
- **MSS SP-95** Swage and Bull Plug
- **ASTM A234 WPB** – Raw material, Process, End Finish (Line Pipe High Temp)
- **ASTM A420 WPL6** – Raw material, Process, End Finish (Line Pipe Low Temp)

Marking

All J.B. Smith fittings are permanently marked as follows:



Manufacturer's

- **ASTM B633 Type III Class III** – Zinc Electroplate
- **NACE MR-01-75** – As Applicable

bar stock, API grades J-55 through N-80 tubing and casing, processed and heat treated to applicable specification requirements. Fitting chemical and physical properties fall within the ranges listed below.

All fittings are manufactured in the U.S.A.

Traceability

All material purchased by J.B. Smith is fully traceable to the mill source. A unique JBS material code appears on all products made since the institution of this program. As a result, mill test reports are now available at any time on products so coded (See EXTRAS for MTR charges.)



Pressure Ratings

Due to the wide variation in service conditions, temperature, vibrations, etc., J.B. Smith Mfg. can make no recommendations as to allowable working pressure of swage nipples and bull plugs. There are a number of working pressure formulas from which the end user may choose to determine the required wall thickness of the piping system. It is our responsibility only to furnish a fitting with end dimensions equal to those of the pipe size and schedule ordered.

Material Certification – Carbon Steel

J.B. Smith certifies that the material used to manufacture line pipe sizes of swage nipples and bull plugs has been processed to comply with the requirements of ASTM A234 grade WPB and the chemical and physical properties of the fittings fall within the ranges listed below.

- **Material Specification or Grade WPB** (Line Pipe Sizes)
J-55, K-55, L-80, N-80 (Oil Country Sizes)
- **Raw Material Code** - Each part is die stamped with unique JBS material code for traceability to material type, details of purchase and mill test report.

- **Heat Treatment** - Heat treatments are performed to ASTM A234 WPB or API 5CT specification grade requirement as applicable. Fittings bear a two letter code provide traceability to final heat treatment.

Threading

Line Pipe, Tubing and Casing threads conform to ASME B1.20.1 B or API 5B as applicable.

Oil Country Industry Thread Color Code

Industry Color Codes as follows:

8R - Red 10R - Yellow 10V - Blue 11½V - Green
LP - Silver

Coatings

- **Zinc Electroplate** - ASTM B633 Type III Class III
- **Paint** (Weld Bevel Ends)

Weld Bevels

Weld bevels are machined per ASME B16.9 specifications.

Chemical and Physical Requirements

API 5CT MATERIAL										
Chemical Requirements										
Grp	Gr	C	Mn	Mo	Cr	Ni	Cu	P	S	Si
1	J55	—	—	—	—	—	—	0.030 Max	0.030 Max	—
1	K55	—	—	—	—	—	—	0.030 Max	0.030 Max	—
1	N80 Type1	—	—	—	—	—	—	0.030 Max	0.030 Max	—
2	L80 Type1	0.43 Max	1.90 Max	—	—	0.25 Max	0.35 Max	0.030 Max	0.030 Max	0.45 Max
Physical Requirements										
Grp	Gr	Total Elongation under load %	Yield Strength ksi	Tensile Strength ksi	Hardness					
1	J55	0.5	55-80	75	—					
1	K55	0.5	55-80	95	—					
1	N80 Type1	0.5	80-110	100	—					
2	L80 Type1	0.5	80-110	95	23		241			

Note:

- Fittings made from bar or plate may have 0.35 Max Carbon.
- Fittings made from forgings may have a 0.35 Max Carbon and 0.35 Max Silicon.
- For each reduction of 0.01% below the specified carbon maximum, an increase of 0.06% manganese above the specified maximum will be permitted, up to a maximum of 1.35%.
- The sum of Copper, Nickel Chromium and Molybdenum shall not exceed 1.00%.
- The sum of Chromium and Molybdenum shall not exceed 0.32%.



Oil Country Fittings

Current API Thread Standards

Current API Thread Standards					
Size		O.D.		Pipe	Tubing & Casing
NPS	DN	in	mm		
3/4	20	1.050	27	14	-
3/4 EUE	20	1.050	27	-	10 Rd.
1	25	1.315	33	11 1/2	10 Rd.
1 EUE	25	1.315	33	-	10 Rd.
1 1/4	32	1.660	42	11 1/2	10 Rd.
1 1/4 EUE	32	1.660	42	-	10 Rd.
1 1/2	40	1.900	48	11 1/2	10 Rd.
1 1/2 EUE	40	1.900	48	-	10 Rd.
2	50	2 3/8	60	11 1/2	10 Rd.
2 EUE	50	2 3/8	60	-	8 Rd.
2 1/2	65	2 7/8	73	8V	10 Rd.
2 1/2 EUE	65	2 7/8	73	-	8 Rd.
3	80	3 1/2	89	8V	10 Rd.
3 EUE	80	3 1/2	89	-	8 Rd.
3 1/2	90	4	102	8V	8 Rd.
3 1/2 EUE	90	4	102	8V	8 Rd.
4	100	4 1/2	114	8V	8 Rd.
4 EUE	100	4 1/2	114	-	8 Rd.
-	-	5	127	-	8 Rd.
-	-	5 1/2	140	-	8 Rd.
5	125	5 5/16	141	8V	-
-	-	6	152	-	8 Rd.
6	150	6 5/8	168	8V	8 Rd.
-	-	7	178	-	8 Rd.
-	-	7 5/8	194	-	8 Rd.
8	200	8 3/8	219	8V	8 Rd.
-	-	9 3/8	244	-	8 Rd.
10	250	10 3/4	273	8V	8 Rd.
-	-	11 3/4	298	-	8 Rd.
12	300	12 3/4	324	8V	-
-	-	13 3/8	340	-	8 Rd.
-	-	14	356	8V	-
-	-	16	406	8V	8 Rd.
-	-	18	457	8V	-
-	-	20	508	8V	8 Rd.

Figure: 2

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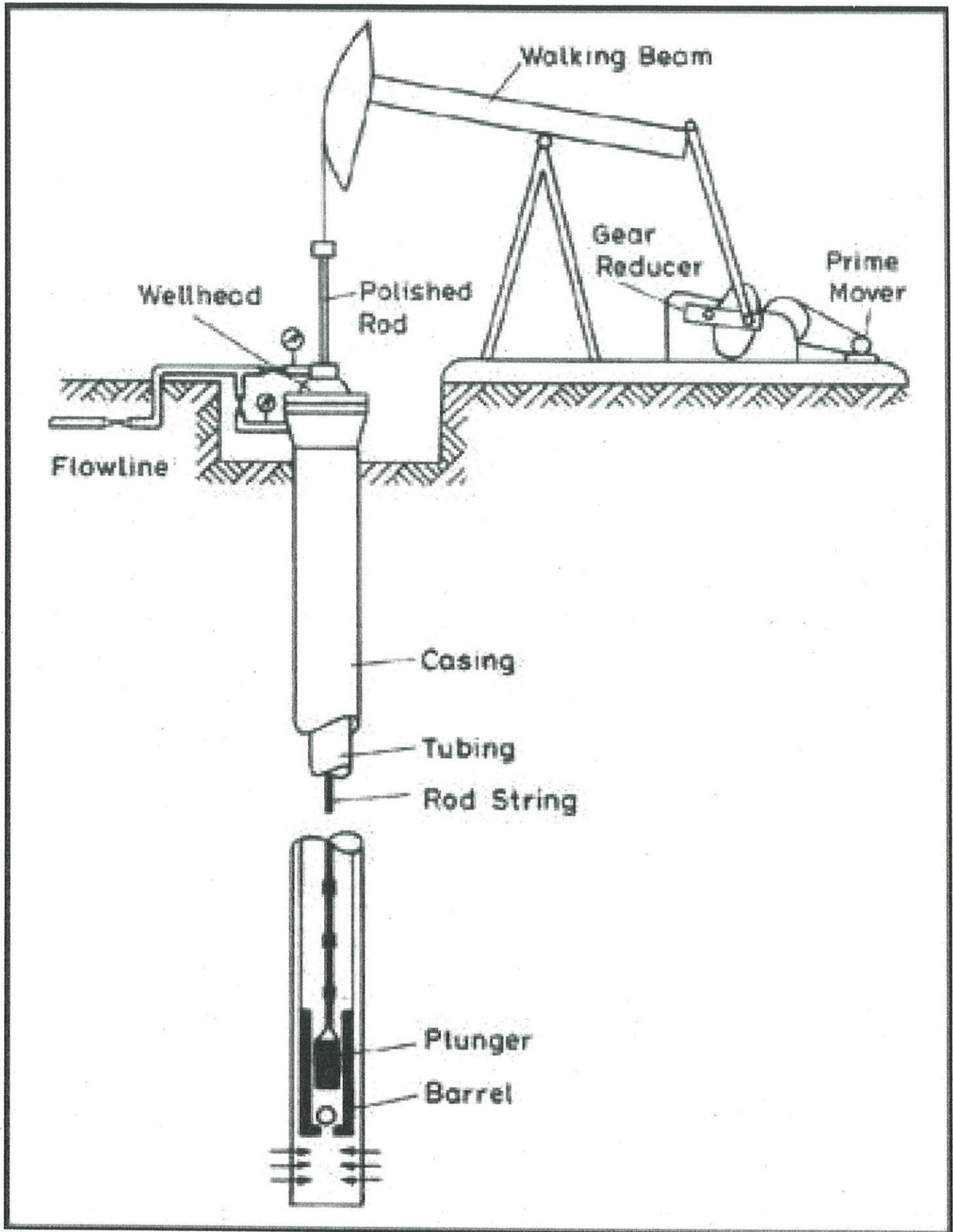


Figure: 3

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The Well

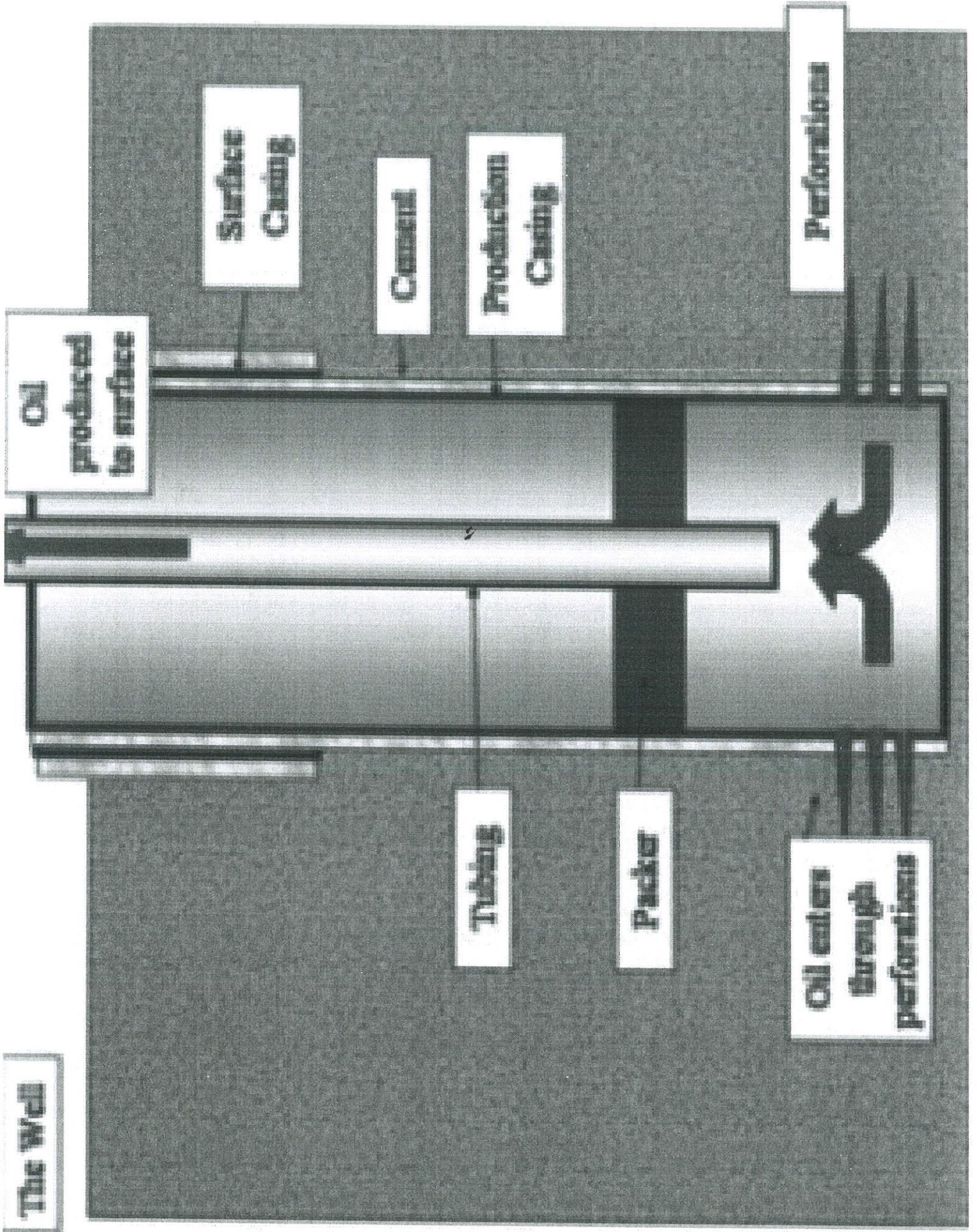


Figure: 4

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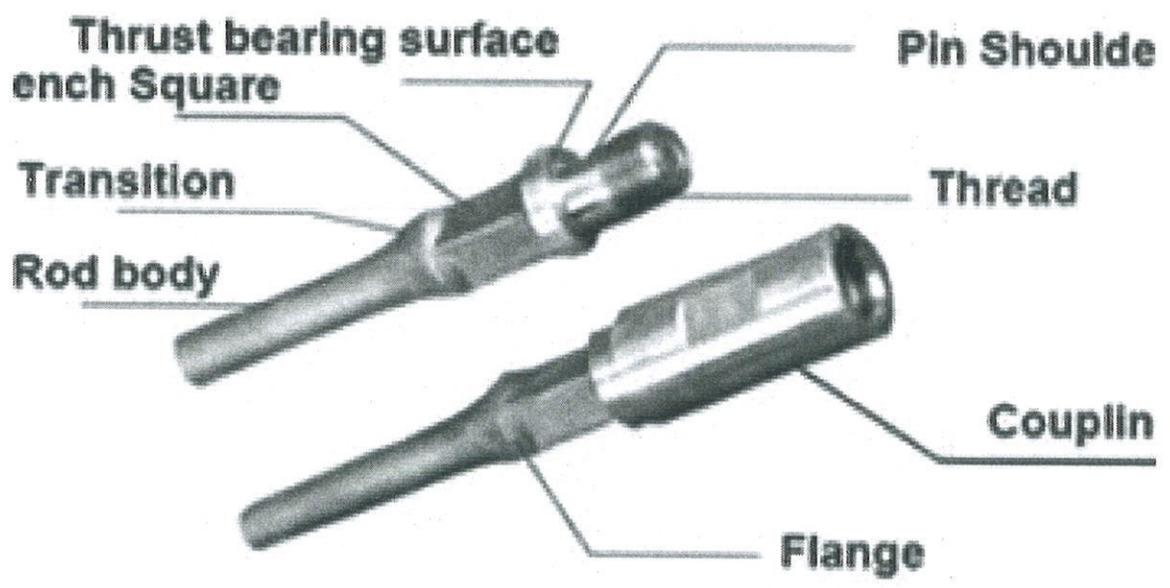


Figure: 5

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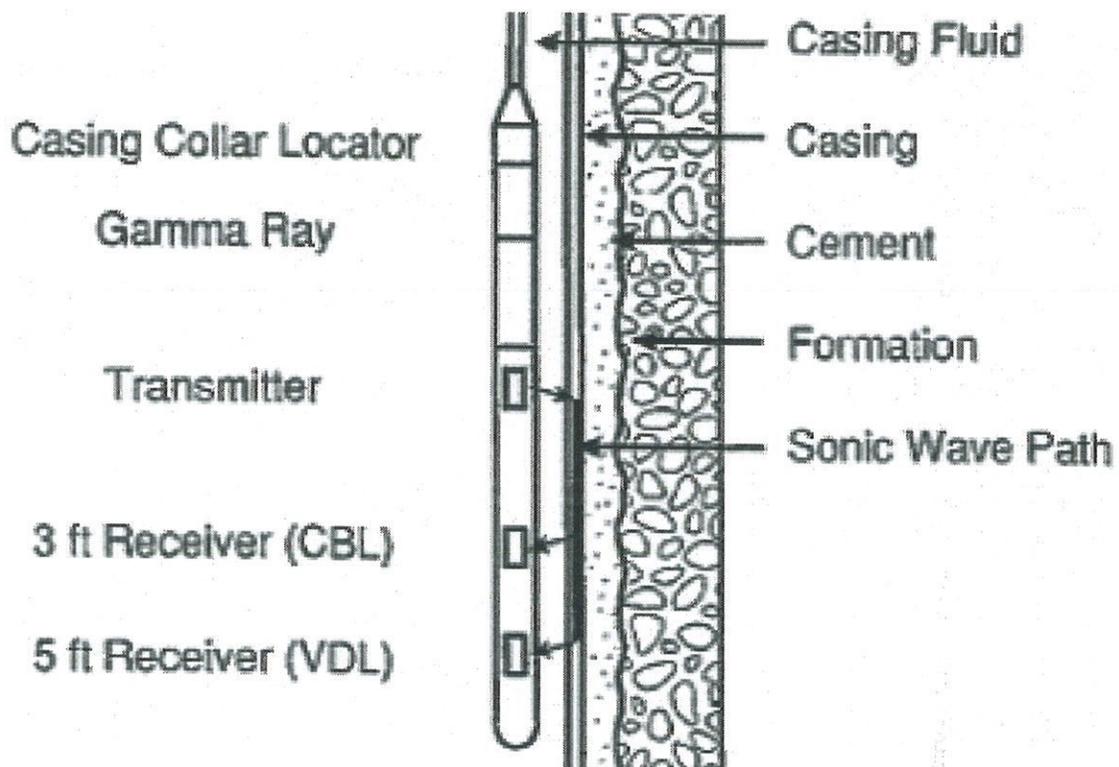


Figure: 6

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Figure: 6 - Cross-Section of Royal Heirs Number 2W Well

(Not to Scale):

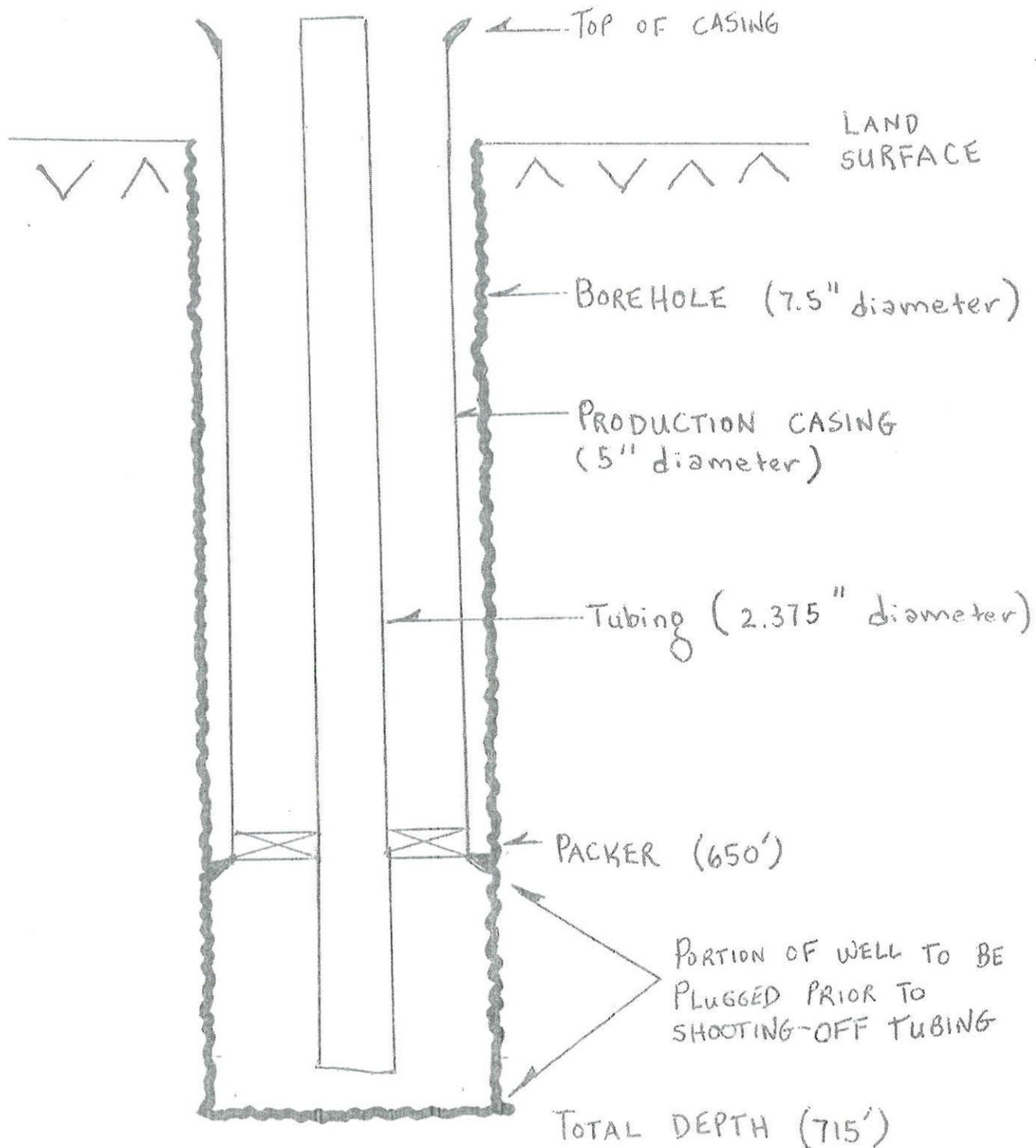


Figure: 7

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SOUTHERN Well Surveys

GAMMA BOND V D L

Company C. M. C. Well HAYNESVILLE RD. OIL WELL 3070 Field E.G. BANNON O-13 RICHARDS SCH County HANCOCK State KY	Company C. M. C.		
	Well HAYNESVILLE RD. OIL WELL 3070		
	Field E.G. BANNON O-13 RICHARDS SCHOOL		
	County HANCOCK	State KY	
Location:		API #:	Other Services
SEC 14 TWP O RGE 34			
Permanent Datum		Elevation	Elevation
Log Measured From G.L.			K.B.
Drilling Measured From			D.F.
			G.L.
Date	11-13-08		
Run Number	ONE		
Depth Driller	240		
Depth Logger	238		
Bottom Logged Interval	238		
Top Log Interval	0		
Open Hole Size			
Type Fluid			
Density / Viscosity			
Max. Recorded Temp.			
Estimated Cement Top	150		
Time Well Ready			
Time Logger on Bottom			
Equipment Number	175		
Location	HEND. KY.		
Recorded By	ROBERTSON		
Witnessed By	ANDERSON	EGER	GAUGHAN
Borehole Record			
Run Number	Bit	From	To
Tubing Record			
	Size	Weight	From To
Casing Record			
Surface String	Size	Wgt/Ft	Top Bottom
Prot. String			
Production String	4.5		0 278
Liner			

Fold Here

Figure: 8

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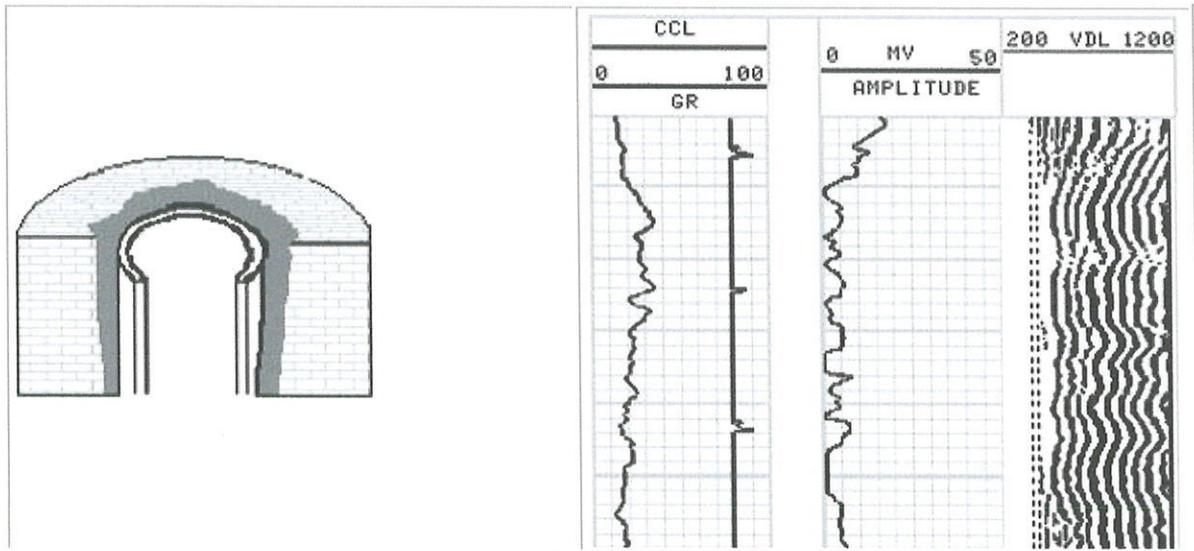
CEMENT BOND LOG CBL-VDL

The Cement Bond Log (CBL) gives a continuous measurement of the amplitude of sound pulses from a transmitter to receiver. This amplitude is maximum in unsupported pipe and minimum in well-cemented casing. The wave train can be displayed as a Variable Density Log (VDL) where the positive and negative cycles of the wave train are shaded black and white respectively.

CEMENT BOND LOG INTERPERTATION MODELS:

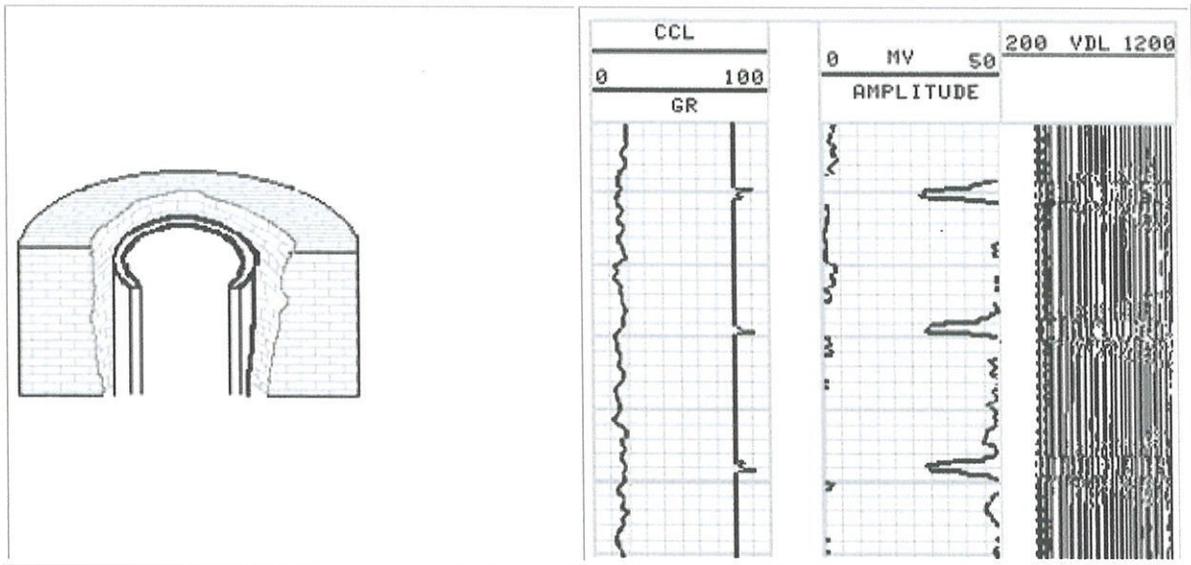
1) GOOD CEMENT

- "Amplitude" low.
- "VDL" formation signals are strong.
- Good cement. No need for squeeze



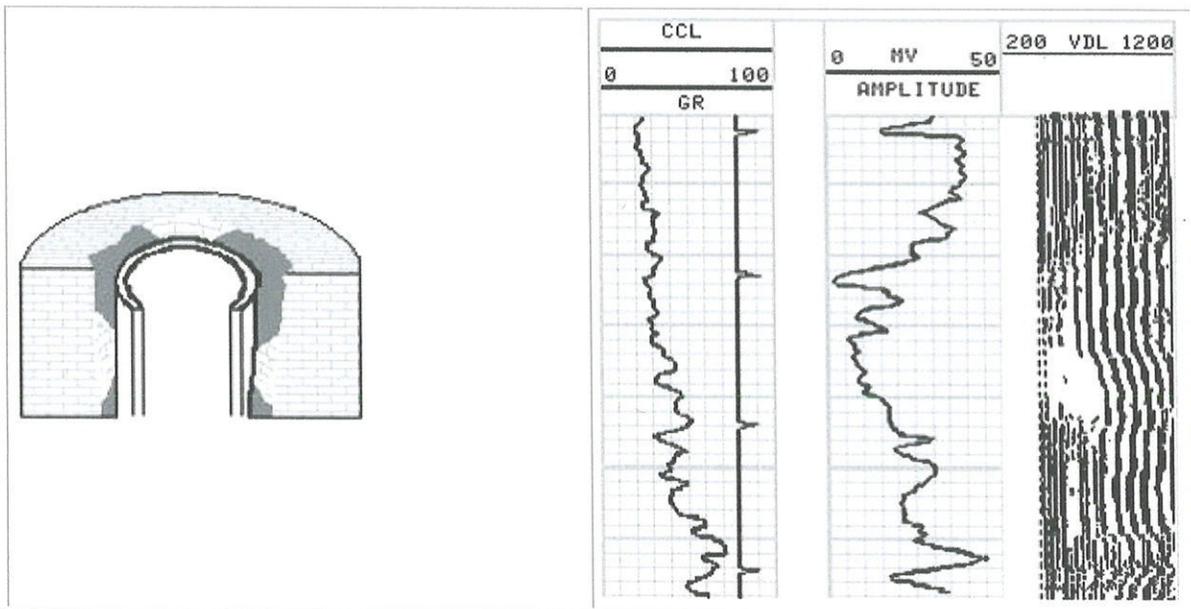
2) NO CEMENT

- "Amplitude" High.
- "VDL" straight. No formation signals. "V" type Chevron patterns are seen at collars.
- Squeeze cement needed.



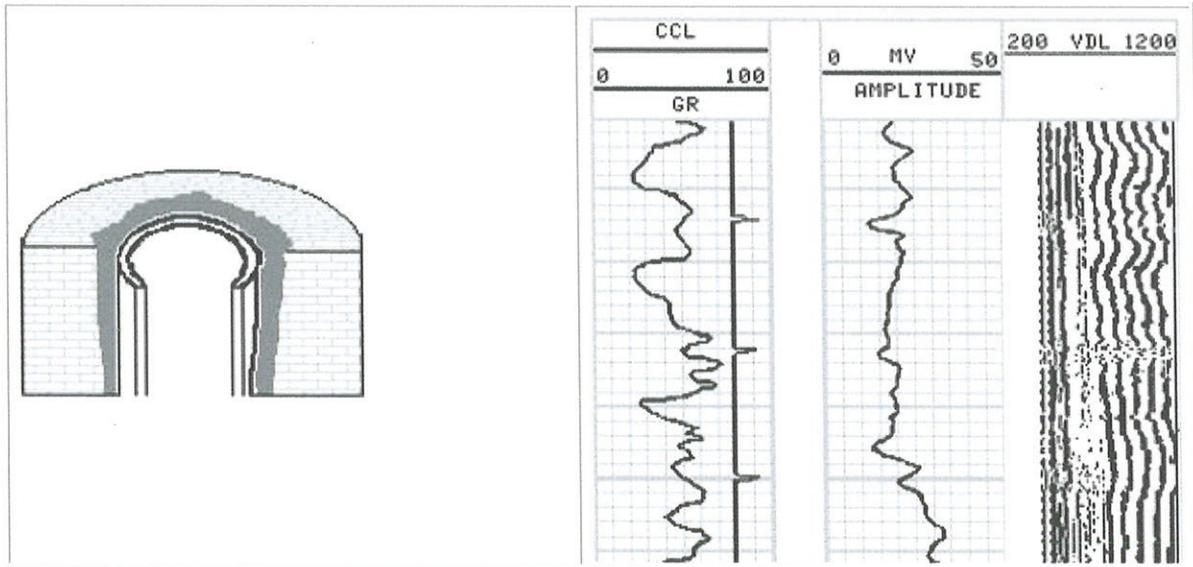
3) PARTIAL CEMENT

- "Amplitude" is low and moderate.
- "VDL" can shows both wiggly formation signals and straight casing signals
- Squeeze can be necessary if the channel is long enough..



4) MICROANNULUS (micro gap between cement and casing)

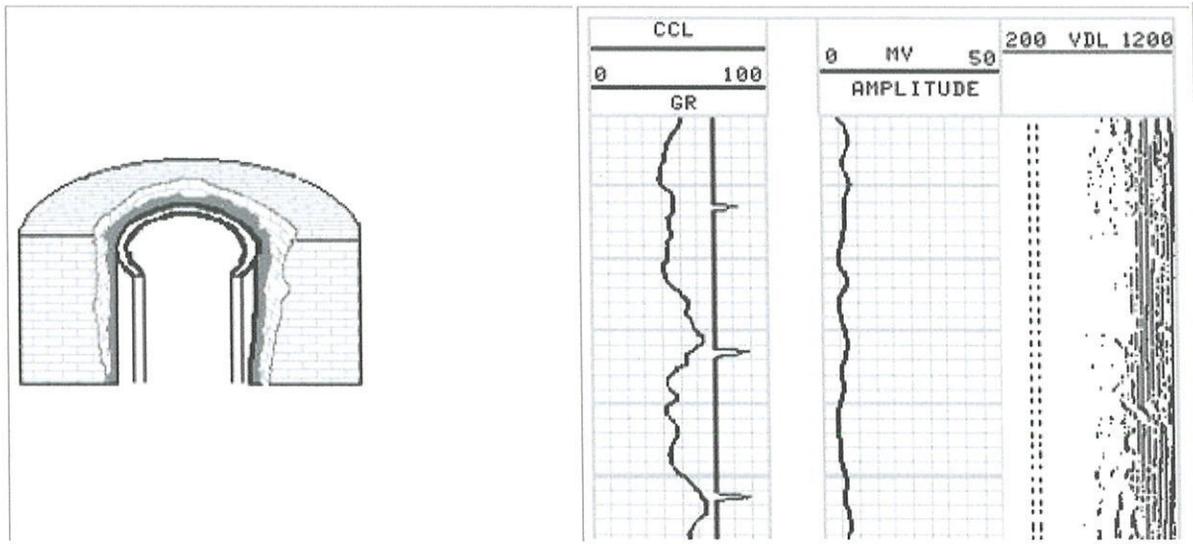
- "Amplitude" is moderate..
- "VDL" can shows both wiggly formation signals and straight casing signals
- In case of doubt, repeat the log under 1000psi pressure to the well. The gap will be closed and log will change to "Good Cement"
- No need for squeeze..



5) CEMENT WITHOUT BOND TO FORMATION

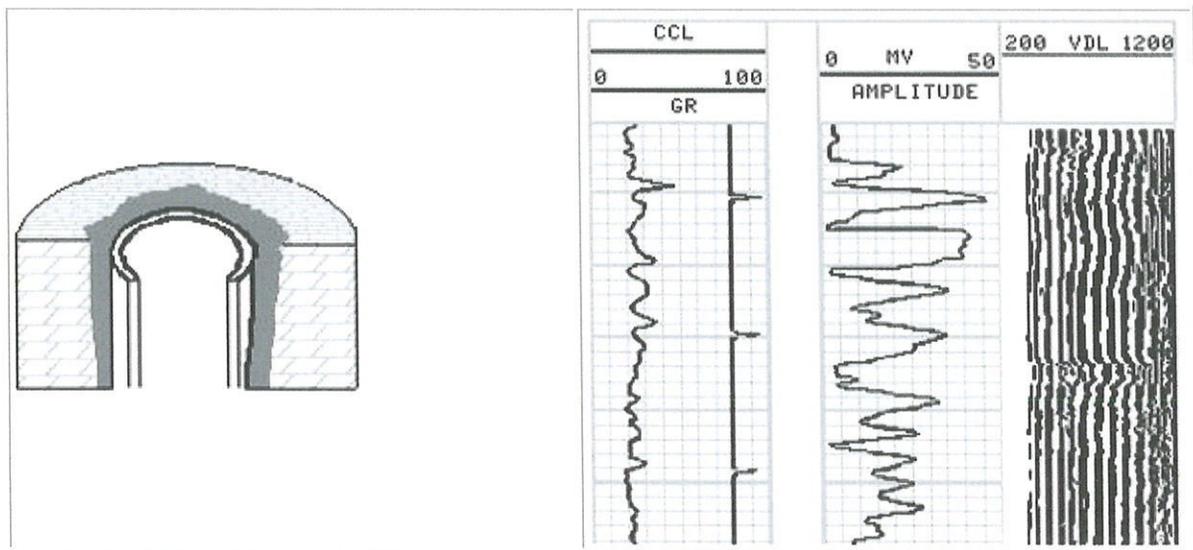
- "Amplitude" low.
- "VDL" doesn't show casing and formation signals. Thin mud signals are visible
- Squeeze needed

Note: Keep in mind that gas in formation can give the same model.



6) CEMENT BOND IN HARD FORMATIONS

- "Amplitude changes between low and high
- Formation signals cover casing signals.
- No need for cement...

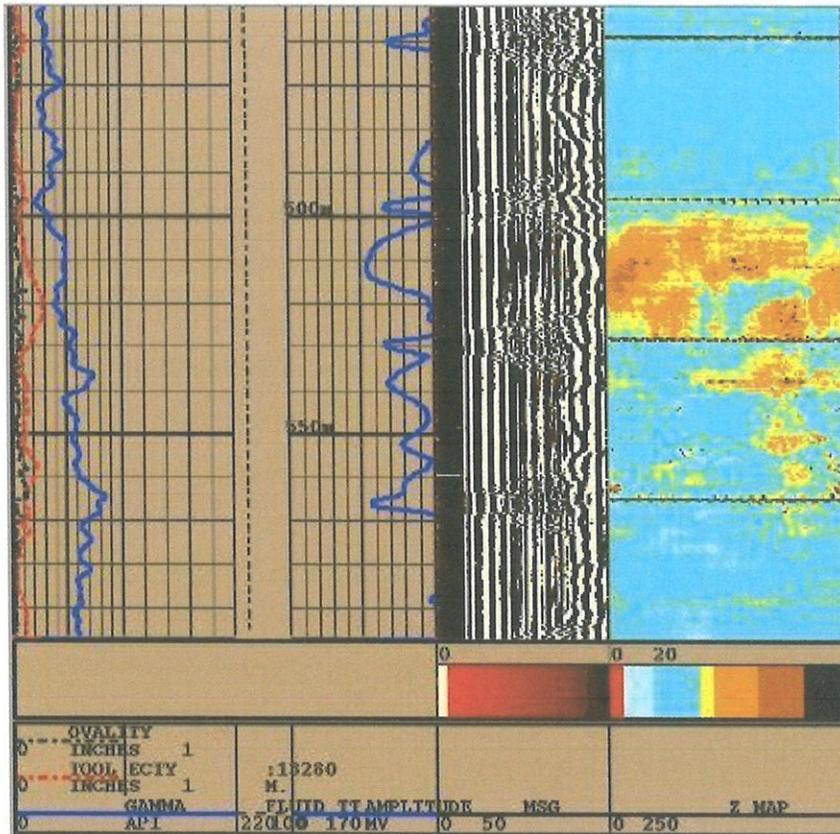


CEMENT BOND WITH ACOUSTIC IMAGING

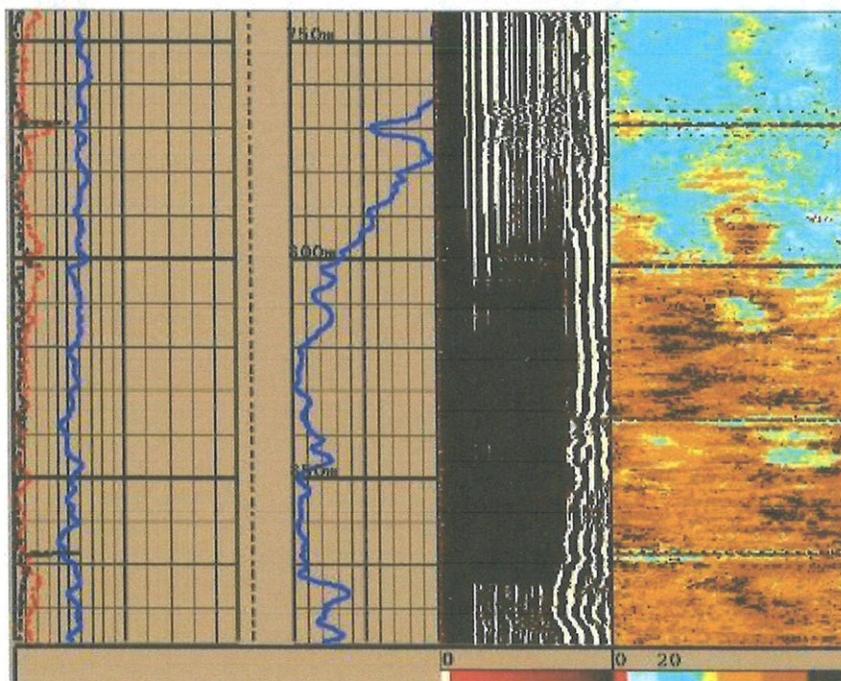
There are two types of cement bond evaluation tools :Sonic tools (as above) and ultrasonic tools (as below)

CBL-VDL and acoustic image log

(Schulumberger's USIT or Halliburton's CAST tool)



FREE-PIPE



← TOP OF CEM

Figure: 9

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BLACKHAWK
SPECIALTY TOOLS

COMPLIANT WITH API 11D1 3RD EDITION

ENGINEERED CEMENTING SOLUTIONS

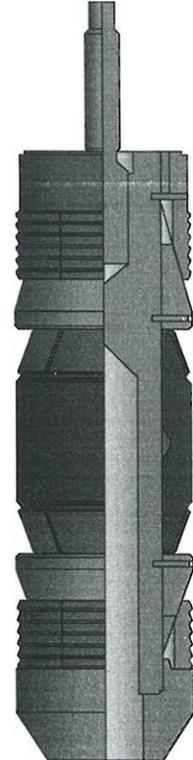
CAST IRON BRIDGE PLUG

Blackhawk's Cast Iron Bridge Plug is the most dependable and well known isolation plug on the market. It is used for zonal isolation, well abandonment, casing pressure tests, and stimulation, and can be set via electric wireline using a wireline setting tool, or on tubing/coiled tubing using a hydraulic setting tool. The cast iron bridge plug is designed to be drilled out if necessary, maintaining sufficient strength while set.

FEATURES

- Available in tubing and casing sizes from 2-3/8" to 20".
- Wireline, tubing, or coiled tubing set.
- Drillable cast iron construction.
- One piece slips with hardened wickers for use in up to 110 yield casing.
- Anti-swab/anti-preset characteristics with 360° slips.
- Angled backup design prevents element extrusion.
- Setting force held in place by ratcheting, internal lock ring.

400° F plugs, sour gas plugs, and 125+ yield casing plugs are available upon request.





COMPLIANT WITH API 11D1 3RD EDITION

BLACKHAWK
SPECIALTY TOOLS

ENGINEERED CEMENTING SOLUTIONS

Cast Iron Bridge Plug				
Casing (in)	Setting Range		Pressure/Temp Ratings (psi/°F)	Setting Tool
	Min	Max		
2 3/8"	1.867	2.107	10,000 / 325	1.75 / 1-11/16
2 7/8"	2.28	2.563		1.75 / 1-11/16
3 1/2"	2.625	2.75		1.75 / 2 1/8
3 1/2"	2.867	3.258		
4"	3.34	3.732		#10
4 1/2"	3.826	4.09		
4 1/2"	3.92	4.56		
5"	3.92	4.56		
5 1/2"	4.58	5.047		
5 3/4"	4.58	5.047		
6"	5.14	5.595		
6"	5.595	6.366		
6 5/8"	5.14	5.595		
6 5/8"	5.595	6.366		
6 5/8"	5.989	6.655		
7"	5.595	6.366		
7"	5.989	6.655		
7 5/8"	6.625	7.263		
8 5/8"	7.511	8.248	8,000 / 300	
9 5/8"	8.435	9.063		
10 3/4"	9.25	9.784		
10 3/4"	9.85	11.15	5,000 / 300	
11 3/4"	9.85	11.15		
13 3/8"	11.633	12.454	3,000 / 300	
13 3/8"	12.347	12.715		
16"	14.688	15.25		
18 5/8"	17.655	18.73	2,000 / 200	
20"	17.655	18.73		

