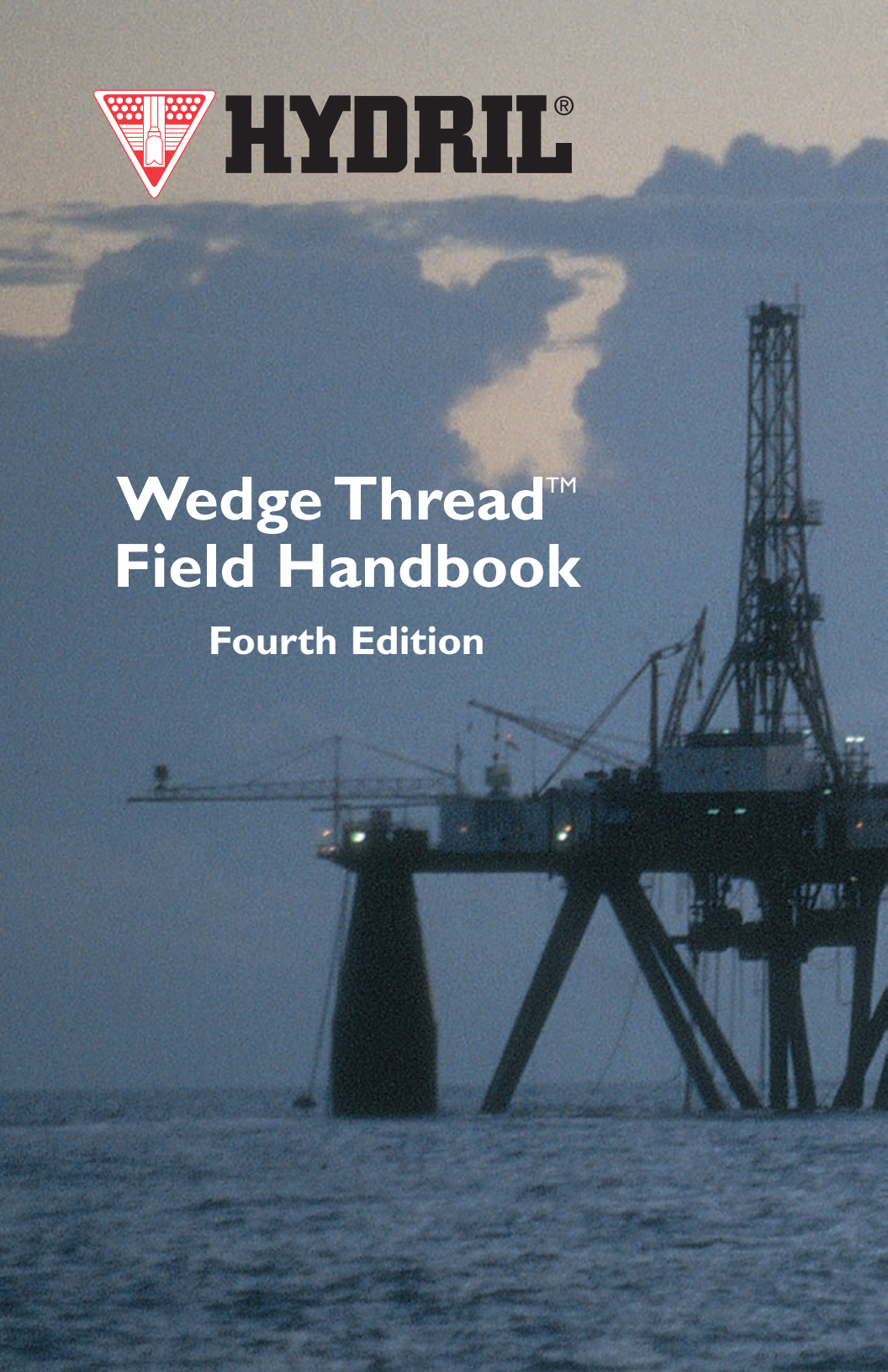
HYDRIL®
Wedge Thread™
Field Handbook
Fourth Edition

Wedge Thread™ Field Handbook

PRODUCT

INSPECTION

RUNNING AND HANDLING

RECUTTING AND ACCESSORIES

The Wedge Thread™ Drill Pipe Tool Joint

"The Series 500™ Wedge Thread™ drill pipe tool joint is a tapered, two-step threaded connection. The pipe body sealing capability of the Wedge Thread is provided by the tapered, dovetail Wedge Thread and the lubricant. A comprehensive process of designing and testing led to the initial exhibition of a proto-type two-step, tapered configuration at the Aberdeen Oil Show in September, 1993. Since that time, the Wedge Thread has become recognized as the industry leader in drill pipe tool joint technology, as evidenced by its universal application including the North Sea, Africa, Gulf of Mexico, Australia, Southeast Asia, Canada, South America and Mexico. The following tables contain performance data and dimensions for the Series 500™ Wedge Thread™ drill pipe tool joint."

Performance Data

Drill Pipe Data				Tool Joint Data				Mechanical Properties				
								Tensile Yield		Torsional Yield		
Nominal Size	Nominal Weight	Adjusted Weight	Type Upset	Connection	OD	ID	Drift	Pipe	Tool Joint	Pipe	Tool Joint	Torsional Ratio
in.	lb/ft.	lb/ft.			in.	in.	in.	1000 lb.	1000 lb.	ft-lb.*	ft-lb.*	
2 3/8	6.65	7.20	EU-105	WT26	3 3/8	1 3/4	1.625	194	416	8750	12300	1.41
		7.10	EU-105	WT23	3 1/8	1 1/2	1.375	194	387	8750	10400	1.19
		7.20	EU-105	WT14S	3 3/8	1 3/4	1.625	194	314	8750	11100	1.27
2 7/8	10.40	11.30	EU-135	WT31	4 1/8	2	1.875	386	697	20800	28500	1.37
		10.50	IU-135	WT26	3 3/8	1 3/4	1.625	386	416	20800	12300	0.59
		10.50	IU-135	WT23	3 1/8	1 1/2	1.375	386	387	20800	10400	0.50
		10.50	EU-135	WT14S	3 3/8	1.975	1.875	386	314	20800	11100	0.53
3 1/2	13.30	14.50	EU-135	WT38	4 3/4	2 9/16	2.438	489	877	33390	41000	1.23
		14.90	EU-135	WT38	5	2 9/16	2.438	489	877	33390	41000	1.23
		13.90	IU-135	WT31	4 1/8	2	1.875	489	697	33390	28500	0.85
		13.40	IU-135	WT26	3 9/16	1 3/4	1.625	489	416	33390	12300	0.37
3 1/2	15.50	16.70	EU-135	WT38	4 3/4	2 1/2	2.375	581	907	37950	41000	1.08
		17.10	EU-135	WT38	5	2 1/2	2.375	581	907	37950	41000	1.08
		16.20	IEU-135	WT31	4 1/8	2	1.875	581	697	37950	28500	0.75
4	14.00	15.80	EU-135	WT40	5 3/8	3 1/8	3.000	514	998	41920	54000	1.29
		16.00	EU-135	WT40	5 1/2	3 1/8	3.000	514	998	41920	54000	1.29
		15.30	IU-135	WT39	5	2 13/16	2.688	514	910	41920	46000	1.10
		15.50	IU-135	WT39	5 1/8	2 13/16	2.688	514	910	41920	46000	1.10
		15.20	IU-135	WT38	4 3/4	2 9/16	2.438	514	877	41920	41000	0.98
		15.60	IU-135	WT38	5	2 9/16	2.438	514	877	41920	41000	0.98
		14.70	IU-135	WT31	4 1/8	2	1.875	514	697	41920	28500	0.68
4	15.70	17.40	EU-135	WT40	5 3/8	3 1/8	3.000	583	998	46460	54000	1.16
		17.60	EU-135	WT40	5 1/2	3 1/8	3.000	583	998	46460	54000	1.16
		16.90	IU-135	WT39	5	2 13/16	2.688	583	910	46460	46000	0.99
		17.10	IU-135	WT39	5 1/8	2 13/16	2.688	583	910	46460	46000	0.99
		16.80	IU-135	WT38	4 3/4	2 9/16	2.438	583	877	46460	41000	0.88
		17.10	IU-135	WT38	5	2 9/16	2.438	583	877	46460	41000	0.88
		16.20	IU-135	WT31	4 1/8	2	1.875	583	697	46460	28500	0.61
4 1/2	16.60	18.60	EU-135	WT46	6	3 1/2	3.375	595	1280	55450	70000	1.26
		19.10	EU-135	WT46	6 1/4	3 1/2	3.375	595	1280	55450	70000	1.26
		17.80	IEU-135	WT40	5 1/2	3 1/8	3.000	595	998	55450	54000	0.97
		17.60	IEU-135	WT39	5 1/8	2 13/16	2.688	595	910	55450	46000	0.83
		17.10	IU-135	WT38	4 5/8	2 9/16	2.438	595	877	55450	41000	0.74

*multiply ft-lb by 1.36 to convert to N-m

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Performance Data Con't.

Drill Pipe Data				Tool Joint Data				Mechanical Properties				
								Tensile Yield		Torsional Yield		
Nominal Size	Nominal Weight	Adjusted Weight	Type Upset	Connection	OD	ID	Drift	Pipe	Tool Joint	Pipe	Tool Joint	Torsional Ratio
in.	lb/ft.	lb/ft.			in.	in.	in.	1000 lb.	1000 lb.	ft-lb.*	ft-lb.*	
4 1/2	20.00	22.00	EU-135	WT46	6	3 1/2	3.375	742	1280	66420	70000	1.05
		22.50	EU-135	WT46	6 1/4	3 1/2	3.375	742	1280	66420	70000	1.05
		21.50	IEU-135	WT40	5 1/2	3 1/8	3.000	742	998	66420	54000	0.81
		21.30	IEU-135	WT39	5 1/8	2 13/16	2.688	742	910	66420	46000	0.69
		20.80	IU-135	WT38	4 5/8	2 9/16	2.438	742	877	66420	41000	0.62
5	19.50	22.70	EU-135	WT50	6 3/4	4	3.875	712	1440	74100	109000	1.47
		23.30	EU-135	WT50	7	4	3.875	712	1440	74100	109000	1.47
		22.20	IEU-135	WT50	6 5/8	3 7/8	3.750	712	1533	74100	109000	1.47
		21.40	IEU-135	WT46	6	3 1/2	3.375	712	1280	74100	70000	0.94
		20.80	IEU-135	WT40	5 3/8	3 1/8	3.000	712	998	74100	54000	0.73
		20.80	IEU-135	WT39	5 1/8	2 13/16	2.688	712	910	74100	46000	0.62
5	25.60	28.50	EU-135	WT50	6 3/4	3 7/8	3.750	954	1533	94060	109000	1.16
		29.10	EU-135	WT50	7	3 7/8	3.750	954	1533	94060	109000	1.16
		28.20	IEU-135	WT50	6 5/8	3 5/8	3.500	954	1710	94060	109000	1.16
		27.00	IEU-135	WT46	6	3 1/2	3.375	954	1280	94060	70000	0.74
		26.40	IEU-135	WT40	5 3/8	3 1/8	3.000	954	998	94060	54000	0.57
		26.40	IEU-135	WT39	5 1/8	2 13/16	2.688	954	910	94060	46000	0.49
5 1/2	21.90	24.20	EU-135	WT56	7	4 5/8	4.500	787	1473	91280	132000	1.45
		24.70	EU-135	WT56	7 1/4	4 5/8	4.500	787	1473	91280	132000	1.45
		24.30	IEU-135	WT56	7	4 3/8	4.250	787	1685	91280	132000	1.45
		24.90	IEU-135	WT56	7 1/4	4 3/8	4.250	787	1685	91280	132000	1.45
		24.30	IEU-135	WT54	7	4 3/8	4.250	787	1406	91280	120000	1.31
		24.40	IEU-135	WT50	6 3/4	4	3.875	787	1440	91280	109000	1.19
		25.00	IEU-135	WT50	7	4	3.875	787	1440	91280	109000	1.19
		23.40	IEU-135	WT46	5 7/8	3 1/2	3.375	787	1280	91280	70000	0.77
5 1/2	24.70	26.60	EU-135	WT56	7	4 5/8	4.500	895	1473	101830	132000	1.30
		27.20	EU-135	WT56	7 1/4	4 5/8	4.500	895	1473	101830	132000	1.30
		26.70	IEU-135	WT56	7	4 3/8	4.250	895	1685	101830	132000	1.30
		27.30	IEU-135	WT56	7 1/4	4 3/8	4.250	895	1685	101830	132000	1.30
		26.70	IEU-135	WT54	7	4 3/8	4.250	895	1406	101830	120000	1.18
		26.90	IEU-135	WT50	6 3/4	4	3.875	895	1440	101830	109000	1.07
		27.40	IEU-135	WT50	7	4	3.875	895	1440	101830	109000	1.07
		25.80	IEU-135	WT46	5 7/8	3 1/2	3.375	895	1280	101830	70000	0.69
5 7/8	23.40	25.90	IU-135	WT54	7	4 3/8	4.250	844	1406	105490	120000	1.14
		25.50	IU-135	WT56	7	4 5/8	4.500	844	1473	105490	132000	1.25
5 7/8	27.00	28.60	IU-135	WT54	7	4 3/8	4.250	961	1406	117920	120000	1.02
		28.10	IU-135	WT56	7	4 5/8	4.500	961	1473	117920	132000	1.12
6 5/8	25.20	28.30	IEU-135	WT66	8	5 3/8	5.250	881	1654	127050	168000	1.32
		27.00	IEU-135	WT56	7	4 5/8	4.500	881	1473	127050	132000	1.04
6 5/8	27.70	30.10	IEU-135	WT66	8	5 3/8	5.250	962	1654	137330	168000	1.22
		28.80	IEU-135	WT56	7	4 5/8	4.500	962	1473	137330	132000	0.96

*multiply ft-lb by 1.36 to convert to N-m

Tool Joint Dimensions

Tool Joint	Drill Pipe			Tool Joint									
	Size and Style	Nominal Weight	Grades	OD of Pin and Box	ID of Pin	Bevel Diameter	Length of Tool Joint Pin	Pin Tong Space	Box Tong Space	Comb. Length of Pin and Box	Diameter of Box at elevator Upset Max.	Make-Up Torques	
												Min.	Max
		lb/ft.		in.	in.	in.	Lp	Lpb	Lb	L	Dte	ft-lb.*	ft-lb.*
WT14S	2 3/8 EU	4.85	X G	3 1/4 - 3 3/8	1.945	3 5/32	11	7	10	17	2 9/16	2800	8900
	2 3/8 EU	6.65	X G	3 1/4 - 3 3/8	1 3/4	3 5/32	11	7	10	17	2 9/16	2800	8900
	2 7/8 IU	6.85	X G S	3 1/4 - 3 3/8	1.975	3 5/32	11	7	10	17	3	2800	8900
	2 7/8 EU	10.40	X G S	3 1/4 - 3 3/8	1.975	3 5/32	11	7	10	17	3 3/16	2800	8900
	3 1/2 IU	13.30	X G S	3 9/16	1.975	3 5/32	11	7	10	17	3 11/16	2800	8900
WT23	2 3/8 EU	6.65	X G	3 1/8	1 1/2	2 15/16	12	7	10	17	2 9/16	2200	8300
	2 7/8 IU	10.40	X G S	3 1/8	1 1/2	2 15/16	12	7	10	17	3	2200	8300
WT26	2 3/8 EU	6.65	X G	3 3/8	1 3/4	3 9/64	12	7	10	17	2 9/16	2800	9800
	2 7/8 IU	10.40	X G S	3 3/8	1 3/4	3 9/64	12	7	10	17	3	2800	9800
WT31	2 7/8 EU	10.40	X G S	4 1/8	2	3 29/32	14	7	12	19	3 3/16	6200	22500
	3 1/2 IU	13.30	X G S	4 1/8	2	3 29/32	14	7	12	19	3 11/16	6200	22500
	3 1/2 IEU	15.50	X G S	4 1/8	2	3 29/32	14	7	12	19	3 7/8	6200	22500
	4 IU	14.00 - 17.00	X G S	4 1/8	2	3 29/32	14	7	12	19	4 1/8	6200	22500
WT38	3 1/2 EU	13.30	X G S	4 3/4 - 5	2 9/16	4 9/16	15	8	14	22	3 7/8	9000	31500
	3 1/2 EU	15.50	X G S	4 3/4 - 5	2 1/2	4 9/16	15	8	14	22	3 7/8	9000	31500
	4 IU	14.00 - 17.00	X G S	4 3/4 - 5	2 9/16	4 9/16	15	8	14	22	4 3/16	9000	31500
	4 1/2 IU	16.60 - 20.00	X G S	4 3/4	2 9/16	4 9/16	15	8	14	22	4 11/16	9000	31500
WT39	4 IU	14.00 - 17.00	X G S	5 - 5 1/8	2 13/16	4 13/16	15	8	14	22	4 3/16	10000	36000
	4 1/2 IEU	16.60 - 20.00	X G S	5 1/8	2 13/16	4 13/16	15	8	14	22	4 11/16	10000	36000
	5 IEU	19.50 - 25.60	X G S	5 1/8	2 13/16	4 13/16	15	8	14	22	5 1/8	10000	36000
WT40	4 EU	14.00 - 17.00	X G S	5 1/2	3 1/8	5 1/8	15	8	14	22	4 1/2	12000	42000
	4 1/2 IEU	16.60 - 20.00	X G S	5 1/2	3 1/8	5 1/8	15	8	14	22	4 11/16	12000	42000
	5 IEU	19.50 - 25.60	X G S	5 3/8	3 1/8	5 1/8	15	8	14	22	5 1/8	12000	42000
WT46	4 1/2 EU	16.60 - 20.00	X G S	6 - 6 1/4	3 1/2	5 3/4	15	8	14	22	5	15000	56000
	5 IEU	19.50 - 25.60	X G S	6	3 1/2	5 3/4	15	8	14	22	5 1/8	15000	56000
	5 1/2 IEU	21.90 - 24.70	X G S	5 7/8	3 1/2	5 3/4	15	8	14	22	5 11/16	15000	56000
WT50	5 EU	19.50	X G S	6 3/4 - 7	4	6 11/32	16	8	15	23	5 11/16	23000	86000
	5 EU	25.60	X G S	6 3/4 - 7	3 7/8	6 11/32	16	8	15	23	5 11/16	23000	86000
	5 IEU	19.50	X G S	6 5/8	3 7/8	6 11/32	16	8	15	23	5 1/8	23000	86000
	5 IEU	25.60	X G S	6 5/8	3 5/8	6 11/32	16	8	15	23	5 1/8	23000	86000
	5 1/2 IEU	21.90 - 24.70	X G S	6 3/4 - 7	4	6 11/32	16	8	15	23	5 11/16	23000	86000
WT54	5 1/2 IEU	21.90 - 24.70	X G S	7	4 3/8	6 5/8	16	8	15	23	5 11/16	25000	90000
	5 7/8 IU	23.40 - 27.00	X G S	7	4 3/8	6 5/8	16	8	15	23	5 15/16	25000	90000
WT56	5 1/2 EU	21.90 - 24.70	X G S	7 - 7 1/4	4 5/8	6 7/8	16	8	15	23	6	27000	99000
	5 1/2 IEU	21.90 - 24.70	X G S	7 - 7 1/4	4 3/8	6 7/8	16	8	15	23	5 11/16	27000	99000
	5 7/8 IU	23.40 - 27.00	X G S	7	4 5/8	6 7/8	16	8	15	23	5 15/16	27000	99000
	6 5/8 IEU	25.20 - 27.70	X G S	7	4 5/8	6 7/8	16	8	15	23	6 57/64	27000	99000
WT66	6 5/8 IEU	25.20 - 27.70	X G S	8	5 3/8	7 45/64	18	10	16	26	6 57/64	35000	120000

*multiply ft-lb by 1.36 to convert to N-m

Drill Pipe Body Data

The following is a list of sizes and mechanical properties of OCTG drill pipe used with the Hydril Wedge Thread tool joint

Drill Pipe Body Data Table Legend

DIA	WNU	WN	WPE	WALL
NOMINAL OD (IN)	NOMINAL WEIGHT UPSET (LBS/FT)	NOMINAL WEIGHT NON-UPSET (LBS/FT)	PLAIN END WEIGHT/FT (LBS/FT)	WALL THICKNESS (IN)

Minimum Yield - 1000's of PSI Strength

Minimum Tensile (ULT) - 1000's of PSI Strength

A - AREA (IN^2)
ID - NOMINAL ID (IN)
DD - DRIFT DIAMETER (IN)

COLLAPSE PRESSURE - Pipe Body Collapse Rating (psi)
BODY YIELD STRENGTH - Axial Yield Capacity (1000 lbs)
API INTERNAL PRESSURE - Pipe Body Min Wall Burst Rating (psi)
YIELD TORQUE - Yield Torque (ft-lbs)

Conversions:
psi x 6890 = Pa
ft-lbs x 1.36 = N-m

Drill Pipe Body Data

					MINIMUM YIELD STRENGTH, KSI						
					75	95	100	105	115	120	135
	WEIGHT				MINIMUM TENSILE STRENGTH, KSI						
					95	105	110	120	125	130	145
DIA	WNU		WPE	WALL	GRADE						
					E	X-95	100	G-105	115	120	S-135
2.375	4.85		4.44	0.190							
	1.304	A	COLLAPSE PRESSURE		11040	13980	14720	15460	16730	17310	19030
	1.995	ID	BODY YIELD STRENGTH		98	124	130	137	150	156	176
	1.870	DD	API INTERNAL PRESSURE		10500	13300	14000	14700	16100	16800	18900
		SD	YIELD TORQUE		4760	6030	6350	6670	7300	7620	8570
2.375	6.65		6.27	0.280							
	1.843	A	COLLAPSE PRESSURE		15600	19760	20800	21840	23920	24960	28080
	1.815	ID	BODY YIELD STRENGTH		138	175	184	194	212	221	249
	1.690	DD	API INTERNAL PRESSURE		15470	19600	20630	21660	23730	24760	27850
		SD	YIELD TORQUE		6250	7920	8330	8750	9580	10000	11250
2.875	6.85		6.17	0.217							
	1.812	A	COLLAPSE PRESSURE		10740	12940	13490	14020	15070	15560	17030
	2.441	ID	BODY YIELD STRENGTH		136	172	181	190	208	217	245
	2.316	DD	API INTERNAL PRESSURE		9910	12550	13210	13870	15190	15850	17830
		SD	YIELD TORQUE		8080	10240	10780	11320	12390	12930	14550

Drill Pipe Body Data (Con't.)

DIA	WNU		WEIGHT WPE	WALL	MINIMUM YIELD STRENGTH, KSI 75	95	100	105	115	120	135
					MINIMUM TENSILE STRENGTH, KSI 95	105	110	120	125	130	145
					GRADE E	X-95	100	G-105	115	120	S-135
2.875	10.40		9.72	0.362							
	2.858	A	COLLAPSE PRESSURE		16510	20910	22010	23110	25310	26410	29720
	2.151	ID	BODY YIELD STRENGTH		214	272	286	300	329	343	386
	2.026	DD	API INTERNAL PRESSURE		16530	20930	22030	23140	25340	26440	29750
		SD	YIELD TORQUE		11550	14640	15410	16180	17720	18490	20800
3.500	13.30		12.32	0.368							
	3.621	A	COLLAPSE PRESSURE		14110	17880	18820	19760	21640	22580	25400
	2.764	ID	BODY YIELD STRENGTH		272	344	362	380	416	435	489
	2.639	DD	API INTERNAL PRESSURE		13800	17480	18400	19320	21160	22080	24840
		SD	YIELD TORQUE		18550	23500	24740	25970	28450	29680	33390
3.500	15.50		14.64	0.449							
	4.304	A	COLLAPSE PRESSURE		16770	21250	22370	23480	25720	26840	30190
	2.602	ID	BODY YIELD STRENGTH		323	409	430	452	495	516	581
	2.477	DD	API INTERNAL PRESSURE		16840	21330	22450	23570	25820	26940	30310
		SD	YIELD TORQUE		21090	26710	28110	29520	32330	33740	37950
4.000	14.00		12.95	0.330							
	3.805	A	COLLAPSE PRESSURE		11350	14380	15140	15900	17410	18170	20140
	3.340	ID	BODY YIELD STRENGTH		285	361	381	400	438	457	514
	3.215	DD	API INTERNAL PRESSURE		10830	13720	14440	15160	16600	17330	19490
		SD	YIELD TORQUE		23290	29500	31050	32600	35710	37260	41920
4.000	15.70		14.71	0.380							
	4.322	A	COLLAPSE PRESSURE		12900	16340	17200	18050	19770	20630	23210
	3.240	ID	BODY YIELD STRENGTH		324	411	432	454	497	519	583
	3.115	DD	API INTERNAL PRESSURE		12470	15790	16630	17460	19120	19950	22440
		SD	YIELD TORQUE		25810	32690	34410	36130	39580	41300	46460
4.000	17.00		15.90	0.415							
	4.674	A	COLLAPSE PRESSURE		13950	17670	18600	19530	21390	22320	25110
	3.170	ID	BODY YIELD STRENGTH		351	444	467	491	538	561	631
	3.045	DD	API INTERNAL PRESSURE		13620	17250	18160	19060	20880	21790	24510
		SD	YIELD TORQUE		27440	34760	36590	38420	42080	43910	49400

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Drill Pipe Body Data (Con't.)

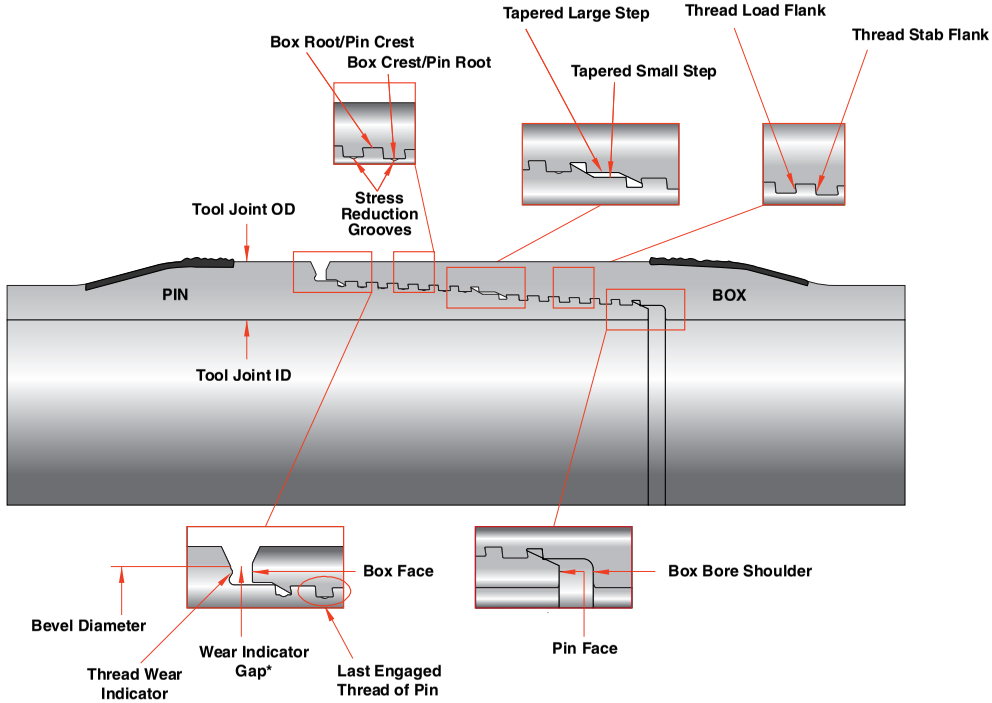
DIA	WNU			WEIGHT WPE	WEIGHT WALL	MINIMUM YIELD STRENGTH, KSI 75	95	100	105	115	120	135
						MINIMUM TENSILE STRENGTH, KSI 95	105	110	120	125	130	145
						GRADE E	X-95	100	G-105	115	120	S-135
4.500	16.60			15.00	0.337							
	4.407	A	COLLAPSE PRESSURE			10390	12760	13300	13820	14850	15340	16770
	3.826	ID	BODY YIELD STRENGTH			331	419	441	463	507	529	595
	3.701	DD	API INTERNAL PRESSURE			9830	12450	13110	13760	15070	15730	17690
		SD	YIELD TORQUE			30810	39020	41080	43130	47240	49290	55450
4.500	20.00			18.71	0.430							
	5.498	A	COLLAPSE PRESSURE			12960	16420	17280	18150	19880	20740	23330
	3.640	ID	BODY YIELD STRENGTH			412	522	550	577	632	660	742
	3.515	DD	API INTERNAL PRESSURE			12540	15890	16720	17560	19230	20070	22580
		SD	YIELD TORQUE			36900	46740	49200	51660	56580	59040	66420
5.000	16.25			14.88	0.296							
	4.374	A	COLLAPSE PRESSURE			6940	8110	8370	8620	9080	9280	9830
	4.408	ID	BODY YIELD STRENGTH			328	416	437	459	503	525	590
	4.283	DD	API INTERNAL PRESSURE			7770	9840	10360	10880	11910	12430	13990
		SD	YIELD TORQUE			35040	44390	46730	49060	53730	56070	63080
5.000	19.50			17.95	0.362							
	5.275	A	COLLAPSE PRESSURE			9960	12020	12520	13000	13940	14380	15670
	4.276	ID	BODY YIELD STRENGTH			396	501	528	554	607	633	712
	4.151	DD	API INTERNAL PRESSURE			9500	12040	12670	13300	14570	15200	17100
		SD	YIELD TORQUE			41170	52140	54890	57630	63120	65870	74100
5.000	25.60			24.05	0.500							
	7.069	A	COLLAPSE PRESSURE			13500	17100	18000	18900	20700	21600	24300
	4.000	ID	BODY YIELD STRENGTH			530	672	707	742	813	848	954
	3.875	DD	API INTERNAL PRESSURE			13130	16630	17500	18380	20130	21000	23630
			YIELD TORQUE			52260	66190	69680	73160	80130	83610	94060
5.500	19.20			16.89	0.304							
	4.962	A	COLLAPSE PRESSURE			6040	6940	7140	7310	7630	7760	8090
	4.892	ID	BODY YIELD STRENGTH			372	471	496	521	571	595	670
	4.767	DD	API INTERNAL PRESSURE			7250	9190	9670	10160	11120	11610	13060
			YIELD TORQUE			44070	55830	58770	61700	67580	70520	79330

Drill Pipe Body Data (Con't.)

DIA	WNU		WEIGHT WPE	WALL	MINIMUM YIELD STRENGTH, KSI 75	95	100	105	115	120	135
					MINIMUM TENSILE STRENGTH, KSI 95	105	110	120	125	130	145
					GRADE E	X-95	100	G-105	115	120	S-135
5.500	21.90		19.83	0.361							
	5.828	A	COLLAPSE PRESSURE		8410	10020	10400	10750	11450	11760	12670
	4.778	ID	BODY YIELD STRENGTH		437	554	583	612	670	699	787
	4.653	DD	API INTERNAL PRESSURE		8610	10910	11490	12060	13210	13780	15510
		SD	YIELD TORQUE		50710	64230	67610	70990	77760	81140	91280
5.500	24.70		22.56	0.415							
	6.630	A	COLLAPSE PRESSURE		10460	12930	13480	14010	15060	15560	17020
	4.670	ID	BODY YIELD STRENGTH		497	630	663	696	762	796	895
	4.545	DD	API INTERNAL PRESSURE		9900	12540	13200	13860	15190	15850	17830
		SD	YIELD TORQUE		56570	71660	75430	79200	86750	90520	101830
5.875	23.40		21.28	0.361							
	6.254	A	COLLAPSE PRESSURE		7450	8770	9080	9360	9910	10140	10820
	5.153	ID	BODY YIELD STRENGTH		469	594	625	657	719	750	844
	5.028	DD	API INTERNAL PRESSURE		8060	10220	10750	11290	12370	12900	14520
		SD	YIELD TORQUE		58610	74230	78140	82050	89860	93770	105490
5.875	27.00		24.22	0.415							
	7.119	A	COLLAPSE PRESSURE		9560	11500	11970	12410	13290	13700	14890
	5.045	ID	BODY YIELD STRENGTH		534	676	712	747	819	854	961
	4.920	DD	API INTERNAL PRESSURE		9270	11740	12360	12980	14220	14830	16690
		SD	YIELD TORQUE		65510	82980	87340	91710	100450	104810	117920
6.625	25.20		22.21	0.330							
	6.526	A	COLLAPSE PRESSURE		4790	5320	5420	5500	5620	5720	6040
	5.965	ID	BODY YIELD STRENGTH		489	620	653	685	750	783	881
	5.840	DD	API INTERNAL PRESSURE		6540	8280	8720	9150	10020	10460	11770
		SD	YIELD TORQUE		70580	89400	94110	98810	108220	112930	127050
6.625	27.70		24.24	0.362							
	7.123	A	COLLAPSE PRESSURE		5890	6750	6940	7100	7400	7520	7810
	5.901	ID	BODY YIELD STRENGTH		534	677	712	748	819	855	962
	5.776	DD	API INTERNAL PRESSURE		7170	9080	9560	10040	11000	11470	12910
		SD	YIELD TORQUE		76300	96640	101730	106810	116990	122070	137330

Terminology

The following illustration will assist in the understanding and identification of the various Hydril Wedge Thread Drill Pipe Tool Joint features.
Note: WT14S uses a single step thread profile and does not incorporate the stress reduction groove or the thread wear indicator.

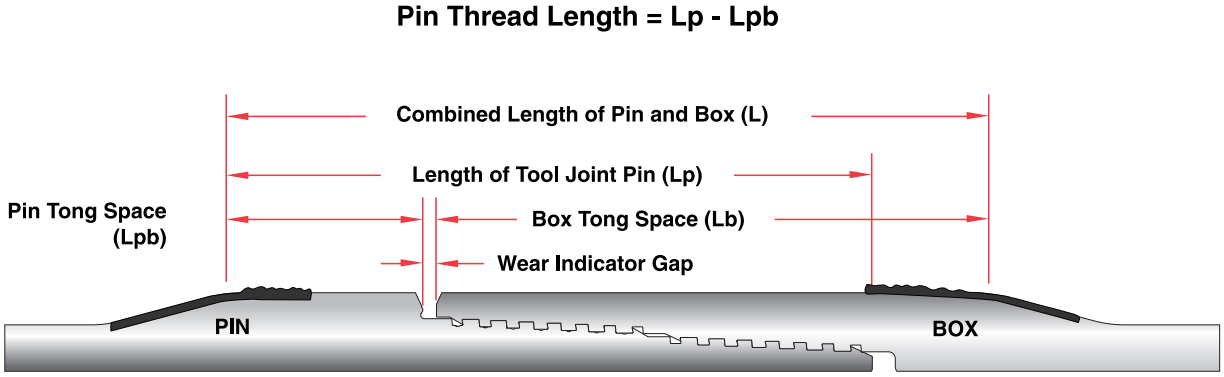


*Gap must always be present after make-up.

API Designations

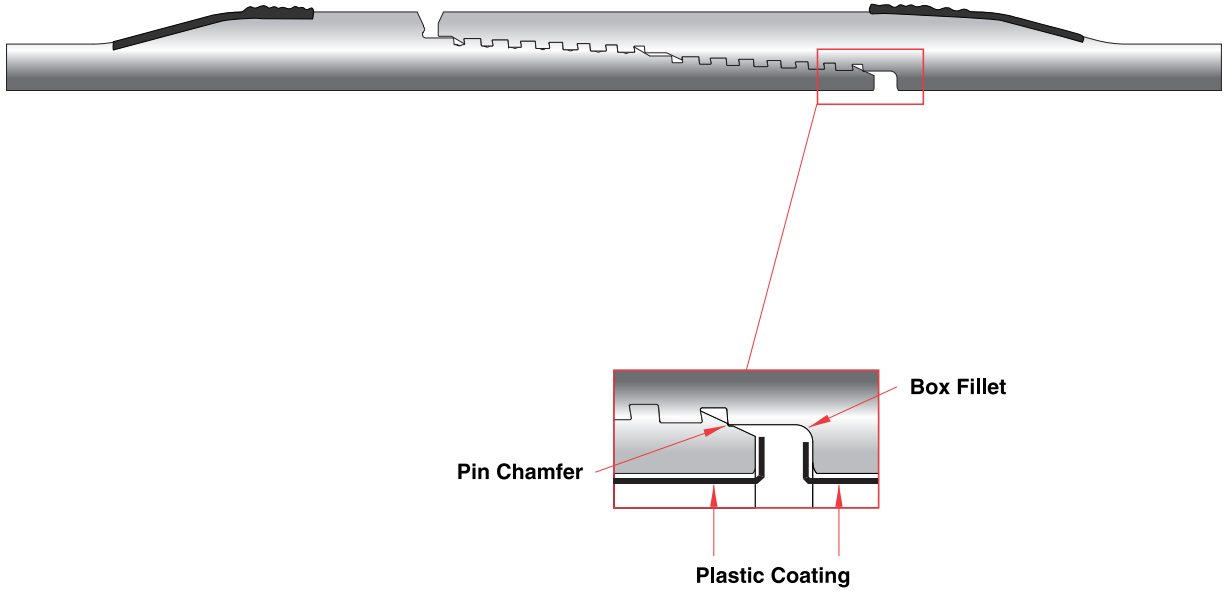
The diagram below shows the lengths for the various tool joint components as designated in Specification for Rotary Drill Stem Elements, API Specification 7 (Spec 7), Thirty-Ninth Edition, June 1, 1998. Since the Wedge Thread tool joint connection develops its high torque strength in the flanks of the thread, the length of the thread is significantly greater than that of API tool joint connections. Because of this greater connection length, the values for both the tong space tolerance on new Wedge Thread tool joints and the minimum recommended tong space for used Wedge Thread tool joints differ from the requirements for API tool joints.

On API tool joints, Table 7 of Specification 7 calls for a tong space tolerance of ±1/4" for Lpb and Lb. For the 4 threads per inch API tool joint threads, this is sufficient tolerance to permit minor rework during manufacture, thereby eliminating excessive material loss. To facilitate manufacture of the coarser Wedge Thread, having as few as 2 threads per inch, tool joints are made using a tong space tolerance of -1/4", +3/4". This expanded tolerance band provides the same minimum tong space with the potential for increased tong space.



Internal Coating Recommendation

Ensure that correct areas have been coated and that coating is not excessive or misplaced. The pin face and the box bore shoulder should be plastic coated, with overspray permitted on the pin chamfer and box fillet areas. Overspray is not permitted on the threads as this will not allow the threads to engage properly.



Capacities, Displacements, And Equivalent Diameters

Capacities and Displacements

Capacity is defined as the cross-sectional area of the pipe ID expressed in units of volume per unit length. The open end displacement refers to the cross-sectional area of steel in the pipe expressed in units of volume per unit length. Closed end displacement is the sum of the two.

Equivalent Diameters

The ID of the tool joint and the ID of the drill pipe differ. For hydraulics, an equivalent diameter (De) can be determined, using the following formula:

$$De = \left[\frac{(L_2)\bullet(D_1)^4\bullet(D_2)^4}{(L_1)\bullet(D_2)^4 + (L_2\text{-}L_1)\bullet(D_1)^4} \right]^{1/4}$$

where
D_1 = tool joint ID
D_2 = drill pipe ID
L_1 = tool joint length
L_2 = drill pipe joint length

Capacities, Displacements and Equivalent Diameters

Drill Pipe Data				Tool Joint Data			Displacement Open End	Capacity	Displacement Closed End	Equivalent Hydraulic Diameter ‡
Nominal Size	Nominal Weight	Adjusted Weight	Upset Type	Connection	OD	ID				
in.	lb/ft.	lb/ft.			in.	in.	bbl/ft.*	bbl/ft.*	bbl/ft.*	in.
2 3/8	6.65	7.20	EU	WT26	3 3/8	1 3/4	0.0026	0.0032	0.0058	1.810
		7.10	EU	WT23	3 1/8	1 1/2	0.0026	0.0031	0.0057	1.780
2 7/8	10.40	11.30	EU	WT31	4 1/8	2	0.0041	0.0045	0.0086	2.137
		10.50	IU	WT26	3 3/8	1 3/4	0.0038	0.0044	0.0082	2.105
		10.50	IU	WT23	3 1/8	1 1/2	0.0038	0.0044	0.0082	2.043
		10.50	EU	WT14S	3 3/8	1.975	0.0038	0.0045	0.0083	2.136
3 1/2	13.30	14.50	EU	WT38	4 3/4	2 9/16	0.0053	0.0073	0.0126	2.742
		14.90	EU	WT38	5	2 9/16	0.0054	0.0073	0.0127	2.742
		13.90	IU	WT31	4 1/8	2	0.0051	0.0072	0.0123	2.636
3 1/2	15.50	16.70	EU	WT38	4 3/4	2 1/2	0.0061	0.0065	0.0126	2.592
		17.10	EU	WT38	5	2 1/2	0.0062	0.0065	0.0127	2.592
		16.20	IEU	WT31	4 1/8	2	0.0059	0.0064	0.0123	2.514
4	14.00	16.00	EU	WT40	5 1/2	3 1/8	0.0058	0.0107	0.0165	3.317
		15.30	IU	WT39	5	2 13/16	0.0056	0.0106	0.0162	3.268
		15.50	IU	WT39	5 1/8	2 13/16	0.0056	0.0106	0.0162	3.268
		15.20	IU	WT38	4 3/4	2 9/16	0.0055	0.0105	0.0160	3.209
		15.60	IU	WT38	5	2 9/16	0.0057	0.0105	0.0162	3.209
		14.70	IU	WT31	4 1/8	2	0.0053	0.0104	0.0157	3.000
4	15.70	17.60	EU	WT40	5 1/2	3 1/8	0.0064	0.0102	0.0166	3.229
		16.90	IU	WT39	5	2 13/16	0.0061	0.0100	0.0161	3.186
		17.10	IU	WT39	5 1/8	2 13/16	0.0062	0.0100	0.0162	3.186
		17.10	IU	WT38	5	2 9/16	0.0062	0.0099	0.0161	3.134
		16.20	IU	WT31	4 1/8	2	0.0059	0.0098	0.0157	2.944
4 1/2	16.60	19.10	EU	WT46	6 1/4	3 1/2	0.0069	0.0141	0.0210	3.789
		17.80	IEU	WT40	5 1/2	3 1/8	0.0065	0.0139	0.0204	3.724
		17.60	IEU	WT39	5 1/8	2 13/16	0.0064	0.0137	0.0201	3.639
4 1/2	20.00	22.50	EU	WT46	6 1/4	3 1/2	0.0082	0.0128	0.0210	3.626

*multiply bbl/ft by 522 to convert to L/m

‡calculated assuming 30 ft. drill pipe joint length

Capacities, Displacements and Equivalent Diameters

Drill Pipe Data				Tool Joint Data			Displacement Open End	Capacity	Displacement Closed End	Equivalent Hydraulic Diameter ‡
Nominal Size	Nominal Weight	Adjusted Weight	Upset Type	Connection	OD	ID				
in.	lb/ft.	lb/ft.			in.	in.	bbl/ft.*	bbl/ft.*	bbl/ft.*	in.
4 1/2	20.00	21.50	IEU	WT40	5 1/2	3 1/8	0.0078	0.0126	0.0204	3.573
		21.30	IEU	WT39	5 1/8	2 13/16	0.0077	0.0125	0.0202	3.503
5	19.50	23.30	EU	WT50	7	4	0.0085	0.0176	0.0261	4.245
		22.20	IEU	WT50	6 5/8	3 7/8	0.0081	0.0175	0.0256	4.228
		21.40	IEU	WT46	6	3 1/2	0.0078	0.0173	0.0251	4.163
		20.80	IEU	WT40	5 3/8	3 1/8	0.0076	0.0172	0.0248	4.061
5	25.60	29.10	EU	WT50	7	3 7/8	0.0106	0.0155	0.0261	3.987
		28.20	IEU	WT50	6 5/8	3 5/8	0.0103	0.0153	0.0256	3.955
		27.00	IEU	WT46	6	3 1/2	0.0098	0.0153	0.0251	3.938
		26.40	IEU	WT40	5 3/8	3 1/8	0.0096	0.0151	0.0247	3.859
5 1/2	21.90	24.20	EU	WT56	7	4 5/8	0.0088	0.0221	0.0309	4.762
		24.30	IEU	WT56	7	4 3/8	0.0088	0.0219	0.0307	4.731
		24.30	IEU	WT54	7	4 3/8	0.0088	0.0219	0.0307	4.731
		24.40	IEU	WT50	6 3/4	4	0.0089	0.0217	0.0306	4.666
		23.40	IEU	WT46	5 7/8	3 1/2	0.0085	0.0214	0.0299	4.540
5 1/2	24.70	26.60	EU	WT56	7	4 5/8	0.0097	0.0212	0.0309	4.666
		26.70	IEU	WT56	7	4 3/8	0.0097	0.0210	0.0307	4.637
		26.70	IEU	WT54	7	4 3/8	0.0097	0.0210	0.0307	4.637
		26.90	IEU	WT50	6 3/4	4	0.0098	0.0208	0.0306	4.579
5 7/8	23.40	25.90	IU	WT54	7	4 3/8	0.0094	0.0253	0.0347	5.045
		25.50	IU	WT56	7	4 5/8	0.0093	0.0254	0.0347	5.088
5 7/8	27.00	28.60	IU	WT54	7	4 3/8	0.0104	0.0243	0.0347	4.956
		28.10	IU	WT56	7	4 5/8	0.0102	0.0244	0.0346	4.996
6 5/8	25.20	28.30	IEU	WT66	8	5 3/8	0.0103	0.0340	0.0443	5.884
		27.00	IEU	WT56	7	4 5/8	0.0098	0.0335	0.0433	5.736
6 5/8	27.70	30.10	IEU	WT66	8	5 3/8	0.0109	0.0333	0.0442	5.831
		28.80	IEU	WT56	7	4 5/8	0.0105	0.0328	0.0433	5.688

*multiply bbl/ft by 522 to convert to L/m
‡calculated using 30 ft. drill pipe joint length

Bending Strength Ratios

The bending strength ratios (BSR) of the Wedge Thread tool joints will generally be less than those of comparable number API tool joints. Since the Wedge Thread "shoulder" mechanism is different from the conventional shoulder system of API tool joints, these lower BSR values are appropriate for the Wedge Thread tool joints. Hydril recommends BSR between 1.0 and 1.5 for the Wedge Thread tool joint to maximize fatigue strength when using the Wedge Thread tool joint on drill collars. The API indicates a BSR of 2.50 is desired and between 1.90 and 3.20 may be acceptable for API tool joints. In the conventional shouldering connection, the pin critical section is pre-loaded at make-up. During bending, this pre-load reduces the amplitude of the cycling stress in the pin critical section. The box in this system does not benefit from a reduced stress amplitude, so it is subjected to a greater stress range than the pin. Making the bending strength of the box greater than that of the pin produces a balanced connection for the conventional shouldering tool joints. In the Wedge Thread "shouldering" system, neither pin nor box use a conventional shoulder. Since the pin and the box will not have this dissimilar stress range, the API BSR values would not be applicable.

BSR for Drill Collars

	ID (inches)	OD (inches)				
WT14S		3.250	3.375	3.500	3.625	3.750
	1.500	0.89	1.13	1.38	1.63	1.91
	1.750	0.97	1.22	1.49	1.77	2.07
	1.975	1.09	1.37	1.67	1.99	2.32

	ID (inches)	OD (inches)				
WT23		3.000	3.125	3.250	3.375	3.500
	1.000	1.27	1.51	1.76	2.04	2.33
	1.250	1.31	1.56	1.83	2.12	2.42
	1.500	1.41	1.68	1.96	2.27	2.60

	ID (inches)	OD (inches)						
WT26		3.250	3.375	3.500	3.625	3.750	3.875	4.000
	1.250	1.27	1.49	1.74	1.99	2.27	2.56	2.86
	1.500	1.33	1.57	1.82	2.09	2.38	2.69	3.01
	1.750	1.45	1.71	1.99	2.29	2.60	2.93	3.29

	ID (inches)	OD (inches)						
WT31		4.000	4.125	4.250	4.375	4.500	4.625	4.750
	1.500	1.35	1.53	1.72	1.91	2.12	2.33	2.56
	1.750	1.40	1.58	1.78	1.98	2.19	2.42	2.65
	2.000	1.48	1.67	1.88	2.09	2.32	2.55	2.80

	ID (inches)	OD (inches)							
WT38		4.750	4.875	5.000	5.125	5.250	5.375	5.500	5.625
	1.500	1.31	1.45	1.61	1.77	1.94	2.12	2.30	2.50
	1.750	1.33	1.48	1.64	1.80	1.98	2.16	2.34	2.54
	2.000	1.37	1.52	1.68	1.85	2.03	2.22	2.41	2.61
	2.250	1.42	1.58	1.75	1.93	2.12	2.31	2.51	2.72
	2.500	1.51	1.68	1.86	2.05	2.25	2.45	2.67	2.89
	2.563	1.54	1.71	1.90	2.09	2.29	2.50	2.72	2.94

	ID (inches)	OD (inches)							
WT39		5.000	5.125	5.250	5.375	5.500	5.625	5.750	5.875
	2.000	1.35	1.49	1.65	1.81	1.97	2.15	2.33	2.52
	2.250	1.39	1.54	1.70	1.87	2.04	2.22	2.41	2.60
	2.500	1.46	1.62	1.79	1.96	2.14	2.33	2.53	2.73
	2.813	1.60	1.77	1.96	2.15	2.35	2.55	2.77	2.99

WT40

ID (inches)	OD (inches)							
	5.250	5.375	5.500	5.625	5.750	5.875	6.000	6.125
2.000	1.16	1.29	1.43	1.57	1.71	1.87	2.02	2.19
2.250	1.19	1.32	1.46	1.61	1.76	1.91	2.07	2.24
2.500	1.23	1.37	1.52	1.66	1.82	1.98	2.15	2.32
2.813	1.32	1.46	1.62	1.77	1.94	2.11	2.29	2.48
3.000	1.39	1.54	1.70	1.87	2.05	2.23	2.42	2.61
3.125	1.45	1.61	1.78	1.96	2.14	2.33	2.52	2.73

WT46

ID (inches)	OD (inches)							
	5.875	6.000	6.125	6.250	6.375	6.500	6.625	6.750
2.250	1.09	1.21	1.32	1.45	1.57	1.71	1.84	1.98
2.500	1.11	1.23	1.35	1.48	1.61	1.74	1.88	2.03
2.813	1.16	1.28	1.41	1.54	1.67	1.81	1.95	2.10
3.000	1.19	1.32	1.45	1.58	1.72	1.87	2.02	2.17
3.250	1.26	1.39	1.53	1.67	1.82	1.97	2.13	2.29
3.500	1.35	1.49	1.64	1.79	1.95	2.11	2.28	2.46

WT50

ID (inches)	OD (inches)							
	6.500	6.625	6.750	6.875	7.000	7.125	7.250	7.375
2.500	1.09	1.20	1.31	1.42	1.54	1.66	1.78	1.91
2.813	1.12	1.23	1.34	1.46	1.58	1.70	1.83	1.96
3.000	1.14	1.26	1.37	1.49	1.61	1.73	1.86	2.00
3.250	1.18	1.30	1.42	1.54	1.67	1.79	1.93	2.07
3.500	1.24	1.36	1.48	1.61	1.74	1.88	2.02	2.16
3.750	1.31	1.44	1.57	1.71	1.85	1.99	2.14	2.29
4.000	1.42	1.56	1.70	1.85	2.00	2.15	2.31	2.48

WT54

ID (inches)	OD (inches)							
	6.750	6.875	7.000	7.125	7.250	7.375	7.500	7.625
3.000	1.09	1.19	1.30	1.41	1.52	1.64	1.76	1.88
3.250	1.12	1.22	1.33	1.45	1.56	1.68	1.81	1.93
3.500	1.16	1.27	1.38	1.50	1.62	1.75	1.88	2.01
3.750	1.22	1.33	1.45	1.58	1.70	1.83	1.97	2.11
4.000	1.29	1.42	1.55	1.68	1.81	1.95	2.09	2.24
4.250	1.40	1.54	1.67	1.82	1.96	2.11	2.27	2.43
4.375	1.47	1.61	1.76	1.91	2.06	2.22	2.38	2.55

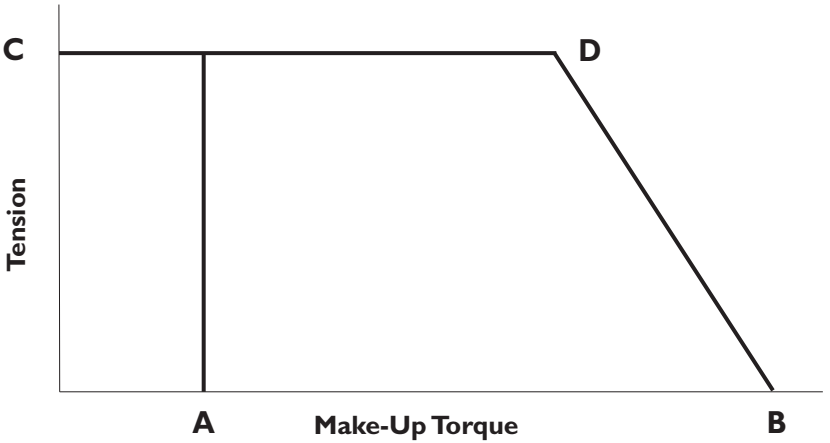
WT56

ID (inches)	OD (inches)								
	7.000	7.125	7.250	7.375	7.500	7.625	7.750	7.875	8.000
3.000	1.04	1.14	1.24	1.34	1.45	1.56	1.67	1.79	1.90
3.250	1.06	1.16	1.27	1.37	1.48	1.59	1.71	1.83	1.95
3.500	1.10	1.20	1.31	1.42	1.53	1.64	1.76	1.89	2.01
3.750	1.14	1.25	1.36	1.47	1.59	1.71	1.84	1.96	2.09
4.000	1.20	1.31	1.43	1.55	1.67	1.80	1.93	2.06	2.20
4.250	1.28	1.40	1.53	1.65	1.79	1.92	2.06	2.20	2.35
4.500	1.39	1.52	1.66	1.80	1.94	2.09	2.24	2.39	2.55
4.625	1.46	1.60	1.74	1.89	2.04	2.20	2.35	2.52	2.69

WT66

ID (inches)	OD (inches)								
	8.000	8.125	8.250	8.375	8.500	8.625	8.750	8.875	9.000
3.000	1.09	1.18	1.27	1.37	1.46	1.56	1.66	1.76	1.87
3.500	1.13	1.22	1.32	1.42	1.51	1.62	1.72	1.83	1.93
4.000	1.20	1.29	1.39	1.49	1.60	1.70	1.81	1.93	2.04
4.500	1.30	1.41	1.51	1.62	1.74	1.85	1.97	2.10	2.22
4.750	1.38	1.49	1.60	1.72	1.84	1.97	2.09	2.22	2.35
5.000	1.48	1.60	1.73	1.85	1.98	2.11	2.25	2.39	2.53
5.250	1.62	1.76	1.89	2.03	2.17	2.32	2.47	2.62	2.77
5.375	1.72	1.86	2.00	2.14	2.29	2.45	2.60	2.77	2.93

Tension Vs. Make-Up Torque For Wedge Thread Tool Joint



Tension Versus Make-Up Torque

Size	Tool Joint		A	B	C	D	
			Minimum Torque	Yield Torque/1.1	Tensile Yield/1.1	Transition Point	
	OD	ID				Torque	Tension
	Inches	Inches	1000 ft-lbs.	1000 ft-lbs.	1000 lbs.	1000 ft-lbs.	1000 lbs.
WT14S	3.375	1.975	2.8	10.1	285	7.3	285
WT23	3.125	1.500	2.2	9.5	352	6.5	352
WT23	3.375	1.500	2.2	9.5	352	6.5	352
WT26	3.375	1.750	2.8	11.2	378	7.7	378
WT31	4.125	2.000	6.1	26	634	19.1	634
WT38	4.750	2.500	9.0	37	825	27	825
WT38	4.750	2.563	9.0	37	797	27	797
WT38	5.000	2.563	9.0	37	797	27	797
WT39	5.000	2.813	10.0	42	827	30	827
WT39	5.125	2.813	10.0	42	827	30	827
WT40	5.375	3.125	12.0	49	907	36	907
WT40	5.500	3.125	12.0	49	907	36	907
WT46	5.875	3.500	15.0	64	1164	44	1164
WT46	6.000	3.500	15.0	64	1164	44	1164
WT46	6.250	3.500	15.0	64	1164	44	1164
WT50	6.625	3.625	23.0	99	1555	70	1555
WT50	7.000	3.875	23.0	99	1394	73	1394
WT50	7.000	4.000	23.0	99	1309	74	1309
WT54	7.000	4.375	25.0	109	1278	83	1278
WT56	7.000	4.375	27.0	119	1532	87	1532
WT56	7.000	4.500	27.0	119	1436	89	1436
WT56	7.000	4.625	27.0	119	1339	91	1339
WT56	7.250	4.625	27.0	119	1339	91	1339
WT66	8.000	5.375	35.0	153	1504	117	1504

Field Inspection (see page 10)

The Series 500 Wedge Thread drill pipe tool joint is a rugged connection and not as susceptible to field damage as most connections. Unlike conventional shouldering tool joints, the Wedge Thread creates a seal in the tapered thread of the small step rather than on the external shoulder. Because the threads create the seal, damage to the pin external shoulder or box face does not require re-facing or rejection of the joint. Typical running and handling damage to the Wedge Thread can be field repaired. Damage to the pin face, pin external shoulder, box face, and box internal shoulder can be hand dressed to remove any protrusion that would interfere with make-up of the mating threads. Shoulders should not be re-faced. Repair threads as needed. The thread surface can be dressed with a file or hand grinder and then wiped clean. The thread flanks, roots, and crests should have a relatively even surface. Inspect threads for:

- **Dents and mashed areas.** Damage that raises metal above the original surface will interfere with full engagement of pin and box and must be removed with a file or hand grinder.
- **Excessive galling and scoring.** Galling that wipes out threads or that cannot be dressed using a file or hand grinder will prevent proper thread engagement and is excessive.
- **Out-of-roundness that would prevent proper stabbing.** A connection that is exceedingly out-of-round will not stab deep and will develop torque prematurely.
- **Excessive rust or scale.** Build-up of corrosion products will prevent proper make-up of pin and box and should be removed. This can be done with a wire brush. Small pits and other local metal loss corrosion will not interfere with proper make-up or sealing and are not cause for rejection. However, the surface should be free of pits and other surface imperfections that exceed 1/16" in depth and 1/8" in diameter or extend more than 1 1/2" in length along the thread helix.
- **Thread protrusions.** Any burrs, raised corners, or other damage projecting outward from the thread surface should be hand dressed until the surface is even.

The Hydril Wedge Thread tool joint inspection procedure allows drilling crews to determine if the connection warrants repairs. Hydril's rugged design permits field repairing most of the damage encountered by the Wedge Thread, a repair procedure that is less expensive and time consuming than re-cutting the tool joint.

Shoulder Gap

The Hydril Series 500 Wedge Thread drill pipe tool joint is designed with a wear indicator gap between the box face and the external shoulder of the pin. This gap eliminates the reaction surface found in the torque shoulder of conventional tool joints. However, after repetitive make-up and break-out operations, the thread flanks wear permitting additional travel of the pin into the box. This leads to a smaller gap at the external shoulder and, eventually, an engagement between the face of the box and the thread wear indicator projecting from the pin shoulder. The protruding shape of the thread wear indicator was designed such that it would amply deform showing adequate signs of a nearly worn out connection. The purpose of the indicator is to provide an allowance of several make-and-breaks before the connection is fully worn out, and ultimately indicating when the connection should be re-cut. When the connection is fully worn out, there is full contact between the external pin shoulder and the face of the box.

After the thread wear indicator contacts the box face, the connection should be re-cut. Inspectors should check for:

- deformation on the wear indicator
- scoring marks on pin shoulder or box face
- burnish patterns on pin shoulder or box face
- gap closure

If any of the above indications are found on either the box or the pin end, then that end should be re-cut.

When calculating the string length, the gap between the box and the pin can be incorporated after the joints have been made up. New pipe will have a shoulder gap of approximately 3/16" to 1/4" (0.188" to 0.250")

Bevel Diameter

The bevel diameter provides an indication of tool joint OD wear. Hydril's Wedge Thread tool joint is designed to compensate for OD wear and reduction encountered during drilling applications. The tool joint retains full rated tension and torque strength with OD wear down to the bevel diameter. Allowance must be made for adequate tool joint OD wear to extend the life of the string.

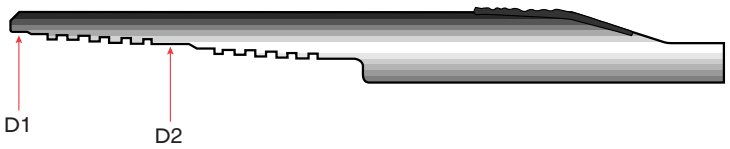
If hard banding is present, a smaller initial tool joint OD may be used. Often, the OD of the hard banding will be larger (proud) than the tool joint OD. The proud hard banding will absorb the wear during drilling. When the hard banding is reduced to the tool joint OD, the hard banding should be rebuilt. With this system, the proud hard banding replaces the wear allowance of large OD tool joints.

Box OD Swell and Ovality Guidelines

The Series 500 Wedge Thread drill pipe tool joint is a rugged connection and not as susceptible to over-torque or other field damage as conventional tool joints. However, gross over-torque of the tool joint or application of an excessive amount of thread compound can cause swelling of the box. If there is indication of box swelling or out-of-roundness, it is recommended that box counterbore diameters be checked.

There are two locations to be measured, the counterbore diameter at the face of the box, D1, and the counterbore diameter immediately behind the large step thread, D2. If either has a maximum diameter that is larger than the maximum acceptable value shown in the table, the box should be re-cut.

	Maximum Counterbore Diameter	
	D1 (inches)	D2 (inches)
WT14S	3.090	Not Applicable
WT23	2.765	2.415
WT26	2.980	2.630
WT31	3.685	3.145
WT38	4.295	3.755
WT39	4.510	3.970
WT40	4.820	4.280
WT46	5.390	4.850
WT50	5.940	5.360
WT54	6.180	5.600
WT56	6.430	5.850
WT66	7.155	6.575



Thread Compound

The Series 500 Wedge Thread drill pipe tool joint creates a seal in the threads rather than on the external shoulder. Because the threads and lubricant are used to create the seal, selection and application of the thread compound warrants individual attention. The following procedures should be used when running Hydril Wedge Thread tool joints:

- **Compounds That Contain Solid Fillers Are Required** - These tool joints use a thread lubricant seal system for both internal pressure and external pressure. Solid particles dispersed in the thread compound provide the fillers necessary to create the seal.
- **Arctic Grade Compound Is Recommended During Freezing Weather** - Normal compounds can become stiff at low temperatures, leading to an excessive amount of compound applied to the tool joint. A compound that can be applied at low temperatures using a bristle brush is recommended.
- **Application** - When picking up the drill pipe for the initial run into the hole, apply an even coating of thread compound over the entire pin thread. There is no need to dope the box - thread compound will be carried into the box by the pin thread. After the first trip, apply compound sparingly to the pin or re-distribute the existing compound around the pin without adding thread compound. A stress reduction groove is located in the root of the large step of the pin to prevent excess thread compound build up.

Zinc tool joint compounds and copper/graphite tool joint compounds have been used extensively on Hydril Wedge Thread tool joints. These compounds will provide proper performance for the life of the tool joint.

Initial Make-up Procedure (Break-In)

Hydril has not found it necessary to use a standard break-in procedure. Initial break-in of the connection is performed on the first trip into the hole and should include slowly making up the pin, with its application of thread compound, to the targeted torque. No make and break or low torque break-in is required.

Make-Up Torque

The Wedge Thread tool joint has a very broad range of acceptable make-up torques. Many operators prefer a make-up torque 10-20% higher than the expected operating torque. When the expected operating torque is relatively low, using a make-up torque at the lower end of the range provides several benefits:

1. The lower make-up torques will result in less wear on the make-up equipment, i.e. hydraulic tongs, rig tongs, iron roughnecks, etc.
2. A lower make-up torque requires fewer turns to make-up from the hand tight position to the power tight position. This can reduce the running time.
3. The lower make-up torque will reduce the wear on the tool joint itself, thus extending the life of the string.

Since additional torque does not produce additional tensile stress in the pin, downhole make-up will not create excessive stress in the tool joint. For this reason, using a lower make-up torque while tolerating subsequent downhole make-up is recommended.

Top Drive Make-Up

When making-up the top drive to a drill pipe tool joint box, maintain top drive spin mode while slowly lowering the top drive. Upon tagging up, continue slacking-off to allow thread engagement. Maintaining rotation of the top drive while lowering it into the box will reduce stabbing damage.

Back-Up Tong Distance From Face

The Wedge Thread box tong length provides about the same unthreaded length as available on API tool joints. The box tong length on the Wedge Thread tool joint is greater than that for API in order to both accommodate the longer box and provide adequate gripping length without the need to get over the thinnest section of the box. Hydril's recommendation for gripping the box is to be no closer to the face of the box than shown in the table below:

Tool Joint	Minimum Length From Box Face
WT14S	1"
WT23	1"
WT26	1"
WT31	2"
WT38	2"
WT39	2"
WT40	2"
WT46	2"
WT50	2"
WT54	2"
WT56	2"
WT66	2"

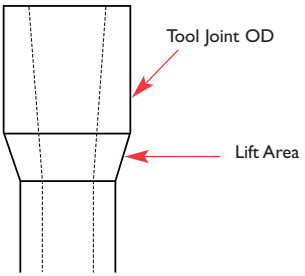
These distances will be adequate to prevent crushing of the box. However, since the connection can tolerate considerable OD wear without loss of torque strength and there is a very broad range for make-up torque, use of worn OD strings at very high make-up torques may require adjustment.

Alignment and Standing Back

The Hydril Wedge Thread tool joint is a two-step connection, which allows deep stabbing on make-up. However, even with this advantage, proper alignment of the pipe in the stand with the box in the floor is crucial. Excessive make-up speed could be damaging and should be avoided. Ocean currents as well as windy weather can impair proper alignment and drilling crews need to use extra care when working in these conditions. Hydril's rugged tool joints are designed as thread sealing connections, making them less susceptible to damage during the standing back process.

Elevators

Hydril tool joints are intended for use with conventional 18° bottleneck elevators. The diameter of the box at the elevator upset (Dte) is the same as that on conventional tool joints using API upsets. For those Wedge Thread tool joints that are welded on to non-API upsets, special elevator bores may be needed. In cases where the lift area of the tool joint (see diagram) is not sufficient, lifting plugs should be used in conjunction with collar type elevators.



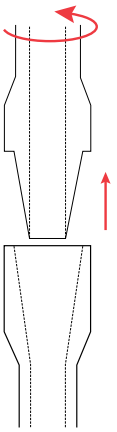
Characteristic Break-Out Torques

Hydril Wedge Thread tool joints generally have break-out torques approximately equal to the make-up torques. When downhole make-up occurs, the break-out torque will be higher than the make-up torque. During extended reach drilling operations, downhole make-up is not uncommon and break-out torques can become very large.

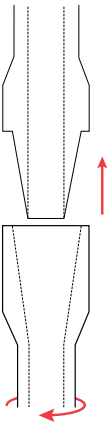
Lift-Out

During break-out of the Hydril Wedge Thread tool joint, the negative load flank of the thread can become hooked on the box. The pin will lift out of the box more smoothly and possibly avoid thread damage if a lift-out, or de-stabbing, guide is used. After spin-out the lift-out guide is placed straddling pin and box. As the pin is lifted out of the box, the guide maintains centering between pin and box permitting trouble-free lift-out.

The pin will also lift out of the box more smoothly if the pipe is still rotating slightly to the left as the pin is hoisted. If that is not practical, rotate the pin a half turn past the drop back position prior to lift out. Rotating the box to the right (drilling direction), as with a rotary table, while lifting the pin end out will serve the same purpose.



Left Rotation of Pin with Lift-Out



Right Rotation of Box with Lift-Out

Free Point and Back-Off

When using a free-point and string shot back-off system, the shot size and procedure should be the same as the shot size and procedure used for a comparable size API tool joint. When a string shot is used in backing-off operations, swelling of the connection may occur. To determine the extent of this swelling in the pin, make-up a good box with the pin retrieved from the well. If a good box will make-up onto this pin with little resistance and with no unusual standoff, that pin is good and can continue to be used. In addition, minimal swelling of the box downhole may be assumed. If a good box will not make-up with the pin without excessive standoff, the pin retrieved is oversize and should be set aside for re-cutting. Continued use of an oversize pin could cause a good mating box to split.

Upon retrieving the backed-off box, if the box is not rejected for fishing tool damage, the box counterbore diameter should be inspected for swelling using the criteria covered in Inspection. A swollen box should be set aside for re-cutting.

In some instances, a string shot will be set off across a tool joint without backing off the string at that location. The location in the drill string that the string shot was made should be noted so the tool joint exposed to the shot can be inspected immediately upon recovery. A tool joint that has been exposed to an excessively large shot charge can cause swelling in the tool joint without any obvious indication of damage. Continued used of a swollen box can result in a parted string due to inadequate thread engagement. Continued use of an oversize pin could cause a good mating box to split.

Minimum Blanking Dimensions and Re-Cut Length Loss

The blanking dimensions for the Hydril Wedge Thread tool joint provide minimum material dimensions for initial threading. ODs shown provide very little wear allowance and are the minimum diameters that can be threaded. The IDs shown are the maximums that can be threaded. Tool joint ODs consistent with the tool joints in the rest of the string are recommended. The length shown provides no allowance for re-cut. Add the appropriate length for the desired re-cut potential.

Re-cut loss is that length of tong area that will be lost when the wedge thread is re-cut. Existing threads are used during re-cut unless the tool joint has suffered severe damage and thus greater length is required.

Blanking Dimensions

Connection	Minimum Material Dimensions			Re-Cut Loss
	OD	ID	Length	
	in. (-0.031)	in. (+ 0.016)	in.	in.
WT14S	3.250	1.975	4.60	0.87
WT23	3.000	1.500	5.94	0.70
WT26	3.250	1.750	5.94	0.70
WT31	4.000	2.000	7.87	0.87
WT38	4.750	2.563	7.87	0.87
WT39	5.000	2.813	7.87	0.87
WT40	5.250	3.125	7.87	0.87
WT46	5.875	3.500	7.87	0.87
WT50	6.500	4.000	8.64	0.99
WT54	6.750	4.375	8.64	0.99
WT56	7.000	4.625	8.64	0.99
WT66	8.000	5.375	8.64	0.99

Minimum Tong Space (see page 11)

The recommended minimum tong space for used API tool joints is provided in API RP 7G, section 12.10.2.e. This same criteria is applied to the Wedge Thread tool joint with the values for the longer Wedge Thread shown in the table below. For the pin, the minimum space is the greater of either 75% of the tool joint OD or 4". For the box, the minimum space is equal to the length of the thread plus 1" for non-hardbanded boxes. As stated in RP 7G, the tong space may need to be greater for hardbanded joints.

	Minimum Recommended Tong Space (inches)										
	WT14S	WT23 WT26	WT31	WT38	WT39	WT40	WT46	WT50	WT54	WT56	WT66
PIN (L_{pb})	4	4	4	4	4	4	4 1/2	5 1/4	5 1/4	5 1/2	6
BOX (L_b)	5	6 1/4	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	9	9	9	9

Converting API to Wedge Thread

The Hydril Wedge Thread tool joint occasionally can be cut over existing API tool joints. The API tool joint ODs must not be smaller and the IDs must not be larger than the values shown in the blanking dimensions table.

Kellyguard™ Valve Information

Hydril's Kellyguard is a manually operated ball valve used to close the bore of the drill string to flow. Hydril designed and developed the one piece Kellyguard to serve the full range of kelly valve applications: upper kelly cock, top drive kelly cock, lower kelly cock, drill pipe safety valve, and mud saver. The compact, one piece assembly offers high pressure sealing, high tension strength, high torsional strength, and durability.

Kellyguard and Wedge Thread Tool Joint Options

Kellyguard Size	Valve				Crossover			
	OD	Ball ID	Pin	Box	OD	ID	Pin	Box
	inches	inches			inches	inches		
3	4 3/4 4 3/4 4 3/4 4 15/16	1 3/4 1 3/4 1 3/4 2 1/16	WT26 WT31 WT38 WT38	WT38 WT38 WT38 WT38	4 3/4 4 3/4	2 1/8 2 1/8	WT38 WT38	WT26 WT31
3 1/2	5 3/8 5 3/8 5 3/8 6 1/8	2 1/4 2 1/4 2 1/4 2 1/4	WT38 WT39 WT40 WT46	WT40 WT40 WT40 WT46	5 3/8 5 3/8	3 3	WT40 WT40	WT38 WT39
4 1/4	6 5/8 6 5/8 6 5/8	2 13/16 2 13/16 2 13/16	WT40 WT46 WT50	WT46 WT46 WT50	6	3 1/2	WT46	WT40
5 1/4	7 3/8 7 3/8 7 3/8 7 3/8 7 3/4 8	3 1/16 3 1/16 3 1/16 3 1/16 3 1/16 3 1/16	WT40 WT46 WT50 WT54 WT56 WT66	WT50 WT50 WT50 WT54 WT56 WT66	6 1/2 6 1/2	3 1/2 4	WT50 WT50	WT40 WT46
6	10 1/2	5	WT84	WT84				

On some Kellyguard and Wedge Thread combinations, the desired Wedge Thread size is available on both valve pin and box. However, on other combinations, the bore on the box end of the one piece valve body prevents using the desired Wedge Thread box. In these cases, a larger size Wedge Thread with its larger box ID must be used on the box end of the valve. A crossover sub is then used on the box end of the valve to cross back to the smaller Wedge Thread size. For example, the 3 1/2" Kellyguard is available with a WT40 thread on both pin and box. No crossover is needed. However, if the 3 1/2" valve is desired with a WT38 connection, the valve is threaded with a WT38 pin and a WT40 box. A WT40 pin by WT38 box sub is then bucked-on to the box end of the valve to crossover to the desired WT38 connection. The valve and crossover sub are handled as a unit. When it is necessary to replace the internal components of the valve, the sub is bucked-off and repairs made.

Index of Tables

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