ConocoPhillips, ZIA HILLS 19 FEDERAL COM 102H

1. Geologic Formations

TVD of target	**11,994'**	Pilot hole depth	N/A
MD at TD:	**22,270'**	Deepest expected fresh water:	300

Basin

Formation	Depth (TVD) from KB	SSTVD (ft.)	Water/Mineral Bearing/Target Zone	Hazards *
Quaternary Fill	Surface	0	Water	
Base of Fresh Water	300	300	Water	
Rustler	1,119	2060	Water	
Top of Salt / Salado	1,279	1900	Mineral	
Castile	2,629	550	Mineral	
Delaware Top / Base Salt	4,229	-1050	O & G	
Ford Shale	4,354	-1175	O & G	
Cherry Canyon	5,154	-1975	O & G	
Brushy Canyon	6,629	-3450	O & G	
Bone Springs	8,029	-4850	O & G	
Bone Springs 3rd Carb	10,339	-1760	O & G	
WolfCamp	11,379	-8200	O & G	
WolfCamp 1	11,604	-8425	O & G	

*H2S, water flows, loss of circulation, abnormal pressures, etc.

2. Casing Program

ConocoPhillips Company respectfully requests to approve the following 3-string casing and cementing program with the 8-5/8" casing set in the Bone Spring 3rd Carb. The intent for the casing and cementing program:

- Drill 14-3/4" surface hole to Rustler.
- Drill 10-5/8" hole from Rustler to Bone Spring 3rd Carb with the same density mud (OBM or Saturated Brine).
- Case and cement the well with 11-3/4" surface, 10-5/8" intermediate and 5-1/2" production casing (3-strings).
- Isolate the Salt & Delaware utilizing Annulus Casing Packer and Stage Tool with 2-Stage Cement or Remediate with Bradenhead Squeeze if necessary.
- Bring cement for 11-3/4" casing and 8-5/8" casing to surface. Cement 5-1/2" casing to lap inside 8-5/8" casing shoe.
- 5-1/2" TXP buttress Casing Connection in 7-7/8" OH for minimum of 0.422 in clearance per Onshore Oil and Gas Order #2 III.B.

ConocoPhillips, ZIA HILLS 19 FEDERAL COM 102H

Hole Size	Casing Interval From	Casing Interval To	Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14.75"	0	1170	11.75"	47.0	J55	BTC	2.89	5.87	15.4
10.875"	0	11420	8.625"	32.0	P110	BTC	**2.04	1.55	3.53
7.875"	0	22270	5.5"	20.0	P110	TXP	1.48	1.69	2.26
				BLM Minimum Safety Factor			1.125	1.00	1.6 Dry 1.8 Wet

**COP Collapse Design: 1/3 Partial Evacuation to the next casing depth (TVD).

All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

Must have table for contingency casing

	Y or N
Is casing new? If used, attach certification as required in Onshore Order #1	Y
Does casing meet API specifications? If no, attach casing specification sheet.	Y
Is premium or uncommon casing planned? If yes attach casing specification sheet.	Y
Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria).	Y
Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing?	Y
Is well located within Capitan Reef?	N
If yes, does production casing cement tie back a minimum of 50' above the Reef?	
Is well within the designated 4 string boundary.	
Is well located in SOPA but not in R-111-P?	Y
If yes, are the first 2 strings cemented to surface and 3rd string cement tied back 500' into previous casing?	Y
Is well located in R-111-P and SOPA?	N
If yes, are the first three strings cemented to surface?	
Is 2nd string set 100' to 600' below the base of salt?	
Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

3. Cementing Program

Option 1:

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H_20 gal/sk	500# Comp. Strength (Estimated hours)	Slurry Description
Surf.	470	13.5	1.68	8.94	8	**Lead:** Class C + 4.0% Bentonite + 0.2% Anti-Foam + 2.0% CaCl2 +0.125lb/sk LCM + 0.1% Dispersant.
	240	14.8	1.35	6.38	7	**Tail:** Class C + 0.2% Anti-Foam + 0.1% Lost Circ Control
Inter.	800	11.0	2.7	16.5	18	**Lead:** Class C 75.00 lb/sk BWOB D049 + 1.00 % BWOB D013 Retarder + 10.00 % BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti foam + 2.00 % BWOB D154 Extender + 0.15 % BWOB D208 Viscosifier
	570	13.5	1.29	6.02	7	**Tail:** Class C 75.00 lb/sk BWOB D049 + 0.50 % BWOB D013 Retarder + 1.00 % BWOB D020 Extender + 3.00 lb/sk WBWOB D042 Extender + 0.02 gal/sk VBWOB D047Anti foam + 0.10 % BWOB D065 Dispersant + 0.13 lb/sk WBWOB D130 Lost Circulation + 0.30 % BWOB D238 Fluid loss
Prod.	2290	16.4	1.08	4.38	10	**Tail:** Class H + 1.00 % BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti Foam + 0.10 % BWOB D065 Dispersant + 0.15 % BWOB D255 Fluid loss + 0.30 % BWOB D800 Retarder
	DV/ACP Tool: NO					

Option 2:

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H_20 gal/sk	500# Comp. Strength (Estimated hours)	Slurry Description
Surf.	470	13.5	1.68	8.94	8	**Lead:** Class C + 4.0% Bentonite + 0.2% Anti-Foam + 2.0% CaCl2 +0.125lb/sk LCM + 0.1% Dispersant.
	240	14.8	1.35	6.38	7	**Tail:** Class C + 0.2% Anti-Foam + 0.1% Lost Circ Control
Inter.	370	11.0	2.7	16.5	18	**Lead:** Class C 75.00 lb/sk BWOB D049 + 1.00 % BWOB D013 Retarder + 10.00 % BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti foam + 2.00 % BWOB D154 Extender + 0.15 % BWOB D208 Viscosifier

	570	13.5	1.29	6.02	7	**Tail:** Class C 75.00 lb/sk BWOB D049 + 0.50 % BWOB D013 Retarder + 1.00 % BWOB D020 Extender + 3.00 lb/sk WBWOB D042 Extender + 0.02 gal/sk VBWOB D047Anti foam + 0.10 % BWOB D065 Dispersant + 0.13 lb/sk WBWOB D130 Lost Circulation + 0.30 % BWOB D238 Fluid loss
	DV/ACP Tool: 4,200'					
	420	11.0	3.10	19.03	15	**2nd Stage Lead:** Class 'C' + 2.00 % BWOB Extender + 3.40 lb/sk WBWOB D042 Extender + 0.02 gal/sk VBWOB D047 Anti Foam + 2.00 % BWOB D079 Extender + 5.00 % BWOB D154 Extender + 1.00 % BWOB S001 CaCl2
Prod.	2290	16.4	1.08	4.38	10	**Tail:** Class H + 1.00 % BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti Foam + 0.10 % BWOB D065 Dispersant + 0.15 % BWOB D255 Fluid loss + 0.30 % BWOB D800 Retarder
	DV/ACP Tool: NO					

DV tool depth(s) will be adjusted based on hole conditions and cement volumes will be adjusted proportionally. DV tool will be set a minimum of 50 feet below previous casing and a minimum of 200 feet above current shoe. If it cannot be set below the shoe, a CBL shall be run to verify cement coverage.

Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC	% Excess in OH
Surface	0'	>100%
Intermediate	0'	>30%
Production	10,200'	>15%

Include Pilot Hole Cementing specs: NO PILOT HOLE.
Pilot hole depth N/A
KOP

Plug top	Plug Bottom	% Excess	No. Sacks	Wt. lb/gal	Yld ft3/sack	Water gal/sk	Slurry Description and Cement Type

4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	✓	Tested to:
10-5/8"	11" or 13-5/8"	10M	Annular	x	50% of working pressure
			Blind Ram	x	100% of working pressure
			Pipe Ram	x	
			Double Ram	x	
			Other*		
7-7/8"	11" or 13-5/8"	10M	Annular	x	50% of working pressure
			Blind Ram	x	100% of working pressure
			Pipe Ram	x	
			Double Ram	x	
			Other*		

*Specify if additional ram is utilized.
Note: A 11" or 13-5/8" BOPE will be utilize depending on availability and Rig Substructure Clearance.

BOP/BOPE will be isolated from the casing and tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. BOPE controls will be installed prior to drilling under the surface casing and will be used until the completion of drilling operations. The intermediate interval and the production interval will be tested per 10M working system requirements.

Pipe rams will be operationally checked each 24-hour period. Choke manifold will have one remotely operated valve and a manual adjustable valve in front of the choke manifold, as detailed in the Onshore Order 2. It currently contains one 10M hydraulic choke for a total of three choke branches (two manual and one hydraulic). Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

A Spudder Rig may be used to drill the surface and/or intermediate hole for economical reason depending on availability.

The wellhead will be installed and tested as soon as the surface casing is cemented. Prior to drilling out the surface casing, ConocoPhillips shall nipple up a 10M BOPE & choke arrangement with 10M components and test to the rated working pressure of a 10M BOPE system as it is subjected to the maximum anticipated surface pressure 5781 psi. The pressure test to MASP and 50% for annular shall be performed with a test plug after installing the casing head and nippling up the 5M BOPE system prior to drilling out the surface casing.

However, ConocoPhillips shall nipple up a 10M BOPE with 5M Annular Preventer if drilling out surface casing with Primary Rig.

Y	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart. • See attached data sheet & certification.
N	Are anchors required by manufacturer?
Y	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested. • See attached schematic.

5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	1,170	Spud Mud	8.34 - 8.6	32-36	N/C
0	11420	Cut-Brine or OBM	8.6-9.4	30-40	≤5
0	22,270	Oil Base Mud	9.5-13.5	30-40	≤5

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?	PVT/MDTotco/Visual Monitoring

6. Logging and Testing Procedures

Logging, Coring and Testing.	
x	GR from 200' above KOP to TD (GR as part of the BHA while drilling).
	No Logs are planned based on well control or offset log information.
	Drill stem test? If yes, explain
	Coring? If yes, explain
x	Dry samples taken 30' from intermediate 1 casing point to TD.

Additional logs planned		Interval
	Resistivity	
	Density	
	CBL	
x	Mud log	
	PEX	

7. Drilling Conditions

Condition	Specify what type and where?

BH Pressure at deepest TVD	8420 psi
Abnormal Temperature	No

Mitigation measure for abnormal conditions. Describe. Lost circulation material/sweeps/mud scavengers.

Hydrogen Sulfide (H2S) monitors will be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.	
N	H2S is present
Y	H2S Plan attached

8. Other facets of operation

Is this a walking operation? If yes, describe. Yes, please see below.
Will be pre-setting casing? If yes, describe. Yes, please see below.

Spudder Rig and Batch Drilling Operations:

A blind flange cap of the same pressure rating as the wellhead will be secured to seal the wellbore on all casing strings. Pressure will be monitored via flanged port tied to a needle valve and pressure gauge to monitor pressures on each wellhead section and a means for intervention will be maintained while the drilling rig is not over the well.

Attachments:

Attachment#1:	Directional Plan.
Attachment#2:	Wellbore Casing & Cementing Schematic.
Attachment #3:	Special (Premium) Connections.
Attachment#4:	Wellhead Schematic.
Attachment #5:	BOP Schematic.
Attachment #6:	Choke Schematic.
Attachment #7:	Flex Hose Documentation.
Attachment #8:	Rig Layout.

Option 2:

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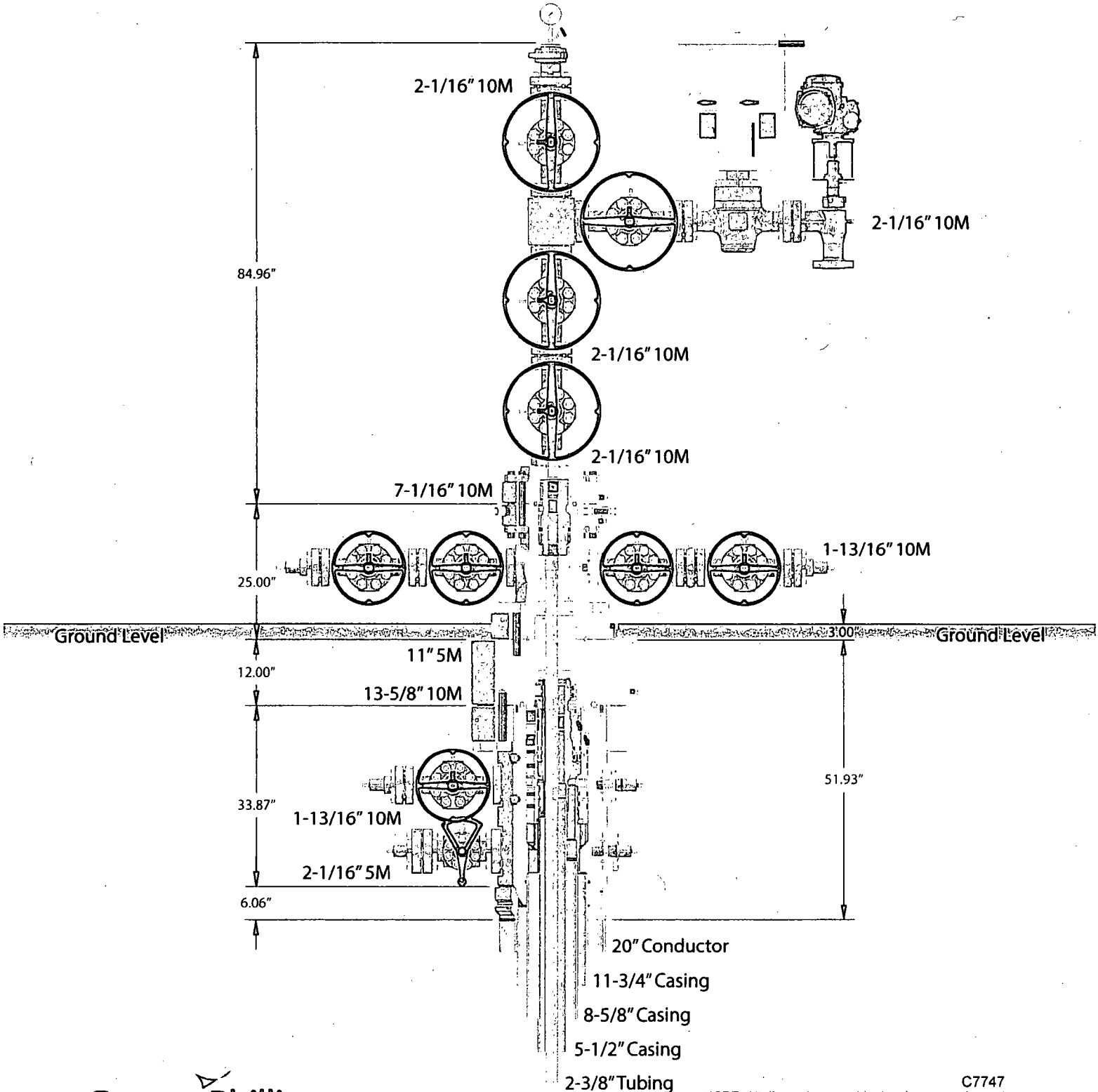
	DV/ACP Tool: NO					

ZIA HILL 19 PAD #1

CAMERON
A Schlumberger Company

13-5/8" 10M MN-DS Wellhead System
with CXS Completion



ConocoPhillips

C7747

NOTE: All dimensions on this drawing are estimated measurements and should be evaluated by engineering.

Attachment #7

Continental CONTITECH

Hose Data Sheet

CRI Order No.	516273
Customer	ContiTech Beattie Co.
Customer Order No	PO5438 STOCK
Item No.	3
Hose Type	Flexible Hose
Standard	**API SPEC 16 C**
Inside dia in inches	3
Length	35 ft
Type of coupling one end	FLANGE 4 1/16" API SPEC 6A TYPE 6BX FOR 10000 PSIBX155 RING GROOVE
Type of coupling other end	FLANGE 4 1/16" API SPEC 6A TYPE 6BX FOR 10000 PSI BX155 RING GROOVE
H2S service NACE MR0175	Yes
Working Pressure	10 000 psi
Design Pressure	10 000 psi
Test Pressure	15 000 psi
Safety Factor	2,25
Marking	USUAL PHOENIX
Cover	NOT FIRE RESISTANT
Outside protection	St.steel outer wrap
Internal stripwound tube	No
Lining	OIL RESISTANT
Safety clamp	No
Lifting collar	No
Element C	No
Safety chain	No
Safety wire rope	No
Max.design temperature [°C]	100
Min.design temperature [°C]	-20
MBR operating [m]	1,60
MBR storage [m]	1,40
Type of packing	WOODEN CRATE ISPM-15

Continental ContiTech

Fluid Technology

Quality Document

QUALITY CONTROL INSPECTION AND TEST CERTIFICATE

CERT. N°:	184		
PURCHASER:	ContiTech Beattie Co.	P.O. N°:	006438
CONTITECH ORDER N°:	516273	HOSE TYPE:	3" ID Choke and Kill Hose
HOSE SERIAL N°:	61477	NOMINAL / ACTUAL LENGTH:	10,67 m / 10,71 m

W.P. 68,9 MPa 10000 psi	T.P. 103,4 MPa 15000 psi	Duration: 60 min.

Pressure test with water at ambient temperature

See attachment. (1 page)

↑ 10 mm = 10 Min

→ 10 mm = 20 MPa

COUPLINGS Type	Serial N°		Quality	Heat N°
3" coupling with	10178	10173	AISI 4130	20231
4 1/16" 10K API Flange end			AISI 4130	33051

NOT DESIGNED FOR WELL TESTING

API Spec 16 C

Temperature rate:"B"

All metal parts are flawless

WE CERTIFY THAT THE ABOVE HOSE HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE TERMS OF THE ORDER INSPECTED AND PRESSURE TESTED AS ABOVE WITH SATISFACTORY RESULT.

STATEMENT OF CONFORMITY: We hereby certify that the above items/equipment supplied by us are in conformity with the terms, conditions and specifications of the above Purchaser Order and that these items/equipment were fabricated inspected and tested in accordance with the referenced standards, codes and specifications and meet the relevant acceptance criteria and design requirements.

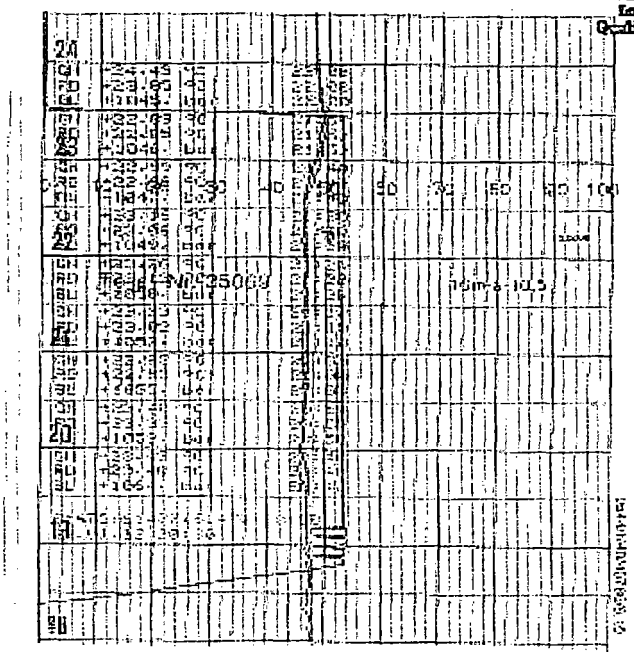
COUNTRY OF ORIGIN HUNGARY/EU

Date:	Inspector	Quality Control
30. January 2012.		ContiTech Rubber Industrial Kft. Quality Control Dept. (1) [signature]

ATTACHMENT OF QUALITY CONTROL INSPECTION AND TEST CERTIFICATE *No: 182, 184, 185*

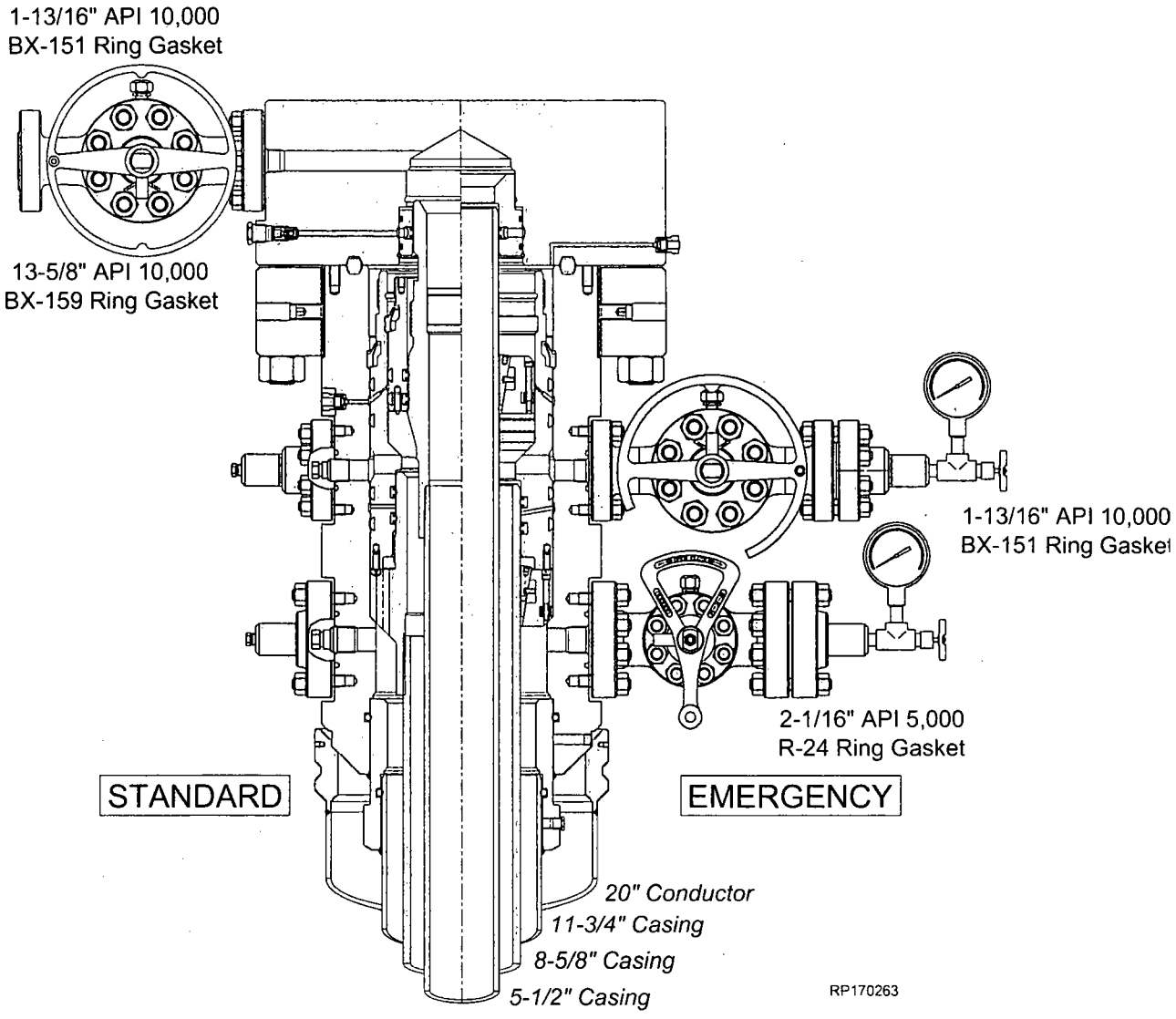
Page: 1 / 1

CastiTech Rubber Industrial Kft.
Quality Control Dept.



RUNNING PROCEDURE

ConocoPhillips
Permian



Surface Systems Publication

CAMERON A Schlumberger Company	**13-5/8" 10K MN-DS System** **20" x 11-3/4" x 8-5/8" x 5-1/2" Casing Program**	**RP-003766** **Rev 01**

Safety Hazard Indicators

The Safety Hazard Indicators listed below will be used throughout this procedure to indicate potentially hazardous and/or personnel risks that may be encountered during the performance of the tasks outlined in this procedure.

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
NOTICE	Preferred to address practices not related to personal injury

ES-000175-02

This version of the document completely replaces any other version, published or unpublished. Document revision information is indicated on the bottom of each page.

To confirm the correct version is in use, make sure the revision and release date match those on the controlled version of the document in SAP. Refer to the Document Control page for the document revision history.

NOTE: This document alone does not qualify an individual to Install/Run the Equipment. This document is created and provided as a reference for Qualified Cameron Service Personnel and does not cover all scenarios that may occur.

Table of Contents

Table of Contents

RUNNING PROCEDURE GENERAL WARNING

READ AND UNDERSTAND ALL INSTRUCTIONS. Failure to follow may result in serious personal injury and damage not only to the equipment but also the environment.

1. Safety is a combination of staying alert, common sense, and experience with the oil field equipment and environment. Read this Running Procedure prior to operating and installing the equipment. Be familiar with the operation terminologies of oil field equipment.
2. This document includes basic installation guidance. **The field service personnel shall be fully trained in all aspects of handling pressure control equipment as well as of the job that they are going to perform.** If any of the procedures and policies listed in this procedure cannot be followed, contact a Cameron Representative for the best course of action.
3. Proper **Personal Protective Equipment (PPE)** shall be utilized according to Company policies. Always use proper tools when servicing the equipment.
4. A **Job Hazard Analysis (JHA)** must be performed prior to beginning any service on a well location. A JHA review meeting will be held with all affected rig personnel PRIOR to the commencement of work to review the results of the JHA, evacuation routes, emergency contacts, etc. All meeting attendees and a Company Representative will sign-off on the JHA to acknowledge this meeting has taken place
5. **Be aware of unexpected circumstances** that may arise when operating or servicing the equipment. Utilize the **Step Back 5X5 Process** in order to assess the hazards posed before, during, and after the servicing of equipment under pressure or with the potential of hazardous chemicals present. Be familiar with the company's and facility's Lockout/Tagout program in order to ensure all sources of energy (i.e. electrical, pneumatic, pressure) are isolated and/or de-energized prior to beginning work.
6. All **governmental or Company safety requirements** shall be met before working on the equipment. **Requirements of fully tested pressure barriers prior to servicing the equipment shall be observed. Cameron recommends that two mechanical pressure barriers is the preferred practice.** Additional precautions should be taken to ensure that the mechanical pressure barriers are functioning correctly prior to any work being carried out on this particular equipment.
7. Always check for any **trapped pressure** before servicing the equipment. All valves downstream of the pressure barriers must be cycled several times to release any trapped pressure.
8. Ensure the chemical and physical properties of the fluid flow product inside the equipment are known. Obtain applicable **Material Safety Data Sheets (MSDS)** for commonly encountered chemicals such as hydrogen sulfide, cements, etc. in order to identify appropriate PPE to use, emergencies, procedures, and methods or exposure control.
9. Always use **correct lifting devices** and follow safety rules in handling heavy products. The actual weight can vary for the system configurations. Never attempt to lift the equipment by hand.
10. Cameron manufactures a variety of oil field equipment with different features and operating requirements. Be certain of the equipment model and refer to the appropriate procedure, before attempting any operation or service on the equipment. **This procedure is to assist field personnel in the operation and installation of the equipment that is listed in this document. Different procedures are available for other oil field products.**

SD-045055-01 Rev 01 - RP General Warning M. Contreras 25/OCT/2010

HSE Hand Safety Rules

1. **No Hands on Loads**
   Select the appropriate device to control the load
2. **Hands on Handles Only**
   Use manufacturers handles or safe alternatives
3. **Permission to Touch**
   Use lifting assistance/technology for loads > 20kg or 44 lbs
4. **Hands Off...Energy On**
   Remove hands from load BEFORE setting in motion
5. **Safe Cargo Handling**
   Use pallets & crates designed to prevent tip over or loss of load
6. **Use the Correct PPE**
   Use the right glove for the job (chemical, hot work, impact, etc.)

HSE VISION: NO ONE GETS HURT; NOTHING GETS HARMED — HEALTH, SAFETY & ENVIRONMENT

HSE Tenets of Operation

Stop Work
Stop work immediately until unsafe behaviors and conditions are addressed.

Leadership & Accountability
Hold each other accountable for working safely and complying with applicable regulations.

Follow Procedures
Maintain all training and follow established HSE policies and practices.

PPE
Always wear the correct Personal Protective Equipment for the task.

Report ALL Incidents
Immediately report incidents, including injuries, illnesses, property damage, near misses, and environmental releases.

Equipment Operations
Always operate equipment and vehicles with safety devices enabled, and never beyond their capabilities, environmental limits, or designed purposes.

HSE Observations
Recognize safe behaviors and conditions, and address those at-risk.

Ask
Ask questions when in doubt, and for assistance when dealing with new or unusual situations.

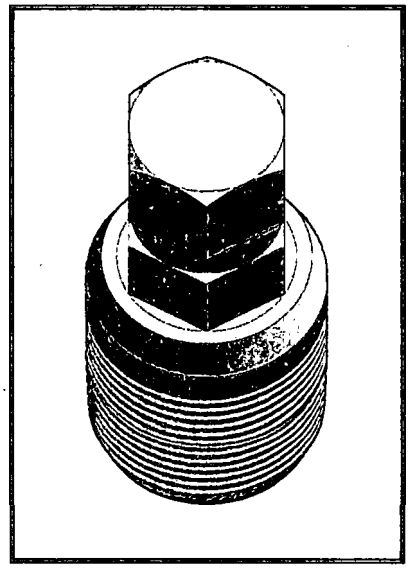
HSE VISION: NO ONE GETS HURT; NOTHING GETS HARMED — HEALTH, SAFETY & ENVIRONMENT

Valve Removal Plugs

For Installation and Removal of Valve Removal Plugs Refer to:

Publication: RP-001558

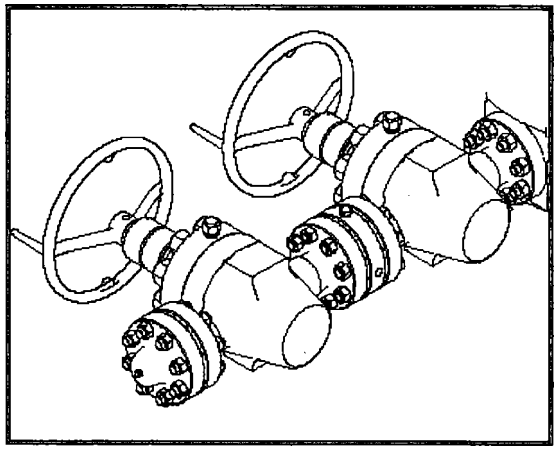
(Assembly Procedure for VR Plugs and Recommended Torque Values)



Make-up Requirements for API Flange Connections

For Make-up Requirements for API Flange Connections Refer to:

Publication: RP-002153

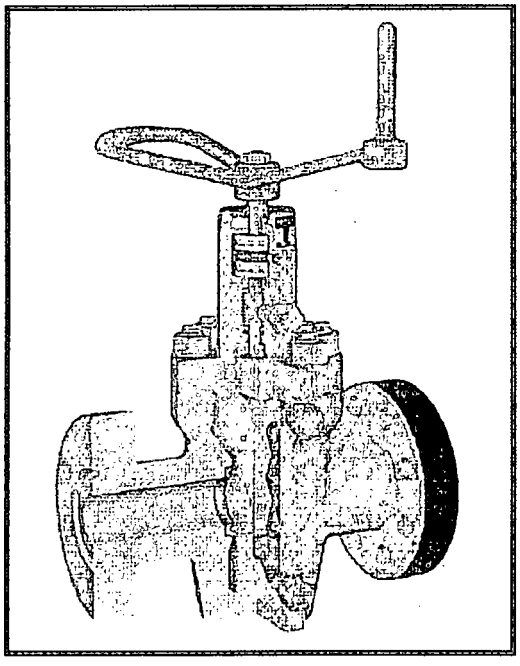


WKM Model M Power R- Seal Gate Valves

For Operation and Maintenance refer to:

Publication: TC9084-2

(Operation and Maintenance Manual)



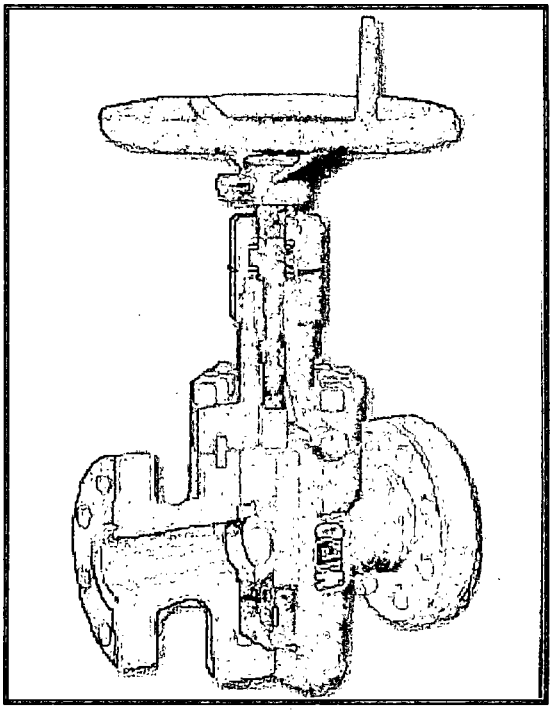
TC9084-2

Cameron Type FL & FLS Gate Valves

For Operation & Maintenance Refer to:

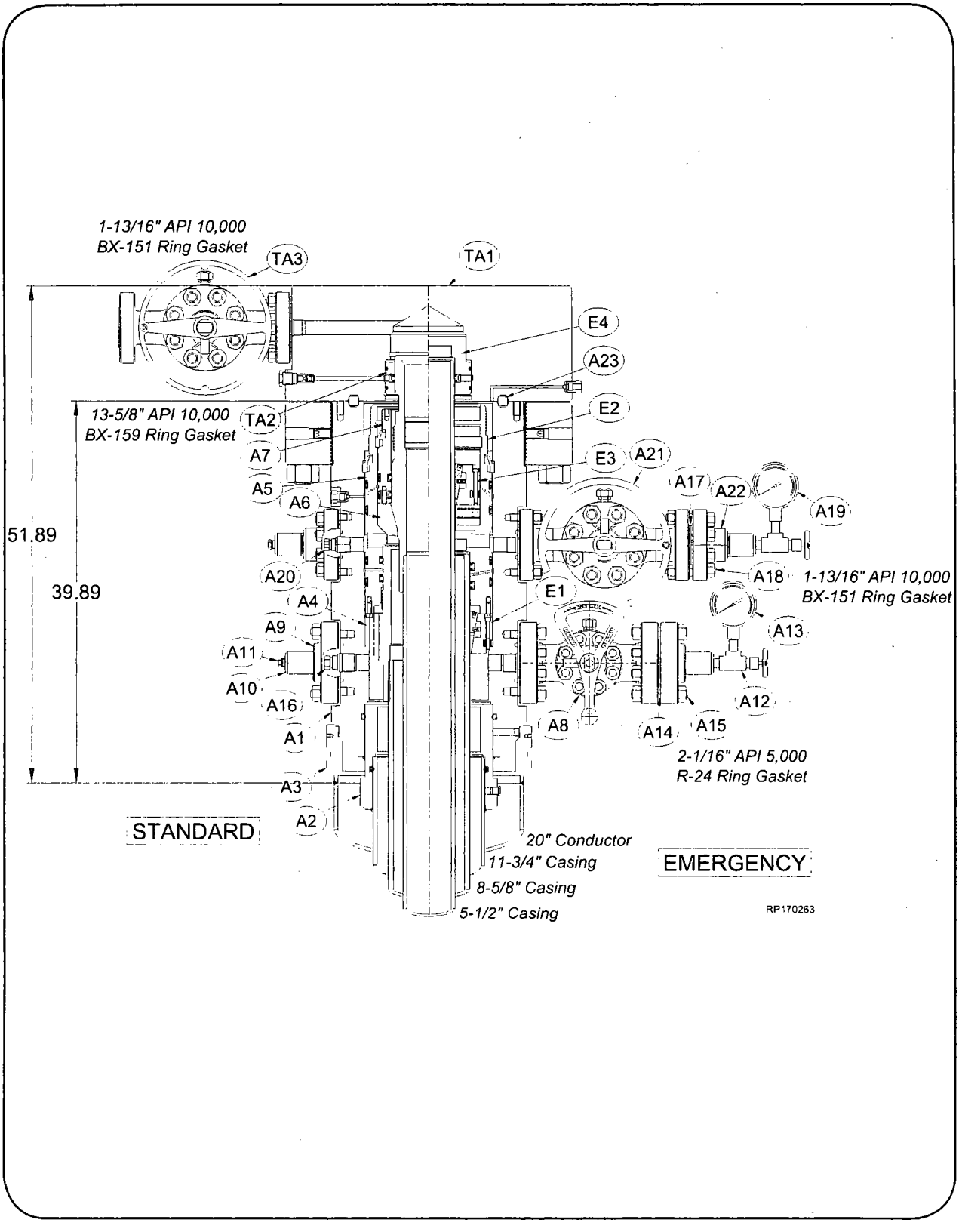
Publication: TC148-2

(FL & FLS Gate Valves Operation and Maintenance Manual)



TC148-2

System Drawing



Bill of Materials

NOTE **Contact your Cameron representative for replacement part inquiries. Cameron personnel can check the latest revision of the assembly bill-of-material to obtain the appropriate and current replacement part number.**

MN-DS HOUSING

Item	Qty	Description
A1	1	Conversion; Casing Head Housing, Type 'Mn-Ds', 10K, 13-5/8 Nom 10K Oec BX-159 w/ 20.500-4TPI LH Stub Acme Top f/ Thded Flg and Prep f/ Internal Snap Ring x 13-3/8 SOW Btm w/ Four Grout Ports, w/ (2) Upper 1-13/16 API 10K BX-151 Outlets w/1-1/4 API Vr Thds Part# 2031060-48-02
A2	1	Body, Bushing Reducer,13-3/8 SOW x 11-3/4 SOW Part# 2310058-03-01
A3	1	Body, Load Ring f/ 20 Casing (.375 C.S. Casing) To Accept Low Pressure Adapter Part# 2329761-07-01
A4	1	Casing Hanger, Mandrel, Type 'Mn-Ds', 13-5/8 Nom x 8-5/8 API BC Box Thd Btm x 10.000-4TPI L.H Stub Acme Running Thd, Min Bore: 8.000, 10,000 Psi Max Working Pressure, 700,000 Lbs Max Hanging Load Part# 2345509-17
A5	1	Assy; Packoff Support Bushing, Type MN-DS', 13-5/8 10K, w/ 13-5/8 Nom Dovetail Seal, and 9-5/8 Nom 'T' Seal and w/ Internal and External Lock Ring Prep, Min. Bore 8.835 Part# 2161673-01-01
A6	1	Rotating Mandrel Hanger, Type 'MN-DS'; 11 Nom, 5-1/2 20 Lb/Ft Tenaris XP Buttress Box Thd Btm X 7.500- 4 TPI Stub ACME Running Thd w/ 5.010 OD type 'H' BPV Thd w/ 7 Nom Slick Neck Top, w/ FLow-by Slots; Min Bore: 4.754 Part# 2345649-49-01

MN-DS HOUSING

Item	Qty	Description
A7	1	Assy; Seal Packoff f/ 11 Nom Type 'Mn-Ds', w/ 9.875-4TPI LH Stub Acme Thd w/ 7.75 Dbl 'T' Seals At ID and Dovetails At OD Part# 2217588-05-03
A8	1	Gate Valve, Manual, Model M Pow-R-Seal, 2-1/16 Bore, 5K Psi Psi, 2-1/16 API Flg x Flg Part# 2148451-31-22
A9	2	Companion Flange, 2-1/16 API 5K x 2" API LP Thd Part# 142362-01-03-02
A10	4	Bull Plug 2" LP w/1/2 NPT x 3.750" Lg Part# 007481-01
A11	2	Bleeder Fitting, Plug 1/2 NPT 4140 Nace Part# 2738068-02
A12	2	Needle Valve, 1/2 NPT 10000 Psi Part# 006818-23
A13	1	Pressure GaugE 0-5M Liquid Filled Part# Y52100-00300791
A14	3	Ring Gasket, R-24 Part# 702001-24-02
A15	8	Stud w/(2) Nuts 7/8" x 6" Lg Part# Y51201-20220301
A16	1	VR Plug 1-1/2 In 11-1/2 TPI - 3/4 TPF 'Vee' Tubing Thd, 2-1/16 2K - 10K Part# 2222164-02-01
A17	3	Ring Gasket, BX-151 Part# 702003-15-12
A18	8	Stud w/(2) Nuts, 3/4"-10 x 5-1/4" Lg Part# Y51201-20120201
A19	1	Pressure Gauge 0-10M Liquid Filled Part# Y52100-00301391

MN-DS HOUSING

Item	Qty	Description
A20	1	VR Plug 1-1/4 LP Thd, 1-13/16 2K - 10K Part# 2222164-01-01
A21	1	Gate Valve, Manual, Model FLS, 1-13/16 Bore, 10K Psi, 1-13/16 API Flg x Flg Part# 141510-41-91-01
A22	2	Companion Flange, 1-13/16 API 10K w/ 2" API Line Pipe, 5000 Psi WP Part# 142359-01-03-02
A23	1	Ring Gasket, BX-159 Part# 702003-15-92

Bill of Materials

NOTE **Contact your Cameron representative for replacement part inquiries. Cameron personnel can check the latest revision of the assembly bill-of-material to obtain the appropriate and current replacement part number.**

SERVICE TOOLS

Item	Qty	Description
ST1	1	Conversion Assy; Casing Head Torque Tool, f/ 'MN-DS' w/ Lift Plate, 13-3/8 In API 8Rnd Short Thread Casing Box Thread Top X .750-10UNC (16) Bolt Pattern Btm, (8) Torque Pins, Min Bore: 12.605 Part# 2143701-75
ST1A	1	Conversion Body; Lift Plate for Casing Head Torque Tool w/ Exrt 14.75 Stub ACMERng Thd and (2) OD O-ring Seals Part# 2143700-76
ST2	1	Assy; Test Plug, Type "C" 13-5/8" Nom f/ Use In Cactus Head w/ WQ Seal 4-1/2" IF Box X 4-1/2" IF Pin Btm, w/ Weep Hole On Top Portion Of Test Plug Part# 2247044-01-01
ST3	1	Weldment and Assy; Wear Bushing Running & Retrieving Tool IC-2,13-5/8" Nom x 4-1/2" IF Box Btm x Top Part# 2301310-02
ST4	1	Assy; Wear Bushing, f/ 13-5/8" Nom 10K Type 'Mn-Ds' Housing, Installed w/ (4) O-Rings & (4) Welded Stop Lugs Min Bore: 12.615 Part# 2367788-02
ST5	1	Assy; Running Tool, 13-5/8" Nom, w/ 8-5/8 BC Box Thd Top x 10.000-4TPI LH Stub Acme Running Thd Btm, C/ W Single O-Ring and (3) Centralizing Ribs, Min Bore: 8.00 Part# 2161757-98-01
ST6	1	Assy; Jetting Tool, 13-5/8" Nom Compact Housing, Type 'SSMC' Part# 2125914-01

SERVICE TOOLS

Item	Qty	Description
ST7	1	Running Tool, 'MN-DS' Type f/ 13-5/8" Nom Pack-off Support Bushing w/ 4-1/2" API IF Thd Top x 4-1/2" API IF Thd Btm and 12.375" 4-TPI LH Stub Acme Thd, Safe Working Load: 275K Lbf Part# 2017712-10-01
ST8	1	Assy; Test Plug, Type 'IC', 11" Nom 4-1/2" IF Box X Pin Btm, w/ Weep Hole On Top Portion Of Test Plug, w/(2)Dovetail Seal Grooves Part# 2247042-07-01
ST9	1	Weldment and Assembly, Retrieving Tool, 11" In Nom x 4-1/2" IF Box Btm x Top, Min Bore: 4.19" Part# 2367902-01-01
ST10	1	Assy; Wear Bushing, f/ 11" Nom Type 'MN-DS', Min Bore: 8.910" Part# 2125720-06
ST11	1	Assy; Rotating Fluted Mandrel Hanger Running Tool, TSDS-S; 11 Nom X 7.500-4TPI Stub ACME Thd Btm X 5-1/2 23 Lb/Ft TSH Blue Box Thd Top, w/ 1/8-27 NPT Test Port Part# 2161757-83-01
ST12	1	Running Tool; F/ 11 Nom Seal Assembly w/ 4-1/2 API IF Thd Top X 2-7/8 API IF Thd Btm and 9.875-4 TPI LH Stub ACME Thd Part# 2017712-15-01
ST13	1	Assy; Casing Head Running Tool; 14.750-4 TPI LH Internal Stub ACME Thd Btm X 11-3/4 API 8Rnd Short Thd Casing Box Thd Top; Min Bore: 11.359 Part# 2254468-04-01
ST14	1	Assy; Low Pressure Adapter; 24.00 OD X22.740 ID Part# 2222008-06-01

EMERGENCY EQUIPMENT

Item	Qty	Description
E1	1	Assy; MN-DS-IC-1 Casing Slip, 13-5/8 Nom X 8-5/8 Casing; w/ Holes F/ Antirotation Pins, (Control Height) Part# 2161741-09-01
E2	1	Assy; Emergency Bushing Packoff Support, 'MN-DS', 13-5/8, w/ 13-5/8 Dovetail; 8-5/8 'T' Seals, w/ Internal and External Lockring Prep; 10K Service Part# 2161673-20-01
E3	1	Assy; Casing Hanger, IC-2, 11" x 5-1/2", (f/ 10K Above and Below) Part# 2357372-01-01
E4	1	Assy. 'NX' Bushing Nom 11" x 5-1/2" OD Csg w/ Integral Bit Guide Part# 2161829-02-01

CAPPING FLANGE

Item	Qty	Description
TA1	1	Assy; Capping Flg, 7-1/16" API 10K BX-156 Std'd Blind Top x 13-5/8" API 10K BX-159 Std'd Btm, w/ One 1-13/16" API 10K BX-151 Std'd Side Outlet, w/ 1-13/16" API Vr Thd, w/ 11" 'NX' Btm Prep, Oal: 12" Part# 2392883-03-01
TA2	1	Assy 'NX' Bushing Nom 11" w/ 7" OD Csg Part# 608783-17
TA3	1	Gate Valve, Manual, Model FLS, 1-13/16 Bore, 10K Psi, 1-13/16 API Flg x Flg Part# 141510-41-91-01

Stage 1.0 — 20" Conductor

SAFETY NOTE: Always wear proper PPE (Personal Protective Equipment) such as safety shoes, safety glasses, hard hat, gloves, etc. to handle and install equipment.

⚠ CAUTION Threaded Devices should *NEVER* be routinely tightened under pressure. This includes: Flange Bolting, Pipe Plugs, Bull Plugs, Union Nuts, Tiedown/Lockscrew Glands.

⚠ CAUTION Use of Teflon tape is prohibited. Use appropriate thread compound/sealant only. TS-73; PN: 687950-38-31-26, TF-15; PN: 687950-39-31-26, Liquid O-Ring 104G or any other thread sealant approved by Cameron Engineering.

1.1. Install the Load Ring

1.1.1. Run the 20" Conductor and space out as required.

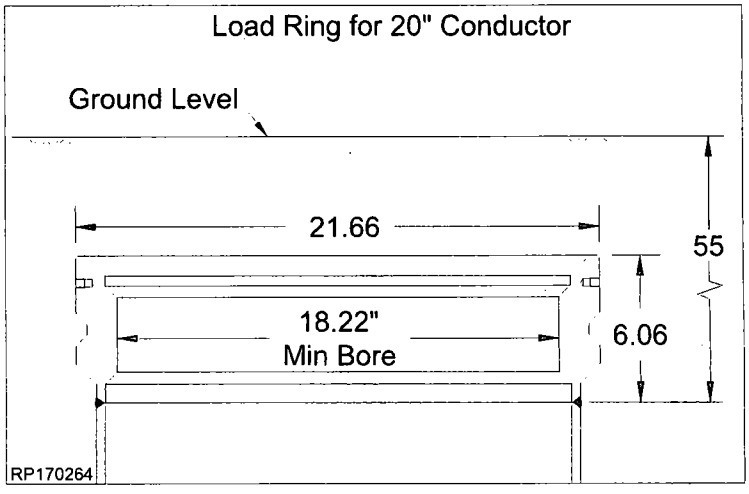
1.1.2. Cut the 20" Conductor 55" below the ground level.

1.1.3. Examine the ***Load Ring (Item A3).*** Verify the following:

- bore is clean and free of debris
- seal area is clean and undamaged

1.1.4. Install the Load Ring as required.

1.1.5. Weld Load Ring to conductor after Load Ring is landed on conductor.



NOTE: The weld should be a fillet type weld with legs no less than the wall of the casing. Legs of 1/2" to 5/8" are adequate for most jobs.

Refer to the *Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal* found at the back of this procedure for details of the welding and testing procedure.

Stage 1.0 — 20" Conductor

1.2. Install the Low Pressure Adapter

1.2.1. Examine the ***Low Pressure Adapter (Item ST14).*** Verify the following:

- bore is clean and free of debris
- seals are properly installed, clean and undamaged
- all (24) set screws are retracted from the bore

1.2.2. Orient the assembly as illustrated.

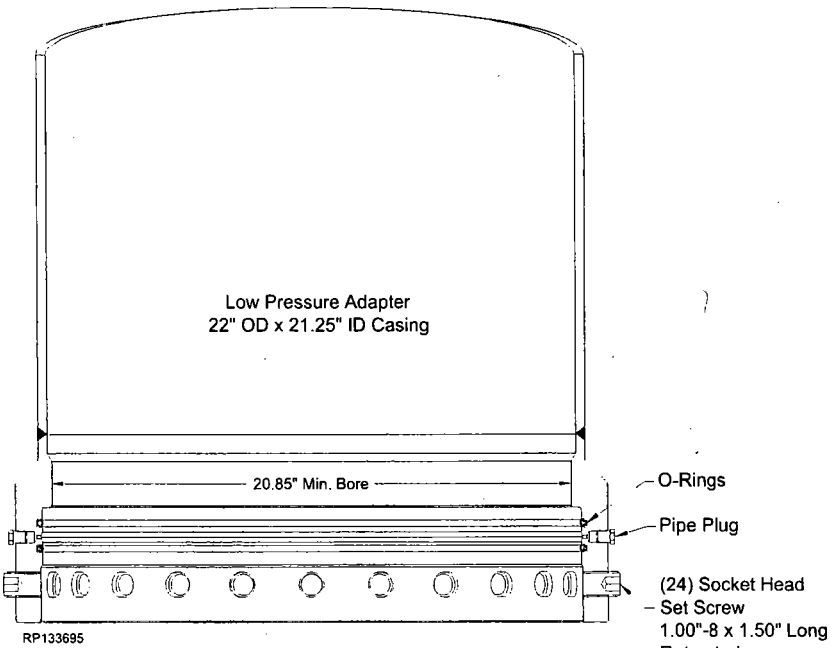
1.2.3. Wipe the ID of the Adapter seals with a light coat of oil.

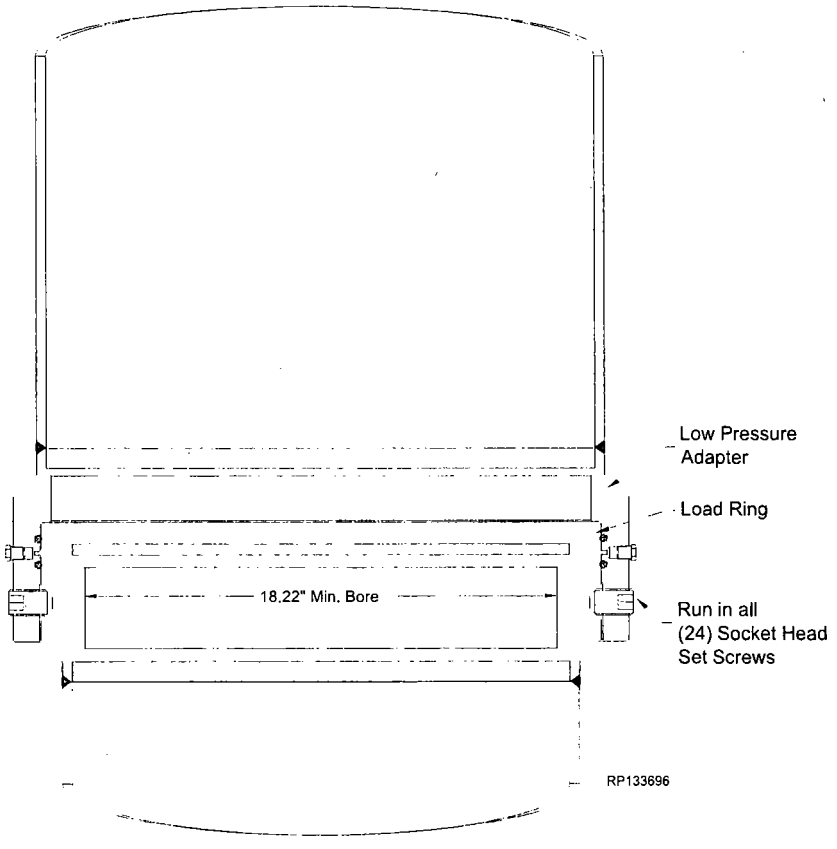
NOTE Excessive oil may prevent a positive seal from forming.

1.2.4. Carefully slide the Adapter over the Load ring and land it on top of the load ring.

⚠WARNING Be careful not to damage the o-rings.

1.2.5. Run in all (24) set screws into the Load ring as required.





Stage 1.0 — 20" Conductor

1.3. Test Between the Seals of the Low Pressure Adapter

1.3.1. Locate the test ports on the OD of the Adapter and remove one fitting.

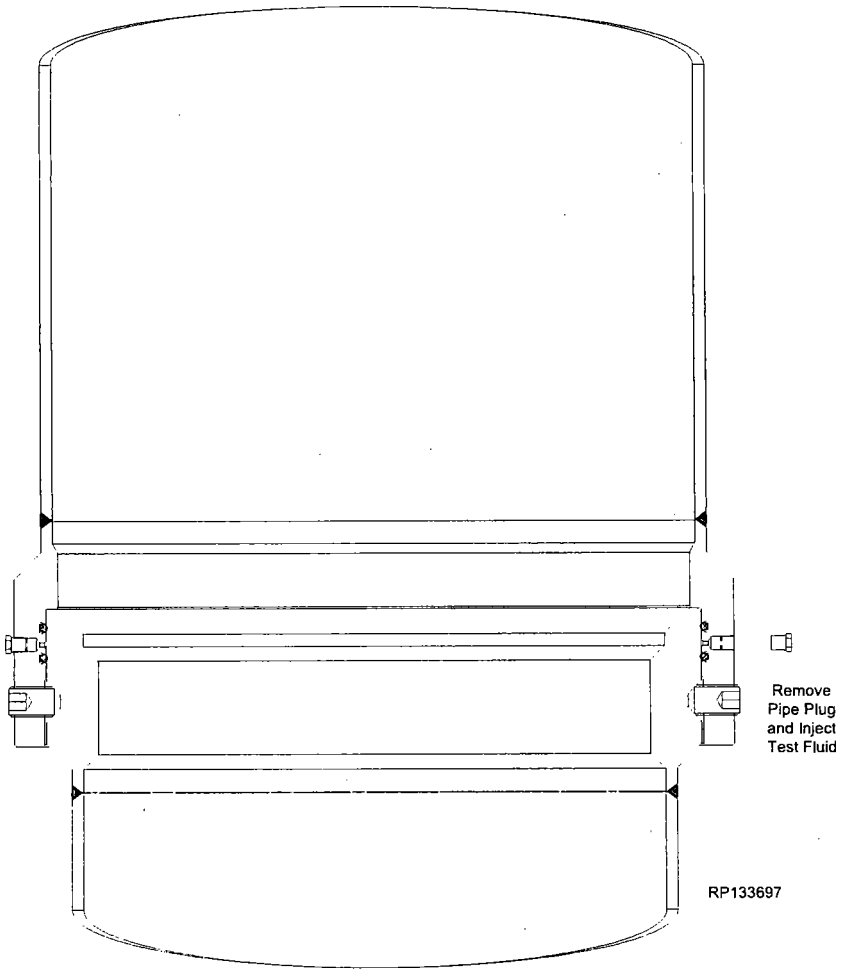
1.3.2. Install a hydraulic test pump to the open test port and inject test fluid to ***2,000 psi***

⚠WARNING Do Not over pressurize!

1.3.3. Hold and monitor the test pressure for fifteen minutes or as required by the Drilling Supervisor.

1.3.4. Once a satisfactory test is achieved, carefully bleed off all test pressure, remove the test pump and reinstall the fitting.

1.3.5. Reinstall the pipe plug.



Stage 2.0 — 11-3/4" Casing

2.1. Install the Casing Head Housing

2.1.1. Run the 11-3/4" casing and space out as required. Retrieve the landing joint.

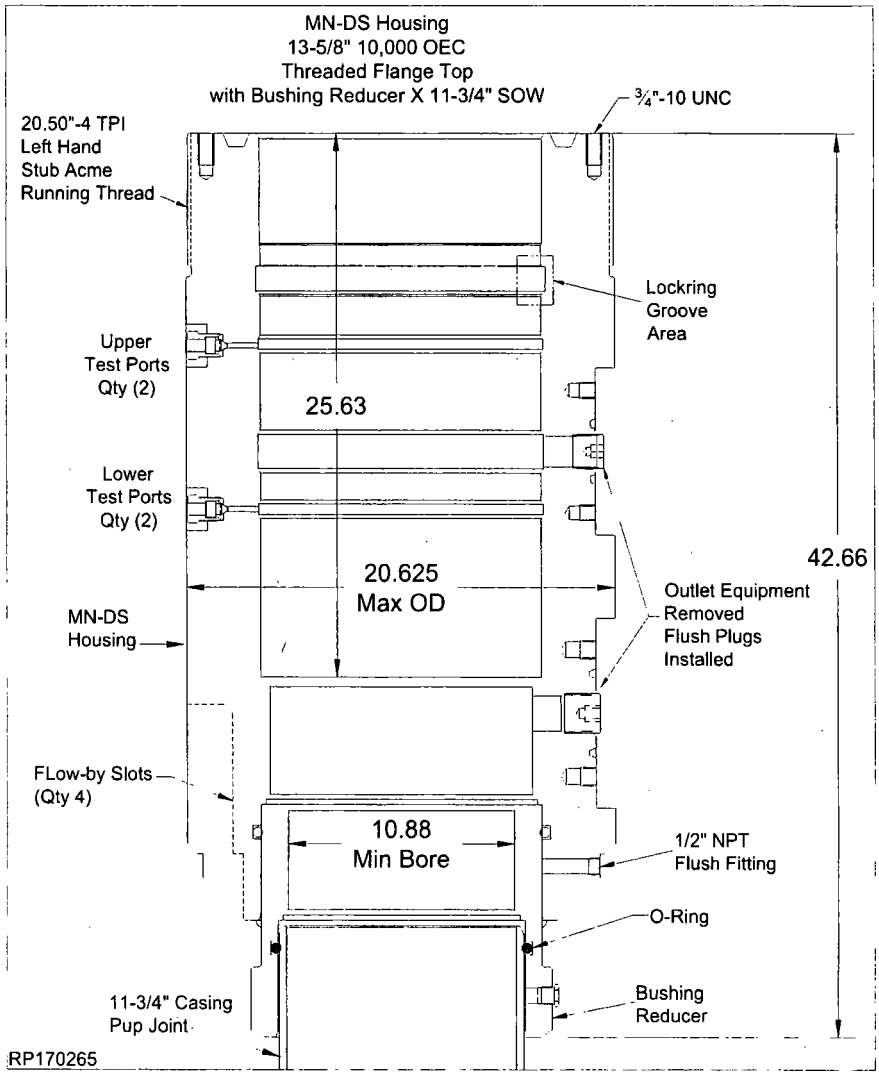
NOTE Lift plate, Running Tool, Landing Joint, Casing Head Housing, and Bushing Reducer(Step 2.1.2. through 2.1.9.) will be made up offline and shipped to location as one assembly.

OFFLINE

2.1.2. Examine the ***MN-DS Housing (Item A1)***. Verify the following:

- bore is clean and free of debris
- ring groove and seal areas are clean and undamaged
- all threads are clean and undamaged
- flow-by slots (4) are clean and free of debris
- casing pup joint is properly installed and pin connection is undamaged
- ***Bushing Reducer (Item A2)*** is properly welded onto the casing head
- ***Lift Plate and Running Tool Assembly (Item ST1A & ST13)*** are properly installed onto the top of the Housing
- outlet equipment removed and flush plugs are installed

2.1.3. Orient the assembly as illustrated.



OFFLINE

2.1.4. Examine the ***Lift Plate and Running Tool Assembly (Item ST1A & ST13).*** Verify the following:

- bore is clean and free of debris
- all threads are clean and undamaged
- o-rings are properly installed, clean and undamaged

2.1.5. Make up a landing joint to the top of the Lift Plate/Running Torque Tool Assembly.

NOTE Landing joint may be made up to the running tool in advance.

2.1.6. Wipe the o-ring of the Lift Plate and the ID of the Casing Head with a light coat of oil.

NOTE Excessive oil may prevent a positive seal from forming.

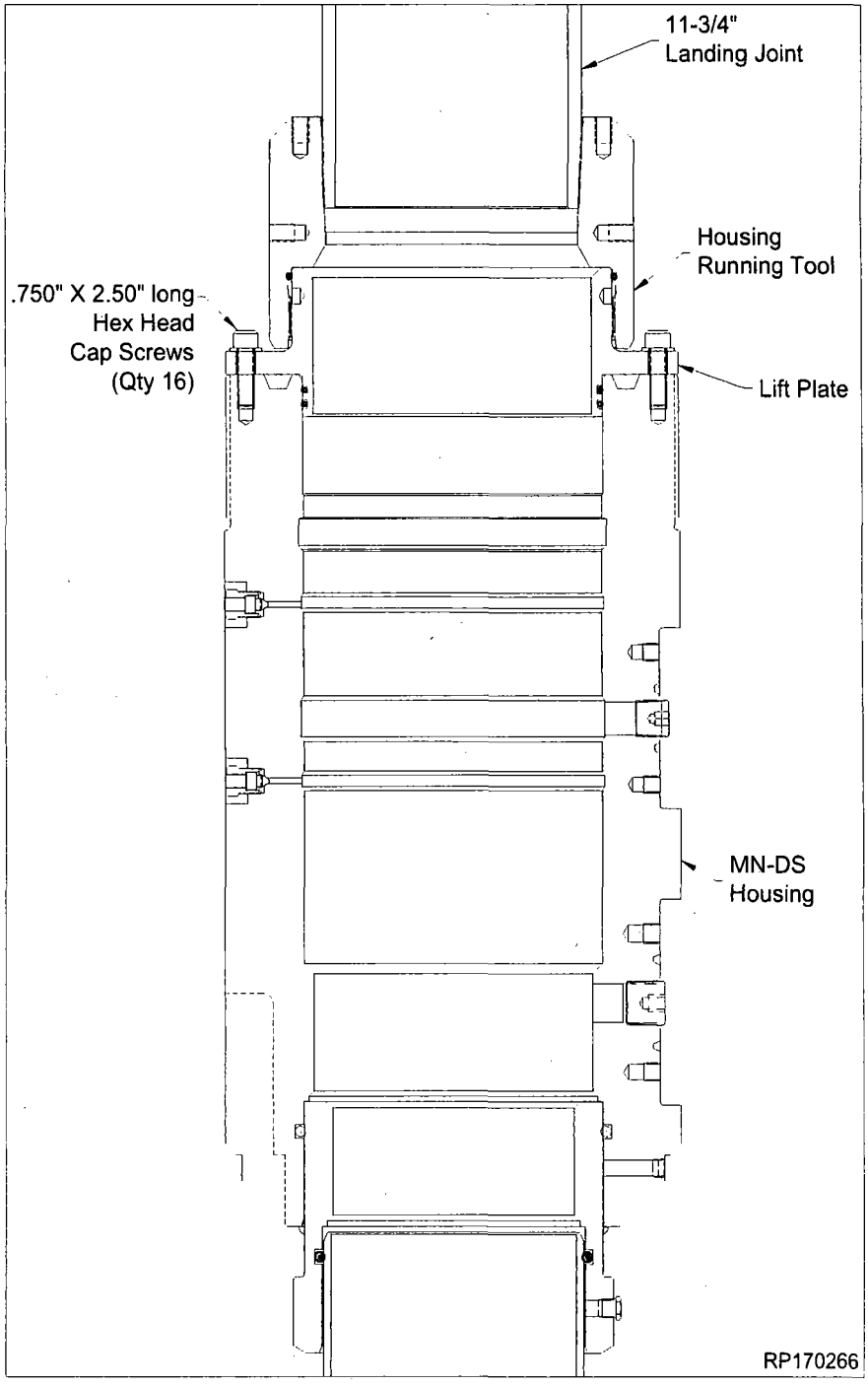
2.1.7. Lift and suspend the Assembly over the Casing Head.

2.1.8. Lower the Assembly into the Casing Head and align the cap screw holes on the Lift Plate and the threaded holes on the Casing Head.

2.1.9. Run in all (16) cap screws to a positive stop to hold the Assembly and the Casing Head together.

NOTE Cap screws will be made up and torqued offline per API 6A (referenced in the torque chart at the back of this manual).

NOTE Ensure the pin threads of the pup joint are protected by a metal protector



2.1.10. Remove the thread protector from the pin thread of the pup joint in the bottom of the MN-DS Assembly.

NOTE Do NOT remove thread protector until pup joint is ready to be made up to casing.

Stage 2.0 — 11-3/4" Casing

2.1.11. Lower the MN-DS Assembly until the mating threads of the 11-3/4" casing and the pin threads of the pup joint make contact.

2.1.12. Balancing the weight of the Assembly, such that it is unloaded, rotate the Assembly first to the left until the threads have aligned and then to the right to the thread manufacturer's recommended optimum torque.

WARNING Ensure Running Tool connection to Housing is not back off during make up of the pup joint to the casing string.

NOTE Max torque 20,000 ft/lbs.

2.1.13. Pick up and release Casing from floor slips.

2.1.14. Remove the rotary table bushing on the rig floor to allow enough room to pass the MN-DS Assembly.

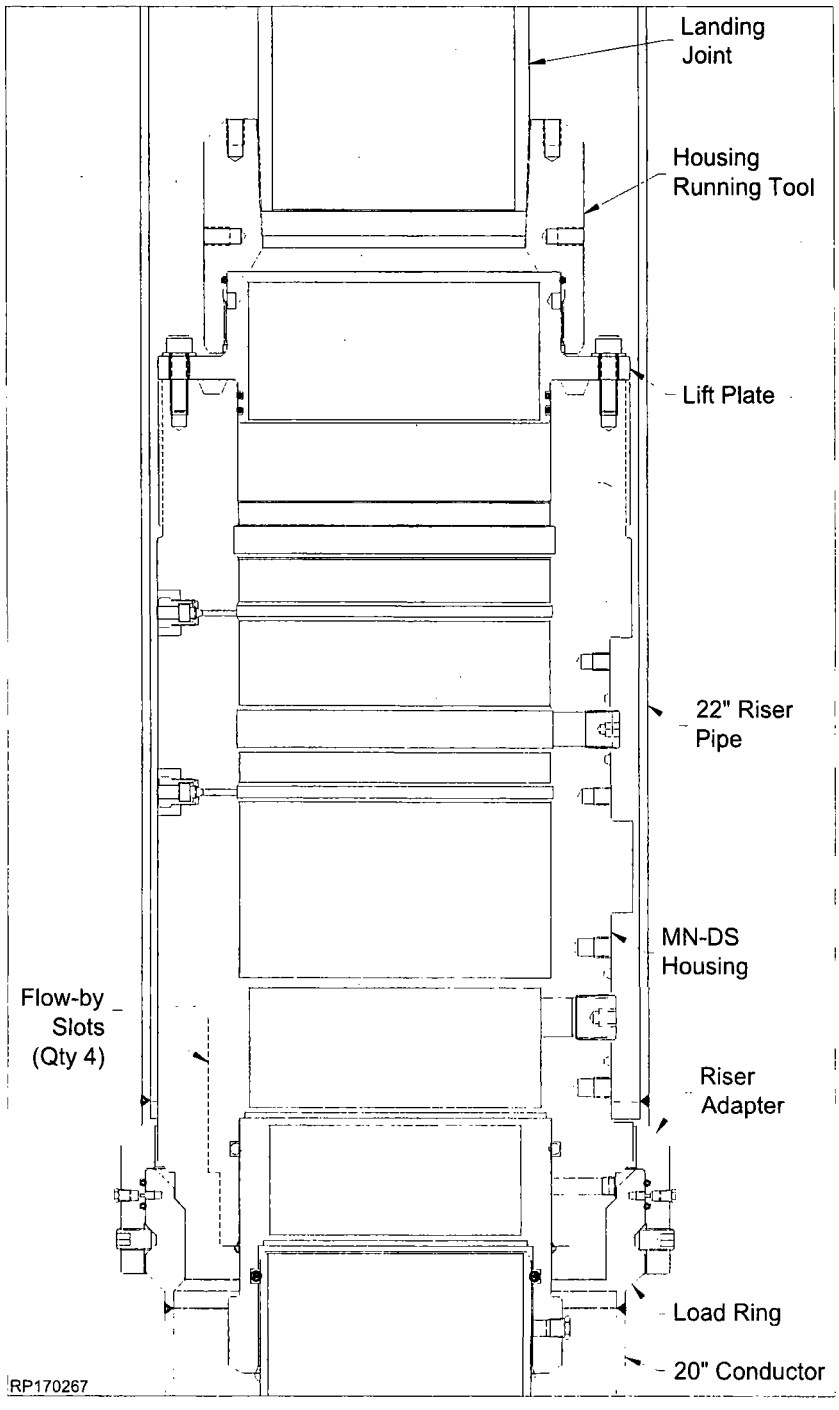
2.1.15. Orient the outlets as required and carefully lower the MN-DS Assembly through the rig floor and land on the Load Ring load shoulder.

2.1.16. Cement the casing string as required .Take the returns in the cellar until the casing cemented to the surface.

NOTE Returns may be taken through the Flow-by slots (4) of the Housing and out of the Stack.

2.1.17. Slack off the remaining casing string weight onto the conductor.

2.1.18. Verify that the pressure in the casing is bled off and the cement head is removed from the landing joint.



NOTE Verify with the Cement Supervisor and the Rig Tool Pusher that all pressure is bled off the casing before proceeding.

2.1.19. Remove the flush plugs from the outlets.

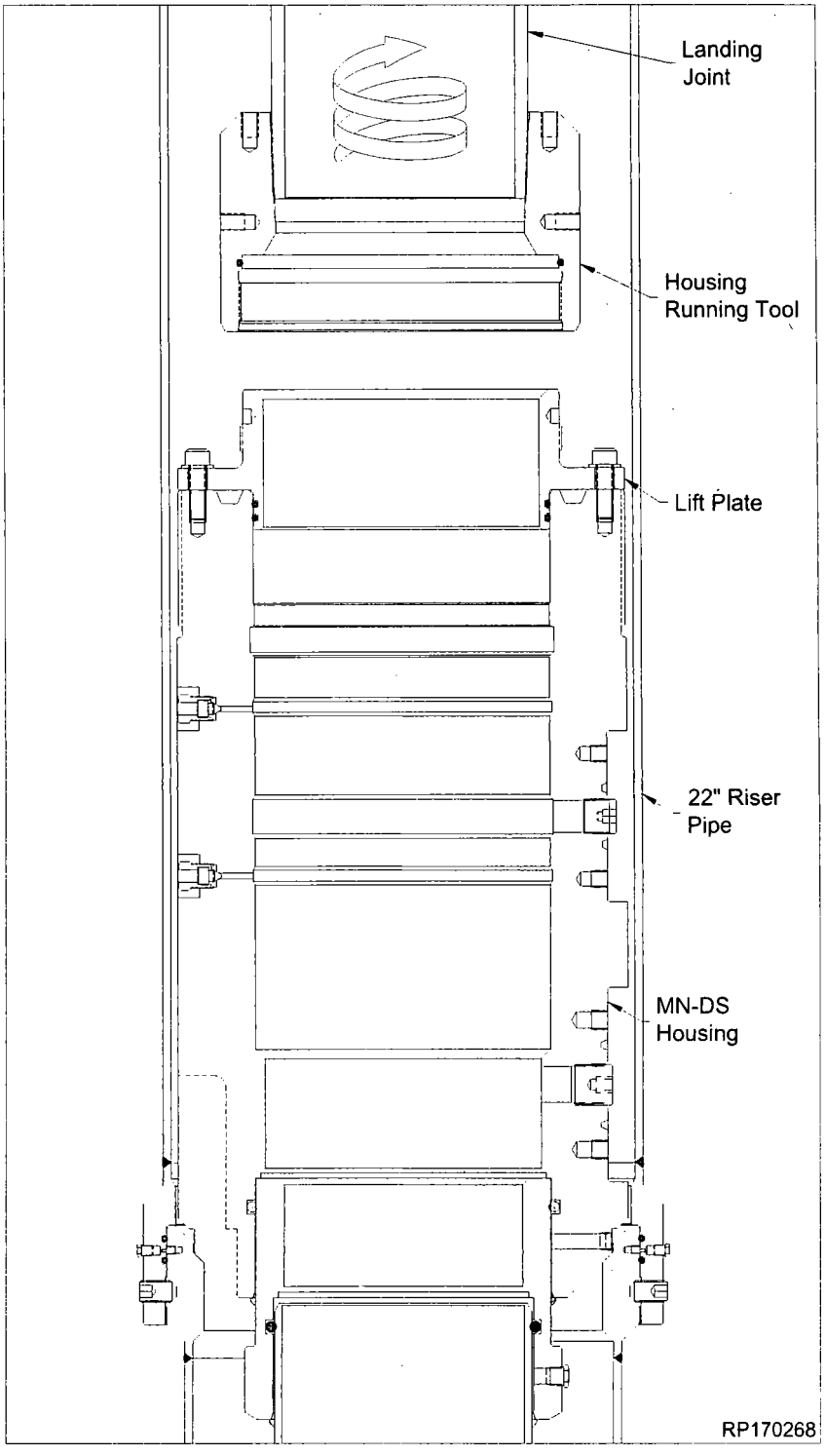
2.1.20. Washout the MN-DS system as required.

Stage 2.0 — 11-3/4" Casing

2.1.21. Rotate the landing joint to the right to remove the Running tool from the lift plate, approximately 6 turns.

2.1.22. Retrieve the Tool to the rig floor and remove it from the landing joint.

2.1.23. Clean, grease and store the Tool as required.



Stage 2.0 — 11-3/4" Casing

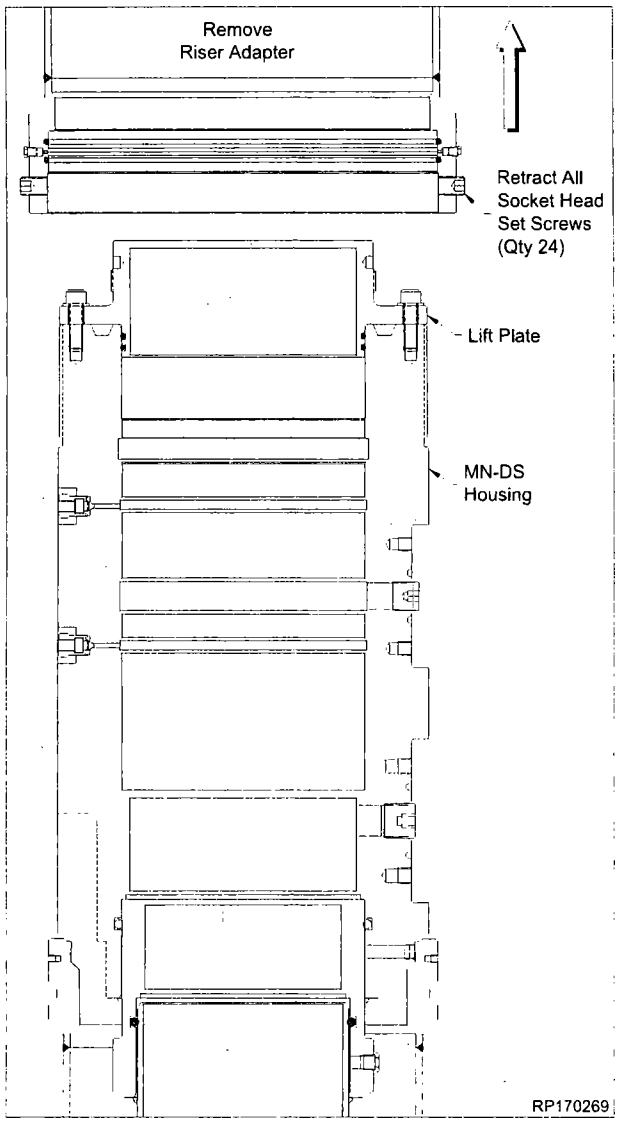
2.1.24. Install a bleeder tool to the fitting of the Riser Adapter and vent all trapped pressure.

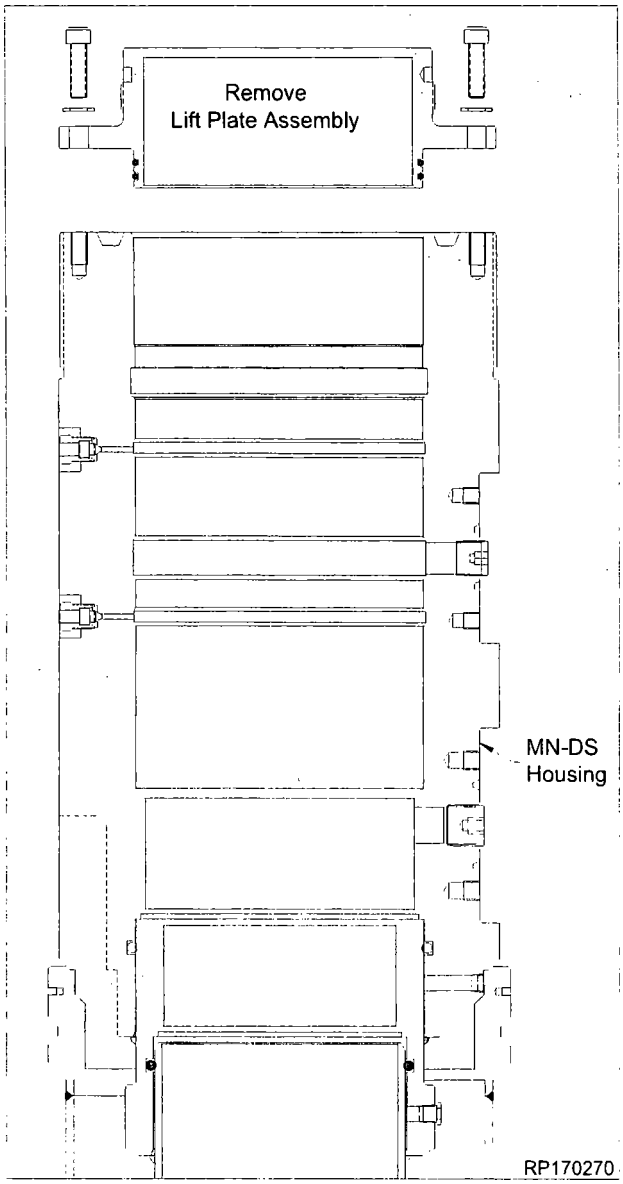
2.1.25. Retract all (24) set screws of the Riser Adapter and remove the Riser Adapter over the Casing Head Housing.

2.1.26. Clean, grease and store the Low Pressure Adapter as required.

2.1.27. Remove the Lift Plate from the top of the Housing.

2.1.28. Clean, grease and store the Tool as required.





Stage 2.0 — 11-3/4" Casing

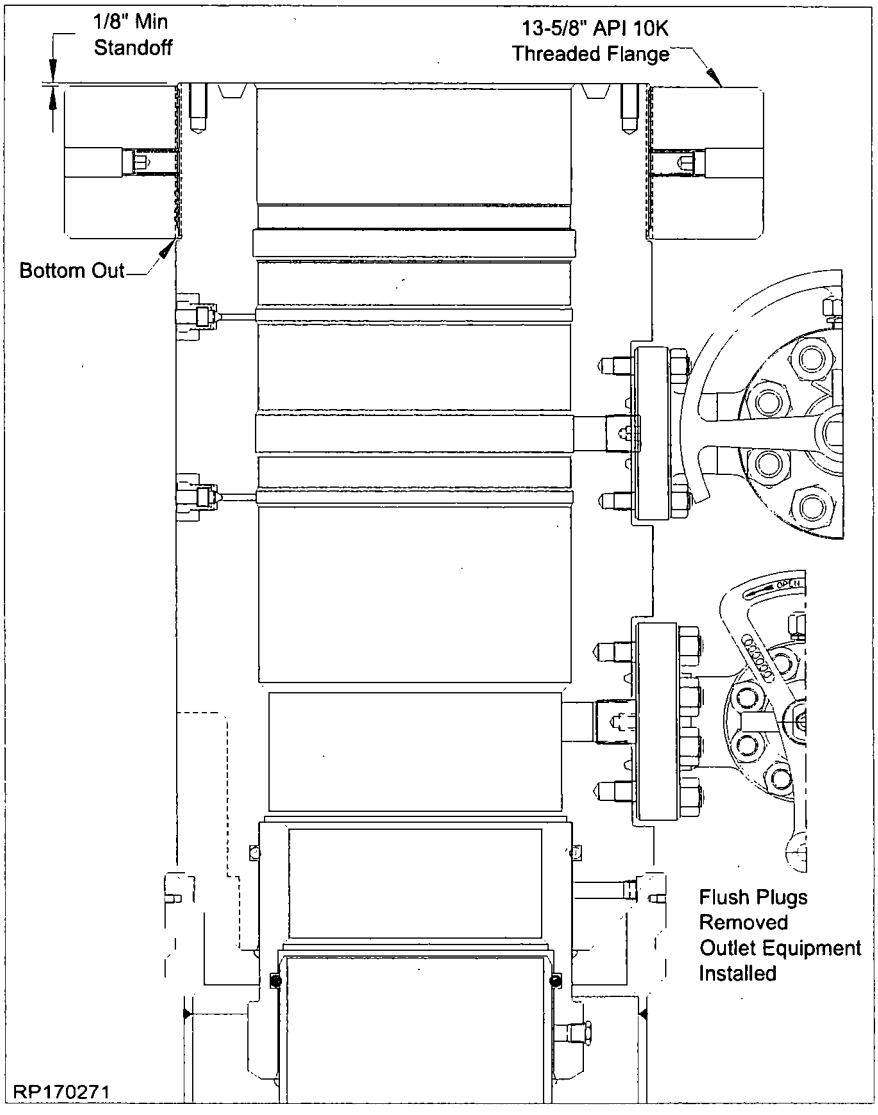
2.1.29. Install the Threaded Flange to the top of the Casing Head Housing.

2.1.30. Install upper and lower Casing Head outlet valves.

2.1.31. Install VR Plugs, and test the outlet valves to:

- Lower Valves to 5,000 psi
- Upper Valves to 10,000 psi

2.1.32. Remove VR Plugs, and close Upper and Lower outlet valves.



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

Stage 3.0 — 8-5/8" Casing

3.1. Test the BOP Stack

3.1.1. Clean and inspect the BX-159 ring groove on the Housing flange. Make up the BOP stack to the Housing using a spare ***BX-159 Ring Gasket***

3.1.2. Use the ***Test Plug (Item ST2).***

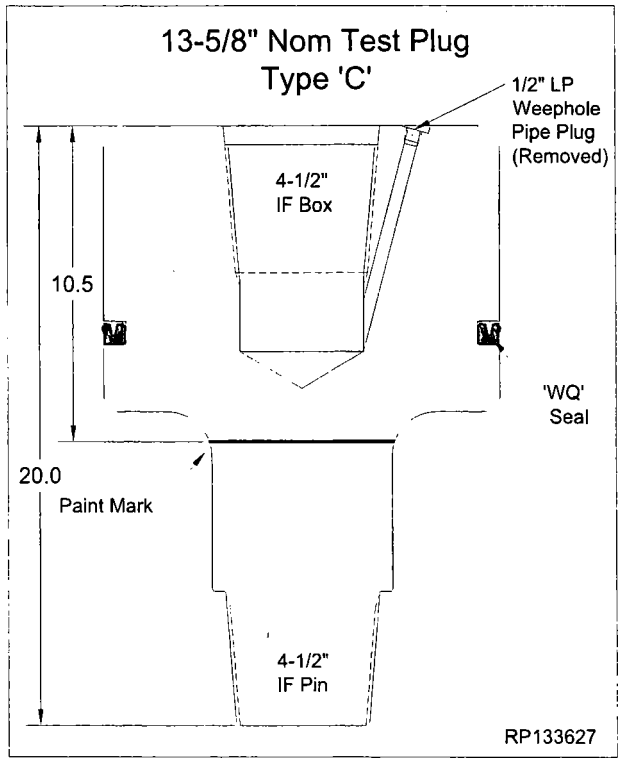
3.1.3. Place a paint mark around the Test Plug for landing verification as illustrated. Approximately 10.5" from the top.

NOTE When the Test Plug is properly landed, paint mark will be visible in the center of the lowermost annulus valve of the Housing.

⚠WARNING

SEE RP-000654

PROCEDURE FOR STANDARD IC TEST PLUG



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

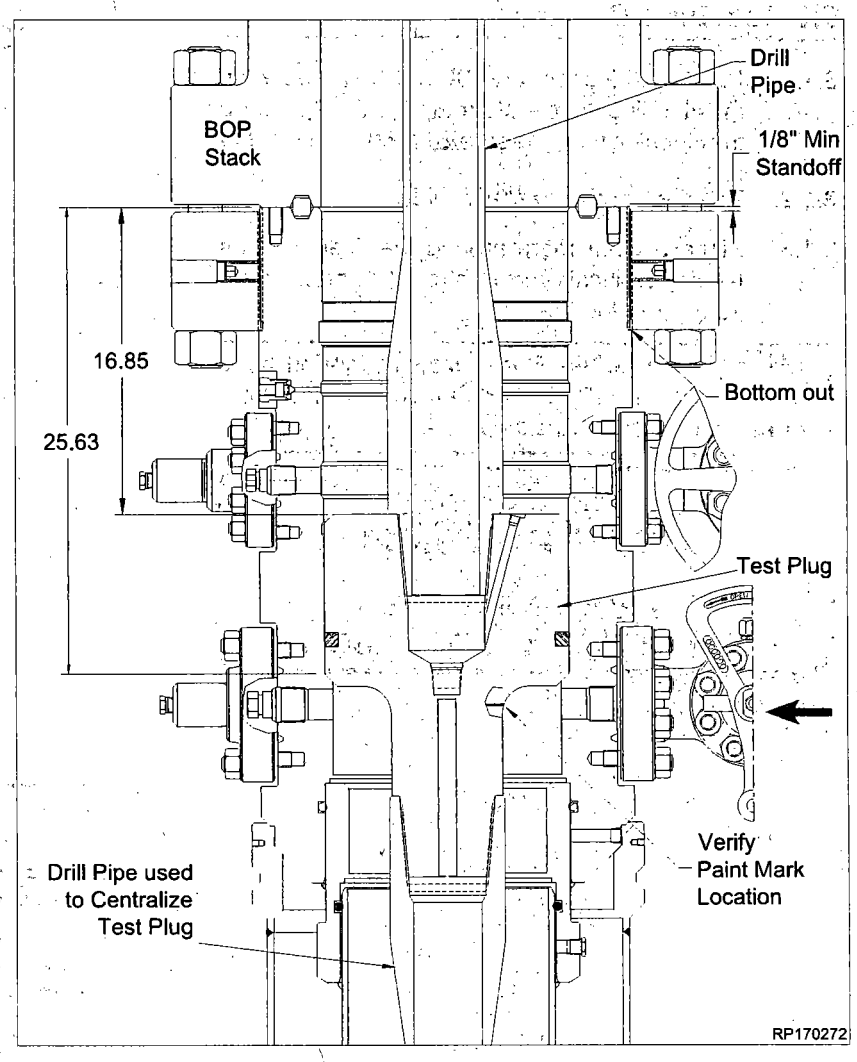
1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

Stage 3.0 — 8-5/8" Casing

NOTE **Distance from the Housing shoulder to the face of the BOP Flange is 25.63".**

3.1.4. Close the BOP rams on the drill pipe and test to ***10,000 psi maximum.***



Stage 3.0 — 8-5/8" Casing

3.2. Run the Wear Bushing Before Drilling

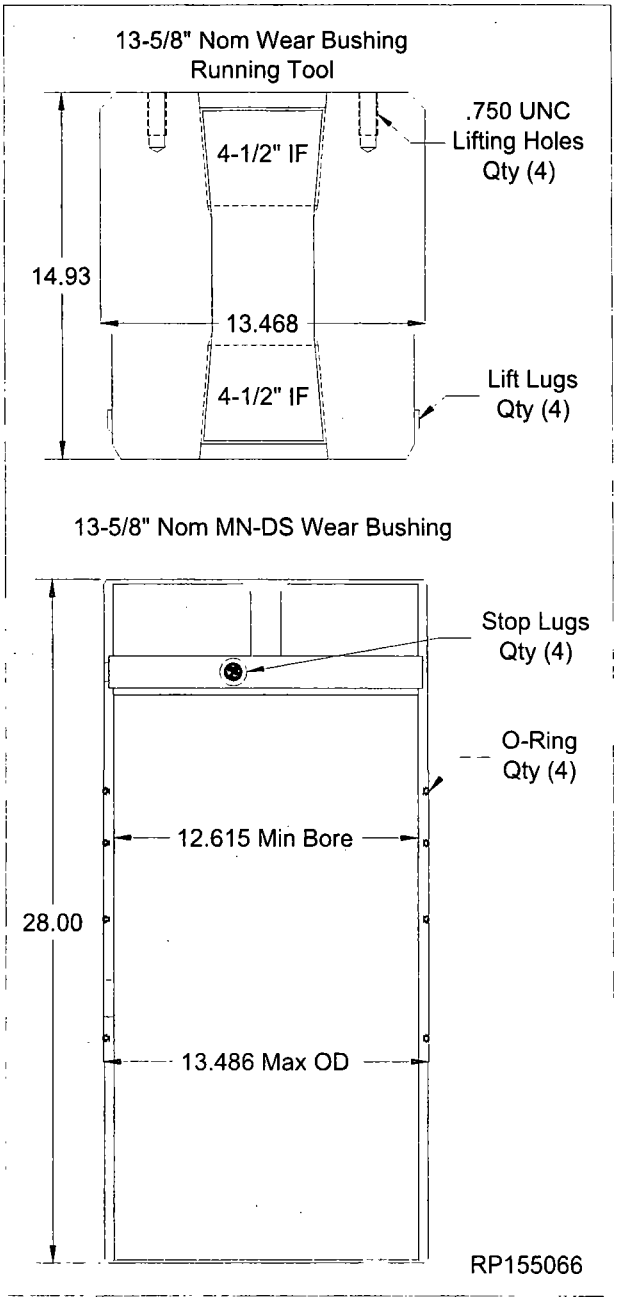
3.2.1. Use the ***Wear Bushing Running Tool (Item ST3).***

3.2.2. Use the ***Wear Bushing (Item ST4).***

⚠WARNING

SEE RP-000655

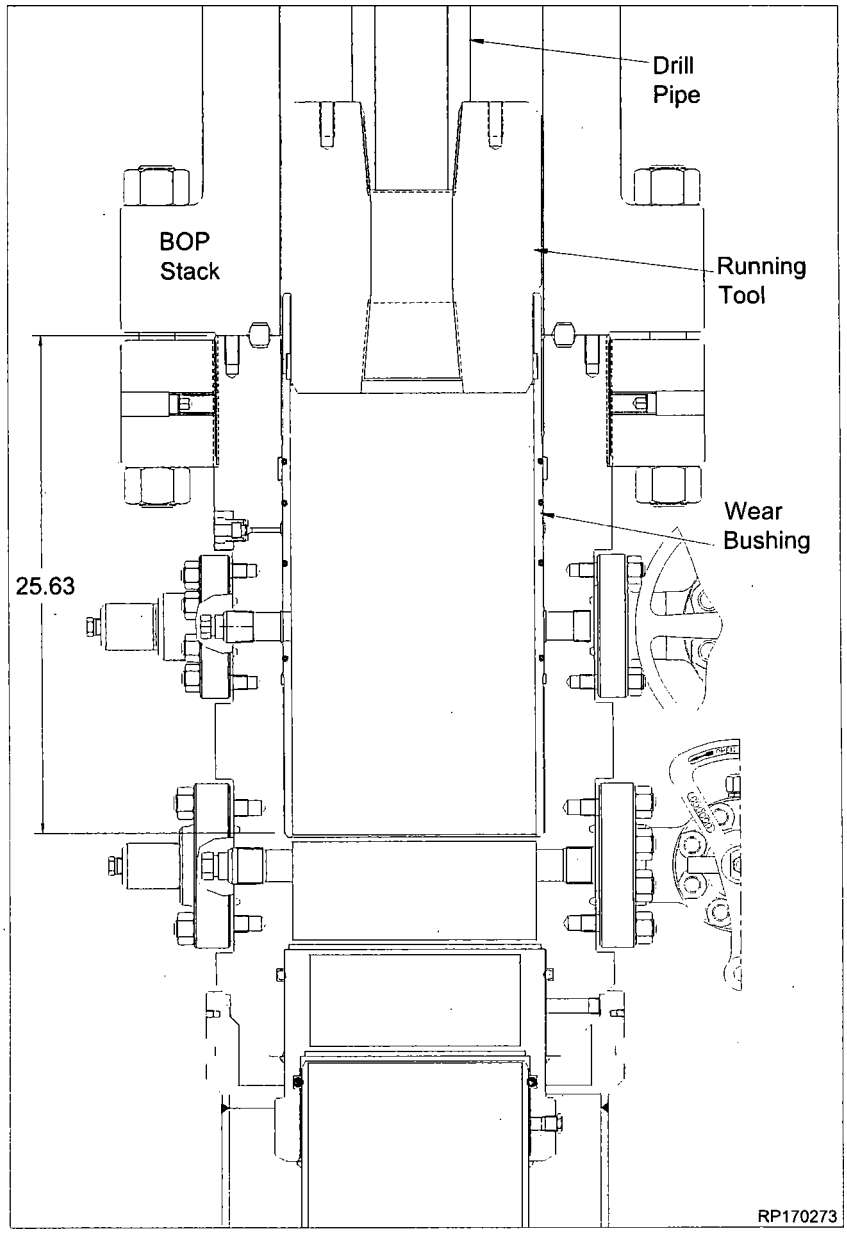
PROCEDURE FOR STANDARD IC WEAR BUSHING



Stage 3.0 — 8-5/8" Casing

NOTE **Distance from the Housing shoulder to the face of the BOP Flange is 25.63".**

3.2.3. Carefully lower the Tool/ Wear Bushing Assembly through the BOP stack until it lands on the load shoulder in the Housing. Measure and record. Estimated weight required to lower Wear Bushing into Housing is 2,000 lbs.



Stage 3.0 — 8-5/8" Casing

3.3. Retrieving the Wear Bushing After Drilling

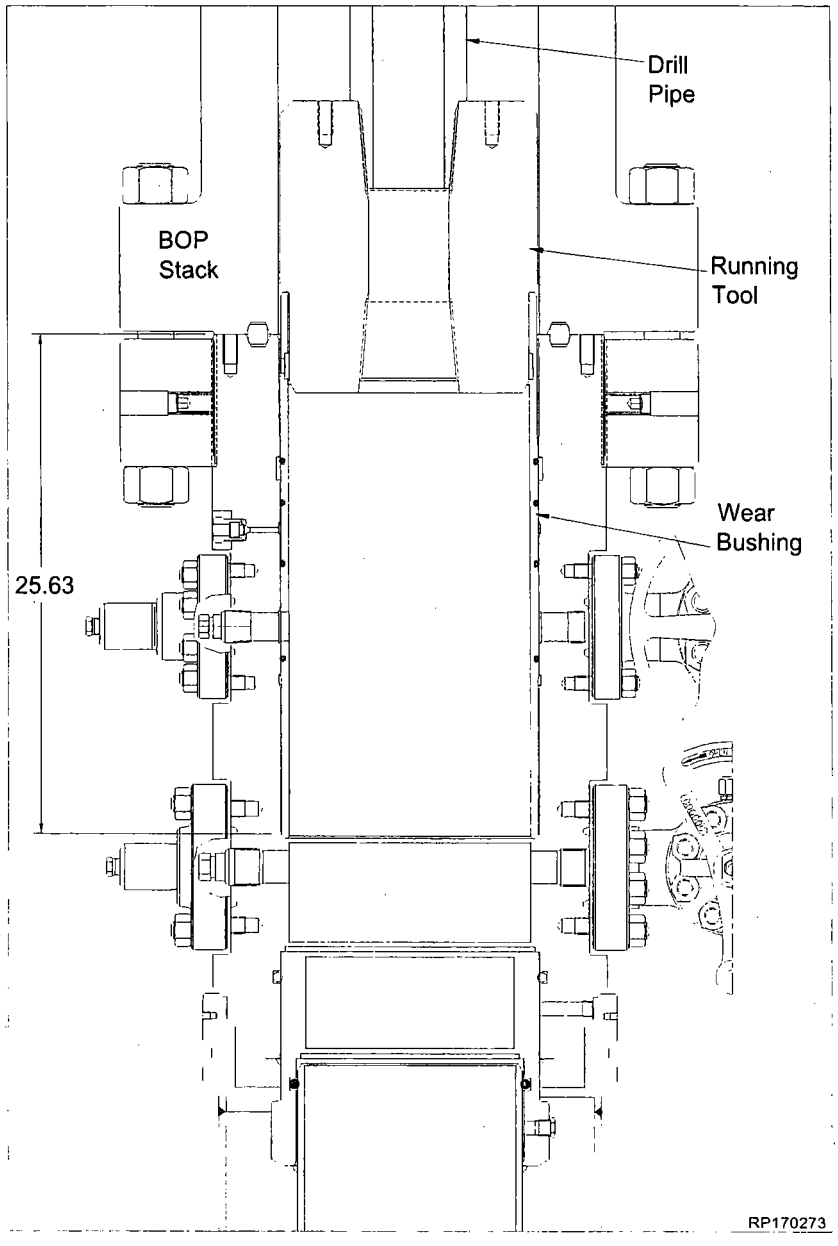
3.3.1. Make up a joint drill pipe to the ***Tool (Item ST3).***

⚠WARNING

SEE RP-000655

PROCEDURE FOR STANDARD IC WEAR BUSHING

NOTE **Maximum allowable pull on Wear Bushing is 25,000 lbs. Contact Surface Engineering if additional force is required.**



Stage 3.0 — 8-5/8" Casing

Landing of Mandrel Hangers

Cameron service personnel must verify that the mandrel hanger is landed properly on the load shoulder in the wellhead. This can be accomplished by one of two methods.

- Calculate the distance from the rig floor to the landing shoulder and confirm that the hanger has traveled the required distance.
- Or the preferred method: Conduct a dry run and mark the dedicated landing joint prior to running the casing or tubing.

3.4. Hang Off the Casing

NOTE In the event the 8-5/8" casing should become stuck, and the mandrel hanger is unable to be used, refer to Section 5.1. Hang off the Casing - Emergency Procedure.

3.4.1. Use the ***Casing Hanger Running Tool (Item ST5).***

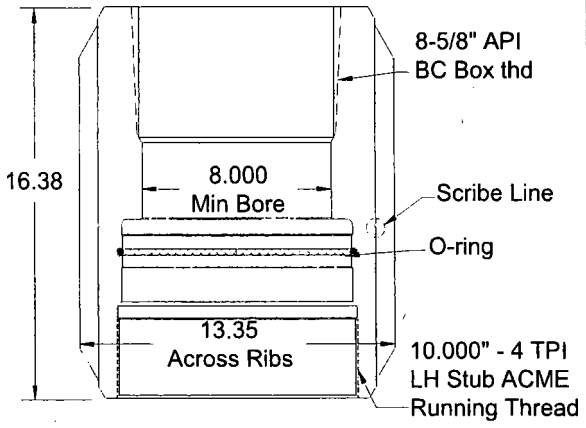
3.4.2. Use the ***Casing Hanger (Item A4).***

WARNING

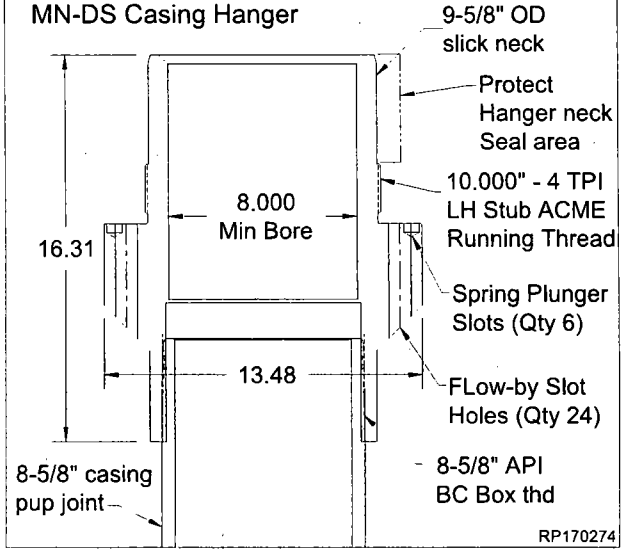
SEE RP-003740

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE CASING HANGER

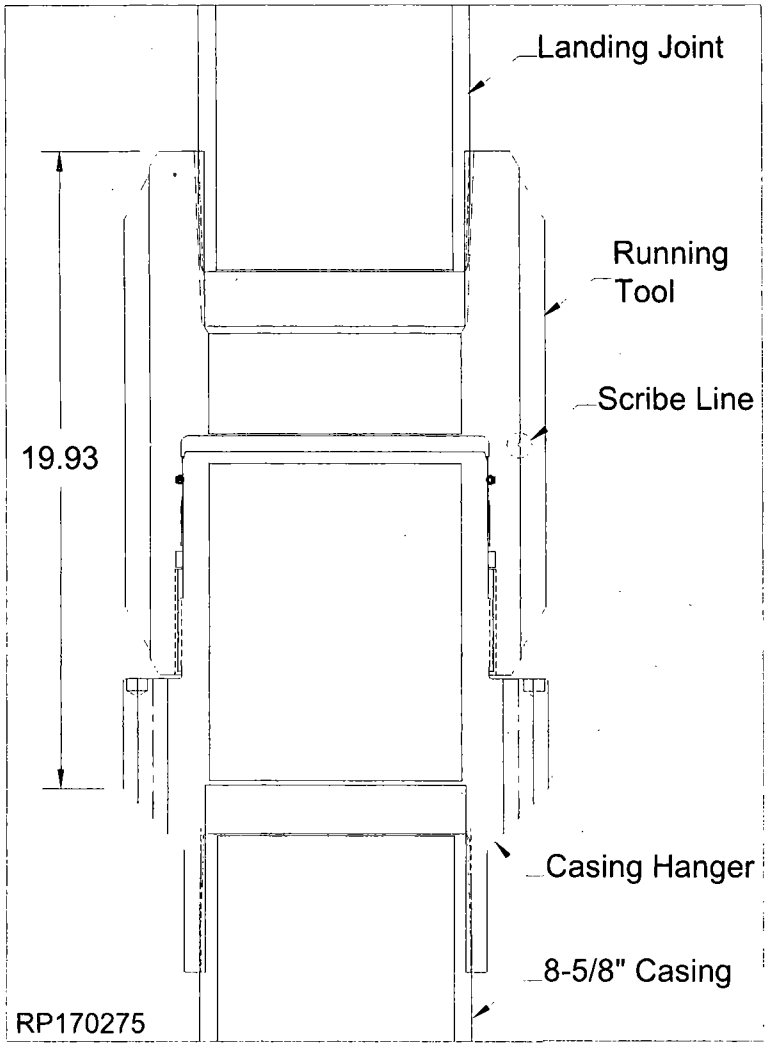
13-5/8" Nom Casing Hanger Running Tool with 3 Centralizing Ribs



13-5/8" Nom MN-DS Casing Hanger

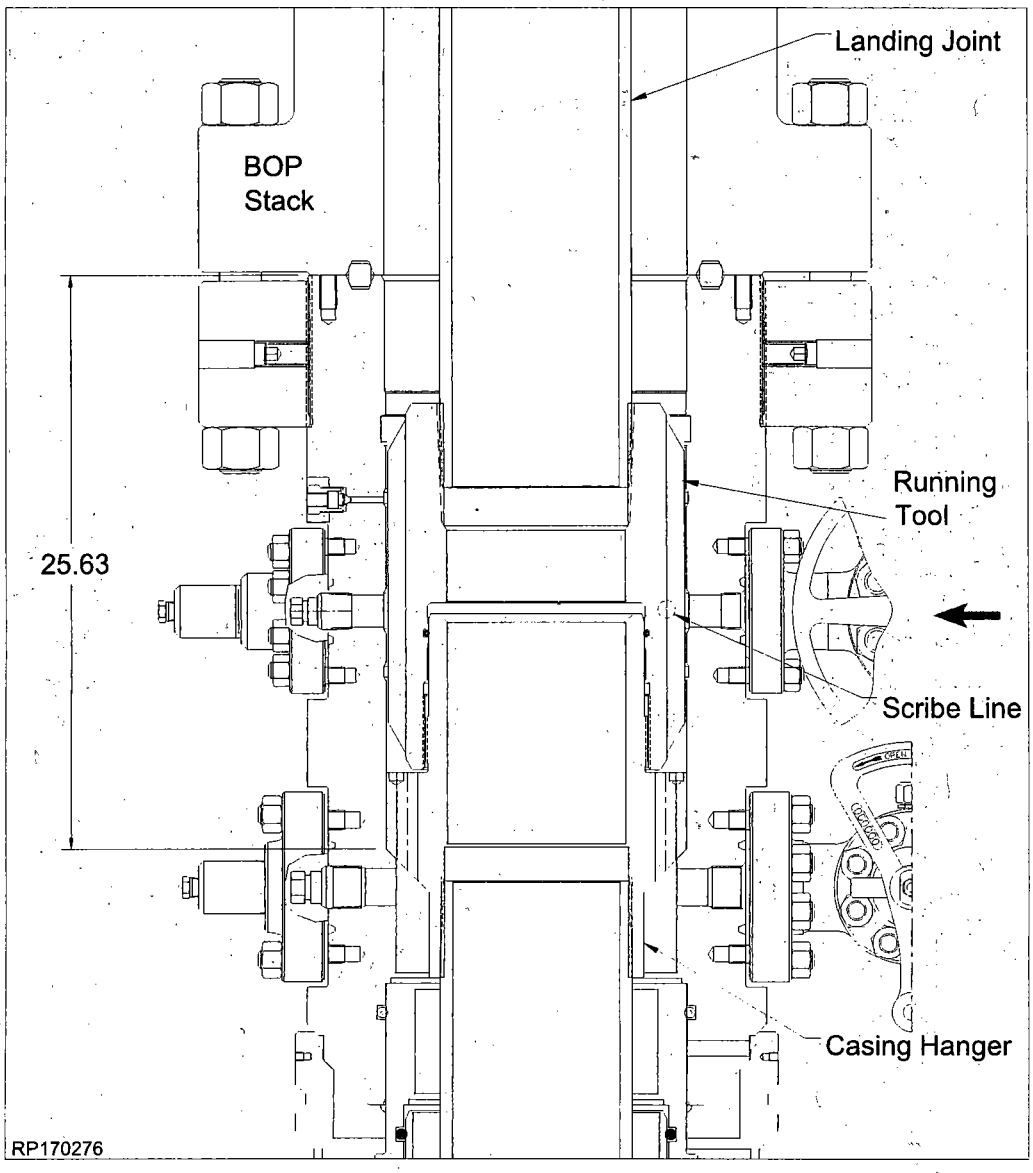


Stage 3.0 — 8-5/8" Casing



Stage 3.0 — 8-5/8" Casing

NOTE **Distance from the Housing load shoulder to the face of the BOP Flange is 25.63".**



Stage 3.0 — 8-5/8" Casing

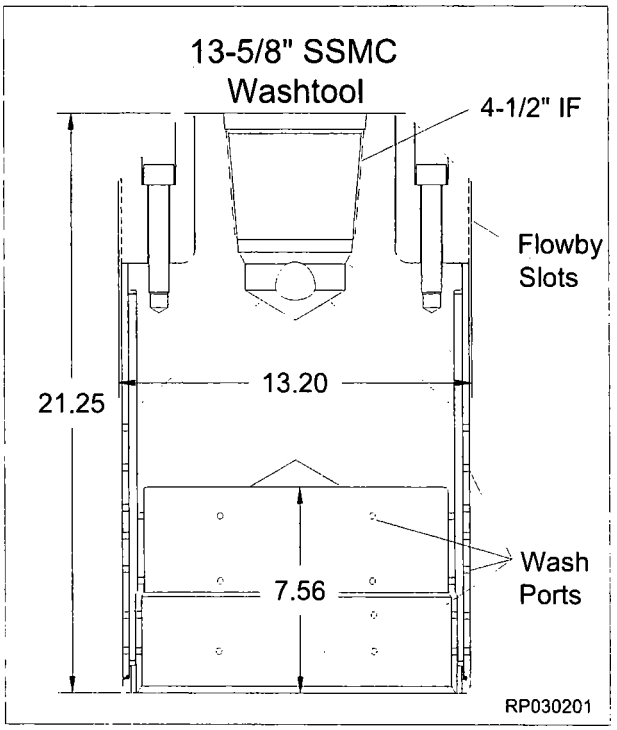
3.5. Recommended Procedure - Washout prior to landing Seal Assembly

3.5.1. Use the ***Wash tool (Item ST6).***

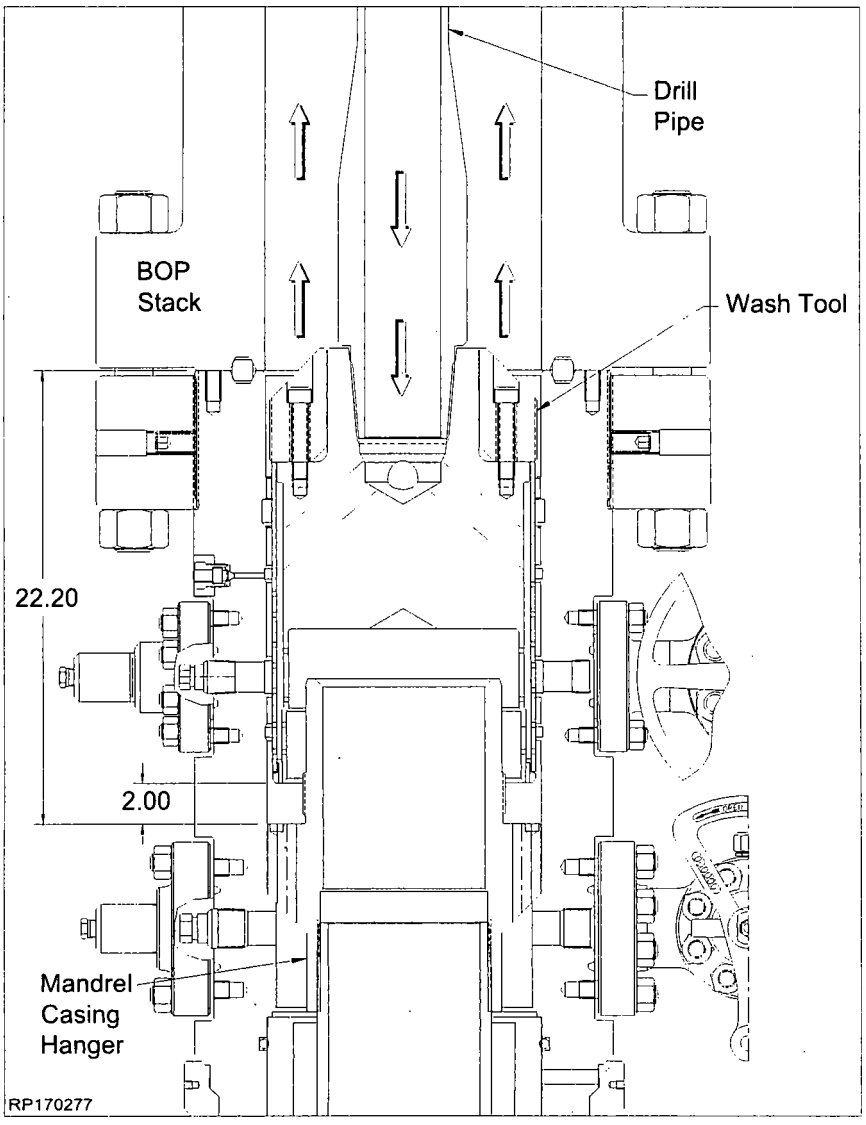
⚠WARNING

SEE RP-003734

PROCEDURE FOR STANDARD WASH TOOL



Stage 3.0 — 8-5/8" Casing



3.6. Installing the Packoff Support Bushing

3.6.1. Use ***Packoff Support Bushing Running Tool (Item ST7).***

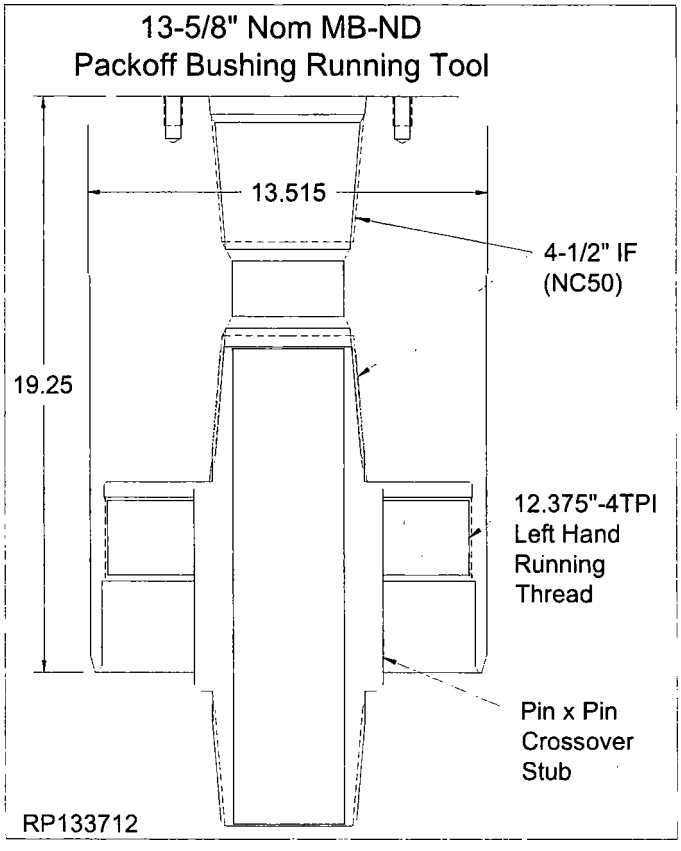
3.6.2. Use ***Packoff Support Bushing (Item A5).***

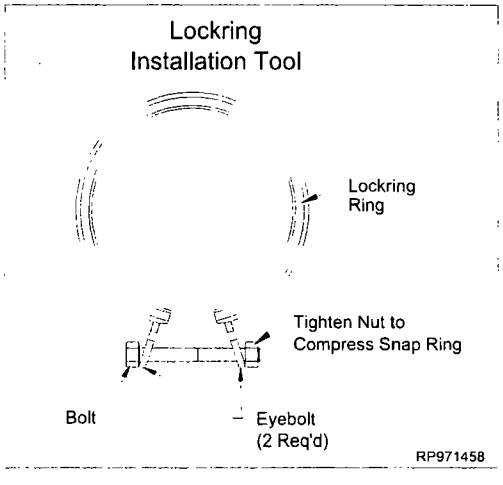
⚠ WARNING

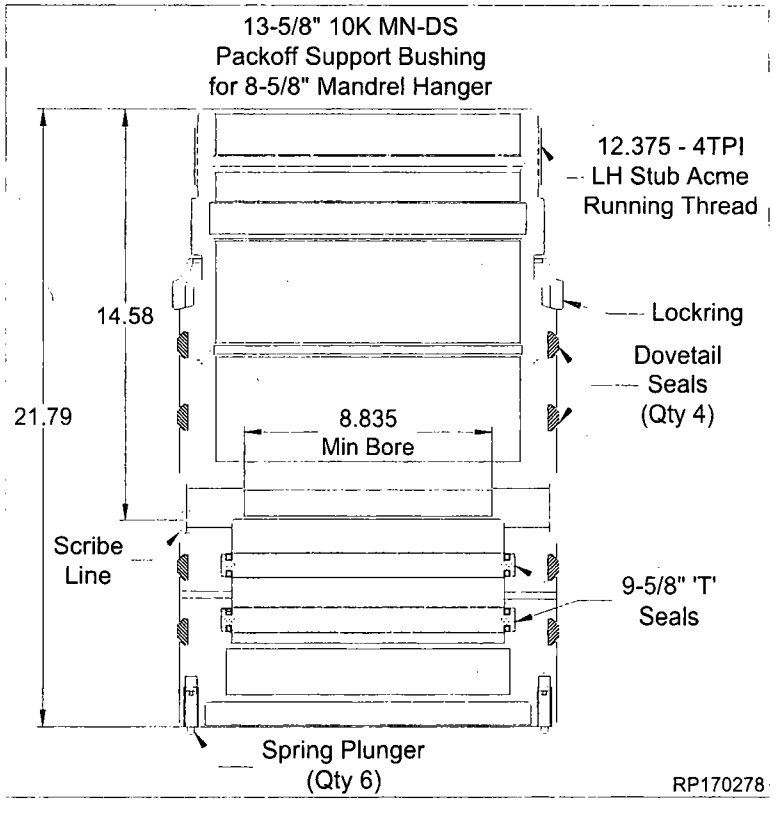
SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING

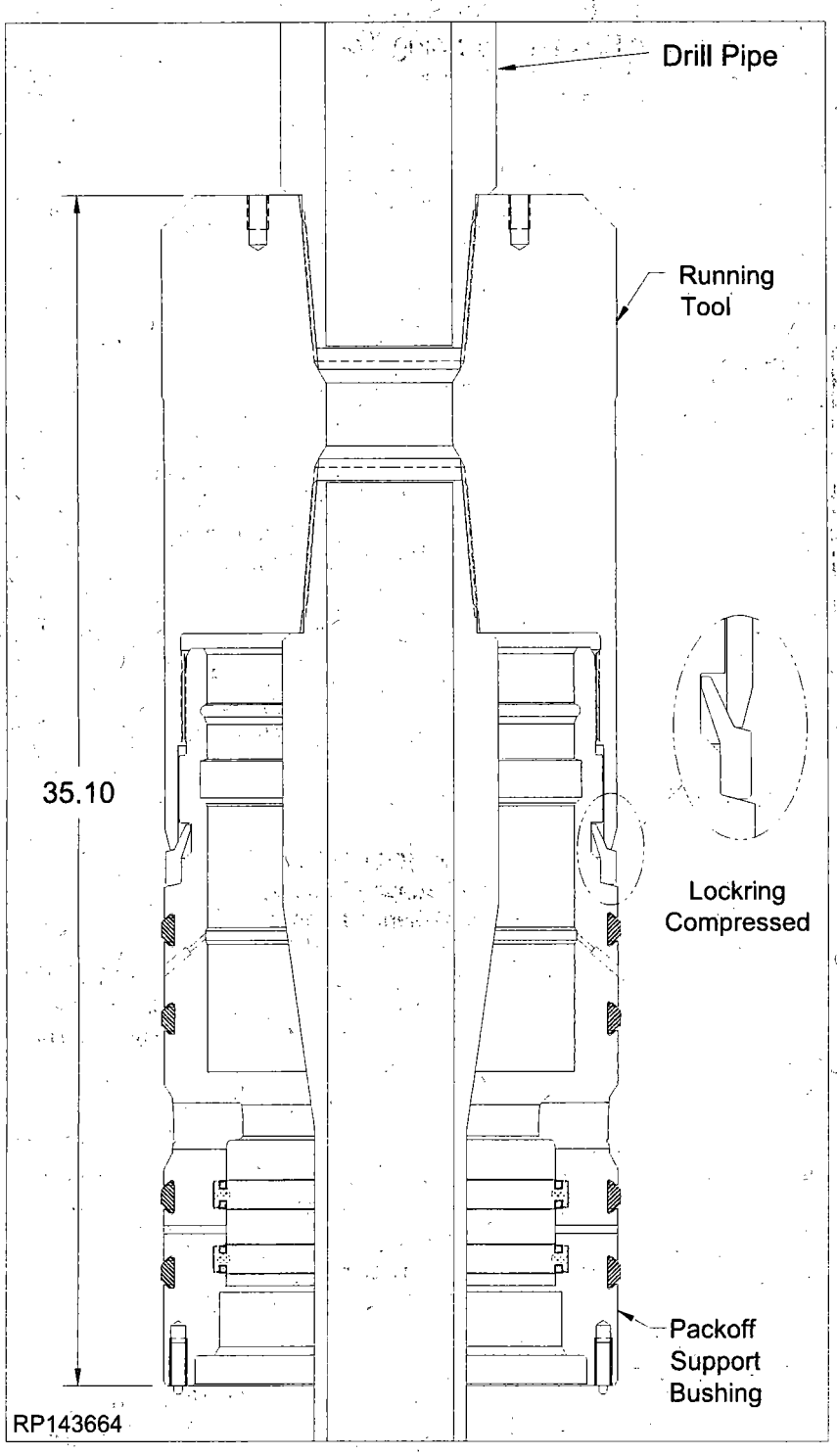
3.6.3. Use ***Lockring Installation Tool.***



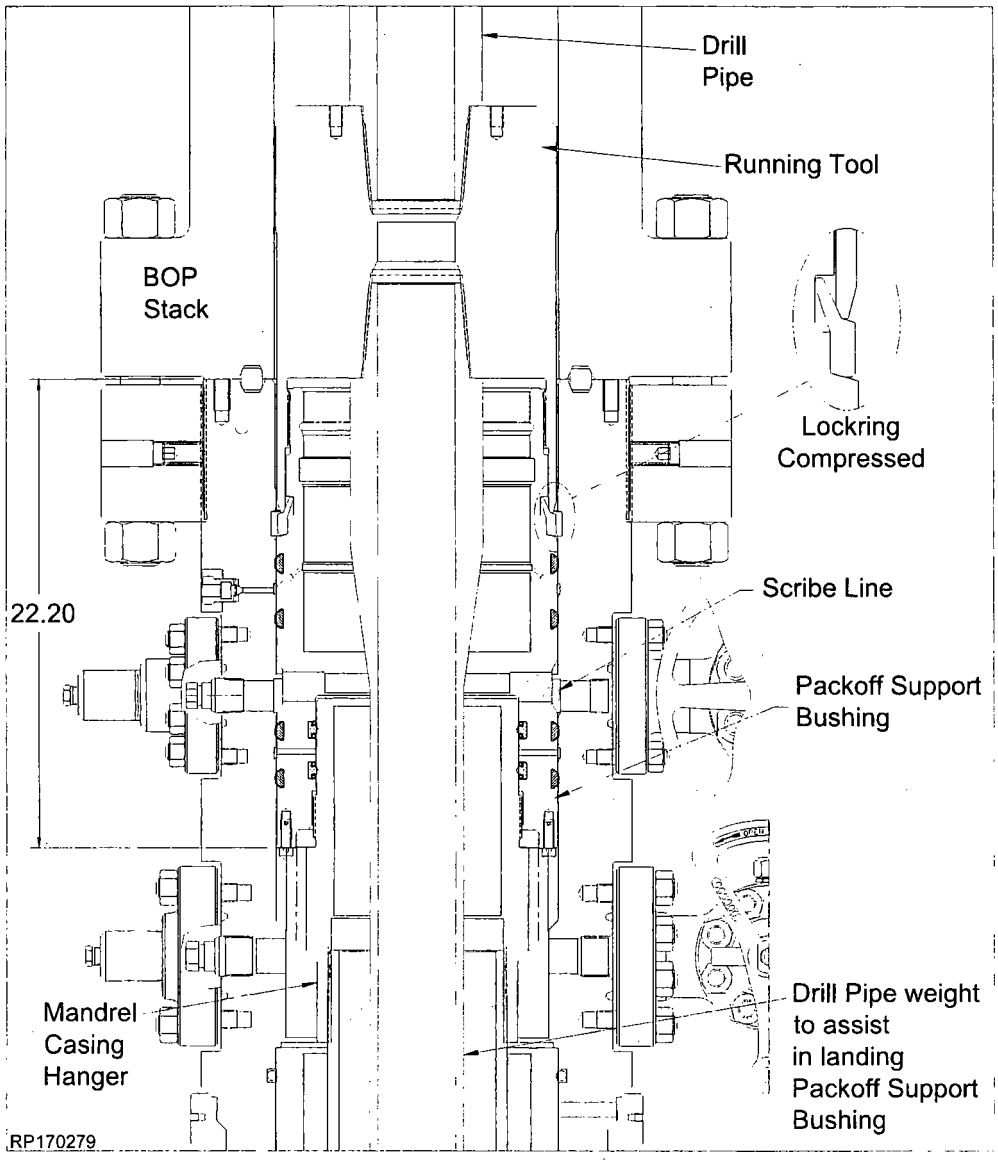




Stage 3.0 — 8-5/8" Casing



Stage 3.0 — 8-5/8" Casing



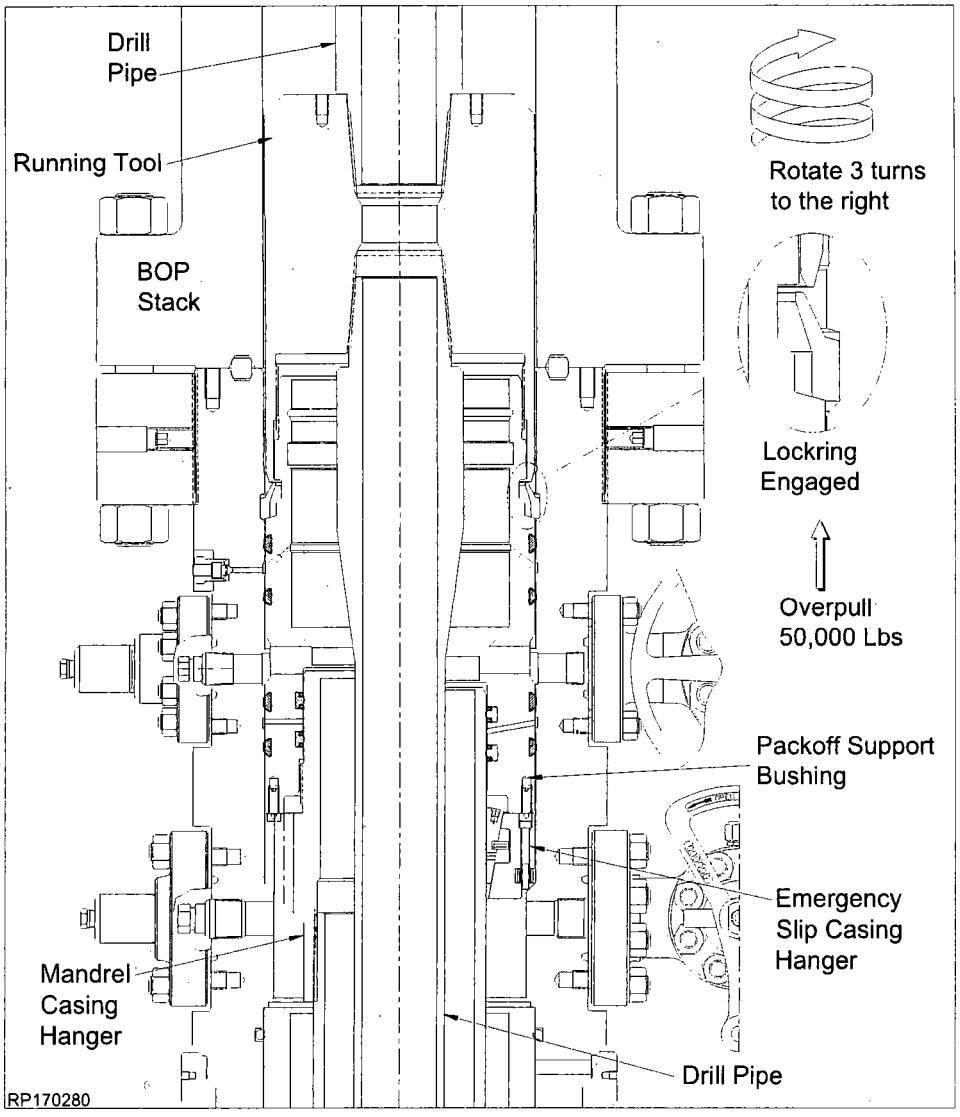
Stage 3.0 — 8-5/8" Casing

3.7. Set the Packoff Support Bushing Lockdown Ring

WARNING

SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING



Stage 3.0 — 8-5/8" Casing

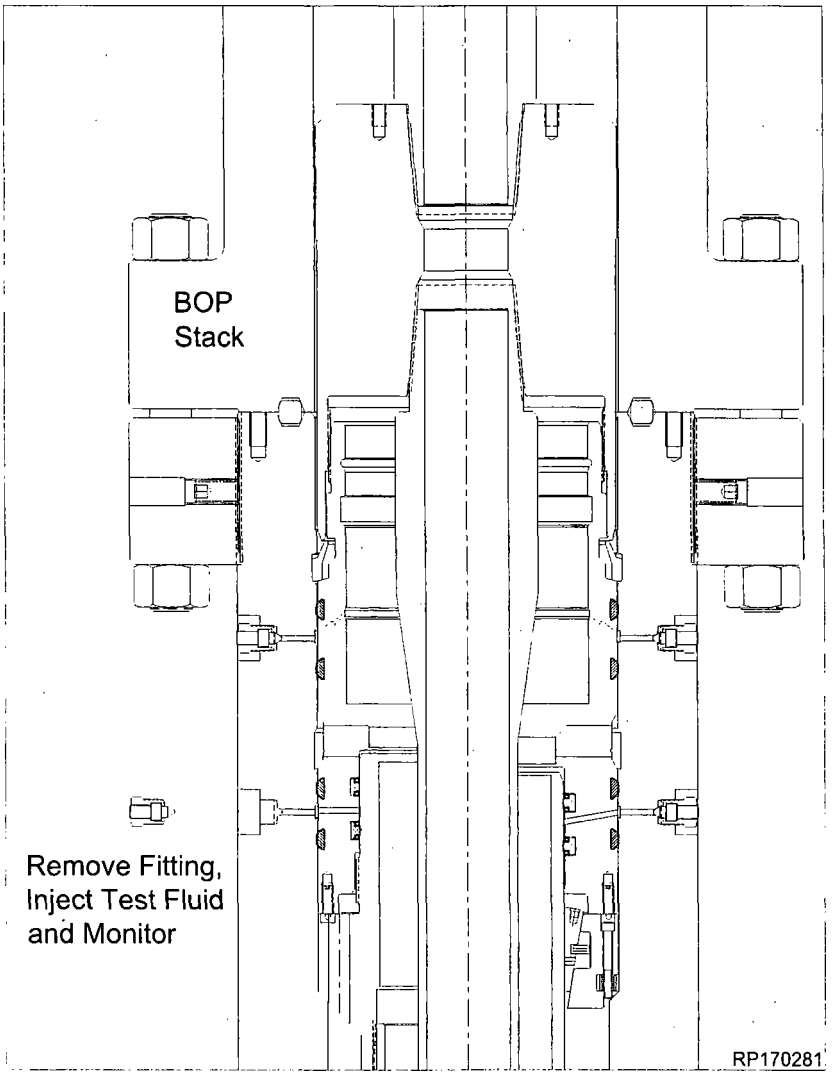
3.8. Test Between the Lower Packoff Seals (ID &OD)

⚠ WARNING

SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING

3.8.1. Test pressure to ***10,000 psi or 80% of casing collapse—whichever is less.***



3.9. Test Between the Upper Packoff Seals

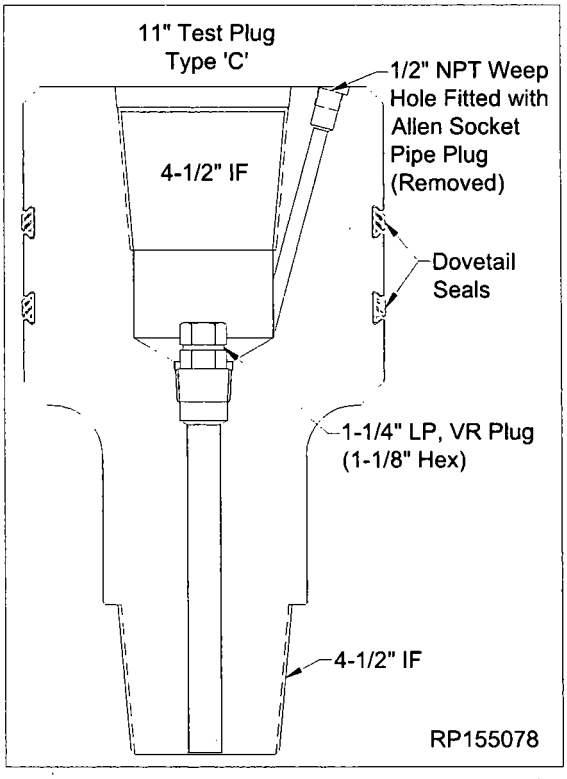
3.9.1. Use the ***Test Plug (Item ST8)***

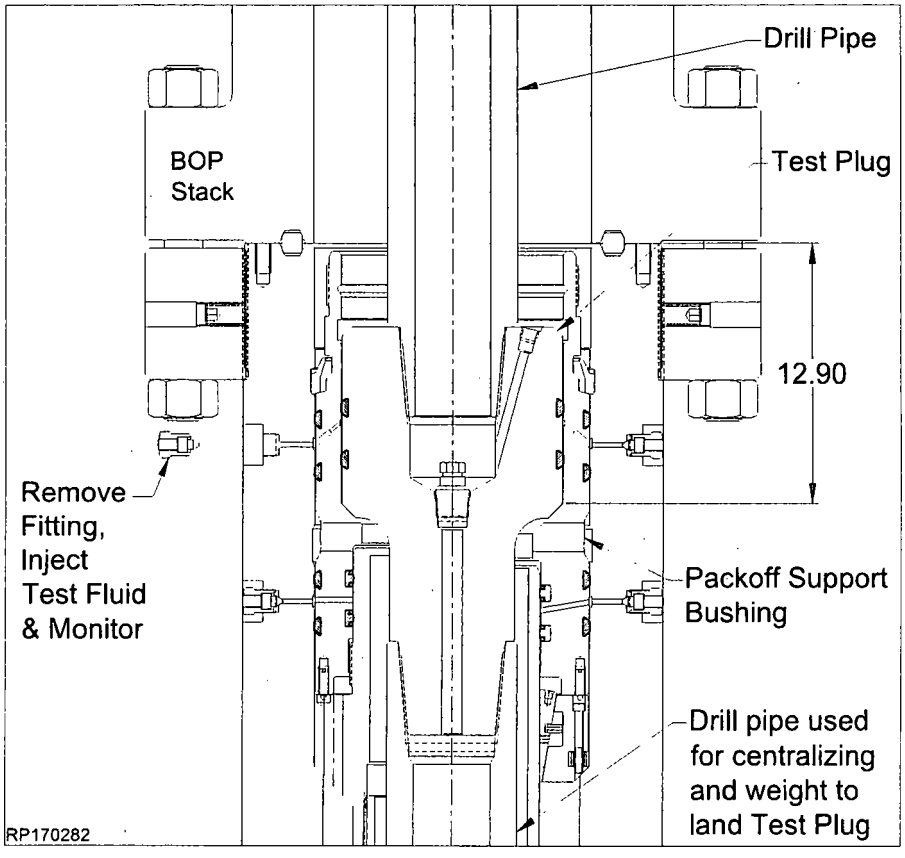
⚠WARNING

SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING

3.9.2. Test pressure to ***10,000 psi maximum.***





Stage 3.0 — 8-5/8" Casing

⚠ CAUTION

The following procedure should be followed **ONLY** in the event Retrieval of the Packoff Support Bushing is necessary. If the Packoff Support Bushing Assembly was properly landed, skip this procedure.

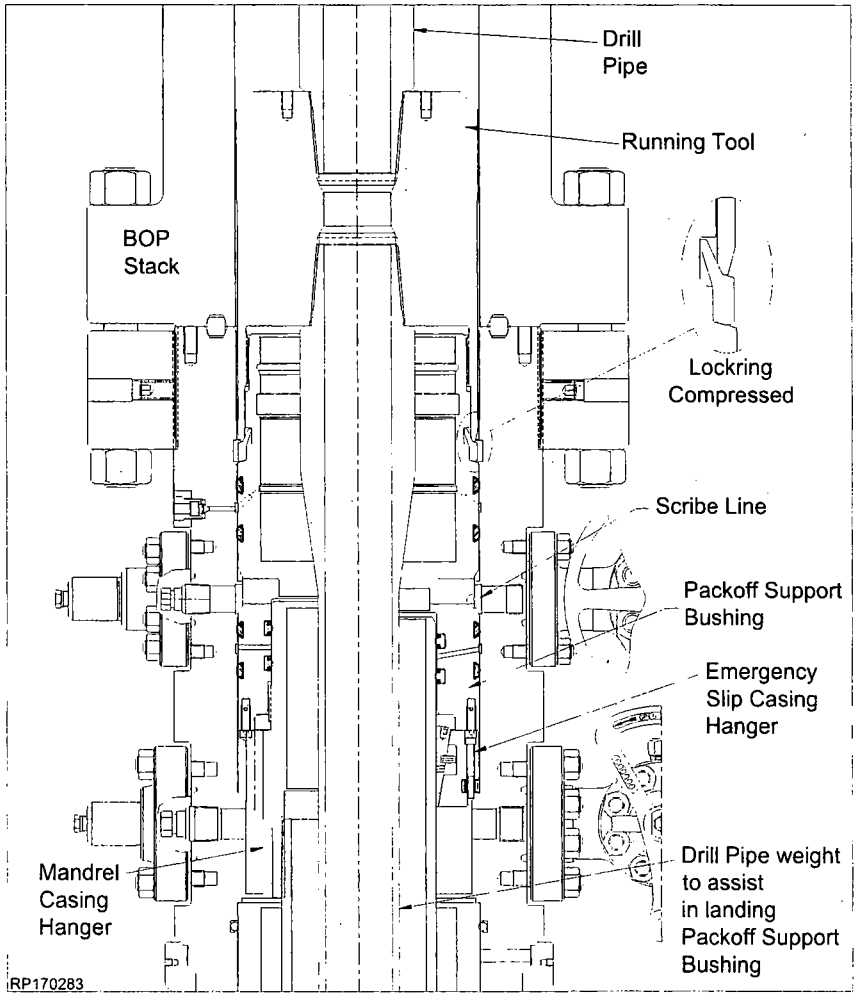
3.10. Retrieval of Packoff Support Bushing Assembly

3.10.1. Use the ***Packoff Support Bushing Running Tool (Item ST7).***

⚠WARNING

SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING



Stage 4.0 — 5-1/2" Casing

4.1. Test the BOP Stack

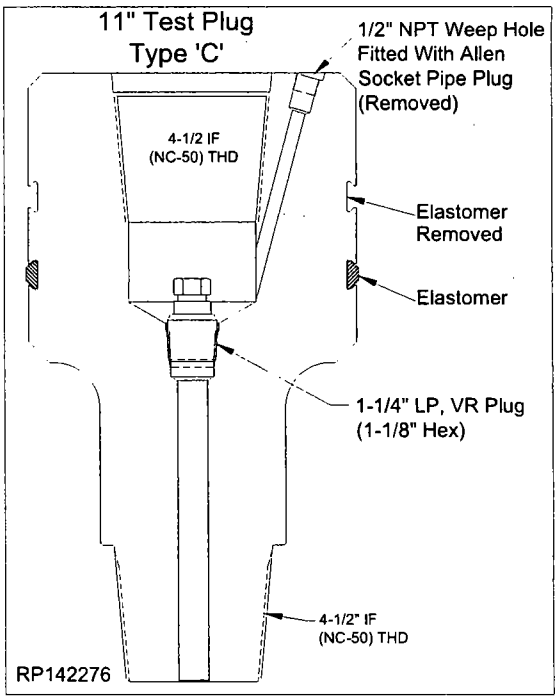
4.1.1. Use the ***Test Plug (Item ST8).***

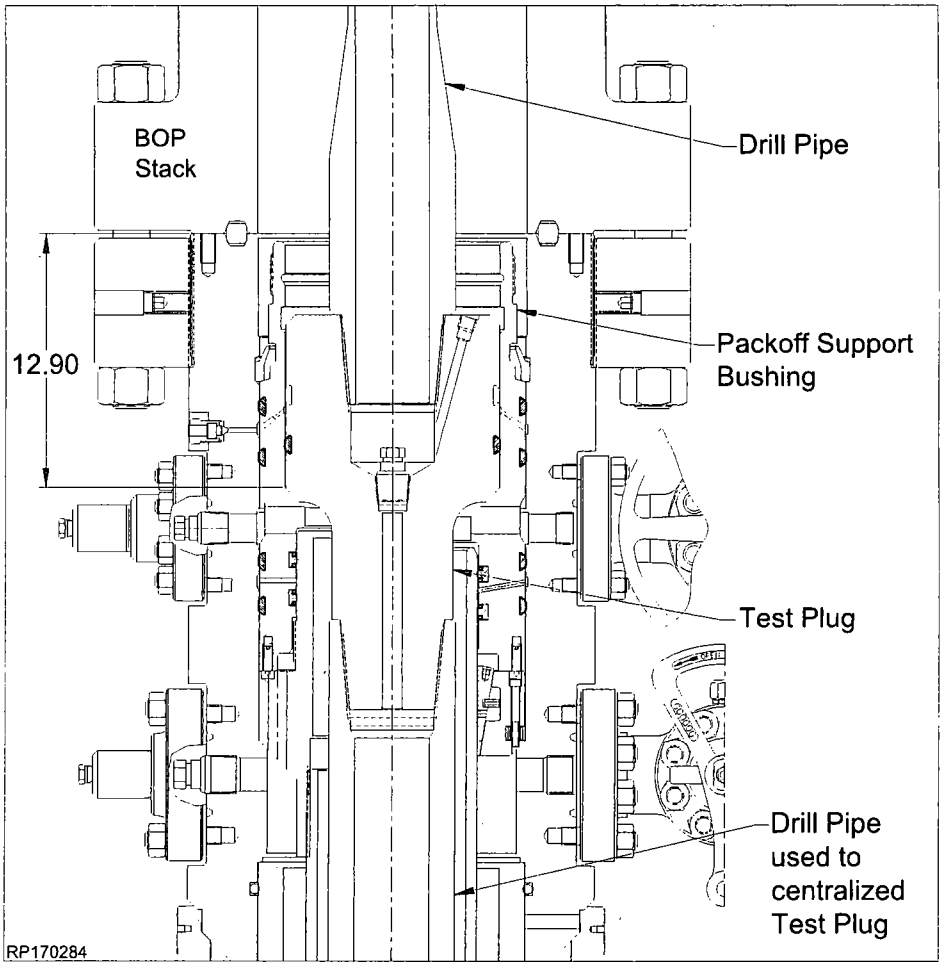
4.1.2. Close the BOP rams on the drill pipe and test to ***10,000 psi maximum.***

⚠WARNING

SEE RP-000654

PROCEDURE FOR STANDARD IC TEST PLUG





Stage 4.0 — 5-1/2" Casing

4.2. Run the Wear Bushing Before Drilling

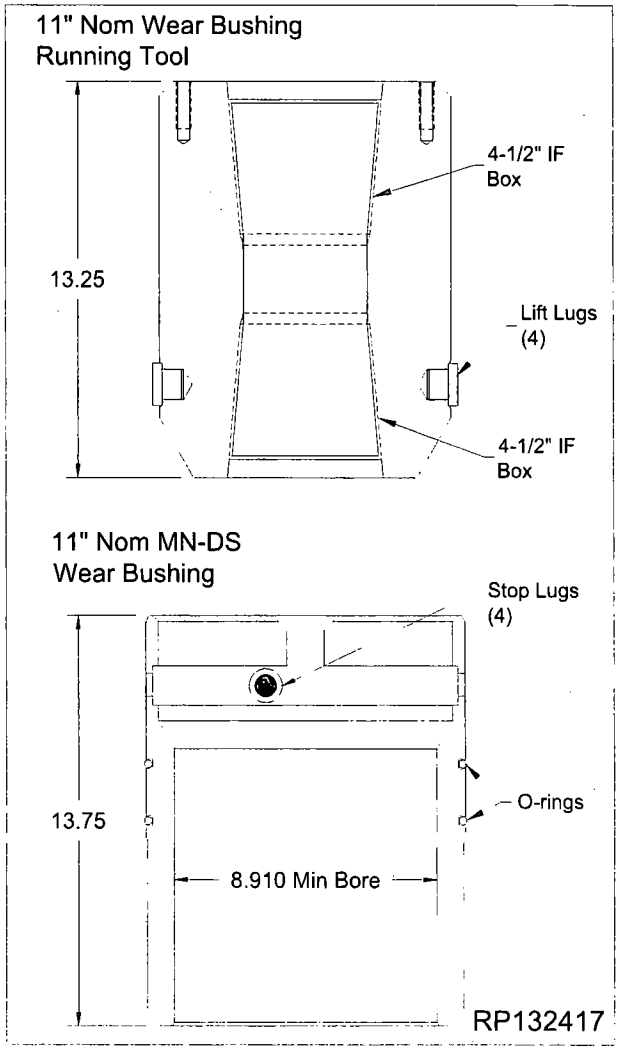
4.2.1. Use the ***Wear Bushing Running Tool (Item ST9).***

4.2.2. Use the ***Wear Bushing (Item ST10).***

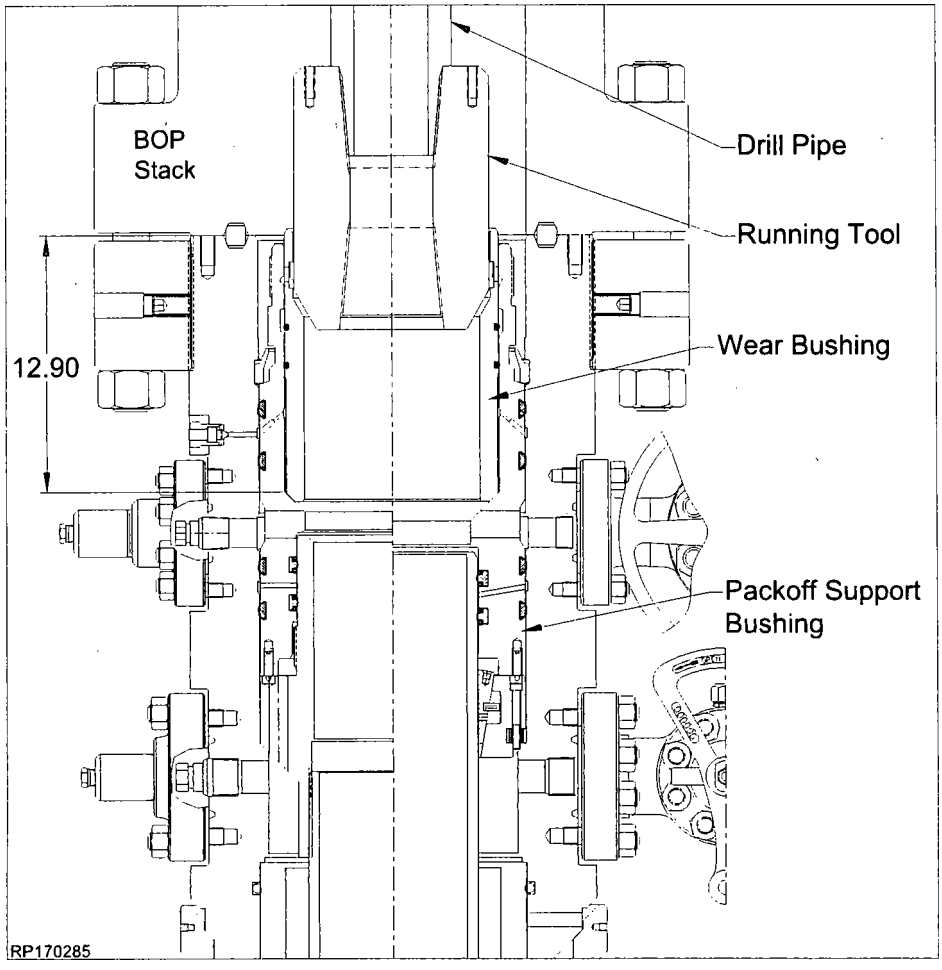
⚠WARNING

SEE RP-000655

PROCEDURE FOR STANDARD IC WEAR BUSHING



Stage 4.0 — 5-1/2" Casing



Stage 4.0 — 5-1/2" Casing

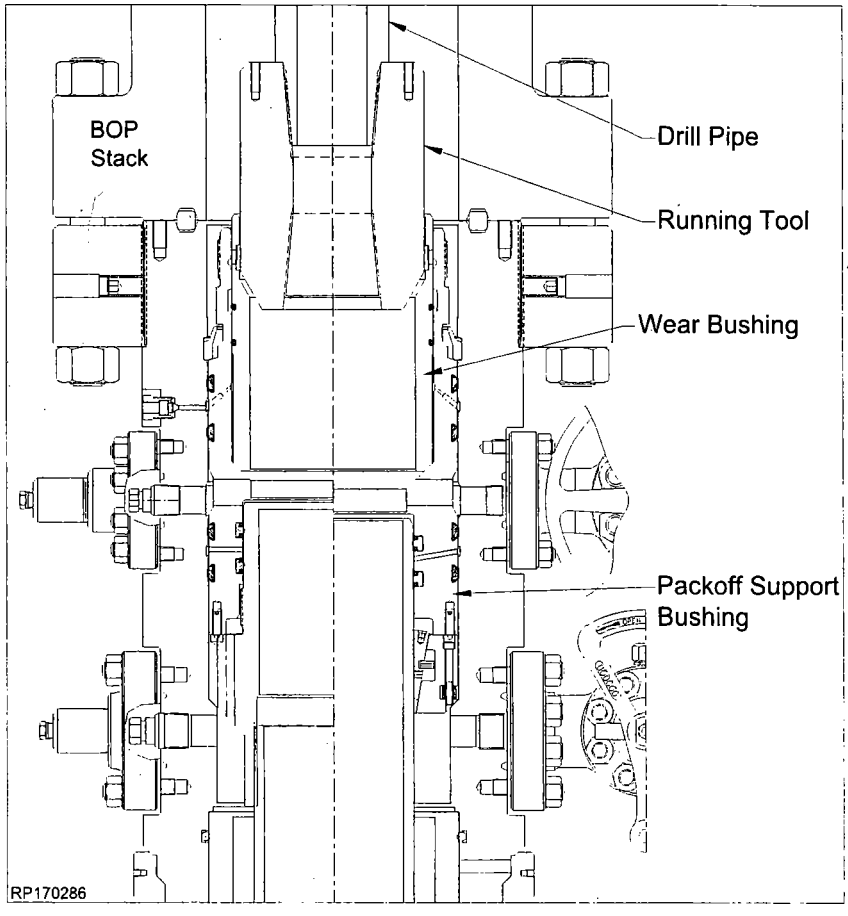
4.3. Retrieving the Wear Bushing After Drilling

4.3.1. Make up a joint drill pipe to the ***Tool (Item ST9).***

⚠WARNING

SEE RP-000655

PROCEDURE FOR STANDARD IC WEAR BUSHING



Landing of Mandrel Hangers

Cameron service personnel must verify that the mandrel hanger is landed properly on the load shoulder in the wellhead. This can be accomplished by one of two methods.

- Calculate the distance from the rig floor to the landing shoulder and confirm that the hanger has traveled the required distance.
- Or the preferred method: Prior to running the casing or tubing conduct a dry (dummy) run using the air hoist (recommended) and mark the dedicated landing joint

4.4. Hang Off the Casing

NOTE: In the event the 5-1/2" casing should become stuck, and the mandrel hanger is unable to be used, refer to Section 6.1. Emergency 5-1/2" Casing.

4.4.1. Run the 5-1/2" casing and space out appropriately.

4.4.2. Hang off the last joint of casing to be run in the floor slips at height that will enable easy handling and make up of the hanger and landing joint.

NOTE: Steps 4.4.3.-4.4.19. may be conducted offline and the made-up assembly shipped to the field.

4.4.3. Examine the ***Casing Hanger Running Tool (Item ST11).*** Verify the following:

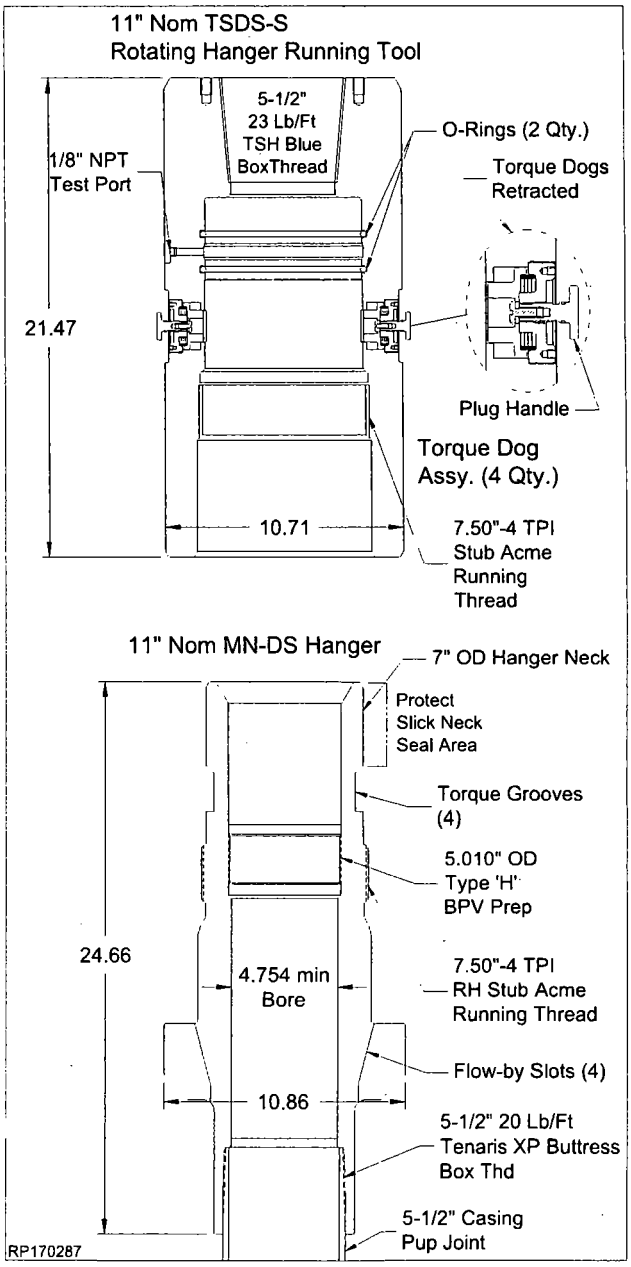
- bore is clean and free of debris
- all threads are clean and undamaged
- fitting is in place and does not protrude beyond the tool OD
- o-rings are properly installed and undamaged
- all torque dogs are properly installed, function correctly and retracted from the ID by compressing the springs

4.4.4. Fully retract the torque dogs by turning T-Handle threaded plug to the left until a positive stop is reached. Verify that the torque dogs do not protrude into the bore.

4.4.5. Orient the Running Tool with the stub acme running threads down.

4.4.6. Examine the ***Casing Hanger (Item A6).*** Verify the following:

- bore is clean and free of debris
- all threads are clean and undamaged
- neck seal area is clean and undamaged
- flow-by slots (4) are clean and free of debris



4.4.7. Orient the Hanger with the casing threads down.

OFFLINE

OFFLINE

4.4.8. Make up a joint of casing to the top of the Running Tool.

4.4.9. Wipe the running threads of both the Tool and the Hanger and the seal of the Tool with a light oil or grease.

NOTE Excessive oil or grease may prevent a positive seal from forming.

4.4.10. Lift and suspend the Tool over the Hanger.

4.4.11. Lower the Tool onto the Hanger until the mating threads make contact.

4.4.12. While balancing the weight, rotate the Tool to the left until the thread 'jump' can be felt then to the right to a positive stop (approximately 10 turns) then back off the tool to the left 1/4 turn.

NOTE Right Handed running threads

WARNING DO NOT Torque the connection.

⚠ CAUTION

Do not use Top Drive to engage/disengage the running tool. Using the Top Drive will permanently damage the equipment running threads and will require the damaged part to be replaced.

4.4.13. Turn the (4) plug handles to the right to engage all torque dogs until a positive stop can be reached.

4.4.14. Rotate the tool to the left until all torque dogs engage in their respective slots. Rotate the tool to the right until a positive stop can be felt.

WARNING DO NOT rotate more than half a turn

4.4.15. Locate the test port on the OD of the running tool.

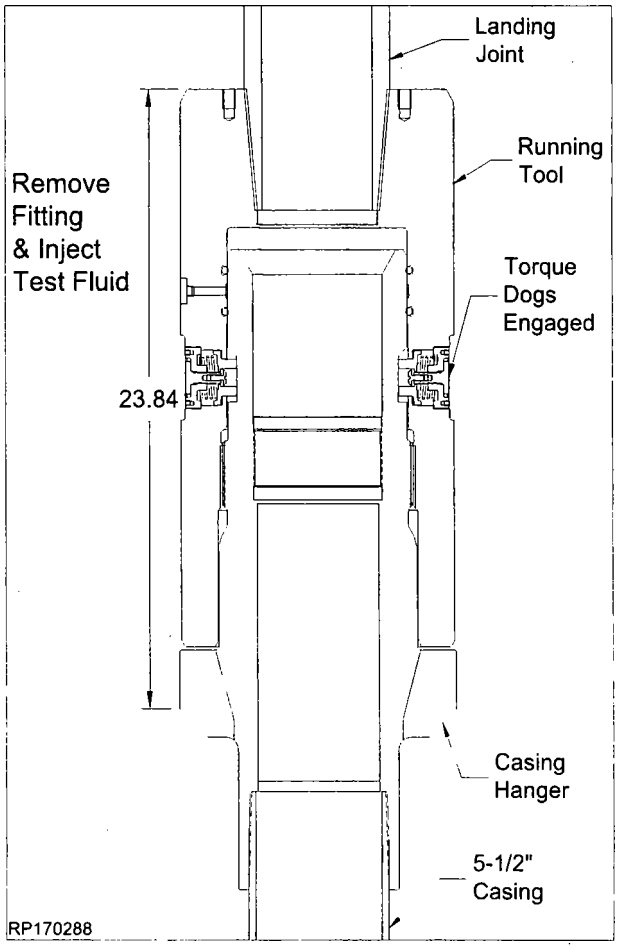
4.4.16. Remove the plug from the port and connect test pump.

4.4.17. Inject test fluid to ***10,000 psi.***

WARNING DO NOT over pressurize!

4.4.18. Hold and monitor test pressure for 5 minutes or as required by the Drilling Supervisor.

4.4.19. Once a satisfactory test has been achieved, bleed off all test pressure and remove test pump.



4.4.20. Reinstall the fitting into the test port.

4.4.21. Lift the Hanger above the casing hung off in the floor.

4.4.22. Lower the hanger assembly until the mating threads of the 5-1/2" casing make contact.

NOTE When making up the Hanger to the casing do not use the seal neck area for back up.

4.4.23. While balancing the weight, rotate the assembly to the left until the thread 'jump' can be felt then to the right to the thread manufacturer's recommended optimum torque.

WARNING Rotate Mandrel Hanger and Running Tool as a unit. DO NOT allow the Running Tool to back out of the Mandrel Hanger.

WARNING Maximum rated torque for Running Tool P/N 2161757-83-01 (Item ST11) and Mandrel Hanger P/N 2345649-49-01 (Item A6) is 20,000 ft-lbf.

Stage 4.0 — 5-1/2" Casing

4.4.24. Release the casing from the floor slips and lower it into the well, tallying the casing as it is lowered, until the Hanger lands on the load shoulder of the Packoff.

WARNING DO NOT rotate on the load shoulder.

NOTE Distance from the Pack-off load shoulder to the face of the BOP Flange is 12.90".

4.4.25. Ensure Mandrel hanger is centered in well bore.

4.4.26. Slack off all weight.

4.4.27. Verify the Hanger has landed properly.

4.4.28. Mark on the OD of the landing joint with a paint marker.

4.4.29. Raise the mandrel Hanger above the load shoulder approximately 2 feet.

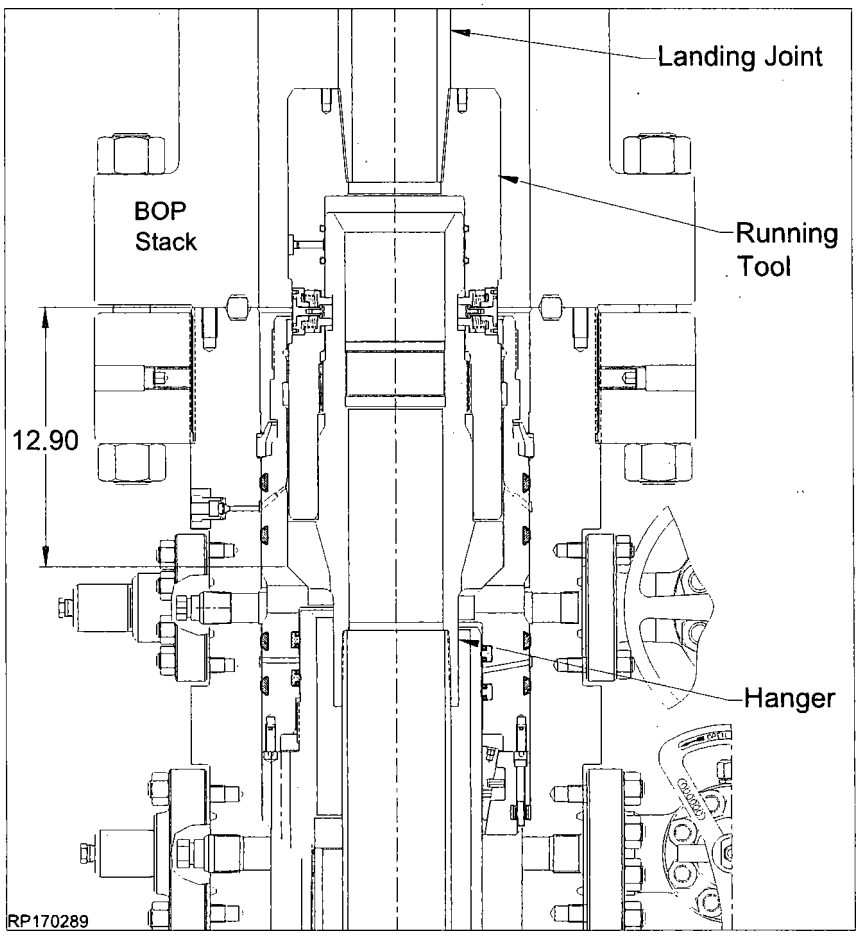
4.4.30. Cement the casing as required.

WARNING Mandrel Hanger must be lowered back to shoulder before cement is allowed to set.

NOTE Casing Hanger may be rotated while it is lowered into the well with torque limit of 20,000 ft-lbf

NOTE Cement returns may be taken through the flow-by slots of the Hanger/Running Tool and out of the BOP Stack.

4.4.31. Immediately after, carefully lower the Hanger back down until it lands on the load shoulder of the Packoff Support Bushing. Check the paint mark to ensure that the Hanger has landed properly.



4.4.32. With cementing completed, rotate the landing joint to the left to release the running tool from the Hanger, approximately 10 turns. Pins will automatically disengage when the Hanger running tool is rotated to the left.

4.4.33. Retrieve the Tool to the rig floor.

4.4.34. Examine the ***Running Tool.*** Verify the following:

- all torque dogs function properly and retract from the ID by compressing the springs
- o-rings are undamaged. Replace if necessary

4.4.35. Clean, grease and store the Tool as required.

Stage 4.0 — 5-1/2" Casing

4.5. Install the Seal Assembly

4.5.1. Examine the ***Seal Assembly Running Tool (Item ST12)***. Verify the following:

- bore is clean and free of debris
- all threads are clean and undamaged

4.5.2. Orient the Running Tool as illustrated.

4.5.3. Examine the ***Seal Assembly (Item A7)***. Verify the following:

- bore is clean and free of debris
- all elastomer seals are in place, clean and undamaged
- all threads are clean and undamaged
- lockring is in place
- ensure spring plunger pins on the inside of the Seal Assembly are properly installed and spring loaded pins retract properly.

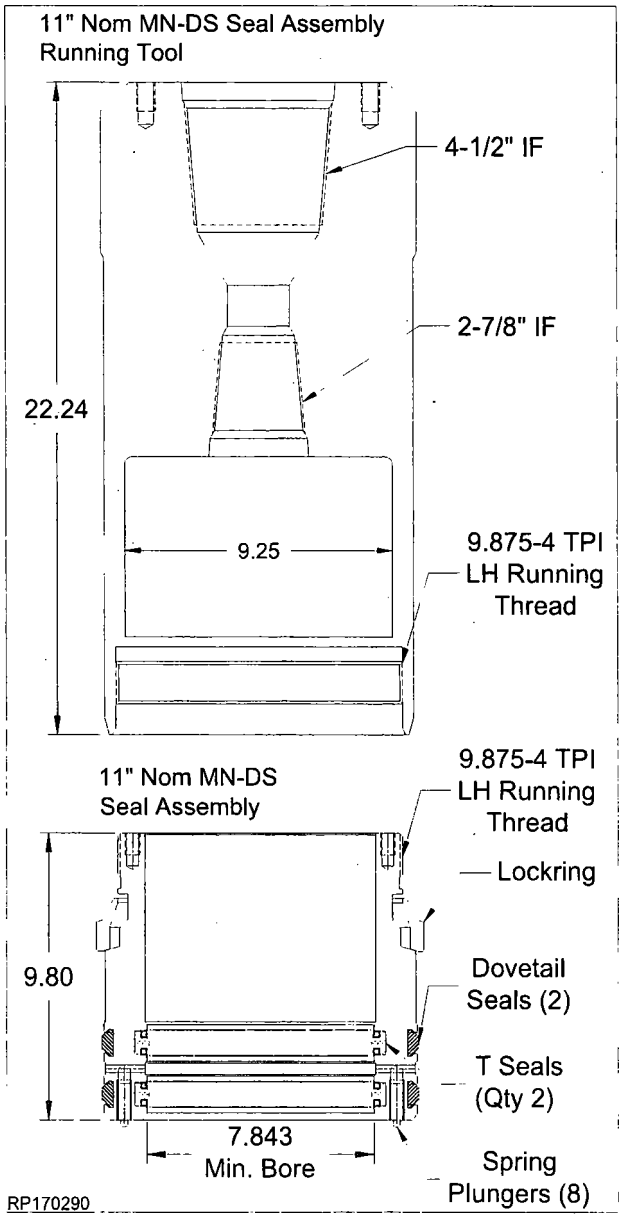
4.5.4. Orient the Seal Assembly as illustrated.

4.5.5. Lubricate the running threads of the Seal Assembly and threads of the Running Tool with a light coat of oil or grease.

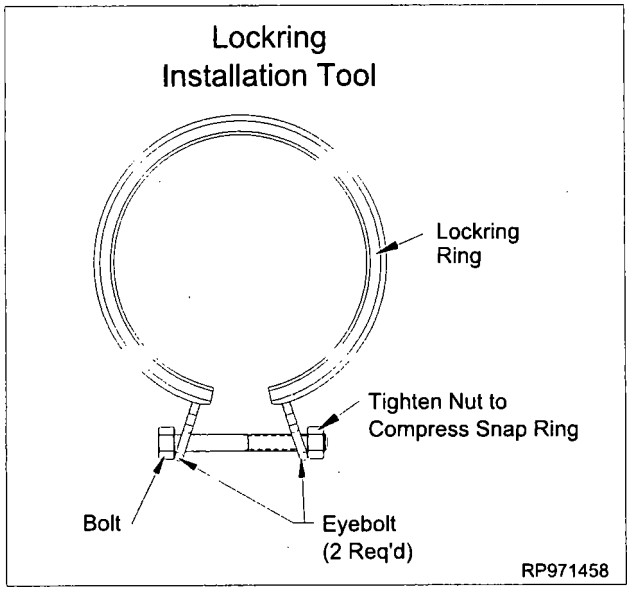
4.5.6. Run drill pipe or heavy weight collars through the rotary table and hang off in the floor slips. This will be used for weight to set the Seal assembly into position. If running heavy weight pipe, measure OD of all pipe and connection to make sure pipe will drift casing.

NOTE **Heavy weight drill pipe or drill collars are used to aid in landing the Seal Assembly. Weight required to run the Seal Assembly into the Housing is approximately 3,000 lbs.**

4.5.7. Make up a joint of drill pipe to the top of the Running Tool.



4.5.8. Install a ***Lockring Installation Tool (Item ST14)*** onto the lockring of the Seal Assembly.



NOTE See APPENDIX 1 for optional Lockring Installation Tool on the back of this procedure.

4.5.9. Fully compress the lockring.

NOTE The Lockring Installation Tool will assist in minimizing the length of time that the lockring is compressed.

4.5.10. Carefully lower the Running Tool onto the Seal Assembly until the threads make contact.

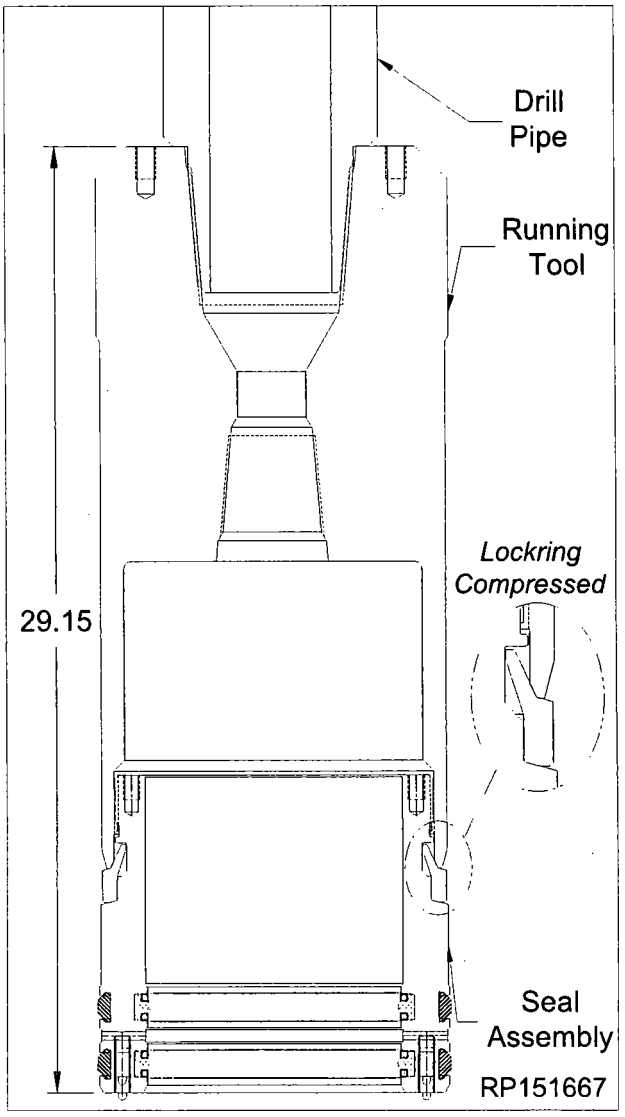
4.5.11. Make up the connection by first turning the Tool to the right to align the threads then to the left until the Tool engages the lockring.

NOTE Approximate 6-1/2 turns are required for full make-up. Write down the number of turns to make up the Tool to the Seal Assembly in the Field Service Report.

⚠ CAUTION

Do not use Top Drive to engage/disengage the running tool. Using the Top Drive will permanently damage the equipment running threads and will require the damaged part to be replaced.

4.5.12. Once the lockring is engaged remove the Lockring Installation Tool.



NOTE Ensure the lockring is flush or below the OD of the Seal Assembly.

4.5.13. Wipe the ID of the 'T' seals and the OD of the dovetail seals with a light coat of oil or grease.

⚠WARNING Excessive oil or grease may prevent a positive seal from forming.

4.5.14. Lift and suspend the Seal Assembly over the drill pipe hung off in the rig floor.

4.5.15. Lower the Seal Assembly onto the threads of the drill pipe and make up the connection.

⚠WARNING Do NOT damage the internal seals of the Packoff Support Bushing assembly.

Stage 4.0 — 5-1/2" Casing

4.5.16. Open the uppermost side outlet valves on the Housing.

NOTE The uppermost side outlet valve is to remain open during the setting of the Seal Assembly.

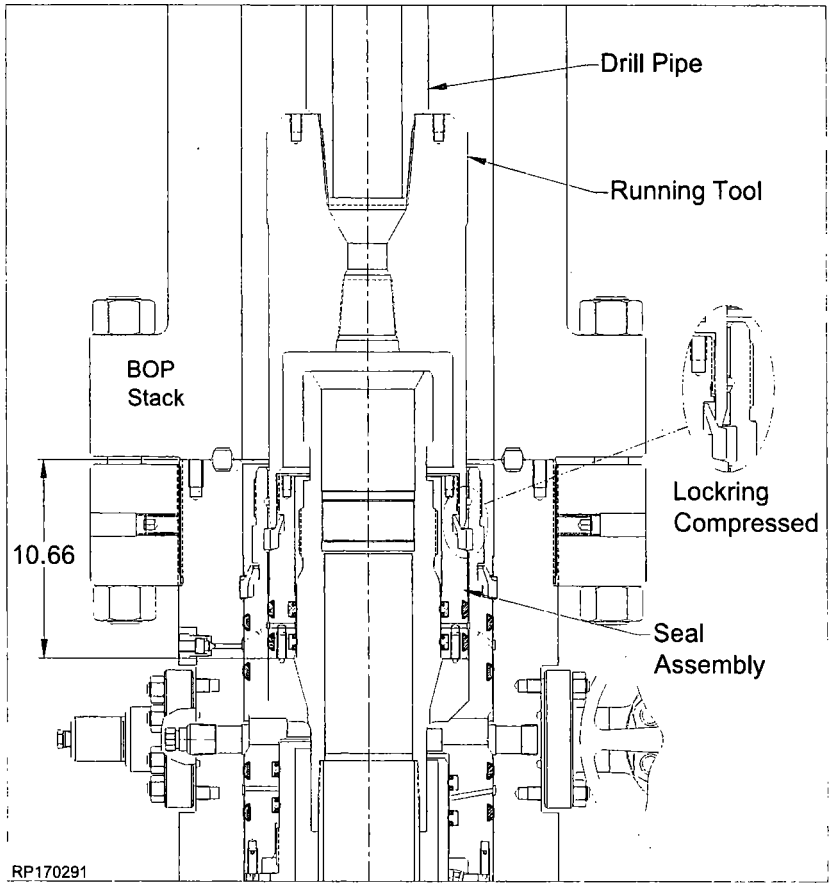
4.5.17. Center and lower the assembly through the BOP Stack and Housing, measure and record, until the Seal Assembly lands on the Casing Hanger.

NOTE Distance from the Mandrel Casing Hanger landing shoulder to the face of the BOP flange is 10.66".

4.5.18. Turn the landing joint to the left until the (8) Spring Plunger pins engage the casing hanger mating slots. When the pins engage the hanger, STOP turning when a positive stop is felt.

4.5.19. Verify the Seal assembly has landed properly.

NOTE Test between the seals of the Seal Assembly will be conducted after the Lockdown Ring has been properly engaged/ set into the Packoff Support Bushing.



4.6. Set the Seal Assembly Lockdown Ring

NOTE ***Confirm the Seal Assembly has properly landed on Mandrel Casing Hanger.***

4.6.1. Make a vertical mark on the landing joint to monitor the number of turns.

4.6.2. Using chain tongs, back out the Tool 3 turns clockwise (right) to allow the Locking ring to expand into its mating groove in the Packoff Support Bushing.

NOTE **Horizontal mark should raise no more than .75".**

WARNING **DO NOT ATTEMPT TO BACK OUT MORE THAN 3 TURNS.**

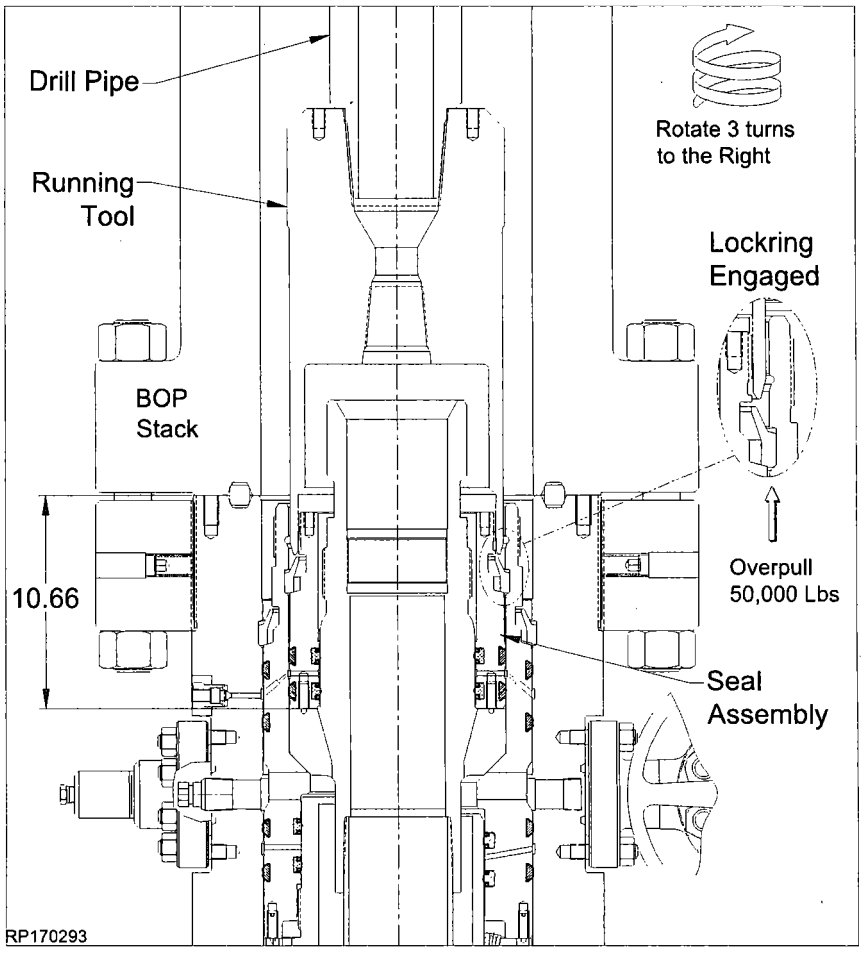
4.6.3. Perform an over pull 50,000 lbs to confirm the lockring has properly engaged.

⚠ CAUTION

Clear out personnel from rig floor during overpull test. Precautions must be taken for personnel verifying the overpull.

⚠ CAUTION

There should be minimum upper movement on the landing joint at any point during the overpull. Actual nominal lockring clearance is 1/8". If vertical movement is greater, check and verify if Seal Assembly has been lifted off from its land off position. If such situation arises, collapse lockring and retrieve Seal Assembly to rig floor to troubleshoot.



NOTE If initial over pull test is unsuccessful, do not immediately collapse the lockring for a second installation attempt. Conduct the following steps prior to Support Bushing retrieval:

- Ensure Packoff Support Bushing Running Tool is backed off 3-1/2 turns.
- Re-apply the installation load (10,000 - 20,000 lbs) to force the Packoff and Lockring down into the groove of the housing.
- Re-attempt 50,000 lbs over pull test.

⚠ CAUTION

If a successful over pull test is not achieved after three installation attempts, follow step 4.5.11 to fully retract the lockring and remove the Packoff Support Bushing. Retrieve the Packoff Support Bushing and lockring to the rig floor for trouble shooting.

NOTE **Dovetail seals must be replaced prior to re-installing the Packoff Support Bushing.**

Stage 4.0 — 5-1/2" Casing

4.7. Testing Between the 8-5/8" Packoff Upper Seals & 5-1/2" Packoff

4.7.1. Locate the upper test port on the MN-DS Casing Head and remove the fitting from the port.

4.7.2. Attach a hydraulic test pump to the open test port and inject fluid into the seal assembly to the ***10,000 psi maximum.***

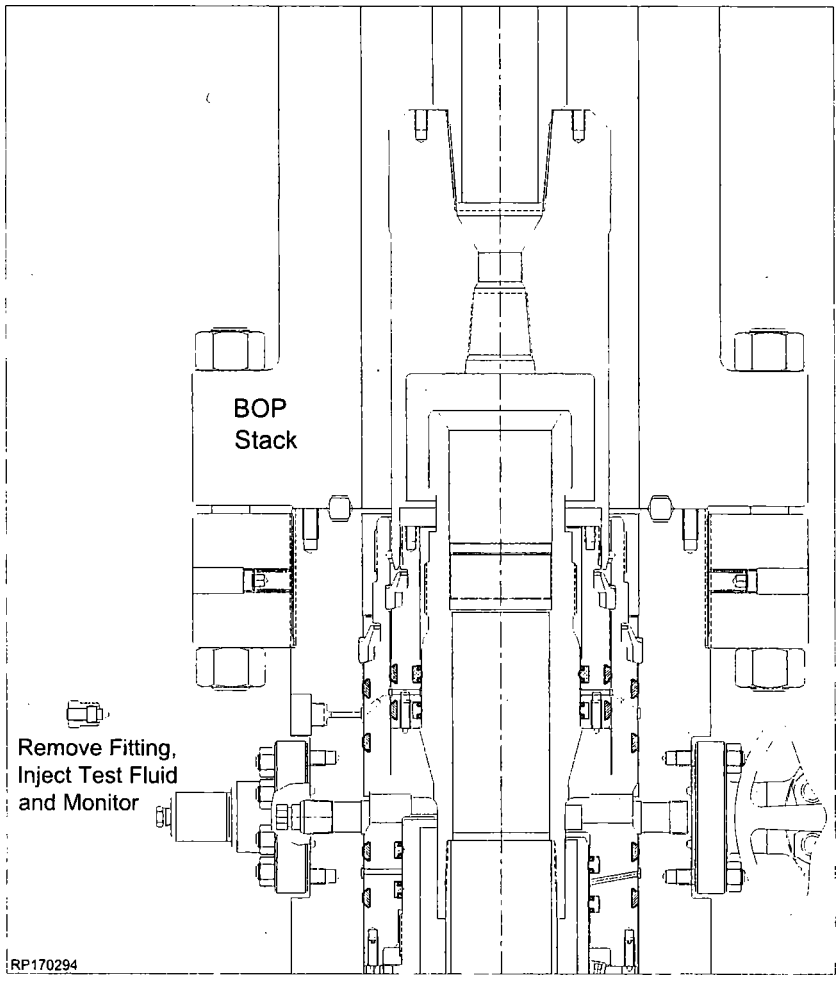
⚠WARNING Do Not overpressurize!

4.7.3. Hold and monitor the test pressure for 15 minutes or as required by the Drilling Supervisor.

4.7.4. After a satisfactory test is achieved, carefully bleed off the test pressure, remove the test pump and install the fitting.

4.7.5. Retrieve the running tool by rotating the drill pipe (with chain tongs) to the right approximately 3-1/2 turns or until it comes free from the seal assembly. A straight lift will retrieve the running tool.

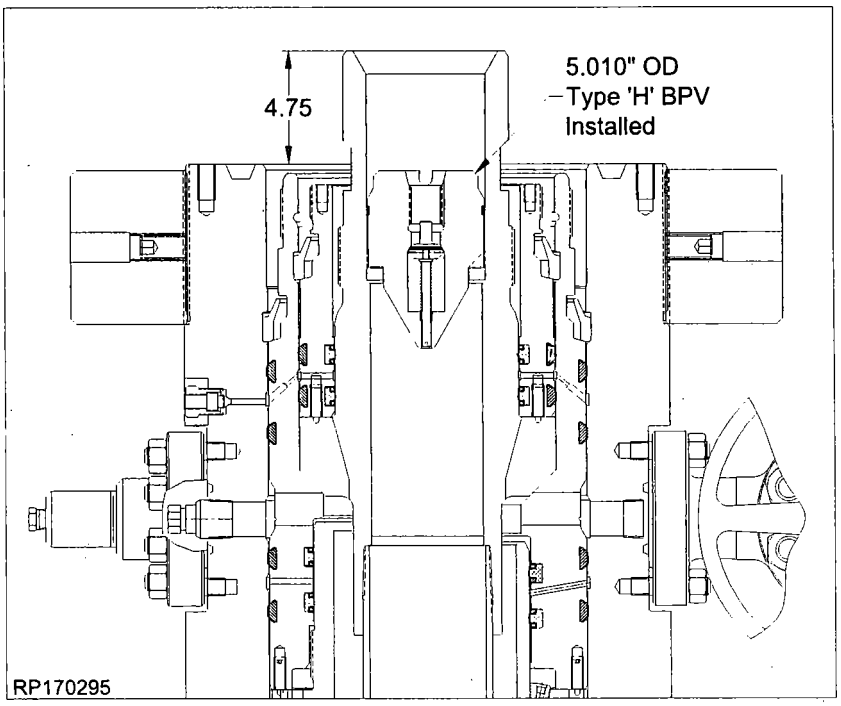
4.7.6. Remove the running tool from the drill string. Clean, grease, and store the tool as required.



4.7.7. Install a back pressure valve into the Hanger prep.

NOTE Installation and/or removal of the Type 'H' Left Hand Back Pressure Valve to be performed only by a qualified Cameron Service Technician.

4.7.8. With the well safe and secure, nipple down the BOP stack.



⚠ CAUTION

A TWC (Two Way Check) is a tool used for testing only and shall not under any circumstances be used as a BPV (Back Pressure Valve).

DO NOT remove the Tree or BOP with a TWC in place. A BPV is used for this purpose.

If for some reason, pressure builds up unexpectedly with the TWC in place, a lubricator outfitted with the proper tool can unseat the TWC poppet to allow equalization of the pressure for safe removal of the TWC after which a BPV can be installed with the lubricator to secure the well.

⚠ CAUTION

The following procedure should be followed **ONLY** in the event Retrieval of the Seal Assembly is necessary. If the Seal Assembly was properly landed, skip this procedure.

4.8. Retrieval of Seal Assembly

4.8.1. Make up a joint of drill pipe to the top of the ***Seal Assembly Running Tool (Item ST12).***

4.8.2. Lower the Running Tool through BOP stack and land on top of Seal Assembly.

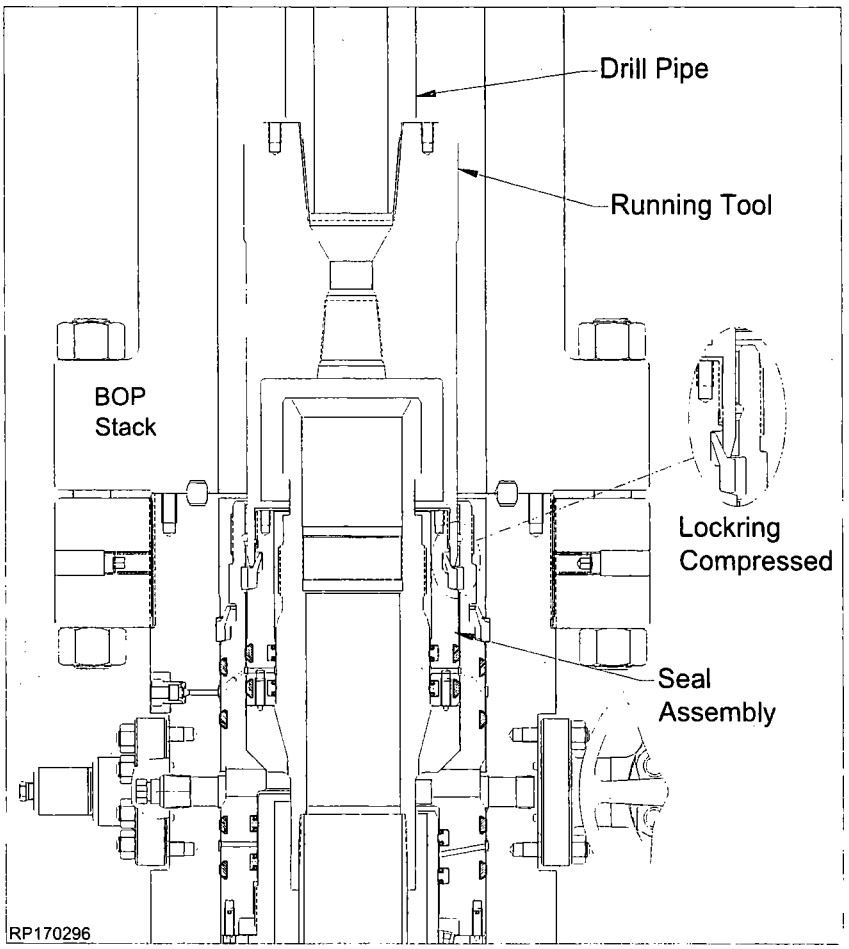
4.8.3. Rotate the Tool counter-clockwise approximately 6-1/2 turns or the number of turns documented per section 4.5, until the tool fully engages the lockring and a firm stop is encountered. Back off from this point a maximum 1/8 of a turn.

4.8.4. Retrieve the Seal Assembly by pulling vertically (approximately 3,000 lbs).

⚠WARNING If overpull exceeds this value, repeat counter-clockwise rotation until a firm stop is encountered and repeat overpull.

4.8.5. To remove Seal Assembly from the running tool, install ***Lockring Installation Tool*** and fully compress the Lockring.

NOTE Dovetail seals must be replaced prior to re-installing the Seal assembly.



Stage 4.0 — 5-1/2" Casing

4.9. Install the Capping Flange

4.9.1. Use the ***Capping Flange (Item TA1).***

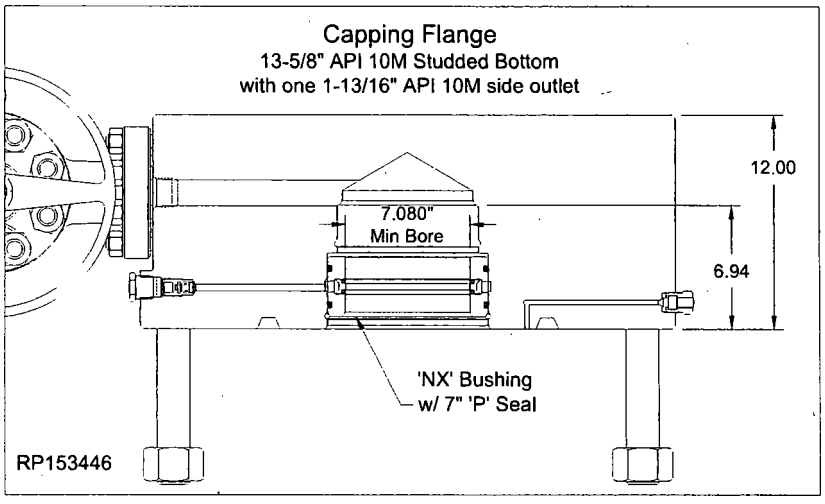
4.9.2. Use the ***'NX' Bushing (Item TA2).***

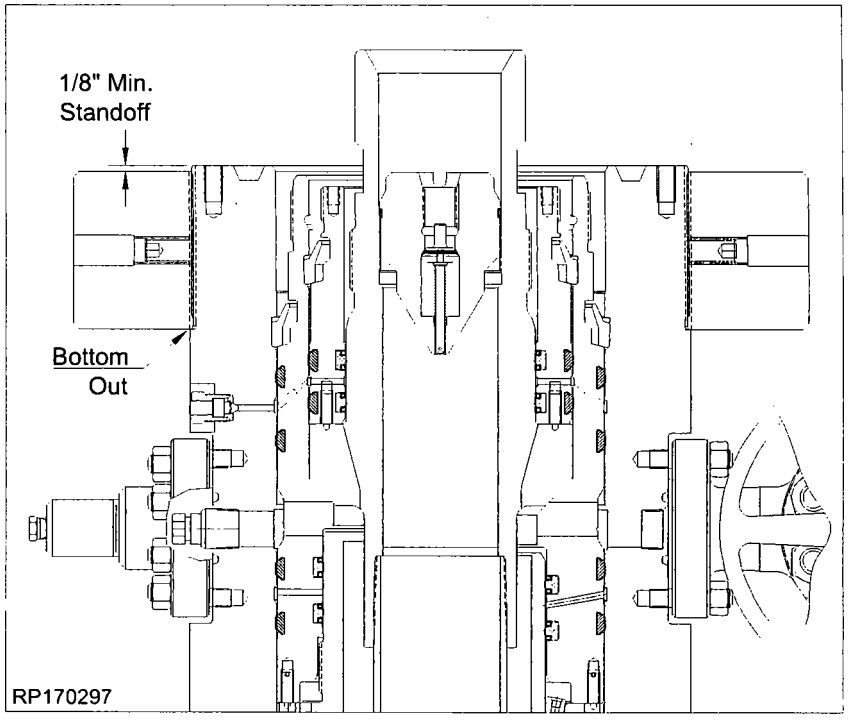
NOTE **Verify Casing Head Housing Threaded Flange is two-holed over the side studded outlets and confirm make up dimension. Dimension must be 1/8" from the top of the Threaded Flange to the top of the Housing.**

WARNING

SEE RP-000592

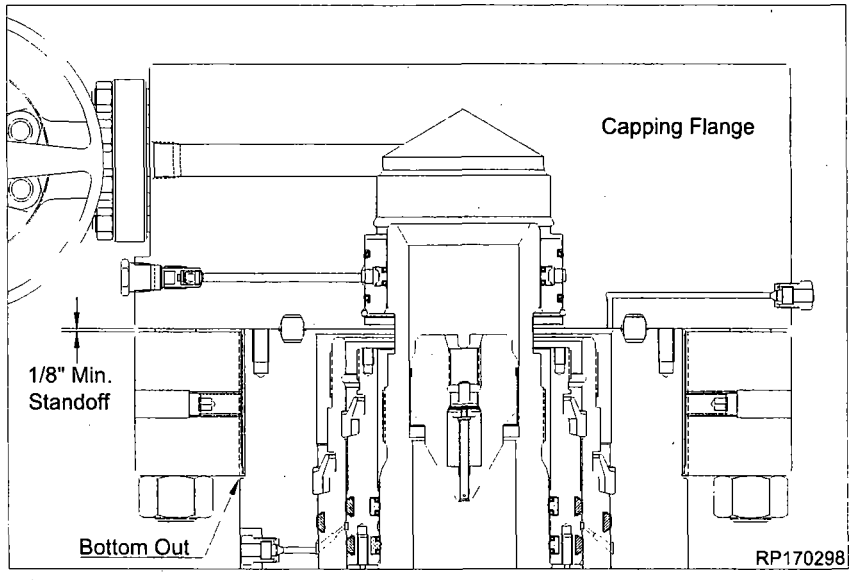
PROCEDURE FOR STANDARD 'NX' BUSHING





Stage 4.0 — 5-1/2" Casing

4.9.3. Use ***Ring Gasket BX-159 (Item A23).***



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

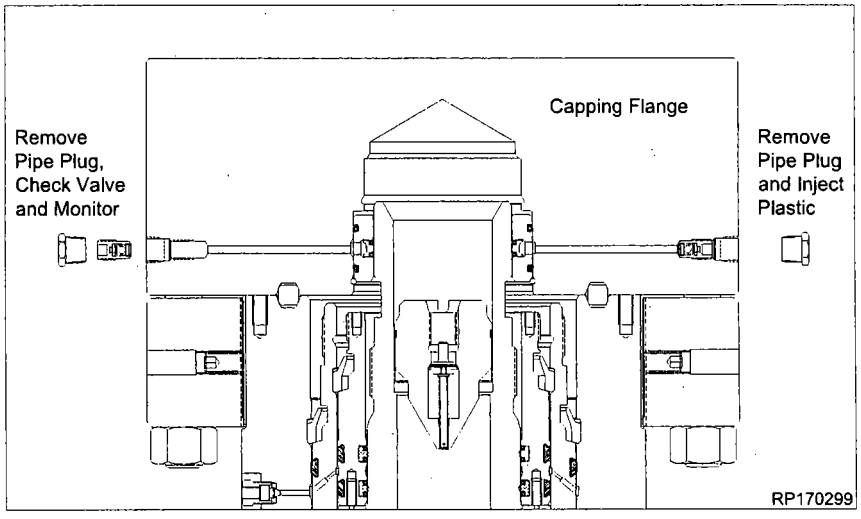
Stage 4.0 — 5-1/2" Casing

4.10. Energize the NX Bushing 'P' Seal

WARNING

SEE RP-000592

PROCEDURE FOR STANDARD 'NX' BUSHING



WARNING

SEE RP-000608

PROCEDURE FOR SINGLE 'P' SECONDARY SEAL

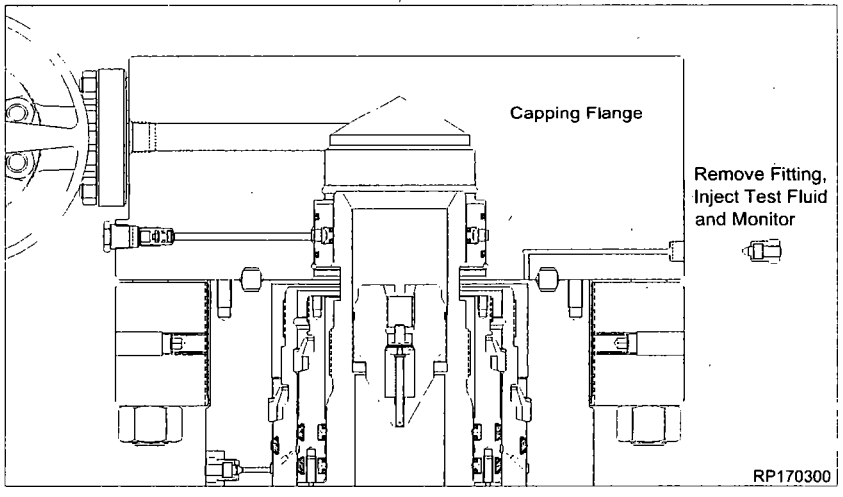
4.11. Test the Connection

4.11.1. Test pressure to ***10,000 psi maximum.***

WARNING

SEE RP-000592

PROCEDURE FOR STANDARD 'NX' BUSHING



Stage 5.0 — Emergency 8-5/8" Casing

SAFETY NOTE: **Always wear proper PPE (Personal Protective Equipment) especially gloves to handle and install the slip type casing hanger.**

NOTE

1. **Reconfirm the Casing OD and grade. Remove and clean loose scale from Casing OD.**
2. **Verify Slip Bowl taper is smooth, clean with no corrosion and damage free.**
3. **Disassembly of the Hanger to re-orient the slips is not required.**

5.1. Hang off the Casing (Emergency)

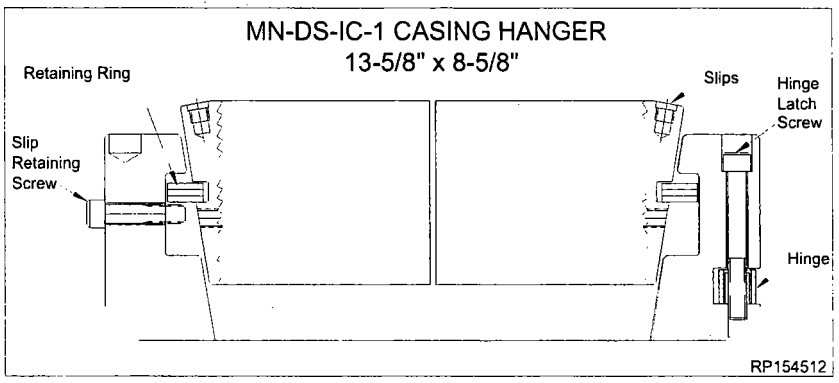
NOTE **The following procedure should be followed ONLY if the casing should become stuck. If the Mandrel Casing Hanger was used, skip this stage.**

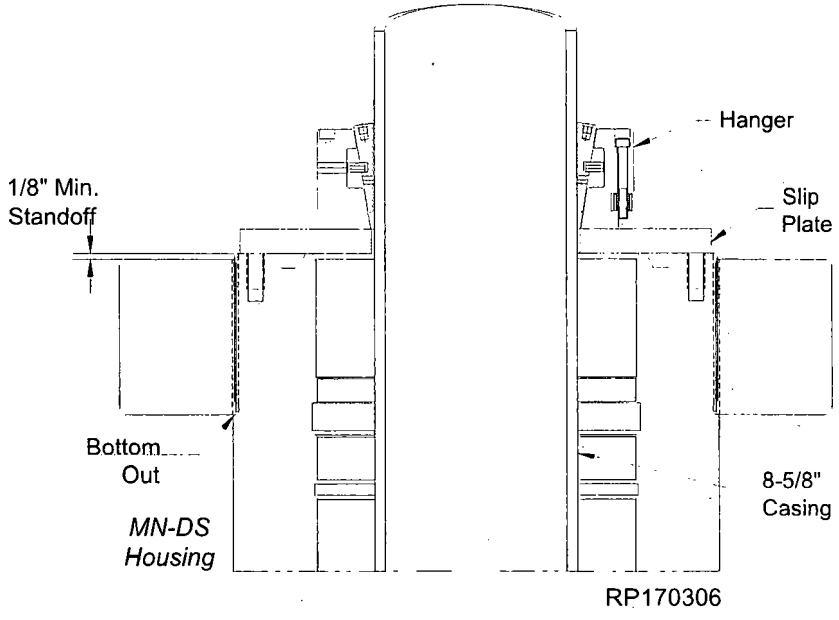
5.1.1. Use ***MN-DS-IC-1 Casing Hanger (Item E1).***

WARNING

SEE RP-000617

PROCEDURE FOR HANGING OFF IC-1 CASING HANGER





Stage 5.0 — Emergency 8-5/8" Casing

5.1.2. Rough cut the casing no less than 5-1/2" above the top flange of the Housing and move the BOP and excess casing out of the way.

5.1.3. Using an internal cutter, final cut the casing at 16" +/-1/8" below the Housing flange.

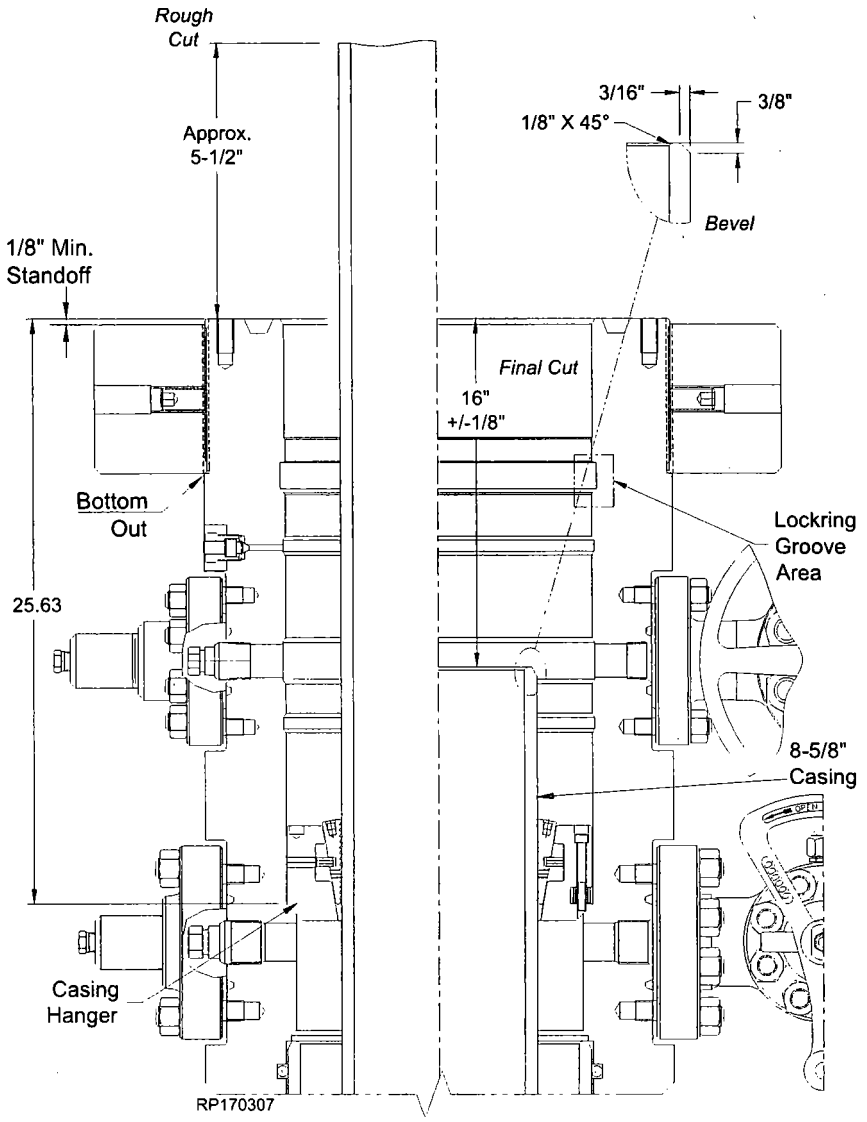
5.1.4. Place a 3/8" x 3/16" bevel on the casing stub and remove all burrs and sharp edges.

NOTE **There must not be any rough edges on the casing or the seals of the Packoff will be damaged.**

5.1.5. Use a new ***BX-159 Ring Gasket (Item A23)*** in the Housing ring groove.

5.1.6. Reconnect the BOP Stack to the Housing using the ***Studs and Nuts***. Tightening the studs and nuts in an alternating cross pattern to the torque referenced in the chart in the back of this procedure.

5.1.7. Close the lower casing valve.



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

Stage 5.0 — Emergency 8-5/8" Casing

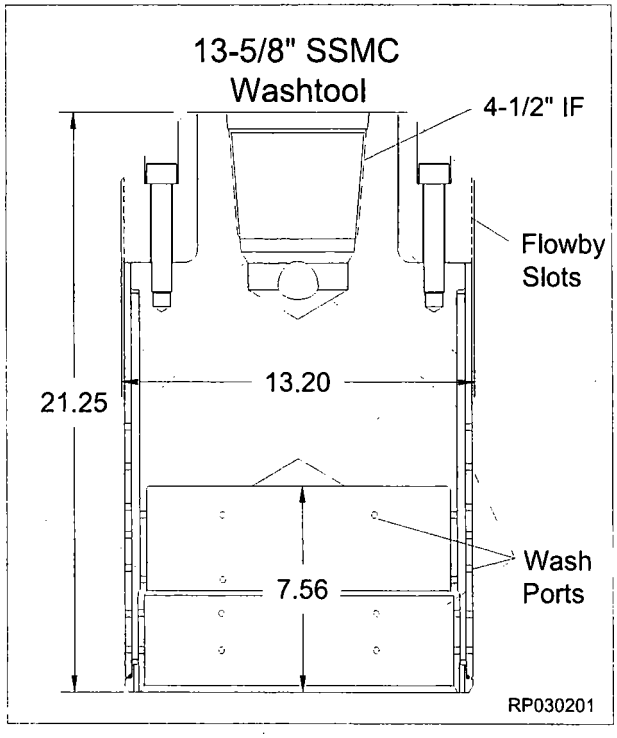
5.2. Recommended Procedure - Washout prior to landing Seal Assembly

5.2.1. Use the ***Wash tool (Item ST6).***

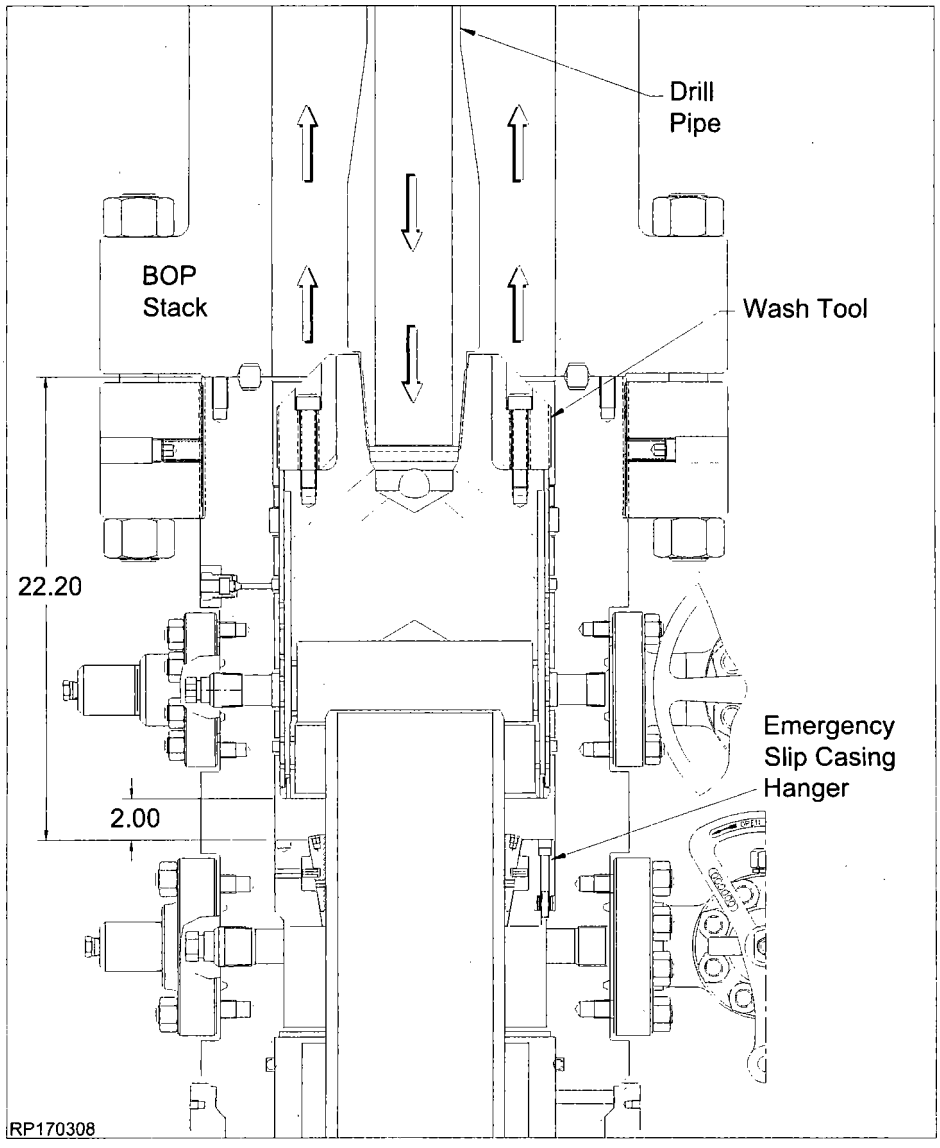
⚠WARNING

SEE RP-003734

PROCEDURE FOR STANDARD WASH TOOL



Stage 5.0 — Emergency 8-5/8" Casing



Stage 5.0 — Emergency 8-5/8" Casing

5.3. Installing the Packoff Support Bushing

5.3.1. Use ***Packoff Support Bushing Running Tool (Item ST7).***

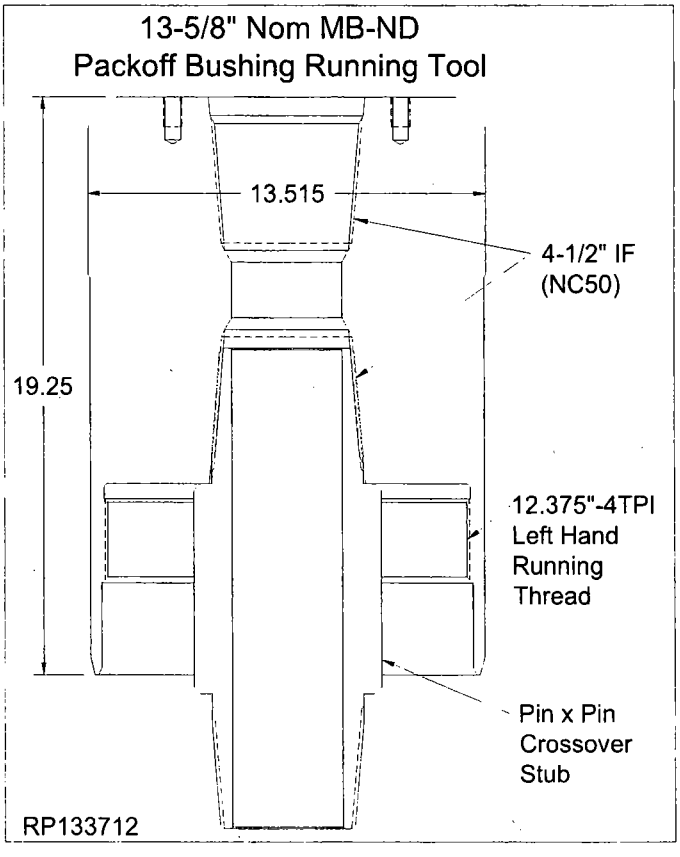
5.3.2. Use ***Emergency Packoff Support Bushing (Item E2).***

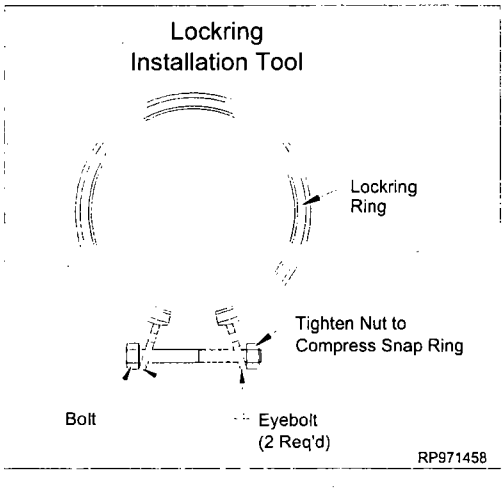
⚠ WARNING

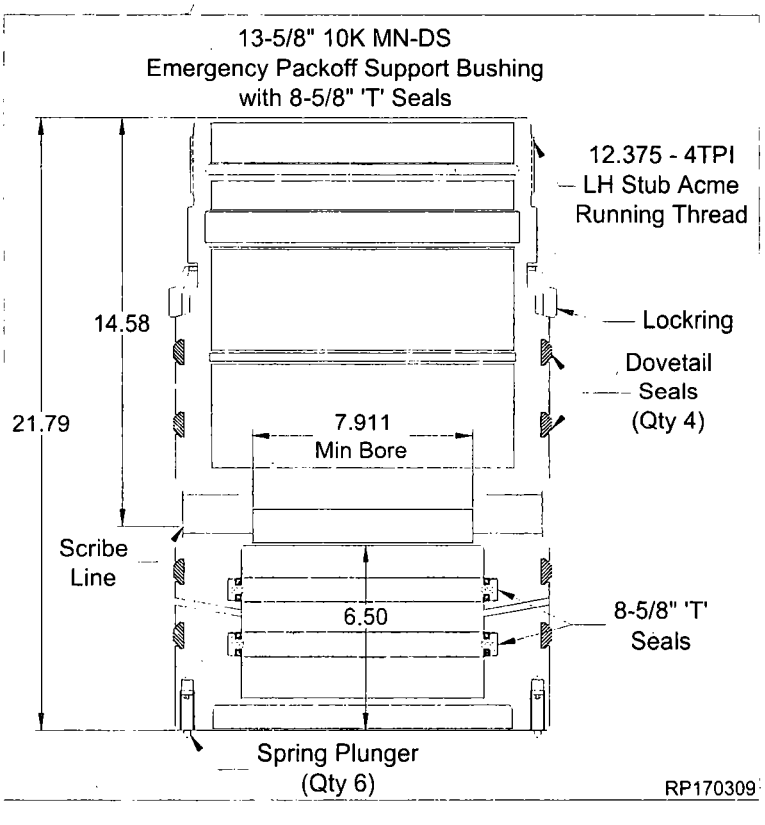
SEE RP-003741

PROCEDURE FOR STANDARD MN-DS INTERMEDIATE PACKOFF SUPPORT BUSHING

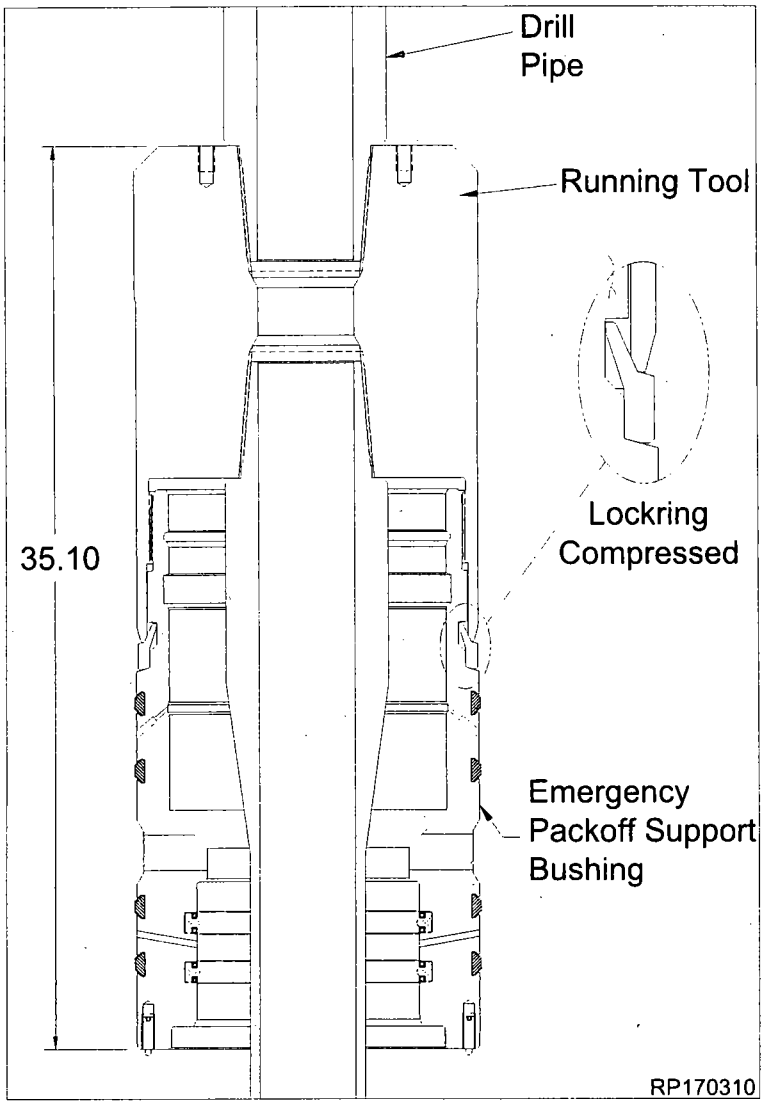
5.3.3. Use ***Lockring Installation Tool.***



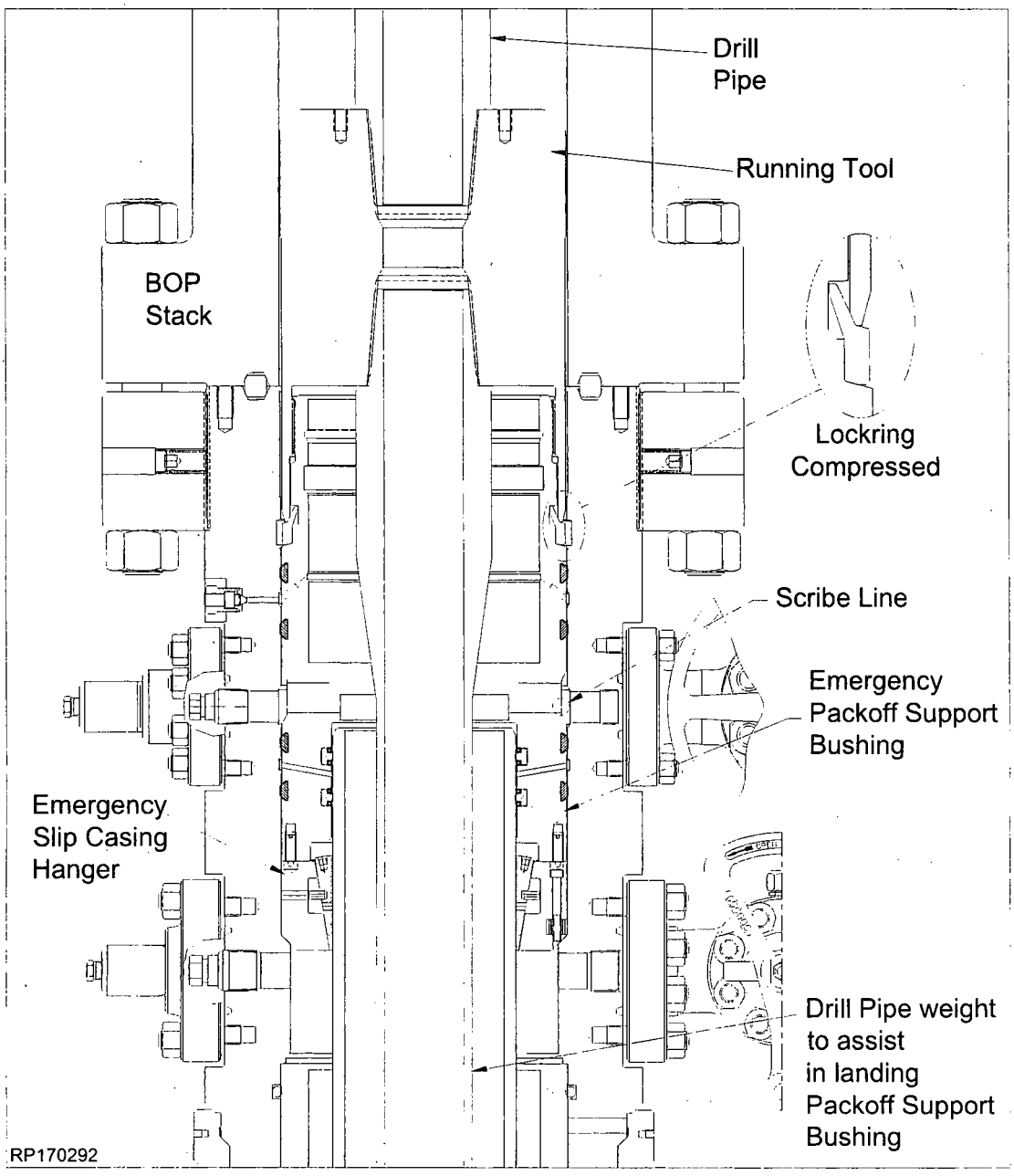




Stage 5.0 — Emergency 8-5/8" Casing



Stage 5.0 — Emergency 8-5/8" Casing



NOTE Continue Section 3.7. for system installation.

Stage 6.0 — Emergency 5-1/2" Casing

SAFETY NOTE: **Always wear proper PPE (Personal Protective Equipment) especially gloves to handle and install the slip type casing hanger.**

NOTE

1. **Reconfirm the Casing OD and grade. Remove and clean loose scale from Casing OD.**
2. **Verify Slip Bowl taper is smooth, clean with no corrosion and damage free.**
3. **Disassembly of the Hanger to re-orient the slips is not required.**

6.1. Hang off the Casing (Emergency)

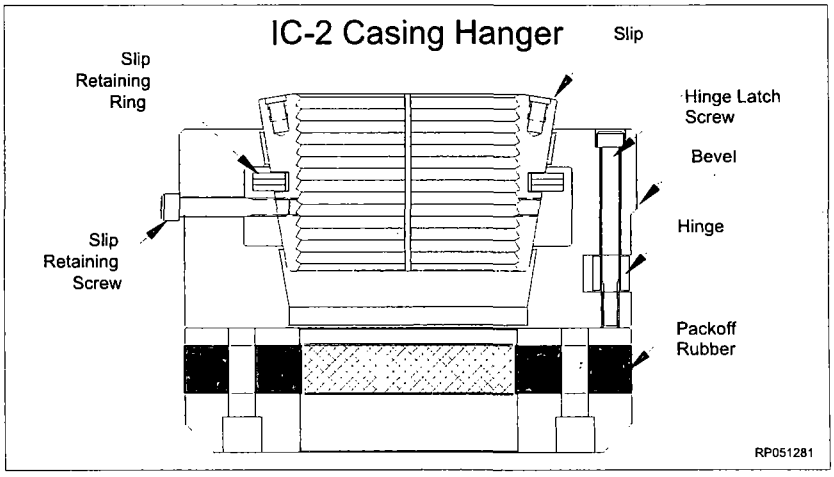
NOTE **The following procedure should be followed ONLY if the casing should become stuck. If the Mandrel Casing Hanger was used, skip this stage.**

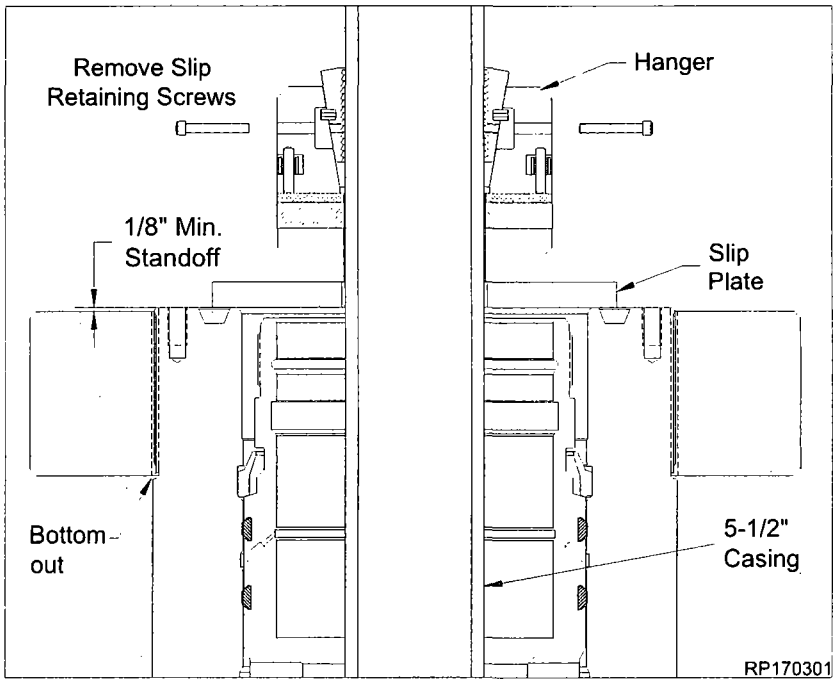
6.1.1. Use ***IC-2 Casing Hanger (Item E3).***

WARNING

SEE RP-000573

PROCEDURE FOR STANDARD IC-2 CASING HANGER



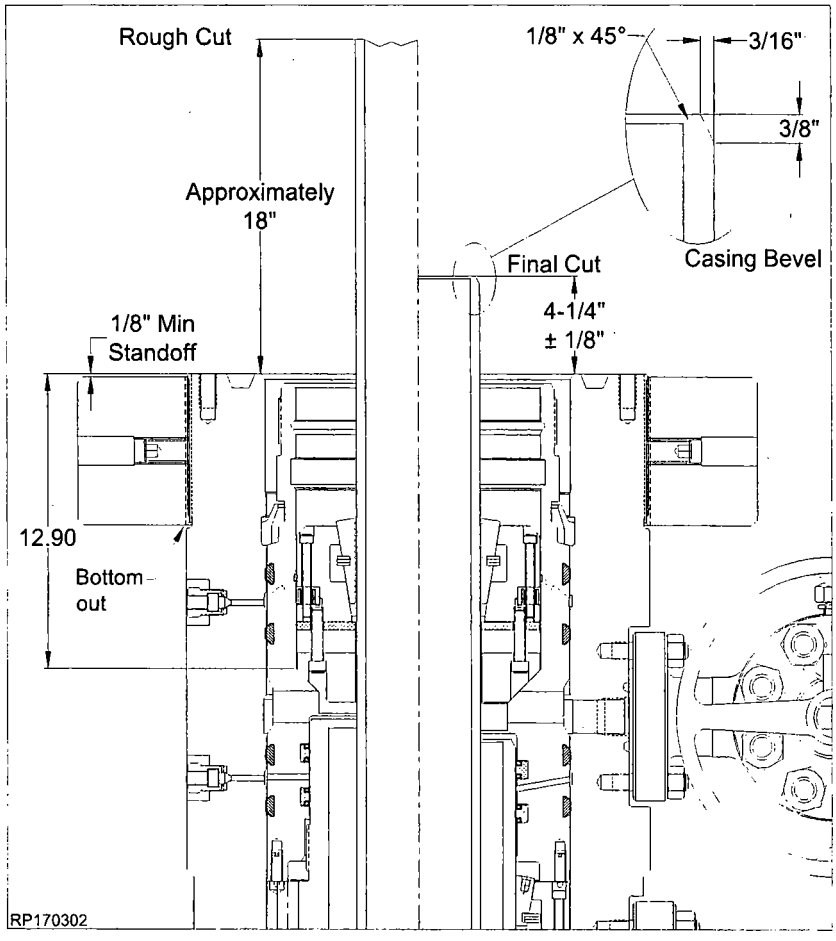


Stage 6.0 — Emergency 5-1/2" Casing

NOTE **Approximately 70,000 lb is needed to set 5-1/2" packoff.**

6.1.2. Rough cut the casing approximately 18" above the top of the Housing flange.

6.1.3. Final cut the casing at 4-1/4" +/- 1/8" above the top of the Housing.



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

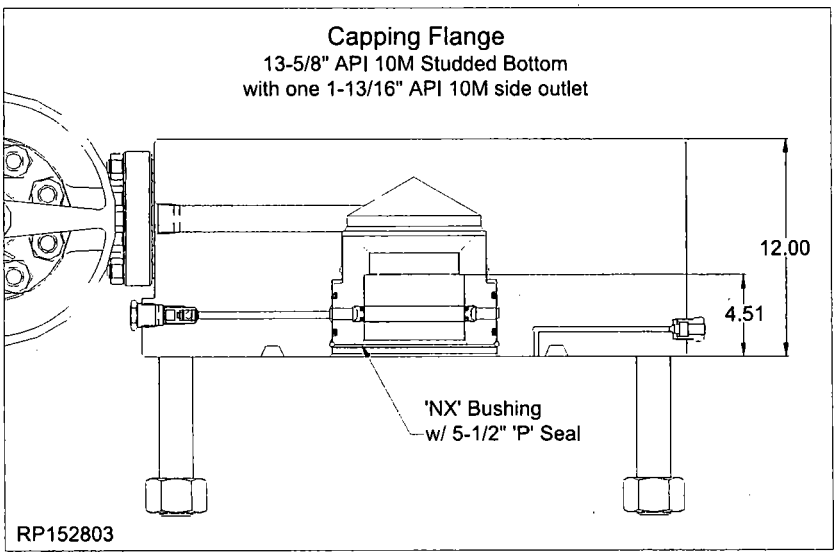
Stage 6.0 — Emergency 5-1/2" Casing

6.2. Install the Capping Flange and the Emergency 'NX' Bushing

6.2.1. Use the ***Capping Flange (Item TA1).***

6.2.2. Use the ***'NX' Bushing (Item E4).***

NOTE **Verify Casing Head Housing Threaded Flange is two-holed over the side studded outlets and confirm make up dimension. Dimension must be 1/8" from the top of the Threaded Flange to the top of the Housing.**

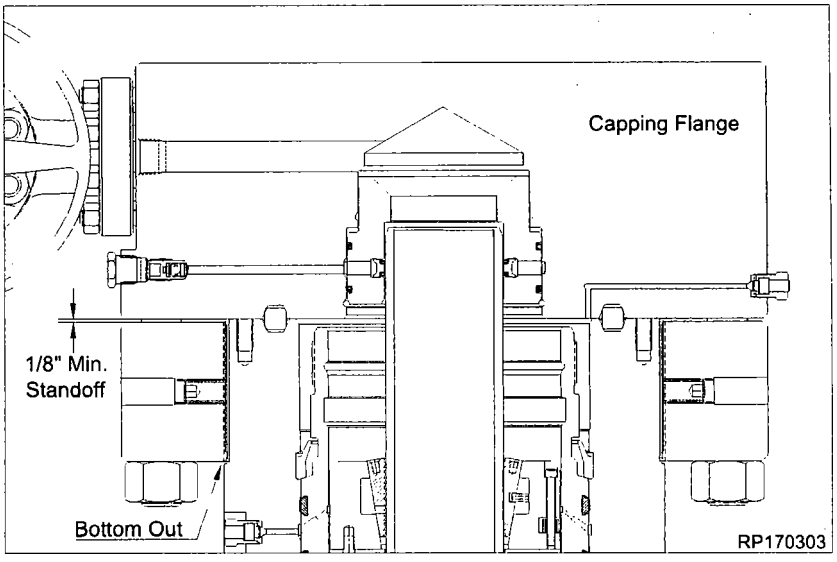


⚠ WARNING

SEE RP-000592

PROCEDURE FOR STANDARD 'NX' BUSHING

6.2.3. Use ***Ring Gasket BX-159 (Item A23).***



⚠ CAUTION

Ensure and verify Threaded Flange is properly installed to the Casing Head.

1. **Rotate the threaded flange counterclockwise (left hand thread) to a positive stop and bottom out threaded flange on Casing Head flange shoulder.**
2. **Verify make up dimension. Dimension from the top of the threaded flange to the top of the casing head must be 1/8" or greater.**

Threaded flange must remain shouldered out during installation.

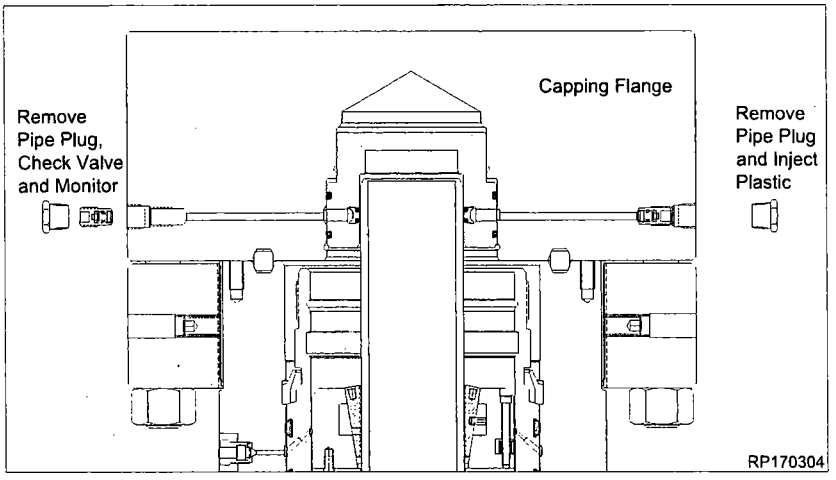
Stage 6.0 — Emergency 5-1/2" Casing

6.3. Energize the NX Bushing 'P' Seal

WARNING

SEE RP-000592

PROCEDURE FOR STANDARD 'NX' BUSHING



WARNING

SEE RP-000608

PROCEDURE FOR SINGLE 'P' SECONDARY SEAL

6.4. Test the Connection

6.4.1. Test pressure to ***10,000 psi maximum or 80% of casing collapse-whichever is less.***

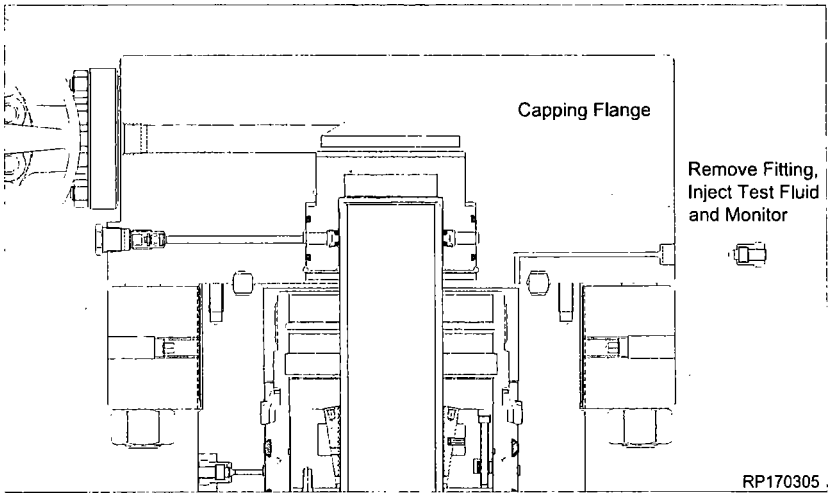
NOTE ***Do not exceed 80% of casing collapse.***

NOTE **Contact the Drilling Supervisor to determine the collapse pressure of the specific grade and weight of the casing used.**

WARNING

SEE RP-000592

PROCEDURE FOR STANDARD 'NX' BUSHING



Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

The following procedure is a direct extraction (except for the numeric footnote designators) from the Fourteenth Edition of API 6A[1]. Editorial footnotes have been added to provide additional information that may be of benefit when developing procedures for specific field welding applications. The recommended procedure and footnotes are for general information purposes and it should be mentioned that Cameron is not responsible for determining or administering any field welding practices. The organization performing the welding should qualify their welding procedure(s) and welder(s) in accordance with applicable codes and standards[2]. The success of any field weld should be verified by subsequent hydrostatic test at the direction of the customer.

B.1 Introduction and Scope. - The following recommended procedure has been prepared with particular regard to attaining pressure-tight welds when attaching casing heads, flanges, etc., to casing. Although most of the high strength casing used (such as P-110) is not normally considered field weldable, some success may be obtained by using the following or similar procedures[3].

⚠ CAUTION In some wellheads, the seal weld is also a structural weld and can be subjected to high tensile stresses. Consideration must therefore be given by competent authority to the mechanical properties of the weld and its heat affected zone.

1. The steels used in wellhead parts and in casing are high strength steels that are susceptible to cracking when welded. It is imperative that the finished weld and adjacent metal. be free from cracks, The heat from welding also affects the mechanical properties. This is especially serious if the weld is subjected to service tension stresses.

2. **This procedure is offered only as a recommendation. The responsibility for welding lies with the user and results are largely governed by the welder's skill. Weldability of the several makes and grades of casing varies widely, thus placing added responsibility on the welder.** Transporting a qualified welder to the job, rather than using a less-skilled man who may be at hand, will, in most cases, prove economical. The responsible operating representative should ascertain the welder's qualifications and if necessary, assure himself by instruction or demonstration, that the welder is able to perform the work satisfactorily.

B.2 Welding conditions. - Unfavorable welding conditions must be avoided or minimized in every way possible, as even the most skilled welder cannot successfully weld steels that are susceptible to cracking under adverse working conditions, or when the work is rushed. Work above the welder on the drilling floor should be avoided. The weld should be protected from dripping mud, water, and oil and from wind, rain, or other adverse weather conditions. The drilling mud, water, or other fluids must be lowered in the casing and kept at a low level until the weld has properly cooled. It is the responsibility of the user to provide supervision that will assure favorable working conditions, adequate time, and the necessary cooperation of the rig personnel.

B.3 Welding. - The welding should be done by the shielded metal-arc[4] or other approved process.

B.4 Filler Metal. - After the root pass, low hydrogen electrodes or filler wires of a yield strength equal to the casing yield strength should be used[5]. The low hydrogen electrodes include classes EXX15, EXX16, EXX18, EXX28 of AWS A5.1 (latest edition): *Mild Steel Covered Arc- Welding Electrodes** and AWS A5.5 (latest edition): *Low Alloy Steel Covered Arc-Welding Electrodes**. Low hydrogen electrodes should not be exposed to the atmosphere until ready for use. Electrodes exposed to atmosphere should be dried 1 to 2 hours at 500 to 600°F *(260 to 316°C)* just before use[6].

*Available from the American Society for Testing and Materials, 1916 Race street, Philadelphia, Pa. 19103.

B.5 Preparation of Base Metal. - The area to be welded should be dry and free of any paint, grease, scale, rust or dirt.

B.6 Preheating. - Both the casing and the wellhead member should be preheated to 250-400°F *(121 to 204°C)* for a distance of at least 3 inches *(76.2 mm)* on either side of the weld location, using a suitable preheating torch. Before applying preheat, the fluid should be bailed out of the casing to a point several inches *(mm)* below the weld location. The preheat temperature should be checked by the use of heat sensitive crayons. Special attention must be given to preheating the thick sections of wellhead parts to be welded, to insure uniform heating and expansion with respect to the relatively thin casing[7].

NOTE Preheating may have to modified because of the effect of temperature on adjacent packing elements which may be damaged by exposure to temperatures 200°F ***(93°C)*** and higher. Temperature limitations of the packing materials should be determined before the application of preheat.

⚠WARNING If Casing Head is designed with an internal o-ring bottom prep and the internal o-ring is installed, ensure the o-ring preheat temperature does not exceed 300°F

Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

B7. Welding technique. - Use a 1/8 or 5/32 inch *(3.2 or 4.0 mm)* E6010 electrode[8] and step weld the first bead (root pass); that is, weld approximately 2 to 4 inches *(50 to 100 mm)* and then move diametrically opposite this point and weld 2 to 4 inches (50 to 100 mm). Then weld 2 to 4 inches *(50 to 100 mm)* halfway between the first two welds, move diametrically opposite this weld, and so on until the first pass is completed. The second pass should be made with a 5/32 *(4.0 mm)* low hydrogen electrode of the proper strength and may be continuous. The balance of the welding groove may then be filled with continuous passes without back stepping or lacing, using a 3/16-inch *(4.8 mm)* low hydrogen electrode. All beads should be stringer beads with good penetration, and each bead after the root pass should be thoroughly peened before applying the next bead. There should be no undercutting and welds shall be workmanlike in appearance.

NOTE ***E7018 RODS HAVE BEEN SUCCESSFULLY USED FOR ROOT PASS.***

1. Test ports should be open when welding is performed to prevent pressure build-up within the test cavity.
2. During welding the temperature of the base metal on either side of the weld should be maintained at 250°F *(121°C)* minimum.
3. Care should be taken to insure that the welding cable is properly grounded to the casing, but ground wire should not be welded to the casing or the wellhead. Ground wire should be firmly clamped to the casing, the wellhead, or fixed in position between pipe slips. Bad contact may cause sparking, with resultant hard spots beneath which incipient cracks may develop; The welding cable should not be grounded to the steel derrick, nor to the rotary-table base.

B.8 Cleaning. - All slag or flux remaining on any welding bead should be removed before laying the next bead. This also applies to the completed weld.

B.9 Defects. - Any cracks or blow holes that appear on any bead should be removed to sound metal by chipping or grinding before depositing the next bead.

B.10 Postheating. - For the removal of all brittle areas on high strength steel casing, a post heat temperature of 1050-1100°F *(566 to 593°C)*[9] is desirable. It is recognized, however, that this temperature is difficult or impossible to obtain in the field, and that the mechanical properties of the wellhead parts and the pipe may be considerably reduced by these temperatures. As a practical matter, the temperature range of 500-900°F *(260 to 482°C)* has been used with satisfactory results.

B.11 Cooling. - Rapid cooling must be avoided. To assure slow cooling, welds should be protected from extreme weather conditions (cold, rain, high winds, etc.) By the use of a blanket of asbestos[10] or other suitable insulating material. Particular attention should be given to maintaining uniform cooling of the thick sections of the wellhead parts and the relatively thin casing, as the relatively thin casing will pull away from the head or hanger if allowed to cool more rapidly. The welds should cool in air to 250°F *(121°C)* (measured with a heat sensitive crayon) prior to permitting the mud to rise in the casing.

NOTE The above procedure is presented for the convenience of our customers. Please Contact Cameron's Land Wellhead engineering Group in Houston, Texas if any additional assistance is required.

Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

[1]API SPECIFICATION 6A - Fourteenth Edition, March 1983, Appendix B, Page 109

[2]ASME Section IX is one such code that provides guidelines for the qualification of welding procedures and welders. It specifically assigns the responsibility of qualification of welding procedures and welders to the organization with "responsible operational control" over the production welding.

[3]Many of the high strength casing grades are weldable but weldability will vary from one casing manufacturer to another even within a given casing grade. The weldability of any base metal is determined largely by its chemical composition. Casing materials, even within a given grade vary widely in their chemical makeup. This necessitates the qualification of welding procedures, not just for a particular grade but also for each different chemical makeup. When qualifying welding procedures intended for field application, it is recommended that field welding conditions be simulated as much as is possible. It is very important that the welding parameters and techniques qualified are duplicated in the field.

[4]American Welding Society designation SMAW (Shielded Metal Arc Welding), commonly referred to as "stick welding."

[5]Finding filler metals that will match the strength of the high strength casings will be very difficult if not impossible to do. For instance, E12018M is the highest strength electrode classified by AWS A5.5. It has a minimum specified yield strength of 108 ksi. That does not meet the minimum specified yield strength for P-110 or Q-125 casing. When joining carbon and low alloy materials of different strengths, it is standard practice to use a carbon steel or low alloy filler metal that will match, as a minimum, the strength of the weaker of the two materials being joined. When dealing with the high strength casings such as N-80, P-110 and Q-125, the material to which any one of these is to be joined will probably be the weaker of the two. In such cases, filler metals should be selected based on the minimum specified strength of the weaker material. It is the responsibility of the user to specify the size of weld required based on anticipated loads and strength of weld metal being used.

[6]The reason for maintaining low moisture in the electrodes is to minimize the amount of hydrogen that is liberated at the arc during welding. When welding high strength low alloy steels, hydrogen can promote delayed cold cracking in hardened weld metals and heat affected zones. One of the ways to reduce the chance of cold cracking is to minimize the hydrogen potential of the electrodes through moisture control.

[7]Internal preheaters for preheating the casing and wellhead member from the inside are available from Cameron and are highly recommended.

[8]E6010 electrodes contain high levels of moisture in their coating. Hydrogen which is liberated from moisture under the intense heat of the electric arc, migrates into the weld metal and heat affected zone and can promote hydrogen induced cold cracking as the weld cools down. For this reason, some companies elect not to use E6010 electrodes for the first pass, even though there are benefits from the standpoint of operator appeal and penetration. If they are used, precautions must be taken to get rid of the diffusible hydrogen before the weld cools from preheating temperatures. Given enough time at elevated temperatures, the hydrogen will diffuse out of the metal. The rate of diffusion is time and temperature dependant. Therefore, the diffusion process can be promoted through the use of high preheats, post weld stress relief, post weld soaks at or above preheat temperatures and slow cooling.

NOTE ***E7018 RODS HAVE BEEN SUCCESSFULLY USED FOR ROOT PASS***

[9]Low alloy welds that are required to meet NACE MR0175 specification must be stress relieved at 1150°F *(621°C)* minimum.

[10]For health reasons, Cameron strongly recommends **against** the use of asbestos insulating blankets . There are many good non-asbestos materials that can be used as an acceptable substitute.

Torque Chart

Recommended Makeup Torques for Flange Bolting Ft•Lbf Per API 6A: preload = .50Sy				
Bolt Size Nom OD - TPI	B7M, L7M (Sy=80 ksi)		B7, L7, 660 (Sy=105 ksi)	
	cf=0.07	cf=0.13	cf=0.07	cf=0.13
.500-13	27	45	35	59
.625-11	52	88	68	115
.750-10	90	153	118	200
.875-9	143	243	188	319
1.000-8	213	361	279	474
1.125-8	305	523	401	686
1.250-8	421	726	553	953
1.375-8	563	976	739	1280
1.500-8	733	1280	962	1680
1.625-8	934	1640	1230	2150
1.750-8	1170	2050	1530	2700
1.875-8	1440	2540	1890	3330
2.000-8	1750	3090	2300	4060
2.250-8	2500	4440	3280	5820
2.500-8	3430	6120	4500	8030
2.625-8	3970	7100	4720	8430
2.750-8	4570	8180	5420	9700
3.000-8	5930	10700	7050	12700
3.250-8	7550	13600	8970	16100
3.500-8	9430	17000	11200	20200
3.750-8	11600	21000	13800	24900
3.875-8	12800	23200	15200	27500
4.000-8	14100	25500	16700	30300

NOTE

- The information in this table is based on API-6A's recommended torque for a given bolt size. The information is presented for the convenience of the user and is based on assumptions of certain coefficients of friction (cf). The coefficients of friction are based on approximations of the friction between the studs and nuts, as well as the nuts and flange face. A coefficient friction of 0.13 assumes the threads and nut bearing surfaces are bare metal and are well lubricated with thread compound. A coefficient of friction of 0.07 assumes the thread and nuts are coated with a fluoropolymer material.

- Lubrication

  It is essential that threads and nut faces be well lubricated with an appropriate grease prior to assembly. Cameron clamps and fast clamps require lubrication on the hub-clamp contact area. Acceptable lubricants include thread joint compounds which meet the formulation, evaluation and testing requirements specified in API Recommended Practice 5A3/ISO13678. (Reference - Jet Lube Grease, 1 lb can PN: 2737980-02).

  Studs and nuts coated with Xylan/PTFE compound in accordance with a Cameron procedure do not require lubrication. However, a light coat of API Recommended Practice 5A3/ISO13678 thread compound is recommended for Xyland-coated bolting as an aid to assembly.

  Material gaskets should be lightly coated with lubricant prior to assembly. Acceptable lubricants include motor oil or Cameron gate valve greases.

IC Test Plug Load Chart

IC Test Plug Maximum Load							
Bowl		Maximum Hanging Load (in 1000s lbs) at Test Pressure					
Size	Pressure	0 psi	2,000 psi	3,000 psi	5,000 psi	10,000 psi	15,000 psi
7-1/16"	2,000 to 5,000 psi	213	135	96	19	N/A	N/A
	10,000 psi	253	175	136	59	0	N/A
	15,000 psi	477	399	360	282	88	0
9"	2,000 to 10,000 psi	600	479	419	299	0	N/A
	15,000 psi	751	630	570	450	149	0
11"	2,000 to 10,000 psi	1277	1091	998	812	348	N/A
	15,000 psi	1596	1410	1317	1131	667	202
13-5/8"	2,000 to 10,000 psi	1713	1426	1283	997	281	N/A
	15,000 psi	2142	1855	1712	1426	710	5
16-3/4"	2,000 to 5,000 psi	3076	2641	2424	1990	N/A	N/A
20"	2,000 to 5,000 psi	2733	2096	1778	1142	N/A	N/A

IC-2 Casing Load Chart

Minimum Casing Load Chart for IC Type Hangers

Minimum Casing Load for IC-2 & IC-6 Casing Hangers		
Hanger Nom. Size	**Casing Size**	**Load (Pounds)**
9"	4-1/2"	46,000
	5-1/2"	42,000
11"	4-1/2"	78,000
	5"	74,000
	5-1/2"	70,000
	6-5/8"	59,000
	7"	55,000
	7-5/8"	48,000
13-5/8"	5-1/2"	120,000
	7"	106,000
	7-5/8"	99,000
	8-5/8"	86,000
	9-5/8"	72,000
	10-3/4"	54,000

Minimum Casing Load for IC-2 & IC-6 Casing Hangers		
Hanger Nom. Size	**Casing Size**	**Load (Pounds)**
16-3/4"	9-5/8"	146,000
	10-3/4"	128,000
	11-3/4"	110,000
	11-7/8"	109,000
	13-3/8"	79,000
20-3/4" 21-1/4"	10-3/4"	228,000
	13-3/8"	180,000
	13-5/8"	175,000
	16"	120,000

RP-000573

Fraction to Decimal Conversion Chart

FRACTION TO DECIMAL CONVERSION CHART													
4THS	8THS	16THS	32NDS	64THS	TO 3 PLACES	TO 2 PLACES	4THS	8THS	16THS	32NDS	64THS	TO 3 PLACES	TO 2 PLACES
				1/64	.016	.02					33/64	.516	.52
			1/32		.031	.03				17/32		.531	.53
				3/64	.047	.05					35/64	.547	.55
		1/16			.062	.06			9/16			.562	.56
				5/64	.078	.08					37/64	.578	.58
			3/32		.094	.09				19/32		.594	.59
				7/64	.109	.11					39/64	.609	.61
	1/8				.125	.12		5/8				.625	.62
				9/64	.141	.14					41/64	.641	.64
			5/32		.156	.16				21/32		.656	.66
				11/64	.172	.17					43/64	.672	.67
		3/16			.188	.19			11/16			.688	.69
				13/64	.203	.20					45/64	.703	.70
			7/32		.219	.22				23/32		.719	.72
				15/64	.234	.23					47/64	.734	.73
1/4					.250	.25	3/4					.750	.75
				17/64	.266	.27					49/64	.766	.77
			9/32		.281	.28				25/32		.781	.78
				19/64	.297	.30					51/64	.797	.80
		5/16			.312	.31			13/16			.812	.81
				21/64	.328	.33					53/64	.828	.83
			11/32		.344	.34				27/32		.844	.84
				23/64	.359	.36					55/64	.859	.86
	3/8				.375	.38		7/8				.875	.88
				25/64	.391	.39					57/64	.891	.89
			13/32		.406	.41				29/32		.906	.91
				27/64	.422	.42					59/64	.922	.92
		7/16			.438	.44			15/16			.938	.94
				29/64	.453	.45					61/64	.953	.95
			15/32		.469	.47				31/32		.969	.97
				31/64	.484	.48					63/64	.984	.98
1/2					.500	.50	1					1.000	1.00

Appendix 1

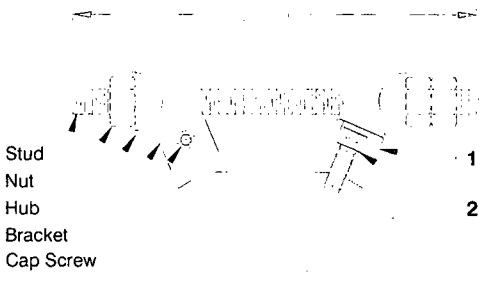
CAMERON SINGAPORE	DRAWN BY	DATE	REVISION	DOCUMENT
	Jacob Yuan	1 Mar 2010	03	RP-001601
	APPROVED BY	DATE		PAGE
	Tony Poh	1 Mar 2010		1 / 3

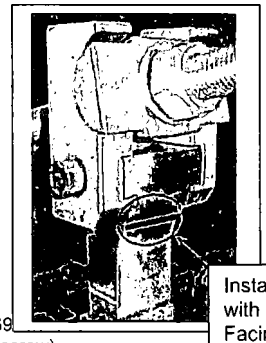
RECOMMENDED LOCKDOWN RING (COLLAPSING/EXPANDING) TOOL FOR SSMC AND E-LOCK

Scope

Recommended tool Top level assembly **2273869-05** contains common assembly parts with optional interchangeable adaptors and associated cap screws for specific lockdown ring size.

Table 1 lists recommended and existing tool Part numbers.



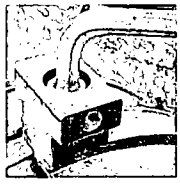


Install adaptor with Undercut Facing out

Figure 1 – Components in recommended tool top level assembly 2273869 (optional Item 1 – adaptor; comes with associated Item 2 – cap screw)

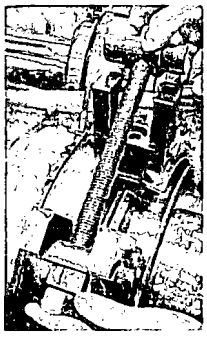
Procedure to use recommended tool 2273869-05

(A) Collapsing lockdown ring



Step 1
Power tight dedicated adaptor and cap screw to the specific lockdown ring size.

! **Adaptor "Legs" must rest fully on ring profile to prevent loading stress on cap screw.**

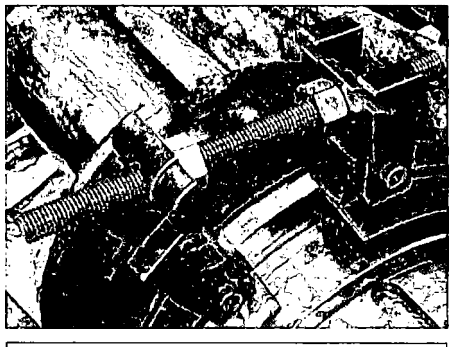


Step 2
Make up brackets to receive Hub.

Step 3
Torque nut sufficiently to collapse ring.

! **Torque should not exceed 10ft-lbs. Verify collapse interference by wiggling lock ring.**

(B) Expanding lockdown ring



Step 1
Power tight dedicated adaptor and cap screw to specific lockdown ring size.

Step 2
Make up bracket to receive Hub.

Step 3
Torque nut sufficiently to expand ring.

! **Similar checks as collapsing the ring.**

Appendix 1

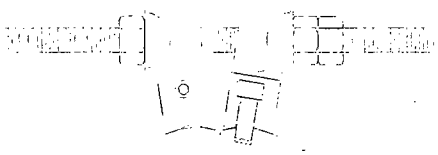
Table 1
Recommended and Existing Tool PN

Type	Size	Recommended* and Existing Tools	Tool Model (Table 2)	Adaptor (Fig 1 - Item 1)	Cap Screw (Fig 1 - Item 2)	Use on Lock Down Ring PN
SSMC	7-1/16	2273869-05*	A	2309218-05	702550-05-00-12	2017505-01
		2017561-06	D	NA		
	9	2273869-05*	A	2309218-06	702550-05-00-12	2202370-01 2236286-01
		2017561-06	D	NA		
		2017561-14	D			
	11	2273869-05*	A	2309218-07	702550-05-00-14	2094484-02 2094484-02-01 2094484-05 2094484-06
		2209192-01	D	NA		
		2017561-06	D			
		2017561-14	D			
	13-5/8	2273869-05*	A	2309218-02	702550-06-00-12	2062967-02 2062967-02-13 2062967-06
		2017561-02	D	NA		
		2017561-15	D			
		2273869-02	E			
		2230761-02	C			
		2230761-05	C			
		2273869-09***	A	2309218-12	702550-07-00-22	Y15003-31506990
	18-3/4	2273869-05*	A	2309218-08	702550-06-00-14	2125281-01 2125281-02 2125281-04
		2017561-15	D	NA		
		2230761-01	C			
		2209898-01	D			
	21-1/4	2273869-05*	A	2309218-08	702550-06-00-14	2125281-03
		2230761-01	C	NA		
E-LOCK	9	2273869-05*	A	2309218-11**	702503-16-00-40	2236573-01
	11	2273869-05*	A	2309218-01	702550-05-00-22	2216464-01 2216464-03
		2017561-13	D	NA		
		2273869-04	B			

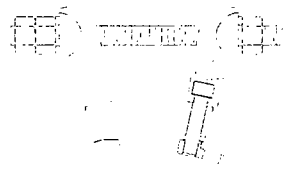
** Only to use on E-lock Union Connector with Enlarged Window (PN 2236288-03)
*** Only to use on E-15 13-1/2 Nom. Dual Load Shoulder Lock Ring

Appendix 1

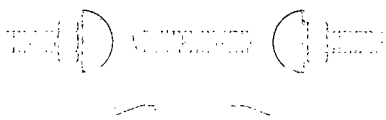
Table 2
Tool Models



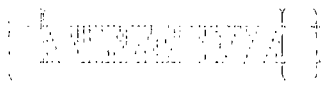
Model A - PN: 2273869-05 / 2273869-09
- **Recommended tool** for SSMC and E-lock
- Common assembly component
- Interchangeable adaptor and cap screw for specific lock ring size



Model B - PN: 2273869-04
- Specifically designed for 11" E-lock
- Adaptor not interchangeable for other lock ring sizes.

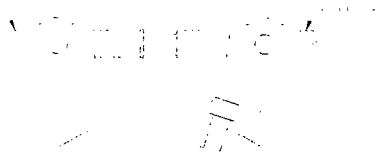


Model C - PN: 2230761
- Historically used on SSMC
- Various body components per ring size.
- Comes with extension pin for E-lock

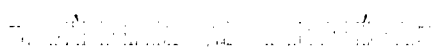


Model D - PN: 2017561 / 2209192 / 2209898
- Most common tool for SSMC and E-lock
- High occurrence to replace eyebolt

! **Potential hazard due to shearing of eyebolt.**



Model E - PN: 2273869-02
- Specifically designed for 13-5/8" SSMC
- Opposite direction threaded ends to facilitate quick collapsing/expansion.



Model F - PN: 2273869-03
- Specifically designed for expanding process

Document Control

Revision History

Revision	Date	Description	Prepared by:
01	January 28, 2017	Initial Release per 650245114	Author: S. Luu

About this Revision

Owner: **Surface Systems Engineering - Running Procedures Department, Houston, TX**

Author: **Suzanne Luu**

Reviewer: **Kyle Dykhuizen, Adam Kolinek**

Approver: **Kyle Dykhuizen, Adam Kolinek**

Released by: **Neil Waghorne, SAP**

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE
620 E. GREENE ST.
CARLSBAD, NM 88220
BLM_NM_CFO_APD@BLM.GOV

In Reply To:
3160 (Office Code)
[NMLC062749B]

09/26/2017

Attn: ASHLEY BERGEN
CONOCOPHILLIPS COMPANY
600 N. DAIRY ASHFORD RD
HOUSTON, TX 77079

Re: Receipt and Acceptability of Application for Permit to Drill (APD)
FEDERAL - NMLC062749B
Well Name / Number: **ZIA HILLS 19 FEDERAL COM / 102H**
Legal Description: T26S, R32E, SEC 19, LOT 2
County, State: LEA, NM
Date APD Received: 07/12/2017

Dear Operator:

This is the subsequent deficiency letter pursuant to Onshore Oil and Gas Order, Number 1, Section III.E.2.a.

The BLM received your initial Application for Permit to Drill (APD), for the referenced well, on 09/20/2017 . The BLM reviewed the revised APD package pursuant to part III.B.2 of Onshore Oil and Gas Order No.1 and it is:

1. ☑ Incomplete/Deficient (*The BLM cannot process the APD until you submit the identified items within 45 calendar days of the date of the original notice or the BLM will return your APD.*)

   - ☐ Well Plat
   - ☑ Drilling Plan
   - ☐ Surface Use Plan of Operations (SUPO)
     - ☐ Certification of Private Surface Owner Access Agreement
   - ☐ Bonding
   - ☐ Onsite (The BLM has scheduled the onsite to be on)
     This requirement is exempt of the 45-day timeframe to submit deficiencies. This requirement will be satisfied on the date of the onsite.
   - ☐ Other

[Please See Addendum for further clarification of deficiencies]

2. ☐ Missing Necessary Information (*The BLM can start, but cannot complete the analysis until you submit the identified items. This is an early notice and the BLM will restate this in a 30-day deferral letter, if you have not submitted the information at that time. You will have two (2) years from the date of the deferral to submit this information or the BLM will deny your APD.*)

[*Please See Addendum for further clarification of deficiencies*]

NOTE: The BLM will return your revised APD package to you, unless you correct all deficiencies identified above (item 1) within 45 calendar days of the original deficiency notice.

- The BLM will not refund an APD processing fee or apply it to another APD for any returned APD.

Extension Requests:

- If you know you will not be able to meet the 45-day timeframe for reasons beyond your control, you must submit a written request through email/standard mail for extension before to the 45th calendar day from this original deficiency notice, **11/10/2017.**

- The BLM will consider the extension request if you can demonstrate your diligence (providing reasons and examples of why the delay is occurring beyond your control) in attempting to correct the deficiencies and can provide a date by which you will correct the deficiencies. If the BLM determines that the request does not warrant an extension, the BLM will return the APD as incomplete after the original 45 calendar days have elapsed.

    - The BLM will determine whether to grant an extension beyond the required 45 calendar days and will document this request in the well file. If you fail to submit deficiencies by the date defined in the extension request, the BLM will return the APD.

APDs remaining Incomplete:

- If the APD is still not complete, the BLM will notify you and allow 10 additional business days following the end of the original 45 calendar day period to submit a written request to the BLM for an extension. The request must describe how you will address all outstanding deficiencies and the timeframe you request to complete the deficiencies.

    - The BLM will consider the extension request if you can prove your diligence (providing reasons and examples of why the delay is occurring) in attempting to correct the deficiencies and you can provide a date by which you will correct the deficiencies. If the BLM determines that the request does not warrant an additional extension, the BLM will return the APD as incomplete.

If you have any questions, please contact Priscilla Perez at (575) 234-5934.

Sincerely,

Cody Layton
Assistant Field Manager

cc: Official File

ADDENDUM - Incomplete/Deficient Clarifications

ADDENDUM - Deficient

Engineering Comments

- BOP requirements are not met
  BOP Pressure rating is not correct.
  Submit a variance for the Multibowl Wellhead.
  9/25/2017
  Second Request : Submit a variance for the Multibowl Wellhead.
  Response: Our request for variance to use multi-bowl well head is included in APD Drilling Plan; Section 2 and Section 8.
- Cementing design information is inadequate and/or incomplete
  Submit cementing program with DV Tool at correct depth.
  9/26/2017
  Second Request: Submit cementing program with DV Tool at the correct casing depth that match the drilling plan.
  Response: Option 2 to set a DV/stage tool at 4200' is now reflected in our cement program. Option 1 remains to cement without stage tool.
- Mud program information is inadequate and/or incomplete
  12.3 ppg MW is not sufficient for this area.
  9/26/2017
  Second Request: Max mud weight 12 is not sufficient for this area.
  Response: The mud program for this well reflects a maximum mud weight of 13.5 ppg.
- Bottom hole pressures and hazards inadequate and/or incomplete
  SHP and BHP needs to be updated.
  ABHP in Section 7 that was submitted exceeds the BHP for the maximum MW submitted.
  9/26/2017
  Second Request:SHP and BHP needs to be updated.
  ABHP in Section 7 that was submitted exceeds the BHP for the maximum MW submitted.
  Response: The mud weight contained in our program is 13.5 ppg.

APD ID: 10400015572 **Submission Date:** 07/12/2017

Operator Name: CONOCOPHILLIPS COMPANY

Well Name: ZIA HILLS 19 FEDERAL COM **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	QUATERNARY	3180	0	0		NONE	No
2	RUSTLER	2061	1119	1119	DOLOMITE,ANHYDRITE	NONE	No
3	TOP SALT	-1279	1279	1279	SALT	NONE	No
4	CASTILE	551	2629	2629	SALT	NONE	No
5	DELAWARE	-1049	4229	4229	SANDSTONE	NATURAL GAS,OIL	No
6	CHERRY CANYON	-1974	5154	5154	SANDSTONE	NATURAL GAS,OIL	No
7	BRUSHY CANYON	-3449	6629	6629	SANDSTONE	NATURAL GAS,OIL	No
8	BONE SPRINGS	-4849	8029	8029	SANDSTONE	NATURAL GAS,OIL	No
9	BONE SPRING 1ST	-6024	9204	9204	SANDSTONE	NATURAL GAS,OIL	No
10	BONE SPRING 2ND	-6699	9879	9879	SANDSTONE	NATURAL GAS,OIL	No
11	BONE SPRING 3RD	-7159	10339	10339	LIMESTONE	NATURAL GAS,OIL	No
12	WOLFCAMP	-8199	11379	11379	LIMESTONE,SHALE,SANDSTONE	NATURAL GAS,OIL	Yes

Section 2 - Blowout Prevention

Pressure Rating (PSI): 10M **Rating Depth:** 22270

Equipment: Rotating Head, Annular Preventer, Pipe/Blind Rams, Kill Lines, Choke Lines, Adapter Spool

Requesting Variance? YES

Variance request: A variance to use flexible choke line(s) from the BOP to Choke Manifold. Testing certificate is attached in "Flexhose Variance data" document. A variance to use a mulitbowl wellhead system is requested. Please see attached in Section 8 of Drilling Plan.

Testing Procedure: BOP/BOPE will be isolated from the casing and tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. See attached "Drill Plan" document.

Operator Name: CONOCOPHILLIPS COMPANY

Well Name: ZIA HILLS 19 FEDERAL COM **Well Number:** 102H

Choke Diagram Attachment:

Zia_Hills_19_Pad_1_Choke_Manifold_07-11-2017.pdf

BOP Diagram Attachment:

Zia_Hills_19_Pad_1__BOPE_07-11-2017.pdf

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	14.75	11.75	NEW	API	N	0	1170	0	1170	-8814	-9984	1170	J-55	47	OTHER - BTC	2.89	5.87	DRY	15.4	DRY	15.4
2	INTERMEDIATE	10.875	8.625	NEW	API	N	0	10410	0	10410	-8814	-19224	10410	P-110	32	OTHER - BTC	2.04	1.55	DRY	3.53	DRY	3.53
3	PRODUCTION	7.875	5.5	NEW	API	N	0	22270	0	22270	-8814	-31084	22270	P-110	20	OTHER - TXP	1.48	1.69	DRY	2.26	DRY	2.26

Casing Attachments

Casing ID: 1 **String Type:** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

ZIA_HILLS_19_Fed_COM_102H_csg_design_07-11-2017.pdf

Operator Name: CONOCOPHILLIPS COMPANY

Well Name: ZIA HILLS 19 FEDERAL COM **Well Number:** 102H

Casing Attachments

Casing ID: 2 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

ZIA_HILLS_19_Fed_COM_102H_csg_design_07-11-2017.pdf

Casing ID: 3 **String Type:** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Zia_Hills_19_Pad_1__Production_csg_specification_07-05-2017.pdf

ZIA_HILLS_19_Fed_COM_102H_csg_design_07-11-2017.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	1170	470	1.68	13.5	789.6	100	Class C	+ 4.0% Bentonite + 0.2% Anti-Foam + 2.0% CaCl2 +0.125lb/sk LCM + 0.1% Dispersant.
SURFACE	Tail				240	1.35	14.8	324	100	Class C	+ 0.2% Anti-Foam + 0.1% Lost Circ Control
INTERMEDIATE	Lead		0	10410	370	2.7	11	999	30	Class C	75.00 lb/sk BWOB D049 + 1.00 % BWOB D013 Retarder + 10.00

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
											% BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti foam + 2.00 % BWOB D154 Extender + 0.15 % BWOB D208 Viscosifier
INTERMEDIATE	Tail				570	1.29	13.5	735	30	Class C	75.00 lb/sk BWOB D049 + 0.50 % BWOB D013 Retarder + 1.00 % BWOB D020 Extender + 3.00 lb/sk WBWOB D042 Extender + 0.02 gal/sk VBWOB D047Anti foam + 0.10 % BWOB D065 Dispersant + 0.13 lb/sk WBWOB D130 Lost Circula + 0.30 % BWOB D238 Fluid loss
PRODUCTION	Lead		0	22270	0	0	0	0	0	no lead	no lead
PRODUCTION	Tail				2290	1.08	16.4	2473	15	Class H	+ 1.00 % BWOB D020 Extender + 0.02 gal/sk VBWOB D047 Anti Foam + 0.10 % BWOB D065 Dispersant + 0.15 % BWOB D255 Fluid loss + 0.30 % BWOB D800 Retarder

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

Describe what will be on location to control well or mitigate other conditions: Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times. See attached "Drill Plan" for additional information.
Describe the mud monitoring system utilized: Closed-loop mud system using steel mud containers will be on location. Mud monitoring of any changes in levels (gains or losses) will use Pressure Volume Temperature, Pason, Visual Observations. See attached "Drill Plan" for additional information.

Operator Name: CONOCOPHILLIPS COMPANY

Well Name: ZIA HILLS 19 FEDERAL COM **Well Number:** 102H

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
0	1170	SPUD MUD	8.34	8.6							
0	10410	OIL-BASED MUD	8.6	9.4							
0	22270	OIL-BASED MUD	9.5	13.5							

Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures:

Production tests will be conducted multiple times per week, through a test separator, during first months following completion. Thereafter, tests will be less frequently. See attached "Drill Plan" for additional information

List of open and cased hole logs run in the well:

GR

Coring operation description for the well:

No coring operation is planned, at this time.

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 8420 **Anticipated Surface Pressure:** 5781.32

Anticipated Bottom Hole Temperature(F): 205

Anticipated abnormal pressures, temperatures, or potential geologic hazards? NO

Describe:

Contingency Plans geoharzards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

ZIA_HILLS_19_PAD_1_H2S_C_Plan_06-29-2017.pdf

Zia_Hills_19__Pad_1_Rig_Layout_07-05-2017.pdf

Operator Name: CONOCOPHILLIPS COMPANY

Well Name: ZIA HILLS 19 FEDERAL COM **Well Number:** 102H

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

Zia_Hills_19_Federal_COM_102H_Directional_Plan_06-29-2017.pdf

Zia_Hills_19_Federal_COM_102H_Wellbore_Schematic_07-03-2017.pdf

Zia_Hills_19_Federal_COM_102H_Section_View_07-11-2017.pdf

Other proposed operations facets description:

A variance to use a multi-bowl well head system is requested. Supporting documents are attached.

Other proposed operations facets attachment:

Zia_Hills_19_Pad_1_Drill_Waste_Containment_07-03-2017.pdf

Zia_Hills_19_Pad_1_Gas_Capture_Plan_07-05-2017.pdf

ZIA_HILLS_19_102H_DRILLING_PLAN_20171008144533.pdf

Option_2_for_cement_plan_20171008144550.pdf

Other Variance attachment:

Zia_Hills_19_Pad_1_Generic_WH_07-03-2017.pdf

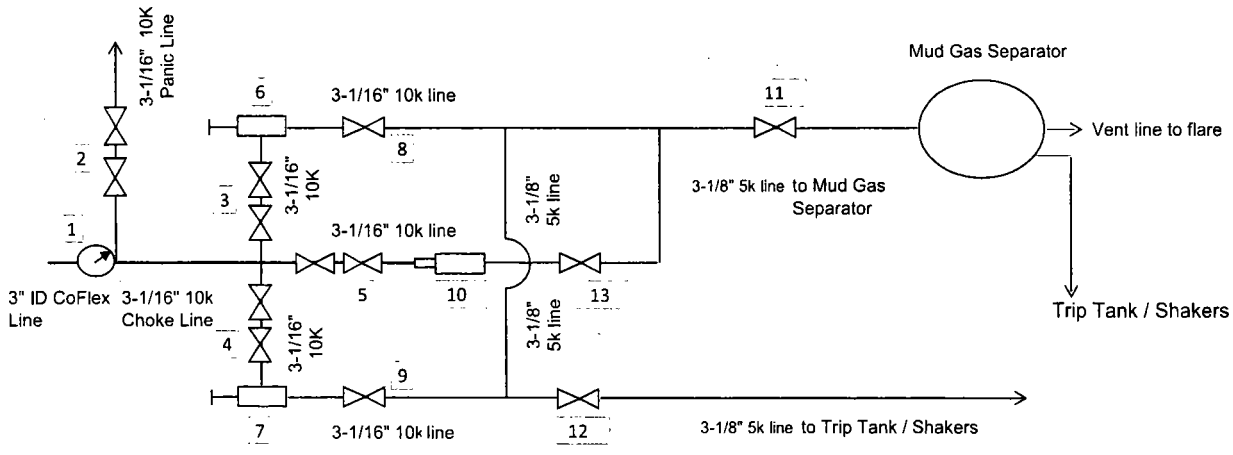
Zia_Hills_19_Pad_1_Flexhose_Variance_07-03-2017.pdf

Zia_Hills_19_Pad_1_Running_Procedure_07-11-2017.pdf

Zia_Hills_19_Fed_102H__DeficiencyResponse_20171012103359.pdf

CHOKE MANIFOLD ARRANGEMENT - 10M Choke

per Onshore Oil and Gas Order No. 2 utilizing 5M/10M Equipment



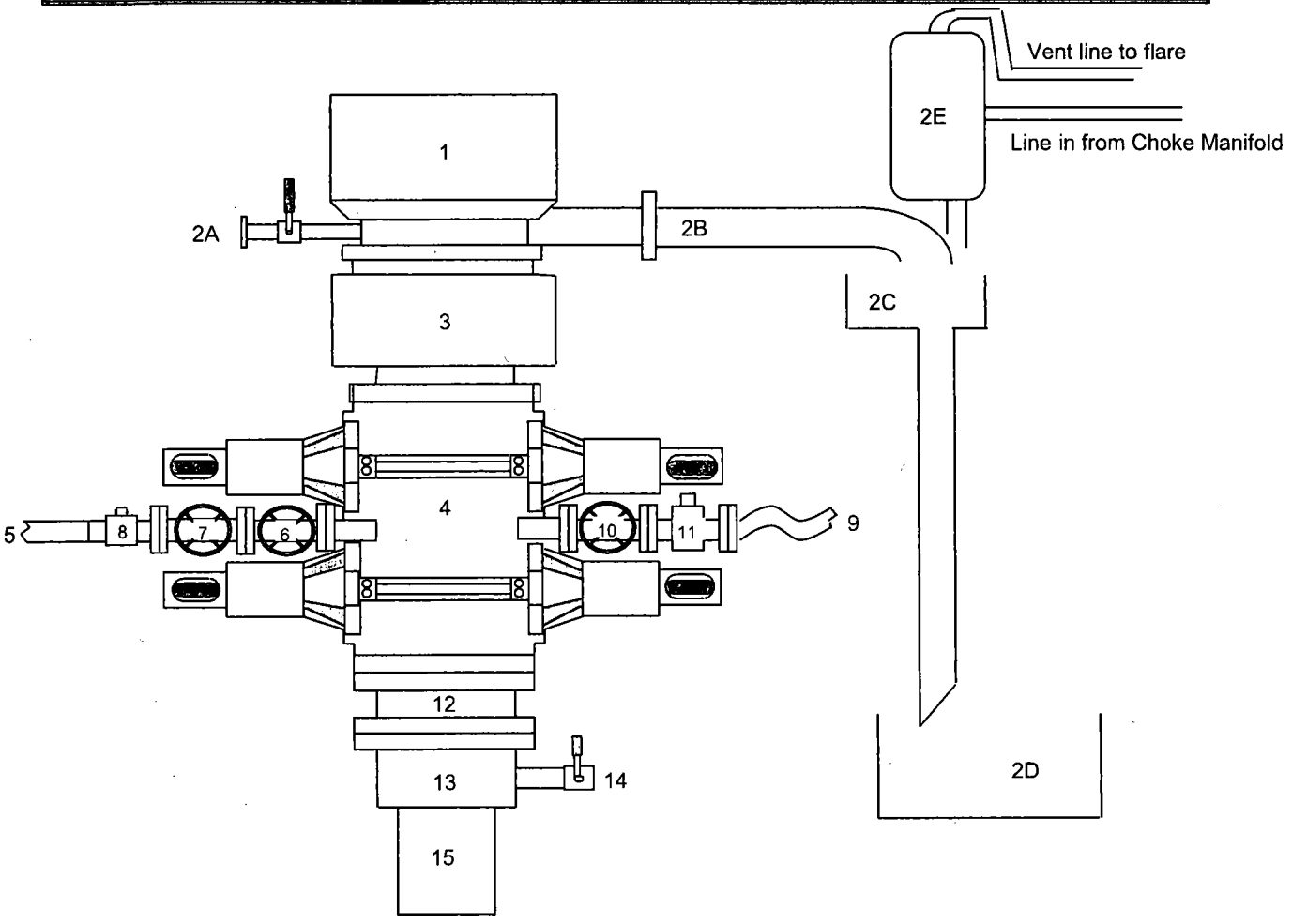
All Tees must be Targeted

Item	Description
1	Pressure Gauge
2	2 Gate Valves, 3-1/16" 10M
3	2 Gate Valves, 3-1/16" 10M
4	2 Gate Valves, 3-1/16" 10M
5	2 Gate Valves, 3-1/16" 10M
6	Upper Manual Adjustable Choke, 4-1/16", 10M
7	Lower Manual Adjustable Choke, 4-1/16", 10M
8	Gate Valve, 3-1/16" 10M
9	Gate Valve, 3-1/16" 10M
10	Remote Controlled Hydraulic Adjustable Choke, 4-1/16", 10M
11	Gate Valve, 3-1/8" 5M
12	Gate Valve, 3-1/8" 5M
13	Gate Valve, 3-1/16" 10M

The 10M Choke Manifold & Valves will be tested to rated working pressure.

*Choke manifold will have one remotely operated valve and a manual adjustable valve in front of the choke manifold, as detailed in the Onshore Order 2. It currently contains one 10M hydraulic choke for a total of three choke branches (two manual and one hydraulic).

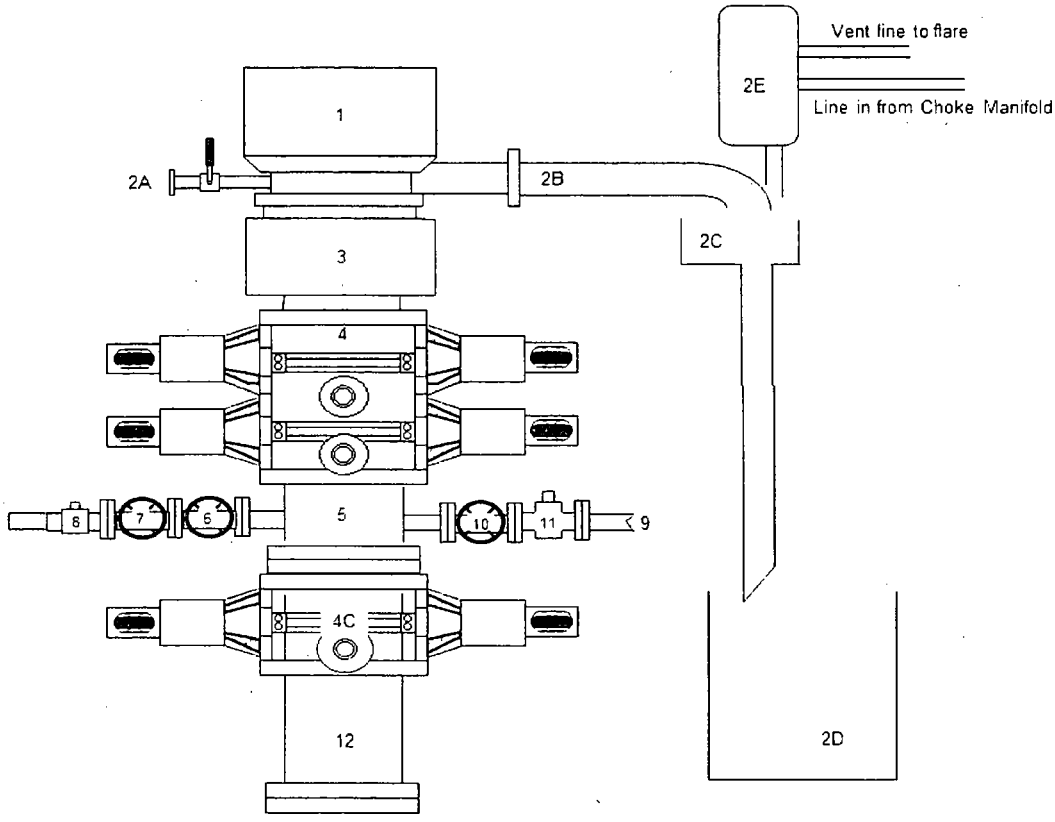
BLOWOUT PREVENTER ARRANGEMENT - 13-5/8" 5M BOPE
per Onshore Oil and Gas Order No. 2 utilizing 5M Rated Equipment



Item	Description
1	Rotating Head, 13-5/8"
2A	Fill up Line and Valve
2B	Flow Line (10")
2C	Shale Shakers and Solids Settling Tank
2D	Cuttings Bins for Zero Discharge
2E	Rental Mud Gas Separator with vent line to flare and return line to mud system
3	Annular BOP (13-5/8", 5M)
4	Double Ram (13-5/8", 5M, Blind Ram top x Pipe Ram bottom)
5	Kill Line (2" flexible hose, 5M)
6	Kill Line Valve, Inner (2-1/16", 5M)
7	Kill Line Valve, Outer (2-1/16", 5M)
8	Kill Line Check Valve (2-1/16", 5M)
9	Choke Line (3-1/8", 5M Stainless Steel Coflex Line)
10	Choke Line Valve, Inner (3-1/8", 5M)
11	Choke Line Valve, Outer (3-1/8", Hydraulically operated, 5M)
12	Spacer Spool (13-5/8", 5M)
13	Casing Head (13-5/8" 5M)
14	Ball Valve and Threaded Nipple on Casing Head Outlet, 2" 5M
15	Surface Casing

BLOWOUT PREVENTER ARRANGEMENT - 11" 10M BOPE

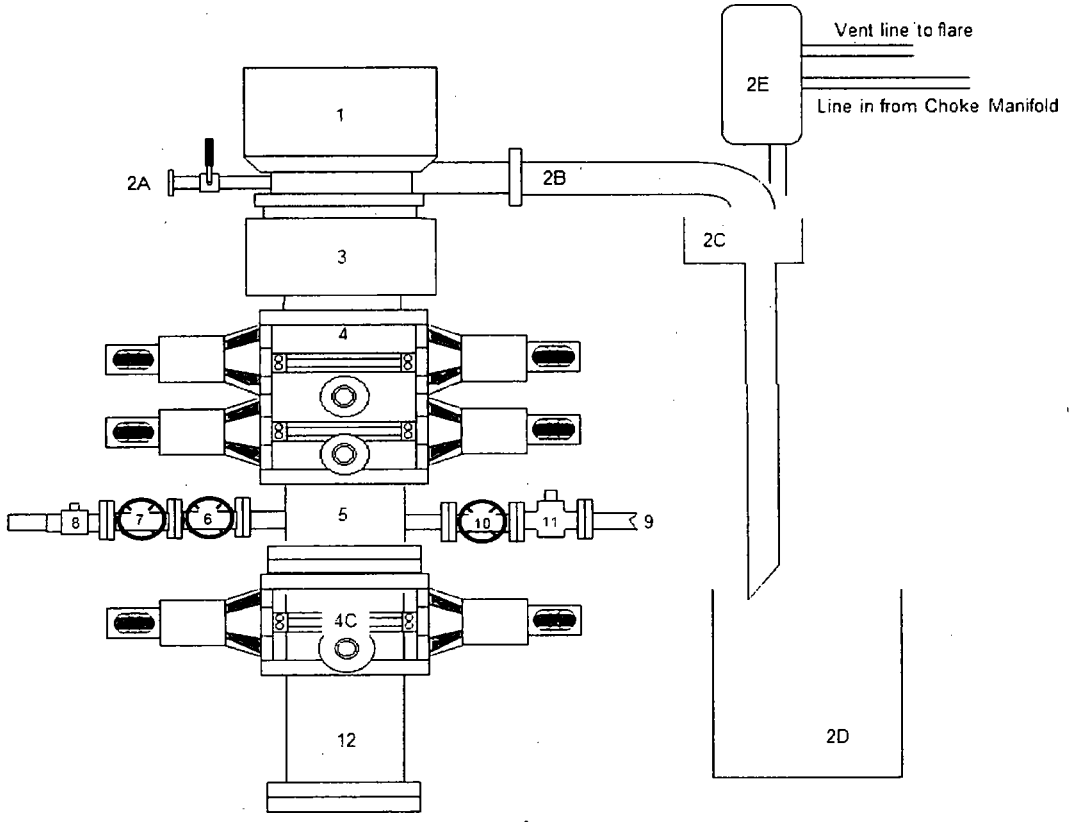
per Onshore Oil and Gas Order No. 2 utilizing 10M Rated Equipment



Item	Description
1	Rotating Head
2A	Fill up Line and Valve
2B	Flow Line (10")
2C	Shale Shakers and Centrifuges
2D	Cuttings Bins for Zero Discharge
2E	Mud Gas Separator with vent line to flare and return line to mud system
3	Annular Preventer (11", 10M)
4	Double Ram (11", 10M, Pipe Ram top x Blind Ram bottom)
5	Drilling Spool (11" 10M)
4C	Single Ram (11", 10M, Pipe Rams)
6	Kill Line Gate Valve, Inner (2-1/16", 10M)
7	Kill Line Gate Valve, Outer (2-1/16", 10M)
8	Kill Line Check Valve (2-1/16, 10M)
9	CoFlex Choke Line (4-1/16", 10M)
10	Choke Line Gate Valve, Inner (4-1/16", 10M)
11	Choke Line Hydraulically Operated Gate Valve, Outer, (4-1/6" 10M w/ Double Acting
12	HCR) Drilling Spool Adapter (11", 10M)

BLOWOUT PREVENTER ARRANGEMENT - 13-5/8" 10M BOPE

per Onshore Oil and Gas Order No. 2 utilizing 10M Rated Equipment



Item	Description
1	Rotating Head
2A	Fill up Line and Valve
2B	Flow Line (10")
2C	Shale Shakers and Centrifuges
2D	Cuttings Bins for Zero Discharge
2E	Mud Gas Separator with vent line to flare and return line to mud system
3	Annular Preventer (13-5/8", 10M)
4	Double Ram (13-5/8", 10M, Pipe Ram top x Blind Ram bottom)
5	Drilling Spool (13-5/8" 10M)
4C	Single Ram (13-5/8", 10M, Pipe Rams)
6	Kill Line Gate Valve, Inner (2-1/16", 10M)
7	Kill Line Gate Valve, Outer (2-1/16", 10M)
8	Kill Line Check Valve (2-1/16, 10M)
9	CoFlex Choke Line (4-1/16", 10M)
10	Choke Line Gate Valve, Inner (4-1/16", 10M)
11	Choke Line Hydraulically Operated Gate Valve, Outer, (4-1/6" 10M w/ Double Acting HCR)
12	Drilling Spool Adapter (13-5/8", 10M)

Type	Depth MD	Depth TVD	Csg length ft	Wt	MIY	Col	Tensile	Drill Fluid
Surface Casing	1170	1170	1170	47	3070	1510	737000	8.6
Intermediate 1 Casing	10410	10379	10410	32	7860	3420	1006000	9.4
Intermediate 2 Casing	0	0	0					
Production 1 Casing	22270	11994	22270	29	12630	11100	641000	12
Production 2 Casing								

Uses TVD!!!!

Burst Design (Safety) Factors – BLM Criteria

Burst Design (Safety) Factor: SFb

SFb = Pi / BHP

Where

- Pi is the rated pipe Burst (Minimum Internal Yield) Pressure in pounds per square inch (psi)
- BHP is bottom hole pressure in pounds per square inch (psi)

The Minimum Acceptable Burst Design (Safety) Factor SFb = 1.0

Surface Casing
SFb = 3070 / 523 = **5.87**

Intermediate 1 Casing
SFb = 7860 / 5073 = **1.55**

Intermediate 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFb = 12630 / 7484 = **1.69**

Production 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Collapse Design (Safety) Factors – BLM Criteria

Collapse Design (Safety) Factor: SFc

SFc = Pc / (MW x .052 x Ls)

Where

- Pc is the rated pipe Collapse Pressure in pounds per square inch (psi)
- MW is mud weight in pounds per gallon (ppg)
- Ls is the length of the string in feet (ft)

The Minimum Acceptable Collapse Design (Safety) Factor SFc = 1.125

Surface Casing
SFc = 1510 / 523 = **2.89**

Intermediate 1 Casing
SFc = 3420 / 5073 = **0.67**

Intermediate 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFc = 11100 / 7484 = **1.48**

Production 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Joint Strength Design (Safety) Factors – BLM Criteria

Joint Strength Design (Safety) Factor: SFt

SFt = Fj / Wt;

Where

- Fj is the rated pipe Joint Strength in pounds (lbs)
- Wt is the weight of the casing string in pounds (lbs)

The Minimum Acceptable Joint Strength Design (Safety) Factor SFT = 1.6 dry or 1.8 buoyant

Surface Casing
SFt Dry = 737000 / 54990 = **13.4**
SFt Bouyant = 737000 / (54990 x 0.869) = **15.4**

Intermediate 1 Casing
SFt Dry = 1006000 / 333120 = **3.02**
SFt Bouyant = 1006000 / (333120 x 0.856) = **3.53**

Intermediate 2 Casing
SFt Dry = 0 / 0 = **#DIV/0!**
SFt Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

Production 1 Casing
SFt Dry = 641000 / 347826 = **1.84**
SFt Bouyant = 641000 / (347826 x 0.817) = **2.26**

Production 2 Casing
SFt Dry = 0 / 0 = **#DIV/0!**
SFt Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

Type	Depth MD	Depth TVD	Csg length ft	Wt	MIY	Col	Tensile	Drill Fluid
Surface Casing	1170	1170	1170	47	3070	1510	737000	8.6
Intermediate 1 Casing	10410	10379	10410	32	7860	3420	1006000	9.4
Intermediate 2 Casing	0	0	0					
Production 1 Casing	22270	11994	22270	29	12630	11100	641000	12
Production 2 Casing								

Uses TVD!!!!

Burst Design (Safety) Factors – BLM Criteria

Burst Design (Safety) Factor: SFb

SFb = Pi / BHP

Where

- Pi is the rated pipe Burst (Minimum Internal Yield) Pressure in pounds per square inch (psi)
- BHP is bottom hole pressure in pounds per square inch (psi)

The Minimum Acceptable Burst Design (Safety) Factor SFb = 1.0

Surface Casing
SFb = 3070 / 523 = **5.87**

Intermediate 1 Casing
SFb = 7860 / 5073 = **1.55**

Intermediate 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFb = 12630 / 7484 = **1.69**

Production 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Collapse Design (Safety) Factors – BLM Criteria

Collapse Design (Safety) Factor: SFc

SFc = Pc / (MW x .052 x Ls)

Where

- Pc is the rated pipe Collapse Pressure in pounds per square inch (psi)
- MW is mud weight in pounds per gallon (ppg)
- Ls is the length of the string in feet (ft)

The Minimum Acceptable Collapse Design (Safety) Factor SFc = 1.125

Surface Casing
SFc = 1510 / 523 = **2.89**

Intermediate 1 Casing
SFc = 3420 / 5073 = **0.67**

Intermediate 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFc = 11100 / 7484 = **1.48**

Production 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Joint Strength Design (Safety) Factors – BLM Criteria

Joint Strength Design (Safety) Factor: SFt

SFt = Fj / Wt

Where

- Fj is the rated pipe Joint Strength in pounds (lbs)
- Wt is the weight of the casing string in pounds (lbs)

The Minimum Acceptable Joint Strength Design (Safety) Factor SFT = 1.6 dry or 1.8 buoyant

Surface Casing
SFt Dry = 737000 / 54990 = **13.4**
SFt Bouyant = 737000 / (54990 x 0.869) = **15.4**

Intermediate 1 Casing
SFt Dry = 1006000 / 333120 = **3.02**
SFt Bouyant = 1006000 / (333120 x 0.856) = **3.53**

Intermediate 2 Casing
SFt Dry = 0 / 0 = **#DIV/0!**
SFt Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

Production 1 Casing
SFt Dry = 641000 / 347826 = **1.84**
SFt Bouyant = 641000 / (347826 x 0.817) = **2.26**

Production 2 Casing
SFt Dry = 0 / 0 = **#DIV/0!**
SFt Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

Production Casing Specification Sheet

For the latest performance data, always visit our website: www.tenaris.com

August 29 2016

Tenaris

Size: 5.500 in.
Wall: 0.361 in.
Weight: 20.00 lbs/ft
Grade: P110
Min. Wall Thickness: 87.5 %

Connection: TenarisXP® BTC
Casing/Tubing: CAS
Coupling Option: REGULAR

PIPE BODY DATA

GEOMETRY

Nominal OD	**5.500** in.	Nominal Weight	**20.00** lbs/ft	Standard Drift Diameter	**4.653** in.
Nominal ID	**4.778** in.	Wall Thickness	**0.361** in.	Special Drift Diameter	**N/A**
Plain End Weight	**19.83** lbs/ft				

PERFORMANCE

Body Yield Strength	**641** x 1000 lbs	Internal Yield	**12630** psi	SMYS	**110000** psi
Collapse	**11100** psi				

TENARISXP® BTC CONNECTION DATA

GEOMETRY

Connection OD	**6.100** in.	Coupling Length	**9.450** in.	Connection ID	**4.766** in.
Critical Section Area	**5.828** sq. in.	Threads per in.	**5.00**	Make-Up Loss	**4.204** in.

PERFORMANCE

Tension Efficiency	**100** %	Joint Yield Strength	**641** x 1000 lbs	Internal Pressure Capacity(1)	**12630** psi
Structural Compression Efficiency	**100** %	Structural Compression Strength	**641** x 1000 lbs	Structural Bending(2)	**92** °/100 ft
External Pressure Capacity	**11100** psi				

ESTIMATED MAKE-UP TORQUES(3)

Minimum	**11270** ft-lbs	Optimum	**12520** ft-lbs	Maximum	**13770** ft-lbs

OPERATIONAL LIMIT TORQUES

Operating Torque	**21500** ft-lbs	Yield Torque	**23900** ft-lbs		

Type	Depth MD	Depth TVD	Csg length ft	Wt	MIY	Col	Tensile	Drill Fluid
Surface Casing	1170	1170	1170	47	3070	1510	737000	8.6
Intermediate 1 Casing	10410	10379	10410	32	7860	3420	1006000	9.4
Intermediate 2 Casing	0	0	0					
Production 1 Casing	22270	11994	22270	29	12630	11100	641000	12
Production 2 Casing								

Uses TVD!!!

Burst Design (Safety) Factors – BLM Criteria

Burst Design (Safety) Factor: SFb

SFb = Pi / BHP

Where

- Pi is the rated pipe Burst (Minimum Internal Yield) Pressure in pounds per square inch (psi)
- BHP is bottom hole pressure in pounds per square inch (psi)

The Minimum Acceptable Burst Design (Safety) Factor SFb = 1.0

Surface Casing
SFb = 3070 / 523 = **5.87**

Intermediate 1 Casing
SFb = 7860 / 5073 = **1.55**

Intermediate 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFb = 12630 / 7484 = **1.69**

Production 2 Casing
SFb = 0 / 0 = **#DIV/0!**

Collapse Design (Safety) Factors – BLM Criteria

Collapse Design (Safety) Factor: SFc

SFc = Pc / (MW x .052 x Ls)

Where

- Pc is the rated pipe Collapse Pressure in pounds per square inch (psi)
- MW is mud weight in pounds per gallon (ppg)
- Ls is the length of the string in feet (ft)

The Minimum Acceptable Collapse Design (Safety) Factor SFc = 1.125

Surface Casing
SFc = 1510 / 523 = **2.89**

Intermediate 1 Casing
SFc = 3420 / 5073 = **0.67**

Intermediate 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Production 1 Casing
SFc = 11100 / 7484 = **1.48**

Production 2 Casing
SFc = 0 / 0 = **#DIV/0!**

Joint Strength Design (Safety) Factors – BLM Criteria

Joint Strength Design (Safety) Factor: SFt

SFt = Fj / Wt;

Where

- Fj is the rated pipe Joint Strength in pounds (lbs)
- Wt is the weight of the casing string in pounds (lbs)

The Minimum Acceptable Joint Strength Design (Safety) Factor SFT = 1.6 dry or 1.8 buoyant

Surface Casing
SFi Dry = 737000 / 54990 = **13.4**
SFi Bouyant = 737000 / (54990 x 0.869) = **15.4**

Intermediate 1 Casing
SFi Dry = 1006000 / 333120 = **3.02**
SFi Bouyant = 1006000 / (333120 x 0.856) = **3.53**

Intermediate 2 Casing
SFi Dry = 0 / 0 = **#DIV/0!**
SFi Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

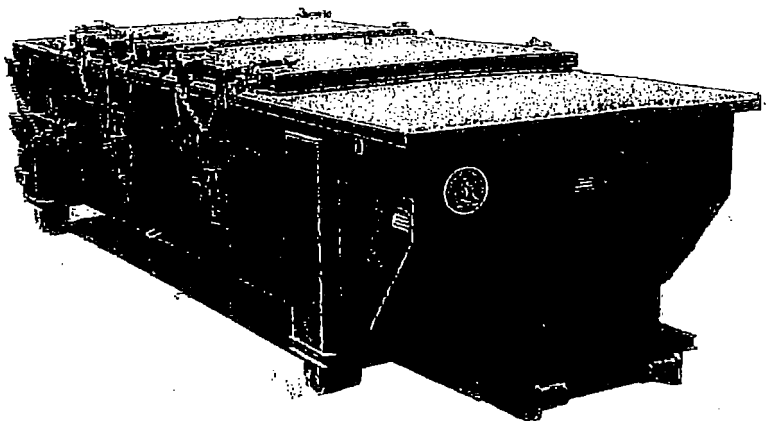
Production 1 Casing
SFi Dry = 641000 / 347826 = **1.84**
SFi Bouyant = 641000 / (347826 x 0.817) = **2.26**

Production 2 Casing
SFi Dry = 0 / 0 = **#DIV/0!**
SFi Bouyant = 0 / (0 x 1.000) = **#DIV/0!**

SPECIFICATIONS

FLOOR: 3/16" PL one piece
CROSS MEMBER: 3 x 4.1 channel 16" on center
WALLS: 3/16" PL solid welded with tubing top, inside liner hooks
DOOR: 3/16" PL with tubing frame
FRONT: 3/16" PL slant formed
PICK UP: Standard cable with 2" x 6" x 1/4" rails, gusset at each crossmember
WHEELS: 10 DIA x 9 long with rease fittings
DOOR LATCH: 3 Independent ratchet binders with chains, vertical second latch
GASKETS: Extruded rubber seal with metal retainers
WELDS: All welds continuous except sub-structure crossmembers
FINISH: Coated inside and out with direct to metal, rust inhibiting acrylic enamel color coat
HYDROTESTING: Full capacity static test
DIMENSIONS: 22'-11' long (21'-8" inside), 99" wide (88" inside), see drawing for height
OPTIONS: Steel grit blast and special paint, Ampliroll, Heil and Dino pickup
ROOF: 3/16" PL roof panels with tubing and channel support frame
LIDS: (2) 68" x 90" metal rolling lids spring loaded, self raising
ROLLERS: 4" V-groove rollers with delrin bearings and grease fittings
OPENING: (2) 60" x 82" openings with 8" divider centered on container
LATCH: (2) independent ratchet binders with chains per lid
GASKETS: Extruded rubber seal with metal retainers

Heavy Duty Split Metal Rolling Lid



CONT.	A	B
20 YD	41	53
25 YD	53	65
30 YD	65	77