

Specification for Independent Wellhead Equipment

API SPECIFICATION 11IW
FIRST EDITION, JUNE 2000

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Upstream Segment

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FOREWORD

This specification for independent wellhead equipment was formulated by the API Exploration and Production Department Subcommittee on Standardization of Field Operating Equipment. This specification provides for a family of independent wellhead equipment for use at the wellhead in the production of oil and gas.

This standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution.

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CONTENTS

	Page
1 SCOPE.....	1
1.1 Purpose	1
1.2 Applications	1
2 REFERENCED PUBLICATIONS.....	1
2.1 General	1
2.2 Requirements	1
2.3 Equivalent Standards	1
2.4 Appendices	1
2.5 Documents	1
2.6 Abbreviations	6
3 DEFINITIONS.....	6
4 DESIGN AND PERFORMANCE—GENERAL REQUIREMENTS	7
4.1 Performance Requirements	7
4.2 Service Conditions	7
4.3 Design Methods	8
4.4 Miscellaneous Design Information	9
4.5 Design Documentation	9
4.6 Design Review	9
4.7 Design Verification	10
5 MATERIALS—GENERAL REQUIREMENTS.....	10
5.1 General	10
5.2 Written Specifications.....	10
5.3 Material Properties	10
5.4 Processing	10
5.5 Chemical Compositions	11
5.6 Sour Service	11
5.7 Material Qualification Testing	11
6 WELDING—GENERAL REQUIREMENTS.....	11
6.1 Welding Procedure/Performance	11
6.2 Application	11
6.3 Base Metal Groupings	11
6.4 Sour Service	11
7 QUALITY CONTROL.....	11
7.1 Scope.....	11
7.2 Quality Control Records.....	11
7.3 Measuring and Testing Equipment.....	12
7.4 Quality Control Personnel Qualifications	12
7.5 Quality Control Requirements	12
8 EQUIPMENT MARKING	14
8.1 Content	14
8.2 Methodology.....	14

CONTENTS

	Page
9 STORING AND SHIPPING	14
9.1 Rust Prevention	14
9.2 Sealing Surface Protection	14
9.3 Assembly and Maintenance Instructions	14
9.4 Ring Gaskets	14
9.5 Elastomer Age Control	14
10 EQUIPMENT—SPECIFIC REQUIREMENTS	14
10.1 Flanged End and Outlet Connections	14
10.2 API Threaded End and Outlet Connections	15
10.3 Studs and Nuts	16
10.4 Independent Wellheads	16
10.5 Casing and Tubing Mandrel Hangers	18
10.6 Belled Nipples	18
10.7 Connector Flanges	19
10.8 Stripper Adapters	19
10.9 Top Connectors	19
10.10 Other End Connectors (OECs)	19
APPENDIX	21
Figures	
1—Independent Wellhead Designs Flanged Configurations Tubing and Casing Heads	2
2—Independent Wellhead Designs Threaded Connectors	3
3—Flange Connectors for Casing Heads and Tubing Heads to Attach BOP to Wellhead	4
4—Belled Nipple	5
Tables	
1—Pressure Ratings for Internal API Threaded End or Outlet Connections	8
2—API Material Property Requirements	10
3—API Material Applications	10
4—Steel Composition Limits (wt. %)	11
5—ANSI/API Compatible Flanges	15
6—Threaded Independent Wellhead Top End Connections	16
7—Minimum Vertical Full Opening Body Bores	18
8—Minimum Vertical Restricted-Opening Body Bores	18
9—Drilling/Adapter Flange Minimum Bore Dimensions	18

Specification for Independent Wellhead Equipment

1 Scope

1.1 PURPOSE

This specification was formulated to provide for the availability of safe, dimensionally and functionally interchangeable independent wellhead equipment. The technical content provides requirements for performance, design, materials, testing, inspection, welding, marking, handling, storing and shipping.

1.2 APPLICATIONS

1.2.1 Coverage

This specification covers the independent wellhead equipment utilized for pressure control systems for the production of oil and gas. Specific equipment covered by this specification is listed as follows:

- a. Independent wellheads.
- b. Top connectors.
- c. Tubing and casing slip hangers.
- d. Tubing and casing mandrel hangers.
- e. Packoffs.
- f. Belled nipples.
- g. Connector flanges.
- h. Stripper adapters.

The typical equipment nomenclature used in this specification is shown in Figures 1, 2, 3, and 4.

1.2.2 Service Conditions

1.2.2.1 General

Service conditions refer to classifications for pressure, temperature, and the various well-bore fluid and operating conditions.

1.2.2.2 Pressure Ratings

Pressure ratings indicate rated working pressures expressed as gage pressure (psig).

1.2.2.3 Temperature Rating

Temperature rating indicates the temperature range, from minimum ambient to maximum flowing fluid temperature, expressed in degrees Fahrenheit (degrees F).

1.2.2.4 Materials Class Rating

Materials class rating indicates the material of the equipment components.

2 Referenced Publications

2.1 GENERAL

This specification includes by reference, either in total or in part, the latest edition of other API, industry and government standards listed in 2.5.

2.2 REQUIREMENTS

Requirements of other standards included by reference in this specification are essential to the safety and interchangeability of the equipment produced.

2.3 EQUIVALENT STANDARDS

Standards referenced in this specification may be replaced by other international or national standards that can be shown to meet or exceed the requirements of the referenced standards. Manufacturers who use other standards in lieu of standards referenced herein are responsible for documenting the equivalency of the standards.

2.4 APPENDICES

Appendices to this specification shall not be considered as requirements. They are included only as guidelines or information.

2.5 DOCUMENTS

API

Spec 5B *Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads*

Spec 6A *Specification for Wellhead and Christmas Tree Equipment*

ASME/ANSI¹

B16.5 *Pipe Flanges and Flanged Fittings*
ASME Boiler and Pressure Vessel Code, Section VIII: Rules for Construction of Pressure Vessels

ASME Boiler and Pressure Vessel Code, Section IX: Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

¹American Society of Mechanical Engineers, 3 Park Avenue, New York, New York 10016-5990.

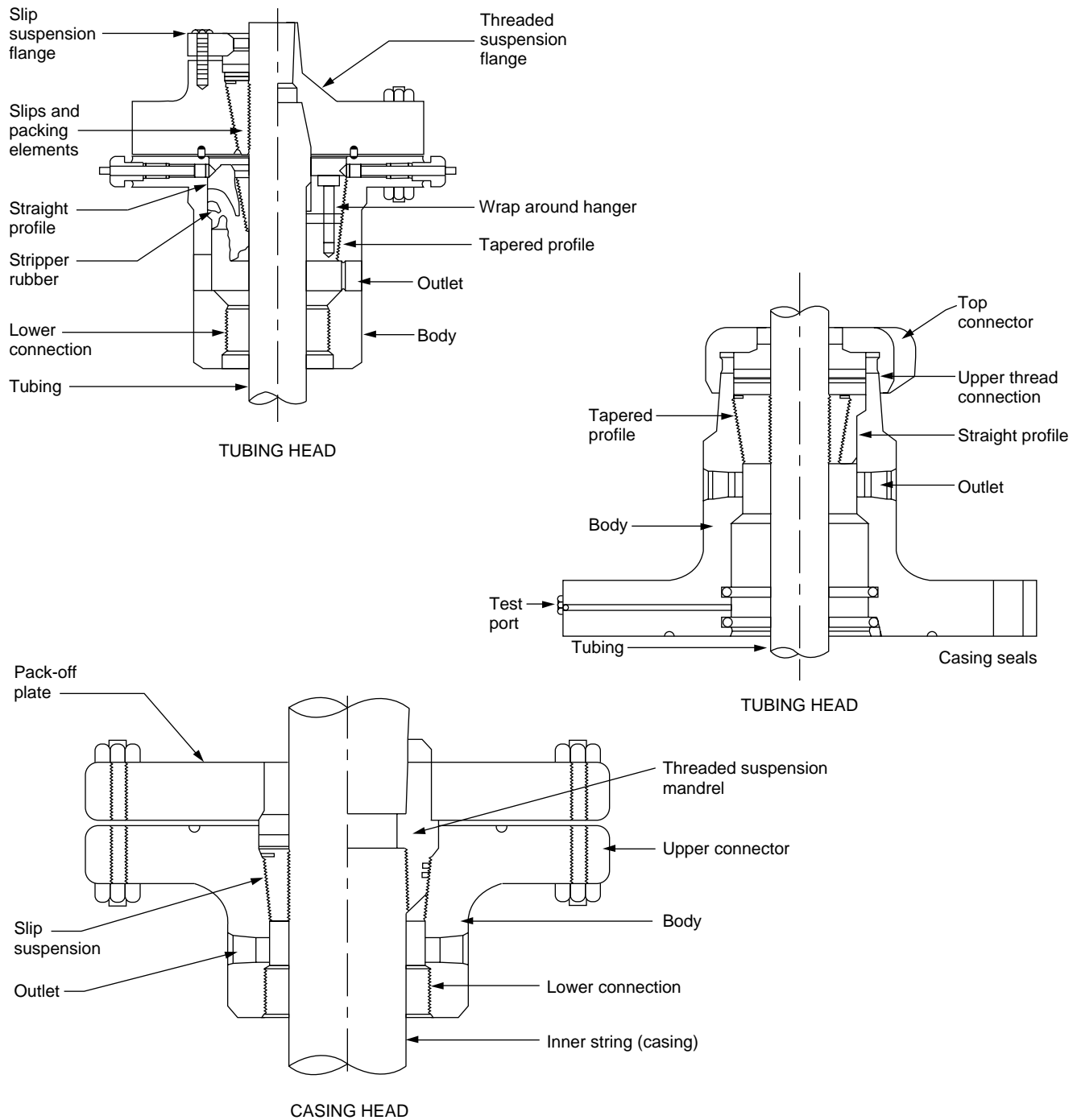


Figure 1—Independent Wellhead Designs Flanged Configurations Tubing and Casing Heads

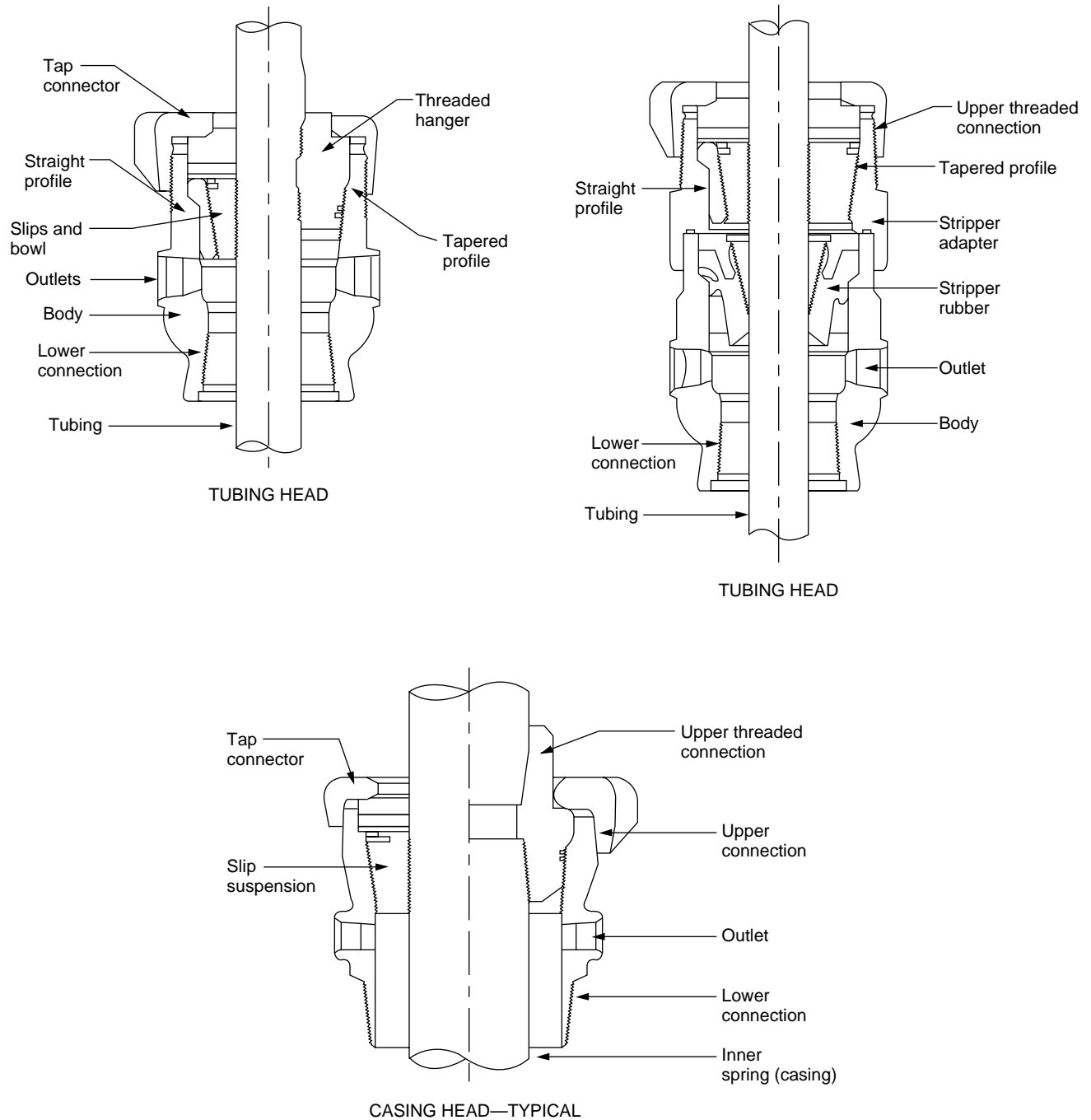


Figure 2—Independent Wellhead Designs Threaded Connectors

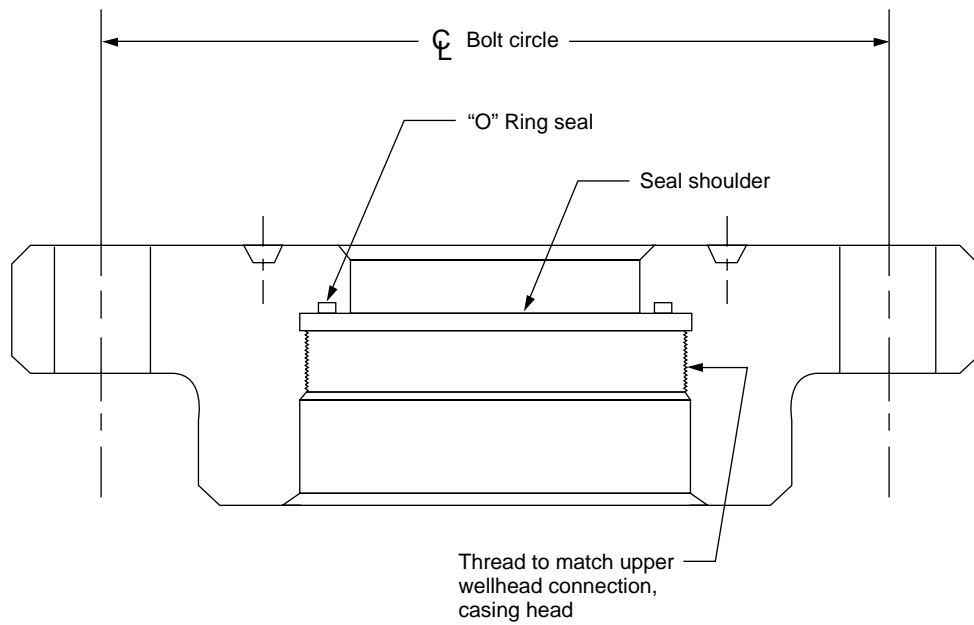


Figure 3—Flange Connectors for Casing Heads and Tubing Heads to Attach BOP to Wellhead

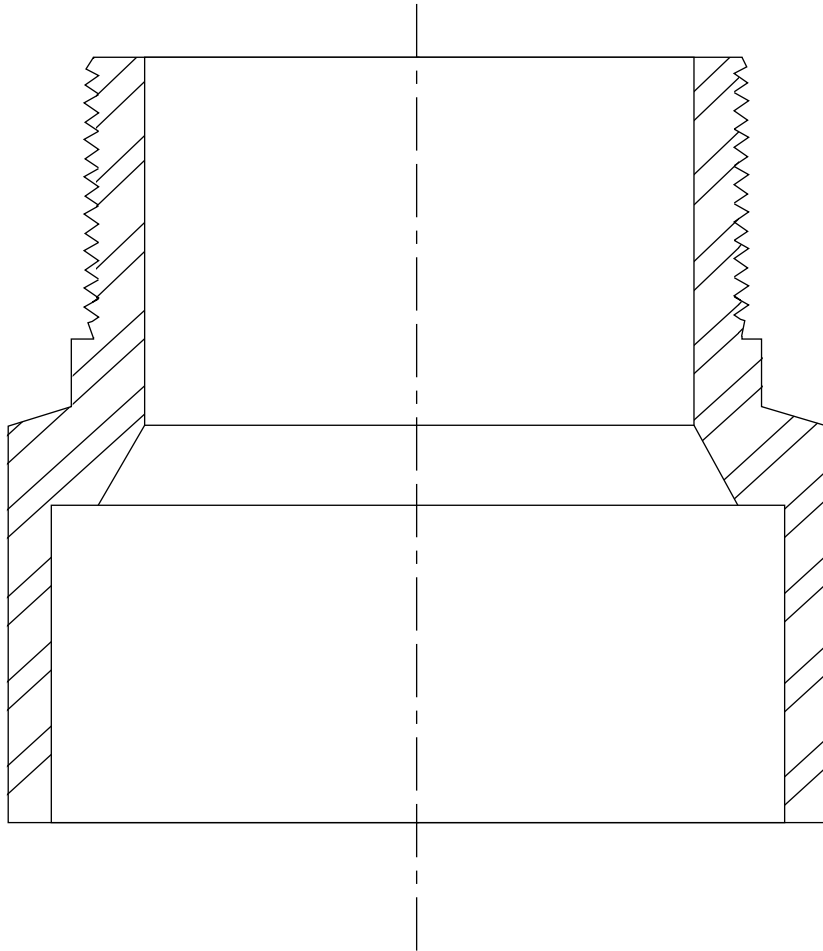


Figure 4—Belled Nipple

ASQ/ANSI²

Z1.4 *Sampling Procedures and Tables for Inspection by Attributes*

ASTM³

A193 *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*

A194 *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service*

A370 *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

A395 *Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*

D1418 *Standard Practice for Rubber and Rubber Lattices—Nomenclature*

NACE⁴

MR0175 *Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment*

2.6 ABBREVIATIONS

Abbreviations used within this specification are defined below.

degrees F	degrees Fahrenheit
ID	inside diameter
max.	maximum
min.	minimum
NACE	NACE International
OD	outside diameter
psi	pounds per square inch

3 Definitions

3.1 acceptance criteria: Defined limits placed on characteristics of materials, products, or services.

3.2 as shipped condition: The condition of the product or equipment when it is ready for shipment.

3.3 belled nipple: A mechanism which is slip jointed (slip on and weld—SOW) on one end and threaded on the other, used to connect a Threaded Independent Wellhead or Flanged Independent Wellhead with threaded bottom connector to wellbore casing or tubing which does not have threads as its top connection.

3.4 body: Any portion of an independent wellhead, belled nipple, or stripper adapter between the end connections which contains wellbore pressure.

3.5 bolting: Threaded fasteners (studs, nuts, bolts and capscrews) used to assemble pressure containing parts or join end or outlet connections.

3.6 carbon steel: An alloy of carbon and iron containing a maximum of 2% carbon, 1.80% manganese, and residual quantities of other elements, except those intentionally added in specific quantities for de-oxidation (usually silicon and/or aluminum).

3.7 casting: (1) An object at or near finished shape obtained by solidification of a substance in a mold. (2) Pouring molten metal into a mold to produce an object of desired shape.

3.8 connections, end and outlet: Integral threads, male or female; and flanges, through-bolted; or any other means used to join together equipment that contains or controls pressure.

3.9 connector flange: An ASME/ANSI B16.5 flange which may be an end connection on a Flanged Independent Wellhead or an Adapter Flange such as blind, threaded, drilling or slip type.

3.10 ductile iron: A cast iron that has been treated while molten with a magnesium or cerium-containing master alloy to transform primary graphite into spheroidal form during solidification. Also known as nodular iron or nodular cast iron.

3.11 dynamic seal: Seals in which motion exists relative to the sealing surface after installation.

3.12 flanged independent wellhead: Any casing or tubing head or spool covered by this specification which has as the upper end connection a flanged connection as defined in 10.1.

3.13 forging: (1) Plastically deforming metal, usually hot, into desired shapes with compressive force, with or without dies. (2) A shaped metal part formed by the forging method.

3.14 heat (cast lot): Material originating from a final melt. For remelted alloys, a heat shall be defined as the raw material originating from a single remelted ingot.

3.15 heat treatment (heat treating): Alternated steps of controlled heating and cooling of materials for the purpose of changing physical or mechanical properties.

3.16 hot working: Deforming metal plastically at a temperature above the recrystallization temperature.

3.17 independent wellhead: Any flanged or threaded, casing or tubing head or spool that meets the requirements of this specification.

²American Society for Quality. www.asq.org

³American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.

⁴NACE International (formerly the National Association of Corrosion Engineers), 1440 South Creek Drive, P.O. Box 218340, Houston, Texas 77218-8340.

3.18 low alloy steel: Steel containing less than 5% total alloying elements, but more than specified for carbon steel.

3.19 mandrel hanger (tubing or casing): A mechanism used to support a casing or tubing string by means of a male or female thread.

3.20 other end connector: Any connector other than those specified in this specification. API Spec 6A flanges may not be included as other end connectors.

3.21 packoff: A mechanism for sealing annular pressure from release to the atmosphere in a threaded independent wellhead or a flanged independent wellhead.

3.22 post weld heat treatment: Any heat treatment subsequent to welding, including stress relief.

3.23 pressure containing parts: Those parts whose failure to function as intended would result in a release of retained fluid to the atmosphere.

3.24 pressure controlling parts: Those parts intended to control or regulate the movement of pressurized fluids.

3.25 pressure integrity: The structural and leak resistant capability of a product to contain applied pressure.

3.26 pressure vessel quality: Metallic material whose integrity is such that it can be used to safely contain pressure without risk of leakage or rupture.

3.27 qualified personnel: Individuals with characteristics or abilities gained through training, experience, or both, as measured against the manufacturer/user/API established requirements.

3.28 rated working pressure: The maximum internal pressure equipment is designed to contain and/or control. Working pressure is not to be confused with test pressure.

3.29 records: Retrievable information.

3.30 retained fluid: The actual fluid produced by a well.

3.31 slip hanger (tubing or casing): A mechanism used to support a tubing or casing string by gripping the pipe with serrated wedge type members.

3.32 stress relief: Controlled heating of material to a predetermined temperature for the purpose of reducing any residual stresses after welding.

3.33 stripper adapter: A pressure containing device used to house a stripper rubber.

3.34 stripper rubber: A dynamic seal through which the tubing can be manipulated while the well bore contains pressure. A stripper rubber is not intended for passing couplings while containing well pressure.

3.35 sulfide stress cracking: Cracking of metallic materials due to exposure to hydrogen sulfide-containing fluids.

3.36 test and gage connection ports: Holes drilled and tapped into API Spec 11IW equipment through which internal pressure may be measured or through which pressure may be applied to test the sealing mechanisms.

3.37 threaded independent wellhead: Any casing or tubing head or spool covered by this specification which has as the top end connection a threaded connection as defined in 10.2.

3.38 top connector: Uppermost closure mechanism of an independent wellhead used to contain the packoff assembly.

3.39 traceability, job lot: The ability for parts to be identified as originating from a job lot which identifies the included heats.

3.40 visual examination: Examination of parts and equipment for visible defects in material and workmanship.

3.41 welding: The fusion of materials, with or without the addition of filler materials.

3.42 wrought products: Products shaped by means of forging.

3.43 wrought structure: One that contains no case dendritic structure.

3.44 yield strength: The stress level measured at room temperature, expressed in pounds per square inch of loaded area, at which material plastically deforms and will not return to its original dimensions when the load is released. Yield strengths specified in this specification shall be considered as being the 0.2% yield offset strength per ASTM A370.

4 Design and Performance—General Requirements

4.1 PERFORMANCE REQUIREMENTS

Performance requirements are specific and unique to the product in the as shipped condition. All products shall be designed to perform according to the requirements of this section and Section 10 while in the pressure and temperature ranges and the test fluids consistent with the materials class in 4.2.3.

4.2 SERVICE CONDITIONS

4.2.1 Pressure Ratings

4.2.1.1 General

Equipment shall be designed to operate in only the following maximum rated working pressures:

Flanged Independent Wellheads	1500 and 2250 psi
Threaded Independent Wellheads	1500, 200, and 3000 psi

Stated values are nominal pressure ratings. Actual pressure rating for flanged independent wellheads shall comply with ASME/ANSI B16.5.

4.2.1.2 API Threaded Equipment Limitations

Equipment designed with internal API threaded end and outlet connections shall be limited to the thread sizes and rated working pressures in Table 1. Ratings do not include tubing and casing mandrel hangers.

4.2.1.3 Design Considerations

The design shall take into account the effects of pressure containment and other pressure-induced loads. Specialized conditions shall also be considered, such as pressurizing with temporary test plugs. The effects of external loads (i.e., bending moments, tensions, etc.) on the assembly of components are not within the scope of this document.

4.2.2 Temperature Rating

Equipment shall be designed to operate in the temperature range of -20°F to 20°F .

Minimum temperature is the lowest ambient temperature to which the equipment may be subjected. Maximum temperature is the highest temperature of the fluid that may directly contact the equipment.

4.2.3 Materials Class Rating

Equipment shall be designed for general oil field service. If the specified service conditions fall within the "sulfide stress cracking region" as defined by NACE MR0175 (sour service), or if equipment is specified to be designed to operate in sour service, equipment shall be designed to meet the requirements of NACE MR0175.

4.3 DESIGN METHODS

4.3.1 Flanges

Flanges shall be designed in accordance with design criteria and methods specified in ASME/ANSI B16.5.

4.3.2 Top Thread Connection

Top thread connections shall be designed in accordance with design criteria and methods developed by the API Committee on Standardization of Valves and Wellhead Equipment.

Table 1—Pressure Ratings for Internal API Threaded End or Outlet Connections

Type of API Thread	Size (Inches)	Rated Working Pressure, PSI
Line Pipe (Nominal Sizes)	$\frac{1}{2}$	3,000
	$\frac{1}{2} - 2$	3,000
	$2\frac{1}{2} - 6$	2,000
Tubing, Non-upset & Ext. Upset Rnd. Thd.	$1.050 - 4\frac{1}{2}$	3,000
Casing (8 Round, Buttress & Extreme Line)	$4\frac{1}{2} - 9\frac{5}{8}$	3,000
	$10\frac{3}{4} - 13\frac{3}{8}$	2,000

4.3.3 Casing Hangers, Tubing Hangers

Casing hangers and tubing hangers shall be designed to satisfy the manufacturer's documented performance characteristics and service conditions as in Section 4. The manufacturer shall specify methods to be used in design which are consistent with accepted engineering practices.

4.3.4 Bodies and End and Outlet Connections

4.3.4.1 Bodies

Bodies and end and outlet connections not specified in this specification shall be designed in accordance with one or more of the following methods:

Note: In the event stress levels calculated by these methods exceed the allowable stresses, other industry accepted methods shall be used to justify these stresses. Fatigue analysis and localized bearing stress values are beyond the scope of this specification.

4.3.4.2 ASME

The design methodology as described in the ASME Boiler and Pressure Vessel Code, Section VIII, Division 2, Appendix 4, may be used for design calculations for pressure containing equipment. Design allowable stresses shall be limited by the following criteria:

$$St = 0.83 Sy \text{ and } Sm = \frac{2}{3} Sy$$

where

Sm = design stress intensity at rated working pressure, psi,

St = maximum allowable general primary membrane stress intensity at hydrostatic test pressure, psi,

Sy = material minimum specified yield strength, psi, and

Hydrostatic test pressure = $1\frac{1}{2}$ x working pressure.

4.3.4.3 Distortion Energy Theory

The Distortion Energy Theory method may be used for design calculations for pressure containing equipment. Rules for the consideration of discontinuities and stress concentrations are beyond the scope of this paragraph. However, the basic pressure vessel wall thickness may be sized by combining triaxial stresses based on hydrostatic test pressure and limited by the following criterion:

$$Se = Sy$$

where

Se = maximum allowable equivalent stress at the most highly stressed distance into the pressure vessel wall, computed by the Distortion Energy Theory method, psi,

Sy = material minimum specified yield strength, psi.

4.3.5 Closure Bolting

The maximum allowable tensile stress for closure bolting shall be determined considering initial boltup, rated working pressure, and hydrostatic test pressure conditions. Bolting stresses, based on the root area of the thread, shall not exceed the following limits:

$$Sa = 0.83 Sy$$

where

Sa = maximum allowable tensile stress psi,

Sy = bolting material specified minimum yield strength, psi.

4.3.6 Other Parts

All other pressure containing parts and all pressure controlling parts shall be designed to satisfy the manufacturer's documented performance characteristics and the service conditions in 4.2. The manufacturer shall specify methods to be used in design which are consistent with accepted engineering practices.

4.3.7 Specific Equipment

Refer to the individual sections of Equipment-Specific Requirements, Section 10, for additional design requirements.

4.4 MISCELLANEOUS DESIGN INFORMATION

4.4.1 General

End and outlet connections shall be an integral part of the body or attached by welding which meets requirements of Section 6.

4.4.2 Interchangeability

A decimal/inch system is the standard for the dimensions shown in this specification.

4.4.3 Tolerances

Unless otherwise specified in the appropriate table or figure, the following tolerances shall apply:

Dimension	Tolerance
X.XX	± 0.02
X.XXX	± 0.005

4.4.4 Bolting

4.4.4.1 Hole Alignment

End and outlet bolt holes for flanges shall be equally spaced and shall straddle common center lines.

4.4.4.2 Other Bolting

The stud thread anchoring means shall be designed to sustain a tensile load equivalent to the load which can be transferred to the stud through a fully engaged nut.

4.4.5 Test and Gage Connections

4.4.5.1 Sealing

Test and gage connections shall provide a leak tight seal at the hydrostatic test pressure of the equipment in which they are installed.

4.4.5.2 Test and Gage Connection Ports

Ports shall not be less than $\frac{1}{2}$ inch nominal API line pipe.

4.5 DESIGN DOCUMENTATION

Documentation of designs shall include methods, assumptions, calculations, and design requirements. Design requirements shall include, but not be limited to, those criteria for size, test and operating pressures, material, environmental and API specification requirements, and other pertinent requirements upon which the design is to be based. Design documentation media shall be clear, legible, reproducible and retrievable. Design documentation retention shall be for 5 years after the last unit of that model, size and rated working pressure is manufactured.

4.6 DESIGN REVIEW

Design documentation shall be reviewed and verified by any qualified individual other than the individual who created the original design.

4.7 DESIGN VERIFICATION

Manufacturers shall document their procedures and the results of design verification testing to hydrostatic test pressure.

5 Materials—General Requirements

5.1 GENERAL

This section describes the material property, processing, chemical composition and performance requirements for independent wellheads, tubular end connectors, bodies, connector flanges, top connectors, tubing and casing mandrel hangers and belled nipples. Other pressure containing and pressure controlling parts shall be made of materials that satisfy Section 5.2 and the design requirements of Section 4.

All material requirements in this section apply to carbon steels, low alloy steels, and cast ductile iron. Other alloy systems may be used provided they satisfy the requirements of this section and the design requirements of Section 4.

5.2 WRITTEN SPECIFICATIONS

Metallic and non-metallic pressure containing or pressure controlling parts shall require a written material specification.

5.2.1 Metallic Requirements

The manufacturer's written specified requirements for metallic materials shall define the following along with accept-reject criteria:

- mechanical properties
- material qualification
- heat treatment procedure including cycle time and temperature with tolerance
- material composition with tolerance

5.2.2 Non-Metallic Requirements

The manufacturer's written specified requirements for non-metallic materials shall define the following:

- generic base polymer(s)—ASTM D1418
- physical property requirements
- material qualification—physical property change(s) after testing consistent with the materials class
- storage and age control requirements

5.3 MATERIAL PROPERTIES

Independent wellheads, end connectors, bodies, connector flanges, top connectors, tubing and casing mandrel hangers and belled nipples shall be fabricated from materials which meet the applicable property requirements shown in Tables 2 and 3.

Table 2—API Material Property Requirements

API Material Designation	0.2% Yield Strength min. (psi)	Tensile Strength min. (psi)	Elongation in 2 in. min. (%)	Reduction in Area min. (%)
35K	35,000	60,000	18	—
36K	36,000	70,000	22	30
40K	40,000	70,000	18	35
45K	45,000	70,000	19	32
55K	55,000	80,000	18	35

Table 3—API Material Applications

Parts	Pressure Ratings (psi)			
	1500	2000	2250	3000
API Material Designation				
Bodies, Integral End Connections, And Top Connectors	35K*	<u>36K</u> 40K	<u>36K</u> 40K	40K
Connector Flanges	<u>36K</u> 40K <u>45K</u>	—	<u>36K</u> 40K <u>45K</u>	—
Tubular End Connectors	55K <u>40K</u>	55K <u>40K</u>	55K —	55K

Note: *Ductile cast iron meeting the requirements of ASTM A 395 shall be acceptable for use in this application, with the exception of welded connections.

5.4 PROCESSING

5.4.1 Casting Practices

Castings shall be of pressure vessel quality.

5.4.2 Hot Working Practices

Wrought material(s) shall be of pressure vessel quality and shall be formed using a hot working practice(s) which produces a wrought structure throughout.

5.4.3 Heat Treating

5.4.3.1 Equipment Qualification

Heat treatment operations shall be performed utilizing equipment qualified in accordance with the requirements specified by the manufacturer.

5.4.3.2 Furnace Loading

The loading of material within furnaces shall be such that the presence of one part does not adversely affect the heat treating response of any other part within the same heat treatment load.

5.4.3.3 Temperatures

Time at temperature and temperature level for heat treatment cycles shall be determined in accordance with the manufacturer's specification.

5.4.3.4 Quenching

(Applies to those materials that are quenched and tempered).

Water quenching—The temperature of the water or quenching media used to approximate the cooling rate of water shall not exceed 100°F at the start of the quench. For bath type quenching the temperature of the water or quench media shall not exceed 120°F at the completion of the quench.

Other quenching media—The temperature range of other quenching media shall meet the manufacturer's written specification.

5.5 CHEMICAL COMPOSITIONS

5.5.1 General

All material shall conform to the manufacturer's written specification. The manufacturer shall specify the nominal chemical composition including composition tolerances of material. Material composition shall be determined on a heat basis (or a remelt ingot basis for remelt grade materials) in accordance with a recognized industry standard.

5.5.2 Composition Limits

Table 4 lists element limits (wt. %) for carbon and low alloy steel used to manufacture independent wellheads, bodies, connector flanges and belled nipples. Composition limits of other alloy systems are purposely omitted from these tables to provide the manufacturer with freedom to utilize alloy systems for the requirements encountered. It should be noted that limits have been selected to allow for weldability of materials which might require field attachment.

Table 4—Steel Composition Limits (wt. %)

Alloy Element	Carbon and Low Alloy Steel Composition Limits (max.)	Materials for Welded Connections (max.)
Carbon, C	0.45	0.35
Manganese, Mn	1.80	1.05
Silicon, Si	1.00	1.35
Phosphorous, P	0.05	0.05
Sulfur, S	0.05	0.05
Nickel, N	1.00	N/A
Chromium, Cr	2.75	N/A
Molybdenum, Mo	1.50	N/A
Vanadium, V	0.30	N/A

5.6 SOUR SERVICE

If the specified service conditions fall within the "sulfide stress cracking region" as defined by NACE MR0175 (sour service), or if sour service is specified, materials shall meet the hardness requirements of NACE MR0175.

5.7 MATERIAL QUALIFICATION TESTING

When minimum tensile properties are required in order for material to be qualified for service, the required tests shall be performed on longitudinal specimens as described in ASTM A370.

Tensile tests shall be performed at room temperature in accordance with the procedures specified in ASTM A370.

A minimum of one tensile test per heat shall be performed. The results of the tensile test(s) shall satisfy the applicable requirements of Table 2.

6 Welding—General Requirements

6.1 WELDING PROCEDURE/PERFORMANCE

Welding procedures and performance qualifications shall be per Articles II & III of ASME Boiler and Pressure Vessel Code, Section IX.

6.2 APPLICATION

Welding shall be performed in accordance with qualified procedures by qualified welding personnel. Weld joint types and sizes shall meet the manufacturer's design requirements.

6.3 BASE METAL GROUPINGS

The manufacturer may establish a P-number grouping for material(s) not listed in ASME Boiler and Pressure Vessel Code, Section IX.

6.4 SOUR SERVICE

If the specified service conditions fall within the "sulfide stress cracking region" as defined by NACE MR0175 (sour service), or if sour service is specified, weld and associated base material heat affected zone shall meet the hardness requirements of NACE MR0175.

7 Quality Control

7.1 SCOPE

This section specifies the quality control requirements for equipment and material manufactured to meet this specification.

7.2 QUALITY CONTROL RECORDS

This section also summarizes the quality control record requirements of the specification.

7.3 MEASURING AND TESTING EQUIPMENT

Equipment used to inspect, test or examine material or other equipment shall be identified, controlled, calibrated and adjusted at specified intervals in accordance with documented manufacturer instructions, and consistent with referenced industry standards, to maintain the accuracy required by this specification.

7.4 QUALITY CONTROL PERSONNEL QUALIFICATIONS

Personnel performing quality control activities directly affecting material and product quality shall be qualified in accordance with manufacturer documented requirements.

7.5 QUALITY CONTROL REQUIREMENTS

7.5.1 General

7.5.1.1 Quality Control Instructions

Quality control work shall be controlled by manufacturer's documented instructions which include appropriate methodology and quantitative or qualitative acceptance criteria.

7.5.1.2 Acceptance Status

The acceptance status of equipment, parts and materials shall be indicated either on the equipment, parts or materials or in records traceable to the equipment, parts or materials.

7.5.2 Bodies, Top Connectors, Belled Nipples, Connector Flanges, Stripper Adapters, End and Outlet Connections

7.5.2.1 Tensile Testing

Refer to Section 5.3.

7.5.2.2 Dimensional Verification

7.5.2.2.1 Sampling

Sampling shall be in accordance with ASQC/ANSI Z1.4. The manufacturer shall specify and verify critical dimensions.

All end and outlet connection threads shall be considered critical dimensions.

7.5.2.2.2 Methods

Each piece of the sample shall be dimensionally inspected for compliance to specific tolerances. Threaded end and outlet connections shall be gauged for standoff at hand-tight assembly by use of gauges and gauging practices specified in API Specification 5B.

7.5.2.2.3 Acceptance Criteria

Acceptance criteria for critical dimensions shall be as required by the manufacturer's written specification.

Acceptance criteria for threads shall be in accordance with API Specification 5B.

7.5.2.3 Traceability

Job lot traceability is required.

Identification shall be maintained on materials and parts, to facilitate traceability, as required by documented manufacturer requirements.

Manufacturer documented traceability requirements shall include provisions for maintenance or replacement of identification marks and identification control records.

7.5.2.4 Chemical Analysis

7.5.2.4.1 Sampling

Chemical analysis shall be performed on each heat used in the manufacturing process.

7.5.2.4.2 Methods

Chemical analysis shall be performed in accordance with recognized industry standards specified by the manufacturer. A certified material test report for the heat from the original manufacturer is an acceptable means to comply with this requirement.

7.5.2.4.3 Acceptance Criteria

The chemical composition shall meet the requirements of the manufacturer's written specification.

7.5.2.5 Visual Examination

7.5.2.5.1 Sampling

Each part shall be visually examined.

7.5.2.5.2 Methods

Visual examination shall be performed in accordance with manufacturer's written specifications.

7.5.2.5.3 Acceptance Criteria

Acceptance criteria shall be in accordance with manufacturer's written specifications.

7.5.2.6 Hardness Testing

7.5.2.6.1 Sampling

When hardness is limited (sour service), each pressure containing and pressure controlling part and each weld therein shall be hardness tested.

7.5.2.6.2 Methods

Hardness testing shall be performed in accordance with NACE MR0175 and manufacturer's written specifications.

7.5.2.6.3 Acceptance Criteria

Acceptance criteria shall be in accordance with NACE MR0175.

7.5.3 Non-Metallic Sealing Material**7.5.3.1 Dimensional Verification****7.5.3.1.1 Sampling**

Sampling shall be in accordance with ASQC/ANSI Z1.4. The manufacturer shall specify and verify critical dimensions.

7.5.3.1.2 Methods

Each piece of the sample shall be dimensionally inspected for compliance to specific tolerances.

7.5.3.1.3 Acceptance Criteria

Acceptance criteria shall be in accordance with manufacturer's written specifications.

7.5.3.2 Visual Examination**7.5.3.2.1 Sampling**

Sampling shall be in accordance with ASQC/ANSI Z1.4.

7.5.3.2.2 Method

Visual examination shall be performed in accordance with manufacturer's written specifications.

7.5.3.2.3 Acceptance Criteria

Acceptance criteria shall be in accordance with manufacturer's written specifications.

7.5.4 Casing and Tubing Mandrel Hangers**7.5.4.1 Tensile Testing**

Refer to Section 5.3.

7.5.4.2 Dimensional Verification**7.5.4.2.1 Sampling**

Sampling shall be in accordance with ASQC/ANSI Z1.4. The manufacturer shall specify and verify critical dimensions. All suspension threads shall be considered critical dimensions.

7.5.4.2.2 Methods

Each piece of the sample shall be dimensionally inspected for compliance to specific tolerances. Threaded suspension connections shall be gauged for standoff at hand-tight assembly by use of gages and gauging practices specified in API Specification 5B.

7.5.4.2.3 Acceptance Criteria

Acceptance criteria for critical dimensions shall be as required by the manufacturer's written specification.

Acceptance criteria for threads shall be in accordance with API Specification 5B.

7.5.4.3 Traceability

Job lot traceability is required.

Identification shall be maintained on materials and parts, to facilitate traceability, as required by documented manufacturer requirements.

Manufacturer documented traceability requirements shall include provisions for maintenance or replacement of identification marks and identification control records.

7.5.4.4 Chemical Analysis**7.5.4.4.1 Sampling**

Chemical analysis shall be performed on a heat basis.

7.5.4.4.2 Methods

Chemical analysis shall be performed in accordance with recognized industry standards specified by the manufacturer.

7.5.4.4.3 Acceptance Criteria

The chemical composition shall meet the requirements of the manufacturer's written specification.

7.5.4.5 Visual Examination**7.5.4.5.1 Sampling**

Each part shall be visually examined.

7.5.4.5.2 Methods

Visual examination shall be performed in accordance with manufacturer's written specifications.

7.5.4.5.3 Acceptance Criteria

Acceptance criteria shall be in accordance with manufacturer's written specifications.

7.5.4.6 Hardness Testing

7.5.4.6.1 Sampling

When hardness is limited (sour service), each pressure containing and pressure controlling part and each weld therein shall be hardness tested.

7.5.4.6.2 Methods

Hardness testing shall be performed in accordance with NACE MR0175 and manufacturer's written specifications.

7.5.4.6.3 Acceptance Criteria

Acceptance criteria shall be in accordance with NACE MR0175.

7.5.5 Records to Be Maintained by Manufacturer

Material Test Records:

Chemical Analysis

Tensile Test

Weld Procedure Specification

Weld Procedure Qualification Record

Welder Qualification Record

8 Equipment Marking

8.1 CONTENT

Equipment other than ASME/ANSI B16.5 flanges shall be marked on the exterior surface with the designation "11IW", the size, the pressure rating, the designation "SS" (if NACE MR0175 compatible), the manufacturer's name, the date of manufacturer, and the designation "API" as illustrated in the following examples. The marking of size shall include the nominal size and, when applicable, the restricted or over-size bore. The bore size shall be preceded by the word "Bore".

Licenses may additionally mark as shown in Appendix A.

Threaded independent wellheads	11IW 9¼—2000 Name 3/92 API
Flanged independent wellheads	11IW 6-600-SS Name 3/92 API
Top connectors	11IW 9¼—2000
Stripper adapters	11IW 7¼—2000 Name 3/92 API
Belled Nipples	11IW 4½ CSG x 4½ SOW x 2000 Name 3/92 API
Slip Hangers	11IW 2¾ Name 3/92 API
Mandrel Hangers	11IW 7¼ x 2¾
Connector Flanges	11IW 10-600 x 9¼ Name 3/92 API
Connector Flanges	11IW 7¼ x 2¾ Name 3/92 API

Thread type symbols shall be as follows:

API Line Pipe	LP
API Casing (short thread)	CSG
API Casing (long thread)	LCSG
API Tubing (non-upset)	TBG
API tubing (external-upset)	UPTBG

ASME/ANSI B16.5 flanges shall be marked in accordance with ASME/ANSI B16.5.

8.2 METHODOLOGY

Nameplates are not required if the information is permanently marked on the body or connector.

Identification stamping using low stress (dot, vibration or rounded V) stamps is acceptable. Conventional sharp V stamping is acceptable in low stress areas, such as the outside diameter of flanges. Sharp V stamping is not permitted in high stress areas unless subsequently stress relieved at 1100°F minimum.

9 Storing and Shipping

9.1 RUST PREVENTION

Prior to shipment, parts and equipment shall have exposed metallic surfaces protected with a rust preventative which will not become fluid and run at a temperature less than 125°F.

9.2 SEALING SURFACE PROTECTION

Exposed sealing surfaces shall be protected from mechanical damage for shipping.

9.3 ASSEMBLY AND MAINTENANCE INSTRUCTIONS

The manufacturer shall furnish to the purchaser suitable drawings and instructions concerning field assembly and maintenance of independent wellhead equipment, if requested.

9.4 RING GASKETS

Loose ring gaskets shall be boxed or wrapped during shipping and storage.

9.5 ELASTOMER AGE CONTROL

Age control procedures and protection elastomer materials shall be documented by the manufacturer.

10 Equipment—Specific Requirements

10.1 FLANGED END AND OUTLET CONNECTIONS

10.1.1 General

Two types of end and outlet flanges are controlled by this specification: ANSI Class 600 and ANSI Class 900.

ANSI Class 600 and ANSI Class 900 flanges may be used as integral, blind, threaded or weldneck flanges.

Table 5—ANSI/API Compatible Flanges

ANSI Flange Size	API Flange Size	Bolt Circle Diameter	Ring Groove Pitch Diameter	Ring Gasket No.	No. of Studs	Stud Size
2" 600	2 ¹ / ₁₆ " 2000#	5.00"	3.250"	R23	8	5/8" x 4.50"
2" 900	2 ¹ / ₁₆ " 3000#	6.50"	3.750"	R24	8	7/8" x 6.00"
2 ¹ / ₂ " 600	2 ⁹ / ₁₆ " 2000#	5.88"	4.000"	R25	8	3/4" x 5.00"
2 ¹ / ₂ " 900	2 ⁹ / ₁₆ " 3000#	7.50"	4.250"	R27	8	1" x 6.50"
3" 600	3 ¹ / ₈ " 2000#	6.62"	4.875"	R31	8	3/4" x 5.25"
3" 900	3 ¹ / ₈ " 3000#	7.50"	4.875"	R31	8	7/8" x 6.00"
4" 600	4 ³ / ₁₆ " 2000#	8.50"	5.875"	R37	8	7/8" x 6.00"
4" 900	4 ³ / ₁₆ " 3000#	9.25"	5.875"	R37	8	1 ¹ / ₈ " x 7.00"
6" 600	7 ¹ / ₁₆ " 2000#	11.50"	8.312"	R45	12	1" x 7.00"
6" 900	7 ¹ / ₁₆ " 3000#	12.50"	8.312"	R45	12	1 ¹ / ₈ " x 8.00"
8" 600	9" 2000#	13.75"	10.625"	R49	12	1 ¹ / ₈ " x 8.00"
8" 900	9" 3000#	15.50"	10.625"	R49	12	1 ³ / ₈ " x 9.00"
10" 600	11" 2000#	17.00"	12.750"	R53	16	1 ¹ / ₄ " x 8.50"
10" 900	11" 3000#	18.50"	12.750"	R53	16	1 ³ / ₈ " x 9.25"
12" 600	13 ⁵ / ₈ " 2000#	19.25"	15.000"	R57	20	1 ¹ / ₄ " x 9.00"
12" 900	13 ⁵ / ₈ " 3000#	21.00"	15.000"	R57	20	1 ³ / ₈ " x 10.25"

Note: For convenience in application, Table 5 provides compatible mating API flange designations for ANSI Class 600 and ANSI Class 900 flanges.

For convenience in application Table 10.1.1 provides compatible mating API flange designations for ANSI Class 600 and ANSI Class 900 flanges.

10.1.2 Design

10.1.2.1 General

ANSI Class 600 and ANSI Class 900 flanges for use on API Spec 11IW equipment shall be of the through bolted design.

10.1.2.2 Standard Dimensions

Dimensions for ANSI Class 600 and 900 flanges shall conform to ASME/ANSI B16.5.

10.1.2.3 Flange Face

Flange face may be flat or raised on the right joint side and shall be fully machined. Flange back face may be fully machined or spot faced at the bolt hole. The flange back face or spot faces shall be parallel to the front face within one degree and the thickness after facing shall conform to ASME/ANSI B16.5.

10.1.2.4 Gaskets

Type R or Type RX gaskets in accordance with API Specification 6A shall be used.

10.1.2.5 Ring Groove Surface

All 23 degree surfaces on ring grooves shall have a surface finish no rougher than 63 micro-inch Ra.

10.1.2.6 Materials

Flange material shall conform to the requirements in Section 5.0.

10.1.3 Marking

Flanges shall be marked to conform with Section 8.

10.1.4 Storing and Shipping

Flanges shall be stored and shipped in accordance with Section 9.

10.2 API THREADED END AND OUTLET CONNECTIONS

10.2.1 General

Loose threaded end and outlet connections are not covered by the specification. This section gives requirements for integral equipment end and outlet connections, including tubing and casing hangers, which are API threaded.

10.2.2 Design

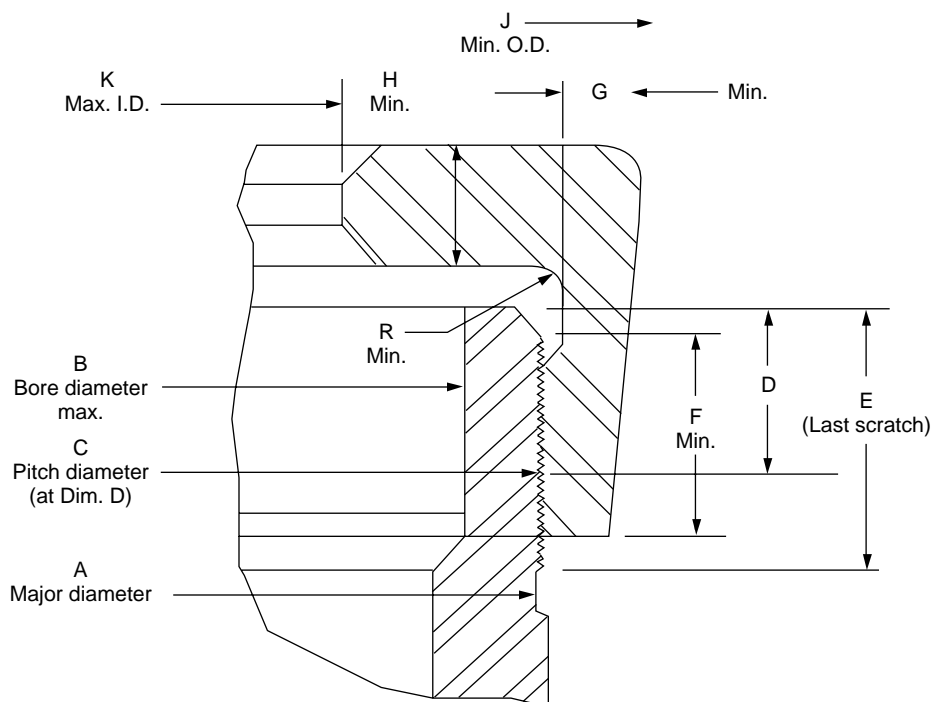
10.2.2.1 General

Internal and external API thread dimensions and tolerances shall conform with API Specification 5B.

10.2.2.2 API Thread Lengths

The length of internal API threads, except for top connectors, shall not be less than the effective thread length L2 of the external thread as stipulated in API Specification 5B.

Table 6—Threaded Independent Wellhead Top End Connections



Top End Connection Size	API Modified Thread	Pressure Rating	A	B	C	D	E	F	G	H*	J	K*	R
4 ⁵ / ₈	5 ¹ / ₂ OD 8R	1500	5.50	4.75	5.403	0.921	1.33	1.19	0.33	0.50	6.35	3.80	0.06
6 ³ / ₄	7 ⁵ / ₈ OD 8R	1500	7.63	6.85	7.524	0.354	1.50	0.88	0.38	0.75	8.38	4.63	0.13
7 ¹ / ₄	8 ⁵ / ₈ OD 8R	2000	8.63	7.80	8.524	1.354	2.50	2.00	0.50	1.00	9.56	6.27	0.13
7 ¹ / ₄	8 ⁵ / ₈ OD 8R	3000	8.63	7.27	8.524	1.354	2.50	2.44	0.50	1.50	9.56	6.00	0.13
8 ¹ / ₈	9 ⁵ / ₈ OD 8R	2000	9.63	8.88	9.524	1.354	2.50	1.50	0.47	1.00	10.56	6.97	0.13
9 ¹ / ₄	10 ³ / ₄ OD 8R	2000	10.75	9.30	10.649	1.354	2.50	1.50	0.50	1.00	11.75	9.34	0.13
10 ¹ / ₈	11 ³ / ₄ OD 8R	2000	11.75	10.20	11.649	1.354	2.50	1.50	0.47	1.00	12.69	8.63	0.13
11 ¹ / ₄	12 ³ / ₄ OD 8V	2000	12.75	11.30	12.618	1.301	2.50	1.50	0.47	1.00	13.69	9.80	0.13
14	16 OD 8R	2000	16.00	14.01	15.899	2.854	4.00	2.00	0.63	1.00	17.25	12.00	0.13

Note: *Specific values for dimensions H and K are outside the scope of this specification, but shall be designed in accordance with 4.3.6.

10.2.2.3 Top Connection Thread Lengths

The length of internal and external top connection threads (modified 8 Round) shall be as shown in Table 6.

Cautionary Note to Users: With the exception of 16 OD 8R, threaded components with an API modified thread as defined in Table 6 should not be mated with components with an API thread as defined in API Specification 5B. The thread defined in Table 6 is identical to the API Specification 5B thread except for the axial location for determination of the pitch diameter. The 16 OD 8R thread in Table 6 is the only thread that is identical to the API Specification 5B thread. Effectively this means that an API threaded component can mate with an API modified threaded component, but the resultant thread engagement length may not afford a sound connection.

10.3 STUDS AND NUTS

The requirements for studs and nuts apply only to those used to connect end and outlet flanges specified in 10.1. Studs and nuts shall meet the requirements of the applicable ASTM specification. Dimensions and thread pitch shall be in accordance with ASTM A193 for studs and ASTM A194 for nuts.

10.4 INDEPENDENT WELLHEADS

10.4.1 General

This section covers wellheads that typically incorporate a threaded lower connector for direct attachment to the upper end

of a casing string. This section is also applicable to wellheads having an integral ASME/ANSI B16.5 lower flange for direct attachment to a dimensionally compatible API Spec 6A flange for converting a formerly flowing well to an artificial lift well. In addition, this section is applicable to wellheads with various proprietary lower connections for direct attachment to a wellhead having a threaded top connection meeting the requirements of this section. Refer to Figures 1 and 2.

10.4.2 Design

10.4.2.1 Design Verification

Design verification shall meet the requirements described in Section 4.

10.4.2.2 Loads

The following loads shall be considered when designing independent wellheads and slip and mandrel type hangers:

- Suspended tubular loads
- Internal pressure loads from manufacturer's maximum rated working pressure
- Radial loads on well head body due to tapered landing surface of slip and mandrel type hangers

10.4.2.3 Connectors

10.4.2.3.1 Lower Body Connector

A threaded lower body connector shall conform to API Specification 5B. The lower body connector may have a female socket for welding directly to the surface or production casing, provided the body is manufactured from a weldable steel material listed in Section 5. Wellheads from a weldable steel material listed in Section 5. Wellheads may also incorporate either an integral flange or a welded flange meeting the requirements of ASME/ANSI B16.5 for direct attachment to an existing API Specification 6A flange with compatible dimensions.

Special lower connectors designed to attach to a lower wellhead having a threaded top connection, thereby creating a casing head/tubing head assembly, shall meet the requirements of Sections 4, 5, and 6. Specific dimensional requirements are outside the scope of this specification.

10.4.2.3.2 Outlet Connector

Bodies shall be provided with two side outlets in one of the following configurations:

- 2" API Line Pipe internal threads
- 2", 2½", or 3" ANSI Class 600 or 900 flanged connections

These flanged connections shall be equal to the working pressure of the upper end connector.

10.4.2.3.3 Upper End Connectors

Threaded upper connectors shall be in accordance with the dimensions shown in Table 6.

Independent wellheads with integral upper flange connections designed for direct attachment to a blowout preventer shall utilize dimensions conforming to Class 600 or 900 series flanges listed in ASME/ANSI B16.5. These flange sizes are dimensionally compatible with certain sizes of API Specification 6A flanges (See 10.1.1), but have a lower working pressure rating. The upper flange may be forged or cast integral with the wellhead body or attached by welding.

Other upper connections not intended for attaching directly to equipment having industry standard flanges (i.e., not designed to ASME/ANSI B16.5 flange dimensions) and used only for retaining the packoff assembly, shall meet the requirements of Sections 4, 5, and 6. Specific dimensions are outside the scope of this specification.

10.4.2.4 Bore Requirements

10.4.2.4.1 Full Opening Wellheads

To permit internal passage of tools and bottom-hole equipment, the minimum vertical bore of full opening wellheads shall be as shown in Table 7.

10.4.2.4.2 Restricted Opening Wellheads

Units that have bodies with a minimum vertical bore less than those specified above are classified as restricted opening wellheads. The vertical bores of these heads are intended only to allow passage of casing or tubing collars of the largest diameter inner string to be used with a particular body, and are not intended to allow passage of all tools and bottom-hole equipment. The minimum vertical body bore for restricted opening wellhead bodies shall be as shown in 8.

Table 7—Minimum Vertical Full Opening Body Bores

Bottom Casing Connection (inches)	Minimum Wellhead Body Bore (inches)
2⅜	1.93
2⅞	2.47
3½	2.90
4	3.38
4½	4.00
5	4.47
5½	4.92
6⅝	5.95
7	6.44
7⅝	6.94
8⅝	7.925
9⅝	8.88
10¾	9.92
11¾	10.88
13⅜	12.48

Table 8—Minimum Vertical Restricted-Opening Body Bores

Inner String OD (inches)	Minimum Wellhead Body (inches)
1.050 Upset	1.25
1.315 Upset	2.50
1.660 Upset	2.50
1.900 Upset	2.62
2 ³ / ₈ Upset	3.38
2 ⁷ / ₈ Upset	3.88
3 ¹ / ₂ Upset	4.62
4 Upset	5.12
4 ¹ / ₂ Upset	5.69
4 ¹ / ₂ Casing	5.12
5 Casing	5.69
5 ¹ / ₂ Casing	6.38
6 ⁵ / ₈ Casing	7.50
7 Casing	7.78
7 ⁵ / ₈ Casing	8.62
8 ⁵ / ₈ Casing	9.75
9 ⁵ / ₈ Casing	10.75
10 ³ / ₄ Casing	11.88

10.4.2.5 Nominal Size

Wellheads shall be designated by the size of the tubular member to which it is attached and by the size of the suspended tubular member (inner string).

10.4.2.6 Rated Working Pressure

Independent wellheads shall be designed for working pressures as described in 4.2.1.

10.4.3 Materials

Materials for wellhead bodies, internal components, flanges, fasteners, and top connectors shall comply with Section 5.

10.4.4 Marking

Equipment shall be marked in accordance with Section 8.

10.4.5 Storing and Shipping

Equipment shall be stored and shipped in accordance with Section 9.

10.5 CASING AND TUBING MANDREL HANGERS

Casing and tubing mandrel hangers, with API threads for suspending an inner string, shall conform to API Specification 5B.

10.6 BELLED NIPPLES

10.6.1 Design

10.6.1.1 Socket End (Lower) Connection

The socket end of belled nipples shall have a minimum ID large enough to slip over casing manufactured to the maximum OD permitted by the API Casing OD tolerances listed in API Specification 5CT. Belled nipples shall meet the requirements of Section 4.

Note: Housing-to-casing weld preparations are outside the scope of this specification.

10.6.1.2 Upper Connection

The upper connection shall be threaded conforming to API Specification 5B.

10.6.1.3 Bore Requirements

To permit internal passage of tools and bottom hole equipment, the minimum vertical bore of the upper connection shall be identical to dimensions shown in Table 10.4.1 for full opening wellheads.

10.6.1.4 Nominal Size

Belled Nipples shall be designated by the size of the tubular member to which it is attached.

10.6.1.5 Rated Working Pressure

Belled nipples shall be designed for 2000 and 3000 psi maximum working pressure ratings.

10.6.2 Materials

Belled nipples shall meet the requirements of Section 5.

Table 9—Drilling/Adapter Flange Minimum Bore Dimensions

	6" Series	8" Series	10" Series	12" Series
Flange Size Upper End Connection	600/900	900	600/900	600/900
7 ⁵ / ₈ 8RD	6.813	—	—	—
8 ⁵ / ₈ 8RD	7.220	—	—	—
8 ⁵ / ₈ 8RD	7.235	7.235	—	—
9 ⁵ / ₈ 8RD	—	—	7.890	—
10 ³ / ₄ 8RD	—	8.938	8.938	—
11 ³ / ₄ 8RD	—	—	9.845	9.845
12 ³ / ₄ 8V	—	—	10.970	—
16 8RD	—	—	—	13.688

Note: Tubing heads

10.6.3 Markings

Marking shall be in accordance with Section 8.

10.6.4 Storing and Shipping

Equipment shall be stored and shipped in accordance with Section 9.

10.7 CONNECTOR FLANGES

Refer to Figure 3.

10.7.1 Design

10.7.1.1 Drilling Flange Thread Connection

The thread connection shall meet the requirements of Section 4. The bending effect of bolt torque shall be considered.

10.7.1.2 Flange Dimensions

Drilling and completion flange dimensions shall conform to ASME/ANSI B16.5. The minimum bore of drilling flanges shall meet the requirements of Table 9.

10.7.2 Materials

Drilling and completion flanges shall be manufactured from materials meeting the requirements of Section 5.

10.7.3 Markings

Connector flanges shall be marked in accordance with Section 8.

10.8 STRIPPER ADAPTERS

10.8.1 Application

Stripper rubbers shall not be used as a substitute for blow-out preventers. Stripper rubbers shall be capable of allowing passage of tubing couplings at normal atmospheric pressure.

10.8.2 Pressure Rating

The working pressure rating for stripper rubbers shall be equal to the manufacturer's maximum recommended cold working pressure for the specific wellhead body with which it will be used. This requirement is only applicable for static conditions (stationary inner string).

10.8.3 Design Verification Requirements

Refer to Section 4.

10.9 TOP CONNECTORS

10.9.1 General

This section covers top connectors which are used to retain pressure containing equipment in threaded independent wellhead equipment.

10.9.2 Material

Top connectors shall meet the requirements of Section 5.

10.10 OTHER END CONNECTORS (OECs)

10.10.1 General

This section covers other end connectors which may be used for joining pressure containing or pressure controlling equipment and which are not specified in an API dimensional specification.

10.10.2 Design

10.10.2.1 OECs shall be designed in accordance with Sections 4.3.4 and 4.3.5 as appropriate.

10.10.2.2 Nominal Size and Pressure Rating

OECs shall be designed with the same nominal size and pressure ratings shown in 10.1 or where appropriate, the sizes shown in 10.2.

10.10.2.3 Dimensions

There are no dimensional requirements for OECs except as may be required by the previous paragraph.

10.10.3 Material

Material shall meet the requirements of Section 5.

10.10.4 Marking

OECs shall be marked in accordance with Section 8.

APPENDIX

API Licensees may stamp the API Monogram at the location indicated for the API Specification in 8.1. The requirements for the “Use of API Monogram” as specified in API S1,

Organization and Procedures for Standardization of Oilfield Equipment and Materials, shall be met for application of the API Monogram.

API Related Publications Order Form - 2000

Date: _____
(Month, Day, Year)

☐ API Member
(Check if Yes)

Invoice To – ☐ Check here if same as "Ship To"

Company: _____

Name/Dept.: _____

Address: _____

City: _____ State/Province: _____

Zip: _____ Country: _____

Customer Daytime Telephone No.: _____

Fax No.: _____

(Essential for Foreign Orders)

Ship To – (UPS will not deliver to a P.O. Box)

Company: _____

Name/Dept.: _____

Address: _____

City: _____ State/Province: _____

Zip: _____ Country: _____

Customer Daytime Telephone No.: _____

Fax No.: _____

(Essential for Foreign Orders)

☐ Payment Enclosed \$ _____

☐ Payment By Charge Account:

☐ MasterCard ☐ VISA ☐ American Express

Account No.: _____

Name (As It Appears on Card): _____

Expiration Date: _____

Signature: _____

☐ Please Bill Me

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