Ghadeer Atheb. Co

Company Profile

Al Ghadeer Al Atheb

Contracting Services _ Specialized Mechanical

Saudi Arabia _ Riyadh

More Than Power ,More Than Piping

2018

وزارة التجارة و الاستثمار
Ministry of Commerce and Investment

شهادة تسجيل فرع مؤسسة

الرقم: ١١١٢٠٠٠٣٧٩
التاريخ: ١٤٣١/٠٩/١٥ هـ

اسم التاجر : فهد ابراهيم محمد الدايل
الجنسية : سعودى
تاريخ الميلاد : ١٣٩٤ هـ
رقم السجل المدني / بطاقة الأحوال : ١٠٤٠٠٩٨٨٩٧
تاريخه : ١٤١٠/١١/٢٧ هـ
مصدره : شقراء
المركز الرئيسي : الرياض
ص.ب : ٠٠٠١١٢
الرمز البريدي : ١١٩٣٣
هاتف :
فاكس :
رقم سجل المركز الرئيسي : ١٠١٠٢٣٨٢٠٩
الاسم التجاري للفرع : مؤسسه الغدير الغذب للمقاولات
العنوان : مرات - حي المدرجيه طريق الملك عبدالعزيز
ص.ب : ١١٢
الرمز البريدي : ١١٩٣٣
هاتف : ٦٢٣١٢٠٩
فاكس :
النشاط : مقاولات عامه للمباني وصيانه ونظافه وترميم وتشغيل المباني واعمالالتكييف والتبريد والاعمال الميكانيكيه والاعمال الكهربائيه والحدادهوالنجاره والالمنيوم والسباكه واعمال الديكور والجبس وتأجير المعداتالثقيله .....,,,,,

رأس المال : ٢٥٠٠٠ خمسة و عشرون ألف ريال فقط لا غير
اسم المدير أو الوكيل المفوض : فهد ابراهيم محمد الدايل
الجنسية : سعودى
تاريخ الميلاد : ١٣٩٤ هـ
رقم السجل المدني - الإقامة : ١٠٤٠٠٩٨٨٩٧
تاريخه : ١٤١٠/١١/٢٧ هـ
مصدره : شقراء
سلطات المدير

يشهد مكتب السجل التجاري بمدينة مرات . بأنه تم تسجيل هذه المؤسسة بسجل مدينة مرات .
وتنتهي صلاحية الشهادة في ١٤٤١/١٠/١٧ هـ بموجب الإيصال رقم: ٣٢٢٢٧٥٣ و تاريخ : ١٤٣٩/١٠/١٧ هـ

الختم

مدير السجل التجاري: نايف صالح الطاسان
التوقيع:

يمكنك التحقق من صحة هذه الشهادة بالدخول على http://v.mci.gov.sa To Verify the information of this certificate visit

وزارة التجارة و الاستثمار
Ministry of Commerce and Investment

شهادة تسجيل فرع مؤسسة

٧٠٠٣٩٤٤٧٩٧
الرقم: ١١١٢٠٠٠٨٥٤
التاريخ: ١٤٣٧/١٢/٠٣ هـ

اسم التاجر : فهد ابراهيم محمد الدايل
الجنسية : سعودي
تاريخ الميلاد : ١٣٩٤ هـ
رقم السجل المدني / بطاقة الأحوال : ١٠٤٠٠٩٨٨٩٧
تاريخه : ١٤١٠/١١/٢٧ هـ
مصدره : شقراء
المركز الرئيسي : الرياض
ص.ب : ٠٠٠١١٢
الرمز البريدي : ١١٩٣٣
هاتف :
فاكس :
رقم سجل المركز الرئيسي : ١٠١٠٢٣٨٢٠٩
الاسم التجاري للفرع : مؤسسة الخير العذب للسلامه
العنوان : مرات
ص.ب :
الرمز البريدي :
هاتف :
فاكس :
النشاط : تركيب وصيانة أجهزة ومعدات الاطفاء وتركيب وصيانة أجهزة ومعدات الانذارمن الحريق بموجب ترخيص الدفاع المدني رقم ٢٧٣٤٠ بتاريخ ١٤٣٧-٠٩-١٢ ****

رأس المال : ٢٥٠٠٠ خمسة و عشرون الف ريال فقط لا غير
اسم المدير أو الوكيل المفوض : فهد ابراهيم محمد الدايل
الجنسية : سعودي
تاريخ الميلاد : ١٣٩٤ هـ
رقم السجل المدني - الإقامة : ١٠٤٠٠٩٨٨٩٧
تاريخه : ١٤١٠/١١/٢٧ هـ
مصدره : شقراء
سلطات المدير

يشهد مكتب السجل التجاري بمدينة مرات . بأنه تم تسجيل هذه المؤسسة بسجل مدينة مرات .
وتنتهي صلاحية الشهادة في ١٤٤٢/١٢/٠٣ هـ بموجب الإيصال رقم: ٣٧١٦٨٨٠٨ و تاريخ : ١٤٣٧/١٢/٠٣ هـ

الختم
مدير السجل التجاري: نايف صالح الطاسان
التوقيع:

يمكنك التحقق من صحة هذه الشهادة بالدخول على http://v.mci.gov.sa To Verify the information of this certificate visit

المؤسسة العامة للتأمينات الاجتماعية
General Organization for Social Insurance

التاريخ ١٤٣٩/١١/٠٦
الموافق ٢٠١٨/٠٧/١٩
رمز الشهادة ٢٦٣٢٧٨٤٥

شهادة

إسم المنشأة : مؤسسة الغدير العذب للتجارة وفروعها
إسم صاحب العمل : فهد ابراهيم محمد الدايل
ص.ب : ١١٢ الرياض ١١٩٣٣
السعودية
رقم الإشتراك : ٥٠٣٢٥٨٠٤٨
رقم السجل التجاري: ١٠١٠٢٣٨٢٠٩
مصدره : الرياض

	رقما	كتابة
عدد المشتركين السعوديين	٥	خمسة مشتركين
عدد المشتركين غير السعوديين	٩	تسعة مشتركين
المجموع	١٤	اربعة عشره مشتركا

تشهد المؤسسة العامة للتأمينات الإجتماعية بأن المنشأة المذكورة أعلاه قد أوفت بإلتزاماتها تجاه المؤسسة وفق البيانات المقدمة منها حتى تاريخ إصدار هذه الشهادة ، والتي تم منحها لتقديمها لأية جهة تطلبها ، وهي صالحة لجميع الأغراض التي نص عليها نظام التأمينات الإجتماعية في المادة (٦/١٩) منه.

هذه الشهادة سارية المفعول حتى ١٤٣٩/١٢/٠٦ هـ

يلزم التحقق من صحة وصلاحية الشهادة عبر زيارة الرابط أدناه في الموقع الإلكتروني للمؤسسة العامة للتأمينات الإجتماعية أو عن طريق استخدام الرمز المعرف التالي :

www.gosi.gov.sa/vc

(الشهادة معتمدة من صاحب الصلاحية ولا تحتاج إلى توقيع أو ختم)

www.gosi.gov.sa
800 1243344

تعد هذه الشهادة من الوثائق الالكترونية الحكومية الرسمية ، ويحظر قطعيا تقليدها أو إدخال أي تعديلات عليها سواء بالإضافة أو الحذف أو التغيير في بياناتها أو غير ذلك من انواع التعديل ، وتعد الشهادة لاغية إذا شابها شيء من ذلك ، كما تعرض صاحبها للملاحقة النظامية أمام الجهات المختصة بالإضافة إلى مايفرضه نظام التأمينات الاجتماعية من عقوبات ، ولايجوز تداول الشهادة إلا في الأغراض التي أصدرت لأجلها وفقا لأحكام نظام التأمينات الاجتماعية ، والمؤسسة العامة للتأمينات الاجتماعية غير مسؤوله عن أي أثار أخرى مترتبة قبل الغير عن الشهادة وغير مسؤولة عن أي عملية تزوير أو تعديل تتم على البيانات الواردة فيها .

التأمينات الإلكترونية

المملكة العربية السعودية
الهيئة العامة للزكاة والدخل
GENERAL AUTHORITY OF ZAKAT & TAX
(١٨٥)

بسم الله الرحمن الرحيم

الهيئة العامة للزكاة والدخل
GENERAL AUTHORITY OF ZAKAT & TAX
فرع الرياض

رقم الشهادة : ١٠٢٠٣٣٣٨٢٢
التاريخ : ١٤٣٩/١٠/٠٥ هـ
الرقم المميز : ٣٠٠١٦٧٤٨٧٥

شهادة
CERTIFICATE

تشهد الهيئة العامة للزكاة والدخل بأن المكلف / مؤسسة الغدير العذب للتجاره

سجل مدني رقم ١٠٤٠٠٩٨٨٩٧ وسجل تجاري رقم ١٠١٠٢٣٨٢٠٩

قدم إقراره عن الفترة المنتهيه في ١٤٣٨/١٢/٢٩ هـ

وقد منح هذه الشهاده لتمكينه من إنهاء جميع معاملاته بما في ذلك صرف مستحقاته النهائية عن العقود.

يسري مفعول هذه الشهادة حتى تاريخ ١٤٤٠/٠٤/٢٩ هـ الموافق ٢٠١٩/٠١/٠٥م.

(التاسع و العشرون من ربيع الثاني ألف و أربعمائة و أربعون هجري)

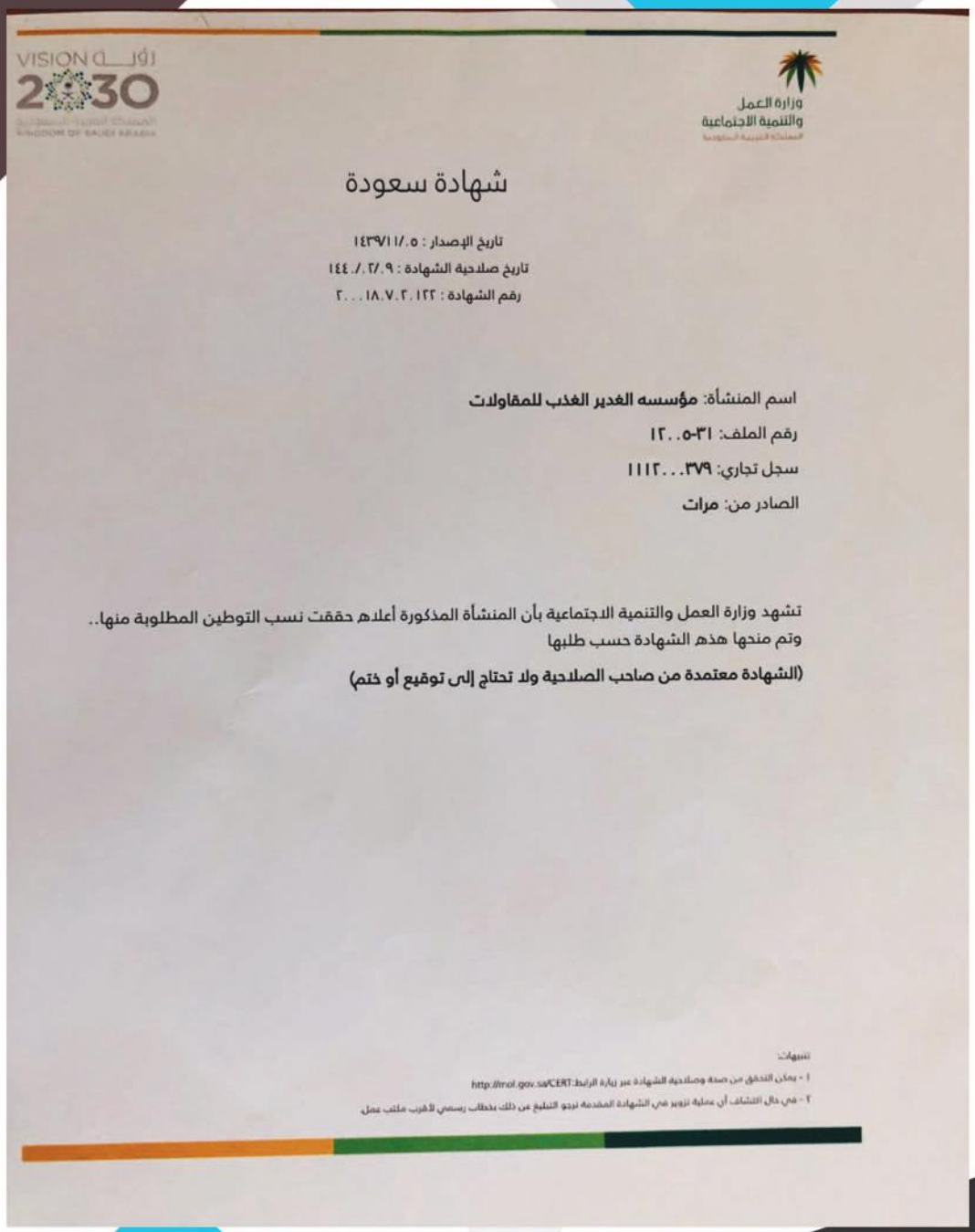
الفروع (٦) في النموذج المرفق

الهيئة العامة للزكاة والدخل
GENERAL AUTHORITY OF ZAKAT & TAX
الشهادات

الختم الرسمي

هذه الوثيقة مستخرجة من النظام الآلي ولا تحتاج إلى توقيع

لايعتد بهذه الشهادة إلا بعد التحقق من موقع الهيئة www.gazt.gov.sa



رؤية VISION 2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

وزارة العمل
والتنمية الاجتماعية
المملكة العربية السعودية

شهادة سعودة

تاريخ الإصدار : ١٤٣٩/١١/٠٥
تاريخ صلاحية الشهادة : ١٤٤٠/٠٢/٠٩
رقم الشهادة : ٢٠٠٠١٨٠٧٠٢١٢٢

اسم المنشأة: **مؤسسه الغدير الغذب للمقاولات**
رقم الملف: **١٢٠٠٥٠٣١**
سجل تجاري: **١١١٢٠٠٠٣٧٩**
الصادر من: **مرات**

تشهد وزارة العمل والتنمية الاجتماعية بأن المنشأة المذكورة أعلاه حققت نسب التوطين المطلوبة منها..
وتم منحها هذه الشهادة حسب طلبها

(الشهادة معتمدة من صاحب الصلاحية ولا تحتاج إلى توقيع أو ختم)

تنبيهات:
١ - يمكن التحقق من صحة وصلاحية الشهادة عبر زيارة الرابط: http://mol.gov.sa/CERT
٢ - في حال اكتشاف أي عملية تزوير في الشهادة المقدمة نرجو التبليغ عن ذلك بخطاب رسمي لأقرب مكتب عمل

المملكة العربية السعودية
الهيئة العامة للزكاة والدخل
GENERAL AUTHORITY OF ZAKAT & TAX
(١٨٥)

بسم الله الرحمن الرحيم

الهيئة العامة للزكاة والدخل
GENERAL AUTHORITY OF ZAKAT & TAX

فرع الرياض

شهادة
CERTIFICATE

1020333822

رقم الشهادة : ١٠٢٠٣٣٣٨٢٢
التاريخ : ١٤٣٩/١٠/٠٥ هـ
الرقم المميز : ٣٠٠١٦٧٤٨٧٥

صفحة رقم : ١

قائمة فروع المكلف مؤسسة الغدير العذب للتجاره

وسجل تجاري رقم ١٠١٠٢٣٨٢٠٩

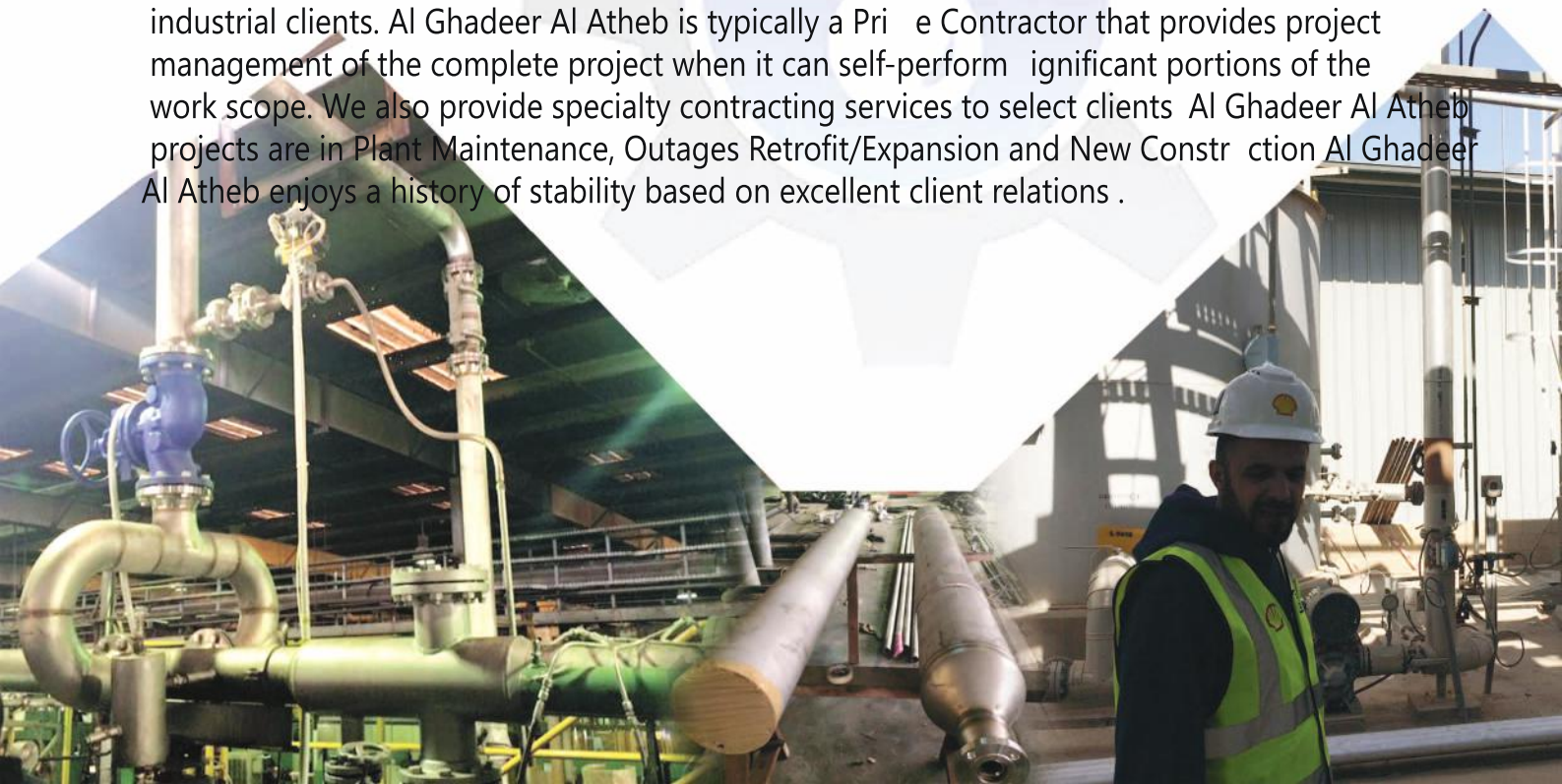
رقم السجل	الرخصة	إسم الفرع	المدينة
١١١٢٠٠٠٨٥٤		مؤسسة الغدير العذب للسلامه	
١١١٢٠٠٠٣٧٨		مؤسسة الغدير العذب للتجاره	
١١١٢٠٠٠٣٧٩		مؤسسة الغدير العذب للمقاولات	
	١٦-٣٥	الغدير العذب	
١١١٢٠٠٠٨٥٨		ورشة الغدير العذب للنجارة	
١١١٢٠٠٠٦٩٤		ورشة الغدير العذب للحدادة والالمونيوم	

هذه الوثيقة مستخرجة من النظام الآلي ولا تحتاج إلى توقيع

لايعتد بهذه الشهادة إلا بعد التحقق من موقع الهيئة www.gazt.gov.sa

Introduction

Al-Ghadeer Al-Atheb
Has complete piping spool structural and field fabrication capabilities for Carbon Steel Stainless Steel, Alloy and Aluminum's.
Our team of skilled and experienced tradespersons are completely mobile and equipped to work in both new construction projects as well as existing facilities. All welding performed in the field or in our fabrication facility is done to ASME & CWB qualified welding procedures and welding staff are tested and certified to these standards at regular intervals. All fitters are Interprovincial Red Seal Certified .
The fo ndation of quality fabrication is speed, precision and quality which are gained through nnovative techniques and equipment in controlled environment. The fabrication shop utilizes epoxy flooring to provide easy cleaning nd decontamination for controlled alloy welding and assembly along with state-of-the-art air scrubbing nd cleansing equipment to ensure the highest level of safety for our staff and again to ensure pa ticulate matter crosses no boundaries of contamination .
Al Ghadeer Al Atheb Company has been providing construction and fabrication services to industrial clients. Al Ghadeer Al Atheb is typically a Pri e Contractor that provides project management of the complete project when it can self-perform ignificant portions of the work scope. We also provide specialty contracting services to select clients Al Ghadeer Al Atheb projects are in Plant Maintenance, Outages Retrofit/Expansion and New Constr ction Al Ghadeer Al Atheb enjoys a history of stability based on excellent client relations .



Industrial/Commercial HVAC

From innovative design & build to retrofit, repair or expansion, we provide practical, energy efficient solutions for all aspects of HVAC the highest safety standards and consistent outstanding performance are just a few of the many reasons to make Al-Ghadeer first choice for installation, supply and maintenance of any industrial/commercial HVAC system :

Turnkey Installations
Maintenance
Service and Repair
Equipment Retrofits
Design Build Projects
Preventive Mai tenance

C A G

Boilers & Steam Systems

We offer expert, and certified, installation, operation and maintenance services that are both reliable and energy efficient

Regardless of the facility or industry, there are five key factors for the installation and upgrade of automatic control systems: safety, stability accuracy, reliability and efficiency. At Al-Ghadeer, these factors are the basic foundation of our service

Fuel Delivery Systems
Combustion Controls
Continuous Emission Monitorin
Feedwater Controls
Integrated Control Systems

Fire Fighting Protection

Fire Extinguisher Inspections, Recharging and Hydrostatic Testing
Fire Alarm Systems
Fire Suppression Systems
FM-200, Inergen, FE-13, C02, Novec, Argonite, Sapphire
UL-300 Kitchen Systems, Industrial Vehicle Dry Chemical
Fire Sprinkler Systems: Wet, Dry, Preaction, Foam, Deluge
Live burn / ire Extinguisher Training: Classroom
SCBA Flow Testin & Repairs
Respira or SCBA Fit Testing
Carb n Dioxide(C02) Refills and Hydrostatic Testing
Fire Ho e Testing(Industrial).
Gas Detector/ Air Monitor Calibra ion and Repairs
Honeywell, BW, Scott, Lumidor, Biosystems
Repairs /Emergency Light Inspections / xit

Piping Systems

AL Gadeer Al Azeb has fabricated and installed systems with diameters up to 48", wall thicknesses over 3", in carbon steel, low alloy steel (including P-91) nickle alloys, and stainless steel materials. Fabrication and installation of new and replacement High Energy Piping Systems for the Power Industry are a specialty Power Piping has .of the AL Gadeer Al Atheb Company extensive experience in nonmetallic piping including FRP, UPVC, CPVC welding by heat gun
HDPE welding by elecrofution or butt fution ..

Steel Structural

Pipe Rack and Pipe Bridges Fabrication and installation of pipe bridges and Pipe Rack are performed in conjunction with piping system or equipment installation

Non Destructive Testing is performed in our facilities or at site as required as like PT, RT, MAGNETIC, ULTRASOUND also Shop production schedule is controlled internally by Power Piping Personnel providing on-time fabrication completion for our clients We maintain engineering Capability for Piping Layout

*Multiple shift operations are available to support client needs..

Our employees know that our success is based on offering skills, experience and resources to our clients each and every time we provide services.

Special client requirements associated with unique work processes, special material and contamination control requirements..

All the work is performed under written QC/QA Program

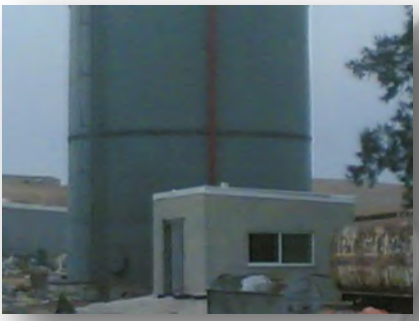
We maintain a complete welding program in accordance AWS Standards with ASME, API to build vessel and tank

PREVIOUS PROJECTS

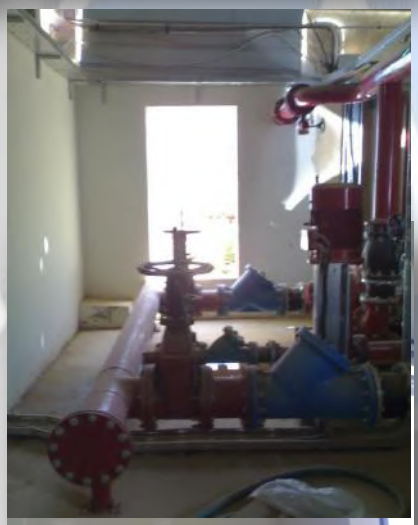
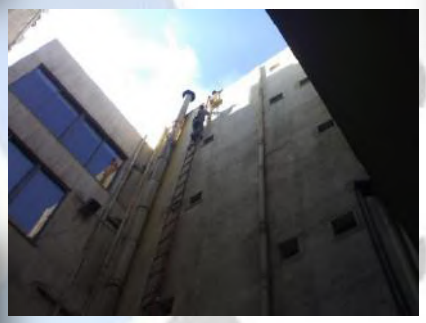
CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Advanced Furniture Industry Co	AWADAH	INSTALLATION		•FIRE PUMP STATION	SAHAB JORDAN	12/2004	1/2005	12,000.00 JD
DAEWOO, ARAB BANK, QASTAL JUICE, ARAMEX, National Poultry	ALAMAN	INSTALLATION		•FIRE PUMP STATION •SPRINKLER SYSTEM •HYDRANT •HOSE CABINET	SAHAB JORDAN	2/2005	3/2006	36,000.00 JD

REFERENCE : www.naffire.com
+962 796678455 +962 064881999
+962 06 4888861 +962 064888861
info@naffire.com

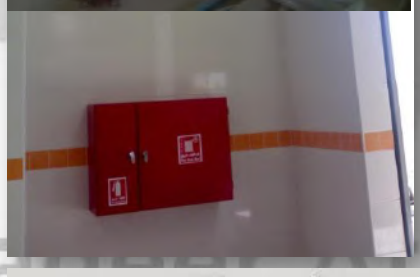
*REFERENCE : www.alaman.com
+962 065399906
+962 065349124
+962 795608874

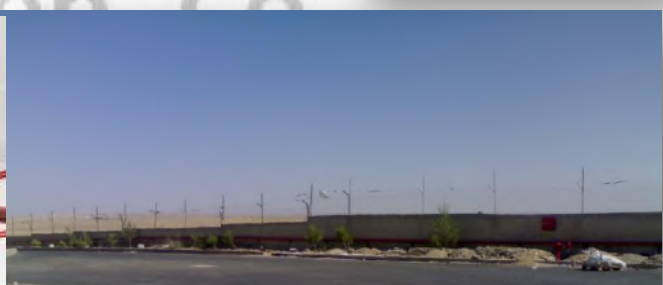






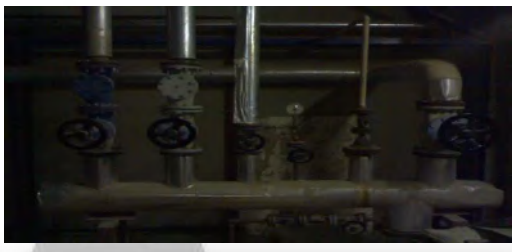



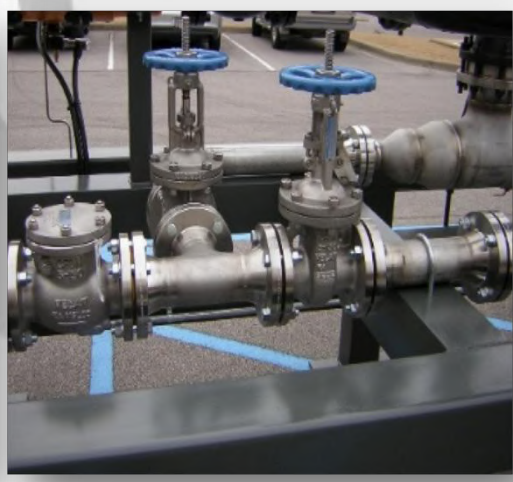


PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
AL NABIL FOOD INDUSTRIES COMPANY LTD	Alghade-er	FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813	•HVAC –CHILLED WATER SYSTEM •STEAM BOILER •NH3 FREEZING SYSTEM •STAINLESS STEEL 316L DUCKT	SAHAB JORDAN	4/2006	2/2007	198,030.00 JD

REFERENCE : http://nabilfoods.com
+962 6 4022004
INFO@NABILFOODPRODUCTS.COM
+962 6 4022 693
P.O.BOX 97 ،SAHAB 11512 ،AMMAN ،JORDAN





PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Arab Center for Pharmaceuticals and Chemical Indus	Alghade-er	STAINLESS - STEEL FABRICATION ERECTION INSTALLATION HYDROTEST	ASME BPE2002 AWS D18 ASME A269	•JACKETED VESSELS 316L •SS316L STEAM NETWORK •GARBAGE CONTAINER	SAHAB JORDAN	6/2007	3/2008	47,000.00 JD

REFERENCE : www.acpc.com.jo
TELL +962 06 4022470
FAX +962 06 4022473
info@acpc.com.jo

PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Arabian Cement Company (ACC)	ENG-HOLTEC ---------- MID CONTRA-CTING	FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813 NS 4054 ISO 4406 ISO 9095 ASME PCC-1 EN 1591	• HEAVY FUEL OIL NETWORK, • COAL DUST TO BURNER PIPELINE • FIRE PROTECTION SYSTEM (FOAM/WATER/CO2) • RAW MATERIALS, PRODUCTION SAMPLES, DISPATCHED PRODUCT PIPELINE TO LABORATORY • PROCESS LINES, POTABLE WATER • HDPE PIPELINE UNDERGROUND FROM BORE WELL	KARAK JORDAN	5/2008	8/2010	342,860.00 JD

REFERENCE : www.mid-contracting.com
Tel: +962 6 55 36 851, Tel: + 966 11 465 93 38,
Fax: +962 6 55 18 843, Fax: + 966 11 465 00 46
P.O. Box (675), Um Essummaq, Amman 11821 Jordan,
E-mail: mid@mid-contracting.com.jo













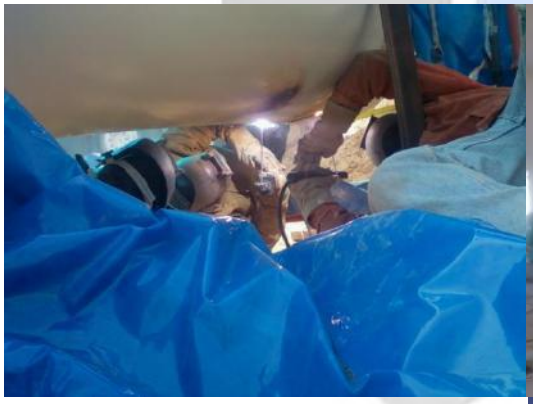


PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
JIFCO Jordan India Fertiliser Company (JIFCO)	SNC·LAVALIN SNC-Lavalin MID CONTRA-CTING	FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII	•STAINLESS STEEL 316L PIPE NETWORKS •PIPES P22, P91, TURBINE POWER PLANT •PUMP STATION	MAA'AN JORDAN	2/2011	4/2013	288,000.00 JD

REFERENCE : www.mid-contracting.com
Tel: +962 6 55 36 851, Tel: + 966 11 465 93 38,
Fax: +962 6 55 18 843, Fax: + 966 11 465 00 46
P.O. Box (675), Um Essummaq, Amman 11821 Jordan,
E-mail: mid@mid-contracting.com.jo






PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
UNITED GROUP UNITED FOOD CORPOR ATION	ALGHAD -EER	SUPPLY FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813 NS 4054 ISO 4406 ISO 9095 ASME PCC-1 EN 1591	•STEAM NETWORK	DAMMAM SAUDI ARABIA	8/2013	12/2014	124,000.00 SR

REFERENCE : http://www.unitedgroup.com.sa
Tel # +966 13-8147440
Fax# +966 13-8147450
contact@unitedgroup.com.sa

PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
National Company for Sulphur Products (NCSP)	ALGHAD -EER	SUPPLY FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813 NS 4054 ISO 4406 ISO 9095 ASME PCC-1 EN 1591	• STAINLESS STEEL 316L PIPES: ALCOHOL ACID	RIYADH SAUDI ARABIA	1/2014	3/2014	211,000.00 SR
				• CARBOS STEEL ASTM 53A COILS TO HEATING SULPHUR	RIYADH SAUDI ARABIA	5/2016	6/2016	108,000.00 SR
				• STAINLESS STEEL 316L PIPES: CONNECTION TANKS AREA PLUS HEAT EXCHANGER AND PUMPS	RIYADH SAUDI ARABIA	6/2016	9/2016	288,000.00 SR

REFERENCE : http://imad.ps/ncsp1
Phone: 00966114647711
Fax: 00966112170866
Email : ncsp@ncsp.com.sa

PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Riyadh Cables Group Company	ALGHAD-EER	SUPPLY FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813 NS 4054 ISO 4406 ISO 9095 ASME PCC-1 EN 1591	• STAINLESS STEEL 304L INSTALATION NITROJEN TANK HIGH PRESSURE WITH ALL ACCESSORIES CCV-line 1	RIYADH SAUDI ARABIA	1/2015	3/2015	132,000.00 SR
				• CS CHILLED WATER SYSTEM , PIPING ACCESSORIES, CLADDING RCC2	RIYADH SAUDI ARABIA	4/2015	8/2015	322,000.00 SR
				• STAINLESS STEEL 304L WATER TRAPS, DUST FILLTER, PIPELINE CCV-line 1	RIYADH SAUDI ARABIA	7/2015	9//2015	244,000.00 SR
				• STAINLESS STEEL 304L DUST BLOWER, PIPELINE 304L CCV-line 3	RIYADH SAUDI ARABIA	9/2015	11/2015	256,000.00 SR
				• STAINLESS STEEL 304L WATER TRAPS, DUST FILLTER, RCP-line 3	RIYADH SAUDI ARABIA	1/2016	4/2016	287,000.00 SR
				• STAINLESS STEEL 304L PIPELINE, RCP-line 3	RIYADH SAUDI ARABIA	1/2016	5/2016	311,000.00 SR
				• STAINLESS STEEL 304L NITROJEN GAS FILLTERS CCV-line 1	RIYADH SAUDI ARABIA	7/2016	9/2016	124,000.00 SR
				• STAINLESS STEEL 304L REPLACE HIGH PRESSURE PIPING CCV-line 1	RIYADH SAUDI ARABIA	1/2017	2//2017	32,000.00 SR

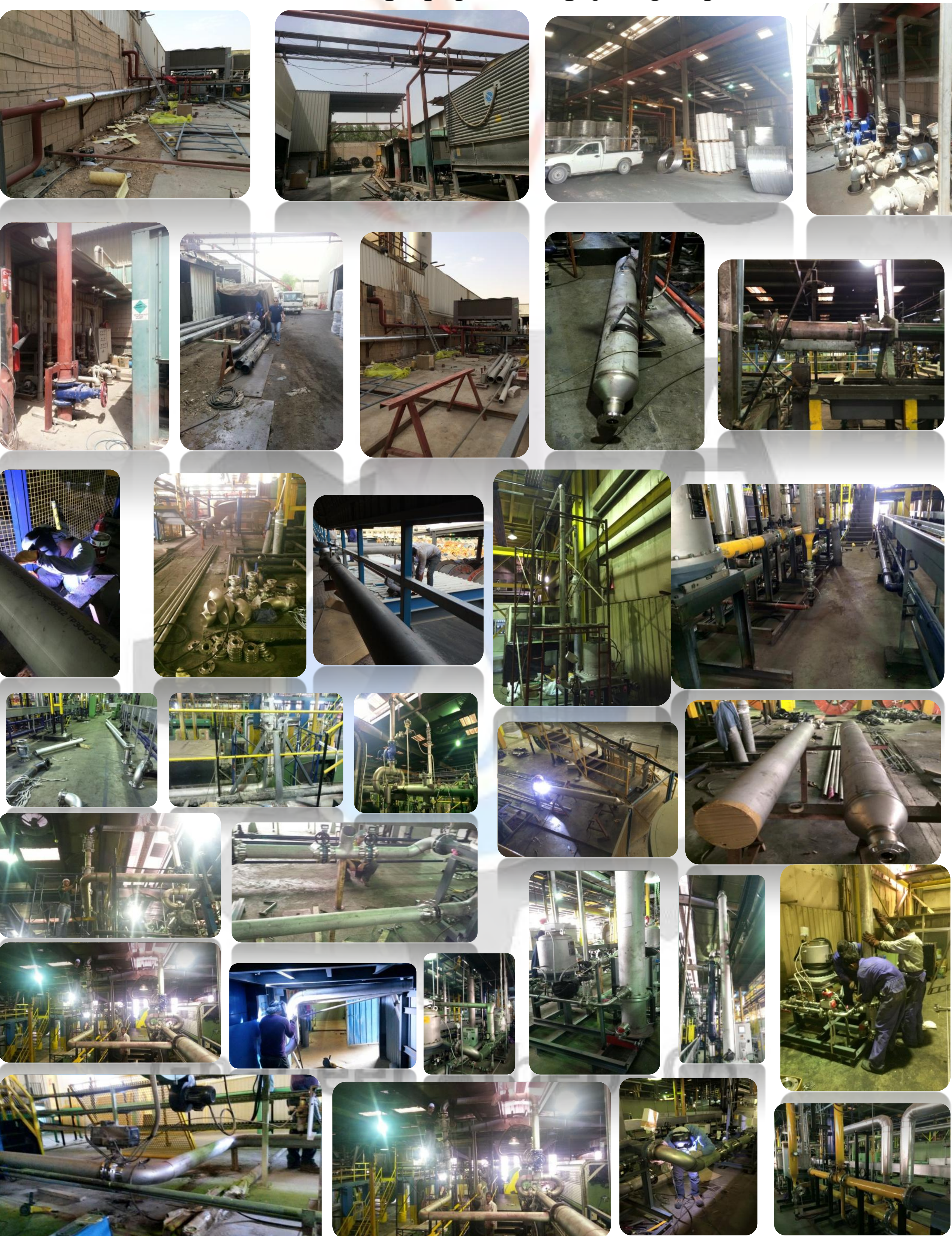
REFERENCE : http://www.riyadh-cables.com
Telephone +966-11-2650850
Direct Telephone: +966-11-2651810
Fax: +966-11-2652062
Email rcgc@riyadh-cables.com







PREVIOUS PROJECTS



PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Saudi Ceramic Company	ALGHAD -EER	SUPPLY FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A NS 813 NS 4054 ISO 4406 ISO 9095 ASME PCC-1 EN 1591	• TP2 WATER SUPPLY NETWORK CS ASTM 53A SCH80	RIYADH SAUDI-AR	4/2014	3/2015	1,288,000.00 SR
				• TP2 STAINLESS STEEL 316L TANK	RIYADH SAUDI-AR	12/2014	1/2015	366,000.00 SR
				• PP LPG GAS PIPE LINE	RIYADH SAUDI-AR	11/2014	1/2015	244,000.00 SR
				• TP1 LNG GAS PIPE LINE	RIYADH SAUDI-AR	5/2015	8/2015	310,000.00 SR
				• WHP2 WATER SUPPLY NETWORK CS ASTM 53A SCH40	RIYADH SAUDI-AR	9/2015	1/2016	387,000.00 SR

REFERENCE : www.saudiceramics.com
00966118298888
0096611267569
info@saudiceramics.com











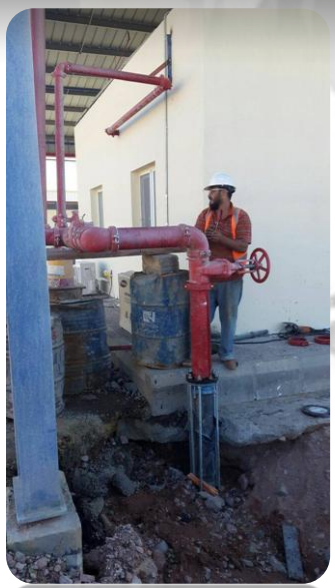
PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Aqaba Development Corporation (ADC)	ENG-Dar Al-Handasah ---------- MID CONTRA-CTING	FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3 ASMEB1.20.1 ASME PCC2 ASMEVIII, VIII API 6A	• FIRE FIGHTING SYSTEMS TO THE 3 SHEDS AT PORT YARDS	AQABA JORDAN	2/2017	4/2018	86,000.00 JD

REFERENCE : www.mid-contracting.com
Tel: +962 6 55 36 851, Tel: + 966 11 465 93 38,
Fax: +962 6 55 18 843, Fax: + 966 11 465 00 46
P.O. Box (675), Um Essummaq, Amman 11821 Jordan,
E-mail: mid@mid-contracting.com.jo



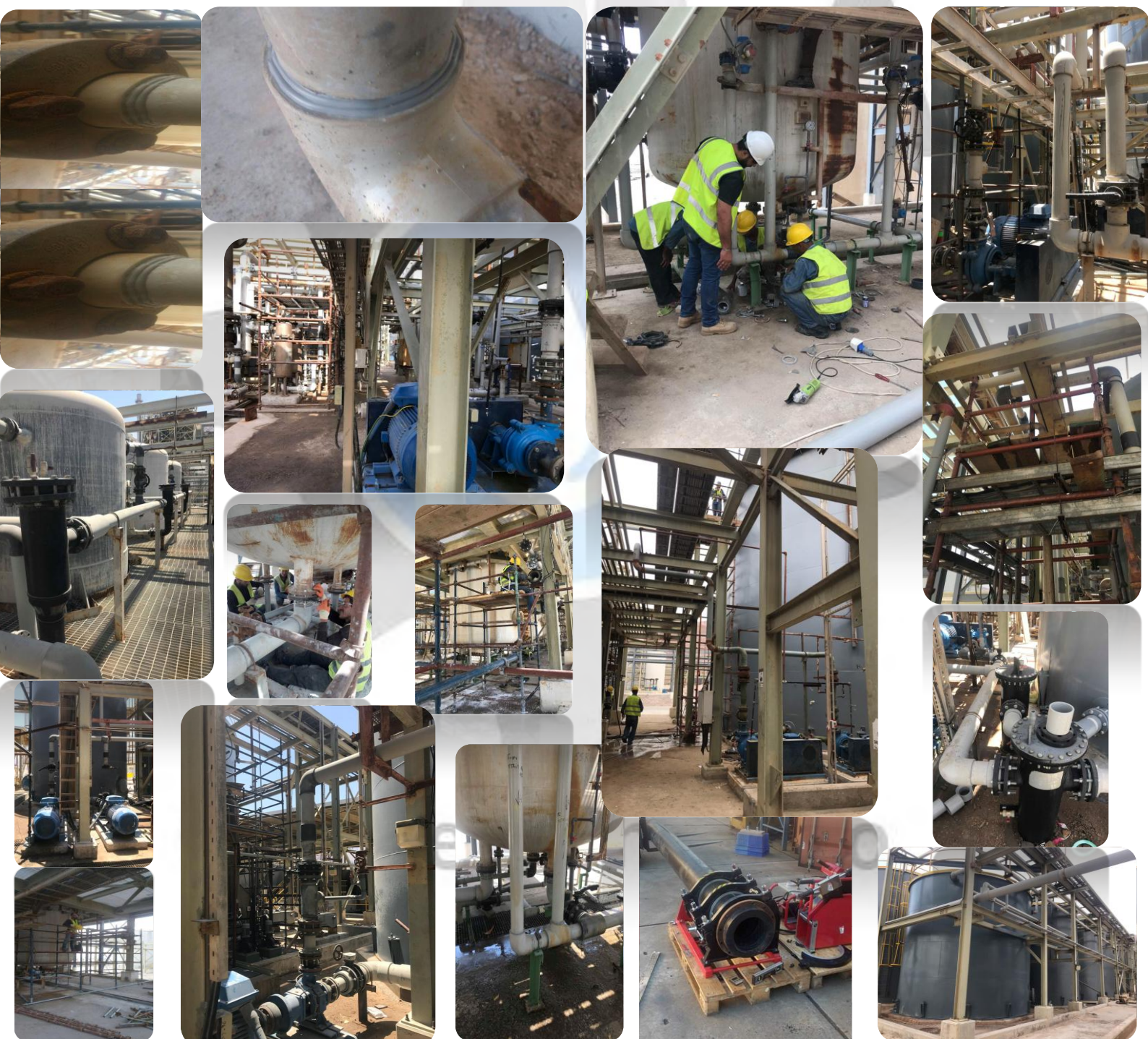


PREVIOUS PROJECTS

CLIENT	MAIN CONT	SERVICE	CODE & STANDARD	SCOPE OF WORK	REGION LOCATION	PERIOD		VALUE
Jordan Magnesia JORMAG	ALGAHDEER	FABRICATION ERECTION INSTALLATION HYDROTEST	ASME B31.3, B31.4, B31.5 ASTM D5260 ASTM F441 ASTM D2846 ASTM NSF-61	•REPAIRE ALL CPVC-UPVC PIPING @55 AREA PLUS ACCESSORIES	GHORE JORDAN	3/2018	7/2018	105,000.00 JD

REFERENCE : http://www.manaseergroup.com
Phone +962 (6) 565-0902
Fax +962 (6) 585-8549
P.O Box 925988 Amman 11110, Jordan
Feedback@manaseergroup.com



REFERENCES

Throughout this Standard the following dated and undated standards/codes are ,referred to. These referenced documents shall, to the extent specified herein form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated ncluding anyi(references, the latest edition of the referenced documents .supplements and amendments) applies

1. ASME B31.3 Process Piping
2. ASME B1.20.1 Pipe Threads, General purpose, Inch
3. ASME PCC2 Repair of Pressure Equipment and Piping
4. ASME VIII Boiler and Pressure Vessel Code, Section VIII – Rules for construction of Pressure Vessels, Division 1
5. API 6A API standard 6A
6. NS 813 Piping systems – Identification colours for the content
7. NS 4054 Colours for ident fication
8. ISO 4406 Hydraulic fluid power – Fluids – Method for coding the level of contamination by so id particles
9. ISO 9095 Steel tubes – Continuous character arking and colour coding for material identification
10 ASME PCC-1 Guidelines for Pressure Boundary Bolted Flange Joint Assembly
11.EN 1591 Flanges and their joints

ASME B31.3

ASME B31.3 contains requirements for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals. It covers materials and components, design, fabrication, assembly, erection, examination, inspection, and testing of piping.

This Code applies to piping for all fluids including：

(1)raw, intermediate, and finished chemicals；

(2)petroleum products；

(3)gas, steam, air and water；

(4)fluidized solids；

(5)refrigerants; and

(6)cryogenic fluids.

Also included is piping that interconnects pieces or stages within a packaged equipment assembly.

Key changes to this revision include:

- Severe Cyclic Conditions
- MPa Allowable Stresses
- Expansion Joints

ASME B31.3

- Flange Joint Assembly
- Ultrasonic Examination Acceptance Criteria
- Category M Fluid Service Examination
- Leak Testing of Instrument Connections
- Leak Testing of Vacuum Systems
- Leak Testing of Insulated Systems
- Leak Testing of Assembled Piping

B31.3 is one of ASME's most requested codes. It serves as a companion to ASME's B31.1 Code on Power Piping as well as to the other codes in ASME's B31 series. Together, they remain essential references for anyone engaged with piping.

ASME B1.20.1

ASME's widely-referenced B1.20.1 Standard on Pipe Threads, General Purpose, Inch covers dimensions and gaging of the world's most common pipe threads: NPT, NPSC, NPTR, NPSM, and NPSL.

From critical applications demanding robustness and precision to common plumbing and hardware, these threads are used everywhere in the United States and abroad .

This long awaited revision incorporates both subtle and substantive changes, including:

Moving of the gaging point of reference of external threads in certain circumstances;

A new acceptability section for instances of gaging disputes;

A change to parameters, facilitating the calibration of working gages;

Guidance for plated or coated pipe threads;

Better explanatory language for the lay-user.

This is the foundational Standard for NPT, NPSC, NPSM, and NPSL pipe threads. All companies that manufacture, sell, or use these threads should have this revision in their technical library.

ASME PCC-2

ASME PCC-2 provides methods for repair of equipment and piping within the scope of ASME Pressure Technology Codes and Standards after it has been placed in service. These repair methods include relevant design, fabrication, examination, and testing practices and may be temporary or permanent, depending on the circumstances. The methods provided in this Standard address the repair of components when repair is deemed necessary based on appropriate inspection and flaw assessment. These inspection and flaw evaluation methods are not covered in this document, but are covered in other post-construction codes and standards. Only technical procedures and information are provided; administrative or policy requirements are outside of the scope of this Standard.

Key changes to this revision include a new supplemental article on repair welding considerations for Cr-Mo steel pressure vessels, and updates to Article 2.2 on External Weld Buildup to Repair Internal Thinning and Article 4.1 on Nonmetallic Composite Repair Systems: High Risk Applications.

ASME PCC-2 serves as a companion to the other codes in ASME's PCC series. Together, they remain essential references for anyone engaged with pressure equipment and piping.

ASME Section VIII

ASME Section VIII is the section of the ASME Boiler & Pressure Vessel Code (BPVC) that covers pressure vessels. It gives detailed requirements for the design, fabrication, testing, inspection, and certification of both fired and unfired pressure vessels. It specifically refers to those pressure vessels that operate at pressures, either internal or external, that exceed 15 psig. The latest edition was published on July 1, 2015.

Section VIII contains three divisions, each of which cover different vessel specifications.

Division 1 largely contains appendixes, some mandatory and some non-mandatory, that detail supplementary design criteria, nondestructive examination techniques, and inspection acceptance standards for pressure vessels. It also contains rules that apply to the use of the single ASME certification mark with the U, UM, and UV designators.

Division 2 contains requirements for the materials, design, and nondestructive examination techniques for pressure vessels. Compared to Division 1, Division 2's standards are far more rigorous, but allow for higher stress intensity values. The rules put forth in Division 2 can also apply to human occupancy pressure vessels, primarily in the diving industry. Like Division 1, Division 2 contains guidelines that apply to the use of the single ASME certification mark as it applies to the U2 and UV

ASME Section VIII

designators.

Division 3 provides rules that to pressure vessels that operate at pressures, either internal or external, exceeding 10,000 psi. Division 3 does not establish maximum pressure limits for either of the preceding Section VIII divisions, nor does it establish a minimum pressure limit for itself. Like the previous two divisions, it also provides rules that dictate the use of the single ASME certification mark with the U3 and UV3 designator.

API Specification

6A

20th Edition, October 2010

Specification for Wellhead and Christmas Tree Equipment

ISO 10423:2009 (Modified), Petroleum and natural gas industries–Drilling and production equipment–Wellhead and christmas tree equipment

Table of Contents

1.0 Product Description

Specification 6A includes the following requirements for product ordered and may be applicable in addition to any product-specific requirements listed in other sections identified herein:

1.1 PRODUCTS: WELLHEAD & CHRISTMAS TREE EQUIPMENT

1.1.1 API Specification 6A – Introduction

It is necessary that users of this International Standard be aware that further or differing requirements can be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the Purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the vendor to identify any variations from this International Standard and provide details.

1.1.2 API Specification 6A – 1.1

This International Standard specifies requirements and gives recommendations for the performance, dimensional and functional interchangeability, design, materials, testing, inspection, welding, marking, handling, storing, shipment, Purchasing, repair and remanufacture of wellhead and christmas tree equipment for use in the petroleum and natural gas industries.

1.1.3 API Specification 6A – 1.2

This International Standard is applicable to the following specific equipment:

a) Wellhead equipment:

- casing-head housings
- casing-head spools
- tubing-head spools
- cross-over spools
- multi-stage head housings and spools

b) Connectors and fittings:
- cross-over connectors
- tubing-head adapters
- top connectors
- tees and crosses
- fluid-sampling devices
- adapter and spacer spools

c) Casing and tubing hangers:
- mandrel hangers
- slip hangers

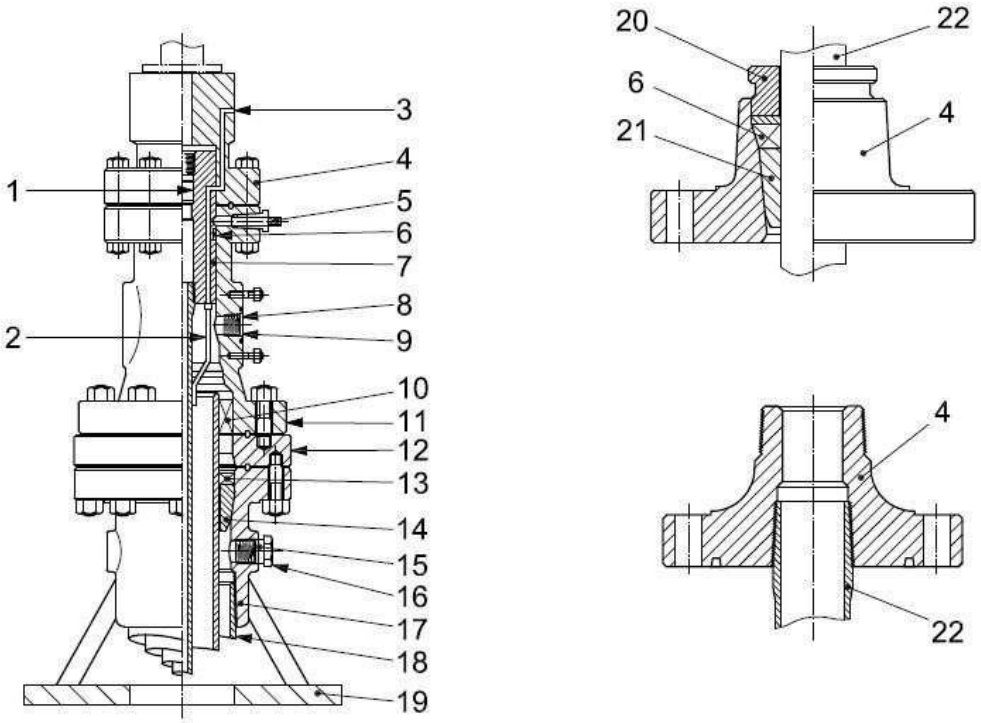
d) Valves and chokes:
- single valves
- multiple valves
- actuated valves
- valves prepared for actuators
- check valves
- chokes
- surface and underwater safety valves and actuators
- back-pressure valves

e) Loose connectors [flanged, threaded, other end connectors (OEC), and welded]:
- weld neck connectors
- blind connectors
- threaded connectors
- adapter and spacer connectors
- bullplugs
- valve-removal plugs

f) Other equipment:
- actuators
- clamp hubs
- pressure boundary penetrations
- ring gaskets
- running and testing tools (see Annex H)
- wear bushings (see Annex H)

1.2 Wellhead Equipment Description

1.2.1 API Specification 6A – 1.4 Figure 1

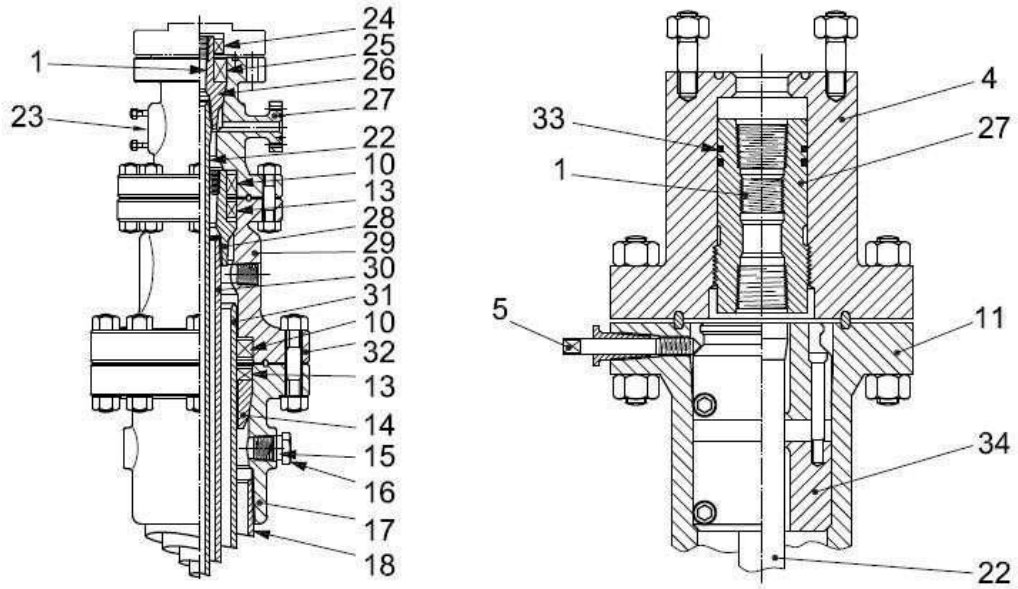


Key

1 back-pressure valve preparation
2 subsurface safety valve control line
3 subsurface safety valve control line outlet
4 tubing-head adapter
5 lock screw
6 tubing hanger pack-off
7 extended neck tubing hanger with subsurface safety valve control line
8 studded side outlet
9 valve-removal preparation
10 bottom casing pack-off
11 tubing-head spool
12 double-studded adapter
13 annular casing pack-off
14 casing hanger (slip style)
15 threaded outlet connection
16 bullplug
17 casing-head housing
18 surface casing
19 wellhead support plate
20 tubing pack-off retainer
21 tubing hanger (slip style)
22 tubing

Figure 1 — Typical wellhead assembly nomenclature

1.2.2 API Specification 6A – 1.4 Figure 1 (cont.)



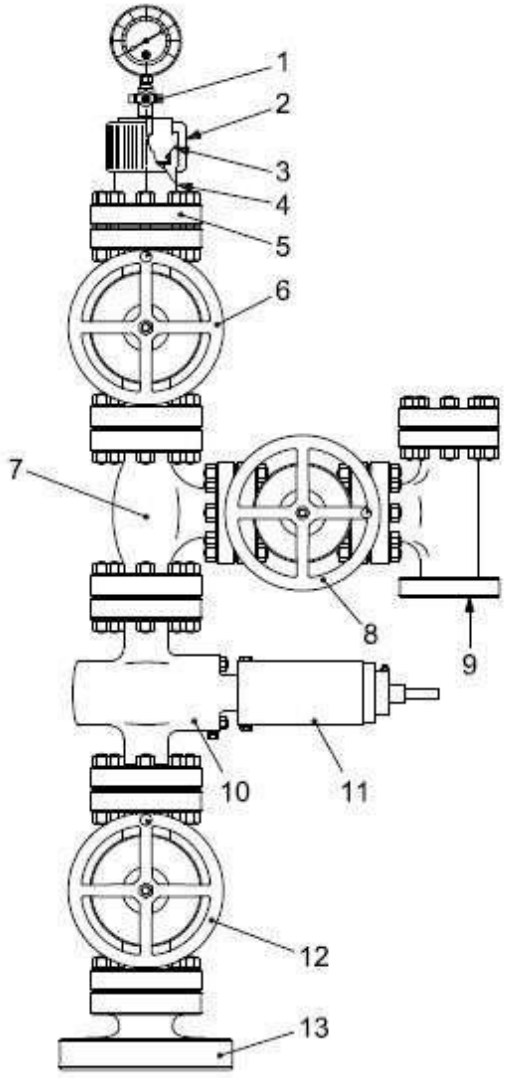
Key

23 studded side-outlet connection	29 casing-head spool
24 extended neck tubing hanger seal	30 inner casing
25 annular tubing hanger seal	31 intermediate casing
26 tubing hanger mandrel	32 flanged end connection
27 flanged outlet connection	33 tubing hanger mandrel seals
28 casing hanger mandrel	34 wrap-around hanger pack-off

Figure 1 — Typical wellhead assembly nomenclature (*continued*)

1.3 Christmas Tree Equipment

Description: API Specification 6A – 1.4 Figure 2



Key

1	gauge valve	8	wing valve (manual or actuated)
2	bonnet nut	9	choke
3	blanking plug	10	surface safety valve
4	body	11	actuator
5	top connector	12	master valve
6	swab or crown valve	13	tubing-head adapter
7	tee		

Figure 2 — Typical christmas tree nomenclature

1.4 PRODUCT COMPONENTS

1.4.1 Actuator

API Specification 6A – 3.1.3
Mechanism for the remote or automatic operation of a valve or choke.

1.4.2 Adapter

API Specification 6A – 3.1.4
Pressure-containing piece of equipment having end connections of different nominal sizes and/or pressure ratings, used to connect other pieces of equipment of different nominal sizes and/or pressure ratings.

1.4.3 Annular pack-off

API Specification 6A – 3.1.5
Mechanism that seals off annular pressure between the outside diameter of a suspended tubular member or hanger and the inside diameter of the head or spool through which the tubular member passes or hanger is suspended.

1.4.4 Back-pressure valve

API Specification 6A – 3.1.7
Unidirectional or bidirectional check valve that is installed through the christmas tree, into the tubing hanger, and prevents well fluids from flowing out of the well.

1.4.5 Blind flange

API Specification 6A – 3.1.8
Flange with no centre bore, used to close off completely a flanged end or outlet connection.

1.4.6 Body

API Specification 6A – 3.1.9
Any portion of wellhead and christmas tree equipment between end connections, with or without internal parts, which contains well-bore pressure.

1.4.7 **Bonnet**
API Specification 6A – 3.1.10
Pressure-containing closure for a body, other than an end or outlet connection

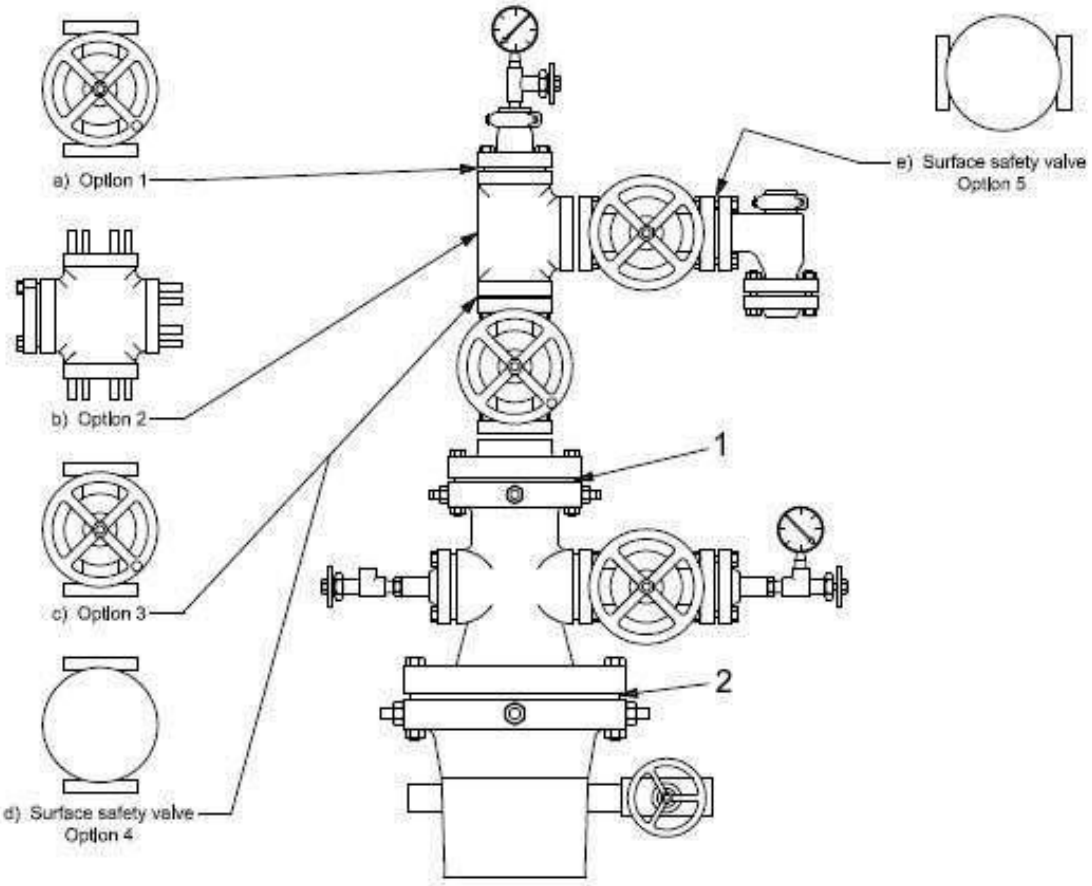
1.4.8 **Bullplug**
API Specification 6A – 3.1.12
Pressure-containing closure for a female-threaded end or outlet connection, which may have an internal counter-bore and/or test port.

1.5 CONFIGURATION

Product: **Wellhead & Christmas Tree Equipment**

1.5.1 API Specification 6A – Annex A.3
Examples of typical wellhead and christmas tree configurations are shown in Figures A.12 and A.13. Also included are examples of casing and bit programmes that are consistent with the wellheads shown.

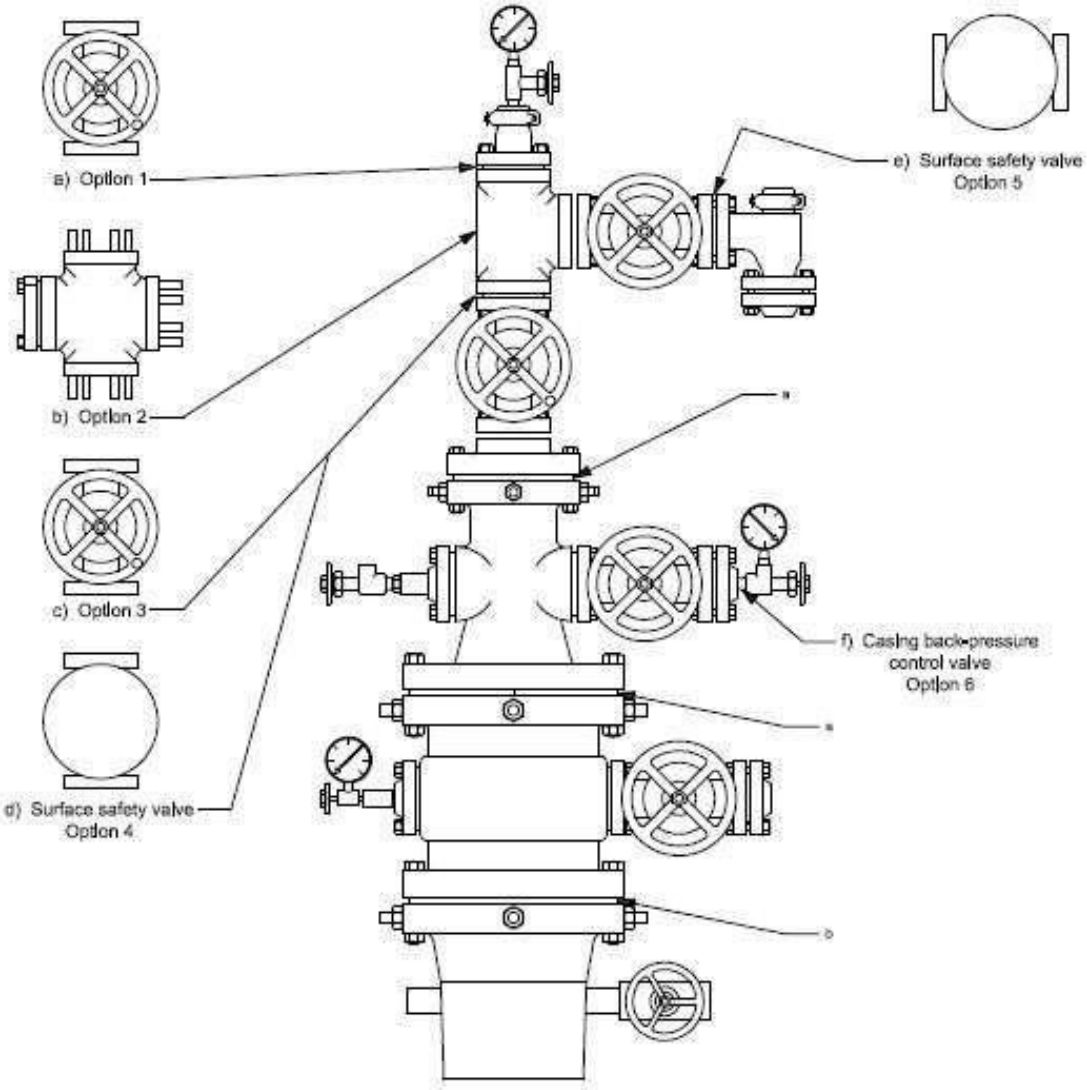
1.5.2 API Specification 6A – Annex A.5 Figure A.12



Key
1 tubing-head top flange 34,5 MPa (5 000 psi)
2 casing-head top flange 20,7 MPa (3 000 psi) or 34,5 MPa (5 000 psi)

Typical programmes			
Casing programme mm (in)	**Bit programme** mm (in)	**Casing head top flange** mm; MPa (in; psi)	**Tubing head top flange** mm; MPa (in; psi)
219,1 (8 5/8) × 139,7 (5 1/2)	200,0 (7 7/8)	279; 20,7 (11; 3 000)	179; 34,5 (7 1/16; 5 000)
244,5 (9 5/8) × 177,8 (7)	215,9 (8 1/2) or 222,2 (8 3/4)	or	
273,1 (10 3/4) × 193,7 (7 5/8)	250,8 (9 7/8)	279; 34,5 (11; 5 000)	

Figure A.12 — Typical wellhead and tree configuration for a 34,5 MPa (5 000 psi) rated working pressure



a 69,0 MPa (10 000 psi).

b 34,5 MPa (5 000 psi).

Figure A.13 — Typical wellhead and tree configuration for a 69,0 MPa (10 000 psi) rated working pressure

Typical programmes (SI units)				
Casing programme mm	**Bit programme** mm	**Casing-head housing top flange** mm; MPa	**Casing-head spool top flange** mm; MPa	**Tubing-head top flange** mm; MPa
406,4 × 273,1 × 193,7	374,7 × 250,8 or 241,3	425; 34,5	279; 69,0	179; 69,0
406,4 × 298,5 × 244,5 × 177,8 liner	374,7 × 269,9 × 215,9	425; 34,5	346; 69,0	179; 69,0
			279; 69,0	
339,7 × 244,5 × 177,8	311,2 × 215,9 × 152,4	346; 34,5	279; 69,0	179; 69,0
273,1 × 193,7 × 127,0	250,8 × 165,1	279; 34,5	279; 69,0	179; 69,0

Typical programmes (USC units)				
Casing programme in	**Bit programme** in	**Casing-head housing top flange** in; psi	**Casing-head spool top flange** in; psi	**Tubing-head top flange** in; psi
16 × 10 3/4 × 7 5/8	14 3/4 × 9 7/8 or 9 1/2	16 3/4; 5 000	11; 10 000	7 1/16; 10 000
16 × 11 3/4 × 9 5/8 × 7 liner	14 3/4 × 10 5/8 × 8 1/2	16 3/4; 5 000	13 5/8; 10 000	7 1/16; 10 000
			11; 10 000	
13 3/8 × 9 5/8 × 7	12 1/4 × 8 1/2 × 6	13 5/8; 5 000	11; 10 000	7 1/16; 10 000
10 3/4 × 7 5/8 × 5	9 7/8 × 6 1/2	11; 5 000	11; 10 000	7 1/16; 10 000

Figure A.13 *(continued)*

1.6 SPECIFICATION LEVEL

Product: **Wellhead & Christmas Tree Equipment**

1.6.1 API Specification 6A – Annex A.4.1

Product specification level (PSL) 1 includes practices currently being implemented by a broad spectrum of the industry for service conditions recommended in this annex.

PSL 2 includes all the requirements of PSL 1 plus additional practices currently being implemented by a broad spectrum of the industry for a specific range of service conditions, as described in this annex.

PSL 3 includes all the requirements of PSL 2 plus additional practices currently being implemented by a broad spectrum of the industry for a specific range of service conditions, as described in this annex.

PSL 3G includes all the requirements of PSL 3 plus additional practices currently being implemented by a broad spectrum of the industry for a specific range of service conditions, as described in this annex. The designation PSL 3G is utilized only in those clauses, subclauses and tables where it is necessary to define the additional gas testing requirements of equipment that can be gas-tested.

PSL 4 includes all the requirements of PSL 3G plus certain additional requirements and is intended for applications that exceed the service conditions usually identified within the scope of this International Standard, and is normally used only for primary equipment.

Figure A.14 shows the recommended specification level for primary equipment. Primary equipment of a wellhead assembly includes the following, as a minimum:

- tubing head
- tubing hanger
- tubing-head adapter
- lower master valve

All other wellhead parts are classified as secondary. The specification level for secondary equipment may be the same as or less than the level for primary equipment.

The selection of a PSL should be based on a quantitative risk analysis, which is a formal and systematic approach to identifying potentially hazardous events and estimating the likelihood and consequences to people, environment and resources, of accidents developing from these events.

2.0 PURCHASER'S RIGHTS

2.1 COMPLIANCE

Product: **Wellhead & Christmas Tree Equipment**

2.1.1 API Specification 6A – 3.1.88

Qualified Personnel - individual with characteristics or abilities gained through training, experience, or both, as measured against the established requirements of the manufacturer/Purchaser/this International Standard.

2.1.2 API Specification 6A – 4.2.3.2
For material classes DD, EE, FF and HH, the manufacturer shall meet the requirements of ISO 15156 (all parts) (NACE MR0175; see Clause 2) for material processing and material properties (e.g. hardness).

2.2 REPAIR & REMANUFACTURE

Product: **Wellhead & Christmas Tree Equipment**

2.2.1 API Specification 6A – Annex J.1
Annex J defines the requirements for repair and remanufacture of user/purchaser-owned wellhead and christmas tree equipment originally manufactured in accordance with this International Standard for continued service by the user/purchaser.

2.2.2 API Specification 6A – Annex J.2.1
Repair and remanufacture levels (RL) provide the basis for defining and controlling repair and remanufacture of wellhead and christmas tree equipment during its life cycle. RL levels as defined in this annex include requirements consistent with sound industry practices for repair and remanufacture activities.

2.2.3 API Specification 6A – J.2.2
RL levels are representative of the product specifications and, if applicable, product specification level (PSL) to which the equipment was originally manufactured. RL levels indicate the level of technical requirements associated with the repair or

remanufacture of equipment and do not represent equipment suitability for specific service or performance requirements. Table J.1 summarizes the requirements of this annex to assist the customer and the repairer/remanufacturer in the selection of the appropriate RL level for equipment.

2.2.4 API Specification 6A – J.2.3

The original product specification and PSL levels shall be used to determine the RL levels to which equipment may be repaired or remanufactured as follows:

a) Equipment identified as originally manufactured to API Spec 6A prior to introduction of PSL levels shall be repaired or remanufactured to RL 1.

b) Equipment identified as originally manufactured to PSL 1 shall be repaired or remanufactured to RL 1.

c) Equipment identified as originally manufactured to PSL 2 shall be repaired or remanufactured to RL 1 or RL 2.

d) Equipment identified as originally manufactured to PSL 3 shall be repaired or remanufactured to RL 1, RL 2 or RL 3.

e) Equipment identified as originally manufactured to PSL 4 shall be repaired or remanufactured to RL 1, RL 2, RL 3 or RL 4.

f) Equipment identified as originally manufactured to API Spec 14D or ASME SPPE 1 shall be repaired or remanufactured to RL 2.

2.2.5 API Specification – Annex J.2.3 Table J.1

Table J.1 — Summary of Annex J requirements

Requirement	RL 1	RL 2	RL 3	RL 4
Corresponding PSL level	**PSL 1**	**PSL 2**	**PSL 3/3G**	**PSL 4**
Equipment identified as originally manufactured in accordance with API Spec 6A prior to introduction of PSL levels	x	—	—	—
Equipment identified as originally manufactured as PSL 1	x	—	—	—
Equipment identified as originally manufactured as PSL 2	x	x	—	—
Equipment identified as originally manufactured as API Spec 14 D, or ASME SPPE 1	—	x	—	—
Equipment identified as originally manufactured as PSL 3, or PSL 3G	x	x	x	—
Equipment identified as originally manufactured as PSL 4	x	x	x	x
Design status indeterminate	x	—	—	—
Design status acceptable	x	x	x	x
Design of product attributes and parts similar to the OPD[a] requirements	x	—	—	—
Design of product attributes and parts meet or exceed OPD requirements	—	x	x	x
Complete disassembly and cleaning	—	x	x	x
Visual examination	x[b]	x	x	x
Dimensional inspection of specified dimensions of this International Standard	x	x	x	x
Surface NDE for remanufactured parts	—	x	x	x[c]
Welding controlled to include material identification	x	x	x	x[c]
Visual weld examination for remanufactured parts	—	x	x	x[c]
Weld surface NDE for remanufactured parts	—	x	x	x[c]
Weld volumetric NDE for remanufactured parts	—	x	x	x[c]
Weld hardness test	—	—	x	x[c]
Hardness testing for sour service	x[e]	x[e]	x[e]	x[e]
Hardness testing to requirements of this International Standard	—	x[e]	x[e]	x[e]
Reassembly traceability	—	—	x	x
Hydrostatic body test	x[f]	x	x	x
Hydrostatic seat test	x	x	x	x
Extended seat test	—	—	x	x
Drift test	x	x	x	x
Gas test	—	—	x[d]	x
Certificate of conformance provided to customer	—	—	x	x
Assembly traceability and test records provided to customer	—	—	x	x
Complete quality control records provided to customer	—	—	—	x

[a] OPD indicates "original product definition".
[b] Examination required only to extent permitted by disassembly.
[c] Welding is not permitted except for weld overlays.
[d] Gas test for PSL 3G option only.
[e] Applicable to body, bonnet, end and outlet connections and stems.
[f] Hydrostatic test required only at working pressure.

3.0 PURCHASER'S RESPONSIBILITY

3.1 MATERIAL SELECTION

Product: **Wellhead & Christmas Tree Equipment**

3.1.1 API Specification 6A – 4.2.3.2
Choosing material class and specific materials for specific conditions is ultimately the responsibility of the Purchaser.

31.2 API Specification 6A – 4.2.3.2
In making the material selections, it is the responsibility of the Purchaser to also consider the various environmental factors and production variables listed in Annex A.

31.3 API Specification 6A – 4.2.3.2
It is the responsibility of the Purchaser to evaluate and determine the applicability of the documented data for the intended application.

3.1.4 API Specification 6A – Annex A.2
The effects of external loads (i.e. bending moments, tensions, etc.) on the assembly of components are not explicitly addressed by this International Standard (see 4.2.1.3). The purchaser should specify any exceptional loading configuration.

3.1.5 API Specification 6A – Annex A.2
The purchaser should specify whether the design validation procedures in Annex F are applicable.

3.2 DATA SHEETS & ORDERING

Product:

3.2.1 **Wellhead & Christmas Tree Equipment**

Requirement

3.2.1.1 API Specification 6A – Annex A.1
Annex A provides guidelines for enquiry and purchase of wellhead and christmas tree equipment. These guidelines consist of data sheets for completion by the purchaser, a series of typical

wellhead and christmas tree configurations, and a decision tree for determining product specification levels. An electronic, revisable form of each data sheet can be accessed by clicking on the figure title, as indicated.

The data sheets are designed to perform two functions:

a) assist the purchaser in deciding what he wants;

b) assist the purchaser in communicating his particular needs and requirements, as well as information on the well environment, to the manufacturer for his use in designing and producing equipment.

To use this annex, a copy of the data sheets should be completed as accurately as possible. The typical configurations should be referred to, as needed, to select the required equipment. The decision tree, given in Figure A.14, together with its instructions, provides the recommended practice as to which PSL each piece of equipment should be manufactured. A copy of the data sheet should then be attached to the purchase order or request for proposal.

3.2.1.2 API Specification 6A – Annex A.2
The following pages contain questions and information that can be used to select wellhead equipment, including chokes and actuators. Figure A.1 contains general information that pertains to the entire well. Figures A.2 to A.11 are designed for use with each type of equipment.

3.2.1.3 **ISO 15156 (all parts)**
API Specification 6A – A.4.2
This applies if the partial pressure of hydrogen sulfide (H2S) in the produced fluid equals or exceeds the minimum amount specified by ISO 15156 (all parts) (NACE MR0175; see Clause 2) for sour service.

3.2.1.4 High H2S concentration

API Specification 6A – Annex A.4.3
Use "Yes" if the H2S concentration of the produced fluid is such that in air an H2S concentration of 70 ml/m3 [70 ppm (parts per million)] can develop in case of a leak (human sense of smell cannot detect concentrations higher than 70 ml/m3).

Alternatively, use "Yes" if the radius of exposure (ROE) to 100 ml/m3 (100 ppm) H2S is greater than 15 m (50 ft) from the wellhead. ROE is defined in Texas Administrative Code, Title 16, Part 1, Chapter 3, Rule 3.36, b) 3); see A.4.5. Other methods of calculating ROE may apply, depending on local regulations.

The above requires the knowledge of the adjusted open-flow rate of offset wells. If this is not available, but if hydrogen sulfide can be expected, a 100 ml/m3 (100 ppm) ROE equal to 1 000 m (3 000 ft) may be assumed.

3.2.1.5 Close proximity

API Specification 6A – Annex A.4.4
Users who are accustomed to the use of the close-proximity and radius-of-exposure concepts may substitute close proximity for gas well in Figure A.14.

The proximity assessment should consider the potential impact of an uncontrolled emission of H2S threatening life and environment near the wellhead. The following list of items can be used for determining potential risk:

a) 100 ml/m3 (100 ppm) ROE of H2S is greater than 15 m (50 ft) from the wellhead and includes any part of a public area except a public road. ROE is defined in A.4.5. "Public area" means a dwelling, place of business, place of worship, school, hospital, school bus stop, government building, a public road, all or any portion of a park, city, town, village, or other similar area that one can expect to be populated. "Public road" means any street or road owned or maintained for public access or use

b) 500 ml/m3 (500 ppm) ROE of H2S is greater than 15 m (50 ft) from the wellhead and includes any part of a public area including a public road

c) well is located in any environmentally sensitive area, such as a park, wildlife preserve, city limits, etc.

d) well is located within 46 m (150 ft) of an open flame or fired equipment

e) well is located within 15 m (50 ft) of a public road

f) well is located in or near inland navigable waters

g) well is located in or near surface domestic water supplies

h) well is located within 107 m (350 ft) of any dwelling

These conditions are recommended minimum considerations. Any local regulatory requirements should be met.

3.2.1.6 Radius of exposure of H2S

API Specification 6A – Annex A.4.5.1
The following information is taken from Texas Railroad Commission Rule 36. SI metric-equivalent rules are not given, as the method of determining the ROE is used in the United States only. Other methods of calculating ROE may apply, depending on local regulations.

3.2.1.7 Radius of exposure of H2S

API Specification 6A – Annex A.4.5.2
The location, X100, of the 100 ml/m3 (100 ppm) ROE is determined as given in Equation (A.1):

$$X_{100} = [(1{,}589)(y_{H_2S})(q)]^{0{,}625\,8} \quad \text{(A.1)}$$

The location, X_{500}, of the 500 ml/m^3 (500 ppm) ROE is determined as given in Equation (A.2):

$$X_{500} = [(0{,}454\,6)(y_{H_2S})(q)]^{0{,}625\,8} \quad \text{(A.2)}$$

where

y_{H_2S} is the mole fraction H_2S in the gaseous mixture available for escape;

X is the radius of exposure, expressed in feet;

q is the maximum volume flow rate determined to be available for escape, expressed in cubic feet per day.

3.2.1.8 Radius of exposure of H2S

API Specification 6A – Annex A.4.5.3

The volume flow rate used as the escape rate in determining the radius of exposure shall be that specified below, as applicable.

a) For new wells in developed areas, the escape rate shall be determined by using the current-adjusted open flow rate of offset wells, or the field-average current-adjusted open flow rate, whichever is larger.

b) The escape rate used in determining the radius of exposure shall be corrected to standard conditions of 0,101 Mpa (14,65 psia) and 16 °C (60 °F).

3.2.1.9 Corrosivity of retained fluid

API Specification 6A – Annex A.5

To select the desired material class in Table 3, the purchaser should determine the corrosivity of the retained, produced or injected fluid by considering the various environmental factors and production variables listed in Figure A.1. General corrosion, stress-corrosion cracking (SCC), erosion-corrosion and sulfide stress cracking (SSC) are all influenced by the interaction of the environmental factors and the production variables. Other factors and variables not listed in Figure A.1 may also influence fluid corrosivity.

The purchaser should determine whether materials shall meet ISO 15156 (all parts) (NACE MR0175; see Clause 2) for sour service. ISO 15156 (all parts) (NACE MR0175; see Clause 2) is concerned only with the metallic material requirements to prevent sulfide stress cracking and not with resistance to general corrosion. Consideration should also be given to the partial pressure of carbon dioxide, which generally relates to corrosivity in wells, as shown in Table A.1. This table is a guideline only.

Analysis of produced fluids might not predict the field performance of metallic or non-metallic material.

The minimum partial pressure of carbon dioxide required to initiate corrosion and the relative effect of increasing partial

pressures on the corrosion rate are strongly influenced by other environmental factors and production variables, such as:

a) temperature;

b) H2S level;

c) pH;

d) chloride ion concentration;

e) sand production;

f) water production and composition;

g) types and relative amounts of produced hydrocarbons.

Finally, the purchaser should consider future service of the well when selecting a material class. This not only should not be limited to anticipated changes in the acid-gas partial pressures for production or increased water production with or without increased chloride content, but also should include consideration of operations such as acidification or other well treatments.

3.2.1.10 API Specification 6A – Annex A.5 Table A.1

Table A.1 — Relative corrosivity of retained fluids as indicated by CO_2 partial pressure

Retained fluids	Relative corrosivity	Partial pressure of CO_2	
		MPa	(psia)
General service	non-corrosive	< 0,05	(< 7)
General service	slightly corrosive	0,05 to 0,21	(7 to 30)
General service	moderately to highly corrosive	> 0,21	(> 30)
Sour service	non-corrosive	< 0,05	(< 7)
Sour service	slightly corrosive	0,05 to 0,21	(7 to 30)
Sour service	moderately to highly corrosive	> 0,21	(> 30)

3.2.2: Wellhead Equipment

3.2.2.1 API Specification 6A – Annex A.5 Figure A.1

Wellhead equipment data sheet — General

Well name(s) and location(s): _____

Maximum operating pressure: _____

Anticipated wellhead shut-in pressure: _____

Temperature ranges anticipated: _____

Minimum ambient temperature: _____

Maximum flowing fluid temperature at wellhead: _____

Anticipated composition of produced fluids: CO_2 _____ (mg) _____ Chlorides _____ (mg)

_____ H_2S _____ (mg) _____ Other _____

Anticipated completion or future workover or recovery operations which would affect pressure, temperature or fluid content:

_____

New values: _____

Are there any government regulations that apply or must be met by this equipment? _____

If so, which one(s)? _____

Water or brine pH: _____

Does ISO 15156 (all parts) (NACE MR0175; see Clause 2) apply? _____

Will scale, paraffin, corrosion or other types of inhibitors be used? _____

Inhibitor type: _____ Inhibitor carrier: _____ Batch or continuous inhibition? _____

Will acidification be performed? _____ Type of acid: _____

Anticipated production rates: _____ m^3/d oil/condensate

_____ m^3/d gas

_____ m^3/d S&W[a]

Will erosion be a concern? _____ Cause: _____

External coating? Yes, type _____ No _____

Internal coating? Yes, type _____ No _____

Delivery requirements: _____

Special shipping, packing and storage instructions: _____

Casing programme

Top joint in string

	Size (OD)	kg/m (lb/ft)	Grade	Connection	Total string hanging wt daN (lbs)	Bit size mm (in)
Conductor						
Surface casing						
Protective casing						
Production casing						
Tubing						
Type of completion: single or multiple						

[a] Sand and water.

Figure A.1 — Wellhead equipment data sheet — General

Wellhead equipment data sheet — Casing-head housing

Casing-head housing PSL: _____ PR: _____
Bottom connection: Size: _____
Rated working pressure: _____
Type: _____
Top connection: Size: _____
Rated working pressure: _____
Type: _____
Outlets: Size: _____
Rated working pressure: _____
Type: _____
Number: _____
Equipment for outlets: Valve-removal plug: _____
Valves (inboard): Qty _____ PSL: _____ PR: _____
Valves (other): Qty _____ PSL: _____ PR: _____
Companion flanges: Qty ____ PSL: _____
Bullplugs: Qty _____
Nipples: Qty _____
Needle valves: Qty _____
Gauges: Qty _____
Lock screws? Yes _____ No _____ Lock screw function: _____
Baseplate requirements: _____
Special material requirements: _____
Casing hanger:
Size: _____
Type: _____
PSL: _____
PR: _____
Temperature rating (Table 2): _____
Material class (Table 3): _____
Retained fluid corrosivity (Table A.1): _____
Witness? Yes [a] _____ No _____
External coating? No _____ Yes _____ If yes, type _____
Internal coating? No _____ Yes _____ If yes, type _____
Flange bolting requirements (Table 62) Non-exposed _____ Exposed _____ Exposed (low strength) _____
Main run (studs): _____ (nuts): _____
Outlet inboard (studs): _____ (nuts): _____
Outlet other (studs): _____ (nuts): _____
Test and auxiliary equipment:
Wear bushing: _____
Running and retrieving tools: _____
Test plug: _____
Other requirements: _____

[a] If yes, specify what and by whom.

Figure A.2 — Wellhead equipment data sheet — Casing-head housing

3.2.2.3 API Specification 6A – Annex A.5 Figure A.3

Wellhead equipment data sheet — Casing-head spool

Casing-head spool PSL: _____ PR: _____
Bottom connection: Size: _____
Rated working pressure: _____
Type: _____
Top connection: Size: _____
Rated working pressure: _____
Type: _____
Outlets: Size: _____
Rated working pressure: _____
Type: _____
Number: _____
Equipment for outlets: Valve-removal plug: _____
Valves (inboard): Qty _____ PSL: _____ PR: _____
Valves (other): Qty _____ PSL: _____ PR: _____
Companion flanges: Qty _____ PSL: _____
Bullplugs: Qty _____
Nipples: Qty _____
Needle valves: Qty _____
Gauges: Qty _____
Lock screws? Yes _____ No _____ Lock screw function: _____
Special material requirements: _____
Bottom casing spool pack-off size: _____
Type: _____
PR: _____
Casing hanger:
Size: _____
Type: _____
PSL: _____
PR: _____
Temperature rating (Table 2): _____
Material class (Table 3): _____
Retained fluid corrosivity (Table A.1): _____
Witness? Yes [a] _____ No _____
External coating? No _____ Yes _____ If yes, type _____
Internal coating? No _____ Yes _____ If yes, type _____
Flange bolting requirements (Table 62) Exposed _____ Non-exposed _____
Outlet inboard (studs): _____ (nuts): _____
Outlet other (studs): _____ (nuts): _____
Test and auxiliary equipment:
Wear bushing: _____
Running and retrieving tools: _____
Test plug: _____
Other requirements: _____

[a] If yes, specify what and by whom.

Figure A.3 — Wellhead equipment data sheet — Casing-head spool

3.2.2.4 API Specification 6A – Annex A.5 Figure A.4

Wellhead equipment data sheet — Tubing-head spool

Tubing-head spool PSL: _____ PR: _____
Bottom connection: Size: _____
Rated working pressure: _____
Type: _____
Top connection: Size: _____
Rated working pressure: _____
Type: _____
Outlets: Size: _____
Rated working pressure: _____
Type: _____
Number: _____
Equipment for outlets: Valve-removal plug: _____
Valves (inboard): Qty _____ PSL: _____ PR: _____
Valves (other): Qty _____ PSL: _____ PR: _____
Companion flanges: Qty ____ PSL: _____
Bullplugs: Qty _____
Nipples: Qty _____
Needle valves: Qty _____
Gauges: Qty _____
Lock screws? Yes _____ No _____ Lock screw function: _____
Material requirements: _____
Bottom tubing spool pack-off: Size: _____
Type: _____
PR: _____
Tubing hanger: Size: _____
Type: _____
PSL: _____
PR: _____
Back-pressure valve type: _____
Surface-controlled subsurface valve control lines: _____
Temperature rating (Table 2): _____
Material class (Table 3): _____
Retained fluid corrosivity (Table A.1): _____
Witness? Yes [a] _____ No _____
External coating? No _____ Yes _____ If yes, type _____
Internal coating? No _____ Yes _____ If yes, type _____
Flange bolting requirements (Table 62) Non-exposed _____ Exposed _____ Exposed (low strength) ____
Main run (studs): _____ (nuts): _____
Outlet inboard (studs): _____ (nuts): _____
Outlet other (studs): _____ (nuts): _____
Test and auxiliary equipment:
Wear bushing: _____
Running and retrieving tools: _____
Test plug: _____
Other requirements: _____

[a] If yes, specify what and by whom.

Figure A.4 — Wellhead equipment data sheet — Tubing-head spool

3.2.2.5 API Specification 6A – Annex A.5 Figure A.5

Wellhead equipment data sheet — Cross-over flange	
Cross-over flange	PSL: _____ PR: _____
Bottom connection:	Size: _____
	Rated working pressure: _____
	Type: _____
Top connection:	Size: _____
	Rated working pressure: _____
	Type: _____
Pack-off type: _____	
Size: _____	
Temperature rating (Table 2): _____	
Material class (Table 3): _____	
Retained fluid corrosivity (Table A.1): _____	
Witness? Yes [a] _____	No _____
External coating? No _____ Yes _____	If yes, type _____
Internal coating? No _____ Yes _____	If yes, type _____
Flange bolting requirement (Table 62)	Non-exposed _____ Exposed _____ Exposed (low strength) _____
Main run (studs): _____ (nuts): _____	
[a] If yes, specify what and by whom.	

Figure A.5 — Wellhead equipment data sheet — Cross-over flange

3.2.2.6 API Specification 6A – Annex A.5 Figure A.6

Wellhead equipment data sheet — Tubing head adaptor	
Tubing head adaptor	PSL: _____ PR: _____
Bottom connection:	Size: _____
	Rated working pressure: _____
	Type: _____
Top connection:	Size: _____
	Rated working pressure: _____
	Type: _____
Surface-controlled subsurface safety valve outlets: _____	
Number: _____	
Size: _____	
Electrical feed-through connection? _____	
Special material requirements: _____	
Temperature rating (Table 2): _____	
Material class (Table 3): _____	
Retained fluid corrosivity (Table A.1): _____	
Witness? Yes [a] _____	No _____
External coating? No _____ Yes _____	If yes, type _____
Internal coating? No _____ Yes _____	If yes, type _____
Flange bolting requirement (Table 62)	Non-exposed _____ Exposed _____ Exposed (low strength) _____
Main run (studs): _____ (nuts): _____	
[a] If yes, specify what and by whom.	

Figure A.6 — Wellhead equipment data sheet — Tubing head adaptor

3.2.2.7 API Specification 6A – Annex A Figure A.7

Wellhead equipment data sheet — Christmas tree and choke

Christmas tree – Single ___ Dual ___ Solid block ___ Stacked ___

	Size	Material[a]	PSL	PR	Witness?[b]	External coating? If yes, state type	Flanged bolting requirements[c] Studs Nuts	Ring gasket type
Lower master valve								
Upper master valve								
Swab (crown) valve								
Wing valve—inboard								
Wing valve(s)—other								
Tee/cross (circle one)								
Choke								
End flange								
Companion flanges								
Instrument flanges								
Tree cap/top conn.								

Rated working pressure: _____

Retained fluid corrosivity (Table A.1): _____

Temperature rating (Table 2): _____

Material class (Table 3): _____

Upper master prepared for actuator: Yes _____ No _____ If yes, specify class I or II below PR column

Wing valve—inboard prepared for actuator: Yes _____ No _____ If yes, specify class I or II below PR column

Wing valve—other prepared for actuator: Yes _____ No _____ If yes, specify class I or II below PR column

Choke: adjustable or fixed: _____

Orifice size: _____ Nominal size: _____

Pressure drop: _____

Flowline connection: Size: _____

Type: _____

Special material requirements: _____

Other requirements:

Upper master valve type actuator requirements: Pneu./piston _____ Hydr./piston _____ Electric ____

Supply pressure/power _____ Pneu./diaphragm _____ Hydr./diaphragm _____ Electric ____

Air _____ Gas _____

Wing valve type actuator requirements: Pneu./piston _____ Hydr./piston _____ Electric ____

Pneu./diaphragm _____ Hydr./diaphragm _____ Electric ____

Supply pressure: _____

Other: _____

[a] Define or specify material requirements and, if cladding or other corrosion-resistant materials are to be inlaid, state base material type/clad material type, e.g. 4130/625.

[b] If yes, specify what and by whom.

[c] Indicate required bolting for the applicable retained fluid and temperature classification specified in Table 62.

Figure A.7 — Wellhead equipment data sheet — Christmas tree and choke

3.2.2.8 API Specification 6A – Annex A.5 Figure A.8

Wellhead equipment data sheet — Compact casing-head housing

Compact casing-head housing		PSL: _____ PR: _____
A. Bottom connection:		Size: _____
		Rated working pressure: _____
		Type: _____
Outlets:		Size: _____
		Rated working pressure: _____
		Type: _____
		Number: _____
Equipment for outlets:		Valve-removal plug: _____
		Valves (inboard): Qty _____ PSL: _____ PR: ___
		Valves (other): Qty _____ PSL: _____ PR: ___
		Companion flanges: Qty _____ PSL: _____
		Bullplugs: Qty _____
		Nipples: Qty _____
		Needle valves: Qty _____
		Gauges: Qty _____
Lock screws? Yes _____	No _____	Lock screw function: _____
Base plate requirements:		_____
Witness? No _____	Yes [a]	_____
Special material requirements:		_____
Bottom casing spool pack-off:	Size:	_____
	Type:	_____
Casing hanger:		
	Size:	_____
	Type:	_____
	PR:	_____
	PSL:	_____
Temperature rating (Table 2):		_____
Material class (Table 3):		_____
Retained fluid corrosivity (Table A.1):		_____
External coating? No _____	Yes _____	If yes, type: _____
Internal coating? No _____	Yes _____	If yes, type: _____
Flange bolting requirements (Table 62)	Non-exposed _____	Exposed _____ Exposed (low strength) _____
Outlet inboard (studs): _____	(nuts):	_____
Outlet other (studs): _____	(nuts):	_____
Other requirements:		_____

[a] If yes, specify what and by whom.

Figure A.8 — Wellhead equipment data sheet — Compact casing-head housing

3.2.2.9 API Specification 6A – Annex A.5 Figure A.9

B. Top connection:		Size: _____
		Rated working pressure: _____
		Type: _____
Outlets:		Size: _____
		Rated working pressure: _____
		Type: _____
		Number: _____
Equipment for outlets:		Valve-removal plug: _____
		Valves (inboard): Qty _____ PSL: _____ PR: ____
		Valves (other): Qty _____ PSL: _____ PR: ____
		Companion flanges: Qty _____ PSL: _____
		Bullplugs: Qty _____
		Nipples: Qty _____
		Needle valves: Qty _____
		Gauges: Qty _____
Lock screws? Yes _____	No _____	Lock screw function: _____
Special material requirements:		_____
Casing hanger:		
	Size:	_____
	Type:	_____
	PSL:	_____
	PR:	_____
Temperature rating (Table 2):		_____
Material class (Table 3):		_____
Retained fluid corrosivity (Table A.1):		_____
External coating? No _____	Yes _____	If yes, type: _____
Internal coating? No _____	Yes _____	If yes, type: _____
Flange bolting requirements (Table 62)	Non-exposed _____	Exposed _____ Exposed (low strength) _____
Outlet inboard (studs): _____	(nuts):	_____
Outlet other (studs): _____	(nuts):	_____
Test and auxiliary equipment: (top and/or bottom)		_____
Wear bushings:		_____
Running and retrieving tools:		_____
Test plugs:		_____
Other requirements:		_____

Figure A.8 *(continued)*

3.2.2.10 API Specification 6A – Annex A.5 Figure A.10

Wellhead equipment data sheet — Choke sizing							
Application							
Fluid							
Quantity							
End connections / A&B Dimensions [a]							
Pressure rating/Inlet				Outlet			
Temperature rating							
Material class		Body		Trim			
PSL		PR					
Service conditions at		Max. flow (Units)		Normal flow (Units)		Min. flow (Units)	
Pressure	Inlet						
	Outlet or ΔP						
Temperature at inlet							
Oil	Flow rate						
	S.G. (if available)						
Gas	Flow rate						
	or G.O.R.						
	S.G. (if available)						
Liquid	Flow rate						
	S.G. (if available)						
Manual/actuated							
Actuator type/make/model							
Power source							
Manual override							
Position indication	Local			Remote/position transmitter			
Positioner							
Additional comments Adjustable or positive : maximum orifice diameter: type of flow bean:							
[a] See Figures 17 and 18.							

Figure A.10 — Wellhead equipment data sheet — Choke sizing

3.2.2.11 API Specification 6A – Annex A.5 Figure A.11

Wellhead equipment data sheet — Actuator and bonnet

	Quantity		Quantity		Quantity
Pneumatic		**Hydraulic**		**Electric**	
Diaphragm	Single	Conventional	Rising stem		
	Double		Non-rising stem		
		Retained fluid	Rising stem		
Piston	Single		Non-rising stem		
	Double	Wirecutter		Wire/cable size	
		Self-contained		Stand-alone power source	

Supply requirements/specifications

Pneumatic
Availability ____ MPa (psi)
Max. ____ Min. ____
Clean air ____
Nitrogen ____
Well gas ____ non-sour ____
Other ____ sour ____

Hydraulic
Availability ____ MPa (psi)
Max. ____ Min. ____
Well fluid
non-sour ____ sour ____
Self-contained ____
Other ____

Electric
Voltage
DC ____ AC ____ Phase ____ Frequency ____
Current available ____
Other ____

Actuator requirements

Specifications	**Actuator**
Temperature rating (Table 2)	
Retained fluid (Table A.1)	
Materials class (Table 3)	
External coating? No ____ Yes ____	
If yes type ____	

Field data
Customer ____
Field location ____
Platform ____
Well No. ____
Closed-in tubing head pressure ____ MPa (psi)

Accessories
Fusible hold-open device ____
Manual hold-open device ____
Quick exhaust valve ____
Position indication a) local ____
b) remote ____

Bonnet requirements
Size ____
Model ____
Maximum working pressure ____ MPa (psi)

Specification	**PSL**
SSV PR2 ____	2 ____
	3 ____
	3G ____
	4 ____

Material class: **Temperature rating:**

Figure A.11 — Wellhead equipment data sheet — Actuator and bonnet

3.2.2.12 API Specification 6A – Annex A.5 Figure A.14

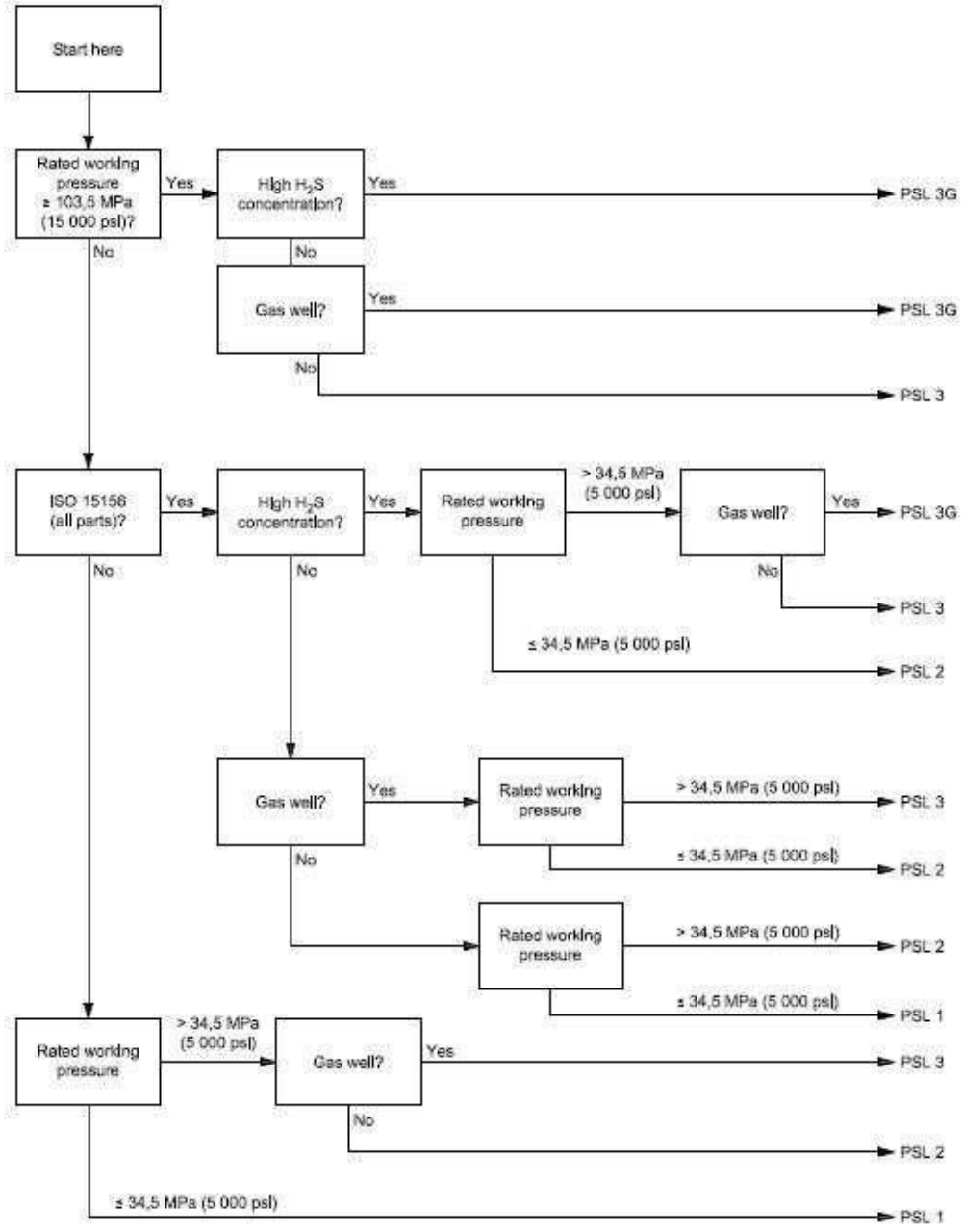


Figure A.14 — Recommended minimum PSL for primary parts of wellhead and christmas tree equipment

4.0 DESIGN REQUIREMENTS

4.1 PERFORMANCE

Product: **Wellhead & Christmas Tree Equipment**

4.1.2 API Specification 6A – 4.1
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 4.2 to 4.7 and the relevant requirements specified in Clause 10 while in the pressure and temperature ranges and used with the test fluids consistent with the material class in Table 3 for which they are rated. Other requirements specified by the Purchaser may include load capability, cycles, lubrication and operating force or torque.

4.1.3 API Specification 6A – 4.2.2.1
Equipment shall be designed to operate in one or more of the specified temperature ratings with minimum and maximum temperatures as shown in Table 2, or to minimum and maximum operating temperatures as agreed between the Purchaser and manufacturer.

4.1.4 API Specification 6A – 4.7
Manufacturers shall document their design validation procedures and the results of design validation of designs. The design validation procedures, including acceptance criteria for SSVs and USVs, are given in Annex I. Additional validation procedures, including acceptance criteria, are given in Annex F for use if specified by the manufacturer or Purchaser.

5.0 TESTING REQUIREMENTS

5.1 DATA SHEETS

Product: **Wellhead & Christmas Tree Equipment**

5.1.1 API Specification 6A – Annex J.7.10
RL 3 shall be tested according to the requirements of PSL 3 or PSL 3G, as applicable, and specified by the user/Purchaser.

5.1.2 **Christmas Tree Equipment**
API Specification 6A – 10.13.7
Any disassembly, removal or replacement of parts or equipment after testing shall be as agreed with the Purchaser.

5.1.3 **Valves & Actuators**

5.1.3.1 API Specification 6A – 10.20.7.2
The following shall be furnished to the Purchaser:
Each SSV/USV shall be delivered to the purchaser with a completed SSV/USV functional test data sheet in accordance with Figure 24.

5.1.3.2: API Specification 6A – 10.20.7.2 Figure 24

SSV/USV functional test data sheet (example)

SSV/USV valve data:
Manufacturer _____
Valve catalog or model No. _____ Serial No. _____ Size _____
Rated working pressure _____ Temperature class _____
Valve bore _____ Material class _____ PSL _____ PR2 class _____
Class II SSV/USV valve performance test agency _____ Test report No. _____

SSV/USV actuator data:
Manufacturer _____
Actuator catalog or model No. _____ Serial No. _____ Size _____
Rated working pressure _____ Temperature rating _____
Material class _____ PSL _____ PR 2 class _____

Functional test data:

I. SSV/USV actuator seal test _____ Performed by _____
Pneumatic _____ Hydraulic _____
At 20 % of working pressure rating
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____
At 100 % of working pressure rating
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____

II. Drift check
Drift mandrel OD _____
Visual inspection _____ Performed by _____

III. SSV/USV actuator operational test _____ Performed by _____
Number of cycles completed _____

IV. SSV/USV valve body and bonnet hydrostatic test performed by _____
Required test pressure _____
Primary pressure-holding period
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____
Secondary pressure-holding period
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____

V. SSV/USV valve seat test performed by _____
SSV/USV valve type: Unidirectional _____ Bidirectional _____
Required test pressure _____
Primary seat test (pressure applied from downstream end)
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____
Secondary seat test (pressure applied from downstream end)
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____
Tertiary seat test (pressure applied from downstream end)
Beginning time _____ Test gauge pressure reading _____
Ending time _____ Test gauge pressure reading _____

Certified by _____ Company _____
Title _____ Date _____

Figure 24 — Example of an SSV/USV functional test data sheet

6.0 SHIPPING REQUIREMENTS

6.1 REPORTS

Product: **Christmas Tree Equipment**

6.1.1 API Specification 6A – 10.13.7
Christmas trees shall be stored and shipped in accordance with Clause 9.

6.1.2 **Valves & Actuators**

6.1.2.1 API Specification 6A – 10.20.7.2
A report in accordance with Figure 25 shall be furnished to the purchaser.

6.1.2.2 API Specification 6A – 10.20.7.2 Figure 25

Surface safety valve or underwater safety valve shipping report (example)

SSV/USV valve data:

Manufacturer _____

Catalogue or model No. _____ Serial No. _____ Size _____

Working pressure rating _____ Temperature rating: Max. _____ Min. _____

Material class _____ PSL _____ PR2 class _____

Date of manufacture (month and year) _____

Class II SSV/USV valve performance test agency _____ Test report No. _____

SSV/USV actuator data:

Manufacturer _____

Catalogue or model No. _____ Serial No. _____ Size _____

Working pressure rating _____ Temperature rating: Max. _____ Min. _____

Material class _____ PSL _____

Date of manufacture (month and year) _____

Customer _____ Purchase order No. _____

Function test date _____ Shipment date _____

Inspected by _____

Figure 25 — Example of a surface safety valve or underwater safety valve shipping report

7.0 DOCUMENTATION REQUIREMENTS

7.1 INSTRUCTIONS / MANUAL

Product: **Wellhead & Christmas Tree Equipment**

7.1.1 API Specification 6A – 9.4
The manufacturer shall furnish to the Purchaser suitable drawings and instructions concerning field assembly and maintenance of wellhead and christmas tree equipment, if requested. This includes, if relevant, an operating manual for equipment specified in Annex H.

7.1.2 **Actuator**
API Specification 6A – 10.16.8.2
The manufacturer shall furnish to the Purchaser suitable drawings and instructions concerning field assembly and maintenance of actuators, if requested.

7.1.3 **Valves & Actuators**

7.1.3.1 API Specification 6A – 10.20.7.2
The following shall be furnished to the Purchaser:
- Operating manual - An operating manual meeting the requirements of 10.20.7.3 shall be furnished to the purchaser.

7.1.3.2 API Specification 6A – 10.20.7.3.1
The following minimum design information shall be included:

a) type, model and size for which the manual is applicable

b) performance requirements for which these types, model, and sizes are suitable

c) temperature and working pressure ranges for which the unit(s) are designed

d) drawings and illustrations giving dimensional data of unit(s), as required, for installation or operation

e) parts list

7.1.3.3 API Specification 6A – 10.20.7.3.2
The following minimum inspection and testing information shall be included:

a) checklist for visual inspection prior to hook-up;

b) written and graphic instructions for field hook-ups;

c) appropriate test procedures.

7.1.3.4 API Specification 6A – 10.20.7.3.3
Proper installation methods shall be clearly written and illustrated as necessary. Any necessary preliminary lubrication or greasing shall be specified in detail. Warnings to indicate potential danger to personnel or cautions to indicate potential danger to equipment shall be clearly marked "Warning" or "Caution".

7.1.3.5 API Specification 6A – 10.20.7.3.4
The following minimum operation and maintenance information shall be included:

a) maintenance requirements, including recommended intervals of maintenance;

b) proper operating techniques;

c) disassembly and assembly instructions;

d) assembly diagram showing individual parts in proper relationship to one another;

e) repair instructions and precautions, including a chart listing symptoms, probable cause(s) of the problem, and repairs necessary.

7.2 RECORDS

7.2.1 Wellhead & Christmas Tree Equipment

7.2.1.1 API Specification 6A – 7.5.3.1
Records that shall be furnished to Purchaser
These records shall be provided by the manufacturer to the original Purchaser of equipment made to comply with this International Standard.

7.2.1.2 API Specification 6A – 7.5.3.1
These records, if applicable, shall be identical to or contain the same information as those retained by the manufacturer.

7.2.1.3 API Specification 6A – 7.5.3.1
These records provided by the manufacturer shall prominently reference part serial number(s).

7.2.2 Body, bonnet, end and outlet connections, stem, valve-bore sealing mechanism, mandrel tubing hanger and casing hanger and back-pressure valves.
API Specification 6A – 7.5.3.2
For PSL 4, the following records are required:
- NDE records
- hardness test records
- material test records
- heat treatment records

7.2.3 Non-Metallic Sealing Material
API Specification 6A – 7.5.3.5
For PSL 4, certification of compliance is required, stating that non-metallic seals conform to PSL 4 of this International Standard.

7.2.4 Assembled Equipment

API Specification 6A – 7.5.3.6

For PSL 3, the following records are required:

- certificate of compliance stating that equipment conforms to PSL 3 of this International Standard, and the temperature and material class
- assembly traceability records
- pressure test records

For PSL 3G and PSL 4, all records/certifications for PSL 3 are required with the addition that gas-test records shall also be furnished.

NS 813

Color coding of pipeline and piping materials are standard industry practices. Color marking will make identification easier for raw material and fluid that being transport by the pipe. There are various national and international Pipe Color Code Standards are available. **(I have used both English and American version to spell color/colour)**

1. ASME/ANSI A13.1 – Scheme for the Identification of Piping Systems
2. BS 1710 – Specification for Identification of Pipelines and Services
3. IS 2379 – Pipelines Identification Colour Code
4. PFI ES-22 – Recommended Practice for Color Coding of Piping Materials

Color Coding of Piping Material – PFI ES-22

Why color coding of piping material?

During construction and fabrication, various grades of carbon steel, alloy steel, and stainless steel are used. To avoid mixing of this material and easy storing and retrieving in the warehouse, piping components such as pipe, fittings, flanges, and valves are color coded.

All most all company has their own color coding system. Pipe Fabrication Institute (PFI) Standard ES-22 provides Piping Materials color coding requirements for most commonly used piping material grades. It also provides guidance on marking location on piping components.

Refer below images for the color band location on piping components.

NS 813

COLOR CODE FOR PIPE MATERIAL IDENTIFICATION – PFI Standard ES-22 -1999		
Carbon Steel		
Material	**Material Garde**	**Band / Strip Color**
Carbon Steel, Electric Resistance Welded Pipe	A53 Gr. B/API	1 solid white
Carbon Steel, Smls, specified tensile strength under 70,000 psi (483 MPA)	A53 Gr. B	No Marking
Carbon Steel, killed steel	A106 Gr. B	1 solid green

NS 813

Carbon Steel, specified tensile strength 70,000 psi (483 MPA) and over	A106 Gr. C	2 solid green
Carbon Steel, low temperature (impact tested)	A333 Gr. 6	1 solid red
High Yield Carbon Steel		
52,000 min. yield	API 5L X-52	1 solid yellow, 1 solid green
60,000 min. yield	API 5L X-60	1 solid yellow, 1 solid pink
65,000 min. yield	API 5L X-65	2 solid yellow
70,000 min. yield	API 5L X-70	1 solid yellow, 1 solid orange
Low Alloy Materials		
C-Mo steel	A335 Gr. P1	1 solid orange
1 Cr-1/2 Mo Steel	A335 Gr. P12	1 solid orange, 1 solid blue

NS 813

1 1 /4 Cr-1/2 Mo Steel	A335 Gr. P11	1 solid yellow
2 1/4 Cr-1 Mo Steel	A335 Gr. P22	1 solid blue
5 Cr-1/2 Mo Steel	A335 Gr. P5	1 solid blue, 1 solid yellow
9 Cr-1/2 Mo Steel	A335 Gr. P9	2 solid orange
Ferritic and Martensitic Stainless Steels		
Type 405	A268 TP405	1 solid green, 1 solid black
Type 410	A268 TP410	1 solid green, 1 solid red
Austenitic Stainless Steels		
Type 304	A312 TP304	1 solid black
Type 304L	A312 TP304L	2 solid black
Type 304H	A312 TP304H	1 intermittent black
Type 309	A358 Gr309	1 solid black, 1 solid

NS 813

		brown
Type 310	A358Gr310	1 solid green, 1 solid orange
Type 316	A312 TP316	1 solid gray
Type 316L	A312 TP316L	2 solid gray
Type 316H	A312 TP316H	1 intermittent gray
Type 317	A312 TP317	1 solid brown, 1 solid green
Type317L	A312 TP317L	1 solid brown, 1 solid red
Type 321	A312 TP321	1 solid pink
Type 321 H	A312 TP321H	2 solid pink
Type 347	A312 TP347	1 solid brown
Type 347H	A312 TP347H	2 solid brown
Nickel Based Alloys		

NS 813

Nickel 200		1 solid black, 1 solid pink
Incoloy 800		1 solid black, 1 solid orange
Incoloy 800H		1 solid gray, 1 solid red
Incoloy 825		1 solid gray, 1 solid blue
Inconel 600		2 solid blue
Inconel 625		1 solid blue, 1 solid pink
Hastelloy Alloy 8-2		1 solid red, 1 solid orange
Hastelloy Alloy C-276		1 solid red, 1 solid blue
Hastelloy Alloy C-22		2 solid red
Hastelloy Alloy G		1 solid red, 1 solid yellow
Carpenter Alloy 20 C 8-3		1 solid black, 1 solid

NS 813

		blue
Monel 400		1 solid black, 1 solid yellow
Note: Any product manufactured by welding shall have an additional white stripe.		

Color Coding of Pipeline and Piping Identification

Oil and Gas Industries, Process industries are complex installation. Piping systems are used in these plants to transport various fluids. These pipelines transport various industrial materials such as gases such as Air, Nitrogen, Oxygen, Hydrogen etc., liquids such as water, acids, hydrocarbon, toxic materials etc.

Without proper pipe color code, it is extremely difficult to identify the material pipeline transporting. To reduces the safety hazard, reduce the possibility of mistakes in identification and accidents associated with wrong identification of pipeline during the emergency situation, systematic color coding of pipeline and piping system is essential. Uniformity of color marking promotes greater safety, lessens the chances of error and reduces hazards involved in the handling of material inside the pipelines.

There are national and international standard that provides the guidelines for uniform color coding in industries that are used to color code of pipe to identify.

NS 813

- ASME A13.1 – Scheme for the Identification of Piping Systems
- BS 1710 – Specification for Identification of Pipelines and Services
- IS 2379 – Pipelines Identification Colour Code

These standard uses different color code methodology to identify the pipe material. They use a base color, band color, letters and direction arrow to identify fluid inside the pipeline.

ANSI/ASME A13.1 – Scheme for the Identification of Piping Systems

The purpose of ASME/ANSI A13.1 Standard is to establish a common system that assists in the identification of hazardous materials conveyed in piping systems and their hazards when released into the environment.

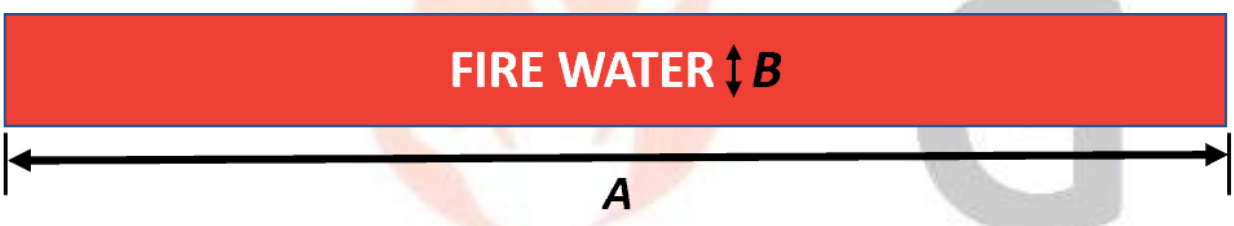
ASME A13.1 – 2015 edition has six fixed colors and 4 users define colors that can be used to identify the hazardous material. In this standard, following category are used;

1. **Flammable** – Fluids or a vapor or produce vapors that can be ignited and continue to burn in air.
2. **Combustible** – Fluids that can burn, but are not flammable.
3. **Oxidizing** – Oxidizing fluid is any gas or liquid that may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.
4. **Toxic and Corrosive** – Fluids that are corrosive or toxic, or will produce corrosive or toxic substances when released.
5. **Fire Quenching** – Fluid Such as water, foam, and CO2 used in sprinkler systems and firefighting piping systems.

Size of Label and Letters as per ASME B13.1-2015

Fluid Service	Background Color	Letter Color	Color and Letter Sample
Fire quenching fluids	Safety red	White	Letters
Toxic and corrosive fluids	Safety orange	Black	Letters
Flammable and oxidizing fluids	Safety yellow	Black	Letters
Combustible fluids	Safety brown	White	Letters
Potable, cooling, boiler feed, and other water	Safety green	White	Letters
Compressed air	Safety blue	White	Letters
To be defined by the user	Safety purple	White	Letters
To be defined by the user	Safety white	Black	Letters
To be defined by the user	Safety gray	White	Letters
To be defined by the user	Safety black	White	Letters

NS 813



Outside Diameter of Pipe in Inches	Outside Diameter of Pipe in mm	Length of Color Field, *A*, in Inches	Length of Color Field, *A*, in mm	Size of Letters, *B*, in Inches	Size of Letters, *B*, in mm
3/4 to 11/4	19 to 32	8	200	1/2	13
11/2 to 2	38 to 51	8	200	3/4	19
21/2 to 6	64 to 150	12	300	11/4	32
8 to 10	200 to 250	24	600	21/2	64
Over 10	over 250	32	800	31/2	89

BS 1710 – Specification for Identification of Pipelines and Services

NS 813

BS1710 use two types of colour coding to identify the content of pipe and hazard.

1. Base colour – Base colours are used to indicate the content inside the pipe.
2. Safety colours – These colours are used as band colours that applied in conjunction with the base pipe color code to create various service identifier.

Other than colour code, additional information regarding the nature of the contents of the pipe by using the following systems either individually or in combination:

1. Name in full
2. Abbreviation of name
3. Chemical symbol and
4. Appropriate code indications or code colour bands

Basic identification colours		
Pipe Contents Name Reference	Colour	Colour
Water	Green	
Steam	Silver-Grey	
Oils (mineral, vegetable or animal) Combustible liquids	Brown	
Gases in either gas or liquid phase - except air	Yellow Ochre	
Acids / Alkalis	Violet	
Air	Light Blue	
Waste effluents	Black	
Electrical Services & Ventilation Ducts	Orange	
Safety Colour		
Safety Reference	Colour	Colour
Fire	Red	
Water from a public supply	Auxiliary blue	
Water from any other source	Flint grey	
Warning	Yellow	

NS 813

Size of Label as per BS 1710 -2014

1. When Only Basic Identification Color Used

Decorative or Natural Colour	Basic Identification Colour	Decorative or Natural Colour

Pipe Diameter	Minimum Band Width
Up to 50 mm	130 mm
50 mm to 100 mm	275 mm
above 100 mm	450 mm

2. Basic identification colour with code and/or safety colours

Pipe Diameter	Minimum Band Width - Basic Colour (1)	Minimum Band Width - Safety Colour (2)

NS 813

Up to 50 mm	50 mm	30 mm
50 mm to 100 mm	100 mm	75 mm
above 100 mm	150 mm	150 mm

IS 2379 – Pipelines Identification Colour Code

IS 2379 is Indian Standard for the colour coding requirements. It is quite comprehensive and little complex as compared to BS and ASME standard. IS 2379 is more in line with BS 1710. It used the ground colour, band colour and letter labeling to identify fluid content and associated hazards.

This standard cover piping systems that include pipes of any kind and in addition fittings, valves, and pipe coverings. Supports, brackets or other accessories are excluded from this standard. This standard is not applicable to pipelines buried underground or used for electrical services.

Refer table for the ground colour that used in pipeline marking.

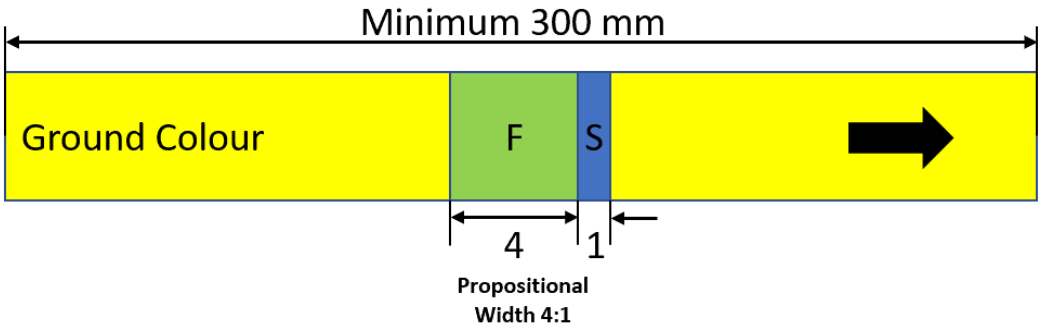
Ground Colours	
Substance	**Colour**
Water	Sea green

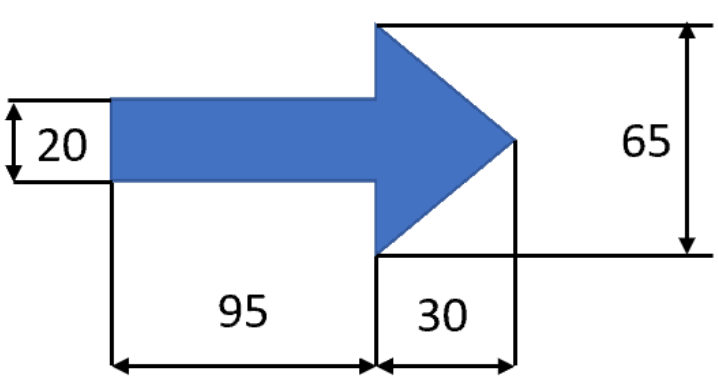
NS 813

Steam	Aluminium to IS 2339
Mineral, vegetable, and animal oils, combustible liquids	Light brown
Acids	Dark violet
Air	Sky blue
Gases	Canary yellow
Alkalies	Smoke grey
Other liquids/gases which do not need identification	Black
Hydrocarbons/organic compounds	Dark admirality grey

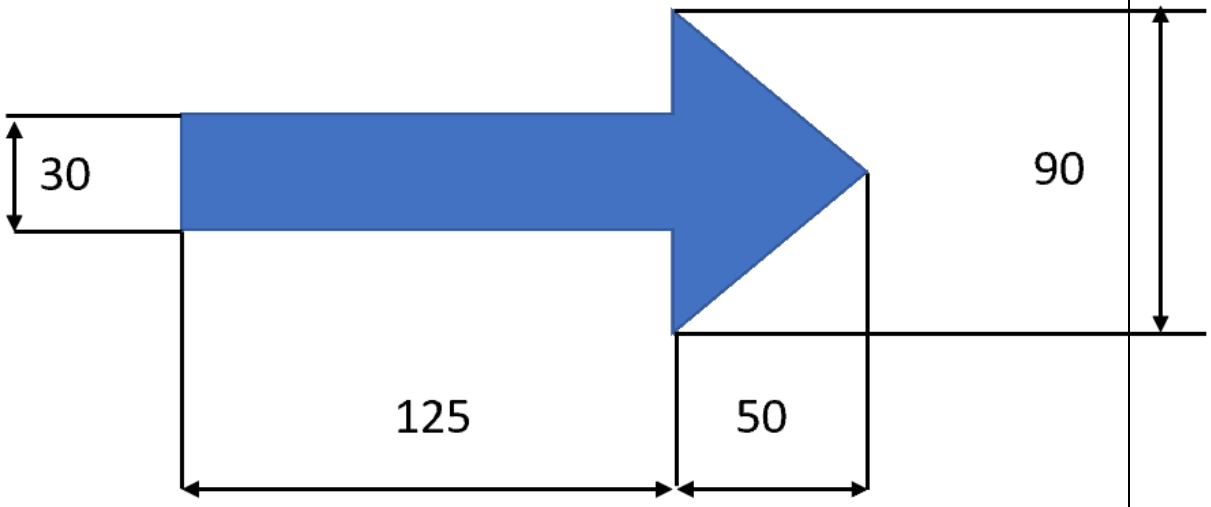
NS 813

Size of Label and Letters as per IS 2379 – 1990 (Reaffirmed 2006)





For Pipes DN 200 and Below



For Pipes Above DN 200

NS 813

Length of the Colour Band			
Nominal Pipe Size (mm)	**Ground Colour**	**First Colour Band (mm)**	**Second Colour Band**
80 NB and below	Throughout the entire length or Band no case less than 300 mm	25	4:1 Proportion to the First Colour Band

Letter Size	
Outside Diameter of Pipe (mm)	**Size of Legend (mm)**
20 to 30	10
Above 30 to 50	20
Above 50 to 80	30

Above 80 to 150	40
Above 150 to 250	90
Over 250	90

Commonly used Pipe Color Code As per Is 2379

Pipe Colour Code Use in Refinery As per IS 2379			
Contents	**Ground Colour**	**First Colour Band**	**Second Colour Band**
Cooling Water	Sea green	French blue	-
Boiler feed water	Sea green	Gulf red	-
Drinking water	Sea green	French blue	Signal red

NS 813

Plant air	Sky blue	Silver grey	-
Very high pressure steam	Aluminium to IS 2339	Signal red	-
High pressure steam	Aluminium to IS 2339	French blue	-
Medium pressure steam	Aluminium to IS 2339	Gulf red	-
Low pressure steam	Aluminium to IS 2339	Canary yellow	-
Light diesel fuel	Light brown	Brilliant green	-
Lubricating oil	Light brown	Light grey	-
Flare gases	Canary yellow	-	-
Nitrogen	Canary yellow	Black	-
Oxygen	Canary yellow	White	-

NS 813

Hydrogen	Canary yellow	Signal red	French blue
Naptha	Dark Admirality grey	Light brown	Black
LPG (Liquid)	Dark Admirality grey	Brilliant green	Dark violet

Location of the color band and Labels

Coloring and identification labels on the pipe should apply in such a way that is clearly visible from the all the approach especially when pipes are overhead. ASME B13.1 and IS 2379 provides guidance on the positions of the labeling. Refer the table below for the general guideline provided in the standards.

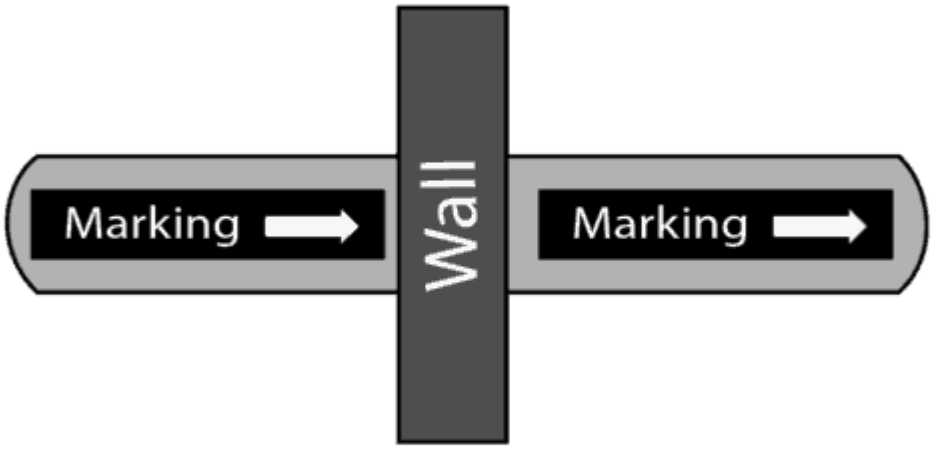
Location of the Colour Band	
As Per IS -2379	**AS Per BS 1710 & ASME B13.1**
At battery limit points	Close to valves or flanges
Intersection points and change of direction points in piping ways	Adjacent to changes in direction, branches
Other points such as midway of each piping way, near valves,	where pipes pass through walls

NS 813

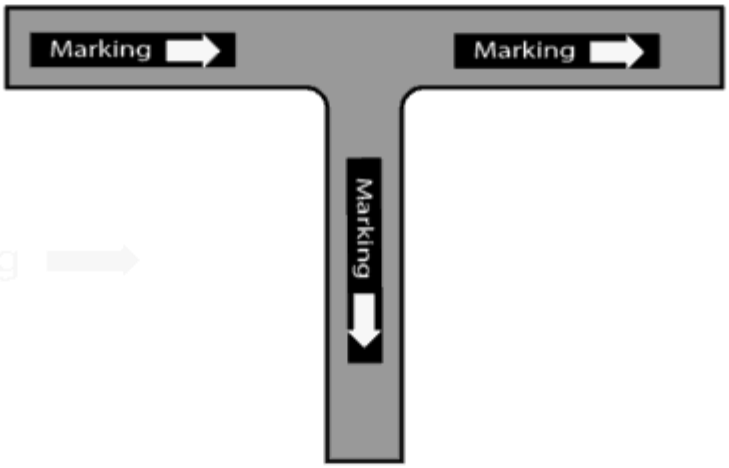
junction joints of service appliances, walls, on either side of pipe culverts	or floors
For long stretch yard piping at 50 m interval	at intervals on straight pipe runs sufficient for identification
At start and terminating points	

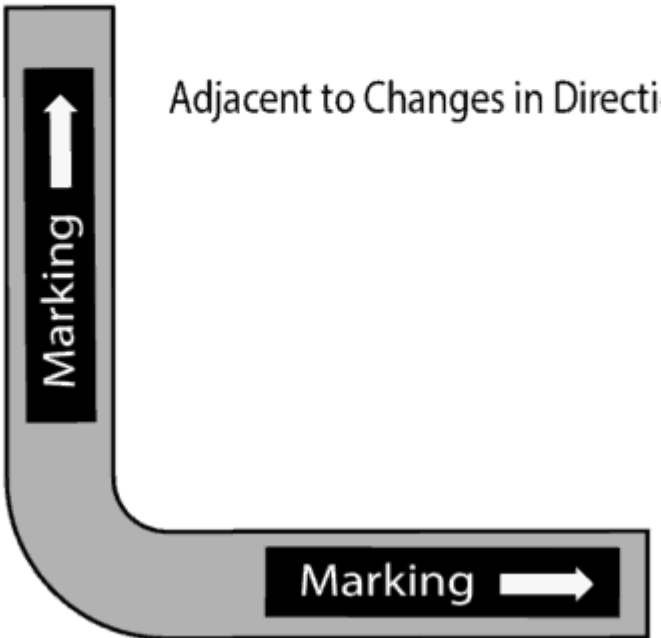
NS 813

At Regular Interval in Straight Pipe



Pass Through Walls or Floors





Adjacent to Changes in Direction, Branches

ISO 4406

ISO 4406 Cleanliness Codes

ISO Cleanliness Code 4406:1999

The International Organization for Standardization created the cleanliness code **4406:1999** to quantify **particulate contamination**levels per milliliter of fluid at three sizes: 4µ[c], 6µ[c], and 14µ[c]. This ISO code is expressed in 3 numbers: 19/17/14. Each number represents a contaminant level code for the **correlating particle size**. The code includes all particles of the specified size and larger. It is important to note that each time a code increases the quantity range of particles *doubles*.

Understanding ISO Cleanliness Codes

When setting target ISO fluid cleanliness codes for hydraulic and lubrication systems it is important to keep in mind the objectives to be achieved. **Maximizing equipment reliability and safety**, minimizing repair and replacement costs, extending useful fluid life, satisfying warranty requirements, and minimizing production down-time are attainable goals. Once you set a target **ISO cleanliness code** you should follow a progression of steps to achieve the target, monitor it, and maintain it, which will provide you with many justafiable rewards.

ISO 4406:1999 Code Chart

Range Code		Particles per milliliter		
		More than		Up to / Including
24		80000		160000
23		40000		80000
22		20000		40000
21		10000		20000
20		5000		10000
19		2500		5000
18		1300		2500
17		640		1300
16		320		640
15		160		320
14		80		160
13		40		80
12		20		40
11		10		20
10		5		10
9		2.5		5
8		1.3		2.5
7		0.64		1.3
6		0.32		0.64

Set the Target

The first step in identifying a **target ISO code** for a system is to identify the **most sensitive component** on an individual system, or the most sensitive component supplied by a central reservoir. If a central reservoir supplies several systems, the overall cleanliness must be maintained, or the most sensitive component must be protected by filtration that cleans the fluid to the target before reaching that component.

UNDERSTANDING ISO CODES

The ISO cleanliness code is used to quantify particulate contamination levels per milliliter of fluid at 3 sizes 4μ[c], 6μ[c], and 14μ[c]. The ISO code is expressed in 3 numbers (ie 19/17/14). Each number represents a contaminant level code for the correlating particle size. The code includes all particles of the specified size and larger. It is important to note that each time a code increases the quantity range of particles is doubling.

ISO 4406 Chart		
Range Code	Particles per milliliter	
	More than	Up to/including
24	80000	160000
23	40000	80000
22	20000	40000
21	10000	20000
20	5000	10000
19	2500	5000
18	1300	2500
17	640	1300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2.5	5
8	1.3	2.5
7	0.64	1.3
6	0.32	0.64

Sample 1 (see photo 1)

Particle Size	Particles per ml*	ISO 4406 Code range	ISO Code
4μ[c]	151773	80000~160000	24
6μ[c]	38363	20000~40000	22
10μ[c]	8229		
14μ[c]	3339	2500~5000	19
21μ[c]	1048		
38μ[c]	112		

Sample 2 (see photo 2)

Particle Size	Particles per ml*	ISO 4406 Code range	ISO Code
4μ[c]	492	320 ~ 640	16
6μ[c]	149	80 ~ 160	14
10μ[c]	41		
14μ[c]	15	10 ~ 20	11
21μ[c]	5		
38μ[c]	1		

Photo 1

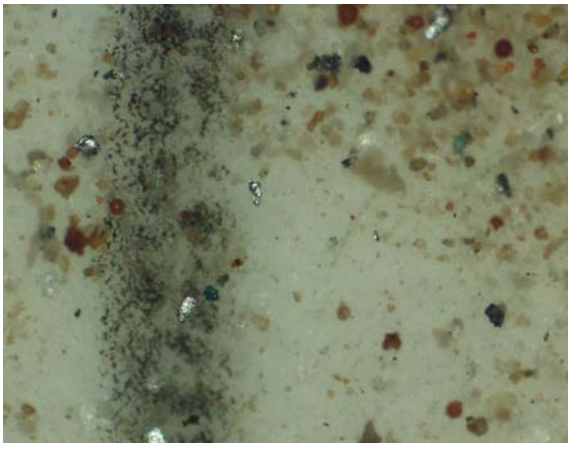
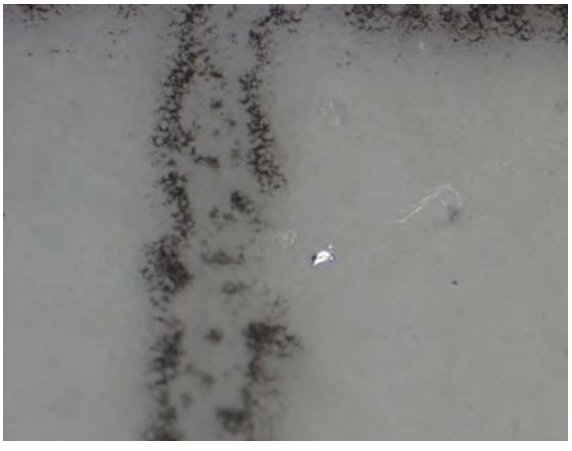


Photo 2



TARGET ISO CLEANLINESS CODES

When setting target ISO fluid cleanliness codes for hydraulic and lubrication systems it is important keep in mind the objectives to be achieved. Maximizing equipment reliability and safety, minimizing repair and replacement costs, extending useful fluid life, satisfying warranty requirements, and minimizing production down-time are attainable goals. Once a target ISO cleanliness code is set following a progression of steps to achieve that target, monitor it, and maintain it justifiable rewards will be yours.

Set the Target.

The first step in identifying a target ISO code for a system is to identify the most sensitive on an individual system, or the most sensitive component supplied by a central reservoir. If a central reservoir supplies several systems the overall cleanliness must be maintained, or the most sensitive component must be protected by filtration that cleans the fluid to the target before reaching that component.

Other Considerations

Table 1 recommends conservative target ISO cleanliness codes based on a several component manufacturers guidelines and extensive field studies for standard industrial operating conditions in systems using petroleum based fluids. If a non-petroleum based fluid is used (i.e. water glycol) the target ISO code should be set one value lower for each size (4 µ[c]/6µ[c]/14µ[c]). If a combination of the following conditions exists in the system the target ISO code should also be set one value lower:

- Component is critical to safety or overall system reliability.
- Frequent cold start.
- Excessive shock or vibration.
- Other Severe operation conditions.

Recommended* Target ISO Cleanliness Codes and media selection for systems using petroleum based fluids per ISO4406:1999 for particle sizes 4µ[c] / 6µ[c] / 14µ[c]

	Pressure < 140 bar < 2000 psi	Media βx[c] = 1000 (βx = 200)	Pressure 212 bar 3000 psi	Media βx[c] = 1000 (βx = 200)	Pressure > 212 bar > 3000 psi	Media βx[c] = 1000 (βx = 200)
Pumps						
Fixed Gear	20/18/15	22µ[c] (25 µ)	19/17/15	12µ[c] (12 µ)	-	-
Fixed Piston	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)	17/15/12	7µ[c] (6 µ)
Fixed Vane	20/18/15	22µ[c] (25 µ)	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Variable Piston	18/16/13	7µ[c] (6 µ)	17/15/13	5µ[c] (3 µ)	16/14/12	7µ[c] (6 µ)
Variable Vane	18/16/13	7µ[c] (6 µ)	17/15/12	5µ[c] (3 µ)	-	-
Valves						
Cartridge	18/16/13	12µ[c] (12 µ)	17/15/12	7µ[c] (6 µ)	17/15/12	7µ[c] (6 µ)
Check Valve	20/18/15	22µ[c] (25 µ)	20/18/15	22µ[c] (25 µ)	19/17/14	12µ[c] (12 µ)
Directional (solenoid)	20/18/15	22µ[c] (25 µ)	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Flow Control	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Pressure Control (modulating)	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)	17/15/12	7µ[c] (6 µ)
Proportional Cartridge Valve	17/15/12	7µ[c] (6 µ)	17/15/12	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)
Proportional Directional	17/15/12	7µ[c] (6 µ)	17/15/12	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)
Proportional Flow Control	17/15/12	7µ[c] (6 µ)	17/15/12	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)
Proportional Pressure Control	17/15/12	7µ[c] (6 µ)	17/15/12	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)
Servo Valve	16/14/11	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)	15/13/10	5µ[c] (3 µ)
Bearings						
Ball Bearing	15/13/10	5µ[c] (3 µ)	-	-	-	-
Gearbox (industrial)	17/16/13	12µ[c] (12 µ)	-	-	-	-
Journal Bearing (high speed)	17/15/12	7µ[c] (6 µ)	-	-	-	-
Journal Bearing (low speed)	17/15/12	7µ[c] (6 µ)	-	-	-	-
Roller Bearing	16/14/11	7µ[c] (6 µ)	-	-	-	-
Actuators						
Cylinders	17/15/12	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)	15/13/10	5µ[c] (3 µ)
Vane Motors	20/18/15	22µ[c] (25 µ)	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Axial Piston Motors	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)	17/15/12	7µ[c] (6 µ)
Gear Motors	20/18/14	22µ[c] (25 µ)	19/17/13	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Radial Piston Motors	20/18/15	22µ[c] (25 µ)	19/17/14	12µ[c] (12 µ)	18/16/13	12µ[c] (12 µ)
Test Stands, Hydrostatic						
Test Stands	15/13/10	5µ[c] (3 µ)	15/13/10	5µ[c] (3 µ)	15/13/10	5µ[c] (3 µ)
Hydrostatic Transmissions	17/15/13	7µ[c] (6 µ)	16/14/11	5µ[c] (3 µ)	16/14/11	5µ[c] (3 µ)

*Depending upon system volume and severity of operating conditions a combination of filters with varying degrees of filtration efficiency might be required (I.e. pressure, return, and off-line filters) to achieve and maintain the desired fluid cleanliness.

Example		ISO Code	Comments
Operating Pressure	156 bar, 2200 psi		
Most Sensitive Component	Directional Solenoid	19/17/14	recommended baseline ISO Code
Fluid Type	Water Glycol	18/16/13	Adjust down one class
Operating Conditions	Remote location, repair difficult		Adjust down one class, combination
	High ingression rate	17/15/12	of critical nature, severe conditions

Precision Filtration Products
YOUR ONE STOP FOR FILTERS

Selecting Target ISO Cleanliness Codes

When setting target ISO fluid cleanliness codes for hydraulic and lubrication systems it is important keep in mind the objectives to be achieved. Maximizing equipment reliability and safety, minimizing repair and replacement costs, extending useful fluid life, satisfying warranty requirements, and minimizing production down-time are attainable goals. Once a target ISO cleanliness code is set following a progression of steps to achieve that target, monitor it, and maintain it justifiable rewards will be yours.

Set the Target.
The first step in identifying a target ISO code for a system is to identify the most sensitive on an individual system, or the most sensitive component supplied by a central reservoir. If a central reservoir supplies several systems the overall cleanliness must be maintained, or the most sensitive component must be protected by filtration that cleans the fluid to the target before reaching that component.

Other Considerations
Table 1 recommends conservative target ISO cleanliness codes based on a several component manufacturers guidelines and extensive field studies for standard industrial operating conditions in systems using petroleum based fluids. If a non-petroleum based fluid is used (i.e. water glycol) the target ISO code should be set one value lower for each size (4μ[c]/6μ[c]/14μ[c]). If a combination of the following conditions exists in the system the target ISO code should also be set one value lower:

- Component is critical to safety or overall system reliability.
- Frequent cold start.
- Excessive shock or vibration.
- Other Severe operation conditions.

Recommended* Target ISO Cleanliness Codes and media selection for systems using petroleum based fluids per ISO4406:1999 for particle sizes 4μ[c] / 6μ[c] / 14μ[c]

	Pressure < 140 bar < 2000 psi	Media βx[c] = 1000 (βx = 200)	Pressure 212 bar 3000 psi	Media βx[c] = 1000 (βx = 200)	Pressure > 212 bar > 3000 psi	Media βx[c] = 1000 (βx = 200)
Pumps						
Fixed Gear	20/18/15	22μ[c] (25μ)	19/17/15	12μ[c] (12μ)	-	-
Fixed Piston	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)	17/15/12	7μ[c] (6μ)
Fixed Vane	20/18/15	22μ[c] (25μ)	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Variable Piston	18/16/13	7μ[c] (6μ)	17/15/13	5μ[c] (3μ)	16/14/12	7μ[c] (6μ)
Variable Vane	18/16/13	7μ[c] (6μ)	17/15/12	5μ[c] (3μ)	-	-
Valves						
Cartridge	18/16/13	12μ[c] (12μ)	17/15/12	7μ[c] (6μ)	17/15/12	7μ[c] (6μ)
Check Valve	20/18/15	22μ[c] (25μ)	20/18/15	22μ[c] (25μ)	19/17/14	12μ[c] (12μ)
Directional (solenoid)	20/18/15	22μ[c] (25μ)	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Flow Control	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Pressure Control (modulating)	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)	17/15/12	7μ[c] (6μ)
Proportional Cartridge Valve	17/15/12	7μ[c] (6μ)	17/15/12	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)
Proportional Directional	17/15/12	7μ[c] (6μ)	17/15/12	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)
Proportional Flow Control	17/15/12	7μ[c] (6μ)	17/15/12	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)
Proportional Pressure Control	17/15/12	7μ[c] (6μ)	17/15/12	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)
Servo Valve	16/14/11	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)	15/13/10	5μ[c] (3μ)
Bearings						
Ball Bearing	15/13/10	5μ[c] (3μ)	-	-	-	-
Gearbox (industrial)	17/16/13	12μ[c] (12μ)	-	-	-	-
Journal Bearing (high speed)	17/15/12	7μ[c] (6μ)	-	-	-	-
Journal Bearing (low speed)	17/15/12	7μ[c] (6μ)	-	-	-	-
Roller Bearing	16/14/11	7μ[c] (6μ)	-	-	-	-
Actuators						
Cylinders	17/15/12	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)	15/13/10	5μ[c] (3μ)
Vane Motors	20/18/15	22μ[c] (25μ)	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Axial Piston Motors	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)	17/15/12	7μ[c] (6μ)
Gear Motors	20/18/14	22μ[c] (25μ)	19/17/13	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Radial Piston Motors	20/18/15	22μ[c] (25μ)	19/17/14	12μ[c] (12μ)	18/16/13	12μ[c] (12μ)
Test Stands, Hydrostatic						
Test Stands	15/13/10	5μ[c] (3μ)	15/13/10	5μ[c] (3μ)	15/13/10	5μ[c] (3μ)
Hydrostatic Transmissions	17/15/13	7μ[c] (6μ)	16/14/11	5μ[c] (3μ)	16/14/11	5μ[c] (3μ)

*Depending upon system volume and severity of operating conditions a combination of filters with varying degrees of filtration efficiency might be required (I.e. pressure, return, and off-line filters) to achieve and maintain the desired fluid cleanliness.

Example		ISO Code	Comments
Operating Pressure	156 bar, 2200 psi		
Most Sensitive Component	Directional Solenoid	19/17/14	recommended baseline ISO Code
Fluid Type	Water Glycol	18/16/13	Adjust down one class
Operating Conditions	Remote location, repair difficult		Adjust down one class, combination
	High ingression rate	17/15/12	of critical nature, severe conditions

Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com

Extending Roller Bearing Life.
Improving fluid cleanliness in lubrication systems for roller bearings can exponentially increase component life. Figure B describes attainable increases in life expectancy of roller bearings as improvements in ISO fluid cleanliness codes are made. Life extension for hydraulic components can be achieved by improving fluid cleanliness.

Current ISO Code	Target ISO Code	Target ISO Code	Target ISO Code	Target ISO Code
	2 x Life	3 x Life	4 x Life	5 x Life
28/26/23	25/22/19	22/20/17	20/18/15	19/17/14
27/25/22	23/21/18	21/19/16	19/17/14	18/16/13
26/24/21	22/20/17	20/18/15	19/17/14	17/15/12
25/23/20	21/19/16	19/17/14	17/15/12	16/14/11
25/22/19	20/18/15	18/16/13	16/14/11	15/13/10
23/21/18	19/17/14	17/15/12	15/13/10	14/12/9

Accurate oil analysis - Once the target ISO fluid cleanliness code is established it is critical to properly measure the actual cleanliness of the system. A well designed plan to achieve cleanliness can be undermined if steps are not taken to ensure accurate and repeatable oil analysis. When sampling the oil a wide range of variables can affect the outcome yielding inaccurate results. For more information see Accurate oil sampling and analysis article.

Oil sampling methods and practices - Bottle samples analyzed by independent laboratories is common and widely accepted as a method of quantifying fluid cleanliness. However, there are many variables associated with bottle sampling that can cause inaccurate readings.

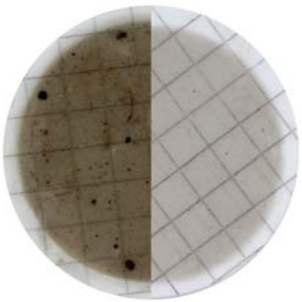
- Background contamination in "clean" sample bottles or vacuum tubes can increase ISO codes by 1~4 classes per size measured, 4μ[c]/6μ[c]/14μ[c].
- Inconsistent in-plant sampling practices (i.e. sample port flush time, bottle rinsed or not).
- Exposure of sample to airborne contaminate during sampling and analysis
- Analysis lab procedure repeatability by operator (i.e. agitation~count interval affect on suspension).
- Analysis lab calibration drift.
- Variability between oil analysis lab particle

On-line particle counting - Connecting an on-line particle counter directly to the hydraulic or lube system through sampling ports provides the most accurate snapshot of fluid cleanliness and eliminates many of the inherent variables associated with bottle sampling. Some particle counters can function with system pressure as low as 20 psi (1.42 bar) at certain viscosities for sampling pressure line, return line, or lubrication system. There are also particle counter options available to draw (Sip) the fluid from a reservoir, tote, or other container directly into the particle counter when system pressure is not available. Monitor sample port cleanliness in real time to know when the sample is truly representative of the system and not tainted with sample port contaminate buildup.

Maintaining control of the sampling and analysis procedures increases the accuracy of your results, eliminates the waiting game to get samples back from a lab, allows quicker response to contamination related issues, and even save money on oil sample kits. No one knows your system better than you and once armed with the right oil analysis approach and diagnostic equipment you can make improvements in reliability.

Oil sampling port types and locations - Just as sampling technique and method can compromise results, sampling port and location can also be a challenge. Sampling ports are often contamination collection points and must be flushed for up to 6 minutes before a truly representative sample is captured. Without a proper port flush the results can be affected. Port location is also critical to obtaining a good sample. Locating a sampling where there is turbulent flow will provide more realistic results than a laminar area. For more information see Accurate oil sampling and analysis article.

PTK-1 Oil analysis kit - Patch test kits are a good complement to on-line particle counters as they provide the capability to visually analyze contamination levels and types in the system. The kit includes a microscope, vacuum pump, test patches, and solvent dispenser integrated into a carrying case. The kit also features a reference manual to correlate visual patch appearance to approximate ISO code.



Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com

Machine Tool Contamination Field Study

Focus: Solving contamination issues resulting from insufficient filtration on power units and machine tools.

APPLICATIONS

- Pressure filters are ideal for protecting control valves and other sensitive components from internally generated contaminate and ingression.
- Machine tools without a pressure filter protecting valve manifolds after the pump.
- Power units on CNC lathes and milling equipment, Plastics injection molding, mobile equipment, and other small industrial machines with sensitive control valves.

The Problem - Insufficient filtration

Machine tools and power units are frequently designed without the filtration necessary to maintain recommended fluid cleanliness levels for the system. A fluid cleanliness case study of three CNC lathes (A, B, C) raised some concern. The only filtration present was either a coarse suction strainer or coarse return-line screen. Baseline oil analysis (see fig 1) revealed that the fluid cleanliness levels of the hydraulic fluids (per ISO 4406 code chart) were higher than recommended levels for the system components (see fig 2).

fig. 1

Machine	ISO code*
A	22 / 20 / 14
B	23 / 20 / 14
C	23 / 21 / 16

fig 2.

Pumps	**<2000 psi**	**2000~3000**	**>3000 psi**
Fixed gear	20/18/15	19/17/15	
Fixed vane	20/18/15	19/17/14	18/16/13
Fixed piston	19/17/14	18/16/13	17/15/12
Variable vane	18/16/13	17/15/12	
Variable piston	18/16/13	17/15/13	16/14/12
Valves		**2000~3000**	**>3000 psi**
Directional	(solenoid)	20/18/15	19/17/14
Proportional		17/15/12	16/14/11
Servo Valve		16/14/11	15/13/10

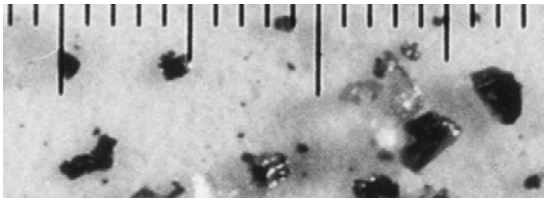
Contamination Basics & Sources

Particulate contamination is the number one cause of hydraulic component failure, and 70~75% of failures are related to surface degradation caused by mechanical wear.

Sources of particulate contamination

- Built-In contamination (assembly environment, dirty new components and hoses, metal fabrication)
- Ingested contamination (leaky reservoirs, no reservoir breather, worn rod wipers and bearing seals, dirty replacement components, system exposure during maintenance, new oil—see fig 3.)
- Internally generated contamination (abrasive wear, adhesive wear, stress related wear, corrosion, fluid breakdown)

Fig 3 (new oil typical ISO code 24/21/18).



Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com

Solution Part I - System Clean-up

The pressure filter assembly, including β12[c] = 1000 filter element and element condition indicator, was added to each of the three machines (see fig 4) after the pressure pump (piston type). After nine days of operation the indicators on machines A and C were signaling terminal pressure drop. At that time all three elements were serviced and the oil was analyzed (see fig 5). The ISO codes improved, but not to the level recommended for servo valves. The next step was to set target cleanliness codes and enhance the filtration efficiency to reach the target. The spent elements that were removed contained large particles including piping putty (from installation of new hoses) and other large debris that was not being removed by the suction strainer.

Fig 4.

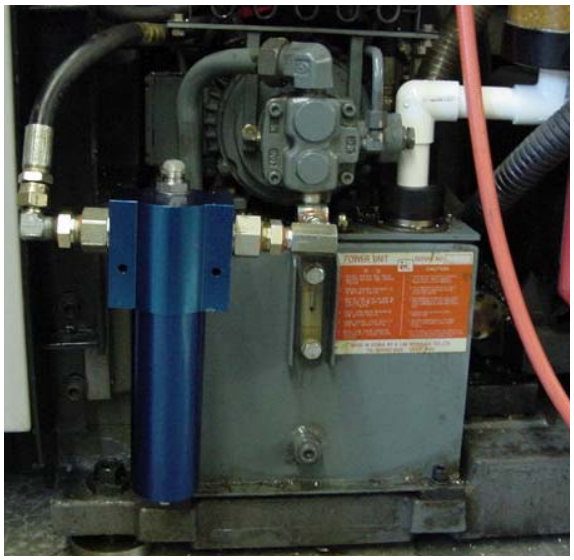


fig. 5

Mach.	ISO code before Pressure filter	ISO code after 9 days (β12[c] = 1000)
A	22 / 20 / 14	19 / 18 / 12
B	23 / 20 / 14	21 /18 / 12
C	23 / 21 / 16	20 / 18 / 13

Solution Part II - Enhanced Filtration and Target Cleanliness Codes

A target ISO Cleanliness Code of 16 / 14 / 11 (measured at filter effluent) was established for all three machines to protect and maximize piston pump and solenoid valve life. New filter elements were installed with a more efficient rating of β5[c] = 1000 (β3 = 200 according to old standards) to achieve the target. After 60 days of service the oil from all three machines was analyzed (see fig 7), even though none of the assemblies were indicating terminal pressure drop. Machines B and C were able to attain the target while A did not, although adding of the pressure filter made considerable improvement in cleanliness. The oil was sampled after 180 days using an on-line particle counter connected to the drain plug of the filter bowl. This location represents one of the dirtiest points on the system since the oil has been through the system and in the reservoir. Sampling with an on-line particle counter and proper flushing techniques eliminates variables associated with bottle sampling. Figure 8 illustrates increased life expectancy for hydraulic components that can be realized by reducing fluid cleanliness codes. The benefits of clean fluid justify the cost of filtration.

fig. 7

Mach.	ISO code before filter	ISO code after 60 days (β5[c] = 1000)	ISO code after 180 days (β5[c] = 1000)
A	22 / 20 / 14	17 / 15 / 11	11 / 9 / 7
B	23 / 20 / 14	15 / 13 / 8	13 / 11 / 9
C	23 / 21 / 16	16 / 12 / 10	14 / 11 / 9

fig. 8 Hydraulic Component

Current ISO Code	Target ISO Code	Target ISO Code	Target ISO Code	Target ISO Code
	2 x Life	**3 x Life**	**4 x Life**	**5 x Life**
28/26/23	25/22/19	22/20/17	20/18/15	19/17/14
27/25/22	23/21/18	21/19/16	19/17/14	18/16/13
26/24/21	22/20/17	20/18/15	19/17/14	17/15/12
25/23/20	21/19/16	19/17/14	17/15/12	16/14/11
25/22/19	20/18/15	18/16/13	16/14/11	15/13/10
23/21/18	19/17/14	17/15/12	15/13/10	14/12/9
22/20/17	18/16/13	16/14/11	15/13/10	13/11/8
21/19/16	17/15/12	15/13/10	13/11/8	-
20/18/15	16/14/11	14/12/9	-	-
19/17/14	15/13/10	13/11/8	-	-
18/16/13	14/12/9	-	-	-
17/15/12	13/11/8	-	-	-

Benefits of clean fluid

- Minimize unplanned equipment downtime.
- Reduce maintenance costs and labor.
- Reduce expensive component repair or replacement costs.
- Improve operating efficiency of equipment with sensitive components.
- Extend service life of fluids.

Adding a desiccant breather to the reservoir assures that the air ingested is dry and clean. Reducing water content reduces chemical compound formation, biological growth, oxidation and extends fluid life. Desiccant breathers also control particulate contaminate ingression down to 4μ[c] or 2μ with absolute efficiency. Filler-breather caps commonly found on reservoirs don't properly control particulate contamination. Specific desiccant breathers also adsorb water and oil mist as the reservoir exhales. A full range of adapters is commonly available to retro-fit any reservoir.

Precision Filtration Products
YOUR ONE STOP FOR FILTERS
Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com

Ghadeer Atheb. Co

Al Ghadeer Al Atheb

Contracting Services - Mechanical Specialized

- www.alghadeer-construction.com
- info@alghadeer-construction.com
- Tellfax No- +966114490705

More Than Power ,More Than Piping