TECHNICAL SPECIFICATION

L80 13%Cr CASING AND TUBING
(AMENDMENTS/SUPPLEMENTS TO ISO/DIS 11960.2)

DEP 39.01.20.10-Gen.

October 1995

DESIGN AND ENGINEERING PRACTICE

PREFACE

DEP (Design and Engineering Practice) publications reflect the views, at the time of publication, of:

Shell International Oil Products B.V. (SIOP)
and
Shell International Exploration and Production B.V. (SIEP)
and
Shell International Chemicals B.V. (SIC)

The Hague, The Netherlands,

and other Service Companies.

They are based on the experience acquired during their involvement with the design, construction, operation and maintenance of processing units and facilities, and they are supplemented with the experience of Group Operating companies. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual operating companies to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

The right to use DEPs is granted by SIOP, SIEP or SIC, in most cases under Service Agreements primarily with companies of the Royal Dutch/Shell Group and other companies receiving technical advice and services from SIOP, SIEP or SIC. Consequently, three categories of users of DEPs can be distinguished:

1) Operating companies having a Service Agreement with SIOP, SIEP, SIC or other Service Company. The use of DEPs by these Operating companies is subject in all respects to the terms and conditions of the relevant Service Agreement.

2) Other parties who are authorized to use DEPs subject to appropriate contractual arrangements.

3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, SIOP, SIEP and SIC disclaim any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any DEP, combination of DEPs or any part thereof. The benefit of this disclaimer shall inure in all respects to SIOP, SIEP, SIC and/or any company affiliated to these companies that may issue DEPs or require the use of DEPs.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of SIOP and SIEP, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of SIOP and SIEP. The copyright of DEPs vests in SIOP and SIEP. Users shall arrange for DEPs to be held in safe custody and SIOP or SIEP may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

All administrative queries should be directed to the DEP Administrator in SIOP.

NOTE: In addition to DEP publications there are Standard Specifications and Draft DEPs for Development (DDDs). DDDs generally introduce new procedures or techniques that will probably need updating as further experience develops during their use. The above requirements for distribution and use of DEPs are also applicable to Standard Specifications and DDDs. Standard Specifications and DDDs will gradually be replaced by DEPs.

TABLE OF CONTENTS

PART I INTRODUCTION

1.1 SCOPE

This DEP defines the minimum technical requirements for the purchase of seamless grade L80 13%Cr casing, tubing, liners, pup-joints, connectors, and couplings. Part II of this DEP gives amendments and supplements to clauses of ISO/DIS 11960.2 (July 14, 1994).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by SIOP and SIEP, the distribution of this DEP is confined to companies forming part of the Royal Dutch/Shell Group or managed by a Group company, and to Contractors and Manufacturers/Suppliers nominated by them (i.e. the distribution code is "F", as described in DEP 00.00.05.05-Gen.).

This DEP is intended for use in oil and gas production facilities.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant, authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Defect (in NDT) - a discontinuity or group of discontinuities whose indication(s) do not meet specified acceptance criteria.

Flaw/Discontinuity (in NDT) - an interruption which may be either intentional or unintentional, in the physical structure or configuration of a pipe.

Indication (in NDT) - evidence of a discontinuity that requires interpretation to determine its significance.

Premium Connection - a connection in which sealing is achieved by metal to metal contact between the two mating surfaces of the pin and box.

Purchaser - term used in ISO/DIS 11960.2 which has the same meaning as Principal.

1.4 ABBREVIATIONS

CLA - centre line average
CVN - Charpy vee notch

DN	-	diameter nominal
ECT	-	eddy current testing
EMI	-	electromagnetic inspection
FBH	-	flat bottomed hole
HB	-	Brinell hardness
ID	-	inside diameter
MFL	-	magnetic flux leakage
MPI	-	magnetic particle inspection
NDT	-	non-destructive testing
OCTG	-	oil country tubular goods
OD	-	outside diameter
RDH	-	radially drilled hole
S	-	seamless
UT	-	ultrasonic testing

1.5 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Referenced section numbers of the ISO document are not shown in brackets.

1.6 GUIDANCE FOR USE

The amendments to ISO/DIS 11960.2 given in Part II are directly related to equivalent sections in ISO/DIS 11960.2. For clarity, the section and paragraph numbering of ISO/DIS 11960.2 has been used as far as possible. Where clauses in ISO/DIS 11960.2 are referenced within this DEP, it shall mean those clauses as amended by this DEP. Clauses in ISO/DIS 11960.2 that are not amended by this DEP shall remain valid as written.

PART II AMENDMENTS/SUPPLEMENTS TO ISO/DIS 11960.2

SECTION 1 SCOPE

1.1 Delete the first two paragraphs and replace with the following:

This specification covers seamless casing, tubing, liners, pup-joints, connectors, couplings and thread protection manufactured from Group 2, Grade L80 13%Cr martensitic stainless steel in the sizes shown in Annex A.

All pipes shall be supplied with premium connections specified by the Principal.

SECTION 2 NORMATIVE REFERENCES

Add the following to the list of normative references:

ASTM A 388	Practice for ultrasonic examination of heavy steel forgings
ASTM E 883	Standard guide for metallographic photomicrography
IADC/SPE paper 17029	Performance evaluation of commercially available thread protectors, by E.J.C. Spruijt, Koninklijke/Shell E&P Laboratorium. Paper presented at IADC/SPE Drilling Conference, Dallas, Feb. 28 - Mar 2 1988
ISO 8501 Part 1	Preparation of steel substrates before application of paints and related products; visual assessment of surface cleanliness; Part 1: rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
ISO 9001	Quality systems - Model for quality assurance in design, development, production, installation and servicing
ISO 9712	Non-destructive testing; qualification and certification of personnel
ISO 10474	Steel and steel products - Inspection documents
SEL 072	Ultrasonically tested heavy plate; technical delivery specifications

SECTION 5 PROCESS OF MANUFACTURE

5.1 GENERAL

Delete the first sentence of the second paragraph and replace it with the following:

Pipe furnished to this specification shall be produced by the seamless process, as shown in Table 1.

Billets used for seamless pipe shall be inspected visually, and shall be free from surface defects such as cracks, laps or seams which exceed 1 mm in depth.

5.2 HEAT TREATMENT

5.2.1 General

Delete the second paragraph of this section and replace it with the following:

The furnaces shall be provided with suitable equipment to record the temperature-time relationship during continuous annealing or the heat treatment cycle in a batch type furnace.

5.2.2 Group 1

Delete this section.

5.2.3 Group 2

Delete this section and replace it with the following:

The Manufacturer shall demonstrate to the Principal that the tempering practice will result in the pipe attaining the minimum tempering temperature.

5.2.4 Groups 3 and 4

Delete this section.

5.3 STRAIGHTENING

5.3.1 Group 1, 3

Delete this section.

5.3.3 Group 4

Delete this section.

5.4 TRACEABILITY

5.4.1 General

Add to this section:

The Manufacturer, processor, threader and any other subcontractor shall apply a traceability system that meets the following requirements:

- unique lot identification numbers to provide direct and positive traceability to manufacturing and testing documentation;
- the lot number shall be marked on each pipe and coupling by low stress die stamping;
- the system shall provide for unique identification of any single component that in any way deviates from the acceptance standard of the lot, but is accepted by concession. The unique identification shall ensure that the history of deviant components remains uniquely traceable;
- the traceability system employed shall be documented, as required by Annex B, SR 15.2.

5.4.2 Serialization of Group 2 (Grades C90 and T95) and Group 4

Delete this section and its sub-sections.

SECTION 6 MATERIAL REQUIREMENTS

6.1 CHEMICAL REQUIREMENTS

Add to this section:

The composition of the pipe to be supplied shall be stated in the manufacturing procedure specification (Section 12.6) and, as determined by product analyses, shall comply with the maximum allowable limits specified in Table 2. The limitations on heat and product analyses shall be those agreed following acceptance of the manufacturing procedure specification; refer to Annex B, SR 15.

6.2 MECHANICAL PROPERTIES REQUIREMENTS

6.2.1 Tensile Properties

Insert below this heading:

All mechanical tests shall be performed on specimens taken from tubulars (unless otherwise stated) which have been subjected to all of the cold and hot working, and all of the heat treatment procedures which are performed on the finished product.

Samples removed for the determination of tensile properties shall be prepared by machining. If thermal cutting is used to remove pipe coupons from which test specimens are prepared, the full extent of the heat-affected region shall be removed during machining of the specimens.

6.2.3 Charpy V-notch - General requirements. All Groups

Delete the last sentence of the first paragraph and replace it with the following:

Only one of the tested impact specimens may exhibit an absorbed energy below that specified, and then the measured absorbed energy shall not be below 75% of that specified.

Full Charpy impact transition temperature curves shall be determined (longitudinal testing) of one completely finished pipe of each of the first two heats. The curves shall show impact energy (in Joules) and percentage shear (fibrous) of the fracture surface, plotted against temperature, over a temperature range sufficient to reproduce fracture appearance from 10% to 100% fibrous shear.

6.2.3.6 Group 4 Statistical impact testing

Delete this section.

6.2.4 Charpy V-Notch; Absorbed energy requirements for coupling stock, coupling blanks, couplings with ISO threads and connectors with internal ISO threads; except integral joint ISO tubing connections and extreme-line casing connections, all Groups.

6.2.4.1 Group 1, H40 only

Delete this section.

6.2.4.2 Group 1, grades J55 and K55 only

Delete this section and Table 7.

6.2.4.3 Group 1, grade N80 only, Groups 2, 3 and 4

Delete Tables 9, 10, 11 and 12.

6.2.5 Charpy V-notch; Absorbed energy requirements for casing, pup-joints and externally threaded connector material, Group 4

Delete this section and Tables 15 and 16.

6.2.6 Charpy V-notch; Absorbed energy requirements for pipe, Groups 1, 2 and 3.

Delete this section and replace it with the following:

The requirements of (Annex B, SR 16.2) shall apply.

6.2.7 Hardness Maximums

6.2.7.1 Group 2 - Casing, Tubing, Couplings, Pup-Joints and Connectors

1. Grade L80 all types

Delete this section and replace it with the following:

Each pipe selected for a product analysis shall be tested for hardness and shall comply with the requirements given in Table 3.

2. Grade C90 and Grade T95

Delete this section.

6.2.7.2 Group 4 - Casing, Couplings, Pup-Joints and Connectors

Delete this section.

6.2.8 Hardness Variation - Group 2 (Grades C90 & T95) and Group 4 (Grade Q125)

Delete this section.

6.2.9 Process Control - Group 2 (Grades C90 & T95) and Group 4 (Grade Q125)

Delete this section.

6.2.10 Hardenability - Group 2 (Grades C90 & T95)

Delete this section.

6.2.11 Grain Size - Group 2 (Grades C90 & T95)

Delete this section.

6.2.12 Flattening - Electric Welded Pipe - All Groups

Delete this section.

6.2.13 Sulphide Stress Cracking Test - Group 2 (Grades C90 and T95)

Delete this section.

Add new section:

6.2.14 Microstructural Examination

The microstructure of every pipe or bar selected for tensile testing from the first two heats shall be examined using optical microscopy (magnification 400X) in accordance with ASTM E 883. The findings shall be documented in photographs which will allow for a positive identification of the microstructure. The material shall have a homogeneous tempered martensitic microstructure.

Add new section:

6.3 SURFACE CONDITION

6.3.1 Pipe

The mill scale shall be removed from all surfaces using grit blasting, grinding or pickling (and passivating). The material used for grit blasting shall be non-metallic, such as glass bead, or stainless steel. The surface shall be fully cleaned from mill scale to a cleanliness level of Sa $2^1/_2$, as defined by ISO 8501, Part 1.

The surface roughness shall be defined by the Centre Line Average (CLA) method.

The surface roughness, Ra, shall not exceed 12.5 microns.

An acceptable method for checking the surface roughness of pipe is to prepare a reference specimen with known surface roughness. This reference shall be used to confirm, by visual inspection, that the surface roughness of each pipe is within specification.

Throughout all stages of the manufacturing process, care shall be taken to ensure that the pipe is not left exposed in a wet environment that could give rise to any corrosion of the surface.

6.3.2 Threaded Surfaces

Threading shall be manufactured and inspected in accordance with the Manufacturer's specification, which shall (if specified by the Principal) be provided for prior approval by the Principal.

Burrs shall be removed from all thread forms including the imperfect thread form.

All threaded surfaces of pipe shall be visually inspected. Any of the following imperfections shall be considered defects:

- broken threads, cuts, grinds, shoulders, seams, laps, pits, dents, tool marks, torn threads (tears), handling damage, cracks and chattered threads.

Any indication resulting from other imperfections that breaks the continuity of the thread shall also be considered a defect.

Any thread containing a defect shall be rejected.

SECTION 7 DIMENSIONS, MASSES, TOLERANCES AND PIPE ENDS

7.6 CASING JOINTERS

Delete this section.

7.7 HEIGHT AND TRIM OF ELECTRIC WELD FLASH

Delete this section.

7.11 PIPE ENDS

7.11.1.1 Casing

Delete this section and replace it with the following:

Casing shall be supplied either plain end or threaded and coupled.

7.11.1.3 Tubing

Delete this section and replace it with the following:

Tubing shall be supplied either plain end or threaded and coupled.

7.11.1.4 Pup-joints and Connectors

Delete this section and replace it with the following:

Pup-joints and connectors shall be supplied either plain end or threaded and coupled.

7.11.2 Threading

Delete this section and replace it with the following:

Pipe threads, gauging practice and thread inspection shall conform with the Manufacturer's specification (see also 6.3.2).

7.12 COUPLING MAKE-UP AND THREAD PROTECTION

7.12.1 Group 1, Group 2, Group 3

Add to this section:

During make-up, the actual coupling torque shall be recorded graphically. This record shall be made available to the Principal.

The threads and seals of the pipe and the space between thread protector and seal on both the pin and coupling shall be provided with a high pressure, environmentally acceptable thread compound during coupling make-up, such as Shell Francaise "SF 3646" (Malleus TC 1), Malleus STC 1 (SSG 3001), Mercassol Multimake White 633R, or Bestolife "2000". This thread compound shall be approved by the Principal. The Manufacturer's procedures shall ensure that the compound is effectively applied in the correct quantity to thread roots, seal area and torque shoulder, and that the compound is maintained free of contamination at all times.

7.12.2 Group 4

Delete this section.

SECTION 8 COUPLINGS

8.1 MATERIAL

Add to this section:

The base material used for couplings shall be examined by NDT in accordance with the supplementary requirements stated in Section 8.13.1 and Annex B, SR2.

8.1.1 Group 1

Delete this section.

8.1.2 Group 3

Delete this section.

8.1.3 Group 4

Delete this section.

8.2 PROCESS OF MANUFACTURE

8.2.1.2 Subcritical Forging

Delete the first two sentences of this section.

8.2.1.3 Centrifugal Casting

Delete this section.

8.2.2 Group 4

Delete this section.

8.3 PERFORMANCE PROPERTIES

Delete this section.

8.5 DIMENSIONS AND TOLERANCES

8.5.2 Group 4

Delete this section.

8.9 REDUCING COUPLINGS

8.9.2 Group 4

Delete this section.

8.13 SURFACE INSPECTION

8.13.2

Delete this section.

8.15 REPAIR AND REMOVAL OF IMPERFECTIONS AND DEFECTS

Add to this section:

If grinding or machining is carried out, care shall be taken to ensure that carbon steel does

not come into contact with the L80 13%Cr coupling.

8.16 THREAD PLATING - GROUP 4

Delete this section.

8.17 COUPLINGS AND COUPLING BLANK PROTECTION - GROUP 4

Delete this section.

Add new section:

8.18 ANTI-GALLING TREATMENT

Copper plating shall be applied to the threads of couplings as an anti-galling treatment.

SECTION 9 INSPECTION AND TESTING

9.1 GENERAL

9.1.1 Mill Control Tests

9.1.1.1 Mill Control Tensile Tests - Group 1, Group 2 and Group 3

Delete the last sentence of this paragraph.

9.1.3 Imperfections and Defects

9.1.3.1 Surface Breaking Pipe Body and Weld Seam Defects

Delete this section and replace it with the following:

The supplementary requirement SR2 shall apply.

9.1.3.4 Non-surface Breaking Weld Seam Defects

Delete this section.

9.2 TESTING OF CHEMICAL COMPOSITION

9.2.1 Heat Analyses

9.2.1.1 Group 1, Group 2, Group 3

Add to this section:

The analysis of each heat of steel used in the manufacture of pipe specified on the purchase order shall conform to the requirements of (Section 6.1). The Manufacturer shall furnish a certificate of all heat analyses to the Principal in accordance with (Section 12.1).

9.2.1.2 Group 4

Delete this section.

9.2.2 Product Analyses - All Groups

Delete this section and replace it with the following:

All product analyses shall be carried out on finished tubular products. In this instance, a finished tubular product shall be understood to mean pipe which has been formed and undergone its final heat treatment but before trimming to final tubular lengths (or threading). The Manufacturer shall furnish a certificate of all product analyses to the Principal in accordance with (Section 12.1).

From each lot, samples for product analysis shall be taken at random. The number of samples taken from each lot shall be determined as follows:

- for pipe of diameter up to and including $5^1/_2$", one sample per 200 lengths shall be taken;
- for pipe of diameter greater than $5^1/_2$", one sample per 100 lengths shall be taken.

For every diameter there shall be at least one product analysis, irrespective of the number of lengths produced.

9.3 TESTING OF MECHANICAL AND TECHNOLOGICAL PROPERTIES

9.3.1.1.1 Groups 1, 2 (Grade L80, Type 1 and C95)

Delete this section.

9.3.1.2.2 Additional Requirements for Groups 2 (Grades C90 and T95) and 4

Delete this section.

9.3.2.1.1 Casing and Tubing

Delete the first sentence of this section and replace it with the following:

A tensile test shall be carried out on each of the pipe lengths selected for product analysis.

If the Brinell hardness measurements (refer to (Section 9.11)) result in a hardness variation within the lot greater than 30 HB (i.e. the difference between the highest surface hardness value and the lowest surface hardness value of that lot), two additional tensile tests shall be performed. One sample shall be taken from the pipe having the highest Brinell hardness and one sample shall be taken from the pipe having the lowest Brinell hardness.

In the event that a reheat treatment of all or part of a lot is carried out, then mechanical testing shall be repeated on material in its final heat treatment condition.

9.3.2.1.2 Couplings, Pup-joints and Connectors

Delete this section and replace it with the following:

For each lot of pup-joints, couplings and connectors, one test shall be made on one length selected at random from every 100 pup-joints or less and on one length selected at random from every 400 connectors and couplings or less.

No test is required for pup-joints, couplings and connectors manufactured from casing or tubing which has been tested and approved in accordance with this specification, provided they are not subsequently heat treated.

If the Brinell hardness measurements (refer to (Section 9.11)) result in a hardness variation within the lot larger than 30 HB (i.e. the difference between the highest surface hardness value and the lowest surface hardness value of that lot), two additional tensile tests shall be performed. One sample shall be taken from the pipe having the highest Brinell hardness and one sample shall be taken from the pipe having the lowest Brinell hardness.

9.3.2.3 Hardness Tests

9.3.2.3.1 Group 2 - Grade C90 & T95

Delete this section.

9.3.2.3.2 Group 2 - Grade L80 Type 1, L80 9Cr and L80 13Cr

Delete this section and replace it with the following:

1. Pipe

Each pipe selected for a product analysis shall be hardness tested. A hardness value shall be considered the average of three impressions in an arc concentric with the circumference of the pipe, as shown in Figure 10. All hardness values shall comply with the requirements given in Table 3.

2. Couplings

Each item selected for product analysis shall be subject to through wall (transverse) hardness tests. Three hardness values shall be taken in one of the quadrants, as shown in Figure 10.

9.3.2.3.3 Group 4

Delete this section.

9.3.2.4 Hardenability Test - Group 2 (Grades C90 and T95)

Delete this section.

9.3.2.5 Grain Size Determination - Group 2 (Grades C90 and T95)

Delete this section.

9.3.2.6 Impact Test

9.3.2.6.1 Groups 1, 2 and 3

Delete this section and replace it with the following:

Each pipe selected for a product analysis shall be subjected to Charpy testing.

9.3.2.6.2 Group 4

Delete this section.

9.3.2.7 Metallographic Evaluation - Group 3EW

Delete this section.

9.3.3 Test Specimens

9.3.3.1.2 Additional: Casing and Tubing

Delete this section.

9.3.3.1.3 Couplings, Pup-Joints and Connectors - Group 4

Delete this section.

9.3.3.2 Flattening Test

Delete this section.

9.4 HYDROSTATIC TEST

9.4.1 Hydrostatic Test Procedures

Delete the first paragraph of this section and replace it with the following:

All casing, tubing, liners and pup-joints shall be tested full length after final heat treatment. Each length of pipe shall withstand, without leakage, an inspection hydrostatic test to at least the pressure specified in Section 9.4.2. Each pipe shall be hydrostatically tested at room temperature, maintaining the calculated test pressure for 10 seconds.

Only fresh water with a chloride ion content of less than 200 ppm shall be used for the test.

After hydrostatic testing, the pipes shall be dried by an air blower and kept dry by the use of end caps.

The test shall be performed on pipe in either the plain end or threaded and coupled condition.

9.7 NON-DESTRUCTIVE INSPECTION

Add new sub-section:

9.7.1.2 Ultrasonic Equipment

The automatic ultrasonic equipment shall incorporate:

1. A device which monitors the effectiveness of the coupling. In the case where a zero degrees compression wave probe is used to monitor coupling or where a through transmission technique is used, loss of coupling occurs when the sensitivity (echo height) decreases by more than 10 dB relative to the static calibration. A clear acoustic warning system and an automatic paint spray system (or equivalent) shall be activated when loss of coupling occurs.
2. An automatic paint-spraying device or equivalent system which is activated when the received ultrasonic echo exceeds the preset acceptance limit. This alarm shall operate without any interference from the ultrasonic operator and shall be applied within 25 mm advancement past the detected defect. The reset time of the alarm system to be available for detection, following detection of a defect, shall be shorter than the time for 25 mm advancement in the scanning direction.

If ultrasonic angle beam shear wave inspection is used, the entrance angles of shear wave probes shall be 45 (40-48) degrees.

The transducer arrangement shall be such that the sound intensity in both the longitudinal and circumferential directions does not decrease by more than 3 dB at any point in the pipe wall, referred to the maximum sound intensity adjusted in the static calibration.

Lamination testing may be performed in pulse echo or transmission mode and wall thickness determination in pulse echo mode only. The probe(s) used for lamination/wall thickness testing shall satisfy the following requirements:

-	Twin crystal probes	:	The focal length should be approximately 50% of the wall thickness
-	Single crystal probes in pulse echo mode	:	The near surface resolution shall be better than 25% of the wall thickness, measured at the primary reference sensitivity level.

The equipment shall be checked with an applicable reference standard at least every four hours and at the beginning and end of a batch, in order to demonstrate the effectiveness of the inspection procedures and show that the equipment is functioning correctly.

If discrepancies of more than 3 dB occur, then all pipes inspected since the previous check shall be reinspected. Proper functioning of the UT equipment and the linearity of the electronic instrumentation shall be checked at least once every six months or if a change is made to the equipment.

From each pipe under test, an automatic on-line record shall be made without operator intervention. For every pipe, a summary record shall be made showing pipe identification number, time and examination results, including re-examinations.

If parts of the ultimate pipe ends are not covered by an automatic UT system, manual UT shall be carried out using procedures for manual UT approved by the Principal and based on the requirements given above. The complete circumference of seamless pipe ends shall be tested manually over the length of the untested area plus 25 mm overlap of the automatically tested area.

Add new sub-section:

9.7.1.3 Electromagnetic Equipment

Testing shall be performed by automatic equipment. The pipe ends which cannot be inspected by automatic equipment shall be inspected by a manual method.

9.7.2 Pipe Body Inspection

Add to this section:

The Manufacturer shall demonstrate to the Principal prior to the start of pipe production that the NDT techniques and procedures to be used are capable of identifying all surface and sub-surface defects that may exist, which are equal to or larger than the acceptable defect sizes referred to in (Section 9.1.3).

The UT and EMI techniques shall be capable of detecting transverse and longitudinal defects over the full length of the pipe. The rejection limits for transverse defects shall be the same as those specified for longitudinal defects (refer to (Section 9.1.3)).

All pipe shall be examined by UT and EMI in accordance with Section 9.7.6.

EMI shall only be used for pipe with a nominal wall thickness less than 6 mm.

The NDT shall take place after all heat treatment operations, but may take place before cropping or threading.

Demagnetisation shall be performed after EMI and MPI if the residual magnetism exceeds 25 Gauss.

The surface to be examined and all adjacent areas within 25 mm shall be dry and free of all dirt, grease, lint, scale, oil or other extraneous matter that could interfere with the inspection.

Pipes used for the manufacture of couplings shall be inspected for longitudinal and transverse defects over the entire surface area by UT.

Bar stock to be used for pup-joints, connectors or couplings shall be inspected after final heat treatment for longitudinal and transverse defects over the entire surface area by UT in accordance with ASTM A 388. All recordable indications defined in ASTM A 388 shall be considered defects.

Pipe and couplings furnished to this specification shall be examined by NDT in accordance with (Section 8.13).

NDT for acceptance of the pipe (final inspection) shall take place after all heat treating and expansion operations. It may, however, take place before cropping, bevelling and end sizing.

9.7.3.2 End Areas

Delete the first sentence of this section and replace it with the following:

Ends of pipe and bar stock which cannot be examined by automatic UT or automatic EMI shall be subjected to manual UT or cut from the pipe or bar.

9.7.5 Inspection of Weld Seam

Delete this section.

9.7.7 Reference Standards

Add to this section:

The reference calibration standard shall have the same specified diameter and thickness as the product being inspected and shall be of sufficient length to permit calibration of ultrasonic inspection equipment at the speed to be used in production. The reference standard shall also be of the same material type and have the same surface finish and heat treatment as the product to be inspected. It shall be free from discontinuities or other conditions producing indications that may interfere with detection of the reference reflectors.

The Manufacturer may use a type of reference reflector not specified above, provided he can demonstrate to the Principal that the examination is at least as sensitive as prescribed in this specification. In such cases, the Manufacturer shall obtain approval from the Principal.

The primary reference sensitivity level shall be adjusted on the following reference reflectors:

TYPE OF EXAMINATION	REFERENCE REFLECTOR
Lamination detection	FBH 6.3 mm
Surface defect detection	Notch N5
Defect detection body and pipe ends	Notch N5

All sensitivity adjustments shall be carried out dynamically.

Flat bottomed holes for lamination detection shall be applied at the midwall position.

9.7.7.1 Acceptance Limits

For all reference reflectors the acceptance limit signal shall be equal to the primary reference sensitivity level, i.e. equal to the height of the signal produced by the reference reflector.

For all examination types, indications exceeding the acceptance limit signal are unacceptable.

For lamination detection of seamless pipe and pipe ends, the acceptance limits shall be based on the lamination size and frequency and be in accordance with the classification of SEL 072, as described below:

LOCATION	SEL 072 LAMINATION ACCEPTANCE LEVEL
Pipe Edges	Table 2, Class 1
Pipe Body	Table 1, Class 3

9.7.10 Certification and Qualification of Personnel

Delete this section and replace it with the following:

All non-destructive examinations shall be performed by an inspector qualified to ISO 9712 or equivalent in the relevant technique; equivalence shall be documented and accepted by the Principal. For UT, at least one ISO 9712 level III or equivalent qualified inspector shall be available to the mill (on call) for endorsement of relevant NDT procedures and verification of the quality of NDT reports. A level II inspector is required for shift supervision and calibration of both manual and automated systems.

An ISO 9712 level I inspector is acceptable for all other NDT methods. An ISO 9712 level II inspector is acceptable for supervision of all other NDT methods.

The personnel qualification records and certification shall be made available to the Principal.

9.7.12.1 Grinding or Machining

Add to this section:

If grinding is performed to remove any defects, care shall be taken to ensure that carbon steel does not come into contact with the L80 13%Cr pipe.

9.8 TEST METHODS AND RESULTS

9.8.3 Flattening Test

Delete this section.

9.8.4 Hardness Test

Delete the first two paragraphs of this section and replace them with the following:

For through wall (transverse) hardness tests, the Rockwell C method shall be used, in accordance with ISO 6508. Results converted from Brinell hardness tests are not acceptable.

9.8.6 Sulfide Stress Cracking Test

Delete this section.

9.8.7 Impact Test

9.8.7.2 Test Temperature

Delete this section and replace it with the following:

The test temperature shall be 0 °C.

9.8.7.3 Sub-size Test Temperature Reduction - Group 1: Grades J55 and K55

Delete this section.

9.10 RETESTS

9.10.1 Chemical Composition: Recheck Product Analysis - All Groups

Delete this section and replace it with the following:

If the product analysis of any length of pipe representing a lot fails to conform to the requirements specified in Table 2, at the Manufacturer's option the lot shall either stand rejected or all of the remaining lengths in the lot shall be tested individually for conformance to the specified requirements.

9.10.2 Tensile Retests

9.10.2.1 All Groups

Delete this section and replace it with the following:

If any tensile test specimen representing a lot of pipe fails to conform to this specification, the Manufacturer may elect to make a retest on two further test specimens taken from the pipe from which the failed specimen was taken. If the retests conform to the requirements of this specification, then all the lengths in the lot shall be accepted. If any retest specimen fails to conform to this specification, the Manufacturer may elect to carry out acceptance testing on the remaining lengths in the lot individually, or may reject the lot completely without further testing.

9.10.2.2 Group 2 (Grades C90 and T95) and Group 4

Delete this section.

9.10.3 Flattening Retests

Delete this section.

9.10.4 Hardness Retests

9.10.4.1 Group 2 (Grade L80)

Delete this section and replace it with the following:

If any test specimen representing a lot of pipe fails to conform to the hardness requirements of this specification, the Manufacturer may elect to make a retest on two further test specimens taken from the original pipe. If the retests conform to the requirements of this specification, then all of the lengths in the lot shall be accepted. If any retest specimen fails to conform to the specification, the Manufacturer may elect to test the remaining lengths in the lot individually or reject the lot completely.

9.10.4.2 Group 2 (Grade C90 & Grade T95)

Delete this section.

9.10.4.3 Group 4

Delete this section.

9.10.5 Impact Tests

9.10.5.1 Retest of a Length - All Groups

Delete the first sentence of this paragraph and replace it with the following:

If more than one specimen exhibits a value below the specified minimum absorbed energy requirement or if any value is below 75% of the specified minimum absorbed energy requirement, three additional specimens from the same length of pipe shall be retested.

9.10.5.2. Replacement of a Reject Length - All Groups

Delete this section.

9.10.5.3. Multiple Length Rejection - All Groups

Delete this section.

Add new section:

9.11 IN-PROCESS HARDNESS TESTING

To ensure that proper heat treatment has been carried out, hardness testing shall be performed as follows:

1. Brinell hardness testing on the surface of all bar stock used for pup-joints, connectors and couplings.
2. On all lengths of produced pipe under the following conditions:
   a) If batch-like heat treatment is carried out, in-process Brinell testing of each pipe shall be carried out.
   b) If in-line heat treatment is applied, then either in-process Brinell testing of each pipe or through wall Rockwell testing (in accordance with Figure 10) on every 25th pipe shall be carried out.

If the Brinell reading does not exceed 245HB, the item is acceptable. If any reading is over 245HB, then two additional tests shall be made in the immediate area of the first test. If either of the second tests exceeds 245HB, then the item shall be rejected. The Rockwell hardness tests shall comply with the requirements of Table 3. The results of all hardness tests shall be made available to the Principal.

SECTION 10 MARKING

10.2 COUPLINGS AND CONNECTORS

10.2.1 Group 1, Group 3

Delete this section.

10.2.2 Group 2, Group 4

Delete this section and replace it with the following:

The following shall be both paint marked and die stamped on the coupling or connector:

- the Manufacturer's name or mark, "ISO/DIS 11960", the Manufacturer's alloy code, the lot number and the symbol for the grade.

The marking shall be located at the middle of the coupling or connector.

10.3 PIPE AND PUP-JOINTS

10.3.1 Group 1, Group 3

Delete this section.

10.3.2 Group 2, Group 4

Delete the first paragraph and replace it with the following:

Marking of bundled tubing by die stamping on a metal tag affixed to the bundle is not allowed.

Each length of pipe and each pup-joint shall be marked by both die stamping and paint stencilling as specified in Sections 10.5 and (10.6) respectively.

7. Grade

Delete this clause and replace it with the following:

The following grade marking shall be paint stencilled on the pipe:

- L80-13Cr.

8. Process of Manufacture

Delete this clause and replace it with the following:

The letter "S" shall be paint stencilled on the pipe to designate that it was produced by the seamless process.

11. Type of Thread (Casing Only)

Delete this title and replace it with the following:

11. Type of Thread

Add to this clause:

Paint stencil marking of the type of thread shall be applied to casing and tubing (refer to (Section 10.8)).

12. Serialization of Grades C-90, T-95 and Q-125 Products

Delete this clause.

Add new clause:

13. Additional Information

The following additional information shall be paint stencilled to each pipe:

- the purchase order number
- the type of non-destructive testing carried out, using the following symbols;
  - for ultrasonic testing - UT
  - for magnetic particle inspection - MPI
  - for electromagnetic inspection - EMI

10.4 DIE STAMP MARKING REQUIREMENTS

10.4.1 Group 1 and Group 3

Delete this section.

10.4.2 Group 2

Delete this section and replace it with the following:

Die stamped markings shall be low stress and produced by interrupted dot or round vee cold die stamps.

10.4.3 Group 4

Delete this section.

10.6 PAINT STENCIL MARKING

10.6.1 Groups 1, 2, 3

Add to this section:

The paint stencil marking shall be made with white paint in block capitals with a minimum height of 30 mm.

10.6.2 Group 4

Delete this section.

10.8 THREAD MARKING - ALL GROUPS

Delete the second paragraph and replace it with the following:

All thread types shall be identified by die stamping and paint stencilling adjacent to the threads, with the threader's name or mark and the size and type of thread.

All thread type symbols not covered by this Section shall be submitted to the Principal for approval prior to commencement of manufacture.

SECTION 11 COATING AND PROTECTION

11.1 COATINGS - ALL GROUPS

Add to this section:

With the prior approval of the Principal, the pipe shall be supplied with an external varnish based coating, using the Manufacturer's applicable specification.

Add the following two new sections:

11.1.3 Method of Packing and Storage

All pipes shall be cleaned, dried, packed, handled and transported so as to arrive at their destination dry and without distortion or other damage. The use of hooks or similar lifting equipment which may cause damage to machined surfaces is prohibited. Pipe ends shall be protected by caps.

If the pipe is to be stored in the open air before, during or after shipment, it shall be suitably protected from environmental contamination.

Handling and movement of all casing and tubing, other than that in the normal sequence of manufacture, shall be kept to a minimum. Deformation and damage of machined surfaces shall be avoided. The Manufacturer's handling and packing procedures shall be designed to prevent any type of damage to casing and tubing during transit. All casing/tubing shall be packed and stored in accordance with a procedure agreed by the Principal (refer to (Section 11.1.4)).

Threaded connections shall be properly cleaned, thoroughly doped with an environmentally acceptable high pressure thread compound approved by the Principal and protected by thread protectors as described in (Section 7.12).

The packing of the pipe, in accordance with the agreed procedure, shall be confirmed by a certificate which will be included in the manufacturing data book.

Each shipment shall be accompanied by a packing list, a copy of the release note and the manufacturing procedure specification (Section 12.6).

11.1.4 Transportation and Handling

Pipes transported by sea shall not be shipped as deck cargo and shall not be bundled. A cradling system, such as Drilltec's Econorap (Type LE), Sigma's Rhino or a Principal approved equivalent, shall be used.

11.2 THREAD PROTECTORS

11.2.2 Material

Add to this section:

The material and type of protectors shall comply with the requirements of Note 1 below, such as Sigma Thedgard EHD, Webco Mark III, Weatherford WL 1901 or any other approved by the Principal.

NOTE 1: IADC/SPE Drilling Conference in Dallas, Feb 28-Mar 2, 1988: Paper 17029: Performance Evaluation of Commercially Available Thread Protectors by E.J.C. Spruijt, Koninklijke/Shell E & P Laboratorium.

11.2.4 Driftable Thread Protectors

Delete the first sentence of this section and replace it with the following:

The opening of the thread protector shall allow free passage of an appropriate drift mandrel in both directions. For any horizontal position of the pipe, the drift mandrel shall pass through without obstruction (i.e. any rotation of the pipe does not result in obstruction of the drift mandrel by the protector).

All thread protectors shall be visually inspected prior to use to ensure that they are clean

and free from contamination or defects.

SECTION 12 DOCUMENTS

12.1 CERTIFICATION

Delete the first paragraph of this section and replace it with the following:

The Manufacturer shall furnish the Principal with a certificate of compliance, in accordance with the requirements of (Section 12.6).

All documentation shall be in the English language.

Before acceptance of the complete order or part thereof, the Manufacturer shall submit to the Principal for review a set of inspection certificates in accordance with ISO 10474, type 3.1.B.

12.2 CERTIFICATION REQUIREMENTS - GROUP 4

Delete this section.

12.4 RETENTION OF RECORDS

Delete the second sentence of this paragraph and replace it with the following:

These records shall be retained by the Manufacturer for a period of ten years after the purchase date.

Add new section:

12.5 QUALITY SYSTEM

The Manufacturer, processor, threader and any other subcontractor shall maintain a quality assurance system in accordance with ISO 9001, or an approved equivalent, and furnish the Principal with a quality plan in accordance with (Annex D).

The quality plan shall be submitted to the Principal for approval a minimum of five weeks prior to the pre-manufacturing meeting (if any) or five weeks prior to the commencement of production.

Add new section:

12.6 MANUFACTURING PROCEDURE SPECIFICATION

The Manufacturer shall produce a manufacturing procedure specification for the production and inspection of pipe and couplings which shall be submitted for the Principal's approval at least five weeks prior to the start of production.

This document shall include the following data as a minimum:

a. Name of the 13%Cr stainless steel supplier and the steel mill
b. Steel making and casting techniques including details of the following:
   - details of steel making process
   - casting speed, tundish superheat, segregation and control measures
c. Heat treatment
d. Chemical composition:
   - target chemistry
   - ranges for deliberately added elements
   - maxima for other elements specified in (Section 6.1)
e. Purchase order number
f. Applicable specification number
g. Grade designation of the material
h. Pipe heat treatment procedure
i. Pipe forming procedure
j. Procedures for mechanical testing
k. Method of surface finishing
l. Procedure for the application of the anti-galling treatment to the coupling
m. Hydrostatic test procedure
n. Coupling make-up procedure, proposed thread compound and thread protectors
o. Marking procedure, including type of paint to be used
p. Coating procedure
q. NDT procedure
r. Repair procedure and method of recording repairs
s. Traceability procedure
t. Final grade verification procedure
u. Boxing and packing procedure
v. Transportation and handling procedures
w. Quality plan.

ANNEX B SUPPLEMENTARY REQUIREMENTS

SR 1 Supplementary Non-Destructive Inspection for Grades H40, J55, K55 and N80

Delete this section.

SR 9 Coupling Blanks - Group 4 Only

Delete this section.

SR 10 Upset Casing - Group 4 Only

Delete this section.

SR 11 Electric Welded Casing - Group 3 and Group 4

Delete this section.

SR 12 Statistical Impact Testing - Group 4

Delete this section.

SR 16 Impact Testing (Charpy V-Notch) for Pipe in Groups 1, 2 and 3

SR 16.1. CHARPY V-NOTCH (CVN) - GENERAL REQUIREMENTS

Delete the last sentence of the first paragraph and replace it with the following:

Only one of the tested impact specimens may exhibit an absorbed energy below that specified and, in this case, the measured absorbed energy shall not be below 75% of the specified absorbed energy.

SR 16.2. CHARPY V-NOTCH - IMPACT REQUIREMENTS FOR PIPE AND FOR EXTERNALLY THREADED CONNECTOR MATERIAL. GROUPS 1, 2 AND 3.

SR 16.2.1 Group 1: Grade H-40 only

Delete this section.

SR 16.2.2 Group 1: Grades J-55 and K-55 only

Delete this section.

SR 16.2.3 Group 1: Grade N-80 only, and Groups 2 and 3

1. Transverse requirement.

Delete this section and replace it with the following:

The minimum full size CVN absorbed energy requirement shall be 20 J or as specified in Table SR 16.5, whichever is greater.

2. Longitudinal requirement.

Delete this section and replace it with the following:

The minimum full size CVN absorbed energy requirement shall be 35 J or as specified in Table SR 16.6, whichever is greater

SR 16.3 IMPACT TEST PROCEDURES

SR 16.3.1 General Procedures

Delete this section and replace it with the following:

Charpy testing shall be carried out in accordance with ASTM A 370, together with the amendments in this specification.

SR 16.3.3 Test Temperature

Delete this section and replace it with the following:

The test temperature shall be 0 °C.

SR 16.3.5 Sub-size Test Temperature Reduction, Group 1: Grades H-40, J-55 and K-55 Only

Delete this section.

SR 16.3.6 Frequency of Testing, Groups 1, 2 and 3

Delete this section and replace it with the following:

Each pipe selected for a product analysis shall be subjected to Charpy testing.

ANNEX C INSPECTION BY THE PRINCIPAL

C.1 INSPECTION NOTICE

Add to this section:

The Principal shall specify whether, and to what extent, he will monitor the Manufacturer's production, quality control, HSE Management and inspection. A suggested extent of Principal's inspection (for the Principal to confirm or amend) is included in Annex E.

C.2 PLANT ACCESS

Add to this section:

Sufficient lighting (more than 500 lux) both overhead and at pipe ends shall be provided at the inspection area. Facilities shall be provided for rolling each pipe joint for inspection. The Manufacturer shall make ultrasonic or other suitable equipment available for use by the Principal to check the wall thickness where any defects have been ground out of the pipe.

C.4 REJECTION

Add to this section:

If the Principal has to reject pipe repeatedly for any recurring cause, this shall be reason to refuse further pipes for final examination until the cause has been rectified.

ANNEX D MINIMUM REQUIREMENTS FOR THE QUALITY PLAN

The Quality Plan shall include:

1. List of contents.
2. The date of issue, revision number and person(s) responsible for the execution of the Quality Plan.
3. A 'Statement of Authority' confirming the authority of the document.
4. References detailing the document upon which the plan is based, i.e. the Manufacturer's Quality Manual or the Purchase Order and Specification.
5. The Manufacturer's organisation, indicating names, responsibilities and reporting lines.
6. The procedure for the revision of actions included in the Quality Plan, before and during manufacture.
7. The procedure for providing the Principal with the required information and documentation. The number of copies of documents will be specified by the Principal when approving the Quality Plan.
8. Access arrangements for the Principal and facilities at his disposal (see Annex C).
9. A flow diagram showing all of the proposed tests and inspection in the sequence of the pipe and coupling fabrication, and indicating:
   - pipe and coupling fabrication stage
   - inspection action
   - location
   - relevant inspection procedure
   - acceptance criteria
   - responsibility to carry out inspection
   - involvement of inspector (Witness, Review, Hold).
10. Copies of all the applicable manufacturing, test and inspection procedures referenced including:
    - title
    - revision number
    - date
    - author
    - authority for approving changes.

ANNEX E SUMMARY OF PRINCIPAL'S INSPECTION

SEQUENCE NO	INSPECTION ACTION	FULL RUNNING	LIMITED RUNNING	FULL FINAL	LIMITED FINAL
1.0	Attendance in the mill during production	Yes	Spot	No	No
2.0	Manufacturing Procedure Specification	RA	RA/RR	RR	-
3.0	Pre-manufacturing meeting	E*	E*	E*	-
4.0	Quality Control Plan	RA	RA	RA	RA
5.0	Mill production				
5.1	Pipe rolling	SWA	SWA	-	-
5.2	Heat treatment	FW/RR	FW/RR	RR	RR
5.3	Sampling test pieces	E	E	-	-
5.4	Physical properties	FW/RC	FW/RC	RC	RC
5.5	Hydrostatic test	FW/RC	FW/RC	RC	RC
5.6	NDT for acceptance	FW/RR	FW/RR	RR/RC	RR/RC
5.7	Visual inspection				
5.7.1	Dimensions	SW/SE/RR	SW/SE/RR	SE/RR	SE/RR
5.7.2	Preservation/packing	SW	SW	SW	SW
5.7.3	Marking (incl. ship marks)	SW	SW	SW	SW
6.0	Document review				
6.1	Production records	RR	RR	RR	RR
6.2	Tally lists	RR	RR	RR	RR
6.3	Certificates	RC	RC	RC	RC
6.4	Release note	E	E	E	E
7.0	Manufacturing Procedure Qualification Test	W/RC	W/RC	RC	RC

Abbreviations:

E Execution by Principal Inspector.
FW Witness first operation for compliance, including check of calibrations; subsequently random inspection, review document and endorse for acceptance.
RA Review document and endorse for acceptance.
RC Review certificate and endorse for acceptance.
RR Review production records and endorse for acceptance.
SE Random execution by Principal.
SW Random witness by Principal.
SWA Random witness applicable when pipe forming is part of finishing line (e.g. there is no additional heat treatment on a different line).
W Full witness.
* When specified on the purchase order.

Where there is a requirement for the Principal to inspect the casing/tubing or witness tests, at least 5 working days notice (unless otherwise agreed) shall be given by the Manufacturer of the time and the location at which the inspection or test is to be made.

PART III REFERENCES

In this DEP reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

SHELL STANDARDS

Index to DEP publications and standard specifications	DEP 00.00.05.05-Gen.
Performance evaluation of commercially available thread protectors, by E.J.C. Spruijt, Koninklijke/Shell E&P Laboratorium. Paper presented at IADC/SPE Drilling Conference, Dallas, Feb. 28 - Mar 2 1988	IADC/SPE Paper 17029

AMERICAN STANDARDS

Practice for ultrasonic examination of heavy steel forgings	ASTM A 388
Standard guide for metallographic photomicrography	ASTM E 883

Issued by:
American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103
USA.

GERMAN STANDARDS

Ultrasonically tested heavy plate; technical delivery specifications	SEL 072

Issued by:
Stahl-Eisen-Lieferbedingungen
Deutsches Institut für Normung e.V.
Burggrafenstrasse 6
Postfach 1107
D-1000 Berlin 30
Germany.

INTERNATIONAL STANDARDS

Metallic materials - Hardness test - Rockwell test	ISO 6508
Preparation of steel substrates before application of paints and related products; visual assessment of surface cleanliness; Part 1: rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings	ISO 8501 Part 1
Quality systems - Model for quality assurance in design, development, production, installation and servicing	ISO 9001
Non-destructive testing; qualification and certification of personnel	ISO 9712
Steel and steel products - Inspection documents	ISO 10474
Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells (API Spec 5CT)	ISO/DIS 11960.2 (July 14, 1994).

Issued by:
International Organisation for Standardisation
1 Rue de Varembé
CH-1211 Geneva 20
Switzerland.
Copies may also be obtained through the national standards organisations.