CORINTH PIPEWORKS
PIPE INDUSTRY SA

- **PRODUCTION TECHNOLOGY – METHODOLOGY, TECHNICAL EQUIPMENT;**

Attached you may find:

1. The list of manufacturing and testing equipment to be used on the project.
2. Summary sections describing the main involved manufacturing processes.
3. Charts to demonstrate the range of our production capabilities safely cover the demands of the project
4. A project specific Quality plan

Please note as well that the entire operations of our company, including all production phases are traceable and managed through our SAP ERP system.

The attached data describe the technical means – type of equipment, software, etc., which CPW intends to use. They justify the impact of the selected technical means on the quality of the performance, as the capacity –both in terms of production and quality- of our organization safely covers the standards of the project

In the following section we are presenting:

- List of equipment
- Summary of the main manufacturing processes
- Range charts
- Quality plan

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LIST OF EQUIPMENT

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CPW SAWH MILL / LIST OF EQUIPMENT (06/2010)

A. BASIC DESCRIPTION OS SAWH MILL PRODUCTION EQUIPMENT

UNIT	MANUFACTURER	YEAR OF MANUFACTURE	PIPE DIAM. (MM)	STRIP WIDTH (mm)	WALL THICKNESS (mm)	PIPE WEIGHT (kgr/m)	PIPE LENGTH (m)	TACK WELDING (m/min)	MATERIAL QUALITY	WELDING SPEED (m/min)	TEEST PRESSURE (BAR)	FACE PLATE SPEED (rpm)	LIFT CAPABILITY (Tn)
SPM (1ST STEP) INCLUDING COIL FEEDING – ECOILING – EGE MILLING –FORMING – TACK WELDING AND PIPE CUTTING	MEG	2000	24-100	1000-1850	6-25	Max. 1580	8-18	13 max.	Max. API 5L/ISO 3183 grade X80M				
OFF LINE WELDING STATION 1,2,3	MEG	2001	24-100		6-25	Max. 1580	8-18			0,5-3			
OFF LINE WELDING STATION 4	MEG	2008	24-100		6-25	Max. 1580	8-18			0,5-3			
HYDROSTATIC TESTING MACHINE	MEG	2000	24-100		6-25	Max. 1580	8-18				Up to 320		
PIPE END BEVELLING MACHINE	MEG	2000	24-100		6-25	Max. 1580	8-18					6-60	
CRANES	DEMAG	2000											45
	DEMAG	2000											20
	DEMAG	2001											20
	DEMAG	2001											20
OVENS	THERMAWATT	2000											
	ELECTROHEAT AB SWEDEN	1999											

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B. LIST OF SAWH MILL NON DESTRUCTIVE EQUIPMENT

UNIT	MANUFACTURER / TYPE	UT PROBES	DATE OF PURCHASE	OTHER CHARACTERISTICS
WELD SEAM AND HAZ INSPECTION FOR LONGITUDINAL, TRANSVERSE AND LAMINAL DEFECTS	KRAUTKRAMER SNUP/REP (s.n. 771733)	10 PROBES W45Z4NB18, 45°, 4MHz, 8X9mm W60Z4NB18, 60° 4MHz, 8X9mm W70Z4NB18, 70°, 4MHz, 8X9mm IA-FG10.6X35A, 0° , 10MHz, 6X35mm	2001	• UNIVIS SYSTEM WITH 16 CHANNEL CAPACITY • PIPE DIAMETER: 24" – 100" • WALL THICKNESS: 5,0mm – 25,0 mm • SCANNING SPEED: 20 m/min max. • PULSE REPETITION FREQUENCY: 20.000Hz • ELECTRONIC STORAGE AND EVALUATION OF RESULTS
PIPE BODY UT INSPECTION FOR LAMINAR DEFECTS (FBUT)	KRAUTKRAMER OPR (s.n. 771733)	6 PROBES SEG 5NC, 0°, 5MHz, 6mm x 25mm	2001	• UNIVIS SYSTEM WITH 16 CHANNEL CAPACITY • PIPE DIAMETER: 24" – 100" • WALL THICKNESS: 5,0mm – 25,0 mm • SCANNING SPEED: 20 m/min max. • PULSE REPETITION FREQUENCY: 20.000Hz • ELECTRONIC STORAGE AND EVALUATION OF RESULTS
PORTABLE UT EQUIPMENT	KRAUTKRAMER USN 52 / USM 35 / StressTel FlawMike	45° (MWB45) / 60° (MWB60) / 70° (MWB70) 4MHz, 8x9mm MSEB4, 0° 4MHz, 3,5x10mm	2001 – 2008	
PIPE END RADIOGRAPHY	<u>X-Ray Sources</u> P.SEIFERT - ERESCO 42MF2 (2 UNITS) P.SEIFERT - ERESCO 42MF3 (1UNIT) <u>Viewers</u> RICH SEIFERT KOWOLUX		2001 2004 2001 2006	• VOLTAGE MAX : 200kV • CURRENT MAX : 0,5-10 mA (4,5mA στα 200kV) • 230V. 50Hz, 45.000cd/m² D=3,7 • 230V. 50Hz, 50.000cd/m² D=3,7
FLUOROSCOPY	P.SEIFERT - ISOVOLT XS 225M2		2001	• REAL TIME RADIOGRAPHY AND MAGNETIC MEAN STORAGE • POWER: 225kV, 7mA • IMAGE INTENSIFIER • VISTAPLUS IMAGE ANALYSIS SOFTWARE
EQUIPMENT FOR DIMENSIONAL CONTROL	• PREISSER : VERNIER CALIPERS • PREISSER : MEASURING TAPES • MITUTOYO : DIAL INDICATORS • STANLEY : METERS • KRAUTKRAMER : WALL THICKNESS METER DM4			

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CPW SAWL MILL / LIST OF EQUIPMENT (12/2015)

A. MANUFACTURING EQUIPMENT

Unit	Manufacturer / Type	Scope	Other Characteristics
Plate Edge Milling	SMS	Weld-seam preparation of the longitudinal plate edges with rotating cutter heads	Number of milling heads: 2 Plate feed: max. 20 m/min
Crimping Press	SMS	Two C-presses arranged opposite of each other to simultaneously crimp both plate edges	Crimping force for each C-press: 22MN
JCO® Pipe Forming	SMS	Press for the stepwise forming of the crimped steel plate into an open-seam pipe.	Diameter range: 16" – 56" Press force of the bending beam: 100MN Effective bending length : 19,100mm Synchronism accuracy of beam under load: 0,5mm
Pipe Finishing Press	SMS	For further closing of thick-walled pipes (especially with small diameter)	Diameter range: 16" – 56" Press force of the bending beam: 25MN Effective bending length : 13,000mm (max. pipe length: 12,300mm) Synchronism accuracy of beam under load: 0,5mm
Hydraulic tack-welding machine	SMS	For the temporary inert-gas welding of the open-seam pipe as preparation for the subsequent final inside and outside submerged-arc welding processes	Welding technology: Ar/CO2 MAG Welding speed: max. 8 m/min Welding wire diameter: 2,4-4,8mm Number of roller beams: 9
SAW inside welding machine	SMS	For the execution of the ID SAW welding	Number of welding stations: 2 Welding process: SAW Number of welding heads: 1 for 3-ARC or 4-ARC Welding speed: 0,5 – 3 m/min

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Unit	Manufacturer / Type	Scope	Other Characteristics
SAW outside welding machine	SMS	For the execution of the OD SAW welding	Number of welding stations: 2 Welding process: SAW Number of welding heads: 1 for 3, 4 or 5-ARC Welding speed: 0,5 – 3 m/min
Single-head Mechanical Expander	SMS	For the calibration of pipes	Cylinder force: 11MN Max. pipe length to be expanded (with pipe rotation): 12,8m (18,3m) Max. permanent expansion rate: 1,5% Cylinder positioning accuracy: ±1,0mm
Hydrostatic Pipe Tester	SMS	For high pressure testing of pipes	Testing fluid: Water (with appropriate corrosion and biological activity inhibitors) Maximum test pressure: 650bar (as far as max. end load is not exceeded) Pressure holding time range: 0 – 60s Inclination of press: 0 deg

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B. NON DESTRUCTIVE EQUIPMENT

Unit	Manufacturer / Type	UT Probes	Other Characteristics
Plate and area adjacent to the weld seam ultrasonic inspection for laminar imperfections	GE Type OBPE-Plate	24 straight broad beam probes (type IA-FR10.4,5x60 B test frequency 10 MHz, angle of incidence 0° 4.5x60 mm rectangular element, probe housing 18x70 mm)	Evaluation program "UNIVIS" for both calibration and automated testing. Plate Width: 1435 - 4800 mm Plate Thickness: 8 - 40 mm Test Speed: max. 20 m/min movement of oscillating device max. speed of plate depending on plate width (2 - 11 m/min) Test Area: Up to 100% of Plate + 100% of 100mm area adjacent to the weld seam (Plate longitudinal edges) Pulse Repetition Frequency: max. 20,000 Hz. Probes Overlap: Approx. 4 mm.
Mill control ultrasonic inspection of the weld seam and HAZ, prior to pipe cold expansion, for the detection of longitudinal and transverse defects.	GE Type SNUP-LO/OFF	• 4 Composite angle beam probes Alternative type: W 70 K4 NB 1A, 4 MHz, 70°, 8x9 mm) W 60 K4 NB 1A, 4 MHz, 60°, 8x9 mm) W 60 K2 GC 2, 2 MHz, 60°, 14x14 mm) W 45 K4 NB 1A, 4 MHz, 45°, 8x9 mm) • 1 on-bead Wheel probe with three elements (two composite 45° angle probes for the detection of transverse defects and one normal probe for the control of continuous coupling).	Diameter: 16"- 60" (406 - 1524 mm) Wall Thickness: 8 - 40 mm Pipe Length: 8 – 18 m Pulse repetition frequency: Max. 20,000 Hz (typical 6000Hz divided by the number of testing cycles). Coupling medium: Water
Mill control digital radiographic inspection.	YXRAY SYSTEMS RTS FD 1.2.165		Voltage max. : 320Kv Focal spot size: 0,4 mm / 0,8 kW and 1,0 mm / 1,8 kW

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Unit	Manufacturer / Type	UT Probes	Other Characteristics
Final ultrasonic inspection of the weld seam and HAZ for the detection of longitudinal and transverse defects and for laminar imperfections at pipes ends.	GE Type SNUP-LO/OFF-REP-PAT	• 8 Phased Array probes (3 MHz, 32 elements 14x14 mm) • 8 Phased Array probes (3 MHz, 20 elements, 8x9 mm) • 1 Straight broad beam probe (type IA-FR10.4,5x60 B, 10 MHz, 0°, 4.5x60 mm • 2 Composite angle beam probes (type W 45 K4 NB 1A. 4 MHz, 45°, 8x9 mm) • 2 Composite angle beam probes (type W 70 K4 NB 1A, 4 MHz, 70°, 8x9 mm) • 2 Composite angle beam probes (type W 60 K4 NB 1A, 4 MHz, 60°, 8x9 mm) • 2 Composite angle beam probes (type W 60 K2 GC 2, 2 MHz, 60°, 14x14 mm)	Diameter: 16" – 60" (406 – 1524 mm) Wall thickness: 8 – 40 mm Pipe Length: 8 – 18 m Longitudinal Testing Speed: Max. 20 m/min Testing Speed at Pipe Ends: 100-300 mm/s circumferential speed Pulse repetition frequency: Max. 20,000 Hz divided by the number of focal laws.
Final ultrasonic inspection of the weld seam and HAZ for the detection of longitudinal and transverse defects and for laminar imperfections at pipes ends.	GE Type SNUP-LO/OFF-REP-PAT	• 8 Phased Array probes (3 MHz, 32 elements 14x14 mm) • 8 Phased Array probes (3 MHz, 20 elements, 8x9 mm) • 1 Straight broad beam probe (type IA-FR10.4,5x60 B, 10 MHz, 0°, 4.5x60 mm • 2 Composite angle beam probes (type W 45 K4 NB 1A. 4 MHz, 45°, 8x9 mm) • 2 Composite angle beam probes (type W 70 K4 NB 1A, 4 MHz, 70°, 8x9 mm) • 2 Composite angle beam probes (type W 60 K4 NB 1A, 4 MHz, 60°, 8x9 mm) • 2 Composite angle beam probes (type W 60 K2 GC 2, 2 MHz, 60°, 14x14 mm)	Diameter: 16" – 60" (406 – 1524 mm) Wall thickness: 8 – 40 mm Pipe Length: 8 – 18 m Longitudinal Testing Speed: Max. 20 m/min Testing Speed at Pipe Ends: 100-300 mm/s circumferential speed Pulse repetition frequency: Max. 20,000 Hz divided by the number of focal laws.

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Unit	Manufacturer / Type	UT Probes	Other Characteristics
Portable UT equipment	KRAUTKRAMER USN 52 / USM 35 / StressTel FlawMike	45° (MWB45) / 60° (MWB60) / 70° (MWB70) 4MHz, 8x9mm MSEB4, 0° 4MHz, 3,5x10mm	
	Olympus OMNISCAN MX2	Phased Array Probes: 5L16-A10 / SA10-N55S 5L64-A12 / SA12-N55S	
Pipe end radiography	P.SEIFERT – ERESCO 42MF2 (2 Units) P.SEIFERT – ERESCO 42MF3 (1Unit)		• Voltage max. : 200kV • Current max : 0,5-10 mA (4,5mA – 200kV)
Fluoroscopy	P.SEIFERT – ISOVOLT XS 225M2		• Power: 225kV, 7mA
Computed radiography scanning system	GE CRxVision		BSR: (MR) 70 μm / 80 μm (HR) 35 μm / 40 μm TFT Monitor, 2MP, 1500:1 contrast ratio, 420 cd/qm brightness, 21.3 inch

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Quality Control Laboratory

Technical File

Plant	Corinth Pipeworks S.A.,Thisvi plant
Issued by	T. Tsakoumas, Laboratory Manager
Reviewed by	N. Voudouris, Quality Director
Date	12.10.2016
Revision	4

A. Accreditation

EN ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories"

Accreditation body: ESYD (Hellenic Accreditation System)
Certificate Nr: 113

Accredited tests: Tensile testing; Bend Testing; Charpy-V Impact testing; Hardness Testing; Chemical analysis. Conformity assessment- General requirements for proficiency testing according to ISO 17043.

B. Testing of pipes and hollow sections (Production units: HFW, SAWH, SAWL)

B.1 Tensile testing

B.1.a Applicable standards and specifications:
Testing: ASTM E-8, ASTM A370, ISO 6892-1,2, EN 10002-1
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, EN10208-2, EN 10219, DNV-OS-F101

B.1.b. Equipment

Description	Type / model	Pos.	Additional information
Tensile testing machine	Zwick/ Roell Z1200E	1	• Maximum load: 1200 kN (120 t) • Electromechanical drive • Incremental extensometer Zwick MAkroXtens • Monotonic tensile testing of steel grades up to X120 and specimen thicknesses up to 40 mm • Testing of either flattened strip specimens or round bar • Simultaneous determination of $R_{p0.2}$ and $R_{t0.5}$ • Automatic elongation determination • Pre-strain capability to minimize effects of specimen flattening • Annual calibration of load-cell and extensometer • Tensile testing at elevated temperatures (up to +250°C) via use of environmental chamber

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Tensile testing machine	INSTRON 8800 Load frame: 4493	1	• Maximum load: 600KN (covers grade X100/ thickness 25mm for API specimen size). • Testing of either flattened strip specimens or round bar • Simultaneous determination of $R_{p0.2}$ and $R_{t0.5}$ • Automatic elongation determination • Pre-strain capability to minimize effects of specimen flattening • Annual calibration of load-cell and extensometer

B.2 Compression testing

B.2.a Applicable standards and specifications:
Testing: ASTM E-9

B.2.b. Equipment

Description	Type / model	Pos.	Additional information
Tensile testing machine	Zwick/ Roell Z1200E	1	• Electromechanical drive • Compression kit capacity: 250kN • Annual calibration of load-cell and extensometer

B.3 Monotonic and cyclic strain testing

B.3.a Applicable standards and specifications:
Testing: Customer's specification

B.3.b. Equipment

Description	Type / model	Pos.	Additional information
Tensile testing machine	Zwick/ Roell Z1200E	1	• Maximum load: 1200 kN (120 t) • Cyclic loading testing capacity (tension-compression) • Automatic strain level determination using incremental extensometer Zwick MAkroXtens
Tensile testing machine	INSTRON 8800 Load frame: 4493	1	• Maximum load: 600KN. • Monotonic loading testing capacity (tension) • Automatic strain level determination using extensometer

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B.4 CHARPY-V impact testing

B.4.a Applicable standards and specifications:
Testing: ASTM E-23, ASTM A370, ISO 148-1, EN 10045-1
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, EN10208-2, EN 10219, DNV-OS-F101

B.4.b. Equipment

Description	Type / model	Pos.	Additional information
Charpy-V impact testing machine	Pendulum type INSTRON WOLPERT PW -30	1	• ASTM striker radius • Maximum capacity: 450J • Digital display • Liquid bath cooling system (minimum temperature: -78°C). • Bath temperature monitoring with digital thermometer (±0,1°C) • Specimen centering tongue acc. to ASTM E23 • Testing of specimen dimensions with ASTM Go-no-Go caliper • Annual direct and indirect (NIST specimens) calibration
Charpy-V impact testing machine	Pendulum type TINIUS OLSEN	1	• EN striker radius • Maximum capacity: 300J • Analog display • Liquid bath cooling system (minimum temperature: -78°C) • Bath temperature monitoring with digital thermometer (±0,1°C) • Testing of specimen dimensions with ASTM Go-no-Go caliper (complies also to EN) • Annual direct calibration
V-notch broaching machine	BLACKS EQUIPMENT	1	• Motorized with adjustable speed • According to ASTM/ISO/EN requirements
V-notch broaching machine	BLACKS EQUIPMENT	1	• Manual forwarding • According to ASTM/ISO/EN requirements

B.5 Batelle Drop Weight Tear (BDWTT) testing

B.5.a Applicable standards and specifications:
Testing: API RP5L3, EN10274
Pipe manufacturing (typical): API 5L, ISO 3183, EN10208-2, DNV-OS-F101

B.5.b. Equipment

Description	Type / model	Pos.	Additional information

DWTT testing machine	CPW/DEMAG	1	• Testing temperature (Room down to -78°C) • Non-instrumented testing • Maximum capacity (3000kgs x 2,50m = 7500J)

B.6 Hardness Testing

B.6.a Applicable standards and specifications:
Testing: ISO 6507, ASTM E92, ASTM E384
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, EN10208-2, DNV-OS-F101

B.6.b. Equipment

Description	Type / model	Pos.	Additional information
Hardness testing machine	SHIMADZU HSV-30	1	• Vickers testing with adjustable load (0.2 – 30) kgf • Results can be converted to HRC scale • Digital display with result storage • Annually equipment direct and indirect (reference hardness block) calibration.
Hardness testing (portable)	ERNST COMPUTEST	1	• HRC testing (up to 70HRC) • Annually indirect (reference hardness blocks) calibration.

B.7 Bend Testing

B.7.a Applicable standards and specifications:
Testing: ISO 5173, ISO 7438, EN910, ASTM A370
Pipe manufacturing (typical): API 5L, ISO 3183, EN10208-2, EN 10219, DNV-OS-F101

B.7.b. Equipment

Description	Type / model	Pos.	Additional information
Bend testing machine	TINIUS OLSEN	1	• Root, face and side-bend testing • Reverse bend testing up to 20'' (upon agreement) • Various mandrel sizes available depending on tested wall thickness and diameter

B.8 Metallography / Macro examination

B.8.a Applicable standards and specifications:
Testing: ASTM E112
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, EN10208-2, DNV-OS-F101

B.8.b. Equipment

Description	Type / model	Pos.	Additional information

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Metallographic preparation equipment	STRUERS	1	• Pre-grinding, grinding and final polishing (diamond-paste) equipment up to 1μm.
Metallographic microscope	LEICA DM 2500M	1	• Available magnification levels: 50x, 100x, 200x, 500x and 1000x
Stereoscope	LEICA MZ 7,5	1	• Adjustable magnification from 6.3x up to 50x
Digital camera and image analysis	NIKON	1	• Image and video capturing • 4Mpixel analysis

B.9 Chemical analysis

B.9.a Applicable standards and specifications:
Testing: ASTM A751, ASTM E415
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, EN10208-2, EN 10219, DNV-OS-F101

B.9.b. Equipment

Description	Type / model	Pos.	Additional information
Optical emission spectrometer	SPECTROLAB M-8	1	• Calibrated for HSLA steels • Analyzed elements: C,Si,Mn,P,S,Cr,Mo,Ni,Al,Co,Cu,Nb,Ti,V,W,Sn,As,Ca,Sb,N, B, CE (P_{cm} and IIW)

B.10 Sour service (HIC & SSCC) corrosion testing

B.10.a Applicable standards B.9.a Applicable standards and specifications:
Testing: NACE TM 0284, NACE TM 0177
Pipe manufacturing (typical): API 5L, ISO 3183, API 5CT, DNV-OS-F101

Description	Type / model	Pos.	Additional information
Glass testing vessels	Cormet Ltd.	3	• Simultaneous execution of HIC and SSCC tests. • 28 lt volume each • Large testing capacities (e.g. HIC testing up to 100 specimens,5mm thick at once)
Four point bend (FPB) loading devices	Cormet Ltd.	29	• 316L stainless steel load frames with Teflon derivative coating (corrosion resistant) • Conformance with ASTM G39 and ISO 7539-2 international standards
Stress frame for FPB loading devices	Cormet Ltd.	1	• Deflection method utilization (acc. to ASTM G39) • Mitutoyo micrometer for deflection measurement
Temperature control system	Lauda ECO RE 1050	1	• Recirculating chiller • Retention of constant temperature conditions during HIC and/or SSCC testing
Pressure gauges	Swagelok	10	• Pressure control

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Precision balances	Ohaus	2	• Precision balance 0-15Kg • Precision balance 0-810g
Flowmeters	Kytölä Finland	10	• Gas flow control
Gas alarm system	Dräger Regend 3910	1	• Gas concentration control system

C. Testing of external coating (3LPE, 3LPP, FBE) and lining

C.1 Cathodic disbondment test

C.1.a Applicable standards and specifications:
ASTM G8, CSA Z245.20, CSA Z245.21, ISO 21809-1 Annex H

C.1.b. Equipment

Description	Type / model	Pos.	Additional information
Heating furnace	THERMAWATT TG210L	2	Temperature range: (50 – 350)°C
Heating furnace	THERMAWATT TG104	1	Temperature range: (50 – 250)°C
Potentiometer	COESFELD MCP4	4	• Max voltage: 2,0V • Total simultaneous testing positions: 4x4 = 16
Potentiometer	COESFELD	1	• Max voltage: 3,5V • Total simultaneous testing positions: 3
Potentiometer	METRIX AX502	1	• Max voltage: 3,5V • Total simultaneous testing positions: 2
Potentiometer	ISO TECH IPS 3303D	2	• Applicable voltage range:1,5-32V • Total simultaneous testing positions: 3

C.2 Differential Scanning Calorimetry (DSC) testing

C.2.a Applicable standards and specifications:
ASTM E968, ASTM D3418, ASTM E793, ASTM D3895, ISO 11357-6, ISO 21809-1 Annex D

C.2.b. Equipment

Description	Type / model	Pos.	Additional information
DSC equipment	SHIMADZU DSC-50	3	• Heating rate: (1-50)°C/min • Temperature range: Room - 725°C • Inert gas (nitrogen) flow:20-50 ml/min • Measurement heat flow range: ±0,01 to ±100,0mW
Precision scale	ADP 210L	1	• Weighing range (0 -200)g • Precision: ±0.001g

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C.3 Gel-time testing

C.3.a Applicable standards and specifications:
CSA Z245.20, ISO 8130, ISO 21809-1 Annex J

C.3.b. Equipment

Description	Type / model	Pos.	Additional information
Hot plate	LabTech LHT- 2070D	1	• With digital display • Max. temperature: 300°C

C.4 Melt Flow Rate Index testing

C.4.a Applicable standards and specifications:
CSA Z245.21, ISO1133

C.4.b. Equipment

Description	Type / model	Pos.	Additional information
Melt Flow Tester	MELTIFLEXER 556-0011	1	• Weight: 2.16 / 5.0kgs • Max. temperature: 400°C
Precision scale	ADP 210L	1	• Scale (0 -200)g • Precision: ±0.001g

C.5 Hot Water Soak testing

C.5.a Applicable standards and specifications:
CSA Z245.20, ISO 21809-1 Annex M

C.5.b. Equipment

Description	Type / model	Pos.	Additional information
Heating furnace	THERMAWATT TG210L	2	Temperature range: (50 – 350)°C
Heating furnace	THERMAWATT TG104	1	Temperature range: (50 – 250)°C
Knife with special blade	STANLEY FatMax	1	

C.6 Polymer tensile testing

C.6.a Applicable standards and specifications:
DIN30670, ISO 527-3

C.6.b. Equipment

Description	Type / model	Pos.	Additional information
Polymer tensile testing machine	INSTRON 4411	1	• Max. Capacity: 5kN • Determination of elongation and tensile strength
Specimen preparation	COESFELD	2	According to DIN30670 (specimen type 2 and 4)

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knives			and ISO 527-2 (specimen type 1A).

C.7 Indentation Testing

C.7.a Applicable standards and specifications:
DIN30670, ASTM G17, ISO 21809-1 Annex F

C.7.b. Equipment

Description	Type / model	Pos.	Additional information
Penetration Resistance Testing Unit	COESFELD	3	• 3 positions per unit for simultaneous testing • Testing temperature: Room to +120°C

C.8 Coating Flexibility (Bend) Testing

C.8.a Applicable standards and specifications:
CSA Z245.20, ISO 21809-1 Annex I

C.8.b. Equipment

Description	Type / model	Pos.	Additional information
Bend testing equipment	TINIUS OLSEN	1	Various mandrel sizes depending on bend radius required
Specimen cooling chamber	INSTRON SFL	1	• Temperature range: (-78 to +350)°C • Furnace dimensions: (30x30x30)cm^3

C.9 Abrasion Resistance Testing

C.9.a Applicable standards and specifications:
ASTM D4060

C.9.b. Equipment

Description	Type / model	Pos.	Additional information
Abrasion Resistance Tester	QC Tech 619T	1	• Wheel load: 500 / 1000g • Different wheel types available according to ASTM D4060

C.10 Sieve Analysis (Particle Size Distribution)

C.10.a Applicable standards and specifications:
ISO 8130, ISO 21809-2 Annex A6

C.10.b. Equipment

Description	Type / model	Pos.	Additional information
Sieve (motorized)	RETSCH AS 200	1	Available sieve range: (63μm – 2.00mm)
Precision scale	KERN PLJ 3500-2NM	1	• Scale (0 -3500)g • Precision: ±0.01g

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C.11 Moisture content

C.11.a Applicable standards and specifications:
CSA Z245.20, ISO 21809-1 Annex K

C.11.b. Equipment

Description	Type / model	Pos.	Additional information
Heating furnace	THERMAWATT TG210L	2	Temperature range: (50 – 350)°C
Heating furnace	THERMAWATT TG104	1	Temperature range: (50 – 250)°C
Precision scale	ADP 210L	1	• Scale (0 -200)g • Precision: ±0.001g
Dessicator		1	With Silica-gel drying medium

C.12 Porosity / contamination

C.11.a Applicable standards and specifications:
CSA Z245.20, ISO 21809-2 Annex A11

C.11.b. Equipment

Description	Type / model	Pos.	Additional information
Stereoscope	LEICA MZ 7,5	1	• Adjustable magnification from 6.3x up to 50x
Digital camera and image analysis	NIKON	1	• Image and video capturing • 4Mpixel analysis

C.13 Density determination

C.13.a Applicable standards and specifications:
ISO 1133

B.13.b. Equipment

Description	Type / model	Pos.	Additional information
Density Measurement Kit	KERN AES-A01	1	
Precision scale	KERN AES 220-4	1	• Scale (0-220)g • Precision: ±0.0001g

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COATING/LINING EQUIPMENT LIST

Date: 04/04/2016

HEAD OFFICES: 2-4 Mesogeion Av., 115 27 Athens, Greece
CORPORATE HEADQUARTERS: 33, Amarousiou-Halandriou Str., GR-15125, Marousi, Athens, Greece
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General Commercial Registry No: 003978401000
VAT Number: EL 099362325
Tax Office: FAE Athens

CORINTH PIPEWORKS

CORINTH PIPEWORKS
PIPE INDUSTRY S.A.

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1. COATING PLANT EQUIPMENT

1.1 Coating Plant TCP 48

General Data

Pipe OD range: 4 ½" to 48"
Pipe length: 8-18,3m

Major Equipment Data

Blasting units: ONE

Manufacturer: SELMERS
Year of manufacture: 2000
Connected Power: Approx. 230kW
Production capacity: 500-600 m²/h for surface quality SA2½

Acid Wash unit: ONE

Manufacturer: TKPS
Year of manufacture: 2014
Production capacity: 700 m²/h
Pipe OD range up to 48"

Induction Heating Units: Two operating in tandem

1st Unit
Manufacturer: AJAX Magnethermic Europe Ltd.
Year of manufacture: 2000
Output Power: 1500kW
Frequency of operation: 300Hz
Production capacity: at least 30t/h for FBE coating

2nd Unit
Manufacturer: AJAX Magnethermic Europe Ltd.
Year of manufacture: 1991-1992
Output Power: 1000kW
Frequency of operation: 300Hz
Production capacity: at least 24 t/h for FBE coating

Epoxy Powder Spraying Units: TWO

1st Unit
Manufacturer: Nordson
Year of manufacture: 2009
Number of guns: 22
Operating Voltage: Up to 100kV
Production capacity: >400 m²/h at 500μm

2nd Unit
Manufacturer: Nordson
Year of manufacture: 2015

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Number of guns: 16
Operating Voltage: Up to 100kV
Production capacity: >400 m²/h at 500μm

Adhesive Extruder: ONE, single screw

Manufacturer: Battenfeld Extrusiontechnik
Year of manufacture: 1998
Connected Power: 200 kVA
Production Capacity: 250 kg/h

Poly-olefin Extruder: ONE, single screw

Manufacturer: Battenfeld Extrusiontechnik
Year of manufacture: 1998
Connected Power: 800 kVA
Production Capacity:
- 2000 kg/h HDPE or MDPE
- 1600 Kg/h LDPE
- 1100 Kg/h PP

Pipe cooling tunnel: 35m long

Special design by CPW – highly versatile and adjustable to production needs; allows intensive internal cooling.
Pipe temperature at exit: well below 80°C
Flow rate: 200m³/h
Cooling Tower: Marley Davenport

Other facilities:

Pipe pre-washing withhigh pressure water (prior to blasting, max. 150bar)
Pipe drying (prior to blasting)
Pipe inside cleaning after blasting
Pipe chromate surface treatment: Available on request.

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1.2 Coating Plant TCP 100

General Data

Pipe OD range: 8 5/8" to 100"
Pipe length: 8-23,2m

Major Equipment Data

Blasting units: Two operating in tandem

1st Unit
Manufacturer: SELMERS
Year of manufacture: 2000 - 1
Connected Power: 230kW
Production capacity: 500 to 700+ m²/h for surface quality SA2½, depending on initial condition of the pipe

2nd Unit
Manufacturer: SELMERS
Year of manufacture: 2015
Connected Power: 230kW
Production capacity: 500 to 700+ m²/h for surface quality SA2½, depending on initial condition of the pipe

Acid Wash unit: ONE

Manufacturer: SELMERS
Year of manufacture: 2010
Production capacity: 700m²/h
Pipe OD range up to 60"

Induction Heating Units: ONE

Manufacturer: Ajax Magnathermic Europe Ltd.
Year of manufacture: 2000
Output Power: 3000kW
Frequency of operation: 100-300Hz (adjustable)

Epoxy Powder Spraying Units: TWO

1st Unit
Manufacturer: INTEC Maschinenbau GmbH
Year of manufacture: 2000
Number of guns: 30
Operating Voltage: Up to 100kV
Production capacity: 700 m²/h at 500μm

2nd Unit
Manufacturer: INTEK Maschinenbau GmbH
Year of manufacture: 2000
Number of guns: 12
Operating Voltage: Up to 100kV
Production capacity: 700 m²/h at 200μm

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Adhesive Extruder: ONE, single screw

Manufacturer: Battenfeld Extrusiontechnik
Year of manufacture: 2000-1
Connected Power: 200 kVA
Production Capacity: 250 kg/h

Poly-olefin Extruder: ONE single screw

Manufacturer: Battenfeld Extrusiontechnik
Year of manufacture: 2000-1
Connected Power: 800 kVA
Production Capacity:
• 2000 kg/h HDPE or MDPE
• 1600 Kg/h LDPE
• 1100 Kg/h PP

Pipe cooling tunnel: 35m long

Special design by CPW – highly versatile and adjustable to production needs; allows intensive internal cooling.
Pipe temperature at exit: well below 80°C
Flow rate: up to 600 m^3/h
Cooling Tower: Marley Davenport

Other facilities:

Pipe pre-washing with high pressure wsater (prior to blasdting, max 150bar)
Pipe drying (prior to blasting)
Pipe inside cleaning after blasting:
Pipe chromate or phosphate surface treatment: Available on request

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Tax Office: FAE Athens

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1.3 Lining Plant TLP 56

General Data

Pipe OD range: 8 5/8 to 56"
Pipe length: 8-23,2m
Liming method: 2 component epoxy resin

Major Equipment Data
Preheating Section: ONE

Manufacturer: BAUHUIS
Year of Manufacture: 2003
Connected Power: 15kW

Blasting units: TWO (Identical)

Manufacturer: SELMERS
Year of manufacture: 2000 (both)
Connected Power: 375kW each
Shot acceleration: Purely mechanical
Production capacity: (actual blasting – not including handling delays) based on 18 m pipe
Up to 100m²/h for pipe diameter equal to or smaller than 14"
Up to 225m²/h for diameters 16" - 20"
Up to 300m²/h for diameters 22" - 24"

Lining units: TWO

1st Unit
Manufacturer: BAUHUIS - WIWA
Year of manufacture: 2003
Connected Power: 50kW
Method of application: Multi Airless spray nozzles
Paint Mix System: Semiautomatic Premix System for FLOWCOAT Applications
Plural feed and Static Mixing for High Build Applications – including heaters
Production capacity: 700m²/h @ 400μm wet film thickness (actual lining – not including handling delays)
Equipped with heating mantle, for paint temperature regulation

2nd Unit
Manufacturer: WIWA
Year of manufacture: 2012
Connected Power: 50kW
Method of application: Multi Airless spray nozzles
Paint Mix System: Semiautomatic Premix System for FLOWCOAT Applications
Hydraulic pump for high solid paints
Plural feed and Static Mixing for High Build Applications – including heaters
Production capacity: 700m²/h @ 400μm wet film thickness (actual lining – not including handling delays)
Equipped with heating mantle, for paint temperature regulation.

Other facilities

Pipe drying (prior to balsting)
Curing room after paint application

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SUMMARY OF THE MAIN MANUFACTURING PROCESSES

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Summary of processes

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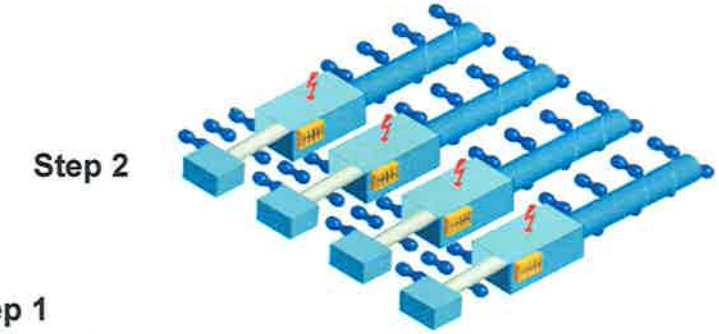
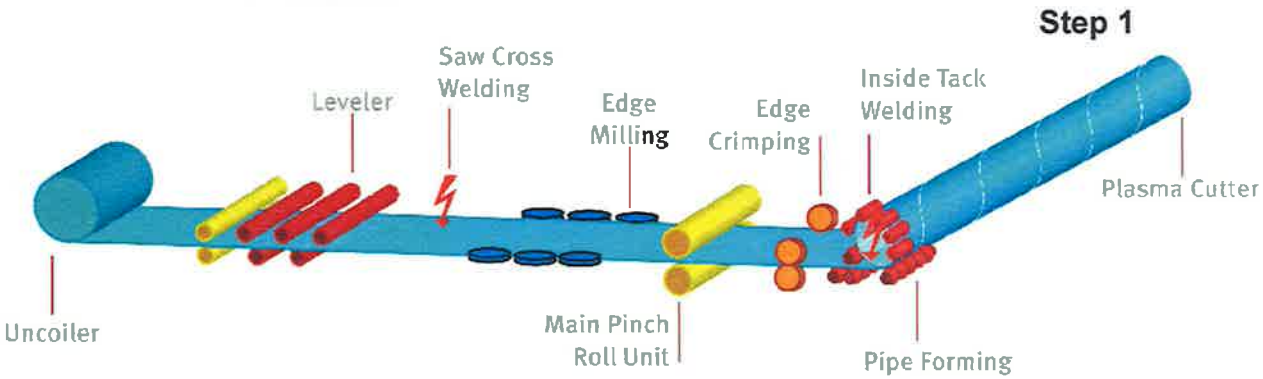
100" SAWH mill

STEP 1
- **3 – roll bending system and external roll cage for pipe forming**

STEP 2
- **Combined two-pass submerged – arc welding stands**
- **4 – stands**





Key advantages

- Excellent pipe geometry
- Uniform weld quality
- High productivity

Key capabilities

Grade: up to X80

Outside Diameter: 24'' – 100''

Wall Thickness: up to 25,4 mm

Pipe Length up to: 18 m (59')

Piling Pipe Length up to: 33 m (108')

Capacity: 375.000Tn/year

Manufacturer: MEG / SMS (Germany)

56” LSAW - JCOE

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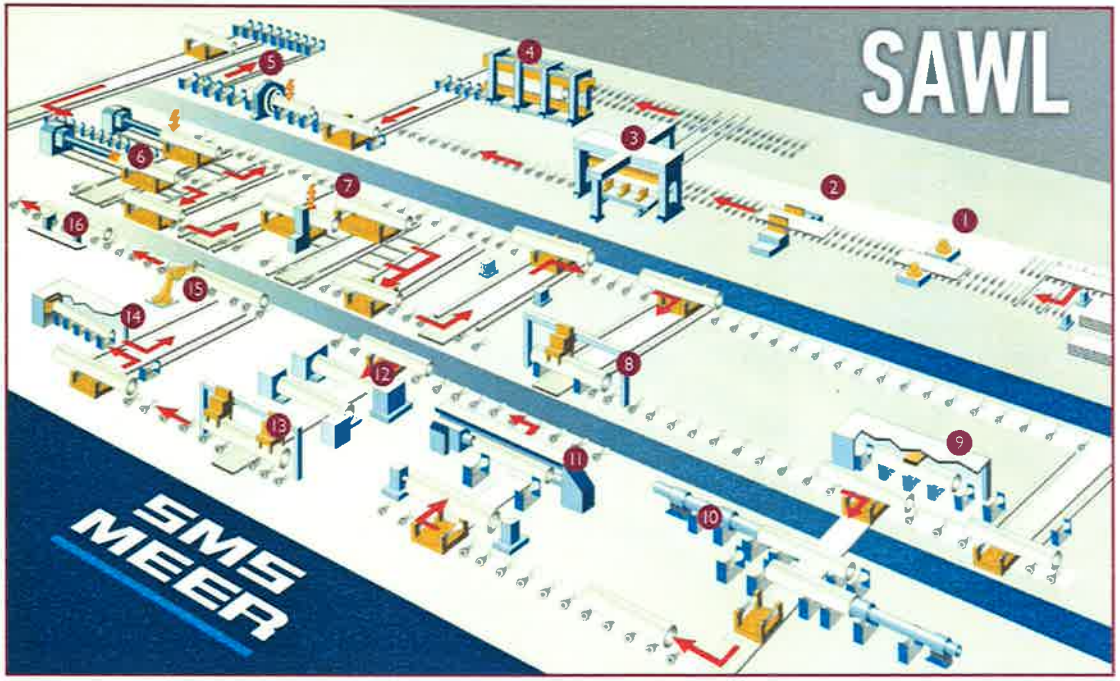

1. Plate edge milling
2. Crimping of plate edges
3. JCO-press
4. Finishing press
5. Tack welding (temporary se
6. Inside welding (ID)
7. Outside welding (OD)
8. Ultrasonic testing I
9. X-ray testing I
10. Mechanical Expansion
11. Hydrostatic pipe testing
12. Pipe end bevelling
13. Ultrasonic testing II
14. X-ray testing II
15. Robotic system for pipe en dimensional measurement
16. Visual / dimensional inspect

Edge Crimping | JCO Pipe forming | Mechanical expander | Hydrostatic testing | Ultrasonic testing

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56” LSAW - JCOE

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- **Production capabilities**

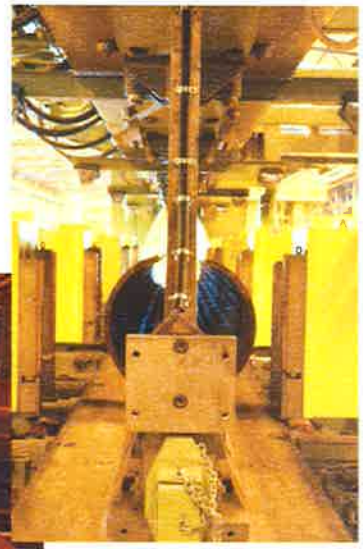
  O.D. : 16“ - 56“ (O.D. 16’’ with W.T. 1’’)

  W.T. : up to 40 mm,

  Length: up to 18.3m,

  Steel Grades up to X100

Sophisticated process control
‘ShapeView’



JCO Main press 10.000Tn

Finishing press for
small diameter /
high wall thickness

Expander

Hydrotest

Pipe end &
full body laser
measuring systems

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Coating solutions

Anti-corrosion coating and lining

2 production lines for external 3 layer PE / PP and FBE/ FBE-ARO coating
1 line for liquid Epoxy lining

	External		Internal (lining)
	1st line - TCP 48	2nd line - TCP 100	TLP 56
Outside Diameter (inch)	4 1/2''–48''	8 5/8''–100''	8 5/8''–56''
Max. Length (m)	18 m	24 m	24 m
Capacity (per year)	6.300.000 m^2		2.000.000 m^2

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RANGE CHARTS

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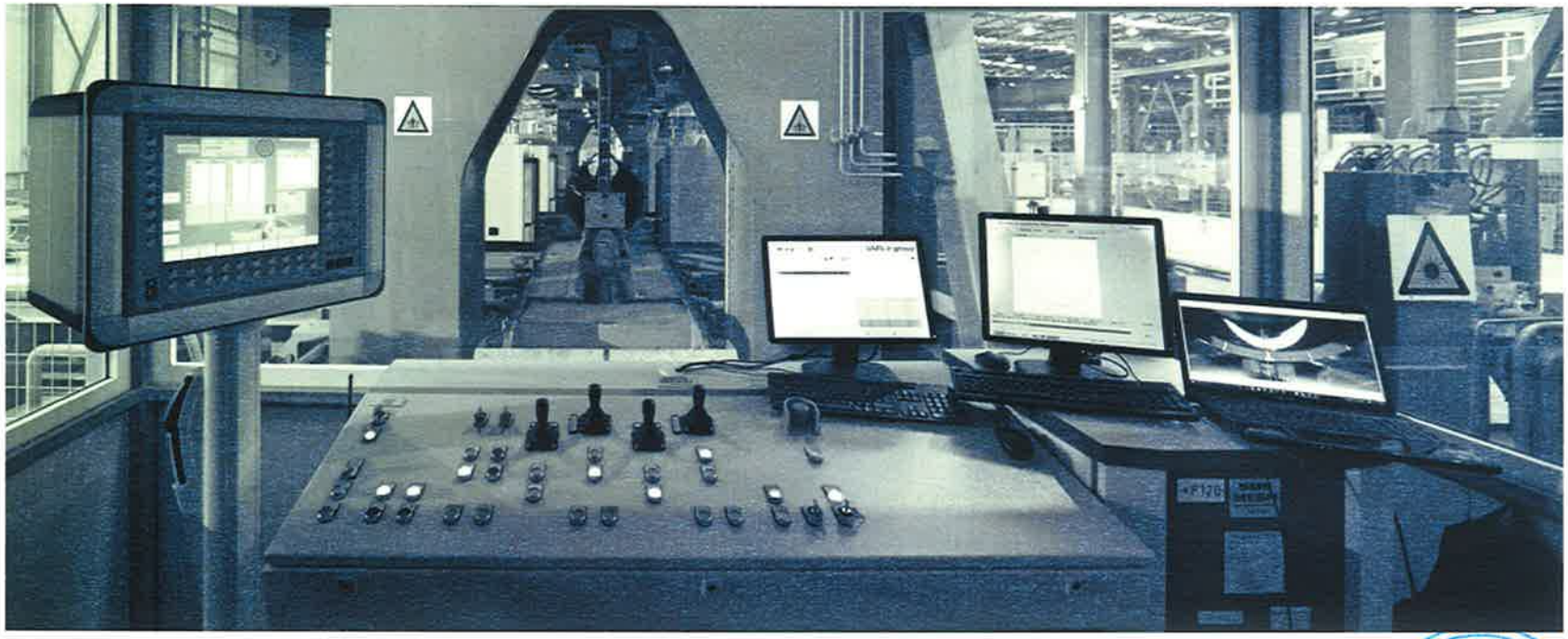

Production units – Range Data

100” SAWH mill - Production range

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Product range 100" HSAW pipe mill

Outside Diameter (in inches and mm)		4,00	4,50	5,00	5,60	6,35	7,14	7,92	8,74	9,53	10,31	11,13	12,70	14,27	15,88	17,48	19,05	20,62	22,23	25,40
100	2.540,0												■	■	■	■	■	■	■	■
96	2.438,4												■	■	■	■	■	■	■	■
92	2.336,8											■	■	■	■	■	■	■	■	■
88	2.235,2											■	■	■	■	■	■	■	■	■
84	2.133,6										■	■	■	■	■	■	■	■	■	■
80	2.032,0										■	■	■	■	■	■	■	■	■	■
76	1.930,4										■	■	■	■	■	■	■	■	■	■
72	1.828,8									■	■	■	■	■	■	■	■	■	■	■
68	1.727,2									■	■	■	■	■	■	■	■	■	■	■
64	1.625,6									■	■	■	■	■	■	■	■	■	■	■
60	1.524,0								■	■	■	■	■	■	■	■	■	■	■	■
56	1.422,4								■	■	■	■	■	■	■	■	■	■	■	■
52	1.320,8								■	■	■	■	■	■	■	■	■	■	■	■
48	1.219,2							■	■	■	■	■	■	■	■	■	■	■	■	■
44	1.117,6							■	■	■	■	■	■	■	■	■	■	■	■	■
40	1.016,0							■	■	■	■	■	■	■	■	■	■	■	■	■
36	914,4						■	■	■	■	■	■	■	■	■	■	■	■	■	■
32	812,8						■	■	■	■	■	■	■	■	■	■	■	■	■	
30	762,0						■	■	■	■	■	■	■	■	■	■	■	■		
28	711,2					■	■	■	■	■	■	■	■	■	■	■	■			
26	660,4					■	■	■	■	■	■	■	■	■	■	■	■			
24	609,6					■	■	■	■	■	■	■	■	■	■	■				
	mm																			
in		0,157	0,177	0,197	0,220	0,250	0,281	0,312	0,344	0,375	0,406	0,438	0,500	0,562	0,625	0,688	0,750	0,812	0,875	1,000

Wall thickness (in inches and mm)

■ API 5L / ISO 3183 grade BM/L245M up to X80M/L555M (Sour service up to X65MS / L450MS)

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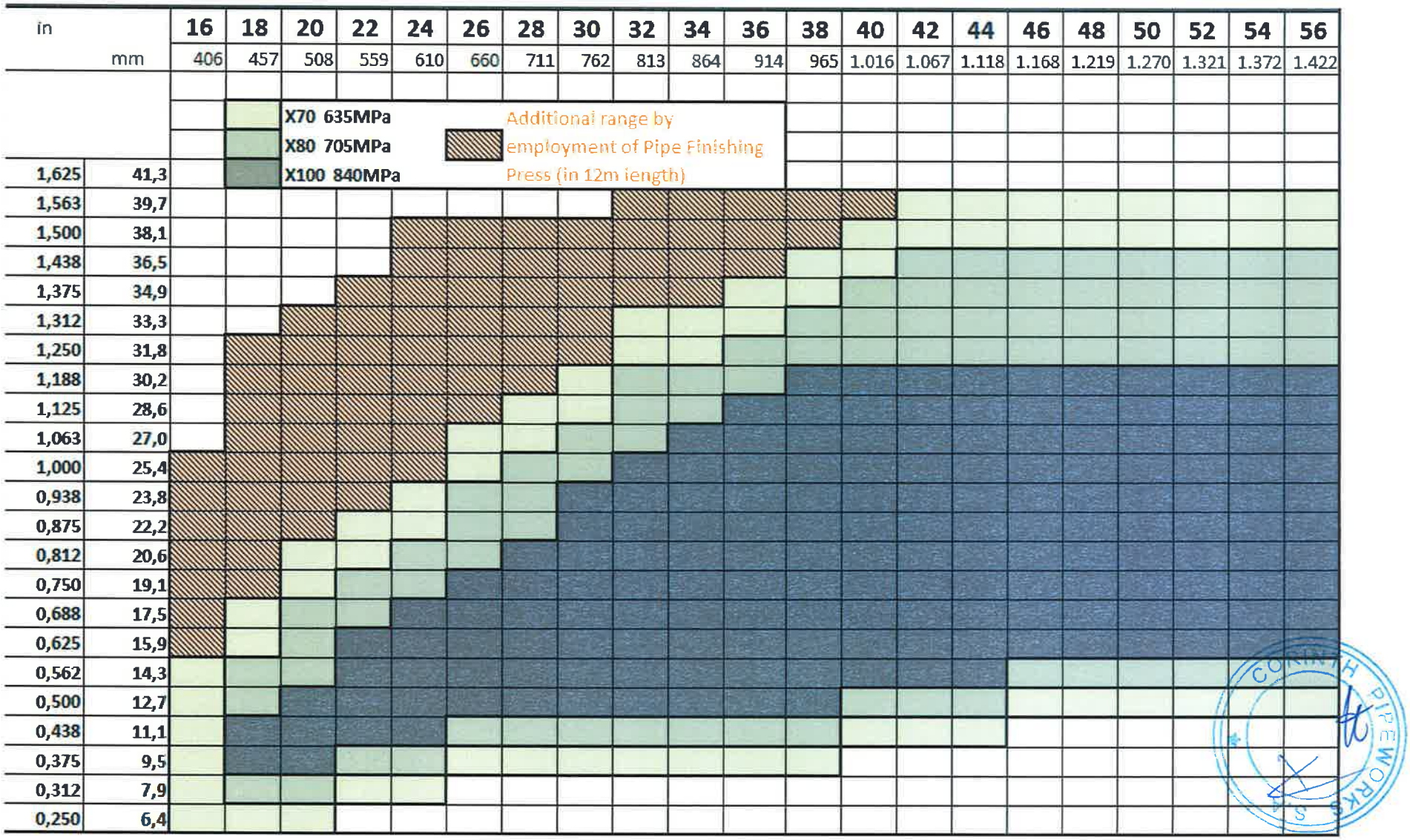
56” LSAW – JCOE - Production range

Production program – Length up to 18.3m



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Coating solutions

Anti-corrosion coating and lining

2 production lines for external 3 layer PE / PP and FBE/ FBE-ARO coating
1 line for liquid Epoxy lining

	External		Internal (lining)
	1st line - TCP 48	2nd line - TCP 100	TLP 56
Outside Diameter (inch)	4 1/2''–48''	8 5/8''–100''	8 5/8''–56''
Max. Length (m)	18 m	24 m	24 m
Capacity (per year)	6.300.000 m^2		2.000.000 m^2

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QUALITY PLAN

CORINTH PIPEWORKS S.A.

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CORINTH PIPEWORKS	QUALITY PLAN	NO	QP_03_18
		REVISION	0
		ISSUE DATE	05/03/2018

TITLE	QUALITY PLAN		
DOCUMENT No.	QP_03_18		
REVISION No.	0		
CUSTOMER	ICGB INTERCONNECTOR ICGB AD		
PROJECT	NATURAL GAS INTERCONNECTOR GREECE-BULGARIA (IGB)		
SCOPE OF WORK	LINE PIPES MANUFACTURE AND SUPPLY FOR THE NEEDS OF GAS INTERCONNECTOR GREECE - BULGARIA		
PRELIMINARY			
	ISSUED	REVIEWED / APPROVED	CUSTOMER APPROVED
DATE	05/03/2018	05/03/2018	
NAME / SIGNATURE	A. PETRINOLI QUALITY SYSTEMS MANAGER	N. VOUDOURIS QUALITY DIRECTOR	

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DOCUMENT MANAGEMENT OF CHANGE				
Rev. No	Date	Change Description	Actions needed (MOC)	Need for Risk management
0	05/03/2018	*Initial Issue*	*None*	*No*

* ***R.M: Risk Management*** *(If "YES," the code number of the risk, as given in Form CPW-B-X-140.0.1, shall be reported)*

CORINTH PIPEWORKS S.A.

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1 Control of Contract Quality Plan

1.1 Revision Status

This document is submitted to **ICGB AD** for approval.

1.2 Controlled Copy Distribution List

The distribution of the Project Specific Quality Plan is performed in a controlled manner. The approved document is distributed electronically (soft copy), to facilitate all parties and avoid postal delay. The soft copy is a scan of the signed original, which is kept in the file of the Project by CPW Project Management Department.
The document name, revision status, submission date and approval status is depicted in the Project Document Register.

1.3 Preparation, Approval, Issue and Revision of the Contract Quality Plan

The Project Specific Quality Plan is prepared and issued by the Quality Systems Manager of CPW and approved by the Quality Director of CPW. Upon approval the document is send to **ICGB** for review via CPW's Project Management Department.

This Project Specific Quality Plan is taking into consideration all the project specific requirements and the requirements of the following International Standards:

- ISO 9001.
- API Q1.

2 General Quality Planning

2.1 Corporate & Contract Specific Quality System Documentation

The main Quality System documents of CPW are:

- CPW Quality Policy
- CPW Quality Manual
- CPW specific procedures and Working instructions.

In order to incorporate project specific requirements, CPW will issue project specific Manufacturing Procedure Specification (MPS) and Inspection and Test Plan (ITP). MPS and ITP shall be prepared, reviewed and approved as described in paragraph 2.3.12.3.

All other aspects of the project are covered by CPW quality system provisions and presented in the following paragraphs.

2.2 Activities to be controlled by the Quality Plan, including Sub contractors

CPW has developed and implements a documented system to safeguard that all sales- purchasing, inspection and test operations are performed under controlled conditions. The following paragraphs describe all the above activities from customer order acceptance to the delivery of products.
Each activity presented in this project specific quality plan is covered by the relevant procedures of CPW Quality System. These procedures are mentioned at the end of each section.
The activities to be controlled by this Quality plan are presented in the following paragraphs.

2.2.1 RISK MANAGEMENT

CPW maintains documented procedures to identify and control risk associated with impact on delivery and quality of product. Risk Management is the process of eliminating potential sources of failure to achieve objectives and is

consisted of risk assessment and risk control (mitigation plans, treatment plans, contingency planning). Application of consistent and comprehensive risk management process:

- Increases the likelihood of achieving the quality objectives
- Supports effective decision making through better understanding of risk
- Creates a more stable working environment

Risk management applies for risks:

- associated with product delivery, including CPW plant facilities or equipment and raw/secondary material availability and supply
- associated with product conformance to the specified requirements, including the availability of competent and trained personnel.

Relevant Procedures:
CPW-B-X-140.0 QMS Risk Assessment and Management with Contingency Planning

2.2.2 PLANNING OF PRODUCT REALIZATION

CPW has developed and implements the processes needed for product realization consistent with corporate policy, objectives set by the management and fulfillment of customers' requirement.
In particular plant planning function operates at the corporate level, covers the life cycle of orders and incorporates the following:

- Short-term production, material and personnel scheduling.
- Middle, long-term production capacity, material requirements and personnel planning.

In addition, developing these processes, CPW determines necessary resources, required verification, validation, monitoring, inspection and test activities, appropriate records needed to provide evidence that the realization processes and resulting product meet the requirements.

Planning of the project is in accordance with the Execution Plan.

2.2.3 CUSTOMER RELATED PROCESSES

2.2.3.1 Determination of requirements related to the product

CPW has developed and implements procedures for the determination of customers' requirements taking into account statutory and regulatory requirements related to the product.
Additionally it has established and maintains procedures for identification and significance evaluation of activities and services, covering the following circumstances:

- Direct and indirect.
- Past, present and planned.
- Normal and abnormal.

Furthermore it has established and maintains procedures for the ongoing identification of hazards, the assessment of risks and the implementation of necessary control measures, which shall include:

- Routine and non-routine activities.
- Activities of all personnel having access to the workplace (including subcontractors and visitors).
- Facilities at the workplace, whether provided by CPW or others.

2.2.3.2 Review of requirements related to the product

GENERAL

CPW has established business procedures for reviewing Customer requirements specified in contracts under negotiation, tenders, or changes to existing contracts ensure that:

- Requirements are adequately defined and properly documented and
- CPW has the technical ability and the necessary resources to satisfy them.

REVIEW

Before a new contract is signed or an offer is submitted all organization elements of the Company affected or at any way involved during the implementation phase are analyzing and evaluating, with respect to their functions and responsibilities, all available data (Contract, Request for Proposal, Specifications and Standards etc) to ensure that Customer and other requirements are clearly and adequately defined.

The objective is to identify the commercial, technical and legal requirements and the impact that the new requirements may have to the Company's functions.

The results of such reviews are submitted accordingly to the relative authorized person for final approval before agreement is made with and contractual commitment is undertaken to the Customer by CPW.

AMENDMENT TO A CONTRACT

Changes made during the life of the contract, either imposed by the Customer or proposed by the Company shall always be incorporated into the contract in the form of Amendments.
Such changes are reviewed by all affected functions of the Company like the original contract, in order to evaluate the impact the changes may have to the current operations and determine the actions to be taken for their implementation.
It is the responsibility of the relevant Commercial Section Manager to transfer all information related to the change to all affected functions and, after obtaining the concurrence of Plant Managers, inform the Customer about CPW decision and the necessary arrangements for the implementation of the change.
Relevant modifications to current Quality Plans and/or Procedures / Work Instructions are applied in order to be in compliance with new contract requirements.

RECORDS

All documentation, which is developed during contract review, is collected by the Commercial Department and maintained as System Records.

2.2.3.3 Communication

CUSTOMER

CPW has developed and implements procedures to control communication with customers for:

- Product information
- Enquires, contracts, order handling including amendments
- Customer feedback, including customer complaints

Relevant Procedures:
CPW-B-X-240.0 Monitoring of customer satisfaction and claim handling
CPW-B-X-255.0 Technical review of customer inquiry
CPW-B-X-225.0 Order review, acceptance & order entry

2.2.4 PURCHASING

It is the policy of CPW to purchase materials and services, hereafter referred to as "items", through suppliers (vendor and subcontractors) of known quality, environmental and safety performance. All purchased items shall conform to the contractual and other requirements in accordance with documented procedures and instructions.
The term "items" also covers any processes affecting product conformity that may be subcontracted (outsourced).

2.2.4.1 Evaluation of suppliers & subcontractors

The selection of the suppliers and subcontractors is made on the basis of their ability to assure the required quality aspects with due regard to quality. Their performance is continuously evaluated and recorded and the so obtained records constitute the basis for continuation of the Company's cooperation with them.

The approved suppliers and subcontractors are listed in the "Approved Suppliers & Subcontractors List" per supplier category, where applicable.

To qualify for approval to receive orders for CPW a supplier / subcontractor must comply with certain basic requirements, which are fundamental to the effective control and assurance of the quality of the ordered items, in conjunction with the environmental and safety principles.

Suppliers and Subcontractors listed in the Approved Suppliers & Subcontractors List are periodically evaluated to assure that they maintain their approval status.

The introduction of a new Supplier / Subcontractor in the above List is made through the following procedure.
An evaluating team consisting of representatives of various functions the Company and is formed and responsible for the evaluation of the candidate. The survey is made according to standard checklists, which has been structured in such a way as to reveal the suppliers/ subcontractors ability to meet the Company procurement requirements.

The basic criteria against which the evaluation is made are:

- Technical capabilities and capacity.
- Quality / Environmental/ H&S System.

Evaluation is carried out using one or more of the following methods:

- Technical evaluation / auditing of suppliers-subcontractors conformance to CPW requirements.
- Production trials and/or samples testing, where applicable.
- Review of Supplier's Management System for compliance with applicable standard and CPW requirements.

2.2.4.2 *Purchasing Data*

The identification of the requirements of the products and services needed for the implementation of the Contract is made during the contract review, as described in Section 3.
The purchasing documents shall contain a complete and clear description of the items to be ordered, including:

- Commercial terms, quantity and pricing.
- The type, class, style, grade, batching or other precise identification.
- The title or other positive identification and applicable issue of specifications, drawing, process requirements or other relevant technical data.
- The quality-environment-safety-health control/ inspection requirements.
- Change control instructions.
- Packing, delivery and shipping instructions.

For steel raw materials, CPW has established specific procedures to address particular issues.
All purchasing documents shall be reviewed and approved prior to their release to suppliers by relevant authority as described in specific procedures.

2.2.4.3 *Verification of purchased product*

Purchased products or services before being accepted by CPW are subject to a process of verification, the purpose being to assure that they meet the Purchasing Document's requirements. The verification process includes verification at source and/or receiving inspection at Plant. No release of purchased product is allowed before all verification activities have been completed.
Specific procedures for verification of received raw and secondary material special products are issued.

2.2.4.4 *Supplier verification at supplier's premises*

When required product quality may be verified at supplier premises. Such a verification method shall be explicitly specified in Quality Plan and / or procedures.
Specific procedures for verification of subcontracted product are issued according to Quality plan requirements.

2.2.4.5 Customer verification of subcontracted product/ service

When specified in the order Plant Management is responsible for making arrangements for customer's representative to verify that subcontracted products/ services conform to specified requirements. This verification may take place where appropriate at CPW's and/or supplier's premises. Specific procedures for verification of subcontracted product are issued.

Relevant Procedures:
CPW-B-X-271.0 Critical Purchases
CPW-B-X-272.0 Non critical purchases

2.2.5 PRODUCTION AND SERVICE PROVISION

CPW has established and maintains procedures and work instructions to:

- Cover situations where their absence could lead to deviations from the corporate policy, objectives and targets.
- Stipulate operating criteria.
- Design of workplace, process, installations, machinery, operating procedures and work organization, including their adaptation to human capabilities, in order to eliminate or reduce H&S risks at their source.

2.2.5.1 Control of production and service provision

All production/ inspection and test operations are performed under controlled conditions.
These conditions include documented work instructions, certified (licensed) personnel, suitable equipment, criteria for workmanship and, when required, controlled special processes and working environment. Such conditions also cover management of HSE aspects related to production and service operations.
Customer servicing is confined to information communications with the customer at all stages of the order life cycle. Such tasks are undertaken by commercial department as described in procedure CPW-B-X-240.0 (Monitoring of customer satisfaction and claim handling).

PROCEDURES / WORK INSTRUCTIONS

All operations are performed as prescribed in detail Procedures / Work Instructions. Depending on the complexity and criticality of the works such documents include or refer to Process Sheets, Inspection/Test Procedures.
It is the responsibility of the Quality Function to assure that Documents related to product quality are and continue to be in full compliance with the agreed or prescribed requirements.

MANUFACTURING PROCESS SHEETS

The Manufacturing Process Sheets are issued on a project basis and contain controlling operations, special processes, inspection and test, hold point and acceptance criteria. They provide detailed description on how a job will be done, the order with which the manufacturing/operations are to be performed, associated specifications to be used and other pertinent information.

PERSONNEL CERTIFICATION

Employees performing specialized functions with a critical impact on: Product quality (e.g. production or inspection and testing) such as welding, non-destructive testing, etc. are required to be certified prior to perform such operations. To fulfill the certification requirements the employees have to demonstrate adequate proficiency by succeeding in theoretical written and/or oral examinations and operational tests which can prove his sufficiency in respect to the knowledge and practice of the operation.

Personnel Certification is performed using external sources. Certificates or licenses are issued and retained to demonstrate the required competence level.
Quality Function is responsible to identify the certification requirements, co-ordinate the certification process and follow-up to ensure that personnel maintain their certification status.

2.2.5.2 Identification and traceability

CPW has established plant specific procedures to cover the following:

- Materials and products are uniquely identified along all stages of receiving, storage, production, storage and delivery by using suitable marking according to the applicable specifications and internal procedures (eg. labeling).
- Product and materials traceability and inspection/test status is achieved through data collection systems (manual and automatic) through all production and processing stages in all company manufacturing lines.
- Identification and traceability of materials and products are monitored throughout by designated Quality Control personnel to ensure that requirements are met and initiate corrective action.
- Maintenance and/or replacement of product identification marks and identification control records, should it be required.

Relevant Procedures:
CPW-T-HSJCL-310.0 Traceability during manufacturing and coating of HFW, SAWH & SAWL Pipes

2.2.5.3 Preservation of products and materials

CPW has established documented procedures on a project basis for handling, storage, packaging and preservation of products and materials. These procedures also stipulate that stored products are periodically assessed to prevent product and materials deterioration due to environmental conditions and ageing.
Depending upon the nature of the material, which can be raw material, consumables, semi-finished or finished product and the contract or regulatory requirements, specific instructions are developed and implemented to assure that they are handled, stored, packaged and delivered to the customer in such a manner as to protect the quality as well as to ensure environmental and safety requirements.
Logistics function is responsible to assure that relative procedures are implemented in accordance to a Logistics Plan.

2.2.6 CONTROL OF MONITORING AND MEASURING DEVICES

All inspection, measuring and test equipment, including tools used as media for inspection and affecting quality, environmental, health and safety performance, are controlled and maintained in a manner which ensures that their capability and accuracy satisfy relevant specified requirements, according to established procedures.
All the devices - as described above - when purchased and before being released for use are identified by unique identification number which is properly marked on the equipment and listed in the Calibration List. Personnel are not permitted to use any means of inspection measuring and testing other than the ones provided by the Company.
The required accuracy of the inspection, measuring and test equipment is achieved and maintained through a Calibration Program.
Calibrations are made by using external sources always following applicable calibration standards, which provide information and instruction with regard to Equipment Identification, including identification number, manufacturer, type and model, accuracy and range of application, Calibration method, Frequency of calibration and Repair Instructions as to correct deviations found during calibration.
Suitable environmental conditions for calibration, inspections, measurements and tests are specified in relevant plant procedures. These procedures specify any handling, preservation and storage special requirements for inspection, measuring and test equipment in order accuracy and fitness-for-use is maintained. These will also cover suitable safeguards of inspection, measuring and test facilities (hardware and software) to prevent any adjustments that would invalidate the calibration settings.
Calibrations are documented through calibration records.
When an inspection, measuring and test equipment during calibration is found to be out of the specified tolerance, the products or work which have been inspected, measured or tested shall be re-inspected by an equipment of known accuracy while the defected equipment shall be sent for calibration.

Quality Function is responsible to coordinate relevant activities regarding its area of responsibility for assuring the effective and successful implementation of the Calibration Program.

Relevant procedures:
CPW-T-HSJCL-195.0 Calibration Procedure

2.2.7 *MEASUREMENT, ANALYSIS AND IMPROVEMENT*

CPW plans and implements the monitoring, measurement, analysis and improvement processes needed to:

- Demonstrate conformity of the product and related production processes to project applicable specifications.
- Ensure conformity of the QMS in relation to the project quality requirements.
- Continually improve the effectiveness of the QMS.
- Meet the corporate objectives and targets of the project.
- Meet the planning schedule for the project.

2.2.8 *MONITORING AND MEASUREMENT*

2.2.8.1 *Customer satisfaction*

As a measurement of the overall performance of the QMS, CPW monitors information relating to customer perception as to whether the organization has met customer requirements and expectations. The methods for obtaining and using this information are determined in relevant procedures.

2.2.8.2 *Audits*

2.2.8.2.1 *Internal Audits*

CPW conducts periodical internal audits within all its functions and levels at least annually according to documented procedure, in order to determine whether the QMS:

- Conforms to planned arrangements, the requirements of Quality Management Standards implemented in CPW and to customer requirements.
- Is effectively implemented and maintained.
- Is effective in meeting the corporate policy, objectives and targets.

Audit programs are planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits or any other information and data required. The audit criteria, scope, frequency and methods are defined. Selection of auditors and conduct of audits ensures objectivity and impartiality of the audit process, by avoiding auditors being directly responsible for audited areas.
The responsibilities and requirements for planning and conducting audits and for reporting results and maintaining records are defined in the relevant documented procedure.
The management responsible for the area being audited ensures that actions are taken without undue delay to eliminate detected nonconformities and their causes. Follow-up activities include the verification of the actions taken and the reporting of verification results.

2.2.8.2.2 *External Audits*

CPW shall cooperate with the Project Management Team to allow customer or their authorized representatives and Certifying Authorities access at reasonable times for the purpose of audit, review and surveillance of the services.

2.2.8.2.3 *Internal Audit Schedule*

The internal audits conducted in the company Quality Management System are planned and communicated to the company through the Internal Audit schedule issued by the Quality Director of CPW. All processes should be audited against ISO 9001 requirements at least once per year.

2.2.8.3 *Monitoring and measurement of processes*

CPW applies suitable methods for monitoring and - where applicable - measurement of the QMS processes, as well as production and service provision processes. When planned results are not achieved, correction and corrective actions are taken, as appropriate, to ensure conformity of the product.

2.2.8.4 Monitoring and measurement

CPW monitors and measures the characteristics of the product to verify that product requirements have been met, according to documented procedures. This is carried out at appropriate stages of the product realization process (receiving, in-process and final) in accordance with documented procedures. Incoming material is never released on urgent basis; it is mandatory that receiving inspection has been completed and results verify its conformity.
Evidence of conformity with the acceptance criteria is maintained. Records indicate the person(s) - Quality Control - authorizing release of product, which is different than those who performed or directly supervised product manufacture. Product release does not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by a relevant authority and -where applicable- by the customer.

Relevant procedures:
All procedures regarding monitoring and measurement of parameters related to product/process specifications are referenced within each production line process manuals. In addition, at corporate level the following procedures apply:
CPW-B-X-105.0 Internal audits
CPW-B-X-110.0 Quality Objectives / Continuous Improvement
CPW-B-X-111.0 Analysis of Data- QMS Performance Monitoring
CPW-B-X-240.0 Monitoring of customer satisfaction and claim handling

2.2.9 CONTROL OF NON -CONFORMANCES, DEVIATIONS, ACCIDENTS, INCIDENTS

PRODUCTS

CPW ensures that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. The controls and related responsibilities and authorities for dealing with nonconforming product are defined in the relevant documented procedure. The company deals with nonconforming product by one or more of the following ways by:

- Rework or repair to specified requirements and re-inspection.
- Authorizing its use, release or acceptance under concession by a relevant authority and - where applicable - by the customer.
- Taking action to preclude its original intended use or application, by downgrading or scraping.

The decision for disposition of nonconforming products is based on the evaluation of the type and the severity of nonconformance in relation to:

- Manufacturing acceptance criteria.
- Design acceptance criteria.

which are both stipulated by customer requirements. In all cases where acceptance criteria need to be revised customer approval is obtained in written.
Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, are maintained. When nonconforming product is corrected it is subject to re-verification to demonstrate conformity to the requirements.
When nonconforming product is detected after delivery or field use has started, the organization takes respective action appropriate to the effects, or potential effects, of the nonconformity.

CPW ensures that any corrective action taken to eliminate causes of non-conformances is appropriate to the magnitude of problems and commensurate with the product deficiencies encountered. Relevant records are kept.

Relevant procedures:
All practices regarding handling of non-conformances related to product/ process specifications are referenced within each production line process manuals:
CPW-B-X-130.0 Non-conformances, corrective and preventive actions
CPW-B-X-135.0 Addressing Nonconforming Product

2.2.10 ANALYSIS OF DATA

CPW determines, collects and analyzes appropriate data to demonstrate the suitability and effectiveness of the QMS and to evaluate where continual improvement of the effectiveness of the QMS can be made. This includes data generated as a result of monitoring and measurement and from other relevant sources. The analysis of data provides information relating to:

- Customer satisfaction.
- Internal and External Complaints and Observations/ Recommendations.
- Conformity to product requirements.
- Characteristics and trends of processes and products including opportunities for preventive action.
- Evaluation and performance monitoring of Suppliers and Subcontractors.

This includes determination of applicable methods, including statistical techniques and the extent of their use. In all cases where such techniques are applied, they are described in relevant documented procedures either at corporate or plant level.

Relevant procedures:
CPW-B-X-111.0 Analysis of Data- QMS Performance Monitoring

2.2.11 IMPROVEMENT

2.2.11.1 Continual improvement

CPW continually improves the effectiveness of the QMS through the use of the corporate policy, objectives, targets, audit results, analysis of data, corrective actions, as well as management review.

2.2.11.2 Corrective action

CPW ensures that any corrective actions taken to eliminate causes of actual non-conformances are appropriate to the magnitude of problems and commensurate with the product deficiencies encountered, in order to avoid recurrence. A documented procedure has been established to define requirements for:

- Reviewing nonconformities (including customer complaints).
- Determining the causes of nonconformities.
- Evaluating the need for action to ensure that nonconformities do not recur.
- Determining and implementing corrective action needed.
- Records of the results of corrective action taken.
- Reviewing corrective action taken.

Relevant procedures:
CPW-B-X-110.0 Quality Objectives / Continuous Improvement
CPW-B-X-111.0 Analysis of Data- QMS Performance Monitoring
CPW-B-X-120.0 Management Review
CPW-B-X-130.0 Non-conformances, corrective and preventive actions

2.2.12 CONTROL OF DOCUMENTS AND DATA

CPW has established documented procedure for controlling all documents and data of the QMS System for work or activities affecting Quality matters. The issuance, the authorization, the correctness and the proper distribution of all such documents are assured through methods and mechanisms, which have been determined and implemented by the company.

All controlled documents bear on each page the revision number and the corresponding date.
In order to avoid 'bulks of paper', the documents and data distribution procedure is applied electronically to all workstation with computer access and paper is confined to a minimum. At any case the scope of this procedure provides for:

- Establishing and updating of an official distribution list.
- Proof that the recipients receive the documents.
- Indication of the update (e.g. master list) and authorization status.
- Removal of the obsolete Documents.

2.2.12.1 Document and Data Changes

Any changes to the standards or the technical documentation or even the contract are reviewed and analyzed with respect to the impact that may have on the existing documentation and the necessary changes and/or modifications are made in order to ensure that at any time the documents in use are consistent with the Customer requirements and the applicable Standards and specifications.
Changes to contract and customer technical documentation will also be followed-up, in order to implement the appropriate revisions to the affected documents and functions within the company.
The revisions are made and approved by those who are accordingly responsible for the issuance and approval of the original or current documentation. Revision numbers on each document identifies revision status.
All obsolete documents, which are retained, are suitably identified and kept in separate record files to avoid unintended use. Such documents may be kept only for legal or customer requirements purposes.

2.2.12.2 Control of Records

It is CPW to develop and maintain records to be used as objective evidence that the works performed and the activities carried out, comply with Quality requirements.
Contracts, Work Instructions, Test procedures, Materials' Certificates of conformity, Lab and Test reports, Audit reports, Nonconformance reports, Suppliers evaluation Sheets, Corrective Action reports etc. after completion of the relevant work become objective evidence and constitute system records.
System records are identified when applicable by subject, they are kept in hard copies or into the computer in such a manner as to be readily available when requested.
Records shall always be available upon request by the Customer or a Third Party, which is involved in the Project.

CPW has established documented procedure for records control. In particular, each procedure / work instruction has a section which describes the records kept as objective evidence of its implementation, as well as the time period, responsible person for maintenance and format of each record. System records will be kept for a minimum of 10 years or longer if required by customer specification.
All records are legible, identifiable, traceable, stored and maintained in such a way that they are readily retrievable, using facilities that provide suitable environments to minimize deterioration and prevent loss.

2.2.12.3 Project Specific QA/QC Plans

The project specific Manufacturing Procedure Specification (MPS) and specific Inspection & Test Plan (ITP) are issued by the Quality Dpt Managers/Engineers of CPW and approved by the Quality Director of CPW. Upon approval the document is send to **ICGB AD** for review via CPW's Project Department. The reviewed document is returned to CPW project department and forwarded to the Quality Dpt. for further action, if needed.

The distribution of the approved project MPSs/ITPs is performed in a controlled manner. Responsible for the distribution of the documents is the Project Manager. Responsible for the implementation of the project MPS are the Quality Control Managers of CPW production lines.

The documents are distributed as a soft copy, electronically to facilitate all parties and avoid postal delay. The soft copy is a scan of the signed original, which is kept in the file of the ICGB Project by CPW project department.
The documents names, revision status, submission dates and approvals status are presented in the project document register.

Relevant Procedures:
CPW-B-X-100.0 Control of Documents & Records

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3 Organizational Structure

3.1 CPW Organization Chart

CPW Organization Chart is analytically described in CPW document CPW-B-X-050.0.1.

3.2 Job Descriptions, Authority Levels and Reporting Relationships

Job description, authority levels and reporting relationships are analytically described in CPW procedure CPW-B-X-050.0.

The main responsibilities and the reporting relationship of CPW personnel directly involved with quality are as follows:

The Mill Quality Control Manager of each production line is responsible for:

- Implementing the requirements of the approved ITP and MPS.
- Verify full compliance with the project specific procedures.
- Prepare all quality records required.
- Issue the Qualification reports.

They report to the Quality Director on a weekly base (internal meetings) on the overall progress of the project and cooperate with him on issues concerning documentation and customer inquiries.

The Project Manager is responsible for:

- Management of all the project specific documents required by the contract and their approval by **ICGB AD**.
- Being the contact person for **ICGB AD** on technical and quality issues concerning the project.

The Project Manager is in close cooperation with the Quality function on all aspects concerning the project.

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